

convex, the outer margins 2–3-sided; pistils slightly raised; stigma broadly ellipsoid, 0.3–0.4 mm long; stamens grouped in a tight cluster above the pistil; anthers 0.4–0.5 mm long, 0.3–0.5 mm wide; thecae oblong, slightly or not at all divaricate. *Infructescence* with spathe persisting, withered; spadix 7.5–9.8 cm long, 0.6–0.9 cm diam.; berries violet, \pm ovoid, ca. 3.5 mm long, 3.4 mm diam.; seeds drying yellowish brown, ovoid, darker at the ends, ca. 1.7–2 mm long, 1.2–1.4 mm diam., 1 mm thick.

Anthurium uleanum var. *nanayense* is endemic to Peru in Loreto Department at 100 to 160 m, in the tropical moist forest transitional to tropical wet forest life zone. All collections have been made in the Iquitos region in Maynas Province, many from the Río Nanay (hence the name).

This variety is characterized by its relatively small size, rather elongate stem, broadly oblanceolate to almost obovate leaf blades drying brown and attenuate to narrowly acute at the base and slender, tapered spadix apparently starting as purplish and eventually becoming grayish white (appearing glaucous).

Variety *nanayense* is likely to be confused only with var. *uleanum*, which occurs in the same area and differs in having longer petioles, a longer spadix, more oblong leaf blades, and fewer flowers per spiral. Variety *nanayense* is smaller in overall size than var. *uleanum*, and the uniformity of herbarium specimens of the former is notable.

PERU. LORETO: 17 km SW of Iquitos, *Croat* 18460A (MO); Río Nanay, Iquitos, 100 m, *Plowman* 2482 (F, GH); Mishana, 120 m, *Solomon* 3559, 3562 (MO); Río Tepiche, Santa Elena, *McDaniel & Marcos* 11261 (MO); Prov. Maynas, Iquitos Region, ca. 120 m, *Revilla* 3597 (MO), 3685 (AMAZ, F, MO); Río Momón, 130 m, *Croat* 19929 (MO), *Díaz & Jaramillo* 45 (MO), *Rimachi* 7711, 7856, 7858 (IBE, MO); Mishana, 130 m, 3°55'S, 73°35'W, *Vásquez et al.* 5319 (MO); Puerto Almendras, 122 m, 3°48'S, 73°25'W, *Vásquez & Jaramillo* 3159, 6100, 6618, 7590 (MO); Río Nanay, Casería Mishana, 30 km SW of Iquitos, *Foster* 4215, 4227, 4350, 4437 (F); Iquitos–Santa María de Nanay, Mishana, 140 m, 3°50'S, 73°30'W, *Gentry & Emmons* 38015 (MO), *Gentry et al.* 28905, 31632, 36437 (MO); Santa María de Nanay, 130 m, *Schunke* 2453 (F, NY); Río Putomayo, Ecuador border, Guarnición Militar de Gueppi, *Díaz* 356 (F); Río Yaguasyacu, affluent of Río Ampiyacu, Brillo Nuevo, 2°40'S, 72°00'W, *Plowman et al.* 6854 (GH); Prov. Maynas, Dto. Iquitos, Iquitos Region, Puerto Almendras, 120 m, 3°48'S, 73°25'W, *Croat* 51207 (MO); Iquitos–Puerto Almendras, 15 km from Iquitos, 120 m, 3°47'S, 73°25'W, *Croat* 51190 (MO); Río Nanay, Carretera de Picuruyacu, 160 m, *Rimachi* 5464 (IBE); Prov. Requena, Río Ucayali, 4°55'S 73°45'W, *Gentry et al.* 56361 (MO).

Anthurium upalaense Croat & R. A. Baker, *Brenesia* 16(Suppl. 1): 97. 1979. TYPE: Costa Rica. Alajuela: between Cañas (Guanacaste) and Upala, near Río Zapote, 1.8–2.7 km S of Río Canalete, ca. 1,000 m, *Croat* 36342 (holotype, MO 2381219; isotypes, CR, F, K). Figures 321, 323, 324.

