

in the Netherlands Antilles. It is found on steep, rocky cliffs and dry slopes, rarely reported from primary forest, from sea level to 600 m in tropical moist, tropical dry, and premontane dry forest life zones.

This species can be distinguished by the blades, which dry with pale raphide cells conspicuously visible under low magnification and with conspicuous undulations along the margin, and by the petiole, which is more or less quadrangular, adaxially flat to broadly sulcate, and abaxially usually squared or 3-ribbed. The spathe and spadix of *A. wagnerianum* are both quite small, and the spadix is cream-colored to green at anthesis, sometimes with the tepals faintly tinged with purple.

Anthurium wagnerianum is deceptively similar to *A. crassinervium* in habit, range, and leaf shape. The above-mentioned blade and petiole characteristics, however, aid in identification of dried specimens. Furthermore, dried abaxial leaf surfaces of *A. wagnerianum* do not demonstrate the highly light-reflective character nor the readily distinguished concentric epidermal cell pattern of *A. crassinervium* (see that species for more details). The spathe and spadix of *A. wagnerianum* are, moreover, quite short and stout in comparison with those of *A. crassinervium*. Both species have red berries basally attached to the spadix by tepalar fibers at maturity. *Anthurium wagnerianum*, however, has a drier berry upon rehydration, its seeds being attached to the inner carpel wall at its apical end by a thick strand of fibers running midway down the carpel toward the basal end of the fruit, as in *A. bonplandii*. *Anthurium crassinervium*, in contrast, has seeds attached to the rehydrated berry by a mucilaginous substance typically found in fruits of most members of sect. *Pachyneurium*. Another feature separating *A. wagnerianum* from *A. crassinervium* are the pistils which are earlier emergent at anthesis in *A. wagnerianum* than is true of *A. crassinervium*.

Bunting *et al.* 11993 is included in *A. wagnerianum* with reservation. It is reportedly an epiphyte from a wet forest life zone, with an adaxially convex petiole. All three of these characteristics conflict with the norm for *A. wagnerianum*. Its lower leaf epidermal characteristics, stubby spadix, and short spathe suggest that its placement in this species is, however, correct.

Anthurium huequeense was compared by Bunting (1986) with *A. crassinervium*, but is in fact conspecific with *A. wagnerianum* and cannot be distinguished from typical material of the latter.

NETHERLANDS ANTILLES, CURAÇAO: Christoffel Mountain, Tuinen 79GR00095 (K). VENEZUELA, CARABOBO: Puerto Cabello, 100 m, Curran & Haman 1140 (GH, US); Las Trincheras-El Cambúr, 1.5 km N of bridge over Río Trincheras, N edge of Las Trincheras, 0–500 m, 10°21'N, 68°05'W, Croat 54543 (CAS, F, MO, RSA, SEL, US), 54544 (GH, K, MO, NY); Puerto Cabello-Valencia, El Cambúr, Bunting 2848, 2854 (NY); 100–300 m, Bunting 13512 (cultivated at MO). DISTRITO FEDERAL: W of Naiguatá, 0 m, Gentry & Berry 14735 (MO); Río Las Caracas, above town of Las Caracas, 100 m, Croat 21620 (MO). FALCÓN: Sierra de San Luis, Piedra de Agua, 600 m, 11°08'N, 69°40'W, Liesner *et al.* 7634 (MO); Dtto. Acosta, Via Pílancones, 6 km of Mirimire, Ruiz & Rondon 3726 (MY); Dtto. Colina, Río Rícora, S of Las Dos Bocas, 200 m, 11°19'N, 69°24'W, Steyermark & Gonzales 113632 (MO); Dtto. Zamora, Delta of Río Hueque, Coro-Morón, 100 km E of Coro, 50 m, Bunting 7704 (cultivated; originally collected as *van der Werff* 3522) (MO, NY, VEN), Croat 71734 (MO). MIRANDA: Carenero-Chirimena, 2 km NW of Carenero, 0–5 m, Steyermark & Bunting 102313 (MO); Río Chuapquire, new road 1 km S of main road, S of El Guacuco, 7 km E of Cupira, 0–150 m, 10°09'N, 65°38'W, Liesner & Gonzalez 11906 (MO, WIS), 11917 (MO); Dtto. Brion, Laguna Grande, 0–30 m, 10°33'N, 66°04'W, Berry *et al.* 3740 (MO). ZULIA: Dtto. Mara, Río Guasare, near Destacamento Guasare No. 1 (La Yolanda), abajo del Destacamento, 200–250 m, Bunting *et al.* 11993 (MO).

