

## EPACRIDACEAE (H. Sleumer, Leyden)

Small trees or mostly shrubs. *Leaves* spirally arranged, sometimes imbricate or crowded at the end of the shoots in  $\pm$  distinctly spaced pseudowhorls, xeromorphic, generally stiff and coriaceous, entire (Mal. spp.), sessile or petioled; venation palmate, *i.e.* several longitudinal, simple or forked nerves or streaks, prominent at least underneath. Stipules 0. *Spikes* or *spike-like racemes* terminal and/or axillary, bracteate, solitary, rarely reduced to a single flower; rachis, if any, usually ending in a rudimentary flower or its subtending bract. *Flowers* bisexual, rarely polygamous (and plants gynodioecious) or unisexual (and plants dioecious). Bracteoles 2 or several, imbricate, inserted immediately below the calyx (Mal. spp.). *Sepals* 4–5, free, imbricate, persistent, usually finely marked with parallel or diverging veins as are the leaves, bracts and bracteoles. *Corolla* campanulate or tubular below, the limb rather deeply divided, lobes often spreading, valvate or imbricate. *Stamens* isomerous, inserted high in the corolla tube (Mal. spp.) and alternating with the corolla lobes, included or exerted to various degree; anthers 1-celled, free (Mal. spp.), both locules dehiscent by a common longitudinal slit. Disk entire, 5-lobed or consisting of 5 distinct scales, rarely absent. *Ovary* 1, superior, 1–10-celled; placentas axillary; ovules solitary (Mal. spp.). *Fruit* a berry-like drupe (Mal. spp.) containing a central stone with as many cells as the ovary, or the cells becoming hard pyrenes and remaining  $\pm$  separate from each other within the pulpy mesocarp. *Seeds* with a thin testa; embryo straight; endosperm fleshy.

**Distribution.** About 21 genera with *c.* 400 spp., the bulk of which occur in Australia (incl. Tasmania), 1 Mal. sp. extending to S. Indo-China, Tenasserim and S. Siam, *c.* 30 spp. in New Zealand (partly also occurring in Australia), *c.* 20 spp. in New Caledonia and the New Hebrides, 1 sp. in Micronesia (Marianas), 4 spp. in Polynesia (incl. Hawaii, Marquesas and Rapa, but not yet known from Samoa), 1 sp. in SW. temperate South America, and in Malesia 18 spp., four of which known from outside Malesia. Fig. 1.

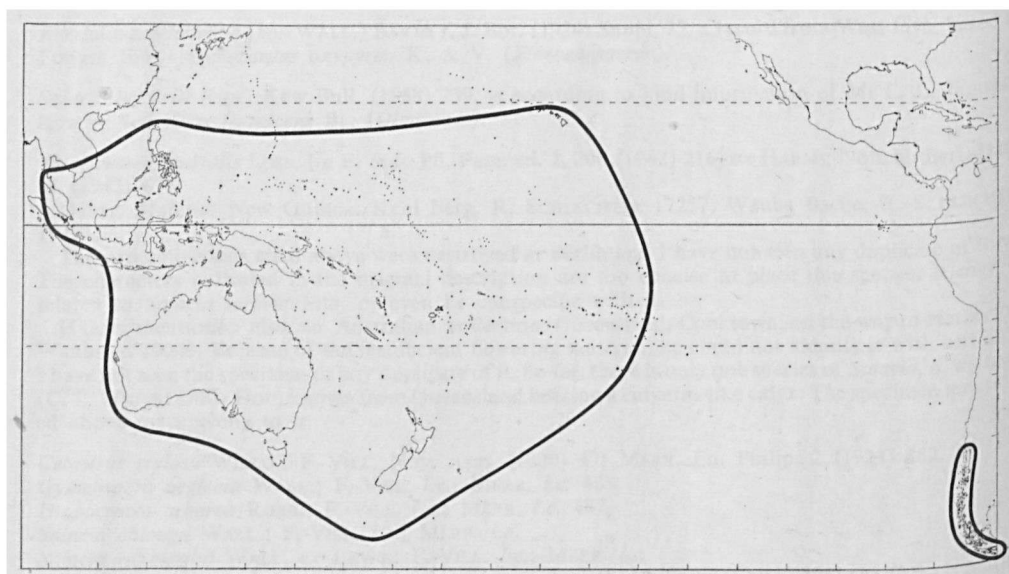


Fig. 1. Distribution of *Epacridaceae*.

The family is mainly distinguished from the *Ericaceae* by entirely free (and imbricate) sepals and unilocular anthers. It is naturally subdivided into 2 tribes, viz the *Styphelieae* (with 1 ovule per cell) and the *Epacrideae* (with numerous ovules per cell); only the first tribe is represented in Malesia.

In Malesia 3 genera occur, of which *Decatoca* is endemic in New Guinea; *Trochocarpa* and *Styphelia* are also found in Australia; the latter genus extends from SE. Asia far into the Pacific (Hawaii, Marquesas, Rapa).

The close alliance of the Malesian *Epacridaceae* with those of Australia and/or New Zealand is emphasized by the occurrence of *Styphelia acuminata* R.Br. in N. Australia and the Lesser Sunda Is., of *Styphelia suaveolens* (HOOK. f.) WARB. in Malesia, SE. Australia, and New Zealand, and of *Trochocarpa laurina* (R.Br. ex RUDGE) R.Br. which is found in NE. and E. Australia and in NW. New Guinea.

The wide distribution of some species is remarkable.

**Ecology.** Malesian *Epacridaceae* are bound to acid soils as are most Malesian *Ericaceae*, with which they not rarely grow gregariously together, especially in summit vegetation. They are always terrestrial and partly are found both on coastal sands, lowland hills and again in the mountains, mostly in open or rather open places; they are distinctly light demanding. As to altitude they are found up to 4700 m (Mt Carstensz, Mt Wilhelm) under frigid conditions; there they belong to the few species which are found immediately below the eternal snow. In Malesia most species occur under everwet conditions but the habitat of the species of East Java and the Lesser Sunda Is. is subject to seasonal drought. As to soil humidity, they seem to occur both in dry places and on moist, peaty ground.

**Dispersal.** Practically nothing is known about the dispersal of Mal. spp., but their drupes are surrounded by a rather well-developed pulpy mesocarp which may be attractive and palatable for birds; in this way the stones or pyrenes may become dispersed endozoically.

**Pollination.** The corolla—fragrant as far as known—is bearded inside as are the lobes and partly down the tube in many species. In these unicellular hairs, the walls are densely covered with brief longitudinal ridges; this structure is presumably an adaptation for insect-pollination (H. F. COPELAND, *Am. J. Bot.* 41, 1954, 219. Cf. also what is said under *Styphelia javanica*).

**Morphology & Anatomy.** Work on floral morphology up to now has been done exclusively on a number of Australian members of the family (short review by B. R. PATERSON in *Bot. Gaz.* 122, 1961, 259–279). The scattered results have not yet influenced the taxonomy of the family and the definition of the genera. The same can be said of the work done on the morphology of the leaves, the vegetative shoot and of the general anatomy of the family (review by SOLEREDER, *Syst. Anat. Dicot.*, rev. by D. H. SCOTT, 1 (1908) 490; K. J. DORMER in *New Phyt.* 44 (1945) 149; M. Y. ORR in *Trans. Bot. Soc. Edinb.* 34 (1948) 472, pl. 10; METCALFE & CHALK, *Anat. Dicot.* 2 (1950) 840; L. WATSON in *New Phyt.* 61 (1962) 36–40, as to stomatal distribution).

Polymorphism of leaves (in the same specimen) has been observed by the author in New Guinea in *Styphelia malayana* and in several spp. of *Trochocarpa*, exactly corresponding to what VIROT has stated from *Styphelia* (subg. *Leucopogon*) in New Caledonia (*Mém. Mus. Nat. Hist. Nat. Paris sér. B, Bot.* 7, 1956, 103, f. 6, 1). Such extremely narrow-leaved shoots are either juvenile forms or probably sports. Sometimes a whole plant—may be previously damaged by fire or cut down by man—is built up from such anomalous shoots, called 'microform' in descriptions.

**Palynology.** Work on pollen has started but recently and still is limited to Australian species, cf. S. SMITH WHITE in *Austr. J. Bot.* 3 (1955) 48–67 (chromosome numbers and pollen types; C. VENKATA RAO in *J. Ind. Bot. Soc.* 40 (3) (1961) 409–423 (pollen types); L. WATSON in *Nature* 194 (1962) 889 (pollen of *Styphelia* sect. *Styphelia*); J. W. FRANKS & L. WATSON in *Pollen & Spores*, *Mus. Nat. Hist. Nat. Publ. semestr.* 5 (1) (1963) 51–68. The pollen of the subfam. *Epacrideae* is nearly always borne in full tetrads and so far seems unpromising for elucidating the system of genera in this subfamily. In the subfam. *Styphelieae* where solitary pollen grains occur in a number of genera and species, the palynological diversity is surprising considering the close relation of the genera on ground of floral gross morphology. In the present state of knowledge both cytology, karyology and palynology of the subfamily do not allow to define the genera more sharply.

In *Styphelia s. str.* pollen grains are provided with peculiar warts, which gives additional value to its distinction as a section. There is no need to overrate this single character, i.e. to use it for keeping apart *Styphelia s. str.* on the generic level from other groups of species so closely allied with it. These groups are more naturally arranged on the subgeneric and sectional level within *Styphelia s. lat.* as used by the author in his precursory work on the family.

**Phytochemistry.** Curiously enough phytochemists have never been attracted by this highly interesting family, generally regarded as closely related to *Ericaceae*. In the leaves leucoanthocyanins seem to be widespread (R. C. CAMBIE c.s., *New Zeal. J. Sc.* 4, 1961, 604; E. C. BATE-SMITH, *J. Linn. Soc. Lond. Bot.* 58, 1962, 95). High concentrations of tannins and the presence of saponins (CAMBIE c.s.) are recorded in literature for a few species. According to a very old statement (ROCHLEDER, 1866) ursolic acid accumulates in great amounts in leaves of a species of *Epacris*. A few observations on the nature of the anthocyanins in flowers of some Australian species were recorded by GASCOINE c.s. (*J. Proc. R. Soc. N.S.W.* 82, 1948, 44).—R. HEGNAUER.

**Uses.** Of *Styphelia malayana* the roots and leaves are used medicinally. The inner bark to make canoes waterproof.

Notes. In habit *Epacridaceae* show a distinct resemblance to *Ericaceae*, from which they are generally easily distinguished by the palmate, almost monocotylean 'open' nervation of the leaves.

The family has almost been monographed by BENTHAM in the fourth volume of his 'Flora Australiensis' (1869) and little work has been done since on the family. For Malesia and the Pacific a precursory paper was published by the present author (Blumea 12, 1963, 145-171).

## KEY TO THE GENERA

1. Cells of the fruit, *i.e.* the endocarp of all carpels, consolidated within the drupaceous fruit into a compact (2-)5(-10)-celled, hardly or not 5-10-ribbed hard stone (putamen), with 1 seed per cell. Mesocarp mostly rather thin and dry or certainly not very pulpy. Fruit of a light colour (white, greenish, pinkish, rarely red) when ripe . . . . . 1. *Styphelia*
1. Cells of the fruit, *i.e.* the endocarp of the single carpels within the fruit either remaining separate, or loosely coherent, or rarely  $\pm$  conerescent to a deeply 8-10-ribbed stone-like centre, each cell becoming a one-seeded, distinct, or easily, respectively finally separable,  $\pm$  hard pyrene within the rather rich and  $\pm$  pulpy mesocarp. Fruit mostly dark blue or purplish-blackish, rarely pink when ripe.
  2. Corolla lobes decidedly imbricate in anthesis . . . . . 2. *Decatoca*
  2. Corolla lobes valvate in anthesis (tips only slightly imbricate in bud) . . . . . 3. *Trochocarpa*

## 1. STYPHELIA

J. E. SMITH, Sp. Bot. New Holl. (1793) 45, t. 14, *sensu* F. v. M. Fragm. 6 (1867) 50; SLEUM. Blumea 12 (1963) 145.—*Cyathodes* LAB. Nov. Holl. Pl. 1 (1805) 57, t. 81, *em.* R.BR. Prod. (1810) 539.—*Astroloma* R.BR. Prod. (1810) 538.—*Stenanthera* R.BR. *l.c.* 538.—*Melichrus* R.BR. *l.c.* 539.—*Lissanthe* R.BR. *l.c.* 540.—*Leucopogon* R.BR. *l.c.* 541.—*Anacyclodon* JUNGH. Nat. Geneesk. Arch. N.I. 2 (1845) 49.—Fig. 2—10.

Shrubs or small trees, bisexual, dioecious or polygamous (gynodioecious). *Leaves* often whitish underneath between the nerves. *Flowers* sessile, or, when solitary, on top of a very short peduncle. Bracteoles 2 and strictly opposite, or several (3 or more) and imbricate. *Sepals* 5. *Corolla* tube cylindric, as long as or shorter or slightly longer than the sepals (*Mal. spp.*); tube mostly hairy above the middle inside, rarely glabrous; limb  $\pm$  deeply 5-parted; lobes valvate in bud, spreading or recurved in the upper portion, their inner surface entirely or partly bearded, rarely glabrous. Stamens wholly or partially enclosed in the tube or the erect base of the lobes, reduced in size and without pollen in  $\text{♀♀}$ . *Filaments* short, filiform, inserted at the top of the corolla tube or almost so, attached at or near the top of the anthers. Disk cup-shaped, truncately 5-lobed, or consisting of 5,  $\pm$  free lobes. *Ovary* (2-)5(-10)-celled, with 1 ovule per cell; style mostly short, stigma obtuse. *Fruit* a baccate drupe, with a compact crustaceous or hard endocarp (putamen) with as many cells as are found in the ovary (or less by abortion); mesocarp around the central stone rarely pulpy, usually rather dry and of a whitish-greenish, pink or rarely (light) red colour (in the *Mal. spp.* never purplish-blackish) at full maturity.

Distr. Chiefly in Australia (incl. Tasmania) with about 130 *spp.*, also in New Zealand (incl. Stewart, Chatham, Campbell, and Auckland Is.) (8 *spp.*), in New Caledonia (*c.* 13 *spp.*), found all over the Pacific area (6 *spp.*), in the Marianas (1 *sp.*), S. Indo-China, Lower Burma (Tenasserim), and S. Siam (1 *sp.*, which is also widely distributed in Malesia), in *Malesia* 8 *spp.*

Ecol. As substage in forest, mostly in open sunny places, on the seashore and again in the mountains upwards to alpine height in North Borneo and New Guinea, on acid, sandy or peaty soils, often gregarious.

Note. The genus is taken here in the broad sense as proposed by F. v. MUELLER. The differences between BROWN's genera are either slight or inconsistent, and maintaining them, as BENTHAM (*Fl. Austr.* 4, 1869, 142 *seq.*) with some hesitation did, does not seem to be justified.

