

A Reappraisal of the *Anthurium cuspidatum* Masters Complex, section *Polyneurium* (Araceae)

Thomas B. Croat
P. A. Schulze Curator
Missouri Botanical Garden

Orlando O. Ortiz
Herbario PMA & Programa de Maestría en Ciencias Biológicas
Universidad de Panamá, Estafeta Universitaria
Panama City, Republic of Panama

ABSTRACT

A realignment is made in the circumscription of *Anthurium cuspidatum* Mast. which has for many years been interpreted as being plants with reddish brown, moderately elongated blades with usually well-developed posterior lobes in contrast to typically green-drying blades which are more broadly ovate and have the basal veins more nearly free to the base. A study of the type specimen of *Anthurium cuspidatum* shows it to be a plant with broadly ovate green-drying blades with the basal veins nearly free to the base whereas the more narrowly ovate reddish brown-drying plants long considered *A. cuspidatum* have proven to represent four different species: *A. talamancae* Engl. with leaves more than two times longer than wide and with up to five pairs of basal veins, *A. intactum* Croat & O. Ortiz sp. nov. with leaf blades less than two times longer than broad with

six or more pairs of basal veins, *A. christeliae* Croat & O. Ortiz sp. nov. with leaf blades attenuated at base and *A. palosecense* Croat & O. Ortiz sp. nov. with leaf blades rounded to subcordate at base with few basal veins (1–2 pairs).

Anthurium propinquum Sodiro var. *albispadix* Croat & J. Rodr., long considered to be a member of the *A. cuspidatum* complex and initially considered to be a variety of *A. propinquum* Sodiro (now a synonym of *A. cuspidatum* as treated here) is now considered to be distinct at the species level and is here elevated to the species level as *Anthurium albispadix* (Croat & J. Rodr.) Croat & O. Ortiz. Another close relative to *Anthurium talamancae* is *A. monticola* Engl. which is reported for the first time from Panama and included in the key.

	Habit	Cataphylls	Dry color of leaves	Leaf base	Pairs of basal veins
<i>A. albispadix</i>	Terrestrial	Persisting intact	Greenish	Cordate	6–8
<i>A. christeliae</i>	Terrestrial	Persisting intact, later deciduous as fibers	Dark brown	Attenuated	0
<i>A. cuspidatum</i>	Terrestrial or Epiphytic	Persisting as fibers	Green to brownish to yellowish brown	Cordate	(5)6–9
<i>A. intactum</i>	Terrestrial or hemiepiphytic	Intact and deciduous	Reddish brown	Cordate	(5)6–7(8)
<i>A. monticola</i>	Terrestrial or Epiphytic	More or less intact, later deciduous as fibers	Greenish gray to brownish green	Subcordate or rounded	(2)3–4(5)
<i>A. palosecense</i>	Epiphytic	More or less intact, later deciduous as fibers	Grayish to paler greenish	Rounded to subcordate	1–2
<i>A. talamancae</i>	Terrestrial or Epiphytic	More or less intact, later deciduous as fibers	Dark brown to dark greenish brown	Rounded to cordate or subcordate to sagittate	3–5

Table 1. Characters distinguishing all species of the complex

KEY WORDS

Anthurium, section *Polyneurium*, Araceae, new species, new combination and status.

INTRODUCTION

For most botanists working with Central America and northern South America the true identity of *Anthurium cuspidatum* was always quite uncertain. The type of unknown origin but purported to be from South America did not fit well with most of the Central American specimens but the situation in South America was just as confusing. Recent reappraisals have shown that the type of *Anthurium cuspidatum*, now known not only to have broadly ovate leaf

blades but one blade which dries not dark brown but green, closely matches material long known by the name, *A. urbanii* Sodiro, and would include its synonyms *A. propinquum* from Ecuador and *A. williamsii* K. Krause described from Darién Province in Panama. Thus *Anthurium cuspidatum* as now defined is no less widely distributed than before but now constitutes a range more in South America and less in Costa Rica and Panama. *Anthurium cuspidatum* now consists of plants with broadly ovate greenish to greenish yellow-drying blades which are less than twice as long as broad with a heavy concentration of basal veins (six or more), most of which are free to the base or nearly so and have cataphylls which

soon become fibrous, as well as a typically long-tapered dark violet-purple spadix.

What we previously called *Anthurium cuspidatum* in Panama (Croat, 1983, 1986; Croat & Stiebel, 2001; Grayum, 2003), should go by the validly published *A. talamancae* and would include the synonyms, *A. donnell-smithii* Engl., *A. ortegianum* Engl. and *A. johnii* Engl. All but the latter were published in the same issue of the *Botanische Jahrbücher* and the publication indicated how variable plants are in this complex. In contrast to *Anthurium cuspidatum*, *A. talamancae* is characterized by having dark reddish brown-drying blades that are narrowly ovate, usually more than two times longer than broad with a much broader sinus and fewer than four pairs of basal veins. The species has a more northerly range, extending from Nicaragua to Colombia.

Separated from *Anthurium talamancae* is another similar but undescribed species that like *A. talamancae*, dries reddish brown. It differs by being a usually terrestrial species with caducous cataphylls which often act as a trough for the extending adventitious roots. It has more than six pairs of basal

veins and has blades less than two times longer than broad. That species described here as *Anthurium intactum* ranges from Costa Rica to Colombia. In addition, two other Panamanian new species related to *A. talamancae* and *A. cuspidatum* were separated, *A. christeliae* from Colón Province and *A. palosecense* from Bocas del Toro and Veraguas. In the case of *Anthurium christeliae*, it is the unique species of the complex in that it presents leaves with attenuated bases. On the other hand, *A. palosecense* is separated from the other species of the complex by having leaves with few basal veins (1–2 pairs) and are rounded to subcordate at base (Table 1).

Anthurium monticola, another predominantly terrestrial species also belongs in this closely related group of species. It is reported here for the first time and redescribed. Only *Anthurium monticola* var. *monticola* occurs in Central America but the variety *attenuatum* Croat & D. C. Bay is recognized in Colombia. Only the more widespread *Anthurium monticola* var. *monticola* will be treated here.

The following key separates the taxa in this complex:

KEY TO THE ANTHURIUM CUSPIDATUM MASTERS COMPLEX

- 1a. Leaf blades more than 2 times longer than wide (sometimes to ca. 1.6 times longer in *A. monticola*); basal veins absent or up to 5 pairs.
- 2a. Leaf blades rounded, acute or attenuated at base (sometimes subcordate) with 0–2 pairs of basal veins.
- 3a. Terrestrial plants; leaf blades acute to rounded, prominently attenuated at base; spadix violet purplish ***A. christeliae* Croat & O. Ortiz.**
- 3b. Epiphytic plants; leaf blades rounded to subcordate at base; spadix yellowish to red ***A. palosecense* Croat & O. Ortiz**
- 2b. Leaf blades cordate, subcordate to sagittate at base with 3–5 pairs of basal veins.
- 4a. Leaf blades drying dark reddish brown; internodes typically more than 2 cm diam.; Costa Rica to Colombia ***A. talamancae* Engl.**
- 4b. Leaf blades drying grayish green; internodes 1–1.5 cm diam.; Costa Rica to Ecuador ***A. monticola* Engl.**
- 1b. Leaf blades less than 2 times longer than wide; basal veins 6 or more pairs.
- 5a. Leaf blades drying greenish or yellowish green; cataphylls persisting intact or fibrous at upper nodes; lower nodes usually with fibrous remnants of cataphylls.
- 6a. Cataphylls persisting as pale fibers, usually persistent semi-intact at bases; spadix dark violet-purple to maroon; Costa Rica to Panama, Colombia and Ecuador, 400–2300 m, *Tropical wet forest*, *Premontane wet forest*, *Premontane moist forest* life zones as well as in the transition zone between *Premontane wet forest* and *Tropical moist forest* life zones ***A. cuspidatum* Mast.**
- 6b. Cataphylls persisting intact, dark red-brown, tinged purple; pale creamy white to yellow-cream, matte; Ecuador, western slopes of Andes, 60–1000 m, *Tropical wet forest* life zone ***A. albispadix* (Croat & J. Rodr.) Croat & O. Ortiz**
- 5b. Leaf blades drying reddish brown; cataphylls intact and caducous at upper nodes, not leaving fibrous remnants in the lower nodes; Costa Rica to Panama and Colombia at 600–1520 m in *Tropical wet forest* and *Premontane rain forest* life zones ***A. intactum* Croat & O. Ortiz**



Figure 1. *Anthurium albispadix* (Croat & J. Rodr.) Croat & O. Ortiz. Habit showing leaf blade, adaxial surface.

Anthurium albispadix (Croat & J. Rodr.) Croat & O. Ortiz, **stat. & comb. nov.** Basionym: *Anthurium propinquum* Sodiro, var. *albispadix* Croat & J. Rodr., *Aroideana* 18: 118–119. 1995. TYPE: ECUADOR. Pichincha: Río Blanco, at Valle Hermosa, 1.9 mi N of Santo Domingo de los Colorados-Esmeraldas Hwy, 410 m, *T. B. Croat* 72981 (holotype, MO-4075125–6; isotypes, B, COL, F, NY, QCA, QCNE, S, US). **Figures 1–4.**

The species is a member of section *Polyneurium* characterized by its terrestrial habit, short internodes, coriaceous dark brown persisting intact cataphylls,

subterete, weakly sulcate petioles, ovate-cordate greenish drying abruptly long-acuminate leaf blades with rounded usually overlapping posterior lobes, 6–8 pairs of basal veins 2 to 3 pairs free to the base and the remainder fused for usually a short distance and with the posterior rib not naked as well as by the long-pedunculate inflorescence, green lanceolate spreading spathe, whitish long-tapered spadix and violet-purple berries.

Terrestrial; stems 20–60 cm long; **internodes** short, 2.7–3.5 cm diam.; **cataphylls** persisting intact, dark red-brown, tinged purple; **petioles** 57–122 cm



Figure 2. *Anthurium albispadix* (Croat & J. Rodr.) Croat & O. Ortiz. Stems, cataphylls and inflorescences.



Figure 3. *Anthurium albispadix* (Croat & J. Rodr.) Croat & O. Ortiz. Inflorescence, close-up.

long, 7–10 mm diam., weakly flattened, weakly and narrowly sulcate, dark green, tinged purple toward base, semiglossy, drying dark brown; **blades** broadly ovate, 40–81 cm long, 29.5–51 cm wide, 1.3–1.7 times longer than wide, 0.4– times as long to 1.06 times as long as broad, abruptly long-acuminate at apex, deeply lobed at the base, subcoriaceous, somewhat bicolorous, semiglossy to matte subvelvety above, pale and semiglossy below, drying greenish; **anterior lobe** 30.7–64 cm long, broadly rounded along the margins; **posterior lobes** broadly rounded, usually prominently overlapped with a small closed sinus; **basal veins** 6–8 pairs, 1st & 2nd (3rd) pair free to the base; **midrib** narrowly rounded and

slightly paler above, narrowly rounded and moderately paler below, drying concolorous above, paler, often brownish below, 4th – 6th fused to 1 cm; **primary lateral veins** 7 pairs, arising at a 50–70° angle, narrowly rounded and almost concolorous in valleys above, narrowly rounded, thicker than broad and paler below; **tertiary veins** prominently visible but not much raised. **INFLORESCENCE** erect; **peduncle** (14)44–73 (87.5) cm long; **spathe** 5.5–26.5 cm long, (0.7)1.0–2.6 cm wide, pale to dark green, reflexed, matte inside, semiglossy outside; **spadix** 9–35.5 cm long, 5–9 mm diam., pale creamy white to yellow-cream, matte, turning pale brown after anthesis; pistils weakly exserted; stamens weakly



Figure 4. *Anthurium albispadix* (Croat & J. Rodr.) Croat & O. Ortiz. Inflorescences.

exserted, pollen yellowish. INFRACTESCENCE 38–42 cm long, to 5 cm diam. with berries exserted; **berries** ellipsoid, red on emerging, becoming dark violet-purple, whitish toward base; seeds 2 per berry, 4 mm long, 3 mm wide, 2 mm thick.

Anthurium albispadix is most closely related to *A. cuspidatum* which has a terrestrial habit with similarly shaped blades with several basal veins free to the base. The species differs by having fibrous cataphylls persisting as pale fibers and by having a violet-purple spadix. *Anthurium intactum* differs by having intact but caducous cataphylls and reddish brown-drying leaf blades as well as a dark violet-purple spadix.

Anthurium albispadix was once considered to be a color form of *Anthurium propinquum* (now a synonym of *A. cuspidatum*) but studies conducted for this paper have shown it to be distinct at the species level.

Anthurium albispadix is endemic to Ecuador ranging from Esmeraldas, Pichincha, Cotopaxi, Cañar, El Oro and Loja on the western slopes of the Andes at 60–1000 m in a *Tropical wet forest* life zone.

Additional specimens seen: ECUADOR. **Bolívar:** Near frontier of Los Rios, Bolivar, & Chimborazo Provinces, 0.9 km E of junction to El Triunfo at edge of General Elizalde (Bucay), along a stream with steep, rocky banks, near highway & immediately above Río Chimbo, 02°12'S, 79°05'W, 315

m, 19 July 1986, *Croat 61595* (MO, NY, QCA). **Cotopaxi:** 1 km N of Pacayacu, 14 km N of Rio Guasaganda at Guasaganda, 22 km N of Palmar (village NE of La Maná on Quevedo-Latacunga Rd. 13 km NE of La Maná) along river bank at edge of pasture, 00°41'30"S, 79°06'30"W, 670 m, 11 Oct 1983, *Croat 57062* (CM, MO, QCA); La Maná, along road between Guayacán (13.1 km NE of La Maná) and Montinuevo (N of Pucayacu), 0.8 km N of Pucayacu, 00°41'S 079°06'W, 760 m, 20 Mar 1992, *Croat 73257* (MO). **El Oro:** Road Santa Rosa-Balsas, 9 km NW of Balsas, 11 km SE of Saracay, 03°42'51"S, 79°49'00"W, 700 m, 2 Dec 1996, *G. Lewis & P. Lozano 2899* (MO); Along road from Balsas to Piñas via asphalt road departing main Balsas-Machala road ca. 24 km W of Balsas, 9.2 km from jct. at main Balsas-Machala Hwy, 03°39'21"S, 79°44'40"W, 918 m, 31 July 2004, *Croat & L. P. Hannon 92802* (MO). **Esmeraldas:** Road between Esmeraldas and Santo Domingo, 63.0 km SE of the jct of roads to Esmeraldas and Sucio, 117 km NW of Santo Domingo de los Colorados, 00°34'N, 79°33'W, 60 m, 2 Apr 1983, *Croat 55634* (MO, QCA); Along road between Santo Domingo de los Colorados to Esmeraldas, 90 km NW of Santo Domingo, 8.8 km NW of Quinde, 85 km SE of Esmeraldas, 00°26'N, 79°03'W, 270 m, 31 Mar 1983, *Croat 55543* (B, K, MO, NY, QCA); Gravel Road 8, 6 km beyond bridge over Río Esmeraldas (near San Mateo, road to Esmeraldas airport), ca 6.6 km beyond Univ. Tech. Luis Vargas Torres-Est. Exp. Mutile), Río Mutile, 00°52'N, 79°33'W, 80 m, 1 Apr 1983, *Croat 55631* (MO); Along

road from Santo Domingo de los Colorados to Puerto Quito, at Km 148 marker, 00°07'21"N, 79°14'10"W, 130 m, 15 Oct 2007, *Croat, M. Carlsen & D. Levin 99933* (MO); Muisne, along road between Esmeraldas and El Sucio, 2.3 km S of El Sucio, 18.6 km S of Atacames-Muisne Road, 00°36'N, 79°54'W, 180 m, 16 Mar 1992, *Croat 73093* (DUKE, MO). **Los Ríos:** Río Palenque Biological Station, ca. Km 48 Santa Domingo-Quevedo Hwy, 00°35'S, 79°25'W, 250 m, 13 Oct 1980, *Croat 50657* (MO). **Manabi:** Pedernales Cantón, 45 km N of Pedernales along new coastal hwy, low ground in stream valley, with forest remnants, just above tidal estuary of Río Cojimiés, 00°18'N, 79°53'W, 5 m, 22 Aug 1993, *D. Neill & QCNE botany interns 11423* (QCNE). **Pichincha:** Vicinity of El Centinela, 0.2 km past Escuela Mixta El Centinela, along trail to left of road, exactly 13 km E from main Santo Domingo-Quevedo Hwy in Patricia Pilar, 00°32'S, 79°11'W, 1000 m, 14 Mar 1992, *Croat 73038* (COL, CUVC, GB, M, MO, UB), Centro Científico Río Palenque, 00°35'S, 79°21'W, 220 m, 15 Mar 1992, *Croat 73057* (CM, MO); Along road between Independencia and Puerto Quito (old road via Mindo and Nono to Quito from the coast), 0.5 km W of Puerto Quito, 00°08'N, 79°16'W, 150 m, 18 Mar 1992, *Croat 73146* (KYO, L, MO); Along road between main Santo Domingo-Esmeraldas Hwy and Valle Hermoso, 25 km NW of Santo Domingo, 1.9 km N of hwy, in vicinity of the bridge over the Río Blanco just S of Valle Hermosa, along steep banks of Río Blanco and in adjacent disturbed areas above river banks, 00°05'S, 79°15'W,

410 m, 13 Mar 1992, *Croat 72981* (AAU, B, COL, F, K, MO, NY, QCA, QCNE, S, US); Tinalandia, east of Santo Domingo on Santo Domingo along highway, 00°18'S, 79°03'W, 738–720 m, 24 Feb 2005, *Croat, C. Davidson & S. Christoph 95270* (MO).

