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New species of *Araceae* from Colombia

Abstract

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Thirty-five *Anthurium* species and eight *Philodendron* species are described as new to science from Colombia: *Anthurium algentryi*, *A. alstonii*, *A. altobueyense*, *A. angelopolisense*, *A. arbelaezii*, *A. birdseyanum*, *A. cardenasii*, *A. cirinoi*, *A. cocornaense*, *A. cotejense*, *A. delannayi*, *A. dorbayae*, *A. dylanii*, *A. espinae*, *A. gaskinii*, *A. jesusii*, *A. libanoense*, *A. maasii*, *A. munchiquense*, *A. novitaense*, *A. palmareense*, *A. paraguasense*, *A. pichindense*, *A. pulidoae*, *A. ramosense*, *A. ramosii*, *A. recavum*, *A. renteriae*, *A. sierpense*, *A. suramaense*, *A. torraense*, *A. triciafrankiae*, *A. venadoense*, *A. vientense*, *A. yatacuense*, *Philodendron cardonii*, *P. devianum*, *P. mcphersonii*, *P. merenbergense*, *P. patriciae*, *P. pipolyi*, *P. silverstonei* and *P. urraoense*.

Additional key words: *Anthurium*, *Philodendron*, taxonomy, Cordillera Occidental, Cordillera Central, Cordillera Oriental

Introduction

In terms of aroid species diversity, Colombia is the richest area on earth. With 908 described species (not counting those in this paper), the country does not currently have a significantly higher number of recorded species than does Ecuador (a much smaller country with 902 recorded species). However, Colombia has potentially many more species owing to the wide variety of habitats in the country created by three separate mountain chains.

The Cordillera Occidental is by far the richest in species diversity and both eastern and western slopes have their own endemic species. The Pacific lowlands extending from the border of Panama to the border of Ecuador is one of the wettest areas on earth, especially in the northwest where rainfall can be up to 12 metres per year. This is probably also the area of greatest species diversity. Much of the area of the Pacific lowlands remains unexplored, especially lowland Valle Department south of Buenaventura and all the way south to the Department of Nariño where roads are few or lacking. The lower slopes of the Cordillera Occidental are also very rich in species,

especially up to about 1500 metres elevation. The eastern slopes of the Cordillera Occidental are much drier and have been largely denuded, but in areas where forests still exist endemic species are also present.

The Cordillera Central is considerably drier than the Cordillera Occidental and considerably more denuded. However, in those areas still forested the aroid flora is quite rich and there are many endemic species. Despite the fact that this is the most heavily collected part of Colombia, there is still considerable work needed. This mountain range also has a rich array of educational institutions in or around its periphery, including three major institutions of higher learning in Medellín as well as those at Manizales in Caldas Department, Pereira in Rizaralda, Ibagué in Tolima and at Neiva in Huila, where botanical work can be carried out. Thus there is a lot of promise that more aroid studies will eventually be carried out in Colombia.

The Cordillera Oriental is probably richer than the Cordillera Central. While parts of the region contain the largest populations and certainly some of the most de-

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forested parts of Colombia, many regions of the mountain chain are heavily forested and very poorly known, especially in the central part of the country on the eastern slopes in Boyaca department as well as in Huila, Cauca, Putomayo and Nariño departments in the south.

Other areas that remain poorly explored and where many endemic species occur are in the Cordillera de la Macarena in Meta Department and in the Sierra de Santa Marta and the Serranía de Perijá in the northeastern region of the country. In short, the country is vastly underexplored botanically and is in danger of losing much of its richness owing to extinction even before new species are discovered and described. Little botanical exploration is taking place in this rich country where the permitting process, even for Colombians, is difficult and where the general dangers of field work, owing to political problems also discourage even local collectors from spending much time in the field. Nevertheless, many collections have already been made and remain undetermined and it is this material that will be the focus of our investigations until opportunities for collecting return.

This paper is the first of what will hopefully be a series describing species from Colombia. Already the species from Bajo Calima have been enumerated and described (Croat & al. 2006–08) and the treatment for the *Araceae* of La Planada will soon be completed and published. The senior author is currently collaborating with a large group of botanists in Colombia to prepare an up to date checklist of the *Araceae* of Colombia and some of these individuals have their own individual research interests with certain areas or certain genera. Included among these are Felipe Cardona working with *Spathiphyllum* (Cardona 2004), Marcela Mora with the *Araceae* of the Flora of Cabo Corrientes (Croat & Mora 2004; Mora & al. 2006; Mora & Croat in prep.) and with *Philodendron* (Mora & al. 2008), Alejandro Zuluaga with *Monstera*, Natalia Castaño with *Stenospermation* and Jorge Jácome working with the *Araceae* of the Bogotá region.

Throughout the paper references are made to the Lucid keys to *Anthurium* (Haigh & al. 2007) and *Philodendron* subg. *Philodendron* (Mora & al. 2008), which are multichotomous interactive keys on the CATE *Araceae* version 0.7 website (Haigh & al. 2009).

Classification of the forest vegetation in the habitat notes of the new species follows Holdridge & al. (1971).

***Anthurium algentryi* Croat, sp. nov.**

Holotype: Colombia, Chocó, Río Tagachi, c. 12 km W of Río Atrato, c. 100 m, alluvial floodplain forest, 6°15'N, 76°W, 19.6.1982, A. Gentry, L. Escobar & J. Brand M. 37064 (JAUM 006250; isotype: MO 6031690). – Fig. 1A.

Internodia 4–9 cm longa, 2 mm diam.; cataphylla decidua; folia petiolo sulcato, 5–6.5 cm longo, c. 1 mm diam., lamina anguste ovato-subcordata, 10.5–14.5 cm longa, 5–5.6 cm lata, nervis basalibus 3(–4) utroque; pedunculus c. 11 cm longus, 1 mm diam.; spathe viridis, c. 6 cm

longa, 1 cm lata, viridis; spadix sessilis, c. 8.5 cm longus, 5 mm diam., viridis.

Appressed-climbing hemiepiphyte; *caudex* elongated, with numerous internodal adventitious roots; *internodes* elongated and slender, 4–9 cm long, c. 2 mm diam., drying dull green; *cataphylls* deciduous, without any remnants visible on mature nodes. *Leaves* spread along the stem; *petiole* green, drying sharply sulcate adaxially and prominently several-ribbed around its circumference, 5–6.5 cm long, c. 1 mm diam., sheathed for up to 2.5 cm of its length, with the base of the sheath clasping the caudex; *blade* narrowly ovate-subcordate, widest near base and gradually tapering into a short acumen, 10.5–14.5 cm long, 5–5.6 cm wide, averaging 12.7 × 5.2 cm, 2.1–2.6 × as long as wide, 2–2.5 × as long as petiole, drying dark greyish green above, light greyish green below; *midrib* weakly sunken and concolorous above, raised and slightly paler below; *primary lateral veins* 5–6 pairs, rising at 50–60° angle, raised and concolorous above, raised and slightly paler below, weaker than the collective veins; *collective veins* arising from the first pair of basal veins, 3–12 mm from margin at the middle of the blade; *basal veins* 3(–4) pairs, all free to the base, the first pair arching directly towards the apex and turning into the collective veins, the 2nd pair following the margin for about half the length of the blade, the lower pairs more diffuse and remaining within the basal lobes. *Inflorescence* protruding at 90° angle from the stem; *peduncle* terete, c. 11 cm long, 1 mm diam.; *spathe* green, lanceolate, c. 6 cm long, 1 cm wide, membranaceous; *spadix* sessile, tapering towards the apex, c. 8.5 cm long, 5 mm diam., green. *Flowers* 2–3 visible per spiral, 2.5–2.8 mm long, 1.6–2 mm wide; tepals moderately smooth but with a few coarse granules and with the margins somewhat turned up on drying; lateral tepals 2–2.1 mm wide, outer margin 2-sided, inner margin rounded. *Infructescences* with *berries* orange.

Anthurium algentryi is known only from the type locality in Colombia in Chocó Department in alluvial flood plain forest at 100 m elevation in a Premontane rain forest transition life zone.

The species is a member of *Anthurium* sect. *Polyphyllium* and is characterised by its elongate, slender internodes, the presence of internodal roots, slender petioles, which dry sharply sulcate adaxially and prominently several-ribbed around the circumference, by its narrowly ovate-subcordate, greyish-drying leaf blades with 3 pairs of basal veins, the innermost pairs of which forms the collective veins, as well as by the long-pedunculate inflorescence with a green, lanceolate spathe and a green spadix with orange berries.

Anthurium algentryi is only the third species in section *Polyphyllium*, the others being *A. clidemioides* Standl. and *A. flexile* Schott from Central America. It is

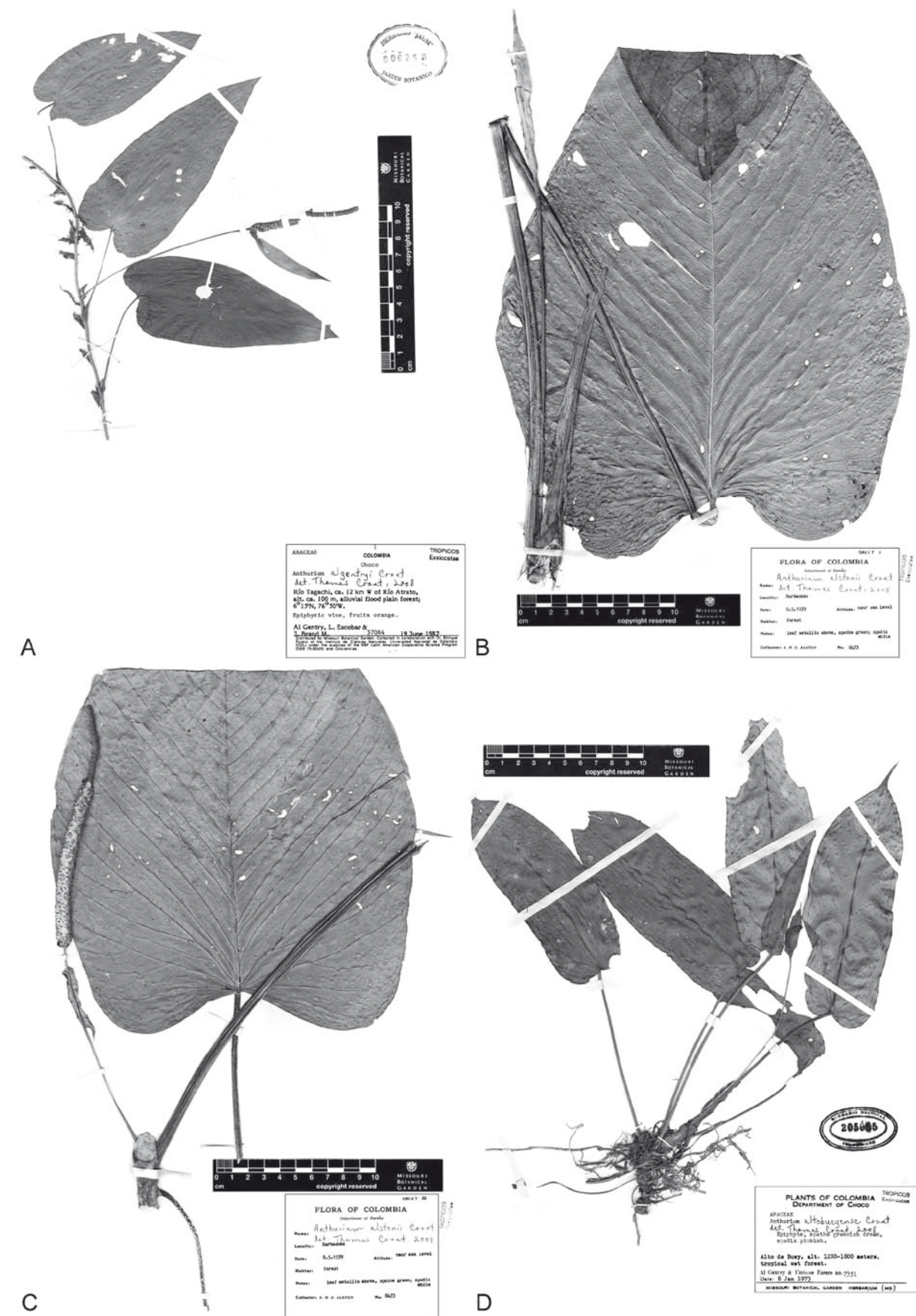


Fig. 1. A: *Anthurium algentryi* – holotype at JAUM, Gentry 37064; B–C: *A. alstonii* – holotype at BM, Alston 8473; D: *A. alto-bueyense* – isotype at COL, Gentry 7351.

most similar to *A. flexile* owing to its rather elongated leaf blades but these are subcordate and widest near the base in *A. algentryi*, whereas generally rounded at the base, sometimes subcordate, and always widest near or above the middle in *A. flexile*.

Anthurium algentryi is also similar to *A. clidemioides* var. *pacificum* from Costa Rica, which has leaf blades $2.1\text{--}3\times$ longer than broad and also widest near the base, but that species differs in having very a short peduncle that is much shorter than the spadix. In contrast, *A. algentryi* has a long, slender peduncle much longer than the spadix. *A. clidemioides* var. *clidemioides* differs in the same manner but in addition has blades that are more conspicuously bullate and broadly ovate, $1.2\text{--}1.4\times$ longer than broad.

The species is named after the late Dr Al Gentry who collected the type specimen. Gentry was a renowned explorer and plant collector, who worked for the Missouri Botanical Garden until the time of his death on 3 August 1993, when his small plane crash in Ecuador while on a field collecting trip.

***Anthurium alstonii* Croat, sp. nov.**

Holotype: Colombia, Nariño, Barbacoas, $1^{\circ}39'N$, $78^{\circ}09'W$, near sea level, 8.5.1939, A. H. G. Alston 8473 (BM; isotypes: U). – Fig. 1B–C.

Internodia c. 1.5 cm diam.; cataphylla 13–20 cm longa; folia petiolo sulcato, 48–61 cm longo, lamina late ovato-cordata, 30–47 cm longa, 20–27 cm lata, nervis primariis lateralibus 11–14 utroque, nervis basalibus (2–)4–5 liberis ad basim; pedunculus 13–25 cm longus, c. 2 mm diam.; spathe 5–11 cm longa, 0.8–1 cm lata, viridis; spadix stipitatus 7–15 mm, 6–16 cm longus, 4–10 mm diam., albus vel cremeus.

Terrestrial plant, *caudex* elongated with adventitious roots; *internodes* c. 1.5 cm diam.; *cataphylls* 13–20 cm long, 3 cm wide at base when unfolded. *Leaves* with *petiole* green, sulcate at base, terete toward apex, geniculate, 48–61 cm long, c. 8 mm diam. at base, 3–4 mm diam. at top; *geniculum* 2–2.5 cm long, concolorous with petiole; *blade* broadly ovate-cordate, wider below the middle and triangular in the upper half, shortly acuminate at apex, 30–47 cm long, 20–27 cm wide, averaging 36×23 cm, c. $1.5\times$ longer than wide, c. $0.65\times$ as long as petiole, metallic green and matte above, pale green and moderately glossy below; *sinus* somewhere between parabolic and arcuate; *midrib* narrowly raised and concolorous above, prominently round-raised and lighter below; *primary lateral veins* 11–14 pairs, arising at $30\text{--}40^{\circ}$ angle, narrowly raised and concolorous above, round-raised below, concolorous with midrib; *tertiary veins* prominulous; *collective veins* generally arising from the 2nd–4th pair of basal veins, 2–4 mm from margin; *basal veins* (2–)4–5 pairs, all free to the base. *Inflorescences* erect; *peduncle* terete,

much thinner and shorter than petioles, 13–25 cm long, c. 2 mm diam.; *spathe* membranaceous, linear-lanceolate and acuminate, clasping the base of the stipe, 5–11 cm long, 0.8–1 cm wide, light green or green; *spadix* stipitate for 7–15 mm, cylindrical, 6–16 cm long, 4–10 mm diam., white or cream. *Flowers* 1.3–1.6 mm long, 1.3–1.4 mm wide, 5–6 visible per spiral; tepals pale manilla, moderately smooth with thick pale granular inclusions, lateral tepals 0.8–0.9 mm wide, outer margins 2–3-sided, inner margins broadly rounded.

Anthurium alstonii is endemic to Colombia, known only from Nariño Department in the vicinity of Barbacoas near sea level in a Tropical rain forest life zone.

The species is a member of *Anthurium* sect. *Cardiollonchium* and is characterised by its long internodes, its ovate-subcordate leaves with the upper surface matte and the lower surface moderately glossy with prominulous tertiary venation, its 11–14 pairs of narrowly raised primary lateral veins, its light green or green spathe and its short-pedunculate, long-stipitate, white to cream spadix.

The species is most closely related to *Anthurium suramaense* Croat (described elsewhere in this paper) from Chocó Province on Cerro Torrá at 1000–1150 m, which differs in having blades rounded at the base and proportionately more elongated ($1.7\text{--}2.3\times$ longer than wide in *A. suramaense* versus $1.5\times$ longer than wide in *A. alstonii*) and by its yellow spadix that is usually 29–33× longer than broad (rather than usually white or cream and $12.8\text{--}16.7\times$ longer than broad in *A. alstonii*). In addition, the flowers of *A. suramaense* are 2.3–2.5 mm long on drying (versus 1.4–1.6 mm long in *A. alstonii*).

Anthurium alstonii is also closely related to *A. silanchense* Croat & J. Rodríguez from Pichincha Province in Ecuador at 800 m elevation, which shares very similar leaves with ovate-subcordate blades, but that species differs in having a short and stubby green spadix rather than a white or cream, long-tapered spadix as in *A. alstonii*.

The Lucid key to *Anthurium* keys out this species to *A. wallisii* Mast. and *A. choreense* Engl., but both of these species differ in having blades much more elongated. In the case of *A. wallisii* the blades are narrowly oblong-ovate-sagittate and $2.5\times$ longer than broad with a deep, \pm hippocrepiform sinus. In the case of *A. choreense*, which apparently has no existing type specimen, Engler refers to the blade as being elongate-oblong-cordate and he compares the species with *A. crassivenium* Engl., which has blades $1.8\times$ longer than broad. *A. choreense* also differs in having only 4 pairs of primary lateral veins (versus 11–14 pairs in *A. alstonii*).

The New York Botanical Garden's specimen of *Alston* 8473 (renamed *Alston* 8473A), represents a different, yet undescribed species, which was mixed with *Alston* 8473. It differs in having a greyish green colour after drying rather than the yellow-green of *Anthurium alstonii*, a less glossy, almost matte lower surface and collective veins

arising from the 1st–2nd pair of primary lateral veins and running much farther from the margin (c. 1 cm versus 2–4 mm in *A. alstonii*).

The species is named in honour of the British botanist Arthur Hugh Garfit Alston, who made collections in Ceylon, Panama, Colombia and Venezuela as well as in Europe and who collected the type specimen. Alston collected the first specimen of the species on 8 May 1939 and it was collected again by Dr Joseph A. Ewan on 3 February 1945.

Paratypes. — COLOMBIA: NARIÑO: Pambana, Río Pimbi-Río Cuembí on Río Telembi above Barbacoas, 1°40'N, 78°02'W, c. 5 m, 3.2.1945, *J. A. Ewan 16838* (MO, US). — VALLE: Puerto Merizalde, Río Nanay, 10 m, 22.2.1983, *Gentry & Juncosa 40578* (COL, MO).

***Anthurium altobueyense* Croat, sp. nov.**

Holotype: Colombia, Chocó, Alto del Buey, 1200–1800 m, 8.1.1973, *A. Gentry & E. Forero 7351* (MO 2130070; isotype: COL). – Fig. 1D.

Internodia 0.5–3 cm longa, 4–5 mm diam.; cataphylla persistentia intacta; folia petiolo 12–34 cm longo, lamina anguste oblongo-ovata, debiliter cordata, 15–21 cm longa, 5.3–6.6 cm lata, nervis primariis lateralibus 10–13 utroque; pedunculus 14–35 cm longus; spatha 3.5–4 cm longa, 8–10 mm lata; spadix stipitatus 3–4 mm, 2.2–2.4 cm longus, 3–4 mm diam., roseus.

Epiphyte; *caudex* short, with multiple internodal roots; *roots* thin and elongated, branched, c. 1 mm thick; *internodes* short, 0.5–3 cm long, 4–5 mm diam.; *cataphylls* membranaceous, persisting intact on the upper nodes, to 7 cm long. *Leaves* erect; *petiole* terete, sulcate at the base, 12–34 cm long, drying 2–3 mm diam.; *blade* narrowly oblong-ovate, weakly subcordate, long-cuspidate at apex, 15–21 cm long, 5.3–6.6 cm wide, averaging 17 × 6 cm, 2.6–3.2 × longer than wide, 0.5–1.3 × as long as petiole, subcoriaceous, dark green and subglossy above, pale green and glossy below, drying dark brown and conspicuously granular upon magnification above, moderately paler and much smoother below with a scattering of dark punctations and raised pustules, both surfaces with pale linear cellular inclusions, those on the upper surface much shorter than those on the lower surface; *midrib* raised, concolorous above, rounded and darker than the surface below, drying finely ridged and granular with a scattering of pale short-linear cellular inclusions on both surfaces; *primary lateral veins* 10–13 pairs, rising at 40–50° angle, weakly raised above and below; *collective veins* arising from the 1st pair of basal veins, 3–6 mm from margin; *basal veins* 2–3 pairs, all free to the base, the 1st pair arching towards the apex and forming the collective veins, the 2nd pair spreading outwards at first and then arching upwards for a short distance along the mar-

gin in the lower part of the blade, the 3rd pair very weak and confined to the very base of the blade. *Inflorescences* very small; *peduncle* very slender, terete, 14–35 cm long, c. 1 mm diam.; *spathe* membranaceous, lanceolate and long-acuminate-aristate, 3.5–4 cm long, 8–10 mm wide, greenish cream; *spadix* stipitate for 3–4 mm, cylindrical, 2.2–2.4 cm long, 3–4 mm diam., pinkish. *Flowers* 1.4–1.5 mm long and wide, 5–6 visible per spiral; tepals moderately glossy and granular, lateral tepals 0.7–0.8 mm wide, the outer margins 3(–4)-sided, the inner margins broadly rounded; *stamens* displayed immediately above the edge of the tepals, anthers 0.5 mm wide, 0.4 mm long upon drying, thecae broadly ovoid, scarcely divaricate.

Anthurium altobueyense is known only from the type collection from Chocó Department of Colombia in the Alto del Buey (hence the epithet “altobueyense”), an important intercoastal range at 1200–1800 m in a Tropical rain forest life zone.

The species is a member of *Anthurium* sect. *Calomys-trium* and is characterised by its epiphytic habit, the slender internodes, persistent intact cataphylls, thin petioles usually about as long as the blades, narrowly oblong-ovate, weakly subcordate blades and the greenish cream spathe and pinkish spadix with minute flowers. Also characteristic are the densely granular dried upper blade surfaces and the presence of pale lineate cellular inclusion on both surfaces.

The species is an unusual member of section *Calomys-trium* due to its atypical leaf shape (short and narrow while weakly subcordate). It is most similar to *Anthurium callejasii* Croat of Colombia and *A. hammelii* Croat of Panama. *A. callejasii* differs from *A. altobueyense* by its long, narrow, oblanceolate blades that are acute at the base and by its dark violet-purple spadix. *A. hammelii* differs in having long, lanceolate blades that are also acute at the base and in having an orbicular, dark burgundy spathe.

***Anthurium angelopolisense* Croat, sp. nov.**

Holotype: Colombia, Antioquia, less than 1 km below the village of Angelópolis, 6°06'05"N, 75°41'06"W, 900–1000 m, 19.4.2007, *T. B. Croat 98078* (MO 5945978–80; isotype: HUA). – Fig. 2A–C.

Internodia brevia, 4–7.5 cm diam.; cataphylla c. 33 cm longa; folia petiolo 73–138 cm longo, lamina ovato-sagittata (24–)73–95 cm longa, (16–)48–70 cm lata, nervis primariis lateralibus 5–6 utroque; pedunculus 27–40 cm longus; spatha 20–25 cm longa, 4.7–5.8 cm lata; spadix 12.7–27.5 cm longus, viridis.

Terrestrial on steep stream banks; *caudex* to 1 m long; *internodes* short, 4–7.5 cm diam.; *cataphylls* c. 33 cm long, thick, brittle, tinged purple, persisting semi-intact initially, somewhat marcescent, pale and semi-intact but finally as pale fibres. *Leaves* with *petiole* 73–138 cm

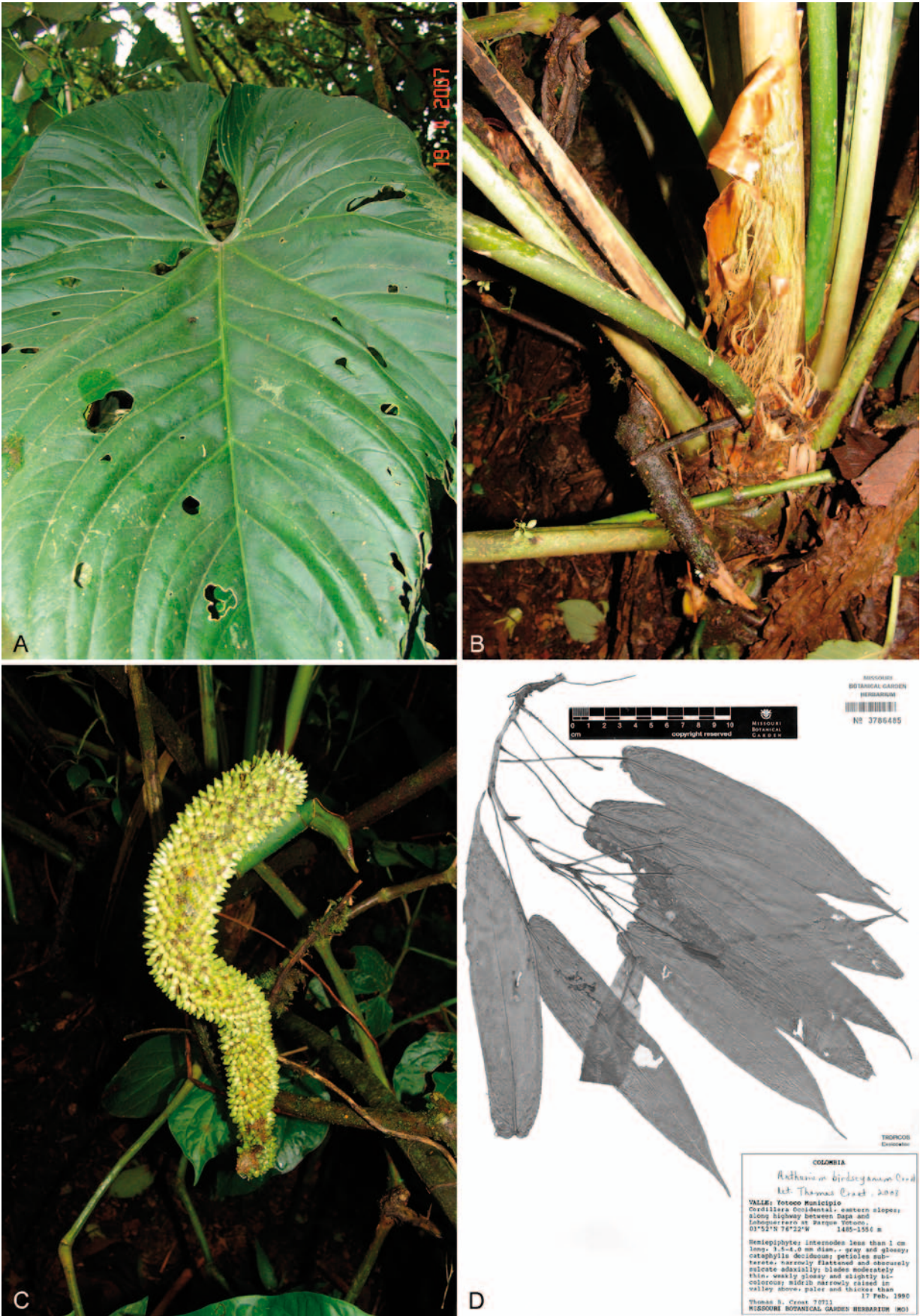


Fig. 2. A–C: *Anthurium angelopolisense* – blade, adaxial surface (A), stems and cataphylls (B), infructescence (C), from Croat 98078; D: *A. birdseyanum* – holotype specimen at MO, Croat 70711.

long, 1–1.5 cm diam. midway, 0.7–1.5 cm diam. at apex, to 3.3 cm diam. at base, subterete, obtusely somewhat flattened adaxially to narrowly sulcate, above middle, weakly and obtusely sulcate toward base, moderately yellow-green, matte; *geniculum* 3 cm long; *blade* ovate-sagittate, moderately coriaceous to subcoriaceous, soft and pliable, dark green and matte-subvelvety above, paler and weakly glossy to matte below, (24–)73–95 cm long, (16–)48–70 cm wide, 1.3–1.5 × longer than broad, 0.6–0.65 × as long as blades, broadest above petiole attachment, gradually acuminate at apex; greenish to medium grey above, greyish yellow-brown below, surfaces eglandular, drying minutely granular upon magnification above, smooth below; *anterior lobe* 59–68 cm long, broadly rounded along the margins; *posterior lobes* 25–30 cm long, 18–24 cm wide, turned inward and often overlapping; *sinus* hippocrepiform, 19–27 cm deep, 6–8 cm wide, with the posterior lobe markedly turned inward; *midrib* bluntly acute to acute and weakly paler above, narrowly rounded to bluntly acute and paler, somewhat weakly ribbed medially below; *primary lateral veins* 5–6 pairs, slightly to acutely raised and weakly paler above, acute and paler below, arising at an acute angle, then spreading at 45–50° angle; *collective veins* arising from 3rd–4th basal veins, (1–)3–5 mm from margin; *basal veins* 7–8(–9) pairs, 1st and 2nd free to base, 5th and 6th fused for 5–8.5 cm; *posterior rib* thick, broadly curved, naked c. 8 cm. *Inflorescences* erect to semi-erect; *peduncle* medium green, matte, 27–40 cm long, c. 8 mm diam.; *spathe* reflexed and recurled, persistent, fully extended or boat-shaped, lanceolate, 20–25 cm long, 4.7–5.8 cm wide, medium green matte above, weakly glossy below; *spadix* sessile, tapering slightly toward apex, 12.7–27.5 cm long, 1.1–2.7 cm diam. at base, only slightly narrower in middle, 0.7–1.5 cm diam. at 1 cm from apex, medium to pale yellow-green, semiglossy. *Flowers* 1.6–1.9 mm long, 1.5–1.7 mm wide, 7–15 visible per spiral; tepals drying moderately smooth, pale yellow-brown, lateral tepals 0.8–1.1 mm wide, outer margin obtusely 3-sided, inner margin broadly rounded, drying with a scarious edge; pistils exerted soon after anthesis, blunt; *stamens* exerted, pollen white. *Infructescence* reflexed, to 38 cm long, 3.5 cm diam. (with exerted berries); *berries* pale yellow-green; *seeds* 1–2.

Anthurium angelopolisense is known only from Antioquia and Risaralda Departments at 900–1650 m elevation in a Premontane wet forest life zone.

The species is a member of *Anthurium* sect. *Cardiolonchium* and is characterised by its large (nearly 1 m long), dark green and matte-subvelvety leaf blades with prominent posterior lobes, a well-developed posterior rib as well as by its long-pedunculate yellow-green spadix and an infructescence with pale yellow-green berries.

Anthurium angelopolisense is similar to *A. triciafrankiae* Croat (described elsewhere in this paper), a species from Nariño Department at 1150 m elevation, but that species differs in having the collective veins arising from the primary lateral veins or at most from the first pair rather than from the 3rd or 4th pair of basal veins and in the spadix turning reddish after anthesis. It is also similar to *A. metallicum* Linden ex Schott from the Cordillera Oriental, but that species differs in having more narrowly ovate leaf blades c. 2.2 × longer than broad with prominent, paler major veins on the upper surface and with the collective veins arising from one of the pairs of primary lateral veins in the middle of the leaf.

Anthurium angelopolisense is also similar to a new species represented by Croat & Gaskin 80148 from Cauca Department at 2090 m in the Parque Nacional Munchique. It differs in having semiglossy blades with thick prominulous reticulate venation on both leaf surfaces as well as by the petiole being multiribbed in the lower part.

Other unpublished species that are confused with *Anthurium angelopolisense* are two other large-leaved members of section *Cardiolonchium*. Madison 825 from Chocó Department at 2100 m along the road between Bolívar and Tutunendo differs in having the major veins on the lower surface densely granular-puberulent. McPherson 12935 from Antioquia Department in the Municipio of Frontino at 1875 m differs in having the collective veins extremely close to the margins.

Anthurium angelopolisense also somewhat resembles *A. hodgei* Croat & al., but that species has very short peduncles and a long, more strongly tapered spadix.

Anthurium cirinoi Croat, another member of *A.* sect. *Cardiolonchium* described in this paper, differs from *A. angelopolisense* in having a narrow sinus with three pairs of basal veins free to the base and the remaining basal veins coalesced into a posterior rib only about 1 cm long.

In the Lucid key to *Anthurium*, the species also keys out with other members of *A.* sect. *Cardiolonchium* including *A. marmoratum* Sodiro, *A. ravenii* Croat & Baker and *A. versicolor* Sodiro. The latter is not at all related, differing in its much smaller, more ovate blades with acute to bluntly acute primary lateral veins. *A. ravenii* differs in a broader spathe, a more cylindrical spadix with promptly emergent stamens throughout its length and red berries. *A. marmoratum* differs in having persistent, coarsely fibrous cataphylls and a purple, more long-tapered spadix at anthesis.

The epithet “angelopolisense” refers to the type locality at the village of Angelópolis in Antioquia Department.

Paratype. — COLOMBIA: RISARALDA: Along road between Apia and Pueblo Rico, 8 km SE of Pueblo Rico, 19 km NW of Apia, along banks of rocky stream, 5°04'30"N, 76°02'45"W, 1650 m, 24.2.1990, Croat 70978 (JAUM, K, MO).