Anthurium watermaliense hort. ex L. Bailey & Nash, Stand. Cycl. Hort. 1:303. 1922. TYPE: Colombia. Not seen, introduced into horticulture via Watermall, Belgium. Neotype: Panama. Bocas del Toro: Changuinola-Almirante, Railroad Station Milla 7.5, less than 100 m, Croat 38129 (lectotype MO-2820846; isoelectotypes, CAS, F, MEXU, NY, PMA, S, SEL, UC, US). Figures 333, 334.

Terrestrial; stem to 25 cm long, (1)1.5–3 cm diam.; roots numerous, descending, velutinous, 3–4 mm diam.; cataphylls thin, 4.5–14 cm long, obtuse to acute at apex, persisting as coarse linear fibers. Leaves erect-spreading; petioles (12)25–60(88) cm long, ca. 4–5 mm diam., subterete, flattened to slightly and narrowly sulcate with blunt to rounded margins adaxially, rounded abaxially; geniculum, 1–1.5 cm long; blades moderately coriaceous, ovate-triangular, long-acuminate at apex, deeply lobed at base, 21–60 cm long, (14)20–40 cm wide; anterior lobe 20–45 cm long; the posterior lobes mostly oblong, (7)14–26 cm long, (3.5)5–10(16) cm wide, rounded at apex; sinus parabolic to hippocrepiform; both surfaces semiglossy; midrib convexly raised above and below; basal veins 5–8 pairs, 2nd through 8th coalesced

4.5–8 cm, prominulous above and below; posterior rib mostly naked, weakly turned up on outer margin; primary lateral veins 4–8 per side, departing midrib at 40–45° angle, prominulous in grooves above, prominulous below; tertiary veins conspicuously raised below when dried; collective vein arising from 1st or 2nd basal vein, raised above and below, equally as prominent as primary lateral veins when dried, 3–6 mm from margin. *Inflorescences* spreading, shorter than leaves; peduncle (12)25–60(75) cm long, 3–7 mm diam., 0.5–1.5 × as long as petiole; spathe erect to reflexed, subcoriaceous, usually dark violet-purple, sometimes green, lanceolate to ovate-lanceolate, 5–15(21) cm long, (1.5)2–6(8.5) cm wide, inserted at 75° angle on peduncle, long-acuminate at apex, acute to rounded (rarely cordate) and conspicuously decurrent at base; stipe 0.3–3 cm long; spadix white to greenish, yellow or purple, tapered, 7–19 cm long, 5–10 mm diam. near base, 2–5 mm diam. near apex; flowers rhombic to 4-lobed, 1.5–3.4 mm long, 1.8–3.1 mm wide, the sides straight to jaggedly sigmoid; 5–12 flowers visible in principal spiral, 6–16 in alternate spiral; tepals matte, punctate; lateral tepals 1.5–2.2 mm wide, the inner margins convex to ± straight; pistils raised, protruding beyond the stamens at anthesis, glossy, weakly exserted just before stamens emerged, dark green; stigma narrowly ellipsoid, ca. 0.5 mm long, droplets appearing 2–3 days before stamens emerge; stamens emerging rapidly from the base or sometimes in a scattered pattern throughout, held erect above the tepals; filaments translucent, exserted, 0.3–0.4 mm long, 0.6 mm wide; anthers creamy white, 0.9 mm long, 0.9–1 mm wide; thecae ellipsoid, divaricate; pollen white. *Infructescence* with spadix to 22 cm long, ca. 2 cm diam., bearing berries in the basal portion only; berries yellow to usually orange, ovoid to obovoid, shortly beaked at apex, 10–15 mm long, ca. 4–5 mm diam.

