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Studies on Schismatoglottideae (Araceae) of Borneo XXXIII – A review of the *Schismatoglottis* Tecturata Group, including description of a new species, *Schismatoglottis evelyniae*

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ABSTRACT

Schismatoglottis evelyniae P.C.Boyce & S.Y.Wong is described as a taxonomically new species in the Tecturata Group, morphologically most similar to *Schismatoglottis platystigma* M.Hotta and *S. petri* A. Hay. *Schismatoglottis evelyniae, S. platystigma, S. petri*, and *S. tecturata* are illustrated from living plants. A key to the species of the *Schismatoglottis* Tecturata Group is provided.

KEY WORDS

Araceae, Borneo, *Schismatoglottis,* Malaysia, Sarawak, Schismatoglottideae.

INTRODUCTION

Schismatoglottis is one of the larger genera of Asian aroids, with an estimated 200 species, of which somewhat less than half have now been formally described. *Schismatoglottis* species display a considerable variety of shoot architecture and leaf morphologies, combinations of which have been used to delimit informal groups (Hay & Yuzammi 2000). One such, the Tecturata Group, is defined by the very short petiolar sheaths, often reduced to only a thickened collar, with the role of protecting the next developing leaf blade being taken on by cataphylls which alternate with the foliage leaves (analogous to many *Philodendron*

species). Until now the Tecturata group has comprised five species (*Schismatoglottis jepomii* P.C.Boyce & S.Y. Wong, *S. petri* A.Hay, *S. platystigma* M.Hotta, *S. pudenda* A.Hay, and *S. tecturata* (Schott) Engl.). Of these, only *S. tecturata* and *S. petri* were included in the Tecturata Group by Hay & Yuzammi (2000) owing to the problem in interpreting the very incomplete herbarium material of *S. pudenda* and *S. platystigma*; *Schismatoglottis jepomii* was only described later (Boyce & Wong 2006).

KEY TO THE *SCHISMATOGLOTTIS* TECTURATA GROUP

1. Spathe limb margins marcescent **2**

– Spathe limb shedding by deliquescing or degrading into a granular mass **3**

2. Leaf blade abaxially glossy with the primary venation impressed; spadix appendix clavate-cylindric, distinctly thicker than staminate zone; anthers with the connective much elevated above the thecae. Brunei. Sandstones . . . . . ***S. petri***

– Leaf blade abaxially matte (or at least not glossy) with the primary venation not impressed; spadix appendix cylindric, more or less isodiametric with top of staminate zone; anthers with the connective not or hardly elevated. Widespread on Borneo and extending to the Riau Archipelago, A variety of substrates . . . . . ***S. tecturata***

3. Leaf blades broadly lanceolate, matte medium to matte olive green, adaxially concolorous, or with the mid-rib paler; mid-rib impressed; lithophytes not associated with watercourse **4**

– Leaf blades narrowly lanceolate, glossy deep green, often spattered paler green and yellow-green; mid-rib conspicuously bluntly raised; obligate rheophytes **5**

4. Stem ascending and rooting; leaf blades cuneate to narrowly rounded at base; petioles scabrid with broken paler striations; spadix elongate hourglass-shaped, appendix clavate, staminate flower zone narrower than the pistillate zones and the appendix; staminate flowers without an expanded collar; the staminodes of the interstice expanding laterally at the onset of staminate anthesis. NW Borneo. Limestone . . . . . ***S. evelyniae***

– Stem condensed, leaf blades shallowly cordate; petioles smooth; spadix conic-cylindric; appendix conic; staminate flower zone stout and wider than the rest of the spadix; staminate with a distinctive expanded collar; staminodes of the interstice not expanding. NE Sarawak, Brunei. Sandstones . . . . . ***S. platystigma***

5. Spadix appendix stoutly clavate; appendix staminodes not well-defined, the apices almost flat and with a suture in the middle; NW Sarawak. Sandstones . . . . . ***S. jepomii***

– Spadix appendix only slightly expanded; appendix staminodes well-defined, the tops convex and smooth; SW Sarawak. Shales . . . . . ***S. pudenda***

Schismatoglottis evelyniae P.C.Boyce & S.Y.Wong, **sp. nov**. Type: Malaysian Borneo, Sarawak, Kuching Division, Bau District, Krokong, Kampung Tringgus, Sungai Bong, 01° 15 '32.2" N 110° 05' 37.2" E, 27 June 2006, *P.C.Boyce, Jeland ak Kisai & Wong Sin Yeng AR-1846* (SAR, holo; alcohol preserved).

Diagnosis

Schismatoglottis evelyniae is morphologically most similar to *S. platystigma* M.Hotta, but distinguished by ascending & rooting (not condensed) stem, the cuneate (not shallowly cordate) leaf bases, the scabrid (not smooth) petioles, by the spadix elongate hourglass-shaped (vs conic-cylindric), with the appendix clavate (not conic), and the slender staminate flower zone narrower than the pistillate zones and the appendix (vs stout and wider) with staminate flowers lacking the distinctive expanded collar present in *S. platystigma*, and by the staminodes of the interstice expanding laterally at the onset of staminate anthesis. *Schismatoglottis evelyniae* is also rather similar to *S. petri* in sharing a narrowly rounded to cuneate leaf base and clavate staminate appendix, but is readily distinguished by matte (not glossy) leaf blades, the flat (not extended) anther connective, and by the caducous (not marcescent) spathe limb

Description

Lithophytic herb to 50 cm tall. **Stem** ascending and elongated, rooting as it grows, shoot modules pleionanthic, c. 2 cm diam. **Leaves** several together, alternating with stout, somewhat brittle tapering lanceolate scabrid cataphylls to 10 cm long; **petiole** up to 35 cm long, 1.5 cm diam., sheathing only at extreme base, the sheath forming a conspicuous collar, scabrid matte medium green with conspicuous paler broken striations; **leaf blade** somewhat brittle coriaceous, matte pale to medium green adaxially, paler abaxially, elliptic, to 29 cm long × 10 cm wide, the base cuneate, the tip rather abruptly acuminate for 1.5–2 cm; midrib adaxially impressed, abaxially prominent; primary lateral veins adaxially rather obscure, distinct abaxially, not prominent, ca 15 on each side of midrib, diverging at 45–60°, alternating with lesser interprimary veins and running into a intramarginal vein ca 1.5 mm from the margin; secondary venation adaxially obscure, abaxially very faint, arising from the midrib. **Inflorescence** solitary, subtended by a lanceolate cataphyll and a 2-keeled prophyll both to ca 4 cm long; **peduncle** very short, obscured by cataphylls. **Spathe** ca 9 cm long; lower spathe glossy pale green, squat subcylindric, oblique-based, ca 2 cm long × 1 cm diam., differentiated from the limb by a slight constriction; **spathe limb** caducous, degrading into a granular mass, gaping and somewhat cucullate at pistillate anthesis, reflexing and falling at staminate anthesis, c. 7 cm long, apically mucronate, white, degrading to dirty greyish. **Spadix** sessile, ca 7 cm long; pistillate flower zone ca 1.2 cm long, obliquely inserted but not adnate to the spathe; **pistils** ovoid, crowded, ca 1.5 mm diam. white; **stigma** sessile, globose

Figure 1

Figure 2

Figure 1. *Schismatoglottis evelyniae* P.C.Boyce & S.Y.Wong [Kampung Sadir, Sarawak]. Plants in habitat showing the ascending rooting stem.
Figure 2. *Schismatoglottis evelyniae* P.C.Boyce & S.Y.Wong [Kampung Sadir, Sarawak]. Detail of the ascending, rooting stem.

discoid, as wide as the ovary, ca 0.7 mm diam.; interpistillar staminodes absent; **sterile interstice** ca 4 mm long × 5 mm diam., a few whorls of clavate staminodes ca 1 mm across, these expanding laterally at onset of staminate anthesis, medium yellow; **staminate flower zone** 2 cm long, held partly within the lower spathe chamber, slender and somewhat attenuate, narrower than the pistillate zone and the appendix. ca 3–4 mm diam.; stamens crowded, ivory; anther sessile, connective flat, ca 0.25 mm across, flat-topped, polygonal; **spadix appendix** clavate, about twice as thick as the male zone, c. 6 mm diam., composed of columnar (lowermost malformed owning to pressure from the spathe limb) impressed-topped, irregularly polygonal (sometimes united), medium yellow staminodes each ca 0.8 mm diam. *Infructescence* with the spathe limb shed and the lower spathe persisting; mature infructescence not observed.

Figure 3

Figure 4

Figure 3. *Schismatoglottis evelyniae* P.C.Boyce & S.Y.Wong [AR-1846]. Close-up of the collar-like much-reduced petiolar sheath.
Figure 4. *Schismatoglottis evelyniae* P.C.Boyce & S.Y.Wong [AR-1846]. Cataphyll protecting an emerging leaf.

Distribution — NW Borneo, so far as known restricted to S Kuching and Samarahan Divisions (Sarawak, Malaysian Borneo), and to Nanga Taman, Sekadau Regency (Kalimantan Barat, Indonesian Borneo).

Ecology — Lithophytic on vertical clay-covered limestone cliffs under tropical lowland moist evergreen forest at 60–250 m asl.

Eponymy — Named for Evelyn ak Bidel, formerly one of the nursery staff at Malesiana Tropicals. Evelyn contributed much to the well-being of the living collection at that time, and it was under her attention that this plant first flowered and revealed itself as undescribed.

Other material examined — MALAYSIAN BORNEO. Sarawak. **Kuching Division:** Bau District, Krokong, Kampung Tringgus, 01° 43' 18.9" N 109° 42' 53.8" E, 19 Feb.

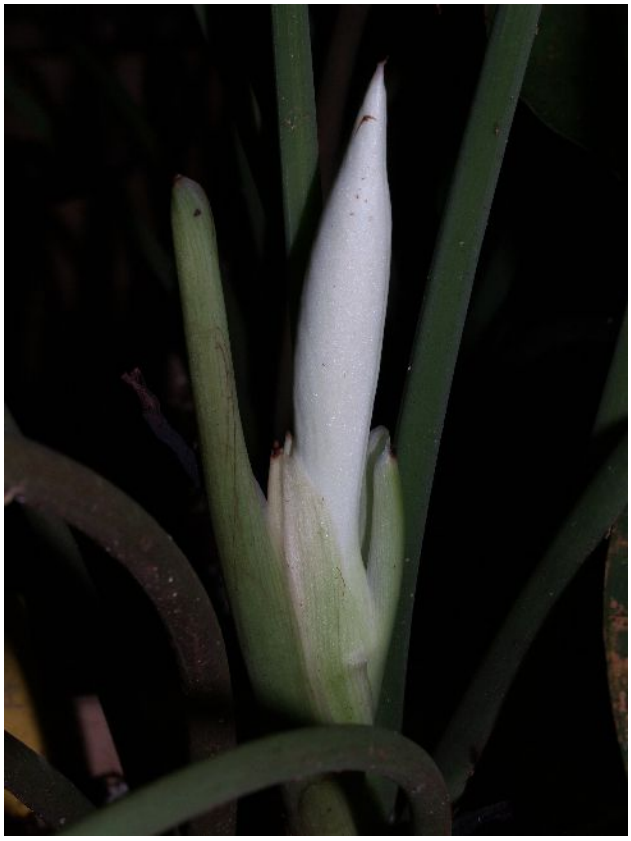

Figure 5

Figure 6

Figures 5,6. *Schismatoglottis evelyniae* P.C.Boyce & S.Y.Wong [AR-1846].
Emerging inflorescence subtended by a cataphyll (right) and a 2-keeled prophyll (left). Note that the petiolar sheath on both leaves is larger than that in **Figure 3.**

2005, *P.C.Boyce, R.Kneer & Jeland ak Kisai AR-994* (SAR); Padawan District, Kampung Sadir, Simpang Banyak, 1 May 2005, *Simon Kutuh ak Paru AR-1818* (SAR); Kuching District, Siburan, Kampung Sikog, Air Terjun Baan Gong, 01° 20' 16.1" N 110° 20' 09.6" E, 26 July 2009, *P.C.Boyce & Wong Sin Yeng AR-2580* (SAR). **Samarahan Division:** Serian District, Pichin, Utak Manangi, 28 Dec 2004, *Simon Kutuh ak Paru AR-937* (SAR); Serian District, Pichin, Umon Murut, Tiab Belanting, 01° 08' 03.7" N 110° 27' 00.3" E, 22 June 2005, *P.C.Boyce & Jeland ak Kisai AR-1257* (SAR); Serian, Pichin, Sungai Umpuh, 01° 07' 24.2" N 110° 27' 07.7" E, 25 Jan. 2006, *P.C.Boyce, Jeland ak Kisai & Simon Kutuh ak Paru AR-1680* (SAR); Serian, Pichin, Tubih Tahang, Sipukam, 01° 07' 16.6" N 110° 26' 51.2" E, 26 July 2005. *P.C.Boyce, Jeland ak Kisai, Mael ak Late, Simon Kutuh ak Paru & Tebas ak Libui AR-1309* (SAR). INDONESIAN BORNEO. Kalimantan Barat. **Sekadau Regency**: Nanga Taman, 2 hours walk to west from Simpang Tapang Perodah, 23km south of Kayu Lapis and 19 km main road

Figure 7

Figure 8

Figure 7. *Schismatoglottis evelyniae* P.C.Boyce & S.Y.Wong [AR-3942].
Inflorescence at early pistillate anthesis. Note that the spathe limb is gaping slightly.
Figure 8. *Schismatoglottis evelyniae* P.C.Boyce & S.Y.Wong [AR-1846].
Inflorescence at late pistillate anthesis. The damage to the spathe limb is owing to the chrysomelid beetle. Such damage is typically seen in wild plants.

west of Sekadau, 22 May 2012, 0° 09' 56.64" S 111° 03' 28.67" E, 22 May 2012, *K.Nakamoto AR-3942* (BO, SAR).

Notes — In habitat *Schismatoglottis evelyniae* forms large colonies on vertical clay-covered limestone banks in deep shade and is unusual for the genus in possessing an ascending rhizome-like stem that roots as it grows (**Figure 1 & 2**). As with other species of the Tecturata Group the petiolar sheath is mostly reduced to a thickened collar (**Figure 3)**, with the protective role of the sheath taken over by the cataphylls that alternate with the foliage leaves (**Figure 4)**. An exception to this are the two foliage leaves before an inflorescence, where the sheath is somewhat more developed (**Figure 5)** and the cataphyll accordingly reduced. The solitary inflorescence emerges from the second foliage leaf, and is immediately surrounded by a cataphyll

Figure 9

Figure 10

Figure 9. *Schismatoglottis evelyniae* P.C.Boyce & S.Y.Wong [AR-1846].
Detail of typical damage to the spadix appendix caused by chrysomelid beetles.
Figure 10. *Schismatoglottis evelyniae* P.C.Boyce & S.Y.Wong [AR-3942].
Spadix at late pistillate anthesis, spathe artificially removed. Note that the interstice staminodes have expanded.

(**Figure 6,** right hand side of spathe) and a 2-keeled prophyll (**Figure 6,** left hand side of spathe). The spathe gapes slightly at pistillate anthesis (**Figure 7)** at which time it produces a powerful esteric-like smell. In nature inflorescences are exclusively visited by beetles of the Chrysomelidae (**Figure 8),** and almost always show sign of damage to the spathe limb (**Figure 8)** and the spadix appendix (**Figure 9)**. During staminate anthesis the staminodes separating the pistillate and staminate flower zones abruptly (in about 10 mins) expands laterally (**Figure 10 & 11**). The spathe limb opens fully and reflexes at staminate anthesis, and very quickly darkens and degrades into a granular mass (**Figure 12 & 13**). The spathe limb is soon completely lost, with the developing infructescence held within the urceolate persistent lower spathe. Ripe infructescences have yet to be observed, and thus is not yet known whether the

Figure 11

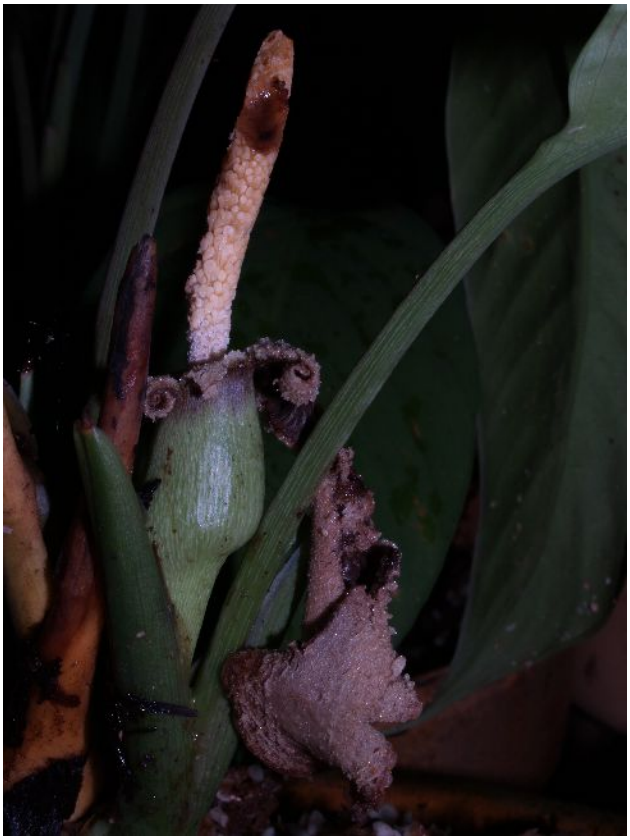

Figure 12

Figure 11. *Schismatoglottis evelyniae* P.C.Boyce & S.Y.Wong [AR-3942].
Detail of the expanded interstice staminodes.
Figure 12. *Schismatoglottis evelyniae* P.C.Boyce & S.Y.Wong [AR-1846].
Spathe limb degrading post anthesis.

lower spathe splits basiscopically (as in *S. jepomii* and *S. pudenda*, and indeed most *Schismatoglottis*), or acroscopically as, so far uniquely, in *S. tecturata* (**Figure 14)**.

Despite the seemingly unique (for *Schismatoglottis*) shared morphologies of a very reduced petiolar sheath and the protective role of the cataphylls, preliminary molecular analyses fails to provide support of the monophylly of the Tecturata Group, with the thee sampled species (*S. evelyniae*, *S. jepomii*, and *S. tecturata*) falling in different lineages. While more sampling is obviously needed, it does seem probable that molecular analyses will reveal *S. evelyniae* and (as yet unsampled) *S. platystigma* to be closely allied, although *S. platystigma* is readily differentiated by its conic-cylindric spadix and conical appendix (**Figure 15)**, by having the staminate flower zone wider than the pistillate zone and appendix, and by the distinctive expanded collar to the staminate flowers, which is diagnostic for *S. platystigma*

Figure 13

Figure 14

Figure 13. *Schismatoglottis evelyniae* P.C.Boyce & S.Y.Wong [AR-1846].
Spathe limb degrading post anthesis. Note the pollen visible on the staminate flower zone.
Figure 14. *Schismatoglottis tecturata* (Schott) Engl. [AR-1606].
Mature infructescence with the persistent lower spathe splitting and opening acroscopically to reveal the ripe fruits.

(**Figure 16)**, and by the staminodes of the interstice not laterally.

Schismatoglottis petri is also rather similar to *S. evelyniae* by the cuneate to narrowly rounded leaf base, and the clavate staminate appendix, but is readily distinguished by the caducous (not marcescent) spathe limb, the glossy leaf blades, and the extended triangular anther connective, and by caducous (not marcescent) spathe limb (**Figure 17)**.

Figure 15

Figure 16

Figure 15. *Schismatoglottis platystigma* M.Hotta [AR-2289].
Spadix at staminate anthesis, spathe artificially removed.
Figure 16. *Schismatoglottis platystigma* M.Hotta [AR-2289].
Spadix at pistillate anthesis, spathe artificially removed. Note the distinctive collar of the staminate flowers.

Figure 17

Figure 17. *Schismatoglottis petri* A.Hay [P.C.Boyce 283].
Note the marcescent spathe limb.

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Hay, A. & Yuzammi. 2000. Schismatoglottideae (Araceae) in Malesia I—*Schismatoglottis*. *Telopea* 9(1): 1–177.

New Species of *Philodendron* (Araceae) from South America

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ABSTRACT

Nineteen new species of *Philodendron* subgenus *Philodendron* are described and illustrated: *P. alonsoae* Croat, *P. atratum* Croat, *P. attenuatum* Croat, *P. caracaraiense* Croat, *P. caranoense* Croat, E. Trujillo & M. Correa, *P. davidneillii* Croat, *P. edwinii* Croat & M. Correa, *P. genevieveanum* Croat, *P. grahamii* Croat, *P. gribianum* Croat, *P. macarenense* Croat, *P. marcocorreanum* Croat, M. Mora & E. Trujillo, *P. linganii* Croat, *P. meieri* Croat, *P. pseudoverrucosum* Croat, *P. ricaurtense* Croat, *P. sanmarcoense* Croat, *P. schmidtiae* Croat and *P. werneri* Croat. The new species occur in areas throughout the continent of South America with one species from Brazil, seven from Colombia, three from Ecuador (one of which is likely eventually to be found in Peru, while another may be found to occur in Colombia), five from Peru (one of which might be found in Ecuador), one species ranges from Colombia to Ecuador, three range from Ecuador to Peru and one from Venezuela.

KEY WORDS

New species, *Philodendron*, Araceae

INTRODUCTION

The genus *Philodendron* was last revised in '*Das Pflanzenreich*' near the turn of the last century (Krause, 1913) at which time only 226 species were included. Currently there are 482 published species which have been accepted as of 9 January 2012 (Boyce & Croat, 2012). Partial revisions of *Philodendron* have been published in recent years. Mayo (1991) published a revision of *Philodendron* subgen. *Meconostigma.* Grayum (1996) published a revision of *Philodendron* subgen. *Pteromischum* for Central America, the West Indies and Andean South America. The senior author (Croat, 1997) published a revision of *Philodendron* subgen. *Philodendron* for Central America.

Work in recent years has concentrated in South America, especially the Andean countries. An additional 150 new species have been separated and described but not yet published. This paper is the beginning of the process of publishing some of this backlog of known new species. All species were keyed out in the Lucid Philodendron Key (Mora et al., 2008) and all species published here were then entered into the key and rekeyed for verification.

Philodendron alonsoae Croat, **sp. nov.** Type: COLOMBIA. Valle: Isla de Gorgona, playas y zonas cerca a las instalaciones del Inderena; troche en dirección a la playa del Pablo VI, ca. 2^{238}_{92}58'S, 78^{238}_{92}11'W, 0–150 m, *J. L. Fernández Alonso, O. Rangel & G. Lozano 7502* (holotype, COL-331204). **Figure 3** A.

The species is a member of subgen. *Philodendron* sect. *Macrobelium*, subsect. *Glossophyllum* characterized by its hemiepiphytic habit, slender elongated dark brown-drying internodes, petioles winged in the lower one third, elliptic grayish yellow-brown-drying blades with scarcely visible primary lateral veins as well as by the solitary short-pedunculate inflorescence with a green spathe.

The species is closest to *Philodendron longipes* Engl. but that species differs in having much longer peduncles, much longer and thicker petioles, primary lateral veins that are more conspicuous and a narrower blade.

Epiphyte; **internodes** 3 cm long, 1 cm diam.; **cataphylls** less than 5 cm long, deciduous, drying intact with reddish brown epidermis; **petioles** 5.7–7.9 cm long, 3 mm diam., sheathed midway and free-ending, drying narrowly and obtusely sulcate, finely ribbed and reddish brown; **blades** elliptic, 22.1–24.2 cm long, 10.9–11.8 cm wide (averaging 23 x11), 2.03–2.05 (averaging 2.04) times longer than broad, broadest midway, 3.0–4.2 (averaging 3.5) times as long as petioles, abruptly acuminate at apex, (acumen to 1.2 cm long), mildly acute at base, drying coriaceous, grayish yellow-brown and semiglossy above, reddish yellow-brown and weakly glossy below; **upper surface** minutely and sparsely

Figure 1. A–D. *Philodendron atratum* Croat. (*Croat & Hannon 86951*). A. Habit. B. Blade, adaxial surface. C. Blade, abaxial surface with stems. D. Stems of preadult plant showing leaf bases and roots.

wrinkled; **lower surface** sparsely pustular and more conspicuously wrinkled than upper surface; **midrib** drying broadly convex, minutely ribbed and paler above, narrowly convex, finely ribbed and slightly darker below; **primary lateral veins** obscure on both surfaces; **minor veins** arising from midrib, drying moderately visible and distinct above and below; **laticifers** continuous and weakly raised. INFLORESCENCE 1 per axil; **peduncle** 1.7 cm long; **spathe** 7.5–8.5 cm long, 1.7 cm wide, green, drying coriaceous, reddish brown; **spadix** 7.8 cm long; pistillate portion 1.7 cm long, 6.8 mm diam.; staminate portion 6.5 cm long, narrowly rounded at apex, the sterile staminate portion 2–3 mm long, 7 mm diam. scarcely distinguishable from the fertile flowers, slightly paler; constricted area weak, to 6 mm diam.; pistils 2 mm long, 1.2–1.3 mm diam. bottle-shaped; style slender, steeply sloping away from the apex, rounded at apex; stigma 0.6–1 mm diam., 0.6 mm thick, the stigmatic papillae forming a broad ring around the margins, depressed medially; locules 5 per ovary, 1 mm long; ovules 2–5 per locule, basal, enclosed within a translucent envelope 0.6 mm long, funicles about as long as the ovules.

Philodendron alonsoae is endemic to Colombia, known only from the type locality on Isla Gorgona at less than 150 m in a *Premontane wet forest* life zone.

The species is named for Spanish botanist, J. L. Fernández Alonso, born in Encinas de Esgueva, Valladolid, Spain, 18 December 1959, who collected the type specimen. José Luis, a specialist on Labiatae, worked in Colombia beginning in the 1990's at the Instituto de Ciencas Naturales at the Universidad Nacional in Bogotá and served as Curator before returning to Spain in 2010. He now works at the Real Jardin Botanico.

Philodendron atratum Croat, **sp. nov.** Type: ECUADOR. Morona-Santiago: Along road between Palora and Yushin, departing main Palora-San Vincente de Tarqui road, 8.7 km NW of Palora, 3.4 km S of Río Amudalo, 2.1 km E on road to Yushin, 922 m, 01°41'46"S, 78°01'21"W, 25 Aug 2002, *T. B. Croat & L. P. Hannon 86951* (holotype, MO-5746852–53; isotypes, AAU, B, CAS, COL, F, GH, K, M, NY, S, SEL, QCNE, US, USM). **Figure 1** A–D.

The species is recognized by its thick stems with short internodes, sharply 2-ribbed, marcescent and deciduous cataphylls, obtusely flattened petioles, very large, thick black-drying blades as well as by the 4–5 inflorescences per axil with medium green spathe outside with the tube heavily tinged violet-purple in the tube.

There is no other species of *Philodendron* that has black-drying leaves of this size but in the Lucid Philodendron Key the species tracks to *P. dodsonii* Croat & Grayum, a species that occurs only on the Pacific slope of the Andes and has blades that dry much

paler and reddish brown and the spathe tube red-purple to dark reddish outside.

Terrestrial, epiphyte or hemiepiphyte; **stems** less than 1 m long; **internodes** dark green and semiglossy, later gray-brown, short, 3–8 cm diam., 1–3 cm long, coarsely short-ribbed at apex; **cataphylls** 18.8–35 cm long, medium green, sharply 2-ribbed, marcescent then deciduous, drying with fragments of dark brown epidermis and pale fibers; **petioles** spongy, subterete, obtusely flattened adaxially, medium green, matte-subvelvety to semiglossy, dark green-lineate, obtusely ribbed adaxially, 2.2 cm diam. at apex, 2.8 cm diam. midway, drying 59.8–86.9 cm long, 0.9–1.7 cm diam., blackish brown; **geniculum** 1.5–3.2 cm long, drying slightly paler than petioles; **preadult blades** broadly ovate cordate to sagittate, to 34.3 cm long, 25.5 cm wide (averaging 30 x 22), the sinus ca. 3 cm deep, narrowly rounded at the apex; **adult blades** broadly ovate, 61.1–93.4 cm long, 41–68 cm wide (averaging 76 x 55), 1.30–1.49 (averaging 1.38) times longer than broad, 0.7–1.4 (averaging 1.0) times longer than petioles, abruptly acuminate at apex (acumen to 1.7 cm), broadest above petiole attachment, subcoriaceous, semiglossy, moderately bicolorous, dark green and semiglossy to matte-subvelvety above, moderately paler and weakly glossy below, drying dark grayish black and glossy above, paler and semiglossy below; **anterior lobe** 46.3–72.2 cm long, the margins broadly rounded; **posterior lobes** 19.3–35.2 cm long, 15.8–27.6 cm wide, directed downward and inward; **midrib** broadly convex to flattened and slightly paler above, narrowly rounded, faintly dark-lineate and concolorous below, drying darker above and below; **primary lateral veins** 5–6 per side, arising at a 60° angle near base then a 50° angle near apex, weakly and obtusely sunken, slightly paler above, thickly convex and slightly paler below, drying darker above and below; **minor veins** moderately obscure, arising mostly from midrib but also from the primary lateral veins closer to margins, drying obscure above and distinct below; **laticifers** long and discontinuous, weakly raised appearing like minor veins; **basal veins** 7(8) pairs, the 1st pair free to the base, 2nd pair fused to 2–2.5 cm, the 3rd and 4th pair fused to 2.4–5 cm; **posterior rib** gradually curved, naked 1.5–2.5 cm; **sinus** spathulate, 13.3–21.9 cm deep, 5.4–16.8 cm wide. INFLORESCENCES 4–5 per axil; **peduncle** 8.7–11.3 cm long, 0.9–1.7 cm diam. midway, pale green, whitish at base, pale-striate, drying black-brown; **spathe** medium green, semiglossy, faintly pale short-lineate, open face paler, tinged violet-purple on outside, inner surface white and glossy on blade, heavily tinged violet-purple in tube, drying 14.9–18 cm long, 4.4–6.2 cm wide, reddish black-brown**; tube** 3.2–4.7 cm diam., constriction 2.5–3.0 cm, blade 2.6–2.9 cm diam.; **spadix** 17 cm long, drying 12.6–16.4 cm long, dark brown; pistillate portion 1.3–2.3 cm long in front, 2.2–3.1 cm long in back, 12 mm diam. at middle; staminate portion 10.6–11.5 cm long, 1–1.2 cm diam., gradually tapered; sterile staminate portion 5–8 mm long, 1.3–2.0 cm diam. toward apex, to 1.5 cm diam. at constriction; **pistils** 2.5–2.6 mm long, 1.5–

1.7 mm diam.; style with margins rounded, slightly narrower than the stigma; **stigma** rounded, 15–1.6 mm diam., 0.1 mm thick, consisting of 5–6 irregular mounds around the periphery with a medial concavity, completely covered with stigmatic papillae; locules 5–6, 1 mm long, 0.2 mm diam.; **ovules** ca. 10 or more per locule; placentation axile, 0.1 mm long, the funicle about as long as the ovule.

Philodendron atratum ranges from southern Colombia (Putomayo) to southern Ecuador (Sucumbios, Napo, Pastaza, Morona-Santiago and Zamora-Chinchipe from 280–1524 m in a *Premontane wet forest* life zone.