KEY TO THE SPECIES

1. Bracteoles 2, strictly opposite. SUBG. LEUCOPOGON.
  2. Leaves with (very) numerous equally faint nerves close to each other, the individual course of which can hardly be traced; sessile or almost so.
    3. Leaves initially ciliate along the entire margin, at full maturity still so at least in the basal part, 12-25 by 4-6 mm . . . . . 1. *S. abscondita*
    3. Leaves eciliate from the beginning, (15-)20-50(-80) by (2-)3-10 mm (juvenile microforms excepted) . . . . . 2. *S. malayana*
    4. Ovary glabrous. Style glabrous or patently short-hairy in the lower part.
      2. *S. malayana* var. *malayana*
    4. Flattened top of ovary hairy. Style always patently short-hairy in the lower half.
      2. *S. malayana* var. *novoguineensis*
  2. Leaves with fewer nerves, the inner 3-5(-7) ones running straight and parallel from the base to the apex of the lamina and stronger (or more conspicuous) than the outer ones, which are fan-like diverging from them, generally (shortly) petioled.
    5. Leaves ending in a very short (not caducous or breakable) callose, acute point or tip, or subacute, or obtuse . . . . . 3. *S. suaveolens*
    5. Leaves ending with a conspicuous hair- or needle-like, pungent and rather persistent (though breakable) 1-2 mm long point.
      6. Corolla 6(-7) mm. Leaves densely and rather coarsely serrulate-ciliate . . . . . 4. *S. javanica*
      6. Corolla up to 4 mm. Leaves whether or not finely and appressedly ciliate.
        7. Leaves all equal, oblanceolate. (Corolla 3½-3½ mm.) . . . . . 5. *S. forbesii*
        7. Leaves in the same specimen lanceolate to linear-lanceolate.
          8. Leaves subdensely to rather densely arranged, (1-)1½-2 mm wide. Corolla 2½-2¾(-3) mm . . . . . 6. *S. acuminata*
          8. Leaves densely to very densely, *i.e.* imbricately arranged, 2-3 mm wide. Corolla (3-)3½ mm . . . . . 7. *S. abnormis*
  1. Bracteoles 7-10, imbricate. SUBG. CYATHODES . . . . . 8. *S. brassii*

1. Subgenus *Leucopogon*

(R.BR.) DRUDE in E. & P. Pfl. Fam. 4, 1 (1889) 78; SLEUM. *Blumea* 12 (1963) 146.  
 —*Leucopogon* R.BR. Prod. (1810) 541; MIQ. Fl. Ind. Bat. 2 (1859) 1052, *incl.*  
 § *Stypheliopsis* MIQ. et § *Anacyclodon* (JUNGH.) MIQ.; CLARKE in Hook. f.  
 Fl. Br. Ind. 3 (1882) 477; GAMBLE, J. As. Soc. Beng. 74, ii (1905) 83; RIDL. Fl.  
 Mal. Pen. 2 (1923) 223.—*Anacyclodon* JUNGH. Nat. Geneesk. Arch. N.I. 2 (1845)  
 49.—Fig. 2-9.

Bracteoles 2, strictly opposite, inserted immediately below the sepals and covering their basal part.

Distr. About 125 *spp.* in Australia (incl. Tasmania), 4 *spp.* in New Zealand (of which 3 endemic), *c.* 13 *spp.* in New Caledonia (one of them also in the New Hebrides and Fiii). in *Malesia* 7 *spp.*, one of them (*S. acuminata*) also in N. Australia, a second one (*S. malayana*) extending into S. Siam, Lower Burma (Tenasserim), and Southern Indo-China, a third one (*S. suaveolens*) extending into SE. Australia, New Zealand, and Melanesia (Bougainville). Fig. 2.

1. *Styphelia abscondita* J.J.S. Nova Guinea 18 (1936) 124, t. 33, 2; SLEUM. *Blumea* 12 (1963) 147.  
 Shrub, *c.* 1½ m. Stem decumbent to erect. Branchlets rather robust, tips puberulous, older parts early corticate, bark blackish, fissured lengthwise. Leaves very dense or imbricate, sessile, lanceolate, apex acute-acuminate, ending in a short (½-1 mm), rather early caducous, almost pungent point, base narrowed into a 1-1½ mm wide foot, light green and bordered red when fresh, initially ciliate, glabrous except some basal ciliae when mature, ± coriaceous, entire, edge semipellucid, (12-)15-25 by 4-6 mm. *In-florescences* axillary, 3-5-flowered, ± hidden among the leaves. Peduncle *c.* 2 mm, covered by

several concave, ciliate, imbricate, minute bracts, puberulous as is the very short rachis. Subtending bract and the 2 bracteoles suborbicular, dorsally glabrous, ciliate, ± 2 mm. Sepals oblong to ovate, obtuse, ciliate, *c.* 3 by 1½-2 mm. Corolla funnel-shaped, 5-parted to ⅓-⅓, *c.* 4½ mm long in all, by 2 mm across the tube, white, glabrous outside, villous at the throat and all over the lobes inside, lobes narrow-triangular, subacute. Anthers oblong, *c.* 1 mm, fertile, slightly exserted from the tube. Ovary pear-shaped, 5-celled, glabrous, 1 mm, style conical-cylindric, 2 mm, subdensely long patently hairy to almost the top. Fruit not known.

Distr. *Malesia*: West New Guinea (Doorman-

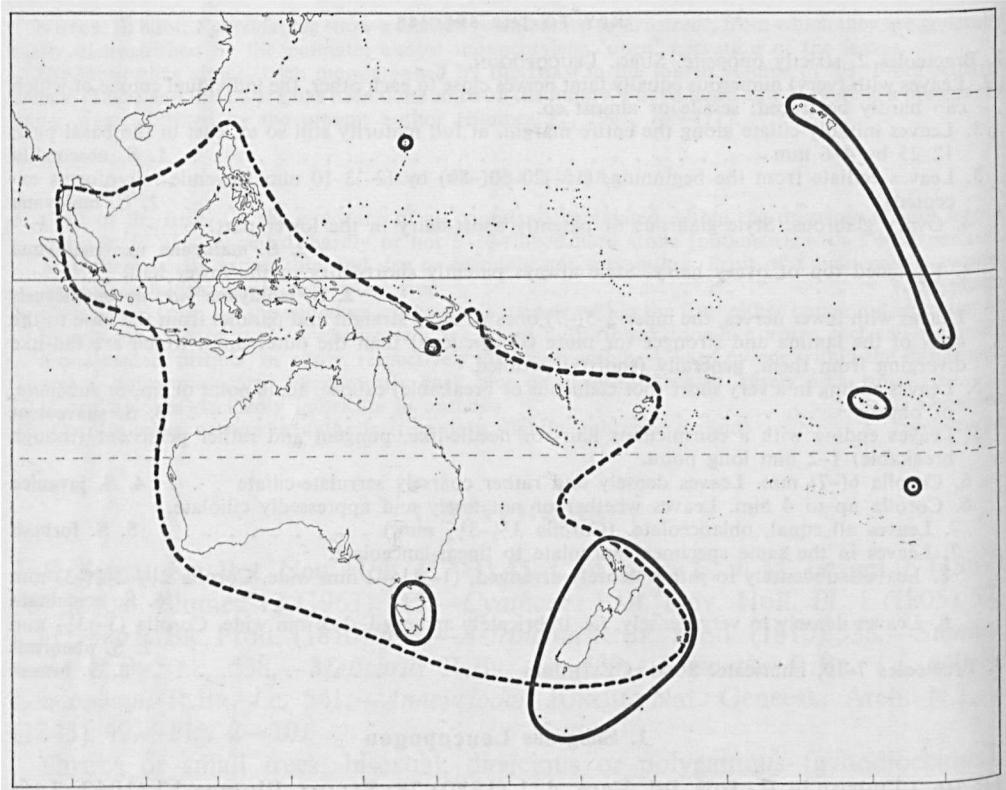


Fig. 2. Distributional areas of *Styphelia* subg. *Leucopogon* (----) and subg. *Cyathodes* (——).

top), once found.

Ecol. In dry open, nearly flat places, at 3250 m. Fl. Oct.

Note. To judge from the size of the anthers and the form of the ovary, the species has apparently bisexual flowers similarly as the closely related *S. malayana* (JACK) SPR., of which *S. abscondita* is perhaps a mere variety.

2. *Styphelia malayana* (JACK) SPR. Syst. 4 (1827) Cur. post. 67 ('*malaica*'); F. v. M. Fragm. 6 (1867) 56; DRUDE in E. & P. Pfl. Fam. 4, 1 (1889) 78; KOORD. Rec. Trav. Bot. Néerl. 7 (1910) 65, in text.; J.J.S. Ic. Bog. 4 (1910) 82; Nova Guinea 8 (1912) 797; GIBBS, J. Linn. Soc. Bot. 42 (1914) 107; MERR. En. Born. (1921) 467; STEEN. Bull. Jard. Bot. Btzg III, 13 (1933) 52; RICHARDS, J. Ecol. 24 (1936) 35 & 352; DUNSELMAN, Trop. Natuur 28 (1939) 74; HEINE in Fedde, Rep. 54 (1951) 246; MERR. J. Arn. Arb. 33 (1952) 230; SLEUM. Blumea 12 (1963) 147.—*Leucopogon malayanus* JACK, Mal. Misc. 1, 5 (1820) 20, ref. Edinb. Phil. J. 6 (1822) 397, repr. WALL. in Roxb. Fl. Ind. ed. Carey & Wall. 2 (1824) 301, ditto in Hook. Bot. Misc. 2 (1830) 71; DON, Gen. Syst. 3 (1834) 777; DC. Prod. 7 (1839) 744; VOIGT, Hort. Suburb. Calc. (1845) 334; MIQ. Fl. Ind. Bat. 2 (1859) 1052; Sum. (1861) 250, 585; KURZ, Nat.

Tijd. N.I. 27 (1864) 215; SCHEFF. *ibid.* 31 (1870) 363; HANCE, J. Bot. 15 (1877) 335; KURZ, J. As. Soc. Beng. 46, ii (1877) 217, var.  $\alpha$ ; For. Fl. Burma 2 (1877) 95; CLARKE in Hook. f. Fl. Br. Ind. 3 (1882) 477; STAFF, Trans. Linn. Soc. II, Bot. 4 (1894) 198; RIDL. J. Str. Br. R. As. Soc. 33 (1900) 103; GAMBLE, J. As. Soc. Beng. 74, ii (1905) 83; RIDL. J. Linn. Soc. Bot. 38 (1908) 314, repr. J. Fed. Mal. St. Mus. 2 (1908) 121; *ibid.* 6 (1915) 49, 158; MERR. Philip. J. Sc. 10 (1915) Bot. 191; RIDL. Fl. Mal. Pen. 2 (1923) 223, f. 94; DOP, Fl. Gén. I.-C. 3 (1930) 747, f. 83; BURK. Dict. (1935) 1340; SYMINGTON, J. Mal. Br. R. As. Soc. 14 (1936) 355; FLETCHER in Craib, Fl. Siam. En. 2 (1938) 320; CORNER, Ways. Trees (1940) 218, f. 58; HENDERS. Mal. Nat. J. 6 (1950) 265, f. 248.—*Leucopogon malayanus* JACK var. *moluccanus* (non SCHEFF. pro spec.) KURZ, J. As. Soc. Beng. 46, ii (1877) 217 (based on a narrow-leaved, apparently juvenile microform); For. Fl. Burma 2 (1877) 96; CLARKE in Hook. f. Fl. Br. Ind. 3 (1882) 477; RIDL. J. Fed. Mal. St. Mus. 7 (1916) 46; Fl. Mal. Pen. 2 (1923) 224; DOP, Fl. Gén. I.-C. 3 (1930) 748.—Fig. 3-5.

var. *malayana*.—Fig. 3.  
Shrub, or sometimes a small tree, up to 5 m, sparingly branched. Branchlets rather slender, densely puberulous in the younger, early corticate

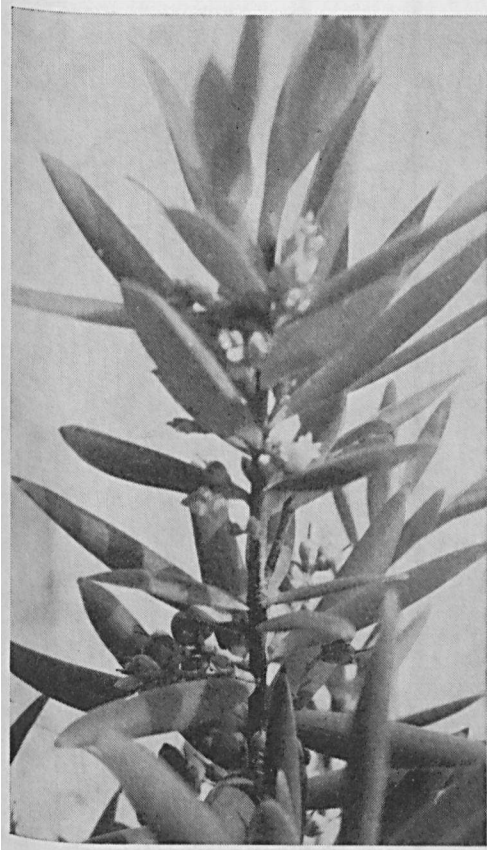


Fig. 3. *Styphelia malayana* (JACK) SPR. var. *malayana*. Pasir Pandjang, Singkawang (W. Borneo) (A. ELSENER, 1961).

in the older parts; bark dark, splitting lengthwise. Leaves  $\pm$  densely crowded round the twigs, lanceolate, apex gradually attenuate or sub-acuminate, acute, tip sharply spine-pointed or hair-like ( $\pm$  caducous with age), base narrowed and truncate, without proper petiole, hard or coriaceous, glabrous, pale green and shining above, whitish or glaucous papillose-puberulent beneath, withering yellow-brown to reddish, quite entire, narrowly and rather translucently marginate, (25-)30-50(-60, rarely up to 80) by (3-)5-10 mm, in - generally sterile - microforms (sports) narrow-lanceolate, 15-30 by 2-4 mm; no proper midrib, nerves or veins numerous, equal, fine, parallel with the edge and close to each other, well visible though hardly raised on both faces. Inflorescences axillary, in abbreviate, 3-7 (rarely 10)-flowered spikes; rachis slender, densely whitish-pubescent or -subvillous,  $\frac{1}{2}$ -1(-1 $\frac{1}{2}$ ) cm, with numerous basal perulae. Flowers bisexual. Pedicel very short or almost absent. Subtending bract and two bracteoles ovate, concave, glabrous and generally but faintly veined dorsally, ciliolate, 1-2 mm. Sepals ovate-oblong to elliptic, glabrous

and generally hardly or not veined dorsally, ciliate, 3 $\frac{1}{2}$ -4 by c. 2 mm. Corolla white, sometimes with pink tinge, fragrant, tubular for 2 $\frac{1}{2}$ -3 mm, funnel-shaped and 5-partite for 2-2 $\frac{1}{2}$  mm, lobes deltoid, subacute, spreading or reflexed, villous inside as is the upper inner part of the corolla tube, glabrous outside. Anthers narrow-oblong, c.  $\frac{3}{4}$  mm, on filiform filaments (c.  $\frac{3}{4}$  mm), a little exerted from the throat. Ovary sub-orbicular, glabrous, 1 mm; style rather slenderly columnar, (2-)2 $\frac{1}{2}$  mm, glabrous or laxly patently short-pubescent especially below. Fruit round, 4-5 mm across, mesocarp thinly pulpy and translucent, of a sweet though rather adstringent taste, yellow or orange, finally red, endocarp a central stone with generally 5 cavities, each with one seed.

Distr. S. Indo-China, Lower Burma, S. Siam, in *Malesia*: Sumatra (Tapanuli, West Coast), Malay Peninsula, Banka, Billiton and Riouw, Anambas Is., Borneo incl. Karimata Arch.

