

# New Species of Araceae from the Ecuadorian Amazonía

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## ABSTRACT

Six new species of Araceae from the Amazon basin in Ecuador are described as new to science, *Anthurium chacoense* Croat, *A. cuyabenoense* Croat, *A. dolichocnemum* Croat, *A. effusispathum* Croat, *A. ionanthum* Croat and *A. longiusculus* Croat.

## KEY WORDS

Araceae, Amazon basin, *Anthurium*, eastern Ecuador, new species.

## INTRODUCTION

The aroid research group at the Missouri Botanical Garden is working on preparing the treatment of the Araceae for the Flora of Ecuador Project. Toward this end the senior author has assembled a small group of volunteers to assist in the preparation of species descriptions. To expedite the descriptive process volunteers are trained to download all pertinent existing descriptions which are in the computer. Descriptions are collated to make a comprehensive description of each species and a prepared Excel spreadsheet facilitates the recording of all measurements of vegetative and inflorescence parts. Xavier Delannay, second author of this paper is one of these volunteer researchers.

The Ecuadorian Amazonía, while relatively homogenous in the dispersion of

aroids, continues to turn up species new to science. Those described here are from a wide expanse extending from Sucumbios in the north of Ecuador to Zamora-Chinchi in the south of Ecuador. References used in this paper are based on the Holdridge Life Zone System (Holdridge, 1971) and Ecuador mapa ecológica (PRONAREG, 1978).

## *Anthurium chacoense* Croat, **sp. nov.**

Type: ECUADOR. Río Granadillo, Campamento de INECEL "Codo Alto", 00°08'S, 77°28'W, 1,300 m, 13 Sep 1990–15 Sep 1990, W. Palacios 5590 (holotype. MO-4372270–71; isotype, QCNE). Figures 1a, 1b.

*Internodia brevia*, ad. 3.5 cm diam.; cataphylla semi-intacta; petiolus subteres, 46–85 cm longus; lamina anguste ovata-sagittata, 35–80 cm longa, 18–47 cm lata; pedunculus 9–60 cm longus; spatha 5–17 cm longa, .9–3.8 cm lata; spadix cylindroidus, pleurumque purpureus, 7–20 cm longus, 5–12 mm diam.

Epiphyte; caudex short; **internodes** short, to 3.5 cm diam.; **cataphylls** membranaceous, red-brown, 11–30 cm long, 2–4 cm wide, semi-intact at apex, weathering quickly at base to brown fibers surrounding the base of the caudex. LEAVES clustered at the base of the plant; **petioles** medium green, semiglossy, subterete, narrowly and obtusely sulcate, geniculate at apex, 46–



85 cm long, ca. 8 mm diam.; geniculum ca. 10 mm long; **blades** narrowly ovate-sagittate, cuspidate at apex, 35–80 cm long, 18–47 cm wide, averaging  $56 \times 34$  cm, 1.2–2.4 times longer than wide, .6–1.4 times as long as petioles, subcoriaceous, dark green and glossy above, paler green and glossy below; anterior lobe usually broadly rounded to straight or slightly concave; **midrib** slightly paler with a narrow medial wing, convex with an acute rib below, drying concolorous and narrowly acute; **primary lateral veins** 9–10 pairs, rising at an acute angle then spreading at 40–45° angle, narrowly raised in valleys above, drying narrowly raised and concolorous, acute and paler than the blade below, drying slightly darker with an acute medial rib below; collective veins arising from (1st) 4th–5th pair of basal veins, 2–5 mm from margin; basal veins (4–)8–12, 1st pair free to base, the remainder coalesced to varying degrees and regularly branching from the posterior rib; posterior rib thick, broadly curved, naked (3.7–)7–12.5 cm; sinus narrowly hippocrepeiform to spatulate, sometimes with the posterior lobe markedly turned inward. INFLORESCENCES erect; **peduncle** terete, narrower and shorter than petioles, 9–60 cm long, 2–4 mm diam.; **spathe** membranaceous, hooding, oblong to elliptic, clasping the base of the stipe, 5–17 cm long, .9–3.8 cm wide, 1.1–4.8 times shorter than peduncles, green or red-purple; **spadix** stipitate 5–10 mm, cylindrical, often more or less curved, usually purple but sometimes pink or red at different stages of development, matte, 7–20 cm long, 5–12 mm diam. Flowers 9–10 visible per spiral, 2–2.1 mm long, 1.7–1.8 mm wide (dried); lateral tepals densely granular on magnification, 1–1.3 mm wide, the outer margins 2-sided, inner margins broadly rounded; stamens exerted ca. 1 mm and remaining exerted; anthers .4–.6 mm long, .4 mm wide; thecae ovoid, weakly divaricate. INFRUCTION semi-erect, to 23 cm long; **berries** drying ca. 2 mm diam., subglobose, purplish violet.

*Anthurium chacoense* is at present known only from northern Ecuador (Napo,

Sucumbios) at 1,000–1,850 m elevation in *Premontane wet forest*, *Premontane rain forest* life zones. It is to be expected in adjacent Putomayo Department of Colombia.

The species is a member of sect. *Belolochium* and is characterized by its red-brown, persistent, semi-intact cataphylls which weather quickly to brown fibers, subterete petioles, narrowly ovate-sagittate blades with 9–10 pairs of primary lateral veins, the broad posterior lobes with 8–12 basal veins, a thick, broadly curved posterior rib and the collective veins arising from the 4th–5th pair of basal veins. Also characteristic is the hooding, usually green spathe and the stipitate red to violet-purple spadix. Typically the inflorescences are moderately short-pedunculate at anthesis.

The species is similar to *A. cuyabenoense* (see below) but that species has blades which are decidedly concave along the margins and occur in the Amazon lowlands at elevations of below 350 m elevation (versus above 1,000 m for *A. chacoense*).

