
Three New South American Species of *Randia* (Rubiaceae, Gardenieae)

Claes G. R. Gustafsson

Botanical Institute, Systematic Botany, Box 461, 405 30 Göteborg, Sweden.
claes.gustafsson@systbot.gu.se

ABSTRACT. Three new species of South American *Randia* (Rubiaceae, Gardenieae) are described and illustrated: *Randia wigginsii* Standley ex Gustafsson from montane tropical forests in Ecuador and northern Peru is mainly recognized by its tomentose to velutinous corolla tube and the lanate-velutinous pedicels and fruits. The possible features of being unarmed and having single male flowers are discussed. *Randia pubistyla* Gustafsson from lowland tropical dry forests in western Ecuador and Colombia is recognized by its puberulous style, the tomentose to puberulous fruits that usually are crowned by a calyx with reflexed lobes, and by the small thorns. *Randia longifolia* Gustafsson from lowland tropical humid forests in western Ecuador is mainly recognized by its relatively large, glabrous corolla, the linear calyx lobes, and by the reticulate finer vasculature on the abaxial surface of the leaves. The affinities for each species are discussed.

Randia is a neotropical genus of approximately 90 species ranging from ca. 30°N to 30°S. In South America and the Caribbean there are approximately 45 species. The genus is represented by shrubs, trees, and lianas in deciduous and evergreen vegetation from sea level to about 3300 m elevation. *Randia* can be recognized from other members of the Gardenieae by the following combination of characters: dioecious (female flowers with nonfunctional stamens, male flowers with a nonfunctional stigma and rudimentary ovary), pollen in permanent tetrads, a unilocular ovary with two parietal placentas, fruits with many discoid seeds embedded in a sweet pulp that turns dark when dry, thorns, and conspicuous short-shoots with clustered stipules and leaves. There are, however, exceptions. Monoecious and hermaphroditic species have been reported (Lorence & Dwyer, 1987; Burger & Taylor, 1993), pollen in dyads or monads have been reported (Burger & Taylor, 1993), some species are unarmed (Burger & Taylor, 1993; pers. obs.), and sometimes the short-shoots are less conspicuous (Burger & Taylor, 1993; pers. obs.). Within the ge-

nus there is also variation in the structure of the inflorescence. The inflorescences are usually terminal but sometimes axillary or cauliflorous (Burger & Taylor, 1993). Female flowers are usually solitary but sometimes in fascicles of 2 to 8 flowers (Burger & Taylor, 1993). The male flowers are usually in fascicles with a few to several flowers but sometimes form cymes with many flowers (Lorence & Nee, 1987; Lorence & Dwyer, 1987) and are sometimes solitary. This large variation makes it difficult to understand which genus has the closest affinities to *Randia*.

Robbrecht and Puff (1986) discussed that all genera in Gardenieae with pollen shed in permanent tetrads may represent a natural group. This gained support in a phylogenetic analysis by Persson (1996) but was contradicted by Andreasen and Bremer (1996, in press) and Persson (in press), who discussed that pollen in tetrads may have arisen several times in Gardenieae. In Persson's (1996) analysis *Casasia* gained support as sister to *Randia*, but the later mentioned analyses did not point out any strongly supported sister to *Randia*. Other neotropical genera that in these analyses (Andreasen & Bremer, 1996, in press; Persson, in press) grouped together with *Randia* and *Casasia* as possible relatives were *Rosenbergiodendron*, *Sphinctanthus*, and *Tocoyena*. *Sphinctanthus* and *Tocoyena* were not included in the analyses by Andreasen and Bremer (1996, in press). In this group the genus with the morphologically nearest affinities to *Randia* is *Casasia* by being dioecious and having pollen in tetrads. Lorence (1986) and Lorence and Dwyer (1987) discussed the morphological features in *Casasia* and *Randia* and also expressed doubt (Lorence & Dwyer, 1987) whether *Casasia* can be maintained as a valid genus. More phylogenetic studies in Gardenieae need to be done in order to find the monophyletic group to which *Randia* belongs.

The taxonomical work in *Randia* is complicated by the intraspecific variation in size and shape of leaves, calyx lobes, degree of pubescence, persistence of stipules and calyx, and number of thorns.

Extensive collecting in the Neotropics in the last 50 years has dramatically increased the number of herbarium specimens available, facilitating our understanding of the genus. Even so, several species are still unsatisfactorily collected with only a single or a few flowering specimens collected or none at all. During the course of a revisionary study of South American and Caribbean representatives of *Randia* (Gustafsson, in progress) collections representing a number of undescribed species have been encountered, three of which are described below.

Randia wigginsii Standley ex Gustafsson, sp. nov.

TYPE: Ecuador. Loja: along Río Juntas, about 14–15 km S of San Lucas, ca. 2000 m, 10 Oct. 1944, *I. L. Wiggins 1099* (holotype, F; isotype, NY). Figure 1.

