

Five new species of *Anthurium* (Araceae) from the Caribbean Forests of Panama

Orlando O. Ortiz^a  and Thomas B. Croat^b

^aHerbario PMA & Programa de Maestría en Ciencias Biológicas, Universidad de Panamá, Estafeta Universitaria, Panama City, Panama;

^bDepartment of Research (Monographs Section), Missouri Botanical Garden, St. Louis, USA

ABSTRACT

Five new species of *Anthurium* are described as new to science from the Caribbean slope of Panama: *Anthurium alvinii*, *Anthurium baldinii*, *Anthurium cerrofrioense* and *Anthurium santamariae* are known only from Bocas del Toro Province and *Anthurium cerrosantiagoense* is known only from Comarca Ngäbe-Buglé.

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Introduction

Panama contains the greatest diversity of Araceae of any Central American country, with 383 species described (Correa et al. 2004; Croat and Hannon 2015; Ortiz and Croat 2016; Ortiz et al. 2016). Not only does the Araceae represent the fifth most diverse group of vascular plants in Panama, but it is also one of the groups with the greatest local endemism (Correa et al. 2004).

The Caribbean slope of Panama has a larger (and more diverse) forest cover than its Pacific slope, mostly owing to climatic and geological conditions. The collision of moisture-laden trade winds from the Caribbean with the mountains creates a much wetter system, and the dry and rainy seasons are not as pronounced as in other regions of the country (ANAM 2010). According to the ecoregion classification system (World Wildlife Fund 2016), the greater part of Caribbean forests in west and central Panama is within the *Isthmian-Atlantic moist forests ecoregion*, characterized by the presence of high-canopy tropical evergreen forest, with a rich epiphytic flora, high humidity-precipitation (between 2500 and 5000 mm annually) and annual temperatures above 24°C (Powel et al. 2016a). Also, almost totally, Caribbean forests of eastern Panama are contained within the *Chocó-Darién moist forests ecoregion*, characterized by precipitation ranging between 4000 and 9000 mm annually, elevations between sea level to c. 1000 m and annual temperatures averaging 23.6°C (Powel et al. 2016b).

Apparently, the Caribbean slope of Panama has been poorly explored. Croat (1986) in its revision of *Anthurium* for Panama, mentions that although there have been significant discoveries on the Caribbean slope, much of this area remains unexplored. Recently, Schatz et al. (2015) and Idarraga et al. (2015) indicated that recent explorations in

the province of Colón (district of Donoso) have revealed a considerable number of new species. Additionally, Bogarín et al. (2014) mentions that for the Orchidaceae, it is necessary to explore many areas of the Caribbean slope, mainly in the Cordillera de Talamanca. Recent botanical explorations conducted in some parts of the Caribbean forests of Panama (Bocas del Toro, Veraguas, Colón, Coclé and Comarca Guna Yala) by the University of Panama (PMA Herbarium) in collaboration with the University of Florence (FT Herbarium), have revealed the presence of new species and an interesting flora (Baldini and Ortiz 2014, 2015; Ortiz and Croat 2015a, 2015b, 2016), including new species described in this paper.

Here we describe five new endemic species of *Anthurium*. The descriptions are of fertile material and all new species were keyed using the Lucid *Anthurium* Key (Haigh et al. 2009). The descriptive terminology follows Croat and Bunting (1979). The estimations of the conservation status of all new species were made based on the criteria of the International Union for Conservation of Nature (2001). The acronyms of all herbaria mentioned in this work are according to Thiers (2016).

Taxonomic treatment

Anthurium alvinii Croat & O. Ortiz, **sp. nov.** (Figures 1, 2).

Diagnosis

Anthurium alvinii is characterized by its terrestrial habit, short internodes, fibrous loosely persistent reddish brown cataphylls, subterete grey-brown-drying petioles, greyish-brown-drying gradually long-acuminate ovate-subtriangular blades with a parabolic sinus, five or six pairs



Figure 1. *Anthurium alvinii* Croat & O. Ortiz. Holotype specimen: Bocas del Toro, Changuinola, Área de la Hidroeléctrica Bonyic, bosque cercano al área de Michela, 09°19'11"N, 82°38'47"W, 378 m, 30 September 2013, O. Ortiz, A. Zapata & A. De Sedas 1637 (PMA). Photo credits © MO Herbarium, used with permission.

of primary lateral veins, the collective arising from the first pair of basal veins and close to the margin as well as by the moderately short-pedunculate inflorescence with the lanceolate spreading salmon-coloured spathe and the long-stipitate creamy white weakly tapered spadix.

Type: Panamá. Bocas del Toro, Changuinola, Área de la Hidroeléctrica Bonyic, bosque cercano al área de Michela, 09°19'11"N, 82°38'47"W, 378 m, 30 September 2013, O. Ortiz, A. Zapata & A. De Sedas 1637 (holotype PMA!).

