New species of *Anthurium* (Araceae) from the Andean Slopes of Ecuador

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ABSTRACT
Three new species of *Anthurium* (Araceae) are described as new and compared with other species in the genus: *Anthurium antisanense* Croat & R.Zambrano, *Anthurium patriciaroseroae* R.Zambrano & Croat and *Anthurium phlebodes* Croat & R.Zambrano.

Key words: New *Anthurium*, Pichincha, Napo, *Calomystrium*, *Belolonchium*

INTRODUCTION

This is the first of several expected papers resulting from a collaboration with the second author, Tom Croat, who has devoted much of his career to the study of Ecuadorian Araceae. Two of the three species published in this paper were collected in Pichincha Province as the result of the first author's previous work on the *Florula of the Masphi Lodge Reserve (Pichincha)* which is an essential part of a future Master's degree program at the Pontificia Universidad Católica del Ecuador in Quito.

Many of the species in that coming *Florula* are expected to be new to science. The reserve area is located on the western slopes of Pichincha Province, in a Premontane rain forest life zone (Holdridge, 1971). The region ranges from 580 to 1400 m in elevation, with rainfall heavily distributed throughout the year. It has been only poorly explored in search of Araceae, but has been visited previously several times by Efrain Friere of the QCNE Herbarium and Tom Croat. This interesting area of study and exploration was declared as a private reserve in 2001 by Roque Sevilla, former Mayor of Quito City. It is unusually rich in species of Araceae owing to its elevational gradient with constant cloudy conditions, high humidity and frequent rainfall, with an average annual precipitation of 3,945 mm and temperatures ranging between 18 °C and 26 °C. It features 2,500 hectares where lush vegetation thrives, of which approximately 70 percent is primary forest, surrounded by disturbed forests and grasslands in more than 50% of the area (Ministry of the Environment "MAE," 2017; Monitoring of the Andean Amazon Project "MAAP," 2019). It is considered a 'Hotspot' in the 'Tumbes-Chocó-Magdalena' region (Mittermeier et al., 2011).

The additional newly described species was collected on the eastern slopes of the Ecuadorian Andes, in Napo Province, near the Cosanga locality, within the Hemisferios Biodiversity Reserve. Covering just over 2000 hectares, this reserve remains largely unexplored in a Montane rain forest life zone (Holdridge, 1979). The region, which is an important buffer zone of the Antisana Ecological Reserve, ranges from 2000 to 3300 m in elevation. The plant composition and weather of this area exhibit similarities to the Western montane forest, featuring an abundant presence of moss on trees and abundant rain and clouds all year round.

The first author actively participated in exploring both private reserves through various educational and ex-situ conservation programs conducted by the Jardin Botánico de Quito, where he currently serves as the Director of Gardens and Botanical Collections. These initiatives were collaboratively developed in partnership with prominent organizations such as the BGCI (Botanical Gardens Conservation International), Universidad Hemisferios, and more recently, the Pontificia Universidad Católica del Ecuador. Both conservation areas face imminent threats from high rates of deforestation, livestock farming, and the encroachment of illegal mining operations (Zambrano-Cevallos, personal observation).

The discovery of these species highlights the significance of private protected areas and underscores the urgent need to establish exploration and conservation programs on a medium to large scale. This is especially crucial in the consistently endangered and highly biodiverse Ecuadorian Andean ecosystems (Gentry, 1988), where the diversity of Araceae, particularly within the genus *Anthurium*, remains incompletely cataloged. It is likely that more than half of the species are yet to be discovered (Croat, 2019). Therefore, conducting extensive collection efforts is imperative, especially in the Andean regions, focusing on systematic studies that comprehensively document all species within specific areas. This approach aims to achieve thorough coverage across various zones (Croat, 2019).

Materials and Methods

The species have been separated using the Lucid Anthurium Key which involves comparing a given unknown species with all other known published species which involves the rejection of all species which are negatively correlated after choosing a series of the most conservative characters, then making detailed studies of all possible candidates to be assured that it is not one of those names selected.

The Lucid keys were the result of technology developed by the University of Melbourne but Lucid, Inc. is presently an independent company that markets this product. The tool we are using is a computer-generated key developed by the Royal Botanic Gardens Kew and the Missouri Botanical Garden that contains all important taxonomic characters of all *Anthurium* species. It works by a process of elimination using only the most conservative and least variable characters.

At present, keys have been developed for *Adelonema, Anthurium, Dieffenbachia, Dracontium, Philodendron, Spathiphyllum, Stenospermation, Rhodospatha* and *Xanthosoma* [The latter two authored by Xavier Delannay] and work is under way to develop keys for *Chlorospatha* and *Monstera*. These are largely unpublished, especially those with large numbers of new species but

it is intended that all these keys will be placed online for public use. For examples of published keys see: http://www.lucidcentral.com.

Descriptions follow the standard methodology for species of the genus *Anthurium* (Croat and Bunting, 1979). Life zone ecology mentioned is based on the Holdridge life zone maps (Holdridge, 1971). The IUCN status for these species is designated as "Data Deficient" (DD) due to a lack of comprehensive knowledge regarding the species' distribution and the absence of additional documented collections (IUCN, 2023).

NEW SPECIES DESCRIBED

Anthurium antisanense Croat & R.Zambrano, **sp. nov**. — Type: ECUADOR. Napo: Hemisferios Biodiversity Reserve, SSW of Cosanga, S of Río Aragon, 00°41'27.38"S 77°55'57.18"W; 2267 m, 10 June 2022, *R. Zambrano C., A. Villarreal, K. Ayala, M. Sulen & D. Barragán 03* (holotype, QCA247607).

