

THREE NEW SPECIES OF *SLOANEA* (ELAEOCARPACEAE) FROM COSTA RICA, WITH EMPHASIS ON THE SPECIES FROM THE OSA PENINSULA.

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Abstract. Three new species of *Sloanea* (Elaeocarpaceae) from Costa Rica, are described, illustrated, and discussed morphologically with reference to allied species. *Sloanea damonsmithii* is found in the Osa Peninsula, and apparently also occurs in Panama; *S. eugenifloresii* is from the Golfo Dulce Forest Reserve, Golfito region, and La Cangreja National Park; and *S. herrerae* occurs on the Caribbean slope of Costa Rica, in the Cordillera de Talamanca and Llanuras de San Carlos.

Resumen. Tres nuevas especies de *Sloanea* (Elaeocarpaceae) de Costa Rica son descritas e ilustradas y la relación morfológica con especies afines se discute. *Sloanea damonsmithii* se distribuye en la Península de Osa y aparentemente ocurre en Panamá; *S. eugenifloresii* ocurre en la Reserva Forestal Golfo Dulce, región de Golfito, y el Parque Nacional La Cangreja; y *S. herrerae* se encuentra en la vertiente Caribe de la Cordillera de Talamanca y Llanuras de San Carlos.

Keywords: Cordillera de Talamanca, Costa Rica, Península de Osa, *Sloanea*

Sloanea L., distributed in tropical and subtropical regions of the world except in continental Africa, is the largest genus of Elaeocarpaceae. In Costa Rica, *Sloanea* is represented by 22 species (Smith, 2010), not including the three species described herein. Overall, 12 species occur on the Osa Peninsula, Puntarenas (principal area of focus of the second author; e.g., see <http://sweetgum.nybg.org/osa/index.php>). The most recent revision of the genus in the New World was published by Smith (1954), who recognized 62 species in two subgenera and four sections. Characters associated with the sepals distinguish two American subgenera: subgenus *Quadrisepala* Earle Sm. (sections *Corymbo-racemi* Earle Sm. and *Paniculi* Earle Sm.) comprises species with four sepals—equal in shape and size—that cover the reproductive organs before anthesis; and subgenus *Sloanea* (sections *Brevispicae* Earle Sm. and *Sloanea*) comprises species with 4–11 sepals—unequal in size and shape—that do not fully cover the reproductive organs before anthesis. Since the publication of this revision, approximately 47 new species have been described (Lundell, 1975; as Tiliaceae; Steyermark, 1988; Smith, 1996; Palacios-Duque, 2004a,b, 2005, 2007a,b; Palacios-Duque and Fernández-Alonso,

2005, 2011; Lozada-Pérez, 2008; Vasquéz-Martínez, 2009; Sampaio and Souza, 2010, 2011; Boeira et al., 2012; Palacios-Duque and Baeza, 2014).

In the Osa Peninsula, species of *Sloanea* generally are known by the vernacular name “abrojo” and/or “guellaperro.” In this region the genus is represented by large trees, often with very high buttresses [e.g. *S. laurifolia* (Benth.) Benth.] with cylindrical trunks that are twisted or deeply grooved; stipules that are small or large and leaf-like (*S. damonsmithii* and *S. medusula* K. Schum. & Pittier); petioles that are thickened at one or both ends and frequently unequal; leaves that are usually alternate, opposite or subopposite [in *S. guianensis* (Aubl.) Benth. and *S. rugosa* Dam. A. Sm.]; flowers lacking petals (as in all spp. from Costa Rica, with numerous stamens; and fruits unarmed or with rigid or flexible spines, sometimes few in number [*S. brachytepala* Ducke, *S. garcia-cossioi* Pal.-Duque, *S. laurifolia* (Benth.) Benth. and *S. longipes* Ducke]).

Sloanea medusula and *S. zuliaensis* Pittier are among the most common species in the Osa Peninsula, while *S. petenensis* Standl. & Steyerm. and the two other species described here are known from few individuals.

TAXONOMY

Sloanea damonsmithii D. Santam. & Aguilar, *sp. nov.*
TYPE. COSTA RICA. Puntarenas: Cantón de Golfito, Península de Osa, 7 Km. SW. of Rincon, La Cuenca de Aguabuena, sector sur, disturbed primary forest along edge of pasture, 08°42'20"N, 83°31'30"W, 70–100 m, 24 February 1994 (old fl and young fr), D. Smith, R. Aguilar, S. G. Smith

1301 (Holotype: CR; Isotypes: F, GH, K, MO, NY, US to be distributed). Fig. 1.

Tree 15–25 m tall × 0.12–0.40 m DBH; external bark described as reddish, with lenticels. *Twigs* 3–4 mm wide, below the terminal bud, cylindrical, densely puberulent, the trichomes ferruginous. *Leaves* alternate, spaced along twigs;

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FIGURE 1. *Sloanea damonsmithii* D. Santam. & Aguilar. **A**, branch with young fruits, showing leaves on adaxial and abaxial surface; **B**, stipules; **C**, branch with young fruits; **D**, stamen; **E**, fruit. **A** to **D** from the type; **E** from *Quesada & J. Marín 562* (CR).