Ecol. On exposed cliffs or rocks and sandy beach plains, in sandy 'blukar' behind coconut groves near the sea, in open spots in bushy 'kerangas' woodland on sandstone or sandy soils, often associated with *Baeckea frutescens*, in 'padang' vegetation at low altitudes up to 1800 m, again in the mountains in rather dry *Leptospermum* forest, and widespread in mossy forest, on Mt Kinabalu up to 2745 m on open ridges, generally on acid soil, sandstone or granitic sands, locally gregarious. Fl. fr. Jan.-Dec., mainly July-Aug.

Uses. A decoction of leaves and roots is drunk for stomach ache and pain all over the body. In Banka the fibre (*i.e.* the inner bark) is used to make canoes waterproof.

Pollination. The flowers are visited by various *Hymenoptera*.

Vern. *Chorèng* (or *chuchur*) *atap*, *hujung atap*, *jiring atap*, *kaju glam*, *kaju tjina*, *kémili bawang*, *maki china*, *mèmpadang*, *mèntadah*, *tasèk timbul*, *M*, *kémili bawang*, *sèkun'jung*, *t(a)ratap*, Banka, *kaju djarum*, *mata udang*, W. Borneo, *Malayan Heath*, E.

Note. The most related species is *S. cymbulæ* (LAB.) SPR. from New Caledonia, New Hebrides, and Fiji, which has shorter, generally distinctly veined sepals (c. 2 mm), longer filaments (1-1 $\frac{1}{2}$  mm), a constantly short style (1 mm), the ovary abruptly truncate apically, whilst in *S. malayana* the ovary is  $\pm$  gradually tapering into the rather long style.

*var. novoguineensis* SLEUM. Blumea 12 (1963) 148. —Fig. 4-5.

Ovary hairy all over the top. Style 1 $\frac{1}{2}$ -2 mm, patently hairy in the lower half. Fruit globular, red, edible, 3 $\frac{1}{2}$ -4 mm across in fresh specimens. Leaves 25-45 by 4-10 mm; much narrower and more lanceolate leaves observed in part of the branchlets on the same specimen, probably due to bud-mutation (sports). Otherwise as in *var. malayana*.

Distr. *Malesia*: New Guinea, only known from the S. slope of the Cycloop Mts above Kotanica.

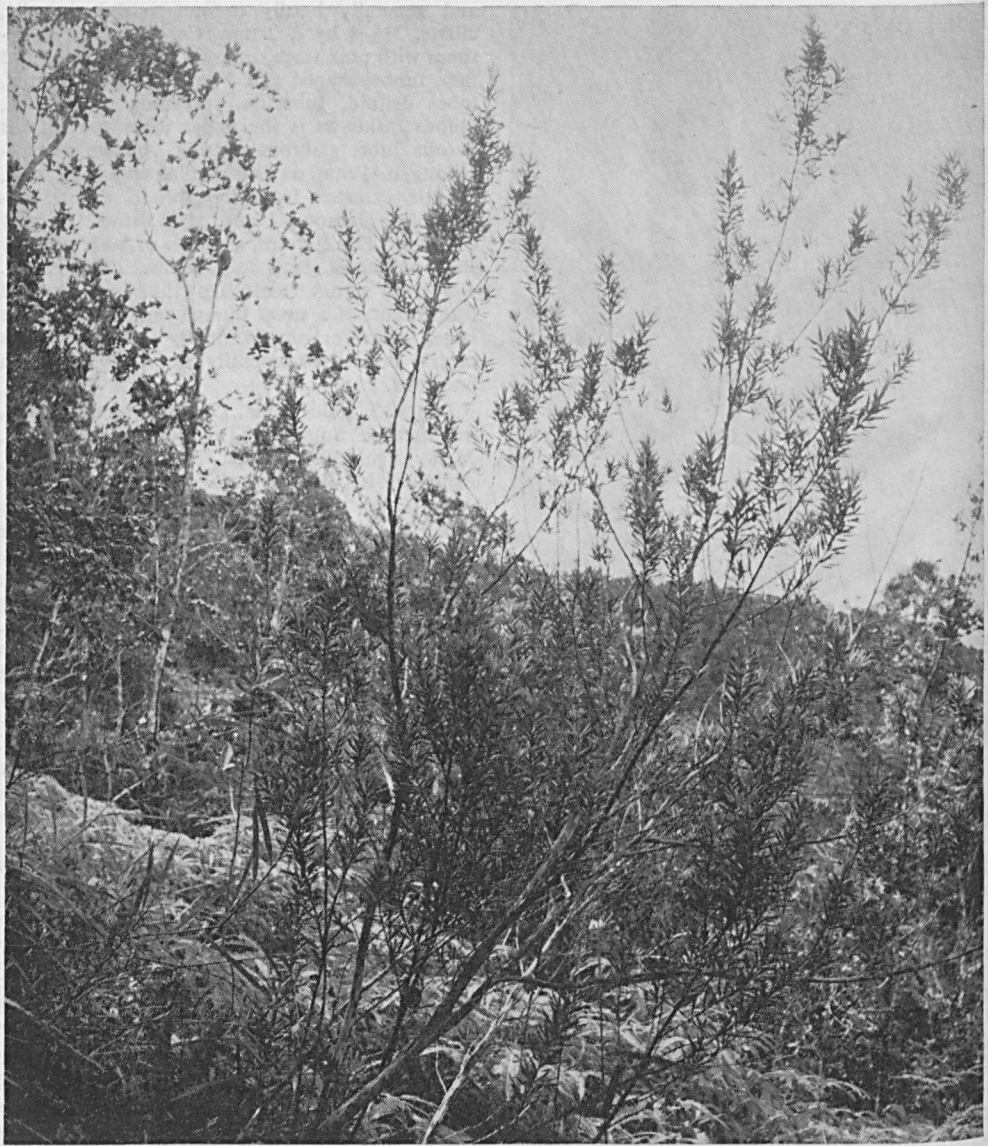


Fig. 4. *Styphelia malayana* (JACK) SPR. var. *novoguineensis* SLEUM. Cycloop Mts (New Guinea) (VAN ROYEN & SLEUMER 6200) (SLEUMER, 1961).

Ecol. In woody grassland with *Xanthostemon brassii* MERR. & PERRY and *Stenocarpus moorei* F. v. M., scattered at 600–700 m, on laterite soil. Fl. fr. July.

3. *Styphelia suaveolens* (HOOK. f.) WARB. in Sarasin, Reisen 2 (1905) 329, *in text.*; KOORD. Rec. Trav. Bot. Néerl. 7 (1910) 65; J.J.S. Nova Guinea 8 (1912) 798; KOORD. Exk. Fl. Java 3 (1912) 22; GIBBS, Linn. J. Soc. Bot. 42 (1914) 107; MERR. En. Born. (1921) 468; H. J. LAM, Blumea 5 (1945) 571; SLEUM. Blumea 12 (1963) 148.—

*Leucopogon obtusatus* HOOK. f. in Hook. Lond. J. Bot. 6 (1847) 269, *non* SOND. (1844/45).—*Leucopogon suaveolens* HOOK. f. Ic. Pl. (1852) *sub* t. 898; WALP. Ann. 5 (1858) 454; VID. Synopsis, Atlas (1883) 30, t. 60, f. A.—*Leucopogon colensoi* HOOK. f. Fl. Nov. Zel. 1 (1853) 165.—*Leucopogon hookeri* SOND. Linnæa 26 (1854) 248, *non* SOND. (1844/45); HOOK. f. Fl. Tasm. 1 (1857) t. 75; BENTH. Fl. Austr. 4 (1869) 205; WRIGHT, Kew Bull. (1899) 104; BAIL. Fl. Queensl. 3 (1900) 933; RODWAY, Tasm. Fl. (1903) 108; EWART, Fl. Vict. (1930) 931.—*Cyathodes colensoi* (HOOK. f.) HOOK. f.



Fig. 5. *Styphelia malayana* (JACK) SPR. var. *novoguineensis* SLEUM. Cycloop Mts (New Guinea) (VAN ROYEN & SLEUMER 6200 A) (SLEUMER, 1961).

Handb. New Zeal. Fl. (1864) 177; CHEESEMAN, Man. New Zeal. Fl. (1906) 412; Ill. New Zeal. Fl. (1914) t. 125; ALLAN, Fl. New Zeal. 1 (1961) 517.—*S. 'montana'* F. v. M. Fragm. 6 (1867) 45, *pro parte* (excl. *basion*. *Lissanthe montana* R. BR. 1810), 55; Trans. R. Soc. Vict. 1, 2 (1889) 25, as to var. *hookeri*, in text.—*S. hookeri* (SOND. 1854) J.J.S. Nova Guinea 8 (1912) 797, non F. v. M. (1867); MAIDEN & BETCHE, Cens. New S. Wales Pl. (1916) 165.—*S. obtusifolia* J.J.S. Nova Guinea 8 (1912) 798, t. 143; *ibid.* 12 (1917) 539, *incl. var. hypoleuca* J.J.S. l.c. 799; DIELS, Bot. Jahrb. 62 (1929) 488; J.J.S. Nova Guinea 18 (1936) 123.—*S. trilocularis* J.J.S. Nova Guinea 8 (1912) 798, 799, t. 144; *ibid.* 18 (1936) 123, *incl. var. quinquelocularis* J.J.S.—*S. vandewateri* WERNH. Trans. Linn. Soc. II, Bot. 9 (1916) 101.—*S. spicata* J.J.S. Nova Guinea 12 (1917) 539, t. 224; KANEH. & HATUS. Bot. Mag. Tokyo 56 (1942) 484, f. 7.—*S. philippinensis* MERR. Philip. J. Sc. 20 (1922) 419; En. Philip. 3 (1923) 252.—*S. 'obovata'* MALM in Fedde. Rep. 41 (1937) 295, *excl. basion. Leucopogon obovatus* FAWC.—*Leucopogon philippinensis* (MERR.) HOSOKAWA, Trans. Nat. Hist. Soc. Formosa 30 (1940) 336.—Fig. 6.

Diocious, low, erect, diffuse or bushy, stiff shrub, (0.15-)½-2(-3) m, becoming prostrate and mat-forming at high altitude. Branchlets slender, rather rigid, densely short-hairy, subsdensely to densely leaved; bark transversely cracking. *Leaves*

long or subovate-oblong, variable in shape and size, apex generally shortly attenuate, or acuminate to various degree, ending with a ± bluntish, callous point, rarely more long-acuminate and acutely pointed (Philippines and New Guinea in part), base attenuate into a short broadened petiole, coriaceous, ± stiff, flat or the edge slightly recurved, entire, ciliate initially and often remaining so in the upper part or at the apex and/or the base, generally glabrescent with age and finally quite glabrous, medium-green and dull above, ± whitish or greyish glaucous beneath, often finely white-papillose between the nerves, (6-)8-15(-18) by (1½-)2-3(-3½) mm, few- to rather many-nerved, nerves or ribs 3-5, parallel to each other, close or more distant, ± obscure above, mostly

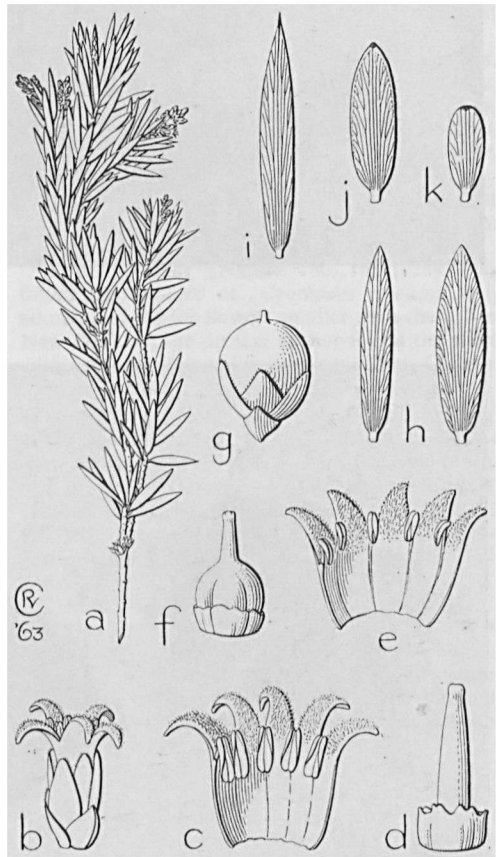


Fig 6. *Styphelia suaveolens* (HOOK. f.) WARB. a. Habit, × ⅓, b. flower, × 4, c. ♂ flower, open corolla, × 6, d. rudimentary ovary in ♂ flower, × 12, e. ♀ flower, open corolla, × 6, f. ♀ flower, ovary, × 12, g. fruit, × 2, h. two leaves, × 2, i. leaf, × 2, j. leaf, × 2, k. leaf, × 2 (a-h SLEUMER & VINK 4299, New Guinea: Arfak Mts, 2400 m, i ELMER 11389, Philippines: Mindanao, Mt Apo, 2600-2800 m, j JACOBS 5747, Borneo: Mt Kinabalu 3500-4000 m, k BRASS 10099, New Guinea: Mt Wilhelmina, 4250 m).



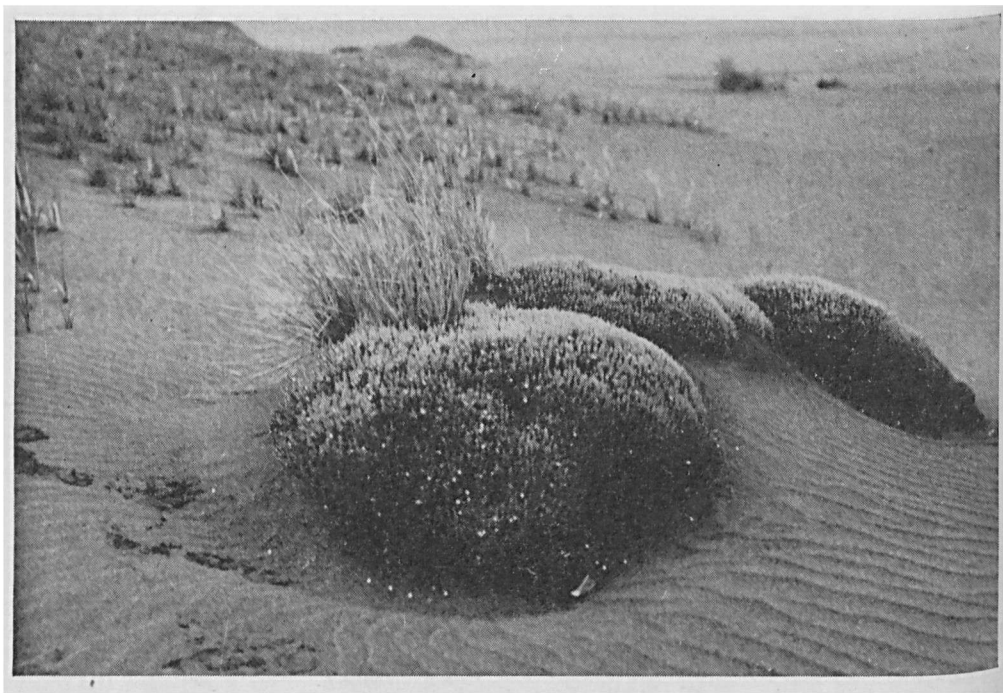


Fig. 8-9. *Styphelia javanica* (DE VRIESE) J.J.S. in the dunes of the Sandsea, within the caldera of Mt. Tengger (E. Java), c. 2050 m; above associated with *Calamagrostis australis* and *Imperata* in background (photogr. CLASON, 1928), below almost covered with volcanic sand (photogr. JESWIET, 1918).



