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A SYNOPSIS OF THE MALESIAN SPECIES OF STEGANTHERA (MONIMIACEAE)

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SUMMARY

Revision of the Malesian species of the genus *Steganthera*, which centres in New Guinea; precursor to treatment in Flora Malesiana. There are 16 species accepted; 5 are described as new, 12 names are reduced, 3 are excluded and 9 are imperfectly known.

INTRODUCTION

The geographical range of the genus *Steganthera* extends from Celebes to Queensland and the Solomon Islands, with its centre of diversity in New Guinea. Sixteen species are recognized in this revision, all of which occur in New Guinea. Three extend beyond New Guinea. *Steganthera salomonensis* is frequent throughout the Solomon Islands. *S. hirsuta* occurs in the Moluccas and Celebes, is the only species in New Britain and New Ireland, and also crosses the Torres Straits to the Iron Range in Queensland. *S. australiana* of Queensland also has a limited range in eastern New Guinea. One other species is recorded for Queensland (Endress, Blumea 25, 1979, 315).

Besides the widespread species *S. hirsuta* and *S. salomonensis* whose ranges scarcely overlap, two other species have ranges extending over the main island of New Guinea, *S. hospitans* at low to moderate altitudes and *S. ilicifolia* at higher elevations. The other species have limited ranges, the following being known from one or very few collections: *S. myrtifolia, S. cyclopensis, S. insculpta, S. hentyi*, and *S. oligantha*. Six species have more extended ranges but are still local in their distributions, namely *S. parvifolia, S. royenii, S. dentata, S. moszkowskii, S. chimbuensis* and *S. fasciculata* (fig. 1).

All the widespread species exhibit considerable variation, and it is possible that they may eventually be found to include local taxa which warrant specific rank. In that event this outline of geographical distribution would require modification. Details of this variability are given under the species concerned, but it may be said here that the patterns of variation, especially in the group of closely linked species *S. hirsuta, S. ilicifolia, S. australiana* and *S. chimbuensis*, suggest that the process of speciation is far from stabilization. For this reason, no attempt has been made in the key to

Fig. 1. Distribution of some species of *Steganthera*. 1. *S. australiana*; 2. *S. chimbuensis*; 3. *S. cyclopensis*; 4. *S. fasciculata*; 5. *S. insculpta*; 6. *S. moszkowskii*; 7. *S. oligantha*; 8. *S. royenii*; ● *S. hentyi*; + *S. parvifolia*; ▲ *S. dentata*; ■ *S. myrtifolia*. The distributions of the four widely spread species (*S. hirsuta, S. ilicifolia, S. hospitans, S. salomonensis*) are not shown.

the species, to provide absolute distinguishing features for these four species. Similar excessive variation has been found in *Levieria, Palmeria* and *Matthaea*, so must be general in this family at least in Malesia.

This difficulty in the recognition of diagnostic characters is aggregated by the fragmentary nature of many specimens. Collectors frequently do not realize that what they regard as flower-buds, and therefore do not collect, are, in fact, fully mature flowers. The infructescence, being the most conspicuous feature, is the most collected, but it is relatively unimportant for discriminating between species. In all cases a diligent search for flowers of both sexes is essential.

Steganthera is frequently confused with *Kibara*, another common and widely distributed genus, because the foliage, fruits and inflorescences are similar. The technical differences between these two genera are not readily observable – they are, firstly, the greater number of tepals in *Kibara*, certain of which are thickened and glandular in the female receptacle, and, secondly, the greater number of stamens in the androecium (but see *S. salomonensis*). However, other features usually allow a generic identification to be made. The most important of these is the appearance of the pedicel: in *Steganthera* the pedicel is relatively slender and is clearly distinct from the receptacle, whereas in *Kibara* the pedicel is thickened distally and has a less clearly defined junction with the receptacle or none at all. Another useful indication is that the leaves usually dry greenish (often yellowish green) in *Kibara*, whereas in *Steganthera* they are mostly brown when dry. Thirdly, the achenes of *Steganthera* are black and verruculose (when dry), while those of *Kibara* appear to be mostly smoother and often dry to a brown or fawn colour (until *Kibara* has been studied in greater detail this indication is given only tentatively).

It was necessary to extend the definition of the genus *Steganthera* to include dioecious species and also because of variations found in the number of stamens in *S. salomonensis*. The Malesian genera of the Mollinedieae are defined by the nature of the androecium. The androecium of *Steganthera* has been considered to comprise a single whorl of 4 stamens (or 2 dicussate pairs), the filaments being free from one another and each bearing an anther opening by a single horizontal slit. *Matthaea* also has 4 free stamens, but its anthers open by two vertical slits. *Tetrasynandra* has anthers similar to those of *Steganthera* but the 4 filaments are united into a column. In *Wilkiea* a variable number of stamens (usually 8 or more) are distributed over the inner surface of the receptacle, and the anthers open by horizontal slits. The androecium of *S. salomonensis* fits more of these descriptions, consisting of the usual 4 stamens in an outer whorl usually, but not always, enclosing a variable number of smaller stamens. All the anthers open by horizontal slits. This arrangement is similar to that found in *Kibara*, but the number of tepals in the female receptacle and the absence of glandular thickenings on them, clearly excludes the inclusion of *S. salomonensis* from *Kibara*. It has therefore been necessary to modify the important diagnostic character of the androecium by allowing for the occurrence of an inner whorl of stamens.