Species insignis habitu arbore 4–10(–16) m alta, floribus solitariis pedicellatis, pedicellis et ovaris et calycum tubis lanato-velutinis, corollarum tubis 3–4 mm diam. tomentoso-velutinis, corollarum lobis ciliatis, fructibus 4–5 × 3–4 cm longis, velutinis, a congeneris distincta.

Trees 4–10(–16) m high, dioecious. Leaf branchlets velutinous when young, glabrous when old, unarmed. Stipules fused at base, on long shoots not seen, persistent on brachyblasts, broadly to narrowly triangular, 5–12 × 3–6 mm, acute at apex, outer surface minutely verruculose, glabrate, inner surface with hairs and colleters at base, margin ciliate to glabrous. Petioles 5–17 × 1–2 mm, velutinous. Leaf blades subcoriaceous, broadly elliptic to obovate, 8–13(–17) × 4–7(–8) cm, shortly acuminate at apex, cuneate to shortly attenuate at base, adaxial midrib and secondary nerves slightly to distinctly impressed, tertiary veins slightly impressed to plane, veinlets plane, abaxial midrib and secondary nerves prominent, tertiary veins slightly elevated to level, veinlets level, adaxial leaf surface puberulous on midrib, otherwise glabrous, abaxial leaf surface tomentose to velutinous all over or mainly on midrib and secondary veins, margins glabrous. Flowers unisexual. Male flowers solitary, pedicels 10–30 × 1–1.5 mm, lanate-velutinous. Calyx tube 1–2 mm long, lanate-velutinous externally, with a ring of hairs at base internally, lobes 5, narrowly triangular to narrowly elliptic, 9–14 × 1–2 mm, acute at apex, pilose externally, glabrous or with a few scattered hairs internally, margins membranaceous, ciliate. Corolla white, salverform; tube 15–18 × 3–4 mm medially, tomentose to velutinous externally, pilose in upper half internally, glabrous below; lobes 5, broadly elliptic to suborbicular, ca. 12–14 × 11–12 mm, obtuse at apex, glabrous externally, pilose toward base internally,

margins ciliate; anthers sessile, ca. 10 mm long, dorsifixed in lower third, attached distally in the widened part of the corolla tube, connective process minute or absent; style glabrous, nonfunctional stigma lobes ca. 4 mm long; ovary rudimentary. Female flowers not seen. Pedicels of fruit 10–25 × 1.5–3 mm, glabrate; fruits broadly ellipsoid to subspherical, 4–5 × 3–4 cm, surface with slightly elevated veins, densely velutinous when young, fruit wall ca. 1 mm thick, apex umbonate, persistent calyx lobes similar to those of male flowers in shape, size, and pubescence, seeds irregularly discoidal, 10–14 mm diam., imbedded in pulp.

Distribution and habitat. This new species is found in montane tropical forest from 1500 to 2250 m in Ecuador and northern Peru. The only two flowering collections examined (*Wiggins 10996*, *Espinosa 1919*) were collected in August and October.

Randia wigginsii is easily recognized by the solitary, pedicellate, male and female flowers; by the flowering pedicel, ovary, and calyx tube being lanate-velutinous; by the tomentose to velutinous corolla tube 3–4 mm in width; by the ciliate corolla lobes, and by the quite large velutinous fruit (4–5 × 3–4 cm). Useful vegetative characters are the petiolate, subcoriaceous leaves with glabrous adaxial sides (apart from the midrib) and slightly to distinctly impressed midrib and secondary veins. The abaxial sides are tomentose to velutinous (at least on vasculature) and have prominent midrib and secondary veins.

Randia wigginsii is here described as unarmed by assumption, as no thorns have been found on the studied material, and no mention of being armed is mentioned on the specimen labels. The only two male flowering specimens examined had solitary flowers, which is unusual in *Randia*. Further collecting will reveal if this is the true state for *R. wigginsii*. The closest relatives are probably found among a small group of undescribed montane species (Gustafsson, in prep.) with large fruits, pubescent leaves, and small pubescent flowers.

The name *Randia wigginsii* was written on the here designated holotype by Paul C. Standley but was never published by him.

Paratypes. ECUADOR. **Chimborazo:** canyon of Río Chanchán, ca. 5 km N of Huigra, 1500–2000 m, *Camp 3316* (MO, NY, S, US). **El Oro:** Guayquichuma, 03°49'S, 79°34'W, 1600 m, *Cornejo & Bonifaz 6022* (GB, GUAY); San Antonio, E of Zaruma, 2100–2200 m, *Espinosa E1919* (F, NY). **Loja:** 25 km Catamayo–Catocha, turnout at Las Chinchas 2.3 km toward Piñas, 03°57'21"S, 79°29'07"W, 2250 m, *Jørgensen et al. 1464* (GB); Cerro de Celica, 2.7 km on Celica–Guachanamá road, 04°05'46"S, 79°56'45"W, 2250 m, *Jørgensen et al. 96* (GB). PERU. **Piura:** Huancabamba, Canchaque, Cerro Chorro Blanco,

