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STUDIES OF NEOTROPICAL COMPOSITAE–X. REVISION OF THE WEST INDIAN GENUS *NARVALINA* (COREOPSIDEAE)

JOHN F. PRUSKI
Missouri Botanical Garden
P.O. Box 299
St. Louis, Missouri 63166

ABSTRACT

The genus *Narvalina*, long known solely from the single species *Narvalina domingensis*, presumably discovered by Surian and Plumier between 1689–1691, is expanded to include a second species, **Narvalina antrorsa** Pruski, **sp. nov.** Both species of *Narvalina* are endemic to the West Indian island of Hispaniola. *Narvalina* is characterized by its shrubby habit, fertile ray florets, and alate cypselae, but *Narvalina antrorsa* differs from the generitype by antrorsely barbed pappus awns; in this regard it seems to approach monotypic exalate-fruited *Selleophytum*, another shrubby Coreopsid also endemic to Hispaniola. The history of the misapplication of continental *Lasianthaea fruticosa* to West Indian *Narvalina domingensis* is summarized.

Narvalina Cass. (Compositae: Coreopsideae) is traditionally recognized as a monotypic genus endemic to the West Indian island of Hispaniola (Candolle 1836; Bentham and Hooker 1873; Blake 1915, 1923; Sherff and Alexander 1955; Bremer 1994; Liogier 1999; Panero 2007; Crawford et al. 2009). This genus of shrubs often has petiolate holly-like leaves, and is characterized by obcompressed alate fruits (Figs. 1, 6, 10) and fertile ray florets. Other shrubby Coreopsid genera distinguished from *Narvalina* typically have exalate fruits (e.g., *Selleophytum* Urban; viz fig. 2b) or sterile ray florets (e.g., *Coreopsis* L. s. lat.).

Narvalina was likely first collected and illustrated on the joint expedition by Surian and Plumier between 1689–1691. Shortly thereafter the plant appeared in the literature as the polynomials "*Bidens frutescens, ilicis folio, flore luteo*" (Plumier 1703: 10), "*Bidens Americana, frutescens, ilicis folio, flore luteo*" (Tournefort 1719: 462), and "*Ceratocephalus ilicis foliis*" (Vaillant 1722: 326). The genus was described validly as *Needhamia* Cass. (non Scop., 1777, Fabaceae) by Cassini (1825a), who drew attention to the obcompressed alate biaristate fruits. Soon thereafter, Cassini (1825b) provided the new generic name *Narvalina* to replace his valid albeit illegitimate later homonym *Needhamia*. Lessing (1832) provided the needed new binomial combination *Narvalina domingensis* (Cass.) Less. for the sole species then placed in the genus.

After Plumier's death, his illustration drawn 50 years earlier appeared belatedly in Burman (1756: 42, tab. 52, as "*Verbesina frutescens, foliis ovatis ac serratis*"; reproduced here as Fig. 1). Linnaeus (1759, 1763) under *Verbesina fruticosa* (L.) L. gave Plumier's illustration and the accompanying Burman phrase name in synonymy, and Urban (1907) synonymized *N. domingensis* under his new *Narvalina fruticosa* (L.) Urban. Plumier's West Indian plate (in Burman 1756: tab. 52), was a century ago identified as a resurrected *N. domingensis* by Blake (1915), who excluded *N. fruticosa* from *Narvalina*. Becker (1979) treated the Linnaean species as continental *Lasianthaea fruticosa* (L.) Becker of Heliantheae subtribe Ecliptinae. Although Hieronymus (1900) described three South American subscandent to vining Coreopsids as Narvalinas, these were quickly dispatched by Blake (1923) to *Cyathomone* and *Ericentrodea* (Compositae: Coreopsideae). Thus, basically since Surian and Plumier discovered this West Indian plant in the 1600s, *Narvalina* was known from only its generitype, but here three centuries after the type of the genus was first collected the genus is with some hesitation expanded to include a second species, *Narvalina antrorsa*, also endemic to Hispaniola.

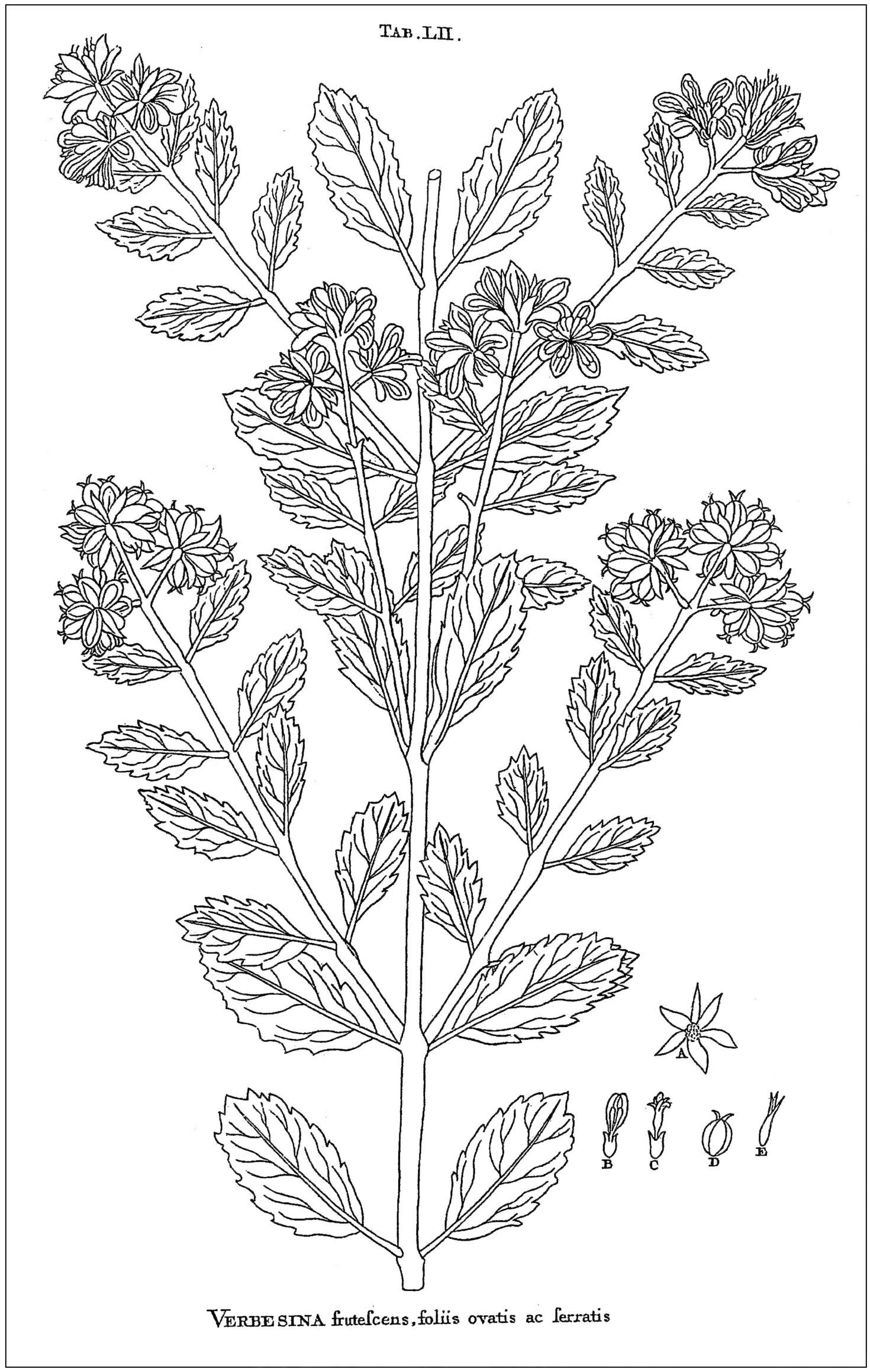

Figure 1. Illustration of *Narvalina domingensis* showing alate biaristate cypselae (lower right, D). This illustration by Charles Plumier (as copied by Claude Aubriet for Herman Boerhaave), who died in 1704, was misidentified for more than two centuries, and was recognized as *Narvalina domingensis* by Blake (1915). Plumier's drawings are often based on collections from Haiti of Joseph Surian housed in his ten folios at P. Surian and Plumier are not known to have visited the Cordillera Central, i.e., within the range of moderately similar *Narvalina antrorsa*. Plumier's own collections from two expeditions after Surian's 1691 death were supposedly lost at sea, and thus do not voucher his illustrations. Reproduced from Burman 1756, tab. 52, as the polynomial *Verbesina frutescens, foliis ovatis ac serratis.*