*Croat 72787*, a collection from Morona-Santiago Province (Macas – Puyo, 31 km N of Macas, 28.5 km N of bridge over Río Upano, 02°01'S, 77°56'W, 1,125 m) is perhaps this species but may also represent a mixed collection. Sheet MO-4239568 closely matches *A. chacoense* but the other sheets have much constricted and broadly spreading posterior lobes and more closely match *A. berthae* K. Kr.

The majority of the collections made of the species are from the Cantón El Chaco and the epithet “chacoense” recognizes this.

*Paratypes*: ECUADOR. **Napo**: El Chaco, faldas al sur del Volcán Reventador, margen izquierda del Río Reventador, entre carretera y sendero al crater, 00°07'S, 77°36'W, 1,600–1,850 m, 11 Oct 1990, *W. Palacios 6203* (MO, QCNE); Proyecto Hidroeléctrico Coca, Punto ST3, margen derecha del Río Quijos, ca. 10 km al sur de Reventador, 00°11'S, 77°39'W, 1,500 m, 3 Oct 1990–5 Oct 1990, *W. Palacios 5901* (MO); Proyecto Hidroeléctrico Coca, Punto ST3, margen derecha del Río Quijos, ca. 10 km al sur de Reventador, 00°11'S,

77°39'W, 1,500 m, 3 Oct 1990–5 Oct 1990, *W. Palacios 5919* (MO, QCNE); Proyecto Hidroeléctrico Coca, 3–5 Oct 1990, *W. Palacios 5874* (MO, QCNE); Proyecto Hidroeléctrico Coca: *W. Palacios 5837* (MO, QCNE). **Sucumbios**: Gonzalo Pizarro, Bosque Protector Los Cedros, Cuenca del Río Tigre, 00°05'S, 77°25'W, 1,000 m, 17 Mar 1992, *G. Tipaz, C. Quelal, B. Castro & T. Maña 740* (MO, QCNE).

***Anthurium cuyabenoense*** Croat, **sp. nov.** Type: ECUADOR. Napo: Yasuní National Park, primary lowland rain forest close to Estación Científica Yasuní, 00°40'S, 76°23'W, 200–250 m, 13 Aug 1998, *R. Leimbeck 28* (holotype, MO-5183987; isotype, AAU). Figure 1c.

Internodia 1–2 cm longa, ca. 2 cm diam.; petiolus subteres, 39–77 cm longus; lamina late cordata, 37–80 cm longa, 22–56 cm lata; pedunculus 16–60 cm longus; spatha oblonga vel elliptica, 6.5–14 cm longa, 1.6–3.5 cm lata, alba vel cremeus; spadix stipitata 4–8(–15) mm, cylindrica, rubra, 9–25 cm longa, 5–8 mm lata.

Epiphyte; caudex slightly elongate, rooting at the nodes, densely covered along its length by roots, remaining bases of petioles and remnants of cataphylls; **internodes** short to slightly elongate, 1–2 cm long, ca. 2 cm diam.; **cataphylls** membranaceous, 11–19 cm long, semi-intact at apex, weathering quickly at base to brown fibers surrounding the caudex, ultimately deciduous with scaly bases remaining around the stem. LEAVES moderately thin, concentrated at the top of the caudex; **petioles** subterete, slightly geniculate at apex, 39–77 cm long, ca. 8 mm diam.; geniculum ca. 8 mm long; blades broadly cordate and concave near the middle, cuspidate at apex, 37–80 cm long, 22–56 cm wide, averaging 53 × 38 cm, .8–1.7 times longer than wide, .7–1.4 times as long as petioles, moderately thin, dark green and glossy above, pale green and glossy below; **midrib** raised above, prominently raised and darker than the blade below; **primary lateral veins** (8–)10–17 pairs, rising at an

acute angle then spreading at 40–60° angle, raised above, strongly raised and darker than the blade below, concolorous with midrib; collective veins arising from 4th–5th pair of basal veins, 2–5 mm from margin basal veins (6–)7–10, 1st pair free to base, the remainder coalescing to varying degrees and regularly branching from the posterior rib; posterior rib thick, broadly curved, 5–9.5 cm; sinus broadly to narrowly hippocrepiform, sometimes with the posterior lobe turned inward. INFLORESCENCES erect; **peduncle** terete, thinner and shorter than petioles, 16–60 cm long, 2–4 mm diam.; **spathe** membranaceous, spreading, oblong to elliptic, acuminate at apex, obtuse at base, clasping the base of the stipe, 6.5–14 cm long, 1.6–3.5 cm wide, 2.3–5.2 times shorter than peduncles, white, cream-colored, light brown or green; **spadix** stipitate 4–8(–15) mm, 9–25 cm long, 5–8 mm diam., cylindrical, often more or less curved, usually red or dark red, sometimes purplish red. Flowers 6–7 visible per spiral, 2.4–2.6 mm long, 2.2–2.6 wide; lateral tepals 1.8–1.9 mm wide, densely granular on drying, the outer margin 2-sided, the margin rounded. INFRACTESCENCE somewhat deflexed; spadix up to 32 cm long, 1.2 cm wide; **berries** bright red.

*Anthurium cuyabenoense* is known only from Ecuador (Napo, Sucumbios) at 200–350 m elevation in *Tropical wet forest*, *Tropical moist forest* life zones.

The species is a member of sect. *Belolonchium* and is characterized by its short internodes, subterete petioles, ovate-sagittate to narrowly ovate-sagittate leaves that are distinctly concave near the middle of the anterior lobe with 10–17 pairs of primary veins, broad posterior lobes with 7–10 pairs of basal veins, a thick, broadly curved posterior rib with the collective veins arising from the 4th–5th pair of basal veins. Also characteristic is the long-tapered, hooded red spadix.

*Anthurium cuyabenoense* is somewhat similar to *A. herthae* but that species is distinguished by having a narrower anterior lobe which is much more constricted above the posterior lobes and in having a

proportionately longer and more slender spadix. It also occurs at much higher elevations (900–2,016 m).

