

THREE NEW SPECIES OF *SOLANUM* SECTION *HERPYSTICHUM*
(SOLANACEAE) FROM ECUADOR

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ABSTRACT

Three new species of *Solanum* sect. *Herpystichum* from Ecuador are described and illustrated: ***S. limoncochaense***, endemic to the lowlands of eastern Ecuador, ***S. pacificum***, endemic to the Pacific lowlands, and ***S. crassinervium***, from northwestern Ecuador and southwestern Colombia. *Solanum limoncochaense* resembles the Colombian species *S. dalibardiforme*, but differs primarily in having stellate corollas. *Solanum pacificum* is similar to *S. dolichorhachis*, but has very thin, symmetrical leaves rather than chartaceous to coriaceous leaves with markedly oblique bases. Lastly, *S. crassinervium* is most similar to *S. evolulifolium*, but can be differentiated by its larger, somewhat fleshy leaves with prominent veins. *Solanum limoncochaense* and *S. pacificum* are both apparently restricted to small reserves and are believed to be in critical danger of extinction.

RESUMEN

Tres especies nuevas de *Solanum* sección *Herpystichum* del Ecuador son descritas e ilustradas: ***S. limoncochaense***, endémica a las tierras bajas del Ecuador oriental, ***S. pacificum***, endémica de las tierras bajas del Ecuador occidental, y ***S. crassinervium***, del noroeste del Ecuador y el suroeste de Colombia. *Solanum limoncochaense* guarda semejanza con la especie colombiana *S. dalibardiforme*, de la cual se distingue por sus corolas esteladas. *Solanum pacificum* se asemeja a *S. dolichorhachis*, pero tiene hojas muy finas y simétricas en vez de hojas de cartáceas a coriáceas con las bases claramente oblicuas. Finalmente, *S. crassinervium* se parece a *S. evolulifolium*, pero se puede diferenciar por las hojas más grandes y algo carnosas con nervaduras prominentes. Las distribuciones de *S. limoncochaense* y *S. pacificum* están restringidas a reservas pequeñas y se creen en peligro grave de extinción.

INTRODUCTION

The genus *Solanum* has been the focus of intense research because it contains several important crop species, including the potato (*S. tuberosum*), tomato (*S. lycopersicum*), and eggplant (*S. melongena*). Despite the economic importance of the genus, however, many groups among its ca. 1500 species remain poorly known. The “PBI *Solanum*: a world-wide treatment” project (www.solanaceaesource.org), an NSF-funded initiative to provide online descriptions and keys to all *Solanum* taxa, has allowed for increased exploration and discovery of new *Solanum* species. Ecuador is home to 183 species of *Solanum*, including 31–34 endemics, and is one of the highest centers of diversity for the genus (Jørgensen & León-Yánes 1999; Montúfar 2000). This paper, along with three others funded by this project (Knapp 2007, 2008; Stern & Bohs 2009), adds seven new species, five of which are endemic, to the list of Ecuadorian *Solanum*.

Solanum sect. *Herpystichum* Bitter is a group of ca. ten species found from Central America to northern Peru, and is a member of the informally-named “Potato clade” (Weese & Bohs 2007). Molecular phylogenetic analyses indicate that sect. *Herpystichum* constitutes a monophyletic group sister to sect. *Pterioidea* Dunal (Weese & Bohs 2007; Tepe & Bohs, unpublished manuscript). Species of sect. *Herpystichum* are trailing, terrestrial or climbing, herbaceous to woody vines rooting at the nodes. They are primarily plants of the rainforest understory, but several species are also found in pastures or other open areas. Like sect. *Pterioidea*, they have perfect flowers, but can be distinguished by the usually extra-axillary inflorescences (those in sect. *Pterioidea* are axillary in position). Some species have flattened fruits that are unique in *Solanum*. This group has never been revised and has received little attention since Bitter described most of its species in 1912 and 1913 (Bitter 1912, 1913a, b). Detailed study of sect. *Herpystichum* has revealed three additional species, described herein, that have been collected since Bitter’s focus on the genus. Two of the species are endemic

to Ecuador and occur in small reserves in areas under intense pressure from large-scale agricultural or oil exploration. They should both be added to the Red List for Ecuadorian Endemics (Knapp et al. 2007).

Maximum parsimony analysis of sequence data from nuclear ITS and GBSSI (or *waxy*) sequences place all three species in sect. *Herpystichum* (Tepe & Bohs, unpublished manuscript). *Solanum crassinervium* and *S. pacificum* are in a clade with *S. evolulifolium* Greenm., a widespread species that occurs from Central America and Andean South America and *S. loxophyllum* Bitter from the Pacific lowlands of Ecuador. *Solanum limoncochaense* is in a clade with the morphologically similar Central American species *S. phaseoloides* Polak. and *S. trifolium* Dunal, a high-elevation species known only from Bolívar Province, Ecuador. We were unable to obtain material for molecular analysis of *S. dalibardiforme* Bitter and *S. dolichorhachis* Bitter, the species most similar morphologically to *S. limoncochaense* and *S. pacificum*, respectively.

***Solanum pacificum* Tepe, sp. nov. (Fig. 1).** TYPE. ECUADOR. LOS RÍOS: Centro Científico Río Palenque, in secondary forest, 215 m, 5 Feb 2009 (fl, fr), E.J. Tepe et al. 2696 (HOLOTYPE: QCNE!; ISOTYPES: BM!, MO!, NY!, QCA!, UT!).

