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A NEW MINIATURE GHOST ORCHID APPEARS IN THE DOMINICAN REPUBLIC

James D. Ackerman[1,4], Eladio Fernández[2], Betsaida Cabrera[2,3] & Normandie González-Orellana[1]

[1]Department of Biology, University of Puerto Rico, 17 Avenida Universidad Suite 1701, San Juan, Puerto Rico 00925-2537, U.S.A.

[2]Jardín Botánico Nacional Rafael M. Moscoso, Avenida República de Colombia, Santo Domingo, Distrito Nacional, República Dominicana.

[3]Ministerio de Medio Ambiente y Recursos Naturales, Avenida Cayetano Germosén, Santo Domingo, Distrito Nacional, República Dominicana.

[4]Author for correspondence: ackerman.upr@gmail.com

Abstract. A small population of an epiphytic orchid in the leafless genus *Dendrophylax* was discovered in the valley of Río Amina, on the northwestern side of the Cordillera Central of the Dominican Republic. The tiny yellow to yellow-green flowers proved to be unique and therefore we describe here the new species as *D. pustulatus*, for the brown ellipsoid pustules of the inflorescence and ovary, the 90° bend at the transition between the pedicel and ovary, the simple mid lobe of the lip, and a laterally flattened spur not exceeding the length of the ovary. Based on morphology, *D. pustulatus* appears to be closely allied with *D. constanzensis* and *D. serpentilingua*. *Dendrophylax* now has 16 species, 12 of which are present in Hispaniola and half of those are endemic to the island.

Resumen. En el valle del Río Amina, en el noroeste de la Cordillera Central de la República Dominicana, se descubrió una pequeña población de orquídeas epífitas sin hojas del género *Dendrophylax*. Las diminutas flores de color amarillo a verde amarillento resultaron ser únicas y por eso describimos aquí la nueva especie como *D. pustulatus*, por las pústulas elipsoides de color marrón de la inflorescencia y el ovario, la curva de 90° en la transición entre el pedicelo y el ovario, el lóbulo medio del labio simple y un espolón aplanado lateralmente que no excede el largo del ovario. Según su morfología, *D. pustulatus* parece estar estrechamente relacionada con *D. constanzensis* y *D. serpentilingua*. *Dendrophylax* cuenta actualmente con 16 especies, 12 de las cuales están presentes en La Española y la mitad de ellas son endémicas de la isla.

Keywords / Palabras clave: Angraecinae, *Dendrophylax*, ghost orchids, Orchidaceae, orchid flora, orquídeas fantasmas, orquideoflora, República Dominicana

Introduction. The genus *Dendrophylax* Rchb.f. (Epidendroideae: Vandeae: Angraecinae), commonly known as "ghost orchids", currently consists of 15 species distributed primarily in the Greater Antilles but with two species that have ventured north to Florida (USA) [*D. lindenii* (Lindl.) Benth. ex Rolfe, *D. porrectus* (Rchb.f.) Carlsward & Whitten], and two occur in Megamexico (*D. megarhizus* Molgo & Carnevali, *D. porrectus*). *Dendrophylax* and its sister genus, *Campylocentrum* Benth., are the only two representatives of the subtribe Angraecinae in the western hemisphere.

Dendrophylax is epiphytic yet leafless at maturity, rendering them inconspicuous. Flowers are borne singly or on laxly flowered racemes or sparsely branched panicles (*Campylocentrum* has distichous, densely flowered racemes). Flowers are yellow, green, or white, spurred, and produce nectar as a pollinator reward. The stubby column has a split rostellum and the anther bears two independent, yellow pollinia with separate stipes (hemipollinaria). The larger species have spectacular white, nocturnally fragrant flowers that seem to float in the understory as they are usually borne alone at the end of long, slender inflorescences;

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hence the name "ghost orchids" (Ackerman & Collaborators, 2014).

The center of *Dendrophylax* diversity is Hispaniola, which is home to 11 species, five of which are endemic. This matches the overall percent endemism for orchids on the island (44% for all orchids; 45% for *Dendrophylax*) (Ackerman & Collaborators, 2014). High endemism is not only characteristic of the orchid flora of Hispaniola, but also prevalent across many plant and animal groups making Hispaniola a major contributor to the Caribbean biodiversity hotspot (e.g., Powell *et al.*, 1999; Santiago-Valentín & Olmstead 2004). Its geological diversity, physiographic and climatically fragmented landscape offers opportunities for population isolation where genetic drift and natural selection may occur without homogenizing effects of gene flow (Cano Carmona *et al.*, 2010; Cano Ortiz *et al.*, 2016; Hu *et al*., 2022; Tremblay *et al.*, 2005).

While it is tempting to regard the Hispaniola as the evolutionary origin of the *Dendrophylax*, the phylogenetic evidence is equivocal. The earliest diverging clades have the most widespread species occupying multiple islands of the Greater Antilles: *D. monteverdi* (Rchb.f.) Ackerman & Nir (Puerto Rico, Hispaniola, Jamaica, and Cuba), *D. barrettiae* Fawc. & Rendle (Hispaniola, Jamaica, and Cuba), and *D. porrectus* (Puerto Rico, Hispaniola, Jamaica, Cuba, Florida, and Mexico) (Ackerman & Collaborators, 2014; Carlsward *et al.*, 2006; Molgo *et al.*, 2016). As for diversification of *Dendrophylax*, it likely diverged from *Campylocentrum* in the late Miocene (Farminhão *et al.*, 2021). Unfortunately, diversification within *Dendrophylax* lacks clarity since only three morphologically disparate species of *Dendrophylax* have been assessed, and they diverged in the early to mid-Pliocene (Pessoa *et al*., 2018). Nonetheless, the phylogram depicting *Dendrophylax* phylogeny of Carlsward *et al.* (2006) showed short Fitch lengths, suggesting recent divergence of sister species occupying different islands (*D. sallei* of Hispaniola and *D. lindenii* of Cuba and Florida; *D. fawcettii* of the Cayman Islands and *D. funalis* of Jamaica).

We encountered a population of a small flowered *Dendrophylax* that we have concluded is an undescribed species, which we rectify here.

Taxonomic Treatment

Dendrophylax pustulatus Ackerman & E.Fernández, ***sp. nov.*** (Fig. 1–2)

TYPE: República Dominicana. Cordillera Central: provincia Santiago, a 1 km en dirección este por el sendero, después de la caseta del Parque Nacional Armando Bermúdez, La Diferencia, frente a La Diferencia Eco-Retreat. A lo largo de la vegetación contigua al Río Amina. En pequeñas poblaciones a lo largo del sendero. Pico floral parece ser entre principios y mediados de Julio, 19°16"13"N, 71°03'07"W, elev. 735 m, 12 julio 2024, *E. Fernández 23* (holotype: JBSD 138476; isotype: NY). Fig. 1–2.

Diagnosis: *Dendrophylax pustulatus* differs by a combination of characteristics from other small-flowered and short-spurred members of the genus, *D. serpentilingua* (Dod) Nir, and *D. constanzensis* (Garay) Nir. *Dendrophylax pustulatus* inflorescence has abundant ellipsoid pustules and an obovate retuse mid lobe of the lip, whereas the pubescence of *D. serpentilingua* is hispid and the mid lobe is ovate, apiculate and two-tailed, and *D. contanzense* is setaceous-hirsute, and the mid lobe is anchor-shaped, apiculate. *Dendrophylax pustulatus* also has a laterally compressed spur, a trait that is shared only with *D. serpentilingua*. Furthermore, *D. pustulatus* consistently has a 90° bend at the transition between the pedicel and ovary, not yet seen in other species of the genus.

Plant epiphytic, monopodial, leafless. *Roots ca*. 10 or more, green when wet, white to whitish green when dry, caespitose, 1.0–1.5 mm diam., up to 15 cm long, smooth. *Rhizome* largely obscured by roots, 5–10 mm long. *Inflorescences* erect, filiform, racemose or sparsely branched, 1–6 flowers produced in succession, usually 1 open at a time, densely provided with brown elliptical pustules; *peduncle* green, 17–30 mm long, 0.5 mm diam., comprised of 3 nodes, bracts brown, sheathing, acute, 1.5–2.0 mm long, progressively smaller toward the apex; *rachis* 5–15 mm long, somewhat fractiflex; *floral bract* 1.5–2.0 mm long. *Flowers* yellow to yellow green, in the resupinate position; *pedicellate ovary* geniculate; *pedicel* erect, 2.0–2.5 mm long, glabrous or with sparse brown pus-

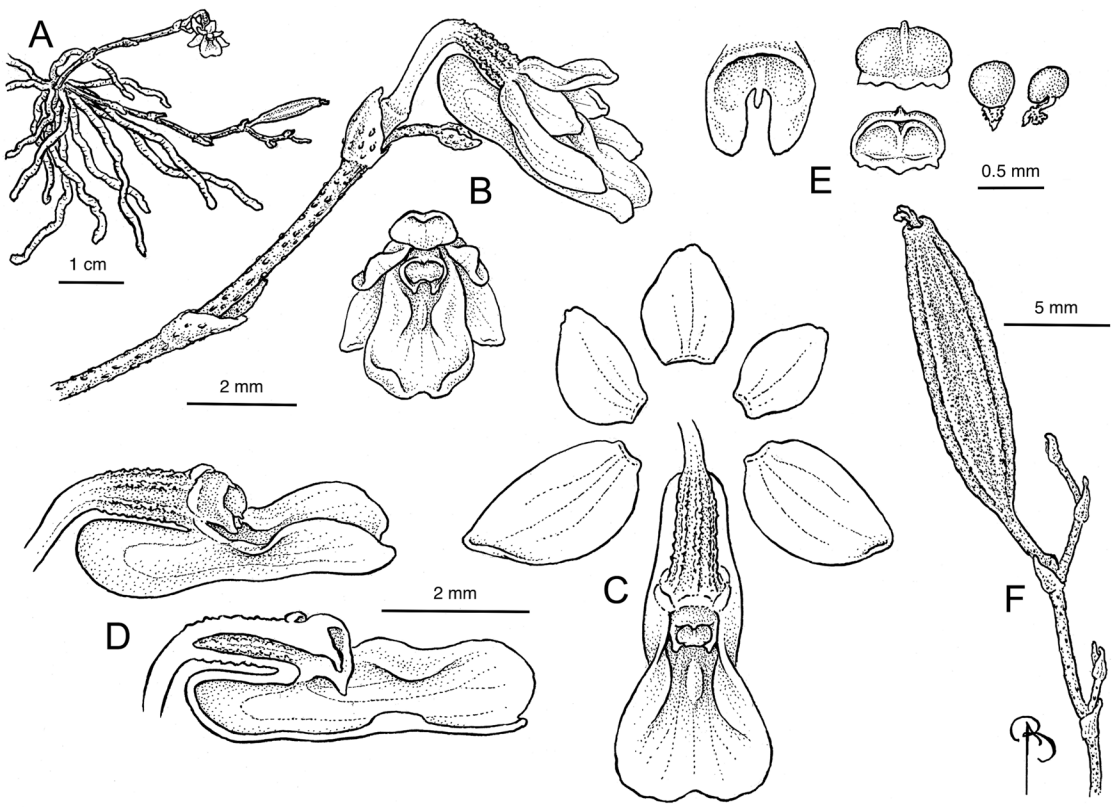

Figure 1. *Dendrophylax pustulatus* Ackerman & E.Fernández. **A**. Habit. **B**. Inflorescence, side view; flower front view. **C**. Flower, top view with sepals and lateral petals removed. **D**. Flower side view with sepals and lateral petals removed. **E**. Anther with anther cap removed; anther cap, dorsal and ventral views; hemipollinaria, front and side views. **F**. Infructescence. Illustrated by Bobbi Angell based on alcohol preserved specimen (later pressed and dried; *E. Fernandez s.n*., 28 Jun 2024; UPRRP) and Eladio Fernández photographs.

tules; *ovary* perpendicular to the pedicel, 1.5–2.0 mm long, ribbed, densely provided with brown pustules; *sepals* weakly pustulose/verrucose abaxially, entire; *dorsal sepal* ovate, obtuse, 1.9 × 1.2 mm, reflexed upward 0.5 mm from base; *lateral sepals* ovate, slightly oblique, acute, entire, 2.8–3 mm long, 1.8 mm wide; *petals* glabrous, flanking column, ovate, obtuse, 1.8 × 1.2 mm; *lip* glabrous, 3.0–3.5 mm long, excluding spur, superficially simple, obscurely trilobed, lateral lobes erect, flanking column, rounded, entire, creating a narrow entryway to spur, and meeting the mid lobe at about half the length of the lip, mid lobe obovate, rounded, retuse, *ca*. 2.0 mm long, 2.4 mm wide, disc callus a low elliptical bump in front of the column 0.7 mm long, spur 1.5–2.0 mm long × 1.0–1.2 mm deep, laterally compressed, truncate, parallel to ovary, abutting against the pedicel; *column* light green, stubby, 0.5 mm long; *anther* cap yellow with two brown spots, pollinia 2, globose, *ca*. 0.16 mm diam., attached to separate stipes and viscidia. *Fruit* pedicel *ca*. 4 mm long; *capsule* green with sparse, brown, elliptical pustules, fusiform, ribbed, slightly asymmetrical both basally and apically, 12–18 × 3.0–3.5 mm, dehiscence longitudinal along a single suture.

Etymology: In reference to the brown, ellipsoid pustules on the peduncle and ovary.

Distribution: Dominican Republic: province Santiago; Cordillera Central.

Taxonomic discussion: It is not entirely clear which species are most related to *D. pustulatus*. The most complete phylogenetic analysis published to date is

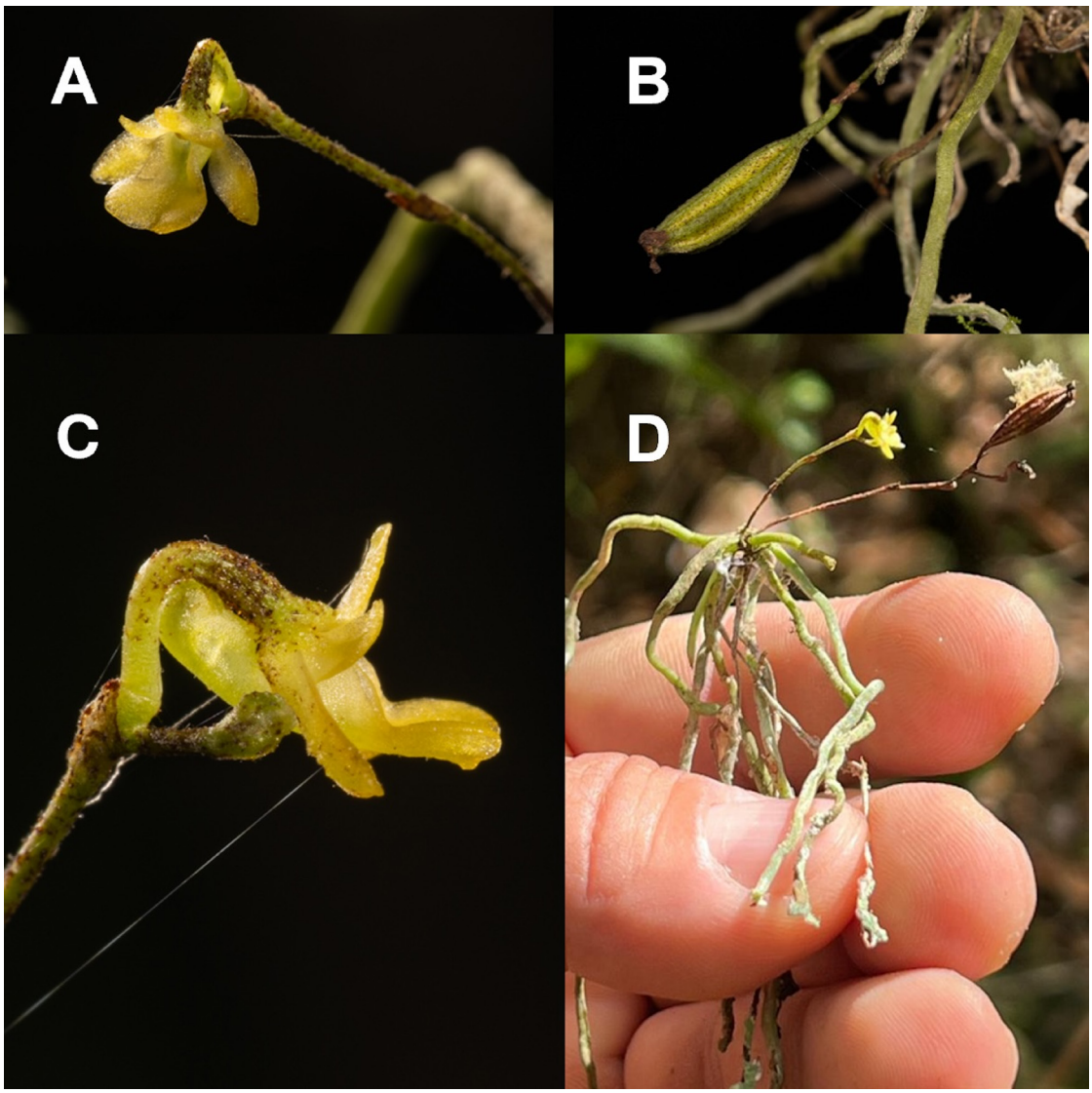

Figure 2. *Dendrophylax pustulatus* Ackerman & E.Fernández. **A**. Flower, off-center view (note the pustulate peduncle and ovary). **B**. Fruit, nearly mature. **C**. Flower, side view. **D**. Plant with young inflorescence and old infructescence. See Fig. 1 for floral dimensions. Photographs by Eladio Fernández.

of Molgo *et al*. (2016) and they sampled nine species, only one of which, *D. porrectus*, is among the short-spurred species of the Dominican Republic. DNA of *D. constanzensis*, *D. macrocarpus* (Dod) Carlsward & Whitten, *D. monteverdi*, and *D. serpentilingua* have yet to be sequenced and included in phylogenetic analyses. Nonetheless, based on morphology, we expect *D. pustulatus* to be related to *D. serpentilingua* and *D. constanzensis* (Table 1). This brings the number of species in the genus to 16 and increases the number of Hispaniolan endemics to six.

Ecology: Plants are epiphytic on branches of small, broadleaf trees. The population appears to be about 60 plants distributed along the southern side of Río Amina and the western side of Río Dajao. Reproductive biology is largely unknown, but flowering peak appears between June and August, and plants are

Table 1. Species of *Dendrophylax* with short spurs (equal to or less than the length of ovary). HIS = Hispaniola, PR = Puerto Rico, CUB = Cuba, JAM = Jamaica, CAY = Cayman Islands, MEX = Megamexico, FLA = Florida (USA).

***Dendrophylax* species**	**Distribution**	**Inflorescence**	**Spur**	**Inflorescence pubescence**	**Mid lobe of lip**
D. constanzensis	HIS	filiform to 7 cm long	oblong, cylindrical	setaceous-hirsute	anchor-shaped, apiculate
D. macrocarpa	HIS	stout 1–2 cm long	obovoid	glabrous	ovate, acute
D. megarhizus	MEX	filiform to 10 cm long	scrotiform-saccate	glabrous	ovate-triangular, apiculate
D. monteverdi	PR, HIS, CUB, JAM	stout < 1 cm long	oblong to obovoid	glabrous	ovate, truncate
D. porrectus	PR, HIS, CUB, JAM, CAY, MEX, FLA	filiform 2–5 cm long	scrotiform-saccate	glabrous	ovate, apiculate
D. pustulatus	HIS	filiform 2.2–4.5 cm long	oblong, laterally flattened	pustulate	obovate, retuse
D. serpentilingua	HIS	filiform 2–3 cm	obovoid, laterally flattened	hispidus	ovate, 2-tailed, apiculate

likely pollinator-dependent since fruit production is sparse. Fragrance production is unknown. Pollinators of only one *Dendrophylax* are known, the large-flowered *D. lindenii*, which is pollinated by hawkmoths (Lepidoptera: Sphingidae) in Florida (USA) (Ackerman *et al*., 2023; Danaher *et al*., 2019; Houlihan *et al*., 2019). It is unlikely that the small flowers of the present species are pollinated by the high energy-demanding sphingids. The tiny flowers *of D. pustulatus* suggest that they are visited by either microlepidopterans or small bees, the latter of which are known to pollinate the small, white, short-spurred flowers of three species of *Campylocentrum* in Brazil (Cabral & Pansarin, 2016; Carlsward *et al*., 2003; Singer & Cocucci 1999).

Conservation status: We know of only one population occupying an area of approximately 2.5 hectares, with about 60 plants, all of which occur within a protected national park, Parque Nacional Armando Bermúdez. These conditions meet the IUCN Red List criterion D for endangered status (EN) (IUCN 2012).

Paratypes: República Dominicana. Cordillera Central: Provincia Santiago, La Diferencia, *E. Fernández s.n.,* 28 Jun 2023 (UPRRP, illustration voucher). Provincia Santiago, La Diferencia, a 1 km en dirección este por el sendero, después de la caseta del Parque Nacional Armando Bermúdez, a lo largo de la vegetación contigua al Río Amina, 19°16’13”N, 71°03’07”W, elev. 735 m, 28 de marzo 2023, *E. Fernandez 22B* (JBSD).

Key to the Species of *Dendrophylax*

Modified from Ackerman & Collaborators (2014) and Molgo *et al*. (2016)

1. Inflorescences hispid to hirsute-setaceous throughout 2
   2. Apical lobes of the labellum short, retrorse ..... *D. constanzensis* (Garay) Nir
   2a. Apical lobes of the labellum long, filiform, pendent ..... *D. serpentilingua* (Dod) Nir
1a. Inflorescences glabrous to sparsely verrucose or pustulate 3
   3. Labellum simple or nearly so, retuse, entire or apiculate 4
      4. Inflorescence less than 1 cm long 5
         5. Roots smooth; fruits 8–9(–14) mm long; spur 2.5–3.0 mm long; Cuba, Jamaica, Hispaniola, Puerto Rico ..... *D. monteverdi* (Rchb.f.) Ackerman & Nir
         5a. Roots verrucose; fruits 25–30 mm long; spur 3.0–3.5 mm long, Hispaniola ..... *D. macrocarpa* (Dod) Carlsward & Whitten
      4a. Inflorescences 2–10 cm long 6

6. Spur scrotiform, saccate 7
7. Roots 0.8–1.6 mm in diameter; lip callus 0.2–0.5 long ..... *D. porrectus* (Rchb.f.) Carlsward & Whitten
7a. Roots ca. 1.4–2.3 mm in diameter; lip callus 0.07–0.20 mm long ..... *D. megarhizus* Molgo & Carnevali
6a. Spur infundibuliform, tubular, or laterally flattened, not scrotiform or saccate 8
8. Spur 1.5–5 mm long, ovary tuberculate or pustulate 9
9. Spur 3–5 mm long, infundibuliform ..... *D. alcoa* Dod
9a. Spur 1.5–2.0 mm long, straight, laterally flattened ..... *D. pustulatus* Ackerman & E.Fernández
8a. Spur 15–25 mm long, ovary glabrous 10
10. Roots smooth; labellum without a crest; fruits less than 15 mm long; Cuba, Jamaica, and Dominican Republic ..... *D. barrettiae* Fawc. & Rendle
10a. Roots tuberculate; labellum with a simple, basal crest 1 mm long; fruits 17–20 mm long; Dominican Republic ..... *D. helorrhiza* Dod
3a. Labellum conspicuously trilobed, deeply emarginate, or apically bilobed 11
11. Spur less than 10 cm long 12
12. Dorsal sepal 17–29 mm long; Jamaica ..... *D. funalis* (Sw.) Benth. ex Rolfe
12a. Dorsal sepal less than 7 mm long; Cuba and Hispaniola 13
13. Labellum lobes falcate, lanceolate, about 9 × 3 mm, margin entire ..... *D. gracilis* (Cogn.) Garay
13a. Labellum obovate, margin minutely denticulate ..... *D. varius* (Gmel.) Urb.
11a. Spur more than 10 cm long 14
14. Labellum apical lobes rounded, neither twisted nor elongate; Grand Cayman ..... *D. fawcettii* Rolfe
14a. Labellum with falcate, twisting apical lobes 4.5–7.0 cm long; Cuba and Hispaniola 15
15. Lateral lobes of the labellum low triangles, distally spreading 1–3 mm at the isthmus; Cuba ..... *D. lindenii* (Lindl.) Benth. ex Rolfe
15a. Lateral lobes of the labellum triangular, fang-like, spreading 8–14 mm at the isthmus; Hispaniola ..... *D. sallei* (Rchb.f.) Benth. ex Rolfe

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Author contributions. JDA: field work, taxonomic assessments, writing the first draft and coordinating revisions. EF: field work, logistics, photography, specimen preparation. BC: field work, logistics, specimen preparation. NG: field work and figure preparations. All authors have revised and approved the manuscript.

Conflict of interest. The authors declare that they have no known competing financial interests or relationships that could be construed to influence this work.

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SOBRALIA ARYAELIZABETHIANA (ORCHIDACEAE), A SMALL AND UNUSUAL NEW SPECIES FROM NORTHWESTERN PERU

Luis Ocupa-Horna[1,3] & Janice Valencia-D.[2]

[1]Departamento de Orquideología, Centro de Investigación en Biología Tropical y Conservación - CINBIOTYC, Cal. Nestor Martos Mza. e Lote. 16, A.H. Almirante Miguel Grau II, Piura, Perú.

[2]Grupo Tándem Max Planck, Facultad de Ingeniería, Universidad Nacional de Colombia, Carrera 30 # 45-03, Edificio 615, Bogotá D.C., Colombia.

[3]Author for correspondence: luisocupa.horna@gmail.com

Abstract. A new species of *Sobralia* from the Andes of northern Peru is described and illustrated. *Sobralia aryaelizabethiana* can be easily recognized by its short stems with axillary racemose inflorescences. The species is most similar to *S. rigidissima* but differs in having smaller leaves (up to 8 cm *vs*. 15 cm), oblanceolate sepals up to 29 mm long (*vs*. linear-oblong, up to 13 mm), and an unlobed, ovate lip (*vs*. trilobed, cuneate-flabellate). Additionally, it has longer petals, widely ovate floral bracts with a triangular apex, and lavender flowers with purplish lip stains (*vs*. rose-colored with a white lip). *Sobralia aryaelizabethiana* is found only in a small area near Abra de Porcuya in the Piura department, on northwestern Peru. It thrives in semiarid soils that are partially covered with herbaceous or shrubby vegetation. This species is adapted to an environment characterized by intense sunlight and the constant air currents that bring in dense fog. The species diversity of *Sobralia* in Peru remains incompletely understood and a comprehensive taxonomic revision is required to clarify its richness.

Resumen. Se describe e ilustra una nueva especie de *Sobralia* de los Andes del norte de Perú. *Sobralia aryaelizabethiana* se puede reconocer fácilmente por sus tallos cortos con inflorescencias racemosas axilares. La especie es más similar a *S. rigidissima* pero se diferencia por tener hojas más pequeñas (hasta 8 cm *vs*. 15 cm), sépalos oblanceolados de hasta 29 mm de largo (*vs*. linear-oblongos, hasta 13 mm) y un labelo entero, ovado (*vs*. trilobulado, cuneado-flabelado). Además, tiene pétalos más largos, brácteas florales ampliamente ovadas con un ápice triangular y flores de color lavanda con manchas violáceas en el labelo (*vs*. rosa con labelo blanco). *Sobralia aryaelizabethiana* está restringida a una pequeña zona cerca del Abra de Porcuya en el departamento de Piura, en el noroeste de Perú. Crece en suelos semiáridos, parcialmente cubiertos de vegetación herbácea o arbustiva, expuestos a la intensa la luz solar y a la densa niebla transportada por las constantes corrientes de aire en la zona. La diversidad de *Sobralia* en Perú es aún poco comprendida y se requiere de una revisión taxonómica para establecer su riqueza.

Keywords/Palabras clave: especie nueva, Huarmaca, new species, Piura, Porcuya, Sobralieae, taxonomía, taxonomy

Introduction. *Sobralia* Ruiz & Pav. is a polyphyletic genus comprising approximately 172 recognized species (Baranow, Dudek & Szlachetko, 2017; Neubig *et al*., 2011; POWO, 2025). Plants of the genus typically exhibit caespitose growth and can be epiphytic, lithophytic, or terrestrial (Serracín, Samudio & Bogarín, 2022). Their growth form is variable, featuring cylindrical, erect, or arching stems that are usually unbranched, though they can be rarely branched. The stems are covered by tubular, appressed leaf sheaths. The leaves are sessile and plicate, arranged either along the entire stem or only in the apical half. Inflorescences may be terminal or axillary, simple or branched, elongated or short and compact, often strongly condensed to form conical clusters of floral bracts (Baranow, 2015; Baranow & Dudek, 2018; Pridgeon *et al*., 2005), occasionally with a new growth arising from old inflorescences (Dressler, 2012). The flowers are generally showy, gregarious, or synchronous, usually ephemeral, and vary in size. The lip can

ORCID of the Author: LOH, JVD
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be entire or trilobed, typically infundibuliform (Serracín *et al.*, 2022) and often adorned with two ridges along the length of the lip base (Neubig, 2015). The gynostemium is usually claviform, erect, sigmoid, or curved in various ways. The anther bends forward, and the pollinia are soft and mealy, consisting of four or eight distinctly curved bands that are joined together (Szlachetko *et al*., 2009).

Members of *Sobralia* inhabit a variety of environments, ranging from humid and shady tropical forests to sunny and dry savannas, and they thrive from sea level to over 3,000 meters of elevation (Baranow *et al*., 2014; Pridgeon *et al.*, 2005). This genus is distributed across the tropical regions of Central and South America, specifically from Mexico to Peru, Bolivia, and southeastern Brazil (Garay, 1978; Dressler, Acuña & Pupulin, 2016; Pridgeon *et al*., 2005).

Peru is recognized for its rich diversity of orchid species (Ulloa Ulloa *et al*., 2017), with dozens of new species described annually (Martel, 2020). However, some genera remain poorly understood, and *Sobralia* is a prime example. Despite ongoing efforts to improve our understanding of its diversity (Arias-Sapa *et al*., 2023; Bennett & Christenson, 1995, 1998, 1999, 2001; Bennett *et al.*, 1996; Christenson, 1996, 2002, 2003; Christenson & Moretz, 2003; Rodríguez Arzubialde, 1999; Schweinfurth, 1958, 1970; Szlachetko *et al.*, 2009), it remains to be one of the least studied orchid genera in the country. Its classification remains outdated compared to other orchid groups (Dressler, 2005), largely due to the lack of sampling in most clades of *Sobralia* (I, II, II, IV, V) (Neubig, 2012; Neubig *et al*., 2011). Moreover, the fragile and short-lived flowers of *Sobralia* pose challenges for classifying the genus (Dressler, 2011; Dressler & Pupulin, 2010). Primarily because preserving floral characteristics, three-dimensional structure, and color patterns in herbarium specimens is particularly challenging (Neubig, 2012). As a result, identifying pressed specimens becomes notably difficult (Dressler, 2011).