The species epithet “cuyabenoense” refers to the Río Cuyabeno where many of the collections of this new species were made.

**Paratypes:** ECUADOR. **Napo:** Estación Científica Yasuní, Río Tiputini, al noroeste de la confluencia con el Río Tivacuno, 6 km este de la carretera Maxus, Km 44, desvío hacia el pozo, 00°38'S, 76°30'W, 200–300 m, 23 Oct 1996, *Romoleroux, M. Bass, R. Foster & G. Villa 2656* (QCA, MO); Estación Científica Yasuní, Río Tiputini, al noroeste de la confluencia con el Río Tivacuno, 6 km este de la carretera Maxus, Km 44, desvío hacia el pozo Tivacuno, Parcela de 50 Ha, 00°38'S, 76°30'W, 200–300 m, 27 Aug 1996, *Romoleroux & P. Ojeda 2473* (QCA); Aguatico, Reserva Etnica Huaorani, carretera del oleoducto de Maxus en construcción Km 72–75, 00°50'S, 76°21'W, 270 m, 23 Jan 1994–31 Jan 1994, *Dik & J. Andi 915* (MO, QCNE).

**Sucumbios:** Río Wai si ayá, a northern tributary to Río Aguatico, 1.5 km up the river on a small path going in the direction SE, 00°15'S, 76°21'W, 300 m, 8 Aug 1980, *Brandbyge, E. Asanza C., P. Kelly & K. Bryan 32649* (AAU); Río Cuyabeno, ca. 2 km upstream from Puerto Bolívar, 00°06'S, 76°10'W, 300 m, 18 Aug 1981, *Brandbyge, E. Asanza C., Werling & Letb-Nissen 33672* (AAU). Río Cuyabeno, about 2 km upstream from Puerto Bolívar on the right margin, 00°06'S, 76°10'W, 300 m, 20 Aug 1981, *Brandbyge, E. Asanza C., Werling & S. Letb-Nissen 33809* (AAU); Reserva de Produccion Faunistica Cuyabeno, N of Laguna Grande, Hectare plot no. 1, 00°00'S, 76°12'W, 265 m, 11 Apr 1980–10 July 1988, *Ingvar Nielsen 76355* (AAU); Vic. of Lago Agrio, Km 3, San Miguel–Lago Agrio, 350 m, July 1982, *Besse, Kennedy & R. Baker 1553* (MO, SEL); Estación Científica Cuyabeno, 00°01'N, 76°11'W, 220 m, *J. Jaramillo & E. Grijalva 14721* (QCA); Reserva Faunistica Cuyabeno, Laguna Grande and surroundings, including Río Cuyabeno from Pto. Bolívar to above Laguna Cañangueno, 00°00'S,

76°10'W, 265 m, 11 Mar 1990, *Balslev, C. Berg, M. Gavilanes, A. Thygesen, D.E. Christensen, L. Ellemann & R. Brucculieri 97444* (AAU); Reserva Faunistica Cuyabeno, N of Laguna Grande, 00°01'N, 76°11'W, 265 m, 26 Mar 1989, *Balslev, R. Valencia, G. Paz & Miño 84630* (AAU); Reserva Faunistica Cuyabeno, N of Laguna Grande, 00°01'N, 76°11'W, 265 m, 26 Mar 1989, *Balslev, R. Valencia, G. Paz & Miño 84617* (AAU, QCA); *Balslev, R. Valencia, G. Paz & Miño 84633* (AAU, QCA); Reserva Faunistica de Cuyabeno, N of Laguna Grande, 00°01'N, 76°11'W, 265 m, 16 Mar 1989, *Balslev, R. Valencia, G. Paz & Miño 84401* (AAU).

***Antburium dolichocnemum* Croat, sp.**

**nov.** Type: ECUADOR. Zamora-Chinchi: Cordillera del Cóndor, along road from Namirez to Nambija, along mining road, 10.0 km S of Namirez and Río Zamora, vic. of Nambija, along road to mine headquarters ca. 5 km long, just S of Nambija, 04°03'44"S, 78°47'29"W, 1,779 m, 23 July 2004, *T. B. Croat 92058* (holotype, MO- 6031690, isotypes, AAU, B, BR, CAS, COL, CUVC, DUKE, GH, HUA, INB, F, G, GB, K, L, M, MEXU, MICH, NY, P, PMA, QCA, QCNE, RJ, RSA, S, SEL, TEFH, TEX, U, UB, US, USCG, USM, VEN, W). Figures 2a–d

Planta terrestre; internodia 1–13 cm long, 3–6 mm diam.; cataphylla pro parte maxima decidua; petiolus subteres, 12–29 cm longus; lamina sagittata-subhastata, 17–31 cm longa, 6–20 cm lata; pedunculus 18–46 cm longus, 2–3 mm diam.; spathe viridis, lanceolata, ca. 7 cm longa, 1.3 cm lata; spadix violeta, 2.3–6.5 cm longa, 4–5 mm lata.

