

Gonolobus aloiensis (Apocynaceae, Asclepiadoideae), a New Species from St. Eustatius

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Abstract—A new species from St. Eustatius, *Gonolobus aloiensis* (Apocynaceae, Asclepiadoideae, Gonolobinae), is described and illustrated. This new species is endemic to St. Eustatius (northern Leeward Islands) and represents the first record of the genus for the island. It exhibits morphological similarity to continental *G. albomarginatus*, but can be distinguished in part by abaxial leaf surfaces glabrous, calyx and corolla lobes shorter and narrower, and abaxial corolla lobes completely lacking glandular indumentum and with eglandular indumentum restricted at most to only the top two-thirds of the lobes. An amplified key to species of *Gonolobus* s. s. in the West Indies is provided.

Keywords—Climbing milkweeds, Gonolobinae, Lesser Antilles.

Gonolobus Michx. (Apocynaceae: Asclepiadoideae) is a New World genus comprising an estimated 100–150 species (Rosatti 1989; Mabberley 1997; Stevens 2001). In the West Indies, here defined to include the Bahamas, the Greater Antilles, and the Lesser Antilles (excl. Aruba, Bonaire, Curaçao, Trinidad, and Tobago), ten species of *Gonolobus* were recognized by Krings (2008), all endemic to the region. Eight of these species are single island endemics: *G. absalonensis* Krings (Martinique), *G. iyanolensis* Krings (St. Lucia), *G. jamaicensis* Rendle (Jamaica), *G. martinicensis* Decne. (Martinique), *G. stapelioides* Desv. ex Ham. (Jamaica), *G. stellatus* Griseb. (Jamaica), *G. waitukubuliensis* Krings (Dominica), and *G. youroumaynesis* Krings (St. Vincent). Only two species are known from two or more islands (*G. dussii* Krings: Martinique and Guadeloupe; *G. stephanotrichus* Griseb.: Cuba, Hispaniola, and Puerto Rico). Recent collections from St. Eustatius, undertaken by Brian Boom and his team from the New York Botanical Garden (NY), as part of its Caribbean Biodiversity Program, and by Franklin Axelrod of the University of Puerto Rico-Rio Piedras (UPRRP) and Hannah Madden of Quill/Boven National Park, as part of an ongoing study of the vascular plant flora of St. Eustatius, have resulted in the discovery of a new species, herein described as *Gonolobus aloiensis*.

Gonolobus aloiensis is remarkable in several respects, but importantly represents the first record of the genus for St. Eustatius. In the course of revising *Gonolobus* in the West Indies, the first author studied all specimens available through loan requests from ninety herbaria (of which sixty-five responded with either loans, digital images, or negative search results) and visits to BM, BSC, DUKE, HAC, HAJB, IJ, K, UCWI, UPRRP, US, and P (see Krings 2008). However, prior to the collections of Boom, Axelrod, and Madden, no record had yet been found of any collection of *Gonolobus* from St. Eustatius. The only member of the Gonolobinae previously recorded in Floras that cover St. Eustatius, namely those of Boldingh (1909), Van der Aa (1982), and Howard (1989), is *Matelea maritima* (Jacq.) Woodson.

Gonolobus aloiensis is easily distinguished from the six other Lesser Antillean species of *Gonolobus* in part by the indumentum of the abaxial corolla surface. The other Lesser Antillean *Gonolobus* species exhibit an abaxial corolla surface that is either glabrous (*G. absalonensis*, *G. martinicensis*,

G. waitukubuliensis), with eglandular trichomes basally disposed (*G. dussii*, *G. iyanolensis*, *G. martinicensis*, *G. waitukubuliensis*), or with eglandular trichomes fairly uniform from base to tip (*G. youroumaynesis*; Fig. 1). Glandular trichomes are absent from the abaxial corolla surface in these species (or, rarely, very sparse in *G. dussii*). *Gonolobus aloiensis* also lacks glandular trichomes from the abaxial corolla surface, but exhibits apically disposed eglandular trichomes (distributed primarily from the tip of corolla lobes to at most two-thirds of the length toward the base; Fig. 2B).