Epiphytic; stem less than 20 cm long, 1.5–3 cm diam.; leaf scars obscured by root mass and persistent cataphylls; roots moderately dense and numerous, brown to green, scurfy to pubescent, moderately thick and elongate, mostly 2–6 mm diam.; cataphylls lanceolate, coriaceous, acutely 1-ribbed throughout, 11–25 cm long, obtuse to acute to narrowly acuminate at apex, plain green to slightly tinged with red, drying brown, persisting intact, eventually deciduous. *Leaves* erect-spreading to spreading; petioles (6)10–47 cm long, 7–13 mm diam., subquadrangular, broadly sulcate with the margins sharply raised adaxially, 3–5-ribbed abaxially, the surface pale-speckled; geniculum thicker and paler than petiole, sometimes reddish abaxially, 1–2 cm long; blades subcoriaceous to coriaceous, elliptic to narrowly oblong-elliptic to oblong-lanceolate, obtuse to acute to gradually acuminate at apex (the acumen downturned and weakly apiculate), usually acute to narrowly acute (rarely obtuse) at base, (30)40–106 cm long, (4.5)8–34 cm wide, broadest at or near the middle, the margins prominently undulate; upper surface semiglossy, dark green, lower surface semiglossy to glossy, slightly paler; midrib flat to obscurely angular at base, becoming prominently and sharply raised toward the apex and paler than surface above, prominently higher than broad and 3-ribbed at base, becoming prominently and acutely raised toward the apex below; primary lateral veins 10–20 per side, departing midrib at 60–75° angle, almost straight to the collective vein, loop-connected in the upper half, prominently and convexly raised above and below, more so above, paler than surface; interprimary veins less prominent than primary lateral veins; tertiary veins weakly visible, paler than surface above, darker than surface below, flat above and below; reticulate veins partially visible above, darker than surface below, drying prominulous above and below; collective vein arising in the upper half or in the upper third of the blade, flat, when dried slightly raised on both surfaces, 3–5 mm from margin. *Inflorescences* erect to spreading or arching-pendent; peduncle (18)40–54 cm long, 4–10 mm diam., equaling to 1.4–2.4 \times as long as petiole, light green, weakly pale-speckled, sometimes tinged with purple at base,

terete or 1-ribbed below opening of the spathe, sometimes faintly many-ribbed; spathe erect to reflexed, often rolled up, subcoriaceous, yellow-green, sometimes heavily tinged with violet-purple (B & K yellow-green 6/7.5 to 7/2.5), oblong-lanceolate to lanceolate, (4.5)8–20 cm long, 1–4 cm wide, broadest near the base, inserted at 60–75° angle on peduncle, short-acuminate (the acumen minutely inrolled), acute to decurrent on peduncle at base, the margins meeting at 20–60° angle; spadix green (B & K yellow-green 5/6) to maroon (B & K red-purple 2/7.5), long-tapered, 9–30 cm long, 6–15 mm diam. near base, 4–6 mm diam. near apex; flowers square to rhombic, 2.3–3.4 mm long, 1.7–2.8 mm wide, the sides shallowly sigmoid to straight; 10–20 flowers visible in principal spiral, 7–15 in alternate spiral; tepals matte, inconspicuously pale punctate, with droplets appearing usually after 2 or more anthers emerge; lateral tepals 0.8–1.8 mm wide, the inner margins straight to slightly convex; pistils raised, rectangular to bluntly pyramidal, green to purplish; stigma ellipsoid, green, 0.4–1.1 mm long, brush-like, droplets appearing 12–22 days before stamens emerge, persisting for 5–15 days; stamens emerging \pm rapidly from the base or near the base, grouped in a tight cluster above the pistil; filaments retracting, short, ca. 0.2 mm long, 0.5–1 mm wide; anthers pale orange, 0.5–0.6 mm long, 0.7–1 mm wide, contiguous; thecae ellipsoid, scarcely divaricate; pollen orange fading to pale orange to lavender to white or tan. *Infructescence* pendent; spathe reflexed; spadix to 55 cm long, 6 cm diam., with berries emerging \pm uniformly throughout; berries red, oblong, acute at apex, tapered to both ends, to 15 mm long; mesocarp mealy, white, sweet; seeds 2 per berry, white, oblong, to 4 mm long.

Anthurium upalaense is known from the Atlantic slope of Nicaragua and Costa Rica, from near sea level to usually less than 700 m (rarely to 1,300 m) in tropical wet forest, premontane wet forest, and wetter parts of tropical moist forest.