Terrestrial with creeping rhizome, sometimes epiphyte; **internodes** 1–13 cm long, 3–6 mm diam., medium green, matte or weakly glossy, soon light gray-brown; **cataphylls** thin, 3–7 cm long, bluntly 1-ribbed, weathering brown, mostly deciduous or with a few weak fibers persisting; LEAVES drying green; **petioles** subterete,



Fig. 2. a–d. *A. dolichochnemum* Croat. (Croat & Menke 89700). a. Habit showing scandent habit. b. Inflorescence and leaf. c. Leaf blade adaxial surface. d. Spadix, close up.

narrowly and obtusely sulcate (the margins bluntly acute), medium green, matte to weakly glossy, 12–29 cm long, 3 mm diam.; geniculum 1 cm long, 4 mm diam., broadly sulcate; **blades** sagittate-subhastate, with lobes projecting outwards, concave near the base, acuminate, 17–31 cm long, 6–20 cm wide, averaging  $23 \times 15$  cm, 1.2–2.6 times longer than wide, .8–1.7 times as long as petioles, thinly coriaceous, dark green and matte-subvelvety above, light green and matte below; **midrib** narrowly raised and slightly paler above, narrowly raised and slightly paler below; **primary lateral veins** 6–10 pairs, arising at  $45\text{--}60^\circ$  angle, loop-connected to the connective veins, deeply sunken and concolorous above, narrowly raised and slightly paler below; tertiary veins in part weakly raised below; collective veins arising from the 1st basal vein, 4–8 mm from margin; basal veins 4–6, first 2 free to base, the remainder coalesced to varying degrees and branching from the posterior rib; posterior rib

straight or slightly curved, naked 8–27 mm; sinus broadly to narrowly hippocrepiform. **INFLORESCENCES** erect-spreading; **peduncle** generally longer than petiole, terete, 18–46 cm long, 2–3 mm diam.; **spathe** green, lanceolate, caducous, ca. 7 cm long, 1.3 cm diam.; **spadix** sessile, tapered, dark green and glossy when immature, turning violet and matte when mature, 2.3–6.5 cm long, 4–5 mm thick. Flowers 4–5 visible per spiral, 2.4–2.6 mm long and wide; lateral tepals 2.2–2.4 mm wide, the outer margin 2-sided, inner margin broadly rounded. **INFRUCTESCENCES**: **Berries** green, early-emergent, mature berries not seen.

*Anubium dolichochnemum* is believed to be endemic to Ecuador (Morona-Santiago, Napo, Zamora-Cinchipe) at 1,000–2,000 m elevation in *Montane moist forest*, *Montane wet forest* and *Premontane wet forest* life zones.

The species is a member of sect. *Xialophyllum* and is characterized by its gener-

ally terrestrial creeping habit, elongated internodes sub-3-lobed leaves with outward-projecting lobes, 6–10 pairs of primary lateral veins, and collective veins arising from the first pair of basal veins as well as by its violet spadix.

The species is most closely related to *A. ionanthum* (see below) with which it sometimes occurs. That species differs in having leaf blades ovate-cordate with the margins of the blades broadly convex, not at all concave. Despite the fact that they may occur together there is no tendency for intermediacy between the two species.

The species is also similar to *Antburium puberulum* Croat & Langan from central Peru. *Antburium dolichocnemum* is distinguished from *A. puberulum* by its longer and thinner internodes, its leaves with a more pronounced constriction above the posterior lobes, the more outward-spreading posterior lobes, the primary lateral veins less prominently raised on the lower surface.

*Antburium dolichocnemum* can be confused with *A. constrictum* Croat & Carlsen, but that species has blades deeply lobed to within 1.5–4 cm from the midrib with the lateral lobes directed somewhat toward the apex. In contrast the lateral lobes of *A. dolichocnemum* are not constricted even half of the way to the base and the lobes are directed outward and somewhat toward the base.

Several collections along the road between Loja and Zamora and Loja and Valladolid at 2,400–2,800 m elevation (*Harling & Andersson 21797*, *Madsen 75543 & 87009* and *Stein & D'Alessandro 2784*) could be confused with *A. dolichocnemum* owing to their somewhat constricted anterior lobes. However these specimens differ in having narrowly triangular-sagittate leaves which have much less constricted anterior lobes than *A. dolichocnemum* and by occurring at higher elevations. They probably represent another undescribed species.

The species epithet “dolichocnemum” comes from the Greek “dolichos” or elongated and “cneme” or internode.

*Paratypes*: ECUADOR. **Morona-Santiago**: San Miguel de los Cuyes, Main trail to San Miguel de los Cuyes via the Cordillera Morire, 03°10'S, 78°57'W, 2,400–3,400 m, 7 Jan 2001, *J.L. Clark & C. Morocho 5851* (AZUAY, MO, QCNE, US); Above Ganazhuma, 03°27'S, 78°50'W, 1,829–2,195 m, 15 Dec 1979, *Thompson 332* (MO). Napo: Archidona–Baeza, 39.9 km N of Archidona, 18.4 km S of Cosanga, 40.8 km S of jct. with Baeza–Papallacta–Lago Agrio Road, 00°40'55"S, 77°48'05"W, 1,486 m, 24 Apr 2003, *Croat, L. Hannon & N. Altamirano 88035* (HUA, MO, UB). **Zamora-Chinchi**: Ca. 5 km above Zamora on road to Loja, 1,300–1,400 m, 10 Apr 1985, *G. Harling & L. Andersson 23951* (GB, QCA); 4 km W of Panguintza on road to Panguintza Alto, 1,100–1,200 m, 14 Apr 1985, *G. Harling & L. Andersson 24129* (QCA, GB); Loja – Zamora, ca. 13 km E of the pass, just before junction with old road, 03°58'S, 79°05'W, 2,030 m, 8 Mar 1989, *B. Øllgaard, J.E. Madsen & L. Ellemann 90868* (AAU); Zamora – Parque Nacional Podocarpus, ca. 1 km SW of Zamora, 04°04'42"S, 78°57'02"W, 731 m, 29 May 2003, *Croat & Menke 89700* (MO); Zamora–Loja, 81.3 km E of summit of divide and border with Loja Province, 04°08'02"S, 78°56'31"W, 1,341 m, 31 May 2003, *Croat & Menke 89840* (K, MO); Area of Estación Científica San Francisco, road Loja–Zamora, ca. 35 km from Loja, Q5 plot A, 03°58'S, 79°04'W, 1,950 m, 1 Oct 2004, *F. Werner 737* (MO); Area of Estación Científica San Francisco, Loja–Zamora, ca. 35 km from Loja, Q5 below C. Canal, 03°58'S, 79°04'W, 1,850 m, 18 Oct 2004, *F. Werner 1210* (MO, QCNE); Estación Científica San Francisco, Loja–Zamora, 03°58'S, 79°04'W, 1,850 m, *F. Werner 1083* (MO); Podocarpus National Park, Plot near trail Trail T2, S of Estacion Científica San Francisco, 30 km E of Loja near Sabanilla, 03°58'S, 79°03'W, 2,000 m, 30 Nov 2000, *Leimbeck 450* (AAU, MO, QCA); 1 ha study plot about 1 km SW of Bombuscaro Visitors Center, 6 km S of Zamora, 04°06'S, 78°57'W, 1,050 m, 20 Nov 2000, *Leimbeck 416* (AAU, MO, QCA); Zamora, forested ravine 2 km W of Zamora, 900 m, 11 May