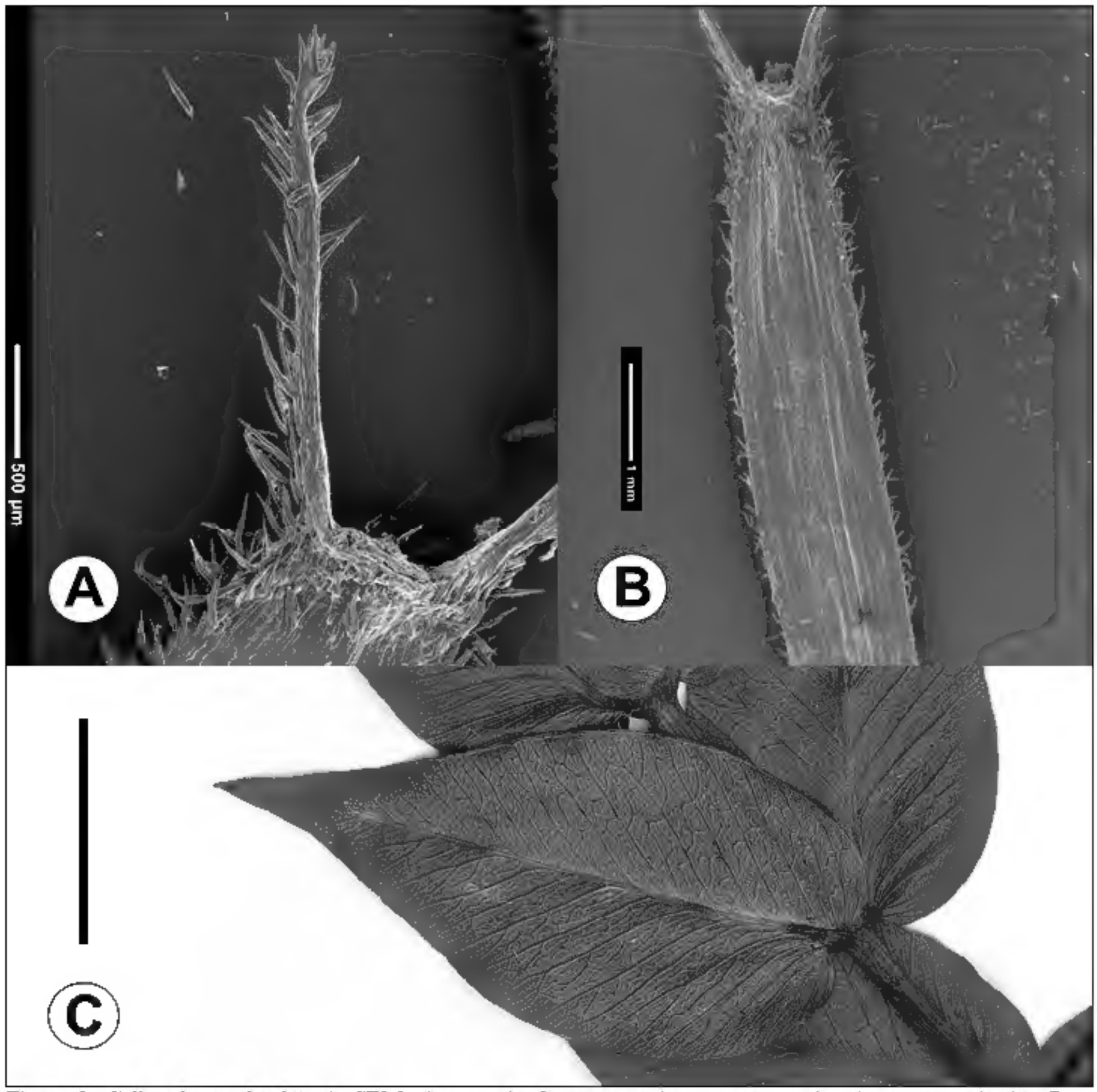

Figure 2. *Selleophytum buchii*. A. SEM micrograph of a ray cypsela pappus awn showing antrorse barbs. B. SEM micrograph of an exalate disk cypsela. C. Sessile leaf showing cordate base and entire margins. All from *Pruski & Ortiz 4076*, MO; scale bar C is 2 cm.

While the characters including retrorse-barbed pappus awns in *Narvalina* have until now been viewed as consistent, the six collections referred here to *Narvalina antrorsa* have antrorsely barbed pappus awns. Thus by recognition of an expanded *Narvalina,* a former useful character of *Narvalina*, i.e., the retrorse barbed pappus awn character, is with some hesitancy discarded. By antrorse pappus awn barbs as well as by cypselae faces distally hirsutulous (see Figs. 2, 6), *N. antrorsa* is similar to monotypic Hispaniolan endemic *Selleophytum*, which in molecular studies was recovered as sister to *Narvalina* by each Kimball and Crawford (2004), Mort et al. (2008), Crawford et al. (2009), and Mesfin Tadesse and Crawford (2014). However, cypsela pubescence appears not to be overly important in Coreopsid generic-level taxonomy. Possibly lessening the significance of antrorse barbs being found in each *N. antrorsa* and *S. buchii* Urban is the fact that Gray (1862) noted that on rare occasions both retrorse and antrorse barbed pappus awns may be found even within an

individual species of Coreopsideae. Moreover, large-capitulate *S. buchii* by its exalate fruits and sessile cordiform leaves with entire margins (see Fig. 2) seems very different from both species of *Narvalina*. With the reproductive character lability inferences of Gray (1862) and Kimball and Crawford (2004) in mind, the circumscription of *Narvalina* is broadened here to include a second vegetatively similar species. My aim here is basically to validate *Narvalina antrorsa* and comment on its generic placement, largely as interpreted from the suite of specimens of these three species in two genera (*Narvalina* and *Selleophytum*), SEM micrographs of their fruits, and literature now in front of me.

NARVALINA Cass. in F. Cuvier (ed.), Dict. Sci. Nat. (ed. 2) 38: 17. 1825. (see also Cass. in Dict. Sci. Nat. (ed. 2) 59: 320. 1829, 60: 614. 1830). *Needhamia* Cass. in F. Cuvier (ed.), Dict. Sci. Nat. (ed. 2) 34: 335. 1825 (non *Needhamia* Scop., 1777, Fabaceae). **TYPE**: *Needhamia domingensis* Cass. (≡ *Narvalina domingensis* (Cass.) Less.).

