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Taxonomic and nomenclatural novelties in the Neotropical genus *Schnella* section *Caulotretus* (Leguminosae: Cercidoideae)

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Abstract

Schnella isiboro, a new species from the Amazon rainforest is described and illustrated. Information on its distribution, conservation status, and relationships with morphologically similar species is also provided. *Schnella isiboro* is characterized by its bilobed leaf blade 6–12 × 5–10.5 cm, rounded to orbicular and concave bracts, ovate-lanceolate bracteoles, and pink petals 22–28 × 4–9 mm. Additionally, based on a unique combination of macromorphological and palynological evidence, we propose *S. klugii* as a synonym of *S. herrerae*, and designate a new lectotype.

Key words: Amazon rainforest, Bolivia, Fabaceae, Lianas, Neotropical Flora, Peru

Resumen

Schnella isiboro, una nueva especie de la Amazonia es descrita e ilustrada. Se proporciona información sobre su distribución, estado de conservación y relaciones con especies morfológicamente similares. *Schnella isiboro* se caracteriza por presentar láminas foliares bilobadas de 6–12 × 5–10.5 cm, brácteas cóncavas, redondas a orbiculares, bractéolas ovado-lanceoladas, y pétalos rosados de 22–28 × 4–9 mm. Adicionalmente, con base en evidencias macromorfológicas y palinológicas exclusivas, proponemos *S. klugii* como sinónimo de *S. herrerae*, y designamos un nuevo lectotipo.

Palabras clave: Bolivia, Fabaceae, Flora Neotropical, Lianas, Perú, Selva Amazónica

Introduction

Schnella Raddi (1820: 32) is a genus within Leguminosae, subfamily Cercidoideae, comprising approximately 50 species distributed across the Neotropics. Species of this genus are lianas characterized by the presence of tendrils and flowers with ten fertile stamens. However, the exact number of species remains uncertain due to differing taxonomic opinions regarding species delimitation, the recognition of infraspecific taxa, and the lack of an updated taxonomic treatment focused on the genus (Wunderlin 2010a, Trethowan *et al*. 2015, Casas-Restrepo *et al*. 2023).

Schnella has a complex taxonomic history, with its circumscription revised multiple times. For much of the period following its description, its species were placed within the genus *Bauhinia* L. (1753: 374) (Bentham 1865, Wunderlin *et al*. 1987). However, preliminary phylogenetic analysis by Hao *et al*. (2003) suggested that the lianescent species of *Bauhinia* formed a distinct clade separate from the tree and shrub lineages. This finding led certain taxonomists

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to propose the inclusion of *Schnella* species within a broadly circumscribed genus *Phanera* Lour. (1790: 37) (Lewis & Forest 2005, Queiroz 2006, Vaz 2010). More recently, a more comprehensive phylogenetic study with extensive sampling of *Bauhinia* s.l. provided support for the reestablishment of *Schnella* as a distinct genus (Sinou *et al*. 2009), encompassing species previously assigned to *Bauhinia* sect. *Schnella* (Raddi) Benth. and *B.* sect. *Caulotretus* DC. (1825: 516).

Currently, *Schnella* is confined to the Neotropical region, whereas *Phanera* occurs in tropical areas of Asia and Australia. Based on the findings of Sinou *et al*. (2009), Wunderlin (2010a, 2010b) recognized *Schnella* as a distinct genus, including two sections: *S.* sect. *Schnella* (c. 10 species) and *S.* sect. *Caulotretus* (DC.) Wunderlin (c. 40 species) (2010b: 2), reflecting a classification similar to that previously adopted under *Bauhinia* (Wunderlin *et al*. 1987). These sections are readily distinguishable based on floral, fruit, and pollen morphology. Species of *S.* sect. *Schnella* exhibit a calyx irregularly bilobed with inconspicuous venation, actinomorphic flowers, indehiscent fruits with thin valves, and pollen grains bearing supratectal elements (Wunderlin 2009, Casas-Restrepo *et al*. 2023). In contrast, *S.* sect. *Caulotretus*, is characterized by a 5-lobed calyx, conspicuously 5–15-veined or winged, zygomorphic flowers resulting from the reduction of the median (upper) petal, dehiscent fruits with woody valves, and pollen grains lacking supratectal elements (Wunderlin 2010a, Trethowan *et al*. 2015, Casas-Restrepo *et al*. 2024).

Schnella is distributed from southern Mexico to northern Argentina, with the greatest diversity concentrated in the Amazon rainforest (Trethowan *et al*. 2015). Although several species have been widely collected, particularly in the Brazilian Amazon, certain species complexes remain underrepresented in collections. This is largely due to their occurrence in remote or inaccessible areas, the difficulty of obtaining flowering material from the forest canopy, and the limited botanical exploration in understudied regions. As a result, potentially new taxa are often overlooked, collected without reproductive structures, or represented by few or unique collections.

As part of an ongoing taxonomic revision of *Schnella* sect. *Caulotretus*, this study describes a new species from the Bolivian and Peruvian Amazon rainforest and proposes one new synonymization. A detailed morphological description is provided, along with color photographic plates, line drawings highlighting key diagnostic features, comparisons with morphologically similar species, and distribution data.