To contribute to the knowledge of this genus, a new species of *Sobralia* from northwestern Peru is here described and illustrated. This new species is characterized by its unusual short stems (< 60 cm) for this clade within the genus and racemose axillary inflorescences. It is restricted to a small area near Abra de Porcuya, where it grows in semi-arid soils, partially covered by grasses or shrubs. This species is adapted to sunlight exposure and dense fog that is transported by the constant air currents in the region.

Materials and methods. In November 2017, the first author discovered a small species of *Sobralia* during field exploration near Abra de Porcuya, located in the Huarmaca district of the Huancabamba province in the Piura department. A specimen was collected and deposited in the HUT Herbarium at the Universidad Nacional de Trujillo. In 2024, the author returned to the area to gather more information about the *Sobralia* specimen and its habitat, preparing two herbarium specimens that were deposited in the PRG Herbarium of the Pedro Ruiz Gallo National University.

We examined *Sobralia* specimens with similar vegetative and floral characteristics that were deposited in the Peruvian herbaria CUZ, HOXA, HUT, PRG, and USM. Additionally, we reviewed high-resolution digital images of specimens housed in foreign herbaria, including AAU, AMES, BR, F, K, MO, NY, P, and W, which were accessible through various virtual platforms. Original descriptions and relevant literature on the genus were consulted.

The description was based on fresh flowers preserved in liquid. Vegetative and floral structures were photographed using a Canon® Rebel 80D camera equipped with a Canon EF 100 mm f/2.8L Macro IS USM lens, and the images were processed with Adobe Photoshop 24.0.1 (Adobe Inc., 2022). The conservation status was suggested according to the categories and criteria of the International Union for Conservation of Nature Red List (IUCN, 2019). Maps were created using QGIS Desktop 3.22.0 (QGIS, 2021) and further edited in Adobe Photoshop. Botanical terminology followed Beentje (2016) and Stearn (2004).

Taxonomic treatment

Sobralia aryaelizabethiana Ocupa, ***sp. nov.*** (Fig. 1–2).

TYPE: PERU. Piura: Prov. Huancabamba, Distrito de Huarmaca, Cerro Porcuya, carretera hacia Tallacas, 2689 m, 15 November 2023, *L. Ocupa 322* (holotype: PRG!, isotype: PRG!).

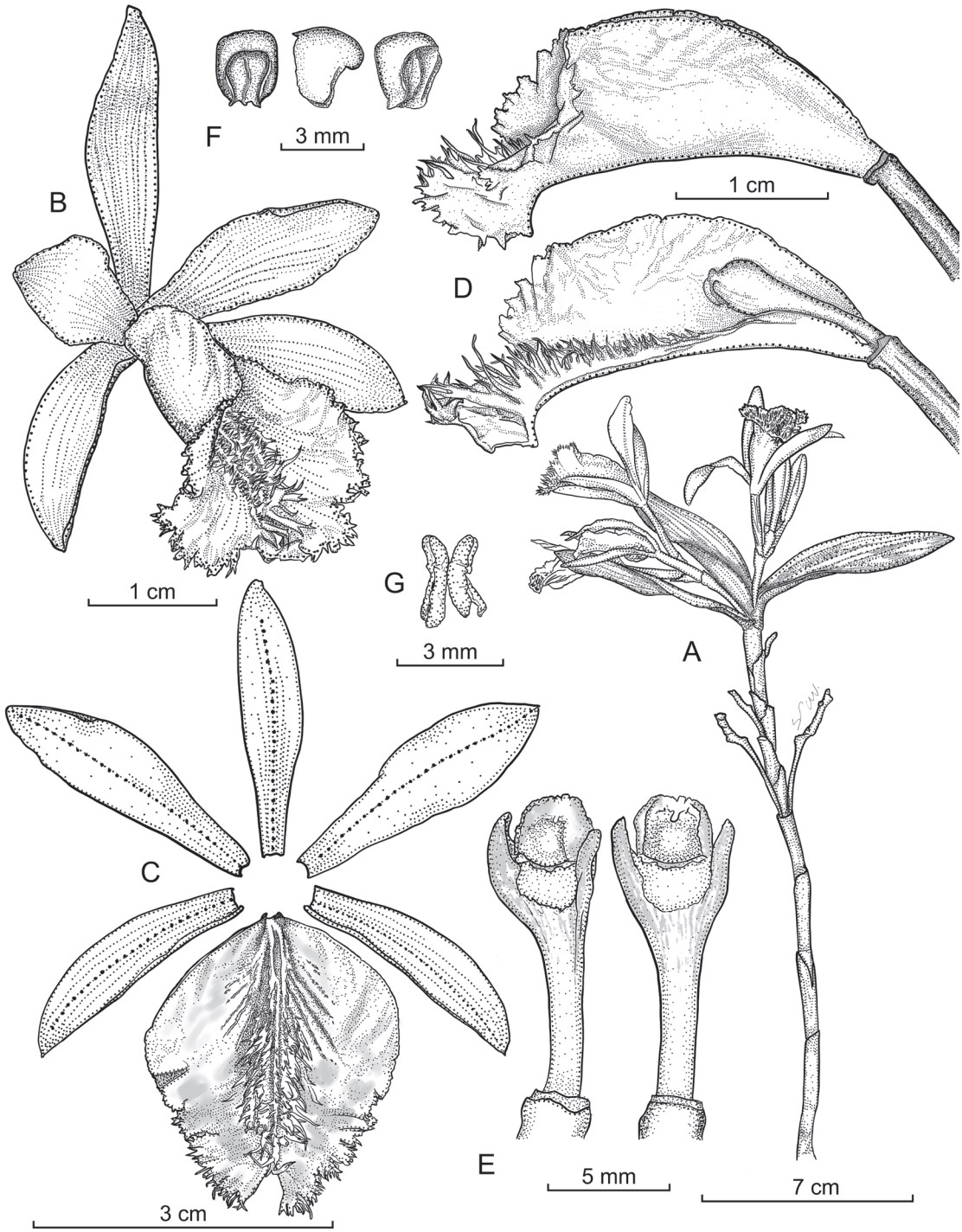

FIGURE 1. *Sobralia aryaelizabethiana*. **A**. Habit. **B**. Flower. **C**. Dissected perianth. **D**. Column, lip and ovary, lateral view (above), and with the lip longitudinally sectioned (below). **E**. Column (without anther) three-quarters and ventral views. **F**. Anther cap, ventral, lateral, and three-quarters views. **G**. Pollinarium, ventral view. Drawing by S. Vieira-Uribe from the plant that served as type.

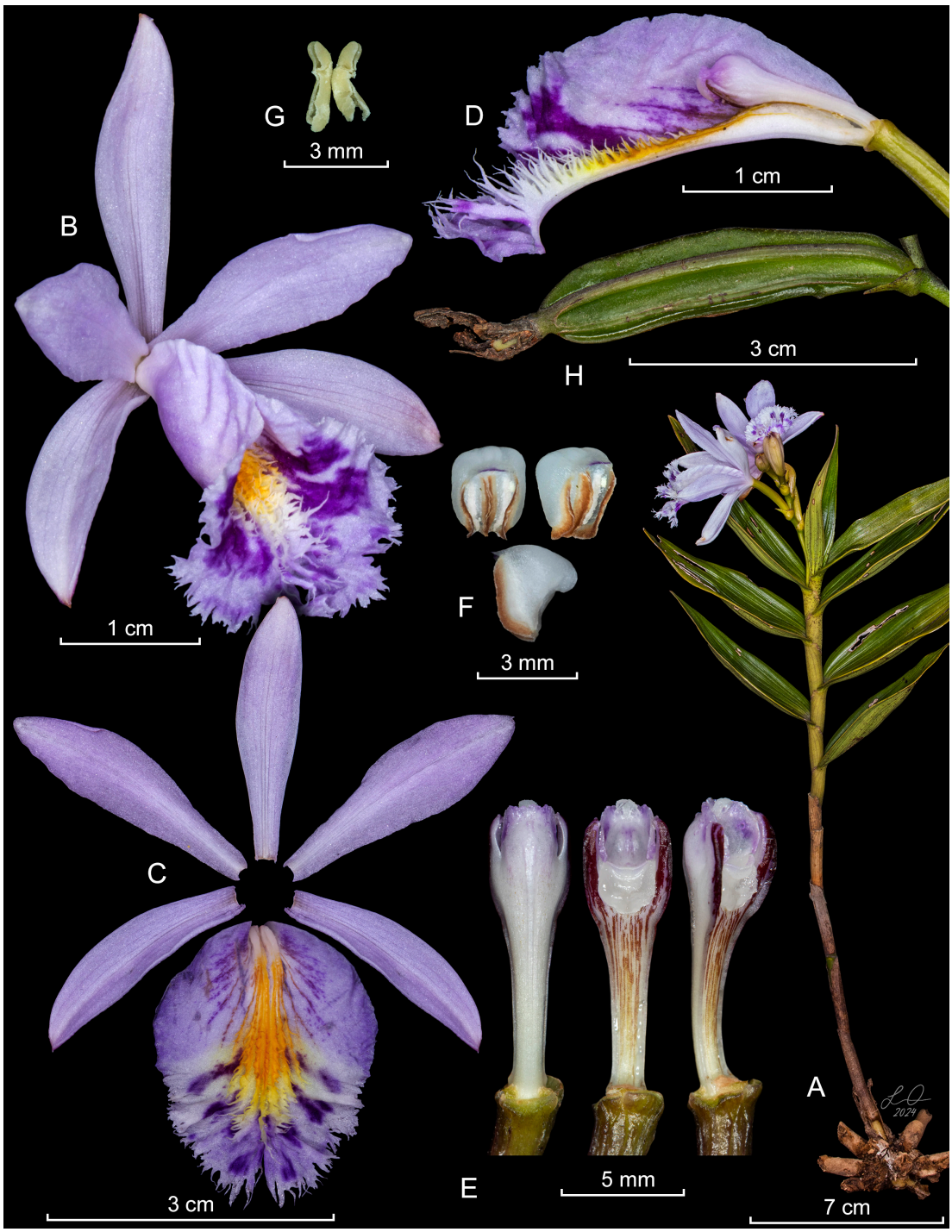

FIGURE 2. Composite plate of *Sobralia aryaelizabethiana*. **A**. Habit. **B**. Flower. **C**. Dissected perianth. **D**. Column, lip and ovary, lateral view (the lip longitudinally sectioned). **E**. Column (without anther), dorsal, ventral and, three-quarters views. **F**. Anther cap, ventral, three-quarters, and lateral views. **G**. Pollinarium, ventral view. **H**. Fruit. Prepared by L. Ocupa-Horna.

Diagnosis: *Sobralia aryaelizabethiana* is most similar to *S. rigidissima* Linden ex Rchb.f., but differs in the shorter leaves which are up to 8 cm long (*vs.* up to 15 cm long), widely ovate floral bracts with a triangular apex (*vs.* triangular-ovate and obtuse), the oblanceolate sepals, up to 29 mm long (*vs.* linear-oblong, up to 13 mm long), the narrowly obovate petals, up to 29 mm long (*vs*. obovate-oblanceolate, up to 13 mm long), and the unlobed, ovate lip, 29–30 mm long (*vs*. trilobed, cuneate-flabellate, 15 mm long).

Plant terrestrial, caespitose, up to 60 cm tall. *Roots* coarse, fleshy, white to pale brown, finely pubescent, 4–6 mm in diameter. *Stem* cane-like, erect, cylindric, rigid, 21–45 cm long, 3–6 mm in diameter, with leaves distributed in the upper third, covered by adpressed, coriaceous, pale green leaf sheaths, with folded margins, 28 mm long, with age they become chartaceous, brown and with black spots. *Leaves* sessile, alternate, strongly plicate, coriaceous, elliptic-lanceolate to lanceolate, acute, 30–80 × 16–36 mm. *Inflorescences* axillar, suberect, congested racemes, arising from the apical internodes, with 1–3 simultaneous inflorescences per stem, up to 9 cm long including the peduncle, with 3–7 flowers per inflorescence, 2–3 opening at the same time, peduncle somewhat flexuous, laterally compressed, *ca*. 30–40 mm long, rachis fractiflex, cylindric, 10–18 mm long. *Floral bracts* coriaceous, slightly oblique, widely ovate, triangular at the apex, dorsally low-keeled, 4–6 × 4–7 mm. *Ovary* pedicellate, straight to arched, cylindric, green or reddish brown colored, 17–23 mm long, 6-furrowed; ovary and pedicel shorter in apical flowers. *Flowers* white, light pink, lavender or purple-colored, with pale purple to violet or pale magenta lip spots, column white with pale brown spots along the ventral side, column wings basally colored from brown or dark purplish red, clinandrium purple to pale purple. *Sepals* concave, distinctly conduplicate at the base, subsimilars, oblanceolate, acute, abruptly apiculate-carinate, 25–29 × 6.0–7.5 mm; *dorsal sepal* slightly recurved towards the apex; *lateral sepals* spreading to recurved, basally connate 1.0 mm. *Petals* slightly recurved or arched forward, narrowly obovate, briefly sinuated, irregularly erose, obtuse, 29–30 × 8–10 mm. *Lip* unlobed, surrounding the column, ovate when expanded, 29–30 × 24–26 mm, deeply incised; basal margins entire to irregularly erose, somewhat undulate; apical margins reflexed, fimbriate-lacerate; the base of the lip with two, linear, high, parallel, white, *ca*. 5 mm long calli, and 7 slightly diverging, orange, fimbriate-laciniate keels, these becoming higher and more ornate distally, located from 1/3 of the base of the lip to the apex. *Column* claviform, winged, slightly arched at the base, ventrally flattened, 1-keeled dorsally, the apex with two falcate, upcurved wings, 11–12 mm long, 4 mm wide distally; rostellum semi-circular; anther and stigma ventral; *anther cap* cucullate, rounded, white, stained yellow at the apex, 2-celled, 3 × 2 mm. *Pollinia* 4, crescent-shaped, flattened, soft, mealy, pale yellow, in two symmetrical pairs of different size, without defined caudicles, each hemipollinarium *ca*. 2.6 mm long. *Fruit* fusiform, trilocular, pale green, up to 4 cm long.

Eponymy: This species is named in honor of Arya Elizabeth, daughter of the first author.

Distribution and ecology: The known population of *S. aryaelizabethiana* is found exclusively along Cerro Porcuya, at elevations ranging from 2689 to 2740 meters. This region is situated near the Abra de Porcuya, a mountain pass in the Western Cordillera of the Andes, in the Piura department, northwestern Peru (Fig. 3). It is regarded as the lowest point of the Huancabamba Depression, which is at 2145 meters of elevation. The area is part of the Andean scrubland ecosystem, characterized by predominately sclerophyllous vegetation that includes herbaceous plants, shrub thickets, and small trees (MINAM, 2018). This ecosystem experiences dense fog, driven by air currents, and features moderate environmental humidity. Additionally, its ecological processes are distinctly seasonal, with a wet season marked by heavy rainfall.

Sobralia aryaelizabethiana grows in sympatry with other orchid species such as *Epidendrum rauhii* Hágsater, *Masdevallia bonplandii* Rchb.f., *M. civilis* Rchb.f. & Warsz., and *Oncidium cajamarcae* Schltr. Like some other terrestrial *Sobralia*, individuals of this new species can be found scattered on soils and slopes made up of sedimentary layers of clay, silt, sand, and boulder gravel. These areas are typically partially covered by herbaceous plants, subshrubs, and shrubs, and they are fully exposed to solar radiation and dense fog. Competition for light availabil-

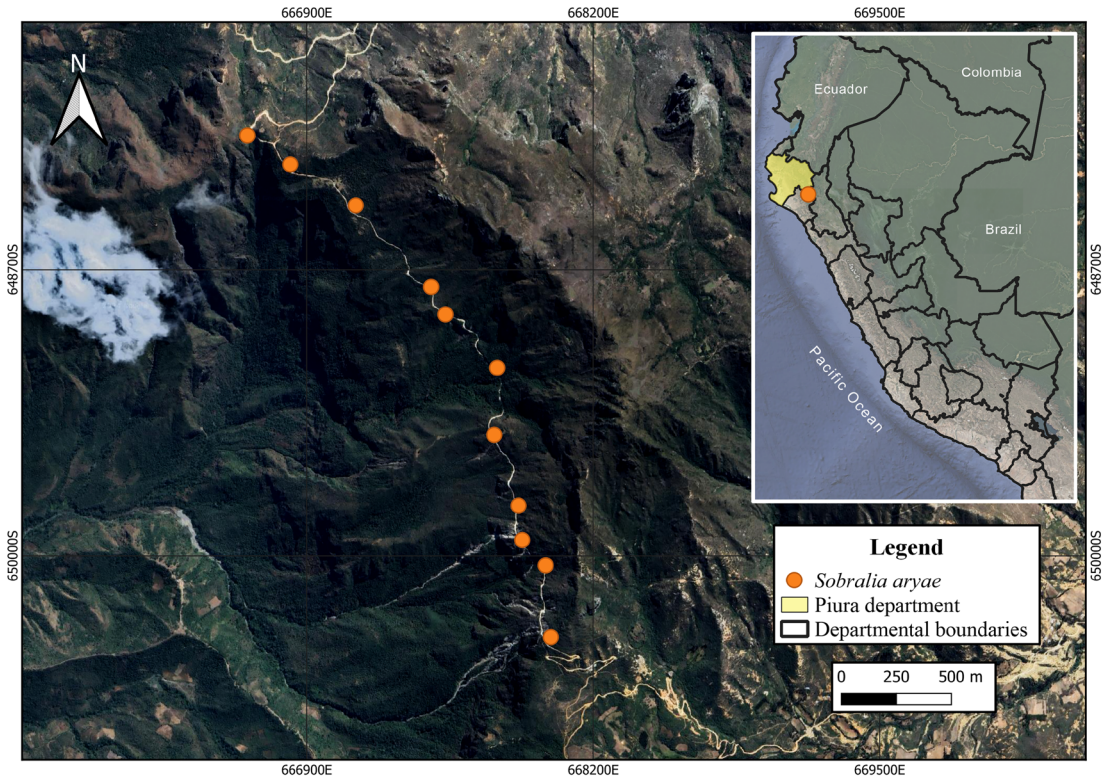

Figure 3. Location map of the population of *Sobralia aryaelizabethiana* in Piura Department, Peru. Prepared by L. Ocupa-Horna.

ity significantly influences the growth of *S. aryaelizabethiana* plants. In regions where the vegetation consists mainly of grasses and scattered subshrubs, these plants can reach heights of up to 45 cm high. On the other hand, *S. aryaelizabethiana* individuals that grow in denser shrub areas can also reach approximately 60 cm (Fig. 4B–C).

The longest-lived individuals of *S. aryaelizabethiana* can develop up to three bifurcate and functional inflorescences simultaneously, which can produce around 36 flowers per plant (Fig. 5). Additionally, some individuals of this new species exhibit variations in flower color and the size of the perianth segments, particularly in the petals and sepals. Some plants may produce flowers in white, light pink, lavender, or purple, with lip spots that range in color from pale purple to violet or pale magenta (Fig. 6). These variations in flower coloration are not always documented in other *Sobralia* species.

Phenology: The flowering of *S. aryaelizabethiana* occurs between November and December, during the end of the dry season. Individuals flower at least once a year.

Conservation status: *Sobralia aryaelizabethiana* is only known from its type locality, which is located on Cerro Porcuya and along the slopes of the road to Tayacas. Currently, the habitat of *S. aryaelizabethiana* faces potential threats due to the maintenance of the road that passes through this ecosystem and the frequent landslides caused by erosion and heavy rainfall. Local populations use this ecosystem as grazing land for goats and sheep, resulting in the persistent practice of burning pastures (Fig. 7). Until a more thorough assessment is conducted, the species should be classified as "Data Deficient" (DD) according to IUCN criteria (IUCN, 2019).

Paratype: PERU. Piura: Prov. Huancabamba, ruta Abra Porculla – Tallacas, 2640 m, 14 November 2017, *L. Ocupa 241* (HUT-65426!).

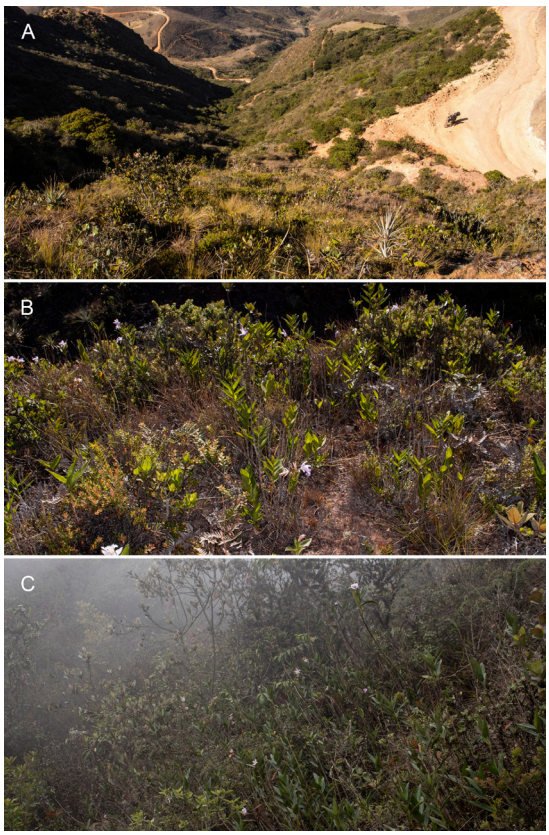

FIGURE 4. Habitat of *Sobralia aryaelizabethiana*. **A**. View of the road from Cerro Porcuya to Tallacas. **B**. Individuals growing in eroded soils, partially covered by grasses and subshrubs. **C**. Individuals growing among the shrubs. Photographs by L. Ocupa-Horna.

SPECIMENS EXAMINED OF *S. RIGIDISSIMA*: COLOMBIA. Norte de Santander: Ocaña, 1846–1852, *L. J. Schlim 36* (lectotype: W-0070331; isolectotypes: BR-06589516, BR-06589189, BR-06590499; F-0360849; K-000364488; P-00441742; photo of the type: AMES). ECUADOR. Zamora-Chinchipe: Road Loja – Zamora, km 24–25, steep rocky slopes, covered with scrub, alt. 1950–2100 m, 15 April 1973, *L. Holm-Nielsen, S. Jeppesen, B. Löjtnant & B. Ollgaard 3455* (AMES-02161502; AUU [photo seen]).

Discussion. Morphological characteristics such as axillary and racemose inflorescences (Fig. 8A), along with prominent internodes and floral bracts that are shorter than the pedicel and ovary (Fig. 8B), suggest that *S. aryaelizabethiana* belongs to one of the *Sobralia* clades related to *Elleanthus* C.Presl. and *Sertifera* Lindl. ex Rchb.f., rather than being part of *Sobralia s.s.* (Neubig, 2012; Neubig *et al*., 2011). These polyphyletic clades were previously classified under *Brasolia* (Rchb.f.) Baranow, Dudek & Szlach. (Baranow *et al*., 2017), which is currently not accepted (Govaerts *et al*., 2021; POWO, 2025). Consequently, the new species is described under *Sobralia* in a broad sense until new phylogenetic evidence clarifies the taxonomic framework of the genus.

FIGURE 5. Individuals of *S. aryaelizabethiana* with many pollinated flowers. Photograph by L. Ocupa-Horna.

Species in its clade exhibit racemose, axillary, and elongated inflorescences with prominent internodes and floral bracts that are shorter than the pedicel and ovary. Additionally, their stems persist for several years, with older inflorescences remaining attached. One species in this clade is *Sobralia ciliata* C.Schweinf. ex Foldats, which has a strong resemblance to *S. rigidissima* (Neubig, 2012), but is easily differentiated from *S. aryaelizabethiana* by the bright rose-purple flowers (*vs*. white, light pink, lavender or purple flowers with purplish to violet stains on the lip), 3-lobed lip, *ca*. 23 × 15 mm (*vs*. unlobed, ovate lip, 29–30 × 24–26 mm). Other species within these clades include *S. altissima* D.E.Benn. & Christenson, *S. boliviensis* Schltr., *S. caloglossa* Schltr., *S. dichotoma* Ruiz & Pav., *S. scopulorum* Rchb.f., and *S. weberbaueriana* Kraenzl. (Neubig, 2012; Neubig *et al*., 2011). A comparison between *S. aryaelizabethiana* and the Peruvian species in this clade is presented in Table 1.

Several features distinguish *S. aryaelizabethiana* from *S. rigidissima*. The leaves of *S. aryaelizabethiana* are elliptic-lanceolate to lanceolate and acute (*vs*. lanceolate to ovate-lanceolate, acuminate), and the flowers are white, light pink, lavender or purple with purplish

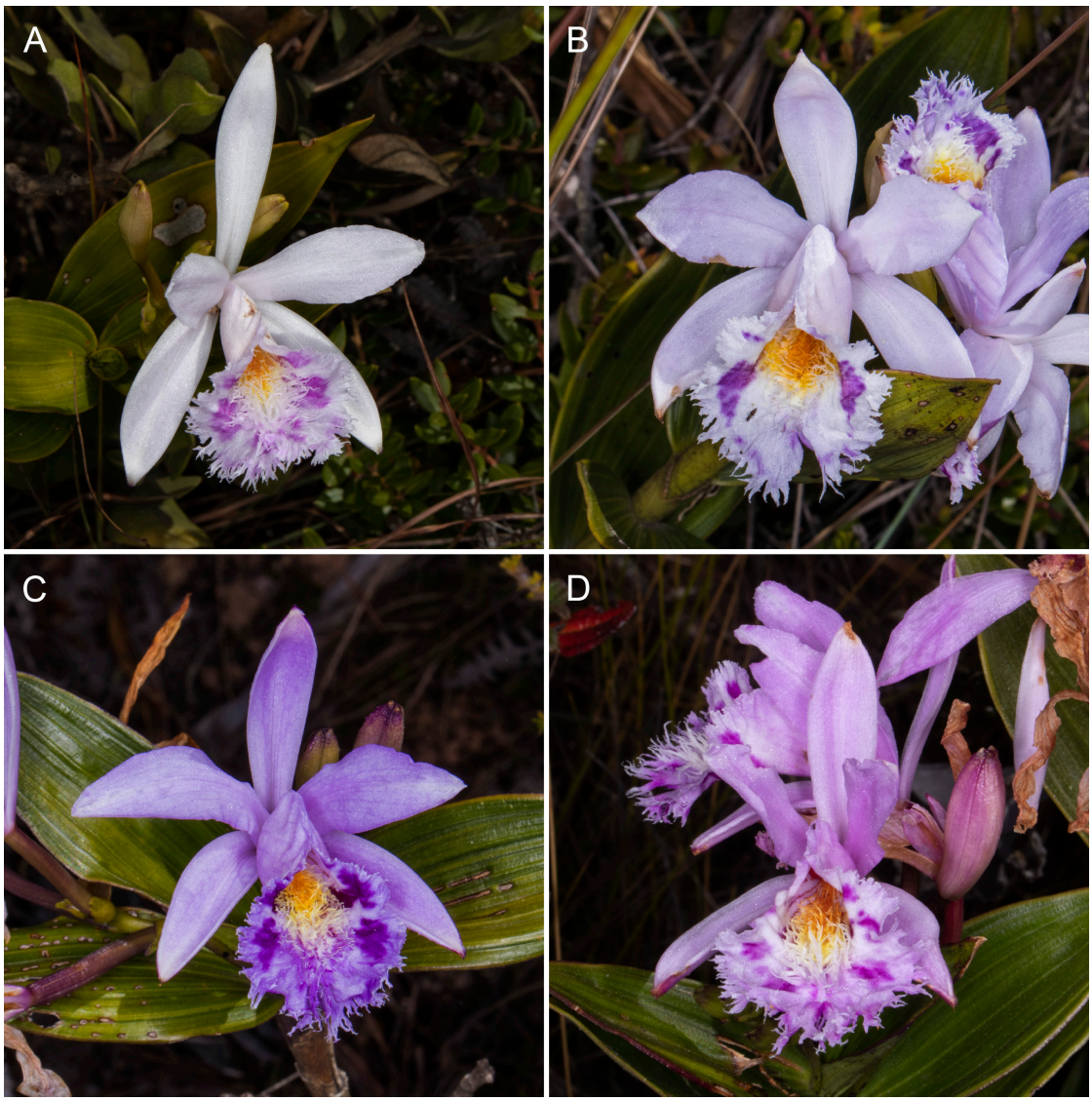

FIGURE 6. Variation in the coloration of flowers of *Sobralia aryaelizabethiana*. Photographs by L. Ocupa-Horna.

to violet stains on the lip (compared to rose-colored with a white lip as noted by Reichenbach (1854) and Garay (1978). Additionally, the lateral sepals are acute and abruptly apiculate-carinate (instead of obtuse), and the lip is unlobed with a fimbriate-laciniate apical margin (*vs*. three-lobed and lacerate-denticulate).

The diversity of *Sobralia* in Peru is not yet fully understood. Therefore, further efforts, including additional explorations and a comprehensive taxonomic revision, are necessary to better identify and understand the richness of this genus in the country.

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FIGURE 7. Habitat type *S. aryaelizabethiana* affected by the traditional practice of pasture burning. Photograph by L. Ocupa-Horna.

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AUTHOR CONTRIBUTION. LO-H: Conceptualization, Methodology, Investigation, Writing - Original Draft, Writing - Review & Editing, Visualization. JV-D: Investigation, Writing - Review & Editing, Visualization. FUNDING. This study was carried out with funding from the authors. CONFLICT OF INTEREST. The authors declare that no competing interests exist.

