

Six New Species of *Hiraea* (Malpighiaceae) from South America: *H. andersonii*, *H. brevistipulata*, *H. holmgreniorum*, *H. kariniana*, *H. singularis*, and *H. woytkowskii*

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ANDERSON, CHRISTIANE (University of Michigan Herbarium, 3600 Varsity Drive, Ann Arbor, MI 48108-2228, U.S.A.; e-mail: chra@umich.edu). Six new species of *Hiraea* (Malpighiaceae) from South America: *H. andersonii*, *H. brevistipulata*, *H. holmgreniorum*, *H. kariniana*, *H. singularis*, and *H. woytkowskii*. Mem. New York Bot. Garden **108**: 205–221. 2013. Six new species of *Hiraea* (Malpighiaceae) from South America are described and illustrated. *Hiraea andersonii* (Peru), *H. holmgreniorum* (Brazil), *H. kariniana* (Ecuador), *H. singularis* (Venezuela), and *H. woytkowskii* (Peru) belong to the group of species characterized by 4(–6)-flowered umbels, borne singly or in secondary inflorescences; *H. brevistipulata* (Peru) bears multiradiate umbels.

Key Words: *Hiraea*, Malpighiaceae, Brazil, Ecuador, Peru, Venezuela

Hiraea Jacq. (Malpighiaceae) comprises ca. 60 species occurring from southern Mexico to Argentina. The woody vines or sometimes small shrubs have short-petioled leaves with mostly obovate or elliptical laminas. Stipules borne on the petiole, umbellate axillary inflorescences of bilaterally symmetrical flowers, and butterfly-shaped samaras characterize the genus. Recent molecular studies (Davis & Anderson, 2010) place *Hiraea* in a clade with *Adelphia* W. R. Anderson, *Excentradenia* W. R. Anderson, *Lophopterys* Adr. Juss., and *Psychopterys* W. R. Anderson & S. Corso. Since Niedenzu's account of *Hiraea* for *Das Pflanzenreich* (1928), additional species have been described as more collections from Latin America became available. Six new species are added here.

For the most part, the species of *Hiraea* fall into two categories in inflorescence structure: 4(–6)-flowered umbels, borne singly or in secondary inflorescences, and multiflowered umbels borne on a single peduncle. Five species described here belong in the first group. *Hiraea woytkowskii* has 4-flowered umbels arranged in axillary ternate cymes. *Hiraea holmgreniorum* bears showy clusters of (3–)5–25 umbels per leaf axil; each umbel represents a sessile or subsessile ternate cyme with the lateral axes suppressed and only the subtending reduced leaves retained. The 4-flowered umbels of *H. kariniana* are displayed in compound thyrsoid inflorescences. In *H. andersonii*

single pedunculate umbels are stacked in a vertical array of as many as five per leaf axil, and in *H. singularis* one or two 4-flowered umbels are essentially sessile within the leaf axil. The sixth species, *H. brevistipulata*, has 20–25-flowered umbels arising singly from the leaf axils.

Within an umbel the flowers are borne on a sessile pedicel subtended by a pair of bracteoles and one bract; the floriferous peduncle is absent, as also in some other genera, e.g., *Peixotoa* Adr. Juss. (Anderson, 1982), and *Pterandra* (Anderson, 1997). The lateral sepals are generally biglandular and the anterior sepal eglandular, but this pattern may vary, even within a population, from all biglandular to all eglandular. The clawed petals are yellow or sometimes streaked with red, and the posterior petal, the “flag,” commonly differs from the lateral ones. The ten stamens are similar in shape but differ in length of filaments and size of anthers. Three free styles with the stigma placed terminally at the adaxial angle (an “internal” stigma) arise from a hirsute tricarpellate ovary. The fruit is a schizocarp of three samaras, each with two large lateral wings and a greatly reduced dorsal wing. Similar fruits are found in numerous other genera of Malpighiaceae, and many such species were first described in *Hiraea*.

Hiraea andersonii C. E. Anderson, **sp. nov.** Type: Peru. Loreto: Mishuyacu, near Iquitos, 100 m, Dec 1929 (fl), *G. Klug* 737 (holotype: US; isotypes: F, NY). (Fig. 1)

Liana vel frutex. Lamina foliorum majorum 5–16.5 cm longa, 2.3–8.2 cm lata, elliptica vel anguste obovata, nitida, adaxaliter et abaxaliter glabra vel sparsim sericea, margine eglanduloso, glandulis basalibus 0.5–1.5 longis; petiolus 4.5–12 mm longus, dense sericeus; stipulae 0.8–1.5 mm longae, infra apicem petioli portatae. Flores in umbellis 4-floris pedunculatis portati; pedunculus 1.5–5 mm longus, bibracteolatus; (1–)3–5 umbellae e axillis ortae. Sepala eglandulosa vel biglandulosa. Petala limbo fimbriato, eglanduloso. Samara alis lateralibus 2–2.2 cm latis, 2.2–3 cm altis, ala dorsali 4.6–5 mm lata, 3.5–4 mm alta.

Woody vine or shrub to 3 m; stems sericeous when young but soon glabrate to glabrous. *Leaves* opposite; laminae of the larger leaves 5–16.5 × 2.3–8.2 cm, elliptical or narrowly obovate, shiny, apex acute to rounded and mucronate or apiculate, base acute, adaxially glabrous or with some thinly scattered hairs, abaxially glabrous or with some thinly scattered hairs especially on the costa, the hairs sessile and appressed, 0.1–0.3 mm long; margin eglandular; costa prominent abaxially, secondary (and tertiary) veins prominulous abaxially; a pair of glands borne abaxially at the base or partly on the petiole, each gland 0.5–1.5 mm long; petioles 4.5–12 mm long, 1–1.2 mm wide, densely sericeous but glabrescent with age; stipules 0.8–1.5 mm long, inserted at or near apex of petiole. *Inflorescence* a 4-flowered umbel borne on a bibracteolate peduncle 1.5–5 mm long, sometimes solitary, commonly the umbels inserted in a vertical array of as many as five per leaf axil; umbel without a gland in the center;