The species of *Steganthera* can be placed in three groups on morphological grounds. One is characterized by the expansion of the female, and to a lesser extent also the male flower into a turbinate or patelliform receptacle. This group formerly was segregated as the genus *Anthobembix*, but Kanehira and Hatusima (Bot. Mag. Tokyo 56, 1942, 256) set out valid reasons for uniting the two genera. A second group of species is characterized by their fasciculate inflorescences and by being dioecious. The third group comprises those species lacking both these characters; that is, the species have sub-globose receptacles in cymose inflorescences. It includes a number of species which are difficult to separate, including *S. hirsuta* which is very variable in all its characters. The species of the first two groups are well defined morphologically and geographically, whereas those of the third group form a complex which has not yet resolved itself into stable species. These three groups of species are not given formal taxonomic recognition because their limits are not clearly defined. *S. dentata* and *S. cyclopensis* combine fasciculate inflorescences with discoid receptacles and therefore fall into both of the first two groups. In some species the expansion of the receptacle is a variable character; for examples, in *S. hospitans* and *S. oligantha* the male flower may be globose, but this may be due to hybridity with *S. hirsuta*.

Nomenclatural problems arise because the type specimens of many of the earlier species were destroyed during the Second World War. Janet Perkins had available only a small number of collections and she accepted the differences between them as of specific rank. Several are now reduced to synonymy, but where the type has been lost and no other authentic material exists, it has often been impossible to interpret the names conclusively. For this reason several of the early names are listed here as insufficiently known. Most of these would probably be referable to *S. hirsuta* and some to *S. ilicifolia* if specimens of them could be found. It is unfortunate that the type of the earliest name attributable to the most common species, *S. hirsuta*, has

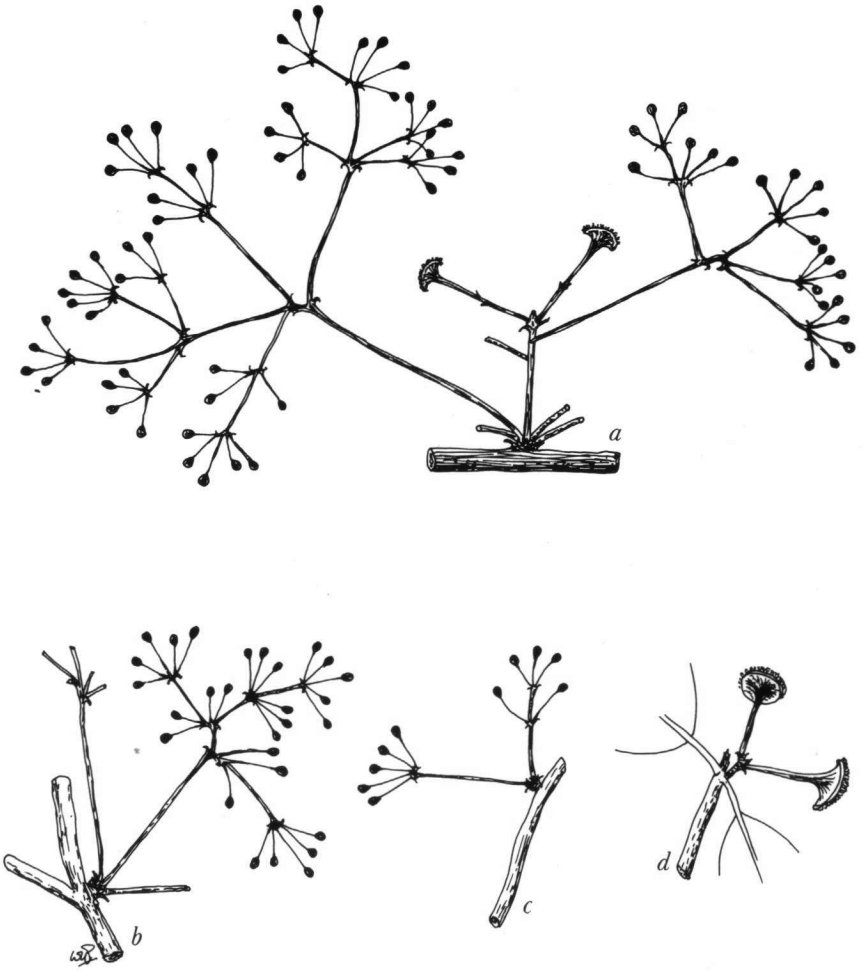

Fig. 2. Inflorescences of *Steganthera salomonensis*. a. A cauliflorous panicle with several principal peduncles, the central rhachis ending with two female flowers; b, c. two purely male inflorescences, the pedicels mostly clustered; d. a purely female inflorescence (a. *BSIP 10575*; b. *NGF 28733*; c, d. *Schodde 5388*). All × ½.

not been available. The name is adopted because a later collection identified by Perkins has been seen and because later collections from the same region as the type agree closely with the original description. The name *S. schlechteri* is treated as insufficiently known, but it may yet prove to be conspecific with *S. ilicifolia*. In that event Smith's name would have to be reduced to synonymy. That course is not adopted here, because the identity of *S. schlechteri* remains very uncertain and its type was collected below the usual altitudinal range of *S. ilicifolia*.

An interesting type of shoot morphology has been observed in several species and may well occur throughout the genus. Growth is intermittent. At the end of each increment a terminal bud forms enclosed by a few pairs of perulae (cataphylls). When growth resumes then internodes between these perulae may elongate so that the basal part of the new shoot is devoid of foliage leaves. The buds of lateral branches are similarly enclosed in perulae and may also have a basal leafless portion.

The inflorescences are lateral, either in the axils of foliage leaves or in the axils of the perulae. In the latter case, if the internodes between the perulae do not elongate, the inflorescences appear to arise in the axils of the last leaves of the previous growth increment. On the other hand, if the internodes between the perulae elongate, the inflorescences appear to be borne on the bare portions of shoots (since the perulae are minute and often caducous). In the diagnoses of the species given below such inflorescences are described as supra-axillary, because they appear on stems well above the insertion of the last pair of leaves of the previous growth increment. This arrangement has been illustrated by Endress (Blumea 25, 1979, 316) for the Australian species, *S. macooraia*, where each growth increment bears only one pair of leaves.

