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THE FIRST WILD RECORD OF *BULBOPHYLLUM LEMNISCATOIDES* CONFIRMS ITS OCCURRENCE IN THE PHILIPPINE ARCHIPELAGO WITH NOTES ON ITS HABITAT AND CONSERVATION STATUS

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Abstract. *Bulbophyllum lemniscatoides* Rolfe is a species native to Peninsular Malaysia, Thailand, Laos, Cambodia, Vietnam, Sumatra, Java, and Borneo. It was recently collected in Mt. Timolan Protected Landscape of Zamboanga del Sur, confirming its occurrence in the Philippine archipelago. Here, we provide species descriptions based on our collected material and photographs to aid identification, geographical distribution information, habitat, phenology, and an IUCN conservation assessment.

Keywords/Palabras clave: *Bulbophyllum* sect. *Lemniscata*, Dendrobieae, Mindanao, Orchidaceae, Península de Zamboanga, plant taxonomy, taxonomía de plantas, Zamboanga Peninsula.

Introduction. *Bulbophyllum* Thouars is one of the largest genera of angiosperm belonging to the family Orchidaceae. It is represented by over 2200 species widely distributed in tropical and subtropical regions throughout Africa, Asia, and the South Americas (Lin *et al.* 2020, Vermeulen *et al.* 2015). In the Philippines, the genus is represented by approximately 204 species (of which 71% are endemics) belonging to over 20 sections (Cootes 2011, Pelser *et al.* 2011 onwards). Currently, the taxonomy of the genus in the country is very problematic and requires revision. Furthermore, given the increasing pace of forest destruction and habitat loss in the Philippines (Naive 2017), it is likely that some unknown or poorly known *Bulbophyllum* species face extinction before their taxonomy, phylogeny, and ecological or economic uses, can be fully explored.

An unknown *Bulbophyllum* species identified as a member of section *Lemniscata* was collected in Mount Timolan Protected Landscape, Zamboanga del Sur of the island of Mindanao in January 2022, as part of the first authors' ongoing exploratory and conservation work on Philippine Orchidaceae. We identified this as *Bulbophyllum lemniscatoides* Rolfe using Vermeulen *et al.* (2015), a species distributed in Borneo, Java, Lesser Sunda Islands, Malaysia, Sumatera, Thailand, and Vietnam (POWO 2022). In the account of Co's Digital Flora of the Philippines, the species was reported to occur in Negros based on the photographs taken from the cultivated material of Mr. Ravan Schneider in February 2013 but without exact locality data (Pelser *et al.* 2011 onwards). We confirm the occurrence of *B. lemniscatoides* in the Philippine archipelago with a voucher specimen and provide a description based on our collected material, photographs to aid identification, updated geographical distribution information, habitat, phenology, and a preliminary IUCN conservation assessment.

Materials and methods. The measurements and descriptions were based on freshly collected material. Multiple photographs were taken using Canon EOS 800D, and coloured plates were prepared and edited in Affinity Photo software. Flowers were preserved in 70% ethanol and were subjected to stereomicroscopy. The general plant descriptive terminology follows Beentje (2016). Herbarium citations follow Index Herbariorum (Thiers 2022). Relevant specimens and literature of *Bulbophyl-*

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lum section *Lemniscata* species from neighbouring countries were examined in different herbaria through high-resolution images from Global Plants on JSTOR accessed at https://plants.jstor.org/ or Global Biodiversity Information Facility (GBIF) accessed from https://www.gbif.org. An assessment of the conservation status was carried out following IUCN (2019), based on our current knowledge and using their terminology on categories, criteria, and subcriteria.

Taxonomic treatment

Bulbophyllum lemniscatoides Rolfe, Gardeners' Chronicle Series 3, 7: 67, 1890. *Hordeanthos lemniscatoides* (Rolfe) Szlach., Richardiana 7(2): 89, 2007. LECTOTYPE (designated by Averyanov *et al.* 2019): INDONESIA. Java, *cult. Van Lansberge s.n.* (K000829216-image seen!). Fig. 1.

Small to medium-sized, epiphytic *herb*. *Pseudobulbs* ovoid, 1.6–2.0 cm long, 1.3–1.7 cm in diameter, glabrous, furrowed as it matures, green suffused with purple. *Leaves* 2, deciduous when flowering; *petiole ca.* 7–10 mm long, glabrous, pale green; *blade* elliptic, 10–14 cm long by 2–3 cm wide, glabrous both sides, margin entire, apex subacute. *Inflorescences* dense raceme, 19–20 cm long, 15–25-flowered; *peduncle* terete, 15–17 cm long, gradually thickening towards the rachis but thin again at the base of the rachis, glabrous, scales 2, persistent, 7–8 mm long, chartaceous, margin entire, apex acute; *rachis* 2.0–2.5 cm long; *floral bracts* persistent, narrowly ovate, 3–4 mm long by 1.0–1.5 mm wide, glabrous, apex long acuminate. *Flowers* sepals green, largely suffused with blackish purple except near the base, hairs white, appendage white with pale purple bands; petals white; lip blackish purple. *Pedicel with ovary* stout, 1–2 mm long. *Dorsal sepal* slightly porrect, ovate, 1.5–1.7 mm long by 1.0–1.1 mm wide, adaxially glabrous, abaxially sparsely hirsute with thin hairs, margin entire to slightly erose distally, apex obtuse, with a narrowly cylindrical appendage, 6.2–7.8 mm long by 0.10–0.15 mm wide, minutely papillose, obtuse to subacute. *Lateral sepals* ovate to triangular, 1.5–1.8 mm long by 1.3–1.4 mm wide, adaxially glabrous, abaxially sparsely hirsute with thin hairs, margin entire to slightly erose distally, apex obtuse, with appendage, appendage narrowly cylindrical, 6.2–7.8 mm long by 0.10–0.15 mm wide, minutely papillose, obtuse to subacute. *Petals* porrect, ovate, 1.5–1.7 cm long by 0.4–0.5 cm wide, glabrous, margins erose to finely lacerate, apex acuminate. *Lip* recurved, elliptic, 1.5–1.7 mm by 0.9–1.0 mm wide, papillose, margin entire, adaxially slightly concave near the base, slightly convex and channeled along median line, abaxially with a rounded ridge towards the base, concave towards the apex, apex rounded. *Column* 9–10 mm long; *stelidia* conspicuous, triangular, 0.4–0.5 mm, glabrous, apex acuminate; *pollinia* 4. *Capsule* 8–14 mm long, 4–5 mm in diameter, corrugated, sparsely pubescent, green.

Distribution: Peninsular Malaysia, Thailand, Laos, Cambodia, Vietnam, Sumatra, Java, Borneo, and the Philippines. *Bulbophyllum lemniscatoides* was reported from Myanmar by Kress *et al.* (2003), Nyan Tun (2014), and Averyanov *et al.* (2019). However, this report was found erroneous by Ormerod *et al.* (2021) as this is a misidentification of its closely similar species *Bulbophyllum lemniscatum* C.S.P.Parish ex Hook.f. In the Philippines, we will only report its occurrence in Zamboanga del Sur on the island of Mindanao, as the record in Negros of Visayas by Pelser *et al.* (2011) is based only on photos taken from a cultivated material without exact or sure locality.

Habitat: The species was found in the peak of Mt. Timolan growing as an epiphyte in the branches or trunks of *Mangifera indica* L. together with *Oberonia* sp. with direct sunlight and cool environment at elevations between 1000–1200 m a.s.l. In Borneo, the species was found in forest of lowland conditions (Vermeulen *et al.* 2015). In Vietnam, it was observed growing in evergreen broadleaved and semideciduous submontane forests at elevations between 600–1200 m a.s.l. (Averyanov *et al.* 2019).

Phenology: Observed flowering and fruiting in the wild in January and February. Under cultivation at Kew, the species flowers in March (POWO 2022). Based on herbarium records, the species flowers in November. The recorded flowering season of this species revealed to be in congruence with the observations of Averyanov *et al.* (2019), which is from November to February.

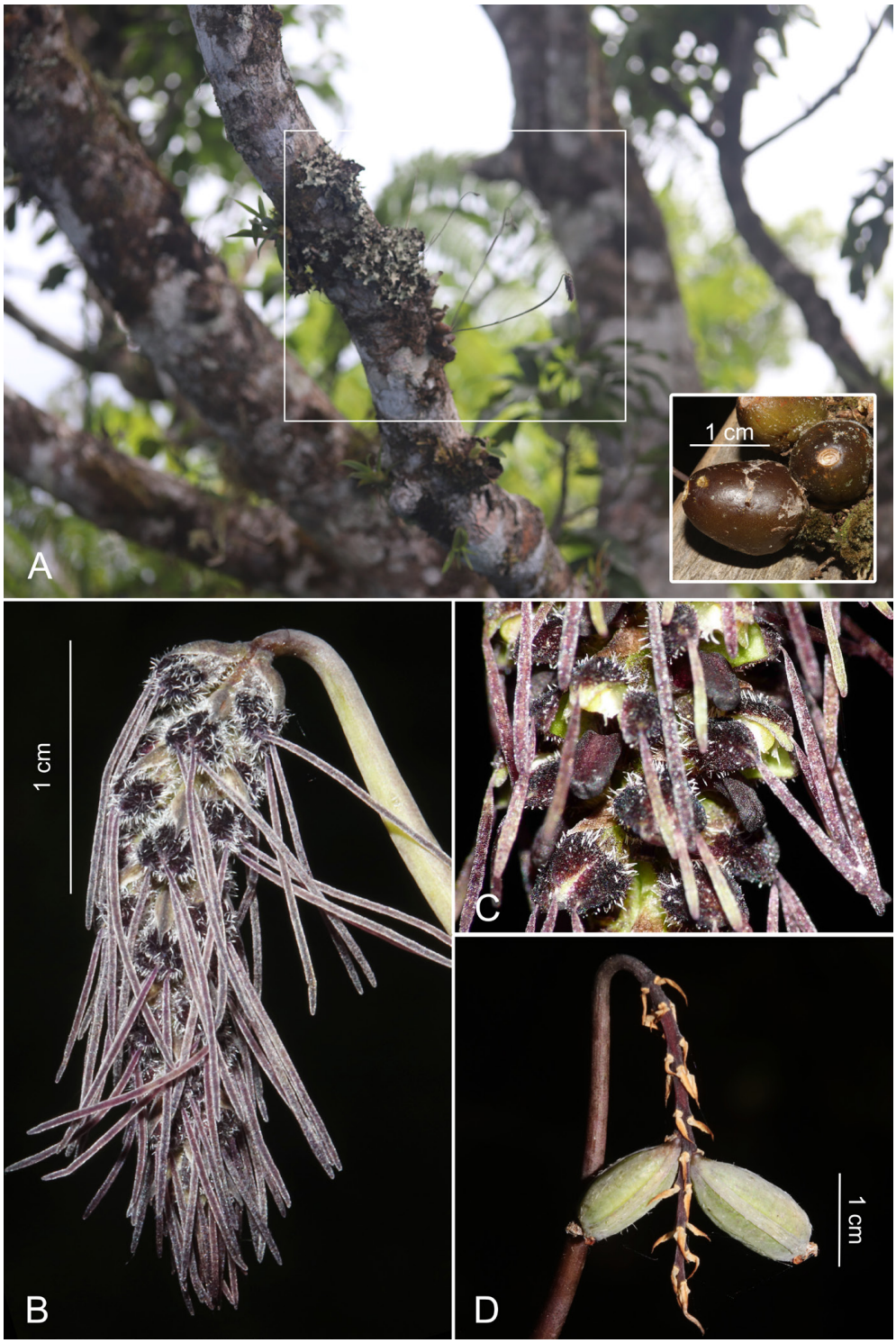

Figure 1. *Bulbophyllum lemniscatoides* in the wild. **A**. Habitat and habit, inset: pseudobulbs. **B**. Inflorescence. **C**. Detail of flowers. **D**. Fruits. Photos by M.A.K. Naive (A–B, D–E) and R. Schneider (C) based on *MAK Naive 128* (HNUL).

Proposed conservation status: Endangered (EN). Although widespread across Southeast Asia, the species observed to be very rare. In the Philippines, we found it at the peak of Mt. Timolan with less than 20 individuals and where anthropogenic activities are occurring. Mindanao embeds a diverse natural forest, however, the island is experiencing environmental pressures at present due to expansion of oil pal and rubber plantations coupled with other anthropogenic threats such as wildlife hunting and poaching (Tanalgo 2017). Thus, in this paper, we proposed this species to be treated as 'Endangered' following the Red List criteria of the IUCN Standards and Petitions Subcommittee (IUCN 2019). Accordingly, our assessment on *Bulbophyllum lemniscatoides* is in agreement to the proposed conservation status in Vietnam by Averyanov *et al.* (2019).

Specimen examined: PHILIPPINES. Mindanao: Zamboanga Peninsula, Zamboanga del Sur, Tigbao, Mt. Timolan Protected Landscape, elev. 1150 m, 29 January 2022, *MAK Naive 128* (HNUL).

Bulbophyllum lemniscatoides belongs to the section *Lemniscata*, characterized by having pseudobulbs of flowering shoots 2-leafed combined with deciduous leaves. This section is represented by approximately 32 species distributed in India, Nepal, Bhutan, China, Myanmar, Laos, Vietnam, Thailand, Peninsular Malaysia, Sumatra, Java, Borneo (Vermeulen *et al.* 2015), and now they can also be found in the Philippines, represented only by *B. lemniscatoides*.

All in all, the study was able to discover specimens of *B. lemniscatoides* in the wild enabling us to confirm its occurrence in the Philippine archipelago. Since the discovery of *B. lemniscatoides*, possibly further specimens could persist in the neighbouring localities, especially in relatively under-collected and under-explored forests and mountains of Mindanao. Therefore, it is highly recommended to conduct more extensive explorations to reveal the actual species diversity of Philippine Orchidaceae. We also advise *in situ* conservation plan for the species, including studies on phenology, pollination ecology, seed dispersal, and population dynamics, as well as to conduct fieldwork to search for other populations in any potential areas where this species may occur, such as in Negros.

Acknowledgements. We are grateful to the Protected Area Management Board of Mt. Timolan Protected Landscape especially to the Protected Area Superintendent (PASu) Mario B. Ronulo for permitting us to conduct this study; Maricris Cudal and Liberty Grace Calimbo for assisting and accompanying the first author during fieldwork; DENR Region IX (IX-PA-02-2022) for the issuance of the gratuitous permit; Michael Jay Calaramo for the processing of voucher specimen; Vuong Ba Truong for providing us relevant literature for *Bulbophyllum lemniscatoides,* and Ravan Schneider for allowing us to use his photo. The first author would like to thank Yayasan Konservasi Biota Lahan Basah and the International Association of Plant Taxonomy 'IAPT Research Grant 2021' for the funding support during his expedition; and Yhebron J. Lagud (Unit Head for Research) and Dr. Merlyn N. Luza (Campus Administrator) of JRMSU-Tampilisan Campus for their unwavering support.

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FOUR NEW SPECIES OF *LEPANTHES* (PLEUROTHALLIDINAE) FROM THE SOUTHWESTERN ANDES IN COLOMBIA

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Abstract. Four new species of *Lepanthes* from the southwestern Andes of Colombia are described, illustrated, and compared with morphologically similar species. The new species were found in San José del Salado, the Municipality of Dagua, Department of Valle del Cauca where several new species have been found and described in the past years.

Resumen. Se describen, ilustran y comparan cuatro nuevas especies de *Lepanthes* del suroeste de los Andes occidentales de Colombia con especies morfológicamente similares. Las nuevas especies fueron encontradas en el Municipio de Dagua, en San José del Salado, Valle del Cauca donde se han encontrado y descrito varias especies nuevas en los últimos años.

Keywords/Palabras clave: Cordillera Occidental, Dagua, Neotrópico, Neotropics, Orchidaceae, San José del Salado, Valle del Cauca, Western Cordillera.

Introduction. *Lepanthes* Sw., one of the most diverse genera in species number within the Orchidaceae (Karremans & Vieira-Uribe 2020), comprises more than 300 species described in Colombia, and new species are discovered and described every year (Baquero *et al*. 2021, Luer & Thoerle 2012, Restrepo *et al*. 2022). In the last seven years in San José del Salado, located on the western slope of the Western Andes of Colombia, Department of Valle del Cauca in the Municipality of Dagua, eleven new species from the genera *Pleurothallis* R.Br., *Epidendrum* L. and *Lepanthes* (Moreno *et al*. 2021) have been described. Furthermore, in 2022, several expeditions to the mountains of San José del Salado were made, and during these field trips, four new species of *Lepanthes* were discovered. Here, we describe, illustrate, and provide information about their distribution and similarity with the most closely related species.

Materials and methods. *Descriptions and drawings*.— The descriptions and drawings were prepared from living specimens and flowers preserved in 70% alcohol. Flowers were dissected, measured, and photographed using Celestron Handheld Digital Microscope Pro. Vegetative structures were measured from dried material and reproductive structures from spirit material. Digital images were taken with a Nikon d750 or Nikon D810 and a 105mm f/2.8 macro lens. Sketches from living and preserved specimens were digitized, and the images were used for diagramming a draft composite template in Adobe Photoshop® CS6. A digital composite line drawing was then made (lines and stippling) in Procreate illustration application for iPad 6th generation tablet computer (Bogarín *et al*. 2019). The new species were described following the botanical terminology by Stearn (1992), Beentje (2012), and Luer & Thoerle (2012). In addition, all original descriptions of related species were consulted for detailed comparisons (Dodson & Luer 2011, Luer 1996, Luer & Thoerle 2012).

Plant material.— Specimens from the following herbaria: AMES, CAUP, COL, CUVC, HUA, JAUM, JBB, VALLE, and MO (online) were consulted, and no additional material of the new species was found.

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Taxonomic treatment

Lepanthes cardenasii J.S.Moreno, Gal.-Tar. & Zuluaga, ***sp. nov.*** (Fig. 1, 2, 3A).

TYPE: Colombia. Valle del Cauca: Municipio de Dagua, Corregimiento de San José del Salado, 1716 m, 11 Jul 2020, *R. Galindo-T, D.L. Mora, J. Serna & C. Silva 1485* (Holotype: CUVC-Spirit).

Diagnosis: *Lepanthes cardenasii* is most similar to *L. praemorsa* Luer & R.Escobar but is differentiated by a lip with the blades wide and lunate (*vs*. the blades thin and oblong), with a reduced ovate and bifid appendix (*vs*. appendix thick and broadly triangular).

Plant small to medium in size, epiphytic, caespitose, 6.4–10.2 cm tall; *roots* slender, filiform 0.5–0.6 mm in diameter. *Ramicauls* sub-erect, weak, slender, horizontal, 3.8–7.5 cm long, enclosed by 6–10 closely fitting, microscopically ciliate-scabrous long acuminate lepanthiform sheaths with narrowly dilated, acuminate ostia. *Leaves* with brown edges, elliptic, thinly coriaceous, long acuminate, the apex emarginate with an abaxial apiculum in the middle, 1–8 × 0.5–2.0 cm, the base obtuse, contracted into a petiole 4.3–7.0 mm long. *Inflorescence* a congested, distichous, successively many-flowered, 7–11, raceme up to 1.6 cm long, including the peduncle, held appressed to the adaxial surface of the leaf by a filiform, terete peduncle, 3.4–7.8 cm long, borne near the apex of the ramicaul; *floral bracts* conical, acuminate 0.7–1.0 mm long; *pedicels* terete, 1.4–1.7 mm long. *Ovary* terete, costate, curved up, 1.9 mm long. *Flowers* with sepals pale green-brown; petals brownish yellow; lip burgundy in the center brownish-yellow in the borders, ovary red. *Dorsal sepal* suborbicular, convex, acute, 3-veined, 2.35 × 2.49 mm, connate to the lateral sepals for 0.6 mm. *Lateral sepals* ovate, oblique, acute, 2-veined, 1.9 × 1.4 mm, connate for 1.2 mm. *Petals* microscopically pubescent, transversely bilobed, 3.6 × 1.3 mm, with a filiform lateral midlobe, 1 mm long; the upper lobe subquadrate, sharply truncate, with a pronounced and acuminate inner corner, the upper edge praemorse; the lower lobe sub-triangular, oblique, acute. *Lip* minutely pubescent, bilaminate, the blades wide, membranaceous, thin, adherent medially over the column, sub-lunate with rounded ends, minutely ciliate, 2.8 × 1.4 mm, supported by short, thin cuneate connectives, from the base, the body wide, concave, adnate to the base of the column, the sinus obtuse, with a reduced, ovate, bifid, ciliate appendix. *Column* urceolate, flattened, 1.5–2.5 mm long, the anther dorsal and stigma ventral, the stigmatic cavity wide and expanded towards the base, bilobulate. *Anther cap* cordate, cucullate, 0.4 mm wide. *Pollinia* yellow, two, pyriform, 0.5 mm long.

Eponymy: The name of the new species honors Dairon Cárdenas López (1957–2022), one of the most prolific Colombian botanists and plant collectors who worked at Instituto Amazónico de Investigaciones Científicas – SINCHI. Dairon collected more than 50,000 plant specimens, mainly in the most remote places of the Colombian Amazon. Many of his collections represent new species and new records of plants for the country.

Habitat and ecology: *Lepanthes cardenasii* was found growing on *Andesanthus lepidotus* (Bonpl.) P.J.F.Guim. & Michelang. (Melastomataceae) isolated trees in cattle fields, close to a very well-preserved forest.

Lepanthes cardenasii is related to a group of species morphologically similar to *L. mucronata* Lindl., with a weak habit, ovate and acuminate leaves, small flowers born on top of the leaf, proportionally large petals compared with the size of the sepals, and a lip with thin, well-developed blades and sometimes concave appendices (Luer & Thoerle 2012). The most similar species is *L. praemorsa* (Fig. 3B), an endemic species from Colombia, but the new species could be easily distinguished by its suborbicular and small sepals (*vs*. ovate and larger), the petals praemorse but with a pronounced and acuminate inner corner and almost as wide as the length of the sepals (*vs*. praemorse petals with an absent inner corner, as wide as the length of the dorsal sepal); the lip bilaminate, with the blades wide and lunate (*vs*. the blades thin and oblong), with a reduced ovate and bifid appendix (*vs*. appendix thick and broadly triangular).

Lepanthes davidii Gal.-Tar., Zuluaga & J.S.Moreno, ***sp. nov.*** (Fig. 4, 5, 6C).

TYPE: Colombia. Valle del Cauca: Municipio de Dagua, corregimiento El Limonar, Quebrada La Española, 1700 m, 24 Jan 2021, *A. Zuluaga, R. Galindo-T & D.L. Mora 5077* (Holotype: CUVC-Spirit).

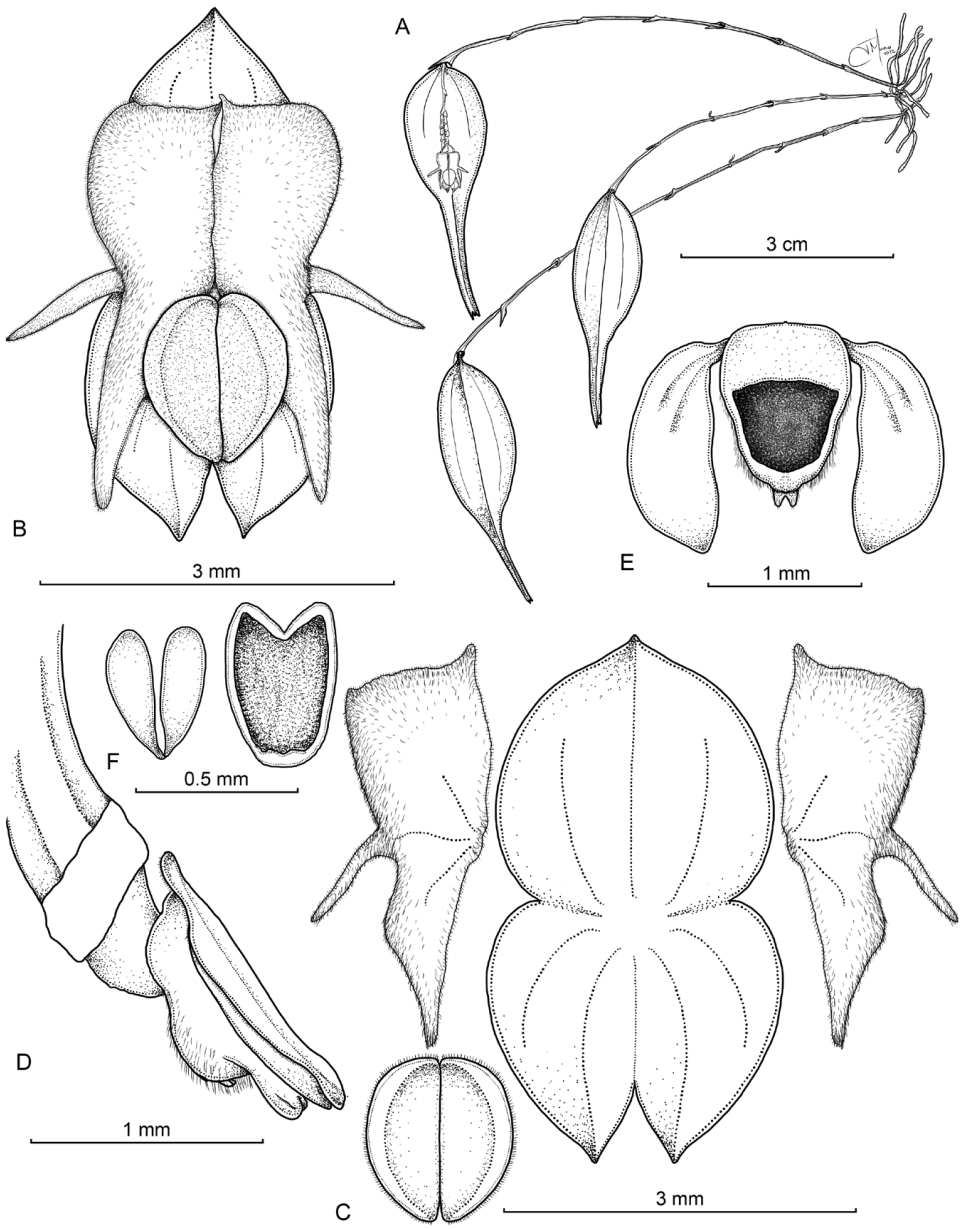

Figure 1. Drawing of *Lepanthes cardenasii* J.S.Moreno, Gal.-Tar. & Zuluaga. **A**. Habit. **B**. Flower. **C**. Dissected perianth. **D**. Ovary, column and lip, side view. **E**. Expanded lip. **F**. Pollinia and anther cap. Drawn by J.S. Moreno from the plant that served as the holotype.

Diagnosis: *Lepanthes davidii* is most similar to *L. ankistra* Luer & Dressler, but can be easily distinguished by the petals with the lower lobe triangular, acute (*vs*. petals with the lower lobe subfalcate and strongly uncinate), the lip with blades oblong-lunate with the apex and base sub-acute, (*vs*. blades ovate with the apex rounded and an acute base), and a bisegmented slender appendix with an ovoid deflexed apical portion (*vs*. single segment concave appendix with an apical gland).

Plants medium in size, epiphytic, caespitose, 13.1–17.4 cm tall; *roots*, slender, flexuous, filiform, 0.4 mm

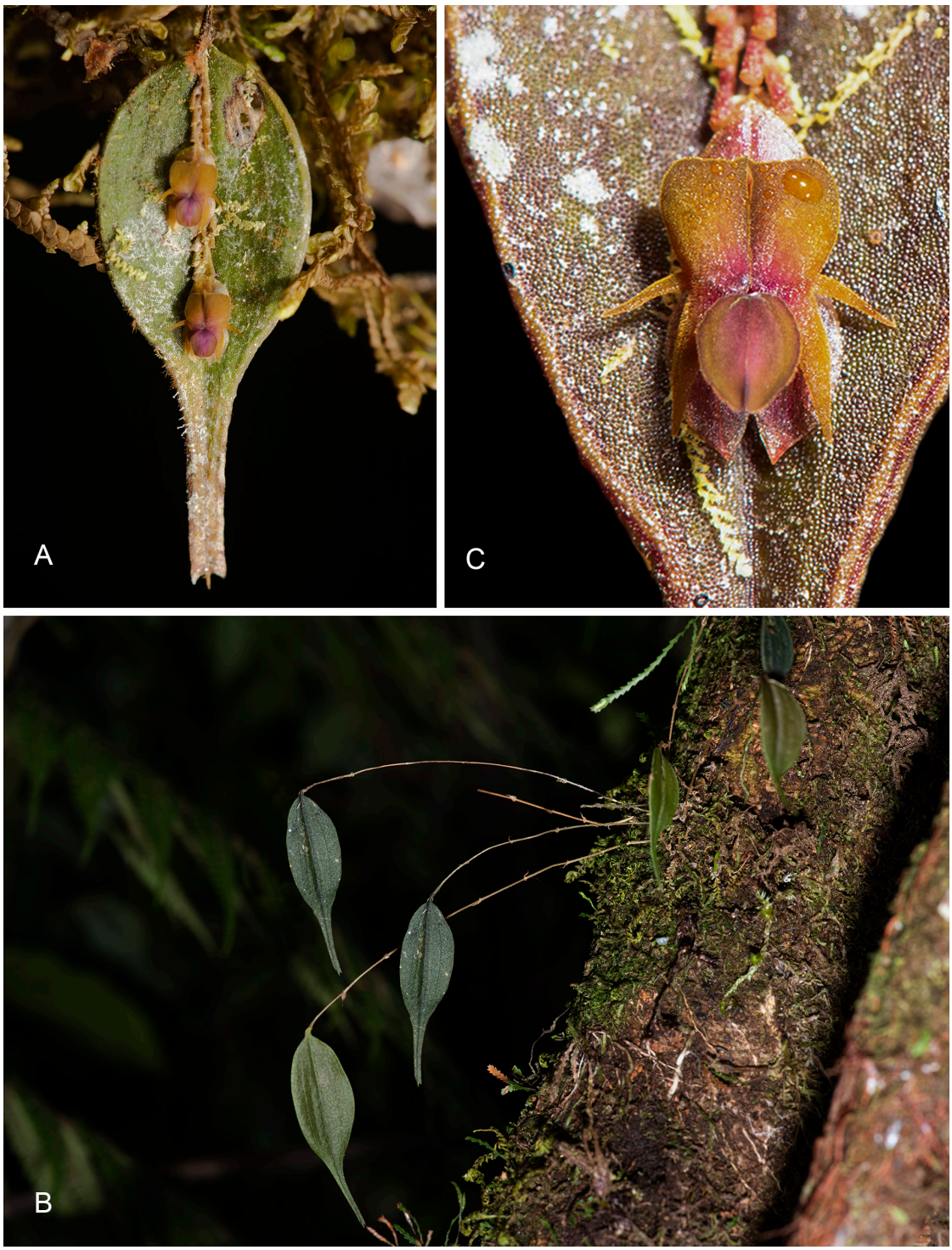

FIGURE 2. Photographs of *Lepanthes cardenasii* J.S.Moreno, Gal.-Tar. & Zuluaga. **A**. Leave and flower. **B**. Front view of the flower. **C**. Habit and plant *in-situ*. Photographs by R.G. Tarazona.

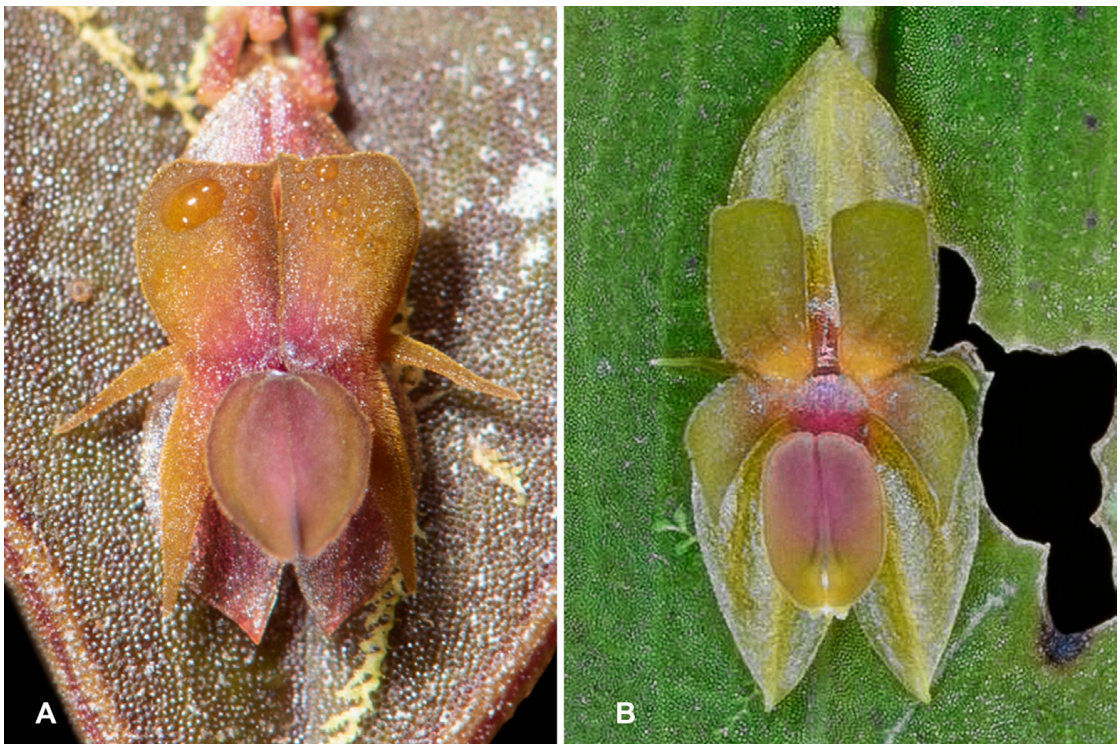

Figure 3. Comparison of *Lepanthes cardenasii* J.S.Moreno, Gal.-Tar. & Zuluaga with the most similar species. **A**. *Lepanthes cardenasii*. **B**. *Lepanthes praemorsa* Luer & R.Escobar. Photographs by R.G. Tarazona (A) and Esteban Domínguez Vargas (B).

in diameter. *Ramicauls* slender, suberect to horizontal 10.8–15.3 cm long, enclosed by 6–13 acuminate, furrowed, and microscopically pubescent lepanthiform sheaths, with a dilated, ciliate ostia. *Leaves* purple, more or less vertical at an angle of 90º from the ramicaul, coriaceous, corrugate, reticulate-veined, with 8 main veins, corrugate, ovate, attenuate, 6.1–6.9 × 2.3–3.4 cm, the apex emarginate with an abaxial apiculum in the middle, the obtuse base cuneate contracted into a petiole 2–3 mm long. *Inflorescence* a congested, distichous raceme, 12–26, successively many-flowered, up to 1.3–4.4 cm long, including the peduncle, held appressed to the adaxial surface of the leaf by a filiform, terete peduncle, 0.7–3.1 cm long, borne near the apex of the ramicaul; *floral bracts* conical, acuminate, minutely ciliate, 0.5–1.1 mm long; *pedicels* terete, 2.2–2.6 mm. *Ovary* terete, costate, 2.5 mm long. *Flowers* with sepals fulvous-yellow, dorsal sepal reddish-brown in the center; petals with lobes dull green, reddish-brown in the center; lip dull red-violet, column dull green. *Dorsal sepal* broadly ovate, acute, slightly revolute in natural position, 3-veined, 3.3–4.0 × 2.7–2.9 mm connate to the lateral sepals for 0.9 mm. *Lateral sepals*, ovate, oblique, slightly attenuate, 2-veined, 2.9–3.4 × 1.9–2.0 mm, connate for 1.6–1.7 mm long. *Petals* transversally bilobed, pubescent, imbricate 0.9–1.3 × 4.3–6.5 mm, with a filiform marginal midlobe, 1.1–1.7 mm long, 3-veined; the upper lobe oblong, sub-falcate, truncate, minutely erose; the lower lobe triangular, sub-sigmoid towards the apex, acute. *Lip* bilaminate, microscopically pubescent, the blades oblong-lunate, with sub-acute base and apices, thin, flat, adherent medially to each other over the column, 2.2–3.1 × 0.6–0.8 mm, supported by cuneate connectives from near the middle, the body broad, adnate to the base of the column, the sinus obtuse, with a bisegmented slender, recurved, pubescent appendix with an ovoid apical portion deflexed and the basal portion concave. *Column*, terete, bilobed with short, lateral, triangular lobes, 1.5 mm long, the clinandrium large, rostellum oblong-truncate, the anther dorsal, and stigma ventral.