stipules 0.9–1.5 × 0.5–0.8 cm, foliaceous, persistent, the pedicel 0.15–0.2 cm long, pubescent on both surfaces, with midrib and lateral veins distinctive, margin entire; petiole 1.5–4.7 cm long, cylindrical, puberulent, the trichomes ferruginous, both pulvini prominent; lamina 6.3–12.8 (–19) × (3–) 5.4–8 cm, elliptic, glabrous on the adaxial surface, minutely pubescent to glabrescent on the abaxial surface; midrib flat and pubescent on the adaxial surface, raised and densely or sparsely puberulent on the abaxial surface; lateral veins 9–13 per side, densely or sparsely puberulent on both surfaces, abaxially raised; tertiary veins distinct, flat on the adaxial surface, raised on the abaxial surface; base acute-cuneate to obtuse; apex acute to short acuminate; margin entire, or rarely crenate distally. *Inflorescences* racemes, axillary, often at nodes lacking leaves; peduncle 6–15 mm long, terete, pubescent; pedicels 5–7 mm long in flower, 3–15 mm long in fruit, terete or weakly compressed, pubescent; bracts and bracteoles 2–3.1 × 0.3–1 mm, lanceolate or narrowly triangular, densely pubescent on both surfaces, margin entire, apex acute or acuminate, sometimes tridentate, sometimes three or four bracts at node. *Flowers* with the sepals apparently not covering the reproductive organs in the floral bud, brown, generally 5–9, 1.5–3 × 0.8–1.5 (at the base) mm, erect, narrow or broadly triangular, pubescent on both surfaces, the margin entire, the apex acute; stamens inserted separately in pores in the receptacular disc, ca. 2–3 mm, pubescent, the filament 1.5–3 mm long, color unknown, pubescent, the anther 0.5–1 mm long, color unknown, pubescent, elliptic, the base rounded to cuneate, the thecae opening by lateral pore, the awn 0.1–0.2 mm long, more or less conical, glabrescent; ovary ca. 2 × 1.5– mm, sub-globose or more or less conical, densely pubescent, 3 or 4-locular, color unknown; style ca. 3.1 mm long in flowers (past anthesis, *Quesada 429*) and 5–7 mm long in immature fruits (*Smith 1301*), densely pubescent, glabrescent at the apex, 3 or 4-lobed at apex. *Fruits* 1.4–3.5 × 1.2–2.5 cm, green, yellowish green, or brown; valves 0.2–0.4 cm thick, external surface pubescent, covered with dimorphic, rigid and semi-flexible spines, the longer ones 0.45–1 cm long, strigose, the shorter ones 0.23–0.32 cm long, strigose; seeds 1.1–1.5 × 0.6–0.7 cm, the aril reported as red.

Etymology: This species is named in honor of Damon A. Smith for his important contributions to Neotropical *Sloanea*, including the excellent preparation of the type specimen for this species.

Distribution and Habitat: In Costa Rica, *Sloanea damonsmithii* is known only from the Osa Peninsula of the country's south Pacific coast, where it has been found growing in very wet forests from approximately 70 to 350 m in elevation. Although this species was reported from Panama by Smith (2010) and Zamora et al. (2004), we found no specimens from that country during the present study.

Phenology: *Sloanea damonsmithii* has been collected in old and past anthesis flowers in February and with fruits in February, March, August and September.

Additional specimens examined: COSTA RICA. Puntarenas: Cantón de Osa, Rancho Quemado, Fila Estero Guerra, 08°43'50"N, 83°34'40"W, 250–350 m, 01 August 1991 (fr), *J. Marín 73* (CR, MO); Rancho Quemado, sector

norte, camino a Cerro Chocuaco, 08°43'30"N, 83°34'20"W, 350 m, 17 March 1992 (fr), *J. Marín 434* (CR-2 sheets, MO); Rancho Quemado, alrededores de la toma de agua, bosque primario, Rincón, 08°42'N, 83°34'W, 200 m, 15 February 1991 (fl past anthesis), *J. F. Quesada 429* (CR); Rancho Quemado, Fila Guerra, Rincón, bosque primario, 08°46'N, 83°38'W, 200 m, 01 August 1991 (fr), *J. F. Quesada & J. Marín 562* (CR-2 sheets); Rincón de Osa, Reserva Forestal Golfo Dulce, Aguabuena, La Cuenca, 08°42'20"N, 83°31'30"W, 50–150 m, 01 September 1991 (fr), *R. Aguilar 297* (CR); Aguabuena, 3 km W of Rincón, one hectare permanent sample plot 800 m N of the house of Henry Monge in well-drained, moderately sloping terrain, 08°42'N, 83°30'W, 130 m, 19 April 1993 (ster), *K. Thomsen 904* (CR); Rincón de Osa, 100 m, October 1965 (ster), *S. Hern 28* (CR-2 sheets).

Sloanea damonsmithii is readily recognized by the foliaceous and pediculate stipules with conspicuous venation which are pubescent on both leaf surfaces. It is further distinguished by its densely puberulent twigs; alternate, relatively small leaves that are spaced along twigs with entire margins (rarely crenate distally); flowers with pubescent filaments and anthers; short staminal awn; and fruits with dimorphic spines.

Because it shares similar leaves, short staminal awns, and fruits with dimorphic spines, this new species is similar to *S. faginea* Standl. from Costa Rica and Panama (Smith 2010), which grows between 400–1,400 m in elevation in the north of Costa Rica in the Alajuela, Guanacaste, and Puntarenas provinces. However, *S. damonsmithii* differs from *S. faginea* by its foliaceous and pediculate stipules (vs. lanceolate and not pediculate stipules). The new species is also likely to be confused with the similarly low-elevation (100–300 m) *S. geniculata* Dam. A. Sm., endemic to the Caribbean slope in Heredia and Limón provinces, Costa Rica. The latter differs, however, by its leaves with crenate to serrate margins (vs. entire or rarely distally crenate in *S. damonsmithii*), numerous lateral veins (17–25 vs. 9–13 per side), and flowers with long staminal awns ([0.9–] 1.1–2.1 vs. 0.1–0.2 mm long). In the Osa Peninsula, the new species resembles *S. medusula* for its conspicuous stipules and fruits with dimorphic spines, but the latter is easy to differentiate by its larger leaves ([40.5–] 48–65 [–99.5] vs. 6.3–12.8 [–19] cm long) with cordate bases and with the abaxial surface covered with whitish trichomes.

In the treatment of Elaeocarpaceae for the *Manual de Plantas de Costa Rica* (Smith, 2010), *S. damonsmithii* was treated as *Sloanea* “sp. C.” Zamora et al. (2004) used the name *S. latistipula*, though it was not validly published.

Sloanea eugenifloresii Aguilar & D. Santam. *sp. nov.* TYPE. COSTA RICA. Puntarenas: Refugio de Vida Silvestre Golfito, 3 km al norte del aeropuerto, sendero natural, 08°40'25"N, 83°11'25"W, 200 m, 26 January 1992 (fl), *R. Aguilar, R. Martín, C. Formoso & M. H. Grayum 878* (Holotype: CR [202324]; Isotype: BM, COL, CR, F, GH, K, LPB, MO, MEXU, NY, P, PMA, RB, US to be distributed). Fig. 2–3.