1978, *Madison 4235* (SEL); Zamora, Cordillera del Cóndor, cuenca del Río Jamboe, Romerillos Bajo, sendero hacia la Cordillera de Curintza, 04°15'S, 78°55'W, 1,600 m, 27 Aug 1999, *P. Fuentes, P. Conza & P. Villa 1005* (MO, QCNE).

***Anthurium effusispathum*** Croat, **sp. nov.** Type: ECUADOR. Morona-Santiago: Macas-Riobamba between Proaño and Parque Nacional Sangay, 12.1 Km west of Proaño, 02°16'59"S, 78°11'06"W, 1,185 m, 13 Aug 2002, *T. B. Croat, L. Hannon & P. Schmidt 86523* (MO-5744765-66; isotypes, AAU, B, COL, F, GB, GH, HUA, K, NY, QCNE, RJ, RSA, S, SEL, US, VEN, UB, US). Figures 3a-d.

Internodia brevia, 1 cm longa, 2–5.3 cm diam.; cataphylla persistens intacta; petiolus teres, (27–)56–128 cm longus; lamina anguste ovata-sagittata, (28)50–84 cm longa, (13–)21–41 cm lata, pedunculus (32–)53–99 cm longus; spatha erecta-effusa, 12–25 cm longa, 4–17 cm lata; spadix cremeus vel flavo-virens per anthesis, 11–31 cm longus, 9–30 mm diam.

Terrestrial or epiphytic; **internodes** short, ca. 1 cm long, 2–5.3 cm diam.; **cataphylls** persisting intact or semi-intact, red-brown or dark brown, 17–30 cm long, up to 8 cm wide at the base when flattened. LEAVES clustered at the base of the plant; **petioles** terete, weakly and obtusely sulcate, geniculate at apex, (27–)56–128 cm long, ca. (.6–)1–2 cm diam. midway, medium to dark green, matte to semiglossy, sometimes minutely and densely speckled; geniculum ca. 3 cm long; **blades** narrowly ovate-sagittate, cuspidate at apex, with broad posterior lobes projecting inward and often overlapping, (28–)50–84 cm long, (13–)21–41 cm wide, averaging 70 × 32 cm, 1.4–2.7 times longer than wide, .5–1.0 times as long as petioles, subcoriaceous, dark green and matte-subvelvety or glossy above, paler green and glossy below, with punctations often clearly visible below; **midrib** convex and slightly paler above, acute and moderately paler below, prominently raised and 3-ribbed on

older plants; **primary lateral veins** 11–17 pairs, rising at a 45–80° angle, weakly and narrowly raised, slightly paler in deep valleys above, acute and paler or almost concolorous below; tertiary veins mostly flattened and slightly darker below; collective veins arising from 3rd–4th pair of basal veins, 0–3 mm from margin; basal veins (5–)6–7, first (1–)2–3 pairs free to base, the remainder coalesced to varying degrees and regularly branching from the posterior rib; posterior rib thick, broadly curved, naked (1–)3–5 cm; sinus spatulate, with the posterior lobes markedly turned inward and often overlapping. INFLORESCENCES erect-spreading; **peduncle** terete, shorter than petioles, (32–)53–99 cm long, .9–1.7 cm diam., medium yellow-green, semiglossy; **spathe** erect-spreading, broadly ovate to lanceolate, 12–25 cm long, 4–17 cm diam., 2.2–6.2 times shorter than peduncles, coriaceous, white or greenish white and glandular inside, white or pale green and glossy outside, surrounding back and sides of spadix, sometimes hooding; **spadix** stipitate 5 mm, thick and tapering towards the apex, creamy white or pale yellow-green, becoming brownish green, pinkish or dark lavender after anthesis, matte, 11–31 cm long, 9–3.0 mm diam., 1.0 cm from tip. Flowers 13–15 visible per spiral, 3.6–3.8 mm long, 3–3.2 mm wide; pistils weakly emergent; tepals glossy, drying matte, minutely papillate, lateral tepals 1.8–2.0 mm wide, the outer margin 2-sided, the inner margin broadly rounded; stamens 6 mm wide, .4 mm long, the thecae narrowly ovate, slightly divaricate; pollen creamy white. INFRUCTESCENCES erect, to 31 cm long, 3 cm diam., spathe green, spadix turning purplish violet at maturity, weakly glossy; **berries** purplish red, 6 mm long.

*Anthurium effusispathum* is at present known only from Ecuador (Morona-Santiago, Napo, Zamora-Chinchipec), at 610–1,875 m elevation mostly in *Premontane wet forest* but also in *Premontane moist forest*, *Lower montane moist forest* and *Lower montane wet forest* life zones.

