LILIACEAE—I (J. P. Jessop, Adelaide)[1]

Herbs, usually glabrous, with perennial underground stems (corms, bulbs, tubers, or rhizomes) in all Mal. *spp.* Aerial stems usually herbaceous and annual, erect or climbing. *Leaves* simple, caespitose and basal, sometimes distichous, if cauline usually alternate, generally linear to lanceolate or oblanceolate especially when basal, but sometimes shorter and broader (to ovate) when cauline, usually sessile (in *Asparagus* and *Petrosavia* reduced to non-photosynthetic scales), usually with parallel venation. Stipules 0. *Inflorescence* terminal or axillary, usually racemose (less often at least partly umbellate) or flowers solitary, usually bracteate. *Flowers* bisexual (except, in Mal., *Asparagus cochinchinensis* and *Astelia alpina*), usually actinomorphic. *Perianth segments* almost invariably 6 in two more or less similar or less often distinctly dissimilar whorls of 3, petaloid, connate or free, the outer whorl sometimes saccate at the base. *Stamens* 6, inserted on receptacle or perianth; filaments connate or free, rarely forming a corona-like ring attached to the perianth; anthers basifixed or dorsifixed, rarely sessile, usually 2-celled, extrorse to introrse or rarely dehiscing by an apical pore. *Ovary* usually superior, of 3 (usually fused) carpels; styles 1 or 3, simple or 3-branched; locules usually 3 (1 in *Tricalistra*); ovules 1 to numerous, placentation axile, rarely basal or parietal, usually in 2 rows. *Fruit* usually a loculicidal or septicidal capsule or berry, rarely the ovary wall ruptured by the developing seed which develops unprotected by a fruit, perianth caducous or persistent. *Seeds* with copious fleshy or cartilaginous endosperm.

Distribution. About 180 genera with approximately 3500 *spp.*, distributed all over the world, especially in the temperate regions of Asia, Australasia and Africa, but relatively poorly represented in South America (13 genera).

In *Malesia* 22 genera, with a total of 31 *spp.*, no genus being represented by more than two species. The only genus endemic to the region is the Malayan genus *Tricalistra* whose separation from *Tupistra* is, however, somewhat uncertain. Most other genera are represented in Malesia by a minority of their species, exceptions being *Gloriosa* and *Peliosanthes*, which are probably both monotypic, and *Petrosavia*, which consists probably of two species.

The genera can roughly be arranged into three geographical groups.

Old World genera are *Asparagus*, *Chlorophytum*, *Dianella*, *Gloriosa* and *Iphigenia*, among which *Chlorophytum* is mainly Africa-centred, and *Dianella* mostly Australasian.

Northern hemisphere genera, especially from the Far East, Sino-Himalayan, are the following: *Aletris*, *Disporopsis**, *Disporum*, *Lilium**, *Liriope**, *Ophiopogon*, *Peliosanthes*, *Petrosavia*, *Tricyrtis**, and *Tupistra*. Of these four, provided with an asterisk, are found only in Malesia in the Philippines, and *Tupistra* only in Malaya and Sumatra. All of them are absent from East Malesia. Most of their species occur in the montane zone, testimony of their subtemperate ecology.

Australasia-derived genera are *Arthropodium*, *Astelia*, *Caesia*, *Schelhammera*, *Thysanotus*, and *Tricoryne*. Their occurrence in Malesia is confined to New Guinea, except for *Thysanotus chinensis* Bth. which is found through Malesia as far as Thailand and S. China. Their ranges are sometimes wider in Austral regions, as *Arthropodium* and *Caesia* occur also in the Malagasy area, and *Caesia* also in South Africa, while *Astelia* ranges widely from Mauritius to the southern Pacific islands and the Falkland Islands. Except for *Astelia*, which occurs in Malesia only in the

(1) Gratefully acknowledging a stipend from C.S.I.R., Pretoria, for work on this revision during the period July 1973 to June 1974, at the Rijksherbarium, Leyden, when on long-leave from Rhodes University, Grahamstown, South Africa.

