Taxonomic Novelties in *Philodendron* subg. *Philodendron* (Araceae) from Panama

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Abstract. *Philodendron* Schott subg. *Philodendron* is the largest of three subgenera, with 457 described species, which are mainly distributed in the Andes, Amazonia, Central America, and the Chocó ecoregion. Through the exhaustive revision of herbarium specimens and recent explorations in remote areas of Panama, seven species are described as new to science, *P. cerrojefense* M. M. Mora & Croat, *P. chepiganense* O. Ortiz, Croat & Rodr.-Reyes, *P. coibense* Croat & O. Ortiz, *P. darienense* O. Ortiz, Croat & Rodr.-Reyes, *P. longilobum* M. M. Mora & Croat, *P. martinezii* Croat & O. Ortiz, and *P. samudioense* Croat & O. Ortiz, and two new records of *Philodendron* have been identified for Panama, *P. anisotomum* Schott and *P. auriculatum* Standl. & L. O. Williams, all belonging to the subgenus *Philodendron*. For each taxonomic novelty, illustrations, taxonomic information, and notes on its distribution and conservation status are provided.

Key words: Aroids, Central America, conservation, new species, taxonomy.

Philodendron Schott is a Neotropical genus of Araceae that occurs from northern Mexico to southern Brazil and the Caribbean islands (Grayum, 1996; Croat, 1997; Mayo et al., 1997). This genus is one of the most characteristic hemiepiphytic components in Neotropical forests (Croat, 1997; Canal et al., 2018). It becomes more dominant in areas with large expanses of lowland forest, and it is frequently the most abundant aroid genus in seasonally dry forests, even compared to the mega-diverse *Anthurium* Schott (Croat, 1994; Mora et al., 2006; Ortiz et al., 2019a). The number of *Philodendron* species is estimated to be 1500 (Boyce & Croat, 2020), with ca. 560 species currently published (Canal et al., 2018), including 124 that are present in Central America (Croat et al., in prep), where the greatest diversity is found in Panama with 103 species (Croat, 1997; Ortiz et al., 2018). Ornamental species of *Philodendron* have been introduced in Panama, including *P. domesticum* G. S. Bunting (*Ortiz 2908*, PMA), *P. burle-marxii* G. M. Barroso (*Ortiz 2911*, PMA), *P. gloriosum* André (*Ortiz 2915*, PMA), *P. erubescens* K. Koch & Augustin (*Ortiz 2936*, PMA), *P. xanadu* Croat, Mayo & J. Boos (*Ortiz 2924*, PMA), *P. bipinnatifidum* Schott ex Endl. (*Ortiz 3719*, PMA), *P. pinnatifidum* (Jacq.) Schott (Ortiz *3720*, PMA), and *P. lacerum* (Jacq.) Schott (*Ortiz 3721,* PMA).

Traditionally, the infrageneric classification of *Philodendron* has included three subgenera: *Philodendron*, *Pteromischum* (Schott) Mayo, and *Meconostigma* (Schott) Engl. (Mayo, 1988, 1989, 1991; Grayum, 1996; Croat, 1997). For a long time, this infrageneric classification

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was accepted and supported by morphological, anatomical, and molecular data (Mayo, 1988; Gauthier et al., 2008). Several studies have been conducted to resolve the relationship among the three subgenera, but currently it is highly debated (Gauthier et al., 2008; Loss-Oliveira et al., 2014, 2016; Canal et al., 2018, 2019; Sakuragui et al., 2018; Vasconcelos et al., 2018). Sakuragui et al. (2018) proposed the recognition of *Philodendron* subg. *Meconostigma* as a distinct genus (*Thaumatophyllum* Schott) based on molecular, morphological, and cytological evidence. According to Vasconcelos et al. (2018), the separation of *Philodendron* subg. *Meconostigma* from *Philodendron* also may imply the separation of *Philodendron* subg. *Pteromischum*. The same authors recommended the resurrection of the genus *Elopium* Schott to encompass the species of subgenus *Pteromischum*. Nevertheless, recent studies have proposed *Philodendron* as monophyletic, through phylogenetic reconstructions that also include three major lineages within the genus that correspond to the three traditional subgenera (Canal et al., 2018, 2019; Vasconcelos et al., 2018).

Conventionally, morphological and anatomical characters and geographical range have been used to differentiate the three subgenera of *Philodendron* (Mayo, 1991; Grayum, 1996; Croat, 1997). According to Croat (1997), subgenus *Philodendron* is difficult to define and is primarily distinguished by the absence of characters that are present in subgenera *Pteromischum* and *Meconostigma*. According to Grayum (1996), subgenus *Pteromischum* is distinguished by the combination of the following characters: anisophyllous sympodial growth in flowering individuals, the stem articles consisting of a variable number of leaves, sympodial leaves extensively sheathed (the sheath more than 40% the total petiole length), tannin cells absent in stamens, and ovules more than 20 per locule. Subgenera *Philodendron* and *Meconostigma* have the sympodial article diphyllous with leaves with a rudimentary sheath (less than 40% the petiole length), tannin cells present in stamens, and ovules fewer than 20 per locule (Grayum, 1996). Subgenus *Meconostigma* differs from subgenus *Philodendron* in having usually arborescent stems (vs. rarely arborescent), staminodial zone between staminate and pistillate zones of the spadix subequal to or longer than fertile zone (vs. much shorter than the fertile staminate zone), and slender stamens, usually at least three times longer than broad (Mayo, 1991; Croat, 1997).

Subgenus *Philodendron* is the largest of the three subgenera of *Philodendron* (Croat et al., 2019), with approximately 457 published species, corresponding to about 85% of the species diversity of the genus, which are mainly distributed in the Andes, Amazonia, Central America, and the Chocó ecoregion (Canal et al., 2018). The classification within subgenus *Philodendron* as traditionally accepted consists of 10 sections, 12 subsections, and 11 series mainly characterized by leaf morphology in combination with the number of locules per ovary, the type of placentation, and the shape of the style (Croat, 1997). According to the recent study by Canal et al. (2018) using molecular data, no section from the currently accepted infrageneric classification of subgenus *Philodendron* was recovered as monophyletic.

Through the exhaustive revision of herbarium specimens and recent explorations in remote areas of Panama, seven new species and two new records of *Philodendron* have been identified, all belonging to subgenus *Philodendron*. The new species are described and illustrated here. With these new additions, Panama has 116 native species (121 with exotic species) including 48 endemics.

Materials and Methods

Identification using lucid key and morphological descriptions

All suspected new species were keyed out using the second author's Lucid *Philodendron* Key (Haigh et al., 2009; Croat et al., 2019) to ensure that they could not be assigned to any published species. This key (continuously expanded, therefore as yet unpublished) is an interactive identification tool that includes a total of 81 features and 224 character states. Keying out a specimen implies choosing a series of conservative characters (usually 10 characters). Subsequently, the software shows a number of potential species, which are discarded one by one comparing directly with the specimen to be identified (for more details, see Croat et al., 2019). Herbarium specimens, including types, were studied from MO, PMA, SCZ, and UCH (acronyms of all herbaria mentioned follow Thiers, 2021). The descriptions are based on fertile material, and descriptive terminology follows Croat (1997).

Conservation status

The conservation status assessments of all species were made based on the criteria of the International Union for Conservation of Nature (IUCN Standards and Petitions Committee, 2019), using the parameters of number of locations (the number of geographically or ecologically distinct areas of occurrence), extent of occurrence (EOO), and/or area of occupancy (AOO). Calculations of EOO and AOO values were performed using GeoCAT (Bachman et al., 2011). To evaluate the conservation status of the new records, we used the Rapid Least Concern web application (Bachman et al., 2020).

SCANNING ELECTRON MICROSCOPY

For a detailed documentation of placentation and number of locules and ovules in each new species, scanning electron microscopy (SEM) images were used. A few flowers were separated from the spadix and soaked in water for 10 minutes. Some species required rehydration with a glycerin solution before further processing. Each flower was sectioned transversely and longitudinally using a stereoscopic microscope. Material was critical point dried and samples were mounted on an SEM stub of metal with adhesive, coated with 40–60 nm of metal such as gold/palladium. After preparation, the sections were observed and imaged in an SEM microscope model Zeiss Evo 40vp (15–20 kV) (Zeiss, Oberkochen, Germany) at the Smithsonian Tropical Research Institute. For *Philodendron longilobum*, SEM results were not satisfactory, and collecting more samples of this species has not been possible.

NEW SPECIES OF *PHILODENDRON* FROM PANAMA

1. Philodendron cerrojefense M. M. Mora & Croat, sp. nov. TYPE: Panama. Panamá: vic. Cerro Jefe, at Altos de Pacora, 9°15′N, 79°29′W, 750 m, 4 July 1994, *T. B. Croat & G. Zhu 76606* (holotype, MO!; isotype, PMA!). Figures 1, 2, 3A.

Diagnosis. *Philodendron cerrojefense* M. M. Mora & Croat differs from *P. tripartitum* (Jacq.) Schott by having thicker stems (> 2 cm vs. 1–2 cm diam.), subcoriaceous leaf blades that dry dark reddish brown on both sides (vs. yellowish brown below), the lateral lobes extended predominantly outward (vs. upward), and inflorescences with the pistillate portion of the spadix longer than the staminate portion (vs. staminate portion longer than the pistillate portion).

Hemiepiphyte, appressed-climber habit; **internodes** 2–10 cm, 2–4 cm diam., dark green becoming grayish, semiglossy; **cataphylls** 15–21 cm, green to reddish, unribbed to sharply low-2-ribbed, moderately spongy, deciduous. *Leaves* with **petiole** red-purple spotted at apex, terete, moderately spongy, somewhat flattened adaxially and obtusely ribbed near apex, 45–50 cm, 1.1–1.4 cm diam. (when dry); **blade** trisect, subcoriaceous, semiglossy, discolorous, dark green and semiglossy above, weakly glossy beneath, drying dark brown to reddish brown on both sides; **medial lobe** elliptic, long-acuminate at apex (acumen 1–2 cm), 30–48.5 × 10–15 cm, 2.4–2.7 times longer than broad; **lateral lobes** 27–30 × 10–12 cm, directed outward or slightly upward, elliptic to falcate, acute at the apex, conspicuously inequilateral, the outer side 1.4–2 times wider than the inner margin at the middle, the inner margin always narrower than the outer margin, the outer margin rounded at the base; **sinus** parabolic to hippocrepiform, 3.5–6.2 cm deep, 2–4 cm wide in middle portion; **midrib** broadly convex and concolorous or paler than the rest of the leaf blade above, convex and darker below; **primary lateral veins** 18 to 25(+) pairs, quilted-sunken above, convex below, departing midrib at 80°–90° angle; interprimary veins conspicuous near the midrib to halfway to the margin and then narrowing and becoming inconspicuous toward the margin; minor veins moderately distinct. *Inflorescence* 1 per axil; **peduncle** 3–6 cm; **spathe** 17–21 cm, weakly constricted, drying blackish, tube 6–7 cm, 1.5–1.7 cm diam., green outside, reddish inside, spathe blade 6.5–7 cm, green on both surfaces; **spadix** 12.5–15 cm, creamy white, drying blackish; staminate portion 3.5–6 cm, white; sterile staminate portion 0.5–0.7 cm, white; pistillate portion 9.5–10.5 cm, creamy white; stigma button-shaped, **ovary** ca. 2 × 1.6 mm wide; locules 5 to 9, placentation basal, **ovules** 1 to 2 per locule, 1.4–1.6 × 0.4–0.5 mm, striate; funicule short. Berries not seen.

Distribution and habitat. *Philodendron cerrojefense* is endemic to Panama, so far only known from the vicinity of Cerro Jefe in Panamá Province at 750–930 m in a *Premontane rain forest* life zone (Holdridge et al., 1971).

Etymology. The species epithet refers to the only area where the species is known to occur to date.

Conservation status. To date, *Philodendron cerrojefense* has been reported only from Cerro Jefe, part of the Chagres National Park. Despite being a protected area, this location faces moderate anthropic disturbances, mostly in the boundaries such as Altos de Pacora, the type locality. The biggest threat facing this species is the loss of habitat caused by new road constructions. There are two locations with respect to this threat, as the subpopulation at Altos de Pacora is at more risk of anthropic disturbance than the population represented by the paratypes. Because this species has a limited distribution (EOO: 5.5 km^2; AOO: 16 km^2), the impact on its natural habitat may be extremely dangerous and may compromise its conservation. *Philodendron cerrojefense* must be considered as Endangered [EN B1ab(iii)+2ab(iii)].

