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A new Species of *Anthurium* section *Calomystrium*, subsection *Rupicola* (Araceae) from Peru

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Abstract

Anthurium is a highly diverse neotropical genus, in which many species remain undescribed. Here, we describe a new species of *Anthurium* (sect. *Calomystrium*, subsect. *Rupicola*) from Central Peru, which we name *Anthurium huaytae*. The species is also the first record for subsect. *Rupicola* for Peru. *Anthurium huaytae* resembles *A. amnicola* but differs by its epiphytic habit (vs. epipetric habit), white or light lavender spathe (vs. purple spathe), persistent cataphylls (vs. promptly deciduous cataphylls) and slimmer flowers in relation to its length (ratio 1:1.1) (vs. flowers with a length-width ratio of 2:3). We provide a description, photographs and the floral scent composition of the new species. In addition, an updated identification key including all the known species of *Anthurium* subsect. *Rupicola* is also provided.

Keywords: epiphytic plant, floral scent, montane forest, new record, rupiculous plant

Introduction

The neotropical *Anthurium* Schott (1829: 828), accounting for 1144 described species, is the largest genus of Araceae (Carlsen & Croat 2013). The genus occurs from Mexico to southern Brazil, northern Argentina, and Paraguay (Carlsen & Croat 2019), and *Anthurium* highest richness and endemicity is found in the Andes of Ecuador, Colombia and Peru (Reimuth & Zotz 2020). Recent estimations suggest that *Anthurium* diversity is around 3000 species throughout the Neotropics (Boyce & Croat 2020), which indicates that less than half of the species have been described. While the diversity of *Anthurium* from Central America is relatively well known (Croat 1983, 1986) and was recently revised (397 accepted species; Croat *in press*), the diversity of *Anthurium* from South America has been the subject of little revisionary work aside from a comprehensive revision of sect. *Pachyneurium* (Schott 1860: 466) Engler (1905: 64) (Croat 1991) and sect. *Leptanthurium* (Schott 1860: 447) Engler (1905: 87) (Delannay & Croat 2020).

Anthurium includes 20 taxonomic sections (Croat & Carlsen 2020), although only eight seem to be monophyletic (Carlsen & Croat 2019; Croat & Carlsen 2020). Among those sections, *Calomystrium* (Schott 1860: 496–497) Engler (1905: 200), in its current circumscription, includes around 184 species and seems to be a monophyletic group (Carlsen & Croat 2013). Although cordate leaf blades have been traditionally used to recognise this sect. (Carlsen & Croat 2013), some species bear lanceolate blades such as those of the subsect. *Rupicola* Croat (in Croat *et al*. 2007: 24). Subsect. *Rupicola* is a small group that currently includes 9 species, all of them having a rupiculous habit. Plants of this subsection are characterized by being small in size, having slender internodes, and lanceolate to oblong-elliptic blades (Croat *et al*. 2007). So far, representatives of subsect. *Rupicola* are only known from Colombia, Ecuador and Panama, all presenting narrow distributions (Croat *et al*. 2007).

In Peru, 138 *Anthurium* species are currently recognized (WCSP 2022). Although the knowledge about the Peruvian *Anthurium* diversity has considerably increased during the last three decades (82 species in Brako & Zarucchi 1993), it is calculated that a similar number of *Anthurium* species remains undescribed for Peru (T.B. Croat pers. obs.). Further field expeditions and revision of herbarium material are helping to shorten this gap. During field expeditions

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in central Peru, an epiphytic plant without reproductive structures was spotted and collected then potted to allow it to produce flowers. When the plant eventually produced flowers, it showed to be a remarkable *Anthurium* species bearing a small but colourful and highly scented spadix. Given the plant's particular morphological and scent characteristics, we concluded that it belongs to an undescribed species of *Anthurium* subsect. *Rupicola*, which was so far unknown to the country. Here, we describe this new *Anthurium* species and provide information on its habitat, floral scent composition and characteristics to discriminate this species from other species of the subsect. *Rupicola*.