A single collection from Carchi Province on the Pacific slope in Tulcán Cantón appears to be this species also but since this would be the only species I know of from that area to occur in the Amazona basin, we are reserving judgment regarding its determination.

A collection from Cajamarca Department, San Ignacio Province at 1650 m is perhaps this species. It has blades which dry dark brown and has a similar shape but only a short portion of the posterior rib which is naked (only about 1 cm).

The species epithet "atratum" refers to Latin meaning blackened or dark referring to the very dark to blackened dried leaf blades.

Paratypes: COLOMBIA. **Putumayo**: Intendencia of Putumayo; vicinity of Macoa, along south bank of Río Macoa, 01°10'N, 76°33'W, 2 Dec 1980, *T. B. Croat 51740* (MO). ECUADOR. **Carchi**: Tulcán, Parroquia Tobar Donoso, Sector Sabalera, Reserva Indígena Awá, Bosque primario Noreste Casa Comunal, 01°00'N, 78°24'W, 19–28 June 1992, *G. Tipaz, J. Zuleta & N. Guanga 1297* (MO, QCNE). **Morona-Santiago**: Cultivated plants from Waimea Arboretum, Cordillera Tutucu, E of Logrono, originally collected by M. Madison; also as Waimea 77668, *T. B. Croat 75199* (MO); Along road between Patuca and Santiago along south edge of Cordillera del Cutucú, entering from main Limón-Macas road at 44.6 km N of Limón, 3.9 kmKm from Bella Union and jct. to Méndez, 23.9 km from jct., 02°51'58"S, 78°14'51"W, 9 Sep 2002, *T. B. Croat 87340* (MO); Along road between Palora and Yushin, departing main Palora-San Vincente de Tarqui Road, 8.7 km NW of Palora, 3.4 km S of Río Amundalo, 2.1 km E on road to Yushin, 01°41'46"S 78°01'21"W, 25 Aug 2002, *T. B. Croat & L. P. Hannon 86951* (MO); Along road into Cordillera del Condor departing from Chuchumbleza, then 6.8 km S of Chuchumbleza to Quime ferry on Río Zamora, then SW via Numbaime into Cordillera del Condor, 24 km SW of Río Zamora., 03°38'11"S,78°25'49"W, 14 July 2004, *T. B. Croat, L. P. Hannon, G. Walhert & T. Katan 91019* (MO). **Napo**: cultivated as Tan, Halton & Besse s.n.; Selby 79–0184, 17 Sep 1991, *Ingram 1121* (MO); Reserva Biologia Jatun Sacha, ca. 8 km ESE of Puerto

Misahualli, 1º04'N, 77º37'W, 450 m; Primary forest along the Misahualli-Coca Road,Transect 5, 01°04'N, 77°37'W, 9 Jul 1986, *J. S. Miller, W. Wilbert & S.F.S. Med. Bot. Class 2524* (MO); Parque Nacional Sumaco-Galeras, Cordillera Galleras, forest, 00°49'S, 77°35'W, 26 Oct 2006, *S. Trogisch, S. Moritz & J. Homeier 210* (GOET, MO, QCNE); Along road between Lago Agrio and Río San Miguel, 3 km N of Lago Agrio, 00°05'N, 76°50'W, 3 Oct 1980, *T. B. Croat 50308* (MO); Along road SE of Francisco de Orelleno (Coco) to the way to El Auca 14.6 km past bridge over Río Napo, 00°37'S 076°40'W, 5 Oct 1980, *T. B. Croat 50379* (MO); Along road between Lago Agrio and Francisco de Orellano (Coco), 4.7 km N of Coco, 00°28'S, 76°58'W, 5 Oct 1980, *T. B. Croat 50405* (MO); Cultivated Plants - Selby Gardens. Collected Sept. 25–27, 1999, Selby 79–184, collected in Auca oil fields by Tan, Halton & Besse, 15 Dec 1999, *T. B. Croat 83584* (MO); Archidona, Volcán Sumaco, sureste, Carretera Hollin-Loreto, km 67. Cerca a la Comunidad de Huiruno, 00°42'S, 77°20'W, 27 Nov 1989, *A. Alvarado 391* (MO, QCNE); Along road between Coca (San Francisco de Orellana) and the Baeza-Tena road, via Loreto and Hollin, 82.5 km W of Río Payamino, 6 km W of Juticocha, 28.3 km W of Loreto, 58 km E of Tena-Baeza Hwy, 00°48'S, 77°31'W, 2 Mar 1992, *T. B. Croat 72616* (MO); Tena. Estacion Biologica Jatun Sacha; along S bank of Río Napo, 8 km E of Puerto Misahualii, 01°04'S, 77°36'W, 1 Apr 1992, *T. B. Croat 73386* (MO, QCNE); Cabañas Chuva Urcu, collections for Chuva Urcu's ethnobotanical trail project, sponsored by GTZ, 01°08'32"S, 77°35'29"W, 15 Jan 1999, *T. Delinks, S. Mahlau & G. Tapuy 270* (MO, QCNE). **Pastaza**: Along road between Macas and Puyo, between Río Pastaza and Puyo, 1.2 kmKm south of Yantana, 38.4 kmKm south of Veracruz, 01°45'38"S, 77°50'23"W, 14 Aug 2002, *T. B. Croat, L.P. Hannon & P. Schmidt 86582* (MO). **Sucumbíos**: Shushufindi, Limoncocha, Comunidad Kichwa Itaya,. Recinto San Pedro Capucuy a 20 km del Punto de Control de Oxxy, vía principal a Puero Itaya, Proyecto Etnobotánico del Herbario Nacional, co-financiado por PetroEcuador, 00°22'26"S, 76°33'08"W, 29–31 Mar 2004, *D. Reyes & L. Carrillo 419* (GB, MO. **Zamora-Chinchipe**: Cordillera del Cóndor region, vicinity of Río Zamora and village of Quime, along road from military post to Condor Mirador military outpost, ca. 3.5 km S of junction in road to Tandaime, San Marcos and Ecua-Corriente copper mine headquarters, 03°36'21"S, 78°28'17"W, 12 Apr, 2006, *T. B. Croat 96971* (MO); Vicinity of Ecuacorrientes mining company, Valley of Río Quime, trail along Río Waiwaime near its mouth at Río Quime., 03°33'45"S, 78°27'47"W, 23 Sept 2007, *T. B. Croat & G. Ferry 99107* (MO); Along road between El Pangui and Monterrey departing main highway (Zamora-Gualaquiza), 8.5 km N of El Pangui., 03°32'26"S, 78°37'16"W, 25 May 2003, *T. B. Croat & M. MenkeMe 89364* (MO); Along road from Los Encuentros to El Sarsa, Cordillera del Cóndor, 14.4 km SE of Los Encuentros, 03°47'44"S, 78°37'01"W, 26 May 2003, *T. B. Croat & M. Menke 89497* (MO); Along road from Namirez (22.3 km S of Yanzaza) to

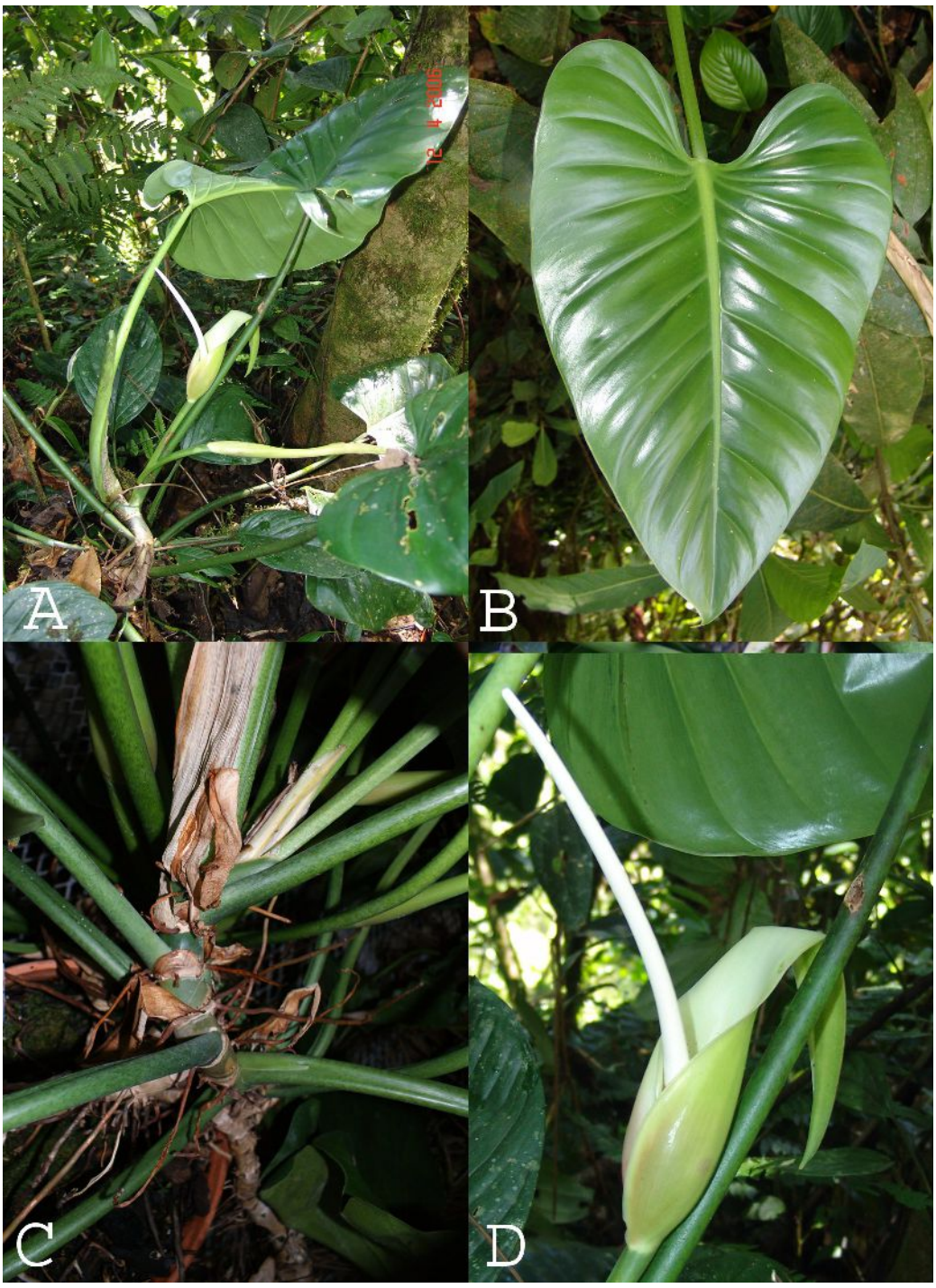

Figure 2. A–D. *Philodendron attenuatum* Croat. (*Croat et al. 87955*). A. Habit. B. Blade, adaxial surface. C. Stems with cataphylls and petiole bases. D. Inflorescence showing typical position of spathe and spadix at anthesis.

Nambija, 8.1 km S of San Carlos, 04°03'37"S, 78°47'25"W, 28 May 2003, *T. B. Croat & M. Menke 89641* (MO); Zamora, Podocarpus National Park, near El Tambo, 40 km northwest of Zamora on road to Loja. Transect 1, 03°58'S, 79°07'W, 13 Jul 1993, *A. Gentry 79932* (MO, QCNE).

Philodendron attenuatum Croat, **sp. nov.** Type: ECUADOR. Napo: Vicinity of Archidona, along road to San Pablo, 1.8 km E from main plaza in Archidona, 00°57'S, 77°49'W, 945 m, 21 Apr 2003, *T. B. Croat, L. P. Hannon & N. Altamirano 87955* (holotype, MO-5704871–72; isotypes, AAU, B, CAS, COL, F, GOET, K, NY, QCNE, S, SEL, US). **Figure 2** A–D.

The species is a member of subgen. *Philodendron* sect. *Macrobelium*, subsect. *Glossophyllum*, ser. *Ovata* characterized by its moderately short internodes, unribbed, more or less marcescent and deciduous cataphylls, subterete, spongy petioles, more or less ovate blades with attenuated bases, inflorescences 2–3 per axil with the spathe green and long-tapered to the apex and often somewhat reflexed with the tube dark purple-violet inside as well as by a long-tapered staminate portion of the spadix which usually remains exposed outside the spathe after it closes.

The species is confusing from the standpoint of the presence of laticifers. There are unusual features that sometime resemble laticifers in that they have a rather undulating course between the minor veins but these structures seem to be continuous and typically pale, not blackened as in the case of most laticifers. Occasionally these structures become darkened in places but it is not certain that they are laticifers. *Croat 50770,* a collection from north of Yangzatza at 890 m elevation, is similar to *Philodendron attenuatum* in having the leaf base attenuated at the base but it differs in drying more yellow-brown and thicker, has the midrib drying darker than the surface on the lower surface and has the minor veins moderately obscure with no sign of cross-veins. In addition it has obvious laticifers which, as mentioned above, are lacking on *Philodendron attenuatum.*

Usually hemiepiphytic, sometimes terrestrial, or rupicolous; **stems** to 1 m long, drying light yellow-brown; **internodes** 1–4 cm long, 1–4.5 cm diam., typically about as long as broad, dark green to greenish gray and matte, scurfy; **cataphylls** 15.5–31 cm long, unribbed, spongy, medium green, pale green-speckled-lineate marcescent and deciduous; **petioles** 24.7–65 cm long 0.5–1.25 cm diam., spongy, subterete, obtusely and shallowly sulcate toward base, moderately spongy, obtusely flattened adaxially, semiglossy, densely dark green-lineate, dark green apical ring; **blades** ovate to ovate-cordate, 26.1–49.1 cm long, 14.5–36.6 cm wide, 1.39 (1.24–1.55) times longer than broad, 0.9 (0.7–1.1) times longer than petioles, truncate to subcordate at base with the leaf tissue usually decurrent on the petiole, subcoriaceous, moderately bicolorous, dark green and weakly glossy to semiglossy above, paler and semiglossy

below, drying yellow-brown above, yellow-green below; **anterior lobe** length 20–40 cm, abruptly acuminate at apex; **midrib** broadly convex and slightly paler above, convex and much paler below, drying darker above, moderately paler below; **primary lateral veins** 3–5 per side, arising at an acute angle then spreading at a 50–60° angle, obtusely quilted-sunken and concolorous above, convex to slightly and paler below, drying moderately paler than the surface; **minor veins** moderately obscure to distinct below, minutely granular upon magnification with a paler, vein-like structure loosely coursing in a somewhat undulating pattern between the minor veins; the cross-veins typically clearly visible; **laticifers** if present, not obvious, the lower surface sometimes minutely granular; **basal veins** 4–5(–6); **posterior lobes** when present rounded, length 10–15 cm, width 10–14 cm; **sinus**, arcuate with blade decurrent and or hippocrepiform to 5.6 cm deep. INFLORESCENCES 2–3 per axil; **peduncle** medium green, terete, 16–21 cm long, 10–12 mm diam., semiglossy, clearly demarcated at apex, 11.5–18 cm long, drying 4–7 mm diam., dark yellowish green; **spathe** 16–23 cm long, moderately green and semiglossy outside, pale green and glossy inside on blade, dark violet-purple inside on tube (to ca. 3 cm high), not obviously constricted, long-attenuate and often spreading back at apex; tube to 7.7 cm wide when flattened, drying yellowish to reddish brown; **spadix** stipitate 1.5 cm long, drying 15.6–18.6 cm long, medium brown to dark reddish brown; pistillate portion 3.7–7.7 cm long in front, 9 mm diam. at middle, 3.4–7.2 cm long in back, pale green; staminate portion 7.2–13.1cm long, 6 mm diam., gradually long-tapered, the apex of male spadix protruding forward at anthesis, persisting dark brown post-anthesis; sterile staminate portion 5–7 mm long, 6 mm diam.; **pistils** 2.6–2.8 mm long, 2.6–2.8 mm diam., the style thick with rounded margins, shallowly sunken midway with a weakly raised stigma; **stigma** funnel-shaped, 0.4–0.5 mm diam., covered initially by a thin, very ephemeral mantle 1.4–1.5 mm wide; **locules** 5, 1.4–1.6 mm long; completely filled with a single, thin-walled ovular envelope filled with watery fluid; **ovules** with basal placentation, solitary, 0.2 mm long, funicles 0.2–0.4 mm long, the base of the funicle covered with a dense layer of glands.

Philodendron attenuatum is known from the Cordillera del Condor in southeastern Ecuador and northern to Central Peru (Amazonas, Loreto, Pasco). In Ecuador it ranges from Pastaza in the north to Zamora-Chinchipe.

R. Rojas & G. Ortiz 5975 differs from Ecuadorian material of the species in having an arcuate sinus with no decurrent tissue along the petiole but otherwise must be placed in the species.

J. Ruiz & J. Campos 1723 from the Peruvian province of San Martín in San Martín Province is probably also this species but it differs in having the sinus narrowly hippocrepiform with no leaf tissue

decurrent along the petiole as is the case for material in Ecuador.

Paratypes: ECUADOR. **Morona-Santiago:** Cultivated Plants. Collected originally by Betsy Feuerstein. Along road between Cuenca and Limón at military checkpoint above Limón, 12 May 1997, *Croat 79574* (MO); Along the road from the main Puyo-Macas Road to Palora, departing main Puyo-Macas Road 38 km SSE of Puyo, 9.8 km from main road; remnant forest in pasture, 01°44'40"S, 77°54'49"W, 20 Aug 2002, *Croat & L. P. Hannon 86698* (CUVC, F, HUA, INB, MEXU, MO, PMA, PSO, RB, TEFH); Río Cuyes y vía Bomboiza-Gualaquiza Bosque Húmedo Premontano, 03°25'S, 78°35'W, 1 Nov l986, *W. Palacios 1469* (MO, QCNE); Gualaquiza, Along Río Bomboiza at bridge on road from Gualaquiza to Nueva Targuí., 03°26'S, 78°36'W, 6 Mar 1992, *Croat 72762* (MO, QCNE); **Pastaza:** 3 km al norte desde Pto. Santana en el borde del Río Pastaza., 01°38'S, 77°57'W, 15 Aug 1997, *Ceron & I. Suárez 34548* (QAP); Along rock road to Tarabita and the portage over the Río Pastaza, ca. 3 km from the turn-off from main Puyo-Mera road; disturbed primary forest, 23 Dec 1979, *Croat 49681* (MO); Vicinity of Shell, ca. 1 Km north of town along Río Claro, 00°29'39"S, 78°03'52"W, 27 Aug 2002, *Croat & L.P. Hannon 87076* (AAU, GB, K, MO, QCA, QCNE, S); **Zamora-Chinchipe**: La Saquea on Río Yacuambi-Yanzatza and near Pincho, 1974, *G. Harling & Lennart Andersson 13969* (GB); Podocarpus National Park, 1 ha study plot about 1 km SW of Bombuscaro Visitors Centre, 6 km S of Zamora, 04°06'S, 78°57'W, 15 Nov 2000, *R. Leimbeck & B. Windeballe 398* (AAU); Vicinity of Ecua-Corrientes copper mine development near Tundaime, banks of Río Waiwaime, 03°33'58"S, 78°26'16"W, 8 Apr 2006, *Croat 96790* (MO); Cordillera del Cóndor region, vicinity of Ecua-Corriente copper mine development, valley of Río Waiwaime, along road to mine site, 2.5 km from end of road, 03°34'30"S, 78°37'W, 9 Apr 2006, *Croat 96826* (MO); Cordillera del Cóndor region, vicinity of Rio Zamora and village of Quime, along road from the military outpost to Condor Mirador military outpost, 7.1 km S of junction in road to Tandaime, San Marcos and Ecua-Corriente copper mine headquarters, 03°36'42"S, 78°28'02"W, 12 Apr 2006, *Croat 96942* (F, HUA, MO); Along graveled road roughly paralleling the Chuchumbleza-Yantzaza Highway, E along Río Chuchumbleza, then SW to Chicaña and back to main highway (entering road from main highway 4.8 km S of Río Chuchumbleza and re-entering main highway 9.6 km N of plaza in Yantzaza) via Guisme, Miasi, Uwents, Kunki, El Oso, and Chicaña, vicinity of Uwents, 21.5 km N of Chicaña, 6.2 km N of Kunki and Río Uens del Kunki bridge, 03°36'02"S, 78°41'16"W, 14 Apr 2006, *Croat 97066* (CAS, EAP, MO); Vicinity of El Pangui, east of El Pangui, across Río Pachicuza, 0.5 km east of river; disturbed virgin forest along stream, 03°39'48"S, 78°34'11"W, 6 Sep 2002, *Croat 87171* (AAU, CHEP, GB, MO); Along road between El Pangui and Zamora, vicinity of San Roque, 2 km S of San Roque, 10 km S of El Pangui, 03°42'11"S, 78°35'59"W, 7

Sep 2002, *Croat 87204* (MO, S); Along road between Zamora and Gualaquiza, 70.9 km N of bridge over Río Zamora in Zamora, between Los Encuentros and El Pangui, 03°42'S, 78°36'W, 4 Mar 1992, *Croat 72729* (LE, MO); Along road to Romerillao Alto from Zamora, 19.1 km E of Río Bombuscaro in Zamora, 6.3 km E of La Pituca, 04°10'04"S, 78°56'10"W, 20 July 2004, *Croat 91544* (CUVC, GH, HUA, K, MO, NY, TEX, US); Along road from Zamora to Romerillos along Río Jambué, 13.3 km E of Río Bombuscaro Bridge in Zamora, 0.3 km E of Pituca, 04°08'03"S, 78°56'37"W, 21 July 2004, *Croat 91708* (CAS, CUVC, DUKE, MO, RSA, UB, USM); Vicinity of Ecuacorrientes mining company, Valley of Río Quime, trail along Río Waiwaime near its mouth at Río Quime, 03°33'45"S, 78°27'47"W, 23 Sept 2007, *Croat & G. Ferry 99108* (MO); Along road between Los Encuentros and El Sarsa, 4.7 kmKm E of Los Encuentros, 03°46'42"S, 78°38'32"W, 26 May 2003, *Croat & M. Menke 89444* (MO, Q, QAP, QCA); Along road between Zumbi (on Río Zamora, 7.7 kmKm S of Yanzaza), and Cordillera del Cóndor, 6.8 kmKm E of Paquisha at Río Nangaritza, 03°54'18"S, 78°35'W, 27 May 2003, *Croat & M. Menke 89519* (MO); Along road between Zamora and Parque Nacional Podocarpus, 3.3 km NW of Zamora, 04°05'31"S, 78°57'30"W, 29 May 2003, *Croat & M. Menke 89677* (LPB, M, MO); Along road from near Paquisha south to Las Orchídeas and end of road on Río Nangaritza via Guayzimi, beginning 15.9 km E of Zumbi and Río Zamora, then 49.6 km S at Las Orchídeas, in vicinity of Las Orchídeas, 04°13'44"S, 78°39'30"W, 16 Jul 2004, *Croat, Lynn P. Hannon, G. Walhert & Tuntiak Katan 91291* (K, MO, US); Along road from near Paquisha, south to Las Orchídeas, and end of road on Río Nangaritza, via Guayzimi, beginning at 15.9 km E of Zumbi and Río Zamora, then 38.5 km S, 11.1 km N of Las Orchídeas, 04°12'48"S, 78°38'41"W, 17 July 2004, *Croat, L. P. Hannon, G. Walhert & T. Katan 91400* (AAU, GB, MO); Nangaritza Cordillera del Cóndor region, parroquia Zurmi, vicinity of Las Orquideas, Cabañas Yancuam, ca. 3 km S of Las Orquideas, along stream just S of Cabañas Yancuam, on steep rocky slopes, 04°15'01"S, 78°39'33"W, 19 Apr 2006, *Croat 97246* (MO); Vicinity of Las Orchideas; near Cabañas Yankuam; along Río Nangaritza, S of camp, old trail along river and on steep slopes of forest W of River, 04°15'06"S, 78°39'29"W, 16 Sep 2007, *Croat & G. Ferry 98688* (MO); Along Río Nangaritza, between Las Orchideas and Miasi, 04°17'53"S, 78°39'W, 17 Sept 2007, *Croat & G. Ferry 98778* (MO); Shaime Frente a destacamento Militar Márgen derecha del Río Nangaritza Bosque primario Suelos con 20 % de pendiente, 20 cm de profundidad, 04°18'S, 78°43'W, 27 Oct 1991, *W. Palacios, I. Vargas & E. Freire 8730* (MO, QCNE); Yacuambi Valley of Río Yacuambi, along road between La Saquea and 28 de Mayo, 31.4 km NW of La Saquea, 13.1 km SE of 28 de Mayo, 03°43'02"S, 78°53'47"W, 20 Apr 2006, *Croat 97286* (MO); Along valley of Río Yacuambi, between La Saquea and Esperanza, 3.9 km NW of 28 de Mayo 0.2 km before bridge over Río Yacuambi, 03°37'S, 78°56'W, 20

Figure 3. A. *Philodendron alonsoae* Croat. (*Fernandez 7502*). A. Herbarium type specimen, leaf on left showing abaxial surface, middle and right hand leaf with adaxial surface. B. *Philodendron carcaraiense* Croat. (*Steward et al. 101*). B. Herbarium type specimen, top two blades showing abaxial surface, lower two blades showing adaxial surface. C. *Philodendron grahamii* Croat (*Graham 4255*). C. Habit close up of living type plant in Peru showing stem, petioles bases and inflorescences. D. *Philodendron davidneillii* Croat. (*Neill & W. Rojas 9930*). D. Herbarium type specimen, showing abaxial surface and two inflorescences arising from separate leaf axils.

Apr 2006, *Croat 97314* (MO). PERU. **Amazonas:** Luya, Distrito Camporredondo, Tullanya-Camino a Wicsocunga Bosque Primario, 06°06'33"S, 78°20'55"W, 1 Dec 1996, *J. Campos & L. Campos 377* (MO); Prov. Condorcanqui, Cordillera del Cóndor, Puesto de Vigilancia Alfonso Ugare (PV3), headwaters of Río Comainas, tributary W of Río Cenepa, 03°54'S, 78°25'W, 1200–1400 m, 18 July 1994, *H. Beltran & R. Foster 963* (MO). **Loreto:** Maynas Dtto. Iquitos. km 8 carretera Quistococha-Varillal, mature forest over sandy, 3 Jan 1984, *S. T. McDaniel, M. Rimachi Y. & J. McMannes 27448* (IBE, MO). **Pasco:** Oxapampa, Distrito Palcazú, Comunidad Nativa Alto Lagarto-Reserva Comunal Yanesha; 10°08'04"S, 75°22'06"W, 6 Aug 2008, *R. Rojas & G. Ortiz 5975* (MO, QCNE, USM).

Philodendron caracaraiense Croat, **sp. nov.** Type: BRAZIL. Rondonia: Manaus-Venezuela Highway, between Manaus and Caracarai, BR 101 at km 355, 1 km S of 00°00'00", 60°38'45"W, flooded campina on white sand, 18 Nov 1977, *W. C. Steward, I . Arujo, W. R. Buck, J. F. Ramos, & J. Ribamar 101* (holotype, NY-01074041; isotypes, INPA, US-2989973). **Figure 3** B.

Philodendron caracaraiense is a member of *Philodendron* subgenus *Philodendron* sect. *Macrobelium*, subsect. *Macrobelium*, ser. *Macrobelium* and is characterized by its terrestrial habit on white sand soil, internodes longer than broad, cataphylls unribbed and promptly deciduous, subterete petioles, narrowly ovate leaf blades and with obscure primary lateral veins, prominulous minor veins as well as the moderately large solitary inflorescences in several of the upper leaf axils.

In the Lucid Philodendron Key the species tracks to *P. ecordatum* Schott, which differs by having warty stems and usually broadly ovate blades.

Terrestrial, in flooded campina on white sand soil; **internodes** 3 cm long, 1 cm diam.; **cataphylls** 2.9 cm long, deciduous, unribbed, drying slightly reddish brown ; **petioles** 6.7–7.2 cm long, 3 mm diam., drying narrowly and acutely sulcate, finely ribbed, yellowish brown; **blades** ovate-elliptic, 15.1–16.7 cm long, 6.3–6.6 cm wide (averaging 16 x 6), 2.40–2.53 (averaging 2.46) times longer than broad, broadest midway, 2.2–2.5 (averaging 2.3) times long as petioles, abruptly acuminate at apex, obtuse at base, drying subcoriaceous, weakly bicolorous, yellowish brown and semiglossy above, grayish medium brown and semiglossy below; **upper surface** irregularly sub-granular to irregularly ridged; **lower surface** densely pale-speckled; **midrib** drying narrowly raised, prominently and narrowly ribbed and paler above, narrowly acute, irregularly folded or ridged and paler below; **primary lateral veins** 2–3 pairs, obscure, arising at a 40–45° angle, drying narrowly convex and concolorous above, bluntly acute and darker below; **basal veins** 2 pairs, free to base; **minor veins** arising from midrib, drying distinct above and below; **laticifers** long and discontinuous,

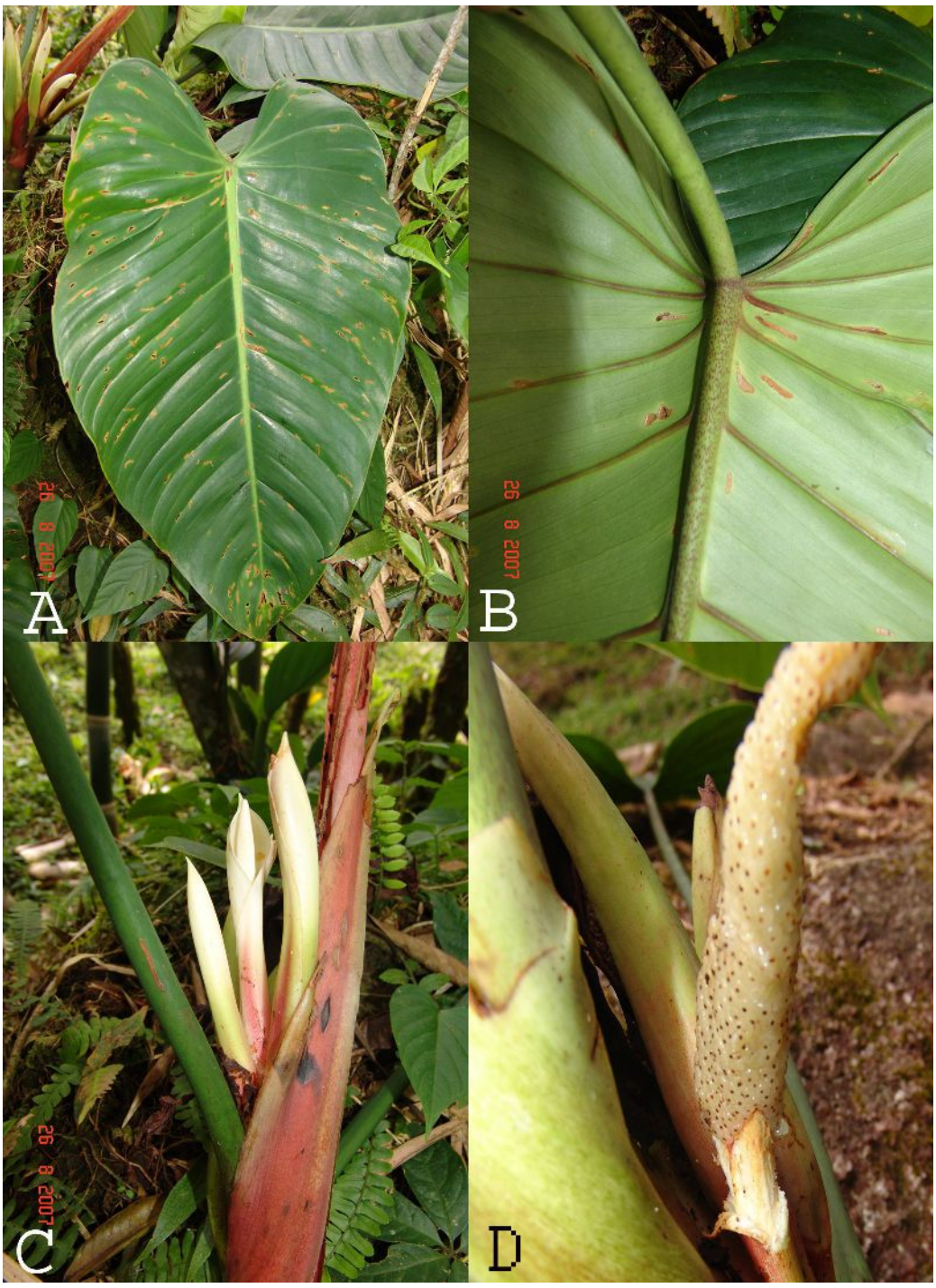

Figure 4. A–D. *Philodendron caranoense* Croat, E. Trujillo & M. Correa. (*Croat, Trujillo & Correa 98177*). A. Habit, showing stem and leaf, adaxial surface. B. Blade, abaxial surface. C. Stem, cataphylls and three inflorescences (middle one at anthesis). D. Infructescence with spathe fallen and one inflorescence with spathe.

weakly raised appearing like minor veins. INFLORESCENCES 1–2 per axil; **peduncle** 2.5 cm long, drying 5 mm diam. midway; **spathe** 10.6 cm long, 2.8 cm wide, to 1.5 cm diam. at the constriction just above the tube, acute at apex, flattening to 8 cm wide, tube and blade green outside; inside of tube reddish, blade inside color not noted, moderately thick, drying dark brown and matte outside, dark reddish brown and semiglossy inside with resin canals prominent and close, mostly in the tube; **spadix** white, 8 cm long, stipitate 3 mm; pistillate spadix 2.7 cm long, 1.3 cm diam.; staminate portion 5.2 cm long, bluntly pointed at apex, 8 mm diam.; sterile staminate portion 0.9–1.6 cm long, 11 mm diam. at base, 10 mm diam. at apex, paler than fertile staminate portion; **pistils** 2.5–2.8 mm long, 1.6–2 mm diam., 3–4-locular; **ovules** 1 per locule, basal 0.4 mm long, borne in a gelatinous envelope to 1. 8 mm long, the funicle about as long as the ovule.