Cultivated plants: ECUADOR. Unknown origin, cultivated at *Anthurium Selecties*, Bleiswijk, Holland, specimens collected from greenhouse plants April 1991, originally collected in Ecuador by Nic van der Knaap & Nick van Rosmalen, 3 Jan 1992, *Croat 71960* (MO); Santo Domingo-Esmeraldas, originally collected in 1990 by Nic van Rosmalen & Nic van der Knaap of *Anthurium Selecties* as Bleiswijk 90–10–174, 4 Sept 1992, *Croat 74018* (MO).

Anthurium christeliae Croat & O. Ortiz, **sp. nov.** TYPE: PANAMA. Colón: Distrito de Donoso, camino hacia Brazo, entrando por desvío Molejón, antigua cantera a 200 m de helipad BR01, 08°48'43.3" N, 80°38'11.1" W, 240 m, 26 Sep 2014, *C. Ramos, C. Rodríguez y A. Bushell 329* (holotype, PMA!; isotypes, FT!, MO!, SCZ!, UCH!, US!). **Figures 5–8.**

The species is a member of section *Polyneurium* characterized by its terrestrial habit, short internodes, persisting intact cataphylls, later deciduous as fibers, long-petiolate leaves, terete petioles, ovate long-acuminate and basally long-attenuate dark brown-drying blades with a moderately short-pedunculate inflorescence, a moderately broad spreading greenish white



Figure 5. *Anthurium christeliae* Croat & O. Ortiz. Habit (Photo Christel Ramos).

spathe and a prominently stipitate purplish violet cylindroid-tapered spadix.

Terrestrial to less than 1 m tall; **internodes** about as long as broad; **cataphylls** to 13.5 cm long, persisting intact at upper node, mostly deciduous at lower nodes with a few fibers; **petioles** terete, 21.5–27.5 cm long, 2–2.5 mm diam., narrowly and weakly sulcate adaxially; geniculum 2–2.7 cm long, 3.5 mm diam. on drying, the petiole shaft shrunken on drying where it meets geniculum; **blades** narrowly ovate,

20–27 cm long, 11.2–11.9 cm wide, 2.2 times longer than broad, 0.72 times as long as petioles, gradually long-acuminate at apex (acumen to 2.7 cm long), acute to rounded and also prominently attenuated at base. **INFLORESCENCE** erect, short-pedunculate; **peduncle** 27 cm long, terete, medium green; **spathe** 4.7 cm long, 6 mm wide, spreading, green to whitish green, tinged purple-violet near apex; **spadix** 2.7 cm long, 7 mm diam., prominently stipitate, dark purplish violet, cylindroid-tapered, moderately glossy; flowers 4–5 visible per



Figure 6. *Anthurium christeliae* Croat & O. Ortiz. Herbarium sheet of holotype (*Ramos 329 PMA*) (Photo PMA Herbarium).



Figure 7. *Anthurium christeliae* Croat & O. Ortiz. Spathe and spadix (Photo Christel Ramos).

spiral, 2.5 mm long, 3 mm wide; tepals 2.5 mm wide, lateral tepals 1 mm wide, inner margin rounded, outer margin 2-sided. INFRUCTESCENCE with **berries** early emergent, ca. 1 cm long, ovoid becoming ellipsoid, light red, rounded at apex; fruiting tepals brownish.

A seemingly closely related species is *Anthurium cotejense* Croat from the Pacific slope of Colombia in Cauca Department that differs by having leaf blades that dry yellow-green below and have 10–14 pairs of

primary lateral veins. *Anthurium monticola*, especially var. *attenuatum*, which is a similar terrestrial species from the Pacific slope of Panama and northern Colombia, also has blades of similar shape but that species differs in having blades much paler and less glossy on the lower surface with a usually thicker more cylindroid spadix.

The species is also related to *Anthurium cuspidatum* but that species differs by having blades that dry green with rounded posterior lobes, (5)6–9 pairs of basal veins



Figure 8. *Anthurium christeliae* Croat & O. Ortiz. Inflorescence (Photo Christel Ramos).

and purple to dark purple berries. Seemingly closer relatives which dry dark brown are *Anthurium intactum*, which differs by its cordate leaf base, (5)6–7(8) pairs of basal veins and dark red-purple berries and *A. talamancae*, which differs by blades with subcordate to cordate leaf bases, 3–5 pairs of basal veins and purple to bright red berries.

In the Lucid Anthurium Key the species also tracks to *A. bullianum* Engl., differing by a much less decurrent leaf base, less prominently acuminate apex, the ovate

naviculiform much shorter spathe and the cylindroid weakly stipitate spadix; *A. cajambrense* Croat, differing by having blades not attenuated at base, 13–14 pairs of primary lateral veins and a sessile more prominently tapered spadix and *A. yatacuense* Croat differing its much larger blades with the base broadly cordate and by its 28–32 primary lateral veins.

Anthurium christeliae is endemic to Panama, known only from Colón Province at 240 m elevation in a *Tropical wet forest* life zone. It is



Figure 9. *Anthurium talamancae* Engl. Habit (Photo Orlando Ortiz).



Figure 10. *Anthurium talamancae* Engl. Inflorescence (Photo Orlando Ortiz).

common at Donoso, usually occurring in deposits of fallen leaves.

The species is named in honor of Panamanian botanist, Christel Ramos who collected the type specimen. Christel has participated heavily in the large inventory being made in the region of Donoso.

Paratypes: PANAMA. **Colón**: San Juan de General, Concesión de Proyecto Cobre Panamá, Área de Brazo, cima de colinas, 08°48'58"N, 80°38'08"W, 242 m, 9 July 2014, *J. E. De Gracia 790* (FT, MO, PMA); Donoso, Minera Panamá copper-mining concession, slopes and ridges in drainage of Quebrada Brazo, 08°48'38"N, 80°38'18"W, 243 m, 30 Aug 2014, *M. H. Grayum, G. McPherson, C. Ramos, I. Vergara & L. Rojas 13251* (MO, PMA); Distrito de Donoso, Afueras del Proyecto Mina de Cobre Panamá. Camino hacia Brazo, entrando por Desvío Molejón, antigua cantera, 8°48'40.0"N, 80°38'19.4"W, 247 m, 30 Aug 2014, *C. Ramos, G. McPherson, M. Grayum, I. Vergara & L. Rojas 293* (FT, MO, PMA); Afueras del Proyecto Mina de Cobre Panamá, Camino hacia Brazo, entrando por Desvío Molejón, antigua cantera, 8°48'40.0"N, 80°38'19.4"W, 247 m, 30 Agosto 2014, *C. Ramos, G. McPherson, M. H. Grayum, I. Vergara & L. Rojas 294* (FT, MO, PMA); Distrito de Donoso. Proyecto Mina de Cobre Panamá, 8°49'39.2"N, 80°39'24.0"W, 144 m, 12 Sept 2014, *C. Ramos 312* (PMA).

Anthurium cuspidatum Mast., Gard. Chron. 3: 428. 1875. Type: Colombia, Hort. Vietch, Jan. 1875, *Wallis s.n.* (hololectotype, K) designated here. **Figures 11–12.**

Anthurium urbanii Sodiro, Anturios Ecuador 2: 224. 1903. Type: ECUADOR. Cañar: Río Rircay, 500 m, *Rimbach 43* (holotype, QPLS).

Anthurium propinquum Sodiro, Anturios Ecuador. 2: 7. 1903. Type: Ecuador. Valley of Río Cañar, Hacienda de San Nicolás, 1500 m, *Rimbach 88* (holotype, US).

Anthurium williamsii K. Krause, Notizblat. Bot. Gart. Berlin-Dahlem 11: 610. 1932. Type: Panama. Darién: Cana, ca. 07°45'N, 77°40'W, 548 m, *Williams 817* (holotype, US).

The species is a member of section *Polyneurium* characterized by its terrestrial habit, short internodes, persisting pale fibers cataphylls which are ultimately deciduous, subterete sulcate petioles sometimes narrowly flattened and with marginal ribs, usually broadly ovate greenish drying blades with (5)6–9 pairs of basal veins, 1–3 pairs of which are free to the base and with the remainder barely fused into a posterior rib which is weakly or not at all naked, collective veins arising from one of the lowermost pairs of basal veins as well as by the long-petiolate inflorescence, green lanceolate spathe, long-tapered dark purple-violet to maroon spadix and usually dark violet-purple spadix.



Figure 11. *Anthurium cuspidatum* Mast. Habit (Photo Orlando Ortiz).

Terrestrial or sometimes epiphytic; **internodes** short, 1.5–3.2 cm diam.; **cataphylls** persisting as pale fibers, bases persistent semi-intact, then deciduous; **petioles** 41.5–81(118) (averaging 66.4 cm), 0.97–3.4 times longer than peduncles, terete, medium to dark green, sometimes tinged purple, semiglossy, narrowly flattened, sometimes faintly ridged circumferentially; **blades** broadly ovate, 29.5–53.2(82) cm long, 17–40(47) cm wide (average 39.9 x 26.4 cm), broadest near middle or between middle and petiolar plexus, (1.2)1.9–2.3 times longer than wide, 0.39–0.97 times as

long as petioles, thin, subcoriaceous or coriaceous, slightly bicolorous, dark green and weakly glossy or semiglossy above, paler and semiglossy or weakly glossy below, drying green to brownish above, green to yellowish brown below, acute to rounded and abruptly long-acuminate at apex, deeply lobed at base; **anterior lobe** 23–34.8(55) cm long (averaging 32.2 cm), the margins broadly rounded; **posterior lobes** directed toward the base, usually about as broad as long, (6.5)9.5–16(19.5) cm long, (6.5)10–14(18.5) cm wide; **basal veins** (5)6–9, 1st & 2nd sometimes 3rd – 5th free to base, 3rd & 4th



Figure 12. *Anthurium cuspidatum* Mast. Inflorescence (Photo Orlando Ortiz).

usually fused 3–7 mm, rarely to 2 cm; 4th & higher sometimes fused 1 cm, 5th & higher rarely fused to 3 cm; **posterior rib** when present rarely more than 1.2 cm long; **sinus** 3–17 cm deep, closed to V-shaped, rarely narrowly parabolic, when open usually very narrow or mostly 1–4(5) cm wide when open; **midrib** narrowly raised to yellow, and slightly paler above, round-raised and acutely ribbed, moderately paler below, bluntly acute and concolorous above; **primary lateral veins** 11–15 pairs, weakly quilted-sunken and concolorous or deeply quilted and concolorous above, narrowly

round-raised, bluntly acute and paler below, usually drying weakly raised and concolorous above, prominently and narrowly raised, paler than surface, sometimes reddish below; **tertiary veins** in part raised below; **collective veins** usually arising from near the base, sometimes from the 1st or 2nd pair of basal veins, 3–7 mm from margins. **INFLORESCENCE** erect; peduncle 22–83.5 cm long, 0.29–to 1.0 times as long as petiole; **spathe** (3.7)8.5–(10)13 cm long, (0.6)1.3–2.3(1.7) cm wide, elliptic-oblancheolate, medium green or green, reflexed, glossy inside, sometimes tinged

reddish outside; **spadix** usually sessile or stipitate to 6 mm, (4.2)9–17 cm long, 5–8 mm diam., dark violet-purple to maroon, glossy or semiglossy. INFRUCTESCENCE 17–33 cm long, semi-erect with spathe still attached; berries early-emergent, red to finally dark violet-purple to purple, sometimes magenta.

Anthurium cuspidatum ranges from Costa Rica to Panama, Colombia and Ecuador (Cotopaxi, Los Rios, Manabí, Pichincha) at 400–2300 m occurring in *Tropical wet forest*, *Premontane wet forest*, *Premontane moist forest* life zones as well as in the transition zone between *Premontane wet forest* and *Tropical moist forest* life zones.

Additional specimens seen: COLOMBIA.