Discussion. This species is a member of *Philodendron* sect. *Tritomophyllum* (Schott) Engl., and it is considerably similar to *P. tripartitum* (Jacq.) Schott in the overall shape of the leaf blade and that of the medial and lateral lobes. It is characterized by its appressed-climber habit, short internodes (2–10 cm long), trisect blades which dry dark brown to reddish brown on both sides, elliptic medial lobe, elliptic to falcate lateral lobes, parabolic to hippocrepiform sinus, usually 18 to 25 primary lateral veins, a single inflorescence per

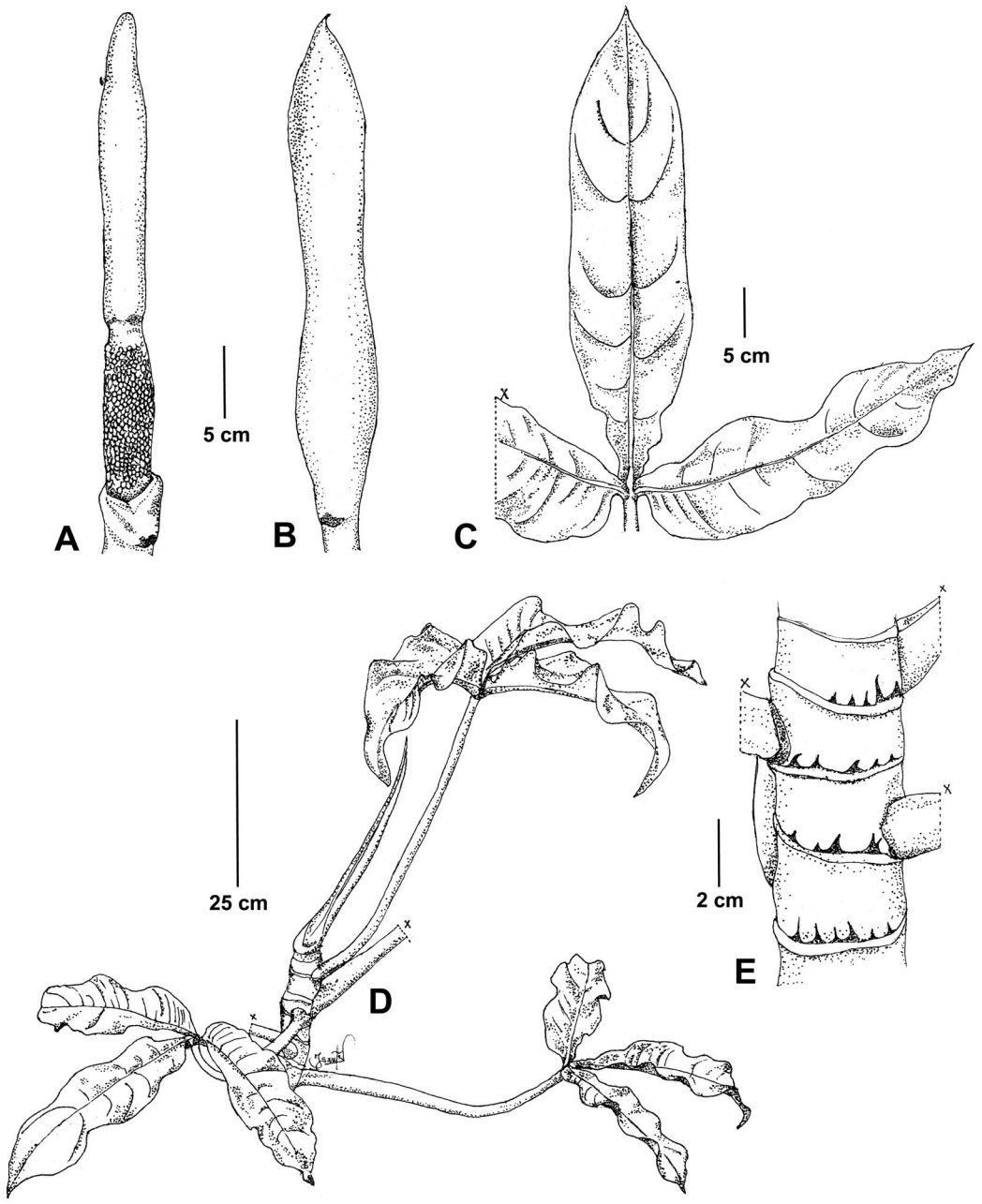

Figure 1. *Philodendron cerrojefense* M. M. Mora & Croat. —A. Spadix. —B. Spathe. —C. Leaf blade. —D. Habit. —E. Stem. Illustration by Jeraldín Vergara (from *Ortiz et al. 2415*).

axil, weakly constricted and greenish spathes on both blade and tube externally, reddish spathe tubes and green spathe blades internally, white spadices (all portions), five to nine locules with one to two ovules per locule, and basal placentation.

Other similar species include *Philodendron anisotomum* Schott, *P. cotobrusense* Croat & Grayum, and *P. madronense* Croat. *Philodendron anisotomum* differs from *P. cerrojefense* by having leaf blades gray-green (when dry), four or five pairs of primary lateral veins,

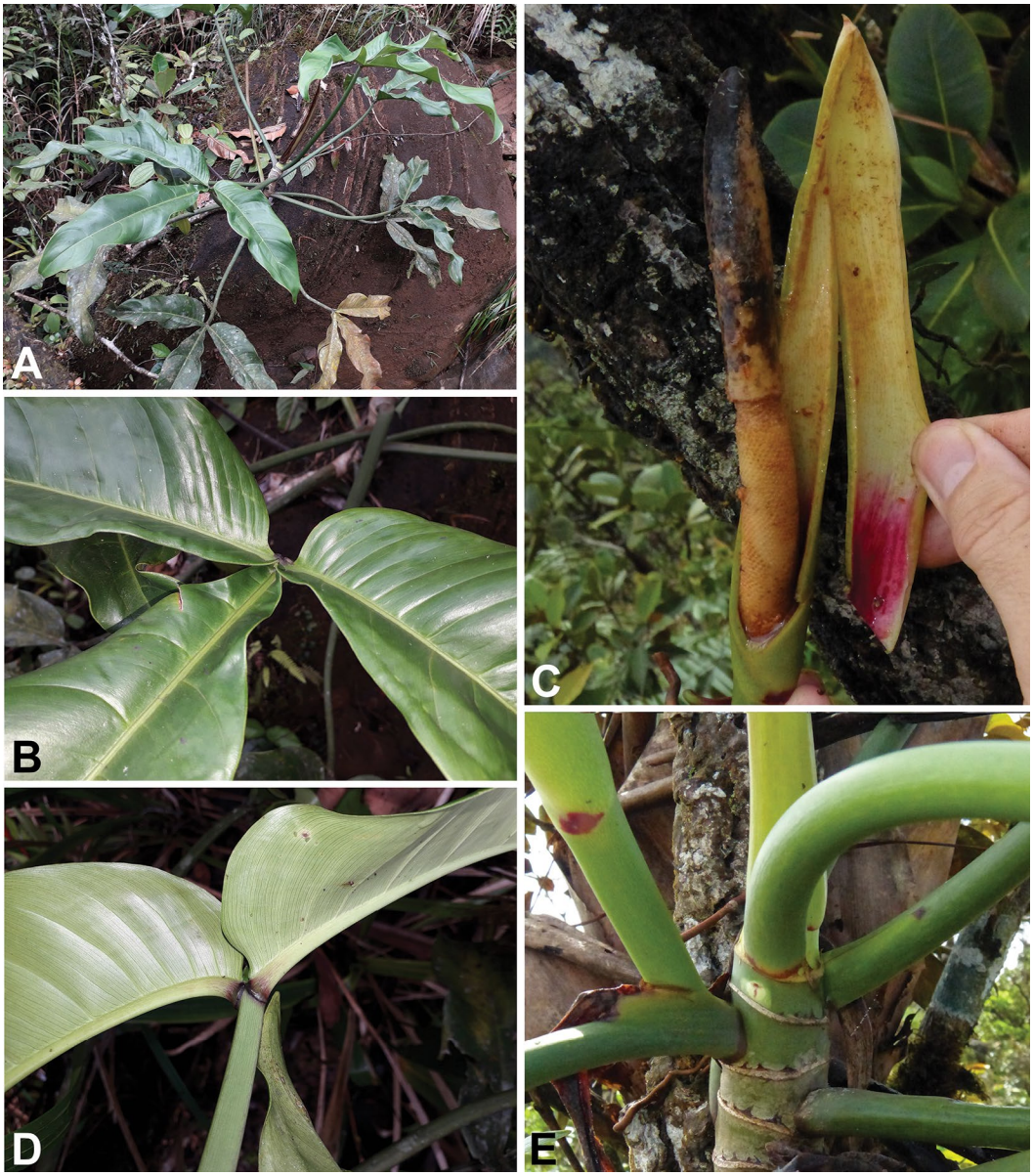

Figure 2. *Philodendron cerrojefense* M. M. Mora & Croat. —A. Habit. —B. Leaf blade (sinus). —C. Inflorescence with a longitudinal cut (dissected). —D. Leaf blade base (lower surface). —E. Stem. Photos by Orlando Ortiz.

and three ovules per locule. *Philodendron cotobrusense* differs by having blades drying gray-green, medial and lateral lobes roughly equal in length, up to five inflorescences per axil, and three ovules per locule, and *P. madronense* differs in having longer peduncles (to 25 cm long) and lateral lobes without basal veins.

Paratypes. PANAMA. **Panamá:** vic. Cerro Jefe, along rd. to summit which leads S off of main rd., 9°14′N, 79°22′W, 750–800 m, 8 July 1987, *T. B. Croat 67082* (F, MO); vic. Cerro Jefe, along rd. to summit which leads S off of main rd., 9°14′N, 79°22′W, 750–800 m, 8 July 1987, *T. B. Croat 67084* (MO); along rd. ca. 1 km SW of Cerro Jefe Summit, cloud forest, 9°13′N, 79°21′W, 950 m, 8 June 2014, *O. Ortiz, J. Harrison & L. Harrison 2415* (PMA); Cerro Jefe, bosque enano cercano a las antenas, 9°13′24″N, 79°22′31″W, 929 m, 10 June 2019, *O. Ortiz, M. Cedeño & R. da Pena 3724* (MO, PMA).

2. Philodendron chepiganense O. Ortiz, Croat & Rodr.-Reyes, sp. nov. TYPE: Panama. Darién: Distr. Chepigana, [Darién National Park, rd. to top

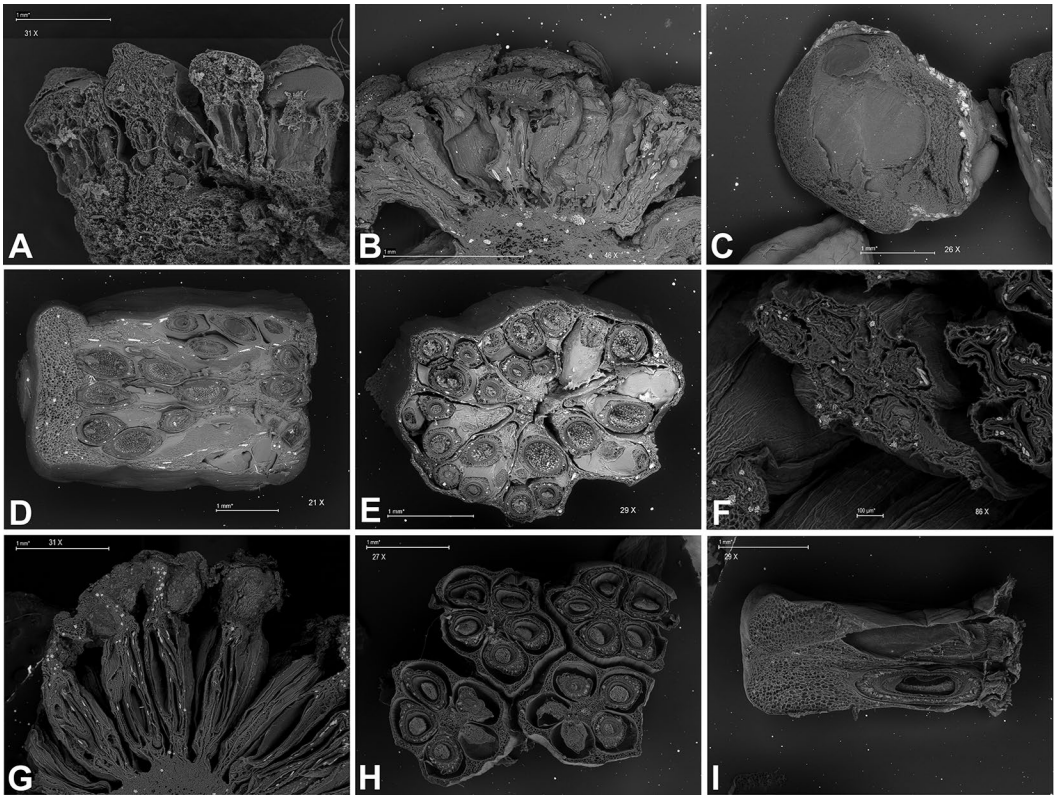

Figure 3. Scanning electron micrographs of floral ovaries. —A. *Philodendron cerrojefense* M. M. Mora & Croat (longitudinal section). —B. *Philodendron chepiganense* O. Ortiz, Croat & Rodr.-Reyes (longitudinal section). —C. *Philodendron coibense* Croat & O. Ortiz (transverse section). —D. *Philodendron darienense* O. Ortiz, Croat & Rodr.-Reyes (longitudinal section). —E. *Philodendron darienense* (transverse section). —F. *Philodendron martinezii* Croat & O. Ortiz (transverse section). —G. *Philodendron martinezii* (longitudinal section). —H. *Philodendron samudioense* Croat & O. Ortiz (transverse section). —I. *Philodendron samudioense* (longitudinal section).

of Cerro Sapo Hill] Parque Nacional Darién, camino hacia la cima de Cerro Sapo, 7°58′40″N, 78°21′31″W, 891–900 m, 15 Apr. 2014, *O. Ortiz, J. Aranda, J. Batista & J. Moreno 2345A* (holotype, PMA!; isotype, MO-106827!). Figures 3B, 4, 5.

Diagnosis. *Philodendron chepiganense* O. Ortiz, Croat & Rodr.-Reyes differs from *P. sparreorum* Croat in having pinkish (vs. orangish) spathes and blunt tapered (vs. prominently long-tapered) styles.