Solano dolichorhache aemulans, differt omnibus organis glabris, caulibus molliter herbaceis et foliorum basibus symmetricis.

Vine, climbing other vegetation via adventitious roots at the nodes. Stems slender, weakly herbaceous, glabrous, densely gland-dotted; fertile branch tips pendent. Sympodial units plurifoliate, not geminate. Leaves simple, 14–19 × 4.5–8 cm, 2–3 times as long as wide, lanceolate to ovate, membranaceous to thinly chartaceous, glabrous adaxially and abaxially, densely gland-dotted, the base rounded to obtuse, more or less symmetrical, the margin entire, the apex acuminate; petioles 1–1.5 cm, glabrous, densely gland-dotted. Internodes 1.5–7 cm. Inflorescences 4–10 × 2–3 cm, slender, extra-axillary, unbranched with 17–58 flowers (scars), all flowers apparently perfect, the axes glabrous, very slender; peduncle 2–4.5 cm long; rachis ca. 6 cm; pedicels 8–10 mm in flower, slender, 15–20 mm in fruit, enlarged apically, glabrous, spaced nearly contiguously to 12 mm apart, articulated at base. Flowers with the calyx 1–1.2 mm long, glabrous to minutely and sparsely ciliate along margins, the tube 0.5–0.7 mm long, the lobes 0.5–0.6 × 0.8–1 mm, rounded, rounded to weakly acuminate at tips; fruiting calyx somewhat accrescent, the lobes 0.6–0.8 × ca. 1 mm. Corolla 0.8–1 cm in diameter, ca. 5 mm long, stellate, membranous, green to white near the margins of the petals, the lobes 4–5 × 1.2–2.5 mm, reflexed at maturity, acute at apices, glabrous adaxially and abaxially, the margins ciliate. Stamens subequal, with filaments ca. 0.8 mm long, glabrous, free; anthers 1.5–2 × 0.7–1.2 mm, oblong, not connivent, yellow, the pores directed distally, opening into short longitudinal slits with age. Ovary glabrous; style 4–4.5 × 0.1–0.2 mm, glabrous, slightly clavate; stigma truncate. Fruit (immature) ca. 0.9 × 0.6 cm, ovoid, pointed at apex, green, glabrous. Seeds unknown.

Additional specimens examined: **ECUADOR. Junction of the provinces Bolívar, Cañar, Chimborazo, and Guayas:** Foothills of the western cordillera near the village of Bucay, 1000–1250 ft, 8–15 Jun 1945 (st), W.H. Camp E-3782 (MO). **Los Ríos:** Cantón Quevedo, Centro Científico Río Palenque, along road between Santo Domingo de los Colorados and Quevedo at km 47, 1.7 km S of Patricia Pilar, 0°35'S 79°21'W, 220 m, 9 Apr 1992 (st), T.B. Croat 73807 (MO); Río Palenque Biological Station, km 56 Rd. Quevedo-Sto. Domingo, 150–220 m, 26 Oct 1974 (st), C.H. Dodson 5663 (SEL); Río Palenque Biological Station, km 56 Rd. Quevedo-Sto. Domingo, 150–220 m, 7 Aug 1975 (fl), C.H. Dodson 5933 (AAU, MO, QCA, SEL); Río Palenque Field Station, half way between Quevedo and Santo Domingo de los Colorados, 200 m, 22 Feb 1974 (fl), A. Gentry 10109 (MO).

Solanum pacificum is a striking species with leaves that are deep purplish-green above with whitish veins, and weakly to intensely purple below. This species is apparently quite rare and has not been collected extensively, but it is clearly distinct from other members of sect. *Herpystichum*. It is recognizable by its climbing habit, completely glabrous vegetative parts, its large, very thin leaves and slender, weakly herbaceous stems.

Solanum pacificum specimens have been identified as *S. dolichorhachis*, but *S. dolichorhachis* has wiry woody stems, chartaceous to coriaceous leaves with distinctly oblique leaf bases, and spindle-shaped fruits 2–3 times longer than wide vs. the weak-herbaceous stems, membranaceous leaves more or less symmetrical at the base, and globose to somewhat conical (but less than twice as long as wide) fruits of *S. pacificum*. It is also related to *S. crassinervium*, *S. evolulifolium*, and *S. loxophyllum*, but is easily distinguished from these species by the texture, shape, and size of the leaves. *Solanum pacificum* also bears a resemblance to the sympatric *S. leptorhachis* Bitter (sect. *Geminata*) due to its simple leaves, long, slender inflorescences, and small,