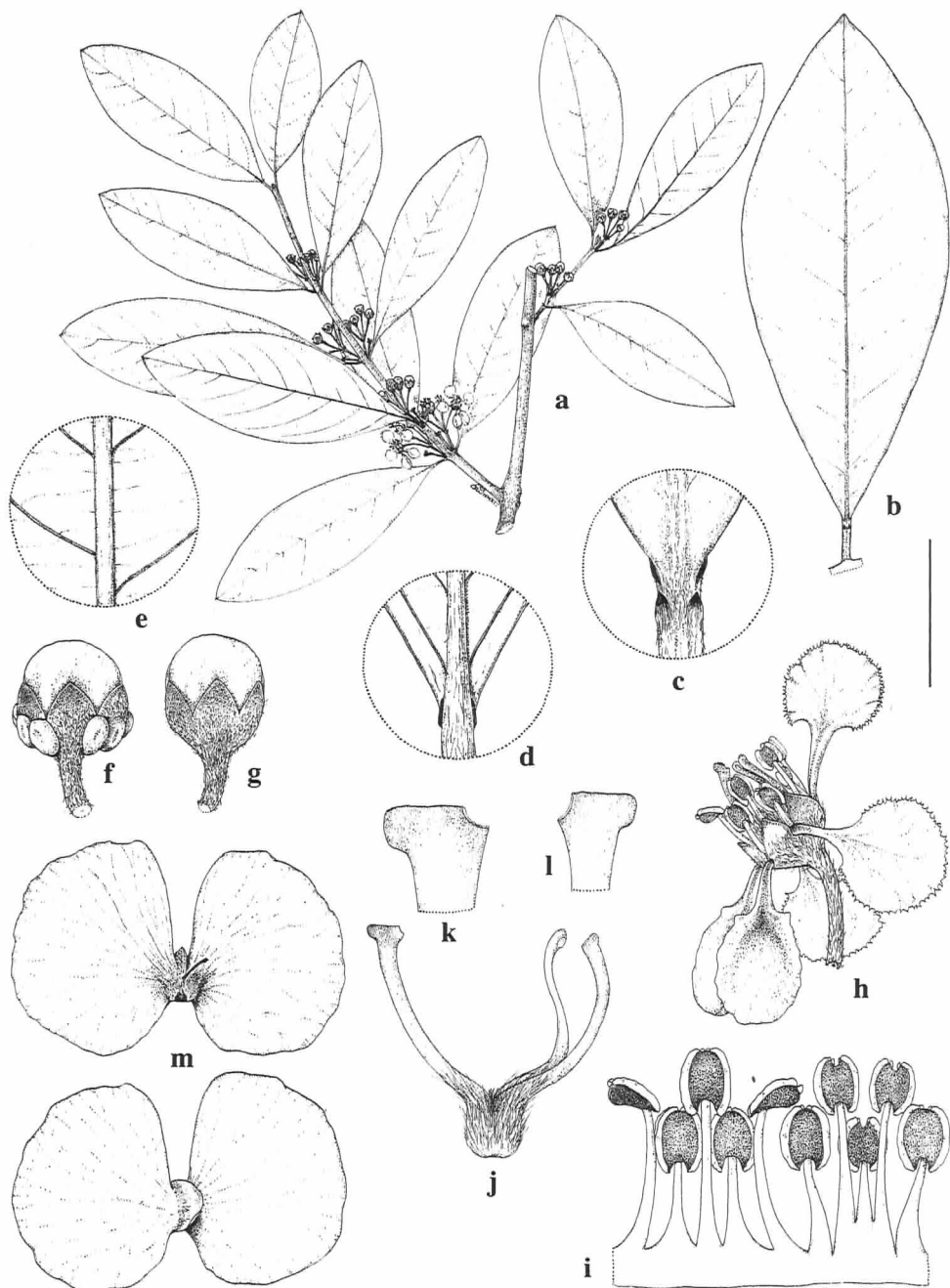


Fig. 1. *Hiraea andersonii*. **a.** Flowering branch. **b.** Large leaf, adaxial view. **c.** Distal portion of petiole and base of lamina, adaxial view. **d.** Distal portion of petiole and base of lamina, abaxial view. **e.** Midrib and adjacent veins, mid-lamina, abaxial view. **f.** Flower bud with most sepals biglandular. **g.** Flower bud with all sepals eglandular. **h.** Flower, lateral view, posterior petal uppermost. **i.** Androecium laid out, abaxial view, the stamen third from right opposite posterior petal. **j.** Gynoecium, anterior style at left. **k.** Terminal portion of anterior style. **l.** Terminal portion of posterior style. **m.** Samaras, adaxial view (above) and abaxial view (below). Scale bar: a, b, 4 cm; c, d, 5 mm; e, 8 mm; f, g, 4 mm; h, 5.7 mm; i, j, 2.7 mm; k, l, 1 mm; m, 2 cm. (Based on: a, c–e, g–l, *Klug 737*, US; b, *Gentry & Jaramillo 22301*, MICH; f, *Rimachi Y. 8435*, MO; m, *Rimachi Y. 4811*, MO.)

bracts 0.5–1.1 mm long, 0.4–0.6 mm wide, bracteoles like bracts or slightly shorter and/or narrower; pedicels 7.5–13 mm long, ca. 0.3 mm wide; peduncle, pedicels, and abaxial surface of bracts and bracteoles densely sericeous. *Sepals* 1.6–1.7 mm long and wide, triangular, adaxially glabrous, abaxially sericeous, all eglandular or all biglandular, or the lateral sepals biglandular and the anterior sepal eglandular or uniglandular, each gland 1.8–2 mm long, prominent. *Petals* yellow, glabrous, the limb orbicular, margin with fimbriae to 0.3 mm long; lateral petals with the claw 1.5–2.2 mm long, limb ca. 5 mm long and wide; posterior petal with the claw 1.7–2.3 mm long and slightly thicker than that of lateral petals, limb ca. 4 mm long and wide. *Stamens* glabrous, filaments basally connate; stamen opposite anterior sepal: filament 3–3.3 mm long, anther 1.1–1.2 mm long; stamens opposite anterior-lateral petals: filaments 2–2.3 mm long, anthers 1–1.2 mm long; stamens opposite anterior-lateral sepals: filaments 2.5–3 mm long, anthers ca. 1 mm long; stamens opposite posterior-lateral petals: filaments 1.5–2 mm long, anthers 1–1.1 mm long; stamens opposite posterior-lateral sepals: filaments 2.6–3 mm long, anthers ca. 1 mm long; stamen opposite posterior petal: filament 1.5–1.8 mm long, anther 0.8–1 mm long. *Styles* incurved, the apex extended into a rounded spur 0.05–0.1 mm long; anterior style 3.5–3.7 mm long, 0.3–0.4 mm wide, with scattered hairs in the proximal $\frac{1}{4}$ – $\frac{1}{2}$; posterior styles 3.3–3.8 mm long, 0.2–0.3 mm wide, with scattered hairs in the proximal $\frac{1}{4}$ or glabrous; ovary 1–1.2 mm long, hirsute. *Samara* butterfly-shaped, the wings sparsely sericeous; lateral wings 2–2.2 cm wide, 2.2–3 cm high, semicircular, margin erose; dorsal wing 4.6–5 mm wide, 3.5–4 mm high, subentire or with 1–2 coarse teeth; nut 3–3.5 mm in diameter, subspherical, sericeous, areole ca. 1.5 mm in diameter; mature seed not seen.

Etymology: *Hiraea andersonii* is named in honor of William R. Anderson (b. 1942), expert authority on Malpighiaceae, who first noted as undescribed the six species here published.

Phenology: Collected in flower in November, December, February, and May, and in fruit in February and May.

Distribution: Peru (Loreto, Prov. Maynas); on white sand substrates in forest and uplands; 130–200 m.

Additional specimens examined: PERU. Loreto: Prov. Maynas, 1979, *Ayala 1818* (MICH); Prov. Maynas, just past Quistococha, ca. 200 m, 27 May 1978, *Gentry & Jaramillo 22301* (MICH, MO); Prov. Maynas, vicinity of Mishana, between Río Nanay and Río Itaya, ca. 130 m, 29 Nov 1977, *Gentry et al. 20956* (MICH, MO); Prov. Maynas, Dtto. Iquitos, Río Nanay below Bellavista, carretera de Picuruyacu, 200 m, 2 Jul 1974, *MacDaniel & Rimachi Y. 18912* (MO); Prov. Maynas, Dtto. Iquitos, Río Nanay, carretera de Picuruyacu below Bellavista, ca. 160 m, 29 Feb 1980, *Rimachi Y. 4811* (BR, MO, NY, US); Prov. Maynas, Dtto. Iquitos, Río Nanay, carretera de Picuruyacu, ca. 140–160 m, 30 May 1980, *Rimachi Y. 4811* (MO, US); Prov. Maynas, Dtto. Iquitos, carretera Iquitos-Nauta, Km 1.5, ca. 130–150 m, 24 Nov 1987, *Rimachi Y. 8435*

(MO, NY); Prov. Maynas, Mishana (Río Nanay), 03°55'S, 73°35'W, 150m, 20 Jan 1985, *Vásquez & Jaramillo 6119* (MICH, MO).

Hiraea andersonii, an Amazonian species collected on white sand substrates, is readily recognized by the inflorescence pattern, single 4-flowered umbels on a bi-bracteolate peduncle set in a vertical array of as many as five per leaf axil. The shiny laminae bear a pair of glands at the base abaxially (or partly on the petiole) but lack marginal glands. The notably small stipules are inserted at or near the apex of the petiole. The presence of calyx glands is variable: all sepals biglandular or all eglandular, or the lateral sepals biglandular and the anterior sepal eglandular, uniglandular, or biglandular.