This species is known from Costa Rica and Panama, between sea level and 2,400 m; most collections have been made at about 750 m in premontane and lower montane rainforest. Populations occur near sea level in tropical moist and premontane wet forest. The species is extremely variable, especially in leaf size and shape, and spathe and spadix color.

Anthurium watermaliense can be recognized by its ovate-triangular leaf blades with pronounced posterior lobes (a unique feature within the section), its broad, decurrent and frequently dark purple

spathe, tapered spadix with exserted stamens, and usually orange berries.

This species is most easily confused with specimens of *Anthurium cotobrusii*, which have unusually long posterior lobes, but the latter species differs in having the pistils shorter than the stamens at anthesis and stamens that do not persist exserted.

Anthurium watermaliense might also be confused with *A. standleyi*. See discussion of that species for distinguishing characters.

Although originally reported to have come from Colombia, no wild collections from present-day Colombia are known. Since Colombia encompassed Panama at the time of its introduction, it is believed that *A. watermaliense* was originally collected in Panama and may never be found in Colombia. In Panama, it has been found no further east than western Veraguas.

WITHOUT LOCALITY: *Drake* 219 (P). COSTA RICA: WITHOUT FURTHER LOCALITY: *Lankester* 349-49 (K). ALAJUELA: Monteverde, Chomogo trail and Refugio El Valle, 1,600 m, *Kennedy & Guindon* 3799 (MO). CARTAGO: Palo Verde, beyond Quebrada Cangreja, 1,500 m, *Luteyn & Wilbur* 4376 (MO); SE of Platanillo (Tspiri), Raiz de Hule Camino, 1,200–1,300 m, *Croat* 36713 (MO, PMA); 4.5 km S of bridge on Agua Caliente on Lourdes, ca. 8 km S of Cartago by air, Finca El Chaparral, 1,500 m, 9°49'N, 83°55'W, *Liesner & Judziewicz* 14612 (MO); Quebrada Cangreja, 3 km S of Pan American Hwy., ca. 6 km S of Cartago by air, 1,620–1,650 m, 9°46'N, 83°57'W, *Liesner & Judziewicz* 14455 (B, CR, MO, NY, RSA, WISC; Río Reventazón, CATIE, 3 km E of Turrialba "Los Espaveles" nature trail, 525–600 m, 9°54'N, 83°39'W, *Liesner et al.* 15326 (MO); Tapantí Reserve, 1,400–1,700 m, *Goméz* 19262 (MO). HEREDIA: Braulio Carrillo Park, Zurquí, 1,700–2,000 m, *Goméz* 20220 (B, CR, K, MO, RSA); Cerro Zurquí, southern slope, 5 km N of San Luis Norte, 1,800 m, 10°03'N, 84°02'W, *Stolze* 1548 (F, MO); Río San Rafael, Atlantic slope of Volcán Barva, 1,500 m, 10°13'N, 84°05'W, *Grayum* 7021 (MBM, MO); between Río San Fernando and Río Sardinal, Atlantic slope of Volcán Barva, 1,850–1,880 m, 10°12'N, 84°06.5'W, *Grayum* 7342 (MO). LIMÓN: Puerto Viejo de Cahuita–Manzanillo at Punta Mona, Panama border, 0–50 m, *Taylor & Skotak* 4435 (DUKE, MO), 4529 (DUKE); range of hills 2 km S of Manzanillo de Talamanca, E of Quebrada Hone Wark, 190 m, 9°37'N, 82°39.5'W, *Grayum et al.* 4393 (MO); Cordillera de Talamanca, Río Madre de Dios–Río Barbilla, Quebrada Cañabral, 280–400 m, *Grayum et al.* 8839 (CR, MBM, MO); Reserva Biol. Hitoy Cerere Valle del Río La Estrella, 400 m, 9°40'15"N, 83°03'20"W, *Herrera & Chacón* 2356 (CM, CR, MO); SE of Lago Dabagiri, Telire, *Goméz et al.* 23225 (CR, MO); Portete, 10 km N of Puerto Limón, 3 m, *Lent* 347 (MO); Siquirres, Las Brisas de Pacuarito, 300 m, *Gomez et al.* 23396 (MO, NY, US); Cerro Pirripí, just SE of Puerto Viejo de Talamanca, along trail from cemetery, 100–150 m, 9°39'N, 82°45'W, *Grayum* 3631 (CR, MO, RSA); Río Catarata, Bribri, less than 50 m, *Croat* 43224 (CM, MO); Río Sixaola, 10–

