

# New Species of *Anthurium* (Araceae) from South America

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## ABSTRACT

Eleven new species of *Anthurium* (Araceae) are described as new: *Anthurium apiaense* Croat, *A. aylwardianum* Croat, *A. benktsparrei* Croat, *A. bicordoense* Croat, *A. diversicaudex* Croat, *A. mapiriense* Croat, *A. molawi* Croat, *A. porcesitoense* Croat, *A. punkuyocense* Croat, *A. riojaense* Croat, and *A. straminopetiolum* Croat. All are members of section *Cardiolonchium*, except two of the species, *A. bicordoense* and *A. porcesitoense*, which are members of section *Xialophyllum*. Five of the new species are from Peru but *A. apiaense*, *A. bicordoense* and *A. porcesitoense* are from Colombia and *A. benktsparrei*, *A. diversicaudex* and *A. molawi* from Ecuador.

## KEY WORDS

*Anthurium*, Araceae, Colombia, Peru, Ecuador, new species.

## INTRODUCTION

This paper is another in a series that studies South American *Anthurium*, especially species from the western Andes where speciation is highest. Both sect.

*Cardiolonchium* (with 9 of the 11 new species in this present paper) and sect. *Xialophyllum*, remain poorly known with no revision since Engler's revision at the turn of the last century (Engler, 1905). The new species were discovered through routine attempts to identify undetermined collections at the Missouri Botanical Garden. Both sect. *Cardiolonchium* and sect. *Xialophyllum* have blades which typically dry greenish (especially in the case of sect. *Cardiolonchium*). While sect. *Xialophyllum* typically have elongated internodes and elongated leaf blades, some collections of section *Xialophyllum* may have short internodes. Similarly section *Cardiolonchium* which typically has larger, ovate-cordate or sagittate blades and short internodes may sometimes have internodes longer than broad. Molecular studies currently being made on *Anthurium* at the sectional level at the Missouri Botanical Garden and the University of Missouri-St. Louis will hopefully allow a better circumscription of these sections.

*Anthurium apiaense* Croat, **sp. nov.**

Type: COLOMBIA. Risaralda: along road between Apia and Pueblorico, at Km 44.1, 14.6 km NW of Apía,

11.7 km E of Pueblorico, 44.1 km E of Santa Cecelia, 05°08'38"N, 76°00'00"W, 2,300 m, 12 Aug 1997, *T. B. Croat & J. F. Gaskin 80708* (holotype, MO-04936534; isotypes, COL, JAUM). Fig. 1 A.

Internodia 15–25 cm longa, 2–3.5 cm diam.; cataphylla 10–11 cm longa; petiolus 48 cm longus, 7–10 mm lata; lamina 62 cm longa, 46 cm lata; nervis primariis lateralibus 7–8 utroque; pedunculus 24.5 cm longus, 4–6 mm lata; spathe viridis, 12 cm longa, 1.8–2.2 cm lata; spadix atropurpureus, 23.5 cm longus, 1.2 cm diam.

Terrestrial to hemiepiphyte, to 4 m tall; **internodes** 15–25 cm long, 2–3.5 cm diam., dark green, soon gray, many finely-ribbed, moderately glossy, minutely granular; **cataphylls** 10–11 cm long, 1.5–2.0 cm wide, persisting semi-intact in pieces at upper nodes, then deciduous, granular, pale-lineate, lower surface finely-ribbed; **petioles** 48 cm long, 7–10 mm wide, drying grayish brown, terete, narrowly and acutely flattened, with a few major ribs, sometimes with a few extra acute low ribs on sides below, glossy, minutely granular; **geniculum** 1.8 cm long, 6 mm wide, drying darker grayish brown, granular, moderately ribbed; **blades** narrowly ovate-sagittate, 62 cm long, 46 cm wide, 1.25–1.5 times longer than broad, 1.2 times longer than petioles, subcoriaceous, dark green and weakly glossy above, slightly paler and semiglossy below drying dark gray and weakly glossy above, slightly paler and semiglossy below; **upper surface** drying minutely granular on magnification, sparsely pale-short-lineate along the veins; **lower surface** drying moderately smooth, sparsely pustular; **anterior lobe** 45 cm long, broadly rounded; **posterior lobes** 21 cm long, 15–17 cm wide, rounded at apex; **basal veins** 4–6 pairs, 1<sup>st</sup> to 2<sup>nd</sup> pair free to base, 2<sup>nd</sup> fused 15 mm, 3<sup>rd</sup> fused 25 mm, 4<sup>th</sup>–5<sup>th</sup> pairs fused 6.0 cm, 6<sup>th</sup> fused 8 cm.; **posterior rib** naked 1.8–3 cm; **sinus** 17 cm deep, 6 cm wide; **midrib** narrowly raised and more or less concolorous above, convex and paler below, granular with speckled inclusions; **prima-**

**ry lateral veins** 7–8 on both sides, arising at 50–55°(–70°), granular; **tertiary veins** moderately prominulous below, fewer and less prominent above; **collective veins** arising from 1<sup>st</sup> pair of basal veins, 2–12 mm from margin. INFLORESCENCE with **peduncle** 24.5 cm long, 4–6 mm wide; **spathe** 22 cm long, 1.8–2.3 cm wide, spreading, green, pale-lineate, granular on magnification, 9.5 times longer than broad; **spadix** 23.5 cm long, 1.2 cm diam., dark purple, glossy, rounded at apex, becoming green in fruit; berries pale green, darker at apex; **flowers** 6–7 per spiral, 2.8–4.1 mm long, 3.0–4.0 mm wide; tepals coarsely and evenly pustular; lateral tepals 1.6–1.9 mm wide, inner margins broadly rounded, outer margins 2–3-lobed. INFRUCTESCENCE with **berries** pale green, darker at apex; **seeds** 2.

*Anthurium apiaense* is endemic to Colombia known only from the type locality in Risaralda Department between Apia and Pueblorico at ca. 1,200 m in a *Montane wet forest* life zone (Holdridge, 1971).

The species is believed to be a member of sect. *Cardiolonchium*, despite its dark gray to olive-green drying color and its long internodes. It is characterized by its terrestrial to hemiepiphytic habit loosely attached to trees, cataphylls semi-intact at upper nodes then deciduous, petioles subterete, narrowly and acutely flattened and sometimes with an extra acute, low rib on the sides, blades narrowly ovate-sagittate with a hippocrepiform sinus, 7–8 basal veins, 8–10 primary lateral veins, collective veins from the 1<sup>st</sup> pair of basal veins, as well as by the green, lanceolate spathe and the dark purple, narrowly tapered spadix.

The species is most similar to *Anthurium nigrescens* Engl. but that species typically has smaller blades and a green or yellow-green spadix.

The species also closely resembles *Anthurium diversicaudex* Croat (also described in this paper), a species with a similar habit and similar stems and leaves from the Lita-San Lorenzo region in Ecuador but that species has a creamy white spadix, blades with a higher length to width ratio (1.6–1.9 times longer than broad

compared to 1.25–1.5 times longer than broad for *A. apiaense*), mostly hippocrepi-form posterior lobes, more prominent primary lateral veins, collective veins arising from 6<sup>th</sup> or 7<sup>th</sup> basal veins, as well as by having the posterior rib naked 3.0–4.5 cm (versus only 2 cm for *A. apiaense*).

In terms of habit the species is closest to another Colombian species, the widespread *Antburium martae* Croat & Castaño, but that species differs in having the spadix greenish.

The epithet “*apiaense*” refers to the type locality near Apia.

***Antburium aylwardianum* Croat, sp.**

**nov.** Type: PERU. Huanuco: Leoncio Prado Province, Distrito Padra Abad, along road from Tingo María to Pucalpa, 2.4 km N of San Isidro, 09°13'18"S, 75°49'40"W, 891 m, 3 June 1998, T. B. Croat & M. Sizemore 81671 (holotype, MO-04951780; isotypes, K, US, USM). Fig. 1 B.

Internodia brevia, 3.5 cm diam.; cataphylla pro parte maxima decidua; petiolus subteres, 47–56 cm longus; lamina 32–43.5 cm longa, 23.2–39 cm lata; nervis primariis lateralibus 7–9 utroque; pedunculus 22 cm longus; spatha 10 cm longa, 2 cm lata; spadix 2 cm longus, 6 mm diam. in siccus.

