

The *Anthurium bredemeyeri* Complex (Araceae) of Venezuela and Colombia

THOMAS B. CROAT

Missouri Botanical Garden, Box 299, St. Louis, Missouri 63166

Abstract: *Anthurium bredemeyeri* Schott, a Venezuelan endemic in Section *Xialophyllum*, is redefined and redescribed. Five additional species, all members of Section *Porphyrochitonium* and previously confused with *A. bredemeyeri*, are described as new. These are *A. bernardii*, *A. fernandezii*, *A. gehrigeri*, *A. gonzalezii*, and *A. smithii*.

Because of the immense amount of variation in specimens identified as *A. bredemeyeri* Schott, a more thorough investigation of this material was undertaken, resulting in a redefinition of *A. bredemeyeri*. Specimens from the type locality at Colonia Tovar in the State of Aragua lacked any dark glandular punctations known to be characteristic of Section *Porphyrochitonium* (Croat, 1983). Engler, in fact, placed *A. bredemeyeri* in his Section *Xialophyllum*, a group that consistently lacks dark glandular punctations. In this paper, 5 new species of Venezuelan plants which have long been confused with *A. bredemeyeri*, all having dark glandular punctations and all typical members of *Porphyrochitonium* (as defined by Croat & Sheffer, 1983) are described. These plants share characteristics in common with *A. bredemeyeri*, including a similar terrestrial or low-growing epiphytic habit in forest understory at moderately high elevations, an elongate stem (usually exceeding 30 cm but up to 1.5 m in length), long petioles (in all but one species they are longer than the blade), somewhat elongate blades

which are never prominently lobed at the base, and long inflorescences with relatively narrow, green to purplish spathes and green to purplish, scarcely tapered spadices. Considering the large variation in *Anthurium* species, it is not surprising that these species have been confused, but it is surprising that so many novelties have been masquerading for so long as a single species from such a small area. Species of *Anthurium* do have a tendency, however, to have many endemics, (Croat, 1983) and the species described here do sort themselves out geographically to a great extent with four of the species, i.e., *A. bernardii*, *A. bredemeyeri*, *A. gehrigeri*, and *A. gonzalezii*, being apparent narrow endemics, while the other two species, *A. smithii* and *A. fernandezii*, are chiefly from the Cordillera de los Andes or the Cordillera Coastal respectively.

A key is provided for the identification of species of this complex, and all species are described. It should be pointed out that fruiting collections of most species are lacking and attention should be given to the collection of fruiting material.

Key to the *Anthurium bredemeyeri* Complex

- A. Blades epunctate, mostly more than 3.5 times longer than wide, elliptic, mostly acute at the base, petioles usually shorter than the blade; vicinity of Colonia Tovar (Aragua, Venezuela)..... *A. bredemeyeri* Schott
- A. Blades dark glandular-punctate, at least on the lower surface, mostly less than 3.5 times longer than wide, mostly ovate to narrowly ovate, petioles longer than the blade (except *A. gehrigeri*); more widespread species. B
- B. Blades glandular-punctate on the lower surface only; widespread throughout the Cordillera de los Andes from Zulia to Tachira and in Colombia. *A. smithii* Croat
- B. Blades glandular-punctate on both surfaces; species with relatively narrow ranges.
- C. Blades usually less than 7 cm wide, broadest usually at or above the middle; primarily lateral veins 6-7, moderately inconspicuous, interprimary veins scarcely visible. *A. gonzalezii* Croat
- C. Blades usually more than 7 cm wide, broadest usually below the middle, ovate to narrowly ovate; primary lateral veins 8-10, prominent below, the interprimary veins also moderately prominent on drying. D
- D. Petioles shorter than the blades; stems with internodes long (generally 3-8 cm long near apex); spadix with 2-3 flowers visible per spiral; endemic to Merida and Portuguesa, 2300-2800 m elevation. *A. gehrigeri* Croat
- D. Petioles longer than the blades; stems with internodes short in upper part of the stem (generally 1-2 cm or less); spadix with 4-6 flowers visible per spiral; occurring farther to the NE in the Cordillera de los Andes (Trujillo, Yaracuy) or in the coastal Cordillera at less than 1900 m elevation. E
- E. Spadix with 4-5 flowers visible per spiral, the tepals drying straightened and fully erect at anthesis and in fruit; stamens and pistils mostly fully visible.
..... *A. bernardii* Croat
- E. Spadix with 2-3 (rarely 4) flowers visible per spiral, the tepals drying weakly cucullate in the normal manner (i.e., end of tepal truncate, turned inward toward the berry); only the tips of stamens and the pistil visible. ... *A. fernandezii* Croat

Anthurium bernardii Croat, sp. nov.

TYPE: Venezuela: Trujillo: Virgin forest above Escuque, between Escuque and La Mesa de San Pedro; elev. 1300-3000 m. *Steyermark 104669* (MO 2673894, holotype: VEN, isotype).

Planta terrestris; internodia brevia, ca. 1 cm diam.; cataphyllum persistens in fibris tenuibus; petiolus subteres, sulcatus 28-45 cm longus; lamina subcoriacea, ovata, 19-33 cm longa, 12-18 cm lata, basi rotundata, pagina glandulosa-punctata; pedunculus teres, 16-32 cm longus; spatha lanceolata, ad 7 cm longa, 8-14 mm lata; spadix rubro-purpureum, 6-5-11 cm longa, ad 6 cm lata.

Terrestrial; stem erect, 10-20 cm long; internodes short, 8-10 cm diam. (dried); cataphylls 6.5-12.5 cm long, promptly turning reddish brown and persisting in a network of pale fibers (often only the basal parts at lower nodes). Leaves with petioles 28-45 cm long, 3-5 mm diam. midway, subterete, sulcate adaxially, much longer than blades; geniculum 2-3.3 cm diam., drying blackened; blades subcoriaceous, ovate, 19-33 cm long, 12-18 cm wide, about 2/3 as long as petioles, acuminate at apex, rounded at base; both surfaces dark glandular-punctate (drying brown, matte above, semi-glossy beneath), midrib convex above and below; primary lateral veins in 8-12 pairs, spreading from midrib at ca. 55 degree angle, at least those in the middle of the blade arcuate, drying weakly raised and scarcely distinguishable from the interprimary veins above, raised and about equaling the collective vein below; collective vein arising from the base straight or weakly loop-connected at the primary lateral veins, 2-7 mm from the margin; tertiary veins drying prominulous on both surfaces. Inflorescences erect, shorter than the petioles; peduncle

terete, 16-32 cm long; spathe moderately thin, erect to reflexed-spreading, lanceolate, to 7 cm long, 14-18 mm diam, rounded and clasping at base, green to somewhat maroon; spadix scarcely tapered, maroon to violet-purple, 6.5-11 cm long, 5-6 mm diam; flowers (dried) rhombic, 2.8-4.4 mm long, 2.5-2.8 mm wide, 5-6 per principal spiral; tepals weakly glossy, lateral tepals 2-2.6 mm wide, turned markedly upward in bud and opposing the other lateral tepal of a pair to form a much-flattened bud-like union, stiffly erect and narrowly rounded after anthesis; pistils ovoid to rounded, probably purplish, (wholly visible on dried post-anthesis spadix), the stigma sessile, button-like, 0.7 mm diam.; stamens ca. 3 mm long, (full length) at least some with filaments wholly exposed on drying, about as long or slightly longer than the tepals and the pistil and positioned between the two at anthesis; pattern of staminal emergence unknown; anthers 0.5 mm long, 0.3 mm wide, the thecae ellipsoid, borne at angle to one another when fully opened, not divaricate in face view. Berries not seen.