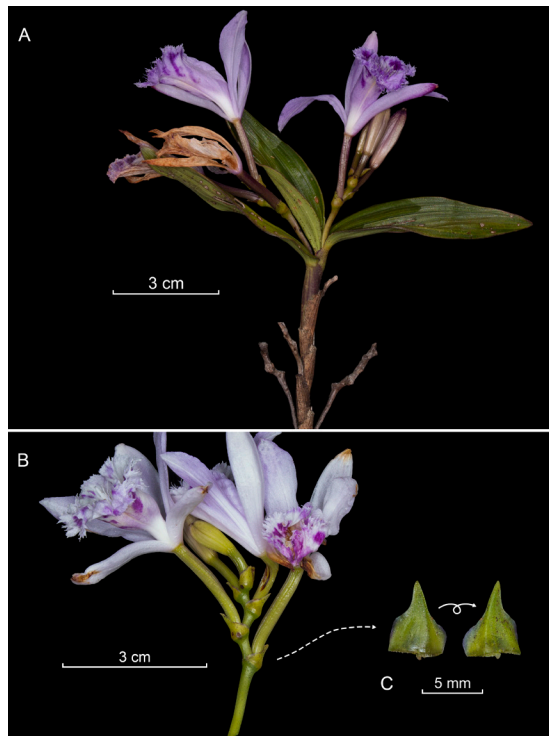

FIGURE 8. Inflorescence of *Sobralia aryaelizabethiana*. **A**. Apical portion with axillary inflorescences, including fresh inflorescences (above) and traces of old inflorescences (below). **B**. Detailed view of the rachis, bracts, pedicels, and ovaries. **C**. Close-up of the floral bracts. Photographs by L. Ocupa-Horna.

TABLE 1. Comparison of *S. aryaelizabethiana* with other species of *Sobralia* sect. *Sobralia*.

	S. aryaelizabethiana	***S. caloglossa***	***S. ciliata***	***S. dichotoma***	***S. scopulorum***	***S. weberbauriana***
Plant size	Up to 60 cm tall	Up to about 6 m tall	More than 2 meters tall	Up to about 6 m tall	Up to about 1.2 m tall	Up to 5 m tall
Flower color	White, light pink, lavender or purple with purplish to violet stains on the lip	Brown, rarely violet-purplish, lip of lavender	Bright rose-purple	Ruby red to red-vinaceous, or magenta or purple	Apparently purple (Schweinfurth, 1958)	Purple (Schweinfurth, 1958)
Lip	Unlobed, ovate, 29–30 × 24–26 mm	Pandurate with a bilobed apex, or obscurely tri-lobed a, *ca.* 40–50 × 32–34 cm	3-lobed, lateral lobes rounded, mid-lobe subor-bicular, *ca.* 23 × 15 mm	Ovate-subquad-rate or rarely broadly obovate, or obscurely tri-lobed, *ca.* 4.7 × 4	Unlobed, ob-ovate, *ca.* 28–30 ×18 mm	Unlobed, very broadly ovate, *ca.* 35 × 40 mm
Lip keels	7 fimbriate-laciniate keels	5 irregularly laciniate keels	7 denticulate keels, thick-ened and almost to the apex of the median lobe	5-7 laciniate keels that elon-gate and den-sify towards the apex, forming a pubescent mass	5 keels dentate or serrulate to-wards the apex	5 denticulated keels

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SYNOPSIS OF *EPIDENDRUM* (LAELIINAE) FROM THE STATE OF MATO GROSSO, BRAZIL: TAXONOMY AND DISTRIBUTION

Micheli Lara[1,3] & Edlley M. Pessoa[2]

[1]Laboratório de Estudos Integrados de Plantas, Departamento de Botânica e Ecologia, Universidade Federal de Mato Grosso, Cuiabá, Mato Grosso, Brazil.

[2]Centro de Ciências Naturais e Humanas, Universidade Federal do ABC, Santo André, São Paulo, Brazil.

[3]Author for correspondence: michelilara2013@outlook.com

Abstract. The state of Mato Grosso, in Central-West Brazil, is located within the Amazon Forest, Cerrado and Pantanal phytogeographical domains, harboring diverse habitats for species of *Epidendrum*. The goal of the present study was to develop a taxonomic treatment, including diagnoses, identification key, photographs and distribution maps for the species of *Epidendrum* in the state. We confirmed the presence of 20 species. Additionally, after analyzing the type specimen of *E. callobotrys*, a species described from Mato Grosso and known from only one specimen, we concluded it does not differ from *E. coronatum*; thus, we propose its synonymization. Most species are distributed in the Amazon (17 spp.) and Cerrado (13 spp.) domains. On the other hand, the Pantanal only had five species, recorded for the first time in the present study, which is among the first studies on Orchidaceae in this domain.

Resumo. O estado de Mato Grosso, no Centro-Oeste do Brasil, está localizado entre os domínios fitogeográficos da Amazônia, Cerrado e Pantanal, e possui uma grande diversidade de habitats para espécies de *Epidendrum*. O objetivo deste estudo foi desenvolver um tratamento taxonômico incluindo diagnoses, chave de identificação, fotografias e mapas de distribuição para as espécies de *Epidendrum* que ocorrem no estado. Confirmamos a presença de 20 espécies. Adicionalmente, depois de analisar o espécime tipo de *E. callobotrys*, uma espécie descrita para Mato Grosso e conhecida apenas por uma amostra, concluímos que esta não difere de *E. coronatum*, portanto propomos sua sinonimização. A maioria das espécies são distribuídas nos domínios da Amazônia (17 spp.) e Cerrado (13 spp.). Por outro lado, no Pantanal ocorrem somente cinco espécies, todas registradas pela primeira vez para o domínio neste estudo, que é o primeiro para a família para o Pantanal.

Keywords / Palavras Chave: Amazon, Amazônia, Cerrado, Epidendroideae, Pantanal

Introduction. *Epidendrum* L. is one of the largest genera of Orchidaceae, comprasing 1400–2400 species (Christenhusz *et al.*, 2017; Hágsater & Soto-Arenas, 2005). It is included in subfamily Epidendroideae Lindl, tribe Epidendreae Kunth, and subtribe Laeliinae Benth., differing from the remaining genera in these groups by the presence of a clawed labellum usually adnate to the column, presence of a cuniculus (internal nectary in the ovary) and by the dorsal apical anther (Hágsater & Soto-Arenas, 2005). In Brazil, the genus is represented by 133 species, 65 of which are endemic. The species are distributed in all regions, but they are more common in humid forests in the north and east of the country (Pessoa, 2020). Species show wide vegetative and floral morphological variation (Hagsáter & Soto-Arenas, 2005), leading to the description of several names currently treated as synonyms. In Brazil, for example, 413 synonyms are listed besides the accepted names (BFG, 2015, 2018, 2022). Recent studies have investigated the validity of similar species (Pessoa *et al*., 2021), even showing a hybrid origin for some of them (Pessoa *et al.*, 2022a), but there are still many species to be further investigated. For example, few Brazilian species have been sampled in phylogenetic studies of the genus (Granados-Mendoza *et al.* 2020; Hagsáter & Soto-Arenas, 2005; Klein *et al.*, 2019; Pessoa *et al.*, 2012, 2021, 2022b; Pinheiro *et al.* 2009).

Taxonomic studies focusing on *Epidendrum* have been carried out in some regions of Brazil (Engels & Rocha, 2017; Gomes *et al.*, 2021; Pessoa *et al.*, 2024;

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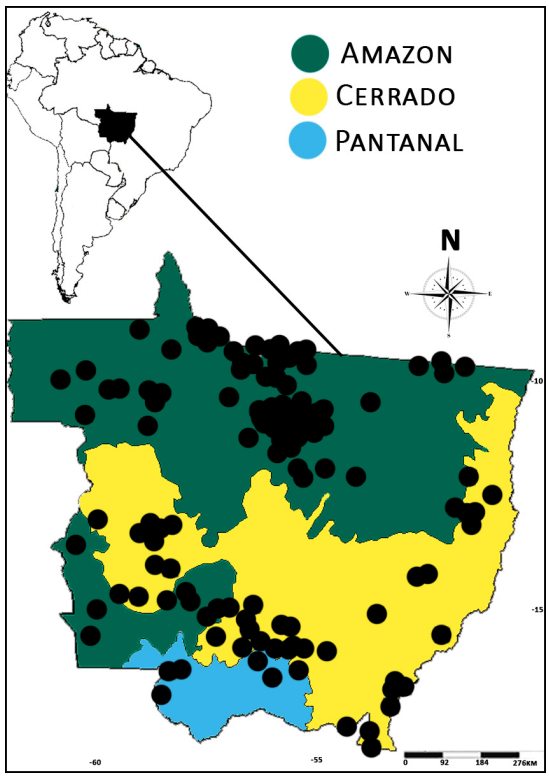

FIGURE 1. Geographic position of Mato Grosso state in South America and its main phytogeographical domains. All *Epidendrum* collections analyzed are plotted as black circles.

Santos & Silva, 2020; Stancik *et al.*, 2009), and some new species have been described (Barberena & Gonzaga, 2016; Cordeiro *et al.*, 2022; Fraga *et al.*, 2015; Krahl *et al.*, 2022; Pessoa & Pedrosa, 2022; Pessoa *et al.*, 2014, 2016). However, the Central-West region represents a significant gap in the knowledge of the genus, where the contributions in literature consist mostly of general floristic studies at the family level (Batista & Bianchetti, 2003; Hall *et al.*, 2013; Koch & Silva, 2012). Exceptions are Engels & Rocha (2017), who show new records for the genus and Santos & Silva (2020), who provide a taxonomic treatment for species that occur in Parque Nacional da Chapada dos Veadeiros, in the state of Goiás.

Therefore, we present here a taxonomic study of the species of *Epidendrum* from the state of Mato Grosso, the third largest federative unit in Brazil in terms of territorial area (IBGE, 2022). The state has the potential to direct the development of public policies for conservation of the genus in the state level. In this context, we hereby show morphological diagnoses of the species, geographical distribution maps, phenology data, photographs and an identification key of the genus for the state.

Material and methods. The state of Mato Grosso comprehends a total area of 903,207.047 km² (almost as big as Venezuela), located in the Central-West region of Brazil (IBGE, 2022). The state contains distinct ecosystems within its large territory. The northern part of the state is in the Amazon phytogeographical domain, with an extension of 480,215 km² (53.6% of the state's area), the median part is covered by Cerrado, with 354,823 km² (39.6%), and the Pantanal is found to the south, with 60,885 km² (6.8%) (SEMA, 2010) (Fig. 1). The tropical monsoon and tropical savanna climates dominate, with high annual mean temperature, with rainy summers and dry winters. It contains abundant hydric resources, with several water bodies, springs, and aquifers (IBGE, 2022).

Images of specimens of *Epidendrum* from Mato Grosso were examined, from the following herbaria: ALCB, CEN, CESJ, CGMS, CNMT, ESA, HAMAB, HCF, HEPH, HERBAM, HPAN, HUCS, HUEFS, IAN, INPA, K, MBM, MO, NY, P, R, RB, SP, SPF, TANG, UB, UEC, UFG, UFMT, and UPCB. The morphological descriptions were based on specimens deposited at the herbarium UFMT. Flowers were rehydrated, and perianths were mounted in cardstock paper for measurement.

Geographical coordinates of the specimens were recorded for assembling distribution maps. Specimens without coordinates were georeferenced based on approximate locality, determined using an online geographical dictionary (GeoLoc-CRIA). Distribution maps were produced using the software SimpleMappr (Shorthouse, 2010). Information about global distribution of the species was obtained from POWO (2024), and their distribution in Brazil was verified in Pessoa (2020). Specimens were identified with help of specialized literature (Carnevali *et al.,* 2003; Pabst & Dungs, 1975; Pessoa, 2020; Stancik *et al.*, 2009), original species descriptions and comparisons with type specimens, when those were available online (JStor, 2024; Reflora, 2024; Tropicos, 2024). The identification key was produced based on the examined specimens.

Taxonomic treatment

Key for identification of species of *Epidendrum* from Mato Grosso (Based on Pessoa 2020)

1. Ovaries partially or completely covered by floral bracts 2
   2. Stems unbranched, rachis ≥ 2.5 cm long ..... ***E. rigidum***
   2a. Stems branched; rachis ≤ 2.0 cm long 3
      3. Ventral face of pedicellate ovary without distinct vesicle ..... ***E. sculptum***
      3a. Ventral face of pedicellate ovary with distinct vesicle ..... ***E. strobiliferum***
1a. Ovaries not covered by floral bracts 4
   4. Leaves cylindrical; inflorescences pubescent ..... ***E. stiliferum***
   4a. Leaves plane; inflorescence glabrous 5
      5. Stems swollen, forming pseudobulbs 6
         6. Terrestrial or rupicolous herbs; flowers pink; labellum 4-lobed ..... ***E. campestre***
         6a. Epiphytic herbs; flowers white; labellum 3-lobed ..... ***E. viviparum***
      5a. Stems not swollen, not forming pseudobulbs 7
         7. Labellum concave-cucullate ..... ***E. dendrobioides***
         7a. Labellum plane, or slightly concave or convex 8
            8. Inflorescences (peduncle + rachis) ≤ 2.0 cm long 9
               9. Median labellum lobe at least twice as long as the lateral lobes ..... ***E. carpophorum***
               9a. Median labellum lobe slightly longer than the lateral lobes 10
                  10. Leaves oblong; sepals green or yellow ..... ***E. pareciense***
                  10a. Leaves elliptical; sepals brown to pink ..... ***E. bahiense***
            8a. Inflorescences (peduncle + rachis) ≥ 3.5 cm long 11
               11. Peduncle at least four times longer than rachis 12
                  12. Inflorescence peduncle dorsoventrally compressed ..... ***E. anceps***
                  12a. Inflorescence peduncle cylindrical 13
                     13. Labellum margin entire ..... ***E. myrmecophorum***
                     13a. Labellum margin denticulate 14
                        14. Flowers orange to red, clearly 3-lobed ..... ***E. macrocarpum***
                        14a. Flowers pink, obscurely 3-lobed ..... ***E. flexuosum***
               11a. Peduncle up to twice as long as the rachis 15
                  15. Flowers with a distinct ventral vesicle in the pedicellate ovary 16
                     16. Labellum entire ..... ***E. strobilicaule***
                     16a. Labellum 3-lobed ..... ***E. smaragdinum***
                  15a. Flowers without a distinct ventral vesicle in the pedicellate ovary 17
                     17. Inflorescence compound 18
                        18. Labellum 3-lobed ..... ***E. amblostomoides***
                        18a. Labellum 4-lobed ..... ***E. densiflorum***
                     17a. Inflorescence simple 19
                        19. Petals linear oblong; labellum margin fringed ..... ***E. cristatum***
                        19a. Petals oblanceolate; labellum margin entire ..... ***E. coronatum***

1. *Epidendrum amblostomoides* Hoehne, Arq. Bot. Estado São Paulo 1: 18. 1938. (Fig. 2A)
   ≡ *Auliza amblostomoides* (Hoehne) Brieger, Orchideen 3 1/A(9): 547. 1977. *comb. inv.*
   ≡ *Amblostoma amblostomoides* (Hoehne) F.Barros, Bol. Mus. Bot. Munic. 53: 3. 1982.

Diagnosis: Epiphytic. Stems swollen forming narrow-ellipsoid pseudobulbs, unbranched. Leaves linear, plane. Inflorescence 4.5–13.5 cm long, compound, glabrous; peduncle 1.5–3.5 cm long, cylindrical; rachis 3.0–10.0 cm long. Flowers 8–20 per inflorescence, resupinate, white; pedicellate ovary without

distinct vesicle in the ventral face, exposed; elliptical sepals; linear petals; labellum 3-lobed, plane, margin erose; column white. Fruits not seen.

Distribution: Endemic to Brazil (states of Goiás, Maranhão, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Pará, Rondônia, Tocantins, and the Distrito Federal). In the study area it occurs in the municipalities of Chapada dos Guimarães, Cuiabá, Itaúba and Paranaíta (Fig. 3A).

Comments: Flowers between April and December. It is part of the Amblostomoides Group and the most similar species in Brazil is *E. subpurum* Rchb.f. The limits between these two taxa need further studies since the main difference relies on the lip morphology that is variable in shape even comparing flowers from the same individual. In the study area, it can be confused with *E. smaragdinum* due to the flower color (Fig. 1, 6), but *E. amblostomoides* differs vegetatively due to the presence of swollen stems forming pseudobulbs (*vs.* cylindrical), linear leaves (*vs*. lanceolate), labellum with erose margin (*vs.* labellum with entire margin) and pedicellate ovary without distinct vesicle in the ventral face (*vs.* with distinct vesicle in the ventral face).

Examined material: Chapada dos Guimarães, Trilha Histórica do Matão, 01.XII.2022, *E. Pessoa et al. 1365* (UFMT); Cuiabá, Serra de São Vicente, 05.VI.2006, *B.A. Petini 29* (UFMT 36340); Itaúba, resgate de flora da UHE Colíder, 14.V.2016, *M.E. Engels 4444* (MBM 417249, RB 01338943, TANG 6230); Paranaíta, Terra Firme, 19.IV.2012, *C.R.A. Soares et al. 2026057* (HERBAM 8143); Ibidem, 05.V.2012, *C.R.A. Soares et al. 2196296* (HERBAM 8310).

2. *Epidendrum anceps* Jacq., Select. Stirp. Amer. Hist.: 224. 1763. (Fig. 2B)
   ≡ *Amphiglottis anceps* (Jacq.) Britton, Sci. Surv. Porto Rico & Virgin Islands 5: 200. 1924.
   = *Amphiglottis lurida* Salisb., Trans. Hort. Soc. London 1: 294. 1812.
   = *Cattleya galeottiana* (A.Rich. & Galeotti) Beer, Prakt. Stud. Orchid.: 210. 1854.
   = *Epidendrum amphistomum* A. Rich., Hist. Fis. Cuba, Bot. 11: 240. 1850.
   = *Epidendrum cearense* Barb.Rodr., Gen. Sp. Orchid., 2: 141. 1881.
   = *Epidendrum ensatum* A.Rich. & Galeotti, Ann. Sci. Nat., Bot., III, 3: 22. 1845.
   = *Epidendrum fuscatum* Sm., Spic. Bot.: 21. 1792.
   = *Epidendrum galeottianum* A.Rich. & Galeotti, Ann. Sci. Nat., Bot., II, 3: 21. 1845.
   = *Epidendrum schenckianum* Kraenzl., Repert. Spec. Nov. Regni Veg. Beih. 7: 114. 1909.
   = *Epidendrum schreineri* Barb.Rodr., Gen. Sp. Orchid. 2: 142. 1881.
   = *Epidendrum viridipurpureum* Hook., Bot. Mag. 65: t. 3666. 1838.
   = *Tritelandra fuscata* (Sm.) Raf., Fl. Tellur. 2: 86. 1837.

Diagnosis: Epiphytic. Stems cylindrical, unbranched. Leaves elliptical, plane. Inflorescence 2.6–10.0 cm long, simple, glabrous; peduncle 1.6–6.0 cm long, dorsoventrally compressed; rachis 0.5–4.0 cm long. Flowers 3–11 per inflorescence, resupinate, orangish with a pinkish lip; pedicellate ovary without distinct vesicle in the ventral face, exposed; sepals oblanceolate; petals linear; labellum 4-lobed, plane to slightly concave, margin entire; column greenish orange or greenish pink. Fruits not seen.

Distribution: Dominican Republic, Haiti, Puerto Rico, and Brazil (states of Acre, Amazonas, Amapá, Bahia, Ceará, Espírito Santo, Goiás, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Pará, Paraná, Pernambuco, Rio Grande do Sul, Santa Catarina, São Paulo, Rio de Janeiro, Roraima, and the Distrito Federal). In the study area it occurs in the municipalities of Cáceres, Chapada dos Guimarães, Diamantino, Itaúba and Paranaíta (Fig. 3A).

Comments: Flowers between February and November. It is part of the Anceps Group. Many species names were proposed under this group, most of which are considered synonyms since represent color and slight morphological variation found in Brazilian populations of this species. A similar accepted species is *E. musciferum* Lindl. that is distinguished by the 3-lobed lip (*vs.* 4-lobed), this species also lacks the prominent callus between the terminal lobes (*vs*. callus present). The most similar species in Brazil is *E. forcipatoides* Hágsater, but *E. anceps* is easily distinguished by the corymbiform rachis (*vs.* lax racemiform rachis) and

orangish sepals and petals (*vs*. greenish). In the study area it can be mistaken with *E. flexuosum* due to the flowers grouped in the apex of the inflorescences, and rachis longer than the peduncle, but it differs by the 4-lobed labellum with entire margin (*vs.* obscurely 3-lobed and denticulate) and linear petals (*vs.* elliptical-oblanceolate petals).

Examined material: Cáceres, 01.IX.1908, *F.C. Hoehne 445* (R 2812); Ibidem, 01.VII.1909, *F.C. Hoehne 2218* (R 2813); Chapada dos Guimarães, 14.VIII.1998*, A.M. Amaral 38* (UFMT 18395); Ibidem, base aérea do Sindacta, 21.X.1995, G. *Hatschbach 63700* (RB 00419460); Ibidem, Complexo Cachoeirinha, 11.VII.2006, *B.A. Petini 39* (UFMT 36673); Diamantino, 23.XI.2015, *C.A Silva 592* (TANG 4183); Itaúba, resgate de FLORA da UHE Colíder, 09.X.2014, *M.E. Engels 1332663 Copel1* (HERBAM 15503); Ibidem, 21.IX.2014, *M.E. Engels 2876* (MBM 403778); Ibidem, 05.II.2017, *M.E. Engels 4938* (MBM 417226); Paranaíta, Terra Firme, 20.IX.2011, *C.R.A. Soares et al. 124023* (HERBAM 6741); Ibidem, 21.V.2012, *C.R.A. Soares et al. 2296400* (HERBAM 8414); Ibidem, UHE São Manoel Reservatório, 06.VI.2017, *L.P. Zanzini 389* (HERBAM 17502).

3. *Epidendrum bahiense* Rchb.f., Hamburger Garten-Blumenzeitung 15: 53. 1859. (Fig. 2C)
   = *Epidendrum belmontense* V.P.Castro & Marçal, Icon. Orchid. Brasil. 3: t. 253. 2012.
   = *Epidendrum krukoffii* Hágsater, J.M.P.Cordeiro & Krahl, Icon. Orchid. 18(2): t. 1877. 2021.
   = *Epidendrum minus* (Cogn.) Hágsater, Monogr. Syst. Bot. Missouri Bot. Gard. 75: 956. 1999.
   = *Epidendrum nocturnum* var. *minor* Schltr., Repert. Spec. Nov. Regni Veg. 27: 69. 1924.
   = *Epidendrum nocturnum* var. *minus* Cogn., Bull. Soc. Roy. Bot. Belgique 43: 323. 1906.

Diagnosis: Epiphytic. Stems cylindrical, unbranched. Leaves elliptical, plane. Inflorescence 0.6–1.0 cm long, simple, glabrous; peduncle 0.1–0.5 cm long, cylindrical; rachis 0.5–0.7 cm long. Flowers 1–2 per inflorescence, resupinate, brown to pinkish-brown; pedicellate ovary without distinct vesicle in the ventral face, exposed; sepals elliptical; petals elliptical; labellum 3-lobed, plane, margin entire; column green. Fruits not seen.

Distribution: Bahamas, Belize, Bolivia, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, French Guiana, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Peru, Puerto Rico, Suriname, Trinidad and Tobago, United States (Florida), Venezuela, and Brazil (states of Amazonas, Amapá, Bahia, Espírito Santo, Goiás, Mato Grosso, Pará, Pernambuco, Rio Grande do Norte, Rio de Janeiro and Rondônia). In the study area it occurs in the municipalities of Novo Mundo, Paranaíta, Sapezal, Santa Cruz do Xingu, Tabaporã and Vila Bela da Santíssima Trindade (Fig. 3B).

Comments: Flowers between January and August. It is part of the Nocturnum Group, and is similar to the species with smaller flowers, such as *E. micronocturnum* Carnevali & G.A.Romero and E. *longicolle* Lindl. It is easily distinguished by the brown to pinkish-brown sepals and petals (*vs.* green). In the study area it can be confused with *E. pareciense* and *E. carpophorum* due to the deeply 3-lobed labellum (Fig. 1, 6), but it is easily distinguished by the presence of greenish-brown or pinkish-brown flowers (*vs.* yellow, beige or greenish).

Examined material: Novo Mundo*,* Parque Estadual do Cristalino, 09.II.2008, *G.S Henicka et al. 179* (HERBAM 1030, SPF 207005); Ibidem, 27.I.2008, *D.C Zappi et al. 860* (HERBAM 2053, SPF 207009); Ibidem, 29.I.2008, *D.C. Zappi et al. 951* (SPF 207011, HERBAM 2135); Paranaíta, Terra Firme, 17.II.2012, C.R.A. Soares et al 1195305 (HERBAM 7703); Sapezal, Aldeia Utiariti, 26.III.1997, *R. Godinho 280* (UFMT 15396); Ibidem, Salto do Utiariti, 26.VIII.1995, *R. Godinho & M. Macedo 68* (UFMT 18308); Santa Cruz do Xingu, Parque Estadual do Xingu, 08.III.2011, *C.R.A. Soares et al. 3191* (RB 00622094); Tabaporã, Fazenda Crestani, 22.V.2010, *J. Dambroz 14* (CNMT 201); Vila Bela da Santíssima Trindade, Subindo o rio Alegre, 25.III.2014, *M.F Simon et al. 2421* (UB 218416), Ibidem, 25.III.2014, *M.F Simon et al. 2421* (UFMT 41939); Ibidem, 25.III.2014, *M.F Simon 2421* (CEN 87433, UB 218416, UFMT 41939).

4. *Epidendrum campestre* Lindl., Edwards's Bot. Reg. 30: Misc. 17. 1844. (Fig. 2D)
   ≡ *Auliza campestris* (Lindl.) Brieger, Orchideen (ed. 3) 1/A(9): 547. 1977. *comb. inv.*

= *Epidendrum blandum* Kraenzl., Kongl. Svenska Vetensk.-Acad. Handl., n.s. 46(10): 58. 1911.
= *Pseudolaelia lyman-smithii* R.J.V. Alves., Folia Geobot. Phytotaxa. 27: 191. 1992.

Diagnosis: Terrestrial or rupicolous. Stems swollen forming ovoid pseudobulbs, unbranched. Leaves elliptical, plane. Inflorescence 10.6–36.5 cm long, simple, glabrous; peduncle 7–20 cm long, cylindrical; rachis 3.6–16.5 cm long. Flowers 9–27 per inflorescence, resupinate, lilac; pedicellate ovary without distinct vesicle in the ventral face, exposed; sepals oblanceolate; petals oblanceolate; labellum 4-lobed, slightly concave, margin entire; column lilac. Fruits not seen.

Distribution: Endemic to Brazil (states of Espírito Santo, Goiás, Mato Grosso, Mato Grosso do Sul, Minas Gerais and São Paulo). In the study area, it occurs in the municipalities of Araguainha, Campo Verde and Chapada dos Guimarães (Fig. 3B).

Comments: Flowers between July and November. It is a distinctive species that is not similar to any other. It is superficially similar to pink flowered species of tge Oerstedella Group, but it is distinguished by its pseudobulbs (vs. terete stems). In the study area, it can be confused with *E. flexuosum* due to the pink flowers (Fig. 1), but differs by being terrestrial and rupicolous (*vs.* epiphytes), margin of the labellum entire (*vs.* denticulate) and swollen stems forming pseudobulbs (*vs.* cylindrical).

Examined material: Araguainha, Fazenda Ribeirão das pedras, 11.VIII.2012, *C.F Hall et al. 774* (SP 473759); Campo Verde, 08.XI.1997, *G. Hatschbach 66638* (ESA 098958); Ibidem, Rio Casca, 11.VIII.1997, *G. Hatschbach et al. 66638* (ALCB 68921, CGMS 63405, HUCS 25486, HUEFS 117329, SP 382522); Chapada dos Guimarães, pr. Bocca de Serra, 15.VII.1902, *G.O.A. Malme 2266* (S08-3346); Parque Nacional, São Jerônimo, 14.VIII.1998, *A.M. Amaral 730* (UFMT 18407); Ibidem, 04.X.2006, *O.S. Nasser 396* (UFMT 36297); Ibidem, 04.X.2005, *O.S. Nasser 394* (UFMT 36296); Ibidem, 04.X.2005, *O.S. Nasser 395* (UFMT 36295).

5. *Epidendrum carpophorum* Barb. Rodr., Gen. Sp. Orchid. 2: 148. 1.882. (Fig. 2E)
= *Epidendrum ancipitinocturnum* Hágsater & J.M.P.Cordeiro., Icon. Orchid. 18(1): t. 1803. 2020.
= *Epidendrum tridens* var. *briegeri* I.Bock, Orchidee (Hamburg) 33: 157. 1982.
= *Epidendrum prancei* Hágsater & L.Sánchez., Icon. Orchid. 15(2): t. 1594. 2016.

Diagnosis: Epiphytic. Stems cylindrical, unbranched. Leaves elliptical, plane. Inflorescence 1.0–2.0 cm long, simple, glabrous; peduncle 0.8–1.0 cm long, cylindrical; rachis 0.2–1.2 cm long. Flowers 1–2 per inflorescence, resupinate, yellowish, beige or greenish; pedicellate ovary without distinct vesicle in the ventral face, exposed; sepals elliptical; petals linear-elliptical; labellum 3-lobed, plane, margin entire; column white. Fruits not seen.

Distribution: Bolivia, Colombia, French Guiana, Guyana, Suriname, Trinidad and Tobago, Venezuela and Brazil (states of Alagoas, Amazonas, Amapá, Bahia, Ceará, Espírito Santo, Maranhão, Mato Grosso, Minas Gerais, Pará, Paraíba, Paraná, Pernambuco, Rio de Janeiro, Rondônia, Roraima, Santa Catarina, São Paulo and Sergipe). In the study area it occurs in the municipalities of Alta Floresta, Apiacás, Aripuanã, Chapada dos Guimarães, Cláudia, Colíder, Guarantã do Norte, Itaúba, Itiquira, Juruena, Nova Canaã do Norte, Novo Mundo, Paranaíta, Ribeirão Cascalheira, Tabaporã, Tangará da Serra, Santa Cruz do Xingu, Sapezal and Sinop (Fig. 3C).

Comments: Flowers between February and December. It is part of the Nocturnum Group, but the limits among taxa in this group need further studies. Cytogenetic data provided evidence of autopolyploid speciation (Cordeiro et al. 2022), but the delimitation of most taxa is still poor. The most similar species in Brazil is *E. purpureocaulis* Essers & Sabin, but it can be distinguished by the acute lateral lobes of the lip (*vs.* acuminate). In the study area, it can be confused with *E. pareciense* due to the deeply 3-lobed labellum (Fig. 1, 6), but differs due to the elliptical leaves (*vs.* oblong), petals linear-elliptical (*vs.* elliptical) and median lobe of the labellum twice or more times longer than the lateral lobes (*vs.* slightly longer).