Gross similarities in calyx, corolla, and gynostegium size and form, suggest a relationship to *Gonolobus albomarginatus* (Pittier) Woodson (Nicaragua to Colombia), treated by Stevens (2009) in the broad sense, recognizing that additional taxa may be represented among the continental populations, particularly in the highlands of Costa Rica and Panama. *Gonolobus albomarginatus* sensu Stevens (2009) is recognized by internodes pubescent in two lines, leaf blades lacking glandular capitate trichomes, calyx lobes relatively narrow, but long ((8.2–)9–14 × 2–4 mm), and corolla lobes long (16.4–25 × 4.7–8 mm) and adaxially pubescent. *Gonolobus aloiensis* similarly exhibits stem internodes pubescent in two lines. However, the internode indumentum is much sparser and internodes often approach being glabrous. In addition, the abaxial surface of the corolla lobes of *G. albomarginatus* is characterized by a moderate to dense, mixed indumentum consisting of eglandular and glandular capitate trichomes, distributed essentially uniformly from base to apex (Fig. 2A). As noted above, the indumentum of *G. aloiensis*, in contrast, is rather sparse, consists entirely of eglandular trichomes, and is distributed primarily at the apex or at most to two-thirds the lengths to the base (Fig. 2B). Though there is some overlap, calyx lobes in *G. aloiensis* are generally shorter and narrower (6.2–8.4 × 1.8–2.4 mm) compared to *G. albomarginatus*, as are the corolla lobes (15.7–18.9 × 4.8–5 mm).

A description of the new species is provided below. Corona morphological terminology follows Liede and Kunze (1993) and Kunze (1995): Ca = faucal annulus (corolline corolla); Cd = dorsal anther appendage; Ci = interstaminal gynostegial corona; C(is) = fused staminal and interstaminal gynostegial corona; Cs = staminal gynostegial corona.