Description

Terrestrial to c. 30 cm tall; internodes short, c. 1.5 cm diameter; cataphylls to 6 cm long, soon weathering to pale moderately loose fibres; petioles 20–28 cm long, drying 3 mm diameter, subterete, finely and closely ribbed, grey-brown, densely granular; blades ovate-subtriangular, 26.2–27.5 × 17.3–19.9 cm, broadest across the posterior lobes, 1.3–1.5 times longer than broad, 1.04–1.3 times longer than petioles, narrowly and gradually long-acuminate at apex, subcordate at base, drying greyish brown and more or less matte above, subcoriaceous, drying greyish green and semi-glossy below; anterior lobe 23.5–24 × 17.5–20 cm, margins broadly rounded except weakly concave slightly above petiolar plexus; posterior lobes 9–10.3 cm long, somewhat directed outward, narrowly rounded at apex; basal veins five or six pairs, first pair free to the base, second pair fused 5–10 mm, third pair fused 1.8–2.8 cm, fourth pair fused 2.5–3.8 cm; posterior ribs weakly curved, mostly



Figure 2. (A–C) *Anthurium alvinii* Croat & O. Ortiz. (A) In its habitat. (B) Flowering spadix. (C) Cataphylls. All from O. Ortiz et al. 1637 (holotype specimen). Photo credits: © Orlando O. Ortiz, used with permission.

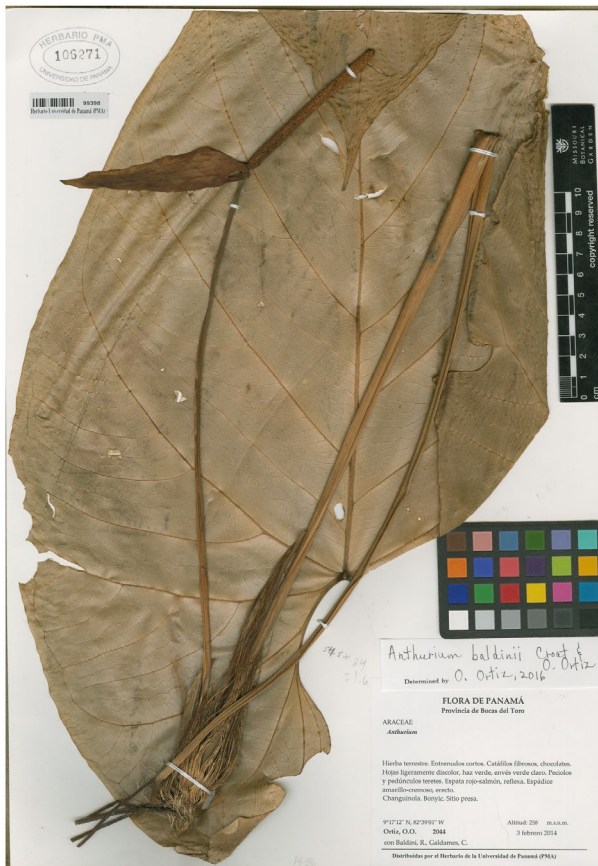


Figure 3. *Anthurium baldinii* Croat & O. Ortiz. Holotype specimen: Bocas de Toro, Changuinola, Bonyic, sitio presa, 09°17'12"N, 82°39'01"W, 258 m, 3 February 2014, O. Ortiz, R. Baldini & C. Galdames 2044 (PMA). Photo credits © MO Herbarium, used with permission.

marginal; sinus parabolic 2.5–3 cm deep, 6–7.5 cm wide; midrib drying acute, darker and short pale-lineate, sparsely pustular above, narrowly rounded, darker minutely granular below; primary lateral veins five or six pairs, arising at a steep angle, spreading at 30–40° angle, narrowly raised, bluntly acute, short pale-lineate, above, narrowly rounded, short dark-streaked and short pale-lineate below; collective veins arising from the first pair of basal veins, 1.5–3 mm from margins; upper surface densely dark-speckled and densely short pale-lineate; lower surface sparsely dark-mottled, weakly and sparsely short pale-lineate below. Inflorescence erect; peduncle 12 cm long, 1.5 mm diameter; spathe 4.1 × 0.8 cm, lanceolate, spreading, salmon-coloured; spadix 5 cm long, 3.5 mm diameter, long-stipitate, creamy white, weakly tapered, erect, stipite 1.2 cm (stipe drying 1.2 mm diameter); flowers five or six visible per spiral, 1.3 × 1–1.3 mm; tepals smooth, lateral tepals 0.8–1 mm wide, inner margin concave, outer margin two- or three-sided. Infructescence not seen.

Phenology

The only specimen found was observed flowering in September. Further investigations are required to determine exact flowering and fruiting seasons.

Distribution and habitat

Anthurium alvinii is endemic to Panama, known only from the type locality in Bocas del Toro Province at 378 m in a *Tropical wet forest* life zone according to the classification of zones proposed by Holdridge et al. (1971). It is to be expected in adjacent Costa Rica.