With bibliographic co-operation of the General Editor.

alpine zone of New Guinea, all the species of the genera of this southern group are bound to lowland drought habitats.

Ecology. Of the 22 genera 13 are integrated in lowland to montane everwet-forest conditions. *Astelia alpina* is a high-altitude cushion plant which sometimes plays a significant role in the alpine bogs of New Guinea. The eight other genera, *Arthropodium*, *Asparagus*, *Caesia*, *Gloriosa*, *Iphigenia*, *Schelhammera*, *Thysanotus*, and *Tricoryne*, are constituents of areas subject to a seasonal climate. Consequently, the ranges of *Asparagus racemosus*, *Gloriosa superba*, *Iphigenia indica* and *Thysanotus chinensis* show in Malesia the usual disjunctions of drought-preferring plant species. They are predominantly grassland or open savannah plants at low altitudes. Most of them are Australasia-centred.

Except for *Astelia papuana*, species of these *Liliaceae sensu stricto* do not form major constituents or natural communities.

Dispersal. The great majority of *Liliaceae* spread and reproduce vegetatively by the branching of their subterranean axes. In most species this appears to be a slow process, with the branches often not extending more than a few centimetres in a year. It may, however, result in fairly dense monospecific stands, for example, in *Astelia* and *Liriope*.

Fruits are generally capsules or berries. In the former, dispersal mechanisms do not usually result in the removal of seeds to any great distance, although wind and water can contribute significantly.

Birds are probably the most efficient vectors over longer distances. Several genera have fleshy fruits and two (*Ophiopogon* and *Peliosanthes*) have a fleshy coating to the seeds, which are exposed through rupture of the ovary wall. Mammals may also disperse the seeds by eating the fruits. *Liliaceae* seeds in other areas are known to be carried by ants if there is a substance attractive to ants (often oil bodies) in the testa or fruit. Specific data on the Malesian species have not, however, been found.

For a study of the structure and relationships of the seeds, see HUBER, Die Samenmerkmale und Verwandtschaftsverhältnisse der Liliifloren, Mitt. Bot. Staatssamml. Münch. 8 (1969) 219–538.

Cytology. *Liliaceae*, because of the usually large size of their chromosomes, because of the ease with which material can often be obtained at the stages of division required for study, and because many species are in cultivation, have been fairly well studied cytologically. Chromosome numbers, and even basic chromosome numbers vary widely sometimes within, as well as between, genera. At least six different somatic numbers have, for example, been reported for *Disporum*, based on x = 6, 7, 8, 9 and 11. Other genera, for example, *Asparagus* (x = 10) and *Dianella* (x = 8), have relatively stable basic numbers, although polyploidy may be common.

Taxonomy. The family *Liliaceae*, in the sense of BENTHAM & HOOKER and of KRAUSE in E. & P. Nat. Pfl. Fam. is a very large and rather heterogeneous one including possibly as many as 3500 species. Many more recent authors have attempted to distribute these species over a larger number of families. In this treatment the family delimitation of HUTCHINSON (Families of flowering plants, ed. 3, 1973) has been adopted, with two modifications: the inclusion of *Petrosavia* which HUTCHINSON placed in its own family, and of the naturalised *Nothoscordum* which HUTCHINSON placed in the *Amaryllidaceae*. It is very doubtful if the family is more naturally defined by excluding a number of genera represented in Malesia, as HUTCHINSON has done, but this has been followed here as much for the convenience of dealing with smaller families as for any conviction that these families have any botanical significance. Table 1 indicates the genera retained in the *Liliaceae* and the families to which other genera, sometimes included in the *Liliaceae*, were ascribed by HUTCHINSON. These families have also been included in the key to the genera of Malesian *Liliaceae*.

Much work remains to be done on the relationships of Liliaceous genera and HUTCHINSON's work, although the most recent, is probably no better than KRAUSE's. HUTCHINSON's placing of *Ophiopogon* and *Peliosanthes* in separate tribes is, for example, almost certainly unjustified.