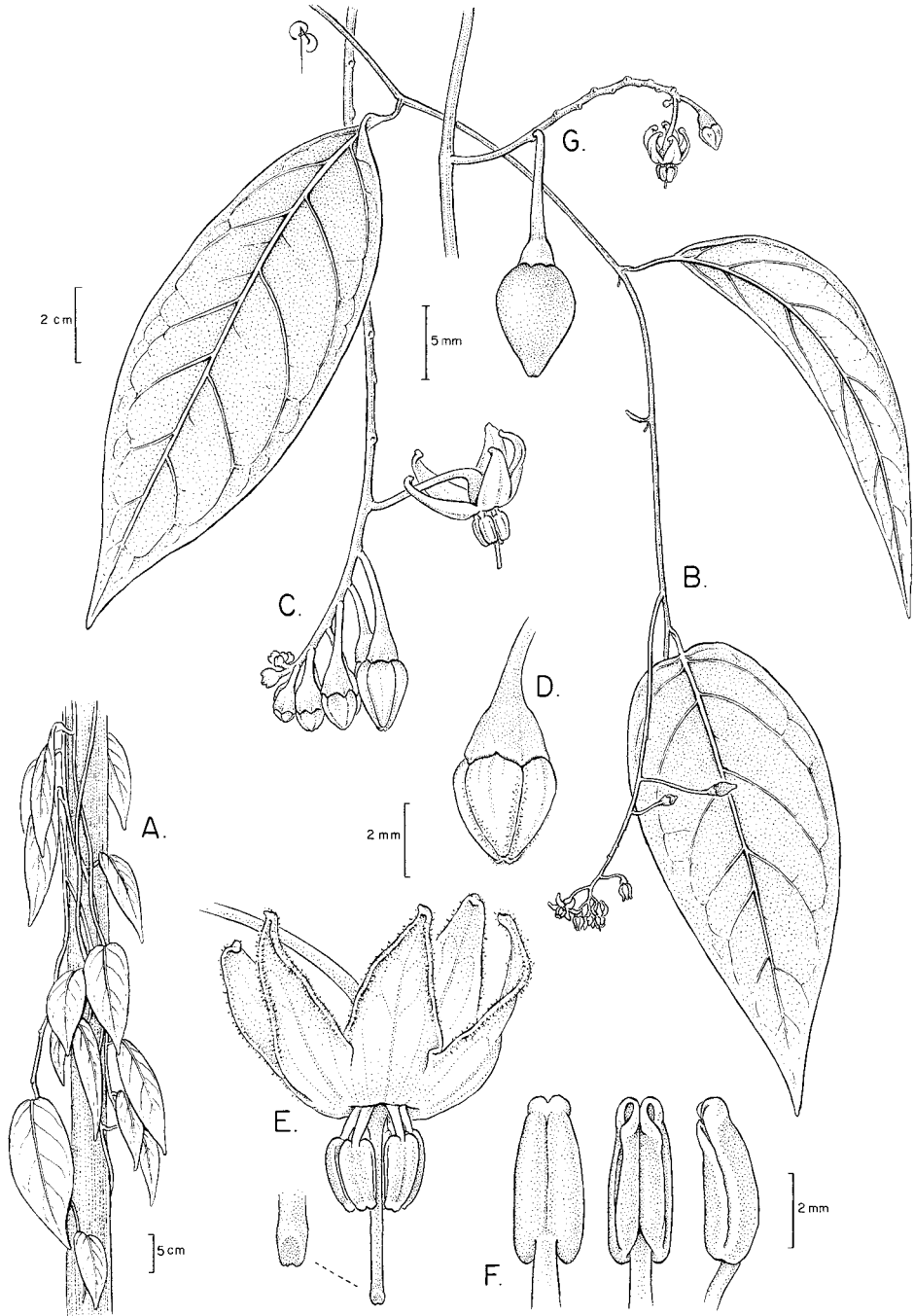


FIG. 1. *Solanum pacificum* Tepe. A. Habit. B. Leaves and inflorescence. C. Inflorescence. D. Bud. E. Flower and detail of stigma. F. Stamens. G. Inflorescence with fruit (immature). (All drawn from E.J. Tepe 2696 [photo & NY]).

stellate, greenish-white flowers. However, *S. leptorhachis* is a free-standing shrub 1–2 m tall with unifoliate sympodial units on flowering stems vs. a vine with plurifoliate sympodial units in *S. pacificum*.

The lowlands of Ecuador between the Pacific Ocean and the Andes are under large-scale cultivation of cacao, papayas, bananas, African oil palm, etc., and very few areas of undisturbed habitat remain intact. Most collections of *S. pacificum* are from the small, but well-preserved Centro Científico Río Palenque reserve. There are no large reserves in western Ecuador (like Yasuni in the east) and it is likely that *S. pacificum* and other plant species endemic to western Ecuador are surviving in small, isolated reserves. As a result, *S. pacificum* is in critical danger of extinction due to habitat loss and every effort should be made to maintain the reserves in this region.

Etymology.—*Solanum pacificum* is named after the Pacific lowlands of Ecuador where it is endemic, and as a tribute to ET's wife and frequent field companion María Paz Moreno.

Habitat and Distribution.—*Solanum pacificum* occurs in rainforest habitats in the Pacific lowlands of Ecuador, 50–300 m in elevation.

Phenology.—Flowering specimens have been collected from Feb–Aug; the type collection, collected in Feb, is the only fruiting specimen seen. It is likely that fruiting is more frequent than the collection record indicates.

***Solanum crassinervium* Tepe, sp. nov. (Fig. 2).** TYPE. ECUADOR. CARCHI/ESMERALDAS: near Lita, 600 m, wet evergreen forest, 19 May 1987 (fl, fr), *H.H. van der Werff 9496* (HOLOTYPE: QCNE!; ISOTYPES: MO!, NY!).

Solanum evolvulifolio affinis sed foliis et floribus majoribus, foliarum nervis lateralibus conspicuis, et petiolis plerumque ultra 5 mm longis notabilis.