***Anthurium arbelaezii* Croat, sp. nov.**

Holotype: Colombia, Valle del Cauca, La Florida-border with Tolima Department, 13 km E of La Tayrona, 1975 m, 3°21'N 76°07'W, 15.7.1997, T. B. Croat & J. F. Gaskin 79791 (MO 4824096; isotypes: B, BR, COL, CUV, K, NY, QCNE, US, VEN). – Fig. 3A–D.

Internodia brevia, 2.5–8 cm longa, 1–2 cm diam.; *cataphylla* 9.5–16 cm longa; *folia petiolo* 39–59 cm longo, 4–8 mm diam., *lamina ovato-cordata*, 22–42 cm longa, 18.5–33 cm lata, *nervis primariis lateralibus* 5–6 utroque, *nervis basalibus* 5(–6) utroque; *pedunculus* 31–68 cm longus, 4–7 mm diam.; *spatha* 4–12 cm longa, 2.5–6.8 cm lata; *spadix* 4.5–10.5 cm longus, 0.7–1.2 cm diam.

Terrestrial or epiphytic; *caudex* bare at the base, with adventitious roots; *internodes* moderately short, 2.5–8 cm long, 1–2 cm diam.; *cataphylls* persisting intact, red-brown, 9.5–16 cm long, 3 cm wide at base when unfolded. *Leaves* with *petiole* terete, 39–59 cm long, 4–8 mm diam., dark green and glossy; *geniculum* 2.5–4 cm long, slightly darker than petiole; *blade* broadly ovate-cordate with rounded, often overlapping lobes, broadest below the middle and triangular in the upper half, 22–42 cm long, 18.5–33 cm wide, averaging 29 × 23 cm, 1.2–1.5 × longer than wide, 0.5–0.8 × as long as petiole, gradually to abruptly short-acuminate at apex, subcoriaceous, semiglossy or glossy, moderately bicolorous, drying medium grey-brown and matte to weakly glossy above, yellow-brown to greenish and semiglossy below, often with a bronze tinge; *anterior lobe* 16–30 cm long; *posterior lobes* narrowly rounded, directed toward the base or curved inward with lobes overlapping, 5.5–12 cm long, 8.5–15 cm wide; *sinus* 5.5–12 cm deep, 1–5.5 cm wide, often closed; *midrib* convex on both surfaces, concolorous above, concolorous or darker below, drying ± concolorous above, darker or lighter below; *primary lateral veins* 5–6 pairs, arising at 45–55° angle, weakly sunken to somewhat quilted and concolorous above, weakly raised and concolorous below, much weaker than midrib or basal veins; *tertiary veins* moderately obscure; *collective veins* generally arising from the 1st(–2nd) pair of basal veins or from the 1st(–2nd) pair of primary lateral veins, 4–10 mm from margin; *basal veins* 5(–6) pairs, either all free to the base or the 2(–3) lower pairs coalesced for 6–20 mm, only slightly weaker and concolorous to the midrib except for the last, generally weaker pair. *Inflorescence* erect; *peduncle* terete, 31–68 cm long, 4–7 mm diam.; *spathe* erect, ovate-lanceolate and cuspidate, boat-shaped, 4–12 cm long, 2.5–6.8 cm wide, white or greenish white and somewhat glossy outside, slightly paler and matte inside; *spadix* cylindrical, 4.5–10.5 cm long, 0.7–1.2 cm diam., white or grey-white and moderately glossy, becoming faintly lavender-purple after anthesis. *Flowers* sub-4-lobed, 5–6 per spiral (8–9 on fresh material), 3–3.8 mm long, 3.6–4.2 mm wide, glossy; lat-

eral tepals 1.9–2.2 mm wide, obtusely 3-sided to shield-shaped; *stamens* tightly aggregated around pistil just above tepals, 0.4 mm long, 0.8 mm wide, thecae broadly ovoid-rounded, scarcely divaricate; pollen white. *Infructescence* erect, fruiting spadix to 14 cm long, 2 cm diam., reddish; *berries* red at maturity.

Anthurium arbelaezii is endemic to southern Colombia, presently known from the valleys of the Río Cauca and the Río Magdalena in the departments of Huila, Quindio, Tolima and Valle at 800–1975 m elevation in a Premontane wet forest life zone.

The species is a member of *Anthurium* sect. *Calomys-trium* and is characterised by its moderately short internodes, persistent, intact cataphylls, terete petioles, ovate-cordate blades with often overlapping lobes, 5–6 pairs of weak primary lateral veins, basal veins nearly free to the base, and also by the moderately long-pedunculate inflorescences with a green, erect spathe and a whitish cylindroid spadix at anthesis.

The species is most similar to *Anthurium nymphaeifolium* K. Koch, but that species differs in having leaf blades more narrowly ovate (1.6–1.7 × longer than wide) with the basal veins more prominently coalesced into a posterior rib (usually with 3–4 basal veins being joined into the posterior rib) as well as the typically pink to flesh-coloured or lilac to purplish violet spadix. In contrast, the blades of *A. arbelaezii* are broadly ovate-cordate, 1.2–1.5 × longer than broad with the basal veins typically free to the base or when the basal veins are fused usually no more than 2 veins are involved in the posterior rib.

Anthurium arbelaezii is also similar to *A. subcaudatum* Engl., but that species occurs on the western slopes of the Cordillera Occidental and differs in having blades more narrowly ovate and a more narrowly caudate-acuminate spathe.

The species is named in honour of the retired Colombian botanist Dr German Arbelaez, an agronomist and professor of botany and genetics at the University of Quindio (Colombia), who founded the biology department and herbarium of the university and collected specimens throughout the department of Quindio. He was an excellent and charismatic teacher who trained several generations of biologists at the university and was the first Colombian to collect this handsome new species.

Paratypes. — COLOMBIA: 1923, *Claes s.n.* (BR). — TOLIMA: La Plata, Tolima, 800–1500 m, *Lehmann* 7203 (F, GH, K, US). — HUILA: In deep ravine along road 5 km above Vegalarga, 41.5 km NE of Neiva, 2°57'N, 74°58'W, 1300 m, 20.3.1983, *Croat* 55270 (MO); Neiva–San Antonio, 19.5 km on road to Vegalarga (NE of Neiva), 2°56'N, 75°07'W, 870 m, 20.3.1983, *Croat* 55262 (MO, NY); Neiva, Sitio El Vergel, Floragaita and a little far-



Fig. 3. *Anthurium arbelaezii* – A: blade, adaxial surface; B: stems and cataphylls; C: inflorescence; D: inflorescence, close-up. – Photographs from Croat 79791 cultivated at Missouri Botanical Garden.

ther on the road Neiva–San Vicente del Caguán, Cordillera Oriental, western slope, 1000–1400 m, 23.11.1990, *J. Betancur & S. Churchill 2039* (HUA). — QUINDIO: La Tebaida, Vrda. El Alambrado, Finca El Faro, margen izq. carretera Tebaida–El Alambrado, antes del Puente, 1100 m, 28.4.1987, *G. Arbelaez S., C. Vélez N., I. García J., N. Carvajal D. & J. Uribe M. 2047* (MO); Montenegro, bank of Río La Vieja, bridge La María, 1000 m, 6.5.1984, *G. Arbelaez S., C. Vélez N., N. Carvajal D., J. Uribe M. 334* (HUO, MO). — VALLE DEL CAUCA: Near Buga, “El Vinculo”, 950 m, 5.5.1982, *H. Murphy 365* (DUKE, MO, US); San José del Palmar (Chocó)–Anserma-nuevo, c. 5–10 km from Ansermanuevo, 950–1000 m, 27.2.1977, *E. Forero, A. Gentry, A. Sugden & D. Daly 3560* (COL, MO).

***Anthurium birdseyanum* Croat, sp. nov.**

Holotype: Colombia, Valle del Cauca, Mun. Yotoco, Cordillera Occidental, eastern slopes, along hwy. from Dapa and Loboguerrero at Parque Nacional Yotoco, 3°52'N, 76°22'W, 1485–1550 m, 17.2.1990, *T. B. Croat 70711* (MO 3786485; isotype: CUVIC). – Fig. 2D.

Planta hemiepiphytica; internodia 2–3 cm longa, 3.5–4 mm diam.; cataphylla 3.8–4 cm longa, decidua; folia petiolo subtereti, 6–9.4 cm longo, 1–1.5 mm diam. (in sicco), lamina oblongo-lanceolata, 15–23 cm longa, 3.7–4.3 cm lata, cordulata ad basim, nervis primariis lateralibus 5–6 utroque; pedunculus 8.5 cm longus; spatha lanceolata, 3.7 cm longa, 8 mm lata, viridis; spadix cremeus, 2.3–19 mm longus, 2.5 mm diam.

Hemiepiphyte; internodes 2–3 cm long, 3.5–4 mm diam., grey and glossy, drying 3 mm diam., densely ridged-folded, matte; cataphylls c. 3.8–4 cm long, deciduous. Leaves with petiole subterete, narrowly flattened and obscurely sulcate adaxially, drying 6–9.4 cm long, 1–1.5 mm diam., brownish, densely speckled; blade oblong-lanceolate, widest near or above the middle, narrowly caudate-acuminate at apex, cordulate at base, 15–23 cm long, 3.7–4.3 cm wide, averaging 21×3.8 cm, $5.1\text{--}6.4 \times$ longer than wide, $2.4\text{--}3.2 \times$ longer than petiole, moderately thin, weakly glossy and slightly bicolorous, drying dark yellow-brown above, slightly paler and yellow-green to somewhat yellowish brown below; upper surface minutely granular on magnification; lower surface more conspicuously granular on magnification; midrib narrowly raised in valley above, paler and thicker than broad below, drying concolorous above, slightly paler below; primary lateral veins 5–6 pairs, arising at 45–50° (–60°) angle, weakly sunken above, weakly raised below, much less conspicuous than collective veins; interprimary veins drying undulate; basal veins 2 pairs, the 1st pair forming the collective veins 1–3 mm from margin. Inflorescence erect, 12 cm long; peduncle 8.5 cm long, drying c. 1.5 mm diam.; spathe lanceolate, 3.7 cm long, 8 mm wide, narrowly acumi-

nate at apex, green, spreading-recurved, drying brown; spadix stipitate, 2.3–19 mm long, creamy white, drying reddish brown, 2.5 mm diam. Flowers 3–4 visible per spiral, 1.7 mm wide in both directions, drying markedly granular with a few pale linear inclusions; lateral tepals 1 mm wide, the outer margins 3-sided, the inner margins rounded; stamens not seen.

Anthurium birdseyanum is known only from the Parque Nacional Yotoco in Colombia (Valle del Cauca) at 1485–1550 m in a Premontane moist forest life zone.

Anthurium birdseyanum is a member of *A.* sect. *Xialophyllum* Schott and is characterised by its oblong-lanceolate, caudate-acuminate leaf blades with cordulate base.

It is most similar to the widespread *Anthurium microspadix* Schott, but that species differs by its more broadly ovate or elliptic leaf blades ($2.5\text{--}3.5 \times$ longer than wide), which are merely rounded to cubcordate at base, merely acuminate at apex and dry generally light yellow-green (instead of dark yellow-brown in *A. birdseyanum*), and in having a spadix that is greenish at anthesis. It is also somewhat similar to *A. caucanum* Engl., *A. infectarium* R. E. Schult., *A. interruptum* Sodiro, *A. oblongo-cordatum* Engl. and *A. stipitatum* Benth. *A. caucanum* differs in the larger and broader leaf blades, which are broader below the middle, dry reddish brown and have the collective veins more remote from the margins, and in typically thicker stems with more persistent cataphylls. *A. infectarium* differs in its elliptic leaf blades with obtuse base and its much larger spadix; it is probably a member of *A.* sect. *Pachyneurium*. *A. interruptum* differs in having broadly ovate leaf blades that dry blackened and in the internodes that alternate between very short and much longer. *A. oblongo-cordatum* differs in having leaf blades that are much more broadly ovate and more conspicuously cordate. *A. stipitatum* has ovate-lanceolate leaves that are more broadly rounded, obtuse at the base and that dry pinkish brown.

The species is named in honour of the late Dr Monroe Birdsey, one of the founding members of the International Aroid Society and a person who devoted most of his professional life to collecting, growing and teaching about *Araceae*. Birdsey's Ph.D thesis was a revision of *Syngonium* with an emphasis on anatomy (Birdsey 1955).

***Anthurium cardenasii* Croat, sp. nov.**

Holotype: Colombia, Antioquia, Municipio de San Luis, Carretera hacia Aquitania, a 12 km de la autopista Medellín–Bogotá, 5°53'N, 74°56'W, 850 m, 24.11.1988, *A. Cogollo, D. Cardenas L. & A. Daza 3739* (MO 4222659; isotype: HUA). – Fig. 4A.

Internodia 2 cm longa, 3–4 mm diam.; cataphylla c. 6.5 cm longa; folia petiolo 5–5.5 cm longo, lamina ob-



Fig. 4. A: *Anthurium cardenasii* – holotype at MO, Cogollo 3739; B: *A. cocornaense* – holotype at COL, Galeano 203; C: *A. cotejense* – paratype at NY, Lehmann 540; D: *A. dorbayae* – holotype at NY, Schultes & Villarreal 7391.

longo-lanceolata, 20–23 cm longa, 4.5–5 cm lata, nervis primariis lateralibus 8–10 utroque; pedunculus c. 19 cm longus; spatha 8–9.5 cm longa, 0.8–1.4 cm lata, viridis; spadix stipitatus 5 mm, c. 7 cm longus, 3 mm diam., viridis.

Epiphyte; *internodes* elongated, c. 2 cm long, 3–4 mm diam.; *cataphylls* c. 6.5 cm long, deciduous after becoming fibrous at base. *Leaves* erect; *petiole* terete, thinly sheathed for 1–1.5 cm, 5–5.5 cm long, 1–2 mm diam., drying dark yellow-brown; *blade* oblong-lanceolate, acuminate at apex, rounded at base, 20–23 cm long, 4.5–5 cm wide, averaging 22×4.8 cm, 4.2–5.1 \times longer than wide, 3.9–4.5 \times longer than petiole, drying weakly glossy and dark yellow-brown above, semiglossy and slightly lighter below; *midrib* narrowly raised and concolorous above, drying concolorous and with a faint medial rib, sharply raised and concolorous below, drying darker than the surface; *primary lateral veins* 8–10 pairs, arising at 40–50° angle, slightly raised and concolorous above and below; *collective veins* arising from the first pair of basal veins, 2–4 mm from margin; *basal veins* 2 pairs, both free to the base, the 2nd pair weak and confined to the base of the blade; *tertiary veins* prominent, reticulate veins prominent, close with a fine array of minute granules in the areoles, the surface glossy upon magnification. *Inflorescences* erect; *peduncle* slender, c. 19 cm long, c. 1 mm diam., drying dark yellow-brown; *spathe* lanceolate, 8–9.5 cm long, 0.8–1.4 cm wide, green, drying dark yellow-brown; *spadix* stipitate for 5 mm, cylindrical, c. 7 cm long, 3 mm diam. when immature, green. *Flowers* 2.4–3 mm long, 2.1–2.5 mm wide, 3–5 visible per spiral; tepals minutely papillate, lateral tepals 0.8–1 mm diam., outer margin 3-sided, inner margin rounded.

Anthurium cardenasii is known at present only from the type locality in Colombia (Antioquia) on the eastern slopes of the Cordillera Central in the Municipio of San Luis at 850 m in a Premontane rain forest life zone.

Anthurium cardenasii is a member of *A. sect. Xialophyllum* and is characterised by its scandent habit, elongated internodes, deciduous cataphylls, short-petiolate leaves with nearly oblong, dark yellow-brown-drying blades, which are rounded at base, and by the long pedunculate inflorescence with a green spathe and green spadix.

The species is most similar to *Anthurium maasii* Croat from the western slopes of the Cordillera Occidental at 150 m elevation. That species is remarkably similar with leaf blades of nearly the same size and colouration, but it differs in the somewhat paler and more matte lower leaf blade surface, by the reticulate veins less closely aggregated and the upper midrib only slightly thicker than broad. In addition, the areoles are sparsely granular with frequent pustules. In contrast, *A. cardenasii* has the areoles minutely and finely granular and lacks pustules. Were it not for the radical differences in range and eleva-

tion, these two taxa might be considered only morphological variations of a single species, but in the light of the existing range of these two species it is highly unlikely that they are the same.

Anthurium cardenasii also is similar to *A. microspadix* Schott, but that species differs by its much longer petioles in proportion to the blade and the generally proportionately wider blades that are ovate-lanceolate rather than oblong and that dry consistently greenish.

The species is named in honour of Dayron Cardenas, Curator of the Herbarium at the Instituto Amazónico de Investigaciones Científicas SINCHI (COAH) in Colombia, who was one of the collectors of the type specimen. Dayron Cardenas works principally on projects in the Amazon basin but has collected a lot of interesting *Araceae* throughout Colombia.

Anthurium cirinoi Croat, *sp. nov.*

Holotype: Colombia, Chocó, east of San José Palmar, less than 1000 m, received from Rick Cirino via Alberts and Merkle 1988, *T. B. Croat 71719* (MO 3872604). – Fig. 5A–D.

Internodia brevia, 1–2 cm longa, 3–4 cm diam.; *cataphylla* c. 20 cm longa, in fibras persistentes tenuibusque soluta; folia petiolo 79–90 cm longo, 8–13 cm diam., lamina late ovata vel ovato-elliptica, 45–90 cm longa, 25–33 cm lata, lobulis posterioribus 6–14 cm longis, nervis primariis lateralibus 8–10 utroque, nervis basalibus 6–7 utroque; pedunculus 20–37 cm longus; spatha oblongo-lanceolata, 10–18 cm longa, 1.2–4 cm lata; spadix viridis, 5–8 mm stipitatus, 9–15 cm longus.

Plants to 2 m tall; *habit* unknown, probably hemiepiphytic; *stems* erect, to 1 m or longer, leaf scars large and conspicuous; *internodes* short and broad, 1–2 cm long, 3–4 cm diam.; *roots* numerous, 8–10 per node, c. 5 mm diam., purplish, descending; *cataphylls* c. 20 cm long, sometimes rounded at apex, persisting as long, thin, fibrous strands along internodes. *Leaves* with *petiole* suberect, 79–90 cm long, 8–13 cm diam., terete, pale-speckled; *blade* pendent from the petiole, broadly ovate to ovate-elliptic, gradually acuminate at apex, deeply lobed at base, broadest near or slightly below the middle, 45–90 cm long, 25–33 cm wide, 1.7–2.2 \times longer than wide, 0.75–0.83 \times as long as petiole; moderately coriaceous, slightly bicolorous; *anterior lobe* 40–55 cm long, broadly convex and weakly revolute along margins; *posterior lobes* 6–14 cm long, directed toward the base but held somewhat at an angle to the midrib, narrowly rounded at apex; *sinus* oblong or weakly overlapping on live plants, narrowly triangular at apex; upper surface matte, dark green velvety; lower surface matte, somewhat paler; *midrib* raised and acute and paler than surface above, round-raised and much paler than surface below; *primary lateral veins* 8–10 pairs, departing mid-



Fig. 5. *Anthurium cirinoi* – A: leaf blade, adaxial surface; B: leaf blade, abaxial surface; C: stems and cataphylls; D: inflorescence. – Photographs from Croat 71719 cultivated by Rick Cirino, Costa Mesa, California.

rib at 50–60° angle, acutely raised and paler than surface above, round-raised and paler below; *collective veins* arising from 4th pair of basal veins, sunken above, acute and raised below, 1–9 mm from margin; *basal veins* 6–7 pairs, either all free to the base or the 4th and 5th pair coalesced for 2–3 cm, raised and acute above, round-raised and paler below; the 1st pair of basal veins arising at 40° angle; *sinus* narrowly spatulate or closed. *Inflorescence* erect-spreading; *peduncle* 20–37 cm long, 2–5 mm diam., terete, medium green; *spathe* oblong-lanceolate, reflexed, rounded at base, gradually tapered towards and acuminate at apex, rolled up irregularly lengthwise at anthesis, 10–18 cm long, 1.2–4 cm wide, broadest below peduncle insertion, subcoriaceous, pale green with the veins darker; *spadix* green, stipitate for 5–8 mm, 9–15 cm long, 3–4 mm diam. at apex, 5–8 mm diam. at base, curved slightly along its length. *Flowers* 1.4–1.7 mm long and wide, 7–9 visible per spiral; tepals seemingly pustular at high magnification, lateral tepals 0.8–0.9 mm wide, outer margin 2-sided, inner margin broadly rounded; *stamens* held in a tight cluster at edge of tepals around the pistil, anthers 0.4 mm long, 0.5 mm wide, thecae weakly divaricate; pollen white.

Anthurium cirinoi is apparently endemic to Colombia, known for certain only from the type locality at less than 1000 m.

The species is a member of *Anthurium* sect. *Cardiolonchium* and is characterised by narrowly ovate, velvety, deeply cordate blades with a narrow sinus and virtually free basal veins, as well as by its light green, reflexed, recurled and twisted spathe and greenish spadix with white pollen.

The species most closely resembles *Anthurium metallicum* Linden ex Schott but that species differs in having a narrower leaf blade, 2.5 × longer than wide, with the widest point below the middle but above the petiole attachment, with lighter green upper surface, somewhat narrower posterior lobes and 9 pairs of basal veins of which the first pair ascends at a broader angle. In contrast, *A. cirinoi* has leaf blades more broadly ovate to ovate-elliptic, 1.7–2.2 × longer than wide and usually broadest at or near the middle (at least on the larger leaves), with more broadly rounded posterior lobes and 6 pairs of basal veins.

The Lucid key to *Anthurium* suggests a relationship to three other species of *A.* sect. *Cardiolonchium*: *A. marmoratum* Sodiro, *A. ravenii* Croat & Baker and *A. versicolor* Sodiro. It is in no way related to the latter, which has a more broadly ovate blade with more prominently acute primary lateral veins, a prominent posterior rib (which is not obvious in *A. cirinoi*) and with the lower surface drying with granulations in each areole on the lower blade surface. *A. versicolor* also has a flattened spathe that is not irregularly twisted as in *A. cirinoi*. *A. ravenii* differs in having a much more cylindrical spadix with the stamens emerging rapidly throughout

the length of the spadix. *A. marmoratum* differs by the coarse, persistent cataphyll fibres and a long-tapered, dark violet-purple spadix. *A. metallicum* differs in having the collective veins arising from the primary lateral veins in the middle of the blade and the major veins much paler than the surface.

Anthurium cirinoi is dedicated to the senior author's friend, collaborator and benefactor, Dr Richard Cirino of Costa Mesa, California, who provided the type material and helped greatly with the preparation of the description. Dr Cirino is assisting the senior author with a revision of the *A.* sect. *Cardiolonchium* and owing to the unique conditions of Costa Mesa where night temperatures are low, he can cultivate many species that can not be cultivated successfully at the Missouri Botanical Garden. Thus, his living collection is very useful for this group, which requires high humidity and cool temperatures to thrive.

***Anthurium cocornaense* Croat, sp. nov.**

Holotype: Colombia, Antioquia, Municipio Cocorná, Vereda La Roca (autopista Medellín–Bogotá, km 62), Quebrada La Roca, 2000 m, 3.5.1980, G. Galeano & R. Ber-
nal 203 (COL 330976). – Fig. 4B.

Internodia 9–11 cm longa, 3 mm diam. in sicco; cataphylla 3.5–5 cm longa; folia petiolo 3.5–7 cm longo, lamina anguste ovato-lanceolata, 9.5–14.5 cm longa, 3.9–5.2 cm lata, nervis primariis lateralibus 4–5 utroque; pedunculus 9–10 cm longus; spatha 2.5–3 cm longa, c. 6 mm lata, rubella; spadix rubellus, stipitatus 3 mm, 2.5–3 cm longus, 2–3 mm diam.

Epiphytic vine; *internodes* elongated and slender, 9–11 cm long, 3 mm diam. upon drying; *cataphylls* membranaceous, persistent, 3.5–5 cm long, drying reddish brown. *Leaves* with *petiole* terete, slender, rising at 50–70° angle from the caudex, 3.5–7 cm long, c. 2 mm diam. upon drying; *blade* narrowly ovate-lanceolate, acuminate at apex, rounded at base, 9.5–14.5 cm long, 3.9–5.2 cm wide, averaging 12 × 4.4 cm, 2.4–3 × longer than wide, 2–3.3 × as long as petiole, subcoriaceous, dark green and semiglossy above, light green and semiglossy (drying glossy) with glandular punctuations below, the margin slightly inrolled downwards when dried; *midrib* moderately raised and slightly paler above, sharply raised and paler below; *primary lateral veins* 4–5 pairs, rising at 45–75° angle, flat above and moderately raised below, concolorous; *collective veins* arising from the 1st pair of basal veins, 3–8 mm from margin; *basal veins* consisting of one main pair turning into the collective veins, and sometimes a diffuse 2nd pair near the base. *Inflorescences* several, rising at 40–70° angle from each node along the stem; *peduncle* terete, thinner and much longer than petioles, 9–10 cm long, c. 1 mm diam.; *spathe* membranaceous, lanceolate, 2.5–3 cm long, c. 6 mm wide, becoming reflexed then caducous in

fruit, reddish; *spadix* reddish, stipitate for 3 mm, thin and cylindrical when young, becoming thicker and knotty at maturity, 2.5–3 cm long, 2–3 mm diam. when young, growing to 7 mm diam. in fruit. *Flowers* 2.2–2.4 mm long and wide, 3 visible per spiral; tepals drying dark yellow-brown, smooth except for an occasional large pale cellular inclusion, lateral tepals 0.5–0.7 mm wide, outer margins 2–3 sided, inner margins rounded, scarious.

Anthurium cocornaense is endemic to Colombia (Antioquia), known only from the type locality at Municipio Cocorná (hence the epithet “cocornaense”) at 2000 m elevation in a Premontane rain forest life zone.

The species is a member of *Anthurium* sect. *Tetraspermium* and is characterised by its elongated slender internodes, persistent, slender, intact, reddish brown cataphylls, ovate-elliptic blades and long-pedunculate inflorescence with a shortly stipitate, pinkish spadix and pinkish spathe.

The species appears to be close to *Anthurium subaequans* Croat & Oberle, another member of *A.* sect. *Tetraspermium*, which shares similar features. The latter differs by cataphylls persisting as net-reticulated fibres and blades that are glandular punctate on both surfaces and conspicuously roughened with mounded cells on the upper surface. In contrast, the leaf blades are glandular-punctate only on the lower surface and smooth on the upper surface in *A. cocornaense*. It is also similar to *A. scandens* (Aubl.) Engl., but that species has cataphylls persisting as net-reticulated fibres and has blades that are narrowly elliptic and obtuse at the base rather than ovate-lanceolate and rounded as is the case in *A. cocornaense*.

***Anthurium cotejense* Croat, sp. nov.**

Holotype: Colombia, Cauca, forests of Coteje on Río Timbiquí, 2°39'N, 77°34'W, near sea level, 12.1898, *F. C. Lehmann* 8883 (F; isotypes: G, GH, NY). – Fig. 4C.

Planta terrestris; internodia 1–3.5 cm longa, 0.8–1.2 cm diam.; folia petiolo tereti, 13–34 cm longo, 4–5 mm diam., lamina ovato-elliptica, 18–31 cm longa, 9–15 cm lata, nervis primariis lateralibus 10–14 utroque; pedunculus 20–29 cm longus; spathe 4–5.5 cm longa, 0.6–1.1 cm lata; spadix stipitatus 2–3 mm, 2–5 cm longus, 2–4 mm diam., purpurascens.

Terrestrial plant; *caudex* elongated, rooting at the nodes; *internodes* 1–3.5 cm long, 0.8–1.2 cm diam.; *cataphylls* to 7 cm long, reddish brown, persistent intact. *Leaves* with *petiole* green, terete, 13–34 cm long, 4–5 mm diam.; *geniculum* c. 8 mm long, darker than petiole; *blade* ovate-elliptic, long-acuminate at apex, attenuate at base, 18–31 cm long, 9–15 cm wide, averaging 24.5 × 11.5 cm, 1.6–2.7 × longer than wide, 0.7–1.9 × as long as petiole, subcoriaceous, dark reddish green and semiglossy above, light green and semiglossy below, lacking glandular punctuations on both surfaces; *midrib* narrowly raised and

slightly paler above, prominently round-raised and much paler below; *primary lateral veins* 10–14 pairs, arising at 45–55° angle, flat above, raised below, concolorous with midrib; *collective veins* generally arising from the 2nd pair of primary lateral veins, 3–10 mm from margin, concolorous with midrib. *Inflorescences* erect; *peduncle* terete, much thinner than petioles, 20–29 cm long, c. 2 mm diam.; *spathe* membranaceous, linear-lanceolate and acuminate, clasping the base of the stipe, 4–5.5 cm long, 0.6–1.1 cm wide, purplish; *spadix* stipitate for 2–3 mm, cylindrical and slender, 2–5 cm long, 2–4 mm diam., purplish. *Flowers* 1.4–1.6 mm long, 1.4–1.5 mm wide, 4–5 visible per spiral; tepals moderately glossy, minutely papillate with a few thick cellular inclusions, lateral tepals 1–1.1 mm wide, outer margins broadly 2-sided, inner margins broadly rounded; *stamens* held at level of tepals, 0.7 mm long and wide, thecae broadly divaricate.

Anthurium cotejense is known at present only from the type locality of Coteje along the Río Timbiquí (hence the epithet “cotejense”) in Cauca Department of Colombia near sea level in a Premontane rain forest life zone.

The species is a member of *Anthurium* sect. *Polyneurium* and is characterised by its moderately long internodes, persistent, intact, reddish brown cataphylls, long-petiolate leaves with narrowly ovate-elliptic blades that are narrowly acuminate at apex, attenuate at base and with 10–14 pairs of primary lateral veins, as well as by the slender purplish, short-stipitate spadix.

The species is remarkably similar to *Anthurium umbricola* Engl. in shape and size, but that species is a member of *A.* sect. *Porphyrochitonium*, which has leaf blades less conspicuously acuminate at apex and with distinct dark punctations on the lower surface, which dries considerably darker yellow-brown. In contrast, *A. cotejense* has leaf blades narrowly long-acuminate at the apex that are eglandular and dry yellow-green on the lower surface. In addition, the cataphylls of *A. cotejense* persist intact, whereas those of *A. umbricola* are more frequently fibrous.

No species really comes close in the Lucid *Anthurium* key to the new species and all species that remain present near the end of the keying process have leaf blades decidedly lobed at base.

Paratype. — COLOMBIA: CAUCA: Coteje on Río Timbiquí, 2°39'N, 77°34'W, near sea level, 6.1901, *F. C. Lehmann* 540 (K, NY).

***Anthurium delannayi* Croat, sp. nov.**

Holotype: Colombia, Chocó, Medellín–Quibdó, 78 km W of Bolívar, 466 m, 11.12.1979, *T. B. Croat* 49297 (MO 3001697; isotype: HUA). – Fig. 6A–D.

Internodia ad 15 cm longa, 1–1.5 cm diam.; cataphylla ad 25 cm longa; folia petiolo 20–45 cm longo, lamina ovato-



Fig. 6. *Anthurium delannayi* – A: habit; B: leaf blade, adaxial surface; C: flowering plant in habit with side view of inflorescence; D: inflorescence, close-up. – Photographs from *Croat 56279*.

lanceolata, sagittata, 21–32 cm longa, 9–15 cm lata, nervis primariis lateralibus 4–5 utroque, nervis basalibus 4–6 utroque; pedunculus 18–32 cm longus, 4–5 mm diam.; spatha 9–11 cm longa, c. 2.5 cm lata, viridis; spadix stipitatus 15 mm, 4.5–5.5 cm longus, 5–7 mm diam., albus.

Epiphyte; *internodes* to 15 cm long, 1–1.5 cm diam.; *cataphylls* persisting intact to semi-intact, to 25 cm long, reddish brown. *Leaves* with *petiole* terete, firm, geniculate at apex, 20–45 cm long, 4–6 mm diam.; *geniculum* 1.5–2.5 cm long; *blade* ovate-lanceolate, sagittate at base, rounded and long-cuspidate at apex, 21–32 cm long, 9–15 cm wide, averaging 26×11.8 cm, $1.9\text{--}2.6 \times$ longer than wide, $0.6\text{--}1 \times$ as long as petiole, coriaceous and markedly quilted, dark green and matte to weakly glossy above, slightly paler and semiglossy below, young blades reddish below; drying medium-dark yellow-brown and matte above, reddish brown and semiglossy below; *anterior lobe* 16–24 cm long, broadly rounded to nearly straight along margins; *posterior lobes* rounded, often curved inward, 4–8.5 cm long, 3.5–6 cm wide, directed somewhat upward at an angle from the midrib with the lobes almost touching; *sinus* hippocrepiform when flattened, 2–7.5 cm deep, 1.5–3 cm wide; *midrib* raised, pale above and darker below; *primary lateral veins* 4–5 pairs, rising at $60\text{--}70^\circ$ angle, quilted-sunken above, acutely pleated-raised below; *collective veins* arising from 3rd–4th pair of basal veins, 2–5 mm from margin; *basal veins* 4–6 pairs, 1st 1–2 pairs free to the base, the remainder coalesced to varying degrees and branching from the posterior rib; *posterior rib* thick, broadly curved, naked 1.5–2 cm. *Inflorescence* erect; *peduncle* terete, 18–32 cm long, 4–5 mm diam.; *spathe* lanceolate, long-acuminate, 9–11 cm long, c. 2.5 cm wide, green; *spadix* stipitate for 15 mm, cylindrical, 4.5–5.5 cm long, 5–7 mm diam., white, pleasant-smelling. *Flowers* 1.5–1.7 mm long, 1.8–2.1 mm wide, 8–10 visible per spiral, sub-4-lobed; tepals minutely papillate, lateral tepals sub-shield-shaped, 1–1.2 mm wide, outer margins mostly 3-sided, inner margins rounded.

Anthurium delannayi is endemic to Colombia (Chocó), at 300–470 m elevation in a Premontane moist forest life zone.

The species is a member of *Anthurium* sect. *Calomystrium* and is characterised by its epiphytic habit, persistent, intact cataphylls, terete petioles, narrowly ovate-sagittate and matte to weakly glossy leaf blades with prominently quilted-sunken primary lateral veins and a narrow sinus as well as by its green spathe and white spadix.