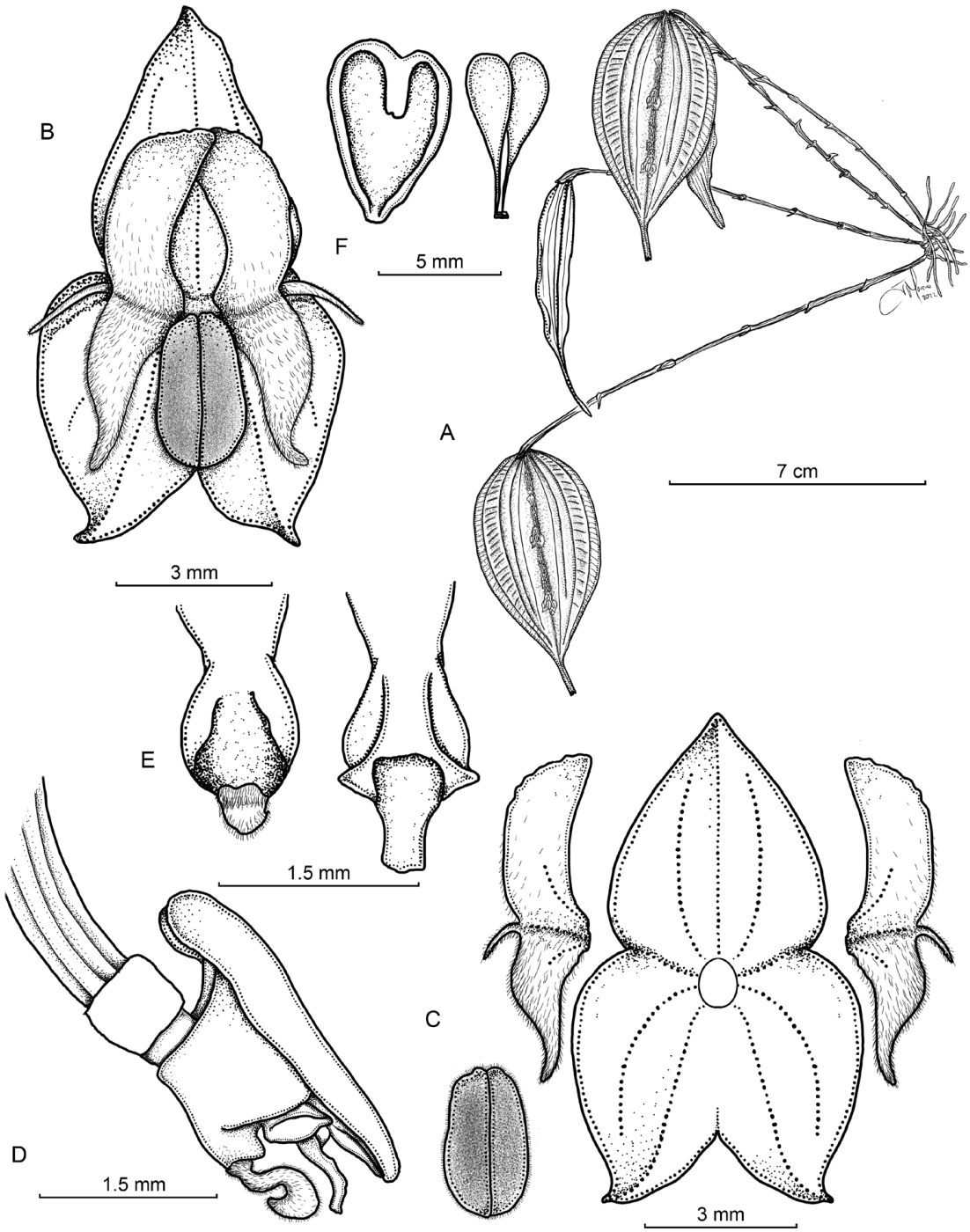

FIGURE 4. Drawing of *Lepanthes davidii* Gal.-Tar., Zuluaga & J.S.Moreno. **A**. Habit. **B**. Flower. **C**. Dissected perianth. **D**. Ovary, column and lip, side view. **E**. Dorsal view of the appendix without the column (left) and dorsal view of the column showing the short wings. **F**. Anther cap and pollinia. Drawn by J.S. Moreno from the plant that served as the holotype.

Figure 5. Photographs of *Lepanthes davidii* Gal.-Tar., Zuluaga & J.S.Moreno. A. Front view of the flower. **B**. Leave with inflorescence. **C**. Habit and plant *in-situ*. Photographs by R.G. Tarazona.

FIGURE 6. Comparison of *Lepanthes davidii* Gal.-Tar., Zuluaga & J.S.Moreno with the most similar species. **A**. *Lepanthes ankistra* Luer & Dressler. **B**. *Lepanthes brunnescens* Luer. **C**. *Lepanthes davidii*. **D**. *Lepanthes sinuosa* Luer & R.Escobar. Photographs by J.S. Moreno (A, D), Peter Peeters (B), and R.G. Tarazona (C).

Anther cap cordate, cucullate, 0.5 mm wide. *Pollinia* 2, yellow, pyriform, narrowly obovoid, 0.7 mm long.

Eponymy: The name honors Andres David Galindo Rey, son of Robinson Galindo-Tarazona, the first author of the species.

Habitat and ecology: *Lepanthes davidii* has been found up to 1.5 m high in a humid secondary forest and shares a habitat with *L. irmae* Gal.-Tar., Zuluaga, J.S.Moreno & Mora-Aguilar. It has been observed in a second locality sharing habitat with *L. satyrica* Luer & Hirtz, *L. yubarta* E.Calderón, and *L. dumbo* Luer.

Lepanthes davidii is most similar to *L. ankistra* from Costa Rica, Panama, and Colombia, a species also with reticulate leaves but distinguished easily by its transversely bilobed petals with the lower lobe strongly uncinate (Fig. 6A) (*vs*. the lower lobe triangular, falcate towards the apex and acute). The most relevant feature that defines the identity of *L. davidii* is the appendix, which is bisegmented, slender, recurved, pubescent with an ovoid apical portion deflexed, and the basal portion concave (*vs*. a concave and ciliate appendix but with an apical gland (Luer & Dressler 1986). Another similar species from Colombia is *L. brunnescens* Luer, recognized and separate from this species by having no uncinate lower lobes in its transversely bilobed petals (Fig. 6B) but with the same blades of the lip and appendix as *L. ankistra*. From the western Andes of Colombia, *L. sinuosa* Luer & R.Escobar (Fig. 6D) is also recognized by its thin ovate leaves, acute, slightly acuminate, and reticulate with markedly sinuate margin (*vs*. margin entire), truncate lower lobe of the transversely bilobed petals (*vs*. the lower lobe triangular, sub-sigmoid towards the apex, acute), the blades of the lip flat, falcate, adherent below the middle over the column (*vs*. the blades oblong-lunate, with sub-acute base and apices, thin, flat, adherent medially to each other over the column) and the appendix is boat-shaped and pubescent, with a bifid gland at the apex (*vs*. bisegmented slender, recurved, with an ovoid apical portion deflexed and the basal portion concave).

Lepanthes dorae J.S.Moreno, Gal.-Tar. & Zuluaga, ***sp. nov.*** (Fig. 7, 8, 9A).

TYPE: Colombia. Valle del Cauca: Municipio de Dagua, corregimiento El Limonar, quebrada La Española, 1700 m, 24 Jan 2021, *A. Zuluaga, R. Galindo-T, D. L. Mora & J.S.Moreno 5078* (Holotype: CUVC-Spirit).

Diagnosis: *Lepanthes dorae* is similar to *L. pachyglossa* Luer, but the new species can be distinguished by ovate-lanceolate sepals (*vs*. triangular-ovate); the transversely bilobed petals with the lower lobe triangular and falcate (*vs*. the lower lobe broadly uncinate), and the most distinguishing characteristic is the oblong, bilobed pubescent appendix, located into an anterior cavity from the sinus (*vs*. an external, short, minute appendix).

Plants medium in size, epiphytic, caespitose, 11.3–15.5 cm tall; *roots*, slender, flexuous, filiform, up to 0.65 mm in diameter. *Ramicauls* slender, erect, 8.7–12.0 cm long, enclosed by 8–15 acuminate, furrowed, and long-ciliate lepanthiform sheaths, with a dilated, ciliate ostia. *Leaves* erect, coriaceous, elliptical, attenuate, the blade subplicated above the base, with three main veins, 5.90–8.47 × 1.73–2.19 cm, the apex emarginate with an abaxial apiculum in the middle, the obtuse base cuneate contracted into a petiole of 2–3 mm long. *Inflorescence* a congested, distichous raceme, 13–15, successively many-flowered, 2.73–3.75 cm long, including the peduncle, held appressed to the abaxial surface of the leaf by a filiform, terete peduncle, 1.65–2.68 cm long, borne near the apex of the ramicaul; *floral bracts* conical, acuminate, minutely verrucose, 1.45–1.66 mm long; *pedicels* terete, 1.44–1.87 mm. *Ovary* terete, costate, 2.03–3.10 mm long. *Flowers* with sepals pale green-yellow; petals dark red in the borders, yellow in the middle; lip red-brown. *Dorsal sepal* ovate-lanceolate, slightly convex, acute, 3-veined, 5.85–8.26 × 2.99–4.62 mm connate to the lateral sepals for 0.9 mm. *Lateral sepals*, ovate-triangular, oblique, acute, sometimes imbricate in natural position, 2-veined, 5.17–7.61 × 1.86–2.87 mm, connate for 1.2–1.85 mm long. *Petals* transversally bilobed, microscopically pubescent, imbricate, 3-veined, 1.45–2.05 × 3.09–4.63 mm; the upper lobe broadly-oblong, rounded; the lower lobe triangular, falcate towards the apex, rounded. *Lip* bilaminate, the blades with the base obtuse and the apices acute, hirsute, embracing the column, clavate, 3.5–2.25 × 0.33–0.61 mm, supported by broadly cuneate connectives, the body broad, thick, adnate to the base of the column, the sinus thick, protuberant with a cleft cavity on the anterior surface into which the oblong, pubescent and

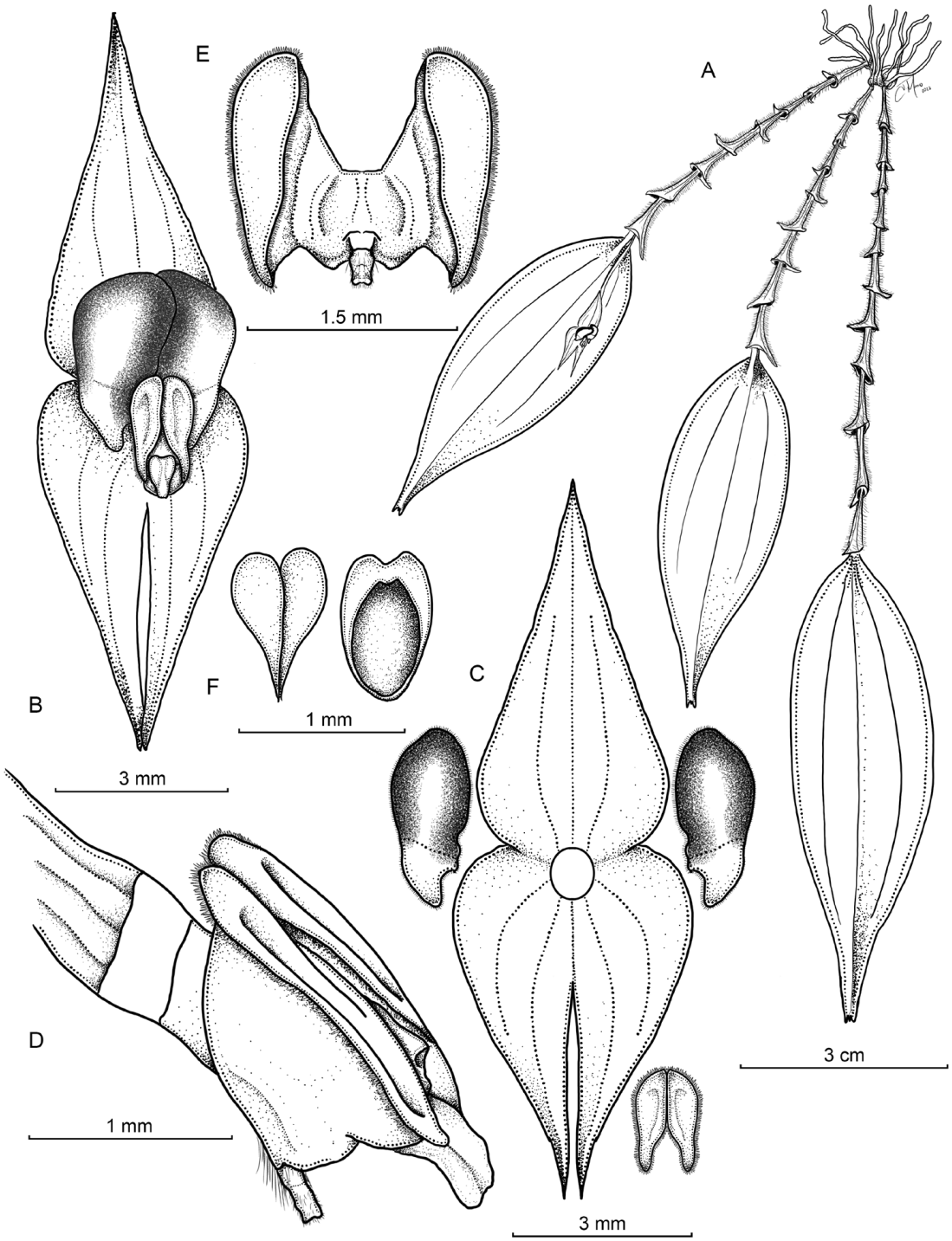

FIGURE 7. Drawing of *Lepanthes dorae* J.S.Moreno, Gal.-Tar. & Zuluaga. **A**. Habit. **B**. Flower. **C**. Dissected perianth. **D**. Ovary, column and lip, side view. **E**. Expanded lip. **F**. Pollinia and anther cap. Drawn by J.S. Moreno from the plant that served as the holotype.

Figure 8. Photographs of *Lepanthes dorae* J.S.Moreno, Gal.-Tar. & Zuluaga. **A**. Front view of the flower. **B**. Habit and plant *in-situ*. Photographs by J.S. Moreno.

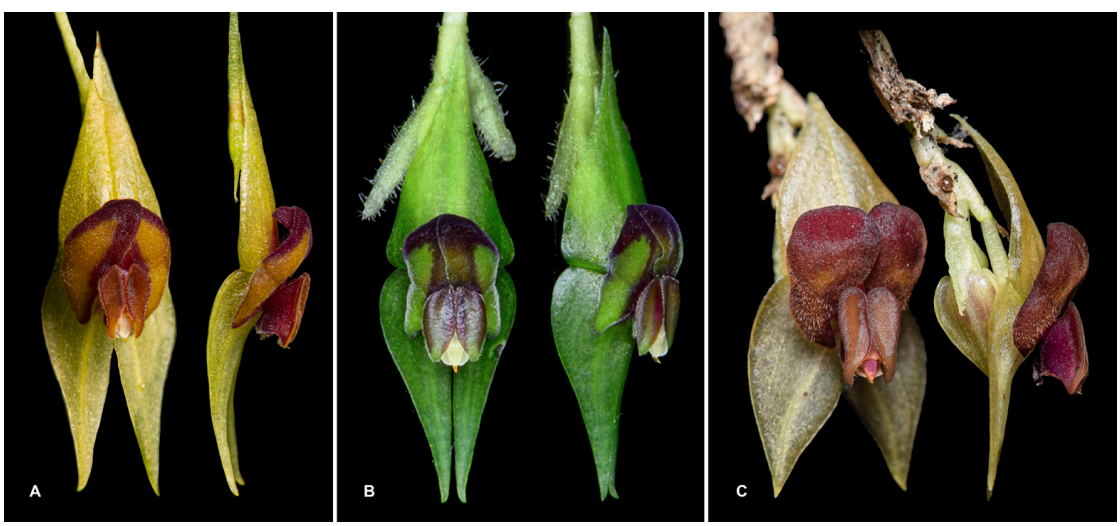

Figure 9. Comparison of *Lepanthes dorae* J.S.Moreno, Gal.-Tar. & Zuluaga with the most similar species from Colombia. **A**. *Lepanthes dorae*. **B**. *Lepanthes porracea* Luer & R.Escobar. **C**. *Lepanthes troglodytes* Luer & R.Escobar. Photographs by J.S. Moreno (A, C) and A. Posada (B).

bilobed appendix fits. *Column* terete, 1.24–1.99 mm long, the rostellum protruding, the anther dorsal, and stigma ventral. *Anther cap* cordate, cucullate, 0.63–0.67 mm wide. *Pollinia* 2, yellow, pyriform, narrowly obovoid, 0.44–1.07 mm long.

Paratype: Colombia. Valle del Cauca: Municipio de Dagua, corregimiento El Queremal, vereda El Descanso km 55, Avistamiento de Aves Doña Dora, 1400 m, 6 Dec 2016, *J.S.Moreno & A.L.Erazo 337* (CAUP).

Eponymy: The name of the new species honors Dora Alicia Londoño Hoyos "Doña Dora", a woman who has developed a spot for bird watching in the km 55, El Descanso, El Queremal, Valle del Cauca Department, one of the locations where the new species was found.

Habitat and ecology: *Lepanthes dorae* has been found growing in two localities in Valle del Cauca. In the first locality in San José del Salado, it was found in a very humid area in a secondary forest, growing close to the ground near a small creek that flows into the Quebrada Española, sharing the habitat with *L. aciculifolia* Luer, *L. pogonochila* Zuluaga, Alegria-Valencia, J.S.Moreno & Gal.-Tar., *L. escifera* Luer & R.Escobar, *L. agglutinata* Luer, and *L. posadae* Luer & R.Escobar. In El Queremal, the new species was found growing in dead branches covered by moss next to *L. filamentosa* Luer & Hirtz.

Lepanthes dorae is most similar to *Lepanthes pachyglossa* from Panama (Luer 1985), which is characterized by having the petals transversely bilobed with the upper lobe oblong-rounded and the lower lobe smaller, broadly-uncinate (*vs*. the upper lobe broadly-oblong; the lower lobe triangular, falcate towards the apex, rounded), and the lip with the appendix with a minute, external appendix (*vs*. a large bilobed appendix located into a cleft cavity on the anterior surface). From Colombia two species are very similar. *Lepanthes porracea* Luer & R.Escobar (Fig. 9B) is distinguished by its petals which are transversely broadly oblong with rounded apices (*vs*. the upper lobe broadly-oblong; the lower lobe triangular, falcate towards the apex), the blades of the lip flat, elliptical with the ends rounded (*vs*. the blades with the base obtuse and the apices acute) and with a small and densely pubescent appendix (*vs*. large bilobed appendix located into a cleft cavity on the anterior surface). *Lepanthes troglodytes* Luer & R.Escobar (Fig. 9C) is recognized by its larger leaves, the lip with the blades flat, acute (*vs*. clavate, the base obtuse and the apices acute), and a hinged oblong pubescent appendix (*vs*. an oblong bilobed pubescent appendix).

Lepanthes morae Zuluaga, J.S.Moreno, Gal.-Tar., ***sp. nov.*** (Fig. 10, 11, 12A).

TYPE: Colombia. Valle del Cauca: Municipio de Dagua, corregimiento El Limonar, Quebrada La Española, 1700 m, 10 Jan 2022, *R. Galindo-T, D. L. Mora & A. Zuluaga 1558* (Holotype: CUVC-Spirit).

Diagnosis: *Lepanthes morae* is most similar to *Lepanthes declivis* Luer & R.Escobar, but the new species could be easily distinguished by its thick, fimbriate, and concave bilaminate lip with the blades narrowly-oblong, shortly depressed laterally, externally with a thick callus at the base of the connectives. Each blade with spathulate, rounded apices overlapped beneath the apex of the column, with no appendix (*vs*. bilaminate lip, with the blades elliptical, microscopically ciliate, the appendix small, oblong and ciliate).

Plant medium in size, epiphytic, caespitose, 8.4–13.3 cm tall; *roots*, slender, flexuous, filiform, up to 0.46 mm in diameter. *Ramicauls* erect 4.3–7.4 cm long, enclosed by 6–14 acuminate, furrowed lepanthiform sheaths, with a dilated, oblique ostia. *Leaves* erect, coriaceous, elliptical-lanceolate, attenuate, 3.84–5.79 × 0.90–1.14 cm, the apex emarginate with an abaxial apiculum in the middle, the obtuse base cuneate contracted into a petiole of 1.54–2.26 mm long. *Inflorescence* a dense, congested, distichous, long-pedicellate raceme, successively many-flowered, 30–56, 2/3 the length of the leaf, 1.7–3.4 cm long including the peduncle, held appressed to the abaxial surface of the leaf by a filiform, terete peduncle, 1.0–2.1 cm long, borne near the apex of the ramicaul; *floral bracts* conical, acuminate, muricate, 0.81–1.25 mm long; *pedicels* terete, 1.52–1.88 mm. *Ovary* conical, costate, curved up 2.03–3.10 mm long. *Flowers* with sepals translucent green-yellow; bright yellow, with the center orange-yellow and border or the upper lobe red,; lip yellow-orange; column purple. *Dorsal sepal* broadly-ovate, convex, acute, 3-veined, 1.63–2.47 × 1.40–2.25 mm connate to the lateral sepals for 0.34 mm. *Lateral sepals*, ovate, oblique, acute, 2-veined, 1.59–2.23 × 0.85–1.30 mm,

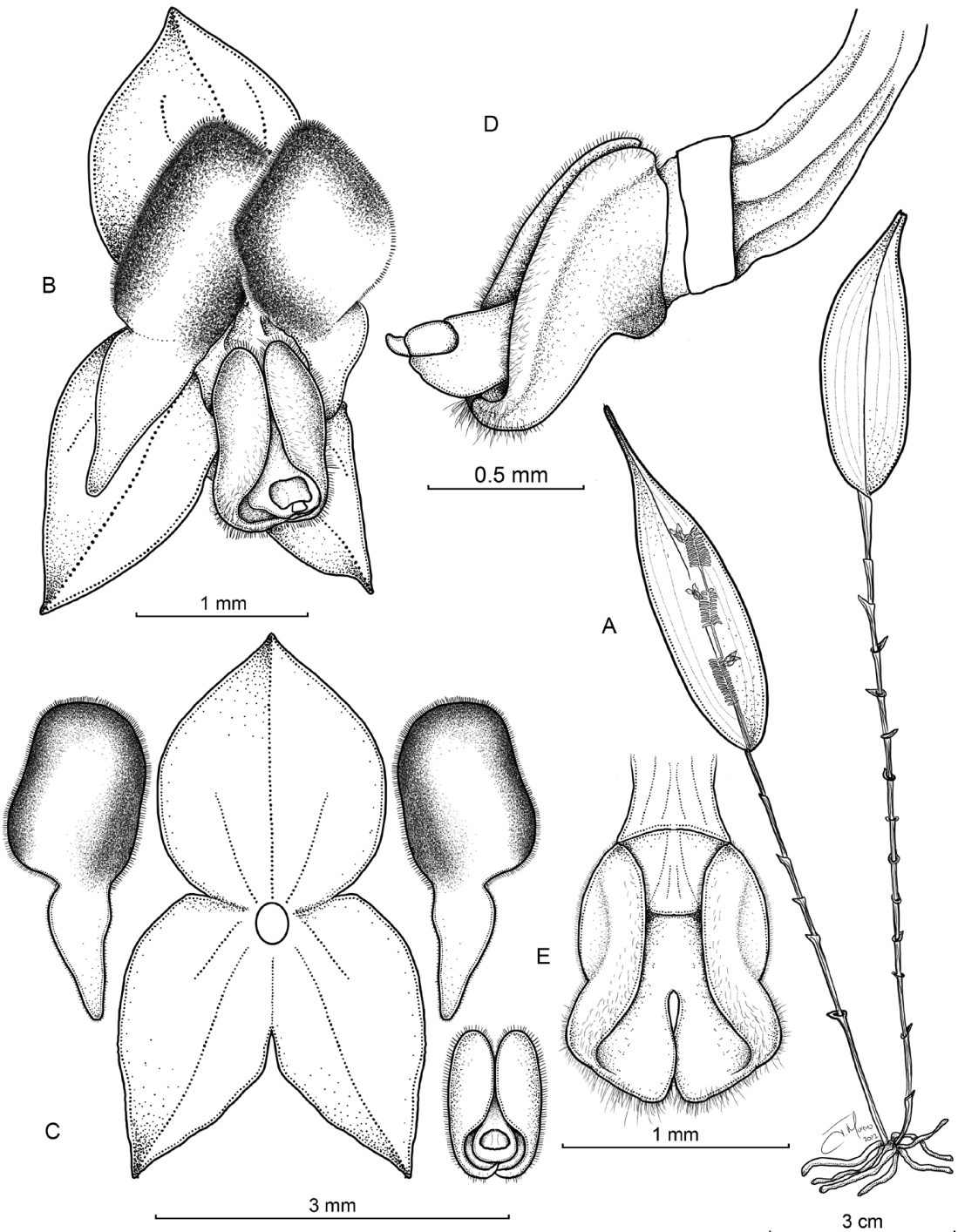

Figure 10. Drawing of *Lepanthes morae* Zuluaga, J.S.Moreno & Gal.-Tar. **A**. Habit. **B**. Flower. **C**. Dissected perianth. **D**. Ovary, column and lip, side view. **E**. Expanded lip. Drawn by J.S. Moreno from the plant that served as the holotype.

FIGURE 11. Photographs of *Lepanthes morae* Zuluaga, J.S.Moreno & Gal.-Tar. **A**. Flowers with the inflorescence. **B**. Side view of the flower. **C**. Habit and plant showing three congested racemes of the inflorescence. Photographs by R.G. Tarazona.

Figure 12. Comparison of *Lepanthes morae* Zuluaga, J.S.Moreno & Gal.-Tar. with the most similar species. **A**. *Lepanthes morae*. **B**. *Lepanthes declivis* Luer & R.Escobar. Photographs by R.G. Tarazona (A) and J.S. Moreno (B).

connate for 0.80 mm long. *Petals* transversally bilobed, microscopically pubescent, imbricate, 1.08–1.12 × 2.78–2.88 mm; the upper lobe broadly-elliptic, rounded, twice as wide as the lower lobe; the lower lobe triangular, obtuse, oblique. *Lip* bilaminate, thick, concave, the blades narrowly-oblong with the bases rounded, fimbriate, embracing the column, the apices spathulate and rounded, overlapped beneath the apex of the column in natural position, 1.11 × 0.36 mm, supported by broadly cuneate connectives, shortly depressed laterally in the outer side, externally with a thick callus at the base of the connectives, the body broad, very thick, adnate to the base of the column with no appendix. *Column* terete, with an expanded apex, 1.30–1.48 mm long, the anther dorsal, and stigma ventral. *Anther cap* not seen. *Pollinia* not seen.

Eponymy: The name of the new species honors Danny Leandro Mora, who has been exploring the flora and fauna of the forests around his hometown San José del Salado, for several years, leading us to discover several new species.

Habitat and ecology: *Lepanthes morae* shares habitat with *L. davidii*, as they grow at the same locality.

Lepanthes morae vegetatively is similar to other species from Colombia with very congested racemes that are born on the abaxial surface of an elliptical and acuminate leaf, such as *L. cogolloi* Luer & R.Escobar, *L. declivis*, *L. perdita* Luer & Hirtz, and *L. setifera* Luer & R.Escobar. However, the most similar species is probably *L. declivis* (Fig. 12B), a species that can be identified by its ovate and slightly convex leaves (*vs*. elliptical-lanceolate), and long pedicels and ovaries, 2.0–2.5 and 4 mm long, respectively (*vs*. pedicel 1.52–1.88 mm and ovary 2.03–3.10 mm long). Finally, the most distinctive feature of *L. morae* is the lip with the bases of the elliptical blades, abruptly reflexed with the apices narrowed and recurved beneath the column and the connectives narrow with an oblong and ciliate appendix (*vs*. blades of the lip narrowly-oblong with the apices spathulate and rounded, overlapping beneath the apex of the column, thick and concave; the broad connectives cuneate, shortly depressed laterally with a thick callus at the base of each connective in the outer side with no appendix).

The most striking features that separates *Lepanthes morae* from other similar species is the presence of a small callus at the base of the outer face of the connectives, and the spathulate and rounded apices of the lip blades that overlap beneath the apex of the column, and the absence of an appendix.

Conservation status: *Lepanthes cardenasii*, *L. davidii*, *L. dorae*, and *L. morae* are known only from one or two localities in the same mountain range. Therefore, the IUCN classification is data deficient (DD) because adequate population and distribution information to make an assessment is not available.

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PLEUROTHALLIS ARIANA-DAYANAE, A NEW SPECIES IN SUBSECTION *MACROPHYLLAE-FASCICULATAE* (PLEUROTHALLIDINAE) FROM THE CORDILLERA DEL CÓNDOR, ECUADOR

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Abstract. A new species of *Pleurothallis* from the Cordillera del Cóndor in southeast Ecuador is described and illustrated. In addition, information concerning its distribution, habitat, and phenology is provided. *Pleurothallis ariana-dayanae* is similar to *P. paquishae* but differs in the size of the flower, the dorsal sepal 6.5–7.8 mm long, the petals slightly falcate, linear, microscopically verrucose-papillose on the dorsal surface, minutely denticulate along the margins; the lip is ovate-elliptic with, denticulate-ciliate margins, with a slightly bilobed glenion. *Pleurothallis ariana-dayanae* is also compared with *P. scabrilinguis,* and *P. applanata*, an endemic species to Ecuador.

Resumen. Se describe e ilustra una nueva especie de *Pleurothallis* de la Cordillera del Cóndor en el sureste de Ecuador. Adicionalmente, se proporciona información sobre la distribución, el hábitat y la fenología de esta especie. *Pleurothallis ariana-dayanae* es similar a *P. paquishae* pero difieren en el tamaño de la flor, el sépalo dorsal de 6.5–7.0 mm de largo, los pétalos levemente falcados, lineares, microscópicamente verrugoso-papiloso en la superficie dorsal, diminutamente denticulados en los márgenes; el labelo aovado-elíptico, con los márgenes denticulados-ciliados y el glenion levemente bilobulado. *Pleurothallis ariana-dayanae* también se compara con *P. scabrilinguis,* y *P. applanata*, una especie endémica del Ecuador.

Keywords/Palabras clave: Andean tepuis, micro-endemism, microendemismo, *Pleurothallis applanata*, *Pleurothallis paquishae*, taxonomía, taxonomy, Tepuyes andinos

Introduction. Pleurothallidinae Lindl. is one of the most species-rich neotropical orchid subtribes. Luer (1986) accounted for as many as 4000 species in the subtribe. About two decades later, Pridgeon (2005) accounted for 4100 species. Then, more than 30 years after Luer's monograph, just over 5114 species are currently being accepted among the 12,000 published names applicable to the subtribe (Luer 1986, Karremans 2016, Karremans & Vieira-Uribe 2020). *Pleurothallis* R.Br., as defined by Pridgeon (2005), is a highly diverse neotropical orchid genus in the Pleurothallidinae, including some 500 species (Karremans & Vieira-Uribe 2020) ranging from Mexico, Central America, and the Caribbean to South America.

