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New species of *Anthurium* (Araceae) from Chucantí Nature Reserve, eastern Panama

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Abstract

In the present paper we describe two new endemic species of *Anthurium*, discovered during field trips to study the Araceae flora of the Chucantí Nature Reserve (Reserva Natural Chucantí) located in the province of Darién, Panama. *Anthurium annularum* sp. nov., a member of section *Xialophyllum*, is principally characterized by its hemiepiphytic climbing habit, stems with ring-shaped nodes with short internodes alternating with much longer internodes, a yellow-green spadix and pale green globose berries which are nearly translucent toward the base. *A. chucantiense* sp. nov., a member of section *Polyneurium*, is characterized by its epiphytic habit, short internodes at stem apex, terete petioles, blades with obscure primary lateral veins, greenish to pale orange spadix and narrowly ovoid, and bluntly pointed red-orange berries.

Key words: Taxonomy, Flora of Panama, Darién, *Xialophyllum*, *Polyneurium*.

Introduction

Anthurium Schott (1829: 828) is a Neotropical genus characterized principally by having leaf blades with reticulated venation, dimerous perigyniate bisexual flowers, a usually persistent spathe, seeds with endosperm, and pollen usually forate (Mayo *et al.* 1997). This genus is represented by 905 described species, but it is estimated that there are about 1500 species (Boyce & Croat 2012). In Panama, there are about 182 species described (Croat & Ortiz unpubl. data). According to Correa *et al.* (2004), in Darién Province there are about 2638 species of vascular plants, including 121 species of Araceae with 28 endemic species, representing one of the groups of vascular plants with the highest endemism (ANCON 2010).

Darién Province, which is located in eastern Panama, has a rich biodiversity and a high level of endemism (Dinerstein *et al.* 1995). Chucantí (Fig. 1) is located on the border of eastern Panama Province and Darién Province on the eastern edge of Serranía de Majé (Majé Mountain Range), a nature reserve of 404 ha. Aizprúa (unpubl. data) states that the elevation of the area ranges from 600 to 1480 m with the most of the vegetation characteristic of a premontane cloud forest. According to classification of Holdridge *et al.* (1971) Chucantí Nature Reserve has Tropical wet forests and Premontane rain forests. On the other hand, according to the ecoregion classification system (Fund 2014), Chucantí is a part of the Eastern Panamanian montane forests ecoregion, characterized by precipitation that ranges between 3000–4000 mm annually and elevations between 500–1800 m. According to Croat (1986), the mountains near Tortí Arriba (eastern Panamá Province), including the Serranía de Majé and the Serranía de Cañazas are centers of endemism of *Anthurium* and remain a underexplored area.

Recent exploration of the forests of the Serranía de Majé, specifically in the area of Chucantí, have revealed the presence of new species of plants and animals (Dressler 2003, Miranda & Bermúdez 2010, Bezark *et al.* 2013, Batista *et al.* 2014). An unpublished preliminary study on the flora of Chucantí mentions that the Reserve includes more than 500 species of vascular plants (Ibáñez & Flores unpubl. data). Fieldwork in Chucantí by the first and third

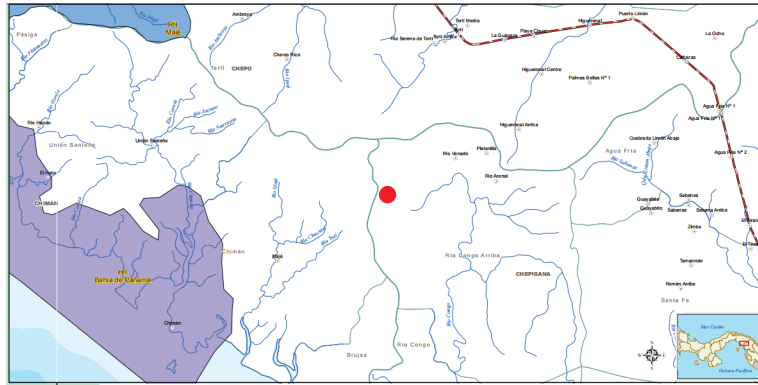


FIGURE 1. Location of the Chucantí Nature Reserve within Serranía de Majé, between Panama and Darien Province.

authors revealed the presence of poorly known and sparsely collected aroid species with restricted distribution such as: *Anthurium collinsii* Croat (1986: 59), *A. tacarcunense* Croat (1986: 186), *Philodendron lazorii* Croat (1997: 476), *P. annulatum* Croat (1997: 400) and *Xanthosoma caladioides* Grayum (1986: 471). At present, the areas near the Chucantí Nature Reserve are severely under threat by agricultural and livestock activities (Dinerstein *et al.* 1995, Laurance 2008, Fund 2014). It is essential to continue protecting the forests of Chucantí owing to their high species diversity, rates of endemism and, although some new plant and animal species have been described from this site, as noted the area is still poorly understood.