Diagnosis: The species is a member of section *Belolonchium* and is characterized by its terrestrial habit, short internodes, persisting fibrous cataphylls, long subterete petioles, narrowly triangular-sagittate blades, 7–8 basal veins with the first pair free to the base, the long posterior rib nearly straight and about ¾ naked, as well as by the long pedunculate inflorescence, reddish linear–lanceolate spreading spathe that is held erect, and the long–tapered pendent purplish violet sessile spadix with long–exserted whitish stamens.

Hemiepiphyte growing over tree trunk, stems short < 70 cm long; internodes short, 4–5 cm, 3.5 cm diam; cataphylls 15–18 cm long, acute, persisting intact at apex, becoming loosely fibrous with fragments of reddish brown epidermis, the fibers reddish brown. LEAVES erect-spreading; petioles broadly spreading, 38–54 cm long, 7–8 mm diam., subterete, obtusely and narrowly sulcate adaxially, tinged dark purplish violet, semiglossy; geniculum 2.5–3.0 cm, subterete, narrowly sulcate adaxially; blades pendent from petiole, acuminate at apex, prominently lobed at base, narrowly triangular–sagittate, 49–66 cm long, 21–25 cm wide at petiolar plexus, 2.3–2.5 times longer than wide, 1.2 times as long as petioles, dark green and glossy above, light green and glossy below; anterior lobe 37–52 cm long, broadly convex to almost straight along the margin; posterior lobes 12–14 cm long, 8.0–9.5 cm wide, directed toward the base; sinus hippocrepiform-triangular, 12–14 cm deep, 8–12 cm wide; basal veins 7 pairs, 1st pair free to base, 2nd pair fused at 0.5–1.5 cm, 3rd pair fused at 2–4 cm, 4th pair fused at 6–7 cm; 5th,6th & 7th pairs fused at 8–9 cm; posterior ribs broadly curving, 8–9 cm long, naked 5–6 cm, ca. ¾ its length; midrib adaxially sunken, forming a weak valley, rounded to U–shaped, reddish to paler green above, rounded to U–shaped and raised below; primary lateral veins 12–14 per side, meeting midrib at 45–47°, weakly sunken and pale green above, U–shaped, raised and paler below; interprimary veins sunken above and visible below; secondary and tertiary veins slightly raised above and visible as dark green diffuse lines below, drying raised on both surfaces; reticulate veins slightly raised above and visible as dark green diffuse lines below, drying raised on both surfaces; collective veins rising from the 2nd pair of basal veins. INFLORESCENCE erect-spreading, long-pedunculate; peduncle 58–63 cm long; **spathe** green at the base, reddish linear, held erect, lanceolate, 14–19 cm long, 2.5–3.2 cm wide; **spadix** sessile, long–tapered, 16–24 cm long, 0.9–10 mm diam.; flowers 8 visible per

principal spiral, ca. 2–3 mm long, ca 1.8–2.8 mm wide; tepals matte, purplish; lateral tepals 1.0–1.5 mm wide, inner margin two-sided; pistils not seen; stamens minute, appressed to the pistil , held at level of tepals, thecae yellow, weakly divaricate, 1.5 mm wide and 0.8 mm long, pollen white. INFRUCTESCENCE not seen. **Figures 1–5 & 20.**

Distribution and ecology — *Anthurium antisanense* is endemic to Ecuador, known only from the type locality in the Hemisferios Biodiversity Reserve at 2267 m in a *Montane rain forest* life zone. It is rare in the registered area, and finding it requires several hours of walking and crossing rivers and streams, transitioning from secondary forests to primary forests. This species prefers lower strata of the forest and shares much of that habitat with other more abundant representatives of the genus, such as *A. bustamanteae* Croat, E.Freire, Bleiweiss & Sorn. Mol., *A. flavolineatum* Sodiro, and *A. giganteum* Engl.

Etymology — The species epithet refers to the Antisana volcano, one of Ecuador's highest peaks standing at 5758 meters. The reserve, where the plant was collected, is situated on the eastern slopes of this imposing volcano.

Comments — In the Lucid Anthurium Key the species tracks to *A. cupreonitens* Engl. which differs by having a white spadix and a dark purple spathe; *A. dichrophyllum* Sodiro, which differs by having proportionately less elongate leaf blades that are markedly concave along the margins and have a green, narrowly ovate spathe; *A. gaffuriii* Sodiro, which differs by having much shorter posterior ribs which are naked for only 2 cm; *A. lehmannii* Engl, which differs by having proportionately less elongate, moderately hastate leaf blades that are markedly concave along the margins and a dark brown ovate spathe and *A. obtegens* Engl. which differs by having a proportionately shorter blade with concave lateral margins, more incurved, overlapping posterior lobes, a shorter posterior rib, a proportionately shorter and broader spathe and spadix.

Anthurium patriciaroseroae R.Zambrano & Croat, **sp. nov.** — Type: ECUADOR. Pichincha: Pacto–Reserva Mashpi road, 00°09'35.34"N, 78°49'30.24"W, 1560 m., 23 Oct. 2022*, R. Zambrano C., M. Sulen & K. Ayala 01* (holotype, QCA247605).