Cauca: Along road between Popayán and Juntas via Viente de Julio Popayán, 17 km W of summit, 02°31'18"N, 77°01'56"W, 1280 m, 19 July 1997, *Croat & J. F. Gaskin 80114* (CAUP, MO). **Chocó:** S ridge of Cerro Mecana, 06°15'N, 77°19'W, 710–880 m, 06°15'N, 77°19'W, 710–880 m, 8 Jan 1984, *A. Juncosa 1789* (MO); Dense forest S of Río Condoto, between Quebrada Guarapo and Mandinga, 120–180 m, 22–28 Apr 1939, *E. P. Killip 35143* (US); Río Atrato, Samurindó, forest on hill, 05°35'N, 76°39'W, 80 m, 1 Apr 1958, *J. Cuatrecasas 24108* (MO, US); Along road between San Jose del Palmar and Cartago, Vereda La Bella between San Jose del Palmar and turnoff to El Cairo, 04°53'N, 76°13'W, 1430 m, 04°53'N, 76°13'W, 1430 m, 12 May 1983, *Croat 56673* (MO); Bahia Solano, Alto de Buey, 06°06'N, 77°13'W, 1200–1800 m, 8

Jan 1973, *A. H. Gentry & E. Forero 7352* (COL, MO); **Valle del Cauca:** Along road between Queremal and Anchicayá, 3 km W of Queremal, 03°31'00"N, 76°44'00"W, 1400 m, 10 July 1997, *Croat & J. F. Gaskin 79674* (MO). COSTA RICA. Palma, 09°49'48"N, 84°00'36"W, *A. C. Brade 2520* (BR). **Alajuela:** Reserva Biológica Monteverde, Cordillera de Tilarán, San Ramón, Río Peñas Blancas, Refugio Eladio's, Sendero Eston's, 10°18'36"N, 84°42'36"W, 800 m, 5 Mar 1992, *E. Bello C., E. Cruz L. & M. Brenes 4538* (CR); San Bosco, Monteverde Río Peñas Blancas, 10°23'N, 84°40'W, 900 m, 13 Jan 1988, *W. A. Haber & E. Bello C. 8052* (MO); Reserva Biológica Monteverde Río Peñas Blancas, 10°18'36"N, 84°42'36"W, 800 m, 14 Dec 1987, *W. A. Haber & E. Bello C. 7903* (CR); Reserva Monteverde, Poco Sol, 13 km South Fortuna, 10°21'N, 84°41'W, 700–900 m, 20 Aug 1989, *W. A. Haber & W. Zuchowski 9463* (MO); Guatuso, 15 km NW of Arenal by air, 2 km NW of Nuevo Arenal on road to Tilarán, then 3 km NE on road to San Rafael de Guatuso, then 2 km west on road to Finca Cote, on N side of road, 10°33'36"N, 84°54'00"W, 700 m, 30 Apr 1983, *R. L. Liesner, E. J. Judziewicz & B. Pérez G. 15089* (MO); San Carlos, Sucre, Caribbean rain forest, 10°17'02"N, 84°25'48"W, 975 m, 1 Mar 1939, *A. Smith H1658* (MO); Cordillera de Tilarán, falda norte del Volcán Arenal, camino a Tabacón, 10°29'24"N, 84°43'12"W, 500–600 m, 18 Jan 1994, *E. Lépez, L. J. Poveda Álvarez, Q. Jiménez M. & V. H. Ramírez 115* (CR); Upala, Río Naranjo, N of river along road to Upala, 10°40'48"N, 85°04'48"W, *J. F.*

Utley & *K. Burt-Utley* 5343 (DUKE).
Cartago: Turrialba, Parque Nacional Barbilla, Cuenca del Matina, Sendero Principal junto al río, 09°58'20"N, 83°27'10"W, 300–400 m, 20 Sep 2000, *E. Mora Castro* & *E. Rojas* 1501 (MO); Valle del Reventazón, Grano de Oro, Moravia de Chirripó, 08°48'36"N, 83°27'00"W, 1110 m, 29 June 1993, *P. Campos* 108 (CR); Valle del Reventazón, Moravia de Chirripó, 09°49'48"N, 83°26'24"W, 1200 m, 16 Sep 1992, *P. Campos* & *M. M. Chavarría* 23 (CR); Valle del Reventazón, Moravia de Chirripó, 09°49'48"N, 83°26'24"W, 1200 m, 16 Sep 1992, *P. Campos* & *M. M. Chavarría* 25 (CR).
Guanacaste: Tilarán, Z.P. Tenorio, Cordillera de Tilarán, Tierras Morenas, Río San Lorenzo, 10°36'36"N, 84°59'24"W, 1050 m, 29 Apr 1993, *G. Rodríguez* 169 (CR, MO).
Heredia: 9 km SE of Virgen del Socorro, 9 km E of Isla Bonita, 10°13'48"N, 84°04'48"W, 1530 m, Jan 1987, *B. A. Loiselle* 235 (MO); Finca La Selva, the OTS field station on the Río Puerto Viejo just E of its junction with the Río Sarapiquí, 10°25'53"N, 84°00'13"W, 100 m, 30 Aug 1980, *B. E. Hammel* 9638 (DUKE); La Selva Biological Station, 10°25'53"N, 84°00'13"W, 100 m, 22 Mar 1980, *B. E. Hammel* 8216 (DUKE); La Selva Biological Station, 10°25'53"N, 84°00'13"W, 100 m, 24 Mar 1980, *B. E. Hammel* 8265 (DUKE); Finca La Selva, the OTS field station on the Río Puerto Viejo just E of its junction with the Río Sarapiquí, 10°25'53"N, 84°00'13"W, 100 m, 12 July 1980, *B. E. Hammel* 9199 (DUKE); La Selva Biological Station, 10°25'53"N, 84°00'13"W, 100 m, 30 May 1985, *B. Jacobs* 3206 (DUKE); Finca La

Selva, the OTS Field Station on the Río Puerto Viejo just E of its junction with the Río Sarapiquí, 10°25'53"N, 84°00'13"W, 100 m, 1 Dec 1979, *C. A. Todzia* 1174 (DUKE); La Selva Biological Station, 10°25'53"N, 84°00'13"W, 100 m, 10 Feb 1981, *J. P. Folsom* 8893 (DUKE); *J. P. Folsom* 10061 (DUKE); 3 Apr 1981, *J. P. Folsom* 9625 (DUKE); 17 Feb 1981, *J. P. Folsom* 9007 (DUKE); 9 May 1981, *J. P. Folsom* 10048 (DUKE); 2 May 1981, *J. P. Folsom* 9982 (DUKE); 24 Mar 1981, *J. P. Folsom* 9480 (DUKE); 6 Feb 1981, *J. P. Folsom* 8803 (DUKE); Finca La Selva, the OTS Field Station on the Río Puerto Viejo just E of its junction with the Río Sarapiquí, 10°25'53"N, 84°00'13"W, 100 m, 25 June 1979, *J. Sperry* 604 (DUKE); *J. Sperry* 628 (DUKE); *M. H. Grayum* 2076 (DUKE); *M. H. Grayum* 2317 (DUKE); *M. H. Grayum* 2357 (DUKE); 23 July 1979, *M. H. Grayum* 1976 (DUKE); 5 Aug 1979, *M. H. Grayum*, *J. Sperry* & *A. Artavia* 2244 (DUKE); La Selva Biological Station, 10°25'53"N, 84°00'13"W, 100 m, 7 June 1985, *R. L. Wilbur* 38002 (DUKE); Finca La Selva, the OTS field station on the Río Puerto Viejo just E of its junction with the Río Sarapiquí, 10°25'53"N, 84°00'13"W, 100 m, 21 Nov 1982, *T. McDowell* 862 (DUKE); Barva, Finca La Selva, the OTS Field Station on the Río Puerto Viejo just E of its junction with the Río Sarapiquí, 10°25'53"N, 84°00'13"W, 100 m, 15 June 1995, *M. K. Whitson* 89 (DUKE); Heredia, La Palma, Río Bajo de Honduras, Braulio Carrillo National Park, 10°02'24"N, 83°58'48"W, 1150 m, 23 Jan 1983, *N. C. Garwood*, *M. Gibby*, *R. J. Hampshire* & *C. J.*

Humphries 416 (BM); Sarapiquí, Parque Nacional Braulio Carrillo, Estación El Ceibo, bosque entre la Estación y la margen izquierda del Río Peje, 10°19'45"N, 84°04'50"W, 500 m, 12 Dec 1989, *A. Chacón* 632 (MO); La Selva Biological Station. Sendero: SURA 450m, cerca de una quebrada, 10°25'53"N, 84°00'13"W, 100 m, 7/2/2004, *D. Solano DS 1161*; *D. Solano DS 1159*; La Selva Biological Station, 10°25'53"N 084°00'13"W, 100 m, 26 Marzo 1983, *I. A. Chacón G. 583* (DUKE); Sendero: CES 10m. Izq., 10°25'53"N, 84°00'13"W, 100 m, 7/12/2006, *O. Vargas 1577*. **Limón:** Fila Matama, PILA buffer zone: laguna. Forest growing in swamp, recently filled-in laguna ca 50–60 m in diam., canopy to 12 m, dbh 15–30 cm, crown diam. 6 m, a heavy epiphyte load visible, 09°49'02"N, 83°10'00"W, 1200 m, 28 Oct 2007, *A. K. Monro & A. Rodríguez G. 5878* Fila Matama: buffer zone for PILA, 'la ventana', canopy 10–15 m, many small trees, dbh 25–40 cm, canopy 5–8 m diam., many clearings present, 09°48'56"N, 83°09'49"W, 1200 m, 26 Oct 2007, *A. K. Monro & D. Solano 5804*. Parque Nac. Braulio Carrillo, in forest on slopes along small stream ca. 2 km E of lower park Station, Braulio Carrillo, Finca González, San José-Guapiles Highway, 10°12'36"N, 83°54'36"W, 500 m, 16 Apr 1988, *B. E. Hammel, R. Robles, M. M. Chavarría & P. Chavarría 16683* (MO); W of Tortuguero, 10°32'24"N, 83°30'00"W, *C. Davidson 6746* (MO); SW of Siguerres, 10°05'24"N, 83°30'00"W, *J. F. Utley & K. Burt-Utley 5445* (DUKE); Cerro Tortuguero Ladera Noroeste, pendientes pronunciadas 4 Km al Norte de Tortuguero, rumbo a la

Barra del Colorado, suelos bien drenados y pedregosos, 10°34'48"N, 83°31'48"W, 10 m, 14 Oct 1988, *R. Robles 2115* (MO); Limón, El Progreso, Cabeceras de Río Aguas Zarcas, Fila Matama, Valle de La Estrella, 09°47'24"N, 83°08'24"W, 1350 m, 29 Apr 1989, *G. Herrera Ch. & A. Chacón 2860* (MO); Pococí, vicinity of U.S.D.A. Rubber Experiment Station, Los Diamantes, on Río Santa Clara (1.6 km E of Guapiles), 10°12'49"N, 83°46'33"W, 200 m, 12 July 1949, *R. W. Holm & H. H. Iltis 417*; **Puntarenas:** Bosque Eterno De Los Niños, Cordillera de Tilarán, Monteverde flora, Laguna Poco Sol 18 km ENE of Monteverde, 10°21'00"N, 84°39'36"W, 800 m, 12 July 1991, *W. A. Haber, W. Zuchowski & E. Bello C. 10826* (CR). **San José:** Parque Nac. Braulio Carrillo, Alrededores Estación Carrillo, hasta Quebrada Sanguijuela, 10°09'00"N, 83°57'00"W, 500 m, 17 May 1988, *G. Umaña Dodero 231* (MO). ECUADOR. **Cotopaxi:** La Maná, Reserva Ecológica Los Ilinizas, sector Brasil, acceso desde La Carmela, Cordillera Occidental, vertiente occidental, bosque nublado primario, 00°40'37"S, 079°05'09"W, 1480 m, 13 July 2003, *P. A. Silverstone-Sopkin, N. Paz, A. Giraldo & M. Cerna 9132* (CUVC, MO, QCNE). **El Oro:** Road Santa Rosa-Balsas, 9 km NW of Balsas, 11 km SE of Saracay, vegetation, 03°42'51"S, 79°49'W, 700 m, 2 Dec 1996, *G. Lewis & P. Lozano 2899* (MO); Along road between Machala and Loja, 25 km SE of junction in road to Piñas, 04°15'S 79°45'W, 890 m, 17 Oct 1980, *Croat 50717* (MO). **Pichincha:** Quito. Reserva Mashpi, along road leading into reserve, departing main Pacto-San Miguel de los Bancos Road,

14.0 km N of plaza in Pacto, then 4.6 km on road to left, Valley of Quebrada Mashpi, main gate is 3 km from road, this stop was 2.9–3.5 km from gate, 00°09'23"N, 78°51'55"W, 1150 m, 6 Dec 2008, *T. B. Croat 100934* (MO). **PANAMA.** 1875, *Anonymous s.n.* (MO). **Bocas del Toro:** Ca. 15 km S of the town of Changuinola, vicinity of Changuinola 1 dam site, along the ridge NE of campsite, 09°18'30"N, 82°32'30"W, 900–1500 ft, 13 Dec 1979, *T. M. Antonio 3145* (MO); 29 km past Gualaca on road to Chiriquí Grande, 08°47'N, 82°12'W, 1070 m, 18 Feb 1986, *W. S. Hoover 1330* (F, MO); Changuinola, bosque Protector Palo seco, Sendero El Verrugoso, entrando por la finca del Sr. Desiderio Meneses, 08°46'47"N, 82°10'44"W, 972 m, 7 Feb 2013, *J. E. Aranda B., L. Martínez & E. García 4430* (MO, PMA). **Chiriquí:** Fortuna Field Station, Cordillera, 08°43'00"N, 82°16'00"W, 7 Dec 1997, *D. W. Roubik & L. Quiroz 1279* (MO); Fortuna dam site, upriver from the main camp, 08°45'N, 82°12'W, 1200–1400 m, 15 Sep 1977, *J. P. Folsom, R. L. Dressler & K. Dressler 5506* (MO); Along road between Fortuna Lake and Chiriquí Grande, 4.5–5 km N of dam over Fortuna Lake, 08°45'N, 82°13'W, 1100–1135 m, 8 Mar 1985, *Croat 60082* (MO); Vic. of Cerro Colorado Copper Mine development, 28 mi above San Felix, 9–10 mi above turn off to Escopeta, 08°32'N, 81°49'W, 1200–1500 m, 13 Mar 1976, *Croat 33264* (MO); 31.4 km past Gualaca on road to Chiriquí Grande, 08°44'23"N, 82°14'47"W, 1081 m, 18 Feb 1986, *W. S. Hoover 1332* (CM, MO). **Coclé:** Near Sawmill above El Copé, Atlantic drainage

east of sawmill, 08°40'00"N, 80°35'30"W, 20 June 1978, *B. Hammel 3526* (MO); Foot of Cerro Pilón, above El Valle de Antón, 08°38'06"N, 80°06'48"W, 2000 ft, 28 Mar 1969, *D. M. Porter, M. R. Crosby & R. K. Baker 4655* (MO); Forest along Río Gatú above Chitra Bajo, NW of Laguna La Yeguada, 08°42'N, 80°28'W, ca. 650 m, 08°42'N, 80°28'W, 650 m, 14 Jan 1986, *G. McPherson 7999* (MO); Cerro Tigreiro, 08°37'33"N, 80°41'18"W, 1000–1350 m, 26–28 Sep 2001, *J. A. Mendieta M. 17–427* (MO). **Colón:** Distrito de Donoso, Punta Rincón, Río Caimito, dirección 53° NW, hacia cerro Arenosa, 09°01'00"N, 80°41'00"W, 4 Julio 1996, *A. Zapata 992* (MO); South approach of Cerro Bruja from Río Escandaloso, 09°28'30"N, 79°34'00"W, 3000 ft, 18 May 1978, *B. Hammel 3161* (MO); Donoso, Coclé del Norte, Minera Panama, Helipat C02, Coordenadas UTM 17 P 529304 988638, 134 m, 16 Mar 2010, *A. Espinosa 5717* (MO, PMA); Quebrada Colorada abajo hasta caer al Río Petaquilla, luego a la derecha, río abajo, dirección 80° SW, 08°56'N, 80°46'W, 2 July 1996, *A. Zapata, D. Mosquera & W. Martínez 917* (MO); MPSA Concession, Valle Grande, collected with: J. De Gracia, J. Martínez, H. Quiel, & M. Merello, (UTM 536312, 975563), 08°49'31"N, 80°40'11"W, 291 m, 18 May 2012, *B. Hammel 26250* (MO); Campamento Botija, unos 2 km al SO del campamento principal, 08°49'N, 80°33'W–08°52'N, 80°34'W, 8–14 July 1996, *J. A. Polanco J., A. Zapata, D. Mosquera & W. Martínez 1893* (MO); Vicinity of La Mesa, N of El Valle de Antón, along E edge of Cerro Gaital, 900–1000 m, 08°37'N,