Materials and methods

A single plant material was collected from central Peru, near Chontabamba town in Pasco Department, in November 2019. The plant was then cultivated in a pot and has produced flowers continuously since January 2021. Detailed photographs were taken with a Nikon D3300 equipped with Tamron SP 90 mm F/2.8 lenses.

Floral scents emitted by the inflorescence were collected following standard headspace methods (for details see Martel *et al.* 2021). Briefly, an inflorescence was bagged using a roasting bag for one hour, after which, the emitted scent was pooled out to an adsorbent filter (a mixture of Carbotrap and Tenax, ratio 1:1) with the help of a membrane pump. Floral scents trapped in the adsorbent filters were then analysed in the laboratory by gas chromatography coupled with mass spectrometry.

One specimen of the new species was dried and deposited at HOXA (the acronym follows Thiers 2023). Descriptions of vegetative and reproductive structures are based on standards by Croat & Bunting (1979). An informal conservation status assessment was carried out following IUCN (2022) criteria. Finally, we used Croat *et al*. (2007) to compare the morphology of the new entity with all the other *Anthurium* species of the sect. *Calomystrium* subsect. *Rupicola*.

Taxonomy

Anthurium huaytae Croat & C.Martel, *sp. nov*. (Figs. 1–2)

Most similar to Anthurium amnicola Dressler, but differing by its epiphytic habit (vs. epipetric habit in A. amnicola), white or light lavender spathe (vs. purple spathe in A. amnicola), persistent cataphylls (vs. promptly deciduous cataphylls in A. amnicola) and slimmer flowers in relation to its length (ratio 1:1.1) (vs. flowers with a length-width ratio of 2:3 in A. amnicola). Also similar to Anthurium antioquiense Engl., but differing by its epiphytic habit (vs. lithophytic habit in A. antioquiense), narrowly ovate spathe (vs. lanceolate in A. antioquiense) and the 5 primary lateral veins on either side of the midrib (vs. 3–4(6) primary lateral veins on either side of the midrib in A. antioquiense).

Type:—PERU: Pasco: Province of Oxapampa, District of Chontabamba, Marquizo, SW of Oxapampa, flowered in cultivation, cultivated by Abel Huayta, 1825 m elevation, 02 August 2022, *C. Martel, T. B. Croat & A. Huayta 151* (holotype HOXA! [Accession 80405], isotypes MO!, K!).

Epiphytic herb to less than 30 cm high; ***internodes*** short, 4.0–7.5 mm long, 0.5–1.0 cm diam.; ***cataphylls*** 3.5–6.5 cm long, persisting green and intact at upper internodes, eventually brownish, somewhat broken up but not fibrous; ***petioles*** 7–13 cm long, 4–5 mm diam., subterete, medium green, semi-glossy, with an obscure narrow sulcus adaxially; ***leaf blades*** narrowly elliptic to lanceolate, 14–17 cm × 4–6 cm, three times longer than broad, two times longer than petioles, subcoriaceous, dark green and glossy above, light green below, attenuate apex, cuneate at base; ***midrib*** narrowly rounded and paler above; ***primary lateral veins*** 5 pairs, arising from below the middle, spreading at 27º angle; ***collective veins*** 1 pair, arising from the base, 8–10 mm from margins midway. ***Inflorescence*** erect, 18–28 cm long; ***peduncle*** 13–25 cm long, terete; ***spathe*** spreading and weakly reflexed, narrowly ovate, white (weakly tinged with lavender) or light lavender, matte on the inner surface, semi-glossy on the outer surface, inserted at 45º angle on peduncle; ***spadix*** stipitate (stipe 7–9 mm pale green), terete, 1.7–2.4 cm long, 3.5–4.5 mm diam., lavender-violet, semi-glossy; ***flowers*** 6–7 per spiral, 2.0–2.2 × 2.3–2.6 mm, sub-rhombic to weakly 4-lobed; ***lateral tepals*** 1.0–1.2 × 0.8–1.0 mm, subtriangular to pentagonal, inner margin broadly rounded, outer margin 3-sided; ***pistils*** with stigma weakly protruding, whitish; ***stamens*** not seen. ***Infructescence*** not observed.

