

## TRIURIDACEAE (J.P.M. van de Meerendonk, Leyden)<sup>1</sup>

The *Triuridaceae* are a small family (c. 6 genera, and c. 45 spp.) of very delicate, saprophytic, terrestrial, mostly dark-red coloured herbs growing in the deep shade of everwet tropical forest, entering the subtropics only in Japan and the Bonin Is. They are in Africa confined to restricted areas in the West and are also in continental Southeast Asia remarkably rare, as yet only known from two localities in Assam and N. Thailand respectively. Fig. 1. The nearest localities to Indochina and China are in Hainan and Botel Tobago Is. (southeast off Taiwan). In Australia they are only found in the Bellenden Ker Range in NE. Queensland, showing their aversion to dry and seasonal climates.

By their small stature (10–40 cm), dark colour, and very small flowers they are evasive to collectors; the only one reaching some size (45–140 cm) is *Sciaphila purpurea* which is found in Peru, according to GIESEN mainly in termite nests in hollow trunks. During exploration, trip stops, either for felling or climbing trees, or for culinary or sanitary purposes, offer the best opportunity to observe them.

Flowering specimens can probably be found throughout the year, as it appeared that of common species such as *Sciaphila arfakiana*, specimens have been collected in all months of the year.

Formerly *Triuridaceae* were usually placed in the affinity with *Liliaceae* by BENTHAM & HOOKER and by ENGLER & PRANTL. HUTCHINSON (1934) raised the family to the order *Triuridales*, alongside *Alismatales* to which he also reckoned the saprophytic genus *Petrosavia*, which usually was accommodated in *Liliaceae*, but deviates from *Liliaceae* in having an apocarpous gynoeceium. He recognized *Petrosavia* as representing a distinct family *Petrosaviaceae*.

Recently this controversial matter was further elaborated by CRONQUIST (1981), who also recognized *Triuridaceae* in the rank of an order, *Triuridales*, but more closely associated *Petrosaviaceae* with *Triuridaceae* and finds 'the resemblance so complete that I would have no hesitation in placing *Petrosavia* in the family *Triuridaceae* on the basis of anatomical evidence.' This view is shared by DAHLGREN & CLIFFORD (1982). The removal of *Petrosavia* from *Liliaceae* to the affinity of *Triuridaceae* is here also supported by MULLER (*vide infra*) who found that the pollen of *Triuridaceae* shows some similarity to that of *Petrosavia* and *Vallisneria* and does not suit that of *Liliaceae*.

The family was meticulously revised by H. GIESEN (1938) who had the rich material (much on liquid) of Herbarium Bogoriense. In addition, the great value of his work is the fact that he reported in detail on many type specimens, of which some in Berlin are now lost and also on those of Florence, which were not sent to me on loan. This enabled me to reach a satisfactory interpretation.

From Malesia GIESEN had some 130 collections at his disposal. The present revision is based on 300 collections. This increase led to a better insight in the variability of characters and made it possible to select those that are reliable, which in turn led to a rather heavy reduction in the number of species and more critical generic and specific delimitations.

As to the genera, *Sciaphila* (incl. *Andruris*) is by far the largest (c. 35 spp.), and covers the entire range. Three small genera (1 or 2 spp. each) are neotropical, a fifth is confined to the Malagasian area, and the sixth is endemic in the Deccan and Ceylon; both are monotypic.

*Literature:* A. CRONQUIST, An integrated system of classification of flowering plants (1981) 1074; R.M.T. DAHLGREN & H.T. CLIFFORD, The Monocotyledons (1982) 289, 323, 324; H. GIESEN, *Triuridaceae*. Pfl. R. Heft 104 (1938); J. HUTCHINSON, The families of flowering plants. 2. Monocotyledones (1934) 37.

(1) Revised under the supervision of the late Dr. M. Jacobs; made ready for the press with a general introduction by the General Editor.

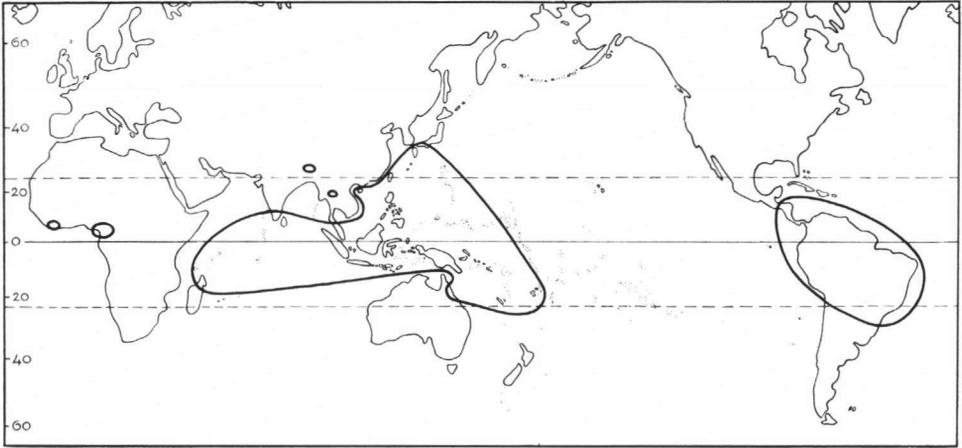


Fig. 1. Approximate range of the family *Triuridaceae*.

### 1. SCIAPHILA

BLUME, Bijdr. 10 (1826) 514; BECCARI, Malesia 3 (1890) 329; SCHLTR, Bot. Jahrb. 49 (1912) 70–84, 3 fig.; GIESEN, Pfl. R. Heft 104 (1938) 30; MEERENDONK, Ident. Lists Males. Specim. n. 63 (1983). — *Aphyllia* CHAMPION, Calc. J. Nat. Hist. 7 (1847) 468. — *Andruris* SCHLTR, Bot. Jahrb. 49 (1912) 71; GIESEN, Pfl. R. Heft 104 (1938) 15. — Fig. 1–4.

Small and delicate, echlorophyllose, mostly erect, simple or branched herbs up to c. 45 cm high (in Mal.). Rhizome often with a few scale-like leaves, sometimes branched, mostly with hairs. Stem usually glabrous, sometimes with air-roots, descending from both sides of the leaves (up to 5 cm of the stem). *Leaves* scale-like, scattered, spaced, sessile, mostly appressed, sometimes amplexicaul. *Inflorescences* terminal, racemose, all around or most flowers to one side, with male and female flowers, or male and bisexual flowers, or only bisexual flowers. Monoecious; female flowers usually in the upper part of the raceme. *Flowers* actinomorphic, perianth with 4–10, usually 6, valvate, patent or reflexed, equal or alternately unequal (larger and smaller) segments, connate at base, at the top glabrous or bearded by uniseriate hairs, or with knob-like appendages. — ♂ *Flowers*: with 2–3 or 6 sessile or  $\pm$  sessile, epitepalous (in *Triuris* alternitepalous) stamens, in case there are 2 or 3 stamens they are in front of the larger segments; anthers 1–4-celled, 2–4-lobed, first opening transversally, later also longitudinally; filaments sometimes far exceeding the dorsifixed anthers, rarely connate at base. — ♀ *Flowers*: with c. 10–80 obovoid, free ovaries, each with 1 orthotropic, later anatropic ovule; style inserted laterally and adaxially, usually exceeding the ovary, club- or awl-shaped, in the former case with many hairs and papillae, in the latter with glabrous apex. — *Bisexual flowers*: with (2–) 3–6 persistent stamens with clearly visible filaments, anthers 1-celled, 2–3-lobed; ovaries c. 10–50, like in the female flowers, but the style always

club-shaped. *Fruits* obovoid, 3–8 times as large as the ovaries, with persistent, partly shrivelled style, dehiscent lengthwise from the apex, first abaxially, later also adaxially. *Seed* 1, endospermous, elliptic to ovate, the surface netted and mostly lined, sometimes with a dent. Endosperm absent; embryo anatropous (first orthotropous).

*Distr.* About 33 *spp.*; pantropical and subtropical in Southern Japan and Bonin Is., in Africa only in the West (Ivory Coast, Nigeria, Cameroun), in continental Southeast Asia only in Assam and N. Thailand, in Hainan and Botel Tobago Is., throughout Malesia (14 *spp.*), not in the Central Pacific, but rather well represented in Micronesia and Melanesia, and Western Polynesia; in Australia only locally in Queensland (Bellenden Ker Ra., c. 16° S). Fig. 2.

*Ecol.* Saprophytes in humous soil between litter of rain-forest, often associated in local saprophyte 'colonies' with species of *Burmanniaceae*, tiny orchids, and *Epirixanthes* (*Polygal.*). Mostly at low altitude, ascending to c. 1200 m, very rarely higher, up to 2200 m altitude.

The root system carries endotrophic mycorrhiza.

*Morph. & Anat.* Several large papers have been devoted to the morphology and anatomy, notably by JOHOW (1889), POULSEN (mainly on the embryology) (1906), WIRZ (1910), and TOMLINSON (1982).

The anatomy is reduced and stomata are absent. Whether the plants are annual or perennial is not clear; probably they are annual.

The pollen is that of a Monocot, the grains being inaperturate, as in *Scheuchzeria*, monosulcate in *Sciaphila*, and trinucleate as in most *Alismatiflorae*.

The ovule is orthotropous first, anatropous later. The single integument is two cell layers thick. The seed, c. 1 mm in size, lacks endosperm and the cells of the testa are filled with air, which might favour wind dispersal, anyway at very short distances only, with respect to its 'concealed' habit and small size of the plants.