80°08'W, 13 July 1987 (MO). **Darién:** S of El Real on trail up Cerro Pirre, 08°00'N, 77°45'W, 550–1030 m, 29 Mar 1985, *G. McPherson 7002* (MO); Cerro Pirre, ridge top near Rancho Plastico, 07°57'N, 77°42'W, 1200 m, 10–20 July 1977, *J. P. Folsom 4229* (MO); Ridge top area N of Cerro Pirre, between Cerro Pirre top and Rancho Plastico, 07°51'N, 77°42'W, 1200–1400 m, 14 Nov 1977, *J. P. Folsom, J. Contrerra & Brijilio 6288* (MO). **Panamá:** Chepo, along El Llano-Cartí Road, 10.1 mi above Inter-American Hwy, 09°17'45"N, 78°56'15"W, 325–350 m, 16 July 1987, *Croat 67343* (MO); El Llano-Cartí road, 8.4 mi beyond the highway, 09°16'55"N, 78°55'55"W, 500 m, 5 Dec 1979, *Croat 49134* (MO), Cerro Jefe vicinity, 09°14'02"N, 79°22'30"W, 700–1000 m, *R. D. Sheffer 323* (MO); *R. D. Sheffer 266* (MO). **Veraguas:** "Cerro Tute" ridge up from former Escuela Agrícola, Santa Fé, 08°35'N, 81°05'W, 800–1100 m, 15 July 1983, *C. W. Hamilton & K. Krager 3962* (IBE, MO); "Cerro Tute" ridge up from former Escuela Agrícola, Santa Fe, 08°35'N, 81°06'W, 1000–1300 m, 20 Feb 1983, *C. W. Hamilton & R. L. Dressler 3060* (MO); Santa Fe. 2–5 km NW de Santa Fé por el camino a Río Calovébora, 08°30'46"N, 81°06'56"W, 500–700 m, 26 Aug 1984, *H. M. Hernández M., A. Chacón, H. W. Churchill & A. Liese 737* (MO); Headwaters of Río Calveborita, ca. 15 km past Escuela Agrícola Alto Piedra above Santa Fé, Atlantic watershed, 08°36'15"N, 81°07'05"W, 500 m, 16 May 1981, *K. J. Sytsma & L. Andersson 4778* (MO); Along steep trail to summit of Cerro Tute, ca 3 km above Escuela Agricultura Alto Piedra near Santa Fé, 08°30'28"N,

81°08'34"W, 2800–3000 ft, 4 Jan 1981, *K. J. Sytsma & T. M. Antonio 3030* (MO); Cerro Tute, ca. 10 km NW of Santa Fé, on lower slopes, 08°30'11"N, 81°06'06"W, 750–1000 m, 2 Aug 1975, *S. A. Mori, A. Bolten & R. L. Dressler 7554* (MO); *S. A. Mori et al., 7536* (MO); Santa Fé region, between Escuela Agrícola Alto Piedra and Río Calovebora, 08°30'47"N, 81°06'54"W–08°33'03"N, 81°10'17"W, 500–800 m, *Croat & J. P. Folsom 26901* (MO). NICARAGUA. **Matagalpa:** Río Mancera, ca. 57 km NE of El Tuma, 13°16'N, 85°31'W, 500 m, 3 Mar 1981, *W. D. Stevens & P. P. Moreno 19252* (MO). **Río San Juan:** Municipio El Castillo, Comunidad El Diamante, al SO en el Río Santa Cruz, 11°09'41"N 084°16'42"W, 100 m, 12 Apr 2005, *D. Urbina 3212* (HULE, MO); Reserva Indio-Maíz, Municipio del Castillo, Estación experimental La Lupe, 11°07'N, 84°22'W, 100 m, 22–25 Nov 2000, *R. M. Rueda & W. Velásquez 15018* (HULE); Reserva Indio-Maíz, Municipio de el Castillo, en los alrededores de la desembocadura del caño el Pavon, Río Bartola, 11°01'N, 84°16'W, 12 Jan 1997, *R. M. Rueda, I. Coronado G., O. Aráuz & F. Flores 5664* (HULE); Reserva Indio-Maíz, Municipio de San Juan del Norte, Río Indio, Cerro Canta Gallo, 11°04'N, 83°51'W, 150–200 m, 14 Sep 1998, *R. M. Rueda, I. Coronado G., W. Velásquez & Y. Rubi 8579* (HULE); 17 Sep 1998, *R. M. Rueda, I. Coronado G., W. Velásquez & Y. Rubi 8742* (HULE). PANAMA. **Bocas del Toro:** Oleoducto Road, near Continental Divide. Fortuna Dam area. [Coordinates on original label: 08°48'N 82°12'W], 08°46'59"N, 82°12'22"W, 1000 m, 5 Feb 1984, *H.W.*

Churchill, G. C. de Nevers & H. Stockwell 4634 (MO); Along road between Fortuna Dam and Chiriquí Grande, along gravel road which departs main hwy. near Continental Divide (4.5 mi N of bridge over Fortuna Lake), just S of border with Bocas del Toro Province. [Coordinates on original label: 08°44'N, 82°17'W], 08°47'06"N, 82°13'18"W, 1170 m, 22 June 1987, *Croat 66652A* (MO); Along road between Gualaca and Chiriquí Grande, 6.6 mi N of middle of bridge over Fortuna Lake, steep slope in forest above hwy. [Coordinates on original label: 08°45'N, 82°18'W], 08°47'18"N 82°11'54"W, 780 m, 24 June 1987, *Croat 66730* (MO); Along road between Fortuna and Chiriquí Grande, 8.5 mi N of bridge over the Fortuna Lake, 4.3 km N of the Continental Divide. [Coordinates on original label: 08°46'N, 82°14'W], 08°49'N, 82°12'W, 590 m, 10 Mar 1985, *Croat & M. H. Grayum 60206* (MO); Along Continental Divide from road branching N off main Fortuna-Chiriquí Grande Highway near Continental Divide, 1.1 mi from main hwy., 08°44'N, 82°17'W, 1200 m, 11 Mar 1985, *Croat & M. H. Grayum 60356* (MO). **Chiriquí:** Fortuna Dam area, along Quebrada Bonito to E of road, 08°45'N, 82°13'W, 1100 m, 8 Feb 1984, *H.W. Churchill, G.C. de Nevers & H. Stockwell 4822* (MO); Along the road to the Fortuna Dam site, N of Gualaca, 22.7 mi beyond the bridge over the Río Estí, 11.8 mi N of Los Planes de Hornito, 10.7 mi N of jct. to tunnel, 08°42'20"N, 82°13'50"W, 1400 m, 26 Nov 1979, *Croat 48683* (MO); Vicinity of Gualaca, ca. 8.5 mi from Planos de Hornito on the road to the La Fortuna dam site, 08°42'N, 82°14'W, 4400 ft, 10 July 1980, *T. M. Antonio 5080* (MO); Boquete, Fortuna dam site, 08°44'59"N, 82°14'40"W, 1200 m, 6 Feb 1985, *H. van der Werff & C. van Hardeveld 6574* (MO); **San Blas:** Cerro Brewster, 09°18'N, 79°16'W, 800–850 m, 20 Nov 1985, *G. C. de Nevers, A. J. Henderson, H. Herrera, G. McPherson & L. Brako 6289* (MO); El Llano-Cartí road, 14–15 mi from Pan American Hwy. 09°20'N, 78°58'W, 350 m, 10 May 1981, *K. J. Sytsma & L. Andersson 4460* (MO). **Veraguas:** Trail on ridge to summit of Cerro Tuté, Cordillera de Tuté, 1 km past Escuela Agrícola Altos de las Piedras, just W of Santa Fe, 08°36'N, 81°06'W, 1250–1410 m, 15 Dec 1981, *S. Knapp & K. J. Sytsma 2505* (MO); 950–1250 m, 15 Dec 1981, *S. Knapp & K. J. Sytsma 2622* (MO); Santa Fe, Headwaters of Río Calveborita, ca. 15 km past Escuela Agrícola Alto Piedra above Santa Fé, Atlantic watershed, 08°36'15"N, 81°07'05"W, 500 m, 16 May 1981, *K. J. Sytsma & L. Andersson 4781* (MO); NW of Santa Fé, 8.8 km from Escuela Agrícola Alto de Piedra, Pacific slope, 08°32'23"N, 81°09'26"W, 900 m, 17 May 1975, *S. A. Mori & J. A. Kallunki 6183* (MO); Cerro Tute, ca. 10 km NW of Santa Fé, on lower slopes, 08°30'11"N, 81°06'06"W, 750–1000 m, 2 Aug 1975, *S. A. Mori, A. Bolten & R. L. Dressler 7551* (MO); Beyond Río Tres Brazos, 9 km from Santa Fé, 08°31'38"N, 81°08'22"W, 750 m, 24 July 1974, *Croat 25602* (MO); Vicinity Santa Fé, along road between Santa Fé and Calovebora, 1.7 mi past Alto Piedra School, 1.5 mi beyond Quebrada Cosilla (previously referred to as Río Primero Braso), 08°31'28"N, 81°07'50"W, 570 m, 13 July

1994, *Croat & G. Zhu 76855* (MO); Vicinity of Escuela de Agricultura Alto Piedra, near Santa Fé, along trail to the top of Cerro Tute, 08°28'56"N, 81°05'53"W, 3200–3400 ft, 3 Apr 1980, *T. M. Antonio 3962* (MO); Cerro Tute region, above Sante Fé, 08°31'N, 81°07'W, 800–1400 m, 20 Mar 1982, *W. J. Kress & S. Knapp 82–1429* (DUKE, MO).

Cultivated Plants: THAILAND. Cultivated at Nong Nooch Tropical Garden, Patlaya, 12°55'39"N, 100°52'31"E, 8 m, 27 Apr 2012, *Croat 103648* (HUA, MO); ECUADOR. Cultivated by *Anthurium* selectities, Bleiswijk, Holland, collected April 1991, originally collected in Ecuador by Nic van der Knaap and Nick van Rosmalen, 3 Jan 1992, *Croat 71936* (MO); *Croat 71954* (MO).

Anthurium intactum Croat & O. Ortiz, **sp. nov.** TYPE: PANAMA. Coclé: Alto Calvario above El Copé, ca. 6 km N of El Copé, Atlantic slope which leads down to Las Ricas, Limón and San Juan, 08°39'N, 80°36'W, 710–810 m, *T. B. Croat 68721* (holotype, MO-3610891; isotype, PMA). **Figures 13–16.**

The species is a member of section *Polyneurium* characterized by its usually terrestrial habit, its moderately short internodes, long intact reddish brown cataphylls which are eventually deciduous while intact, often having roots developing in the spreading trough-like angle which is directed upward, subterete weakly sulcate brownish drying petioles, reddish brown-

drying abruptly long-acuminate blades which are 1.2–1.7 times longer than wide, 0.44–0.93 times as long as petioles with (5)6–7(8) pairs of basal veins, 2–3 sometimes 4th & 5th (6th) pairs of which are free to the base, often non-existent or short posterior ribs and when present only 5–1.2 mm long, a narrow spatulate to V-shaped, sometimes parabolic sinus, close prominently raised primary lateral veins as well as by the green tinged violet-purple lanceolate spathe, long-tapered whitish to yellowish spadix that turns burgundy or maroon-brown to purplish and purplish violet to opaque red, ovoid-ellipsoid berries.

Terrestrial or sometimes hemiepiphytic growing near the ground; caudex elongate, to 75 cm long; roots mostly 1–2 per node, ensheathed in cataphyll; **internodes** 3–4 cm diam.; **cataphylls** 26–31 cm long, intact, soon deciduous while intact, frequently initially spreading and serving as a trough for the development of adventitious; **petioles** 47–89(118) cm long, (average 69.1), terete, purplish, weakly and narrowly and obtusely sulcate; geniculum to 3.5 cm long, sulcate near apex; **blades** 25.5–52(60) cm long, 16.5–36.5 cm wide (average 43.1 x 28.8 cm), 1.2–2.5(4.2) times longer than wide, 0.44–0.93 times as long as petioles, abruptly long-acuminate at apex, prominently lobed at base, usually drying reddish brown, sometimes greenish on lower surface with reddish brown veins; **anterior lobe** 32–46.5 cm long, convex along margins; **posterior lobes** more or less rounded, (6)10–15 cm long, (6.5)10–13.5 cm wide; **basal veins** (5)6–7(8) pairs, 2–3



Figure 13. *Anthurium intactum* Croat & O. Ortiz. Habit. (Photo Alicia Ibáñez).



Figure 14. *Anthurium intactum* Croat & O. Ortiz. Leaf blade, adaxial surface (Photo Alicia Ibáñez).

sometimes 4th & 5th (6th) pairs free to the base; **posterior rib** 5–1.2 mm long; **sinus** usually narrow, 0.5–3 cm wide, spatulate to V-shaped, sometimes parabolic, 3–11 cm deep; **midrib** narrowly rounded above, bluntly acute and often reddish below; major lateral veins and collective veins sunken above; **primary lateral veins** 12–16 pairs, arising at a 50–60° angle, weakly raised in prominent valleys above, often tinged reddish on lower surface; **tertiary veins** obscurely visible on both surfaces on fresh material; **upper surface** drying minutely granular; **lower surface** dark-granular below. **INFLORESCENCE** erect; **peduncle** 26.5–43 cm long; **spathe** 17 cm

long, 1.7 cm wide, narrowly lanceolate, spreading to reflexed, green, turning purplish at least at base; **spadix** 8–19 cm long, 3–8 mm diam., narrowly long-tapered, pale green, turning whitish, greenish yellow or yellow finally turning burgundy or maroon-brown to purplish, sometimes remaining yellowish at apex. **INFRACTESCENCE** 18–27 cm long; **berries** green tinged purple, eventually purplish violet to opaque red, ovoid-ellipsoid, 9 mm long, 5 mm diam.; seeds paler green, 2 per berry, 5 mm long, flattened on one side.



Figure 15. *Anthurium intactum* Croat & O. Ortiz. Inflorescence (Photo Alicia Ibáñez).



Figure 16. *Anthurium intactum* Croat & O. Ortiz. Inflorescence (Photo Alicia Ibáñez).

Anthurium intactum ranges from Costa Rica (Cartago, Heredia, Limón) to Panama (Chiriquí, Coclé, Darién and Veraguas) and Colombia (Chocó) at 600–1520 m in *Tropical wet forest* and *Premontane rain forest* life zones.

The species epithet is from the Latin “*intactus*” (meaning intact or entire), referring to the conspicuous long intact cataphylls.

The species is most easily confused with *Anthurium talamancae* which differs by its longer leaf blades which are more than 2 times longer than broad and by having 5 or fewer pairs of basal veins.