Uses. Several species of *Liliaceae* native to Malesia have been taken into cultivation as garden ornamentals, for example of the genera *Dianella*, *Gloriosa*, *Lilium*, *Liriope*, and *Ophiopogon*. Other uses are, however, rather few. Several genera, for example, *Asparagus*, *Gloriosa*, *Ophiopogon*, have been used in traditional medicines but they have not contributed to modern

Table 1. Malesian Liliaceous genera in the classification by KRAUSE (1930), first column, and by HUTCHINSON (1973), third column.

Subfamily I.	*Melanthioideae*			
I.	2. *Petrosavieae*	—	*Petrosavia*	(*Petrosaviaceae*)
I.	6. *Uvularieae*	—	*Schelhammera*	*Uvularieae*
		—	*Gloriosa*	
I.	7. *Tricyrteae*	—	*Tricyrtis*	*Tricyrtideae*
I.	8. *Anguillarieae*	—	*Iphigenia*	*Iphigenieae*
Subfamily III.	*Asphodeloideae*			
III.	11. *Asphodeleae*	—	*Chlorophytum*	*Asphodeleae*
		—	*Thysanotus*	
III.	11a. *Asphodelinae*	—	*Arthropodium*	*Asphodeleae*
		—	*Tricoryne*	*Johnsonieae*
		—	*Caesia*	*Asphodeleae*
III.	11g. *Dianellinae*	—	*Stypandra*	*Dianelleae*
		—	*Dianella*	
III.	17. *Lomandreae*	—	*Lomandra*	(*Xanthorrhoeaceae*)
		—	*Romnalda*	
Subfamily IV.	*Allioideae*	—	*Nothoscordum* (introduced)	(*Amaryllidaceae*)
Subfamily V.	*Lilioideae*	—	*Lilium*	*Tulipeae*
Subfamily VII.	*Dracaenoideae*			
VII.	27. *Dracaeneae*	—	*Cordyline*	(*Agavaceae*)
		—	*Dracaena*	
		—	*Astelia*	*Milliganieae*
Subfamily VIII.	*Asparagoideae*			
VIII.	28. *Asparageae*	—	*Asparagus*	*Asparageae*
VIII.	29. *Polygonatae*	—	*Disporum*	*Polygonatae*
		—	*Disporopsis*	
VIII.	30. *Convallarieae*	—	*Tupistra*	*Aspidistreae*
		—	*Tricalistra*	
Subfamily IX.	*Mondoideae*	—	*Liriope*	*Ophiopogoneae*
		—	*Ophiopogon*	
		—	*Peliosanthes*	*Peliosantheae*
Subfamily X.	*Aletroideae*	—	*Aletris*	*Narthecieae*
Subfamily XI.	*Luzuriagoideae*	—	*Luzuriaga*	(*Philesiaceae*)
		—	*Geitonoplesium*	
		—	*Eustrephus*	
Subfamily XII.	*Smilacoideae*	—	*Rhipogonum*	(*Smilacaceae*)
		—	*Smilax*	
		—	*Heterosmilax*	

medicine. Others have edible underground parts (e.g. *Arthropodium*) or fruits (*e.g. Astelia*), but none is probably of great significance.

Notes. A very large number of exotic *Liliaceae* are recorded to be or have been cultivated in gardens in Malesia. They have been treated elaborately, with keys for their identification by C. A. BACKER in his 'Handboek voor de Flora van Java', part 3 (1924), in Dutch, and by C. A. BACKER & R. C. BAKHUIZEN VAN DEN BRINK Jr in their 'Flora of Java', volume 3 (1968), in English.

Only one exotic, *Nothoscordum inodorum*, has been introduced and has run wild in West Java; this has been incorporated in the treatment.

Almost all drawings were made by Mr. L. DUTKIEWICZ, Adelaide.