*Literature:* JOHOW, Pringsh. Jahrb. Bot. 20 (1889) 475–525, t. 19–22; POULSEN, Medd. Naturl. Foren. Kbhvn 49 (1906) 1–16, t. 6; P.B. TOMLINSON in Metcalfe (ed.), Anatomy of the Monocotyledons, VII. *Helobiaeae* (1982) 466–473, t. 15; WIRZ, Flora 101 (1910) 395–446, f. 1–22, t. 4.

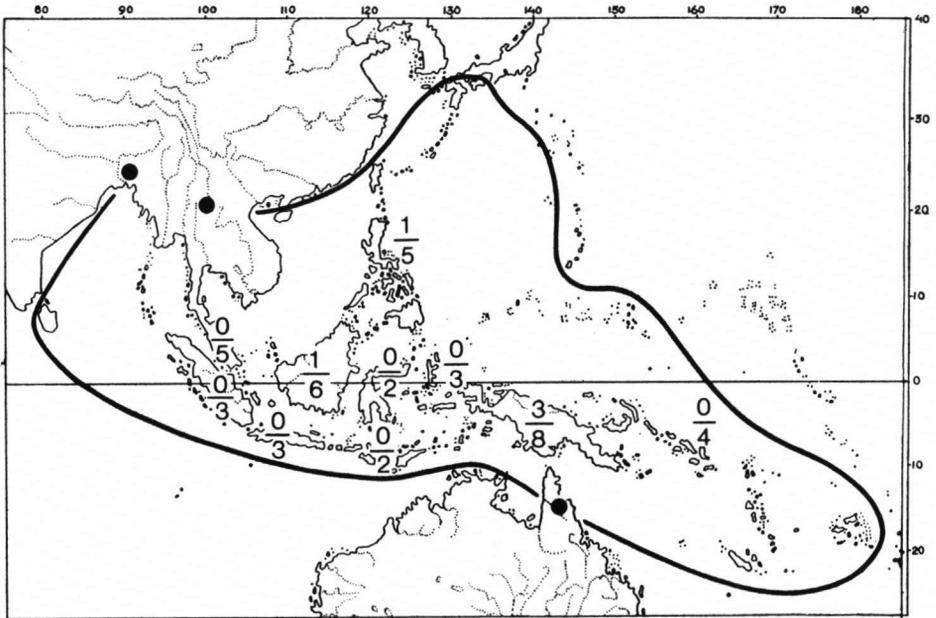


Fig. 2. Distribution of *Sciaphila* Bl. east of Africa; outline of range, with the only known localities in India, Thailand, and Australia represented by a dot. For the Malesian subareas number of endemics above the hyphen and number of non-endemics below the hyphen.

**Palyn.** Pollen of *Sciaphila* is trinucleate, boatshaped-ellipsoidal, 25–40 µm long with an indistinctly outlined colpate aperture. The exine is very thin, probably intectate and covered with microverrucae. In *S. arfakiana* and *S. corniculata* the microverrucae are coarser on the apertural side of the grain and finer on the opposite side and they are densely spaced in a hexagonal pattern. In *S. densiflora*, *S. tenella* and *S. winkleri* the microverrucae are of uniform size and more or less densely spaced. The pollen of *S. multiflora* is transitional between these two types.

*Sciaphila* pollen is similar in the microverrucate sculpture to that of *Triuris*, but the latter is spherical and inaperturate. The pollen of *Hyalisma* which is also spherical and inaperturate differs in the rather coarse, dimorphic gemmate-echinate sculpture.

The pollen of *Triuridaceae* shows some similarity to that of *Petrosavia* (*Liliaceae*) and *Vallisneria* (*Hydrocharitaceae*).

**Literature:** G. ERDTMAN, Pollen morphology and plant taxonomy, Angiosperms (1952) 439. — J. MULLER.

**Chromosomes.** Chromosome numbers are few and only known from *Sciaphila*. OHBA & SINOTO found for the non-Malesian *S. japonica*  $2n = 48$ ; LARSEN for *S. thaidanica* from N. Thailand  $2n = 28$ ; GREEN & SOLBRIG for the New Caledonian *S. dolichostyla*  $2n = 44$ , while SOLBRIG noted for *S. densiflora* (*in sched.* P.S. GREEN 1329) the number as  $2n = 22$ .

**Literature:** P.S. GREEN & O.T. SOLBRIG, J. Arn. Arb. 47 (1966) 266–269, f. 1–3; K. LARSEN, Dansk Bot. Ark. 30 (1963) 249; OHBA & SINOTO, Bot. Mag. Tokyo 38 (1924) 203.

**Taxon.** Following SCHLECHTER (1912), GIESEN (1938) distinguished between *Sciaphila* BL. and *Andruris* SCHLTR, on account of the absence *sq.* presence of what he called an awl-shaped prolonged connective. Actually the anther is dorsally attached near the base of the usually very long filament. The apical part of the latter is easily shed, as GIESEN himself already noted, and hence the structure is often difficult to recognize.

Using this feature as a character on generic level would in my opinion lead to artificial distinctions. This becomes clearly evident in comparing the type specimens and/or descriptions for example of *Sciaphila arfakiana* and *Andruris anisophylla*, and of *S. tuberculata* and *A. clemensiae*, which are all otherwise identical; in fact they represent only a single species, *Sciaphila arfakiana*.

GIESEN had subdivided the genus into a number of sections and subsections which can be retained. The species accepted for Malesia are accommodated in the key almost all according to his subdivision.

**Notes.** As essential characters for specific distinction are mainly found in the structure of the androecium, collectors should gather ample material and ensure that male flowers are represented, and check whether plants with bisexual flowers are extant. Hitherto these are only found in *S. maculata* and *S. tenella*. The structure of the stamens can be best observed in mature buds or very young flowers.

The great influx of material since GIESEN's monograph has led to a rather heavy reduction in the number of accepted species in Malesia and adjacent countries. GIESEN recognized for Malesia 49 *spp.* and 2 doubtful ones; one, *S. buruensis* being added later. In the present revision I recognize 14 *spp.*, plus a doubtful one.

In the 'Identification Lists of Malesian Specimens' n. 63, published simultaneously with this revision, all names in *Sciaphila* of Malesia and adjacent regions in the West Pacific are listed, with indication of their types and disposition.

#### KEY TO THE SPECIES

1. Plants with bisexual flowers. Mostly also male flowers present towards the apex. *Sect. Hermaphroditantha* subsect. *Polyandra*.
2. Male and bisexual flowers with 3 stamens ..... 1. *S. maculata*
2. Male flowers with 6 stamens. Bisexual flowers with 3–6, but generally 6, stamens ..... 2. *S. tenella*
1. Flowers unisexual (the female towards the base, the male towards the apex).
3. Perianth of the male flower consisting of 4–8 equal segments. *Sect. Oliganthera* subsect. *Quadrilobata* (incl. also 14. *S. micranthera*).
4. Stamens 2. Male perianth segments at the apex with a knob ..... 3. *S. quadribullifera*
4. Stamens 3. Male perianth segments at the apex bearded or glabrous.
5. Male flowers always with 6 perianth segments. Style awl-shaped, in general 2–3 times as long as the carpel ..... 4. *S. corniculata*
5. Male flowers with 4–8 perianth segments. Style club-shaped, generally as long as the carpel ..... 5. *S. secundiflora*
3. Perianth of the male flower consisting of 3 larger segments alternating with 3 smaller ones.
6. At least 3, mostly 6, of the male perianth segments at the apex with a stipitate globose to ellipsoid knob.
7. Female perianth segments with a minute knob at the apex (look at buds) ..... 6. *S. wariana*

7. Female perianth segments at the apex without appendages.  
 8. Only the 3 smaller male perianth segments at the apex with a stipe and a small ellipsoid knob. The 3 larger perianth segments without appendages ..... 7. *S. nana*  
 8. All male perianth segments with a stipe and knob ..... 8. *S. arfakiana*  
 6. Male perianth segments at the apex without a stipe or knob, but long-bearded.  
 9. Stamens 6. *Sect. Hexanthera*.  
 10. Young anthers 3-lobed. Flowers all around the stem, rarely most flowers to one side (secund) ..... 9. *S. densiflora*  
 10. Young anthers 2-lobed. Flowers generally all to one side (secund) ..... 10. *S. corallophyton*  
 9. Stamens 3.  
 11. Young anthers 2- or 3-lobed.  
 12. Anthers 2-lobed. *Sect. Oliganthera subsect. Bilobatae* ..... 11. *S. winkleri*  
 12. Anthers 3-lobed. *Sect. Oliganthera subsect. Trilobatae*.  
 13. Pedicels c. 5–8 mm long ..... 12. *S. consimilis*  
 13. Pedicels c. 2–4 mm long ..... 13. *S. multiflora*  
 11. Young anthers 4-lobed. (Belongs to *sect. Oliganthera subsect. Quadrilobatae*, see lead 3)  
 14. *S. micranthera*

