A revision of the genus *Gouania* (Rhamnaceae) in the Philippines and Sundaland

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**Summary.** The climbing genus *Gouania* (Rhamnaceae) is revised in western Malesia. Five species are recognised for the Philippines and Sundaland using morphological evidence, including a new species from the Philippines: *Gouania longipedunculata*. A taxonomic treatment, including a preliminary IUCN conservation status assessment, is presented for each species.

**Key Words.** conservation, IUCN, Malesia, South-East Asia, systematics, taxonomy, tropical climbers.

**Introduction**

*Gouania* Jacq. is a pantropical genus of over 50 species of woody climbers, recognised by having circinnate tendrils and 3-winged dry schizocarps separating into three 2-winged indehiscent mericarps (Medan & Schirarend 2004). The genus belongs to the monophyletic tribe Gouanieae, first formally described by Endlicher (1840) and confirmed to be monophyletic by Richardson et al. (2000a, b). *Gouania* and *Helinus* E.Mey. ex Endl. are the only members of the tribe occurring in the Old World. *Helinus* species are also climbers with tendrils, but their fruits are unwinged explosive capsules and are restricted to Eastern and Southern Africa, Madagascar, the southern end of the Arabian Peninsula and the Indian subcontinent. *Gouania* alone is found in the Philippines and Sundaland. As noted by Medan & Schirarend (loc. cit.), the genus needs revision, but recent headway has been made with revisions for the Western Indian Ocean (Buerki et al. 2011) and North America (Pool 2014). Most of the c. 15 South-East Asian genera of Rhamnaceae, and the climbing genera in particular, have yet to be revised and included in contemporary floras such as *Flora Malesiana* or the *Flora of Peninsular Malaysia*, although a synopsis of *Smythea* (Cahen & Utteridge 2018) and a key to the Bornean species of *Ventilago* (Cahen & Utteridge 2017) were recently published. The most complete overview of Asian *Gouania* species to date is by Lauterbach (1922), with some minor changes by Suessenguth (1953) in the last attempt at a complete treatment at species level.

While Sundaland’s phytogeographical boundaries differ according to sources and the distribution of a single species is often at odds with general patterns (van Steenis 1950), the area delimited by Woodruff (2003) shares the same northwestern and southeastern limits as the distribution of *Gouania obtusifolia*, with limits just north of the Isthmus of Kra on the Malay Peninsula and immediately east of Java, and is used here to define the extent of the study area for Sundaland. The taxonomic history of the genus in Sundaland is complex and best understood by starting with Java as more literature is available for this area. Blume (1826) recognised two species that had originally been described from Réunion: *G. tiliifolia* Lam. [*[G. tiliifolia* Lam.] and *G. mauritiiana* Lam. The same year, Bronniart (1826) described *G. obtusifolia* Vent. ex Brongn., a new species based on material in Ventenats’s herbarium collected in Java. Miqel (1856) seems to have been unaware of Bronniart’s species when he described *G. javanica* Miq., and also treated *G. tiliifolia* sensu Blume non Lam. as a synonym of *G. leptostachya* DC. and listed *G. microcarpa* DC. and *G. retinaria* DC. as additional species for the island. *Gouania microcarpa* however is restricted to India and Sri Lanka, as noted by King (1896), and *G. retinaria* is a synonym of *G. scandens* (Gaertn.) R.B.Drumm., which is only known to occur in the Western Indian Ocean (Buerki et al. 2011). Backer & Bakhuizen van der Brink (1965) recognised only *G. javanica* and *G. leptostachya* for Java. Study of herbarium material supports this view, although *G. javanica* is placed here in the synonymy of *G. obtusifolia*. The same two species found in Java occur in Peninsular Malaysia as was recognised by King (loc. cit.) and Ridley (1922) and are the only *Gouania* species known to occur there. Confusingly, the name *G. javanica* has also been extensively used to refer to plants observed in southern China and throughout SE Asia (Chen & Schirarend 2007; Pitard 1907 – 1912; Wilson 1916). Plants identified as *G. javanica* collected north of the Malay Peninsula differ from *G. obtusifolia* but are best referred as *G. brandisii* Hassk. (discussed below in Notes for *G. obtusifolia*). Little could be found about the genus
in Sumatra; *Gouania* is not included in *Prohromus flore Sumatranae* (Miquel 1860), but Suessenguth (1953) mentions both *G. javanica (= G. obtusifolia)* and *G. leptostachya* as occurring on the island.

The Philippine and Malaysian floras are closely related (van Steenis loc. cit.) and both areas are included in a recognised Sunda Shelf and Philippines bioregion (Wikramanayake et al. 2002). While two species included here are Philippine endemics, *G. nematostachya* straddles both Sundaland and the Philippines and the genus is advantageously studied for both areas together. Blanco (1837) originally presented *G. domingensis* (Jacq.) L. as the only species of the genus occurring in the Philippines. *Gouania domingensis* sensu Blanco, non L, was later treated as a synonym of *G. leptostachya* by Fernández-Villar (1880) in *Novissima Appendix* to Blanco’s *Flora*. *Gouania microcarpa* was later recognised as an additional species of the Philippines by Rolfe (1885), who noted that nearly all plants included in the *Novissima Appendix* were based on descriptions of species from India and the Malay Archipelago, resulting in an underestimation of the number of endemic species. Following Rolfe’s publication, *G. domingensis* sensu Blanco, non L. and *G. leptostachya* sensu Fern-Vill., non DC. were placed as synonyms of *G. microcarpa* by Vidal (1886) and Merrill (1918), resulting in a single recognised species for the Philippines. Merrill (1923) then placed *G. microcarpa* in synonymy under *G. tiliacefolia* and recognised *G. javanica* as an additional species for Luzon, Polillo, Mindoro, Leyte and Mindanao. Lauterbach (1922) did not consider *G. tiliacefolia* and *G. javanica* to occur in the Philippines and described two endemic new species: *G. fimbriata* Reissek ex Lauterb. and *G. nematostachya* Reissek ex Lauterb., and both species were retained by Suessenguth (1953) and are recognised here as distinct species after study of herbarium material. *Gouania nematostachya* also occurs in Sulawesi and Borneo. It is the only species of *Gouania* known to grow in Borneo, where it was identified as *G. microcarpa* by several authors, e.g. Merrill 1921, Masamune 1942, Beaman & Anderson 2004, but differs from *G. microcarpa* in several morphological characters (discussed below in Notes for *G. nematostachya*). Specimens from Philippine islands south of Luzon, with densely hairy leaves and peduncles longer than in *G. fimbriata*, are described here as belonging to a new species: *G. longipetiolata*.

### Material and Methods

Herbarium specimens from BKF, E, GH, K and L were studied and measurements with additional digital images studied from A, E, G, L, M, NY, P, U, S, W, WAG and WRSL; an exclamation mark (!) is used to show that a specimen has been seen and barcodes are given for type information where there could be confusion. An alphabetical index to all numbered collections examined is given at the end of the paper (Appendix 1). Material was examined under a Zeiss Stemi 1000 binocular microscope at magnifications of up ×350. Leaf anatomy terms used are from Hickey (1979). Leaf measurements were made on branchlet leaves inserted proximally to the racemiform inflorescences, rather than leaves inserted along the racemiform inflorescence rachis. The terminology used to describe stipules follows Pool (2014). Hair density terms are defined as follows: sparse when hairs are scattered enough not to touch when pressed towards each other, abundant when hairs are close enough to touch if pressed towards each other, dense when hairs are so close to each other that they hide the surface of the organ they grow on. Inflorescences are described here as racemiform thyrses because they superficially resemble racemes, with the cymes inserted along a well-developed, unbranched axis. Fruit measurements follow Pool (loc. cit.), but only on fruit mature enough to be at dispersal, i.e. splitting, or on free mericarps; pedicels were also measured at the mature fruit stage. Other morphology terms follow Beenije (2010). Climber length, basal diameter, flower colour and fragrance information were retrieved from herbarium specimen labels. Habitat names used in species accounts are based on the Ecoregions 2017 map (Dinerstein et al. 2017). Localities and collection dates were inferred where possible using the Cyclopaedia of Malesian Collectors (van Steenis-Kruseman 2017) but coordinates are not given for localities when uncertainty or imprecision is too great. Conservation assessments in species accounts apply IUCN Red List categories and criteria (IUCN 2012), using GeoCat (Bachman et al. 2011) to calculate Extent of Occurrence (EOO) metrics. Protected areas were located using the World Database on Protected Areas online interface (IUCN & UNEP-WCMC 2018).

### Key morphological characters

#### Leaves

*Gouania* species all have simple, alternate, petiolate leaves. Glands and foliaceous appendages are often present along the petiole, especially near the junction with the leaf blade. Glands are also usually present along the leaf margin, with one gland associated to each serration when serrations are abundant. Glands are also usually present along the leaf margin, with one gland associated to each serration when serrations are abundant. Glands and foliaceous appendages are often present along the leaf margin, with one gland associated to each serration when serrations are abundant. Glands and foliaceous appendages are often present along the leaf margin, with one gland associated to each serration when serrations are abundant.

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margins (Fig. 1C). Other species have leaves with up to 30 serrations along the margin. A foliaceous appendage or tufts of hairs (domatia) are often present in axils of veins in *G. fimбриata, G. longipedunculata* and *G. obtusifolia* (Fig. 1D). Of the three, *G. obtusifolia* is the only species with conspicuous crenations all along the leaf margin. *Gouania longipedunculata* leaves are abundantly to densely hairy when mature (Fig. 2D & E), unlike the glabrous to sparsely hairy leaves of *G. fimбриata. The leaf blade apex is rounded to acute in *G. obtusifolia*, acute to attenuate (–acuminate) in *G. fimбриata* and *G. longipedunculata* and attenuate to acuminate in *G. leptostachya* and *G. nematostachya*.

**Stipules**

Stipules are soon fugaceous for all *Gouania* species from the region and are visible in just a small proportion of herbarium specimens from that area. They are usually lost by anthesis and are most easily observed remaining near the apical meristem of developing shoots. Only in *G. fimбриata, and to a certain extent G. longipedunculata*, are stipules frequently retained at anthesis. Reissex (1861), and especially Pool (2014), recognised the diagnostic usefulness of stipules for identification of American *Gouania* species. Stipules are also useful to recognise Asian species. They are deeply pinnatifid and up to 8 mm long in *G. fimбриata*, pinnatifid and up to 7 mm in *G. longipedunculata* (Fig. 2F & G), entire to slightly pinnatifid and c. 6 mm long in *G. obtusifolia*, entire and c. 2.5 mm long in *G. nematostachya*. The only species of this region that has stipules with a lobule at the base is *G. leptostachya*. The upper portion of the stipule is entire and c. 4 mm long; the lobule diverges at c. 120° from the upper portion and is c. 1 mm long (Fig. 1A).