The species is a member of sect. *Calomystrum* and is characterized by its large



Fig. 3. a–d. *Anthurium effusispatulum* Croat. (Croat & Menke 89323). a. Leaf blade adaxial surface. b. Stem, cataphylls and petiole bases. c. Inflorescence showing spreading spathe and spadix. d. Inflorescence and leaf showing spathe and spadix.

size, persistent, red-brown cataphylls, terete petioles, narrowly ovate-sagittate blades with 11–17 pairs of primary lateral veins, the broad, inward-projecting posterior lobes with 6–7 basal veins, a thick, broadly curved posterior rib and the collective veins arising from the 3rd–4th pair of basal veins. Also characteristic is the large whitish erect-spreading spathe surrounding the back and sides of the spadix and the thick creamy-yellow spadix turning purplish-violet at maturity.

The epithet for *Anthurium effusipathum* comes from the Latin “effusus” meaning spread out and “spathum” spathe.

**Paratypes:** ECUADOR. **Morona-Santiago:** Parque Nacional Sangay, 22.4 km W of airport in Macas, 8 km SE of 9 de Octubre, 30.8 km E of Zunil, 02°14'13"S, 78°12'50.5"W, 1,610 m, 26 Sep 2007, *Croat & G. Ferry 99213* (MO, QCNE); Gualaquiza–Indanza, along Río Sambo Rancho, ca. 15 km S of San Juan Bosco, 03°11'28"S, 78°33'04"W, 1,500 m, 8 Sep 2002, *Croat 87266* (MO); Limón–Gualaquiza, 41.4 km S of Plan de Milagro (jct. with Limón–Gualaquiza Rd.), 35.3 km S of San Juan Bosco, 14.8 km N of Tucumbatza, 03°10'59"S, 78°33'27"W, 1,584 m, 23 May 2003, *Croat & Menke 89323* (MO); Cordillera del Cóndor, along road into Cordillera del Cóndor departing from Chuchumbleza, then 6.8 km S of Chuchumbleza to Quime ferry on Río Zamora, then SW via Numbaime into Cordillera del Cóndor, 24 km SW of Río Zamora, 03°38'11"S, 78°25'49"W, 1,562 m, 14 July 2004, *Croat, L. Hannon, Walbert & Tuntiak Katan Jua 91000* (MO); Gualaquiza, Gualaquiza–Limon, vicinity of Tumbes, 39 km N of Río Bomboiza Bridge, 4.1 km S of Tucumbatza, 03°17'S, 78°31'W, 1,520 m, 6 Mar 1992, *Croat 72775* (HUA, MO, QCNE, US). **Napo:** Archidona–Baeza, 40.8 km N of Archidona, 15.5 km S of Cosanga, 39.9 Km N of jct. of Baeza Road with main Papallacta–Lago Agrio Road, 00°39'01"S, 77°47'45"W, 1,875 m, 24 Apr 2003, *Croat, L. Hannon & N. Altamirano 88065* (CUVC, HUA, K, MO, UB, US); Archidona, Tena–Baeza, 2.7 km N of the turn-off to the Loreto coca Road, 00°42'S, 77°51'W, 1,525 m, 2 Mar 1992, *Croat 72644*

(MO, QCNE). **Zamora-Chinchipe:** Loja–Zamora along Río Zamora near bridge which crosses Río Zamora 39 km E of Loja, 04°05'S, 79°00'W, 610 m, 18 Oct 1980, *Croat 50758* (F, MO, NY, US); Namirez (22.3 Km S of Yanzaza) to Nambija, 8.1 km S of San Carlos, 04°03'37"S, 78°47'25"W, 1,524 m, 28 May 2003, *Croat & Menke 89626* (MO); Along road between Zumbi on Río Zamora and summit of Cordillera del Cóndor beyond Paquisha, 10.1 km beyond Río Nangaritzza Bridge, 29.1 km E of Zumbi, 03°56'13"S, 78°37'27"W, 1,352 m, 16 July 2004, *Croat, L. Hannon, Walbert & Tuntiak Katan Jua 91205* (MO); Along road between Namirez on Río Zamora to Nambija, 14.7 km E of Namirez and Río Zamora, 5.9 km above San Carlos, 04°03'11"S, 78°47'48"W, 917 m, 19 July 2004, *Croat 91429* (GB, MO); Zamora–Romerillao Alto, 19.1 km E of Río Bombuscaro in Zamora, 6.3 km E of La Pituca, 04°10'04"S, 78°56'10"W, 1,203 m, 20 July 2004, *Croat 91578* (QCA, MO).

***Anthurium ionanthum* Croat, sp. nov.**

Type: ECUADOR. Zamora-Chinchipe: Cordillera del Cóndor, Namiera–Nambija, 10 km S of Namirez and Río Zamora, along road to mine headquarters ca. 5 km long, just south of Nambija, 04°03'44"S, 78°47'29"W, 1,779 m, 23 July 2004, *T. B. Croat 92059* (holotype, MO-5857803; isotypes, AAU, B, BR, CAS, COL, CUVC, DUKE, F, G, GB, GH, HUA, INB, K, L, M, MEXU, MICH, NY, P, PMA, QCA, QCNE, RJ, RSA, S, SEL, TEFH, TEX, U, UB, US, USCG, USM, VEN, W). Figures 1d, 4a, 4b.

Internodia 2–16 cm longa, 5–15 mm diam.; cataphylla pro maxima parte decidua; petiolum 10–66 cm longus; lamina late ovata-cordata, 15–45 cm longa, 10.5–27 cm lata; pedunculus 11–51 cm longus; spatha ad 7 cm longa, 1.5 cm lata, decidua; spadix purpuracens vel violaceus, 5–10 cm longus, 4–8 mm diam.