Phenology:—In cultivation, the species flowered several times throughout the year.

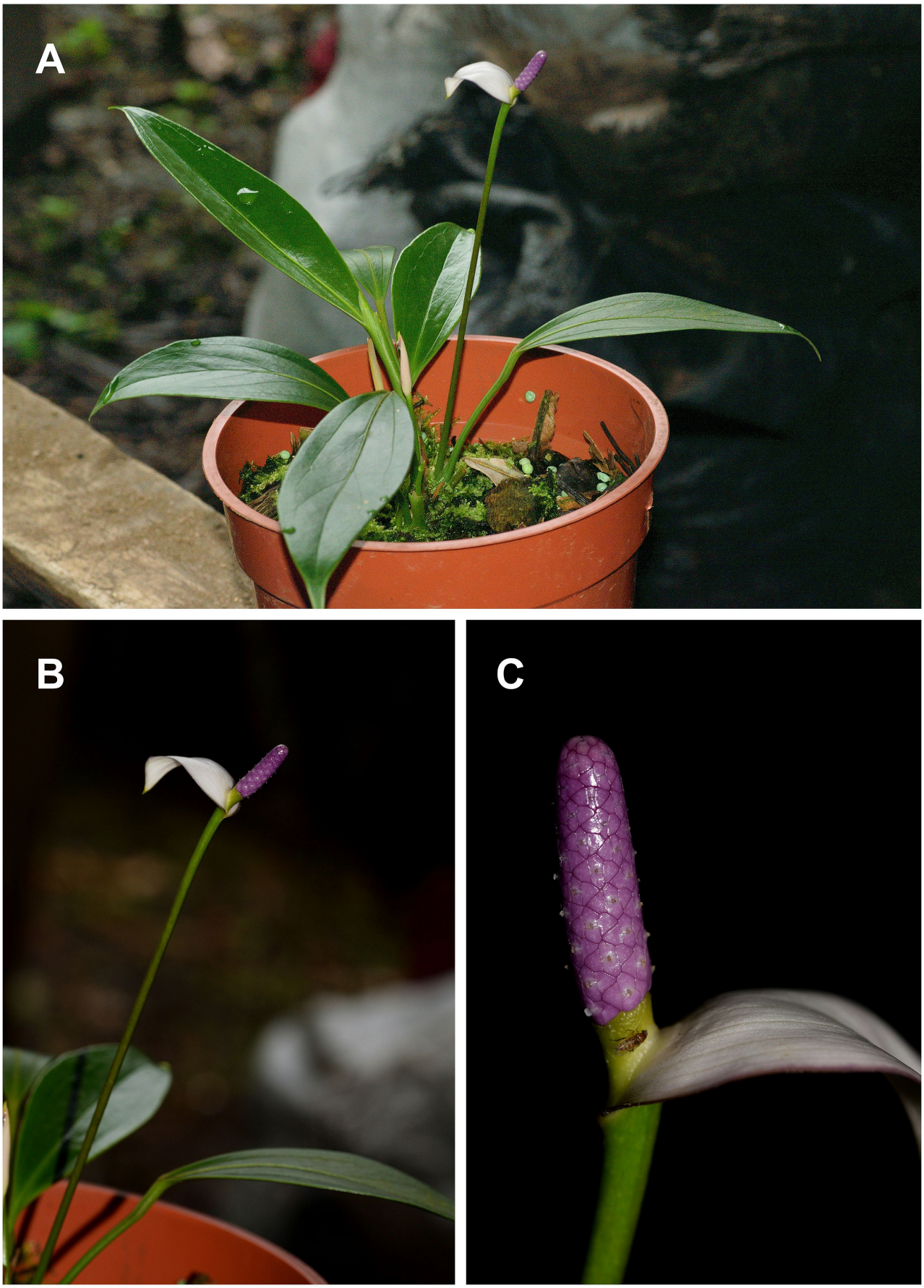

FIGURE 1. *Anthurium huaytae*. **A.** Plant habit, plant growing in a pot. **B.** Peduncle, spadix and spathe. **C.** Inflorescence, showing details of the flowers. Photographs by C. Martel.