Hemiepiphyte, climber habit; clear sap with turpentine odor; **internodes** slightly longer than broad, 1.3–2 cm diam., drying medium yellowish brown and prominently transverse-fissured; **cataphylls** 20 cm, deciduous. *Leaves* with **petiole** terete, ca. 38 cm, ca. 4.5 mm diam., drying dark brown; **blade** ovate-sagittate, ca. 38 × 28.3 cm, 1.3 times longer than broad, broadest near petiolar plexus, drying thinly coriaceous, moderately bicolorous, drying dark greenish brown and matte above, moderately paler, pale yellow-brown, and semiglossy below; **anterior lobe** 28 cm, broadly rounded on margins; **posterior lobes** 14.2–15 × 11.5–12 cm; **sinus** narrowly hippocrepiform, ca. 14.5 cm deep, 4.5 cm wide; **basal veins** 8 pairs, 1st and 2nd pairs free to the base; posterior rib 4.4–4.6 cm, nearly straight and naked about 1/2 of its length; **primary lateral veins** 7 to 8 pairs, arising at 50°–55° angle, drying flattened and concolorous above, narrowly rounded, drying darker, flattened and overlapping on edges, finely ribbed below; upper surface short-pale-lineate; lower surface with laticifers visible, dark-punctate, inconspicuously cross-veined. *Inflorescences* 5 per axil; **peduncle** slender, 9.5–10 cm, ca. 2 times as long as spathe, drying 1.5 mm diam., dark brown; **spathe** 5–6 cm, pink, tube 2.5–2.8 cm, spathe blade 2.5–3 cm, flattening to 2.5 cm wide; **spadix** 5 cm; staminate portion 2.3 cm, 5–6 mm diam.; sterile staminate portion scarcely obvious; pistillate portion 3.1 cm, 4–5 mm diam.; pistils 1.4 mm, 0.8 mm diam., druse cells very abundant in the spadix

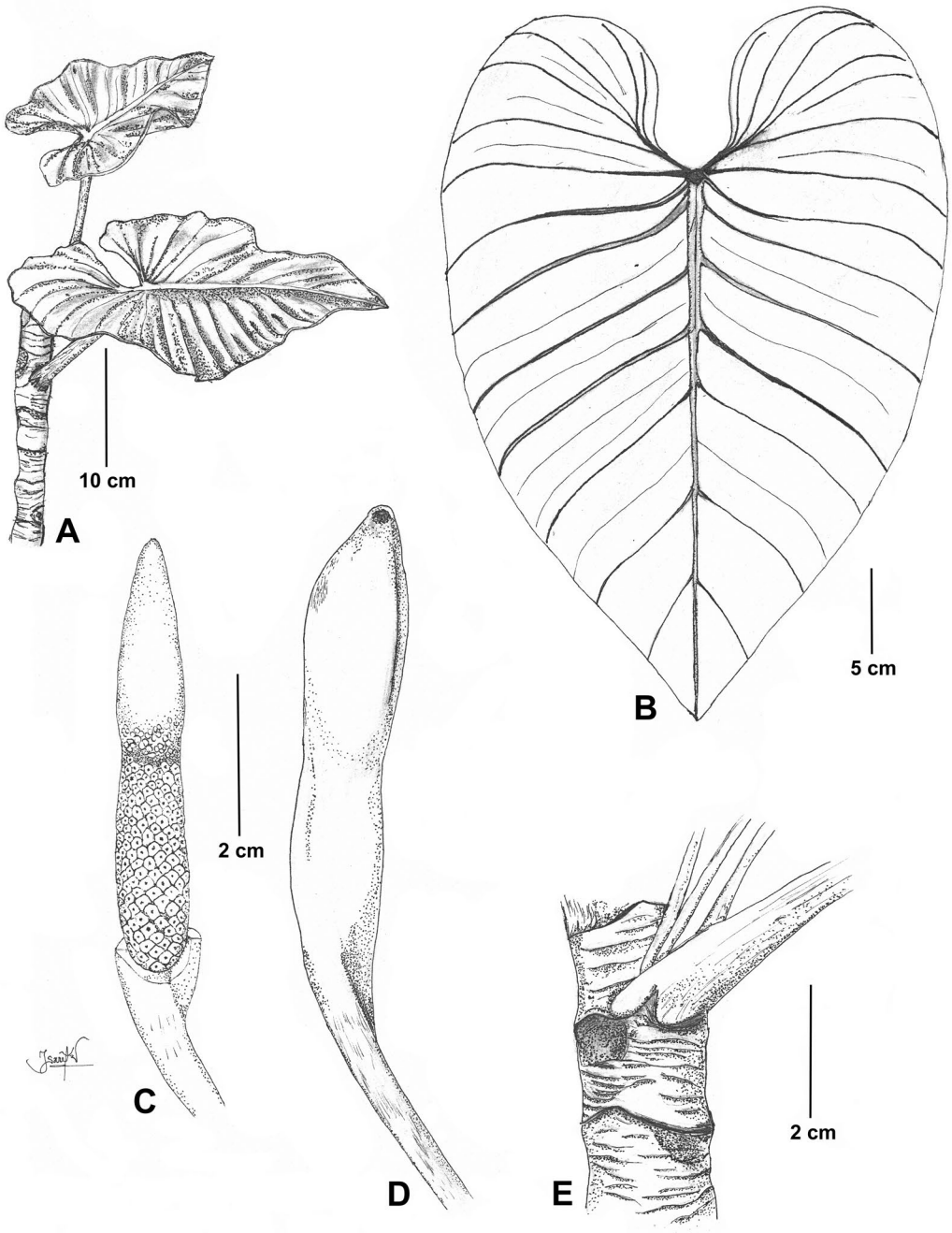

Figure 4. *Philodendron chepiganense* O. Ortiz, Croat & Rodr.-Reyes. —A. Habit. —B. Leaf blade. —C. Spadix. —D. Spathe. —E. Stem. Illustration by Jeraldín Vergara (from *Ortiz et al. 2345A*).

axis; **ovary** ovoid, 5-locular, placentation axile, raphide cells occasional in the ovary walls; style short, stigma 0.2 mm thick, 0.8 mm diam., drying blackened; **ovules** l per axil, 0.15 mm, contained in a translucent envelope 1 mm. Berries not seen.

Distribution and habitat. *Philodendron chepiganense* is endemic to Panama, known only from the type locality in Darién Province on Cerro Sapo at 890–900 m in a *Premontane wet forest* life zone (Holdridge et al., 1971).

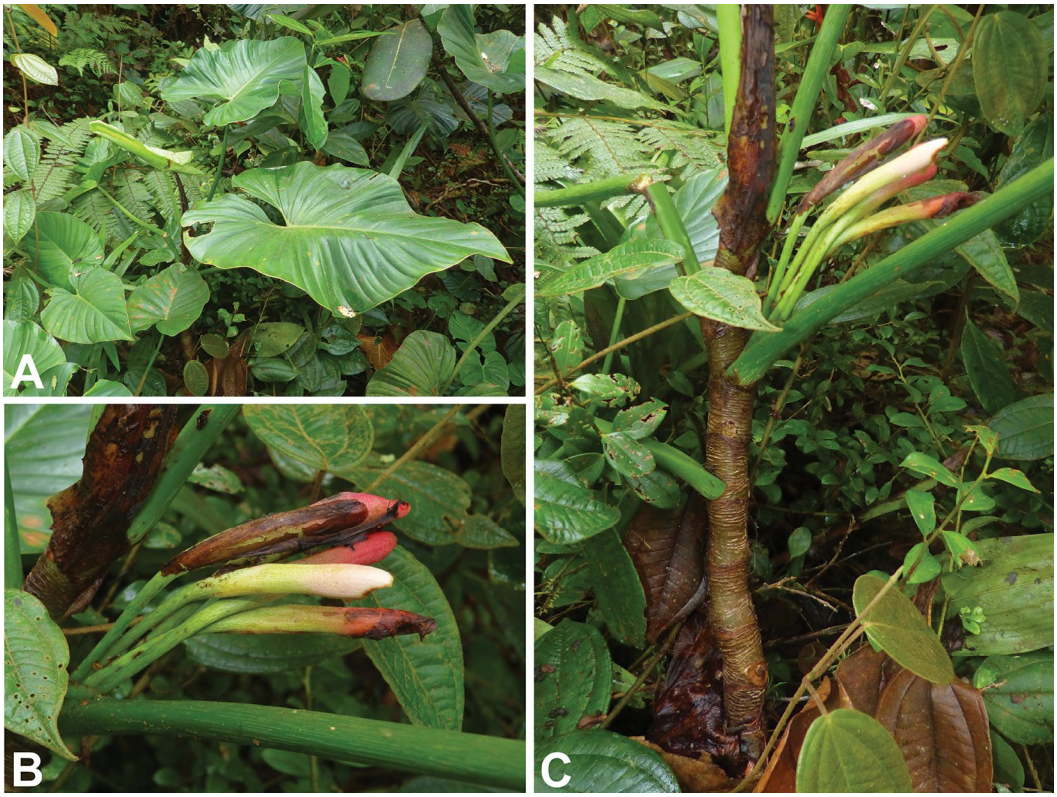

Figure 5. *Philodendron chepiganense* O. Ortiz, Croat & Rodr.-Reyes. —A. Habit. —B. Inflorescences. —C. Stem. Photos by Orlando Ortiz.

Etymology. The species is named after its type locality in the Chepigana District (Darién Province, Panama).

Conservation status. *Philodendron chepiganense* is known only from the fairly remote and inaccessible area of the Serranía de Sapo, which is located almost entirely within the limits of Darién National Park. Currently, the rest of the Serranía de Sapo is poorly explored (Ortiz et al., 2019b); therefore, we could expect this species to have a broader geographical distribution. We believe it is necessary to obtain further information on the distribution and population status in order to perform a more precise conservation assessment of this species. Consequently, *P. chepiganense* would be considered as Data Deficient [DD].

Discussion. The species is a member of *Philodendron* sect. *Macrobelium* (Schott) Sakur. subsect. *Oligocarpidium* (Engl.) Mayo. It is characterized by its hemiepiphytic life form, internodes slightly longer than broad and drying medium yellowish brown and prominently transverse-fissured, terete dark brown–drying petioles, ovate-sagittate brown-drying blades with a narrowly hippocrepiform sinus, eight pairs of basal veins, one or two of which are free to the base, the posterior nearly straight and naked about half of its length, seven to eight pairs of primary lateral veins as well, up to five narrowly long-pedunculate inflorescences per axil, and peduncles nearly twice as long as the slender pink spathes.

In the Lucid *Philodendron* Key, the species tracks to *P. deflexum* Poepp. ex Schott, *P. dodsonii* Croat & Grayum, *P. sparreorum* Croat, *P. parvidactylum* Croat, or *P. strictum* G. S. Bunting. *Philodendron deflexum* differs from *P. chepiganense* in having usually a spatulate sinus, longer spathes (8.5–24 cm), and wider spadices (usually 1–1.5 cm diam.); *P. dodsonii* differs in having usually much larger leaves (36–87 × 28–66 cm) and a spathe that is much longer (16–18 cm) with white on the blade and red on the spathe tube; *P. sparreorum* differs in having inflorescences with usually longer peduncles (8–21 cm), orangish spathes, and prominently long-tapered styles; *P. strictum* differs in having shorter and thicker internodes (2.5–6 cm diam.) and longer D-shaped petioles (60–100 cm), which dry with

a yellowish, somewhat flaking epidermis; and *P. parvidactylum* differs in having conspicuous roots at each node, medium to dark green–drying blades, numerous primary lateral veins (13 to 18 pairs) and shorter peduncles (ca. 0.6 times as long as spathe).

3. Philodendron coibense Croat & O. Ortiz, sp. nov. TYPE: Panama. Veraguas: Parque Nacional Coiba, camino de subida al Cerro La Torre, rastrojo, zona con abundantes helechos, 7°30′44″N, 81°49′20″W, 30 m, 19 Nov. 2004, *O. Rodríguez, A. Ibañez, C. Chizmar & N. Bastidas 713 JR* (holotype, MO-6051216!; isotype, PMA!). Figures 3C, 6.

Diagnosis. *Philodendron coibense* Croat & O. Ortiz differs from *P. jacquinii* Schott by having glabrous (vs. pubescent) stems, petioles, and lower leaf blade surfaces, and a short (vs. elongated) style with a circular and flattened (vs. funnel-shaped) stigma.

Hemiepiphyte, pendent habit; **internodes** ca. 14 cm or more, 6–7 mm diam. (dried), drying yellow-brown, irregularly and deeply ridged, glossy, the epidermis glabrous, smooth except for some transverse fissures. *Leaves* with **petiole** 23–24.7 cm, ca. 4 mm diam., drying tan, irregularly low-ribbed, weakly ribbed with a few transverse fissures; **blade** ovate-cordate, 14–17.2 × 14.2 cm, 1.1–1.2 times longer than broad, 0.6–0.7 times as long as petiole, drying thin, grayish green and semiglossy above, grayish and semiglossy below, narrowly and gradually acuminate at apex, cordate at base; **sinus** parabolic, 2.7–3.5 cm deep, 2.7–4 cm wide; major veins concolorous or bicolorous; midrib broadly raised and concolorous above; **primary lateral veins** 2, rarely 3 pairs, arising at 35°–45° angle, drying flattened and concolorous above, flattened, with laticifers below; **basal veins** 4 or 5 pairs, 1st pair nearly free or fused up to 8 mm, 2nd and 3rd pairs fused 10–12 mm, 4th pair fused 15–20 mm; posterior rib straight, short, scarcely or not at all naked; minor veins mostly interspersed with distinct laticifers on lower surface. *Inflorescence* solitary; **peduncle** 10–10.5 cm, drying flattened, the epidermis extended laterally for a few mm; **spathe** green, deciduous; fertile and sterile staminate portion of spadix not seen, stylar portion conspicuously wrinkled, orange-brown; stigma 2 mm diam., circular, flattened with weakly raised margin, this surrounding 3 or 4 circular funnel-shaped pores, tightly crowded together; **ovary** 3-locular, raphide cells abundant in the outer and inner areas; **ovules** 1 or 2 per locule with funicle flattened in flower, locules with a dorsal bundle, placentation basal, ovule flattened, ca. 0.02 mm, 0.03 mm wide. *Infructescence* green, 4.5–5.6 cm, 2.5–2.8 cm diam., starch grains present in the spadix axis parenchyma. **Berries** green, 7–10 mm, 4–6 mm diam.; seeds 3.6 mm, subglobose.