**Disk and disk lobes**

Disks of *Gouania* flowers provide especially useful diagnostic characters and have been extensively used in dichotomous keys (Reissex 1861; Lauterbach 1922; Suesenguth 1953; Buerki et al. 2011; Pool 2014) and are helpful to identify

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**Fig. 1.** Morphological characters in *Gouania* species of the Philippines and Sundaland. **A** stipule of *G. leptostachya; B** detail of leaf margin of *G. leptostachya, abaxial view; C** detail of leaf margin of *G. nematostachya, adaxial view; D** detail of domatia of *G. obtusifolia; E** flower of *G. nematostachya, opened flat, apical view; F** fruit of *G. leptostachya, splitting, apical view. Scale bar: A, E = 2 mm; B – D = 4 mm; F = 5 mm. A, F from Lörzing 13270; B from s.c. s.n. [Java, K001293563]; C from Duaneh 429; D from Teo & Pachiappan 221; E from Clemens 26263. DRAWN BY NAOKO YASUE.
 Philippine and Sundaland species. In all known Asian Gouania species, nectar disks are fleshy and fill most of the hypanthium above the ovary and around the exerting trifid style. The central portion of the disk, called the annulus (following Pool 2014), often forms a sheath around the style, especially in G. fimбриata, G. longipedunculata and G. obtusifolia. Weak ridges are sometimes visible on the disk surface, radiating from the annulus. The surface is glabrous in all Malesian species, smooth in G. fimбриata, G. longipedunculata and G. obtusifolia, smooth to rugulose (weakly wrinkled) in G. leptostachya and rugose (wrinkled) in G. nematostachya (Fig. 1E). Narrow disk lobes opposite the sepals are present in many species of Gouania worldwide, including all species of the Philippines and Sundaland except G. nematostachya. The disk lobes are tapering in G. fimбриata, G. longipedunculata (Fig. 2K) and G. obtusifolia, unlike in G. leptostachya, which has disk lobes with parallel sides as noted by Lauterbach (1922) and Suessenguth (1953). It is often possible to observe the presence of disk lobes and determine whether the disk is smooth or rugose by looking at the flower remains at the distal end of fruits.

Fruit
The mature fruit provides diagnostic characters for several taxa from North America (Pool 2014) and the Western Indian Ocean (Buerki et al. 2011), and is also useful for the identification of Philippine and Sundaland species. What is referred to here as mature is when mericarps can be found splitting from each other (Fig. 1F). This definition is not completely satisfactory because some fruits with not fully developed wings can occasionally be seen splitting on herbarium specimens (Cahen & Stenn pers. obs.). When immature, fruits are obvoid and unwinged (Fig. 2H). The inferior ovary dries with a darker colour than the persisting sepal lobes, giving the impression it might mature into a fleshy fruit. As fruits develop however, the mericarp wings expand, both laterally and vertically (Fig. 2N). Gouania leptostachya has significantly bigger fruits than all other species of the region, with a fruit body (the medial portion of the mericarp where the seed is enclosed) c. 8 mm high and mericarps 10 – 16 mm wide (Fig. 1F). Fruit bodies are c. 4 mm high in G. fimбриata, G. longipedunculata (Fig. 2N) and G. obtusifolia, and c. 5 mm high in G. nematostachya. Their mericarps are 9 – 12 mm wide. The fruit body also tends to be sparsely hairy and to dry with a darker colour than the mericarp wings in these species, unlike G. leptostachya, which has a glabrous fruit body that dries with the same colour as the mericarp wings. Gouania nematostachya fruits are slightly smaller and have more of a “bowtie shape” (terminology from Pool 2014), with a smaller height/width ratio than all other species of the region. Note that peduncles and pedicels can easily be confused when examining Gouania specimens. Peduncles are persistent after fruit dispersal and bear scars where the pedicels were inserted. The only species in this region with strongly developed peduncles are G. fimбриata (to 4 mm long) and G. longipedunculata (to 8 mm long).

Taxonomic Treatment

Key to Gouania species for the Philippines and Sundaland
1. Leaf margin densely, finely serrate with usually 40 – 50 serrations on either side. Flower nectar disk unlobed, disk surface wrinkled ................................................................. 4. Gouania nematostachya
   Leaf margin subentire, crenate or crenate-serrate with up to 30 serrations on either side. Flower nectar disk stellate, with five narrow lobes opposite the sepals, similar in appearance to stamen filaments, disk surface smooth to slightly wrinkled ................................................................. 2

2. Leaf margin crenate, with up to 30 serrations on either side, marginal glands sunken inside serrations; domatia in axils of secondary veins absent; secondary veins 4 – 5 pairs; lamina surface glabrous abaxially except along veins. Stipules with a basal lobule pointing sideways. Thyrses to 35 cm long; bracts entire, c. 2.5 mm long, glabrous. Fruiting pedicel to 2.5 mm long, sparsely hairy. Fruit body c. 8 mm high, same colour as wings; mericarps 10 – 16 mm wide. Seeds 4 × 4 mm ................................. 2. Gouania leptostachya
   Leaf margin subentire to crenate, with usually 15 – 20 serrations on either side, marginal glands protruding; domatia in axils of secondary veins often present; secondary veins 5 – 6 (– 8) pairs; lamina surface glabrous to densely hairy abaxially. Stipules simple. Thyrses to 25 cm long; bracts entire to deeply divided, 3 – 6 mm long, densely hairy. Fruiting pedicel to 1 mm long, densely hairy. Fruit body c. 4 mm high, darker than wings, mericarps 9 – 12 mm wide. Seeds to 3 × 2.5 mm .... 3

3. Leaf margin conspicuously crenate; apex rounded to acute. Stipules soon fugaceous. Cymes sessile. Seeds 2 × 2 mm ......................................................... 5. Gouania obtusifolia
   Leaf margin weakly serrate, subentire in proximal ⅓, apex usually attenuate. Stipules often persisting to anthesis. Cymes usually pedunculate. Seeds to 3 × 2.5 mm ......................................................... 4

4. Leaf surface glabrous to sparsely hairy abaxially when mature. Peduncles 1 – 4 mm long .... 1. Gouania fimбриata
   Leaf surface abundantly to very densely hairy abaxially when mature. Peduncles to 8 mm long ................................. 3. Gouania longipedunculata sp. nov.
Fig. 2. *Gouania longipedunculata*. A habit; B leaf margin, abaxial view; C detail of leaf serration; D detail of leaf indumentum, abaxial view; E detail of leaf surface, abaxial view; F stipule and inflorescence rachis with a bract; G stipule, adaxial view; H pedunculate cyme with flowers in bud and open; J flower, lateral view; K flower cut and opened flat, ovary part-sectioned; L petal enclosing stamen and isolated stamen, abaxial, side and ¾ view (left to right); M infructescence; N fruit, lateral view; P seed, ventral view. Scale bar: A = 5.3 cm; B = 1 cm; C, E = 0.9 mm; F, H = 3.7 mm; G, N = 5 mm; J, K = 1.6 mm; L = 1.3 mm; M = 3.7 cm; P = 2.6 mm. A, D, E, G, H – L from Ramos BS 39368; B, C, M – P from Sulit PNH 17083 (sheets 1 & 2); F from Sulit & Conklin PNH 17745. DRAWN BY ANDREW BROWN.
1. Gouania fimbriata Reiss. ex Lauterb. (Lauterbach 1922: 338). Type: Philippines, Luzon, Prov. Albay, 1836, Cuming 973 (lectotype, selected here: W!-image seen [W 0076908], isolecotype: K! [K001293409]).

Gouania domingensis sensu Blanco (1837: 196), non L.
Gouania microcarpa sensu Rolfe (1885: 211), pro parte, non DC.
Gouania microcarpa sensu Vidal (1886: 92), pro parte, non DC.
Gouania domingensis sensu Merr. (Merrill: 1918: 245) non L.
Gouania microcarpa sensu Merr. (Merrill: 1918: 245) non DC.
Gouania javanica sensu Merr. (Merrill: 1923: 525), pro parte, non Miq.
Gouania tiliaefolia sensu Merrill (Merrill: 1923: 526), pro parte, non Lam.

**Woody climber** with circinnate tendrils, to at least 3 m long; girth to at least 5 cm. *Indumentum* lacking on older branches to dense at distal end of branchlets; stem hairs 0.2 mm long, curved to tortuous, spreading to appressed-antrorse, mostly reddish-ferruginous, some whitish. Branchlets hollow in the centre, slender, subterete, smooth, with flush longitudinal striations. *Stipules* fugaceous although often persisting to anthesis, densely hairy, slightly asymmetric, lanceolate, acuminate, pinnatisect, 7 (– 9) mm long, medial undivided portion c. 1.3 mm wide, divisions narrow, c. 0.2 mm wide, to 3 mm long. *Leaves* discolorous, dark green adaxially, glossy adaxially when fresh, paler abaxially, blade wide ovate – ovate, 3.0 – 8.2 cm long, 2.0 – 6.0 cm wide, chartaceous, apex attenuate (– acuminate), base rounded to cordate, margins weakly serrate, usually 15 – 20 serrations on either side, margin subentire in proximal 1/3, serrations more densely crowded at leaf apex, margin with one protruding gland at the apex of each serration, glands crowned with hairs, leaf margin often ciliate; primary vein densely hairy abaxially, hairs mostly appressed, antrorse; secondary veins (5 – 6) 6 – 7 pairs, densely hairy abaxially, venation eucamptodromous, basal secondary veins reaching margin at c. 60% of leaf height, angle of divergence from primary vein 30 – 40°; outer secondary veins branching off basal secondary veins conspicuous, 4 – 5; lamina glabrous adaxially when leaf mature, including along veins; lamina glabrous to sparsely hairy abaxially when leaf mature, densely hairy when immature; domatia usually present in vein axils, a foliaceous appendage or tufts of hairs; petiole suberete, flattening distally, channelled, 8 – 21 mm long, densely hairy, with glands and foliaceous appendages, especially along edges of channel and near junction with leaf blade, similar to appendages found in domatia. *Inflorescence* of congested cymes arranged along racemiform thyrses, the distal thyrses often arranged in a panicle, thyrses to 25 cm, with c. 6 flowers in each cyme; bracts narrow-lanceolate, acuminate, 4 – 6 mm long, pinnatifid, densely hairy; cymes mostly pedunculate, peduncles 1 – 4 mm long, pedicels to 1.5 mm long, densely hairy. *Flower* odour unknown; *hypanthium* densely hairy adaxially, indumentum often paler than on *inflorescence* rachis, sepals triangular, c. 1.0 mm long, greenish-white when fresh, glabrous and keeled adaxially; petals clawed, c. 1.0 mm long, rugulose adaxially, colour when fresh unknown; stamen filaments flat, subulate, c. 0.7 mm long, anthers c. 0.2 mm long, enclosed by petals, nectary disk stellate, glabrous, smooth, diameter excluding lobes c. 1.5 mm, annulus glabrous, raised, tightly sheathing style, disk lobes narrow, tapering, apex often notched, usually appressed to sepal lobe when dry, 0.5 – 0.7 mm long (1/3 of sepal length); style arms 3, glabrous. *Fruit* green when fresh, fruit body glabrous to sparsely hairy, more densely near apex, drying darker brown than wings, c. 4.5 mm high, wings glabrous, c. 7 mm high, > 1.5 x height of fruit body, distance between highest points of wings 3 – 5 mm, mericarp width 7 – 9 mm, fruit body width 2 – 3 mm, 1/3 mericarp width. *Seeds* 3 x 2 mm, obovate, dorsally convex, ventrally concave, shiny brown.