Materials and methods

For the preparation of the species descriptions, plant organs were measured using digital calipers from specimens in the following herbaria: BM, BOLV, COL, HUA, HUEFS, MBM, K, P, and RB, as well as from virtual collections of MEXU, MO, NY, U, and US (acronyms follow Thiers 2026 [continuously updated]). Protologues available through the Biodiversity Heritage Library (BHL; https://www.biodiversitylibrary.org/) and images of type specimens from material housed in herbaria BAB, BKL, F, G, GH, HBG, K, NY, PH, and US accessed via JSTOR PLANTS (http://plants.jstor.org) were also examined. Terminology for the species descriptions follows Beentje (2016).

The species delimitation and circumscription were based primarily on the morphological species concept, defined as groups of organisms sharing similar morphological features (Du Rietz 1930, Bisby & Coddington 1995, de Queiroz 2007). A preliminary conservation assessment was conducted following IUCN (2024) criteria, with extent of occurrence (EOO) and area of occupancy (AOO) calculated using GeoCat (http://geocat.kew.org) (Bachman *et al*. 2011).

Results and discussion

1. ***Schnella isiboro*** Casas-Restrepo & Fonseca-Cortés ***sp. nov.***

Schnella isiboro morphologically resembles *S. uleana* (Harms) Wunderlin and *S. vulpina* (Rusby) Trethowan & R.Clark by sharing bilobed leaves and flowers with pink petals. However, it differs from *S. uleana* by exhibiting rounded to orbicular and concave bracts, ovate-lanceolate bracteoles (vs. lineal-lanceolate bracts and bracteoles) and petals 22–28 mm long (vs. petals 13–15 mm long), and from *S. vulpina* by exhibiting branches and floral buds with sericeous indumentum, calyx with 5 lobes equally distributed, lanceolate upper petal, larger petals 22–28 mm long, and style 2.5–3 mm long (vs. branches and floral buds with hirsute indumentum, calyx with lobes closely clustered in two groups, cymbiform and reflexed upper petal, smaller petals up to 13 mm long, and style up to 1 mm long).

Type:—BOLIVIA: Cochabamba: Provincia Chapare. Territorio indígena y Parque Nacional Isiboro–Sécure, Community of El Carmen de la Nueva Esperanza, 230 m elev., 16°23’00.0”S 65°57’00.0”W, 26 May 2005, (fl), *E. Thomas & R. Berdeja 1786* (holotype RB barcode RB00515939!, isotype BOLV30143!).

Figs 1–4

Liana with tendrils; young branches terete; indumentum sericeous ferrugineous on young branches, tendrils, petiole, inflorescence, pedicels, bracts, bracteoles, calyx lobes, and ovary, caducous, organs becoming glabrescent to glabrous. **Stipules** not seen, caducous. **Petiole** 3.5–6 cm long; basal pulvinus 3–5 mm long; apical pulvinule 4–6 mm long; **leaf** blade 6–12 × 5.5–10.5 cm, ovate-cordate, bilobed, lobes 1/4–1/5 of the leaf length, ovate-lanceolate, coriaceous, acrodromous, main veins 9–11, sunken on the upper surface, prominent on the lower surface, secondary veins perpendicular to the primary veins, reticulate on both surfaces, tertiary veins intricately reticulate, leaf base subcordate to cordate, apex of the lobes acuminate, upper surface and lower surface glabrous. **Racemes** 9–13 cm long, axillary or terminal; peduncle 4–7 cm long; bracts 10–9 × 9–8 mm, foliaceous, rounded to orbicular, concave, glabrous or slightly glabrescent on the apex and margins, persistent, bracteoles 9–8 × 4–5 mm, foliaceous, ovate-lanceolate, glabrous or slightly glabrescent on the apex and margins, persistent; pedicel 4–6 mm long. **Flower buds** 9–12 × 3–5 mm, elliptic, conspicuously 15-veined, apex truncate, bearing 5 apical lobes. **Flowers** 2.5–3.5 cm long; **hypanthium** up to 2 mm long; **calyx** 6–7 × 6–7 mm, campanulate, tube 4–5 mm long, lobes 5, 2–4 mm long, triangular, sericeous ferrugineous; **petals** 5, 22–28 × 4–9 mm, pink-colored, heteromorphic, the median petal lanceolate 22–24 × 4–5 mm, claw 5–6 mm long; the lateral and inferior petals obovate, 22–28 × 7–9 mm, claw 8–9 mm long, venation brochidodromous, with 4–7 pairs of secondary veins, the petals blade surface externally sericeous ferrugineous, internally glabrous, the claw villous internally and externally; **stamens** 10, free, unequal in length, the antisepalous larger, 5–8 mm long, filaments 4–7 mm long, glabrous; anthers 0.5–1 × 0.5–0.8 mm, oblong, glabrous; **ovary** 2–2.5 × 0.7–1 mm, ovoid, the stipe up to 1 mm long, sericeous ferrugineous, style 2.5–3 mm long, oblong, glabrous; stigma oblique. **Fruit** and **seeds** not seen.