Examined material: Alta Floresta, PCH Cabeça-de-boi, área B1, margem esquerda, Floresta ombrófila, 26.V.2014, *C.R.A. Soares-Lopes et al.* (HERBAM 9687);

Apiacás, Margem esquerda do Rio Juruena, próximo a cachoeira de S. João da Barra, 07.VI.1977, *N. A. Rosa, 2078* (RB00250623); Aripuanã, Rio Juruena, Cachoeira de São João da Barra, 07.VI.1977, *N.A. Rosa 2078* (INPA 79091); Ibidem, Dardanelos, rio Aripuanã e salto de Dardanelos, 21.V.1973, *N. Saddi 839* (UFMT 41654); Ibidem, 10.VI.1974, *B.S. Pena 477* (IAN 141726); Chapada dos Guimarães, Trilha da gruta Aroe-jari e Lagoa Azul, Campo cerrado, 19.II.1997, *A.G Nave et al. 1089* (UEC 97604, RB01228135, ESA 034775, UFMT 32544); Ibidem, Área urbana, 10.VIII.2006, *A.M. Amaral 8* (UFMT 18408); Cuiabá, 20.II.1991, *I.V. Lima 17* (HEPH 7305); Ibidem, 23.I.1989, *A.E.H. Salles 1504A* (HEPH 6877); Cláudia, Supressão da vegetação do futuro reservatório da UHE Sinop, 13.III.2018, *D.C. Dias 371* (CNMT 7214); Ibidem, 01.III.2018, *D.C. Dias 368* (CNMT 7212); Colíder, Resgate da Flora da UHE Colíder, 13.X.2014, *L. Sardelli et al. 696* (MBM 403861); Ibidem, 31.III.2017, *M.E. Engels et al. 5095* (MBM 417242); Ibidem, 10.X.2014, *L.F. Sardelli et al. 693* (MBM 403853); Guarantã do Norte, Margem direita do rio Braço Sul**,** 27.II.1992, *M. Macêdo 3063* (INPA 172477); Itaúba, Floresta do Planalto dos Parecís, 21.I.2015, *M.E. Engels 2849* (RB01381640); Ibidem, Resgate da Flora da UHE Colíder, 26.VIII.2014, *M.E. Engels 2565* (MBM 403777); Ibidem, 26.II.2015, *M.E. Engels 6662831BCopel6* (HERBAM 12913); Ibidem, 29.V.2017, *M.E. Engels et al. 5611* (MBM 417230); Ibidem, 08.IV.2016, *M.E. Engels & B.K. Canestraro 4332* (TANG 6168); Ibidem, 09.V.2017, *M.E. Engels et al. 5286* (MBM 417236); Ibidem, 26.VIII.2014 M.E. *Engels 352565Copel3* (HERBAM 12914); Ibidem, 13.VII.2008, *R. Dias Melo 509* (RB00570822); Ibidem, 03.V.2015, *M.E. Engels 3852* (RB01166636, MBM 417225); Ibidem, 08.IV.2016, M.E. Engels 4332 (RB01340581); Ibidem, 06.II.2015, *L.H. Berticelli 7242* (HERBAM 21992); Ibidem, 03.IV.2015, *A.Z. Bronholi et al.* (MBM 404590); Ibidem, 16.V.2017, *M.E. Engels et al. 5325* (MBM 417237); Ibidem, 05.IV.2017, *A.S. Bezerra et al.* (MBM 417240); Ibidem, 08.IV.2016, *M.E. Engels & B.K. Canestraro 4332* (MBM 417247); Ibidem, 26.VIII.2014, *M.E. Engels 2565* (CNMT 1914); Ibidem, 23.V.2017, *M.E. Engels et al* (RB01381462); Ibidem, 26.II.2015, *M.E. Engels 2831* (MBM 403735, MBM403735, TANG 5014, RB01175543, TANG 5014, CNMT 1479, HCF000024962, HCF 24470, CNMT 9081); Itiquira, Rio Corrente, 01.II.1974, *G. Hatschbach, 33789* (MBM 30881); Juruena, 01.V.1909, *F.C. Hoehne 1902* (R 2805); Nova Canaã do Norte, Resgate da Flora da UHE Colíder, Estrada de acesso a UHE Colíder, 12.IV.2016, *M.E. Engels & B.K. Canestraro 4305* (MBM 417246); Novo Mundo, Parque Estadual Cristalino, 07.II.2008, *D.C. Zappi et al. 1068* (HERBAM 2232); Ibidem, 18.III.2007, *D. Sasaki et al. 1500* (HERBAM 1383, INPA 222933); Ibidem, 02.II.2008, *D. Sasaki et al. 2147* (SPF 207013, HERBAM 1810), Ibidem, 15.XII.2024, *E. Pessoa et al. 1391* (UFMT); Paranaíta, Afloramento Rochoso, 23.IV.2012, *C.R.A. Soares et al. 1246112* (HERBAM 8198); Ibidem, UHE São Manoel, 16.XI.2011, C.R.A. Soares et al. 2053 (HERBAM 4350); Ibidem, 14.VI.2012, *C.R.A. Soares et al. 26677* (HERBAM 8625); Ibidem, 16.XI.2011, *C.R.A. Soares et al. 2288* (HERBAM 4455); Ibidem, 23.IV.2012, *C.R.A. Soares et al. 1206108* (HERBAM 8194); Ribeirão Cascalheira, Base Camp, 16km ao N de Base Camp., 18.V.1968, *R.R. Santos R1447* (UB 102962, UB0018412); Tabaporã, Fazenda Crestani, 21.V.2011, *J. Dambroz 60* (CNMT 3127); Tangará da Serra, Epifitário Catasetum UNEMAT, 27.IV.2012, *C.A. Silva 502* (TANG 1769); Santa Cruz do Xingu, Parque Estadual do Xingu, 30.VII.2020, *D.R. Giacoppini et al. 1096* (CNMT 10254); Ibidem, 08.III.2011, *C.R.A. Soares 3191* (CESJ 61243, HERBAM 2800, HUEFS 190429); Sapezal, Cabeceira Rio Papagaio - Reserva Bieocatinga, 09.XII.1995, *R. Godinho 142* (INPA 216755, UFMT 18327); Ibidem, Aldeia Utiariti. Salto do Rio Papagaio, 19.VIII.1996, *R. Godinho & M. Macedo 234* (UFMT 15394); Ibidem, 20.III.1996, *R. Godinho 284* (UFMT 15377); Ibidem, 28.XII.1996, *R. Godinho 246* (UFMT 15384); Sinop, Supressão da vegetação do futuro reservatório da UHE Sinop, 17.X.2017, *D.C. Dias 294* (CNMT 7203).

6. *Epidendrum coronatum* Ruiz & Pav., Syst. Veg. Fl. Peruv. Chil.: 242. 1798. (Fig. 2F)
   = *Epidendrum amazonicum* Schltr., Beih. Bot. Centralbl. 42(2): 78. 1925.
   = *Epidendrum benignum* Ames., Schedul. Orchid. 2: 26. 1923.
   = *Epidendrum callobotrys* Kraenzl., Kongl. Svenska Vetensk. Acad. Handl. n.s. 46(10): 60. 1911. ***syn. nov.***
   = *Epidendrum compositum* Vell., Fl. Flumin. Icon. 9: t. 39. 1831.
   = *Epidendrum moyobambae* Kraenzl., Repert. Spec. Nov. Regni Veg. 1: 185. 1905.

= *Epidendrum subpatens* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 17: 40. 1922.
= *Epidendrum sulphuroleucum* Barb.Rodr., Gen. Sp. Orchid. 1: 56. 1877.

Diagnosis: Epiphytic. Stems cylindrical, unbranched. Leaves oblong-elliptical, plane. Inflorescence 10.5–32.0 cm long, simple, glabrous; peduncle 1.5–7.0 cm long, cylindrical; rachis 9.0–25.0 cm long. Flowers 4–35 per inflorescence, resupinate, beige; pedicellate ovary without distinct vesicle in the ventral face, exposed; sepals oblanceolate; petals oblanceolate; labellum 4-lobed, slightly convex, margin entire; column beige. Fruits not seen.

Distribution: Bolivia, Colombia, Costa Rica, Ecuador, Guatemala, Mexico, Panama, Peru, Suriname, Trinidad and Tobago, Venezuela, and Brazil (states of Acre, Amazonas, Bahia, Ceará, Espírito Santo, Goiás, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Pará, Paraná, Rio de Janeiro, and Roraima). In the study area, it occurs in the municipalities of Chapada dos Guimarães, Colíder, Itaúba, Nova Canaã do Norte and Tangará da Serra (Fig. 3B).

Comments: Flowers in August and October. It is part of the Coronatum Group, and the most similar species in Brazil is *E. ammophilum* Barb. Rodr. It is easily distinguished by the 4-lobed lip (*vs.* 3-lobed). In the study area it can be confused with *E. cristatum* due to the vegetative morphology, but differs due to the beige flowers (*vs.* green or yellow with brown spots), oblanceolate petals (*vs.* linear-oblong) and by the labellum with entire margin (*vs.* fringed). *Epidendrum callobotrys* was described based in a specimen collected by Malme at Chapada dos Guimarães, but the referred specimen corresponds to the species that we treat here as *E. coronatum*. Thus, we hereby propose synonymizing it.

Examined material: Chapada dos Guimarães, Santa Anna da Chapada, s.d., *G.O.A. Malme s.n.* (S90/143); Colíder, resgate de FLORA da UHE Colíder, 20.X.2014, *M.E Engels 982628Copel9* (HERBAM 12908); Itaúba, resgate da Flora da UHE Colíder, 12.X.2016, *M.E. Engels 4845* (MBM 417215); Nova Canaã do Norte, resgate de FLORA da UHE Colíder, 08.X.2014, *M.E. Engels 2945* (MBM 417216, R B01341375, TANG 5654); Tangara da Serra, 16.VIII.2016, *C.A Silva 575* (TANG 3094).

7. *Epidendrum cristatum* Ruiz & Pav., Syst. Veg. Fl. Peruv. Chil.: 243. 1798. (Fig. 2G)
= *Epidendrum alexandri* Schltr., Anexos Mem. Inst. Butantan, Secc. Bot. 1: 60. 1922.
= *Epidendrum bathyschistum* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 6: 36. 1919.
= *Epidendrum calliferum* Lem., Jard. Fleur. 4(Misc.): 65. 1845.
= *Epidendrum hexadactylum* Barb.Rodr., Gen. Sp. Orchid. 1: 56. 1877.
= *Epidendrum longovarium* Barb.Rodr., Gen. Sp. Orchid. 1: 57. 1877.
= *Epidendrum raniferum* Lindl., Gen. Sp. Orchid. Pl.: 109. 1831.
= *Epidendrum validum* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 9: 95. 1921.

Diagnosis: Epiphytic, terrestrial or rupicolous. Stems cylindrical, unbranched. Leaves oblong-elliptical, plane. Inflorescence 23.5–27.5 cm long, simple, glabrous; peduncle 13–13.5 cm long, cylindrical; rachis 10.5–14 cm long. Flowers 17–30 per inflorescence, resupinate, green or yellow with brown spots; pedicellate ovary without distinct vesicle in the ventral face, exposed; sepals elliptical-lanceolate; petals linear-oblong; labellum 4-lobed, slightly convex, margin fringed. Fruits not seen.

Distribution: Belize, Bolivia, Colombia, Costa Rica, Ecuador, Guatemala, Guiana, Honduras, Mexico, Nicaragua, Panama, Peru, Suriname, Trinidad and Tobago, Venezuela, and Brazil (states of Amazonas, Bahia, Espírito Santo, Mato Grosso, Minas Gerais, Pará, Paraná, Rio de Janeiro, Santa Catarina, and *São Paulo).* In the study area, it occurs in the municipalities of Colíder and Itaúba (Fig. 3D).

Comments: Flowers between October and November. It is part of the Cristatum Group, and the most similar species in Brazil is *E. warrasii* Pabst. It is easily distinguished by the 4-lobed lip (*vs.* 3-lobed). In the study area, it can be confused with *E. coronatum* due to the vegetative morphology, but it differs by the green flowers or yellow with brown spots (*vs.* beige) and margin of the labellum fringed (*vs.* entire).

Examined material: Colíder, resgate de FLORA da UHE Colíder, 22.X.2019, *C.A. Silva 637* (TANG 6946); Itaúba, resgate de flora da UHE Colíder, 12.X.2016, *M.E. Engels 4841* (MBM 417217); Ibidem, 02.XI.2015, *M.E. Engels 3752* (MBM 403743).

8. *Epidendrum dendrobioides* Thunb. Pl. Bras. 2: 17. 1818. (Figure in Santos & Silva 2020)
   = *Epidendrum aquaticum* Lindl., Ann. Mag. Nat. Hist. 12: 39. 1843.
   = *Epidendrum carnosum* Lindl., J. Bot. (Hooker) 3: 87. 1841.
   = *Epidendrum carnosum* var. *nutans* Cogn., in Martius (ed.), Fl. Bras. 3(5): 158. 1898.
   = *Epidendrum durum* var. *parviflorum*, Fol. Orchid. 4: 90. 1853.
   = *Epidendrum wels-windischii* Pabst., Bradea 2(10): 50. 1975.

Diagnosis: Terrestrial or rupicolous. Stems cylindrical, unbranched. Leaves linear-elliptical to linear-oblong, plane. Inflorescence 5.8–13.6 cm long, simple or compound, glabrous; peduncle 0.3–1.0 cm long, cylindrical; rachis 4.5–11.6 cm long. Flowers 6–16 per inflorescence, non-resupinate, yellow; pedicellate ovary without distinct vesicle in the ventral face, exposed; sepals elliptical-ovate; petals linear-elliptical; labellum 3-lobed, concave-cucullate, 3-lobed, margin entire; column yellow. Fruits not seen.

Distribution: Endemic to Brazil (states of Bahia, Espírito Santo, Goiás, Mato Grosso do Sul, Mato Grosso, Minas Gerais, Rio de Janeiro, São Paulo, Tocantins, and the Distrito Federal). In the study area, it occurs in the municipalities of Araguainha, Campo Novo do Parecis and Cuiabá (Fig. 3D).

Comments: Flowers between December and January. It is part of the Aquaticum Group, but the delimitation of most taxa of this group is still poor. We follow a wider circumscription for this taxon that includes all extra-amazonian terrestrial-rupicolous populations of this group under *E. dendrobioides*. The most similar species in Brazil is *E. alsum* Ridl. ex Oliv., but it can be distinguished by the erect inflorescences (*vs.* pendulous). In the study area it can be distinguished from the remaining species by its concave-cucullate labellum and the ecological preference for waterlogged soils.

Examined material: Araguainha, 06.I.2011, *R.D. Sartin et al. 164* (UFG 47597); Campo Novo do Parecis, Aldeia Crauaré, 28.XII.1996, *R. Godinho 245* (CEN 30713, UFMT 15407); Cuiabá, 01.XI.1914, *J.G Kuhlmann* (R 35860).

9. *Epidendrum densiflorum* Hook., Bot. Mag. 66: pl. 3791. 1840. (Fig. 2H)
   ≡ *Epidendrum polyanthum* var. *densiflorum* (Hook.) Lindl., Fol. Orchid. 3: 60. 1853.
   = *Epidendrum andres-johnsonii* Hágsater & E.Santiago, Icon. Orchid. 14: t. 1408. 2013.
   = *Epidendrum brachythyrsus* Kraenzl., Kongl. Svenska Vetensk. Acad. Handl. 46(10): 59. 1911.
   = *Epidendrum dipus* Lindl., Edwards's Bot. Reg. 31: t. 4. 1845.
   = *Epidendrum floribundum* var. *lilacinum* Rchb.f., Linnaea 22: 840. 1849.
   = *Epidendrum nutans* var. *dipus* (Lindl.) Lindl., Fol. Orchid. 3: 56. 1853.
   = *Epidendrum rubrocinctum* Lindl., Edwards's Bot. Reg. 29(Misc.): 9. 1843.
   = *Epidendrum silvae* Hágsater & V.P.Castro, Icon. Orchid. 3: t. 382. 1999.

Diagnosis: Epiphytic or rupicolous. Stems cylindrical, unbranched. Leaves elliptical, plane. Inflorescence 10.5–23.0 cm long, compound, glabrous; peduncle 2.5–4.0 cm long, cylindrical; rachis 8.0–19.0 cm long. Flowers 10–81 per inflorescence, resupinate, green and white; pedicellate ovary without distinct vesicle in the ventral face, exposed; sepals oblanceolate; petals linear-oblanceolate; labellum 4-lobed, slightly convex, margin entire; column whitish green. Fruits not seen.

Distribution: Argentina, Paraguay and Brazil (states of Bahia, Espírito Santo, Goiás, Mato Grosso do Sul, Mato Grosso, Minas Gerais, Paraná, Rio de Janeiro, Rio Grande do Sul, Santa Catarina, São Paulo, Tocantins, and the Distrito Federal). In the study area, it occurs in the municipalities of Alto Araguaia, Araguainha, Barra do Garças, Cáceres, Campo Novo do Parecis, Chapada dos Guimarães, Ribeirão Cascalheira, Reserva do Cabaçal, Salto do Céu and Tangara da Serra (Fig. 3D).

Comments: Flowers between March and December. It is part of the Pseudepidendrum Group, and the most similar species in Brazil is *E. hassleri* Cogn., but it can be distinguished by the absence of an isthmus of the lip (*vs.* isthmus present). In the study area, it can be confused with *E. amblostomoides* due to the light colors of the flowers and compound inflorescences (Fig. 1), but it can be distinguished by the presence of cylindrical stems (*vs*. pseudobulbs), 4-lobed labellum (*vs.* 3-lobed) with entire margin (*vs.* erose).

Examined material: Alto Araguaia, Ribeirão Claro, 22.IX.1974, *G. Hatschbach & R. Kummrow 35065* (MBM 32086); Araguainha, Fazenda Ribeirão das pedras, 11.VIII.2012, *C.F Hall et al. 775* (SP 473757); Barra do Garças, Road Chavantina, 15.X.1964, *G.T Prance 59427* (K000878437, NY 418345, UB 87188, UB0018381); Cáceres, Assentamento Laranjeira I, 10.IV.2014, *M.A Carniello & T.M Santos 4960* (HPAN 3385); Campo Novo do Parecis, Aldeia Uauari, 28.XII.1996, *R. Godinho 245* (CEN 00030713); Chapada dos Guimarães, UHE Manso, 16.IX.1999, *M. Macedo et al. 7093* (UFMT 21827); Ribeirão Cascalheira, c. 2 km NE Base Camp, 22.X.1968, *R. Harley & Souza 10753* (P 00411545); Reserva do Cabaçal, Fazenda Três Rios, 07.III.2002, *U.M. Resende & V. Kinupp 1768* (CGMS 8972); Salto do Céu, Arredores da cidade, 12.XII.1997, *A.M. Amaral 13* (UFMT 18387); Ibidem, 10.X.1998, *E.J. Anjos-Silva dos 329* (UFMT 18369); Santa Cruz do Xingu, Parque Estadual do Xingu, 01.II.2023, *M.O. Córdova & M. Penhacek 335* (CNMT); Tangara da Serra, Epifitario Catasetum, 26.VII.2013, C.A Silva (TANG 2074).

10. *Epidendrum flexuosum* G. Mey., Prim. Fl. Esseq.: 260. 1818. (Fig. 2I)
    = *Epidendrum buenavistae* Kraenzl., Repert. Spec. Nov. Regni Veg. 6: 19. 1908.
    = *Epidendrum imantophyllum* Lindl., Gen. Sp. Orchid. Pl.: 106. 1831.
    = *Epidendrum lorifolium* Schltr., Repert. Spec. Nov. Regni Veg. 17: 35. 1922.
    = *Epidendrum palpigerum* Rchb.f., Gard. Chron. 12: 40. 1879.
    = *Epidendrum persimile* Schltr., Repert. Spec. Nov. Regni Veg. 7: 142. 1920.

Diagnosis: Epiphytic. Stems cylindrical, unbranched. Leaves oblong-elliptical, plane. Inflorescence 7.5–20.5 cm long, simple, glabrous; peduncle 3.5–7.0 cm long, cylindrical; rachis 4.0–13.5 cm long. Flowers 13–71 per inflorescence, non-resupinate, pinkish; pedicellate ovary without distinct vesicle in the ventral face, exposed; sepals elliptical-oblanceolate; petals elliptical-oblanceolate; labellum obscurely 3-lobed, slightly concave, margin denticulate; column pinkish. Fruits not seen.

Distribution: Belize, Bolivia, Colombia, Costa Rica, Ecuador, French Guiana, Guatemala, Guyana, Honduras, Mexico, Nicaragua, Panama, Peru, Suriname, Trinidad and Tobago, Venezuela and Brazil (states of Acre, Alagoas, Amazonas, Amapá, Bahia, Espírito Santo, Mato Grosso do Sul, Mato Grosso, Maranhão, Minas Gerais, Pará, Paraíba, Pernambuco, Rio de Janeiro, Rio Grande do Norte, Rondônia, Roraima and Tocantins). In the study area, it occurs in the municipalities of Alto Xingú, Aripuanã, Brasnorte, Cáceres, Campo Novo do Parecis, Colíder, Juruena, Nova Canaã do Norte, Novo Mundo, Paranaíta, Pontes de Lacerda, Ribeirão Cascalheira, Santa Carmem, Sinop and Xavantina (Fig. 5A).

Comments: Flowers between July and October. It is part of the Secundum Group, and among the species that occur in Brazil it is superficially similar to *E. secundum* Jacq., but it is easily distinguished by the epiphytic growth (*vs*. terrestrial). In the study area, it can be confused with *E. campestre* due to the pinkish flowers (Fig. 1) but can be differentiated by the epiphytic habit (*vs.* terrestrial), cylindrical stems (*vs.* pseudobulbs), and denticulate labellum margin (*vs.* undulate).

Examined material: Alto Xingú, 01.VIII.1949, *B.H. Sick 490* (RB00250528); Aripuanã, Arredores da Serra Morena, 09.VII.1997, *V.C. Souza et al. 18460* (UFMT 32542); Ibidem, 07.IX.1997, *V.C. Souza et al. 18460* (ESA 044761, RB 01228146); Brasnorte, Igarapé Chuini, 15.VII.1977, *M.G. da Silva 3339* (INPA 127722, NY 418256); Cáceres, 01.IX.1908, *F.C. Hoehne 977* (R 2830); Campo Novo do Parecis, Margem do córrego da Aldeia Perdiz, 23.VIII.1996, *R. Godinho & M. Macedo 236 (*UFMT 15385); Colíder, resgate da FLORA da UHE Colíder, 23.IX.2014, *L.F. Sardelli et al. s.n.* (CNMT

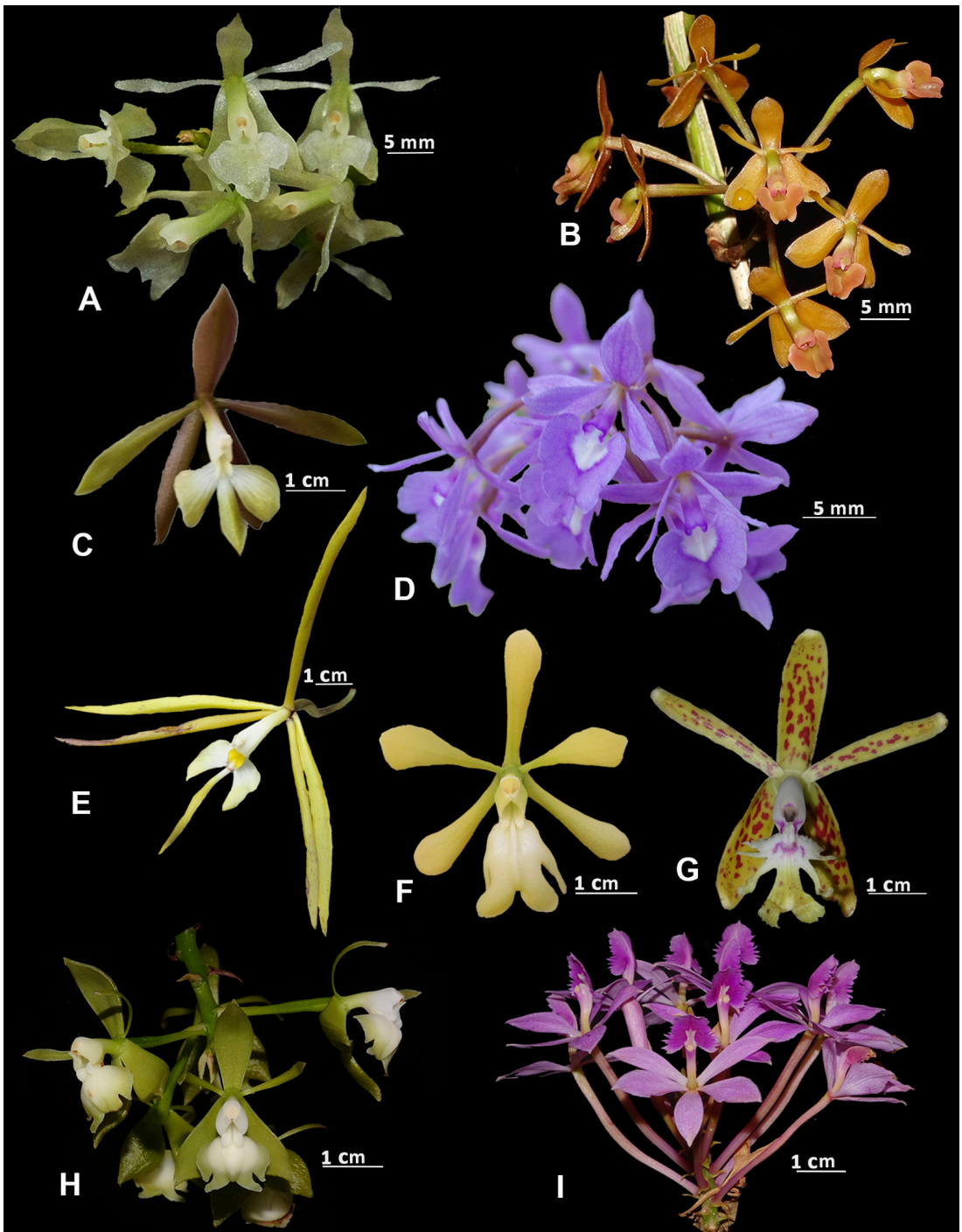

Figure 2. Species of *Epidendrum* that occur in Mato Grosso, Brazil. **A**. *Epidendrum amblostomoides*. **B**. *Epidendrum anceps*. **C**. *Epidendrum bahiense*. **D**. *Epidendrum campestre*. **E**. *Epidendrum carpophorum*. **F**. *Epidendrum coronatum*. **G**. *Epidendrum cristatum*. **H**. *Epidendrum densiflorum*. **I**. *Epidendrum flexuosum*. Photos by E. Pessoa (A), M. Engels (B, F, G, H, I), A. Koch (C), and A. Benelli (D, E).

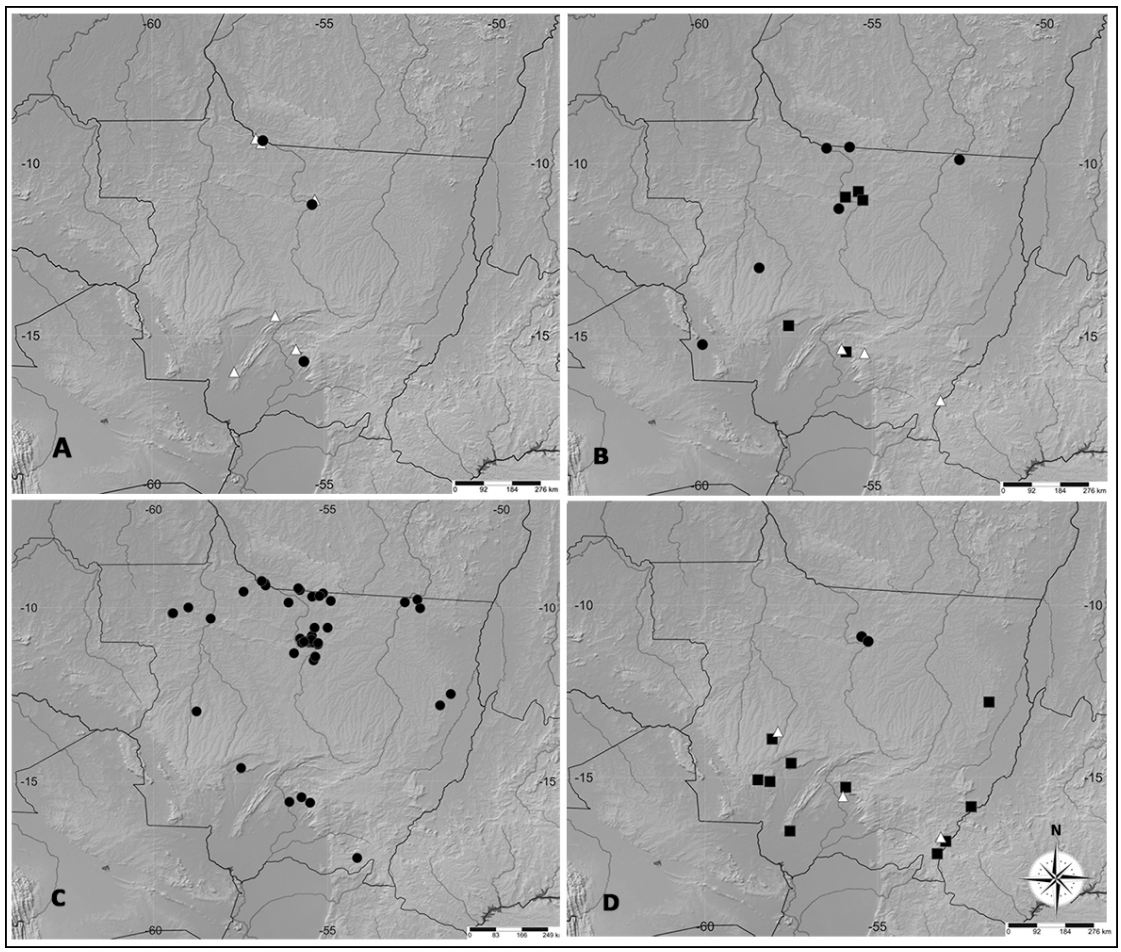

FIGURE 3. Geographical distribution of: A. *Epidendrum amblostomoides* (black circle) and *E. anceps* (white triangle). B. *Epidendrum bahiense* (black circle), *E. campestre* (white triangle) and *E. coronatum* (black square). C. *Epidendrum carpophorum* (black circle). D. *Epidendrum cristatum* (black circle), *E. dendrobioides* (white triangle) and *E. densiflorum* (black square).