**DISTRIBUTION.** Philippines: Luzon. Map 1.

**ADDITIONAL SPECIMENS EXAMINED.** PHILIPPINES. LUZON. **ABRA:** Poblacion Gangal, Municipality of Sallapadan 17°28.0’N 120°49.6’E, 250 m, 14 Nov. 1996, Fuentes & de la Rosa PPI 38586 (L!); Prov. of Abra, Jan. 1909, Ramos BS 7117 (L!, P!-image seen); BULACAN: Norzagaray, Jan. 1911, Foxworthy BS 122411 (E!); Mt Biak na Bato, San Miguel, 15°7.5’N 121°4.7’E, 12 Sept. 1994, Garcia et al. PPI 15057 (L!); CAGAYAN: Peñablanca, Quibal along the river [17°43’N 121°48’E], 20 Jan. 1994, Reynoso et al. PPI 11785 (BISH, L!); ILOCOS NORTE: Mt Pico de Loro, Brgy, Dampig, Pagudpod 14°12.9’N 120°38.8’E, 450 m, Garcia & Fernando PPI 25152 (K!, L!-image seen); Nagbasalan [Nagbagalan] [18°5’N 120°37’E], 2 Feb. 1955, Menos PNH 54153 (K!); LAGUNA: Cavinti, Feb. 1906, Loher 5825 (K!); ibid., 7 Feb. 1906, Loher 5836 (K!); MANILA: Manille, 1857, Barthe s.n. (L!); Novaliches, 1 Feb. 1890, Loher 328 (K!); San Juan del Monte, Oct. 1883, Loher ex Wellman s.n. (L!); Novaliches, 1 Feb. 1890, Loher 326 (K!), 1 Feb. 1890, Loher 327 (K!, P!-image seen); PAMPANGA: Arayat, March 1903, Merrill 1425 (K!, L!-image seen); QUEZON: Balara, 26 Jan. 1952, Layosa PNH 15015 (L!); San Francisco del Monte, 8 Dec. 1893, Loher 326 (K!, P!-image seen); RIZAL: Bosoboso [14°38’N 121°14’E], Dec. 1904, Ahern’s collector Forestry Bureau 2159 (K!, P!-image seen); ibid., 20 Jan. 1892, Loher 327 (K!, P!-image seen); Montalban [Rodriguez], Dec. 1906, Loher 5841 (K!); Antipolo, Jan. 1914, Merrill 250 (K!, P!-image seen); ibid., 8 Feb. 1953, Manayon 69 (L!); Rizal, Dec. 1909, Ramos 96 (U!-image seen); ibid., Jan. 1907, 1.593’E; ibid., 8 Dec. 1893, Loher 326 (K!, P!-image seen); ibid., 20 Jan. 1892, Loher 327 (K!, P!-image seen); Montalban [Rodriguez], Dec. 1906, Loher 5841 (K!); Antipolo, Jan. 1914, Merrill 250 (K!, P!-image seen); ibid., 8 Feb. 1953, Manayon 69 (L!); Rizal, Dec. 1909, Ramos 96 (U!-image seen); ibid., Jan. 1907,

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Map 1. Distribution of Gouania fimbriata (●).
**Ramos BS 1749** (K!, WRSL!-image seen); Antipolo, Araneta, 25 Jan. 1953, Viola 34 (L!).

**HABITAT.** Luzon rain forests; alt. 0 – 450 m.

**CONSERVATION STATUS.** *Gouania fimbriata* was collected in many parts of Luzon, from Albay in the south-east to Ilocos Norte in the north-west, including several collections in the 1990s from various parts of the island (Abra, Bulacan, Cagayan, Ilocos Norte). The species has been observed in less threatened parts of the island, along the Central Cordillera and Southern Sierra Madre. The EOO of *G. fimbriata* is of over 85,000 km² and it is assessed here as of Least Concern (LC). However, most collections available were made before World War II, including many made near Manila where the species could be severely threatened. Populations could also be threatened in the Central Luzon Plains and Cagayan River Valley, which have experienced extensive clearing for logging and agricultural use (Lamoreux 2001).

**PHENOLOGY.** Mostly collected in flower from Dec. to Feb., but also Sept. and Oct.; collected in fruit (mature, splitting) from Jan. to March and Oct.

**VERNACULAR NAMES.** Lituan (Tagalog, fide Viola 34); Sitiran or Fitiran (Tagalog, fide Menayan 69).

**NOTES.** *Gouania fimbriata* is recognised by its deeply pinnatifid stipules and bracts and by the stipules often persisting at anthesis on herbarium specimens. The leaf lamina is glabrous to sparsely hairy abaxially when mature and cymes are borne on peduncles 1 – 4 mm long. The other known species of the genus found in the Philippines are *G. nematostachya*, which has a rugose nectar disk with no narrow lobes opposite the sepals, and *G. longipedunculata*, which has abundantly to densely hairy mature leaves and peduncles to 8 mm long (Table 1).

Like *Gouania nematostachya*, this species was published by Lauterbach (1922) based on a manuscript name and notes by Reissek with no clear indication of type specimens and has hardly appeared in the taxonomic literature since (see Notes for *G. nematostachya*).

In his description of *Gouania domingensis*, Blanco (1837) specified that narrow disk lobes are present opposite the sepal lobes, which rules out that he was referring to *G. nematostachya*. In addition, he wrote that the leaves are somewhat hairy, unlike the densely hairy leaves of *G. longipedunculata*. Blanco observed the plant in Angat on Luzon where *G. longipedunculata* is not known to occur. It is therefore most likely that *domingensis* sensu Blanco is a synonym of *G. fimbriata*. Merrill (1918: 245) selected Merrill 250 — a *G. fimbriata* specimen — as illustrative of Blanco’s *G. domingensis*. Merrill (loc. cit.) also reduced *G. domingensis* sensu Blanco to a synonym of *G. microcarpa*, a name commonly used to designate *Gouania* specimens from the Philippines despite being a species restricted to India and Sri Lanka (also see Notes for *G. nematostachya*).

The lectotype of *Gouania fimbriata* selected here was collected in Albay according to the specimen’s label. However, the collection location may have been Pangasinan according to Merrill (1915: 183).

2. *Gouania leptostachya* DC. (de Candolle 1825: 40). Type: India, Calcutta, cultivated in Hort. Bot. Calcutta, Oct. 1815, Wallich s.n. (lectotype, selected here: G-DC!-image seen [G00476307]).

**Naegelia dubia** Zoll. & Moritz (Moritzi 1846: 20) Type: Indonesia, Java, Jawa Barat, Prov. Bandong [Bandung], bei Tjikoya [Cikuya], March 1843, Zollinger 1183 (lectotype, selected here: PI-image seen [P06788276], isoselectotype: A!-image seen [A 00051366]).

*Gouania tiliaefolia* sensu Roxb. (Roxburgh 1795: 68), non Lam.

*Gouania tiliaefolia* sensu Blume (1826: 1152), non Lam.

Woody climber with cincinnate tendrils, to at least 20 m long; girth to 15 cm. *Indumentum* lacking on branchlets except on rachis of racemiform thyrses. Branchlets hollow in the centre, slender, suberete, often flattened distally by collapsing inside hollow section, smooth, with flush longitudinal striations. *Stipules* soon fugaceous, glabrous except at apex and along margins, asymmetric, upper lobe lanceolate, acuminate, c. 4 mm long, entire, lower lobe lanceolate, acuminate, diverging at c. 120° angle from the upper lobe, c. 1.0 mm long. *Leaves* discolorous, dark green adaxially, paler abaxially, blade (narrow-)ovate, 4.5 – 10.0 cm long, 2.5 – 6.2 cm wide, chartaceous, shiny when fresh, apex acuminate, base rounded to cordate, margins crenate, up to 30 serrations on either side, all along leaf margin, quite evenly spaced, serrations with glands submarginal, often in a small depression, leaf margin glabrous; primary vein sparsely to abundantly hairy, hairs mostly appressed, antrorse; secondary veins 4 – 5 pairs, sparsely to abundantly hairy, venation eucamptodromous, basal secondary veins reaching margin at c. 60 % of leaf height, angle of divergence from primary vein 35 – 50°; outer secondary veins branching off basal secondary veins often conspicuous, 3 – 5; lamina glabrous to very sparsely hairy adaxially and abaxially; domatia lacking; petiole suberete, channelled, often laterally compressed, 7 – 29 mm long, glabrous except along edges of channel, with glands and foliaceous appendages, especially near junction with leaf blade. *Inflorescence* of congested cymes arranged along racemiform thyrses, the distal thyrses often arranged in a panicle, thyrses to 35 cm, with c. 5 flowers in each cyme; bracts narrow-lanceolate, acuminate, c. 2.5 mm long, entire, glabrous; cymes sessile, pedicels to 2.5 mm long, sparsely hairy. *Flowers* scented; hypanthium adaxially sparsely hairy at base, more densely distally; sepals triangular,
Table 1. Morphological comparison between species of Gouania in the Philippines.

|          | G. fimbriata | G. longipesculata | G. nematostachya |
|----------|--------------|-------------------|------------------|
| Stipules | often persisting to anthesis          | pinnatisect       | soon fugaceous    |
|          | 7 (~ 9) mm long                         | 7 (~ 9) mm long   | entire            |
| Leaves   | weakly serrate, usually 15 – 20        | weakly serrate,   | finely and densely |
|          | serrations on either side               | usually 20        | serrate, usually  |
|          | margin subentire in proximal 1/3,       | 15 – 20 serrations| 40 – 50 serrations|
|          | serrations more densely crowded at leaf apex | in proximal 1/3, | on either side     |
|          |                                           | more densely      | serration spacing |
|          |                                           | crowded at leaf apex | 2 regular along margin |
|          |                                           |                   |                  |
| Domatia  | usually present in vein axes            | usually present in | absent            |
|          |                                          | vein axes         |                  |
|          |                                           | (5 –) 6 – 7 pairs |                  |
|          | Secondary veins                         | abundantly to densely hairy |                  |
|          | Abaxial surface                         | sparsely hairy    |                  |
|          |                                            |                   |                  |
| Bracts   | 4 – 6 mm long                            | 2 – 5 mm long     | c. 2.5 mm long    |
|          | pinnatisect                              | entire to pinnatisect |                  |
|          |                                            |                   |                  |
| Peduncle length | up to 4 mm                             | up to 8 mm         | undeveloped      |
| Pedicel length | up to 1.5 mm                            | up to 3 mm         |                  |
| Body height       | c. 4.5 mm                               | c. 4.5 mm          |                  |
| Wing length       | c. 7 mm                                 | c. 7 mm            |                  |
| Mericarp width    | 7 – 9 mm                                | 6 – 8 mm           |                  |
| Seed size        | 3 × 2 mm                                | 2 × 2.5 mm         |                  |
|          |                                            |                   |                  |
| DISTRIBUTION. In Sundaland: Malay Peninsula, Sumatra and Java. Also found in the Andaman and Nicobar Islands, Bhutan, China, India, Laos, Myanmar, Nepal, Thailand and Vietnam. Map 2 (Sundaland occurrences only).