Philodendron caracaraiense is known only from Brazil but could be expected in southern Venezuela. It occurs on white sand soils in flooded campinas at about 200 m elevation probably in a *Tropical moist forest* life zone.

The epithet "*caracaraiense*" refers to the type locality near Caracarai, Rondonia.

Philodendron caranoense Croat, E. Trujillo & M. Correa, **sp. nov.** Type: COLOMBIA. Caqueta: Florencia, Vereda Villaraz, Quebrada El Caraño, km 20 on road from Florencia to Neiva, Finca La Estrella, 01°43'34"N, 75°40'06"W, 900 m, 26 Aug 2007, *T. B. Croat & E.Trujillo 98177* (holotype-COL; isotype, HUAZ). **Figure 4** A–D.

The species is a member of subgen. *Philodendron* sect. *Macrobelium*, subsect. *Glossophyllum*, series *Ovata* characterized by its epiphytic habit, short, thick internodes, bluntly 2-ribbed, marcescent cataphylls, obtusely flattened petioles, narrowly ovate-sagittate, brown-drying blades with mostly free basal veins and prominent resin canals as well as by the small inflorescences, 3 per axil and greenish white on both surfaces.

The species is similar to *Philodendron montanum* Engl. which has similarly shaped blades and several inflorescences per axil. *Philodendron montanum* differs in somewhat longer internodes, more broadly and sharply sulcate cataphylls, leaf blades with a narrower sinus and spathes with the tube red on the inside of the tube.

In the Lucid Philodendron Key *P. caranoense* keys out to *P. asplundii* Croat & M. L. Soares, *P. chiriquiense* Croat, *P. colombianum* R. E. Schultes, *P. ferrugineum* Croat, *P. fragrantissimum* Hook. G. Don and *P. grayumii* Croat. The last three all differ in not having three inflorescences per axil (4–6 per axil and spathe tube maroon inside for *P. ferrugineum* and 1–2 per axil and the spathe tube maroon inside for both *P. fragrantissimum* and *P. grayumii*). *Philodendron*

asplundii and *P. colombianum* both differ in having blades drying more greenish while the former also differs in having papery, reticulate cataphylls and the latter differs in having subrounded leaf blades. Finally *P. ferrugineum* differs in having blades typically much longer than 40 cm long.

Epiphyte; **internodes** short, 5 cm diam.; **cataphylls** drying 20.2 cm long, bluntly 2-ribbed, marcescent, medium green becoming mushy at apex first, the basal portion dark brown, persisting, the epidermis reddish medium brown; **petioles** obtusely flattened adaxially, medium-green with many dark green lineations, drying broadly and acutely sulcate, 19–36.6 cm long, 6 mm diam., reddish medium brown; **blades** ovate-cordate, 25.4–39.2 cm long, 11.2–22.2 cm wide (averaging 30 x 15), 1.77–2.31 (averaging 2.11) times longer than broad, broadest above petiolar attachment, 1.1–1.4 (averaging 1.3) times long as petioles, abruptly acuminate at apex, (acumen to 1.3 cm long), prominently lobed at base, coriaceous, semiglossy, moderately bicolorous, drying grayish brown and weakly glossy above, yellowish brown and semiglossy below; **upper surface** short pale-lineate, moderately smooth, minutely areolate upon magnification; **lower surface** smooth, glandular-punctate, the glands mostly rounded and black; **anterior lobe** 26.2–35.1 cm long, with straight margins; **posterior lobes** 8.7 cm long, 5.7 cm wide, directed downward and inward; **midrib** broadly convex and slightly paler above, narrowly rounded and obtusely short dark-lineate below, drying broadly convex, finely ribbed and paler above, narrowly raised to narrowly acute, finely ribbed and darker below; **primary lateral veins** 7 pairs, arising at a 60° angle, obtusely sunken and more or less quilted above, narrowly convex and more or less concolorous below, drying weakly and broadly convex, slightly paler above, narrowly rounded, sharply 2-ribbed and darker below; **minor veins** arising from midrib, drying obscure above and moderately visible and distinct below; **basal veins** 3 to 4 pairs; **laticifers** very distinct, drying long and discontinuous, weakly raised appearing like minor veins; **posterior rib** gradually curved, naked 1 cm; **sinus** parabolic, 4.6 cm deep. INFLORESCENCES 3 per axil; **peduncle** 3.8–5.5 cm long, to 5 mm diam., whitish, drying reddish brown; **spathe** 10.5 cm long, 1.6 x 2 cm diam. when furled, flattening to 4 cm wide, green-white on both surfaces, matte outside, moderately glossy inside, abruptly acuminate at apex, with laticifers in lower 2/3 especially in lower ½; **spadix** 10.4 cm long, pistillate portion 5.8 cm long, 6 mm diam. at base, 8 mm diam. midway, 5 mm diam. near apex; male portion 2.8 cm long; staminate portion 4.4 cm long, 6 mm diam. 8 mm diam. midway, 3 mm diam. at apex, the sterile staminate portion 4 mm diam., scarcely distinguishable from the fertile portion; **pistils** 1.5–2.8 mm long, 1.8–2.3 mm diam.; styles light brown, irregularly rounded, drying with erect, moderately acute margins; stigma dark brown, 0.6–0.8 mm diam., weakly raised, the stigmatic papillae arising from a deep concavity, drying flattened and disk-like; locules 8–9, 0.8 mm long; **ovules** 1–2 per

locule, basally attached, contained within a gelatinous envelope, 0.6–1.0 m long, 0.1–0.15 mm long, 0.2 mm diam., the funicle about as long as the ovary.

Philodendron caranoense is endemic to Colombia, known only from the type locality on the eastern slopes of the Cordillera Oriental in Caqueta Department at 900 m elevation in a *Lower montane rain forest* life zone.

The species is named for the type locality at the Quebrada El Caraño in Caqueta Department.

Philodendron davidneillii Croat, **sp. nov.** Type: ECUADOR. Orellana: Aguarico Cantón, Yasuní National Park, Laguna Jatun Cocha, near mouth of the Río Yasuní, blackwater "igapo" lagoon and seasonally inundated forest, 01°01'S, 75°25'S, 180 m, 8 Nov 1991, *D. Neill & W. Rojas 9930* (holotype, MO-4312392; isotype QCNE-62811). **Figure 3** D.

The species is a member of subgen. *Philodendron* sect. *Philodendron* subsect. *Solenosterigma* characterized by its elongated internodes, terete petioles, ovate-cordate, grayish brown-drying papyraceous blades with 3(–4) pairs of basal veins with one pair free to base, a parabolic sinus, as well as the solitary long-pedunculate inflorescence with a white spathe.

Philodendron davidneillii is similar to *P. rimachii* Croat, another terrestrial species that occurs in temporarily inundated areas along rivers. That species differs in having short internodes and leaf blades with posterior lobed more elongated and possessing conspicuous laticifers. The species must be compared with *Philodendron colombianum* R.E Schultes which differs in having short internodes, a green spathe and usually occurs above 300 m elevation.

Philodendron davidneillii is also similar to *P. hederaceum* (Jacq.) Schott but that species, though having elongated internodes is a canopy vine with subcoriaceous, moderately glossy leaf blades.

Terrestrial; **internodes** short, 5 mm diam.; **cataphylls** not available; **petioles** 22.7–26.7 cm long, 4–5 mm diam., terete, drying flattened and relatively smooth, grayish brown; **blades** ovate-cordate, 21.9–25.4 cm long, 12.8–14.2 cm wide (averaging 22 x 14), 1.62–1.79 (averaging 1.72) times longer than broad, broadest at middle, 0.9 (0.8–1.0) times long as petioles, abruptly acuminate at apex, prominently lobed at base, drying papyraceous, grayish olive-brown and semiglossy above, grayish brown and semiglossy below; **upper surface** densely and minutely granular; **lower surface** densely and minutely granular; **anterior lobe** 19.7–22.9 cm long, with straight margins; **posterior lobes** 4.2–5.1 cm long, 2.4–2.8 cm wide; **midrib** drying flattened and paler above, flattened, medially ribbed and paler below; **primary lateral veins** 7 pairs, arising at a 55–60° angle, drying

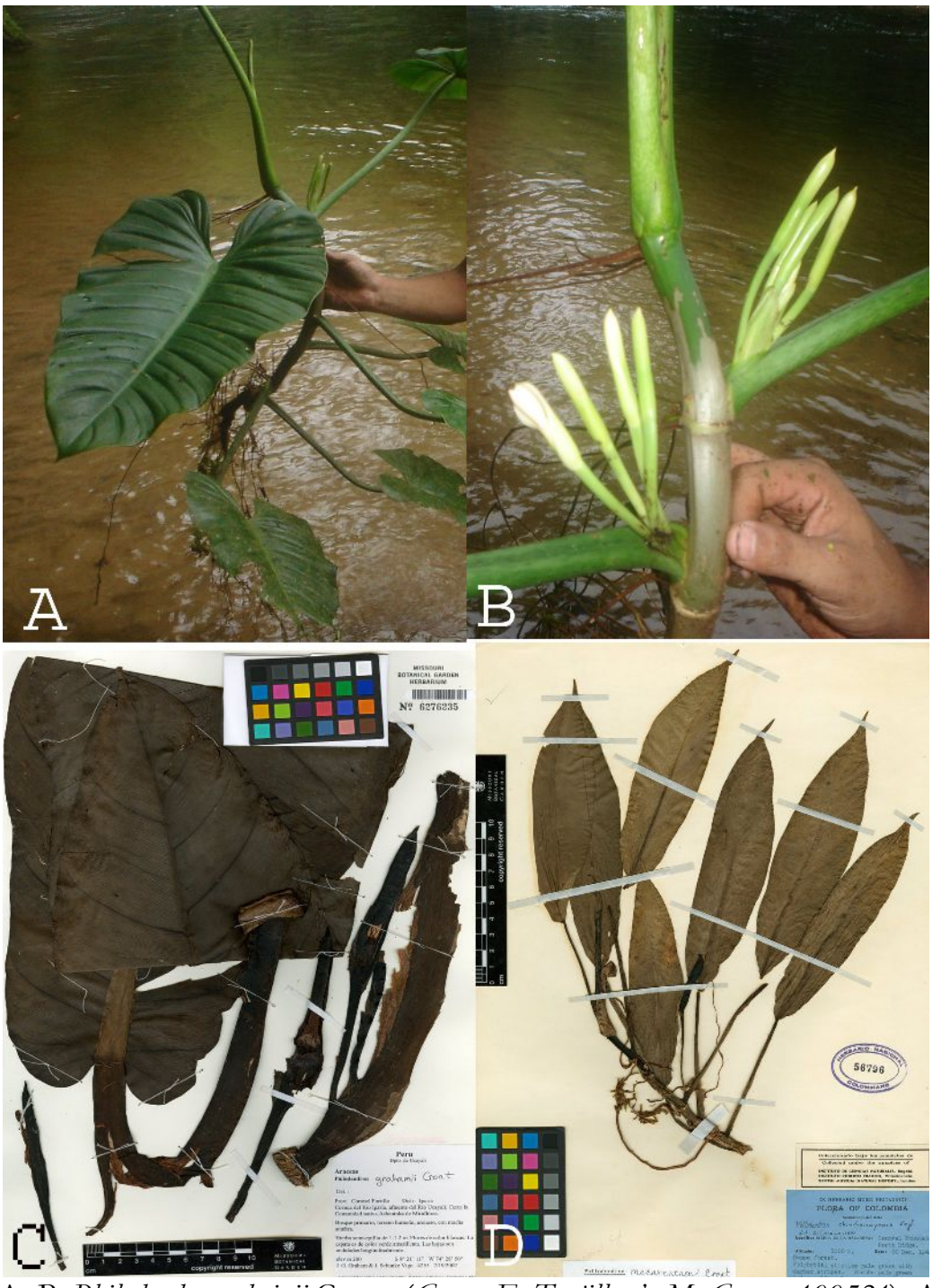

Figure 5. A–B. *Philodendron edwinii* Croat. (*Croat, E. Trujillo & M. Correa 100521*). A. Entire plant (hand held). B. Inflorescence on stem, showing two axils with four inflorescences in each axil. C. *Philodendron grahamii* Croat. (*J. Graham 4255*). C. Herbarium type specimen, blade folded twice, showing abaxial surface at base and apex. D. *Philodendron macarenense* Croat. (*Philipson 2002*). D. Herbarium type specimen, seven leaves, only 3rd from left showing abaxial surface.

flattened and concolorous above and below; **minor veins** arising mostly from midrib but also from the primary lateral veins closer to margins, drying obscure above and moderately visible below; the cross-veins few, obvious but weak; **laticifers** inconspicuous, long and wavy; **basal veins** 3(4) pairs, 1st pair free to base, 2nd and 3rd pair fused to 2 cm; **posterior rib** gradually curved, naked 1 cm; **sinus** parabolic, 1.7–2.5 cm wide, 2–2.1 cm deep. INFLORESCENCE 1 per axil; **peduncle** 10.7–12.7 cm long; **spathe** white, 6.6–7.2 cm long, 2.4–2.7 cm wide when flattened, drying moderately coriaceous, medium reddish brown; **spadix** white; **pistil** 2 mm diam., the ovary walls with subglobular cellular inclusions near the apex; style 1.6–1.8 mm diam., thin, subrounded, plate-like and extending over the top of the ovary; stigma 1–1.2 mm diam., dark brown on reconstitution, covered by a thin almost translucent mantle ca. 1.6 mm diam.; **ovules** with axile placentation in the lower ½ of the axil, 8–10 per locule, 0.3–0.4 mm long; funicle 0.1–0.2. mm long.

Philodendron davidneillii is apparently endemic to Ecuador, known only from the type locality in Orellana Province in the drainage of the Río Napo at 180 m elevation in a *Tropical moist forest* life zone. It is to be expected at least in adjacent Peru which lies relatively near the type locality.

The species is named in honor of my old friend and colleague, David Neill, formerly from the Missouri Botanical Garden, who spent most of his career working in Ecuador. He has collected plants all over Ecuador and has trained many of the Ecuadorian scientists who work in Ecuador today. He has collected many new species including the type of this species whichich bears his name.

Philodendron edwinii Croat & M. Correa, **sp. nov.** Type: COLOMBIA. Caquetá: Florencia region, Vereda Villaraz, Quebrada El Caraño, km 20 on road from Florencia to Neiva, Finca Estrella, disturbed forest along stream, 01°43'34"N, 75°40'06"W, 900 m, *T. B. Croat, E. Trujillo & M. Correa 100521* (holotype, MO-6290408; HUAZ). **Figure 5** A–B.

The species is a member of subgen. *Philodendron*, sect. *Macrobelium*, subsect. *Oligocarpidium* and is characterized by its scandent habit on cliffs, elongate internodes, obtusely flattened and somewhat spongy petioles, ovate-cordate-sagittate dark-drying blades with a parabolic sinus and especially by the cluster of up to at least 5 small, greenish inflorescences.

The species is similar to *P. wilburi* Croat & Grayum but that species has more triangular blades and much larger inflorescences (7.5–14 cm long). It is also similar to *P. menkei* Croat from Ecuador but that species has blades triangular and usually with the anterior lobe concave along its margins.

Growing up rocky cliff; **internodes** elongate, 4–6 cm long, 2.1–2.2 cm diam.,

medium green, soon light brown; **sap** clear, but weakly chalky white upon drying; **roots** 5–6 at each node to ca. 30 cm long, 2–3 mm diam., yellow-brown; **cataphylls** obtusely 1-angled, medium dark green and dark-speckled, 25 cm long, deciduous; **petioles** weakly flattened and somewhat spongy, obtusely sulcate in lower half, obtusely sub-rounded adaxially, 25.9–35.6 cm long, drying 5–7 mm wide, blackish brown; **blades** broadly ovate, 36.6–51.8 cm long, 24.4–29.2 cm wide (averaging 43 x 27), 1.50–1.77 (averaging 1.61) times longer than broad, broadest at petiolar attachment, 1.2–1.6 (averaging 1.4) times long as petioles, abruptly acuminate at apex, prominently lobed at base, subcoriaceous, semiglossy, moderately bicolorous, drying blackish brown, semiglossy above, black-brown and semiglossy below; **upper surface** smooth, short, pale-lineate between veins; **lower surface** smooth, conspicuously pale-pustular; **anterior lobe** 31.2–41.7 cm long, with straight margins, the distal margin broadly rounded; **posterior lobes** 10.9–15.1 cm long, 7.9–10.4 cm wide, directed downward and inward; **midrib** flattened, and slightly paler above, narrowly rounded and slightly darker below, drying flattened and darker above, flattened to broadly convex and darker below; **primary lateral veins** obtusely sunken and weakly quilted adaxially, narrowly rounded and paler below, drying weakly and narrowly convex, concolorous above, obtusely sunken and darker below; **minor veins** moderately fine and visible arising mostly from midrib but also from the primary lateral veins closer to margins, drying distinct above and below; the cross-veins visible below; **laticifers** wavy and long above, more conspicuous, wavy and long, parallel to veins below; **primary lateral veins** 8–10 pairs with departing angle of 40–55°; **basal veins** 7 pairs, 1st and 2nd pairs free to base, 3rd pair fused to 2.2 cm, 6th pair fused to 2.7 cm; **posterior ribs** gradually curved; **sinus** parabolic, 6.1–10.2 cm deep, 3.5–4.9 cm wide at middle. INFLORESCENCES 4–6 per axil; **peduncle** 7 cm long, 4 mm diam., green, semiglossy, drying blackish; **spathe** 4.5 cm long, tube 6 x 7 mm diam., pale green throughout inside, drying blackish brown; **spadix** 4.1 cm long, 5 mm diam. at middle, 4 mm diam. at apex; male portion length 1.4 cm, female portion length 1.6 cm; pistillate portion pale green; **pistils** 4-locular, 1 mm long, 0.7–1.0 mm diam.; style broadly rounded on the margins; stigma weakly stalked, 0.4–0.5 mm diam., the stigmatic papillae erect to spreading; **ovules** basal, 1 per locule, contained within a translucent envelope that fills the entire locule, this 0.5–0.6 mm long, 0.3–0.4 mm diam., the ovule proper filling most of the translucent envelope, and about 1/3 of its total length is funicle.

Philodendron edwinii is endemic to Colombia, known only from the type locality in Caquetá Department in the region of Florencia on the eastern slopes of the Cordillera Orientale at 900 m in a *Tropical wet forest* life zone.

The species is named in honor of Edwin Trujillo Trujillo of the Universidad de Amazonia in Florencia, Caquetá, one of the

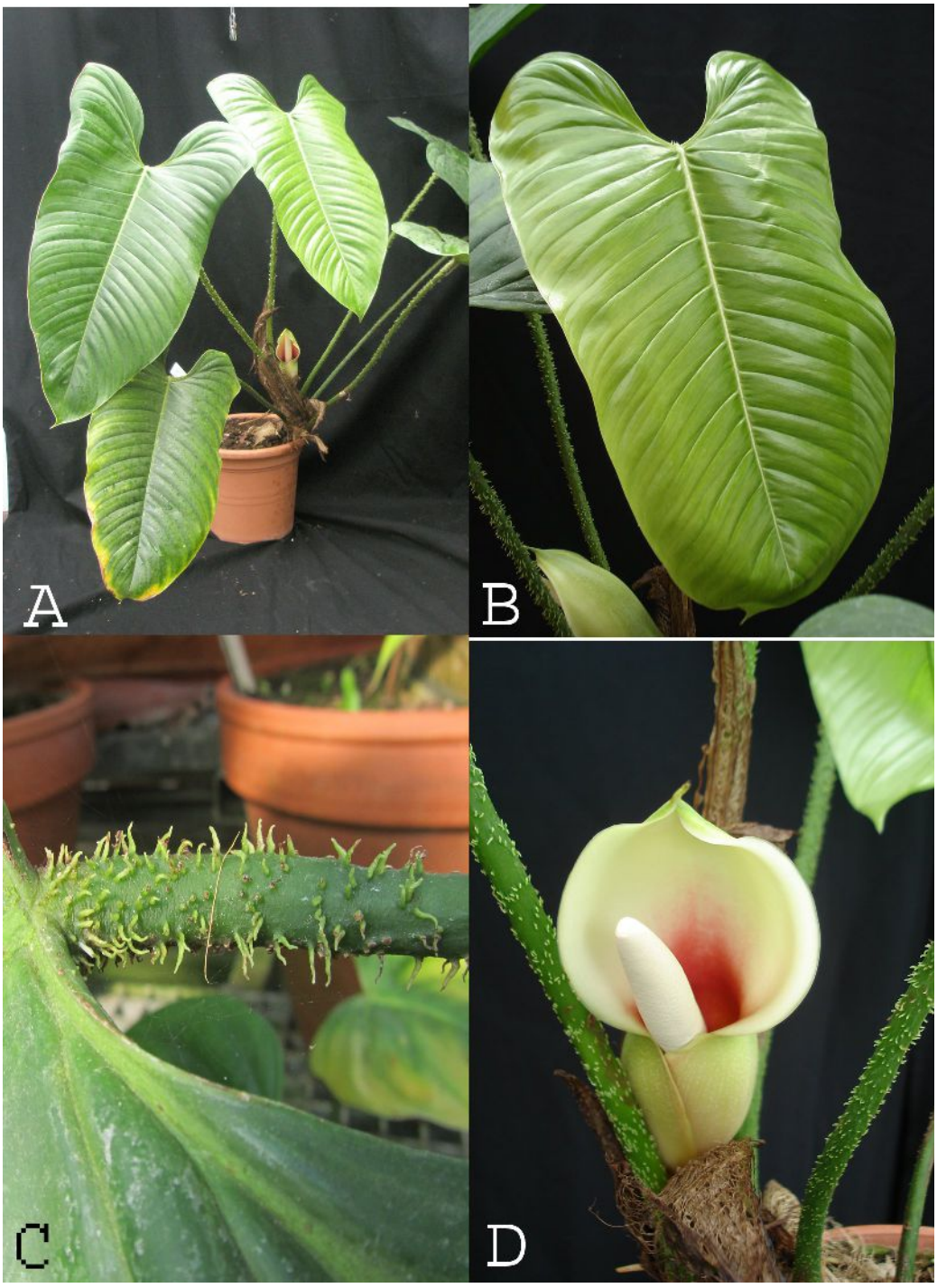

Figure 6. A–D. *Philodendron genevieveanum* Croat. (*Croat 97833*). A. Habit of potted plant. B. Blade, adaxial surface. C. Petioles at base of blade showing petiolar scales. D. Inflorescence with spathe at anthesis with spadix protruding forward.

principalal aroid researchers in Colombia. Edwin Trujillo, along with Marco Correa, one of the species' coauthors is concentrating his research efforts on the Araceae of Caquetá.

Philodendron genevieveanum Croat, **sp. nov.** Type: COLOMBIA. Antioquia: San Luis: Valley of Río Claro, 27 km E of the turn off to San Luis, 53 km E of Río Calderas, 05°53'30"N, 74°51'20"W, 500 m, 21 Apr 2007, *T. B. Croat 97883* (holotype, HUA). **Figure 6** A–D.

The species is a member of *Philodendron* subgen. *Philodendron* sect. *Philodendron*, subsect. *Achyropodium* characterized by its lithophytic habit, short thick internodes; marcescent cataphylls persisting as a fine network of pale brown fibers, subterete densely pale green scaly petioles, blackish drying oblong-ovate-sagittate blades which are somewhat constricted above the petiolar plexus as well as by a single inflorescence per axil with a green spathe that is red-purple on the tube within.

Philodendron genevieveanum is not closely related to any other known published species but it might be confused with *P. caquetense* Croat from the eastern slopes of the Cordillera Oriental at 900 m but that species differs in having blades constricted somewhat above the petiolar plexus with the lobes somewhat hastate and are dark grayish brown on the upper surface. In addition to the petiolar scales of *P. genevieveanum* are much sparser and proportionately longer than those on the petioles of *P. caquetense.*

Philodendron genevieveanum should also be compared with members of *Philodendron* sect. *Achyropodium* such ass *P. nanegalense* Engl., *P. serpens* Hook.f., *P. rubrocintum* Engl., *P. verrucosum* Mathieu ex Schott all of which have scaly petioles but differ by having more broadly ovate-sagittate blades which are not constricted anywhere on the anterior lobe.

Superficially *P. genevieveanum* looks much like *P. jodavisianum* Bunting which has blades of similar shape and size and drying the same color and with similar venation as well has similar persisting cataphylls but that species differs in having smooth, non-scaly petioles.

Growing on rocks along stream; **internodes** 1.5–2 cm long, 2.2–3.0 cm diam., sap black; **cataphylls** 10.5–12.0 cm long, promptly mushy, marcescent, persisting as a fine network of pale brown fibers, drying with fragments of dark brown epidermis; **petioles** terete, dark green, weakly glossy, densely pale green scaly throughout its length (the scales simple or rarely branched, up to 3 mm long) 31–59 cm long, 6–9 mm diam., drying 3–8 mm diam., obtusely and broadly sulcate, dark brown; **juvenile blades** narrowly ovate, subcordate, 7.8–16.4 cm long, 3.8–8.5 cm wide, with scaly petioles; **pre-adult blades** narrowly ovate, subcordate, 19.2–22.3 cm

long, 10.4–10.6 cm wide, with scaly petioles; **blades** oblong-ovate-sagittate, 35.7–50.1 cm long, 20.4–28.3 cm wide, 1.75–2.02 (averaging 1.87) times longer than broad, broadest midway, 0.8–1.1 (averaging 0.9) times longer than petioles, abruptly acuminate at apex, prominently lobed at base, subcoriaceous, semiglossy on both surfaces, dark green above, much paler below, drying subcoriaceous, black-brown with moderately conspicuous short pale lineations, semiglossy above, medium brown, moderately smooth with sparse fine granules, semiglossy below; **anterior lobe** 28.7–41.4 cm long and 18–22 cm wide, slightly constricted above the petiolar plexus; **posterior lobe** 11.2–16.6 cm long, 7.8–10.3 cm wide, directed downward and inward; **midrib** narrowly rounded and slightly paler above, much thicker than broad and darker below, drying broadly convex and darker above, bluntly acute, multi-ribbed and darker below; **primary lateral veins** 8–9 pair arising at a $65\frac{238}{92}$ angle, drying broadly convex and paler above, narrowly convex, finely ribbed and darker below; **minor veins** arising mostly from midrib, from primary lateral veins closer to margins, moderately visible and moderately sparse below, drying obscure above and distinct below; **basal veins** 6–7 pairs, 1st free to base, 5th and higher order fused 6.5–7 cm; **laticifers** long and discontinuous, weakly raised appearing like minor veins; **posterior rib** gradually curved, naked 1.7 cm; **sinus** parabolic, 6.7–9 cm deep, 5.3–7.2 cm wide midway. INFLORESCENCE 1 per axil; **peduncle** 2.5–4.0 cm long, coarsely striate toward apex, 9–10 mm diam. midway; **spathe** 15–17.5 cm long, 2.5–2.9 cm diam., post-anthesis, pale green, weakly glossy outside, dark red-purple and glossy inside on tube, greenish on blade, 2 cm diam., at constriction; **spadix** 12.5 cm long; pistillate portion 3.8 cm long in front, 2.8 cm long in rear, 0.8 cm diam. at base, 1.0 cm diam. midway, 1.3 cm diam. near apex; staminate portion 7.6 cm long, 0.5 cm diam. near the base, tapered to a slender point and 3 mm diam. at 5 mm below the apex; sterile staminate portion 2.2–2.3 cm long, 1.5 cm diam. at base, 1.3 diam. at apex; **pistils** 1.6–2.2 mm long; ovary 1–1.5 mm diam.; style 1.2–1.8 mm wide, 0.4–0.5 mm thick, the margins smoothly rounded; **stigma** donut-shaped, dark on reconstituted material with a low rim 0.7–0.8 mm diam. with a broad medial depression inside, the entire style covered by a slightly broader, thin mantle that extends nearly to the edge of the style; locules 4–5; **ovules** 5–7 per locule, with axile placentation, 0.1 mm long with the funicle about as long as the ovary.

Philodendron genevieveanum is endemic to Colombia in the Department of Antioquia in the Municipio San Luis in the Valley of Río Claro, at 500 m in a *Premontane wet forest* life zone.

The species is named in honor of my friend and colleague, Geneviève Ferry of the Conservatoire et Jardins Botaniques de Nancy in Nancy, France, who is my frequent traveling companion during field work in the tropics. Madame Ferry is a spectacular horticulturist and has developed

one of the finest collections of Araceae in Europe and can be counted on to keep plants alive and to bring them into flower, as she did with this species which bears her name. The species had not previously been seen with open flowers until Geneviève brought her collection into flower recently in Nancy.