Conservation status

Anthurium alvinii is known only from one locality and also exhibits a reduced area of occupancy (4 km²). Currently, the habitat where this species grows is potentially affected by road and urban constructions. Using the criteria of IUCN, this species must be considered as critically endangered, CR B2ab(ii,iii,v).

Etymology

The species is named in honour of Panamanian botanist Alvin Zapata, who participated in the collection of the type specimen. Alvin is an experienced botanist, a distinguished collector and has made important contributions in ethnobotany, especially with his work on the uses of plants in western Panama. In addition to this, he has participated in many floristic inventories conducted in different parts of Panama. Currently, he is working on a floristic project in the district of Donoso, Colón Province.

Discussion

Anthurium alvinii is a somewhat unusual member of sect. *Cardiolonchium*. The species perhaps most closely resembles *Anthurium alstonii* Croat, which differs by its 13–20 cm long cataphylls, 11–14 primary lateral veins and a leaf blade that lacks any constriction above the base.

In the Lucid *Anthurium* key *A. alvinii* tracks to *Anthurium lucorum* Engl., differing by having a massive blade with a spatulate sinus and inflorescences with longer spathes (c. 20 cm long); *Anthurium nitidum* Benth., differing by having a closed sinus with prominently incurved posterior lobes; *Anthurium pluviaticum* R.E. Schult., differing by having shorter petioles (4.5–6 cm long) and small blades to 10 cm by 7.5 cm and *Anthurium velutinum* Engl., differing by having leaf blades scabrid on upper surface.

Anthurium baldinii Croat & O. Ortiz, **sp. nov.** (Figures 3, 4).

Diagnosis

Anthurium baldinii is characterized by its terrestrial habit, short internodes, persistent coarse closely parallel cataphyll fibres, long-petiolate blades, terete brown-drying petioles, ovate-sagittate blades with a hippocrepiform or closed sinus, three or four pairs of primary lateral veins,



Figure 4. (A–C) *Anthurium baldinii* Croat & O. Ortiz. (A) In its habitat. (B) Flowering spadix. (C) Infructescence spadix. A, B from O. Ortiz *et al.* 2044 (holotype specimen); C from Ortiz *et al.* 1662. Photo credits: © Orlando O. Ortiz, used with permission.

collective veins arising from primary lateral veins in the distal half of the blades and not close to the margin with upper surface short pale-lineate as well as by the long-pedunculate inflorescences with a narrowly lanceolate light green spathe and the long-tapered wine-red spadix.

Type: Panamá, Bocas de Toro, Changuinola, Bonyic, sitio presa, 09°17'12"N, 82°39'01"W, 258 m, 3 February 2014, O. Ortiz, R. Baldini & C. Galdames 2044 (holotype PMA!).

Description

Terrestrial to c. 1 m tall; internodes short, 1.5–2.5 cm diameter; cataphylls 9–14.5 cm long, drying dark brown soon weathering to coarse pale closely parallel fibres with some dark brown fragments, the fragments of epidermis; petioles 52–72 cm long, terete, 6–10 mm diameter, drying greenish to light yellow-brown, matte, erect with the blades pendent, geniculum 1–2 cm long, drying blackened; blades narrowly ovate-sagittate, 41.5–53.5 × 29–35 cm (averaging 40.2 × 33.1 cm), 1.4–1.5 times longer than wide, 0.69–0.89 times as long as petioles, gradually long-acuminate at apex (acumen narrowly long-tapered, 3 cm long), deeply lobed at base, dark, dark green and semi-glossy above, moderately paler and glossy below, drying grey-brown to greenish and semi-glossy to weakly glossy above, much paler, yellow-brown to yellow-green and glossy below; anterior lobe 35–42 cm long, broadly rounded on margins; posterior lobes 14.7–18 × 9.4–13 cm; basal veins 6(7) pairs, first pair free to the base, second pair fused 0.7–1.7 cm; third pair fused 2.5–3.5 cm, fourth pair fused 5.5–6 cm; posterior rib broadly curved, naked throughout its

length; sinus hippocrepiform to parabolic, 10–13.8 cm deep, 3.7–8 cm wide; midrib drying acute and concolorous above, narrowly rounded and obtusely three-ribbed below on drying; primary lateral veins three or four pairs, arising at 35–50° angle, narrowly rounded and weakly quilted above, drying narrowly acute and darker above, narrowly rounded and darker below; collective veins arising from the primary lateral veins in the distal half of the blade, arranged at an oblique angle to the margin; tertiary veins distinctly visible but only weakly raised; upper surface smooth, minutely and densely dark reddish brown punctiform, sparsely short pale-lineate above; lower surface smooth. Inflorescence erect with peduncles 21–32 cm long, 5 mm diameter, drying light to dark brown; spathe 9.5–16.5 × 0.8–3 cm, lanceolate, spreading-reflexed, faintly purplish violet and weakly glossy on the inside greenish outside; spadix 8–13 cm long, 5–6 mm diameter, creamy-white pre-anthesis, turning pinkish finally wine-red during anthesis, moderately tapered to apex, turning olive-green after anthesis; flowers five or six visible in the principal spiral, 9–11 flowers visible in the alternate spiral, 2.6–2.7 × 2.3–2.5 mm; tepals drying dark brown, moderately smooth; lateral tepals 1.2 mm wide, broadly rounded to straight on inner margin, broadly two-sided on outer margin. Infructescence erect, spathe green, spadix dark purple; berries 3 mm diameter, violet-purple.