Anthurium bernardii is endemic to Venezuela, occurring in the Cordillera de Los Andes at 1300-1900 m elevation in adjacent portions of the states of Barinas, Merida and Trujillo.

The first collection of the species was collected by A. L. Bernardi (Geneva Herbarium) in 1957 and the species is named in his honor. It is a member of Section *Porphyrochitonium* and is distinguished by its long-petiolate, thick, ovate leaf blades which are dark glandular-punctate on both surfaces, by its slender stem with persistent cataphyll fibers, and especially by its unusual flowers which are unlike any other known species of *Anthurium*, having opposing lateral tepals which are flattened and erect with their respective lateral margins very near one another in bud (much like a pair of folded hands held in prayer with the fingers ex-

tended) as in a much flattened bud. At anthesis, the tepals are fully extended or nearly so, often with the full length of both the pistil and style visible much as in most ordinary flowers. The extended flower parts and especially the tepals, which are completely straightened and look like round-ended spades, give the entire spadix a very coarse, asperous appearance.

If the fresh flowers look anything like the dry ones, this species is probably not closely related to any other species of Section *Porphyrochitonium*; certainly it is not closely related to *A. bredemeyeri*, with which it has been confused. Probably in terms of habit and blade shape it would be most easily confused with *A. fernandezii*, which has similar leaves that are also punctate on both surfaces. That species differs in having tepals of the fruiting spadix shaped normally (i.e. the tepals do not straighten out to become spade-shaped, but retain their normal, almost cucullate, shape, even in fruit). In addition, *A. bernardii* has 5-6 flowers per spiral whereas *A. fernandezii* usually has only 2-3 flowers visible per spiral.

Like several other species with long-petiolate blades and slender stems with persistent cataphyll fibers (e.g. *A. fernandezii*, *A. smithii*, and *A. gonzalezii*), *A. bernardii* has been confused with *A. bredemeyeri*, but that species lacks dark glandular punctations on either blade surface. (See also discussion of *A. gehringeri*).

VENEZUELA. BARINAS: Altamira-Calderas, 850-1600 m, Bernardi 6885 (NY). MÉRIDA: carretera Mérida-Barinas, 16 km E of Santo Domingo, 975 m. Bunting 2605 (MY). TRUJILLO: Es-cuque-La Mesa de San Pedro, along Quebrada Los Ríos, 1300-1650 m, Steyermark 104669 (MQ): 1-4 km NNE of Guaramecal, 9° 12'N, 70° 09'W, 1600-1900 m. Llesner et al. (MO, NY, VEN).

Anthurium bredemeyeri Schott non Engl., Oesterr. Bot. Wochenbl. 7:269. 1857.

LECTOTYPE: Venezuela: Aragua: Colonia Tovar, Fendler 1346 (MO 2131314, holotype; K, isolectotype).

A. bredemeyeri Schott var. *elongata* Engl., in Martius, Fl. Bras. 3(part 2):80. 1878. TYPE: Venezuela: (As the typical variety).

Terrestrial or sometimes a low epiphyte; stems to 30 cm or more long; internodes 1 cm long or shorter (at least on the apical part of the stem), 8-15 mm diam., cataphylls 7-14 cm long, promptly weathering to persistent, pale brown fibers, ascending and densely covering at least most of the upper part of the stem. Leaves with petioles erect, 15-43 cm long, 3-4 mm diam., terete, almost as long to scarcely half as long as the blade, rarely somewhat longer than the blade; blade mostly erect, subcoriaceous, oblong-lanceolate to narrowly oblong, rarely oblong-elliptic, 13-35 cm long, 2-9.5 cm wide, broadest at or below the middle, gradually long-acuminate, acute to obtuse at the base, moderately bicolorous, drying dark brown to olive green above, yellow-green to brown beneath, semi-glossy, epunctate; midrib convex and narrow above, convex below; primary lateral veins 5-10, arising at 30-45 degree angle and extending almost straight to the collective veins, sunken in valleys above (the blade appearing weakly pleated), raised beneath; collective vein arising from the base, 3-9 mm from the margin, broadly loop-connecting the primary lateral veins; tertiary veins inconspicuous when fresh (drying prominent). Inflorescence erect, longer than the petioles but shorter than the leaves;

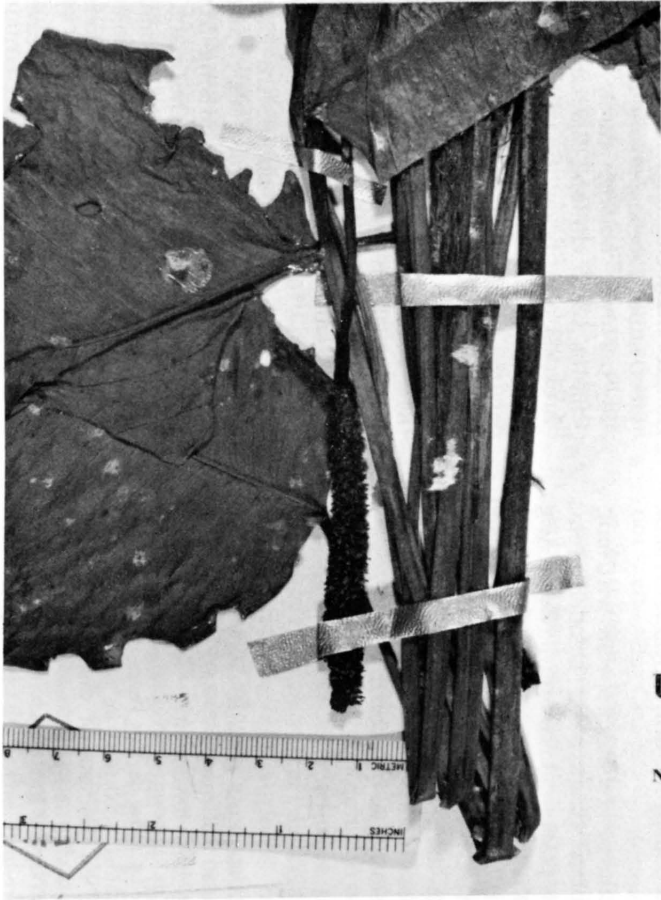


Fig. 1. *Anthurium bernardii* Croat, herbarium specimen, *Bernardi* 6885 (NY).