Philodendron grahamii Croat, **sp. nov.** Type: PERU: Ucayali, Coronel Portillo Prov.; Distrito Iparia, Cuenca del Río Iparia, affluente del Río Ucayali, near the indigenous community Ashaninka de Miraflores, 9°21'11"S, 74°28'50"W, 200 m, 19 July 2007, *J. G. Graham & J. Schunke Vigo 4255* (holotype, MO-6276235; isotypes, F, USM). **Figures 3** C, **5** C.

The species is a member of subgen. *Philodendron* sect. *Macrobelium*, subsect. *Glossophyllum*, series *Glossophyllum* characterized by its hemiepiphytic habit, somewhat elongated internodes with glossy yellow-brown epidermis, deciduous cataphylls, blackish drying leaves with the blades oblong-oblanceolate blades with cordulate lobes and two pair of basal lobes as well as by its long-pedunculate yellow-green inflorescences with up to three borne at each axil.

Philodendron grahamii is most easily confused with *P. acutifolium* K. Krause. This species differs in green drying oblong elliptic blades that are acute at the base.

Hemiepiphyte; **internodes** elongated, 2.8 cm long; **cataphylls** deciduous; **petioles** spongiose, obtusely flattened adaxially, 28 cm long, drying 2.2 cm diam., dark reddish brown; **blades** oblong-oblanceolate blades, 66.2 cm long, 24.1 cm wide, 2.75 times longer than broad, broadest midway, 2.4 times long as petioles, abruptly acuminate at apex, drying subcoriaceous, blackish brown, weakly glossy above, black brown and semiglossy below; **upper and lower surface** minutely granular with scattering of pustules upon magnification; **anterior lobe** 64.2 cm long, with straight margins; **posterior lobes** 3.8 cm long, 3.2 cm wide, cordulate; **midrib** spongiose, drying broadly convex with margins drying thin and spreading up to 4 mm wide in both directions, finely ribbed, paler above, convex, finely ribbed and slightly paler below; **primary lateral veins** 8 pairs, arising at a 60° angle near middle, drying convex, finely ribbed and slightly darker above, narrowly convex, finely ribbed and darker below; **minor veins** arising mostly from midrib but also from the primary lateral veins closer to the margins, drying obscure above and moderately visible and distinct below; **cross-veins** visible on upper and lower surfaces; **laticifers** short and discontinuous and free-ending, weakly raised on both surfaces; **basal veins** 2 pairs, both free to base; **sinus** parabolic, 2 cm deep, 1.8 cm wide at middle. INFLORESCENCES up to 3 per axil; **peduncle** 10.2–11.2 cm long; **spathe** 12.8–13.6 cm long, 3.2–3.6 cm wide, drying coriaceous, black-brown, densely granular and sparsely pustular on the outer surface,

Figure 7. A–B. *Philodendron gribianum* Croat. (*Croat 50279*). A. Habit, showing all blades with adaxial surface exposed. B. Stems with up to five inflorescences per axil. C–D. *Philodendron linganii* Croat. (*Lingan et al. 601*). C. Leaf showing adaxial surface. D. Stem, cataphylls and clusters of inflorescences in two leaf axils.

moderately glossy on inside with prominent resin canals in the tube, tube color outside green and blade color outside greenish yellow; **spadix** yellow-green, staminate spadix up to 7.5 cm long), sterile staminate portion 1.4–1.5 cm long, 1.7 cm wide, paler than the fertile portion, female spadix 5–5.5 cm long; **pistils** 1.5–18 mm long, 1–1.2 mm diam.; style completely covered with mantle; stigma 4–5 mm diam., covered with a mantle 9–11 mm wide; ovules 1 per locule, basal, truncate at apex, 0.5–6 mm long, including the funicle, the funicle slightly shorter than the ovary, densely glandular at the base; placentation basal.

Philodendron grahamii is endemic to Peru, known only from the type locality in Ucayali Department, Province of Coronel Portillo in the valley of the Río Iparia at 200 m in a *Tropical wet forest* life zone.

The species is named in honor of Dr. James Graham from the University of Illinois, Chicago in the Department of Pharmacology and the Field Museum. James' expeditions to interior of Ucayali Department of Peru have been very productive and have turned up many new species, especially new Araceae.

Philodendron gribianum Croat, **sp. nov.** ECUADOR. Napo: Along road between Quito and Baeza, between Cuchauco and Papallacta, just W of village of Papallacta at km 189, 00°22'S, 78°04'W, 3205 m, 2 Oct 1980, *T. B. Croat 50279* (holotype, MO-2819236–37; isotype, QCA). **Figure 7** A–B.

The species is a member of subgen. *Philodendron*, sect. *Macrobelium*, subsect. *Glossophyllum* ser. *Ovata* characterized by its hemiepiphytic habit, short, thick internodes about as long as broad, soft, more or less unribbed, deciduous cataphylls, terete petioles, dark green, lustrous, moderately bicolorous broadly ovate-cordate blades with all the basal veins essentially free to the base as well as by the long-pedunculate green inflorescences with up to 5 per axil and with the pale green pistillate portion having prominently protruding styles more than 1.5 mm diam.

The species does not closely resemble any other species but could be confused with *Philodendron asplundii* Croat & M.L. Soares which differs in having distinct cross-veins on drying and has a persistent, fibrous cataphyll. It also resembles *P. atratum* Croat, described in this paper, a species that dries much more blackened, has cataphylls sharply 2-ribbed and basal veins fused to 5 cm.

Epiphytic creeper; **stems** 4–5 cm diam.; **internodes** ca. 4 cm long; **cataphyll**s soft, lacking a prominent rib, faintly reddish, deciduous; **petioles** moderately firm, terete, drying 11.6–31.7 cm long, 5–12 mm diam., medium reddish brown to dark reddish brown; **preadult blades** broadly ovate, 17.4–23.7 cm long, 12–17.1 cm wide, the sinus ca. 1 cm deep, narrowly rounded at

the apex; **adult blades** broadly ovate-cordate, 38.5–42.1 cm long, 35.5–42.1cm wide (averaging 40 x 39), 0.9–1.2 (averaging 1.05) times longer than broad, broadest above petiole attachment, 2.3 times long as petioles, abruptly acuminate at apex, (acumen to 1.6 cm long), prominently lobed at base, dark lustrous green, moderately bicolorous, drying olive-brown and semiglossy above, reddish medium brown and semiglossy below; **upper surface** minutely scattered pustular; **lower surface** minutely and irregularly ridged (including on the veins); **anterior lobe** 30.2–32.7 cm long, with straight margins, the distal margin broadly rounded; **posterior lobes** 14.4–15.5 cm long, 12.2–14.7 cm wide, directed downward and inward; **midrib** slightly paler than surface above, drying flattened, finely ribbed and darker above, flattened, with irregularly short wing-like ridges and slightly paler below; **primary lateral veins** 8 pairs, arising at a 50–55° angle near middle, drying flattened and concolorous above, narrowly raised to narrowly acute with irregularly short wing-like ridges and slightly darker below; **minor veins** indistinct, arising mostly from midrib but also from the primary lateral veins closer to margins, drying moderately visible and distinct above and below; **laticifers** sometimes etched in upper surface, moderately conspicuous and close together, near veins below; **basal veins** 5 pairs, all free to base, 2nd and 3rd pairs coalesced to 2 cm; **sinus** parabolic, 8–9 cm deep, 2.8 cm wide at middle. INFLORESCENCES up to 5 per axil; **peduncle** 13–16.6 cm long; **spathe** green throughout, 11.5–15.7 cm long, to 1.7–2.4 cm wide, drying coriaceous, medium reddish brown to dark reddish brown; **spadix** 11.1–13.1 cm long, drying medium brown, staminate portion bluntly pointed at apex, 4.8 cm long, 8 mm diam. in distal 2/3, 6 mm diam. at 1 cm from apex; sterile staminate portion 3–5 mm long, 5 mm diam.; pistillate portion 6.5 cm long, pale green, 6 mm diam. at apex, 1.2 cm diam. midway, 1.3 cm diam. nearer the base, pistils obovoid and mammiliform at apex, the style and stigma together more than 1.5 mm long; style drying thin but somewhat coriaceous, with the margin thin; stigma 0.6–0.7 mm wide, ca. 0.1 mm thick; locules 4, **ovules** 1 per locule, 1.4 mm long, 0.2 mm wide, basifixed, enveloped in a gelatinous matrix, funicle 0.3 mm long, densely glandular, the base of the ovule proper with a dark spot.

Philodendron gribianum is endemic to Ecuador, known only from the type locality in Napo Province on the eastern slopes of the Cordillera Oriental between Quito and Baeza at about 2500 m in a *Lower montane moist forest* life zone.

The species is named in honor of James Grib, my trusted Volunteer Research Assistant who has helped me describe over a hundred new species. Without his able assistance much of this work of discovery would remain unfinished.

Philodendron linganii Croat, **sp. nov.** Type: PERU. Pasco: Oxapampa Province, Distrito Oxapampa, road

to Sector San Alberto, 10°33'S, 75°22'W, 2170 m, 13 June 2003, *J. Lingan, R. Rojas, K. Meza, C. Rojas & E. Fernádez 601* (holotype, MO-5799455; isotypes, K, US, USM). **Figure 7** C–D.

The species is a member of subgen. *Philodendron*, sect. *Macrobelium*, subsect. *Glossophyllum*, ser. *Glossophyllum* characterized by it epiphytic habit, long-petiolate leaves with subterete petioles, ovate-elliptic brown-drying blades, subcordate blades with obscure primary lateral veins as well as by the three moderately pedunculate inflorescences per axil with reddish spathes.

Philodendron linganii is closest to *P. ruizii* Schott, but that species differs in having blades more elongated with distinct primary lateral veins, distinct laticifers between the minor veins and by having and larger inflorescences with white spathes.

In the Lucid Philodendron Key the species also tracks to *P. asplundii* Croat & M. L. Soares, differing by having persistent fibrous cataphylls and leaves with prominent cross-veins; *P. densivenium* Engl., differing by having more broadly ovate blades, to 1.3 cm times longer than broad; *P. kroemeri* Croat & Acebey differing in having leaf blades much more prominently lobed at the base; *P. weberbaueri* Engl., differing by having proportionately more ovate leaf blades (1.2–1.5 times longer than broad).

Epiphyte; **internodes** short, 1.5–3 cm but also sometimes to 10 or 12 cm long, 2–3 cm diam.; **cataphylls** 19–23 cm long, weakly persistent, soon deciduous, 2-ribbed. LEAVES 29.4–87.7 (averaging 64.3) cm long; **petioles** 15.8–46 (averaging 33.9) cm long, 7 mm diam., subterete, drying grayish medium brown; **blades** ovate-elliptic (subcordate-oblong), 23.4–44 cm long, 10.2–24 cm wide (averaging 37.0 x 16.7 cm), 1.3–2.8 (averaging 2.37) times longer than broad, broadest midway, 0.7–2.6 times long as petioles, abruptly to gradually acuminate at apex, cordulate and often inequilateral at base, dark green and semiglossy above, paler and less glossy below, drying subcoriaceous, reddish brown to gray-brown and matte to weakly glossy above, yellowish gray-brown and semiglossy below; **upper surface** minutely granular with a dense mixture of pustules; **lower surface** irregularly folded and sparsely pustular; **anterior lobe** 39.5–40.6 cm long, with straight to broadly rounded margins, the distal margin rounded; **posterior lobes** rounded, 2.5–7 cm long, 3–7 cm wide, often markedly of unequal size); **sinus** parabolic to arcuate, rarely spatulate, almost closed, 0.5–4.2 cm deep, 1.3–4 cm wide; **major veins** all sunken above, **midrib** drying broadly flattened, minutely ridged, sparsely pustular and darker above, broadly convex, finely ridged, conspicuously pustular and paler below; **primary lateral veins** 8–12 pairs, moderately obscure above, narrowly rounded and slightly paler below, drying usually paler than surface, arising at a steep angle on midrib then spreading at a 45–65°(–75°) angle; **minor veins** arising from midrib, moderately obscure in fresh

material but drying moderately visible and distinct above and below; **laticifers** usually not visible except on younger leaves; **upper surface** with some of the major veins irregularly and often deeply etched, the intervening area mostly finely ridged longitudinally; **lower surface** more conspicuously granular to minutely warty-granular; **posterior rib** gradually curved; **sinus** arcuate, 1 cm deep, 3.8 cm wide at middle. INFLORESCENCES 2–5 per axil; **peduncle** 4–7.3 cm long; **spathe** reddish in bud, whitish at anthesis with pale speckles, becoming reddish, sometimes becoming yellowish to reddish in age, 6.5–10.5 cm long, 9 mm wide when furled, flattening to 2.6 cm wide, oblong-oblanceolate, drying moderately coriaceous, reddish medium brown; **spadix** green, drying 6–9.5 cm long, drying medium brown to reddish brown; pistillate portion 5.3–5.6 cm long in front, 4.2–5.1 cm long in rear, 7 mm diam. at base, 6 mm diam. at middle, 8 mm at apex,; staminate portion gradually broadened toward apex, 2.2–4.3 cm long, 7 mm diam. at base, 11 mm diam. in middle, 9 mm diam. at 1 cm from apex, broadly rounded at apex; sterile staminate portion not easily distinguishable, to 6 mm long, 6 mm diam.; pistils 1–1.5 mm, ca. long, 1.3 mm diam.; ovary 5–6-locular, the sides tapered slightly outward and broader than the style; style 1.4–2.2 mm wide, irregularly 4–5-sided, the margins bluntly rounded to somewhat acute; stigma button-shaped, yellowish brown on reconstitution, 1 mm diam., 0.6–0.8 mm diam., with 6–7 pits in a circle around the center, weakly raised medially; ovules 2 per locule, 0.6 mm long; funicles 0.4 mm long, borne in a gelatinous matrix

Philodendron linganii is endemic to Peru, known from Cajamarca Department, San Ignacio Province at 1500–1600 m, in a *Montane rain forest* life zone and in Pasco Department in the Province of Oxapampa, Distrito Oxapampa at 2170–2450 m in a *Premontane rain forest* life zone.

One paratype from Cusco, La Convención is unique in having a spatulate, nearly closed sinus.

The species is named in honor of Peruvian botanist, Jorge Lingan Chavez, an aroid specialist who did his undergraduate thesis in the Oxapampa region and discovered many new species including this one that bears his name. He later worked at the Missouri Botanical Garden on an internship where he worked on the Araceae of Peru Still later he completed his Master's Degree working on the Araceae of SE Peru under the direction of Dr. John Janovec at Texas Christian University and is now associated with the herbarium at the Universidad San Marcos in Lima.

Paratypes: PERU. **Cajamarca:** San Ignacio, Huarango, Nuevo Mundo-Caserio Gosen, márgen derecha de la Quebrada Las Juntas, afluente de Shimutas; 05°18'30"S, 78°44'01"W, 1500–1600 m, 19 July 1997, *J. Campos & S. Nuñez 4196* (MO, USM); San Ignacio San José de Lourdes. Selva Andina. Cerro Las Yeguas. Bosque primario, suelo

arcillosos, 05°00'42"S, 78°54'29"W, 1900 m, 22 Jan 2001, *R. Vásquez, S. Flores, L. Campos 26439* (MO, USM). **Cusco:** La Convención, Distrito Echarate, 12°45'18"S 72°36'50"W, 1834 m, 23 May 2007, *G. Calatayud, I. Huamantupa, H. Coasaca, M. Luza, N. Anaya, M. Callalli, F. Zamora 4033* (CUZ, MO). **Pasco**: Oxapampa; Parque Nacional Yanachaga-Chemillen, Quebrada Yanachaga, 10°23'S, 75°28'W, 2250 m, 14 June 2003, *R. Vasquez et al. 28356* (MO, USM); Distrito Huancabamba, zona de amortiguamiento del Parque Nacional Yanachaga-Chemillen, Quebrada Yanachaga, 10°23'44''S, 75°28'56''W, 2250 m, 28 Sep 2007, *A. Monteagudo, A. Peña, V. Flores, L. Chuck & C. Rojas 15440* (MO, USM); Parque Nacional Yanachaga-Chemillen, Quebrada Yanachaga, 10°32'S, 75°21'W, 2350 m, 19 Mar 2003, *J. Lingan & J. Opisso 354* (F, K, MO, USM); 10°33'S, 75°22'W, 2450 m, *J. Lingan et al. 348* (B, G, M, MO, USM); Parque Nacional Yanachaga-Chemillen, Sector Muchuymayo, 10°19'34''S, 75°31'16''W, 2026 m, 25 Mar 2010, *Juan Perea, J.L. Mateo & R. Rivera 4196* (MO, USM).

Philodendron macarenense Croat, **sp. nov.** Type : COLOMBIA. Meta: Sierra de la Macarena, Central Mountains, North Ridge, ca. $2\frac{238}{92}$46'N, $73\frac{238}{92}$52'W, 1500 m, 30 Dec 1949, *W. R. Philipson & J. M. Hidrovo 2002* (holotype, BM). **Figure 5** D.

Epiphytic appressed climber; **internodes** short**,** slightly longer than broad, 1 cm long, 8 mm diam.; **cataphylls** light green with darker stripes, unribbed, deciduous, drying 2.5 cm long, fibrous with fragments of grayish olive-brown epidermis; **petioles** 7.3–10.7 cm long, 4 mm diam., spongiose, drying broadly and acutely sulcate, grayish olive-brown; **blades** narrowly oblong-elliptic, 14.2–18.9 cm long, 3.8–4.3 cm wide (averaging 17 x 4), 3.74–4.40 (averaging 4.12) times longer than broad, broadest at middle, 1.7–1.9 (averaging 1.8) times long as petioles, abruptly acuminate at apex, broadly acute at base, drying papyraceous to subcoriaceous, grayish and matte above, grayish yellow-brown and weakly glossy below; **upper surface** smooth, densely pale-lineate, areolate upon magnification; **lower surface** relatively smooth, minutely granular upon magnification; **midrib** drying flattened, finely ribbed and darker above, narrowly raised, finely ribbed and darker below; **primary lateral veins** 16–20 pairs, arising at a 50–55° angle near middle, scarcely more prominent than minor veins, drying narrowly convex and concolorous above, narrowly rounded and darker below; **minor veins** arising from midrib, drying obscure above and moderately visible and distinct below, with weakly raised transverse veins present; **laticifers** short, pale, relatively visible; **basal veins** 2 pairs. INFLORESCENCES 1–2 per axil; **peduncle** 6.5 cm long, 2 mm diam.; **spathe** 4.3 cm long, 8 mm diam., flattening to 2.3 cm wide, outer blade color white, outer tube color green, resin canals moderately conspicuous and dense in the lower ¾ of the spathe; **spadix** 4 cm long; staminate spadix 1.9 cm long, 2 mm diam. at base, 2.2 mm diam. midway, the sterile portion not

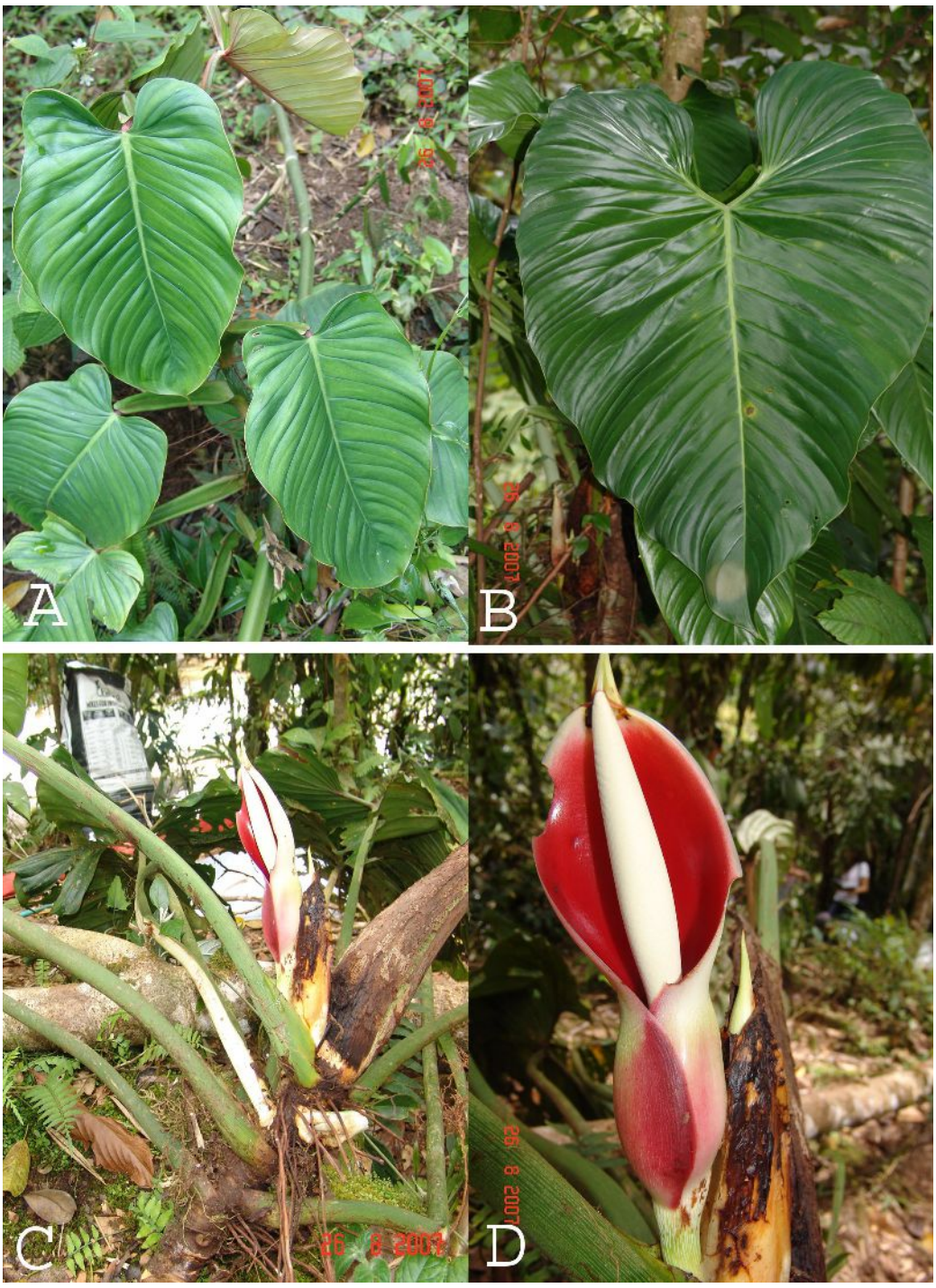

Figure 8. A–D. *Philodendron marcocorreanum* Croat. (*Croat & E. Trujillo 98145*). A. Habit of preadult plant showing fully sheathed petioles. B. Blade, showing adaxial surface. C. Stems showing petioles bases, cataphylls and inflorescence in nearly side view. D. Inflorescence with spathe at anthesis in face view.

obvious; pistillate portion 2.1 cm long, 2.6 mm diam. at base, 2–2.2 mm diam. at apex; pistils 1–1.2 mm long, 0.6–0.8 mm diam., style scarcely wider than the stigma, prominently sloping; stigma 0.4–0.5 mm diam., 0.2 mm thick, with 5 pits in a circle around the center, the stigmatic papillae flattening into a thin disk, covering the surface of the stigma; ovary with thin walls ribbed longitudinally between the locules; **ovules** affixed basally, 1 per locule, 0.4 mm long, borne in a gelatinous envelope, this 0.8 mm long, 0.4 mm diam., funicle 0.2 mm long.

Philodendron macarenense is endemic to Colombia in the Sierra de la Macarena at 1500 m in a *Premontane wet forest* life zone.

The species is named for the type locality in the Sierra de la Macarena in Meta Department at the edge of the Amazon basin.

Philodendron marcocorreanum Croat & M. Mora & E. Trujillo, **sp. nov.** Type: COLOMBIA. Caquetá, Vereda Villaraz, Quebrada El Caraño, km 20 on road to Neiva, Finca La Estrella, 01°43'34"N, 75°40'06"W, 900 m, 26 Aug 2007, *T. B. Croat & Edwin Trujillo 98145* (holotype, HUAZ). **Figure 8.** A–D.

The species is a member of subgen. *Philodendron*, subsect. *Philodendron*, series *Fibrosa* characterized by its hemiepiphytic habit, sharply 2-ribbed cataphylls which persist as a network of pale fibers, faintly striate, obtusely flattened petioles, large ovate-sagittate leaf blades with narrowly rounded posterior lobes, 11–12 pairs of basal veins, a well-developed posterior rib as well as by having 1–2 inflorescences per axil with the peduncle coarsely white-striate at the apex, spathe whitish to pale green outside and dark purple-violet inside.

In the Lucid Philodendron Key the species is closest to *P. ornatum* Schott, a species with similarly shaped large leaf blades and a network of fibrous cataphylls. That species differs in having conspicuously warty petioles near the apex.

Other species featured in the Lucid Philodendron Key include *P. advena* Schott, *P. grayumii* Croat and *P. sagittifolium* Liebm, all from Central America and all of which differ in having many fewer basal veins.

Epiphyte; **stem** less than 1 m long; **internodes** short, 6 cm diam.; **cataphylls** medium green, sharply 2-ribbed, soon persisting as a network of pale fibers, drying 37.6 cm long, fibrous with fragments of brown epidermis, the fibers manila; **petioles** 74 cm long, 1.7 cm diam. midway, finely striate throughout with pale discontinuous ridges, obtusely flattened toward apex, drying reddish brown; **juvenile blades** ovate elliptic, 15.5–17.2 cm long, 6.3–7.6 cm wide; **preadult blades** oblong-oblanceolate with cordulate lobes, 27.1–27.2 cm long, 17.4–17.7 cm wide; **blades** ovate-sagittate,

52.1–84.2 cm long, 42.9–66.6 cm wide, 1.21–1.30 (averaging 1.26) times longer than broad, broadest above petiole attachment, 0.7–1.1 (averaging 0.9) times long as petioles, abruptly acuminate at apex, prominently lobed at base, subcoriaceous, semiglossy, purplish violet on lower surface when young, medium green below in age, drying subcoriaceous, medium brown and semiglossy above, reddish brown and semiglossy below; **upper surface** smooth, areolate upon magnification, short-pale-lineate; **lower surface** sparsely pustular; **anterior lobe** 40.8–62.5 cm long, the distal margin broadly rounded; **posterior lobes** 19.1–29.1 cm long, 14.9–24.7 cm wide, directed downward and inward; **midrib** flattened and moderately paler above, narrowly rounded and purplish violet (eventually medium green) below, drying flattened, finely ribbed and darker above, narrowly rounded, finely ribbed and darker below; **primary lateral veins** 12 pairs, arising at a 55–60° angle, obtusely sunken and concolorous above, narrowly round-raised and purplish below, drying obtusely sunken and concolorous above, narrowly rounded and darker below; **minor veins** moderately indistinct, arising mostly from midrib but also from the primary lateral veins closer to margins, drying distinct above and moderately visible below; **laticifers** long and continuous, lying between every minor vein; **basal veins** 10–12 pairs, 1st and 2nd pair free to base, 3rd pair fused to 5.2 cm, 7th and 8th pair fused to 6.2 cm; **posterior rib** gradually curved, naked 5.2 cm; **sinus** hippocrepiform, 11.2–21.5 cm deep, 6.5–14.4 cm wide. INFLORESCENCES 1–2 per axil; **peduncle** 8.5 cm long, pale green with short white lineations, coarsely white striate at apex; **spathe** 17.5 cm long, whitish to pale green outside and matte to weakly glossy outside, 2.2–2.8 x 2.7–3.4 long, dark purple-violet and glossy inside, pale green and pale short-lineate outside, whitish on tube, moderately glossy throughout outside, the open margin of tube violet-purple; **spadix** 14.7 cm long; **staminate portion** 10.5 cm long; sterile segment 2 cm long, 1.3 x 1.5 cm at base; **pistillate portion** 4.2 cm long in front, 2.5 cm long in rear, 1.5 x 1.7 cm diam. at base, 1.3 x 1.6 at apex; pistils 1.5 mm long, more or less quadrangular to subterete, 0.8–1 mm diam. style broadly rounded on margins; stigma 0.8 mm diam. the margins turned up, with 6–7 pores in a circle around the slightly raised center; ovules 15–20 per locule with axile placentation, 0.3 mm long, the funicle, 0.3–0.4 mm long.

Philodendron marcocorreanum is endemic to Colombia, known only from the type locality in Caquetá Department at 900 m in a *Premontane rain forest* life zone.

The species is named in honor of Professor Marco Correa from the Universidad de Amazonia in Florencia, Colombia in the Department of Caquetá. Marco is a colleague and good friend who assisted in making the type collection. Along with Edwin Trujillo Trujillo, Marco is assisting in the study of Araceae of Caquetá.

Figure 9. A. *Philodendron meieri* Croat. (*Meier 12229*). A. Herbarium type specimen with base showing abaxial surface, apex showing adaxial surface. B–C. *Philodendron pseudoverrucosum* Croat. (*Croat & L. Hannon 86647*). B. Habit showing blade and petiole. C. Inflorescence with spathe closed, base of petiole. D. *Philodendron sanmarcoense* Croat. (*Tipaz et al. 1131*). D. Herbarium type specimen, blade showing base with abaxial surface, stem with inflorescence showing prophylls and two exposed spathes.

Philodendron meieri Croat, **sp. nov.** Type: VENEZUELA. Mérida: Municipio Liberatador, NE of Mérida, Valley of Río Mucujún, via Páramo de la Culuta, Finca San Javier del Valle, Escuela Fe y Alegria, 8°40'3"N, 71°7'18"W, 1900–2400 m, 10 Nov 2005, *W. Meier & N. Gutiérez 12229* (holotype, MO-5939857). **Figure 9** A.

The species is a member of subgen. *Philodendron*, sect. *Macrobelium*, subsect. *Glossophyllum*, ser. *Ovata* characterized by its terrestrial habit, long internodes with flaky light yellow-brown epidermis, long-petiolate leaves, subterete, weakly sulcate petioles, narrowly ovate-sagittate and especially by its cluster of up to four short-pedunculate, short, narrowly ovate-elliptic spathes lacking a constriction and with the staminate spadix much shorter than the pistillate portion.

Terrestrial; **internodes** long 6–9 cm, 1.9 cm diam., with flaky light yellow-brown epidermis; **cataphylls** not available; **petioles** 51.8 cm long, 7 mm diam., subterete, weakly sulcate drying medium to dark brown; **blades** narrowly ovate-sagittate, 37.2 cm long, 24.8 cm wide, 1.50 times longer than broad, broadest at petiole attachment, 0.72 times long as petioles, abruptly acuminate at apex, prominently lobed at base, drying coriaceous, medium brown and weakly glossy above, slightly paler and semiglossy below; **upper surface** short and irregularly ridged upon magnification; **lower surface** short and irregularly ridged upon magnification; **anterior lobe** 24.7 cm long, with straight margins; **posterior lobes** 10.7 cm long, 8.7 cm wide, directed downward; **midrib** drying flattened, finely ribbed and concolorous above, narrowly rounded, finely ribbed and paler below; **primary lateral veins** 6 pairs, arising at a 55° angle near middle, drying convex, concolorous and frequently puckered up along their length above, narrowly acute and paler, occasionally with depressions (matching the raised areas on upper surface) below; **minor veins** arising mostly from midrib but also from the primary lateral veins closer to margins, drying obscure above and moderately visible and distinct below; **basal veins** 6 pairs, 1st and 2nd pairs free to base, 3rd and 4th pairs fused to 2.6 cm; **posterior rib** gradually curved, it is not naked; **sinus** narrowly spathulate, 13.2 cm deep, 2.6 cm wide. INFLORESCENCES short-pedunculate, up to four per axil; **peduncle** 2–4.6 cm long, 4 mm diam.; **spathe** 5.6–6.5 cm long, 2.5 cm diam. at anthesis, narrowly ovate-elliptic, drying moderately coriaceous, dark reddish brown; **spadix** 3–5 cm long, staminate portion 1 cm long, 1 cm diam.; pistillate portion 1.75–3.3 cm long, 1 cm diam. at base, 1.3 cm diam. at apex, much longer than staminate portion; **pistils** 2 mm long, less than 2.5 mm diam.; style 1.8–2.6 mm diam., the margins rounded, flattened and thin; **stigma** button-shaped, 0.5 mm diam., somewhat stalked, covered with a more or less funnel-shaped mantle that is only slightly narrower than the stigma; **ovary** 5-locular; ovules basal, 2 per locule, 0.2 mm long, the funicle ca. 0.1 mm long, usually with only one ovule developing

into seed; seeds ovoid, 1.3–1.5 mm long, 0.9–1.1 mm wide, slightly narrow in one dimension, brownish green, semiglossy, minutely granular.