Distribution and habitat. *Philodendron coibense* is endemic to Panama, only reported from the type locality in Coiba Island, Pacific Coast of Veraguas Province at near 30 m of elevation in a *Tropical moist forest* life zone (Holdridge et al., 1971).

Etymology. The species is named for the type locality on Coiba Island.

Conservation status. *Philodendron coibense* is known from two collections made on Coiba Island in Coiba National Park. This protected area includes Coiba Island and surrounding islands and comprises 53,582 ha of island territories, which are not currently experiencing any major threats due to effective protection (Ibáñez, 2011). This species is therefore assessed as Least Concern [LC].

Discussion. This species seems to be a member of *Philodendron* sect. *Macrogynium* Engl., which previously included only *P. jacquinii*, owing to its vining habit, thin veiny leaves, and bulging roomy spathe tube with few-seeded fruits. It is characterized by its scandent habit, long glabrous internodes, and moderately long-petiolate leaves with thin ovate-cordate, gradually acuminate blades, which become grayish green when dry and have two (or three) pairs of primary lateral veins. *Philodendron coibense* is also distinguished by the posterior lobes of the leaf blades that form a parabolic sinus with four or five pairs of basal veins with a short posterior rib, as well as by a moderately long-pedunculate inflorescence with a deciduous spathe in early fruit.

In general appearance, *Philodendron coibense* is perhaps most similar to *P. hederaceum* (Jacq.) Schott (*Philodendron* sect. *Philodendron* subsect. *Solenosterigma* (Klotzsch ex Schott) Engl.), but that species differs in having greenish stems that are finely and closely ribbed, subcoriaceous blades, infructescences with persistent spathes, and berries with many seeds per locule.

Paratypes. PANAMA. **Veraguas:** Isla de Coiba, campamento Playa Hermosa-Cerro del Mirador, 17NMU0831, 200 m, borde bosque degrado, cerca del camino, 20 Jan. 1994, *S. Castroviejo, J. Cuadros & M. Velayos 13062 SC* (MA, PMA).

4. Philodendron darienense O. Ortiz, Croat & Rodr.-Reyes, sp. nov. TYPE: Panama. Darién: Parque Nacional Darién, Cerro Pirre, Rancho Frío, orillas del Río Perresenico, 8°1′15″N, 77°43′58″W, 112 m, 3 Dec. 2016, *O. O. Ortiz, R. Vergara & T. Contreras 2691* (holotype, PMA!; isotype, MO!). Figures 3D, E, 7, 8.

Diagnosis. *Philodendron darienense* O. Ortiz, Croat & Rodr.-Reyes differs from *P. maximum* K. Krause in having ovate-sagittate (vs. narrowly ovate-sagittate to sagittate) leaf

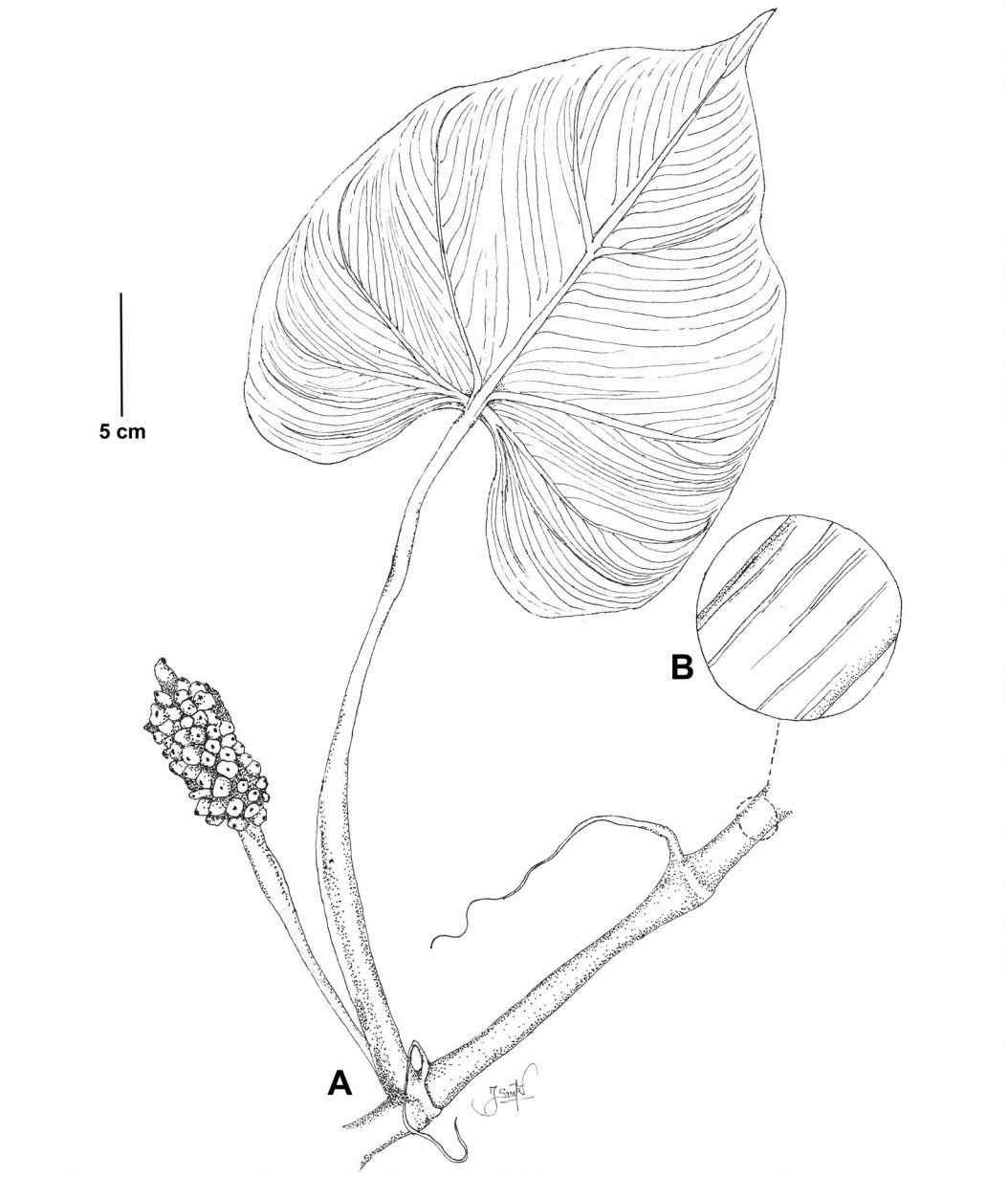

Figure 6. *Philodendron coibense* Croat & O. Ortiz. —A. Habit with the infructescence and leaf blade. —B. Stem with an irregular and deeply ridged, smooth surface (10× optical zoom). Illustration by Jeraldín Vergara (from *Castroviejo et al. 13062 SC*).

blades, naked posterior ribs, petioles subterete to ovoid in cross-section (vs. D- or U-shaped), 8- or 9-locular (vs. 6-locular) ovaries, and four inflorescences per node with peduncles 3–4 cm (vs. two inflorescences per node with peduncles 27–37 cm).

Hemiepiphyte, appressed-climber; feeder roots to 8 mm diam.; stems to ca. 1 m; the epidermis reddish green to greenish gray; **internodes** short, 3–5 cm diam. on juvenile plants, to 10 cm diam. on adults; petiole scars conspicuous; **cataphylls** sharply 2-ribbed, mostly persistent intact at upper nodes, eventually deciduous (deciduous on juvenile plants). *Leaves* with **petiole** 72–100 cm, 1.3 times longer than blades and purplish on juvenile plants to ± as long as the blades on adult plants, subterete to ovoid; **blade** ovate-sagittate, abruptly short-acuminate at apex, prominently lobed at base, 55–95 × 36–90 cm, 1.1–1.5(1.9) times as long as wide,

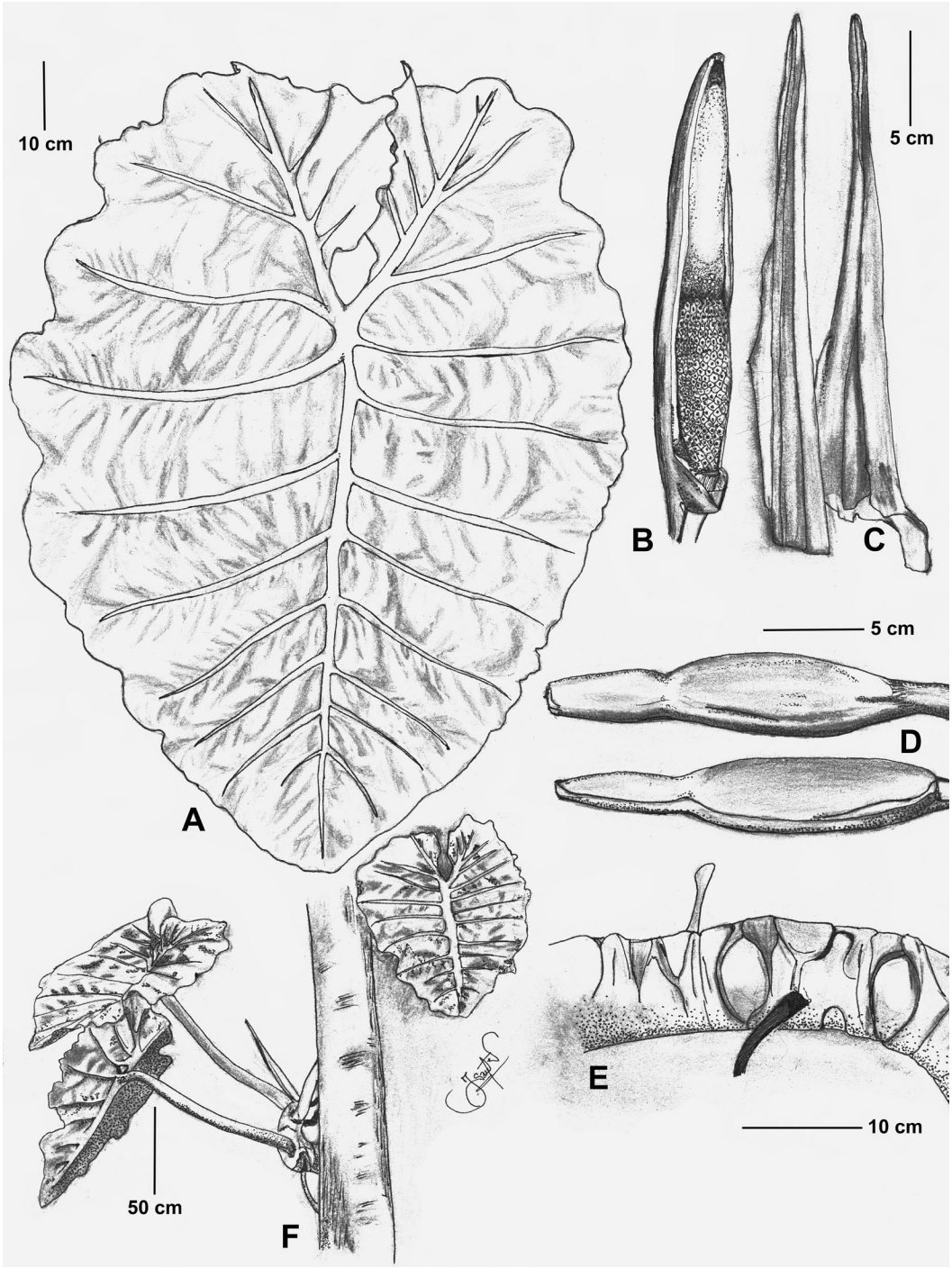

Figure 7. *Philodendron darienense* O. Ortiz, Croat & Rodr.-Reyes. —A. Leaf blade. —B. Inflorescence with a longitudinal cut (dissected). —C. Cataphylls. —D. Spathes. —E. Stem. —F. Habit. Illustration by Jeraldín Vergara (from *Ortiz et al. 2691*).

Figure 8. *Philodendron darienense* O. Ortiz, Croat & Rodr.-Reyes. —A. Habit. —B. Inflorescence with a longitudinal cut (dissected). —C. Leaf blade (lower surface). —D. Inflorescences. —E. Stem. Photos by Orlando Ortiz.