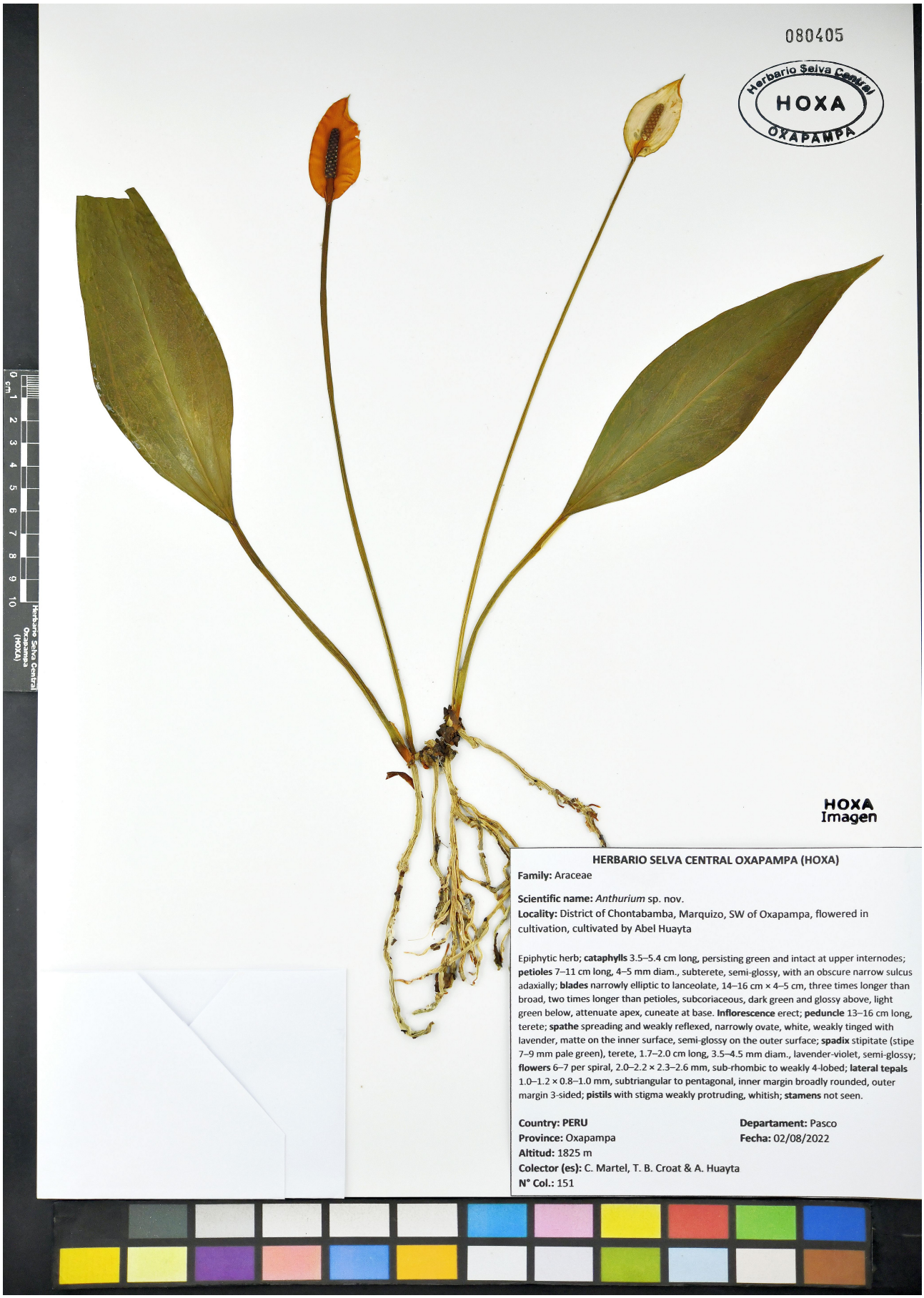

FIGURE 2. *Anthurium huaytae*. Herbarium type specimen (*Martel et al. 151*, HOXA!). Photograph by Rocio Rojas. Reproduced with permission.