Terrestrial on steep bank; **internodes** short, 3.5 cm diam., dark green; **cataphylls** deciduous except for a few short pale fibers which persist; cataphyll scars conspicuously raised; **petioles** 47–56 cm long, subterete, obtusely flattened and sulcate adaxially, faintly ridged (3–5) on either side toward upper edge, dark green, matte, drying matte, greenish yellow-brown; **geniculum** much thicker, narrowly and obtusely sulcate; **blade** ovate-sagittate, 32–43.5 cm long, 23.2–39 cm wide, subcoriaceous, dark green and subvelvety-matte above, moderately paler and matte below, drying medium dark brown and matte above, slightly paler and weakly glossy and yellowish brown below; **anterior lobe** 22.5–30.2 cm long, weakly concave along most of its margin, broadly rounded

near apex and abruptly, narrow-acuminate; **posterior lobes** 12.5–20 cm long, 8–14.5 cm wide; **basal veins** 7(–8) pairs, 1<sup>st</sup> pair free to base, 2<sup>nd</sup> pair fused 1.3–1.8 cm, 3<sup>rd</sup> pair fused 3.5–3.7 cm, 4<sup>th</sup> & 5<sup>th</sup> pairs fused 5–5.3 cm; **sinus** parabolic, 9–12.5 cm deep, 8.5–10 cm wide; **midrib** bluntly acute and paler above, narrowly convex and darker below, drying bluntly acute and concolorous above, subtriangular with a medial rib and convex, finely ribbed sides, minutely and sparsely granular; **primary lateral veins** 7–9 on each side, narrowly raised and more or less concolorous above, narrowly raised and paler below, drying narrowly rounded to bluntly acute, slightly paler, minutely granular on magnification above, narrowly acute and slightly darker, minutely granular on magnification below; secondary veins raised; **tertiary veins** in part moderately raised below; **collective veins** arising from one of the lowermost primary lateral veins or the 1<sup>st</sup> or 2<sup>nd</sup> pair of basal veins, 2–4 mm from margin, moderately loop-connecting the primary lateral veins; **upper surface** drying moderately smooth; **lower surface** densely and minutely dark granular-speckled. INFLORESCENCE erect; **peduncles** terete, 22 cm long matte; **spathe** erect-spreading, 14 cm long, 2 cm wide, medium green; stipe ca. 7 cm long; **spadix** long-stipitate (stipe ca. 7 cm long) 20 cm long, drying ca. 6 mm diam., dark green and weakly glossy, smooth.

*Antburium aylwardianum* is endemic to Peru, known only from the type locality in Huanuco Department in the region of La Divisora along the Huanuco-Ucayali Departmental border at 891 m in a *Premontane wet forest* life zone transitioning to *Tropical moist forest* life zone.

The species is a member of sect. *Cardi-olonchium*, characterized by its terrestrial habit, short, thick internodes, cataphylls mostly deciduous, petioles subterete and obtusely flattened, brownish-drying blades sagittate-hastate with a parabolic sinus and especially by the inflorescence with the green lanceolate spathe and the long-stipitate dark green spadix.

In the Lucid *Antburium* Key, *Antburium aylwardianum* keys to *A. breviscapum*

Poepp., which differs in having long, moderately narrow internodes, *A. cymbispathum* Sodiro which differs by having a weakly stipitate, short-tapered spadix and scabrid veins on the lower surface and *A. nigrescens* Engl. which differs in having longer internodes and blades with more prominent tertiary veins. Based on the size and shape of the blades, *Anthurium aylwardianum* appears to be closest in appearance to *A. steubellii* Engl. from Nariño Department in Colombia on Cerro Mayasquer located at about 2,500 m near the Ecuadorian border (0°53'N, 78°04'W) but no species from that part of the western Andes of Colombia and Ecuador on the Pacific slope is known to occur in the Amazon basin.

The species is named in honor of Volunteer Researcher, Steve Aylward, of the Missouri Botanical Garden. Steve regularly keys out undetermined plants to find out if they are likely to be new, just as he did in the case of this specimen which proved to be a new species. Through Steve's efforts, we have isolated and determined many species, a great number have proved to be new to science, including this one being named in his honor. Steve volunteers about 20 hours each week and his skills as a former Latin teacher are also helpful to our research program.

***Anthurium benktsparrei* Croat, sp. nov.**

Type: ECUADOR. Zamora-Chinchipe: Loja-Zamora Road, km 16–18, ecotone between cloud forest and paramo, 2,500–2,650, 31 Dec 1978, *J. L. Luteyn, M. Lebrón-Luteyn, B. McAlpin 6577* (holotype, MO-2726271; isotype, NY). Fig. 1 C–D.

Internodia 1–5 cm longa, 5–12 mm diam.; cataphylla 6–18 cm longa; petiolus 13–60 cm longus; lamina ovata-sagittata ad ovata-triangularata-sagittata, 15.8–44.5 cm longa, 7.1–25.3 cm lata; nervis primariis lateralibus 5–11 utroque; pedunculus 10.9–41.8 cm longus; spatha decidua; spadix 2.8–10.4 cm longus.

Terrestrial scandent herb in the understory; leaves terminally clustered on an erect stem, **internodes** 1–5 cm long, 5–

12 mm diam., light to medium green to gray-green, semiglossy, drying brownish to yellowish brown, usually finely ridged, sometimes transversely fissured; **cataphylls** 6–18 cm long, 1.0–1.5 cm wide, fibers pale, semi-organized, erect and parallel, weathering to a mass of white to brown fibers, gradually acuminate at apex; **petioles** 13–60 cm long, sheathed in lower 1/3 to 1/4, subterete, narrowly and obtusely sulcate to slightly sulcate; **blades** ovate-sagittate to ovate-triangular-sagittate, 15.8–44.5 cm long, 7.1–25.3 cm wide, 1.4–2.7 times longer than wide, .64–1.6 times the length of the petiole, subcoriaceous, bicolorous, dark green above, dark green to bullate, semiglossy above, paler and matte below, drying usually greenish, moderately bicolorous, sometimes yellow-brown; **upper surface** pale lineate, smooth, veins much less prominent; **lower surface** many fine-randomized veins, smooth; **anterior lobe** 18.5–33 cm long, 8.0–17.3 cm wide broadly rounded to almost straight, sometimes weakly convex; **posterior lobe** spatulate, 4.2–7.5 cm long, 2.5–8.0 cm wide; **basal veins** 6–7 pairs, 1<sup>st</sup>–2<sup>nd</sup> free to base, 3<sup>rd</sup> 2.4–3.6 cm from base, 4<sup>th</sup>–7<sup>th</sup> 2.8–3.5 cm from base; **posterior rib** naked 2.8–3.5 cm, ending at 4<sup>th</sup>–7<sup>th</sup> basal veins; **sinus** 3.4–13.1 cm deep, hippocrepiform or sometimes parabolic; **midrib** bluntly acute, narrowly raised and concolorous above; narrowly round-raised and paler below, drying bluntly acute to acute and concolorous above, paler to concolorous below; midrib primary lateral veins hispidulous below; **primary lateral veins** 5–11 on each side, arising at 45°–50°, deeply sulcate and concolorous above, about equaling the interprimary lateral veins, narrowly raised below, drying convex in deep valleys above, round-raised and concolorous to slightly paler below; **tertiary veins** concolorous above and slightly more conspicuous than tertiary veins below, prominently raised and concolorous below; all other veins clearly sunken above, raised below, creating a reticulate pattern; most major veins on the lower surface densely and minutely granular-puberulent (almost appearing as a frost),

some collections have a noticeably longer indumentum being densely puberulent-villous; **collective veins** sunken above, raised below, 2–6(–8) mm from margins, arising usually from the 1<sup>st</sup> pair of basal veins, sometimes from the lower 1<sup>st</sup> or 2<sup>nd</sup> pair of primary lateral veins, frequently from the 2<sup>nd</sup> or 3<sup>rd</sup> pair of basal veins (rarely from the 4<sup>th</sup> pair of basal veins). INFLORESCENCES erect, 14–48 cm in length; **peduncle** 10.9–41.8 cm long, flattened with broad, convex rib adaxially; **spathe** 38–11 cm long, 7–23 mm wide, green to light green, oblong, acuminate, deciduous; **spadix** 2.8–10.4 cm long, pink, light violet-red, pinkish red, purplish to red, blackish purple, deep blue to bluish violet, odorless, cylindroid to cylindroid-tapered, matte; **flowers** 4 visible per spiral, 1.5–4.2 mm long, 1.2–3.9 mm wide; tepals minutely granular, very pale; lateral tepals .5–1.2 mm wide, inner margins rounded, outer margins 2–3-sided; **pistils** early-emergent, whitish. Fruits not seen.