Shrubs 1–3 m tall; stems erect, subterete, striate, glabrous or weakly pubescent, leafy distally, pith solid; herbage without latex. **Leaves** simple, opposite, petiolate, isomorphic; blade stiff, midrib broad and slightly raised abaxially, venation pinnate, secondary veins at about 60° to midrib, secondary veins basically immersed or sometimes at least in dried material slightly raised adaxially, surfaces glabrous or very nearly so, margins toothed, teeth evenly spaced; petioles basically exalate but opposing leaves narrowly to indistinctly subclasping. **Capitulescence** terminal, erect, narrowly cymose to open-corymbiform or nearly umbellate, ultimate branching usually opposite but sometimes subopposite or alternate. **Capitula** radiate, moderately small; involucre cylindrical to narrow-campanulate, base nearly truncate or at least so in dried material, somewhat gibbous-based post-fruit; phyllaries 2(–3)-seriate and dimorphic, free to base, outer series of phyllaries differing from inner series in texture and color, at least the inner series of phyllaries persistent; outer phyllaries 2–5, ascending to reflexed, shorter than the inner ones, subherbaceous and at least distally green, indistinctly 1–3-nerved, margins entire; inner phyllaries 3–5, broad-lanceolate, ascending-erect, greenish-yellow, striatulate, stiff-chartaceous with narrowly hyaline-scarious margins, becoming indurate especially in fruit, not widely spreading in fruit; clinanthium flat to convex, paleate; paleae slightly navicular, chartaceous but becoming indurate in fruit, yellowish-stramineous, few-striate, falling only well past fruit dispersal. **Ray florets** 2–5, pistillate, uniseriate; corolla yellow, limb shortly exserted, nerves with paired resin canals seen best among the specimens in front of me in adaxial view, apex minutely lobed. **Disk florets** 5–19, bisexual; corolla narrow-funnelform, 5-lobed, yellow, throat with broad nerves when dried with or without clear separation of paired resin ducts, glabrous or subglabrous; anthers ecaudate, yellowish, filaments glabrous, endothecial pattern polarized, appendage longer than wide, eglandular, with a proximal central colored resin duct to near midpoint or on occasion continuing as thin dark resin duct to apex; style appendiculate, branches slightly dilated, stigmatic surfaces seemingly continuous. **Cypselae** alate or a few inner ones rarely weakly alate, typically nearly isomorphic although disk cypselae wings less developed than in the rays, strongly obcompressed or rarely a few disks weakly so, erostrate, apex truncated, body dark brown but apparently not papillate-carbonized, cells quadrangular in longitudinal rows with dark secretions on both radial and tangential cells walls (surface ornamentation Type A in Mesfin Tadesse and Crawford 2014), usually 1–few striate-costate but otherwise smooth, never tuberculate, wings stramineous-brownish, entire, antrorsely ciliate, slightly thickened, never thin-membranous, base flat, carpopodium inconspicuous and annular; pappus awns 2 or in weakly alate interior disks rarely 3–4-awned, subequal, stramineous, somewhat stout although sometimes broken off, triquetrous-subulate, adaxial surface flattened basally in plane perpendicular to that of cypselae body flattening, antrorsely or retrorsely barbed along the two adaxial edges as well as abaxially.

Panero (2007) placed *Narvalina* in subtribe Coreopsidinae and gave the bisexual disk flowers as "functionally staminate," as is characteristic of the *Petrobium* R. Br. generic group of Kimball and

Crawford (2004). The disk florets of *Narvalina* prove instead to be bisexual, with those of each species setting fruit. The genus *Narvalina* is further diagnosed by its shrubby habit, pistillate ray florets, and obcompressed erostrate alate biaristate cypselae.

Narvalina is recognized here as containing two species, each endemic to Hispaniola. Four other names referred at one time or another to *Narvalina* are based on material from continental America and have been excluded from *Narvalina*. Three South American former Narvalinas are now placed in either *Cyathomone* S.F. Blake and *Ericentrodea* S.F. Blake & Sherff (Blake 1923). A fourth excluded name is the weak-compressed, biaristate- and exalate-fruited taxon now recognized as continental *Lasianthaea fruticosa* (Becker 1979). *Lasianthaea fruticosa* was recognized as *N. fruticosa* by Urban (1907) and Schulz (1911), who thought it was the plant illustrated as tab. 52 by Plumier in Burman (1756) as "*Verbesina frutescens, foliis ovatis ac serratis.*" However, Blake (1915) and Urban (1920, 1921) each correctly determined Plumier's tab. 52 in Burman as *N. domingensis*. Although suggested as or formally treated earlier as synonyms (Burman 1756; Linnaeus 1759, 1763; Sprengel 1826; Candolle 1836; Urban 1907; and Schulz 1911), *Lasianthaea fruticosa* and *N. domingensis* are heterotypic, allopatric, and now placed in different tribes of Compositae.

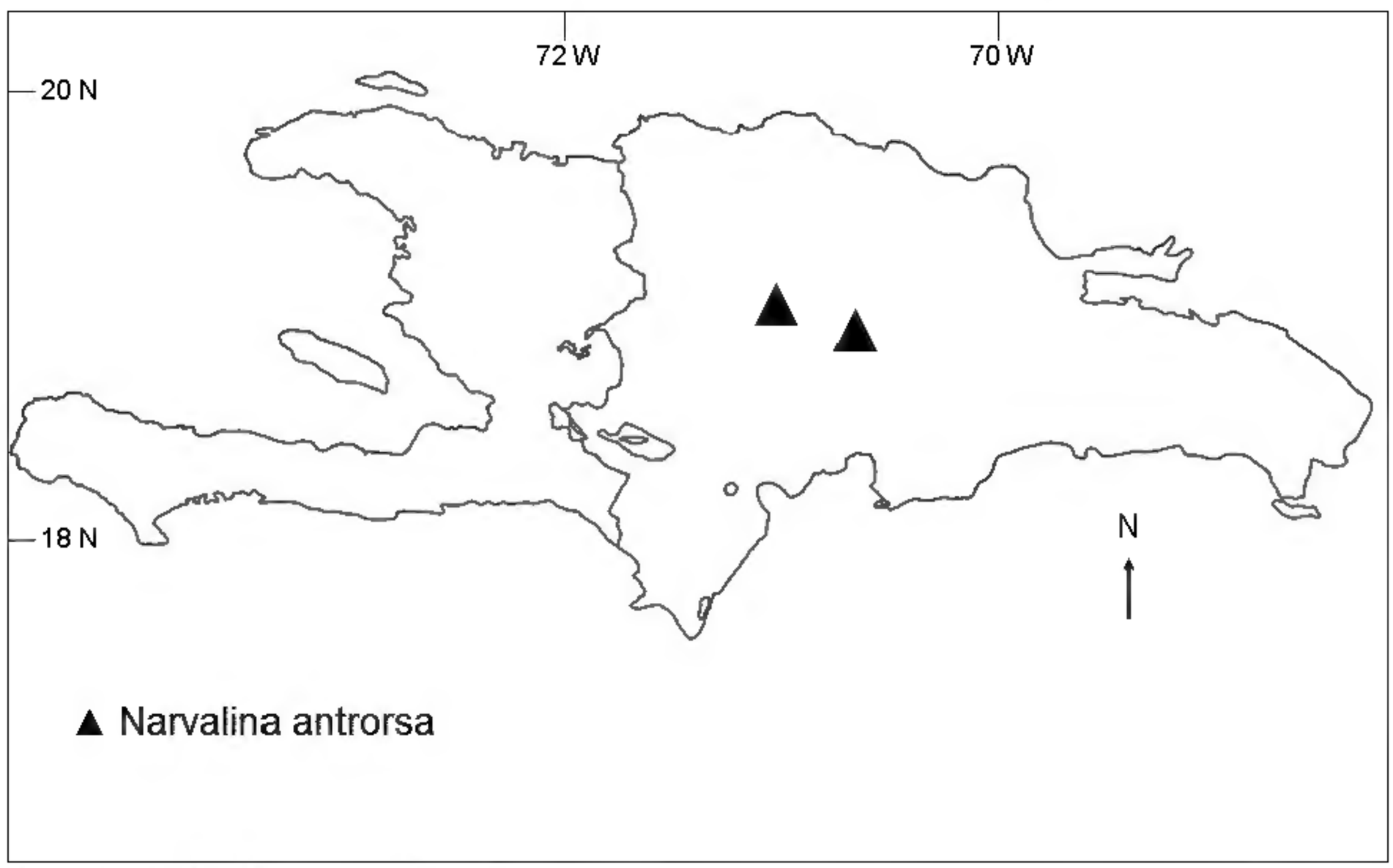

Figure 3. Distribution of *Narvalina antrorsa*.