Anthurium delannayi is similar to another new species, *A. recavum* Croat (described in this paper), found only in the Valle del Cauca Province of Colombia. It differs from the latter species by having long internodes, matte to weakly glossy leaves, a green spathe and white spadix (instead of a purplish spathe and rosy spadix for

A. recavum). It also occurs at lower altitudes than *A. recavum*, which occurs at 600–2100 m elevation in Lower montane wet forest, Premontane wet forest and Premontane moist forest life zones.

Anthurium delannayi is also somewhat similar to *A. viridescens* Engl., but that species has wider, more triangular leaves instead of the narrowly elliptic leaves of *A. delannayi*.

The species is named in honour of Xavier Delannay, Volunteer Research Assistant at the Missouri Botanical Garden and co-author of this paper. Xavier was responsible for the “discovery” of this species when he found that it was distinct from *Anthurium recavum* Croat, which is being described in this same publication. Xavier is an excellent botanist and conducted field work throughout much of Europe before embarking on a career in molecular genetics with Monsanto. Now retired, Xavier is helping the senior author with research on neotropical *Araceae*.

Paratypes. — COLOMBIA: CHOCÓ: Chocó–Medellin, km 185, 14 km E of Tutunendo, $5^\circ 44'N$, $76^\circ 43'W$, 300 m, 22.4.1983, Croat 56279 (COL, MO); Quibdó–Medellin, 31 mi E of Quibdó, $5^\circ 45'N$, $76^\circ 20'W$, 18.12.1980, Croat 52321 (MO).

***Anthurium dorbayae* Croat, sp. nov.**

Holotype: Colombia, Valle del Cauca, Río Calima, Quebrada La Brea, 40–80 m, 19.5.1946, R. E. Schultes & M. Villarreal 7391 (US 986249; isotypes: COL, GH). – Fig. 4D.

Internodia brevica, 0.7–1 cm diam.; cataphylla ad 10.5 cm longa; folia petiolo 11–18 cm longo, c. 2 mm diam., lamina oblongo-oblancoolata, 42–49 cm longa, 5–7.2 cm lata, nervis primariis lateralibus 18–25 utroque; pedunculus 14–29 cm longus, 1–2 mm diam.; spatha 4.5–7 cm longa, 4–8 mm lata, viridis; spadix stipitatus 2–3 mm, 10–14 cm longus, 3–4 mm diam., viridis vel purpureus.

Hemiepiphyte; *caudex* elongated with long roots spreading from the nodes; *internodes* short, 0.7–1 cm diam.; *cataphylls* to 10.5 cm long, drying pinkish when young, soon deciduous with a few short pale fibres remaining on the upper nodes, remaining intact only on the uppermost node. *Leaves* clustered at the apex of the caudex; *petiole* sulcate with angular edges upon drying, glossy, 11–18 cm long, c. 2 mm diam., drying light green; *geniculum* c. 7 mm long, darker than the petiole; *blade* oblong-oblancoolata, tapered into a long acumen at apex, cuneate at base, 42–49 cm long, 5–7.2 cm wide, averaging 46×6.4 cm, $6\text{--}9.1 \times$ longer than wide, $2.6\text{--}4.2 \times$ longer than petiole, subcoriaceous, drying grey-green to brownish and semiglossy above, greyish yellow-green and nearly matte below; *midrib* sharply raised and concolorous above, paler and rounded below; *primary lat-*

eral veins 18–25 pairs, arising at 50–80° angle and arching towards the apex, flat to slightly raised above, narrow-raised below; *collective veins* arising from the first pair of basal veins, 2–5 mm from margin; *basal veins* 1 main pair, sometimes with a weak 2nd pair near the base. *Inflorescence* erect; *peduncle* terete, 14–29 cm long, 1–2 mm diam., 1.3–1.75 × longer than the petioles; *spathe* linear-lanceolate, reflexed, 4.5–7 cm long, 4–8 mm wide, green; *spadix* stipitate for 2–3 mm, narrowly cylindrical and curved, 10–14 cm long, 3–4 mm diam., greenish to purplish. *Flowers* 5 visible per spiral, 1.8–1.9 mm long, 1.3–1.4 mm wide; tepals weakly papillate, sometimes pitted, sometimes with pale inclusions on drying, lateral tepals broadly 2-sided outside, broadly rounded inside; stigma drying broadly cup-shaped, 0.3 mm diam. *Infructescence* erect; *berries* ovoid, green, projecting out from the thin spadix.

Anthurium dorbayae is endemic to Colombia (Chocó, Valle del Cauca) at 40–275 m elevation in a Premontane rain forest transition life zone.

Anthurium dorbayae is a member of *A. sect. Polyneurium* and is characterised by its epiphytic habit, short internodes, the long, slender cataphylls, which persist as short fibres, long-petiolate leaves with narrowly oblanceolate, greenish blades drying thin with narrowly long-acuminate apices and collective veins arising from the base and close to the margins. The inflorescence are long-pedunculate with a narrow, green spathe and green to purplish slender spadix with slender, early protruding reddish berries.

The species is most similar to *Anthurium iltisii* Croat from the western slope of Ecuador, but that species differs in having leaf blades with more loop-connected primary lateral veins, with the lower surface more glossy and with prominent reticulate veins, and an inflorescence with shorter peduncles (usually about as long or shorter than the subtending petiole) and a more prominently stipitate, yellow spadix with only about 2 flowers visible per spiral. In contrast, *A. dorbayae* has leaf blades with the collective veins straight and with the lower blade surface nearly matte with the reticulate venation weak. The inflorescence has a very long peduncle, which is much longer than the subtending petiole, and the spadix is greenish to purplish with 4 flowers visible per spiral.

Anthurium lygrum Croat & Bay is another species that may be confused with *A. dorbayae*, since both species occur in the Bajo Calima region in Valle Department of Colombia. Both species have long, narrow leaves with the acumen narrowly attenuated and inflorescences of similar size and shape, but *A. lygrum* differs in drying grey, has a minutely granular lower blade surface (including on the major veins) and collective veins that are proportionately more remote from the margins (5–9 mm versus 3–6 mm from margin in *A. dorbayae*). In contrast, the leaf blades dry grey-green to brownish above and greyish

yellow-green below in *A. dorbayae* and the lower blade surface is smooth, not granular.

Anthurium dorbayae is also similar to *A. julospadix* Sodiro, *A. fuscopunctatum* Sodiro and *A. langsdorffii* Schott in shape and size of vegetative and fertile parts, but the two former species are members of *A. sect. Porphyrochitonium* and differ therefore in having glandular punctuations on the blade surfaces. *A. langsdorffii* is a species from southeastern Brazil and differs in having an inflorescence 2 × to almost 3 × longer than the petioles and having the spadix stipitate to 1 cm.

It is important to note that the specimens here designated as *Anthurium dorbayae* were listed as paratypes of *A. lygrum*. It was only recently that the senior author discovered that the presumed taxon consisted of two species. The name *A. lygrum*, proposed by R. E. Shultes (and written by hand on the sheets of *Schultes & Villarreal* 7391, the type of the present species) was adopted by Croat & Bay (2006), but the type selected for that species was *Croat & Bay* 75753. Thus the name *A. lygrum* could not be used for the actual specimen that Schultes proposed for this name. Instead it is being called *A. dorbayae* Croat, named in honour of Dr Dorothy Bay, former student of the senior author and coauthor of the *Araceae* of Flora of Bajo Calima (Valle Department) Colombia (Croat & al. 2006; Croat & al. 2007; Croat & al. 2008). Dorothy conducted field work in the Bajo Calima region and worked on the Flora of Bajo Calima for her Ph.D. thesis at St Louis University under the direction of the senior author.

Paratypes. — COLOMBIA: CHOCÓ: Corcovada region, upper Río San Juan, ridge along Yeracuí valley, 200–275 m, 24.–25.4.1939, *Killip* 35315 (COL). — VALLE DEL CAUCA: About 18 km east of Buenaventura, 3°53'16"N, 76°56'45"W, 50 m, 14.2.1939, *E. P. Killip & Hernando Garcia* 33249 (MO, US); Buenaventura region, vic. of village of Bajo Calima, field station of Secretaria de Agricultura, 0°56'03"N, 76°29'18"W, 31.3.1984, *Linda Albert de Escobar & al.* 4008 (HUA, MO).

***Anthurium dylanii* Croat, sp. nov.**

Holotype: Colombia, Chocó, along road between Quibdó and Las Animas, vic. of Yuto, 5°29'N, 76°35'W, 100 m; live plant originally collected by R. Cirino in 1995, cultivated at Huntington Botanical Gardens, San Marino, California; specimen vouchered from living collection by Dylan Hannon 11.10.2007, *T. B. Croat* 101473 (MO 6126467; isotypes: B, CHOCO, COL, HUA, K, US). — Fig. 7A–D.

Internodia brevia, c. 1 cm longa, 2–4 cm diam.; cataphylla 12–13(–20) cm longa; folia petiolo 16–30 cm longo, lamina 35–62 cm longa, (9.2–)15–21 cm lata, elliptica vel debiliter oblanceolato-elliptica; pedunculus 25–29.5 cm longus; spathe 14–16 cm longa, 2.2–3 cm lata, viridis; spadix 30–37 cm longus, 8–13 cm diam., griseo-viridis.



Fig. 7. *Anthurium dylanii* – A: habit of potted plant in flower; B: blade, adaxial surface; C: spathe and spadix; D: portion of spadix with fully exerted berries. – Photographs from *Croat 101473* cultivated by Dylan Hannon at Huntington Botanical Garden.

Slow-growing epiphyte; stem spreading-ascending; *internodes* short, c. 1 cm long, 2–4 cm diam.; *cataphylls* 12–13(–20) cm long, persisting as semi-organised red-brown fibres, especially near apex, the fibres mostly parallel. *Leaves* erect-spreading; *petiole* 16–30 cm long, subterete, sharply sulcate adaxially and margins drying bluntly acute, sulcus c. 3 mm wide; *geniculum* 2–3 cm long, 1.5 × diam. of petiole, tinged brown to orange; *blade* 35–62 cm long, (9.2–)15–21 cm wide, 3.6 × longer than wide, 1.5–2.2 × longer than petiole, coriaceous, elliptic to weakly oblanceolate-elliptic, acute to weakly acuminate at apex, acute at base, dark green and moderately glossy above, moderately paler and semiglossy, glandular-punctate below, margin turned downward; *midrib* narrowly rounded and slightly paler above, narrowly rounded and moderately paler below; *primary lateral veins* 13–14 pairs, arising at 50–60° angle in upper half of blade, to 60–80° angle in lower half of blade, weakly quilted-sunken, raised below, concolorous and slightly less prominent than the collective veins above, narrowly rounded, darker and ± equal to the collective veins below; *collective veins* arising from very near the base, the lower portion almost fused with the midrib in the lower 1 cm, two major collective veins arising from base of blade and with 1st (outermost) meeting margin in lower 1/3 of blade, the 2nd forming the main collective veins, 8–15(–25) mm from the margins, moderately loop-connecting and equal in prominence to the primary lateral veins. *Inflorescence* erect-spreading; *peduncle* 25–29.5 cm long, 8–10 mm diam., green, spreading and slightly turned upwards; *spathe* 14–16 cm long, 2.2–3 cm wide, dull to medium green, lanceolate, acuminate at apex, decurrent at base, spreading at 90° angle then curved downward with the apex held next to petiole, margins rolled outward, drying dark brown, moderately coriaceous; *spadix* 30–37 cm long, 8–13 cm diam. at base, 6–12 mm diam. midway, slightly tapered, c. 7 × 9 mm at flattened apex, grey-green, at 1 cm from apex, 5.5 mm diam. at 1 cm from tip, drying dark brown, matte. *Flowers* c. 0.4–2.8 mm long, 1.4 mm wide, 9–10 visible per spiral; tepals smooth when fresh, drying minutely granular, lateral tepals 1.4 mm wide, the outer margins obtusely and broadly 2-sided to broadly rounded; anthers 0.4 mm long, about as broad as long, emerging weakly at the level of the tepals then retracted below the level of the tepals after anthesis; pollen cream-coloured; *berries* c. 4–8 mm long, 5–6 mm diam., early-emergent, obovoid, pale red; *seeds* c. 2–3 mm long.

Anthurium dylanii is endemic to Colombia, known only from the type locality near Las Animas in Chocó Department at c. 100 m in a Tropical rain forest life zone.

The species is a member of *Anthurium* sect. *Porphyrochitonium* and is characterised by its short internodes, persistent cataphyll fibres, sulcate petioles, usually oblong-elliptic blades, which are glandular-punctate on the lower

surface with the collective veins rather remote from the margins, as well as by its long-tapered greenish spadix with retracted stamens.

The species is named in honour of Dylan Hannon from the Huntington Botanical Garden. Dylan worked as assistant of the senior author for three years and has worked with him in the field in both Central and South America. Dylan helped to prepare the revision of *Anthurium* sect. *Pachyneurium* and is now in charge of the living collections at Huntington. He is one of the best growers known by the senior author and someone to whom he can entrust species that are difficult to cultivate. This attractive new species is a tribute to his great talents.

***Anthurium espiniae* Croat, sp. nov.**

Holotype: Colombia, Chocó, Quibdo, Yuto-Lloró, 80 m, 30.6.1983, E. Forero, R. Jaramillo M., J. Espina & L. M. Quiñones 9671 (COL). – Fig. 8A.

Planta epiphytica; internodia brevía, 1.7 cm diam.; cataphylla 12–25 cm longa, persistentia intacta, lamina ovata-subcordata, 29–36 cm longa, 17–22 cm lata, nervis primariis lateralibus 8–10 utroque; pedunculus (8–)16–22 cm longus; spatha 9.5–12 cm longa, 1.5–2.2 cm lata, viridis; spadix ruber, 5–9 cm longus, stipitatus (1–)2.4–2.8 cm.

Terrestrial or epiphytic plant; *internodes* short, 1.7 cm diam.; *cataphylls* 12–25 cm long, drying medium yellowish brown, persistent. *Leaves* with *petiole* terete, 35–50 cm long, drying 5–7 mm diam., medium yellowish brown, smooth; *blade* ovate, subcordate to cordate, narrowly long-acuminate at apex (acumen 2 cm long), 29–36 cm long, 17–22 cm wide, 1.4–1.9 × longer than wide, 0.55–0.9 × as long as petiole, drying weakly glossy, grey-green above, slightly paler and slightly more glossy below; *midrib* drying narrowly raised and weakly paler above, thicker, narrowly raised and darker brown below, upper surface faintly pale-punctate but difficult to discern upon magnification; lower surface minutely granular upon magnification; *primary lateral veins* 8–10 pairs, arising at 45° angle, sometimes first arising at an acute angle before spreading; *basal veins* 3–4(–5) pairs, the 1st 2–3 free to the base, the lower ones sometimes fused with higher order veins for 5 mm; *posterior rib* absent or if present to 8–10 mm long, naked or nearly so for all of its length; *collective veins* arising from the 3rd or 4th pair of basal veins, 1–5 mm from margin; *tertiary veins* weakly prominulous. *Inflorescence* erect; *peduncle* (8–)16–22 cm long, drying as petiole in colour, 4 mm diam.; *spathe* 9.5–12 cm long, 1.5–2.2 cm wide, medium green, drying medium yellowish brown, long-acuminate, the lower margins joining at c. 90° angle upon peduncle; *spadix* stipitate for (1–)2.4–2.8 cm, yellow, bright red in fruit, drying pale greyish brown, matte, 2.5 mm diam., spadix proper red, 5–9 cm

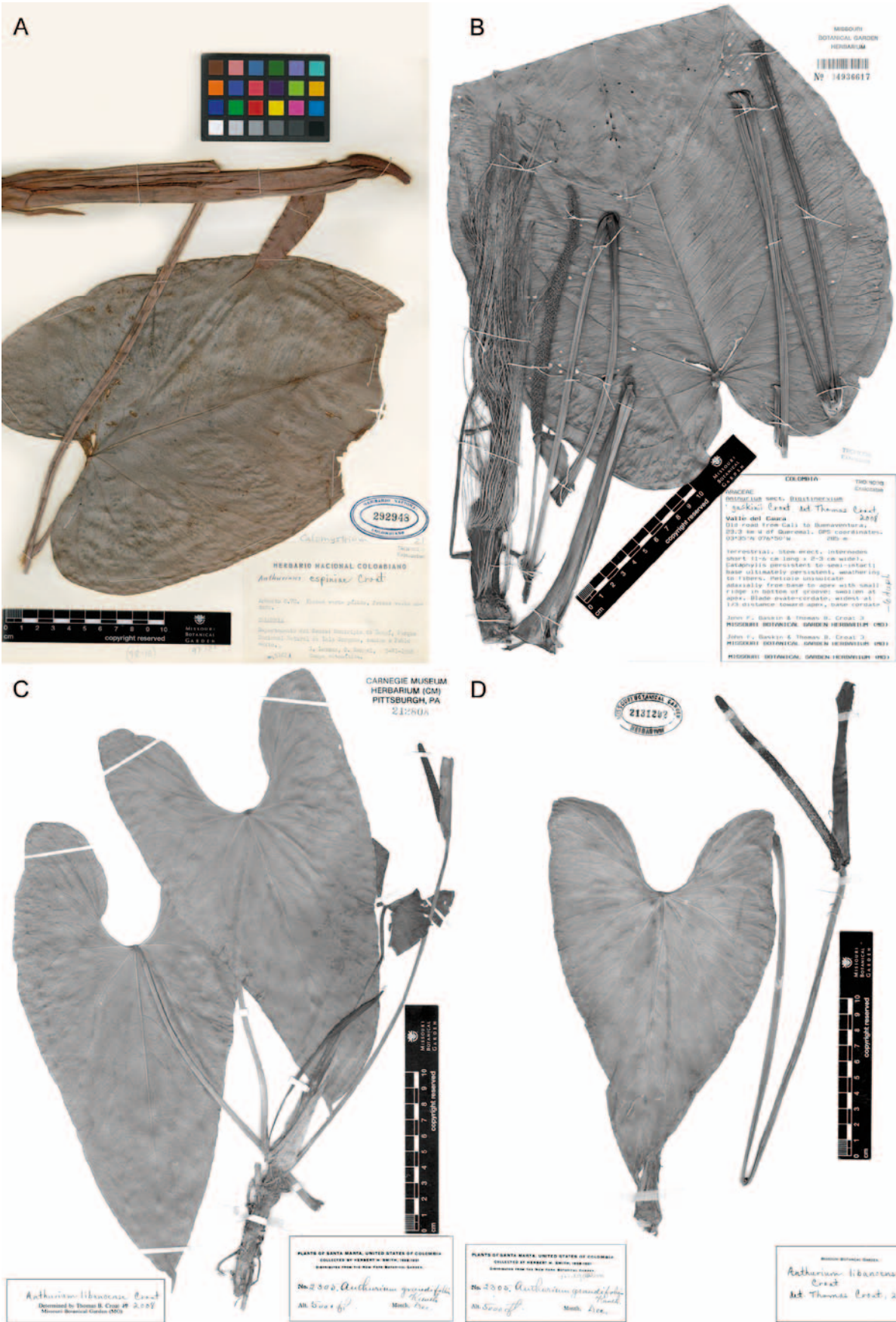


Fig. 8. A: *Anthurium espiniae* – paratype at COL, Lozano 5162A; B: *A. gaskinii* – holotype at MO, Gaskin & Croat 3; C–D: *A. libanense* – isotype at CM (C), holotype at MO (D), H. H. Smith 2305.

long, 6–8 mm diam., 1.2–1.7 cm diam. in fruit including the prominently protruding moderately acute pistils (these extruded 2–3 mm upon dried material). *Flowers* 7–8 visible per spiral, drying 3–4 mm long, 4.5–5 mm wide, matte.

Anthurium espinae is known only from Colombia (Cauca, Chocó) at 80–250 m elevation in Tropical moist forest life zone. Most of the collections have been made on Isla Gorgona off the Pacific coast of Cauca, but the species has also been collected on the mainland in Chocó Department near Quibdó.

The species has been confused with *Anthurium nymphaeifolium* K. Koch & Bouché but only vaguely resembles that species, which has much thicker stems, a whitish or flesh-coloured, mostly sessile or weakly stipitate spadix lacking protruding pistils, a much larger, \pm ovate spathe and more deeply cordate leaf blades.

In some characteristics, *Anthurium espinae* is similar to *A. durangoense* Croat, primarily from adjacent Esmeraldas Province of Ecuador but also found in Buenaventura Department of Colombia (Bajo Calima, Croat 70119). However, *A. durangoense* has a white spadix and leaf blades that dry dark brown and have more prominent glandular punctuations but are on the lower surface not minutely granular as in *A. espinae*.

Anthurium espinae is named in honour of the senior author's good friend, Josefina Espina, Colombian botanist and former student of Enrique Forero at the Herbario Nacional in Bogotá, who spent time as the Curator of the CHOCO Herbarium in Quibdó and who helped to collect the type collection. Josefina collected many new species of *Araceae* and her home in Quibdó was open to many visiting botanists working in the Department of Chocó.

Paratypes. — COLOMBIA: CAUCA: Guapi, Parque Nacional Isla Gorgona, camino al Mirado, 3°00'01"N, 78°12'13"W, 190 m, 12.9.1987, G. Lozano & O. Rangel 5847 (FMB-38589, COL); Parque Nacional Natural Isla de Gorgona and Gorgonilla, salida a la Boca de Horno, 2°59'N, 78°11'W, 9.8.1985, C. Barbosa, J. P. La Torre & J. V. Rueda 3870 (FMB-8652); Parque Nacional Natural de Isla Gorgona, 250 m, 1.6.1986, G. Lozano & al. 5083 (COL); Camino a Pablo sexto, 3.6.1986, G. Lozano & al. 5162A (COL).

***Anthurium gaskinii* Croat, sp. nov.**

Holotype: Colombia, Valle del Cauca, Old Cali–Buenaventura road, 23.3 km W of Queremal, 3°35'N, 76°50'W, 285 m, 12.7.1997, J. Gaskin & Croat 3 (MO) (MO 4936617; isotypes: B, CUV, K, QCNE, S, US). – Fig. 8B.

Internodia 1–6 cm longa, 1–3 cm diam.; cataphylla ad 25 cm longa, persistentia intacta; folia petiolo 82–97 cm longo, lamina late ovato-cordata, (18–)34–49 cm longa,

(10–)23–38 cm lata, nervis primariis lateralibus 24–29 utroque, nervis basalibus 4–6 utroque, libris ad basim; pedunculus 36–55 cm longus; spatha 2.5–11 cm longa, 0.8–2.1 cm lata, viridis; spadix sessilis, 8–18 cm longus, albus; baccae rubrae.

Terrestrial or epiphytic plant; *caudex* erect; *internodes* 1–6 cm long, 1–3 cm diam.; *cataphylls* to 25 cm long, persistent to semi-intact, ultimately weathering to brownish, closely parallel fibres. *Leaves* with *petiole* green, unisulcate adaxially from base to apex with small ridge in bottom of groove, swollen at apex, 82–97 cm long, c. 7 mm diam. at base, 5 mm diam. at apex; *geniculum* 2 cm long, darker than petiole; *blade* broadly ovate-cordate, wider below the middle, (18–) 34–49 cm long, (10–)23–38 cm wide, averaging 42 \times 29 cm, 1.2–1.8 \times longer than wide, 0.4–0.6 \times as long as petiole, acuminate at apex, deeply cordate at base, dark green and glossy above, lighter green and semiglossy below, sparsely and weakly glandular-punctate above and more prominently glandular-punctate below; *sinus* V-shaped to narrowly spatulate, often closed, (1.5–)4–7.5 cm deep, to c. 1 cm wide; *midrib* concolorous, drying bluntly acute and concolorous or brownish above, brownish and sometime acute below; *primary lateral veins* 24–29 pairs, arising at 40–55° angle, closely parallel and somewhat indistinct; *collective veins* arising from the 2nd–3rd pair of basal veins, 4–8 mm from margin; *basal veins* 4–6, all free to the base, much more visible than the primary lateral veins, arching towards the apex with the first 2 basal veins running all the way to the tip of the blade with a network of tertiary veins interconnecting them; *tertiary veins* similar in appearance to the primary lateral veins. *Inflorescences* erect; *peduncle* terete when immature, with 8 small evenly spaced ridges when mature, 36–55 cm long, up to 10 mm wide at base, 3–5 mm diam. at apex, terete, much thinner and shorter than petioles, sulcate at base and terete at apex; *spathe* membranaceous, lanceolate and short-acuminate, reflexed, 2.5–11 cm long, 0.8–2.1 cm wide, green; *spadix* sessile, tapering towards apex, 8–18 cm long, 6–10 mm diam., white to yellowish or maroon. *Flowers* 2.3–2.6 mm long, 2.3–2.7 mm wide, 6 visible per spiral; tepals coarsely warty, lateral tepals 1.2–1.3 mm wide, outer margins 2-sided, inner margins straight to broadly rounded, often turned upward after anthesis upon drying. *Infructescence* erect; *berries* round, 4 mm wide, red or purple.

Anthurium gaskinii is endemic to the western slopes of the Cordillera Occidental in Colombia (Valle del Cauca), in the valley of Río Digua at 285–1250 m in Premontane wet forest and Premontane wet forest-Premontane rain forest transition.

The species is a member of *Anthurium* sect. *Digitinervium* and is characterised by its short internodes, persistent brownish, closely parallel cataphyll fibres, broadly ovate-cordate, greenish-drying blades with a V-shaped

sinus, white spadix and red infructescence. This species is probably the most attractive of all members of this section and the most noteworthy for its potential value in the horticultural trade, but is not in cultivation anywhere.

The species does not seem to have close relatives. Among all the members of *Anthurium* sect. *Digitinervium* it has the broadest, most glossy leaf blades. Dried specimens of *A. gaskinii* could be confused with dried specimens of *A. ovatifolium*, but *A. gaskinii* has deeply cordate leaves with a V-shaped sinus, while *A. ovatifolium* has mostly truncate and sometimes subcordate leaves.

Anthurium gaskinii is named in honour of a former student of the senior author, Dr John Gaskin, a graduate of Washington University, who began his Ph.D. thesis work with the senior author, intending to do a revision of *A. section Digitinervium*. John made an expedition with the senior author to Colombia and collected many samples of section *Digitinervium* including this species. Unfortunately after much deliberation with other professors who insisted that his thesis be a more direct molecular study, he decided to transfer to another professor and Ph.D. thesis. Despite this he warrants recognition owing to his extensive efforts over the course of his first year to revise section *Digitinervium*.

Paratypes. — COLOMBIA: VALLE DEL CAUCA: Road from El Danubio, just below CVC camp “Yatacué” (Alto Anchicaya), 3°30'N, 76°52'W, 580 m, 7.2.1984, *A. Juncosa* 2039 (CUVC, MO); Yatacué, CVC camp at Anchicaya, 3°40'N, 76°50'W, 700–900 m, 25.2.1983, *Al Gentry*, *A. Juncosa* & *F. Gomez* 40794 (COL, MO); old Cali–Buenaventura road, km 55, on trail from road to Río Cavis, near bridge over Río San Juan, 3°32'23"N, 76°45'26"W, 1250 m, 26.7.1997, *J. Gaskin & Croat* 15 (MO), *J. Gaskin & Croat* 16 (MO), *J. Gaskin & Croat* 19 (MO); Cordillera Occidental, vertiente occidental, hoya del Río Digua, lado izquierdo, Piedra de Moler, 900–1180 m, 20.8.1943, *J. Cuatrecasas* 14931 (CUVC).

***Anthurium jesusi* Croat, sp. nov.**

Holotype: Colombia, Valle del Cauca, old road from Cali to Buenaventura, 2 km W of Queremal, 3°34'N, 76°41'W, 1450 m, 10.7.1997, *J. F. Gaskin & T. B. Croat* 1 (MO 4936615; isotypes, B, CUVC, K, QCNE, S, US). – Fig. 9A–D.

Internodia 1–15 cm longa, 1–3.5 cm diam., cataphylla ad 16 cm longa; folia petiolo 35–75 cm longo, 7–8 mm diam., lamina elliptica vel ovata, 25–51 cm longa, 13–23 cm lata, nervis primariis lateralibus 10–20 utroque; pedunculus 37–87 cm longus; spatha lanceolata, 13–18 cm longa, 0.7–1.7 cm lata, plus minusve viridis; spadix stipitatus 1–8 mm, 11–45 cm longus, 5–15 mm diam.

Terrestrial or epiphytic plant; *caudex* erect, rooting at the nodes; *internodes* 1–15 cm long, 1–3.5 cm diam.,

sometimes purplish; *cataphylls* to 16 cm long, persistent to semi-intact, ultimately weathering to fibres. *Leaves* erect; *petiole* unisulcate adaxially from base to apex, 35–75 cm long, 7–8 mm diam., sometimes speckled and tinged purple, geniculate at apex; *geniculum* to 2 cm long, often darker than petiole; *blade* elliptic to ovate, obtuse at apex, obtuse, rounded or weakly subcordate at base, 25–51 cm long, 13–23 cm wide, 1.6–2.6 × longer than wide, 0.5–1.1 × as long as petiole, moderately coriaceous, dark green and glossy above, lighter green and semiglossy below, sparsely and weakly glandular-punctate above and more prominently glandular-punctate below, drying brown; *midrib* convex and reddish or paler above, in deep valley formed by upturned sides of blade, round-raised and paler or reddish below; *primary lateral veins* 10–20 pairs, rising at 60–70° angle, quilted-sunken above, prominently pleated-raised and weakly convex below; *basal veins* 2 pairs, the first soon merging with the leaf margin, the 2nd pair arching towards the leaf apex and running 1–2 cm from margin, ending at the tip; *collective veins* arising from the first pair of primary lateral veins, running directly along the margin; all *veins* usually red or purplish. *Inflorescences* erect or pendent-spreading; *peduncle* terete with very small adaxial ridge, 37–87 cm long, 4–7 mm diam.; *spathe* lanceolate, spreading, falling off as fruit develops, 13–18 cm long, 0.7–1.7 cm wide, green, reddish or purplish green; *spadix* stipitate 1–8 mm, narrowly tapered, 11–45 cm long, 5–15 mm diam., pale green, yellow-green, purplish or brown. *Flowers* 3–3.7 mm long, 2.6 mm wide, 8–9 visible per spiral; tepals minutely granular, lateral tepals 1.3–1.7 mm wide, outer margins 2-sided, inner margins straight. *Infructescences* erect; *berries* early emergent, green when young, usually yellow but sometimes orange at maturity; *seeds* 2 per fruit.

Anthurium jesusi is found in Colombia (Antioquia, Cauca, Chocó, Nariño, Risaralda, Valle del Cauca) and Ecuador (Carchí, Esmeraldas) at 300–2400 m in Lower montane wet forest, Montane wet forest and Premontane rain forest life zones.

The species is a member of *Anthurium* sect. *Digitinervium* and is characterised by its erect stems with elliptic to ovate leaf blades, which are obtuse, rounded or weakly subcordate at base and 0.5–1.1 × as long as the petiole, have usually reddish veins, two well-developed pairs of basal veins arching towards the leaf tip, the first becoming the collective veins running along the margin, by its long, lanceolate, green or reddish-tinted spathe, its very long, narrowly tapered spadix and the fruits that are usually yellow at maturity.

The species was described by Engler as *Anthurium caucanum* var. *maximum* Engl. but the taxon has little relation with *A. caucanum* and must instead be recognised as a distinct species. The epithet *maximum* cannot be used at the species rank because it has already been



Fig. 9. *Anthurium jesusii* – A: habit, *Croat 75580*; B: leaf blades, adaxial surface and inflorescence, *Croat 57270*; C: inflorescence, close-up, *Croat 56704*; D: infructescence *Croat 75580*.

occupied with *A. maximum* (Desf.) Engl. (a confused and poorly understood species that the senior author considered as a species dubium (Croat 1991).

Anthurium jesuui differs from *A. caucanum* in typically having leaves that are larger and broader, with two well-developed basal veins instead of only one in *A. caucanum*, and especially by its very long, narrowly tapered spadix and yellow to orange fruits. The spadix of *A. jesuui* is 11–45 cm long and its length to diameter ratio ranges from 11 to 50, whereas the spadix of *A. caucanum* is typically 5–12 cm long with a length to diameter ratio of 7–13.

Cuatrecasas 18260, a collection from the eastern slope of the Cordillera Occidental near Cali along the Río Cali at Alto de las Brisas at 2160 m, is similar to *Anthurium jesuui*, but differs in having a short, cylindric rather than a long, weakly tapered spadix.

Anthurium jesuui is named in honour of the Colombian botanist Jesus Idrobo, who spent most of his career at the Instituto Botanico at the Universidad Nacional in Bogotá. Jesus was the senior author's professor in the 1965 OTS course on tropical botany in Costa Rica and has remained a life-long friend. He collected the first specimen of this beautiful new species in 1967. Curiously this is the second species in section *Digitinervium* from Colombia named in honour of Idrobo, *A. idroboanum* R. E. Schultes being the other one. That species has more broadly ovate leaf blades, which dry greyish and have the basal veins mostly free to the base.