0.5–0.9 times as long as the petiole, prominently sinuate, ± concolorous, drying subcoriaceous, drying dark gray-brown and matte above, slightly paler, yellowish gray-brown and semiglossy below; **anterior lobe** (42.5–)56–74 cm; **posterior lobes** (23.5–)29–40 × 38–50 cm; **sinus** subreniform-hippocrepiform, closed when lobes are flattened, ca. 29 cm, 10 cm wide; **basal veins** 7 or 8, usually fused into a straight posterior rib directed to the apex of the posterior lobes, regularly branching off on both sides, sometimes 1 free to the base, 3 or 4 acroscopic, 3 or 4 basioscopic; **posterior rib** naked to 5.6 cm; **midrib** broadly raised with a few purple spots above, narrowly rounded and paler below; **primary lateral veins** 6 to 8 pairs, convex and paler above, convex and purplish below when young; minor veins moderately distinct; **upper surface** drying coarsely wrinkled with close, prominently raised veins much paler than surface; **lower surface** smoother with the

veins less prominently raised. *Inflorescences* 4 per axil; **peduncle** 3–4 cm, terete, dark green, sometimes cream in lower 1/2; **spathe** 24–25 cm, tube 12.5 cm, 3.5 cm diam., olive-green outside, pale orange inside, spathe blade 12–12.5 cm, purplish outside, reddish purple inside; **spadix** ca. 20 cm; staminate portion ca. 12.3 cm, 1.5 cm diam. at widest area about 2/3 to apex, starch grains present in the spadix axis parenchyma; fertile staminate portion white; sterile staminate portion creamy brown, ca. 1.7 cm, ca. 1.3 cm diam., the lowermost 1.5 cm, drying darker, 1.8 cm diam. on drying, tapering upward to 1.6 cm diam.; pistillate portion up to 8.4 cm, ca. 1 cm diam. near base, to 2.1 cm diam. midway, 1.7 cm at apex; **pistil** 4–5 mm, 1.3–1.5 mm diam.; styles 2.4–2.8 mm diam., drying light brown, subrounded to 5-sided with the margins broadly rounded; stigma round, slightly raised and broadly rounded, drying dark brown with a narrow light brown margin, usually sunken into the surrounding style with 9 moderately deep pits around the circumference; **ovary** 8- or 9-locular, raphide cells abundant in outer regions rather than the stylar canals and in the aerenchyma of the spadix axis; **ovules** 8 to 10 per locule, axile placentation (though several seemingly branching in a sub-basal cluster of up to 3 ovules, the remainder tightly arrayed throughout the length of the locule all the way to the apex), placentas biseriate, 1 mm, one end nipplelike, finely striate longitudinally, druse cells abundant in ovule walls and spadix axis. *Infructescence* with immature berries whitish.

Distribution and habitat. *Philodendron darienense* is endemic to Panama, known only from Darién Province in a *Premontane wet forest* life zone at 100–200 m (Holdridge et al., 1971).

Etymology. The species is named after the type locality in Darién Province of Panama.

Conservation status. *Philodendron darienense* is known from nine specimen collections representing five locations, of which four are in protected areas, Darién National Park (low- and mid-elevation primary forests from Cerro Pirre and Cana), Matusagaratí wetland complex, and Reserva Hidrológica Filo del Tallo (pastures and secondary lowland forests). We have recently observed that some of the habitats that this species occupies, specifically forests from Filo del Tallo and wetlands from Matusagaratí, have been disturbed by anthropic activities, despite being within protected areas. With five locations in relation to the principal threats from logging and burning of natural areas and an EOO of 656 km^2 and an AOO of 28 km^2, *P. darienense* qualifies as Endangered [EN B1ab(iii)+B2ab(iii)].

Discussion. *Philodendron darienense* is a member of *Philodendron* sect. *Philodendron* subsect. *Philodendron* and is characterized by its hemiepiphytic life form, appressed-climber habit, robust stems (up to 10 cm diam.) with conspicuous petiolar scars, intact and deciduous 2-ribbed cataphylls, massive ovate-sagittate leaf blades (ca. 1.5–2 m long) with markedly sinuate margins, inflorescences four per node, short peduncles (less than 5 cm long), spadices with a long pistillate region (ca. 9 cm long), spathe blade olive-green externally and pale orange internally, spathe tube purple externally and red-purple internally, and ovaries with nine locules with eight to 10 ovules per locule. *Philodendron darienense* is most similar to *P. maximum*, due to the size of the leaves and sinuate margins. Taking into account type specimens (*Ule 9229* from K and L), botanical illustrations, and the original description by Krause (1913), *P. darienense* differs from *P. maximum* by the characters listed in the diagnosis.

Other species in *Philodendron* sect. *Philodendron* subsect. *Philodendron* that share similar features include *P. josefinense* Croat, which is distinguishable by its slenderer internodes (3 cm diam.), two pairs of acroscopic basal veins, and longer peduncles (more than 13 cm long); *P. dodsonii* Croat & Grayum, which differs in having cataphylls persisting in parchmentlike mats and as fibers, peduncles 5–14 cm long, the spathe blade white outside and reddish on the inside, and the spathe tube bright red outside; and *P. giganteum* Schott, known from the Greater Antilles, Venezuela, and Brazil, which differs mainly in having persistent cataphylls in most upper nodes, thinner greenish drying leaves, and ovaries with four to six locules.

An additional three species not belonging to subsection *Philodendron* were also compared because of their similar morphological features. These included *Philodendron ferrugineum* Croat (*Philodendron* subsect. *Macrolonchium* (Schott) Engl.), which differs by having the spathe tube green, heavily spotted with purple-violet outside and purple-violet to light maroon at least in the lower three fifths but otherwise greenish white inside); *P. ornatum* Schott (*Philodendron* subsect. *Psoropodium* (Schott) Engl.), which differs by having a densely tuberculate petiole; and *P. pterotum* K. Koch & Augustin (*Philodendron* subsect. *Macrobelium* (Schott) Engl.), which differs by its sharply D-shaped petioles.

In the *Philodendron* revision of Croat (1997), a sterile specimen of *P. darienense* (*Croat 77157*, MO) was determined as *P. edenudatum* Croat. However, the latter species comprises moderately sized plants with smaller leaves and entire blade margins.

Paratypes. PANAMA. **Darién:** vic. Cerro Pirre, along trail from base camp to Rancho Frio on slopes of Cerro Pirre, 7°58′N, 77°43′W, 200–450 m, 27 July 1994, *T. B. Croat &*

G. Zhu 77157 (MO); Parque Nacional Darién, Cerro Pirre, camino hacia Rancho Plástico, después del primer mirador, 8°00′57″N, 77°43′41″W, 157 m, 14 Apr. 2016, *O. O. Ortiz & T. Contreras 2576* (PMA); Laguna de Matusagaratí, El Golfo, 8°15′56.04″N, 77°56′35.14″W, 11 m, 11 Feb. 2019, *O. O. Ortiz, A. Ibáñez, N. Galvéz, J. Castillo & J. Páez 3285 OO* (MO, PMA); área inundable próxima al Río Tuira, transecto 2, islote de vegetación arbustiva en humedal dominado por *Typha dominguensis*, 8°7′34.37″N, 77°47′15.75″W, 9 m, 9 Feb. 2019, *A. Ibáñez, O. O. Ortiz, N. Gálvez & I. Candanedo 9606 AI* (PMA); El Golfo, reducto boscoso, bosque secundario, 8°16′5.76″N, 77°56′53.47″W, 21 m, 12 Feb. 2019, *A. Ibáñez, O. O. Ortiz, N. Gálvez & I. Candanedo 9628 AI* (PMA); área inundable próxima al Río Tuira, cercano a la desembocadura de quebrada Lirial, bosque de *Mora oleifera* con *Rhizophora racemosa*, 8°13′59.13″N, 77°54′11.45″W, 6 m, 30 Mar. 2019, *A. Ibáñez & A. Baúles 9665 AI* (PMA); Serranía de Pirre, Cana, orillas de río, 7°45′24″N, 77°41′4″W, 509 m, 13 Apr. 2019, *O. O. Ortiz, R. Flores, R. Quijano, Z. Samudio & R. Fuentes 3564* (PMA); Metetí, Reserva Hidrológica Filo del Tallo, 8°27′7″N, 77°59′27″W, 174 m, 18 Feb. 2020, *O. O. Ortiz, R. Baldini & J. Vázquez 3753* (FT, MO, PMA).

5. Philodendron longilobum M. M. Mora & Croat, sp. nov. TYPE: Panama. Panamá: Cerro Jefe, cercano a las antenas, 9°13′21″N, 79°22′20″W, 856 m, 10 June 2019, *O. O. Ortiz, M. Cedeño & R. da Pena 3723* (holotype, PMA!; isotypes, FT!, MO!, USJ!). Figures 9, 10.

Diagnosis. *Philodendron longilobum* M. M. Mora & Croat differs from *P. tripartitum* (Jacq.) Schott by having shorter internodes (0.5–2 cm vs. 3–14 cm), leaf blades with posterior lobes that are narrowly elliptic to falcate (vs. widely elliptic), and inflorescences with pinkish (vs. whitish, green, or yellow-green) spathes that are larger and more robust.

Climbing hemiepiphyte; roots clasping; stem less than 30 cm; sap watery; **internodes** broader than long, 0.5–2 cm, 2–3 cm diam., gray-green, with a thin waxy coating, easily flaking off; **cataphylls** 28–40 cm, sharply 1-ribbed, deciduous, green tinged reddish near the tip or reddish throughout. *Leaves* with **petiole** 53–65 cm, dull gray-green to dark purple-green, terete, obtusely flattened at base, less flattened toward apex, obtusely angled at apex, moderately soft, streaked; **blade** deeply trilobed, almost trisect, thinly coriaceous, semiglossy, dark green above, moderately bicolorous, heavily tinged with maroon below in juvenile blades, drying olive-green to reddish brown above and olive-green below, olive-green to reddish brown when dry; **medial lobe** 32–40 × 3.2–9 cm, 3.5–10 times longer than broad, narrowly oblong to narrowly elliptic, gradually acuminate at the apex, acute at the base; **lateral lobes** directed outward or upward, 27–40 × 3–7.5 cm, narrowly elliptic to falcate, acute at the apex, conspicuously inequilateral, the outer side 1.4–1.8 times wider than the inner margin at the middle, the inner margin always narrower than the outer margin, the outer margin rounded at the base, sometimes forming a wide arcuate sinus with blade decurrent on the petiole; **sinus** 0–2.2 cm deep; **midrib** narrowly raised above, thicker than broad below, medium green; **primary lateral veins** (4 to)7 to 9 per side, narrowly sunken above, weakly raised below, departing midrib at 50°–60° angle; minor veins obscurely visible, conspicuously and densely granular on the upper surface at drying. *Inflorescences* 1 to 4 per axil; **peduncle** 11–13 cm, as wide as the base of the spathe tube; **spathe** 13–20.5 cm, weakly constricted, pinkish red with white margins outside or solid pinkish, with a purple splotch near the peduncle, white on the blade and reddish on the tube inside, drying black; **spadix** 15–20 cm, white, drying blackish; staminate portion 10–12 cm; sterile staminate portion ca. 1 cm, pistillate portion 5.5–9.5 cm; pistils 1.1–1.6 × 0.4 mm, stigmas 0.45 mm, dark yellow; **ovary** 7- to 11-locular, placentation basal; **ovules** 1 or 2 per locule. *Infructescence* 13–14 cm. **Berries** ovoid, 6–8 mm, green; seeds oblong-elliptic, 1.4 × 0.65 mm.

Distribution and habitat. *Philodendron longilobum* is endemic to Panama, occurring only in Panamá Province, at 200–856 m in a *Tropical wet forest* life zone (Holdridge et al., 1971).

Etymology. The epithet *longilobum* refers to the length of the lateral lobules, which we consider as an important feature of this proposed new taxon.

Conservation status. *Philodendron longilobum* is known from eight specimen collections representing four locations: Santa Rita (Colón Province), Llano Cartí (Panamá Province), Cerro Jefe (Panamá Province), and Alturas de Nique (Darién Province). Three of these (Santa Rita, Cerro Jefe, and Llano Cartí) are under intensive disturbance due to livestock-related activities. During recent fieldwork, we observed that the destruction of the natural areas in these sites still persists, putting the species in obvious peril. We have calculated this species has an estimated AOO of 32 km^2 and an EOO of 5509.3 km^2. Based on the information mentioned above, *P. longilobum* qualifies as Endangered [EN B2ab(i,ii,iii,iv,v)].

Discussion. This species, a member of *Philodendron* sect. *Tritomophyllum*, is characterized by its climbing habit, short internodes, deciduous cataphylls, deeply trilobed or trisect blades that dry olive-green to reddish brown and have narrowly elliptic to falcate lateral lobes, one to four inflorescences per axil, spathes pinkish red with white margins outside or solid pinkish, 7- to 11-locular ovary, and one or two ovules per locule with basal placentation.

