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Front Cover

Lazarum johnsonianum, a tropical Australian arum with a restricted distribution. It is one of the former *Typhonium* species transferred to *Lazarum* in this issue.
Photo: M. Barrett.

Back Cover

Englerarum montanum on forested Karst limestone in Tham Pha Tup, Nan Thailand. Photo: D. Prehsler.

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Follow this order: title, author name and address, abstract, introduction, materials and methods, results, discussion, acknowledgments, and literature cited. Captions must accompany all tables and figures. Abstracts should summarize the character and scope of the paper in 250 words or less, followed by no more than eight key words. Literature cited must be referenced in the text and listed alphabetically by author.

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Voucher Materials

Descriptions of new species require deposit of type materials in a recognized herbarium.

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CONTENTS

Note:

- Clicking an article in the Table of Contents will link directly to the article.
- Clicking the star in the middle of an article's footer will return the reader to the Table of Contents.
- Many references to photos when clicked will link directly to the photo.
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Three new species of South American *Anthurium* (Araceae) — incidences of distant collaboration

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ABSTRACT

Anthurium hoellii Croat from Valle del Cauca Department, Colombia, *A. holyi* Croat and *A. wellingae* Croat both from southern Ecuador, Zamora-Chinchipe Province are described as new.

Key words: new species, Colombia, Ecuador, *Anthurium*, sect. *Belolonchium*, sect. *Calomystrium*,

INTRODUCTION

Anthurium is the largest genus in the Araceae family with 950 published species and an estimated total of 3000 species (Boyce & Croat, 2011 onward). New species of Araceae are constantly being discovered but most owe their discovery to herbarium or field studies directly. In the course of work with horticultural enthusiasts throughout the world, I am constantly being asked to determine images of plants that someone somewhere in the world sends to me. In my regular duties, this is an almost daily occurrence but only infrequently does it actually result in the receipt of herbarium material which enables me to officially describe and publish the results of discovery. Most images obtained are interesting and many represent new species but they remain plants of little importance, either because they are of unknown origin or they are of known origin but represent plants for which there is little hope of obtaining herbarium specimens, an essential part of describing and publishing new species. Normally the pictures are saved, but with little hope that it will result in the production of needed herbarium specimens. This paper will describe three separate incidences which have enabled the discovery of new species. Hopefully, this will encourage more such collaboration.

In the first situation, I received a message from Peter Hoell who lives in Cali, Colombia. Peter sent me images of three *Anthurium* species he found in his backyard. At least two of the four plants proved to be new to science. Admittedly not a normal occurrence for the average home owner to find new species in their backyard but Peter lives adjacent to a watershed reserve just below the summit of the Cordillera Occidental, one of the richest areas for Araceae in all of the tropics. Working with the late Dr Philip Silverstone, then Curator of the Herbarium at the Universidad del Valle, the plant was collected, described and deposited in the local CUVC herbarium. I was able to visit Peter, stay at his house and make studies of the new species first hand. The new species is being named in his honor. It is a beautiful plant for which he can truly be proud. As an interesting aside, Peter spent 18 years living no more than 10 miles away from the Missouri Botanical Garden and worked at Meramec Community College in the Art

Department. After retirement, Peter moved to Cali where he has become an avid naturalist and has developed an interesting web site devoted to his pictures of natural history. This can be observed at: colombianature (smugmug.com).

In the second situation, I received a message from Ladislav Holý, an aroid enthusiast in the Czech Republic city of Louny. Like others before him, he had purchased a cultivated plant from a plant dealer in Ecuador and wanted a determination. He sent me a series of images and later unmounted specimens which allowed me to determine that the species was undescribed.

The third situation, equally fortuitous, was through another email message with another set of pictures of an *Anthurium*. The email message from Simon Wellinga in Heerenveen, The Netherlands, immediately caught my interest because Simon actually had the plant in cultivation and was willing to provide herbarium material. Simon had purchased the plant from a tropical plant nursery in Ecuador under the name *Anthurium flavolineatum* Sodiro and fortunately was able to find out where it came from so this plant was worth pursuing. Simon was not just any aroid enthusiast but actually a well-trained botanist and a graduate of the University of Amsterdam in The Netherlands. He had spent time in Borneo doing fieldwork and was enthusiastic about pursuing a career in botany. Although the inability to find work in botany owing to the lack of jobs in this field had directed his attention into the health care industry, Simon still had a strong love of plants and an interest in taxonomy so he accumulated interesting tropical plants including the one he showed me. After I told Simon that his plant was new, he set about making specimens and taking measurements and properly photographing the new species. It is being named in his honor. It is a member of *Anthurium* section *Belolonchium* but a strange one for the section in many respects (see comments below).

It is hoped that this publication will encourage similar collaboration with other growers of plants and especially to encourage those cultivating plants to get the original collecting details for their specimens because without that information most plants cannot credibly be described and published. It should be pointed out that plants resulting from hybridization or other breeding studies are not good candidates for describing as new.

New species confirmation was made using the author's 50-year experience with work in Central America and confirmation was affirmed with the Lucid Anthurium Key which contains a detailed database on all new species in the genus, at present over 1660 species. Descriptions in this paper were made according to standards established by Croat & Bunting (1979). Ecological parameters were based on the Holdridge Life Zone System (Holdridge, 1979). Conservation status was based on Redbook values (IUCN-2021)].

THE NEW SPECIES

1. *Anthurium hoellii* Croat, **sp. nov.** — Type: COLOMBIA. Valle del Cauca: Cordillera Occidental, eastern slope of divide, vic. of Dapa, Parcelación Hacienda Los Morales, 2.91 km from Parroquia San Francisco de Asis (Iglesia de Dapa), 03°34'43"N, 76°34'21"W, 2131 m, 17 June 2014, *T.B. Croat & P. Hoell 105472* (holotype, CUVC-55398–99; isotypes, B, COL, K, MO-6673970–71, NY, US).

Diagnosis: *Anthurium hoellii* is a member of sect. *Calomystrium* and is recognized by its appressed-climbing epiphytic habit, short thick internodes, intact cataphylls, essentially terete, weakly sulcate petioles, narrowly ovate-sagittate, weakly acuminate, deeply lobed gray-brown-drying leaves which are short pale-lineate on both surfaces and weakly dark-punctate on lower surface with a weakly hippocrepiform sinus, 5(6) pairs of basal veins, 1st & 2nd (sometimes 3rd pair) free to the base, a mostly naked, curved posterior rib, 8–10 primary lateral veins per side, collective veins arising from the 4th–6th pair of basal veins 3–4 mm from margin, as well as by the long-pedunculate inflorescence with a spreading-recurled, whitish spathe, and pinkish red, long-tapered spadix.

Appressed-climbing epiphyte at 1.5 m; internodes short, 4.0 cm diam.; cataphylls 6.5–12.0 cm long, persisting intact, turning gray-brown; *Leaves* erect to erect-spreading; petioles 73–109 cm long, 2.0 cm diam. at base, 1.0–1.2 cm diam. midway, 0.7–1.0 cm diam. at apex below geniculum, medium green, semiglossy; geniculum (1.5)2.0–5.0 cm long, 0.9–1.3 cm diam., (drying 5.0–7.0 mm diam.), terete midway, weakly sulcate near apex, drying slightly darker; blades narrowly ovate-sagittate, weakly acuminate at apex, deeply lobed at base, 55–68 cm long, 32–49 cm wide (averaging 60.4 cm long, 38.8 cm wide), 1.3–1.8 (average 1.6) times longer than wide, held at ca. 180° angle to petiole, dark green and semiglossy drying medium gray-brown and matte above, paler and glossy drying medium yellow-brown and weakly glossy below; upper surface sparsely and weakly short pale-lineate, lower surface densely granular on magnification, sparsely short pale-lineate, sparsely and weakly dark-punctate; anterior lobe 40–51 cm long, broadly rounded to almost straight along the margin; posterior lobes 19.0–22.5 cm long, (6.5)10.0–14.7 cm wide; sinus weakly hippocrepiform, 14–17 cm deep, (6.5)9.0–11.0 cm wide in live condition with lobes held somewhat upward, 13.5–19.0 cm long, 10.0–14.5 cm wide with blades flattened; basal veins 5(6) pairs, 1st & 2nd (sometimes 3rd pair) free to the base, 3rd pair fused 1.2 cm, 4th pair fused 3.6 cm, 5th & 6th pairs fused ca. 6 cm; posterior rib curved ca. 6.0 cm long, naked along most or all of its length; midrib narrowly rounded and slightly paler above, narrowly rounded and paler below; primary lateral veins 8–10 per side, departing midrib at ca. 40°, narrowly rounded and slightly paler near midrib, obtusely sunken toward apex above, narrowly rounded and paler below; tertiary veins drying weakly prominulous below; collective veins arising from the 4th–6th pair of basal veins, 3.0–4.0 mm from margin. *Inflorescence* erect; peduncle to 36 cm long, 8–10 mm diam., drying 6–8 mm diam.; spathe spreading-recurled, whitish and matte inside, greenish white and glossy outside, oblong-lanceolate, (19.0)27.0–30.5 cm long, 3.5–4.5 cm wide, drying 2.7–3.0 cm wide, drying reddish yellow-brown, matte; spadix pinkish red, long-tapered, (14)20–30(43) cm long, 1.4–1.6 cm diam. at base, 1.4–1.7 cm diam. midway, 6.0 mm diam. at 1.0 cm from tip, drying 8–13 mm diam. near base; flowers 13–14 visible per principal spiral, 1.3–1.5 mm long and wide; tepals smooth, sparsely pale-speckled, 0.8–1.0 mm wide, inner margin narrowly rounded, outer margin 2- or 3-sided; stamens not seen emerged; anthers 0.4 mm long, 0.4 mm wide; thecae slightly divaricate; *Infructescence* spreading-pendent; spathe medium green; spadix brownish, to 43 cm long, 2.5 cm diam. at base, 1.0 cm at 1.0 cm from tip; berries immature.

Distribution and ecology — *Anthurium hoelii* is endemic to Colombia, known only from Valle del Cauca Department on both slopes of the Cordillera Occidentale at 2000–2130 m elevation in a *Lower montane rain forest* life zone.

Figure 1. Peter Hoell, American naturalist living in Colombia.

Etymology — The species is named in honor of American naturalist, Peter Hoell, who discovered it and brought it to my attention. Peter, an artist by profession, lived most of his career near the Missouri Botanical Garden and was a member of the famed Webster Groves Nature Society that did so much to explore and discover the Flora of Missouri. After retirement, Peter moved to Colombia where he lives at the type locality of the species which now bears his name.

Comments — The species may be closest to *Anthurium silverstonei* Croat & Oberle, described from Cerro Torrá in Chocó Department near the border with Valle del Cauca Department.

Figure 2. *Anthurium hoellii* Croat. Habit of flowering plant in nature near home of Peter Hoell.

That species differs by having leaf blades that dry gray-brown, has 7 or 8 pairs of basal veins, 10–15 primary lateral veins per side, a spathe which is greenish adaxially and a much larger spadix (38.0 cm x 2.2 cm). *Anthurium hoelii* is also similar to *A. sanguineum* Engl. which occurs in the area but that species differs by having a red spathe and a bright green spadix.

In the Lucid Anthurium Key the species tracks to *Anthurium obtusilobum* Schott, which differs by having a more cylindroid and cream to pale yellow-green spadix at anthesis; to *A. riparium* Engl., which differs by having only a short posterior rib and only a single pair of basal veins free to the base; to *A. subtriangulare* Engl., which differs by its much smaller leaf blades (less than 25 cm long) with an arcuate sinus and a cylindroid spadix; to *A. subulatum* N.E. Br., which differs by its more prominently acuminate blades, more widely spaced primary lateral veins, more narrowly ovate-subulate spathe and more cylindroid purple-red spadix.

The species is present in moderately large numbers in the type locality, part of a natural reserve and protected from deforestation, so the IUCN Redbook status of the species is LC (Least Concern).

Figure 3. *Anthurium hoellii* Croat. Stem with cataphylls and bases of petioles.

Paratypes — COLOMBIA. **Valle del Cauca:** Mun.: Yumbo, Dapa, Parcelación Los Morales, Casa 8, Cordillera Occidental, vertiente oriental, 2100 m, 19 Nov 2014, *P. Hoell 3* (CUVC); La Cumbre, Corregimiento de Bitaco, Vda. Chicoral, 03°34’13”N, 76°35’11”W, 2093 m, 22 July 2003, *H. Mendoza, F. Quevedor, M.V. Ruiz, C.A. Loaiza & A. Robles 14865* (FMB, MO).

Figure 4. *Anthurium hoelii* Croat. Leaf blade adaxial surface.

Figure 5. *Anthurium hoelii* Croat. Inflorescence with spathe and spadix.

COLOMBIA
ARACEAE [23]
Anthurium hoellii Croat
det. Thomas B. Croat 2014
Valle del Cauca: Ansermanuevo

Cordillera Occidentale, eastern slope of divide, vic. of Dapa, Parcelación Hacienda Los Morales, 2.91 km from Parroquia San Francisco de Asis (Iglesia de Dapa).
03°34'43"N 076°34'21"W 2131 m

Hemiepiphytic at 1.5 m; internodes short, 4 cm diam.; cataphylls 6.512 cm long, persisting intact, turning gray-brown. LEAVES erect to erect-spreading; petioles 2 cm diam. at base, 1 cm diam. midway, 1 cm diam. at
17 June 2014
Thomas B. Croat & Hoell, P. 105472
MISSOURI BOTANICAL GARDEN HERBARIUM (MO)
Thomas B. Croat & Hoell, P. 105472
MISSOURI BOTANICAL GARDEN HERBARIUM (MO)
Thomas B. Croat & Hoell, P. 105472
MISSOURI BOTANICAL GARDEN HERBARIUM (MO)

Figure 6. *Anthurium hoellii* Croat. Type specimen: leaf blade adaxial surface in middle; *T.B. Croat & P. Hoell 105472* (isotype, MO-66739790)

COLOMBIA
ARACEAE [23]
Anthurium hoellii Croat
det. Thomas B. Croat 2014
Valle del Cauca: Ansermanuevo

Cordillera Occidentale, eastern slope of divide, vic. of Dapa, Parcelación Hacienda Los Morales, 2.91 km from Parroquia San Francisco de Asis (Iglesia de Dapa).
03°34'43"N 076°34'21"W 2131 m

Hemiepiphytic at 1.5 m; internodes short, 4 cm diam.; cataphylls 6.512 cm long, persisting intact, turning gray-brown. LEAVES erect to erect-spreading; petioles 2 cm diam. at base, 1 cm diam. midway, 1 cm diam. at
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Thomas B. Croat & Hoell, P. 105472
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Thomas B. Croat & Hoell, P. 105472
MISSOURI BOTANICAL GARDEN HERBARIUM (MO)
MISSOURI BOTANICAL GARDEN HERBARIUM (MO)

Figure 7. *Anthurium hoelii* Croat. Type specimen: petiole and inflorescence; *T.B. Croat & P. Hoell 105472* (isotype, MO-66739791)

2. *Anthurium holyi* Croat, **sp. nov.** — Type: Cultivated by Ladislav Holý , Louny, Czech Republic. Origin: ECUADOR. Zamora-Chinchipe: Vicinity of El Pangui, in hills west of town, 1000 m; vouchered 8 May 2013, *T.B. Croat & Ladislav Holý 100584* (holotype, MO-6473249; isotypes, to be distributed).

Diagnosis: The species is a member of Section *Belolonchium* and is characterized by its elongated stems, short internodes, mostly intact cataphylls, subterete, deeply and narrowly sulcate petioles, ovate-sagittate, narrowly long-acuminate blades drying medium brown above, greenish below, with a parabolic to hippocrepiform sinus, posterior lobes directed toward the base, 4 or 5 pairs of basal veins, 1st pair free to the base, a weakly curved, naked posterior rib, 4 or 5 primary lateral veins per side, collective veins arising from the 1st pair of basal veins, 2–4 mm from margins, a long-pedunculate inflorescence with a pale green, erect spathe and a narrowly cylindroid-tapered, dark violet-purple spadix with prominently exserted stamens and white globose berries.

Habit unknown; stem to ca. 30 cm long; internodes moderately short, to 1.5 cm diam.; cataphylls 3.5–4.0 cm long, persisting intact at upper nodes, eventually becoming reddish brown fibers; *Leaves* with petioles 28.0–36.5 cm long, 3 mm diam., subterete, deeply and narrowly sulcate toward middle, sharply and narrowly flattened toward base, medium green, tinged with violet-purple, semiglossy; geniculum 2–3 cm long, 3–5 mm diam., darker than the petiole; blades ovate-sagittate, 21–24 cm long, 15.0–17.2 cm wide, 1.2–1.6 times longer than wide, 0.6–0.7 times as long as petiole, subcoriaceous, semiglossy, slightly bicolorous, narrowly long-acuminate at apex (acumen 2–3 cm long), prominently lobed at base, medium brown and semiglossy above, greenish and semiglossy below; anterior lobe 18.5–36.5 cm long, broadly convex to weakly concave; posterior lobes 7.3–8.3 cm long, 5–7 cm wide, directed mostly toward the base at 100°–120°; sinus parabolic to hippocrepiform, 3.5–4.5 cm deep, 3.5–5.5 cm wide; basal veins 4 or 5 pairs, 1st pair free to the base, 2nd pair fused 5–10 mm, 3rd pair fused 1.5–1.7 cm long; 4th and 5th pair fused 2.0–2.5 cm; posterior ribs weakly curved, naked for 2 cm; midrib narrowly rounded and slightly paler above, thicker, paler and narrowly rounded to bluntly acute below; primary lateral veins 4 or 5 per side, departing midrib at 40–50°, weakly quilted-sunken and concolorous above, narrowly rounded and slightly paler below; collective veins arising from the 1st pair of basal veins, 2–4 mm from margins; both surfaces moderately smooth. *Inflorescence* erect to erect-spreading; peduncle 29–31 long, 2–3 mm diam.; spathe pale green, erect, 7.0–7.5 cm long, 2.0–2.9(4.5) cm wide, narrowly and gradually long-acuminate, drying dark brown; spadix stipitate for 1.5–2.5 mm, narrowly cylindroid-tapered, dark violet-purple, 4.8–5.2 cm long, 4.5–7.0 mm diam., to 6 mm diam. midway, to 4 mm diam. at 1 cm from tip, rounded at apex; stipe 1.5 mm diam. on drying; flowers 6(7) visible per spiral, 3.0–3.2 mm long, 2.8–3.0 mm wide, drying 2 mm long, 4.5 mm wide; tepals weakly pale-granular; lateral tepals 1.4–2.2 mm wide, drying 1 mm wide, inner margin broadly rounded, outer margin 2-sided to obtusely 3-sided and nearly shield-shaped; stamens prominently exserted 2.0–2.2 mm; filament grayish white, translucent, 5 or more times wider than the width of the anthers; anthers positioned flat across the end of the filament with the pollen directed upward, narrowly ovate, 0.25 mm long, 0.20 mm wide; thecae more or less parallel; pistils early emergent; berries subglobose, white, 4 mm long, 3.5 mm diam., weakly beaked at apex.

Figure 8. Ladislav Holý, Czech aroider from Louny, Czech Republic.

Figure 9. *Anthurium holyi* Croat. Habit of potted plant.

Figure 10. Anthurium holyi Croat. Stem with cataphylls, root and bases of petioles

Distribution and ecology — *Anthurium holyi* is endemic to Ecuador, found only in the locality from which the type was derived in Zamora-Chinchipe Province at 1000 m in a *Premontane wet forest* life zone.

Etymology — The species is named in honor of Ladislav Holý from the Czech Republic. He has long been a devotee of aroids and collaborates regularly with Jiří Haager, then Director of the Teplice Botanical Garden where most of his collections now reside.

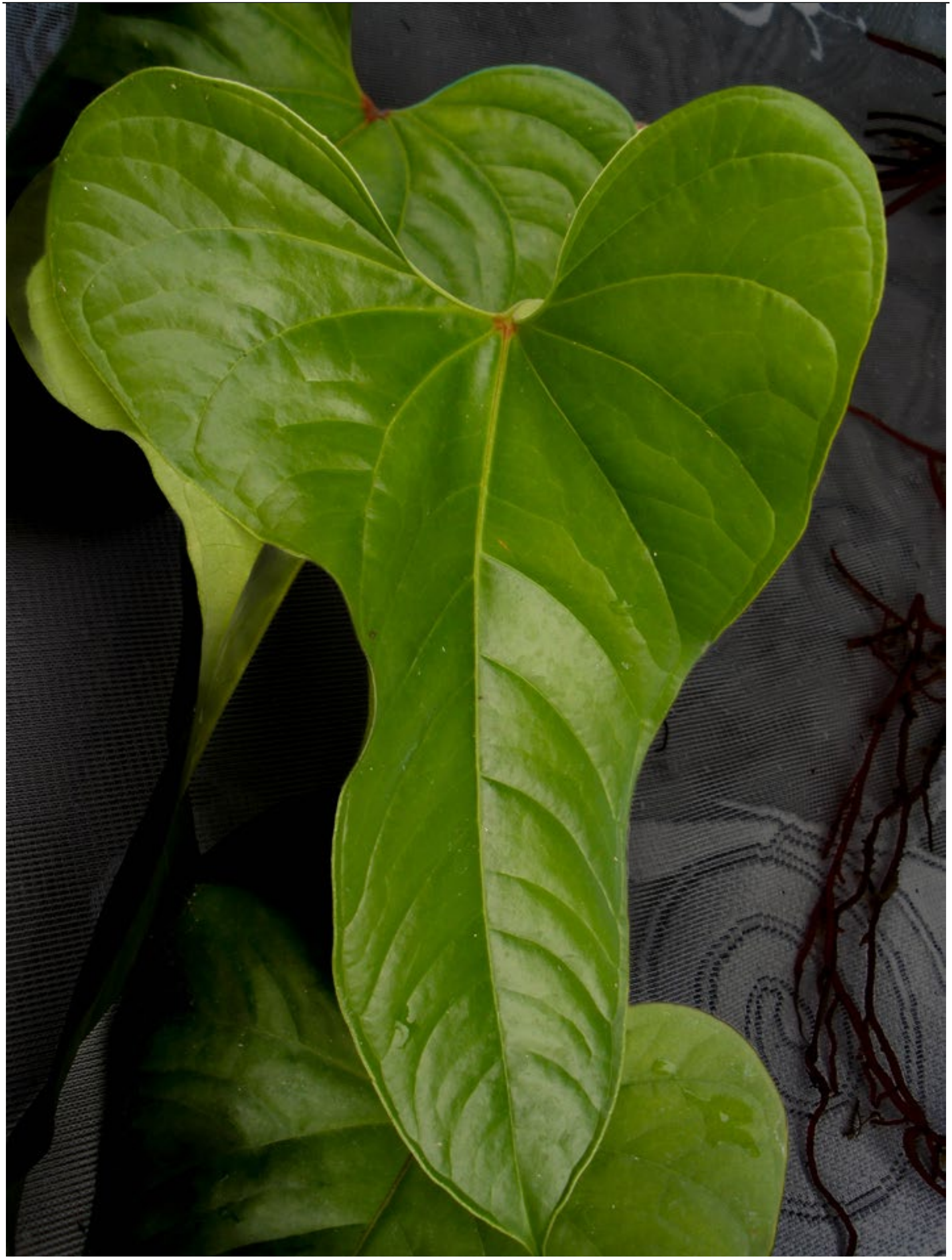


Figure 11. *Anthurium holyi* Croat. Potted plant with several leaves, all adaxial surface.

Comments — In the Lucid Anthurium Key the species tracks to *Anthurium cupulispathum* Croat & J.Rodrig. which differs in occurring on the western slopes of the Andes, having much larger blades, more primary lateral veins, a larger, broadly elliptic spathe, and a more ellipsoid spadix; to *A. macbridei* K.Krause, from Peru at more than 2100 m which differs by having

Figure 12. *Anthurium holyi* Croat. Leaf blade adaxial surface.

Figure 13. *Anthurium holyi* Croat. Inflorescence at pistillate anthesis.

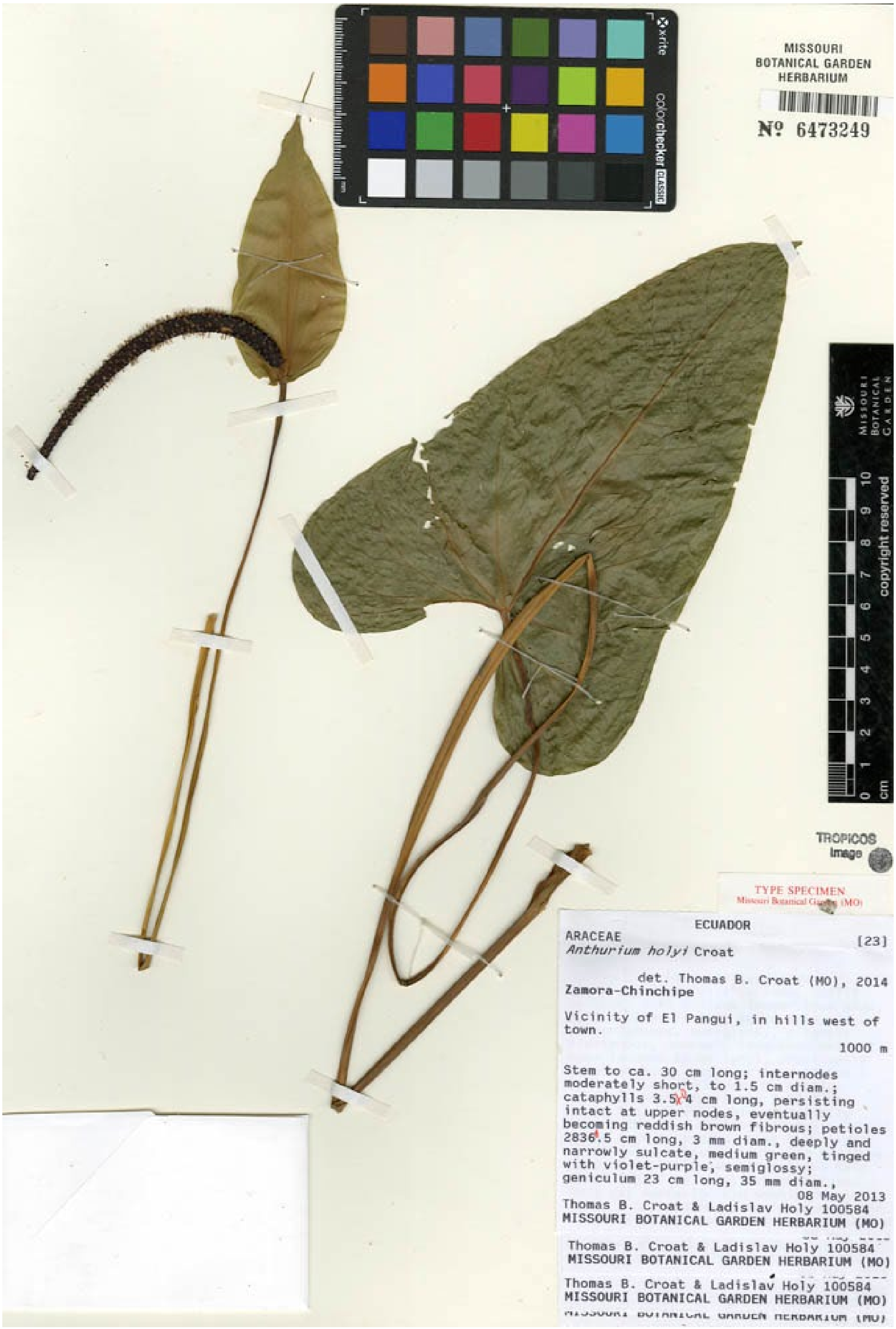
Figure 14. *Anthurium holyi* Croat. Inflorescence at staminate anthesis with exerted stamens.

Figure 15. *Anthurium holyi* Croat. Infructescence with berries greenish and nearing maturity.

Figure 16. *Anthurium holyi* Croat. Infructescence with mature white berries.

petioles to 1.5 m long, spathes 15–20 cm long, a spadix 20–30 cm long and stipitate to 1.5 cm; to *A. oxybelium* Schott a mostly high elevation species rarely occurring lower than 2400 m, which differs by having cataphylls 8–13 cm long, petioles subterete and sharply sulcate (versus deeply and narrowly sulcate for *A. holyi*), leaf blades 2.3–4.0 times longer than wide (versus1.2–1.6), collective veins usually arising from the 3rd pair of basal veins; to *A. ridgidifolium* Engl. which differs by occurring mostly on the western slopes of Ecuadorian Andes at 1900–3200 m and being much larger plants with petiole 36–67 cm long, blades 30–60 cm long, 9 pairs of basal veins, 0–12 primary lateral veins per side; and *A. schunkei* Macbride from Peru, which differs by having the anterior lobe prominently constricted toward its base.

The species is present in cultivation in many areas throughout the world. It is known presumably from only one collection in the wild (that made originally by Ecuagenera, Inc.) so the IUCN Redbook status of the species is DD (Data Deficient).



ECUADOR
ARACEAE [23]
Anthurium holyi Croat

det. Thomas B. Croat (MO), 2014
Zamora-Chinchipe

Vicinity of El Pangui, in hills west of town.

1000 m

Stem to ca. 30 cm long; internodes moderately short, to 1.5 cm diam.; cataphylls 3.5x4 cm long, persisting intact at upper nodes, eventually becoming reddish brown fibrous; petioles 2836.5 cm long, 3 mm diam., deeply and narrowly sulcate, medium green, tinged with violet-purple, semiglossy; geniculum 23 cm long, 35 mm diam.,

08 May 2013
Thomas B. Croat & Ladislav Holy 100584
MISSOURI BOTANICAL GARDEN HERBARIUM (MO)

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Thomas B. Croat & Ladislav Holy 100584
MISSOURI BOTANICAL GARDEN HERBARIUM (MO)

MISSOURI BOTANICAL GARDEN HERBARIUM (MO)

Figure 17. Anthurium holyi Croat. Type specimen, T.B. Croat & L. Holý 100584 (holotype, MO-6473249).

3. *Anthurium wellingae* Croat, **sp. nov.** — Type: Cultivated by Simon M. Wellinga, Heerenveen, The Netherlands. Origin: ECUADOR. Zamora-Chinchipe: vicinity of El Pangui, in hills west of El Pangui, ca. 03°36'S, 78°38'W, ca. 2000 m; vouchered 22 Dec 2017, *T.B. Croat & S.M. Wellinga 107766* (holotype, MO- 6904255; isotypes, AAU, COL, K, NY, QCNE, S, U, US).

Diagnosis: *Anthurium wellingae* is characterized by its short slender internodes, nearly intact reddish brown cataphylls, subterete weakly sulcate petioles, narrowly triangular-sagittate, narrowly acuminate light brown-drying blades, parabolic sinus, 3 or 4 pairs or basal veins with the 1st pair free to base, short nearly naked posterior ribs, (9)11–13 primary lateral veins per side, collective veins arising usually from the upper pairs of basal veins and 1–2 mm from margin, a short pale-lineate upper blade surface, long-pedunculate inflorescence, green hooding spathe and weakly stipitate, pale yellowish green, down-turned spadix with exserted stamens.

Terrestrial or epiphytic; stems to 70 cm long; internodes 1.5 cm long, 5.1–7.4 mm diam.; cataphylls 5.1–7.4 cm long, persisting intact but splitting near middle in lower half as plant expands, reddish brown; *Leaves* with petioles 47.0–63.5 cm long, 1.3–2.4 times longer than blades, subterete, shallowly and obtusely sulcate throughout, medium green, semiglossy; sheath 3.9–6.0 cm long; geniculum 1.9–3.4 cm long, 3.5–4.5 mm diam., dark brown, reddish where it joins petiole and at the opposite end of the petiolar plexus, obtusely and narrowly sulcate; blades narrowly triangular-sagittate, 23.0–36.5 cm long, (9.5)10.8–13.5 cm wide, 2.1–3.1 times longer than wide, 0.40–0.75 times as long as petioles, narrowly acuminate at apex, prominently lobed at base, subcoriaceous, medium dark green and matte above, slightly paler and weakly glossy below, drying light brown on both surfaces; anterior lobe 16.7–37.0 cm long (averaging 23.3 cm long), straight to weakly concave, (sometimes convex, especially on young leaves) along margins; posterior lobes (2.5)4.0–6.0 cm long, 3.5–3.7 cm wide; basal veins 3 or 4 pairs, 1st pair free to base; 2nd pair fused 3–10 mm; 3rd and 4th pairs fused 8–15 mm; sinus parabolic or hippocrepiform, sometimes slightly decurrent onto petiole, 2.0–3.3 cm deep, 2.5–3.0 cm wide; posterior ribs 1.0–1.5 cm long, naked not at all or up to 1 cm; midrib drying bluntly acute and reddish brown above, round-raised, finely ridged, red-brown and darker below; primary lateral veins (9)11–13 per side, departing midrib at 60–70°, weakly quilted adaxially, more conspicuously sunken than collective veins, weakly loop-connecting collective vein; collective veins arising usually from the 1st pair of basal veins, sometimes 2nd pair, rarely from 3rd pair, 1–2 mm from margin; upper surface drying smooth on magnification, sparsely very short pale-lineate; lower surface densely and irregularly, moderately dark brown-speckled. *Inflorescence* erect; peduncle 24.0–50.5 cm long, drying 3 mm diam., erect-spreading, medium green, drying yellowish brown; spathe green, hooding spadix, 8.0–11.5 cm long, 2.7–4.0 cm wide, narrowly ovate; spadix weakly stipitate (stipe to 3 mm long), 8.0–9.5 cm long, 6–7 mm diam., pale yellowish green, semiglossy, directed downward, curved back toward peduncle; flowers 8–10 visible per spiral, 2.0 mm long, 1.8 mm wide; tepals sparsely pustular; lateral tepals 0.8 mm wide, inner margin rounded, outer margin 2- or 3-sided, producing a scent of burnt metal during anthesis; stamens exserted ca. 2 mm; anther 0.6 mm long, 0.7 mm wide, white, persisting exserted; berries not seen.