In his infrageneric classification of *Pleurothallis,* Lindley (1859) established *Pleurothallis* sect. *Macrophyllae-Fasciculatae* Lindl. for a group of plants characterized by fleshy, cordate leaves and fasciculate flowers. Later, Luer (1988) classified the group as a subsection of *Pleurothallis* creating *Pleurothallis* subsect. *Macrophyllae-Fasciculatae*. This group was later given a generic status under *Zosterophyllanthos* Szlach. & Marg. (Szlachetko &

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Margonska 2001). However, Luer (2005) treated the members of *Macrophyllae-Fasciculatae*, together with *Pleurothallis* subsect. *Acroniae* Luer (1986), under *Acronia* C.Presl. Nevertheless, according to available phylogenetic studies, this subsection is a monophyletic group, and the recognition of additional genera segregated from *Pleurothallis* is not yet supported (Karremans 2016, Pridgeon 2005, Wilson *et al.* 2011, 2013). Luer (2005) indicated that species of section *Macrophyllae-Fasciculatae* differ by the sessile leaves with a cordate base, the single or simultaneously flowers produced in a fascicle, with lateral sepals connate into a synsepal, the lip usually with a well-developed glenion, and a bilobed stigma.

In Ecuador, there are approximately 269 accepted species of *Pleurothallis* (WSCP, 2022), and the number of species recorded in the country increases quickly (Jiménez et al. 2018, 2021, Luer 2005, Luer & Thoerle 2012, 2013, Wilson et al. 2016, 2017, 2018, Zambrano et al. 2017). Around 56% (ca. 150 species of Ecuadorian *Pleurothallis*) are members of the subsection *Macrophyllae-Fasciculatae* (Zambrano *et al.* 2017). Recently, some specimens of *Pleurothallis* were collected from the Cordillera del Cóndor; when the material was compared with several species, it was found that they correspond to a different and unknown taxon described here.

Materials and methods. The description and illustration of the new taxon were generated from specimens collected during a comparative study on the orchids of the Cordillera del Cóndor under a permit granted by the Ministry of the Environment of Ecuador (No 037-2019-IC-FLO-FAU -DPAZCH-UPN-VS / MA). Photographs of individuals of the new species and morphologically similar species in bloom were taken using a Canon® EOS 1100D camera and +10 Kernel Pro Optics 58 mm close-up lenses and Panasonic® FZ300 camera with Raynox DCR-150 50 mm, EFS 18-58 mm lens. The systematics of *Acronia* by Luer (2005) and the new species were compared to the previously described related species (Lindley 1836, Luer 1979, 1996). The new species was compared in detail with *P. paquishae* Luer, to which it is morphologically most similar in appearance. Voucher specimens where deposited at Herbario Amazónico (ECUAMZ).

Taxonomic treatment

Pleurothallis ariana-dayanae Vélez-Abarca, M.M.Jiménez & D.Gutiérrez del Pozo, ***sp. nov.*** (Fig. 1, 2, 4A, 5A).

TYPE: Ecuador. Zamora Chinchipe: Cantón El Pangui, Cordillera del Cóndor flank, 1090 m, 15 Dec 2020, *L. Vélez LV0067* (holotype: ECUAMZ!).

Diagnosis: Similar to *Pleurothallis paquishae* from which it differs by the lanceolate dorsal sepal (*vs.* narrowly elliptical), broadly ovate lateral sepals (*vs.* ovate), the petals with the apical third slightly falcate (*vs.* narrowly linear-oblong, recurved), minutely denticulate margins (*vs.* finely serrulate), the lip ovate-elliptical, papillose (*vs.* ovate-oblong, minutely spiculate), with a slightly bilobed glenion (*vs.* ovate).

Plant medium in size, up to 15 cm tall, epiphytic, caespitose; *roots* slender, flexuous, whitish, 1 mm in diameter. *Ramicauls* yellowish-green, erect, 6–12 cm long, with a tubular sheath on the lower third and two other sheaths at the base. *Leaf* horizontal, coriaceous, ovate, acute, 3.5–6.5 × 2.5–4.0 cm, the base sessile, deeply cordate, margin slightly involute. *Inflorescence* a fascicle of successive, single-flowered, resupinate, enclosed at the base by a spathaceous bract *ca.* 8 mm long; *peduncle* terete, 3 mm long, covered with the spathaceous bract; *floral bract* tubular, acute, 3 mm long; *pedicel* clavate, curved, *ca.* 4 mm long. *Ovary* smooth, lustrous, pedicellate, cylindrical, longitudinal sulcate, covered with black dots on the dorsal surface, with a slight curvature at the junction with the pedicel, 3 mm long, 0.7 mm in diameter. *Flower* small, the sepals brownish red, the petals reddish-brown, the lip brown to dark red-purple, the column light-green, the anther orange suffused with purple. *Sepals* fleshy; *dorsal sepal* lanceolate, subverrucose at the apical half, acute, 6.5–7.8 × 2.3–2.4 mm, 3-veined; the *lateral sepals* connate into a broadly ovate, acute synsepal, concave at the base, subverrucose, lustrous on abaxial surface, 5.8–6.5 × 4.3–4.5 mm, 4-veined. *Petals* fleshy, slightly falcate, narrowly linear, acute, with a cleft in the basal third, microscopically verrucose-papillose on the dorsal surface, margins minutely denticulate, 4.0–4.5 × 0.75 mm, 1-veined. *Lip* fleshy, ovate-elliptic, obtuse,

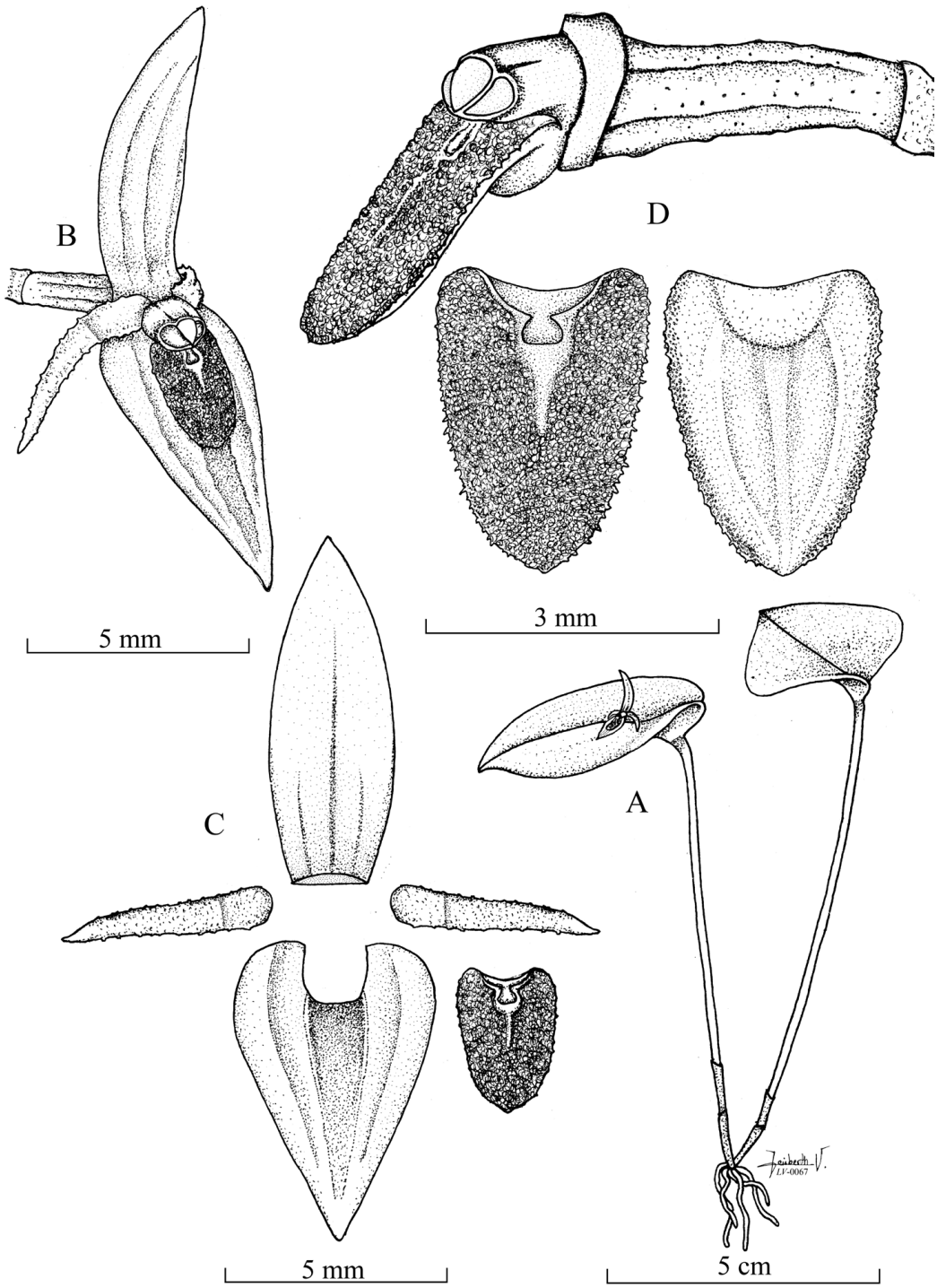

Figure 1. *Pleurothallis ariana-dayanae* Vélez-Abarca, M.M.Jiménez & D.Gutiérrez del Pozo. **A**. Habit. **B**. Flower, ¾ view. **C**. Dissected perianth. **D**. Ovary, column and lip in lateral view, and lip adaxial and abaxial view. Illustration by L. Vélez-Abarca, based on the holotype *Vélez-Abarca LV-0067* (ECUAMZ).

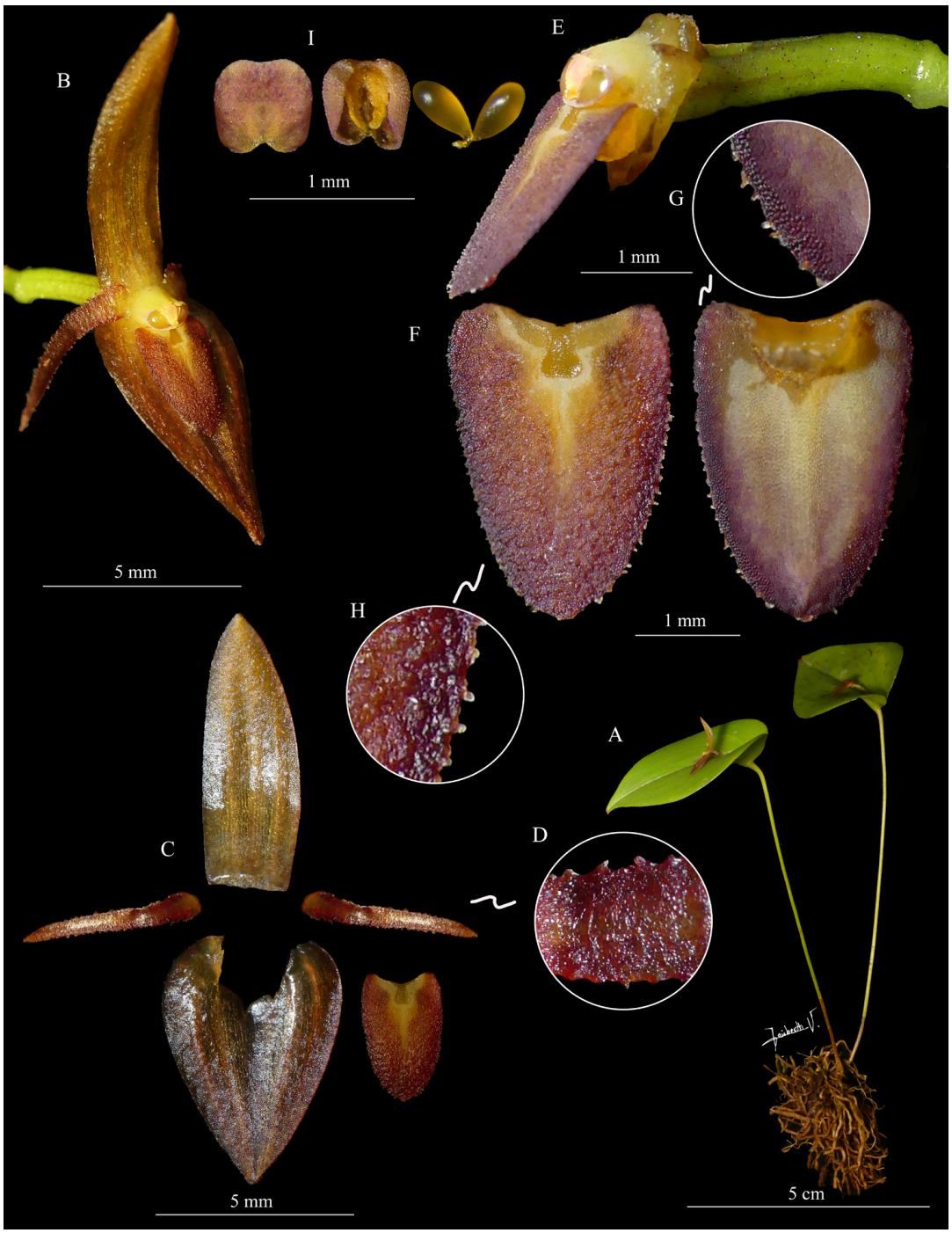

FIGURE 2. *Pleurothallis ariana-dayanae* Vélez-Abarca, M.M.Jiménez & D.Gutiérrez del Pozo. **A**. Habit. **B**. Flower, ¾ view. **C**. Perianth dissected. **D**. Close-up of the petal margin. **E**. Ovary, column, and lip, lateral view. **F**. Lip, adaxial and abaxial view. **G**. Close-up to the abaxial margin of the lip. **H**. Close-up to the adaxial margin of the lip. **I**. Anther cap and pollinia. LCDP by L. Vélez-Abarca from photos by M. M. Jiménez based on the holotype *Vélez-Abarca LV-0067* (ECUAMZ).

verrucose-papillose abaxially, margins minutely denticulate-ciliate, 3.2 × 2.0–2.2 mm, 3-veined, the disc with a small, slightly bilobed glenion near the base, the base subtruncate, shortly deflexed. *Column* short, stout, semiterete, 1.3 × 1.0 mm, with a short, thick, obsolescent foot; stigma apical, bilobed. *Anther cap* apical, sub-globose-cordiform, minutely papillose, 0.5–0.6 × 0.5–0.6 mm. *Pollinia* 2, obovoid. *Capsule* not seen.

Other specimens examined: Ecuador. Zamora Chinchipe: Cantón El Pangui, Cordillera del Cóndor, near Tundayme, 1170 m, 12 Mar 2022, *L. Vélez LV0071* (ECUAMZ!); near El Quimi, 14 Mar 2022, *L. Vélez LV0070* (ECUAMZ!).

Eponymy: Combination of the names of the first author's daughters Nathasha Ariana and Dayana Mishell.

Distribution and habitat: The new species is an epiphyte growing under the shade of *Chrysophyllum sanguinolentum* (Pierre) Baehni (Sapotaceae), and *Protium amazonicum* (Cuatrec.) Daly (Burseraceae), trees in dwarf forests of a sandstone plateau of the Cordillera del Cóndor located in the Amazonian region of south-eastern Ecuador. This territory is characterized by dense vegetation, including trees with abundant bryophytes and lichens. The Cordillera del Cóndor plateau zone is the southern portion of the "Andean Tepui Region" proposed by Neill (2007) and Neill *et al.* (2014), areas of very high diversity whose biological richness is only partially described to date.

Pleurothallis ariana-dayanae generally grows in shady areas, on branches parallel to the ground, in the middle layer of small trees with very small diameters, typical of the vegetation of the Cordillera del Cóndor. It has been found at 980 to 1100 m above sea level.

Pleurothallis ariana-dayanae (Fig. 2, 4A, 5A, 6A) is very similar to other species of the "scabrilinguis" morphological group (Fig. 4), characterized by its elliptic-lanceolate dorsal sepal, narrowly linear, slightly falcate petals, an ovate-elliptic lip with a slightly bilobed glenion, and a sub-globose-cordiform anther. Among them, the most similar species is *P. paquishae* (Fig. 3, 4B, 5B, 6C), which has the same distribution in Ecuador in the Cordillera del Cóndor. These two species are vegetatively similar, but they differ strongly in the floral parts; the flower of *P. ariana-dayanae* is proportionally smaller (Fig. 4A–B), the dorsal sepal is lanceolate, 6.5–7.0 × 2.3–2.4 mm (*vs*. narrowly elliptical 11.0 × 3.5 mm), the synsepal measures 5.8–6.0 × 4.3–4.5 (*vs*. 11 × 6 mm), the petals have the apical third slightly falcate, 4.0–4.5 × 0.75 mm (*vs*. apical third slightly recurved, 9.5 × 1.0 mm), the lip may have a brown to dark purple-red color, ovate-elliptical, 3.0 × 2.0–2.2 mm, the surface papillose, minutely denticulate-ciliate margins, with a slightly bilobed glenion (*vs*. lip red to velvety brown, ovate-oblong, 5.5 × 2.5 mm, surface thoroughly verrucose-spiculated, denticulate margin, turned-shaped glenion) anther cap sub-globose (*vs*. cordiform with horn-shaped upper lobes) (Fig. 5A–B).

This species could also be mistaken as a variation of *P. applanata* (Fig. 4C, 5C, 6B) since they are superficially similar; however, the color of the flowers in *P. applanata* is variable from a purple-brown color (hue shared with *P. ariana-dayanae*), yellow hue, tan hue and intermediate colors between yellow and purple-brown. This color variation is something that does not occur in the new species. In addition, *P. ariana-dayanae* is a species with a smaller flower (Fig. 4), dorsal sepal lanceolate, sub-verrucose at the apical half, 6.5–7.0 × 2.3–2.4 mm (*vs*. narrowly elliptical-ovate, glabrous, 10.0 × 3.6 mm), lateral sepals broadly ovate, subverrucose, 5.8–6.0 × 4.3–4.5 mm (*vs*. ovate, smooth, 9.5 × 6 mm). Lip ovate-elliptical, 3.0 × 2.0–2.2 mm, with a slightly bilobed glenion (*vs*. oblong-ovate, 4.5 × 2.2 mm, with an orbicular glenion), anther cap sub-globose (*vs*. cordiform) (Fig. 6).

Another similar species is *Pleurothallis scabrilinguis* (Fig. 4D, 5D), but they differ from *P. ariana-dayanae* by leaf ovate, deeply cordate, 3.5–6.5 × 2.5–4.0 cm (*vs*. narrowly ovate, base shallowly cordate, 4–10 × 1–2 cm), floral bract 3 mm long (*vs*. 4–7 mm long), pedicel 4 mm long (*vs*. 5-10 mm long), dorsal sepal lanceolate, sub-verrucose at the apical half, acute, 6.5–7.8 × 2.3–2.4 mm (*vs*. elliptical-ovate, glabrous, subacute to obtuse, 6–10 × 2.5–7.0 mm), lateral sepals subverrucose, acute synsepal, 5.8–6.0 × 4.3–4.5 mm (*vs*. glabrous, obtuse, 5–10 × 4–8 mm),

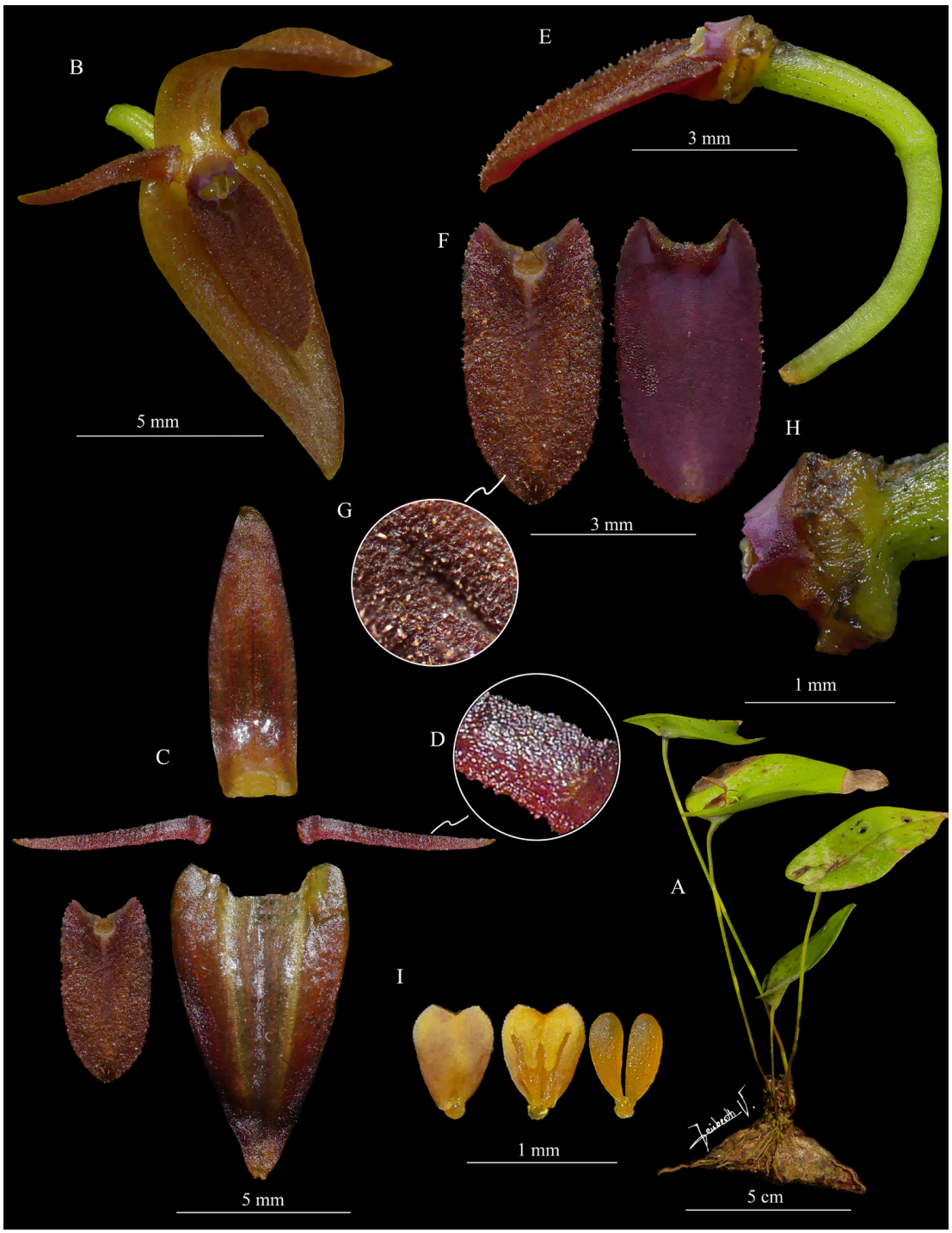

FIGURE 3. *Pleurothallis paquishae* Luer. **A**. Habit. **B**. Flower, ¾ view. **C**. Perianth dissected. **D**. Close-up of petal margins. **E**. Pedicel, ovary, column, and lip, lateral view. **F**. Lip, adaxial and abaxial views. **G**. Close-up to the adaxial surface of the lip. **H**. Close-up of column, lateral view. **I**. Anther cap and pollinia. LCDP by L. Vélez-Abarca from photos by M. M. Jiménez based on *Jiménez M. 1313* (ECUAMZ).

Figure 4. Comparison of the flowers between related species. **A**. *Pleurothallis ariana-dayanae*. **B**. *Pleurothallis paquisahe*. **C**. *Pleurothallis applanate*, based on *Jiménez M. 796* (ECUAMZ). **D**. *Pleurothallis scabrilinguis*, based on *Jiménez M. 1134* (ECUAMZ). Scale bar = 5 mm. By L. Vélez-Abarca from photos by M. M. Jiménez.

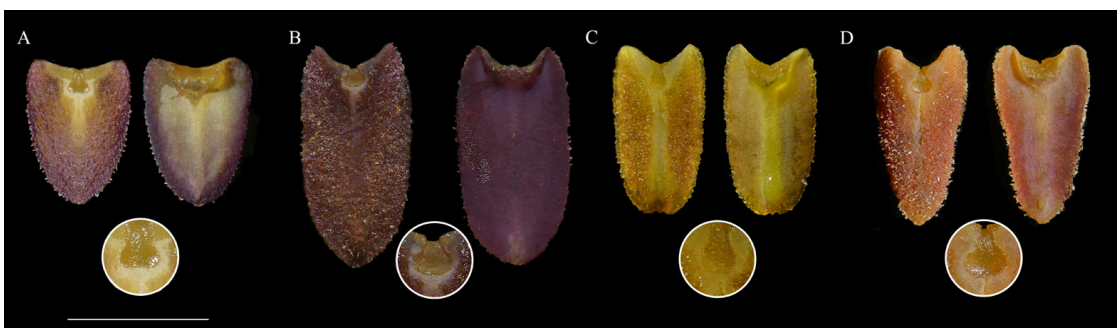

Figure 5. Comparison of the lip in adaxial and abaxial views, and the glenion. **A**. *Pleurothallis ariana-dayanae*. **B**. *Pleurothallis paquishae*. **C**. *Pleurothallis applanata*. **D**. *Pleurothallis scabrilinguis*. Scale bar = 3 mm. Figure by L. Vélez-Abarca from photos by M. M. Jiménez.

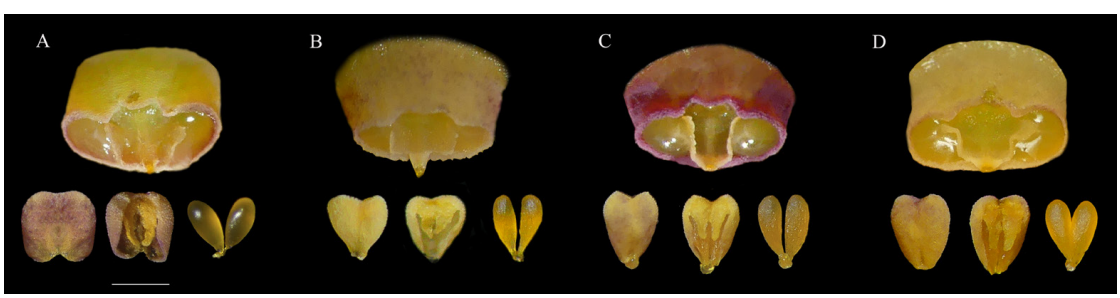

Figure 6. Frontal view of the column, anther and pollinarium. **A**. *Pleurothallis ariana-dayanae*. **B**. *Pleurothallis applanata*. **C**. *Pleurothallis paquishae*. **D**. *Pleurothallis scabrilinguis*. Scale bar = 0.5 mm. Figure by L. Vélez-Abarca from photos by M. M. Jiménez.

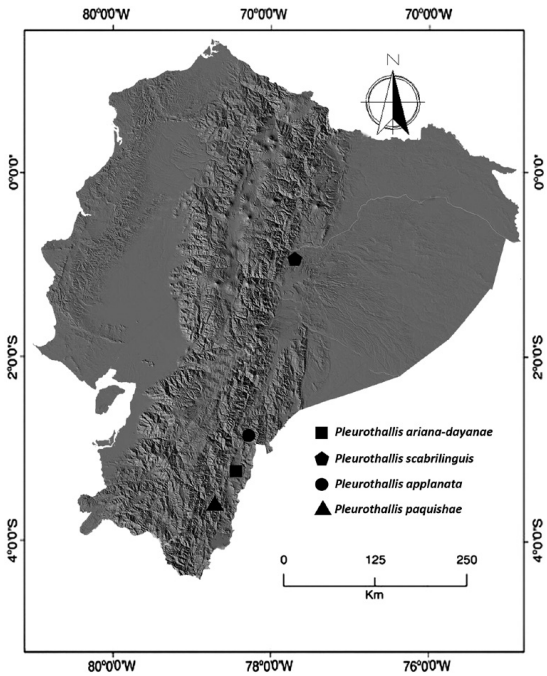

FIGURE 7. Distribution map of *Pleurothallis ariana-dayanae*, *P. applanata*, *P. paquishae*, and *P. scabrilinguis* in Ecuador. Created by L. Vélez-Abarca.

petals slightly falcate, with a cleft in the basal third, microscopically verrucose-papillose on the dorsal surface, 4.0–4.5 × 0.75 mm (*vs.* glabrous on the dorsal surface, 3–7 × 0.5–1.2 mm), lip ovate-elliptic, obtuse, verrucose-papillose abaxially, margins minutely denticulate-ciliate, with a slightly bilobed glenion, 3.2 × 2.0–2.2 mm (*vs.* triangular, oblong, subacute or round at the apex, papillose abaxially with denticulate margins, turned-shaped glenion, 3–7 × 2–4 mm), anther cap, sub-globose, (*vs*. cordiform) (Fig. 6D).

CONSERVATION STATUS: This species has been only reported from the cantón of El Pangui (Fig. 7) in the province of Zamora Chinchipe, Ecuador. The plateau where *P. ariana-dayanae* was found could act as a natural barrier that determines its restricted distribution; perhaps more research in other similar "tepuis" from Ecuador and Peru will lead to discovering new populations of *P. ariana-dayanae*. However, only three populations were found in an area no greater than 49 km^2. Micro-endemism is restricted to an area subject to rapid deforestation due to mining activities.

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A NEW SMALL-FLOWERED *CYRTOCHILUM* (ONCIDIINAE) FROM PERU

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Abstract. A new small-flowered *Cyrtochilum* from Peru is described, illustrated with photos and drawings, and compared to similar species. The new species is similar to *C. fidicularium* and *C. gracile* in having extra thumb-like projections above the rounded ventral lobes of the column but differs from *C. fidicularium* by the more sharply pointed and forward projecting callus keels on the lip and by a longer front-lobe of the lip, versus blunt and downward directed lobes in *C. fidicularium*. The new species differs readily from *Cyrtochilum gracile* by the long and wiry inflorescence, versus a more sub-erect and straighter panicle in *C. gracile.*

Keywords/Palabras clave: Amazonas, bosque nuboso, cloud forest, Cymbidieae, Huánuco, new orchid, nueva orquídea

Introduction. The Department of Amazonas (here referred to as DoA) is in the northern part of Peru, in the transition zone between the Andes and the Amazonian lowland plains (Fig. 1). This area consists of large tracts of humid and semi-humid forest where the authors have experienced a high diversity in orchids. Since the early nineteenth century, many plant collectors and botanists have been recording the species richness that inhabits the forests of the DoA and other ecologically similar areas in Peru. As a result, numerous new species have been described from these forests, such as *Dichaea hutchisonii* D.E.Benn. & Christenson, *Epidendrum camilo-diazii* Hágsater & Chocce, *Epidendrum mathewsii* Rchb.f., *Masdevallia wurdackii* C.Schweinf., and *Otoglossum weberbauerianum* (Kraenzl.) Garay & Dunst. These and numerous other species were named in honor of their collectors (Bennett & Christenson 2001, Hágsater & Sánchez 2010, Kränzlin 1906, Reichenbach 1877, Schweinfurth 1970).

Nevertheless, this unique biological habitat appears to be under intense pressure due to the deforestation that the authors have witnessed over the years. It is estimated that approximately 33% of the surface of the original forest has been altered in the DoA (Reátegui & Martínez 2010); the most deforested zone ranges from the center to the south of the Department. In deforested areas, however, part of the rich original flora is luckily preserved in small patches of original vegetation where even new orchid species can be found (Fig. 2). Here we described one such new species of *Cyrtochilum* Kunth, discovered in a small fragment of wet montane forest in the southwestern part of the DoA, with second documentation of the same taxon from the Department of Huánuco, Peru.

Taxonomic treatment

Cyrtochilum pollex Dalström & D.Trujillo, ***sp. nov.*** (Fig. 3–6).

TYPE: Peru. Amazonas: Prov. Luya, Distrito San Francisco del Yeso, Ipaña–Las Palmas, alt. 3055 m, 1 May 2010, *D. Trujillo 499* (holotype: MOL).

Diagnosis: *Cyrtochilum pollex* is similar to *C. fidicularium* (Dalström) Dalström and *C. gracile* (Lindl.) Kraenzl., in having an extra thumb-like projection above the rounded ventral lobe of the column. *Cyrtochilum pollex* differs from *C. fidicularium* in having

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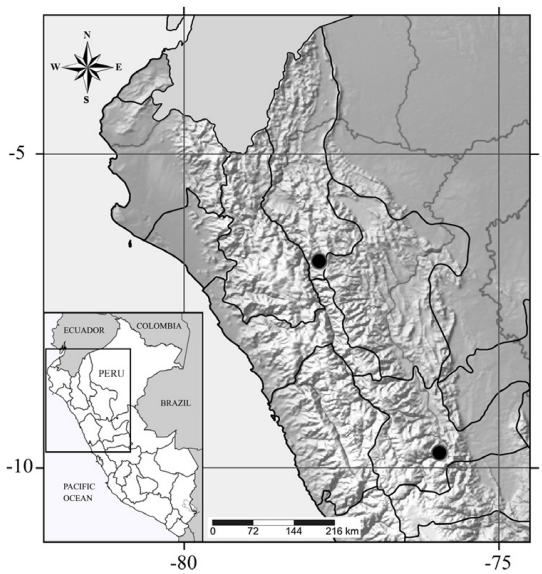

FIGURE 1. Map showing the known distribution of *Cyrtochilum pollex* in Peru. Map composed by Delsy Trujillo using SimpleMappr.

more sharply pointed and forward projecting callus keels on the lip and a longer front lobe of the lip versus blunt and downward directed lobes in *C. fidicularium*. *Cyrtochilum pollex* differs from *C. gracile* by the long and wiry inflorescence versus a more sub-erect and straighter panicle in *C. gracile.*

Epiphytic *herb,* type plant rather small for the genus, but much larger plants have been observed (*SD 3679, 3680*). *Pseudobulbs* caespitose, ovoid, to *ca*. 5 × 1.5 cm, unifoliate, surrounded basally by 3 to 6 foliaceous sheaths. *Leaf* conduplicate, petiolate, elliptic, acuminate, *ca.* 10 × 1.8 cm. *Inflorescence* axillary from the base of the pseudobulb and the uppermost sheath, wiry, to *ca*. 70 cm long panicle, with widely spaced side branches carrying clusters of 6 to *ca*. 15 flowers. *Peduncular* and *floral bracts* appressed, scale-like, acute, 4–10 mm long. *Pedicel* with *ovary* 5–8 mm long. *Flowers* with spreading to indistinctly campanulate brown sepals and petals, and a basally white and apically pale purplish lip; callus white with

FIGURE 2. The disturbed habitat of *Cyrtochilum pollex* in the department of Amazonas. Photo by Delsy Trujillo.