KEY TO THE GENERA

including the families sometimes segregated from Liliaceae sensu lato

1. Leaves reduced to small, non-photosynthetic scales.
   2. Stem branched, bearing green cladodes . . . . . **13. Asparagus**
   2. Stem simple. Small echlorophyllous saprophyte . . . . . **4. Petrosavia**
1. Leaves usually well-developed, always green (sometimes absent when the plant is in flower).
   3. Anthers 1-celled. Plants usually woody and often prickly climbers (*Heterosmilax*, *Rhipogonum*, *Smilax*) . . . . . **Smilacaceae**
   3. Anthers 2-celled. Plants erect or herbaceous, not prickly, rarely woody climbers.
      4. Plants dioecious.
         5. Panicle glabrous or scaberulous. Flowers clustered at all or most nodes (*Lomandra*) **Xanthorrhoeaceae**
         5. Panicle silvery-scaly. Flowers solitary at each node . . . . . **22. Astelia**
      4. Flowers bisexual.
         6. Foliage leaves caespitose, usually basal or radical.
            7. Inner perianth segments fringed . . . . . **10. Thysanotus**
            7. Perianth segments not fringed.
               8. Inflorescence a simple umbel. Bulbous . . . . . **23. Nothoscordum**
               8. Inflorescence a raceme, spike or panicle. Plant rhizomatous.
                  9. Flowers sessile. Anthers sessile or subsessile on the perianth.
                     10. Fruit a capsule . . . . . **21. Aletris**
                     10. Fruit fleshy.
                        11. Style distinct. Stigma simple or indistinctly lobed . . . . . **17. Tupistra**
                        11. Style absent. Stigmas distinctly 3 . . . . . **16. Tricalistra**
                  9. Flowers pedicelled. Filaments usually well-developed.
                     12. Seeds fleshy and exposed soon after the commencement of their development.
                        13. Filaments free of one another. Corona absent . . . . . **18. Liriope**
                        13. Filaments connate or anthers sessile on a staminal corona.
                           14. Anthers borne on a distinct staminal corona. . . . . **20. Peliosanthes**
                           14. Anthers borne on connate filaments . . . . . **19. Ophiopogon**
                     12. Seeds retained in the fruit until mature.
                        15. Anthers dorsifixed.
                           16. Ovary half-inferior . . . . . **21. Aletris**
                           16. Ovary fully superior.
                              17. Fruit a capsule. Stems to 5 cm long and 2–3 mm diameter (*Romnalda*) . **Xanthorrhoeaceae**
                              17. Fruit a berry. Stems woody and usually long (*Dracaena*, incl. *Pleomele*) . . **Agavaceae**
                        15. Anthers basifixed.
                           18. Fruit a berry . . . . . **9. Dianella**
                           18. Fruit a capsule.
                              19. Base of anthers with a papillose appendage. Pedicels 12–20 mm. Outer perianth segments distinctly broader than inner ones . . . . . **6. Arthropodium**
                              19. Base of anthers without appendages. Pedicels 3–12 mm. Perianth segments equal.
                                 20. Perianth spirally twisting after anthesis, blue . . . . . **7. Caesia**
                                 20. Perianth segments persistent, but not twisted after flowering, white to green **8. Chlorophytum**
      6. Foliage leaves distributed at intervals along the stem.
         21. Plant with scaly bulb. Flowers 10–25 cm long . . . . . **12. Lilium**

21. Plant with a rhizome, corm or tuber. Flowers up to at most 9 cm.
22. Stem(s) woody. Venation reticulate (*Eustrephus, Geitonoplesium*) . . . . . **Philesiaceae**
22. Stem(s) herbaceous. Venation parallel.
23. Style simple, or if 3 lobed the filaments forming a corona.
24. Fruit a berry. Inflorescence a panicle . . . . . **9. Dianella**
24. Fruit consisting of 1–3 nutlets. Inflorescence consisting of umbels each on a winged peduncle **11. Tricoryne**
23. Style branched, sometimes to the base.
25. Flowers large, 5–9 cm. At least some leaves ending in a coiled tendril . . . **1. Gloriosa**
25. Flowers smaller, up to 3 cm. Leaves never ending in a tendril.
26. Filaments expanded to form a corona. Fruit a berry . . . . . **15. Disporopsis**
26. Filaments free, sometimes connivent.
27. Fruit a berry . . . . . **14. Disporum**
27. Fruit a capsule.
28. Pedicels not articulated. Anthers dorsifixed.
29. Rootstock a rhizome. Style branches bifid . . . . . **2. Tricyrtis**
29. Rootstock a corm. Style branches simple . . . . . **3. Iphigenia**
28. Pedicels articulated. Anthers basifixed . . . . . **5. Schelhammera**