1. Leaf blades not appearing pellucid-dotted, margins mildly crenate-serrate, teeth ca. 1 mm deep, usually forward-directed or sometimes slightly spreading, obtuse callous-tipped; ray florets typically 5, disk florets 10–19; cypsela face apices hirsutulous, pappus awns antrorsely barbed ..... **Narvalina antrorsa**

1. Leaf blades appearing pellucid-dotted, margins sharply serrate-dentate, teeth 1–2 mm deep, often spreading laterally, sharply and stiffly callous-tipped; ray florets typically 2–3, disk florets 5–8; cypsela faces subglabrous, pappus awns retrorsely barbed ..... **Narvalina domingensis**

NARVALINA ANTRORSA Pruski, **sp. nov. TYPE: DOMINICAN REPUBLIC. Santiago.** Cordillera Central, Municipio San José de Las Matas, comunidad Mata Grande, subida del Valle del Bao, A. Bermúdez, 2109-479 N, 285-771 E [= 19° 04' 01" N, 71° 02' 09" W], 1600–1700 m, 3 Dec 2001, *T. Clase, R. Ramírez, M. Pérez & M. Calzada 3202* (holotype: MO; isotype: JBSD). Figures 3–6.

Figure 4. Holotype of *Narvalina antrorsa* (*Clase et al. 3202*, MO).

Fruticosa 2–3 m alta; folia petiolata, lamina 2–6 × 1.5–3 cm elliptica-obovata vel obovata nec pellucida crenata-serrata; capitulescentia laxe corymbiforma, ramuli 7–13-capitulati; capitula radiata circiter 10 mm alta; involucrum circiter 4 mm diam.; phyllaria valde 2-seriata, externa 2–5, 2–4 × 0.5–0.9 mm, interna circiter 5, 8–9.3 × 2–3 mm; flosculi radiati 5 pistillati; flosculi disci 10–19, corollis 4.1–5.4 mm longis, lobis 0.6–0.8 mm longis; cypselae alatae, setae pappo 2(3–4), 2.2–3 mm longae.

Shrubs 2–3 m tall; stems branched distally, distal portions (as seen on herbarium specimens) 2–4 mm diam., brown, basically glabrous throughout or sometimes sparsely hirtellous-puberulent. **Leaves** petiolate; blade 2–6 × 1.5–3 cm, elliptic-obovate to obovate, chartaceous, usually with 3–7 widely spaced secondary veins, not appearing pellucid-dotted, base cuneate, margins mildly crenate-serrate, teeth 3–7 per side, ca. 1 mm deep, usually forward-directed or sometimes slightly spreading, obtuse callous-tipped, apex usually broadly acute to rounded; petiole 0.5–1.5 cm long, opposing leaves forming a small ridge but usually indistinctly subclasping. **Capitulescence** open-corymbiform to nearly umbellate, branchlets mostly 7–13-capitulate, moderately ascending, glabrous or at least subglabrous, ultimate capitula always pedunculate; peduncles 3–40 mm long, stout, often drying costate-sulcate, glabrous or at least subglabrous. **Capitula** 9–13 mm long; involucre 4-6 mm diam.; phyllaries clearly biseriate and dimorphic especially in bud, obviously unequal but outer phyllaries often withered in fruiting material which often seems to show only the equal and isomorphic inner phyllaries; outer phyllaries 2–5, 2–4 × 0.5–0.9 mm, lanceolate, spreading to reflexed, loosely subtending involucre to sometimes decurrent onto peduncle, much smaller and narrower than the inner, green, indistinctly 1–3-nerved, obviously noncontiguous at base, margins entire, eciliate, apex obtuse; inner phyllaries ca. 5, directly subtending and in one-to-one association with a ray floret, 8–9.3 × 2–3 mm, finely striatulate but striae embedded; clinanthium flat, 2–2.7 mm diam.; paleae 8.5–9.4 × 1–1.5 mm, about as long as cypselae with pappus, narrowly oblanceolate but otherwise more or less similar to inner phyllaries, reaching to about middle of disk corolla throat. **Ray florets** typically 5; corolla limb 4–5.5 × ca. 2 mm, 5-nerved, long-papillose in bud. **Disk florets** 10–19; corolla 4.1–5.4 mm long, glabrous or lobes sparsely long-papillose pre anthesis, tube ca. 1.5 mm long, the narrow throat with closely paired resin ducts visible distally, often appearing as single proximally, lobes 0.6–0.8 mm long, triangular-lanceolate; anthers and styles yellow, concolorous with ray and disk corollas; anthers 1.6–2.6 mm long, anther collar ca. 0.3 mm long, longer than the short-sagittate thecae, appendage 0.4–0.5 mm long, lance-ovate; style branches 0.8–0.9 mm long, apex narrowed. **Cypselae** strongly obcompressed or inner ones sometimes only slightly so, body slightly shorter than to about as long as phyllaries but pappus awns typically at least partly exserted, faces glabrous or very sparsely hirtellous proximally, apex hirsutulous, wings moderately thin, tan, moderately ciliate, cilia ca. 0.5 mm long, spreading; ray cypselae 3.5–6 × 1.5–2 mm, elliptic-ovate in outline, the body to ca. 1 mm diam., each wing to ca. 0.5 mm diam.; disk cypselae 5–9 × (0.5–)1–1.8 mm, narrowly oblanceolate or oblong in outline, wings 0.2–0.5 mm diam.; pappus awns 2(3–4), 2.2–3 mm long, subequal or with 1 or 2 shorter awns less well-developed than lateral ones, adaxial surface flattened at very base in plane perpendicular to that of cypselae body flattening, then awns distally quickly flattened in plane parallel to that of cypselae body flattening, antrorsely barbed, barbs 0.1–0.2 mm long, irregular, closely spaced, often obviously more well-developed on outer-abaxial edge.

Paratypes: **DOMINICAN REPUBLIC. La Vega**. Cordillera Central, Constanza, al sureste del poblado de Pinalito, en la confluencia del Arroyo Madre Vieja y el Rio Tireo, 18° 55' N, 70° 37' W, 1300–1350 m, 7 Feb 1986, *García & Peláez 994* (JBSD, MO). **Santiago**. Cordillera Central, Municipio San José de las Matas, seccion Mata Grande, Parque Nacional Armando Bermudez, colectada en la subida del valle de Bao 1 km antes del valle, s. elev., 23 Mar 1999, *Clase & Peruero 1024* (JBSD, MO); Cordillera Central, Municipio San José de las Matas, sección Mata Grande, en Montes Prietos, en la cabezera del Río Bao, Parque A. Bermúdez, 286-581 N, 2107-430 E, [= 19° 02' 55" N, 71° 01' 41" W], 1760 m, 24 Mar 1999, *Clase & Peruero 1039* (JBSD, MO); Cordillera Central, on slope from Baíto to El Valle, upper Bao Valley, 1500 m, 1–7 Oct 1968, *Liogier 12840* (NY, P); San José de las Matas, Loma del Valle de Bao, 1700 m, 31 Dec 1969, *Marcano 5757* (NY).

Figure 5. Close-up from Figure 4 of capitula of *Narvalina antrorsa* showing the outer series of short spreading to reflexed phyllaries (*Clase et al. 3202*, MO). The leaf margin on left shows the obtuse teeth.

Etymology, distribution, and ecology. *Narvalina antrorsa*, the epithet of which alludes to its antrorsely barbed pappus awns, is known from 1300–1760 meters in elevation in humid broadleaf forests and cloud forests in the Cordillera Central of La Vega and Santiago, Dominican Republic, where it appears to be endemic. *Narvalina antrorsa* has been collected in flower and fruit from October to March, namely when *N. domingensis* is less commonly found flowering. *Narvalina antrorsa* appears to be occasional at least in the Valle de Rio Bao. One collection appears to be from a loma, but I do not know whether or not other collections of *N. antrorsa* were found on granitic substrates.