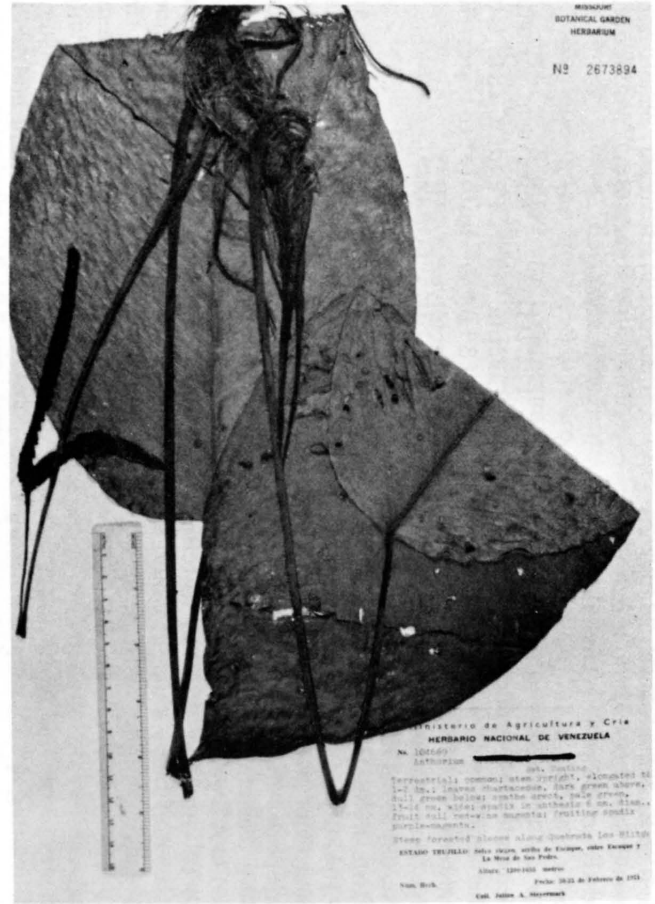


Fig. 2. Type specimen, *Steyermark* 104669 (MO).

peduncle 14-42 cm long, 2-4 mm diam., terete; spathe narrowly lanceolate, green, erect-spreading to erect, 2.3-11 cm long, 6-12 mm wide, narrowly acuminate, (the margins inrolled), rounded and clasping at base; spadix stipitate 4-12 mm, scarcely tapered, 3-10 cm long, 4-5 mm diam. midway, green but soon becoming dark violet-purple to maroon; flowers (dried) rhombic, 1.8-2.9 mm long, 1.6-2.5 mm wide, the sides parallel to the spiral straight, those perpendicular to the spiral sigmoid; 4-6 flowers visible per spiral; tepals 1.2-1.7 mm wide, the inner margins broadly rounded, the outer margins obtusely triangular; pistil not emergent, stigma slit-like, 0.5 mm long; staminal sequence unknown, remaining weakly exerted after anthesis in a close (not closed) circle around the pistil; anthers 2.5 mm long, 3.5 mm wide, the thecae ovate, scarcely divaricate. Berries not seen.

Anthurium bredemeyeri is endemic to Venezuela, and is known only from the vicinity of the type locality in Aragua and the Distrito Federal near Colonia Tovar at 920-2300 m elevation, growing terrestrially (rarely as a low trunk epiphyte) in densely forested areas.

The species lacks glandular punctations and though it looks like a member of Section *Porphyrochitonium* in some respects, it is best placed in Section *Xialophyllum*. It is recognized by its narrowly oblong-elliptic epunctate (see note below) blades which are narrowly long-acuminate at the apex and obtuse to acute at the base, by the slender, elongate stems with short internodes bearing pale cataphyll fibers, and by the inflorescence generally borne among the leaves (but shorter than the leaves). The slender, tapered purplish spadix is usually stipitate 6-10 mm and the green, oblong-lanceolate spathe is erect-spreading at anthesis.

The species has long been confused with two other widespread species. One

of these species, *A. smithii* Croat, is common throughout the Cordillera de los Andes from Zulia to Tachira, but is more common in the central and southwestern part of the Cordillera. It is also common in adjacent Colombia, especially in the Eastern Cordillera (in Santander and Santander Norte).

Anthurium smithii differs from *A. bredemeyeri* in being conspicuously dark glandular-punctate on the lower blade surfaces and in usually having blades proportionately broader and more frequently rounded to obtuse at the base. Both species have similar inflorescences, with a generally green spathe (which may become tinged with purple) and a spadix which may be either green or violet-purple or maroon at anthesis. In addition, both species have 4-6 flowers visible in each spiral of the spadix.

One collection of *A. bredemeyeri* (Croat 54455) is unusual in being lightly but densely flecked on the lower blade surface with dark specks of relatively uniform size and shape, but these can be easily rubbed off and may be areas where insects have oviposited. In any event, these structures differ markedly from the structures found on *A. smithii*, which are more definitely gland-like and cannot be easily removed from the leaf surface.

Although Engler did not admit any significance in the presence or absence of punctations in *Anthurium*, it is interesting to note that in his revision of *Anthurium* (1905) he placed *A. bredemeyeri* in Section *Xialophyllum* (a consistently epunctate group); whereas, he placed all glandular-punctate Andean species in Section *Urospadix*, a group which, as defined by Engler, included many species with glandular-punctate blades. The latter group is now known to have contained two or more apparently unrelated entities (Croat & Sheffer, 1983).

A second new species that has been confused with *A. bredemeyeri* is *A.*

fernandezii. It ranges somewhat less widely than *A. smithii*, and it occurs from Aragua in the Coastal Cordillera to Trujillo and Mérida. It differs from *A. bredemeyeri* in having narrowly ovate to ovate-elliptic leaf blades that are dark glandular-punctate on both surfaces (thus in the latter character differing also from *A. smithii*, which is glandular-punctate only on the lower surfaces), and by having a spadix with only 2 to 3 flowers visible per spiral.

Two additional species have been confused with *A. bredemeyeri*. Both are apparently more rare than those discussed above and both are new species (see *A. gonzalezii* and *A. bernardii*).

It becomes necessary, I believe, to lectotypify the Fendler collection (1346) since Schott's publication cites no specific type collection, stating only "Caracas" (it is most unlikely that the type specimen was actually made near Caracas). Schott illustrated different collections for this species for his *Icones Aroideae et Reliquiae* (1794-1865) and all agree with plants collected at Colonia Tovar (fiche address 6:d 2-5). Illustration 366 (NYBG #3810) is of Fendler 1346 collected at Colonia Tovar; 367 is of Gollmer s.n., also from Colonia Tovar; 368, collector unknown, is reportedly from Caracas and was cultivated in Vienna; and 369 is a Bredemeyer collection reportedly from Caracas and cultivated in Vienna. (The fact that the species was named in honor of Bredemeyer lends no credence to the theory that *Bredemeyer* 369 was intended as the type by Schott). While any of Schott's drawings might equally serve as the type, the Fendler collection is the only extant specimen, and it is thus selected as the lectotype.

Engler (1878) included *A. bredemeyeri* in Martius' *Flora Brasiliensis*, basing it on the misidentification of a Sello collection from southern Brazil. At the same time, he recognized two varieties, var. *elongata* and var. *lanceolata*.