Fig. 7. *Styphelia javanica* (DE VRIESE) J.J.S. Mt Ardjuno (E. Java), c. 3000 m.

± distinctly raised beneath, the inner 1 or 3 ones straight from the base to the top of the lamina and not branched, outer ones fan-like branched from below or upwards only. *Spikes* either solitary and terminal, or 2-3 in the upper axils, (2-)3-8-flowered; rachis slender, grey-puberulous, up to 5 mm, with several minute basal bracts. *Flowers* sessile or almost so, sweet-scented. Subtending bract subovate, hardly 1 mm. Bracteoles 2, suborbicular, obtuse, ciliate, clasping the base of the sepals, 1-1¼ mm. *Sepals* oblong to obovate-oblong, obtuse, membranous, dull reddish, often distinctly veined lengthwise, ciliate, 1¾-2 mm. *Corolla* suburceolate, white, creamy or pinkish red, 3½-4 mm long in all, apparently usually slightly longer in the ♂ flowers, lobed from ⅓ to almost ½ their length, tube slightly to rather long exerted from the sepals, lobes lanceolate, acute, covered with woolly white hairs inside, ± reflexed in full anthesis.—♂ *Flowers*: anthers attached above the middle of the corolla, oblong, ¾-1 mm, slightly exerted from the throat. Pistil columnar, c. 2 mm, its basal part (ovary) hardly swollen, disk lobes ± spreading.—♀ *Flowers*: anthers much reduced in size, hardly ½ mm, less exerted and without pollen. *Ovary* subglobular, disk lobes closely attached; style columnar, ¾-1 mm. *Drupe* subglobose, (3-)4-5 mm across, 2-3(-5)-celled, mesocarp fleshy, thin, either whitish or yellowish (Arfak Mts), or pink to red at maturity. *Seeds* red.

Distr. Australia (S. Queensland, New South Wales, NE. Victoria, Tasmania), New Zealand, Solomon Is. (Bougainville), in *Malesia*: N. Borneo (Kota Belud and Kinabalu), Lesser Sunda Is. (Timor), Central and SW. Celebes, Philippines (Luzon, Negros, Mindanao), and New Guinea.

Ecol. In Timor a common to subdominant undergrowth in *Eucalyptus* and *Podocarpus* mountain-forest, 1800-3000 m, in Celebes, Borneo, and New Guinea rare in (even secondary) montane forest, more common in scrub forest, open mossy forest and forest glades, summit vegetation, in alpine grassland and on rocks, mostly on dry, also on moist, peaty ground, and on ultrabasic rock, locally common and even gregarious, (1800-) 2000-4000 m, on the southern slope of Mt Carstensz in fissures of rock between 4500 and 4700 m, and just below the top of Mt Wilhelm at 4690 m. *Fl. fr.* Jan.-Dec.

Vern. *Kadoro buku*, Makassar, *bacay*, Negros, *gaing*, *sadumdum*, Bag.; New Guinea: *mukehfa*, Dunantina, *zamosa*, Asaro: Kefamo, *muasopo*, Chimbu: Masul, *wamoreh*, Mairi: Mondo, *nubiri*, *porparu*, Mendi, *mundumund*, *paungupi*, *rone*, Enga, *nakat-nakat*, Dani.

Uses. In Negros the roots are used to treat hemorrhage. Reported to be ± fire-resistant from Timor.

Note. GODLEY (Nature 180, 1957, 284) has found the flowers of '*Cyathodes colensoi*' unisexual, and the ♀ flowers smaller than the ♂ flowers in New Zealand; the present author found the same within populations of *S. suaveolens* in New Guinea.

4. *Styphelia javanica* (DE VRIESE) J.J.S. Ic. Bog. 4 (1910) 82; SLEUM. Blumea 12 (1963) 150.—*Anacyclodon pungens* JUNGH. Nat. Geneesk. Arch. N.I. 2 (1845) 49, non *S. pungens* (SOND.) F. v. M. (1867).—*Pentachondra javanica* ZOLL. *ibid.* 2 (1845) 576, repr. Flora 30 (1847) 601, *nom. illeg.*—*Leucopogon javanicus* DE VRIESE in Miq. Pl. Jungh. 1 (1851) 84; JUNGH. Java ed. 2, 1 (1853) 597, 666; *ibid.* 3 (1854) 734; ZOLL. Syst. Verz. 2 (1854) 137; MIQ. Fl. Ind. Bat. 2 (1859) 1053; F. v. M. Fragm. 6 (1867) 56 in text.; BOERL. Handl. 2, 1 (1891) 274; SCHIMPER, Pflanzengeogr. (1898) 768, f. 428; KOORD. Nat. Tijds. N.I. 60 (1901) 263.—*S. pungens* KOORD. Jungh. Gedenkb. (1910) 185, non (SOND.) F. v. M. (1867); Rec. Trav. Bot. Néerl. 7 (1910) 64; Exk. Fl. Java 3 (1912) 21, f. 5; KOORD.-SCHUM. Syst. Verz. 1 (1912) fam. 234, p. 113; J.J.S. Nova Guinea 8 (1912) 798; DAMMERMAN, Pres. Wild Life & Res. Neth. Ind. (4th Pac. Sc. Congr. Java, 1929) 49, fig.; DOCTERS VAN LEEUWEN, Pangrango (1933) 258, f. 67; HOCHR. Candollea 6 (1936) 470; STEEN. Trop. Natuur 25 (1936) 38, f. 2; BACK. Bekn. Fl. Java (em. ed.) 7 (1948) fam. 164, p. 1.—Fig. 7-9.

Creeping, much branched, low-growing and mat-forming shrub, 10-30 cm, with squamiferous runners. Branchlets ± erect, slender, dark purple in the younger, puberulent and imbricately leaved parts, densely scarred and early defoliate in the older ones. *Leaves* obliquely erect, elliptic-oblong or oblong or mostly subobovate-oblong, apex

shortly acuminate, ending with a pale needle-like pungent point or cusp (1 mm), base suddenly and truncately narrowed into a red petiole (hardly 1 mm), rather hard, glabrous, rather lustrous, dark green-glaucous when fresh, red-brown when old, edge rather coarsely and persistently serrulate-ciliate (lens!), 6–13 by 1½–2 mm, midrib distinct, not branched, nerves 5–7, parallel to the midrib, fan-like branched and generally so only on the outer side, *i.e.* towards the edge, slightly raised beneath, less visible above. *Flowers* normally solitary in the upper axils, (4)–5-merous, bisexual; peduncle 2–3 mm, grey-pubescent, with c. 6 basal bracts, the latter similar to the subtending bract, small, ½ mm. Bracteoles 2, ± rounded, forming a cup, which is appressed to the sepals, 1–1½ mm, ciliate, keeled and mucronulate. *Sepals* ovate-oblong, acuminate, 3(–4) mm. *Corolla* white or ± suffused with pink, very sweet-scented, 6(–7) mm long in all, tube urceolate, ± equalling the sepals in length, glabrous in- and outside, lobes acute, recurved, densely hairy within, 2½(–3) mm. *Anthers* oblong, c. 1 mm, slightly exserted from the throat. *Ovary* ovoid, 1 mm, base surrounded by the fleshy disk. Style slender, red, long white-hairy below, c. 3½ mm, topped by a capitate stigma. *Drupe* ellipsoid or subglobose, slightly 5-angled, yellow or orange coloured, c. 4½ mm across.

Distr. *Malesia*: East Java (from Mts Penanggungan, Ardjuno, and Kawi to Mt Jang).

Ecol. In sunny, dry, sandy or stony places, may be near craters, occasionally also in *Casuarina* forest, locally common, gregarious, even vegetation-forming, often interlaced in low mats of *Festuca nubigena* at Mt Penanggungan at 1650 m, otherwise 2100–3350 m. *Fl. fr.* Jan.–Dec.

Pollination. According to DOCTERS VAN LEEUWEN the stigma leans often against the anthers and this renders self-pollination possible. The sweetly scented flowers are visited by *Bombus rufipes* var. *flavipes*.

Dispersal. DOCTERS VAN LEEUWEN observed on Mt Kawi that the fruits were regularly eaten by the thrush *Turdus javanicus whiteheadii*, and that the stones and seedlings were not rare in the excrements of these birds.

Vern. *Dukut malelo*, J.

Note. Apparently most related to *S. cuspidata* (R. Br.) SPR. from Queensland, the leaf-margin of which is, however, finely ciliate, and not as coarsely serrulate-ciliate as it is in *S. javanica*. In the habitually very similar *S. nesophila* (DC.) SLEUM. from New Zealand, the corolla is definitely longer, and no proper unbranched midrib is present.

5. *Styphelia forbesii* SLEUM. *Blumea* 12 (1963) 151. —*Leucopogon obovatus* FAWC. in Forbes, Wand. (1885) App. 6, p. 509, non (LAB.) R. BR. (1810). — *S. obovata* J.J.S. Ic. Bog. 4 (1910) 82; *ibid.* (1913) 172, in text.; Nova Guinea 8 (1912) 798, non LAB. (1805).

Erect shrub. Branchlets slender, densely shortly grey-pubescent, imbricately leaved. *Leaves* all

equally obovate-oblong or oblanceolate, apex rather suddenly acuminate, ending with a pale, needle-like and breakable cusp (1–1½ mm), base attenuate to a flattened, very short petiole, almost sessile, hard and rather rigid, glabrous besides some hairs at the very base, very finely, sometimes hardly visibly appressed-ciliate along the edge (lens!), nerves numerous, fan-like branched except the middle one, minutely raised or impressed, often rather obscure especially above, 11–15 by 3–4 mm. *Flowers* bisexual, mostly solitary, sometimes in twos in the upper axils, sessile or almost so, with several basal minute scaly bracts. Subtending bract small, bracteoles 2, ovate, ciliate, 1–1½ mm. *Sepals* oblong-elliptic, (sub)obtusely, rather longish ciliate, 2½ mm. *Corolla* white, 3½ mm in all, 5-lobed ± halfway, tube cylindric, ± included by the sepals, lobes densely set with ± retrorse villous hairs inside. *Anthers* oblong, ½ mm, slightly exserted from the throat. *Ovary* pear-shaped, glabrous as is the slender style (1 mm). *Fruit* subglobose-ellipsoid, c. 2½ by 2 mm, striate lengthwise, apex truncate, style subsistent, 1½ mm, central stone 1–3-celled.

Distr. *Malesia*: Timor (eastern part: Mt Telulah), Alor.

Ecol. In *Eucalyptus* forest, 1000–1220 m, locally plentyful. *Fl. fr.* April–May.

Vern. *Kewana*, *wuêwe*, Alor.

6. *Styphelia acuminata* (R. Br.) SPR. Syst. 1 (1825) 659; SLEUM. *Blumea* 12 (1963) 151. —*Leucopogon acuminatus* R. Br. Prod. (1810) 545; BENTH. Fl. Austr. 4 (1869) 216; EWART & DAVIES, Fl. North. Terr. (1917) 216. — *S. wetarensis* J.J.S. Ic. Bog. 4 (1913) 171, t. 352.

Shrublet, c. ½ m. Branchlets slender, puberulous, subdensely to rather densely foliate. *Leaves* lanceolate to linear-lanceolate, apex ending in an acicular point or cusp (1 mm), base narrowed, sessile or practically so, subcoriaceous, rather stiff, glabrous and shining, minutely subserrulate-ciliate (lens!), 5–11 by (1)–1½–2 mm; nerves numerous, parallel to the edge, fan-like branched, not much visible especially not above. *Flowers* bisexual, axillary, mostly in twos, rarely in threes, puberulous on a peduncle, 1–1½ mm long, which bears some minute bracts or scales. Pedicel very short or almost 0. Subtending bract ovate-acuminate, finely mucronulate, ciliate, ½–¾ mm. Bracteoles suborbicular-ovate, strongly keeled and ± mucronulate, ciliate, appressed to the sepals, c. 1 mm. *Sepals* ovate to ovate-elliptic, apiculate, ciliate, veined lengthwise, 1½–1¾ mm. *Corolla* tubular below, funnel-shaped above, white, glabrous outside, 2½–2¾(–3) mm long in all, 5-lobed halfway, lobes erecto-patent, recurved distally, acute, set with retrorse long spreading hairs inside. *Anthers* oblong, c. ¾ mm. *Ovary* subglobose, glabrous, style slender, terete, glabrous, ¾ mm. *Fruit* obovoid-ellipsoid, apex truncate, c. 3½ by 3 mm at maturity.

Distr. N. Australia (precise locality not known), in *Malesia*: Lesser Sunda Is. (Wetar, twice found).

Ecol. In *Eucalyptus* bush, on rather dry volcanic tuff, 150–550 m. *Fl. fr.* Febr.

Note. The fruit of *S. acuminata* from Australia is described by BENTHAM as 5-celled, whilst the one specimen from Wetar with fruits has only 2 cells by abortion. I have, however, also found 2- and 1-celled fruits in the original collection of *S. acuminata* and there are otherwise no differences. Similar to *S. acuminata* in leaves is *S. leptospermoides* (R. BR.) SPR. from Queensland, which, however, has decidedly larger flowers.

1. *Styphelia abnormis* (SOND.) J.J.S. Ic. Bog. 4 (1910) 82, in text.; *ibid.* (1913) 172, in text.; Nova Guinea 8 (1912) 797; SLEUM. Blumea 12 (1963) 151.—*Leucopogon acuminatus* (non R. BR.) DUPERREY, Voy. Coquille Bot. Atlas (1826) t. 53.—*Leucopogon abnormis* SOND. in Lehm. Pl. Preiss. 1 (1845) 325.—*Leucopogon lancifolius* HOOK. f. Ic. Pl. (1852) t. 898.—*Leucopogon moluccanus* SCHEFF. Nat. Tijd. N.I. 32 (1873) 419; BOERL. Handl. 2, 1 (1891) 274.—*Leucopogon malayanus* JACK var. *moluccanus* KURZ, J. As. Soc. Beng. 46, ii (1877) 217; For. Fl. Burma 2 (1877) 96, pro stirp. molucc.—*S. lancifolia* J.J.S. Ic. Bog. 4 (1910) 82, in text.; Nova Guinea 8 (1912) 797; GIBBS, J. Linn. Soc. Bot. 42 (1914) 107; MERR. En. Born. (1921) 467.—*S. moluccana* J.J.S. Ic. Bog. 4 (1910) 72, in text.; Nova Guinea 8 (1912) 798; H. J. LAM & HOLTHUIS, Blumea 5 (1942) 224.

Erect, twiggy shrub, 1–1½(–3) m. Branches scarred. Branchlets rather slender, younger parts greyish puberulous, densely appressedly and ± imbricately leaved. *Leaves* sessile, lanceolate (the lowest ones in the new shoots oblanceolate), apex acuminate, ending with a needle-like point or brittle pungent tip (± 1 mm) when young, less pungent when the very tip is gone in later stages, base very shortly narrowed, truncate, no proper

petiole, often convex above, coriaceous, stiff, shining, glabrous, finely ± caducously subserrulate-ciliate (lens!) along the whole margin, 11–18(–20) by 2–3 mm, with numerous close though distinct nerves parallel to the edge, only the outer ones fan-like-branched, all rather conspicuous on both faces. *Flowers* bisexual, axillary, solitary or in twos, rarely in threes; peduncle (½–)1–2 mm, grey-puberulous, with several minute basal bracts. Subtending bract ovate, hardly 1 mm. Bracteoles 2, ovate-acuminate, keeled dorsally, the keel ending in short mucro, ciliolate, c. 1½ mm. *Sepals* oblong, acute or submucronate by a very short apical callus, ciliolate, rather obscurely veined lengthwise as are the bracteoles, c. 2 mm. *Corolla* tubular below, funnel-shaped above, white or greenish, 3½(–4) mm long in all, 5-lobed down to almost ¾, glabrous outside, tube hidden in the sepals, lobes erecto-patent, subovate-lanceolate, acute, densely set with reverse, stout hairs inside. *Anthers* oblong, ¾ mm, slightly exerted from the corolla tube. *Ovary* pear-shaped, glabrous, 1 mm across; style slenderly columnar, glabrous, c. 1½ mm. *Submature fruit* ellipsoid, much truncate distally, c. 3 by 2½ mm, 4–5-celled (endocarp and walls separating the seeds rather thin), said to become yellowish at maturity.