Narvalina antrorsa was long known to me from only three collections: two made in 1960s by Drs. Liogier and Marcano, and the third from 1986 by my friend Ricardo Garcia of JBSD. During a 2006 visit to the Dominican Republic, Teodoro Clase (also of JBSD), with whom I had the pleasure of recently publishing *Ageratina nubicola* Pruski & Clase (2012), brought to my attention three more recent collections (two from 1999, and another made in 2001). Although the earlier collections known to me are good representatives of *N. antrorsa*, *Clase et al. 3202* is also complete and is designated as the type.

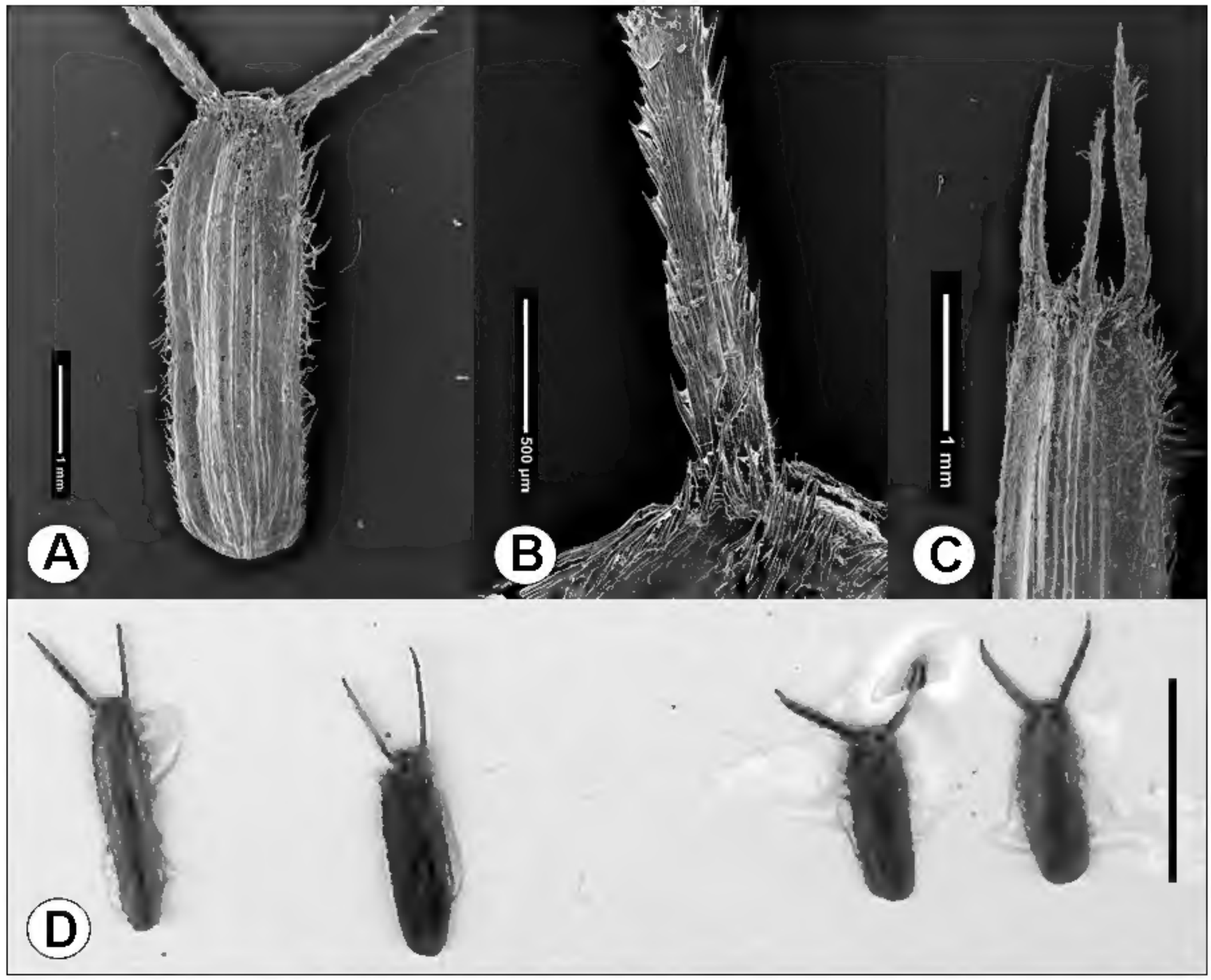

Figure 6. *Narvalina antrorsa*. SEM micrographs and photograph of cypselae and pappus awns. A. Ray cypsela, showing lateral wings narrower than body. B. Ray cypsela awn close-up showing antrorse barbs. C. Atypical interior disk cypsela showing poorly developed wings and 3 awns. D. Two disk cypselae (left) and two ray cypselae (right); the stramineous-brownish lateral wings are slightly narrower than the black bodies. All from *Clase et al. 3202*, MO; scale bar D is 5 mm.

At one point I thought the antrorse awns in the relatively large capitula in *Liogier 12840* and *Marcano 5757* each originally determined by Alain Liogier as *Narvalina domingensis* were mirages. Subsequently however, this feature was seen to remain consistent in a third gathering, *García & Peláez 994*. Dissections of these three early collections, along with observations of the three more recent collections received as gift for identification in 2009, confirm this "non-*Narvalina*-like" feature, which resembles the antrorse-barbed awns of *Selleophytum* (viz fig. 2). Further distinctions of the new species may be found in its non-pellucid dotted non-spinose-margined leaves, more florets per capitulum, shorter spreading to reflexed outer series of phyllaries, and distally hirsutulous cypselae faces. I do not believe that fertile-fruited non-hybrid *N. antrorsa* is an off-season variant of the common allopatric *N. domingensis*.

NARVALINA DOMINGENSIS (Cass.) Less., Syn. Gen. Compos. 234. 1832. *Needhamia domingensis* Cass., Dict. Sci. Nat. (ed. 2) 34: 336. 1825. **TYPE. HISPANIOLA** (as "Ile de Saint-Domingue). 1788, *Nectoux s.n.* (holotype: P n.v., as "dans l'herbier du Museum, ou M. Desfontaines nous a permis de l'observer"; possible isotype: K p.p., fragments in packet above the branchlet, fragment packet reads "S. Domingo - Nectoux"). Figures 1, 7–9.