ADDITIONAL SPECIMENS EXAMINED. INDONESIA. JAVA. s.a., Blume s.n. (K!); s.a., Horsfield s.n.; s.a., Spanoghe s.n. (K!); s.a., c.c. (K! [K001293563]); JAWA BARAT: Preanger, Bantardawa, Bandjar [Banjar] [7°23′N 108°34′E], 28 Dec. 1910, Backer 1911 (L!); Res. Batavia, Pondok Salam (bij Poerwakarta [Purwakarta]) [6°37′N 107°30′E], 300 m, 28 July 1920, Bakhui zen van den Brink Sr 4873 (K!, L!-image seen). SUMATRA, RIAU: c. 50 m, 4 Aug. 1988, Project Soma EM17 (E!); SUMATERA UTARA: Medan Southward along the Petani, 30 m, 25 June 1928, Lörzing 13270 (K!, L!-image seen); MALAYASIA. PENINSULAR MALAYSIA. JOHOR: Pulau Pemanggil, Latiff & Zainudin 1133 (UKMB n.v.); PAHANG: Raub track, May 1903, Machado 11604 (K!); PERAK: Larut [Taiping], 200 ft [50 m], Aug. 1884, King’s collector 6420 (E!-image seen); s.a., Scottechini 1158 (L!, P!-image seen); s.a. Scottechini s.n. (K!); Kampong Kota [Kota] 14°28′N 100°47′E, July 1889, Wray Jr 3324 (PI-image seen); ibid., Feb. 1889, Wray Jr 3346 (L!); MYANMAR. TANINTHARYI REGION: Kyakai [10°41′N 98°27′E], 28 Sept. 1932, Parkinson 15131 (NY!-image seen); THAILAND. CHUMPHON: Chumpawn, c. 50 m, 27 Jan. 1927, Kerr 11654 (K!, L!-image seen); Sawee, Khao Khai, Road from Sawee to La-Un, 200 m, 26 Dec. 2006, Poona et al. 6685 (E!, GH!, L!-image seen); RANONG: Ban Na, Kapur [Kapoe], c. 50 m, 8 Dec. 1976, Santisuk 789 (K!); Ranawng, 3 Jan. 1929, Kerr 16503 (K!); SATUN: Kuan Po [Kuan Pho] [6°45′N 100°1′E], c. 20 m, Jan. 1928, Kerr 13830 (K!, L!-image seen); La-Ngu, c. 5 m, 8 Jan. 1928, Kerr 13944 (K!, L!-image seen); Khaun Kradaon [Khuan Kalong], 7 Dec. 1986, Ni yom dham 1292 (L!); SONGKHLA: Kopah Ban Krap, 12 Dec. 1917, Haniff & Nur 2911 (K!); SURAT THANI: Phano, Khao Sok. Km 99 trail from the road towards the reservoir, 8°54′54″N 98°36′11″E, 200 m, 2006, Middleton et al. 4019 (E!-image seen, L!-image seen);
TRANG: Mueang Trang, 10 m, Oct. 1915, Vanpruk 766 (K!); YALA: Than To waterfall, 45 km S of Yala and surroundings, 6°12’N 101°10’E, 100 – 200 m, 27 Nov. 1990, Larsen et al. 41762 (P!-image seen); Ban Nang Sata [Bannang Sata], 6 Dec. 1986, Niomdahm 1292 (E!-image seen, K!); Bannang Sata, 23 Nov. 1961, Suwanakoset 1714 (K!, L!).

HABITAT. Tropical moist broadleaf forests, specifically Tenasserim-South Thailand semi-evergreen rain forests, Peninsular Malaysian lowland rain forests, Sumatran lowland rain forests and Western Java lowland rain forests; alt. 0 – 200 m. Habitat for regions outside Sundaland not indicated here.

CONSERVATION STATUS. With a broad distribution from Uttar Pradesh and Nepal, across Assam and Indo-China to Java, Gouania leptostachya is not threatened. In Sundaland, its EOO is over 450,000 km² and is assessed here as of Least Concern (LC). However, only two Sundaland specimens available for study were collected since 1990. Both were collected in Thailand. The status of the species in Malaysia and Indonesia is very uncertain. No recent records for either country were found in GBIF (2018).

PHENOLOGY. Collected in flower in Jan. – March, Aug., Oct and Nov.; collected in fruit (mature, splitting) in Jan., May – July, Sept. and Dec.

VERNACULAR NAMES. Am dap tai (Chumphon and Ranong, fide Kerr 11654 and Kerr 16503); Areuj sahagi (Sunda, Heyne 1917); Areuj s r r p (Sunda, ibid.); Aroij-sirareb (Sundanese, Filet 1876); Garangan (Java, ibid.); Phi-khum (Myanmar, Kress et al. 2003); Saw-sam-daw-ku (Tanintharyi, fide Parkinson 15131); S r r p (Java, Heyne 1917); Si Chan (Satun, fide Kerr 13830); Sowagi-aroij (Sundanese, Filet 1876); Tayaw-nyo-new (Myanmar, Kress et al. 2003).

USES. Finely crushed roots, stems and leaves were used externally against headaches and as a treatment for scabies; shampoo made from the bark and applied to the scalp was used to kill parasites (Heyne 1922).

NOTES. Gouania leptostachya is the only species in Sundaland to have stipules with a basal lobule
pointing sideways, glabrous bracts, 4–5 pairs of secondary veins, marginal glands sunken inside margin serrations, a fruit body c. 8 mm high and that has the same colour as the wings; mericarps 10–16 mm wide and seeds 4 × 4 mm. All other species have unlobed stipules (entire to pinnatifid), hairy bracts, usually at least 5 pairs of secondary veins, protruding marginal glands, a fruit body to 5 mm high and that is usually darker than the wings, mericarps to 12 mm wide and seeds to 3 × 2.5 mm (Table 2).

*Gouania retinaria** DC. is listed as a possible synonym of *G. leptostachya* by Suessenguth (1953). According to Buerki et al. (2011), *G. retinaria* is instead a synonym of *G. scandens* (Gaertn.) R.B.Drumm., which occurs in Mauritius, Réunion and Madagascar. *Gouania leptostachya* material from Sundaland was identified as *G. liliifolia* [*G. liliifolia* Lam.] by Blume (1826), which is also synonym of *G. scandens* according to Buerki et al. (*loc. cit.*).

A. P. de Candolle cited material from the botanical garden of Calcutta in his protologue of *Gouania leptostachya*. The sheets found in G-DC include a specimen from Hort. Bot. Calcutt. designated here as the lectotype. Additional material of *G. leptostachya* from the botanical garden of Calcutta listed in the Wallich Catalogue (Catalogue no 4270.E) is present in herbaria (e.g. G!-image seen [G00378049], K-W! [K001038588], E!-image seen [E00777941]). Because De Candolle received material from Calcutta before Wallich started sorting the East India Company specimens, it is uncertain as to whether these specimens are duplicates of the type and they are not listed here as islectotypes. The lectotype for *Nagelia dubia* is selected here at P where Java collections by Zollinger and received by Moritzi are held according to Staaleu & Cowan (1981: 589).

Several authors have described *Gouania leptostachya* flowers as polygamous (Hooker 1862; Kurz 1877; Brandis 1906; Gamble 1935; Chen & Schirarend 2007). All examined flowers were perfect, although style branches were undeveloped in some flowers (D. Cahen pers. obs.). Whether the flowers were functionally male by abortion could not be conclusively observed in herbarium specimens.

3. *Gouania longipedunculata* Cahen, Sterrn & Ulteridge **sp. nov.** Type: Philippines, Mindoro, Mt Calavite [13°28′N 120°23′E], April 1921, Ramos BS 39368 (holotype K! [K001293410]).

http://www.ipni.org/urn:lsid:ipni.org:names:77204803-1

*Woody climber* with cincinate tendrils, to at least 2 m long; girth unknown. *Indumentum* lacking on older branches to dense at distal end of branchlets; stem hairs 0.2 mm long, curled to tortuous, spreading to appressed-antrorse, mostly reddish-ferruginous, some whitish. Branchlets hollow in the centre, slender, suberetete, smooth, with flush longitudinal striations. *Stipules* soon fugaceous, densely hairy, slightly asymmetric, lanceolate, acuminate, c. 1.5 mm wide, 7 (~9) mm long, pinnatisect, divisions narrow, c. 0.2 mm wide, c. 2 mm long. *Leaves* discolorous, dark green adaxially, paler abaxially, blade wide ovate (~ovate), 3.2–9.5 cm long, 2.2–7.4 cm wide, chartaceous, apex attenuate, base rounded to cordate, margins weakly serrate, usually 15–20 serrations on either side, margin subentire in proximal 1/3, serrations gradually getting closer to each other towards leaf apex, margin with one protruding gland at the apex of each serration, glands crowned with hairs, leaf margin often ciliate; primary and secondary veins glabrous to densely hairy on primary and secondary veins adaxially, abundantly to densely hairy abaxially, hairs mostly appressed, antrorse; secondary veins (5–6) 6–7 (~8) pairs, venation eucamptodromous, basal secondary veins reaching margin at c. 60% of leaf height, angle of divergence from primary vein 30–40°; outer secondary veins branching off basal secondary veins conspicuous, 4–5; lamina sparsely to abundantly hairy adaxially, sparsely to densely hairy abaxially; domatia usually present in vein axils, a foliaceous appendage or tufts of hairs; petiole suberetete, flattening distally, channelled, 8–21 mm long, densely hairy, with glands and foliaceous appendages, especially along edges of channel and near junction with leaf blade, similar to appendages found in domatia. *Inflorescence* of congested cymes arranged along racemiform thyrses, the distal thyrses often arranged in a panicle, thyrses to 30 cm, with c. 6 flowers in each cyme; bracts lanceolate, acuminate, 2–5 mm long, entire to pinnatifid, densely hairy; cymes pedunculate, peduncles 1–8 mm long, pedicels to 3 mm long, densely hairy. *Flower* odour unknown; hypanthium densely hairy adaxially, indumentum usually same colour as on inflorescence rachis, sometimes paler, sepals triangular, c. 1.0 mm long, white when fresh, glabrous and keeled adaxially; petals clawed, c. 1.0 mm long, rugulose adaxially, colour when fresh unknown; stamen filaments flat, subulate, c. 0.7 mm long, anthers c. 0.2 mm long, enclosed by petals, nectary disk stellate, glabrous, smooth, diameter excluding lobes c. 1.5 mm, annulus glabrous, raised, tightly sheathing style, disk lobes narrow, tapering, apex often notched, usually appressed to sepal lobe when dry, 0.5–0.7 mm long (2/5 of sepal length); style arms 3, glabrous. *Fruit* green when fresh, fruit body glabrous to sparsely hairy, more densely near apex, drying darker brown than wings, c. 4.5 mm high, wings glabrous, c. 7 mm high, > 1.5 × height of fruit body, distance between highest points of wings 3–4 mm, mericarp width 6–8 mm, fruit body width 2–3 mm, c. 1/3 mericarp width. *Seeds* 3
× 2.5 mm. obovate, dorsally convex, ventrally concave, shiny brown. Fig. 2.

RECOGNITION. Most like *Gouania fimbriata* in having narrow disk lobes opposite the sepals, deeply divided stipules often persistent to anthesis and pedunculate cymes, but differs by its abundantly to densely hairy leaves and longer peduncles to 8 mm long.

**DISTRIBUTION.** Philippines: Mindanao, Mindoro, Negros and Visayas. Map 3.

**ADDITIONAL SPECIMENS EXAMINED. PHILIPPINES. MINDANAO:** Bukidnon, Musuan [7°52'N 125°4'E], 31 Dec. 1952, Cid 60 (L!); Davao, Todaya (Mt Apo), July 1909, Elmer 11106 (E-image seen, K!, L!-image seen); Zamboanga, 10 Feb. 1904, Hallier 4625 (L!); Abra de Ilog, Jan. 1951, Sulit & Conklin PNH 17745 (K!); Bo. Manaul, Mansalay, Dec. 1952, Sulit PNH 17083 (K-2 sheets!); **NEGROS:** Province de Negros Oriental, Dumaguete (Cuernos Mts.) [9°18'N 123°17'E], June 1908, Elmer 10301 (E-image seen, K!, L!-image seen); **VISAYAS:** Cebu, Panilipan, Catmon, 10°44.0'N 124°00.8'E, 670 m, 12 June 1997, Gaerlan & Reynoso PPI 20316 (K!, L!-image seen).

**HABITAT.** Greater Negros-Panay rain forests, Mindanao-Eastern Visayas rain forests, Mindoro rain forests; alt. to at least 670 m.

**CONSERVATION STATUS.** *Gouania longipedunculata* was collected on several islands of the Philippines and has an EOO of over 185,000 km². It is assessed here as of Least Concern (LC), however, except for Gaerlan & Reynoso PPI 20316 collected in Cebu in 1997, all available specimens were found before the 1960s and may be Near Threatened especially as much of the forest of Mindanao (Morrison 2001b), Negros and Visayas (Morrison 2001a) has been cleared, and Mindoro is one of the most severely deforested islands of the Philippines (Morrison 2001c). However, some collections are from protected areas: Elmer 11106 was collected near Mt Apo, which is currently within a Natural Park (IUCN Category II), but over a century ago. Similarly, Hallier 4625 was collected in Zamboanga, where there currently is a protected area (Pasonanca Natural Park, IUCN Category II), but in 1904.