Distribution and ecology — *Anthurium wellingae* is endemic to Ecuador, known only from Zamora-Chinchipe Province at 2000 m in a *Premontane wet forest* life zone.

Figure 18. Simon Wellinga in his greenhouse pollinating *Bulbophyllum ecinolabium*. Netherlands

Figure 19. *Anthurium wellingae* Croat. Habit of cultivated plant.

Figure 20. *Anthurium wellingae* Croat. Stem with cataphylls and bases of petioles.

Figure 21. *Anthurium wellingae* Croat. Leaf with adaxial surface

Figure 22. *Anthurium wellingae* Croat. Leaf with inflorescence.

Figure 23. *Anthurium wellingae* Croat, Inflorescence showing side view of pendent spathe and spadix.

Figure 24. *Anthurium wellingae* Croat. Adaxial surface of spathe.

Figure 25. *Anthurium wellingae* Croat. Interior surface of spathe with spadix bearing protruded stamens.

Etymology — The species epithet honors Dutch botanist, Simon M. Wellinga who studied biology at the University of Amsterdam with an emphasis on tropical ecology, evolutionary biology and pollination biology. Simon originally acquired the type plant from Ecuagenera (advertised erroneously as *A. flavolineatum* Sodiro) and later prepared specimen from his living plants. Simon retains his strong interests in plants and will continue to work in the process of discovery with his easy access to the many Dutch scientific collections in his native Netherlands.

ECUADOR
RACEAE [23]
Anthurium wellingae Croat

det. Thomas B. Croat (MO), 2019
Zamora-Chinchipe: El Pangui Cantón

In the hills west of El Pangui.
03°36'S 078°38'W 2000 m

Terrestrial or epiphytic; stems to 70 cm long; internodes 1.5 cm long, 5.17.4 mm diam.; cataphylls 5.17.4 cm long, persisting intact but splitting near middle in lower half as plant expands, reddish brown; petioles subterete, shallowly and obtusely sulcate throughout, medium green, semiglossy; geniculum dark brown, reddish where it
22 December 2017
Thomas B. Croat & Simon M. Wellinga
107766
MISSOURI BOTANICAL GARDEN HERBARIUM (MO)
MISSOURI BOTANICAL GARDEN HERBARIUM (MO)

Figure 26. *Anthurium wellingae* Croat. Type specimen; *T.B. Croat & S.M. Wellinga 107766* (holotype, MO- 6904255).

Comments — The species is related to *Anthurium variegatum* Sodiro, a species that also occurs in the Amazon region, owing to its somewhat slender, somewhat elongated internodes and its blade shape but that species differs by having a purple spathe with prominent green veins. The species has also been confused with *Anthurium flavolineatum* Sodiro, which differs by having blades with narrower, more broadly spreading posterior lobes and a purplish violet spathe with prominent green stripes.

Anthurium wellingae is an unusual member of sect. *Belolonchium* in that that section typically has cataphylls that persist as fibers and typically has no pale lineations on the leaf surfaces. Moreover, the pale brown speckling on the lower surface and the persistent intact cataphylls are more typical of sect. *Calomystrium* than *Belolonchium*. However, the pendent spadix and hooding spathe and even the blade shape and exserted stamens are typical of sect. *Belolonchium*.

So far as is known the species was collected only once (by Ecuagenera) but has been rather widely distributed by that company following propagation. Its IUCN Redbook satus is DD (Data Deficient) owning our ignorance of its abundance in the wild.

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A new species of pendent-leafed *Anthurium* in sect. *Porphyrochitonium* (Araceae) from Costa Rica

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ABSTRACT

A new species of *Anthurium* sect. *Porphyrochitonium* (Araceae) is described, illustrated and compared with *A. wendlingeri* G.M.Barroso with which it has been confused.

Key Words: *Anthurium kubickii*, *Porphyrochitonium*, Araceae, Costa Rica, new species.

INTRODUCTION

Anthurium is the largest genus in Araceae, with 1144 published species, and is one of the world's largest plant genera with an estimated potential of 3000 species (Boyce & Croat, 2011 onward). Central America is now relatively well known for the genus (Croat, 1983; 1986; 1991), which has recently been revised again for the region, now with 397 species (Croat, 2023, in press). Costa Rica has only 119 *Anthurium* species, with 35 of them, including this new one, endemic. However, the species diversity of the genus increases dramatically to the south in the direction of Colombia, with Panama possessing 293 species and with Colombia having probably upwards of a thousand species.

Section *Porphyrochitonium* is the largest section in Central America with 127 species. Speciation in the section virtually explodes in the wetter regions of Colombia on the Pacific slope and in northwest Ecuador but no revision for any significant portion of the region has been completed. Preliminary studies in Esmeraldas Province in northwest Ecuador show that approximately 130 species occur in the region (Croat & Dmitrieva, in prep.). Many of the species in the section are small to minuscule and are easily overlooked, and many in the wettest part of the Pacific slope, such as in the pluvial forest in the Chocó, are terrestrial, unusually for *Anthurium*, a group of species of primarily epiphytic habit. This may help to explain the high species diversity in sect. *Porphyrochitonium* because of the greater number of niches exploited.

The new species of *Anthurium* sect. *Porphyrochitonium* described here was recently brought to my attention by Brian Kubicki who found it on his property in Costa Rica near the type locality of *Anthurium wendlingeri* G.M.Barroso (**Figure 1**). He questioned if his collection could be *A. wendlingeri* which led me to re-read the original diagnosis. Surprisingly, it fitted his plant well, except for the illustration provided by Barroso in her original publication (Barroso, 1965), a drawing which clearly showed a coiled spadix, a condition never found on the plant collected

Figure 1. Google Earth map showing type locality of *Anthurium wendlingeri*.

Figure 2. Topographical map showing type locality of *Anthurium wendlingeri* (blue hexagon) and *A. kubickii* (red star)

by Brian Kubicki but virtually always present on *A. wendlingeri*. This led to more examination of Barroso's species, including a study of the type specimen (RB 118049; **Figure 1**) which unquestionably proved to be typical usual *A. wendlingeri*.

However, another, unusual specimen (**Figure 2**), one made by Josef Bogner without date but believed to have been made shortly after the publication of Barroso's new species, was definitely not *A. wendlingeri* and has proven to be the same species collected on the property of Brian Kubicki. Bogner's collection came directly from the German horticulturist and plant seller, the late Clarence Horich, then living in Costa Rica. Bogner frequently wrote to Horich and got plants directly from him as in this case. It is assumed that Bogner, anxious to get a plant of this exciting new species by Barroso, must have contacted his friend Horrich to obtain a collection. *Anthurium wendlingeri* was said to have come from Pavones [published erroneously as 'Turones' in the original publication (Croat, 1983)] near Turrialba, where it had been collected by another German, Kurt Wendlinger, then chief horticulturist at the Jardín Botanico de Munique de Caracas in Venezuela. Since Wendlinger also had a position at the Munich Botanical Garden and worked with Josef Bogner, Bogner soon learned of this mistake in the name of the collecting site and contacted his friend Clarence Horich in Costa Rica to find this plant.

Anxious to find this species for his friend Bogner, Horich went to the type locality of *A. wendlingeri* and collected a long strap-shaped leaved plant. He just got the wrong strap-shaped leaved plant, not *A. wendlingeri,* but rather the newly proposed species described here. It is also possible that Barroso had both species and made her description based on both species, thus illustrating *A. wendlingeri sensu stricto* but in part preparing the description from the newly proposed species below (i.e. describing both the spathe and spadix as dark purple). However, the exact nature of the type (which is clearly *A. wendlingeri* as generally understood) is more important than any discrepancy in the description. The other strap-shaped leaved plant thus remains as an undescribed species. Note that while the newly proposed species has not been recollected near Pavones it is not surprising that it has been collected not so far away at the Guayacán Rainforest Reserve.

The description is based on the standard established by Croat & Bunting (1979). Ecological assessments are based on the Holdridge Life Zone System (Holdridge et al., 1971).

ANTHURIUM KUBICKII

Anthurium kubickii Croat, **sp. nov.** — Type: COSTA RICA. Limón: Guayacán Rainforest Reserve, along CR Hwy #10, in foothills above Siquirres, 450 to 610 m, 10°03’18”N, 83°33’04”W to 10°03’40”N, 83°32’30”W, primary forest, *T.B. Croat & B. Kubicki 108730* (holotype, MO-6813000; isotypes CR, K, US).

Diagnosis: Pendent epiphyte with short internodes, persistent cataphyll fibers, subterete sulcate petioles, narrowly oblong to oblong-oblanceolate, pendent, narrowly long-acuminate, moderately coriaceous, dark green and matte-subvelvety blades which are narrowly rounded at base with the collective veins arising from near the base; it is further characterized by the pendent, moderately long-pedunculate inflorescence with a reflexed-spreading, dark violet purple spathe, a medium purplish violet, matte, sessile, long-pendent spadix with 5–6(7) flowers visible per spiral and red, subglobose berries.

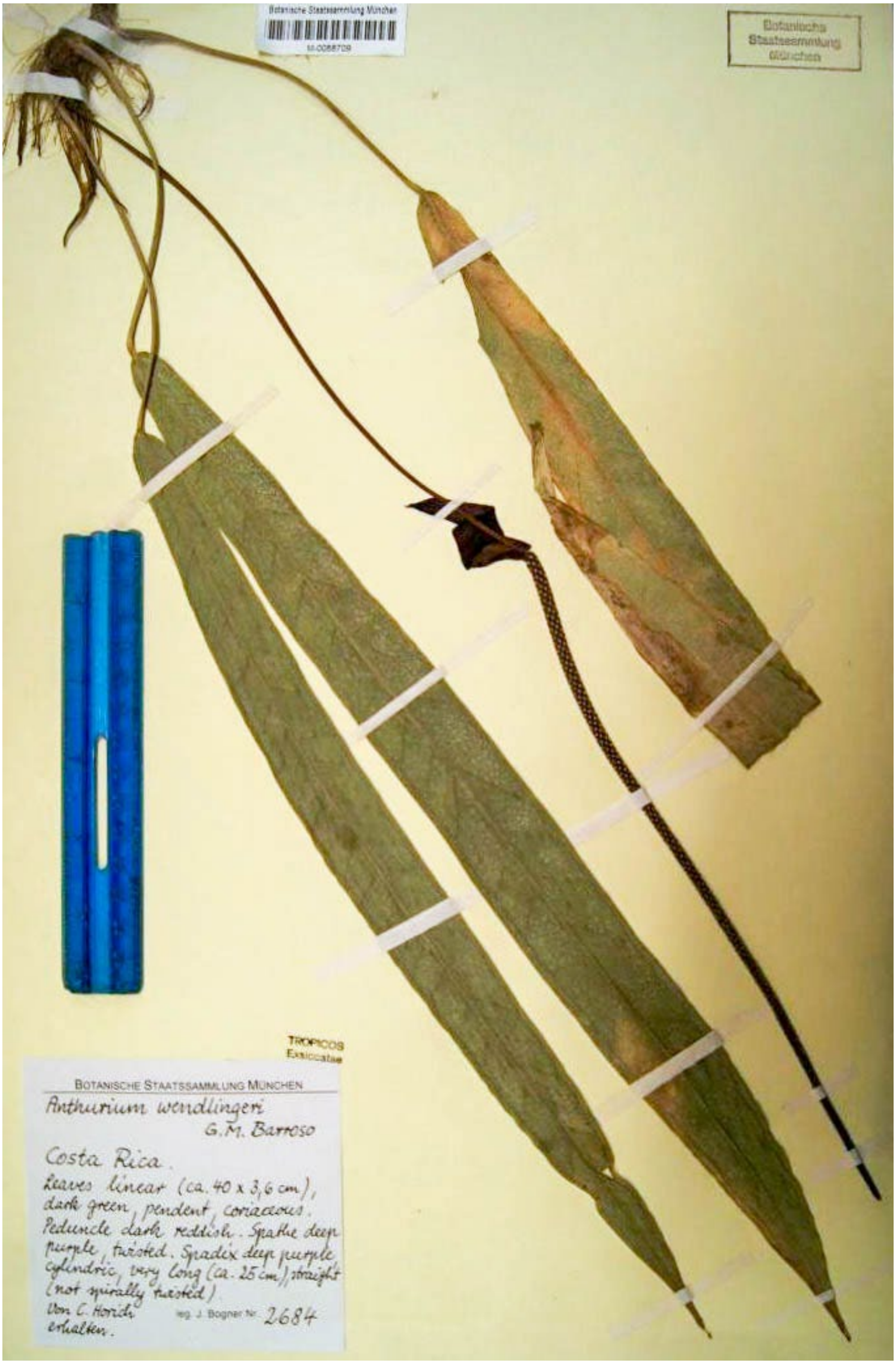
Pendent epiphyte at 1.5 to over 25 m high in the canopy; internodes very short, 1.5–2.5 cm diam.; cataphylls 6–7 cm long, drying reddish brown, mostly fibrous, erect to erect-spreading; petiole 15–20 cm long, 4–5 mm diam., subterete, sulcate adaxially, rounded abaxially, medium green, semiglossy; geniculum slightly swollen and nearly concolorous. *Leaves* with blades pendent, narrowly oblong to oblong-oblanceolate, 100–120 cm long, 6–8 cm wide, 6 times longer than wide, 5 times longer than petioles, narrowly long-acuminate at apex, narrowly rounded at base, moderately coriaceous, dark green and matte-subvelvety above, paler and semiglossy below; midrib narrowly rounded, pale to nearly concolorous above, narrowly rounded and slightly paler below; primary lateral veins 25–28 per side, departing midrib at 40–55°, weakly raised, concolorous above, weakly raised, concolorous below; collective veins arising from near the base, 6–7 mm from margins, only weakly loop-connected; tertiary veins obscure on both surfaces. *Inflorescence* pendent; peduncle terete, 25 cm long, weakly tinged purplish; spathe reflexed-spreading, dark violet purple and semiglossy on inner surface, more nearly matte and curled inward longitudinally with age; spadix medium purplish violet, matte, sessile, long-pendent, 34.5 cm long, 6–7 mm diam., weakly glossy to matte; flowers 5–6(7) visible in principal spiral, 7–8(15) visible in alternate spiral; stamens held at surface of tepals. *Infructescence* 60 cm long, 2 cm diam.; berries red, subglobose, 6–7 mm diam., semiglossy with a nearly button-shaped style; seeds not studied.

Distribution and ecology — *Anthurium kubickii* is endemic to Costa Rica, known only from the eastern slope of the Cordillera de Talamanca in Limón Province at 450–610 m in a *Tropical wet forest* transition zone to *Premontane wet forest* life zone.

Etymology — The specific epithet is a patronym honoring Brian Kubicki, owner and operator of the Guayacán Rainforest Reserve, a small ecolodge near Guayacán de Siquirres, Limón Province, which is one of the most biodiverse private nature reserves in Central America. Brian moved from his home in Minnesota, U.S.A. to study amphibians in Costa Rica and has been living there full-time since 1998, during which time he has published several scientific papers on the amphibians of the country, including the taxonomic descriptions of several new species. In addition to his work with amphibians Brian is also making studies of many of the principal plant groups at his reserve.

Comments — The species has been confused with *Anthurium wendlingeri* G.M.Barroso but that species differs in having a green or faintly purplish spathe and a whitish spadix that is soon turned in a cork-screw-shaped configuration. In contrast, *A. kubickii* has a dark purple spathe and a dark purple straight inflorescence never formed in a cork-screw shape.

In the Lucid Anthurium Key *A. kubickii* tracks to *Anthurium friedrichsthalii* Schott which differs by having a much smaller spadix, less than 10 cm long and 4–6 mm in diam. and yellow-orange berries, and also to *A. utleyorum* Croat & R.A.Baker, which differs from *A. kubickii* by its smaller spathe (3.4-6.0 cm long, 1.0-1.5 cm wide) and by smaller stipitate spadix that is less than 15 cm long.



BOTANISCHE STAATSSAMMLUNG MÜNCHEN

Anthurium wendlingeri
G.M. Barroso

Costa Rica.
Leaves linear (ca. 40 x 3,6 cm), dark green, pendent, coriaceous. Peduncle dark reddish. Spathe deep purple, twisted. Spadix deep purple cylindric, very Long (ca. 25 cm), straight (not spirally twisted)
Von C. Horich erhalten.
leg. J. Bogner Nr. 2684

Figure 3. Herbarium specimen of *Bogner 2684* (M), first herbarium collection of *A. kubickii*, vouchered from living plant cultivated at Munich Botanical Garden (without date but believed to be 1965 or 1966).

Figure 4. Holotype specimen of *Anthurium wendlingeri* G.M.Barroso.

Figure 5. Brian Kubicki with *Anthurium kubickii*. Guayacan Rainforest Reserve, Costa Rica.

Conservation status — IUCN red list category ranking for the species is Data Deficient (DD) owing to the small number of known collections (IUCN, 2019).

Acknowledgements

Images of topo maps and all images of living plants were provided by B.Kubicki. Scans of herbarium specimens from MO scanning group.

Figure 6. *Anthurium kubickii.* Potted plant showing habit. Guayacan Rainforest

Figure 7. *Anthurium kubickii* Close-up of stem, leaf base and petiole. Guayacan Rainforest Reserve, Costa Rica.

Figure 8. *Anthurium kubickii.* Lower portion of leaf with inflorescence. Guayacan Rainforest

Figure 9. *Anthurium kubickii.* Infructescence. Guayacan Rainforest Reserve, Costa Rica.

COSTA RICA
ARACEAE
Anthurium kubickii Croat [23]
det. Thomas B. Croat (MO), 2022
Limón

Guayacan Rainforest Reserve, along CR Hwy #10, in foothills above Siquirres. Primiary forest.
10°03'18"N 083°33'04"W 450 - 610 m
10°03'40"N 083°32'30"W
Pendent epiphyte at 1.5-2 m high; internodes very short, 1.52.5 cm diam.; cataphylls 67 cm long, mostly fibrous, erect to erect-spreading; petiole 45 mm diam., subterete, sulcate adaxially, rounded abaxially, medium green, semiglossy; geniculum slightly swollen and nearly concolorous; blades pendent,
07 March 2022
Thomas B. Croat & Brian Kubicki 108729
MISSOURI BOTANICAL GARDEN HERBARIUM (MO)

Figure 10. Type specimen of *Anthurium kubickii* Croat, T.B.Croat & B.Kubicki 108730 (MO)

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New species of *Philodendron* subgenus *Philodendron* (Araceae) from Ecuador and Peru

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ABSTRACT

Ten new species of *Philodendron* are described and illustrated: *P. ayalae* Croat, *P. fasciculatum* Croat, *P. gentryi* Croat, *P. ishichimiense* Croat, *P. manuelii* Croat, *and P. minesianum* Croat, all from Peru; and *P. guasagandense* Croat, *P. narvaezii* Croat, *P. nelsonzamorae* Croat, and *P. oxycataphyllum* Croat, all from Ecuador.

Key words: *Philodendron*, subgenus *Philodendron*, Ecuador, Peru, South America

INTRODUCTION

This paper continues our study of South American *Philodendron*. Earlier work from the Aroid Research Group at the Missouri Botanical Garden included a recent publication of 22 species, mostly from Colombia and Ecuador but also from the Guianas (Croat et al., 2019). An earlier paper described eight new species from Colombia (Croat et al., 2010). With Volunteer Research Associate James Grib another paper published three species from the Guianas (Croat et al., 2012), yet another with the same author and Carla Kostelac published 19 new species from South America (Croat et al., 2013). With Ben Friedenberg and Kostelac an additional nine species were published (Croat et al., 2014). Finally, 28 new species were described from NW Ecuador (Croat et al., 2016).

Considerable work remains in the genus *Philodendron* especially at middle elevation in the upper Amazon drainage along the eastern edge of the Andes and in the species-rich forests along the Pacific coast of Colombia.

MATERIALS AND METHODS

The Lucid keys mentioned in this paper were the result of technology developed by the University of Melbourne but Lucid, Inc. is presently an independent company which markets this product. The tool we are using is a computer generated key developed by the Royal Botanic Gardens Kew and the Missouri Botanical Garden which contains all important taxonomic characters of all species. It works by a process of elimination using only the most conservative and least variable characters. At present keys have been developed for *Adelonema*, *Anthurium*, *Dieffenbachia, Dracontium*, *Philodendron*, *Stenospermation* and *Xanthosoma,* and work is under way to develop a Lucid Key for *Spathiphyllum* and *Chlorospatha*. The present keys for *Anthurium* and *Philodendron* are not yet published as they still contain much unpublished work, but they are intended to be placed online for public use. For examples of published keys see: http://www.lucidcentral.com. All IUCN red list category rankings are to be called Data Deficient (DD) (IUCN, 2019).

For a discussion of *Philodendron* sections including sectional descriptions and a key to sections refer to Croat (1997: 326–339).

Characterizations of life zone ecology are based on the Holdridge life zone system (Holdridge, 1967). Plant descriptions follow the formats outlined in Croat & Bunting (1979)

THE NEW SPECIES

1. *Philodendron ayalae* Croat, **sp. nov. —** Type: PERU. Loreto: Prov. Maynas; vicinity of Quistococha, upland forest on white sand, ca. 200 m., 26 May 1978, *A. Gentry, F. Ayala, N. Jaramillo & E. Andrade C. 22296* (holotype, MO-2694061–63, 3 sheets). **Figures 1–3.**

Diagnosis: The species is a member of subgenus *Philodendron* section *Macrobelium* subsection *Macrobelium* series *Macrobelium* and is characterized by its epiphytic climbing habit, prominently ribbed internodes which are much longer than broad with brown peeling epidermis, subterete petioles which are sharply sulcate toward the base, narrowly ovate to oblong, subcordate, brown-drying abruptly acuminate blades with 3 or 4 pairs of basal veins, all of which were free to the base, (3)5–8 primary lateral veins per side, as well as the cluster of up to 6 green inflorescences per axil.

Nomadic vine; stem climbing; internodes 13 cm long, 8–25 mm diam., drying terete, deeply ridged, epidermis semiglossy reddish tan; cataphylls 11 cm long, 1-ribbed, deciduous. *Leaves* 29.5–66.5 cm long; petioles subterete 10.0 – 27.5 cm long, 4–7 mm diam., drying reddish brown, longitudinally bluntly to acutely ribbed, sheathed 22–34 %; geniculum indistinct; blade, narrowly ovate to oblong-elliptic in outline, weakly lobed and inequilaterally subcordate at base, 20.7–41.5 cm long, 11.8–20.0 cm wide; 1.6–2.7 times longer than wide, 1.5–2.1 times longer than petiole, abruptly short-acuminate at apex, drying matte brownish tan to dark yellowish brown above, matte lighter reddish to yellowish brown, below; anterior lobe 21.0–40.5 cm long, straight along margin; posterior lobes 3.5–8.5 cm long, 4.4–9.0 cm wide; basal veins 3 or 4 pairs, all free to base; posterior ribs lacking; sinus arcuate, sometimes V-shaped, 0.7–2.1 cm deep, 1.5–4.0 cm wide; midrib drying slightly raised, concolorous above, prominent and narrowly raised, concolorous to darker reddish brown below, finely ribbed longitudinally; primary lateral veins (3)5–8 per side, very weak and often difficult to discern above, meeting midrib at 55°, weakly raised, 1–3-ribbed, concolorous below, minor veins weakly present on both surfaces with cross veins very weakly present on the lower surface; upper surface smooth, the laticifers sometimes apparent, lower surface minutely pale-granular, laticifers often obscure. *Inflorescences* 2–6 per axil, 5.2–8.0 cm long; peduncle 3.0–3.5 cm long, 2–4 mm wide, drying dark brown, longitudinally ribbed; spathe green, 4.3–6.0 cm long, 4–7 mm wide furled, flattening 1.8–2.0 cm wide, acuminate, drying dark brown, longitudinally ribbed; spadix 4.4 cm long, staminate portion 2.4 cm long, narrowed toward apex, 2.5 mm diam. at 5 mm from apex; pistillate portion 1.8 cm long, narrowed near apex and abruptly changing to a presumably

TROPICOS
Exsiccatae

PERU
Loreto

Family: ARACEAE
Philodendron ayalae CROAT
Provincia: Maynas. Vicinity of Quistococha, upland forest on white sand, ca. 200 m. alt.
Epiphytic vine.

A. Gentry, F. Ayala, N. Jaramillo, & E. Andrade C. 22296
26 May 1978

Figure 1. *Philodendron ayalae* Croat. Holotype specimen sheet 1 (MO-2694061). Shoot with cataphylls, leaves and inflorescence.

Figure 2. *Philodendron ayalae*. Holotype specimen sheet 2 (MO-2694062). Leaf blade and petiole.

Figure 3. *Philodendron ayalae.* Holotype specimen sheet 3 (MO-2694063). Internode, synflorescence and leaf.

sterile segment 3 mm long with florets 0.4–0.8 mm diam.; pistils 0.5–1.0 mm long; styles 0.2 mm thick, 0.4–0.6 mm diam.; stigmas tufted, 0.2–0.3 mm diam.; ovules ovoid, 5-locular, 0.6–0.8 mm long, 0.6–0.8 mm diam., locules 1-ovulate; ovules 0.5 mm long including funicles; funicles as long as or to 1.5 times longer than ovule. *Infructescence* not seen.

Distribution and ecology — *Philodendron ayalae* is endemic to Peru, known only from the type locality in the area between Iquitos and Nauta at 200 m elevation in Loreto Department in a *Tropical moist forest* life zone.

Etymology — The species is named in honor of Peruvian botanist Franklin Ayala Flores, Universidad Nacional de la Amazonía Peruana in Iquitos, Perú, who helped to collect the type specimen. Ayala is a specialist on the genus *Dioscorea* (Dioscoreaceae).

Comments — In the Lucid Philodendron Key the species tracks to *Philodendron maculatum* K.Krause which differs by having typically larger, dark brown-drying blades with hippocrepiform sinus as well as by a much larger spathe; to *P. oligospermum* Engl. which differs by having leaf blades that dry greenish and are 2.6–3.0 times longer than broad; and to *P. pulchrum* G.M.Barroso which differs by having leaf blades which are proportionately longer than broad, coriaceous, ovate-elliptic to oblong-elliptic and obtuse to rounded or weakly subcordate at base, its sharply to obtusely sulcate petioles and its long pedunculate inflorescence (1 per axil) with the spathe usually green on the outer surface and described variously as white, green or pinkish within.

2. *Philodendron fasciculatum* Croat, **sp. nov. —** Type: PERU. San Martín: along road between Tocache Nuevo and Juanjuí; in disturbed primary forest ca 96 km N of Tocache Nuevo, 84 km S of Juanjuí, 14.1 km beyond bridge over Río Pulcache (and town of San Martín, not Pulcache as on maps). 600 m 7.41S 76.40W. 8 April 1984, *T.B. Croat 58026* (holotype, MO3189466 & 67, 2 sheets; isotype, USM, not seen). **Figures 4 & 5.**

Diagnosis: The species is a member of subgenus *Philodendron* section *Macrobelium* subsection *Glossophyllum* series *Glossophyllum* and is characterized by its climbing habit, short internodes which dry yellow-brown, sharply 2-ribbed, deciduous cataphylls, weakly flattened, spongy petiole, spreading, narrowly oblanceolate-elliptic, acuminate, brownish green-drying blades which are narrowly rounded at the base as well as by its clusters of up to 4 inflorescences per axil with the spathe green outside and dark purple inside on the tube.

Nomadic vine; stem climbing, coarsely and deeply folded ribbed longitudinally, epidermis drying light brown, glossy; internodes 1.5– 2.0 cm long, 6 mm diam.; cataphylls 14 cm long, sharply 2-ribbed. *Leaves* 44.3–66.1 cm long; petioles 9.5–28 cm long, 5–12 mm diam., medium green, deciduous, weakly flattened adaxially, weakly spongy, drying mostly brown to black, flat, longitudinally ribbed, sheathed 18% of its length on petiole subtending inflorescence; geniculum indistinct; blade 31–50.1 cm long, 8.2–16 cm wide, oblong-oblanceolate, 1.9–4.2 times longer than broad, 1.1–3.6 times longer than petiole, acuminate at apex, subcoriaceous, semiglossy dark green above, much paler below, drying dark green and semiglossy with black spots above, paler and semiglossy below; major veins flat and concolorous above, brown to tan, flat to slightly raised below, with interprimary veins, laticifers weakly present below; midrib

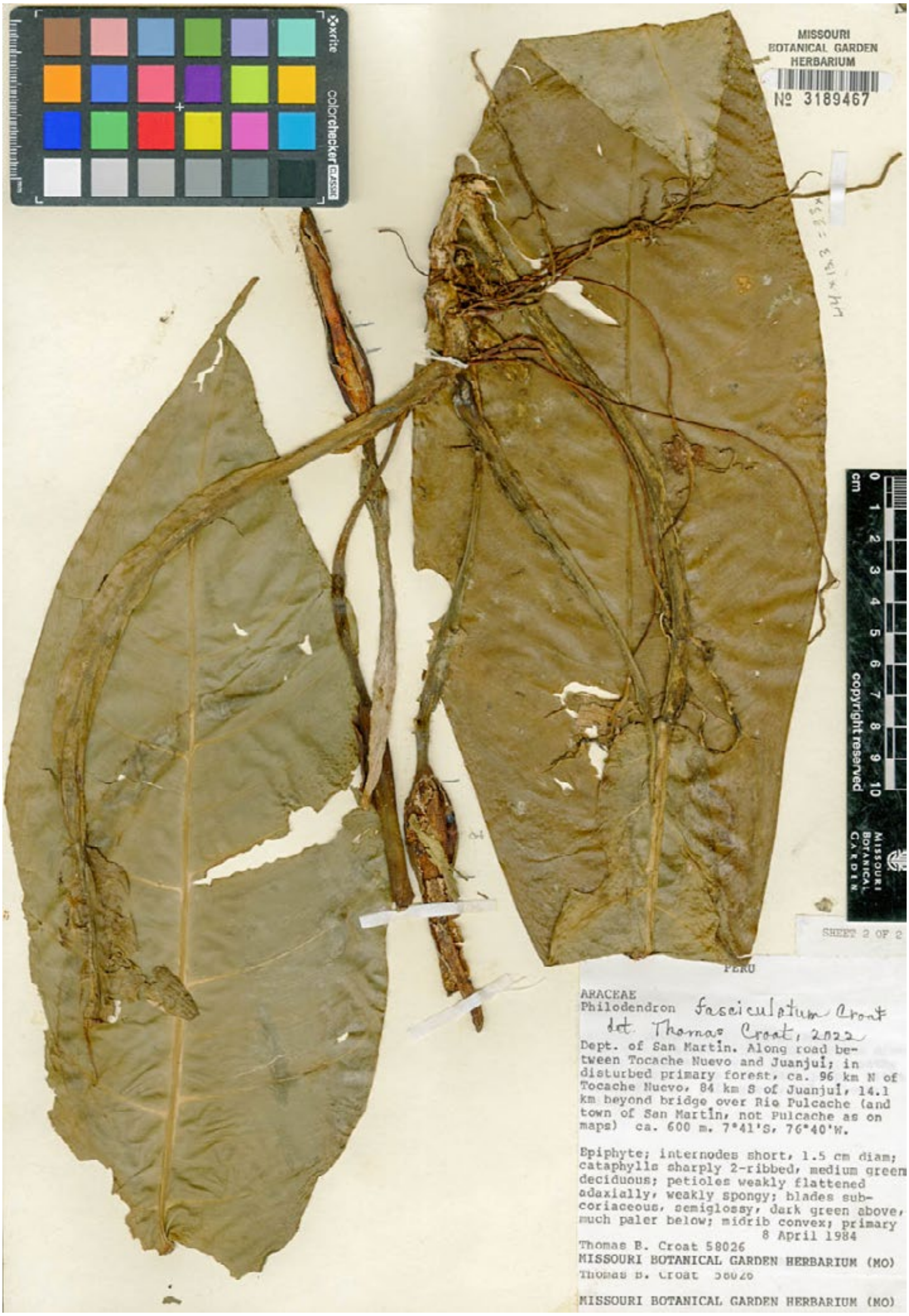


Figure 4. *Philodendron fasciculatum* Croat. Holotype specimen sheet 1 (MO-3189466). Portion of shoot with inflorescences.

PERU

ARACEAE
Philodendron fasciculatum Croat
det. Thomas Croat, 2022
Dept. of San Martin. Along road between Tocache Nuevo and Juanjui; in disturbed primary forest, ca. 96 km N of Tocache Nuevo, 84 km S of Juanjui, 14.1 km beyond bridge over Rio Pulcache (and town of San Martin, not Pulcache as on maps). ca. 600 m. 7°41'S, 76°40'W.

Epiphyte; internodes short, 1.5 cm diam; cataphylls sharply 2-ribbed, medium green, deciduous; petioles weakly flattened adaxially, weakly spongy; blades subcoriaceous, semiglossy, dark green above, much paler below; midrib convex; primary
USM +5
8 April 1984
Thomas B. Croat 58026
MISSOURI BOTANICAL GARDEN HERBARIUM (MO)
Thomas B. Croat 58026

MISSOURI BOTANICAL GARDEN HERBARIUM (MO)

Figure 5. *Philodendron fasciculatum*. Holotype specimen sheet 2 (MO-3189467). Leaves.

convex, drying concolorous, raised and longitudinally ribbed above, paler brown-tan, raised and longitudinally ribbed below; basal veins lacking, primary lateral veins 6–8 per side, meeting midrib at 60_{o}, drying concolorous and flat above, light brownish tan, slightly raised below; minor veins distinct in fresh condition. *Inflorescences* 3 or 4 per axil, 17–21 cm long; peduncle 10–13 cm long, 2–4 mm wide, drying dark brown, weakly longitudinally ribbed; spathe green outside, the tube dark purple within, 7.3–8.3 cm long, 1.3–1.8 cm wide, acuminate, drying dark brown, moderately glossy, constricted 3.5 cm above base, 1.0 cm wide at constriction; spadix 6.2–7.1 cm long, 5.4–1.3 cm diam.; staminate portion 4.1–4.7 cm long. 4.5–6.0 mm diam., white; sterile staminate portion 1 cm long, 5 mm diam.; pistillate portion 2.1–3.2 cm long, 7–18 mm diam., pale green; pistils closely aggregated, 1.0–1.8 mm diam.; ovary 4- or 5-locular, drying pale brown, densely warty; stigma drying dark brown, funnel-shaped, 0.4 mm diam.; ovules 1 per locule, basal, 1–1.2 mm long.