50 m, 9°35'N, 82°53'E, *Burger et al.* 10444 (F, MO). SAN JOSÉ-HEREDIA: Cerro Zurquí, southern slope, end of Calle Zurquí, 1,800–2,000 m, *Almeda & Nakai* 3706 (MO); Río Para Blanca, Cerro de Zurquí, 1,600–1,800 m, 10°03'N, 84°01'W, *Burger et al.* 9342 (MO). SAN JOSÉ: Carrillo Station, 700 m, *Gomez et al.* 21168 (MEXU, MO). PANAMA, BOCAS DEL TORO: Changuinola-Almirante, Railroad Station at Milla 7.5, less than 100 m, *Croat* 38129 (CAS, F, IBE, K, MEXU, MO, NY, PMA, RSA, S, SEL, UC, US, VDB, W, WIS), *Croat & Porter* 16246 (MO); Criollo (just above Buena Vista)-Quebrada Higueirón, Chiriquí trail, *Kirkbride & Duke* 784 (MO); 15 km S of town of Changuinola, Changuinola-1 dam site, 300–500 m, *Antonio* 3146 (MO). CHIRIQUÍ: Quebrada Hondo-Continental Divide, on Calderas-Chiriquito Trail, *Kirkbride & Duke* 960 (MO); Boquete Region, Palo Alto, 4.5 mi. NE of Boquete, *Hammel* 7542 (MO); Cerro Colorado, 1,200–1,500 m, *Croat* 33265 (F, MO, SEL, US, VEN), *Folsom & Collins* 1754, 1764 (MO), *Folsom et al.* 4840 (MO), *Mori & Dressler* 7849, 7852 (MO), *Sullivan* 359 (MO); Cerro Colorado mine area, from Chami station to 9 mi. along rd., 1,100–1,750 m, 8°35'N, 81°54'W, *Hammel & Trainer* 14977 (MO); Fortuna Road, Gualaca-Fortuna Dam, 5.9 mi. NW of Los Planes de Hornito, 1,370 m, 8°43'N, 82°15'W, *Croat* 49898 (MO). VERAGUAS: Santa Fe Region, N of Escuela Agrícola Alto Piedra, 700–900 m, *Croat* 49035 (MO), *Croat & Folsom* 33958 (CM, F, MO), *Folsom* 2994 (MO), *Mori & Kallunki* 2563 (MO); 6–7 km W of Santa Fe, 900 m, *Nee* 9717 (MO, PMA).

Anthurium willifordii Croat, sp. nov. TYPE:

Peru. Loreto: Napo River, Explorama Camp, on Río Sucuari, below 200 m (originally collected by Jack Williford), *Croat* 61087 (holotype, MO 3244489; isotypes, B, K, NY, USM). Figures 339, 340.