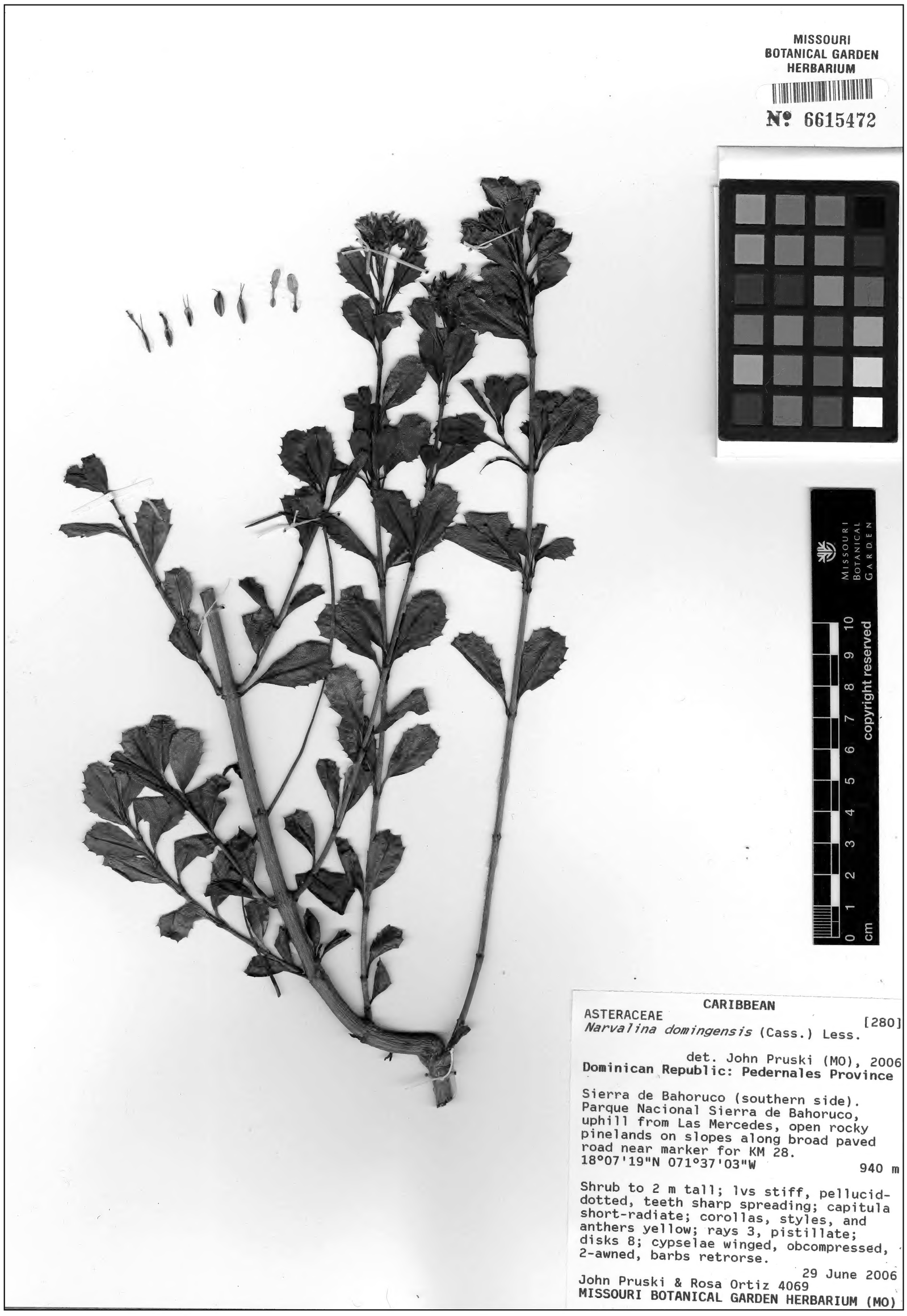

Figure 7. Representative specimen of *Narvalina domingensis* (*Pruski & Ortiz 4069*, MO).

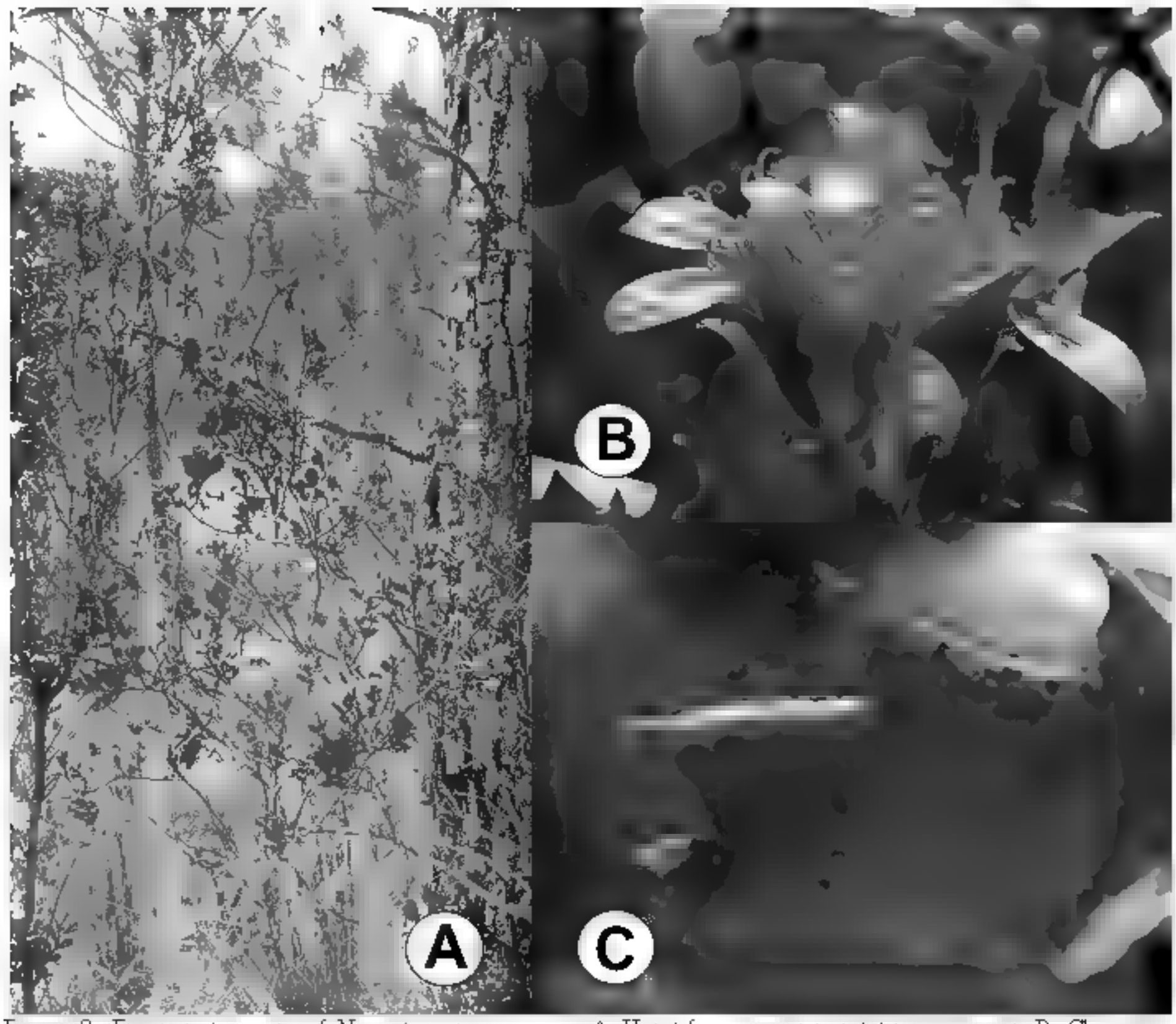

Figure 8. Field photographs of *Narvalina domingensis*. A. Habit foreground, habitat background. B. Close-up of flowering capitula. C. Leaf showing sharp marginal teeth and pellucid dots. All from *Pruski & Ortiz 4069*.

Shrubs, at least sometimes virgate, 1–3 m tall; stems 1 few from base; main stems usually stiffly erect, brittle, and weakly branched proximally, becoming moderately branched distally; puberulent or crisped puberulent distally on young vegetative branchlets or immediately below capitulescence, otherwise basically glabrous nearly throughout; petiole base sometimes persistent and in slow growing short internode plants the stems thereby appearing knotted. **Leaves** petiolate; blade 0.8–5 × 0.6–2.5 cm, hollly like, elliptic or oblong to obovate or spatulate, subcoriaceous, usually with 3–5 widely spaced secondary veins at about 60° to midrib; veins inconspicuous, appearing pellucid dotted or streaked, dots associated with veins and not with areoles; base cuneate to attenuate; margins sharply serrate-dentate; teeth 3–9 per side, 1–2 mm deep, often spreading laterally to sometimes slightly forward directed, sharply and stiffly callous tipped; apex acute or usually obtuse to rounded, sometimes even nearly retuse; petiole 0.3–1.1 cm long; opposing leaves narrowly subclasping. **Capitulescence** narrowly cymose branchlets 3–11 capitulate, strongly ascending, often somewhat puberulent or crisped puberulent; ultimate capitula sometimes subsessile, ternate-clustered; peduncles stout, 1–20+ mm long, sometimes flattened or at least drying so, often somewhat puberulent or crisped puberulent. **Capitula** 8–12 mm long; involucre 3–6 mm diam; phyllaries slightly unequal; outer phyllaries ca. 3.5–6 × 1–1.5 mm, lanceolate to oblanceolate, ascending to slightly spreading, often more than half as long as but narrower than the inner, stiff and apex sometimes callous tipped.