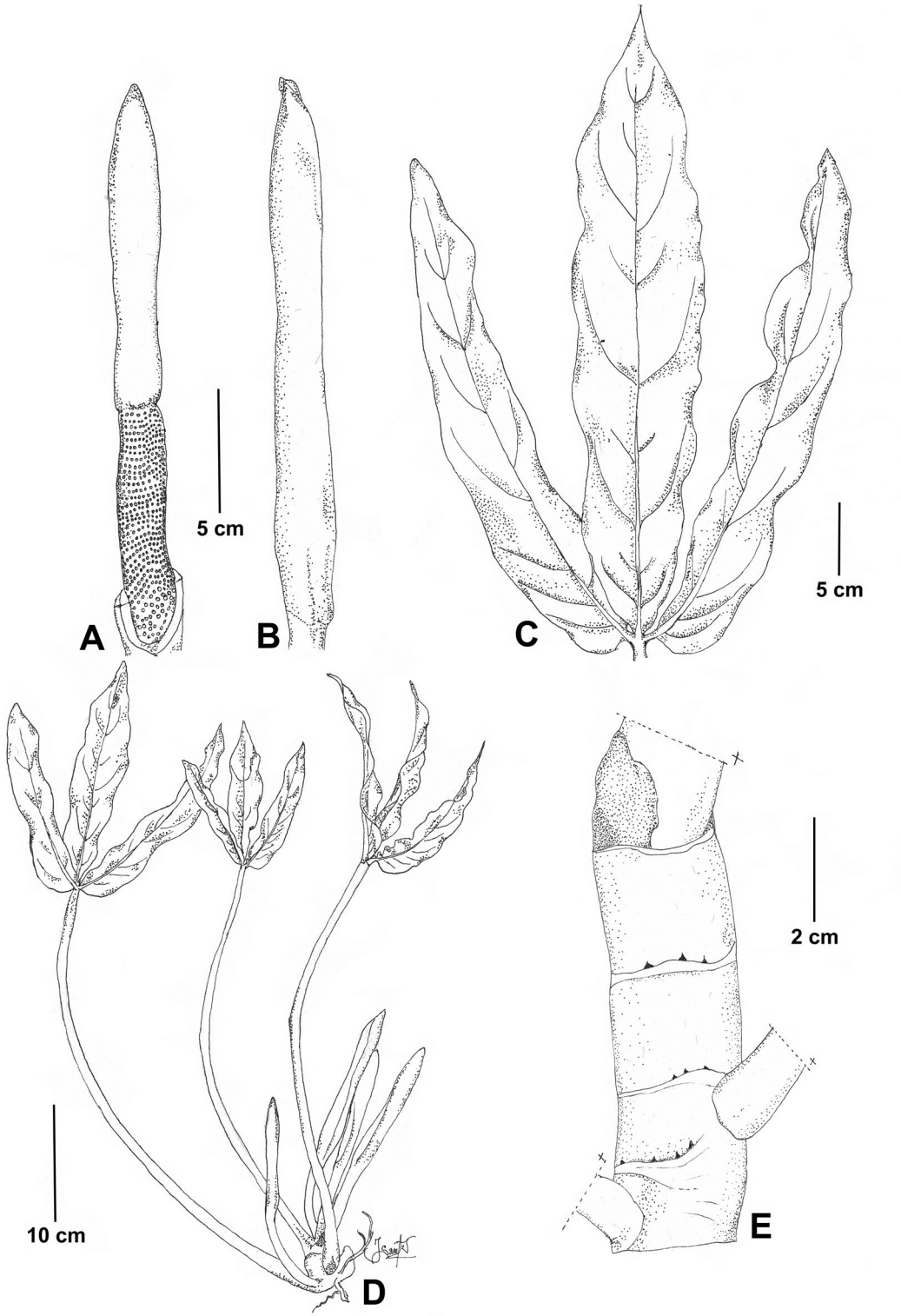

Figure 9. *Philodendron longilobum* M. M. Mora & Croat. —A. Spadix. —B. Spathe. —C. Leaf blade. —D. Habit. —E. Stem. Illustration by Jeraldín Vergara (from *Ortiz et al. 3723*).

Figure 10. *Philodendron longilobum* M. M. Mora & Croat. —A. Habit. —B. Leaf blades (lower surfaces). —C. Inflorescence with a longitudinal cut (dissected). Photos by Marco Cedeño.

Philodendron longilobum is most similar to *P. tripartitum*, discussed above. It is also somewhat similar to other 3-lobed species such as *P. angustilobum* Croat & Grayum, *P. anisotomum* Schott, and *P. madronense* Croat. However, *P. angustilobum* differs by having leaves with broadly spreading lateral lobes, which are much narrower and shorter than the medial lobes, and spathes greenish white externally. *Philodendron anisotomum* differs by having gray-green leaf blades (when dry) with more broadly spread lateral lobes, spathes greenish white to creamy yellow externally (sometimes tinged with violet-purple outside), and three ovules per locule. *Philodendron madronense* differs in having more numerous primary lateral veins (ca. 25 pairs vs. four to nine in *P. longilobum*).

Three specimens (*Gentry 7433*, *Luteyn 3178*, and *Luteyn 4066*) from Coclé Province, at the forests of La Mesa about three miles from El Valle de Antón, are very similar to *Philodendron longilobum*; however, they differ by having blades that are deeply lobed but not approaching trisect, with fewer primary lateral veins (three to five vs. four to seven) that depart the midrib at an angle less than 45° (vs. more than 50°), and smaller inflorescences with spathes less than 17 cm long (vs. 20 cm or longer) and thinner and shorter peduncles. A mature specimen from Colón Province (*McPherson 11760*) is very similar to the juvenile plants of *P. longilobum* but differs by having blades with much narrower, more asymmetrical lobes (one side 2–2.7 times as wide as the other), fewer primary lateral veins (four vs. usually seven to nine), and shorter peduncles (5–6 cm long vs. more than 10 cm). It also differs by having stigmas that are blackish on the outside with a yellow margin and tan at the center (vs. solid brown) and concave at the center (vs. convex), and the seeds are shaped like a bowling pin with a short neck (vs. ovoid). It is probable that these collections may represent undescribed taxa, but we prefer to withhold judgment pending additional material.

Paratypes. PANAMA. **Colón:** 25–26 km from Transismica Hwy. on Santa Rita Ridge, forest on NW-facing slopes; 9°24′30″N, 79°40′00″W, 500 m, 21 Oct. 1981, *S. Knapp, D. W. Roubik & R. J. Schmalzel 1708* (MO). **Darién:** S of El Real, region called Alturas de Nique, near Cana mine, along trail following old Camino Real towards Colombia, 7°45′N, 77°40′W, 900–1250 m, 26 Aug. 1987, *G. McPherson 11603* (MO). **Guna Yala (formerly San Blas):** Nusigandí, along El Llano–Cartí Rd., 0.7 mi. beyond Cuna Headquarters, located 10.9–11.6 mi. N of Pan-American Hwy., 9°18′N, 78°59′W, 450 m, 3 Apr. 1993, *T. B. Croat 75135* (MO). **Panamá:** El Llano–Cartí rd., 10.6 mi. from the Pan American Hwy., tropical wet forest, 9°17′N, 78°58′W, 400 m, 28 July 1983, *J. S. Miller, L. Miller & C. W. Hamilton 862* (MO); rd. past Altos de Pacora, 3–3.5 mi. NE of Altos de Pacora, 7.8–8.2 mi. above Pan-American Hwy., 11.1–11.6 mi. beyond Lago Cerro Azul, 9°15′N, 79°25′W, 700–750 m, 19 June 1988, *T. B. Croat 68636* (MO); 6–10 mi. N of Pan-American Hwy. on El Llano–Cartí Rd., 9°15′N, 78°59′W, 200–250 m, 1 Apr. 1988, *S. A. Thompson 4704* (MO); vic. Cerro Jefe, 4.6 km

beyond peak on rd. to Altos de Pacora, 26.3 km from the Inter-American Hwy., 9°14′20″N, 79°20′25″W, 600 m, 12 June 1976, *T. B. Croat 35900* (MO).

6. Philodendron martinezii Croat & O. Ortiz, sp. nov. TYPE: Panama. Bocas del Toro: Changuinola, Cerro Frio, headwaters of Río Tsuki, Point 22, disturbed forest, canopy to 10 m, DBH 10–30 cm, resembling a cloud forest with many roots on surface, many palms, many epiphytic plants & mosses growing on ground, 9°15′37.6″N, 82°30′14.6″W, 1200 m, 27 Oct. 2008, *L. Martínez, A. K. Monro & D. Santamaría 432* (holotype, PMA-80306!). Figures 3F, G, 11, 12.

Diagnosis. *Philodendron martinezii* Croat & O. Ortiz differs from *P. ubigantupense* Croat by having stems which dry medium dark reddish yellow-brown (vs. grayish), blades narrowly cordulate at the base (vs. rounded), and ovaries with three ovules per locule (vs. one).

Hemiepiphyte, somewhat laxly scandent habit; stem loosely attached; **internodes** 3–5.5 cm, drying medium dark reddish yellow-brown, finely many-ribbed; **cataphylls** to 12.5 cm, unribbed, promptly deciduous. *Leaves* long-petiolate; **petiole** 14.7–17.7 cm, subterete, slender, sulcate, drying gray-brown, closely and acutely ribbed longitudinally, closely transverse ridged-fissured toward apex; **blade** 17–23 × 4.1–5 cm, 3–5 times longer than broad, ± as long as petiole, gradually acuminate at apex, rounded at base, subcoriaceous, drying light gray-brown and semiglossy above, yellow-brown and nearly matte below; **midrib** drying narrowly sunken and concolorous above, narrowly raised, prominently ridged and slightly paler below; **primary lateral veins** not apparent on upper surface and only faintly apparent below on dried material; minor veins moderately prominulous and close on upper surface on magnification, less close and only faintly visible above; laticifers not apparent below. *Inflorescence* solitary; **peduncle** ca. 1.7 cm; **spathe** ca. 12 cm, reddish pink-orange outside, pinkish inside (post-anthesis); **spadix** ca. 12 cm, staminate portion 7 cm, sterile staminate portion ca. 1 cm, 7 mm diam. at base, 6 mm diam. at apex, with starch grains in the spadix axis; pistillate portion 3.7 cm, 1.2 cm diam.; pistils 2.8–3 mm, 1.6–1.8 mm diam.; **ovary** 1.8–1.9 mm diam. at apex; stigma depressed-globose, when dried with 5 or 6 pits around the circumference, thin, slightly wider than ovary, raphide and druse cells present in the ovary walls, locules 5 or 6(to 12); **ovules** basal, 3 per locule, 0.7 mm, the funicle shorter or longer than ovules. *Infructescence* unknown.

Distribution and habitat. *Philodendron martinezii* is endemic to Panama, known only from the type locality in Bocas del Toro Province at 1200 m in a *Tropical wet forest* life zone (Holdridge et al., 1971).

Etymology. The species is named in honor of Panamanian botanist Laurencio Martínez, who collected the type specimen along with Alex K. Monro and Daniel Santamaría.

Conservation status. Currently, as there is not sufficient information to support an accurate conservation assessment based on distribution or population status for this species, we therefore propose *Philodendron martinezii* to be listed as Data Deficient [DD].

Discussion. *Philodendron martinezii* is an unusual member of *Philodendron* sect. *Macrobelium* subsect. *Glossophyllum* (Schott) Croat because it has three ovules per locule instead of one or two. This species is characterized by its epiphytic, somewhat laxly scandent habit, deciduous, unribbed, dark brown–drying cataphylls, slender and elongated internodes which dry medium dark brown, long, finely ribbed, subterete, sulcate petioles, and brown-drying, narrowly lanceolate-oblong-elliptic leaf blades that are gradually acuminate at the apex and rounded at the base with primary lateral veins inconspicuous, as well as by its short-pedunculate solitary inflorescence with the spathe reddish pink-orange outside and pinkish inside (post-anthesis). *Philodendron martinezii* resembles *P. ubigantupense* morphologically (mainly in its obscure primary lateral veins) but is distinguished from it by the characters listed in the diagnosis.

In the Lucid *Philodendron* Key, the species tracks to *P. bakeri* Croat & Grayum, which differs by having a stem that dries less prominently ridged and light brown, thicker leaf blades that are proportionately broader with a more broadly rounded base, petioles that are sheathed to near the middle, and a more long-pedunculate inflorescence, and to *P. correae* Croat, which differs by much larger (21–46 × 5–12 cm), blackish-drying leaf blades, and a larger inflorescence (spadix 15–18 cm long).

7. Philodendron samudioense Croat & O. Ortiz, sp. nov. TYPE: Panama. Chiriquí: Distr. Gualaca, Reserva Forestal Fortuna, Sendero Samudio, 8°44′4″N, 82°14′57″W, 1205 m, 6 Nov. 2013, *O. O. Ortiz, J. E. Batista & F. Miranda 1773* (holotype, PMA-106393!). Figures 3H, I, 13, 14.

Diagnosis. *Philodendron samudioense* Croat & O. Ortiz differs from *P. cotonense* Croat & Grayum by having narrowly oblong-triangular-sagittate leaf blades (vs. narrowly ovate-triangular blades), shorter peduncles, ca. 4.5 cm (vs. usually more than 10 cm), and ovaries with one ovule per locule (vs. four or five).