Tree 7–30 m tall × 0.10–1 m DBH; external bark described as reddish. *Twigs* 5–7 mm wide, below the terminal

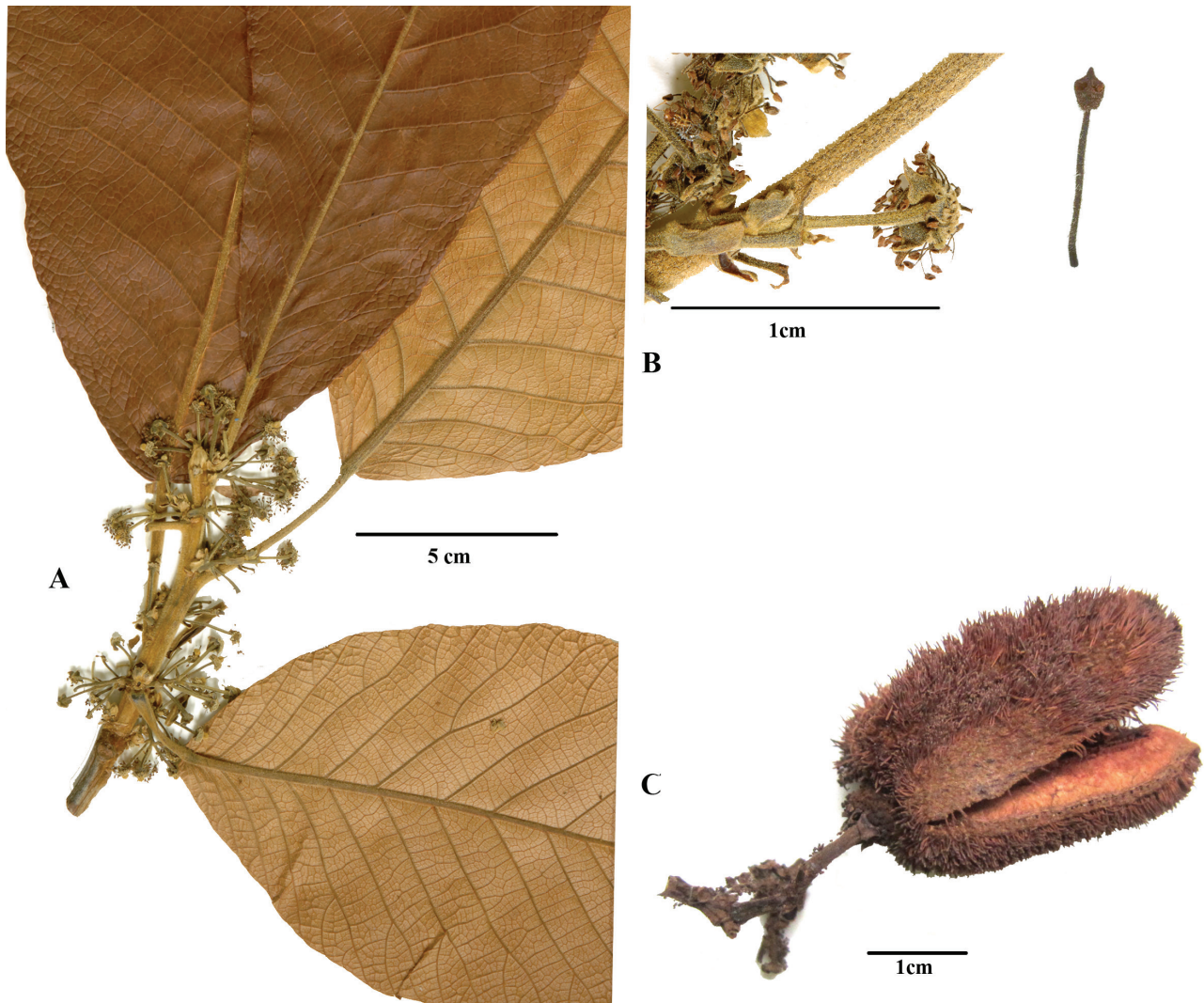


FIGURE 2. *Sloanea eugenifloresii* Aguilar & D. Santam. **A**, branch with inflorescences; **B**, flower and stamen; **C**, fruit. A and B based on Aguilar 3160 (CR); C based on Aguilar 4431 (CR).

bud, cylindrical or weakly ribbed, densely pubescent, the trichomes brown or pale-brown. *Leaves* alternate, spaced along twigs; stipules 0.6–1 (–1.4) × 0.3–0.5 cm, ovate or deltate, quickly caducous, leaving a conspicuous scar on the twig, sessile, densely pubescent on the external surface, glabrous on the internal surface, the venation indistinct, the margin entire; petiole 1.8–6.5 cm long, cylindrical to weakly compressed, densely pubescent, the trichomes brown or pale brown, upper pulvinus prominent; lamina 13–30.1 × 8–18.5 cm, obovate, pubescent on both surfaces, denser on the abaxial surface; midrib flat on the adaxial surface, raised, rounded or more or less square on the abaxial surface; lateral veins 14–19 per side, generally densely pubescent on both surfaces, raised below; tertiary veins very distinct, flat and weakly sulcate on the adaxial surface, raised on the abaxial surface; base rounded or subcordate; apex rounded or emarginate; margin entire, either crenulate or undulate. *Inflorescences* axillary racemes; peduncle 3–10 mm long, terete or compressed, pubescent; pedicels 5–13

mm long in flower, 10–20 mm long in fruit, compressed, densely pubescent; bracts and bracteoles 3–6 × 1–1.5 mm, wide to narrowly triangular, densely pubescent on both surfaces or glabrous inside, the margin entire, the apex acute or acuminate. *Flowers* with the sepals not covering the reproductive organs in the floral bud, green or red, generally 4, sometimes 5 to 7, 2–3 × 1.2–2 mm (at the base), reflexed, triangular, pubescent on both surfaces, the margin entire, the apex acute to acuminate; stamens inserted separately in pores in the receptacular disc, ca. 3–4 mm, pubescent, the filament 1.5–4 mm long, red, densely pubescent, the anther 0.5–1 mm long, possibly red, densely pubescent, ovate or elliptical, the base truncate or subcordate, the thecae opening by widely lateral pore, the awn 0.1–0.3 mm long, more or less conical, glabrescent; ovary 1.3–1.5 × 1–1.5 mm, orange, subglobose, densely pubescent, weakly lobulate, 4-locular; style 1.1–1.4 mm long, pubescent at the base and glabrous distally, sometimes with scattered trichomes along the style, 4-lobed at apex. *Fruits* 3.5–4 × 1.8–3 cm, green;