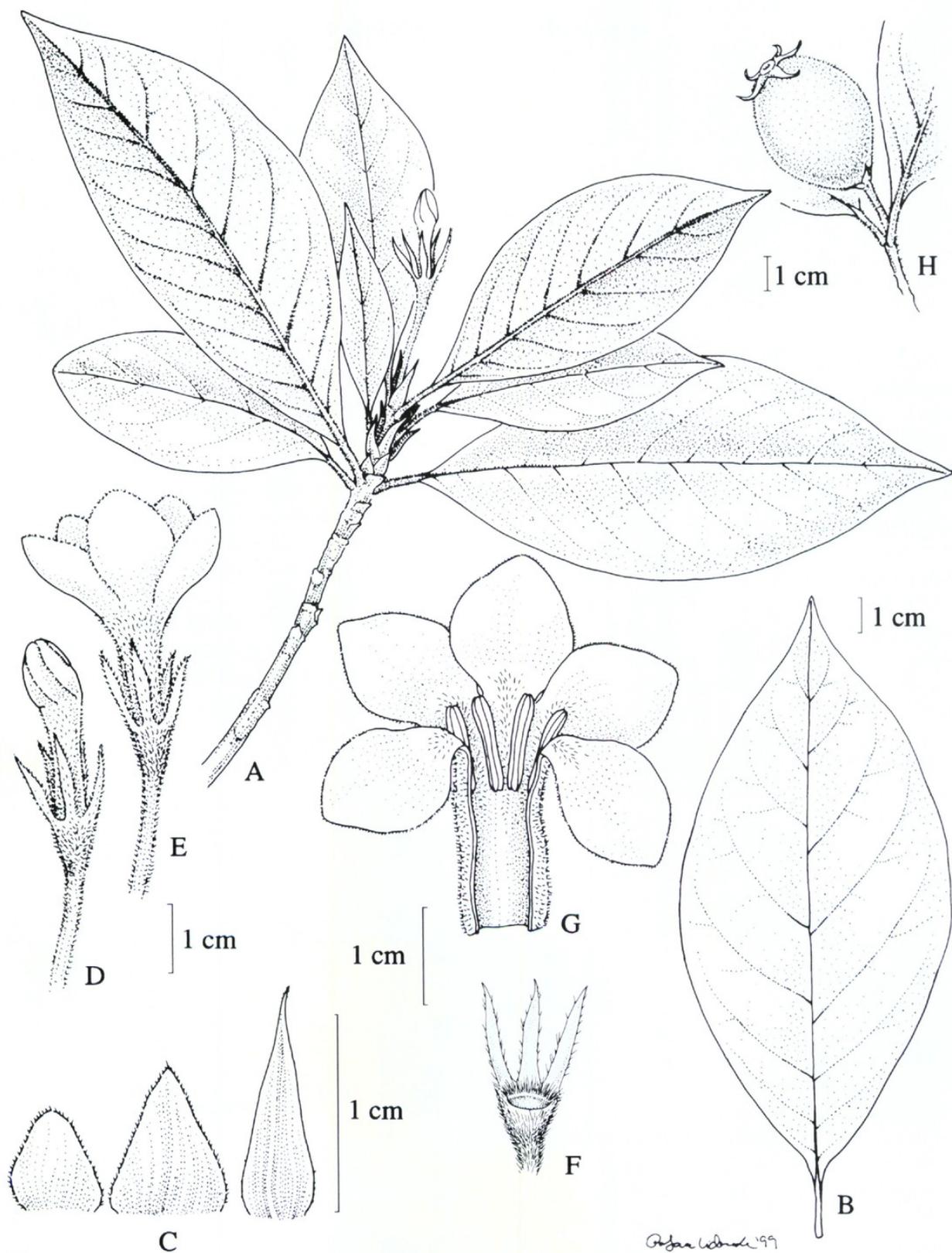


Figure 1. *Randia wigginsii* Standley ex Gustafsson. —A. Flowering branch, male specimen. —B. Adaxial side of leaf. —C. Stipules, small stipules (first and second from left) from short-shoot, large stipule from long-shoot. —D. Male flower bud. —E. Male flower in anthesis. —F. Calyx of male flower with two lobes removed. —G. Male corolla, opened. —H. Fruit. A, Wiggins 10996 (F); B, Diaz & Baldeón 2455 (GB); C–E, Wiggins 10996 (F); F, Espinosa 1919 (F); G, Wiggins 10996 (F); H, Diaz & Baldeón 2455 (GB).

1500–1900 m, *Diaz S. & Baldeón 2455* (GB), 1600 m, *Diaz S. et al. 2779* (GB).

Randia pubistyla Gustafsson, sp. nov. TYPE: Ecuador. Guayas: 15 km E of Guayaquil, Cerro Mirador de los Monos, 02°10'S, 79°58'W, 200 m, 26 Feb. 1992, *D. Rubio & W. Palacios 2439* (holotype, GB; isotypes, MO not seen, QCNE not seen). Figure 2.