*Anthurium benktsparrei* is known from southern Ecuador and northern Peru at 1,500–3,000 m in a *Montane wet forest* life zone.

The species is a member of sect. *Cardi-olonchium*, characterized by its terrestrial, sometime sub-scandent habit, internodes typically longer than broad, subterete weakly sulcate petioles, the ovate-cordate to ovate-triangular-sagittate greenish-drying blades with a typically hippocrepiform sinus as well as by the reddish or purplish cylindroid to cylindroid-tapered spadix. Another character typical of the species is a puberulous or frosty type of pubescence on the major veins of the lower surface.

*Anthurium benktsparrei* is most easily confused with *A. dolichocnemum* Croat and *A. ionanthum* Croat. The former differs in having the leaf blades much more prominently constricted on the anterior lobe and the latter differs in having the blade with more or less ovate blades.

While most specimens of *Anthurium benktsparrei* have the lower surface granular-puberulent (appearing like a frost) some specimens have a longer puberulent indumentum. There seems to be no geo-

graphic correlation involved in the distribution of the pubescence types. The specimens with puberulent indumentum are represented by *Harling & Andersson 24078* from 10 km E of Paquisha at 1,400–1,500 m and *van der Werff 12494* from the Province of Bolívar between Chillanes & El Tambo at 1,700–2,300 m. One collection (*Harling & Lennart Andersson 21283*) from the Río Palanda at crossing with Zumba Road (04°38'52"S, 79°07'55"W), is not listed among the paratypes but it is nevertheless closely related to *Anthurium benktsparrei*. This specimen differs in having a longer subvillous type of pubescence and occurs 300 m lower in elevation than *A. benktsparrei*.

Two other collections which are similar to *Anthurium benktsparrei* are not listed among the paratypes. These specimens represent a species which seem closely related to *A. benktsparrei* but the leaves are completely glabrous. The specimens are *Leimbeck & Windeballe 342* from Loja Province in Podocarpus National Park north of the Cajanuma Visitors Center from 1,700–2,300 m, and a *Harling & Andersson* collection from near Zamora in Podocarpus National Park. These may represent some other species.

The species is named in honor of Swedish botanist, Baron Benkt Sparre, one of the original authors of the Flora of Ecuador, then based at the Rijksherbarium in Stockholm. Benkt Sparre, often accompanied by his wife, collected many Araceae in the early days of exploration by the Swedes. Sparre told the senior author that he made a special point of collecting Araceae and indeed he did collect hundreds of specimens, many of which proved to be new to science.

**Paratypes:** ECUADOR. **Bolivar:** Along road Chillanese-El Tambo, in forest remnants, 19 Jul 1991, *H. van der Werff*, *B. Gray & G. Tipas 12494* (MO). **Loja:** Nudo de Sabanilla, W slope on road to Yangana-Valladolid, 8 Feb 1985, *G. Harling & L. Andersson 21797* (GB); Loja-Zamora Road, W of the pass, disturbed forest and scrub, 03°59'53"S, 79°09'02"W, 14 Feb 1985, *G. Harling & L. Andersson 22056* (GB);

Parque National Podocarpus/Reserva El Bosque, above San Pedro de Vilcabamba (5 km east of the village); Quebrada Romerillo, lower part, 04°16'S, 79°10'W, 30 Nov 1994, *H. B. Pedersen 104125* (AAU, MO, QCA, QCNE); road to Cerro Toledo, E of Yangana; 04°21'S, 79°07'W, 29 Nov 2000, *R. Leimbeck, J.E. Madsen & B. Windeballe 434* (AAU, QCA); Curishiro, zona minera cercana al Parque National Podocarpus, 4 horas a pie desde Masanamaca, 04°16'S 079°05'W, 2-4 Apr 1990, *P. Mena V., L. Suarez & Medina, G. Tipaz 2763* (QCA). **Zamora-Chinchipe:** road Loja - Zamora, Km 16, near the pass to Loja, 20 May 1967, *B. Sparre 16502* (S); road from Loja to Zamora, E slope of Cordillera Oriental, 04°00'S, 79°00'W, 15 May 1985, *B. A. Stein & D. D'Alessandro 2784* (MO, QCNE); Nudo de Sabanilla-Valladolid, horse trail to Caserío Quebrada Honda, 18 Mar 1993, *G. Harling 27167* (S); 10 km E of Paquisha, lumber tracks in primary forest, 13 Apr 1985, *G. Harling & Lemart Anderson 24078* (GB, QCA); Parque Nacional Podocarpus, new road Loja-Zamora, E of Cerro Yanococha, along former indigenous trail to Zamora, slightly disturbed, 03°59'S, 79°07'W, 26 Nov 1988, *J.E. Madsen 75543* (AAU); old mule track towards Zamora, 03°59'S, 79°07'W, 08 Mar 1990, *J.E. Madsen 87009* (AAU, QCA); road between Loja & Zamora ca. km 16-18, ecotone between cloud forest and páramo, 03°59'52"S, 79°09'27"W, 31 Dec 1978, *J.L. Luteyn 6577* (MO, NY); road Loja-Zamora, km 17, road sides and steep slopes, 03°59'S, 79°08'W, 17 Apr 1973, *L.B. Holm-Nielsen, S. Jeppesen, B. Løjnant & B. Øllgaard 3551* (AAU, S); Palanda, Región de la Cordillera del Cóndor, sector sur, Parroquia San Francisco de Vergel, margen izquierdo del Río Vergel, pantano, 04°43'01"S, 78°57'47"W, 13 Mar 2005, *W. Quizhpe 998* (HUA, LOJA, MO). PERU. **Cajamarca:** Cutervo, San Andrés de Cutervo, San Andrés - Santo Tomás, Km 15 a 20, 06°13'00"S, 78°40'00"W, 15 Mar 1989, *C. Díaz & H. Beltrán 3360* (MO); *C. Díaz & H. Beltrán 3362* (MO, USM). **San Martín:** Rioja, Pedro Ruíz-Moyobamba road, Km 390, Venceremos, habitat analysis for Yel-

low-tailed Woolly Monkey study, Trail A, 05°50'S, 77°45'W, 7-9 Aug 1983, *D.N. Smith & S. Vasquez S. 4684* (MO, USM).

***Anthurium bicordoense* Croat, sp. nov.**

Type: COLOMBIA. Chocó: Hoya del Río San Juan, Andagoya. Alrededores de campamento de la Compañía Mineros de Chocó, ca. 5°06'N, 76°42'W, 13 Apr 1979, *E. Forero, R. Jaramillo, J. Espina Z. & P. Palacios H. 5164* (holotype, COL). Fig. 2 A.

Internodia 3.6-13 cm longa, .4-8 cm diam.; cataphylla 8.2-9.3 cm longa; petiolus 18.3-27.7 cm longus, 2.0-3.5 mm lata; lamina 23.2-33.5 cm longa, 13.2-25.4 cm lata; nervis primariis lateralibus 9-10 utroque; pedunculus 8.4-15.8 cm longus, 1-3 mm lata; spatha 5 cm longa, .7 cm lata; spadix viridis, 4.8-5.2 cm longus, 3-4 mm diam.

