
A Review of the Aroid Tribe Caladieae with the Description of Three New Species of *Caladium* and Seven New Species of *Syngonium* (Araceae)

Thomas B. Croat,¹ Xavier Delannay,² Orlando O. Ortiz,³ and Pedro Díaz Jiménez⁴

¹ P. A. Schulze Curator, Missouri Botanical Garden, 4344 Shaw Blvd., St. Louis, Missouri 63110, U.S.A. Thomas.Croat@mobot.org

² Volunteer Research Associate, Missouri Botanical Garden, 4344 Shaw Blvd., St. Louis, Missouri 63110, U.S.A.

³ Herbario PMA & Programa de Maestría en Ciencias Biológicas, Universidad de Panamá, Estafeta Universitaria, Panama City, Panama.

⁴ Centro de Investigaciones Tropicales, Universidad Veracruzana, Xalapa, Veracruz, Mexico.

ABSTRACT. A review of the aroid tribe Caladieae is presented, and three new species of *Caladium* Vent. and seven new species of *Syngonium* Schott are described and illustrated. Two species, *C. picturatum* K. Koch & C. D. Bouché and *C. steudnerifolium* Engl., previously considered to be synonymous with *C. bicolor* (Aiton) Vent., are fully redescribed. New species of *Caladium* are *C. cortesae* Croat & E. G. Gonç., *C. palaciosii* Croat & L. P. Hannon, and *C. stevensonii* Croat & Delannay. New species of *Syngonium* are *S. adsettiorum* Croat, O. Ortiz & J. S. Harrison, *S. bastimentoense* O. Ortiz & Croat, *S. brewsterense* Croat & Delannay, *S. churchillii* Croat & O. Ortiz, *S. litense* Croat, *S. purpureospathum* Croat & Raz, and *S. taylori* Croat & O. Ortiz. *Syngonium yurimaguense* Engl. is also reported for the first time outside the Amazon Basin.

Key words: Araceae, Caladieae, *Caladium*, *Chlorospatha*, *Hapaline*, *Jasarum*, *Scaphispatha*, *Syngonium*, *Xanthosoma*.

The tribe Caladieae Schott (Araceae, subfamily Aroideae) comprises seven genera, and together with the tribe Zomicarpeae Schott, constitutes the *Caladium* alliance sensu Mayo et al. (1997). The genera in tribe Caladieae are *Scaphispatha* Brongn. ex Schott, *Caladium* Vent., *Jasarum* G. S. Bunting, *Xanthosoma* Schott, *Chlorospatha* Engl., *Syngonium* Schott, and *Hapaline* Schott. With the exception of *Hapaline*, a genus of seven species from Southeast Asia, the remaining genera are all Neotropical.

The Neotropical Araceae are still poorly understood and no group more poorly so than Caladieae. Little taxonomic work was done on the tribe since Engler's revision in *Das Pflanzenreich* (Engler, 1920), but a notable effort was made by Madison (1981) in a paper

that summarized our knowledge of the group, described new species, and discovered important distinctions between *Caladium* and *Xanthosoma*, markedly that differences occur in the display of their pollen. Pollen grains are borne in tetrads in *Xanthosoma* and solitarily in *Caladium*. Madison (1981) provided a key to the six genera considered to be Caladieae at that time, namely *Aphyllarum* S. Moore, *Caladium*, *Chlorospatha*, *Jasarum*, *Scaphispatha*, and *Xanthosoma*. *Aphyllarum* has subsequently been subsumed into *Caladium* (Mayo et al., 1997).

Scaphispatha, with only two species, occurs in Bolivia and ranges across much of Brazil in southern Amazonia. The genus most closely resembles *Caladium* but differs in having the spathe tube partially open at anthesis and the staminate portion of the spadix lacking sterile flowers, as well as in having a single basal ovary and the style much narrower than the ovary. In contrast, *Caladium* has the spathe tube prominently convolute, well-developed sterile male flowers, the style about as broad as the ovary, and parietal placentation with several ovules.

Jasarum is a monotypic genus with a much-reduced range and specialized habitat, occurring only in a few blackwater streams in the Guayana Highlands of Venezuela and Guyana. It is a submerged aquatic with thin, long-flowing leaves suspended in the water currents, which are oxygenated by flowing water except at the time of flowering when only the inflorescence emerges above the water.

Hapaline, a genus of eight species restricted to Asia, is known only from the Malay Archipelago in Southeast Asia from South China (Yunnan) to Thailand, Malaysia (both peninsular as well as northwest Borneo), Myanmar, Laos, and Vietnam. The genus consists of small to moderate-sized evergreen to seasonally dormant herbs

with tuberous stems, shortly sheathed petioles, cordate, sagittate to hastate leaf blades and inflorescences with few pistils, these fused to the axis, and male flowers in contiguous synandria. It differs from most other Caladieae by having unilocular ovaries.

Caladium is a relatively widespread and modestly sized genus with 20 species (12 species accepted) mostly occurring in the northern half of the Amazon Basin in seasonally dry habitats with a subterranean tuberous rhizome with the vegetation disappearing during times of drought. Aside from the widespread *C. bicolor* (Aiton) Vent., most of the species have a relatively restricted range. The species diversity is greatest in Venezuela and the Guianas. The genus was partially revised by Madison (1981: 366–374), who provided a key to six species, giving full descriptions and full exsiccatae for *C. bicolor*, *C. coerulescens* G. S. Bunting, *C. humboldtii* Schott, *C. lindenii* (André) Madison, *C. macrotites* Schott, and *C. schomburgkii* Schott. His treatment oversimplified *C. bicolor* by placing at least two distinct species into synonymy under *C. bicolor*. Those species, *C. picturatum* K. Koch & D. Bouché and *C. steudnerifolium* Engl., are resurrected and fully redescribed in this paper. Leaf blades are usually peltate and frequently colorfully marked with shades of gray, white, or even red. The genus is often confused with *Xanthosoma* and deserves a thorough molecular analysis since there are reports of intermediacy. *Xanthosoma* and *Chlorospatha* differ from *Caladium* by having styles that are expanded or thickened and expanded into a mantle as well as by having their pollen shed in tetrads. In addition, neither genus commonly has peltate leaf blades.

Chlorospatha, once among the most poorly known genera of Araceae, was recently revised by Croat and Hannon (2015) and comprises 69 taxa (68 species and one subspecies). Although widespread in Colombia and Ecuador, it ranges no further, except for three species that are present in Central America (*C. croatiana* Grayum is found in Colombia, Costa Rica, and Panama; *C. hammeliana* Grayum & Croat is endemic to Panama; and *C. mirabilis* (Mast.) Madison is found in Colombia and Panama). Some of the species were initially described in preparation for the treatment of the *Flora of Antioquia* (Croat & Hannon, 2004) and in another paper by Bogner and Hannon (2007). One or two additional new species have been discovered by Natalia Castaño near Manizales but have not yet been described. Species of *Chlorospatha* tend to be rare and highly endemic. As yet only two species, *C. bogneri* Croat & L. P. Hannon and *C. litensis* Croat & L. P. Hannon, are known from both Ecuador and Colombia. Habit is variable, but in general, plants are not only rare but also small and not easy to spot in the

forest understory. Inflorescences are often very long with slender peduncles held in the petiolar sheaths. The spathes are usually small with a narrow, elongated spathe tube with a somewhat nodding narrow blade and with only a narrow slitlike opening accommodating only the smallest of insects. The spadix is usually completely fused to the spathe in the pistillate portion, and the sterile male flowers are somewhat fungiform and irregular. Madison (1981) provided a key for 10 species. Along with Anbreen Bashir, the senior author is presently working on the production of an interactive LUCID3 key (Haigh et al., 2009) for this genus, which will make determination easier owing to the fact that many *Chlorospatha* collections do not always have all the necessary information for a dichotomous key, especially the very critical sexual parts of the inflorescence.

Syngonium, while closely related to genera mentioned above by having anastomosing laticifers and thus usually with white latex in the veins, is easily recognized by its hemiepiphytic climbing habit, elongate internodes, and fruits connate into a globose syncarp with usually black, shiny berries. The genus was revised by Croat (1981a) and 30 species were recognized. Since then, a variety, *S. podophyllum* Schott var. *peliocladum* (Schott) Croat, was justifiably raised to species level by Grayum (2003) and two additional new species, *S. castroi* Grayum and *S. rayi* Croat & Grayum, were published (Grayum, 1997). With the addition of the six new species in this paper, the genus now has 39 species with greatest diversity in Central America. Taxonomically, the genus is complex, especially owing to its immense plasticity in growth form as well as the size and shape of its vegetative parts. A number of species have become widespread and invasive, especially *S. podophyllum* Schott. They have become troublesome weeds owing to their ability to fare so well vegetatively.

Xanthosoma is differentiated from *Chlorospatha* by having a subglobose, usually much larger spathe tube, and a usually shorter and thicker peduncle. The pistillate spadix is usually attached only near the base, and the styles are usually discoid and expanded laterally while the sterile male flowers are prismatic and well-developed. Until recently, *Xanthosoma* was one of the most poorly understood genera in the Neotropics, with only 86 accepted species as of the last published survey (Boyce & Croat, 2014). However, the authors recently published four articles describing numerous new species, raising the number of accepted species to 204. These publications include a revision of *Xanthosoma* for western South America with 92 new species (Croat et al., 2017a), a revision of *Xanthosoma* for Central America with seven new species (Croat et al., 2017b), a revision of *Xanthosoma* for the Guianas with 10 new species

(Croat & Delannay, 2017a), and nine new *Xanthosoma* species for Venezuela and other Caribbean countries (Croat & Delannay, 2017b). The authors also reorganized the genus into six seemingly natural groups based on leaf morphology, habit, and stem differences (Croat et al., 2017a).

In this paper, the taxonomy of Caladieae is further advanced by the description of three new species of *Caladium* and seven of *Syngonium*, as well as the revival of two species incorrectly lumped into *C. bicolor* and the report of a major range extension for *S. yurimaguense* Engl.

NEW SPECIES, NEWLY RECOGNIZED NAMES, AND NEW RANGE RECORDS PUBLISHED HERE

I. *Caladium* Vent.

1. *Caladium cortesae* Croat & E. G. Gonç., sp. nov.

TYPE: Colombia. Vaupés: Serranía de Taraira, 10 km NE of Raudal de La Libertad, 4 km W of hwy., 01°00'S, 69°41'W, 200 m, 27 Aug. 1993, *J. Rodríguez 141* (holotype, COL-378547!; isotype, COL-415253!). Figures 1, 2.

Diagnosis. *Caladium cortesae* Croat & E. G. Gonç. differs from *C. bicolor* (Aiton) Vent. in having smaller leaf blades that lack reddish, whitish, or gray mottling, and much smaller inflorescences.

Terrestrial or semi-aquatic herb, growing along streams; **stem** tuberous, subterranean, rooted only at apex, ca. 1.5 cm diam.; **internodes** very short, much broader than long; **cataphylls** to 13 cm, enclosing the base of petioles. LEAVES arising from base; **petioles** terete, fleshy, and somewhat fragile, 19–33.5 cm, 2–3 mm diam., sheathed at base, drying dark brown; **blades** narrowly ovate-sagittate, peltate, narrowly acuminate, 14–21 × 5.5–10 cm, 1.7–2.8 times as long as wide, 0.5–0.8 times as long as petiole, widest near middle, drying yellowish brown or yellowish green; **posterior lobes** short, 2.5–4 × 2–3 cm; **sinus** 1.2–3.3 cm deep, 1.2–7 mm wide, V-shaped to spatulate, sometimes with lobes overlapping; **midrib and major veins** drying darker than blade; **basal veins** 4 to 6 pairs, first pair free to base, 3 to 4 acroscopic, 1 to 2 basioscopic; **primary lateral veins** 3 to 4 pairs, arising at a 30°–40° angle; **collective vein** running 2 mm from margin. INFLORESCENCES 1 to 2; **peduncle** 9.5–22 cm (to 31 cm in fruit), 2–3 mm diam.; **spathe** 5–7 cm, enclosing spadix completely, tube 2–2.5 cm, 8 mm diam., green, blade greenish or white; **spadix** 4–6 cm, female spadix dark purplish.

Distribution and habitat. *Caladium cortesae* is endemic to the Vaupés Department in Colombia at 100–250 m in a *Tropical moist forest* life zone.