Species *Randia hebecarpae* Benthaffinis, sed stylis puberulis, fructibus majoribus ad 2.5 × 2 cm diam., spinis parvis ad 0.5 cm longas, foliis majoribus 7–16 × 4.5–10 cm differt.

Shrubs to small trees to 6 m high, deciduous, dioecious. Leaf branchlets tomentose when young, later glabrate, thorns 1 or 2 at base of brachyblast, the thorns short, only to 5 mm, straight to slightly deflexed. Stipules fused at base, persistent on long shoots, narrowly to broadly triangular, 4–6 × 2–3 mm, aristate to mucronate at apex, outer surface tomentose, inner surface with hairs and colleters at base, stipules on brachyblasts persistent, broadly triangular to suboblong, 3–8 × 2–4 mm, obtuse to mucronate at apex, outer surface minutely verruculose, with many parallel veins, glabrous, inner surface with hairs and colleters at base, margin minutely ciliate. Petioles 2–8 × 0.5–1 mm, tomentose to puberulous. Leaf blades papery, broadly elliptic, 7–16 × 4.5–10 cm, shortly acuminate to acuminate, sometimes apiculate at apex, attenuate at base, all veins on adaxial side ± plane, abaxial midrib and secondary veins prominent, tertiary veins less prominent to plane, veinlets plane, reticulate, adaxial leaf surface glabrous or with scattered hairs on midrib, abaxial leaf surface tomentose to puberulous when young, glabrescent, the hairs on midrib and secondary veins more persistent, blade margins ± ciliate. Flowers unisexual. Male inflorescence in fascicles of 2 to 8 flowers, pedicels 4–8 × 0.3–0.5 mm, tomentose. Calyx tube to 0.5 mm long, pilose externally, glabrous internally, lobes 5, irregularly linear-oblong, 3–7 × 0.3–1.5 mm, acute to shortly acuminate at apex, glabrous or pilose toward base externally, glabrous internally, margin fimbriate to ciliate. Corolla white, salverform, tube 9–13 × ca. 1.0 mm medially, distally widened, pilose externally, pilose internally but glabrous toward base, lobes 5, oblong to broadly obovate, 5–9 × 4–7 mm, obtuse to rounded at apex, ± pilose externally, glabrous internally but basally pilose, margin glabrous; anthers sessile, 2–3 mm long, dorsifixed in lower third, attached distally in the widened part of the corolla tube, connective process absent; style puberulous, nonfunctional stigma lobes ca. 1 mm long; ovary

rudimentary. Female flowers not seen. Pedicels of fruit 5–8 × 1.0–2.0 mm, glabrate; fruits subspherical to ellipsoid, ca. 2–3 × 1.8–2.5 cm, tomentose when young, later becoming puberulous, yellow when mature, fruit wall ca. 0.5 mm thick, calyx reflexed and persistent; seeds irregularly discoidal, 5.0–9.0 mm diam, imbedded in pulp.

Distribution and habitat. *Randia pubistyla* is found in lowland tropical dry forests in western Colombia and western Ecuador. The only three flowering collections examined (*Brand 1082*, *Haught 4792*, *Rubio & Palacios 2439*) were collected in February (Ecuador) and April (Colombia).

Randia pubistyla is characterized by the puberulous style and the tomentose to puberulous fruit, which is often characteristically crowned by the almost free, reflexed calyx lobes. The small (only to 0.5 cm long) thorns on the branchlets, together with the usually reticulate venation of the broadly elliptic leaf blades, are useful vegetative characters. It is similar to *Randia hebecarpa* Benthaffinis, a species found in northeastern South America, in size and pubescence of the flowers and leaf shape, but that species has a smooth style, distinctly smaller fruit (to 1.5 cm diam.), larger thorns (0.5–1.6 cm long), and smaller leaves (3.0–6.5 × 1.2–2.7 cm).