**Internodes** 3.6-13 cm long, .4-8 cm diam., drying light yellowish gray, ribbed, slightly granular, few-dispersed pale inclusions, moderately glossy; **cataphylls** 8.2-9.3 cm long, .8-1.4 cm wide, drying greenish gray, pale lineate, persisting as pale fibers; **petioles** 18.3-27.7 cm long, 2.0-3.5 mm wide, subterete, drying yellowish brown but greenish gray at base, few deeply ribbed, slightly glossy, dark inclusions, slightly granular; **geniculum** .7-1.4 cm long, 2-4 mm wide, drying a darker yellowish brown, finely many-ribbed; **blades** broadly ovate, 23.2-33.5 cm long, 13.2-25.4 cm wide, 1.5 times longer than broad, abruptly acuminate at apex, subcordate at base, drying medium, green above, light greenish gray below; **upper surface** densely granular; **lower surface** moderately smooth, weakly pale, short-lineate; **anterior lobe** 17.8-27.8 cm, rounded to broadly rounded; **posterior lobes** 3.8-4.4 cm, 4.3-9.2 cm wide, narrowly rounded; **sinus** arcuate to parabolic, 2.7-4.5 cm deep, 4.5-4.7 midway; **basal veins** 4-5 pairs, 1<sup>st</sup>-3<sup>rd</sup> free to base, 4<sup>th</sup> fused 1.2-2.1 cm, 5<sup>th</sup> fused 1.8-3.2 cm; **posterior rib** naked 1.6-2.1 cm; **midrib** narrowly rounded to bluntly acute and concolorous above, narrowly round-raised and paler below;

**primary lateral veins** 9–10 on both sides, arising at 45–50°, narrowly rounded to convex and concolorous above, narrowly raised and narrowly round-raised and granular below; **tertiary veins** weak on upper surface, weakly raised and concolorous below; **collective veins** arising from 3<sup>rd</sup> basal vein, 2–4 mm from margin. INFLORESCENCES with **peduncle** 8.4–15.8 cm long, 1–3 mm wide, many-deeply ribbed, cellular inclusions, slightly darker than petiole; **spathe** spreading, 5 cm long, .7 cm wide, 7 times longer than broad, drying greenish gray, finely many-ribbed, pale-lineate; **spadix** green to yellow, 4.8–5.2 cm long, 3–4 mm diam., 14 times longer than broad, stipitate 3–4 mm; **flowers** 5 visible per spiral, .9–1.4 cm long, .9–1.1 cm wide; tepals darkly-color, moderately granular, lateral tepals .7–.8 mm, inner margins rounded, outer margins 3–4-sided, sometimes with 2 obtuse angles and one rounded side.

*Anthurium bicordoense* is believed to be endemic to Colombia, known only from the valley of the Río San Juan in Chocó Department at less than 100 m elevation in a *Tropical rain forest* life zone.

The species is a member of sect. *Xialophyllum*, characterized by its elongate, light grayish-brown-drying internodes, cataphylls persisting mostly as pale fibers, subterete petioles about as long as the blades, the ovate-elliptic, greenish-drying blades which are broadest between the middle and the petiolar plexus as well as by a long-petiolate inflorescence with a green spathe and the slender, cylindroid, green to yellow short-stipitate spadix.

The species is closest to *Anthurium oblongo-cordatum* Engl. but that species differs in having blades that are about 2.5 times longer than broad. It also occurs only at higher elevation 1,100 to 2,530 m elevation.

The species is also close to *Anthurium porcesitoense* Croat, another member of sect. *Xialophyllum* with blades of similar shape and which also has scattered pale cellular inclusions on the lower surface. That species differs in occurring above 1,100 m and by having stems drying brown,

the upper blade surfaces drying densely, closely and more densely granular (including on the veins)

*Anthurium bicordoense* may also be confused with smaller plants of *A. breviscapum* Kunth but that species is typically found in the drainage of the Amazon basin and also differs in having a dark purplish spadix.

The species is named after the locality where it was first collected along the Río Bicordó in Chocó Department.

**Paratype:** COLOMBIA. **Chocó:** Hoya del Río San Juan, Hoya del Río San Juan, Río Bicordó, above Noanamá, banks of the river, ca. 4°42'N, 76°55'W, ca. 20 m, 6 Apr 1979, E. Forero, R. Jaramillo, J. Espina Z, & P. Palacios H. 4709 (COL).

***Anthurium diversicaudex* Croat, sp. nov.** Type: ECUADOR. Esmeraldas: Lita-San Lorenzo Road, 17 km W of bridge over Rio Lita (on old road below Lita), 00°52'11"N, 78°27'06"W, 425 m, 6 July, 1998, T.B. Croat, R. Mansell, L.P. Hannon & J. Whitebill 82390 (holotype, MO-04882024; isotypes, AAU, B, COL, F, K, NY, QCNE, S, SEL, US). Fig. 2 B–C.

Internodia (2–)10–16(–25) cm longa, 8–12(–27) mm diam.; cataphylla 12–14 cm longa; petiolus 45–62 cm longus; lamina ovata-sagittata, 41–56 cm longa, 23–32 cm lata; nervis primariis lateralibus 7–9 utroque; pedunculus 16–49 cm longus; spathe 16–21.5 cm longa, 2–3 cm lata; spadix 15–19 cm longus, 6–10 mm diam.

Terrestrial or hemiepiphytic; **internodes** (2–)10–16(–25) cm long, 8–12(–27) mm diam., dark olive-green and semiglossy, turning grayish to gray-brown, epidermis thin, exposing dark green stem, semiglossy; **cataphylls** 12–14 cm long, dark green and glossy, the fibers pale, briefly persistent intact at upper nodes, finally as straight, appressed fibers then deciduous; **petioles** 45–62 cm long (averaging 52.8 cm), subterete obtusely flattened to bluntly C-shaped, weakly, narrowly and obtusely sulcate adaxially, semiglossy to moderately glossy, dark to medium green,

drying dark brown; **blades** ovate-sagittate, 41–56 cm long, 23–32 cm wide, 1.5–2.0 times longer than wide, .74–1.23 times as long as petioles, subcoriaceous, dark green and glossy to semiglossy above, moderately to much paler and weakly glossy to glossy below, drying dark blackish brown (rarely grayish green) and semiglossy above, medium blackish brown or rarely yellowish brown below, gradually to abruptly acuminate at apex, deeply lobed at base; **anterior lobe** 29–37 cm long, margins straight to convex; **posterior lobes** 14–18 cm long, 10–12 cm wide, directed toward the base; **basal veins** 6–8 pairs, the 1st and sometimes 2nd free to the base, the 4th and higher order coalesced 3.5–4.5 cm; **posterior rib** naked along the sinus 2–4.5 cm; **sinus** spatulate to narrowly hippocrepiform, 12–14 cm long, 3.5–6 cm wide; **midrib** slightly paler than surface, convex at base, bluntly acute to narrowly raised toward the apex and concolorous above, bluntly acute to convex or round-raised and concolorous to paler below, drying concolorous and acute above, darker and narrowly raised below; **primary lateral veins** 7–9 on both sides, arising at 40–45° angle, narrowly acute to narrowly raised and concolorous on both surfaces, sometimes in valleys above, sometimes pleated-raised below; **tertiary veins** flat, darker than surface, in part weakly raised, prominulous on drying; **collective veins**, arising from one of the lowermost basal veins, 2–5(–7) mm from margins, often more prominently raised than the primary lateral veins below. INFLORESCENCES erect-spreading; **peduncle** 16–49 cm long, dark green, terete; **spathe** 16–21.5 cm long, 2–3 cm wide, medium-green, erect or spreading to reflexed, semiglossy; **spadix** 15–19 cm long, 6–10 mm diam., creamy white, greenish to pale yellowish-green, becoming creamy white at anthesis, sometimes tinged brown toward apex post-anthesis, finally becoming dark green and semiglossy. INFRUCTIONES 23–27 cm long, with tepals green; young **berries** 3 mm diam., greenish white or whitish, pale yellow-green to green at maturity.

*Anthurium diversicaudex* is currently assumed to be endemic to Ecuador since it is known only from the Lita-San Lorenzo region at 350–822 m elevation. It is a member of section *Cardiolonchium*, characterized by frequently long internodes which dry light reddish brown to grayish and finely striate, the blackish-drying, obtusely sulcate petioles about as long as the blades, the blackish-drying ovate-sagittate blade with the collective veins arising from one of the lowermost basal veins as well as its pale yellow-green to creamy white spadix and greenish white berries.

The epithet “diversicaudex” refers to the fact that the species is enormously variable in terms of the length of its internodes with the internodes sometime being very short and at other times much longer than broad.