Inflorescences which occur in the axils of the last leaf-pair of a growth increment may appear terminal, but usually a terminal bud can be detected between the peduncles. This terminal bud may abort, when the inflorescences remain apparently terminal, or the bud may produce new growth increment, in which case their lateral position becomes obvious. In several species, notably *S. salomonensis*, additional inflorescences may subsequently arise at the same sites, so that flowers continue to be borne on older twigs, or even on large branches.

The branching pattern of the inflorescence is cymose. This may vary from slightly terminal flowers, or dichasia, to simple pleiochasia or cymose panicles. In several species the internodes between the ultimate branches (especially the pedicels) are suppressed, so that they occur in fascicles. Ultimately all the pedicels may appear to arise at the same level, resulting in the fasciculate inflorescences of *S. fasciculata, S. hentyi, S. dentata* and *S. cyclopense*.

The association of some species with ants is very striking. These species have enlarged nodes with well-defined pores leading into the hollow stems. Scale insects line the pith cavities and small black ants abound over the plant surface and in the hollow stems. The association is most conspicuous in the large-leaved and abundant species *S. hospitans*, but also occurs in the species *S. moszkowskii, S. ledermannii* and *S. royenii.*

Pollination biology has not been studied and the structure of the receptacles poses several problems. The male receptacles have open, if small, ostioles at the time the anthers dehisce, but it is not known what insects visit them. The carpels in the female receptacles are covered by the 'calyptra' at anthesis. The ostiole giving access to the female receptacle is even smaller than that of the male and it is not known how pollen reaches the stigmas. These are awl-shaped and converge towards the ostiole. In *Kibara* and some other genera pollen is received on a hypostigma outside the receptacle (Endress, Experientia 35, 1979, 45) but this is not so in *Steganthera.*

STEGANTHERA

Steganthera Perkins, Bot. Jahrb. 25 (1898) 564; Pflanzenreich Heft 4 (1901) 52; ibid. Heft 49 (1911) 20; Bot. Jahrb. 52 (1915) 197; Übersicht über die Gattungen der Monimiaceae, Leipzig (1925) 33. – *Anthobembix* Perkins, Bot. Jahrb. 25 (1895) 567.

Trees or shrubs, resting buds with cataphylls. *Leaves* simple, opposite, exstipulate, pubescent at first, sometimes becoming glabrous, entire or dentate, principal secondary veins arched and meeting within the margin. Monoecious or dioecious. *Inflorescence* lateral, cymose or fasciculate. *Male flowers* globose, turbinate or patelliform, with 4 small tepals, stamens (3) 4 (5), or rarely with a second (inner) whorl of 1–4 smaller stamens; anthers opening by a single horizontal slit. *Female flowers* similar to male but larger and with a smaller ostiole surrounded by 4 tepals, the upper half abscissing as a calyptra after anthesis to reveal numerous carpels; ovary pubescent; style glabrous awl-shaped. *Achenes* sessile or long stipitate.

KEY TO THE MALESIAN SPECIES

1 a. Female inflorescence pedunculate 2
b. Female inflorescence sub-sessile . . . . . **16. S. insculpta**
2 a. Male inflorescence umbellate (fig. 3) 3
b. Male inflorescence of dichasia, pleiochasia or panicles (figs. 2–4) 6
3 a. Leaves elliptic to broadly elliptic (mostly under 100 mm long: W. Sepik Prov., Papua New Guinea) . . . . . **1. S. hentyi**
b. Leaves oblanceolate to narrowly elliptic (mostly over 100 mm long) 4
4 a. Male receptacle globose (figs. 2–4) (Papua New Guinea, east of 146°30′ E) **2. S. fasciculata**
b. Male receptacle discoid 5
5 a. Leaves narrower than 45 mm (West Irian) . . . . . **3. S. cyclopensis**
b. Leaves wider than 70 mm (West Irian) . . . . . **4. S. dentata**
6 a. Pedicels of male flowers mostly in irregular clusters (fig. 2) 7
b. Pedicels of male flowers mostly solitary 10
7 a. Nodes dilated, with a pore inhabited by ants (West Irian) 8
b. Nodes not harbouring ants 9
8 a. Male receptacle globose . . . . . **5. S. royenii**
b. Male receptacle turbinate with a 4-lobed apical disc . . . . . **6. S. moszkowskii**
9 a. Leaves large*, inflorescence large with stout pedicels (Solomon Islands and Papua New Guinea, east of 48°30′ E) . . . . . **7. S. salomonensis**
b. Leaves smaller (to 100 mm long), inflorescence small with slender pedicels (Wau, Goilala, Moresby Provinces, Papua New Guinea) . . . . **15. S. australiana**
10 a. Receptacles discoid or turbinate 11
b. Receptacles globose (or only slightly depressed) 14

* Rarely (in the Solomon Islands) small leaves occur on stunted individuals.