Distr. *Malesia*: N. Borneo (incl. Balambangan I.), SE. Celebes (Kabaena I.), Moluccas (Ceram, Talaud Is., Sula Is., Manipa I., Buru, Ambon), New Guinea (only P. Gebe and Waigeo).

Ecol. In xeromorphic vegetation on red, nickel- and chrome-containing clay in Waigeo, in the Moluccas on open sunny slopes and stony ground, on Kabaena I. on crystalline schists, in many places locally rather common, 0–1000 m. *Fl.* Jan.–Dec.

Vern. *Tolenasu*, Talaud, *pupua*, Taliabu, *papua laki*, Buru.

## 2. Subgenus *Cyathodes*

(LAB.) DRUDE in E. & P. Pfl. Fam. 4, 1 (1889) 78; SLEUM. Blumea 12 (1963) 155.

—*Cyathodes* LAB. Nov. Holl. Pl. 1 (1805) 57, t. 81, em. R. BR. Prod. (1810) 539.

—Fig. 10.

Bracteoles 7–10, imbricately arranged immediately below the calyx.

Distr. About 15 spp., 6 of which in SE. Australia (S. Victoria and Tasmania), 4 spp. in New Zealand incl. Stewart I., Auckland I., Campbell I., and Chatham I., in Micronesia 1 sp. on Alamagan I. (Marianas Group), in the proper Pacific (Tahiti, Moorea, Raiatea, Hawaii, Rapa, Marquesas) 4 spp., in *Malesia* 1 sp. in SE. New Guinea. Fig. 2.

8. *Styphelia brassii* SLEUM. Blumea 12 (1963) 160.

—Fig. 10.

Straggling or dense woody shrub, or treelet, up to 6 m, with spreading branches. Branchlets slender, tips finely patent-puberulous, early glabrescent and corticate below; bark dark, splitting lengthwise. *Leaves* scattered though rather dense, ± spreading or subreflexed, linear or lanceolate-linear, apex short-acuminate, tapering to a rigid, pale pungent point (½–1 mm),

base very shortly and broadly attenuate into a rather slender, certainly well marked petiole (½–1 mm), coriaceous, stiff, entire, initially ciliate, glabrous with age, brownish olivaceous and shining above when dry, greyish glaucous beneath, (¾–)1–1½ cm by 1–1½ mm, midrib and 2–3 nerves on each side parallel to the edge, slightly or hardly impressed above, finely though well visibly raised beneath, the outer 1 or 2 nerve(s) fan-like branched from at least the upper

half (less distinctly or more shortly so in the flush). *Flowers* solitary in the upper 3–6(–8) axils of the new shoots, subsessile, apparently bisexual. Bracteoles completely covering the very short peduncle (hardly 1 mm), ovate to oblong-ovate, obtuse, ciliate, 1–1½ mm, decreasing in size downwards. *Sepals* oblong, obtuse, ciliate, ± 1¾ mm. *Corolla* tubular-subcampanulate, white, 3¾–4 mm long in all, almost halfway 5-lobed, glabrous outside, subdensely soft-hairy at the lobes and the upper half of the tube inside, tube very shortly or hardly exerted from the sepals. *Anthers* narrow-oblong, 1–1¼ mm, on filiform, glabrous filaments (½ mm), exerted from the corolla tube for almost their full length. *Ovary* broadly obovate, glabrous, c. ¾ mm, tapering to a rather slender glabrous style (0.6–0.7 mm). Disk thin, cup-shaped, 5-lobed halfway. *Fruit* globose, white, turning pink or purple at maturity, c. 4 mm ø, central stone covered by a thin mesocarp, containing 2 or 3 seeds.

*Distr. Malesia*: SE. New Guinea (Milne Bay Distr., only known from Mts Maneao, Simpson, and Dirywa.)

*Ecol.* Edge of mossy or stunted forest, 2600–2900 m. *Fl. fr.* May–June.

*Notes.* Certainly closely related to *S. juniperina* (FORST.) PERS. from New Zealand, which differs by a completely glabrous corolla and a longer, campanulate corolla tube, exerted from the sepals. *S. oxycedrus* LAB. from Australia (S. Victoria and Tasmania) is similar in habit but its nerves are hardly or not branched outward. Also closely related to *S. rapae* SLEUM. (from Rapa I.), which differs by glabrous branchlets and not or inconspicuously ciliate bracteoles, and to *S. brevistyla* MOORE (Society Is.) in which the corolla is practically glabrous inside.

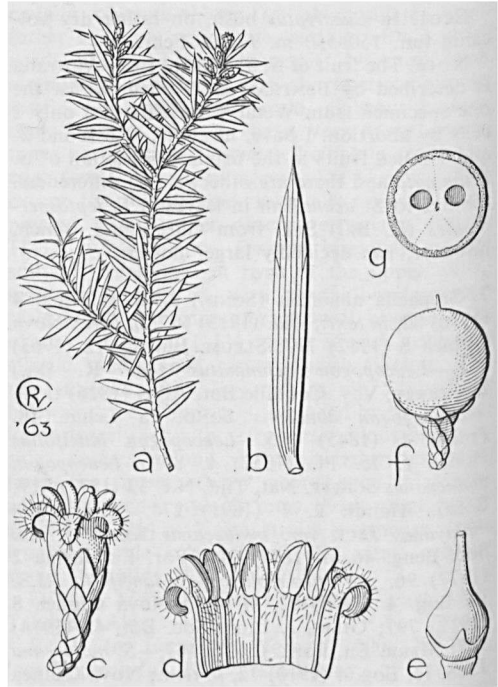


Fig. 10. *Styphelia brassii* SLEUM. a. Habit, × 2/3, b. leaf, × 3 1/3, c. flower with bracteoles, × 4, d. open corolla with stamens, × 6, e. ovary and style, × 8, f. fruit with bracteoles on pedicel, × 3 1/3, g. cross-section of fruit, × 3 1/3 (a–g BRASS 22274).

## 2. DECATOCA

F. v. M. Trans. R. Soc. Vict. 1, 2 (1889) 25; SLEUM. Blumea 12 (1963) 163.—**Fig. 111-p.**

Shrub or low tree, apparently gynodioecious. *Leaves* spirally arranged, shortly petioled. Inflorescences terminal and axillary, in the form of short spikes or spike-like racemes (the axis ending with a sterile flower respectively with a subtending bract). *Flowers* sessile. Bracteoles 2, strictly opposite. *Sepals* 5, imbricate. *Corolla* tube subcylindric, exceeding the sepals, subdensely hairy in the upper 2/3 inside, lobes imbricate in bud and remaining so in anthesis, attaining c. 1/3 of the total length of the corolla, hairy at the base inside, otherwise glabrous. *Stamens* attached below the corolla lobes; filaments very short; anthers pendent, narrow-ellipsoid, hardly exerted from the corolla tube. Hypogynous disk deeply 5-lobed. *Ovary* 10-celled, with 1 ovule per cell; style columnar, short; stigma subcapitate. *Fruit* (as in *Trochocarpa*) baccate; mesocarp rather thick and pulpy, penetrating between the separated 10 pyrenes of the endocarp at full maturity.

*Distr.* Monotypic, in *Malesia*: East New Guinea. Fig. 12.

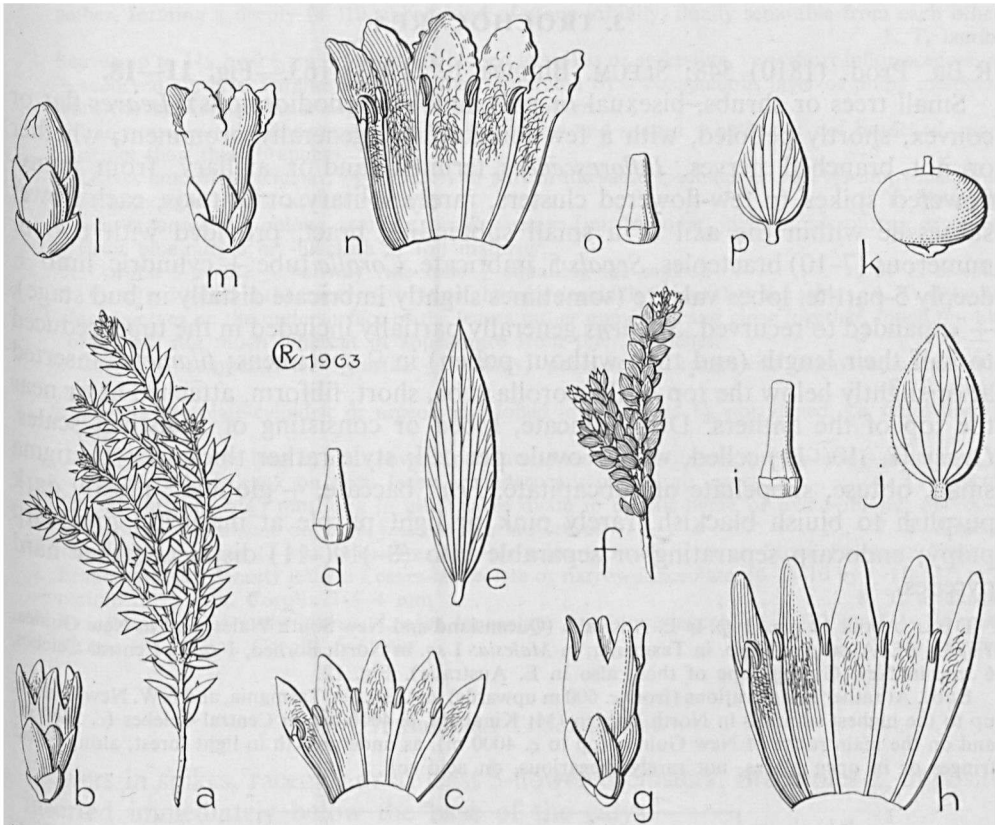


Fig. 11. *Trochocarpa nutans* (J.J.S.) H. J. LAM. a. Habit,  $\times \frac{2}{3}$ , b. ♀ flower,  $\times 4$ , c. open corolla of ♀ flower,  $\times 6$ , d. ovary,  $\times 6$ , e. leaf,  $\times 4$ .—*Trochocarpa decockii* (J.J.S.) H. J. LAM. f. Habit,  $\times \frac{2}{3}$ , g. ♀ flower,  $\times 4$ , h. open corolla of ♀ flower,  $\times 6$ , i. ovarv,  $\times 6$ , i. leaf,  $\times 4$ , k. fruit,  $\times 2$ .—*Decatoca spenceri* F. v. M. l. Flower bud,  $\times 4$ , m. flower,  $\times 6$ , n. open corolla of ♀ flower,  $\times 6$ , o. ovary,  $\times 6$ , p. leaf,  $\times 2$  (a-e VAN ROYEN & SLEUMER 7977, f-k SLEUMER 4150, l-p BRASS 4675).

1. *Decatoca spenceri* F. v. M. Trans. R. Soc. Vict. 1, 2 (1889) 25; WRIGHT, Kew Bull. (1899) 104; J.J.S. Nova Guinea 8 (1912) 798; DIELS, Bot. Jahrb. 62 (1929) 488; STEEN. Bull. Jard. Bot. Btzg III, 13 (1934) 203; SLEUM. Blumea 12 (1963) 163.—Fig. 11l-p.

Compact, densely erect-branched, stiff shrub or treelet, up to 2 m, sometimes dwarfed to rounded clumps c. 20 cm high, or procumbent. Branchlets rather short, densely set with short spreading hairs. *Leaves* crowded, somewhat spreading, suborbicular- to lanceolate-ovate, apex subacute, not rarely subapiculate, base  $\pm$  rounded, subcoriaceous, curved inwards in dry specimens, finely shortly ciliate (lens!), glabrous, dark green and rather glossy above, paler beneath, marginate, entire, 3-5(-6) by 2-3 mm, midrib not branched, lateral nerves in 3 pairs  $\pm$  parallel to the midrib, fan-like branched outward, prominent beneath, hardly visible above; petiole reddish, slender, subterete,  $\frac{1}{2}$ - $\frac{3}{4}$  mm. *Racemes* spike-like, few-flowered, generally terminal, rarely axillary. Subtending bract and the 2 bracteoles ovate, ciliolate, reddish and strongly veined lengthwise as are the

sepals; the latter oblong-ovate, slightly keeled, red-tipped, c. 2 mm. *Corolla* subcampanulate-tubular, i.e. slightly dilated from base to top, white, rather fleshy, 5(-6) mm long in all, tube 4-4½ by 2-2½ mm, glabrous outside,  $\pm$  densely covered with longish subpatent hairs in the upper  $\frac{2}{3}$ , glabrous above the base inside, lobes subovate, erect or hardly reflexed, margin irregularly crisped and finely erose,  $\pm$  1½ mm, hairy at the base inside, glabrous otherwise. *Anthers* narrow-oblong, c. 1¼ mm in the ♂, only 0.7 mm and without pollen in the ♀ flower. Disk bluntly 5-lobed. *Ovary* broadly pear-shaped, glabrous, 1 mm; style thick-columnar, glabrous, c. 1½ mm; stigma obtuse. *Fruit* depressed-globular, dark purple, 5-6 mm  $\phi$  at full maturity; mesocarp rather thick and succulent, including the 10 small, separate pyrenes.

Distr. *Malesia*: East New Guinea (Mt Saruwaged, Owen Stanley and Wharton Ranges).

Ecol. In forest glades, more common in fringes of forest and along banks of grassland streams or in open grassland shrubberies, 2840-3680 m. *Fl. fr.* May-Sept.

## 3. TROCHOCARPA

R.BR. Prod. (1810) 548; SLEUM. *Blumea* 12 (1963) 163.—Fig. 11—18.

Small trees or shrubs, bisexual or polygamous (gynodioecious). *Leaves* flat or convex, shortly petioled, with a few longitudinal, generally prominent, whether or not branched nerves. *Inflorescences* terminal and/or axillary, from many-flowered spikes to few-flowered clusters, rarely solitary or in twos, each flower subsessile within the axil of a small subtending bract, provided with two or numerous (7–10) bracteoles. *Sepals* 5, imbricate. *Corolla* tube  $\pm$  cylindric, limb  $\pm$  deeply 5-partite, lobes valvate (sometimes slightly imbricate distally in bud stage),  $\pm$  expanded to recurved. *Stamens* generally partially included in the tube, reduced to half their length (and then without pollen) in  $\text{\textit{f}}\text{\textit{e}}\text{\textit{m}}\text{\textit{a}}\text{\textit{l}}$  specimens; *filaments* inserted at or slightly below the top of the corolla tube, short, filiform, attached at or near the top of the anthers. Disk truncate, lobed or consisting of 5 distinct scales. *Ovary* (8–)10(–11)-celled, with 1 ovule per cell; style rather thick, short; stigma small, obtuse, subpeltate or subcapitate. *Fruit* baccate,  $\pm$  globular, mostly dark purplish to bluish blackish, rarely pink or light purple at maturity; mesocarp pulpy; endocarp separating or separable into (8–)10(–11) distinct, rather hard pyrenes.