He cited both Fendler 1346 and Gollmer s.n. for the variety *elongata*. Since Fendler 1346 is also the type of *A. bredemeyeri*, the name was redundant. A line drawing bearing the same name in the Berlin herbarium (B) is annotated Fendler 34 but the Berlin drawing is certainly the same species as the Berlin type of *A. bredemeyeri* (i.e. Fendler 1346).

The variety *lanceolata* is more confusing. For this variety, Engler cited several collections, including a Karsten collection from western Colombia, a Linden collection (246) from Caracas, and a Sello collection (s.n.) from southern Brazil. Two of the latter collections cited for the var. *lanceolata* are later disassociated from *A. bredemeyeri*. In his 1905 revision of *Anthurium* in *Das Pflanzenreich*, Engler lists *A. bredemeyeri* var. *lanceolata* as a synonym of both *A. juniferum* Klotzsch & Karsten (based on Karsten s.n.), a species from the Pacific coast of Colombia, and *A. longicuspidatum* Engl., based on the Sello collection from southern Brazil.

VENEZUELA. ARAGUA: Cañada de la Toma, Fernandez 867 (MY); vicinity Colonia Tovar, Aristeguleta 7139 (MO); Croat 54436, 54455, 60512 (MO); Fendler 2826 (GH), 1346 (GH, MO); Gollmer 18 (photo, GH, NY); Liesner 13492 (MO); Luteyn 8260 (MO, NY); Pittier 9319, 10055 (US); Steyermark 115440 (MO); Trujillo & Fernandez 343, 848 (MY); 8-11 km WNW of Colonia Tovar, 2300 m, Steyermark 91536 (MO, NY); Depto. Libertador, 5-10 km desde la carretera La Victoria-Colonia Tovar, 10° 27'N, 67° 21'W, 2020 m, Steyermark 127784 (MO, US); vicinity Caracas-Colonia Tovar road, Berry 956 (MO); Davidse & Tillett 4061 (MO); Steyermark 91729 (MO); El Junquito to Colonia Tovar, 1800 m, Plowman 7773 (F); El Junquito, Trujillo 1133 (MY); Las Adjuntas, Allart 501 (NY).

Anthurium fernandezii Croat, sp. nov.

TYPE: Venezuela: Aragua: Along road from Maracay to Ocumare de la Costa, primary forest along road; 9° 21'N, 67° 24'W, elev. 1420-1520 m, Croat 60557 (MO 3283959, holotype; VEN, isotype; live at MO.)



Fig. 3. *Anthurium bredemeyeri* Schott, plant in flower, x 1/4, Croat 54436.



Fig. 4. *Anthurium fernandezii* Croat, plant in flower, x 1/4, Croat 60557.

Planta terrestris aut epiphytica; caudex assurgens, usque 20-30 cm longus; internodia brevia, 1-2 cm diam.; petiolus 14-37 cm longus, 4-5 mm latus, adaxialiter complanatus; lamina modice coriacea, ovata aut anguste ovata, 17-28 cm longa, 6.8-15 cm lata, apice acuminato, basi rotundata aut obtusa; inflorescentia erecta, longepedunculata; spathe lanceolata, viridis aut viridis tinctus purpurens, 3.5-6.0 cm longa, 6-8 mm lata; spadix linearis, purpureus, 4.5-13 cm longus, ca. 5 mm diam.; Baccae ignotae.

Epiphytic or terrestrial, stems erect, 20-30 cm or more long; internodes short, 1-2 cm diam.; cataphylls 4.5-8.5 cm long, the fibers tan to light brown, persisting semi-intact at nodes on the upper part of the stem. Leaves semi-erect; petioles subterete, weakly and narrowly sulcate to bluntly C-shaped and flattened adaxially, 14-37 cm long, 4-5 mm diam. midway, medium green, glandular-punctate, longer than the blades; geniculum 1.5-3 cm long, scarcely thicker than the petiole, sulcate; blades erect-spreading, ovate to narrowly ovate, 17-28 cm long, 6.8-15 cm wide, subcoriaceous, moderately bicolorous, drying olive green to gray-green or brown, abruptly to gradually acuminate at apex, mostly obtuse to rounded at base, rarely weakly attenuate or weakly subcordate, weakly glandular-punctate above, (the punctae reddish-black, weakly sunken), conspicuously glandular-punctate beneath; midrib convex above, slightly paler than surface, weakly punctate, thicker than broad beneath, paler than the surface; primary lateral veins 9-12, moderately sunken above, raised beneath; interprimary veins about as conspicuous as the primary lateral veins; collective veins arising from the base, 2-4 mm from the margins, sunken like the primary lateral veins; tertiary veins not visible when fresh,

visible on drying. Inflorescence erect; peduncle 14-27 cm long, terete, medium green; spathe oblong-lanceolate, reflexed-spreading, 3.5-6.0 cm long, 6-18 mm wide, green, sometimes tinged with purple-maroon, shortly acuminate and inrolled at apex, amplexicaulous at base, the margins meeting at 180 degree angle; spadix sessile, or with stipe to 2 mm inserted at 40 degree angle, green, promptly becoming purplish violet or dark violet-purple, 4.5-13 cm long, 5 mm diam. at base, 3 mm diam. near the apex; flowers rhombic, 3-4 visible per spiral, 3-3.2 mm long, 2.5-2.8 mm wide, the sides straight; tepals matte with minute raphide cells weakly visible, the lateral tepals 2.5-2.7 mm long, the inner margin broadly thin, becoming somewhat turned upward in age, the outer margin narrowly rounded, the alternate tepals rounded; pistil medium green, the exposed area 0.4 mm diam. stigma slit-like, 0.4 mm long; stamens scarcely emerging from beneath the tepals, the laterals preceding the alternate by only a few spirals; anthers 0.25 mm long, 0.4 mm diam., white, the thecae ovoid, somewhat divaricate. Fruits not seen.

Anthurium fernandezii is endemic to Venezuela, occurring in cloud forests at 1200 to 1900 m in the western end of the Coastal Cordillera and the Cordillera de los Andes in Trujillo. Most collections have been made in Aragua at Altos de Choroni or in the Henri Pittier National Park.

Anthurium fernandezii is a member of Section *Porphyrochitonium* and is distinguished by its elongate stem (with internodes up to 4 cm long on the lower portions of the stem) bearing semi-intact pale brown to tan cataphyll fibers, by its long-petiolate, narrowly ovate to ovate-elliptic blades which are dark glandular-punctate on both surfaces, and by its long-pedunculate inflorescence with a narrowly lanceolate green to purplish spathe and a long, slender purplish spadix with only 3-4



Fig. 5. *Anthurium fernandezii* Croat, infructescence with mature leaves and berries, x 1/2, Croat 60557.



Fig. 6. *Anthurium fernandezii* Croat, closeup of infructescence, x 1, Croat 60557.



Fig. 7. *Anthurium fernandezii* Croat, inflorescence, x 2/3, Croat 54506.



Fig. 8. *Anthurium gehrigeri* Croat, plant in flower, x 1/4, Croat 60729.

flowers per spiral. It is closest to *A. gehrigeri* from Merida which differs in having longer internodes (up to 3.5 cm long or more near the apex), petioles shorter than or equal to the blades, and only 2-3 flowers usually visible per spiral.