11 a. Leaves 200 mm long or longer (widely distributed) . . . . . **8. S. hospitans**
b. Leaves considerably shorter 12
12 a. Male inflorescence 1–2-flowered, leaf 60 mm long of shorter (West Irian, Idenburg R.) . . . . . **9. S. myrtifolia**
b. Male inflorescence with more flowers, leaf over 60 mm long 13
13 a. Male receptacle turbinate (West Irian, W. Sepik, Papua New Guinea) **10. S. parvifolia**
b. Male receptacle patelliform (Central Prov., Papua New Guinea) **11. S. oligantha**
14 a. Leaves usually moderate to large (100–320 mm long) and entire (widely distributed, mainly at lower altitudes, but reaching 2450 m) . . . . . **12. S. hirsuta**
b. Leaves variable in size (usually under 150 mm long, but up to 210 mm), usually coriaceous, often dentate, but also entire, when narrow (widely distributed, usually above 1200 m) . . . . . **13. S. ilicifolia**
c. Leaves 50–100 mm long, coriaceous, more or less rugose, margin entire (Chimbu and E. Highland Provinces, Papua New Guinea, above about 2400 m) **14. S. chimbuensis**
d. Leaves 50–100 mm long, chartaceous, usually narrowly elliptic, acuminate, entire of dentate (Wau, Goilala and Moresby Provinces, Papua New Guinea) **15. S. australiana**

1. Steganthera hentyi Philipson, *spec. nov.*

Arbor parva ad 6 m alta, ramulis dense strigosis. Folia elliptica 80–90 × 30–40 mm. ? Dioecia. Inflorescentiae axillares vel supra-axillares, sub-umbellatae, pedicellis gracilis strigosis. Flos mas ignotus. Flos femineus sub-globosus, strigosus, c. 3–4 mm diam., tepalis 4, carpellis numerosis, ovario dense strigoso. Achenia breve stipitata. – Typus: *Henty & Foreman NGF 42688* (L), Kokomo Creek, tributary of Frieda R.

Distribution. Papua New Guinea. West Sepik Province, Telefomin District. Fig. 1.

Ecology. Primary lower montane valley forest, at 500 m.

Note. The small leaves with appressed hairs on the veins of the underside of the leaf, and the fasciculate inflorescences are distinctive. The flowers are described as pink.

2. Steganthera fasciculata Philipson, *spec. nov.* – **Fig. 3.**

Arbor parva ad 12 m alta, ramulis pubescentibus. Folia oblanceolata ad angusteelliptica, 130–200(–300) × 34–70(–90) mm. Dioecia. Inflorescentiae axillares vel supra-axillares; mas sub-umbellatae, 10–20 florae, pedicellis gracilibus, pubescentibus, femineus 1–2 florae. Flos mas globosus, 4–5 mm diam.; tepala 4; stamina 4. Flos femineus crateriformis, c. 12 mm diam.; tepalis 4, carpellis numerosis. Achenia