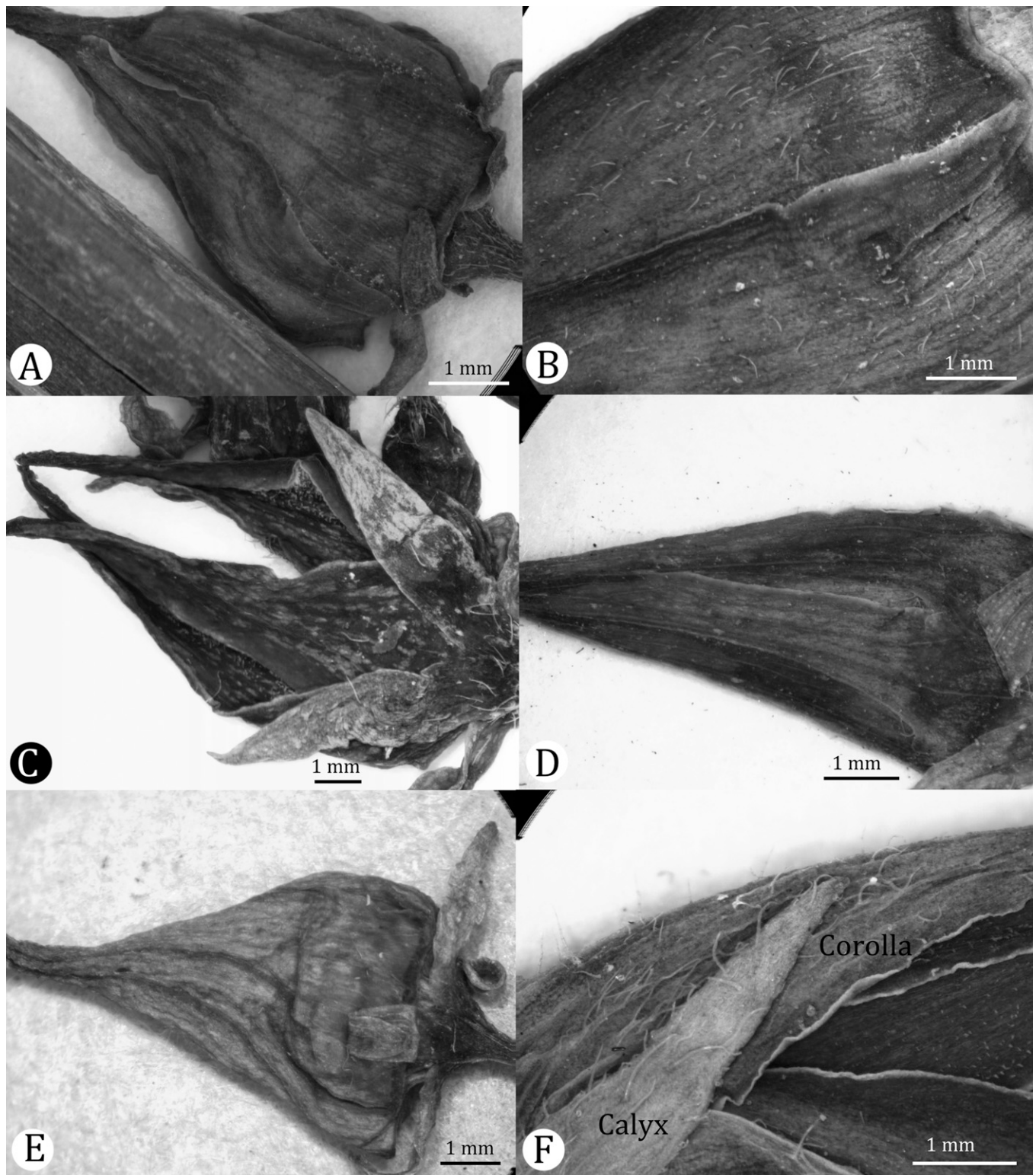


FIG. 1. Abaxial corolla surface of Lesser Antillean *Gonolobus* species, excluding *G. aloiensis*. A. *G. absalonensis*, note glabrous abaxial corolla lobe surface (based on Herb. d'Alleizette s. n. [4801?], L). B. *G. dussii*, note glandular trichomes basally disposed on abaxial corolla lobe surface (based on Duss 3775, NY). C. *G. iyanolensis*, note glandular trichomes basally disposed on abaxial corolla lobe surface (based on Graveson 107, A). D. *G. martinicensis*, note glabrous abaxial corolla lobe surface (based on Herb. Mart. Suppl. 63, MO). E. *G. waitukubuliensis*, note glabrous abaxial corolla lobe surface (based on Eggers 728, HBG). F. *G. youroumaynensis*, note more or less uniform distribution of glandular trichomes from base to tip of abaxial corolla lobe surface (based on Howard 19584, A).