1. *Sciaphila maculata* MIERS, Proc. Linn. Soc. 2 (1850) 72 (*n.v.*), repr. Ann. Mag. Nat. Hist. II, 7 (1851) 324; Trans. Linn. Soc. 21 (1852) 48; BTH. in Hook. J. Bot. Kew Misc. 7 (1855) 10; MIQ. Fl. Ind. Bat. 3 (1856) 232; F. v. M. in Walp. Ann. 5 (1860) 917; SCHNIZL. Iconographia 1 (Suppl.) (1860-67) pl. 57: f. 27, 28; VIDAL. Rev. Pl. Vasc. Filip. (1886) 282; ENGL. in E. & P. Nat. Pfl. Fam. 2, 1 (1889) 238, f. 179: A–F; BECC. Malesia 3 (1890) 331; MERR. En. Philip. 1 (1923) 28; GIESEN, Pfl. R. Heft 104 (1938) 39, f. 7: 1–3. — *S. affinis* BECC. Malesia 3 (1890) 331, pl. 39: 14–18; RIDL. J. Str. Br. R. As. Soc. n. 33 (1900) 197; Mat. Fl. Mal. Pen. (Monoc.) 2 (1907) 126; J. Fed. Mal. St. Mus. 6 (1915) 188; MERR. En. Born. (1921) 38; RIDL. Fl. Mal. Pen. 4 (1924) 364; GIESEN, Pfl. R. Heft 104 (1938) 37; HEND. Mal. Wild Fl. (Monoc.) (1954) 203, f. 121. — *S. hermaphrodita* SCHLTR. Bot. Jahrb. 49 (1912) 76, f. 3: K–O; J. J. SMITH, Nova Guinea 14 (1927) 325; GIESEN, Pfl. R. Heft 104 (1938) 38, f. 7: 9–10. — *S. minuta* SCHLTR. Bot. Jahrb. 49 (1912) 84, f. 2: O–S; GIESEN, Pfl. R. Heft 104 (1938) 68. — *S. decipiens* BACK. Handb. Fl. Java 1 (1925) 66; STEEN. Trop. Natuur 23 (1934) 51; GIESEN, Pfl. R. Heft 104 (1938) 37; BACK. & BAKH. f. Fl. Java 3 (1968) 8.

Erect herb, c. 3–16 cm high, mostly simple, sometimes branched at the base. Roots filiform, c. 0.2–0.3 mm in CS, seldom branched, glabrous. Stem c. 0.4–0.9 (–1.1) mm in CS, mostly glabrous, internodes c. 3–29 mm. *Leaves* oblong, acuminate to acute, c. 1–2.5 by 0.5–0.9 mm, sometimes semi-amplexicaul, appressed, but top often patent. *Raceme* c. 2–8 cm; flowers c. 6–40, all around, sometimes secund. Bracts lanceolate, acute, c. 0.8–2 by c. 0.2–0.5 mm, appressed to the pedicel. Pedicels c. 2–9 mm, c. 0.15–0.25 mm in CS, patent at c. 45–60 (–70)°, straight for almost the whole length. — ♂ *Flowers* (sometimes absent): perianth segments 6, 3 larger ones alternating with 3 smaller ones, all completely

reflexed and bearded at the top; larger segments long-triangular, acuminate, c. 0.75 by c. 0.15 mm; smaller segments triangular, acute, c. 0.65 by c. 0.20–0.25 mm. Stamens 3, c. 0.2 mm; filaments short; anthers 3-lobed. — *Bisexual flowers*: perianth similar to that of the male flower but smaller differences between large and small perianth segments. Stamens 3, very rarely 2, c. 0.2–0.3 mm; filaments short; anthers 2–3-lobed. *Carpels* c. 10–30, c. 0.3–0.6 mm long; style inserted laterally at the base or just above the base, when young just exceeding the carpel, club-shaped, the apex beset with hairs and papillae.

Distr. *Malesia*: Malaya (all parts), Borneo (Sarawak), New Guinea (NE. part).

Ecol. Rain-forest (sometimes on ridges), on humus or between dead leaves, 100–1200 m. *Fl.* April, July, Nov., Dec.

Notes. When fresh plant wine-red, crimson or dark-purplish red; flowers red or purplish red.

It is possible to distinguish between *S. maculata* (incl. *S. minuta*) and *S. affinis* (incl. *S. hermaphrodita* and *S. decipiens*) because male flowers are absent in the latter. In the Identification List such specimens have been marked (f). In my opinion, all are conspecific.

I did not see the types of *S. affinis* and *S. decipiens*, but GIESEN, who did, thought them to be conspecific.

2. *Sciaphila tenella* BL. Bijdr. 10 (1826) 515; Mus. Bot. 1 (1851) 321, f. 48; MIERS, Trans. Linn. Soc. 21 (1852) 48; BTH. in Hook. J. Bot. Kew Misc. 7 (1855) 10; MIQ. Fl. Ind. Bat. 3 (1856) 232; F. v. M. in Walp. Ann. 5 (1860) 917; SCHNIZL. Iconographia 1 (Suppl.) (1860-67) pl. 57: t. 13–16, 19–25; BECC. Malesia 3 (1890) 331; JANSE, Ann. Jard. Bot. Btzg 14 (1896) 85; HEMSL. Ann. Bot. 21 (1907) 75, pl. 10: 11–17; WENT, Nova Guinea 8 (1909) 165; KOORD. Exk. Fl.

Java 1 (1911) 96; MERR. *En. Born.* (1921) 38; BACK. *Handb. Fl. Java* 1 (1925) 66; J.J. SMITH, *Nova Guinea* 14 (1927) 326; STEEN. *Trop. Natuur* 23 (1934) 51; GIESEN, *Pfl. R. Heft* 104 (1938) 40, f. 7: 11–12, *incl. var. robusta* GIESEN *et var. voigtii* GIESEN, *l.c.* 41; MERR. & CHUN, *Sunyatsenia* 5 (1940) 15; BACK. & BAKH. *f. Fl. Java* 3 (1968) 8; ANONYMOUS, *Fl. Hainanica* 4 (1977) 63, f. 985. — *Aphyllia erubescens* CHAMP. *Calc. J. Nat. Hist.* 7 (1847) 468. — *S. erubescens* (CHAMP.) MIERS, *Trans. Linn. Soc.* 21 (1852) 48; BTH. in Hook. *J. Bot. Kew Misc.* 7 (1855) 10; MIQ. *Fl. Ind. Bat.* 3 (1856) 232; F. v. M. in Walp. *Ann.* 5 (1860) 917; SCHNIZL. *Iconographia* 1 (Suppl.) (1860–67) pl. 57: f. 27; THW. *En. Pl. Zeyl.* (1861) 294; ENGLER in E. & P. *Nat. Pfl. Fam.* 2, 1 (1889) 238, f. 179: G–H; Hook. *f. Fl. Br. India* 6 (1893) 558; in Trimen, *Fl. Ceyl.* 4 (1898) 368; ALSTON, *Fl. Ceyl. Suppl.* (1931) 298; GIESEN, *Pfl. R. Heft* 104 (1938) 41, f. 8: 1–3. — *S. subhermaphrodita* J.J. SMITH, *Nova Guinea* 14 (1927) 326, pl. 36: 4. — *S. torricelensis* K. SCH. & SCHLTR in K. Sch. & Laut. *Fl. Schutzgeb. Nachtr.* (1905) 54, pl. 2; GIESEN, *Pfl. R. Heft* 104 (1938) 42, f. 8: 4, 5, 9. — *S. pumila* GIESEN, *Pfl. R. Heft* 104 (1938) 39, f. 7: 4–6. — **Fig. 3 B1–5.**

Erect herb, at the base a little flexuous, rarely branched, (1.5–) 5–24 cm high. Roots filiform, c. 0.1–0.3 mm in CS, sometimes branched, glabrous or with a few hairs. Stem c. (0.3–) 0.5–1.5 mm in CS, glabrous, internodes c. 3–25 mm long. *Leaves* ovate to oblong, acute to acuminate, 1–3 by 0.7–2.0 (–2.5) mm, amplexicaul or semi-amplexicaul, appressed. *Raceme* c. 1–16 cm long, with c. 5–50 flowers, flowers more or less all around. Bracts oblong-ovate to oblong, acute, c. 1–2 (–3) by c. 0.3–0.9 mm, mostly appressed to the pedicel, often the top a bit patent, rarely patent to the pedicel at 20–30°. Pedicels c. 2–7 (–8–15) mm long and c. 0.10–0.35 mm in CS, patent at (30–) 50–90°, straight or recurved for a smaller part to halfway. — *♂ Flowers*: perianth segments 6, all bearded at the top and completely reflexed, 3 larger segments alternating with 3 smaller, the larger ones long-triangular, acute, c. 0.6–1.5 (–1.8) by 0.2–0.4 (–0.6) mm; the smaller ones triangular, acute, 0.5–1.1 (–1.5) by c. 0.2–0.6 mm. Stamens 6, c. 0.2–0.3 mm, filaments c. 0.1 mm long, connate at the base; anthers 3-lobed. — *Bisexual flowers* c. 1–3 mm in size; perianth like in the male flower, but larger segments c. 1.1–2 by c. 0.3–0.7 mm; smaller segments 0.8–1.6 by 0.3–0.6 mm. Stamens 3–6, probably always 6, but easily broken off; filaments long; anthers (2–) 3-lobed, c. 0.2–0.3 mm. *Carpels* c. 15–50, obovoid, c. 0.2–0.5 mm long when young, the upper half with tubercles; style inserted at the base, more or less as long as the carpel, the apex with hairs and papillae.

*Distr.* Ceylon and *Malesia*: Sumatra (Eastcoast, Bencoolen), Malaya (Pahang, Johore, Singapore),

W. Java, Borneo (Sarawak, Sabah), Philippines (Mindanao), Celebes (Central part and SE. Peninsula), Moluccas (Obi I.), New Guinea (all parts except the SW., also in New Britain and Bougainville I.) and the Solomon Is. (Guadalcanal and San Cristobal Is.).