Diagnosis: The species is a member of section *Calomystrium* and is characterized by its erect solitary habit, thick short internodes, intact persistent cataphylls, subterete, narrowly and obtusely sulcate petioles, triangular-ovate-sagittate, gradually acuminate, matte-subvelvety blades which are punctate on both surfaces, a hippocrepiform sinus, 5–6 pairs of basal veins, the 1st pair of which is free to the base, the remainder variously fused into a posterior rib which is naked its entire length, 14–16 primary lateral veins per side, collective veins arising from 2nd pair of basal veins as well as by a long-pedunculate, erect inflorescence, a boat shaped, erect and hooded, greenish spathe and an erect, sub-cylindroid, creamy-yellow to orange, stipitate spadix.

Essentially terrestrial, rooted in soils but growing on the roots of other plants, in clearing next to the road, stems 1.5–2.0 m long**;** internodes short, 4.1–4.9 cm diam.; cataphylls 31–38 cm long, drying reddish brown, persisting intact. LEAVES with petioles subterete, 99.0–113.5 cm long, 9–11 mm diam., pale green and matte, narrowly and obtusely sulcate to obtusely and broadly sulcate abaxially, more evident when dry; geniculum subterete, 4.3–7.5 cm long, weakly triangular abaxially, drying reddish brown; **blades** triangular-ovate-sagittate, 69.6–78.4

Figure 1. *Anthurium antisanense — R. Zambrano C. 03*. Habit. — Photo Ricardo Zambrano C. [For dimensions in all figures, see descriptions].

cm long, 34–36 cm wide, broadest ca. 1.5–2.0 cm below petiolar plexus, 2.0–2.1 times longer than broad, 0.7 times as long as petiole, gradually acuminate at apex (acumen 1.5–2.1 cm long), prominently lobed at base, subcoriaceous, medium green and matte-subvelvety above, paler green and glossy below, drying brownish-green and matte with dark punctations above, reddish-brown and semiglossy, less conspicuously punctate below; anterior lobe 58–66 cm long, weakly undulate, mostly straight along margin; posterior lobes 11–12 cm long, 10.6–13.0 cm wide; sinus hippocrepiform, 10–12 cm deep, 8–11 cm wide; basal veins 5 or 6 pairs, 1st pair free, 2nd pair fused at 2.0–2.5 cm, 3rd pair fused at 4.0–4.3 cm, 4th and 5th pair fused at 6.0–6.5 cm; posterior ribs 11–13 cm long, weakly turned inward, naked for entire length; midrib adaxially raised, rounded to U-shaped, turning V-shaped at tip, paler green to yellowish above, more or less trapezoidal below with three medial ribs, drying bluntly acute and concolorous above and clearly trapezoidal and ribbed below; primary lateral veins 14–16 per side, meeting midrib at 30–40°, narrowly raised and pale green above, V-shaped and slightly paler below, drying weaky and narrowly raised above and finely raised below; interprimary veins raised above and slightly visible below, sometimes appearing as dark diffuse lines, drying prominently raised below; secondary veins barely visible above, non-visible below, drying raised above and prominently raised below; tertiary veins weakly raised above, dark green, darker than blade, slightly visible and raised below, drying raised above and prominently raised below; fine reticulate veins slightly raised above, barely differentiated below, sometimes appearing as dark diffuse lines, drying raised above and prominently raised below; collective vein rising from 2nd pair of basal veins, 1.4–2.6 mm from margin. INFLORESCENCE erect; peduncle 69.0–78.5 cm long, 1.4 times as long as the petiole, terete, drying brown and slightly ribbed; **spathe** boat shaped, erect and hooded, turning forward at apex, 19–23 cm long, 7.9–8.0 cm

Figure 2. *Anthurium antisanense — R. Zambrano C. 03*. Stem showing cataphylls and petioles. — Photo Ricardo Zambrano C.

Figure 3. *Anthurium antisanense* — *R. Zambrano C. 03*. Leaf blade, adaxial surface. — Photo Ricardo Zambrano C.

Figure 4. *Anthurium antisanense — R. Zambrano C. 03*. Inflorescence. — Photo Ricardo Zambrano C.

Figure 5. *Anthurium antisanense* — *R. Zambrano C. 03*. Detail of spadix in early male anthesis. — Photo M. Sulen

wide, pale green with darker green stripes on the adaxial surface, semiglossy, white-green, with pale green stripes abaxially, semiglossy, drying reddish brown and matte; **spadix** erect, more or less cylindroid, weakly tapered at both ends, 9–12 cm long, 1.6–2.0 cm wide at 1 cm from tip, 2.0–2.5 cm wide at midway, matte, creamy-yellow to orange, stipitate, stipe medium green, 1.0–1.3 cm long, drying reddish dark brown; flowers 13 or 14 visible per principal spiral, 2.0–2.2 mm long, 1.8–2.0 mm wide; tepals matte, cream yellow when immature to orange yellowish at maturity; lateral tepals 0.8–1.0 mm wide, inner margin two sided; pistils pale green to purple-pink at maturity, strongly exserted, ca. 3.5–7.8 mm long; stamens with anther sessile, appressed to the pistil, held at level of tepals, thecae weakly divaricate, 0.5 mm wide and 0.8 mm long. INFRUCTESCENCE not seen fully developed. **Figures 6–13 & 20.**

Distribution and ecology — *Anthurium patriciaroseroae* is endemic to Ecuador, known only from the type locality in Pichincha Province at 1560 m in a region of *Premontane rain forest* life zone. Although rare, when spotted, this species is easily identified in the registered area, especially on walls along the road. Some individuals may display multiple inflorescences at various stages of development.