A. fernandezii can be confused with *A. bernardii*, which is distinguished by having 4-5 flowers visible per spiral, tepals which dry straightened and fully erect at anthesis and in fruit, and by having stamens and pistils mostly fully visible. The species has also been confused with both *A. bredemeyeri* and *A. smithii* Croat, which have similar long-petiolate leaves and elongate stems with persistent cataphylls. *Anthurium bredemeyeri* differs in having epunctate, narrowly oblong-elliptic blades while *A. smithii* differs in having blades epunctate on the upper surface. Both *A. bredemeyeri* and *A. smithii* also differ from *A. fernandezii* in having 4-6 flowers visible per spiral versus 3-4 flowers visible per spiral in *A. fernandezii*.

VENEZUELA, ARAGUA: Henry Pittler National Park, ca. 10° 19'N, 67° 43'W, *Buntling 4677* (MY); *Croat 21422, 60557* (MO); *Davidse et al. 16677* (MO, SEL); Bruno Manara s.n. (VEN); Pittler 14126 (VEN); Steyermark & Huber 112880, 112881 (VEN); F. Test 4 (VEN) Maracay to Choroni, *Croat 54506, 60526* (MO); Distrito Girardot, Altos de Choroni, *Fernandez 1438* (F, MY); *Trujillo 7670* (MY, WIS); cerca de Ocumare de la Costa, 400 m, *Badillo 1866* (MY). DISTRICO FEDERAL: 6 km NE of Colonia Tovar, 10° 27'N, 67° 15'W, *Liesner & Medina 13603* (MO, VEN). TRUJILLO: 12 km ESE of Bocono, 9° 12'N, 70° 09'W, *Liesner et al. 12963* (MO).

Anthurium gehrigeri Croat, sp. nov.

TYPE: VENEZUELA: Mérida: Tabay, NE of Mérida, along Río Chama, 8° 38'N., 71° 4'W., elev. 2300-2400 m, *Gehriger 383* (MO 1004233, holotype; US 1498609, isotype).

Planta terrestris aut epiphytica, caudex assurgens; internodia 3.5-8.5 cm longa, ca. 1 cm lata, cata-

phyllum persistens, fibris tenuibus; petiolus 10-21 cm longus, adaxialiter complanatus; lamina subcoriacea, ovata-elliptica aut anguste ovata, raro oblanceolata, 17-30 cm longa, 4-19 cm lata, basi obtusae aut rotundatae; inflorescentia erecta, longa-pedunculata; spatha anguste lanceolata, purpureum, 4.5-7.5 cm longa, 8-10 mm lata; spadix linearis, purpureus, 10-18 cm longus, 3-4 mm diam.; baccae carnae.

Terrestrial or epiphytic vine; internodes mostly (2) 3.5-8.5 cm long, 6-10 mm diam. (the uppermost 1-2 internodes shorter, but perhaps not fully expanded), medium green, semiglossy, drying dark brown to black; roots 1 to few per node, elongate. Leaves with petioles erect, subterete to bluntly D-shaped, weakly sulcate adaxially, medium green, weakly glossy, 10-21 cm long, 3-4 mm diam. midway, slightly shorter than the blades; geniculum 1.5-1.7 cm long (drying darker than petiole); blades subcoriaceous, ovate-elliptic to narrowly ovate, rarely weakly oblanceolate, 17-30 cm long, 4-19 cm wide, broadest usually at the middle or in the lower third, rarely above the middle, acuminate to abruptly acuminate, usually rounded at base, rarely obtuse, not markedly bicolorous, conspicuously dark glandular-punctate on both surfaces (at least on drying); midrib convex above, not paler than the surface, convex below; primary lateral veins 6-11, etched to sunken above, convex and darker than surface below, arising at 40-50 degree angle, straight or weakly arcuate to the collective vein; tertiary veins scarcely visible on fresh leaves, only weakly visible on drying; collective veins arising from the base, the first pairs broadly to obscurely loop-connecting the laterals, 5-7 mm from the margin, a second obscure pair of collective veins sometimes present near the base of the blade. Inflorescences usually 1 or 2, erect-spreading, longer

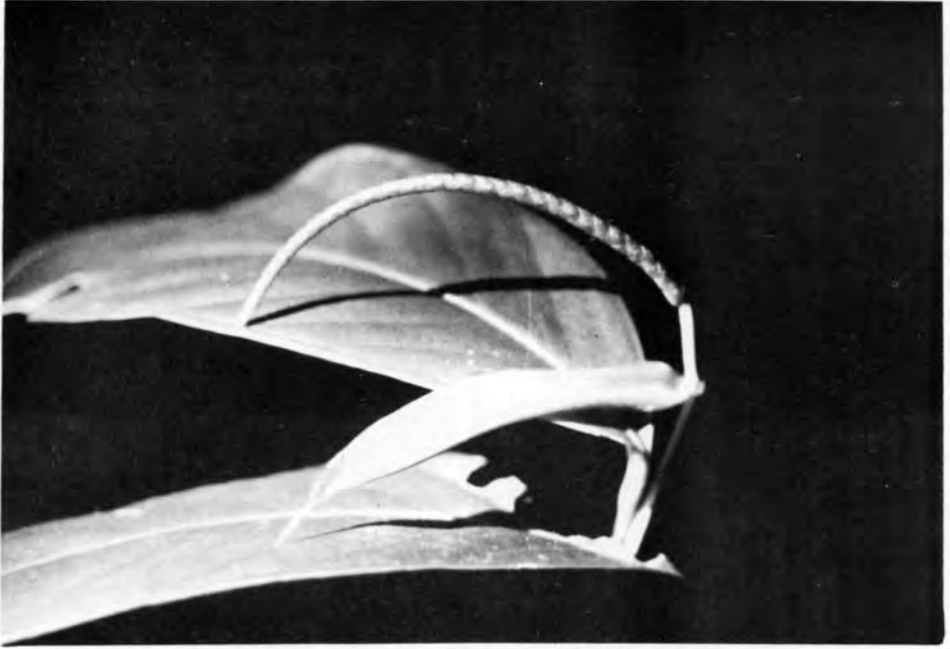


Fig. 9. *Anthurium gehrigeri* Croat, inflorescence and leaves, x 1, Croat 60729.



Fig. 10. *Anthurium gehrigeri* Croat, inflorescence and part of leaf, showing glandular punctations, x 3, Croat 60729.

than the petioles, shorter than or as long as the blade; peduncle terete, 18-45 cm long, 2-3 mm diam.; spathe spreading, narrowly lanceolate, 4.5-7.5 cm long, 8-10 mm wide, acuminate, narrowly rounded at base, purplish; spadix scarcely tapered, 10-18 cm long, 3-4 mm diam., green tinged with purple; flowers (dried) rhombic, 3.8-4.2 mm long, 2-2.3 mm wide, 2-3 (rarely 4) flowers visible per spiral; tepals semiglossy, drying matte with weak, pale punctiforme projections, the lateral tepals 2.2-2.5 mm wide, the inner margins broadly rounded, the outer margins obtusely angular; pistils not emergent, purplish, the stigma slit-like, 0.4 mm long; staminal progression not studied, the stamens scarcely exerted, persisting in a tight cluster over pistil (and hiding the pistil); anthers 0.3 mm long, 0.5 mm wide, the thecae ovate, not divergent. Berries obovoid, ca. 8 mm diam., reportedly flesh-colored, drying dark purplish-black; seeds 1-2, light brown, 4.5-5 mm long, 2.5-3.5 mm diam., somewhat flattened.