Paratypes: COLOMBIA. **Chocó**: S ridge of Cerro Mecana, forest and dense shrubby vegetation, 06°15'N, 77°19'W, 710–880 m, 8 Jan 1984, *A. Juncosa* 1828 (MO). COSTA RICA. **Cartago**: Turrialba, Shipiri, Moravia de Chirripo, 09°48'36"N, 83°24'00"W, 900–1000 m, 15 Aug 1982, *I. A. Chacón* G. 6 (MO); Along Quebrada Platanillo near confluence of Quebrada Sipiri, Platanillo de Chirripó, 09°48'36"N, 83°24'00"W, 1135 m, 2 Mar 1990, *M. H. Grayum* & *D. R. Hodel* 9735 (MO); Along road from Moravia to Quebrada Platanillo (Tsipirí), 09°49'12"N, 83°26'24"W, 1250 m, 1 July 1976, *Croat* 36653 (MO). **Heredia**: Forest between Río Peje and Río Sardinalito, Atlantic slope of Volcán Barva, 10°18'N, 84°05'W 700–750 m, 4 Apr 1986, *M. H. Grayum* 6766 (CR, MO); Between Quebrada Tigre and east fork of Río Sardinal, ca. 9 km SW of Las

Horquetas, route crossing several branches of Río Sardinal, 10°17'N, 84°02'W, 600 m, 2 Feb 1985, *M. H. Grayum*, *P. J. Sleeper* & *N. Machado* 5030 (MO); Finca Murillo, Filas adyacente a la catarata, colectando en bosque, borde de bosque y area abierta, 10°14'11"N, 84°07'04"W, 1400–1500 m, 14 Apr 2005, *D. Solano* 2241 (MO); Sarapiquí, no protegida, Cuenca del Sarapiquí, Reserva Rara Avis (área protegida privada), within 1 km of waterfall clearing, 10°16'55"N, 84°02'41"W, 700 m, 20 June 2002, *A. Boyle* 160 (MO); No protegida, Cuenca del Sarapiquí, Rara Avis Lodge and Reserve, Atlantic slope of Costa Rica, 10°16'55"N, 84°02'41"W, 700 m, 9 June 2001, *A. Boyle* & *R. Repasky* 37 (MO). **Limón**: Siquirres, Finca Las Brisas propiedad de Erick Berlin, la finca de arriba, 10°03'55"N, 83°37'51"W, 800–1000 m, 13 July 2006, *D. Santamaría Aguilar* 4660 (CR, INB, MO); Talamanca, forests of Shirores, 09°35'N, 82°58'W, 300 ft, Feb 1895, *H. Pittier* & *A. Tondus* 9233 (BR, MO, US). PANAMA. **Bocas del Toro**: Oleoducto Road, near Continental Divide, Fortuna Dam area [coordinates on original label: 08°48'N 82°12'W], 08°46'59"N, 82°12'22"W, 1000 m, 5 Feb 1984, *H. W. Churchill*, *G. C. de Nevers* & *H. Stockwell* 4639 (MO); Refugio de Culebra. Siguiendo el camino hasta el río Cerro Azul, 16 Sep 1992, *D. Santamaría*, *V. Cedeño*, *F. Arosemena*, *C. Muñoz* & *J. Tovar* 419 (PMA); Fortuna Field Station. Continental Divide trail, 23 Aug 1993, *D. W. Roubik*, *D. Beath* & *L. Quiroz* 1186 (MO, PMA); Fortuna Field Station. Cordillera, 7 Dic 1997, *D. W. Roubik* & *L. Quiroz* 1271 (MO, PMA). **Chiriquí**: Fortuna Dam area, along Quebrada Los

Chornos, to N of reservoir, forest on "kaolinite" soil, 8°45'N, 82°14'W, 8°45'N, 82°14'W, 1100 m, 18 Sep 1984, *H. W. Churchill & A. Churchill 6075* (MO); Along Quebrada Bonito to E of road, 08°45'N, 82°13'W, 1100 m, 8 Feb 1984, *H. W. Churchill, G. C. de Nevers & H. Stockwell 4815* (MO); Fortuna, camino de quebrada Bonita, hacia el este del río Chiriquí, 1150 m, 7 Apr 1987, *I. A. Valdespino Q. et al. 483* (MO); Border of Bocas del Toro/Chiriquí Provinces, Continental Divide above Quebrada Arena, Carretera del Oleoducto, IRHE Fortuna Hydroelectric Project, 08°46'N, 82°12'W, 1150–1200 m, 19 June 1982, *S. Knapp & M. R. Vodicka 5659* (MO); Fortuna Lake Area, along road which departs from just S of the Continental Divide, 1 mi W to near where road ends, then along trail that follows the Continental Divide, 08°44'N, 82°17'W, 1200 m, 29 Mar 1993, *Croat 74968* (MO); Gualaca-Chiriquí Grande Road over Fortuna Lake, along gravel road which departs main highway near Continental Divide, (4.5 mi N of middle of bridge over Fortuna Lake), just S of border with Bocas del Toro Province, 08°44'N, 81°17'W, 1170 m, 23 June 1987, *Croat 66705* (AAU, CAS, G, GB, L, M, MO, S, SEL, W, Z); Fortuna Dam Area: Trail to Meteorological Station of Río Hornito, beginning 0.5 km S of Centro de Científicos, 08°45'N, 82°18'W, 23 June 1994, *Croat & G. Zhu 76317* (AAU, CM, F, MEXU, MO, US); 29 km past Gualaca on road to Chiriquí Grande, 08°43'N, 82°14'W, 1240 m, 13 Feb 1986, *W. Scott Hoover 1328* (CM, MO); Gualaca, Reserva Forestal Fortuna, División Continental, 08°48'09"N,

82°11'55"W, 961 m, 6 Mar 2014, *O. Ortíz & G. Villareal 2122* (MO, PMA). **Coclé:** El Copé, on slope and ridge W of sawmill, 08°40'N, 80°36'W, 5 Apr 1978, *B. E. Hammel 2407* (MO); Near Continental Divide above sawmill N of El Copé, 08°40'30"N, 80°36'30"W, 3300 ft, 13 June 1978, *B. E. Hammel 3469* (MO); Along lumbering road, 2.2 km beyond sawmill in forest along lumber road above El Copé, 08°41'N, 80°36'W, 900 m, 20 Jan 1978, *B. E. Hammel 1022* (MO); Forest around Rivera sawmill, Alto Calvario, 7 km N of El Copé, road to summit, 08°40'18"N, 80°36'02"W, 13 May 1977, *J. P. Folsom 3236* (MO); Summit at Alto Calvario, ridge-type vegetation, 08°40'30"N, 80°36'37"W, 900 m, 4 Apr 1977, *J. P. Folsom & R. Robinson 2420* (MO); *J. P. Folsom & R. Robinson 2427* (MO); Along Atlantic side of Continental Divide above sawmill above El Cope, 1000 m, 8.40'N, 80.37'W, 08°40'N, 80°37'W, 1000 m, 25 July 1983, *J. S. Miller et al. 820* (MO); NE slopes and summit of Cerro Caracoral, north rim of El Valle, 08°37'30"N, 80°06'48"W, 2700–3200 ft, 22 Apr 1981, *K. J. Sytsma 4061* (MO); El Valle de Antón, Monumento Natural Cerro Gaital, 08°37'N, 80°07'W, 26 May 2012, *O. Ortíz & R. Flores 667* (MO); Foothills and summit of Cerro Caracoral, near La Mesa, N of El Valle de Antón, 08°37'18"N, 80°06'36"W–08°37'20"N, 80°07'12"W, 800–1100 m, 10 Sep 1981, *S. Knapp 1071* (MO); Hills N of El Valle, E slope of Cerro Gaital, 08°37'35"N, 80°07'20"W, 900–1000 m, 29 May 1982, *S. Knapp 5307* (MO); Along ridge of Cerro Gaital, N slopes of mountains near La Mesa, N of El Valle, 08°38'00"N,

80°08'30"W, 800–900 m, 28 Apr 1982, *S. Knapp & R. J. Schmalzer* 4919 (MO); Cerro Pilón, 5 km NE of El Valle, 08°38'00"N, 80°06'30"W, 800–1045 m, 13 Jun 1975, *S. A. Mori et al.* 6582 (MO); Near Continental Divide along lumber road 5.2 mi N of El Cope, 1.5 mi N of lumber camp, 08°40'20"N, 80°35'44"W, 900 m, 19 Jan 1978, *Croat* 44594 (MO); *Croat* 44559 (MO); La Mesa, above El Valle de Antón, ca. 2 km W of Cerro Pilón on slopes of steep hill, disturbed virgin forest, 08°37'30"N, 80°07'30"W, 860–900 m, 21 July 1976, *Croat* 37345 (MO); Mountains N of El Valle de Antón, 08°37'N, 80°06'W–08°39'N, 80°08'W, 2500–3000 ft, 28 May 1967, *W. H. Lewis, B. MacBryde, R. L. Oliver & J. E. Ridgway* 1721 (MO); La Pintada, Alto Calvario above El Copé, ca. 6 km N of El Copé, Atlantic slope, along trail which leads W off old lumber trail which leads down to Las Ricas, Limón and San Juan, 08°40'41"N, 80°35'47"W–08°41'04"N, 80°35'50"W, 710–800 m, 22 June 1988, *Croat* 68721 (MO); Alto Calvario, above saw mill, on Continental Divide, 5.2 mi above El Copé, 08°40'16"N, 80°36'44"W, 930 m, 6 Dec 1979, *Croat* 49194 (MO); Vicinity of La Mesa, N of El Valle de Antón, along E edge of Cerro Gaital, 08°37'N, 80°08'W, 900–1000 m, 13 July 1987, *Croat* 67278 (MO). **Veraguas:** Vicinity of Cerro Tute, 08°30'N, 81°07'W, 750 m, 18 Mar 1987, *G. McPherson* 10644 (MO); W of Santa Fe, beyond Alto de Piedra, 08°30'N, 81°07'W, 600–800 m, 17 Oct 1985, *G. McPherson* 7155 (MO); Ridge of Cordillera de Tute, trail to Cerro Tute, above Escuela Agrícola Alto de Piedra, just W of Santa Fé, 08°32'N, 81°07'W, 800–1350 m, 5 June 1982, *S. Knapp & R. L. Dressler* 5452 (MO); Ridge of Cordillera de Tute, along trail to Cerro Tute, ca. 3–4 km past Escuela Agrícola Alto de Piedra, just W of Santa Fé, 08°32'N, 81°07'W, 800–1400 m, 20 Mar 1982, *S. Knapp & W. John Kress* 4375 (MO); Santa Fe Mts, 3.5 mi N of Santa Fé, 08°31'51"N, 81°08'19"W, 500–1000 m, 12 Dec 1971, *A. H. Gentry* 2977 (MO); NW of Santa Fé, 10.8 km from Escuela Agrícola Alto de Piedra, on road to Calovebora, very wet area, 08°33'05"N, 81°10'28"W, 400 m, 18 June 1975, *S. A. Mori* 6708 (MO); 8.8 km from Escuela Agrícola Alto de Piedra, in forest, 08°32'23"N, 81°09'26"W, 900 m, 17 Nov 1974, *S. A. Mori & J. A. Kallunki* 3260 (MO); Primary forest on Caribbean slope above Río Primero Brazo, 5 miles NW of Santa Fé (below Escuela Agrícola Alta Piedra), 08°32'23"N, 81°08'04"W, 700–1200 m, 18–19 Mar 1973, *Croat* 23220 (MO); Beyond Río Tres Brazos, 9 km from Santa Fé, 08°31'38"N, 81°08'22"W, 750 m, 24 July 1974, *Croat* 25605 (MO); Along banks of first river on road between Escuela Agrícola Alto Piedra and Río Calovebora, 08°31'26"N, 81°07'46"W, 500 m, 4 Apr 1976, *Croat & J. P. Folsom* 34145 (MO), Cerro Mariposa, 18 July 2009, *F. Hernández, A. Ibáñez, B. Rodríguez & W. Adsett* 1150FH (PMA); Parque Nacional Santa Fe. Cerro Mariposa, 9°40'10" N, 48°68'52" E, 1100 m, 18 June 2009, *F. Hernández, A. Ibáñez, B. Rodríguez & W. Adsett* 1197FH (PMA); About 20 km. NW of Santa Fé, near Continental Divide, 8°31' N, 81°05' W, 650–800 m, 29 March 1975, *H. Kennedy & R. L. Dressler* 3426 (PMA); Vicinity of Santa Fe, along dirt road between Santa Fe and Río

San Luis, 08°33'N, 81°08'W, 600 m, 28 June 1987, *Croat 66932* (MO).

Anthurium monticola Engl., var. ***monticola***. Bot. Jahrb. 25: 387. 1898. TYPE: Colombia. Valle: 1200 m, *Lebmann 1974* (lectotype, designated here, B!). **Figures 17–20.**

Anthurium chlorocarpum Sodiro, Revista Chilena Hist. Nat. 9: 251. 1905. Syn. nov. TYPE: ECUADOR. Esmeraldas: Paramba-Cachabí, Aug. 1904, *Sodiro s.n.*

The species is a member of section *Polyneurium*, characterized by its usually terrestrial habit, stems with the lower internodes to 4 cm long, cataphylls drying more or less intact near apex then deciduous lower down leaving only a few fibers at the nodes, narrowly ovate narrowly long-acuminate usually grayish green-drying mostly subcordate leaf blades (except in *A. monticola* var. *attenuatum* [see below]) that are usually more than 2 times longer than broad with a sinus usually arcuate and decurrent on the petiole, basal veins that are free to the base, 9–11 pairs of primary lateral veins as well as a short-pedunculate inflorescence with a usually green narrowly lanceolate spathe and a narrowly long-tapered dark violet-purple spadix and red early-emergent berries.

Usually terrestrial, rarely epiphytic; stem moderately short; **internodes** short, 5–40 mm long, 5–20 mm in diam., matte, medium green short; roots several per node;

cataphylls (6)9–11.4 cm long, 8–10 mm wide, drying greenish to light brown, more or less intact, later deciduous but leaving a few basal portions of cataphyll fibers on stem; **petioles** 15.7–68 cm long, 2–4 mm on drying, subterete, gray-green to light yellow-brown; geniculum 1–2 mm long, drying darker; **blades** narrowly to broadly ovate or rarely ovate, 21.7–43.5 cm long, 12–21.5 cm wide (averaging 31.4 x 14.7 cm), 1.5–3 times longer than wide, 0.47 times as long as petiole to 1.3 times longer than petioles (averaging 0.93 times as long), dark green and semiglossy to glossy above, moderately paler below, drying greenish gray to brownish green and matte to semiglossy above, greenish or reddish brown tinged and semiglossy below, narrowly long-acuminate, usually abruptly so at apex, subcoriaceous, subcordate to rarely rounded at base; **sinus** arcuate and with petiole decurrent on petiole, a few mm to 2 cm deep, 2.5–5.5 cm wide; major veins drying concolorous, weakly raised above, usually reddish brown, sometimes paler, round-raised below; **midrib** narrowly raised in valleys, slightly paler above, acute to narrowly rounded, paler than surface below, drying concolorous, narrowly rounded to subacute above, paler, somewhat 3-ribbed and densely granular below; **primary lateral veins** (9)10–11(14) pairs, arising at a (35)45–55(60)°angle, sunken to deeply sunken above, convex to narrowly raised below; **basal veins** usually 3 pairs, sometimes 2, rarely 4 or 5 pairs, 1st free to the base, 2nd usually free to the base, 3rd and 4th when present, fused 2–5 mm; **collective veins** arising from 1st (2nd) pairs of basal veins,



Figure 17. *Anthurium monticola* Engl. var. *monticola*. Habit.

4–6 mm from blade margin, slightly loop-connected at primary lateral veins; tertiary veins reticulate, barely raised above, narrowly raised below. INFLORESCENCE erect; **peduncle** (9)11–18(25) cm long, shorter than petiole, medium green, sometimes tinged purplish, drying olive-green to medium brown; **spathe** reflexed to spreading, 3–4.5(8.4) cm long, 6–11 mm wide, medium green to rarely white, often tinged purple, narrowly lanceolate, acuminate, spreading to prominently reflexed; **spadix** sessile or stipitate 1–4 mm, 3.6–8(10.8) cm long, 4–5 mm in diam. (dry),

cylindrical to narrowly long-tapered, blunt at apex, glossy, dark purple, violet-purple, or purple-maroon; flowers square, 3 visible per spiral, (1.4)3.1–3.4 mm long, (1.4)3.1–3.4 mm wide; tepals somewhat exserted, drying smooth; lateral tepals 1.2–1.5 mm wide, inner margins rounded, 2-sided on outside; **pistils** strongly exserted; stigma round; thecae oblong, 0.6–0.7 mm long, 0.2–0.3 mm wide, emerging well above tepals; stamens apparently withdrawn beneath tepals, 0.5 mm long and wide. INFRUCTESCENCE erect, 4–7(16.3) cm long, often sterile at apex; berries early



Figure 18. *Anthurium monticola* Engl. var. *monticola*. Stem and cataphylls (Photo Orlando Ortiz).



Figure 19. *Anthurium monticola* Engl. var. *monticola*. Leaf blade, adaxial surface.

emergent and to ca. 1 cm long, 5 mm diam., ovoid to ellipsoid, acute at apex, becoming purplish to red at anthesis.

Anthurium monticola var. *monticola* ranges from Costa Rica and Panama along the Caribbean coast and to Colombia along the Pacific coast to Esmeraldas Province in Ecuador, ranging from sea level to 1200 m elevation in *Tropical wet forest* and *Premontane rain forest* life zones in Panama and extending into *Tropical wet forest* life zones and the *Tropical wet forest* to *Tropical rainforest* transition life zones in Colombia.

In Panama *Anthurium monticola* has been confused with *A. talamancae* (previously

erroneously called *A. cuspidatum*) but that species has thicker internodes (to 2 cm diam.), typically larger leaves that dry dark brown and have more pairs of basal veins (usually 4–5 pairs) and a longer peduncle (25–77.5 cm long). *Anthurium monticola* is also similar to *A. intactum* but that species differs in drying dark reddish brown, in having usually more than 6 pairs of basal veins and by having thicker stems. In addition *Anthurium cuspidatum* is similar to *A. monticola* but differs in having more broadly ovate blades with (5)6–9 pairs of basal veins.