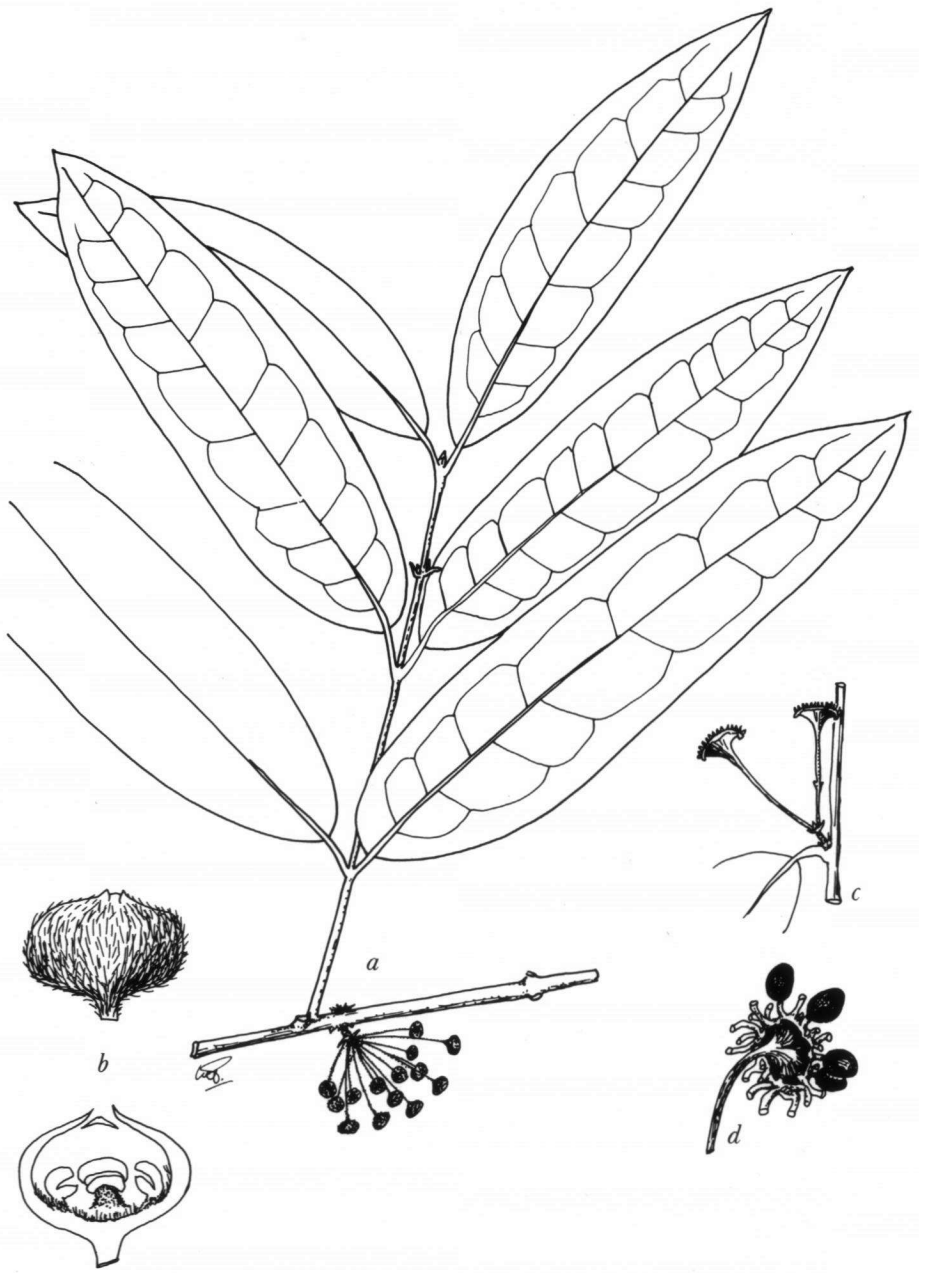

Fig. 3. *Steganthera fasciculata*. a. Branch with sub-umbellate inflorescence of male flowers (*Philipson & Kairo 3642*), × ½; b. male flower, external view and in section (*Philipson & Kairo 3643*), × 5; c. inflorescence of female flowers (*Philipson & Kairo 3641*), × ½; d. infructescence with four stipitate achenes (*Pratt 1082*), × ½.

stipitata. – Typus: *Philipson & Kairo 3641*, Morobe Prov., Mt Missim near Wau, 1200 m, 16-7-79 (L).

Distribution. Papua New Guinea. Morobe Province, near Wau; Northern Province, Hydrographers Range; Milne Bay Province, Raba Raba District, east of Mt Suckling, Esa'ala District, Goodenough Island. Fig. 1.

Ecology. Primary lower mountain rain forest from 365–1200 m.

Vernacular name. Mamkananeh (Daga lang.).

Note. The young flowers are greenish cream and the mature torus red.

3. Steganthera cyclopensis Philipson, *spec. nov.*

Frutex ad 3 m altus, ramulis strigosis. Folia oblanceolata ad anguste-elliptica, ad 170 × 42 mm. ? Dioecius. Inflorescentiae axillares vel supra-axillares, sub-umbellatae, c. 12-florae, pedicellis gracilibus, strigosis, c. 15 mm longis. Flos mas discoideus vel patelliformis, c. 8 mm diam., pubescens; tepala 4; stamina 4. Flos femineus ignotus. Achenia ut videtur sessilia. – Typus: *van Royen 3668* (L), saddle between Mt Baboko and Mt Merariboch, path from Ifar to Ormoe.

Distribution. West Irian. Northern District. Fig. 1.

Ecology. In primary *Nothofagus* lower montane forest, 1200–1340 m.

Note. Similar to *S. dentata* in many respects, but with smaller, usually lanceolate leaves. The flowers are described as carmine and pale orange.

4. Steganthera dentata (Valeton) Kanehira & Hatusima

Anthobembix dentata Valeton, Bull. Dep. Agric. Ind. Néerl. 10 (1907) 13. – *S. dentata* (Valeton) Kanehira & Hatusima, Bot. Mag. Tokyo 56 (1942) 257.

Distribution. West New Guinea, Northern and Southern Districts. Fig. 1.

Ecology. At low altitudes (to 160 m) in primary and secondary forest.

Note. The short-petioled or sub-sessile leaves and fasciculate male inflorescences are distinctive. A shrub with spreading branches. The flowers are described as red, orange or yellow. The anthers are considerably narrower than the connective except in one collection (*Kalkman BW 6411*) where the more widely gaping anthers may be at a stage after anthesis with the lateral lobes of the connective no longer turgid. It has not been possible to determine whether male and female flowers occur on the same or on separate plants.

5. Steganthera royenii Philipson, *spec. nov.*

Frutex c. 4 m altus, ramulis pubescentibus, nodis dilatatis porosis. Folia oblongo-elliptica ad 290 × 111 mm. Monoecia. Inflorescentiae axillares vel supra-axillares, late paniculata, 40–50 mm longae, pedicellis gracilibus fasciculatis. Flos mas globosus, 2–2.5 mm diam. Flos femineus ignotus. Achenia stipitata. – Typus: *van Royen 3588*, near Steenkool (L).

Distribution. West Irian, occurring in a restricted area which includes portions of the Vogelkop, Northern and Southern Districts. Fig. 1.

Ecology. In low-lying primary forest, sometimes periodically flooded, from sea-level to 1200 m. The flowers are yellow, the fruit black. The swollen nodes are inhabited by ants.

Vernacular name. Sirochomenwhah (Manikiong dialect).

Note. Similar to *S. hospitans* in the appearance of its vegetative parts, but the arrangement of the ultimate branches of the inflorescence is distinctive. The male flowers lack any disc-like extension of the receptacle but female receptacles have not been seen. This species is described as possibly monoecious because one collection (*van Royen 3478*) bears male inflorescences and also old fruits. However, as these are not on the same branches, the monoecious condition is not certain. All the inflorescences seen consist solely of male flowers, which suggests the possibility of the sexes being on separate plants.

6. Steganthera moszkowskii (Perkins) Kanehira & Hatusima

Anthobembix moszkowskii Perkins, Pflanzenreich Heft 49 Nachtr. (1911) 26. – *S. moszkowskii* (Perkins) Kanehira & Hatusima, Bot. Mag. Tokyo 56 (1942) 255.

Distribution. West New Guinea. Northern District. Fig. 1.

Ecology. Understorey in rain forest at low altitude.

Note. The male receptacle, with four rounded lobes radiating from the apex, is distinctive. The swollen nodes are apparently inhabited by ants which gain entrance through pores.

7. Steganthera salomonensis (Hemsl.) Philipson, *comb. nov.* – Fig. 2.

Hedycarya salomonensis Hemsley, Kew Bull. (1895) 137. – *S. suberoso-alata* Kosterm., Gard. Bull. Sing. 22 (1968) 445.