Anthurium gehrigeri is endemic to Venezuela, occurring in the state of Mérida at 2225-2800 m elevation along the northern slope of the Sierra Nevada and in Portuguesa at 1700 m. It occurs generally as a terrestrial plant in nearly full shade on steep banks.

Porphyrochitonium, is distinguished by its climbing stem with long internodes, persistent cataphyll fibers, petioles that are shorter than the more or less ovate blades (glandular-punctate on both surfaces), by its long-pedunculate inflorescence with a purple spathe and spadix, and by its large flowers, usually only 2-3 of which are visible per spiral.

Anthurium gehrigeri is similar to *A. fernandezii* and *A. bernardii*, which are distinguished by their shorter internodes and by having petioles longer than (rarely equal to) the blades. *A. bernardii* is also distinguished by having 4-5 flowers visible per spiral.

The species might be confused with *A. smithii*, which is abundant in Mérida, and which has similar leaves and a similar habit with internodes sometimes relatively elongate near the apex of the stem (see *Liesner 11725, Croat 38479*), but that species differs in being only inconspicuously glandular-punctate on the lower surface (eglandular above).

VENEZUELA, MERIDA: without locality. *Vareschi 441a* (VEN); *Cerro El Toro, 2500 m. Bernardi 117* (NY); between La Trampa and Casadero, 2225-2590 m. *Steyermark 56176* (F); above Las Cuadras, N of Torondoy, 1820-2225 m. *Steyermark 55785* (F, VEN); La Montaña, *Badillo 6962, Bunting 3341, Trujillo 5139* (MY); La Muey, *Bunting 4549, Vareschi 179* (MY); *Croat 60729* (MO); *Vareschi & Pannier 586B* (VEN); Tabay, 2300-2400 m, *Gehriger 383* (F, MO, NY, US, VEN); La Isla, above Tabay, *Steyermark 56616* (F, NY); 29 km S of Estanques, 2450 m. *Luteyn 5397* (NY) PORTUGUESA: *van der Werff et al. 7586* MO, US, K, PORT), 7549 (MO, NY, PORT), 7612 (MO, B, PORT).

Anthurium gonzalezii Croat, sp. nov.

TYPE: Venezuela: Carabobo: evergreen forest above Río San Gian, S of Borburata, between La Toma and the summit of the divide at "Capuchinos", 750-1000 m. *Steyermark 95238* (MO 267293, holotype: US, VEN, isotypes).

Planta epiphytica; caudex brevis, internodia brevia; cataphyllum persistens fibris tenuibus; petiolus teres, 14-23 cm longus; lamina lanceolata aut ovato-elliptica, 9-16 cm longa, 3.7-7.3 cm lata, subcoriacea, basi rotunda ad subcordatum, pagina glandulosa-punctata; pedunculus teres, 10-20 cm longus; spatha anguste lanceolata, 2-3.3 cm longa, 3-5 mm lata; spadix sessilis, 3-7.3 cm longus, 4-5 mm latus; baccae ignotae.

Epiphyte, stems short, mostly less than 20 cm long, sometimes branching;

internodes short, 5-10 mm diam., roots moderately few; cataphylls up to 3 cm long, thin, soon weathering to persistent reddish brown fibers. Leaves with petioles terete, slightly flattened adaxially, 14-23 cm long, 2-3 mm diam.; geniculum 8-15 mm long; blades subcoriaceous, lanceolate to ovate-elliptic, gradually acuminate, 9-16 cm long, 3.7-7.3 cm wide, rounded to weakly subcordate at base, moderately bicolorous, dark green above, moderately paler below, (drying gray-green to brownish), both surfaces glandular-punctate (the punctae inconspicuous); midrib convex on both surfaces; primary lateral veins 5-7 per side, departing the midrib at 30-45 degree angle, drying moderately obscure, often less conspicuous than the collective vein; basal veins 2 pairs, the first forming a collective vein 3-8 mm from the margins at the middle of the blade, the second collective vein merging with the margin in the lower 1/4 of the blade. Inflorescences 1-2, shorter than or equal to the leaves; peduncles terete, 10-20 cm long, ca. 2 mm diam.; spathe thin, narrowly lanceolate, 2-3.3 cm long, reddish brown or green tinged with lavender, abruptly acuminate, becoming reflexed; spadix sessile, scarcely tapered, to 7.5 cm long, 4-5 mm diam., (3.5 mm diam. dried), reddish brown to brownish lavender tinged with green; flowers square, 2.1-2.3 mm long and broad, 4 flowers visible in the principal spiral, tepals drying matte; lateral tepals 1.3-1.5 mm diam., the inner margin rounded, the outer margin bluntly triangular; pistils weakly protrudent on drying; stigmas subrounded, depressed, 0.3 mm long; stamens emerging promptly in a regular sequence, the 4th stamen in the first spiral emerging before all of the laterals have emerged to the apex, weakly exerted about the tepals, then mostly retracting beneath the surface of the tepals after anthesis; anthers 0.3 mm long, 0.5 mm wide, the thecae ovate,

somewhat divergent; pollen not seen. Infructescence not seen.