Distribution and ecology — *Philodendron fasciculatum* is endemic to Peru, known only from the type locality in San Martín Department at 600 m in *Premontane wet forest* life zone.

Etymology — The species epithet is from the Latin '*fasciculatus*', meaning clustered, and refers to the clustered inflorescences.

Comments — *Philodendron fasciculatum* might be confused with *P. paucinervium* Croat, a species which ranges from southern Colombia (Putumayo) to Ecuador (Napo, Pastaza), Peru (Loreto) and western Brazil (Amazonas) and differs by having leaf blades which are broadest well above the middle of the blade and are much more narrowly long-acuminate at apex and gradually tapered to a much narrower, more or less acute leaf base. *Philodendron paucinervium* has the primary lateral veins drying darker than the surface below and have smaller inflorescences with the peduncle less than 5 cm long and the spathe green on both surfaces.

The species is perhaps closest to *Philodendron paxianum* K.Krause, a Bolivian species with similar greenish drying leaves. That species differs in having stems with longer internodes, a smooth, light brown-drying epidermis and blades that lack short pale lineations along the midrib on the upper surface.

In the Lucid Philodendron Key the species tracks to *Philodendron acutifolium* K.Krause which differs by its much larger leaf blades with the petioles thick with broadly raised lateral margins and the blades with more than 25 primary lateral veins per side and *P. pulchrum* Barroso, which differs by its much larger, more coriaceous blades and only one, much larger inflorescence per axil.

3. ***Philodendron gentryi*** Croat, **sp. nov.** — Type: PERU. Loreto: Maynas, Mishana, along Río Nanay, halfway between Iquitos and Santa Mar ◌ía de Nanay, 140 m, mature upland forest on white sand soil near Campamento 1; 03°50'S, 73°30'W, 19 March 1982, *A. Gentry, D. Smith & D. Alfaro 36485* (holotype, MO-3001417). **Figures 6 & 7.**

Diagnosis: The species is a member of subgenus *Philodendron* section *Philodendron* subsection *Philodendron* series *Fibrosa* and is characterized by its appressed-climbing habit near the ground in areas of sandy soil, short longitudinally ridged internodes, persistent pale cataphyll fibers,

Figure 6. *Philodendron gentryi* Croat. Holotype specimen (MO-3001417).

Figure 7. *Philodendron gentryi.* Specimen from Peru: Loreto, Prov. Maynas, Estación Biológica Río Blanco. *Vásquez et al. 6744* (MO-3435678).

subtriangular deeply sulcate petioles, broadly ovate, acuminate blades with short posterior lobes, 6 or 7 pair of basal veins, naked posterior ribs, an arcuate to parabolic sinus, 5 or 6 primary lateral veins per side, 1 or 2 inflorescences per axil, a cream-colored to yellow spathe and with many ovules per locule with axile placentation.

Nomadic vine near the ground in areas of sandy soil; internodes short, 2.0–2.5 cm long, 1.5–2.5 cm diam., ribbed longitudinally; cataphylls 11.5–15.5 cm long, persistent, pale cataphyll fibers with fragments of red-brown epidermis. *Leaves* 40–76 cm long; petioles moderately long, subtriangular, deeply sulcate, 29–46 cm long, 2–5 mm diam., drying tan to brown, flat to ribbed; geniculum indistinct; blade broadly ovate, 22.5–37.0 cm long, 19–31 cm wide; 0.95–1.35 times longer than broad, 0.67–0.82 times as long as petiole, acuminate at apex, moderately lobed at base, drying gray-green to grayish brown, semiglossy above, slightly paler, greenish to greenish brown or yellowish brown, semiglossy sometimes weakly glossy below, with convex margin; anterior lobe 16–30 cm long; posterior lobes 3–7 cm long, (7.0)8.3–12.0 cm wide; basal veins 6 or 7 pairs, 1st and 2nd pairs free to base, 3rd pairs fused 1.3 cm, 4th pairs fused 1.2 cm, 5th pairs fused 2.5 cm, 6th pairs fused 4.5 cm, 7th pairs fused 5.0 cm; posterior ribs 3.0–5.5 cm long, naked 2.0–4.5; sinus arcuate to parabolic, 3.0–4.0 cm deep, 6.4–12.4 cm wide; midrib drying raised, tan brown to concolorous above, narrowly rounded to round-raised, paler tan, longitudinally ribbed below, sometimes short-pale-lineate below; primary lateral veins 5 or 6 per side, meeting midrib at 40–45°, drying sunken, tan to concolorous above, sharply raised, paler tan and irregularly ribbed below; interprimary and interbasal veins present, minor veins moderately obscure; laticifers faintly visible, usually one between alternate minor veins; cross veins sometimes present on both upper and lower surfaces; upper surface short pale-lineate; lower surface smooth, sometimes brown-speckled. *Inflorescences* 1 or 2 per axil, 11–27 cm long; peduncle 6–9 cm long, 2–4 mm wide, drying dark brown to black, prophyll 7.5–8.5 cm long, reddish brown, forming a fibrous mesh; spathe cream-colored to yellow, 4.0–8.5 cm long, 1.0–1.5 cm wide, short-acuminate, drying reddish brown, constricted 3.5–4.0 cm above base, 1.0–2.0 cm wide at constriction, the epidermis sometimes bubbled loose in longitudinal ribs on blade; spadix 6.0–7.5 cm long; staminate portion 3.0–3.5 cm long and 5–6 mm diameter; sterile staminate portion 8.0 cm long with constricted portion 4–7 mm wide; pistillate portion 2.3 cm long in front and 2.0 cm long in back; pistils 5- or 6-locular, 2–3 mm long; styles subrounded with bluntly acute margins, densely granular, with a broad mantle 1.0–1.2 mm diam. when moistened; stigma button-shaped, 0.6–0.8 mm diam., moderately raised [on young infructescences]; **ovules** many per locule, at least 10 but difficult to count, 0.1 mm long, the funicle about as long or longer than ovule, 1 mm long, 0.3 mm diam.; placentation axile.

Distribution and ecology — *Philodendron gentryi* is endemic to Peru, known only from the type locality in Loreto Department near Iquitos at 140 m in a *Tropical moist forest* life zone.

Etymology — The species is named in honor of the late Dr Alwyn Gentry of the Missouri Botanical Garden who collected the type specimen. Gentry, a graduate of Washington University and a specialist on Bignoniaceae, spent much of his career studying species diversity in different parts of the world and was on the Rapid Assessment Program (RAP) team devoted to making analyses of virgin forests to determine their worthiness for preservation. He was on such an expedition when he was killed in an airplane accident in Ecuador in 1993.

Comments — In the Lucid Philodendron Key *Philodendron gentryi* tracks to *P. asplundii* Croat & M.L.Soares which differs by its much larger leaves, thicker stems and dense network of cataphyll fibers; to *P. fragrantissimum* (Hook.) G.Don, which differs by its acutely D-shaped petioles; to *P. melanoneuron* Croat, which differs by its much larger size and dark brown drying blades; and to *P. sagittifolium* Liebm., which differs by its sharply 2-ribbed, deciduous cataphylls and subterete petioles.

4. ***Philodendron guasagandense*** Croat, **sp. nov.** — Type: ECUADOR. Prov. Cotopaxi: vicinity of Verde Magdalina, 8 km N of Pucayacu, 21 km N of Rio Guasaganda, 29 km N of Palmar (village NE of La Mana on Quevedo-Latacunga hwy) 13 km NE of La Mana, 79° 06’ W, 00° 41’ S, c 900 m. *T.B. Croat 57102*, (holotype, MO-3137007; isotype, QCA). **Figures 8 & 9.**

Diagnosis: Philodendron guasagandense is a member of subgenus *Philodendron* section *Macrobelium* subsection *Glossophyllum* characterized by its appressed-climbing habit, moderately elongated, light tan-brown internodes, sharply 2-ribbed, deciduous cataphylls, subterete petioles, ovate-elliptic, grayish-brown-drying blades, seven primary lateral veins per side, as well as by having 3 or 4 inflorescences per axil with spathe tubes green on both surfaces and the blade white on both surfaces, 6-locular ovaries with a single basal ovule per locule.

Nomadic vine; stem appressed climbing, drying closely ribbed and light tan-brown with glossy, somewhat flaking epidermis; internodes 4–7 cm long, 2.5 cm diam., drying 1.5–1.7 cm diam., light brownish tan, closely ribbed longitudinally; cataphylls sharply 2-ribbed, deciduous, drying light brown, longitudinally ribbed, subcoriaceous. *Leaves* 57 cm long; petioles subterete, 20 cm long, 3–4 mm diam., sheathed 18% of their length, somewhat bluntly C-shaped, drying dark greenish brown, longitudinally ribbed; geniculum indistinct; blade ovate-elliptic, 37 cm long, 17 cm wide, 2.2 times longer than broad, 1.9 times longer than petiole, acuminate at apex, more or less rounded at base, dark green and semiglossy above, slightly paler and semiglossy below, drying weakly glossy below, drying light tannish green and semiglossy above, slightly brownish tan and semiglossy to matte below; midrib convex; basal veins lacking; primary lateral veins seven per side, meeting midrib at 50$_{o}$, concolorous and weakly sunken above, concolorous and weakly raised below, minor veins very obscure below. *Inflorescences* 3 or 4 per axil, 13–17 cm long; peduncle pale green, 4–8 cm long, 3–5 mm wide, drying dark brown to black, longitudinally ribbed; spathe 8.0–10.3 cm long, 7–13 mm wide furled, flattening to 4.4 cm wide, acuminate, drying dark brown to blackened, resin canals conspicuous, fine, located mostly on both sides of the constricted areas and along the sides down to near the bottom of the tube; tube pale green on both sides, blade white; spadix 9 cm long, 6 mm diam.; staminate portion 6 cm long, medium green, narrowly long-tapered to a narrowly blunt point; sterile staminate portion 9 mm long, 7 mm diam., about as broad as the pistillate and staminate portions; pistillate portion 2.4 cm long, 7 mm diam., white; pistils 2 mm long, 0.55 mm diam., 0.2 mm diam.; ovaries 6-locular; ovules 1 per locule, 0.55 mm, each contained within a translucent envelope, each 0.6 mm, 0.2 mm diam.

Distribution and ecology — Known only from the type locality in Cotopaxi Province, Ecuador, at ca. 900 m elevation in *Premontane wet forest.*

Figure 8. *Philodendron guasagandense* Croat. Habit photo of living plant from which the type was prepared.

ECUADOR
ARACEAE
Philodendron

Prov. Cotopaxi. Vic. of Vereda Magdalina, 8 km N of Pucayacu, 21 km N of Rio Guasaganda at Guasaganda, 29 km N of Palmar (village NE of La Mana on Quevedo-Latacunga hwy) 13 km NE of La Mana. 79 06'W, 0 41'S; elev. ca 900 m.

Epiphytic creeper; internodes 4-6 cm long, 2.5 cm diam; light brown, becoming transversely and minutely fissured; petiole more or less bluntly C-shaped.

11 Oct. 1983
Thomas B. Croat 57102

Missouri Botanical Garden Herbarium (M

MISSOURI BOTANICAL GARDEN HERBARIUM (MO)

Figure 9. *Philodendron guasagandense*. Holotype specimen (MO-3137007), showing leaf cataphyll and synflorescence.

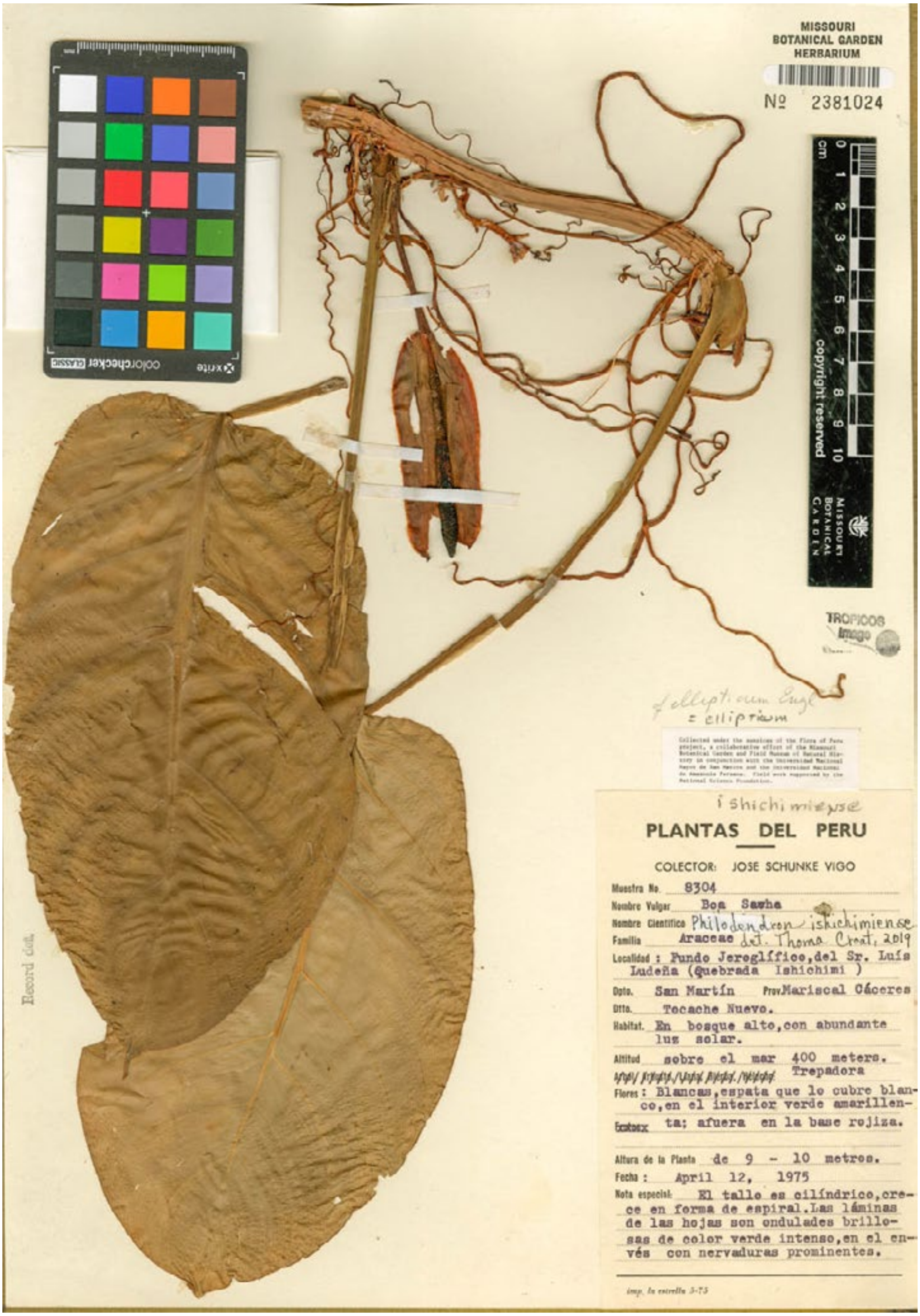
Etymology — The species epithet derives from the type locality in the Vereda Guasaganda in Cotopaxi Province, Ecuador.

Comments — The species is probably most easily confused with *Philodendron oligospermum* Engl, which differs by having less coriaceous, typically greenish drying blades as well las smaller inflorescences only 4–5 cm long; with *P. cardonii* Croat, which differs by having prominently cordate leaf blades; with *P. coriaceum* Croat & D.C.Bay, which differs by being more of a vine with longer internodes and small cordate blades with a single inflorescence per axil; and with *P. patriciae* Croat, which differs by having much longer, pendent blades to 4.5 times longer than broad.

5. *Philodendron ishichimiense* Croat, **sp. nov.** — Type: PERU. San Martín: Province Mariscal Cáceres; Distrito Tocache Nuevo, Fundo Jeroglífico del Sr. Luís Ludeña (Quebrada Ishichimi), 400 m, ca 08°12'S, 76°30'W, 12 April 1975, *J. Schunke-Vigo 8304* (holotype, MO-2381024). **Figure 10.**

Diagnosis: The species is a member of subgenus *Philodendron* section *Macrobelium* subsection *Glossophyllum* Series *Glossophyllum* characterized by its high-climbing scandent habit with light brown, glossy, somewhat flaky epidermis, deciduous cataphylls, long-petiolate leaves, more or less terete petioles, moderately small, ovate, gray-green-drying, abruptly short-acuminate blades which are inequilaterally rounded at the base; as well as the solitary inflorescence, slender peduncle about 60% as long as the spathe and the slender weakly constricted spathe which is green on the blade outside, red on the tube outside and yellow-green throughout on the inside.

Nomadic vine; stem cylindrical, growing in a spiral climbing pattern on trees to a height of 9–10 meters; internodes 12 cm long, 8 mm diam., terete, light brown, glossy, with somewhat flaky epidermis, drying tan with glossy epidermis, ribbed longitudinally; cataphylls deciduous. *Leaves* 39–43 cm long; petioles somewhat terete, 20–21 cm long, drying 4 mm diam., lightly greenish brown, flat, longitudinally ribbed, sheathed 14 % its length; geniculum indistinct; blade ovate, 19–22 cm long, 11– 12 cm wide, 1.7–1.8 times longer than broad, 0.9–1.0 as long as petiole, abruptly and narrowly short-acuminate at apex, inequilaterally rounded at the base, obtuse on one side, weakly subcordate at base on other side?, drying dark greenish gray-brown and semiglossy above, pale grayish yellow-green and weakly glossy below; major veins slightly raised and concolorous above, lighter tan and slightly raised to flat below; basal veins 2 or 3 pairs, all free to base or essentially so; midrib drying concolorous and broadly round-raised above, paler tan, flat, and finely longitudinally ribbed below; primary lateral veins 10 or 11 per side, meeting midrib at 60°, drying concolorous, slightly and broadly raised above; light brownish tan, raised, finely longitudinally ribbed below; interprimary veins present, concolorous; minor veins visible. *Inflorescences* 1 per axil, 13 cm long; peduncle 6 cm long, drying 2 mm diam., dark brown; spathe moderately glossy, 7.7 cm long, tube 3.5 cm long, 6–8 mm wide, narrowly oblong-elliptic, red on outside; blade 4.2 cm long, green outside, yellow-green throughout on both blade and tube inside, drying dark brown with black veins, weakly constricted, 6 mm wide at constriction; spadix 6.8 cm long; staminate portion 4.3 cm long, 4.4 mm diam. at base, 5 mm diam. closer to apex; sterile staminate portion with staminodia in 2 spirals, 0.2 mm long, 0.4 mm diam.; pistillate portion 2.4 cm long, 5 mm diam.; pistils 0.6–0.8



ishichimiense

PLANTAS DEL PERU

COLECTOR: JOSE SCHUNKE VIGO

Muestra No. 8304
Nombre Vulgar Boa Sacha
Nombre Científico Philodendron ishichimiense
Familia Araceae det. Thoma Croat, 2019
Localidad : Fundo Jeroglífico, del Sr. Luís Ludeña (Quebrada Ishichimi)
Dpto. San Martín Prov. Mariscal Cáceres
Dtto. Tocache Nuevo.
Habitat. En bosque alto, con abundante luz solar.
Altitud sobre el mar 400 meters.
Trepadora
Flores : Blancas, espata que lo cubre blanco, en el interior verde amarillenta; afuera en la base rojiza.
Altura de la Planta de 9 - 10 metros.
Fecha : April 12, 1975
Nota especial: El tallo es cilíndrico, crece en forma de espiral. Las láminas de las hojas son onduladas brillosas de color verde intenso, en el envés con nervaduras prominentes.

imp. la estrella 3-75

Figure 10. *Philodendron ishichimiense* Croat. Holotype specimen (MO-2381024).

mm diam.; ovaries 5- or 6-locular; styles 0.9 mm diam.; stigma 0.4 mm diam. with a medial funnel, covered by a broad thin mantle to 1 mm diam.; ovules 1 per locule, basal, ca. 0.35 mm long, funicles slightly longer than ovule, each contained in a gelatinous envelope.

Distribution and ecology — *Philodendron ishichimiense* is endemic to Peru, known only from the type locality in San Martín Department in the Province of Mariscal Caceres at 400 m elevation in a *Tropical moist forest* life zone.

Etymology — The species is named for the type locality along the Quebrada Ishichimi near Tocachi Nuevo in the Province of Mariscal Cáceres.

Comments — In the Lucid Philodendron Key the species tracks to *Philodendron ecordatum* Schott from eastern South America, which differs by having warty stems and a petiole about as long as petioles; to *P. glaziovii* Hook.f. from eastern Brazil, which differs by having narrowly oblong-elliptic blades; and to *P. oligospermum* Engl., which differs by having usually rounded posterior lobes or more broadly ovate blades with clusters of greenish inflorescences per axil.

6. *Philodendron manuelii* Croat, **sp. nov.** — Type: PERU. Loreto: Prov. Maynas; Distrito Iquitos; Carretera de Peña Negra, km 8 de Quistococha al Caserio de Varillal, terreno alto y arenoso, ca. 150 m, 03°51'52"S 073°20'09"W, 6 Apr. 1984, *M. Rimachi Y. 7430* (holotype, MO-5458795-96, 2 sheets). **Figures 11 & 12.**

Diagnosis: The species is a member of subgenus *Philodendron* section *Macrobelium* subsection *Macrobelium* series *Reticulata* characterized by its nomadic epiphytic climbing habit, short internodes, persistent cataphyll fibers, light yellow-brown drying, sulcate petioles which are short-pale-lineate, greenish brown-drying broadly ovate, gradually long-acuminate blades with a weakly hippocrepiform sinus, 1 or 2 pairs of free basal veins, upper surfaces short pale-lineate and lower surface with moderately conspicuous laticifers and short pale lineations; as well as by the clusters of 3 inflorescences with the peduncles about as long as the spathe.

Nomadic vine; stem appressed climbing with internodes short, 1.8 cm diam., closely ribbed longitudinally, drying dark brown; cataphylls ca. 10 cm long, persisting as fine pale fibers and large fragments of reddish-brown epidermis. *Leaves* 97.5 cm long; petioles 31.5 cm long, terete, drying dark brown, 6 mm wide, closely and finely ribbed, short-pale-lineate; geniculum indistinct; blade broadly ovate-sagittate, 66 cm long, 34 cm wide, 1.9 times longer than broad, 2.1 times longer than petiole, gradually long-acuminate at apex, prominently lobed at base, subcoriaceous, drying dark to brownish green, glossy above, paler, yellowish brown and matte below; anterior lobe 66 cm long, 33 cm wide, broadly rounded along margin; posterior lobes 14.2 cm long, 34 cm wide, drying darker with a curved margin; sinus broadly spathulate, 10.5 cm deep, 8.0 cm wide; basal veins 8 pairs, 1st and 2nd pairs of veins free to base, 3rd pairs fused 2.0 cm, 4th pair fused 2.0 cm, 5th pair fused 3.0 cm, 6th & 7th pairs fused 5.0 cm, 8th pair fused 3.0 cm; posterior ribs 4 cm long, naked 3.5 cm; midrib broadly rounded and slightly paler above, narrowly raised, paler below, longitudinally creased in the middle, coarsely ribbed longitudinally; primary lateral veins 11 per side, meeting midrib at 40°; minor veins prominent with laticifers and black resin channels on upper surface, white speckling on the lower surface; interprimary lateral veins present on both surfaces, drying light brownish tan,

ARACEAE
Philodendron manuelii Croat
det. Thomas Croat, 2018
PERU. LORETO. Maynas. Dtto. Iquitos. Carretera de Peña Negra, km 8 de Quisto Cocha al caserio de Varillal, en terreno alto y arenoso, elev. 150+. Epiphytic, spathe yellow.

April 6, 1984
Manuel Rimachi Y. 7430
Institute for Botanical Exploration (IBE)

Figure 11. *Philodendron manuelii* Croat. Holotype specimen sheet 1 (MO-5458976). Leaf blade.

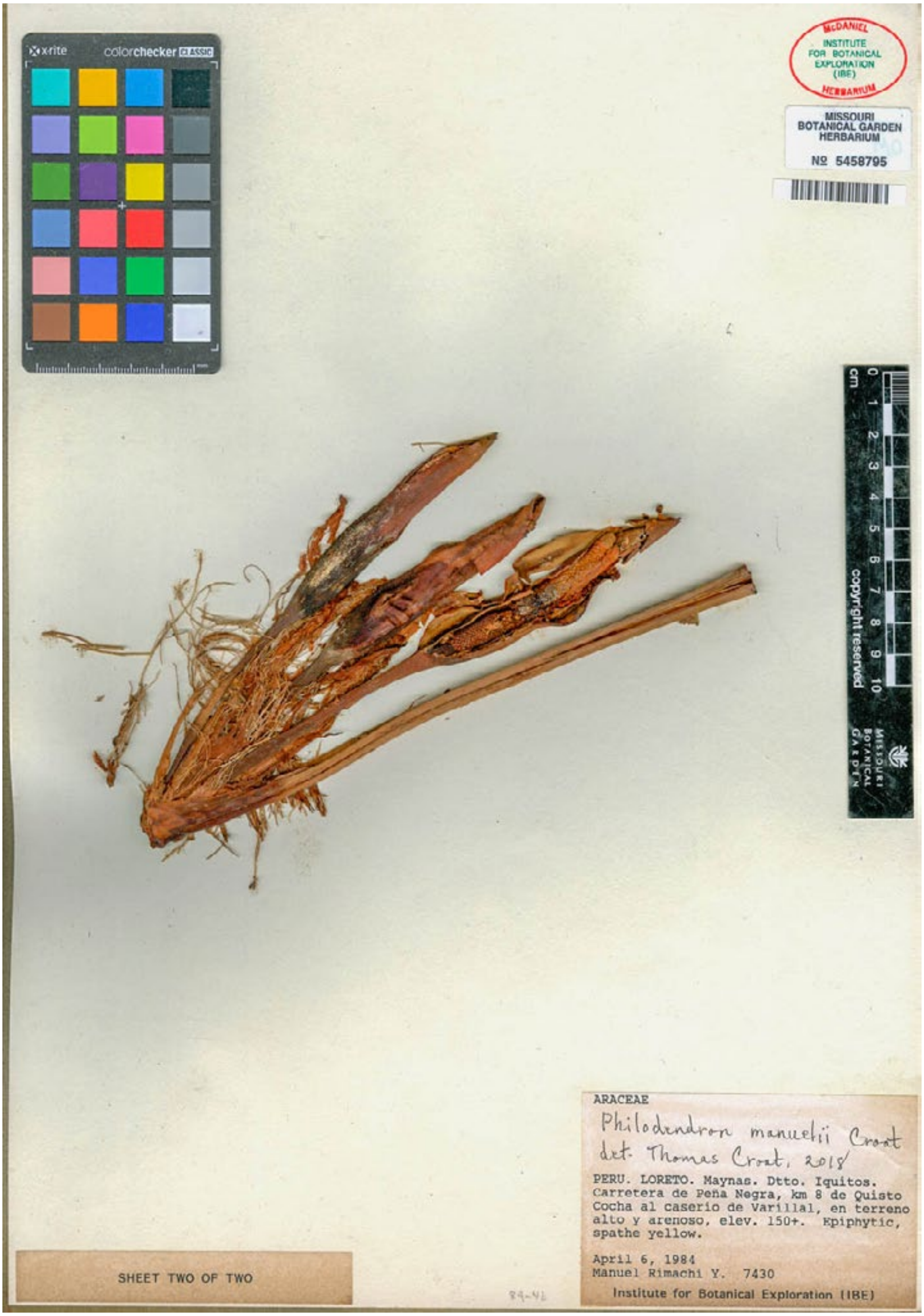


Figure 12. *Philodendron manuelii* Croat. Holotype specimen sheet 2 (MO-5458975). Synflorescence

weakly longitudinally ribbed, raised on the upper surface, sunken on lower surface. *Inflorescences* 3 per axil, 15–19 cm long; peduncle 7–10 cm long, 2–4 mm wide, drying dark brown; spathe 8–10 cm long, 1.2–1.5 cm diam. when furled, yellow, short-acuminate at apex, drying dark brown or black to reddish brown towards apex, constricted 4.5 cm above base, 1.1 cm wide at constriction; spadix 7.5 cm diam.; staminate portion 5 cm long; sterile staminate portion 7–8 mm long, 7 mm diam.; pistillate portion 2.2 cm long, 1.8 cm diam.; pistils 1–2 mm long, 1.1–1.2 mm diam.; style discoid, covered and obscuredby the depressed-globose stigma, the latter 0.8 mm thick, 0.9 mm diam., depressed medially; locules ca. 5; ovules basal, ca. 3 per locule, 0.15 mm long, much shorter than funicle, together with funicle 0.4 mm long.

Distribution and ecology — *Philodendron manuelii* is endemic to Peru, known only from the type locality in Loreto Department, Maynas Province at ca. 150 m in a *Tropical moist forest* life zone.

Etymology — The species is named in honor of Peruvian botanist Manuel Rimachi who collected the type specimen. Manuel (who changed his name to Manuel Villacorta in recent years) worked for many years for the Institute for Botanical Institute under the direction of the late Dr Sidney McDaniel at Mississippi State University. Manuel began his career working with the Amazon Tropical Drug Company as a collector in the early 1970's. The senior author had an opportunity to work with Manuel in 1972 on an extensive collection trip in Loreto Department collecting specimens for the anti-cancer drug program. Manuel has collected over 18,000 numbers since that time and his collections have included many new species.

Comments — *Philodendron manuelii* is closest morphologically to *P. schmidtiae* Croat & Cerón which differs in typically having larger leaves (57–66 cm long), D-shaped petioles with an obtuse medial rib which dries much scruffier with lenticels and lacks short pale lineations as well as by having much larger inflorescences (18–23 cm long) which are pale green to whitish versus yellow and have peduncles typically only about 1/3rd as long as the spathe (versus having peduncles between 2/3rd to fully as long as the spathe in *P. manuelii*). In addition, *Philodendron schmidtiae* typically occurs above 500 m elevation.

In the Lucid Philodendron Key the species tracks to *Philodendron deflexum* Poepp. ex Schott which differs by having deciduous cataphylls, proportionately much narrower blades with a length to width ratio of more than 1.6 and more prominently pedunculate inflorescences (8.5-23 cm long); to *P. maculatum*, from the Rio Acre in Brazil, which also differs by having a narrower leaf blade to 1.4 times longer than broad and a petiole which is markedly flattened adaxially with a narrowly raised marginal rib as well as a peduncle less than 4 cm long; and to *P. marcocorreanum* Croat, M.M.Mora & Edwin Trujillo which differs by having deciduous cataphylls, markedly larger blades 52.1–84.2 cm long, 42.9–66.6 cm wide and a larger inflorescence with the spathe 17.5 cm long.

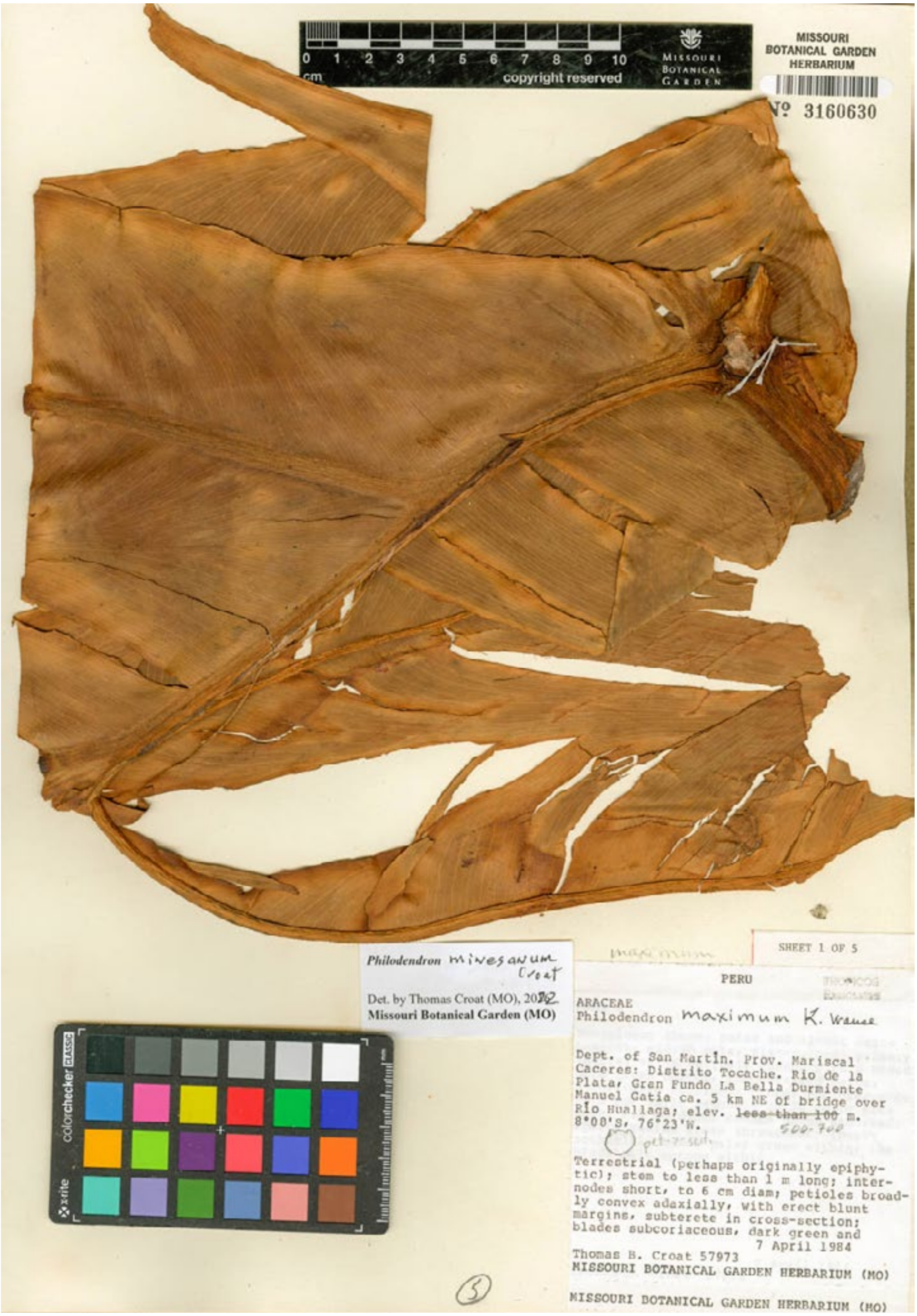
7. *Philodendron minesianum* Croat, **sp. nov**. — Type: PERU. San Martín: Prov. Mariscale Caceres; Distrito Tocache, Río de la Plata, Gran Fundo La Bella Durmiente Manuel Gatia, ca. 5 km NE of bridge over Río Huallaga; 08°08'S, 76°23°'W, 500–700 m, 7 Apr. 1984, *T.B. Croat 57973* (holotype, MO-3160630–34, 5 sheets; isotype MO-3213302). **Figures 13–19.**

Figure 13. *Philodendron minesianum* Croat. Living type plant with inflorescences (*Croat 57973*).