1901, MBM 403847, TANG 3480); Ibidem, 08.IX.2014, *A.Z Bronholi et al. s.n* (CNMT 7715, MBM 402849, RB 01086591, TANG 2709); Ibidem, 08.X.2014, *M.E Engels 1542684Copel1* (HERBAM 12910); Ibidem, 08.X.2014 *M.E. Engels 2684* (MBM 403760); Ibidem, 25.IX.2014, *L.F. Sardelli et al.* 653 (MBM 403855); Ibidem, 23.VII.2014, *L. Sardelli et al. s.n.* (RB 01135699); Itaúba, resgate da Flora da UHE Colíder, 03.X.2014, *A.Z Bronholi et al. s.n. (*MBM 402846, TANG 2694); Ibidem, 04.VII.2017, *M.E. Engels & J.A.O. Freitas 5721* (HCF 000025129, MBM 417239, RB 01378892, TANG 4933); Ibidem, 27.VII.2015, *P.V. Oliveira et al.* (MBM 417248); Ibidem, 28.VII.2016, *M.E. Engels & A.S. Bezerra 4714* (MBM 417234, TANG 3875); Ibidem, 14.X.2014, *M.E. Engels* 2669 (MBM 417223); Ibidem, resgate de FLORA da Linha de Transmissão, 04.VII.2017, *M.E. Engels 5721* (HCF 24634); Juruena, Projeto RADAM, 01.IX.1974, *N.A. Rosa 206* (IAN 145920, SP 197647); Nova Canaã do Norte, Lote A de supressão, 18.X.2014, *M.E. Engels 2650 (*MBM 398603, TANG 2339); Novo Mundo, Parque Estadual Cristalino, 01.VI.2007, *D. Sasaki et al* s.n. (HERBAM 1511); Paranaíta, Terra Firme, 11.X.2011, *C.R.A Soares et al. 044150* (HERBAM 6866); Pontes de Lacerda, Sararé, 06.VII.1978, *J. M. Pires 16472* (HAMAB, INPA 127627, NY 418257); Ribeirão Cascalheira, Pelo bloco 2 do Brejo, 10.VIII.1968, *G. C. G. Argent 6641* (K 000878071, NY 1031716); Ibidem, 10.VIII.1968, *G.C. Argent 6641* (K000878071);

Santa Carmem, Margem rio Arraias, 00.IX.1996, *R. Godinho 237* (CEN 30710); Ibidem, 11.VII.1995, *M. Macêdo 4322* (INPA 197050); Ibidem, 27.VII.1995, *M. Macedo 4425* (CEN 30716, UFMT 15390); Sinop, Rio Celeste, 18.IX.1985, *W.W. Thomas 3861* (INPA 151334, NY 418258); Ibidem, margem direita do rio Teles Pires, 31.VIII.2017, *D.C. Dias 315* (UFMT 43680); Xavantina, Pelo bloco 2 do Brejo, 10.VIII.1968, *G. C. G. Argent & P.W. Richards 6641* (IAN 145274, UB 108253).

11. *Epidendrum macrocarpum* Rich., Actes Soc. Hist. Nat. Paris 1(1): 112. 1792. (Fig. 4A)
    = *Epidendrum incisum* Vell., Fl. Flumin. Icon 9: t.18. 1831.
    = *Epidendrum pitanga* Campacci., Colet. Orquídeas Brasil 6: 202. 2008.
    = *Epidendrum schomburgkii* Lindl., Edwards's Bot. Reg. 24(Misc.): 15. 1838.
    = *Epidendrum splendens* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 9: 93. 1921.

Diagnosis: Epiphytic. Strems cylindrical, unbranched. Leaves oblong-elliptical, plane. Inflorescence 10.0–27.0 cm long, simple, glabrous; peduncle 6.0–17.0 cm long, cylindrical; rachis 4.0–10.0 cm long. Flowers 3–26 per inflorescence, resupinate, red or orange; pedicellate ovary without distinct vesicle in the ventral face, exposed; sepals elliptical; petals elliptical; labellum 3-lobed, plane, margin denticulate; column orange. Fruits not seen.

Distribution: Colombia, Ecuador, French Guiana, Guyana, Peru, Suriname, Trinidad and Tobago, Venezuela and Brazil (states of Alagoas, Amazonas, Amapá, Bahia, Mato Grosso, Maranhão, Pará, Paraíba, Pernambuco, Rio de Janeiro and Roraima). In the study area, it occurs in the municipalities of Cotriguaçu, Itaúba, Tangará da Serra and Santa Cruz do Xingu (Fig. 5A).

Comments: Flowers from May to August. It is part of the Secundum Group, and among the species that occur in Brazil it is similar to *E. cinnabarinum* Salzm. ex Lindl., but it is easily distinguished by the epiphytic growth (*vs*. terrestrial). In the study area it can be confused with *E. flexuosum* due to the flowers grouped at the apex of the long-pedunculate inflorescence, but it can be easily distinguished by the red flowers (*vs.* pinkish) and markedly 3-lobed labellum (*vs.* obscurely 3-lobed).

Examined material: Cotriguaçu, Parque Nacional do Juruena, 18.V.2018, *P. Labiak et al. 7154* (UPCB 101546); Itaúba, Resgate de flora da UHE Colíder, 09.V.2015, *M.E. Engels 3820* (TANG 6878); Ibidem, 28.VII.2016, *M.E. Engels & A.S. Bezerra 4719* (MBM 417233); Tangará da Serra, Epifitário Catasetum UNEMAT, 04.VIII.2011, *A.P. Santos 5* (TANG 1771); Santa Cruz do Xingu, Parque Estadual do Xingu, 01.VIII.2020, *D.R. Giacoppini & G. Almeida 1208* (CNMT 10359).

12. *Epidendrum myrmecophorum* Barb. Rodr., Vellozia 1: 123. 1888. (Fig. 4B)
    = *Epidendrum huebneri* f. *denticulatum* (C.Schweinf.) C.Schweinf., Mem. New York Bot. Gard. 14(3): 137. 1967.
    = *Epidendrum rectopedunculatum* C.Schweinf. in Bot. Mus. Leafl. 11: 110. 1943.
    = *Epidendrum rectopedunculatum* f. *denticulatum* C.Schweinf., Bot. Mus. Leafl. 20: 18. 1962.
    = *Epidendrum spilotum* Garay & Dunst., Venez. Orchids Ill. 6: 144. 1976.

Diagnosis: Epiphytic. Stems cylindrical, unbranched. Leaves lanceolate, plane. Inflorescence 5.0–12.5 cm long, simple, glabrous; peduncle 4.0–10.0 cm long, cylindrical; rachis 1.0–2.5 cm long. Flowers 6–10 per inflorescence, resupinate, green or beige with brown spots; pedicellate ovary with distinct vesicle in the ventral face, exposed; sepals elliptical-oblanceolate; petals linear-elliptical; labellum 4-lobed, slightly convex, margin entire; column green or beige. Fruits not seen.

Distribution: Bolivia, Colombia, Ecuador, Peru, Venezuela and Brazil (states of Amazonas, Mato Grosso, Pará and Roraima). In the study area, it occurs in the municipalities of Itaúba, Cotriguaçu, Ribeirão Cascalheira and Tangará da Serra (Fig. 5B).

Comments: Flowers in October. It is part of the Smaragdinum Group, and among the species that occur in Brazil it is similar to *E. orchidiflorum* Salzm. ex Lindl., but it is easily distinguished by the epiphytic growth (*vs*. terrestrial). In the study area, it can be confused with *E. smaragdinum* by the leaf shape, but it differs by the longer inflorescence ($\geq$ 5.0 *vs*. $\leq$4.5 cm long) and 4-lobed labellum (*vs.* 3-lobed).

Examined material: Itaúba, Resgate da Flora da UHE Colíder, 12.X.2016, *M.E. Engels 4846* (MBM 417218); Ribeirão Cascalheira, Acampamento Base da Expedição, 22.X.1968*, R.M. Harley & R. Souza 10753* (IAN 132015, K 000878120, MO 1106243, MO 2821550, P 00411545); Tangará da Serra, Pedreira Pedremat, 04.X.2016, *C.A. Silva 581 (*TANG 3281).

13. *Epidendrum pareciense* J.M.P.Cordeiro, L.P.Felix & Hágsater, Botany (Ottawa) 100(5): 416. 2022. (Fig. 4C)

Diagnosis: Epiphytic. Stems cylindrical, unbranched. Leaves oblong, plane. Inflorescence 0.7–1.7 cm long, simple, glabrous; peduncle 0.5–1.2 cm long, cylindrical; rachis 0.2–0.5 cm long. Flowers 1 per inflorescence, resupinate, yellowish or green; pedicellate ovary without distinct vesicle in the ventral face, exposed; sepals elliptical; petals elliptical; labellum 3-lobed, plane, margin entire; column white. Fruits not seen.

Distribution: Endemic to Brazil (states of Mato Grosso and Rondônia). In the study area, it occurs in the municipalities of Colíder, Comodoro, Itaúba and Novo Mundo (Fig. 5B).

Comments: Flowers from January to August. It is part of the Nocturnum Group, and among the species of this group in Brazil it can be confused with *E. carpophorum*, that occur in the study area, due to the deeply 3-lobed labellum (Fig. 1, 6) but differs by the oblong leaves (*vs.* elliptical), elliptical petals (*vs.* linear-elliptical), and median lobe of the labellum slightly longer than the lateral lobes (*vs.* twice or more times longer).

Examined material: Colíder, Resgate da Flora da UHE Colíder, 21.I.2015, *M.E. Engels 2849* (MBM 403765); Comodoro, Rio Pardo, 26.IV.2017, *L. P. Felix & E. M. Almeida 16382* (EAN 23246); Ibidem, Reserva das Nascentes do Abastecimento, 29.IV.2017, *L. P. Felix 16435* (EAN 26081); Itaúba, Resgate da Flora da UHE Colíder, 29.V.2017, *M.E. Engels et al. 5606* (MBM 417228); Ibidem, 23.V.2017, *M.E. Engels et al. 5497* (MBM 417229); Ibidem, 22.III.2017, *M.E. Engels et al. 5415* (MBM 417243); Ibidem, 03.V.2015, *M.E. Engels 3852* (TANG 5555); Ibidem, 26.VIII.2014, *M.E. Engels 2565* (TANG 5004); Novo Mundo, Parque Estadual do Cristalino, 18.III.2007, *D. Sasaki et al. 1500* (SPF 207573).

14. *Epidendrum rigidum* Jacq., Enum. Syst. Pl.: 29. 1760. (Fig. 4D)
    ≡ *Spathiger rigidus* (Jacq.) Small, Fl. Miami: 55. 1913.
    = *Epidendrum cardiophorum* Schltr., Repert. Spec. Nov. Regni Veg. 9: 214. 1911.
    = *Epidendrum pium* Rchb.f. & Warm. in H.G.Reichenbach, Otia Bot. Hamburg.: 92. 1881.

Diagnosis: Epiphytic. Stems cylindrical, unbranched. Leaves oblong-elliptical, plane. Inflorescence 3.0–8.8 cm long, simple, glabrous; peduncle 0.5–1.3 cm long, cylindrical; rachis 2.5–7.5 cm long. Flowers 3–9 per inflorescence, non-resupinate, green; pedicellate ovary without distinct vesicle in the ventral face, covered by floral bracts; sepals oval-lanceolate; petals linear; labellum sub-orbicular, entire, plane, margin entire; column green. Fruits not seen.

Distribution: Argentina, Bolivia, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, French Guiana, Guyana, Haiti, Honduras, Jamaica, Mexico, Panama, Paraguay, Peru, Puerto Rico, Suriname, Trinidad and Tobago, Venezuela, and Brazil (states of Acre, Amazonas, Amapá, Alagoas, Bahia, Ceará, Espírito Santo, Goiás, Mato Grosso do Sul, Mato Grosso, Maranhão, Minas Gerais, Paraíba, Pará, Paraná, Pernambuco, Rio de Janeiro, Rio Grande do Sul, Rondônia, Roraima, Santa Catarina, Sergipe and Tocantins). In the study area, it occurs in the municipalities of Alto Araguaia, Buriti, Colíder, Cuiabá, Itaúba, Nova Canaã do Norte and Paranaíta (Fig. 5B).

Comments: Flowers from April to November. It is part of the Spathiger Group, and the most similar species in Brazil is *E. amazonicoriifolium* Hágsater, but it can be distinguished by the sepals and petals < 1.0 cm long (*vs.* ≥ 1.5 cm). In the study area, it can be confused with *E. sculptum* and *E. strobiliferum* due to the ovary partially or totally covered by floral bracts, but it can be differentiated by the unbranched stem (*vs*. branched).

Examined material: Alto Araguaia, Margens do rio Ariranha, 02.XI.2013*, J. Paula-Souza et al. 11480*

(ESA 132279); Buriti, 25.VI.1827, *C.L. Collenette 115* (K 000878138); Ibidem, 25.VI.1927, *C.L. Collenette 115 (*K 000878139); Colíder, Resgate de FLORA da UHE Colider, 18.IX.2014, *M.E. Engels 2866* (CNMT 1930, HCF 000025048, HCF 24553, MBM 403792, RB01176678, TANG 5016); Ibidem, 17.IX.2014, *A.Z. Bronholi* s.n. (MBM 402847); Cuiabá, Fazenda São Júlio IV, 15.VIII.2018, *C. Kreutz CK269* (UFMT 44233); Itaúba, Resgate de flora da UHE Colíder, 10.V.2015, *M.E. Engels 3870* (MBM 417224, TANG 3565); Nova Canaã do Norte, Resgate de flora da UHE Colíder, 15.IV.2015, *M.E. Engels 3201* (MBM 403809, TANG 5024); Paranaíta, Terra Firme, 16.IV.2012, *Soares* et al. *1026010* (HERBAM 8096); Ibidem, UHE São Manoel, 02.V.2017, *L.P. Zanzini 356* (HERBAM 17467); Ibidem, 15.V.2017, *C.Z. Pereira 66* (HERBAM 17122).

15. *Epidendrum sculptum* Rchb. f., Bonplandia (Hannover) 2(7): 89. 1854. (Figure in Klein & Piedade 2019)
    = *Epidendrum colonense* Ames., Schedul. Orchid. 1: 4. 1922.
    = *Epidendrum florijugum* Barb.Rodr., Gen. Sp. Orchid. 1: 57. 1877.

Diagnosis: Epiphytic. Stems cylindrical, branched. Leaves oblong, plane. Inflorescence 0.7–1.5 cm long, simple, glabrous; peduncle 0.2–0.5 cm long, cylindrical; rachis 0.5–1.0 cm long. Flowers 1–3 per inflorescence, non-resupinate, green or yellow; pedicellate ovary without distinct vesicle in the ventral face, covered by floral bracts; sepals oblong-lanceolate; petals oblong-elliptical; labellum 3-lobed, slightly concave, margin entire; column green or yellow. Fruits not seen.

Distribution: Belize, Bolivia, Colombia, Costa Rica, Ecuador, French Guiana, Guatemala, Guyana, Honduras, Mexico, Nicaragua, Panama, Suriname, Venezuela and Brazil (states of Amazonas, Mato Grosso, Maranhão and Pará). In the study area, it occurs in the municipalities of Alta Floresta and Paranaíta (Fig. 5C).

Comments: Flowers between March and May. It is part of the Ramosum Group, and the most similar species in Brazil is *E. ramosum* Jacq., but it can be distinguished by the shorter inflorescence ≤ 1.5 cm (*vs.* > 2.0 cm). In the study area, it can be confused with *E. rigidum*, due to the ovary covered by floral bracts, but differs by the branched stem (*vs.* unbranched), and 3-lobed labellum (*vs*. entire).

Examined material: Alta Floresta, Área estrutural da UHE Salta Apiacás, 10.V.2014, *C.R.A. Soares-Lopes et al. 137501* (HERBAM 9543); Paranaíta, Floresta Ombrófila, 23.III.2012, *C.R.A. Soares* et al. *1835619* (HERBAM 8017).

16. *Epidendrum smaragdinum* Lindl., Edwards's Bot. Reg. 24: Misc. 32. 1838. (Fig. 4E)
    = *Epidendrum acrirachis* Pabst., Arq. Bot. Estado São Paulo 3: 123. 1955.
    = *Epidendrum geraldoi* Porto & Brade., Rodriguésia 1(2): 30. 1935.
    = *Epidendrum rudolfianum* Hoehne., Ind. Bibl. Pl. Col. Com. Rondon: 172. 1951.

Diagnosis: Epiphytic or terrestrial. Stems cylindrical, unbranched. Leaves lanceolate, plane. Inflorescence 3.5–4.5 cm long, simple, glabrous; peduncle 1.0–1.5 cm long, cylindrical; rachis 1.5–3.0 cm long. Flowers 6–11 per inflorescence, resupinate, beige or greenish; pedicellate ovary with distinct vesicle in the ventral face, exposed; sepals elliptical-oblanceolate; petals linear-oblanceolate; labellum 3-lobed, slightly convex, margin entire; column beige. Fruits not seen.

Distribution: Bolivia, Colombia, French Guiana, Guyana, Peru, Suriname, Venezuela and Brazil (states of Acre, Amazonas, Mato Grosso, Pará, Rondônia and Roraima). In the study area, it occurs in the municipalities of Colíder, Itaúba, Juruena, Sapezal, Santa Carmem and Sinop (Fig. 5C).

Comments: Flowers from September to December. It is part of the Smaragdinum Group, and among the species that occur in Brazil it is similar to *E. hombersleyi* Summerh., but it is easily distinguished by the 3-lobed lip (*vs*. entire). In the study area, it can be confused with *E. myrmecophorum* due to the similarly lanceolate leaves but differs by the 3-lobed labellum (*vs.* 4-lobed) and by the absence of spots in the perianth (*vs.* with spots).

Examined material: Colíder, Resgate da Flora da UHE Colíder, 26.X.2015*, L.C. Ferneda Rocha 374 (*MBM

417244); Itaúba, Resgate da Flora da UHE Colíder, 12.XI.2014, *M.E. Engels 3063* (CNMT 1922, MBM 403784, RB 01175537, TANG 5020); Ibidem, 02.X.2014, *M.E. Engels* 2734 (MBM 417219); Ibidem, 02.X.2014, *M.E. Engels* 2736 (MBM 417220); Ibidem, 02.X.2014, *M.E. Engels 2042734Copel2* (HERBAM 15492*)*; Juruena, 01.XII.1911, F.C. Hoehne 5568 (R-Tipos 2807); Sapezal, Reserva Tirecatinga, 20.XI.1986, *R. Godinho & M. Macedo 230* (UFMT 15381); Santa Carmem, Margem do rio Arraias, 26.IX.1996, *R. Godinho & M. Macedo 239* (CEN 30711, UFMT 15406); Sinop, reservatório da UHE Sinop, 04.IX.2017, *D.C. Dias 321* (UFMT 43679).

17. *Epidendrum stiliferum* Dressler., Brittonia 19: 242. 1967. (Figure in Koch AK & Silva CA 2012)
= *Lanium subulatum* Rolfe., Bull. Misc. Inform. Kew 1896: 46. 1896.

Diagnosis: Epiphytic. Stems swollen forming ovoid pseudobulbs, unbranched. Leaves linear, cylindrical. Inflorescence 4.5–19.1 cm long, compound, pubescent; peduncle 2.0–8.4 cm long, cylindrical; rachis 2.5–10.6 cm long. Flowers 11–51 per inflorescence, non-resupinate, brown; pedicellate ovary without distinct vesicle in the ventral face, exposed; sepals elliptical; petals elliptical; labellum entire, slightly concave, margin entire; column brown. Fruits not seen.

Distribution: Bolivia, Ecuador, Peru and Brazil (states of Mato Grosso do Sul, Mato Grosso and Pará). In the study area, it occurs in the municipalities of Chapada dos Guimarães, Itaúba, Novo Mundo and Paranatinga (Fig. 5C).

Comments: Flowers from March to September. It is part of the Lanium Group, and among the species that occur in Brazil it is similar to *E. avicula* Lindl., but it is easily distinguished by the cylindrical leaves (*vs*. plane). This feature also distinguishes it from the other species of the study area.

Examined material: Chapada dos Guimarães, APM-Manso, 04.IV.2006, *A.B Petini 21* (UFMT 36345); Ibidem, U.H.E-Manso, 13.VIII.1999, *M. Macedo et al. 7089* (UFMT 21618); Ibidem, 09.III.2001, *M. Macedo & E. Gonçalves 7624* (UFMT 25225, UFMT 25234); Ibidem, 05.IX.2008, *A.E.H. Salles 1611* (HEPH 6994); Itaúba, Resgate da Flora da UHE Colíder, 10.VI.2016, *M.E. Engels 4555* (MBM 417232); Ibidem, 10.IX.2015, *M.E. Engels* 3699 (MBM 403836, TANG 4451); Novo Mundo, RPPN Cristalino, 30.IV.2017, *S.C. Gallo et al.* 143 (UB); Paranatinga, PCH Paranatinga II, 23.IV.2006, *A.B Petini 16* (UFMT 36336);Santo Antônio de Leverger, Caité, 07.IX.1996, *R. Godinho & M. Macedo 224* (UFMT).

18. *Epidendrum strobilicaule* Hágsater & Benelli., Icon. Orchid. 11: 200. 2008. (Fig. 4F)

Diagnosis: Epiphytic, terrestrial or rupicolous. Stems cylindrical, unbranched. Leaves elliptical-lanceolate, plane. Inflorescence 9.5–24.6 cm long, simple, glabrous; peduncle 7.0–20.0 cm long, cylindrical; rachis 2.5–4.6 cm long. Flowers 5–8 per inflorescence, resupinate, greenish-brown; pedicellate ovary with distinct vesicle in the ventral face, exposed; sepals elliptical-ovate; petals linear; labellum entire, slightly convex, margin entire; column green. Fruits not seen.

Distribution: Endemic to Brazil (state of Mato Grosso). In the study area it occurs in the municipalities of Chapada dos Guimarães and Cuiabá (Fig. 5D).

Comments: Flowers in May and August. It is part of the Physinga Group, and among the species that occur in Brazil it is similar to *E. acreense* (Brieger & Bicalho) Christenson, but it is easily distinguished by the presence of pseudobulbs (*vs*. pseudobulbs absent). In the study area it can be confused with *E. myrmecophorum* due to the presence of a vesicle in the ventral face of the labellum, but it can be differentiated by the elliptical-lanceolate leaves (*vs.* oblanceolate) and entire labellum (*vs.* 4-lobed).

Examined material: Chapada dos Guimarães, Portão do Inferno, 14.VII.2005, *A. Grade 2002* (UFMT 38353), ibidem., 10.V.1983, *J.C.C. Barcia et al.1466* (R 169826); Cuiabá, Serra de São Vicente, 01.V.2008, *M. Castro s.n.* (UFMT 45134); Ibidem, 10.VIII.2004, *M. Castro 201* (UFMT 38352); Serra de São Vicente, 01.V.2005, *M.D. Castro s.n. (*MO 101179482).

19. *Epidendrum strobiliferum* Rchb. f., Ned. Kruidk. Arch. 4(3): 333. 1859 [1858]. (Fig. 4G)
≡ *Spathiger strobilifer* (Rchb. f.) Small, Man. S.E.

Fl.: 390. 1933.
≡ *Spathiger strobiliferus* (Rchb. f.) Small, Man. S.E. Fl.: 390. 1933.
≡ *Epidendrum ramosum* House, Muhlenbergia 1: 129. 1906. *nom. illeg.*
≡ *Isochilus ramosus* Focke, Tijdschr. Wis-Natuurk. Wetensch. Eerste Kl. Kon. Ned. Inst. Wetensch. 4: 69. 1851. *nom. illeg.*
= *Epidendrum verecundum* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 17: 42. 1922.
= *Epidendrum mosenii* Barb.Rodr., Gen. Spec. Orchid. 2: 144. 1882. *nom. illeg.*

Diagnosis: Epiphytic. Stems cylindrical, branched. Leaves oblong-lanceolate, plane. Inflorescence 1.1–3.0 cm long, simple, glabrous; peduncle 0.1–1.0 cm long, cylindrical; rachis 1.0–2.0 cm long. Flowers 2–7 per inflorescence, non-resupinate, white; pedicellate ovary with distinct vesicle in the ventral face, covered with floral bracts; sepals lanceolate; petals linear; labellum entire, slightly concave, margin entire; column white.

Distribution: Belize, Bolivia, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, French Guiana, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Peru, Puerto Rico, Suriname, Trinidad and Tobago, United States (Florida), Venezuela, and Brazil (states of Acre, Amazonas, Amapá, Alagoas, Bahia, Ceará, Espírito Santo, Goiás, Mato Grosso do Sul, Mato Grosso, Maranhão, Minas Gerais, Pará, Paraná, Pernambuco, Rio de Janeiro, Rio Grande do Sul, Rondônia, Roraima, Santa Catarina and Sergipe). In the study area, it occurs in the municipalities of Alta Floresta, Barra do Bugres, Chapada dos Guimarães, Campinápolis, Colíder, Itaúba, Nova Canaã do Norte, Novo Mundo, Paranaíta, Sapezal and São José do Couto (Fig. 5D).

Comments: Flowers from February to October. It is part of the Ramosum Group, and among the species that occur in Brazil it is similar to *E. rodriguesii* Cogn., but it is distinguished by the perianth not covered by the floral bract (*vs*. perianth partially covered). In the study area, it can be confused with *E. sculptum* due to the rachis partially to completely covered by floral bracts and branched stems but can be differed by the white flowers (*vs*. green or yellow) and linear petals (*vs*. elliptical or oblong petals).

Examined material: Alta Floresta, PCH Cabeça-de-boi, 29.V.2014, *C.R.A. Soares-Lopes et al. 2077649 (*HERBAM 9691); Barra do Bugres, Tapirapoan, 01.III.1909, *F.C Hoehne 1609* (R 2834); Chapada dos Guimarães, Usina Hidrelétrica de Manso, 12.VIII.1999, *M. Macedo 7097* (UFMT 21831); Ibidem, 22.VI.1999, *M. Macedo & I.C. Lopes 7061* (UFMT 21521); Campinápolis, PCH Paranatinga II, 10.III.2006, *A. Petini-Benelli & P.R. Paello 7* (UFMT 36356); Colíder, Resgate da Flora da UHE Colíder, 08.X.2014, *M.E. Engels 2948* (*MBM 417221);* Ibidem, 08.III.2015, *M.E. Engels 3153* (CNMT 1910, MBM 403802, TANG 5023); Ibidem, 31.I.2015, *M.E. Engels 6492814BCopel6* (HERBAM 15750); Ibidem, 21.III.2017, *M.E. Engels 5028* (MBM 417241); Itaúba, Resgate da Flora da UHE Colíder, 10.II.2015, *M.E. Engels 2789* (MBM 417222); Ibidem, 29.V.2017, *M.E. Engels et al. 5614* (MBM 417231); Ibidem, 05.II.2017, *M.E. Engels 4939* (MBM 417227); Ibidem, 05.IV.2017, *M.E. Engels et al. 5215* (MBM 417238, RB 01377275); Ibidem, 14.II.2015, *M.E. Engels* 2798 (TANG 5656); Ibidem, 10.V.2017, *M.E. Engels et al.* 5399 (MBM 417235); Nova Canaã do Norte, Resgate de flora da UHE Colíder, 05.IV.2017, *M.E. Engels et al.* 5215 (TANG 5818); Novo Mundo, Parque Estadual do Cristalino, 27.VIII.2008, *D.C. Zappi 1478* (HERBAM 2518, SPF 207119); Ibidem, RPPN Lote Cristalino, 03.VII.2017, *D.R. Da Silva 197* (HERBAM 17768), Ibidem, Trilha do Limão, 14.XII.2024, *E. Pessoa et al. 1380* (UFMT); Paranaíta, Terra Firme, 16.IV.2012, *C.R.A. Soares 1056013* (HERBAM 8099); Sapezal, Reserva Tirecatinga, 26.III.1997, *R. Godinho 278* (UFMT 15389); São José do Couto, Distrito de Paranatinga, 10.III.2006, *A.P. Beneli* s.n. (HCF 11757, HCF 000017871).

20. *Epidendrum viviparum* Lindl., Edwards's Bot. Reg. 19: 10. 1841. (Fig. 4H)
≡ *Coilostylis vivipara* (Lindl.) Withner & P.A. Harding, Cattleyas Rel.: Debatable Epidendrums: 146. 2004.
= *Epidendrum viviparum* f. *maior* Hoehne in Relat. Commiss. Linhas Telegr. Estratég. Matto Grosso Amazonas 5(4): 19. 1912.

Diagnosis: Epiphytes. Stems swollen forming ellipsoid pseudobulbs, unbranched. Leaves elliptical, plane. Inflorescence 24.4–70.0 cm long, simple, glabrous; peduncle

17.0–57.4 cm long, cylindrical; rachis 7.4–12.6 cm long. Flowers 4–6 per inflorescence, resupinate, white; pedicellate ovary without distinct vesicle in the central face, exposed; sepals elliptical; petals elliptical; labellum 3-lobed, plane, margin erose; column white. Fruits not seen.

Distribution: Bolivia, Colombia, Ecuador, French Guiana, Guyana, Peru and Brazil (states of Amazonas, Mato Grosso, Maranhão, Pará, Rondônia and Roraima). In the study area, it occurs in the municipalities of Aripuanã, Colíder, Barra do Bugres, Chapada dos Guimarães, Campinápolis, Itaúba, Juruena, Nova Canaã do Norte, Santa Carmem, Tangará da Serra and Terra Nova do Norte (Fig. 5D).

Comments: Flowers from January to December. It is part of the Coilostylis Group, and among the species that occur in Brazil it is similar to *E. purpurascens* Focke, but it is distinguished by the longer peduncle ≥ 17.0 cm long (*vs*. < 8.0 cm). In the study area, it can be confused with *E. carpophorum* due to the deeply 3-lobed white labellum but differs by the presence of pseudobulbs (*vs*. stems not swollen not forming pseudobulbs) and by the labellum with erose margin (*vs.* labellum with entire margin).