Etymology. The species is named in honor of Colombian botanist Rocío del Pilar Cortés-Ballén, who collected the new species for the first time on 2 August 1993. Rocío received her undergraduate degree in biology at the Universidad Distrital Francisco José de Caldas in Bogotá, her Master's degree in Forest Science at the Universidad Nacional de Colombia in Bogotá, and her Ph.D. at the City University of New York in 1996. She is a specialist on Rubiaceae.

Discussion. *Caladium cortesae* is characterized by its small size, tuberous stems, short internodes, moderately long petiolate leaves, terete petioles, narrowly ovate-sagittate, peltate, yellow-brown-drying, narrowly acuminate blades, and moderately long-pedunculate inflorescences with a green spathe tube and dark purplish staminate spadix. It is similar to *C. bicolor*, but that species differs in having much larger blades that are typically colored with reddish, whitish, or gray mottling as well as much larger inflorescences. *Xanthosoma viviparum* Madison also bears a superficial resemblance to *C. cortesae* but is easily distinguished by the tubercles in the leaf axils.

Paratypes. COLOMBIA. **Vaupés:** Serranía de Taraira, 10 km al NE del Raudal de la Libertad, 01°00'S, 69°41'W, 200 m, 2 Aug. 1993, *R. Cortés & J. Rodríguez 760* (COL); Serranía de Taraira, 8 km al NW del Raudal de la Libertad, 00°58'S, 69°45'W, 250 m, 2 Aug. 1993, *R. Cortés & J. Rodríguez 741* (COL); Raural Jirijirimo, Pacoa, colecciones hechas a las orillas del raudal, vegetación rupícola, 00°02'S, 70°56'W, 100–250 m, 20 Mar. 2009, *J. C. Betancur B., D. Cárdenas L. & A. Cavillari 13620* (COL).

2. *Caladium palaciosii* Croat & L. P. Hannon, sp. nov.

TYPE: Peru. Amazonas: Bagua, Imaza, Quebrada Almendro, 05°18'00"S, 78°00'00"W, 400 m, 9 Feb. 1999, *R. Vásquez 26097* (holotype, MO [3 sheets] MO-5173998!, MO-5173999!, MO-517400!; isotypes, B!, COL!, HOXA!, K!, NY!, QCNE!, S!, US!). Figures 3–7.

Diagnosis. *Caladium palaciosii* Croat & L. P. Hannon differs from *C. steudnerifolium* Engl. by its smaller size, caulescent stem with internodes occasionally to 1 cm long, its narrowly ovate-elliptic blades, and inflorescences 1 to 2 per axil.

Terrestrial herb, 20–60 cm tall; **stem** caulescent, or apparently so, in part subterranean, 2.5–12 cm, with remnants of leaf bases and cataphylls retained as short, linear, medium brown fibers on aboveground portion; **internodes** (0.1)0.2–0.5(–1) × 1–1.5 cm, weakly glossy, greenish brown, glabrous, quickly becoming scurfy, brown; **cataphylls** 2, 9.5–12 cm (ultimate), 4.5 cm (proximal), lanceolate, apiculate at apex, acutely 2-ribbed abaxially, semiglossy, pale-medium green, irregularly weakly darker green-speckled in narrow transverse bands on outer surface, glossy on inner



Figure 1. *Caladium cortesiae* Croat & E. G. Gonç. (Rodríguez 141, COL-415253). Herbarium specimen showing tuberos stem, roots, petioles, leaf blades, mostly adaxial surface with abaxial surface on folded posterior lobes, and inflorescence.

surface. LEAVES 1 to 5, erect to erect-spreading; **petioles** 35–57 cm, 2–4 mm diam., glabrous, semi-glossy, medium green, weakly to moderately darker

purplish-lineate in transverse bands most of length, sheathed 2.5–3.5 cm; sheath decurrent at apex, with sides convolute; free portion 4–5 mm diam. midway,



Figure 2. *Caladium cortese* Croat & E. G. Gonç. (Rodríguez 141, COL-378547). Herbarium specimen showing tuberous stem, roots, petioles, leaf blades, abaxial surfaces, and inflorescence.

weakly obtusely C-shaped; **blades** narrowly ovate-elliptic, peltate, with petiole attached 2–3.5 cm from base, weakly acuminate at apex, broadest below middle,

21–57 × 5–9.5 cm, 3–4.5 times as long as wide, 0.5–0.7 times as long as petiole, inequilateral with one side slightly less than 1 cm wider than opposite



Figure 3. *Caladium palaciosii* Croat & L. P. Hannon (*van der Werff et al.* 14532, MO-4922234). Herbarium specimen showing tuberous stem, petioles, leaf blades, adaxial and abaxial surfaces, and infructescence.

side midway, thinly coriaceous, glabrous, prominently bicolorous; upper surface flat (not quilted), velvety-matte to semiglossy, entirely dark blackish green or

sparingly to moderately minutely whitish-maculate; maculations 1–4 mm diam., usually longer than wide; lower surface matte, glaucous; drying dark grayish green



Figure 4. *Caladium palaciosii* Croat & L. P. Hannon (not collected). Greenhouse-grown plant showing petioles and whitish maculate leaf blades, adaxial surface.



Figure 5. *Caladium palaciosii* Croat & L. P. Hannon (not collected). View of leaf blades, abaxial and partial adaxial surfaces.

above, light grayish green below; **major veins, secondary veins, and collective veins** concolorous on upper surface, concolorous or weakly to moderately darker than lower surface; **midrib** narrowly or broadly obtusely sunken above, round-raised or convex and obtusely angular below; **basal veins** 3 to 4 (on each side), the first free to the base, the rest coalesced into a prominent posterior rib (one on each side, from petiolar plexus almost to margin at base of blade, arising at 180° , as per midrib; **primary lateral veins** 2 to 3 pairs, arising at ca. 15° – 30° , occasionally 40° – 45° , straight to weakly arcuate, weakly etched-sunken or obtusely sunken on upper surface, convex and obtusely angular on lower surface; **secondary veins** entirely or in part weakly etched on upper surface, raised and weakly darker on lower surface; **tertiary veins** in part visible on lower surface, weakly darker than surface; **collective veins** 3, arising from base, \pm straight, 3–5 mm from margin, etched-sunken on upper surface, raised on lower surface. **INFLORESCENCES** 1 to 2 per axil, erect-spreading; **peduncle** 20.5–22 cm, 3–5 mm diam., slightly more than 1/2 to more than 3/4 as long as petiole, broadest at base, \pm cylindrical, thicker than broad, glossy, medium green, weakly darker purplish-lineate in narrow transverse bands; **spathe** 5–7.8 cm,

acuminate at apex, with margins in-rolled in apical 1/3, prominently constricted above tube; tube 2–3.5 \times 1.5–2 cm (at anthesis), weakly glossy medium green on both surfaces, narrowly paler along margin on outer surface; blade 2.8–4.3 \times 1.8–2.2 cm at anthesis, the opening broadly elliptical (ca. 2 cm wide), matte, pale-medium yellow-green on both surfaces, with weakly darker longitudinal veins on outer surface; **spadix** sessile, 4–5 cm, adnate to spathe 1–2 mm at base, weakly cylindrical, thicker than broad, bluntly acute to narrowly rounded at apex; fertile male portion cream-colored, weakly yellowish-tinged, 2.2–2.5 \times 0.3–0.55 cm, \pm tapering, ca. 4 mm diam. at 1 cm from apex, broadest near base; sterile male portion cream-colored, 1–1.2 \times 0.3–0.6 cm, broadest at base, weakly attenuate toward apex; pistillate portion 1 \times 0.4–0.6 cm, \pm cylindrical; fertile male flowers ca. 1 \times 1–1.9 mm, (2)3- to 4-androus, sinuously sub-hexagonal, densely arranged; pistils 1–1.2 \times 0.8–1 mm, broadest at apex; ovaries yellowish cream, \pm cylindrical, slightly narrowed at apex, \pm coherent (except at apex), entirely free in apical and basal 1 to 2 whorls, 2-locular, with pseudoaxile placentation and placentae fused at base and apex, or 1-locular with single intrusive parietal placenta; ovules 8 per locule,



Figure 6. *Caladium palaciosii* Croat & L. P. Hannon (not collected). View of petiole, leaf blade, adaxial surface, and inflorescence with light green spathe tube outside. Photo by Josef Bogner.



Figure 7. *Caladium palaciosii* Croat & L. P. Hannon (Croat 90274). Close-up of opened inflorescence with medium green spathe tube inside, pistillate portion of cream-colored spadix, and white sterile and fertile staminate portions.

16 per locule when 1-locular, anatropous, biseriate, attached in basal 2/3 (of axis); funicle as long as ovule; stylar region ca. 0.3 mm, slightly broader than ovary apex, the margins \pm coherent with adjacent styles, free in apical and basal 1 to 2 whorls; stigma whitish, ca. 0.6 mm diam., disklike, wider than long, almost as wide as style; sterile male flowers in 5 whorls, ca. 1 mm, 1–1.2 mm diam. (viewed from above) in basal whorl and weakly to moderately elongated in direction of axis, 2–3 mm, 1–1.5 mm diam. in apical whorls (viewed from above) and prominently elongated in direction of axis, subprismatic to prismatic, densely arranged.

Phenology. Flowering is only known to occur in *Caladium palaciosii* in January, February, and April through July.

Distribution and habitat. *Caladium palaciosii* occurs on the eastern slopes of the Andes in Zamora-Chinchipe Province, Ecuador, and Amazonas Province in Peru, at an elevation of 400–2000 m, in *Premontane wet forest*, *Premontane rainforest*, or *Lower montane wet forest* life zones.

Etymology. The species is named for Walter Palacios, renowned Ecuadorian plant collector and former employee of the Missouri Botanical Garden

(1989–1995). Palacios and his group were the first to collect this species in October 1991. Palacios, now Professor of Dendrology and Forest Ecology at the Universidad Técnica del Norte in Ibarra, Ecuador, and a research associate of the Herbario Nacional in Quito (QCNE), has collected many new species of Araceae all over Ecuador and will have species named in his honor in several genera of Araceae.

Discussion. *Caladium palaciosii* is distinguished by its small size, narrowly ovate-elliptic, peltate leaf blades that lack a sinus at the base, or nearly so, and apparently caulescent stem with relatively long internodes (to 1 cm long). *Caladium palaciosii* could not be confused with any other species but has been marketed as *Chlorospatha* ‘China’. The species most closely resembles *Caladium steudnerifolium*, particularly with its blade shape and the absence of seasonal dormancy, but the latter species is significantly larger when mature and usually produces three inflorescences per sympodium. Additionally, morphology of the ovaries and stylar regions is different in some unspecified way (J. Bogner, pers. comm.). Finally, the stems are significantly different, with *C. steudnerifolium* clearly having an elongate tuber with extremely short internodes.



Figure 8. *Caladium picturatum* K. Koch & C. D. Bouché (Croat 54080b). Greenhouse-grown plant showing leaf blades, adaxial surface.

The subject of tuber versus rhizome has never been fully addressed in the morphology of Araceae, and the stem of *Caladium palaciosii*, although caulescent in appearance, could be described as an elongate tuber, according to Wilbert Hetterscheid (pers. comm.). However, the species grows continuously throughout the year, exhibiting no seasonal dormancy in habitat or cultivation. This species serves as yet another example of the problems of generic delimitation of *Caladium* and *Xanthosoma*, as discussed by Mayo and Bogner (1988). The style is conspicuously thickened and also laterally expanded beyond the diameter of the ovary apex, with the margins coherent with those of the adjacent pistils. This combination of a seemingly rhizomatous stem and discoid style could easily place the species in *Xanthosoma* sect. *Xanthosoma*, but *C. palaciosii* has the pollen shed in monads while the pollen is in tetrads in *Xanthosoma*, confirming that it should be placed in *Caladium*.