Here we describe two new species of *Anthurium* endemic to the Chucantí Nature Reserve (Reserva Natural Chucantí).

Materials and methods

The descriptions are of fertile material and all new species were keyed out with the Lucid *Anthurium* Key (Haigh *et al.* 2009). The descriptive terminology is according to Croat & Bunting (1979).

Taxonomy

Anthurium annularum O.Ortiz, Croat & Baldini, *sp. nov.* (Figs. 2, 3)

Anthurium annularum is characterized by its hemiepiphytic climbing habit, swollen ring-shaped nodes separated internodes of alternating lengths, long and short, cataphylls persisting intact at apex, later deciduous with a few fibrous remnants at the nodes, short (0.9–2.0 cm long) terete petioles, lanceolate-elliptic or narrowly elliptic yellow-brown drying leaf blades, a cylindrical yellow-green spadix, pendent inflorescence and pale green globose berries.

Type:—PANAMÁ. Darién: Serranía de Majé, Reserva Privada Chucantí, cima del Cerro Chucantí, 1325 m, 8°47'45" N, 78°27'47" W, 30 Aug 2014, Orlando O. Ortiz, Rodolfo Flores, Adriel Sierra, Juvenal Batista, Yessenia Guadalupe, Calixto Rodríguez, Zabdý Samudio & Zuleika Serracín 2450 (holotype, PMA!; isotypes, FT!, MO!, SCZ!, UCH!, US!).

Hemiepiphytic climbing herb; stems to 1 m long, drying yellow-brown, longitudinally ribbed, matte; **internodes** alternating between short internodes and much longer internodes, 0.3–7 cm long, 2–4 mm diam., with ring-shaped



FIGURE 2. *Anthurium annularum*. Holotype specimen: Panamá. Darién: Serranía de Majé, Reserva Privada Chucantí, cima del Cerro Chucantí, 1325 m, 8°47'45" N, 78°27'47" W, 30 Aug 2014, Orlando O. Ortiz, Rodolfo Flores, Adriel Sierra, Juvenal Batista, Yessenia Guadalupe, Calixto Rodríguez, Zabdy Samudio & Zuleika Serracín 2450 (Photo PMA Herbarium).



FIGURE 3. *Anthurium annularum* at the type locality. A. In its habitat. B. Flowering spadix. C. Infructescence spadix (Photo Orlando O. Ortiz).

swellings at the apex of each internode; **cataphylls** persisting intact at apex, later deciduous with a few fibrous remnants at node, drying yellow-brown, 0.5–5 cm long; **petioles** terete, 0.9–2.0 cm long, 1.0 mm in diam., drying matte, dark brown on geniculum and at base; **blades** lanceolate-elliptic or narrowly elliptic, gradually acuminate at apex, acute at base, 5–10 × 1.4–3.3 cm, 2.4–3 times longer than broad, ca. 5 times longer than petioles, broadest slightly below the middle, subcoriaceous to moderately thin, medium green and semi-glossy above, slightly paler and semi-glossy below, drying yellow-brown; **midrib** narrowly rounded and slightly paler above, narrowly rounded below; **primary lateral veins** ca. 16 pairs, obscure on both surfaces when fresh, moderately obscure when dried, arising at 40–50° angle; tertiary veins obscure. **Inflorescence** erect-spreading; peduncle 1.5–3.5 cm long, 1.0 mm in diam., slender, reddish; **spathe** reflexed-spreading (at anthesis) or erect, 1.1–1.5 × 0.4–0.6 cm, whitish-green to green, ovate to narrowly lanceolate, abruptly acuminate at apex; **spadix** yellow-green, erect, cylindrical, 0.7–1.9 cm long, 1–2 mm in diam. on drying, 7–10 times longer than wide, stipitate ca. 1–2 mm when dried, stipe whitish; **flowers** 3–4 visible in the principal spiral, 2–3 in the alternate spiral; stamens slightly exerted; anthers whitish. **Infructescence** pendent; spathe deciduous; spadix cylindrical, 3.5–4.2 cm long, 1–1.3 cm diam., 3.2–3.4 times longer than wide, rounded at apex, tepals faintly purplish red; **berries** globose, pale green, fading to greenish white, finally translucent in lower half; seeds 1–2 per berry.