Distr. About 12 *spp.*, 1 *sp.* in E. Australia (Queensland and New South Wales) and in New Guinea, 1 *sp.* in SE. Australia, 3 *spp.* in Tasmania; in *Malesia*: 1 *sp.* in North Borneo, 1 *sp.* in Central Celebes, 6 *spp.* in New Guinea (one of them also in E. Australia). Fig. 12.

Ecol. At rather low elevations (from c. 600 m upwards) in Australia, Tasmania, and NW. New Guinea, up to the highest summits in North Borneo (Mt Kinabalu, c. 4000 m), in Central Celebes (c. 3460 m) and on the main range of New Guinea (up to c. 4000 m), as undergrowth in light forest, along forest fringes or in open places, not rarely gregarious, on acid soil.

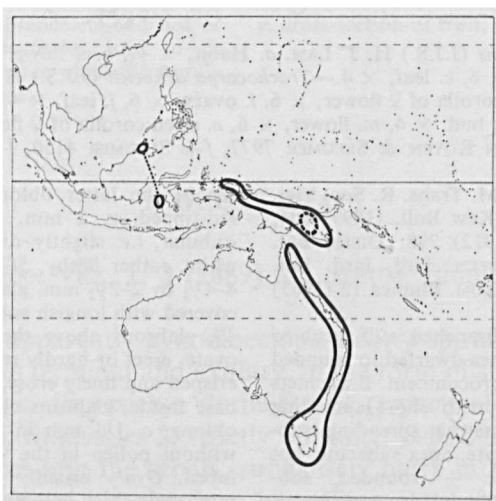


Fig. 12. Distributional area of the genera *Trochocarpa* R. Br. (—) and *Decatoca* F.v.M. (-----).

## KEY TO THE SPECIES

1. Bracteoles 2, opposite. Flowers in spikes, racemes or at least 3-flowered clusters. SUBG. TROCHOCARPA.
2. Leaves (2½–)3–5(–7½), rarely up to 8½ by (½–)1–2½(–2¾), occasionally up to 3½ cm, juvenile microforms excepted. Spikes many-flowered, suberect, (1½–)2–4(–5) cm. Pyrenes very close to-

- gether, forming a deeply (8-)10-ribbed kind of stone initially, finally separable from each other.
1. *T. laurina*
  2. Leaves up to 1¾ by 0.6 cm. Flowers condensed in spikes or spike-like, very short inflorescences, or ± recurved clusters. Pyrenes close together, separated by a conspicuous layer of pulpy mesocarp from the beginning, easily separable from each other.
  3. Main nerves on the undersurface of the leaves few and spaced, whether or not branched, more distinct than their branches.
  4. Leaves lanceolate-acicular, ½-1 (rarely in part in the same specimen up to 1½) mm wide. Fruit pink to light purple at full maturity . . . . . 2. *T. gjellerupii*
  4. Leaves lanceolate, oblong or ovate, on an average (much) wider, juvenile microforms excepted. Fruit blue-purple or -blackish at full maturity.
  5. Corolla 5-partite ± halfway (the tube ± equalling the sepals) . . . . . 3. *T. celebica*
  5. Corolla 5-lobed in the upper ½ (or less), the tube decidedly longer than the sepals. 4. *T. dekokkii*
  3. Main nerves on the undersurface of the leaves rather numerous and close together, much fan-like branched, not much different in appearance from their branches.
  6. Corolla ± campanulate, 5-partite ± halfway, prominently lengthwise many-veined outside. 5. *T. nutans*
  6. Corolla urceolate-cylindric or urceolate, 5-lobed in the upper ½, not veined, *i.e.* quite smooth outside.
  7. Corolla 4-5 mm long in all. Leaves lanceolate to lanceolate-oblong; nerves hardly prominent or mostly a little sunk on both faces or underneath in mature leaves . . . . . 6. *T. nubicola*
  7. Corolla 5-6(-6½) mm long in all. Leaves ovate to elliptic-ovate or ovate-oblong; nerves ± strongly prominent on both faces in mature leaves . . . . . 7. *T. dispersa*
  1. Bracteoles numerous (7-10), imbricate. Flowers solitary, rarely in twos. SUBG. PSEUDOCYATHODES.
  8. Branchlets very densely leaved. Leaves lanceolate or narrow-lanceolate, (6-)8-10 by 1-1½(-2) mm; petiole c. ½ mm. Corolla 3½-4 mm . . . . . 8. *T. arfakensis*
  8. Branchlets less densely leaved. Leaves lanceolate to oblong-lanceolate, 8-10 by 2½-3½ mm; petiole 1-1½ mm. Corolla 5-6 mm . . . . . 9. *T. papuana*

1. Subgenus *Trochocarpa*

Flowers in spikes, racemes or at least 3-flowered clusters. Bracteoles 2, opposite, inserted immediately below the base of the calyx.

1. *Trochocarpa laurina* (R. BR. *ex* RUDGE) R. BR. Prod. (1810) 548; HOOK. Bot. Mag. (1834) t. 3324; BENTH. Fl. Austr. 4 (1869) 166; BAIL. Queensl. Fl. 3 (1900) 928; DOMIN, Bibl. Bot. 89 (1928) 496, f. 172 (above); WHITE, J. Arn. Arb. 4 (1933) 85; SLEUM. Blumea 12 (1963) 165.—*Cyathodes laurina* R. BR. *ex* RUDGE, Trans. Linn. Soc. 8 (1807) 293.—*Styphelia cornifolia* RUDGE, l.c. t. 9.—*Styphelia trochocarpoides* F. v. M. Pap. Pl. 1 (1875) 107; J.J.S. Ic. Bog. 4 (1913) 173; Nova Guinea 12 (1917) 540, *in text.*; in Gibbs, Arfak (1917) 168; KANEH. & HATUS. Bot. Mag. Tokyo 56 (1942) 485.—*Decaspora laurina* O. KTZE, Rev. Gen. Pl. 2 (1891) 391.—*T. bellendenkerensis* DOMIN, Bibl. Bot. 89 (1928) 496, f. 172 (below).—Fig. 13.

Erect, much branched shrub or treelet, rarely small tree, (0.3-)1½-4 (sometimes up to 10) m; trunk up to 15 cm across. Branchlets terete, slender, glabrous, early greyish corticate. Leaves either clustered at the ends or scattered, though rather close together in the upper part of each year's shoots, mostly ovate- or elliptic-lanceolate, more rarely ovate, sometimes rather narrowly lanceolate or almost elliptic, variable both in shape and size, apex gradually long or more shortly acuminate, subacute, base broadly cuneate to almost rounded, glabrous, pinkish to reddish in young shoots, at maturity glossy, dark green

above, light green beneath, subcoriaceous, flat, entire, normal ones (2½-)3-5(-7½), rarely up to 8½) by (½-)1-2(-2¾), occasionally up to 3½) cm, in microforms reduced to 12-16 by 2½-4½ mm, 5-7 (rarely 9)-plinerved, main nerves somewhat prominent on both faces, each nerve giving way to numerous less prominent ascending or sometimes rather obsolete veins or streaks which are crossing each other and form a kind of fine network between the main nerves; petiole rather slender, grooved above, (2-)3-4(-7) mm. Flowers bisexual, arranged in terminal and axillary solitary or terminally clustered, suberect spikes; rachis stoutish, glabrous or laxly to subdensely puberulous, (1½-)2-4(-5) cm; perulæ several, small. Subtending bract ovate-oblong, striate, 1½-2 mm, subpersistent. Bracteoles 2, ovate, keeled, striate, ciliate, c. 1.2 mm. Sepals subovate, obtuse, indistinctly striate, ciliate, c. 2 mm. Corolla white or whitish green or pink, subcylindric, tube 2-2½ mm, lobes suberect, 1-1½ mm, bearded to the middle as well as the upper part of the tube inside with retrorse hairs, otherwise glabrous. Anthers narrow-oblong, c. 1¼ mm, exerted for about half their length. Disk shortly 5-lobed. Ovary subglobose, glabrous, tapering to a thick style (1 mm). Fruit depressed-globular, 6-8 by 4-5 mm, dull, bluish-blackish and often a little pruinose at full maturity, the (8-)



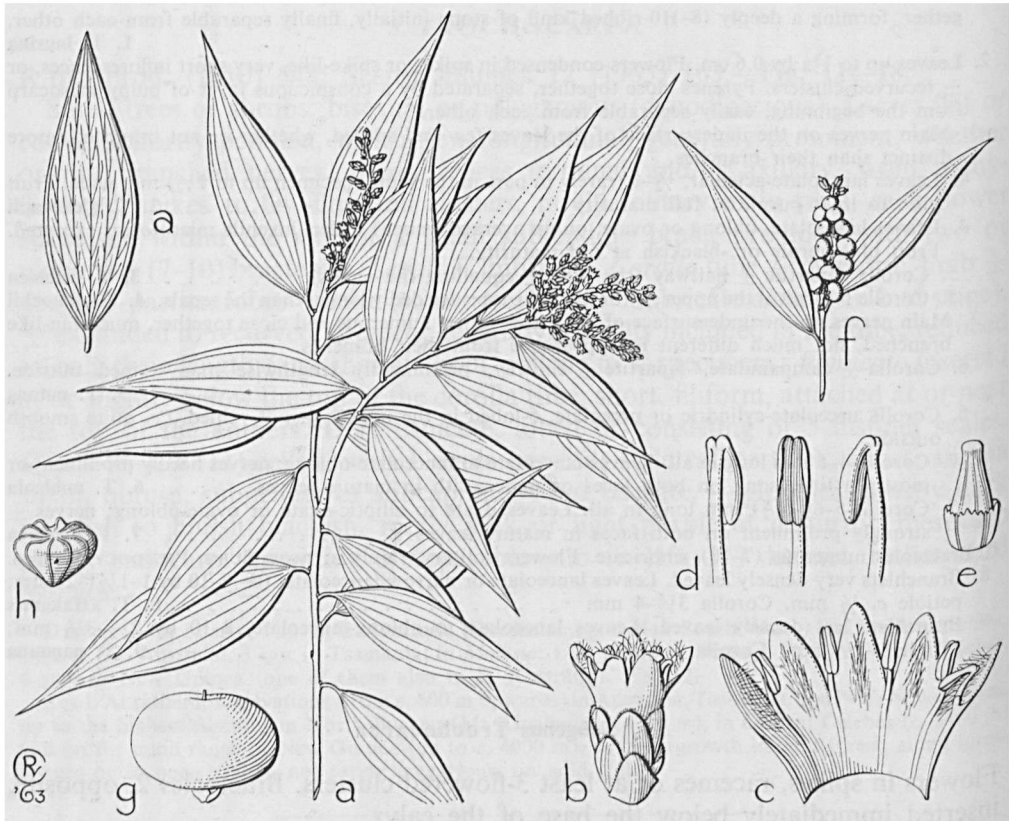


Fig. 13. *Trochocarpa laurina* (R. BR. ex RUDGE) R. BR. a. Leaf,  $\times \frac{2}{3}$ , b. flower,  $\times 4$ , c. open corolla,  $\times 6$ , d. stamens,  $\times 12$ , e. ovary,  $\times 8$ , f. infructescence,  $\times \frac{2}{3}$ , g. fruit,  $\times 2$ , h. pyrenes in submature fruit still close together in form of a central 10-ribbed stone,  $\times 2$  (a VAN ROYEN & SLEUMER 7335, b-e SLEUMER & VINK 4352, f VAN ROYEN 3940, g-h VAN ROYEN & SLEUMER 7335).

10(-11) pyrenes very close together with scanty mesocarp tissue between them forming a semi-globose, sharply 10-ribbed, almost compact kind of stone for a long time, finally separable from each other, surrounded by a rather abundant pulpy mesocarp.

Distr. Australia (Queensland, New South Wales), in *Malesia*: NW. New Guinea (Vogelkop Peninsula).

Ecol. In New Guinea edge of primary (*Araucaria-Castanopsis-Nothofagus*) forest or in (also secondary) scrub forest or shrubberies on steep, rocky slopes or summit vegetation, on clayey or sandy soil, (600-)700-2600 m, locally common. Fl. fr. Jan.-Dec.

Uses. The wood is of a pinkish colour, close-grained, hard, and nicely marked.

Vern. *Botdzjemiei*, *kéru*, Manikiong, *duon*, Andjai, *perannek*, *Kébar*, *humtotkau*, *urer*, Hattam.

Note. The New Guinea specimens show the same variation in size and form of the leaves and the length of the spikes as do the Queensland specimens, and there is no difference in the flowers.

2. *Trochocarpa gjellerupii* (J.J.S.) H. J. LAM. *Blumea* 5 (1945) 573; SLEUM. *Blumea* 12 (1963) 165.—*Styphelia gjellerupii* J.J.S. *Nova Guinea* i2 (1917) 540; *ibid.* (1918) t. 225; in Gibbs, *Arfak* (1917) 167; STEEN. *Bull. Jard. Bot. Btzg III*, 13 (1934) 203; KANEH. & HATUS. *Bot. Mag. Tokyo* 56 (1942) 484.—Fig. 14.