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### Table 2. Morphological comparison between species of *Gouania* in Sundaland.

|                | *G. leptostachya*          | *G. nematostachya*         | *G. obtusifolia*          |
|----------------|---------------------------|---------------------------|--------------------------|
| **Stipules**   | lobed                     | unlobed                   | unlobed                  |
|                | upper lobe entire         | entire                    | entire to pinnatifid     |
|                | c. 4 mm long              | c. 2.5 mm long            | c. 6 mm long             |
| **Leaves**     |                           |                           |                          |
| **Apex**       | acuminatum                | acuminatum                | roudned to acute         |
| **Margin**     | crenate, up to 30 serrations on either side | densely serrate, 40 – 50 serrations on either side | crenate-serrate, 15 – 20 serrations on either side |
|                | glands sunken             | glands protruding         | glands protruding in vein axils |
| **Domatia**    | absent                    | absent                    | (4–) 5 pairs             |
| **Secondary veins** | 4 – 5 pairs               | 4 – 5 pairs               | 5 – 6 (-) pairs          |
| **Surface (abaxial)** | glabrous                 | glabrous                  | hairy                    |
| **Inflorescence** | up to 35 cm              | up to 35 cm              | up to 25 cm              |
| **Braacts**    | c. 2.5 mm long            | c. 2.5 mm long            | c. 4 mm long             |
|                | entire                    | entire                    | entire to pinnatifid     |
|                | glabrous                  | densely hairy             | densely hairy            |
| **Flower**     |                           |                           |                          |
| **Disk diameter** | c. 1.8 mm                | c. 1.6 mm                | c. 1.5 mm                |
| **Disk surface** | smooth to rugulose       | rugose                    | smooth                   |
| **Disk lobes** | with parallel sides       | absent                    | tapering                 |
|                | ¼ sepal length            | usually bending away from sepals | ½ sepal length usually appressed to sepals |
| **Disk annulus** | barely raised             | barely raised             | raised                   |
|                | loosely sheathing style   | loosely sheathing style   | tightly sheathing style  |
| **Fruit**      |                           |                           |                          |
| **Pedicel**    | to 2.5 mm long            | to 2 mm long              | to 1 mm long             |
| **Body**       | sparsely hairy            | densely hairy             | densely hairy            |
|                | c. 8 mm high              | c. 5 mm high              | c. 4 mm high             |
|                | same colour as wings      | darker than wings         | darker than wings        |
|                | glabrous                  | glabrous to sparsely hairy| sparsely hairy           |
| **Wing height** | 9 – 12 mm                | 6 – 7 mm                  | 7 – 10 mm                |
| **Mericarp width** | 10 – 16 mm               | 9 – 11 mm                 | 9 – 12 mm                |
| **Seed size**  | 4 × 4 mm                  | 3 × 2 mm                  | 2 × 2 mm                 |
|                |                           |                           |                          |
Map 3. Distribution of Gouania longipedunculata (●).
PHENOLOGY. Collected in flower in April – July and Dec.;
collected in fruit (mature, splitting) in Dec. – Feb.
ETYMOLOGY. The specific epithet refers to the peduncles
to 8 mm long, which are the longest of any known
Gouania species of Malesia.
NOTES. Gouania longipedunculata is unique in the genus
with the following combination of characters: peduncles
to 8 mm long, flower disks with five narrow lobes
opposite the sepals and leaves abundantly to very
densely hairy abaxially when mature.
All specimens of this species were collected outside
of Luzon, in various islands and habitats. There is
significant variability in how deeply the bracts are
divided and how long the peduncles are. This
contrasts with the more morphologically consistent
Luzonian Gouania fimbriata. All the specimens examin-
ed did however share the character of abundantly
to densely hairy mature leaves and peduncles mostly
longer than the maximum of 4 mm for G. fimbriata
(Table 1). This suggests that G. longipedunculata could
form a group distinct from G. fimbriata but possibly
comprising of morphological subsets.

Cuming 1623 is filed as Gouania syringaefolia at W, an
unpublished name presumably used by Reisse for this
material, although Lauterbach (1922) did not men-
tion such a species. The label on the herbarium
specimen at K indicates that the specimen was
collected in Mindanao, but it would have been
collected in Mindoro according Merrill (1915: 183).
Specimens of Gouania longipedunculata were origi-
nally identified as G. microcarpa less often than
specimens of G. fimbriata and G. nematostachya. Instead,
they were more often identified as G. tiliaefolia [= G.
tiliaefolia Lam.], a species restricted to islands of
the Western Indian Ocean (see G. leptostachya notes).

4. Gouania nematostachya Reiss. ex Lauterb. (Lauterbach 1922: 339). Type: Philippines, Luzon,
Batangas, 1837, Cuming 1578 (lectotype, selected here:
W!-image seen [W 0076905], isolecotypes: K!
[K001293408], L!-image seen [L.2331975], P!-images
seen [P06788291 & P06788292], WRSL!-image seen).
Gouania microcarpa DC. var. subglabra Elmer (1915:
2801) synon. nov. Type: Philippines, Mindanao,
District of Davao, Todaya (Mt Apo) [6°58’N
125°21’E], 3750 ft (1150 m), Aug. 1909, Elmer
11308 (lectotype, selected here: AI-image seen
[00051343], isolecotypes: E!-image seen [E
00718589], K!, L!-image seen [L.0484850], NY-
image seen [233278], US!-image seen [00094524]).
Gouania javanica sensu Merr. (Merrill: 1923: 525), pro
parte, non Miq.
Gouania tiliaefolia sensu Merr. (Merrill: 1923: 526), pro
parte, non Lam.
Woody climber with cincinniate tendrils, to 30 m long;
girth to at least 6 cm. Indumentum lacking on older
branches to dense at distal end of branchlets; stem
hairs 0.2 mm long, curved to tortuous, appressed to
spreading, cream to ferruginous. Branchlets hollow in
the centre, slender, subterete, smooth, with flat
longitudinal striations. Stipules soon fugacious,
unlobed, entire, narrowly triangular, c. 2.5 mm long,
densely hairy. Leaves: discolorous, dark green
adaxially, paler abaxially, blade narrow ovate – ovate,
4.0 – 8.5 cm long, 2.0 – 4.9 cm wide, chartaceous, apex
acuminata, base obtuse to cordate, cuneate to round-
ed in distal leaves, margins densely, finely serrate,
serration spacing regular, usually 40 – 50 serrations on
either side, all along leaf margin, with one protruding
gland at the apex of each serration, glands crowned
with hairs, leaf margin often ciliate; primary vein
densely hairy abaxially, hairs mostly appressed,
antorse; secondary veins (4 –) 5 – 6 pairs, densely
hairy abaxially, venation eucamptodromous, basal
secondary veins reaching margin at c. 60% of leaf
height, angle of divergence from primary vein 30 –
50°; outer secondary veins branching off basal sec-
ondary veins conspicuous, (3 –) 4 (– 5); lamina
sparingly hairy adaxially, more densely along primary
and secondary veins; indumentum sparse to abundant
abaxially; domatia lacking; petiole subterete, flattening
distally, channelled, 7 – 24 mm long, abundant to
densely hairy, with glands and foliaceous appendages,
especially along edges of channel and near junction
with leaf blade. Inflorescence of congested cymes
arranged along racemiform thysres, the distal thrysres
often arranged in a panicle, thrysres to 35 cm, with c. 5
flowers in each cyme; bracts narrow-lanceolate, acu-
minate, c. 2.5 mm long, entire, densely hairy; cymes
sessile, pedicels to 2 mm long, densely hairy. Flowers
scent unknown; hypanthium densely hairy adaxially,
sepals triangular, c. 1.0 mm long, greenish-white when
fresh, glabrous and keeled adaxially; petals clawed, c.
1.0 mm long, smooth adaxially, whitish when fresh;
stamen filaments flat, subulate, c. 0.9 mm long,
anthers c. 0.2 mm long, enclosed by petals, nectar
disk 5-angled, glabrous, rugose, diameter c. 1.6 mm,
forming a pentagon in outline except notches where
petals are inserted to hypanthium, sides truncate to
emarginate, annulus glabrous, slightly raised, loosely
sheathing style; style arms 3, glabrous. Fruit green when
fresh, fruit body glabrous to sparsely hairy, more densely
nearly apex, drying darker brown than wings, c. 5 mm high,
wings glabrous, 6 – 7 mm high, c. 1.2 × height of fruit body,
distance between highest points of wings c. 7 mm, mericarp
width 9 – 11 mm, fruit body width c. 3 mm, 1/3 mericarp
width. Seeds c. 3 × 2 mm, elliptic-ovate, dorsally convex, ventrally concave, shiny brown.

**DISTRIBUTION.** Indonesia: Borneo and Sulawesi; Malaysia: Sabah; Philippines: Luzon, Mindanao, Polillo and Samar. Map 4.

**ADDITIONAL SPECIMENS EXAMINED. INDONESIA. BORNEO.** SOUTH KALIMANTAN: Doesoen [Barito R.], 1836 [according to van Steenis-Kruseman 2017], Korthals s.n. (L-4 sheets!), NORTH KALIMANTAN: B. S. Toelit [Bukit Sungai Tulit], Sept. 1912, Amdjah 667 (L!); SULAWESI. CENTRAL SULAWESI: Sopu valley c. 80 km SSE of Palu, 1°16’S 120°16’E, 1000 m, 3 May 1979, de Vogel et al. 5184 (K!, L!-image seen); ibid., 1°16’S 120°18’E, 1000 m, 26 May 1979, de Vogel et al. 5557 (K-2 sheets!, L!-image seen); NORTH SULAWESI: 220 km W of Manado, km 50 inland from Pangi on Sungai Ilarga, 0°41’N 123°40’E, 500 m, 3 March 1990, Burley et al. 3622 (GH!, K!); Minahasa, 50 m, 25 Feb. 1895, Koorders 16943L (L!); Prov. Minahassa, 500 m, 25 Jan. 1895, Koorders 18451 (L!); Bolaang Mongondow: Gunung Ambang Nature Reserve, Danau Mooat area, 0°44’N 124°27’E, 1000 m, 14 April 1985, de Vogel & Vermeulen 7170 (K!, L!-image seen); Dumoga – Bone proposed N.P.
Doloduo, Tumokang, Lama [0°35’N 123°55’E], 270 m, 20 Sept. 1984, Whitmore & Sidiyasa TCW 3467 (K!, L!-image seen); SOUTH SULAWESI: Kab. Luwu [East Luwu Regency], Ds. Teromu [Teromu Desa], Faruhumpenai, 350 m, 19 Feb. 1986, Wardi 79 (L!);

MALAYSIA. MALAYSIAN BORNEO. SABAH. Upper Kinabalu, 6000 – 13500 ft [1800 – 4100 m], 1 Sept. 1939, Clemens 26265 (K!, L!-image seen); BELURAN: Sg. Ansuan, Meliaw, 100 m, 13 Aug. 2003, Diwod & Markus SAN 136538 (K!, L!-image seen); KENINGAU: Crocker range mil. 16, Kimanis road, 18 Aug. 1986, Krispinus SAN 138804 (K!, L!-image seen); Miles 84.5 on path from Tenom to Ranau (200 miles SW of Kerakot village), 2400 ft [750 m], 27 Aug. 1954, Wood & Wyatt-Smith SAN A4435 (GH!, L!);