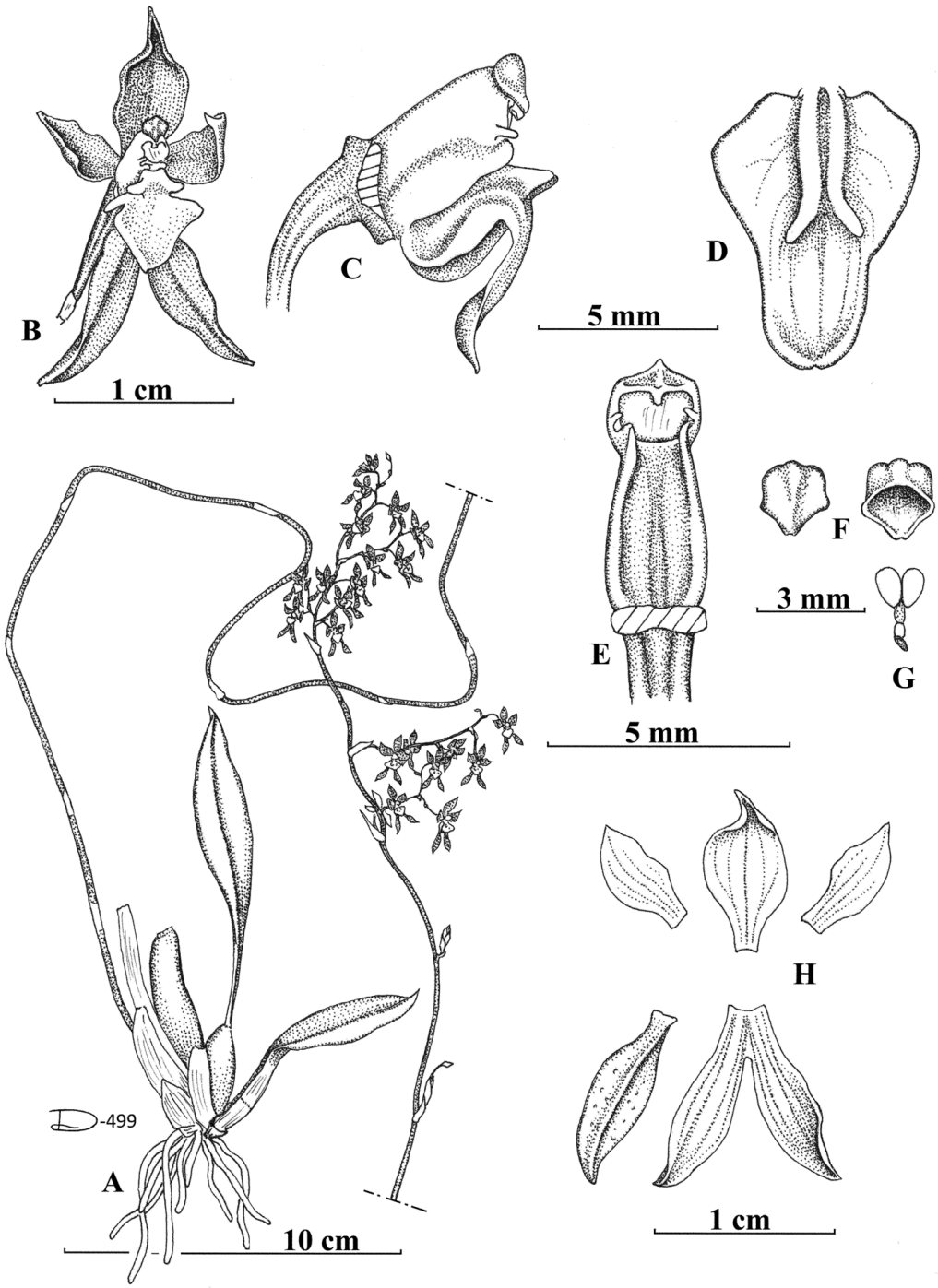

Figure 3. *Cyrtochilum pollex* Dalström & D.Trujillo. **A**. Plant habit. **B**. Flower, front view. **C**. Lip and column, lateral view. **D**. Lip flattened, ventral view. **E**. Column, ventral view. **F**. Anther cap, front and ventral views. **G**. Pollinarium. **H**. Flower dissected. The drawing by Delsy Trujillo is based on the holotype and inked by Stig Dalström.

FIGURE 4. Inflorescence of *Cyrtochilum pollex* in the natural habitat. Photo by Delsy Trujillo.

FIGURE 5. Close-up of part of the inflorescence of *Cyrtochilum pollex*. Photo by Delsy Trujillo.

purple dots above; *dorsal sepal* unguiculate, broadly elliptic, acuminate, *ca*. 10 × 5 mm; *lateral sepals* basally fused for 2.5–3.0 mm, unguiculate, externally carinate and indistinctly verrucose, slightly oblique, narrowly ovate, obtuse to acute *ca*. 10 × 4 mm; *petals* subsessile, obliquely ovate, acute, *ca*. 7 × 3 mm; *lip* rigidly attached to the base of the column, trilobed with blunt lateral lobes, and a broadly ligulate, rounded front lobe, 7–8 × 5.5 mm; *callus* of a pair of fleshy, longitudinal apically spreading, projecting acutely angulate keels, emerging gradually from the base of the lip and extending to the base of the front lobe; *column* whitish with a purple rim around the stigmatic surface, straight, compact, ventrally furrowed and with an apical rounded lobe, with a digitate and "thumb-like" projection above, 5–5.5 mm long excluding the anther cap; *anther cap* pale yellow, campanulate, indistinctly rostrate and dorsally lobulate, *ca.* 2 × 2.5 mm; *pollinarium* of two folded/cleft pyriform pollinia on a linear, *ca.* 0.3 mm long stipe, with an equally long string of viscine, on an ovoid pulvinate infinitesimal viscidium.

PARATYPE: Peru. Huánuco: Road from Pillao to Miraflores, S09°45.57'; W75°56.104', alt. 3056 m, 27 Nov. 2013, *S. Dalström 3679*, photo record (Dalström archives).

DISTRIBUTION: *Cyrtochilum pollex* is known from the type collection in the Department of Amazonas and a second locality in the Department of Huánuco, Peru. Plants were found growing as epiphytes in shrubby and mainly disturbed or deforested areas above 3000 m of elevation.

ETYMOLOGY: Named in reference to the tiny thumb-like appendage (Latin: *pollex*), on each side of the stigma.

ACKNOWLEDGMENTS. The authors thank the Peruvian Ministerio de Agricultura for granting a collection permit (R.D. N° 0137-2010-AG-DGFFS-DGEFF), and we thank the Asociación Centro Mallqui for supporting the field work in the provinces of Luya and Chachapoyas. We also thank Wesley Higgins for viewing and commenting on the manuscript.

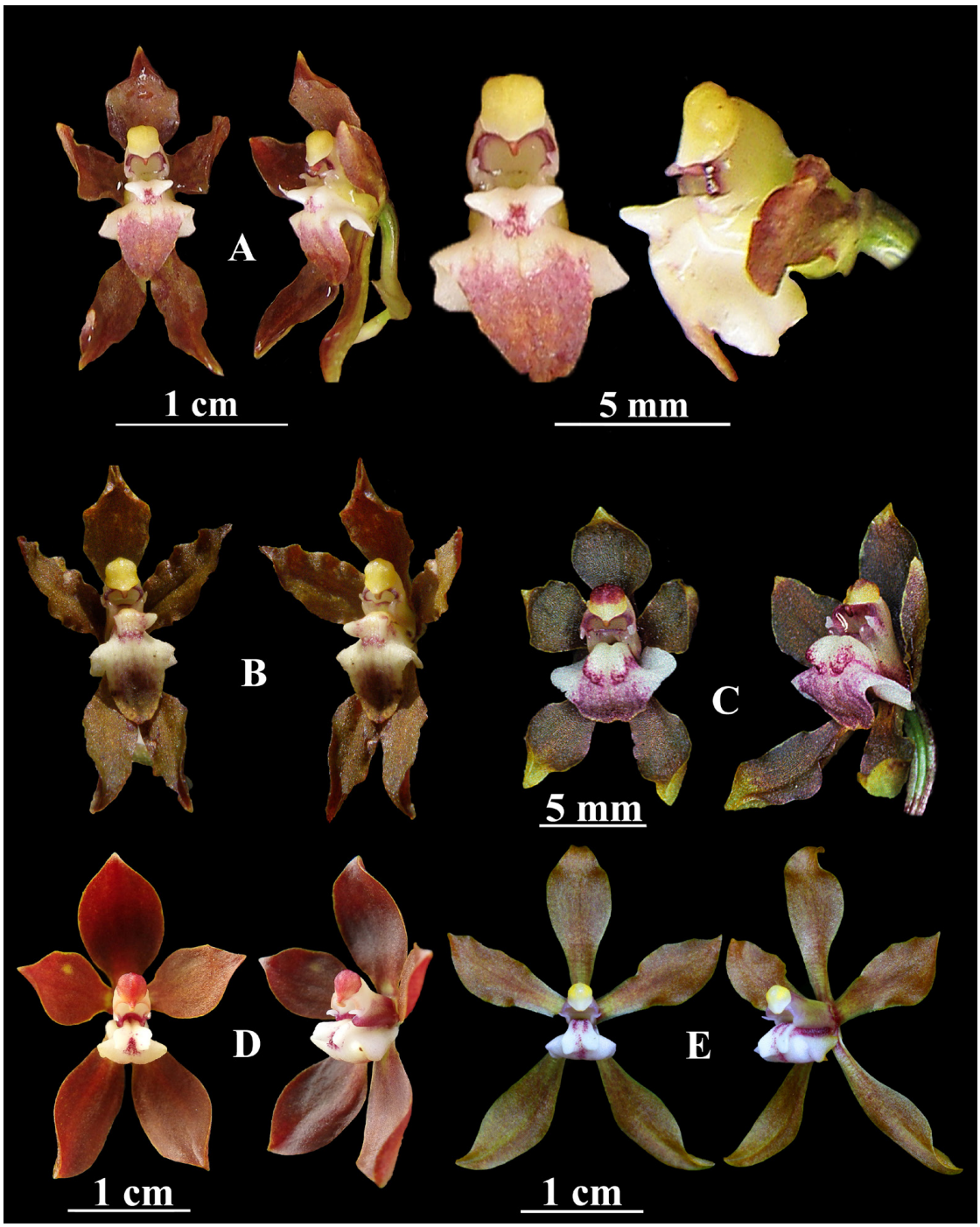

Figure 6. Plate of *Cyrtochilum pollex* and similar species **A**. *Cyrtochilum pollex* (*D. Trujillo 499*). **B**. *Cyrtochilum pollex* (*S. Dalström 3679*). **C**. *Cyrtochilum fidicularium* (*S. Dalström s.n.*). **D**. *Cyrtochilum gracile* (*S. Dalström 3807*). **E**. *Cyrtochilum longifolium* (*G. Deburghgraeve s.n.*). Photos by Delsy Trujillo (A), Stig Dalström (B–D), and Guido Deburghgraeve (E).

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A NEW EARLY-FLOWERING SPOTTED *CHILOSCHISTA* (AERIDINAE) FROM BHUTAN

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Abstract. A new species of *Chiloschista* from a restricted area in Bhutan is described and illustrated. It is featured with color photos and a map showing its only known locality. The new species is compared with the other three spotted *Chiloschista* species from Bhutan: *C. densiflora*, *C. gelephuense*, and *C. himalaica*, which have similarly colored flowers, but different lip structure and the differences are explained and illustrated.

Keywords/Palabras clave: Himalaya, new species, nueva especie, Orchidaceae, Vandeae

Introduction. During an orchid inventory expedition to the southern part of Bhutan in May 2014 by a research team from the National Biodiversity Centre in Serbithang, Bhutan (NBC), plants of a *Chiloschista* Lindl. species without flowers were found growing epiphytically on small trees in deep shade near the Gelephu Tshachu, or hot springs, just north of the city of Gelephu in the Sarpang District and near the Assamese Indian border. A few plants were collected for cultivation at the Royal Botanical Garden in Serbithang, where one plant flowered in May the following year. The identity of this plant turned out to be unknown. After some research, it was concluded that it represented a new species described as *Chiloschista gelephuensis* C.Gyeltshen & Dalström (2019). The flowers are yellow with brown spots like many other members of this genus, but the internal structure of the lip is distinct from other similar-looking species. The internal morphology of the lip has also turned out to be a useful tool for distinguishing other similarly colored *Chiloschista* species in Bhutan and elsewhere (Fig. 1). That led to the identification of two additional undescribed and similarly colored *Chiloschista* species in Bhutan: *C. densiflora* Gyeltshen, C.Gyeltshen & Dalström, and *C. himalaica* Tobgay, C.Gyeltshen, Dalström (Gyeltshen *et al*. 2020).

During the process of preparing the manuscript for the two latter *Chiloschista* species mentioned above, a third similarly colored taxon was discovered by Forest Ranger Bhakta Bdr. Ghalley, while on a leisurely stroll together with his wife and son along the Wangchhu river in the Chhukha district of Bhutan. Photos of this taxon were included in Gyeltshen *et al*. (2020), where it was speculated to be a potential new species. After revisiting the area in February and March of 2022, additional plant material was discovered and has been examined and preserved (Fig. 2). This led to the conclusion that it, indeed, is a new species and is described here. The much earlier February–March flowering season for the new taxon, compared to April–May for the sympatric *C. himalaica*, and the distantly distributed *C. densiflora*, and distinct differences in the internal lip morphology, together with the smaller flower with a relatively large anther cap readily separate this species from other spotted *Chiloschista* species in Bhutan and elsewhere (Fig. 3).

Taxonomic treatment

Chiloschista bhutanensis B.B.Ghalley & Dalström, ***sp. nov.*** Fig. 2, 3, 4.

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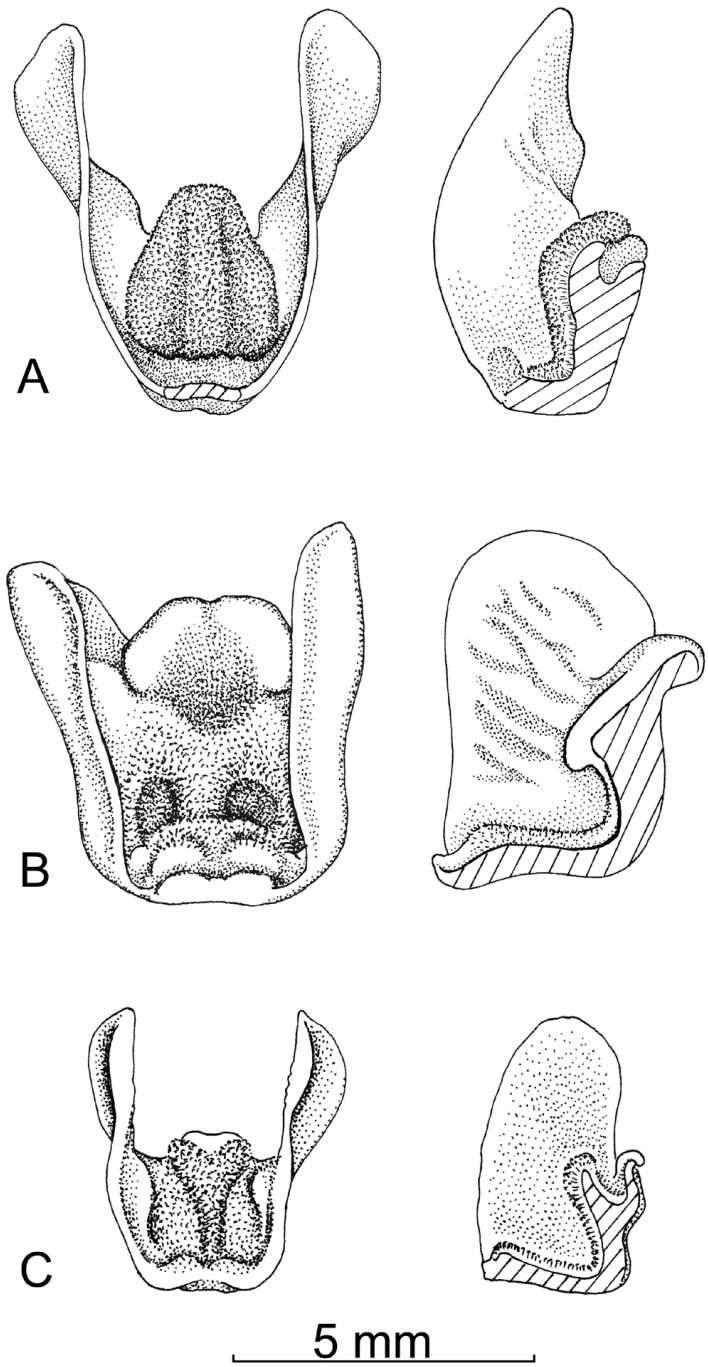

FIGURE 1. The interior callus structures of the lip can be helpful in separating otherwise similarly looking *Chiloschista* species. **A**. *Chiloschista densiflora*. **B**. *Chiloschista gelephuensis*. **C**. *Chiloschista himalaica*. Drawings made from the type specimens by Stig Dalström.

FIGURE 2. A revisit in 2022 of the Wangchhu river location revealed more blooming plants of what has become *Chiloschista bhutanensis*. Photo by Bhakta Bdr. Ghalley.

TYPE: Bhutan. Chhukha: along Wangchhu river, epiphytic in warm broad-leaved forest, 27° 2'59.59"N; 89°34'52.43"E, alt. 1374 m, 27 Mar., 2022, *B. Bdr. Ghalley s.n.* (holotype: THIM).

DIAGNOSIS: *Chiloschista bhutanensis* is most similar to the sympatric *C. himalaica*, but differs by an earlier flowering season, the paler and smaller flowers, *ca.* 10 mm across versus 12–13 mm across for the latter species. *Chiloschista bhutanensis* also differs from other similarly colored species in the genus by a distinct erect interior hump near the middle of the bottom of the lip, and by a distinctly larger anther cap in relation to the overall size of the flower.

Epiphytic *herb*. *Roots* numerous, spreading, terete to slightly flattened, 2–3 mm in diameter and *ca.* 24–30 cm long. *Stem* reduced, virtually absent. *Leaves* seasonal and only present during the rainy season, and not seen on flowering plants (the holotype). *Inflorescence* sub-erect to pendent, 1–10 cm long, but usually very short and densely flowered, almost straight to indistinctly flexuous, micro-pubescent, densely 4

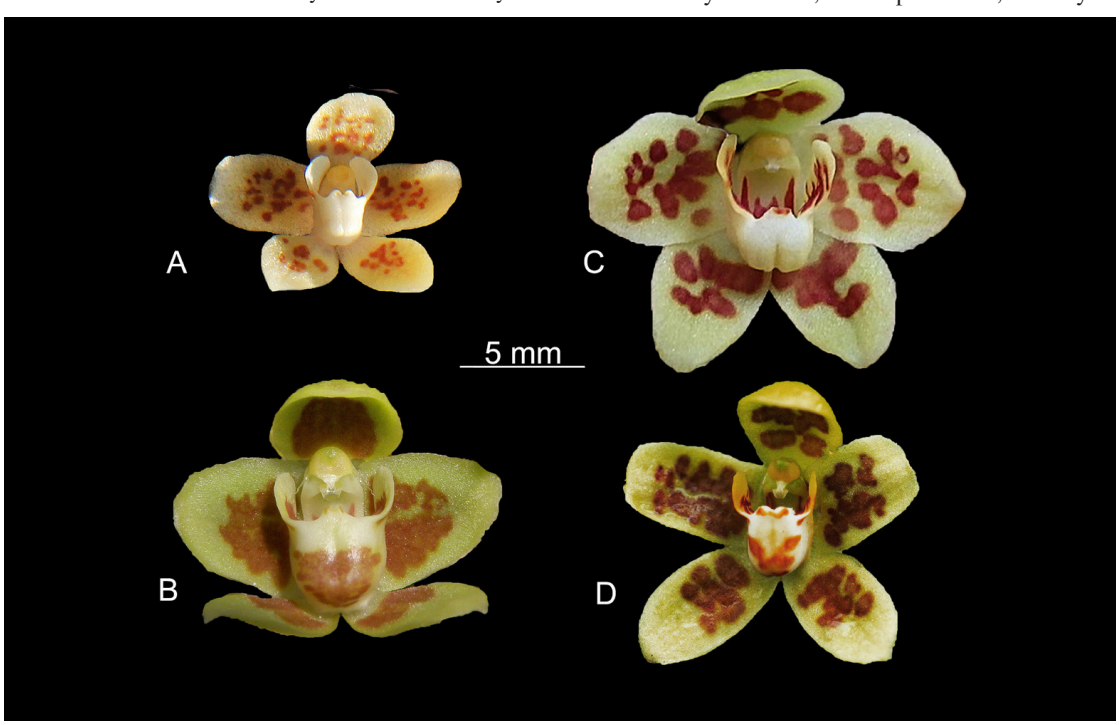

FIGURE 3. The four spotted *Chiloschista* species known from Bhutan. **A**. *Chiloschista bhutanensis*. **B**. *Chiloschista densiflora*. **C**. *Chiloschista gelephuensis*. **D**. *Chiloschista himalaica*. Photo arrangement by Stig Dalström.

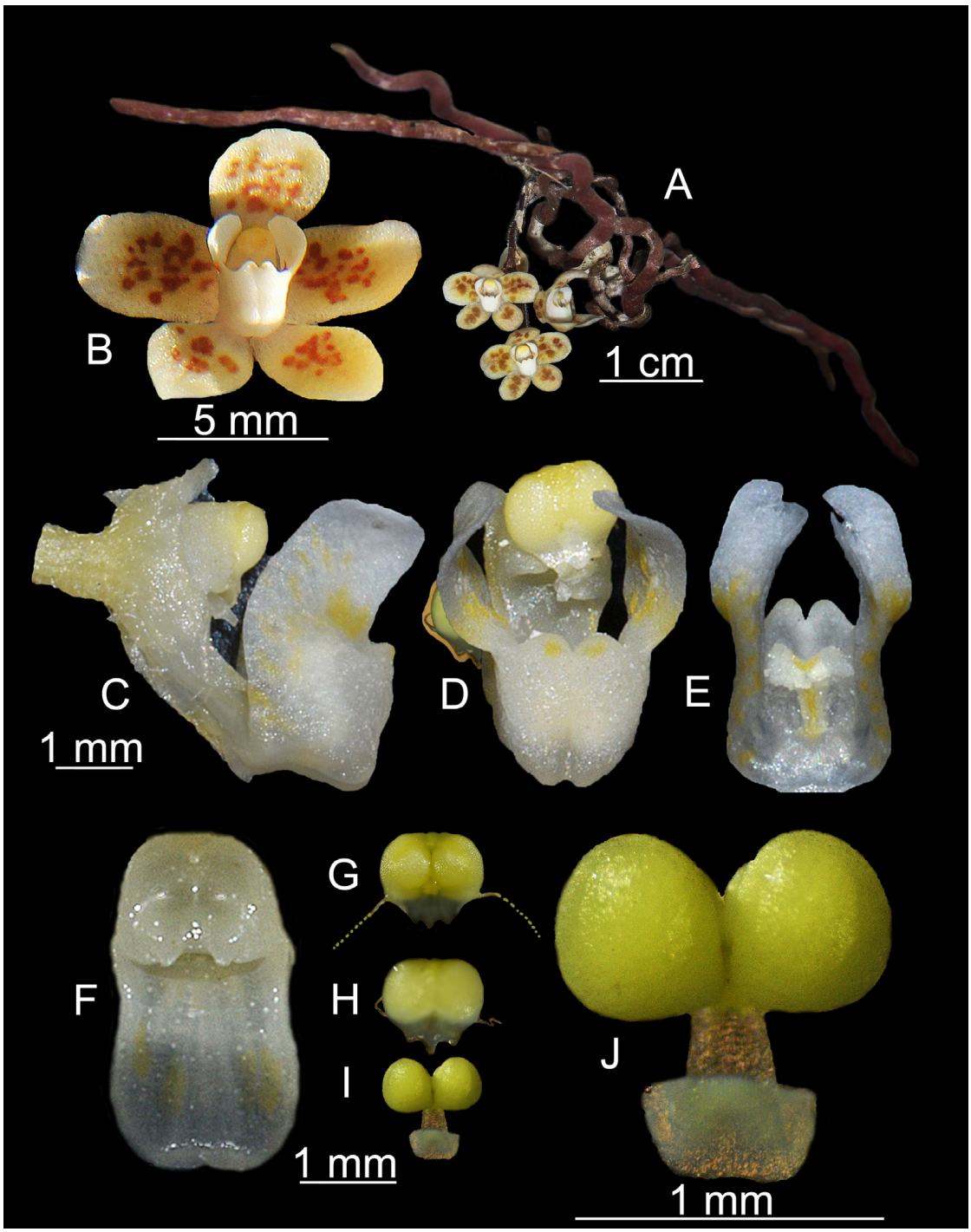

FIGURE 4. *Chiloschista bhutanensis* B.B.Ghalley & Dalström. **A**. Plant habit. **B**. Flower. **C**. Column and lip, lateral view (from preserved material). **D**. Column and lip, frontal view. **E**. Lip, back and interior view. **F**. Column, front view. **G**. Anther cap, ventral view (tendrils partially missing). **H**. Anther cap, dorsal view (tendrils partially missing). **I–J**. Pollinarium. From *B. Bdr. Ghalley s.n.* (holotype: THIM).

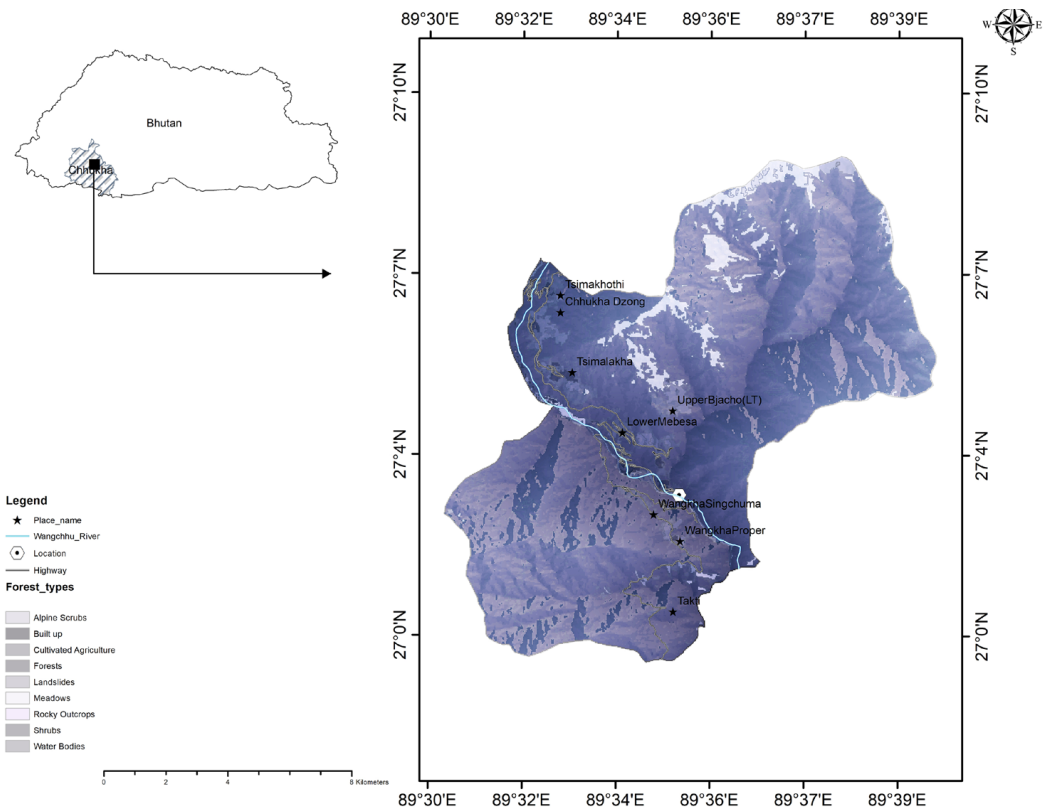

FIGURE 5. Map of the Chhukha District, Bhutan, with an indication for the only known site of *Chiloschista bhutanensis*. Map provided by Bhakta Bdr. Ghalley.

to 13-flowered; *peduncle* 8–10 mm long; rachis 2–4 mm long; *bracts* scale-like, narrowly acute, 2–3 mm long. *Pedicel* with *ovary* micro-pubescent, 3–4 mm long. *Flower* pale yellowish to white with brown spots, and with rather flat and spreading sepals and petals; *lip* generally white with pale brownish bars inside the lateral lobes and occasionally with a pair of minute brown dots near the apex of the front lobe; *dorsal sepal* broadly obovate to sub-orbiculate, erect or bent forward over the column, mainly glabrous, *ca*. 6 × 3 mm; *lateral sepals* similar in shape, mainly glabrous, fused basally along the micro-pubescent column foot, *ca*. 6 × 4 mm; *petals* similar in shape, glabrous, sessile and fused to the micro-pubescent column foot, sub-rectangular to indistinctly obovate, apically rounded, *ca*. 5 × 3 mm; *lip* rigidly attached to the apex of the column foot, deeply saccate and indistinctly canaliculated ventrally, tri-lobed, lateral lobes erect to indistinctly curved inwards, apically rounded, front lobe short and erect, fleshy, indistinctly bi-lobed, lip in total *ca*. 4 mm high and 2–3 mm wide; *callus* of a fleshy basically glabrous to micro-pubescent swelling near the base, developing into a raised and distinct hump near the middle of the bottom of the sac-like lip, and with a tuft of glandular hairs near the base of the bi-lobed, erect but indistinct front lobe; *column* with the apical free part short and stocky, *ca*. 3.6 mm long, including the column foot; *anther cap* light yellow, galeate and minutely rostrate, *ca*. 1 mm across, with a pair of hair-like, easily broken off and partially missing on the type specimen, *ca*. 1 mm long tendrils on each side; *pollinarium* of 2 globose, cleft pollinia on a narrowly rectangular *ca*. 0.6 mm long stipe, on a sub-quadrate, indistinctly concave viscidium.

DISTRIBUTION: *Chiloschista bhutanensis* is only known from the original type locality along the Wangchhu river in the Chhukha district of southwestern Bhutan,

growing epiphytically on rough-barked trees such as *Alnus nepalensis* D.Don (Betulaceae) and *Albizia* Durazz. sp. (Fabaceae).

Etymology: Named in reference to the country of origin to which this tiny but attractive species may very well be endemic.

Acknowledgments. The authors thank the administration of the College of Natural Resources (CNR) for allowing the use of laboratory facilities in the identification process of the species, and we sincerely thank Dr. Dhan Bdr. Gurung for his valuable advices. We sincerely thank the Sarasota Orchid Society for continuous financial support and Wesley Higgins and the anonymous reviewers for improving and simplifying the manuscript.

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THE DISCOVERY OF *SCAPHYGLOTTIS PUNCTULATA* (LAELIINAE) IN THE HIGHLANDS OF BRAZILIAN AMAZONIA WITH A KEY TO THE SPECIES OF THE REGION

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Abstract. The genus *Scaphyglottis* Poepp. & Endl. presents 78 species and occurs from Mexico to Brazil. *Scaphyglottis punctulata* (Rchb.f.) C.Schweinf. is known from various high elevation locations from Panama to Bolivia. Here, we report new records in two regions of the Brazil portion of the Guiana Shield. We provide a detailed description, photographic plates, updated distribution map, ecological and taxonomic comments for *S. punctulata*, and an identification key for *Scaphyglottis* species from the Brazilian portion of the Guiana Shield.

Keywords/Palabras clave: América del Sur, epífitas, epiphytes, Escudo Guayanés, Guiana Shield, South America, taxonomía, taxonomy

Introduction. *Scaphyglottis* Poepp. & Endl. ranges from Mexico to southern Brazil and contains 78 species (Dressler 2001, Dressler *et al*. 2004, Govaerts *et al*. 2021, Szlachetko & Kolanowska 2014). Molecular and morphological studies place the genus in the Laeliinae (Dressler 2004). The genus may be distinguished from the other members of the subtribe by the overlapping pseudobulbs, usually apical leaves, flowers that are almost always resupinate, and a free column (Dressler 2001, Szlachetko & Kolanowska 2014).

Brazil has 13 recorded species of *Scaphyglottis* (Barros *et al*. 2015, Brazil Flora Group 2022), of which 11 occur in the North region of the country: *S. bidentata* (Lindl.) Dressler, *S. boliviensis* (Rolfe) B.R.Adams, *S. emarginata* (Garay) Dressler, *S. fusiformis* (Griseb.) R.E.Schult., *S. graminifolia* (Ruiz & Pav.) Poepp. & Endl., *S. imbricata* (Lindl.) Dressler, *S. modesta* (Rchb.f.) Schltr., *S. prolifera* (Sw.) Cogn., *S. reflexa* Lindl., *S. sickii* Pabst, and *S. stellata* Lodd. ex Lindl. (Brazil Flora Group 2022). Of these 11 species, eight are recorded from the Guiana Shield (GS) (Brazil Flora Group 2022, Cantuária *et al*. 2021, Pessoa *et al*. 2015), a region that, within Brazil, is within the states of Roraima, Amapá, Amazonas, and Pará (Barbosa-Silva *et al*. 2020, Funk *et al*. 2007).

Regarding hydrography, the GS region covers parts of the Amazon, Negro, and Orinoco river basins (Barbosa-Silva *et al*. 2020, Berry & Riina 2005). In Brazil, the region contains elevation areas higher than Central Amazonia, including mountains and tepuis that harbor considerable plant species diversity and endemism (Riina *et al*. 2019). In addition, a series of scien-

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tific expeditions carried out recently to some Brazilian protected areas within the Guiana Shield found new records for the Brazilian flora (Barbosa-Silva *et al*. 2016, 2020, Farroñay *et al*. 2019, Flores & Rodrigues 2017), including several species of Orchidaceae (Cantuária *et al*. 2020, Pessoa *et al*. 2013).