Moderately small climbing hemiepiphyte; **internodes** short, 3–10 mm, ca. 2 cm diam. (drying to 1.6 cm diam.), up to 5 cm diam. at lower parts; **cataphylls**

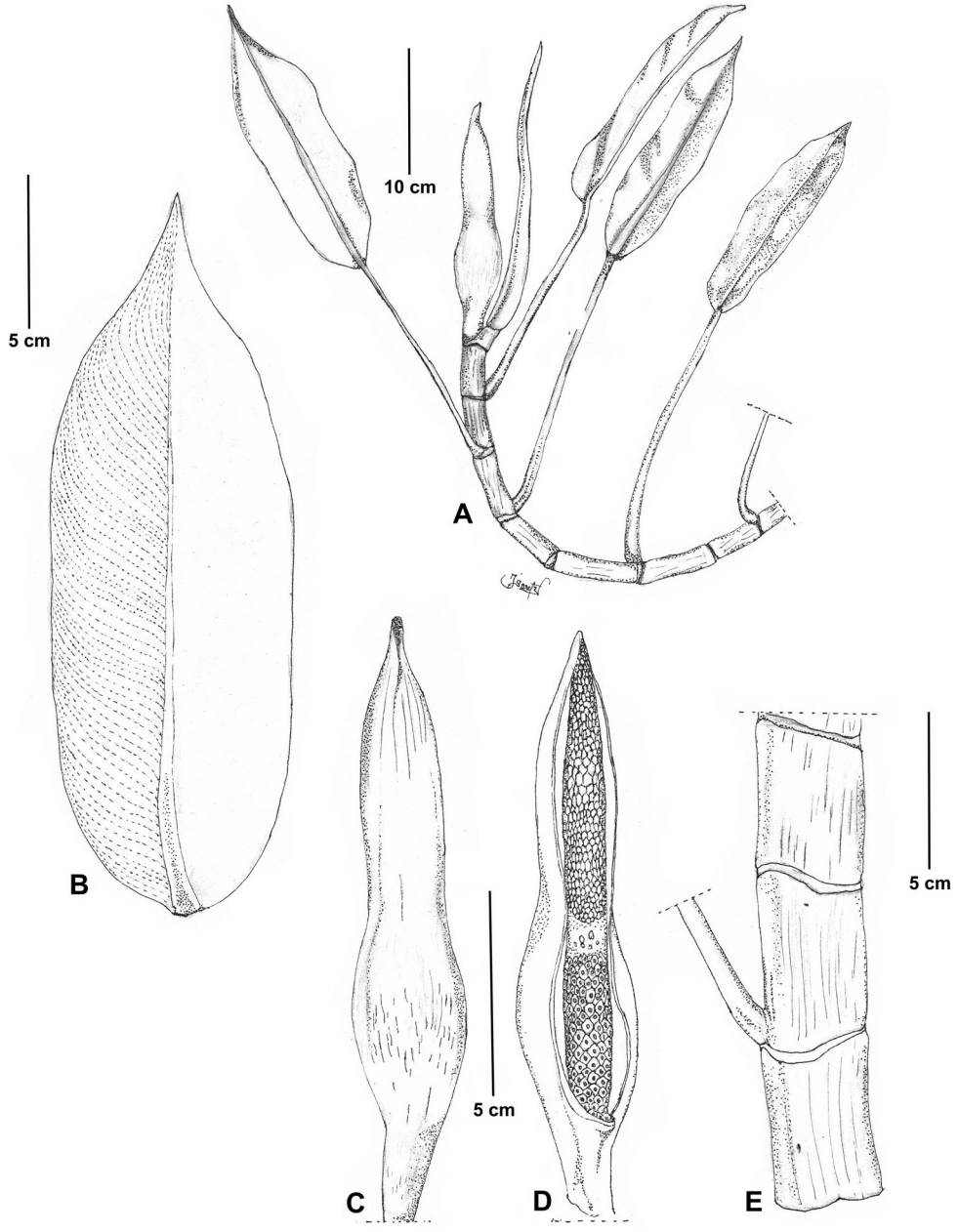

Figure 11. *Philodendron martinezii* Croat & O. Ortiz. —A. Habit. —B. Leaf blade. —C. Spathe. —D. Spadix. —E. Stem. Illustration by Jeraldín Vergara (from *Martínez et al. 432*).

17 cm, unribbed, deciduous. *Leaves* with **petiole** 22.5–24 cm, sheathed 1–3 cm, subterete, drying 5 mm diam., gray-brown, minutely granular, geniculum not apparent; **blade** narrowly oblong-triangular-sagittate, 26.5–31.4 × 10.7–12 cm, broadest across the posterior lobes, 2.4–2.6 times longer than broad, 1.1–1.3 times as long as the petiole, gradually acuminate at apex, prominently lobed at base, dark green and weakly glossy above, slightly paler and semiglossy below, drying scarcely bicolorous, weakly glossy above, semiglossy below; **anterior lobe** 20.7–24.7 × 6.5–7.4 cm, broadly concave along the margins in lower 1/2 of anterior lobe, otherwise broadly convex; constricted area 6.5–7.5 cm above petiolar plexus; **posterior lobes**

Figure 12. *Philodendron martinezii* Croat & O. Ortiz. —A. Habit. —B. Inflorescence with a longitudinal cut (dissected). —C. Spathe. Photos by Alex Monro.

6.3–8.8 × 3.3–3.8 cm, directed slightly outward; **basal veins** 4 pairs, 1st pair usually free to the base, 2nd and 3rd pairs fused 1.5–2 cm; posterior rib weakly curved, naked ca. 1/2 its length or up to ca. 1 cm; **midrib** weakly and broadly raised, paler above, broadly rounded to convex, nearly concolorous below; **primary lateral veins** scarcely visible on upper surface, moderately weak below, arising at a steep angle then spreading at a 45° angle; minor veins fine, mostly arising from the midrib; upper surface moderately smooth, densely short-pale-lineate; lower surface densely granular, sparsely short-pale-lineate near major veins; laticifers weakly visible, darker, sinuous, elongate. *Inflorescences* 1 or 2 per axil, ca. 14.2 cm; **peduncle** ca. 4.5 cm, drying 3 mm diam. at midpoint, medium yellow-brown; **spathe** 10.2 cm; tube green, 4.5 cm, 2.3 cm diam., flattening to 7.5 cm wide; resin canals not obvious, the region of the constriction with an accumulation of resin; blade white, prominently acuminate, flattening to 4 cm wide, constricted zone weak; **spadix** 6.8 cm; staminate portion drying yellow-brown, 2.7 cm, 7 mm diam. at midpoint; sterile staminate portion 1.5 mm, 7.5 mm diam., drying blackened; constricted area 7 mm diam.; pistillate portion 3.7 cm in front, 2.5 cm in rear, 8 mm diam. near base, 1.2 cm diam. at midpoint, 9 mm diam. at apex; pistils 1–1.2 mm, 1–1.2 mm diam.; style 0.4 mm, 0.8 mm wide, upper margins rounded, druse cells and starch grains very abundant in the stylar lobes; stigma thin, depressed medially; **ovary** 4- or 5-locular; **ovules** 1 per locule, basally affixed, 1.3–1.4 mm, apical portion mammiliform, ovary walls with raphide cells; funicle very short. *Infructescence* unknown.

Distribution and habitat. *Philodendron samudioense* is endemic to Panama, known only from Chiriquí Province in the Reserva Forestal Fortuna at 1205 m in a *Premontane wet forest* or *Premontane rain forest* life zone (Holdridge et al., 1971).

Etymology. The species is named for the type locality on the Sendero Samudio in the Fortuna Reserve.

Conservation status. *Philodendron samudioense* is known so far from two occurrences in the primary cloud forest from the Fortuna Forest Reserve. This protected zone includes a functioning dam, but its natural areas are not currently subject to any threats. In the absence of data on population size, and contingent upon effec-

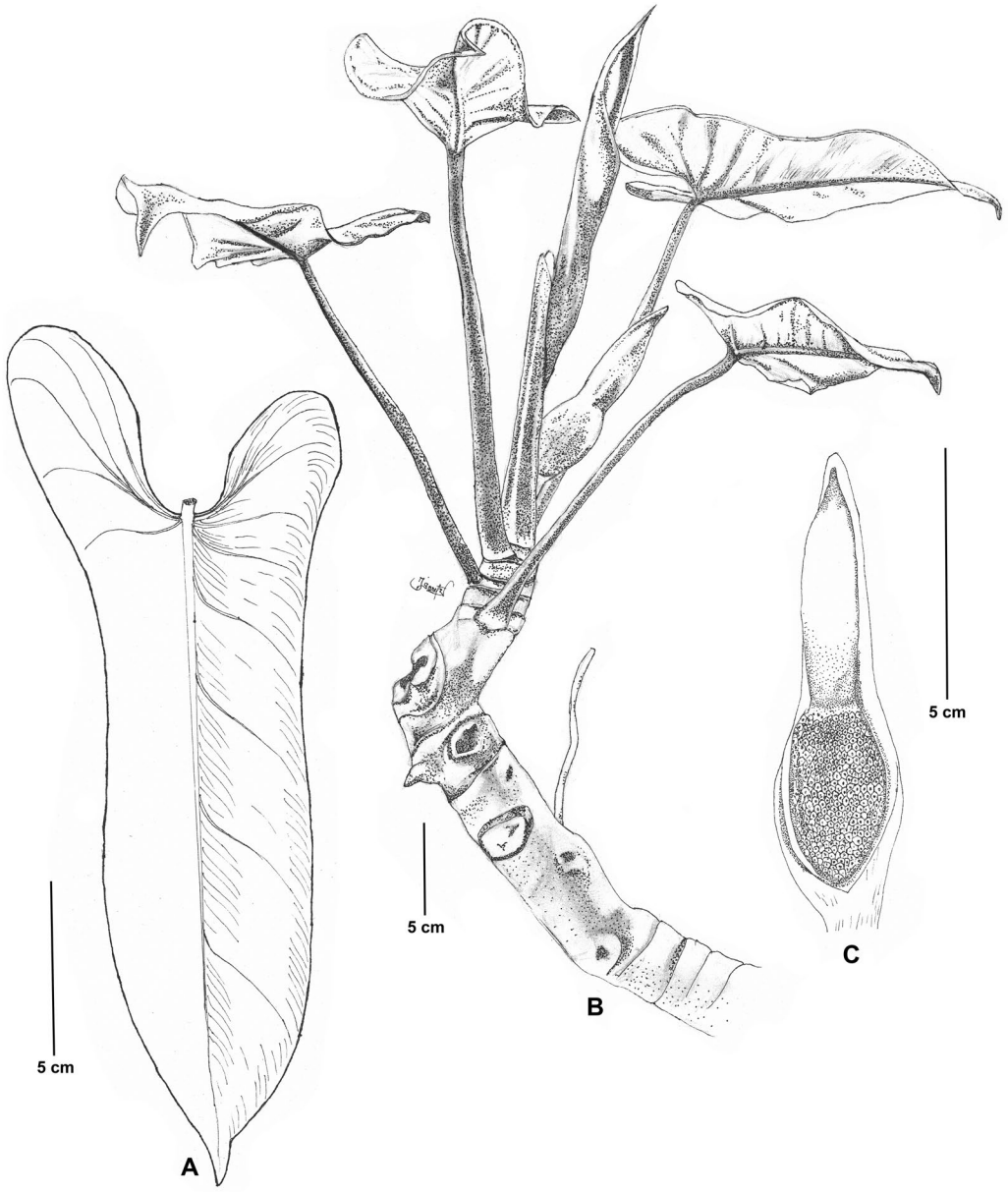

Figure 13. *Philodendron samudioense* Croat & O. Ortiz. —A. Leaf blade. —B. Habit with a closed inflorescence. —C. Inflorescence with a longitudinal cut (dissected). Illustration by Jeraldín Vergara (from *Ortiz et al. 1773*).

tive protection of the Fortuna Reserve, *P. samudioense* can be provisionally assessed as Least Concern [LC].

Discussion. *Philodendron samudioense* is a member of *Philodendron* sect. *Macrobelium* subsect. *Glossophyllum* ser. *Ovata* Croat and is characterized by its climbing hemiepiphytic habit, short internodes, long, unribbed, and promptly deciduous cataphylls, long, subterete, dark brown–drying petioles, narrowly sagittate and gradually acuminate, greenish drying blades with four pairs of primary lateral veins and somewhat flaring narrow posterior lobes that form a barely naked, narrow parabolic sinus, and moderately short-pedunculate inflorescence with a somewhat constricted spathe that is green on the tube and white on the blade.

In the Lucid *Philodendron* Key, *P. samudioense* tracks to *P. brenesii* Standl. and *P. zhuanum* Croat, both species of subsection *Macrobelium*. *Philodendron brenesii*

Figure 14. *Philodendron samudioense* Croat & O. Ortiz. —A. Habit. —B. Leaf blades (upper surfaces). —C. Inflorescence with a longitudinal cut (dissected). —D. Spathes. —E. Stem. Photos by Orlando Ortiz.

differs by having sharply 1- or 2-ribbed cataphylls, more broadly ovate, dark brown–drying blades with a V-shaped sinus, non-naked posterior rib, numerous primary lateral veins (usually eight to 12), and six to 12 ovules per locule. *Philodendron zhuanum* differs by having much larger leaf blades (38–62 × 27–32 cm) with the margins convex, up to three inflorescences per axil with the peduncles more than 9 cm long, and pistillate flowers with eight or nine locules. *Philodendron samudioense* also resembles *P. cotonense* morphologically, mainly in its habit, deciduous intact cataphylls, and leaf blade size, but is distinguished from it by the characters listed in the diagnosis.

In the Central America *Philodendron* key (Croat, 1997), *P. samudioense* tracks to *P. aromaticum* Croat & Grayum, which differs in having a sharply 2-ribbed

cataphyll, a D-shaped petiole with raised lateral margins, much larger brown-drying leaf blades with five to seven pairs of primary lateral veins, and 9- or 10(–11)-locular ovaries with two or three ovules per locule.

Paratype. PANAMA. **Chiriquí:** Distr. de Gualaca, Reserva Forestal Fortuna, División Continental, 8°47′1″N, 82°12′54″W, 1154 m, 25 Sep. 2019, *O. O. Ortiz & M. Cedeño-Fonseca 3754* (PMA).

New Records of *Philodendron* for the Flora of Panama

Philodendron anisotomum Schott, Oesterr. Bot. Z. 8: 179. 1858. TYPE: Guatemala. Las Nubes, *Wendland 321* (lectotype, designated by Croat [1997: 397], GOET!). Figure 15.

Distribution and habitat. *Philodendron anisotomum* ranges from Mexico to Panama, at 30–1800 m. In Panama, it occurs in *Premontane wet forest* and *Tropical wet forest* life zones (Holdridge et al., 1971).

Conservation status. This species has a very wide distribution (EOO: 1,014,092 km^2); it is not currently experiencing any major threats and no significant future threats have been identified. This species is therefore assessed as Least Concern [LC].

Discussion. This species is distinguished by its deeply 3-lobed blades with frequently much smaller, falcate lateral lobes broadly confluent with the medial lobe. *Philodendron anisotomum* is easily confused with *P. tripartitum* (Jacq.) Schott, which differs in having proportionately narrower medial lobes (mostly 3–3.5 cm, rarely to 1.7 times longer than broad) with four to nine prominently sunken primary lateral veins and lateral lobes typically directed more or less toward the apex.