Terrestrial or hemiepiphyte; **internodes** 2–16 cm long, 5–15 mm diam., medium green, matte, soon light gray-brown, very weakly glossy; **cataphylls** thin, 6–13 cm



Fig. 4. a–b. *Anthurium ionanthum* Croat. (Croat et al. 92059). a. Habit showing stem, leaves and inflorescences. b. Unmounted plant on newspaper showing stem, leaves and inflorescences. 4. c–d. *Anthurium longiusculus* Croat. (Croat & Menke 89717). c. Habit of type plant showing leaves and inflorescences. d. Close-up of inflorescences with leaves in background.

long, medium green, matte, marcescent, mostly deciduous or with a few pale fibers persisting. LEAVES drying green; **petioles** 10–66 cm long, 2–4 mm diam., subterete, narrowly and obtusely sulcate, medium green, matte, the margins bluntly acute; **blades** broadly ovate to ovate-lanceolate, cordate with deep lobes at the base, acute at the apex, thinly coriaceous, dark green and velvety above, moderately paler and matte below, 15–45 cm long, 10.5–27 cm wide, averaging  $31 \times 19$  cm, 1.2–1.9 times longer than wide, .5–1.4 times as long as petioles, dark green and matte-subvelvety above, moderately paler and matte below; all veins moderately puberulent to granular-puberulent; **midrib** acute in deep valley, concolorous above (slightly paler towards base), narrowly round-raised and paler below; **primary lateral veins** 9–13 pairs, rising at an acute angle then spread-

ing 40–45° angle, loop-connected to the connective veins, deeply and obtusely sunken, concolorous above, bluntly acute to narrowly round-raised and concolorous to slightly paler below; tertiary veins in part sunken above, raised below; collective veins arising from the 1st–3rd pair of basal veins, 3–6 mm from margin; basal veins 5–8, first 2 free to base, the remainder coalesced to varying degrees and branching from the posterior rib; posterior rib broadly curved, naked 8–35 mm; sinus broadly hippocrepiform. INFLORESCENCES erect-spreading; peduncle terete, 11–51 cm long, 2–3 mm diam.; **spathe** medium green, to 7 cm long, 1.5 cm wide, promptly rolled and twisted, readily falling off; **spadix** weakly tapered to apex, initially pale yellow-green, matte, finally lilac, light purple or violet, 5–10 cm long, 4–8 mm wide, 10–14 times longer than

broad, stipitate 1–9 mm. Flowers 6 visible per spiral, weakly 4-lobed, 2 mm wide in both directions; lateral 1–1.2 mm wide, the outer margins 2–3-sided, minutely papillate on magnification, matte; stamens .7 mm long, .5 mm wide, held just above the tepals and persisting, not retracting; pollen white. **Berries** not seen.

*Anthurium ionanthum* is believed to be endemic to Ecuador (Azuay, Loja, Morona-Santiago, Zamora-Chinchi) at 1,200–2,700 m elevation in *Lower montane wet forest* and *Premontane wet forest* life zones.

The species is a member of sect. *Xialophyllum* and is characterized by its generally terrestrial habit, elongated internodes, broadly cordate leaves, moderately puberulent to granular-puberulent veins, 9–13 pairs of primary lateral veins, collective veins arising from the 1st–3rd pair of basal veins, and a short and stubby purple or violet spadix.

A collection *Montalvo & Cerón 07* from Cantón Macas at differs in having a proportionately longer and less tapered spadix which is ca. 30 times longer than broad but otherwise appears to be this species.

Some collections from Zamora-Chinchi are similar but apparently not this species. *Holm-Nielsen 3551*, *Luteyn 6577* and *Sparre 16502* from the Loja–Zamora Road at Km 16–18, and *Harling 27167* from the Nudo de Sabanilla–Valladolid Road differ in having the anterior lobe constricted midway, weakly to moderately granular veins and a pinkish red or light violet-red spadix. *Harling & Andersson 24078* from E of Paquisha differs in having somewhat sagittate blades with more elongated, more pointed posterior lobes. *Harling 1039* from Yurupaza at 600 m has thin sagittate blades which are nearly glossy below and has a dark violet-red spadix. *Madsen 7577* from Parque Nacional Podocarpus, Yangana–Valladolid Road at Km 26 has larger, more elongated leaves with more elongated posterior lobes projecting inward and with granular-puberulent veins.

A collection from Peru (San Martín: Rioja prov., Pedro Ruiz–Moyobamba, Km. 390, Venceremos, 05°59'S, 77°45'W, 2,100 m,

7–9 Aug 1983, *D.N. Smith & Sergio Vasquez S. 4684*), is also similar but that Peruvian specimen has triangular-shaped leaves instead of broadly ovate leaves as in *A. ionanthum*.

The epithet *Anthurium ionanthum* comes from the Latin “ion” which means violet-colored, hence “ionanthus” meaning “with violet flowers”.

**Paratypes:** ECUADOR. **Azuay:** Paute–Mendez (Santiago de Mendez), 84.3 km E of Paute, 5.5 km NE of Ama Luza, vic. of junction of Río Mangan and Río Negro with Río Paute, 02°32'36"S, 78°33'46"W, 1,524 m, 20 May 2003, *Croat & Menke 89055* (MO). Loja: Vilcabamba–Zumba, 33.9 km S of Vilcabamba, 48.6 km N of Palanda, 04°24'42"S, 79°09'33"W, 2,254 m, 26 July 2004, *Croat 92322* (MO); Loja–Zamora, W of the pass, 2,700 m, 14 Feb 1985, *Harling & Andersson 22056* (GB, MO). **Morona-Santiago:** Cantón Macas, Parque Nacional Sangay, Sendero a Sardina Yacu, entre el Río Sardina y Volcán, 02°05'S, 78°10'W, 1,500–1,700 m, 1 Oct 1996, *Consuelo Montalvo & C. Cerón 7* (QAP). **Zamora-Chinchi:** N side of Río Palanda at crossing with Zumba Road, 1,200 m, 30 Jan 1985, *G. Harling & L. Andersson 21283* (GB, MO).