Etymology — The species is named in honor of Patricia Rosero, an important collaborator of the QCA Herbarium at the Pontificia Universidad Católica del Ecuador, who passed away in 2019. She dedicated over 28 years to the preservation of the botanical collection in the QCA Herbarium and played a significant mentoring role during the academic career of the first author.

Comments — In the Lucid Anthurium Key the species tracks to *A. albidum* Sodiro from the Lita-San Lorenzo region but that species differs by having 2 or 3 pairs of free basal veins; *A. ceratineum* Diels, from the Santo Domingo Province, which differs by having nearly all of the basal veins free to the base and *A. cordiforme* Sodiro, which differs by having only 2–3(4) primary lateral veins, by having the collective veins arising from one of the primary lateral veins, rather remote from margins and 6–8(9) pairs of basal veins, the first 2(or 3), free to the base.

Anthurium phlebodes Croat & R.Zambrano, **sp. nov.** — Type: ECUADOR. Pichincha: Pacto–Reserva Mashpi road, 00°8'57.68"N 78°48'41.52"W, 1567 m., 24 Oct. 2022, *R. Zambrano C., A. Villarreal, M. Sulen & K. Ayala 02* (Holotype, QCA247606).

Diagnosis: The species is a member of section *Calomystrium* and is characterized by its terrestrial habit, huge size, thick short internodes, persistent intact, reddish brown cataphylls, terete, weakly sulcate petioles, broadly ovate-sagittate blades, closed sinus, 8 or 9 pairs of basal veins, 4 pairs of which are free to the base, a short, mostly naked posterior rib, collective veins arising from 6th pair of basal veins as well as by the long-pedunculate inflorescence, narrowly ovate green spathe and long-tapered sessile white spadix.

Terrestrial to ca. 2 m tall; stem < 60 cm long; internodes short, 6 cm diam.; cataphylls 30–36 cm long, persisting intact, reddish brown, persisting more or less intact. LEAVES with petioles 90–110 cm long, 8–10.5 mm diam., terete, weakly and narrowly sulcate, green, semiglossy; geniculum subterete, 3.5–4.0 cm long, drying blackish; **blades** broadly ovate-sagittate, 79–89 cm

Figure 6. *Anthurium patriciaroseroae — R. Zambrano C. 01*. Habit. — Photo Ricardo Zambrano C.

Figure 7. *Anthurium patriciaroseroae — R. Zambrano C. 01*. Stem showing cataphylls. — Photo Ricardo Zambrano C.

Figure 8. *Anthurium patriciaroseroae* — *R. Zambrano C. 01*. Leaf blade, adaxial surface. — Photo Ricardo Zambrano C.

Figure 9. *Anthurium patriciaroseroae* — *R. Zambrano C. 01*. Leaf blade, abaxial surface. — Photo Ricardo Zambrano C.

Figure 10. *Anthurium patriciaroseroae — R. Zambrano C. 01.* Early infrutescence. — Photo M. Sulen

Figure 11. *Anthurium patriciaroseroae — R. Zambrano C. 01.* Detail of spadix showing strongly exserted pale green pistils. — Photo M. Sulen

Figure 12. *Anthurium patriciaroseroae — R. Zambrano C. 01.* Early infrutescence. — Photo M. Sulen