Paratypes. COLOMBIA. **Antioquia:** La Playona, 15 km from Turbo, 10 Mar. 1958, *Bernal 10* (COL 2 sheets); Mun. de Arboletes, 5 km S of Arboletes on rd. to Turbo, 08°49'N, 76°27'W, 0–50 m, *Zarucchi et al. 4940* (F, K, MO, NY); Turbo, hills near Río Mulatas, 300 m, *Haught 4792* (COL, US); rd. Tapón del Darién, sector Río León-Lomas Aisladas, km 37, 0–50 m, *Brand 1212* (COL, MO), *Brand 1082* (COL, MO); Corrito. Currulao, new Antioquia rd. E-NE of Turbo, 11 km from Currulao, 0–50 m, *Callejas et al. 4966* (MO 2 sheets, NY). **Chocó:** Mun. de Ríosucio, vicinity of El Salto de Tilupo, corrito. Tilupo, *Romero-Castañeda 6246* (COL); Parque Natural Nacional, Los Kátios, Río Peye rd. to Tilupo, 0–100 m, *León 470* (COL); Los Kátios, Tilupo, 250–350 m, *León 492* (COL); ascent to El Alto de Limón, 250–300 m, *León 430* (COL, MO); Peye, rd. to El Alto del Limón, 50–200 m, *León & Forero P. 1795* (COL, MO). ECUADOR. **Esmeraldas:** ca. 7 km SW of Súa, 00°51'N, 78°58'W, 50 m, *Webster 22822* (MO); Cerro Mútiles, 00°54'S, 79°37'W, 200–300 m, *Cornejo & Bonifaz 5262* (GB, GUAY). **Manabí:** 5 km from Jama on rd. to Pedernales, 00°10'N, 80°14'W, 50 m, *Cornejo & Bonifaz 5836* (GUAY). **Guayas:** Bosque protector Parafso, 02°12'S, 79°57'W, 200 m, *Cornejo & Bonifaz 1364* (GB, GUAY), 150 m, *5598* (GB, GUAY); Cerro Azul, W of Guayaquil, *Asplund 15402* (S); Cerro Azul, 200 m, *Harling 4839* (S); Cerro Azul, 02°08'S, 79°59'W, 400–500 m, *Cornejo & Bonifaz 2926* (GB, GUAY); Cerro Azul, 10 km NW of Guayaquil on rd. to Salinas, 50–100 m, *Dodson & Thien 527* (MO); Cerro Azul, Cordillera Chongón-Colonche, behind Cemento Nacional, 12 km W of Guayaquil, Canyon of Canoa, 02°15'S, 80°00'W, *Gentry & Josse 72348* (GB); Chongón, Hacienda Cerro Azul, 300–500 m, *Harling et al. 9509* (GB); Cantón Guayaquil, Bosque Protector Cerro Blanco, 15 km on rd. to Salinas, 02°10'S, 79°58'W, 350