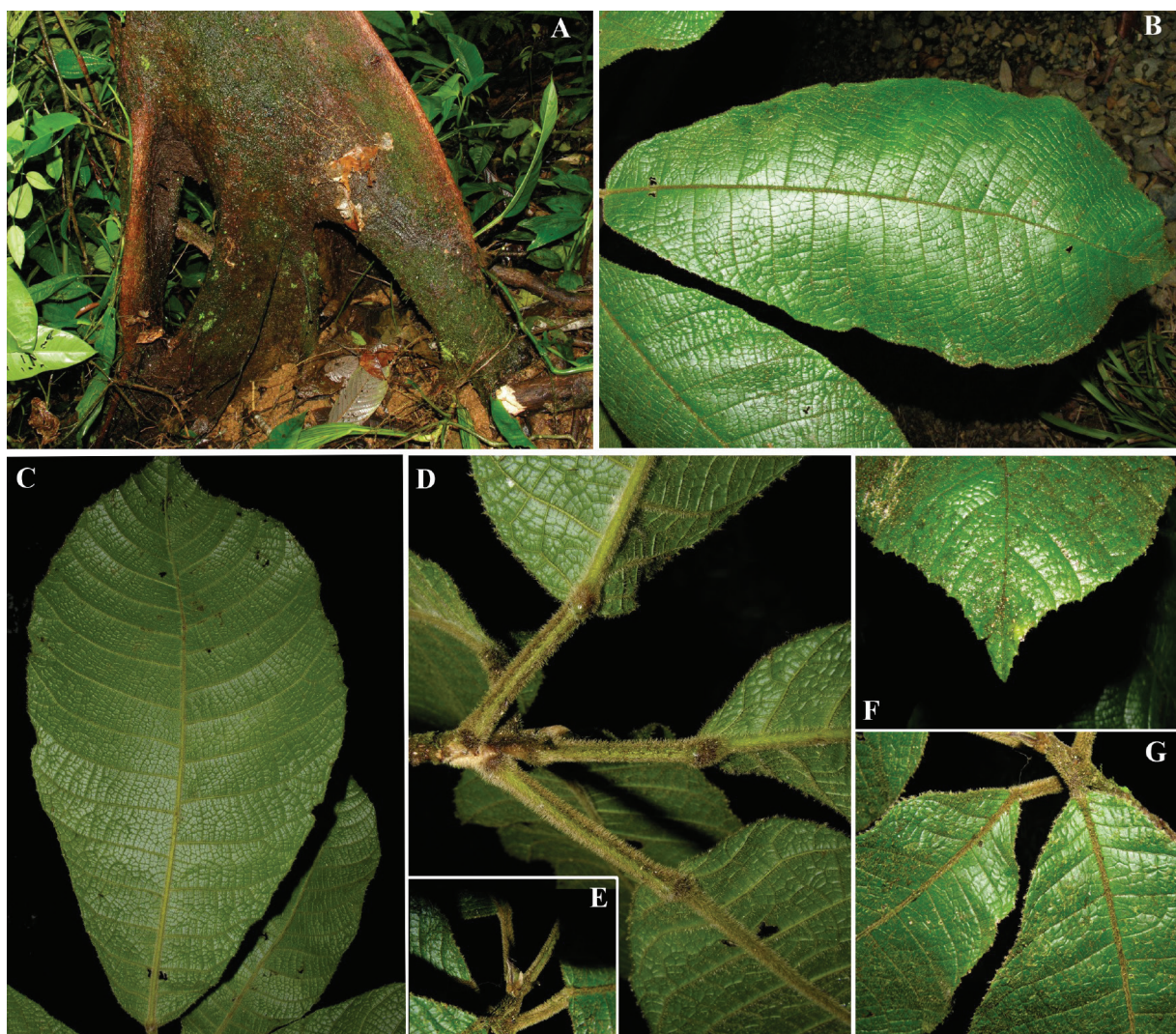


FIGURE 3. *Sloanea eugenifloresii* Aguilar & D. Santam. A, buttresses; B, leaf adaxial surface; C, leaf abaxial surface; D, petioles; E, stipules; F, leaf apex; G, leaf base. A to G based on *Santamaría & R. Aguilar 9817* (CR). Photos by R. Aguilar.

valves 0.3–0.5 cm thick, external surface pubescent, densely covered with semi-flexible and monomorphic spines 0.2–0.4 cm long, flattened, pubescent; seeds 1.7–1.8 × 0.8–1 cm, the aril reported as red.

Etymology: This species is named in honor of Eugenia Flores Vindas for her important contributions to botanical sciences and for supporting the work of the first author of this species.

Distribution and Habitat: *Sloanea eugenifloresii* is endemic to Costa Rica. It is found in very wet forest, on the Pacific slope in Puntarenas and San José provinces, 20 to 650 m in elevation. This species was reported from Llanura de San Carlos (Alajuela Province) on the Caribbean slope by Smith (2010), though we found no specimens from that area during the present study.

Phenology: *Sloanea eugenifloresii* has been collected in flower in January and March and in fruit in April and September.

Additional specimens examined: COSTA RICA. Puntarenas: Osa, distrito Sierpe, Reserva Forestal Golfo Dulce, Mogos Bahía Chal (entrada de Chocuaco a 35 km. de Chacarita) Finca de Carlos Rojas (entre los repastos, charrales y parches de bosque intervenido), 08°44'10"N, 83°28'00"W, 20 m, 13 March 1994 (fl), *R. Aguilar 3160* (BM, CR, GH, LPB, MEXU, MO, P, PMA, RB, US); Reserva Forestal Golfo Dulce, entrada a Chocuaco, Bahía Chal, 08°43'00"N, 83°34'50"W, 200–350, 10 April 1994 (fr), *R. Aguilar 4431* (CR, MO); Reserva Forestal Golfo Dulce, Rancho Quemado, camino a Drake, lugar donde se encuentran las antenas del ICE, 08°41'33"N, 83°35'35"W, 350–400 m, 28 May 2015 (ster), *D. Santamaría & R. Aguilar 9817* (CR, other duplicates to be distributed). San José: cantón de Puriscal, Zona Protectora La Cangreja, cuenca del Tulín, faldas de la fila Cangreja, costado sur, 09°42'10"N, 84°22'25"W, 650 m, 15 September 1998 (fr, collected from the ground), *L. Acosta 7* (CR-2 sheets, MO).