Paratypes. ECUADOR. **Zamora-Chinchipec:** Campamento Miazí, along Río Nangaritzá, at base of vertical limestone bluffs, 04°16'S, 78°40'W, 900 m, 17 Feb. 1994, *H. van der Werff, B. Gray, E. Freire & M. Tirado 13179* (MO); Cordillera del Cóndor region, along upper Río Nangaritzá betw. Las Orquídeas & Shaime, 04°15'29"S, 78°39'21"W, 900 m, 5 Nov. 2006, *H. van der Werff, B. Gray & W. Quizhpe 21938* (F, HUA); Río Nangaritzá, ca. 45 min. upriver, by boat, from end of rd. at Las Orquídeas, at base of cliffs, 1200–2000 m (est.), 04°16'42.5"S, 78°38'55.2"W, 19 Jan. 2004 (originally collected by *M. Sizemore 04-001*), *T. B. Croat & L. P. Hannon 90274* (HUA, MO, PMA, QCNE, SEL); cultivated at Munich Botanical Garden, *Bogner 3006* (M); Río Nangaritzá up river from Cabañas Yankuam, 04°15'35"S, 78°39'23"W, 852 m, 17 Sep. 2007, *T. B. Croat & G. Ferry 98736* (MO); Miazí, Detrás Campamento Militar, 04°16'00"S, 78°42'00"W, 900–1000 m, 21 Oct. 1991, *W. Palacios, I. Vargas, C. Galarza & J. Romero 8583* (MO). PERU. **Amazonas:** Quebrada El Almendro, lowland rainforest, along creek & on sandstone, 05°14'40"S, 78°21'24"W, 430 m, 8 Mar. 1998, *H. van der Werff, B. Gray, R. Vásquez & R. Rojas 14532* (MO); Bagua, Dpto. Imaza, comunidad Aguaruna de Wanás (Km. 92 Carretera Bagua–Imacita),



Figure 9. *Caladium picturatum* K. Koch & C. D. Bouché (Croat 54080b). View of plant base showing purple-maculate petioles and inflorescence with green spathe tube outside.

Cerros Chimim, 650–750 m, 28 Aug. 1996, *C. Diaz, A. Peña, L. Tsamajain & M. Roca 8023* (F, M, MO, PMA); Chiriaco, lower slope of Cerro Tayu, 05°15'56"S, 78°22'07"W, 500–625 m, 27 Oct. 2012, *H. van der Werff, R. Rojas, L. Valenzuela, G. Shareva, R. Apanú, A. Roca & A. Reyes Barrantes 24593* (MO).

3. *Caladium picturatum* K. Koch & C. D. Bouché, Index Sem. (Berlin) 1854: 6. 1854. TYPE: Peru. Loreto: Prov. of Maynas (fide H. W. Schott, Prodr. Aroid. [1860]) (holotype, origin unknown). Figures 8, 9.

Caladium belleyeni Lem., Ill. Hort. 7: t. 252. 1860, as “Belleymei.” *Caladium picturatum* var. *belleyeni* (Lem.) Engl., Fl. Bras. 3(2): 187. 1878, as “Belleymii.” TYPE: [Icon in] Lem., Ill. Hort. 7: t. 252. 1860 (lectotype, designated here).

Caladium aturense G. S. Bunting, Phytologia 60(5): 298–300. 1986. TYPE: [Venezuela], Territorio Federal Amazonas, Depto. Atures, entre Puerto Ayacucho y Km. 35 hacia Sanariapo, 100–140 m, 6–19 July 1969, *G. S. Bunting, L. M. A. Akkermans & J. van Rooden 3480* (holotype, NY!; isotypes, K!, MY!, U not seen).

Terrestrial to 40 cm tall; **stem** tuberous, subterranean, moderately subglobose, flattened on bottom side, rooted only at apex, internally white, 4 cm diam.; sap white. **LEAVES** with **petioles** 17–63.5 cm, 4–7 mm diam., terete, weakly glossy, spongy, medium yellow-green, tinged purple; **blades** peltate, narrowly ovate-triangular to triangular-subhastate, 11.6–35.2 × 6.4–22.1 cm, 1.2–2.7 times longer than broad, broadest typically across posterior lobes, 0.5 times as long as

to 1.07 times longer than petioles, thin, dark green and semiglossy above, matte and much paler, sea-green below, drying moderately bicolorous, drying gray-green and matte above, much paler and gray-green to brownish and matte below; major veins sunken and margined with red above, all major veins narrowly raised below; **anterior lobe** 8.5–24.4 × 2.9–14.6 cm on broadest portion; **posterior lobes** fused 0.16–0.35 (0.45) their length, 5.4–19 × 1.8–7.8 cm; **sinus** 3.9–11.5 cm deep (averaging 7.1 cm deep), 0.3–8 cm wide, 0.64–0.8 the total length of anterior lobe; **major veins** sunken to flat and concolorous above, convex and concolorous below; **primary lateral veins** 2 to 4(5) pairs, arising at a 25°–45° angle; **tertiary veins** prominent, flat and darker below. INFLORESCENCES erect, long-pedunculate, usually 1 per axil; **peduncles** 15–48 cm, 4–8 mm diam., pale to medium green, semiglossy, pale-striate near apex; **spathe** 7–14.5 cm; spathe tube narrowly ovate-elliptic, 3.7–5 cm, 1–1.7 cm diam. at anthesis (dried), medium green and glaucous, matte outside on tube, glossy to weakly glossy inside; spathe blade 6–10 cm, erect-spreading, greenish white and veined on outside, flattening to 2.7–3.2 cm wide, finally deciduous; **spadix** 6.5–8.3 cm; staminate portion creamy white, 4.5 cm, 5–10 mm diam. at broadest part, 2–4.7 mm diam. at constricted part; sterile staminate portion 1.8–4.7 cm, sterile flowers elongate in direction of axis, 3–6 mm; pistillate portion 2–2.5 cm, 6–8 mm diam., green to cream in bud, becoming pale yellowish, semiglossy.

Distribution and habitat. *Caladium picturatum* ranges from southern Venezuela (Acre, Amazonas, Apure, Bolívar, Pará) to Brazil (Maranhão), Guayana, Suriname, French Guiana, and Peru (Loreto) at 35–600 m in *Tropical moist* and *Premontane wet forest* life zones.

Discussion. *Caladium picturatum* is characterized by its small size, tuberous stem, moderately long-petiolate leaves, white sap, terete petioles, peltate, narrowly ovate-triangular to triangular-subhastate blades with slender, somewhat spreading posterior lobes, a frequently, somewhat constricted anterior lobe with the upper surface dark green and semiglossy and the lower surface much paler, sea green below with the major veins margined with red above and the posterior lobes fused a short distance below. *Caladium picturatum* was erroneously synonymized with *C. bicolor* by Madison (1981). That species differs in having more ovate blades that are broadest around the petiolar plexus, with a sinus usually parabolic, not broadly V-shaped, and in having the tuber yellowish brown internally.

Caladium picturatum has not been frequently collected in flower, and no fruiting spadices have been located. In Trinidad, the species has become a weed in cultivated fields (Hans Boos, pers. comm.).



Figure 10. *Caladium steudnerifolium* Engl. (Croat 87985). Live plant showing petioles, white-maculate leaf blade, adaxial surface, and inflorescence.

Additional specimens examined. S. loc., T. B. Croat 84906 (MO). BRAZIL. **Acre:** 55 km from Rio Branco on Rio Branco-Brasileira rd., site of abandoned fazenda & environs, 3 Oct. 1980, S. R. Lourie et al. 350 (INPA, MO). **Maranhão:** Município de Monção, basin of the Rio Turiaçu, Ka'apor Indian Reserve, within 7 km of the settlement of Urutawy, moist terra firme forest, small forest herb transplanted in house garden, inventory voucher #CG112 (sterile), 22 Apr. 1985, W. L. Balée 909 (MO). **Pará:** Mpio. São Felix do Xingu near the Rio Xingu, right bank of the Mutum Creek, 06°38' S, 52°00' W, 400 m, 13 Aug. 2011, T. B. Croat 103095 (MO). ECUADOR. **Morona-Santiago:** Limón-St. Morona, 17 June 1993, T. B. Croat 75301 (MO). PERU. **Loreto:** Nueva Jerusalem & vic., Río Macusari, 220 (river) to 300 (village) m elev., mostly low, but ridged, rainforest, terra firma, Mayna Jívaro, 02°55' S, 76°15' W, 10–11 June 1986, W. H. Lewis, M. Elvin-Lewis, M. C. Gnerre & C. Díaz S. 10978 (MO). VENEZUELA. **Amazonas:** Carretera Pto. Ayacucho hacia Samariapo, Km. 11, afloramiento "Piedra La Tortuga" al lado occidental de la carretera, entre piedras abajo de *Tabebuia pilosa* y *Pseudobomax croizatii*, 05°34' N, 67°35' W, 3 May 1993, A. Gröger 897 (MO); right bank tributary of middle reach of Caño kaenaeruoto, right bank tributary of upper Cuao river, 05°33' N, 66°50' W, 400–450 m, 23 Mar. 1986, S. Zent 0386-61 (MO); Atures, 22 km S of Puerto Ayacucho along the rd. to Samariapo, near Garcitas, 05°28' N, 67°36' W, 85 m, 16 Apr. 1978, G. Davidse & O. Huber 15188 (MO); Dpto. Atures, Puerto Ayacucho,



Figure 11. *Caladium steudnerifolium* Engl. (Croatt 97098). View of non-maculate leaf blade, adaxial surface.



Figure 12. *Caladium steudnerifolium* Engl. (Croatt 97098). View of leaf blade, abaxial surface.

bosque húmedo del Río Cataniapo entre cominidad de las Pavas y Puente Cataniapo, 06°25'N, 67°25'W, 35 m, 14 Apr. 1987, A. Castillo 2383 (MO); along rd. betw. Puerto Ayacucho & Sanariapo, ca. 1 km S of airport rd. near Río Cataniapo & around huge boulders (granitic lajas), 100 m, 14 Aug. 1982, T. B. Croat 55069 (MO). **Apure:** Hato "El Polver," 79 km S of Elorza, sabanas de banco adyacentes al caño Cicuture (Afluente del alto Río Cinaruco), 06°38'N, 69°37'W, 80 m, 28 Apr. 1987, G. Aymard *et al.* 5655 (MO); Dito. Romulo Gallegos, 21 Nov. 1990, G. de Martino 206a (MO); zona húmeda bajios y lagunas, creciendo en el suelo, La Cochina-La Morita, Hato El Frio, llanos Inundables de Apure, 07°43'02"N, 68°54'33"W, 25 June 1997, A. Rial 39 (CAR, MO). **Bolívar:** vic. of Icabarú, S side of Río Icabarú along rd. to Los Caribes, disturbed area, 04°19'N, 61°44'W, 600 m, 25 July 1982, T. B. Croat 54080 (CM, MO).

4. *Caladium steudnerifolium* Engl., Bot. Jahrb. Syst. 6: 284. 1885, as "steudneriaefolium." TYPE: Colombia. Valle del Cauca: bei Cordova, Suretto vis Juntas am Fluss Dagua, 300 m, *Lehmann 1904* (holotype, B, lost); Colombia. Valle: Río Dagua, *Lehmann 758* (neotype, designated here, B!). Figures 10–13.

Terrestrial; **rhizome** subterranean, moderately elongated, 10–18 cm, **internodes** short, (1.5)2–3.5(5) cm diam., sparsely rooted, light grayish brown, pale orange inside; **cataphylls** persisting intact, brown; sap yellowish, viscid. **LEAVES** with **petioles** 24–103 cm, 6–10 mm diam., terete, weakly glossy to semiglossy, moderately firm to spongy, dark green to medium yellow-green, tinged heavily purple in lower half to throughout much its length, short pale-lineate, sometimes spotted whitish, sometimes tinged purple, with dark purple stripe most of the length of petiole; **blades** peltate 23–54 × 6.1–18 cm, 1.16–2.4 times longer than wide, 0.33 as long as to 1.25 times longer than petioles (averaging 0.7 times as long as petioles), thinly coriaceous, dark green and matte to matte-subvelvety above, glaucous below, plain or mottled with whitish maculations midway to margin along full length

of blade, much paler, matte, grayish bluish green, matte below, drying moderately bicolorous, grayish green, semiglossy to matte; **anterior lobe** 17–39.7 cm; **posterior lobes** fused throughout most of their length; **sinus** lacking or to 6 cm deep, averaging 2.5 cm deep, 0.6–0.8 the total length of anterior lobe; **major veins** sunken to flat and concolorous above, convex and concolorous below; **midrib** sometimes round-raised below; **primary lateral veins** 3 to 5 pairs, arising at a 30°–55° angle; **tertiary veins** prominulous, flat and darker below. **INFLORESCENCES** erect, long-pedunculate, usually 2 to 3 per axil; **peduncles** 23–41 × 12.4–40 cm, pale to medium green, semiglossy, weakly speckled; **spathe** 7–11.5 cm; spathe tube broadly ellipsoid, 2–2.3 cm diam. at anthesis, roomy inside, pale to medium green on both surfaces, matte outside, glossy to weakly glossy inside; spathe blade green becoming white outside, glaucous inside, flattening to 4–4.5 cm wide, finally deciduous; **spadix** 6.5–8.3 cm; staminate portion white, 4.5–6.5 cm, 6–9 mm diam., 5–7 mm diam. at constricted part; pistillate portion 2.5–3.5 cm, green to cream in bud, becoming pale yellowish, semiglossy.