Hiraea brevistipulata C. E. Anderson, **sp. nov.** Type: Peru. Amazonas: Condorcanqui Prov., Dtto. El Cenepa, Comunidad de Mamayaque, Cerro Sakee-gaig, bosque primario, 04°34'58"S, 78°14'01"W, 1010m, 14 Feb 1997 (fl), *R. Vásquez et al. 22543* (holotype: MICH). (Fig. 2)

Liana. Folia ternata; lamina foliorum majorum 11–14.5 cm longa, 4.5–5.7 cm lata, anguste elliptica, adaxaliter et abaxaliter glabra, margine glandulis parvis instructo; petiolus 1.5–2 mm longus, distaliter biglandulosus; stipulae 0.7–0.8 mm longae, basi petioli portatae. Umbella axillaris 20–25-flora; pedunculus 2.3–2.5 cm longus; pedicellus 7–8.5 mm longus. Sepala eglandulosa. Petala limbo basi brevisagittato; petala lateralia limbo eroso, eglanduloso; petalum posticum limbo glanduloso-fimbriato.

Woody vine; stems glabrous. *Leaves* ternate; laminae of the larger leaves 11–14.5 × 4.5–5.7 cm, narrowly elliptical, shiny, apex apiculate, base acute, adaxially and abaxially glabrous or with scattered hairs on the costa, the hairs appressed and sessile or subsessile, 0.5–0.8 mm long; margin with scattered glands ca. 0.2 mm in diameter; costa and secondary veins prominent abaxially, tertiary veins nearly parallel, ca. 1–2 mm apart; petioles 1.5–2 cm long, ca. 1 mm wide, sericeous but glabrescent with age, with a pair of glands ca. 2–5 mm below the laminar base, each gland 0.5–1 mm long; stipules 0.7–0.8 mm long, inserted on the basal 1/5–1/4 of the petiole. *Inflorescence* an axillary 20(–25)-flowered umbel borne on a bibracteolate peduncle 2.3–2.5 cm long; bracts 0.7–0.8 mm long, ca. 0.5 mm wide, bracteoles like bracts or slightly shorter and/or narrower; pedicel 7–8.5 mm long, 0.8–1 mm wide; peduncle, pedicels, and abaxial surface of bracts and bracteoles densely sericeous. *Sepals* ca. 1.5 mm long, ca. 1 mm wide, triangular, adaxially glabrous, abaxially densely sericeous, all eglandular. *Petals* yellow, glabrous; lateral petals with the claw ca. 1.5 mm long, limb ca. 5.5 mm long and wide, orbicular, base briefly sagittate, margin shallowly erose; posterior petal with the claw ca. 2.2 mm long and thicker than that of lateral petals, limb ca. 4 mm long, ca. 3 mm wide, elliptical, base briefly sagittate, margin glandular-fimbriate, fimbriae to 0.5 mm long. *Stamens* glabrous, filaments basally connate; stamens opposite anterior sepal: filament ca. 2.8 mm long, anther ca. 1.4 mm long; stamens

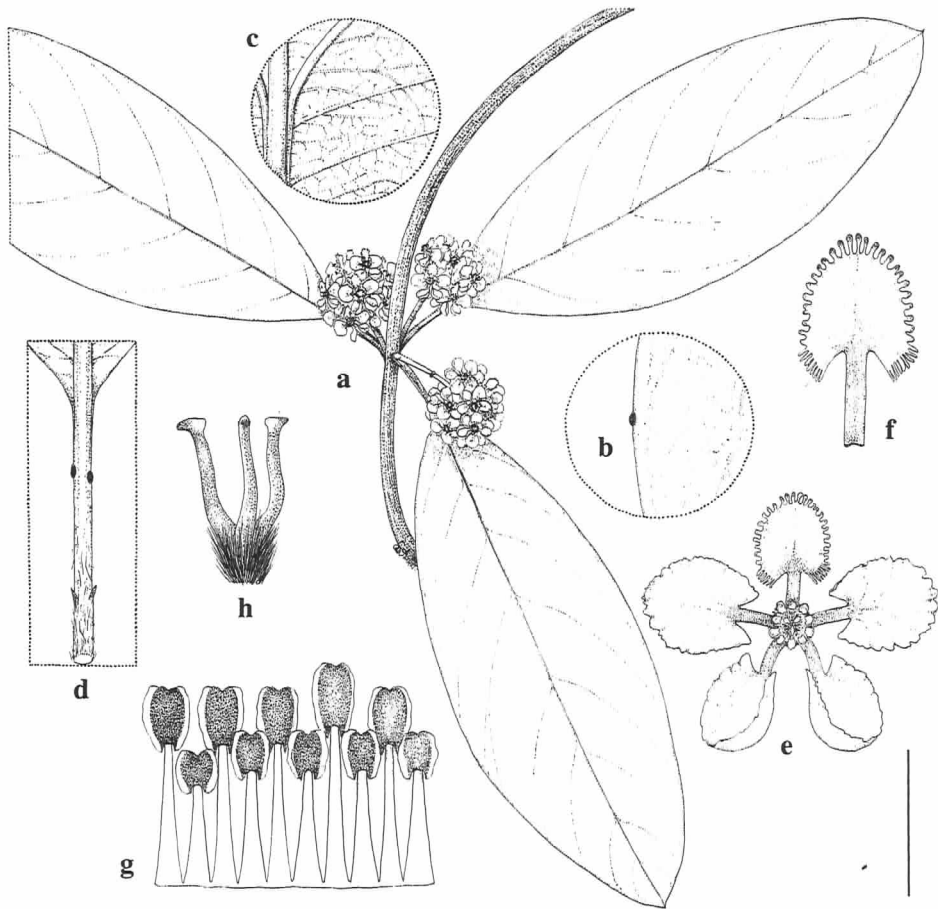


Fig. 2. *Hiraea brevistipulata*. **a.** Flowering branch. **b.** Detail showing marginal leaf gland, adaxial view. **c.** Midrib and adjacent veins, mid-lamina, abaxial view. **d.** Base of lamina, adaxial view, and petiole with a pair of glands and stipules. **e.** Flower, posterior petal uppermost. **f.** Posterior petal. **g.** Androecium laid out, abaxial view, the stamen second from left opposite posterior petal. **h.** Gynoecium, anterior style at left. Scale bar equivalents: a, 4 cm; b, 2 mm; c, 4 mm; d, 8 mm; e, 5.7 mm; f, 4 mm; g, h, 2.7 mm. (Based on *Vázquez et al.* 22543, MICH.)

opposite anterior-lateral petals: filaments ca. 2 mm long, anthers ca. 1 mm long; stamens opposite anterior-lateral sepals: filaments ca. 2.5 mm long, anthers ca. 1.3 mm long; stamens opposite posterior-lateral petals: filaments ca. 1.8 mm long, anthers ca. 1.2 mm long; stamens opposite posterior-lateral sepals: filaments ca. 2.5 mm long, anthers ca. 1.2 mm long; stamen opposite posterior petal: filament ca. 2 mm long, anther ca. 0.8 mm long. *Styles* slightly curved, glabrous; anterior style ca. 2.5 mm long, ca. 0.3 mm wide, apex extended into a spur ca. 0.1 mm long; posterior styles ca. 2.3 mm long, ca. 0.2–0.3 mm wide, apex extended into a spur ca. 0.05 mm long;

ovary ca. 0.8 mm long, hirsute. *Mature samara* not seen; very young samaras butterfly-shaped.

Etymology: *Hiraea brevistipulata* is named for the unusually small stipules.

Phenology: Collected in flower in February.

Distribution: Known only from the type locality, collected in primary forest.

Hiraea brevistipulata is distinctive in its very small stipules (0.7–0.8 mm long); the narrowly elliptical, glabrous laminas with closely set parallel tertiary veins; and the 20–25-flowered umbels with small flowers borne on short pedicels. The margin of the posterior petal is glandular-fimbriate, but that of the lateral petals is slightly erose or subentire; all petal limbs show an unusual, briefly sagittate base. In the type specimen the leaves are ternate and the sepals eglandular; additional collections may show these to be variable characters, as in some other species in which the leaf arrangement is opposite and ternate, and the calyx varies from eglandular to glandular. Superficially *H. brevistipulata* resembles *H. fagifolia* (DC.) Adr. Juss., which also has glabrous laminas with closely set tertiary veins, but that species has 4-flowered umbels borne in ternate cymes and longer stipules.