In Colombia the variety *Anthurium monticola* var. *attenuatum* Croat & D. C. Bay is



Figure 20. *Anthurium monticola* Engl. var. *monticola*. Inflorescence (Photo Orlando Ortiz).

separable owing to its typically narrower leaf blades (1.7) 2–2.9 times longer than wide and which are acute at the base with longer spadices (in contrast to 1.2–1.8 times longer than wide at least subcordate with shorter stubbier spadices for var. *monticola*). Panamanian collections of *Anthurium monticola* may also be proportionately narrower than those in Colombia (up to 2.3 times longer than broad) but do not have leaf bases acute at base.

Additional specimens seen: PANAMA. **Coclé:** La Pintada, Palmarazo, Río San Juan, Parque Nacional G.D. Omar Torrijos H. Área de Calle Larguita (Palmarazo), bosque al norte del área de acampar, río San Juan. Bosque primario ligeramente intervenido, 08°43'19"N, 80°40'33"W, 178 m, 19 July 2013, *A. Espinosa, L. Martínez, J. Rodríguez & R. Rodríguez* 6147 (FT, MO, PMA). **Colón:** Teck Cominco Petaquilla mining concession, 08°50'25"N 080°41'52"W, 149 m, 17 Sep 2007, *G. McPherson* 19654 (MO); Coclé del Norte, Donoso, Minera Panamá, Proyecto de Cobre, helipat C24, UTM coordinates 17P 547143 993221, 41 m, 13 Mar 2010, *A. Espinosa & K. Lorenzo* 5652 (MO, PMA); Donoso, MPSA Concession, Valle Grande, 08°49'31"N, 80°40'11"W, 291 m, 18 May 2012, *B. E. Hammel, J. De Gracia, J. Martínez, H. Quiel, & M. Merello* 26250 (MO); Valle Grande, 08°49'19"N, 80°40'23"W, 153 m, 19 Apr 2014, *C. Ramos* 200 (PMA); Distrito de Donoso, Área de Concesión Minera Panamá, Pipeline Road, 17P 538777 983387, 111 m, *O. Ortiz, L. Pérez & E. Sánchez* 1279 (MO, PMA). COLOMBIA. **Antioquia:** Frontino, in silvis

densis humidis pr. Frontino in Andibus occiden talibus Antioquiae, 1300–1700 m, Sept 1882, *F. C. Lehmann* 7359 (B). **Chocó:** Along road between Quibdó and Istmina, at Km 14 S of Quibdó, 05°32'N 076°37'W, 100 m, 17 Dec 1980, *Croat* 52217 (MO). **Valle del Cauca:** Santa Rosa, 200–300 m, 22 Sep 1922, *E. P. Killip* 11533 (GH, PH). ECUADOR. **Esmeraldas:** San Lorenzo, upper valley of Río Tulubí, 2 km north of Lita-San Lorenzo road, west of Durango, adjacent to Awá Indigenous Territory, 01°01'45"N, 078°35'24"W, 230 m, 8 Apr 2002, *D. Neill, E. R. Toapanta & D. Pay* 13947 (QCNE); Parroquia Alto Tambo, Reserva Indígena Awá, comunidad de Río Bogotá, Junto al Río Bogotá, y al transecto de inventario de fauna, 00°59'11"N, 078°35'50"W, 300–580 m, 15 Nov 2003, *G. Toasa* 9389 (MO, QCNE).

Anthurium monticola* var. *attenuatum
Croat & D. C. Bay, *Novon* 16(1): 41–42. 2006. TYPE: COLOMBIA. Valle: Buenaventura-Málaga Rd, km 9, 3 Feb 1990, *T. B. Croat* 70122 (holotype, MO-3784810; isotypes, B, COL, CUVC, F, K, NY, PMA, US). **Figure 21.**

Anthurium monticola var. *attenuatum* is a member of section *Polyneurium* and is characterized by its ovate (pear-shaped) blades which are broadly rounded and abruptly attenuate at the base, basal veins which are free to the base, slender petioles, deciduous cataphylls, and dark purple inflorescences borne on short peduncles. Also distinctive are the flowers, which have

exserted tepals, strongly exserted pistils, and early-emergent green berries.

Epiphytic or terrestrial; stem short; **internodes** to 2 cm long, 1.5–3 mm in diam., green to gray-green; roots several per node; **cataphylls** 8–9 cm long, few pale cataphyll fibers persisting at upper nodes, deciduous. LEAVES erect; **petioles** 19.5–45 (49) cm long, 3–4 mm in diam. (dry), subterete, obtusely flattened adaxially, narrowly sulcate, medium green, drying olive-green to olive-brown; geniculum 5–10 mm long, swollen, paler than petiole, drying dark brown; **blades** moderately coriaceous, ovate, abruptly long-acuminate at apex, broadly rounded and abruptly attenuate at base, 19.5–39.5 cm long, 9–20 cm wide, (1.7) 2–2.9 times longer than wide, 0.7–1.5 (1.8) times longer than petiole, upper surface semiglossy, rarely matte, dark green, drying semiglossy, olive-green to olive-brown, lower surface weakly glossy, paler, drying glossy, paler than above; major veins drying concolorous, barely raised above, darker than surface, often reddish brown, prominently raised below; **midrib** convex, slightly raised above, prominently raised, paler below; basal veins 3–4 per side, free to base; **primary lateral veins** 7–12 per side, departing midrib at a 35°–55° angle, curving gradually to collective veins, narrowly sunken above, convex below; collective veins 5–9 mm from blade margin, curving inward at the points where primary lateral veins join, originating from 1st basal vein; tertiary veins reticulate, moderately obscure above, slightly raised below. INFLORESCENCES erect; **peduncle** 7.5–

22 cm long, shorter than petiole, terete, medium green to greenish brown, drying olive-brown; **spathe** reflexed, 4.5–11 cm long, acuminate, medium green, often tinged with purple or maroon; **spadix** sessile or stipitate to 5 mm, cylindrical, blunt at apex, 5.5–16 cm long, 4–5 mm in diam. (dry), glossy, dark purple; flowers rhombic to square, 2.8–3.2 mm long, 1.7–2.5 mm wide; tepals slightly exserted; **pistils** strongly exserted. INFRUCTESCENCES erect, 6.5–16 cm long, often sterile in distal 1/3 to 1/2; **berries** early-emergent, narrowly ovate to oblong ellipsoid, 1.2–1.7 mm long, about 8 mm in diam., green becoming red.

This variety ranges along the Pacific Andean slopes of Colombia in the Departments of Chocó, Nariño, and Valle occurring in *Tropical wet forest*, and *Tropical wet forest* life zones transitioning to *Premontane wet forest* life zones, from sea level to 600 m. In the Bajo Calima region it was collected in primary and regrowth forest.

Anthurium monticola variety *attenuatum* is a member of section *Polyneurium* and is characterized by its ovate (pear-shaped) blades which are broadly rounded and abruptly attenuate at the base, basal veins which are free to the base, slender petioles, deciduous cataphylls, and dark purple inflorescences borne on short peduncles. Also distinctive are the flowers, which have exserted tepals, strongly exserted pistils, and early-emergent green berries.



Figure 21. *Anthurium monticola* Engler. var. *attenuatum*. Herbarium sheet (CUVC).

Anthurium monticola var. *attenuatum* differs from *A. monticola* var. *monticola* in having blades that are narrower [(1.7) 2–2.9 times longer than wide compared to 1.2–1.8 times longer than wide in var. *monticola*], broadly rounded and abruptly attenuate at the base (compared to subcordate), and spadices which are often somewhat longer.

Anthurium monticola var. *attenuatum* was collected in flower and in fruit every month of the year in the Bajo Calima region, individual plants often bearing both an inflorescence and infructescence at the same time.

Additional specimens examined. COLOMBIA. **Chocó:** Yuto-Lloro rd., 100 m, 17 Aug 1976, *Gentry & Fallen 17835* (MO); Nóvita, N of Cerro Torrá, Camino al Alto del Oso, 600–900 m, 22 Feb 1977, *Forero et al. 3197* (MO); Río Atrato, between Loma del Sapo and Bocas del Guayabal, 40 m, 23 June 1983, *Forero et al. 9437* (MO); Quibdó-Guayabal, 11 May 1985, *Moreno et al. 12* (MO); Quibdó-Lloro rd., about 1 km S of ferry over Río Atrato, 150 m, 16 Apr. 1983, *Croat 55978* (MO); Quibdó-Yuto rd., 12 km S of Quibdó, 60 m, 21 Apr 1983, *Croat 56256* (MO). **Nariño:** Barbacoas, 15 km above the Río Telembi, 170 m, 20 Nov. 1986, *Hammel & Bernal 15782* (MO). **Valle:** Buenaventura-Málaga rd, km 9, 3 Feb 1990, *Croat 70122* (MO); Km 11, 1 Feb 1972, *Kennedy & Andrews 1317* (SEL), 2 Feb 1972, *Kennedy & Andrews 1336* (SEL), 16 Feb 1983, *Gentry et al. 40408* (MO), 19 Feb 1983, *Gentry & Juncosa 40531* (MO), 23 Aug 1984, *Monsalve 230* (CUVC, MO), 5 Sep 1984,

Monsalve 347 (CUVC, MO), 20 Feb 1985, *Monsalve 690* (MO), 8 May 1985, *Monsalve 889* (MO), *Monsalve 896* (MO), Aug 1986, *Monsalve 1154* (CUVC), 22 Jan 1988, *van der Werff & Monsalve 9692* (MO), 9 July 1986, *Croat & Monsalve 61402A* (MO), 4 July 1986 (CUVC, MO).

Anthurium palosecense Croat & O. Ortiz, **sp. nov.** TYPE: PANAMA. Bocas del Toro: Bosque Protector Palo Seco, Área boscosa a los alrededores de Williamazú, 09°09'29"N, 82°30'29"W, 363 m, 1 Feb 2013, O. O. Ortiz 1202 (holotype, MO-6431316; isotype, PMA). **Figure 22.**

The species is a member of section *Polyneurium* and is characterized by its epiphytic habit, short stem with short internodes, mostly deciduous cataphylls persisting with a few of the basal fibers, terete petioles, narrowly ovate to ovate-elliptic greenish drying narrowly long-acuminate, eglandular blades which are rounded to weakly subcordate at base with two pairs of basal veins as well as a long-pedunculate inflorescence with a narrow green spreading spathe and a sessile slender orange non-tapering spadix.

Epiphytic herb; roots moderately few, usually 1–2 per node; stem short; **internodes** short (2–6 mm long), 4–5 mm diam., light brown; **cataphylls** 5.5 cm long, light brown, rounded and weakly apiculate at apex, promptly weathering to pale fibers, only the basal portion loosely persisting, with few fibers; **petioles** 19.6–24.5 cm long,



Figure 22. *Anthurium palosecense* Croat & O. Ortiz. Herbarium sheet of holotype (*Ortiz*, 1202 MO) (Photo MO Herbarium)

drying 1 mm diam., light tan, terete, weakly sulcate; geniculum 0.9–13 mm long, blackened; **blades** narrowly ovate to ovate-elliptic, 17.7–24.5 cm long, 5.7–7.3 cm wide (averaging 20.5 x 6.42 cm), 2.4–3.7 times longer than wide, 0.76–1.02 times longer than petioles, gradually narrowly long-acuminate at apex, slightly inequilateral and rounded to weakly subcordate at base, drying thinly coriaceous, grayish and weakly glossy above, moderately paler greenish and moderately glossy below; **midrib** narrowly rounded, slightly paler above, narrowly round-raised, brownish and darker below; **primary lateral veins** 6–7 pairs, arising at a 35–45° angle; tertiary veins moderately inconspicuous; upper surface densely and minutely granular on magnification; lower surface, more sparsely granular, both surfaces lacking glands. INFLORESCENCE erect; **peduncle** 22.5 cm long, ca. 1 mm diam. ; **spathe** oblong-lanceolate, 4 cm long, 4 mm wide, green, spreading; **spadix** yellowish to orange-red, 4.8 cm long, 2.1 mm wide; flowers 3(4) per spiral, 2.1 cm long, 1.8 cm wide; tepals matte, moderately smooth; lateral tepals 0.7–0.8 mm wide, inner margin rounded, outer margin 2-sided; stamens not visible.

Anthurium palosecense is endemic to Panama and is currently known only from Bocas del Toro (Bosque Protector Palo Seco) and Veraguas (Río Belén) at 200–363 m in a *Tropical wet forest* life zone.

The species is named for the type locality at the Palo Seco Reserve in western Panama.

Anthurium palosecense is closest to *A. talamancae* but differs from that species by its much smaller size, smaller mostly narrowly ovate, greenish drying leaf blades which are mostly rounded at the base but especially by its minute orange spadix. In the Lucid Anthurium Key the species also tracks to *A. bullianum* Engl. which differs by its broadly ovate, distinctly subcordate, cupulate spathe and short stubby spadix and *A. reticulatum* Benth. differing by its oblong blades which are 5–7 times longer than broad and narrowly rounded at base.

Paratype: PANAMA. **Veraguas**: Distrito de Santa Fe, área propuesta para conservación, río Belén, bosque cercano q las riveras del río, 08°43'06"N, 80°45'22"W, 207 m, 17 Dic 2013, Zapata et al. 3464 (PMA).

Anthurium talamancae Engl. Bot. Jahrb. Syst. 25: 386. 1898. Type: COSTA RICA: Limón: Talamanca, near Shirores, 100 m, *Tonduz* 9233 (lectotype, B, designated by Croat & Baker, 1979). **Figures 9–10.**

Anthurium donnell-smithii Engl. Bot. Jahrb. Syst. 25: 389. 1898. Type: COSTA RICA: Limón: Río Jiménez, (Zimenez), Llanos de Santa Clara, 280 m, Apr. 1894, *J. Donnell Smith* 4979 (holotype, B; isotype, US).

Anthurium ortegianum Engl., Bot. Jahrb. Syst. 25: 387. 1898. Type: COLOMBIA. Eastern slopes of western Andes near Popayan, 1500–1700 m, *Lehmann* 5989 (holotype, B; isotype, US).

Anthurium johnii Engl. Pflanzenr. IV. 23B: 119. 1905. Type: COSTA RICA. Suerre, Llanos de Santa Clara, 300 m, Feb. 1896, *J. Donnell Smith 6812* (holotype, B).

The species is a member of section *Polyneurium* characterized by its more or less intact cataphylls which are often spreading and enclosing the spreading roots, subterete sulcate petioles, sometimes ribbed marginally, brownish drying acuminate blades which are mostly weakly cordate to broadly rounded at base with a usually parallel to arcuate sinus, 3–5 pairs of basal veins with 1 or sometimes 2 pairs free to the base, 10–13 pairs of primary lateral veins, collective veins arising from the 1st or 2nd pair of basal veins and with both surfaces lacking short pale lineations and dark punctations as well as by the long-pedunculate inflorescence with a green lanceolate spathe, long-tapered dark violet-purple spadix, early emergent berries which are red at maturity.