Sloanea eugenifloresii is characterized by the dense pubescence on twigs, leaves and inflorescences; leaves with rounded or emarginate apex, and reticulate venation that is conspicuous on both surfaces; flowers that are generally with 4 (5–7) sepals, anthers that are densely pubescent, thecae opening by widely lateral pore, and with a short, conical awn; and fruits that are densely covered with monomorphic spines.

For its vestiture of the vegetative and reproductive parts and distinct reticulate leaf venation, *S. eugenifloresii* is similar to *S. rufa* Planch. ex Benth. According to Smith (1954), the latter species has stipules with the margin deeply lacinate (vs. margin entire in *S. eugenifloresii*) and long-awned stamens (0.75–1.5 vs. 0.1–0.3 mm long). *Sloanea kuhlmannii* Ducke also has the leaves and trichomes similar in color to the new species, but the inflorescences are umbellate (vs. racemes in *S. eugenifloresii*) and the flowers have larger sepals (7 vs. 2–3 mm long in *S. eugenifloresii*). In the Osa Peninsula, species of *Sloanea* with fruits with monomorphic spines are: *S. guianensis*, *S. obtusifolia* K. Schum., *S. petenensis*, *S. picapica* Standl., *S. rugosa* Dam. A. Sm., *S. terniflora* (Sessé & Moc. ex DC.) Standl., and *S. zuliaensis* (Fig. 4). But in all these species the spines generally are less dense, thick, rigid and pungent. Among these *Sloanea* species, the new species most resembles *S. terniflora*. However, the latter species differs in its shortly tomentose twigs that are soon glabrescent (vs. densely pubescent in *S. eugenifloresii*), shorter petioles (0.1–0.4 vs. 1.8–6.5 cm), and smaller fruits (1.5–1.9 × 1–1.5 vs. 3.5–4 × 1.8–3 cm). In the Osa Peninsula, young plants of *S. garcia-cossioi* (see D. Santamaría & R. Aguilar 9814, CR; D. Smith et al. 1303, CR; and N. Zamora et al. 6447, CR) resemble adult plants of *S. eugenifloresii* by their densely pubescent branches and leaves, long petioles, and marked venation. However, the stipules in the first species are linear (vs. ovate or deltate in *S. eugenifloresii*). Adult plants of *S. garcia-cossioi* are clearly different from *S. eugenifloresii*, by their glabrous petioles (vs. densely pubescent in *S. eugenifloresii*) and larger fruits (4.7–5.5 × 3.5–4.3 vs. 3.5–4 × 1.8–3 cm).

In the Elaeocarpaceae treatment for the *Manual de Plantas de Costa Rica* (Smith, 2010), *S. eugenifloresii* was treated as *Sloanea* “sp. A.” Zamora et al. (2004) used the name *S. pilosa*, though it was not validly published.

Sloanea herrerae Aguilar & D. Santam., *sp. nov.* TYPE. COSTA RICA. Limón: Cantón de Talamanca, Alto Urén, inmediaciones cerro Laúbeta, 09°24'15"N, 83°00'30"W, 1,190 m, 28 July 1989 (fl), G. Herrera 3390 (Holotype: CR [66518]; Isotype: CR [181540]). Fig. 5–6.

Tree (15–) 25–30 tall × 0.15–0.20 m DBH; external bark unknown. *Twigs* 2–5 mm wide, below the terminal bud, weakly angulate and flattened, densely pubescent or glabrescent, the trichomes yellow or pale brown. *Leaves* alternate, spaced along twigs; stipules ca. 0.15–0.35 × ca. 0.12 cm, deltate, quickly caducous, not a conspicuous scar on the twig, sessile, pubescent on the external surface, glabrous on the internal surface, venation indistinct, margin entire; petiole 2.2–7 cm long, cylindrical, glabrous, both pulvini prominent; lamina 6.8–17.3 × 4.1–8.9 cm, elliptical to obovate, glabrous on both surfaces; midrib flat on the adaxial surface, rounded on the abaxial surface; lateral

veins 4–7 per side, glabrous on both surfaces, raised below; tertiary veins distinct, flat on the adaxial surface, raised on the abaxial surface; base rounded to sub-cuneate; apex rounded, weakly retuse or short-acuminate; margin entire. *Inflorescences* racemes, axillary; peduncle 7–22 mm long, terete, weakly alate and ribbed, diminutely pubescent; pedicels 7–29 mm long in flower, 30–44 mm long in fruit, weakly flattened or cylindrical, diminutely pubescent; bracts and bracteoles unknown. *Flowers* with the sepals covering the reproductive organs in the floral bud, pale green, 4 (5), ca. 7–8 × 5–6 mm (at the base), erect, broadly triangular, pubescent on both surfaces, the margin entire, the apex acute; stamens inserted separately in pores in the receptacular disc, ca. 4–6 mm, pubescent, the filament 0.3–0.7 mm long, color unknown, densely pubescent, the anther 1.4–1.8 mm long, yellow, pubescent, narrowly oblong to lanceolate, the base subtruncate, the thecae opening longitudinally, the awn 0.5–1 mm long, glabrous, linear to lanceolate; ovary ca. 2–2.5 × 1.2–1.5 mm, conical, densely pubescent, 4? locular, pale green; style 0.5–0.6 mm long, glabrous, 4-lobed at apex. *Fruits* 3–4.5 × 2.5–3.2 cm, green; valves 0.4–0.7 cm thick, external surface pubescent, covered with very rigid monomorphic spines 0.5–1.8 cm long, pubescent; seeds ca. 2.5–3.3 × 2.5–2.7 cm, the aril reported as white.

Etymology: The epithet of this species honors Gerardo Herrera Chacón, the first to collect the new species, and who has collected many other important first records for the flora of Costa Rica.

Distribution and Habitat: *Sloanea herrerae* appears to be endemic to Costa Rica, on the Caribbean slope in Alajuela and Limón provinces. It is found in very wet forest in Boca Tapada de San Carlos, Alajuela, from 50 m elevation; and pluvial forest in the Cordillera de Talamanca (Alto Urén and fila Tsiurábeta), Limón, from 700–1,190 m elevation.

Phenology: *Sloanea herrerae* has been collected in flowers and fruits in July.

Additional specimens examined: COSTA RICA. Limón: Reserva Indígena Talamanca, camino entre Sukut y Amubri por la fila Tsiurábeta, 09°27'00"N, 082°59'24"W, 700–900 m, 09 July 1989 (fr), B. Hammel et al. 17612 (CR). Alajuela: Cantón de San Carlos, cuenca del San Carlos, Pital, Boca Tapada, finca Aserradero San Jorge, 10°42'57"N, 084°10'27"W, 50 m, 15 January 1997 (ster), N. Zamora & M. Ocampo 2576 (CR).