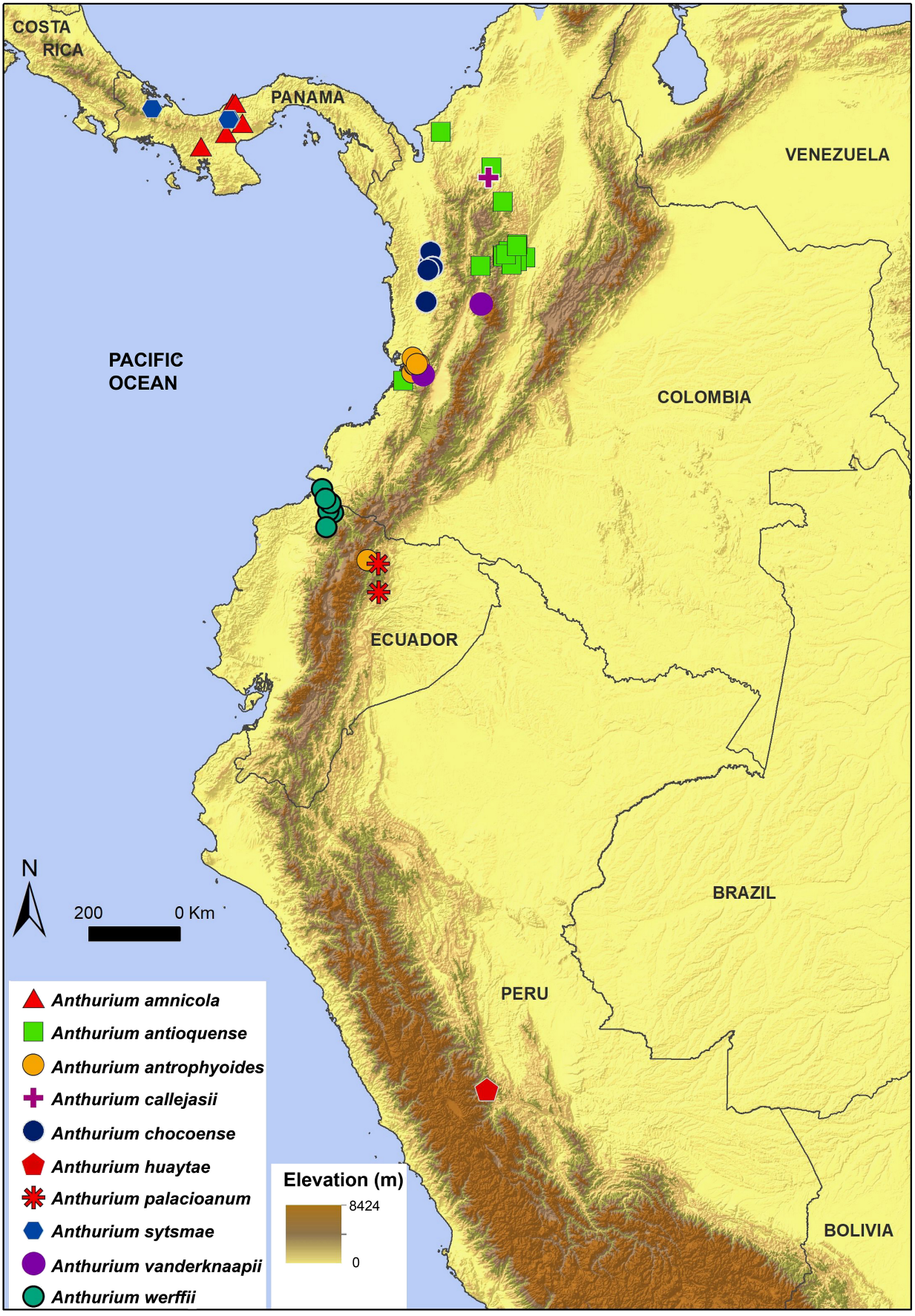

FIGURE 3. Distribution map of the *Anthurium* species of the section *Calomystrium* subsection *Rupicola* (based on Croat *et al*. 2007). Prepared by Roxana Rojas.