Paratypes. — COLOMBIA: S.loc. 11.7.1977, *M. T. Madison 4142* (MO, SEL). — ANTIOQUIA: Frontino, Corregimiento La Blanquita, Nutibara–La Blanquita, 14.5 km W of Nutibara, 10–18 km from Alto de Cuevas to La Blanquita, 6°45'N, 76°25'E, 870–950 m, 12.7.1988, *R. Callejas, J. C. Betancur, A. L. Arbeláez & I. D. Castaño 6643* (HUA, MO); road between Nutibara and La Blanquita, 6°42'N, 76°24'W, 7.2.1989, *J. M. MacDougal, D. Restrepo, D. S. Sylva 3705* (HUA); Corregimiento Nutibara, Región Murí, carretera hacia La Blanquita, 1510 m, 14.7.1986, *P. Acevedo & al. 1309* (HUA); 20–28 km from Nutibara, 5°30'N, 75°50'W, 1050–1350 m, 5.11.1988, *McPherson 12985* (HUA); Parque Nacional Natural “Las Orquídeas”, vereda Venados, Alto Bonito, left bank of Río Venados, Bp-T., 6°32'N, 76°19'W, 800–850 m, 2.2.1995, *J. Pipoly & al. 18260* (JAUM, MO); Urrao, Parque Nacional Natural “Las Orquídeas”, “La Lola” behind the INDERENA cabin on Río Calles, 4°35'56"N, 77°04'51"W, 1320 m, 14.6.1981, *L. t. de Escobar, S. Hoyos, J. H. & B. Madrigal 1660* (HUA, MO); Vereda Calles, Parque Nacional Natural “Las Orquídeas”, Río Calles, ridge NW of Cabaña de Calles, 6°32'N, 76°19'W, 1450 m, 1.12.1993, *A. Cogollo & al. 7645* (MO); Vereda Calles, Río Calles, Parque Nacional Natural “Las Orquídeas”, 6°35'56"N, 76°19'W, 1400–1500 m, 3.5. 1995, *R. Fon-negra & Grupo de Palinología 5513* (HUA, MO);

6°29'N, 76°14'W, 1330 m, 8.12.1992, *J. Pipoly & al. 16809* (MO); Corregimiento La Encarnación, trail to Parque Nacional Natural “Las Orquídeas”, 6°27'N, 76°13'W, 2200–2400 m, 8.2.1995, *J. Pipoly & al. 18576* (JAUM, MO); 6°29'N, 76°10'W, 1700 m, *F. Cardona & al. 18<herbarium>*; 6°33'N, 76°19'W, 1.4.1988, *A. Cogollo, J. Ramírez & O. Alvarez 2901* (JAUM); 6°33'N, 76°19'W, 2.4.1988, *A. Cogollo, J. Ramírez & O. Alvarez 2934* (JAUM); Sector Calles, margen derecha del río Calles, 6°32'N, 76°19'W, 1320–1390 m, 24.3.1988, *A. Cogollo, J. Ramírez & O. Alvarez 2511* (JAUM); Margen derecha de la confluencia de los ríos Polo y Calles, 6°32'N, 76°19'W, 1380 m, 26.3.1988, *A. Cogollo, J. Ramírez & O. Alvarez* (JAUM); Mun. de Frontino, corregimiento Nutibara, cuena alta del Río Cuevas, 1880 m, 20.11.1986, *G. Galeano 660* (MEDEL); *ibid.*, 1900 m, 23.11.1986, *G. Galeano 827* (MO); 4.5 km W of Farallones, 5°46'N, 76°03'W, 15.3.1987, *J. L. Zarucchi & B. Echeverry 4756* (MO); Urrao Mun., Parque Nacional Natural Las Orquídeas, 6°32'N, 76°19'W, 1450–1500 m, 29.11.1993, *J. Pipoly & al. 17343* (MO). — CAUCA: Parque Nacional Munchique, km 50–55 along road above Uribe, 1875–2256 m, 25.4.1979, *J. L. Luteyn, M. Lebrón-Luteyn & G. Morales L. 7475* (COL, MO, NY). — CHOCÓ: Bolívar–Quibdó, km 134.5, 5°46'N, 76°20'W, 1070 m, 13.4.1983, *Croat 55897* (CHOCO, MO); San José del Palmar–Cartago, Vereda La Bella between San José del Palmar and turnoff to El Cairo, 4°53'N, 76°13'W, 1430 m, 12.5.1983, *Croat 56704* (COL, JAUM, MO); Tutunendo–El Carmen, around campamento “El 12”, Alto Río Atrato, 520–620 m, 28.4.1979, *E. Forero, R. Jaramillo, H. Y. Bernal, H. León & M. M. Pulido 6048* (COL, MO); Quibdó–Bolívar between km 175 and 176, 117–118 km E of Quibdó, 5°44'N, 76°28'W, 465 m, 16.3.1984, *Croat 57513* (CHOCO, COL, CUV, HUA, JAUM, MO); Medellín–Quibdó, 73 km W of Bolívar, 5°43'18"N, 76°36'35"W, 533 m, 11.12.1979, *Croat 49280* (HUA, MO); Medellín–Quibdó, 78 km W of Bolívar, 5°43'18"N, 76°36'35"W, 466 m, 11.12.1979, *Croat 49296* (MO); *Croat 49308* (MO); Santa Cecilia–Tadó, Municipio de Tadó, corregimiento de Marmolejo, 15 km adelante de Guaratú (Risaralda), 5°16'35"N, 76°14'00"W, 450 m, 25.4.1991, *J. L. Fernández Alonso & al. 8775* (COL, MO); Quibdó, Bolívar–Quibdó, between km 137 and 138, 79–80 km E of Quibdó, 5°45'N, 76°21'30"W, 910–920 m, 11.3.1984, *Croat 57351* (COL, MO); San José del Palmar, hill SW of town, 4°58'27"N, 76°13'42"W, 1370 m, 1.9.1976, *E. Forero & R. Jaramillo 2478* (COL, MO); San José del Palmar, hill SW of town, 4°58'27"N, 76°13'42"W, 1300 m, 25.2.1977, *E. Forero, A. Gentry, A. Sugden & D. Daly 3395* (COL, MO); Hoya del Río Torito (afluente del Río Habita), declive occidental, 4°58'27"N, 76°13'42"W, 850–950 m, 15.3.1980, *E. Forero & al. 7352* (COL, MO); *ibid.*, declive oriental., 4°58'27"N, 76°13'42"W, 630–850 m, 11.3.1980, *E. Forero & al. 6990* (COL, MO); *ibid.*, declive occidental, Finca “Los Guadales”, 4°58'27"N, 76°13'42"W, 630–830 m,

14.3.1980, *E. Forero & al.* 7280 (COL, MO). — NARIÑO: Altaquer–Junin, Cuyambe, 0°18'16"S, 78°53'29"W, 1200 m, 1.1.1957, *J. M. Idrobo & Kyburz* 2336 (COL, MO); Río Imbi, vicinity Ricaurte, c. 2–3 km above Ecopetrol Campamento Palmar, 3 km NW of Ricaurte, trail to Ramos (indigenous settlement), 1°08'N, 77°56'W, 1150 m, 16.3.1990, *Croat* 71568 (MO); Río Ñambí, Altaquer–Tumaco, between Altaquer and Junin, 7 km W of Altaquer, 1°18'N, 78°04'W, 1100 m, 21.3.1990, *Croat* 71663 (MO). — RISARALDA: 26.4.1992, *Alonso* 10101 (COL); Mistrató, Corregimiento de San Antonio de Chami, San Antonio de Chami–Mistrató, 5°23'00"N, 75°54'00"W, 1600–1650 m, 24.4.1992, *F. Alonso* 9964 (COL, MO, US); *ibid.*, 1500–1600 m, 26.4.1992, *J. Betancur & al.* 3408 (COL); *ibid.*, 22.4.1992, *J. Betancur & al.* 3420 (COL), *J. Betancur & al.* 3394 (COL); Pueblo Rico, Corr. Santa Cecilia, 420–480 m, 24.4.1991, *Favio González* 2334 (COL, MO); Vereda Piunda, 5°14'18"N, 76°02'11"W, 720–850 m, 26.4.1991, *Favio González* 2434 (MO). — VALLE DEL CAUCA: Buenaventura–Cali, 29 km from jct. of new Cali–Buenaventura hwy, 1.1 km S of entrance to Queremal, 52.7 km N of Agua Clara, 3°30'N, 76°44'W, 1350 m, 9.7.1993, *Croat & Dorothy Bay* 75580 (B, CAS, K, MO, NY, US); Lago Calima–Campo Alegre, Mpio. Calima, parallel to Río Calima, W of Cordillera Occidental, 1000 m, 30.8.1981, *F. Silverstone-Sopkin* 601 (CUVC, MO); Río Anchicayá near CVC hydroelectric plant, 3°40'N, 76°50'W, 400–500 m, 16.12.1981, *A. Gentry* 35687 (COL, MO); Cali–Buenaventura, along old hwy between Cali and Buenaventura, 28 km beyond the junction with the new hwy, 3°33'52"N, 76°46'24"W, 1400–1420 m, 28.8.1976, *Croat* 38630 (COL, MO); old road from Cali to Buenaventura, 20.3 km W of Queremal, 3°35'N, 76°48'W, 460 m, 12.7.1997, *J. Gaskin & Croat* 4 (MO); 14 km W of summit on road through Parque Nacional Munchique, past Veinte de Julio, 2°32'05"N, 77°01'07"W, 1740 m, 19.7.1997, *J. Gaskin & Croat* 9 (MO), *J. Gaskin & Croat* 10 (MO); 12 km W of summit on road through Parque Nacional Munchique, 2 km W of Veinte de Julio, 2°32'05"N, 77°00'46"W, 1675 m, 20.7.1997, *J. Gaskin & Croat* 13 (MO); road from summit (km 18) of new Cali–Buenaventura highway toward Dapa, 1 km N of junction, 3°32'22"N, 76°38'00"W, 1945 m, 23.7.1997, *J. Gaskin & Croat* 14 (MO); *ibid.*, 3°32'23"N, 76°45'26"W, 1250 m, 26.7.1997, *J. Gaskin & Croat* 18 (MO); *ibid.*, near bridge over Río Cavis, 3°32'21"N, 76°45'25"W, 1100 m, 26.7.1997, *J. Gaskin & Croat* 21 (MO); vicinity of Queremal, Vereda La Victoria, 3°31'06"N, 76°42'57"W, 1450–1480 m, 27.7.1997, *J. Gaskin & Croat* 23 (MO); Estacion Microndas Tokio, 8 km W of Queremal (along old road to Buenaventura), 2°27'N, 76°45'W, 26.9.1980, *Croat* 50141 (MO); Río Digua, Cordillera Occidental, western slope, Río Digua, Piedra de Moler, 900–1180 m, 23.8.1943, *J. Cuatrecasas* 15044 (VALLE); Tocotá, Western Andes of Cali, 3°31'33"N, 76°39'00"W, 1600–2000 m, 1906, *F. C. Lehmann* 7748 (K, MO); Restrepo, Proyecto Hidroeléctrico del CVC Ca-

lima III, 3°40'00"N, 76°50'00"W, 1290 m, 28.2.1988, *L. de Escobar & M. P. Velásquez* 8181 (HUA, MO).

ECUADOR: CARCHI: Peñas Blancas, 20 km below Maldonado on the Río San Juan, 1°00'42"N, 78°14'49"W, 900–1000 m, 27.5.1978, *M. T. Madison & al.* 4601 (MO, SEL); Río San Juan, environs of Chical, 12 km below Maldonado, 1°04'N, 78°17'W, 1200 m, 29.5.1978, *Madison & al.* 4760 (SEL); Tulcan, Chical, Reserva Etnica Awá-Camumbí, 0°53'30"N, 78°16'30"W, 1700–1900 m, 20.–29.7.1991, *C. Quelal, C. Aulestia & F. Nastacuáz* 154 (MO). — ESMERALDAS: Lita–San Lorenzo, Río Pigumbi, 6.4 km W of Río Lita Bridge (below Lita), 0°52'04"N, 78°29'03"W, 685 m, 30.6.1998, *Croat, R. Mansell, L. Hannon & J. Whitehill* 82187 (CHOCO, HUA, MO, Q, QAP, QCA, QCNE); Lita–San Lorenzo, 5 km W of Río Lita Bridge (below Lita, on old road to San Lorenzo), 0°52'07"N, 78°27'43"W, 3.7.1998, *Croat, Richard Mansell, Lynn Hannon & Jane Whitehill* 82263 (MO, QCNE); Quininde, NW of Las Golondrinas, Cooperativa 3 de Septiembre in sector San Isidro, near Río Jordán, 0°20'N, 79°12'W, 300 m, 9.10.1993, *W. Palacios* 11490 (MO, QCNE).

CULTIVATED. — Colombia, Antioquia, Río Negro, cultivated by Marta Posada de Robledo, 6°07'N, 75°30'W, 2100 m, 1.7.1986, *Croat* 62769 (MO); Colombia, Antioquia, Río San Juan, near Queremal, collected by William Kyburz and cultivated on his finca at Bitaco, cultivated at Honolulu Botanical Gardens, Hawaii, 22.11.1963, *P. C. Hutchison* 3216 (*Cult*) (UC), 12.5.1965, *P. C. Hutchison* 3245 (UC); Costa Rica, Puntarenas, originally collected in Colombia, Valle, Cali–Buenaventura road, 8°49'N, 82°58'W, 1200 m, 6.–7.3.1984, *Croat* 57270 (CR, MO); cultivated at Las Cruces Botanical Gardens 74–535, originally collected in Colombia, 1300 m, 11.1.1978, *Croat* 44434 (MO); United States, Florida, Selby Botanical Gardens, SEL 78-2062, originally from Ecuador (Carchi, based on *Madison* 4601, 900 m, 25.1.1986), *Christenson* 1140 (SEL).

***Anthurium libanoense* Croat, sp. nov.**

Holotype: Colombia, Sierra del Líbano, vic. of Santa Marta, south of the headwaters of Río Galra, 11°05'N, 74°05'W, 1825 m, 24.1.1899, *H. H. Smith* 2305 (MO 2131292; isotypes: CM, G, GH, NY, PH). – Fig. 8C–D.

Internodia brevia, 1–2 cm longa, c. 1 cm diam.; cataphylla ad 9 cm longa; folia petiolo 20–30 cm longo, c. 5 mm diam., geniculo c. 1.5 cm longo, lamina triangulari-ovato-sagittata, 21–40 cm longa, 12.4–24 cm lata, lobulis posterioribus 7–12.5 cm longis, 5–8 cm latis, nervis primariis lateralibus 5–6 utroque, nervis basalibus 5–7 utroque; pedunculus 22–44 cm longus, c. 3 mm diam.; spathe 8–14 cm longa, 1.3–1.6 cm lata; spadix stipitatus 5–10 mm, 5–15 cm longus, 5–9 mm diam.

Terrestrial plant, climbing to c. 8 m; *caudex* elongated, rooting at the nodes; *internodes* short, 1–2 cm long,

c. 1 cm diam.; membranaceous, to 9 cm long, persisting at first and then weathering to short brown fibres. *Leaves* clustered at the tip of the caudex; *petiole* terete, green, semiglossy, geniculate at apex, 20–30 cm long, c. 5 mm diam.; *geniculum* c. 1.5 cm long, darker than petiole; *blade* triangular-ovate-sagittate, widest at the level of the petiole and tapering gradually towards the acuminate apex, 21–40 cm long, 12.4–24 cm wide, averaging 29×16 cm, $1.6\text{--}2.1 \times$ longer than wide, $1\text{--}1.5 \times$ as long as petiole, subcoriaceous, green and semiglossy above, slightly paler and matte below, drying greyish green to yellowish brown; *anterior lobe* 17–37 cm long; *posterior lobes* 7–12.5 cm long, 5–8 cm wide, directed toward the base or slightly outward; *sinus* broadly arcuate to hippocrepiform, sometimes with the posterior lobes turned inwards, 5–11 cm deep, 4–6.5 cm wide; upper surface densely dark-speckled with sparse pale short-linear cellular inclusions; lower surface smooth within the areoles, lacking short-linear cellular inclusion; *midrib* raised and slightly paler above, rounded and paler below; *primary lateral veins* 5–6 pairs, rising at $40\text{--}50^\circ$ angle, raised and concolorous above, acute and paler below; *collective veins* arising from the first pair of basal veins, 5–10 mm from margin; *basal veins* 5–7 pairs, first 1–2 pairs free to the base, the remainder coalesced to varying degrees; *posterior rib* thick, broadly curved, naked 1–3 cm. *Inflorescences* erect; *peduncle* terete, 22–44 cm long, c. 3 mm diam.; *spathe* membranaceous, lanceolate, erect, 8–14 cm long, 1.3–1.6 cm wide; *spadix* stipitate for 5–10 mm, cylindrical, 5–15 cm long, 5–9 mm diam., drying dark purplish brown. *Flowers* 5 visible per spiral, 2.7–2.9 mm long and wide; tepals glossy, coarsely roughened upon drying with pale cellular inclusions, lateral tepals 1.4–1.5 mm wide, outer margin 2-sided, inner margin broadly rounded; *stamens* clustered tightly around pistil, anthers 0.5 mm long, 0.65 mm wide, thecae scarcely divaricate.

Anthurium libanoense is endemic to Colombia, known only from the type locality in the Sierra de Líbano (hence the epithet “libanoense”) at 1370–2300 m in montane forest. The species was reported to be in flower from December to February. The type locality, though believed to be in the area of the Serranía de Santa Marta where H. H. Smith concentrated his collecting, is uncertain. There are six geographical references to Líbano in the Colombian gazetteer but none of these are even close to the Serranía de Santa Marta.

The species is a member of *Anthurium* sect. *Cardi-olonychium* and is characterised by its mostly short internodes, moderately intact, persisting cataphylls, long-petiolate leaves with narrowly triangular-ovate-sagittate blades, which dry greyish green to yellowish brown, as well as by its weakly tapered, probably purplish spadix.

Anthurium libanoense is most easily confused with *A. breviscapum* Poepp., but that species differs in having long internodes, less prominent reticulate venation and a

more long-tapered spadix as well as in occurring in the Amazon basin.

Anthurium libanoense is similar to two Ecuadorian species, *A. coerulescens* Engl. and *A. versicolor* var. *azuayense* Croat (published elsewhere in this issue and represented by W. H. Camp 4435 from Ecuador in the Province Azuay at 2438–2742 m). The new species differs from *A. coerulescens* with long and thin internodes primarily in having short and somewhat thick internodes. *A. versicolor* var. *azuayense* has larger and more broadly ovate leaves with the connective veins arising from the 4th–5th pair of basal veins instead from the first pair as in the case of *A. libanoense*.

Three unnamed collections from other parts of Colombia somewhat resemble *Anthurium libanoense*. Pennel 9262 from Caldas Department above Salento at 2600–2800 m elevation has similar inflorescences and a somewhat similar leaf shape, but the leaf blade has a narrower sinus with posterior lobes somewhat turned inwards and collective veins arising from the second pair of primary lateral veins rather than from the first pair of basal veins as in *A. libanoense*. Grubb, Curry & Fernandez-Perez 795 from Sierra Nevada del Cocuy in Boyaca Department at 3250 m elevation also has similar leaves and inflorescences, but this collection has a long, narrow sinus rather than a wide, open sinus as in *A. libanoense*; it also has a prominent first pair of basal veins that turns into a pair of strong collective veins arching directly from the leaf base to the apex and running at a farther distance from the margin than is the case with *A. libanoense*. Grant 9008 from Cundinamarca Department at 2700 m elevation has larger and more triangular leaves, and large inflorescences with the spathe and spadix more than twice as long as in the case of *A. libanoense*.

Anthurium maasii Croat, sp. nov.

Holotype: Colombia, Valle del Cauca, new road between Cali and Buenaventura, km 85, Boquerón, 150 m, 6.10.1974, P. J. M. Maas & T. Plowman 1941 (GH; isotypes: CUV, U). – Fig. 10A.

Internodia 2.5–3.5 cm longa, c. 5 mm diam.; cataphylla 7.5–9.5 cm longa, decidua; folia petiolo 7.4–9 cm longo, c. 2 mm diam., lamina ovato-elliptica, 18–19 cm longa, 5–6.5 cm lata, nervis primariis lateralibus 6–7 utroque; pedunculus c. 13 cm longus; spatha c. 6 cm longa, 7 mm lata, viridis; spadix luteus, stipitatus 2 mm, c. 6.5–9 cm longus, 3 mm diam.

Semierect vine; *caudex* to 1.5 m tall, with long slender roots c. 1 mm diam. extending from the nodes; *internodes* elongated, 2.5–3.5 cm long, c. 5 mm diam.; *cataphylls* 7.5–9.5 cm long, deciduous. *Leaves* spreading from the elongated caudex; *petiole* terete, 7.4–9 cm long, c. 2 mm diam., drying dark yellow-brown; *blade* ovate-elliptic, long-acuminate at apex, obtuse at base, 18–19 cm long, 5–6.5 cm wide, $3.2\text{--}3.6 \times$ longer than wide, $2\text{--}2.5 \times$ long-

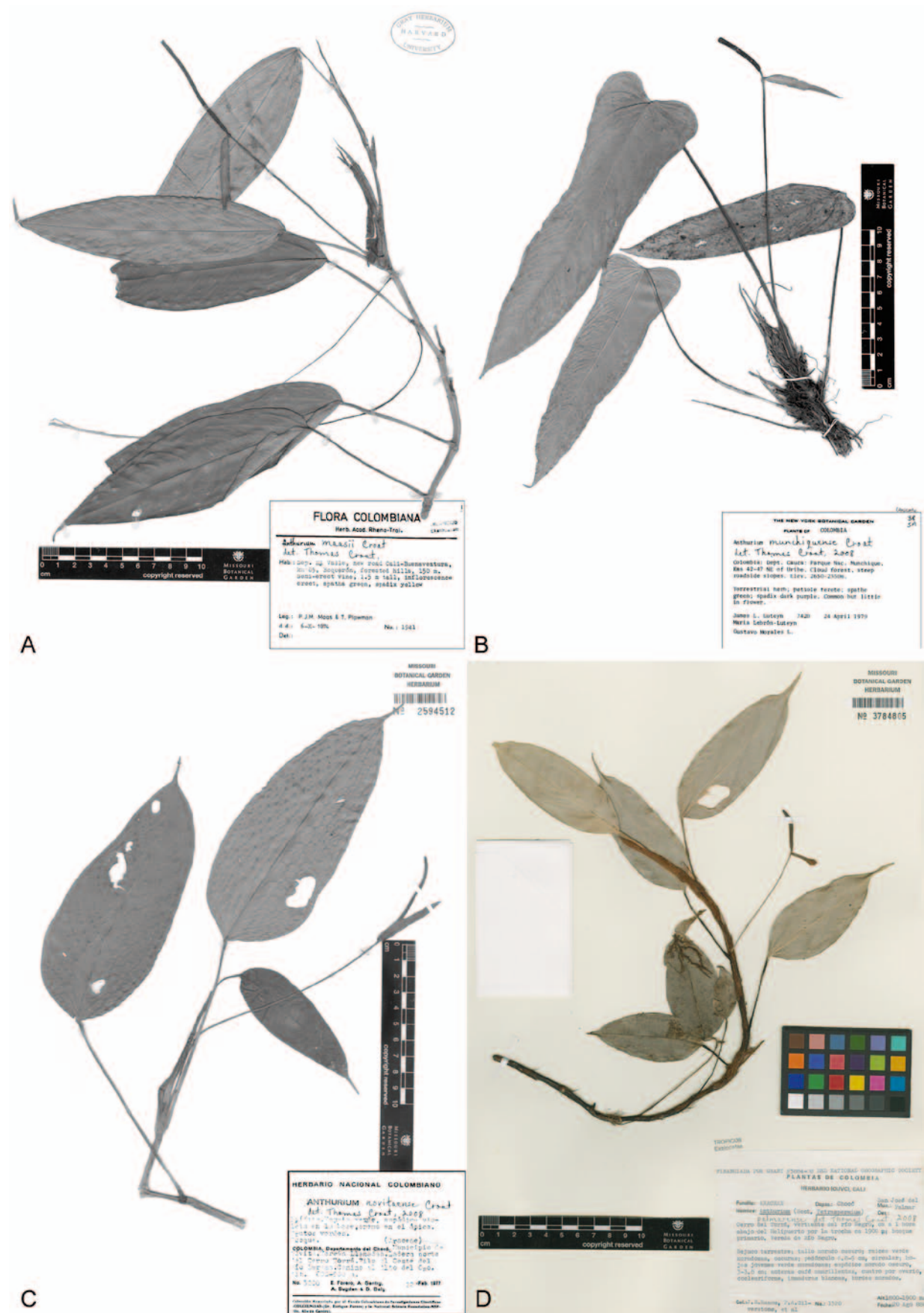


Fig. 10. A: *Anthurium maasii* – holotype at GH, Maas & Plowman 1941; B: *A. munchiquense* – holotype at NY, Luteyn & al. 7420; C: *A. novitaense* – holotype at MO, Forero & al. 3200; D: *A. palmarense* – holotype at MO, Ramos & Silverstone-Sopkin 1320.

er than petiole, semicoriaceous, drying weakly glossy and dark yellow-brown above, semiglossy and light yellow-brown below; upper surface minutely granular, lower surface with subcylindrical pustules; *midrib* narrowly raised and drying slightly darker than the surface above, rounded and drying light brown below; *primary lateral veins* 6–7 pairs, arising at 40–50° angle and arching towards the apex, slightly raised above and below; *collective veins* arising from the first pair of basal veins, 3–5 mm from margin; *basal veins* 2 pairs, both free to the base, the 2nd pair weak and confined to the base of the blade; *tertiary veins* prominulous and reticulate. *Inflorescences* erect; *peduncle* slender and elongated, c. 13 cm long, 1 mm diam., drying dark yellow-brown; *spathe* lanceolate, c. 6 cm long, 7 mm wide, green; *spadix* yellow, stipitate for 2 mm, cylindrical, 6.5–9 cm long, 3 mm diam., drying dark brown. *Flowers* 1.7–1.8 mm long, 0.7–0.8 mm wide (dried), 5 visible per spiral, smooth, drying dark yellow-brown; lateral tepals 1.1–1.2 mm wide, the outer margin broadly 2-sided, inner margin nearly straight, often curled outward upon drying; *stamens* barely emergent, closely arranged around pistil, 0.2 mm long, 0.25 mm wide, thecae ovate, slightly divaricate.

Anthurium maasii is endemic to Colombia, known only from the type locality in Valle Department at 150 m elevation in a Premontane rain forest transition life zone.

The species is a member of *Anthurium* sect. *Xialophyllum* and is characterised by its terrestrial habit, elongated internodes, sulcate petioles, brown-drying ovate-elliptic, long-acuminate leaf blades, the long-pedunculate inflorescence with a slender, erect-spreading green spathe and slender, elongate, yellow spadix. Also characteristic are the prominulous tertiary veins and subcylindrical pustules on the lower leaf surface.

The species is most similar to *Anthurium cardenasii* Croat from the eastern slopes of the Cordillera Central at 850 m elevation. Both *A. maasii* and *A. cardenasii* have remarkably similar leaves with similar shape and colouration, but *A. maasii* differs in having the lower blade surface somewhat paler and more matte, by having the reticulate veins less closely aggregated and with the upper midrib only slightly thicker than broad. In addition, the areoles are sparsely granular with frequent pustules. In contrast, *A. cardenasii* has the areoles minutely and finely granular, lacks pustules and also has the upper midrib markedly thicker than wide. Were it not for the radical differences in range and elevation these two taxa might be considered only morphological variations of a single species, but in the light of the existing range of these two species it is highly unlikely that they are the same.

Anthurium maasii should be compared with *A. pulchellum* Engl., *A. purdieum* Schott and *A. stipitatum* Benth., but all these differ in having long-stipitate spadices and the first two also differ in having persistent,

rather than deciduous cataphylls. Also, *A. stipitatum* has a purple instead of a yellow spadix as has *A. maasii*.

The species is named in honour of Paul Maas, formerly from the University of Utrecht and currently doing research at the Wageningen Botanical Garden. Paul has been active collecting in the neotropics for more than 40 years and has collected many interesting aroids including the type specimen of this species.

***Anthurium munchiquense* Croat, sp. nov.**

Holotype: Colombia, Cauca, Parque Nacional Munchique, kms 42–47 NE of Uribe, 2350–2650 m, 24.4. 1979, J. Luteyn & al. 7420 (NY; isotype: COL). – Fig. 10B.

Internodia brevia, 0.5–1 cm longa, c. 8 mm diam.; cataphylla ad 7 cm longa; folia petiolo 13–21 cm longo, lamina lanceolata, 15–22 cm longa, 3.7–6.8 cm lata, nervis primariis lateralibus 11–12 utroque, nervis basilibus 3–4 utroque; pedunculus c. 20 cm longus; spatha c. 5.5 cm longa, 7 mm lata, viridis; spadix stipitatus 5 mm, c. 3.5 cm longus, 3 mm diam., atropurpureus.

Terrestrial herb; *internodes* short, 0.5–1 cm long, c. 8 mm diam., densely covered by remaining cataphyll fibres, rooting at the nodes; *cataphylls* to 7 cm long, decaying quickly to persistent brownish fibres. *Leaves* clustered at the top of the stem; *petiole* drying blackish, terete, sulcate near base, 13–21 cm long, 1–2 mm diam. near apex, to 4 mm diam. at base; *geniculum* c. 6 mm long; *blade* lanceolate, subcordate, widest at the base with short posterior lobes protruding outwards, slightly constricted below the middle, acuminate at the apex, spreading at 90° angle from the petiole, 15–22 cm long, 3.7–6.8 cm wide, 3.2–4.2 × longer than wide, 1–1.2 × as long as petiole, drying weakly glossy and light green above, subglossy and light green below; *midrib* blunt and tan above, round-raised and tan below; *primary lateral veins* 11–12 pairs, arising at 40–45° angle, somewhat sunken and concolorous above, slightly raised and slightly lighter below; *collective veins* arising from the 1st pair of basal veins or from one of the lowest pairs of primary lateral veins, c. 1 mm from margin; *basal veins* 3–4 pairs, all free to the base. *Inflorescences* erect; *peduncle* slender, c. 20 cm long, 1–2 mm diam., drying concolorous with petioles; *spathe* lanceolate, reflexed, c. 5.5 cm long, 7 mm wide, green; *spadix* stipitate for 5 mm, cylindrical, blunt at the end, c. 3.5 cm long, 3 mm diam., dark purple. *Flowers* 5–6 visible per spiral, 1.5–1.6 mm long, 1.3–1.4 mm wide, sides parallel to spiral smoothly sigmoid; tepals weakly glossy, conspicuously pale glandular, lateral tepals 1–1.1 mm wide, the outer margins 2–3-sided, inner margins broadly rounded.

Anthurium munchiquense is endemic to Colombia, known only from the type locality, Parque Nacional

Munchique (hence the epithet “munchiquense”) in Cauca at 2350–2650 m in a Premontane rain forest life zone.

The species is a member of *Anthurium* sect. *Xialophyllum* and is characterised by its short internodes surrounded by the remnant cataphyll fibres, its long, lanceolate and subcordate leaf blades, which are widest at the base, dry pale green, have 11–12 pairs of primary lateral veins and 3–4 pairs of basal veins all free to the base, and the slender inflorescence with a green spathe and a dark purple spadix.

Anthurium munchiquense somewhat resembles *A. macphersonii* Croat & Oberle, but that species consists of much larger plants with the leaf blades widest above the middle, very prominent tertiary veins and larger inflorescences with a green or yellowish instead of a dark purple spadix as has *A. munchiquense*. It is also somewhat similar to *A. alegriasense* Engl., but that species has long internodes and broader, ovate-subcordate leaves that are widest just below the middle.

***Anthurium novitaense* Croat, sp. nov.**

Holotype: Colombia, Chocó, Municipio Novita, Vereda Llanadas, N slope of Cerro Torrá, ridge W of Río Suramá, trail to Alto del Oso, 4°55'N, 76°30'W, 600–900 m, 22.2.1977, E. Forero, A. Gentry, A. Sugden & D. Daly 3200 (MO 2594512; isotype: COL). – Fig. 10C.

Internodia 5.5–9 cm longa, 4–5 mm diam.; cataphylla 10–11 cm longa; folia petiolo 12–18 cm longo, lamina anguste ovato-lanceolata, 16.5–23.5 cm longa, 6–10 cm lata, nervis primariis lateralibus 15–19 utroque, nervis basalibus 1 utroque; pedunculus 17–22 cm longus, 1 mm diam.; spathe 4–5 cm longa, 9–12 mm lata, viridis; spadix sessilis, 4–6 cm longus, 2 mm diam., cremeus.

Epiphyte; *caudex* elongated, rooting at the nodes; *internodes* 5.5–9 cm long, 4–5 mm diam.; *cataphylls* slender, caducous, 10–11 cm long. *Leaves* well dispersed along the stem; *petiole* drying light brown, terete, 12–18 cm long, c. 2 mm diam.; *blade* narrowly ovate-lanceolate, long-tapered and sharply cuspidate at apex, obtuse to rounded at base, 16.5–23.5 cm long, 6–10 cm wide, averaging 20 × 7.5 cm, 2.4–2.8 × longer than wide, 1.3–1.5 × longer than petiole, matte and drying greyish green above, matte and drying light grey below; *midrib* moderately raised and concolorous above, round-raised and drying light brown below; *primary lateral veins* 15–19 pairs, arising at 45–50° angle, only slightly raised and concolorous above, round-raised and drying light brown below; *basal veins* 1 pair, barely visible; *collective veins* arising from 1st pair of primary lateral veins, 3–5 mm from margin. *Inflorescences* erect; *peduncle* slender, 17–22 cm long, 1 mm diam., concolorous with petioles; *spathe* lanceolate, 4–5 cm long, 9–12 mm wide, green; *spadix* sessile, long-tapered, 4–6 cm long, 2 mm diam., cream, sometimes with violet

base. *Flowers* 3–4 visible per spiral; tepals moderately smooth and unmarked, lateral tepals 0.9–1 mm wide, the outer margins 2-sided, forming a right angle, the inner margin broadly rounded to nearly straight; *stamens* apparently weakly emergent.

Anthurium novitaense is endemic to Colombia, known only from the Municipio de Novita (hence the epithet “novitaense”) at 600–1150 m in a Premontane rain forest life zone.

The species is a member of *Anthurium* sect. *Xialophyllum* and is characterised by its epiphytic habit, long, slender internodes, long, slender deciduous cataphylls, narrowly ovate-lanceolate leaf blades with narrowly long-tapered apices and obtuse to rounded bases, as well as by the long-pedunculate inflorescences with a green, lanceolate spathe and a slender, long-tapered, cream-coloured spadix.

The species is closest to an undescribed species from Cerro Samama and Reserva Mache-Chindul on the western slopes of Ecuador at 400–780 m elevation (Knudsen 380, 393, 476; Cornejo 7750). That species differs in having a short, stubby, purplish spadix and leaf blades that dry semiglossy on both surfaces, in contrast to a long-tapered, cream-coloured spadix and blades that at least dry matte in *Anthurium novitaense*. It also somewhat resembles *A. trianae* Engl. of Antioquia Department in Colombia but that species has leaves with an acute base and with fewer primary lateral veins (8–9 pairs versus 15–19 pairs in *A. novitaense*) and also has shorter peduncles (35 cm long versus 17–22 cm long in *A. novitaense*).