Diagnosis: The species is characterized by its large size, short thick internodes, intact cataphylls, subterete petioles with the lateral margins bluntly raised, ovate-triangular-sagittate blades with a moderately straight to weakly sinuate margin, 6–8 pairs of basal veins, mostly not free to the base, a narrow somewhat spathulate sinus (often closed by overlapping posterior lobes), prominently naked posterior ribs; as well as clusters of up to 6 long-pedunculate inflorescences per axil, a green spathe which is purplish inside on tube.

Figure 14. *Philodendron minesianum*. Living type plant with leaves (*Croat 57973*).

Terrestrial or nomadic vine, found on rocks and sandy clearings. Stem less than 1 m long, abundant clear sticky sap; internodes short, to 6 cm diam.; cataphylls persisting more or less intact, to ca. 25 cm long. *Leaves* suberect; petioles to ca. 1 m long, broadly convex adaxially, with erect blunt margins, subterete in cross-section, drying, 7–15 mm diam., flat with raised edges, reddish brown, longitudinally ribbed, sheathed 51–62%; geniculum indistinct; blades narrowly ovate-triangular-sagittate, subcoriaceous, dark green and semiglossy above, paler and almost matte beneath, drying moderately coriaceous, yellowish brown, 60–133 cm long, 35–100 cm wide, 1.1–2.2 times longer than broad, sharply acuminate at apex, deeply lobed at base, margins at most weakly sinuate, drying brownish tan green and semiglossy above, tannish brown and semiglossy to matte with black spots below; anterior lobe 45–105 cm long, broadly convex and weakly sinuate on margins; posterior lobes 21.5–33 cm long, 17–26 cm wide, directed weakly upward from midrib, the inner margins held in close contact or even overlapping in life, overlapped on drying, sinuate along margin; sinus 11–22 cm deep, 5–26 cm wide, mitered, rhombic or hippocrepiform; basal veins (3)6–8 pairs, usually with none free to the base, 1st pair sometimes free to the base, interbasal veins present, 1st pair usually fused 2.5 cm, 2nd pair fused 7.5 cm, 3rd pair fused 14.5 cm, 4th pair fused 18 cm, 5th pair fused 13 cm, 6th pairs fused 12 cm, 7th and 8th pairs fused 11.5 cm, longitudinally ribbed; posterior ribs 10.5–24.0 cm long, naked 5–15 cm; midrib pale, flattened and concolorous above, narrowly rounded and paler below, drying sunken at base, flat to slightly raised towards apex, whitish to concolorous above, sometimes reddish brown, more distinctly longitudinally ribbed below; primary lateral veins (5)8–9 per side, meeting midrib at 45–65°, narrowly sunken with a broad, pale green border, round-raised and sometimes purplish below, drying flat to slightly raised and medially sunken above, slightly raised with ridges on the margins reddish brown below; interprimary veins lacking; cross-veins sometimes apparent on both upper and lower



Philodendron minesanum Croat

Det. by Thomas Croat (MO), 2022

Missouri Botanical Garden (MO)

PERU

ARACEAE

Philodendron maximum K. Krause

Dept. of San Martin. Prov. Mariscal Caceres: Distrito Tocache. Rio de la Plata, Gran Fundo La Bella Durmiente Manuel Catia ca. 5 km NE of bridge over Río Huallaga; elev. ~~less than 100~~ 500-700 m. 8°08'S, 76°23'W.

Terrestrial (perhaps originally epiphytic); stem to less than 1 m long; internodes short, to 6 cm diam; petioles broadly convex adaxially, with erect blunt margins, subterete in cross-section; blades subcoriaceous, dark green and

7 April 1984

Thomas B. Croat 57973

MISSOURI BOTANICAL GARDEN HERBARIUM (MO)

MISSOURI BOTANICAL GARDEN HERBARIUM (MO)

Figure 15. *Philodendron minesianum*. Holotype specimen sheet 1 (MO-3160630). Part of leaf blade.

Figure 16. *Philodendron minesianum*. Holotype specimen sheet 2 (MO-3160631). Part of leaf blade.

Philodendron minesanum Croat
Det. by Thomas Croat (MO), 2022
Missouri Botanical Garden (MO)

SHEET 3 OF 5

PERU

TROPICOS
Exsiccatae

ARACEAE
Philodendron maximum K.Krause

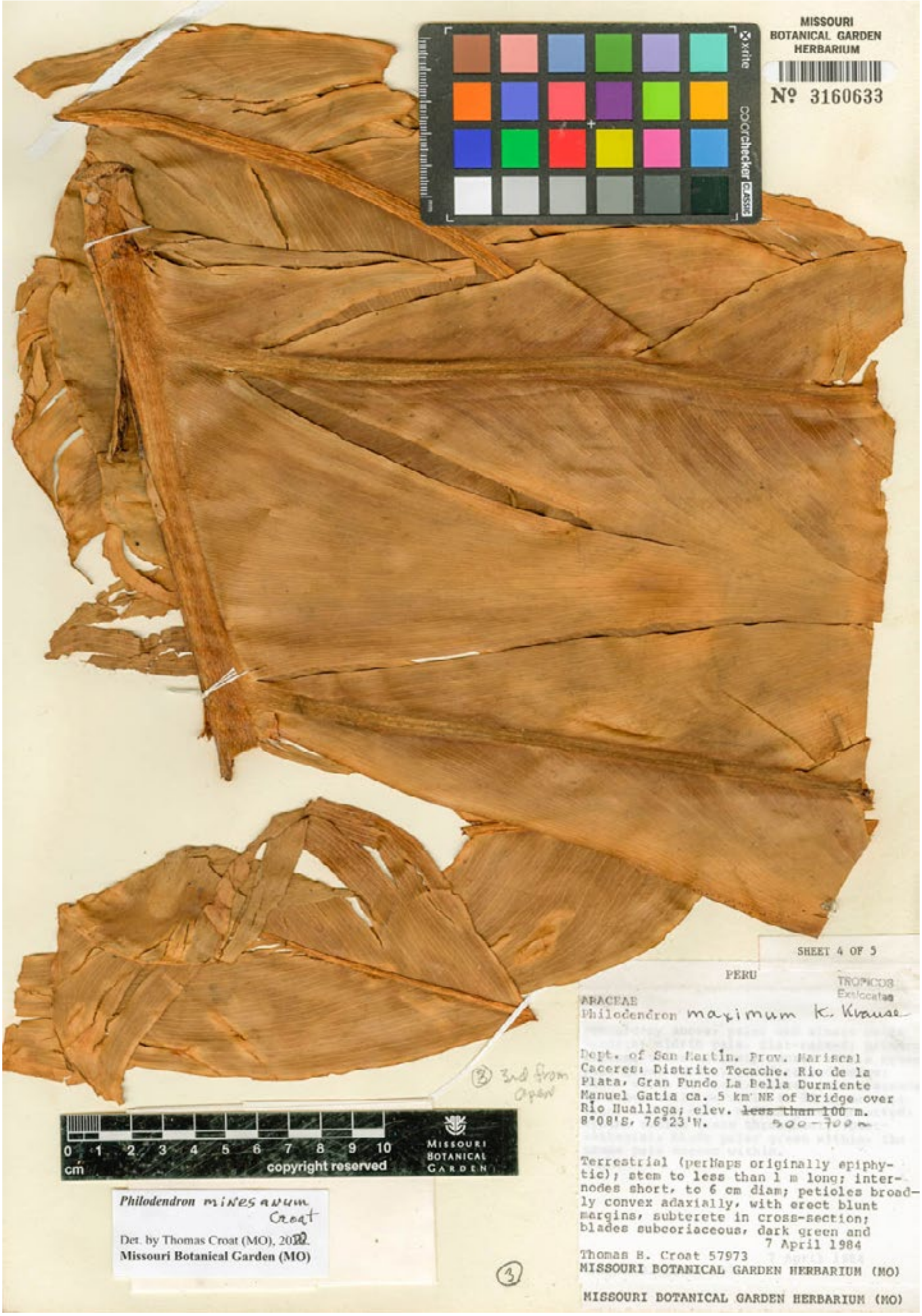
Dept. of San Martin. Prov. Mariscal Caceres: Distrito Tocache. Rio de la Plata, Gran Fundo La Bella Durmiente Manuel Catia ca. 5 km NE of bridge over Rio Huallaga; elev. ~~less than 100~~ 500-700 m. 8°08'S, 76°23'W.

Terrestrial (perhaps originally epiphytic); stem to less than 1 m long; internodes short, to 6 cm diam; petioles broadly convex adaxially, with erect blunt margins, subterete in cross-section; blades subcoriaceous, dark green and

7 April 1984
Thomas B. Croat 57973
MISSOURI BOTANICAL GARDEN HERBARIUM (MO)

MISSOURI BOTANICAL GARDEN HERBARIUM (MO)

Figure 17. *Philodendron minesianum*. Holotype specimen sheet 3 (MO-3160632). Part of leaf blade.



SHEET 4 OF 5

PERU

TROPICOS Exsiccatae

ARACEAE
Philodendron maximum K. Krause

Dept. of San Martin. Prov. Mariscal Caceres: Distrito Tocache. Rio de la Plata, Gran Fundo La Bella Durmiente Manuel Gatia ca. 5 km NE of bridge over Río Huallaga; elev. ~~less than 100~~ m. 500–700 m
8°08'S, 76°23'W.

Terrestrial (perhaps originally epiphytic); stem to less than 1 m long; internodes short, to 6 cm diam; petioles broadly convex adaxially, with erect blunt margins, subterete in cross-section; blades subcoriaceous, dark green and

7 April 1984

Thomas B. Croat 57973
MISSOURI BOTANICAL GARDEN HERBARIUM (MO)

MISSOURI BOTANICAL GARDEN HERBARIUM (MO)

Philodendron minesanum Croat
Det. by Thomas Croat (MO), 2022.
Missouri Botanical Garden (MO)

Figure 18. *Philodendron minesianum*. Holotype specimen sheet 4 (MO-3160633). Part of leaf blade.

Figure 19. *Philodendron minesianum*. Holotype specimen sheet 5 (MO-3160634). Leaf and inflorescences.

surfaces but more prominent on the lower surface; minor veins distinct, close, concolorous, convex and closely ribbed, below; upper surface bluntly and irregularly wrinkled; lower surface flattened, minutely dark yellowish brown-speckled-dotted; laticifers present, visible on lower surface only, neither distinct nor numerous, usually not blackened (but see *Klug 1519* near Iquitos). *Inflorescences* 1–6 per axil, 20–61 cm long; peduncle medium green, unmarked, drying 4–37 cm long, 4–12 mm wide, dark brown, longitudinally ribbed; spathe medium green throughout outside (post-anthesis); tube 7.5–11.0 cm long, 2–3 cm diam., pale maroon within; blade paler green within, drying 15–25 cm long, 2.2–3.7 cm wide, constricted 7–13 cm above base, 7–18 mm wide at constriction, short-acuminate at apex, tan to dark brown, brown to black resin canals present in interior, spadix 11–23 cm long, staminate portion white, 4–15 cm long and 6–15 cm diameter, sterile staminate portion 8–25 mm long, 6–13 mm wide, pistillate portion green-yellow, 5–11 cm long in front and 3–10 cm long in back; pistils closely aggregated, conspicuously granular on sides; style not conspicuous, drying narrower than stigma; stigma 0.9–1.1 mm diam., with apex flattened with bluntly raised central dome and a narrow marginal apron, this usually persisting as a distinct narrowly raised fimbriate margin; ovary 6- or 7-locular; ovules 6–7(10) per locule; placentation basal; funicles of varying lengths, some shorter than ovules, some longer than ovules.

Distribution and ecology — *Philodendron minesianum* is at present known only from Peru but is widespread, ranging from Loreto in the north at 120 m to San Martín Department (500–700 m), occurring in *Tropical moist forest* life zones.

Etymology — The species is named in honor of Thomas Mines, Volunteer Research Associate, Aroid Research Group at the Missouri Botanical Garden and formerly a professor of Chemistry at St. Louis Community-Florissant Valley Campus. He received his B.Sc. degree in Chemistry at University of Missouri-Columbia and his Masters degree in Chemistry at Southern Illinois University, Carbondale Campus. He has been associated with the Missouri Botanical Garden working in the Aroid Research Program for more than eight years.

Comments — Specimens of *Philodendron minesianum* have long been determined erroneously as *P. maximum* K.Krause, a species described from Acre State in Brazil (along the Rio Acre near Paraguassu). That species is substantially different from most of the specimens used to prepare the description above. The type of *Philodendron maximum* (*Ule 9229*, B†; extant isotype at K) was a plant with moderately small blades, described as 60–70 cm long and 25–30 cm wide, posterior lobes 25–28 cm long and 30–35 cm wide with narrow or closed sinus and with the posterior rib naked up to 1 cm as well as moderately short peduncles (12–20 cm long), the spathe tube only 5–6 cm long and 1.8–2.5 cm diam. with the blade portion 7–8 cm long and 1.2–1.5 cm wide. Moreover, the ovules were many per locule and with axile placentation. In contrast *Philodendron minesianum* is a very large plant with leaf blades to more than 1.3 m long and to 1 m wide with the posterior rib 10–24 cm long, naked 5–15 cm and with peduncles to more than 30 cm long with the spathe tube 9–12 cm long.

Many other specimens in similar habitats have also been determined as *Philodendron maximum* and they are mentioned here with notes on their differences with *P. minesianum*. The specimen perhaps closest in general appearance to *Philodendron minesianum* is *Köster et al. 1084* from Tiputini Biodiversity Station in Orellana Prov. of Ecuador. It has dried blades with a similar color with similarly ridged pale veins adaxially, as well as having brownish speckles on the lower blade surface. However, that specimen differs in having blades with much more sinuate margins. Moreover, it has the upper blade surface more coarsely and densely veined and is conspicuously granular, and it has a more broadly arcuate sinus with the outer half of the posterior lobes prominently hooked inward with the lowermost pairs of basal veins recurving at more than a 90° angle. The lower blade surface has the speckling darker, larger and more diffuse. In addition, the collection has the pistils more conspicuously granular on the sides, with the styles lacking a narrow medial dome and possessing 6–9 pores in a circle with each potentially developing a funnel-like appendage arising from the surface of the style.

Of other specimens, *Nee 31750*, from Peru in Madre de Dios Department at 125 m, is also very similar in appearance owing to having a blade with a similar narrow sinus, having the same minute dark speckles on the lower blade surface, as well as by having a long slender peduncle. However, that collection differs by having a blackened pistil and a button-shaped style with a circle of prominent perforations and an ovary with axile placentation and 10 or more seeds stacked in each locule. *Knapp & J. Mallet 6990* from San Martín Dept. at 250 m is also similar to *Philodendron minesianum*, but that collection dries darker brown on the upper surface and is both minutely granular and pustular as well as minutely and irregularly areolate-ridged and short pale-lineate on the lower surface and has a short-pedunculate inflorescence with a pinkish cream spathe. *Young & Salazar 1027* is similar to *Philodendron minesianum* in it blade's drying color, but it differs in having a thinner dried blade, sinuate margins and has both surfaces drying conspicuously areolate-ridged. *Croat et al. 84426* from Bolivia dries the right color but differs in having persistent cataphylls, blades with sinuate margins, granular surfaces and conspicuous laticifers. *Gentry et al. 76643* differs by drying dark brown with pustules on both blade surfaces and with prominent laticifers, as well as short-pedunculate inflorescences. *Gottsberger & Döring G112-29888* differs by drying darker brown with dark brown-drying major veins, markedly sinuate margins and the lower surface dries markedly areolate ridged. *Croat & E. Trujillo 98205* from Macagual in Caqueta differs in having dark brown-drying moderately sinuate-margined blades which dry semiglossy above and matte below, and C-shaped cataphylls with acute margins, persisting dark brown with dark fragments of epidermis and pale fibers.

Paratypes: PERU. Loreto: Mishayacu, *R. Martin, T. Plowman & C. Lau-Cam 1675* (F); Prov. Mayas, Sanangal, Rio Itaya, near Yanayaco, 04°S73°20'W, 120 m, *R. Vasquez, N. Jaramillo & P. Stern 371* (MO). Puno: Río Candamo fila at mouth of Rio Guacamayo, 13°30'S. 69°50'W, 700–800 m, *A. Gentry, R. Ortiz & P. Nuñez 77132* (MO).

8. *Philodendron narvaezii* Croat, **sp. nov.** — Type: ECUADOR. Esmeraldas Prov.: Muisne Cantón, Reserva Ecológica Mache-Chindul, Parroquia San Gregorio, Comunidad indígena Chachi, Chorrera Grande, from the Río Colorado to 500 m N of the community, tropical wet forest, primary forest on alluvial soils, 00°29"S, 79°47'W, 255 m, 17 Feb. 2004, *E. Narváez 912* (holotype, MO-5930801; isotype, QCNE). **Figure 20.**

Diagnosis: The species is a member of subgenus *Philodendron,* section *Macrobelium*, series *Macrobelium* characterized by its epiphytic habit, slender stem with short internodes, deciduous unribbed cataphylls, subterete petiole, blades with poorly developed posterior rib, blades with

Figure 20. *Philodendron narvaezii* Croat. Holotype specimen (MO-5930801).

apparent laticifers but lacking the granules in the aereoles and lacking the rather prominent cross-veins of *P. roseocataphyllum* Croat & M.M.Mora. Otherwise, *Philodendron narvaezii* often looks much like *P. roseocataphyllum.*

Epiphytic at 2 m; internodes longer than broad or about as long as broad, 1.4 cm diam.; surface finely and irregularly ribbed, dark yellow brown; cataphylls 22 cm long, deciduous, drying dark brown. *Leaves* 99.5 cm long; petiole terete, 55.5 cm long, drying 5 mm diam. at middle, 3 mm diam. at apex, drying dark brown and matte, smooth, sulcate near base; geniculum not apparent; blade narrowly ovate-triangular-sagittate, 54 cm long, 30 cm wide, broadest ca. 6 cm above petiolar plexus, broadly convex along margin, 1.8 times longer than broad, 0.93 times as long petiole, gradually short-acuminate at apex, prominently lobed at base, subcoriaceous, dark green and semiglossy above, moderately paler and semiglossy below, drying thin, dark brown and weakly glossy above, lighter brown and semiglossy below; anterior lobe 44 cm long, broadly convex along margin; posterior lobes 15.5 cm long, 11.5 cm wide, narrowly rounded at apex; basal veins 7 pairs, 1st and 2nd vein free to base, 3rd & 4th fused to 0.5–0.6 cm, 4th & 5th fused to (1.0– 2.1 cm), 6th & 7th fused to 3.0 cm; posterior ribs 2.5–3.7 cm long, naked 2.2 cm; sinus parabolic, 10.5 cm deep, 8.5 cm wide; midrib drying narrowly and acutely raised and concolorous above, narrowly rounded, matte and darker with fine ribs on the side on lower surface; primary lateral veins 7 per side, departing midrib at a steep angle then spreading at 40–55°, drying concolorous, flat to weakly raised, minutely granular above, narrowly raised and darker, matte below; upper surface smooth and silky, sparsely short-pale-lineate; lower surface smooth with moderately prominent, frequent, obvious laticifers, these moderately long and straight. *Inflorescences* at least one per axil; peduncle 5 cm long; spathe 12.5 cm long, ca. 2 cm diam. furled, abruptly short-acuminate at apex, flattening to 4.5 cm wide at widest portion on tube, constricted above tube to 3.5–4.0 cm, drying coriaceous, dark brown, with resin canals 5.0 cm long; spadix 10 cm long; staminate portion 7.2 cm long, 1.1–1.4 cm diam.; sterile staminate portion 1.1 cm long, constricted portion 9 mm wide; pistillate portion 3.3–3.9 cm long in front, 2.0–3.2 cm long in back; pistils 2.2 mm long; stigma 0.8 mm wide, 0.3 mm thick; ovary 1.6 mm long, 1.2 diam., ovary ovoid, 6- or 7-locular; ovules 3–5, arising from the base and contained within a gelatinous envelope, 0.6–0.7 mm long, 0.2 mm wide, funicles of varying lengths, the ovules proper less than 0.1 mm long.

Distribution and ecology — *Philodendron narvaezii* is endemic to Ecuador, known only from the type locality in the Reserva Ecológica Mache-Chindul Mountains of western Ecuador in Esmeraldas Province at 500 m in a *Premontane moist forest* life zone.

Etymology — The species is named in honor of Ecuadorian botanist Edwin Narváez who collected the type specimen of this attractive plant. Edwin was born January 3, 1970 and graduated from the Universidad Central in 1997. He worked on the floristics of Antisana and the Parque Nacional Llanganantes, participated with OTS courses in Central America, trained in horticultural practices at the Missouri Botanical Garden, helped to coordinate the initiation of the Jardín Botanico in Quito, and is currently working with environmental conservation for the Projecto Nacional de Reforestación.

Comments — *Philodendron narvaezii* is most closely related to *P. roseocataphyllum* Croat & M.M.Mora, but that species differs in having a much broader stem, persisting cataphyll fibers, blades with a more well-developed posterior rib, more prominent laticifers, prominent cross-veins and granules in the areoles of veins on the lower surface, and a near lack of short pale lineations on the upper blade surface.

9. *Philodendron nelsonzamorae* Croat & Grayum, **sp. nov.** — Type: ECUADOR. Pichincha Province: small patches of forest along ridge to ca. 1.5 km N of Escuela Fiscal Mixta Centinelas del Pichincha (ca. 10 km as-the-crow-flies SE of Patricia Pilar), 00°37'S, 79°18'W, 600–675 m, 10 Apr. 1989, *M.H. Grayum & N. Zamora 9388* (holotype, MO-3686652 & 53, 2 sheets; isotype, QCNE). **Figures 21 & 22.**

Diagnosis: The species is a member of section *Philodendron* subsect. *Philodendron*, Ser. *Philodendron* and is characterized by its appressed-climbing habit, moderately short internodes with roughened brownish transversely fissured epidermis, long-petiolate leaves, unribbed, pinkish, deciduous cataphylls, terete, finely short-lineate, blackish-drying petioles, dark brown-drying, narrowly ovate-sagittate, weakly short-acuminate blades with a narrowly parabolic sinus, 8 or 9 pairs of basal veins, 3 to 4 of which are free to the base, 10 or 11 primary lateral veins per side and with both the laterals and basal veins with intermediate veins; as well as by the solitary, long-pedunculate inflorescence with the spathe magenta-pink outside, becoming light green at apex on outside with tube deep crimson inside and fading upward.

Nomadic vine, loosely appressed-climbing (the apical portions free) to ca. 3.5 m above ground; stem stout; young stems with raised, longitudinal white streaks, drying dark brown, matte with closely spaced transverse sub-scaly ridges; older stems drying medium yellow-brown, closely ridged longitudinally; internodes 6.5–15.0 cm long, to 3 cm diam., roughened, brownish and transversely cracking, drying 1.2–2.5 cm diam.; cataphylls 28 cm long, salmon pinkish, rounded dorsally, deciduous, drying moderately coriaceous. *Leaves* 99–134 cm long; petioles 57– 87 cm long, 5–10 mm diam., terete, firm, finely whitish-lineolate, drying dark brown, matte, finely ribbed, flattened; geniculum indistinct; blade narrowly ovate-sagittate, 53–56 cm long, 34–36 cm wide, 1.5–1.6 times longer than broad, 0.65–0.93 times as long as petiole, acuminate at apex, prominently lobed at base, thinly coriaceous, easily tearing, moderately bicolorous, dark green and semiglossy above, slightly paler and glossy below, drying dark tan/brown, semiglossy above, greenish brown, semiglossy below, paler and sub-hyaline on margins; anterior lobe 42–47 cm long, broadly rounded to nearly straight along margin; posterior lobes 9–12 cm long, 14.5–15.5 wide; basal veins 8 or 9 pairs, interbasal veins present, 1st pair free to base, 2nd pairs fused 1.0–1.3 cm, 3rd pairs fused 1.0–1.3 cm, 4th pairs fused free–1.5 cm, 5th pairs fused 1.2–2.5 cm, 6th pairs fused 2.0–3.0 cm, 7th pairs fused 1.5–3.0 cm, 8th pairs fused 1.5–3.2 cm; posterior ribs 15.3–18.0 cm long, naked not at all or up to 2.5 cm; sinus parabolic, 9–12 cm deep, 8–11 cm wide; midrib convex and paler above, obtusely triangular below, drying slightly raised at base, sunken towards apex above, raised, darker and longitudinally ribbed below; primary lateral veins 13 per side, meeting midrib at 50°– 60°, sunken above, convex below; minor veins visible below, darker, drying concolorous above, raised, darker below; interprimary veins and minor veins present on both upper and lower surfaces. *Inflorescences* erect, 1 or 2 per axil, 27–34 cm long; peduncle subterete (vaguely compressed), 13–16 cm long, 5–8 mm wide, terra-cotta, densely whitish-lineolate, drying black; spathe 17.7–19.0 cm long, thick-walled;

ECUADOR

TROPIC Exsiccatae

ARACEAE
Philodendron nelsonzamorae Croat
det. Thomas Croat, 2022
PICHINCHA:
Small patches of forest along ridge to ca. 1.5 km N of Escuela Fiscal Mixta Centinelas del Pichincha (ca. 10 km as-the-crow-flies SE of Patricia Pilar).
00°37'S 79°18'W 600-675

Stout, loosely appressed-climbing plants (the apical portions free) to ca. 3.5 m above ground in primary forest. Stems to ca. 3 cm thick, the epidermis rough, brownish and transversely cracking. Young stems with raised, longitudinal white streaks. Cataphylls salmon-

10 April 1989
Mike Grayum & Nelson Zamora 9388
MISSOURI BOTANICAL GARDEN HERBARIUM (MO)

greenish-white distally. Male portion of spadix white; ovaries pale greenish.

10 April 1989
Mike Grayum & Nelson Zamora 9388
MISSOURI BOTANICAL GARDEN HERBARIUM (MO)

MISSOURI BOTANICAL GARDEN HERBARIUM (MO)

Figure 21. *Philodendron nelsonzamorae* Croat. Holotype specimen sheet 1 (MO-3686652). Leaf and inflorescence.

ECUADOR

ARACEAE
Philodendron nelsonzamorae Croat
det. Thomas Croat, 2022
PICHINCHA:
Small patches of forest along ridge to ca. 1.5 km N of Escuela Fiscal Mixta Centinelas del Pichincha (ca. 10 km as-the-crow-flies SE of Patricia Pilar).
00°37'S 79°18'W 600-675

Stout, loosely appressed-climbing plants (the apical portions free) to ca. 3.5 m above ground in primary forest. Stems to ca. 3 cm thick, the epidermis rough, brownish and transversely cracking. Young stems with raised, longitudinal white streaks. Cataphylls salmon-
10 April 1989
Mike Grayum & Nelson Zamora 9388
MISSOURI BOTANICAL GARDEN HERBARIUM (MO)

greenish-white distally. Male portion of spadix white; ovaries pale greenish.
10 April 1989
Mike Grayum & Nelson Zamora 9388
MISSOURI BOTANICAL GARDEN HERBARIUM (MO)

10 April 1989
Mike Grayum & Nelson Zamora 9388
MISSOURI BOTANICAL GARDEN HERBARIUM (MO)

Figure 22. *Philodendron nelsonzamorae*. Holotype specimen sheet 2 (MO-3686653). Leaf and inflorescence.

blade 10.0–10.5 cm long, magenta-pinkish inside in lower half, greenish white toward apex, acuminate; tube deep crimson inside, magenta-pink outside, 8.5–9.0 cm long, 2.2–3.0 mm wide, drying dark brown to reddish brown or blackened, weakly constricted, 1.7– 2.2 cm wide at constriction; spadix 15 cm long; pistillate spadix 5.5 cm long in front, 4.7 cm long in rear, 3 cm diam. at base, 2.0 cm diam. at apex, pale green; staminate spadix 10 cm long, 2.2 diam. at base, constricted to 1.7 cm diam. at 3.5-4.5 cm above the base of staminate spadix, 2.2 cm diam. at 7.5 cm above base of staminate spadix; staminate portion white; pistils 2.2 mm long, 1.1-2.1 mm diam., obovoid; ovaries pale greenish, style irregularly 5- or 6-sided, subtruncate but much constricted below stigma; stigmas pinkish, 1.3 mm diam.; ovules 8–10 per locule with axile placentation, 0.6-0.8 mm long, 0.2 mm diam.; funicles short.

Distribution and ecology — *Philodendron nelsonzamorae* is endemic to Ecuador, known only from the type locality in Pichincha Province at 600–675 m in a *Tropical moist forest* life zone.

Etymology — The species is named in honor of Costa Rican botanist Nelson Zamora Villalobos, one of the collectors of the type specimen. Zamora, a forestry engineer, studied at the School of Environmental Sciences of the National University of Costa Rica in Heredia and later worked there lecturing and teaching botanical forestry and dendrology as well as working in their herbarium (JVR). He also taught in the Department of Forestry Engineering at the Technological Institute of Costa Rica and worked as a botanist for the National Museum and Herbarium CR as well as the former National Institute of Biodiversity (INBio) in Santo Domingo, Heredia.

Comments — In the Lucid Philodendron Key this species tracks to *Philodendron edwinii* Croat & Marco Correa which differs by having longitudinally ribbed stems without cross-fissures, more narrowly ovate, gray-drying blades and a single small inflorescence; to *P. narinoense* Croat, which differs by having a parabolic to spathulate sinus, basal veins fused 2–8 cm and with the spathe tube dark purple on the outside; and to *P. pogonocaule* Madison, which differs by its D-shaped petioles and dense fibrous cataphylls and its glossy, pale-speckled lower blade surface.

10. *Philodendron oxycataphyllum* Croat, **sp. nov.** — Type: ECUADOR. Napo Province: along road between Baeza and Lago Agrio, 107 km W of Lago Agrio; boggy area along road with second growth and remnants of primary forest, 1440 m, 01°05'S, 77°30'W, 19 Dec. 1979, *T.B. Croat 49486* (holotype, MO-2737384; isotype, QCA). **Figure 23.**

Diagnosis: The species is a member of subgenus *Philodendron* section *Macrobelium* subsection *Glossophyllum*, characterized by its appressed-climbing habit, internodes longer than broad, drying grayish yellow-brown and smooth, deciduous 1-ribbed cataphylls, oblong-oblanceolate, brownish-drying, gradually acuminate blades which are rounded to weakly subcordulate at base with obscure primary lateral veins; as well as by the 3 inflorescences per axil, and spathe that is greenish white on both surfaces.

Nomadic vine; stems appressed-climbing, brown, flattened on one side; internodes moderately longer than broad, 3.5–5.0 cm long, 2.0–2.5 cm diam., drying grayish yellow-brown; cataphylls green, 11.5–16.5 cm long, sharply 1-ribbed, deciduous. *Leaves* scattered along stem, pendent;

ECUADOR
Province of Napo

Family: ARACEAE
Philodendron oxycataphyllum Croat

Along road between Baeza and Lago Agria, 107 km W of Lago Agria; elev. 1470 m. Boggy area along road with second growth and remnants of primary forest. Epiphytic vine; stems brown, flattened on one side; 2.0-2.5 cm diam; petioles firm obtusely flattened slightly; cataphylls green, sharply ribbed; deciduous; peduncles green, spathe coriaceous greenish-white inside and outside; pistils greenish-white at anthesis; male portion white, extending forward out of spathe.