Distribution and habitat. *Caladium steudnerifolium* ranges from Colombia (Caquetá, Cauca, Valle) and Ecuador (Azuay, Morona-Santiago, Napo, Orellana, Pastaza, Sucumbíos, Zamora-Chinchipe) to Peru (Loreto, Pasco) and Bolivia (Cochabamba) at 40–1662 m (mostly 200–1000 m) in *Tropical wet forest*, *Tropical wet forest transition zone to Pluvial forest*, *Premontane wet forest*, and *Premontane rainforest* life zones.

Discussion. *Caladium steudnerifolium* is characterized by having ovate-elliptic, peltate, matte-subvelvety leaf blades, which are glaucous on the lower surface, and usually two to three inflorescences per axil. The species was erroneously synonymized with *C. bicolor* by Madison (1981), but that species differs by having more broadly ovate, proportionately shorter blades and typically only a single inflorescence per axil.



Figure 13. *Caladium steudnerifolium* Engl. (Croat 87985). Close-up of peduncle and inflorescence with light green spathe tube outside.

The holotype, *Lehmann 1704*, now appears to be lost, so a neotype is designated here to serve in its place. There has been confusion regarding the proper spelling of the specific epithet, with both *Caladium steudnerifolium* and *C. steudneriifolium* having been used over time. Since the species is named after the genus *Stuednera* K. Koch and not *Stuedneria*, the proper spelling is *C. steudnerifolium*.

Additional specimens examined. BOLIVIA. **Cochabamba:** Chapare, Localidad Villa Fatima, con cordenadas, Bosque humedo de Pie de Monte, con dosel de 25 a 30 m de alto caracterizado por *Talauma boliviana* y *Eschueleria corticeae*, 16°28'22"S, 65°53'53"W, 280 m, 1 Dec. 2004, S. Altamirano 562 (MO). COLOMBIA. s. loc., *F. C. Lehmann 758* (MO). **Caquetá:** Florencia, Vereda Villaraz, Quebrada El Caraño, Km. 20 on rd. to Neiva, Finca La Estrella, 01°43'34"N, 75°40'06"W, 900 m, 26 Aug. 2007, *T. B. Croat & E. Trujillo 98172* (MO). **Cauca:** 300 m, *H. G. A. Engler 174* (MO). **Valle del Cauca:** betw. Buenaventura & Cali on old hwy., 5 km S of Río Sabaletas along steep soggy bank along rd., 03°44'N, 76°57'W, 145 m, 10 Feb. 1990, *T. B. Croat 70422* (MO); vic. of Bahía Málaga, Base Naval Málaga, Río Bongito, 04°00'44"N, 77°20'04"W, 40 m, 29 July 1997, *T. B. Croat & J. F. Gaskin 80508* (COL, K, MO, NY, US); along rd. from Queremal to Buenaventura, 28 km W of Queremal, 3 km W of Anchicaya, 03°37'00"N, 76°58'00"W, 220–230 m, 12 July 1997, *T. B.*

Croat & J. F. Gaskin 79749 (CUVC, MO); along rd. betw. Queremal & Buenaventura, 32.2 km W of Queremal, near Río Blanco, 03°36'00"N, 76°52'00"W, 230 m, 12 July 1997, *T. B. Croat & J. F. Gaskin 79760* (CUVC, JAUM, MO); Buenaventura, Bajo Calima Region, along rd. betw. Buenaventura & Málaga, Km. 51.7 from main Cali–Buenaventura Hwy., 04°03'N, 77°05'W, 16 July 1993, *T. B. Croat & D. Bay 75787* (HUA, MO). ECUADOR. **Azuay:** along rd. from Paute to Mendez (Santiago de Mendez), 84.3 km E of Paute, 5.5 km NE of Ama Luza, vic. of jct. of Río Mangan & Río Negro with Río Paute, 02°32'36"S, 78°33'46"W, 1524 m, 20 May 2003, *T. B. Croat & M. Menke 89051* (MO, QAP, QCA). **Morona-Santiago:** Cordillera del Cóndor, Cantón Tiwintza, Cerro Kampa Naint, Centro Shuar Kaputna, bosque intervenido, 03°01'30"S, 77°55'01"W, 280 m, 3 July 2003, *A. Wisum 80* (MO, QCNE); Cantón Macas, Parque Nacional Sangay, sendero que une la Laguna Sardina y Volcán al Upano, propiedad de la Sra. Lusmila Vele, 02°04'40"S, 78°13'41"W – 02°05'57"S, 78°09'06"W, 1340–1730 m, 27 May 2003, *C. E. Cerón et al. 48766* (MO); Parroquia Santiago, Cordillera Winchinkiaim Naint 19, S of Centro Shuar kumas, ridge & border betw. Ecuador & Peru (border at 03°05'26.49"S, 77°52'06.29"), premontane wet forest, 03°03'44"S, 77°56'43"W, 300–900 m, 14 Aug. 2005, *J. L. Clark 9274* (MO, US); along rd. from Gualaceo & Gualaquiza, 45.6 km SE of plaza in Sigisig, 3.7 km NW of Chigüinda, 2.7 km NW of La Libertad, 03°12'52"S, 78°44'39"W, 1662 m, 13 Sep. 2007, *T. B. Croat & G. Ferry 98564* (MO); along rd. betw. Macas & Riobamba (Guamote), 10.5 km W of Proaño, 02°16'09"S, 78°11'35"W, 956 m, 23 Aug. 2002, *T. B. Croat & L. P. Hannon 86839* (MO); along rd. from main Puyo–Macas Rd. to N end of Cordillera del Cutucú & Macuma, ca. 7.5 km E of Río Macuma, 02°07'10"S, 77°47'48"W, 787 m, 16 Jan. 2015, *T. B. Croat, G. Ferry, D. Scherberich & M. Rees 105674* (MO); along rd. betw. Limón (Gen. Plaza Gutiérrez) & Gualaceo, 1.2 km N of Limón, disturbed roadside banks, 02°58'36"S, 78°26'24"W, 1211 m, 11 Aug. 2002, *T. B. Croat, L. P. Hannon & P. E. Schmidt 86474* (AAU, COL, GB, MO, Q, QAP, QCA, S, SEL); along rd. from Limón (Gen. Plaza Gutiérrez) to Macas, 6.5 km N of Limón, 02°55'41"S, 78°24'25"W, 1032 m, 12 Aug. 2002, *T. B. Croat, L. P. Hannon & P. E. Schmidt 86495* (MO); along rd. betw. Puyo & Macas, betw. Río Pastaza & Macas, vic. of Río Tayunza, 02°00'20"S, 77°56'10"W, 953 m, 8 July 2004, *T. B. Croat, L. P. Hannon, G. Walther & T. Katun 90543* (MO). **Napo:** Cotococha, ca. 1 km W of Venecia and 25 km E of Tena, on the S side of the Napo River, *Venecia*, trail along stream into primary forest, 01°02'45"S, 77°42'42"W, 450 m, 16 June 2003, *L. R. Landrum 10679* (ASU, MO); along Río Piatua beginning at Botanical Garden on Campus of Universidad Amazonia (CIPCA) & moving upriver, 01°14'37"S, 77°53'21"W, 570 m, 10 Jan. 2015, *T. B. Croat, G. Ferry, D. Scherberich, T. K. Croat & R. Qualls 105520* (MO); along rd. betw. Archidona & Baeza, 39.9 km N of Archidona, 18.4 km S of Cosanga, 40.8 km S of jct. with Baeza–Papallacta–Lago Agrio Rd., 00°40'55"S, 77°48'05"W, 1486 m, 24 Apr. 2003, *T. B. Croat, L. P. Hannon & N. Altamirano 88039* (MO); along rd. betw. Archidona & San Vincente Para along Río Ollín, 3.5 km E of Archidona, 2–3 km W of San Pablo, 00°55'20"S, 77°47'10"W, 621 m, 23 Apr. 2003, *T. B. Croat, L. P. Hannon & N. Altamirano 87985* (AAU, F, MO, QCNE). **Orellana:** Yasuní National Park, Estación Científica Yasuní, near banks of Río Tiputini, along trail 8, Tinamoa, 00°40'37"S, 77°24'07"W, 230 m, 26 Jan. 2015, *T. B. Croat, G. Ferry, D. Scherberich & M. Rees 105869* (MO). **Pastaza:** virgin rainforest near the posto militar If, 200 m, 20 Mar. 1980, *G. Wilhelm Harling & L. Andersson 17558* (GB); along Río Piatua, tributary of Río Anzu, ca. 10 km W of Puyo–Tena Hwy., 01°12'30"S, 77°13'00"W, 774 m, 23 Aug. 2013, *T. B. Croat 105056* (ECUAMZ, MO); along rd. to Río Anzu, 17.1 km N of Mera,

3.5 km N of Río Anzu, trail W into mtns., 01°23'26"S, 78°03'19"W, 1238–1400 m, 6 May 2003, *T. B. Croat, L. P. Hannon & M. Menke 88739* (AAU, MO); vic. of Shell, along Río Pindo, ca. 1.5 km N of Shell, 01°29'39"S, 78°03'52"W, 1085 m, 5 May 2003, *T. B. Croat, L. P. Hannon & M. Menke 88587A* (GB, MO). **Sucumbíos:** along rd. from Lumbaquí to La Bonita, 43.8 km N of Baeza–Lago Agrio Hwy., 1.2 km N of bridge over Río Aquarico, 13.2 km N of Puerto Libre, 44.2 km S of La Bonita, 15.8 km S of Rosa Florida, 00°15'43"N, 77°28'01"W, 667 m, 20 Aug. 2004, *T. B. Croat & G. Ferry 93712* (MO); along rd. from Lago Agrio, 10.3 km E of Dureno, just N of Río Aguarico, 00°00'20"N, 76°38'36"W, 283 m, 6 Oct. 2007, *T. B. Croat, M. Carlsen & D. Levin 99389* (M, MO, UB); Lago Agrio, along rd. from Lago Agrio–Lumbaquí Rd. to Río Bermejo, 5 km N of Lago Agrio Rd., 00°05'54"N, 77°15'55"W, 485 m, 30 Jan. 2015, *T. B. Croat, G. Ferry, D. Scherberich & M. Rees 105964* (MO). **Zamora-Chinchipe:** in the vic. of the mining camp at the Río Tundaime, pastures along Río Quimi with small patches of disturbed forest, 03°31'10"S, 78°25'53"W, 900–1000 m, 3 Nov. 2004, *H. van der Werff, B. Gray, J. C. Ronquillo & W. Quizpe 19241* (MO, RSA); 14 km NW of Zamora on rd. to Loja, 1500 m, 17 Feb. 1979, *S. A. Thompson 175* (MO); along graveled rd. roughly paralleling the Chuchumbleza–Yantzaza hwy. E along Río Chuchumbleza, then SW to Chicaña, via Guisime, Miasi, Monterey, Kunki & Chicaña back to main rd., departing main rd. S of Chuchumbleza 4.8 km S of Río Chuchumbleza & entering main rd. 9.6 km N of plaza in Yantzaza, 2 km S of Monterey, 03°42'12"S, 78°40'29"W, 974 m, 14 Apr. 2006, *T. B. Croat 97040* (MO); along rd. 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, 1068 m, 21 July 2004, *T. B. Croat 91784* (MO); vic. of Ecuacorrientes copper mine development, valley of Río Waiwaime, along rd. to mine site at end of rd., along trail down from parking spot, 03°34'44"S, 78°26'08"W, 1312 m, 4 Apr. 2006, *T. B. Croat 96592* (MO); along rd. betw. Los Encuentros & El Sarsa, 10.7 km E from Los Encuentros, beyond bridge over Río Zamora, 03°46'40"S, 78°38'28"W, 1066 m, 14 Sep. 2007, *T. B. Croat & G. Ferry 98587* (F, K, MO, NY, US); along rd. betw. El Pangui & Zamora, vic. San Roque, 2 km S of El Roque, 10 km S of El Pangui, 03°38'50"S, 78°33'59"W, 670 m, 26 May 2003, *T. B. Croat & M. Menke 89422* (MO, QCA); along rd. betw. Zamora & Parque Nacional Podocarpus, 3.3 km NW of Zamora, 04°05'31"S, 78°57'30"W, 792 m, 29 May 2003, *T. B. Croat & M. Menke 89645* (MO); along rd. from Quime Ferry Crossing into Cordillera del Condor, 22 km above Río Zamora, in a southward direction, along creek at old military camouflage shed, 03°37'46"S, 78°26'17"W, 1489 m, 14 July 2004, *T. B. Croat, L. P. Hannon, G. Walther & T. Katan 91071* (MO); along rd. betw. Zumbi on Río Zamora & summit of Cordillera del Condor beyond Paquisha, 10.1 km beyond Río Nangariza Bridge, 29.1 km E of Zumbi, 03°56'13"S, 78°37'27"W, 1352 m, 16 July 2004, *T. B. Croat, L. P. Hannon, G. Walther & T. Katan 91168* (MO); Nangariza, Cordillera del Cóndor region, vic. of Las Orquídeas forest near Cabañas Yancuam, ca. 3 km S of Las Orquídeas, slopes W of Río Nangariza, 04°15'01"S, 78°39'33"W, 1130–1140 m, 16 Apr. 2006, *T. B. Croat 97098* (MO). PERU. **Loreto:** Varadero de Mazan from Río Amazonas to Río Napo, 03°29'S, 73°06'W, 22 Aug. 1972, *T. B. Croat 19479* (MO); Alto Amazonas, Pijuyal, quebrada Tinimá, 1 km S on Río Morona and 4 hrs. by outboard NE of jct. of Ríos Pushaga & Morona, edge of rivers & terra firma in vic. of village, 04°22'S, 77°17'W, 150 m, 23 Mar. 1987, *W. H. Lewis, M. Elvin-Lewis, D. Fast & J. Campos de la Cruz 13009* (MO, USM); Maynas, Negro Urco, Río Napo, non-inundated forest on lateritic soil, 03°10'S, 73°28'W, 160 m, 20 Jan. 1983, *A. H. Gentry & L. H. Emmons 39562* (MO); Explorara Tourist Camp, Quebrada Sucusari, tributary of Río Napo, disturbed forest behind camp, 03°15'S, 72°55'W, 130 m, 18 Jan. 1983, *A. H. Gentry, R. Vásquez & N.*