Paratypes. — COLOMBIA: CHOCÓ: Municipio Novita, N slope of Cerro Torrá, W ridge of Río Suramá, trail to Alto del Oso, 600–900 m, 22.2.1977, E. Forero, A. Gentry, A. Sugden & D. Daly 3199 (COL); Municipio Novita, hill N of Cerro Torrá, W edge of Río Suramá, Alto del Oso, 1000–1150 m, 22.2.1977, E. Forero, A. Gentry, A. Sugden & D. Daly 3244 (COL).

***Anthurium palmarense* Croat, sp. nov.**

Holotype: Colombia, Chocó, San José del Palmar, Cerro del Torrá, slopes of Río Negro, c. 1 hour from the helipuerto, path to Río Negro, 1800–1900 m, 20.8.1988, J. E. Ramos & P. A. Silverstone-Sopkin 1320 (MO 3784805; isotype: CUVC). – Fig. 10D.

Internodia 3–5 cm longa, c. 5 mm diam.; folia petiolo 3–8 cm longo, c. 2 mm diam., lamina ovato-lanceolata, 7.5–14 cm longa, 3–4.8 cm lata, nervis primariis lateralibus 10–15 utroque; pedunculus 5.5–7.5 cm longus; spathe 1.2–2 cm longa, 6–7 mm lata; spadix 2.8–3.5 cm longus, 2–3.5 mm diam., purpureus, stipitatus 1 mm.

Terrestrial or epiphytic vine; *caudex* elongated, rooting at the nodes; *roots* slender, purplish; *internodes* terete,

3–5 cm long, c. 5 mm diam., dark purple, blackish green or black; *cataphylls* persisting as closely-meshed brown fibres enclosing most of the length of the adjacent internodes. *Leaves* with *petiole* narrowly, obtusely and moderately deeply sulcate, slightly clasping at base, 3–8 cm long, c. 2 mm diam., often covered with black fungus; *blade* ovate-lanceolate, long-acuminate at apex (acumen to 1.5 cm long), rounded or obtuse at base, widest below the middle, 7.5–14 cm long, 3–4.8 cm wide, averaging 10.5×4 cm, $2.3\text{--}3.2 \times$ longer than wide, $1.4\text{--}2.5 \times$ longer than petiole, subcoriaceous, purplish green when young, drying greyish green and nearly matte above, light greyish green and semiglossy below; upper surface eglandular, drying densely and conspicuously areolate; lower surface drying moderately smooth, dark yellow-brown glandular-punctate; *midrib* raised and concolorous above, rounded and drying yellow-green below; *primary lateral veins* 10–15 pairs, rising at $50\text{--}65^\circ$ angle, flat above and only slightly raised below, concolorous with the blade and inconspicuous; *collective veins* arising from the basal veins, 3–5 mm from margin; *basal veins* 1 pair, forming the collective veins. *Inflorescences* rising at $50\text{--}90^\circ$ angle from the caudex; *peduncle* terete, very slender, 5.5–7.5 cm long, c. 1 mm diam. upon drying; *spathe* narrowly lanceolate, spreading, with the margins turned under, truncate and short-cuspidate at apex, 1.2–2 cm long, 6–7 mm wide (drying 2–4 mm wide), purplish yellow-green, light purple or purplish red or dark reddish violet; *spadix* conspicuously dark violet-purple to light violet-purple, stipitate for 1 mm, cylindrical, 2.8–3.5 cm long, 2–3.5 mm diam. *Flowers* 3–3.8 mm long, 2.3 mm wide, tepals drying densely granular, lateral tepals 1.2–1.4 mm wide, the outer margins 2-sided; *anthers* 0.2 mm long, 0.3 mm wide, held at the level of the tepals, white, the pollen yellowish brown. *Infructescences* erect; *berries* oblate, white with green styler region, 6–9 mm diam.

Anthurium palmarense is endemic to Colombia (Chocó), known only from the type locality in Cerro Torrá near San José del Palmar (hence the epithet “palmarense”) at 1700–1950 m elevation in a Premontane rain forest life zone.

The species is a member of *Anthurium* sect. *Tetraspermium* and is characterised by its slender, elongated internodes, reddish brown, partially intact cataphylls tightly clasping the stem, the long, slender petiole, the ovate-elliptic, grey-green-drying blade, which is aristate at the apex, as well as by the slender, long-pedunculate inflorescence.

Anthurium palmarense is probably most closely related to *A. scandens* (Aubl.) Engl., but that species differs by the cataphylls persisting decidedly more fibrous, proportionately much shorter petioles, leaf blades with the dried upper surface glandular-punctate and densely granular (instead of areolate) and with acute to acuminate rather than aristate blade apices.

The species is similar to *Anthurium tonduzii* Engl., but that species differs in having longer internodes, deciduous cataphylls, proportionately shorter petioles, brown-drying leaf blades, which are noticeably wider below the middle, with a pair of short secondary collective veins and a smooth, non-areolate upper dried surface, and a stipitate spadix.

A collection from the same general area (Forero & al. 3242) appears similar to this species, but differs in its shorter internodes (1.5–2 cm long, c. 3 mm diam.), its shorter cataphylls also persisting as fibres but enclosing the caudex much more loosely and for only about $\frac{2}{3}$ of its length, its slightly smaller leaves (4.5–8.5 cm long, 1.5–3 cm wide) and especially its shorter and more stubby inflorescence (spathe 6–8 mm long, drying c. 2 mm wide; spadix 1–1.5 cm long, 3–7 mm diam.). It also occurs at a lower altitude (1000–1150 m).

Paratypes. — COLOMBIA: CHOCÓ: San José del Palmar, Cerro del Torrá, slopes above Río Negro, c. 1 hour from the helipuerto, path to Río Negro, 1900 m, 16.8.1990, Ramos & al. 1260 (CUVC, MO); San José del Palmar, Cerro del Torrá, oriental slope, above helipuerto, 1920–1950 m, 8.8.1988, Silverstone-Sopkin & al. 4231 (CUVC, MO, NY); San José del Palmar, Cerro del Torrá, road to Río Negro, 1680–1940 m, 10.8.1988, Ramos & al. 1131 (CUVC, MO).

Anthurium paraguayense Croat, **sp. nov.**

Holotype: Colombia, Valle del Cauca, Municipio El Cairo, Correg. Boqueron, Vereda Las Amarillas, Serranía de los Paraguas, Cerro del Ingles, 2000–2200 m, c. $4^\circ 45'N$, $76^\circ 20'W$, 14.5.1988, J. Luteyn, P. Silverstone-Sopkin, M. D. Heredia & N. Paz 12373 (NY; isotype: CUCV). – Fig. 11A.

Internodia 17–22 cm longa, 5–8 mm diam.; cataphylla ad 9 cm longa; folia petiolo 20–28 cm longo, 2–3 mm diam., lamina ovata, 19.5–22.5 cm longa, 10.5–12.5 cm lata, nervis primariis lateralibus 12–13 utroque; pedunculus 28–30 cm longus; spatha 6–7 cm longa, 1.3–1.7 cm lata, viridis; spadix 6.5–11 cm longus, 3–4 mm diam., stipitatus 7–10 mm.

Scandent herb; *caudex* elongated, rooting at the nodes; *internodes* 17–22 cm long, 5–8 mm diam.; *cataphylls* persisting somewhat intact, to 9 cm long, reddish brown. *Leaves* well dispersed along the stem; *petiole* brown, subterete, sulcate, geniculate at apex, 20–28 cm long, 2–3 mm diam.; *blade* ovate, rounded and sharply cuspidate at apex, rounded at base, spreading at 90° angle from the petiole, 19.5–22.5 cm long, 10.5–12.5 cm wide, $1.75\text{--}1.9 \times$ longer than wide, $0.8\text{--}1 \times$ as long as petiole, weakly glossy and dark green above, subglossy and lighter below; *midrib* moderately raised and concolorous above, round-raised and darker and brownish below; *primary lateral veins* 12–13 pairs, arising at 45--

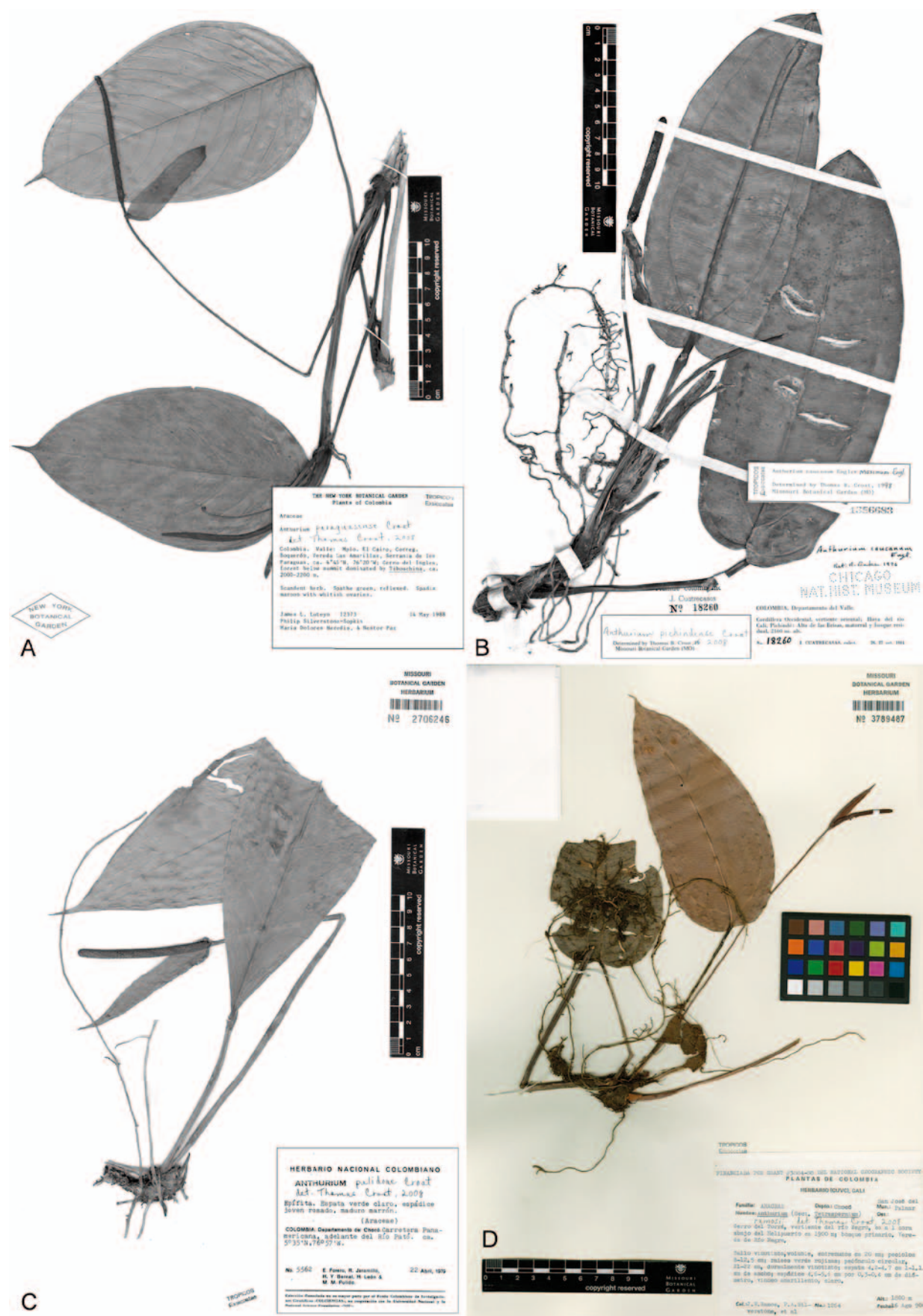


Fig. 11. A: *Anthurium paraguayense* – holotype at MO, Luteyn & al. 12373; B: *A. pichindense* – holotype at F, Cuatrecasas 18260; C: *A. pulidoae* – holotype at MO, Forero & al. 5562; D: *A. ramosii* – paratype at MO, Ramos & Silverstone-Sopkin 1264.

55° angle, only slightly raised and concolorous above, round-raised and darker below, concolorous with midrib; *collective veins* arising from first pair of primary lateral veins, 2–5 mm from margin. *Inflorescences* erect; *peduncle* slender, 28–30 cm long, 2 mm diam., concolorous with petioles; *spathe* lanceolate, reflexed, 6–7 cm long, 1.3–1.7 cm wide, green; *spadix* stipitate for 7–10 mm, narrowly cylindrical, 6.5–11 cm long, 3–4 mm diam., maroon or red-violet. *Flowers* 3.2–3.5 mm long, 2–2.5 mm wide, 3–4 visible per spiral; lateral tepals 1.3–1.5 mm wide, outer margins broadly 2-sided, inner margins straight to concave; pistils whitish.

Anthurium paraguasense is known only from Cerro del Ingles, Serrania de los Paraguas (hence the epithet “paraguasense”) in Colombia (Valle del Cauca) at 2000–2430 m in a Montane rain forest life zone.

The species is a member of *Anthurium* sect. *Xialophyllum* and it is characterised by its long, slender internodes, long-petiolate leaves, narrowly ovate blades, which dry brownish and matte on the upper surface and moderately glossy and greyish yellow-green on the lower surface, as well as by the long-pedunculate inflorescence with a green lanceolate spathe and a stipitate, narrowly cylindrical maroon spadix with whitish pistils.

Anthurium paraguasense is somewhat similar to *A. longigeniculatum* Engl., but that species differs in having shorter internodes, longer petioles and more prominent collective veins running farther from the leaf blade margin. It is also somewhat similar to *A. aristatum* Sodiro but that species differs in having shorter internodes, more prominent and persistent cataphylls, much shorter petioles and narrower blades.

It also somewhat resembles *Anthurium funiferum* Klotzsch & H. Karst. ex Engl., but that species has longer leaves, short internodes and cataphylls persisting as fibres.

Paratype. — COLOMBIA: VALLE DEL CAUCA: Cerro del Ingles, Serrania de los Paraguas, near border Valle-Choco, Mpio. El Cairo, 2070–2430 m, 1.4.1988. P. Silverstone-Sopkin 3955 (CUCV).

***Anthurium pichindense* Croat, sp. nov.**

Holotype: Colombia, Valle, Cordillera Occidental, E slope, hoyá del Río Cali, Pichindé, Alto de las Brisas, 2160 m, 26.–27.10.1944, J. Cuatrecasas 18260 (F). — Fig. 11B.

Internodia 5–14 cm longa, 8–10 mm diam.; cataphylla 6–7.5 cm longa; folia petiolo 14–25 cm longo, 4–5 mm diam., lamina anguste ovato-elliptica, subcordata, 23–27 cm longa, 9–12 cm lata, nervis primariis lateralibus 10–14 utroque; pedunculus 16–19 cm longus, spatha c. 3–5.5 cm longa, 1–1.2 cm lata; spadix 5.5–7 cm longus, 4–6 mm diam., stipitatus 5–9 mm.

Scandent plant; *caudex* elongated, rooting at the nodes; *internodes* 5–14 cm long, 8–10 mm diam.; *cataphylls* membranaceous, 6–7.5 cm long, soon weathering to pale brown fibres. *Leaves* erect; *petiole* 14–25 cm long, 4–5 mm diam., sulcate, winged at base, geniculate at apex; *geniculum* c. 2 cm long, darker than petiole; *blade* narrowly ovate-elliptic, obtuse to almost rounded and weakly acuminate or apiculate at apex, subcordate to rounded at base, 23–27 cm long, 9–12 cm wide, c. 2.5 × longer than wide, 1.05–1.8 × longer than petiole, moderately coriaceous, matte and dark green above, matte and lighter below, drying yellow-brown, sparsely and weakly glandular-punctuate above and more prominently glandular-punctate below; *midrib* moderately raised in valley and concolorous above, drying costate, round-raised and darker below; *primary lateral veins* 10–14 pairs, rising at 75–85° angle, diffuse, connecting to 2nd pair of basal veins; *basal veins* 2 pairs, the outer pair arising from the base and soon merging with the leaf margin, the inner and principal pair arising from the lowermost pair of primary lateral veins and forming the collective veins; *collective veins* arising from 1st pair of primary lateral veins, extending to the apex and running 1–1.5 cm from margin. *Inflorescences* erect; *peduncle* slender, 16–19 cm long, 2–3 mm diam.; *spathe* lanceolate, reflexed, 3–5.5 cm long, 1–1.2 cm wide; *spadix* stipitate 5–9 mm, cylindrical, 5.5–7 cm long, 4–6 mm diam. *Flowers* 2.7–2.8 mm long, 2.3–2.4 mm wide, 7 visible per spiral; tepals semiglossy, sparsely pale-warty, lateral tepals 1.3 mm wide, outer margins 2-sided, inner margins rounded.

Anthurium pichindense is endemic to Colombia, occurring in Valle Department at 2160–2350 m elevation in Premontane moist forest and possibly also in Lower montane moist forest life zones. It is at present known from only two collections, one from the vicinity of Pichindé (hence the epithet “pichindense”) at 3°26'N, 76°37'W and the other at San Antonio west of Cali near the Continental Divide.

The species is provisionally classified as a member of *Anthurium* sect. *Xialophyllum*, closely related to *A. caucanum* Engl., which was placed in that section by Engler (1905). Nevertheless, both *A. caucanum* and *A. pichindense* are an unusual fit in *A. sect. Xialophyllum*, because they have glandular punctations unlike other members of that section. Perhaps they will prove to be more closely related to *A. sect. Porphyrochitonium*, sect. *Digitinervium* or even sect. *Tetraspermium*, which all do have glandular punctations.

The species is characterised by its elongate internodes, persistent, semi-intact to pale fibrous cataphylls, narrowly ovate-elliptic, subcordate yellow-brown-drying blades with two pair of collective veins with broadly spreading lateral veins and especially by its narrowly cylindrical spadix.

Anthurium pichindense is most easily confused with *A. jesuui*, currently considered a member of *A. sect. Digitinervium*. *A. jesuui* differs in having larger blades and a longer, more than 11 cm long, more narrowly tapered spadix.

The species has also been confused with *Anthurium caucanum*, but the leaf blades of that species are typically narrower, usually 3–4 × longer than broad, dry dark brown with the lower surface typically semiglossy and have only a single pair of collective veins

Other species that might be confused with *Anthurium pichindense* are *A. oreodoxum* Sodiro from Ecuador at Volcán Pululahua northwest of Quito in Pichincha Province and *A. macrocephalum* R. E. Schultes from Colombia at eastern slopes in the Cordillera Occidental in Cauca Department. Both species differ in having much larger leaves, more than 25 cm wide, and a much longer spadix exceeding 15 cm.

Paratypes. — COLOMBIA: VALLE: San Antonio, W of Cali, near summit of Continental Divide in the Cordillera Occidental, 1900–2350 m, 26.2.1939, Killip & Hernando Garcia 33878 (US).

***Anthurium pulidoae* Croat, sp. nov.**

Holotype: Colombia, Chocó, Carretera Panamericana, adelante del Río Pató, 5°35'N, 76°W, 22.4.1972, E. Forero, R. Jaramillo, H. Y. Bernal, H. Leon & M. M. Pulido 5562 (MO 2706246; isotype: COL). – Fig. 11C.

Internodia brevia, c. 1 cm diam.; cataphylla 3.5 cm longa; folia petiolo c. 11 cm longo, 5 mm diam.; lamina anguste elliptica, c. 35 cm longa, 9.5 cm lata, nervis primariis lateralibus 13 utroque; pedunculus c. 28 cm longus; spatha c. 10 cm longa, 1.5 cm lata, viridis; spadix stipitatus 1–2 mm, c. 8 cm longus, 6 mm diam., roseus.

Epiphyte; *caudex* short, rooting at the nodes; *internodes* short, c. 1 cm diam.; *cataphylls* membranaceous, persisting semi-intact, eventually as pale fibres, 3.5 cm long. *Leaves* erect; *petiole* sulcate at base, c. 11 cm long, 5 mm diam.; *blade* narrowly elliptic, gradually long-acuminate at apex, acute at base, c. 35 cm long, 9.5 cm wide, 3.6 × longer than wide, 3.3 × as long as petiole, subcoriaceous, drying greyish brown and weakly glossy above, light grey and weakly glossy below; both surfaces of the blades drying matte upon magnification with densely granular surface with a close array of pale short-lineate cellular inclusions; *midrib* conspicuously raised and drying brown above and below; *primary lateral veins* 13 pairs, rising at 45–55° angle, weakly raised above and below, drying whitish above; *collective veins* arising from the 2nd pair of primary lateral veins, 3–5 mm from margin; *basal veins* 2 weak pairs, free to the base, running into the tip of the petiole. *Inflorescences* erect; *peduncle* as thick as petiole, terete, c. 28 cm long, 5 mm

diam.; *spathe* membranaceous, lanceolate, c. 10 cm long, 1.5 cm wide, light green, drying purplish grey; *spadix* stipitate for 1–2 mm, cylindrical, c. 8 cm long, 6 mm diam., pink when young, brownish at maturity. *Flowers* 2.3–2.5 mm long, 2–2.3 mm wide, 6–7 flowers visible per spiral; tepals sparsely pale granular, lateral tepals 1.3–1.4 mm wide, the outer margin 2-sided, inner margin very broadly rounded; *stamens* weakly exerted above tepals then withdrawing mostly beneath the edge of the tepals; anthers 6 mm wide.

Anthurium pulidoae is endemic to Colombia in the Department of Chocó at about 100 m elevation in a Tropical rain forest life zone.

The species is a member of *Anthurium* sect. *Calomystrium* and is characterised by its short stem, short internodes, short, semi-intact cataphylls, sulcate petioles, and especially by its narrowly elliptic grey-brown-drying leaf blades, the pale green, lanceolate spathe and the narrowly cylindroid pink to maroon spadix. Also characteristic are the dense array of short, pale cellular inclusions on both blade surfaces.

The species is most unusual for *Anthurium* sect. *Calomystrium* since most species have more well developed posterior lobes and have thicker and larger cataphylls, which persist intact. In contrast, *A. pulidoi* has narrowly elliptic blades and small cataphylls, which are in part weathering to fibres. Alternatively the species has the pale, linear cellular inclusions, which are commonly present in *A. sect. Calomystrium*.

Anthurium pulidoae is similar to *A. incomptum* Madison, a relatively widespread species with leaf blades of similar size and shape as well as a similar colour. That species differs in having the tertiary veins very prominent, the blades drying reddish brown instead of greyish brown and usually longer internodes. In addition, the epidermis of both leaf surfaces of *A. incomptum* lacks short, pale cellular inclusions and instead the leaf blades often have glossy surfaces upon magnification and frequently have minute dark speckles with the minor veins sometime weakly granular. In contrast, in *A. pulidoae* both surfaces of the blades dry matte upon magnification and are densely granular with a close array of pale short-lineate cellular inclusions.

In the Lucid *Anthurium* key *A. pulidoae* keys closely to *A. bonplandii* Bunting, *A. ernestii* Engl., *A. salviniae* Hemsl., *A. trianae* Engl. and *A. uleanum* Engl. All of these except *A. trianae* are members of *A. sect. Pachyneurium* and all differ in having leaf pyxis involute rather than supervolute. *A. trianae* differs by its glandular-punctations on the lower leaf surface.

Anthurium pulidoae is named in honour of M. M. Pulido, a botanist and graduate of the Universidad Nacional de Colombia in Bogotá. She was a student of Enrique Forero and assisted in collecting the type specimen.

***Anthurium ramosense* Croat, sp. nov.**

Holotype: Colombia, Nariño, Vicinity Ricaurte, along Río Imbí, c. 2–3 km above Ecopetrol Campamento Palmar, 3 km NW of Ricaurte, along trail to Ramos (indigenous settlement), 1°08'N, 77°56'W, 1150 m, 16.3.1990, T. B. Croat 71540 (MO 3790195-96; isotypes: B, COL, F, GH, HUA, K, M, NY, PMA, PSO, QCNE, S, SEL, US). – Fig. 12A–B.

Internodia brevia, 1–7 cm diam.; cataphylls semi-intacta; folia petiolo (41–)83–130 cm longo, (4–)9–12 mm diam., lamina ovato-sagittata, (31–)75–90 cm longa, (20–)58–66 cm lata, nervis primariis lateralibus 3–5 utroque; pedunculus 35–50 cm longus; spatha 17–30 cm longa, 3–4 cm lata, viridis; spadix sessilis, 18–27 cm longus, in sicco 0.5–1.2 cm diam.

Terrestrial plant; internodes short, 1–7 cm diam.; cataphylls semi-intact at upper 1–2 nodes, but soon deciduous or with just the pale bases of the fibres persisting. Leaves with petiole (41–)83–130 cm long, (4–)9–12 mm diam. midway, terete and obtusely, narrowly and obscurely sulcate, tapering towards apex, medium green, weakly glossy, flexible; blade ovate-sagittate, (31–)75–90 cm long, (20–)58–66 cm wide, 1.27–1.38 × longer than wide (juvenile blades to 1.5 × longer than wide), broadest above the petiolar plexus, 0.6–1 × as long as petiole, 24–31 cm long, 20–25 cm wide, abruptly acuminate at apex, prominently lobed at base, coriaceous, dark green and velvety above, much paler and matte below, drying medium green and matte, densely and faintly short-pale-lineate above, pale green and glossy, smooth and unmarked below; anterior lobe 55–65 cm long, broadly rounded along margins; posterior lobes broadly rounded, 22–24 cm long, 23–24 cm wide midway; sinus narrowly spatulate, 20–25 cm deep, (0.5–)3–9 cm wide, with the posterior lobes slightly turned inward; midrib acute and paler above, paler and bluntly acute near the base below, becoming acute towards the apex; primary lateral veins 3–5 pairs, departing midrib at 40–50° angle, paler and acute above, slightly paler and acute below; tertiary veins in part sunken above, raised below; others more numerous and weakly raised below; collective veins arising from the lowermost basal veins, 5–10 mm from margin; basal veins 7–8 pairs, first 3–4 pairs free to the base, the remainder coalesced to varying degrees and branching from the posterior rib; posterior rib thick near the base then tapering, broadly curved, naked (1.5–)5–6 cm. Inflorescence erect; peduncle 35–50 cm long, c. 1 cm diam., drying brownish green, narrowly ribbed, matte; spathe reflexed and sometimes twisted, 17–30 cm long, 3–4 cm wide, light green, tinged purplish on the outside; spadix sessile, tapering towards the apex, 18–27 cm long, drying 0.5–1.2 cm diam., medium green, weakly glossy. Flowers 10–13 visible per spiral, 1.9–2.2 mm long and wide; tepals drying granular, turned up against the emerging pistils, lateral tepals 1–1.2 mm wide, outer margin 2-sided; stamens held in a tight cluster at the

level of the tepals above the tepals; anthers c. 1 mm long and wide, the thecae moderately divaricate; pollen white.

Anthurium ramosense is known only from the type locality in Colombia, in Nariño Department at 1150 m elevation in a Premontane wet forest life zone.

It is a member of *Anthurium* sect. *Cardiolonchium* and is characterised by its short, thick internodes, cataphylls that are semi-intact at upper nodes but are soon deciduous or have just the pale bases of the fibres persisting, terete petioles, which are obtusely, narrowly and obscurely sulcate, ovate-sagittate velvety blades, which are 1.2–1.4 × longer than broad with broadly rounded posterior lobes, 3–5 pairs of primary lateral veins, and by a short-pedunculate inflorescence with a reflexed, twisted green spathe and a medium green moderately tapered spadix.

The species is most easily confused with *Anthurium triciafrankiae*, another new species from the Río Imbí region described in this paper. That species has matte-subvelvety blades that are 1.6–1.9 × longer than wide, collective veins that arise at the first pair of basal veins, more commonly from one of the primary lateral veins, posterior lobes that are significantly longer than broad, 7–8 pairs of primary lateral veins, and typically has stiffly spreading spathes at anthesis (albeit reflexing in fruit) with an olive-green spadix that soon turns reddish. In contrast, *Anthurium ramosense* has blades 1.27–1.38 × longer than wide, collective veins arising from the lowermost basal veins, posterior lobes broadly rounded, 3–5 pairs of primary lateral veins and a medium-green spadix.

The species keys out to *Anthurium chrysolithos* Croat & Oberle in the Lucid *Anthurium* key, but that species has typically smaller leaves usually less than 50 cm long and generally with the collective veins arising from one of the primary lateral veins in the upper half of the blade.

The epithet “ramosense” refers to the indigenous settlement of Ramos, which is situated in the vicinity of the type locality.

***Anthurium ramosii* Croat, sp. nov.**

Holotype: Colombia, Chocó, Cerro Torrá, east slope, above heliport, primary cloud forest, 1920–1950, 11.8. 1998, P. A. Silverstone-Sopkin, N. Paz, R. T. González, J. E. Ramos, L. H. Ramos & A. Henao 4314 (MO 3789486; isotype: CUVC). – Fig. 11. D.

Internodia (11–)20–37 cm longa, (4–)8–12 mm diam.; folia petiolo 8–13 cm longo, lamina ovato-lanceolata, elliptica vel anguste ovato-elliptica, 14–27.1 cm longa, 6–9.7 cm lata, nervis primariis lateralibus 9–14 utroque, nervis basalibus 1–2 utroque; pedunculus 13–33.5 cm longus; spatha 4.2–7.5 cm longa, c. 0.7–1.8 cm lata; spadix stipitatus 3–20 mm, 4.5–9.7 cm longus.



Fig. 12. A–B: *Anthurium ramosense* – two of three sheets of the holotype specimen at MO, Croat 71540; C–D: *A. renteriae* – isotype at MO (C), holotype at COL (D), Gentry & Renteria 23975.

Terrestrial vine; *caudex* elongated and viney, rooting at the nodes; *roots* long and slender, dark green or reddish green; *internodes* terete, (11–)20–37 cm long, (4–)8–12 mm diam., pale yellow-green to violet-purple, drying dark brown with a few narrow ridges; *cataphylls* 5.5–7.3 cm long, clasping stem at base, persisting intact or eventually persisting as light-brown parallel fibres. *Leaves* with *petiole* terete and sulcate, drying prominently sulcate, 8–32.5 cm long, c. 2 mm diam., about 1.3 × longer than blade, purplish brown or light yellowish green, drying medium to dark brown, sometimes black with fungus; *blade* elliptic to narrowly ovate-elliptic, ovate-lanceolate, acuminate to narrowly long-acuminate at apex, slightly subcordate, rounded to narrowly rounded at base, 14–27.1 cm long, 6–9.7 cm wide, averaging 16 × 7 cm, 2.2–3.5 × longer than wide, 1.3–1.4 × as long as petiole, subcoriaceous, drying greyish brown to medium grey and nearly matte to weakly glossy above, greyish yellow-brown to grey-brown and lightly semiglossy below; *upper surface* drying with an irregular surface, densely short-pale-lineate and sparsely glandular punctate; *lower surface* densely and irregularly granular, minutely speckled with reddish brown and more conspicuously glandular-punctate, the linear cellular inclusions present but not conspicuous; *midrib* acute and slightly paler above, somewhat sunken and yellowish above, sharply raised to narrowly round-raised and slightly paler, often white-yellow below; *primary lateral veins* 9–14 pairs, rising at 65–80° angle, flat to weakly raised and concolorous above and only slightly raised to narrowly rounded and paler to concolorous below; *basal veins* 1–2 pairs, the first pair forming the collective veins; *collective veins* arising from 5–14 mm from margin, slightly to much more prominent than the primary lateral veins, weakly loop-connected at the primary lateral veins, the inner pair sunken and concolorous above, drying narrowly raised and concolorous below, the outer pair of collective veins when present merging with the margin near the base then becoming totally marginal to the apex. *Inflorescences* rising at 50–90° angle from each upper node along the stem, running along the subtending petiole; *peduncle* terete, very slender and much longer than petioles, 13–33.5 cm long, c. 1 mm diam. on drying, sometimes violet-purple dorsally; *spathe* greenish pink to red, membranaceous, lanceolate, 4.2–7.5 cm long, c. 0.7–1.8 cm wide, with the base clasping the spadix base, caducous in fruit; *spadix* reddish to red, purplish brown or yellowish purple, stipitate for 3–20 mm, thin and cylindrical when young, becoming thicker and knotty at maturity, 4.5–9.7 cm long, 3–5 mm diam. when young, growing to 7.5 cm long, 6–7 mm diam. in fruit. *Flowers* 4 per spiral, 1.4–2.8 mm long, 1.5–1.7 mm wide, 4–5 visible per spiral; tepals matte, minutely papillate to conspicuously granular on magnification, often with lumpy cellular inclusions, lateral tepals 0.8–1.4 mm wide, outer margin 2-sided to 3-sided and shield-shaped; stigmas purple.

Infructescences erect to 12.5 cm long; *berries* yellow, early-emergent, narrowly ovoid.

Anthurium ramosii is endemic to Colombia in the Department of Chocó, known only from the type locality at 2000 m elevation in a Premontane rain forest life zone.

The species is a member of *Anthurium* sect. *Tetraspermium* and is characterised by its stem with very long internodes rooting at the nodes, cataphylls persisting as fibres, ovate-lanceolate blades, which are glandular-punctate on both surfaces and have close, widely spreading primary lateral veins, long-pedunculate inflorescences with a shortly stipitate reddish or purplish brown spadix and greenish pink spathe, and a violet-purple tint on the internodes, petioles and peduncles.

The species appears to be related to *Anthurium licium* Croat & Oberle, a species that is sympatric with *A. ramosii*, but that species has leaf blades that are more deeply subcordate, more rounded, usually dry reddish brown and have more pronounced primary lateral veins, rising at a more acute angle (50–60° versus 65–80° for *A. ramosii*). *A. licium* also has peduncles that are usually shorter than the petioles instead of being much longer in the case of *A. ramosii*. The species also differs in having green spadices.

The species is named in honour of Jorge Ramos, retired professor at the Universidad del Valle in Cali, Colombia, who, along with Philip Silverstone-Sopkin, collected the type specimen. Ramos made many important collection of *Araceae* in the Department of Valle del Cauca during his long career.

Paratypes. — COLOMBIA: CHOCÓ: San José del Palmar, Cerro del Torrá, slopes above Río Negro, c. 1 hour from the helipuerto, path to Río Negro, 1800 m, 16.8.1990, Ramos & al. 1262 (CUVC, MO), J. E. Ramos & P. A. Silverstone-Sopkin 1264 (CUVC, MO), 12.8.1988, Ramos & al. 1198 (CUVC, MO).