This species is distinguished by its persisting, intact cataphylls, moderately long, subquadrangular, sulcate petioles which are 3–5-ribbed abaxially, long-tapered, usually violet-purple spadix and red fruits.

Anthurium upalaense is most closely related to *A. purpureospathum*. See that species for distinguishing characters. It is also apparently related to *A. concolor* from Panama, but differs in having the inflorescence pendent, the spadix long-tapered and more or less green at anthesis, the spathe

longer and recurled, and the fresh anthers pale orange.

In Nicaragua *Anthurium upalaense* can be confused with *A. schlechtendalii*, but that species differs in having most cataphylls weathering to fibers, as well as generally shorter, less conspicuously tapered spadix and thicker, more prominently reflexed spathe which is more heavily tinged with purple.

COSTA RICA. Cultivated at Kew: *Brown s.n.* (K), *Bull* 467/1873 (K). ALAJUELA: Florencia-Fortuna, 1 km S of Río Peñas Blancas bridge on road 142, 80 m, 10°22'N, 84°35'W, *Hammel et al.* 14054 (MO); NW of New Arenal Volcano, W of Fortuna, *Taylor & Taylor* 1170 (NY); San Juan de Lajas, *Smith* 1498 (NY); NE of Ciudad Quesada, Artezalea and Methodist Rural Center, *Molina et al.* 17264 (EAP, F); Cañas-Upala Road, 3–4 km NNE of Bijagua, along new road to Upala, 400–450 m, 10°45'N, 85°3'W, *Baker & Burger* 9859 (CR, F, MO), *Croat* 36319 (MO); Río Zapote, 1.8–5 km S of Río Canalete, 100–200 m, *Burger & Baker* 9964 (F), 10001 (CR, F, MO), *Croat* 36380 (MO), *Croat* 36342 (CR, F, K, MO); Lago Arenal, Alto de la Carpintera, Tilarán, *Brenes* 18194, 18195 (CR); Río Frio, Los Chiles, 30–40 m, 11°2'N, 84°44'W, *Holm & Iltis* 771 (NY), 811 (B, K, P, U). CARTAGO: 24 km NE of Turrialba on road to Limón, 450–525 m, 9°58'N, 83°34'W, *Liesner et al.* 15363 (B, MO, WIS); 5 km NE of Río Grande de Orosi at Tapanti, 1,300 m, *Utey & Utey* 5062 (MO); Tucurrique, Las Vueltas, *Tonduz* 13319 (US); Forests of Tuis, Turrialba, *Pittier* 12720 (US); Lake Bonilla, *Pacheco* 92 (F). GUANACASTE: El Arenal, *Standley & Valerio* 45328 (US); Río Aguacate, Laguna de Arenal, 500 m, *Khan et al.* 1085 (BM); Río Chiquito, slope above Lake Arenal, 600–700 m, 10°25'N, 84°46'W, *Haber et al.* 4819 (MO). HEREDIA: Puerto Viejo Region, Finca La Selva, *Folsom* 9558 (TEX), *Croat* 61218 (MO); on Río Puerto Viejo just E of its junction with Río Sarapiquí, 100 m, *Chacón* 462 (MO), *Croat* 44263, 44297 (MO), *McDowell* 389, 1058 (MO); Río Sucio, 20 m, *Croat* 35708 (MO); Puerto Viejo-San José, SW of Puerto Viejo, *Burger & Mata* 4343 (F, CR). LIMÓN: Cahuita-Limón, vic. Cahuita, 0–10 m, 9°57'N, 83°2'W, *Baker & Burger* 17A, 17B (CR, F, MO); 3 km W and 1.9 km S from Guayacán, highway to Limón, Los Angeles de Siquirres, 1,000 m, *Gomez et al.* 20543 (CR, MO, MSC, WIS); Hacienda Tapezco-Hacienda La Suerte, 29 air km W of Tortuguero, 40 m, 10°30'N, 83°47'W, *Davidson & Donahue* 8727 (MO); Pandora, 100 m, *Ocampo* 1985 (MO); Hacienda Tapezco-Hacienda La Suerte, 29 air km W of Tortuguero, 40 m, 10°30'N, 83°47'W, *Davidson & Donahue* 8272, 8608 (MO); swamp at Manzanillo de Talamanca, 5 m, 9°38'N, 82°39'W, *Grayum & Burton* 4324 (MO); Puerto Viejo de Talamanca-Manzanillo, 10–20 m, 10°38–39'N, 82°40–44'W, *Grayum* 3638 (MO); Hone Creek-NF on trail paralleling Río Carbón, *Utey & Utey* 660 (F); Limón, *Burger & Burger* 8446 (CR, F); Limón-Puerto Viejo, *Baker & Burger* 174 (F); hills 3.5 air km S of Islas Buena Vista in Río Colorado, 16 air km SW of Barra del Colorado, 10–120 m, 10°39'N, 83°40'40"W, *Davidse & Herrera* 31271 (MO, W); Cerro Coronel, E of Río Zapote, 10–100 m, 10°40'N, 83°40'W, *Stevens* 23923 (MO); E of Laguna Danto, 20–170 m, 10°41'N,