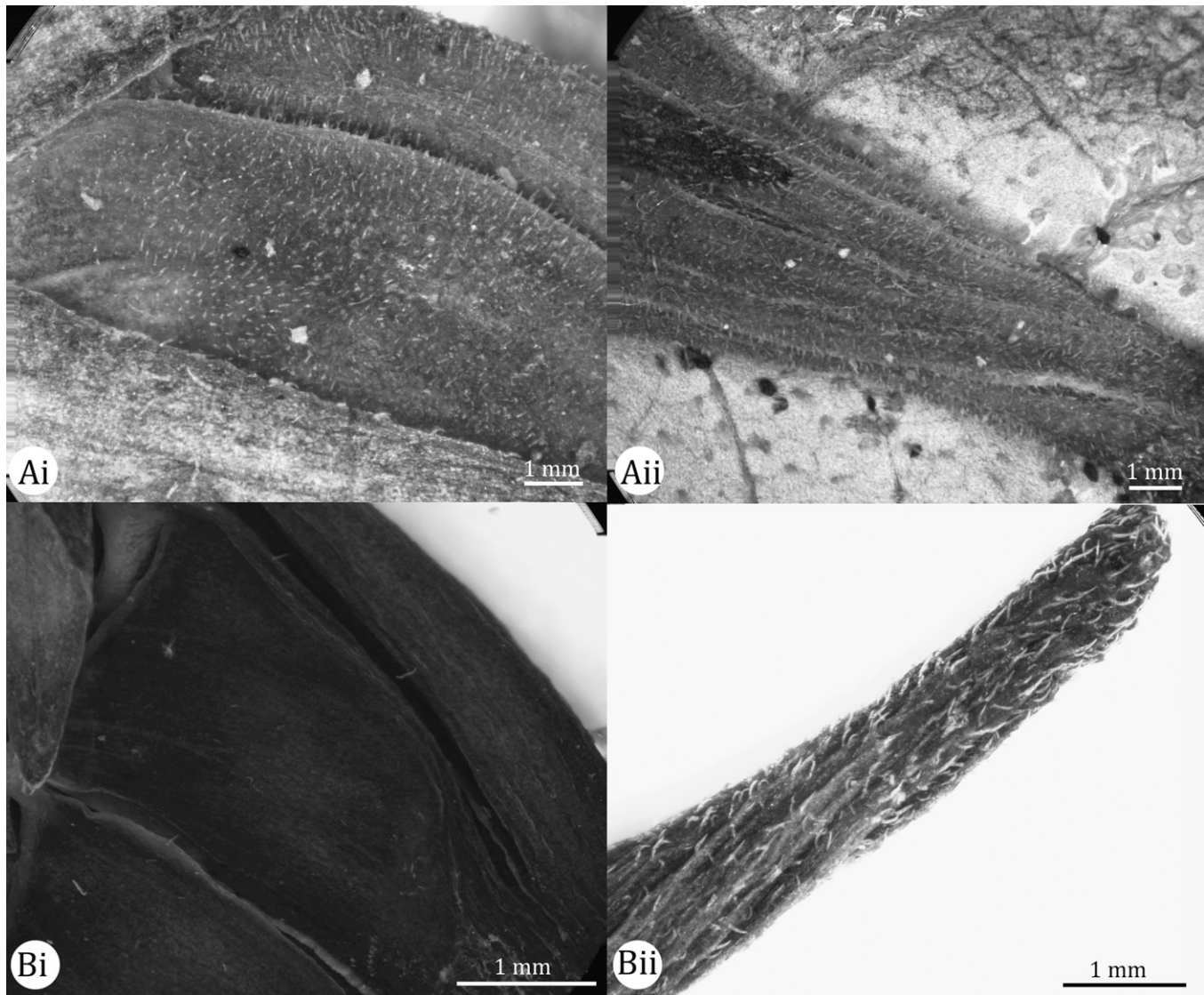


FIG. 2. Abaxial corolla surface of *Gonolobus albomarginatus* and *G. aloiensis*. Ai–ii. *G. albomarginatus*, note dense, uniform pubescence from base (i) to apex (ii) (based on Folsom 9953, DUKE). Bi–ii. *G. aloiensis*, note apically disposed pubescence, with bases (i) glabrous and apices (ii) densely pubescent (based on Boom *et al.* 11157, NY).

TAXONOMIC TREATMENT

Gonolobus aloiensis Krings & F. S. Axelrod, sp. nov.—
TYPE: ST. EUSTATIUS. The Quill, N slope, trail from crater rim down into crater, wet mountain forest, 280–350 m elev., 17°28.48' N, 62°57.65' W, mid Mar 2012 (fl), *H. Madden s. n. with S. Bush* (holotype: UPRRP!).

A new species of *Gonolobus*, distinguished from *G. albomarginatus*, to which it appears related, in part by: abaxial leaf blade surfaces glabrous (vs. sparsely antrorsely strigose, eglandular trichomes 0.23–0.5 mm tall in *G. albomarginatus*), calyx lobes shorter and narrower (6.2–8.4 × 1.8–2.4 mm vs. (8.2–)9–14 × 2–4 mm in *G. albomarginatus*), corolla lobes shorter and narrower (15.7–18.9 × 4.8–5 mm vs. 16.4–25 × 4.7–8 mm in *G. albomarginatus*), abaxial corolla lobes lacking glandular capitate trichomes (vs. glandular capitate trichomes moderate to dense from apex to base, spreading, ca. 0.05 mm tall, in *G. albomarginatus*), abaxial corolla lobes with short eglandular trichomes moderate to dense only for top two-thirds of the length, progressively thinning towards the

base, bottom third glabrous or nearly so, trichomes antrorse, 0.07–0.10 mm tall (vs. moderate to dense from apex to base, trichomes antrorse, retrorse, or spreading, ca. 0.05–0.17 mm tall in *G. albomarginatus*), and long eglandular trichomes moderate to dense only for top two-thirds of the length, progressively thinning towards base, bottom third glabrous or nearly so, trichomes antrorse, 0.14–0.19 mm tall (vs. very sparse, trichomes primarily antrorse, a few retrorse, ca. 0.35–0.46 mm tall in *G. albomarginatus*).