***Anthurium recavum* Croat, sp. nov.**

Holotype: Colombia, Valle del Cauca, along Hwy. 19 from Cali to Buenaventura, E slopes of western Cordillera, c. 4 km W of Salaito, vic. of km 18, 3°30'36"N, 76°37'00"W, 17.7.1997, T. B. Croat & J. F. Gaskin 79940 (MO 04936247; isotypes: CUVC, K, US). – Fig. 13A–C.

Internodia brevica, ad 3 cm longa, 1.5–4 cm diam.; *cataphylla* 10–15 cm longa; *folia* petiolo 15–94 cm longo, *lamina* anguste ovato-sagittata, 18–68 cm longa, 10–28 cm lata, *nervis* primariis lateralibus 4–5 utroque, *nervis* basalibus 5–8 pairs utroque; *pedunculus* (19–)29–40 cm longus, 3–5 mm diam.; *spatha* 10–13 cm longa, 1.5–3 cm lata; *spadix* stipitatus 3–12 mm, 9–15 cm longus, 7–13 mm diam.



Fig. 13. A–C: *Anthurium recavum* – A: habit, *Croat* 79633; B: leaf blade, adaxial surface and inflorescence, *Croat* 56734; C: inflorescence, close-up, *Croat* 70602; D: *A. suramaense* – isotype at COL, *Forero & al.* 3232.

Terrestrial or epiphytic plant; *internodes* short or to 3 cm long, 1.5–4 cm diam.; *cataphylls* persisting intact to semi-intact, reddish brown, 10–15 cm long. *Leaves* with *petiole* terete, obtusely, narrowly and shallowly sulcate adaxially, 15–94 cm long, to 15 mm diam. at base, 8 mm diam. at apex, firm, medium to dark green, semiglossy, reddish and swollen at base; *geniculum* 2–3.5 cm long, 5–8 mm diam., swollen, sometimes tinged violet-purple; *blade* narrowly ovate-sagittate, obtuse and long-cuspidate at apex, prominently lobed at base, 18–68 cm long, 10–28 cm wide, averaging 41.5×17.3 cm, $1.8\text{--}2.6 \times$ longer than wide, $0.6\text{--}1.5 \times$ as long as petiole, subcoriaceous and markedly quilted, glossy or semiglossy, dark or medium green above, moderately paler and sometimes purplish-tinged below, young blades brownish-purple; *anterior lobe* 13–53 cm long, broadly convex along the margin; *posterior lobes* 6–18 cm long, 4–10.5 cm wide; *sinus* narrowly hippocrepiform to spatulate, with the posterior lobes markedly turned inwards and sometimes overlapping, 5.5–17 cm deep, 1–5 cm wide; *major veins* narrowly convex above, paler convex below; *midrib* bluntly acute and weakly paler or concolorous above, acute and slightly paler below; *primary lateral veins* quilted, 4–5 pairs, rising at $60\text{--}75^\circ$ angle, sometimes first arising at a steep angle before spreading narrowly raised, bluntly acute and concolorous in deep, broad valleys above, acutely pleated-raised and slightly paler below; *interprimary veins* lacking; *tertiary veins* in part sunken above, sharply raised below; *collective veins* arising from (1st–)3rd–4th pair of basal veins, rarely (on younger plants) from the lowermost primary lateral veins, prominently loop-connecting the primary lateral veins, 1–6 mm from margin; *basal veins* 5–8 pairs, 1st 1–2 pairs free to the base, 4th–5th(–6th) fused 2.5–4.5 cm; *posterior rib* thick, broadly curved, naked 1.5–5 cm. *Inflorescence* erect; *peduncle* terete, thinner than the petioles, (19–)29–40 cm long, 3–5 mm diam., purplish tinged; *spathe* lanceolate, recurled, 10–13 cm long, 1.5–3.2 cm wide, greenish purple or purple-red to red-violet on both surfaces, glossy; *spadix* stipitate 3–12 mm, cylindrical, 9–15 cm long, 7–13 mm diam., pink, rosy violet, rosy-purple or lavender-purple, glossy. *Flowers* 1.8–2 mm long, 1.7–1.9 mm wide, 8–9 visible per spiral; tepals drying yellowish red-brown, conspicuously granular; lateral tepals 1.3–1.5 mm wide, outer margins 2-sided with each margin somewhat rounded, inner margins rounded; *stamens* white, prominently exerted. *Infructescence* reddish.

Anthurium recavum is endemic to Colombia (Valle del Cauca), known only on the Pacific slope of the Cordillera Occidental at 600–2100 m elevation in Lower montane wet forest, Premontane wet forest and Premontane moist forest life zones.

The species is a member of *Anthurium* sect. *Calomystrium* and is characterised by its terrestrial or epiphytic habit, per-

sistent, intact cataphylls, terete petioles, narrowly ovate-sagittate and moderately glossy blades with prominently quilted-sunken primary lateral veins and a narrow sinus as well as by its purplish spathe and rosy or purple spadix.

Anthurium recavum is similar to another new species, *A. delannayi*, found only in Chocó Province of Colombia, but differs by having short internodes, glossy leaves, and a purplish spathe and rosy spadix (instead of a green spathe and white spadix for *A. delannayi*). It also occurs at higher altitudes than *A. delannayi*, which grows at 300–470 m elevation in a Premontane moist forest life zone.

Anthurium recavum is also somewhat similar to *A. viridescens* Engl. and *A. subtriangulare* Engl., but those species have wider, more triangular leaves instead of the narrowly elliptic leaves of *A. recavum*.

Espinal & Ramos s.n. collected near Paniquitá in Department Cauca in Colombia somewhat resembles *A. recavum* but it occurs on the Central Cordillera and differs by having more elongated leaves that are constricted above the middle and in having a red spathe.

Anthurium recavum is one of the most attractive of all *Araceae* and would be a starling introduction to horticulture.

The species epithet “recavum” comes from the Latin “recavus” meaning “arched inward” or “concave”, referring to the prominently quilted-sunken primary lateral veins, which are one of the principle features of this species.

Paratypes. — COLOMBIA: VALLE DEL CAUCA: Along road around the edge of Lago Calima (situated along highway between Buga and Loboquerero on road to Buenaventura) on steep forested rocky slopes N of lake, $3^\circ 54'N$, $76^\circ 33'W$, 1430 m, 13.5.1983, *Croat 56734* (MO); vicinity of Dapa, northwest of Cali, along Continental Divide, $3^\circ 33'N$, $76^\circ 35'W$, 2000 m, 12.7.1986, *Croat 61417* (MO, COL, HUA, JUAM, USM), *Croat 61419* (MO); Mpio. Cali, Finca Zingara, Cordillera Occidental, eastern slope, 6 km N of km 18 (of Cali–Buenaventura road) by road toward Dapa, $3^\circ 30'N$, $76^\circ 34'W$, 2100 m, 5.5.1995, *P. Silverstone-Sopkin 7561* (CUVC); Cali–Buenaventura just W of the Divide, near km 20.5, 7 km W of Saladita, $3^\circ 30'N$, $76^\circ 14'W$, 2095 m, 26.9.1980, *Croat 50212* (MO); Cali–Buenaventura, km 29, $3^\circ 28'N$, $76^\circ 39'W$, 12.2.1990, *Croat & Jonathan Watt 70496* (MO); Cali–Buenaventura, km 18 from Cali, $3^\circ 25'N$, $76^\circ 38'W$, 1955 m, 13.2.1990, *Croat & J. Watt 70602* (MO); Cali–Buenaventura, km 29, 1 km E of turnoff to Queremal, $3^\circ 30'50''N$, $76^\circ 36'30''W$, 1900 m, 10.7.1997, *Croat & J. F. Gaskin 79633* (CUVC, MO); along old road from Cali to Buenaventura, in valley of Rio Dagua, between villages of La Elasa and La Cascada, c. 6 km E of La Cascada, $3^\circ 36'00''N$, $76^\circ 51'00''W$, 600 m, 28.8.1976, *Croat 38587* (MO); Mpio. Buenaventura, Bajo Calima, Puerto Patino, orillas del rio Calima, 40 m, 19.5.1975, *N. Garcia 5* (CUVC), *J. A. Palta-P. 26* (CUVC).

CULTIVATED. — Colombia, 28.4.1983, *Croat 56361* (MO); United States, Hawaii, cultivated by Windy Aubrey, Hawaii (originally from Colombia, western slopes of Cordillera Occidental, exact locality unknown, sold by Ecuagenera), specimen prepared 13.6.2008, *Croat 100394* (MO).

***Anthurium renteriae* Croat, sp. nov.**

Holotype: Colombia, Chocó, c. 50 km W of Las Animas, c. 4 km E of Río Pato on Panamerican Hwy (under construction), 250 m, A. Gentry & E. Rentería 23975 (COL-204978; isotype: MO 2719131). – Fig. 12C–D.

Internodia brevia c. 1.5 cm diam.; cataphylla ad 16 cm longa; folia lamina anguste oblongo-ovata, 38–41 cm longa, 7.8–9.1 cm lata, nervis primariis lateralibus 12–14 utroque, nervis basalibus 3 utroque; pedunculus c. 31 cm longus, 3 mm diam.; spathe c. 7.5 cm longa, 8 mm lata, viridis; spadix sessilis, c. 7 cm longus, 8 mm diam., viridis.

Epiphyte, rooting at the nodes; internodes short, c. 1.5 cm diam.; cataphylls membranaceous, reddish brown, persisting intact, to 16 cm long. Leaves erect; petiole terete, 26–29 cm long, 4–5 mm diam., geniculate; geniculum c. 1.5 cm long, paler than petiole; blade narrowly oblong-ovate, cuspidate at apex, weakly subcordate at base, 38–41 cm long, 7.8–9.1 cm wide, averaging 40×8.5 cm, 4.5–5 \times longer than wide, 1.4–1.5 \times as long as petiole, subcoriaceous, drying greyish brown and weakly glossy above and below, only slightly paler below; midrib raised and concolorous above, rounded and slightly lighter than the surface below; primary lateral veins 12–14 pairs, rising at 40–50° angle, weakly raised above and below; tertiary lateral veins prominulous; collective veins arising from the 1st pair of basal veins, 3–4 mm from margin; basal veins 3 pairs, all free to the base, the 1st pair arching towards the apex and forming the collective veins. Inflorescences erect; peduncle terete, c. 31 cm long, 3 mm diam.; spathe membranaceous, linear-lanceolate, c. 7.5 cm long, 8 mm wide, green; spadix sessile, cylindrical, c. 7 cm long, 8 mm diam., green. Flowers 1.4–1.6 mm long, 1.7–2 mm wide, sub-4-lobed, 10 visible per spiral; tepals shield-shaped, drying greyish, matte, granular, lateral tepals 0.8–1 mm wide, outer margin 2–3-sided; stamens held just above tepals, anthers 0.2 mm long, 0.4 mm wide, thecae almost rounded, not divaricate.

Anthurium renteriae is endemic to Colombia, known only from the type collection in Chocó Department at 250 m elevation in a Tropical rain forest life zone.

The species is a member of *Anthurium* sect. *Calomystrium* and is characterised by its epiphytic habit, short internodes, persistent, intact, reddish brown cataphylls, long petioles, narrow, \pm oblong, greyish-drying leaves with

rounded or weakly subcordate leaf bases as well as by the long-pedunculate inflorescence with a green spathe and spadix.

Anthurium renteriae is similar to *A. chromostachyum* Croat from Panama, but that species differs in drying brownish rather than greyish, in having narrowly rather than broadly rounded, short posterior lobes and flowers that are about as long as broad, 13–15 visible per spiral with triangular, coarsely pale pustular with stamens all persisting tightly clustered over the stigma just above the tepals and with oblong anthers. In contrast, there are only 10 flowers visible per spiral in *A. renteriae*, they have greyish-drying tepals, the stamens are scattered, not all held together in a tight cluster, and the anthers are oblong.

Anthurium renteriae is dedicated to the Colombian botanist Enrique Rentería, from the Universidad del Chocó in Quibdó, Colombia. Rentería, a former Dean of the Department of Biology at the University, has played a strong role in collecting and in training students in the Department of Chocó. The senior author has fond memories of a long collecting trip with Enrique in Tim Plowman's old Dodge truck in the departments of Cundinamarca, Chocó and Antioquia during May 1983.

***Anthurium sierpense* Croat, sp. nov.**

Holotype: Colombia, Chocó, Hoya del Río San Juan, Quebrada del Sierpe, affluente del Río San Juan, al frente de Palestina, 5 m, 4°10'N, 77°10'W, 24.3.1979, E. Forero, R. Jaramillo, L. E. Forero P & N. Hernández 3879 (MO 2711766; isotype: COL 196150). – Fig. 14A–B.

Internodia brevia, c. 1.5 cm diam.; cataphylla 14–16 cm longa; folia petiolo 35–45 cm longo, lamina anguste ovato-sagittata, 35–40 cm longa, 16.5–18 cm lata, nervis primariis lateralibus 7–8 utroque, nervis basalibus 5–6 utroque; pedunculus 54–64 cm longus; spathe 9.5–13 cm longa, 2.2–3 cm lata; spadix stipitatus 5 mm, 7–7.5 cm longus, creameus; baccae aurantiacae.

Epiphyte; caudex rooting at the nodes; internodes short, c. 1.5 cm diam.; cataphylls membranaceous, 14–16 cm long, persisting intact, drying dark brown. Leaves erect; petiole terete, drying greenish brown, 35–45 cm long, 5–6 mm diam. near base, 3–4 mm diam. at apex, sheathed 8–10.5 cm; geniculum indistinct; blade narrowly ovate-sagittate, widest near base, obtuse and short-acuminate at apex, prominently lobed at base, 35–40 cm long, 16.5–18 cm wide, averaging 38×17.5 cm, 1.9–2.3 \times longer than wide, 0.8–1.1 \times as long as petiole, subcoriaceous, drying dark green and matte above, light greyish brown and semiglossy below; anterior lobe 28–32.5 cm long; posterior lobes 8.5–10 cm long, 7–7.5 cm wide; sinus narrow or closed, with the posterior lobes sharply turned inwards and overlapping, 7–7.5 cm deep, 0.5–2 cm wide; midrib sharply rounded and concolorous below; primary

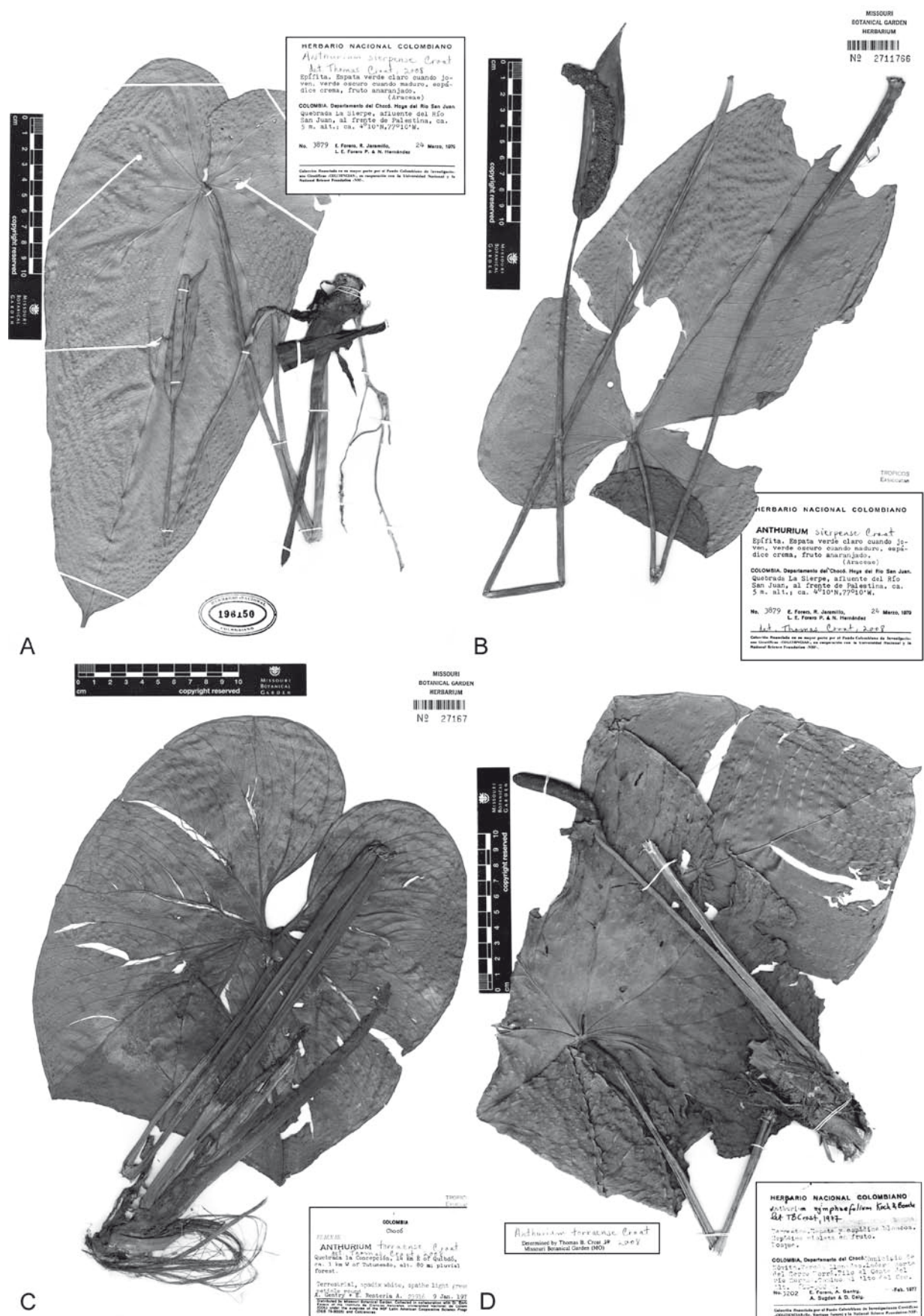


Fig. 14. A–B: *Anthurium sierpense* – isotype at COL (A), holotype at MO (B), *Forero & al.* 3879; C–D: *A. torraense* – paratype at MO, *Gentry & Rentería* 23916 (C), isotype at COL, *Forero* 3202.

lateral veins 7–8 pairs, rising at 50–55° angle, weakly prominent; *collective veins* arising from the 1st pair of basal veins, 3–7 mm from margin; *basal veins* 5–6 pairs, much more prominent than primary lateral veins, 1st three pairs free to the base, the remainder coalesced for c. 1 cm but not forming a prominent posterior rib. *Inflorescences* erect; *peduncle* terete, 54–64 cm long, 4–5 mm diam. near the base, 2–3 mm diam. at apex; *spathe* membranaceous, lanceolate, erect, 9.5–13 cm long, 2.2–3 cm wide, light green when young, dark green when mature, drying greyish purple; *spadix* stipitate for 5 mm, tapering at apex, 7–7.5 cm long, 6 mm diam., cream, drying greyish purple. *Flowers* 9 visible per spiral, 1.3–1.4 mm long, 1.4–1.5 mm wide; tepals matte, pale, evenly and inconspicuously pale granular with fewer dark spots, lateral tepals 0.7–0.8 mm wide, the outer margin \pm shield-shaped, irregularly 4-sided, inner margin narrowly rounded. *Infructescences* erect; *spadix* stubby and rugose, c. 10 cm long, 1.2 cm diam., brown; *berries* orange.

Anthurium sierpense is endemic to Colombia in the Department of Chocó, known only from the valley of the Río San Juan near sea level in a Premontane rain forest transition life zone.

The species is a member of *Anthurium* sect. *Calomys-trium* and is characterised by its epiphytic habit, short internodes, persistent, intact cataphylls, \pm terete petioles, narrowly ovate, deeply sagittate leaf blades with a narrow or closed sinus and the collective veins arising from the first pair of basal veins, as well as by its green spathe, the cream-coloured spadix becoming maroon at maturity and by its orange berries.

The species is similar to *Anthurium obtusilobum* Schott in having leaf blades of similar size and shape, but that species differs in having the collective veins arising from near the base of the blade and in drying more dark brown as well as in having red-violet fruit.

In the Lucid *Anthurium* key the species keys to *A. angustatum* (Kunth) Kunth, but that species is from the Amazonian lowlands in the valley of the Río Orinoco and differs in having the margins of the leaf blade straight to broadly concave and in having a broader spathe with a prominently stipitate spadix.

The species is also similar to *A. sanctifidense* Croat from Panama but that species differs in having much wider leaves with a broadly open sinus and with the collective veins arising from the lower basal veins, and in having longer and thicker fruiting spadices with violet purple berries.

The epithet “sierpense” refers to the collecting locality of the type specimen, the Quebrada La Sierpe.

Paratype. — COLOMBIA: CHOCÓ: Hoya del Río San Juan, Quebrada del Sierpe, affluente del Río San Juan, al frente

de Palestina, 5 m, 4°10'N, 77°10'W, 25.3.1979, *E. Forero*, *R. Jaramillo*, *L. E. Forero* P. & *N. Hernández* 3928 (COL).

***Anthurium suramaense* Croat, sp. nov.**

Holotype: Colombia, Chocó, Municipio de Nóvita, ladera norte del Cerro Torrá, file al oeste del río Surama, Alto del Oso, 1000–1150 m, 22.2.1977, *E. Forero*, *A. Gentry*, *A. Sugden* & *D. Daly* 3232 (MO 2594328; isotype: COL). – Fig. 13D.

Internodia c. 2 cm longa, 1 cm diam.; cataphylla in fibras persistentes soluta; folia petiolo 16–25 cm longo, 3–4 mm diam., lamina ovato-lanceolata, 27–33 cm longa, 12–17 cm lata, ad basim rotundata, nervis primariis lateralibus 12–14 utroque; pedunculus 21–29 cm longus; spathe c. 12.5 cm longa, 1.6 cm lata, viridis; spadix stipitatus 10–12 mm, 8–13 cm longus, 3–4 mm diam., luteus.

Epiphyte; internodes c. 2 cm long, 1 cm diam.; cataphylls persisting as loose fibres. Leaves with petiole terete, 16–25 cm long, 3–4 mm diam. at base; blade ovate-lanceolate, triangular in the upper half, acute and acuminate at apex, broadly rounded at base, widest below middle, 27–33 cm long, 12–17 cm wide, averaging 29 \times 15 cm, 1.7–2.3 \times longer than wide, 1.1–1.6 \times longer than petiole, drying dark green and semiglossy above, pale green and moderately glossy below; midrib narrowly raised and concolorous above, prominently round-raised and paler below; primary lateral veins 12–14 pairs, arising at 30–40° angle, narrowly raised above, round-raised below, concolorous with midrib; tertiary veins prominent, forming a network between the primary lateral veins; collective veins arising from the first pair of basal veins, 2–4 mm from margin; basal veins 3–4 pairs, all free to the base; upper surface drying prominently granular above, sparsely so beneath. Inflorescences erect; peduncle terete, 21–29 cm long, 2–4 mm diam.; spathe membranaceous, linear-lanceolate and acuminate, clasping the base of the stipe, c. 12.5 cm long, 1.6 cm wide, green; spadix stipitate for 10–12 mm, cylindrical, 8–13 cm long, 3–4 mm diam., 29–33 \times longer than broad, yellow. Flowers 7 visible per principle spiral, 4 per alternate spiral, 2.3–2.4 mm long, 1.6–2.4 mm wide; tepals coarsely granular, the outer margin obtusely 2-sided, broadly rounded inside; stamens 1 mm long, 5 mm wide, weakly emergent and persisting in an almost contiguous pattern around the stigma.

Anthurium suramaense is endemic to Colombia (Chocó), in the type locality in Cerro Torrá, near Río Surama (hence the epithet “suramaense”) at 1000–1150 m elevation in a Premontane rain forest life zone.

The species is a member of *Anthurium* sect. *Cardiolonchium* and is characterised by its ovate-lanceolate leaves,

which are triangular at the apex and broadly rounded at the base with the upper surface drying dark green and the lower surface drying light green and have 12–14 pairs of narrowly raised primary lateral veins, its light green spathe and its long-stipitate yellow spadix.

The species seems most closely related to *Anthurium alstonii* Croat, but that species differs by its cordate or subcordate leaves (rather than broadly rounded at the base as in *A. suramaense*) that are less elongated ($1.5 \times$ versus $1.7\text{--}2.3 \times$ longer than wide in *A. suramaense*) and by its usually white or cream spadix, which is $12.8\text{--}16.7 \times$ longer than broad (versus yellow and $29\text{--}33 \times$ longer than broad in *A. suramaense*). It also occurs in a very different environment (Nariño and Valle departments near sea level versus Chocó Department at 1000–1150 m in the case of *A. suramaense*).

***Anthurium torraense* Croat, sp. nov.**

Holotype: Colombia, Chocó, Municipio de Novita, Llanadeas, ladera norte de Cerro Torrá, Filo al Oeste de Río Surama, camino al Alto del Oso, 600–900 m, 22.2.1977, E. Forero, A. Gentry, A. Sugden & D. Daly 3202 (MO 2594618; isotypes: COL, NY). – Fig. 14C–D

Internodia brevia, 1.5–3 cm diam.; cataphylla ad 20 cm longa; folia petiolo 63–73 cm longo, lamina ovato-sagittata 38–48 cm longa, 25–33 cm lata, nervis primariis lateralibus 5–7(8) utroque, nervis basalibus 7 utroque; pedunculus c. 22 cm longus; spatha ovata, c. 10 cm longa, 4.5 cm lata; spadix stipitatus 4 mm, 6–6.5 cm longus, 1–1.1 cm diam., albus; baccae violaceae.

Terrestrial plant; internodes short, 1.5–3 cm diam.; cataphylls persisting intact to semi-intact, to 20 cm long. Leaves with petiole terete, 63–73 cm long, 6–8 mm diam. at base, 3–4 mm diam. at apex; geniculum 1.5–2.5 cm long; blade ovate-sagittate, rounded and shortly acuminate at apex, deeply lobed at base, widest near middle, 38–48 cm long, 25–33 cm wide, averaging 44×30 cm, $1.4\text{--}1.5 \times$ longer than wide, $0.5\text{--}0.7 \times$ as long as petiole, semicoriaceous, drying greyish brown and matte above, slightly lighter and dark-dotted below; anterior lobe 26–35 cm long, broadly convex along margins; posterior lobes rounded and curved inward, 13–16 cm long, 11–12 cm wide; sinus spatulate, 12–13 cm deep, 2–3.5 cm wide; midrib raised and concolorous with the blade above, sharply raised and rounded and concolorous below; primary lateral veins 5–7(–8) pairs, rising at $50\text{--}60^\circ$ angle, raised and concolorous above and below; collective veins arising from 5th–6th pair of basal veins, 2–4 mm from margin; basal veins 7 pairs, 1st 3–4 pairs free to the base, the remainder coalesced to varying degrees and branching from the posterior rib; posterior rib thick, broadly curved, naked 1.5–3.5 cm. Inflorescence erect; peduncle terete, c. 22 cm long, 5–6 mm diam. at base, 3–4 mm diam. at apex; spathe ovate when opened, short-cuspidate, c. 10 cm long, 4.5 cm wide, white or

light green; spadix stipitate for 4 mm, cylindroid and stubby, 6–6.5 cm long, 1–1.1 cm diam., white in bloom. Flowers 12–13 per spiral, 1.7–1.8 mm wide in both directions; tepals minutely and densely pale-granular, lateral tepals 1.2–1.3 wide, outer margin bluntly 2-sided, inner margin broadly rounded; stamens not seen; space between the tepals elongated laterally, 0.15–0.2 mm long. Berries violet.

Anthurium torraense is endemic to Colombia known only from Chocó Department at 80–600 m elevation in a Premontane rain forest transition life zone.

The species is a member of *Anthurium* sect. *Calomys-trium* and is characterised by its terrestrial habit, persistent, intact cataphylls, terete petioles, ovate-sagittate leaf blades with 7 pairs of basal veins and a dark-dotted lower surface as well as by its white to light green moderately broad spathe, white cylindroid spadix and violet berries.

Anthurium torraense is perhaps most similar to *A. nymphaeifolium* K. Koch & Bouché, *A. roezlii* Regel and *A. subcaudatum* Engl., but all three species differ in lacking dark punctations on the lower surface and in generally having fewer primary lateral veins that arise from the upper part of the blade rather than from the lower part in the case of *A. torraense*. In addition, *A. nymphaeifolium* has the collective veins arising from the upper basal veins or the primary lateral veins rather than the lowest basal veins as in *A. torraense*. *A. nymphaeifolium* also has a longer and narrower spadix that is usually pink or red (at least post-anthesis instead of white as in *A. torraense*). *A. roezlii* has very broad cordate spathes and longer spadices as well as much longer peduncles than in *A. torraense*. *A. subcaudatum* also differs from *A. torraense* in having its collective veins arising from the upper basal veins and a V-shaped sinus without a prominent posterior rib.

The Lucid key to *Anthurium* suggests *A. obtusilobum* Schott and *A. veichii* for this species, but the latter has a much longer leaf blade and the former has a much narrower, typically more dark-drying leaf blade and a proportionately narrower spadix and a narrow spathe not so much longer than the spadix.

The epithet “torraense” refers to the type locality, Cerro Torra.

Paratypes. — COLOMBIA: CHOCÓ: Quebrada La Concepción, 14 km E. of Quibdó, c. 1 km W of Tutunendo, 80 m, 9.1.1979, A. Gentry & E. Rentería A. 23916 (JAUM, MO).

***Anthurium triciafrankiae* Croat, sp. nov.**

Holotype: Colombia, Nariño, Río Imbi, vic. Ricaurte, c. 2–3 km above Ecopetrol Campamento Palmar, 3 km NW of Ricaurte, along trail to Ramos (indigenous settlement), 1150 m, $1^\circ 08'N$, $77^\circ 56'W$, 16.3.1990, T. B. Croat 71500 (MO 3790185–88; isotypes: B, COL, CUV, F,



Fig. 15. *Anthurium triciafrankiae* – A: habit; B: stem, cataphylls and inflorescence at anthesis and 2 post-anthesis inflorescences; C: inflorescence at anthesis (side view); D: infructescence. – Photographs from *Croat 71500*.

G, GB, HUA, K, M, NY, PSO, QCNE, US, VEN). – Fig. 15A–D.

Internodia brevia, 1–5 cm diam.; folia petiolo (20–)58–68 cm longo, (3–)8–10 mm diam., lamina anguste ovato-sagittata, (24–)60–77 cm longa, (10–)34–47 cm lata, lobo anteriori 46.5–50 cm longo, lobis posterioribus 18–21 cm longis, 12.5–13.5 cm latis, nervis primariis lateralibus 7–10 utroque, nervis basalibus (6–)8–11 utroque; pedunculus (13–)19–20 cm longus; spatha (14.5–)19–25 cm longa, 2.5–3 cm lata, viridis; spadix sessilis vel 5–7 mm stipitatus, 24–35 cm longus, (0.8–)1–1.4 cm diam., in sicco olivaceus.

Epiphyte; stems to c. 1 m long; internodes short, 1–5 cm diam., medium green matte; cataphylls semi-intact at 2nd or 3rd node, thin, light brown, becoming pale and fibrous at base, then deciduous. Leaves with petiole (20–)58–68 cm long, (3–)8–10 mm diam. midway, terete with an obscure raised sulcate area adaxially, medium green, matte; blade narrowly ovate-sagittate, (24–)60–77 cm long, (10–)34–47 cm wide, 1.6–1.9 × longer than wide, broadest above the petiolar plexus, 0.94–1.04 × as long as petiole narrowly acuminate at apex, deeply lobed at base, subcoriaceous, dark green and velvety matte above, slightly paler and weakly glossy below, drying medium grey-green and matte above, pale greenish yellow and weakly glossy below; anterior lobe 46.5–50 cm long, broadly convex along margin; posterior lobes 18–21 cm long, 12.5–13.5 cm wide, markedly turned inward; sinus narrowly obovate, 12–16 cm deep, (4.5–)8–10 cm wide; major veins drying nearly concolorous above, paler on lower surface; midrib narrowly rounded above at base and paler, becoming acute toward the apex above, prominently convex and much paler below; primary lateral veins 7–10 pairs, departing midrib at 45–55° angle, narrowly raised and paler above and below; tertiary veins in part weakly raised above and below, mostly flattened and darker below; collective veins arising from the 1st pair of basal veins or more commonly from one of the primary lateral veins from near the base to near the upper $\frac{1}{3}$ of the blade; basal veins (6–)8–11 pairs, 1st–2nd free to the base, the remainder coalesced to varying degrees and branching from the posterior rib, the 6th–8th fused 11–12 cm; posterior rib thick, broadly curved, naked (2–)3–9 cm. Inflorescence erect; peduncle (13–)19–20 cm long, drying dark greyish green, narrowly ribbed, matte, shorter than spadix; spathe (14.5–)19–25 cm long, 2.5–3 cm wide (to 5 cm wide in fruit), medium green, spreading, moderately brittle; spadix sessile or stipitate 5–7 mm, 24–35 cm long, drying (0.8–)1–1.4 cm diam., rounded at apex, olive-green, semiglossy, turning red after anthesis. Flowers 12–13 visible per spiral, 2.3–2.9 mm long, lateral tepals 1.2–1.6 mm wide, the outer margin obtusely shield-shaped to 2-sided, inner margin rounded; stamens held briefly above the tepals, shrinking back to level of tepals, anthers 0.8 mm long, 0.4 mm wide, thecae narrowly

triangular. Inflorescence spreading-pendent, to 63 cm long; berries red.

Anthurium triciafrankiae is known from southwestern Colombia in Nariño Department and in northwestern Ecuador in Carchi Province at 1100–1200 m elevation in a Premontane wet forest life zone.

The species is a member of *Anthurium* sect. *Cardiolonchium* and is characterised by its epiphytic habit, short internodes, ovate-elliptic, sub-triangular, matte-subvelvety leaf blades with broadly undulate margins. Especially characteristic is the greenish spadix at anthesis, which is pollinated by small wasp-like insects.