1. GLORIOSA

LINNÉ, Sp. Pl. (1753) 305; Gen. Pl. ed. 5 (1754) 144; BAKER, J. Linn. Soc. Bot. 17 (1879) 457; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 266; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 606; FIELD, Kew Bull. 25 (1971) 243; Lilies and other *Liliaceae* 1973 (1972) 93. — *Methonica* TOURN. *ex* CRANTZ, Inst. rei herb. 1 (1766) 474. — **Fig. 1, 2.**

Climbing, or less often erect, glabrous herbs. *Rhizome* perennial, tuberous, horizontal; roots fibrous. Aerial stem annual, moderately branched; the branches spreading or erect-spreading at the base. *Leaves* cauline, alternate, opposite or in whorls of 3 (4), flat, with many veins and a strong midrib, sessile, entire, lanceolate to ovate, slightly amplexicaul, obtuse at the base, narrowing gradually to an apical, coiled tendril (sometimes lacking tendrils in erect forms); basal leaves lacking a lamina or tendril, ensheathing the stem. *Pedicels* solitary, axillary in the axils of vegetative leaves, not articulated, cernuous. *Perianth* segments connate at the base, many-veined, subequal, reflexed or rarely spreading with a longitudinal papillose furrow in the basal ± third of the adaxial surface. *Filaments* filiform, attached to the receptacle; anthers dorsifixed, linear-oblong, extrorse. *Ovary* superior, sessile, oblong-ovoid to oblong-obovoid, 3-celled, 1 cell slightly shorter than the other 2; ovules axile, numerous; style filiform with 3 stigmatic branches, reflexed or spreading from the attachment to the ovary. *Capsule* coriaceous, septicidal; seeds globose; perianth persistent but withering as the capsule enlarges.

Distr. Widespread in tropical and southern Africa, Madagascar, India, Burma and SE. Asia, as far as *West Malesia*.

Ecol. Usually climbing in bushes, in habitats ranging from savanna to forest.

Note. Stated by FIELD (1971, 1972) to be monotypic. In Malesia only a single indigenous species has ever been recognized, although other species have been described elsewhere.

1. Gloriosa superba LINNÉ, Sp. Pl. (1753) 305; BAKER, Fl. Cap. 6 (1897) 525; BACK. Trop. Natuur 3 (1914) 117, tab. col.; RIDL. Fl. Mal. Pen. 4 (1924) 338; BACK. Handb. Fl. Java 3 (1924) 50; PETCH, Ann. R. Bot. Gard. Perad. 9 (1925) 243; HEYNE, Nutt. Pl. (1927) 436; BACK. Onkr. Suiker. (1928) 189, Atlas (1933) t. 201; GAGNEP. Fl. Gén. I.-C. 6 (1934) 807; H. PERRIER, Fl. Madag. fam. 40 (1938) 135; SILVA, Ceyl. J. Sc. sect. A, 12 (1945) 155; SANTAPAU, J. Bomb. Nat. Hist. Soc. 46 (1946) 202;