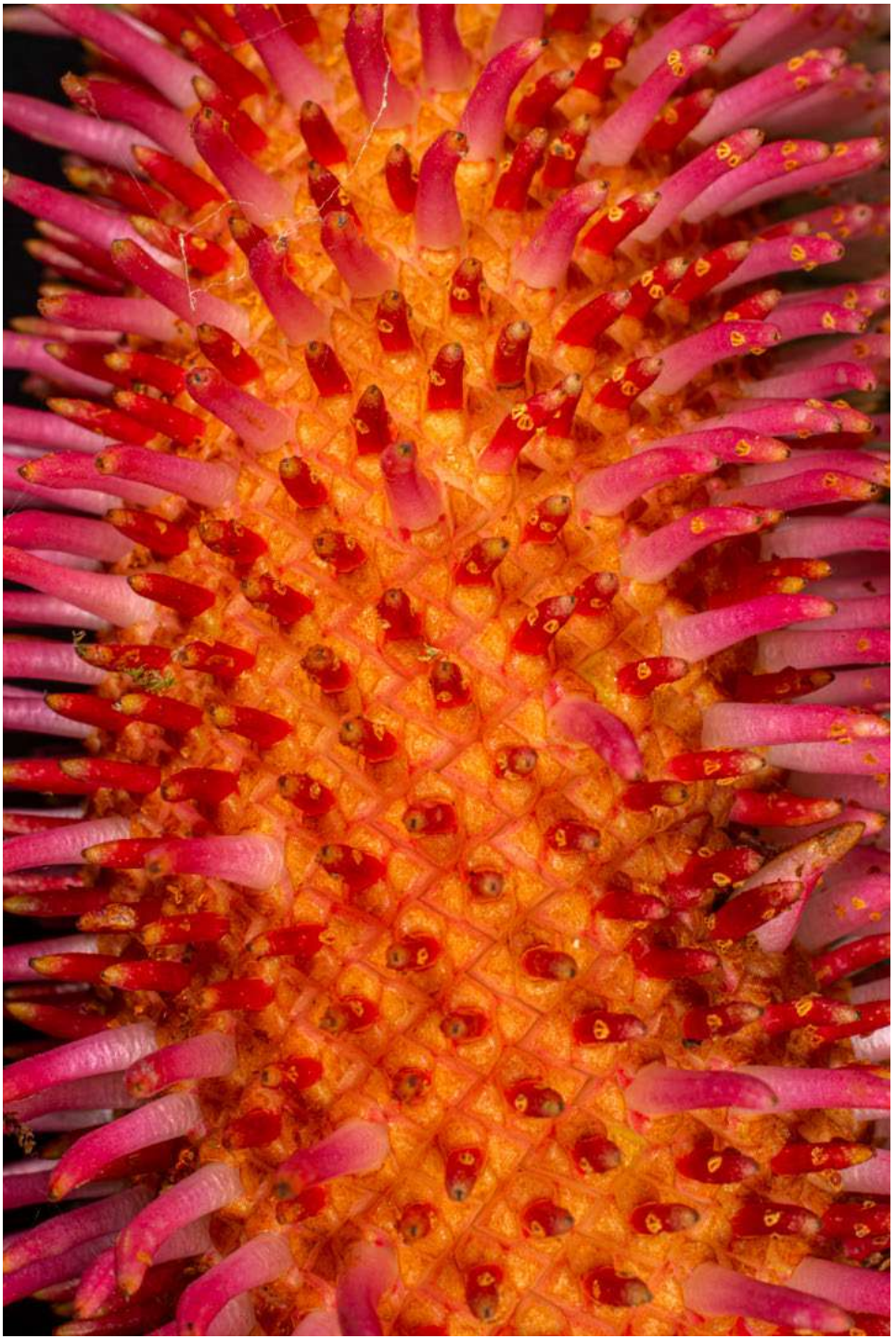

Figure 13. *Anthurium patriciaroseroae — R. Zambrano C. 01.* Detail of spadix showing strongly exserted purple-pink pistils at maturity. — Photo M. Sulen

long, 56–62 cm wide at ca. 15 cm below petiolar plexus, 1.4 times longer than broad, 0.9 times as long as petioles, dark green and moderately glossy above, slightly papery and semiglossy below, with glandular punctations, drying brownish-green and matte with dark punctations above, brownish-green, semiglossy, and less conspicuously punctate below; anterior lobe 60.5–71.0 cm long, rounded on margins; posterior lobes 17–18 cm long, 24.5 cm wide, broadly rounded at apex; sinus closed, obovate, 14–15 cm long, 1–3 cm wide; basal veins 8 or 9 pairs, 1st–4th pairs free to the base, 5th fused at 2 cm; 6th fused at 2.5 cm, 7th & 8th fused at 2.8 cm; posterior rib short 5–6 cm long, more or less straight, naked essentially all of its length; midrib adaxially sunken, forming a weak valley, rounded and turning V-shaped at the tip, green to paler green above, more or less trapezoidal below, with three medial ribs at the basal and mid portion of the leaf, turning V-Shaped at the tip, drying bluntly acute and concolorous above and more or less trapezoidal and ribbed below, turning very acute and V-shaped at the tip; primary lateral veins 11 or 12 per side, meeting midrib at 45–47°, weakly sunken and green to pale green above, V-shaped, raised and paler below, drying weakly sunken above and conspicuously raised below; interprimary veins sunken above and very visible below, drying raised above and finely raised below; secondary and tertiary veins slightly raised above and visible as dark green diffuse lines below, drying raised on both surfaces; fine reticulate veins slightly raised above and visible as dark green diffuse lines below, drying raised on both surfaces; collective veins arising from 6th pair of basal veins, 1.3–1.8 mm from margin. INFLORESCENCE erect-spreading, long-pedunculate; peduncle 106–120 cm long; **spathe** green, initially erect, narrowly ovate, 28–32 cm long, 10–11 cm wide, eventually spreading; **spadix** sessile, moderately long-tapered, 28–32 cm long, 10–11 cm diam., narrowly rounded at apex; flowers 14-16 visible per principal spiral, ca. 2.0–2.2 mm long, ca 1.8–2.0 mm wide; tepals matte, cream white; lateral tepals 0.8–1.0 mm wide, inner margin two sided; pistils not seen; stamens not seen. INFRUCTESCENCE (seen mostly immature showing some mature berries), 42 cm long, 4 cm diam.; tepals faintly purplish violet; pistils green, in part early-emergent; berries ovoid, pointed at apex, 1.2–1.5 cm long, 0.45–0.55 mm wide, yellow-purple, translucent in the lower half, there mostly yellow; seeds 2 per berry, 0.5–0.6 mm long and 0.3–0.4 mm wide. **Figures 14–20**.

Distribution and ecology — *Anthurium phlebodes* is endemic to Ecuador, known only from the type locality at the Pacto–Reserva Mashpi road at 1567 m. in a *Premontane rain forest* life zone. Although not common, this species is easily identified in the registered area, especially on old embankments and walls along the road. Its impressive white spadix releases an intensely fragrant, sweet, and astringent aroma during the day, particularly standing out in the early morning and late afternoon hours.

Etymology — The species epithet comes from Greek for "full of veins" referring to the large number of free basal veins.

Comments — In the Lucid *Anthurium* Key the species tracks to *A. lutescens* Engl. which differs by being a much smaller plant with leaves to 50 cm long and 30 cm wide with the collective veins arising from the 3rd pair of basal veins and more remote from the margin as well as by having a proportionately shorter and thicker spadix; *A. riparium* Engl., which differs by having only 5–7 pairs of basal veins with only 1 to 3 of them free to base as well as by having a stipitate cylindrical spadix; *A. roraimense* N.E.Br. from Venezuela which differs by its distinctly acuminate blade and proportionately shorter cylindroid spadix.

Figure 14. *Anthurium phlebodes — R. Zambrano C. 02*. Ricardo Zambrano-Cevallos discovering the type specimen. — Photo M. Sulen.