Anthurium triciafrankiae somewhat resembles *A. lucorum* Engl., but it differs by having its collective veins emerging from the first pair of basal veins or the lower primary lateral veins rather than from the uppermost primary lateral veins as in the case of *A. lucorum*. *A. triciafrankiae* also resembles *A. hodgei* Croat & al., but that species has the collective veins arising from the lower basal veins, very short peduncles and a long, pronouncedly tapered spadix. *A. angelopolisense* from Antioquia Department is also similar to *A. triciafrankiae*, but that species differs in having the collective veins arising from the third or fourth pair of basal veins instead of the first pair (as in *A. triciafrankiae*) and the greenish spadix, not turning reddish after anthesis. *A. cirinoi* (described elsewhere in this paper) also somewhat resembles *A. triciafrankiae*, but it does not have a prominent posterior rib as *A. triciafrankiae* and its collective veins arise from one of the lowest basal veins.

Another species in Nariño that should be compared with *Anthurium triciafrankiae* is *A. ramosense* Croat, also described in this paper. That species is known from the Ricaurte region at 1150 m in a Premontane wet forest and differs in having more broadly ovate, more velvety leaf blades, which are 1.1–1.3 × longer than broad with collective veins arising from near the base and extending rather evenly along the margin, have more broadly rounded posterior lobes and 3–5 pairs of primary lateral veins, a reflexed and twisted spathe and a medium green spadix. In contrast, *A. triciafrankiae* has matte-subvelvety blades that are 1.6–1.9 × longer than wide, collective veins that arise at the first pair of basal veins more commonly from one of the primary lateral veins, posterior lobes that are significantly longer than broad, 7–8 pairs of primary lateral veins, typically stiffly spreading spathes at anthesis and an olive-green spadix soon turning reddish.

The species epithet honours Tricia Frank, an extraordinary lady who has done more than any other person in maintaining and supporting the International Aroid Society through the many years that it has served as the primary focal point for the study of *Araceae*. Tricia was there at the beginning of the IAS's foundation and has served in many capacities (including Board Member and

President) to keep the organisation functioning but primarily as its long serving Treasurer. It was usually Tricia who was the centre of organisation for the Annual Show and Sale, not necessarily the one with the centre of attention but the quiet force that kept on providing. This beautiful aroid will remain as a tribute to her dedication to aroids, a group that she loves and grows so well at her marvellous property near Fairchild Garden. The senior author is sure that he will one day return to her property to see *Anthurium triciafrankiae* adorning the shady and craggy limestone walls of her yard.

Paratypes. — COLOMBIA: NARIÑO: Río Imbi valley, Pas-to-Tumaco, vicinity of “Palmar”, 3 km NW of Ricaurte, c. 1 km E of Texas Gulf Pipeline Maintenance Station, 1100 m, 1°08'N, 77°56'W, 14.3.1990, *Croat 71465* (MO). ECUADOR: CARCHI: El Chical–Tobar Donoso, along Río Chical, 0.6 km W of center of El Chical, 0°56'57"N, 78°14'11"W, 1200 m, 7.8.2004, *Croat & G. Ferry 92930* (B, COL, F, K, M, MO, NY, QCNE, S, UB, US, USM).

***Anthurium venadoense* Croat, sp. nov.**

Holotype: Colombia, Antioquia, Parque Nacional Natural “Las Orchideas”, Sector Venados, margen derecha de camino hacia Venados arriba, 900 m, 6°33'N, 76°19'W, 7.1.1988, A. Cogollo, J. G. Ramírez & O. Alvarez 3358 (MO 4252618; isotype: JAUM). – Fig. 16A.

Internodia brevia, ad 6 mm longa, 5–6 mm diam.; cataphylla 3.5–8.5 cm longa; folia petiolo 3.7–5.7 cm longo, subtereti, lamina anguste oblongo-oblancheolata, 25.7–38.5 cm longa, 2.5–3.9 cm lata, nervis primariis lateralibus 5–8 utroque; pedunculus 13–20.5 cm longus, 1–2 mm diam.; spathe viridis, 4–6.7 cm longa, 8–9 mm diam.; spadix viridis, 3.2 cm longus, 3 mm diam., stipitatus 2–2.3 cm.

Epiphyte at 2.2–2.5 m from the ground; internodes usually short, to 6 mm long, 5–6 mm diam.; cataphylls 3.5–8.5 cm long, persisting intact, drying matte, pale yellowish green. Leaves with petiole 3.7–5.7 cm long, subterete, sulcate adaxially, drying pale yellow-green, matte, sheathed 1.5–2.5 cm at base; geniculum; blade narrowly oblong-oblancheolata, 25.7–38.5 cm long, 2.5–3.9 cm wide, 8.3–11.5× longer than wide, 6.4–9.4× longer than petiole, narrowly long-acuminate at apex, cuneate at base, dark green and weakly glossy above, slightly paler and semiglossy below, drying dark yellowish grey-green above, slightly paler and greenish below; midrib drying narrowly rounded and concolorous above, narrowly rounded and slightly paler below; primary lateral veins 5–8 pairs, arising at 35–60° angle, scarcely more prominent than the interprimary lateral veins; collective veins arising from the base, 2–6 mm from the margin, scarcely raised and concolorous above, weakly raised and concolorous below; upper surface smooth, unmarked; lower surface slightly paler and weakly dark

granular below, lacking any glandular punctuations. Inflorescences erect; peduncle slender, 13–20.5 cm long, 1–2 mm diam.; stipe 2–2.3 cm long, c. 1 mm diam.; spathe green, spreading to reflexed, 4–6.7 cm long, 8–9 mm wide, spadix green, narrowly cylindroid, 3.2 cm long, 3 mm diam., about 10× longer than wide. Flowers 2–3 visible per spiral; tepals smooth, lateral tepals 1.5–1.6 mm wide, outer margin 2–3-sided, inner margin rounded; anthers yellow. Inflorescence pendent; berries violet-purple at maturity, early-emergent, c. 1 cm long, 5–6 mm diam., narrowly ovoid.

Anthurium venadoense is endemic to Colombia, known only from Antioquia in the Parque Nacional Natural “Las Orchideas” at 785–880 m elevation in Premontane rain forest life zone.

The species is a member of *Anthurium* sect. *Xialophyllum* and is characterised by its epiphytic habit, slender internodes, intact cataphylls, short petioles, narrowly oblong-oblancheolata, narrowly long-acuminate, greenish drying leaf blades, the slender peduncle, the green spathe, the narrowly long-stipitate, green, narrowly cylindroid spadix with only 2–3 flowers visible per spiral and the violet-purple berries.

Anthurium venadoense is perhaps most closely related to *A. iltisii* Croat from Ecuador, but that species differs in having fibrous cataphylls. In addition, the flowering part of the spadix (excluding the stipe) of *A. venadoense* is proportionately much shorter (only about 10× longer than wide versus about 20× longer than wide in *A. iltisii*) and the stipe is proportionately longer in *A. venadoense*, comprising about 40 % of the total length of the spadix (versus less than 10 % in *A. iltisii*). The flowering portion of the spadix in *A. venadoense* is thus 1.3× longer than the stipe, whereas is 9.1× longer in *A. iltisii*.

Paratypes. — COLOMBIA: ANTIOQUIA: Parque Nacional Natural “Las Orchideas”, Sector Venados, margen derecha de camino hacia Venados Arriba, 785–880 m, 6°33'N, 76°19'W, 5.6.1988, A. C. & J. G. Ramírez 3259 (JAUM, MO); Parque Nacional Natural “Las Orchideas”, División entre los Municipios de Urrao y Frontino, Finca La Lola, cabaña de INDERENA de Río Calles, 1410 m, L. Escobar, Saul Hoyos, Juan Hernández, Beatriz Madrigal 1776 (HUA).

***Anthurium vientense* Croat, sp. nov.**

Holotype: Colombia, Cauca, along road between Popayan and Viente de Julio, Parque Nacional Munchique, 7 km W of summit of Cordillera Occidental, 3 km E of Viente de Julio, 2090 m, 2°31'50"N, 77°00'23"W, 20.7.1997, T. B. Croat & J. F. Gaskin 80148 (MO 4929500; isotype: CAUP). – Fig. 16B.

Internodia 2–4 cm longa, 4 cm diam.; folia petiolo 85.5 cm longo, 5–6 mm diam., lamina 66.5 cm longa,



Fig. 16. A: *Anthurium venadoense* – holotype at MO, Cogollo & al. 3358; B: *A. vientense* – holotype at MO, Croat 80148; C–D: *A. yatacuense* – two of the three sheets of the holotype specimen at MO, Croat 79655.

45 cm lata, nervis primariis lateralibus 11 utroque, nervis basalibus 6(–7) utroque; spadix stipitatus 8 mm, viridis, 19 cm longus.

Terrestrial on steep bank; *internodes* 2–4 cm long, 4 cm diam.; *cataphylls* 7.5–10 cm long, thick, persisting semi-intact at upper nodes, persistent as pale fibres, finally deciduous. *Leaves* with *petiole* firm, dark green, semiglossy, 85.5 cm long, 5–6 mm diam. and greyish brown on drying, terete, sharply and weakly 1-ribbed near apex, 9-ribbed on one side in basal half; *geniculum* 2 cm long, drying darker than petiole; *blade* 66.5 cm long, 45 cm wide, $1.4 \times$ longer than wide, $0.77 \times$ as long as the petiole, gradually acuminate at apex, prominently lobed at base, subcoriaceous, semiglossy, moderately bicolorous; *anterior lobe* 49.5 cm long, broadly rounded along the margin; *posterior lobes* 20 cm long, 18.5 cm wide, broadly rounded at apex; *sinus* narrowly hippocrepi-form, 13.5 cm deep, 4 cm wide; *basal veins* 6(–7) pairs, 1st–3rd pair free to the base, 5th–7th fused for 3.5 cm, the 6th–7th fused for 4.5 cm; *midrib* acute and slightly paler above (moderately paler in the lower part), acute and paler below, 3-ribbed near base, drying \pm concolorous above, paler beneath; *primary lateral veins* 11 pairs, narrowly acute above, bluntly acute below, drying the same shape, \pm concolorous; *collective veins* arising from one of the lowermost pairs of basal veins, 2–6 mm from the margins; *tertiary veins* in part raised below, drying equally prominent on both surfaces. *Inflorescence* erect; *spathe* 17 wide, 3.5 cm wide, pale green, soft but not brittle; *spadix* stipitate for 8 mm, pale green, 19 cm long, drying 9 mm diam. *Flowers* 6–8 visible per spiral, 2.6 mm long and wide; tepals conspicuously granular, lateral tepals 1.2 mm wide, the outer margins 2-sided, the inner margin round; *pistils* emergent; *stamens* held at the level of the tepals, anthers 0.7–0.9 mm long and wide, thecae scarcely divergent; pollen white.

Anthurium vientense is endemic to Colombia, known only from the type locality in Cauca Department between Munchique and Viente de Julio at 2090 m in a Premontane rain forest transition to Tropical wet forest life zone.

The species is a member of *Anthurium* sect. *Cardiolonchium* and is characterised by its terrestrial habit, internodes moderately short, cataphylls thick and semi-intact at upper nodes, then deciduous, petioles subterete, sharply and weakly 1-ribbed near the apex and several-ribbed on one side in the basal half, by the subcoriaceous, semiglossy blades with the midrib acute on the upper surface and 3-ribbed on lower surface near the base, with the collective veins arising from near the base and with the reticulate veins prominulous on both surfaces upon drying.

The species is probably closest to *Anthurium angelopolisense*, another species in *A.* sect. *Cardiolonchium*, in

which the collective veins arise from near the base of the blades. That species differs in having matte-subvelvety, somewhat thinner veins which dry with the reticulate venation must less prominent.

The epithet “vientense” refers to the town Viente de Julio near the type locality.

***Anthurium yatacuense* Croat, sp. nov.**

Holotype: Colombia, Valle del Cauca, Queremal–Anchicayá, 3 km W of Queremal, 3°31'00"N, 76°44'00"W, 1400 m, 10.7.1997, T. B. Croat & J. F. Gaskin 79655 (MO 4941926–28; isotypes: B, COL, CUV, F, HUA, K, M, NY, US). – Fig. 16C–D.

Internodia 4–6 cm longa, 1.5–1.7 cm diam.; *cataphylla* ad 33 cm longa; *folia* petiolo 40–79 cm longo, 4–7 mm diam., lamina late ovata, 24–50 cm longa, 10–36 cm lata, nervis primariis lateralibus 28–32 utroque, nervis basalibus 1–2(–3) utroque; *pedunculus* 13–26 cm longus, c. 2 mm diam.; *spatha* 8–15 cm longa, 8–14 mm lata, viridis; *spadix* stipitatus 2–10 mm, 9–30 cm longus.

Terrestrial plant to 1.5 m tall; *internodes* elongate, 4–6 cm long, 1.5–1.7 cm diam.; *cataphylls* to 33 cm long, persisting intact for a while then reduced to fibres surrounding the caudex. *Leaves* erect; *petiole* terete or subterete, narrow and obtusely sulcate, medium green, semiglossy, almost matte, geniculate at apex, 40–79 cm long, 4–7 mm diam.; *geniculum* c. 1 cm long, darker than the petiole; *blade* broadly ovate, long-cuspidate at the apex, rounded or subcordate at the base (rarely acute), rounded or triangular, widest near the base, 24–50 cm long, 10–36 cm wide, averaging 39×25 cm, 1.2 – $2.5 \times$ longer than wide, 0.5 – $0.7 \times$ as long as petiole, subcoriaceous, almost matte and medium-green above, moderately paler and semiglossy below, sometimes turning purplish red along with most of the other parts of the plant upon drying; *posterior lobes* broadly rounded; *midrib* raised above, thicker than broad below; *primary lateral veins* 28–32 pairs, arising at 60–85° angle, quilted-sunken and concolorous above, prominently raised and nearly concolorous below; *collective veins* arising from the 1st–2nd pair of primary lateral veins or the 1st–2nd pair of basal veins, 2–5 mm from margin; *basal veins* 1–2(–3) pairs, free to the base. *Inflorescences* erect; *peduncle* terete, much thinner and shorter than petioles, 13–26 cm long, c. 2 mm diam.; *spathe* membranaceous, lanceolate, reflexed-spreading, 8–15 cm long, 8–14 mm wide, green and sometimes tinged purple at edges; *spadix* stipitate for 2–10 mm, very long and thin, often curved, tapering slightly towards the apex, 9–30 cm long, 4–5 mm diam. near the base, 3–4 mm diam. at the apex, yellow to pale violet-purple at anthesis, becoming brownish-green, yellow-brown or dark purple after anthesis. *Flowers* 5–6 visible per spiral, 2.5–3.5 mm long, 2–2.5 mm diam.; tepals papillate-granular, lateral tepals 1.5 mm wide, outer margins obtusely 2-sided, inner mar-

gins rounded; *stamens* barely emergent, 0.6 mm wide; pollen \pm golden. *Infructescences* erect; *spadix* to 1.7 cm wide in the lower part due to the exerted fruits, remaining thin (c. 4 mm) towards the apex; *berries* first green then wine-coloured (pale violet-purple), red at maturity, oblong-elliptic, truncate and depressed at apex, 8 mm long, 5 mm diam.; *seeds* hemispheroid, 4 mm long, broadly ellipsoid in face view, the appendix on one end only.

Anthurium yatacuense is endemic to Colombia (Valle del Cauca), known only from the western slopes of the Andes near the Continental Divide between Cali and Buenaventura at 580–1400 m in Premontane rain forest and Premontane wet forest life zones.

The species is a member of *Anthurium* sect. *Polyneurium* and is recognised by its terrestrial habit to 1.5 m tall, the cane-like stem with long internodes, semi-intact to fibrous cataphylls, moderately thin, narrowly ovate leaf blades with many primary lateral veins, long-cuspidate apex and rounded to subcordate base, as well as by the green spathe, the dark violet-purple spadix and red berries.

The species is perhaps most easily confused with *Anthurium macrolobium* Sodiro, but it differs by the well-developed posterior rib, which is lacking in *A. yatacuense*.

The species is perhaps most closely related to *Anthurium cuspidatum* Mast., *A. daguense* Engl. and *A. rivulare* Sodiro. In contrast to *A. yatacuense*, those three species have short internodes and cordate leaves with far fewer primary lateral veins. *A. cuspidatum* also has narrower leaves, while *A. daguense* has a larger inflorescence with a thicker spadix.

The species is named for the region where the type was collected. While the name Yatacué does not appear in the wording of the actual type collection, most of the collections of this species were made near the Corporación Valle de Cauca Camp Yatacué, which is a watershed reserve near the hydroelectric camp on the Río Anchicayá.

Paratypes. — COLOMBIA: VALLE DEL CAUCA: Near Yatacué, Alto Anchicayá, near CVC hydroelectric plant headquarters, valley of Río Dagua (tributary of Anchicayá), 3°38'N, 76°45'W, 710–800 m, 16.7.1984, A. Gentry & M. Monsalve 48195 (MO); along old road Buenaventura from Cali, 29 km from jct. of New Cali-Buenaventura Hwy, 1.1 km S of entrance to Queremal, 52.7 km N of Agua Clara, 3°30'N, 76°44'W, 1350 m, 9.7.1993, Croat & D. Bay 75597 (MO); road from El Danubio, just below CVC camp “Yatacué” (Alto Anchicayá), 3°30'N, 76°52'W, 580 m, 7.2.1984, A. Juncosa 2049 (MO); along old highway between Cali and Buenaventura, 28 km beyond the junction with the new hwy (20 km W of Borrero Ayerbe and 7 km W of El Salado), 1400–1420 m, 28.8.1976, Croat 38634 (COL, MO); Anchicayá, at hydroelectric plant, 22.2.1971, Helen Kennedy 729 (DUKE); Yatacué,

CVC camp at Anchicayá, 3°40'N, 76°50'W, 700–900 m, 25.2.1983, A. Gentry, A. Juncosa & F. Gomez 40790 (COL, MO); Queremal–Anchicayá, 3 km W of Queremal, 3°31'00"N, 76°44'00"W, 1400 m, 10.7.1997, Croat & J. F. Gaskin 79676 (MO); Estacion Microndas Tokio, 8 km W of Queremal (along old road to Buenaventura), 2°27'N, 76°45'W, 26.9.1980, Croat 50140 (MO); 27.9.1980, Croat 50179 (MO), Croat 50185 (MO).

Philodendron cardonii Croat & M. M. Mora, **sp. nov.**

Holotype: Colombia, Antioquia, San Luis, valley of Río Claro, 27 km E of entrance to San Luis, 53 km E of Río Calderas, 5°53'30"N, 74°51'20"W, 500 m, T. B. Croat & F. Cardona 97893 (MO 5962586-87; isotypes: HUA, K, US). – Fig. 17A–D.

Internodia (1.5–)6–12 cm longa, 1–2.5 cm diam., cataphylla ad 20 cm longa; folia petiolo 11–48 longo, lamina ovato-elliptica, 21–48 cm longa, 7.5–24 cm lata, nervis basalibus 3–4 utroque, nervis primariis laterilibus 12–15 utroque; pedunculus 4–6 cm longus; spathe 10–15 cm longa, 1.3 cm diam., viridis; spadix 12 cm longus, 1.3 cm diam.

Hemiepiphyte or epiphyte; *internodes* \pm terete, (1.5–)6–12 cm long, 1–2.5 cm diam., medium green and weakly glossy, becoming light yellow-brown and semiglossy; *cataphylls* to 20 cm long, medium green, semiglossy, sharply 1-ribbed below middle, sharply 2-ribbed toward apex, prominently purple-spotted at base, deciduous. *Leaves* spreading; *petiole* thicker than broad, narrowly rounded abaxially, sharply and deeply sulcate above sheath, 11–48 cm long, sheathed 9–17.5 cm, medium green, weakly glossy, matte and dark green short-lineate toward apex, weakly glossy and purple-spotted near base; *blade* narrowly ovate-elliptic, tapering towards the apex and ending with a short acumen, truncate at the base with the larger leaves becoming sagittate, 21–48 cm long, 7.5–24 cm wide, averaging 32×14 cm, 2–2.9 \times longer than wide, 1.2–2 \times longer than petiole, subcoriaceous, dark green and semiglossy above, paler and glossy below; *midrib* slightly paler, flattened at base, broadly convex toward apex above, paler and purple spotted, narrowly rounded, thicker than broad below; *primary lateral veins* 12–15 pairs, rising at 60–70° angle, weakly quilted-sunken and concolorous above, convex and dark purple below; *minor veins* fine, moderately obscure below; *basal veins* 3–4 pairs, all free to the base. *Inflorescence* 1 per axil; *peduncle* 4–6 cm long, whitish, obtusely flattened; *spathe* 10–15 cm long, 1.3 cm diam. on tube, pale green and matte to weakly glossy outside, greenish white throughout inside except dark red-purple in lower $\frac{1}{3}$ of tube, glossy with orange resin canals in lower $\frac{2}{3}$ of spathe (those on coloured part whitish); *spadix* 12 cm long, female part 5.3 cm long in front, 3.7 cm long in rear, pale yellow-green; *pistils* 1.5 mm long, 1.5 mm diam.; stigma 0.2 mm thick, 0.6 mm diam.; locules 5; ovules 2 per locule, borne

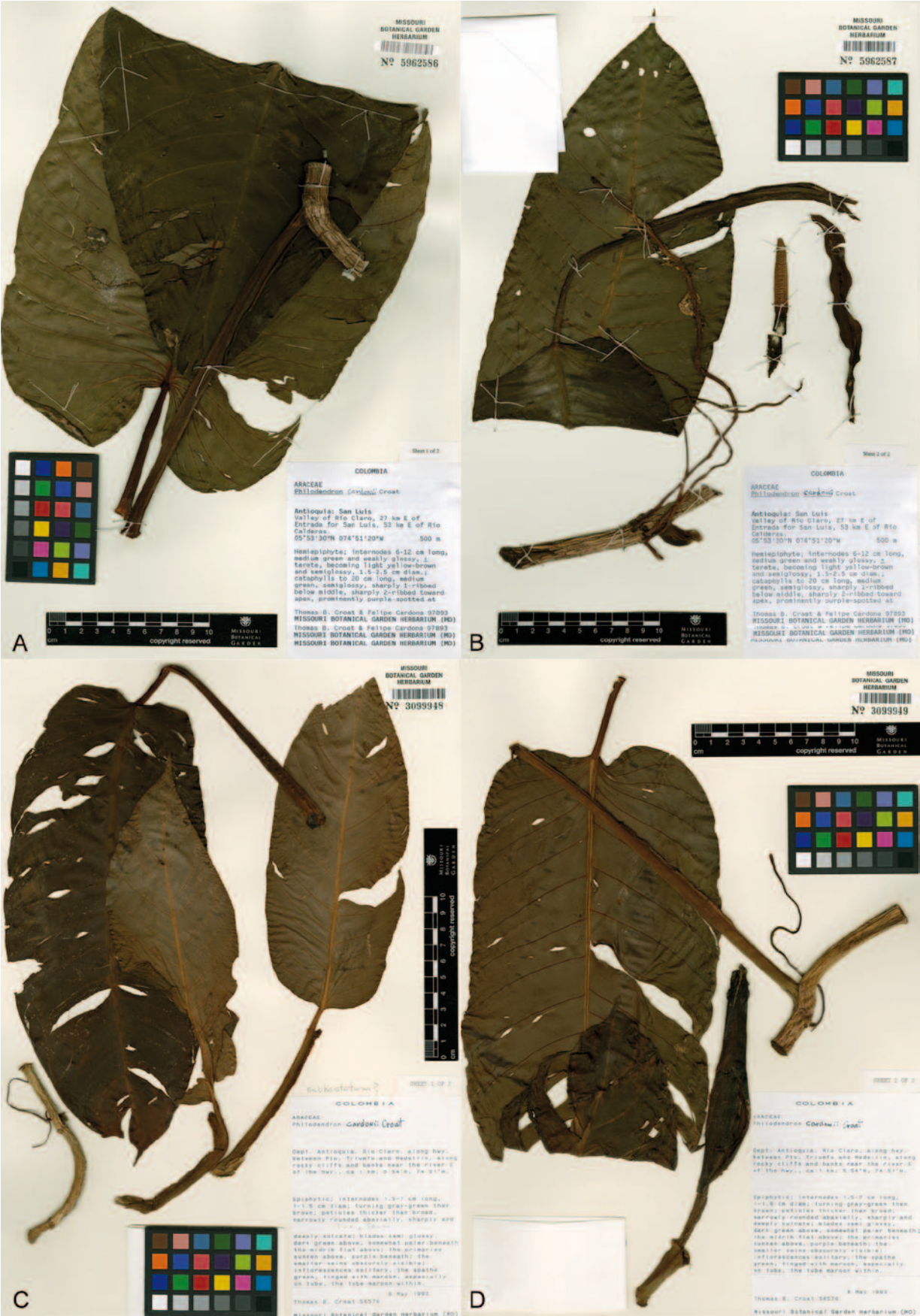


Fig. 17. *Philodendron cardonii* – A–B: the two sheets of the holotype specimen at MO, Croat & Cardona 97893; C–D: the two sheets of the paratype specimen Croat 56576.

in oblong-elliptic transparent mucilaginous sacs; placentation basal.

Philodendron cardonii is endemic to Colombia (Antioquia) in the valley of Río Claro, at 500 m elevation in a Tropical wet forest life zone.

Philodendron cardonii is a member of *P.* subg. *Philodendron*, probably a member of sect. *Macrobium*, but further classification is not possible without further studies. It is characterised by its elongated internodes, its narrowly ovate-elliptic leaves, which are truncate or sagittate at the base, have 12–15 pairs of primary lateral veins and 3–4 pairs of basal veins all free to the base, and its spathe, which is pale green outside and dark red-purple inside the lower part of the tube.

The species is named in honour of the senior author's good friend Felipe Cardona, Curator of the herbarium at the Universidad de Antioquia in Medellín, who is one of the principal aroid taxonomists in Colombia. Cardona is a specialist with *Spathiphyllum* and is one of the principal authors of the *Araceae* treatment for the Flora de Antioquia as well as one of the principal editors for the *Araceae* treatment for the Flora de Colombia.

Paratypes. — COLOMBIA: ANTIOQUIA: San Luis, valley of Río Claro, along highway between Pto. Triunfo and Medellín, along rocky cliffs and banks near the river S of highway, 8.5.1983, Croat 56576 (JAUM, MO).

***Philodendron devianum* Croat, sp. nov.**

Holotype: Colombia, Valle, Mun. Yotoco, Cordillera Occidental, E slope, along hwy. from Dapa and Loboguerrero at Parque Nacional Yotoco, 3°52'N, 76°22'W, 17.2.1990, T. B. Croat & W. Devia 70714 (MO 3786479-480, isotypes: B, COL, CUV, F, HUA, K, NY, US). – Fig. 18A–B.

Planta terrestris, internodia 2–5 cm longa; folia petiolo 52–80 cm longo, acute applanato, lamina late ovata, 29–50 cm longa, 25–42 cm lata, ad basim cordato-sagittata, nervis primariis lateralibus 5–6 utroque; pedunculus 6.5–8 cm longus; spatha 13–14 cm longa, 2.5 cm diam., extus marronina, intus atomarronina.

Terrestrial.

Juvenile plants with internodes 2–5 cm long, 1.5 cm diam.; cataphylls to 12 cm long. *Leaves* with petiole to 29 cm long, sharply flattened laterally, 8–10 mm diam., margins thin; blade broadly ovate-cordate, 18–20 cm long, 13–15 cm wide, 1.3–1.45 × longer than wide, c. 0.6 × as long as petiole, abruptly long-acuminate at apex, prominently lobed at base; primary lateral veins 3–4 pairs; basal veins 6–8 pairs.

Adult plants with internodes 2–5 cm long, dark green, moderately glossy, short white-streaked near nodes; cataphylls moderately fleshy, unribbed near base, acutely D-

shaped toward middle, soft, medium green, deciduous except for a thin layer of the base which may adhere to stem. *Leaves* with petiole 52–80 cm long, obtusely flattened (preadult petioles sharply D-shaped), dark green with even darker streaks; blade broadly ovate, deeply cordate-sagittate at base, abruptly acuminate at apex, 29–50 cm long, 25–42 cm wide, 1.1–1.15 × longer than wide, dark green and glossy above, moderately paler and matte below, drying dark grey-green and weakly glossy above, yellow-brown and matte below; margins broadly rounded; anterior lobe 21–36 cm long, margins broadly rounded; posterior lobes 12–20 cm long, 10–18 cm wide; sinus obovate to narrowly hippocrepiform, 7–12 cm deep, 5–6 cm wide; midrib obtusely broad-flattened and concolorous above, convex below, drying concolorous above, slightly paler than surface below; primary lateral veins 5–6 pairs, arising at 45–50° angle, deeply sunken above, convex below; minor veins darker, fine, moderately distinct; basal veins 11 pairs, the 1st and 2nd pair free to the base, 5th and higher order veins coalesced 2.5–3 cm into a posterior rib. *Inflorescences* 1–3 per axil; peduncle 6.5–8 cm long, pale green, coarsely white-streaked near apex; spathe 13–14 cm long, 2.5 cm diam. when furled, semiglossy, tube flattening to 10 cm wide, maroon outside, except pale green along margins, dark maroon and glossy inside, drying dark brown; blades medium green tinged purplish violet along margins outside, and throughout much of the lower half of white inner surface, the constricted area flattening to 3 cm wide; spadix 10.5–13.3 cm long; pistillate portion 5 cm long, drying 10–11 mm diam., greenish-white; staminate portion 7–8.5 cm long, drying 11–12 mm diam., cream; pistils 2.4–2.6 mm long, 2.2–2.4 mm diam., locules 3–4; style 1.2–1.5 mm diam., drying light yellow-brown, conspicuously granular, stigma 3.5–4.2 mm diam., drying blackened with a distinct depression medially; ovules 1 per locule, basal; seeds 1.7–1.2 mm long, 0.8–1 mm diam., medium-dark yellow-brown, one end with a somewhat constricted nipple.

Philodendron devianum is endemic to Colombia, known at present only from the type locality in Parque Nacional Yotoco in Valle Department at 1485–1500 m on the eastern slopes of the Cordillera Occidental.

It is apparently a member of *Philodendron* subg. *Philodendron* sect. *Macrobium* subsect. *Glossophyllum* series *Ovata* and is characterised by its sharply flattened juvenile petioles, sharply D-shaped pre-adult petioles, obtusely flattened adult petioles, broadly ovate-cordate blades which are glossy above and matte below. It differs from most species in that section by the glossy upper surface of the leaf blades.

Philodendron devianum is somewhat similar to *P. merenbergense* (also published in this article), but it differs by having larger leaves, which are more deeply lobed and



Fig. 18. A–B: *Philodendron devianum* – two of the three sheets of the holotype specimen at MO, Croat & Devia 70714; C–D: *P. mcphersonii* – two of the four sheets of the holotype specimen at MO, McPherson 13315.

have a distinct posterior rib, and by its much larger inflorescences (spathe 13–14 cm long in *P. devianum* versus 5–6 cm long in *P. merenbergense*).

The species is named in honour of the Colombian botanist Wilson Devia Alvarez, Director of the Herbarium TULV in Tuluá, Valle, Colombia. Wilson arranged the field trip on which we collected the type specimen. He has made many collections of *Araceae* in the Department of Valle.

***Philodendron mcphersonii* Croat, sp. nov.**

Holotype: Colombia, Antioquia, Municipio San Carlos, along creeks leading into ISA hydroelectric dam reservoir, 6°00'N, 75°00'W, 775 m, 30.11.1988, G. McPherson 13315 (MO 3640354-57; isotype: HUA). – Fig. 18C–D.

Internodia brevia, c. 5 cm diam.; cataphylla c. 42 cm longa, decidua; folia petiolo 67–99 cm longo, c. 1.5 cm diam., lamina ovato-sagittata, 84–99 cm longa, 60–74 cm lata, lobo anteriori 46–99 cm longo, lobis posterioribus 20–30 cm longis, 21–31 cm latis, nervis primariis lateralibus 5–6 utroque, nervis basalibus 9 utroque; pedunculus 10–14 cm longus, 4–5 mm diam.; spatha 10–15 cm longa, 2.5–3.5 cm diam., ad basim rubra, ad apicem alba; spadix 12–13 cm longus.

Thick-stemmed epiphyte on tree trunk; *stems* with mucilaginous, reddish-brown latex; *internodes* short, c. 5 cm diam., drying dark brown; *cataphylls* 2-ribbed, c. 42 cm long, drying dark brown, deciduous. *Leaves* large; *petiole* terete with tiny ridges, sulcate at the base, 67–99 cm long, c. 1.5 cm diam., drying dark brown, sheathing to c. 6 cm; *blade* ovate-sagittate, 84–99 cm long, 60–74 cm wide, 1.3–1.4 × longer than wide, 1–1.3 × as long as petiole, abruptly long-acuminate at apex, conspicuously lobed at base, subcoriaceous, drying dark grey-green above and light grey-green below, matte on both sides, often ripping apart along some minor veins upon drying; *anterior lobe* 46–69 cm long, broadly convex along the margins; *posterior lobes* 20–30 cm long, 21–31 cm wide, extending inward and sometimes overlapping; *sinus* broadly spatulate, 21–31 cm deep, 6–9 cm wide; *midrib* prominent, flattened and slightly lighter than the blade above, rounded and dark yellow-brown below; *primary lateral veins* 5–6 pairs, arising at 60–85° angle, flattened above and rounded below, concolorous with midrib; *basal veins* 9 pairs, the 1st pair free to the base, the remaining fused to various extent and branching at various intervals on both sides of the posterior rib; *posterior rib* thick, free for c. 7 cm and then extending and branching inside the posterior lobe; *minor veins* numerous and conspicuous, arising from both the midrib and the primary lateral veins and forming a dense network of closely parallel finely raised veins covering the surface of the blade. *Inflorescences* 3 per axil; *peduncles* 10–14 cm long, 4–5 mm diam., drying dark brown; *spathe* 10–15 cm long, 2.5–3.5 cm diam., tube red, blade white;

spadix 12–13 cm long, slightly shorter than spathe, green or white; staminate portion 5–6 cm long, 1–1.5 cm diam.; sterile portion 0–1.2 cm long, 6–8 mm diam.; pistillate portion 5.5–7.5 cm long, 2–2.5 cm diam.; pistils 4.5–5 mm long, 3.5–4 mm diam., stigma 1.5 mm wide, 0.3 mm thick; locules 5, ovules 5–8 per locule with axile placentation, branching from a single point on the midportion of the locule, 0.15 mm long; seeds cylindrical, 1–1.5 mm long, constricted near the apex.