Distribution. Papua New Guinea. Central Province; Kupiano District east of Cape Rodney. Milne Bay Province; Raba Raba, Esa-ala and Misima Districts. Bougainville. Also throughout the Solomon Islands to San Cristobal and Rennell I.

Ecology. From sea-level to 750 m in primary and secondary lowland rain forest; in scrub on coral debris and in stunted forest on ridges.

Note. Considerable variation occurs, one extreme being a handsome tree with large leaves, more or less brown-pubescent below, diffuse panicles on leafy twigs and also on the older stems, and with clusters of many stipitate achenes (= *S. suberoso-alata*). On the other hand many specimens, including the type, have smaller, greener leaves which become more or less glabrous, and have fruits with few or even a single stipitate achene. The latter form is characteristic of higher altitudes. Specimens from a dry crater rim in the New Georgia Group are so stunted that their inclusion in this species is open to doubt, though intermediate forms occur. A number of local forms

are found on the islands off the eastern end of New Guinea (Fergusson I. to the Misima I.). The most distinctive of these, with coarsely serrate leaves, occurs on Sudest Island (*Brass 28133*). This may represent a distinct species, but serrate leaf-margins occur elsewhere, especially on saplings or suckers, and the flowers and inflorescences are quite typical of *S. salomonensis*.

8. Steganthera hospitans (Becc.) Kanehira & Hatusima

Anthobembix hospitans (Becc.) Perkins, Bot. Jahrb. 25 (1898) 567. – *S. hospitans* (Becc.) Kanehira & Hatusima, Bot. Mag. Tokyo 56 (1942) 255.
S. insignis Perkins, Pflanzenreich Heft 49 Nachtr. (1911) 24.

Distribution. Throughout New Guinea, from Vogelkop to the east, including Solomon Islands.

Ecology. In primary rain forest and second growth at low to moderate altitudes, but reaching 1200 m.

Vernacular names. Eppareppar (Utu lang., Adelbert Range); oloni, wolonyik (Waskuk lang., Ambunti); soreng (Rawa lang., Adelbert Range); wasa (Kutubu lang.).

Note. The female receptacles are striking, being broadly expanded into button-like discs of a soft butter-yellow colour. The male receptacles are greener and smaller, with a variable extension of the rim: in some specimens the male receptacles have a broadly expanded rim, but in others the rim may be obsolete, as in the specimens identified as *S. insignis* by Perkins (originally placed by her in *Anthobembix hospitans*). It is possible these are hybrids with *S. hirsuta*. Sterile juvenile plants with lanceolate leaves are frequent, and this type of leaf may be found on the lower parts of more adult shrubs, which have begun to produce flowers. The hollow stems and swollen nodes are inhabited by scale insects (*Adeyrodidae*) and by many small black ants. The receptacle becomes succulent and bright orange in fruit, the ripe achenes are purple-black.

9. Steganthera myrtifolia (A.C. Smith) Philipson, *comb. nov.*

Anthobembix myrtifolia A.C. Smith, J. Arn. Arbor. 22 (1941) 238.

Distribution. West Irian, Northern Division. Idenburg River. Fig. 1.

Ecology. In mossy forest at 2150 m.

Note. Known only from the original two specimens collected by Brass. The small chartaceous entire leaves are unmistakable among species with a disc-like male receptacle.

10. Steganthera parvifolia (Perkins) Kanehira & Hatusima

Anthobembix parvifolia Perkins, Bot. Jahrb. 52 (1915) 205. – *S. parvifolia* (Perkins) Kanehira & Hatusima, Bot. Mag. Tokyo 56 (1942) 257.
Anthobembix brassii A.C. Smith, J. Arn. Arbor. 32 (1941) 239. – *S. brassii* (A.C. Smith) Kanehira & Hatusima, Bot. Mag. Tokyo 56 (1942) 261.

Fig. 4. Branch of *Steganthera hirsuta* with axillary pleiochasia. The larger flowers are female, the smaller male. The terminal bud has not yet developed (*Philipson & Kairo 3657*).

Distribution. West New Guinea, Vogelkop, Arfak Mts; Northern District, Eipomek Valley; Southern District, Lake Habbema. Papua New Guinea, West Sepik Province, Telefomin District. Fig. 1.

Ecology. Understorey of primary lower montane rain forest, 1900–2800 m.

Vernacular name. Bobinok (Telefomin Dist., Bulindup).

Note. The glabrous disc-like upper surface of both male and female receptacle contrasts with the pilose outer surface, especially in dried material in which it takes on a black colouration. The material from the West Sepik Province has narrower leaves than the type, but otherwise conforms. The flowers are described as yellow.

11. Steganthera oligantha (Perkins) Kanehira & Hatusima

Anthobembix oligantha Perkins, Bot. Jahrb. 25 (1895) 568. – *S. oligantha* (Perkins) Kanehira & Hatusima, Bot. Mag. Tokyo 56 (1942) 257.

Distribution. Papua New Guinea. Central Province, Moresby District, Sogeri region. Fig. 1.

Ecology. Forest between 900 and 1600 m.

Notes. A large tree with slender twigs, known certainly only from the three collections of Forbes made in 1855–6 and one recent collection from Efogi (*Schodde 5667*). Other collections from the same region closely match the foliage and fruit, but the male receptacles are globose. These may be hybrids with *S. hirsuta*.

The female flowers are described as bright yellow and the fruit as black on orange stipes.