Vine or scandent shrub, climbing understory trees as high as 4 m via adventitious roots at the nodes; leafy branches spreading to pendulous. Stems thickly herbaceous to weakly woody, somewhat fleshy, glabrous to very sparsely pubescent and soon glabrescent. Sympodial units plurifoliate to rarely unifoliate, not geminate. Leaves simple, 3.5–14 × 1.5–8 cm, ca. 1–2 times as long as wide, gradually reduced in size toward the inflorescence, ovate to elliptic, somewhat fleshy, glabrous adaxially and abaxially, the secondary veins 5–7 per side, conspicuous and prominent abaxially, the base rounded to truncate to cordate, sometimes oblique, the margin entire, the apex shortly acuminate; petioles (0.2–)1–1.5 cm, glabrous. Internodes 1.5–5.5 cm. Inflorescences 1–3 × 1–4 cm to ca. 6 × ca. 5.5 cm in fruit, stem-terminal to axillary to extra-axillary, unbranched to branched, with 2–16 flowers (scars), all flowers apparently perfect, the axes glabrous; peduncle 0.1–0.5 cm long; rachis 0.1–2 cm; pedicels 4–12 mm in flower, 9–18 mm in fruit, only slightly enlarged apically, glabrous to rarely very sparsely pubescent, spaced nearly contiguously, articulated at base. Flowers with the calyx 2.5–3.5 mm long, glabrous, the margins thickened, the tube 2.5–3 mm long, the lobes 1.5–2.5 × 1.5–2 mm, deltoid, acute to acuminate at tips, white to pale pink; fruiting calyx somewhat accrescent, the lobes 1.5–2 × 1.5–2.5 mm. Corolla 1.5–2 cm in diameter, 5–8 mm long, stellate, somewhat fleshy, white, the lobes 5–8 × 2.5–3 mm, planar at anthesis, acute to acuminate at apices, glabrous adaxially, sparsely pubescent near the apex abaxially, the margins densely ciliate. Stamens equal, with filaments 1–1.5 mm long, glabrous, free; anthers 3–4 × 1.2–1.5 mm, oblong, not connivent, yellow, the pores directed distally, opening into short longitudinal slits with age. Ovary glabrous; style 4–6 × ca. 0.3 mm, glabrous, cylindrical, sometimes deflected to one side of flower (Fig. 1D); stigma capitate. Fruit (immature) 0.7–1 × 0.7–0.9 cm, ovoid to nearly globose, slightly flattened, somewhat pointed at apex, green to pale orangish to brownish at maturity, glabrous. Seeds 2–2.2 × 1.8–2 mm, flattened-reniform, tan, the surface minutely reticulate-rugulose.

Additional specimens examined: **COLOMBIA. Nariño:** Mpio. Barbacoas, Corregimiento Altaquer, Vereda El Barro, Reserva Natural Río Nambí, margen derecha del Río Nambí, 1°18'N, 78°08'W, 1325 m, 1 Dec 1993 (fl), *P. Franco et al. 4707* (NY); Mpio. Tumaco, Resguardo de Albí, lado izquierdo del Río Albí, 1°22'N, 78°28'W, 220–280 m, 12 Nov 1995 (fl, fr), *B.R. Ramirez et al. 8826* (NY); Mpio. Barbacoas, Resguardo Indígena de Saundé, 1°30'N, 78°20'W, 350 m, 21 Jan 1996 (fr), *B.R. Ramirez et al. 9699* (NY). **ECUADOR. Carchi:** Cantón Tulcán, Parroquia Tobar Donoso, Reserva Indígena Awá, Centro El Baboso, 0°53'N, 78°25'W, 1800 m, 17–27 Aug 1992 (fr), *G. Tipaz et al. 1813* (BM, NY, QCNE); border area between Prov. Carchi and Esmeraldas, 20 km past Lita on road Lita-Alto Tambo, 550 m, 25 Jun 1991 (fl), *H. van der Werff et al. 11972* (MO, NY, QCNE). **Esmeraldas:** Bilsa Biological Station, Montañas de Mache, 20 km NW of Quinindé, 3 km W of Santa Isabel, 0°22'N 79°45'W, 600 m, 26 Sep 1994 (fr), *J.R. Abbott 15256* (MO); San Lorenzo, Reserva Étnica Awá,