**Paratypes:** ECUADOR. **Esmeraldas:** San Lorenzo Cantón: Lita-San Lorenzo Road, 6.4 km W. of Rio Lita, 609 m, 00°52'08"N, 78°28'09"W, 2 July 1998, *Croat 82254*; 17.1 km W. of Rio Lita, 00°54'06"N, 78°32'27"W, 822 m, 10 Oct 1999, *Croat et al. 83185* (MO, QCNE); 20 July 2000, *Croat et al. 84244* (MO, QCNE); 18 km W of Río Lita, 425 m, *Croat 82619* (MO, QCNE); 26.9 km W of Rio Lita, 13.2 km E of El Durango, 00°58'06"N, 78°33'45", 735 m, 17 Oct 1999, *Croat et al. 88893* (MO, QCNE); 40.1 km W of Lita, 00°56', 78°40'W, 350 m, 21 Feb 1992, *Croat 72317* (MO); 17.3 km W of Alto Tambo, 3.4 km E. of El Durango, 01°02'31"N, 78°37'02"W, 375 m., 8 July, 1998, *Croat et al. 82543* (MO, QCNE).

***Anthurium mapiriense* Croat, sp. nov.**

Type: PERU. Junín: Satipo Province, Gran Pajonal, Mapiri, ca. 12 km SW of Chequitavo, primary and secondary forest, 10°45'S, 74°23'W, 1,300 m, 7 Apr 1974, *D. N. Smith 6821A* (holotype, MO-405903; isotype, USM). Fig. 2 D.

Internodia 1.8–3.5 cm longa; cataphylla 4.8 cm longa; petiolus 14.5–17 cm longus; nervis primariis lateralibus 7–8 utroque; pedunculus 18.3–18.5 cm longus; spatha viridis, 4.5–5.3 cm longa, 4–6 mm lata;





spadix viridis, 5–5.9 cm longus. 2–3 mm diam.

Erect terrestrial herb; **internodes** 1.8–3.5 cm long, 5–6 mm on drying light brown, finely ridged; **cataphylls** 4.8 cm long, truncate and apiculate, with pale linear cellular inclusions, only the basal, pale fibers persisting at nodes; **petioles** 14.5–17 cm long, 1.5–2 mm diam., drying greenish brown to light brown, deeply sulcate adaxially with a few obtuse ridges circumferentially; **geniculum** 15–17 mm long, 1.5 mm diam., drying slightly darker, finely many-ribbed, more or less terete; **blades** oblong-ovate, 18–23.6 cm long, 7.4–10.7 cm wide, 2.37 times longer than broad, 1.2 times longer than petioles, gradually long-acuminate at apex (acumen sometimes down-turned), deep lobed at base, drying medium yellow-brown above, pale yellow-brown to greenish yellow below; **upper surface** minutely areolate-ridged-granular with pale-linear cellular inclusions; **lower surface** moderately smooth with pale-linear cellular inclusions; **anterior lobe** 14–17.6 cm long, broadly convex to straight, rarely weakly concave **posterior lobes** 4.6–6.6 cm long, 2.8–4.1 cm wide, directed toward base; **basal veins** 4–5 pairs, 1<sup>st</sup> pair free to base; 2<sup>nd</sup> pair fused 5–7 mm, 3<sup>rd</sup>–4<sup>th</sup> pairs fused 20–21 mm; **posterior rib** naked 9–18 mm; **midrib** much thicker than broad, bluntly acute, drying slightly darker than surface, minutely granular above; narrowly rounded, drying densely and minutely glandular-ridged, concolorous below; **primary lateral veins** 7–8 pairs, arising at ca. 55° angle, narrowly rounded and concolorous above, narrowly rounded and concolorous below, both densely granular on drying; interprimary veins present; **tertiary veins** moderately inconspicuous; **collective veins** arising from 1<sup>st</sup> pair of basal veins, 2–4 mm from margin. INFLORESCENCE erect or nearly so; **peduncle** 18.3–18.5 cm long, 1–2 mm wide; **spathe** green, drying brownish, 4.5–5.3 cm long, 4–6 mm wide, 9.8 times longer than broad; **spadix** green, 5–5.9 cm long, 2–3 mm diam., 21.6 times longer than broad, stipitate 2 mm, **flowers** 4–5 visible per spiral, 1.6–2.2 mm long, 1.9–

2.1 mm wide, 4-lobed, tepals matte, shield-shaped, minutely granular with several pale subglobular cellular inclusions; lateral tepals 1mm wide, inner broadly rounded, outer margins 3–4 sided.

*Anthurium mapiriense* is endemic to Peru, known only from the type locality in Junín Department at 1,300 m in *Premontane wet forest* and *Premontane rain forest* life zones.

The species is a member of sect. *Cardi-olonchium*, characterized by its erect terrestrial habit, elongated internodes, cataphylls persisting only as a few weak fibers, the subterete petioles which dry finely ribbed, the narrowly oblong-ovate, brownish-drying blades and a spatulate sinus, as well as by the long-pedunculate inflorescences with a linear spreading green spathe and short-stipitate dark green, long-tapered spadix.

*Anthurium mapiriense* is similar to both *A. benktsparrei* Croat and *A. molau* Croat, both of which share pale, linear cellular inclusions. The latter species differs in occurring below 500 m and in having a pale green or yellowish green spadix rather than a dark green spadix, pale green leaves and by having generally broader sinus between the posterior lobes, usually narrowly hippocrepiform to parabolic (versus spatulate on *A. mapiriense*); *A. benktsparrei* usually occurs at elevations mostly above 2,000 m and has major veins more conspicuously pubescent with a short-tapered pinkish to bluish violet spadix with a promptly deciduous spathe.

*Anthurium mapiriense* is also related to *A. breviscapum* Kunth a species with typically thicker internodes, larger leaves and a purple spadix. In addition the epidermis of *A. breviscapum* is more conspicuously granular on the lower surface and lacks the linear cellular inclusions on the lower surface. *Anthurium breviscapum* is typically more abundant at elevations above 500 m. *Anthurium laurelense* Croat differs from *A. breviscapum* by its typically greenish to greenish yellow, short-cylindroid spadix, smaller leaves. The latter species differs in having typically larger, glossier blades with more prominent ter-



tiary venation and a much longer spadix (19–26 cm long at anthesis).

The species is named for the type locality at Mapiri in Satipo Province in Junín Department of Peru.

***Anthurium molau*** Croat, **sp. nov.** Type: ECUADOR: Pastaza: Parroquia Curaray. Pozo Petroleo Villano 2 de ARCO, between Río Iquino and Río Villano, primary forest on dissected hills, 01°29'S, 77°27'W, 350 m, 4–19 Aug 1993, *M. Tirado, V. Zak, L. Vargas & H. Andi 223* (holotype, MO-04583489; isotypes, K, QCNE, US). Fig. 3 A–B.

Internodia 1.5–13 cm longa, 4–7 mm diam.; cataphylla 4–5.3 cm longa; petiolus 14.5–29 cm longus; lamina anguste ovato-sagittata, 15.2–32 cm longa, 11.8–18.7 cm lata; nervis primariis lateralibus 5–8 utroque; pedunculus 2.3–8 cm longus; spathe 2.1–6.3 longa; spadix 3.8–7 cm longus, 4–6 mm diam., viridis vel viridi-flavus; baccae rubrae vel purpurea.

Hemiepiphytic scrambling herb; **internodes** elongate and slender, 1.5–13 cm long, 4–7 mm diam., drying grayish brown, matte; **cataphylls** 4–5.3 cm long, green, narrowly triangular, promptly deciduous, sometimes with a few short fibers persisting; **petioles** subterete, sulcate, drying moderately and deeply sulcate, medium green drying grayish yellow-green, weakly ribbed and minutely granular. LEAVES 30.1–52.7 cm long; **blades** narrowly ovate-sagittate, 15.2–32 cm long, 11.8–18.7 cm wide, broadest usually below the middle and above the petiolar plexus, sometimes at the petiolar plexus, rarely across the posterior lobes, 1.2–2.5 times longer than wide (averaging  $27.4 \times 15.5$  cm), .9–1.9 times as long as petioles, medium dark green and semiglossy above, moderately paler and semiglossy below, drying greenish and weakly glossy above, slightly paler, grayish green and weakly glossy below; **anterior lobe** 15.3–25.9 cm long, broadly rounded along the margins; **posterior lobes** 6–9.5 cm long, 4.6–7.4 cm wide, slightly longer than broad, narrowly

rounded at apex, sometimes turned weakly inward; **sinus** 3.1–7.5 cm deep, 3–5.7 cm wide, parabolic to narrowly hippocrepiform; **midrib** narrowly raised and bluntly acute to acute and concolorous above, narrowly round-raised and paler, minutely granular on drying below; **primary lateral veins** 5–8 on each side, arising at 45–55° angle, acute and concolorous above, narrowly rounded and slightly paler below; **tertiary veins** in part weakly raised; **collective vein** arising from uppermost basal vein, 2–4 mm from margin; **upper surface** moderately smooth, minutely areolate on magnification; **lower surface** minutely granular between the areoles. INFLORESCENCE with **peduncle** 2.3–8 cm long, 1.5–2 mm diam.; **spathe** lanceolate, 2.1–6.3 cm long, 9–12 mm wide, medium green; **spadix** cylindroid, weakly tapered, greenish to greenish yellow, 3.8–7 cm long, 4–6 mm diam., narrowly rounded at apex; **flowers** 5–6 visible per spiral, 1.5–1.6 mm long, 1.3–1.4 mm wide; tepals smooth, drying light tan-brown with a few pale cellular inclusions; lateral tepals .9–1 mm wide, inner margin rounded; outer margin 2–3-sided. INFRUCTESCENCE with spadix to 10.5 cm long; **berries** reddish to purple, ovoid, ca. 6 mm long.