Sloanea herrerae is characterized by its leaves glabrous on both surfaces and with entire margins; flowers borne on long pedicels; sepals that cover the reproductive organs in bud; floral buds rounded; stamens with short filament, elongate anther, and thecae opening longitudinally; fruits with long and very rigid spines; and large seeds.

As mentioned in Smith (2010), the leaves in this new species resemble those of *S. laevigata* Dam. A. Sm. (also from the Caribbean slope) and *S. laurifolia* (Benth.) Benth., (from the Pacific slope), in both of which the sepals also cover the reproductive organs in bud. But of these the first has the fruits unarmed and in the second they have scattered spines up to only ca. 0.2 cm long (vs. always with scattered spines 0.5–1.8 cm in *S. herrerae*). In Costa Rica, the other species with sepals covering the reproductive organs in bud are *S. petenensis* and *S. terniflora*. The former species

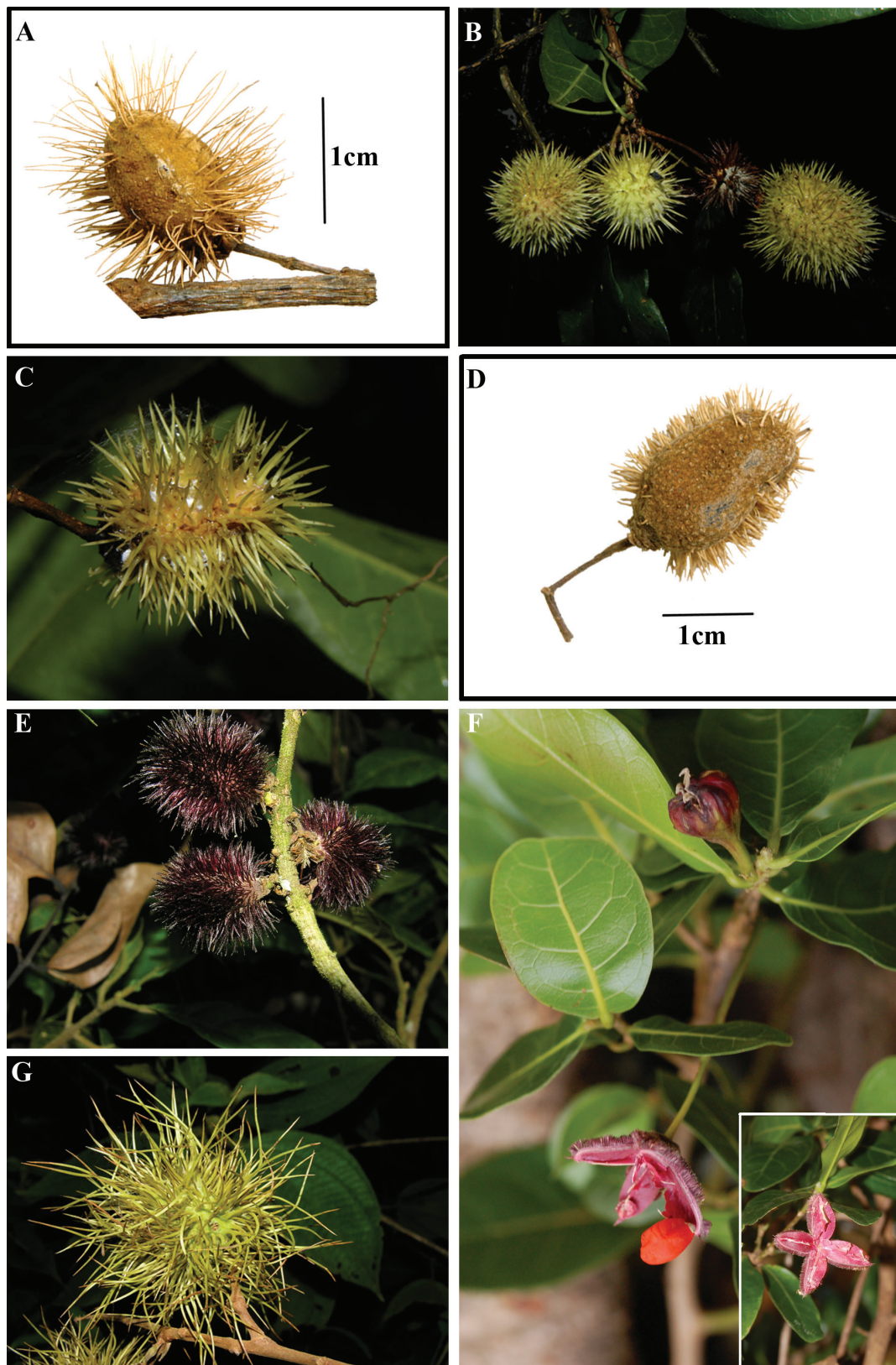


FIGURE 4. Species of *Sloanea* with monomorphic spines presents in the Osa Peninsula. **A**, *S. guianensis* (Aubl.) Benth.; **B**, *S. petenensis* Standl. & Steyer.; **C**, *S. picapica* Standl.; **D**, *S. obtusifolia* K. Schum.; **E**, *S. rugosa* Dam. A. Sm.; **F**, *S. terniflora* (Sessé & Moc. ex DC.) Standl.; **G**, *S. zuliaensis* Pittier. A based on Aguilar 1253 (CR); B based on Aguilar 6766 (CR); C based on Aguilar 13963; D based on Aguilar 281 (CR); E based on Aguilar 10222; F based on Hammel & Pérez 24752 (CR); G based on Quesada & Segura 809 (CR). Photos by R. Aguilar (B, C, E and G), J. Mata-Lorenzen (A and B), and B. Hammel (F).