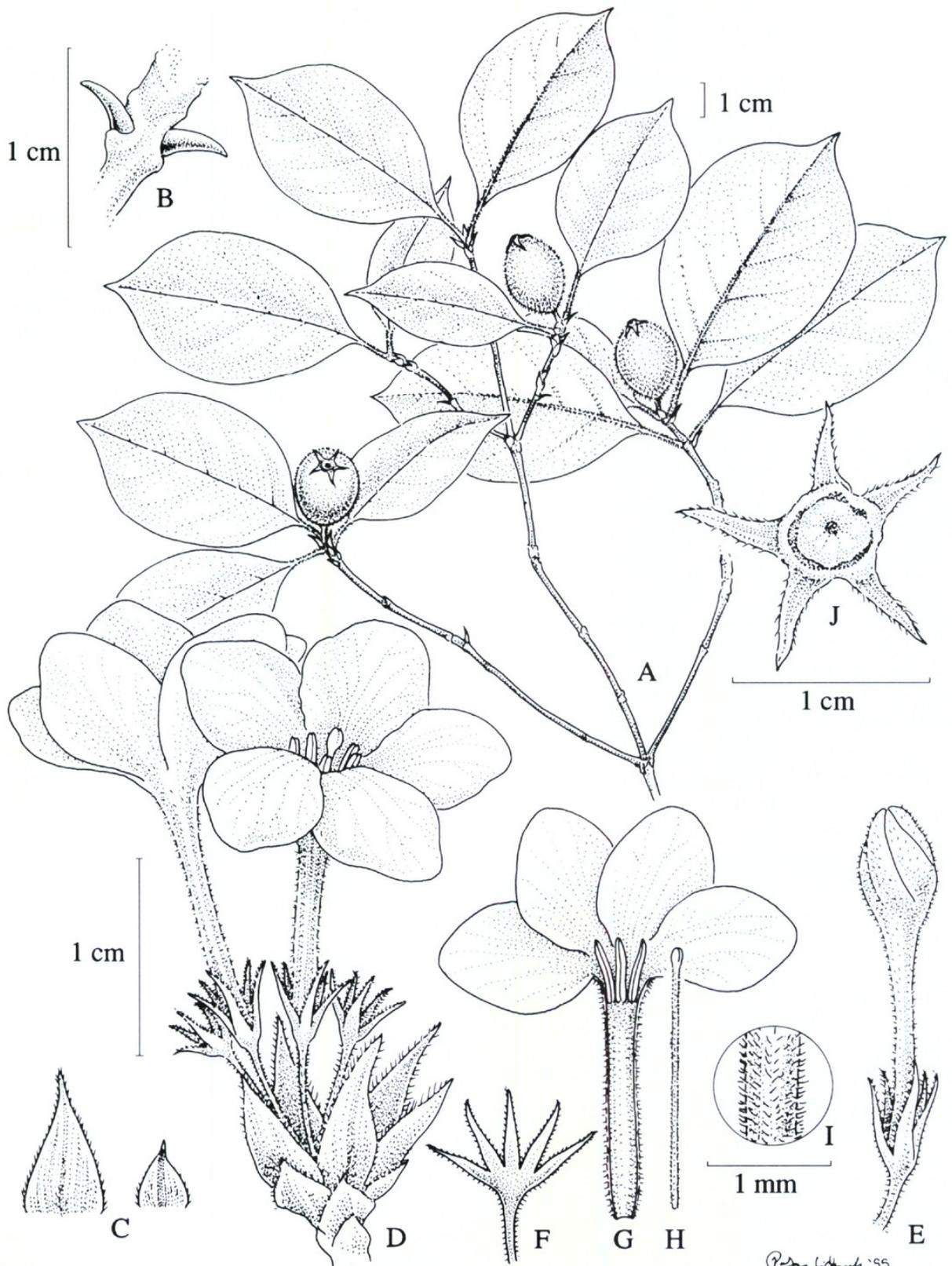


Figure 2. *Randia pubistyla* Gustafsson. —A. Fruiting branch, female specimen. —B. Thorns. —C. Stipules from short-shoot. —D. Short-shoot with male inflorescence. —E. Male flower bud. —F. Calyx of male flower, opened. —G. Male corolla, opened. —H. Style. —I. Detail of style. —J. Detail of persistent calyx on fruit. A–B, Harling 4822 (S); C–D, Rubio & Palacios 2439 (GB); E–I, Haught 4792 (COL); J, Cornejo & Bonifaz 5598 (GB).

m, *Rubio et al.* 1770 (GB, GUAY), 1810 (GB, GUAY), 300 m, *Rubio et al.* 1993 (MO, GUAY), 02°10'S, 79°50'W, 100 m, *Tipaz et al.* 839 (GB, GUAY); 13 km on rd. to Salinas, 02°10'S, 79°58'W, 350 m, *Rubio & Tipaz* 2383 (GB); along Sendero Buenavista above visitor center, 02°10'S, 79°58'W, 250 m, *Neill & Núñez* 10512 (GB), 02°10'S, 80°10'W, 300–400 m, *Neill & Núñez* 10662 (GUAY); Reserva Ecología Churute, Cerro Cimalón, 02°25'S, 79°38'W, 50–100 m, *Cornejo & Bonifaz* 5126 (GB, GUAY); Río Daule below Pichincha, Hacienda Santa Barbarita, *Harling* 4822 (S).

Randia longifolia Gustafsson, sp. nov. TYPE: Ecuador. Los Ríos: Hacienda Clementina, 200 m, 27 Jan. 1947, *G. Harling* 186 (holotype, S). Figure 3.

Species *Randiae carlosianae* K. Krause affinis, sed corollis majoribus, corollarum tubis 30–40 mm longis, corollarum lobis 20–25 mm longis, calycis lobis anguste triangularibus ad linearibus 1.0–2.0 mm latis, venis parallelis numeris differt.

Shrubs to small trees to 6 m high, dioecious. Leaf branchlets puberulent when young, hairs \pm erect, unarmed. Stipules fused at base, persistent on long shoots, narrowly triangular, 12–15 \times 2–4 mm, acuminate to acute at apex, with many parallel veins, glabrous externally, with hairs and colleters at base internally, margin ciliate, stipules persistent on brachyblasts, broadly triangular to narrowly triangular, ca. 2–10 \times 2–4 mm, acute to mucronate at apex, with many parallel veins, verruculose, glabrous externally, with hairs and colleters at base internally, margin ciliate. Petioles 3–6 \times 0.8–1.2 mm, puberulent. Leaf blades papery, obovate, (11–)13–21 \times 4–8(–9) cm, shortly acuminate at apex, shortly attenuate at base, adaxial midrib impressed at base, otherwise all veins \pm plane, abaxial midrib and secondary veins prominent, smaller veins less prominent, reticulation evident, adaxial leaf surface glabrous, minutely tuberculate, abaxial leaf surface puberulous on midrib, secondary and tertiary veins, margin \pm ciliate. Flowers unisexual. Male inflorescence in fascicles of 2 to 6 flowers, pedicels 5–10 \times ca. 1 mm, puberulent. Calyx tube to 0.5 mm long, glabrate externally, glabrate with a few basal hairs internally, lobes 5, narrowly triangular to linear, 10–15 \times 1–2 mm, acute at apex, with parallel venation, glabrous to puberulent throughout, margins \pm ciliate; corolla white, salverform, tube 30–40 \times 2.0–4.0 mm medially, distal part widened, glabrous externally, puberulent in upper part, glabrous below internally, lobes 5, ovate to broadly elliptic, ca. 20–25 \times 10 mm, subacute at apex, glabrous or with a few small hairs externally, glabrous or with a few basal hairs internally, margin glabrous; anthers sessile, ca. 6.0 mm long, dorsifixed in lower third, attached distally in the widened

part of the corolla tube, connective process absent; style glabrous, nonfunctional stigma lobes ca. 5.0 mm long; ovary rudimentary. Female flowers not seen. Pedicels of fruit 2.0–10 mm \times ca. 2.0 mm. Fruits ellipsoid, 3–4 \times 2.5–3 cm, puberulous when young, glabrescent, yellow when mature, fruit wall ca. 1 mm thick, persistent calyx erect; seeds irregularly discoidal, 7–10 mm diam., imbedded in pulp.