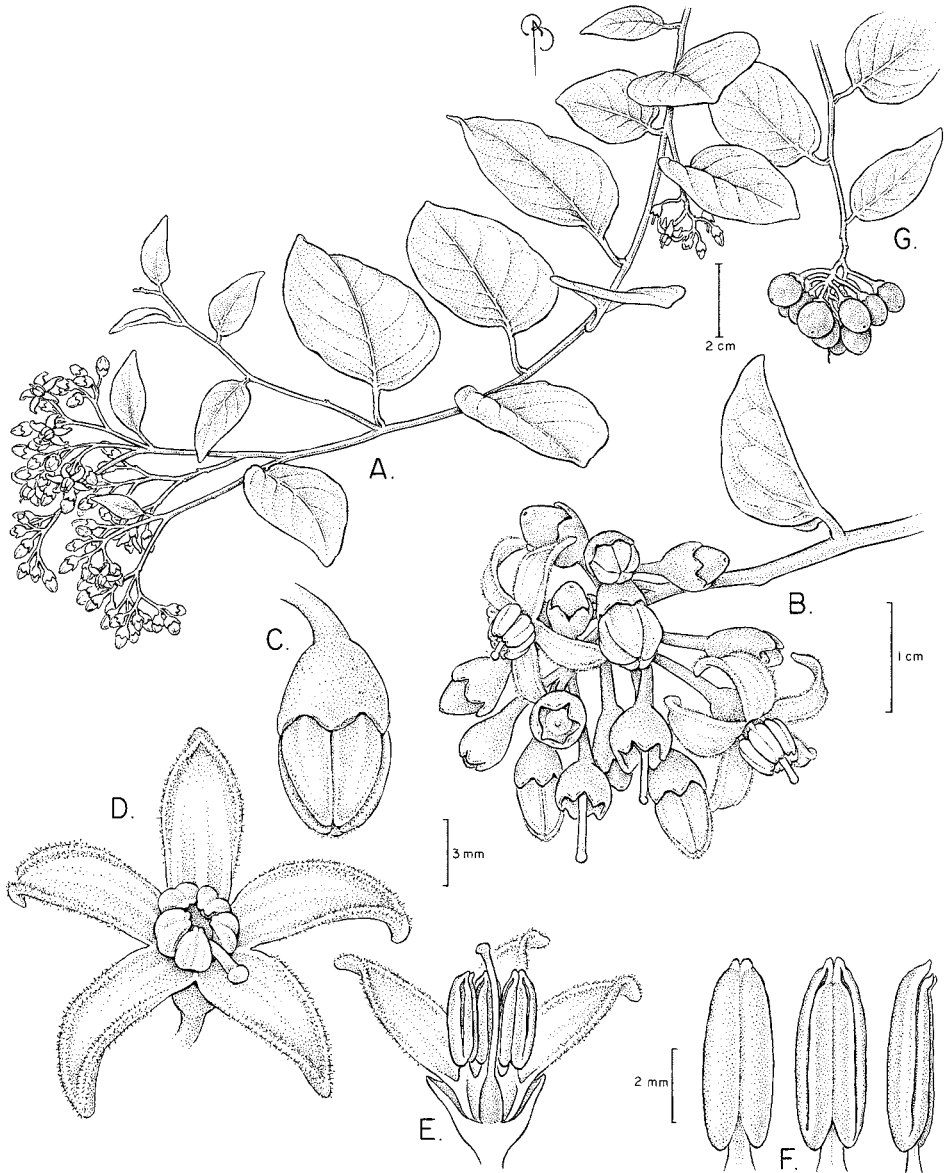


FIG. 2. *Solanum crassinervium* Tepe. A. Habit. B. Inflorescence. C. Bud. D. Flower. E. Flower, longitudinal section. F. Stamens. G. Infructescence (fruits immature). (A, C, E-F drawn from *H. van der Werff* 11972 [MO] and *E.J. Tepe* 2729 [photo]; B drawn from *E.J. Tepe* 2729 [photo]; D drawn from *S. Stern* 400 [photo]; G drawn from *G. Tipaz* 1813 [MO] and *E.J. Tepe* 2729 [photo].

Parroquia Alto Tambo, Centro de la Union, Cañon del Río Mira, 0°52'N 78°26'W, 250 m, 22 Mar 1993 (fl), *C. Aulestia* & *M. Aulestia* 1431 (QCNE); Cantón Quinindé, Bilsa Biological Station, Montañas de Mache, 35 km W of Quinindé, 5 km W of Santa Isabel, reserve boundary N from Station road, between the Río Cube tributary and the E-bearing boundary crossing the Río Cube, 0°21'N, 79°44'W, 400–600 m, 26 Sep 1994 (fr), *M.S. Bass* & *N. Pitman* 68 (BM, NY); Bilsa Biological Station, Montañas de Mache, 35 km W of Quinindé, 5 km W of Santa Isabel, 0°21'N 79°44'W, 400–600 m, 6 Dec 1994 (fl), *M.S. Bass* & *N. Pitman* 289 (MO); San José, km 321 along railroad from Ibarra to San Lorenzo, 1°N, 78°W, 350 m, 5 May 1982 (fl), *B.M. Boom* 1374 (NY, QCA); Cantón Quinindé, Bilsa Biological Station, Montañas de Mache, 35 km W of Quinindé, 5 km W of Santa Isabel, Monkey Bone Trail, 0°21'N, 79°44'W, 400–600 m, 15 Sep 1994