***Anthurium longiusculus* Croat sp. nov.**

Type: ECUADOR. Zamora-Chinchi: Zamora–Romerillos, 6.6 km E of bridge over Río Bombuscaro, vic. of La Pituca, 04°04'59"S, 78°56'12"W, 731 m, 30 May 2003, *T. B. Croat & M. Menke 89719* (holotype, MO-5703734; isotypes, AAU, B, COL, F, GB, GH, HUA, K, M, NY, QCNE, S, SEL, UB, US). Figures 4c, 4d.

Planta terrestri; internodia brevia, 1.5–2.5 cm diam.; cataphylla persistens intactum; petiolus teres, 62–85 cm longus, 5 mm diam.; lamina lanceolata-elliptica, 36–46 cm longa, 7–14 cm lata, siccens denigratus; pedunculus 30–67 cm longus; spatha viride, 4.8–6.0 cm longa.

Terrestrial plant, specimens blackening when dried; caudex slightly elongated; **internodes** short, 1.5–2.5 cm diam.; **cata-**

**phylls** membranaceous, 6–12 cm long, turning dark red-brown, persisting more or less intact as scales surrounding the caudex. **LEAVES** subcoriaceous; **petioles** terete, semiglossy, medium to dark green, 62–85 cm long, ca. 5 mm diam.; geniculum obtusely sulcate, sometimes remote and seemingly disconnected from the leaf tissue; **blades** subcoriaceous, lanceolate-elliptic, 36–46 cm long, 7–14 cm wide, averaging  $41 \times 10.5$  cm, 2.8–5.1 times longer than wide, .48–.61 times as long as petioles, obtuse or acute at base, tapering and acuminate at apex, semiglossy, moderately bicolorous, drying yellow-brown to gray-brown and weakly glossy above, grayish yellow-brown to yellow-brown and semiglossy below; **midrib** convex and slightly paler above, narrowly rounded and slightly paler below; **primary lateral veins** 17–21 pairs, quilted-sunken and concolorous above, weakly pleated-raised and darker below, weakly loop-connected into the connective veins; tertiary veins obscure; collective veins arising from 1st–2nd pair of primary lateral veins, generally more raised below than the primary lateral veins, running 3–15 mm from margin. **INFLORESCENCES** erect to spreading; **peduncle** 30–67 cm long, 2–3 mm diam.; **spathe** green, 4.8–6.0 cm long, 4–5 mm wide (up to 1.5 cm wide when flattened), 5–12 times shorter than peduncles, membranaceous, deflexed, linear-lanceolate with two acute 4-mm extension on each side of the midrib at the apex, obtuse at base and clasping the base of the stipe, twisted-rolled with margins tightly rolled under, green, tinged purple and matte inside, semiglossy outside; **spadix** stipitate, dark green, semiglossy, 4–5 cm long, 4–5 mm diam., 7.5 times longer than wide; flowers 4–5 visible per spiral, 1.5–1.9 mm long, 1.7–2 mm wide; lateral tepals .9–1.2 mm wide, minutely granular, outer margin 2–3-sided, inner margin broadly rounded; stamens .6 mm long, .6 mm wide; anthers oblong, not divaricate. **INFRUCTESCENCE** erect, to 14.5 cm long, 1.2 cm wide, **berries** rounded, purplish, drying 5–6 mm long, 4–5 diam.

*Anthurium longiusculus* is believed to be endemic to Ecuador (Zamora-Chinchipe); at 730–1,520 m elevation in *Premontane moist forest* life zone.

The species is a member of sect. *Decurrentia* and is characterized by its long petioles, its lanceolate-elliptic leaves obtuse or tapering at the base and tapering and acuminate at the apex, its 17–21 pairs of weakly raised primary lateral veins, and its collective veins strongly raised below and arising from the 1st–2nd pair of primary lateral veins.

*Anthurium longiusculus* is somewhat confused with *A. michelii* in having blades of similar shape and also dry somewhat blackened but *A. michelii* differs in having petioles proportionately much shorter than the blades and in having the inflorescence usually conspicuously stipitate.

*Anthurium longiusculus* has very long petioles hence the name is derived from the Latin “longiusculus” which means very long (referring to the petioles).

**Paratypes:** ECUADOR. **Zamora-Chinchipe:** Parque Nacional Podocarpus, Guardería Río Bombuscaro, cuadrante de vegetación del Dr. Benjamin Ollgaard,  $04^{\circ}04'S$ ,  $78^{\circ}57'W$ , 1,100 m, 13 Nov 1991, *M. Larrea, R. Viteri & L. López 29* (QCA); *M. Larrea, R. Viteri & L. López 30* (QCA); *M. Larrea, R. Viteri & L. López 40* (QCA); Podocarpus National Park, 1 ha. Study plot ca. 1 km SW of Bombuscarao Visitors Centre, 6 km S of Zamora,  $04^{\circ}06'S$ ,  $78^{\circ}57'W$ , 1,050 m, 15 Nov. 2000, *Leimbeck & Windeballe 399*, (MO); Along road from Zamora to Janiero vicinity of municipal garbage dump, along Quebrada Janiero, 1 km S of bridge over Quebrada Janiero, ca. 1 km from Río Zamora Bridge in Zamora.,  $04^{\circ}03'24'S$ ,  $078^{\circ}57'49'W$ , 974 m, 22 July 2004, *Thomas B. Croat 91970* (MO); Cordillera del Cóndor, Namirez (22.3 Km S of Yanzaza) – Nambija, 8.1 km S of San Carlos,  $04^{\circ}03'37'S$ ,  $78^{\circ}47'25'W$ , 1,524 m, 28 May 2003, *Croat & Menke 89642* (AAU, B, CAS, COL, F, GB, HUA, K, M, MO, NY, QCA, QCNE, RJ, S, SEL, UB, US, USM); Along road from Zamora to Janiero, ca. 1 km from Río Zamora, 1 km S of bridge over Río Zamora in Zamora,  $04^{\circ}03'24'S$ ,  $78^{\circ}57'49'W$ , 974, 22 July 2004, *Croat 91970* (MO).

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