Herbaceous perennial vines. Latex white. Stems glabrate to sparsely pubescent in two lines, glandular capitate trichomes absent or very sparse, to 0.05 mm long, spreading, eglandular trichomes sparse, retrorse internodally, antrorse-appressed along an indistinct horizontal ridge between two opposing petioles and/or just above the node, 0.3–0.5 mm long; nodes sparsely pubescent, gland field apparently absent. Leaf blades ovate to oblong-ovate, (3.2–) 4.3–7.3 × (1.5–) 2–4.3 cm, abruptly acuminate, acumen narrowly obtuse, to 1 cm long, bases deeply or shallowly cordate, adaxial surface glabrate or very sparsely strigose, glandular capitate trichomes absent,

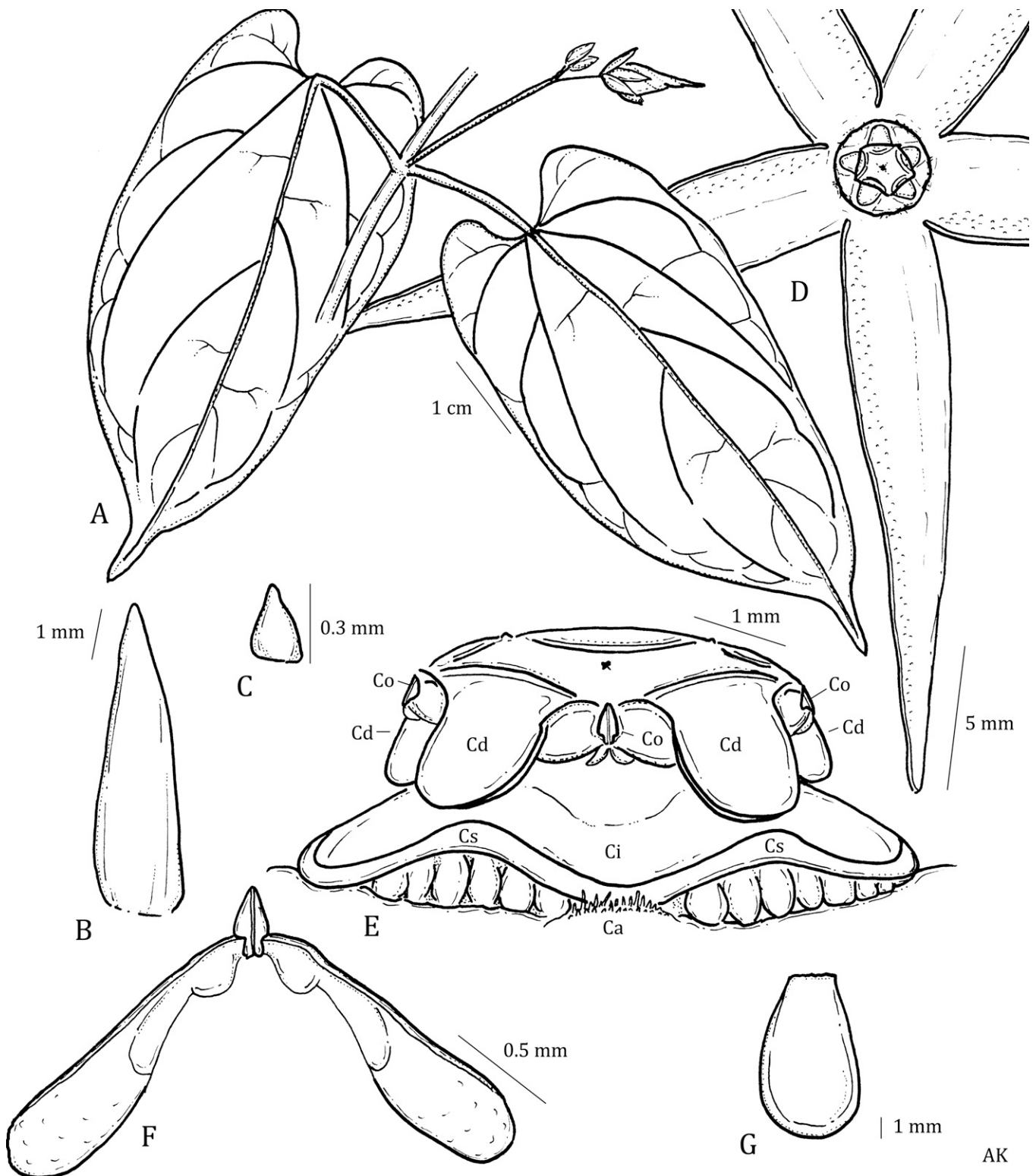


FIG. 3. *Gonolobus aloiensis*. A. Leaves and inflorescence. B. calyx lobe. C. calycine colleters. D. flower. E. gynostegium. F. pollinarium. G. seed. Based on Madden s.n. & Bush (UPRRP). Ca = faucal annulus; Cd = dorsal anther appendage; Ci = interstaminal gynostegial corona; Co = corpusculum; Cs = staminal gynostegial corona.

eglandular trichomes scattered along the major and minor veins, margins entire, colleters 2–3, 0.5–0.6 mm tall; petioles 1.9–3.5 cm long, sparsely pubescent, trichomes most dense along the adaxial ridges, glandular capitate trichomes spreading, to 0.1 mm long, eglandular trichomes mostly antrorse-

appressed or ascending (some spreading and a very few retrorse), 0.3–0.4 mm long; stipular colleters 2–4, ca. 0.3 mm long, 1–2 borne on each side of the petiole base. Inflorescence racemiform, peduncles 1–2 cm long, indumentum as on the petioles; pedicels 0.6–2.6 cm long, indumentum distributed