Much branched, erect shrub, often compact, subglobose or subovoid in shape, with a short stem in open, more loosely branched and less densely leaved in shadowy places, part of the branches sometimes prostrate and rooting, the branchlets then short, erect, partly with larger leaves; ( $\frac{1}{2}$ -)1-2(-4) m. Branchlets very slender, younger parts densely leaved and covered with a subvillous yellowish tomentum, older defoliate parts with a longitudinally splitting blackish bark. Leaves lanceolate-acicular, apex gradually acuminate, base subobtusely, glabrous, entire, minutely  $\pm$  caducously appressed-ciliolate (lens!), ( $2\frac{1}{2}$ -)3-5(-6) by  $\frac{1}{2}$ -1 mm (up to 8 by  $\frac{1}{2}$  mm in rooting prostrate branches), midrib prominent beneath, obscure above, with 1-2 parallel lateral

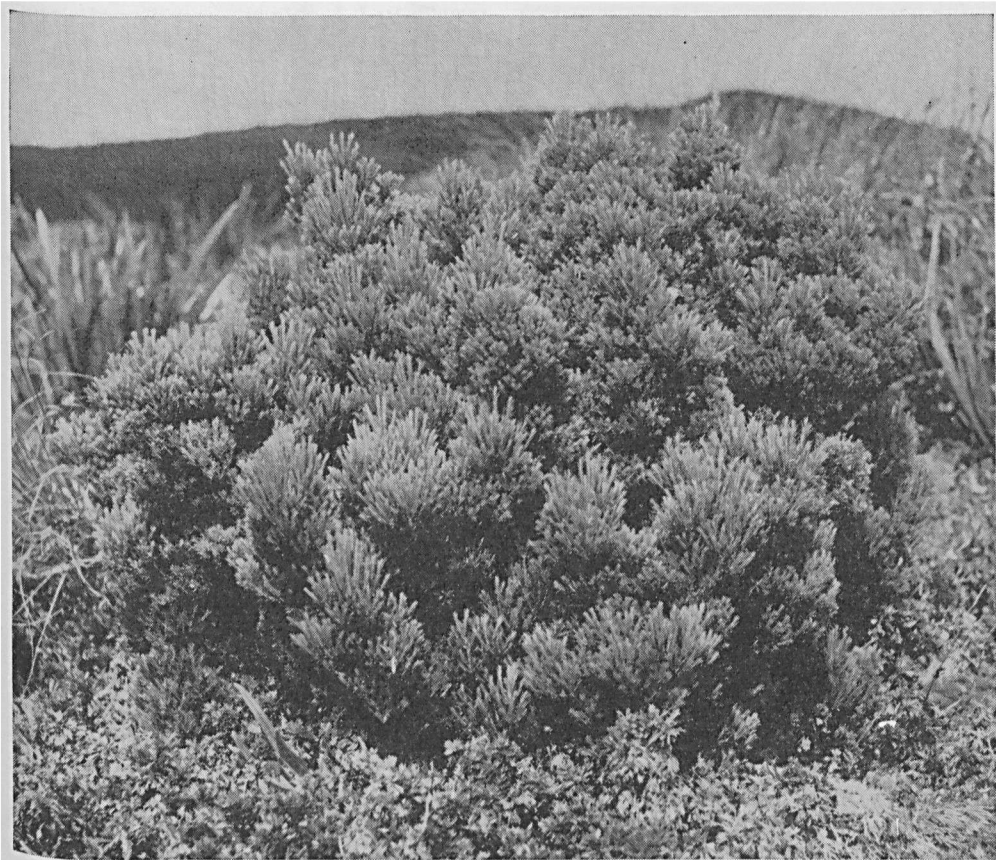


Fig. 14. *Trochocarpa gjellerupii* (J.J.S.) H. J. LAM, Mt Sensenemés, Anggi Gigi Lake, Arfak Mts (New Guinea), 2500 m (SLEUMER & VINK 4312) (SLEUMER, 1962).

main nerves on each side, these whether or not branched at the outer side mainly in the upper half, raised beneath only; flush pinkish; petiole subsemiterete, transversely rugose, *c.*  $\frac{1}{2}$  mm. *Inflorescences* terminal and axillary, 3-7-flowered, abbreviate racemes or clusters. *Flowers* sessile, *c.* 3 mm, glabrous in all outer parts, with reddish-purple tinge in bud stage. Bracteoles 2, shortly ovate-triangular, 0.8-1 mm. *Sepals* green, ovate, obtuse, ciliolate,  $1\frac{1}{3}$ - $1\frac{1}{2}$  mm. *Corolla* whitish or mostly pale green, almost funnel-shaped, *c.*  $2\frac{3}{4}$  mm long in all, 5-partite nearly halfway, tube slightly exceeding the sepals, lobes  $\pm$  divergent, finally  $\pm$  recurved, elongate-triangular, subacute, villous in the lower half inside. Anthers deeply inserted in the throat, reaching almost the apex of the corolla lobes; filaments fleshy, 1-1.3 mm; anthers narrow-oblong,  $\frac{1}{2}$  mm. *Ovary* ovoid-subglobose, glabrous; style thick, *c.*  $\frac{3}{4}$  mm; stigma subcapitate. Disk lobes 5, ovate, subquadrangular, retuse or shortly 3-lobed. *Fruit* depressed-subglobose, 3-4 by 4-5(-6) mm, pink or light purple when fully mature, containing 10 loose pyrenes in a rich pulp.

Distr. *Malesia*: NW. New Guinea (Tamrau, Nettoti and Arfak Mts).

Ecol. Both in open shrubby heath vegetation and as undershrub in low *Nothofagus*-*Tristania* forest or forest edge, on peaty, clayey, or sandy soil, 1900-2550 m, locally plentiful. *Fl. fr.* Jan.-Dec.

Vern. *Angwar*, *ankwarie*, Manikiong.

3. *Trochocarpa celebica* (J.J.S.) STEEN. in H. J. Lam, *Blumea* 5 (1945) 573; SLEUM. *Blumea* 12 (1963) 166.—*Styphelia celebica* J.J.S.  *Ic. Bog.* 4 (1910) 81, t. 325; Nova Guinea 8 (1912) 798; STEEN. *Bull. Jard. Bot. Btzg III*, 13 (1934) 203.—*Styphelia learnmonthiana* GIBBS, *J. Linn. Soc. Bot.* 42 (1914) 105, f. 5; MERR. *En. Born.* (1921) 467.—*T. learnmonthiana* (GIBBS) H. J. LAM, *Blumea* 5 (1945) 574.

Shrub or shrublet, dwarf, decumbent or trailing, or rarely erect (up to 70 cm), much ramified. Branchlets slender, tips patently puberulous, densely to subimbricately leaved in their youngest parts, set with leaf-cushions in their lower, defoliate and glabrescent part. *Leaves* ovate to

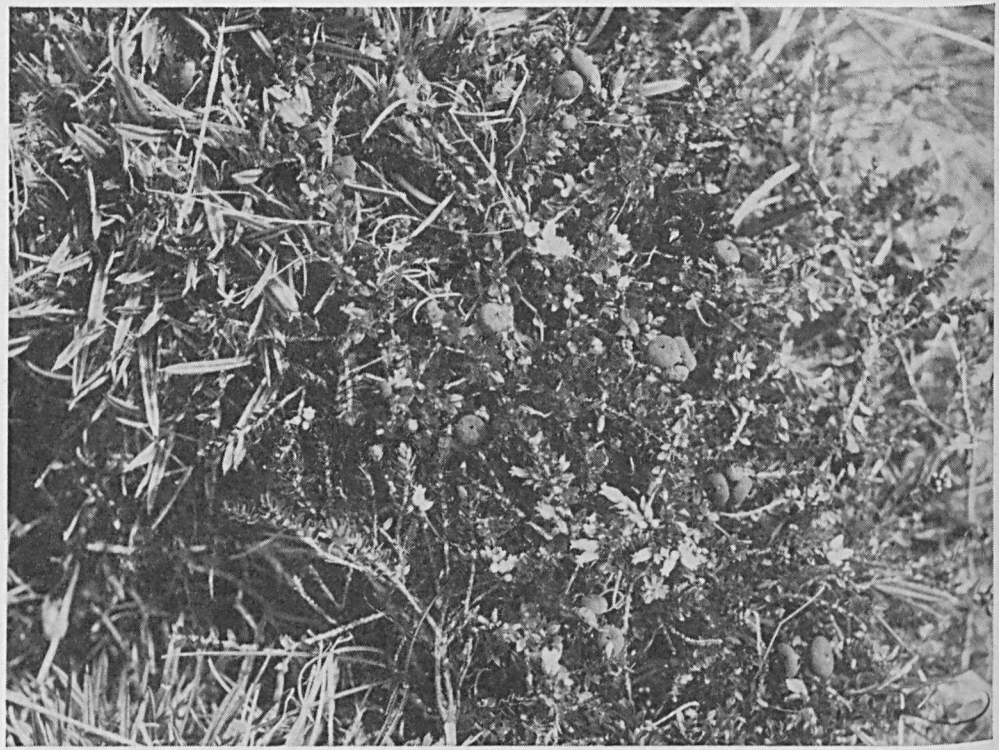


Fig. 15. *Trochocarpa dekokkii* (J.J.S.) H. J. LAM, Mt Wilhelm, Eastern Highlands (New Guinea), 3500 m (SLEUMER 4150) (SLEUMER, 1961).

ovate-lanceolate or elliptic-oblong, rarely lanceolate or narrow-lanceolate, apex subacutely acuminate, base  $\pm$  broadly narrowed to the petiole, coriaceous,  $\pm$  convex above in dry specimens, minutely puberulous at the petiole and at the base above, finely and  $\pm$  caducously serrulate-ciliolate all along the margin, otherwise glabrous, shining, paler beneath, (4-)5-6(-7, rarely up to 9) by (rarely 1-)1½-2½(-3) mm, with 5 (or 7, rarely up to 9) robust main nerves parallel to the edge which are faintly or not immersed above, and  $\pm$  markedly prominent beneath, 1 or 2 outer ones fan-like few-branched into less distinct secondary nerves mainly in the upper half of the lamina; petiole reddish, slender, subterete, ¾-1 mm. *Inflorescences* axillary and terminal, (4-)6-8(-13)-flowered abbreviate racemes or dense  $\pm$  recurved clusters; rachis puberulous, up to 5 mm. *Flowers* subsessile, each with one orbicular-ovate subtending bract (1¼ mm) and 2 opposite suborbicular bracteoles (1½ mm), strongly red-veined as are the *sepals*, the latter ovate- or elliptic-oblong, obtuse, ciliate,  $\pm$  2 mm,  $\pm$  including the corolla tube. *Corolla* tubular in the lower, 5-partite and spreading in the upper half, pink to reddish, 3½-4½ mm long in all, villous at the throat and the base of the lobes inside, otherwise glabrous, lobes elongate-triangu-

lar, subacute. *Stamens* exserted; anthers linear, c. 1 mm; filaments almost 2 mm. *Ovary* subglobose, tapering to the thick columnar style (1½-2 mm). Disk obconical-cup-shaped, shortly 5-lobed. *Fruit* subglobose, dull blue-purple, c. 4 mm  $\phi$ , containing 10 separable pyrenes in a pulpy mesocarp. *Distr. Malesia*: Central Celebes (Quarles and Latimodjong Mts) and North Borneo (Mt Kinabalu).

*Ecol.* In forest or mostly in mountain heath or open summit vegetation, (2700-)3000-3650 m, on Mt Kinabalu prostrate in rock crevices on the summit at 3800-4000 m. *Fl. fr.* Jan.-Dec.

*Note.* A form with narrow-lanceolate leaves (6-8(-9) by 1-1¾ mm) is only known from Mt Mambuliling in Central Celebes, at 2700 m.

4. *Trochocarpa dekokkii* (J.J.S.) H. J. LAM, *Blumea* 5 (1945) 574; SLEUM. *Blumea* 12 (1963) 166.—*Styphelia dekokkii* J.J.S. *Nova Guinea* 8 (1912) 802, t. 146 B; STEEN. *Bull. Jard. Bot. Btzg III*, 13 (1934) 203; J.J.S. *Nova Guinea* 18 (1936) 124; KANEH. & HATUS. *Bot. Mag. Tokyo* 56 (1942) 484.—*Styphelia vannouhuysii* J.J.S. *Nova Guinea* 8 (1912) 801, t. 146 A; *ibid.* 12 (1917) 541; STEEN. *Bull. Jard. Bot. Btzg III*, 13 (1934) 203; J.J.S. *Nova Guinea* 18 (1936) 124.—*Styphelia culminis* WERNH. *Trans. Linn. Soc. II*, Bot. 9

(1916) 101.—*T. yannouhuysii* H. J. LAM, *Blumea* 5 (1945) 573.—Fig. 15, 11f-k.

Small, often dwarf or prostrate, much branched shrub, mostly in flat tussocks or branchlets ascending, 10–20 (rarely up to 50) cm; a trailing form with elongate branchlets (up to 80 cm) and narrower leaves ( $\pm 1$  mm) in swampy places. Branchlets slender, though firm, tips patently puberulous or  $\pm$  glabrescent, densely  $\pm$  imbricately set with leaves on thick, wart-like leaf-cushions. *Leaves* ovate to oblong- or lanceolate-ovate (more ovate in the eastern, more lanceolate in the western part of New Guinea, and from there also known with narrow-lanceolate leaves in swampy places), apex acute, not pungent, base broadly attenuate to rounded, coriaceous,  $\pm$  concave and brown above when dry,  $\pm$  shining, 3–6(–8) by (1–)2–3(–3½) mm, finely caducously to subsersistently serrulate-ciliolate, midrib and nerves obscure above, nerves 5–7, spaced, prominent beneath, all nerves or mostly but the outer 2 pairs minutely branching from the base or mostly (or more distinctly) from the upper part of the lamina; flush pink; petiole  $\pm$  compressed dorsally, transversely rugose, *c.* 1 mm. *Inflorescences* terminal and axillary, suberect, short, dense, (5–)7–12-flowered racemes; rachis *c.* 5(–8) mm, provided with numerous minute perulae below, short-pubescent. *Flowers* polygamous (apparently synodioecious), subsessile, each in the axil of a minute cup-shaped bract ( $\pm 1$  mm). Bracteoles 2, ovate, ciliolate, *c.* 1 mm. *Sepals* green, often with red hue, ovate, ciliate, darker parallel-nerved, 1½–2(–2½) mm. *Corolla* suburceolate-cylindric, pink whitish creamy, or white, 5-lobed to ¼–⅓, 4–5(–6) by 2–3 mm, glabrous outside, tube  $\pm$  inflated, much exserted from the clasping sepals, sparsely to subdensely short-hairy in the upper ⅓ of the tube (not at the lobes) inside, lobes often with pink hue in white corollas, oblong-triangular, slightly spreading. *Anthers* oblong, *c.* ¾ mm (no pollen) and but a little exserted from the throat in the ♀, ¾–1 mm (containing pollen) and more exserted in the normal ♂ flower. *Ovary* subglobose; style glabrous, terete, *c.* 1 mm in the ♀, 1½ mm in the ♂ flower; stigma obtuse. Disk lobes retuse. *Fruit* depressedly globose, 3½–5 by 5–6 mm, dark purple-bluish when ripe, 10-seeded.

*Distr. Malesia:* New Guinea (in the Vogelkop Peninsula only known from the Tamrau and Arfak Mts, in the Main Range from Mt Carstensz to the Maneau Range in SE. New Guinea).

*Ecol.* On open rocky slopes or summits, locally common in alpine tussock grassland, in grassy glades or in bog turf, (2000–)3000–4000 m. *Fl. fr.* Jan.–Dec.

*Vern. Momani, tadampso, Mendi, andidam, Enga:* Poio.

5. *Trochocarpa nutans* (J.J.S.) H. J. LAM, *Blumea* 5 (1945) 573; SLEUM. *Blumea* 12 (1963) 166.—*Styphelia nutans* J.J.S. *Nova Guinea* 8 (1912) 800, t. 145; *ibid.* 12 (1917) 541; in Gibbs, Arfak (1917) 167, *incl. var. arfakensis* J.J.S.; STEEN. *Bull. Jard.*

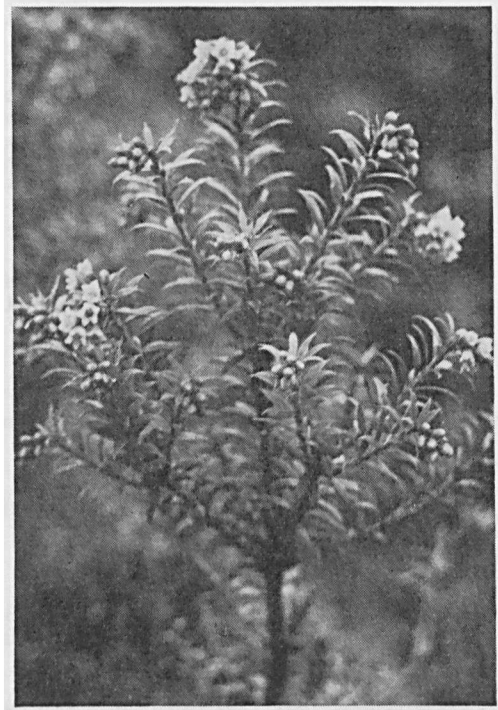


Fig. 16. *Trochocarpa nutans* (J.J.S.) H. J. LAM, Koëbré ridge between Anggi Lakes, Arfak Mts (New Guinea), 2400 m (SLEUMER & VINK 4478) (SLEUMER, 1962).