Hiraea holmgreniorum C. E. Anderson, **sp. nov.** Type: Brazil. Amazonas: Vila Bittencourt, Rio Japurá, Igarapé Patoá, 19 Nov 1982 (fl), I. L. Amaral et al. 589 [INPA Herb. no. 106.973] (holotype: MICH; isotypes: INPA, MG). (Fig. 3)

Liana. Folia opposita vel ternata; lamina foliorum majorum 10.5–19.3 cm longa, 8.2–14 cm lata, obovata vel late elliptica, adaxaliter glabrata vel glabra, abaxaliter pilos V-, Y-, et T-formes et pilos rectos sessiles appressos ferens, margine eglanduloso, glandulis basalibus 1.5–3 mm longis; petiolus 5–8 mm longus, dense tomentulosus; stipulae 1.5–2 mm longae, basi vel medio petioli portatae. Flores in umbellis 4-floris pedunculatis portati; pedunculus 2.5–6 mm longus, basaliter bibracteolatus; (3–)5–25 umbellae e axillis ortae. Sepala lateralia biglandulosa, sepalum anticum eglandulosum. Petala lateralia limbo fimbriato, petalum posticum limbo lacero-fimbriato.

Woody vine; stems appressed-tomentulose when young, soon glabrescent to glabrous. *Leaves* opposite or ternate; laminas of the larger leaves 10.5–19.3 × 8.2–14 cm, obovate to broadly elliptical, apex obtuse- to emarginate-mucronate, base cordate to auriculate, adaxially with Y- and T-shaped hairs when very young but soon glabrate to glabrous, abaxially with a sparse mixture of straight and V-, Y-, and T-shaped hairs but densely so on the veins, with age often becoming glabrescent but the vestiture retained on the veins, the hairs (trabeculae) 0.2–0.7 mm long, the stalk if present to 0.1 mm long; marginal glands absent; the costa and secondary veins prominent and tertiary veins prominulous abaxially; a pair of glands borne abaxially at the base above the insertion of the petiole, each gland 1.5–3 mm long; petioles 5–8 mm long, densely appressed-tomentulose; stipules 1.5–2 mm long, borne near the base of the petiole or at the middle on the shortest petioles. *Inflorescence* an aggregate of (3–)5–25 4-flowered

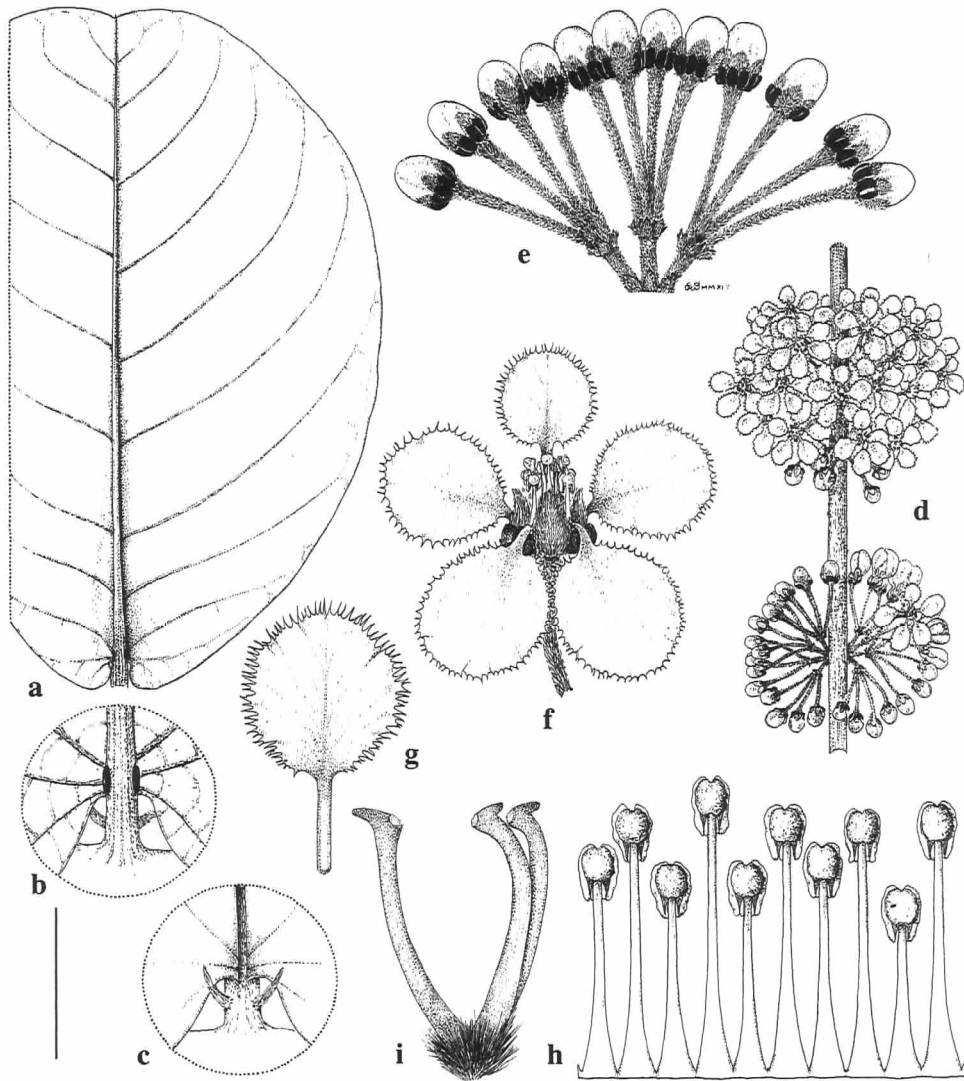


Fig. 3. *Hiraea holmgreniorum*. **a.** Large leaf, abaxial view. **b.** Detail of leaf base, showing short petiole and base of lamina, abaxial view, with a pair of basal glands and a pair of stipules partially hidden by the auricles. **c.** Detail of leaf base, showing short petiole and base of lamina, adaxial view, with a pair of spreading stipules. **d.** Portion of stem with clusters of axillary inflorescences, the leaves abscised. **e.** Ternate sessile cyme. **f.** Flower, posterior petal uppermost. **g.** Posterior petal. **h.** Androecium laid out, abaxial view, the stamen second from right opposite posterior petal. **i.** Gynoecium, anterior style at left. Scale bar: **a,** 4 cm; **b, c,** 1.3 cm; **d,** 4 cm; **e,** 1.3 cm; **f,** 8 mm; **g,** 5.7 mm; **h, i,** 2.7 mm. (Based on: **a–c, e,** *Amaral et al.* 589, INPA; **d, f–i,** *Coelho & Damião* INPA 53267, INPA.)

pedunculate umbels per leaf axil, each pedunculate umbel representing a sessile or subsessile ternate cyme of 4-flowered umbels with the lateral axes suppressed and only the subtending reduced leaves retained; peduncle 2.5–6 mm long; bracts 1–1.2 mm long, ca. 1 mm wide, bracteoles like bracts or slightly narrower; pedicel 12.5–16 mm long, 0.6–0.7 mm wide, densely covered with T-shaped hairs; peduncles and abaxial surface of bracts and bracteoles densely sericeous. *Sepals* ca. 3 mm long, ca. 2.5 mm wide, triangular, adaxially glabrous, abaxially densely sericeous; anterior sepal eglandular, the lateral four biglandular, glands ca. 2 mm long, prominent. *Petals* yellow, glabrous, the limb orbicular; lateral petals with the claw 2–2.5 mm long, limb 7–8 mm long and wide, margin with fimbriae to 0.4(–0.5) mm long; posterior petal with the claw ca. 3.5 mm long and thicker than that of lateral petals, limb 6.5–7 mm long and wide, margin lacerate-fimbriate, fimbriae to 0.7 mm long. *Stamens* glabrous, filaments basally connate; stamen opposite anterior sepal: filament 4–4.5 mm long, anther ca. 1.2 mm long; stamens opposite anterior-lateral petals: filaments 2.5–3 mm long, anthers ca. 1 mm long; stamens opposite anterior-lateral sepals: filaments 3.5–4 mm long, anthers ca. 1 mm long; stamens opposite posterior-lateral petals: filaments 3.3–3.5 mm long, anthers ca. 1 mm long; stamens opposite posterior-lateral sepals: filaments 3.8–4 mm long, anthers ca. 1 mm long; stamen opposite posterior petal: filament ca. 2.5 mm long, anther ca. 0.9 mm long. *Styles* incurved, pubescent in the basal $\frac{1}{3}$ – $\frac{1}{2}$, especially abaxially, sub-equal in size, ca. 4.5 mm long, ca. 0.4 mm wide, apex of anterior style extended into a spur 0.4 mm long, apex of posterior styles extended into a spur 0.2–0.3 mm long; ovary ca. 1.2 mm long, hirsute. *Samara* not seen.