(fr), *J.L. Clark & B. Adnepos 55* (QCNE); Cantón Quinindé, Bilsa Biological Station, Mache Mountains, 35 km W of Quinindé, 5 km W of Santa Isabel, 0°21'N, 79°44'W, 400–600 m, 24 Jan 1995 (fl), *J.L. Clark 412* (BM, NY, QCNE); Cantón Quinindé, Bilsa Biological Station, Mache Mountains, 35 km W of Quinindé, 5 km W of Santa Isabel, 0°21'N, 79°44'W, 500 m, 18 Feb 1996 (fr), *J.L. Clark 2121* (BM, NY, QCNE); Cantón Quinindé, Mache-Chindul Ecological Reserve, Bilsa Biological Station, Mache Mountains, 35 km W of Quinindé, 0°21'N, 79°44'W, 500 m, 1–10 Jan 1997 (fr), *J.L. Clark et al. 3762* (MO, NY, QCNE); 10 km W of Lita on road to San Lorenzo, 0°55'N, 78°30'W, 800 m, 12 May 1991 (fl), *A. Gentry et al. 69984* (MO, NY); Cantón San Lorenzo, Lita to El Cristal road, finca of Dr. La Lama, 13.5 km S of Lita, 0°49'N, 78°26'W, 1220–1350 m, 2 Nov 1992 (fl, fr), *J.L. Luteyn et al. 14744* (MO, NY, QCA); Cantón Quinindé, carretera Herrera–El Páramo (Sat. Isabel), Estación Biológica Bilsa, 0°1'36.7"W, 79°42'40.4"W, 580 m, 18 Feb–5 Mar 1995 (fr), *W. Palacios et al. 13548* (MO, NY, QCNE); Cantón Quinindé, Bilsa Biological Station, Montañas de Mache, 35 km W of Quinindé, 5 km W of Santa Isabel, Monkey Bone trail, 0°21'N, 79°44'W, 400–600 m, 11 Dec 1994 (fl), *N. Pitman & M. Bass 1091* (MO, NY, QCNE); San Lorenzo, Territorio Awá, centro Mataje, 1°11'44"N, 78°34'29"W, 200 m, 17 Nov 2000 (fl), *W. Ramírez et al. 12* (NY), *15* (NY); Bilsa Biological Station, 5 km W of Sta. Isabel, 0°20'49"N 79°42'41"W, 540 m, 14 Feb 2009 (fl, fr), *S. Stern 400* (QCNE, UT); Bilsa Biological Station, 5 km W of Sta. Isabel, 0°20'49"N 79°42'41"W, 540 m, 13 Feb 2009 (fl, fr), *E.J. Tepe & S. Stern 2729* (BM, NY, QCA, QCNE, UT).

Solanum crassinervium is the most robust species in sect. *Herpystichum* and is recognizable by the somewhat fleshy texture of the leaves, stems, and flowers, its ovate to elliptical leaves with conspicuous secondary veins in fresh and dried material, and occasionally branched inflorescences. Its distribution is restricted to the Chocó region of SW Colombia and NW Ecuador, a biodiversity hotspot with one of the highest species diversities per area (Myers et al. 2000), but it is apparently quite common in some parts of its range.

Solanum crassinervium is closely related to *S. evolvulifolium* and *S. loxophyllum*, but differs from both species in its robust habit, ovate leaves (vs. mostly oblong), fleshy calyx and corolla, and inflorescences that may be simple and branched within an individual. The leaves, petioles, and internodes are many times larger than those of *S. evolvulifolium*. *Solanum loxophyllum* is larger in stature than *S. evolvulifolium*, but *S. crassinervium* is easily distinguished from the former based on leaf and inflorescence characters. The leaves of *S. crassinervium*, like those of *S. loxophyllum*, are somewhat fleshy, but *S. crassinervium* has more secondary veins (5–7 vs. 3–4 pairs) and these are prominent abaxially, whereas those of *S. loxophyllum* are obscure within the fleshy leaf blade. These leaf characters are apparent in both fresh and dried material. The often stout inflorescences of *S. crassinervium* differ from those of *S. loxophyllum*, which are apparently always simple and very slender and delicate. Furthermore, inflorescences of *S. loxophyllum* are typically borne on older, leafless parts of the stem, as compared to those of *S. crassinervium*, which appear to always be produced in the leafy parts of the stem. *Solanum crassinervium* has sometimes been identified as *S. siphonobasis* Bitter, a member of *Solanum* sect. *Anarrichomenum* Bitter, but differs from this species in having > 2 flowers per inflorescence (*S. siphonobasis* has 1–2 flowers per inflorescence), and in the fleshy texture of the leaves, stems, and flowers. Species of sect. *Anarrichomenum* are also node-rooting vines, but they differ from sect. *Herpystichum* primarily in possessing pseudostipules at the base of the petioles (Correll 1962).

Etymology.—The epithet *crassinervium* describes the prominent secondary veins that help distinguish this species from its closest relatives.

Habitat and Distribution.—*Solanum crassinervium* occurs in lowland and premontane rainforest habitats in the Chocó region of Colombia and Ecuador, including the Mache-Chindul mountain range in northwestern Ecuador, 150–1800 m in elevation.

Phenology.—Flowering apparently occurs year-round; fruiting specimens have been collected from Jan–Feb, and Sep–Dec.

***Solanum limoncochaense* Tepe, sp. nov. (Fig. 3).** TYPE. ECUADOR. SUCUMBÍOS: Limoncocha, Reserva Biológica Limoncocha, in wet primary forest near NW corner of lake, 250 m, 22 Jan 2009 (fl, fr), *E.J. Tepe & S. Stern 2627* (HOLOTYPE: QCA!; ISOTYPES, BMI, MO!, NY!, QCNE!, US!, UT!)

Solano dalibardiformi simile sed omnibus organis vegetativus glabris et floribus stellatis differt.

Terrestrial herb, trailing, rooting at the nodes. Stems slender, glabrous. Sympodial units apparently plurifoliate, not geminate. Leaves simple, the blades 3.5–7 × 3.5–8 cm, slightly wider than long, rounded, somewhat fleshy, glabrous; venation palmate with 5 (–7) veins, the base cordate, the margins entire, slightly revolute on some leaves, the apex rounded to obtuse to shortly acuminate; petioles 3–16 cm, glabrous. Internodes