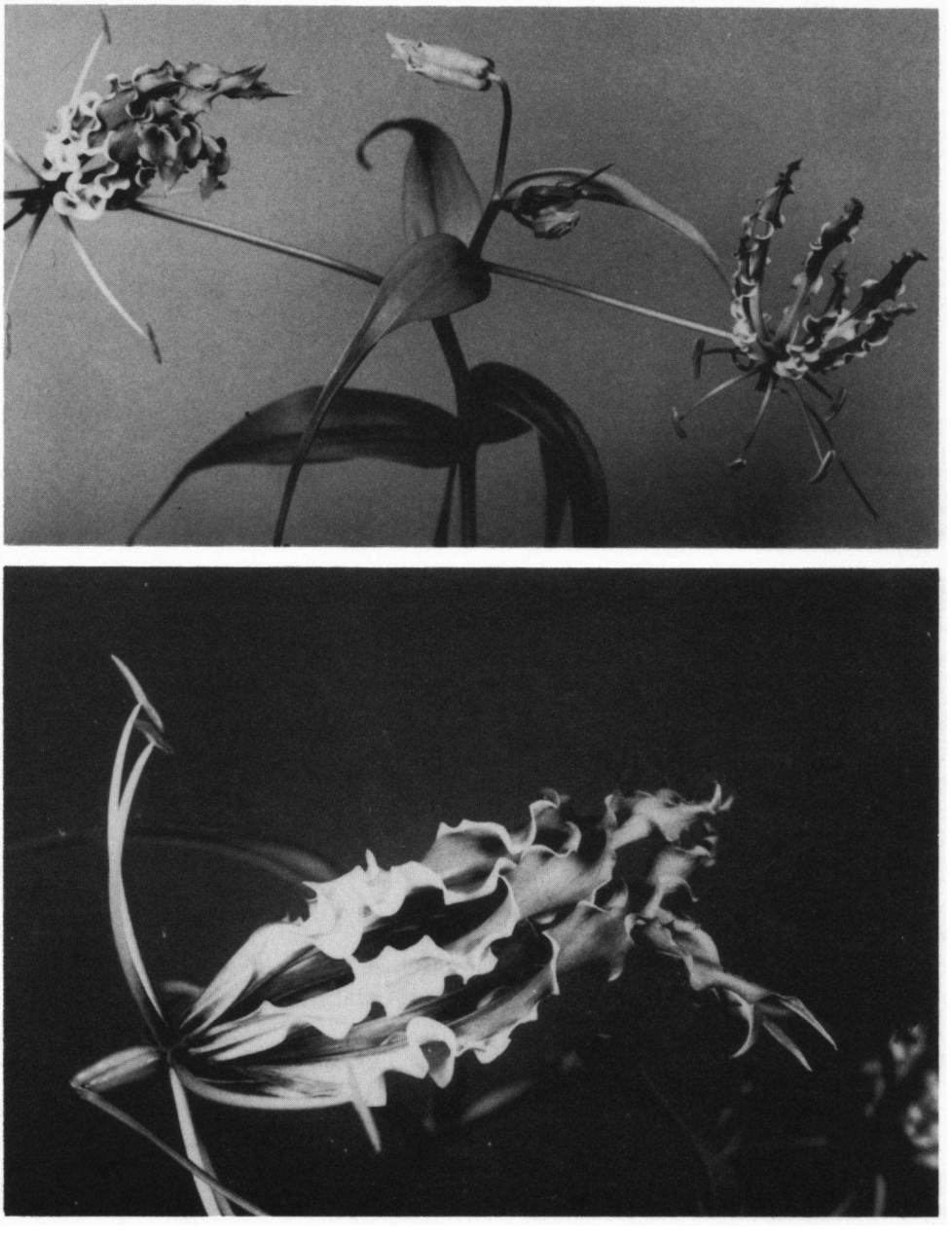

Fig. 1. *Gloriosa superba* L. Botanic Garden Singapore, Febr. 1952 (Photogr. M. R. HENDERSON).

HEND. Mal. Gard. Pl. 4 (1951) 10; Mal. Wild Flow. Monoc. (1954) 178, f. 104; HOLTT. MAHA Mag. 15 (1958) 75 (hybrids); BACK. & BAKH. *f.* Fl. Java 3 (1968) 85; HUTCH. & DALZ. Fl. W. Trop. Afr. ed. 2, 3 (1968) 106; FIELD, Kew Bull. 25 (1971) 243. — *Methonica superba* (L.) CRANTZ, Inst. rei herb. 1 (1766) 474; ZOLL. Syst. Verz. 1 (1854) 66; Nat. Tijd. N. I. 14 (1857) 149; MIQ. Fl. Ind. Bat. 3 (1859) 550. — *G. virescens* LINDL. Bot. Mag. (1825) t. 2539. — **Fig. 1, 2.**