12. Steganthera hirsuta (Warb.) Perkins – Fig. 4.

Kibara (?) hirsuta Warb., Bot. Jahrb. 13 (1891) 316. – *S. hirsuta* (Warb.) Perkins, Bot. Jahrb. 25 (1898) 567.
S. warburgii Perkins, Bot. Jahrb. 25 (1898) 564.
S. schumanniana Perkins, l.c. 565.
S. thyrsiflora Perkins, l.c. 565.
S. oblongiflora Perkins, l.c. 566.
S. fengeriana Perkins, l.c. 566.
S. oblongifolia Perkins, Pflanzenreich Heft 4 (1901) 54.
S. crispula Perkins, Pflanzenreich Heft 49 (1911) 21.
S. torricellensis Perkins, l.c. 21.
S. buergersiana Perkins, Bot. Jahrb. 52 (1915) 199.
S. riparia Kanehira & Hatusima, Bot. Mag. Tokyo 56 (1942) 259.

Distribution. Sulawesi: W. Kraeng. Moluccas: Buru, Ceram (Ambon), Halmahera (Ternate), Aru. New Guinea: throughout the island from Vogelkop Peninsula to Milne Bay Province (Mt Suckling), also on Manus I., New Britain and New Ireland. Australia (Queensland, Iron Range).

Ecology. An understorey tree in rain forest, mostly at low altitudes, but also in lower montane forest up to 2450 m. It is recorded from seasonally inundated swamps

and from ridge forest. Usually a moderate-sized tree with a spreading crown, it may also be a straggling shrub and occasionally is described as a liane.

Vernacular names. Gwa (Wagu), imaitru (Jal), kamakama, kamokam (Enga), kubal (Madang), kuraili (Koropa), kwaffel (Bembi), mankanane (Mt Suckling), metjem, mey (Waskuk), namelawe (Kainantu), napiwa (Talasea, New Britain), ongupinpae (S. New Britain), sakoboe (Moeswaar I.), sap (Madang), sore (Naho), tangitang (Tomba), tonona (Kutubu), tsohren (Rawa), tugwambi (Wagu), tunngacook (Wein), vingi-vingi (Bayer R.), waluwali-i (Gogodala).

Uses. The wood used for clubs (Isago village, Balimo Dist., Western Province, Papua New Guinea). Pipe tobacco rolled in the leaves (Butemu village, Saidor Dist., Madang Province, P.N.G.).

Notes. The number of different forms included within this species cannot be considered satisfactory, yet they appear to be connected by intermediates so that any segregation of these forms as species would seem, at this stage, to be even less satisfactory. This aggregate has a geographical range extending from Celebes almost to the eastern limit of New Guinea, and reaches from sea-level to 2450 m. It is frequent throughout its range, and the number of separate collections of it approaches that of all the other species combined. Several specific names have been applied to different forms within the complex and some of these certainly appear distinctive until intermediate forms are compared. Variability effects most features of the plant: leaf shape, size and the pattern of the principal veins; the presence or absence of marginal teeth and their prominence; the degree of development and persistence of the indumentum; the degree of branching of the inflorescence; the size and shape of the male and female receptacles; the ratio between the cavity and wall thickness in the male flower; and the presence and length of the stipes bearing the achenes. Some combinations of character states may occur frequently in one region, encouraging the belief that local segregate species may eventually become recognizable. An example is the form named *S. oblongiflora* (with elliptical male receptacles with small cavities and narrowly elliptical, more or less glabrous leaves with few, sharply ascending veins) that occurs in the upland parts of the Northern and Central Provinces and adjacent parts of the Manyamya District of Morobe Province. Similar to it and occurring sympatrically is the form named *S. thyrsiflora* which is most frequent in the neighbouring Wau, Mumeng and Lae Districts of Morobe Province. This form has broader glabrous leaves with more spreading principal veins, and with globose receptacles with proportionately larger cavities. However, the character states intergrade and occur in different combinations, so that specific distinctions cannot be maintained. A practical difficulty with herbarium material is that specimens rarely display all the significant characters, so that a definitive treatment of this complex must finally rely on extensive field work. Another distinctive form with densely hairy leaves (and often with more or less sessile achenes) has been collected most frequently east of Wau, but is also found from the Owen Stanley Range to the Western Highlands Province.

The young foliage is pinkish; the flowers are cream coloured; and the black achenes are borne on red, yellow or orange receptacles.

13. Steganthera ilicifolia A.C. Smith

S. ilicifolia A.C. Smith, J. Arn. Arbor. 22 (1941) 235.

Distribution. New Guinea. Frequent along the central mountains usually above 1200 m to as high as 3250 m (but rather lower in Central Province) from Milne Bay Province (including Fergusson I. at 900 m) westwards as far as the Star and Carstensz mountains in West Irian. Also in the mountains north of the Huon Gulf in Morobe and Madang Provinces.

Ecology. A straggling understorey shrub or small tree in lower mountain forest (often with *Nothofagus* and *Castanopsis*) or in thickets at the forest margin.

Vernacular names. Agubporombigl (Hagen), genzphora, iganaphore (Tairoa lang.), kamagam, kamokam, kamokum (Enga lang.), kamokamp (Mendi lang.), kamakama (Ialibu), kombugump (Togoba), munne yambo (Maring), pundpunda (Melpa lang., Mt Hagen), soreng (Nako lang.), toin bekl (Togoba), yuri (Minj).

Uses. Provides stakes for general purposes, e.g. for house building, for digging sticks and for firewood.

Notes. A common and widespread species, usually a straggling shrub, but sometimes attaining tree stature. In its usual form the harsh dentate leaves vary in size and shape, but the prominent venation below is characteristic as are the delicate, few-flowered inflorescences with small, globose male flowers. Female flowers are less frequent and are either terminal or end the distal branches. In less typical forms the dentations become fewer and less prominent, culminating in forms with quite entire, often lanceolate leaves. A few of the specimens with entire leaf-margins cannot be distinguished from forms of *S. hirsuta* with certainty. The young foliage is red or pink, the flowers cream, and the ripe receptacle orange bearing purple-black achenes.