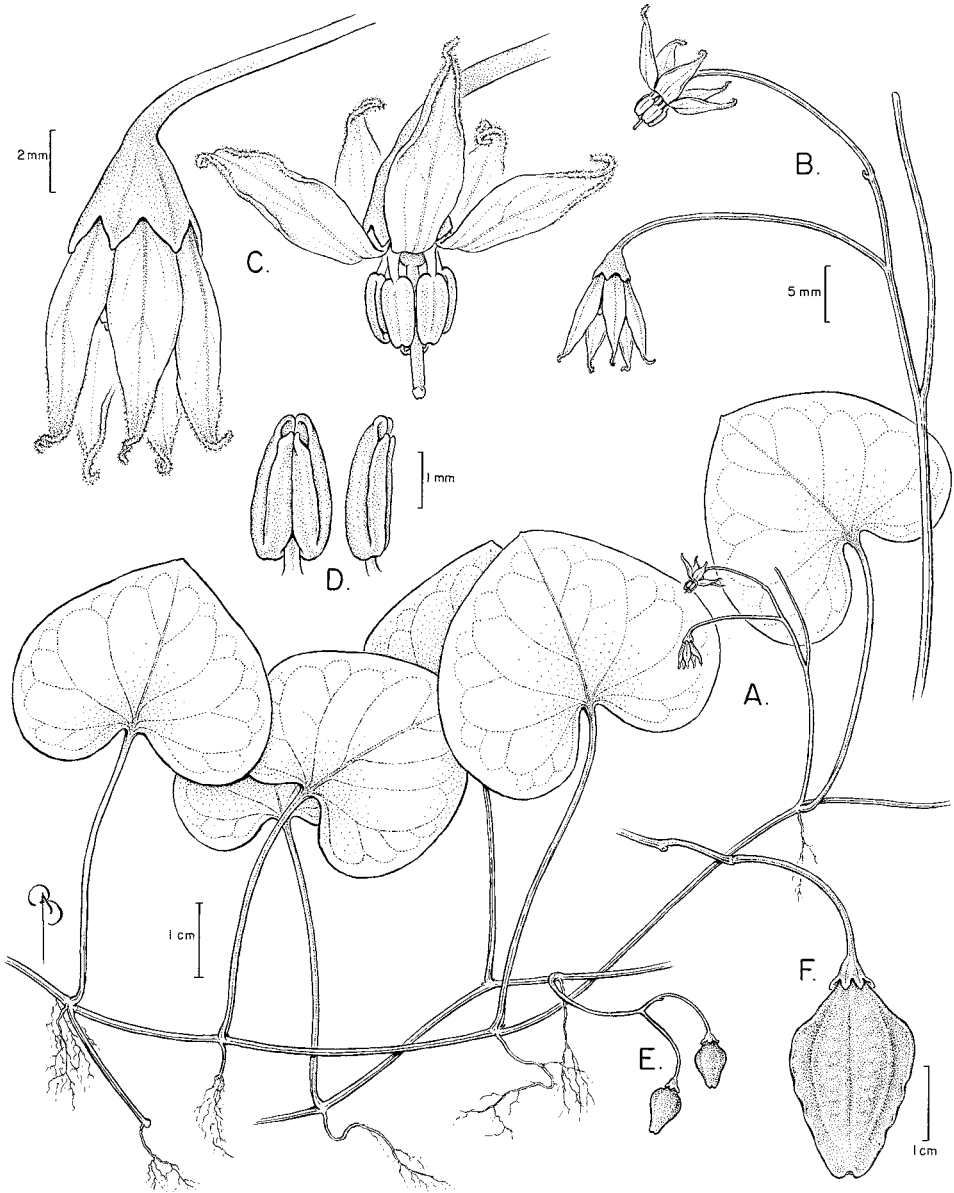


FIG. 3. *Solanum limoncochaense* Tepe. A. Habit. B. Inflorescence. C. Flowers. D. Stamens. E. Inflorescence. F. Fruit (immature). (All drawn from *M.T. Madison et al.* 5327 [MO]).

2.5–20 cm. Inflorescences 4–8 × ca. 3 cm, extra-axillary, unbranched, with 2–3 flowers, all flowers apparently perfect, the axes glabrous; peduncle 1.3–4.5 cm, slender; rachis 0.9–1.5 cm; pedicels 15–25 mm in flower, 25–30 mm in fruit, slender, glabrous, spaced ca. 15 mm apart, articulated at the base. Flowers with the calyx 2.5–4.2 mm long, the tube 1–1.5 mm long, the lobes 1.5–2 × ca. 1.2 mm, rounded, acuminate at tips, glabrous to sparsely pubescent abaxially, densely pubescent adaxially, purplish; fruiting calyx very slightly accrescent, the lobes 1–1.2 × 1.5–2 mm, truncate-acuminate. Corolla 1–1.6 cm in diameter, 5–8 mm long, stellate, membranous, white, the tube 1.5–2 mm, the lobes 6–10 × 1.5–3 mm, lanceolate, narrowly acute

at tips, the apex papillose adaxially and abaxially, the margins ciliate apically. Stamens equal, the filaments ca. 1 mm, glabrous; anthers 2–2.5 × ca. 1 mm, slightly tapered, sagittate basally, not connivent, yellow, the pores large and directed distally, opening into longitudinal slits with age. Ovary sparsely papillose; style 2–2.5 × 0.3 mm, straight, cylindrical, stout, sparsely papillose in lower half; stigma capitate, somewhat 2-lobed. Fruits 1–3 × 0.6–3.2 cm, ovoid-rhomboid, flattened, greenish-brown to purplish near apex when immature, bronze-brown when mature, sparsely pubescent with hairs < 0.1 mm to glabrous when mature, the apex truncate to emarginate, strongly fragrant with a sweet, heavy scent, very juicy, the flavor sweet. Seeds 2–2.5 mm in diameter, lenticular, light reddish-brown, the surface minutely rugose.