*Ecol.* (Solitary) plant, in shade of dense (sometimes somewhat disturbed) rain-forest, often on hillsides, on clay, chalk or porous nickel-rich soil, sometimes ultra-basic soil, at various altitudes between 15 and 2250 m. *Fl.* May–Feb.

*Notes.* Fresh plant red, purple or pinkish to coral-pink, flowers red or bright pink, fruits red or pinkish.

GIESEN distinguished between *S. tenella* and *S. erubescens* by the presence or absence of hairs at the apex of the perianth segments. But he thought it possible that their absence on the type specimen of *S. erubescens* was due to the fact that it possessed only very old flowers. In other specimens I found young flowers with, and old flowers without hairs, on the same plant. Therefore I decided that only one species is concerned.

In the absence of male flowers several specimens are suggestive of *S. picta* from South America. For the time being, we regard these as *S. tenella* with female flowers only; in the Identification List such specimens are marked with (f).

**3. *Sciaphila quadribullifera*** J.J. SMITH, *Nova Guinea* 14 (1927) 324, pl. 35: 1; GIESEN, *Pfl. R. Heft* 104 (1938) 56, f. 13: 1.

Branched, erect at the base, somewhat flexuous herb, 6–15 mm high, glabrous all over. Roots filiform, c. 0.2–0.3 (–0.4 in liquid) mm in CS, with many long (c. 0.4 mm) hairs, sometimes branched. Stem c. 0.4–0.8 mm in CS, internodes c. 3–23 mm long. *Leaves* oblong, acute to acuminate, c. 1–3 by c. 0.5–0.9 mm, not amplexicaul, appressed. *Raceme* c. 0.5–1.5 cm long, flowers c. 5–28, all around. Bracts lanceolate, acute, c. 1–2 by c. 0.3–0.4 mm, appressed to the pedicel. Pedicels straight, c. 1.5–3.5 mm long and c. 0.2–0.3 mm in CS, patent at c. 30–45°. — *♂ Flowers*: perianth segments 4, equal, oblong-ovate, acuminate, at apex with a stipitate globose knob, c. 0.6–0.8 by c. 0.4–0.5 mm. Stamens 2, inserted in front of two opposite perianth segments; filaments short; anthers 4-celled, 4-lobed. — *♀ Flowers*: perianth as in the male flower, but segments acute, 0.6–0.85 by c. 0.35–0.6 mm, apex without a stipe and knob. *Carpels* c. 30–50, c. 0.4–0.6 mm, upper half with tubercles; style inserted laterally about halfway, when young exceeding the carpel, almost club-shaped, apex with papillae.

*Distr. Malesia*: New Guinea (NW. and NE. part).

*Ecol.* In forest, 300–1000 m.

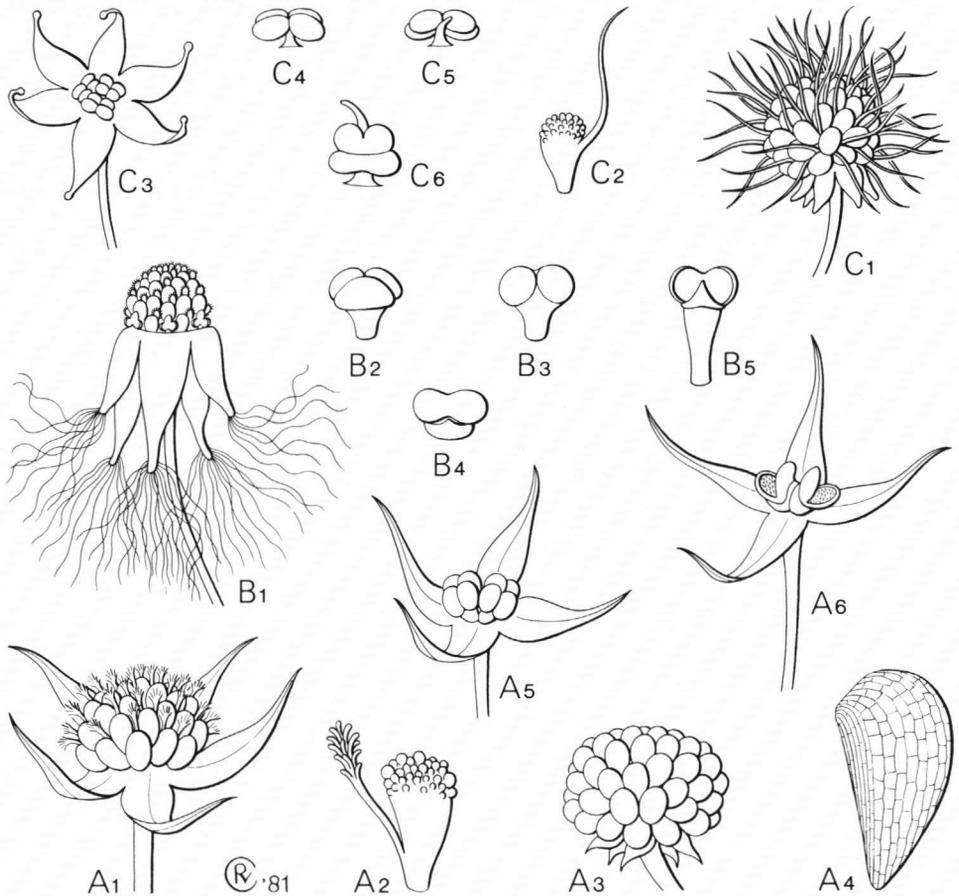


Fig. 3. *Sciaphila secundiflora* THW. ex BTH. A1. Female flower at anthesis,  $\times 10$ , A2. carpel with style,  $\times 20$ , A3. fruits,  $\times 5$ , A4. seed,  $\times 20$ , A5. young male flower, with stamens closed,  $\times 10$ , A6. male flower, with stamens dehisced,  $\times 10$ . — *S. tenella* BL. B1. Bisexual flower, the stamens recurved and seen at their apex, B2. young stamen, seen from inside, B3. the same, from outside, B4. the same, from above, B5. stamen, dehisced, from inside, all  $\times 10$ . — *S. arfakiana* BECC. C1. Female flower,  $\times 10$ , C2. carpel with style,  $\times 20$ , C3. male flower with young stamens,  $\times 10$ , C4. young stamen, from outside, C5. the same, from inside, C6. older stamen, dehisced, from inside, all  $\times 20$  (A1, 2, 5, 6 VAN ROYEN & SLEUMER 6459, A3, 4 VERSTEEG 1231, B1 BSIP 1104, B2-5 NGF 29310, C1-6 SCHMUTZ 3655).

4. *Sciaphila corniculata* BECC. Malesia 3 (1890) 336, pl. 39: 5-13; GIESEN, Pfl. R. Heft 104 (1938) 56. — *S. neo-caledonica* SCHLTR, Bot. Jahrb. 39 (1906) 19; GUILLAUM. Bull. Soc. Bot. Fr. 84 (1937) 256; GIESEN, Pfl. R. Heft 104 (1938) 54; GUILLAUM. Fl. Nouv. Caléd. (1948) 22. — *S. oligochaete* SCHLTR, Bot. Jahrb. 49 (1912) 82, f. 3: E-J; GIESEN, Pfl. R. Heft 104 (1938) 54, f. 12: 8. — *S. gatiensis* SCHLTR, Bot. Jahrb. 49 (1912) 84, f. 2: X-A'; J.J. SMITH, Nova

Guinea 14 (1927) 325; GIESEN, Pfl. R. Heft 104 (1938) 56. — *S. conferta* J.J. SMITH, Nova Guinea 14 (1927) 324, pl. 35: 2; GIESEN, Pfl. R. Heft 104 (1938) 54.

Erect, branched herb, 2.5-13 cm high. Roots filiform, 0.15-2 mm in CS, with a few hairs. Stem glabrous, c. 0.3-0.6 mm in CS, internodes c. 3-20 mm long. Leaves oblong, acute, c. 0.8-1.5 by c. 0.4-0.7 mm, not amplexicaul, appressed. Raceme c. 0.5-3.5

cm long. Flowers c. 3–9 (–18), all around. Bracts oblong to oblong-lanceolate, acute, c. 1–1.5 by c. 0.3–0.7 mm, appressed to the pedicel. Pedicels straight, c. 1–2 (–3) mm long and c. 0.15–0.25 mm in CS, patent at (10–) 30–45 (–90°), flowers not hanging. — ♂ *Flowers*: perianth segments 6, all equal, oblong, acute, c. 0.5–0.8 by c. 0.25–0.4 mm, at the top bearded, patent to reflexed. Stamens 3, c. 0.25–0.3 mm; filaments short, at the base connate; anthers 4-celled, 4-lobed. — ♀ *Flowers*: perianth as in the male flower but segments 0.5–1.2 mm long and the top glabrous. *Carpels* c. 25–60, c. 0.2–0.3 mm long (when young); style inserted laterally, awl-shaped, in general 2–3 times as long as the carpel, with tubercles over its whole length.

Distr. Solomons (Kolombangara I.) and *Malesia*: New Guinea (NW. and NE. parts, Waigeo I.) and Moluccas (Obi and Aru Is.).

Ecol. Mixed primary forest and *Sapotaceae*-dominated forest, sometimes on limestone rocks, growing on humus or among dead leaves, in shade, 75–600 m. *Fl.* Nov.–Feb., June.

Notes. Fresh plant violet or scarlet. Leaves dark wine-red or black, flowers carmine, fruits whitish, with wine-red spots.