*Anthurium molau* is known from eastern Ecuador Orellana, Pastaza and Morona-Santiago Provinces and N. Peru in Loreto Department, Teniente Lopez Province at 200–500 m in a *Tropical moist forest* life zone.

The species is a member of sect. *Cardi-olonchium*, characterized by its hemiepiphytic, somewhat scandent habit, elongated usually gray-brown internodes, deciduous cataphylls, subterete petioles that at least dry deeply sulcate, by the narrowly ovate-sagittate grayish green-drying blades with a long-acuminate apex and narrowly hippocrepiform to parabolic sinus as well as by the short-pedunculate inflorescence with a green, reflexed, lanceolate spathe and a narrowly cylindroid, weakly tapered greenish to greenish yellow spadix and the small red to purple berries.

*Anthurium molau* is closest to *A. benktsparrei* Croat and *A. mapiriense* Croat (both species described in this paper)



differing from both in occurring below 500 m elevation in the Amazon basin. See the discussion following *A. mapiriense* for additional differences.

The only collection from Orellana Department (*Cerón & F. Hurtado 4103*) is described as having a purplish violet spadix but seems not to differ in any other way nor does the spadix appear to have been thus colored since it dries the same color as other specimens in the series.

The species is named in honor of Danish botanist, Ulf Molau, who along with, B. Lojtnant, of Aarhus University, spent six months collecting in Ecuador in 1979 and collected the species twice between May 17<sup>th</sup> and May 19<sup>th</sup>. Molau started his collecting career in 1977, spending time in the field with Gunnar Harling and Mike Madison. Later he spent half a year in Ecuador in 1985 and about four months in 1987/88, (this time with his wife, Bente Eriksen Molau). Most of Molau's collecting was at higher altitudes in the Andes including Peru and Bolivia mostly in cloud forest and páramo since he concentrated on *Calceolaria* (completed for the Flora Neotropica in 1988) and *Bartsia* (revised in 1990). Molau, now a professor in Plant Ecology at the University of Gothenburg, also works for the Swedish Ministry of the Environment as a member of the Swedish Delegation to the CBD (the UN Convention on Biological Diversity and is a lead author of IPCC).

*Paratypes*: ECUADOR. **Pastaza**: Río Bobanza, near its mouth at the Río Pastaza, between Destacamento Cabo Pozo and La Boca; river banks and periodically flooded palm forest, dominated by Mauritia, 2°30'–35'S, 76°38'W, ca. 275 m, 21 Jul 1981, *B. Øllgaard, E. Asanza C., J. Brandbyge, S. Roth & C. Sperling 34934* (holotype, MO-3039088; isotypes, AAU, QCA).

***Anthurium porcesitoense*** Croat, **sp. nov.** Type: COLOMBIA. Antioquia: vicinity of Porcesito in the valley of Río Medellín, 6°32'N, 75°14'04W, ca. 1,100 m, 16 Apr 1946, *W. H. Hodge 6782* (holotype, US; isotypes, GH, P). Fig. 3 C.

Internodia 1.8–8.8 cm longa, .4–.6 cm diam.; cataphylla 4.8–5.5 cm longa; petiolus 10.4–19.7 cm longus, lamina 19.8–23.8 cm longa, 11.5–13.8 cm lata; nervis primariis lateralibus 6 utroque; pedunculus 11–18.8 cm longus, .2–.3 cm lata; spatha viridis, 2.8–4.2 cm longa, .4–.6 cm lata; spadix viridis vel roseus, 4.4–6.0 cm longus, .2–.3 cm diam.

Terrestrial; **internodes** 1.8–8.8 cm long, .4–.6 cm diam., 12 times longer than broad, drying grayish brown, finely granular, few deeply-ribbed; **cataphylls** 4.8–5.5 cm long, .7–.8 cm wide, 7 times longer than broad, drying yellow brownish gray, finely ribbed, pale lineate on outer surface; **petioles** 10.4–19.7 cm long, .2–.3 cm wide, 26 times longer than broad, drying dark brown-gray, finely granular, few moderately deep ribs; **geniculum** .7–.9 cm long, .2 cm wide, 4 times longer than broad, many shallow ribs, drying yellowish brown; **blades** ovate, 19.8–23.8 cm long, 11.5–13.8 cm wide, 1.7 times longer than broad, 1.0–1.7 times longer than blades, abruptly acuminate at apex, deeply lobed at base, drying greenish gray above, light greenish gray below; **upper surface** densely, closely and minutely granular; **lower surface** densely granular, including on the veins; **anterior lobe** 14.8–19.8 cm long, 11.5–13.8 cm wide, 1.3 times longer than broad; **posterior lobe** 3.8–5.8 cm long, 3.8–5 cm wide, 1.2 times longer than broad; **sinus** hippocrepiform to spatulate, parabolic; **basal veins** 4–5 pairs, 1<sup>st</sup>–2<sup>nd</sup> pair free to base, 3<sup>rd</sup> fused .8–1.1 cm, 4<sup>th</sup>–5<sup>th</sup> fused 1.2–1.5 cm; **posterior rib** naked 1.7–2.5 cm; **midrib** narrowly round-raised; **primary lateral veins** 6 on each side, arising at 50–55°, round-raised; **tertiary veins** moderately prominent above, and below; **collective veins** arising from 1<sup>st</sup> basal vein, .1–.4 cm from margin. INFLORESCENCES; **peduncle** 11–18.8 cm long, .2–.3 cm wide, 70 times longer than broad, drying grayish brown, glossy, cellular inclusions; **spathe** green, 2.8–4.2 cm long, .4–.6 cm wide, 7 times longer than broad, spreading, acuminate at apex, narrow ovate, granular outer surface, pale inclusions on inner surface; **spadix** green to

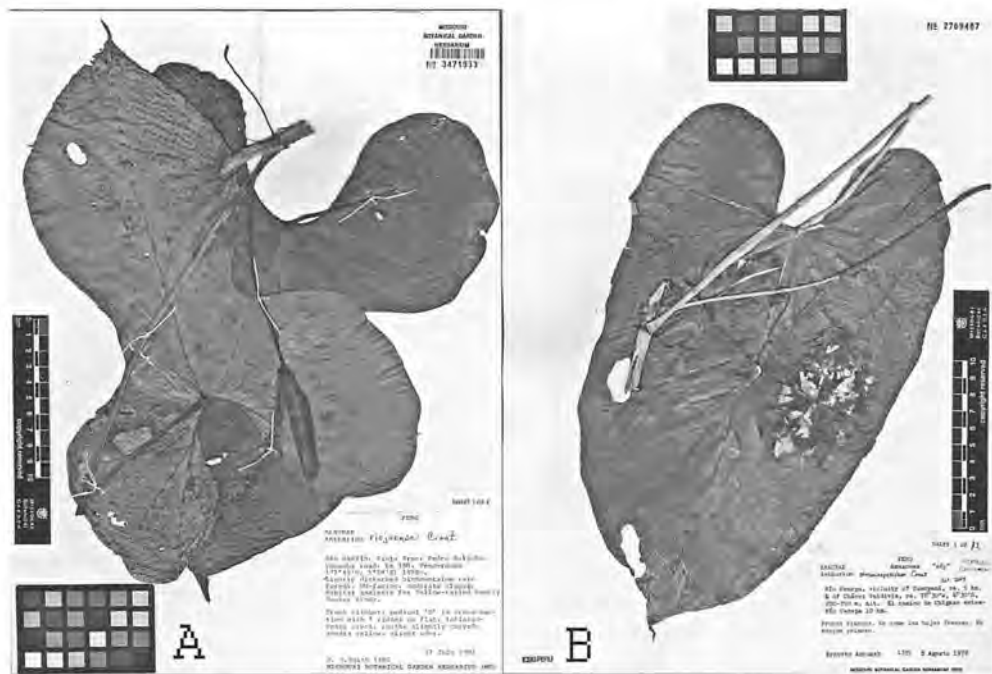


Fig. 4. A. *Anthurium riojaense* Croat (Smith 4400). A. Herbarium type specimen. B. *Anthurium straminopetiolum* Croat (Ancuash 1335). B. Herbarium type specimen.