Etymology: The specific epithet honors Patricia K. Holmgren (b. 1940) and Noel H. Holmgren (b. 1937) in recognition of their scholarly contributions and years of service to the botanical community.

Phenology: Collected in flower in October and November.

Distribution: Brazil (Amazonas); on clay soil in mata igapó.

Additional specimen examined: BRAZIL. Amazonas: cidade de Tefé, 16 Oct 1970, Coêlho & Damião s.n. [INPA Herb. No. 53.267] (INPA).

Hiraea holmgreniorum is distinguished by its striking display of dense inflorescence clusters composed of numerous umbels, each bearing four flowers with large fringed petals. The auriculate laminae are borne on very short petioles (less than 1 cm) and abaxially display a sparse but distinctive vestiture composed of a mixture of straight, V-, Y-, and T-shaped hairs that is persistent on the veins.

Hiraea kariniana C. E. Anderson, **sp. nov.** Type: Ecuador. Orellana: Yasuní National Park, primate research area, in Bogi sector of park, near Km 47 of pipeline road, 00°42'S, 76°29'W, 230 m, 5 Feb 2001 (fl), Neill *et al.* 13653 (holotype: MICH). (Fig. 4)

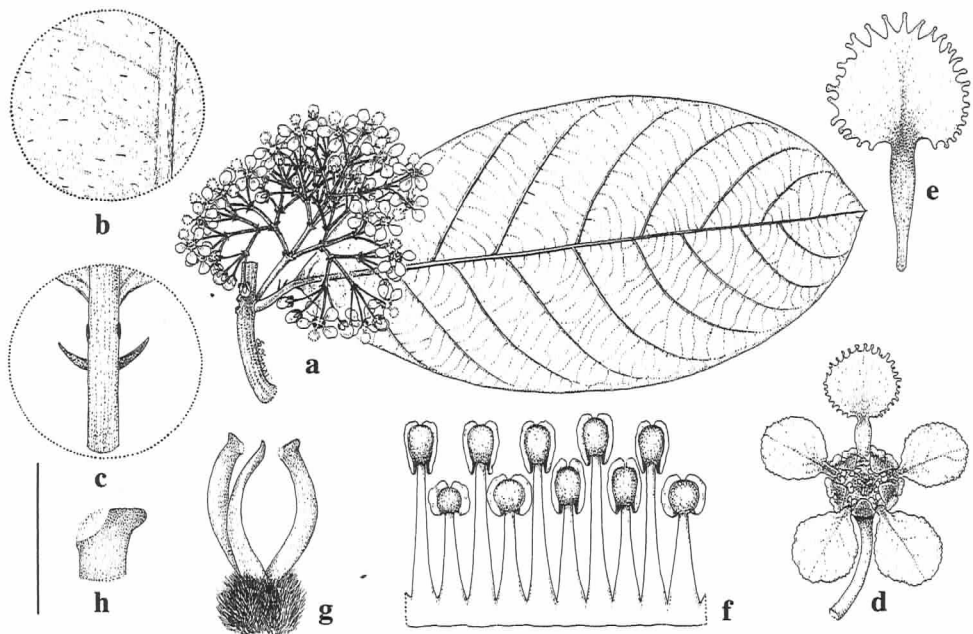


Fig. 4. *Hirta kariniana*. **a.** Portion of flowering branch with large leaf, abaxial view. **b.** Detail of abaxial leaf surface, showing pubescence. **c.** Distal portion of petiole and base of lamina, abaxial view, showing a lateral pair of glands and a pair of stipules. **d.** Flower, posterior petal uppermost. **e.** Posterior petal. **f.** Androecium laid out, abaxial view, the stamen second from left opposite posterior petal. **g.** Gynoecium, anterior style at right. **h.** Apex of anterior style. Scale bar: a, 4 cm; b, 4 mm; c, 1.3 cm; d, 8 mm; e, 4 mm; f, g, 2.7 mm; h, 0.8 mm. (Based on Neill *et al.* 13653, MICH.)

Liana. Lamina foliorum majorum 13.5–15 cm longa, 7–10 cm lata, elliptica vel obovata, adaxialiter glabra, abaxialiter dense sericea, margine eglanduloso; petiolus 1–1.5 cm longus, dense sericeus, distaliter biglandulosus; stipulae 3.5–4 mm longae, medio petioli portatae. Inflorescentia thyriformis axillaris ex umbellis 4-floris constans. Sepala lateralia biglandulosa, sepalum anticum eglandulosum. Petala lateralia limbo eroso vel eroso-denticulato, eglandulosa; petalum posticum limbo glanduloso-fimbriato.

Woody vine; stems densely sericeous, the hairs translucent and the surface appearing glabrous. *Leaves* opposite; laminas 13.5–15 × 7–10 cm, elliptical to obovate, apex apiculate, base truncate, adaxially glabrous, abaxially densely sericeous, the vestiture obscuring the epidermis and composed of appressed, translucent, straight hairs and also flecked with scattered, straight, dark hairs, translucent hairs 0.1–0.2 mm long, dark hairs 0.2–0.3 mm long; marginal glands none; abaxially costa and secondary veins prominent and the tertiary veins parallel and prominulous; petioles 1–1.5 cm long, 2–2.5 mm wide, densely sericeous, with a pair of glands at or just below apex of petiole, each gland ca. 1.5 mm long; stipules 3.5–4 mm long, borne

at middle of petiole. *Inflorescence* axillary, compound (thyrsoid), branched to the 4th order, composed of 4-flowered umbels; umbel without a gland in the center; inflorescence peduncle ca. 10 mm long, secondary axes ca. 8–10 mm long, tertiary axes ca. 3–9 mm long, quarternary axes 8–10 mm long, the central axes exceeding the lateral two; bracts 1.2–1.5 mm long, 1–1.2 mm wide, bracteoles like bracts or slightly shorter and/or narrower; pedicel 9–11 mm long, 0.4–0.5 mm wide; axes, abaxial surface of bracts, bracteoles, and pedicels densely sericeous. *Sepals* 1.5–1.8 mm long, ca. 1.5 mm wide, triangular, adaxially glabrous, abaxially sericeous; anterior sepal eglandular, the lateral four biglandular, glands ca. 1 mm long, prominent. *Petals* yellow, the limb orbicular, glabrous; anterior-lateral petals with the claw ca. 1.5 mm long, limb ca. 4 mm long and wide, margin shallowly erose or denticulate-erose; posterior-lateral petals with the claw ca. 1.5 mm long, limb ca. 3.5 mm long and wide, margin shallowly erose or denticulate-erose; posterior petal with the claw 3–3.5 mm long, limb ca. 4 mm long and wide, margin glandular-fimbriate, fimbriae to 0.4(–0.5) mm long. *Stamens* glabrous, filaments basally connate; stamen opposite anterior sepal: filament 2.8–3 mm long, anther 0.9–1 mm long; stamens opposite anterior-lateral petals: filaments 2–2.1 mm long, anthers ca. 0.8 mm long; stamens opposite anterior-lateral sepals: filaments 2.6–2.8 mm long, anthers 0.9–1 mm long; stamens opposite posterior-lateral petals: filaments ca. 2 mm long, anthers 0.6–0.7 mm; stamens opposite posterior-lateral sepals: filaments 2.6–2.9 mm long, anthers 0.8–1 mm long; stamen opposite posterior petal: filament ca. 2 mm long, anther 0.5–0.6 mm long. *Styles* incurved, subequal, ca. 2.3–2.7 mm long, 0.4–0.5 mm wide, apex extended into a spur 0.05–0.1 mm long, glabrous; ovary 0.8–1 mm long, hirsute. *Samara* not seen.