distally green-herbaceous, slightly noncontiguous at base, margins often ciliate distally; inner phyllaries 3–5, a few often directly subtending ray florets, 6–9 × 2–2.5 mm, ca. 10-striatulate; paleae narrowly lanceolate but otherwise more or less similar to inner phyllaries, at anthesis reaching to near disk corolla lobe bases. **Ray florets** 2–3; corolla tube 2.5–3 mm long, limb 7–8 × 2–3 mm, oblong, partly exserted, 5–7-nerved; style well-exserted from tube, exserted portion of style often longer than the corolla tube. **Disk florets** 5–8; corolla 5–7 mm long, glabrous, tube 1.5–2.5 mm long, the narrow throat much longer than either tube or lobes, with closely and indistinctly paired resin ducts, lobes 0.6–0.7 mm long, triangular-lanceolate, recurved; anthers and styles yellow, concolorous with ray and disk corollas; anthers ca. 3 mm long, appendage ca. 0.7 mm long, lanceolate; style branches to ca. 1.5 mm long, recurved, caudate-appendage 0.5–0.6 mm long, triangular, abaxially papillose but sweeping papillae of appendage not extending proximally onto branch surface. **Cypselae** strongly obcompressed, at maturity to 7–9 mm long and about as long as the involucre, alate, faces subglabrous, wings tan, sparsely ciliolate, cilia ca. 0.3 mm long, forward-directed; ray cypselae elliptic-ovate in outline, to 3–4 mm diam. the body ca. 1 mm diam., each wing 1–1.5 mm diam.; disk cypselae elliptic or oblong in outline, to ca. 2–3 mm diam., all more or less resembling rays or the inner cypselae sometimes distinctly narrower than rays; pappus awns 2, 2–5 mm long, subequal, those of the rays about as long as corolla tube, those of the disks reaching past middle of corolla throat, adaxial surface flattened in plane perpendicular to that of cypselae body flattening, retrorsely barbed along the two adaxial edges as well as abaxially, barbs 0.1–0.2(–0.3) mm long, moderately close-spaced, evenly reducing in length distally.

Representative specimens. **DOMINICAN REPUBLIC**. **Azua**. Ad Las Lagunas, 1000 m, Aug 1912, *Fuertes 1897* (NY). **Barahona**. Pine woods at Aceitial, 4200 ft., 8–12 Aug 1946, *Howard & Howard 8130* (NY). [near border of **Baoruco** and **Independencia**]. Above Juan Santiago, between El Cercado [Baoruco] and Hondo Valle [Independencia], 900 m, 9 Sep 1968, *Liogier 12626* (MO, NY, P, US). **Independencia**. Sierra de Neiba, 17.3 km N of La Descubierta, 910 m, 30 May 1986, *Judd et al. 5187* (F, FLAS, NY, US). **Peravia**. entre 5–6 km S de El Pinar, 1500 ft., 22 Jul 1982, *Zanoni et al. 21967* (JBSD, MO, NY). **Pedernales**. Sierra de Bahoruco, uphill from Las Mercedes, near km 28, 940 m, 29 Jun 2006, *Pruski & Ortiz 4069* (JBSD, MO, NY, USM); Sierra de Bahoruco, km 32.5 N del puerto de Cabo Rojo, 1250 m, 10 Apr 1988, *Zanoni et al. 40759* (JBSD, MO, NY). **San Juan**. Vicinity of Río Arriba del Norte, north of San Juan, s. elev., 9–14 Sep 1946, *Howard & Howard 8965* (NY, P, US); 3 km N de la Presa de Sabaneta, 1900 ft., 24 Jun 1982, *Mejia & Pimentel 21003* (JBSD, MO, NY). **San Rafael** [not located, perhaps now in Elias Piña]. Inter Elias Piña and Calimete, s. elev., 1 Apr 1969, *Marcano et al. 5638* (NY). **HAITI**. **Artibonite**. Marmelade, 800 m, 20 Dec 1925, *Leonard 8345* (NY, US). **Nord-Ouest**. Vicinity of Bassin Bleu, Moustique Mountains, 630–1500 m, 14–27 Apr 1929, *Leonard & Leonard 14851* (NY, US), *Leonard & Leonard 14983* (MO, US). **Ouest**. Montagnes du Trou d'Eau, N of Glore, 800 m, 22 Jul 1924, *Ekman 1062* (NY, S, US); Morne à Cabrites, 500 m, 26 Apr 1942, *Holdridge 1154* (NY, US); Port-au-Prince, 1827, *Jacquemont s.n.* (P). **Port-de-Paix**. Massif du Nord, Haut-Piton, 1200 m, 22 Jul 1924, *Ekman 4629* (NY, S). **Sud**. Tiburon Peninsula, Massif de la Hotte, Morne Macaya, 1900–2150 m, 7 Jun 1984, *Skean et al. 1441* (FLAS n.v.). **Without department**: Prope La Riviere, May 1827, *Jacquemont s.n.* (P-Hennecart-2); La Brande to Mt. Balance, 2750 ft., 15 Aug 1905, *Nash & Taylor 1676* (NY); St. Domingue, *Poiteau s.n.* (P-Drake). **WEST INDIES**: Antill., *Richard s.n.* (P-Drake). **CULTIVATED IN EUROPE**. From seed collected in "Sancto-Domingo" and communicated to de Candolle (1836) by *Adolphe Brongniart s.n.* (G-DC, IDC microfiche 800 card 965.III.8, photograph MO); spec. cult. in calv. Hort. Paris, from type stock, *Anon.* (K p.p., a single branchlet about 10 cm long, mounted below packet of possible isotype); H.P. (Serr. ch.), Dec 1833, *Anon.* (P-Adrien Jussieu); Hort. Paris, 1840, *Anon.* (P-Spach); Hort. Paris, 1863, *Anon.* (P-Delacour); H.P., 1845, *Jamus s.n.* (P); Hort. Paris, 1847, *Spach s.n.* (P-Sch-Bip). **PROVENANCE UNKNOWN**: MO-2094421 ex herb. Bernhardi, possibly cultivated in Europe pre-1840.