Philodendron meieri is endemic to Venezuela, known only from the type locality in Merida State at 1900–2400 m in a *Tropical wet forest* life zone.

The species is named in honor of plant ecologist Wilhelm Meier from the University of Freiburg in Germany who spends much of his time conducting ecological research in Venezuela and who collected the type of the species.

Philodendron pseudoverrucosum Croat, **sp. nov.** Type: ECUADOR. Tungurahua Prov.: Along road from Río Negro on Rió Pastaza to Parque Nacional Sangay, 4.9 km south of Río Negro, 4.8 km S of bridge over Río Pastaza, 01°26'46"S, 78°13'33"W, 1520 m, 19 Aug 2002, *T. B. Croat & L. P. Hannon 86647* (MO-5740188; isotypes, AAU, B, CAS, COL, CUVC, F, K, M, NY, QCNE, S, SEL, US, USM). **Figure 9** B–C.

The species is a member of subgen. *Philodendron*, sect. *Philodendron*, subsect. *Achyropodium* characterized by its internodes typically longer than broad, densely scaly marcescent cataphylls, long densely transverse scaly-ribbed subterete petioles, ovate-sagittate blades with a hippocrepiform sinus, distinct cross-veins on the lower surface, with bands of violet-purple tingeing the areas between primary lateral veins, short and discontinuous laticifers on lower surface, 9 (7–9) pairs of basal veins with the 1st and 2nd pair free to the base, the posterior rib only briefly naked as well as 1–2 moderately long-pedunculate inflorescences per axil, a spathe with the blade whitish, tube reddish to purple violet outside and darker and equally colored within.

The species is to be compared with *Philodendron verrucosum* Mathieu ex Schott, a species found primarily on the western slopes of the Andes which differs in having longer more slender scales on the petioles and by having broad bands of purple-violet on the lower surface. In contrast the scales of *P. pseudoverrucosum* are short and affixed to the petioles in close irregular transverse rows.

Terrestrial or hemiepiphyte on rocky bank along stream and in deep shade in forest; **internodes** 5–10 cm long, 2–5 cm diam., as broad as long or longer than broad, dark green, semiglossy becoming gray-brown, weakly glossy and transversely, minutely ribbed; stem creeping; **cataphylls** 20–35 cm length, reddish purple to reddish brown, densely covered with medium green scales, unribbed, marcescent, persisting at upper nodes as thin intact member, finally deciduous, drying intact with reddish dark brown epidermis; **petioles** 32–93 cm long, 5–10 mm diam., terete, medium green to dark olive-green, matte to weakly glossy, becoming obtusely flattened adaxially towards apex, usually densely transverse

scaly-ribbed, drying reddish medium brown to grayish dark brown; **preadult blades** broadly ovate-sagittate, to 19.7 cm long, 10.5 cm wide, the sinus ca. 2 cm deep, broadly rounded at the apex; **adult blades** ovate-sagittate, 27.3–59 cm long, 21.1–49.6 cm wide (averaging 44 x 35), 1.14–1.54 (averaging 1.27) times longer than broad, broadest at petiole attachment, 0.5–1.1 (averaging 0.72) times long as petioles, abruptly acuminate at apex (acumen to 2 cm long), prominently lobed at base, thin to softly coriaceous, dark green and matte-velvety above, sometimes pale green along main veins, paler, purple tinged and matte below, drying reddish medium brown to reddish dark brown and weakly glossy above, medium brown and semiglossy below; **upper surface** smooth with short pale lineations, sometimes absent; **lower surface** glossier; **anterior lobe** 21.4–42.8 cm long, with straight margins, the distal margin rounded; **posterior lobes** 8.8–23 cm long, 7.2–18.9 cm wide, directed downward and inward; **midrib** flattened to sunken and paler above, narrowly round-raised and paler to slightly darker, drying flattened and concolorous above and round-raised, densely granular puberulent and darker below; **primary lateral veins** 8 (7–9) pairs, arising a $50–60^{\frac{238}{92}}$ angle near middle, narrowly sunken and paler to concolorous above, narrowly round-raised and paler to concolorous below, drying narrowly acute and concolorous above, flattened, densely granular-puberulent and darker below; **minor veins** arising mostly from midrib but also from the primary lateral veins closer to margins, distinct, weakly raised and granular below; **cross-veins** distinct on lower surface with bands of violet-purple tingeing the areas between primary lateral veins; **laticifers** short and discontinuous on lower surface; **basal veins** 9 (7–9) pairs, the 1st and 2nd pair free to the base, 3rd pair fused to 1–1.5 cm, the 4th and 5th pairs fused to 3.5–5.5 cm, drying densely granular puberulent below; **posterior rib** gradually curved, naked 1–1.5 cm; **sinus** hippocrepiform, 5.5–17.6 cm deep, 1.9–7.8 cm wide. INFLORESCENCES 1–2 per axil; **peduncle** 3.3–13.2 cm long; **spathe** 14–18 cm long, blade whitish, tube pale red with darker base and margins internally, post-anthesis inflorescence dark violet-purple in tube and tinged onto spathe blade, drying 10–26.8 cm long, 1.3–4.8 cm diam., coriaceous, reddish dark brown; **spadix** yellowish-white, drying 7.1–18.6 cm long, dark brown to blackish brown; pistillate portion 1.9–8.2 cm long in front, 3–10 mm diam. at middle, 1–6.5 cm long in back; staminate portion 4.6–10.6 cm long, 3–18 mm diam., gradually tapered; sterile staminate portion 7–17 mm long, 2–8 mm diam.; pistils 5–6 mm long, 2.8–3.3 mm diam.(4–)5–6-locular; style 2.2–3 mm wide, the margins rounded, yellow-brown in pickled collections; stigma button-shaped, 0.9–1.0 mm diam., dark brown in pickled collections, with (4–)5–6 deep pits around the periphery; ovules with axile placentations, 8–10 per locule, 0.6–0.9 mm long, 0.3 mm diam., with a minute constricted cap on the apex, funicle very short.

The species ranges from northern Ecuador to northern Peru at 284–1940 m but primarily between 1000 and 1400 m, occurring in *Premontane wet forest* and *Premontane moist forest* life zones.

While most collections of the species have short pale lineations present on the upper surfaces, some collections appear to lack them all together. These are *Foster 7732* (Peru, Pasco, Oxapampa), *Asplund 18412* and *Croat 58803* (Napo), *Croat 99445* (Orellana), *Croat 73480* (Pastaza) and (Napo).

The species epithet comes from the Latin "pseudo" (meaning similar to but not the same) and "verrucosum" (alluding to its presumed relationship to *Philodendron verrucosum* Mathieu ex Schott).

Paratypes: ECUADOR. Approx. 6 km SE of Cosanga, , 00°38'S, 77°50'W, 10 May 2006, *S. Trogisch 9* (GOET, MO, QCA, QCNE). **Cotopaxi:** La Maná. Reserva Ecológica Los Ilinizas, Cerro Tilipulo Grande, vertiente norte, Cordillera Tilinche, acceso desde Pucayacu y Capillas, bosque nublado primario, 00°45'45"S, 79°06'23"W, 30 Jul 2003, *P. Silverstone-Sopkin, N. Paz & A. Giraldo et al. 9705* (CUVC, MO, QCNE). **Morona-Santiago**: Along road between Macas and Riobamba and Guamote, between Proaño and 9 de Octubre, 10.5 km west of Proaño, for 12.1 km west of Proaño, 02°17'S, 78°11'W, 22 Aug 2002, *T. B. Croat & L. P. Hannon 86783* (MO); Along road between Macas and Riobamba, between Proaño and Parque Nacional Sangay, 28.6 km west of Proaño, 02°14'31"S, 78°16'40"W, 13 Aug 2002, *T. B. Croat, L. P. Hannon & P. Schmidt 86557* (MO). **Napo:** Mera, near Mangayacu, 14 Nov 1955, *Asplund 18412* (S); Pastaza: densely forested slopes, along Río Pastaza, between Río Topo, at Topo, and Mera, altitude 1,158–1,675 m., 6 Nov. 1943, *J. A. Steyermark 54878* (NY); Ca. 6 km SE of Cosanga, 00°38'S, 77°50'W, 10 May 2006, *S. Trogisch 9* (MO); Parque Nacional Sumaco-Galeras, Cordillera Galleras, Rio Chiriyacu, 00°50'S, 77°34'W, 25 Oct 2006, *S. Trogisch, S. Moritz & J. Homeier 180* (GOET, MO, QCNE); *192* (GOET, MO, QCNE); Along new road from Pangayacu to Loreto, 10.6 km E of main N/S road between Baeza and Tena (departing main road 23.7 km N of Archidona), 00°47'S, 77°41'W, 30 Apr 1984, *T. B. Croat 58803* (MO, QCA); Along road from Baeza to El Chaco, vic. Río Sardinas Grande, along Río Quijos, disturbed area along swampy pasture; 6 km NNE of San Francisco Borja, 00°22'32"S, 77°49'01"W, 17 Apr 2003, *T. B. Croat, L. P. Hannon & N. Altamirano 87654* (MO); Archidona-Baeza, vic. Jondachi, 20.1 km N of Baeza, 5 km S of turn off to Loreto; disturbed virgin forest, 00°45'56"S, 77°47'33"W, 19 Apr 2003, *T. B. Croat, L. P. Hannon & N. Altamirano 87786* (MO); Along road between Baeza and Lago Agrio, along side road to Paroquia Sumaco, 0.2 km E of main road, 00°23'54"S, 77°49'23"W, 5 Oct 2007, *T. B. Croat, M. Carlsen & D. Levin 99308* (MO); Archidona, along road between Coca and the main Baeza-Tena road, via Loreto and Hollin, 6.7 km W of Río Payamino, 20

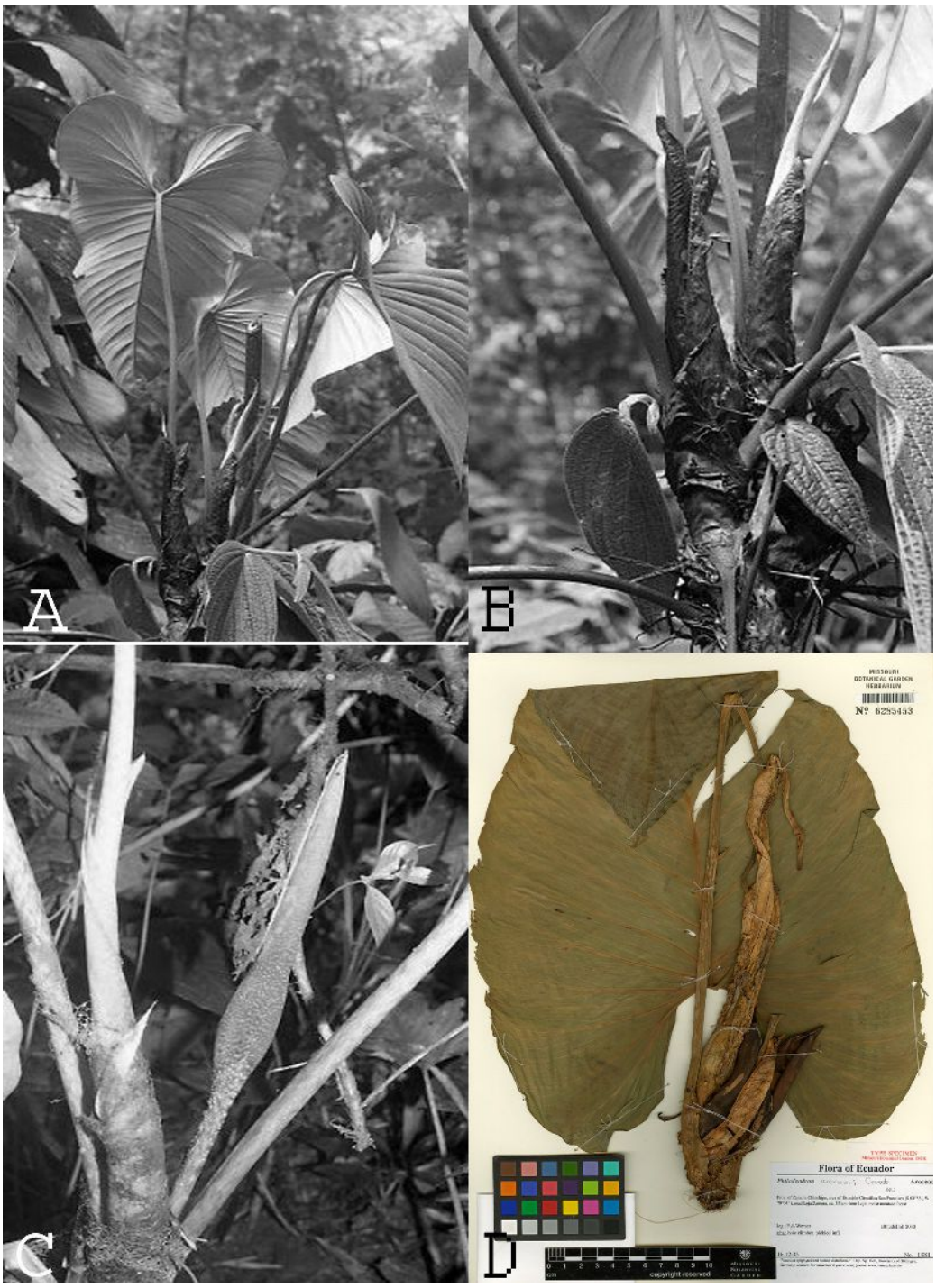

Figure 10 A–C. *Philodendron ricaurtense* Croat. (*Croat 71420*). A. Habit. B. Stem showing cataphylls and bases of petioles. C. Stem with cataphylls, petiole base and a single inflorescence per axil (post-anthesis). D. *Philodendron werneri* Croat. (*Werner 1881*). D. Herbarium type specimen, with base showing abaxial surface, two inflorescences exposed and a third inflorescence contained within the prophyll.

km W of Loreto, 00°48'S, 77°30'W, 2 Mar 1992, *T. B. Croat 72633* (MO). **Orellana**: Along road between Coca and Narupa (jct. of Baeza-Tena Hwy.), 12.9 km W of jct. in Coca., 00°29'47"S, 77°07'50"W, 7 Oct 2007, *T. B. Croat, M. Carlsen & D. Levin 99445* (MO). **Pastaza**: km 18 on the road from Puyo to Tena, disturbed forest, 16 June 1978, *H. Kennedy 3863;* Mera, along road between Puyo and Baños, along creek ca. 5 km W of Mera., 01°26'S, 78°08'W, 7 Mar 1992, *T. B. Croat 72836* (MO, QCNE); Pastaza. Between Shell and Mera, 5.3 km NW of Center of Shell, along gravel road 1.1 km N of highway; disturbed virgin forest at end of a board covered path 25 m E of road, 01°27'S, 78°04'W, 4 Apr 1992, *T. B. Croat 73480* (MO); **Sucumbíos:** NW of Cascada San Rafael, 11 Oct 1990, *Jaramillo, J. et al. 13175* (NY); Along road from Lumbaquí to La Bonita, 68.6 km N of main Baeza-Lago Agrio Road, 1 km S of Rosa Florida, 21.4 km S of La Bonita, 00°23'44"N, 77°31'40"W, 21 Aug 2004, *T. B. Croat & G. Ferry 93732* (MO); Sucumbíos,Localidad El Salado, Finca del Sr. Segundo Pacheco, 13 Oct 1990, *J. Jaramillo, et al. 13278* (NY). **Tungurahua**: Along road from Río Negro on Rió Pastaza to Parque Nacional Sangay, 4.9 km south of Río Negro, 4.8 km S of bridge over Río Pastaza, 01°26'46"S, 78°13'33"W, 19 Aug 2002, *T. B. Croat & L.P. Hannon 86647* (MO); Along road from Río Negro to La Estancia and Parque Nacional Sangay, 1.8 km S of bridge over Río Pastaza, 01°25'24"S, 78°13'01"W, 4 May 2003, *T. B. Croat, L.P. Hannon & M. Menke 88494* (MO). **Zamora-Chinchipe**: Along road between Zumbi (on Río Zamora, 7.7 km S of Yanzaza), and Cordillera del Cóndor, 6.8 km E of Paquisha at Río Nangaritza, 03°54'18"S, 78°35'W, 27 May 2003, *T. B. Croat & M. Menke 89529* (MO). PERU. **Pasco:** Oxapampa, headwaters of Río Tunqui, trail to Chuchurras-Palcazu, forested mossy steep slopes and stream-bank, 10°15'S, 75°28'W, 2 Jan 1984, *R. Foster, M. Chanco, J. Alban & D. N. Smith 7732* (MO, USM).

Philodendron ricaurtense Croat, **sp. nov.** Type: COLOMBIA. Nariño: Along road between Pasto and Tumaco, West of Ricaurte, vic. of Palmar, valley of Río Imbi, ca. 1 km E of Texas Gulf Pipeline Maintenance Station, along slopes above Río Imbí, 1°08'N, 77°56'W, 1100 m, 14 Mar 1990, *T. B. Croat 71420* (holotype, MO-3784061–63; isotype, PSO). **Figure 10.** A–C.

The species is a member of subgen. *Philodendron,* sect. *Philodendron*, ser. *Fibrosa* and is characterized by its terrestrial habit, short, thick internodes, persistent, semi-intact cataphyll fibers, C-shaped and sulcate petioles, the narrowly ovate-triangular-sagittate, dark brown-drying blades with a narrowly hippocrepiform sinus as well as by the inflorescence with a coarsely lineate white peduncle, the spathe tube dark red outside and dark maroon-purple on the inside.

Philodendron ricaurtense is probably most similar to *P. roseocataphyllum* Croat & M.M. Mora which differs in having sharply 2-ribbed cataphylls, petioles terete or obtusely flattened and *P. venulosum* Croat & D.C. Bay which differs in having sharply 2-ribbed cataphylls, petioles terete or obtusely flattened adaxially.

Terrestrial; **internodes** short, to 2.5 cm diam., dark olive-green and moderately glossy on pre-adult plants, 1.7–3.2 cm diam., brown and covered with cataphylls on adult plants; **cataphylls** semi-intact at several upper nodes, red-brown, moderately soft, with thin epidermis underlain with a close network of pale fibers, 28.1–30.2 cm long, persisting semi-intact with a reticulum of fibers woven together, drying reddish brown. LEAVES clustered at apex of stem; **petioles** more or less erect**,** 34.1–61.6 cm long, 4–6 mm diam., terete midway and narrowly sulcate, sharply C-shaped and sulcate toward apex, dark green, weakly glossy, drying reddish medium brown; **preadult** broadly ovate, to 26.4 cm long, 16 cm wide, the sinus ca. 5 cm deep, narrowly rounded at the apex; **adult blades** more or less pendent from petioles, narrowly ovate-triangular-sagittate, subcoriaceous, dark green and matte above, much paler and moderately glossy below, drying 31.2–42.9 cm long, 19.4–28.5 cm wide (averaging 35 x 23), 1.45–1.61 (averaging 1.53) times longer than broad, broadest at petiole attachment, 0.6–0.9 (averaging 0.7) times long as petioles, abruptly acuminate at apex, prominently lobed at base, medium brown and weakly glossy above, reddish medium brown and semiglossy below; **upper surface** densely pale speckled (round to elongated), minutely papillate upon magnification; **lower surface** densely dark reddish brown speckled; **anterior lobe** 22.2–30.7 cm long, with straight to slightly concave margins midway; **posterior lobes** 11.4–14.5 cm long, 8.3–12 cm wide, directed downward and inward; **midrib** sunken and slightly paler above, convex and slightly paler below, drying flattened and darker above, narrowly raised finely ribbed and darker below; **primary lateral veins** weakly quilted-sunken above, weakly pleated-raised below, 9 pairs, arising at a 40° angle near middle, narrowly and bluntly sunken above, prominently convex, darker and matte below, prominently down-turned along midrib, drying broadly convex, paler above, narrowly rounded, finely ribbed and darker below; **minor veins** moderately obscure, arising mostly from midrib but also from the primary lateral veins closer to margins, drying obscure above and distinct below; **laticifers** long and discontinuous, weakly raised appearing like minor veins; **basal veins** 8 pairs, 1st pair free to base, 2nd pair fused to 1 cm, 4th and 5th pair fused to 2.8 cm; **posterior rib** gradually curved, naked 1.8 cm; **sinus** spathulate, 8.9–11.9 cm deep, 2.9–3.9 cm wide. INFLORESCENCES 2 per axil; **peduncle** white, coarsely lineate at apex and on base of tube, 4.7–6.0 cm long, drying 2.2 mm diam., dark brown; **spathe** 9.5–14.7 cm long, flattening to 2.7–3.0 cm wide, narrowly long-acuminate at apex, narrowly acute at base, not markedly constricted; tube dark red outside, the blade white, inner

surface dark maroon-purple on tube, the blade red, green at tip, drying 8.1–11.5 cm long, 6–11 mm wide; **spadix** 7–10 cm long; staminate portion 4.9–7 cm long, 3.0 mm diam. at base, 2.6 mm diam. at apex; pistillate portion. 2.1–3 cm long, 3.6–4 mm diam. wide upon drying; **pistils** pale green (post-anthesis), 1.8 mm long, 1.2–1.6 mm diam.; stigma 1.2 mm diam., 0.2 mm thick, densely covered with stigmatic papillae; ovary 1.4 mm long, 1.4 mm diam., 5-locular; locules 1.2 mm long; **ovules** 8–10 per locule with parietal placentation, 0.2 mm long, the funicle about as long as ovary.

Philodendron ricaurtense is apparently endemic to Colombia, known only from the type locality in Nariño Department near Ricaurte at 1100 m in a *Premontane wet forest* life zone.

The species is named for the type locality near Ricaurte in Nariño Department in Colombia.

Philodendron sanmarcoense Croat, **sp. nov.** Type: ECUADOR. Carchi: Tulcan Cantón, Parroquia Chical, Sector Gualpi medio, Reserva Indígena Awá, along trail to San Marco N of the Casa Comunal, bosque muy húmedo premontano, 01°16'N, 78°16'W, 740 m, 23–27 May 1992, *G. Tipaz, C. Quelal & G. Cantincuz 1131* (holotype, QCNE-68306). **Figure 9** D.

The species is a member of subgen. *Philodendron,* sect. *Macrobelium*, subsect. *Oligocarpidium* characterized by its epiphytic habit, elongated internodes with light, yellow-brown, somewhat flaking epidermis, terete petioles, ovate-cordate blades with a rounded apex, rounded posterior lobes with free basal veins and an narrowly parabolic sinus and with cross-veins clearly visible. Also characteristic is the inflorescence with up to 4 tiny cream-colored spathes.

Philodendron sanmarcoense has no apparent close relatives but the leaves are similar to those of *Philodendron asplundii* in terms of dried color and the presence of cross-veins. That species differs in having much larger inflorescences, short internodes and persistent, pale cataphylls. It is also compared with *P. centinellense* which differs in having an acute base, non-flaking surface and an acuminate apex.

Epiphyte to 2 m off ground; **internodes** short, 1.1 cm diam.; **cataphylls** persisting as a few weathering pale loose fibers, deciduous; **petioles** 23.8 cm long, 5 mm diam., terete, drying dark brown; **blades** ovate, 34.8 cm long, 28.9 cm wide, 1.20 times longer than broad, broadest midway, 1.46 times long as petioles, rounded apex, cordulate at base, drying subcoriaceous, drying grayish olive-brown and weakly above, olive-brown and semiglossy below; **upper surface** densely pale short-lineate, conspicuously areolate upon magnification; **lower surface** with conspicuously pellucid punctations, pale short-lineate associated with and along major veins; **anterior lobe**

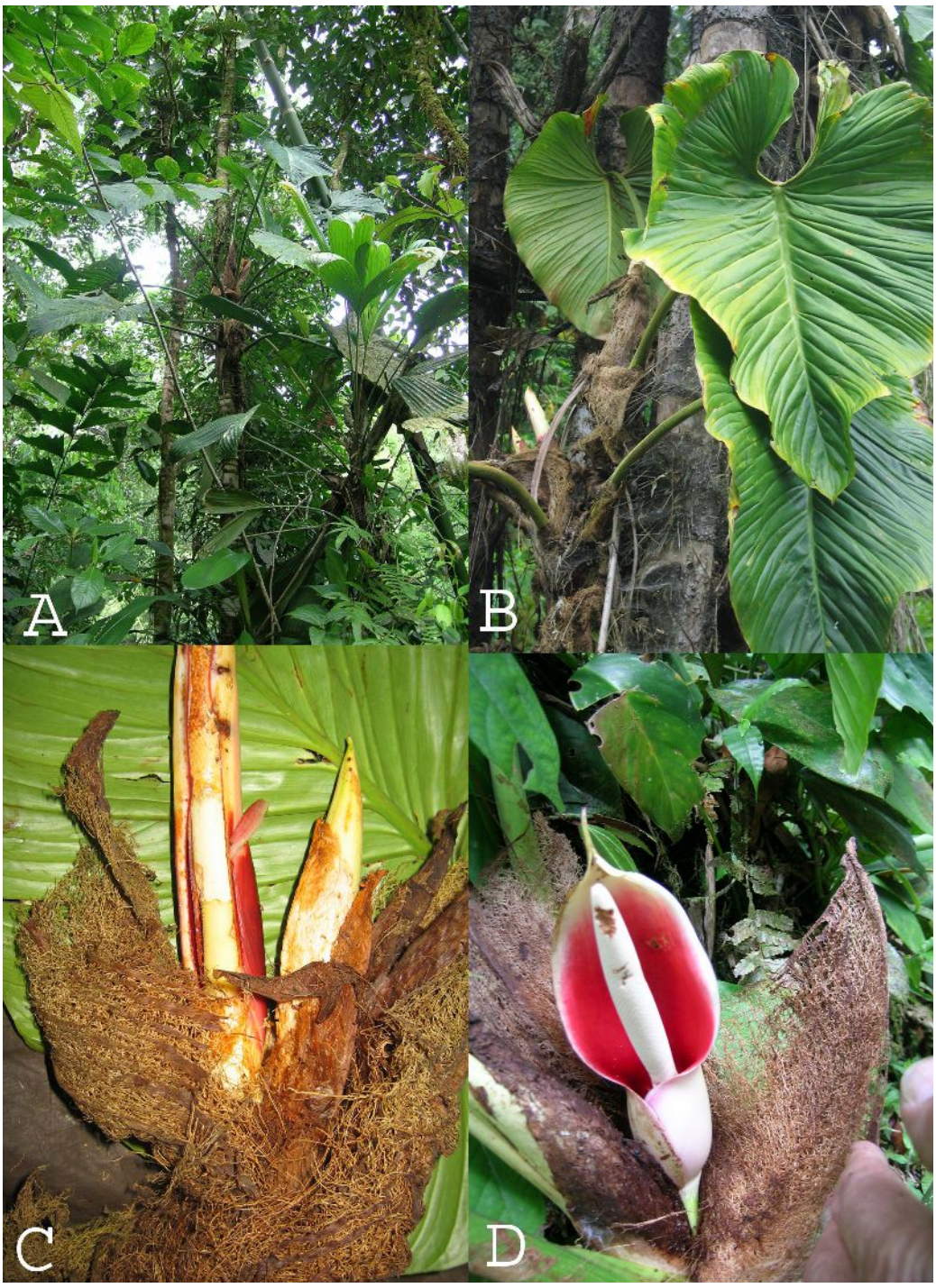

Figure 11. A–D. *Philodendron schmidtiae* Croat. A & C. (*Croat 100659*). B & D. (*Croat, Ferry & Davidson 93512*). A. Habit. B. Habit close up showing stem, cataphylls three leaves and portions of two inflorescences (two blades on right showing adaxial surface), leaf on left showing abaxial surface. C. Stem with cataphyll fibers, two inflorescences, on left with spathe cut open to expose spadix. D. Inflorescence with spathe fully open showing colored spathe blade interior with a pale margin.

29.8 cm long, with straight margins, the distal margin broadly rounded; **posterior lobes** 9.6 cm long, 8.1 cm wide, rounded; **midrib** drying flattened, pale short-lineate and darker above, broadly convex, pale short-lineate, finely ribbed and darker below; **primary lateral veins** 12 pairs, arising at a 55° angle near middle, drying flattened, sparsely pale short-lineate and paler above, narrowly convex, sparsely pale short-lineate, finely ribbed and darker below; **minor veins** arising mostly from midrib but also from the primary lateral veins closer to the margins, drying moderately visible and distinct above and below; **cross-veins** perpendicular to transverse, weakly visible on upper surface, prominent on lower surface; **laticifers** conspicuous and moderately long; **basal veins** 2 pairs, both free to base; **posterior rib** gradually curved; **sinus** parabolic, 4.7 cm deep, 3.1 cm wide at middle. INFLORESCENCES at least 3 per axil; **peduncle** 7.3–8.6 cm long; **spathe** cream 4.4–5 cm long, 5–7 mm wide, flattening to 2.8 cm wide, drying subcoriaceous, medium reddish brown; **spadix** yellow, 4.8 cm long; **staminate portion** 5.2 mm diam. at base, 6.2 mm diam. in distal 2/3rd, rounded at apex; sterile staminate portion not markedly obvious, 4 mm long, 3.6 mm diam. at apex; **pistillate portion** 4 mm long, 5 mm wide at middle, 4.8 mm diam. at apex; **pistils** 1.8 mm long; ovule 1.4 mm long, 1.4 mm diam., 4–5-locular; stigma, 0.8–1.2 mm wide, 0.2 mm thick, ovules 0.2 mm long, about as long at the funcle, basal, 2–3 per locule.

Philodendron sanmarcosense is known only from type locality in Carchi Province of Ecuador near the Colombian border at 740 m in a *Premontane wet forest* life zone. It is expected to be found in adjacent Colombia.

The species is named for the type locality in the vicinity of San Marcos in Carchi Province of Ecuador.

Philodendron schmidtiae Croat & C. E. Cerón, **sp. nov.** Type: ECUADOR. Pastaza: Puyo Baños, vic. Shell, less than 1 km N of town, 01°29'39"S, 78°03'52"W, 1096, 15 Aug 2002, *T. B. Croat, L. P. Hannon & P. Schmidt 86610* (holotype, MO-5746325–27; isotypes, CM, G, IBE, JBGP, KRAM, L, LE, M, MOL, QCNE, SEL, TEX, VDB, WU, Z). **Figure 11** A–D.