Philodendron mcphersonii is endemic to Colombia (Antioquia), at 200–1875 m elevation in Premontane rain forest, Tropical moist forest and Tropical wet forest transition life zones.

The species is a member of *Philodendron* subg. *Philodendron* sect. *Philodendron* subsect. *Philodendron* series *Philodendron* and is characterised by its epiphytic habit, short thick internodes, 2-ribbed, deciduous cataphylls, terete petioles with tiny ridges and drying dark brown, large ovate-sagittate matte blades, which dry grey-green above with finely raised veins and grey-green below with dark yellow-brown major veins on lower surface, as well as by its clusters of up to 3 inflorescences per axil with green or red and white spathes.

Philodendron mcphersonii somewhat resembles *P. zhuanum* Croat of Panama, but that differs by its larger and broader leaves (blade length/width ratio of 1.3–1.4 for *P. mcphersonii* versus 1.8–2 for *P. zhuanum*), its strong posterior rib naked to 7 cm, and its somewhat smaller inflorescences.

The species is named in honour of Dr Gordon McPherson from the Missouri Botanical Garden who collected the type specimen. McPherson has played many important roles as a collector, especially in Panama, Colombia and New Caledonia. His collections are always of the highest quality.

***Philodendron merenbergense* Croat, sp. nov.**

Holotype: Colombia, Huila, Cordillera Central, Finca Merenberg, 100 km E of Popayán, 2300 m, 2°16'N, 76°12'W, 5.12.1980, T. B. Croat 51899 (MO 3658968-69; isotypes: COL, K, US). – Fig. 19A.

Internodia 1–8 cm longa, 1.5–2.5 cm diam.; cataphylla ad 14 cm longa, 2-costata; folia petiolo 20–32 cm longo, lamina ovato-cordata vel subcordata, 17–22 cm longa, 11–14.5 cm lata, nervis primariis lateralibus 5–6 utroque, nervis basalibus 3–4 utroque; pedunculus 5–6.5 cm longus, c. 2 mm diam., spatha 5–6 cm longa, extus rubella, intus alba; spadix 4.5–4.8 cm longus, parte pistillata viridis, 2–3 cm longa.

Terrestrial plant; *stems* 1 or more metres long, rooting at the nodes; *internodes* 1–8 cm long, 1.5–2.5 cm diam., grey-green, drying medium yellow-brown and longitudi-



Fig. 19. A: *Philodendron merenbergense* – holotype at MO, Croat 51899; B–C: *P. patriciae* – leaf blade, abaxial surface and inflorescence (B), inflorescence, close-up (C), Croat 101145; D: *P. urraoense* – holotype at MO, Pipoly & al. 17670.

nally ridged; *cataphylls* to 14 cm long, reddish, sharply 2-ribbed, clasping the base of the petiole at first then deciduous. *Leaves* clustered at the top of the stem; *petiole* obtusely flattened adaxially, moderately soft, sulcate base, 20–32 cm long, 5–7 mm diam. in the lower half, 2–3 mm diam. near apex, drying dark brown; *blade* ovate-cordate to subcordate, 17–22 cm long, 11–14.5 cm wide, averaging 18.5×12.5 cm, $1.4\text{--}1.55 \times$ longer than wide, $0.55\text{--}0.85 \times$ as long as petiole, abruptly acuminate at apex, cordate at base, subcoriaceous, drying yellow-brown and matte on both surfaces, lighter below; *midrib* flat and drying dark brown above, raised and lighter coloured below; *primary lateral veins* 5–6 pairs, arising at $30\text{--}50^\circ$ angle, flat above and slightly raised below, concolorous with midrib; *basal veins* 3–4 pairs, all free to the base; *minor veins* somewhat obscure and diffuse, those veins visible moderately widely spaced, the surfaces obscurely areolate when magnified. *Inflorescences* 2–4 per axil; *peduncles* terete, 5–6.5 cm long, c. 2 mm diam., drying dark brown; *spathe* 5–6 cm long, constricted in the middle between the tube and blade sections, faintly reddish outside, whitish on tube within at anthesis; *spadix* 4.5–4.8 cm long; staminate portion white, 2.2–2.5 cm long, 2.5–3 mm diam., the constricted part just above the sterile portion, 1.2–2 mm diam., sterile male portion indistinct, 4.5 mm long, 1.8 mm diam., the staminodia with pistilodes; pistillate portion green, 2–3 cm long, 4 mm diam.; pistils 1.5–1.6 mm long, stigma 1.6–1.8 mm wide, irregularly rounded; locules 3(–4) per ovary; style 0.3 mm diam., raised with a pale margin, funnel-shaped; ovary 1 per locule; 0.15 mm long; *Infructescences* remaining female portion of spadix c. 4.4 cm long, 7 mm diam.; *fruits* green; *seeds* 1.8 mm long, 1 mm diam.

Philodendron merenbergense is endemic to Colombia, known only from the type locality at Finca Merenberg (hence the epithet “merenbergense”) in Huila Department in the Cordillera Central at 2300 m elevation in a Lower montane rain forest life zone.

The species is a member of *Philodendron* subg. *Philodendron* sect. *Macrobolium* subsect. *Oligocarpidium* and is characterised by its terrestrial habit, short thick internodes that dry medium yellow-brown and longitudinally ridged, the slender, soft obtusely flattened petioles, the ovate-cordate yellow-brown drying blades and especially by the clusters of tiny faintly reddish inflorescences in several upper leaf axils.

Philodendron merenbergense somewhat resembles *P. strictum* G. S. Bunting, but the latter has much larger leaves, which are more deeply lobed and have a prominent posterior rib (which is absent in *P. merenbergense*) and also has much larger spathes (13–18 cm versus 5–6 cm long in *P. merenbergense*). *P. merenbergense* also somewhat resembles *P. devianum* Croat, but that species generally has larger leaves, which are more deeply cor-

date or broadly sagittate, and especially has much larger inflorescences (14–15 cm versus 5–6 cm long in *P. merenbergense*).

***Philodendron patriciae* Croat, sp. nov.**

Holotype: Colombia, Chocó, Quibdó–Lloró, c. 1 km E of turn-off to Lloró from the Quibdó–Las Animas rd., $5^\circ 29'N$, $76^\circ 35'W$, 100 m, original collector unknown, cultivated at Huntington Botanical Garden, vouchered by Dylan Hannon, July 2009, T. B. Croat & D. Hannon 101145 (MO 6126462; isotypes: B, COL, K, MO, US). – Fig. 19B–C.

Internodia 3–11 cm longa, 0.5–2 cm diam.; cataphylla ecostata, decidua; folia petiolo (9–)14–56 cm longo, lamina ovato-lanceolata vel elliptica, ad basim subcordata vel rotundata, (19–)34–97 cm longa, (3–)6–19 cm lata, nervis primariis lateralibus 12–19 utroque; pedunculus c. 5 cm longus; spatha 16–17 cm longa; spadix 14–15 cm longus.

Appressed-climbing epiphyte; *stems* short, rooting at the nodes; *internodes* 3–11 cm long, 0.5–2 cm diam., becoming brown; *cataphylls* green, 31–50 cm long, unribbed, weathering \pm intact (persistent, at least in part, to 9 internodes back), quickly drying dark brown, ultimately deciduous. *Leaves* pendent on adult plants, on adult plants, *petiole* firm, terete, sulcate at base, (9–)14–56 cm long, (2–)3–8 mm diam. near base, (1–)3–5 mm near apex, thinly winged for 3–9 cm, drying dark brown; *blade* ovate-lanceolate to elliptic, subcordate or rounded at base, (19–)34–97 cm long, (3–)6–19 cm wide, averaging 53×11 cm, $3.9\text{--}6 \times$ longer than wide, $1.5\text{--}2.4 \times$ longer than petiole, cuspidate at apex, subcordate at base, thinly coriaceous, dark green and concolorous, matte above, glossy below, somewhat quilted in age, drying dark brown above, lighter brown below; *midrib* convex above and whitish, bluntly triangular below; *primary lateral veins* 12–19 pairs, arising at $70\text{--}75^\circ$ angle, quilted-sunken above, convex below; basal veins 1–3 pairs, all free to the base; *minor veins* obscurely visible, running closely parallel to each other and to the primary lateral veins. *Inflorescences* 1–2 per axil; *prophylls* deciduous intact, 19–22 cm long; *peduncle* short, c. 5 cm long, 1.3 cm diam. at apex; *spathe* 16–17 cm long, tube c. 6 cm long, 2×3 cm wide, lacking any obvious resin canals inside, scarcely or not at all constricted above the tube, outside light green and semiglossy with a purplish tinge at the base, inside weakly glossy and dark red in tube, gradually paler and glossier above tube, more nearly red-violet on middle of blade, with the upper margins and apex white; *spadix* 14–15 cm long; *staminate* portion white, 8.8 cm long, 1.4×1.2 cm wide on fertile staminate portion, sterile staminate portion c. 1.5 cm long, 1.3–1.5 cm wide; *pistillate* portion green, 5.2 cm long in front, 3.8 cm long in the rear, 1.3–1.5 cm wide at base, $1.2 \text{ cm} \times 1.4 \text{ cm}$ diam. midway; pistils 2–2.2 mm long, 3.5–4 mm diam., style 0.8–1.2 mm wide, donut-shaped (torus) with a central depression, loc-

ules 7, ovules axile, 10–12 per locule, c. 0.1 mm long, borne in two rows and contained within and evenly spaced along the axis of translucent envelope which is 0.8–1. mm long, 0.2–0.3 mm wide.

Philodendron patriciae is endemic to Colombia known at present only in Chocó Department in the area of Tutunendo and in the type locality near the Río Atrato on the road to Lloró from 150–400 m.

The species is a member of *Philodendron* subg. *Philodendron* sect. *Philodendron* subsect. *Canniphyllum*. The ovules are arranged axially and number up to at least 10 per locule, so it appears certainly to be a member of *P.* sect. *Philodendron*. It is characterised by its short stems and pendent narrow blades, which are matte and become undulated in age. As an adult plant the species is one of the most attractive species in the genus.

Philodendron patriciae is seemingly closest to *P. rhodospathiphyllum* Croat & D. C. Bay from Valle Department in the Bajo Calima region and at Yatacué in the Alto Anchicaya basin. That species differs in having persistent cataphylls, blades that are merely rounded at the base and has spathes that are yellow-green inside.

Since the senior author first saw this species many years ago he intended to name it *Philodendron splendidum* because he thought it was one of the most spectacular species of *Philodendron* that he had ever seen, especially when it was fully grown. Photographs of the plant were distributed and this name was used in casual correspondence for some time while he hoped for a proper type specimen. However, in the meantime that epithet was used by Eduardo Gonçalves for a Brazilian species. Thus in this publication another name, *P. patriciae*, is being published.

The species is named in honour of the senior author's wife, Patricia Swope Croat, hence the epithet "patriciae". I have always been reluctant to name any species in honour of anyone who did not have a direct role in the discovery of a given species, but I have made exceptions (see for example *Anthurium birdseyanum* and *A. triciafrankiae* in this paper). In fact, my wife Patricia probably has been more responsible for the discovery of more *Araceae* than anyone else by allowing me (the senior author) to spend more than 40 years in the tropics. Though I have been away from home up to 4 months a year (even when my children were small and needed a father), Pat allowed me to leave home on field trips without ever complaining about my absence. She also helped me with field work in the earlier years directly by participating in field trips, helping to press plants, doing work in the greenhouse, and a myriad of other projects, especially the more technical areas such as the production of images for my scientific papers. This beautiful new species is a tribute to her many efforts on behalf of aroid research.

Paratypes. — COLOMBIA: CHOCÓ: Quibdó–Lloró, c. 5 km E of turn-off to Lloró from the Quibdó–Las Animas rd., c. 5 km E of turn off, 5°29'N, 76°35'W, 16.4.1983, *Croat 56008* (B, COL, HUA, K, MO, US); Quibdó–Lloró, c. 5 km E of turn-off to Lloró from the Quibdó–Las Animas rd., departing just S. of Río Atrato near km marker 76 near Yuto, 0.3 km S of bridge over Río Yuto, 0.6 km E of main Quibdó–Las Animas Road, 5°31'11.2" to 5.3"N, 76°43.9 to 30.5"W, 15.8.1997, *Croat 80864* (B, COL, CUV, F, GH, HUA, K, M, MO, NY, QCNE, S, UB, US); c. 10–15 km S of Quibdó on road to Ismina on Pan-American Hwy and 8–10 km E on road to petroleum exploration camp, 5°35'N, 76°37'W, 90 m, *Grayum, Hammel, Kress & G. Brown 7650* (MO); Jequedó, 41 km W of Las Animas on Pan American Hwy. (under construction), c. 10 km E of Río Pato, 220 m, 12.1.1979, *A. Gentry & E. Renteria A. 24115* (MO).

***Philodendron pipolyi* Croat, sp. nov.**

Holotype: Colombia, Antioquia, Municipio Urrao, zona limítrofe del Parque Nacional Natural Las Orquideas, Vereda Calles, 6°32'N, 76°19'W, 1450–1500 m, 30.11.1993, *J. W. Rodríguez & D. Alvarez 17409* (MO 04603592; isotypes: JAUM, K). – Fig. 20A–B.

Internodia 2.5–5 cm diam., cataphylla, ad 28 cm longa, decidua; folia petiolo 38–52 cm longo, lamina ovato-sagittata, 38–51 cm longa, 32–38 cm lata, lobo anteriori 27–40 cm longo, lobis posterioribus 14–20 cm longis, 11–14 cm latis, nervis primariis lateralibus 14–18 utroque, nervis basalibus 9–13 utroque; pedunculus (4–)8–15 cm longus; spatha (5–)6–9 cm longa, 6–8 mm diam.; spadix 9.5–10.3 cm longus.

Climbing, sprawling terrestrial or epiphytic plant; *internodes* elongated, 2.5–5 cm diam., the epidermis light brown, cracking transversely and exfoliating; *cataphylls* to 28 cm long, drying dark brown, deciduous. *Leaves* large; *petiole* whitish striate, convex below, more shallowly convex above, margins rounded, 38–52 cm long, 1.1–1.3 cm diam. at base, 7–8 mm diam. at apex, sheathing to c. 11 cm; *blade* ovate-sagittate, widest just above the petiole attachment, 38–51 cm long, 32–38 cm wide, 1.2–1.35 × longer than wide, 0.9–1.3 × as long as petiole, gradually acuminate at apex, conspicuously lobed at base, subcoriaceous, virtually concolorous, glossy on both sides, drying light brown; *anterior lobe* 27–40 cm long, broadly convex along the margins; *posterior lobes* 14–20 cm long, 11–14 cm wide, rounded at apex and extending inward; *sinus* hippocrepiform to spatulate, 9–13 cm deep, 3–10 cm wide; *midrib* flattish above and paler than the blade, convex below; *primary lateral veins* 14–18 pairs, arising at 50–70° angle, sunken above and C-shaped below, drying concolorous with the blade above, dark brown below; *basal veins* 9–13 pairs, the first 1–3 pairs free to the base, the remaining fused to various extent and branching from the posterior rib; *posterior rib* thick,

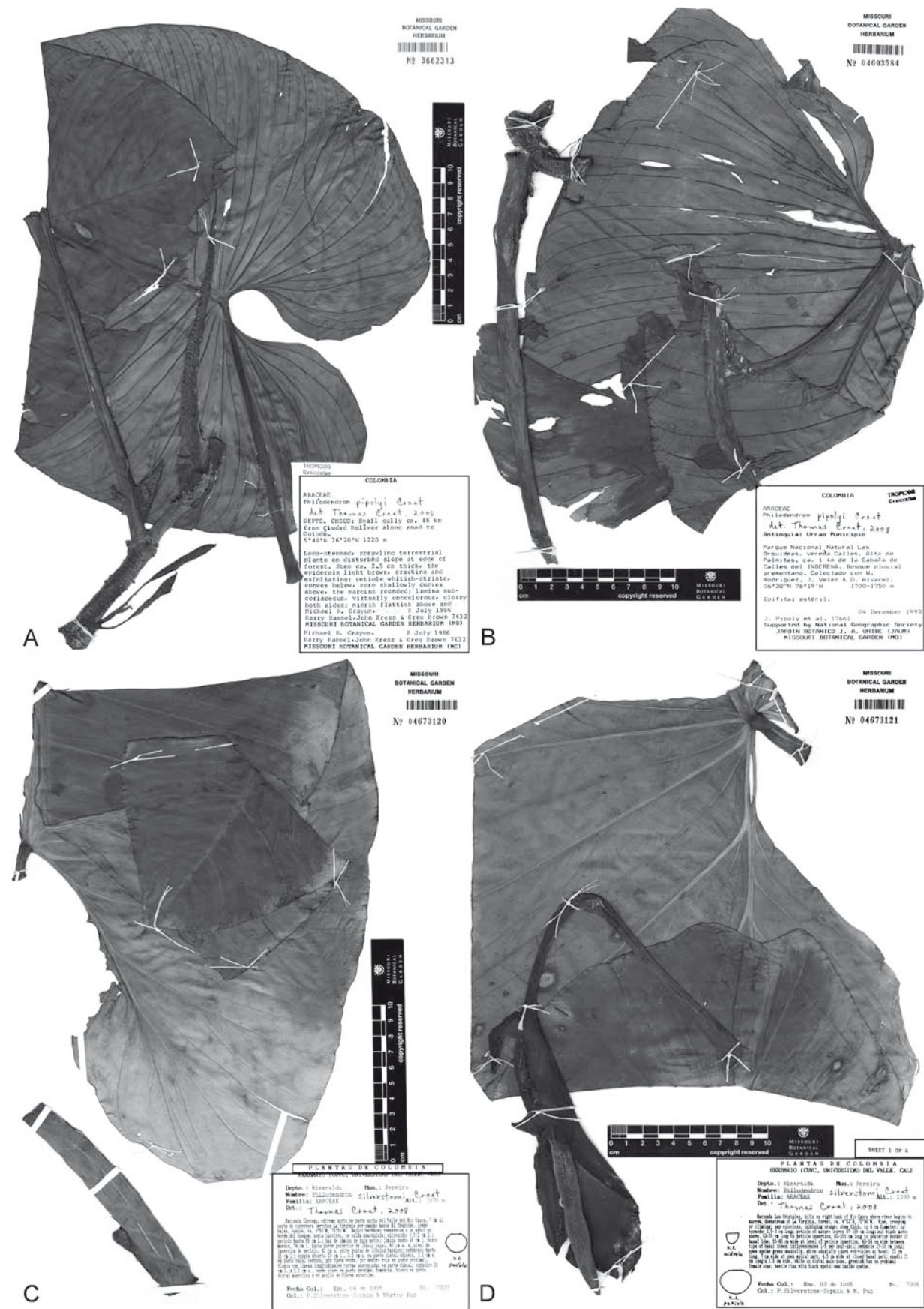


Fig. 20. A–B: *Philodendron pipolyi* – paratypes at MO, Grayum & al. 7632 (A), Pipoly & al. 17661; C–D: *P. silverstonei* – paratype at MO, Silverstone 7337 (C), one of four sheets of the holotype at MO, Silverstone 7305.

free for 2–3 cm and then extending for a short distance into the posterior lobes before splitting into individual basal veins; *minor veins* visible below, darker, forming a network of closely parallel veins between the primary lateral veins. *Inflorescences* 1–4 per axil; *peduncle* terete, (4–)8–15 cm long, 2–3 mm diam., finely whitish striate, drying medium brown; *spathe* (5–)6–9 cm long, with tube about half the length of the spathe, 6–8 mm diam., blade slightly open, 8–10 mm diam., spathe white, yellow-green, light green with reddish apex or magenta (on both surfaces as described by Grayum & al. 7632); *spadix* 9.5–10.3 cm long, white, cream, green with reddish tip, sometimes with staminate portion yellow-orange; pistillate portion 5.3–5.5 mm diam. at base and at apex, 6.5 mm diam. midway; staminate portion 4.8–5.3 cm long, sterile staminate portion 4.6 mm long, 4.5 mm diam., scarcely distinguishable from the fertile staminate flowers; *pistils* 1.1–1.3 mm, 1.2–1.6 mm diam., stigmas 0.6 mm diam., 0.1–0.2 mm thick; locules 6–7 per ovary, ovules 1–2 per locule, 0.13 mm long, the funicle affixed at one side of the base, c. 0.5 mm long; placentation basal.

Philodendron pipolyi is endemic to Colombia and known only from the Parque Nacional de las Orquídeas in Antioquia and Chocó Departments at 1220–1750 m in Premontane rain forest and Premontane moist forest life zones.

The species is a member of *Philodendron* subg. *Philodendron* sect. *Macrobelium* subsect. *Oligocarpidium* characterised by its climbing and sprawling, generally epiphytic habit, its broad ovate-sagittate leaves 1.2–1.35 × longer than wide and widest just above the petiole attachment, its numerous (14–18 pairs) primary lateral veins, its 9–13 pairs of basal veins forming a relatively short posterior rib, and its 1–4 small inflorescences per axil.

Philodendron pipolyi somewhat resembles *P. clewelii* Croat, a Panamanian species, which also has small inflorescences, but that species only has 4–6 widely spaced primary lateral veins instead of the 14–18 pairs found in *P. pipolyi*; it also has much fewer basal veins (3–4 pairs instead of 9–13 pairs for *P. pipolyi*). In addition, *P. clewelii* has the stem epidermis deeply folded longitudinally but otherwise not transverse-fissured.

The species is named in honour of Dr John Pipoly, formerly a staff member at the Missouri Botanical Garden and previous Director of Research at Fairchild Tropical Garden. John was also a former student in a class the senior author taught for Cornell University in Costa Rica. John has been an excellent collector and collected the type specimen of this species.

Paratypes. — COLOMBIA: ANTIOQUIA: Urrao, Las Orquídeas, Vereda Calles, Parque Nacional Natural Las Orquídeas, Quebrada Honda, ridge NW of La Cabaña Calles, Parcela W, subparcelas W 1 y W 2, 6°29'N, 76°14'W,

1330 m, 5.12.1992, J. Pipoly, A. Cogollo, D. Cárdenas, W. Rodríguez, Ol Alvarez y E. Alvarez 16596 (MO); Parque Nacional Natural Las Orquídeas, Vereda Calles, Alto de Palmitas, c. 1 km de la Cabaña de Calles del Inderena, 6°32'N, 76°19'W, 1700–1750 m, 4.12.1993, J. Pipoly, W. Rodríguez, J. Velez & O. Alvarez 17661 (MO); Parque Nacional Natural Las Orquídeas, Vereda Calles, Río Calles, 6°32'N, 76°19'W, 1350–1450 m, 5.12.1993, J. Pipoly, W. Rodríguez & O. Alvarez 17735 (MO). — CHOCÓ: Small gully c. 46 km from Ciudad Bolívar along road to Quibdó, 5°48'N, 76°20'W, 1220 m, 8.7.1986, M. H. Grayum, B. Hammel, J. Kress & G. Brown 7632 (HUA, MO); San José del Palmar, Cerro SW of town, 1300 m, 25.2.1977, E. Forero & al. 3429 (COL, MO).

***Philodendron silverstonei* Croat, sp. nov.**

Holotype: Colombia, Risaralda, Pereira, Hacienda Los Cristales, hills on the right bank of the Río Cauca where river begins to narrow, downstream from La Virginia, 4°53'N, 75°50'W, 1100 m, 3.1.1995, P. Silverstone-Sopkin & N. Paz 7305 (MO 04673121-24; isotypes: COL, CUV, US). – Fig. 20C–D.

Internodia brevica, 0.5–3 cm longa, ad 6 cm diam.; cataphylla decidua; folia petiolo 85–109 cm longo, lamina ovato-sagittata, 58–101 cm longa, 34–65 cm lata, lobis posterioribus 24–40 cm longis, 15–23 cm latis, nervis primariis lateralibus 13–14 utroque, nervis basalibus 10–12 utroque; pedunculus 21–33 cm longus; spathe 20–22 cm longa; spadix 18–21 cm longus, 1.2–1.5 cm latus.

Creeping or climbing vine; *stems* with colourless sap oxidising orange, rooting at the nodes; *internodes* short, 0.5–3 cm long, to 6 cm diam., drying yellow-brown; *cataphylls* deciduous. *Leaves* erect; *petiole* subterete, 85–109 cm long, 1–1.5 cm diam. at the apex; *blade* ovate-sagittate, widest at level of petiole insertion and tapering towards the apex, short-acuminate at apex, deeply lobed at base, 58–101 cm long, 34–65 cm wide, 1.3–1.7 × longer than wide, 0.8–1 × as long as petiole, matte and drying dark olive-green; *posterior lobes* 24–40 cm long, 15–23 cm wide, curving inwards; *sinus* spatulate, 20–31 cm deep, 12–18 cm wide; *midrib* broad-flattened above, convex below, drying concolorous above, lighter than surface below; *primary lateral veins* 13–14 pairs, arising at 60–75° angle, slightly raised above and below; *minor veins* inconspicuous; *basal veins* 10–12 pairs, the first 2–4 pairs free to the base and the others branching on both sides of the posterior rib; *posterior rib* thick, free for 3–8 cm and projecting in a straight line into the centre of the posterior lobe. *Inflorescences* 1–5 per axil; *peduncle* 21–33 cm long, c. 8 mm diam., drying blackened; *spathe* 20–22 cm long, blade 3.5–7 cm wide, tube 3.5–4.5 cm diam., blade green outside, white inside, sometimes with orange longitudinal stripes, tube green outside, red or dark red-violet inside; *spadix* 18–21 cm long, 1.2–1.5 cm wide, white in male and sterile sections, light green in female section;

pistils 1.6–1.8 mm long, 1–1.1 mm diam., style with a prominent central dome, stigma 1.6–1.8 mm diam., *ovary* 4–5-locular, locules 1-ovulate; *ovules* contained within a mucilaginous, very sticky, transparent sac, 0.8–1 mm long, the ovule proper oblong, c. 0.5 mm long, with a glandular funicle 0.3–0.4 mm long.

Philodendron silverstonei is endemic to Colombia, known only from the type locality in Risaralda Department at 1100 m elevation in a Premontane moist forest life zone.

The species is a member of *Philodendron* subg. *Philodendron* sect. *Macrobium* subsect. *Glossophyllum* series *Ovata* and is recognised by its hemiepiphytic habit, thick stem with short internodes, deciduous cataphylls, subterete petioles, its large matte, ovate-sagittate leaf blades with a well-developed posterior rib and 10–12 pairs of basal veins, as well as by up to 5 inflorescences per axil with long peduncles, the spathe tube green outside, red-violet inside and with the spathe blade green outside and white inside.

The Lucid key to *Philodendron* keys out *P. dodsonii* Croat & Grayum, *P. grandifolium* (Jacq.) Schott, *P. pastazanum* K. Krause, *P. sagittifolium* Liebm. and *P. simmondsii* Mayo for this species. *P. dodsonii* has a red spathe tube instead of the green tube in *P. silverstonei*; *P. grandifolium* is from eastern South America (Venezuela, Guyanas); *P. pastazanum* has peltate leaves instead of ovate-sagittate; *P. sagittifolium* has smaller and narrower leaves with small posterior lobes and does not have a well-developed posterior vein like *P. silverstonei*; *P. simmondsii* has blade margins that are distinctly sinuate and not just rounded as in *P. silverstonei*.

The species is named in honour of Dr Philip Silverstone-Sopkin, Curator of the Herbarium at the Universidad del Valle in Cali, Colombia, who collected the type specimen. Philip has made many collections of *Araceae* during his many expeditions to areas in the region of the Cauca river valley. His collections are always well prepared and his field notes have excellent detail.

Paratypes. — COLOMBIA: RISARALDA: Pereira, Hacienda Córsega, northern extreme of the wide part of the Valle del Río Cauca, 7 km W of Cerritos–La Virginia road on the road to El Trapiche, 4°50'N, 75°53'W, 1100 m, 4.1.1995, *P. Silverstone-Sopkin & N. Paz* 7337 (MO, CUVU).

***Philodendron urraoense* Croat, sp. nov.**

Holotype: Colombia, Antioquia, Municipio Urrao, Parque Nacional Las Orchideas, Vereda Calles, Alto de Palmitas, c. 1 km de la Cabaña de Calles de INDERENA, 1700–1750 m, 4.12.1993, *J. Pipoly* 17670 (MO 04603580; isotypes: JAUM). – Fig. 19D.

Internodia elongata, 1.5–2.5 cm diam.; folia petiolo 22–68 cm longo, lamina ovato-sagittata, 44–67 cm longa,

22–37 cm lata, nervis primariis lateralibus 5–7 utroque, nervis basalibus 4–7 utroque; inflorescentia 4–8 in quoque axilla; pedunculus 2.5–12 cm longus; spatha 5.8–7 cm longa; spadix 5.5–6.2 cm longus, parte pistillata 2.7–3.7 cm longa.

Epiphytic or hemiepiphytic vine.

Juvenile plants with internodes elongate, more than 10 cm long, the epidermis yellow brown, smooth, moderately glossy, longitudinally folded. *Leaves* with *petiole* 18–28 cm long, 1–1.7 cm diam. midway, drying c. 1 cm diam., blackened; *blade* broadly ovate-sagittate, 22–23 cm long, 18–20 cm wide, 1.1–1.2× longer than wide, 0.8–1.2× as long as petiole, drying dark olive-green; *anterior lobe* 13–16 cm long, broadly rounded; *posterior lobes* 8–10 cm long, 6–8 cm wide; *sinus* narrowly hippocrepiform, 6–7 cm deep, 2.5–3 cm wide; all veins drying concolorous with the blade above, much darker than the blade below; *primary lateral veins* 2 pairs; *basal veins* 4–5 pairs, the 3–4 lowest pairs joined for 1–2 cm at the base.

Adult plants with stems rooting at the nodes; *internodes* elongated, 1–6 cm long, 1.5–2.5 cm diam., drying yellow-brown with longitudinal ridges. *Leaves* erect; *petiole* subterete, 22–68 cm long, 7–15 mm diam., drying blackened; *blade* ovate-sagittate, generally widest near the petiole attachment and tapering towards the apex, 44–67 cm long, 22–37 cm wide, 1.5–2.5× longer than wide, 1–2.1× as long as petiole, acuminate at apex, deeply and prominently lobed at base, drying dark olive-green and weakly glossy on both sides; *anterior lobe* 33–50 cm long, tapering towards the apex; *posterior lobes* 10–18 cm long, 8–16 cm wide, sometimes curving inwards and overlapping; *sinus* narrowly triangular, 6–15 cm deep; *midrib* broad-flattened above, convex below, drying concolorous above, much darker than surface below; *primary lateral veins* 5–7 pairs, arising at 50–65° angle, flat above, slightly raised below; *minor veins* fine, moderately distinct; *basal veins* 4–7 pairs, all free to the base. *Inflorescences* 4–8 per axil; *peduncle* 2.5–12 cm long, 1–3 mm diam., drying blackened; *spathe* greenish white or creamy white at anthesis, drying blackened, 5.8–7 cm long, 1–1.3 cm diam., broadest toward apex on the blade portion, flattening to 2.8–3.2 cm wide, the tube 6–9 mm diam.; *spadix* 5.5–6.2 cm long, greenish; staminate portion 3–3.5 cm long, 7 mm diam., pistillate portion 2.7–3.7 cm long, 5 mm diam.; *pistils* 4–5 locular, 1.5 mm long, 0.8–1 mm diam., subrounded to pentagonal from the apex; *ovules* 2–3 per locule, basal, 0.2 mm long (including the funicle), the funicle about as long as the ovule; the entire spadix drying blackened.

Philodendron urraoense is endemic to Colombia (Antioquia) at 910–1750 m elevation in a Premontane rain forest life zone.

Philodendron urraoense is a member of *P.* sect. *Philodendron* sect. *Macrobium* subsect. *Macrobium* and

is characterised by its hemiepiphytic climbing habit, the internodes usually longer than broad and drying yellow-brown with longitudinal ridges, petioles subterete and shorter than blades and drying blackened, blades ovate-cordate and drying somewhat blackened with a narrow, triangular sinus and with the basal veins free to the base or nearly so as well as by the cluster of up to 8 moderately small greenish white, long-pedunculate inflorescences.

The epithet refers to the Municipio Urroa, where the type locality is.

Paratypes. — COLOMBIA: ANTIOQUIA: Murri, La Blanquita, Río Murri hills above village, 6°35'N, 76°50'W, 910 m, 28.2.1992, A. Gentry, C. Barbosa & D. Cardenas 75747 (MO); Alto de Cuevas, 10 km W of Blanquita, 12 km W of Nutibara, 1750 m, 3.3.1992, A. Gentry, C. Barbosa & C. Cardenas 76072 (MO); Frontino, Río Cuevas, corregimiento Nutibara, 1350 m, 18.7.1987, Sanchez & al. 1473 (MEDEL); Urrao, Parque Nacional Natural Las Orquídeas, Vereda Calles, Inventario Permanente, Río Calles, 6°32'N, 76°19'W, 1450–1500 m, 28.11.1993, J. Pipoly, A. Cogollo, O. Alvarez, A. Duque, F. Giraldo & W. Rodríguez, 17289 (MO; JAUM); zona limitrofe del Parque Nacional Natural Las Orquídeas, Vereda Calles, Alto de Palmitas, c. 1 km de la Cabaña de Calles del INDERENA, 6°32'N, 76°19'W, 1300–1400 m, 1.12.1993, J. Pipoly, W. Rodríguez, J. Vélez & O. Alvarez 17493 (MO); Parque Nacional Natural Las Orquídeas, Vereda Calles, Alto de Palmitas, c. 1 km de la Cabaña de Calles del INDERENA, 6°32'N, 76°19'W, 1700–1750 m, 4.12.1993, J. Pipoly, W. Rodríguez, J. Vélez & O. Alvarez 17642 (JAUM, MO); Parque Nacional Natural Las Orquídeas, Vereda Calles, Inventario Permanente, right bank of Río Calles, 6°32'N, 76°19'W, 1250 m, 8.12.1993, J. Pipoly, W. Rodríguez & O. Alvarez 17940 (MO).

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