Eponymy:—The species epithet is from the Latin adjective “*annularis*” (meaning ring-shaped or arranged in a circle) referring to the ring-shaped swellings at the apex of the nodes.

Distribution:—*Anthurium annularum* is endemic to Panama, known only from the type locality in the Serranía de Majé.

Habitat and Ecology:—The species grows at 1325 m in a *Premontane rain forest* and *Tropical wet forest* life zones according to the classification proposed by Holdridge *et al.* (1971). *Anthurium annularum* is notable because it usually grows in the canopy together with several species of Orchidaceae, at about 25–30 m above the forest floor, in a forest dominated by *Quercus* Linnaeus (1753b: 994), *Sloanea* Linnaeus (1753a: 512), *Oreomunnea* Oersted (1856: 33) and *Magnolia* Linnaeus (1753a: 535).

Phenology:—Flowering and fruiting in August. Further investigations are required to determine exact flowering and fruiting seasons.

Conservation status:—The species has a reduced geographic distribution. Its area is strongly impacted by agricultural and livestock activities. We suggest it to be considered in the CR B2ab(iii) category according to the IUCN Red List Criteria (IUCN 2001).

Discussion:—*Anthurium annularum* is member of section *Xialophyllum* Schott (1860: 440), by the erect stems that are scandent with long internodes, and with leaf blades typically longer than broad. Within section *Xialophyllum*, *A. annularum* could be confused only with *A. carnosum* Croat & R.A. Baker (1979: 36) and *A. tenerum* Engler (1898: 377), all of which have similar blades shape and greenish spadices. *Anthurium carnosum* also differs in having leaf blades drying black to blue-black, or medium brown, longer petioles, inflorescences with longer peduncles, longer spadices, and infructescences with green tepals and orange berries (Table 1); *A. tenerum* differing in having conspicuous petiole sheath, longer leaf blades that are grayish when dried, a longer spadix and no ring-shaped internodes (Table 1).

TABLE 1. Characters distinguishing *Anthurium annularum* from *A. carnosum* and *A. tenerum*.

	<i>A. annularum</i>	<i>A. carnosum</i>	<i>A. tenerum</i>
Leaves			
Blade length	5–10 cm	(7)9–17 cm	9–15 cm
Petiole length	0.9–2.0 cm	3–12 cm	1–3 cm
Petiole shape	Terete	Weakly sulcate	Terete
Petiole sheath length	0.4–0.5 cm	0.7–1 cm	1.5–2 cm
Dry color	Yellow-brown	Blue-black to brown	Grayish
Primary lateral veins	16 pairs	9–13 pairs	18–19 pairs
Inflorescence			
Peduncle length	1.5–3.5 cm	7–13 cm	2.5–4 cm
Spadix length	0.7–1.9 cm	3–5.5 cm	1.5–3 cm
Infructescence			
Tepal color	Purplish red	Green	Green
Berries color	Pale green	Orange	Green

In the **Lucid Anthurium** key *A. annularum* tracks to *A. pulchellum* Engler (1885: 273), *A. coclense* Croat (1981: 321), *A. interruptum* Sodiro (1902: 301), *A. microspadix* Schott (1858: 180) and *A. stipitatum* Benth (1846: 255). *Anthurium pulchellum* differs from *A. annularum* in having persistent intact cataphylls, greenish to olive-green drying leaf blades and prominent primary lateral veins on lower surface; *A. coclense* differs from *A. annularum* in having oblong-oblong-elliptic to elliptic or ovate-elliptic leaf blades, a spadix with ca. 10 flowers visible in the principal spiral, and reddish berries; *A. interruptum* differs from *A. annularum* in having longer internodes (8–33 cm), brownish green to olive-green drying leaf blades and red berries; *A. microspadix* differs from *A. annularum* in having longer petioles (5–16 cm), longer peduncles (5–15 cm) and yellowish-green berries and *A. stipitatum* differs in having reddish-brown drying blades, primary lateral veins prominent on lower surface and prominently stipitate spadix (with 0.5–2.0 cm long stipe).