pink with yellowish pistils, 4.4–6.0 cm long, .2–.3 cm diam., 19 times longer than broad, stipitate .2–.4 cm; **flowers** 3 visible per spiral, 1.1–1.4 mm long, .8–1.1 mm wide, drying reddish brown, granular, 4-lobed, lateral tepals .6 mm, inner margins rounded, outer margins 4-sided; **INFRUCTESCENCES**; **berries** not seen.

*Anthurium porcesitoense* is endemic to Colombia, known only from the valley of the Río Medellín, above 1,100 m elevation in a *Premontane wet forest* life zone.

The species is a member of sect. *Xialophyllum*, characterized by its elongate medium yellow-brown drying internodes, promptly deciduous cataphylls, subterete petioles about as long as the blades, the narrowly ovate-sagittate, greenish-drying blades which are broadest between the middle and the petiolar plexus as well as by a long-petiolate inflorescence with a green spathe and a green reddish spadix with yellowish areas.

The species is similar to *A. oblongo-cordatum* Engl. a species with proportion-

ately much narrower leaves which are 2.1–2.5 times longer than broad, and occurring at higher elevations.

The species is also close to *Anthurium bicordatum* Croat, another member of sect. *Xialophyllum*, with blades of similar shape and which also have scattered pale cellular inclusions on the lower surface. That species differs in occurring at less than 200 m along the Río San Juan and by having stems light grayish brown, also by having the upper blade surfaces drying smooth except for scattered granules.

The species is named for the type locality near the village of Porcesito in the valley of the Río Medellín.

**Paratype:** COLOMBIA. **Antioquia:** bosques hacienda El Darién, right margin of Río Chontadural, 13 Sep 1979, *R. Fonegra* 1346 (HUA).

***Anthurium punkuyocense* Croat, sp. nov.** Type: PERU. Cusco: La Convención Province, Distrito Santa Ana, Punkuyoc, bosque primario húmedo,



12°54'47"S, 72°50'20"W, 2,000–3,200 m, 17 Oct 2002, L. Valenzuela, E. Sucilli, I. Huamantupa 937 (holotype, MO-5893840; isotype, USM). Fig. 3 D.

Internodia 2.5 cm longa; cataphylla 11.5 cm longa; petiolus 37.3 cm longus; lamina 28.2 cm longa, 17 cm lata; nervis primariis lateralibus 3–4 utroque; pedunculus 14.3 cm longus, 1.5 mm lata; spathe viridis, 7.8 cm longa, 1.8 cm lata; spadix viridis, 7.3 cm longus.

Terrestrial to ca. 1 m; **internodes** 2.5 cm long, 1.1 cm wide on drying grayish brown, finely granulated, finely ridged; **cataphylls** 11.5 cm long, the base persisting as fine pale fiber, finally deciduous; **petioles** 37.3 cm long, drying yellowish brown; **geniculum** 18 mm long, 2.5 mm wide, drying a darker brown, many few-ribbed, finely granulated; **blades** 28.2 cm long, 17 cm wide, 1.65 cm longer than broad, .75 times as long as petioles, deeply lobed at base, nearly concolorous, drying a dark grayish yellow-greenish on both surfaces, abruptly long-acuminate at apex; **upper surface** moderately smooth; **lower surface** moderately smooth but with a few weakly raised bumps in each areole; **anterior lobe** 20.8 cm, broadly rounded or rarely weakly concave; **posterior lobe** 8.7 cm long, 8.6 cm wide, directly toward base; **basal veins** 6–7 pairs, 1<sup>st</sup> and 2<sup>nd</sup> pair free to base, 3<sup>rd</sup> fused 8 mm, 4<sup>th</sup> fused 23 mm, 5<sup>th</sup>–6<sup>th</sup> fused 3.5 cm, 7<sup>th</sup> fused 16 mm; **posterior rib** naked 1.4 cm; **midrib** narrowly rounded to bluntly acute above, narrowly round-raised, minutely granular, sparsely pustular, drying slightly darker than surface below; **primary lateral veins** 3–4 on both sides, arising at 54° angle, minutely granular, short pale-lineate; **tertiary veins** not raised but easily visible above, weakly prominulous below; **collective veins** arising from 1<sup>st</sup> basal vein, 3–5(–8) mm from margin. INFLORESCENCE; **peduncle** 14.3 cm long, 1.5 mm wide; **spathe** green, 7.8 cm long, erect-spreading, 1.8 cm wide, 1.83 times longer than broad, green, drying yellowish brown, narrowly acuminate at apex; **spa-**

**dix** green, 7.3 cm long, drying 5 mm diam., 18 times longer than broad, stipitate 3–4 mm; **flowers** 7 visible per spiral, 1.4 mm long, 1.7 mm wide; lateral 3-lobed, tepals minutely granular with sparse pale inclusions, lateral tepals .6–.8 mm wide, inner margins rounded, outer margins 3-sided.

*Anthurium punkuyocense* is endemic to Peru, known only from Cusco Department, Province of La Convención at 2,000–3,000 m in a *Montane moist forest* life zone

The species is a member of sect. *Cardi-olobchium*, characterized by its terrestrial habit, internodes longer than broad and densely ridged-granular transversely, a subterete petiole that is pustular near the apex, narrowly ovate-sagittate, grayish green-drying, moderately veiny blades with a spatulate sinus and collective veins arising from the 1<sup>st</sup> pair of basal veins as well as by the green spathe and cylindroid-tapered spadix. Also characteristic is the granular-ridged major veins on the lower surface of the blades.

*Anthurium punkuyocense* is most similar to *A. benktsparrei* and *A. mapiriense*, both of which have minute granular-puberulence on the major veins on the lower blade surface. Both species differ in having less prominent tertiary veins on the lower surface and in having more or less smooth internodes. *Anthurium benktsparrei* differs in having the spadix more bluntly tapered and violet to pinkish. *Anthurium mapiriense* differs in having short pale-lineate cellular inclusions which are lacking on the surface of *A. punkuyocense*.

The species is named for the type locality near Punkuyoc in La Convención Province of Cuzco Department.

***Anthurium riojaense* Croat, sp. nov.**

Type: PERU. San Martín: Rioja Prov., Pedro Ruiz-Moyabamba Road, km 390, Venceremos, 05°50'S, 77°45'W, 1,800 m, 27 July 1983, D. N. Smith 4400 (holotype, MO-3490701; isotype, USM). Fig. 4 A.