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Figure 15. *Anthurium phlebodes — R. Zambrano C. 02*. Stem showing cataphylls and petioles. — Photo M. Sulen

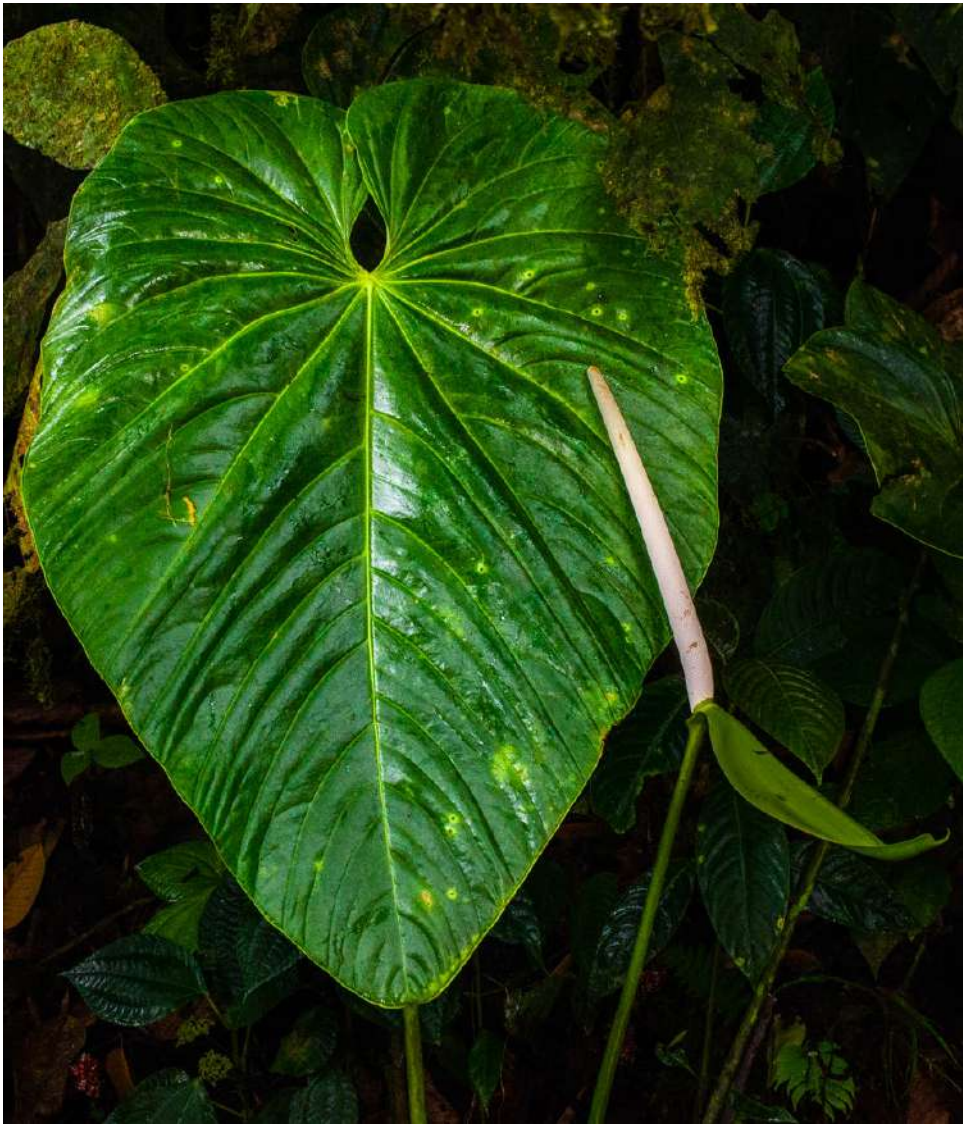

Figure 16. *Anthurium phlebodes* — *R. Zambrano C. 02*. Leaf blade, adaxial surface and inflorescence. — Photo M. Sulen