WENT Sr came to the erroneous conclusion that *S. corniculata* was conspecific with *S. nana*, and this was copied by KOORDERS and Mrs. KOORDERS-SCHUMACHER; they accepted the name *S. corniculata* although this is younger than *S. nana*, and claimed the species for Java, where it does not occur. See under *S. nana*.

**5. *Sciaphila secundiflora*** THW. ex BTH. in Hook. J. Bot. Kew Misc. 7 (1855) 10; MIQ. Fl. Ind. Bat. 3 (1856) 232; THW. En. Pl. Zeyl. (1861) 294; Hook. f. Fl. Br. India 6 (1893) 558; in Trimen, Fl. Ceyl. 4 (1898) 368; MAKINO, Bot. Mag. Tokyo 14 (1905) 141; ALSTON, Fl. Ceyl. 6 (Suppl.) (1931) 298; GIESEN, Pfl. R. Heft 104 (1938) 60, f. 14: 1–3. — *S. major* BECC. Malesia 3 (1890) 332, pl. 40: 1–11; RENDLE, J. Bot. 39 (1901) 178; RIDL. Mat. Fl. Mal. Pen. (Monoc.) 2 (1907) 126; HEMSL. in Hook. Ic. Pl. 29 (1907) t. 2850: f. 1–6; RIDL. J. Fed. Mal. St. Mus. 6 (1915) 188; MERR. En. Born. (1921) 38; RIDL. Fl. Mal. Pen. 4 (1924) 364; GIESEN, Pfl. R. Heft 104 (1938) 59. — *S. sumatrana* BECC. Malesia 3 (1890) 333, t. 40: 12–20; RIDL. J. Fed. Mal. St. Mus. 8 (1917) 119; GIESEN, Pfl. R. Heft 104 (1938) 63. — *S. papuana* BECC. Malesia 3 (1890) 335, t. 41: 1–5; J.J. SMITH, Nova Guinea 14 (1927) 325; GIESEN, Pfl. R. Heft 104 (1938) 60, f. 14: 4–6. — *S. macra* K. SCH. & SCHLTR. in K. Sch. & Laut. Fl. Schutzgeb. Nachtr. (1905) 55, pl. 2, non SCHLTR. (1912) which is *S. multiflora*; GIESEN, Pfl. R. Heft 104 (1938) 61, f. 14: 8–11. — *S. monticola* K. SCH. & SCHLTR. in K. Sch. & Laut. Fl. Schutzgeb. Nachtr. (1905) 55; J.J. SMITH, Nova Guinea 14

(1927) 325; GIESEN, Pfl. R. Heft 104 (1938) 61. — *S. versteegiana* WENT, Nova Guinea 8 (1909) 165, pl. 47; J.J. SMITH, Nova Guinea 14 (1927) 325; GIESEN, Pfl. R. Heft 104 (1938) 63, f. 14: 12–15. — *S. pilulifera* SCHLTR. Bot. Jahrb. 49 (1912) 77, f. 1: Z–C'; J.J. SMITH, Nova Guinea 14 (1927) 325. — *S. maboroensis* SCHLTR. Bot. Jahrb. 49 (1912) 78, f. 1: V–Y; J.J. SMITH, Nova Guinea 14 (1927) 325. — *S. brachystyla* SCHLTR. Bot. Jahrb. 49 (1912) 80, f. 2: J–N; GIESEN, Pfl. R. Heft 104 (1938) 61, f. 14: 7. — *S. wernerii* SCHLTR. Bot. Jahrb. 49 (1912) 80, f. 2: E–H; GIESEN, Pfl. R. Heft 104 (1938) 61. — *S. asterias* RIDL. J. Fed. Mal. St. Mus. 6 (1915) 188; Fl. Mal. Pen. 4 (1924) 365; HEND. J. Mal. Br. R. As. Soc. 17 (1939) 82. — *S. inornata* PETCH, J. Ind. Bot. Soc. 3 (1923) 226; ALSTON, Fl. Ceyl. 6 (Suppl.) (1931) 299; GIESEN, Pfl. R. Heft 104 (1938) 67. — Fig. 3 A1–6.

Erect herb, 6–33 cm high, sometimes somewhat ascending, mostly branched, but often one of the twigs at a ramification broken off. Roots filiform, c. 0.2–0.3 (–1) mm in CS, with hairs. Stem glabrous, c. 0.3–1.5 mm in CS, internodes c. 5–50 mm long. *Leaves* oblong to ovate, acute, c. 1.5–3 (–4) by c. 0.5–1.5 (–2) mm, sometimes semi-amplexicaul, appressed or patent to 25°. *Raceme* c. 0.5–19 cm long. Flowers c. 3–35, more or less all around. Bracts oblong-lanceolate to lanceolate, acute, scale-like, c. 1–3 (–4) by c. 0.3–0.7 (–1) mm, appressed to the pedicel, or sometimes patent to 10°. Pedicels c. 1–5 (–6) by c. 0.1–0.3 (–0.5) mm in CS, patent at c. (30–) 45–90°, mostly straight, sometimes very slightly recurved. — ♂ *Flowers*: perianth segments 4, or 6 or 7, rarely 5 or 8, equal, patent, long-triangular, acute, c. 1.5–5 by c. 0.2–0.6 (–2.2) mm, sometimes at about halfway contracted into a long narrow point, apex glabrous. Stamens 2–3, c. 0.5–0.6 mm; filaments very short (stamens almost sessile); anthers 4-celled, 4-lobed. — ♀ *Flowers*: perianth segments (4–) 5–10, patent, equal, c. 2.8 by c. 0.3–0.7 (–1) mm, oblong to lanceolate, often at about halfway contracted into an awl-shaped point, apex glabrous. *Carpels* c. 20–80, obovoid, c. 0.35–0.6 (–0.8) mm long, the upper half with many tubercles; style club-shaped, inserted laterally at the base or about halfway, the apex with many hairs and papillae.

Distr. Ceylon, Hongkong; in *Malesia*: N. Sumatra (Atjeh), Malaya (all parts), Borneo (Sarawak, Sabah, W. & E. Kalimantan), New Guinea (N. & SE. parts, Japen and Mios Num Is.), New Britain, New Ireland, Solomons (San Cristobal).

Ecol. Plant of (damp rocky) rain-forest, often on rocky terrain, sometimes dominated by *Pandanus* or *Agathis*, on limestone hills but also known from kerangas forest, 15–1250 m. *Fl.* July–Feb.

Notes. Fresh plant white (when young), red, pale mauve or purplish; flowers white, mauve red or pur-

ple (perianth segments sometimes with dark borders), anthers white, fruits red.

PETCH (1923, see above) regarded *S. inornata* as 'most closely allied to *S. secundiflora*' and 'resembling *S. sumatrana*' but, knowing about the characters he used distinguishing between his species and the two others and from his description of *S. inornata* (though I did not see the type), I think it safe to combine them.

With regard to several species here combined, which were still kept apart by GIESEN, his own key even does not work.

I did not see the type of *S. asterias* RIDL., but I did see RIDLEY 16312 which, according to GIESEN, is almost cotypical with the type.

**6. *Sciaphila wariana* (SCHLTR) MEERENDONK, comb. nov.** — *Andruris wariana* SCHLTR, Bot. Jahrb. 49 (1912) 71, f. 1: A–E; GIESEN, Pfl. R. Heft 104 (1938) 22, f. 3: 15–17; TUYAMA, Bot. Mag. Tokyo 52 (1938) 61.

Erect, branched herb, 8–15 cm high. Roots filiform, c. 0.2–0.4 mm in CS, with long (to 1 mm) hairs. Stem glabrous, 0.4–0.7 mm in CS, internodes 4–15 mm long. *Leaves* oblong-lanceolate, acute, 1–1.5 mm by c. 0.2–0.35 mm, not amplexicaul, appressed, but the top often patent. *Raceme* c. 1–2 cm long. *Flowers* c. 10–15, all around. Bracts lanceolate, acute, c. 1–1.5 by c. 0.20–0.25 mm, appressed or patent to 10°. Pedicels straight, c. 6–8 mm long and c. 0.1–0.15 mm in CS, patent at 45–60°. — ♂ *Flowers*: perianth segments 6, patent, 3 larger ones alternating with 3 smaller ones, all oblong and at the apex with a stipitate (stipe c. 0.15 mm long) subglobose knob; the larger ones c. 0.8–0.9 by c. 0.2–0.25 mm; smaller segments c. 0.7 by c. 0.2 mm. Stamens 3, c. 0.15–0.20 mm; anthers almost sessile, 4-celled, 4-lobed, filament mostly clearly exceeding the anther. — ♀ *Flowers*: perianth segments 6, 0.6–0.8 by c. 0.2 mm, completely reflexed, all equal in shape and size, oblong-lanceolate, the apex with a stipitate (stipe c. 0.03–0.05 mm) very minute knob (mostly only well visible in buds or young flowers). *Carpels* c. 30–40, c. 0.2 mm long (without style); style inserted laterally, c. 0.4–0.9 mm long, the apex acute.

*Distr.* *Malesia*: New Guinea (NE. part: Goromia at Waria R.; Lordberg at S. Hunstein Mts), 3 collections.

*Ecol.* In forests, 350–1000 m.

**7. *Sciaphila nana* BL.** Mus. Bot. 1 (1851) 322, f. 48; BTH. in Hook. J. Bot. Kew Misc. 7 (1855) 10; MIQ. Fl. Ind. Bat. 3 (1856) 232; F. v. M. in Walp. Ann. 5 (1860) 917; BECC. *Malesia* 3 (1890) 338; POULSEN, Medd. Naturh. Foren. Kbhvn (1906) 1; WENT, Versl. Verg. Kon. Ak. Wet., Wis- & Nat. Afd. (1909) 698; BACK. Handb. Fl. Java 1 (1925) 65; STEEN. Trop.