Recently, while analyzing specimens deposited in the herbarium of the Instituto Nacional de Pesquisas da Amazônia (INPA) coming from floristic surveys, we registered for the first time in Brazil the occurrence of *S. punctulata* (Rchb.f.) C.Schweinf. Here, we present these new records, accompanied by an updated description, taxonomic and ecological comments, distribution, photographic plates, and an identification key to species of *Scaphyglottis* recorded in the Brazilian portion of the GS.

Materials and methods. All cited specimens are deposited in the INPA herbarium (acronym according to Thiers 2022, continuously updated). Specimen identities were confirmed with the help of various protologues and specialized literature (Reichenbach 1855, Schweinfurth 1960, Szlachetko & Kolanowska 2014, Vásquez & Ibisch 2004). Morphological analyzes and measurements were carried out in dried material only, and dried flowers were hydrated and dissected for identification. Morphological measurements were performed using ImageJ software (Schneider *et al*. 2012) on images of the specimens. The distribution map was made within the R environment (R Core Team 2021), using the R packages base (R Core Team 2021), prettymapr (Dunnington 2017), raster (Hijmans 2022), rgdal (Bivand *et al*. 2021), rworldmap (South 2011), and sf (Pebesma 2018). To determine the conservation status of *S. punctulata*, we calculated the extent of occurrence (EOO) and area of occupancy (AOO) using the GeoCAT platform (Bachman *et al*. 2011). Field photographs were taken with a Nikon D3300 camera and photographs of dehydrated specimens with a Leica M205C Stereomicroscope.

Taxonomic treatment

Scaphyglottis punctulata (Rchb.f.) C.Schweinf., Botanical Museum Leaflets 17(2): 47. 1955. ≡ *Ponera punctulata* Rchb.f., Bonplandia 3: 220. 1855. (Fig. 1). TYPE: Venezuela. *Geitner s.n*. (holotype: W!, W0109821, photo; isotypes: unknown).

Epiphytic or rupicolous *herbs*, 17.6–50.0 cm tall. *Pseudobulbs* 6.5–20.6 × 0.2 cm, green, overlapping, cylindrical and elongated. *Leaves* 2 per pseudobulb, 5.3–14.0 × 0.4–0.5 cm, green, conduplicate, apical, lanceolate, apex obtuse to slightly emarginate. *Inflorescence* 1–2 flowers, 22–29 mm, terminal. *Floral bracts* 5–8 × 1 mm, purple, lanceolate, base attenuated, apex acute. *Flowers* 12.7–12.8 mm, resupinate, petals and sepals cream with 5 purple lines, lip dark purple and cream; *ovary* pedicellate 16–19 × 1 mm, purple and green. *Dorsal sepal* 8 × 2–3 mm, oblong to ovate, apex acute. *Lateral sepals* 7–8 × 3 mm, oblong to elliptic, apex acute. *Petals* 6–8 × 2 mm elliptical to oblong, wider at midportion, apex acute. *Lip* entire 10–11 × 3–4 mm, obovate, apex emarginate to straight, margin entire to slightly eroded, reflex, concave callus. *Column* 5–6 × 1 mm, dark purple and cream, wings curved deltoid at the apex, *anther* obovate, 4-celled, stigmatic cavity conspicuous, obovate. *Pollinarium* and *Capsules* not seen.

Distribution, habitat, and phenology: Previously reported for Bolivia, Colombia, Panama, Peru, and Venezuela (Govaerts *et al*. 2021), and here expanded to Brazil, *Scaphyglottis punctulata* occurs in highland regions of northern Brazil, with the first collection record in 2001 in the Parque Estadual (PE) Serra do Aracá, Amazonas state, then later collected in 2019 in the Indigenous Territory (IT) Raposa Serra do Sol, Roraima state. At PE Serra do Aracá, the species was recorded in a plateau at 1200 m, in a submontane evergreen rainforest with a canopy of *ca*. 10 m, on white-sand soil. In the IT Raposa Serra do Sol, the sheet *Perdiz et al*. *3619* (INPA) was collected by a waterfall on the Cotingo River, surrounded by a forest dominated by *Dimorphandra* Schott (Fabaceae), with a prevalence of mosses and other species of epiphytic orchids in an open submontane rainforest environment. In the same expedition, *Farronãy et al*. *1646* (INPA) was found on a 1500 m plateau, in the same type of forest, with a 25 m high canopy, in organic soil over white clay. Based on all records available on online platforms, the species blooms year-round (CRIA 2022, GBIF 2022).

Material examined: BRASIL. **Amazonas**: Barcelos, Parque Estadual Serra do Aracá, 26 August, 2001, fl., *A. Vicentini & R.C. Mesquita*. *1851*. (INPA 214376); *ibid*., 22 April, 2014, fl., *P. H. Labiak et al*. 5707. (RB

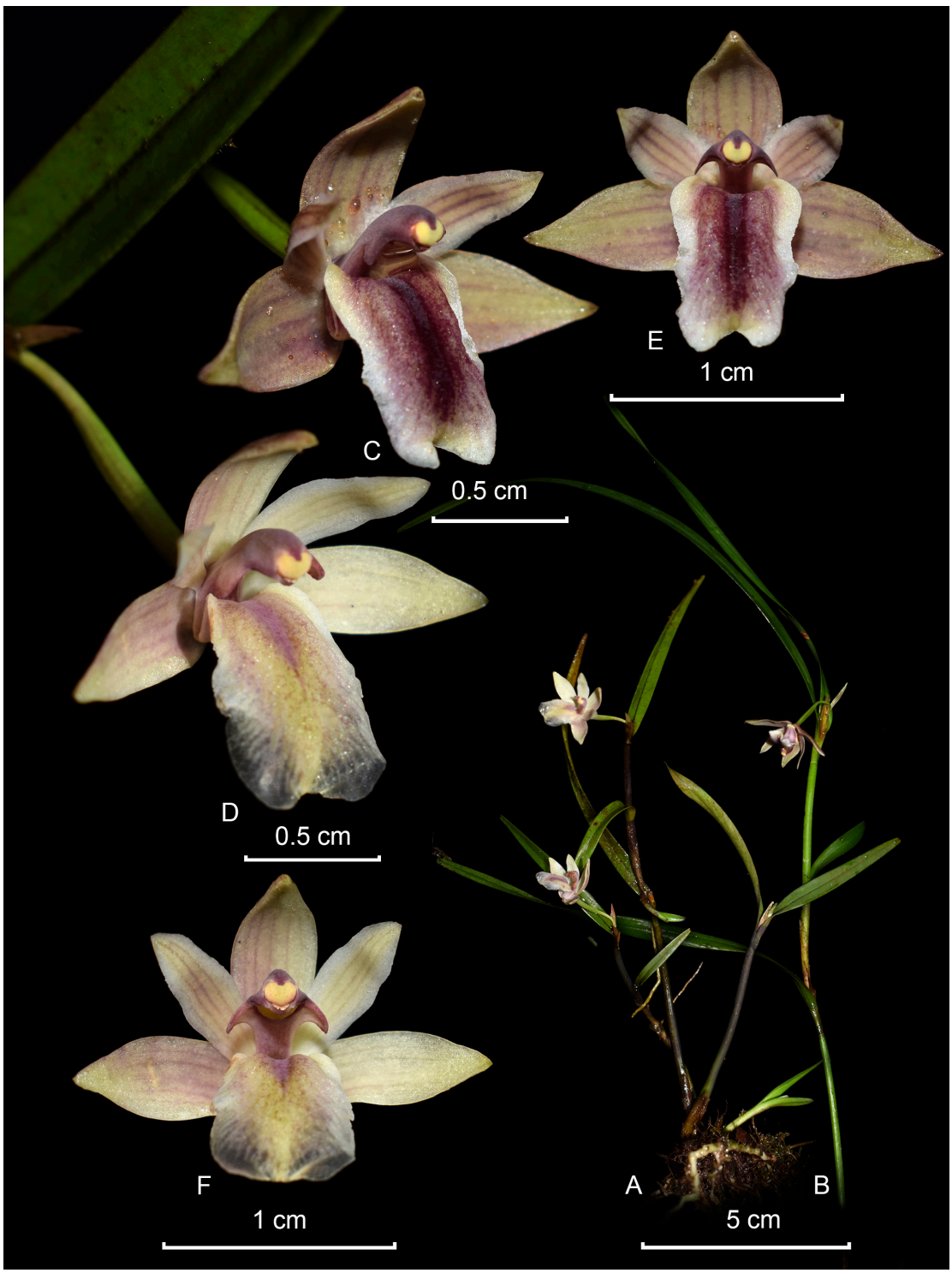

FIGURE 1. *Scaphyglottis punctulata*. **A–B**. Habit. **C–D**. Flower, ¾ view. **E–F**. Flower, frontal view. Based on *Farroñay 1646* (A, C, D) and *Perdiz 3619* (B, E, F). Photographs by F. Farroñay, figure preparation by G. Miranda.

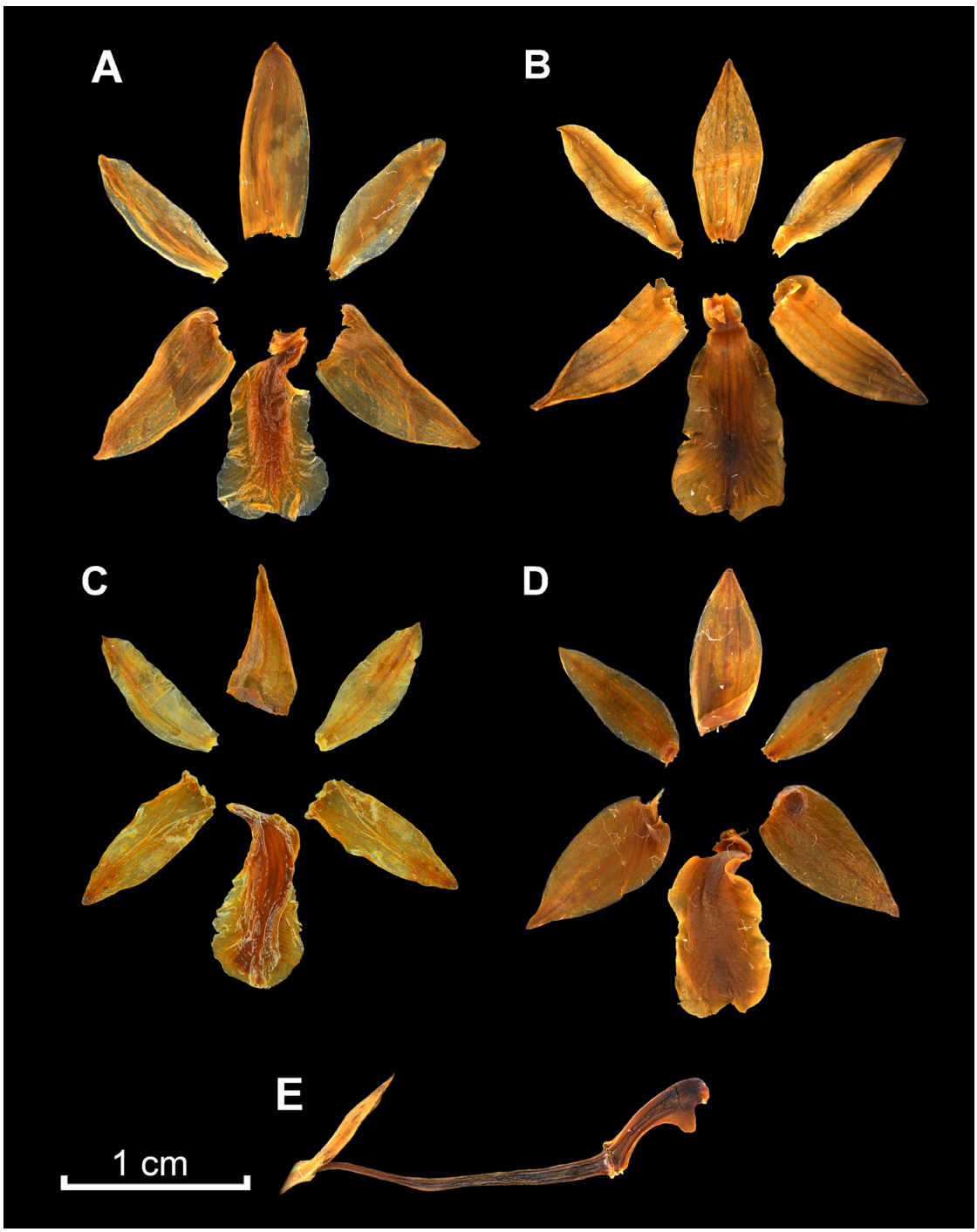

FIGURE 2. *Scaphyglottis punctulata*. **A–D**. Dissected perianth showing the morphological variation of the floral pieces, based on *Vicentini 1851* (A), *Perdiz 3619* (B), *Labiak 5707* (C), and *Farroñay 1646* (D). **E**. Column, pedicellate ovary and bract, based on *Farroñay 1646*. Photographs by F. Farroñay (A, B, D, E) and A. M. Araújo (C). Figure preparation by G. Miranda.

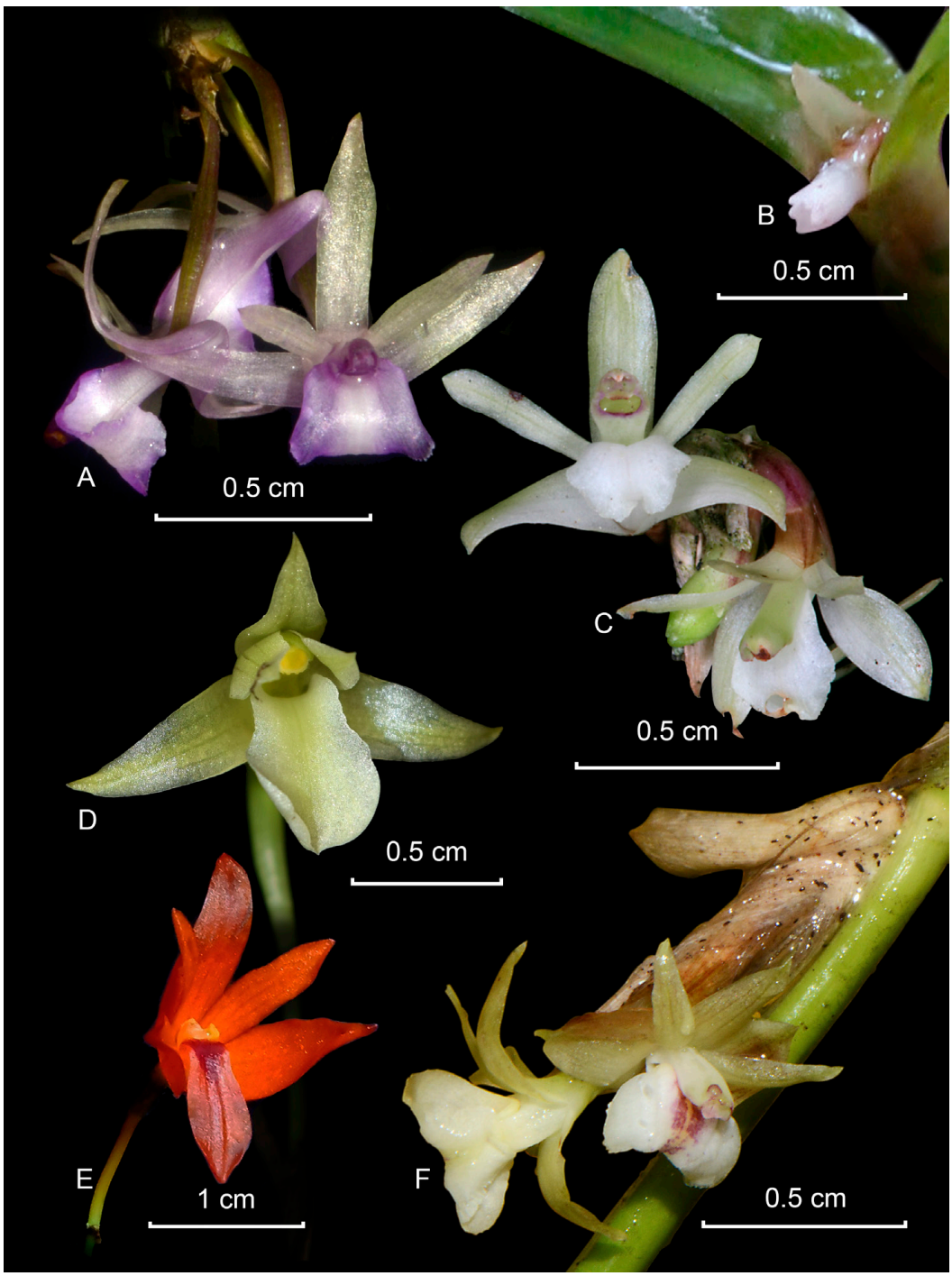

FIGURE 3. Species of *Scaphyglottis* that occur in the Guiana Shield. **A**. *Scaphyglottis stellata* Lodd. ex Lindl. **B**. *Scaphyglottis sickii* Pabst. **C**. *Scaphyglottis prolifera* (R.Br.) Cogn. **D**. *Scaphyglottis fusiformis* (Griseb.) R.E.Schultes. **E**. *Scaphyglottis bidentata* (Lindl.) Dressler. **F**. *Scaphyglottis reflexa* Lindl. Photographs by F. Farroñay (A, D), A. M. Araújo (B, E), L. P. Félix (C), and R. G. Barbosa-Silva (F). Figure preparation by G. Miranda.

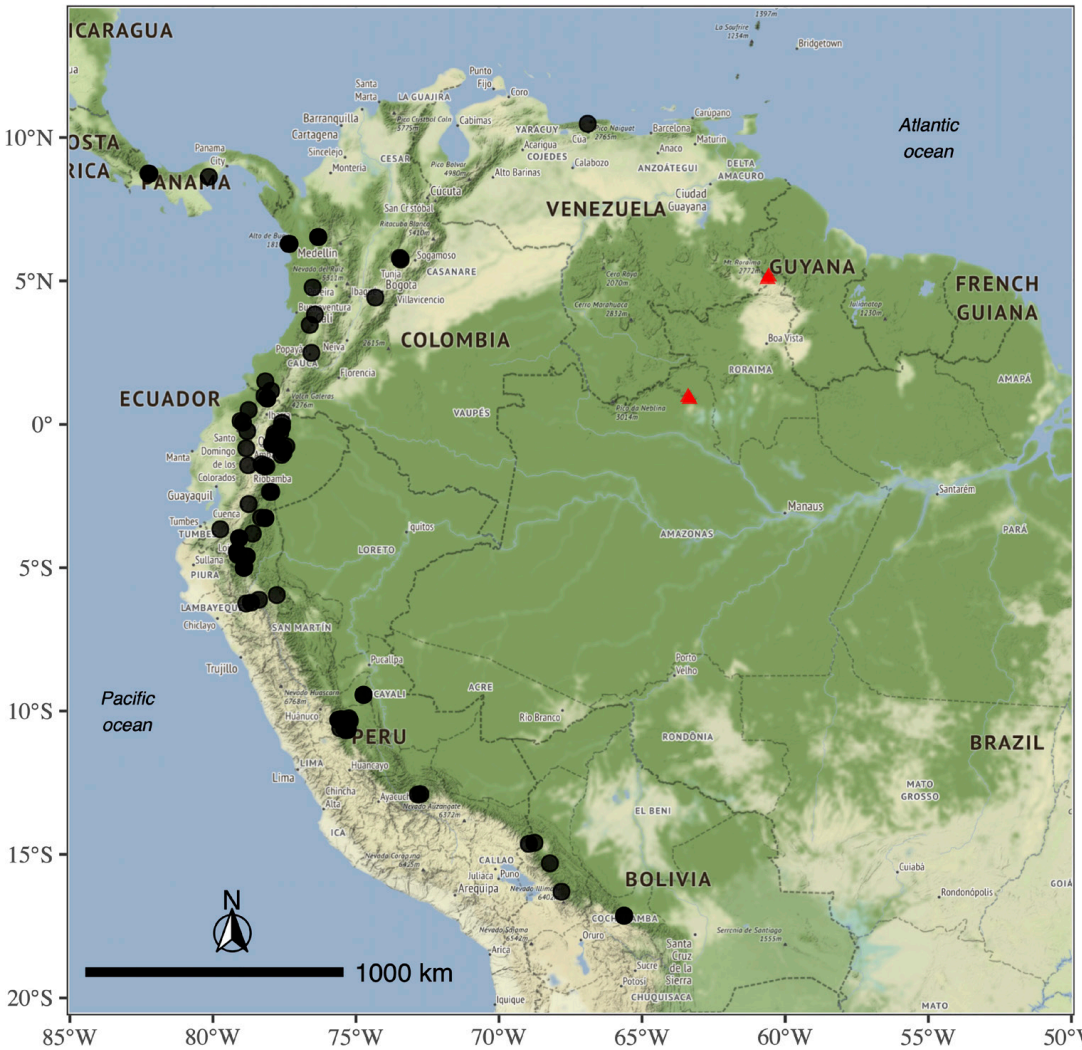

FIGURE 4. Geographical distribution of *Scaphyglottis punctulata*. Sites of old records are indicated by black circles. New record sites are indicated by red triangles. Map preparation by R. O. Perdiz.

601971). **Roraima**: Uiramutã, Terra Indígena Raposa Serra do Sol, 6 December, 2019, fl., *R.O. Perdiz et al. 3619* (INPA 290578); *ibid*., 13 December, 2019, *F. Farroñay et al. 1646* (INPA 290579).

CONSERVATION STATUS: *Scaphyglottis punctulata* is distributed in central and northern South America, with a calculated EOO of 4,882,458.740 km², and an AOO of 360,000 km². Although AOO < 500 km², the number of populations exceeds 10 (condition "a"); therefore, the species is considered Least Concern (LC) according to the criterea of IUCN (2012).

TAXONOMIC NOTES: Based solely on vegetative characters, *S. boliviensis* is the Brazilian species morphologically closest to *S. punctulata*, as it also has elongated pseudobulbs and a stalked ovary. However, *S. punctulata* is distinguished by having 1–2 flowers (*vs*. 1–4 flowers at *S. boliviensis*), with an entire oblanceolate lip (*vs*. trilobed, obovate). Among Brazilian species, the flowers of *S. punctulata* most closely resemble those of *S. fusiformis*, differing by having one leaf non conduplicate, a longer lip spathulate (1.1 *vs*. 0.8 cm), and in the different coloration of the perianth (greenish cream to purple dark *vs*. yellowish white).

IDENTIFICATION KEY FOR *SCAPHYGLOTTIS* SPECIES KNOWN FROM THE BRAZILIAN PORTION OF THE GUIANA SHIELD

1. Leaves cylindrical ..... ***S. reflexa***
1a. Leaves flat 2
2. One leaf per pseudobulb ..... ***S. fusiformis***
2a. Two leaves per pseudobulb 3
3. Lip clearly trilobed ..... ***S. stellata***
3a. Lip entire 4
4. Sepals ≤ 5 mm length 5
5. Lips lilac, obovate, petals ≥ 4 mm length ..... ***S. graminifolia***
5a. Lips white-cream, elliptical or spatulate, petals < 4 mm in length 6
6. Inflorescence a raceme, lip ≥ 2 mm, apex acute ..... ***S. sickii***
6a. Inflorescence a fascicle, lip ≤ 4 mm apex obtuse ..... ***S. prolifera***
4a. Sepals > 5 mm in length 7
7. Lip with emarginate apex, purple and cream ..... ***S. punctulata***
7a. Lip with apex acute or acuminate, red 8
8. Pseudobulbs fusiform, lips with yellow callus ..... ***S. imbricata***
8a. Pseudobulbs cylindrical, lips with brown callus ..... ***S. bidentata***

The first Brazilian collection of *S. punctulata* dates from almost 21 years ago but was only detected after reviewing the *Scaphyglottis* samples deposited at INPA herbarium. In Amazonia, it has been relatively common to describe new species (e.g., Damasco *et al*. 2019, Prata *et al*. 2016) and to document new records of plants (e.g., Holanda *et al*. 2015) based on samples sitting in herbaria for long periods. Such phenomena are reported by Bebber *et al*. (2010) on a global scale but are certainly more common in hyperdiverse tropical forests, where access routes are still scarce. We stress that a more comprehensive understanding of flowering plant diversity and distribution is crucial for any conservation initiative. Our results highlight the importance of new expeditions to Amazonian highlands, where new records of plants and new discoveries are expected. Policies and funding initiatives to facilitate such expeditions would most certainly expand the likely biased (Hopkins 2007, 2019), currently known distribution of Amazonian plant species. It is also important to emphasize that taxonomic studies that unravel such novelties depend on continuous investment, not only for training qualified human resources but enabling their subsequent presence in Amazonian institutions, which currently lack adequate and desired numbers of those professionals.

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A NEW LARGE-FLOWERED *CYRTOCHILUM* (ONCIDIINAE) FROM COLOMBIA, NAMED IN HONOR OF AN ESTEEMED TAXONOMIST

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ABSTRACT. A new and previously little-known *Cyrtochilum* (Orchidaceae: Oncidiinae), is named in honor and in memory of Leonore Bockemühl, who published a monographic treatment of *Odontoglossum* in 1989, which included many species that subsequently were transferred to *Cyrtochilum* based on molecular evidence. One of these species that was included in her treatment as "*Odontoglossum leucopterum*" is in fact an undescribed *Cyrtochilum* and is described here. The real "*Odontoglossum leucopterum*", which was transferred to *Cyrtochilum* in 2001, has proven to be quite elusive since its original description. It was only recently photographed in the Sierra Nevada de Santa Marta in northern Colombia, its only known location, and photos of this rare orchid are featured here for the first time. The new *Cyrtochilum* is described, illustrated and compared with closely related *Cyrtochilum* species which are featured with line drawings and color photographs to illustrate the differences.

KEY WORDS/PALABRAS CLAVE: Cundinamarca, *Cyrtochilum bockemuehlae*, *Cyrtochilum leucopterum*, Leonore Bockemühl, Meta, *Odontoglossum leucopterum*, Orchidaceae

Introduction. The orchid that is described here was first brought to scientific attention by Leonore Bockemühl in her monographic treatment of *Odontoglossum* Kunth (Bockemühl 1989). It was incorrectly featured as "*Odontoglossum leucopterum* Rchb.f.", in subgenus *Unguisepala* Bockemüh. The real "*Odm. leucopterum*" is a species from the Sierra Nevada de Santa Marta in northern Colombia and which may appear superficially similar to the new species but differs distinctly in certain morphological features and general appearance (Fig. 1). "*Odontoglossum leucopterum*" was transferred to *Cyrtochilum leucopterum* (Rchb.f.) Dalström (Dalström 2001). Preserved specimens have been examined; the holotype at the Museum of Natural History in Vienna (*Funck & Schlim 989*, W), which corresponds to a collection in the Herbarium of the Royal Botanical Garden at Kew (*J. Hanbury-Tracy 493*, K; Fig. 2). Very recently, however, some authentic color photographs of *C. leucopterum* were taken by Arthur Evans along the road from ProAves ecolodge, El Dorado, towards the San Lorenzo Ridge on Sierra Nevada de Santa Marta (Fig. 3–4). When Bockemühl's "*leucopterum*" (Bockemühl 1989) is compared with the type specimen as well as the live flowers of *C. leucopterum*, it becomes clear that they represent different species.

The new species may not have been observed in the past because no older collections have been located in the main herbaria, or it has been misidentified by earlier collectors. Only recently were plants observed and properly identified at higher elevation cloud forest environments, primarily in the Colombian Departments of Cundinamarca and Meta (Fig. 5–6). Most recently, plants have also been seen in private collections in Bogota. Plants of this rather large and bulky species tend to grow terrestrially among dense shrubs and often along roadsides where sufficient light and air circulation are provided. The natural variation and geographic distribution of the new species is not very well understood due to a lack of

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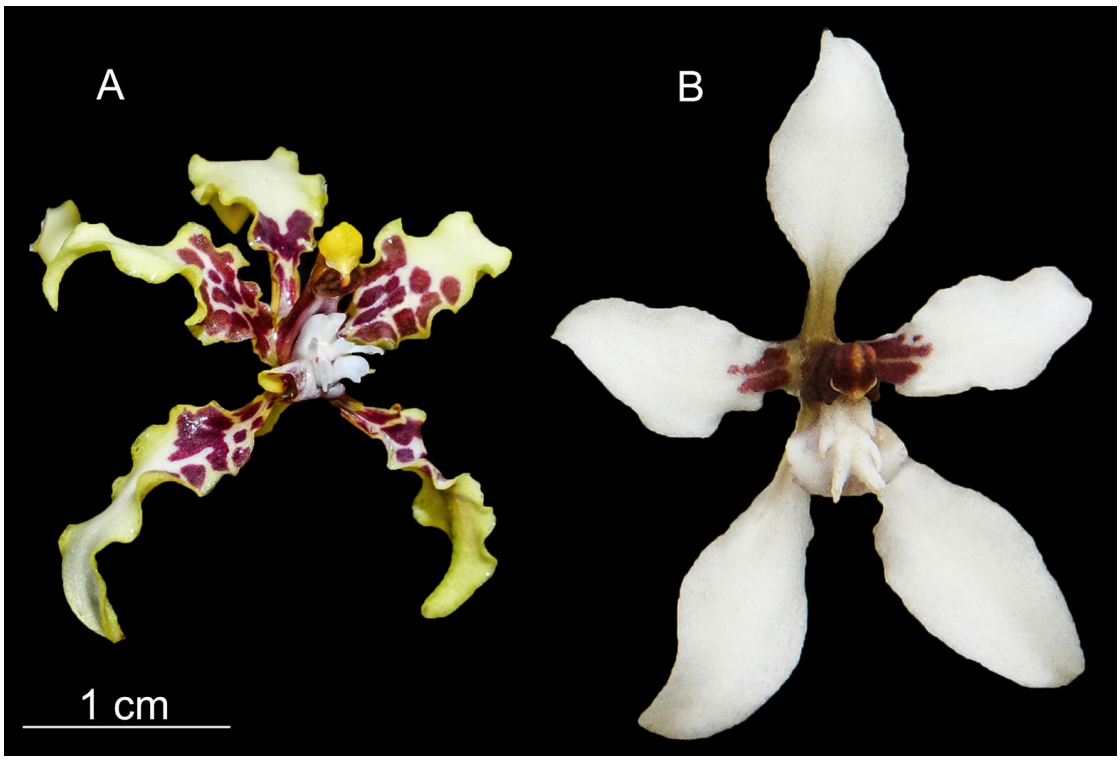

FIGURE 1. **A**. *Cyrtochilum bockemuehlae*. **B**. *Cyrtochilum leucopterum*. Photos by Cristian Castro (A) and Arthur Evans (B).

sufficient material to study. The general morphology of the flower tends to be rather consistent, however, although there appears to be some variation in the intensity and patterns of the colors.

TAXONOMIC TREATMENT

Cyrtochilum bockemuehlae C.Castro, J.S.Moreno & Dalström, ***sp. nov.*** (Fig. 7–8).

TYPE: Colombia. Cundinamarca: Municipio de Fómeque; 40–70 km la Calera hacia Golillas en la entrada a la Reserva de Carpanta 4° 33'32.9" N; 73° 43'11.5" W, 3212 m, 28 Nov. 2018, *C. Castro et al. 1670* (holotype: COL).

DIAGNOSIS: *Cyrtochilum bockemuehlae* is visually distinguished from the closely related *C. dipterum* (Lindl.) Dalström, *C. ionoplocon* (Rchb.f.) Dalström, *C. leucopterum*, *C. ramosissimum* (Lindl.) Dalström, and *C. sodiroi* (Schltr.) Dalström, by having strikingly different coloration of the flowers in combination with morphological differences, primarily in the lip-column structure, as can be seen in the included illustrations (Fig. 9–10).