Distribution, habitat, and ecology:—*Anthurium huaytae* is known from a single locality in the wet montane forests of central Peru (Fig. 3). Different from the other nine species of subsect. *Rupicola* that cling to rocks in streams, *A. huaytae* was found growing as an epiphyte on a tree. The floral traits associated with *A. huaytae* are congruent with those of some plants pollinated by male euglossine bees (Williams & Whitten 1983; Gerlach & Schill 1991), such as colour (the lavender-violet spadix) and floral scent composition (see below), which gather perfumes from flowers and other sources.

Ten chemical compounds were detected in the scent bouquet of the *A. huaytae* inflorescence (Table 1). Terpenoids are best represented with eight compounds followed by one aromatic and one aliphatic compound. The compounds 1,8-cineole and benzyl acetate were the dominant representing more than 90% of the total emitted scent (Table 1). Both main compounds are common among male euglossine pollinated aroids (Diaz Jiménez *et al*. 2019) and specifically 1,8-cineole has been identified in some male euglossine-pollinated *Anthurium* (Hentrich *et al*. 2010).

TABLE 1. Chemical composition of scents emitted by *Anthurium huaytae* inflorescence grouped by chemical class. KI indicates Kovats index. Compound emission is provided in percentage.

Chemical Compound	KI	Relative proportion (%)
Aromatics		
Benzyl acetate	1162.64	41.82
Terpenoids		
Thuja-2,4(10)-diene	960.54	0.36
o-Cymene	1025.73	4.28
1,8-Cineole	1034.75	49.64
γ-Terpinene	1055.27	0.71
Terpinolene	1079.76	0.38
p-Cymenene	1084.25	1.12
Verbenone	1217.56	0.41
Carvacrol	1305.58	0.87
Aliphatics		
2-Ethylhexyl acetate	1139.13	0.39

Conservation Status:—*Anthurium huaytae* is known from a single locality, where a few specimens have been spotted. However, since some areas near the type locality (e.g. areas in Yanachaga–Chemillén National Park and Bosque Sho'llet Conservation area) have similar ecological conditions, more individuals of other populations may potentially exist. Thus, its conservation status cannot be assessed at this time and must be classified as data deficient (DD) according to the IUCN (2022) criteria.

Eponymy:—The species is named in honour of Abel Huayta, a nurseryman and orchid enthusiast from Oxapampa who made the first collection and successfully propagated the species.

Notes:—*Anthurium huaytae* is the first report of the subsect. *Rupicola* for Peru, extending the occurrence of the subsection to the south in more than 1000 km in a straight line (Fig. 3). All the other nine species of subsect. *Rupicola* occur in the rain and montane forests of Colombia, Ecuador and Panama, most showing a rather restricted distribution (Fig. 3). *Anthurium huaytae* is characterized by its moderately small habit, short internodes, intact cataphylls, terete petioles, oblong-elliptic blades with two basal veins serving as the collective veins, two primary lateral veins moderately remote from the margin, a moderately pedunculate inflorescence with narrowly ovate, spreading-reflexed, white spathe and a stipitate lavender-violet spadix. Furthermore, *A. huaytae* is so far the only *Anthurium* species of subsect. *Rupicola* that grows as an epiphyte in contrast to the others that are adapted to grow on rocks. The new species is most similar to *Anthurium amnicola* Dressler (1980: 55) from Panama, which might be its closest relative. They both share rather elliptic blades, a violet spadix tapered toward the apex, the spathe inserted at a 45° angle on the peduncle, and a relative short spadix compared to the spathe. *Anthurium huaytae* is also similar to *Anthurium antioquiense* Engler (1905: 174) and they both share the persistent cataphylls and the lavender spadix.