rather evenly throughout, glandular capitate trichomes ca. 0.08 mm long, eglandular trichomes antrorsely-appressed or -ascending, 0.3–0.4 mm long, bracts linear-lanceolate, ca. 2.3 × 0.18 mm, caducous, adaxial surface glabrous, abaxial surface coarsely pubescent, glandular capitate trichomes absent, eglandular trichomes antrorse, ca. 0.2 mm long. Calyx lobes 5, sublanceolate to elongate triangular, 6.2–8.4 × 1.8–2.4 mm, apices obtuse, margins glabrous, abaxial surface glabrous or very sparsely pubescent medially, glandular capitate trichomes absent, eglandular trichomes antrorsely-appressed or -ascending, 0.3–0.4 mm long; colleters 1–2 per sinus. Corolla green or greenish-white (*vide collectoris*), lobes 5, narrowly lanceolate to elongate triangular, 15.7–18.9 × 4.8–5 mm, slightly overlapping at the base, a glandular swelling frequently present in the sinus, adaxial surface pubescent along the right, pubescence papillate to short-spreading, glandular capitate trichomes absent, eglandular trichomes to 0.12 mm, abaxial surface moderately pubescent only at the tip or to two-thirds the length to the base, glandular capitate trichomes absent, eglandular trichomes 0.14–0.18 mm long; faucal annulus (corolline corona or Ca) interrupted, a distinctly raised ridge opposite each corolla lobe sinus, short-hispid or glabrate; gynostegial corona of fused staminal (Cs) and interstaminal parts (Ci), single, erect-undulating; anther guiderails without appendages, laminar dorsal anther appendages (Cd) 1.6–1.7 × 1.4–1.5 mm, rounded; style-head 3.8–3.9 mm diam., stipe ca. 0.5 mm, not toothed. Pollinaria: corpuscula 0.2–0.3 mm long, pollinia borne horizontally, oblong-ovate ca. 1.1 × 0.4 mm. Follicles ovoid, ca. 9.8 × 4.1 cm, 5-winged, glabrous; seeds pyriform to oblong, compressed, not planoconvex, 6.7–9 × 3.9–4.8 mm, glabrous, margins entire, coma to 1.8 cm long. Figures 2Bi–ii, 3, 4.

Etymology—The epithet is derived from Aloi, an Arawak name for St. Eustatius.

Phenology—Collected in flower in February and March. Collected in fruit in February and July.