The flowers are frequently deformed by insect galls.

14. Steganthera chimbuensis Philipson, *spec. nov.*

Frutex vel arbor parva ad 20 m alta, ramulis glabris vel minute pubescentibus. Folia elliptica, 50–100 × 22–42 mm. Monoecia. Inflorescentiae axillares vel supra-axillares, 1–3 florae. Flos mas globosus, 2–3 mm diam. Flos femineus mari similis, tepalis et ostiolo minutis, carpellis c. 12–20. Achenia breve stipitata. – Typus: *Hoogland & Pullen 5417* (CANB). East Highlands Province, Asaro-Mairi Div., 2400 m.

Distribution. Papua New Guinea. Chimbu Province, Kundiawa District; Eastern Highlands Province, Goroka District. Fig. 1.

Ecology. In primary and secondary lower montane forest, between 2400–2850 m.

Vernacular names. Abangle (Chimbu, Masul), ivananottoi (Mairi, Watabung), pemble (Wahgi; Minj), pogambeg (Hagen, Togoba).

Note. Similar to the more widely spread *S. ilicifolia*, but the leaves are entire (a dentation very rarely occurs on a leaf of a plant with otherwise entire leaves) and the undersurface dries a warm cinnamon brown in contrast to the buff colour of *S. ilicifolia*. The flowers are pale yellow; the achenes purple-black on an orange receptacle.

15. Steganthera australiana C.T. White

S. australiana C.T. White, Proc. Roy. Soc. Queensland 55 (1944) 78.

Distribution. Papua New Guinea. Morobe Province, Wau District; Central Province, Goilala and Moresby Districts. Fig. 1.

Ecology. Lower montane forest (*Castanopsis* and *Nothofagus* dominated) and second growth, between 1000–2300 m.

Note. A plant of restricted distribution in New Guinea characterized by the small, usually more or less lanceolate and apiculate leaves and delicate inflorescences, is identified with the species described from Queensland. The few New Guinea specimens show more variation in size, shape, dentation, and indumentum of their leaves than may occur in Australia. A specimen from near Wau has more richly branched inflorescences, the side branches being clustered, whereas in the other specimens they occur in opposite pairs. Carr collected this species on five occasions, but it has been collected only twice subsequently. A small tree with greenish or cream flowers.

16. Steganthera insculpta Perkins

S. insculpta Perkins, Bot. Jahrb. 52 (1915) 202.

Distribution. New Guinea. Sepik region (known only from the type, *Ledermann 9570*, and a gathering from Telefomin, *Womersley & Umba NGF 48740*). Fig. 1.

Ecology. In forest at 850–1600 m altitude.

Note. This species is distinguished from densely hairy forms of *S. hirsuta* by the virtually sessile female inflorescences and the regular small dentations on the leaf margins. It may prove to be best regarded as a form of that species because a sterile specimen from much further to the east (*Rau 99*, Kaisenik, east of Wau, Morobe Prov.) has leaves identical to those of the type. However, fertile specimens from the same locality with similar (but not so regularly dentate) leaves have long-pedunculate cymose inflorescences and are identified as *S. hirsuta* (e.g. *Philipson & Kairo 3654, 3655*).

INSUFFICIENTLY KNOWN SPECIES

Information about any existing examples of the following types would be welcomed.

1. *S. atepala* Perkins in Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee (1900) 329. *Rodatz & Klink 237*, Bismarck Range.
2. *S. schlechteri* Perkins, Pflanzenreich Heft 49 (1911) 21. *Schlechter 17421*, near Mimi.
3. *S. odontophylla* Perkins, l.c. 23. *Schlechter 17847*, Kaui Mts.
4. *S. symplocoides* Perkins, l.c. 23. *Schlechter 19825*, Goridjoa.

5. *S. pycnoneura* Perkins, l.c. 23. *Schlechter 19517*, Maboro.
6. *S. forbesii* Perkins, l.c. 23. *Forbes 608*, without locality.
7. *S. psychrotrioides* Perkins, Bot. Jahrb. 52 (1915) 198. *Ledermann 9078*, Sepik.
8. *S. alpina* Perkins, l.c. 201. *Ledermann 11968*, Sepik.
9. *S. ledermannii* (Perkins) Kanehira & Hatusima, Bot. Mag. Tokyo 56 (1942) 255. – *Anthobembix ledermannii* Perkins, Bot. Jahrb. 52 (1915) 20. *Ledermann 11412*.

   Very like *S. hospitans* but leaves with long white hairs, a feature not seen in *S. hospitans*.

EXCLUDED SPECIES

S. elliptica A.C. Smith, J. Arn. Arbor. 22 (1941) 236, = **Levieria nitens** Perkins.

S. oligocarpella Kanehira & Hatusima, Bot. Mag. Tokyo 56 (1942) 257, = **Kibara**.

S. villosa Kanehira & Hatusima, Bot. Mag. Tokyo 56 (1942) 259, = **Kairoa**.

A NOTE ON TETRASYNANDRA

A small number of New Guinea specimens have been identified as *Tetrasynandra*. All of these have proved to be species of *Steganthera*. Some specimens of *Steganthera* may bear a few flowers in which the stamens are closely appressed or even slightly connate below, but the filaments are never united into a column as in the Australian species of *Tetrasynandra*, and normal androecia occur in other flowers on the same specimens.

I wish to thank Mr. Don Foreman for sending me fixed flowers of *Tetrasynandra* as well as a prepared slide of the androecium. I am also grateful to the Curator, Herbarium Australiense for the loan of specimens.

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