Distribution and habitat:—*Schnella isiboro* occurs in well-preserved riparian forests of the Amazon rainforest, in a transitional zone between the Andean foothills and the Amazon Basin. In Bolivia, it is recorded in Isiboro-Sécure National Park and Indigenous Territory, near the confluence of the Moleto and Ichoa rivers. It is also known from the Peruvian Amazon, within the Los Amigos Conservation Concession, near the biological station. However, due to the limited number of collections, detailed information on its habitat and biology remains limited. Additional field collections are therefore necessary to better assess its geographic range and ecological preferences.

Phenology:—It flowers in May and August. Data about fructification is not known.

Conservation status:—*Schnella isiboro* is known from two localities in Bolivia and Peru, and under these conditions both its Area of Occupancy (AOO) and Extent of Occurrence (EOO) are estimated at 8 km², falling below the thresholds for Critically Endangered (CR) under criteria B1 and B2. Nevertheless, it is important to highlight that although the AOO value was obtained as a consequence of the default cell size implemented in the software GeoCAT, the EOO value represents only a partial estimate of the actual distribution range. This is because EOO calculations require at least three occurrence points to generate a reliable estimate and, consequently, to support the assignment of a threatened category.

Although both known specimens occur in localities within protected areas, there is clear evidence of environmental decline in the surrounding regions due to various anthropogenic activities, including small-scale agriculture, logging, illegal mining, and forest clearing for road construction. These impacts have even contributed to a well-known socio-environmental conflict within the TIPNIS region in recent years (Delgado 2017).

Moreover, the apparently highly restricted distribution of this species suggests a potential vulnerability to stochastic events, although there is currently no clear evidence of continuing decline. However, if future research confirms such a decline, the species may qualify as Critically Endangered (CR) under criterion B. Conversely, if additional collections reveal a continuous distribution between the two known localities, the species could instead be assessed as Least Concern (LC). It is also possible that the species is more widely distributed than currently documented, potentially occurring throughout the Western Amazon region (Fonseca-Cortés *et al*. in press). Given that the present uncertainty encompasses the full spectrum of threat categories, we maintain its classification as Data Deficient (DD) in accordance to the IUCN criteria (2024).

Etymology:—The specific epithet refers to the Isiboro-Sécure National Park and Indigenous Territory (TIPNIS), a well-preserved region of high biodiversity in Bolivia where the type specimen was collected. Furthermore, this species reinforces the need to conserve the rich biodiversity of the Amazon rainforest and underscores the crucial role of protected areas in safeguarding and advancing knowledge of Neotropical diversity.

FIGURE 1. Holotype of *Schnella isiboro* Casas-Restrepo & Fonseca-Cortés (Barcode RB00515939). Red arrow pointed out the distinctive rounded to orbicular and concave bracts.