Stems usually climbing to *c.* 2 m (rarely to 6 m), less often erect; green. *Leaves* (including the tendril) 8–17½(–25) by (1¼–)1½–4(–4½) cm; tendril usually less than 1 cm long. Pedicels 4½–19 cm. *Perianth* segments narrowly elliptic, with undulate or crisped margins, 5–7(–9) by ¾–1½(–3) cm broad, yellow or red, often (perhaps always in Asia) yellow or green towards the base at first but becoming red throughout later. *Filaments* spreading, 2½–5 cm long; anthers 7–10 mm long. *Ovary* 8–15 mm long; style including the filiform, 3–7 (–12) mm long style branches 3½–5½ cm long. *Capsule* 4–10 by *c.* 1½–2 cm. *Seeds* vivid-red or orange-red, with a fleshy testa, *c.* 5 mm ø, tardily falling.

Distr. Tropical and southern Africa, Madagascar, India to Indo-China; in *Malesia:* Java (also Madura and Kangean Is.), S. Celebes, and all Lesser Sunda Is.

Ecol. Brushwood, hedges, teak-forest, only in regions subject to a strong dry season, from near the beach and dunes up to *c.* 300 m altitude (very rarely 600 m), locally common. It is not native in Sumatra and Borneo, and probably not in continental Malaya. This disjunction in its range between continental SE. Asia and Central South Malesia is clearly caused by its drought preferring ecology. *Fl. fr.* Jan.–Dec.

Uses. Commonly grown as a garden ornamental. The tuber is said to be poisonous (through colchicin), but only slightly so as was tested by BOORSMA (BACKER, 1914; HEYNE, 1927). Fig. 2.

Vern. *Klimlelie*, D, *flame lily, superb lily*, E; Java: *kembang djonggrang, k. kuku matjan, k. sungsang*, M, *dongkèl sungsang, mandalika, pa(n)tjing towo*, J, *katongkat*, S, *mand(h)alika*, Md, Balin.; Lesser Sunda Is.: *enatba, sikal*, Dawan lang., Timor.

Note. In sterile state easily distinguished from another climbing monocot with coiled apical leaf-tendrils, *Flagellaria indica* L., by absence of a leaf-sheath.

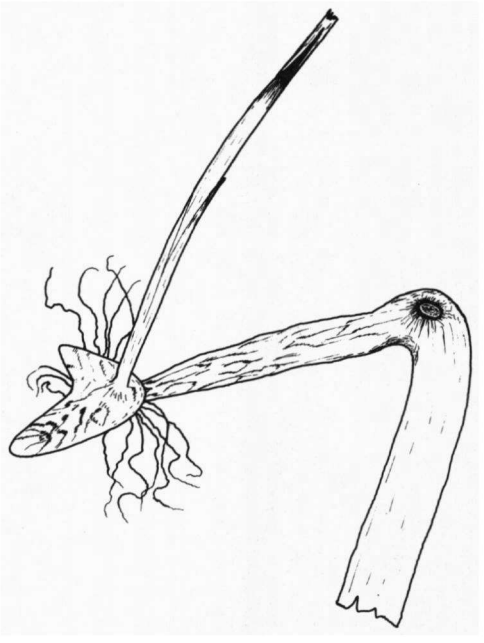

Fig. 2. *Gloriosa superba* L. Old rhizome with scar, the apex with a new tuber emitting roots and a vertical shoot. The two triangular elongations of the new tuber will grow later into new rhizomes; × ½. Botanic Garden, Bandung, 1952. Dug up by L. VAN DER PIJL.

2. TRICYRTIS

WALL. Tent. Fl. Nap. (1826) 61, t. 46; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 269; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 608, *nom. gen. cons.* — *Compsoa* D. DON, Prod. Fl. Nep. (1825) 50. — **Fig. 3.**

Erect puberulous or glabrescent herbs. *Rhizome* short, creeping. Aerial stem annual, simple or branched. *Leaves* cauline, alternate, flat, with several veins and a strong midrib, sessile, entire, lanceolate to ovate, with a sheathing base. *Inflorescence* terminal, racemose, simple or branched, or flowers in the axil of vegetative leaves. *Pedicels* solitary, not articulated. *Perianth* segments free or very shortly united, equal or subequal but the outer three saccate at the base, erect to spreading.