Examined material: Aripuanã, Rio Juruena, 14.II.1966, *M. Mee s.n.* (SP 100025, SP 329665); Itaúba, Resgate de FLORA da UHE Colíder, 26.II.2015, *M.E. Engels 6652830BCopel6* (HERBAM 12916); Ibidem, 20.I.2015, *M.E. Engels 2855* (MBM 403740); Ibidem, 09.I.2016, *M.E. Engels 4062* (MBM 403737); Juruena, 01.XII.1911, *F.C. Hoehne 5589* (R 2826, RB 00250802); Ibidem, 01.XII.1911, *F. Hoehne 5587 (*R 44789); Nova Canaã do Norte, Resgate da Flora da UHE Colíder, 23.I.2015, *M.E. Engels & M.* Lautert *2884* (MBM 403806, TANG 5017); Santa Carmem, Rio Arraias, 01.I.1997, *R. Godinho & M. Macedo 267* (UFMT 15404),Tangará da Serra, Epifitário Catasetum, 03.II.2011, *J.Q .Moraes 38* (TANG 1056); Ibidem, 10.I.2012, *A.P. Santos 25* (TANG 1754); Terra Nova do Norte, Margem do rio Batistão, 26.III.2011, *A.K. Koch 379* (TANG 465).

Discussion. Of the 27 species of *Epidendrum* mentioned by Pessoa (2020) for Mato Grosso, 20 were confirmed. Five species previously recorded in Mato Grosso, *E. avicula* Lindl., *E. ibaguense* Kunth, *E. micronocturnum* Carnevali & G.A.Romero, *E. orchidiflorum* Salzm. and *E. pseudodifforme* Hoehne & Schltr., were excluded here as they represented cases of erroneous identifications due to similarities with other species that occur in the state. This also applies to *E. humidicola* Schltr., *E. peperomia* Rchb. f., *E. secundum* Jacq. and *E. tridactylum* Lindl., which despite never being recorded in Mato Grosso, were misapplied names in herbarium specimens.

The name *E. callobotrys* Kraenzl., originally described based on one specimen from Chapada dos Guimarães collected by Gustaf Malme (Kraenzlin, 1911), was only known from the type specimen deposited at herbarium S. After analysis, we concluded that it should be synonymized in *E. coronatum* Ruiz & Pav., a more widely distributed species known from several records from Mato Grosso.

Among the confirmed species, the most abundant in number of herbarium specimens are *E. carpophorum* Barb. Rodr. (19), *E. flexuosum* G. Mey (16), *E. strobiliferum* Rchb.f. (11) and *E. viviparum* Lindl. (11). Four species are endemic from Brazil: *E. amblostomoides* Hoehne, *E. campestre* Lindl., *E. pareciense* Cordeiro and *E. strobilicaule* Hágsater & Benelli, the last two endemic to the state of Mato Grosso. Among the municipalities, the richest in species are Itaúba (15 spp.), Colíder (9 spp.) Paranaíta (8 spp.) and Chapada dos Guimarães (8 spp.). The Amazon phytogeographical domain has 17 recorded species, the Cerrado has 13 and Pantanal has only five confirmed species: *E. anceps* Jacq., *E. carpophorum* Barb. Rodr., *E. densiflorum* Hook., *E. flexuosum* G. Mey, and *E. stiliferum* Dressler. These five species are new records for this domain (BFG 2015, 2018). The region covered by the Pantanal domain in the state of Mato Grosso has rarely been the subject of taxonomic studies. Thus, the present study shows novel results, as it presents relevant contributions to the understanding of Orchidaceae in this domain.

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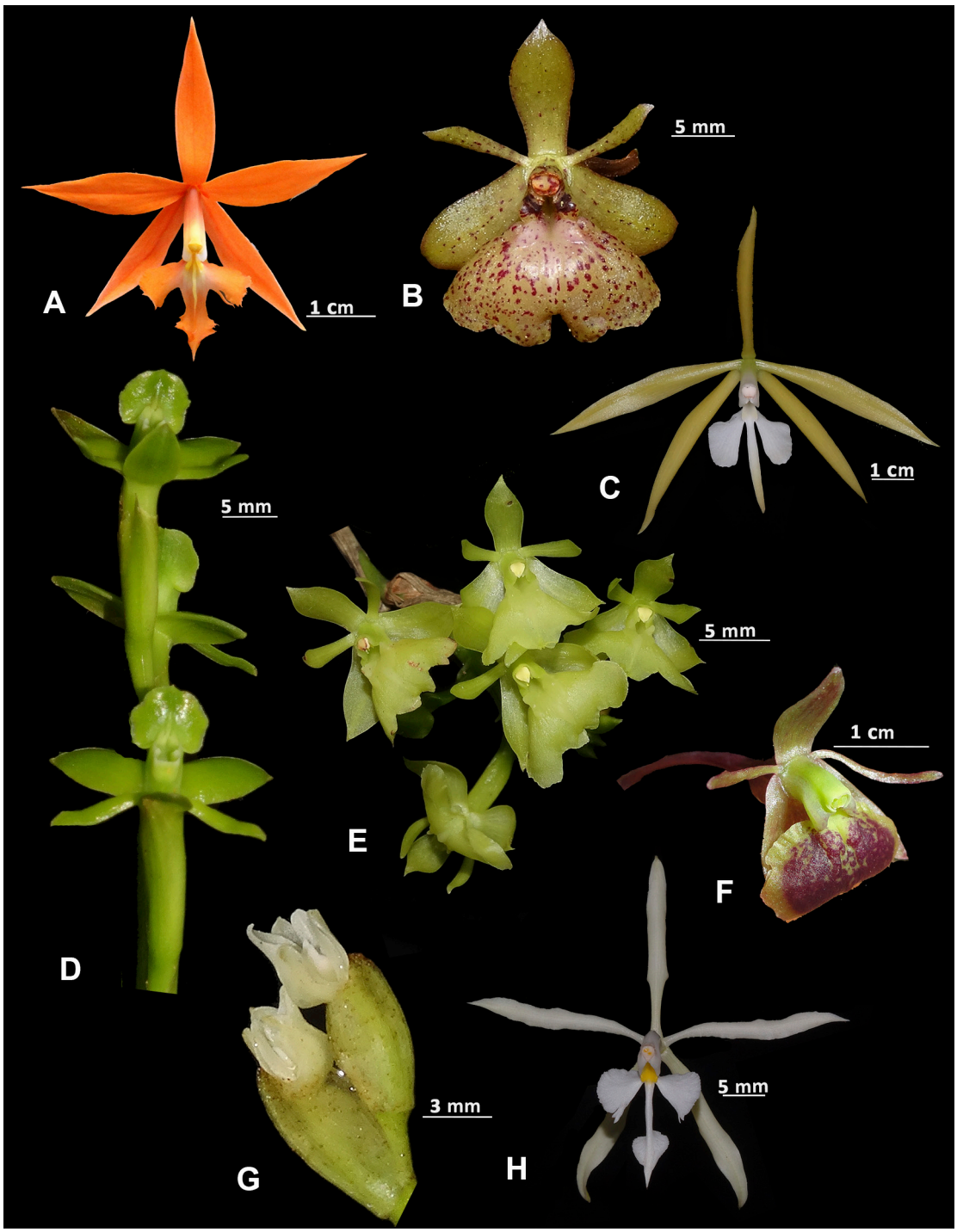

Figure 4. Species of *Epidendrum* occurring in Mato Grosso, Brazil. **A**. *Epidendrum macrocarpum*. **B**. *Epidendrum myrmecophorum*. **C**. *Epidendrum pareciense*. **D**. *Epidendrum rigidum*. **E**. *Epidendrum smaragdinum*. **F**. *Epidendrum strobilicaule*. **G**. *Epidendrum strobiliferum*. **H**. *Epidendrum viviparum.* Photos by M. Engels (A, B, C, D, E, G, H), and A. Benelli (F).

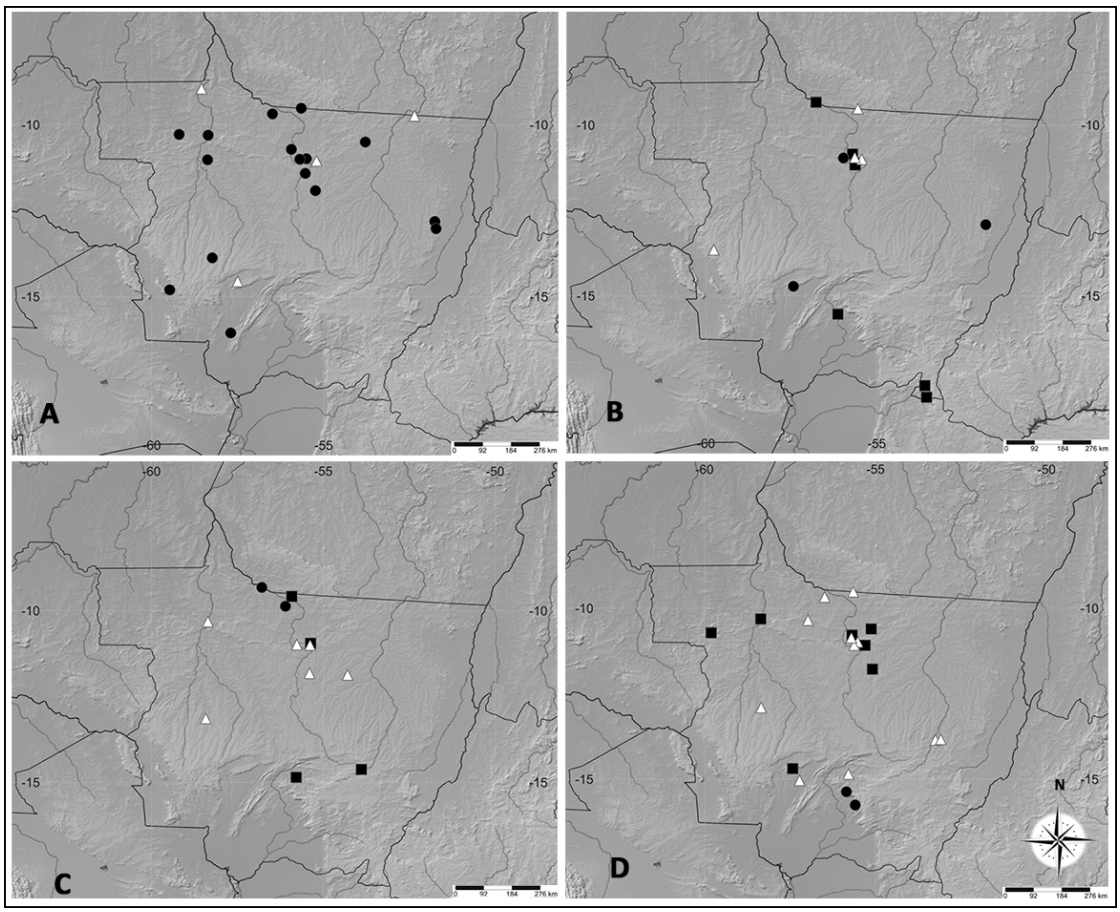

FIGURE 5. Geographical distribution in Mato Grosso of: **A**. *Epidendrum flexuosum* (black circle) and *E. macrocarpum* (white triangle). **B**. *Epidendrum myrmecophorum* (black circle), *E. pareciense* (white triangle) and *E. rigidum* (black square). **C**. *Epidendrum sculptum* (black circle), *E. smaragdinum* (white triangle) and *E. stiliferum* (black square). **D**. *Epidendrum strobilicaule* (black circle), *E. strobiliferum* (white triangle) and *E. viviparum* (black square).

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ANALYSIS OF TRADITIONAL KNOWLEDGE ON EPIPHYTIC ORCHIDS IN RURAL COMMUNITIES OF A PROTECTED NATURAL AREA FROM NORTHEASTERN MEXICO

Julieta A. Hernández-Mejía[1], Edilia de la Rosa-Manzano[1,2,5], Pablo Delgado-Sánchez[3] & Venancio Vanoye-Eligio[4]

[1]Instituto de Ecología Aplicada, Universidad Autónoma de Tamaulipas, División del Golfo 356, Col. Libertad, Ciudad Victoria, Tamaulipas, C.P. 87029, México.

[2]Facultad de Ingeniería y Ciencias, Universidad Autónoma de Tamaulipas, Cd. Victoria, Tamaulipas, C.P. 87149, México.

[3]Facultad de Agronomía y Veterinaria, Universidad Autónoma de San Luis Potosí, Km. 14.5 Carretera San Luis-Matehuala, Soledad de Graciano Sánchez, San Luis Potosí, C.P. 78321, México.

[4]Facultad de Medicina Veterinaria y Zootecnia, Universidad Autónoma de Tamaulipas. Victoria-Mante km 5 highway, Ciudad Victoria, Tamaulipas, C.P. 87000, México.

[5]Author of correspondence: ermanzano@docentes.uat.edu.mx

Abstract. Orchids are in high ethnobiological demand worldwide and are often illegally collected in large quantities, impacting their wild populations. Understanding how rural communities use these species is a relevant cultural element that should be preserved for future generations. We evaluated the traditional uses of epiphytic orchids in three communities within the "El Cielo" Biosphere Reserve (RBEC) through 98 surveys. The communities were Alta Cima, Gómez Farías and San José. Our findings indicated that the community members utilized 10 species of epiphytic orchids mostly for ornamental purposes, accounting for 78% of the uses. Notably, woman contributed to 68% of these mentions. Our study revealed that both gender and community influenced the number of orchids used in the RBEC, with gender showing the highest contribution (21.4% of the variability). San José reported the highest number of uses for orchids (four uses), followed by Gómez Farías (three uses) and Alta Cima (two uses). Lastly, Mexican laws identified three species of orchids in one protection category. Recognizing the traditional knowledge these communities possess about orchids is crucial, as it represents a fundamental part of their cultural identity and can aid in developing sustainable management and conservation strategies.

Resumen. Las orquídeas tienen una alta demanda etnobiológica alrededor del mundo, son recolectadas ilegalmente en cantidades masivas, alterando sus poblaciones silvestres. El conocimiento sobre los usos de las especies es un elemento cultural relevante de las comunidades rurales, que debe ser preservado para las generaciones futuras. Se evaluaron los usos tradicionales de orquídeas epífitas en tres comunidades de la Reserva de la Biosfera "El Cielo" (RBEC) a través de 98 encuestas. Las comunidades fueron Alta Cima, Gómez Farías y San José. Los datos muestran que los miembros de las comunidades utilizan 10 especies de orquídeas epífitas, donde el uso ornamental fue el más mencionado con 78%. Notablemente, las mujeres contribuyeron con el 68% de estas menciones. El género y la comunidad influyeron en el uso de las orquídeas en el RBEC, donde el género tuvo la mayor contribución (21.4% de la variabilidad). En San José se reportó el mayor número de usos de orquídeas (cuatro usos), seguida de Gómez Farías (tres usos) y Alta Cima (dos usos). Finalmente, se identificaron tres especies de orquídeas en una categoría de protección en las leyes Mexicanas. Reconocer el conocimiento tradicional que estas comunidades poseen sobre las orquídeas es crucial, ya que representa una parte fundamental de su identidad cultural y puede ayudar a desarrollar estrategias de gestión y conservación sostenibles.

Keywords / Palabras clave: área natural protegida, conservación, conservation, epiphytes, epífitas, "El Cielo", medicinal use, natural protected area, ornamental use, uso medicinal, uso ornamental

ORCID of the Author: JAHM, ERM, PDS, VVE
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Introduction. Orchids represent the largest family of flowering plants, with approximately 30,000 species (Chase *et al*., 2015). They grow in a wide range of habitats worldwide, mainly in tropical and subtropical regions and at elevations ranging from sea level up to 3000 m (Chase *et al*., 2003; Djordjević *et al*., 2022). This diversity and broad distribution have allowed orchids to play a significant role in various cultures throughout history, being used for medicinal, food, ornamental and ceremonial purposes (Cox-Tamay, 2013; Fonge *et al*., 2019; Góngora-Chin *et al*., 2016; Ibarra-Contreras *et al*., 2021; Lawler, 1984; Ossenbach, 2009; Rosete-Blandariz *et al*., 2019; Teoh, 2019). Despite the vast number of orchid species, a significant portion is lost each year due to the over-collection of specimens. This has led to a decline in wild populations, species extinction, and habitat degradation (Zhao *et al*., 2021).

Orchids are one of the most used groups of plants in Mexico (Cox-Tamay *et al*., 2016; Espinoza-Pérez *et al*., 2018; Jiménez-López *et al*., 2019), with around 1315 species and 170 genera, of which around 40% of which are endemic to the country (Castillo-Pérez *et al*., 2018; Gutiérrez-Rodríguez *et al*., 2022; Hágsater *et al*., 2005). Some orchids, such as *Laelia autumnalis* (Lex.) Lindl. and *Oncidium sphacelatum* Lindl., are frequently used as ornamental plants regularly incorporated into garlands, ornaments, and crafts for religious festivities in communities within the states of Veracruz and Guanajuato (Martínez-Morales *et al*., 2020). This has led to the excessive collection of these species, with reports indicating that more than 60,000 plants or parts of plants may be collected each year, depending on the species (Ticktin *et al*., 2023). Unfortunately, this collection often occurs without proper management or regulation (Espejo-Cruz *et al*., 2023). Another widely used orchid is *Vanilla planifolia* Andrews, from which vanillin is extracted for use as a flavoring and aromatic agent in the culinary industry. In addition, its flowers are in demand in the craft market, with *V. planifolia* being an important source of income for the rural communities of Mexico (Herrera-Cabrera *et al*., 2022; Luis-Rojas *et al*., 2020). The traditional uses and knowledge of orchids within these communities significantly shape their cultural identity. This knowledge is passed down through generations both within and between communities (Hernández-Mejía *et al*., 2024).

Understanding how different demographic groups value and utilize orchids is essential, as ethnobotanical knowledge can vary significantly among generations. Older individuals often possess a deeper, more traditional understanding of medicinal and edible plants, while younger individuals may be more influenced by globalization. Additionally, the appropriation of knowledge is affected by various multicultural factors (Kumar *et al*., 2021).

"El Cielo" Biosphere Reserve is a protected natural area located in the northeast of the country, renowned for its diverse ecosystems, including semideciduous forests, tropical montane cloud forests, pine-oak forests and submontane scrub (Sánchez-Ramos *et al*., 2005). The epiphytic orchids found in this reserve are particularly valuable for nature conservation because they are restricted to a limited number of habitats, showcasing a high degree of heterogeneity. They have the northernmost distribution in the Mexican transition zone, where the environments range from warm subhumid to dry climates (de la Rosa-Manzano *et al*., 2019).

Research conducted in this reserve has focused on describing the diversity patterns of epiphytic orchids within each type of vegetation. The studies indicate that the semideciduous forest and the tropical montane cloud forest host the highest diversity of epiphytic orchids (Lacaille-Múzquiz, 2005; de la Rosa-Manzano *et al*., 2019). Additionally, investigations into the traditional uses of orchids in family gardens by local communities have identified several species, including *Isochilus linearis* (Jacq.) R.Br., *Lycaste aromatica* (Graham) Lindl., *Prosthechea cochleata* (L.) W.E.Higgins and *Stanhopea tigrina* Bateman ex. Lindl., that are valued for their ornamental qualities. These studies also shed light on the processes of acquisition, transmission, and socialization of ethnobotanical knowledge within these communities (González-Romo & Gispert, 2005). Given the diversity of epiphytic orchids in the RBEC (de la Rosa-Manzano *et al*., 2017; de la Rosa-Manzano *et al*., 2019), we propose conducting a systematic analysis of the ethnobotanical significance of these orchids. Our goal is to obtain an updated overview of their use within local communities and to assess whether any species fall under a protection category. This information will serve as a baseline for imple-

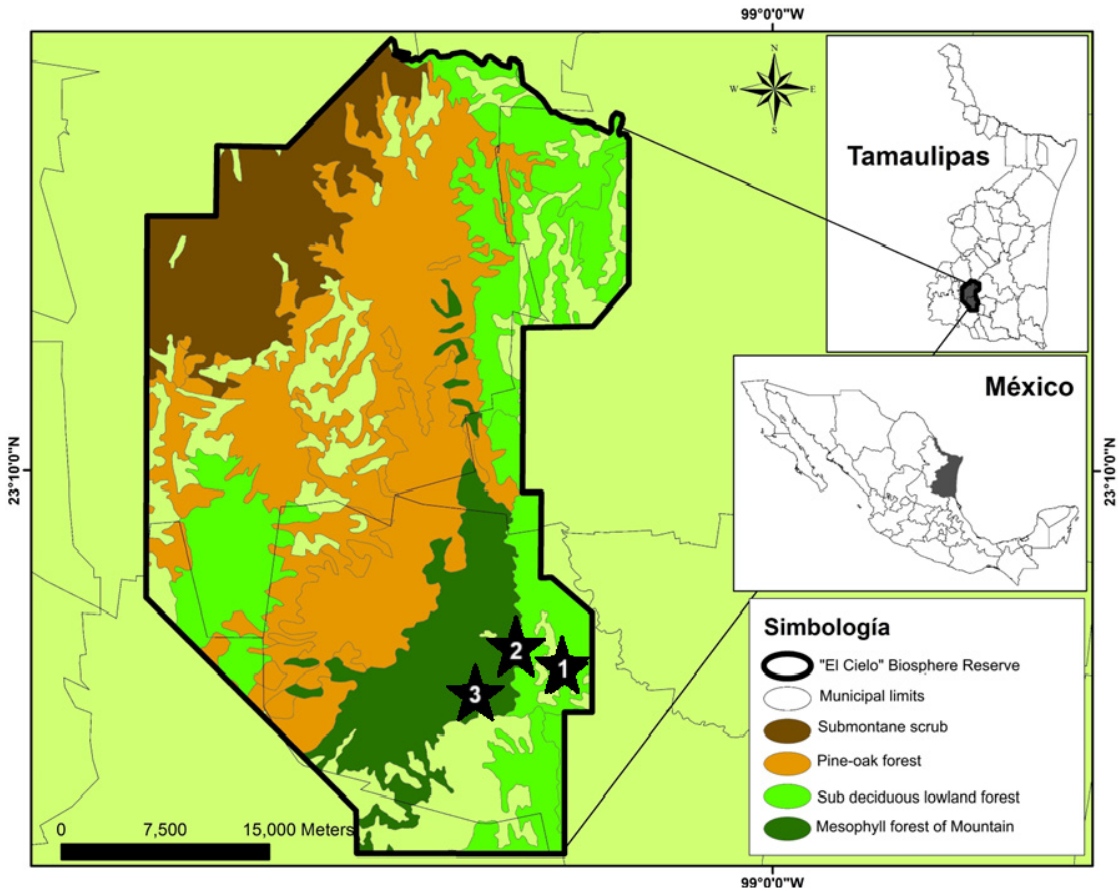

Figure 1. Location of the "El Cielo" Biosphere Reserve, Mexico. The three communities evaluated are indicated: 1. Gómez Farías, 2. Alta Cima and 3. San José. Map prepared by Vanoye Eligio V.

menting management and conservation strategies in collaboration with the communities (Menchaca-García *et al*., 2012).

We plan to (i) evaluate the traditional uses of epiphytic orchids in three RBEC communities, (ii) assess local perceptions regarding the importance of conserving these orchids, and (iii) identify any orchid species in the study area that are classified as protected.

We anticipate that if community members are aware of the richness of epiphytic orchids and have direct contact with the natural resources of the RBEC, they will attribute various uses to these orchids. These uses may differ based on gender and age. Additionally, if traditional knowledge is identified and shared among residents, we expect that interest in conserving the most valued species of epiphytic orchids in the study area will grow.

Materials and methods. *Study area*.— The "El Cielo" Biosphere Reserve (RBEC) is the most significant protected natural area in northeastern Mexico, celebrated for its diverse flora, wildlife, and ecosystems. It is located in the Sierra Madre Oriental, specifically in the regions known as Sierra de Cucharas and Sierra de Guatemala, covering an elevation range from 200 to 2200 m (Fig. 1). The study was conducted in three communities within the reserve: Alta Cima, Gómez Farías, and San José. Alta Cima has a population of 142 residents, comprising 47.9% women and 52.1% men, distributed across 38 families. Gómez Farías is the largest community, with a population of 854 residents (49.4% women and 50.6% men) living in 246 families. San José, the smallest community, has 66 residents, with 45.5% women and 54.5% men, residing in 21 families (INEGI, 2020). The levels of urbanization vary among the three

communities. Gómez Farías is the most urbanized, with access to electricity, piped water, drainage, and the internet. Alta Cima is less urbanized, while San José is the least urbanized, relying on solar-powered electricity and having limited access to piped water (INEGI, 2020).

Ethnobotanical research.— In the Alta Cima community, a survey was conducted with 20 families (52.6% of the response rate), in San José with 21 families (100% response rate), and in Gómez Farías with 57 families (32% response rate) (INEGI, 2020, Fig. 1). The ethnobotanical survey focused on the community´s knowledge, management and use of epiphytic orchids and involved one family member per household, with no age restrictions for participants. Informed consent was obtained and all responses were kept confidential.

The survey included four sections (see Appendix 1): 1) Information about the interviewee, 2) General information about the plant, 3) Ethnobotanical information about orchids, and 4) Local perceptions regarding the conservation status of epiphytic orchids in the Reserve. The survey was validated using the expert panel validation method (INEE, 2019). Age categories were defined into five groups, ranging from 20 to 60+ years, with ten-year intervals. The data collected were compiled to create a database for further analysis.

Ethnobotanical data analysis.— The following ethnobotanical indices were determined according to Hussain *et al*. (2023):

Relative Frequency Citation (RFC): This is used to calculate the relative frequency of citations, using the local importance of each plant species (Birjees *et al*., 2022). It was calculated using the following formula:

$$RFC = FC/N$$

Where FC is the proportion of informants who mentioned the use of a particular species. N represents the total number of informants. This index theoretically varies from 0, when no one refers to the plant as useful, to 1 in the unlikely case that all informants mention the use of the species.

Use value (UV): This index is used to find the relative importance of each species used locally. It combines the frequency of the species mentioned with the number of uses mentioned per species and is often used to highlight notable species of interest (Zenderland *et al*., 2019). It is calculated according to the following formula (Jan *et al*., 2021; Phillips *et al*., 1994):

$$UV = \sum U/n$$

Where $\sum U$ is the number of uses each informant mentions for each species mentioned. It is higher when more uses of a species are reported and lower when fewer uses of a species are reported; n is the total number of informants interviewed for each particular species.

Informant Agreement Ratio (IAR): A metric used to evaluate how suitable specific plants are for each use category. It was determined using the following formula:

$$IAR = (Nur - Nt) / (Nur-1)$$

Where Nur is the number of mentions in each use category and Nt is the number of species mentioned in each category. The values range from 0 to 1.

Plant Part Value (PPV): The method proposed by Chaachuay *et al*. (2019) was used to find the relative value of the different sections of the specimens. The following formula was used:

$$PPV = RU/Rupp$$

Where RU represents the total number of plant uses (including all parts) specified by the informant, while Rupp represents the total number of uses for each given portion.

Analysis of data.— R software version 4.3.3 was used for statistical analyses. The Pearson Chi-square test (χ^2) was applied to find possible differences between (i) gender of the informants in each community and among communities, and (ii) among age range of the informants of RBEC.

Because there is an imbalance in the number of interviews conducted in each community, a subsampling of the majority variable, "community" was performed. Specifically, 20 observations were randomly selected from the Gómez Farías community to match the number of observations in the minority group, creating a balanced model. Additionally, since the food and medicinal categories each recorded less than six observations, they were combined into the "other"

category, resulting in two levels for the response variable: "other" and "ornamental". A binomial logistic regression model with logit link function was used to evaluate the association between the response variable and the predictors "gender", "community" and "age range" (20–30, 30–40, 40–50, 50–60 and 60+ ages). The model was fitted using the glm function of the "Stats" package of the R software version 4.3.3. In the Alta Cima variable, women and 20–30 age range were not present as coefficients because they were taken as reference points, as well as ornamental use. The statistical significance of the predictors was evaluated by Likelihood Ratio Test, considering a significance level of $\alpha = 0.05$. The ratio was obtained as the percentage of the predictor's deviance with respect to null deviance.

Results. Of the total informants, 64% were women and 36% men ($\chi^2 = 8$, d.f = 1, $P < 0.05$). Comparing the three communities, Gómez Farías had both the highest number of women interviewed (52%, 33 informants; $\chi^2 = 10.6$, d.f = 2, $P < 0.05$), and the highest number of men interviewed (68%, 24 informants; $\chi^2 = 20.6$, d.f = 2, $P < 0.05$). According to age range, RBEC informants between 50 and 60 years of age was highest with 33% (33 informants), followed by those who were between 30 and 40 years of age with 19% (18 informants), and both ranges of 20 to 30 and 40 to 50 with 16% (16 informants each); particularly, the smallest number of informants was the 60+ age range (15%, 15 informants) ($\chi^2 = 11.7$, d.f = 4, $P < 0.05$).

Uses of epiphytic orchids by communities.— We found that inhabitants of the RBEC used ten epiphyte orchid species (Fig. 2) for purposes such as ornamental, food, medicinal, and others (inspiration and tourism, which were considered as uses of orchids provided to society according to ecosystem service classification; Hernández-Mejía *et al*., 2024) (Table 1). The ornamental use of orchids stood out with 78% (80 informants), followed by other uses with 12% (10 informants), food with 6% (6 informants) and medicinal with 2% (2 informants) (Fig. 3A). In the analysis by community, Alta Cima stood out for ornamental use, which was 90%, and for other uses (inspiration/tourism) with 10% (Fig. 3B); in Gómez Farías the category of ornamental use was 85%, and other uses with 15% (Fig. 3C). Finally, in San José, four uses of epiphytic orchids stood out: ornamental with 60%, other uses with 28%, food with 7%, and medicinal with 5% (Fig. 3D).

Gender and community influenced the use of orchids in the RBEC (Table 2). Gender contributed the most to the model, explaining 21.4% of the variability, followed by community (18.9%) and age range (6.37%). The male gender showed a 23 times higher probability of using orchids in the "other" category (medicinal, food, inspiration/tourism) compared to the female gender (Odds ratio = 23.19, P = 0.0001; Table 3). For the community variable, a trend was observed in the probability of using orchids in the "other" category in the community of San José compared to Alta Cima. Conversely, Gómez Farías community showed a lower probability of using orchids in the "other" category compared to those from Alta Cima, who are most likely to use orchids as ornamentals. However, these differences were marginally statistically significant (P = 0.05; Table 3). Finally, individuals in the age ranges of 30–40, 50–60, and 60+ showed a lower probability of using orchids in the "other" category. In contrast, the probability of this type of use increased among individuals aged 40–50, although these values were not statistically significant (Table 3).

Ethnobotanical indices.— Relative Frequency Citation (RFC): The RFC ranged from 0.01 to 0.19 in the RBEC. *Laelia anceps* Lindl., presented the highest value with 0.19. For its part, *Isochilus unilateralis* B.L.Rob., *Lycaste aromatica* and *Cohniella ascendens* (Lindl.) Christenson showed values below 0.05.