Natuur 23 (1934) 50; GIESEN, Pfl. R. Heft 104 (1938) 18, f. 2: 4–10; BACK. & BAKH. f. Fl. Java 3 (1968) 7. — *S. corniculata* (non BECC.) WENT, Versl. Verg. Kon. Ak. Wet., Wis- & Nat. Afd. (1909) 698; KOORD. Exk. Fl. Java 1 (1911) 96; KOORD.-SCHUM. Syst. Verz. 1, §1 (1912) 6. — *Andruris gracillima* GIESEN, Pfl. R. Heft 104 (1938) 18, f. 2: 1–3. — *Andruris nana* (BL.) GIESEN, l.c. — *Andruris loheri* GIESEN, l.c. 19, f. 3: 1–4.

Erect, mostly branched herb, c. 5–15 cm high. Roots filiform, c. 0.2 mm in CS, with hairs. Stem c. 0.2–0.8 mm in CS, glabrous, internodes c. 3–18 mm long. *Leaves* not amplexicaul, appressed, oblong to lanceolate, acute, c. 1–2 by c. 0.3–0.7 mm. *Raceme* c. 0.5–5 cm long. *Flowers* c. 7–35, all around. Bracts oblong-lanceolate to lanceolate, acute, c. 0.6–1.3 by c. 0.2–0.3 mm, appressed to the pedicel or patent to 25° to it, in the latter case mostly perpendicular to the stem. Pedicels c. 2–7 mm long and c. 0.1–0.2 mm in CS, patent at c. 30–60 (–70)°, straight, sometimes slightly recurved at the top. — ♂ *Flowers*: perianth segments 6, 3 larger alternating with 3 smaller, all oblong and patent to reflexed; the larger segments acute, without appendages, c. 0.7–1 by c. 0.3–0.35 mm; the smaller segments at the apex with a stipitate, small, ellipsoid knob, c. 0.5–0.8 by c. 0.2–0.3 mm. Stamens 3, c. 0.3 mm; filaments often exceeding the 4-celled, 4-lobed anthers. — ♀ *Flowers*: perianth segments patent, (4–) 5–6, equal, oblong, acute, c. 0.5–0.6 by c. 0.2–0.35 mm, apex without appendages. *Carpels* c. 20–40 (–70), c. 0.3–0.35 mm; style inserted laterally near the top, awl-shaped, c. 0.4–0.8 mm long, apex acute.

*Distr.* *Malesia*: Sumatra (Banka), Malaya (Perak, Pahang), W. Java, Philippines (Luzon).

*Ecol.* Dense forest, sometimes under bamboo, 250–500 m, once at c. 1150 m. *Fl.* Aug.

*Vern.* *Tjengtling*, S.

*Notes.* Stem and flowers of fresh plant purple.

WENT Sr (see above) came to the conclusion that West Javanese specimens belonged to *S. corniculata* and hinted at the conspecificity of that species with *S. nana*.

**8. *Sciaphila arfakiana* BECC.** *Malesia* 3 (1890) 337, t. 41: 6–14; GIESEN, Pfl. R. Heft 104 (1938) 57, f. 13: 4. — *S. crinita* BECC. *Malesia* 3 (1890) 338, pl. 42: 1–9; SCHLTR, Bot. Jahrb. 49 (1912) 71. — *S. andajensis* BECC. *Malesia* 3 (1890) 339, pl. 42: 10–14; WENT, Nova Guinea 8 (1909) 166; J.J. SMITH, *ibid.* 14 (1927) 323. — *S. clemensae* HEMSL. Hook. Ic. Pl. 29 (1907) pl. 2850: f. 7–14; MERR. En. Born. (1921) 38; En. Philip. 1 (1923) 28; BACK. Handb. Fl. Java 1 (1925) 65; STEEN. Trop. Natuur 23 (1934) 51, f. 9; BACK. & BAKH. f. Fl. Java 3 (1968) 7. — *S. australasica* HEMSL. Kew Bull. (1912) 44; DOMIN, Bibl. Bot. 85 (1926) 256. — *Andruris crinita* (BECC.) SCHLTR,

Bot. Jahrb. 49 (1912) 71; TUYAMA, Bot. Mag. Tokyo 52 (1938) 22. — *Andruris andajensis* (BECC.) SCHLTR, Bot. Jahrb. 49 (1912) 71; TUYAMA, Bot. Mag. Tokyo 52 (1938) 61; GIESEN, Pfl. R. Heft 104 (1938) 28. — *Andruris celebica* SCHLTR, Bot. Jahrb. 49 (1912) 72, f. 1: F-L; TUYAMA, Bot. Mag. Tokyo 52 (1938) 61. — *Andruris tenella* SCHLTR, Bot. Jahrb. 49 (1912) 74, f. 1: M-Q; TUYAMA, Bot. Mag. Tokyo 52 (1938) 61. — *S. inaequalis* SCHLTR, Bot. Jahrb. 49 (1912) 77, f. 1: R-U; J.J. SMITH, Nova Guinea 14 (1927) 324; GIESEN, Pfl. R. Heft 104 (1938) 58, f. 13: 5-7. — *S. atrovioleacea* SCHLTR, Bot. Jahrb. 49 (1912) 79, f. 2: A-D; GIESEN, Pfl. R. Heft 104 (1938) 57, f. 13: 2-3. — *S. vitiensis* A.C. SMITH, Bish. Mus. Bull. 141 (1936) 15, f. 5; GIESEN, Pfl. R. Heft 104 (1938) 28. — *Andruris anisophylla* GIESEN, Pfl. R. Heft 104 (1938) 23, f. 4: 2-6. — *Andruris clemensae* (HEMSL.) GIESEN, Pfl. R. Heft 104 (1938) 23, f. 4: 7-9, incl. var. *borneensis* GIESEN, l.c. 25. — *Andruris australasica* (HEMSL.) GIESEN, Pfl. R. Heft 104 (1938) 25, f. 4: 10-13. — *Andruris elegans* GIESEN, l.c. 25, f. 5: 1-4; HOSOKAWA, J. Jap. Bot. 16 (1940) 540. — *Andruris javanica* GIESEN, Pfl. R. Heft 104 (1938) 27, t. 5: 5-9. — *Andruris vitiensis* (A.C. SMITH) GIESEN, l.c. 28; A.C. SMITH, Sargentia 1 (1942) 5; Bull. Torrey Bot. Club 70 (1943) 534; PARHAM, Plants Fiji (1964) 257. — *S. tuberculata* GIESEN, Pfl. R. Heft 104 (1938) 57, f. 12: 9-12. — *S. valida* GIESEN, l.c. 59, f. 13: 8-11. — *Andruris palawensis* TUYAMA, Bot. Mag. Tokyo 52 (1938) 63. — *Andruris buruensis* J.J. SMITH, Bull. Jard. Bot. Btzg III, 16 (1939) 111. — **Fig. 3 C1-6.**

Erect, simple or branched, sometimes a bit flexuous herb, c. (2-) 4-28 cm high. Roots filiform, c. 0.1-0.4 mm in CS, with hairs. Stem c. 0.3-1 (-1.5) mm in CS, glabrous, internodes c. 4-33 mm long. *Leaves* oblong to lanceolate, appressed, not amplexicaul, c. 1-3 by 0.2-1 mm, acute to acuminate. *Raceme* c. 0.5-14 cm long; flowers c. 5-65, all around, very rarely all flowers to one side. Bracts oblong-lanceolate, acute, c. 0.5-2.5 by c. 0.1-0.5 mm, appressed to the pedicel (and the top mostly patent) or patent from the pedicel to 40° (and in that case mostly perpendicular to the stem). Pedicels c. 2-21 mm long and c. 0.1-0.3 (-0.4) mm in CS, patent at 20-90° (mostly 30-45°), straight or the apical part recurved. — ♂ *Flowers*: perianth segments 6, 3 larger ones alternating with 3 smaller ones, all oblong-ovate, the apex with a stipitate globose to ellipsoid knob; larger segments c. 0.7-1.7 by c. 0.3-0.5 mm, smaller segments c. 0.6-1.4 by c. 0.35-0.5 mm. Stamens 3, c. 0.3-0.5 mm; filaments clearly exceeding the 4-celled, 4-lobed anthers (but the acute apex of the filament often broken off). — ♀ *Flowers*: perianth segments 6, more or less equal, oblong to triangular, acute, c. 0.5-1 by c. 0.25-0.50 (-0.65) mm, apex without appendages, but often thickened. *Car-*

*pels* c. (10-) 20-40 (-70), c. 0.2-0.5 mm long; style awl-shaped, acute, inserted laterally, c. 0.6-1.8 mm long, amply exceeding the carpel.

Distr. Micronesia (Palau), W. Polynesia (Fiji Is.: Viti Levu, Vanua Levu, Vanua Mblalavu), Solomons (Bougainville); in *Malesia*: New Guinea (all parts except the SW.; also in New Britain and Manus Is.), Philippines (Mindanao), Moluccas (Ceram, Ambon), Celebes (N. Peninsula and Central part), Lesser Sunda Is. (Flores), West Java, Borneo (Sabah, W., S. & E. Kalimantan), Malaya (Kelantan, Pahang), and Central W. Sumatra.

Ecol. Rain-forest (low montane or montane), often on a hill, cliff, ridge, crest or in a river valley, on sandstone and other bedrock, in shade of trees or fern clumps; on humus, one time on a termite hill. Sometimes associated with *Corsia*, *Burmanna* or *Epirixanthes*; 100-2130 m. *Fl.* Jan.-Dec.