Phenology

Flowering and fruiting in February and October. Further investigations are required to determine exact flowering and fruiting seasons.



Figure 5. *Anthurium cerrofríoense* Croat & O. Ortiz. Holotype specimen: Bocas del Toro, Changuinola, Cerro Frio, headwaters of Río Tskui, 09°16'38"N, 82°30'29"W, 1100 m, 24 October 2008, L. Martínez et al. 370 (PMA). Photo credits © MO Herbarium, used with permission.

Distribution and habitat

Anthurium baldinii is endemic to Panama, known only from Bocas del Toro in a *Tropical wet forest* life zone, according to the classification of zones proposed by Holdridge et al. (1971).

Conservation status

Anthurium baldinii is known from five locations, with two locations within the limits of a proposed dam site, putting the species in obvious peril. This will result in a potential 40% reduction in population size if the dam project is realized. We have calculated that this species has an estimated extent of occurrence of 393.630 km² and an area of occupancy of 24 km². Based on the information mentioned above, *A. baldinii* qualifies as an endangered species [EN A3c; B1ab(ii,iii,iv,v)+B2ab(ii,iii,iv,v)].

Etymology

The species is named in honour of our friend and colleague Riccardo M. Baldini who participated in the collection of the type specimen. R.M. Baldini is a Professor at the University of Florence (Italy), Editor in Chief of the journal *Webbia* and specialist on Neotropical grasses and historical Neotropical botanical collections.

Discussion

Anthurium baldinii is a member of sect. *Cardiolocheium*. The species is most closely similar to *Anthurium ochranthum* K. Koch, which differs by having the dark cataphylls typically more or less intact initially, posterior lobes more pointed, spathe yellow-green and bright yellow spadix.

In the Lucid *Anthurium* key *A. baldinii* tracks to *Anthurium incurvatum* Engl., differing by its typically hemi-epiphytic habit and much thicker (0.6–1.5 cm diameter) green spadix at anthesis; *Anthurium incurvum* Engl., differing by having proportionately more broadly ovate blades with more prominently in-turned posterior lobes; *A. nitidum* Benth., differing by having the collective veins from the lower basal veins and close to the margin; *Anthurium supianum* Engl. by having blades that dry brown and by having the collective veins arising from the 1st pair of basal veins and rather remote from the margins and by occurring at 2000 m, and *A. velutinum* Engl. differing by having much smaller leaves with scabrid upper blade surfaces.

Additional specimens examined (paratypes)

PANAMA: Bocas de Toro, Changuinola, PILA, región Caribe, punto 24, área con inclinación bastante pronunciada, vegetación madura con presencia de *Cryosophila warscewiczii*, *Nyssa talamancana*, *Cuphea* sp., terreno propenso a deslaves, ca. 100 m del Campamento de C, 09°26'12"N, 82°50'28"W, 1005 m, A. De Sedas, N. Zamora & D. Solano 958 (PMA); PILA, región Caribe, punto 7, área con inclinación bastante pronunciada, vegetación de muchos arbustos de *Faramea* sp., *Heisteria* sp., *Zamia* cf. *chigua*, suelos llenos de hojarasca y propenso a muchos deslaves, c. 4 km. del campamento, 09°25'50"N, 82°50'43"W, 999 m, A. De Sedas, D. Solano & F. González 874 (PMA); Distrito de Changuinola, Bosque Protector Palo Seco, área del Río Changuinola arriba, área de Guayacán, 09°07'38"N, 82°29'18"W, 348 m, 5 February 2013, J. Aranda, L. Martínez & O. Quintero 4407 (MO, PMA); Bosque Protector Palo Seco, Río Changuinola arriba. Bosque cercano a la comunidad de Guayacán, 09°07'48.9"N, 82°29'18.4"W, 300 m, 5 February 2013, O. Ortiz, A. Zapata & O. Quintero 1243 (MO); Área de la Hidroeléctrica Bonyic, 09°20'01"N, 82°37'46"W, 303 m, 1 October 2013, O. Ortiz, A. Zapata & A. De Sedas 1662 (PMA).

Anthurium cerrofríoense Croat & O. Ortiz, **sp. nov.** (Figures 5, 6).