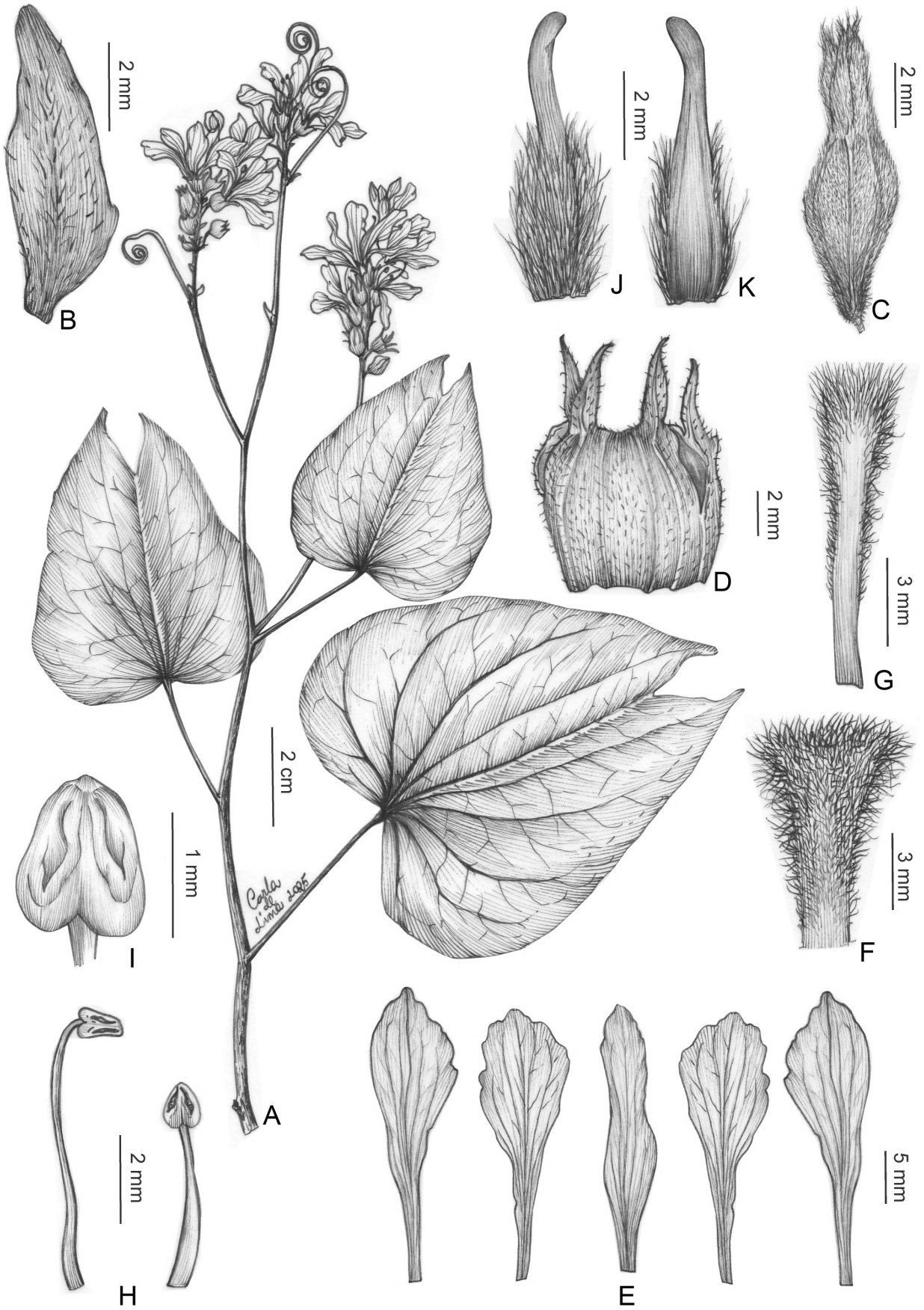

FIGURE 2. Illustration of *Schnella isiboro* Casas-Restrepo & Fonseca-Cortés. A: Flowered Branch; B: Bracteole; C: Floral bud; D: Calyx; E: Petals; F: Indumentum of superior petal claw; G: Indumentum of lateral and inferior petals claw; H: Stamens; I. Anther; J: Gynoecium; K: Detail of the ovary. Illustration: Carla Teixeira de Lima.