Notes. Fresh plant pink, pale mauve, red or purple; flowers light brown, red or purple with white or yellowish anthers, fruit reddish blue, red-purple or pale pink (later orange-brown). The plant flowers and then dies; scarce.

In BUWALDA 6161 (from Ambon) and VAN ROYEN & SLEUMER 6268 (New Guinea: Mt Cycloop) the style does not clearly exceed the carpel.

9. *Sciaphila densiflora* SCHLTR, Bot. Jahrb. 49 (1912) 87, f. 3: U-X; GIESEN, Pfl. R. Heft 104 (1938) 46, f. 9: 1-2. — *S. reflexa* SCHLTR, Bot. Jahrb. 49 (1912) 87; GIESEN, Pfl. R. Heft 104 (1938) 48, f. 9: 9-10. — *S. longipes* SCHLTR, Bot. Jahrb. 49 (1912) 88; J.J. SMITH, Nova Guinea 14 (1927) 326, pl. 36: 3; GIESEN, Pfl. R. Heft 104 (1938) 46, f. 9: 3. — *S. trichopoda* SCHLTR, Bot. Jahrb. 49 (1912) 89, f. 3: P-T; GIESEN, Pfl. R. Heft 104 (1938) 48, f. 9: 7-8. — *S. flexuosa* GIESEN, Pfl. R. Heft 104 (1938) 45, f. 8: 15-17. — *S. nutans* GIESEN, l.c. 46, f. 9: 4-6. — **Fig. 4.**

Erect herb, seldom branched and if so, then at the base, c. 6-43 cm high. Roots filiform, c. 0.15-0.30 mm in CS, sometimes branched, with hairs. Stem c. 0.5-1.2 mm in CS, glabrous, internodes c. 3-55 mm long. *Leaves* oblong-ovate to ovate, acute, c. 1.5-5 by c. 0.6-2.5 mm, mostly semi-amplexicaul, appressed. *Racemes* 1-21.5 cm long, with c. 7-120 flowers, from very dense (100 flowers on 12 cm) to rather lax (35 flowers on 14 cm). Flowers all around, sometimes with a tendency towards one side. Bracts lanceolate, acute, c. 1-2 (-3.5) by c. 0.4-1 (-1.5) mm, mostly appressed to the pedicel, the top often a little (10-20°) patent. Pedicels 3-25 mm long and 0.1-0.2 mm in CS, (45-) 60-90° patent, recurved, straight for a smaller or larger part of the length, sometimes a bit sinuous, the flowers always hanging down. — ♂ *Flowers*: perianth segments 6, 3 larger ones alternating with 3 smaller ones, all completely reflexed and at the top long-bearded; larger segments

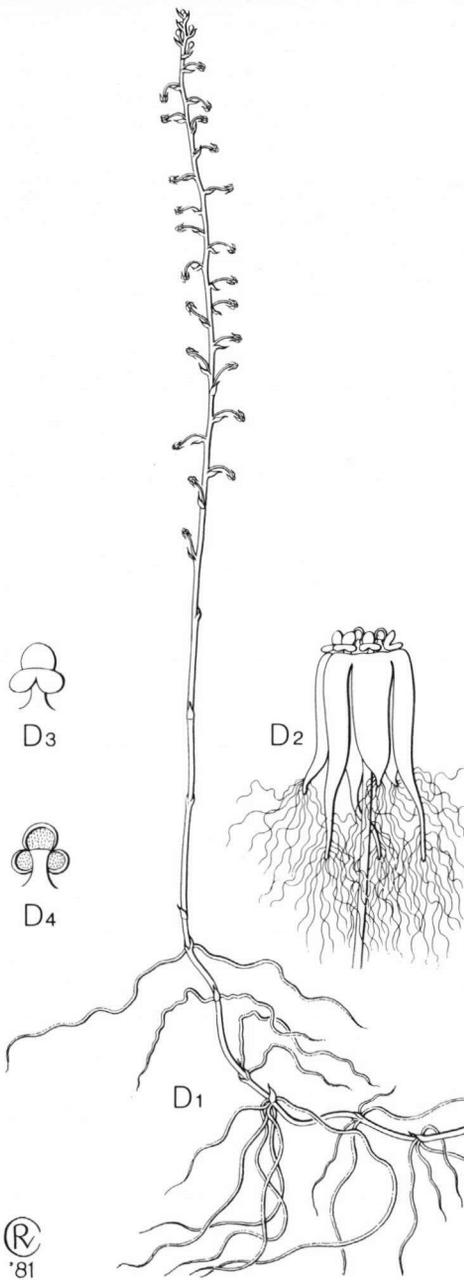


Fig. 4. *Sciaphila densiflora* SCHLTR. D1. Habit,  $\times 1$ , D2. male flower,  $\times 10$ , D3. mature stamen, from outside,  $\times 10$ , D4. the same, from inside,  $\times 10$  (D1 BRASS 28255, D2-4 BW 8553).

long-triangular, (0.6-) 1.3-2 by (0.2-) 0.3-0.5 mm, the top abruptly contracting into a long narrow point (c. 1/3 of the length); smaller segments long-triangular, acute, (0.5-) 0.8-1.5 by c. 0.2-0.4 mm wide. Stamens 6, c. 0.2 mm; filaments short; anthers 3-lobed. — ♀ *Flowers*: perianth like in the male flower, but the larger segments c. 1-2.5 by c. 0.3-0.7 mm and the smaller segments 0.7-1.5 by c. 0.4-0.6 mm. *Carpels* c. 15-40, 0.3-0.55 mm; style club-shaped, inserted laterally at the base or about halfway, exceeding the carpel when young; apex with many hairs and papillae.

*Distr.* Ceylon; in *Malesia*: Lesser Sunda Is. (Timor, Flores), Borneo (Sarawak, W. & E. Kalimantan; Natuna Is.), Philippines (Luzon), Moluccas (Halmaheira), New Guinea (all parts except the SW. part; also in Normanby, Rossel and Sudest Is.) and New Caledonia.

*Ecol.* Local and uncommon plant in rain-forest, often on ridge crests, dry ridges, limestone rocks, clay or sandy or poor stony soils, rooting in raw humus or deep leaf litter, mostly in shade, 100-1200 m, once at c. 1950 m. *Fl.* Feb.-Nov.

*Vern.* New Guinea: *ware*, Uruaru lang., Purari River.

*Notes.* Fresh plant coral-pink, purplish or red; flowers red with yellow stamens, fruits red.

In NGF 19532 (K, liquid) the pedicels are almost parallel to the stem.

**10. *Sciaphila coralophyton* K. SCH. & SCHLTR** in K. Sch. & Laut. *Fl. Schutzgeb. Nachtr.* (1905) 54, t. 2: A: a-d; SCHLTR, *Bot. Jahrb.* 49 (1912) 76, 89; GIESEN, *Pfl. R. Heft* 104 (1938) 45, f. 8: 10-12, *incl. var. gracilis* GIESEN, *l.c.*; HANSEN, *Dansk Bot. Ark.* 25 (1969) 88. — *S. dolichostyla* SCHLTR, *Bot. Jahrb.* 39 (1906) 19; SCHINZ in Sarasin & Roux, *Nova Caledonia, Bot.* 1 (1920) 59; GUILLAUM. *Bull. Soc. Bot. Fr.* 84 (1937) 256; GIESEN, *Pfl. R. Heft* 104 (1938) 45, f. 8: 13-14; GUILLAUM. *Fl. Nouv. Caléd.* (1948) 22; *Mém. Mus. Hist. Nat. Paris n.s. Bot.* 8 (1959) 189.

Erect, mostly simple herb, c. 5-23 cm high. Roots filiform, c. 0.15-0.25 mm in CS, with a few hairs. Stem c. 0.5-1.5 (-2) cm in CS, glabrous, internodes c. 4-20 mm long. *Leaves* oblong-lanceolate, acute, c. (1-) 1.5-2.5 by c. 0.5-1.5 mm, not amplexicaul, appressed to the pedicels. *Raceme* c. 0.5-12 cm long, with c. 4-32 flowers, generally most of the flowers to one side. Bracts lanceolate, acute, c. 1-2 by c. 0.4-0.8 mm, appressed to the pedicel, but the top patent. Pedicels c. 2-5 mm long, c. 0.2-0.4 mm in CS, patent at c. 35-45°, recurved but sometimes straight for half the length or less. — ♂ *Flowers*: perianth segments 6, 3 larger ones alternating with 3 smaller ones, all reflexed and at the top bearded; the larger segments oblong-lanceolate, acute, c. 1.1-1.7 by c. 0.3-0.5 mm; smaller segments oblong, acute,

c. 1–1.4 mm by c. 0.3–0.6 mm. Stamens 6; filaments short, anthers 2-lobed. — ♀ *Flowers*: perianth like in the male flower, but the top of the segments glabrous and the larger segments 1.3–1.8 by 0.4–0.6 mm; smaller segments c. 1.1–1.4 by c. 0.4–0.6 mm. *Carpels* c. 30–50, c. 0.3–0.4 mm; style club-shaped, inserted laterally near the base, exceeding the carpel when young, at apex with many hairs and papillae.

*Distr.* Micronesia: Carolines (Ponape), Melanesia (New Caledonia); in *Malesia*: New Guinea (NE. part).

*Ecol.* In forest, on rockwalls, along clay streams, 400–2100 m. *Fl.* Jan.–Dec.