*Bot. Btzg* III, 13 (1934) 203; KANEH. & HATUS. *Bot. Mag. Tokyo* 56 (1942) 484.—*Styphelia carstensensis* WERNH. *Trans. Linn. Soc. II, Bot.* 9 (1916) 100.—Fig. 16, 17, 11a–e.

Erect, much-branched shrub, ¼–2(–4) m. Branchlets slender, subangular, densely leaved, densely  $\pm$  patently short-pubescent in the younger, defoliate part, set with the prominent leaf-cushions and grey-corticated in the older parts. *Leaves* similar to those of *T. papuana* and *T. nubicola*, dark green to yellowish green, subpatent, oblong- to narrow-lanceolate, apex subacutely acuminate, though subobtuse at the very tip by a minute apical gland, base rather broadly narrowed into the petiole,  $\pm$  coriaceous, finely puberulent initially, quite glabrous and shining on the surface with age, paler beneath,  $\pm$  persistently serrulate-ciliolate, (5–)6–8(–9, rarely up to 12) by 1½–3 (very rarely up to 4) mm, (5–)7–9-nerved, all main nerves parallel to each other and to the edge, and much fan-like branched mainly outward, paler than the interjacent tissue and minutely sunken beneath, slightly impressed as is the generally obscure branching above; petiole downy,  $\pm 1$  mm. *Inflorescences* terminal and from several of the upper axils, (4–)6–8-flowered, abbreviate, nodding racemes or clusters; rachis puberulous, 3–4 mm. *Flowers* sessile or practically

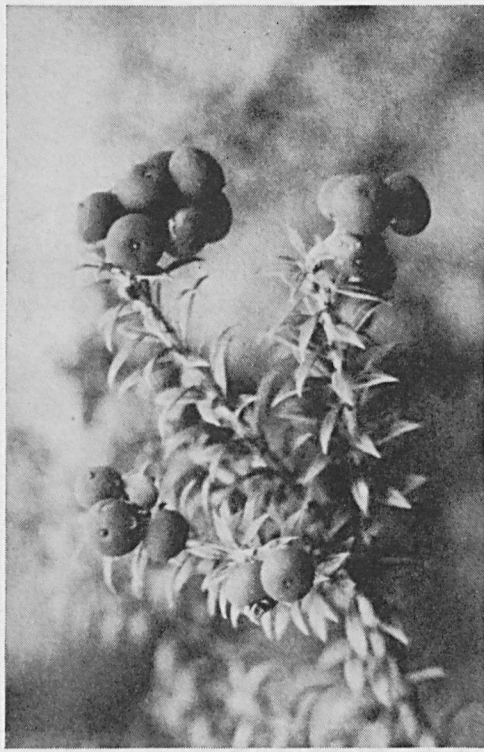


Fig. 17. *Trochocarpa nutans* (J.J.S.) H. J. LAM, Mt Koëbré, ridge between Anggi Lakes, Arfak Mts (New Guinea), 2400 m (SLEUMER & VINK 4478) (SLEUMER, 1962).

so (pedicel up to 1 mm). Subtending bract ovate-triangular, obtuse, longitudinally veined, as are the bracteoles and sepals, ciliate,  $\pm 1\frac{1}{4}$  by 1 mm. Bracteoles 2, ovate, suborbicular, erose, slightly keeled dorsally,  $\pm 1$  mm. *Sepals* ovate, obtuse, ciliate, sometimes puberulous at base and apex,  $1\frac{1}{3}$ -2 by 1-1 $\frac{1}{2}$  mm,  $\pm$  clasping the corolla tube. *Corolla*  $\pm$  campanulate, white, cream or greenish white in shady places, often pinkish especially at the lobes when exposed to full sun or in later stages, (3-) $3\frac{1}{2}$ -4 mm long in all, 5-partite  $\pm$  halfway, all over prominently and longitudinally many-veined outside, lobes  $\pm$  recurved, subacute, villous inside downwards to the throat, glabrous at the apex inside and all over outside. *Stamens* slightly exerted from the throat; anthers oblong,  $\frac{1}{2}$  mm in  $\text{\textcircled{f}}$ , c. 1 mm in  $\text{\textcircled{m}}$  specimens. Disk cup-shaped, 5-lobed. *Ovary* subglobose; style columnar,  $1\frac{1}{2}$ -2 mm. *Fruit* depressedly globose, c. 3 by 5 mm, bluish- or purple-blackish, (8-) $10$ -seeded.

Distr. *Malesia*: New Guinea, in the Vogelkop Peninsula (Tamrau, Nettoti and Arfak Mts) and in the Main Range from Mt Carstensz to Hellwig and Wichmann Mts.

Ecol. Undergrowth in  $\pm$  open, subalpine

*Nothofagus-Myrtaceous* forest and in forest edges, shrubberies, mossy thickets, often on ridges or steep slopes, on peaty or stony ground, 1900-3000 m, locally common. *Fl. fr.* Jan.-Dec.

Vern. *Angwar*, Manikiong.

6. *Trochocarpa nubicola* (WERNH.) SLEUM. *Blumea* 12 (1963) 167.—*Styphelia nubicola* WERNH. *Trans. Linn. Soc. II, Bot.* 9 (1916) 101.

Erect, much-branched shrub,  $\frac{1}{4}$ -1 $\frac{1}{2}$ (-2) m, very similar in habit and leaves to *T. nutans* and *T. papuana*. Branchlets slender, subterete, densely leaved, tips generally densely clothed with short, whitish, subappressed hairs, lower defoliate parts set with the remaining leaf-cushions, early covered with longitudinally splitting greyish or blackish cork. *Leaves* subpatent, lanceolate to oblong-lanceolate, apex subacuminate, base narrowed to the petiole, or sometimes subtruncate, glabrous,  $\pm$  persistently serrulate-ciliolate, 6-9 by (2-)  $2\frac{1}{2}$ -4 mm, (5-) $7$ -9-nerved, all nerves parallel to the edge and fan-like branched outward from below, or partly only in the upper part,  $\pm$  raised in the immature leaves, faintly so or generally a little impressed on both faces in mature ones of dry specimens; petiole c. 1 mm. *Inflorescences* terminal and from a few upper axils, 4-6(-8)-flowered, recurved, abbreviate racemes or clusters; rachis puberulous, 2-4 mm. *Flowers* sessile or almost so, apparently gynodioecious. Subtending bract triangular-ovate, strongly keeled and longitudinally prominently veined as are the bracteoles, glabrous, ciliolate, c. 1 mm. Bracteoles 2, ovate to suborbicular, erose,  $1\frac{1}{2}$  mm. *Sepals* suffused with red, oblong-ovate, markedly veined longitudinally, ciliolate, c. 2 by  $1\frac{1}{2}$  mm. *Corolla* urceolate, white, greenish or pink, or pinkish in later stages especially at the lobes, smooth, (4-) $5$  mm long in all, 5-partite to c.  $\frac{1}{3}$ , lobes suberect, villous at the base and a little down the throat inside. *Stamens* slightly exerted from the throat; anthers elongate, c.  $\frac{1}{2}$  mm in the  $\text{\textcircled{f}}$ , c. 1 mm in the  $\text{\textcircled{m}}$  specimens. Disk cup-shaped, shortly 5-lobed. *Ovary* subglobose; style columnar,  $1\frac{1}{2}$ -2 mm. *Fruit* depressedly globose, blackish blue at full maturity, c. 4 by 5 mm.

Distr. *Malesia*: New Guinea, in the Main Range from Mt Carstensz to Mt Wilhelmina, and again on Mt Scratchley.

Ecol. In subalpine forest or mossy thickets, and in alpine peat-covered ridges, (2530-) $3000$ - $3960$  m. *Fl. fr.* Aug.-Sept.

7. *Trochocarpa dispersa* SLEUM. *Blumea* 12 (1963) 167.

Shrub with numerous suberect, ramified branches, 0.3-1 $\frac{1}{2}$ (-2 $\frac{1}{2}$ ) m. Branchlets slender, subdensely patently hairy or subhirsutulous. *Leaves* dense, subpatent, ovate or elliptic-ovate, more rarely or in part in the same specimen only ovate-oblong, apex gradually subacuminate-attenuate, base rounded to broadly cuneate, initially puberulous at the base and the petiole, edge  $\pm$  caducously subserrulate-ciliolate, otherwise glabrous,  $\pm$  coriaceous, shining above, paler and

rather dull beneath, 7-9(-13) by (3-)4-5 (rarely up to 6) mm, main nerves numerous, parallel to the edge, close to each other and much fan-like branched, main nerves and branching  $\pm$  equally markedly prominent beneath, less so above; petiole c. 1 mm. *Racemes* abbreviated and recurved, terminal or from a few upper axils (3-)4-8(-10)-flowered; rachis very short, densely short-hairy, covered by several perulae below. *Flowers* (sub)sessile, basal bract ovate, c. 1 mm, the two bracteoles ovate, subopposite, c. 1½ mm. *Sepals* oblong-ovate, 2-2½ mm, keeled, ciliolate and prominently veined lengthwise as are the bracts and bracteoles, glabrous dorsally. *Corolla* white, urceolate-cylindric, 5-6(-6½) mm long in all,

subdensely set with longish retrorse hairs in the upper third of the tube inside, otherwise glabrous, lobes ovate-oblong, 1½-1.8 mm, slightly expanded. Anthers in  $\sigma$  flowers 1.2 mm. Disk cup-shaped, shortly 5-10-lobed. *Ovary* subglobose, glabrous; style thick, 1½-2 mm, stigma peltate. Mature fruit depressed-globose, pale blue or purplish, 3-4 by 5-6 mm.

Distr. *Malesia*: New Guinea (scattered in the Western and Eastern Highlands).

Ecol. In subalpine forest undergrowth or forest edge or in alpine thickets, 3400-3600 m. *Fl. fr.* June-Sept.

Vern. *Ngal*, Minj.

## 2. Subgenus *Pseudocyathodes*

SLEUM. *Blumea* 12 (1963) 167.

Flowers solitary, rarely in twos, terminal and/or axillary, (sub)sessile. Bracteoles numerous (7-10), imbricate.

5. *Trochocarpa arfakensis* (KANEH. & HATUS.) SLEUM. *Blumea* 12 (1963) 167.—*Styphelia arfakensis* KANEH. & HATUS. Bot. Mag. Tokyo 56 (1942) 483, f. 6.—Fig. 18.

Erect, few-stemmed, rather compact shrub, 1 (-2) m, part of the branches occasionally prostrate and rooting, the branchlets then short and erect. Branchlets  $\pm$  erecto-patent, tips finely patent-puberulous, generally early practically glabrous, very densely subimbricately leaved. *Leaves* light to yellowish green, subsessile, lanceolate or narrow-lanceolate, apex long acuminate, acute, though not properly pungent, base broadly narrowed into the petiole, coriaceous, glabrous, entire (the edge not more ciliolate-serrulate with age), flat, (6-)8-10 by 1-1½(-2) mm, 5- or 7-nerved, nerves hardly or not impressed above, minutely though distinctly raised beneath, the outer 1(-2) pair(s) finely branched from below externally; petiole c. ½ mm. *Flowers* terminal and axillary, mostly solitary, rarely in twos, subsessile; rachis very short, provided with (8-)10 imbricately arranged, ovate, acute, concave, fimbriate bracteoles (½-1 mm) below the calyx. *Sepals* greenish, ovate, subacute, ciliolate, parallel-nerved, 2(-2½) mm. *Corolla* almost funnel-shaped, white or pale greenish, 5-partite halfway or slightly more, 3½-4 mm in all, tube included by the sepals, lobes spreading, triangular-lanceolate, subacute, villous in the lower half as is the uppermost part of the tube inside, glabrous otherwise. *Anthers* slightly exerted from the throat, oblong, c. 1 mm; filaments ½ mm. *Ovary* ovoid, glabrous, 10-locular; style thick, c. 1 mm; stigma subpeltate. Disk lobes short, retuse. *Fruit*  $\pm$  depressedly globose to subobovoid, 6-12 by 5-10 mm when fresh, dull, bluish-blackish at full maturity, crowned by the slender 1 mm style, containing 10 hard pyrenes embedded in and separated by a soft pulp.

Distr. *Malesia*: New Guinea (Arfak Mts).

Ecol. In low  $\pm$  open *Nothofagus*-Myrtaceous forest or forest edges, locally not rare, 1900-2600 m. *Fl. fr.* Jan.-Dec.

Vern. *Anggwar*, *těnhabar*, Manikiong.

9. *Trochocarpa papuana* (WRIGHT) SLEUM. *Blumea* 12 (1963) 168.—*Leucopogon papuanus* C. H. WRIGHT, Kew Bull. (1899) 104.—*Styphelia papuana* (C. H. WRIGHT) KOORD. Rec. Trav. Bot. Néerl. 7 (1910) 65, in text.; J.J.S. Ic. Bog. 4 (1910) 82; *ibid.* (1913) 172, in text.; Nova Guinea 8 (1912) 798; KOORD. Exk. Fl. Java 3 (1912) 22.—*Styphelia lamii* J.J.S. Nova Guinea 18 (1936) 123, t. 33, f. 1.—*T. lamii* H. J. LAM, *Blumea* 5 (1945) 574.

Small shrub or treelet, up to 2 m, with numerous slender  $\pm$  erect branches. Branchlets suberect-patent, slender, tips generally densely and  $\pm$  shortly pubescent and densely foliate, lower parts  $\pm$  defoliate and rather tardily glabrescent. *Leaves* similar to those of *T. nutans* and *T. nubicola*, lanceolate-oblong, apex rather shortly acuminate, subacute, base  $\pm$  broadly attenuate into the petiole, coriaceous, glabrous, edge very finely subserrulate-ciliate initially and still so for a fairly long time after, 8-10 by 2-3 (rarely up to 3½) mm, 7(-9)-nerved, nerves closely parallel together, inner 3-5 ones generally slightly sunk, outer ones  $\pm$  obscure above, all very slightly raised, besides the innermost 3 ones, much fan-like branched from the base beneath (as in *T. nutans*); petiole mostly rather flattened, 1(-1½) mm. *Flowers* terminal and axillary, mostly solitary, rarely in twos; rachis very short ( $\pm$  3 mm), covered with 7-10 imbricate bracteoles, ½-1¼ mm. *Sepals* subovate-oblong, obtuse, strongly parallel-nerved, reddish at the margins, ciliate especially distally, 2½(-3) mm. *Corolla* subcylindric below, slightly widened upwards at the tube,  $\pm$  expanded at the lobes, 5-6 mm in all, greenish white with pink tips, or pink throughout, lobed to the upper ½,



glabrous outside, bearded at the lobes (the tips excepted) and about the upper third (or less) of the tube inside. *Anthers* exerted from the corolla tube for about half their length or slightly more, linear-oblong, 1 mm. Disk lobes retuse. *Ovary* subglobose, 10-celled, 1 mm; style thick, 1½–2 mm. *Fruit* said to be depressed-globose, purple, c. 5 mm ø (BRASS 4424).

Distr. *Malesia*: New Guinea (Mt Doorman and in the Main Range between the Western Highlands and Mt Scratchley).

Ecol. In montane cloud forest at the upper forest limit, and in alpine scrub vegetation, sheltered ravines, 3170–3960 m, locally fairly common as forest undergrowth. *Fl. fr.* May–Oct.

Fig. 18. *Trochocarpa arfakensis* (KANEH. & HATUS.) SLEUM. with mature fruits near Tridaga, Anggi Gigi Lake, Arfak Mts (New Guinea), 2250 m (SLEUMER & VINK 4391) (SLEUMER, 1962).