Terrestrial or epiphytic *herb*. Plant robust and large for the genus. *Pseudobulbs* caespitose, ovoid, to *ca*. 10 × 5 cm, bifoliate, surrounded basally by up to 8 foliaceous sheaths. *Leaf* conduplicate, linear, narrowly acute to acuminate, *ca*. 110 × 4–5 cm. *Inflorescence* 1 or 2, axillary from the base of the pseudobulb and the uppermost sheaths in an emerging new growth, suberect to arching, or subpendent, rather straight with widely spaced and spreading multifloral, indistinctly flexuous or fractiflex to *ca*. 40 cm long side-branches, incomplete in the featured illustration but exceeding 170 cm in the type specimen. *Peduncular* and *Floral bracts* waxy, appressed, scale-like, acute, 4–24 mm long. *Pedicel* with *ovary* 17–24 mm long. *Flowers* spidery with recurved white to pale yellow sepals and petals, more or less spotted with purple to brown; lip pale yellow and purple with a white callus; *dorsal sepal* unguiculate, elliptic, obtuse, more or less un-

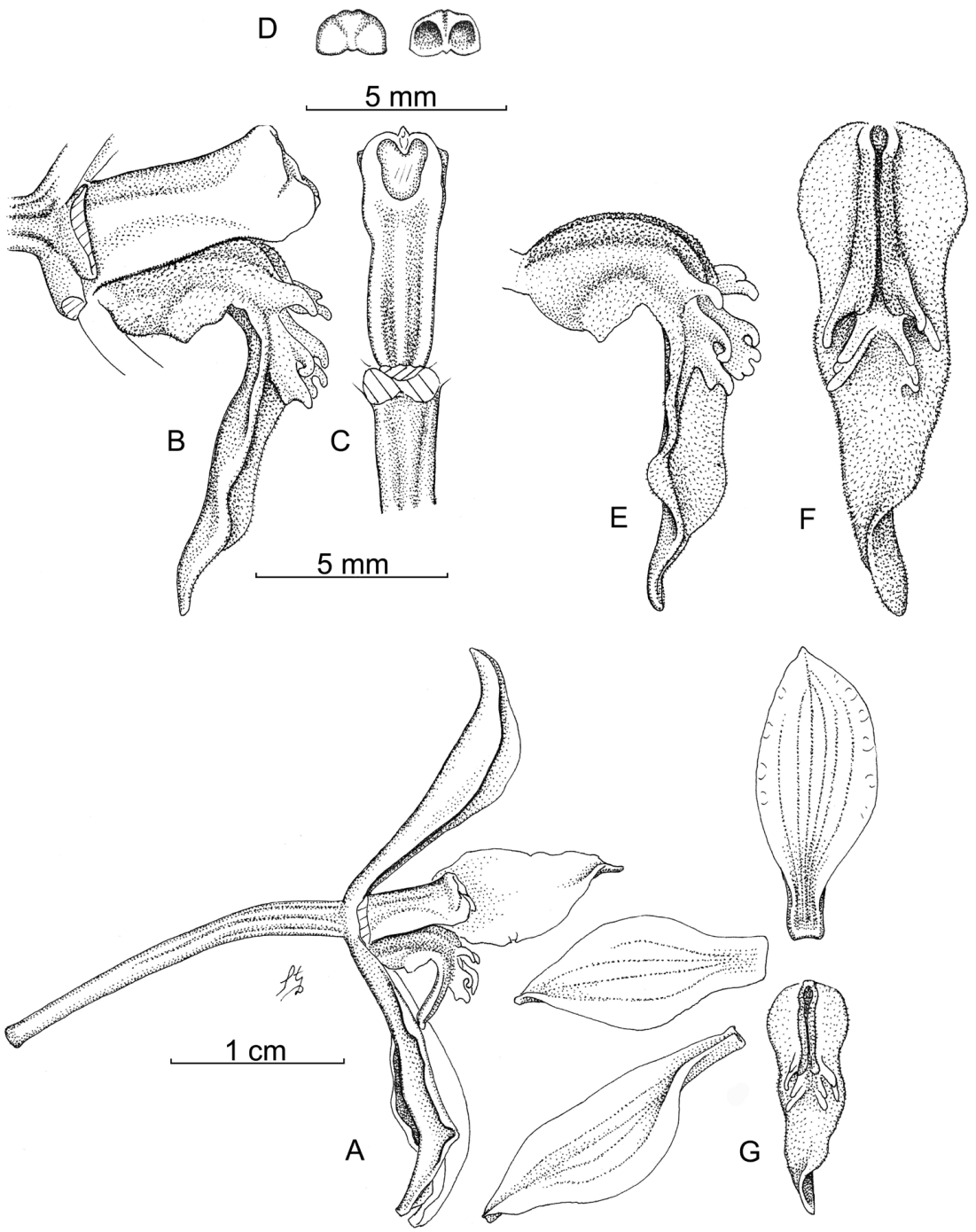

Figure 2. Line drawing of *Cyrtochilum leucopterum* (Rchb.f.) Dalström. **A**. Flower, lateral view. **B**. Lip and column, lateral view. **C**. Column, ventral view. **D**. Anther cap, dorsal and ventral views. **E**. Lip, lateral view. **F**. Lip, ventral view. **G**. Flower dissected. Illustration from *J. Hanbury-Tracy 493* (K) by Stig Dalström.

FIGURE 3. *Cyrtochilum leucopterum in situ* at Sierra Nevada de Santa Marta. Photo by Arthur Evans.

FIGURE 4. *Cyrtochilum leucopterum*, closer view of the flowers. Photo by Arthur Evans.

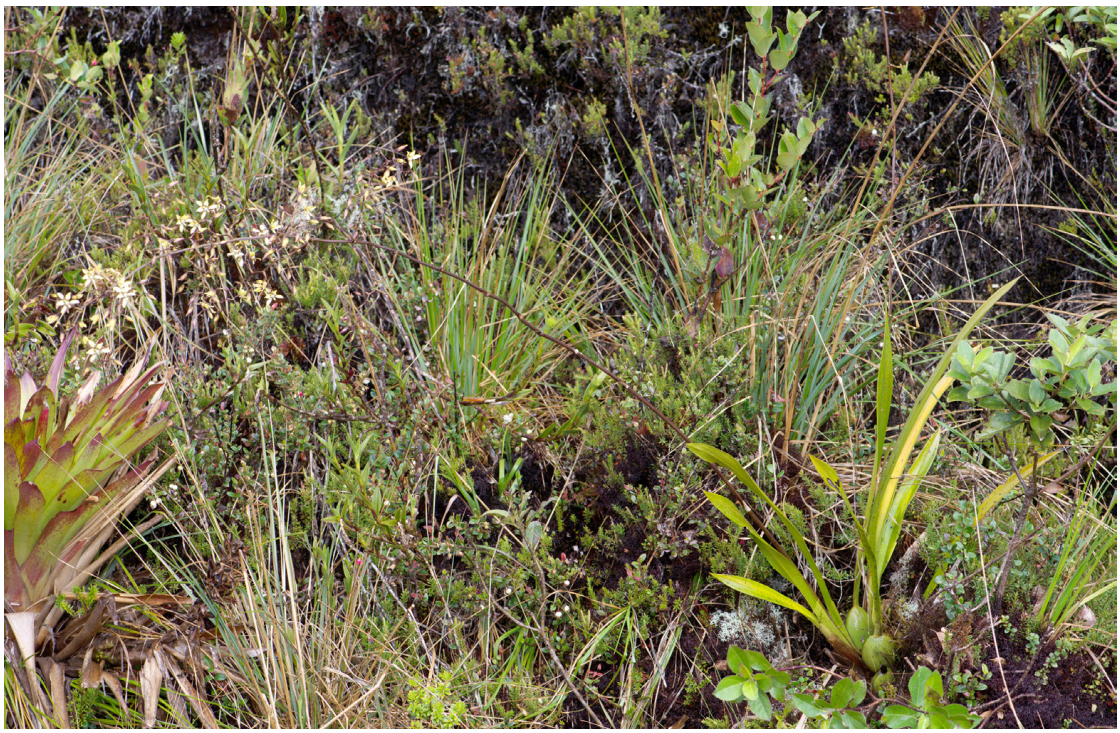

Figure 5. Natural habitat of *C. bockemuehlae*. Photo by Cristian Castro.

dulate and recurved, 15–20 × 5–7 mm; *lateral sepals* unguiculate, slightly oblique, elliptic, obtuse to acute, more or less undulate and recurved, 15–21 × 4–5 mm; *petals* subsessile, ovate to elliptic, acute, more or less undulate and recurved, 13–18 × 5–7 mm; *lip* rigidly attached to the base of the column through a short, central, longitudinal, fleshy keel, trilobed with spreading, revolute unevenly deltoid to auriculate lateral lobes and a strongly reflexed, elongated triangular, ligulate, apically acuminate front-lobe, 12–14 × 5–7 mm; *callus* of a pair of fleshy, longitudinal erect and apically sub-falcate ridges emerging gradually from the base of the lip and extending to the base of the front-lobe, with a pair of narrowly digitate denticles on each side near the end, and a fleshy, narrowly denticulate pair of keels in between, and with a fleshy apical denticle in the middle; *column* pale brown to purple, straight, clavate, ventrally furrowed, to 7–9 mm long excluding the anther cap; *anther cap* white to dark yellow, campanulate, indistinctly rostrate and dorsally lobulate, 1.9 × 2.7 mm; *pollinarium* of two folded/cleft pyriform pollinia on a linear, *ca*. 1.3 mm long stipe, on an ovoid pulvinate viscidium.

Paratypes: Colombia. **Cundinamarca**: Municipio de Fómeque; 40–70 km la Calera hacia Golillas entrada a la Reserva Carpanta, 4° 42’18.11”–4° 33’51.5” N; 73° 44’19”–73° 48’13.5” W, alt. 3450–3690 m, 10 Dic. 2016, *C. Castro et al. 699* (COL). Municipio Junín, vereda Colombia, Sector Carpanta, 2500–2600 m, 6 Ago. 2017, *D. E. Hernández-Rodríguez 26* (COL). Municipio de Junín, vereda Colombia, Sector Carpanta, 2400–2500 m, 31 Ene. 2018, *D. E. Hernández-Rodríguez 38* (COL). Municipio Gachalá, vereda Tendidos del río Negro, Sector Caño Negro, 2514 m, 23 Ago. 2019, *D. E. Hernández-Rodríguez 204* (COL). Municipio Gachalá, vereda Tendidos del río Negro, Sector Alto de Siberia, 2570 m, 24 Ago. 2019, *D. E. Hernández-Rodríguez 232* (COL). **Meta**: Parque Natural Nacional Chingaza, la vía hacia San Juanito, al costado izquierdo de la vía asociado a vegetación ruderal, 4°28’ N; 73°41.2’ W, alt. 2870–2900 m, *C. Castro et al. 278* (COL).

Distribution: *Cyrtochilum bockemuehlae* is only documented from along the eastern cordillera in the Departments of Cundinamarca and Meta at altitudes ranging from 2400–3690 m (Fig. 12).

Figure 6. *Cyrtochilum bockemuehlae in situ*. Photo by Cristian Castro.

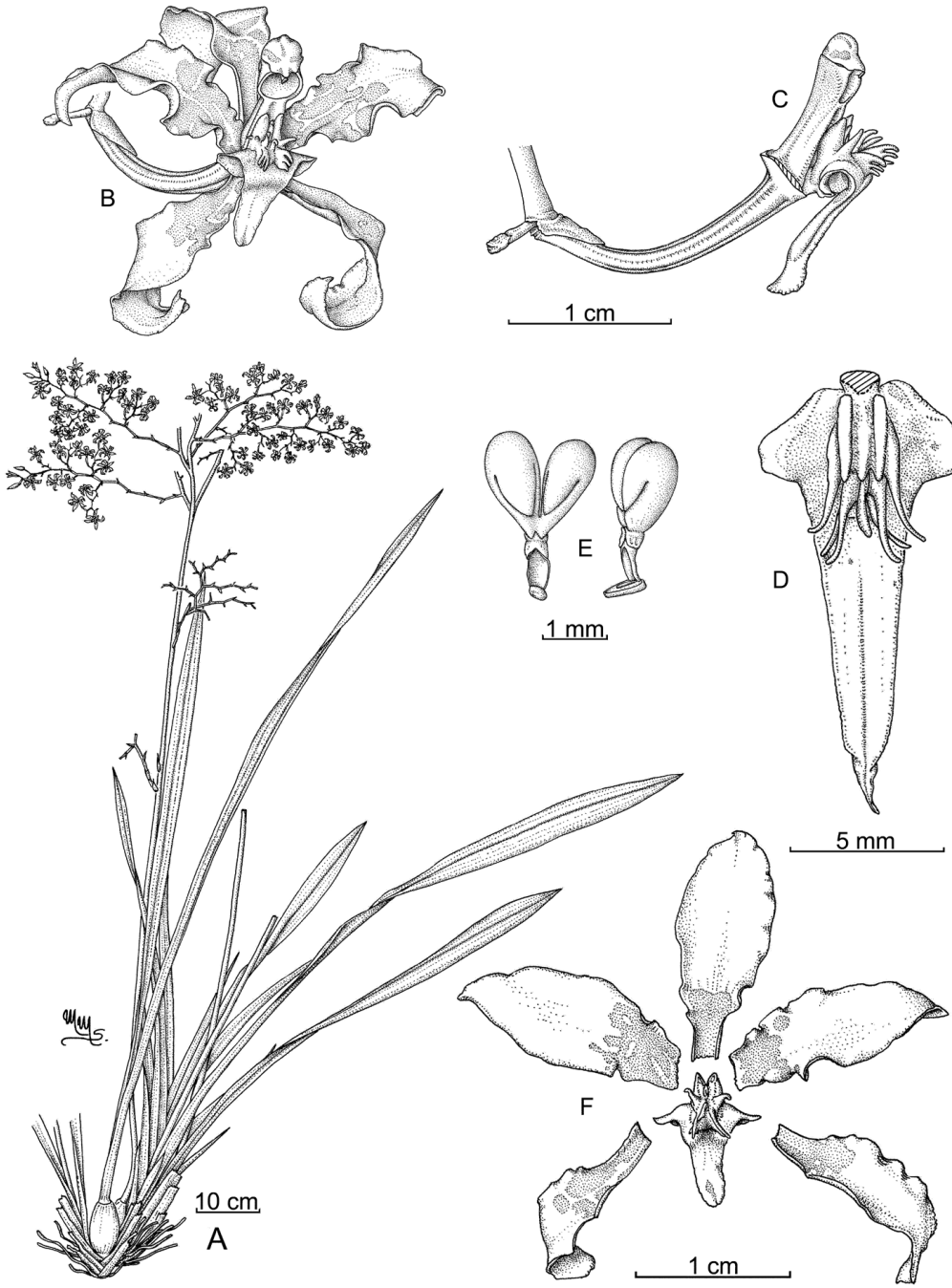

Figure 7. *Cyrtochilum bockemuehlae* C.Castro, S.Moreno & Dalström.. **A**. Plant habit. **B**. Flower, front view. **C**. Column and lip, lateral view. **D**. Lip, dorsal view. **E**. Pollinarium, back and lateral views. **F**. Flower dissected. Drawn from the holotype by Marcela Morales-Sanchez.

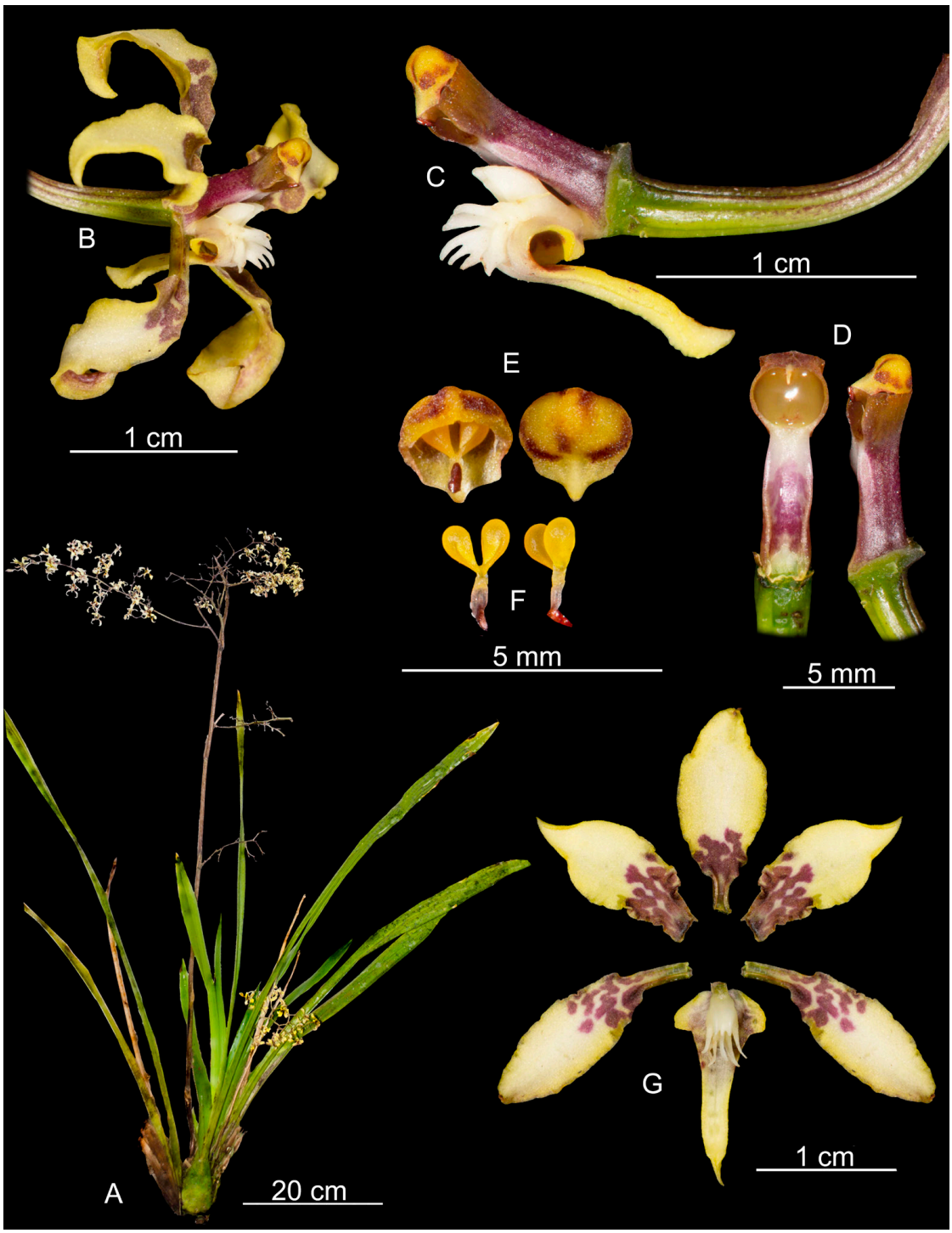

FIGURE 8. *Cyrtochilum bockemuehlae* C.Castro, S.Moreno & Dalström. **A**. Plant habit. **B**. Flower lateral view. **C**. Column and lip lateral view. **D**. Column ventral and lateral views. **E**. Anther cap with pollinarium ventral and dorsal views. **F**. Pollinarium back and lateral views. **G**. Flower dissected. Photo by Cristian Castro, and arrangement by the authors.

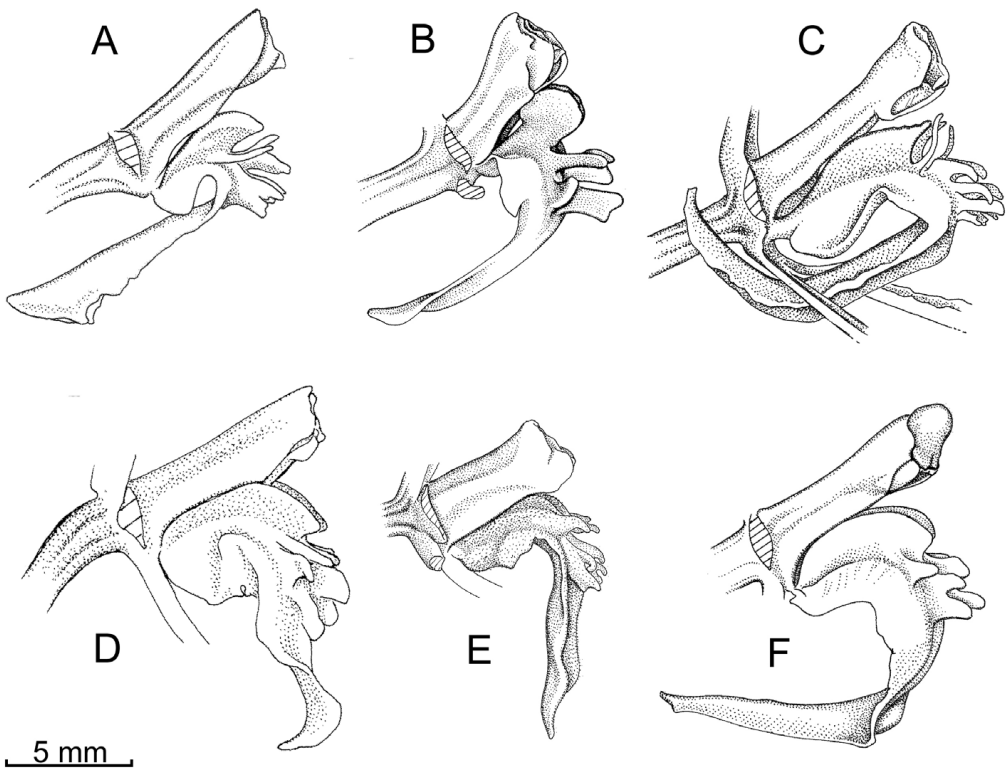

Figure 9. Lip-column comparisons for *Cyrtochilum bockemuehlae* and related species. **A**. *C. bockemuehlae* (*G. Deburghgraeve 020*). **B**. *C. dipterum* (*F. C. Lehmann 6003*). **C**. *C. ramosissimum* (*Funk & Schlim 1041*). **D**. *C. amphiglottis* (*B. Rözl s.n.*). **E**. *C. leucopterum* (*J. Hanbury-Tracy 493*). **F**. *C. sodiroi* (*S. Dalström 606*). All figures drawn by Stig Dalström.

Eponymy: Named in honor of Leonore Bockemühl (1927–2007), a German architect and autodidact orchid taxonomist who specialized in *Odontoglossum* (and indirectly *Cyrtochilum*) taxonomy and published a taxonomic treatment of the genus in 1989.

Discussion. The morphological features of *Cyrtochilum bockemuehlae* are very distinct and it can easily be distinguished from closely related species by comparing the coloration of the flowers in combination with the lip-column views (Fig. 9–10). There is, however, a similar taxon that occurs in the Department of Santander, and which resembles *C. bockemuehlae* in many floral details, but also differs in others (Fig. 11). The general structure of the flower is superficially similar, but the size of the flower differs significantly with the Santander taxon being almost half the size of *C. bockemuehlae* (Table 1; Fig. 8, 11). The Santander taxon also tends to have flatter sepals and petals with less brown-purple markings placed only at the very base of the segments. But these differences alone may prove too variable to have any specific importance. More significant differences, however, can be seen when the lip-column structures are viewed from the side. In *C. bockemuehlae* the apex of the column is straight to slightly up-curved, while the apex of the column in the Santander taxon is slightly curved downwards. These differences may seem minor, but should be seen in relation to how far the basal callus structure reaches along the ventral side of the column. In *C. bockemuehlae* the callus extends to about half the length of the column, while in the Santander taxon, the callus

TABLE 1. Morphological comparisons between the holotype of *Cyrtochilum bockemuehlae* (*C. Castro 1670*) and *Cyrtochilum* sp. (*NGM 85*).

Measurements (length × width) of flower details (mm)	***CC 1670*** **Locality: Cundinamarca**	***NGM 85*** **Locality: Santander**
Dorsal sepal	15–19 × 5–7	10.0 × 4.5
Lateral sepal	16.0–21.5 × 4.5–5.0	11.0 × 2.8
Petal	13.5–17.5 × 5.0–7.2	7.3 × 3.5
Lip	12.5–14.2 × 5.5–6.5	7.9 × 3.5
Column	6.9–9.0	5.2–5.5
Pedicel + ovary	17.0–23.5	18.3–18.5

FIGURE 10. Flowers of related *Cyrtochilum* species **A**. *C. bockemuehlae* (*C. Castro 278*). **B**. *C. dipterum*. **C**. *C. ioplocon*. **D**. *C. leucopterum*. **E**. *C. ramosissimum*. **F**. *C. sodiroi*. Photos by Cristian Castro (A), Sebastián Moreno (B, C, F), Arthur Evans (D), and Karlheinz Senghas (E), not in the same scale.

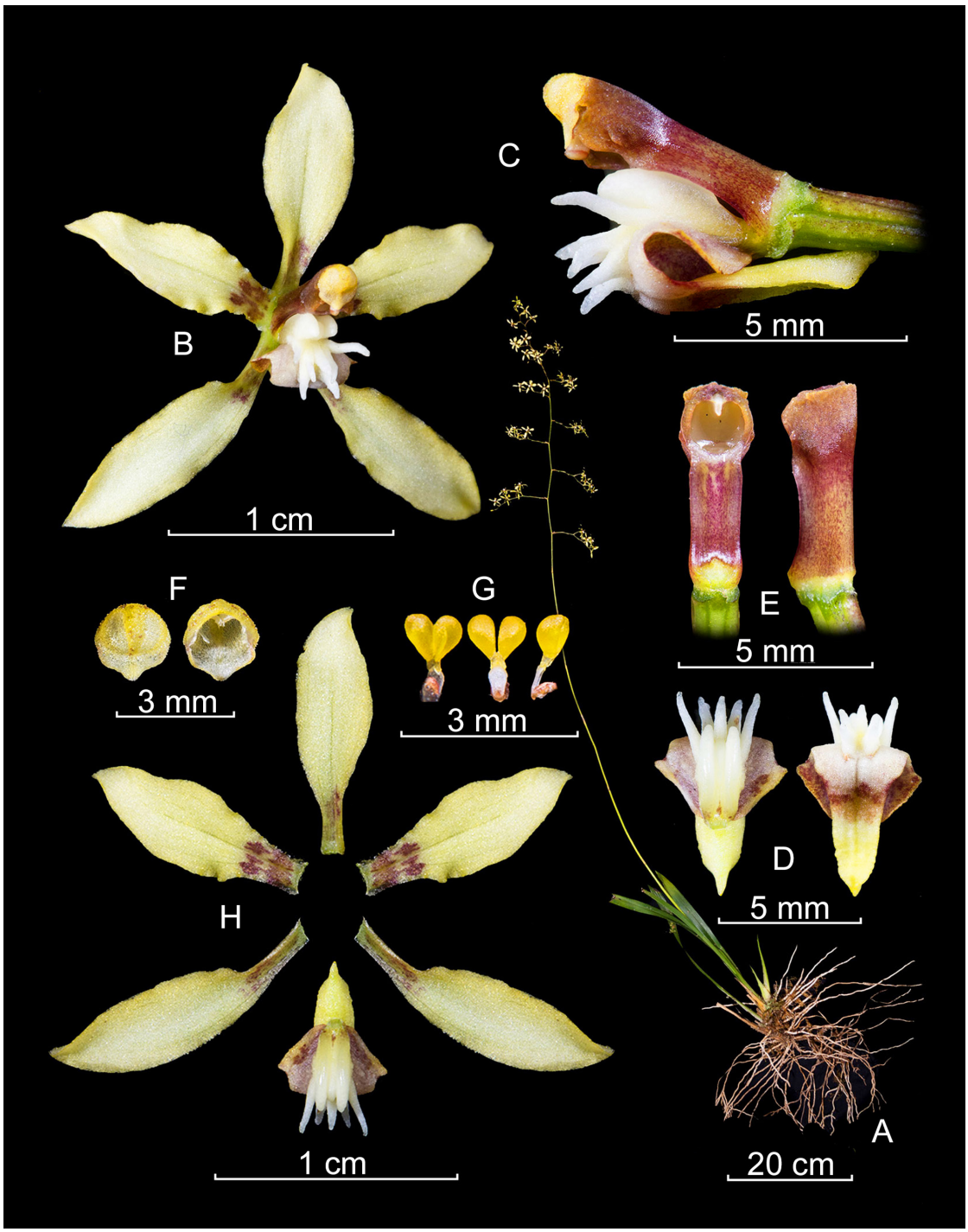

Figure 11. *Cyrtochilum* sp. from the Department of Santander. **A**. Plant habit. **B**. Flower, front view. **C**. Lip and column, lateral view. **D**. Lip, front and back views. **E**. Column, ventral and lateral views. **F**. Anther cap, dorsal and ventral views. **G**. Pollinarium, back, front and lateral views. **H**. Dissected flower. Photo arrangement by Sebastián Moreno based on N. Gutiérrez Morales *NGM 85*.

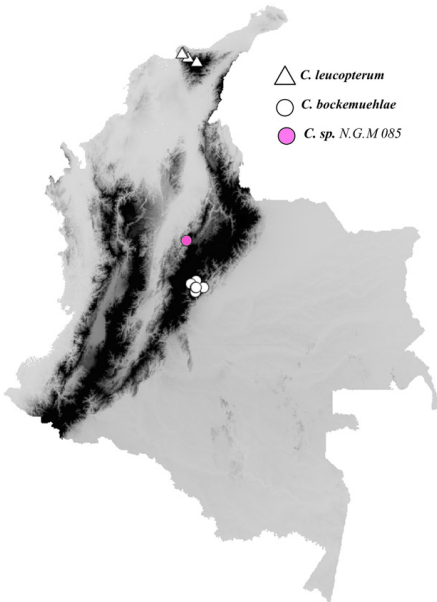

FIGURE 12. Map of the known distribution of *Cyrtochilum bockemuehlae*, *C. leucopterum* and the unresolved Santander taxon, arranged by Leidy Vallejo and edited by Stig Dalström.

extends to near the apex of the column. There are also differences in the outline of the column, which can be seen in the ventral views in the color plates (Fig. 8, 11).

In conclusion, there is not enough data available about the natural variation of the Santander taxon, to fairly determine what exactly the taxonomic status is at this time. Hopefully, additional field research will shed more light on this subject. Meanwhile, the Santander taxon will be kept as unresolved and separate from the taxonomic identity of *Cyrtochilum bockemuehlae*.

ACKNOWLEDGMENTS. The authors cordially thank Julio Betancur (Director of the Herbario Nacional Colombiano, COL) for his support, primarily for the first author. We also thank Robinson Galindo (Director of the Pacific Regional of the Parques Nacionales Naturales), and Marcela Morales for the type illustration, Leidy Vallejo for assistance in constructing the distribution map, and David Hernandez for his contributions to the distribution records of the species. We also thank Nicolás Gutiérrez Morales for providing information and material of the unresolved taxon from Santander. Finally, we thank Wesley Higgins for viewing and commenting on the manuscript.

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A NEW SPECIES OF *EPIDENDRUM* (ORCHIDACEAE) FROM THE CENTRAL ANDES OF ANTIOQUIA, COLOMBIA

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Abstract. The new species, *Epidendrum sonsonense,* was discovered while determining the herbarium specimens housed in the herbarium of Fundación Jardín Botánico Joaquin Antonio Uribe, JAUM. The species belongs to the informal Macrostachyum group and is endemic to the Paramo of Sonsón, Department of Antioquia, Colombia, characterized by the thickened stems, densely many-flowered raceme, and creamy-yellow flowers. A Lankester Composite Digital Plate (LCDP) of fresh material collected at the type locality is presented here. Studying additional collections at Colombian herbaria produced additional specimens of the same species.

Resumen. La nueva especie, *Epidendrum sonsonense*, fue descubierta durante la determinación de los especímenes depositados en el herbario de la Fundación Jardín Botánico Joaquin Antonio Uribe, JAUM. La especie pertenece al grupo informal Macrostachyum, y aparentemente es endémica del páramo de Sonsón, departamento de Antioquia, Colombia, se caracteriza por sus tallos engrosados, el racimo densamente plurifloro, y las flores crema-amarillas; se presenta aquí una Lámina Digital Compuesta estilo Lankester (LCDP) de material fresco recolectado en la localidad tipo. El estudio de colecciones adicionales en herbarios colombianos produjo especímenes adicionales de la misma especie.

Key words / Palabras clave: Endemism, Endemismo, Macrostachyum group, grupo Macrostachyum, paramo, páramo, Sonsón, taxonomía, taxonomy.

Introduction. Preserved historical collections have been a source of information for the biodiversity on our planet. Herbaria are the reservoir of the biological diversity of a region, country, or geographical space (Martínez & Domínguez 2017) and represent the natural patrimony of a country or region in addition of constituting a natural history archive for multiple uses (Álvarez *et al*. 2002). Furthermore, preserved herbarium collections, as a primary source of knowledge and information, constitute a warehouse of the richness, variability, and vegetal abundance through the compilation of dried plants correctly preserved in a well-organized manner (Cascante-Marín 2008).

Historically, the Orchidaceae has been widely collected and studied worldwide. However, there has always been a great difficulty in studying these plants in herbarium collections, especially small and miniature neotropical orchids such as *Lepanthes* Sw. (Swartz 1799), *Platystele* Schltr. (Schlechter 1910), *Pleurothallis* R.Br. (Brown 1813), and *Stelis* Sw. (Swartz 1800), because the floral structures often lose their shape and coloration after drying, a detailed inspection by the taxonomist is required to prepare adequate descriptive work for the preparation of a botanical illustration.

The genus *Epidendrum* L. (Linnaeus 1763) is considered one of the largest and most diverse in the Orchidaceae family; nevertheless, the diversity of the genus has been misjudged by the lack of representative specimen in herbaria and living collections and an overestimation of the natural variation of taxa (Karremans 2021). *Epidendrum* is distributed from South Carolina, in the United States to the south in Argentina (Hágsater & Soto Arenas 2005), and has an impressive vegetative and floral variability. The genus belongs to the Laeliinae subtribe; and it is distin-

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guished by having the following combination of characters: the column is united to the labellum (in most species), the anther is dorsal, the rostellum is parallel to the axis of the column and slit after the removal of viscarium which is semi-liquid, the lateral lobes of the stigma are well-developed, and it has a cuniculate nectary (Dressler 1984). The genus includes approximately 2400 species (Hágsater *et al.* 2016), of which 1100 have been described in the past 40 years. *Epidendrum* is so broad that it has been necessary to separate it into informal groups to understand it better; 90 informal groups are currently in use (IOSPE 2021), but that number will undoubtedly change with further study and the addition of molecular information, probably reducing the number of groups and recognizing more sub-groups.

The Macrostachyum group is characterized by its plants, usually erect, monopodial canes, with subapical ramifications, inflorescences generally in racemes, erect, flowers with the perianth of uniform color, fleshy, with an entire labellum, strongly concave, more or less pubescent at the base (Hágsater *et al.* 2016). Ecologically, many of the species of this group are endemic and have restricted distributions to a geographic region in the high Andean forests and paramos, with major diversity in the north of South America in Colombia, Ecuador, Peru, and Venezuela.

The different species included in this group can be easily recognized by the shape and size of the leaves, the thickness of the stems, the length of the floral bracts compared to the ovaries, the color, size and number of flowers, ornamentation of the tepals and the type of inflorescence. In herbarium specimens, these same features can be seen, but rehydration of a flower is necessary to observe the presence or absence of ornamentation on the tepals, as a superficial observation of dried material can confuse similar species.

In this paper, we describe and illustrate with a Lankester Composite Digital Plate (LCDP) a new species of *Epidendrum* belonging to the Macrostachyum group. The first specimen of this species was collected in the Sonsón Paramo in 1989, and more collections from the same paramo were found until 2020, remaining hidden and without a clear identity for 33 years in the collections studied.