Key to species of sect. *Calomystrium* subsect. *Rupicola*

1. Leaves with a single midrib, either lacking a pair of basal veins or with a single pair of basal veins (one on either side of the midrib) promptly merging with the margin. ..... 2.
- Leaves with 3 to 9 veins (including the midrib) at the base of the leaf blade and with one or more pairs of basal veins extending all

the way to the apex ..... 5.
2. Spathe broadly ovate, flamingo-orange; spadix orange ..... *A. vanderknaapii* Croat
- Spathe lanceolate or elliptic, usually green, sometimes white or lavender-purple; spadix purplish, whitish or greenish ..... 3.
3. Leaf blades more than 30 cm long, broadest well above the middle; collective veins arising from just above the base; tertiary veins not prominulous; Colombia, Antioquia, ca. 200 m ..... *A. callejasii* Croat
- Leaf blades less than 22 cm long, broadest at about the middle; collective veins arising from one of the primary lateral veins in the middle or lower third of the blade; tertiary veins prominulous; Central Panama and NE Ecuador, 200–550 m ..... 4.
4. Spadix green; berries early emergent, tapered and pointed at the apex, initially obovoid and green, maturing red-orange; fibres of weathered cataphylls eventually falling; Central Panama, 200–400 m ..... *A. sytsmae* Croat
- Spadix yellow; berries emerging mature, globose and purple; fibres of weathered cataphylls very persistent; NE Ecuador, 500–550 m ..... *A. werffii* Croat
5. Leaves rhombic or ovate-rhombic, broadest well below the middle; 7–11 veins at the base of leaf blade (3–5 basal veins per side) or with basal veins lacking; spadix white ..... 6.
- Leaves lanceolate or elliptic; 3 veins at the base of leaf blade (midrib and a single pair of basal veins); spadix white or lavender 7.
6. Leaf blades rhombic, drying subcoriaceous, dark brown on upper surface; spathe white; Colombia, slopes of western Andes in Valle Department, 0–250 m ..... *A. antrophyoides* Killip
- Leaf blades ovate-rhombic, drying moderately thin, greenish to greyish yellow-brown on the upper surface (if the weak submarginal veins are included); spathe green; Ecuador, slopes of eastern Andes in Napo Department, 1800 m ..... *A. palacioanum* Croat
7. Primary lateral veins numerous (more than 10 per side), sometimes not distinguishable from interprimary veins; cataphylls weathering into persistent fibres; spathe green; spadix white at anthesis ..... *A. chocoense* Croat
- Primary lateral veins 3–5 pairs per side, distinguishable from interprimary veins; cataphylls deciduous with only their papery bases remaining or persistent and intact, never fibrous; spathe white to lavender; spadix dark violet-purple, lavender-purple, yellowish or pink at anthesis ..... 8.
8. Epiphytic plants from Central Peru; spathe white (weakly tinged with lavender) or light lavender, ovate; spadix lavender-violet; scent spicy with honey notes ..... *A. huaytae* Croat & C.Martel
- Epipetric plants from Panama or Colombia; spathe white to purplish violet, lanceolate or ovate; spadix lavender or dark violet-purple; scent spicy or mint-scented ..... 9.
9. Spathe ovate, lavender to purplish violet; spadix dark violet-purple; flower scent spicy, but not smelling of mint; berries almost purple; stems 4–6 mm diam.; cataphylls 4–5 cm long, soon deciduous, only their papery bases remaining; Central Panama, Coclé Province ..... *A. amnicola* Dressler
- Spathe lanceolate, usually white, rarely lavender; spadix lavender; flower scent minty; berries green or white; stems 12–15 mm diam.; cataphylls 5–11 cm long, persisting intact, drying reddish brown; north-western region of Colombia ..... *A. antioquiense* Engler

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