The species is a member of subgen. *Philodendron*, sect. *Philodendron*, ser. *Fibrosa* and is recognized by its mostly short internodes, conspicuous sharply 2-ribbed cataphylls which persist as fibers, more or less D-shaped, heavily striate petioles, it's broadly ovate, closely and heavily veined leaf blades and by the spathes that are greenish outside and tinged burgundy purple throughout inside.

Philodendron schmidtiae is similar to *P. manuelii* Croat from Loreto Province in Peru which occurs at about 150 m elevation. That species differs in having smaller blades, a sulcate petiole with short pale lineations, smaller blades and smaller, proportionately

more long-pedunculate yellow inflorescences.

Appressed hemiepiphyte or terrestrial on steep slope; **sap** dark purple-brown; **stem** to 1.5 m long; **internodes** short or 4–18 cm long, 2.8–8 cm diam., 1–1.5 cm long and 10–20 cm long on younger plants, medium green to gray-brown, semiglossy to matte, coarsely streaked at upper nodes, completely sheathed with dense reticulum cataphyll fibers, finally brown, close transverse-fissured; **cataphylls** 35–45 cm long, sharply D-shaped to sharply 2-ribbed or sharply flattened and 2-edged, pale to medium green, sometimes tinged pinkish, semiglossy to almost matte, spongy before becoming fibrous, persisting dark brown, semi-intact as thin brown fragments of epidermis overlapping a fine pale network of fibers, drying with fragments of reddish brown to brown epidermis, the fibers manila; **petioles** (30–)57–66 cm long, 1.5–2 cm diam., D-shaped to convex with lateral margins somewhat raised or obtusely to sharply flattened adaxially, more acutely so toward apex, finely striate-ribbed throughout with close parallel ridges, pale-lineate, with a broad, low-ribbed medially, medium to dark green or tinged violet-purple toward apex, darker violet-purple at apex and onto base of midrib, matte to weakly glossy, firm to somewhat spongy, finely pale-raised-striate, drying dark yellow-brown, matte to weakly glossy; **preadult blades** subcordate, to 24.1 cm long, 15.5 cm wide, abruptly acuminate at apex, the sinus to 3 cm deep; **blades** 32–94 cm long, 27–82 cm wide, 1.1–1.3 times longer than broad, broadest at petiole attachment, 0.9–1.2 times long as petioles, abruptly acuminate at apex (acumen to 2 cm), thin to coriaceous, dark green and glossy above, moderately paler and semiglossy below, drying dark brown above, usually slightly paler and yellow-brown below; **upper surface** sparsely pustular, short pale-lineate, relatively smooth but matte; **lower surface** equally smooth, moderately densely dark speckled, minutely pustular, short pale lineate near veins, sometimes sparsely granular; **anterior lobes** 22–68 cm long, broadly rounded; **posterior lobes** 11–34 cm long, 11.5–21.5 cm wide, broadly rounded, turned inward and sometimes overlapping; **midrib** flat to sunken, and slightly to moderately paler to concolorous above, narrowly rounded, weakly dark striate and slightly darker to concolorous, sometimes faintly purplish, matte below; **primary lateral veins** 5–9 per side, arising at a 50–60° angle near middle, quilted-sunken and slightly paler above, round-raised, matte and concolorous, sometimes purplish below; **minor veins** arising mostly from midrib but also from the primary lateral veins closer to margins, fine, moderately distinct below, undulating upon drying; **major veins** sometimes reddish near the base, drying dark brown; smaller veins on lower surface distinct, somewhat intermittent; **laticifers** conspicuous, long, wavy and sometimes crossing over minor veins; **basal veins** 10–14 pairs, (2^{nd}–) 3^{rd}–4^{th} pair free to the base, 4^{th} and 5^{th} and higher order fused 1–6 cm; **posterior rib** gradually curved, naked to 7 cm; **sinus** hippocrepiform, 7–32 cm deep, to closed or obovate.

INFLORESCENCES 2–3 per axil; **peduncle** 7–12 cm long, 1.7 cm diam. midway, pale green, coarsely whitish streaked especially near apex; **spathe** 18–23 cm long, 2.3–3.0 cm diam., pale green outside and weakly glossy pre-anthesis, tube densely pale short-lineate throughout and slightly more greenish than the blade outside; inner surface glossy deeply burgundy-purple throughout; female part pale greenish white, 1.8 cm diam. midway, 1.4 cm diam. at apex, 5.5–6.8 cm long in front, 4.0–4.6 cm long in back; male spadix 13 cm long, 2 cm diam. midway, 1 cm diam. at 1 cm from apex ; sterile male section only slightly thicker than female part 2 cm long; **pistils** 1.4 mm long, 1.4–1.6 mm diam.; styles short; stigma 1.1–1.3 mm diam., 0.2 mm thick, papillae dense but mostly with a open space midway; style slightly wider than the stigmas, sloping down sharply; ovary 5–6-locular, with the outer walls moderately thick, lacking any obvious cellular inclusions; locules 2.8 mm long, 0.6 mm diam.; ovules ca. 20 per locules, 0.4–0.5 mm long, with axile placentation, extending from the very base to the very apex of the locule; **immature fruits** greenish white.

Philodendron schmidtiae is currently known only from Ecuador but it is to be expected in adjacent Colombia (Putumayo) and in Peru (Amazonas). In Ecuador it is known from Sucumbios, Napo, Pastaza, Morona-Santiago and Zamora-Chinchipe, ranging from 450–2400 m.

An unidentified collection from Peru (*A. Monteagudo et. al. 13658*) from the Parque Nacional Yanachaga-Chemillén at 2361 m is very similar but has blades that are matte rather than semiglossy on the upper surface.

The species is named in honor of Petra Schmidt, my long-time and faithful coworker whose hard work and dedication has contributed many works with Araceae. Petra, a professional horticulturist was in charge of the Research Greenhouse at the Missouri Botanical Garden for 12 years before beginning work in the herbarium as my Research Assistant. In all she worked for the Missouri Botanical Garden for 16 years and participated in field work in Ecuador where she helped collect the type of the species that bears her name. With the assistance of Tom Croat and Bob Magill, Petra was responsible for designing one of the first multichotomous data bases designed to produce automated descriptions and to be used as a searchable data base to determine species. She helped with the production of a revision of *Anthurium* sect. *Pachyneurium*, a revision of the *Philodendron* from Central America and the revision of *Dieffenbachia* for Central America.

Paratypes: ECUADOR. **Esmeraldas:** Along road between Lita and San Lorenzo, 36.6 km N of Gasolinera San Lorenzo, 12.6 km N of Río Tulubí, 1.7 km S of El Durango, 01°05'N, 78°38'W, 18 July 2000, *Croat, L.P. Hannon, D. Hannon & E. Kinsinger 84169* (MO). **Imbabura:** Cotacachi. Parroquia: García Moreno, Cordillera de Toisán, Cerro de la Plata, Bosque Protector Los Cedros. Sendero Camino del Oso (north of Lodge), 00°01'N, 78°46'W, 19 Mar

2003, *J.L. Clark, F. Nicolade & R. Hall 7450* (MO, QCNE, US). **Morona-Santiago:** Along road between Pto. Morona at Río Morona and Santiago, 9.5 km W of Río Morona, 02°56'17"S, 77°47'29"W, 10 Sep 2002, *Croat 87403* (MO); Vicinity of Huamboya, 10.5 km west of Puyo-Macas Rd. (Hwy. 45), 6.6 km north of Río Chiguaza; disturbed area near town, 01°36'56"S, 77°59'23"W, 24 Aug 2002, *Croat & L.P. Hannon 86908* (MO); Along road between Palora and Yushin, departing main Palora-San Vincente de Tarqui Road, 8.7 km NW of Palora, 3.4 km S of Río Amundalo, 2.1 km E on road to Yushin, 01°41'46"S, 78°01'21"W, 25 Aug 2002, *Croat & L. P. Hannon 86950* (M, MO); 25 Aug 2002, *Croat & L. P. Hannon 86959* (ENCB, MO, SAR); Along the road from the main Puyo-Macas Road to Palora, departing main Puyo-Macas Road 38 km SSE of Puyo, 9.8 km from main road; 01°44'40"S, 77°54'49"W, 20 Aug 2002, *Croat & L. P. Hannon 86686* (COL, G, GB, M, MO, SEL, TEX, USM); Along road between Macas and Riobamba (Guamote), 10.5 km west of Proaño, 02°16'09"S, 78°11'35"W, 23 Aug 2002, *Croat & L. P. Hannon 86842* (AAU, AMAZ, B, BR, CAS, COL, F, GH, HUA, MEXU, MO, NY); Along road between Limón (Gen. Plaza Guttiérrez) and Gualaceo, 1.2 km N of Limón, 02°58'36"S, 78°26'24"W, 11 Aug 2002, *Croat, L. P. Hannon & P. Schmidt 86476* (CUVC, HUA, MO); Along road between Macas and Riobamba, between Proaño and Parque Nacional Sangay, 28.6 kmKm west of Proaño, 02°14'31"S, 78°16'40"W, 13 Aug 2002, *Croat, L. P. Hannon & P. Schmidt 86533* (MO); Along road between Puyo and Macas, between Río Pastaza and Macas, vicinity of Río Tayunza, 02°00'20"S, 77°56'10"W, 8 July 2004, *Croat, L. P. Hannon, G. Walhert & T. Katan 90530* (QCNE, MO, PMA); Gualaquiza. Misión Bomboiza, Misión Salesiana, 27 Sep 1967, *B. Sparre 19082* (S); Morona, Cordillera de Cóndor, along road from main Puyo-Macas, to Macuma (in construction), 24 km from main Puyo-Macas Road (this departing to E, 22.9 km N of junction to Sevilla), 13.9 km E of Santa Lucia, 5.8 km E of Cuchaentza; then ca. 15 km E of Río Macuma near end of road, 02°07'30"S, 77°45'00"W, 27 Nov 2008, *Croat 100659* (MO); San Juan Bosco, Cerro Winchinkian, the north-eastern most spur of the Cordillera del Cóndor, along Ecuador-Peru border, 3 km south of Río Santiago, 03°05'24"S, 77°57'10"W, 18 Aug 2002, *D. Neill & Shuar conservation interns 14045* (MO, QCNE). **Napo:** Cantón Aguarico, Parque Nacional Yasuní, Lagunas de Garza Cocha, 01°01'S 075°47'W, 22 Sep 1988, *C. E. Cerón & N. Gallo 5066* (AAU, MO, QAP, S); Reserva Florística "El Chuncho" Payamino, Estación Experimental INIAP-Napo, 5 km al NW de Coca, 00°30'S, 77°01'W, 12 Oct 1987, *C. E. Cerón M. 2482* (MO, QCNE); Carretera Hollin-Loreto-Coca, Comunidad Chaluayacu, km 25, Faldas al sur del Valcán Sumaco, 00°45'S, 77°40'W, 23 Dec 1988, *Carlos E. Cerón, A. Gentry, G. Benavides & C. Blanye 5786* (MO, QCNE); Reserva Biologia Jatun Sacha, ca. 8 km ESE of Puerto Mishualli,1º04'S, 77º37'W, 450 m, along the Mishualli- Coca road, 01°04'S, 77°37'W, 08 July 1986, *J. S. Miller & W.Wilbert & S.F.S. Med. Bot. Class 2490* (MO); E of Estacion

Cientifica Yasuni, 00°40'S, 76°22'W, 7 May 1999, *Leimbeck 214* (AAU); Parque Nacional Sumaco-Galeras, southern slope of Sumaco volcano, 00°37'S, 77°35'W, 22 Nov 2006, *S. Trogisch, S. Moritz & J. Homeier 332* (GOET, MO, QCA, QCNE); Jatun Sacha reserve, 01°04'S, 77°37'W, 12 Nov 2006, *S. Trogisch, S. Moritz & J. Homeier 300* (GOET, MO, QCNE); Parque Nacional Sumaco-Galeras, Cordillera Galleras, 00°50'S, 77°34'W, 23 Oct 2006, *S. Trogisch, S. Moritz & J. Homeier 144* (GOET, MO, QCNE); Along road between Baeza and Lago Agrio at 161 km marker (161 km from Lago Agrio; 19 Dec 1979, *Croat 49427* (K, MO, QCA); Baeza-Lago Agrio, 142 km w of Lago Agrio; 19 Dec 1979, *Croat 49461* (CUVC, K. MO, QCA, US); Tena-Puyo, 58.1 km N of Puyo; 01°01'00"S, 77°48'00"W, 22 Dec 1979, *Croat 49634* (QCA, MO, US); Along road from Tena, past Muyuna to end of road, where bridge over Río Tena is under construction, disturbed area in vicinity of bridge, ca 2 km W of Muyuna, ca 5.7 km W of Tena; ca.0º01'S, 77º51'W, elev. ca. 500 m, 00°01'S, 77°51'W, 1 May 1984, *Croat 58851* (MO, QCA); Coca-Río Tiguino, 6.3 km S of Petroecuador Camp "Amazonas", 00°52'S, 76°52'W, 01 Mar 1992, *Croat 72596* (HUA, MO, QCNE); Francisco de Orellana (Coca)-El Auca, 34.8 km SE of Coco, 00°37'S 076°39'W, 5 Oct 1980, *Croat 50402* (MO); Along road toward Parque Nacional Sumaco Napo Galleras, departing main Baeza-Lago Agrio Hwy. 25.3 km S of Baeza turn-off, Sector Gonzales Diaz de Pineda, 0.6 km before reaching village of Gonzalo Diaz de Pineda, 00°17'49"S, 77°45'12"W, 18 Aug 2004, *Croat, G. Ferry & C. Davidson 93512* (AAU, GB, MO, QAP, S, SEL); Baeza-El Chaco, vic. Río Sardinas Grande, along Río Quijos, 6 kmKm NNE of San Francisco Borja, 00°22'32"S, 77°49'01"W, 17 Apr 2003, *Croat, L. P. Hannon & N. Altamirano 87687* (CUVC, INB, K, MEXU, SEL MO); Archidona-Baeza, 6 km N of Archidona, 00°51'12"S, 77°47'20"W, 19 Apr 2003, *Croat, L. P. Hannon & N. Altamirano 87772* (MO, Q, QCA, QCNE, USM); Along road to Mushullacta 1–5 km S of Main Narupa-Coca Road, vic. Parque Nacional Napo-Galeras; 00°42'S, 77°36'W, 20 Apr 2003, *Croat, L. P. Hannon & N. Altamirano 87864* (MO); Archidona, Coca (San Francisco de Orellana)-Baeza-Tena road, via Loreto and Hollin, 82.5 km W of Río Payamino, 6 km W of Juticocha, 28.3 km W of Loreto, 58 km E of Tena-Baeza Highway, 00°48'S, 77°31'W, 2 Mar 1992, *Croat 72619* (MO); Archidona through Cordillera de los Huacamayos to Cosango, 11.4 km N of Narupa, 3.2 km S of summit, 00°37'08"S, 77°49'05"W, 3 Dec 2008, *Croat 100910* (MO, PMA, QCNE, US); El Chaco, Proyecto Hidroeléctrico Coca, Punto ST3, Río Quijos, ca. 10 km al sur de Reventador, 00°11'S 077°39'W, 3–5 Oct 1990, *W. Palacios 5868* (MO, QCNE); Proyecto Hidroeléctrico Coca, Punto ST4, Río Quijos, ca. 10 km al sur de Reventador, 00°08'S, 77°30'W, 6–10 Oct 1990, *W. Palacios 6032* (MO); Proyecto Hidroeléctrico Coca, Punto ST4, Río Quijos, ca. 10 km al sur de Reventador, 00°08'S, 77°30'W, 06–10 Oct 1990, *W. Palacios 6034* (MO, QCNE); Tena. Estación Biologica Jatun Sacha; 8 km E of Puerto Misahualii, 01°04'S, 77°36'W, 2 Apr 1992, *Croat 73413* (MO, QCNE).

Orellana: Loreto. Reserva Étnica Huaorani, Comunidad Dikapare, a 16 km al este de la vía Auca, 120 km al sur del Coca, Río Rumiñacu, 00°59'06"S, 76°50'55"W, 22 Jan 2004, *D. Naranjo & B. Freire 149* (QCNE). **Pastaza**: Road Puyo to Veracruz, km 5–6, 16 May 1967, *B. Sparre 17595* (S); Environs of Quihuaro, a Huaorani village 40 minutes east of Puyo by plane, 01°20'S, 77°10'W, 9–19 Jan 1991, *S. King, C. Limbach, T. Coba & N. Coba 978* (MO, QCNE); Coca-Río Tiguino, straight S of Coca, 85.8 km S of Coca and bridge over Río Napo, near drilling site, 01°10'S, 76°52'W, 1 Mar 1992, *Croat 72568* (MO, QCNE); Along Cajabamba-Mariscal road (under construction) departing main Tena-Puyo road at km 31 N of Puyo, ca. 2 km from main highway, ca. 1°19'S, 77°51'W, 920 m, 01°19'S, 77°51'W, 2 May 1984, *Croat 58931* (MO, QCNE); Along road between Puyo and Macas at km 19 (SE of Puyo); 01°37'S, 77°53'W, 9 Oct 1980, *Croat 50548* (MO, QCA); Puyo-Macas at km 19 (SE of Puyo); 01°37'S, 77°53'W, 9 Oct 1980, *Croat 50554* (HUA, MO); Along rock road to Tarabita and the portage over the Río Pastaza, ca. 3 km from the turn-off from main Puyo-Mera road, 23 Dec 1979, *Croat 49704* (MO); Vicinity Shell, ca. 1 km north of town, along Río Claro, 01°29'39"S 78°03'52"W, 29 Aug 2002, *Croat & L. P. Hannon 87094* (HUA, MO, RSA); Vicinity of Shell, along Río Pindo, ca. 1.5 km N of Shell, 01°29'39"S 078°03'52"W, 5 May 2003, *Croat, L. P. Hannon & M. Menke 88576* (MO, Q); Along road between Macas and Puyo, between Río Pastaza and Puyo, 1.2 km south of Yantana, 38.4 km south of Veracruz, 01°45'38"S, 77°50'23"W, 14 Aug 2002, *Croat, L. P. Hannon & P. Schmidt 86578* (GB, M, MO, QCNE); Puyo-Baños, vic. of Shell, less than 1 km N of village, 01°29'39"S, 78°03'52"W, 15 Aug 2002, *Croat, L. P. Hannon & P. Schmidt 86610* (CM, G, IBE, JBGP, KRAM, L, LE, M, MO, MOL, SEL, TEX, VDB, WU, Z); Shell-Mera, 5.3 km NW of Center of Shell, along gravel road 1.1 km N of highway, 01°27'S, 78°04'W, 4 Apr 1992, *Croat 73519* (CHEP, HUA, MO, QCNE); Mera-Río Anzu (which is 11.7 km N of main plaza in Mera), 11.7 km N of main plaza in Mera (located on Puyo-Baños Road); 01°20'S, 78°06'W, 05 Apr 1992, *Croat 73606* (MO, QCNE, RSA, Z); Mera-Río Anzu (which is 11.7 km N of main plaza in Mera), 11.7 km N of main plaza in Mera (located on Puyo-Baños Road); 01°20'S, 78°06'W, 5 Apr 1992, *Croat 73610* (CHEP, MO, QCNE). **Sucumbíos:** Reserva de Producción Faunística Cuyabeno, N of Laguna Grande, Hectare plot # 1, 00°00'S, 76°12'W, 11 Apr–10 Jun 1988, *A. D. Poulsen 80307* (AAU, MO); Lago Agrio-Río San Miguel, 3 km N of Lago Agrio, 00°05'N, 76°50'W, 3 Oct 1980, *Croat 50315* (MO); Lago Agrio and Río Miguel, 17.3 km N of Lago Agrio; 00°07'N, 76°50'W, 3 Oct 1980, *Croat 50338* (QCA, MO); Río San Miguel 21.2 km N of Lago Agrio (2 km S of river), 00°08'N 076°50'W, 3 Oct 1980, *Croat 50373* (MO); Lago Agrio-Baeza at km 67.5, 00°01'N, 77°19'W, 6 Oct 1980, *Croat 50468* (MO). **Tungurahua**: Along road from Río Negro to La Estancia and Parque Nacional Sangay, 1.8 km S of bridge over Río Pastaza, 01°25'24"S, 78°13'01"W, 4 May 2003, *Croat, L. P.*

Hannon & M. Menke 88503 (MO). **Zamora-Chinchipe**: Estación Cientifica San Francisco, road Loja-Zamora, ca. 35 km from Loja; 03°58'S, 079°04'W, 21 Sept 2005, *F.A. Werner 1785* (MO); Río Palanda at crossing with Zumba Road, 30 Jan 1985, *G. Harling & Lennart Andersson 21250* (GB); Shaime, 1 km del destacamento militar, margen derecho Río Nangaritza, 04°18'S, 78°40'W, 25 Oct 1991, *J.L. Jaramillo A. 14411* (QCA); Podocarpus National Park, 1 ha study plot about 1 km SW of Bombuscaro Visitors Centre, 6 km S of Zamora, 04°06'S 078°57'W, 15 Nov 2000, *R. Leimbeck & B. Windeballe 396* (AAU, QCA); Along road between Zamora and Gualaquiza, 48 km N of Yangzatza, 7 km N of El Pangui, 04°30'S, 78°50'W, 19 Oct 1980, *Croat 50792* (MO); 31 km N of Yangzatza, 04°11'S 078°49'W, 19 Oct 1980, *Croat 50785* (CUVC, MO); Zamora-Gualaquiza, on side road departing main road at Chuchumbleltza (on Río Chuchumbletza), 3.8 km S of village of Chuchumbetza; 03°33'S, 78°30'W, 04 Mar 1992, *Croat 72738* (MO, QCNE); 04 Mar 1992, *Croat 72742* (MO, QCNE); Along road to Romerillao Alto from Zamora, 19.1 km E of Río Bombuscaro in Zamora, 6.3 km E of La Pituca, 04°10'04"S, 78°56'10"W, 20 July 2004, *Croat 91577* (GB, MO, QCNE); Along road from Zamora to Romerillos along Río Jambué, 13.3 km E of Río Bombuscaro Bridge in Zamora, 0.3 km E of Pituca, 04°08'03"S, 78°56'37"W, 21 July 2004, *Croat 91777* (IBE, MEXU, MO, QCNE, RSA); Vicinity of Ecua-Corrientes copper mine development, valley of Río Waiwaime, along road to mine site at end of road, along trail down from parking spot, 03°34'44"S, 78°26'08"W, 4 Apr 2006, *Croat 96593* (MO); Vicinity of Ecua-Corrientes copper mine development, valley of Río Waiwaime, 4.3 km above gate, 03°34'51"S, 78°25'53"W, 7 Apr 2006, *Croat 96764* (MO); Cordillera del Cóndor region, vicinity of Ecua-Corriente copper mine development, valley of Río Waiwaime, along road to mine site, 2.5 km from end of road, 03°34'30"S, 78°37'W, 9 April 2006, *Croat 96833* (MO); El Pangui-Zamora, vicinity of San Roque, 2 km S of San Roque, 10 km S of El Pangui, 03°42'11"S, 078°35'59"W, 7 Sep 2002, *Croat 87206* (MO, UB); Los Encuentros-El Sarsa, 10.7 km E from Los Encuentros, beyond bridge over Río Zamora, 03°46'40"S, 78°38'28"W, 14 Sep 2007, *Croat & G. Ferry 98593* (MO, UB); Vicinity of Ecua-CorrientesC copper mine concession, vicinity of mine site, along trail above parking area near end of road, 03°34'54"S, 78°26'06"W, 21 Sep 2007, *Croat & G. Ferry 98977* El Pangui-Monterrey departing main highway (Zamora-Gualaquiza), 8.5 km N of El Pangui, 03°32'26"S, 78°37'16"W, 25 May 2003, *Croat & M. Menke 89365* (MO, Q, QCA); Los Encuentros-El Sarsa, Cordillera del Cóndor, 14.4 km SE of Los Encuentros, 03°47'44"S, 78°37'01"W, 26 May 2003, *Croat & M. Menke 89496* (CHOCO, MO, Q, QCA, USM); Along road from Namirez (22.3 kmKm S of Yanzaza) to Nambija, 8.1 km S of San Carlos, 04°03'37"S, 78°47'25"W, 28 May 2003, *Croat & M. Menke 89627* (K, MO, US); Zamora-Romerillos, 13.3 km E of bridge over Río Bombuscaro at Zamora, 0.4 km N of Pituca along river, 04°08'02"S, 78°56'31"W, 30 May

2003, *Croat & M. Menke 89782* (CHEP, COCH, MO, QAP); Along road between Zumbi on Río Zamora and summit of Cordillera del Condor beyond Paquisha, 10.1 km beyond Río Nangaritza Bridge, 29.1 km E of Zumbi, 03°56'13"S, 78°37'27"W, 16 July 2004, *Croat, L. P. Hannon, G. Walhert & T. Katan 91179* (MO); Along road from near Paquisha south to Las Orchídeas and end of road on Río Nangaritza via Guayzimi, beginning 15.9 km E of Zumbi and Río Zamora, then 49.6 km S at Las Orchídeas, in vicinity of Las Orchídeas, 04°13'44"S, 78°39'30"W, 16 July 2004, *Croat, L. P. Hannon, G. Walhert & T. Katan 91298* (MO); Road Loja-Zamora, ca. 35 km from Loja, 03°58'S, 79°04'W, 8 Sep 2005, *Werner 1754* (MO); Nangaritza. Cordillera del Cóndor region, parroquia Zurmi; vicinity of Las Orquideas, Cabañas Yancuam, ca. 3 km S of Las Orquideas, along stream just S of Cabañas Yancuam, 04°15'01"S, 78°39'33"W, 19 April 2006, *Croat 97251* (MO); Vicinity of Las Orchideas; near Cabañas Yankuam; along Río Nangaritza, S of camp, old trail along river and on steep slopes of forest W of River, 04°15'06"S, 78°39'29"W, 16 Sept 2007, *Croat & G. Ferry 98684* (CUVC, MO); Vicinity of Las Orchideas; near Cabañas Yankuam; along Río Nangaritza, S of camp, 04°15'06"S, 78°39'29"W, 16 Sep 2007, *Croat & G. Ferry 98689* (MO); Along Río Nangaritza, between Las Orchideas and Miasi, 04°17'53"S, 78°39'00"W, 17 Sep 2007, *Croat & G. Ferry 98805* (MO); Along Río Nangaritza, between Las Orchideas and Miasi, 04°17'53"S, 78°39'W, 17 Sept 2007, *Croat & G. Ferry 98814* (MO); Yacuambí, Valley of Río Yacuambí, along road from 28 de Mayo to Oña, 12.2 km NW of 28 de Mayo, 2.1 km SE of new road to Tuti Pali, 0.6 km NW of La Esperanza, 03°34'57"S, 78°56'33"W, 20 Apr 2006, *Croat 97339* (MO, CUVC, QCNE); Zamora. Along road between Loja and Zamora, at Río Zamora, 04°05'S, 79°00'W, 04 Mar 1992, *Croat 72699* (MO). PERU. **Huanuco:** Leoncio Prado. Along road from Tingo María to Pucalpa, 2.4 km N of San Isidro, 09°13'18"S, 75°49'40"W, 3 Jun 1998, *Croat & M. Sizemore 81659* (CUZ, HUT, MO, MOL, USM); Along road from Tingo María to Pucalpa, less than 1 km N of Sortilegio, 09°13'16"S, 75°50'15"W, 4 Jun 1998, *Croat & M. Sizemore 81739* (AMAZ, CUVC, ENCB, G, HUA, JAUM, LE, MO, SAR, UB, USM, W); Tingo María-Huayna Capac, ca. 1 km east of Huayna Capac, 09°14'45"S, 76°02'18"W, 5 June 1998, *Croat & M. Sizemore 81852* (AAU, B, CM, CUZ, ENCB, F, G, KRAM, MO, RSA, S, U, USM, VDB, WU, Z); Tingo María airport-Huayna Capac, 10.0 km W of bridge over Río Huallaga, 09°14'56"S, 76°02'16"W, 6 Jun 1998, *Croat & M. Sizemore 81892* (MO). **Pasco:** Oxapampa. Distrito Pozuzo, PN Yanachaga – Chemillen, Estacion Biologica Huampal, Oxapampa - Pozuzo y trocha Robin Foster. 10°10'S, 75°34'W, 10 Apr 2003, *J. Lingan & R. Francis 408* (MO, USM); Distrito Chontabamba. Carretera camino a La Suiza antigua (km 10 a 13); 10°33'S, 75°27'W, 28 Mar 2003, *J. Lingan, J. Opisso & C. Rojas 361* (MO, USM); Dist. Villa Rica, Centro poblado: Palma (Centro Bocaz). camino a Alto Atarraz., 10°39'17"S, 75°11'35"W, 14

Jan 2005, *L. Franco Mellado, E. Ortiz V, J. Mateo & R. Francis 2475* (HUT, MO, USM).

Cultivated plants: **Napo**: San Francisco Borija, collected by J. Haager, 20 Aug 1987, *Croat 67412* (MO).

Philodendron werneri Croat, **sp. nov.** Type: ECUADOR. Zamora-Chinchipe: area of Estación Cientifica San Francisco, along the road from Loja to Zamora, 03°58'S, 79°04'W, 2000 m, 16 Dec 2005, *F. A. Werner 1881* (holotype, MO-6285453, isotypes, K, US). **Figure 10** D.

The species is a member of subgen. *Philodendron* sect. *Philodendron*, subsect. *Philodendron*, ser. *Philodendron* characterized by its hemiepiphytic habit, short internodes, the unribbed deciduous cataphylls, subterete petioles which dry matte and greenish gray, the ovate-cordate-sagittate blades which dry grayish green and matte above, grayish yellow-green and matte below as well as by up to 3 inflorescences per axil.

The species is most similar and perhaps related to *Philodendron strictum* G. S. Bunting, a species that ranges from Costa Rica to Venezuela and on the western slope of the Andes in Colombia and Ecuador. That species differs from *P. strictum* by having blades with prominent laticifers on the lower blade surface and in having petioles that dry matte and greenish gray rather than glossy and yellowish brown as in *P. strictum*.