Materials and methods. During recent revisions in 2017, 2018, 2019, and 2020, we examined the specimens deposited in the Colombian herbaria JAUM (where the first specimens of the species described here were found) CAUP, COL, FMB, HUA, JBB, PSO, MEDEL, and TOLI. Some flowers were rehydrated and dissected to study each of the floral segments, also dissecting the column and the ovary to analyze the internal details of the cuniculus and the stigmatic cavity. Photographs with scale were taken for study and description. The information derived from the revision of the specimens was verified at the AMO-DATA base (2021) and was searched for possible duplicates or other unidentified specimens of the Macrostachyum group from the same general geographic area. A LCDP was prepared from the photographic material available and a botanical description. The new species was compared with the most similar species in the Macrostachyum group. The Geospatial Conservation Assessment Tool (GeoCAT) application (http://geocat.kew.org/) was used to establish the conservation status.

Taxonomic treatment

Epidendrum sonsonense Rinc.-González, E.Santiago & Hágsater, ***sp. nov.*** Fig. 1, 2A–B.

TYPE: COLOMBIA. Antioquia: Municipio de Sonsón, Páramo de Sonsón, Cerro las Palomas, 2780 m, 5 noviembre 2017, *Heriberto David, Oswaldo Diaz y Cristian Bedoya 6154* (holotype HUA!). Fig. 3.

Diagnosis: *Epidendrum sonsonense* is recognized by its robust, branched plants, with thickened stems up to 2.3 cm in diameter, leaves 2.7–10 × 1.4–3.0 cm, ovate-elliptic, suberect and very rigid, slightly imbricate and inflorescences 6.0–9.5 cm long, pluriflorous and dense, completely hiding the peduncle, small flowers (sepals 7–12 mm long) of creamy yellow color and cordate labellum.

Terrestrial, monopodial, branched, erect *herb*, 50 to 180 cm tall. *Roots* 1.5–3.0 mm in diameter, basal from primary and secondary stems. *Stems* cane-like, terete, erect, straight, very robust, branching when mature, branches sub-apical and erect, base covered

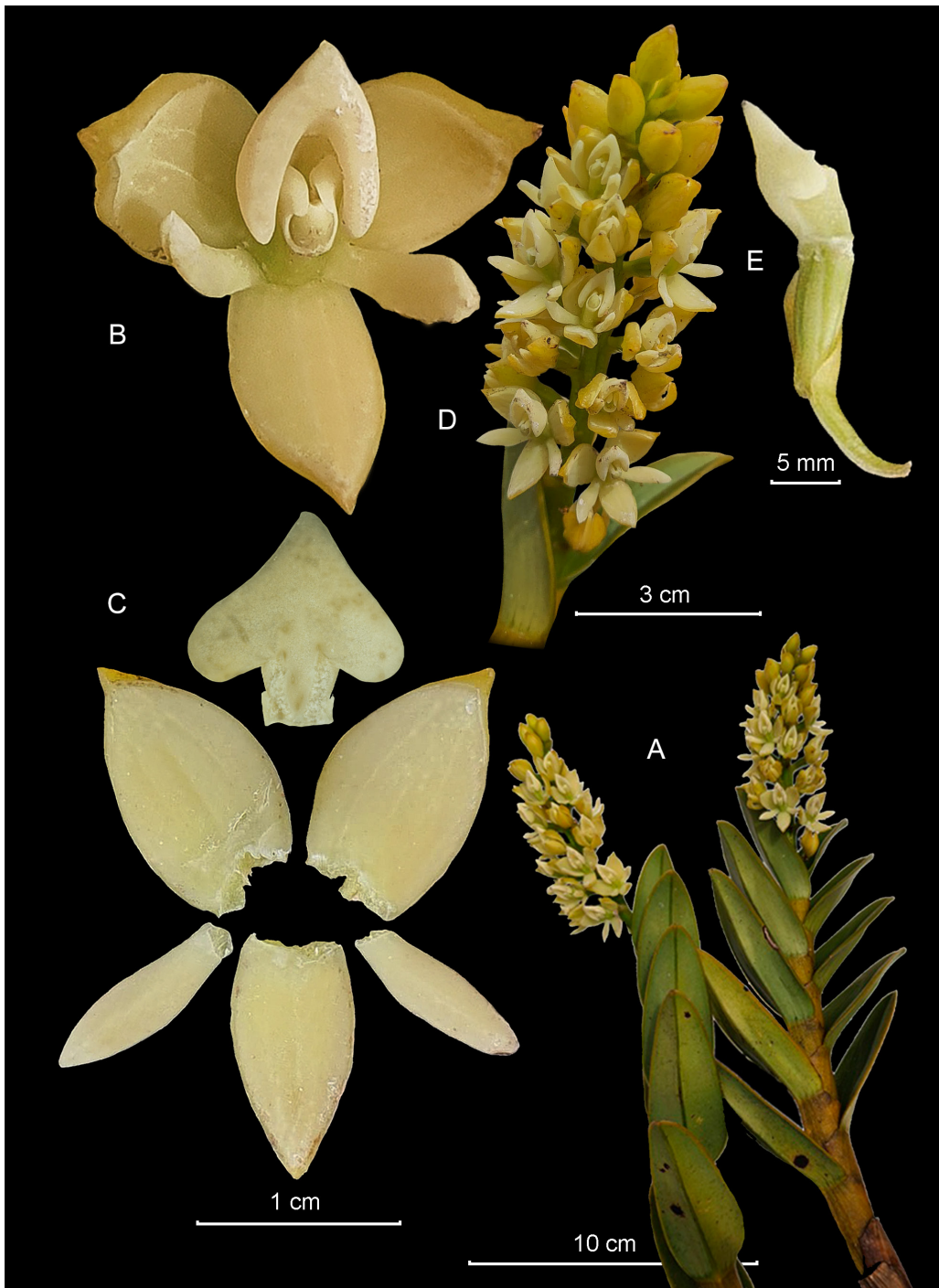

Figure 1. *Epidendrum sonsonense* Rinc.-González, E.Santiago & Hágsater. **A**. Plant habit. **B**. Flower. **C**. Dissected perianth. **D**. Inflorescence.**E**. Ovary, column, and lip. Photographs by Juan José Vergara (Corporación Parque Arví), based on *Deisy Vásquez 001* (JAUM), extended lip based on *Betancur 5864* (FMB). LCDP elaborated by Sebastián Moreno and Anaís Cisneros.

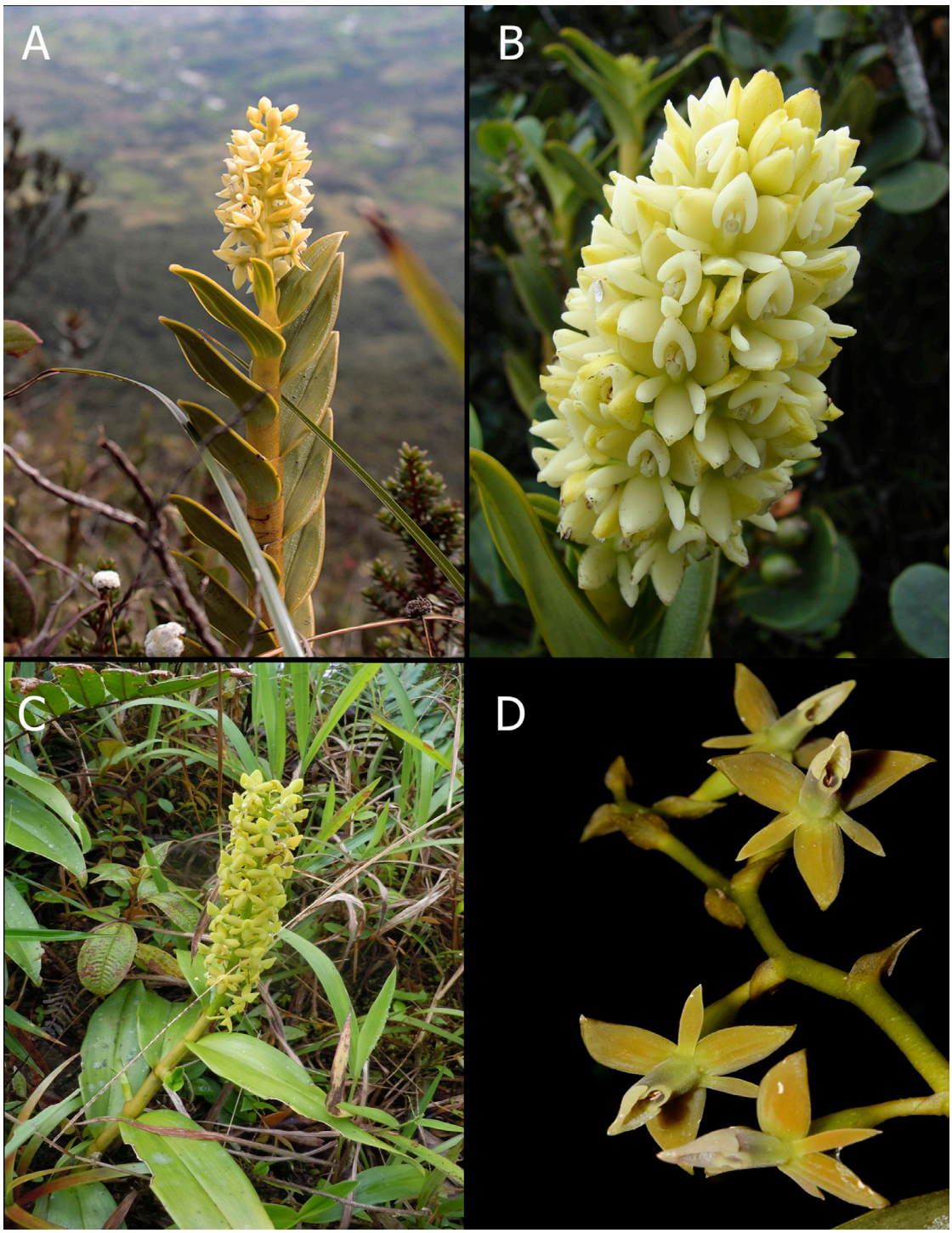

FIGURE 2. *Epidendrum sonsonense*. **A**. Plant habit. **B**. Inflorescence. **C**. *Epidendrum polyanthostachyum*. **D**. *Epidendrum lasiostachyum*. Photos by David Sánchez (A), Jorge M. Vélez (B), Duván A. García R. (C), and Lizeth Rodríguez-Martínez (D).

Figure 3. Type of *Epidendrum sonsonense* Rinc.-González, E.Santiago & Hágsater. Reproduced with the permission of MEDEL herbarium.

by sheaths 2.8 cm long, tubular, non-foliar, scarious; primary stem 44–120 × 2.0–2.3 cm; secondary stems 10–30 × 1.0–1.5 cm. *Leaves* 14–18 from primary stem, 7–14 on the branches, distributed throughout stems, articulate to foliar sheath, sub-erect with respect to stem when mature, slightly conduplicate along basal half, nearly imbricated, similar in shape, two apical leaves decreasing in size, coriaceous, very rigid; sheaths 1.5–3.5 cm long, tubular, striated, rugose, pale yellow to creamy yellow; blade 2.7–10.0 × 1.4–3.0 cm, ovate-elliptic, green concolor when alive with ventral surface glaucous and margin ochre-green, when dry the leaf surface is ochre and the underside brown, entire, slightly revolute, apex obtuse. *Inflorescence* 6.0–9.5 cm long, apical, developing from mature stems, racemose, erect, compact, dense; peduncle 9–13 × 3.8–5.0 mm, terete, straight; rachis 45–75 mm long, straight, pale green. *Floral bracts* 5–11 × 3.5 mm, as long as ovary or slightly longer than ovary, triangular, apex acuminate, margin entire, embracing. *Flowers* 20–35, successive, basal flowers opening first, non-resupinate, distributed along the rachis, pale yellow to creamy yellow, column pale green to pale purple in the apex, fleshy; fragrance sweet, faint. *Ovary* 7–11 mm long, terete, thick, furrowed, yellow-green. *Sepals* free, partly spreading, fleshy, apex obtuse, 3-veined, with a dorsal keel, margin entire, spreading; dorsal sepal 7–11 × 3.5–6.0 mm, narrowly ovate; lateral sepals 7.5–12.0 × 4–8 mm, ovate-elliptic, oblique. *Petals* 6.5–10.0 × 1.5–3.0 mm, partly spreading, free, oblong-oblanceolate, oblique, apex obtuse, 1-veined, margin entire. *Labellum* 4.5–8.0 × 4–8 mm, united to the column, fleshy, entire, cordiform, base cordate, apex obtuse, embracing column in natural position without covering it; disc with two small oblong keels at the base. *Column* 4.5–7.0 mm long, thick, terete, with a pair of apical narrowly rounded wings at the apex. *Clinandrium* reduced, margin entire. *Anther* 4-celled, ovoid, white. *Rostellum* apical, slit. *Nectary* shallow, without penetrating ovary, without ornamentation detail. *Capsule* not seen.

Other specimens examined: COLOMBIA. **Antioquia**: Municipio de Sonsón: Páramo de Sonsón: Cerro de Las Palomas, 3370 m, 16 X 2009, *Alzate et. al. 3379*, HUA! Páramo de Sonsón, 2700–3240 m, 10 I 1995, *Betancur et al. 5864*, FMB! (LCDP, pro-parte (only dissected flower), HUA! Vereda Norí, Cerro de las Papas, vertientes hacia el Magdalena, 2960 m, 20 X 1997, *Cogollo et al. 11436*, JAUM! Cerro de Las Palomas, alrededores de la escalera para subir a la cima del cerro, 3250 m, 16 VI 2012, *Díaz et al. 828*, HUA! Páramo de las Palomas. 3290 m, 11 VII 1989, *Hoyos et al. 1197*, HUA! Páramo Alto de las Palomas, 3400 m, 13–16 XI 2008, *Méndez 4571*, HUA! Páramo de las Palomas, 3366 m, 10 IV 2014, *Sarrazola et al. 507*, HUA! Páramo La Vieja, 3112 m, 15 V 2014, *Sarrazola et al. 616*, HUA! Vereda Manzanares bajo, Morro de La Vieja, 3160 m, 11 XI 2020, *Vásquez et al. 001*, JAUM! (LCDP voucher, (pro parte) Fig. 2). Vereda San Francisco, la Palmita, Cerro La Paloma, 3350 m, 8 IV 2009, *Vélez-Puerta et al. 3297*, MEDEL! (digital images of live material, AMO! MEDEL!)

Other records: COLOMBIA. **Antioquia:** Municipio de Sonsón, Venteadero, 2625 m, 3 IV 2020, *Carmona s.n.*, digital image: https://www.inaturalist.org/observations/43244852.Vda. La Francia, 1850 m, 22 VI 2018, *Salazar s.n.*, digital image: https://www.inaturalist.org/observations/13915103. Páramo de Sonsón, 3200 m, 22 VI 2018, *Sánchez s.n.*, digital image: https://www.inaturalist.org/observations/13824318.

Recognition: *Epidendrum sonsonense* belongs to the Macrostachyum group (Santiago & Hágsater 2013), which is characterized by monopodial plants with sub-apical branching, rugose leaf sheaths, large leaves generally spreading, the erect racemose inflorescence, and the fleshy flowers generally green to black (ripe olive colored), as well as yellow to pink to purple, the entire, conduplicate, generally ecallose lip embracing the column, and the nectary pubescent to papillose in front of the stigmatic cavity and at least at the base of the lip. The new species is recognized by the robust stems, 2.0–2.3 cm thick, the leaves 2.7–10 × 1.4–3.0 cm, sub-erect, coriaceous, very rigid, somewhat imbricated, the inflorescence dense with successive flowers yellow to creamy yellow, the floral segments partly spreading, very fleshy, the sepals 7–12 mm long and the labellum cordiform. It is similar to *Epidendrum polyanthostachyum* Hágsater, E.Santiago & García-Ram. (Hágsater *et al.* 2013)

(Fig. 2C), ranging from the departments of Valle del Cauca and Chocó, Colombia, but that species has thin stems, 0.5–1.0 cm thick, the leaves spreading, larger and sub-coriaceous, the inflorescence dense with simultaneous flowers green turning yellow upon ageing, the floral segments spreading and the labellum widely deltoidal. *Epidendrum lasiostachyum* Rodr.-Martínez, Hágsater & E.Santiago (Hágsater *et al.* 2016, Santiago & Hágsater 2018) (Fig. 2D), endemic to the Valle del Cauca, Colombia, is florally similar but the plants are smaller with thin stems, 0.3–0.5 cm thick, the leaves are 4.5–6.0 × 0.8–1.0 cm, lanceolate and spreading, the inflorescence is laxly few-flowered, the flowers yellow with the apex of the column purple, and the labellum is trullate, thickly covered by trichomes.

Etymology: In reference to the municipality of Sonsón, Paramo de Sonsón, Antioquia, Colombia, where the new species has been found.

Habitat and ecology: The species is known only from the Municipality of Sonsón, Paramo de Sonsón, Cerro de las Palomas, Cerro de las Papas, and Paramo La Vieja (Fig. 4A). Plants are frequently found at 2940 [2700?]–3400 m in a high Andean disturbed shrub paramo where it grows as a terrestrial with *Espeletia* Mutis ex Bonpl. (Mutis 1808) (Asteraceae), *Guzmania mosquerae* Mez (Mez 1896) (Bromeliaceae), and relicts of *Weinmannia* L. (Linnaeus 1759) (Cunoniaceae). The species is found flowering between April and November, probably blooming all year round.

Conservation status: This species has five known locations with an extent of occurrence (EOO) of 13,747 km^2 and an area of occupancy (AOO) of 20,000 km^2; these parameters put *Epidendrum sonsonense* in the Endangered category. However, *E sonsonense* is found within the area that is part of the Regional District of Integrated Management (DRMI) Páramo de Vida Maitamá-Sonsón, declared by Agreement 388 of 2019 by the Board of CORNARE as a conservation figure, in which the Paramo of Sonsón, Argelia, Nariño, is reserved as a special management area, being an area of special ecological importance necessary for the conservation of the strategic ecosystem paramo of Sonsón (CORNARE 2021). Therefore there is no continuing decline in any of the necessary parameters and cannot be assessed with criterium B, but because the species has a very restricted geographic range limited to this protected paramo complex and climate change conditions could negatively affect its distribution and lead to its extinction, the threat category is proposed as Near Threatened (NT).

Conclusion. A new Colombian species, *Epidendrum sonsonense,* is described from a very restricted area in the Department of Antioquia, Municipality of Sonsón, where it could be found within the area that is part of the Regional District of Integrated Management (DRMI) Páramo de Vida Maitamá Sonsón, on the hills of Cerro de las Palomas, and Cerro de las Papas. It belongs to the Macrostachyum group and is added to an extensive list of new species identified from herbarium material, a task that may be possible by revising all available herbaria and a detailed search of photographs of live material.

Acknowledgments. We thank the curators of all the herbaria that were reviewed, especially Norberto López of JAUM, and Jorge Mario Vélez of MEDEL, for their help in providing specimens of the species for review, as well as some photographs, and Heriberto David of HUA, for sharing the photograph of the Holotype. The Corporación Arví of the City of Medellín, for their support of Deisy Liliana Vásquez Gallego and Juan José Vergara, facilitating the photographic process, and Cristian Castro for photographs of rehydrated material (spread lip) that allowed for the preparation of the LCDP (Lankester Composite Digital Plate) and Lizeth Rodríguez, David Sánchez and Duván García for the photographs of the species similar to *Epidendrum sonsonense*. In addition, we thank Mario Sierra, Juan Sebastián Moreno, members of the *Grupo de investigación Schultes* for their comments on the document, and Anaís Cisneros, biologist at the AMO Herbarium in Mexico City for the preparation of the LCDP. Finally, we are especially thankful to Guillermo Reina-Rodríguez and Santiago Mesa for their help in processing the conservation status of this species and Patricia Harding for revising the English text.

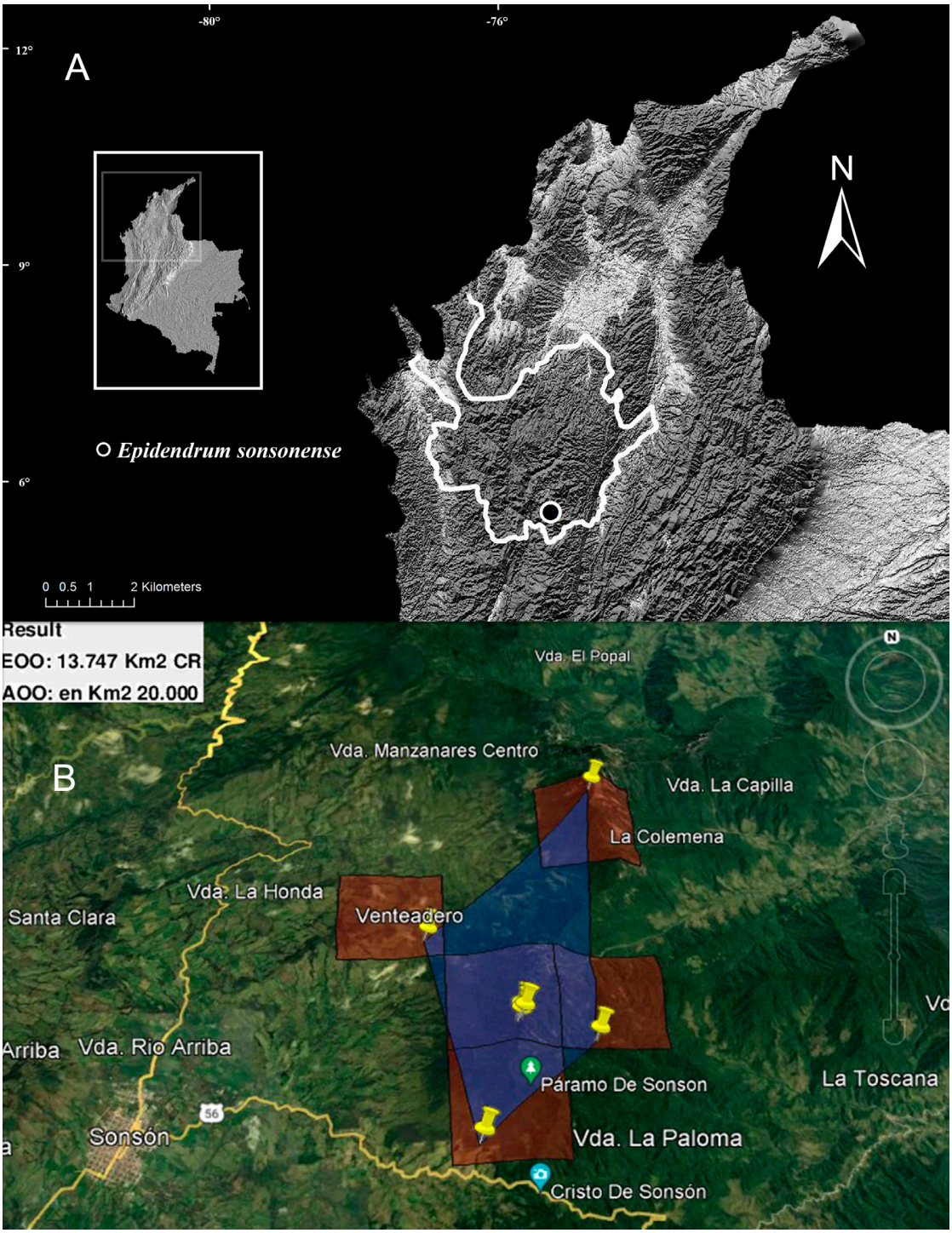

FIGURE 4. **A**. Geographical distribution of *Epidendrum sonsonense.* **B**. Known locations of *E. sonsonense*, with an extent of occurrence (EOO) of 13,747 km^2 (red polygons) and an area of occupancy (AOO) of 20,000 km^2 (blue polygon).

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THRIXSPERMUM OBYRNEANUM (AERIDINAE), A NEW SPECIES FROM PENINSULAR THAILAND AND MALAYSIA

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Abstract. *Thrixspermum obyrneanum* (sect. *Thrixspermum*) is a new species described from Narathiwat Province, southern Thailand, and from Kelantan, Peninsular Malaysia. It is morphologically similar to *T. leucarachne* but differs in the much shorter sepals and petals, tepals and lip pale yellow, lateral lobes of the lip 6–7 mm long, broadly triangular to ovate, with narrowly truncate and erose apex, mid-lobe 3.0–4.7 mm long, cylindrical to broadly triangular, obtuse.

Keywords/Palabras clave: Kelantan, Narathiwat Province, Provincia de Narathiwat, sección *Thrixspermum*, section *Thrixspermum*, taxonomía, taxonomy.

Introduction. *Thrixspermum* Lour. (Loureiro 1790: 519) is a large orchid genus of *ca.* 168 accepted taxa in subfamily Epidendroideae, tribe Vandeae, subtribe Aeridinae (*sensu* Chase *et al*. 2015, Pridgeon *et al*. 1999, 2014). It is distributed from subtropical and tropical Asia to Australia and the western Pacific (Govaerts *et al*. 2021, O'Byrne 2016, Wood 2014). The genus is of limited ornamental value due to its ephemeral and often small flowers, but it has been used as an ingredient in traditional medicine and in the flavouring and perfume industries (Burkill 1935, Chuakul 2002, Kaiser 1993). Because of its ephemeral flowers, which are infrequently produced and do not preserve well when dried (Williams 1938), it is poorly represented in herbaria, and dried material can be hard to interpret. As a result, *Thrixspermum* is taxonomically difficult, and a modern taxonomic revision based on morphometrics and molecular studies is much needed (O'Byrne 2016, O'Byrne *et al*. 2015, Seidenfaden 1988).

Although *Thrixspermum* is mainly epiphytic, some species can also occur as lithophytes, and a few are scrambling terrestrials in open terrain. They most frequently occur in tropical rain forest, peat swamp forest, and dry evergreen forest, but also in lower montane rain forest, lower montane coniferous forest, and lower montane scrub. The genus is characterized by the laterally flattened or swollen inflorescence rachis, ephemeral flowers, an immobile, 3-lobed, basally saccate lip, usually with a central callus, a distinct column-foot, and four unequal pollinia with stipe and viscidium (Pridgeon *et al*. 2014). As a result of molecular studies, the genus *Cordiglottis* J.J.Sm. was included in *Thrixspermum* (Chase *et al*. 2015, Kocyan & Schuiteman 2014, Wood 2014). Three sections have been distinguished previously: sects. *Thrixspermum* (syn. sect. *Orcidice* Rchb.f.), *Dendrocolla* (Blume) J.J.Sm., and *Katocolla* Schltr. (Schlechter 1911, Seidenfaden 1988, Smith 1905). The last-mentioned is no longer recognised (O'Byrne 2015, Seidenfaden 1988, Wood 2014) and is now included in sect. *Dendrocolla*.

Even though the orchid flora of Thailand has so far not been completely revised, *ca.* 1100 species are estimated to occur (Schuiteman & de Vogel 2000). Fifteen species of *Thrixspermum* have been recorded from Thailand (Seidenfaden 1988) and forty from Peninsular Malaysia (Ong *et al*. 2017). During preparations for a taxonomic revision of the genus *Thrixspermum* in mainland Southeast Asia by the first author, an undescribed species was discovered in Narathiwat province, southern Thailand, and it turned out that the second author had found the same species in Kelantan, Peninsular Malaysia. Therefore, it is described here as a new species.

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Materials and methods. Plant collections and documentation were made following standard practice (Bridson & Forman 1992). Living plants were collected under license from Narathiwat province, southern Thailand, and cultivated at an evaporative cooling greenhouse in Queen Sirikit Botanical Garden, Chiang Mai, northern Thailand. The Peninsular Malaysian plant was collected with permission from the Peninsular Malaysian Forest Department and Kelantan Forest Department and cultivated at the Forest Research Institute Malaysia at Kepong. Voucher specimens were collected and photographed from this living collection and made by fixing in 70% ethanol (Bridson & Forman 1992) and deposited at the Thai Traditional Medicine Herbarium (TTM), Bangkok Forest Herbarium (BKF), Queen Sirikit Botanical Garden (QBG) and the Kepong Herbarium (KEP, only for the Peninsular Malaysian material). Colour photographs with scale were created using Nikon D7100 with Nikon 18-105 mm VR DX, Tamron SP AF 70-300 F/4-5.6 Di VC USD, and AF-S Micro NIKKOR 60 mm f/2.8G ED lenses, including habitat, plant habit, stem, roots, leaves, inflorescences, flowers, and floral dissected parts (Baskauf & Kirchoff 2008). Plant identification, description, and line drawing were performed under a stereo microscope (Leica EZ4W) and following the terminology of Kew Plant Glossary (Beentje 2016). Relevant orchid publications, available protologues, and (images of) type specimens of *Thrixspermum* species from tropical Asia were reviewed to confirm the identification and to make morphological comparisons with allied species. The photographic composition of the floral dissected illustration was edited with Adobe Photoshop® CS6. A distribution map was generated employing RStudio (2015). Conservation status was estimated following the IUCN Red List categories and criteria version 3.1, second edition (IUCN 2012).

Taxonomic treatment

Thrixspermum obyrneanum N.Toolmal, P.T.Ong & Schuit., ***sp. nov***. Fig. 1–5.

TYPE: Thailand. Peninsular Thailand: Narathiwat, 27 October 2020, *N.Toolmal, A.Baka, A.Seepae & W.Tanming 27102001* (holotype TTM; isotypes: BKF, QBG).

Diagnosis: *Thrixspermum obyrneanum* differs from *T. leucarachne* Ridl. in the much shorter sepals and petals (2.1–4.2 *vs.* 6.5–8.0 cm long), tepals and lip pale yellow (*vs.* tepals pale yellow or white, tinged with purple at the base, lip white), lateral lobes of the lip 6–7 mm long, broadly triangular to ovate, with narrowly truncate and erose apex (*vs.* 7–8 mm long, narrowly triangular to oblong, with obtuse, unequally bilobed apex), mid-lobe 3.0–4.7 mm long, cylindrical to broadly triangular, obtuse (*vs.* 6–9 mm long, narrowly triangular, acute).

Epiphytic *herb*. *Stems* patent, 6 cm to at least 30 cm long, with 6–27 internodes, cylindrical, slightly laterally compressed, curved upwards from the middle, covered with the leaf sheaths, 6–12-leaved; internodes 3–12 × 0.5–5.5 mm. *Roots* cylindrical, thick, elongate, 13 cm to at least 50 cm long, 0.6–2.0 mm diam., arising from the basal part of the stem and from nodes at the lowest leaf, not or sparsely branching. *Leaves* green, sometimes spotted or suffused with purplish red turning to brown and sulcate with age, patent, narrowly oblong to elliptic, 5–18 × 1.3–2.0 cm, sessile, slightly narrowed to the base, leaves on the same side of the stem 1.5–3.0 cm apart, dorsiventrally flattened, thick, rigid, fleshy, coriaceous, apex slightly unequally bilobed with obtuse lobules, with a small mucro in the middle, the midrib distinct; leaf sheaths green, sometimes spotted or suffused with purplish red turning to brown with age, slightly bilaterally compressed, longer than the stem internodes. *Inflorescences* one to several per plant, patent, racemose, 4.9–18.0 cm long, long pedunculate, arising from the nodes at the opposite side of the leaves and below the roots, green with purplish red spots; peduncle slender, slightly upwards curved from the middle, 80–220 × 1–5 mm, with 3 internodes, the basal internode fairly short, stout, 6–8 mm long, 2.3–2.4 mm in diam., the middle internode normally longer and thinner, 4.5–7.0 cm long, 1.5–2.3 mm in diam., the terminal internode strongly compressed distally, 2–4 cm long, broadening to 2.2–5.0 mm diam. just below rachis; peduncle scales 2–3, green-yellowish green, ovate to broadly triangular, incurved, concave, thickened, slightly boat-shaped, clasping the peduncle, 5–7 × 1.7–2.0 mm, apex acuminate, keeled; rachis 2.7–7.5

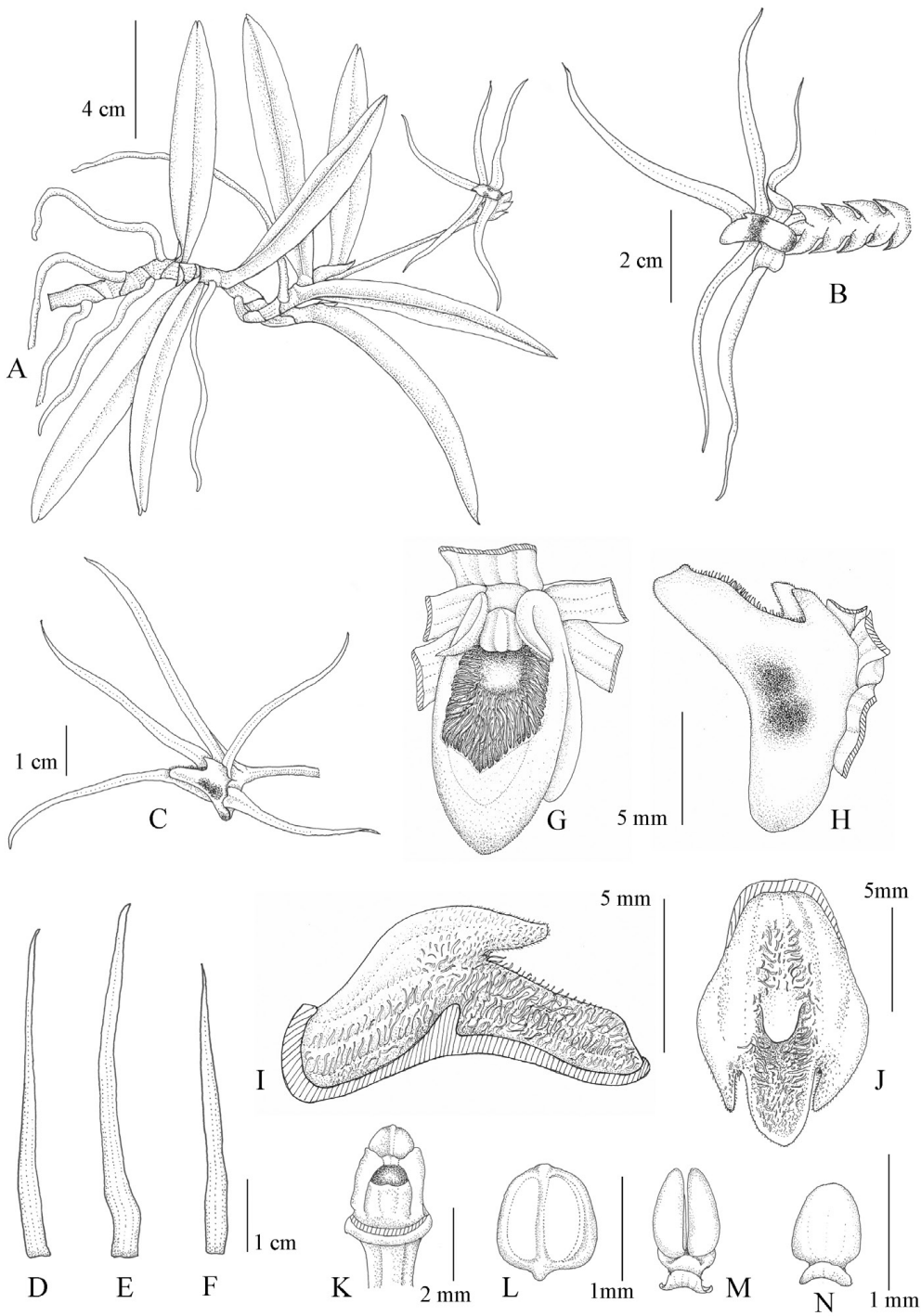

Figure 1. *Thrixspermum obyrneanum* from southern Thailand. **A**. Habit. **B**. Rachis with flower. **C**. Flower (lateral view). **D**. Dorsal sepal. **E**. Lateral sepal. **F**. Petal. **G**. Lip (front view). **H**. Lip (lateral view). **I**. Lip (longitudinal section). **J**. Lip (adaxial view, spread out). **K**. Column (ventral view). **L**. Anther. **M**. Pollinia, with stipe, and viscidium. **N**. Stipe and viscidium. Drawn from holotype by Phataravee Prommanut.