Use value index (UV): The values found for this index were from 0.01 to 0.04, where *S. tigrina* had the highest use value, which was 0.04; species like *Encyclia parviflora* (Regel) Withner, *I. unilateralis,* and *C. ascendens,* had the lowest use value (0.01) and were mentioned in just one category of use.

Informant agreement index (IAR): The IAR applied to orchid species yielded the maximum value of 0.80 for the ornamental use category. The other uses, include touristic purposes and inspiration/creativity, were in second place with a value of 0.40.

Plant Part Value (PPV): The highest proportion of the PPV was for using the racemose inflorescence with 57, while using the complete plant was 43.

FIGURE 2. Total species reported in the study. **A**. *Catasetum integerrimum* Hook. **B**. *Cohniella ascendens* (Lindl.) Christenson. **C**. *Encyclia parviflora* (Regel) Withner. **D**. *Isochilus unilateralis* B.L.Rob. **E**. *Laelia anceps* Lindl. **F**. *Laelia speciosa* (Kunth) Schltr. **G**. *Lycaste aromatica* (Graham) Lindl. **H**. *Prosthechea cochleata* (L.) W.E.Higgins. **I**. *Prosthechea mariae* (Ames) W.E.Higgins. **J**. *Stanhopea tigrina* Bateman. Photo credit: Diederick Antoni (A), Julieta Hernández (C & H), Edilia de la Rosa (B, D & G), Wilfrido Rodríguez Pérez (J), Antonio Guerra (E & F). Illustration assembled by Julieta Hernández.

Communities' perception of orchid conservation.— Regarding the importance of conserving orchids in the RBEC, 52% of those surveyed considered that the conservation of orchids is very important, 30% mentioned that it is important, 15% that it is somewhat important and 3% considered it unimportant.

Orchids used by the RBEC communities include species under protection status according to the Mexican law NOM-059-SEMARNAT-2010 (SERMANAT, 2010); including *Laelia speciosa* (Kunth) Schltr. as under special protection, and both *Prosthechea mariae* (Ames) W.E.Higgins and *S. tigrina* as threatened (Table 1, Fig. 2). Under international listings such as the IUCN Red List of Threatened Species (IUCN 2024), the species reported in this study are still not evaluated according to the list criteria.

Discussion. Orchids play an essential role in the daily lives of the inhabitants of the RBEC, who take advantage of this resource using it for purposes such as ornamental, food, and medicinal, which coincides with our proposal. The use of 10 epiphytic orchid species in this study is low compared to other studies. For instance, 62 Mexican orchid species with anti-inflammatory, vasorelaxant, antinociceptive, antioxidant, and spasmolytic properties have been reported (Castillo-Pérez *et al*., 2024). Similarly, 53 orchid species in Costa Rica are utilized as a tourist resource (Kirby, 2003). These comparisons highlight the need for further research that allows the conservation and maintenance of the species in order to obtain ethnobotanical information on those that have potential medicinal use and have not been evaluated in the study area.

Ornamental use was the most prominent in the three communities, contributing with more than 60% of the uses in each. Generally, the inhabitants of the RBEC collect orchid plants and have one or more species of orchids as part of the family garden, where the main interest is for them to reach the flowering stage to appreciate and decorate their gardens. The ornamental use of orchids has been well documented (Beltrán-Rodríguez *et al*., 2012; Hinsley *et al*., 2018; Ibarra-Contreras *et al*., 2021; Martínez-Morales *et al*., 2020; Nurfadilah, 2020); they are a key element in various religious events and festivities in other places, as in the case of *Laelia autumnalis*, which is used on the Day of the Dead, when its inflorescences are collected for the arrangement of altars that are placed both in homes and cemeteries in the state of Guanajuato, Mexico (Beltrán-Rodríguez *et al*., 2012).

Other species such as *Laelia albida* Bateman ex Lindl., *L. furfuracea* Lindl., and *Prosthechea karwinskii* (Mart.) J.M.H.Shaw also have a high ornamental

Table 1. Ethnobotanical data of epiphytic orchids mentioned in the surveys carried out in the "El Cielo" Biosphere Reserve.

Scientific name	Local name	Used part	Ethnobotanical use in RBEC	Other reported uses outside the study area
Catasetum integerrimum Hook.	Monjito	Complete plant	Orn, Other	Pseudobulbs used to cure tumors; treatment of kidney, gastrointestinal diseases and diabetes mellitus (Castillo-Pérez, 2023; Herbario CICY, 2010; Hernández-Bautista & Martínez-Espinoza, 2019; López-Puc & Herrrera-Cool, 2022).
Cohniella ascendens (Lindl.) Christenson.	Lápiz	Complete plant	Orn	Inflammation caused by splinter; "Limpia" (a ritual to prevent, diagnose, or cure a disease set); headaches; toothaches; stomach aches; kidney diseases. (Cano-Asseleih *et al.*, 2015; Rodríguez-Castro, 2009).
Encyclia parviflora (Regel) Withner.	Rocío	Complete plant	Orn	-
Isochilus unilateralis B.L.Rob.	Marcianita	Complete plant	Orn	-
Laelia anceps Lindl.	Calaverita	Racemose inflorescence	Orn, Other	Religious offerings; to treat pain and inflammation (Menchaca-García & Morales-Ruiz, 2016; Vergara-Galicia *et al.*, 2013).
Laelia speciosa (Kunth) Schltr.	Lirio morado	Racemose inflorescence	Orn, Other	Cough and inflamed blows (Vergara-Galicia *et al.*, 2013).
Lycaste aromatica (Graham) Lindl.	Lirio amarillo	Complete plant	Orn, Other	-
Prosthechea cochleata (L.) W.E.Higgins.	Pulpito	Single flower	Orn, Other	An adhesive mucilage is obtained from the pseudobulbs (Royal Botanic Gardens, 2024).
Prosthechea mariae (Ames) W.E.Higgins.	Lirio blanco	Complete plant	Orn, Other	-
Stanhopea tigrina Bateman.	Torito, cabeza de perro, tigre	Single flower	Food, Med, Orn, Other	Against heatstroke and weakness; renal disorders, and mental disorders (del Carmen Díaz-Torres, 2019; Teoh, 2019).

*Ethnobotanical use in RBEC: Food, (Med) Medicinal, (Orn) Ornamental, Other (including tourism, inspiration and appreciation).

value, and their commercialization is increasing in Oaxaca, Mexico (Ibarra-Contreras *et al*., 2021; Solano-Gómez *et al*., 2010). It is important to consider that orchids and community traditions are a key part of cultural identity, so strategies must be developed to mitigate the damage from over-collecting plants and ensure that their use is sustainable (Ticktin *et al*., 2023).

As expected, responses from informants using orchids in the RBEC across age ranges were different; however, this variable was not significant in the model. The number of mentions from informants between 51 and 60 years old (34%) was the highest, and older people represented the guardians of traditional knowledge. During the interview, participants pointed out that young people from Gómez Farías (between 20 and 30 years old, 62.5% of the total) know and use orchid species such as *P. cochleata* "pulpito" or *C. ascendens* "lápiz" from the tropical dry forest that surrounds the community, but have no interest in cultural knowledge, nor have the tradition of continuing to transmit this knowledge to new generations. In fact, individuals of this community showed a lower probability of using orchids in the "other" category than those from Alta Cima. This could be related to the young people of Gómez Farías having more access to technology compared to the other two populations who are without even an internet signal, probably causing a lack of interest in traditional knowledge and represent-

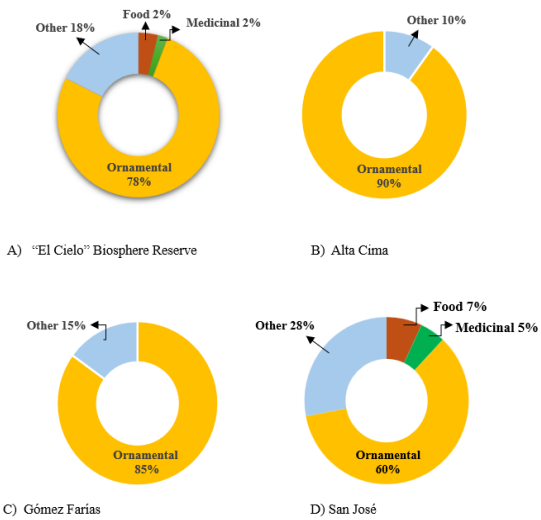

FIGURE 3. Percentages of uses of epiphytic orchids per inhabitant from the "El Cielo" Biosphere Reserve (A); and the three communities evaluated: Alta Cima (B), Gómez Farías (C) and San José (D).

ing a concern for the preservation of the ethnobotanical use of orchids. In addition, community residents mention in the survey that young people often migrate to large cities in search of life opportunities, which could affect interest in the vital role played by orchids and their conservation in the communities of the RBEC. Contrarily, Beltrán-Rodríguez *et al*. (2012), found that the knowledge and customs required to carry out the processes of collection, marketing and use practices of *L. autumnalis* are instilled from parents to children, favoring the preservation and transmission of local traditions. It is important to recognize that residents, particularly those who are older and have more knowledge about epiphytic orchids, can become part of future proposals for the development of conservation strategies, since they have the experience, practices and potential to carry out successful conservation of both the species and the ecosystem (Hussain *et al*., 2023). Proposals such as environmental education workshops and scientific dissemination fairs on the uses and management of orchids in the study area will allow the knowledge of the residents of the RBEC to be transmitted and remain in future generations (Velázquez-Juárez, 2019).

The gender of people who use orchids in the RBEC was a significant factor, as expected. Recent studies on gender bias in ethnobotanical knowledge show that not

TABLE 2. Analysis of variance of the binomial logistic regression model. The table reports likelihood-ratio (LR), Chi-squared, degrees of freedom (Df), and associated p-values. These results evaluate the statistical significance of each predictor (age range, gender and community) in explaining variation in the binary response variable.

	LR Chisq	Df	Pr(>Chisq)
Age range	6.3201	4	0.1765
Gender	21.2273	1	4.08E-06 ***
Community	18.8425	2	8.10E-05 ***

everyone in a community has the same level of knowledge, and one gender is generally held to be the one with the most knowledge (Dan-Guimbo *et al*., 2011; Laleye *et al*., 2015; Müller *et al*., 2015). According to our model, ornamental use of epiphytic orchids in the RBEC was most probably by women, who are mostly housewives (Beltrán-Rodríguez *et al*., 2012) and have learned to take advantage of these plants as inspiration to make souvenirs to sell to tourists, providing an economic income for their families. The implementation of training programs for the propagation of plants destined for sustainable and legal commercialization could be successful, as in Costa Rica (Gutiérrez, 2008), where the Union of Associations of Rural Women Producers of the Western Central Sector and Rambla produce and export orchids, establishing sales stands at exhibitions, supermarkets or on private orders. They also export mainly to Panama and the USA. This program has reduced the over-collection of wild specimens (Gutiérrez, 2008).

The highest number of uses reported for epiphytic orchids was in the community of San José (Fig. 2D), despite having the smallest number of inhabitants compared to Alta Cima and Gómez Farías. San José is the least urbanized community and does not have essential services. However, it is surrounded by tropical mountain cloud forest (González-Medrano, 2005), which houses ~60% of the epiphytic orchid species in Mexico (Espejo-Serna *et al*., 2021), being highly recognized and appreciated for their high nutritional, medicinal, ornamental value, among others (Şen *et al*., 2018; Bozyel & Merdamert-Bozyel, 2020). In this community, *S. tigrina* has different uses, including the use of its flowers as food. Similarly, Teoh (2019) reported that *S. tigrina* has been used against heatstroke and loss of strength

Table 3. Coefficients, standard errors and odds ratios of the binomial logistic regression model, where the variable community (Gomez Farías and San José), male gender and age range (30-40, 40-50, 50-60, and 60+) were evaluated. Variable Alta Cima, women and 20-30 age range are not presented as coefficients because they were taken as reference points, as well as ornamental use. Significance level, * (0.01), ** (0.001), *** (0.05).

	Estimate	Std.error	z value	P.value	Odds_ratio	Lower	Upper
Intercept	-2.376	1.166	-2.037	0.042	0.093	0.009	0.914*
30–40	-0.452	1.308	-0.345	0.730	0.636	0.049	8.267
40–50	1.784	1.178	1.514	0.130	5.951	0.591	59.884
50–60	-0.799	1.022	-0.782	0.434	0.450	0.061	3.336
60+	-0.064	1.110	-0.057	0.954	0.938	0.107	8.261
Male	3.144	0.813	3.866	0.000	23.187	4.710	114.141**
Gómez Farías	-2.051	1.049	-1.955	0.050	0.129	0.016	1.006***
San José	1.607	0.998	1.611	0.107	4.987	0.706	35.230

since the post-Hispanic period; in addition, Moreno-Martínez and Menchaca-García (2007) highlight the use of the flowers of this species in the preparation of tortillas so that they acquire a pleasant aroma since this orchid flower has molecules of phenylmethyl acetate, cinnamyl acetate, indole, benzyl acetate, and methyl salicylate, which give it its intense, sweet and aromatic aroma (Castillo-Pérez *et al*., 2021; Gerlach, 2010).

Alta Cima was the community where the inhabitants used the largest number of orchid species and where orchids are most likely used as ornamental, compared to the other two communities. Alta Cima is a community with a low urbanization level but does have basic services and an elementary school. Here, the male inhabitants use orchid species from the area for tourism and recognize the ornamental value of orchids, exploiting them along the guided routes and trails through the RBEC, where they obtain economic income. In this community, *L. anceps* is well recognized as an ornamental species for the size of its flowers (6.25 to 12.5 cm), and its striking pink color (Fig. 2E), as well as being easily propagated (Halbinger & Soto-Arenas, 1997). Although this species does not show declining populations in Mexico, it is prone to over-collection of specimens for illegal sale and decoration in festivities, in addition to the degradation of its habitat (Solano-Gómez *et al*., 2010; Cox-Tamay & Cervantes-Uribe, 2016). It is necessary to promote its protection to conserve and its habitats and prevent it from becoming threatened due to its ornamental value (Cox-Tamay & Cervantes-Uribe, 2016; Vera-Aguilar *et al*., 2022).

Some epiphytic orchids named in NOM-059-SEMARNAT-2010 include *L. speciosa*, *P. mariae* and *S. tigrina*. Particularly, *L. speciosa* is also used by residents of the RBEC who are dedicated to ecotourism mainly as a visual attraction within the tours they provide. It is reported as a species subject to special protection, so its populations are not strongly affected (Campos-Rojas & Muñoz-Pérez, 2018). The *L. speciosa* population is a conservation priority in our region because it has one of the most northerly distributions of the species (Halbinger & Soto-Arenas, 1997). Community participation, therefore, is essential to conservation and management programs since they have the closest relationship with this resource. The main threat it faces is massive looting to form decorations for the Corpus Christi festival in some towns in Michoacán, Mexico, so it is necessary to promote studies on the biology, ecology and reproduction of species for their effective conservation (Vera-Aguilar *et al*., 2022).

Both *P. mariae* and *S. tigrina* are endemic species to Mexico and are listed as threatened (SEMARNAT, 2010). *P. mariae* is appreciated for its unique appearance and white flowers (Fig. 2I) and for its ornamental and horticultural uses (Alanís-Méndez *et al*., 2024). However, its populations are threatened due to the fragmentation and loss of its natural habitat (Alanís-Méndez *et al*., 2024; Rocha-Gutiérrez & Duque-Sánchez, 2017). Meanwhile, *S. tigrina*, due to its floristic attractiveness and characteristic fragrance (Gerlach, 2010; Castillo-Pérez *et al*., 2021), is the object of looting for illegal trade, while problems with its germina-

tion and propagation have been reported, which makes it a vulnerable species in the face of so many threats (Zamora-Cortez, 2021).

In conclusion, this study emphasizes the importance of traditional knowledge and the conservation of epiphytic orchid species, highlighting their ornamental, medicinal, and cultural values. It notes that gender differences play a role in the utilization of orchids, with women primarily leading ornamental and economic activities. However, factors such as overharvesting and habitat degradation pose significant threats to numerous orchid species, particularly those that are endemic or protected, such as *L. speciosa*, *P. mariae*, and *S. tigrina*.

To address these threats, strategies such as establishing nurseries, creating germplasm banks, and promoting environmental education should be implemented to reduce the overexploitation of orchid species and encourage their conservation. By documenting and preserving cultural practices, this research contributes to biodiversity protection while ensuring the transmission of traditional knowledge amidst globalization and evolving rural lifestyles.

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Appendix 1. Survey to determine the perception and knowledge of orchids by residents of the communities of the "El Cielo" Biosphere Reserve as part of the development of the project titled "Community participation in the conservation of epiphytic orchids in the "El Cielo" Biosphere Reserve".

Interview date:_____

1. Interviewee information

Name: _____

Age:_____ Gender: _____ Ocupation: _____ Scholarship:_____

Are you originally from the community? Yes_____ No_____

2. General plant information

Have you heard about orchids? Yes_____ No_____

If yes, can you name some examples? _____

3. Ethnobotanical information about orchids

Do you use these plants in any way? Yes_____ No_____

What are the most common uses for these plants? Food_____ Spiritual _____ Medicinal_____ Ornamental_____ Religious_____ Other (inspiration/creativity, tourism)_____

What parts do you use the most? Root_____ Leaf_____ Stem (bulb) _____Flower_____Whole plant_____

Where do you usually find the plants? Trees/Branches_____ Thrown on the ground_____ Growing on stones/rocks_____

When you need a plant, who participates in obtaining it?_____

What time of year do you usually find them?
Dry season_____ Rainy season_____ All year_____

Do you have orchid plants in your home? If so, how many different species do you have _____

4. Local perception of the conservation status of orchids in the Reserve

Do you consider orchids to be important within the "El Cielo" Biosphere Reserve? Very important_____ Important_____ A little_____ Not important _____

Why do you think so?_____

Have you noticed that these plants are becoming scarce?
Yes_____ No_____

Since when?_____

How did you notice it? (you no longer find the plant as easily as before; you have to go further to find it) _____

What would you do if this species ended up in the Reserve?_____

Would you be interested in learning about the care and propagation of these plants as a way to conserve them? Yes_____ A little bit_____ No_____

How did you acquire knowledge about the use of orchids?
Own experience_____ By studies_____ By family tradition_____ By hobby_____

With whom do you share the knowledge you have about the uses and information of this group of plants?
Parents_____ Children_____ Siblings_____ Uncles_____ Nephews _____ Neighbors_____

Do you think that the knowledge that the communities of the Reserve have about orchids is being lost? Yes_____ No_____

What do you consider to be the main reasons why this traditional knowledge about orchids is lost?_____

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RESTREPIA RESTREPOI: A NEW SPECIES FROM THE CLOUD FORESTS OF THE COLOMBIAN WESTERN ANDES

Eugenio Restrepo[1,2,3,6], Edicson Parra-Sánchez[4,5] & David P. Edwards[4,5]

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

[2]Semillero de Investigación en Plantas y Afines - PHYTOS, Grupo de Investigación en Biodiversidad y Recursos Naturales – BIONAT, Facultad de Ciencias Exactas y Naturales, Universidad de Caldas, Calle 65 #26-10, Manizales, Colombia.

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

[4] Department of Plant Sciences and Centre for Global Wood Security, University of Cambridge, Cambridge, U.K.

[5]Conservation Research Institute, University of Cambridge, Cambridge, CB2 3EA, U.K.

[6]Author for correspondence: estambul40@gmail.com

Abstract. A new species of *Restrepia* from the Department of Valle del Cauca, exclusively found in the montane rainforest of the Western Colombian Andes, is described and illustrated. This new species is morphologically similar to *Restrepia chrysoglossa*, another species endemic to Valle del Cauca; however, it can be distinguished by its brown-spotted sheaths, cleistogamous non-spreading flowers, oblong, attenuated, non-clavate dorsal sepal, and pyriform, when expanded, ovate lip. We discuss its morphological affinities and provide notes on its conservation status and ecology, highlighting its restricted distribution and potential threats to its habitat, along with a distribution map.

Resumen. Se describe e ilustra una nueva especie de *Restrepia* del departamento del Valle del Cauca, restringida al bosque montano lluvioso de los Andes Occidentales de Colombia. La nueva especie es morfológicamente similar a *Restrepia chrysoglossa*, otra especie restringida al Valle del Cauca; sin embargo, puede distinguirse por sus vainas con manchas marrones, sus flores cleistógamas que no abren completamente, su sépalo dorsal oblongo, atenuado y no claviforme, y su labelo ovado y piriforme cuando está expandido. Se discuten las especies morfológicamente similares y se proporcionan notas sobre su estado de conservación y ecología, destacando su distribución restringida y las posibles amenazas a su hábitat, así como un mapa de distribución.

Keywords / Palabras clave: Dapa, endemic species, especies endémicas, Orchidaceae, Pleurothallidiinae *Restrepia aberrans*, *Restrepia chrysoglossa*, *Restrepia flosculata*, taxonomía, taxonomy

Introduction. Colombia is one of the most orchid-diverse countries in the world, particularly across the three mountain ranges of the northern Andes (Karremans *et al.*, 2023; Luer & Thoerle, 2012; Pérez-Escobar *et al.*, 2022). However, deforestation, primarily driven by agricultural expansion, has diminished the natural habitat cover of Andean ecosystems. The remaining habitat exhibits signs of significant human intervention, with 78% of forest recovery being disrupted, arrested, or unsuccessful (Christmann *et al.*, 2023; Rodríguez Eraso *et al.*, 2013). This trend poses a threat to the rich diversity of many Andean orchid species (Parra-Sánchez *et al.*, 2016, 2023).

Restrepia Kunth (Orchidaceae: Pleurothallidinae) is one of the most taxonomically challenging genera due to high intra-specific variation within species (e.g., color patterns) and extremely uniform interspecific floral morphology. These factors complicate species circumscription and identification in both herbaria and living specimens (Luer, 1996). This taxonomic difficulty has persisted since the earliest collections of the genus in the late 18th and early 19th centuries (Gutiérrez

ORCID of the Author: ER, EPS, DPE
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Morales *et al.*, 2023; Luer, 1996). The genus currently comprises approximately 60 species, distributed from Mexico to the tropical Andes (Gutiérrez Morales *et al.*, 2023; Karremans *et al.*, 2023). It is monophyletic (Chumová *et al.*, 2021; Pérez-Escobar *et al.*, 2017) and can be recognized by its ramicauls, which are surrounded by imbricating, papery, distichous, laterally flattened sheaths, as well as the dorsal sepal and petals that are thickened at the apex by osmophores (Vogel, 1990). Additionally, the lip's hypochile features a pair of uncinate, capillary processes, a characteristic that is absent in *Restrepia aberrans* Luer, the sole member of the *Restrepia* subgen. *Ecmeles* Luer (Luer, 1996).

Phylogenetic studies place *Restrepia* within the *Restrepia* affinity clade (sensu Chumová *et al.*, 2021; Karremans, 2016), alongside related genera such as *Barbosella* Schltr., *Chamelophyton* Garay, *Dresslerella* Luer, *Echinosepala* Pridgeon & M.W.Chase, *Myoxanthus* Poepp. & Endl., *Pleurothallopsis* Porto & Brade, and *Restrepiella* Garay & Dunst. All these genera are characterized by exhibiting single-flowered co-florescences (Rojas-Alvarado & Karremans, 2024).

According to the IUCN criteria (2020), 75% (35 species) of assessed *Restrepia* species are threatened with global extinction due to deforestation and illegal collection (BGC, 2024; Calderón-Sáenz, 2007). This issue is exacerbated by the narrow endemism of many species, some of which are historically rare (e.g., *Restrepia chocoensis* Garay, *R. cuprea* Luer & R.Escobar, *R. chrysoglossa* Luer & R.Escobar, *R. howei* Luer). The Colombian Andes serve as the center of diversity for the genus, with 31 species, of which 19 are endemic to the country (Gutiérrez Morales *et al.*, 2023; Karremans *et al.*, 2023; Luer, 1996). However, less than 40% of the natural cover remains across the three cordilleras in Colombia (Rodríguez Eraso *et al.*, 2013), and the transformation of natural habitats further endangers the future of many orchid species (Ospina-Calderón *et al.*, 2023).

In this study, we describe and illustrate a newly discovered *Restrepia* species found during recent botanical explorations in the montane rainforests of the Department of Valle del Cauca, Colombia. This region has drawn the attention of botanists because it harbors a high level of plant species endemism, and several novel orchids from various genera have been documented in the area (e.g. Ortiz *et al.*, 2011; Reina-Rodríguez *et al.*, 2019, 2022). The new species, *R. restrepoi,* appears to be restricted to the western Andes of Colombia and is morphologically similar to the Valle del Cauca endemic *R. chrysoglossa.* Natural populations of this species have been identified in both highly fragmented and conserved forest patches. We provide a color illustration, a taxonomic description, a comparison with its morphologically similar species, and a distribution map.

Materials and methods. We sampled natural and human-modified habitats using a randomized design in the Departments of Valle del Cauca in Colombia. Following Parra-Sánchez *et al.* (2023), we established 50 sampling points in natural habitats (37 plots) and pastures (13 plots) across an 800 m elevational range (1800–2600 m, Tadono *et al.*, 2014). Natural habitats generally support native species and represent baseline ecosystems, serving as references for understanding ecological dynamics. In contrast, human-modified habitats often display altered species compositions, which can provide valuable insights into the effects of environmental change. After the conversion of natural habitats, about 80% of orchid species are lost, while driving 90% of orchid turnover, indicating that most orchid species are confined to pristine environments (Parra-Sánchez *et al.*, 2016, 2023). Each plot covered 300 m^2 (10 × 30 m), maintaining a minimum distance of 200 m apart, and we sampled all possible substrates up to 2 m in height (i.e., phorophytes, ground, fallen branches). In addition to the randomized plot sampling, we conducted over 56 hours of random walks to enhance our sampling effort. Plants were collected under collection permits issued by the Agencia Nacional de Licencias Ambientales (ANLA n. 791), and vouchers were preserved as dried and spirit specimens for future reference at Jardín Botánico de Bogotá (JBB *sensu* Thiers, 2024).

Field images were captured using a Canon ® T3i, equipped with a Canon 100 mm f/2.8 USM macro lens. Sketches of living and preserved specimens were digitized, and the images were utilized to create a draft composite plate in Adobe Photoshop® 2020. Living and preserved specimens were examined for morphological and taxonomic comparisons in accordance with the latest taxonomic treatment (Luer, 1996) and subsequent new species descriptions (e.g., Gutiérrez

Morales, 2023). Botanical terminology adhered to the standards set by Luer (1996), Gutiérrez Morales *et al.* (2023), and Rojas-Alvarado and Karremans (2024). Environmental variables were obtained from ClimateCharts.net (Zepner *et al.*, 2020) and the Holdridge life zones (Holdridge, 1987). Maps were produced using QGis 3.16 (QGIS 2021). Plant names and authors are based on standard databases (Epidendra, 2025; IPNI, 2025; Tropicos, 2025).

Taxonomic treatment

Restrepia restrepoi E.Restrepo & E.Parra ***sp. nov.*** (Fig. 1, 4A).

TYPE: COLOMBIA. Valle del Cauca: Yumbo, Dapa. Vía a los cultivos de Té, 2200 m, 15 December 2024 (fl.), *E.Restrepo & D. Edwards 319* (holotype JBB!).

Diagnosis: reminiscent of *Restrepia chrysoglossa* (Fig. 2, 4B) in plant shape, size and flower colors, but easily distinguished by its brown-spotted sheaths (*vs.* unspotted, except the lowermost, dotted with brown), the cleistogamous, non-spreading flowers (*vs.* non-cleistogamous, spreading), the oblong, attenuated, non-clavate dorsal sepal (*vs.* narrowly ovate-triangular, clavate) and its ovate lip, pyriform when expanded, 4.8 × 2.9 cm (*vs.* oblong-ovate, 9.00 × 4.25 cm).

Plant epiphytic, caespitose, erect to sub-erect, up to 35 cm tall; *roots* slender. *Ramicauls* erect, 12–24 cm long, enclosed by 5–10 thin, whitish, brown-spotted, papery, loose, imbricating, oblique, laterally compressed, acute sheaths, the uppermost prominent, elongate, acuminate, extended to near the middle of the pseudopeduncle, acuminate. *Leaf* erect, coriaceous, ovate-elliptical, 7.2–8.1 × 2.8–3.4 cm, the apex emarginate, with the mid vein extending beneath and ending in a short mucro, the base slightly cuneate to rounded, contracted into a twisted petiole *ca.* 3 mm long. *Inflorescence* with a reduced peduncle *ca.* 2 mm long, enclosed by a 3 mm long spathe, producing single-flowered coflorescenses in succession. *Pseudopeduncle* 3.2–3.6 cm long, glabrous, subtended by a 1.0–2.5 mm long bracts, 2–3 at a time; *floral bract* thin, tubular, 3 mm long, pedicel 1.5 mm long, the remnant of the axis a filament 1 mm long, free; *ovary* 2.63 mm long; *Flower* yellow, often cleistogamous, *sepals* membranous, glabrous, not wide-spreading, the *dorsal sepal* free, oblong, attenuated at the apex, slightly thickened near the apex, 7.5 × 2.1 mm, 5-veined, the *lateral sepals* connate to each other forming a synsepal, bifid at the apex when expanded, oblong, attenuated, 7.5 × 5.4 mm, 13-veined; *petals* membranous, translucent, suffused with yellow along the margins, with a notorious midvein discontinuously suffused with purple, narrowly linear triangular, the apex minimally clavate-thickened, 7 × 0.8 mm at the base; *lip* magenta-yellow, oblong and concave in natural position, pyriform when expanded, 4.8 × 2.2 mm in natural position, 2.9 mm wide across the lateral processes expanded, 3-veined, the epichile indistinctly demarcated from the hypochile, broadly triangular, concave, smooth, rounded at the apex, the hypochile subquadrate, concave, each side with a microscopic, capillary, uncinate process, the disc featureless, the base connected to the column-foot by a short, thick, cylindrical neck; *column* greenish-white, the basal half slender, clavate, the margins of the apical half irregular 4.92 mm long, the base pedestal-like. *Pollinia* and *anther cap* not seen. *Capsule* oblong, strongly ridged, about 7.9 cm long.

Eponymy: Named after Eugenio Restrepo Hoyos, Colombian entrepreneur and father of the first author, who has enormously supported him in all his passions and personal aims. This species is dedicated to him as an act of gratitude.