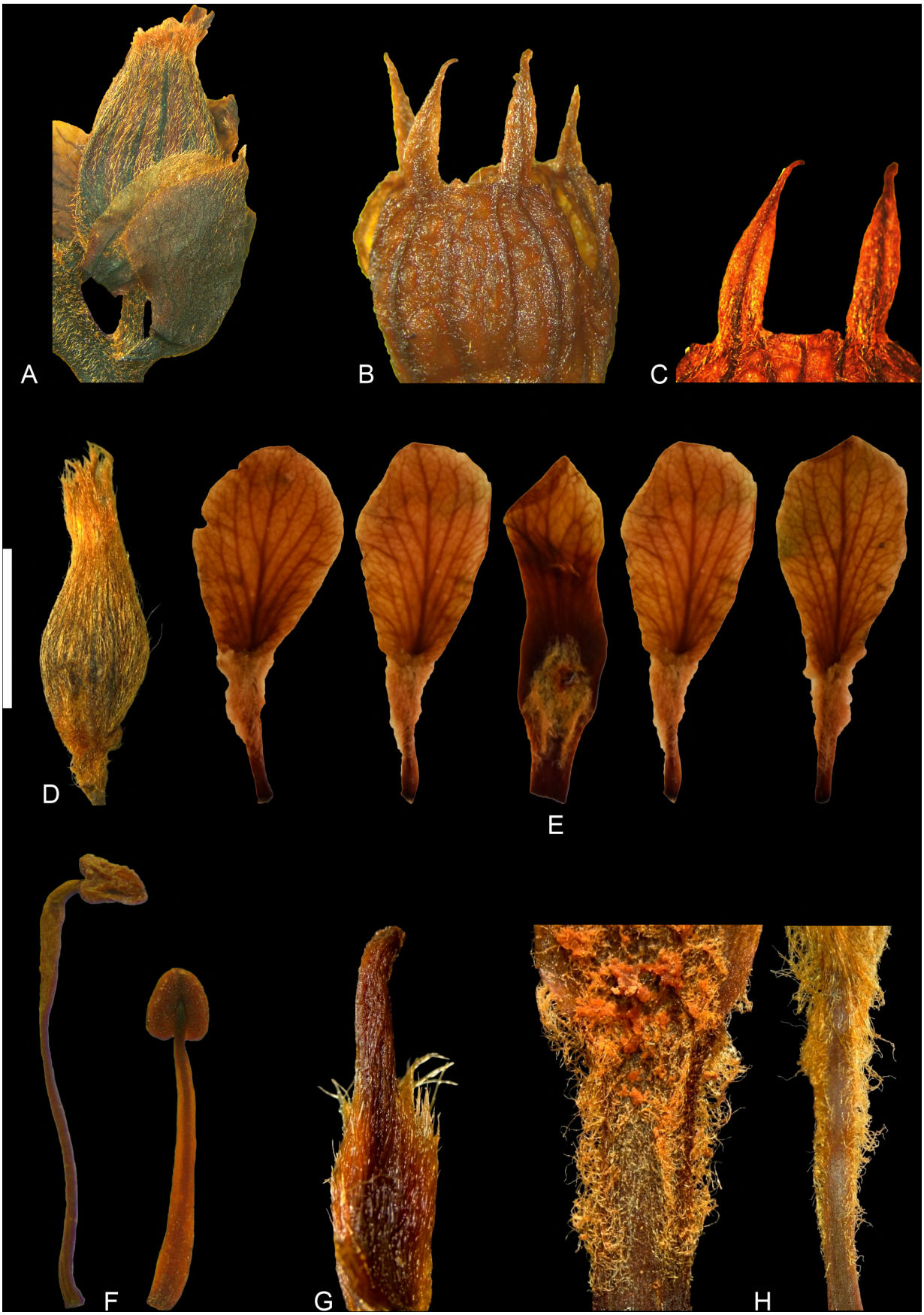

FIGURE 3. *Schnella isiboro* Casas-Restrepo & Fonseca-Cortés. A. Detail of the concave bract covering a bud and bracteole; B. Calyx; C. Detail of calyx lobes; D Floral bud; E. Petals; F. Stamens; G. Gynoecium; H. Detail of claw indumentum; Scales: A–B: 5.0 mm; C: 4.0 mm; D: 5.0 mm; E: 1.0 cm; F: 2.5 mm; G–H: 3.0 mm. Photographs and figure preparation: Luis Casas-Restrepo.

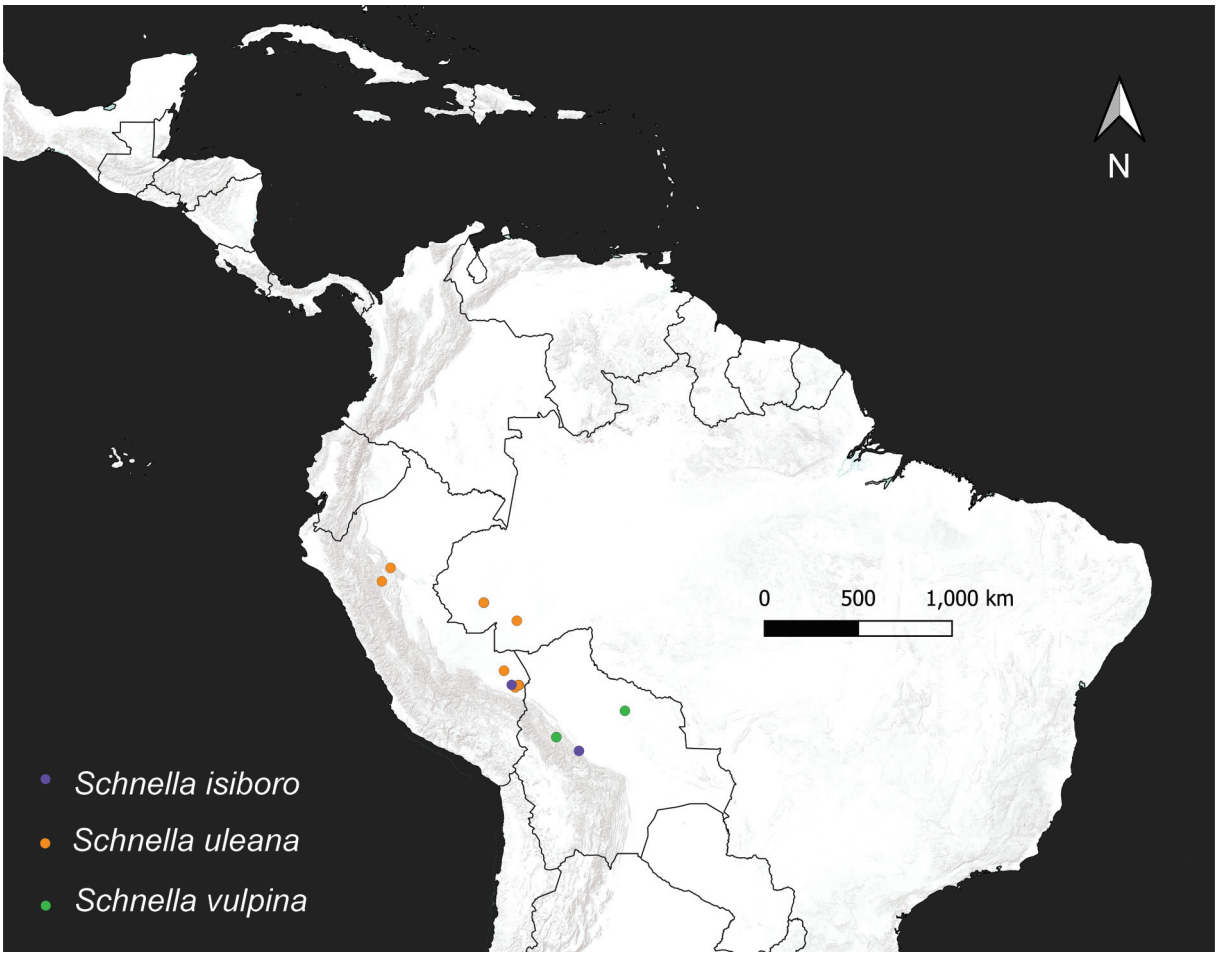

FIGURE 4. Distribution map of *Schnella isiboro* Casas-Restrepo & Fonseca-Cortés and similar species. Elaboration: Andrés Fonseca-Cortés.