Jaramillo 39530 (MO); Dpto. Punchana, Río Momón, trocha de la comunidad de San Antonio, monte alto y arcosillo, 120 m, 30 June 1998, *M. Rimachi Y. 12278* (IBE, MO); Dpto. Iquitos, Allapahuayo, (Estación IIAP), bosque primario, 04°10'S, 73°30'W, 150–180 m, 18 June 1991, *R. Vásquez 16793* (AMAZ, MO, US, USM); Río Zumun, affluent du río Yahuayacu, affluent du río Ampiyacu affluent de l'Amazone à Pebas, commune de Colonia, territoire des indiens Bora, 1 June 1978, *S. Barrier 914* (MO, P); Requena, Sinchiucy, Río Amazonas, bosque primario, 03°35'S, 73°15'W, 106 m, 10 Aug. 1986, *R. Vásquez et al. 7834* (MO). **Pasco:** Oxapampa, Distr. Pozuzo, PN Yanachaga–Chemillen, Estación Biológica Huampal, trocha frente a la estación, camino al pajonal, Bosque Montano Primario, 10°11'S, 75°34'W, 1150 m, 8 Apr. 2003, *J. Lingán 388* (MO, USM); Distr. Puerto Bermudez, Río Pichis, Pozo Carachama, 10°07'03"S, 74°55'15"W, 277 m, 2 Aug. 2009, *L. Valenzuela & J. L. Mateo 13201* (HOXA, MO, USM).

5. *Caladium stevensonii* Croat & Delannay, sp. nov.

TYPE: Colombia. Meta: Parque Nacional Natural Tinigua, Río Duda, Serranía Chamusa, Centro de Investigaciones Ecológicas La Macarena, Camp. Paujil, bosque secundario, 350 m, Apr. 1997, *P. Stevenson 2056* (holotype, COL-402875!; isotype, NY!). Figure 14.

Diagnosis. *Caladium stevensonii* Croat & Delannay differs from *C. corteseae* Croat & E. G. Gonç. by having leaf blades broadly ovate-cordate (vs. narrowly ovate-sagittate and peltate) and drying grayish green with a whitish discoloration along the main veins on the lower surface (vs. yellowish brown or yellowish green) and inflorescences with shorter peduncles.

Terrestrial herb to 50 cm; **stem** tuberous, subterranean, rooted only at apex, ca. 1.5 cm diam., with white latex; **internodes** very short; **cataphylls** to 9 cm, enclosing base of petioles. LEAVES arising from base; **petioles** terete, 9.5–34 cm, 2–6 mm diam.; **blades** broadly ovate-cordate, obtuse at apex, 9.5–18 × 6–13.5 cm, 1.3 times as long as wide, 0.5–1 times as long as petiole, widest near middle, drying grayish green, with a narrow whitish discoloration along main veins on lower surface; **posterior lobes** 3–7.5 × 2.5–6 cm; **sinus** 2.7–5 cm deep, 1.1–2.3 cm wide, V-shaped; **midrib and major veins** slightly raised above and below, concolorous except for thin white blade discoloration along them; **basal veins** 3 to 4 pairs, first pair free to base; **primary lateral veins** 3 to 4 pairs, arising at steep angle then spreading to 35°–40° angle; **collective vein** running 2 mm from margin. INFLORESCENCES 1 to 2; **peduncle** 6–8 cm, 2 mm diam.; **spathe** 6.5–7.5 cm, enclosing spadix completely, tube 2 cm, 8 mm diam., blade white; **spadix** 5.5–6.5 cm; staminate spadix 4.8 cm, 4 mm diam., fertile flowers drying orange-brown; sterile staminate portion 2.1 cm, lower thickened portion 4.8 mm, 5.8 mm diam., consisting of two spirals of staminodia with staminodia 1.8–2 × 1.6–1.8 mm and a third and fourth row of much smaller staminodia at apex, these 2 × 0.5 mm, mostly naked interstitial area 1.2 cm diam.; pistillate portion 1 cm, 4 mm diam., **immature fruits** green.



Figure 14. *Caladium stevensonii* Croat & Delannay (Stevenson 2056; COL-402875). Herbarium specimen showing tuberosus stem, petioles, leaf blades, adaxial and abaxial surfaces, and inflorescence.

Distribution and habitat. *Caladium stevensonii* is endemic to Colombia in the Meta Department at 350 m in a *Tropical wet forest* life zone.

Etymology. The species is named in honor of Colombian botanist Pablo Stevenson of Los Andes University in Bogotá, who collected the type specimen.



Figure 15. *Syngonium adsettiorum* Croat, O. Ortiz & J. S. Harrison (Ortiz et al. 2517, MO-6724956). Herbarium specimen showing stem, petioles, leaf blades, adaxial and abaxial surfaces, and infructescence.

Discussion. *Caladium stevensonii* is characterized by its tuberous stems, short internodes, moderately long-petiolate leaves, terete petioles, broadly ovate-cordate, grayish green-drying blades obtuse at apex with a thin

white discoloration along the veins on the lower surface as well as by short-pedunculate inflorescences with a white spathe blade. It is most similar to *C. cortesae*, which is newly described above, and which has narrowly ovate-sagittate,



Figure 16. *Syngonium adsettiorum* Croat, O. Ortiz & J. S. Harrison (Ortiz et al. 2517). Live plant showing stem, petioles, leaf blades, adaxial and abaxial surfaces, one inflorescence, and three infructescences. Photo by Jerry Harrison.

peltate leaf blades that dry yellowish brown or yellowish green, as well as inflorescences with much longer peduncles.

II. *Syngonium* Schott.

I. *Syngonium adsettiorum* Croat, O. Ortiz & J. S. Harrison, sp. nov. TYPE: Panama. Panamá: Altos de Cerro Azul, El Torreón, Calle Kirkpatrick, a un costado de la casa de William Adsett, 09°12'40"N, 79°24'54"W, 16 Sep. 2015, O. Ortiz, A. De Sedas, P. Palma, Y. González, J. Harrison & L. Harrison 2517 (holotype, MO-2922382!; isotypes, FT!, PMA!). Figures 15–17.

Diagnosis. *Syngonium adsettiorum* Croat, O. Ortiz & J. S. Harrison differs from *S. sparreorum* Croat by having petioles sheathed to near the apex, leaf blades rounded and weakly short-apiculate at the medial lobe apex, narrowly rounded at the lateral lobe apices, and shorter inflorescences (spathe blade 5.5 cm long vs. 7.5–8.5 cm long for *S. sparreorum*) and infructescences (to 5.5 cm long and 2.7 cm diam. vs. 13 cm long and 5 cm diam. for *S. sparreorum*).

Hemiepiphytic appressed climber, growing to 4 m on trees; **internodes** longer than broad except near apex, drying medium yellow-brown, conspicuously ridged longitudinally; sap milky. **LEAVES** widely scattered on stem; **petioles** (8.5)18.5–20 cm, sheathed to near apex, free portion 1–1.5 cm, sheath rolled inward, margin moderately thick, persisting; **petiolules** 8–10 mm; **blades** trisect, (15) 21.2–22.5 × (16)18.3–27.5 cm, moderately coriaceous, dark green and matte above, slightly paler and semiglossy below, drying dark brown, matte and sparsely short pale-lineate above; **medial lobe** elliptic, rounded and weakly short-apiculate at apex, obtuse at base, (11.5)18.5–19.5 × 7.7–8.6 cm, slightly inequilateral (one side 8 mm wider); **lateral lobes** (8)11.1–12.7 × (2.8)5–6.4 cm, narrowly rounded at apex, rounded to obtuse at base; **midrib** weakly and obtusely sunken, concolorous above, reddish,

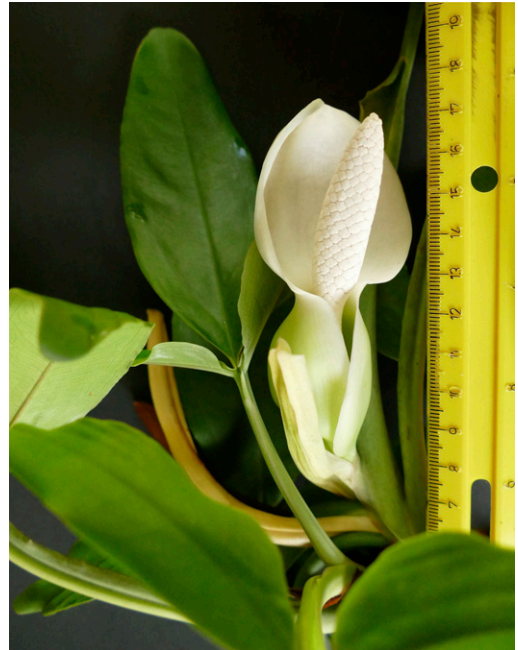


Figure 17. *Syngonium adsettiorum* Croat, O. Ortiz & J. S. Harrison (Ortiz et al. 2517). Close-up of inflorescence showing medium green spathe tube with white margins on both surfaces. Photo by Jerry Harrison.

narrow rounded, drying several-ribbed, minutely granular and nearly concolorous below; **primary lateral veins** 3 pairs, arising at a 20°–30° angle, lowermost weak and near border, second pair prominent and extending to near apex, uppermost pair weak; tertiary veins moderately obscure. **INFLORESCENCES** 4 per axil; **prophylls** 12–14 cm; **peduncles** 6–8 cm, drying finely wavy-ribbed, yellowish brown; **spathe** tube 5 cm, drying 1.8–2.5 cm diam., medium green with white margins on both surfaces, drying dark green; blade medium yellow-brown, initially persistent, 5.5 × 4–5 cm, 3.5 cm wide at anthesis, white inside, creamy white on outside, flattening to 5.5 cm wide; **spadix** 8.5 cm; staminate portion 6.7 cm, 1.2 cm diam.; sterile staminate portion 2.5 cm, lower thickened staminodia 3–3.2 × 2–2.5 mm, these immediately transitioning to longer and thicker staminodia, 4–4.5 × 1.5–2.5 mm, next 4 rows irregularly shaped staminodia 2 × 1 mm; pistillate spadix 1.5 cm, 9 mm diam. at base, 6 mm diam. at apex. **INFRUCTESCENCES** pendent with spathe tube olive-green, fruiting spathe tube drying 5.5 cm long, 2.7 cm diam.