Appressed hemiepiphytic climber; **internodes** short 1–2 cm length, 1.7–1.9 cm diam.; **cataphylls** 16.5–33.6 cm long, unribbed, deciduous possibly, drying intact with yellowish light brown epidermis; **petioles** 51.1–52.3 cm long, 4–7 mm diam., subterete, drying matte and greenish gray; **blades** ovate-cordate-sagittate, 37.2–43.2 cm long, 25.4–33.1 cm wide, 1.41 (1.19–1.56) times longer than broad, broadest at petiole attachment, 0.78 times long as petioles, abruptly acuminate at apex, prominently lobed at base, subcoriaceous, drying grayish green and matte above, grayish yellow-green and matte below; **upper surface** short pale-lineate along midrib; **lower surface** smooth, unmarked; **anterior lobe** 27.5–32.1 cm long, with straight margins, the distal margin broadly rounded; **posterior lobes** 12.7–15.2 cm long, 10.1–11.4 cm wide, directed downward and inward; **midrib** drying flattened, finely ribbed and concolorous above, narrowly convex, finely and acutely ribbed with granules and darker below; **primary lateral veins** 11 pairs, arising at a 55–60° angle, drying broadly convex and paler above, narrowly convex, finely and acutely ribbed with granules and darker below; **minor veins** arising mostly from midrib but also from the primary lateral veins closer to margins, drying obscure above and moderately visible and distinct below; **laticifers** conspicuous and dark, short to elongated and continuous; **basal veins** 9 pairs, 1st and 2nd pair free to base, 3rd pair fused to 1.5–2.3 cm, 5th and 6th pairs fused to 3.8–4.8 cm, finely and acutely ribbed below; **posterior ribs** gradually

curved, naked 1.5–2.2 cm; **sinus** hippocrepiform, 8.9–10.5 cm deep, 2.6–6.2 cm wide at middle. INFLORESCENCES up to 3 per axil; **peduncle** 4.3–6.8 cm long; **spathe** 8.1–10 cm long, 2–2.5 cm diam., moderately constricted above tube to 1.7 cm diam., drying coriaceous, medium reddish brown; **spadix** to 9.5 cm long; staminate portion 5.5 cm long, 10 mm diam. at widest point about 2/3 its length, ca. 6 mm diam. at 1 cm from tip; sterile staminate portion 1.4 cm long, 9 mm diam., the constricted portion 6 mm diam.; pistillate portion 3.1 cm long, 8 cm diam. midway, 7 mm diam. at apex ; **pistils** 2 mm long, 1 mm diam.; style narrower than the stigma with rounded margins; stigma ca. 1 mm diam., sometimes with a conspicuous pit for each ovule; ovary 0.8 mm long, 4–5 locular; **ovules** ca. 15 or more per locule with axile placentation.

Philodendron werneri is endemic to Ecuador, known only from the type locality in Zamora-Chinchipe Province at 2000 m in a *Premontane moist forest* life zone.

The species is named in honor of German botanist, Florian Werner, whose thesis involved the study of epiphytes in Ecuador, especially at the Estación Científica San Francisco between Zamora and Loja. It was in this area where Florian collected the type of this species. Werner has been collecting in Ecuador for a number of years and has collected many interesting and excellent collections of Araceae. Werner's thesis is titled " Effects of human disturbance on diversity and ecology of vascular epiphyte assemblages in the Andes of Ecuador", and he was long affiliated with the Department of Systematic Botany of the University of Göttingen. Then between 2010 and 2012 he worked at the University of Oldenburg and now works for the German agency GIZ and with the Vietnam Forestry University in Xuan Mai near Hanoi.

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Anthurium chamberlainii Masters (Araceae) Rediscovered

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ABSTRACT

Anthurium chamberlainii Masters, a species described from unknown origin in the late 19th Century is fully redescribed and illustrated providing assurance that the species does indeed originate in Venezuela. A modern and detailed description as well as illustrations are provided. The species is a member of section *Belolonchium*.

KEY WORDS

Anthurium chamberlainii, rediscovery Venezuela.

INTRODUCTION

Anthurium chamberlainii was originally described by Masters (1888) based on a living collection that was thought to be introduced from Venezuela toward the end of the 19th century. There was always considerable doubt of its provenance owing to the fact that the species had never been seen in Venezuela despite extensive botanizing by the senior author of this paper, and by George Bunting who spent most of his long career in Venezuela working on Araceae. Gilberto Morillo who studied the flora of the higher portions of the Cordillera de Merida reported never seeing the species (G. Morillo, pers. com.). Thus it came as a great surprise to learn that a collection at the Munich Botanical Garden, occurring in the State of Merida in Venezuela by Frank Hase, a bromeliad enthusiast from Bochum, Germany, has proven to be this long lost species. Since Masters' specimen was rather quaintly described and does not comport to modern descriptions in content or style, the species is herein being completely redescribed. The original specimen prepared by Masters is complete and thus capable of being interpreted, thus there is no need for an

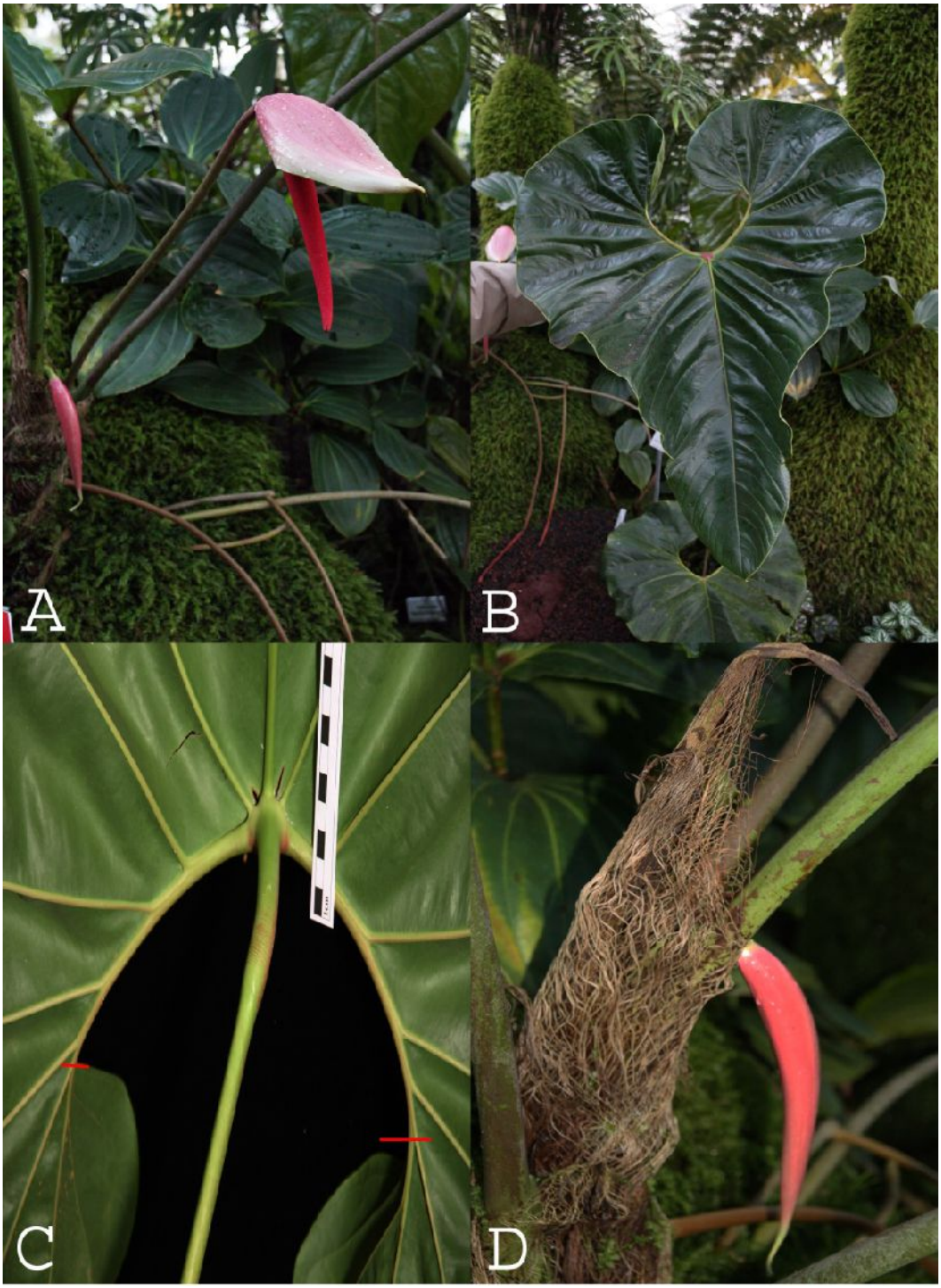

Figure 1. A–D. *Anthurium chamberlainii* Masters. (*Croat & Gröeger 103048*). A. Habit with spathe and spadix showing inflorescence on upper right open and young inflorescence on lower left closed. B. Leaf blade, adaxial surface. C. Leaf blade, abaxial surface showing close-up of sinus and posterior ribs. D. Weathered cataphylls and petiole bases with young inflorescence.

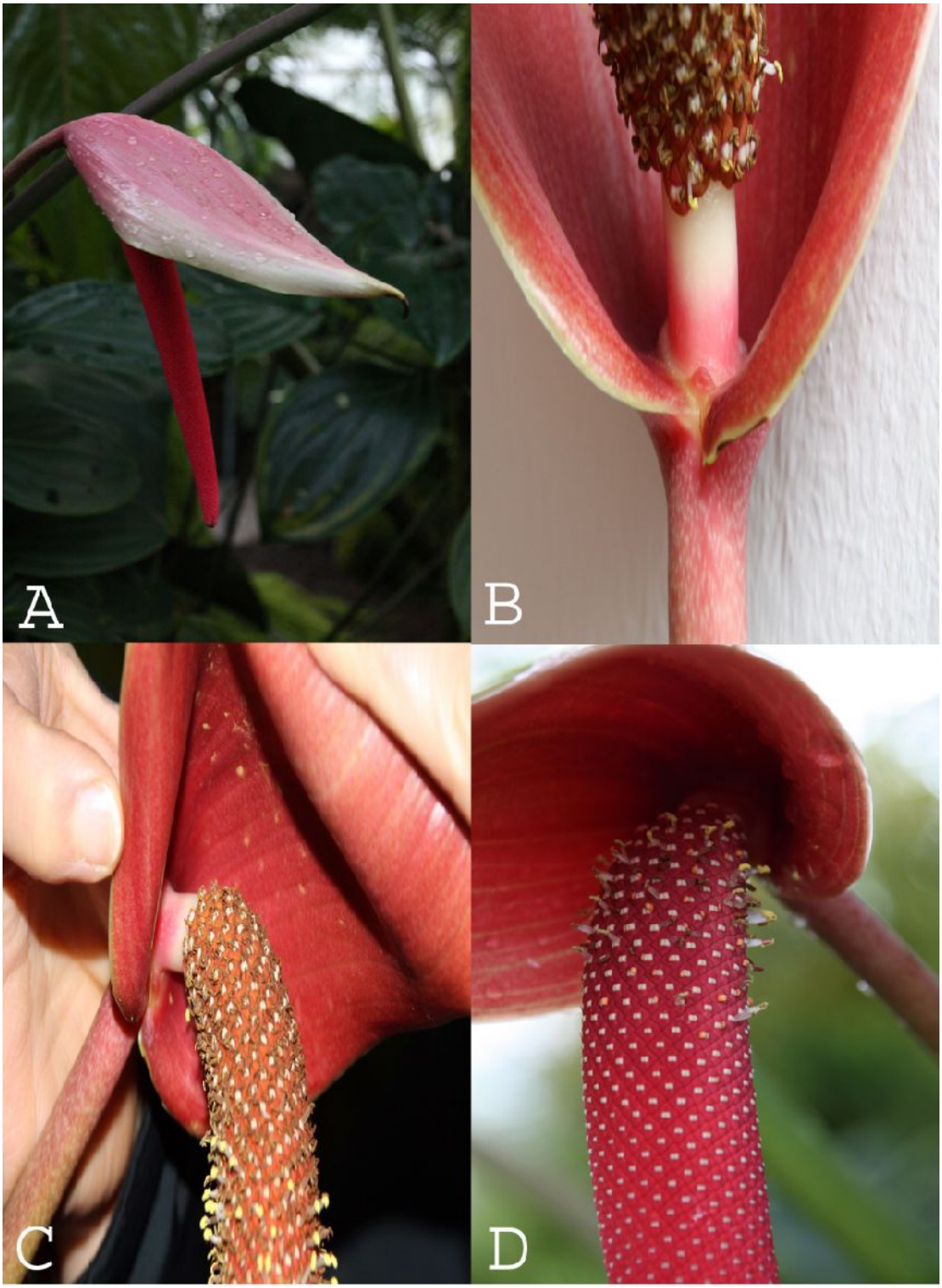

Figure 2. A–D. *Anthurium chamberlainii* Masters. (*Croat & Gröeger 103048*). A. Inflorescence showing spreading spathe and pendent spadix. B. Base of inflorescence showing bicolored stipe. C. Base of inflorescence showing stipe, base of spadix and open exserted anthers with pollen. D. Base of inflorescence, close-up showing long emergent stamens.

epitype. However the current collection cited below serves to provide greater accuracy of location and its description is comparable to other species making direct comparisons possible. The new description was reentered into the Lucid Anthurium Key.

Anthurium chamberlainii Masters, *Gard. Chron.*, III, 1888(1): 462. Figure 67. 1888. Type: Venezuela, exact locality unknown, *Masters s.n.* (K). Figures 1. & 2.

Stems to less than 1 m long; **internodes** short, to 4 cm diam.; **cataphylls** to 20 cm long, persisting as a network of reddish brown fibers; **petioles** 150 cm long, erect-spreading, subterete, unribbed, smooth geniculum 6 cm long, slightly thicker than petiole, tinged conspicuously with red; **blade** ovate-triangular-sagittate, 95 cm long, 70 cm wide, 1.4 times longer than wide, dark green and semiglossy above, moderately paler and semiglossy below, short-acuminate at apex, deeply lobed at base; margin broadly undulate more or less throughout; **anterior lobe** weakly concave and broadly convex along margins; **posterior lobes** 22 cm long, 25 cm wide, directed inward and held somewhat erect in live condition; **sinus** hippocrepiform, 11 cm deep, 18 cm wide, closed and subreniform when closed, more or less rounded at apex; **major veins** narrowly rounded, unribbed, moderately paler than the surface; **basal veins** 9–10 pairs, 1st pair free to the base, 2nd pair fused 5.5 cm, 3rd pair fused 8–8.5 cm, 4th pair fused 12–12.5 cm, 6th & 7th and higher order pairs fused 15 cm, 8th & 9th fused to 16–17.5 cm; **posterior rib** weakly moderately curved, especially toward the apex 17.5 cm long, naked along the sinus for most of its length, to 15 cm; **primary lateral veins** 7–8 pairs, arising at a 45–50° angle; **collective veins** arising from the 4th pair of basal veins, but weakly loop-connecting from 6th pair of basal veins, (2–)5–10 mm from margin; **tertiary veins** moderately obscure, weakly raised upon drying. INFLORESCENCE erect spreading; **peduncle** 60 cm long, 1.3 cm diam.; **spathe** 20–21 cm long, 10–11 cm wide when flattened, hooding, spreading forward at ca. 120° from peduncle, naviculiform, prominently attenuated at apex, reddish in bud, reddish violet except light greenish along margin at anthesis outside, reddish violet except thin, light greenish margin inside; **spadix** stipitate (stipe 12 mm long, 9 mm diam., whitish except pinkish at apex) 24.8–26 cm long, 3 cm diam. (drying to 1.8 cm diam.), oblong-fusiform, orangish red (drying reddish brown), directed mostly downward and an angle of 90°, gradually tapered to apex, narrowly rounded at apex; **flowers** 12–15 visible per spiral, 3.2–3.5 mm long, 1.8–2.1 mm wide; **tepals** drying medium reddish brown, matte, conspicuously granular; lateral tepals 1.8–2 mm, inner margin broadly rounded, outer margin 2-sided; **stamens** whitish, protruded at anthesis and persisting to ca. 3 mm above tepals; anthers 1.8–2 mm long, 0.6 mm wide; pollen yellow.

Anthurium chamberlainii is endemic to Venezuela, known only from the State of

Merida at 1500–1800 m but specific localities for the species are as yet unknown so the life zones (Holdridge, 1971) are undetermined. Most assuredly however the species occurs in some type of *Premontane forest* or *Montane forest* life zones since members of section *Belolonchium* nearly all occur at high elevations in wet forest.

The species might be most easily confused with *A. betanianum* Croat, another large *Belolonchium* which differs in having the collective veins arising from one of the primary lateral veins.

In the Lucid Anthurium Key the species tracks to *A. cartilagineum* (Desf.) Kunth, differing by having much smaller leaves (less than 75 x 40 cm) with the collective veins arising from the first pair of basal veins and very remote from the margin as well as by having a spadix with fewer flowers per spiral and much larger flowers; *A. macarenense* Schultes & Idrobo, differing by having a much narrower spathe with deep red or maroon on both sides with greenish veins; *A. oxybelium* Schott, differing by having more slender internodes typically longer than broad, a more cylindroid spadix with the stamens exserted and *A. supianum* Engl. from western Colombia, differing by having much smaller leaves (blades to 40 cm long) and a smaller more slender spreading spathe (to 7 cm long and 1.5 cm wide).

Other members of section *Belolonchium* in Venezuela also differ. *Anthurium berryi* Bunting differs by having the primary lateral veins from the uppermost basal veins; *A. davidsei* Croat and *A. ginesii* Croat, both differing in having the collective veins from the uppermost basal veins and by having a reflexed spathe; *A. tatei* G. S. Bunting, differing in having a mitered sinus, 6 pairs of basal veins, collective veins arising from 4th pair of basal veins and a spreading green spathe; *A. nubicola* Bunting, differing by having much smaller blades (52 x 28 cm) with the collective veins from the 1st or 2nd pair of basal veins and with a much shorter and stubbier purple spadix and *A. tachiranum* Croat, differing in having hastate to subhastate blades with the collective veins arising from the primary lateral veins from the upper basal veins.

Additional specimen seen: Venezuela. Merida: 1500–1800 m, originally collected by Frank Hase, exact locality unknown, cultivated at Munich Botanical Garden, *T. B. Croat & A. Gröeger 103048* (M, MO).

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Araceae in a High Andean Forest of the Colombian Occidental Cordillera (Natural National Park Tatamá)

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ABSTRACT

Colombia represents the highest register of Araceae species by area. However, across the country there is a high sampling bias, with records especially lacking in the Andes and the biogeographic region of Chocó. Therefore, a study of the aroids was developed in the oriental slope of the Colombian Western Cordillera in the Natural National Park Tatamá using plots every 200m in an altitudinal range between 2400 – 3000m asl. Two genera (*Anthurium* and *Chlorospatha*) and 14 species were recorded. Of these 71.42% had a terrestrial habit, 21.43% were hemiepiphyte and 7.14% epiphyte. The genus with the largest number of species (12) and the widest distribution was *Anthurium*. One species,

Anthurium longegeniculatum, was present through all the altitudinal gradient studied. The highest species diversity was found in the plots located between 2400 – 2600 m. The known distribution of nine species of *Anthurium* and two species of *Chlorospatha* is enlarged in the Natural National Park Tatamá. These results highlight the fact that it's necessary to increase the sampling and the floristic researches on Araceae, due its complexity, high diversity and endemism in the Neotropics, especially in the Andes.

KEY WORDS

Araceae, inventory, distribution, mountain ecosystem, Andes.

RESUMEN

Colombia presenta el mayor registro de especies de Araceae por área. Sin embargo, este es el país con menos muestreo, principalmente la zona andina y el Chocó Biogeográfico. Por lo anterior se realizó el estudio de las aráceas en la vertiente oriental de la Cordillera Occidental en el Parque Nacional Natural Tatamá, por medio de dos parcelas de 50 x 2 m cada 200 m en un rango altitudinal entre 2400–3000 m. Se registran dos géneros (*Anthurium* y *Chlorospatha*) y 18 especies. El género con mayor número de especies y amplia distribución es *Anthurium*. En todo el gradiente se registró *Anthurium longegeniculatum*. La mayoría de las especies se encuentran en las parcelas ubicadas entre los 2400 – 2600 m. 71,42 % de las especies registraron hábito de crecimiento terrestre, 21,43 % hemiepífito y 7,14% epífito. Se amplía la distribución de nueve especies de *Anthurium* y dos de *Chlorospatha* para el Parque Nacional Natural Tatamá. Es necesario incrementar el muestreo y la investigación florística de Araceae, debido a su complejidad, alta diversidad y endemismos en el Neotrópico, especialmente en los Andes.

PALABRAS CLAVE

Araceae, inventario, distribución, ecosistemas montanos, Andes.

INTRODUCTION

The Araceae family is characterized by its high diversity and endemism in the Neotropics (Croat, 1983, 1988, 1992), and Colombia has the highest species diversity (Croat, 1992). This is related to the Andean orography, which has produced speciation, mainly in mid-high elevations in the Andes (Croat, 1992; Mora et al., 2006; Álvarez et al., 2007). Currently, there are few inventory and distribution studies of the family in the Colombian Western Cordillera despite the botanical richness of the region (Croat, 1992). Moreover, Araceae from high altitudes have been poorly documented.

In the 80's, the project "Ecoandes" focused its efforts in the study of the structure, function and evolution of the tropical Andean ecosystem. To achieve its goals, they recently studied the Tatamá Natural Park (in the Colombian Western Cordillera) through vegetation surveys

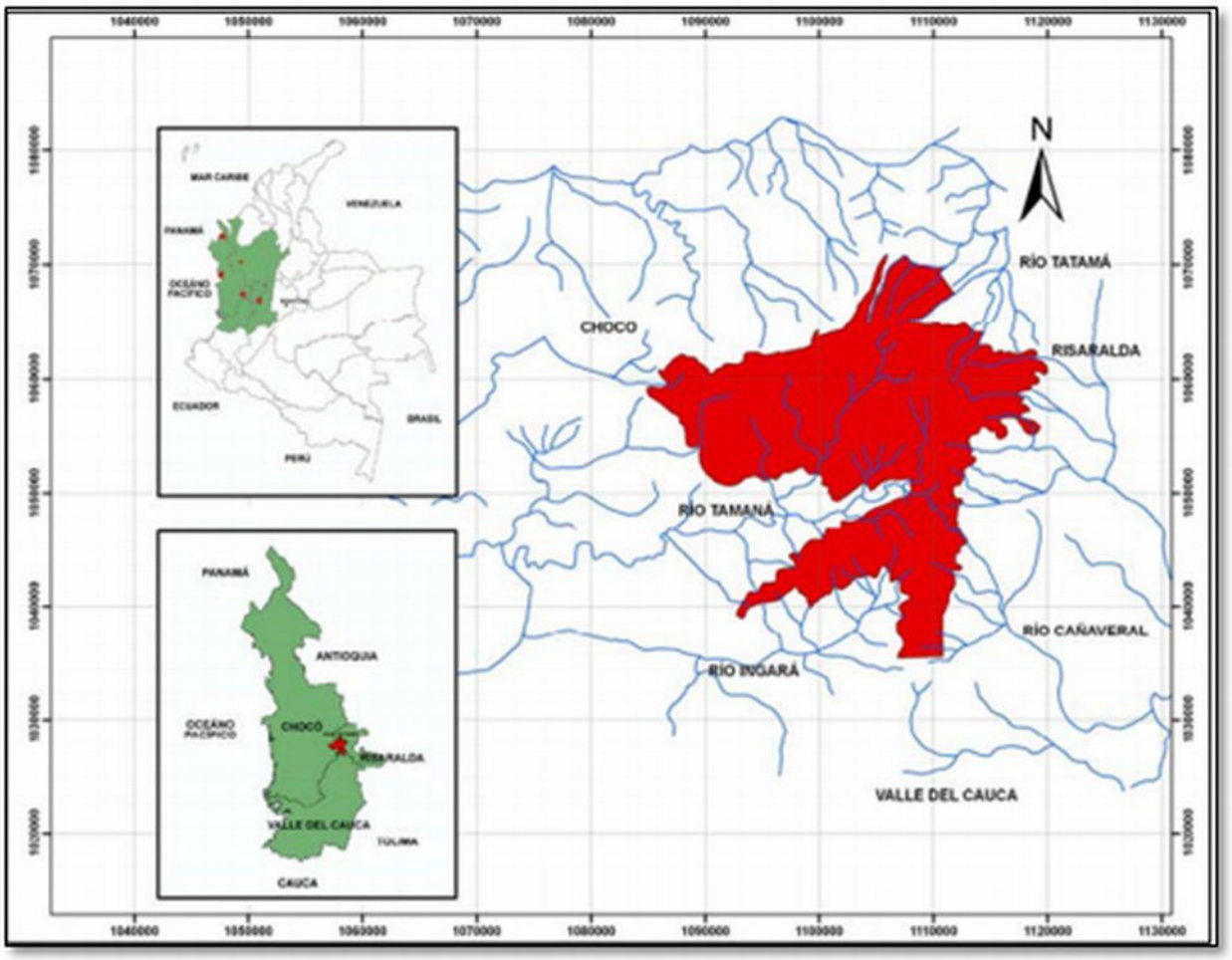

Figure 1. Location National Natural Park Tatamá, source: Ballesteros et al. (2005).

(Rangel–Ch., 2005). The project presented a catalogue of the vascular plants of Tatamá Massif, which reported Araceae records below 2300 m above sea level (asl) of elevation (Rangel–Ch., 2005). However, most of the records are from localities in the south of the Tatamá Massif, and because of that the oriental slopes of the Western Cordillera and especially the high altitude zones are poorly explored.

Here, we present an inventory and an analysis of the distribution of Araceae in the boundary of the Andes and the biogeographic region of Chocó. We focused our research on the high altitude Andean forest of the Natural National Park Tatamá (2400–3000 m asl).

MATERIAL AND METHODS

National Natural Park Tatamá is located in the municipalities of San José del Palmar (Chocó department), Pueblo Rico, Apía, Santuario and La Celia (Risaralda department), and El Águila (Valle del Cauca

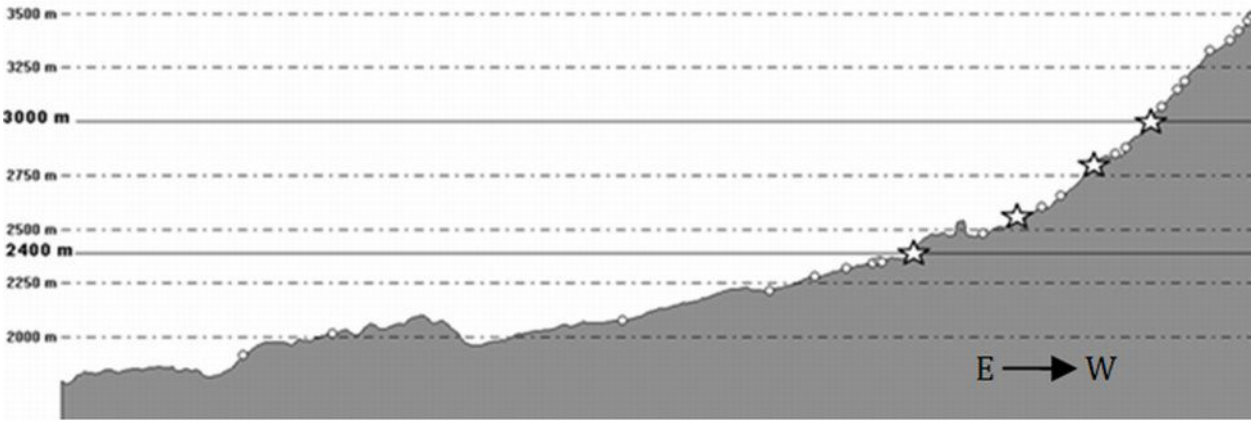

Figure 2. Representation of the eastern slope of the Cordillera Occidental in the NNP Tatamá, between 2000-3500 m asl.

department). Located on the Western Cordillera, the Tatamá park belongs to two biogeographic regions the Andes and Chocó (**Figure 1)** (Rangel–Ch., 2005).

The Tatamá park covers a total area of 51,900 hectares and presents a temperature and altitudinal gradient which varies between 15°C at 2,000 m asl to 3°C at 4,000 m asl. The topography is variable, with strong pending, mainly between 50 y 70% with Andean and Paramo ecosystems highly conserved (Florez, 2005). The oriental slope records an annual average precipitation of 1963 mm in the Sub Andean ecosystem (range: 1100–2350 mm) and 2181 mm in the Andean ecosystem (range: 2350−3500 mm).

The studied site is located on the oriental slope of the Occidental Cordillera, with an altitudinal range from 2400 to 3000 m asl; every 200 m of altitude, two plots of 50 x 2 m (eight in total) were designed (**Figure 2)**. In each plot, all the species of Araceae were registered, the plant habit recorded and photographed, following the collecting procedures recommend in Croat, 1985.

For taxonomic determination the specialized literature was reviewed (Croat, 1983a; 1986a; 1986b; 1992; Croat et al., 2006; Álvarez et al., 2007), and comparisons were done with herbarium specimens from: Caldas University (FAUC) and Antioquia University (HUA). For a correct taxonomic and nomenclatural denomination, the Missouri Botanical Garden data base (W3TROPICOS, 2011); the IPNI data base (2011) and the Nomenclatural Type data base (BORES, 2011) were reviewed.

RESULTS

Two genera were registered (*Anthurium* and *Chlorospatha*) representing 14 species, with the most frequent habi of growth being terrestrial (**Table 1**). The genus *Anthurium* is represented by twelve species while *Chlorospatha* was represented by only two species (**Figures 3–8**). Nine species of *Anthurium* and the genus *Chlorospatha* (with

Figure 3. − 3, − 4, − 5. Anthurium sp1 (JAS 74 FAUC). – 6, −7. Anthurium sp 2 (JAS 108, 109 FAUC).

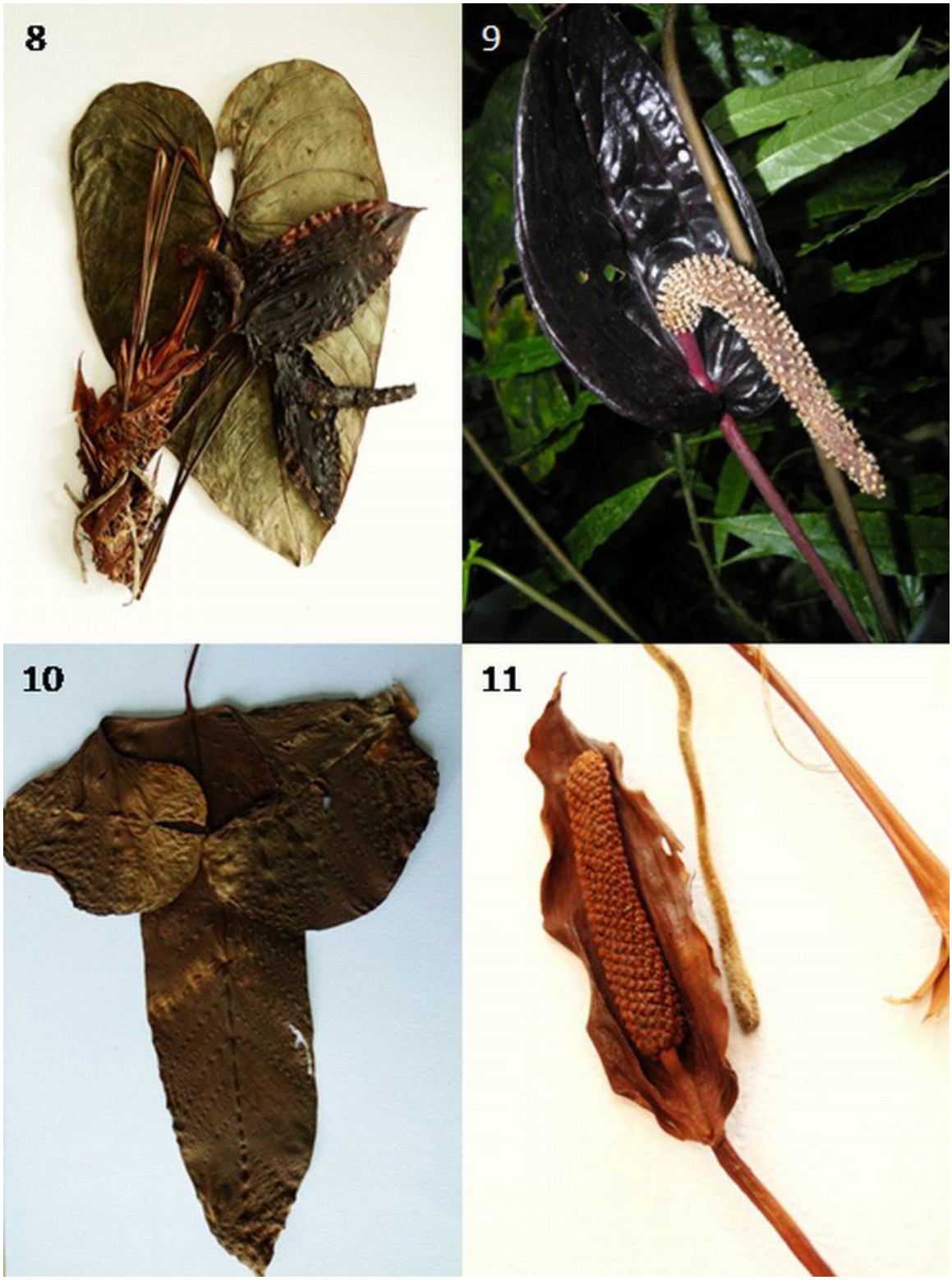

Figure 4. −8, − 9. Anthurium caramantae Engl. (JAS 66 FAUC). – 10, − 11. Anthurium bogotense Schott.(JAS 65 FAUC).