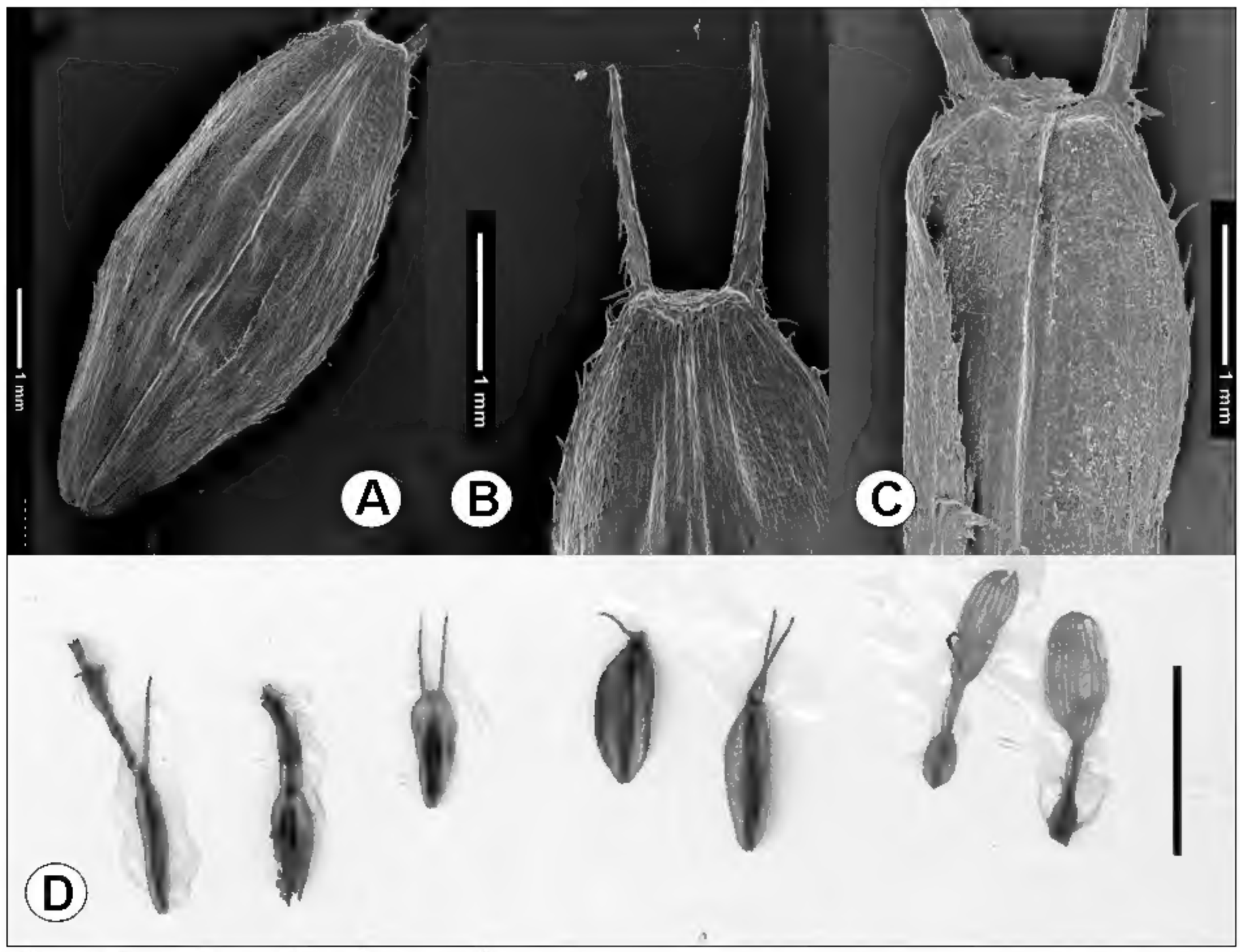

Figure 9. *Narvalina domingensis*. SEM micrographs and photograph of cypselae, pappus awns, and corollas. A. Ray cypsela showing lateral wings about as broad as body. B. Ray cypsela awns close-up showing retrorse barbs. C. Disk cypsela showing on left incurved lateral wing. D. Three disk florets and cypselae (left), two ray cypselae (center), and two pistillate pre-fruiting ray florets (left); the stramineous-brownish lateral wings are about as broad as the black bodies; the two ray florets on right show the short corolla limbs. All from *Pruski & Ortiz 4069*, MO; scale bar D is 10 mm.

Distribution and ecology. *Narvalina domingensis* occurs mostly from 350–1500 meters in elevation in pastures, dry thickets, and open pine forests in central and western Hispaniola, both in Haiti and the Dominican Republic. The species appears to flower most frequently or at least to have been collected mostly between February and September. I have seen *N. domingensis* and *Selleophytum buchii* growing side-by-side. *Narvalina domingensis* has been especially well-collected in Massif du Nord in Haiti and in the Sierra de Bahoruco in the southwestern Dominican Republic; it does not appear to be as common in the Cordillera Central of the Dominican Republic. I have seen no collections from the eastern third of the Dominican Republic. There are several collections of cultivated material from the Paris garden made over more than a twenty year time span in the 1800s.

Typification. I do not know with certainty whether P or FI-W houses the holotype of *Needhamia domingensis* Cass., although strict reading of the Cassini (1825a) protologue suggests the type collected by Nectoux is in P. Examples for purposes of discussion of representative type citations from protologues of some West Indian Compositae include the following. Similar-leaved (albeit trinerved, not pinnate) earlier-described *Verbesina ilicifolia* Poir. 1808 (a synonym of *Wedelia serrata* L.C. Rich. 1807) was given as a Nectoux sheet "in herb. Desf." I have seen a photograph of this Nectoux sheet in FI-W, so it is clear that the Webb herbarium in FI-W has at least some Nectoux

material. The protologues of *Andromachia poiteaui* Cass., *Chthonia leptocephala* Cass., and *Lepidaploa buxifolia* Cass. each gave their respective types as "dans l'herbier de M. Desfontaines. I have seen a photograph of FI-W holotype of the *Andromachia* (now recognized as *Liabum poiteaui* (Cass.) Urb.), so it is clear that the Webb herbarium in FI-W has at least some Cassini holotypes. On the other hand, because the protologue of *Needhamia domingensis* Cassini (1825a) gave "dans l'herbier du Museum," Cassini apparently clearly distinguished the Paris museum from the private Desfontaines herbarium, and the type of *Needhamia domingensis* is presumably as cited a Nectoux collection at P, which I have not seen.

Misapplication of the name *Narvalina fruticosa*. Urban (1907) and Schulz (1911) treated West Indian endemic *N. domingensis* in synonymy of continental endemic *N. fruticosa*. This misapplication of the name *N. fruticosa* as what was once thought to be the earliest name for *N. domingensis* can be traced to Burman and Linnaeus. Plumier's (1703: 10) "*Bidens frutescens, ilicis folio, flore luteo*" was the basis of his illustration of *N. domingensis* for which Burman (1756: 42, tab. 52) used the polynomial "*Verbesina frutescens, foliis ovatis ac serratis*." Burman (1756) also, however, added *Bidens fruticosa* L. (Linnaeus 1753) to synonymy of the Plumier plant. Linnaeus (1759, 1763) in turn also mistakenly equated Plumier's West Indian tab. 52 (in Burman 1756) and continental *Verbesina fruticosa* (based on *Bidens fruticosa*), setting into motion name misapplication not corrected for more than a century. Willdenow (1803: 2227), Persoon (1807: 472), and Poiret (1808: 461) each repeated the synonymy of Linnaeus (1759, 1763). Sprengel (1826: 602) equated Plumier's West Indian plant with continental *V. fruticosa*, albeit under the name *Pascalia baccata* (L.) Spreng. (now *Tilesia baccata* (L.) Pruski 1996). Candolle (1836: 618) in treating the vegetatively similar-to-*Narvalina* basically epappose West Indian *Verbesina ilicifolia* Poir. (some 1800s material of *N. domingensis* was originally misdetermined as *V. ilicifolia*) suggested that both *V. fruticosa* and Plumier's illustration represented a single species. Klatt (1884: 92) cited additional misidentifications of Plumier's West Indian plant. Blake (1915) and Urban (1920, 1921) reinstated the name *N. domingensis* for our West Indian plant, and identified Plumier's plate (here reproduced from Burman 1756 as fig. 1) as *N. domingensis*. Becker (1979) recognized the Linnaean *Bidens*/*Verbesina* as the continental endemic *Lasianthaea fruticosa*, and excluded *N. domingensis* from its synonymy. Finally, Sherff and Alexander (1955), Bremer (1994), Liogier (1999), Panero (2007), and Crawford et al. (2009) each recognized *N. domingensis*.

EXCLUDED NAMES

Narvalina corazonensis Hieron., Bot. Jahrb. Syst. 29: 49. 1900 ≡ **Ericentrodea corazonensis** (Hieron.) S.F. Blake & Sherff.

Narvalina fruticosa (L.) Urb., Symb. Antill. 5: 265. 1907 ≡ *Bidens fruticosa* L. ≡ *Verbesina fruticosa* (L.) L. ≡ **Lasianthaea fruticosa** (L.) K.M. Becker.

Narvalina homogama Hieron., Bot. Jahrb. Syst. 29: 48. 1900 ≡ **Ericentrodea homogama** (Hieron.) S.F. Blake & Sherff.

Narvalina sodiroi Hieron., Bot. Jahrb. Syst. 29: 50. 1900 ≡ **Cyathomone sodiroi** (Hieron.) S.F. Blake.

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