Epiphytic or sometimes terrestrial; **internodes** 1.5(2–3) cm diam.; **cataphylls** 16–19 cm long, persisting intact soon spreading and remaining intact, often enshrouding, spreading, sometimes persisting as short red-brown fibers, deciduous lower down; **petioles** (26.8)35–70(83.6) cm long, subterete, obtusely sulcate, geniculum conspicuous; **blades** 28–65 cm long, (8)12–26(31) cm wide, 1.8–3.8 times longer than broad, 0.5–1.4 times longer than petioles broadest between the middle and the petiolar plexus, ovate to narrowly ovate or lanceolate-ovate, abruptly

short-acuminate to long-acuminate at apex, rounded to cordate, subcordate to sagittate at base, sometimes broadly subcordate and somewhat attenuate at base, subcoriaceous, weakly bicolorous, weakly glossy on both surfaces, usually drying dark brown to dark greenish brown and semiglossy above, yellowish brown and semiglossy below, rarely drying greenish; **anterior lobe** broadly rounded on margins; **posterior lobes** when present, 1–12 cm long, about as long as broad; **basal veins** 3–5 pairs, 1st pair sometimes free to the base; 1st pair & 2nd pairs fused 0.5–1.5 cm; 3rd & 4th pair of basal veins fused 0.5–2 cm; **sinus** (when present) 1–7.8 cm deep, parabolic to arcuate or arcuate with petiole decurrent, rarely weakly spathulate; **midrib** narrowly rounded and concolorous or paler above, round-raised and paler below, tinged with purple below, drying darker or lighter than surface; **primary lateral veins** 10–13 pairs, weakly raised in valleys above, concolorous, narrowly raised and paler below, usually drying darker, sometimes paler than surface beneath; **minor veins** dark green, in part raised below; **collective veins** arising from the 1st or 2nd pair of basal veins. INFLORESCENCE semi-erect; **peduncle** 25–77.5 cm long, 3–5(8) mm diam., terete; **spathe** green, linear-lanceolate, 8–12(14.5), sometimes tinged purplish along margins or with purplish veins, erect-spreading to reflexed; **spadix** stipitate (1)3–4(10) mm long, 4–8 mm diam., long-tapered, (5)8–17(25) cm, dark maroon to dark violet-purple; **flowers** 2.7 mm long, 2.4 mm wide; tepals purple-violet becoming grayish in fruit, drying smooth, lateral tepals 1.6–1.8

mm wide; pistils green, stigmas violet-purple. INFRUCTESCENCE semi-erect, 17 cm long; **berries** early-emergent, green, oblong turning, purple-violet, red at maturity; seeds yellowish or white.

Of the seven species treated in this paper, *Anthurium talamancae* is the most variable in terms of blade shape including the shape of the sinus. Nevertheless all of the species share most of the characteristics mentioned above.

The specimens from Colombia (*Forero & Gentry 790*, *Betancur et al. 6087*, *Jácome 427*, *Mora & Croat 297* [= *Croat 83679*], *Suárez 936*, *Suárez 934*, *Juncosa 1936*) differ from those from Costa Rica and Panama by having leaves that are more broadly ovate (vs. narrowly ovate) which are only 1.4–1.9 times longer than broad (vs. usually more than twice longer than broad). Another difference is that the leaves from the aforementioned specimens dry greyish green while most of the Central American specimens dry dark brown to dark greenish brown. Additionally, these specimens have a rather short peduncle compared with most of the specimens from Central America.

Anthurium talamancae ranges from Costa Rica to Colombia in 20–900(1200) m elevation in *Tropical wet forest*, *Premontane wet* and *Premontane rain forest* life zones.

Additional specimens seen: COLOMBIA. **Chocó:** Alto del Buey, Río Mutatá, 06°06'00"N, 077°13'00"W, 300–1000 m, 9

Jan 1973, *E. Forero & A. Gentry 790* (MO); Nuquí, Corregimiento Coquí, sitio Boca Vieja, Cabo Corrientes, 05°38'15"N, 77°19'38"W, 2 Feb 1995, 5–100 m, *Betancur et al. 6087* (COL); Estación biológica El Amargal, Jan 1999, *Jácome 427* (COL); Corregimiento Arusí, Estación Biológica El Amargal, along trail to Arusí, 05°34'15"N, 77°30'00"W, 20–50 m, 19 June 2000, *Croat & M. Mora 83679* (= *Mora 297*) (COL, MO); Bajo Baudo, Parmisilio, Oct 17 1995, *Suárez 936* (COL); *Suárez 934* (COL); Bahía Solano, Quebrada across from the airport, 10 m, 06°13'23"N, 77°24'05"W, 17 Jan 1936, *Juncosa 1936* (MO) COSTA RICA. *L. Gómez P. 23425* (CR, MO); Camino entre la finca de don Calixto Kiamble y el antiguo camino a Katsi, subiendo hasta el Cerro Kikirchabata, 23 Oct 1985, *L. Gómez P., G. Herrera Ch. & D. Masterson 23791* (MO); **Alajuela:** Reserva Forestal de San Ramón, en filas al noroeste de la estación, 10°12'53"N, 84°36'28"W, 3 May 1987, *G. Herrera Ch. 613* (MO); Reserva Forestal de San Ramón, alrededores de la Estación Cuenca del Río San Lorenzito, 10°12'53"N, 84°36'28"W, 800–1000 m, 1 Nov 1986, *G. Herrera Ch. 136* (MO); P. N. Rincón de la Vieja, Sector de Río Aguas Verdes, 2 Km aguas arriba del puente, 10°49'52"N, 85°15'48"W, 600 m, 12 Feb 1991, *G. Rivera & C. Dennis 1053* (MO); Forest remnants along stream beside road from Cariblanco to Laguna Hule about 2 km W of Costa Rica Hwy. 9, 7 Dec 1975, *R. A. Baker, J. F. Utley & K. Burt-Utley 224* (F, MO); Finca Los Ensayos, ca. 11 mi NW of Zarcero, 10°15'36"N 084°27'00"W, 850 m, 15 Aug 1977, *Croat 43590* (MO); Along Hwy. 15

between Naranjo and Aguas Zarcas, 8.5 km NE of Villa Quesada, 10°14'24"N, 84°22'12"W, 600 m, 3 Feb 1979, *Croat 46958* (MO); Cordillera de Tilarán, along road from San Ramón to Bajo Rodríguez, 17 km NW of San Ramón, 10°14'15"N, 84°33'00"W, 785 m, 27 Sep 1987, *Croat 68137* (MO); Along road between Cañas and Upala, 4 km NNE of Bijagua on slopes leading into Río Zapote, 10°44'24"N 085°04'12"W, 400 m, 24 June 1976, *Croat 36258* (MO); Along road between San Ramón and Bajo Rodríguez, vicinity of Km markers 11–12, ca. 7 km NW of Los Angeles, 11–12 km NW of San Ramón, 10°10'40"N, 84°34'10"W, 1025–1100 m, 3 Sep 1996, *Croat 78877* (INB, MO); Along road between Cañas and Upala, 4 km NNE of Bijagua on slopes leading into Río Zapote, 10°44'24"N, 85°04'12"W, 400 m, 24 June 1976, *Croat 36312* (MO); Reserva Biológica Monteverde Valle del Río Peñas Blancas, 10°18'N, 84°46'W, 900 m, 19 Mar 1989, *W. A. Haber 9154* (MO); Monteverde Reserve, Atlantic slope, Río Peñas Blancas valley, 10°17'59"N, 84°45'03"W, 960 m, 27 Oct 1984, *W. A. Haber 830* (MO); Reserva Biológica Monteverde Río Peñas Blancas, 10°18'36"N, 84°43'48"W, 900 m, 9 Mar 1987, *W. A. Haber & E. Bello C. 6934* (MO); Grecia, eastern rim of Laguna Hule along road through pasturelands, about 1.5 km N of Angeles, 10°17'24"N, 84°12'00"W, 840–860 m, 8 July 1972, *J. L. Luteyn 3353* (DUKE); Guatuso, 15 km NW of Arenal by air, 2 km NW of Nuevo Arenal on road to Tilarán, then 3 km NE on road to San Rafael de Guatuso, then 2 km W on road to Finca Cote, on N side of road, 10°33'36"N, 84°54'00"W, 700 m, 30 Apr 1983, *R. Liesner, E. J. Judziowiec & B. Pérez G. 15080* (MO); San Carlos, 13 km W of Fortuna on road to the Arenal Dam, near crossing of Río Tabacón, 10°28'48"N, 84°42'36"W, 500–550 m, 29 Apr 1983, *R. Liesner, E. J. Judziowiec & B. Pérez G. 15234* (MO); *R. Liesner et al. 15249* (MO); Margen del Río Peñas Blancas, a la altura de San Pedro, a orilla de camino, 10°23'03"N, 84°36'13"W, 29 June 1985, *W. A. Haber & E. Bello C. 1752* (MO); San Ramon, Cordillera de Tilarán, Monteverde, San Gerardo Biological Station, Sendero Viejo, 800 m S of Station, 10°21'36"N, 84°46'48"W, 1250 m, 16 Feb 1995, *D. S. Penneys 155* (INB, MO); Laguna Poco Sol, 9 km W of La Tigra, 10°21'00"N, 84°40'00"W, 700 m, 1 May 1997, *W. A. Haber 12195* (INB, MO); Upala, Bijagua El Pilon, Cerro La Carmela, entre Río Celeste y cabeceras del Río Chimurria, 10°43'12"N, 85°00'20"W, 700–800 m, 7 July 1988, *G. Herrera Ch. 2009* (MO); Arenal Volcano, 22 Apr 1990, *V. Funk et al. 10811* (US).

Cartago: Alvarado, on Costa Rica Hwy. 230 between Trinidad and Coliblanco, 09°56'24"N, 83°48'36"W, 1600–1700 m, 25 July 1975, *J. F. Utley & K. Burt-Utley 2724* (MO); Jiménez, 12 km S of Turrialba by air, 4 km SE of Pejibaye along Río Gato, 09°48'00"N, 83°42'00"W, 700 m, 16–17 Apr 1983, *R. Liesner 14341* (CR, MO); Paraiso, mountains along Río Grande de Orosí between bridge over river and Tapantí, 09°46'01"N, 83°47'54"W, 21 June 1971, *A. Gentry 976* (MO); Parque Nacional Tapantí, Valle del Reventazón, Sector Quebrada Segunda, 09°45'36"N, 83°46'12"W, 1300 m, 1 Feb 1995, *G. Mora V. 474* (INB, MO);

Pasture and forested slope N of Quebrada Casa Blanca, Tapantí, 09°46'48"N, 83°48'00"W, 1350 m, 25 Nov 1984, *M. Grayum* 4589 (MO); Turrialba, Parque Nacional Barbilla, Cuenca del Matina, Sendero Científico Barthón, Sección Cerro Tigre, Río Barbilla, 09°55'15"N, 83°23'55"W, 12 Mar 2001, *E. Castro* 1966 (MO); Catie, 3 km east of Turrialba "Los Espaveles" nature trail, in canyon of Río Reventazón, 09°54'00"N, 83°39'00"W, 525–600 m, 9 May 1983, *R. Liesner, E. J. Judziewicz & B. Pérez* G. 15275 (MO); Along road between Juan Viñas and Turrialba, 7 km W of Turrialba, along ditch, 09°54'00"N, 83°37'12"W, 1 July 1976, *Croat* 36830 (MO); Along road from Moravia to Quebrada Platanillo (Tsipirí), 09°49'12"N, 83°26'24"W, 1250 m, 1 July 1976, *Croat* 36673 (MO); Along camino Raíz de Hule, SE of Platanillo (Tsipirí), 09°49'12"N, 83°24'00"W, 1200–1400 m, 1 July 1976, *Croat* 36721 (MO). **Guanacaste:** Parque Nacional Guanacaste, Estación Pitilla, sendero con dirección Noroeste, 11°02'N, 85°24'W, 550 m, 16 June 1989, *INBio Estudiantes de Biodiversidad I, M. M. Chavarría, B. E. Hammel & Q. Jiménez* M. 38 (CR, MO); Río Negro ford on S side of Lake Arenal, slope and ridges, 10 km NNE of Santa Elena, 10°25'N, 84°46'W, 600–800 m, 9 May 1986, *W. A. Haber, E. Bello C., L. Lierheimer & B. Hammel* 4801 (MO); *W. A. Haber et al.* 4815 (MO). **Heredia:** 8 km east of San Ramon, 10°20'N, 84°04'W, 500 m, Mar 1986, *B. A. Loiselle* 184 (MO); 11 km E of Cariblanco, 10°15'36"N, 84°04'48"W, 1060 m, Apr 1987, *B. A. Loiselle* 315 (MO); La Selva Biological Station, 10°25'53"N, 84°00'13"W, 100 m, 22 June 1984, *B. Jacobs, D. A. Smith & R. Stomberg* 2513 (DUKE, MO); Area between Río Peje and Río Sardinalito, Atlantic slope of Volcán Barva, 10°18'30"N, 84°04'00"W, 480–520 m, 8 Apr 1986, *M. H. Grayum* 6909 (MO); Remnant woods & trees along streams near Río Para Blanco, 10°01'48"N, 84°00'36"W, 1600 m, 10 Sep 1972, *R. W. Lent* 2856 (MO); 4 miles N of Vara Blanca, 10°12'36"N, 84°09'36"W, 1350 m, 26 May 1976, *Croat* 35607 (MO); 3 miles S of Cariblanco, 10°13'48"N, 84°09'36"W, 760 m, 28 May 1976, *Croat* 35776 (MO); Sarapiquí, N of Puerto Viejo, 12 km to ferry, over ferry, 6 km along road, 10°31'12"N, 84°00'36"W, 100 m, 3 Feb 1983, *N. C. Garwood, M. Gibby, R. J. Hampshire & C. J. Humphries* 952 (BM, MO); La Selva Field Station, Puerte Viejo de Sarapiquí, 10°25'12"N, 84°00'36"W, 100 m, 3 Jan 1978, *Croat* 44245 (MO); Near Puerto Viejo along road near the Río Sucio, 10°27'36"N, 83°59'24"W, 20 m, 27 May 1976, *Croat* 35694 (MO); Near Puerto Viejo along road near the Río Sucio, 10°27'36"N, 83°59'24"W, 20 m, 27 May 1976, *Croat* 35763 (MO). **Limón:** Hacienda Tapezco-Hacienda La Suerte, 29 air km W of Tortuguero, S border of Hda. La Suerte E of sentry gate, 10°30'N, 83°47'W, 40 m, 15 Mar 1978, *C. Davidson, A. Kaminer, L. Middleton & B. Rasnow* 6991 (MO); 7 Mar 1978, *C. Davidson et al* 6746 (MO); Hills to airline km SSE of Islas Buena Vista in the Río Colorado, 14 airline km SW of Barro del Colorado, 10°40'N, 83°40'W, 10–120 m, 13–14 Sep 1986, *G. Davidse & G. Herrera Ch.* 31118 (MO); SW ridge of Cerro Coronel, NW-facing slope, just S of the Río

Colorado, 10°40'30"N, 83°39'30"W, 10–80 m, 17–18 Sep 1986, *G. Davidse & G. Herrera Ch. 31349* (MO); Parque Tortuguero Estación Agua Fría, 700 m al Este de la casa-estación, junto al río Agua Fría, 10°24'36"N, 83°33'36"W, 40 m, 25 Oct 1987, *R. Robles 1130* (MO); 5–15 km from Siquierres on the road to Limon, 10°07'48"N, 83°12'36"W, 1 Dec 1975, *R. A. Baker 185* (F, MO); Along Hwy. 32 between Turrialba and Limón, ca. 9 miles S of Siquierres, steep cliff along road, 10°07'48"N, 83°12'36"W, 650 m, 13 Aug 1977, *Croat 43307* (MO); Cerro Coronel, E of Río Zapote, along and above new road within 1 km of Río Colorado, collected with O. M. Montiel, 10°40'N, 83°40'W, 10–40 m, 13–14 Sep 1986, *W. D. Stevens 24357* (MO); W side of Río Colorado about 2 km upstream from downstream branch of Caño Bravo, 10°43'N, 83°40'W, 5 m, 25 Jan 1986, *W. D. Stevens 24019* (MO); Cerro Coronel, E of Laguna Danto, 10°41'N, 83°38'W, 20–170 m, 15–20 Sep 1986, *W. D. Stevens & O. M. Montiel 24470* (MO); Shores of S half of Laguna Pereira, 10°47'N, 83°37'W–10°49'N, 83°37'W, 1–4 m, 20 Mar 1987, *W. D. Stevens, G. Herrera Ch. & O. M. Montiel 25181* (MO); Cerro Coronel, E of Río Zapote, from E of new road to *Raphia* swamp, within 1 km of Río Colorado, 10°40'N, 83°40'W, 10–40 m, 12 Mar 1987, *W. D. Stevens et al. 24712* (MO); Between Limón & Siquierres, nearer to Siquierres along new road & concrete bridge, Río Madre de Dios, 10°07'48"N, 83°12'36"W, 14 Feb 1977, *W. C. Burger, G. Visconti & J. L. Gentry 10522* (F, MO); Limón, Valle de la Estrella, Fila Matama, Cerca de 11 km SW del pueblo de Aguas