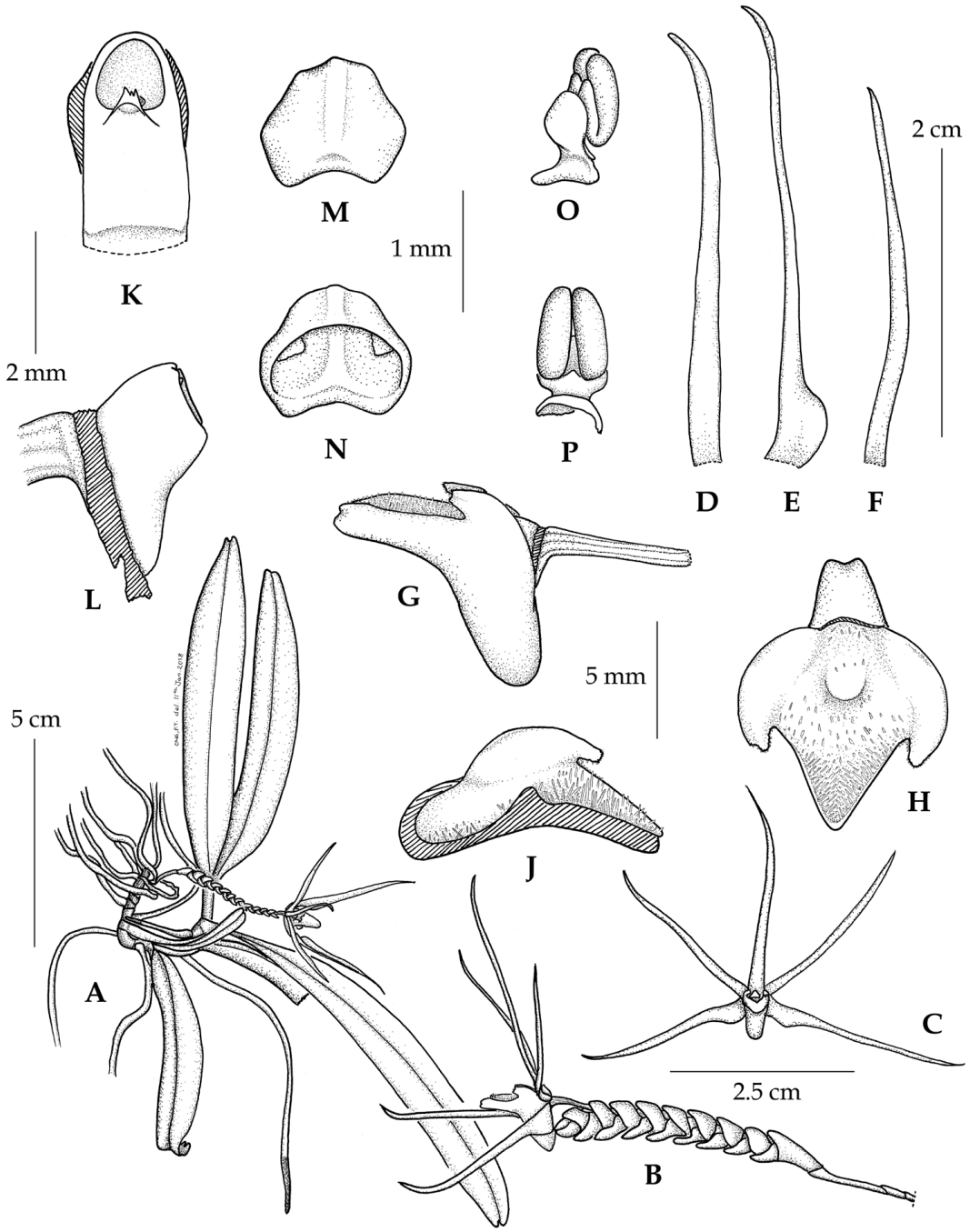

FIGURE 2. *Thrixspermum obyrneanum* from Peninsular Malaysia. **A**. Habit. **B**. Inflorescence with flower (lateral view). **C**. Flower (front view). **D**. Dorsal sepal. **E**. Lateral sepal. **F**. Petal. **G**. Lip with column and pedicel-with-ovary (lateral view). **H**. Lip (adaxial view, spread out). **J**. Lip (longitudinal section). **K**. Column and column-foot (ventral view). **L**. Column and column-foot (lateral view). **M–N**. Anther. **O–P**. Pollinia, with stipe and viscidium. Drawn by Ong Poh Teck based on Ong FRI 88546 (KEP).

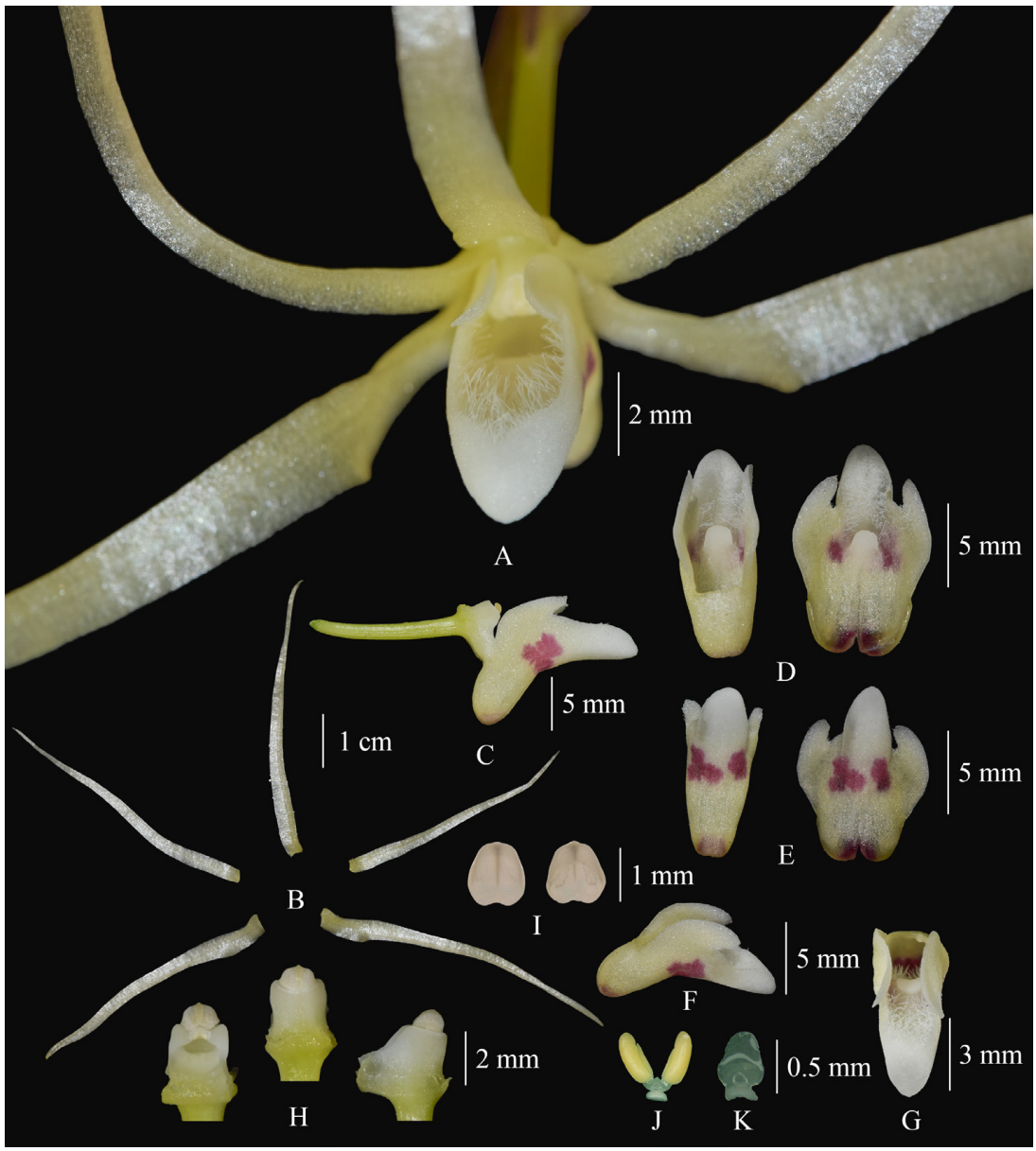

Figure 3. *Thrixspermum obyrneanum*. **A**. Flower (closed up, front view). **B**. Dissected perianth. **C**. Pedicel-with-ovary, column, and column-foot with lip (lateral view). **D**. Lip, adaxial (left: natural position; right: spread out). **E**. Lip, abaxial (left: natural position; right: spread out). **F**. Lip (oblique view). **G**. Mid-lobe (adaxial view). **H**. Column and column-foot (ventral, dorsal & lateral views). **I**. Anther. **J**. Pollinia, with stipe and viscidium. **K**. Stipe and viscidium. Photographed by Wattana Tanming (A–H), Nopparut Toolmal (I) and Phataravee Prommanut (J–K). Illustration assembled by Yongyuth Rattanasootr. A–I from living collection and J–K from spirit collection of *N. Toolmal et al. 27102001* TTM 0006369.

cm long, depending on the age of the inflorescence, 17–30-flowered, with one or two flowers open at a time, strongly bilaterally flattened, with distichous, persistent floral bracts, 0.8–1.5 mm apart, 6.3–8.7 mm wide across the floral bracts. Floral bracts yellowish green with purplish red spots, bilaterally flattened, ovate to broadly triangular, incurved, concave, thickened, slightly boat-shaped, clasping the

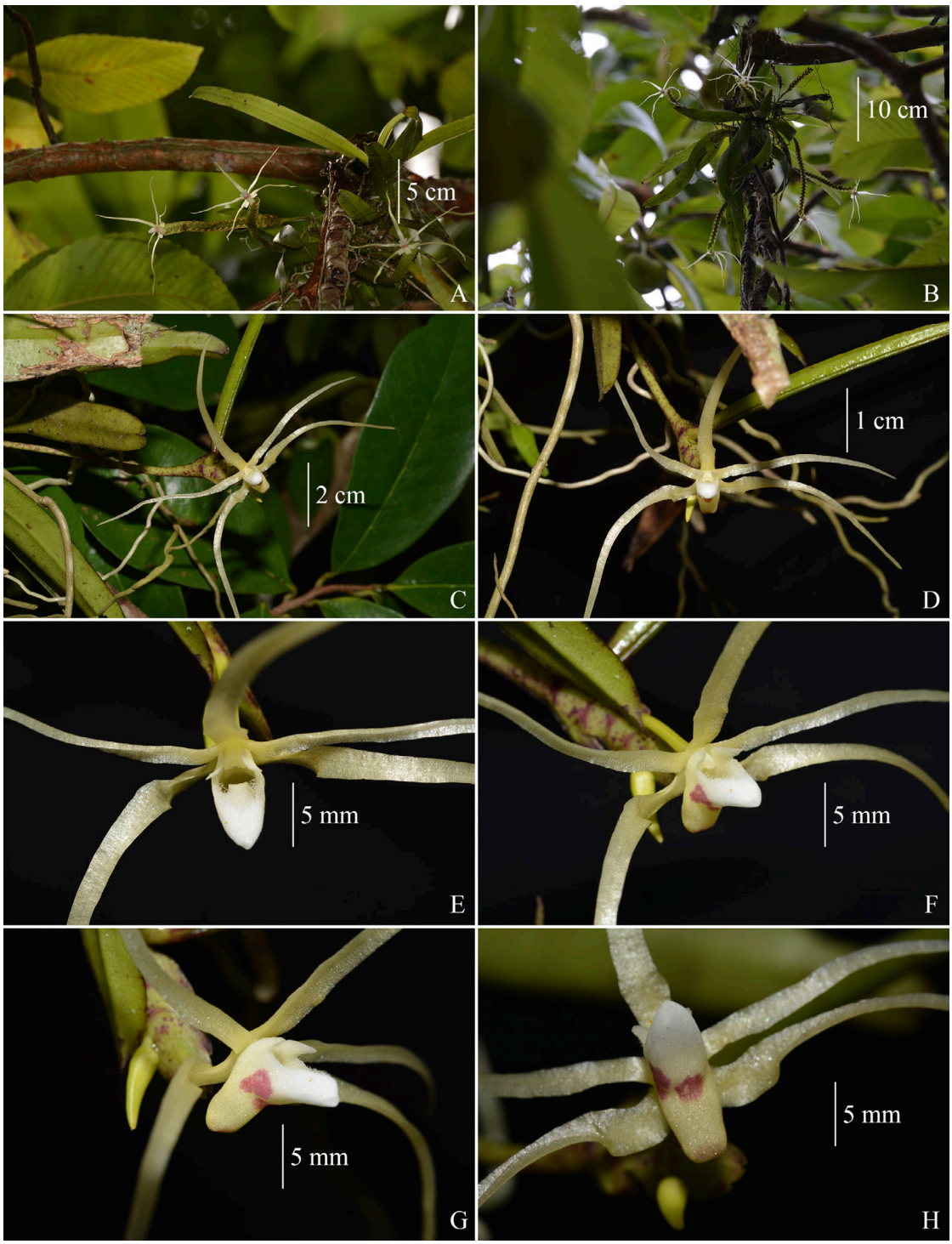

FIGURE 4. *Thrixspermum obyrneanum*, southern Thailand. **A–B**. Plant habit. **C–D**. Flower and fruit (front view). **E**. Flower (close up, adaxial view). **F–G**. Flower (close up, oblique view). **H**. Flower (closed up, abaxial view). Photographed by Nopparut Toolmal (A–H) *in situ*. Illustration assembled by Yongyuth Rattanasootr.

Figure 5. *Thrixspermum obyrneanum*, Peninsular Malaysia. **A–B**. Plant habit with flowers (front and oblique views). **C**. Flower (lateral view). **D**. Flower (front view). Photographed by Ong Poh Teck from living collection of *Ong FRI 88546*. Illustration assembled by Yongyuth Rattanasootr.

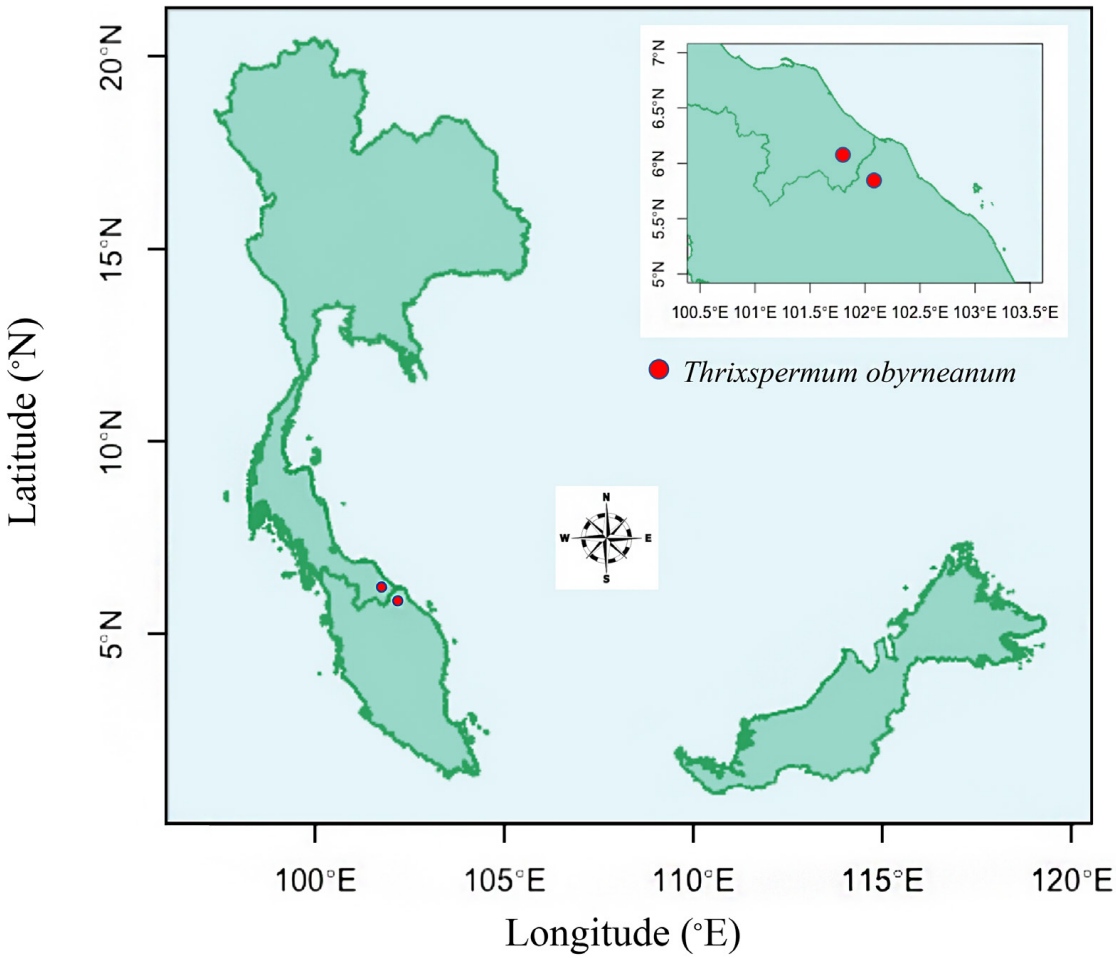

FIGURE 6. Distribution map of *Thrixspermum obyrneanum* from Southern Thailand and Peninsular Malaysia. Illustration by Nopparut Toolmal.

rachis, 3.8–7.0 × 2–3 mm, apex acute-acuminate, keeled. *Flowers* non resupinate, opening widely; tepals pale yellow, lip pale yellow, tinged with purplish red on both surfaces of the sac and between the lateral lobes, callus creamy white, lasting only one day, membranaceous, 4–8 cm across, mildly sweet-scented. *Dorsal sepal* linear, 31.5–42.0 × 2.8–3.0 mm, slightly tapering towards the apex, slightly concave, somewhat twisted near the base, apex acuminate, 5-nerved, glabrous. *Lateral sepals* linear, obliquely subhorizontal, 33.5–42.0 × 3.2–3.5 mm, slightly tapering towards the apex, rather concave, somewhat twisted and expanded near base, apex acuminate, 5-nerved, glabrous. *Petals* similar to sepals, slightly smaller, obliquely, 21.5–38.0 × 1.9–2.5 mm, apex acuminate, 5-nerved, glabrous. *Lip* oblong to broadly ovate in outline, 3-lobed, 11.6–13.0 × 3.0–3.5 mm in natural position, strongly saccate at the base; sac narrowly conical, 3–4 × 3.0–3.2 mm, slightly bilobulate with obtuse lobules, on the back wall densely covered with 1.0–1.3 mm long glandular hairs; lateral lobes narrowly triangular to ovate, slightly falcate, 6–7 × 2–4 mm, free part 1.2–1.8 mm long, erect, slightly incurving around column, apical margins with shortly pubescent, adaxial surface glabrous, abaxial surface sometimes with pubescent and sparsely long glandular hairs, apex narrowly truncate and erose; mid-lobe cylindrical to broadly triangular, *ca*. 3.0–4.7 × 3 mm, *ca*. 4.7 × 5.0 mm (spread out), concave from base to apex, producing

a navicular shape, densely covered with long glandular hairs adaxially (1.0–1.3 mm long), pubescent abaxially, thick (0.8–1.0 mm), more or less evenly thick from base to apex, apex obtuse (slightly unequally bilobed in lateral view), weakly decurved; lip between the lateral lobes sparsely covered with long glandular hairs adaxially, pubescent abaxially, with a tongue-shaped callus a little below the mid-lobe, callus 1.8–2.0 mm long, 1.5–1.8 mm diam., glabrous, apex obtuse, decurved. *Column* creamy white to pale yellow, cylindrical, short, stout, 1.8–2.0 × 1.8–2.0 mm, laterally winged; column-foot creamy white, short, broad, 2–3 × 1.9–2.5 mm. *Anther* creamy white to pale yellow, suborbicular in outline, glabrous, 1.0–1.2 × 1.2–1.5 mm, the median with a longitudinal ridge. *Pollinia* bright yellow, in 2 highly unequal pairs, lanceolate-ellipsoid, curved; the larger *ca*. 1.0 × 0.5 mm; the smaller, *ca*. 0.8 × 0.3 mm; stipe creamy white, broadly ovate-elliptic, *ca*. 0.5 × 0.5 mm, concave in the median, slightly translucent; viscidium cream-white, transverse-linear, *ca*. 0.2 × 0.6 mm, recurved into a crescent shape, slightly translucent. *Pedicel-with-ovary* pale yellow to pale green, cylindrical, 6-grooved, 7–12 × 1.0–1.2 mm. *Fruit* green with dark brown spots, narrowly cylindrical, *ca*. 6 × 1–2 cm, with 6 longitudinal ridges. Described from living plants and flowers, and spirit material.

Distribution: Southern Thailand (Narathiwat, type) and Peninsular Malaysia (Kelantan) (Fig. 6).

Etymology: This species is named in honour of the late Peter O'Byrne (1955–2018), who has done much valuable work on *Thrixspermum* and many other groups of orchids in Southeast Asia.

Phenology: Flowering recorded in January, May and November in cultivation and in October in the natural habitat. Flowering is probably intermittent throughout the year.

Habitat and ecology: In Thailand, epiphytic in orchards along the roadside and in tropical evergreen forest, at 10–120 m in elevation., commonly found on twigs of trees, including *Garcinia mangostana* L. (Clusiaceae), *Dillenia indica* L. (Dilleniaceae), *Baccaurea lanceolata* (Miq.) Müll.Arg. (Phyllantaceae), and *Ficus* sp. (Moraceae) at about 2–10 m above the ground and frequently near waterfalls or along streams in somewhat exposed positions. In Peninsular Malaysia, epiphytic on tree branches at the base of a limestone hill.

Conservation status: This taxon is common in tropical rain forest of Narathiwat province, which covers an area of more than 183 km^2. At present, it is only known in Thailand from this locality, but it may be expected to occur in neighbouring hills. For the time being, *T. obyrneanum* is assessed as a "Data Deficient" (DD) in Thailand, according to the IUCN criteria (IUCN 2012), as more information on its distribution and population status is needed for an accurate evaluation. Similarly, a global assessment would require more data about the occurrence in Peninsular Malaysia.

Vernacular (Thailand): Meng Moom Khao O'Byrne (แมงมุมขาวโอเบริน), Meng Moom Khao Nara (แมงมุมขาวนรา), Meng Moom Khao Hala-Bala (แมงมุมขาวฮาลาบาลา).

Specimens examined: **Peninsular Thailand**: Narathiwat, Su-Ngai Kolok, 23 October 2020, *N. Toolmal & W. Tanming 23102003* (TTM 0006368!). **Peninsular Malaysia**: Kelantan, 19 November 2017, *Ong FRI 88546* (KEP, spirit barcode SC9302).

Taxonomic notes: Among the other species of *Thrixspermum* in Thailand, *T. obyrneanum* is morphologically most similar to *T. leucarachne* Ridl. (1896: 397), which is widespread from north-eastern and eastern Thailand down to the middle of southern Thailand. *Thrixspermum obyrneanum* is distinguished by the much smaller flower, with sepals and petals 2.1–4.2 cm long (*vs*. 6.5–8.0 cm). While their flower colours, which are variable in *T. leucarachne*, can be similar, the flowers are never white and tinged with purple at the base of the sepals and petals in *Thrixspermum obyrneanum*. The lip colour is also different. Whereas it is white, tinged with purplish-red on both surfaces, except the mid-lobe, in *T. leucarachne*, it is pale yellow, tinged with purplish-red only on both surfaces of the sac and between the lateral lobes in *T. obyrneanum*. *Thrixspermum obyrneanum* can also be distinguished by the shape and length of the lateral lobes, which are

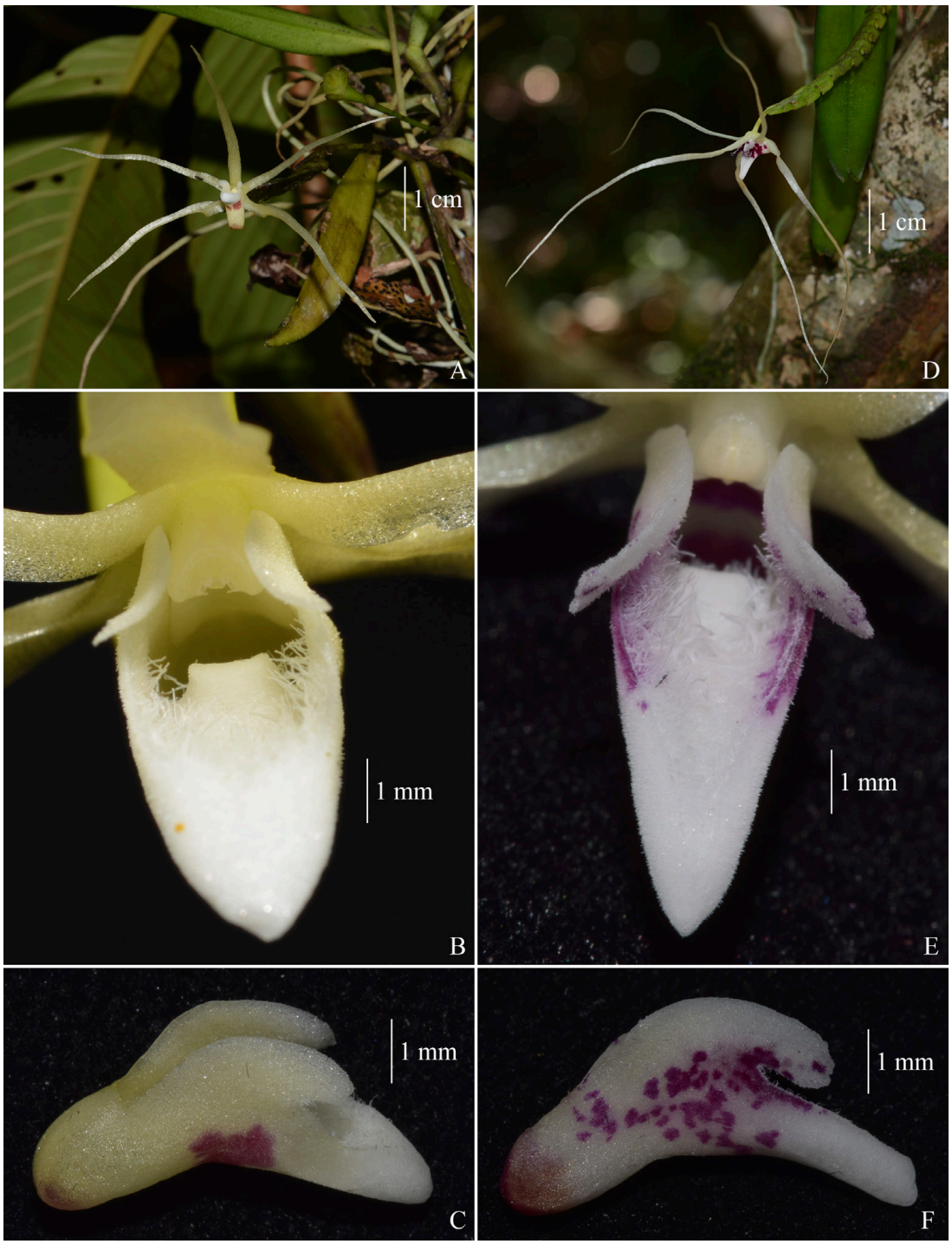

FIGURE 7. Morphological comparison between *Thrixspermum obyrneanum* (A–C) and *T. leucarachne* (D–F). **A**. Flower (front view). **B**. Mid-lobe (close up, adaxial view). **C**. Lip (oblique view). **D**. Flower (front view). **E**. Mid-lobe (close up, adaxial view). **F**. Lip (lateral view). Photographed by Nopparut Toolmal (A, B, D) & Wattana Tanming (C, E, F). Illustration assembled by Yongyuth Rattanasootr.

Table 1. Differences between *Thrixspermum leucarachne* and *T. obyrneanum* in Thailand.

Characters	*T. leucarachne*	*T. obyrneanum*
Flower (size)	8–12 cm across	4–8 cm across.
Tepals colour	White, rarely pale yellow, tinged with purple at the base.	Pale yellow.
Dorsal sepal length	6.5–8.0 cm	3.1–4.2 cm
Lateral sepals' length	6.5–8.0 cm	3.3–4.2 cm
Petals length	6–7 cm	2.1–3.8 cm
Lip colour	White, tinged with purplish red throughout both surfaces of the lip, except the mid-lobe.	Pale yellow, tinged with purplish red only on both surfaces of the sac and between the lateral lobes.
Lateral lobes shape	Narrowly triangular to oblong, falcate.	Broadly triangular to ovate, slightly falcate.
Lateral lobes length	7–8 mm	6–7 mm
Lateral lobes apex	Obtuse, unequally bilobed.	Narrowly truncate and erose.
Mid-lobe shape	Narrowly triangular.	Cylindrical to broadly triangular, depressed.
Mid-lobe (size)	6–9 × 4–5 mm	ca. 3.0–4.7 × 3 mm
Mid-lobe apex	Acute, slightly decurved.	Obtuse, decurved.

broadly triangular to ovate, slightly falcate, 6–7 mm long, apex narrowly truncate and erose (*vs.* narrowly triangular to oblong, falcate, 7–8 mm long, with obtuse and unequally bilobed apex). The two taxa also differ in the morphology of the lip-mid-lobe. Whereas this is almost cylindrical to broadly triangular, *ca.* 3.0–4.7 × 3 mm, and obtuse in *T. obyrneanum*, it is narrowly triangular, 6–9 × 4–5 mm, and acute in *T. leucarachne* (Fig. 3, 4, 5, 7, Table 1).

Comparing the Peninsular Malaysian *Thrixspermum* using Seidenfaden & Wood (1992), *T. obyrneanum* keys out close to *T. iodochilus* Ridl. and *T. centipeda* Lour. Both have a glabrous mid-lobe, whereas in *T. obyrneanum* this is in part covered with long glandular hairs. In *T. iodochilus*, the mid-lobe is violet, narrowly tongue-shaped, and the apex of the lateral lobes is truncate with entire margin (Seidenfaden & Wood 1992, Fig. 291a). In *T. centipeda*, the mid-lobe is white, and the apex of the lateral lobes is broadly rounded with a slightly erose margin. In contrast, in *T. obyrneanum* the lip is pale yellow, and the apex of the lateral lobes is narrowly truncate with a slightly erose margin. There are also no close similarities between *T. obyrneanum* and some of the newly described *Thrixspermum* species from Peninsular Malaysia by O'Byrne *et al.* (2015).

Among Bornean *Thrixspermum* species, *T. obyrneanum* is close to *T. kipandicum* P.O'Byrne & Gokusing and *T. lanatum* P.O'Byrne & Gokusing. Both differ from *T. obyrneanum* in tepal length, lip shape, and hairiness of the lip. In *T. kipandicum*, the sepals and petals are two to three times longer; the mid-lobe is cylindrical, slightly depressed at the base (*ca.* 3 mm long), convex at the distal half (*ca.* 4 mm long), and glabrous on both surfaces. *Thrixspermum obyrneanum* is easily distinguished from *T. lanatum* by the long glandular hairs adaxially at the base of the mid-lobe.

Surprisingly, given their geographical separation, *T. obyrneanum* is similar to *T. validum* J.J.Sm. from New Guinea regarding floral morphology. However, *Thrixspermum validum* differs from *T. obyrneanum* in the more robust plant habit with much longer and stouter stems, internodes 17.5–20.0 mm long (*vs.* internodes 3–12 mm long), and much broader leaves, 3.3–3.6 cm wide (*vs.* 1.3–2.0 cm wide). The inflorescence is also longer, *ca.* 20 cm long in total (*vs.* 4.9–18.0 cm). The lip of *T. validum* is clearly longer than in *T. obyrneanum*, 1.7 cm long (*vs.* 1.1–1.3 cm) and minutely papillose (*v*s. densely covered in long glandular hairs, especially on the adaxial side of the mid-lobe and on the floor of the sac). The callus on the lip of *T. validum* is papillose, whereas, in *T. obyrneanum,* the callus is largely glabrous except for the sparsely long glandular hairs at the base (Smith 1905, 1908, 1909, 1916).

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