Additional specimens examined: **ECUADOR. Napo:** Limoncocha on Río Napo, 300 m, 18 Oct 1974 (fl.), B.A. Drummond 7350 (MO); environs of Limoncocha, 240 m, 16 Jun 1978 (fl, fr), M.T. Madison et al. 5327 (AAU, F, K, MO, NY, QCA, SEL); near northwest corner of lake, Limoncocha, Sep 1969 (fl), R.N. Mowbray 699104 (MO).

Solanum limoncochaense belongs to a distinctive group of species within *Solanum* sect. *Herpystichum* characterized by herbaceous, ground-trailing stems that root at the nodes and bizarre, flattened, arrowhead-shaped fruits; this group includes *S. pentaphyllum*, *S. phaseoloides*, *S. dalibardiforme*, and *S. trifolium*. *Solanum limoncochaense* can be distinguished from other species in this group by its simple leaves and stellate flowers. Vegetatively, it is most similar to *S. dalibardiforme* from central Colombia, and most specimens have been annotated as this species. Both species have simple, cordate leaves, but *S. limoncochaense* is distinguishable because all vegetative parts are glabrous, and has stellate rather than rotate corollas. Furthermore, *S. limoncochaense* is found at low elevations, whereas *S. dalibardiforme* is found at elevations > 2000 m. *Solanum limoncochaense* grows in dense, presumably clonal patches on the rainforest floor and over fallen trees. It is apparently a weak climber and living plants in the field were seen climbing trees to no more than 1 m from the ground (E.J. Tepe & S. Stern, pers. obs).

Mature fruits are bronze-brown in color, very juicy, and have a strongly sweet aroma and flavor. The fruits lie on the ground when stems are trailing, or are pendulous on climbing stems. The dispersal agents of these fruits are unknown, but based on the strong scent, color, and presentation, it is likely that they are eaten by rainforest rodents such as the guatusa or agouti (genus *Dasyprocta*; W. Haber, pers. comm.).

Solanum limoncochaense is endemic to Ecuador and all known collections are from the 'terra firme' forests at the northern side of the Limoncocha lake within the Reserva Biológica Limoncocha, a small reserve of 4613 hectares (including the lake which is ca. 250 hectares). Much of the rest of the reserve is made up of swamps and seasonally flooded forests, and *S. limoncochaense* was not encountered in any of the flooded forest habitats. The reserve is surrounded by cultivated land and oil platforms, whose effects on the habitats within it are unknown. If this area is truly the only locality for this species, then it should be considered critically endangered; however, the Reserva de la Biosfera Yasuní is nearby, and much of this enormous reserve has not yet been explored botanically. It is hoped that this species is more widespread than it appears to be based on the collections currently available.

Etymology.—*Solanum limoncochaense* takes its name from the Laguna de Limoncocha in western Ecuador, the geographic locality of all known collections of the species.

Habitat and Distribution.—This species is apparently endemic to Napo and Sucumbíos Provinces, Ecuador, near the Laguna de Limoncocha, where it grows in primary forests and clearings, 240–300 m in elevation.

Phenology.—Flowering specimens have been collected in Jan, Jun, Sep, and Oct; fruiting specimens have been collected in Jan and Jun.

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REFERENCES

- BITTER, G. 1912. *Solana nova vel minus cognita* II. Repert. Spec. Nov. Regni Veg. 11:1–18.
- BITTER, G. 1913a. *Solana nova vel minus cognita* VII. Repert. Spec. Nov. Regni Veg. 11:481–491.
- BITTER, G. 1913b. *Solana nova vel minus cognita* X. Repert. Spec. Nov. Regni Veg. 12:49–90.
- CORRELL, D.S. 1962. The potato and its wild relatives. Contr. Texas Res. Found., Bot. Stud. vol. 4. Texas Research Foundation, Renner.
- JØRGENSEN, P.M. AND S. LEÓN-YÁNEZ (EDS.) 1999. Catalogue of the vascular plants of Ecuador. Monogr. Syst. Bot., Missouri Bot. Gard. 75:1–1182.
- KNAPP, S. 2007. *Solanum coalitum* (Solanaceae), a new endemic species from southern Ecuador. Novon 17: 212–216.
- KNAPP, S. 2008. A revision of the *Solanum havanense* species group and new taxonomic additions to the Geminata clade (*Solanum*: Solanaceae). Ann. Missouri Bot. Gard. 95:405–458.
- MONTÚFAR, R. 2000. Solanaceae. In: R. Valencia, N. Pitman, S. León-Yánes, P.M. Jørgensen, eds. Libro Rojo de las plantas endémicas del Ecuador 2000. Herbario QCA, Pont. Univ. Católica del Ecuador, Quito.
- MYERS, N., R.A. MITTERMEIER, C.G. MITTERMEIER, G.A.B. DA FONSECA, AND J. KENT. 2000. Biodiversity hotspots for conservation priorities. Nature 403:853–858.
- STERN, S.R. AND L. BOHS. 2009. Two new species of *Solanum* from Ecuador and new combinations in *Solanum* section *Pachyphylla* (Solanaceae). J. Bot. Res. Inst. Texas 3:503–510.
- WEESE, T.L. AND L. BOHS. 2007. A three-gene phylogeny of the genus *Solanum* (Solanaceae). Syst. Bot. 32: 445–463.