Thomas B. Croat 49486 19 Dec. 1979
MISSOURI BOTANICAL GARDEN HERBARIUM

Figure 23. *Philodendron oxycataphyllum* Croat. Holotype specimen (MO-2737384).

petioles 4.6–12.9 cm long, erect-spreading, firm obtusely flattened slightly; blades oblong-oblanceolate, 15.8–25.5 cm long, 5.7–7.2 cm wide, 3.5 times longer than wide, 2.9–3.4 times longer than petioles, gradually acuminate at apex, rounded to weakly cordulate at base (sinus 2–3 mm deep when present), semiglossy and medium dark green above, slightly paler below, drying yellowish green to grayish brown above, gray-brown to yellow-brown below; midrib broadly rounded and concolorous above, narrowly rounded below, drying finely ribbed below, darker than surface above and below; primary lateral veins obscure, perhaps 5–7 per side, meeting midrib at 50° as indicated by the weak undulations on the upper surface; minor veins fine and close, moderately indistinct. *Inflorescences* 3 per axil; peduncles green, 7.8–10.7 cm long, 5–6 mm diam. on drying; spathe greenish-white inside and outside, 9.0–10.3 cm long, opening to lower 1/3 or more at anthesis, ca. 2 cm diam. when furled, flattening to 5 cm wide, coriaceous, weakly emarginated at apex with a short down-turn; spadix sessile, 8 cm long; pistillate portion 3 cm long in front, 1.1 cm diam.; staminate portion white, extending forward out of spathe, 5 cm long, 1 cm diam. at broadest point; sterile staminate portion ca. 3 mm long, as broad at the base of the fertile staminate portion, drying paler than staminate flowers; pistils greenish-white at anthesis; ovary subglobose, 1.4 mm long, 1.2 mm diam.; style short, funnelform; stigma 1 mm diam., 0.15 mm thick; locules 5, each containing a gelatinous translucent mass with a single basal oblong ovule, this mass 0.6–0.7 mm long, 0.5 mm diam.; ovules 0.5 mm long (including funicle, the funicle slightly shorter than the ovule.

Distribution and ecology — *Anthurium oxycataphyllum* is endemic to Ecuador, known only from the type locality in Napo Province at 1410–1470 m in a *Tropical wet forest* life zone.

Etymology — The species epithet '*oxycataphyllum*' comes from the Greek *oxys* meaning acute or sharp, and cataphyll.

Comments — In the Lucid Philodendron Key the species tracks to *Philodendron bicolor* Croat, Scherber., M.M.Mora & G.Ferry which grows with a similar habit, but that species differs by having the blades dark violet-purple when young, pinkish red cataphylls, and only a single inflorescence per axil with the outside of the spathe reddish at the base adaxially.

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Some final novelties in *Anthurium* to complete the Araceae of Mexico and Central America

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ABSTRACT

Five new species of *Anthurium* are described and illustrated to complete the treatment of that genus for Mexico and Central America. Two are in sect. *Calomystrium*, *A. jaimefolsomii* Croat & O.Ortiz from Panama and *A. angelamorae* Croat from Costa Rica. *Anthurium xanthum* Croat, O.Ortiz & Hormell from Panama is in sect. *Cardiolonchium*; *A. oblongispicum* Croat & Grayum from Costa Rica and Panama is in sect. *Decurrentia*; and *A. heathlongorum* Croat from Mexico is in sect. *Andiphilum*.

Key words: Araceae, *Anthurium*, Central America, new species.

INTRODUCTION

The Araceae of Central America has 825 documented species in 26 genera (including four introduced genera with a total of 6 species). *Anthurium* and *Philodendron* are the largest genera and have likewise provided the largest number of new species since the last taxonomic treatment for Central America. For *Anthurium* these were (Croat, 1983, 1986, 1991); for *Philodendron* these were (Grayum, 1996; Croat, 1997), revisions of subgen. *Pteromischum* and subgen. *Philodendron* respectively.

THE NEW SPECIES

1. ***Anthurium angelamorae*** Croat, **sp. nov**. — Type: COSTA RICA. Limón: Cantón de Talamanca, Reserva International Talamanca, Cordillera de Talamanca, Amubri, 09°47'20"N, 83°58'40"W, 1200–1400 m, 7 April 1995, *A. Mora* 94 (holotype, MO-04972754; isotype, CR). **Figure 1**.

Diagnosis: The species is a member of sect. *Calomystrium* recognized by its terrestrial habit, short internodes, persistent intact cataphylls, subterete petioles, ovate-triangular blades with somewhat hastate lobes which are narrowly rounded at the apex, 4 or 5 pairs of basal veins, with one pair free to the base, the collective veins arising from one of the pairs of primary lateral veins, as well as by the long-pedunculate inflorescence with a green erect-spreading spathe.

Figure 1. *Anthurium angelamorae* Croat. Herbarium type specimen, *Mora 94*. Showing on left leaf blade, adaxial surface, then leaf blade, abaxial surface, followed by leaf blade, abaxial surface.

Terrestrial; internodes short; cataphylls 3–4 cm long, slender, persisting intact. *Leaves* 37–48 cm long; petioles subterete, 20–23 cm long, 3–4 mm in diam., drying acutely and narrowly sulcate with a narrow medial groove near the apex, 1–2-ribbed on the sides on drying, the ridges somewhat warty on drying, surface moderately granular; blades ovate–triangular, 17–25 cm long, 11–15 cm broad, 1.6–1.7 times longer than broad, broadest 3–4 cm above petiolar plexus, 0.75–1.2 times longer than the petiole, gradually short-acuminate at the apex, prominently somewhat hastate-lobed at base, drying reddish brown and matte above, moderately paler gray-brown and matte below; anterior lobe 16–20 cm long, straight to weakly convex on margins except weakly concave near petiolar plexus; posterior lobes obtusely subtriangular, 8.1–9.3 cm long, 4.8–5.6 wide midway, narrowly rounded at the apex; sinus 4.5 cm deep, 5.8 cm wide; basal veins 4–5 pairs, with one pair free to the base, lower vein surface granular-puberulent; midrib narrowly rounded, concolorous, granular above, round-raised, drying with several scabrid ribs, slightly darker below; primary lateral veins 5(6) pairs, arising at a 30–45° angle, narrowly rounded and concolorous above, more acutely raised and granular below; venation on lower surface scurfy-puberulent; collective veins arising from one of the primary lateral vein pairs; upper surface, sparsely short pale-lineate, not conspicuously granular; lower surface densely dark-speckled, lacking the short-pale lineations. *Inflorescence* long-pedunculate, held above the leaves; spathe green, erect-spreading, ca. 7.3 cm long, 1.5 cm wide; spadix 4.5 cm long, 7 mm diam., green post-anthesis, short-tapered tapered. *Infructescence* with berries early-emergent, green.

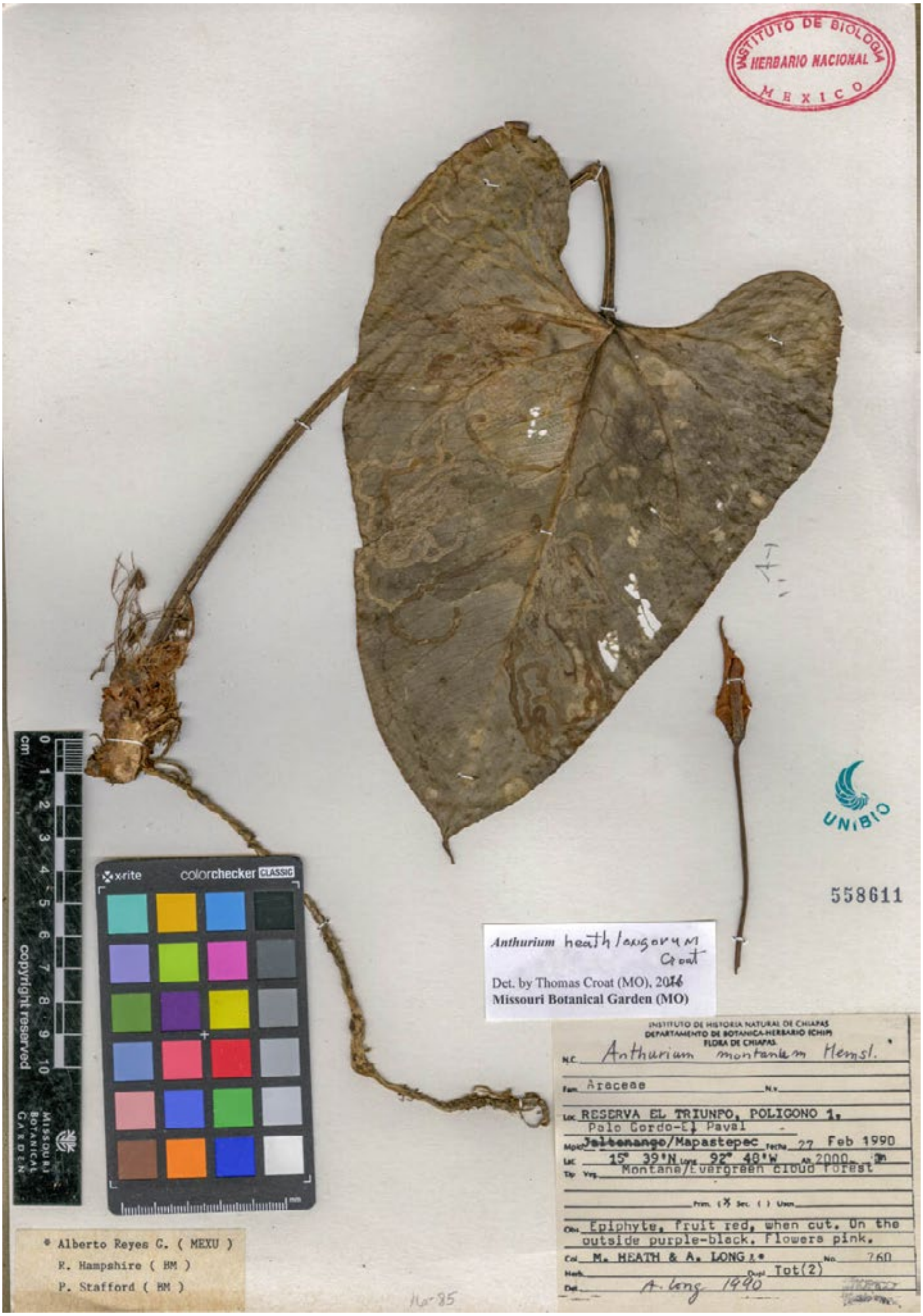
Distribution and ecology — *Anthurium angelamorae* is endemic to Costa Rica, known only from the type locality in Limón Province in the Cordillera de Talamanca at 1200–1400 m in a *Lower montane* wet *forest* life zone.

Etymology — The species is named in honor of the collector, Angela Mora, one of the parataxonomists who were working on large inventory of plants and insects carried out by Instituto Nacional de Biodiversidad (INBio). Angela's area of concentration was in the Cordillera de Talamanca.

Comments —*Anthurium angelamorae* most resembles *A. obtusilobum* Schott but it differs from that species by having the upper surface more sparsely short pale-lineate, having the lineations much shorter, having the upper surface less granular, having the lower surface densely dark-speckled, lacking short-pale lineations on the lower surface, and in having the veins on the lower surfaces scurfy-puberulent.

2. ***Anthurium heathlongorum*** Croat, sp. nov. — Type: MEXICO. Chiapas: Municipio Mapastepec; Reserva El Triunfo, Poligono 1. Palo Gordo-El Paval, 15°39'N, 92°48'W, 2000 m, montane/evergreen cloud forest, 27 Feb. 1990, *M. Heath & A. Long 760* (holotype, MEXU; isotype, CHIP). **Figure 2**.

Diagnosis: The species it believed to be a member of sect. *Andiphilum* and is characterized by its epiphytic habit, fibrous reddish brown cataphyll fibers, sharply D-shaped petioles which dry deeply sulcate, narrowly ovate-sagittate greenish brown-drying abruptly acuminate blades with a parabolic sinus, 4–5 pairs of basal veins with the first pair usually free to the base, as well as



Anthurium heathlongorum Croat
Det. by Thomas Croat (MO), 2016
Missouri Botanical Garden (MO)

INSTITUTO DE HISTORIA NATURAL DE CHIAPAS
DEPARTAMENTO DE BOTANICA-HERBARIO (CHIP)
FLORA DE CHIAPAS
N.C. Anthurium montanum Hemsl.
Fam. Araceae N.v.
Loc. RESERVA EL TRIUNFO, POLIGONO 1.
Palo Gordo-El Pavel
Mpio. ~~Jaltenango~~/Mapastepec Fecha 27 Feb 1990
Lat. 15° 39'N Long. 92° 48'W Alt. 2000 m
Tip. Veg. Montane/Evergreen cloud forest
Prim. (X) Sec. ( ) Usos
Obs. Epiphyte, fruit red, when cut. On the outside purple-black. Flowers pink.
Col. M. HEATH & A. LONG & * No. 760
Herb. Dupl. Tot(2)
Det. A. Long 1990

* Alberto Reyes G. (MEXU)
R. Hampshire (BM)
P. Stafford (BM)

Figure 2. *Anthurium heathlongorum* Croat. Herbarium type specimen, Heath & Long 760. Showing on left leaf blade, adaxial surface.

by its lanceolate green spathe and stipitate purplish cylindroid spadix.

Epiphytic; internodes short, drying 1.5 cm diam.; cataphylls to 4.5 cm long, persisting as reddish brown somewhat loose fibers. *Leaves* 47.5–62.9 cm long; petioles 26.3–38.7 cm long, pink, drying 4 mm wide, deeply and sharply sulcate, with a medial rib toward the base; geniculum D-shaped, less than 10 mm long, slightly darker; blades narrowly ovate-sagittate, 21.2–24.2 cm long, 15 cm wide, 1.6–1.7 times as long as blades, abruptly short-acuminate at apex, prominently lobed at base, drying thinly coriaceous, slightly bicolorous, greenish yellow-brown and semiglossy and gray-brown to greenish yellow-brown above, slightly paler and semiglossy below; anterior lobe 17.7–24 cm long, broadly rounded to almost straight on margins; posterior lobes 6.7–8 cm long, 5.7–6 wide, narrowly rounded at apex; sinus parabolic, 4.5–5 cm deep, 4.3–5.3 cm wide, rounded or slightly decurrent on the petiole at apex; basal veins 4–5 pairs, 1st pair free to fused 3 mm; 2nd pair fused 6–10 mm; 3rd pair fused 1–2.5 cm; 2–posterior ribs 2.7 cm long; collective veins arising from the 1st pair of basal veins, 6–10 mm from margins; primary lateral veins 5–7 pairs, arising at 40–50°; tertiary veins moderately obscure; upper surface sparsely thick-granular, sparsely pale granular to very short pale-lineate (so tiny as to appear like a broad granule); lower surface minutely lumpy, densely dark-speckled. *Inflorescence* erect; peduncle 15–23 cm long, drying 1.5–2 mm diam.; spathe reflexed, lanceolate, 4 cm long, 1 cm wide, green; spadix purple, stipitate for ca. 2 mm, 2.5 cm–3.8 cm long, 4.5 mm diam.; flowers 5–6 visible per spiral, 2.5–2.8 mm in both directions; tepals matte, minutely papillate; lateral tepal 1.4–1.6 mm wide, inner margin rounded, outer margin 2-sided; stamens initially protruded, later withdrawn to the level of the tepals; anthers 0.4–6 mm long, 0.5–6 mm wide; thecae weakly divaricate. *Infructescence* with berries purple-black, the mesocarp red.

Distribution and ecology — *Anthurium heathlongorum* is endemic to Mexico, known only from the type locality in Reserva El Triunfo in Chiapas State on Cerro El Triunfo at 2000–2200 m in *Montane evergreen cloud forest.*

Etymology — *Anthurium heathlongorum* is named in honor of the two collectors who made the only collections of the species, Melanie Heath and Adrian Long. They are British ornithologists who were working in Chiapas under the auspices of the International Council for Bird Preservation in Cambridge and were studying the habitat and distribution of the Azure-rumped Tanager at El Triunfo reserve. While in Mexico they were affiliated with the Departamento de Botánica of the Instituto de Historia Natural in Tuxtla Gutiérrez and presently live in Somerset, England where Melanie is the Director of Science and Policy at BirdLife International Council for Bird Preservation.

Comments — The species has been confused with *Anthurium montanum* Hemsl. which differs by its usually much larger (often 50 to 100 cm long), more coriaceous, light brown-drying more coriaceous leaf blades with a typically spathulate to hippocrepiform sinus and a longer posterior rib (1–5.5 cm long), more numerous primary lateral veins (6–11 pairs) and the more long-tapered spadix. It is actually most similar to *Anthurium huixtlense* but that species differs by having usually larger leaves (usually 30 or more cm long) which dry paler colors (usually greenish, grayish, gray-green or light brown), a typically a narrower sinus (usually spathulate to hippocrepiform or even closed), an upper surface that is conspicuously short-pale-lineated, and by having light reddish-violet to lavender spadix with tepals that are markedly 3–4-sided on the outer margin, and berries that mature orange. In contrast *Anthurium heathlongorum* has darker-drying leaf blades that are less than 25 cm long, lack normal short pale-lineations, and has a purple spadix with tepals which are 2-sided on the outer margin and berries that mature purple-black.

Paratypes: MEXICO. Chiapas: Municipio Mapastepec; Reserva El Triunfo, Poligono 1. Palo Gordo-El Paval, 15°39'N, 98°48'W, 2000 m, montane/evergreen cloud forest, 27 Feb. 1990, *M. Heath & A. Long 760* (holotype, MEXU; isotype, CHIP).

3. ***Anthurium jaimefolsomii*** Croat & O.Ortiz, sp. nov. — Type: PANAMA. Darién: Cerro Pirre, valley between Cerro Pirre and next most southernly peak, sloping hillside, ca. 07°47'N, 77°45' W, ca. 1010 m, 10–20 July 1977, *J.P. Folsom 4479* (holotype, MO-2623499). **Figure 3**. *Diagnosis:* The species is a member of section *Calomystrium* characterized by its epiphytic habit, persisting intact cataphylls; terete yellow-brown matte petioles, narrowly ovate-sagittate gradually acuminate grayish brown-drying blades with the upper surface weakly short pale-lineate and the lower surface weakly dark-dotted, a narrowly parabolic sinus, 4 pairs of basal veins, mostly free to the base, as well as a green lanceolate erect hooding spathe and yellow to red cylindroid spadix.

Epiphytic herb; stem short; internodes short, 1.5 cm diam., less than 1 cm long; cataphylls persisting intact, 6–9 cm long, drying reddish brown, narrowly long-attenuated. *Leaves* with petioles 35.5 cm long, 3 mm diam., terete, drying yellow-brown, matte; geniculum 11 mm long, drying blackened; blades narrowly ovate-sagittate, 24.3 cm long, 13 cm wide, 1.8 times longer than wide, 1.4 times longer than petioles, broadest 5–6 cm above petiolar plexus, gradually acuminate at apex, prominently lobed at base, subcoriaceous, dark green and semiglossy above, moderately paler and semiglossy below, drying dark brown above, yellowish brown, semiglossy below; anterior lobe 27 cm long, broadly rounded on margins; posterior lobes narrowly rounded, 7.4–7.5 cm long, 5.5 cm wide; sinus narrowly parabolic, 3.7 cm long, 2.7 cm wide; basal veins 4 pairs, 1st & 2nd pairs free to the base, 3rd pair free to the base or fused 4–6 mm, 4th pairs moderately obscure, in part fused with posterior rib; posterior rib 2.5–5 mm long, sometimes naked to ca. 1 cm or not at all; midrib weakly raised and concolorous above, narrowly rounded and darker below; primary lateral veins 5–6 cm long, arising at 45° angle, scarcely raised and wrinkled above, narrowly raised and darker below; collective veins, 4–5 mm from the margins; upper surface drying weakly short pale-lineate; lower surface drying weakly dark-dotted below. *Inflorescence* erect; peduncle 20.5–24.5 cm long, drying 3 mm diam.; spathe medium green, 6.3 cm long, 1.7 cm wide, narrowly long-acuminate, drying dark brown, directed at 160° angle from peduncle, hooding spadix; spadix cylindroid, red, 4 cm long, drying 5 mm diam., dark brown, turned somewhat downward at 120° angle. *Infructescence* not seen.

Distribution and ecology — *Anthurium jaimefolsomii* is endemic to Panama, known only from the type locality in Darién Province at about 1200 m elevation in a *Lower montane wet forest* and *Premontane rain forest* life zones.

Etymology —The species is named for Dr James Folsom, Director of the Huntington Botanical Garden and Library. Folsom worked for the senior author as the Curator of Summit Garden in Panama when he was working on his Ph.D. thesis. Jim Folsom is an orchid specialist but collected many new and interesting Araceae.

Figure 3. Anthurium jaimefolsomii Croat & O.Ortiz. Herbarium type specimen, Folsom 4479. Showing underneath on left leaf blade, adaxial surface, then leaf blade, abaxial surface, followed by leaf blade, abaxial surface.

Comments — *Anthurium jaimefolsomii* is most closely related to *A. pauciflorum* Croat from the Fortuna area in Chiriquí Province but that species differs by having leaf blades which dry darker brown and are more densely and more prominently short pale-lineate on upper surface and pale short-lineate and dark dotted on the lower surface, as well as by having a pink spadix.

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4. ***Anthurium oblongispicum*** Croat & Grayum, sp. nov. — Type: COSTA RICA. Heredia: Finca La Selva, Puerto Viejo de Sarpiquí, ridge near end of Pasos Perdidos, 10°25'N, 84°02'W; 120 m, 3 June 1985, *M.H. Grayum, B. Jacobs & R.L. Wilbur 5357* (holotype, MO-3446675; isotype, CR). **Figures 4–7**.

Diagnosis: The species is a member of section *Decurrentia* and is characterized by its small size, its usually oblong-oblanceolate, thin, epunctate leaf blades that dry greenish gray on the upper surface, and especially by its oblong, very dark green, glossy spadix with fascicles of white stamens, as well as its purple depressed-globose berries.

Epiphyte; stems very short, 0.5-1 cm diam.; internodes short; leaf scars 4–6 mm wide; roots long, thin; cataphylls subcoriaceous, 4–6 cm long, green, sharply 1-ribbed, drying tan, weathering into thin mostly parallel fibers. *Leaves* erect-spreading, 13.2–22.6 cm long; petioles 6.5–11.3 cm long, 2–3 mm diam., quadrangular to almost terete, usually slightly thicker than broad, semiglossy, usually somewhat flattened adaxially; geniculum 1.5 cm long, only slightly thicker and more conspicuously sulcate than petioles; blade narrowly obovate-oblanceolate, subcoriaceous, drying moderately thin, gradually short-acuminate at apex (the acumen minutely apiculate), gradually narrowed from the distal ⅔ to the acute to weakly attenuate base, 6.7–11.3 cm long, 5.3–9.7 cm wide, 2–4.1 times longer than broad, 2–5.7 times longer than petioles, usually broadest in upper third; moderately glossy; midrib convex in groove above, much paler, narrowly convex below; primary lateral veins 6–8 per side, departing midrib at 45–50° angle, sunken and weakly quilted above, convex-pleated below, darker than service; tertiary veins darker than surface below, in part prominulous; collective veins arising from the lowermost primary lateral veins, 3–6 mm from the margin, sunken above, raised below. *Inflorescence* erect, usually shorter than leaves; peduncle 13.5–17 cm long, sometimes tinged purplish, terete or weakly 1-ribbed, 2–6 times longer than petioles; spathe pale green, 3.3–4 cm long, 1–1.3 cm wide, broadest in lower half, oblong to narrowly ovate, coriaceous, acuminate at apex, rounded at base, spreading at ca. 90° angle from peduncle to spreading-reflexed; spadix prominently stipitate (sipe 5–20 mm long dark reddish purple, especially toward base), dark green to yellow-green, cylindroid, 2–3 cm long, 5–7 mm diam.; flowers 4 visible per spiral, 4-lobed, 2.6–3 mm long and wide, the sides jaggedly sigmoid; tepals glossy, drying matte, smooth, sparsely short-lineate, turned up against the pistil; lateral tepals 1.4–16 mm wide, the inner margin narrowly rounded, thin and scarious, outer margins 3-sided; pistils raised, only slightly emergent; stigma ca. 0.5 mm long, elliptic, brush-like, exserted before stamens emerge; stamens with anthers held at edge of tepals in a tight cluster against pistil; anthers yellow-orange, ca. 0.5 mm long; thecae oblong, slightly divaricate; pollen white. *Infructescence* with berries ovoid to ovoid-ellipsoid, red to purple, 9–10 mm long, 7–8 mm diam.; pericarp moderately thick; mesocarp with numerous, short raphide cells; seeds 1(–2), tan, ovoid to ovoid-ellipsoid, 7.5–8 mm long, 4.5–5.8 mm wide, weakly sunken at apex with a gelatinous, transparent, sticky appendage.

Figure 4. *Anthurium oblongispicum* Croat & Grayum. Habit of plant in flower and fruit, Santamaria 7871. — Photo Alex Monro

Distribution and ecology — *Anthurium oblongispicum* ranges from north central Costa Rica in Heredia Province at 100 m to 850 m in Limón Province and to northern Panama in adjacent Bocas del Toro Province at 1100 m, in all cases in a *Tropical wet forest* life zone.

Etymology — The species epithet is from the Latin '*oblongus*' (oblong) and '*spica*' (spike or spadix).

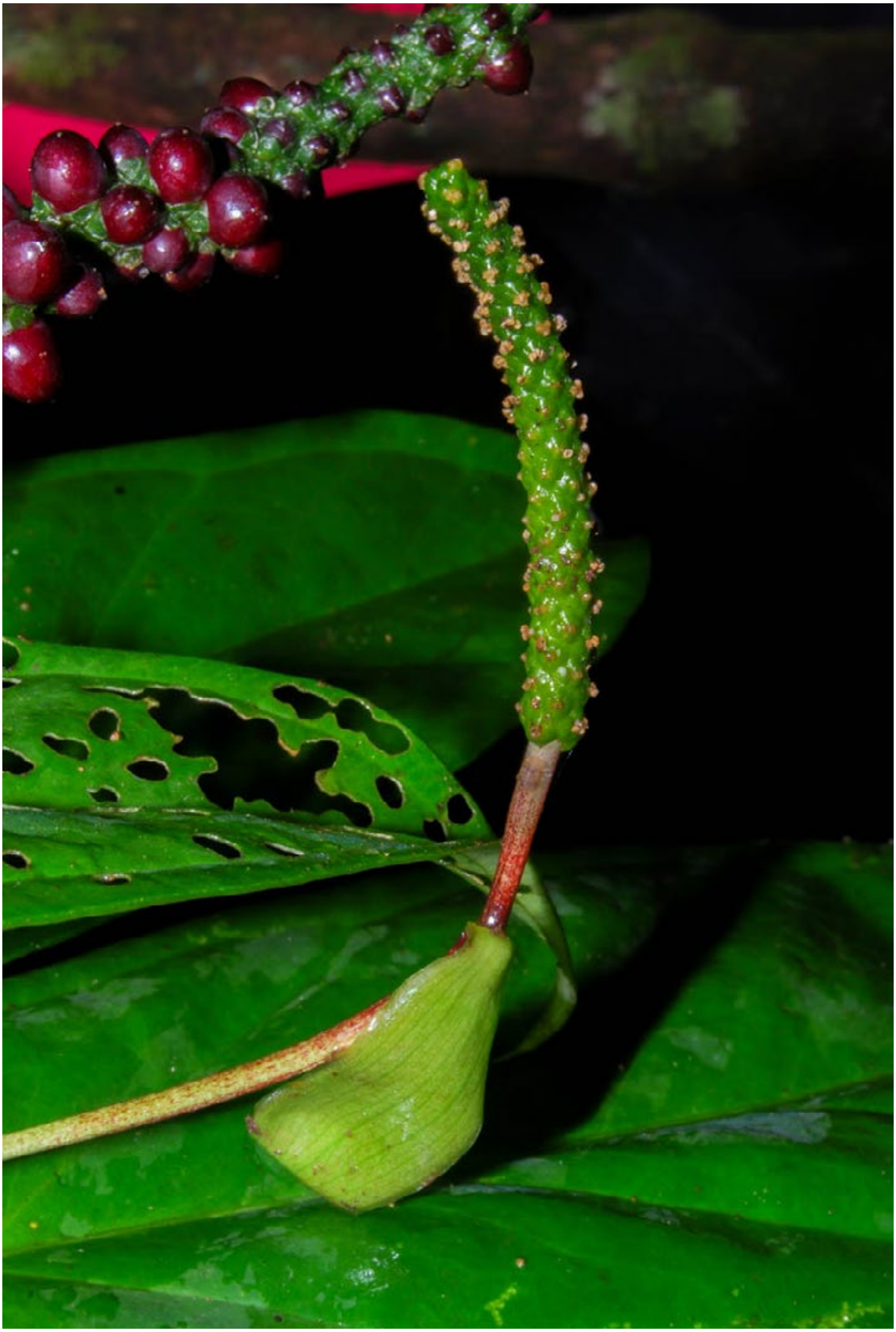
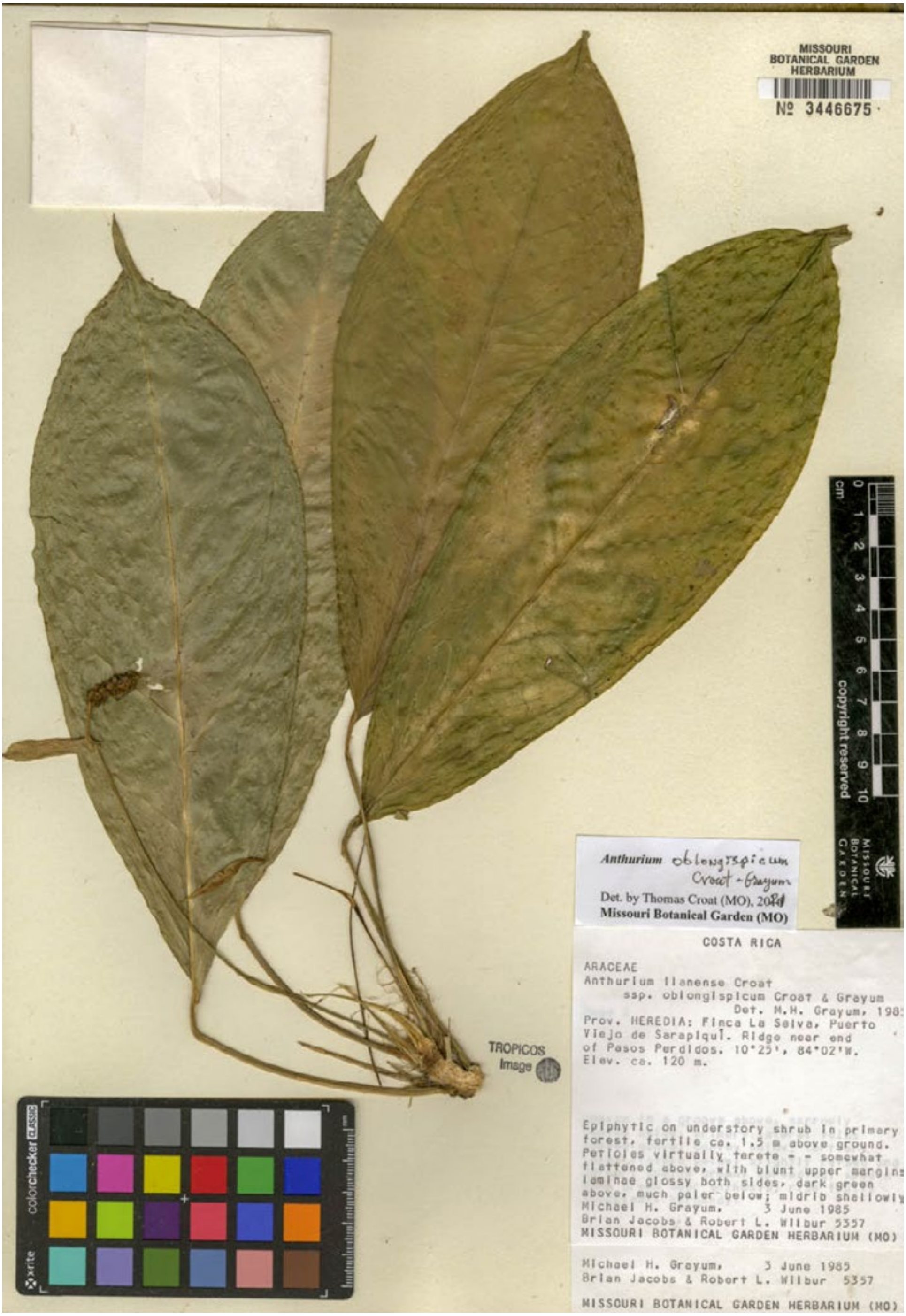


Figure 5. *Anthurium oblongispicum* Croat & Grayum. Inflorescence with reflexed spathe and stipate spadix and inflorescence, Santamaria 7871. — Photo Alex Monro

Figure 6. *Anthurium oblongispicum* Croat & Grayum. Mature berries, Santamaria 7871. — Photo Alex Monro



Anthurium oblongispicum
Croat + Grayum
Det. by Thomas Croat (MO), 2021
Missouri Botanical Garden (MO)

COSTA RICA

ARACEAE
Anthurium llanense Croat
ssp. oblongispicum Croat & Grayum
Det. M.H. Grayum, 198
Prov. HEREDIA: Finca La Selva, Puerto
Viejo de Sarapiquí. Ridge near end
of Pasos Perdidos. 10°25', 84°02'W.
Elev. ca. 120 m.

Epiphytic on understory shrub in primary
forest, fertile ca. 1.5 m above ground.
Petioles virtually terete - - somewhat
flattened above, with blunt upper margin
laminae glossy both sides, dark green
above, much paler below; midrib shallowl
Michael H. Grayum. 3 June 1985
Brian Jacobs & Robert L. Wilbur 5357
MISSOURI BOTANICAL GARDEN HERBARIUM (MO)

Michael H. Grayum, 3 June 1985
Brian Jacobs & Robert L. Wilbur 5357

MISSOURI BOTANICAL GARDEN HERBARIUM (MO)

Figure 7. *Anthurium oblongispicum* Croat & Grayum. Herbarium type specimen, Grayum et al. 5357. Showing leaf blade, adaxial surface, two leaf blades, abaxial surface and one leaf blade, adaxial surface.