Diagnosis

Anthurium cerrofríoense is characterized by an epiphytic habit, short internodes, coarse dark brown cataphylls persisting as light brown fibres with dark fragments of epidermis, subterete, weakly ridged petioles that dry



Figure 6. (A, B) *Anthurium cerrofrioense* Croat & O. Ortiz. (A) Cataphylls, blades and inflorescence. (B) Flowering spadix. All from *L. Martínez et al. 370* (holotype specimen). Photo credits: © Alex K. Monro, used with permission.

greyish, triangular-sagittate greyish-green drying narrowly acuminate blades with a parabolic sinus and moderately straight margins on the anterior lobe, five pairs of basal veins, four or five pairs of primary lateral veins, collective veins arising from the first or second pair of basal veins as well as by the maroon spathe and dark maroon spadix.

Type: Panamá, Bocas del Toro, Changuinola, Cerro Frio, headwaters of Río Tskui. Point 20, old secondary forest on steep slope of minor edge with many palms. Understorey very dense with many Marantaceae. Canopy 15–25 m, diameter at breast height range 20–80 cm, 09°16'38"N, 82°30'29"W, 1100 m, 24 October 2008, *L. Martínez, A. K. Monro & D. Santamaría 370* (holotype PMA!).

Description

Epiphytic near the ground; internodes short, c. 1.5 cm diameter; cataphylls 10–12 cm long, soon weathering to pale fibres with fragments of dark brown epidermis, the fibres arranged moderately closely parallel; petioles 44.5 cm long, drying 3 mm diameter, subterete, weakly ridged; geniculum 1.1 cm long; blades narrowly ovate-triangular-sagittate, 39 × 22 cm, 1.7 times longer than wide, 0.88 times as long as petioles, narrowly acuminate at apex, prominently lobed at base, subcoriaceous, moderately bicolorous, semi-glossy on both surfaces, drying grey green and weakly glossy above, semi-glossy below; anterior lobe 31 cm long broadly convex along margin; posterior lobes 11 × 10 cm, narrowly rounded at apex; sinus parabolic, 6 cm deep, 8.3 cm wide; basal veins five pairs, first pair free to the base, second pair fused 6–7 mm, third pair fused 3 cm, fourth pair fused 3.5–5 cm; posterior rib naked throughout most of its length; midrib drying acutely raised and concolorous above, narrowly rounded and brown-speckled, slightly

darker below; primary lateral veins four or five pairs arising at 40–45° in lower half of blade, to 30° angle toward apex, narrowly rounded and slightly darker and dark-speckled below; collective veins arising from the first or second pairs of basal veins; tertiary veins only weakly raised below, 2–4 mm from the margins; upper surface smooth, weakly short-pale-lineate; lower surface minutely brownish-speckled. Inflorescence erect; peduncle 20 cm long; spathe 5 × 0.8 cm, dark violet-purple, moderately glossy, reflexed; spadix 5.6 cm long, 5.5 cm diameter, cylindroid-tapered, dark violet-purple, semi-glossy; flowers six or seven visible per spiral, 1.0 mm long and wide; tepals smooth, matte; lateral tepals 1.2 mm wide, inner margin almost straight, outer margin two-sided. Infructescence not seen.

Phenology

Flowering in October. More observations are needed to determine the exact time of flowering and fruiting.

Distribution and habitat

Anthurium cerrofrioense is endemic to Panama, known only from the type locality in Bocas del Toro Province on Cerro Frio at 1100 m in a *Premontane rain forest life zone*, according to the classification of zones proposed by Holdridge et al. (1971).

Conservation status

Anthurium cerrofrioense presents an area of reduced occupancy (4 km²) and also is known only from one locality within an unprotected area. Currently, the habitat where this species grows is potentially affected by subsistence farming activities. We consider *A. cerrofrioense* to be a critically endangered species CR B2ab(ii,iii,v).



Figure 7. *Anthurium cerrosantiagoense* Croat & O. Ortiz. Holotype specimen: Comarca Ngäbe-Buglé, Kankintú, quebrada Hacha, faldas del Cerro Santiago, bosque montano maduro, 08°30'26"N, 81°44'53"W, 1986 m, 3 September 2012, A. Ibañez et al. 8332AI (PMA). Photo credits © MO Herbarium, used with permission.



Figure 8. (A, B) *Anthurium cerrosantiagoense* Croat & O. Ortiz. (A) In its habitat. (B) Cataphylls, inflorescence and infructescence. All from A. Ibañez et al. 8332AI (holotype specimen). Photo credits: © Alicia Ibañez, used with permission.

Etymology

The species is named for the type locality on Cerro Frio in Bocas del Toro Province.

Discussion

Anthurium cerrofrioense is an unusual member of sect. *Cardiolonchium* and is most easily confused with *A. ochranthum* K. Koch and one species described in this work: *A. alvinii* Croat & O. Ortiz, all of which have similar blade shapes. *Anthurium ochranthum* differs from *A. cerrofrioense* in having dark cataphylls typically more or less intact initially, a bright golden-yellow spadix and green or pale green spathe; *A. alvinii* differs from *A. cerrofrioense* in having a slender (3.5 mm diameter) and prominently stipitate spadix (with 1.2 cm long stipe), salmon-coloured spathe and a creamy white spadix.