Notes:—*Schnella isiboro* belongs to *S.* sect. *Caulotretus*. Morphological traits such as a conspicuously 15–veined calyx, a reduced upper petal, and pollen grain lacking supratectal processes (pers. obs.) clearly place this species within this section. Nevertheless, additional collections are needed to improve our understanding of fruit and seed morphology, along with population ecology and phenology.

Among the species of *S.* sect. *Caulotretus* with pink petals, *S. isiboro* may be confused with *S. uleana* and *S. vulpina*. However, as previously noted in the diagnosis, *S. isiboro* differs from *S. uleana* by having rounded to orbicular and concave bracts, ovate-lanceolate bracteoles, and petals 22–28 mm long, while it differs from *S. vulpina* by having branches and floral buds with sericeous indumentum, a calyx with five evenly distributed lobes, lanceolate upper petal, larger petals 22-28 mm long, and the style 2.5–3 mm long (Fig. 4).

Additionally, although *S. pterocalyx* (Ducke) Wunderlin is also distinguishable within the section *Caulotretus* by having pink petals, it is considerably less similar to *S. isiboro*, differing in having bilobed to entire leaves with a deeply cordate to auriculate base, linear bracts and bracteoles, urceolate 10-winged calyx with oblong and reflexed lobes, and larger flowers (5.5–8 cm long).

Finally, *Schnella isiboro* may also be confused with other species occurring in the Amazonian rainforests, such as some specimens of *S. glabra* (Jacq.) Dugand with acuminate leaf lobes. However, *S. isiboro* is readily distinguishable by having a calyx with triangular lobes, rounded to orbiculate, concave bracts, ovate-lanceolate bracteoles, and pink petals (vs. calyx with setaceous lobes, linear bracts and bracteoles, and white petals).

Additional specimens examined (paratypes):—PERU. Madre de Dios: Rio Los Amigos, 2 km upstream from junction with rio Amigillo, 12°34’09.8”S, 70°06’01.4”W, 20 August 2004, *P. Acevedo-Rodriguez 14413* (B, K, MO, US).

2. *Schnella herrerae* Britton & Rose, N. Amer. Fl. 23(4): 206. 1930. *Bauhinia herrerae* (Britton & Rose) Standl. & Steyerm., *Publ. Field Mus. Nat. Hist., Bot. Ser.* 23(1): 10. 1943. *Binaria herrerae* (Britton & Rose) A. Schmitz, Bull. Jard. Bot. Natl. Belg. 43(3–4): 403. 1973. Lectotype (designated here among the syntypes):—MEXICO: Oaxaca: Casolapam. November 1913, *F. Salazar s.n.* (lectotype: MEXU 1405364!, isolectotypes: NY barcode 4631 [fragment]!, US barcode 00001300!).

=*Bauhinia klugii* Standl., *Publ. Field Mus. Bot. Nat. Hist., Bot. Ser.* 22(3): 143. 1940. *Phanera klugii* (Standl.) Vaz, *Rodriguésia* 61(Sup): S37. 2010. *Schnella klugii* (Standley) Wunderlin, *Phytoneuron* 49: 3. 2010. Type:—PERU: San Martin: Chazuta, Rio Huallaga, mountain forest, alt. 260 m., Mar 1935, *G. Klug 4027* (holotype: F barcode V0042819F!; isotypes: BM000952218!, GH00059741, K000264847!, MO-714948!, NA0026185!, NY00003477!, S barcode S-R-8752!, UC709954!, US barcode 1310!) ***syn. nov.***

Figs 6–7

Notes:—Although differences in geographic distribution have likely been the main criterion used to justify the recognition of *Schnella herrerae* (ranging from Mexico to northern South America) and *S. klugii* (restricted to the Amazon rainforest of Peru and North Brazil) as distinct species, detailed morphological comparisons indicate that populations from both regions share a consistent suite of diagnostic macro- and micromorphological traits that differ from the diagnostics characters from both currently recognized section within *Schnella*.

This unique combination of characteristics includes yellow petals, a striated calyx, indehiscent and membranaceous fruits, and prolate pollen grains with broad, deep, and elongated colpi, which result in a reduced apocolpium area. The colpi are notably wide relative to the endoaperture, making this pollen type unique within the genus *Schnella* (Casas-Restrepo *et al*. 2024) (Fig 6).

FIGURE 5. Distintive floral characters from *Schnella uleana* (Harms) Wunderlin. A. Type specimen of *S. uleana*; B. Detail of bracts, bracteoles, and flowers; C. Inflorescence showing the lineal-lanceolate bracts and bracteoles, and petals up to 15 mm. A–B: K000264830; C: G00388872. Elaboration: Luis Casas-Restrepo.