Distribution and Ecology—*Gonolobus aloiensis* is endemic to St. Eustatius, where found in humid to wet, evergreen forests from ca. 273–400 m elev. The species occurs only on the inner slopes, those of the crater, of the Quill volcano (Dutch: kuil = pit). It grows over and among the large boulders formed from the collapse of the walls of the crater, the bottom of which is at 273 m above sea level. The walls of the crater rise from 400 m to over 600 m above sea level. The plant has thus far been found only in the area of a maintained route down from the low point of crater rim to the base of the crater. Since its habitat, the walls of the crater, are difficult to access, it is not at

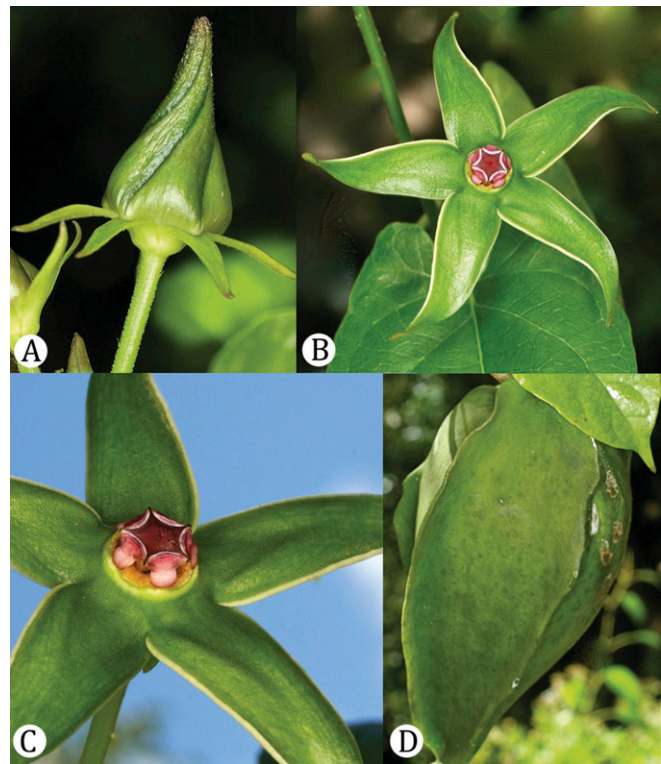


FIG. 4. *Gonolobus aloiensis*. A. Flower buds, note apically disposed pubescence. B. flower. C. gynostegium. D. follicle. Field photographs copyright Carol Gracie; used with permission.

present possible to estimate, for conservation purposes, the extent of the population of a species that has been collected only three times. The only palpable threats to the plants are: first, the goats that roam about the crater, which, however, may not find the taste of a member of the Gonolobinae to their liking and, second, the eruption of the volcano. The volcano has not erupted since 400 AD and is considered to be in a state of dormancy. If it were to erupt, then the population of *G. aloiensis* would be certainly wiped out. We would therefore recommend that attempts be made to grow it in botanical gardens to ensure its preservation.

Additional Specimens Examined—St. Eustatius, N slope of The Quill, trail from crater rim down into crater, wet mountain forest, 280–350 m, 17°28.48' N, 62°57'65" W, 25 Jul 2010 (fr), F. Axelrod 14424 et al. (UPRRP); Quill National Park, Crater Trail into bottom of The Quill, humid evergreen forest, 280–400 m elev., 17°28'38" N, 62°57'3" to 62°57'25" W, 1 Feb 2008 (fl & fr), B. M. Boom et al. 11157 (NY).

An amplified key to *Gonolobus* s. s. in the West Indies (based on Krings 2008), incorporating the new species, follows:

1. Leaf bases cuneate, rounded, or truncate, not cordate; corolla lobes with lateral margins strongly curled downward from base to apex; faucal annulus (corolline corona or Ca) interrupted, strongly developed into two mounds opposite each corolla lobe, appearing absent opposite each corolla sinus, pubescent; laminar dorsal anther appendages erect (spreading when immature or spent), white, to 4.2 mm long, apices divergently and sharply bilobed *G. stapelioides*
1. Leaf bases cordate (uniformly cuneate only in *G. stellatus*, though upper leaves frequently also cuneate to rounded in *G. jamaicensis*); corolla lobes essentially plane, sometimes reflexed, but margins not curled downward from base to apex; faucal annulus (corolline corona or Ca) uninterrupted or if interrupted then at most developed into a shallow ridge opposite each corolla lobe sinus; laminar dorsal anther appendages (Cd) descending or spreading, variously colored, < 2 mm long, apices rounded, truncate, slightly emarginate, or rounded-bilobed (divergently and sharply bilobed only in *G. stellatus*) 2
2. Faucal annulus of corolla (corolline corona or Ca) a conspicuously raised (0.4–0.9 mm tall), uninterrupted ring, pubescent along the entire rim or only opposite each corolla lobe sinus; gynostegial corona basally fused into an erect ring, obscured from view by the faucal annulus 3

3. Gynostegial stipe dentate, a single tooth borne on the lower portion of the column, just above the upwardly rising segment of each Cs *G. stephanotrichus*
3. Gynostegial stipe edentate 4
4. Adaxial corolla lobes green; rim of faucal annulus (corolline corona or Ca) not lobed, annulus to 0.5 mm tall; gynostegial corona appearing densely folded apically; gynostegial stipe not toothed *G. waitukubuliensis*
4. Adaxial corolla lobes purple-red to maroon; rim of faucal annulus (corolline corona or Ca) bilobed in the staminal position, annulus to 0.9 mm tall; gynostegial corona upwardly folded only in the staminal position; gynostegial stipe toothed on the lower portion of the column, just above the upwardly rising segment of each Cs *G. jamaicensis*
2. Faucal annulus of corolla (corolline corona or Ca) reduced to an interrupted ridge, distinct only opposite each corolla lobe sinus, tufted pubescent to glabrate or, if uninterrupted, then very shallow, to 0.25 mm tall; gynostegial corona not basally fused into an erect ring that is obscured from view by the faucal annulus 5
5. Interstaminal gynostegial corona double (i.e. a narrower upper ligulate corona lobe occurring on top of the broader lower corona) 6
6. Corolla robust, base of corolla tube subcampanulate, as broad as long or broader than long; sepals 6.1–6.7 mm × 1.6–1.8 mm; corolla lobes 10.2–17.3 mm × 2.7–4.8 mm; horizontal length of lower interstaminal gynostegial corona (Ci) from base of stipe to lobe apex 1.1–1.4 mm, narrow upper ligulate corona lobe of the Ci abruptly ending in a scooped out depression before reaching the stipe base, dorsally ridged *G. iyanolensis*
6. Corolla slender, base of corolla tube elongate-campanulate, distinctly longer than broad; sepals 4.3–6.7 mm × 1–1.2 mm; corolla lobes 9.7–11.4 mm × 2–3.5 mm; horizontal length of interstaminal gynostegial corona (Ci) from base of stipe to lobe apex ≤ 0.7 mm, narrow upper ligulate corona lobe of the Ci ending essentially at the stipe base, dorsally plane or sometimes slightly raised into a shallow bump *G. martinicensis*
5. Interstaminal gynostegial corona single 7
7. Gynostegial stipe with a single tooth below each anther 8
8. Faucal annulus pubescent along the entire ring; teeth of gynostegial stipe borne on lower portion of the column, just above the upwardly rising segment of the Cs *G. stephanotrichus*
8. Faucal annulus pubescent only in the staminal position; teeth of gynostegial stipe borne on upper portion of the column, just below the anther *G. youroumaynensis*
7. Gynostegial stipe edentate 9
9. Adaxial surface of corolla lobes glabrous throughout 10
10. Interstaminal gynostegial corona (Ci) smooth, lacking raised bumps; laminar dorsal anther appendages (Cd) emarginate; Martinique *G. absalonensis*
10. Interstaminal gynostegial corona (Ci) with two distinctly raised and rounded mounds; laminar dorsal anther appendages (Cd) truncate or rounded; Guadeloupe and Martinique *G. dussii*
9. Adaxial surface of corolla lobes pubescent on right side 11
11. Leaf bases cordate; St. Eustatius *G. aloiensis*
11. Leaf bases uniformly cuneate; Jamaica *G. stellatus*

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