Distribution and habitat. *Syngonium adsettiorum* is endemic to Panama, known only from the type locality in the Cerro Jefe Region at 783 m, in a *Tropical wet forest* life zone.

Etymology. The species is named in honor of William (Bill) Adsett and his wife, Esther, who discovered the new species growing on their property. Both have been active as members and volunteers in the Panama



Figure 18. *Syngonium bastimentoense* O. Ortiz & Croat (Ortiz *et al.* 1719). Live plant showing stem, petiole, leaf blade, adaxial surface, and inflorescence. Photo by Orlando Ortiz.



Figure 19. *Syngonium bastimentoense* O. Ortiz & Croat (Ortiz *et al.* 1719). Close-up of inflorescence showing spathe tube, green outside, and brown staminate spadix. Photo by Orlando Ortiz.

Audubon Society since 1986. Bill is a past president and conservation director of the society, while Esther served for over 15 years as its representative on the Board of Trustees of the Metropolitan Natural Park, a publicly owned preserved tropical forest adjacent to the urban center of Panama City. They continue their work in biodiversity conservation and environmental education. They purchased their property in Cerro Azul, where the new species was discovered, in 1990 in order to preserve and enjoy primary foothill forest. Both Jerry Harrison and Orlando Ortiz have been frequent visitors to the property to monitor the flowering of species there. It was on one of these occasions that Bill alerted Harrison about an aroid blooming next to his house, which led to this new *Syngonium* species being collected, studied, and described.

Discussion. *Syngonium adsettiorum* is a member of section *Syngonium*. It is characterized by its trisect, dark brown–drying leaves with moderately coriaceous, more or less elliptic, slightly inequilateral leaflets that are rounded at the apex and have distinct petiolules, and by a cluster of up to four inflorescences per axil with the tube medium green on both surfaces and somewhat persistent medium brown–drying spathe blades. In the *Syngonium* key (Croat, 1981b), the species keys to *S. sparreorum* Croat, from the western slope of the Ecuadorian Andes at 250-m elevation. That species differs by having petioles sheathed only 1/2 to 2/3 their length, leaf blades abruptly acuminate at the apex, and larger inflorescences with peduncles 7–10 cm long and infructescences (spathe tube) to 13 cm long.

2. *Syngonium bastimentoense* O. Ortiz & Croat, sp. nov. TYPE: Panama. Bocas del Toro: Parque Nacional Bastimento, Área boscosa cerca del pueblo, bosque secundario, 09°18'56"N, 82°08'52"W, 49 m, 6 Oct. 2013, O. Ortiz, A. Zapata, J. Timoteo

& R. Smitt 1719 (holotype, PMA-0107554). Figures 18, 19.

Diagnosis. *Syngonium bastimentoense* O. Ortiz & Croat differs from *S. hoffmanii* Schott by having stems and petioles not glaucous, leaf blades drying greenish gray, inflorescences solitary, and the spathe green, drying dark brown.

Hemiepiphytic appressed climber; sap milky; **internodes** longer than broad, epidermis drying yellowish brown, tightly and prominently and irregularly acutecribbed, these finely and minutely granular. **LEAVES** with **petioles** 26.5 cm, sheathed to 15 cm, 0.45 its length, coarsely ribbed with surface minutely and closely ribbed, matte; sheath acute at apex, margin persisting intact; **blades** trisect, 30.5 × 30 cm, about as long as broad, dark green and matte above, moderately paler and weakly glossy below, drying matte greenish gray above, much paler and weakly glossy below, narrowly long-acuminate at apex, acute at base; medial lobe 26 × 10.2 cm, markedly inequilateral, one side 4 cm narrower; **lateral lobes** inequilateral, 7 cm wide (one side 1.6 cm wider), bluntly acute at apex, markedly auriculate on outer margin at base; auricle 4.7 × 1.7–1.9 cm, constricted to 9–12 mm wide; **primary lateral veins** 13 to 14 pairs, arising at a 45°–50° angle; **primary collective veins** 8 to 12 from margin. **INFLORESCENCE** solitary; **peduncle** 4.5 cm, 4 mm diam., drying dark brown; **spathe** 8 cm; tube 3.7 cm long, 1.7 cm diam., spathe blade green, drying dark brown, matte; **spadix** brown, 5.8 cm; staminate portion 4.6 cm; sterile staminate portion 1.4 cm, 1 cm diam. at base, tapering slightly upward, staminodia 1.5–2 mm diam., subrounded; pistillate portion 1 cm in front, 7 mm in rear, 5.5 mm diam.

Distribution and habitat. *Syngonium bastimentoense* is endemic to Panama, known only from the type locality in Bocas del Toro Province at 49-m elevation in an area of *Tropical moist forest* life zone.



Figure 20. *Syngonium brewsterense* Croat & Delannay (de Nevers et al. 6304, MO-3320660). Herbarium specimen showing stem, petioles, leaf blades, mostly abaxial surface with adaxial surface folded at the tip, and infructescences.

Etymology. The species is named for the type locality in the Parque Nacional Bastimento in Bocas del Toro Province.

Discussion. *Syngonium bastimentoense* is a member of section *Syngonium* and is characterized by tri-lobed greenish gray-drying leaf blades with prominently and

narrowly auriculate lateral lobes and solitary short-pedunculate green inflorescences. The species most closely resembles *S. hoffmanii* Schott, which differs by having glaucous stems and petioles, blackish drying blades, up to three inflorescences per axil, and the spathe surface purplish outside. It also resembles *S. mauroanum* Birdsey ex G. S. Bunting, but that species differs by having the auricle on the lateral lobes broad and more or less triangular. In Croat's (1981a) *Syngonium* revision, the species would key out as *S. triphyllum* Birdsey ex Croat, which differs in having sharply triangular petioles with prominently raised margins, lacking conspicuous auricles on the lateral lobes, and having more numerous and more closely spaced primary lateral veins.

3. *Syngonium brewsterense* Croat & Delannay, sp. nov. TYPE: Panama. Comarca Kunayala, Cerro Brewster, 09°18'N, 79°16'W, 800–850 m, 20 Nov. 1985, G. de Nevers, A. Henderson, H. Herrera, G. McPherson & L. Brako 6304 (holotype, MO-3320660!; isotypes, K!, PMA!). Figure 20.

Diagnosis. *Syngonium brewsterense* Croat & Delannay differs from *S. armigerum* (Standl. & L. O. Williams) Croat in having larger leaves, with longer lobes and blades broadest across the tips of the posterior lobes, and much longer petioles.

Hemiepiphytic climber; **internodes** 1.7–4 cm, drying 0.7–1.7 cm diam., deeply acute-ribbed, yellow-brown. LEAVES with **petioles** 21.5–45.5 cm, sheathed to within 2–3.3 cm from base of blade; free part drying sulcate; sheath erect, to ca. 6 mm high, somewhat free-ending, drying dark brown with sheath margins intact; **blades** narrowly sagittate-hastate, 27–35 × 11.5–15.5 cm, (1.8)2–2.2 times longer than wide, broadest across tips of posterior lobes, acuminate at apex, 0.6–0.9 times as long as petioles, drying very thin and brittle, brownish and matte on upper surface, grayish yellow-green and semiglossy on lower surface; **anterior lobe** 22–28 × 7–10 cm in lower 1/3, somewhat constricted at or slightly above petiolar plexus and 6–9.5 cm wide; **posterior lobes** 7.8–9.8 × 3.2–4 cm across broadest part of lobe on auricle, narrowly rounded at apex, moderately auriculate on lower margin; **sinus** 4–6 cm deep, 1.7–2.3 cm wide above auricles, spatulate to subrhombic; **primary lateral veins** 5 to 6 pairs, lowermost to a 30° angle, upper ones to a 50°–60° angle; tertiary veins moderately distinct below, not markedly raised. INFRACTESCENCES paired; **peduncles** 6–8 cm, 3–4 mm diam.; mature **spathe** 19 cm, spathe blade moderately coriaceous, persisting for a time on fruiting spathe; spadix ca. 17 cm post-anthesis; staminate portion rotten, spathe tube 8–9 cm, 4.3–4.6 cm diam., green outside, red inside, fruiting spadix 6–7.5 cm; seeds gray, 6–7 mm long, 3.5–4 mm diam., ovoid to ellipsoid.

Distribution and habitat. *Syngonium brewsterense* is endemic to Panama, known only from the type locality in the Comarca Kunayala on Cerro Brewster at 800–850 m in a *Premontane rainforest* life zone.

Etymology. The species is named for the type locality on Cerro Brewster in Panama.

Discussion. *Syngonium brewsterense* is a member of section *Cordatium*. It can be recognized by its hemiepiphytic habit with the elongate internodes drying prominently acute-ribbed and yellow-brown, petioles sheathed nearly to the apex and drying with the sheath margins intact, narrowly sagittate-hastate leaf blades with the upper surface brownish and the lower surface grayish yellow-green, and by its pairs of giant infructescences with a green exterior and red interior. The species seemingly has no close relatives but should be compared with *S. armigerum* (Standl. & L. O. Williams) Croat, which is also a vine with large fruiting spathes. That species differs by having smaller leaves, much shorter petioles (5–7 cm long), and smaller blades that are broadest in the middle with much shorter lobes. *Syngonium hastiferum* (Standl. & L. O. Williams) Croat differs by having much larger posterior lobes.

4. *Syngonium churchillii* Croat & O. Ortiz, sp. nov.

TYPE: Panama. Chiriquí: along Pan American Hwy., E of turnout to Gualaca, 08°30'N, 82°17'W, 100 m, 17 Sep. 1984, H. W. Churchill 6033 (holotype, MO [3 sheets] MO-3202025!, MO-3202026!, MO-3285926!). Figure 21.

Diagnosis. *Syngonium churchillii* Croat & O. Ortiz differs from *S. mauroanum* Birdsey ex G. S. Bunting by having the lower outer margin of the lateral leaf blade lobes prominently narrowed (nearly pinched off) (vs. subtriangular or rounded).

Hemiepiphytic, stem scandent, climbing; **internodes** (0.5)1–2 cm, less than 1 cm diam., usually longer than broad, drying acutely several-ribbed, epidermis drying yellowish brown. LEAVES with **petioles** 22–27 cm, subflattened adaxially with raised margins and medial rib, drying finely ribbed, sheathed to 14.3 cm, 0.62 its length, sheath acute at apex, margin persisting intact; **blades** 3-parted, 20–25 × 20.5–23.5 cm, about as broad as long, subcoriaceous, dark green above, slightly paler below, drying medium brown, matte above, yellowish green and weakly glossy below; all lobes narrowly long-acuminate at apex; **medial lobe** 15.5–19.3 × 3.6–7.8 cm, moderately inequilateral, one side 1.1–1.7 cm wider, attenuated at base; **lateral lobes** 14.5–15 × 3.3–5.5 cm, markedly inequilateral, (one side 1.2–2.1 cm wider), narrowly acute at apex, markedly auriculate on outer margin at base, inner margin gradually attenuated; auricles narrow and elongated, directed parallel to petiole, 3.5–7 × 1–2.5 cm, sometimes ± elliptic, 3.7 × 3.2 cm; midrib weakly raised and



Figure 21. *Syngonium churchillii* Croat & O. Ortiz (Churchill 6033, MO-3202025). Herbarium specimen showing stem, petioles, leaf blades, adaxial and abaxial surfaces, and infructescences.

concolorous above, drying darker, 5-ribbed below; **primary lateral veins** 6 to 10 pairs, arising at a 50°–55° angle; primary collective vein 3–6 mm from margin;

tertiary veins moderately inconspicuous below. **INFLORESCENCES** 2 to 3 per axil, post-anthesis, pendent; **peduncle** 9–9.5 cm, 3–5 mm diam., drying blackened;



Figure 22. *Syngonium litense* Croat (Croat et al. 83814). Live plant showing climbing stem, petiole, and leaf blades.

spathe blade absent, **tube** 5–6 cm; 2.3–3.2 cm diam., green outside, maroon inside, drying dark blackened, matte; spadix with sterile staminate portion ca. 1.5 cm, mostly eaten away. **INFRUCTESCENCE** to 6 cm, 2.5 cm diam.; seeds 1.5–2 mm, 1.6–1.5 mm diam.