**11. *Sciaphila winkleri* SCHLTR.** Bot. Jahrb. 48 (1912) 88; MERR. En. Born. (1921) 38; GIESEN, Pfl. R. Heft 104 (1938) 52, f. 11: 5–7. — *S. hydrophila* SCHLTR, Bot. Jahrb. 49 (1912) 85, f. 2: T–W; GIESEN, Pfl. R. Heft 104 (1938) 51, f. 11: 1–4.

Erect, branched herb, c. 3–14 cm high. Roots c. 0.2–0.3 mm in CS, with a few hairs. Stem c. 0.3–0.5 mm in CS, glabrous, internodes c. 3–21 mm long. *Leaves* oblong, acute, c. 1–2 (–2.5) by c. 0.5–0.9 mm, semi-amplexicaul, appressed or patent at c. 10°. *Raceme* c. 0.5–9.5 cm long, with c. 2–40 flowers, mostly all flowers to one side. Bracts oblong-lanceolate, acute, sessile, c. 1–1.5 (–2) by c. 0.3–0.5 mm, appressed to the pedicel. Pedicels c. 1–2 (–3) mm long and c. 0.1 (–0.25, liquid material) mm in CS, c. 60–90° patent, recurved. — ♂ *Flowers*: perianth segments 6, 3 larger alternating with 3 smaller ones, all reflexed and at the top bearded; larger segments oblong, acute, c. 0.5–0.8 by c. 0.3 mm; smaller segments oblong, acute, c. 0.4–0.6 by c. 0.25 mm. Stamens 3, c. 0.2–0.3 mm, filaments short and at the base connate, anthers 2-lobed. — ♀ *Flowers*: perianth like in the male flower but larger segments c. 1–1.2 by c. 0.5–0.6 mm, smaller segments c. 0.7–1 mm by c. 0.4 mm. *Carpels* c. 40–80, obovoid, c. 0.3–0.7 mm; style club-shaped, inserted laterally at the base or about halfway, when young mostly just exceeding the carpel; apex with many hairs and papillae.

*Distr.* *Malesia*: Borneo (Sarawak, W., E. & S. Kalimantan), New Guinea (NW. and NE. parts).

*Ecol.* Rain-forest, rooting between decaying leaves or in humus, in deep shade, 80–180 m.

*Note.* Fresh plant red.

**12. *Sciaphila consimilis* BL.** Mus. Bot. 1 (1851) 322; BTH. in Hook. J. Bot. Kew Misc. 7 (1855) 10; MIQ. Fl. Ind. Bat. 3 (1856) 232; F. v. M. in Walp. Ann. 5 (1860) 917; GIESEN, Pfl. R. Heft 104 (1938) 51, f. 10: 7–9.

Simple, erect but especially at the base a bit flexuous herb, c. 5.5–22 cm high. Roots c. 0.15–0.5 mm in CS, with hairs. Stem c. 0.2–0.5 mm in CS, gla-

brous, internodes c. 5–18 mm long. *Leaves* oblong-lanceolate, acute, c. 1–3 by c. 0.4–1.3 mm, semi-amplexicaul or not, appressed, the top mostly a bit patent. *Raceme* c. 2–14 cm long, flowers c. 15–70, all around. Bracts lanceolate, acute, c. 1–2 by c. 0.2–0.4 mm, sessile, mostly appressed to the pedicel, sometimes 10–30° patent. Pedicels c. 5–8 mm long and c. 0.1 mm in CS, 45–90° patent, recurved or often curled. — ♂ *Flowers*: perianth segments 6, 3 larger ones alternating with 3 smaller ones, all reflexed and at the top long-bearded; larger segments oblong-lanceolate, acute, c. 0.75–0.9 by c. 0.25–0.45 mm, smaller segments (oblong-)lanceolate, acute, c. 0.5–0.7 by c. 0.2–0.3 mm. Stamens 3, c. 0.25–0.3 mm; filaments short and at the base connate; anthers 3-lobed. — ♀ *Flowers*: perianth like in the male flower, but the top glabrous or with very few, short hairs and larger segments 0.7–1 by 0.3–0.45 mm, smaller segments 0.5–0.8 by 0.25–0.3 mm. *Carpels* c. 15–30, 0.2–0.25 mm; style club-shaped, inserted laterally at the base or about halfway, exceeding the carpel when young; apex with many hairs and papillae.

*Distr.* West Polynesia (Fiji Is.: Vanua Levu); in *Malesia*: Philippines (Luzon, Mindanao).

*Ecol.* In forest, among thick carpet of leaves.

*Note.* Stem curved whilst growing from under leaves to get to the light. Stems and fruits of fresh plant red.

**13. *Sciaphila multiflora* GIESEN.** Pfl. R. Heft 104 (1938) 49, f. 10: 1–2. — *S. macra* SCHLTR, Bot. Jahrb. 49 (1912) 86, f. 3: A–D, *non* K. SCH. & SCHLTR in K. Sch. & Laut. (1905), which is *S. secundiflora*. — *S. mindanaensis* GIESEN, Pfl. R. Heft 104 (1938) 51, f. 10: 3–6. — *S. stemmermannii* Fosb. & SACHET, Pac. Sci. 34 (1980) 15, f. 1–2.

Erect, sometimes a bit flexuous herb, 6–40 cm high, branched (mostly at the base). Roots c. 0.2–0.3 mm in CS, glabrous, seldom branched, sometimes with a few hairs. Stem c. 0.4–1.3 mm in CS, glabrous, or with a few hairs, internodes c. (5–) 12–50 mm long. *Leaves* oblong-ovate to oblong-lanceolate, acute, c. 1.5–3 by 0.8–1.2 mm, not amplexicaul, appressed. *Raceme* c. (2–) 7–31 cm long; flowers c. 8–40, all around or more or less to one side. Bracts oblong-lanceolate, acute, c. 1–2 by 0.4–0.8 mm, sessile, appressed to the pedicel but the top mostly a bit patent. Pedicels c. 2–4 mm long and c. 0.1–0.3 mm in CS, 45–90° patent, recurved. — ♂ *Flowers*: perianth segments 6, 3 larger ones alternating with 3 smaller ones, all reflexed and at the top bearded; larger segments oblong, acuminate, c. 0.8–1.3 by c. 0.3–0.5 mm, smaller ones oblong, acuminate, c. 0.6–1.1 by c. 0.3–0.4 mm. Stamens 3, c. 0.4 mm, filament short and at the base connate, anthers 3-lobed. — ♀ *Flowers*: perianth like in the male

flower but the apices glabrous or bearded, larger segments *c.* 0.9–1.5 by *c.* 0.3–0.8 mm, smaller segments *c.* 1.1–1.2 by *c.* 0.4–0.6 mm. *Carpels* *c.* 10–40, *c.* 0.2–0.35 mm; style club-shaped, inserted laterally at the base or about halfway, exceeding the carpel when young; apex with many hairs and papillae.

*Distr.* Micronesia (Carolines: Palau); in *Malesia*: New Guinea (E. part: Waria area; Milne Bay Distr.) and Philippines (Mindanao).

*Ecol.* Plant of primary forest, sometimes on steep slopes; 30–800 m. *Fl.* May, July.

*Note.* Fresh plant reddish purple, with tinged pink or purple flowers, anthers yellow; fruits dark-purple.

14. *Sciaphila micranthera* GIESEN, Pfl. R. Heft 104 (1938) 54, f. 12: 1–4.

Erect herb, *c.* 7–13 cm high, simple or branched at the base. Roots *c.* 0.15–0.2 mm in CS, with a few hairs. Stem *c.* 0.3–0.7 mm in CS, glabrous, internodes *c.* 5–10 mm long. *Leaves* oblong to lanceolate, acute, *c.* 1–3 by *c.* 0.4 mm, not amplexicaul, appressed or 20° patent. *Raceme* *c.* 2.5–11 cm long; flowers *c.* 15–90, more or less all around. Bracts lanceolate, acute to acuminate, *c.* 1–2 by *c.* 0.15–0.3 mm, more or less appressed to the pedicel. Pedicels *c.* (5–) 7–15 mm long and *c.* 0.15–0.2 mm in CS,

more or less perpendicular to the rachis, straight to slightly recurved, sometimes somewhat sinuous. — ♂ *Flowers*: perianth segments 6, 3 larger ones alternating with 3 smaller ones, all reflexed and at the apex bearded; the larger ones oblong-lanceolate, somewhat obtuse, *c.* 1 by 0.25 mm; the smaller ones oblong-lanceolate, obtuse, *c.* 0.8 by *c.* 0.2 mm. Stamens 3, *c.* 0.25–0.3 mm, almost sessile; filaments very short, anthers 4-celled, 4-lobed. — ♀ *Flowers*: perianth like in the male flowers; carpels *c.* 15–25, *c.* 0.3–0.35 mm; style inserted laterally about halfway, exceeding the carpel, club-shaped, the apex with hairs and papillae.

*Distr.* *Malesia*: Borneo (Sarawak and W. Kalimantan: Bt. Kenepai).

*Ecol.* Primary forest, growing on thick humus, 300 m.

*Note.* Fresh plant dark-red all over.

#### Doubtful

*Sciaphila papillosa* BECC. *Malesia* 3 (1890) 334, pl. 39: 1–4; GIESEN, Pfl. R. Heft 104 (1938) 67.

Based on a specimen of BECCARI from NW. New Guinea, Vogelkop Peninsula, Hatam, Mt Arfak in vii-1875 (FI?, *n.v.*). BECCARI has not seen any male flowers, so it is not possible to identify this species.