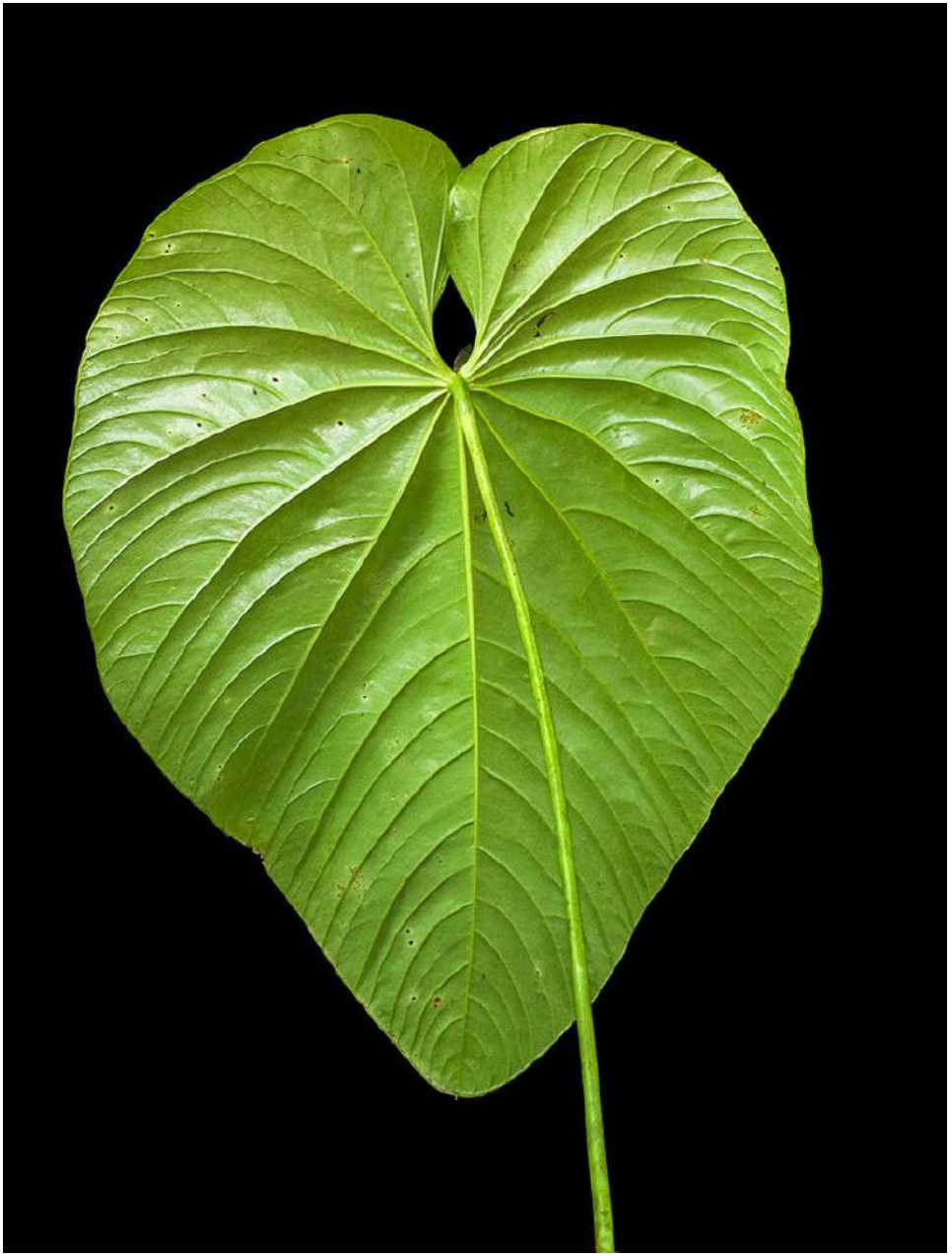

Figure 17. *Anthurium phlebodes* — *R. Zambrano C. 02*. Leaf blade, abaxial surface. — Photo M. Sulen

Figure 18. *Anthurium phlebodes — R. Zambrano C. 02*. Inflorescence. — Photo M. Sulen

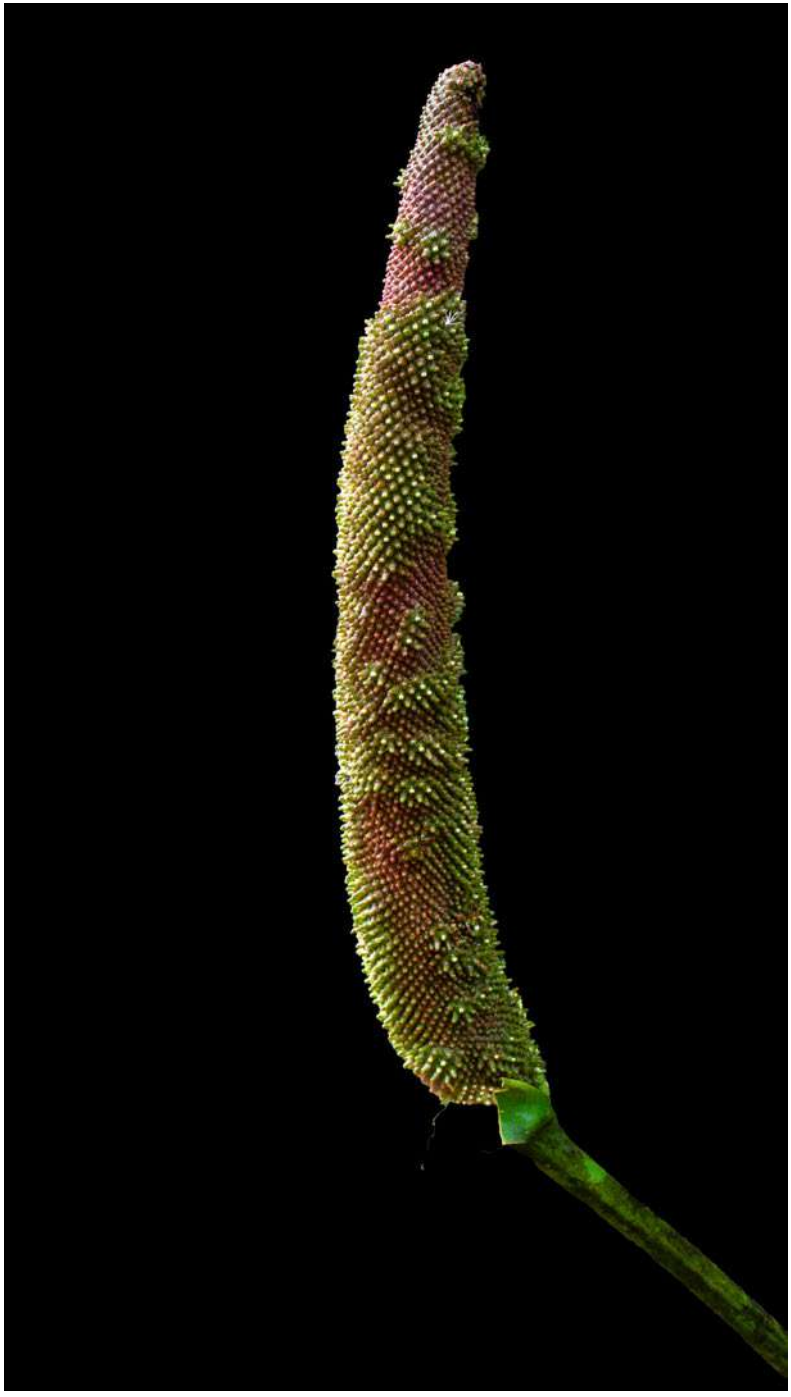

Figure 19. *Anthurium phlebodes — R. Zambrano C. 02*. Early infrutescence. — Photo M. Sulen