Distribution and habitat. *Syngonium churchillii* is endemic to Panama, known only from the type locality in Chiriquí Province at 100-m elevation in a *Premontane wet forest* life zone.

Etymology. The species is named in honor of the late Dr. Hugh Churchill, who collected the only known collection of the species. Churchill worked for the Missouri Botanical Garden and was the collector for the Flora of Panama Project. He collected many new species, especially from the region of the Fortuna Dam, which was just being developed at the time of his service.

Discussion. *Syngonium churchillii* is a member of section *Cordatium* Croat and is characterized by its trisect, brownish drying leaves with acuminate leaflets, these attenuated at the base and with the lateral lobes bearing a typically narrow elongate posterior lobe that is parallel to the petiole, and by its up to three inflorescences per axil with the spathe tube maroon inside.



Figure 23. *Syngonium litense* Croat (Croat et al. 83814). View of leaf blades, adaxial and abaxial surfaces.

Syngonium mauroanum and *S. neglectum* Schott are both seemingly easily confused with *S. churchillii*. The former differs by having the lower outer margin of the lateral lobes subtriangular or rounded, not prominently narrowed. *Syngonium neglectum*, while sometimes having small leaves that are similar to those of *S. churchillii*, differs by being restricted to Mexico and by having much larger inflorescences with the spathe blade alone 9–15 cm long and persisting intact and reflexed after anthesis. In contrast, the spathe of *S. churchillii* is at most 6 cm long and deciduous, not persisting after anthesis.

5. *Syngonium litense* Croat, sp. nov. TYPE: Ecuador.

Esmeraldas: along hwy. from Esmeraldas to San Lorenzo, 32.9 km E of main San Lorenzo Rd., 10.6 km E of Río Santiago bridge, 01°02'47"N, 78°58'13"W, 44 m, 10 July 2000, *T. B. Croat, L. P. Hannon, D. P. Hannon & E. Kinsinger 83814* (holotype, MO [2 sheets] MO-5150837!, MO-5150838!; isotypes, B!, COL!, HUA!, K!, NY!, QCNE!, S!, US!). Figures 22–24.

Diagnosis. *Syngonium litense* Croat differs from *S. macrophyllum* Engl. by having narrower stems (to 2.5 cm diam. vs. 3–4 cm in *S. macrophyllum*), less coriaceous leaves with smaller lobes (with the medial lobe less than 33 cm long vs. usually more than 35 cm long in *S. macrophyllum*), and narrowly ovate-oblong-sagittate (vs. ovate-cordate) juvenile leaves.

Appressed-climber or hemiepiphyte at 3.5 m. **JUVENILE LEAVES** narrowly ovate-oblong-sagittate, 15–17 × 5.3–7 cm, the posterior lobes triangular, 3–4 cm, narrowly rounded at apex. **ADULT PLANTS** with **internodes** 5–10 cm, 1.7–2.5 cm diam., dark green or dark olive-green, glossy, becoming ± grayish green in age, flattened-ribbed on one side, irregularly and smoothly wrinkled, drying yellow-brown and glossy. **LEAVES** with **petioles** 47–64 cm, 5–7 mm diam., sheathed in lower 1/3–1/2 its length, sheath erect, 16–33 cm, to 3.5 cm high at base, medium to dark green, semiglossy, drying dark yellow-brown, sheath

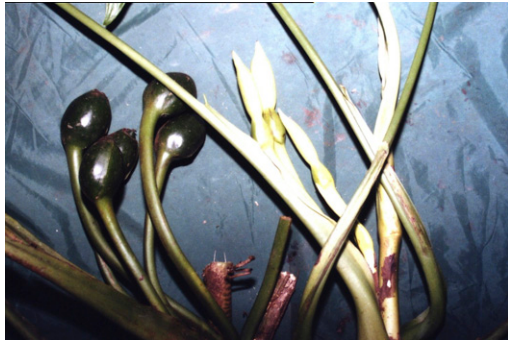


Figure 24. *Syngonium litense* Croat (Croat et al. 83814). Close-up of inflorescences with spathe tube medium green outside, and infructescences with large dark green spathe tube outside.

incurled, later spreading, free-ending at apex; free part terete near base, obtusely angular adaxially; **blades** usually 7-lobed (younger leaves trisected with 2 small lobes at base), 30–39 × 24–37 cm, thinly coriaceous, dark green and semiglossy above, slightly paler and semiglossy below, drying dark yellow-brown to blackish above, greenish yellow-brown and weakly glossy below; **medial lobe** oblanceolate, 29–33 × 10–11.5 cm, 2.6–3.2 times longer than wide, acuminate at apex, attenuated at base; **inner lateral lobes** 23–28 cm, only slightly shorter than medial lobes, narrowly rounded to bluntly acute at apex, markedly inequilateral, outer margin up to 2 cm wider than inner margin; outermost pair of lobes typically markedly auriculate at base of outer margin, auricle pinched off or sometimes becoming essentially free, 2.5–9 × 1.3–3 cm; **major veins** sunken and concolorous above, narrowly rounded and concolorous below; **midrib** narrowly rounded and slightly paler below, drying concolorous and narrowly wrinkled-ridged above, finely many-ridged and paler below; **primary lateral veins** sunken above, convex below, drying sunken and concolorous above, 4- to 5-ridged and paler below; **tertiary veins** fine, visible but not raised below. **INFLORESCENCES** 4 to 7 per axil, post-anthesis; **peduncle** 12–21 × 8–9 mm, slightly off terete, dark green, semiglossy; **spathe** 10–13 cm; tube 4–5 cm, 1.5–2 cm diam., medium to dark green and weakly glossy outside, moderately paler and glossier within, blade 6–8 cm, paler green, already moderately loose, outside weakly glossy, inside glossier; **spadix** 11.5 cm; male spadix 5.5 cm, 1 cm diam. in middle, white; sterile male portion 3.5 cm; female spadix 2.5 cm, pale green. **INFRUCTESCENCES** 6–6.5 cm, 3.7–4 cm diam.; spathe dark green and glossy outside, greenish white and glossy inside; fruit in spadix light brown or dark green, becoming orange at maturity, ca. 3.5 cm diam., 5 cm.

Distribution and habitat. *Syngonium litense* is endemic to Ecuador (Esmeraldas, Imbabura, Los Ríos,

Tsáchilas) at 0–830 m in *Tropical wet forest* and *Premontane wet forest* life zones.

Etymology. The species is named for the Lita region, where the senior author first became acquainted with it and circulated images and specimens with that name.

Discussion. *Syngonium litense* is a member of section *Syngonium* and is distinguished by its vining hemiepiphytic habit, mostly 7-lobed, dark yellow-brown–drying palmately compound leaves with the leaf lobes acuminate, attenuate toward the base with the rachis markedly free between the inner segments and medial lobe and with the outermost lobe usually prominently auriculate with a short narrow lobe, petioles sheathing 1/3 to 1/2 their length, and by four to seven narrowly pedunculate inflorescences with a narrowly ovoid-ellipsoid spathe tube. *Syngonium litense* is most similar to *S. macrophyllum*, which differs by having more coriaceous leaves and larger lobes. The species was first collected in Cerro Samama in Los Ríos Province on 18 May 1994 by Bertil Ståhl and Jette T. Knudsen of Gotland University in Sweden.

Paratypes. ECUADOR. **Esmeraldas:** Lita–San Lorenzo Rd., Río Piguambi, 6.4 km W of Río Lita Bridge (below Lita), 00°52′04″N, 78°29′03″W, 685 m, 30 June 1998, *T. B. Croat, R. Mansell, L. P. Hannon & J. Whitehill* 82179 (MO, QCNE); Lita–San Lorenzo Rd., Río Chuchubi, first waterfall W of Lita, 6.4 km W of Río Lita (below Lita), 00°52′08″N, 78°28′09″W, 609 m, 2 July 1998, *T. B. Croat, R. Mansell, L. P. Hannon & J. Whitehill* 82253 (MO, QCNE); Lita–San Lorenzo Rd., vic. of Alto Tambo, 19.4 km W of Río Lita, 00°54′N, 78°32′W, 829 m, 5 Oct. 1999, *T. B. Croat et al.* 83027 (MO, QCNE); Lita–San Lorenzo Rd., 2 km E of Gasolinera San Lorenzo near E edge of town, 01°07′28″N, 78°43′18″W, 8 m, 7 Oct. 1999, *T. B. Croat et al.* 83079 (MO, QCNE); Lita–San Lorenzo Rd., 3.2 km E of Río Tululbí, 16.7 km E of Gasolinera San Lorenzo, in swampy area, 01°09′30″N, 78°45′W, 140 m, 7 Oct. 1999, *T. B. Croat et al.* 83095 (MO, QCNE); along rd. from Quinindé to Bilsa, 6.4 km W of Santo Domingo to Esmeraldas Hwy., departing ca. 15 km N of Quinindé, 00°23′13″N, 79°34′03″W, 231 m, 9 July 2000, *T. B. Croat et al.* 83806 (MO, QCNE); SW of Esmeraldas, along rd. S of Atacames via la unión & Boca de Tasones & Las Vegas, vic. of Santa Teresa, Finca Julio, along Río Mono, along western edge of Montañas de Mache, 00°52′00″N, 79°51′00″W, 16 Feb. 2015, *T. B. Croat, B. Baumann, E. Campos & J. Avila* 106150 (MO); Quinindé, Bilsa Biological Station, tropical & premontane wet forest, 00°21′00″N, 79°42′00″W, 450–650 m, Oct. 2006, *N. Köster & A. Schnell* 2071 (MO). **Imbabura:** cultivated at Missouri Botanical Garden, collected by R. Mansell in Ecuador, Imbabura, Site 2, Ibarra-Lita, Río Mirabridge, RR cut right of bridge to RR station at Cachacho along tracks E of station, 8.5 km E of hotel in Lita (Resid. Villalobos Naranjo), 617 m, 11 Dec. 1998, *T. B. Croat* 82922 (MO). **Los Ríos:** Jauneche Forest, Canton Vinces, betw. Mocachi & Palenque on Estero Peñafiel, 01°16′00″S, 79°42′00″W, 70 m, 15 Aug. 1978, *C. H. Dodson et al.* 7110 (MO); Hacienda Clementina, Cerro Samama, trail from Destacamento Pita to Limón, 400–500 m, 2 Feb. 2008, *B. Ståhl, S. Petterson & F. Skagerer* 6868 (MO); Hacienda Clementina, Cerro Samama, primary forest, 01°39′S, 79°19′W, 455 m, 28 June 1995, *S. Roponen &*



Figure 25. *Syngonium purpureospathum* Croat & Raz (Raz et al. 718, FTG). Herbarium specimen showing petioles, leaf blades, adaxial and abaxial surfaces, and inflorescence.

S. Lindström 027 (MO); Cerro Samana, SE of Potosí, SW of Caluma, S of Río Pita, vic. of village of Pita, betw. Pita & Escuela 18 de diciembre, 01°38'44"S, 79°19'58"W – 01°39'38"S, 79°39'38"W, 164–400 m, 18 Mar. 2006, *T. B.*

Croat, C. Davidson & S. Davidson 96091 (MO, QCNE); Hacienda Clementina, Cerro Samana, primary forest, 01°39'S, 79°19'W, 455 m, 11 Dec. 1996, *S. Roponen & Å. Johannessen* S047 (MO); Cerro Samana, above Río Mombe,



Figure 26. *Syngonium tacotalpense* Díaz-Jiménez & Croat (*P. Díaz Jiménez 1361*, UJAT). Herbarium specimen showing stem, petiole, leaf blades, mostly adaxial surface with abaxial surface folded under, and infructescences.

ca. 38 km NE of Babahoya, 01°39'S, 79°22'W, 200–400 m, 18 May 1994, *B. Ståhl & J. Knudsen 1042* (S). **Pichincha [Tsáchilas]**: Bosque Protectora “Las Perlas,” along Río Cucharacha, vic. of Km. 40 on Sta. Domingo–Esmeraldas Hwy., ca. 3 km S of Concordia, 00°00'09"S, 79°22'53"W, 300 m, 27 June 1998, *T. B. Croat et al. 82118* (MO, QCNE).