Figure 5. – 12, − 13. Anthurium caucanum Engl. (JAS 64 FAUC). − 14. Anthurium longegeniculatum Engl. (JAS 68 FAUC). – 15, −16. Anthurium nanegalense Sodiro. (JAS 69 FAUC).

Figure 6. – 17, – 18. Anthurium pulchellum Engl. (JAS 73 FAUC). – 19, – 20. Anthurium scabrinerve Sodiro. (JAS 67 FAUC).

Figure 7. – 21, – 22. Anthurium sect. Calomystrium Schott (JAS 106 FAUC). – 23, – 24. Anthurium sect. Cardiolonchium Schott (JAS 70 FAUC).

Figure 8. – 25, – 26. Anthurium versicolor Sodiro. (JAS 76, 97, 98 FAUC). – 27, – 28, – 29. Chlorospatha luteynii Croat & L.P. Hannon (JAS 71 FAUC). –30. Chlorospatha cf. amalfiensis Croat & L. P. Hannon. (JAS 107 FAUC).

Altitude	Growth habit			Total
	Terrestrial	Hemiepiphyte	Epiphyte	
2400	5	2	0	7
2600	6	3	0	9
2800	2	2	0	4
3000	1	2	1	9
Total	10	3	1	

Table 1. Habits of growth represented in each plot evaluated

No.	Species	Altitude (meters) and number of species per altitude				Habit of growth	Total altitudinal levels
		2400	2600	2800	3000		
1.	*Anthurium* sp1.	0	**2**	0	0	HT	1
2.	*Anthurium* sp2.	0	0	**1**	0	HT	1
3.	*Anthurium caramantae* Engl.*	**2**	**2**	0	0	HT	2
4.	*Anthurium bogotense* Schott.*	**1**	0	0	0	HT	1
5.	*Anthurium caucanum* Engl.*	0	**2**	**2**	**2**	HEM	3
6.	*Anthurium longegeniculatum* Engl.	**1**	**4**	**3**	**2**	HEM	4
7.	*Anthurium nanegalense* Sodiro*	**2**	**3**	0	0	HEM	2
8.	*Anthurium pulchellum* Engl.*	0	0	0	**1**	HE	1
9.	*Anthurium scabrinerve* Sodiro.*	0	**1**	0	0	HT	1
10.	*Anthurium* sect. *Calomystrium* Schott *	**1**	0	0	0	HT	1
11.	*Anthurium* sect. *Cardiolonchium* Schott*	**2**	**1**	0	0	HT	2
12.	*Anthurium versicolor* Sodiro*	0	**1**	**1**	**3**	HT	3
13.	*Chlorospatha luteynii* Croat & L.P. Hannon*	**1**	0	0	0	HT	1
14.	*Chlorospatha* cf. *amalfiensis* Croat & L. P. Hannon *	2	**2**	0	0	HT	1
Total		12	**18**	7	10		

Table 2. Total number of species with abundance per plot and the total altitudinal levels where they were recorded. The species with "*" represent the chorological novelties for Natural National Park Tatamá.

two species) are documented here as new chorological records for the Natural National Park Tatamá (Table 2).

DISCUSSION

Altitudinal distribution

Within the altitude gradient studied (2400–3000 m asl), it appears that the terrestrial habit dominates at lower altitudes (2400–2600 m asl), whereas the unique epiphyte species was found at the higher altitude (3000 m asl). The hemiepiphytic habit appears to be evenly present along the studied altitudinal gradient.

Only 6 species out of the 14 observed were present at more than one altitude level. Thus most of the species were growing in one altitude, mainly 2400 and 2600 m asl, except for *Anthurium* sp2. (2800 m asl) and *Anthurium pulchellum* (3000 m asl).

The species from the two highest altitudes could be considered as high altitude "only found in one (or two) altitudinal levels" whereas the species only located on the lower altitudes (below 2600 m asl) could in fact be on the upper limit of the distribution range. It may be the same for the three species present at two altitudes (*Anthurium caramantae, Anthurium nanegalense, Anthurium* sect. *Cardiolonchium*) since they were only growing at 2400 and 2600 m asl. Interestingly the two species (*Anthurium caucanum, Anthurium versicolor*) present at the three higher altitudes were not found at 2400 m asl. These species may be of higher altitudes or species with large distribution area and not found at 2400 m asl due to their low density/frequency and the relatively small surface explored. When looking at the total altitudinal levels of the species, only one species, A. *longegeniculatum* appeared along the entire altitudinal gradient studied (Table 2). When looking at the altitudinal distribution of the three plant habits, it appears that terrestrial habit (n=10) is more restricted (mean+/-sd: 1.4 +/-0.7 altitude levels) compare to hemiepiphyte habit (n=3; 3 +/- 1 altitude levels). Epiphyte represented by only one species present in one level cannot be interpreted.

Abundance distribution

The majority of individuals (30) are in the plots located at lower altitudes (2400 to 2600 m asl), and only seven species were registered to 2800 m asl, this being the plot with lowest abundance of species in this study. The species most abundant throughout the altitudinal range were *A. caucanum*, *A. longegeniculatum* and *A. nanegalense* (Table 2).

The terrestrial plant habit was proposed as an ancestral character in Araceae (Grayum, 1990): this habit is frequent in the genus *Anthurium* (Mayo et al., 1997), the richest taxon in this study. This predominant distribution and richness is due to the altitude (2400–3000 m asl) and it has been found that in evergreen tropical low forest the Aroids can reach the same richness than

Orchids and can be even more abundant than ferns (Wolf & Flamenco, 2003).

According to Vargas et al. (2004), *Anthurium* is the most diverse and widely distributed taxon in the medium and high zones in the Andes. One example of that is represented by *A. longegeniculatum*, which is registered in the Colombian Central Cordillera at 2600 m asl (Álvarez et al., 2007) and Colombian Occidental Cordillera between 2500–2740 m asl (Croat, 1992, Rangel-Ch. et al., 2005). In that sense, this study enlarges the altitudinal distribution of *A. longegeniculatum* since it occurs in the Oriental slope of the Colombian Occidental Cordillera from 2400 to 3000 m asl. Moreover A. longegeniculatum appears in this study to be the species with the largest altitudinal distribution and the most abundant species.

Anthurium sp1; A. sp2; A. sect. Calomystrium and A. sect. Cardiolonchium represent collections that were not determined to species level, so that in the future they will be reviewed to see if any are species new to science.

Our new registers, the chorological novelties, and the increase in the distribution width of some of the more boundary taxa in the Araceae of Natural National Park Tatamá, shows the necessity to increase the floristic exploration and study, mainly for the complexity and high diversity of this ecosystems.

KEY TO ARACEAE OF THE ORIENTAL SLOPE IN THE COLOMBIAN WESTERN CORDILLERA, NNP TATAMÁ

1. Unisexual flowers, spathe compressing the spadix, stipe not visible 2
1. Bisexual flowers, spathe and spadix free, stipe visible 3
2. Leaves hastate; herbs less than 50 cm . . . . *Chlorospatha* cf *amalfiensis*
2. Leaves pedatisect; herbs greater than 50 cm . . . . . *Chlorospatha luteynii*
3. Base of the leaf cuneate, obtuse or cordate 4
3. Base of the leaf auriculate 7
4. Blade and petioles less than 15 cm; stipes larger than 2 cm . . . . *Anthurium pulchellum*
4. Blade and petioles larger than 15 cm; stipes less than 2 cm 5
5. Apex of leaf aristate or setaceous; Side ribs curved and joined together before reaching the edge of the blade, no black spots on the blade 6
5. Apex obtuse; perfect basal venation, with black spots on the underside of the blade . . . . . *Anthurium caucanum*
6. Elliptic leaf shape, margin entire, stem with rough texture . . . . *Anthurium nanegalense*
6. Ovate leaf shape, margin sinuate, stem with smooth texture . . *Anthurium longegeniculatum*
7. Spathe with black color . . . . . *Anthurium cabrerense*
7. Spathe with green or reddish color 8
8. Blade with apical lobe less than 10 cm wide . . . . . *Anthurium bogotense*
8. Blade with apical lobe greater than 10 cm wide 9
9. Blades less than 18 cm long . . . . . *Anthurium* sect. *Calomystrium*
9. Blades greater than 18cm long 10
10. Cataphylls not persistent, spadix greater than 1 cm wide . . . . *Anthurium* sp1
10. Persistent cataphylls, spadix less than 1cm wide 11
11. Tertiary veins prominent and forming reticles . . . . . *Anthurium scabrinerve*
11. Tertiary veins not prominent, and free 12
12. Blade and petiole with superficial black spots 13
12. Blade and petiole without superficial black spots . . . . . *Anthurium* sp2
13. Stems canaliculated. . . . . *Anthurium* sect. *Cardiolonchium*
13. Stems without canals or grooves . . . . *Anthurium versicolor*

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Philodendron joaosilvae, a New Species of *Philodendron*, subgenus *Philodendron*, section *Philodendron* (Araceae) from Brazil

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ABSTRACT

A species of *Philodendron*, subgenus *Philodendron*, section *Philodendron* (Araceae) from Brazil, *Philodendron joaosilvae* Croat, A. Cardoso & Moonen is described as new.

KEY WORDS

Philodendron, subgenus *Philodendron*, Brazil, section *Philodendron*, Araceae.

INTRODUCTION

Philodendron subgenus *Philodendron* section *Philodendron* is the largest of three subgenera of *Philodendron* with approximately 335 published species. The subgenus comprises ten sections: section *Baursia* Rchb., section *Calostigma* (Schott) H. Pfeiff, section *Camptogynium* Krause, section *Dolichogynium* Croat & Köster, section *Macrolonchium* Schott, section *Philodendron* (Jacq.), Schott, section *Philopsammos* G.S. Bunting, section *Polytomum* (Schott) Engl., section *Schizophyllum* Schott and section *Tritomophyllum* Schott. Section *Philodendron* comprises seven subsections: subsection *Achyropodium* (Schott) Engl., subsection *Canniphyllum* (Schott) Mayo, subsection *Macrobelium* (Schott) Engl., subsection

Figure 1. A–D. *Philodendron joaosilvae* Croat, A. Cardoso & Moonen. A. Habit showing leaves, adaxial surface. B. Growth habit, petioles arising from stem with long internodes showing two or more clusters of leaves. C. Unearthed stem showing dense roots and with one inflorescence. D. Complete inflorescence showing staminate and pistillate portions cut open to expose spadix.

Philodendron (Schott) Engl., subsection *Platypodium* (Schott) Engl., subsection *Psoropodium* (Schott) Engl., and subsection *Solenosterigma* (Klotzsch ex Schott) Engl. The new species is placed in subsection *Philodendron.*

Philodendron joaosilvae Croat, A. Cardoso & Moonen, **sp. nov.** Type: BRAZIL. Pará: Municipio de Itaituba, Garimpo do Waldeci, Floresta Nacional do Amana, on plateau during the survey work for the management plan of Flona Amana, run by the STCP Engenharia e Projetos, cultivated in Belém 05°37' 23.5"S, 57° 26' 22.1"W, 150 m, 6 Apr 2009 *João F. Batista da Silva 3031* (holotype, MG-207180; isotypes, B, K, MO, NY, RB, US).

The species is closest to *Philodendron maguirei* G.S. Bunting but that species differs in having petioles which dry glossy yellow-brown and smooth, sagittately lobed, bicolorous blades (drying gray-brown above, reddish brown below) which lack cross-veins and have obvious laticifers. In the Lucid Philodendron Key *Philodendron joaosilvae* also tracks to *P. jodavisianum* G.S. Bunting from Central America and the western slopes of the South American Andes which differs in having blackish drying blades with a V-shaped sinus and stems with prominent fibrous persistent cataphylls.

Terrestrial; stem creeping over surface of soil, in dense shady forest on yellow latosol clay; **internodes** to 50 cm or more long, much shorter near apex on flowering plants, mostly 1–1.5 cm long, pinkish, matte; **cataphylls** to 7.3 cm long, narrowly very long-acuminate, thin, drying dark brown and persisting intact briefly then breaking up with only the bases persisting; **petioles** 45–52.5 cm long, 6–7 mm diam., medium green, densely short-dark-lineate, weakly glossy, terete midway, obtusely flattened toward apex with a faint medial rib, drying medium gray-brown, matte, 4–5 mm diam., finely ridged, short-pale-lineate, irregularly blackish-dotted and streaked; geniculum not apparent; **blade** narrowly triangular-sagittate-hastate, 19.2–39 cm long, 22–27 cm wide, broadest across the posterior lobes, sometimes with a marked constriction just below the petiole attachment, narrowly long-acuminate at apex, prominently lobed at base, dark green and matte above with variegations of gray in a broad area midway between the midrib and the margin, subcoriaceous, moderately paler and semiglossy below, drying medium yellow-brown and matte above, scarcely paler, medium yellow-brown and weakly glossy below; **anterior lobe** 21.5–30.5 cm long, broadly concave along margins; **posterior** lobes slender and narrowly rounded at apex, somewhat spreading, departing midrib at a 125–135º angle, 12.2–17.3 cm long, 6.5–7.6 cm wide midway; **midrib** narrowly sunken and concolorous above, narrowly rounded, moderately paler and matte below, drying concolorous, broadly convex with a narrow medial groove, short-pale-lineate above, concolorous, narrowly rounded, finely and irregularly ridged, faintly short-pale-lineate below; **primary lateral veins** 4(5) pairs, arising at an acute angle then spreading at a 40–50º angle to the midrib, weakly quilted-sunken and concolorous above, narrowly rounded and weakly paler below, drying concolorous and narrowly sunken with a narrow medial vein above, narrowly rounded and concolorous, with marginally raised areas near the midrib, densely short-pale-lineate throughout below; **minor veins** moderately distinct; cross-veins moderately distinct both when fresh and when dried, all lateral veins prominently up-turned near the margin and extending well upward along the margin in several series parallel to the margin; **upper surface** densely short-pale-lineate throughout; **lower surface** short-pale-lineate but mostly along the major veins; **sinus** parabolic, 9–11.5 cm deep, 7–9.5 cm wide, **basal veins** 4–5 pairs,

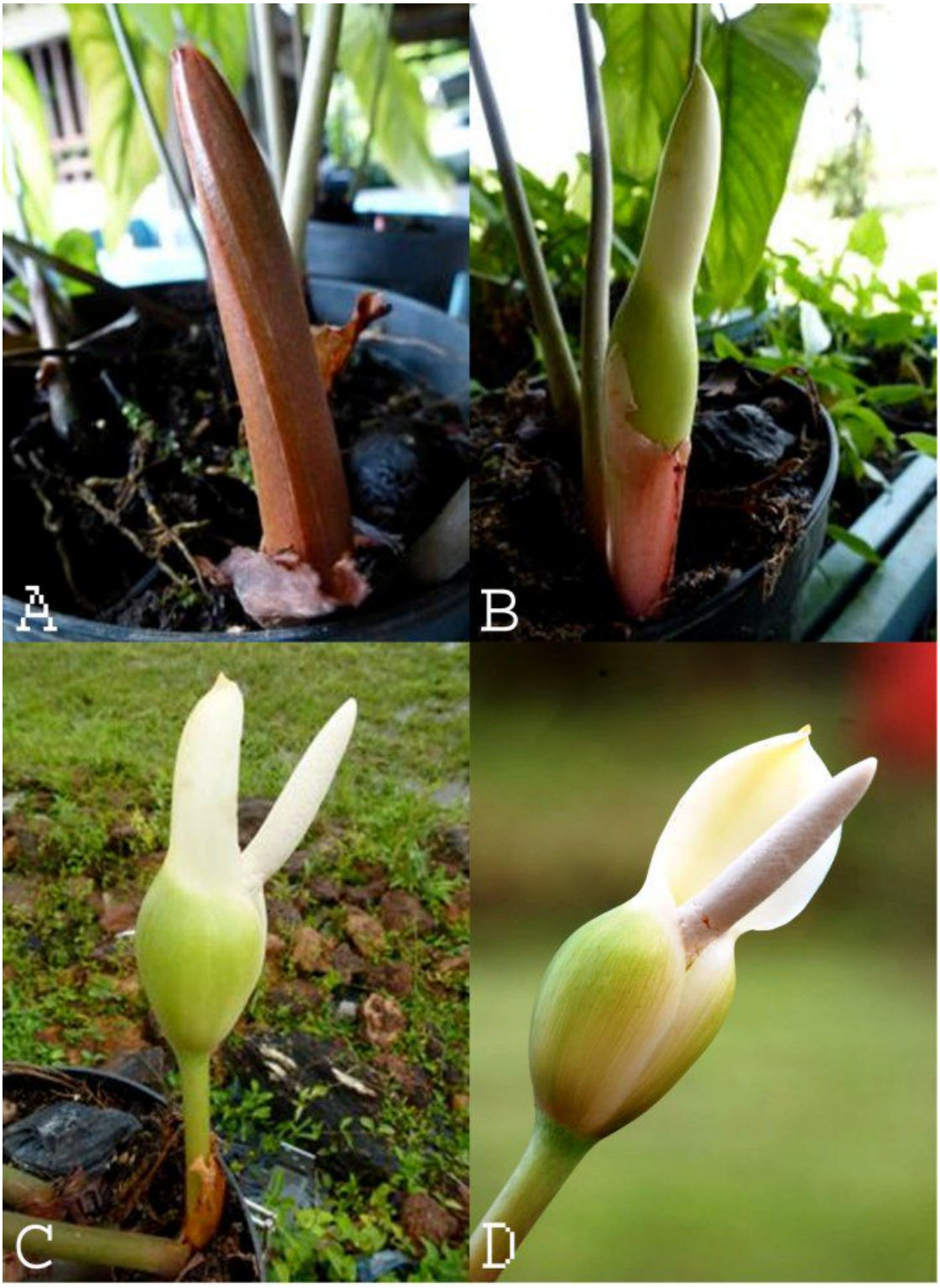


Figure 2. A–D. *Philodendron joaosilvae* Croat, A. Cardoso & Moonen. A. Newly emerged inflorescence still contained within prophyll. B. Newly emerged inflorescence emerging from prophyll. C. Complete inflorescence showing side view at anthesis. D. Complete inflorescence showing near face view at anthesis.

1st pair free to the base, 2nd pair fused to 2–3.3 cm, 3rd–4th (5th) pairs fused 4.5–7.8 cm, the 4th & 5th pairs sometimes fused to 8.3 cm; **posterior rib** nearly straight, naked for 1–1.5 cm. INFLORESCENCE solitary, surrounded by a pinkish, 1-ribbed prophyll; **peduncle** 3.5–4 cm long; 5 mm diam., semiglossy; **spathe** (6.7)8.6–10.1 cm long, wide, tube 3.5–5 cm long, 1.9–2.1–2.6 x 1.5–2.1 cm wide, dark yellow-green outside, pale whitish green and glossy inside; blade 3.2–4.3 cm long, 1.3 cm diam. just above tube, yellow-white to creamy, sometimes yellow-green medially outside, whitish and glossy inside with faint lines in tube; **spadix** stipitate 6–8 mm long, (6 x 7 mm diam.), 5.3–7.8 cm long; staminate spadix 4.1–5.3 cm long, 6–10 mm diam., pale cream (turning creamy brown in pickled condition); sterile staminate flowers, 7–10 mm long, 8–11 mm diam. at base 6–10 mm diam. at apex, creamy white, (yellowish brown in pickled condition); pistillate spadix pale yellow-green, 2.2–3.3 cm long, 8–10 mm diam. at base, 9–12 mm diam. midway, 9–11 mm diam. at apex, light yellowish green (dark brown in pickled condition); **pistils** 1.6–2.2 mm long, 1.0–2.3 mm diam.; style thick and broadly rounded at apex, conspicuously granular in pickled condition; stigma ca. 0.3–0.7 mm thick, 1–1.2 mm diam., broadly flattened; ovules 0.1–0.3 mm long, arranged along the axial margin of the locule, 10–12 per locule, funicles about as long as or slightly longer than ovules.

Philodendron joaosilvae is a member of subgenus *Philodendron*, section *Philodendron* subsection *Philodendron,* and is characterized by its terrestrial creeping habit across the forest floor with leaves widely spaced except near the flowering apex of the stem, terete petioles, narrowly triangular-ovate-sagittate blades with the anterior lobe concave along margins and with narrow, more or less spreading posterior lobes as well as by the solitary greenish inflorescence. Another unusual feature of the species is that one side of blade usually has many more branches arising from the basal veins than on the other side, giving the blade an appearance of being inequilateral.

Philodendron joaosilvae is endemic to Brazil, known only from the type locality in the State of Pará, Municipio de Itaituba, in the Floresta Nacional do Amana, at 150 m in a *Tropical moist forest* life zone (Holdridge, 1971).

The National Forest (Flona) of Amana, or Amanã, consisting of 542, 620 hectares is a Conservation Unit, located in the state of Pará in the municipalities of Itaituba and Jacareacanga at the confluence of the Madeira and Tapajós rivers, bordering the state of Amazonas. The creation of this reserve in February 2006 has provided environmental protection in the region of the BR-163, a national road connecting the cities of Cuiabá in Mato Grosso to Santarém in Pará. It was created with the objectives of promoting sustainable multiple-use management of forest resources, the maintenance and protection of water and biodiversity resources, as well as supporting the development of methods for sustainable use of natural resources. Its

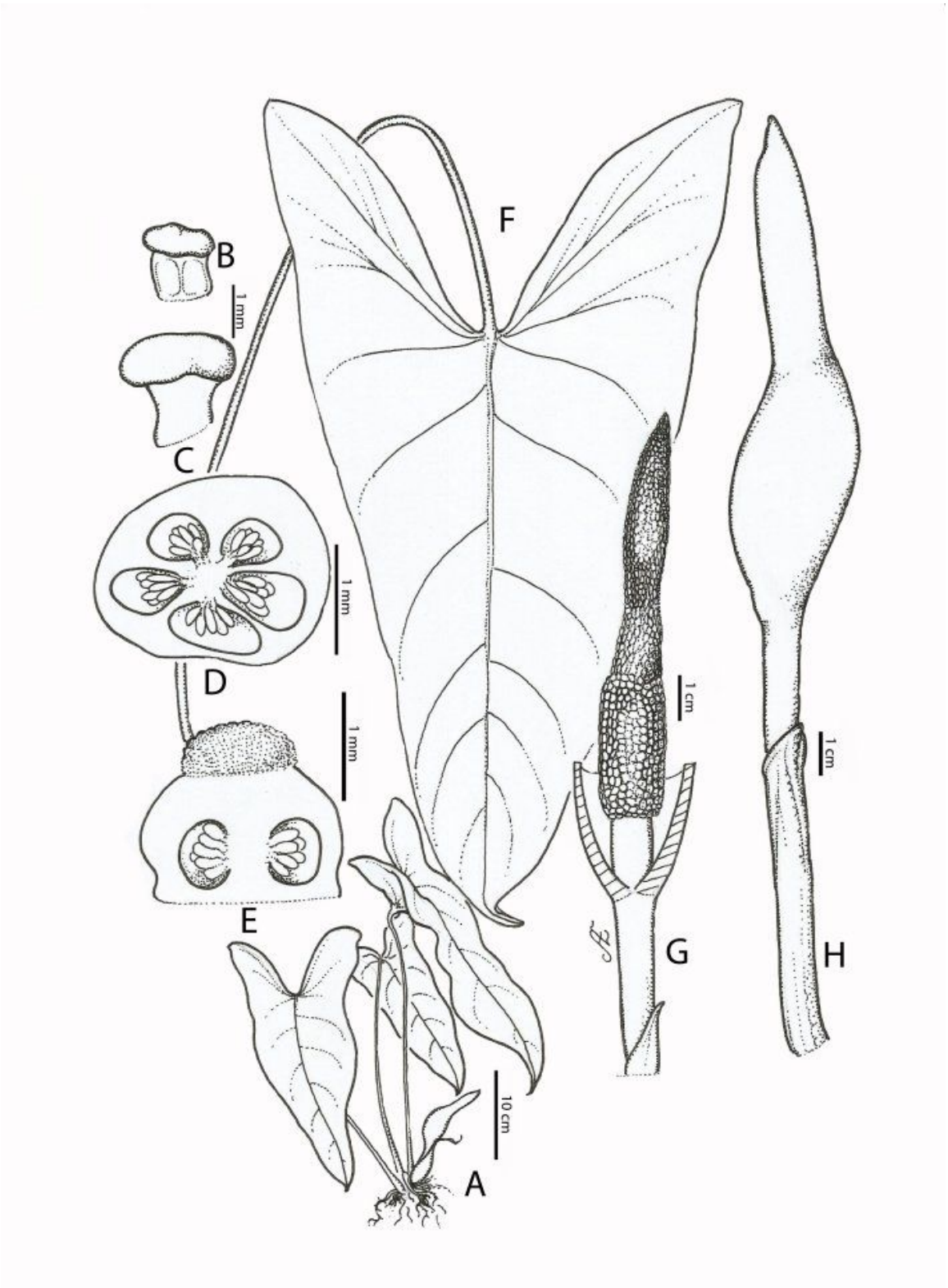


Figure 3. *Philodendron joaosilvae* Croat, A. Cardoso & Moonen. (Drawn by Elielson Rocha from JBF da Silva 3031.)

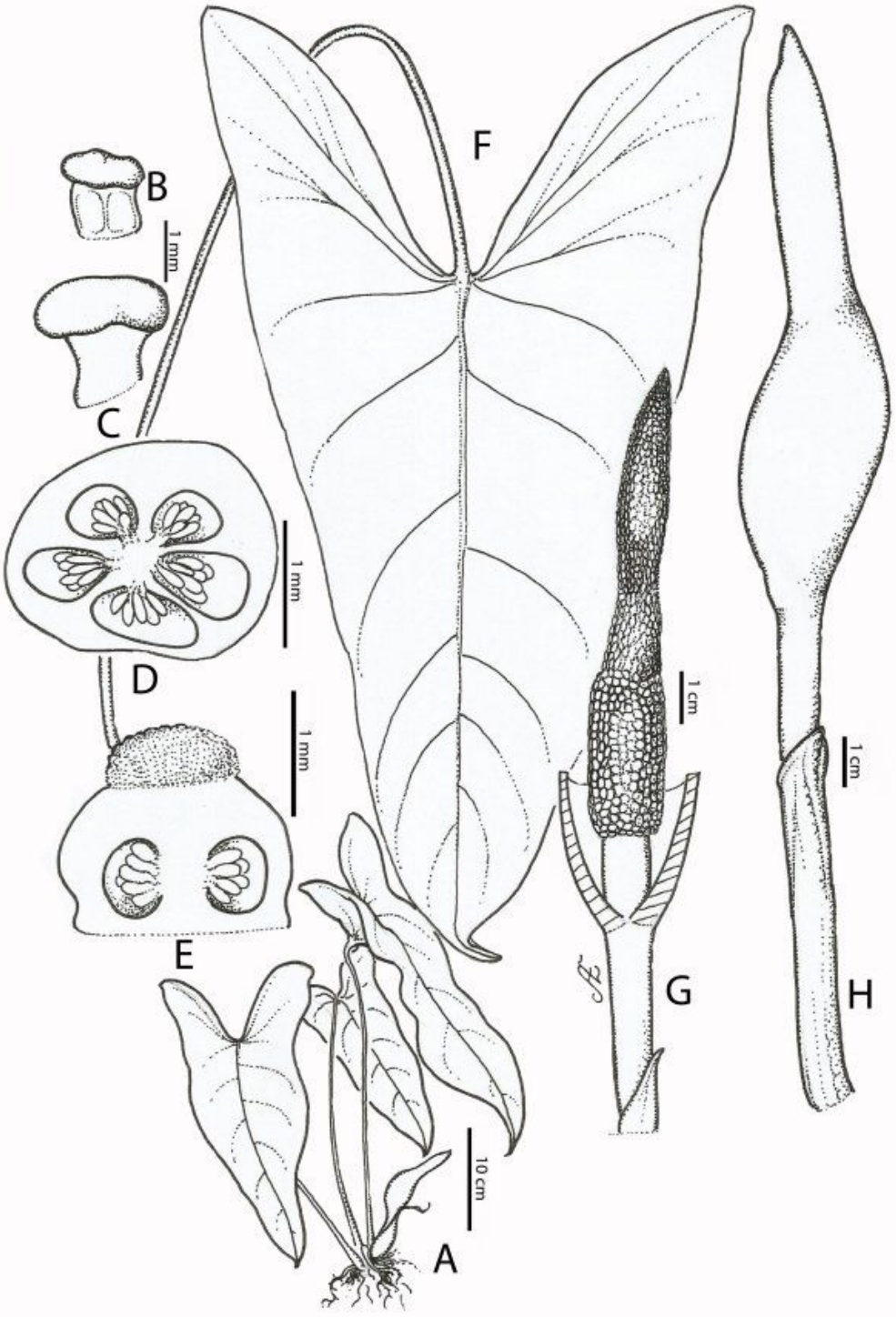
protection is carried out by the Chico Mendes Institute for Biodiversity Conservation (ICMBio) jointly with the Brazilian Forest Service (SFB) that coordinates the sustainable management of forests in the area.

The species is named for João Batista Fernandes da Silva who collected the type specimen. João Batista is one of the foremost plant collectors in Brazil and is frequently involved in inventories where his skills are required. He is the sort of collector that can be taken in by helicopter and can survive for days with little more than what he carries on his back. João Batista is also an accomplished photographer and has conducted research with Orchidaceae, having published two major books on the family in cooperation with Manoela Ferreira Fernandes da Silva. He also has strong interests in Araceae and is now working toward a completion of a book on Araceae of the lowland Amazon basin with the assistance of André Cardoso and Tom Croat.

Paratype: BRAZIL. **Pará**: Garimpo do Waldeci, Floresta Nacional do Amana, on plateau, in dense shady forest on yellow latosol clay, 5º37'22"S, 57º34'07", 150 m, 13 Aug 2011, *T. B. Croat & J.B.F. da Silva 103090* (MO).

REFERENCES

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


B
1 mm
C
1 mm
D
1 mm
E
F
1 cm
G
1 cm
H
10 cm
A