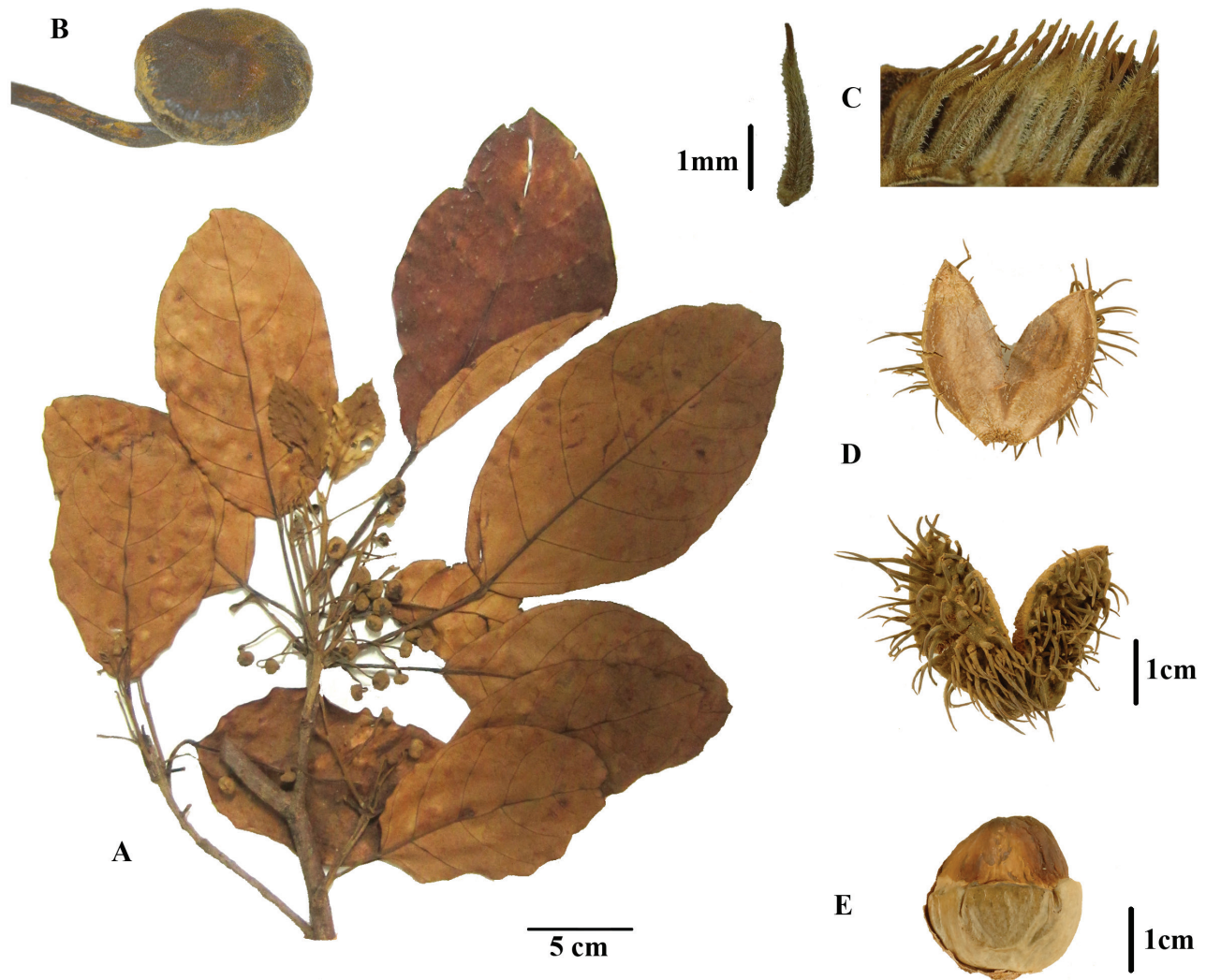


FIGURE 5. *Sloanea herrerae* Aguilar & D. Santam. **A**, branch with inflorescences; **B**, floral bud; **C**, stamens; **D**, fruit showing both surfaces; **E**, seed. A to C based on the holotype; D and E based on Hammel *et al.* 17612 (CR).

differs by its linear stipules (vs. deltate in *S. herrerae*), leaf apex long acuminate (vs. rounded, weakly retuse or short-acuminate), and flowers with glabrous or sparsely pubescent filaments (vs. densely pubescent). *Sloanea terniflora* differs by its leaves with shorter petioles (0.1–0.4 vs. 2.2–7 cm in *S. herrerae*), purple sepals and fruit (vs. pale green and

green, respectively), and fruits densely covered with easily detached spines (vs. not scattered and persistent spines).

In the Elaeocarpaceae treatment for the *Manual de Plantas de Costa Rica* (Smith, 2010), *S. herrerae* was treated as *Sloanea* “sp. D”. Zamora *et al.* (2004) used the name *S. marcescens*, though it was not validly.

LITERATURE CITED

- ATTA, 2015. Sistema de Información del Instituto Nacional de Biodiversidad (INBio), Biodiversidad de Costa Rica; <http://atta2.inbio.ac.cr> (accessed July 13, 2015).
- BOEIRA, A. S. P., A. VICENTINI, AND J. E. LAHOZ DA SILVA RIBEIRO. 2012. Three new species of *Sloanea* L. (Elaeocarpaceae) from the Central Amazon, Brazil. *Brazilian Journal of Botany* 35(1):119–123.
- LOZADA-PÉREZ, L. 2008. Especie nueva de *Sloanea* (Elaeocarpaceae) de Guerrero y Chiapas, México. *Revista Mexicana de Biodiversidad* 79: 303–306.
- LUNDELL, C. L. 1975. Studies of American Plants IX. *Wrightia* 5(5): 146–150.
- PALACIOS-DUQUE, L. 2004A. Una nueva especie de *Sloanea* (Elaeocarpaceae) del Chocó, Colombia. *Hickenia* 3(49): 201–204.
- . 2004b. Dos nuevas especies de *Sloanea* (Elaeocarpaceae) del Chocó, (Colombia). *Caldasia* 26(2): 429–432.
- . 2005. *Sloanea pacuritana* Pal.-Duque, *sp. nov.* (Elaeocarpaceae) del Chocó (Colombia). *Anales del Jardín Botánico de Madrid* 62(2): 191–193.