Etymology: *Hiraea kariniana* is named in honor of the distinguished botanical artist, Karin Weishaar Douthit (b. 1926). Her beautiful drawings elucidate and complement numerous accounts of Malpighiaceae and many other taxonomic and floristic publications.

Phenology: Collected in flower in February.

Distribution: Ecuador (Orellana, Pastaza); in tropical, moist forest on hilly terrain.

Additional specimen examined: ECUADOR. Pastaza: cantón Arajuno, Estación Científica de la Universidad Central del Ecuador, orilla del Río Oglán, aguas abajo de la Estación, 01°19.25'S, 77°41.19'W, 600 m, 5 Mar 2006, Cerón *et al.* 56668 (MO).

Hiraea kariniana is characterized by distinctive leaves and a highly compound inflorescence. The laminae are abaxially densely sericeous; the epidermis is hidden by a dense mat of translucent hairs sprinkled with scattered dark hairs. A pair of spreading stipules is placed at the middle of the petiole. The thyrsoid inflorescences branch to the fourth order, each umbel containing four small flowers. The anterior-lateral petals are slightly larger than the posterior-lateral petals. The margin of the lateral petals varies from shallowly erose to denticulate-erose, and that of the posterior petal is fringed with fimbriae to 0.5 mm long.

Hiraea singularis C. E. Anderson, **sp. nov.** Type: Venezuela. Portuguesa: Dtto.

Guanaré, sector Las Panelas, margen oeste del Río Guanaré, 250 m, 09°05'N, 69°52'W, 27 May 1984 (fl), *Martínez 35* (holotype: MICH). (Fig. 5)

Liana. Folia opposita vel ternata; lamina foliorum majorum 7–17 cm longa, 3.2–9.5 cm lata, late elliptica vel obovata, adaxaliter velutina, abaxaliter pilos T-formes ferens, margine eglanduloso vel distaliter glandulis parvis paucis instructo, glandulis basalibus 0.3–0.6 mm longis vel absentibus; petiolus 2–4 mm longus, dense velutinus; stipulae 3.5–4 mm longae, basi petioli portatae. Flores in umbellis 4–floris sessilibus vel subsessilibus portati; 1–2 umbellae e axillis ortae; pedicelli 13.5–17 mm longi, pilos T-formes ferentes. Sepala glandulosa vel sepalum anticum eglandulosum; glandulae breviter elevatae. Petala limbo eroso-denticulato, eglanduloso.

Woody vine to 8 m; stems densely pubescent with a mixture of V- and T-shaped hairs. *Leaves* opposite or ternate; laminae of the larger leaves 7–17 × 3.2–9.5 cm, broadly elliptical to obovate, apex acute- to emarginate-mucronate, base cordate or slightly so, adaxially velutinous, sparsely in age, the hairs Y-shaped with a stalk 0.1–0.2 mm long, the arms mostly greatly unequal and to 1.5 mm long, often one arm reduced to a spur and the hair appearing basifixed, abaxially densely covered with T-shaped hairs, the stalk 0.1–0.3 mm long, trabecula 1–3 mm long, straight or wavy; marginal glands absent or 1–few in distal 1/5, glands ca. 0.2 mm in diameter; abaxially costa and secondary veins prominent, tertiary veins not raised; a pair of glands at the base of the blade at the insertion of the petiole, each gland 0.3–0.6 mm long, sometimes with an additional gland ca. 0.1 mm in diameter, or basal glands absent; petioles 2–4 mm long, densely velutinous; stipules 3.5–4 mm long, inserted at base of petiole. *Inflorescence* a 4-flowered umbel, solitary or two per leaf axil; each umbel sessile or borne on a rudimentary peduncle to 0.3 mm long; umbel without a gland, in the center; bracts 1.5–2.5 mm long, 1.2–1.5 mm wide, bracteoles like bracts but slightly shorter and/or narrower, abaxially densely sericeous; pedicel 13.5–17 mm long, 0.3 mm wide, densely covered with T-shaped hairs. *Sepals* ca. 2.5 mm long, 1.3–2 mm wide, narrowly triangular, adaxially glabrous, abaxially densely sericeous, all biglandular or the anterior sepal eglandular, glands 1.3–1.5 mm long, briefly stalked. *Petals* yellow, glabrous, the limb orbicular, margin shallowly denticulate-erose; lateral petals with the claw ca. 2.5 mm long, limb 5–6 mm long and wide; posterior petal with the claw 2.2–2.5 mm long and thicker than that of lateral petals, limb 5–5.5 mm long and wide. *Stamens* glabrous, filaments basally connate; no attached anthers seen, all unattached anthers seen ca. 0.5 mm long; stamen opposite anterior sepal: filament ca. 4 mm long; stamens opposite anterior-lateral petals: filaments 3.3–3.5 mm long; stamens opposite anterior-lateral sepals: filaments 3.2–3.5 mm long; stamens opposite posterior-lateral petals: filaments 2.3–2.5 mm long; stamens opposite posterior-lateral sepals: filaments 3.5–3.7 mm long; stamen opposite posterior petal: filament 2.7–3 mm long. *Styles* incurved, glabrous; anterior style 3.2–3.5 mm long, 0.4–0.5 mm wide, apex extended into a spur ca. 0.4–0.5 mm long; posterior styles 3–3.5 mm long,