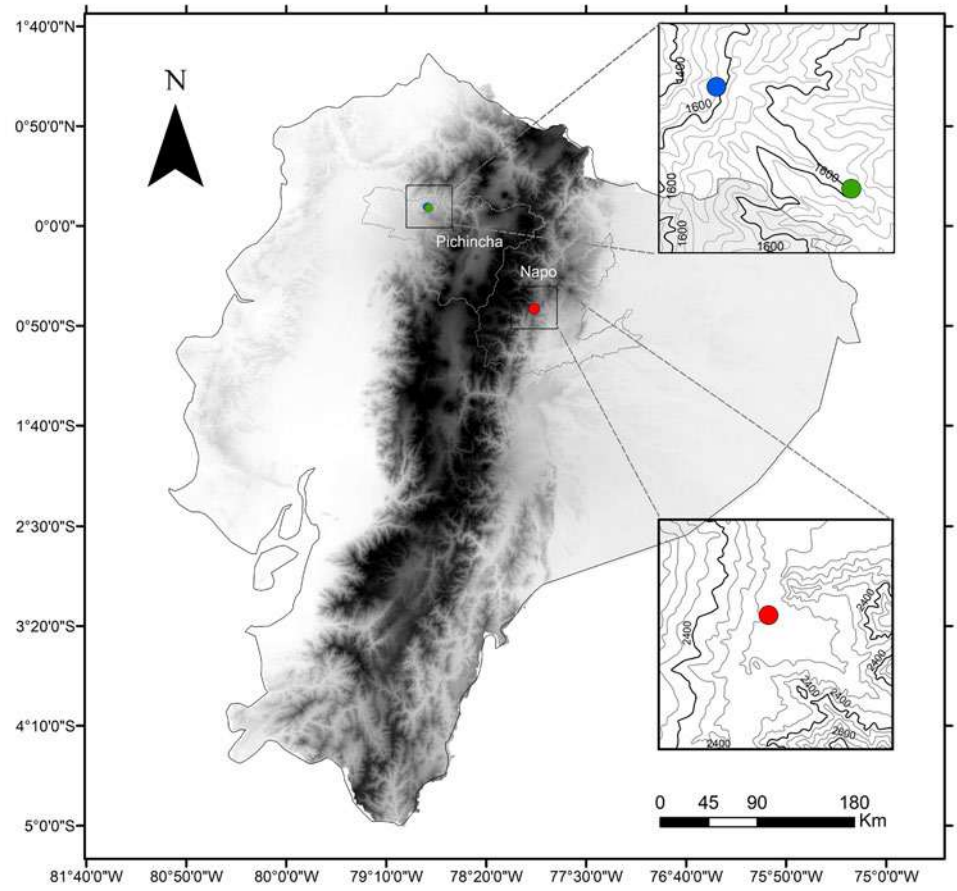

Figure 20. Distribution of *Anthurium antisanense* (red dot) on the Eastern Andean Slopes, Napo Province, Ecuador; *Anthurium patriciaroseroae* (blue dot), and *Anthurium phlebodes* (green dot) on the Western Andean Slopes, Pichincha Province, Ecuador. — Map R. Zambrano C. and A. Villarreal.

REFERENCES

Croat, T.B. & G.S. Bunting (1979). Standardization of *Anthurium* descriptions. *Aroideana* 2(1): 15–25.

Croat, T.B. (2019). Araceae, a family with great potential. *Annals of the Missouri Botanical Garden* 104(1): 3–9.

Gentry, A.H. (1988). Changes in plant community diversity and floristic composition on environmental and geographical gradients. *Annals of the Missouri Botanical Garden* 75: 1–34.

Holdridge, L.R., W.H. Hatheway, T. Liang, & J.A. Tosi (1971). *Forest Environments in Tropical Life Zones*. Pergamon Press, New York.

IUCN (2023). The IUCN Red List of Threatened Species. Version 2023-1. Retrieved from https://www.iucnredlist.org

Mittermeier, R., W. Turner, F. Larsen & T. Brooks (2011). *Global Biodiversity Conservation: The Critical Role of Hotspots*. Springer, Berlin, Heidelberg.

Ministerio del Ambiente "MAE". (2017). *Deforestación del Ecuador Continental periodo 2014–2016*. Retrieved from http://190.152.46.74/documents/10179/1149768/DEFORESTACION_ECUADOR_CONTINENTAL_21%204_2016.pdf/8f5a1064-4aa7-47b0-80a0-3a54bbbb9fae. [Accessed on 31 January 2024].

Monitoring of the Andean Amazon Project "MAAP". (2019). *Amazon Conservation Project*. Retrieved from https://maaproject.org/2019/choco-ecuatoriano/. Accessed on [31 January 2024].