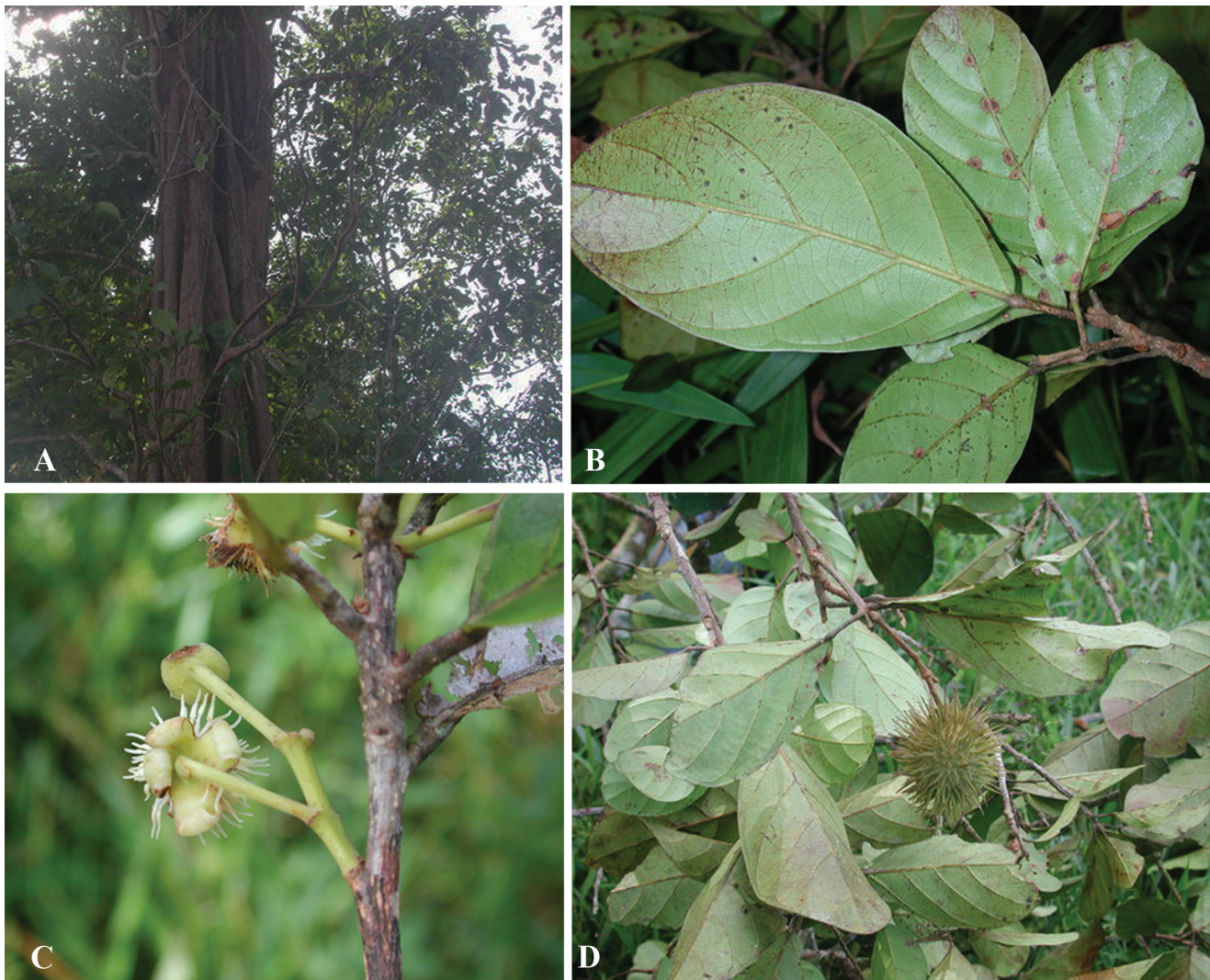


FIGURE 6. *Sloanea herrerae* Aguilar & D. Santam. **A**, trunk; **B**, leaves abaxial surface; **C**, inflorescences; **D**, fruit. Photos by Daniel Solano-Peralta; INBio-Atta.

- . 2007a. *Sloanea chocoana*, nueva especie de Elaeocarpaceae (subgen. *Sloanea*, sect. *Brevispicae*) para Colombia. *Darwiniana* 45(1): 83–87.
- . 2007b. *Sloanea esmeraldana* Pal.-Duque, *sp. nov.* (Elaeocarpaceae) del Chocó (Colombia). *Anales del Jardín Botánico de Madrid* 64 (1): 103–105.
- AND J. L. FERNÁNDEZ-ALONSO. 2005. Una nueva e interesante especie de *Sloanea* (Elaeocarpaceae) del Pacífico colombiano. *Revista de la Academia Colombiana de Ciencias Exactas, Físicas y Naturales* 29 (111): 179–182.
- AND J. L. FERNÁNDEZ-ALONSO. 2011. Dos nuevas especies colombianas de la sección *Brevispicae* del género *Sloanea* (Elaeocarpaceae). *Anales del Jardín Botánico de Madrid* 69(1): 91–95.
- AND C. M. BAEZA. 2014. Una nueva especie de *Sloanea* (Elaeocarpaceae) del alto Madidi en Bolivia. *Novon* 23(1): 70–74.
- SAMPAIO, D. AND V. C. SOUZA. 2010. New species of *Sloanea* (Elaeocarpaceae) from the Brazilian Cerrado. *Rodriguésia* 61(1): 13–15.
- AND ———. 2011. Three new species of *Sloanea* (Elaeocarpaceae). *Phytotaxa* 16: 45–51.
- SMITH, JR., C. E. 1954. The New World species of *Sloanea* (Elaeocarpaceae). *Contributions from the Gray Herbarium* 175: 1–114.
- SMITH, D. A. 1996. Three previously undescribed Central American species of *Sloanea* (Elaeocarpaceae). *Novon* 6: 120–127.
- . 2010. Elaeocarpaceae. Pages 222–236 in B. E. HAMMEL, M. H. GRAYUM, C. HERRERA AND N. ZAMORA EDS. *Manual de Plantas de Costa Rica*. Vol. V. *Monogr. Syst. Bot. Missouri Bot. Gard.* 119: 1–970.
- STEYERMARK, J. A. 1988. Flora of the Venezuelan Guayana VI. *Annals of the Missouri Botanical Garden*. St. Louis, Missouri. 75(4): 1565–1586.
- VÁSQUEZ-MARTÍNEZ, R. 2009. Sinopsis del género *Sloanea* L. (Elaeocarpaceae) en el Perú. *Arnaldoa* 16(2): 37–63.
- ZAMORA, N., Q. JIMÉNEZ MADRIGAL AND L. J. POVEDA ÁLVAREZ. 2004. *Árboles de Costa Rica*. 1 ed. Vol. 3. Santo Domingo de Heredia, Costa Rica. Instituto Nacional de Biodiversidad, INBio.