Cultivated plant. ECUADOR. **Imbabura**: cultivated at Missouri Botanical Garden, collected by R. Mansell in Ecuador, Imbabura, Site 2; Ibarra-Lita, Río Mirabridge, RR cut right of bridge to RR station at Cachacho along tracks E of station, 8.5 km E of hotel in Lita (Resid. Villalobos Naranjo), 617 m, 11 Dec. 1998, *T. B. Croat 82299* (MO).



Figure 27. *Syngonium tacotalpense* Díaz-Jiménez & Croat (P. Díaz Jiménez 1361). Live plant showing stem, petioles, leaf blades, mostly abaxial surface, one inflorescence, and five infructescences.

6. *Syngonium purpureospathum* Croat & Raz, sp. nov. TYPE: Caribbean. Jamaica: St. James Parish: Johnson Distr., Cockpit Country, 1 mi. S of Sweet Water, White Rock Hill, ca. 100 m N of main rd., 18°26'N, 77°50'W, 640 m, 14 Aug. 2007, L. Raz, K. Wendelberger, H. Jacobsen, C. Jones, G. Proctor & S. Palmer 718 (holotype, IJ!; isotypes, FTG!, MO-5996108!, UCWI!). Figure 25.

Diagnosis. *Syngonium purpureospathum* Croat & Raz differs from *S. auritum* (L.) Schott in having a violet-purple spathe and 3-lobed leaf blades that lack auricles on the lateral lobes.

Epiphytic to epipetric; **internodes** short, to ca. 1 cm diam., thicker than broad toward apex, drying closely and sharply ribbed, yellow-brown, uppermost nodes minutely and irregularly ridged. LEAVES with **petioles** 14–24 cm, sheathed to within 1.5–3.5 cm from base of blade; sheath spreading, 1.8–2 cm wide midway, free-ending at apex, weakly undulate along margins, free portion subterete, drying closely and minute acute-ridged; **blades** trisect; medial segment ovate, 14.3–20.3 × 6.9–11.7 cm, 1.6–2.1 times longer than wide, slightly inequilateral, one side 6–10 mm wider, acute to narrowly rounded and short-apiculate at apex, rounded to rounded-truncate at base, scarcely to not at all confluent onto lateral segments; lateral segments much smaller, 7.7–12.2 cm long, 2.7–4.9 cm wide, directed at a 115°–155° angle from midrib, oblong to oblong-elliptic, slightly inequilateral, one side 2–8 mm wider, rounded at apex, inner margin acute and weakly confluent onto medial lobes (confluent portion 1–2 mm wide), outer margin acute to weakly auriculate (but not forming a lobe). INFLORESCENCES one per axil, up to 3 borne in uppermost leaf axils; **prophylls** 9–13.2 cm, 2-ribbed; **peduncle** 4–6.5 cm, drying dark brown, 3–6 mm wide; **spathe** stiffly erect, 13–14.5 × 6 cm



Figure 28. *Syngonium tacotalpense* Díaz-Jiménez & Croat (P. Díaz Jiménez 1361). Close-up of opened inflorescence showing spathe tube, green on both surfaces, greenish spathe blade, green pistillate spadix, and white sterile and fertile staminate spadix.

when flattened, the tube oblong-elliptic, medium green, 4 cm long, drying 1 cm wide, dark brown, finely ridged and weakly pustular, blade naviculiform at anthesis with lateral margins curled backward, violet-purple and semiglossy adaxially, green abaxially, drying medium yellow-brown on both surfaces at anthesis; **spadix** to 10 cm, staminate portion extending about 2/3 up length of spathe; staminate spadix, 6.5–7 cm long, drying 9 mm diam., pale green pre-anthesis, turning yellow at anthesis, drying dark brown, 7–9 mm wide, shedding copious yellow pollen; sterile staminate portion 1 cm, 3 mm diam., slightly broadened at apex with a few staminodia, these 0.6–2 × 0.9–1.2 mm; pistillate portion 3.3 cm × 4–5 mm; pistils widely scattered, 3 to 4 across width of spadix; style rounded, drying blackened, 2 mm diam. Fruits not seen.

Distribution and habitat. *Syngonium purpureospathum* is endemic to the Cockpit Country of St. James Parish in Johnson District on craggy limestone cliffs in Jamaican moist forest at 640-m elevation. It grows on east-facing ledges and cliffs, on lower parts in shade.

Etymology. The specific epithet “*purpureospathum*” comes from the Latin “*purpureus*” (purple) and “*spathum*” (spathe).

Discussion. *Syngonium purpureospathum* is a member of section *Syngonium* and is characterized by its short yellow-brown-drying internodes, broadly sheathed petioles with the sheath free-ending at apex and 1.5–3.5 cm from base of blade, trisect leaf blades with the medial segment ovate and slightly inequilateral and acute to narrowly rounded at apex, rounded to rounded-truncate at base, scarcely to not at all confluent onto the much smaller lateral segments, as well as by the solitary inflorescence, short slender peduncle, stiffly erect spathe with an oblong-elliptic medium green tube, and dark violet-purple-drying spathe blade post-anthesis with its lateral margins curved backward. This species is presumably most closely related to *S. auritum*, which also occurs in Jamaica. It differs from *S. auritum* in having a violet-purple spathe and 3-lobed blades that lack auricles on the lateral lobes of the leaf blades. In contrast, *S. auritum* has prominent auricles on the lateral lobes and a creamy white spathe, more typical of other species in the genus.

Paratypes. CARIBBEAN. **Jamaica:** Trelawny, Crown Lands, ca. 10 km NW of Troy, steep limestone slopes, NW of unpaved rd., about 1 km before rd. terminates, 580 m, 16 Aug. 2006, *L. Raz et al.* 700 (FTG, MO); Hanover Parish, Dolphin Head Mtn., E side (base) of mtn., 544 m, 8 Sep. 2001, *P. Acevedo-Rodríguez & K. Campbell* 12009 (IJ); Westmoreland Parish, Brighton Distr., Negril Hills, 200 ft., 18 Nov. 1955, *G. R. Proctor* 11155 (IJ); vic. of Auchtembeddie, shaded limestone cliff, 1750 ft., 1 Dec. 1962, *G. R. Proctor* 22976 (IJ); along the Ipswich rd., 1 mi. N of Redgate, wooded limestone hillside, 500 ft., 5 Aug. 1962, *G. R. Proctor* 22562 (IJ); vic. of Auchtembeddie, shaded base of limestone cliff, 1250 ft., 9 Aug. 2003, *G. R. Proctor* 52183 (IJ); Geneva Mtn. area, Dolphin Head Forest Reserve, 50–500 ft., 13–14 Feb. 2001, *G. R. Proctor* 52812 (IJ); St. Elizabeth Parish, Black River Morass, near jct. of the Y.S. & Black Rivers, 25 Jan. 1964, *G. R. Proctor* 24515 (IJ); St. Elizabeth Parish, near the Styx River, Slipe Distr., 20–40 ft., 15 Jan. 1963, *G. R. Proctor* 23144 (IJ); Hanover Parish, Bulls Bay, 5–10 ft., 24 Aug. 1963, *G. R. Proctor* 23976 (IJ); Manchester Parish, Smithfield, 1.75 mi. E of Cross Keys, 1750 ft., 8 Nov. 1962, *G. R. Proctor* 22889 (IJ).

7. *Syngonium tacotalpense* Díaz-Jiménez & Croat, sp. nov. TYPE: Mexico. Tabasco: Mpio. Tacotalpa, Buenos Aires, Selva alta perennifolia, 17°21'N, 92°42'W, 14 May 2005, *P. Díaz Jiménez & J. M. Ascencio Rivera* 165 (holotype, MO [2 sheets] MO-6355420!, MO-6355671!; isotypes, K!, UJAT!, US!). Figures 26–28.

Diagnosis. *Syngonium tacotalpense* Díaz-Jiménez & Croat differs from *S. angustatum* Schott in having glaucous stems that are not muricate, leaf blades with more pairs of primary lateral veins (four to eight vs. three to five), and eight (to 10) inflorescences per axil.

Hemiepiphyte; stem dark green and glossy, glaucous, to ca. 1.6 cm diam.; leaf blades of the pre-adult climbing phase simple, usually hastate or sagittate; **adult internodes** 2–6 cm long. LEAVES erect-spreading;

petioles 20–59 cm, sheathed 2/3–3/4 its length; **blades** trisect or 5- to 11-pedatisect, thin, upper surface dark green, lower surface paler; segments 5, usually free; posterior segments rarely auriculate at base; median segment oblong-elliptic to lanceolate, abruptly acuminate at apex, decurrent at base, 29–38 cm long, 6.2–7.3 cm wide; rachis usually cruciform; **midrib** deeply sunken and concolorous above, prominently rounded below; **primary lateral veins** 4 to 8 pairs on median segment; collective veins 2. INFLORESCENCES ca. 8 (to 10) per axil; prophylls ca. 13.5 cm; **peduncle** dark olive-green, 6.5–7.5 cm, erect in anthesis, 13 cm and pendent in fruit; **spathe** 9.3 cm long; spathe blade 7.2 cm long, 4.5 cm wide at anthesis, cream; tube of spathe ovoid to ellipsoid, ca. 3.6 cm, green yellowish inside and green outside; **spadix** with **pistillate portion** ca. 2.2 cm, 10 mm diam., greenish cream and yellowish; **staminate portion** ca. 5 cm, 12 mm diam., cream. INFRUCTESCENCES pendent, peduncles green, weakly flattened, ca. 13 cm, fruits ovoid, 3.5–5 cm long, 1.5–3 cm diam., reddish, spathe persistent in fruit.

Distribution and habitat. *Syngonium tacotalpense* is endemic to Mexico, known only from the type locality at 450 m in a *Tropical moist forest* life zone.

Etymology. The species is named for the type locality in Municipio Tacotalpa in the state of Tabasco in Mexico.

Discussion. *Syngonium tacotalpense* is a member of section *Syngonium* and is characterized by its hemiepiphytic habit, with leaf blades of adult plants trisect or 5- to 11-pedatisect and leaf blades of the pre-adult climbing phase simple, usually hastate or sagittate. The species is perhaps most easily confused with *S. angustatum*, which differs in having stems not glaucous, usually sparsely muricate, and fewer pairs of primary lateral veins (three to five vs. four to eight) and inflorescences ca. seven versus ca. eight (to 10) per axil.

8. *Syngonium yurimaguense* Engl., Bot. Jarhb. Syst. 37: 141. 1905. TYPE: Peru. Yurimaguas, *Ule* s.n. (B).

Discussion. *Syngonium yurimaguense* is reported for the first time outside of the Amazon Basin, with all other collections known from the Amazon lowlands ranging from southern Colombia to Peru and Bolivia at 100–300 m. The collection *César Barbosa* 1140 was collected on 24 July 1979 in Chocó Department at Parque Nacional Los Katios. The collection appears to differ in no significant way from typical material from the Amazon Basin except in having a peduncle on the infructescence to 15 cm long. A distribution of this type is so rare among South American Araceae that it is worth reporting. There are other species of Araceae that occur in Central Colombia in the valley of the Río Magdalena,

but usually the populations in the north of Colombia are considerably changed from the populations in the Amazon Basin and may have evolved considerably. Examples include *Anthurium clavigerum* Poepp., where collections in Magdalena Department (*Fonnegra et al.* 7371 and 7401 at 30-m elevation and *Murulanda et al.* 2008 at 50 m) are sufficiently distinct from *A. clavigerum* that they could be considered another species. *Anthurium eminens* Schott, another widespread species in the Amazon was discovered in the north of Colombia, but was considered to be a subspecies, *A. eminens* subsp. *longispadix* Croat & M. M. Mora from the coast of Chocó Department on Cabo Corrientes. The corridor of immigration from the Amazon Basin would appear to be in the lower passes between the departments of Caquetá or Putumayo in the south of Colombia, where the headwaters of the Río Putumayo and the Río Caquetá are not distant from the headwaters of the Río Magdalena. Perhaps at some time in the past when the Andes were less well developed in these regions these Amazonian species could have immigrated into northern Colombia, or perhaps a more widespread species had populations separated by the rise of the Andes.

Specimen examined. COLOMBIA. **Chocó:** Riosucio, Parque Nacional Natural Los Katios, camino de Tilupo a Quebrada Babillas, 07°53'12"N, 77°07'55"W, 24 July 1979, *C. Barbosa 1140* (FMB).

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