***Anthurium chucantiense* O. Ortiz, Croat & Baldini, sp. nov. (Figs. 4, 5)**

Anthurium chucantiense is characterized by its epiphytic habit, short stems (ca. 10 cm long), short internodes at apex of stem, brown cataphylls persisting as fibers at younger nodes only, terete petioles, narrowly oblong-elliptic brownish-drying long-acuminate blades with moderately obscure primary lateral veins, long-pedunculate inflorescences with green spreading-reflexed recurled spathes, a matte greenish to pale orange stipitate spadix and red-orange berries.

Type:—PANAMÁ. Darién: Serranía de Majé, Reserva Privada Chucantí, Cerro Chucantí, sendero hacia los helicópteros, 1325 m, 8°47'45" N, 78°27'47" W, 29 Aug 2014, Orlando O. Ortiz, Rodolfo Flores, Adriel Sierra, Juvenal Batista, Yessenia Guadalupe, Calixto Rodríguez, Zaby Samudio & Zuleika Serracin 2448 (holotype, PMA!; isotypes, FT!, MO!, SCZ!, UCH!).

Epiphytic herb; stems to 10 cm long; **internodes** short at the apex of the stem, longer on lower stem, 1–1.5 cm long, 5–10 mm diam.; **cataphylls** persisting intact at apex, later deciduous with a few remnant fibers at nodes, dark brown, 12.0–17.0 cm long; **petioles** terete, 8.0–23.0 cm long, 2–3 mm diam., drying semi-glossy, reddish-brown; **blades** narrowly oblong-elliptic, 24.5–45.5 × 3.5–8 cm, 5.5–7.4 times longer than broad, 2–3 times longer than petioles,



FIGURE 4. *Anthurium chucantiense*. Holotype specimen: Panamá. Darién: Serranía de Majé, Reserva Privada Chucantí, Cerro Chucantí. Sendero hacia los helicópteros, 1325 m, 8°47'45" N, 78°27'47" W, 29 Aug 2014, Orlando O. Ortiz, Rodolfo Flores, Adriel Sierra, Juvenal Batista, Yessenia Guadalupe, Calixto Rodríguez, Zabdy Samudio & Zuleika Serracin 2448 (Photo PMA Herbarium).



FIGURE 5. *Anthurium chucantiense* at the type locality. A. In its habitat. B. Flowering spadix. C. Infructescence spadix (Photo Orlando O. Ortiz).

narrowly long-acuminate at apex, attenuate at base, medium-dark green and semiglossy above, moderately paler and matte below, drying dark brown above, moderately paler and yellow-brown below; **midrib** prominently raised, narrowly rounded and slightly paler above, V-shaped and paler below, drying concolorous above, reddish-brown below; **primary lateral veins** up to 15 pairs, arising at 55–75° angle, obscure and weakly etched above, weakly raised below, concolorous on both surfaces, drying weakly raised and slightly darker below; collective veins arising from one of the lowermost primary lateral veins. **Inflorescence** erect; **peduncle** terete, 26.5–54 cm long, 2.0 mm diam.; **spathe** green, medium green, decurrent into peduncle 0.2–2.0 cm, linear-lanceolate, 3.0–8.0 × 1.0–1.9 cm, spreading-reflexed and recurled, abruptly acuminate at apex; **spadix** erect, cylindrical, 5.7–12.5 cm long, 2.0–4.0 mm in diam., yellowish green and matte when stamens begin to emerge, becoming pale orange lower down, stipitate; stipe green, 2–19 mm long, 1–2 mm in diam. when dried; **flowers** 4 visible in the principal spiral, 3–6 in the alternate spiral; stamens slightly exerted, filaments translucent; anthers yellowish. **Infructescence** pendent, spathe green with reddish margins, spadix 8.5 cm long, 1.3 cm diam., ca. 6.5 times longer than wide, tepals brick-red; **berries** narrowly ovoid, orange-red, ca. 1 cm long when fresh, 0.7–0.9 cm long when dried, bluntly pointed at apex; seeds 2.

Eponymy:—*Anthurium chucantiense* is named for the type locality on Cerro Chucantí in the Serranía de Majé of Darién Province in Panama.