83°38'W, *Stevens* 23726 (MO); Cordillera de Talamancas, Reserva Biol. Hitoy Cerere, Cerro Bitarkara, 800 m, 09°38'25"N, 83°08'15"W, *Herrera & Solís* 2493 (CR, MO); Tsaki, *Pittier* 9509 (BR), *Tonduz* 9507 (BR, CR); Parque Tortuguero, 4 m, 10°31'N, 83°30'W, *Robles* 1331 (F, L, MO), 1332 (MO); Forests of Shioreas, Talamancas, *Tonduz* 9228 (BR); Quebrada Mata de Limón headwaters, Finca Anai, Sixaola, 25–40 m, 9°35'N, 82°39'W, *Grayum* 4501 (MO); Río Catarata, Bribrí, 50 m, *Croat* 43221 (F, K, MBM, MO, NY, RSA, SEL); Río Madre, 11 mi SW of Limón, Hwy. 32, 10 m, *Croat* 43305 (AAU, CR, G, GH, K, LE, MO, NY, P, RSA, UCLA, W, WIS); Río Reventazón, Cairo, Hamburg Finca, *Standley & Valerio* 48869 (US). PUNTARENAS: Cantón de Coto Brus, Las Cruces Tropical Botanical Garden, 6 km W of San Vito de Java, 1,200 m, *Croat* 57257 (CR, MO). NICARAGUA. CHONTALES: 4 km NW of Santo Domingo, 250 m, 12°18'N, 85°7'W, *Grijalva & Soca* 3749 (MO); N of Cuapa, 700 m, *Atwood & Neill* AN35 (MO); confluence of Río El Jordan and Río La Pradera, Hacienda San Martín, 390 m, 12°17'N, 85°15'W, *Stevens* 21826 (MO); Cerro Oluma, NE side, above Hacienda San Pedro Oluma, 600–700 m, 12°18'N, 85°23'W, *Nee* 28359 (MO). JINOTEGA: Río Coco, Rapido Plis, 200 m, 14°0'–10'N, 85°20'–30'W, *Stevens et al.* 16823 (MO). MATAGALPA: above Matagalpa–Siuna road, La Gloria, 78 km from Matagalpa, 600 m, 13°15'N, 85°35'W, *Moreno* 17218 (MO); Cerro Musun, Río Bilampi, 500–800 m, *Neill* 1782 (MO); Wanawas, 200–500 m, *Araquistain & Moreno* 2739 (BM, LE, MBM, MO), 2744 (MO); 4 km SW of Wanawas, 200–500 m, 13°0'–1'N, 85°14'W, *Araquistain & Moreno* 2658 (MO, NY); Quebrada Las Carpas, El Limón, 580 m, 13°15'N, 85°34'W, *Stevens & Moreno* 19715 (MO). RÍO SAN JUAN: Río Santa Cruz–Caño Santa Crucita, La Palma, 40–60 m, 11°2'–4'N, 84°24'–26'W, *Stevens* 23437 (MO), *Neill* 1552 (MO); 1 km W of San Juan del Norte, 0–2 m, 10°55'N, 83°43'W, *Rivière* 222 (MO); Río San Juan, San Juan del Norte, Caño la Barca, 0–10 m, *Araquistain* 3283, 3302, 3401 (MO), *Martínez & Rivière* 1952 (MEXU), 1957 (MEXU, MO). ZELAYA: Waslaya–Siuna, 6 km W of La Cuesta El Balsamo, Rosa Grande, 260–300 m, 13°38'N, 85°2'W, *Moreno* 19190 (MO); Río Blanco–Río Copalar, 29–31 km E of Río Blanco, 200–400 m, 12°50'–55'N, 85°0'–5'W, *Stevens* 12143, 12182, 12206 (MO); El Recreo, *Atwood & Neill* AN233 (MO); stream 1 km N of Las Mercedes, 160–180 m, *Vincelli* 3284 (MO); Monkey Point, 3 km above Caño El Pato, 10 m, 11°35'N, 83°42'W, *Moreno* 12466 (MO); Siuna–Matagalpa, 31.4 km beyond Río Uli, 8.9 km beyond Rosa Grande La Balsamo, 200 m, *Stevens* 7524 (MO); Caño Monte Cristo, La Gruperia, 10 m, 11°33'N, 84°48'W, *Moreno & Sandino* 14688, 14655 (MO); village of Germán Pomares, Las Benitas, 100 m, 11°36'N, 83°51'W, *Moreno & Sandino* 14933 (MO); Cerro Waylawas (Peñas Blancas), 5 k S of Wany, 13°30'20"N, 84°45'25"W, *Grijalva & Burgos* 1685 (MO); Río Punta Gorda, Atlanta, 10 m, 11°34'N, 84°1'W, *Moreno & Sandino* 12755 (MO); Río Sucio, 0.5 km E of 1st suspension bridge E of Bonanza, 140 m, 14°1'N, 84°34'W, *Stevens* 12317 (MO).