PHILIPPINES [5°21’N 117°3’E], 9 July 1993, Bakia 181414 (K!, L!-image seen, P!-image seen); Faruhumpenai, 350 m, 19 Feb. 1986, Wardi 79 (L!);

SOUTHERN PHILIPPINES. CAMARINES NORTE: Busch hinter De Freine, Daet [14°6’N 122°55’E], 11 June 1903, Hallier s.n. (L!);

Camarines Sur according to van Steenis-Kruseman 2017, 1837, Cuming 1478 (E!-image seen); IFUGAO: Kiangan, Lake Ambuaya [16°47’N 121°7’E], 14 Aug. 1992, Reynoso et al. PPI 7268 (BISH, K!, L!-image seen); LAGUNA, Los Barios (Mt Maquiling), June – July 1917, Elmer 181414 (K!, L!-image seen, P!-image seen, U!-image seen); POLILLO: Island of Polillo, Aug. 1909, Robinson BS 9069 (E!); QUEZON: Tagkawayanan, Brgy. Bagong Silang [14°3’N 122°25’E], 10 Sept. 1993, Barbon et al. PPI 12224 (BISH, L!); Tayabas, 1837, Cuming 828 (E!-image seen, K!, L!-image seen, W!-image seen); Tayabas, Atimonan, Aug. – Sept. 1904, Whitford 651 (K!, P!-image seen); SORSOGON: Irosin (Mt Bulusan), Oct. 1915, Elmer 14479 (K!, L!-image seen, P!-image seen); Sorsogon Prov., July 1947, Sulit PNH 2632 (L!);

MINDANAO. AGUSAN DEL NORTE: Cabadbaran (Mt Urdaneta), Aug. 1912, Elmer 13552 (E!-image seen, K!, L!-image seen, P!-image seen, WRSLS!-image seen); DAVAO DEL SUR: Todaya (Mt Apo), Aug. 1909, Elmer 11308 (E!-image seen, K!, L!-image seen, NY!-image seen); SAMAR: Ins. Samar, s.a., Jagor 932 (M!-image seen, WRSLS!-image seen).

HABITAT. Borneo mountain lowland and montane rain forests, Luzon rain forests, Mindanao-Eastern Visayas rain forests, Mindanao montane rain forests, Sulawesi rain forests; alt. 100 – 1800 m.

CONSERVATION STATUS. Gouania nematostachya is widely distributed, with occurrences in Borneo, Sulawesi and several of the Philippine islands. Over 20 specimens were collected since 1979, from several locations throughout Sabah, and North Sulawesi and Luzon. It is also likely to be less exposed to extinction threats than other Gouania species because of its capacity to grow at higher elevations. With an EOO of over 1,600,000 km², it is assessed here as of Least Concern (LC), despite extensive clearing for logging and agricultural use in many of its habitats.

PHENOLOGY. Collected in flower in Jan. – May (Sulawesi) and June – Sept. (Borneo, Philippines); collected in fruit (mature, splitting) in May (Sulawesi), July – Aug. (Borneo) and Aug. – Oct. (Philippines).

VERNACULAR NAMES. Lembukud (Sabah, fide Bakia 217); Solo-solo (Bagobo, fide Elmer 11308). NOTES. Gouania nematostachya is the only Gouania species in the region with nectar disks lacking narrow lobes opposite the sepals, and is unique in having consistently rugose (wrinkled) nectar disks; it is also recognised by having leaves with usually 40 – 50 fine serrations along the margin. Gouania nematostachya is the only species of the genus known to occur in Borneo. The only other known species of Gouania in the Philippines are G. fimbriata and G. longipetiolulata, which have narrow disk lobes opposite the sepals and a leaf margin with usually 15 – 20 serrations on each side. Mature fruits of G. nematostachya have a smaller height to width ratio than other species of this region (Table 1). Leaves of this species are acuminate, a character that can also be observed in G. leptostachya, which is not known to grow sympatrically with G. nematostachya and is easily distinguished by its glabrous leaf surface except along veins, fewer secondary veins and crenate leaves with sunken marginal glands (Table 2).

This species and Gouania fimbriata were published by Lauterbach (1922) based on manuscript names and notes by Reissek with no designation of a type specimen. Adherence to the type principle did not become mandatory until 1958, and because a diagnosis is offered for both species, they were validly published. Neither G. fimbriata nor G. nematostachya...
seem to have appeared in the taxonomic literature since Suessengueth’s monographic studies of Rhamnaceae (1953). In addition, no other known herbarium specimens besides those examined by Reissek and Lauterbach had hitherto been identified as belonging to either species.

Cuming 1578 held in W is selected here as the lectotype because it was determined as *Gouania nematostachya* by both Reissek and Lauterbach, has some open flowers and duplicates are available in several herbaria. The collection year (1837) is not indicated on the label and was inferred using the *Cyclopædia of Malesian Collectors* (van Steenis-Kruseman 2017).

About half of the *Gouania nematostachya* specimens from Borneo and the Philippines were determined as *Gouania microcarpa* DC. (the rest mostly determined as *Gouania sp.*). Both species have nectar disks without narrow lobes opposite the sepals, but *G. microcarpa* has a densely hairy nectar disk and narrower, subentire leaves that are nearly glabrous except along veins. It is only known to occur in India and Sri Lanka, as noted by King (1896). Confusingly, Bhandari & Bhansali (1990) correctly specify that the disk of *G. microcarpa* is villous in its key to species of *Gouania*, but note the disk is glabrous in the species description.

Specimens from the Philippines listed by Rolfe (1885) as *Gouania microcarpa* also belong to *G. nematostachya*. Elmer (1915) recognised that Philippine material of *G. nematostachya*—then not yet published by Lauterbach—was distinct from typical *G. microcarpa*. He described it as *G. microcarpa* var. *subglabra* while noting that it should possibly be considered a new species.

Merrill (1921), Masamune (1942) and Beaman & Anderson (2004) all list *Gouania microcarpa* as occurring in Borneo. Illustrative material used by Beaman could be traced in herbaria and is identified here as *G. nematostachya*.

Lauterbach (1922), while agreeing with King (1896) that *Gouania microcarpa* s.s. is restricted to India and Sri Lanka, described several taxa without disk lobes opposite the sepals, from New Guinea as varieties of *G. microcarpa*. Nevertheless, as Lauterbach (*loc. cit.*) noted, none of the New Guinean taxa have hairy disks. Despite Lauterbach considering the New Guinean specimens to be varieties of *G. microcarpa*, he recognised *G. nematostachya* as a separate species and not an additional variety of *G. microcarpa*.

Although the scope of this revision is restricted to the Philippines and Sundaland, occurrences from Sulawesi are included here to give a complete list for this poorly known species. Sulawesi specimens usually have slightly narrower leaves and were collected in flower and fruit at earlier months of the year.

All but two Bornean specimens of *Gouania nematostachya* available were collected in Sabah. *Amoliah* 667 was collected nearby in North Kalimantan. Only Korthals s.n. was collected in the southern half of the island—its leaves are not as conspicuously serrate as other specimens from Borneo, but all other characters suggest it belongs to *G. nematostachya*. A sampling bias may explain why almost all specimens were collected in such a limited area of the island. More material is available from Sabah, especially collections from SAN, than from other parts of the island. BRUN does not hold any *Gouania* specimens (Joffre Haji Ali Ahmad, pers. comm.).

In the specimen label notes of Diwol & Markus SAN 136538 and de Vogel et al. 5557, the length of the climber is estimated to be 30 m. This would exceed the reported maximum length of 20 m for any known *Gouania* species (Medan & Schirarend 2004; Buerki et al. 2011).

5. *Gouania obtusifolia* Vent. ex Brongn. (Brongniart 1826: 72). Type: Indonesia, Java, s.a., Delahaye s.n. (lectotype, selected here: G! [G00011846]).

   *Gouania mauritiana* sensu Blume (1826: 1152), non Lam.

   *Naegelia tomentosa* Hassk. (Hasskarl 1852: 114). Type: Indonesia, Java, Jawa Tengah, in Javea centralis montis Ungarang [Ungaran] [7°8’S 110°24’E] declivitatis sylvestribus prope Medini, s.a., *junghuhn* s.n. (lectotype, selected here: L! [L 0484694]).

   *Gouania javanica* Miq. (Miquel 1856: 649) synon. nov.

   Type: Indonesia, Java, Ronkop [Rongkop], May 1836, *junghuhn* s.n. (lectotype, selected here: L! [L 0484693], isolectotype: L!-image seen [L 0484679]).

   Woody climber with circinate tendrils, to at least 18 m long; girth to at least 2 cm. *Indumentum* lacking on older branches to dense at distal end of branchlets; stem hairs 0.2 mm long, curved to tortuous, mostly spreading, almost all reddish-ferruginous, some whitish. Branchlets hollow in the centre, slender, subterete, smooth, with flush longitudinal striations. *Stipules* soon fugaceous, densely hairy, slightly asymmetric, lanceolate, acuminate, entire to pinnatifid, c. 6 mm long, medial undivided portion c. 1.5 mm wide, divisions narrow, c. 0.1 mm wide, to 0.5 mm long. *Leaves* discolomous, dark green adaxially, paler abaxially, blade shape variable, narrow ovate to wide ovate or oblong, 3.2 – 12.0 cm long, 2.0 – 7.2 cm wide, chartaceous, apex rounded to acute, base rounded to cordate, cuneate to rounded in distal leaves, margins crenate-serrate, usually 15 – 20 serrations on either side, all along leaf margin, serrations getting closer towards leaf apex, leaf margin with one protruding gland at the apex of each serration, glands crowned with hairs, leaf margin often ciliate; primary vein densely hairy abaxially, hairs mostly appressed, antrorse; secondary veins 5 – 6 (–7) pairs, densely hairy abaxially, venation eucamptodromous, basal
secondary veins reaching margin at c. 60% of leaf height, angle of divergence from primary vein 25 – 40°; outer secondary veins branching off basal secondary veins conspicuous, 4 – 6; lamina glabrous to abundantly hairy adaxially, more densely along primary and secondary veins; indumentum sparse to abundant abaxially; domatia usually present in vein axes, a foliaceous appendage or tufts of hairs; petiole subereterete, flattening distally, channelled, 7 – 21 mm long, densely hairy, with glands and foliaceous appendages, especially along edges of channel and near junction with leaf blade, similar to appendages found in domatia. Inflorescence of congested cymes arranged along racemiform thyrses, the distal thyrses often arranged in a panicle, thyrses to 25 cm, with c. 5 flowers in each cyme; bracts narrow-lanceolate, acuminate, c. 4 mm long, entire to pinnatifid, densely hairy; cymes sessile, pedicels to 1 mm long, densely hairy. Flowers odourless or faintly scented; hypanthium densely hairy adaxially, indumentum often paler than on inflorescence rachis, sepal triangular, c. 1.2 mm long, white-cream when fresh, glabrous and keeled adaxially, petals clawed, c. 1.1 mm long, rugulose adaxially, cream-pale yellow when fresh; stamen adaxially; petals clawed, c. 1.1 mm long, rugulose, anthers c. 0.2 mm long, ± 0.8 mm high, c. 1.2 × 2 mm obovate, dorsally convex, ventrally concave, shiny brown.