Discussion. The infrageneric placement of *Restrepia restrepoi* (Fig. 1, 4A) remains uncertain. According to Carl Luer´s infrageneric system (Luer, 1996), the new species displays diagnostic features from both *Restrepia* subgen. *Restrepia* and the monospecific *Restrepia* subgen. *Ecmeles*. The former includes most of the species and is characterized by elliptical to ovate, petiolate leaves; clavate dorsal sepals; lateral sepals without thickened apices; and a lip hypochile that features microscopic, capillary, uncinate processes on each side (also present in *Restrepia* subgen. *pachymeles*). The latter, *Restrepia* subgen. *Ecmeles*, is distinguished by the non-clavate dorsal sepals, free lateral sepals, and a lip with obtuse, marginal, lateral lobes on the hypochile (Luer, 1996).

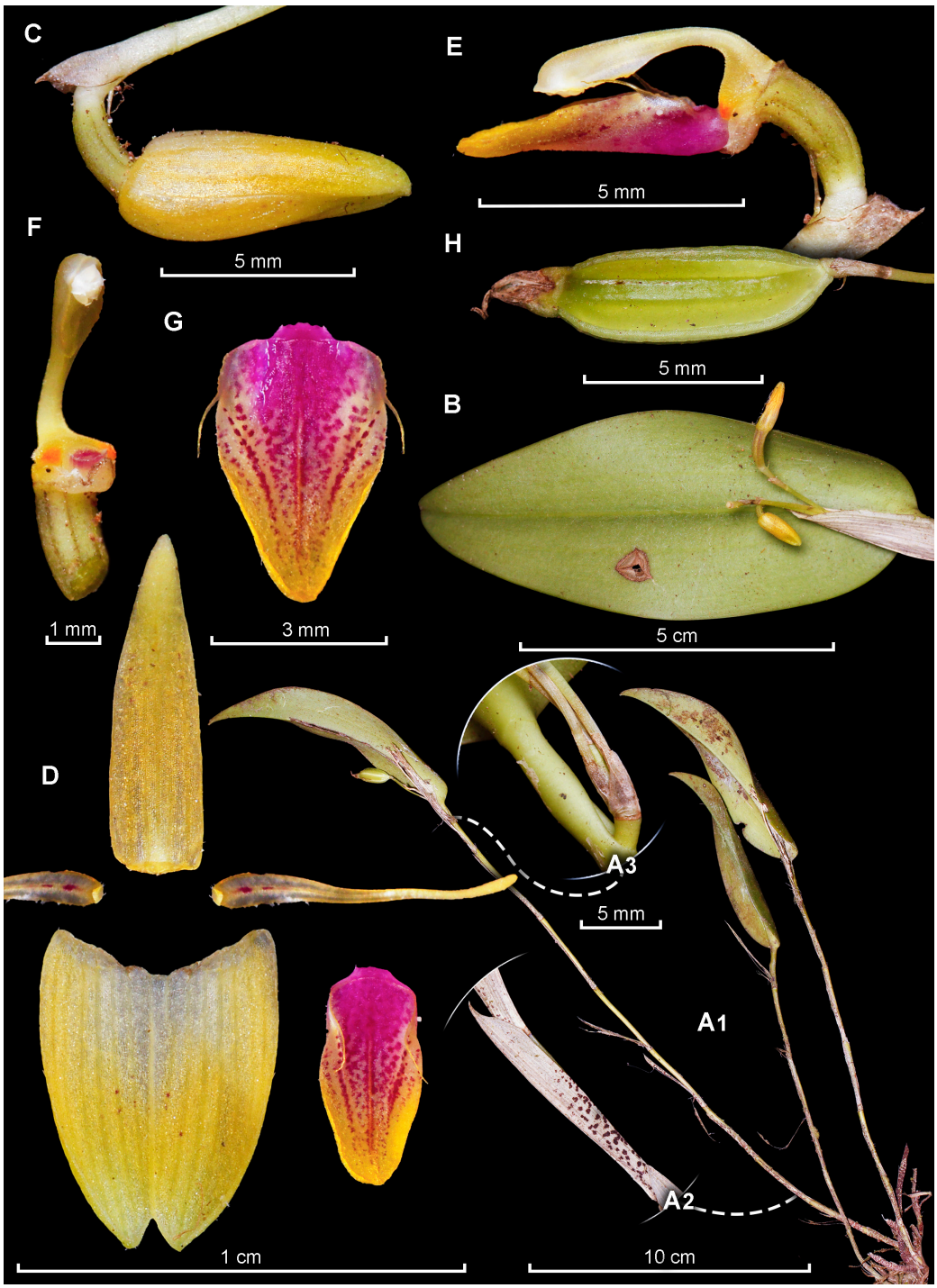

FIGURE 1. Dissection plate of *Restrepia restrepoi* E.Restrepo & E.Parra. **A1**. Plant habit. **A2**. Floral bract. **A3**. Close-up to the peduncle of the inflorescence bearing multiple single flowered co-florescences. **B**. Adaxial view of the leaf, showing the multiple inflorescences at a time. **C**. Mature bud, lateral view. **D**. Dissected perianth. **E**. Column plus lip, lateral view. **F**. Column, ¾ view. **G**. Expanded lip. **H**. Capsule, lateral view. Prepared by Eugenio Restrepo from the holotype.

However, free lateral sepals cannot be used to diagnose the subgenus itself, as they have proven inconsistent across populations of its only member, *R. aberrans* (Fernández *et al.*, 2014; Luer, 1996). Since the new species presents a non-clavate dorsal sepal, lateral sepals connate into a synsepal, and the typical uncinate, capillary processes on the lip hypochile, we believe this species should be classified as "*incertae sedis*" until further phylogenetic studies on the infrageneric relationships of the genus are conducted. Thus, the new species further provides evidence that groups within the genus need to be reconsidered.

Restrepia restrepoi (Fig. 1, 4A) can be distinguished from other species in the genus by its ramicauls, which are enclosed by dark-spotted sheaths, entirely light yellow, unspotted cleistogamous flowers, the oblong, non-clavate dorsal sepal that is attenuated and slightly thickened at the apex, the 13-veined synsepal, and its lip, which is intense rose at the base and pyriform when expanded, featuring basal, capillary, uncinate processes.

The species that are morphologically most similar to *R. restrepoi* are *R. chrysoglossa* (Fig. 2, 4B) and *R. flosculata* Luer (Fig. 3, 4C). Both are yellow-flowered species from the Western Colombian Andes in Valle del Cauca's department. The former is known only from its type locality and is endemic to the department, while the latter, which is also found in northwestern Ecuador, exhibits various color forms across populations, ranging from purple-dotted or striped to entirely yellow (as shown in Fig. 3; Luer, 1996). All three species exhibit similar overall plant size, short pseudopedunculate coflorescences, and almost entirely yellow flowers.

As discussed in the diagnosis, *R. restrepoi* is distinguished from *R. chrysoglossa*, by its brown-spotted sheaths (*vs.* unspotted, except for the lowermost, dotted with brown), the cleistogamous, non-spreading flowers (*vs.* non-cleistogamous, spreading), the oblong, attenuated, non-clavate dorsal sepal (*vs.* narrowly ovate-triangular, clavate) and its ovate lip, pyriform when expanded, 4.8 × 2.9 (*vs.* oblong-ovate, 9.0 × 4.25 cm). In addition to those characteristics, the new species exhibits shorter sepals, *ca.* 7.5 mm long (*vs.* up to 20 mm long), and unstripped synsepal (*vs.* striped with red below the middle).

The new species can be easily distinguished from *Restrepia flosculata* by its brown-spotted sheaths all along the ramicaul (*vs.* the lowermost brown spotted), the uppermost sheath elongate, acuminate (*vs.* oblique, acute), the cleistogamous, non-spreading flowers (*vs.* non-cleistogamous, spreading), the shorter sepals, *ca.* 7.5 mm long (*vs.* to 14 mm long), the oblong, attenauted, non-clavate dorsal sepal (*vs.* narrowly triangular below the middle, attenuate above, clavate), straight petals (*vs.* decurved), and attenuated lip, pyriform when expanded, with rounded apex, 4.8 × 2.9 (*vs.* broadly oblong lip with retuse apex, 7 × 3.75 cm).

Finally, the new species resembles *R. aberrans* (Fig. 4D), which is restricted to Costa Rica and Panama. Both species show autogamous plants with non-clavate dorsal sepals, but the new species presents larger ramicauls, 12.3–23.4 cm long (*vs.* 7.5–11.5 cm long), enclosed by brown-spotted sheaths (*vs.* 1.5–3.5 cm long, unspotted sheaths), lateral sepals connate to each other forming a synsepal, bifid at the apex when expanded, oblong, attenuate, 7.5 × 5.4 mm, 6–7 veined each (*vs.* often free or slightly adherent, oblique, oblong-acute, 10.0 × 1.5 mm, 5-veined each) and the lip shape and dimensions, pyriform when expanded, 4.8 × 2.9 mm, rounded at the apex, the hypochile with two lateral, capillary, uncinate processes (*vs.* oblong-trilobed when expanded, 3.0 × 2.0 mm; the hypochile with two lateral, oblique, erect lobes, and two inner erect blades). The differences among the new species and its morphological affinities are shown in Table 1.

Habitat and ecology: The remaining forests on the eastern flank of Colombia's western cordillera are often highly fragmented, primarily due to extensive conversion of forested areas to pastures (Rodríguez Eraso *et al.*, 2013). *Restrepia restrepoi* is exclusively known from three localities located 9.2 km apart (Fig. 5). Individuals grow epiphytically on branches of tree canopies and young trees, near roads or trails (Fig. 6), alongside other *Restrepia* species (*R. brachypus* Rchb.f.) and several members of the Orchidaceae family, including *Dracula chimaera* (Rchb.f.) Luer, *Dichaea andina* Alomía & Sambin, *Lepanthes trimerinx* Luer, *L. sanjuanensis* Bogarín & Karremans, *L. stellaris* Luer & Hirtz, and *Telipogon mayoi* Reina-Rodr. & C.Martel, among others.

Flowering has been observed in the wild from February to May (Haelterman, pers comm.). Several indi-

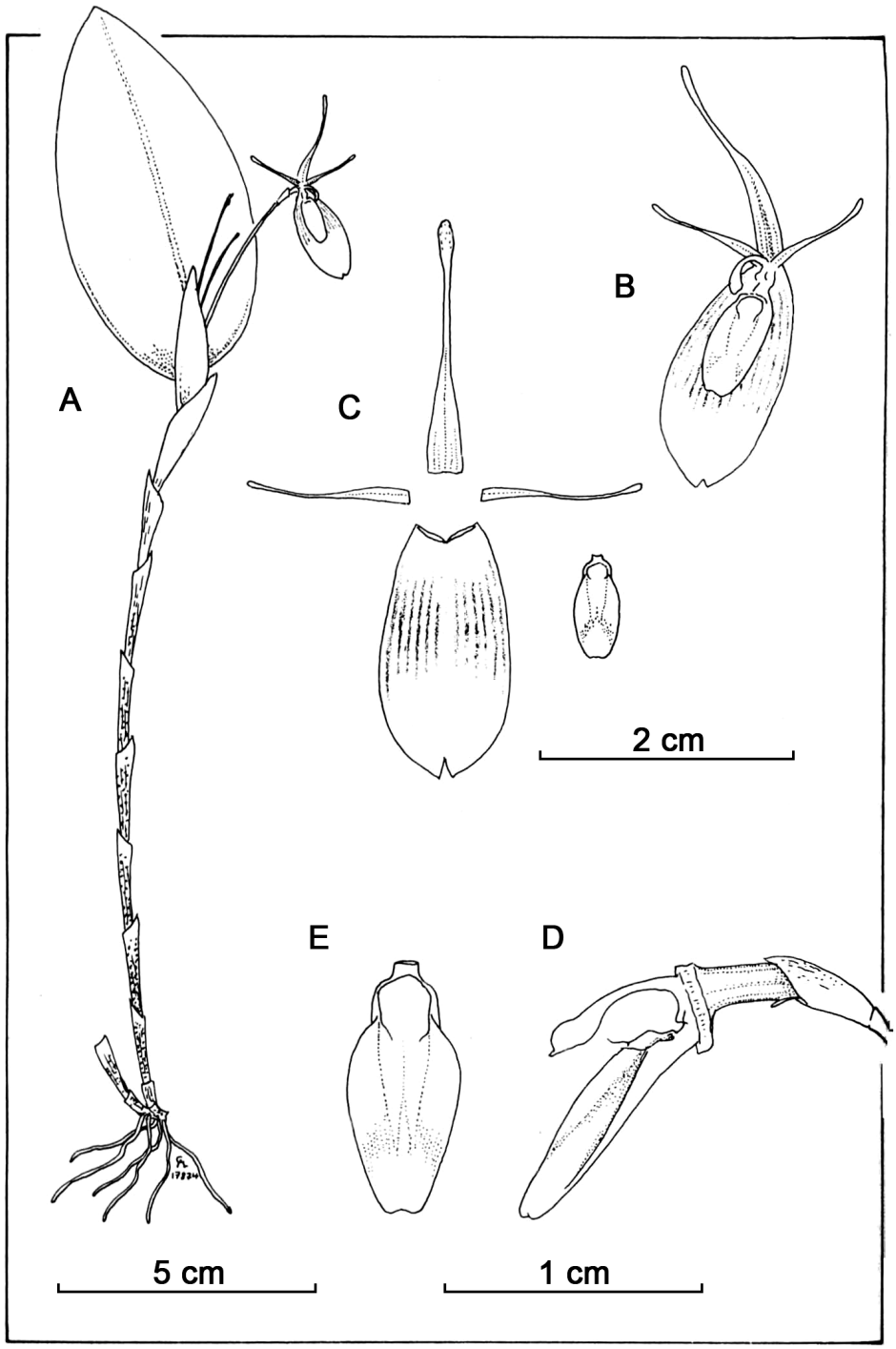

FIGURE 2. Type illustration of *Restrepia chrysoglossa* Luer & R.Escobar. **A**. Plant habit. **B**. Flower, ¾ view. **C**. Dissected perianth. **D**. Column and lip, lateral view. **E**. Lip, frontal view. Illustration by Carlyle A. Luer, featured in the Monographs in Systematic Botany from the Missouri Botanical Garden, Vol. 59, p. 43, Plate 10 (Luer, 1996). Reproduced with permission from the Missouri Botanical Garden Press.

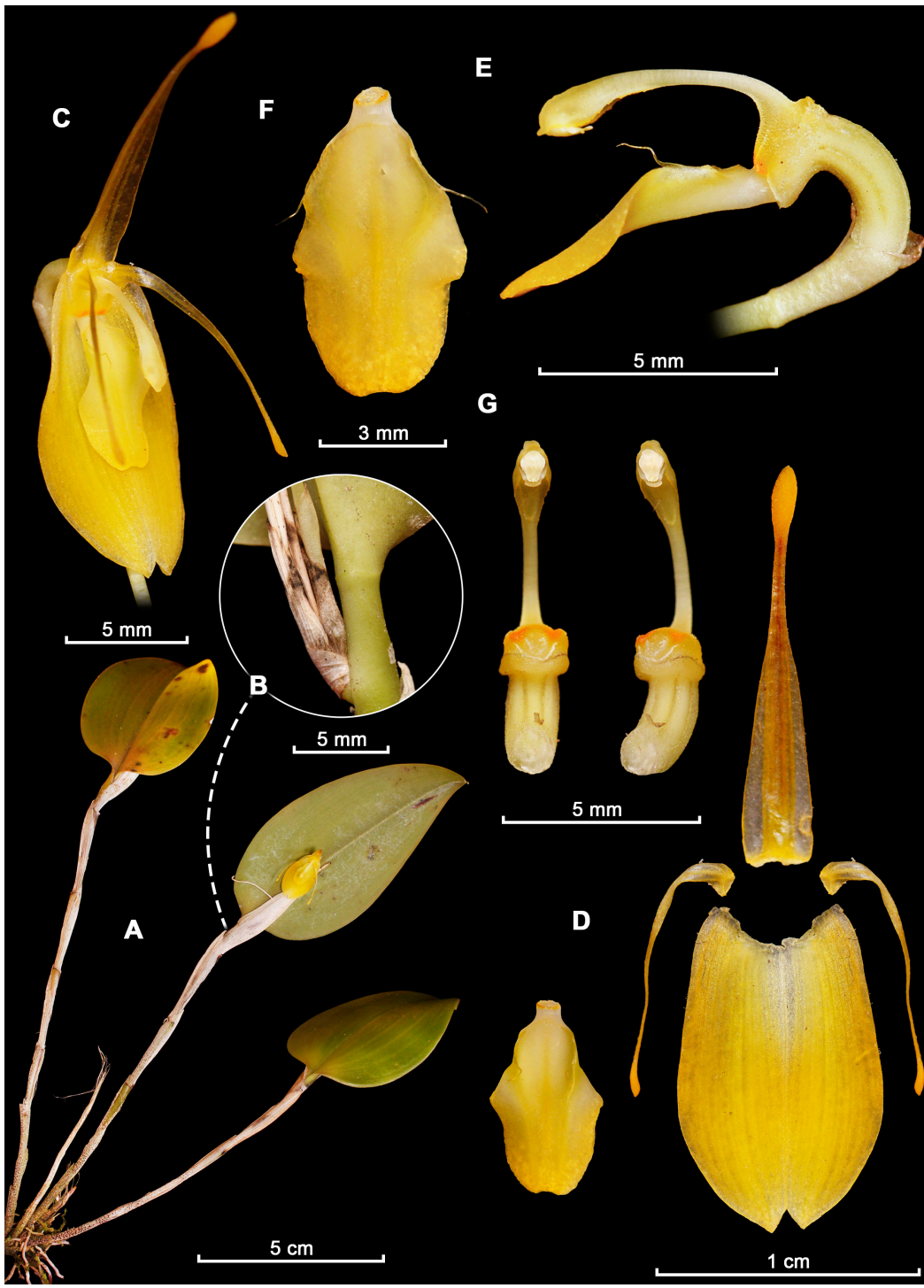

Figure 3. Dissection plate of *Restrepia flosculata* f. *xanthina.* **A**. Plant habit. **B**. Close-up to the peduncle of the inflorescence bearing multiple single flowered coflorescences. **C**. Flower, **¾ view**. **D**. Dissected perianth. **E**. Column and lip, lateral view. **F**. Expanded lip. **G**. Column, ventral and ¾ views. Prepared by Eugenio Restrepo.

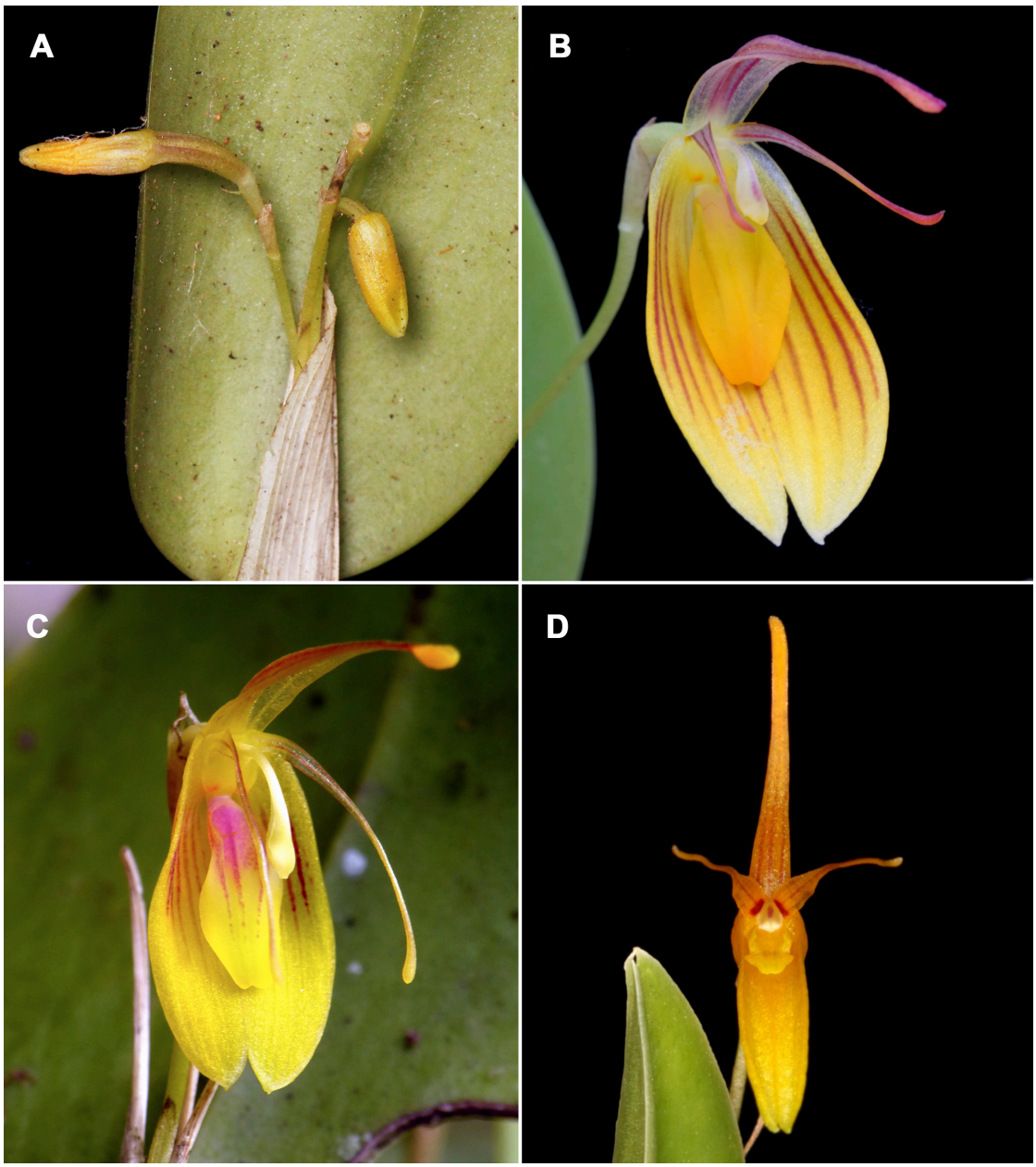

FIGURE 4. Species comparison. **A**. *Restrepia restrepoi* E.Restrepo & E.Parra. **B**. *R. chrysoglossa* Luer. **C**. *R. flosculata* Luer, type form. **D**. *R. aberrans* Luer. Photographs by Eugenio Restrepo (A), Wiel Driessen (B, D), and Andreas Kay (C).

viduals were found with capsules at different stages of development from flowers, leading us to hypothesize, *a priori*, that this species may be autogamous. However, further field observations and experimental treatments are needed to better understand its pollination syndrome and ecological interactions.

CONSERVATION STATUS: The species may be classified as Data Deficient (DD) according to IUCN criteria (IUCN, 2020). However, our data suggests that conservation actions are necessary for the populations. The species is currently known from three sites that are located 9.2 km apart within a narrow elevation-

TABLE 1. Comparison among *Restrepia restrepoi* E.Restrepo & E.Parra and its closest morphological affinities.

Traits	*R. aberrans*	*R. chrysoglossa*	*R. flosculata*	*R. restrepoi*
Distributional and abiotic conditions				
Distributional range	Atlantic basin, premontane wet forest	Cauca river basin, montane wet forest	Cauca river basin, premontane rain forest	Cauca river basin, Montane rain forest
Habitat	Primary cloud forest	Secondary cloud forest	Primary cloud forest	Primary and secondary cloud forest
Elevation range (m a.s.l.)	350–790	2164	2122	1910–2100
Mean annual rainfall (mm)	3040	2934.5	1682.3	1900–2100
Annual mean temperature (°C)	23	23.7	21	15–17
Morphological and phenological conditions				
Ramicauls length (cm)	1.5–3.5	9–20	15–20	12.3–23.4
Leaf blade size (cm)	6.0–8.0 × 3.0–4.0	6–8 × 3–4	8–10 × 3.5–4.5	7.9–8.1 × 3.2–3.4
Lateral sepals	5-veined	6-veined	7–8-veined	6–7-veined
Dorsal sepal	Narrowly linear-triangular	Narrowly ovate-triangular, clavate, thickened at the apex	Narrowly ovate-triangular, clavate, thickened at the apex	Oblong, attenuated, slightly thickened at the apex
Dorsal sepal lenght (mm)	10	20	14	7.5
Lip shape (expanded)	Oblong-trilobed	Oblong-ovate	Oblong	Ovate, Pyriform
Expanded lip dimensions (mm)	3.0 × 2.0	9.00 × 4.25	7.00 × 3.75	4.8 × 2.9
Lip hypochile	Broadly concave above the subtruncate base, bearing two lateral, oblique, erect lobes, and two inner, erect blades	Subquadrate, concave, with a microscopic, capillary, uncinate processes	Rounded, concave with thin, erect margins, each side with a capillary, uncinate process	Subquadrate, concave, with a microscopic, capillary, uncinate processes
Lip epichile (mm)	Oblong, 3-veined, rounded at the apex	Ovate, thickened, smooth, subtruncate	Oblong, smooth, the apex subtruncate-retuse	Broadly triangular, concave, smooth, rounded at the apex

al band (between 1900 and 2200 m in elevation). We encountered only four mature individuals and two juveniles, which indicates a small population size. Additionally, no individuals were found in 50 randomized sampling plots, despite significant sampling efforts involving two experienced orchidologists working eight hours a day for nine days near the type locality of *R. restrepoi*. Therefore, we will refrain from collecting any more individuals until further populations are discovered. The species inhabits a fragmented landscape where population dynamics are disrupted (Ospina-Calderón *et al.*, 2023), and natural forests experience edge effects that may reduce habitat availability (Parra Sánchez *et al.*, 2016).

Our study provides evidence that the species is geographically rare, characterized by a small population size and highly specialized habitat requirements (Rabinowitz, 1981). Two key conservation actions are necessary. First, additional field surveys should be conducted to search for the species in adjacent areas, potentially expanding its known range. Second, the

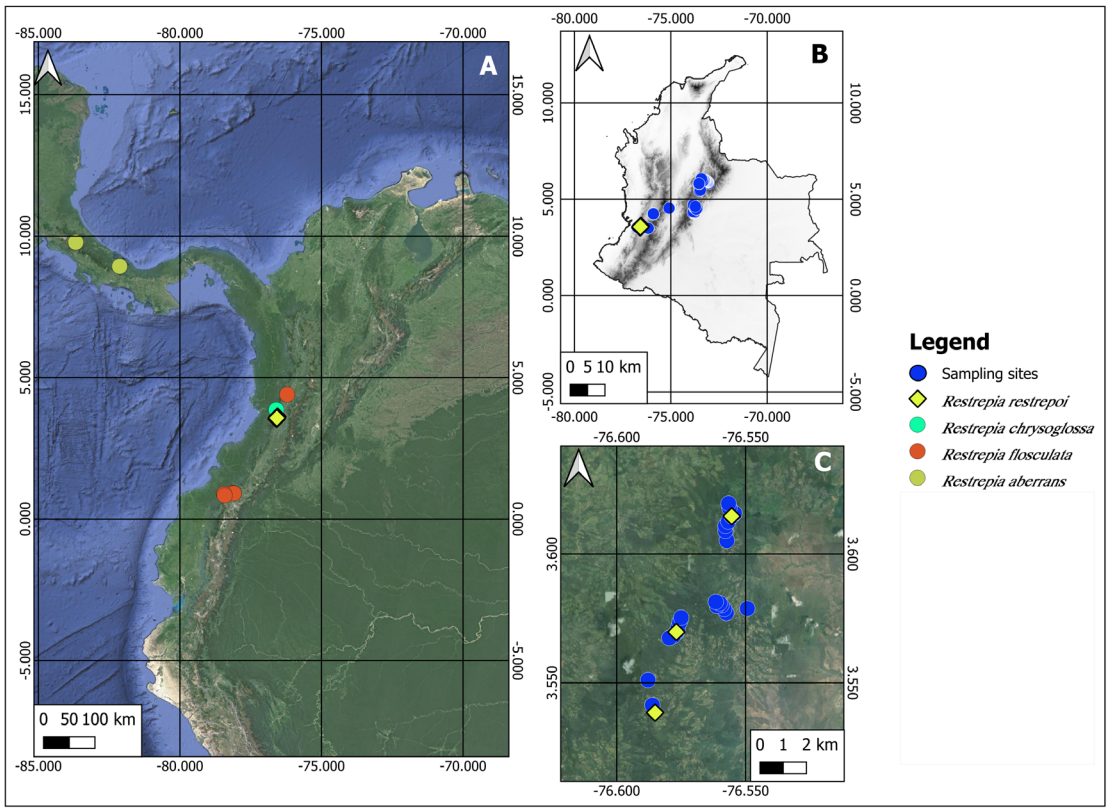

FIGURE 5. Distribution map of *Restrepia restrepoi* E.Restrepo & E.Parra, related species, and the study area in the Western, Central and Eastern Cordilleras of the Colombian Andes. **A**. Distribution of *R. restrepoi* E.Restrepo & E.Parra. (yellow triangles), *R. chrysoglossa* Luer & R.Escobar (cyan dots), *R. flosculata* Luer (red dots), and *R. aberrans* Luer (green dots). **B**. Study area within Colombia (black silhouette), along with sampling plots (blue dots) and elevation data (digital elevation model from Tadono *et al.*, 2014). **C**. Landscape across sampling sites and the localities where *R. restrepoi* was found. Map created by Edicson Parra using QGIS 3.24.1.

protection of the species' habitat and surrounding forests must be prioritized to ensure habitat conservation. This approach would likely facilitate seed dispersal from existing mother plants and promote the regeneration of more extensive secondary forest areas within the species' distribution.

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AUTHOR CONTRIBUTIONS. ER: Writing – original draft, review and editing; taxonomic treatment; discussion; taxonomic comments; visualization and design of figures; and fieldwork. EPS: Writing – original draft, review and editing; visualization; GIS software usage; sampling methodology; data curation; conceptualization; and fieldwork. DPE: Conceptualization; writing – review and editing; supervision; resources; funding acquisition; and fieldwork.

PERMITS. Plants were collected under collection permits issued by the Agencia Nacional de Licencias Ambientales (ANLA n. 791).

Figure 6. Mature and juvenile plants of *Restrepia restrepoi* E.Restrepo & E.Parra growing *in situ*. **A**. Mature plant growing on medium-sized branches of a fallen tree. **B**. A juvenile plant growing on thin branches. **C**. Mature individual seen from the underside, along with other *Lepanthes* spp. Photographs by Eugenio Restrepo (A, B) and David Edwards (C). Prepared by Eugenio Restrepo.

Conflict of interest. The authors declare no competing financial interests or personal relationships that could have influenced the work presented in this paper.

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