***Anthurium validifolium* K. Krause, Notizbl. Bot. Gart. Berlin-Dahlem 11: 607. 1932. TYPE: Panama. Chiriquí: forests along Río Ladrillo,**

above El Boquete, 1,200–1,300 m, *Pittier* 3052 (holotype, US). Figures 322, 325–327, 231, 232.

Epiphytic; stem to 16 cm long; leaf scars 2.5 cm wide; roots numerous, descending, green, smooth, 5–15 mm diam.; cataphylls moderately coriaceous, 20–30 cm long, long-acuminate at apex, medium green, sparsely pale-speckled, matte, drying tan (B & K yellow-red 9/10), persisting \pm intact. *Leaves* erect-spreading; petioles 20–27 cm long, 7–10 mm diam., quadrangular to bluntly D-shaped, flattened to broadly and shallowly sulcate adaxially, rounded abaxially, surface pale-speckled; geniculum thicker and slightly paler than petiole, becoming fissured transversely with age, 3–4.5 cm long; blades coriaceous, oblong to oblong-oblancoate or lanceolate, acute at apex (the acumens apiculate), acute and decurrent to rounded at base, 47–69 cm long, 10–19 cm wide, broadest at or near the middle, the margins broadly undulate; both surfaces matte, dark green above, paler below; midrib flat at base, becoming obtusely angular and narrowly raised at apex above, bluntly 2-ribbed and higher than broad at base, becoming prominently and convexly raised toward the apex below; primary lateral veins numerous, departing midrib at 60–70° angle, \pm straight, arcuate near the margin, sunken in grooves above, raised below, paler than surfaces; interprimary veins obscure above, darker than surface below; tertiary veins obscure above, darker than surface below; collective vein arising in the upper third of the blade, weakly sunken above, raised below, less prominent than primary lateral veins, 5–6 mm from margin. *Inflorescences* spreading, shorter than leaves; peduncle 33–39 cm long, 9–12 mm diam., 2 \times as long as petiole, subterete; spathe reflexed, coriaceous, dark green (B & K yellow-green 5/10), ovate-lanceolate, 16–17 cm long, ca. 4 cm wide, inserted at 45° angle on peduncle, acuminate at apex, rounded at base; stipe 7–13 mm long in front, ca. 3 mm long in back; spadix pale lavender to violet-purple (B & K purple 6/5 to 5/2.5), tapered, 15–23 cm long, (4)6–12 mm diam. near base, 2–5 mm diam. near apex; flowers rhombic, 3–3.5 mm long, 3.1–3.6 mm wide, the sides straight to weakly sigmoid; 7–8 flowers visible in principal spiral, 8–10 in alternate spiral; tepals matte; lateral tepals 1.5–1.8 mm wide, the inner margins broadly convex; pistils scarcely emergent, green; stigma ellipsoid, ca. 0.6 mm long, droplets appearing for ca. 1 week before stamens emerge; stamens emerging rapidly from near the base or sometimes from