In the Lucid *Anthurium* key *A. cerrofrioense* tracks to *A. nitidum* Benth., differing by having blades with more pairs of primary lateral veins (about eight pairs) and a prominently stipitate spadix (1.5–2 cm long) and *Anthurium rotundistigmatum* Croat, differing by having a longer spadix (10–17 cm long) with more flowers (9–12) visible in the principal spiral.

Anthurium cerrosantiagoense Croat & O. Ortiz, **sp. nov.** (Figures 7, 8).

Diagnosis

Anthurium cerrosantiagoense is characterized by its large size, terrestrial habit, erect stem with short interodes, large persistent cataphylls persisting in a pale net-like

reticulum, long terete petioles (more than 1 m long), large ovate-sagittate thin green-drying acuminate blades with large posterior lobes, seven to eight pairs of basal veins, about 15 pairs of sunken primary lateral veins (drying narrowly raised), collective veins arising from the lower basal veins as well as by the broad pale green reflexed-spreading spathe and whitish long-tapered spadix with protruding stamens and bright orange berries.

Type: Panama, Comarca Ngäbe-Buglé, Kankintú, quebrada Hacha, faldas del Cerro Santiago, bosque montano maduro, 08°30'26"N, 81°44'53"W, 1986 m, 3 September 2012, A. Ibáñez, M. Ayala, A. Celis & R. Flores 8332AI (holotype PMA!).

Description

Terrestrial to 1.5 m tall; stem to less than 1 m; internodes short, to 3.5 cm diameter; cataphylls to c. 40 cm long, drying into a semi-intact net-like fine reticulum and falling loose, pendent from stem, finally deciduous. Leaves erect with blades pendent to spreading-pendent; petioles more than 1 m long, terete; blades narrowly ovate-sagittate, 90 × 60 cm, 1.5 times longer than wide, acuminate at apex, prominently lobed at base, thinly coriaceous, moderately bicolorous, drying dark green and weakly glossy above, moderately paler and semi-glossy below; anterior lobe 74 cm long, margin broadly convex; posterior lobes c. 20 cm long; sinus spatulate; midrib narrowly and prominently raised, concolorous above, narrowly rounded and paler below, drying obtusely many-ribbed; sinus spatulate but lobes overlapping when flattened; basal veins seven or eight pairs, three of which are free to the base; posterior rib very short and not at all naked; primary lateral veins 15–18 pairs, arising at 50–55° angle (to 30° near apex); drying narrowly raised and concolorous above, narrowly raised and paler below; collective veins arising from the lower basal veins, 2–4 mm from margins; upper surface coarsely granular; lower surface finely granular. Inflorescence erect; peduncle c. 20 cm long; spathe broadly lanceolate, pale green, 21 × 3.3 cm, spreading-reflexed and twisted, persisting into fruit; spadix 23 cm long, 9 mm diameter at base, 7 mm diameter midway, 4 mm diameter at 1 cm from tip, whitish, prominently stipitate (stipe 1 cm long), whitish, curved toward apex; flowers eight visible per spiral, 3 × 1.2 mm; tepals finely granular, matte; lateral tepals 1.6–1.7 mm wide, inner margin rounded, outer margin two-sided; stamens prominently exerted whitish, 0.6 mm long and wide; thecae parallel. Infructescence with spadix somewhat twisted and coiled, to 35 cm long, 3 cm diameter; berries orange, obovoid, to c. 1 cm long when fresh and rounded at the apex.

Phenology

Flowering and fruiting in September. Further investigations are required to determine exact flowering and fruiting seasons.

Distribution and habitat

Anthurium cerrosantiagoense had been placed in section *Polyneurium*. In Panama the species is most similar to *Anthurium coloradense* Croat which differs by having leaves with petioles sulcate adaxially, blades with collective vein arising from the third basal vein and spadix yellow-green.

Conservation status

According to IUCN guidelines, *Anthurium cerrosantiagoense* would be considered as Data Deficient (DD).

Etymology

The species is named for the type locality on Cerro Santiago, Comarca Ngäbe-Buglé.

Discussion

Anthurium cerrosantiagoense had been placed in section *Polyneurium*. In Panama the species is most similar to *Anthurium coloradense* Croat which differs by having leaves with petioles sulcate adaxially, blades with collective vein arising from the third basal vein and spadix yellow-green.