Distribution and ecology. This species is known only from the rapidly diminishing lowland tropical humid forests in western Ecuador. The two sole flowering specimens examined (*Harling* 186, *Cornejo & Bonifaz* 880, unicates) were collected in late November and January.

Randia longifolia is recognized by the relatively large, glabrous corolla and by the long, almost free, characteristically linear calyx lobes with parallel venation. The fruits are usually crowned by a persistent erect calyx. On the abaxial surface of the leaves, finer vasculature makes the reticulation evident.

Randia longifolia might be confused with *R. carlosiana* K. Krause, another species occurring in the same area, by the similar fruits and large leaves, but that species differs by being armed, by having smaller corollas with tubes 20–26 mm long and lobes 10–14 mm long, and by usually having foliaceous, obovate calyx lobes (broader than 2 mm) with usually reticulate venation.

Randia longifolia is here described as unarmed by assumption, as no thorns have been found on the studied material and no mention of being armed is mentioned on the specimen labels.

Paratypes. ECUADOR. **Esmeraldas:** Cerro Mutiles, 00°54'N, 79°37'W, 250 m, *Cornejo & Bonifaz* 5185 (GB, GUAY). **Manabí:** Vuelta larga, 00°45'S, 80°50'W, 200 m, *Bonifaz* 837 (GB, GUAY); rd. Portoviejo–Pichincha, 3 km E of San Plácido, 150–200 m, *Harling & Andersson* 24888 (GB). **Los Ríos:** Hacienda Clementina, 200 m, *Fagerlind & Wibom* 2650 (S); Hacienda Clementina, Cerro Samama, above Río Mombe, ca. 38 km NE of Babahoyo, 01°39'S, 79°22'W, 200–400 m, *Ståhl & Knudsen* 1182 (GB); Jauneche, 70 km on rd. Quevedo–Palenque via Mocachi, Cantón Vinces, 100 m, *Dodson et al.* 7993 (MO), *Dodson & Gentry* 9883 (MO, US); Jauneche, rd. Mocachi–Palenque, 15 km E on rd. Empalme–Balzar, 50–100 m, *Dodson et al.* 14461 (MO, NY); near Pichilingue, 50–100 m, *Játiva & Epling* 307 (NY, S). **Guayas:** Río Ayampe, Cerro El Burro, 01°41'S, 80°40'W, *Cornejo & Bonifaz* 880 (GUAY); Bosque Protector Cerro Blanco, 02°10'S, 79°58'W, 400 m, *Cornejo & Bonifaz* 1783 (GB, GUAY). **El Oro:** between Piedras and Moromoro, 300 m, *Escobar* 746 (MO).

Acknowledgments. I am grateful to the curators of the following herbaria for making their collections available for study: COL, F, GB, GUAY, K,