Comments — *Anthurium oblongispicum* is most closely related to *A. llanense* Croat which differs in having an oblanceolate to oblong short-acuminate leaf blade, a cupulate-ovate spathe, a blackish purple almost globose spadix with golden-orange pollen. Another seemingly related species is *Anthurium platyrhizum* Croat, which differs in having a thick, short, cylindroid spadix, conspicuously flattened and densely positioned roots, and violet-purple berries. *Anthuurium oblongispicum* is also similar to *A. wedelianum* Croat that has an even longer, more tapered spadix with flowers that lack the prominently raised tepals and prominently exserted pistils of *A. llanense*. *Anthurium llanense* may be confused with *A. correae* Croat with which it occurs, but that species is distinguished by its leaves that dry dark greenish brown to brown-black, a much longer inflorescence equal to or longer than the leaves (much shorter than the leaves in *A. llanense),* and by a long-stipitate oblong spadix.

5. *Anthurium xanthum* Croat, O.Ortiz & Hormell, sp. nov. — Type: PANAMA. Darién: Cerro Pirre, top of mountain and ridge just south of Pirre, visible from Pirre clearing, 10–20 July, 1977, *J.P. Folsom 4517* (holotype, MO-2634188; isotype, PMA). **Figure 8**.

Diagnosis: The species is a member of sect. *Cardiolonchium*, characterized by its short internodes, thin pale cataphylls which persist as skimpy pale fibers, subflattened sulcate pale brown drying petioles, narrowly ovate-cordate, gray-green-drying slightly bicolorous long-acuminate moderately thin-drying blades with prominent posterior lobes, a parabolic sinus, 7 pairs of basal veins, the 1st & 2nd of which are usually free to the base, a short posterior rib that is naked most of its length, 8–9 pairs of primary lateral veins, collective veins arising from the 2nd or 3rd pair of basal veins, as well as the short-pedunculate, greenish reflexed spathe and yellow subsessile cylindroid slightly tapered spadix.

Epiphytic or terrestrial; internodes short, 0.8 cm long; cataphylls 11–14.2 cm long, drying pale green, decomposing to persistent fine pale parallel fibers. *Leaves* 89–106.6 cm long; petioles subflattened sulcate, 45.5–60.8 cm long, drying 5 mm wide; geniculum 1.1–2.8 cm, drying gray-green; blades narrowly ovate-cordate, 43.5–45.8 cm long, 27.6–32.8 cm wide, 1.34–1.62 times longer than broad, 0.71–0.98 times as long as petioles, long-acuminate at apex, prominently lobed at base, slightly bicolorous, semiglossy above, pale, matte below, drying gray above, pale greenish-gray below; anterior lobe 36–36.7 cm long, 27.6–36.7 cm wide, broadest at 8–10 cm above petiolar plexus; posterior lobes 11.4–12.3 cm long, 10.7–11.8 cm wide, directed at 136–147°; sinus narrowly parabolic, 8.4–9.8 cm deep, 4.4–7.9 cm wide; midrib drying acute, moderately raised above, narrowly round-raised, paler, matte below; primary lateral veins 8–9 pairs, arising 36–48°, weakly raised above, bluntly acute, moderately raised below; basal veins 7 pairs, 1st & 2nd pairs free to base, 3rd pair fused 0.8–1.4 cm, 4th pair fused 2,2–3.5 cm, 5th pair fused 3.6–4.0 cm; posterior ribs 3.8–5 cm long, naked 2.2–3.5 cm; tertiary veins rounded, very weakly raised above, rounded, weakly raised below; collective veins arising from 2nd or 3rd basal and 3–6 mm from margin; upper surface epunctate, sometimes faintly short pale-lineate, sometimes 'dimpled', minutely granular at higher magnifications; lower surface smooth, weakly short pale-lineate, sparsely granular at higher magnifications. *Inflorescence* erect, short; peduncle green, 7.3–11.1 cm long, drying 2–3 mm diam.; spathe lanceolate, reflexed and sometimes twisted, pale greenish, 9.1–9.6 cm long, 1.6–1.9 cm wide; spadix subsessile, yellow, 10.2–10.8

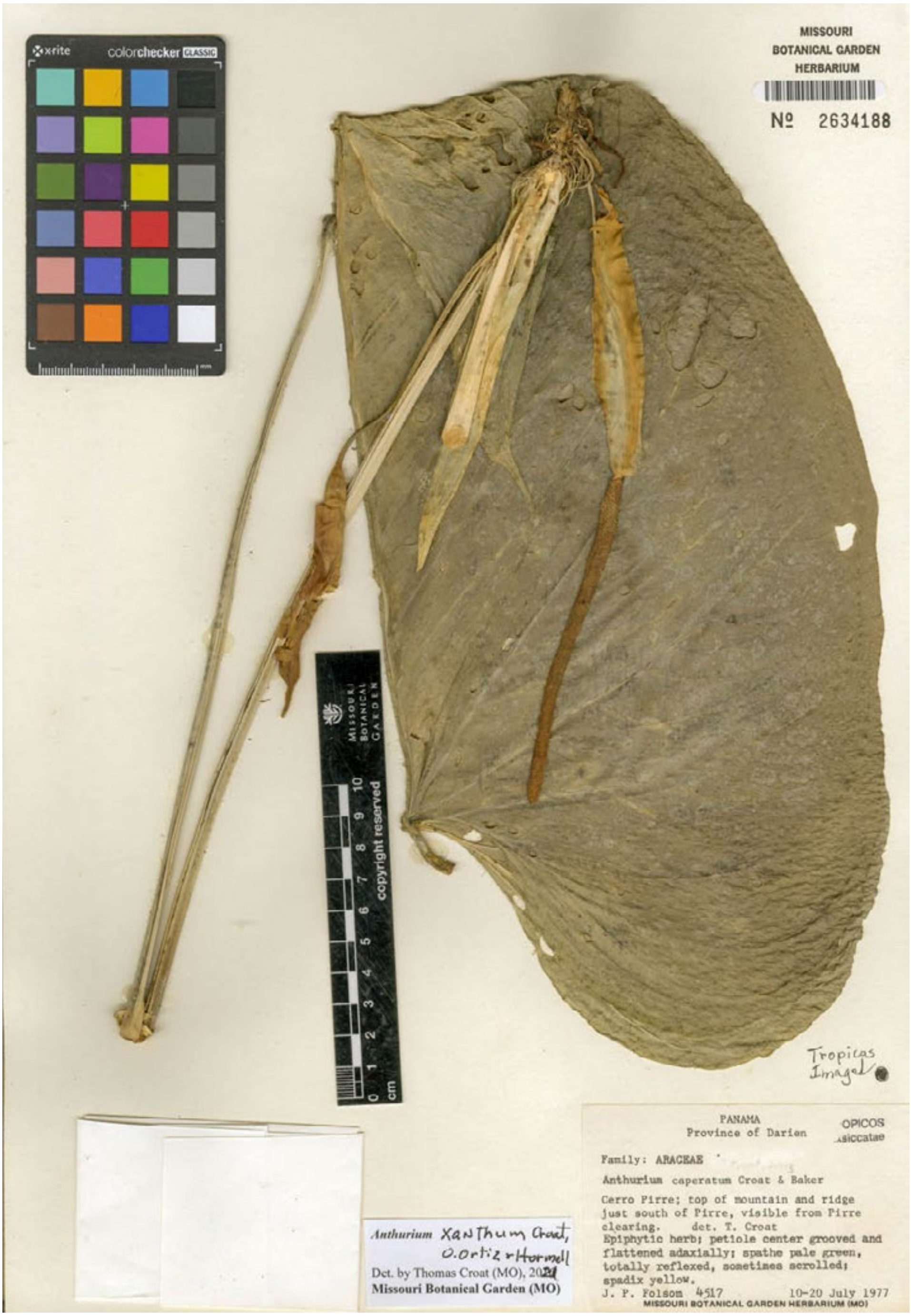


Figure 8. Anthurium xanthum Croat, O.Ortiz & Hormell. Herbarium type specimen, Folsom 4517. Showing posterior of leaf blade, adaxial surface and inflorescence.

cm long, 0.5–0.6 cm wide, cylindroid, slightly tapered; stipe 0.2 cm long, 2–3 mm wide; flowers 11–12 visible per spiral, 1.3–1.5 mm long, 1.1–1.3 mm wide; tepals drying reddish-brown, granular; lateral tepals, 0.6–0.8 mm wide, inner margin rounded, outer margin 2-sided.
Distribution and ecology — *Anthurium xanthum* is endemic to Panama, known only from the type locality on Cerro Pirre in a *Premontane rain forest* life zone.

Etymology — The specific epithet is from the Greek adjective '*xanthos*' (meaning yellow) and which has been Latinized here as "*xanthum*", referring to the yellow spadix.

Comments — *Anthurium xanthum* has been confused with both *A. caperatum* Croat & R.A.Baker and *A. dukei* Croat, the former differing by its greenish spadix and the moderately bullate blade surface, as well as by having 12–15 flowers visible per spiral; the latter differing by having narrower blades with 12–20 primary lateral veins with the interprimary veins scarcely less prominent than the primary lateral veins, as well by the collective veins arising from the lowermost basal veins and extending uniformly close to the margin.

In the treatment for the *Anthurium* of Panama (Croat, 1986) both *A. caperatum* and *A. dukei* were placed in the wrong section, with *A. caperatum* said to be in sect. *Polyneurium* and *A. dukei* placed in sect. *Belolonchium*. Both are now considered to be members of sect. *Cardiolonchium*.

In the Lucid Anthurium Key, *Anthurium xanthum* tracks to *A. nigrescens* Engl. which differs by having typically much longer internodes and blackish drying leaf blades as well as a usually green spadix; *A. ochranthum* K.Koch which differs by having longer blades (35–75 cm), fewer primary lateral veins (4–6), collective veins arising from 1st basal veins, longer spathe (10–15 cm), and fewer flowers per spiral (6–9); *A. sanguinium* Engl. which differs by having longer cataphylls (13–35 cm), a hippocrepiform or spathulate sinus, collective veins arising from 1st basal vein, a dull red, erect-spreading spathe, and a longer, dark green spadix (11.5–26 cm), and *A. versicolor* Sodiro, which differs by having a hippocrepiform or spathulate sinus, the primary lateral veins narrowly and acutely raised on the upper surface and a spadix with fewer flowers per spiral (5).

Folsom 4232 (MO) is probably also this species but was considered too young to be certain and thus its description is not included here.

Paratypes: PANAMA. Darién: Cerro Pirre, valley between Cerro Pirre and next most southerly peak, sloping hillside, 10–20 July, 1977, *J.P. Folsom 4365* (MO); *J.P. Folsom 4459* (MO).

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Characterization of *Amorphophallus* 'Digest', a new hybrid cultivar in Indonesia

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Key words: *Amorphophallus variabilis, Amorphophallus titanum*, hybrid, new cultivar

ABSTRACT

Amorphophallus 'John Tan' (Claudel et al., 2012) was the first successful *Amorphophallus* hybrid involving A. variabilis Bl. and A. titanum (Becc.). In this report, a new hybrid cultivar *A.* 'Digest' is described. This new hybrid was obtained from a cross involving A. variabilis 'Sluka's Dark Giant' as the female parent and A. titanum as the pollen donor.

INTRODUCTION

The genus *Amorphophallus* has attracted cultivators and breeders not only for its uniqueness as ornamental flowering crop but also for its use as a source of glucomannan which is an alternative source of food fiber (Srzednicki & Borompichaichartkul [eds], 2020, incl. a long section by Hetterscheid et al. on *Amorphophallus* incl. all known hybrids). Up to date, the genus encompasses more than 230 species and is distributed in Africa, Continental Asia and Southeast Asia (Claudel et al., 2017et al.)the first well-sampled molecular phylogenetic analysis is presented here, comprising 157 species for which we generate nuclear (ITS1. Breeding efforts have been done since the first *A.* 'John Tan' hybrid cultivar in 2002. However there are major challenges faced by obtaining a successful cross (Claudel et al., 2012et al.. These bottlenecks include incompatibility of inter- and intra- species hybridization, unpredictable and inconsistent flowering, heterozygosity, and lengthy growth cycles (Prana, 2008; Tang et al., 2020et al.). Due to the success of the *A. variabilis* × *A. titanum* cross, a similar cross involving a different *A. variabilis* cultivar was made.

Amorphophallus titanum is considered as endangered due to habitat loss and deforestation based on the International Union for Conservation of Nature Red List of Threatened Species. Up to date, over 90 botanical gardens across 18 countries grow this species. Since it is legally protected within Indonesia, pollen from *A. titanum* was collected from a *A. titanum* plant blooming in the wild in West Sumatera and stored at -20°C until required for pollination.

Amorphophallus variabilis, also known as acung in Indonesia, is a diploid perennial crop native to Indonesia. *Amorphophallus variabilis* is very variable in inflorescence and leaf morphology which makes it advantageous for breeding new cultivars (Santosa et al., 2004; Wahidah et al., 2022). Leaflets shape ranges from lanceolate, elliptical, obovate, to oval with leaf tips generally acuminate and caudate. Other species that are also commonly utilized and similar to acung includes: *A. muelleri* known as porang or iles-iles, and *A. paeonifolius* known as suweg (Mutaqin et al., 2020). Iles-iles produces aerial bulbs, whereas suweg does not. Furthermore, iles-iles contain high amount of glucomannan different from suweg that mainly contain starch (Jansen et al. 1996; Sumarwoto, 2005). Acung on the other hand are less utilized compared to iles-iles due to its relatively small size tuber.

To obtain a new cultivar, a cross was made using *A. variabilis* 'Sluka's Dark Giant' as the female parent and *A. titanum* as the male donor. *A.* 'Sluka's Dark Giant' plant was obtained in West Java where it is cultivated by hobbyists and breeders. This cultivar was selected for its dark purple petiole that reaches 1.7 m in height, which is not found in *A. variabilis* in the wild. Moreover, *A.* 'Sluka's Dark Giant' is also used as parent in other hybrids by other breeders and crossed with *A. hewittii* and *A.* (*variabilis* × *decus-silvae*) 'White stem' (source: "https://alangallowaybotanicals.com/plants/aroids/amorphophallus/hybrids/").

Pollination was performed by Indra Wirianto by brushing the defrosted pollen on female *A.* 'Sluka's Dark Giant' flowers on the day it started to bloom and had developed its peculiar scent. A successful cross yielded fruits that were harvested after 3 months. Ripened seeds were harvested in August 2017 and some were distributed to a number of collectors/breeders in Australia, Europe, Indonesia and USA. Unhealthy seeds (53 seeds) were discarded as they were smaller in size (1-2mm) when compared to healthy seeds (49 seeds). Seeds that were germinated and maintained as a private collection in Riau province, Indonesia started to bloom in December 2019 similarly to those germinated in Australia. In this report, characteristics of *A.* 'Digest' were evaluated from more than one F1 plants germinated from individual seeds as they showed minimal variation.

***Amorphophallus* 'Digest'**

Amorphophallus 'Digest' showed distinct features, in both its vegetative and generative phases, in comparison with to A. 'John Tan'. These similarities and differences are summarized in **Table 1**.

Tubers of *A.* 'Digest' are depressed globose, at least 20 cm in diameter and 10 cm in height (**Figures 1 & 2**). They weigh approximately 1.5 kg which is lighter than *A.* 'John Tan' (2.5 kg) that was compared to in this report. The tuber does not develop offsets or bulbils, therefore vegetative propagation can only be done with leaf cuttings. Propagation via tuber as cutting material is not recommended due to tissue damage and high chance of rotting.

Amorphophallus 'Digest' produces solitary leaves with a green lamina of 100 cm in diameter (**Figures 3-5**). The lamina consists of acuminate leaflets with a diameter of 8 cm and length of 20 cm which is larger and wider than *A.* 'John Tan' and their shape is more rounded at the base. The petiole is 1.2 m long with a base diameter of 6 cm., color and pattern resembles the female parent that has white spots on a maroon background, resembling green lichens growing on an old tree (Claudel et al., 2019). In terms of texture, the petiole is not as hard as in *A.* 'John Tan'.

Amorphophallus 'Digest' produces a solitary inflorescence (**Figures 7 & 8**). Its peduncle is 35-100 cm long and 6 cm in diameter. The distance from tuber to the upper margin of the spathe is 115-200 cm. The spathe is 44 cm in length; the spadix is 85 cm long, carrying a

Table 1

Characteristics	**Female parent (*A.variabilis* 'DGS')**	**Male parent (*A. titanum*)**	***A.* 'John Tan'**
Plant size	◆	◆	◆
Tuber	◆	◆	◆
Petiole pattern	◆		
Lamina division	◆	◆	◆
Peduncle length relation to spathe	◆		◆
Spathe size		◆	◆
Spathe margin		◆	◆
Spathe opening		◆	◆
Spathe venation		◆	◆
Ovary size		◆	◆
Style length		◆	◆
Stigma shape	◆		◆
Appendix base		◆	
Appendix size		◆	

Table 1. Character comparison of *Amorphophallus 'Digest'* with its parents and *A*. 'John Tan'. Similarities are represented with a ◆ mark

pistillate zone of 7 cm long and a staminate zone of 7 cm long (**Figures 9 & 10**). This feature is different to *A*. 'John Tan' flower that has a pink spathe, bright yellow spadix, and stem with white-spotted green pattern (**Figure 6**). The first flower emerges after 2 years post seed germination. The following flowers will emerge every year after plant undergo its vegetative and dormant stage. Furthermore, fruits will not emerge without cross pollination, even within the same cultivar due to different ripening time of the male and female inflorescence. Female inflorescence ripens earlier than the male, therefore, to perform a successful cross, the pollen from one *A*. 'Digest' was collected and stored in the freezer for no longer than 6 months prior to the cross to another A. 'Digest'. (**Figure 11**) shows *A*. 'Digest' that was crossed with another *A*. 'Digest' by hand pollination. Segregation in traits is expected in the F2 generation, however this observation is not covered within this report.

Figure 1. *Amorphophallus* 'Digest' tuber taken from the top.

Figure 2. *Amorphophallus* 'Digest' tuber taken from the front.

Figure 3. *Amorphophallus* 'Digest' in the vegetative phase.

Figure 4. *Amorphophallus* 'Digest' upper petiole pattern.

Figure 5. *Amorphophallus* 'Digest' basal petiole pattern.

Figure 6. Fully bloomed *Amorphophallus* 'John Tan'.

Figure 7. *Amorphophallus* 'Digest' flower that was not yet bloomed.

Figure 8. *Amorphophallus* 'Digest' in full bloom.

Figure 9. *Amorphophallus* 'Digest'. FF: female flowers/carpels, MM: male flowers/stamen, AP: appendix, SP: spathe.

Figure 10. *Amorphophallus* 'Digest' female and male flowering zone. FF: female flowers, MM: male flowers.

Figure 11. *Amorphophallus* 'Digest' fruits.

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Philodendron rex, a massive new western Colombian species of subgenus *Philodendron* subsection *Achyropodium* (Schott) Engl. (Araceae).

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ABSTRACT

Philodendron rex A.Hay, originating from low in the Pacific Andean foothills of Valle del Cauca Department, Colombia, is described as new, and illustrated. It is compared with and distinguished from Panamanian-typified *Philodendron squamicaule* Croat & Grayum *sensu strictiore*, the most similar species in subsect. *Achyropodium* (Schott) Engl. The circumscription of *Philodendron squamicaule* is discussed, and suggested to be narrower than it has hitherto been conceived, though its boundary remains incompletely defined. Aspects of the morphological diversity of species in subsect. *Achyropodium* are briefly noted, mentioning *inter alia* the striking similarity between the enigmatic *Philodendron serpens* Hook.f., ostensibly not rediscovered since its 19th Century introduction from Colombia to British cultivation (though the name since misapplied especially in horticulture, and likely also in molecular phylogenetic sampling), and Antioquian *P. genevieveanum* Croat.

Key words: Philodendreae, sect. *Philodendron*, Chocoan bioregion, Valle del Cauca, *Achyropodium*

INTRODUCTION

Philodendron Schott, in the broad sense, is by far the largest genus of the monoecious subfamily Aroideae, with an estimated 1500 species (Boyce & Croat, 2011 onwards) entirely confined to the Americas, and there most closely allied to the very much smaller genus *Adelonema* Schott (comprised of the formerly American species of *Homalomena*; see Wong et al., 2016). These two genera are in turn most closely related on morphological and molecular grounds to the increasingly large (est. 500 spp.; Boyce & Croat, 2011 onwards) Indo-Malesian genus *Homalomena* Schott (incl. West Malesian *Furtadoa* M.Hotta). These then collectively form the geographically disjunct, almost exclusively tropical tribe Philodendreae Schott [encompassing the formerly recognised Homalomeneae (Schott) M.Hotta]. The tribe is wholly absent from Africa and Madagascar, Sri Lanka and nearly all of India, and from Australia though it is present in trans-Wallacean New Guinea, Bismarck Archipelago and Solomon Islands (Hay, 1999).

Philodendron is divided into three generally well-supported subgenera concerning which opinion is divided over their precise relationships to each other, owing to incompletely congruent molecular-phylogenetic findings (e.g., Gaulthier et al., 2008; Loss-Oliveira et al., 2016; Vasconcelos et al., 2018; Sakuragui et al., 2018; Canal et al., 2018, 2019). Questions thus remain outstanding over whether they could better be recognised as separate genera — *Thaumatophyllum* Schott for subgenus *Meconostigma* (Schott) Engl., *Elopium* Schott for subgenus *Pteromischum* (Schott) Mayo, and *Philodendron sensu strictiore* composed of the species currently of subgenus *Philodendron*. We do not need to explore that further here, as this brief paper touches on only a few species in subgenus *Philodendron,* the largest primary subgroup of the whole broadly conceived genus, and whose species' generic name is not threatened by current molecular ambiguities, barring a future determination that *Philodendron* should be split up further, which is thankfully not yet on the horizon, if at all.

Subgenus *Philodendron* is itself divided into a considerable number of sections, subsections and series (see Krause, 1913; Mayo, 1990; Croat, 1997), which are in large part very likely artificial with many of the characteristics used to define them, in particular leaf and pistil form, evidently subject to parallel/convergent evolution in different clades (see especially the most recent molecular analyses and interpretation: Vasconcelos et al., 2018; Canal et al., 2018, 2019). Nevertheless, in the absence of a new infra-subgeneric classification grounded in molecular-phylogenetic consensus, the current named infra-subgeneric groups remain at least somewhat helpful as a framework for navigating this great subgenus.

PHILODENDRON* SUBSECTION *ACHYROPODIUM

Philodendron subsect. *Achryopodium* (Schott) Engl. is a taxon largely concentrated in the Chocoan bioregion of the Pacific slopes and lowlands of Colombia and Ecuador, though in the latter and in Peru it crosses over to the Amazonian side, and to the north it occurs in Panama and Costa Rica, with one species, *P. glanduliferum* Matuda, in Mexico and Guatemala also having a disjunct subspecies in Venezuela (Croat, 1997). Section *Philodendron*, to which subsect. *Achyropodium* belongs, is so diverse as to be almost characterless, save for having multiovulate locules with axile placentation (Croat, 1997), and in the above-mentioned molecular analyses it emerges as highly artificial. Subsection *Achyropodium* was defined within the context of sect. *Philodendron* as being characterised by the possession of petioles clothed, often profusely, in scaly excrescences (Croat, 1997). The subsection currently includes about 20 species, and is typified by *Philodendron verrucosum* L.Mathieu ex Schott (Mayo, 1990), well known for its beautifully patterned and coloured rather membranous leaves, and scaly internodes, prophylls, petioles, peduncles and spathes. That species is by far the most widespread species of the subsection, found from Costa Rica to Peru. More or less similar and relatively familiar species, in which shaggy scales occur not only on the petioles but also often extend briefly onto the posterior costae, as well as clothing the prophylls, peduncles and spathes, and sometimes the internodes, include rotund-leaved *Philodendron fibrosum* Sodiro ex Croat (Colombia: Cauca to Ecuador: Cotopaxi), *P. squamicaule* Croat & Grayum (Panama: Bocas del Toro to Coclé & Colón; ?Costa Rica: Heredia — but see discussion of this species' still uncertain limits below), *P. squamipetiolatum* Croat (Panama: Coclé & Colón; Colombia: Chocó to Ecuador: Pichincha), *P. pseudoverrucosum* Croat (Ecuador: Sucumbíos, to Peru: Pasco), and *P. meraense* Croat (Ecuador: Pastaza). Some species also share vegetative prophylls with at best very weakly discernible keels. These, together with this new species, might be said to represent 'core *Achyropodium*'. Two other species based by Engler on specimens collected by Sodiro in Ecuador, *Philodendrom gualeanum* Engl. and *P. pilatonense* Engl., may also belong in this core group, but do not seem to have been subjected to recent critical revision.

Few members of subsection *Achyropodium* have been sampled in molecular phylogenetic analyses, and so it is difficult to evaluate whether the wider range of included species form a natural grouping, though some seem somewhat apart in general aspect. Simply having coarsely long-scaly petioles, as do many species placed in this subsection, is not alone a guarantee of relationship to the type, *Philodendron verrucosum*. The quite similarly scaly-petioled *Philodendron squamiferum* Poepp. (Brazil: Amapá, Pará; the Guianas), for example, is clearly a member of *Philodendron* sect. *Schizophyllum* (Schott) Engl., one of the more natural of the traditional sections on both morphological and molecular grounds, and has never been placed in subsect. *Achyropodium*.

A number of species that have been placed in subsect. *Achyropdium* are scaly only on the petioles, and their affinities to *Philodendron verrucosum* are not necessarily clear. It is beyond the scope of this article to review them all, but, for instance, *Philodendron serpens* Hook.f., distinguished by its somewhat panduriform/hastate leaf blades with the sinus broad and tending towards flat, having somewhat sparsely acicular-scaly petioles with the scales sometimes extending a short distance on the abaxial side of the *anterior* costa but not onto the posterior costae, and lacking scales on the internodes, prophylls, peduncle and spathe, may or may not belong here. [This species, incidentally, was said to have originated in Colombia, imported to Britain by Veitch's nursery (Hooker, 1878), and it seems never to have been re-collected, though *Philodendron genevieveanum* Croat (Colombia: Antioquia), also placed in this subsection, is strikingly, perhaps overwhelmingly, similar — compare, for example, Hooker (1878, t. 6375) and Croat et al. (2013, figs 6, A–D) — seeming to differ substantively only in the description of the stigmas. Moreover, the name *Philodendron serpens* is extensively misapplied in cultivation, apparently to some plants of the *Philodendron squamicaule* complex (i.e. *P. squamicaule* in the broad sense of Croat & Grayum in Croat, 1997), and samples included under the name *P. serpens* in molecular analyses may well be misidentified]. *Philodendron malesevichiae* Croat (Panama: Coclé; Colombia: Chocó & Valle del Cauca) is likewise scaly only on the petioles, and somewhat resembles *P. serpens* (*sensu stricto*) in aspect, though with more rotund, cordate leaves and marcescent prophylls that remain almost intact until eventually degrading into a network of fibres with much residual epidermis.

As another example, *Philodendron rubrijuvenile* Croat & R.Kaufmann, recently described from cultivation where it has a long been known under the cultivar name *Philodendron* 'El Chocó Red', has been ascribed to this subsection though, despite its cultivar epithet, it is tentatively thought to originate in the Colombian department of Cundinamarca (Croat & Kaufman, 2022), a long way east of the Chocoan bioregion where most species of the subsection occur. It again entirely lacks scales on the internodes, prophylls and spathes. *Philodendron lynnhannoniae* Croat (Ecuador: Esmeraldas) with very distinctive minutely bullate leaf blades and mostly transversely orientated somewhat praemorse petiolar scales, though it too lacks scales on other parts, is also placed here, together with the similar-bladed but wholly scaleless *P. furcatum* Croat & D.C.Bay (Colombia: Valle del Cauca) (Croat et al., 2008). The form of the scales in *Philodendron lynnhannoniae* appears very similar to that of those on the abaxial side of the lower parts of the anterior and posterior costae in the type of *P. squamicaule*, which as already noted, also possesses a shaggy covering of acicular scales on the petioles, prophylls, peduncles and spathes. In addition, a number of the species ascribed perhaps more peripherally to this subsection, unlike the 'core' members, have clearly keeled prophylls, though *Philodendron furcatum* apparently does not, and in *P. lynnhannoniae* they are described as unribbed or bluntly 1-ribbed (Croat et al., 2016).

This is not to say, necessarily, that subsection *Achyropodium* currently draws together unrelated elements, but merely to point out that there is a core of species evidently grouping closely around the subsection's type, and that the new species described here does appear to sit well within it. On the other hand, it has emerged from the molecular study of Canal et al. (2018) that *Philodendron verrucosum* and *P. fibrosum*, at least, group in a clade [their Clade 10] with other more or less 'velvety', non-scaly (but some verrucate) species generally of western Amazonian rather than Chocoan distribution, among them the well-known *P. melanochrysum* Linden & André (Colombia: Antioquia), *P. ornatum* Schott (widespread Amazonia, to eastern Brazil, Trinidad & Tobago), *P. pastazanum* K.Krause (Ecuador Napo to Peru:: Huánuco), *P. mamei* André (Ecuador: Morona-Santiago to Peru: Amazonas), *P. brandtianum* K.Krause (widespread Amazonian Colombia to western Brazil and Bolivia; the Guianas), and *P. gloriosum* André (Colombia: Casanare to Vaupés). So, were the concept of subsect. *Achyropodium* to be carried across into a new infra-subgeneric classification of subgenus *Philodendron* after further molecular phylogenetic studies have been completed, it might require to be expanded beyond its scaly members.

PHILODENDRON REX

Philodendron rex A.Hay, **sp. nov.** — Type: Cultivated, Jardín Botánico de la Paz y Flora [a.k.a. El Cafetal de las Minas], Bitaco, Valle del Cauca, Colombia; *ex* COLOMBIA. Valle del Cauca: Bajo Anchicayá, nr. Agua Clara, old road to Buenaventura, ca. 100 m alt., [not vouchered from the wild], 25 Oct. 2022, *A. Hay s.n.* (holotype CUVC: CUVC80386–CUVC80388 + spirit).

[*Philodendron* cf. *squamicaule sensu* S.Y.Wong, P.C.Boyce & A.Hay, Webbia 75 (2020) 122, fig. 3; & P.C.Boyce (ed.), Aroideana 43(1&2) (2020) front cover].

Diagnosis: The new species is a member of subgenus *Philodendron,* sect. *Philodendron*, subsect. *Achyropodium* (Schott) Engl. as defined in Croat (1997), and, of the species in that group, it most closely resembles Central American *P. squamicaule* Croat & Grayum *sensu stricto* (see below). It differs in its much larger gross morphological dimensions (approx. to exceeding twice those of *P. squamicaule*) of shoot, leaf, synflorescence and bloom, the absence of dense conspicuous scales on the internodes (present in *P. squamicaule*), the less dense distribution of acicular scales on the petioles (almost obscuring the petiole surface distally in *P. squamicaule*), the broadly ovato-sagitttae leaf blade (vs more narrowly triangular-sagittate in *P. squamicaule*), the absence of praemorse transverse scales on the costae bases abaxially (present and ca. 0.6 mm long and 1 mm wide on the posterior costae in the sinus and the lower ca. 4 cm of the anterior costa in type of *P. squamicaule*), the largely bright intense pink spathe limb interior (vs white in type of *P. squamicaule*), and in the different colour of the female zone of the spadix (whitish in *P. rex* vs. pinkish in type of *P. squamicaule*), and the appendix approaching twice the length of the fertile male zone (vs slightly over half the length of the fertile male zone in *P. squamicaule).* The only named species in the subsection with similarly large dimensions is *Philodendron magnum* Croat (Ecuador: Esmeraldas & Carchi) (Croat et al., 2016). It differs from *Philodendron rex* in lacking scales on the petioles, prophylls and spathes in the adult plant, having sharply keeled prophylls (versus not noticeably keeled in *P. rex*), and the leaf blade with the sinus between the posterior lobes open and rounded (vs. closed and rhomboid in *P. rex*).