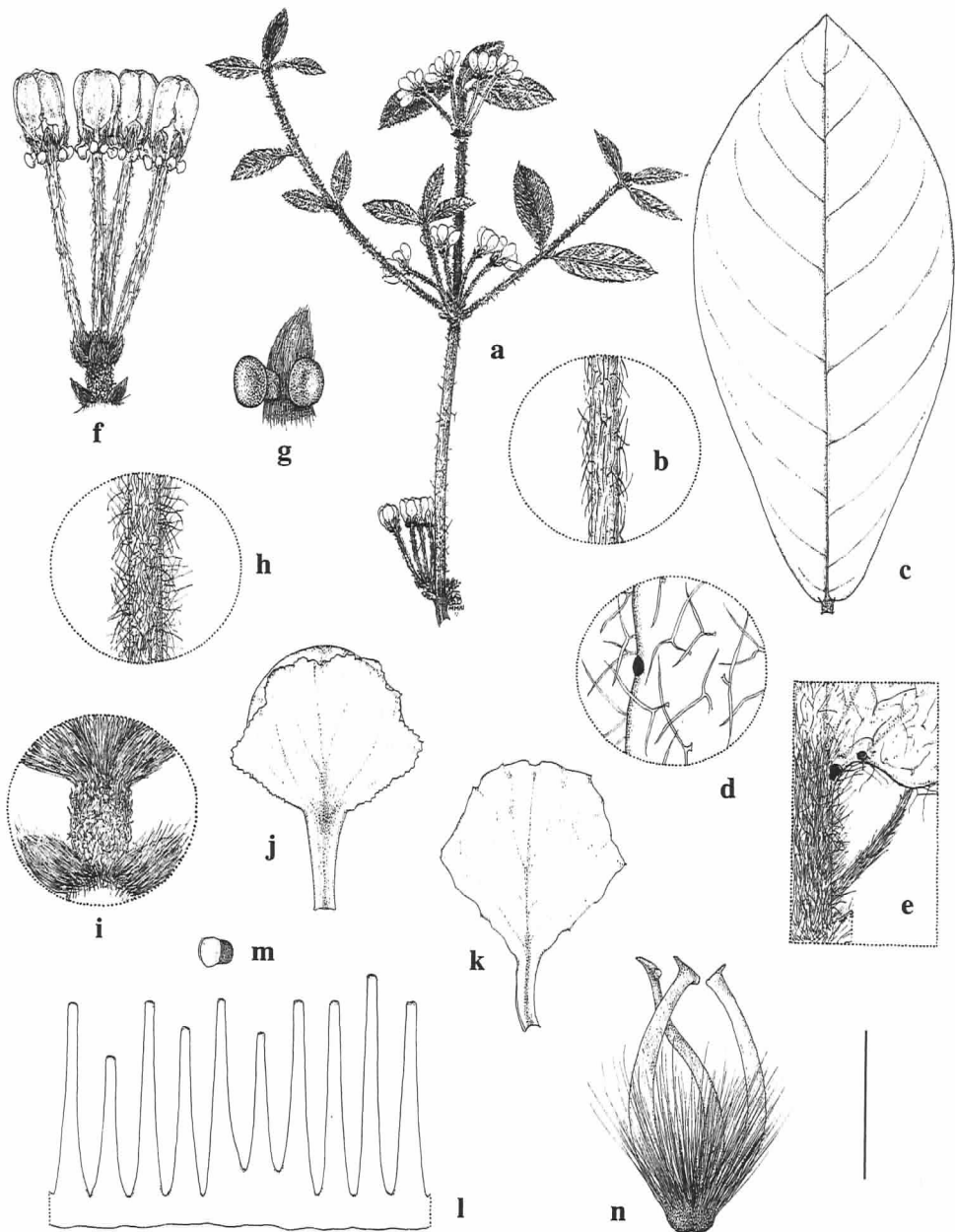


Fig. 5. *Hiraea singularis*. **a**. Habit. **b**. Detail of stem showing pubescence. **c**. Large leaf, adaxial view. **d**. Detail of abaxial leaf surface, showing pubescence and marginal gland. **e**. Detail of leaf base, abaxial view, showing two basal glands, and portion of petiole with one stipule. **f**. Inflorescence. **g**. Sepal, abaxial view, showing stalked glands. **h**. Detail of pedicel showing pubescence. **i**. Detail of inflorescence attachment, showing abbreviated stalk supporting the single umbel. **j**. Posterior petal, adaxial view. **k**. Anterior lateral petal, abaxial view. **l**. Androecium laid out, the anthers detached, filament fourth from left opposite posterior petal. **m**. Anther. **n**. Gynoecium, anterior style to left. Scale bar: a, 4 cm; b, 4 mm; c, 4 cm; d, 2 mm; e, 4 mm; f, 1.3 cm; g-k, 4 mm; l-n, 2.7 mm. (Based on: a, b, f-n, *Martínez 35*, MICH.; c-e, *Wingfield 7826*, MICH.)

0.4 mm wide, apex extended into a spur (0.1–)0.4 mm long; ovary ca. 1.5 mm long, hirsute. *Mature samara* not seen, immature samara butterfly-shaped; lateral wings 1.1 cm wide, 2.2 cm high, semicircular, margin coarsely dentate, with a sparse mixture of seemingly basifixed hairs (Y-shaped hairs with one arm reduced to a spur) and sessile hairs (the arms subequal); dorsal wing 1 mm wide, ca. 2 mm high, erose.

Etymology: The specific epithet emphasizes the unusual characteristics, such as the sessile umbels, that set this species apart.

Phenology: Collected in flower in May, in young fruit in April, and sterile in June, July, and August; collections from March and November show remains of inflorescences.

Distribution: Venezuela (Falcón, Portuguesa); in semi-deciduous, wet, and riverine forest and on limestone bluffs; 50–900 m.

Additional specimens examined: VENEZUELA. Falcón: entre El Paují y María Díaz, quebrada Maporal, a uno 21 km antes de llegar a Churuguara, carretera Coro-Churuguara, 10 Mar 1970, *Aristeguieta 7466* (VEN); Socopo, Dtto. Bolívar, Serranía de San Luis, 800 m, 15 Nov 1977, *Ruiz Z. 2557* (MICH, VEN); Sierra de San Luis, cerca del Punte de Jobo, entre Curimagua y San Luis, 800–900 m, 20 Jul 1967, *Steyermark 99267* (VEN); W of La Peñita, along Golfete de Guare, S of Chichiriviche, 10°54'N, 68°16–17'W, 50 m, 30 Aug 1974, *Steyermark 110445* (NY, VEN); 16 km SE de Coro, arriba de Siburua, 150 m, 20 Apr 1978, *Wingfield 5345* (MICH); Paraguaná, Cerro Sta. Ana, arriba de Moruy, 580 m, 9 Jun 1980, *Wingfield 7826* (MICH).

Hiraea singularis is distinguished by the abundant vesture of all vegetative parts and the unusual inflorescences, one or two 4-flowered sessile or subsessile umbels per leaf axil. The basal leaf glands, if present, are unusually small, only 0.3–0.6 mm long, and hidden by the dense abaxial vesture. The calyx glands are briefly stalked, and the posterior petal hardly differs from the lateral petals. The anthers are easily detached and no entire stamens were seen; all the loose anthers seen were the same minute size, but it should be expected that at least the anterior stamen bears a larger anther. This species may flower at or just before the emergence of new leaves. The type collection is a branch bearing very young leaves and is the only specimen in flower; all other collections have fully developed leaves. *Steyermark 99267*, *Steyermark 110445*, and *Wingfield 7826* are sterile, but *Wingfield 5345* has spent flowers and young fruits. The leafy branches of *Aristeguieta 7466* and *Ruiz Z. 2557* show only axillary arrays of the persistent bracts and bracteoles that remain after the pedicels have fallen.

Hiraea woytkowskii C. E. Anderson, **sp. nov.** Type: Peru. Junín: [Prov. Satipo, fide Woytkowski, 1978] Río Negro, 800 m, 20 Aug 1960 fl, *F. Woytkowski 5855* (holotype: MICH; isotypes: MICH, MO, US). (Fig. 6)

Liana. Lamina foliorum majorum 5.5–15.5 cm longa, 2–7 cm lata, anguste elliptica vel oblanceolata vel obovata, adaxilater et abaxilater glabra vel sparsim sericea,