In the Lucid *Anthurium* key *A. cerrosantiagoense* tracks to *Anthurium caperatum* Croat & R.A. Baker, which differs by having somewhat bullate blades that are matte on the lower surface and greenish white to yellowish green berries; *Anthurium cinereopetiolatum* Croat, differing by having much smaller narrowly lanceolate-triangular blades less than 30 cm long; *A. ochranthum* K. Koch differing by its much smaller size (39–75 × 18–48 cm), more triangular blade, bright yellow spadix at anthesis and the purple berries; *Anthurium panduriforme* Schott, differing by the concave margins of the anterior lobe and the glossy prominently tertiary veined lower blade surface as well as the bright yellow spadix and *Anthurium ravenii* Croat & R.A. Baker differing by its cylindroid spadix and red berries.

Anthurium santamariae Croat & O. Ortiz, **sp. nov.** (Figures 9, 10).

Diagnosis

Anthurium santamariae is characterized by its epiphytic habit, short internodes, weakly persistent pale cataphylls that eventually fall completely free, terete shallowly sulcate petioles, narrowly ovate-sagittate, yellowish brown, acuminate blades, with parabolic to hippocrepiform sinus, 8–10 pairs of basal veins, a curved posterior rib that is naked throughout most of its length, collective veins arising from third to lowermost pairs of basal veins, lower surface sparsely brown-dotted as well as by the moderately long-pedunculate inflorescence with a

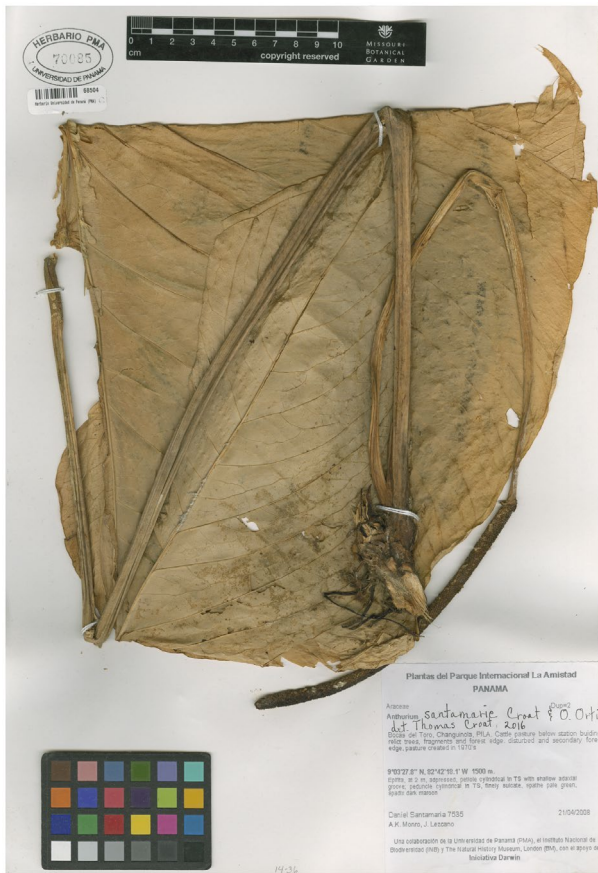


Figure 9. *Anthurium santamariae* Croat & O. Ortiz. Holotype specimen: Bocas del Toro, Changuinola, Parque Internacional La Amistad (PILA), 09°03'27.8"N, 82°42'18.1"W, 1500 m, 21 April 2008, *Daniel Santamaría et al.* 7535 (PMA). Photo credits © MO Herbarium, used with permission.

paler green reflexed spathe and the long-cylindroid dark maroon spadix.

Type: Panama, Bocas del Toro, Changuinola, Parque Internacional La Amistad (PILA), Cattle pasture below station building, relict trees, fragments and forest edge, pasture created in 1970s, 09°03'27.8"N, 82°42'18.1"W, 1500 m, 21 April 2008, *Daniel Santamaría*, A. K. Monro & J. Lezcano 7535 (holotype PMA!).

Description

Epiphyte; internodes short, 2–4 cm diameter; cataphylls drying pale brown, persisting at upper nodes, eventually falling completely free; petioles terete, sulcate, cylindrical, 62.5–91.8 × 0.6–1.0 cm, geniculum 1.8–3.1 cm, drying dark brown; blades narrowly ovate-sagittate, acuminate, 61–79.6 × 49.2–50.4 cm, 1.2–1.58 times longer than broad, 1.07 times longer than petioles, dark green, semi-glossy above, paler green, matte below, drying yellow-brown above and below; anterior lobe 47.3–59.7 × 49.2–50.4 cm, broadest at 7–10 cm above petiolar plexus; posterior lobes 17.2–21.2 × 14.8–17 cm, directed at 130–161°; sinus parabolic to hippocrepiform, 10.0–15.7 cm deep, 6.0–15.0 cm wide; midrib moderately raised, minutely granular above, bluntly rounded,