DISTRIBUTION. Malay Peninsula, Sumatra and Java. Map 5. ADDITIONAL SPECIMENS EXAMINED. INDONESIA. JAVA. s.n., Blume s.n. (L!-image seen); 1794 – 1796, Delahaye 2123 (P!-image seen); s.n., Delahaye s.n. (P!-image seen); s.n., Horsfield s.n. (K!); Tjopper, s.n., Horsfield 874 (K!); s.n., Korthals s.n. (L!-image seen); 1803 – 1804, Leschenault de la Tour s.n. (P!-image seen); s.n. Reinwardt s.n. (L!-image seen); JAVA BARAT: Preanger, Tjikanoeng [Gikawung] [6°37'S 108°2'E], ± 25 m, 29 Aug. 1912, Bacher 4362 (K!, L!-image seen); Res. Cheribon [Cirebon], G. Tjernai [Mt Ciremai], 900 m, 20 Oct. 1912, Bacher 4829 (L!); Res. Preanger, Tjidadap [Cidadap], 1000 m, 12 June 1916, Bakhuisen van den Brink Sr 3895 (L!-image seen, U!-image seen); ibid., Tjibeber [Cibeber], 1000 m, 13 June 1916, Bakhuisen van den Brink Sr 1998 (L!); Preanger, s.n., Ploem s.n. (L!); Res. Preanger Reg, Tjadas Malang (bij Tjidadap); I. v. Tjibeber, 1000 m, 11 June 1923, Wieckel 1383β (L!-image seen, U!-image seen); JAVA TENAGH: Koeripan [Kuripan] [6°56'S 109°53'E], 30 July 1911, Docters van Leeuwen 64 (U!-image seen); Semarang, Kedoengjati [Kedungjati] [7°9'S 110°37'E], 24 Sept. 1896, Koorders 24983β (L!); Semarang, Karangasem, 15 June 1897, Koorders 28269β (U!-image seen); Banjoemas, Noes Kambangan [Nusa Kambangan] [7°44'S 108°55'E], 29 May 1899, Koorders 36900 (L!); JAVA TIMUR: E Java, s.a., Reinwardt s.n. (L!, S!-image seen); Sourabaya [Surabaya], Aug. 1894, Delahaye 1941 (P!-image seen); Parsurawan, Malang, 19 June 1896, Koorders 23447β (L!); Besoeki [Besuki], Poeger [Puger] [8°20'S 113°28'E], ± 10 m, 16 Oct. 1895, Koorders 20511β (K!, L!-image seen); ibid., 17 Oct. 1895, Koorders 21768β (K!, U!-image seen); ibid., Rogodjampi [8°20'S 114°19'E], ± 10 m, 25 Aug. 1897, Koorders 28930β (K!, L!-image seen); Besoeki, Poeger [Puger] Watangan [8°24'S 113°30'E], ± 5 m, 23 Oct. 1895, Koorders 21761β (L!); Kediri, G. Parang [7°50'S 111°59'E], 16 June 1896, Koorders 23043β (K!, L!-image seen); Parsurawan (Pasaruan), Tangkil, 400 – 500 m, 29 June 1896, Koorders 23642β (K!, L!-image seen); Banyuwangi, 1803 – 1804, Leschenault de la Tour 497 (P!-image seen); Soemmerpoettoeng [Sumberpucung] [8°10'S 112°29'E], June 1918, [Unknown collector] 2724 (WAG!-image seen); PULAU PANANITA. Prinseneiland, N of mouth of Tjiharasas [G Harahas], 2 Sept. 1951, van Borsum Waalkes 282 (K!); SUMATRA. Sumatra, 1880, Forbes 2933a (K!, L!-image seen); ACEH: Near Peureulah [Peureulak] [4°49'S 97°54'E], sea level, 3 Jan. 1932, Bangham 629 (K!); Jambi: Sandaranagong [Sanggaran Agung], 2450 ft [750 m], 28 May 1914, Robinson s.n. (K!); LAMPUng: Lampongs, 400 ft [100 m], 30 June 1880, Forbes 1263 (K!); NW of Kota Agung, 5°23'S 104°25'E, 350 – 450 m, 11 May 1968, Jacobs 8836 [GH!, K!, L!-image seen]; SUMATERA SELATAN: Tandjong Ning [3°31'S 103°02'E], 1881, Forbes 2758 (L!, L!-image seen); SUMATERA UTARA: Road from Kaban Djake to Kota Tjane [Kabanjahe and Kutacane], 4000 – 5500 ft [1200 – 1700 m], 17 Feb. 1932, Bangham 1107 (K!); S Sumatra, Pasumah Lands, s.a., Forbes 2593 (L!); Sibolangit, ± 500 m, 22 Nov. 1916, Lörzing 4502 (L!); Vicinity of Hoeta Bagasan [Huta Bagasan], Asahan. 7 Sept. 1934 – 4 Feb. 1935, Rahmat Si Boeoa 7290 (GH!, L!); MALAYSIA. PENINSULAR MALAYSIA. FEDERAL TERRITORY OF KUALA LUMPUR: Weld Hills F. Res. Kuala Lumpur [3°9'N 101°42'E], 21 Jan. 1919, Ahmat C.F. 2345 (K!); Kuala Lumpur, 1899, Ridley 16205 (K!); Kuala Lumpur, Damansara Road [3°8'N 101°41'E], 20 Dec. 1920, Ridley s.n. (K!); KELANTAN: 20 Jan. 1924, Haniff & Nur 10052 (L!); Charming, Kelantan R., 8 Feb. 1917, Ridley s.n. (K!); KRABI: Ghibri, Nong Koh, Jan. 1918, s.c. s.n. [Federa-
ed Malay States Museum] (K!); MALACCA: 1845, Griffith s.n. (K!); NEGERI SEMBILAN: Johol, 16 Jan. 1917, Ridley s.n. (K!); PAHANG: Taman Negara, S. Tembeling, 2 March 1968, Whitmore FRI 4936 (GH!, K!, L!-image seen); PERAK: near Gunong Booboo [Gunung Bubu], 300 – 500 ft [100 m – 150 m], Dec. 1885, King’s collector 8371 (L!); Sunga Ryah, 1880, Kunstler 1009 (E!); ibid., Oct. 1880, King’s collector 1046 (K!); Road to Jor, 1908, Ridley 13570 (K!); PERLIS: Up to 5 miles NW of Kangar, 0 – 50 m, 19 Jan. 1983, Davis 69337 (E!); Kangar, March 1910, Ridley 15089 (K!); Mata Ayer Forest Reserve [6°40’N 100°14’E], 320 ft [100 m], 19 Feb. 1981, Wong FRI 31238 (GH!, K!, L!); Ulu Langat [3°9’N 101°42’E], s.a., Boden Kloss s.n. (K!); Templer Park [3°17’N 101°38’E], 25 Oct. 1979, Koehnmen FRI 26228 (K!, L!-image seen); 12 m.s. Ulu Gombak, roadside [3°18’N 101°44’E], 5 Feb. 1969, Teo & Pachiappan 221 (K!); THAILAND, KRABI: Nai Chong, Khao Khram, 40 m, 18 Jan. 1966, Hansen & Smitinand 11978; Klong Tawn Nua [Khlong Thom Nuea] Subdist. Kow Pra-Bahng [Khao Pra Bangkhram] Wildlife Sanctuary, headquarters, along Klong (stream), Bahng Dtiew, 50 m, 13 Jan. 2006, Maxwell 06-2 (K!, L!); NAKHON SI THAMMARAT: Thung Song, 12 Feb. 1929, Put 2355 (K!, L!-image seen); Khanom, Mu Ko Thale Tai National Park, Nam Tei Waterfall, 9°5’24”N 99°53’36”E, 160 m, 18 Feb. 2004, Middleton, Phuphat, Pooma & Williams 3212 (E!, GH!); NARATHIWAT: Ban Tu Gor, Tan Yong Mas [Tanyongmat], 250 ft [100 m], 30 April 1931 (K!, L!-image seen, P!-image seen); Weang Distr., Hala-Bala Wildlife Sanctuary, 3rd bridge [5°48’N 101°50’E], 133 m, 20 Jan. 2004, Promchua 74 (L!-image seen); SATUN: Nam Rah Village, Toong Ngui [Thung Nui] Subdist., 25 m, 5 Jan. 1985, Maxwell 85-31 (P!-image seen); Tarutao Island, trail from Puntay Bay to Talo Wao [6°35’N 99°41’E], 13 Jan. 1981, Congdon 1072 (GH!); SONGKHLA: Saba Yoi, Namtok Sai Khao National Park. Phra Mai Phai Waterfall, 6°38’20”N 101°45’30”E, 135 m, 16 Feb. 2004, Middleton, Phuphat, Pooma & Williams

Map 5. Distribution of Gouania obtusifolia (●).
3139 (GHI!, L-image seen); Klong Rhang [Khlong Rang] Hill, foothills [6°55′N 100°36′E], 25 m, 27 Jan. 1987, Maxwell 87-108 (L!, P-image seen); SURAT
THANI: Kaw Samui [Ko Samui] [9°30′N 100°0′E], 14 June 1927, Put 851 (E-image seen, KL); Phumphin [Phumphin], on road to Takua Pa, 9°5′N 99°40′E, 50 m, 4 April 1987, Soejarto et al. 5874 (GH!, LI); Yan Yao, c. 50 m, 23 Feb. 1930, Kerr 18223 (KL, L-image seen, P!-image seen); TRANG: Na Yong, Na Muen Si, Wat Hua Khao, Santikhunakorn ladder, 7°35′N 99°40′E, 60 m, 24 Dec. 2006, Pooma et al. 6584 (BK!); YALA: Yala, Feb. 1931, Put 3698 (E! - image seen, KL); Bannang Sata, Wang Bua Thong, 3 Dec. 1966, Sangkhachand 1373 (E!, KL, LI-image seen, P!-image seen).
HABITAT. Tropical moist broadleaf forests, especially Tenasserim-South Thailand semi-evergreen rain forests, Peninsular Malaysian lowland and montane rain forests, Sumatran lowland and montane rain forests, Western Java lowland and montane rain forests, Eastern Java-Bali lowland and montane rain forests; alt. 0 – 1200 m.

CONSERVATION STATUS. Gouania obtusifolia is widespread in Sundaland and was collected several times in the Malay Peninsula since 2004. With an EOO of over 1,200,000 km², it is assessed here as of Least Concern (LC), although its status in Java and Sumatra could be precarious. No Sundaland specimens collected outside of the Malay Peninsula since the 1960s were available for study nor were recent records found in GBIF (2018).

PHENOLOGY. Collected in flower in Jan., May, June and Aug. to Dec.; collected in fruit (mature, splitting) from Jan. to April and Aug. to Oct.

VERNACULAR NAMES. Akar Sibueh (Malay Peninsula, Ridley 1922); Kikok koran (Sundanese, file Bakuhiun van den Brink Sr 1998); Sowag-i-aroij (Sundanese, Filet 1876).

NOTES. Gouania obtusifolia is recognised by its reddish-ferruginous indumentum, coarsely crenate-serrate leaves with usually 15 – 20 serrations on either side, protruding marginal glands and 5 – 6 (=7) pairs of secondary veins. The only other species recorded from the Malay Peninsula, Sumatra and Java is G. leptostachya, which has glabrous leaves, except along the veins, shorter, glabrous bracts, stipules with a basal lobule pointing sideways, longer inflorescences and bigger fruits (Table 2). Gouania obtusifolia resembles G. fimbriata and G. longipetulata from the Philippines but differs in its coarsely crenate-serrate leaves and sessile cymes. Gouania obtusifolia is a name Etienne Ventenat gave to material Félix Delahaye collected in Java (Brongniart 1826). A single specimen identified as Gouania affinis mauritiana obtusifolia was found in Ventenat’s herbarium in G and is selected as the lectotype here.