Specimens examined. PANAMA. **Chiriquí:** Los Planes de Hornitos, camino hacia la cima de Cerro Hornito, bosque nuboso enano, 8°39′14″N, 82°11′53″W, 1609 m, 14 Aug. 2019, *O. O. Ortiz, C. Ramos & R. da Pena 3708* (PMA). **Panamá Oeste:** Distr. de Capira, Parque Nacional Altos de Campana, Sendero de interpretación, 8°40′54″N, 80°55′40″W, 750 m, *C. Galdames, M. Sánchez, C. Chung & V. Rodríguez 926* (PMA); El Valle de Antón, La Mesa, 2 Oct. 1996, *FLORPAN, C. Guerra & A. Espinosa 2684* (PMA); recorrido desde Santa Rita a El Valle por la carretera secundaria, sector entre Río Indio y Los Cholos, 8°43′46″N, 80°6′45″W, 14 June 2017, *C. Galdames & E. Campos 8437* (PMA, SCZ).

Philodendron auriculatum Standl. & L. O. Williams, Ceiba 3(2): 108. 1952. TYPE: Costa Rica. Puntarenas: Esquinas Forest Preserve, Esquinas Experiment Station, region betw. Río Esquinas & Palmar Sur de Osa, 60 m, *P. Allen 5697* (holotype, EAP! [now at US]; isotypes, F not seen, US!). Figure 16.

Distribution and habitat. *Philodendron auriculatum* occurs only in southwestern Costa Rica (on the Pacific slope from San Jose and Puntarenas Provinces) to Panama (on Pacific slope of Chiriquí Province), ranging from near sea level to 1200 m in elevation in *Tropical wet forest* and *Premontane wet forest* life zones (Holdridge et al., 1971).

Conservation status. The natural distribution of this species includes at least 14 locations of which eight are in protected areas (all in Costa Rica). This species occurs from dry open areas to humid forests, where it grows in congested colonies (probably due to vegetative reproduction). It has an EOO of 13,321.5 km^2 and an AOO of 128 km^2 and is not currently experiencing any major threats. Because of this, *Philodendron auriculatum* could be assessed as Least Concern [LC].

Discussion. This species is characterized by its short internodes, sharply 2-ribbed, deciduous cataphylls, moderately long, markedly spongy, somewhat flattened petioles (averaging slightly shorter than the blades), oblong-elliptic to oblong-oblanceolate, pale yellow-green–drying blades, which are usually narrowly cordulate to auriculate at the base, and one to two greenish inflorescences per node, which are red to maroon within at the base of the spathe. *Philodendron auriculatum* is easily confused with *P. pseudauriculatum* Croat, which differs in having darker gray-green–drying leaf blades with a dark green ring at the apex of the petiole, and the base acute, rounded, or broadly subcordate. In addition, *P. pseudauriculatum* has a whitish spathe clearly demarcated from the contrasting green peduncle. In contrast, *P. auriculatum* has a yellowish green spathe that is not at all demarcated from the peduncle.

Specimen examined. PANAMA. **Chiriquí:** carretera hacia Caldera, 8°40′58″N, 82°20′50″W, 366 m, 25 Aug. 2018, *O. O. Ortiz, R. Baldini, R. Flores, M. Cedeño, P. Díaz & H. Hentrich 3387* (PMA).

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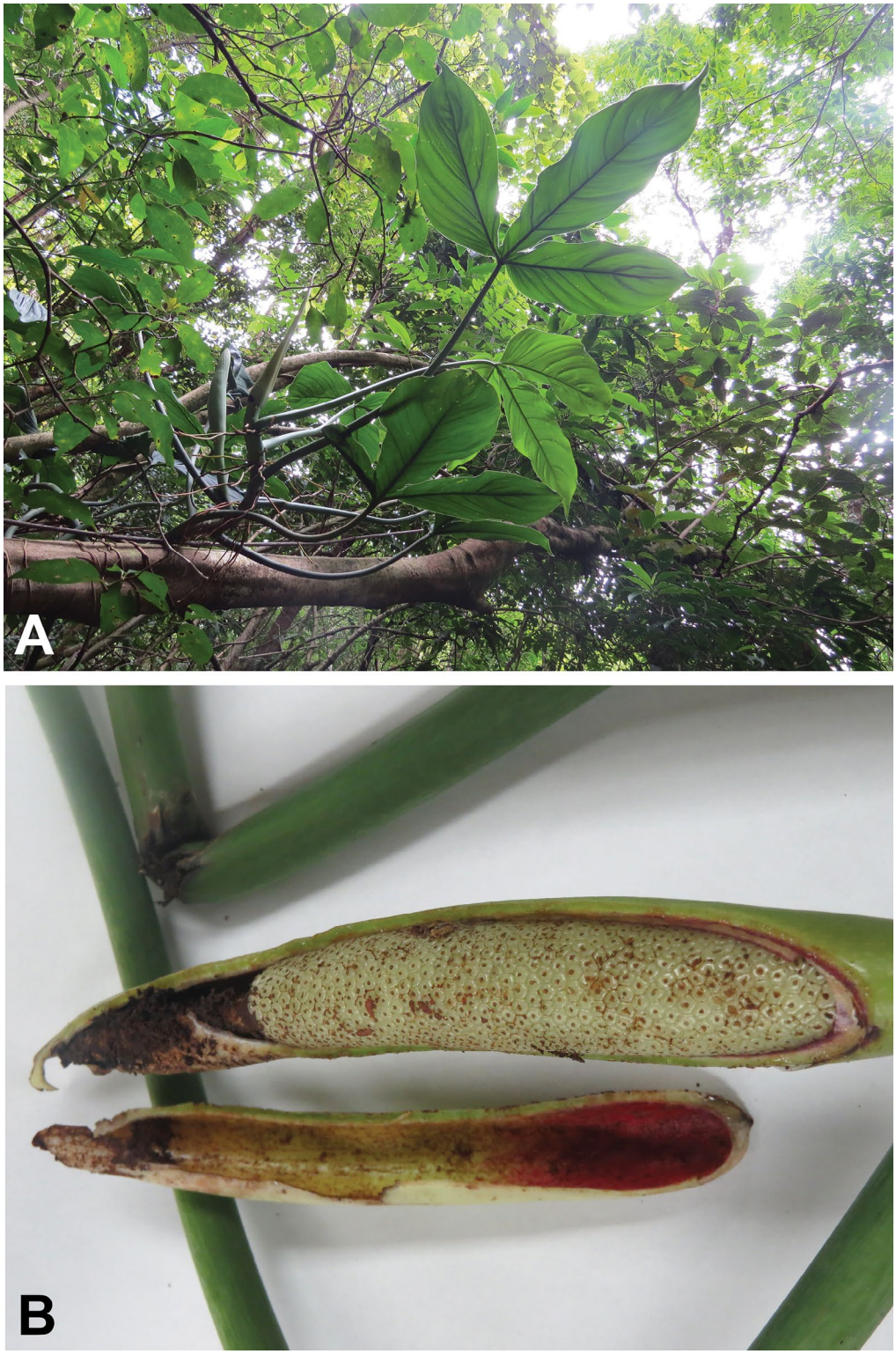

Figure 15. *Philodendron anisotomum* Schott. —A. Habit. —B. Infructescence with a longitudinal cut (dissected). Photos by Orlando Ortiz.

Figure 16. *Philodendron auriculatum* Standl. & L. O. Williams. —A. Habit. —B. Leaf blades with subcordate bases. —C. Stem. —D. Inflorescence with a longitudinal cut (dissected). Photos by Orlando Ortiz.

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Literature Cited

Bachman, S., J. Moat, A. W. Hill, J. de la Torre & B. Scott. 2011. Supporting Red List threat assessments with GeoCAT: Geospatial conservation assessment tool. ZooKeys 150: 117–126.

Bachman, S., B. Eliot-Walker, S. Barrios, A. Copeland & J. Moat. 2020. Rapid Least Concern: Towards automating Red List assessments. Biodivers. Data J. 8: e47018.

Boyce, P. C. & T. B. Croat. 2020. The Überlist of Araceae: Totals for Published and Estimated Number of Species in Aroid Genera. https://doi.org/10.13140/RG.2.2.24820.09605

Canal, D., N. Köster, K. E. Jones, N. Korotkova, T. B. Croat & T. Borsch. 2018. Phylogeny and diversification history of the large Neotropical genus *Philodendron* (Araceae): Accelerated speciation in a lineage dominated by epiphytes. Amer. J. Bot. 105: 1035–1052.

Canal, D, N. Köster, M. Celis, T. B. Croat, T. Borsch & K. E. Jones. 2019. Out of Amazonia and back again: Historical biogeography of the species-rich Neotropical genus *Philodendron* (Araceae). Ann. Missouri Bot. Gard. 104: 49–68.

Croat, T. B. 1994. Taxonomic status of Neotropical Araceae. Aroideana 17: 33–60.

Croat, T. B. 1997. A revision of *Philodendron* subgenus *Philodendron* (Araceae) for Mexico and Central America. Ann. Missouri Bot. Gard. 84: 311–704.

Croat, T. B., T. E. Mines & C. V. Kostelac. 2019. A review of *Philodendron* subg. *Philodendron* (Araceae) from South America with the descriptions of 22 new species. Webbia 74: 193–246.

Gauthier, M. P. L., D. Barabe & A. Bruneau. 2008. Molecular phylogeny of the genus *Philodendron* (Araceae): Delimitation an infrageneric classification. Bot. J. Linn. Soc. 156: 13–27.

Grayum, M. H. 1996. Revision of *Philodendron* subgenus *Pteromischum* (Araceae) for Pacific and Caribbean tropical America. Syst. Bot. Monogr. 47: 1–233.

Haigh, A., S. J. Mayo, T. B Croat, L. Reynolds, M. Mora-Pinto, P. C. Boyce, L. Lay, et al. 2009. Interactive web-taxonomy for the Araceae: www.cate-araceae.org. Blumea 54: 13–15.

Holdridge, L. R, W. C. Grenke, W. H. Hatheway, T. Liang & J. A. Tosi. 1971. Forest Environments in Tropical Life Zones: A Pilot Study. Pergamon Press, New York.

Ibáñez, A. 2011. Guía Botánica del Parque Nacional Coiba. ICBG-STRI-SENACYT, Panama City.

IUCN Standards and Petitions Committee. 2019. Guidelines for Using the IUCN Red List Categories and Criteria, Version 14. Prepared by the Standards and Petitions Committee of the IUCN Species Survival Commission. <http://www.iucnredlist.org/documents/RedListGuidelines.pdf>.

Krause, K. 1913. Araceae-Philodendroideae-Philodendreae-Philodendrinae. Pp. 1–143 *in* A. Engler & K. Krause (editors), Das Pflanzenreich: Regni Vegetabilis Conspectus IV (Heft 60). W. Engelmann, Berlin.

Loss-Oliveira, L., L. S. B. Calazans, E. B. Morais, S. J. Mayo, C. E. G. Schrago & C. M. Sakuragui. 2014. Floral evolution of *Philodendron* subgenus *Meconostigma* (Araceae). PLoS One 9: e89701.

Loss-Oliveira, L., C. Sakuragui, M. De Lourdes Soares & C. G. Schrago. 2016. Evolution of *Philodendron* (Araceae) species in Neotropical biomes. PeerJ. 4: 1–18.

Mayo, S. J. 1988. Aspectos da evolução e da geografia do gênero *Philodendron* Schott (Araceae). Acta Bot. Brasil. 1: 27–40.

Mayo, S. J. 1989. Observations of gynoecial structure in *Philodendron* (Araceae). Bot. J. Linn. Soc. 100: 139–172.

Mayo, S. J. 1991. A revision of *Philodendron* subgenus *Meconostigma* (Araceae). Kew Bull. 46: 601–681.

Mayo, S. J., J. Bogner & P. C. Boyce. 1997. The Genera of Araceae. Royal Botanic Gardens, Kew.

Mora, M., R. Bernal, T. B. Croat & J. Jácome. 2006. A phytogeographic analysis of Araceae of Cabo Corrientes (Chocó, Colombia) and comparable lowland tropical American floras. Ann. Missouri Bot. Gard. 93: 359–366.

Ortiz, O. O., T. B. Croat & R. M. Baldini. 2018. Current status of aroid species diversity in Panama, including new records for the country. Webbia 73: 141–153.

Ortiz, O. O., M. S. de Stapf & T. B. Croat. 2019a. Diversity and distributional patterns of aroids (Alismatales: Araceae) along an elevational gradient in Darién, Panama. Webbia 75: 339–352.

Ortiz, O. O., R. Flores, G. McPherson, J. F. Carrión, E. Campos-Pineda & R. M. Baldini. 2019b. Additions to the Flora of Panama, with comments on plant collections and information gaps. Check List 15: 601–627.

Sakuragui, C. M., L. S. B. Calazans, L. Loss de Oliveira, E. Barroso de Morais, A. M. Benko-Iseppon, S. Vasconcelos, C. E. G. Schrago, et al. 2018. Recognition of the genus *Thaumatophyllum* Schott formerly *Philodendron* subg. *Meconostigma* (Araceae) based on molecular and morphological evidence. PhytoKeys 98: 51–71.

Thiers, B. 2021 [continuously updated]. Index Herbariorum: A Global Directory of Public Herbaria and Associated Staff. New York Botanical Garden's Virtual Herbarium. <http://sweetgum.nybg.org/ih/>.

Vasconcelos, S., M. L. Soares, C. Sakuragui, T. B. Croat, G. Oliveira & A. M. Benko-Iseppon. 2018. New insights on the phylogenetic relationships among the traditional *Philodendron* subgenera and the other groups of the *Homalomena* clade (Araceae). Molec. Phylogen. Evol. 127: 168–178.

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