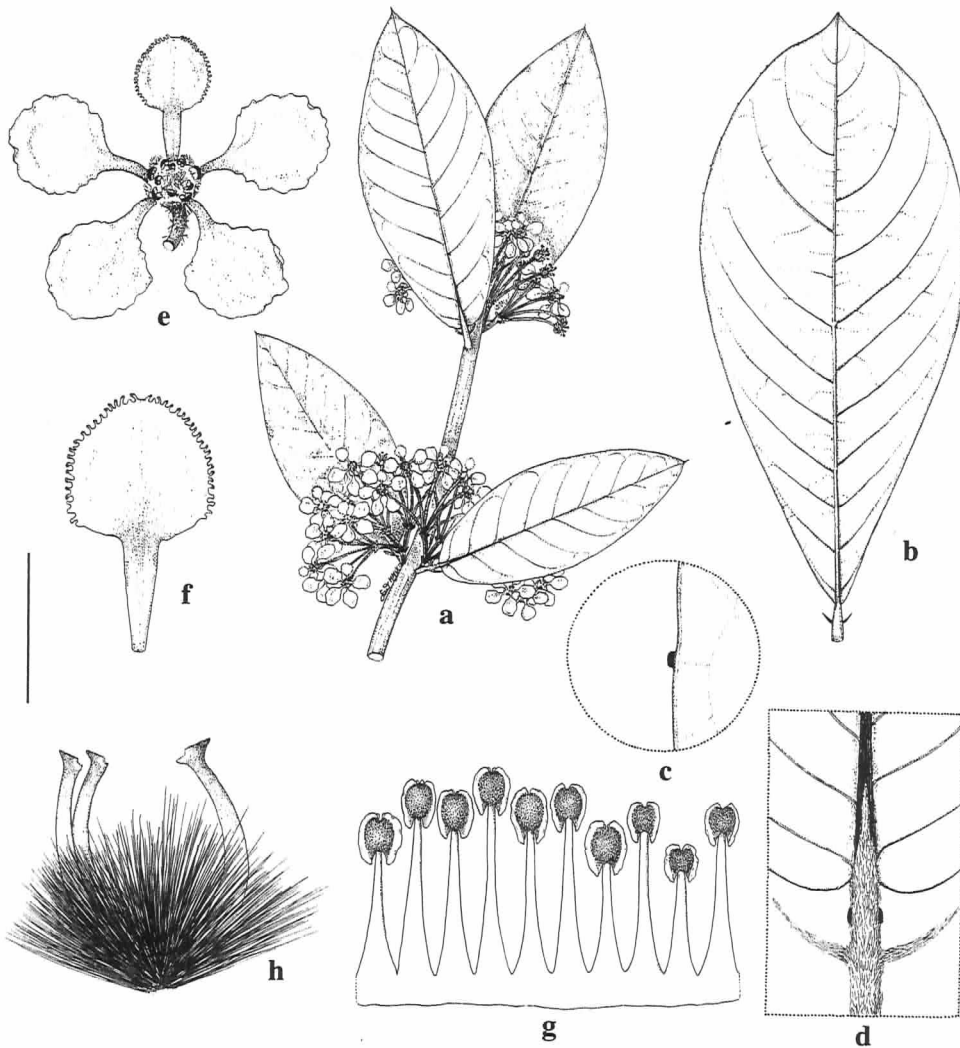


Fig. 6. *Hiraea woytkowskii*. **a.** Flowering branch. **b.** Large leaf, abaxial view. **c.** Marginal leaf gland, abaxial view. **d.** Distal portion of petiole and base of lamina, abaxial view, showing a lateral pair of glands and a pair of stipules. **e.** Flower, posterior petal uppermost. **f.** Posterior petal. **g.** Androecium laid out, abaxial view, the stamen second from right opposite posterior petal. **h.** Gynoecium, anterior style at right. Scale bar: a, b, 4 cm; c, 4 mm; d, e, 8 mm; f, 4 mm; g, h, 2.7 mm. (Based on: a, c–h, *Woytkowski 5855, MICH*; b, *Gentry et al. 26103, MICH*.)

abaxialiter costa prope basin sericea, margine distali glandulis parvis instructo; petiolus 4.5–9 mm longus, dense sericeus, distaliter biglandulosus; stipulae 3.5–5 mm longae, basi vel medio petioli portatae. Cyma axillaris ex 3 umbellis 4(–6)-floris constans; pedunculus 6.5–8 mm longus. Sepala eglandulosa (rare sepalum unum

uniglandulosum). Petala lateralia limbo eroso-denticulato, eglanduloso; petalum posticum limbo glanduloso-fimbriato.

Woody vine to 30 m; stems very sparsely sericeous when young, soon glabrous. *Leaves* opposite; lamina of the larger leaves 5.5–15.5 × 2–7 cm, the smaller and younger leaves narrowly elliptical, the older and largest leaves also oblanceolate and narrowly obovate, apex acute- or obtuse-mucronate, base truncate or slightly cordate, adaxially glabrous, abaxially glabrous or with a few sparsely scattered hairs, the hairs appressed and sessile, 0.2–0.5 mm long, at the base the dense petiolar vestiture extending onto the costa for ca. 0.5–1 cm; margin with scattered glands 0.4–0.5 mm in diameter in distal $\frac{1}{4}$ – $\frac{1}{3}$; abaxially the costa prominent, the secondary veins prominulous, the tertiary veins not raised; petioles 4.5–9 mm long, densely sericeous, with a pair of glands borne laterally and near apex, 0.5–2 mm below the base of the lamina, each gland 0.7–1.2 mm in diameter; stipules 3.5–5 mm long, inserted near base of petiole or in the proximal $\frac{1}{4}$ – $\frac{1}{2}$. *Inflorescence* a ternate cyme of 4(–6)-flowered umbels, sometimes the lateral branches not developed and then a single umbel; umbel without a gland in the center; peduncle 2.5–4.5 mm long, secondary axes 6.5–8 mm long, bracts 1.1–1.5 mm long, 0.8–1.2 mm wide, bracteoles like bracts and slightly shorter and/or narrower; axes and abaxial surface of bracts and bracteoles densely sericeous; pedicel 12.5–16.5 mm long, 0.4–0.5 mm wide, bearing a mixture of subsessile to T-shaped hairs. *Sepals* ca. 2.5 mm long, ca. 1.5 mm wide, narrowly triangular, adaxially glabrous, abaxially densely sericeous, eglandular or rarely one sepal with one gland. *Petals* yellow, glabrous, the limb orbicular; lateral petals with the claw 2.5–3 mm long, limb 5–6 mm long and wide, margin erose-denticulate; posterior petal with the claw ca. 3 mm long and slightly thicker than that of lateral petals, limb ca. 4 mm long and wide, margin glandular-fimbriate, fimbriae to 0.3 (–0.4) mm long. *Stamens* glabrous, filaments basally connate; stamen opposite anterior sepal: filament 3–3.5 mm long, anther ca. 1.1 mm long; stamens opposite anterior-lateral petals: filaments 2.5–2.7 mm long, anthers ca. 1.2 mm long; stamens opposite anterior-lateral sepals: filaments 2.7–3 mm long, anthers ca. 1 mm long; stamens opposite posterior-lateral petals: filaments 2–2.5 mm long, anthers ca. 1.2 mm long; stamens opposite posterior-lateral sepals: filaments 2.5–2.8 mm long, anthers ca. 0.8 mm long; stamen opposite posterior petal: filament 1.8–2 mm long, anther ca. 0.8 mm long. *Styles* incurved, glabrous; anterior style 2.8–3 mm long, ca. 0.4 mm wide, apex extended into a spur ca. 0.2 mm long; posterior styles 3–3.2 mm long, ca. 0.3 mm wide, apex extended into a spur ca. 0.1 mm long; ovary ca. 1 mm long, hirsute. *Samara* not seen.

Etymology: The specific epithet commemorates Felix Woytkowski (1892–1966), astute and indefatigable collector of the Peruvian flora.

Phenology: Collected sterile in March, in bud July and August, and in flower in August.

Distribution: Peru (Cusco, Loreto, Madre de Dios); in disturbed primary forest and upland terrace forest, and on white sand; 140–1100 m.

Additional specimens examined: PERU. Cusco: La Convención, 600 m, 19 Jul 2004, 12°38'28"S, 73°04'18"W, *Galiano et al. 6703* (MICH); Dist. Echarate, Santa Ana, Kepashiato, 12°43'47"S, 73°21'52"W, 1100 m, 21 Aug 2006, *Valenzuela et al. 7595* (MICH). **Loreto:** Prov. Maynas, Mishana, Río Nanay, halfway between Iquitos and Santa María de Nanay, 140 m, 03°50'S, 73°30'W, *Gentry et al. 26103* (MICH, MO). **Madre de Dios:** Prov. Manu, Puerto Maldonado, Los Amigos Biological Station, ca. 0.7 km upriver from mouth of Río Los Amigos, 270 m, 21 Aug 2002, *Janovec & Maceda 2686* (MICH).

Hiraea woytkowskii has glabrous laminae in which the dense vestiture of the petioles extends and tapers onto the abaxial costa for as much as 1 cm. The leaves of the fertile collections are elliptical or slightly oblanceolate, all on flowering branches; the large oblanceolate and obovate leaves were seen only on the sterile collection (*Gentry et al. 26103*). The petiole has a pair of long-spreading stipules, inserted near the base or in the proximal $\frac{1}{4}$ – $\frac{1}{2}$, and two lateral glands near the apex. The stems are glabrous, and even the youngest parts are only very sparsely sericeous. The calyx is eglandular in the type collection, the only one with flowers, and in two collections in bud (the buds of *Janovec & Maceda 2686* are too young to ascertain details); however, in *Valenzuela et al. 7595* a few buds show a single gland on one sepal. Future gatherings may show that the eglandular condition is variable, as in other species of *Hiraea*.

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