Zarcas, camino que lleva al rancho El Hotel, 09°49'27"N, 83°09'42"W, 700–800 m, 19 Oct 2007, *D. Santamaría Aguilar 6496* (MO); 09°49'04"N, 83°09'31"W, 800–900 m, 1 Nov 2007, *D. Santamaría Aguilar 6772* (MO); Z. P. Río Banano, Cuenca del Banano; Limon, Valle de la Estrella, Fila Matama. Cerca de 11 km SW del pueblo de Aguas Zarcas,, 09°49'27"N, 83°09'42"W, 700–800 m, 19 Oct 2007, *D. Santamaría A. 6496* (INB, MO, PMA); Río Segundo, Asunción, Limón, 09°52'48"N, 83°11'24"W, 300–400 m, 26 Apr 1985, *L. D. Gómez P. & G. Herrera Ch. 23447* (MO); Estribaciones Fila Matama, Cerro Matama, 09°52'48"N, 83°11'24"W, 300 m, 25 Apr 1985, *L. D. Gómez P., G. Herrera Ch., J. Berrocal & A. Solís B. 23425* (MO); Matina, P.N. Barbilla, Cuenca del Matina, Colonia Puriscaleña, Sendero Cerro Azul, 09°59'30"N, 83°22'40"W, 300–400 m, 4 Mar 2000, *E. M. Castro 862* (MO); Pococí, R.N.F.S. Barra del Colorado, Llanura de Tortuguero, Sardinas, 10°38'24"N, 83°43'48"W, 15–20 m, 3 Oct 1994, *F. Araya 609* (MO); *F. Araya 741* (INB, MO); Talamanca, Amubri, Siguiendo el camino entre Amubri y Soki, margen izquierda del Río Urén, 09°30'00"N, 82°57'36"W, 150 m, 24 June 1989, *G. Herrera Ch. 2949* (MO); Vicinity of Guápiles, 300–500 m, 12–13 Mar 1924, *P. Standley 37416* (US); *P. Standley 37428* (US); *P. Standley 37498* (US). **Puntarenas:** Canton of Coto Brus, Las Cruces Tropical Botanical Garden, 6 km SW of San Vito de Java, 08°49'N, 82°58'W, 1200 m, 6–7 March 1984, *Croat 57232* (MO); *Croat 57274* (MO); Near Londres and Villa Nueva, 09°28'N, 84°28'W, 300 m, 10–12 Feb 1988, *W. C.*

Burger 12219 (F, MO); Osa, Fila Costeña, Fila Cruces; cabeceras del Río Piedras Blancas, Cerro Anguciana, 08°49'12"N, 83°10'48"W, 950–1150 m, 10 Dec 1993, *M. H. Grayum 10653* (CR, MO); Parrita, La Virgen, sector SE, Fila entre la vuelta del Pallo, cabeceras Río Palo Seco y Fila Chonta, 09°34'48"N, 84°08'24"W, 1100–1400 m, 27 Dec 1997, *J. F. Morales & R. J. Abarca 6288* (INB, MO). **San José:** Pasture on ridge between Río Cascajal and Río Hondura, 10°03'36"N, 83°58'48"W, 1100 m, 10 Feb 1974, *R. W. Lent 3785* (MO); Vicinity of Bajo La Hondura, along road between Paracito and the Río Claro, 10°03'36"N, 83°58'48"W, 1100–1400 m, 14 Jan 1978, *Croat 44511* (MO); Acosta, Fila Zoncuaco, falda SE, entre los dos cruces de Quebrada Zoncuaco, 09°42'00"N, 84°13'40"W, 700–900 m, 7 Apr 2005, *J. F. Morales & D. Santamaría Aguilar 12655* (INB, MO); Along Río Parritilla, ca. 1 km east of Zoncuano, 09°41'24"N, 84°13'48"W, 580 m, 28 Jan 1997, *M. H. Grayum, B. Hammel & J. F. Morales 11180* (INB, MO); Dota, R. F. Los Santos, sendero a Quebrada La Bomba, entre cruce a Cerro Flecha y la quebrada, 09°30'00"N, 83°57'20"W, 600–800 m, 28 Feb 2005, *J. F. Morales 12087* (INB, MO); Dota, Albergue Tinamu, falda NE de Cerro Plano, 09°29'20"N, 83°57'30"W, 900 m, 28 Feb 2005, *J. F. Morales 12052* (MO); 800–900 m, 3 Mar 2005, *J. F. Morales 12237* (MO); Moravia, Bajo La Honduras, about 11 km N of San Jerónimo de Moravia, 10°03'36"N, 83°58'48"W, 1100–1300 m, 24 May 1976, *J. F. Utley & K. Burt-Utley 4997* (DUKE, MO); Perez Zeledon, Cuenca Térraba-Sierpe, 4 km SE de Savegre Abajo,

09°24'48"N, 83°48'56"W, 1300 m, 9 Feb 2001, *A. Rodríguez G. 7047* (MO); Cordillera de Talamanc, General Viejo, Santa Elena, Las Nubes, 09°23'24"N, 83°35'24"W, 1300 m, 4 Aug 1995, *A. Mora 232* (MO); Ca. 1 mi beyond divide between San Isidro del General and coastal town of Dominical, 09°16'12"N, 83°51'36"W, 900 m, 22 May 1976, *Croat 35321* (MO); Above Alfombra along the road from San Isidro del General to Dominical, 09°18'00"N, 83°45'36"W, 1000 m, 21 Feb 1977, *W. C. Burger & G. Visconti 10677* (F, MO); 09°18'00"N 83°45'36"W, 1000 m, 19 Nov 1975, *W. C. Burger & R. A. Baker 10094* (F, MO); Tarrazu, San Marcos de Tarrazu between Cerro Toro and Cerro Hormiguero along the road between Basuero de Tarrazu and Esquipulas, vicinity of Cerro Hormiguero, 09°33'30"N, 84°03'15"W, 1100–1200 m, 5 Sep 1996, *Croat 78900* (MO); Vazquez de Coronado, Paredones del Río Sucio, Parque Nacional Braulio Carrillo, Estación Carrillo, 10°08'24"N, 83°57'00"W, 400 m, 18 Feb 1983, *I. A. Chacón G. 303* (MO); Quebrada Molinete, 10°09'00"N, 83°55'12"W, 600 m, 13 Feb 1984, *L. D. Gómez P., G. Herrera Ch. & I. A. Chacón G. 21090* (MO); Braulio Carrillo National Park, along Highway San José to Siquerres Highway, along trail to Río Sucio, site of the Old Carillo Station, 10°09'50"N, 83°57'10"W, 600–700 m, 30 Aug 1996, *Croat 78759* (MO, SEL, US); La Hondura, 1200–1500 m, 9 Mar 1926, *P. Standley 51880* (US). **NICARAGUA.** **Atlántico Norte:** Cerro El Naranjo, ca. 50 km al SO de Wany, 13°34'N 85°10'W, 300 m, 14 Sep 1982, *A. Grijalva P. & P. P. Moreno 1114* (MO). **Atlántico Sur:**

Municipio de Nueva Guinea Reserva Indio-Maiz, colinas de piedra fina, 11°25'N, 84°13'W, 200–300 m, 5 Jan 1999, R. M. Rueda, I. Coronado G., O. Caballero & L. Ruíz 9843 (MO); R. M. Rueda et al. 9856 (MO); R. M. Rueda et al. 10001 (MO); 11°22'N, 84°01'W, 50–200 m, 14 an 1999, R. M. Rueda et al. 10087 (MO). **Estelí:** Cerro Quiabú, 13°06'N, 86°25'W, 1600 m, 25 Dec 1982, P. P. Moreno 19252 (MO). **Jinotega:** Cordillera Isabelia, near Río Bote, Comarca de Bocaycito, 117 km from Matagalpa, 13°17'N, 85°36'W, 1200 m, 6 May 1976, D. Neill 263 (7148) (MO). **Matagalpa:** Cerro Musún, W and NW side above the Salto Grande of Quebrada Negra, 800 m, and in valley of Río Bilampí, 12°59'N, 85°14'W–13°01'N, 85°15'W, 500–800 m, 20–21 Apr 1977, D. Neill 1815 (MO); Faldas del Cerro Musún, 8 km de la Población Wanawás, área conocida como La Hacienda, Río Bilampí, en Palán Grande, 12°59'N 085°14'W–13°00'N, 85°14'W, 500–800 m, 13 May 1980, M. Araquistain & P. P. Moreno 2352 (MO); Comarca Wanawás, en el litoral del Río Bilampí, 13°02'N, 85°13'W, 180–200 m, 14 May 1980, M. Araquistain et al. 2399 (MO); 78 km de Matagalpa, sobre la carretera Matagalpa-Siuna, La Gloria, 13°15'N, 85°35'W, 600 m, 13 Sep 1982, P. P. Moreno 17230 (MO); Río San Juan, near Caño Chontaleño, 20 km NE of El Castillo (Río Indio watershed), 11°08'N, 84°12'W, 200 m, 7–9 March 1978, D. Neill 3426 (MO); Río Indio, Caño Negro, 11°02'N, 83°54'W, 0–5 m, 4 Dec 1982, M. Araquistain 3422 (MO); Municipio el Castillo, Reserva Indio-Maiz, Cerro Bolívar, 10°51'N, 84°10'W, 150–280 m, 28 Nov 1998, R. M. Rueda, F. Flores, W. Velásquez & O. Caballero 9167 (MO); R. M. Rueda 9338 (MO); Municipio de San Juan del Norte, caño San Juanillo, ramal del río San Juan, 10°54'N, 83°40'W, 31 July 1996, R. M. Rueda, I. Coronado G. & N. Tercero 4751 (MO); Reserva Indio-Maiz, Municipio de San Juan del Norte, Cerro el Gigante, 8 km del Río San Juan, 10°45'N, 83°53'W, 150–250 m, 22 Sep 1998, R. M. Rueda, I. Coronado G. & Y. Rubi 8938 (MO); Municipio de el Castillo, a lo largo del Caño Chontaleño, 11°09'N, 84°11'W, 19 Feb 1997, R. M. Rueda, I. Coronado G., O. Aráuz & F. Flores 6076 (MO); Cerro el Diablo, 11°01'N, 84°12'W, 250 m, 9 Jan 1997, R. M. Rueda, et al. 5619 (MO); Río Indio, 5.5 hours upriver from San Juan del Norte, Finca Las Delicias, Alfonso Crespo Aragón, 11°07'N, 83°52'W, 10–20 m, 8 Sep 1982, R. Riviere 286 (MO). PANAMA. Ul Makai at base of Ewa border, ex cult., UH Dept. of Hort. 299, originally probably wild collected, perhaps in Panama, 3 Jan 1985, K. M. Nagata 3145 (MO); La Palma, A. Tonduz 12602 (US). **Bocas del Toro:** Along oleoducto road between Continental Divide at first crossing N from divide, 08°53'N, 82°10'W, 120 m, 1–2 May 1985, B. Hammel 13728 (MO); Along road from Fortuna Dam towards Chiriquí Grande, 10 mi from Continental Divide, 1 mi alongside road, 08°55'25"N, 82°09'41"W, 120 m, 5 Mar 1986, G. McPherson 8551 (MO); Road from Fortuna Dam to Chiriquí Grande, 3 mi from Continental Divide, 08°47'N, 82°11'W, 650 m, 22 Sep 1984, H. W. Churchill & A. Churchill 6211 (MO); H.W. Churchill & A. Churchill 6219 (MO); Oleoducto Road, near Continental Divide,

Fortuna Dam area, 08°46'59"N, 82°12'22"W, 1000 m, 5 Feb 1984, *H. W. Churchill, G. C. de Nevers & H. Stockwell 4632* (MO); Quebrada Huron, rapid streams through evergreen seasonal forest, 09°22'N, 82°40'W, 300–400 ft, 11 Apr 1968, *J. H. Kirkbride, Jr. & J. A. Duke 439* (MO); A orillas del río Changuinola y bosque alrededor de la escuela de Corriente Grande, 09°18'10"N, 82°32'20"W, 25 Feb 1980, *M. D. Correa A., A. S. Taylor B., N. Salazar A., L. G. Carrasquilla, T. Béliç & C. G. Vergara 3925* (MO); Del campamento Changuinola 1 de Corriente Grande, Cerro Bracha, 09°20'42"N, 82°34'24"W, 280 m, 18 Jan 1980, *M. D. Correa A., A. S. Taylor B., N. Salazar A., R. Mendoza, T. Béliç & C. G. Vergara 3128* (MO); Gualaca-Chiriquí Grande, 13.6 mi N of Continental Divide, 0.4 mi SL of Punta Peña, 08°54'24"N, 82°11'06"W, 120 m, 29 Mar 1993, *Croat 74937* (MO); Along road between Gualaca and Chiriquí Grande; 5.8 mi N of middle of bridge over Fortuna Lake, along steep bank above road, 08°48'36"N, 82°11'36"W, 600 m, 25 June 1987, *Croat 66792* (MO); Cerro Colorado, along road between Río San Felix and mining exploration camp, 7 mi W of Chamé, along trail through Guaymí village, 08°35'N 081°50'W, 1500 m, 8 July 1988, *Croat 69208* (MO); Along road between Fortuna Dam and Chiriquí Grande, 7.3 mi N of bridge over Fortuna Dam, 3.2 mi N of Continental Divide, 08°49'00"N, 82°12'36"W, 700 m, 10 Mar 1985, *Croat & M. H. Grayum 60248* (MO); Along Continental Divide from road branching N off main Fortuna-Chiriquí Grande Hwy. near Continental Divide, 1.1 mi from main hwy., 08°44'N, 82°17'W, 1200 m, 11 Mar 1985, *Croat & M. H. Grayum 60322* (MO); 1.2 mi N of Continental Divide, 5.3 mi N of bridge over Fortuna Dam 4, 08°46'06"N, 82°12'30"W, 910 m, 12 Mar 1985, *Croat & M. H. Grayum 60470* (MO); Ca. 15 km S of the town of Changuinola, Vicinity of Changuinola 1 dam site, along the ridge NE of the campsite, 09°18'30"N, 82°32'30"W, 900–1500 ft, 13 Dec 1979, *T. M. Antonio 3149* (MO); 10–15 miles inland (S) from mouth of Changuinola River, banks of river and adjacent rain forest, 09°22'10"N, 82°31'50"W, 18 Dec 1966, *W. H. Lewis, J. D. Dwyer, T. S. Elias & K. R. Robertson 987* (GH, MO); Chiriquicito to 5 miles S along Río Guarumo, 08°55'N, 82°10'W–09°00'N, 82°11'W, 5–7 June 1967, *W. H. Lewis, N. Escobar A., B. MacBryde, R. L. Oliver & J. E. Ridgway 2023* (GH, MO, UC, US); Chiriqui-Bocas del Toro, ca. 5 km N of Fortuna Dam, trail along Continental Divide, 08°45'N, 82°15'W, 1200–1300 m, 25 Apr 1988, *S. A. Thompson 4957* (MO); 4 km W of Cayo Roldan, 5–80 m, 26 Feb 1989, *P. M. Peterson 7174A* (US).

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