moderately raised below; primary lateral veins 14–18 pairs, arising (44)53–55°, weakly and narrowly raised, sometimes in weak valleys, sometimes bluntly acute above, narrowly rounded, concolorous, minutely granular below; basal veins 8–10 pairs, first pair free to base, second pair free to base, third pair fused 1.1–3.0 cm, fourth pair fused 2.5–5.2 cm, fifth pair fused 4.5–7.4 cm; posterior rib 4.5–8.0 cm long, weakly curved, naked 4.0–8.3 cm, most of its length; tertiary veins rounded, very weakly raised above, rounded, weakly raised below; collective veins arising from third to lowermost pairs of basal veins, 2–5 mm from margin; upper surface moderately granular; lower surface sparsely brown-dotted. Inflorescence with peduncle green, 35.4–52.4 cm long, drying 5–9 mm diameter; spathe pale green to flushed-maroon, reflexed, 10–14 cm long, 1.5–2.5 cm diameter (estimated); spadix sessile, cylindrical, green-purple to dark green-brown to dark maroon, 10.1–24.9 × 0.7–1.1 cm; flowers 14–16 visible per spiral, 1.5–1.7 × 1.5–1.6 mm; tepals drying red-brown to brown, minutely granular, lateral tepals 0.9–1.2 mm wide, inner edge rounded, outer margin two-sided; stamens held at surface of tepals; anthers white, 0.6 × 0.5–0.6 mm wide; ovaries purple. Infructescence not seen.

Phenology

Flowering in April. Further investigations are required to determine exact flowering and fruiting seasons.

Distribution and habitat

Anthurium santamariae is endemic to Panama, known only from the type locality in Bocas del Toro Province at 1400–1500 m elevation in *Premontane rain forest* life zone.

Conservation status

Anthurium santamariae is known from four collections in two locations and has an estimated extent of occurrence of 7.166 km² and an area of occupancy of 16 km². Field notes obtained from all collections seem to indicate that the sites where this species grows were altered in the past. At present, these sites are being protected, but subsistence farming occurs on a small scale in surrounding areas. Based on the number of locations, area of occupancy and the potential threat of farm activities, we suggest *A. santamariae* to be considered as an endangered species [EN B2ab(ii,iii,iv,v)].

Etymology

The species is named in honour of Costa Rican botanist Daniel Santamaría who collected the type specimen and was involved with the collection of most of the paratypes of the species.



Figure 10. (A, B) *Anthurium santamariae* Croat & O. Ortiz. (A) Inflorescence, close-up. (B) Cataphylls, blades and inflorescence. All from *Daniel Santamaría et al.* 7449. Photo credits: © Alex K. Monro, used with permission.

Discussion

Anthurium santamariae is placed in section *Cardiolonchium*. In Panama the species is most similar to *Anthurium dukei* Croat, *A. coloradense* Croat and *A. caperatum* Croat & R.A. Baker, all of which have similar blade shapes. *Anthurium dukei* differs from *A. santamariae* in having blades with the upper surface both dark brownish punctate and short pale-lineate and dark brown-punctate on the lower surface; *A. coloradense* differs from *A. santamariae* in having blades with spatulate sinus and a yellow-green spadix with five or six flowers visible in the principal and *A. caperatum* differs from *A. santamariae* by blades without brown-dots on lower surface and a pale green spadix.

In the Lucid *Anthurium* key, *A. santamariae* tracks to *Anthurium hodgei* Croat, M.M. Mora & Oberle, differing in having a short-pedunculate inflorescence (1.3–2.5 cm long) with prominently protruding pistils; *Anthurium panamense* Croat, differing by having a proportionately much narrower blade with a creamy white spadix and *Anthurium ramosense* Croat, differing by its short pale-lineate upper blade surface and a greenish spadix.

Additional specimens examined (paratypes)

PANAMA: Bocas del Toro, Changuinola, Parque Internacional La Amistad (PILA), cerca de 2 km de la estación de Alto Urí, colectando en bosque intervenido

predominado en el dosel con árboles de *Cedrela tonduzii*, *Ulmus mexicana*, *Hieronyma oblonga*, *Guarea grandifolia* y *Ocotea* spp., 09°03'42.416"N, 82°43'04.908"W, 1453 m, 18 April 2008, D. Solano & A. De Sedas Maltez 5429 (PMA); Point 16, c. 3 km from estación de Alto Urí, very wet forest by river, trees to 25 m, diameter at breast height 20–40 cm, many boulders, 09°03'11.6"N, 82°41'53.9"W, 1400 m, 17 April 2008, J. Lezcano 305 (PMA); Point 17, c. 2 km from estación de Alto Urí, disturbed and secondary forest with some relict trees, 200 m from pasture, very steep, canopy 15–25 m, diameter at breast height 20 to 100 cm, 09°03'54.5"N, 82°42'006"W, 1500 m, 19 April 2008, D. Santamaría, A.K. Monro & J. Lezcano 7449 (PMA).

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Disclosure statement

No potential conflict of interest was reported by the authors.

ORCID

Orlando O. Ortiz  <http://orcid.org/0000-0002-7805-0046>

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