Gouania obtusifolia is restricted to Sundaland. However, its synonym G. javanica has been widely used to refer to plants observed in southern China and throughout SE Asia (Chen & Schirarend 2007; Pitard 1907 – 1912; Wilson 1916). These plants determined as G. javanica but occurring north of the Malay Peninsula share many characters with G. obtusifolia, including stipule and disk characters. Gouania obtusifolia, however, differs in having conspicuously crenate-serrate leaf margins, as noted by Kurz (1871, 1875), Hasskarl (1871) and Lauterbach (1922). It also differs in having a more consistently reddish-ferruginous indumentum, especially on the abaxial surface of sepals (as opposed to more whitish), ovate to oblong leaves (as opposed to consistently ovate) with 5 – 6 (=7) pairs of secondary veins (as opposed to 6 – 7), with a rounded to acute apex (as opposed to attenuate) (D. Cahen pers. obs.). Plants north of the Malay Peninsula commonly referred to as G. javanica best correspond to G. brandisii Hassk. (Hasskarl 1871: 280) as followed by Kress et al. (2003).

A specimen collected by Junghuhn was annotated by Jan-Frits Veldkamp who identified it as a type of Gouania javanica, with both 'holotype' and 'lectotype' circled on the type label (Junghuhn s.n. [L.04846983]). Miquel (1856) possibly used the specimen to describe G. javanica as the label information matches details of the protologue. We lectotypify the specimen here to avoid ambiguity.

Specimens collected by Reinwardt (L! [L.2331537], SI-image seen) were originally identified as Gouania ferruginea. M. C. Johnston wrote that “no such name was ever published” on his 1968 identification label for the S specimen. A protologue could not be retrieved, but the name appears in Filet’s dictionary (1876) as “Gouania ferruginea Rwdt.”. Pool (2014) recently used the epithet ferruginea for a species found in Guatemala and Honduras.

Gouania obtusifolia was identified as G. mauritiana by Blume (1826), months before it was published as G. obtusifolia by Brongniart (1826) and later G. javanica by Miquel (1856). Kurz (1871) wrote that Blume may have been correct in associating the Java material with G. mauritiana. In 1944, Bakuhiun van den Brink Jr added G. mauritiana identifications on all specimens previously identified as G. javanica or G. obtusifolia held in L. However, G. mauritiana is a species endemic to Réunion (Buerki et al. 2011) and differs from G. obtusifolia in several characters, including acuminate leaves, shorter disk lobes and densely arranged fruits that are completely covered by hairs.

Unusual structures, presumably galls, were observed on two specimens from a collection in Nong Koh, Ghirib [Krabi], (specimens with no collector name or number). They are indurated, bell-shaped, modified flowers, c. 3 mm high. The ovary chamber is greatly expanded and the structure is domed by the connivent sepals.

Doubtful and excluded name
Gouania bankana Teijsm. & Binn.
This name appears in a catalogue of plants cultivated in the Buitenzorg Botanic Gardens (Teijmann & Binnendijk 1866) without reference to a specimen, although there is an indication that the species occurs in Bangka Island.

**Dubious specimen**

The following collection has narrow, subentire leaves and its mature (i.e. dehiscing) fruits are smaller than those of *Gouania leptostachya* and *G. obtusifolia*.

**MALAYSIA. PENINSULAR MALAYSIA. PERAK:** Kampar, Gunong Tempurong [4°25′N 101°12′E], 700 ft [200 m], 14 Sept. 1958, Ogata KEP 110168 (K!, L!, image seen).

**Species erroneously cited for Sundaland**

*Gouania laxiflora* Tul. (Tulasne 1857: 130). Type: Madagascar, Antsiranana, Ling-Vatou, s.a., Bernier 207 (holotype P!-image seen [P00386437]).

This species is cited as occurring in “Malakka” by Suessenguth (1953). However, it is only known to be found in mainland Africa (Mozambique and Tanzania), the Mascarenes (Rodrigues Island), the Seychelles (Aldabra, Picard, Cosmoledo), the Comoro Islands (Mayotte), and western Madagascar (Buerki et al. 2011).

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**Appendix 1**

**Alphabetical index to numbered collections examined**

Ahern’s collector Forestry Bureau 2159 (*G. fimbriata*);
Ahmat C.F. 2345 (*G. obtusifolia*); Amidjah 667 (*G. nematostachya*); Amin & Francis SAN 120922 (*G. nematostachya*); Amin & Francis SAN 121537 (*G. nematostachya*); Amin & Suin SAN 123312 (*G. nematostachya*); Amin et al. SAN 119834 (*G. nematostachya*).

Backer 1911 (*G. leptostachya*); Backer 4362 (*G. obtusifolia*);
Backer 4829 (*G. obtusifolia*); Bakhuizen van den Brink 1998 (*G. obtusifolia*); Bakhuizen van den Brink 3895 (*G. obtusifolia*); Bakhuizen van den Brink 4873 (*G. leptostachya*); Bakia 217 (*G. nematostachya*); Bangham & Bangham 1107 (*G. obtusifolia*); Bangham & Bangham 629 (*G. obtusifolia*); Barbon et al. PPI 12224 (*G. nematostachya*); Benman et al. 10508 (*G. nematostachya*); Burley & Tukirin et al. 3622 (*G. nematostachya*).

Chai SAN 25993 (*G. nematostachya*); Cid 60 (*G. longipedunculata*); Clemens 26263 (*G. nematostachya*); Congdon 1072 (*G. obtusifolia*); Cuming 828 (*G. nematostachya*); Cuming 973 (*G. fimbriata*); Cuming 1478 (*G. nematostachya*); Cuming 1578 (*G. nematostachya*); Cuming 1623 (*G. longipedunculata*).

Davis 69337 (*G. obtusifolia*); de Vogel & Vermeulen 7170 (*G. nematostachya*); de Vogel et al. 5184 (*G. nematostachya*); de Vogel et al. 5557 (*G. nematostachya*); Delahaye 1941 (*G. obtusifolia*); Delahaye 2123 (*G. obtusifolia*); Diwol & Markus SAN 136538 (*G. nematostachya*); Docters van Leeuwen 64 (*G. obtusifolia*); Duanenh 429 (*G. nematostachya*).

Elmer 10301 (*G. longipedunculata*); Elmer 11106 (*G. longipedunculata*); Elmer 11308 (*G. nematostachya*); Elmer 13552 (*G. nematostachya*); Elmer 14479 (*G. nematostachya*); Elmer 18144 (*G. nematostachya*).

Forbes 1263 (*G. obtusifolia*); Forbes 2593 (*G. obtusifolia*); Forbes 2933a (*G. obtusifolia*); Forbes PS 2758 (*G. obtusifolia*); Foxworthy BS 12241 (*G. fimbriata*);
Fuentes & de la Rosa PPI 38586 (*G. fimbriata*);
Gaerlan & Reynoso PPI 20316 (*G. longipedunculata*);
Garcia & Fernando PPI 25152 (*G. fimbriata*);
Garcia et al. PPI 15057 (*G. fimbriata*).

Hallier 4625 (*G. longipedunculata*); Hannif & Nur 2911 (*G. leptostachya*); Hannif & Nur 10052 (*G. obtusifolia*);
Hansen & Smitsand 11978 (*G. obtusifolia*); Horsfield 874 (*G. obtusifolia*).

Jacobs 8326 (*G. obtusifolia*); Jagor 932 (*G. nematostachya*);
Kerr, A. F. G. 11654 (*G. leptostachya*); Kerr, A. F. G. 13830 (*G. leptostachya*); Kerr, A. F. G. 13944 (*G. leptostachya*);
Kerr, A. F. G. 16503 (*G. leptostachya*);
Kerr, A. F. G. 18225 (*G. obtusifolia*); King’s collector 1046.
(G. obtusifolia); King’s collector 6420 (G. leptostachya); King’s collector 8971 (G. obtusifolia); Kochammen FRI 26228 (G. obtusifolia); Koorders 16943β (G. nematostachya); Koorders 18451 (G. nematostachya); Koorders 20511β (G. obtusifolia); Koorders 21761 (G. obtusifolia); Koorders 21768β (G. obtusifolia); Koorders 23043β (G. obtusifolia); Koorders 23447 (G. obtusifolia); Koorders 23642β (G. obtusifolia); Koorders 24983β (G. obtusifolia); Koorders 28269β (G. obtusifolia); Koorders 28930β (G. obtusifolia); Koorders 36900 (G. obtusifolia); Krispinus SAN 136827 (G. nematostachya); Kursules 1009 (G. obtusifolia).

Lakshmakara 839 (G. obtusifolia); Larsen et al. 41762 (G. leptostachya); Layosa 15015 (G. fimbriata); Leopold & Petrus SAN 92553 (G. nematostachya); Leschenault de la Tour 497 (G. obtusifolia); Loher 326 (G. fimbriata); Loher 327 (G. fimbriata); Loher 328 (G. fimbriata); Loher 5825 (G. fimbriata); Loher 5836 (G. fimbriata); Loher 5841 (G. fimbriata); Lörzing 13270 (G. leptostachya); Lörzing 4502 (G. obtusifolia); Lugas 757 (G. nematostachya); Lugas 786 (G. nematostachya).

Machado 11604 (G. leptostachya); Manayon 69 (G. fimbriata); Martin PNH 33505 (G. fimbriata); Maxwell 06-2 (G. obtusifolia); Maxwell 87-108 (G. obtusifolia); Minar PNH 34153 (G. fimbriata); Merrill 1425 (G. fimbriata); Merrill 250 (G. fimbriata); Middleton et al. 3139 (G. obtusifolia); Middleton et al. 3212 (G. obtusifolia); Middleton et al. 4019 (G. leptostachya).

Niyomdahn 1292 (G. leptostachya).
Parkinson 15131 (G. leptostachya); Pooma et al. 6584 (G. obtusifolia); Pooma et al. 6685 (G. leptostachya); Project soma Em 17 (G. leptostachya); Promehua 74 (G. obtusifolia); Put 2355 (G. obtusifolia); Put 3698 (G. obtusifolia); Put 851 (G. obtusifolia).

Rahmat Si Boeoe 7290 (G. obtusifolia); Ramos 96 (G. fimbriata); Ramos BS 1749 (G. fimbriata); Ramos BS 39968 (G. longipedunculata); Ramos BS 7117 (G. fimbriata); Reynoso et al. PPI 11785 (G. fimbriata); Reynoso et al. PPI 7268 (G. nematostachya); Ridley 13570 (G. obtusifolia); Ridley 15089 (G. obtusifolia); Ridley 16205 (G. obtusifolia); Robinson BS 9069 (G. nematostachya).

Sangkhachand 1373 (G. obtusifolia); Santissuk 789 (G. leptostachya); Scortechini 1158 (G. leptostachya); Soejarto et al. 5874 (G. obtusifolia); Soibeh 809 (G. nematostachya); Soimun et al. SAN 129124 (G. nematostachya); Suli PNH 2632 (G. nematostachya); Suli PNH 18319 (G. longipedunculata); Suli PNH 17085 (G. longipedunculata); Suli & Conklin PNH 17745 (G. longipedunculata); Suwanakoset 1714 (G. leptostachya).

Teo & Pachaijapan 221 (G. obtusifolia).
van Borssum Wadelkes 282 (G. obtusifolia); Vanoverbergh 2537 (G. obtusifolia); Vanpruk 766 (G. leptostachya); Vidal y Soler 197 (G. fimbriata); Viola 34 (G. fimbriata).
Wardi 79 (G. nematostachya); Whitford 651 (G. nematostachya); Whitmore & Sidtryasa TCW 3467 (G. nematostachya); Whitmore FRI 4936 (G. obtusifolia); Winckel 1383β (G. obtusifolia); Wong FRI 31238 (G. obtusifolia); Wood & Wyatt-Smith SAN 4435 (G. nematostachya); Wray Jr 3324 (G. leptostachya); Wray Jr 3346 (G. leptostachya).
Zollinger 1183 (G. leptostachya).

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