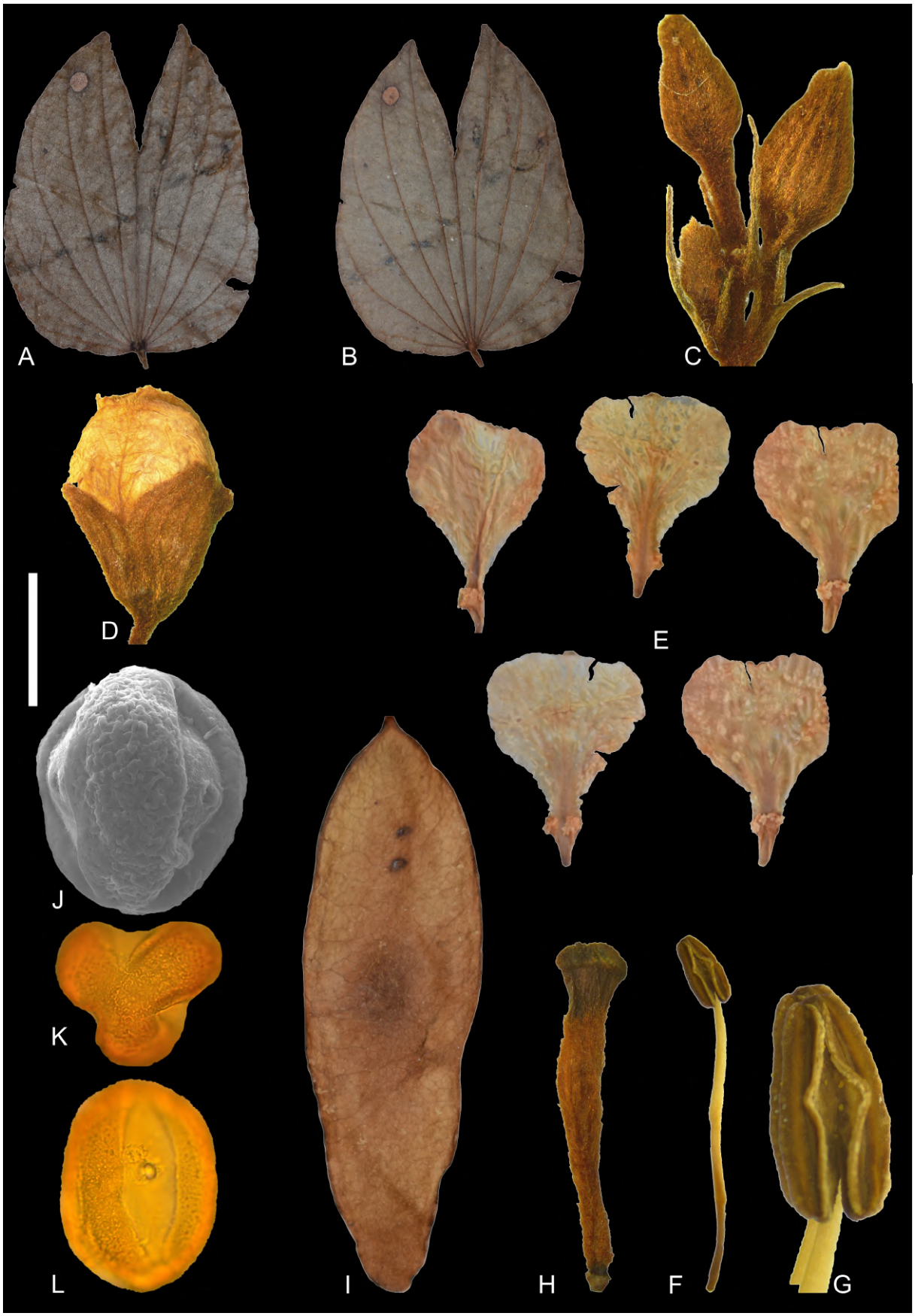

FIGURE 6. *Schnella herrerae* Britton & Rose. A. Upper leaf blade. B. Lower leaf blade. C. Flower buds, bracts and bracteoles. D. Flower bud at anthesis E. Petals. F. Stamen. G. Anther. H. Gynoecium. I. Fruit; J. Pollen grain (SEM); K. Pollen in polar view (LM); L. Pollen in equatorial view (LM). **Scales:** A–B: 3.0 cm; C–D: 5.0 mm; E: 1.0 cm; F: 4.0 cm; G: 1.0 mm; H: 1.0 cm; I: 1.5 µm; J. 20 µm; K–L. 40 µm. Photographs and figure preparation: Luis Casas-Restrepo.

FIGURE 7. Distribution map of *Schnella herrerae* Britton & Rose. Elaboration: Andrés Fonseca-Cortés.