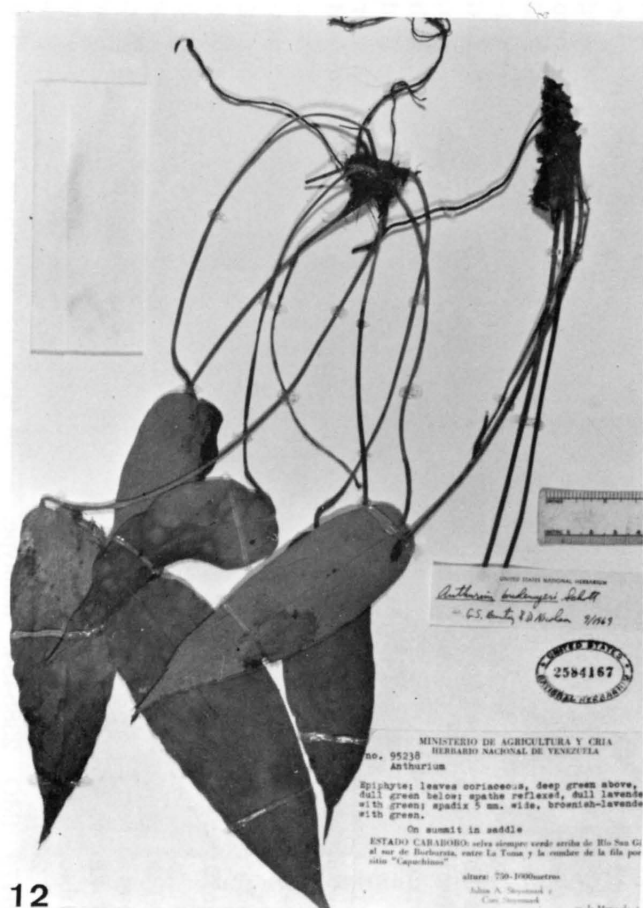
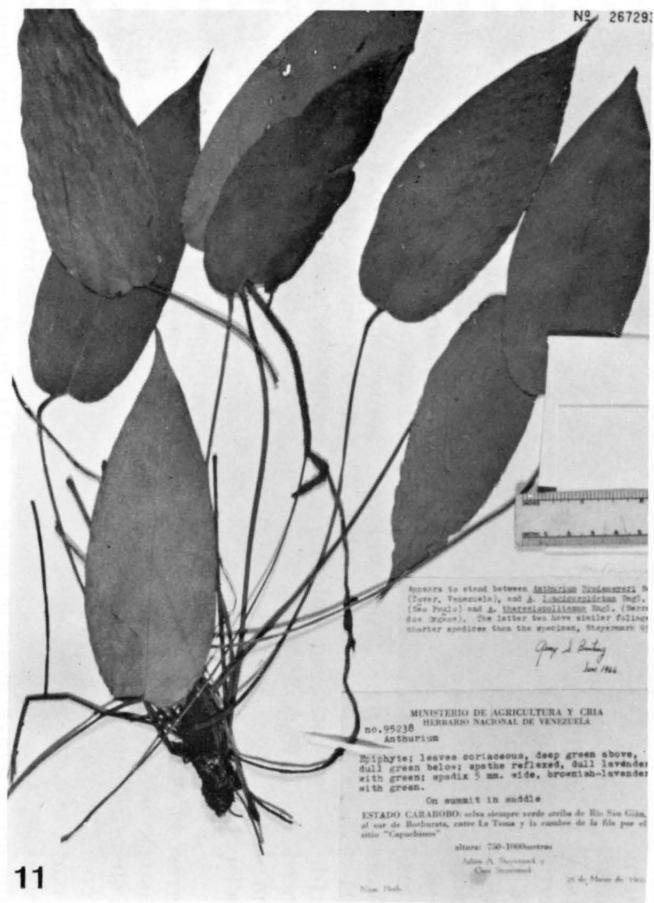
Anthurium gonzalezii is endemic to Venezuela, probably occurring at about 1000 m elevation (exact range uncertain as only two collections exist and one label has a range from 1200-1800 m elevation while the other ranges 750-1000 m) in the Coastal Cordillera in the states of Yaracuy (Sierra de Aroa) and Carabobo.

It was first collected by Julian Steyermark in 1966 and later by Ronald Liesner and Angel Gonzalez in 1980. It is named in honor of Mr. Gonzalez.

The species is a member of section *Porphyrochitonium* and is distinguished by its moderately short, slender stem with short internodes, long petiolate leaves with small mostly ovate-elliptic blades, which are inconspicuously subcordate at the base and glandular-punctate on both surfaces.

It is related to several other species (all once considered *A. bredemeyeri*) which share in common long petiolate blades (petioles generally conspicuously longer than the blades). These include *A. bredemeyeri*, *A. smithii*, *A. fernandezii*, and *A. bernardii*. The species shares with the latter two species blades which are dark glandular-punctate on both surfaces. *Anthurium gonzalezii* differs from *A. fernandezii* in having smaller blades with 5-7 inconspicuous primary lateral veins (blades are less than 16 cm long and 7.5 cm wide). On the other hand, *A. fernandezii* has blades usually greater than 20 cm long and 7 cm wide with 9 or more conspicuous primary lateral veins.

Anthurium bernardii differs in having a much larger leaf blade (19-26 cm long by 13-18 cm wide) with moderately prominent primary lateral veins and especially by its markedly projecting "spade-shaped" tepals on the infructescence which gives the spadix a roughened appearance.



Figs. 11 - 12. *Anthurium gonzalezii* Croat, herbarium specimens, Steyermark 95238 (MO, US).

Anthurium smithii differs from *A. gonzalezii* in being dark glandular-punctate only on the lower blade surface.

Anthurium bredemeyeri differs from *A. gonzalezii* in having proportionately much longer, epunctate leaves which are obtuse to acute at the base (versus rounded to subcordate for *A. gonzalezii*).

VENEZUELA. CARABOBO: arriba de Río San Gian, S of Borburata. 750-1000 m. *Stejnermark 95238* (MO, US VEN); YARACUY: 8 km SW of San Felipe. Cerro Negro. 10°17'N, 69°01'W. *Liesner & Gonzalez 9919* (MO, VEN).

Anthurium smithii Croat, sp. nov.

TYPE: Venezuela: Táchira; along road between Rubio and Delicias, 27 km above Rubio, southwest of Rubio, 7° 41'N, 72° 22'W; elev. ca. 2000 m. *Croat & Bunting 38479* (MO 2385494, holotype; VEN, isotypes).

Planta terrestris aut epiphytica. internodia brevia, 6-15 (20) mm diam.; cataphyllum persistens intactum; petiolus subteres, plerumque sulcatus, (11) 14-47 cm longus, 3-5 mm latus; lamina subcoriacea, ovata-elliptica ad oblonga-elliptica, 11-37 cm longa, 3-18 cm lata, basi plerumque obtusa ad rotundata, pagina abaxial glandulosa-punctata; pedunculus (11) 20-62 cm longus; spatha viridis, lanceolata ad oblongo-lanceolata, 4-10 cm longa, 7-13 mm lata; spadix sessilis, 3.5-14 cm longus, 3-6 mm latus.

Terrestrial or low epiphyte, to 2.5 m tall, usually less than 1.5 m high on trees; stems elongate, reclining at base then erect; internodes 2-8 cm long on older parts, usually 1-2 cm long or less on flowering plants, 6-15(20) mm diam., medium green, weakly glossy to matte, becoming gray on older plants; roots

moderately elongate, 1 to few per node, green and tan, 2-3 mm diam.; cataphylls 3.5-15 cm long, weakly ribbed near the apex, apiculate at apex with a long subapical apiculum, the fibers tan to light brown, persisting semi-intact at all upper nodes. Leaves with petioles erect-spreading, (11) 14-47 cm long, 3-5 mm diam. midway, medium green, sometimes mottled or tinged with purple, epunctate, obtusely and obscurely sulcate adaxially in upper half, sometimes narrowly flattened adaxially; geniculum 2-3.5 cm diam., more sharply sulcate and scarcely thicker than the petioles; blades drooping, subcoriaceous, ovate-elliptic to oblong-elliptic, rarely narrowly ovate, oblong-lanceolate, slightly arched along the midrib, 11-37 cm long, 3-18 cm wide, broadest usually at the middle or below the middle, acuminate to gradually acuminate, rarely abruptly acuminate at apex, usually obtuse to rounded at base, sometimes acute, rarely almost truncate, moderately bicolorous, semi-glossy; upper surface dark green, lacking punctations; lower surface obscurely glandular-punctate when fresh (conspicuously dark glandular-punctate on drying), medium green; midrib convex on both surfaces, moderately paler near the base of the blade; primary lateral veins straight or weakly curved to the collective veins, 4-9 per side, arising at 40-70 degree angle, sunken above (like the collective vein), raised beneath and darker than surface; basal veins 1 or 2, not coalesced, the first forming a collective vein 3-12 mm from the margin, the second at least appearing to join the margin in the lower one-third or at least below the middle, rarely continuing very close to the margin well above the middle; tertiary veins obscure on fresh leaves, prominulous on drying. Inflorescences usually 1 or 2, erect or spreading, usually held above the leaves; peduncle (11) 20-62 cm long, 2-3 mm diam.; spathe flexible, thin, firm, green



Fig. 13. *Anthurium smithii* Croat, leaf, x 1/3, Croat 38479.