Massive terrestrial creeper on steep banks and/or low, pachycaul appressed climber (not yet observed to lose stem contact with the ground, but likely becoming a nomadic vine *sensu*, e.g., Zotz, 2013); stem with internodes longer than wide when juvenile (e.g. 10 cm long x 3 cm diam.), becoming shorter and wider with approaching maturation, at flowering stage wider than long, ca. 7 cm long x 10 cm diam., completely clothed in old prophyll and synflorescence remains and internodes entirely concealed apparently for several years (obs. in cult.); internodes lacking conspicuous scales, but very minutely low-scaly-pubescent and pinkish tan when young, thence with age grey-brown, corky and finely fissured horizontally and more finely fissured vertically, proximally (i.e. immediately above the prophyll) with a row of small triangular dark brown (dead) scales (squamules) ca. 2.5 mm long, distally (i.e. immediately below the prophyll of the next module) with a rather regular row of white tubercular structures ca. 3–4 mm diam., some with setose tips resembling the acicular scales of the prophylls, but with the bases more robust; roots few, piercing and emerging from near the base of the fresh prophyll, mostly ca. 2.5 mm diam. and spreading (skototropic?), occasional (feeder?) roots ca. 5 mm diam and more or less descending, bright pink at first; vegetative prophylls narrowly triangular and acuminate, ca. 50 cm long, not noticeably keeled, abaxially red with very low irregularly transverse ripple-like scales and shaggy elongate greenish-straw-coloured to white multicellular acicular scales to ca. 1.1 cm long, except along the edge covered by the outer side in bud, soon degrading to a network of pale brown fibres with copious dead darker brown remains of epidermis and putrid softer tissue which then all stretches and accommodates the expansion of the synflorescence. *Leaves* several, ca. 8 together in mature plant, spreading, to ca. 2.2 m from petiole base to blade tip; petioles ca. 1.4 m long, more or less terete and apically 2 cm diam., becoming somewhat flattened adaxially towards the base and there ca. 5 cm wide and 4 cm deep with very obtusely rounded edges, chocolate/liver brown, the surface minutely rippled and with scattered minute white protuberances, conspicuously but not very densely (petiole surface readily visible) clothed in more or less erect greenish-white filiform somewhat sinuous acicular scales ca. 1.2 cm long, petiole scales extending onto the adaxial side of the posterior costae for ca. 5 cm and there shorter than on petiole; sheath occupying the lower ca. 12 cm of petiole with the wings mostly somewhat spreading, strongly coriaceous and persistent, lacking scales; blades broadly ovato-sagittate, ca. 110 cm long x 80 cm wide, widest a few cm distal to the petiole attachment, somewhat firmly membranous and quite easily torn, adaxially dark green and more or less matte, abaxially paler green and weakly glossy; anterior lobe to ca. 80 cm long, ca. 80 cm wide; anterior costa scaleless, abaxially prominent and rounded, with ca. 15 primary lateral veins on each side (including usually 1 basal vein running to petiole/anterior costa nexus), diverging at ca. 60°, angle lowering to ca. 45° distally, more or less straight before ascending close to and running into the non-hyaline margin; costae, primary, interprimary and secondary venation adaxially narrowly and conspicuously impressed, abaxially prominent rounded and velvety-textured to the touch, but not pubescent (texture from papillate epidermal cells); interprimary veins few and irregular, more in distal part of anterior lobe, secondary veins rather few and irregular on each primary vein; tertiary veins sub-striate and running to blade margin, arising from the costae, primary, interprimary and secondary veins, numerous and slightly but distinctly raised adaxially and abaxially; posterior lobes well developed, rounded-square, ca. 45 cm long and 46 cm wide, the basalmost part rounded and overlapping (in living plant) and sinus thus closed and rhomboid; posterior costae diverging at ca. 75°, naked in the sinus and straight for to ca. 15 cm, thence running about half the length of the posterior lobe before branching into subequal primary veins, emitting ca. 7 primary lateral veins each briefly decurrent on the posterior costa* on the acroscopic side, on the innermost part of the basiscopic side primary venation sub-pedate, primary veins more or less briefly adnate to the posterior costa before being fully incorporated and indistinguishable from it. *Blooms* 7–9 per synflorescence with flowering activity overlapping in up to three successive synflorescences, though only one open bloom observed on the plant on any one day and several days between open blooms; prophylls of synflorescences prominently and somewhat jaggedly keeled, membranous, quickly disintegrating and less strongly fibrous than vegetative prophylls but some remains persistent; peduncles to ca. 20 cm long, ca. 2 cm diam. sparsely acicular-scaly below, progressively becoming more densely scaly distally, ascending at anthesis, thence declinate; spathe ca. 28–30 cm long, somewhat weakly constricted at interface of lower spathe and limb, abaxially densely scaly except where appressed to another in bud and there whitish-tuberculate (i.e. with scale bases only); lower spathe about one third of the length of the spathe, narrowly ovoid-subcylindric, externally dark purplish-pink beneath the scales, darkening to purple-brown after anthesis, internally dark pink; limb at anthesis gaping, with the margins revolute, broadly ovate-lanceolate, naviculiform, externally ivory white beneath the scales, internally white distally and along the outer sides, the rest intensely vivid pink, darkening at confluence with lower spathe interior, stiffly coriaceous, greening and reclosing with the formerly revolute margins straightening after anthesis; spadix ca. 23–25 cm long, sessile; female zone ca. 9–11 cm long, slightly spindle-shaped, ca. 2.5 cm diam at widest; interstice of staminodes white, 2.4–2.6 cm long, 2 cm diam., isodiametric with top of female zone and base of fertile male zone; fertile male zone creamy white, relatively short, 3.5 cm long, secreting pale brown resin at male anthesis; appendix tapering to a narrow blunt point, white, 7.5–8 cm long; pistils crowded, polygonal, ca. 3 mm tall; ovary 2 mm tall, mostly 5(–6)-locular; ovules numerous; placentation axile; stylar region constricted at top of ovary, thence expanded and angular-annular and mantle-like, 0.5 mm long, 2 mm diam., with mostly 5 obconic pits when stigma removed [nearest to style 'Type D' of Mayo (1989)]; stigma papillate, inconspicuously mostly 5-lobed, 0.5 mm tall, 1.5 mm diam.; staminodes of interstice tightly packed, irregularly polygonal and flat-topped, mostly ca. 2 mm across, some confluent and thus larger; stamens mostly somewhat irregularly tetragonal and close packed, with the connective and short filament thick, sometimes in apparent groups of 4 or 5, some less clearly so, ca. 1 mm across, ca. 2 mm long; thecae cylindric-ellipsoid, 1.5 mm long, not reaching the top of the connective; resin secreted from between the stamen bases(?); staminodes of appendix polygonal (mostly somewhat irregularly hexagonal from above), close packed, flat-topped and some centrally impressed, ca. 1.5 mm diam. *Infructescence* not seen. **Figures 1–9**.

Figure 1. *Philodendron rex*. Habit, growing planted on steep soil bank; stem covered in old prophyll and synflorescence remains. J.B. Paz y Flora. [See description for dimensions in all photos; all photos of plant from which the type was prepared]. — Photo A. Hay.

Figure 2. *Philodendron rex*. Exposed internode with fibrous prophyll remains below and fresh prophyll base above, minute velvety hairs on the internode, dead appressed triangular squamules (like small shark's teeth) at the base of the internode, and a row of enlarged white scale bases at the top. — Photo A. Hay.

Figure 3. *Philodendron rex*. Top of shoot with new leaf emerging from prophyll, and blooms with dead remains of synflorescence prophylls; fibres of old prophyll at base. — Photo A. Hay.

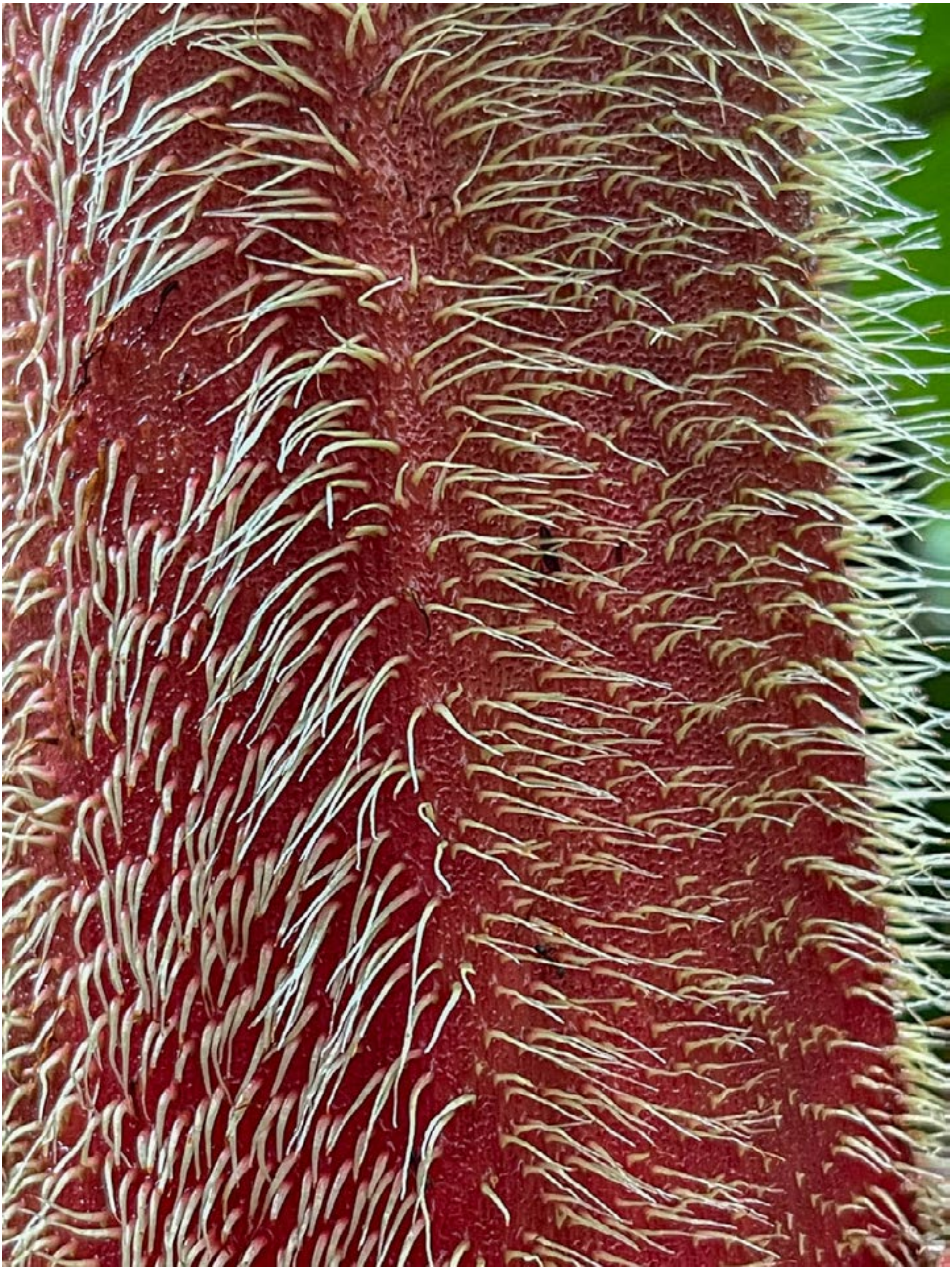

Figure 4. *Philodendron rex*. Detail of abaxial prophyll surface with minute irregular red epidermal ridges and emergent whitish multicellular trichomes. — Photo A. Hay.

Figure 5. *Philodendron rex*. Leaf from beneath showing venation and sinus shape. — Photo A. Hay.

Figure 6. *Philodendron rex*. Detail of petiole with minute ripple-like epidermal ridges and emergent whitish multicellular trichomes. — Photo A. Hay.

Figure 7. *Philodendron rex*. Shoot apex with three synflorescences, one spent (lower left), one active (centre), and one emergent with soon-degrading prophylls (upper left). — Photo A. Hay.

Figure 8. *Philodendron rex*. Spathe in abaxial view. — Photo A. Hay.

Figure 9. *Philodendron rex*. Spadix after anthesis, with re-closed spathe partly cut away. From bottom to top: female zone, interstice, fertile male zone, appendix. — Photo A. Hay.

Distribution and ecology — Endemic to Colombia, Valle del Cauca, known with certainty only from near Buenaventura in the Chocoan bioregion of the Pacific side of the Cordillera Occidental, in very wet lowland forest at low elevation near the initial ascent of the Cordillera.

Etymology — The epithet *rex*, a noun in apposition, signifies 'king' in allusion to the species' great size, and magnificent aspect and spathe colouration, compared with nearly all other members of subsect. *Achyropodium*. Furthermore, vegetative dimensions of *Philodendrom rex* are on a par with those of others of the largest species of subgenus *Philodendron*, such as *P. gigas* Croat (Panama: Guna Yala, Panamá), *P. magnum*, and *P. minesianum* Croat (Peru: Loreto to San Martín), the last described in this issue (Croat & Mines, 2022), though *P. rex* is larger than any of them in the bloom.

Comments — As noted in the diagnosis, the new species is clearly similar to but quite distinct from *Philodendron squamicaule* Croat & Grayum *sensu stricto*, of which the type is from Panama: Coclé (*Croat & Zhu 76798*, holotype, MO examined on-line; isotypes examined on-line at B, COL, K, & US, and directly at PMA). The two species share acicular-scaly vegetative prophylls, petioles, synflorescence prophylls, peduncles and spathe exteriors, prophylls degrading to long-lasting networks of fibres, rather numerous primary lateral veins and well-developed posterior lobes in the leaf blades, spadices with more or less well-developed sterile appendices, and gynoecia with several locules and numerous ovules on axile placentas. The comparison is, however, somewhat complicated by the inclusion under the protologue of *Philodendron squamicaule* of a number of sterile collections from Colombia and Ecuador (Croat, 1997). Most have elongate internodes conspicuously clothed in scales which are smaller and more densely distributed than those on the leaves and prophylls, and more or less triangular-sagittate leaf blades with the sinus rhomboid/horse-shoe-shaped and tending to be open in the living plant. Although they do indeed bear some resemblance to the type of *Philodendron squamicaule*, it is not wholly clear that they represent the same species.

A Colombian collection similar to these and determined as *Philodendron squamicaule* (*Croat & Gaskin 79681*, MO) is from higher up in Anchicayá (ca. 1400 m). Cultivated plants from this area maintain the long- and scaly-internoded habit and produce solitary blooms or small synflorescences of two blooms, also maintaining the much smaller and more triangular as well as paler green leaf blades relative to *Philodendron rex*. In addition, the longer scales on the prophylls emerge from a mass of smaller, lower red scales which are absent or extremely reduced (to weak, ripple-like surface irregularities) in *Philodendron rex*. It has not yet been possible to study the fresh spadices of this plant to compare floral details with *Philodendron rex*, though it is apparent from spent blooms that the spadix is little more than half the overall length of that of *P. rex*. Moreover, the interstice, fertile male zone and appendix are of approximately the same length as each other, while the appendix of *Philodendron rex* is relatively much longer, about equal to or somewhat exceeding in length its sterile interstice and fertile male zone combined. While this plant bears a greater resemblance to *Philodendron squamicaule* overall, these spadix proportions in this plant also differ from those of the type of *P. squamicaule* (see diagnosis above). Comparable sterile specimens from the department of Chocó, cited as *Philodendron squamicaule*, are likely of the same species, and it would appear probable, or at least possible, that these are another unnamed species which perhaps extends from Chocó, down to Ecuador, though the sterile Ecuadorean material again differs slightly in having noticeably more densely and finely scaly and more 'woolly-looking' petioles (e.g. *Croat et al. 82639*, MO; Croat et al., 2016: figs 215–218). These specimens would also repay further comparison with the similarly distributed *Philodendron squamipetiolatum* Croat, though that species differs in having at best weakly developed posterior lobes on the leaf blade with very short to lacking posterior costae, whereas all these plants have well-developed posterior lobes with well-formed posterior costae.

With these uncertain elements provisionally excluded from the concept of *Philodendron squamicaule*, leaving it represented in published treatments by the Panamanian type, *P. rex* can be distinguished by the characteristics in the diagnosis given above. Also included in the protologue of *Philodendron squamicaule* was another sterile specimen from lower Anchicayá (*Croat & Watt 70458*, MO), which is probably of the new species described here, having more rounded leaf blades and short internodes, and from a nearby locality at similarly low altitude (270 m). In conclusion, it seems that *Philodendron squamicaule sensu* Croat & Grayum in Croat (1997) is perhaps a complex of a few allied species, of which one, clearly distinct now that it is known in the adult fertile state, is extracted here.

Morphological notes — A small number of terms used in the description above differ from those conventionally applied to structures in *Philodendron* (and some other aroids). ***1.*** The term 'basal vein', used in the standardised descriptions of Croat (1997, and other works), where the 'posterior rib [or costa]' is interpreted as formed of coalesced basal veins, is here confined to those free primary veins running directly from the nexus of the petiole and the three costae, posterior and anterior, and not running from along any of the costae themselves. The posterior costa is here taken to be a structure *sui generis*, reflecting the fundamentally tripartite structure of most aroid leaf blades (Hay, 2019). It bears primary veins whose course at their bases is somewhat decurrent on the posterior costa before merging with it (as is the course of each primary vein on the anterior costa, though there for a relatively shorter distance). ***2.*** The term 'inflorescence' is conventionally applied to the spathe-and-spadix. However, as articulated by Hay (2019), there is considerable evidence to suggest that the spathe-and-spadix is not an inflorescence *per se*, but a hybrid structure with functional and structural attributes of both 'flower' and 'inflorescence' simultaneously, even in groups such as *Anthurium* and the lasioids with their spadices of tepalate bisexual florets, and which therefore cannot realistically be ascribed exclusively to one or other category. The morphologically non-committal term 'bloom' has therefore been used here (in preference to the fastidiously academic 'pseudanthium', as if any of these results of developmental evolution is somehow false), as has been taken up recently by some other Araceae specialists, such as in *Pothos* (e.g. Wong & Boyce, 2019) and the Schismatoglottideae (e.g. Boyce et al., 2019). ***3.*** 'Appendix' is here used to refer to a substantial apical zone of the spadix occupied by sterile male florets or sterile stamens. Such a zone is relatively uncommon in the Philodendreae as a whole, and is more usually referred to as an apical sterile male zone, even in *Philodendron appendiculatum* (Nadruz Coehlo & Mayo, 1998)! Some may understand an appendix as a structure distinctly different in texture or appearance from the fertile male zone, but it is clear that, across the Aroideae, a distal sterile zone of the spadix may vary and intergrade from a mass of sterile stamens or sterile florets (e.g. in appendices of some Schismatoglottideae) through to a zone of more or less smooth sterile tissue very distinct from the fertile male zone (e.g. in appendices of many Areae). There seems no good reason to shy away from the use of 'appendix' in *Philodendron*, where such a structure occurs. The appendix of *Philodendron rex* is particularly large for the genus, and of as yet unknown function.

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New combinations in resurrected *Lazarum* A.Hay (Araceae—Areae)

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ABSTRACT

On the basis of molecular phylogenetic analyses having indicated that the endemic Australian and New Guinea '*Typhonium*' species form a non-sister clade distinct from Asian *Typhonium* Schott *sensu stricto*, and those clades displaying consistent ovule differences, fourteen species names are formally transferred from *Typhonium* to the genus *Lazarum* A.Hay, which is resurrected from synonymy.

Key words: *Lazarum*, *Typhonium*, Australia, New Guinea, Aroideae, Areae.

BACKGROUND

The genus *Lazarum* was established by Hay (1992) for a remarkable, very diminutive member of tribe Areae from the Tiwi Islands (Northern Territory) which possesses a truly tubular (as distinct from convolute) lower spathe within which there is a septum dividing the lower chamber into an upper and lower part housing the male and female fertile portions of the spadix respectively. However, owing to the discovery of a species, *Typhonium praetermissum*, with a spathe which appeared intermediate between that in the type species *Lazarum mirabile* A.Hay and *Typhonium* in general, Hay (1997) reduced *Lazarum* to a synonym of *Typhonium sensu lato*.

More recently, phylogenetic relationships within the tribe Areae were resolved with nuclear and chloroplast genes (Cusimano et al., 2010), establishing that *Typhonium* in the broad sense was polyphyletic. The sampled Australian species were recovered as a monophyletic clade, strongly supported in Bayesian analyses as more closely related to *Theriophonum*, *Sauromatum* and the Mediterranean genera than to a clade of Asian *Typhonium* species including the type, *T. trilobatum* (L.) Schott. To avoid *Typhonium* being a polyphyletic genus, the Australian lineage and several Asian species must be excluded from *Typhonium sensu lato*. Those Asian *Typhonium* species were transferred to *Sauromatum* Schott by Cusimano et al. (2010), but the Australian clade was retained in *Typhonium pro tempore*, since the type species of *Lazarum*, *L. mirabile*, had not at that time been sequenced, and its position was also uncertain because no morphological synapomorphies were yet known for the Australian clade. Sequence data have since been obtained for *Lazarum mirabile* by one of us (M.D.B.), confirming that it is phylogenetically deeply embedded within the Australian clade. Since *Lazarum* is the only described genus with a type belonging to the Australian clade, it is unambiguously the correct generic name for the group, and it is therefore here resurrected from synonymy. Supporting genetic data will be presented elsewhere, along with novel species of *Lazarum.*

However, new combinations for the described species are expedited here, since two major books on Araceae are currently in preparation (respectively by Deni Bown and Alistair Hay) which need to cite the relevant Australian plants in the right genus, and ongoing research on Australian '*Typhonium*' (e.g., Sayers et al., 2020, 2021) would be better placed in the systematically correct genus, *Lazarum*.

Lazarum, as now circumscribed, comprises all Australian species previously included in *Typhonium* (Hay, 1993; 2011), with the exception of two native species, *T. flagelliforme* (Roxb. ex G.Lodd.) Blume and *T. roxburghii* Schott, and the naturalised weed *T. blumei* Nicolson & Sivad., which all remain in *Typhonium sensu stricto*. All three true *Typhonium* species in Australia have wide distributions in south-east Asia (Nicolson & Sivadasan 1981), and have presumably dispersed to Australia relatively recently. *Typhonium roxburghii* has now been found far from human settlement on Elcho Island in the Northern Territory, and so is considered native in Australia (Northern Territory Herbarium, 2022), whereas it had previously been considered only naturalised in Australasia (Hay, 1993). The distribution of *Lazarum* covers much of mainland Australia, with a single species, *L. angustilobum*, extending to southern New Guinea (Hay, 1993).

Due to the considerable and quite similar breadth of vegetative and floral diversity found in both *Typhonium sensu stricto* and *Lazarum sensu lato*, morphological differentiation of the two genera is difficult, and it appears that only their ovules provide a reliable basis for distinction. All *Lazarum* species, described and undescribed, consistently have a single erect, sessile ovule on a basal placenta, with at most a small apical void between the ovule and the locule wall. In contrast, all species of *Typhonium sensu stricto* checked to date (by M.D.B.), including the three Australian *Typhonium sensu stricto*, have a single ovule, held slightly to prominently obliquely on a short to prominent erect funicle, also on a basal placenta, but with a conspicuous void surrounding the ovule and funicle. It should be noted, however, that published descriptions of ovules are lacking or scanty for nearly all *Typhonium* species, and most generic descriptions or representative illustrations of *Typhonium* are based on or encompass species now placed in *Sauromatum* [e.g. Mayo et al 1997, plate 93K, depicting *Typhonium giganteum* Engl., now *Sauromatum giganteum* (Engl.) Cusimano & Hett.].

We strongly encourage detailed description of ovules in future revisions and new species descriptions of *Typhonium*. [**Figure 1** illustrates two examples of bloom diversity in *Lazarum* as it is now defined].

Figure 1. Bloom structure of two representative species of *Lazarum*. *Left: Lazarum taylori*, closely related to the type species *L. mirabile*, both sharing a tubular spathe formed from connation of the margins of both the lower spathe and the lower part of the blade, where the "constriction" between lower spathe and blade has been modified into a septum; from a plant cultivated to flowering from the type locality, Northern Territory. *Right: Lazarum liliifolium*, showing bloom structure typical of the larger-flowered species of *Lazarum*, from near Keep River, Northern Territory, flowering in the wild from the location of *J. Kirby 14116* (DNA). The spathe is sectioned, showing the thickened constriction between the spathe sheathing base and its blade; the sheathing base was un-fused and involute, with overlapping margins. — photos M. Barrett.

LAZARUM

Lazarum A.Hay, Bot. J. Linn. Soc. 109 (1992) 428. — Type: *Lazarum mirabile* A.Hay [syn. *Typhonium mirabile* (A.Hay) A.Hay, Edinburgh J. Bot. 54 (1997) 334].

New combinations

1. ***Lazarum alismifolium*** (F.Muell.) M.D.Barrett, A.Hay, & Hett., **comb. nov.** — Basionym: *Typhonium alismifolium* F.Muell., Fragm. (Mueller) 8(67) (1874) 186.

2. ***Lazarum angustilobum*** (F.Muell.) M.D.Barrett, A.Hay & Hett., **comb. nov.** — Basionym: *Typhonium angustilobum* F.Muell., Fragm. 10(83) (1876) 66.

3. ***Lazarum cochleare*** (A.Hay) M.D.Barrett, A.Hay & Hett., **comb. nov.** — Basionym: *Typhonium cochleare* A.Hay, Blumea 37(2) (1993) 365.

4. ***Lazarum eliosurum*** (F.Muell. ex Benth.) M.D.Barrett, A.Hay & Hett., ***comb. nov.***— Basionym: *Typhonium brownii* var. *eliosurum* F.Muell. ex Benth., Fl. Austral. 7 (1878) 154. — *Typhonium eliosurum* (F.Muell. ex Benth.) O.D.Evans, Contr. New South Wales Natl. Herb. 3(2) (1961) 86.

5. ***Lazarum johnsonianum*** (A.Hay & S.Taylor) M.D.Barrett, A.Hay & Hett., **comb. nov.** — Basionym: *Typhonium johnsonianum* A.Hay & S.Taylor, Telopea 6(4) (1996) 563.

6. ***Lazarum jonesii*** (A.Hay) M.D.Barrett, A.Hay & Hett., **comb. nov.** — Basionym: *Typhonium jonesii* A.Hay, Blumea 37(2) (1993) 355.

7. ***Lazarum liliifolium*** (F.Muell. ex Schott) M.D.Barrett, A.Hay & Hett., **comb. nov.** — Basionym: *Typhonium liliifolium* F.Muell. ex Schott, Bonplandia 7 (1859) 103.

8. ***Lazarum nudibaccatum*** (A.Hay) M.D.Barrett, A.Hay & Hett., **comb. nov.** — Basionym: *Typhonium nudibaccatum* A.Hay, Blumea 37(2) (1993) 351.

9. ***Lazarum peltandroides*** (A.Hay, M.D.Barrett & R.L.Barrett) M.D.Barrett, A.Hay & Hett., **comb. nov.** — Basionym: *Typhonium peltandroides* A.Hay et al., Nuytsia 13(1) (1999) 243.

10. ***Lazarum praetermissum*** (A.Hay) M.D.Barrett, A.Hay & Hett., **comb. nov.** — Basionym: *Typhonium praetermissum* A.Hay, Edinburgh J. Bot. 54(3) (1997) 331.

11. ***Lazarum russell-smithii*** (A.Hay) M.D.Barrett, A.Hay & Hett., **comb. nov.** — Basionym: *Typhonium russell-smithii* A.Hay, Blumea 37(2) (1993) 365.

12. ***Lazarum taylorii*** (A.Hay) M.D.Barrett, A.Hay & Hett., **comb. nov.** — Basionym: *Typhonium taylorii* ('*taylori*') A.Hay, Edinburgh J. Bot. 54(3) (1997) 334.

13. ***Lazarum weipanum*** (A.Hay) M.D.Barrett, A.Hay & Hett., **comb. nov.** — Basionym: *Typhonium weipanum* A.Hay, Blumea 37(2) (1993) 357.

14. ***Lazarum wilbertii*** (A.Hay) M.D.Barrett, A.Hay & Hett., **comb. nov.** — Basionym: *Typhonium wilbertii* A.Hay, Blumea 37(2) (1993) 359.

Notes — *Typhonium brownii* Schott, has already been combined as *Lazarum brownii* (Schott) M.D.Barrett in Mabberley & Moore (2022: 45). *Typhonium millarii* F.M.Bailey [*Dept. Agric. Brisbane Bot. Bull.* 2 (1891) 20] is not combined here in *Lazarum* as it is currently understood to be a synonym of *L. angustilobum* (e.g. Hay, 2011: 263). That may change, however, on further elucidation of *Lazarum angustilobum* which is a variable species with still unclear boundaries. Accounts of *Typhonium* (as it then was) in Australia were given, with keys to the species, by Hay (1993, 2011). *Lazarum* is currently under revision again by one of us (M.D.B.), and the number of species is expected to approximately double.

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On the identity of *Arum montanum* Roxb. and *Alocasia gageana* Engl. & K.Krause — two earlier names pertaining to *Englerarum* Nauheimer & P.C.Boyce (Araceae).

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ABSTRACT

The long-misinterpreted *Arum montanum* Roxb. is shown to be a species of *Englerarum* Nauheimer & P.C.Boyce (Araceae–Aroideae). It is proposed that its originally stated Indian provenance is a mistake and that it more likely came from Myanmar, from where *Englerarum* is newly recorded here. The frequently misapplied name *Alocasia gageana* Engl. & K.Krause, based solely on an unpublished illustration of a cultivated plant from Myanmar, is also shown to belong in *Englerarum*. The new combination *Englerarum montanum* (Roxb.) P.C.Boyce, K.Z.Hein & A.Hay is made. *Alocasia gageana*, *Englerarum hypnosum* (J.T.Yin, Y.H.Wang & Z.F.Xu) Nauheimer & P.C.Boyce and *Alocasia lihengiae* C.L.Long & Q.Fang are placed in its synonymy. *Arum montanum* Roxb. is lectotypified.

Key words: William Roxburgh, India, Felix Carey, Myanmar, Aroideae, *Englerarum montanum*, *Alocasia lihengiae*.

ARUM MONTANUM

Arum montanum Roxb. has long been a poorly understood species. The name appears first in *Hortus Bengalensis* (Roxburgh, 1814: 65), a catalogue of the plants in the East India Company's botanic garden at Calcutta (now the Acharya Jagadish Chandra Bose Indian Botanic Garden, Kolkata) assembled by the Scottish surgeon and botanist William Roxburgh (1751–1815). However, the name was not validly published until in his posthumous *Flora Indica* (Roxburgh, 1832: 497), and it was not until 1846 that another Scottish surgeon-botanist, Robert Wight (1796–1872), published a lithograph version of Roxburgh's illustration of *Arum montanum* (Wight, 1846: plate 796).

Meanwhile, Karl Sigismund Kunth (1788–1850) had transferred *Arum montanum* to *Colocasia*, with doubt, as *C. montana* (Roxb.) Kunth (Kunth, 1841: 40), a name shortly afterwards applied by Justus Carl Hasskarl (1811–1894) to Javan plants (Hasskarl, 1848: 148). A few years after that, Schott (1854) combined it in *Alocasia* as *Alocasia montana* (Roxb.) Schott, but with no comment on its characteristics, and that name came to be applied by several authors, presumably following Hasskarl, to the Javan species now recognised as *Alocasia flemingiana* Yuzammi & A.Hay (see Hay, 1998). Schott, however, in his *Prodromus* (Schott, 1860: 154), ignored the application of the name to plants from Java, provided a description which accords very closely with Roxburgh's published illustration, and attributed the plant only to Roxburgh and the Indian state of Orissa (now Odisha), a position followed by Engler & Krause (1920: 77). More recently, *Alocasia montana* has been treated as a synonym of *A. macrorrhizos* (L.) G.Don (e.g. Hay, 1998; Govaerts & Frodin, 2002: 68), in the case of Hay under the misapprehension that Roxburgh's drawing was an inaccurate and stylised rendering of that common and widespread species. However, it now clear that this was misguided, though perhaps not an entirely unforgivable mistake given that the species the drawing actually depicts had not yet come to contemporary botanical attention.

There are some hitherto overlooked clues to the plant's identity from the beginning. First, in *Hortus Bengalensis* Roxburgh (1814: 65) had characterised the growth habit of *Arum montanum* with the code 'H', signifying that the plant seasonally died down to the ground. Other *Arum* species listed there which are now correctly in *Alocasia* are coded as 'shrubby' which we take to mean having permanent epigeal shoots. While some alocasias can irregularly become leafless under severe water stress, no species is known which is seasonally fully dormant. Secondly, the watercolour drawing of *Arum montanum* that Roxburgh had had prepared by an anonymous Indian artist depicts long, robust stolons emerging from the rhizome immediately below the leaves; these are barely apparent in the published illustration (Wight, loc. cit.) which was evidently cropped from the original, and were not noted by Schott, though they were mentioned by Hooker (1893: 525) who presumably had studied the original illustration. Such robust stolons are not characteristic of alocasias which typically produce only short, feeble hypogeal stolons terminating in dormant tubercles not far from the base of the shoot. Thirdly, in the drawing, the posterior costae of the leaf do not run to the tips of the posterior lobes as they almost always do in *Alocasia*. Fourthly, the drawing also depicts a short series of blooms on robust peduncles in a centrifugal sequence in a leaf axil, something that Schott (1860: 155) had noted in his description: "*Pedunculi petiolo paullo breviores, plures ex eadem axilla*". This is also not characteristic of *Alocasia* where blooms are in bimodular synflorescences orientated tangentially to the shoot (see Hay, 1998). Finally, the watercolour drawing depicts a spadix with a narrowly conic appendix almost reaching the spathe tip, and an inflated pinkish cucullate spathe limb which appears to sag at the base.

These characteristics of *Arum montanum* accord with the illustration being, far from an inaccurate and stylised representation of *Alocasia macrorrhizos*, an unmistakable depiction of *Englerarum hypnosum* (J.T.Yin et al.) Nauheimer & P.C.Boyce (see **Figures 1 & 2**), which is seasonally deciduous, produces long robust stolons, has pedately branched posterior costae which do not run to the tips of the posterior lobes, centrifugal synflorescences in the leaf axils, robust peduncles, and a highly characteristic inflated usually pinkish erect and cucullate but basally sagging/reflexed spathe limb. One noteworthy anomaly in the drawing is the

Figure 1. *Arum montanum* Roxb., *Icones Roxburghianae* No. 248, the lectotype of *Englerarum montanum* P.C.Boyce, K.Z.Hein & A.Hay. Reproduced with the kind permission of the Board of Trustees of the Royal Botanic Gardens, Kew.

Figure 2. Flowering plant of *Englerarum montanum* near Naung Pin Thar Village, Thabeikkyin Township, Mandalay Region, Myanmar (not collected), showing two centrifugal synflorescences emerged from the leaf sheaths. — Photo: Phyo Kyaw Maung Kham

large elongate rhizome. Recent descriptions refer to or imply a short tuber-like rhizome for *Englerarum*, with the older parts decaying each season, but Roxburgh's plant was cultivated, and the stem may not behave in the same way as it appears to in nature.

The species did not become further known botanically until 2005 when it was described as *Alocasia hypnosa* from Yunnan, China (Wang et al., 2005), and it was Boyce (2008) who first drew attention to the similarity between *Alocasia hypnosa* and *Arum montanum*. *Alocasia hypnosa* was later transferred to its own new genus, *Englerarum,* following it emerging on molecular evidence that it does not group in *Alocasia* or any other immediately allied genus (Nauheimer & Boyce, 2013), though it clearly belongs in this area of the Aroideae along with *Protarum*, *Ariopsis*, the Colocasieae sensu stricto (*Remusatia*, *Steudnera* and *Colocasia*), *Leucocasia*, *Vietnamocasia* and *Alocasia*, a paraphyletic grade of 'Old World Colocasioids' (see Lý et al., 2017).

The provenance of *Arum montanum* — India or Myanmar?