Planta epiphytica; internodia brevía, 1–2 cm diam.; cataphyllum persistens intactum mox deciduum; petiolus quadrangularis ad trapeziformis, interdum subteres, 2–4.5 cm longus, 4–5 mm diam.; lamina oblanceolata aut oblanceolata-elliptica, (14)18–50 cm longa, 5.5–16 cm lata; nervis primariis lateralibus 6–13 utroque; pedunculus 2.5–9 cm longus; spatha erecta, atropurpureus, navicularis, 2.3–4 cm longa, 1–2 cm lata; spadix dilute purpureo-violaceum aut griseo-purpureum, cylindroides, 1.7–4 cm longus, 2–5 mm diam.; baccae magentae.

Epiphytic; stem short, 1–2 cm diam.; roots numerous, dense, spreading to descending, pale to medium green, smooth, bluntly tapered, moderately elongate, 3–4 mm diam.; cataphylls subcoriaceous, broadly triangular, 1.5–5 cm long, acute at apex, pale yellowish green, drying brown, persisting intact, soon deciduous. *Leaves* spreading; petioles 2–4.5 cm long, 4–5 mm diam., erect-spreading to spreading, quadrangular to trapezoidal, sometimes subterete, with a medial rib and the margins prominently raised adaxially, sharply 3–5-ribbed abaxially, the surface slightly pale-speckled; geniculum becoming reddish tinged, 0.4–0.7

cm long; blades subcoriaceous to moderately coriaceous, oblanceolate to oblanceolate-elliptic, obtuse, minutely apiculate at apex, obtuse to rounded at base, (14)18–50 cm long, 5.5–16.5 cm wide, usually broadest above the middle, the margins sometimes undulate; upper surface matte-velvety, moderately quilted, medium green, lower surface velvety with conspicuous crystalline cells, slightly paler and often tinged with red; both surfaces drying brown to grayish brown; midrib prominently acute at base, becoming narrowly raised toward the apex above, prominently acute and tinged with reddish below; primary lateral veins 6–13 per side, departing midrib at 50–70° angle, straight, flat to weakly raised above, weakly raised and darker than surface and tinged with red below, drying slightly raised above and below; interprimary veins less prominent than primary lateral veins, darker than surface below; tertiary veins slightly darker than surface below, drying weakly raised; reticulate veins obscure; collective vein arising from near the base or in upper third of blade, weakly sunken to flat above, weakly raised and darker than surface below, equally as prominent as primary lateral veins, 4–10 mm from margin. *Inflorescences* erect; peduncle 2.5–9 cm long, 2–3 mm diam., 1.2–3 × as long as petioles, green faintly tinged purplish, terete with obscure ridge; spathe erect, subcoriaceous, dark purple to purplish violet (B & K red-purple 2/5), ovate-elliptic, navicular, 2.3–4.7 cm long, 1–2 cm wide, broadest in the lower third, cuspidate-acuminate at apex, acute and weakly decurrent at base; spadix reddish (B & K red 7/10) to faintly purplish violet or grayish purple, very short, cylindroid, erect, 1.7–4.7 cm long, 2–6 mm diam.; flowers rhombic and weakly 4-lobed, 1–1.5 mm long, 1.5–1.7 mm wide, the sides ± straight parallel to spiral, jaggedly sigmoid perpendicular to spiral; 8–9(14) flowers visible in principal spiral, 17–21 in alternate spiral; tepals matte, densely and minutely papillate; lateral tepals 0.5–0.9 mm wide, the inner margins rounded to bluntly 3-sided, the outer margins 2–3-sided to shield-shaped and 4-sided; pistils raised, purple, much darker than the tepals; stigma slitlike, 0.2–0.3 mm long; stamens emerging from near the middle, lateral stamens emerging to ½ the distance to the apex before alternates emerge at lower ⅓ of spadix; anthers white, 0.4–0.5 mm long, 0.4–0.5 mm wide, contiguous at the surface of the tepals; thecae narrowly ovoid, conspicuously divaricate; pollen yellow, fading to white. *Infurcescence* with berries scattered throughout; berries obovoid, magenta, rounded at apex.