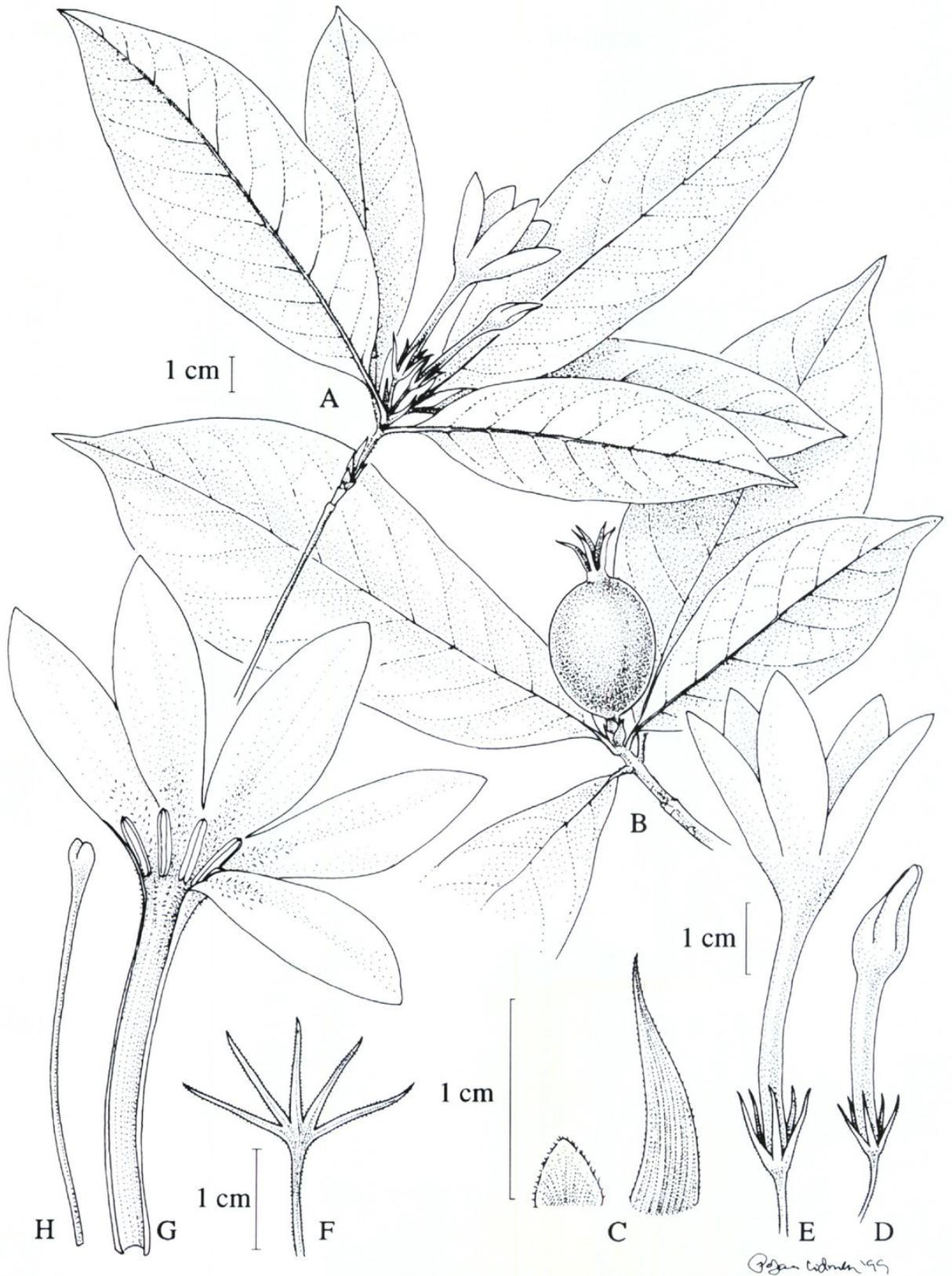


Figure 3. *Randia longifolia* Gustafsson. —A. Flowering branch, male specimen. —B. Fruiting branch, female specimen. —C. Stipules, small stipule (left) from base of short-shoot, large stipule (right) from long-shoot. —D. Male flower bud. —E. Male flower. —F. Calyx of male flower, opened. —G. Male corolla, opened. —H. Style. A, Harling 186 (S); B, Bonifaz 837 (GB); C–H, Harling 186 (S).

MO, NY, S, US. Special thanks are due to the curators of GUAY, MO, and QCNE who sent several collections as gifts. I thank Pollyanna Lidmark for preparing the excellent illustrations and Lennart Andersson for providing useful comments on the manuscript.

Literature Cited

- Andreasen, K. & B. Bremer. 1996. Phylogeny of the subfamily Ixoroideae (Rubiaceae). *Opera Bot. Belg.* 7: 119–138.
- & ———. In press. Combined phylogenetic analysis in the Rubiaceae–Ixoroideae: Morphology, nuclear, and chloroplast DNA data. *Amer. J. Bot.*
- Burger, W. & C. M. Taylor. 1993. Rubiaceae. *In*: W. Burger (editor), *Flora Costaricensis*. *Fieldiana Bot.*, n.s. 33: 1–133. [*Randia*, pp. 279–289.]
- Lorence, D. H. 1986. *Glossostipula* (Rubiaceae), a new genus from Mexico and Guatemala. *Candollea* 41: 453–461.
- & J. D. Dwyer. 1987. New taxa and a new name in Mexican and Central American *Randia* (Rubiaceae, Gardenieae). *Bol. Soc. Bot. México* 47: 37–48.
- & M. Nee. 1987. *Randia retroflexa* (Rubiaceae), a new species from southern Mexico. *Brittonia* 39: 371–375.
- Persson, C. 1996. Phylogeny of Gardenieae (Rubiaceae). *Bot. J. Linn. Soc.* 121: 91–109.
- . In press. Phylogeny of Gardenieae (Rubiaceae) based on chloroplast DNA sequences from the *rps* 16 intron and *trnL*(UAA)–F (GAA) intergenic spacer. *Nordic J. Bot.*
- Robbrecht, E. & C. Puff. 1986. A survey of the Gardenieae and related tribes (Rubiaceae). *Bot. Jahrb. Syst.* 108: 63–137.



Gustafsson, Claes G. R. 2000. "Three new South American species of *Randia* (Rubiaceae, Gardenieae)." *Novon a journal of botanical nomenclature from the Missouri Botanical Garden* 10, 201–208.

View This Item Online: <https://www.biodiversitylibrary.org/item/14670>

Permalink: <https://www.biodiversitylibrary.org/partpdf/38221>

Holding Institution

Missouri Botanical Garden, Peter H. Raven Library

Sponsored by

Missouri Botanical Garden

Copyright & Reuse

Copyright Status: In copyright. Digitized with the permission of the rights holder.

License: <http://creativecommons.org/licenses/by-nc-sa/3.0/>

Rights: <https://biodiversitylibrary.org/permissions>

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.