Roxburgh (1814: 65) indicated that the plant had been collected in 'Circars', ['Northern Circars' in *Flora Indica* (Roxburgh, 1832: 497)], a large, narrow region in eastern India along the part of western side of the Bay of Bengal, which later authors interpreted as the state of Orissa (now Odisha) though it also included part of Andrha Pradesh. He cited a vernacular name, 'Konda-rakis', with the language code 'T' signifying 'Telinga' [now Telugu], spoken in that part of India. The date of collection was given as 1808, and the collector was cited as Felix Carey (1786–1822), the at times wayward (Hall, 1932) eldest son of the zealous Baptist missionary William Carey (1761–1834) whose press at Serampore had printed Roxburgh's *Hortus Bengalensis* and *Flora Indica*. However, it appears that Felix Carey had moved to Burma (Myanmar) by 1808 (Laird, 2004). It therefore seems to be the case that the cited details in *Hortus Bengalensis* were a muddle, and that, assuming the date is correct, if the plant was Indian, it was not collected by Felix Carey, and if it was collected by him, it was not in India.

Englerarum has hitherto been recorded from Yunnan, Thailand and Laos (Boyce, 2008; Nauheimer & Boyce, 2013), but never yet from India. However, it has now been observed in Myanmar, in Kayin and Shan States, and in Mandalay Region (K.Z. Hein, pers. obs.), and, moreover, is represented by a sterile herbarium specimen (**Figure 3**) at US from Popa Mountain National Park, Mandalay Region. In addition, it is represented as from Kachin State by the holotype of *Alocasia gageana* (see below). We therefore think, on the balance of probabilities, that the Indian provenance that Roxburgh gave for *Arum montanum* was an error, and that Felix Carey had sent it to him from Myanmar. Nevertheless, it would of course be a welcome and interesting discovery if *Englerarum* were to be found in eastern India.

Typification of *Arum montanum* Roxb.

No original specimens of *Arum montanum* Roxb. have been located, and none was cited by either Schott (1860: 154), Engler (1879: 500), or Engler & Krause (1920: 78). Hooker (1893: 525) stated he had seen no specimen, and Forman (1997) listed none. Considering the unpublished drawings to be part of the original material on which the name was based, we have lectotypified *Arum montanum* Roxb. with Roxburgh's illustration. There are duplicate sets, at Kolkata (CAL) and at Kew (K), of the large number of plant illustrations Roxburgh had had prepared. The illustration of *Arum montanum* at K (**Figure 1**) has better preserved and more complete colouring, being the original, relative to that at Kolkata (accessible online at https://archive.bsi.gov.in/botanical-details?link=526A3658F45122BF), and it is therefore chosen as the lectotype. Hay (1998) indicated the duplicate drawings together as the "type" [sic], but, as both elements were included equally without distinguishing one as the lectotype, that did not amount to an effective typification. We recommend epitypification with a fertile specimen from Myanmar when suitable material becomes available.

ALOCASIA GAGEANA

Alocasia gageana Engl. & K.Krause is a name quite widely known in horticultural circles where it is, as it now transpires, misapplied to a somewhat small and compact form of the variable *Alocasia odora* (Roxb. ex G.Lodd.) Spach, a distinctive, mainly continental East Asian species with large, more or less membranous, broadly cordato-sagittate, characteristically peltate leaf blades, and glaucous spathes. The earliest published instance we have found of the name being thus used is in David Burnett's comprehensive account of cultivated *Alocasia* (Burnett, 1984: 78, fig. 5), where it was reported as the botanical name already in use for the cultivar *Alocasia* [*odora*] 'California'. Sampled from cultivation, '*Alocasia gageana*' has not surprisingly appeared to group with *A. odora* in molecular phylogenetic analyses (e.g. Renner & Zhang, 2004; Nauheimer et al., 2012; Lý et al., 2017; Van et al., 2017).

Forest Research Institute
Yezin
HERBARIUM
Plants of Burma
No. 2110 Date 24.6.98 Alt. 2800 ft.
Name Bot. Alocasia
Vern. Araceae
State / Division Mandalay
Township Kyaukpadaung
Reserve / U.C.F. Popa
Compartment / Coupe Yonge
Habitat / Habit ... herb with rhizome growing at the under storey of forest and damp places.
Collector Yin Yin Kyi

Figure 3. Herbarium specimen of *Englerarum montanum* collected at Mt. Popa, Kyaukpadaung Township, Mandalay Region, Myanmar, 24 June 1998, *Yin Yin Kyi 2210* (US, barcode 00673016). — © Smithsonian Institution.

Figure 4. The holotype illustration at CAL of *Alocasia gageana* Engl. & K.Krause. — © The Director, Botanical Survey of India, Kolkata.

However, as a result of diligent research by the third author (K.Z.H.), it has now come to light that the original watercolour illustration at CAL **(Figure 4)**, the sole element on which Engler & Krause based the species and depicted it with a small copied drawing (Engler & Krause, 1920: 80, fig. 11), is plainly of a plant conforming to *Englerarum*, and not an *Alocasia* at all. The blooms are in a centrifugal sequence in the leaf axil; the leaf blade, which is not peltate, has short posterior costae which break into branches before reaching the tip of the posterior lobes; the spathe limb is pink, cucullate and inflated (though, it must be said, not as conspicuously so as is usually seen in *Englerarum hypnosum*); and the spadix has a long attenuate interstice, a short, broad male zone, and a long appendix abruptly narrowed at the base and tapering apically to a point, characteristic of *Englerarum hypnosum* (see photos in Nauheimer & Boyce, 2013; Fang et al., 2020). The illustration does not depict the stem, and hence stolons are not included. Nevertheless, the resemblance to *Englerarum hypnosum* is very clear.

The watercolour drawing is annotated "Drawn by Kali Pada Dass. *Alocasia* sp. Sent to this garden (Hort. Calcutt.) by the garden collector Shaik Mokim from Myit Kyina, Upper Burma. Received in the garden on 27.iii.1900. Flowered and figured July 1901. Leaf reduced one half natural size. Separate pistil and stamen magnified. Rest of figures natural size. A. Gage July 1901". [Andrew Thomas Gage (1871–1945), for whom the species was named, was Curator of the then Royal Botanic Garden Calcutta herbarium (1898–1905), and subsequently Superintendent of the Garden (1905–1925) (Desmond, 1994: 286)]. Again, we recommend epitypification with suitable material from Kachin State, when it becomes available.

ENGLERARUM MONTANUM

We formally combine *Arum montanum* in *Englerarum* here, with *E. hypnosum* and *Alocasia gageana* as synonyms. We think *Alocasia lihengiae* should also be placed in the synonymy of *Englerarum montanum*, as it is overwhelmingly similar to *E. hypnosum*, also originating in Yunnan from limestone, the near-obligate substrate for this species in the wild throughout its range, though it is occasionally associated with volcanic calc-alkaline rocks ranging in composition from basalts to andesites in Myanmar (e.g. at Mt. Popa). [The occurrence of otherwise Karst-obligated aroids on base volcanic geologies can be observed elsewhere in Araceae. For example, on Borneo, *Bucephalandra bogneri* S.Y.Wong & P.C.Boyce, *Rhynchopyle viridistigma* (S.Y.Wong, P.C.Boyce & Bogner) S.Y.Wong & P.C.Boyce, and *Pothos ovatifolius* Engl., among others, occur on both limestone and basalt].

Englerarum montanum (Roxb.) P.C.Boyce, K.Z.Hein & A.Hay, **comb. nov.** — *Colocasia montana* (Roxb.) Kunth, Enum. Pl. 3 (1841) 40. — *Alocasia montana* (Roxb.) Schott, Österr. Bot. Wochenbl. 4 (1854) 410. — Basionym: *Arum montanum* Roxb., [Hort. Bengal. (1814) 65, nom. nud.]; Fl. Ind. ed. 1832, 3 (1832) 497. — Type: *Arum montanum* Roxb., Icones Roxburghianae no. 248 (lectotype, K, designated here).

Alocasia gageana Engl. & K.Krause, Pflanzenr. 71 (IV.23E) (1920) 80, **syn. nov**. — Type: Un-numbered watercolour drawing annotated "*Alocasia* sp. sent to... Hort. Calcutt. by... Shaik Mokim from Myit Kyit, Upper Burma. ...flowered and figured July 1901... A. Gage, July 1901" (holotype, CAL).

Alocasia hypnosa J.T.Yin, Y.H.Wang & Z.F.Xu, Acta. Bot. Fennici 42 (2005) 395. — *Englerarum hypnosum* (J.T.Yin et al.) Nauheimer & P.C.Boyce, Pl. Syst. Evol. 300 (2013) 714, **syn. nov**. — Type: CHINA, Yunnan, Menglian County, by Nanlei River, limestone mountain margin, 975 m a.s.l., 12 August 2004, Yin Jian-Tao 816 (holotype, HITBC).

Alocasia lihengiae C.L.Long & Q.Fang, Phytotaxa 436(2) (2020) 98, **syn. nov.** — Type: CHINA, Yunnan, Xishuangbanna Dai Autonomous Prefecture, Jinghong City, Jinuoshan Township, 960 m a.s.l., 22°13'N, 100°53'E, 18 August 2018, *Long Chun-Lin 2018107* (holotype, KUN; isotype, KUN).

Full descriptions and illustrations of *Englerarum montanum* can be found, under various of its synonyms, in Wang et al. (2005), Nauheimer & Boyce (2013), and Fang et al. (2020).

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A new combination and new synonyms for *Sauromatum* Schott (Araceae—Areae) of northeastern India and Bangladesh

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ABSTRACT

Typhonium listeri Prain, of northeastern India and Bangladesh, is transferred into *Sauromatum* as *S. listeri* (Prain) K.Z.Hein & A.Hay, informed by an unpublished painting of the living plant made at Kolkata, India, at the time it was originally named. It is lecto- and epitypified. Its placement is discussed in the context of molecular understanding of generic relationships in the tribe Areae in which *Sauromatum* Schott is clearly distinct from *Typhonium* Schott despite their confused history. *Sauromatum listeri* is compared with the recently named *Sauromatum meghalayense* D.K.Roy, Talukdar, B.K.Sinha & Dutta Choud. and *S. nangkarense* Nangkar & Tag which are here placed in its synonymy. It is suggested that *Sauromatum listeri* may be most closely related to *Sauromatum tentaculatum* (Hett.) Cusimano & Hett. of Thailand. Some biographical notes on J.L. Lister, for whom the species was named, are given.

Key words: *Typhonium*, Aroideae, *Sauromatum listeri*, *S. nangkarense*, *S. meghalayenese*, *Hirsutiarum*, Kolkata Botanic Garden, J.L. Lister

BACKGROUND

The tribe Areae, though absent from the Americas, is nevertheless one of the most widespread tribes in the Araceae, occurring from the Azores, Ireland and Sweden through to tropical and warm temperate Australia. It includes the Mediterranean-focussed (but some much more widespread) temperate and warm temperate genera *Arum* L., *Biarum* Schott, *Dracunculus* Mill., *Eminium* (Bl.) Schott, *Gymnomesium* Schott and *Helicodiceros* Schott ex K.Koch, as well as subtropical and tropical African and Asian *Sauromatum* Schott, southern Indian and Sri Lankan *Theriophonum* Schott, mainly Indochinese *Typhonium* Schott, and Australian *Lazarum* A.Hay, the last now including all Australian and New Guinea former *Typhonium* species except *T. flagelliforme* (Lodd.) Bl. Consisting almost entirely of seasonally dormant geophytes, some of which reach into the most xeric habitats of any Araceae, the tribe is poorly represented in the 'ever wet' tropics.

The limits and definition of the genera of Areae have remained quite stable over recent times even after molecular-systematic upheavals in the family, except for *Lazarum*, *Sauromatum* and *Typhonium*. These have been particularly problematic to define morphologically, and there have been varying (pre-molecular) views about whether to recognise the first two as distinct from *Typhonium* at all (e.g. Hay, 1992, 1997; Hetterscheid & Boyce, 2000; Sriboonma et al., 1994), and, if they are to be separated, what species to assign to *Sauromatum* or *Typhonium*. Two simultaneously published molecular-phylogenetic studies, the only ones with quite dense sampling of relevant species, have taken differing directions. That by Ohi-Toma et al. (2010) proposed that *Typhonium* (*sensu lato*, including *Sauromatum* species) was polyphyletic (even without sampling any Australian species), and that the Mediterranean genera (represented by *Helicodiceros*, *Biarum* and *Arum*) were collectively one clade in an unresolved tetratomy along with three clades of *Sauromatum* species. On that basis, they established three new genera, *Diversiarum* J.Murata & Ohi-Toma, *Pedatyphonium* J.Murata & Ohi-Toma and *Hirsutiarum* J.Murata & Ohi-Toma (Ohi-Toma et al., 2011), in addition to recognising a narrower *Sauromatum*, in order to create monophyletic groups according to the topology of their phylogeny. That by Cusimano et al. (2010), on the other hand, resolved the Areae into genera in serially sister relationships (with strong support) thus: Asian *Typhonium* (= *Typhonium sensu stricto*)—Australian *Typhonium* (= *Lazarum*)—*Theriophonum*—*Sauromatum*—the Mediterranean genera. We note that Murata et al. (2021), while acknowledging but not rebutting Cusimano et al. (2010), have recently expanded their concept of *Hirsutiarum* to include the species discussed as *Sauromatum sensu lato* here, though they did not fully account for the principal subject of this paper, *Typhonium listeri*, simply suggesting that it belongs in *Hirsutiarum*. Faced with a choice between two differing classifications for this area of the Areae, we have settled in favour of adopting the more conservative genera and limits proposed by Cusimano et al. (2010), as have other authors (Talukdar et al., 2014; Odyuo et al., 2015; Nangkar & Tag, 2018; Sasikala et al., 2019; Tiwari et al., 2021). The genera recognised by Ohi-Toma et al. (2010, 2011) can be understood to correspond to sections of the broader *Sauromatum* (i.e. *sensu* Cusimano et al., 2010), which have epithets validated at that rank in *Typhonium* (Sriboonma et al., 1994), yet to be formally combined in *Sauromatum*.

While no fully reliable *diagnostic* morphological characteristics of *Sauromatum* have yet been identified, Cusimano et al. (2010) gave four *differential* characteristics which can be used to distinguish *Sauromatum* from all other genera of Areae, of which the last two are of key importance and near-diagnostic taken together: 1) pedatisect leaves, 2) the lower spathe with connate margins forming a true tube, 3) clavate (or thickly spathulate) lower staminodes above the female zone, and 4) differently shaped upper staminodes below the fertile male zone, sometimes reduced to little more than ridges. Most but not all *Sauromatum* species have pedatisect leaves at maturity, but *S. giganteum* always has sagittate leaves, as do some examples of *S. diversifolium*, and pedatisect (or pedate) leaves characterise a minority of *Typhonium* species, as well as some of the Mediterranean Areae. The truly tubular lower spathe has in the past been taken as characteristic of *Sauromatum* (e.g. Mayo et al., 1997: 265), however, several species since found to be of the *Sauromatum* clade have a convolute lower spathe with free margins, viz. *S. giganteum*, *S. tentaculatum*, *S. horsfieldii*, and *S. diversifolium* (Cusimano et al., 2010), as well as the more recently described *S. meghalayense* and *S. nangkarense* here placed in the synonymy of *S. listeri*. Tubular lower spathes are also found in some *Lazarum* and most *Biarum* species, but not in *Typhonium sensu stricto*.

TYPHONIUM LISTERI

Typhonium listeri was described by David (later Sir David) Prain (1857–1944), one of the considerable number of Scottish physician-botanists associated with the botany of India in the late 18th and 19th Centuries. A man of humble origins, he rose to become Curator of the herbarium of the Royal Botanic Garden Calcutta in 1887, Director of the Royal Botanic Garden Calcutta and Director of the Botanical Survey of India in 1898, and later, in 1905, Director of Kew (Burkill, 1944). His name is perhaps best known to aroid students in its association with the eponymous white-bloomed *Amorphophallus prainii* Hook.f. of Thailand, Peninsular Malaysia and Sumatra.

Prain (in King & Prain, 1898) based *Typhonium listeri* on two specimens deposited at the Kolkata herbarium (CAL), one collected by J.L. Lister (see biographical note below), the second taken from a living plant sent by the distinguished economic botanist Sir George Watt (l851–1939), known particularly for his six volume *Dictionary of the Economic Products of India* (Watt, 1889–1896). Both specimens are in poor condition, and it is perhaps for this reason that the species has remained doubtful; indeed Ohi-Toma et al. (2010) stated that they could not place *Typhonium listeri* in their classification because of a lack of information. However, with the Kolkata herbarium's collection of illustrations having been scanned and made accessible on-line, it transpires that Prain had had Watt's plant painted when it flowered in the garden. The painting provides clear detail, and shows that *Typhonium listeri* is a species of *Sauromatum* as it is currently defined by Cusimano et al. (2010). It is a tuberous plant with a solitary pedate leaf, and most crucially the spadix shows clavate to thickly spathulate staminodes, some of which have cleft tips, immediately above the female zone, with an abrupt transition into a dense zone of low tubercular staminodes extending to the base of the fertile male zone. The painting also clearly depicts the characteristics, distinctive for the species, of the spathe limb being abruptly turned back at about 90° to the lower spathe, and the appendix likewise abruptly turned sideways at 90° so that it lies along the spathe limb (in that respect somewhat reminiscent of *Helicodiceros muscivorus*). Recently, the painting has been used to illustrate *Typhonium listeri* for the *Flora of Bangladesh* (Ara & Hussein, 2019: Plate LXXXIII).

Typification of *Typhonium listeri*

Prain (loc. cit.) cited the two above-mentioned syntypes: the specimen of the plant cultivated in the Calcutta Garden nursery, which George Watt had sent from Assam, India [Cultivated Royal Botanic Garden Calcutta, Nursery division, 6 April 1896, without collector; plant sent 15 June 1895 from Assam, India, orig. coll. *G. Watt s.n.* CAL, barcode CAL0000001327], and the other (cited below as the lectotype), collected by Lister in the Chittagong Hill Tracts, now Bangladesh. The Lister specimen (**Figure 1**) consists only of a bloom and a cataphyll, but it shows spadix details sufficient to recognise a) the lower zone of down-turned spathulate-clavate staminodes contiguous with and sharply demarcated from b) the upper zone of low tubercular staminodes reaching and contiguous with the base of c) the slightly obconic male zone, and d) the narrowly stipitate and then basally obliquely thickened tapering and deflected appendix. The Lister specimen, as it appears online, lacks a collector's number, though the label note of the cultivated Watt specimen refers to that plant being the "same as *Lister no. 335* from Chittagong", apparently in Prain's handwriting. It was also cited by Engler (1920: 12) as "Chittagong (*Lister n. 335 — Herb. Bot. Gart. Calcutta.*)", and again with the number *335* by Sriboonma et al. (1994: 296).

The specimen from cultivation ex Watt now lacks much spadix detail to speak of, though it does include a leaf. We have designated the Lister specimen as the lectotype as, even without

Figure 1. The lectotype specimen at CAL of *Sauromatum listeri* (Prain) K.Z.Hein & A.Hay (see text for details). — © The Director, Botanical Survey of India, Kolkata.

a leaf, it is the more informative. However, since it is incomplete, we have designated the painting prepared from the same plant as the Watt specimen (**Figure 2**) as the interpretive epitype. While it may be more conventional to use a specimen rather than an illustration as an epitype, we think using the painting is justified in this instance, at it represents the whole plant and floral details with greater clarity than any specimen of this species that we have seen, and undeniably accords with Prain's concept of the species. It will be noted that the dates indicated for when the plant was received at Calcutta Botanic Garden and when it flowered there both differ slightly between the label notes on the specimen and the notes on the painting. They are however, so similar that it seems quite reasonable, given the identical information about the collector, Watt, and the provenance, Assam, to view these inconsistencies as errors of transcription rather than substantive discrepancies.

SAUROMATUM LISTERI

Sauromatum listeri (Prain) K.Z.Hein & A.Hay, **comb. nov.** — Basionym: *Typhonium listeri* Prain, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 67 (1898) 304. — Type: BANGLADESH. Chittagong Hill Tracts, 1876, *J.L. Lister 335* (lectotype, CAL, barcode CAL0000001328, examined on-line, designated here). — Epitype: Un-numbered watercolour drawing annotated "11/2b[?] *Typhonium Listeri,* Drawn by K.P. Dass, sent by Dr Watt, from Assam 14/5/[18]95, fld. in H.B.C. [*Hortus Botanicus Calcuttensis*] 8/4/[18]96. *Typhonium Listeri* Prain" (CAL, examined on-line, designated here).

Sauromatum meghalayense D.K.Roy, Talukdar, B.K.Sinha & Dutta Choud., NeBIO 5(3) (2014) 1, **syn. nov**. — *Hirsutiarum meghalayense* (D.K.Roy et al.) J.Murata & Ohi-Toma, J. Jap. Bot. 95(5) (2020) 289. — Type: INDIA. Meghalaya: South Garo Hills district, Hatisia, 5 June 2014, *D.K. Roy 130216* (holotype, ASSAM, barcode ASSAM0000000691, examined on-line).

Sauromatum nangkarense Nangkar & Tag, Pleione 12(1) (2018) 88, **syn. nov.** — *Hirsutiarum nangkarense* (Nangkar & Tag) J.Murata & Ohi-Toma, J. Jap. Bot. 95(5) (2020) 289. — Type: INDIA. Arunachal Pradesh: Papum Pare District. Kimin, 27º21'16»N 93º58'07"E, 28 April 2015, *A. Nangkar & H. Tag 055* (holotype, ASSAM, barcode ASSAM0000000925, examined on-line; isotype, HAU, n.v.).

Typhonium listeri Prain var. *geniculatum* H.Ara & M.A.Hassan, Fl. Bangladesh 75 (2019) 239, Pl. LXXXIV, a–s. — [*Typhonium geniculatum* H.Ara & M.A.Hussein, in H. Ara, Tax. Studies Araceae Bangladesh (2016) 427: not effectively published]. — Type: BANGLADESH. Sylhet division, Maulvibazar district, Muraichhara beat, Aowlachhara forest, 12 March 2011, *H. Ara HA.2778* (holotype, DACB).

Seasonally deciduous herb, to ca. 50 cm tall; stem hypogeal, a subglobose/subcylindric tuber with some annular cataphyll scars, ca. 3–4 cm in diam.; leaf solitary (to three, *fide* Nangkar & Tag, 2018; possibly in immature plants?), subtended by a series of increasing more or less narrow–triangular purplish cataphylls; petiole to ca. 45 cm long, ca. 1.7 cm in diam., glabrous (but rough-textured, *fide* Nangkar & Tag, 2018), green, sometimes with purple spots; petiolar sheath very short, ca. 1.5 cm long; blade very deeply pedatisect/pedate, with 5–7 leaflets (entire to trifoliolate in juvenile plants), glabrous; leaflets narrowly ovate to oblanceolate with the bases cuneate and very to extremely narrowly decurrent onto the posterior rhachises, apices acuminate; anterior leaflet ca. 15–20(–33) cm long, 8–10 cm wide; lateral leaflets somewhat but not markedly diminishing serially in size from the anterior leaflet; outermost leaflets slightly wider on their basiscopic sides; primary lateral veins of leaflets diverging at ca. 30º–45º (higher angles on wider leaflets), approx. 10 per side, weakly distinguished from interprimary veins, arcing acropetally and irregularly forming intramarginal collective veins, the lower ones running up and to the margin and sequentially replaced by intramarginal collective vein originating from a more distal primary vein; finer venation reticulate. *Bloom* solitary, appearing with the foliage leaf and emerging from its sheath ('Type A' shoot of Murata, 1990; Murata et al., 2020; Sriboonma et al., 1994); peduncle short, 2–5 cm long, ca. 0.5 cm thick, erect, at flowering concealed by the soon-withering last cataphyll subtending the leaf; spathe strongly differentiated into lower spathe and limb, glabrous; lower spathe convolute, squat-globose, 4–5 cm long, 2–3 cm in diam., abaxially green or suffused purple-brown, adaxially (i.e. internally) yellowish to pinkish purple; spathe limb large, to ca. 14 cm long, abruptly deflected 90º or more at the constriction and held horizontal or below horizontal, broadly ovate, somewhat naviculiform, somewhat acuminate-tipped, green without, purple within, or green suffused purple on both sides; spadix sessile, shorter than the spathe; female zone broadly conic, to ca. 3.2 cm long, ca. 2.5 cm in diam.; pistils crowded, subglobose/angular, unilocular (sometimes bilocular, *fide* Nangkar & Tag, 2018; but possibly connate pistils?), green, topped by mostly 2 short, sharply conic white points (stigma lobes? — see below); lower zone of of interstice of conspicuous dark purple down-curved spathulate-clavate sometimes apically cleft staminodes ca. 2 cm long, ca. 3 mm wide, partly concealing the upper part of the female zone; upper zone of interstice contiguous with and abruptly differentiated from lower zone, of low verrucate elongate (parallel to spadix axis) somewhat sinuous stretched-rhomboid yellowish-pink to purple staminodes; male zone cylindric-obconic, distally abruptly truncate, ca. 1.7–2 cm long, 5–9 mm in diam., of crowded yellowish to purple-infused stamens; appendix 7–12 cm long, stipitate, the stipe about half the diameter of the top of the male zone and bearing some ?staminodes; body of appendix white/cream, slender, basally asymmetrically expanded, thence gradually tapered to a point, somewhat grooved, abruptly deflected at the base to horizontal or below horizontal. *Infructescence* on the now declinate peduncle, contained in the persistent greyish-purple lower spathe; developing berries up-turned ellipsoid, white to green, globose and purple when ripe (Nangkar & Tag, 2018).

Distribution and ecology — Northeastern India (Arunachal Pradesh, Assam and Meghalaya States) and Bangladesh (Sylhet and Chittagong Divisions). In tropical evergreen broadleaved forest, secondary degraded forest, open wet area, hilly slopes, abandoned shifting cultivation gardens, and grassland at 150–400 m elevation. The type of *Sauromatum nangkarense* was collected in flower in April, and that of *S. meghalayense* in immature fruit in June. Nangkar & Tag (2018) noted that flowering starts in March, and that plant dies down as the leaf withers in August–September, when the fruits ripen.

Sriboonma et al. (1994) indicated that *Typhonium listeri* occurred in Myanmar, but this seems to be have been a simple slip for Bangladesh. They further tentatively suggested that *Typhonium pedatisectum* Gage, another poorly known species but which *is* based on Burmese plants (Gage, 1904: 110), might be a synonym of *T. listeri*. However, *Typhonium pedatisectum* is not a *Sauromatum* species, as can be seen from paintings Gage had prepared of live plants sent from

Figure 2. The epitype illustration at CAL of *Sauromatum listeri* (Prain) K.Z.Hein & A.Hay (see text for details). — © The Director, Botanical Survey of India, Kolkata.

Minbu District, in Magway Region, Central Myanmar, grown at Kolkata [https://archive.bsi.gov.in/botanical-details?link=812R5238X22315IY and https://archive.bsi.gov.in/botanical-details?link=977P5671Q45270CD.]. Nevertheless, *Sauromatum listeri* is perhaps to be expected in Myanmar, in Rakhine and Chin States, which are adjacent to Chittagong.

Comments — *Sauromatum listeri* is distinguished from all other *Sauromatum* species by the combination of its sharply deflected spathe limb and concomitantly sharply deflected white to pale yellowish, long-tapering narrowly stipitate appendix, its down-turned clavate/spathulate lower staminodes and its low, verruculate, irregularly elongate-rhombo-hexagonal upper staminodes, and by the pistils topped by pointed structures (of currently unclear identity) associated with the stigmas. These last are depicted clearly by Nangkar & Tag (2018, fig, 2C), and are also apparent in the detail of the pistil in the painting of *Typhonium listeri* in **Figure 2** here.

Sauromatum meghalayense D.K.Roy et al. was described as a new species based only on a fruiting specimen collected from South Garo Hills District, Meghalaya, India (Talukdar et al., 2014). Subsequently, another new species, *S. nangkarense* Nangkar & Tag was described based on a flowering specimen collected from Papum Pare District, Arunachal Pradesh, India (Nangkar & Tag, 2018). Both new species have a solitary 5–7-foliolate pedatisect leaf with primary veins departing the leaflet midribs at a rather low angle, and forming broken intramarginal collective veins, and blooms emerging from the foliage leaf sheath (Type A shoots). They also have in common an infructescence with a persistent lower spathe and incurved banana-shaped developing berries. Since there are no significant morphological differences in vegetative and fruiting characters between the two taxa, Roy (2018) pointed out that *Sauromatum nangkarense* is to be treated as a synonym of *S. meghalayense*. However, as a result of our re-examination of type specimens, protologues and illustrations of both taxa, we found that both the vegetative and reproductive characters of *Sauromatum nangkarense* are also congruent with *S. listeri* by having a solitary 5–7-foliolate pedatisect leaf, green ovaries with pointed white projections, a sterile interstice bearing down-turned spathulate-clavate purple lower staminodes and low tubercular pinkish upper staminodes, and a stipitate and basally obliquely thickened tapering and deflected yellowish white appendix (see Nangkar & Tag, 2018: **Figure 2**). Together, the three species have a quite circumscribed small distribution in northeastern India and Bangladesh. We therefore conclude that both *Sauromatum nangkarense* and *S. meghalayense* are both conspecific with *S. listeri* and place them in its synonymy here.

Typhonium listeri var. *geniculatum* H.Ara & M.A.Hussein was based on several specimens from Sylhet Division in northeastern Bangladesh. We have seen a photograph of the holotype in which, sadly, floral details are not well-preserved owing to beetle damage. The leaf and description accord with *Sauromatum listeri*, and so we include the variety in the synonymy of *S. listeri* here. Notable characteristics with which Ara & Hussein (2019: 241) distinguish the segregate variety are the sometimes much longer peduncle (to 15 cm) and the absence of sterile florets (staminodes) above the fertile male zone. The latter appear at best vestigial when present. It is not clear if the longer peduncle measurement equates to an elevated bloom on the plant in habitat: the peduncle colour is described as whitish, which could suggest that much of the stated length is underground. Photographs of a flowering plant of var. *geniculatum* (Ara & Hussein, 2019: Plate LXXXIV) show the lower spathe at ground level. Another characteristic apparently differentiating the variety is that the pale yellowish appendix in the plant (without number) illustrated with the protologue (cited above) is sharply bent sideways at the stipe, but is then ascending, though the spathe limb is strongly deflected throughout as in the type variety. However, we are unable to form an opinion on whether the segregate variety should be maintained.

In the characteristics of the pistils and the staminodes of the interstice, *Sauromatum listeri* seems close to *S. tentaculatum* (Hett.) Cusimano & Hett., from limestone of Kanchanaburi Province in western Thailand, in their convolute spathe tubes, horizontally flexed spathe limbs, conical projections associated with the stigmas, sterile zones covered with down-turned spathulate-clavate purple lower staminodes and low tubercular upper staminodes, and obliquely truncate-based stipitate appendices (see Cusimano et al., 2010, Figure 3A for *S. tentaculatum*). However, *Sauromatum listeri* differs from *S. tentaculatum* in having a spathe with green outside and dark purple inside (vs. a spathe with whitish greenish with faint pale purplish spots outside and dull whitish green inside), green ovaries each with two narrowly conical projection around the stigma (vs. white ovaries each with three to four conical projections around the stigma), and an appendix longer than the total length of female, sterile and male zones of the spadix (vs. an appendix shorter than the total length of female, sterile and male zones). Hetterscheid et al. (2001) have indicated that the pointed structures associated with the stigmas in *Sauromatum tentculatum* are not part of the stigma itself, but possibly serve a role as "pollen catchers". We have not been able to examine them directly in either species, but draw attention here to their apparent similarity with those of *Sauromatum listeri*.

Some biographical notes on J.L. Lister (?–1916)

Although perhaps a digression from the subject of this paper, we draw together some fragments about Lister here as, curiously, despite his considerable importance as a botanical collector, there are few known biographical details about him and even now his forenames, place and date of birth, and nationality remain obscure. He was a plant collector and planter in India for whom a large number of plant species (and a genus of butterfly) are named (including one other aroid, *Arisaema listeri* Prain ex Burkill, now regarded as a synonym of *A. petiolulatum* Hook.f.). He initially worked at Calcutta under the direction of Sir George King (1840–1909) who had preceded Prain as Director of the Calcutta garden and the Botanical Survey of India. In correspondence to the then Director of Kew, Sir Joseph Hooker, King described Lister in 1874 as "very willing but young and inexperienced" (KGLA DC 155/287, 23rd January 1874.), perhaps suggesting he was born in the early 1850s. He was variously Assistant Curator and Officiating [Acting] Curator of the Calcutta Garden in 1873 and 1874 ([Kew Director's Correspondence] KDC 156/1002. 17 June 1873; KDC 156/1004. 8 Aug 1873; KDC 156/1003. 14 Aug 1873), though in 1874 he sent seed of the palm *Borassus* to Kew with his position indicated as 'Seed Dept." (KDC 156/1005. 25 Aug 1874). He was then appointed as a collector in 1875: King had evidently had to obtain special permission to appoint a "European" to this role which he saw as a means of restoring the Calcutta Garden's plant collection (see Gard. Chron, Oct. 14 1876: 486). Lister collected in the Dafla Hills (Arunachal Pradesh) in 1874/5, the Chittagong Hills in 1876, and Sikkim in 1877 and 1878. By 1877 he had become Senior Assistant at the Mungpoo Cinchona [quinine] Plantation in

Darjeeling, northern West Bengal, still sending seeds to the Calcutta garden (King, 1877), but left in 1879 to plant tea (Burkill, 1962: 357), also in Darjeeling, where he became Manager at the Pashok tea estate, apparently both offering and winning(!) prizes for tea at the Kalimpong Mela [fair/festival] in 1893 (Louis, 1894: 10, 50). He evidently continued to be interested in botany and collecting, sending seeds to botanic gardens at least until 1906/7 (Hartless, 1907). He died in 1916 and is buried in Kalimpong (BACSA, 2017)].

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