Distribution:—*Anthurium chucantiense* is endemic to Panama, known only from the type locality in the Serranía de Majé.

Habitat and Ecology:—The species grows between 963–1325 m in a *Premontane rain forest* and *Tropical wet forest* life zones according to the classification of zones proposed by Holdridge *et al.* (1971). This species usually grows near the forest floor, 0.2–3 m high, in association with *Symbolanthus pulcherrimus* Gilg (1896: 344), *Hieronyma oblonga* (Tulasne 1851: 248) Müller Argoviensis (1865: 66), *Calathea spiralis* H. Kennedy (1978: 350), *Juanulloa wardiana* (D’Arcy 1973: 671) S. Knapp (1995: 283) and other Aroid species such: *Anthurium tacarcunense* and *Stenospermatum multiovulatum* (Engler 1885: 281) N.E. Brown (1894: 684).

Phenology:—The specimens examined are all flowering and fruiting in August and September. Further investigations are required to determine exact flowering and fruiting time.

Conservation status:—The habitat where *A. chucantiense* grows is strongly impacted by human activities (farming). This species is restricted to a very small geographic area and for these reasons we consider it in the CR B2ab(iii) category according to the IUCN Red List Criteria (IUCN 2001).

Additional specimens examined (paratypes):—PANAMÁ. Darién: Cerro Chucantí, sendero al filo (helicópteros), bosque premontano, 963 m, 8°47'25.4" N, 78°27'23.7" W, 18 Sept 2012, *Ibáñez, Ayala, Celis & Peris 8335 AI* (MO, PMA).

Discussion:—*Anthurium chucantiense* had been tentatively placed in section *Polyneurium* Engler (1898: 384). Within section *Polyneurium*, *A. chucantiense* could be confused with *A. testaceum* Croat & R.A. Baker (1979: 92) and *A. cerropirrense* Croat (1986: 47), all of which have similar blades shape. *Anthurium testaceum* differs in having longer stems, leaf blades with conspicuous primary lateral veins on upper surfaces, midrib quadrangular in cross-section on lower surfaces, violet-purple spadix at anthesis and infructescences with violet tepals and oblong-ellipsoid, bright red berries (Table 2); *A. cerropirrense* Croat differs in having leaf blades with conspicuous and sunken primary lateral veins on upper surfaces, spadix with 7–10 flowers visible in the alternate spiral and purple berries (Table 2).

In the **Lucid *Anthurium* key** *A. chucantiense* tracks to *A. carinatum* Engler (1885: 275), *A. lygrum* Croat & D.C. Bay (in Croat *et al.* 2006: 40), *A. macphersonii* Croat & Oberle (2004: 77) and *A. reticulatum* Benth (1846: 255). However, *A. carinatum* differs from *A. chucantiense* in having C to D-shaped petioles and purplish to maroon or reddish spadix; *A. lygrum* differs from *A. chucantiense* in having shorter cataphylls (6–7.5 cm), sulcate and ribbed petioles and winged peduncles; *A. macphersonii* differs from *A. chucantiense* in having D-shaped petioles, ovate-lanceolate blades with a truncate base and *A. reticulatum* differs from *A. chucantiense* in having sulcate petioles, yellowish to olive-green or grayish drying leaf blades and midrib drying yellowish or grayish below.

TABLE 2. Characters distinguishing *Anthurium chucantiense* from *A. testaceum* and *A. cerropirrense*.

	<i>A. chucantiense</i>	<i>A. testaceum</i>	<i>A. cerropirrense</i>
Stems			
Internodes length in the basal part of the stem	1–1.5 cm	1.5–2.5 cm	0.8–1 cm
Stem length	ca. 10 cm	ca. 100 cm	≥ 20 cm
Leaves			
Primary lateral veins presence	Obscure	Conspicuous	Conspicuous
Midrib shape below	Narrowly rounded	Quadrangular	Rounded to acute
Inflorescence			
Spadix color	Yellowish to pale orange	Violet-purple	Olive-green
Number of flowers in the alternate spiral	3–6	2–4	7–10
Infructescence			
Tepal color	Brick-red	Violet	Dark-purple
Fruit shape	Narrowly ovoid	Oblong-ellipsoid	Oblong
Berries color	Orange-red	Bright red	Purple

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