Internodia 4.5 cm longa, 6 mm diam.; cataphylla 5.9 cm longa, 7 mm lata; petiolus



25.2–37.5 cm longus; lamina 26.3–34.3 cm longa, 18.8–23.4 cm lata; nervis primariis lateralibus 5–6 utroque; pedunculus 11.2–14.5 cm longus; spathe 5.8–8.6 cm longa, 9–14 mm lata; spadix luteus, 6.4–7 cm longus

Hemiepiphytic climber; **internodes** 4.5 cm long, 6 mm diam., drying dark brownish grey, finely granulated, pale inclusions rarely dispersed; **cataphylls** 5.9 cm long, 7 mm wide, lightly dispersed-pale-lineate, abruptly acuminate at apex; **petioles** 25.2–37.5 cm long, 3–4 mm wide, drying dark-brownish yellow, D-shaped with 3 ridges adaxially; **geniculum** 15–17 mm long, 3–4 mm wide, drying dark brown, finely many-ribbed, moderately smooth; **blades** 26.3–34.3 cm long, 18.8–23.4 cm wide, 1.43 times longer than broad, sub-trilobate, abruptly acuminate at apex, deeply lobed at base, subcoriaceous, weakly bicolorous, drying weakly glossy, medium brown above, grayish yellow-brown below; **upper surface** moderately smooth, densely pale-lineate; **lower surface** moderately smooth, less prominent-densely pale-lineate; **anterior lobe** 17.4–25.4 cm long, 7.8–13.3 cm wide, abruptly concave near base, the constricted area 5.8–7.6 cm wide; **posterior lobes** 8.4–10.2 cm long, 8.0–9.4 cm wide, rounded at apex, 4.6–6.7 cm across the confluent area (from petiolar plexus to inner edge of confluence); concave toward base; **basal veins** 5–6 pairs, 1<sup>st</sup> pair free to base, 2<sup>nd</sup> fused 5–14 mm, 3<sup>rd</sup> fused 17–27 mm, 4<sup>th</sup>–6<sup>th</sup> fused 36–42 mm; **posterior rib** naked 16–26 mm; **midrib** narrowly rounded to bluntly acute, darker above, broadly rounded, minutely granular, pale-lineate, drying slightly darker than surface below; **primary lateral veins** 5–6 on both sides, arising at 50–53°, narrowly round-raised, bluntly acute, minutely granular; **tertiary veins** obscure above, slightly raised below; **collective veins** arising from 2<sup>nd</sup>–3<sup>rd</sup> primary lateral vein, 3–6 mm from margin. INFLORESCENCES erect; **peduncle** 11.2–14.5 cm long, 1–2 mm wide; **spathe** green, 5.8–8.6 cm long, 9–14 mm wide, 6.3 times longer than broad, abruptly acute at apex, erect-spreading, hooding spadix, slightly curved, green, drying yellowish brown;

**spadix** 6.4–7 cm long, drying 4–5 mm diam., 13 times longer than broad, stipitate 4–5 mm, yellow, with slight aroma at anthesis; **flowers** 6 visible per spiral, 1.5–1.6 mm long, 1.4–1.5 mm wide, weakly 4-lobed; tepals minutely granular with pale inclusions, lateral tepals 4–6 mm wide, inner margins rounded, outer margins 4-sided; **stamens** held in a contiguous cluster around stigma at level of tepals; **anthers** .5 mm long, .4 wide; thecae parallel.

*Anthurium riojaense* is endemic to Peru, known only from the type locality in San Martín Department, Rioja Province at 1,800 m in a *Montane rain forest* life zone or *Lower montane wet forest* life zone.

The species is a member of sect. *Cardi-olonchium*, characterized by its hemiepiphytic habit, elongated internodes, deciduous cataphylls, D-shaped petioles with 3 ribs adaxially, deeply 3-lobed, yellow-brown blades with the anterior lobe markedly contracted near its base as well as by its moderately pedunculate somewhat hooding spathe and its yellow, weakly tapered, weakly stipitate spadix. Especially characteristic of this species is the presence of pale, linear cellular inclusion which is visible on both surfaces.

*Anthurium riojaense* appears to be closest to *A. izcuchacense* Croat which occurs at a similar elevation in the Department of Amazonas. That species differs in having blades which dry darker brown, are more prominently constricted on the anterior lobe, have a proportionately longer peduncle, a more prominently stipitate and a broader green, rather than yellow spadix.

*Anthurium riojaense* is also close to *A. siccisilvarum* K. Krause which differs in having typically larger blades which tend to dry grayish and a more long-tapered, more prominently stipitate green spadix.

The species is named for the type locality in Rioja Province.

***Anthurium straminopetiolum* Croat, sp. nov.** Type: PERU. Amazonas: Río Cenepa, vicinity of Huampami, ca. 5 km E of Chávez Valdivia, ca. 04°30'S, 78°30'W, 200–250 m, El ca-

mino Chigkan entsa to Río Cenepa 10 km, 8 Aug 1978, *E. Ancuash* 1335 (holotype, MO-2769487; isotype, USM). Fig. 4 B.

Terrestris; internodia 6.0–9.0 cm longa, .5–.7 cm diam.; cataphylla 5.0–10.2 cm longa, .6–1.0 cm lata; petiolus 25.4–33.2 cm longus, .4–.6 cm diam.; lamina ovata, 31.3–40.7 cm longa, 15.8–24.6 cm lata; nervis primariis lateralibus 6–8 utroque; pedunculus 9.6–20.2 cm longus, 2–4 mm lata; spathe 8.3–9.6 cm longa, .8–1.2 cm lata; spadix 7.3–11.8 cm longus.

Terrestrial; **internodes** 6.0–9.0 cm long, .5–.7 cm diam., drying light grayish green, coarsely granular, wispy; **cataphylls** 5.0–10.2 cm long, .6–1.0 cm wide, pale yellow, gradually narrowing toward apex, dense dispersion of pale linear, minute ribs resembling waves; **petioles** 25.4–33.2 cm long, .4–.6 cm wide, drying pale grayish-yellow, moderate to deeply ribbed areas; **geniculum** 1.3–1.5 cm long, .3–.5 cm wide, drying with a darker shade of grayish-yellow, deeply ribbed on upper surface, round-raised on lower surface; **blades** ovate, 31.3–40.7 cm long, 15.8–24.6 cm wide, 1.8 times longer than broad, slightly to moderately lobed, abrupt acuminate at apex; **upper surface** densely and finely granular on magnification; **lower surface** drying semiglossy, sparsely granular in the areoles; **anterior lobe** 29.2–37.5 cm long, 15.2–24.0 cm wide; **posterior lobe** 3.2–6.6 cm long, 4.8–7.5 cm wide, parabolic to hippocrepiform, rounded at apex; **basal veins** 5–6 pairs, 1<sup>st</sup>–2<sup>nd</sup> pair free to base, 3<sup>rd</sup> fused 1.2–1.8 cm, 4<sup>th</sup> fused 2.0–2.2 cm, 5<sup>th</sup>–6<sup>th</sup> fused 2.5–2.8 cm; **posterior rib** naked 1.3–2.1 cm; **midrib** narrowly rounded to bluntly acute, above, thicker than broad to weakly round-raised below, very minutely granular above and below; **primary lateral veins** 6–8 on each side arising at 48°–52°, narrowly rounded, somewhat glossy, thicker than broad above and below; **tertiary veins** drying much lighter than the blade; **collective veins** arising from 1<sup>st</sup>–2<sup>nd</sup> basal vein, 1.0–3.0 mm from margin. INFLORESCENCE

erect; **peduncle** 9.6–20.2 cm long, 2–4 mm wide; **spathe** 8.3–9.6 cm long, .8–1.2 cm wide, 9 times longer than broad, oblong, narrowly rounded at apex, minutely ribbed, pale-lineate, light green, spreading, drying greenish gray; **spadix** 7.3–11.8 cm long, drying .5–1.2 diam., white, 11 times longer than broad; **flowers** 5 visible per spiral, 1.0–1.2 cm long and wide, 4-lobed, tepals minutely granular, bicolorous, lateral tepals .4–.6 mm wide, inner margins rounded, outer margins 3-sided.

*Anthurium straminopetiolum* is endemic to Peru, known only from the type locality in Amazonas Department in the valley of the Río Cenepa at 200–250 m elevation in a *Premontane wet forest* life zone.

The species is a member of sect. *Cardiolonchium* characterized by its hemiepiphytic to terrestrial and climbing habit, elongated internodes, mostly deciduous cataphylls, subterete, straw-colored petioles, narrowly ovate-sagittate, greenish drying blades with a hippocrepiform sinus as well as by the green spathe and spadix.

*Anthurium straminopetiolum* is close to *A. molau* since both have long internodes and blades of similar shape and drying color and both have a green spathe and green spadix. In addition, both species tend to have the lower surface granular on magnification. However, *A. molau* differs in having much shorter, more stubby spadices only 10–12 times longer than wide versus about 35 times longer than wide for *A. straminopetiolum*.

*Anthurium straminopetiolum* is most similar to *A. breviscapum* Kunth, a species that is more abundant at higher elevations and has a purple long-tapered spadix.

The epithet “straminopetiolum” is based on the Latin stramineous (straw-yellow) and petiolus (petiole).

Note that the species was apparently not included in the Flora of Río Cenepa despite having been common there unless it was included in *A. breviscapum* (Croat *et al.*, in press).

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