Previous studies have also noted that *Schnella herrerae* exhibits characteristics intermediate between the two major sections of *Schnella*. This led Wunderlin *et al*. (1987) to propose the monospecific *Bauhinia* subsect. *latisiliquae* Wunderlin, K. Larsen & S. S. Larsen (1987: 25) under *Bauhinia* sect. *Caulotretus* to accommodate this taxon. However, while Wunderlin acknowledged the morphological distinctiveness of *S. herrerae*, he retained *S. klugii* as a separate species—likely due to their contrasting geographic ranges—and did not include it within the new subsection.

A disjunct distribution pattern between the Amazon rainforest and Central America has been previously reported in other legume species such as *Macropsychanthus megacarpus* (Rolfe) L.P.Queiroz & Snak (2020: 100) (Queiroz & Snak 2020; Fonseca-Cortés *et al*. 2025) and *Hydrochorea elegans* (2022: 416) (Ducke) M.V.B.Soares, Iganci & M.P.Morim (Soares *et al*. 2022). Considering that this pattern is present within the family, and given the overwhelming morphological and palynological evidence supporting their conspecificity, we treat *Schnella herrerae* as the correct name for this species and subsume *S. klugii* as a heterotypic synonym.

In addition, the protologue of *S. herrerae* cites the type municipality as "Casolapam," whereas the specimen label reads "Cosolapan" The current accepted name of the municipality is Casolapa in the Oaxaca state.

Additional specimens examined:—BRAZIL. Acre: BR 364, Igarapé marizinho, 28 May 2009, *F. obermuller 463* (RB); Assis Brasil, Basin of Rio Purus, upper Rio Acre, left bank, 10°56'09.0"S 69°42'27.5"W, 24 March 1998, *D.C. Daly 9773* (NY, RB, UFACPZ); Marechal Thaumaturgo, rio Alto Juruá. Reserva Extrativista do Alto Juruá, margem esquerda, Igarape Amonia, 12 April 1993, *M.S. Silveira 531* (MO, UFACPZ, US); Reserva Extrativista do Alto Juruá, Boca do Baje, 8°55'59.9"S, 72°33'39.6"W, 29 April 2001, *l. G. lohmann 394* (MO, NY, RB); Sena Madureira: Igarapé Maloca, colocação Vitor, propriedade do Sr. Raimundo Nonato. Reserva Extrativista Cazumbá-Iracema, 220 m, 9°13'05.0"S 69°00'31.0"W, 13 May 2023, *P. H. labiak 8647* (RB, UPCB). COLOMBIA. Amazonas: Leticia, Corregimiento de Tarapacá; Parque Nacional Natural Amacayacu; Cabaña Pamaté (extremo nor-occidental del parque); Caño Pamaté; a orillas del caño, 100 m, 3°12'00.0"S 70°18'60.0"W, 27 June 1991, *A. Rudas 2574* (MO, VDB). HONDURAS. Santa Bárbara: Matorrales húmedos a orillas del Rio Sisisapa, 315 m, 12 December 1950, *A. Molina 3716* (US). MEXICO. Campeche: Calakmul, a 8 km al o de nuevo becal. 180 m, 18°36'00.0"N 89°22'00.0"W,

14 January 1997, *P.M. Alvaro 659* (MBM, MEXU); Chiapas: Ocosingo, 5.78 km al N del poblado de Nuevo Guerrero, 203 m, 17°2’3” N, 91°17’6”W, 26 November 2003, *G.M. Aguilar & G. lópez 8625* (MBM, MEXU); 4 km al S de Ejido Benemérito de las Américas en la zona Marqués de comillas, 120 m, 2 December 1984, *F. Martínez 8915* (MBM, MEXU); En Boca Lacantum sobre el rio Lacantum, 120 m, 10 December 1984, *E. Martínez 9589* (MBM, MEXU); Oaxaca: Tuxtepec, al E Temazcal, donde inicia la Cortina de la Presa Miguel Alemán, 16 February 1996, *P.l. Tenorio 19211* (MEXU, MBM); Tabasco: Tenosique, sobre la W-O, segunda etapa S-14 (Ojochal), 4 November 1976, *F. Menéndez 444* (MBM, MEXU). NICARAGUA. Río San Juan, 2.7 km from Pajaro Negro along road to El Almendro, 70 m, 11°35’46”S 84°49’22”W, 5 December 2012, *W.D. Stevens 33313* (BM, MO). PERU. Loreto: Puerto Arturo, lower rio Huallaga below Yurimaguas, 135 m, 24–25 August 1929, *E. P. Killip & A. C. Smith 27719* (US); Gramalote ad Saposoa, 29 April 1962, *F. Woytkowski 7309* (K, US); Pucallpa, Yarina-Cocha on the shore of lake, 200 m, 30 April 1961, *F. Woytkowski 6263* (MO, US); San Martin: Mariscal Cáceres, Tocache Nuevo, 7 March 1971, *J. Schunke-Vigo 4750* (COL, F, MO, K, US); Ucayali: 30–50 km S of Pucallpa-Aguaytia highway near Rio Pachitea, 200 m, 8°49’60.0”S 74°45’00.0”W, 15 June 1987, *A. Gentry & C. Diaz 58383* (MO).

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