Fig. 14. *Anthurium smithii* Croat, whole plants in flower, x 1/4 (fruits at center and upper left corner belong to another plant), Croat 54808.

sometimes tinged with purple-violet in lower one third, lanceolate to oblong-lanceolate, reflexed-spreading, 4-10 cm long, 7-13 mm wide, sometimes tinged with red or purple, inserted at 40 degree angle on peduncle, gradually acuminate, (the acumen inrolled), rounded at base, not decurrent, the sides meeting at 130-180 degree angle; spadix sessile, scarcely tapered, 3.5-14 cm long, 3-6 mm diam. midway, erect or sometimes curved forward, green at anthesis usually soon turning dull purple or red-purple (B & K Red-purple 2/7.5 to Purple ca. 2/7.5); flowers rhombic to square, 2-2.8 mm long, 1.4-2.5 mm wide, 4-6 flowers visible per principal spiral; tepals glossy, minutely papillate, epuncate to inconspicuously punctate, with a few scattered nectar drops; lateral tepals 1-1.5 mm wide, the inner margin broadly convex, the outer margin bluntly triangular; pistil not at all emergent, purple (like tepals) or slightly greener than tepals, promptly emerging after anthesis; stigma linear, slit-like, 0.3-0.5 mm long, with droplets 3-4 days before first anthers emerge, stamens slowly emerging in a regular sequence, the flowers near the apex with at least their lateral stamens exerted before flowers of the lower one-third to one-half of inflorescence have all their stamens fully emerged and before the third stamens are emerged to three-fourths the length of the spadix; filaments not exposed; anthers pale orange, held in a close, contiguous cluster over the pistil, 0.2-0.3 mm long, 0.4-0.5 mm wide, the thecae ellipsoid, slightly divaricate; pollen pale orange (B & K Yellow-red 8/7.5), drying white. Berries not seen.

Anthurium smithii is known from eastern Colombia and western Venezuela, occurring at 1300 to 3200 m (rarely as low as 900 m) as an understory herb, where it is generally terrestrial or on fallen logs or on rocks. It is less frequently reported as an epiphyte (presumably near the ground),

In Venezuela, it ranges from Táchira to Trujillo in the Cordillera de los Andes, as well as in Perijá Peninsula (Zulia). In Colombia, it is abundant in Santander and especially in Santander Norte. The species was first collected in Colombia in 1927 by E. P. Killip and A. C. Smith. It is named in honor of A. C. Smith, who made many collections of Araceae.

The species is a member of section *Porphyrochitonium* and has been confused with *A. bredemeyeri*, which differs in being epuncate (see discussion following that species) and which is also endemic to the coastal Cordillera of Venezuela in Aragua.

Anthurium smithii is variable in blade shape, with the blades mostly ovate-elliptic to oblong-elliptic throughout most of its range, but more often oblong-lanceolate in Táchira. These latter plants are similar to *A. deflexum* Engler from the western Andes of Colombia (Antioquia), which has a similar habit, short stems, persistent cataphyll fibers, similar leaves and inflorescences. That species differs in having thicker blades that are velvety above, with smaller glandular punctations below and a collective vein which is very near the margin.

The species might also be confused with *A. gehrigeri* which is similar in habit, with persistent cataphylls, similar leaves and a long inflorescence. *A. gehrigeri* also occurs in Mérida. That species differs however, in having petioles shorter than the blades, having glandular punctations on both surfaces and in having only 2-3 flowers visible per spiral.

COLOMBIA. NORTE DE SANTANDER: North of Toledo, Killip & Smith 20237, 20325 (US); 20456, (GH, US); 20269 (GH, NY, US); road from Pamplona to Toledo, Killip & Smith 19939 (US). SANTANDER: vicinity California, 2300 m, Killip & Smith 17065 (US); vicinity La Baja, Killip & Smith 18301 (NY, US); Killip & Smith 18369 (US).

VENEZUELA. MERIDA: without locality, *Vareschi* 441 (VEN). Along highway between Merida and La Azulita, *Croat* 54855, 60721 (MO); 54818 (DUKE, L. MO, NY, RSA, US); arriba de la Azulita, *Bunting* 2593 (MY); *Steyermark & Rabe* 97131 (US, VEN): 1 km N of La Carbonera, 8° 37'N, 71° 21'W, 1300 m, *Croat* 54808 (B, GH, MO, NY, US); *Vareschi & Pannier* 1092, 1098 (VEN); carretera N de La Mesa, E de Jafí, SE de La Carbonera, *Steyermark & Rabe* 97040 (MO, VEN); La Macuy, 2760 m, *Vareschi & Pannier* 586A Dto. Andres Bello, Zerpa, 8° 40'N, 71° 25'W, *Wessels Boer* 1726 (MO); Tustas, 29 km S of Estanques, *Luteyn et al.* 5397 (MO, VEN). TACHIRA: vicinity Betania, on slopes below Paramo de Tama, *Berry* 3422, *Croat* 60679 (MO); *Luteyn* 5998 (MO, NY, VEN); *Steyermark* 57262 (F); *Steyermark & Dunsterville* 98450 (US); 16 km NW of San Cristóbal, Parque Cazadero, 7° 54'N, 72° 18'W, *Liesner & Guariglia* 11725 (MO, NY, VEN); Carretera Guarague-Tovar, 2460 m, *Baltasar et al.* 8295 (MY); Junín, between Fatima and San Vicente de la Revancha, 2760 m, *Fernandez* 1965 (MY); 20 km S of San Vicente de la Revancha, *Steyermark et al.* 100835 (MO, NY, VEN); between Michelena y Boca de Monte, W of Zumbador, *Steyermark & Rabe* 96744 (MO, US, VEN); 14 km SE of Delicias, 7° 31'N, 72° 24'W, *Steyermark & Liesner* 118296 (MO, VEN); *Steyermark & Liesner* 11397 (VEN); Rubio-Las Delicias, *Bunting* 2325, 2342, 2419, 2440, 2458 (MY); *Croat* 55030 (MO); *Croat & Bunting* 38479 (MO); *Fernandez* 2138 (MY). TRUJILLO: Páramo de Guaramacal, 20 m E of Boconó, 9° 14'N, 70° 11'W, G. *Aymard et al.* 2934 (MO). ZULLA: camino de Las Tres Tetas, 2500 m, *Gines* 1179 (MY); Perijá, 2400-2800 m, *Gines* 2003 (US).

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