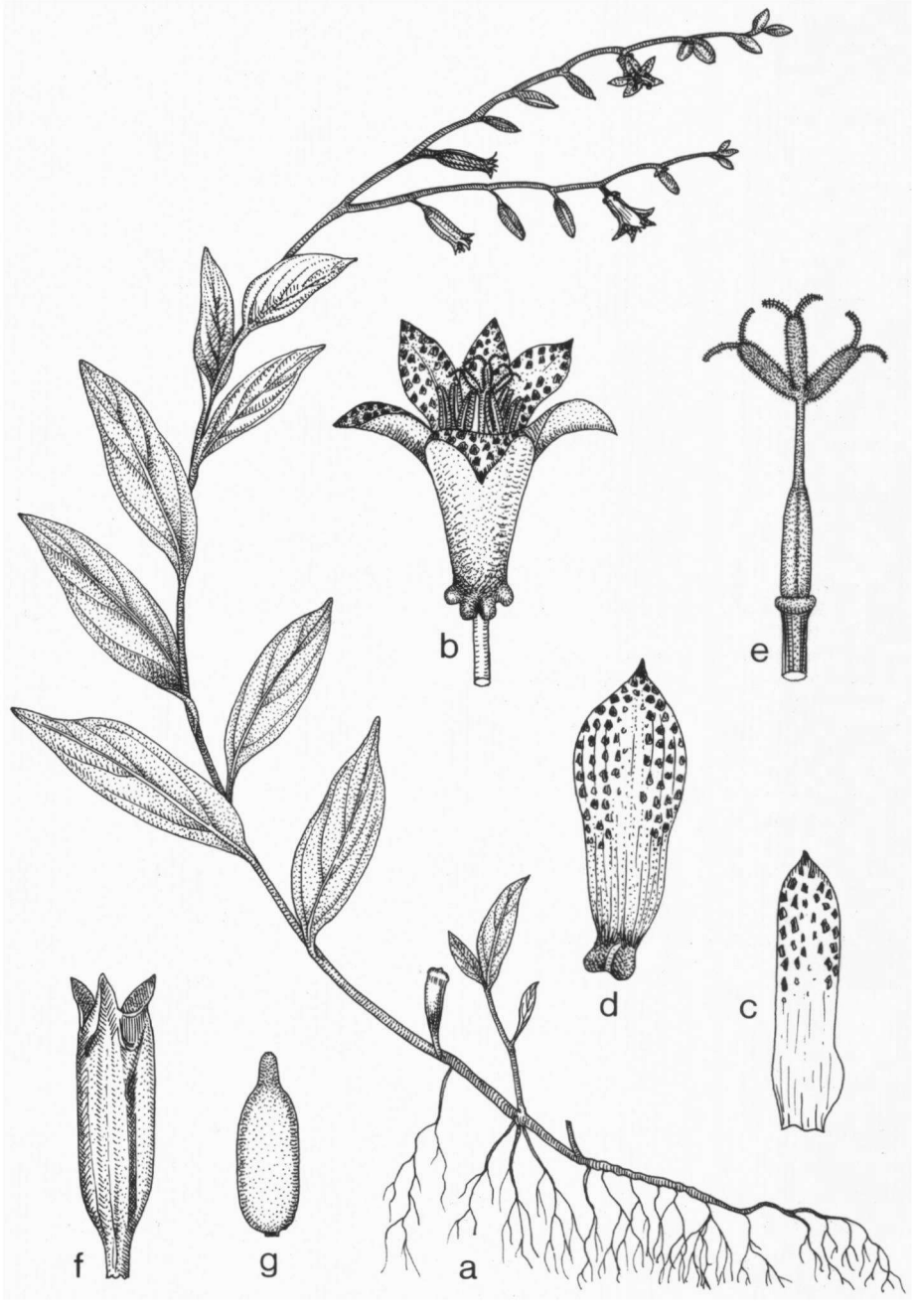

Fig. 3. *Tricyrtis imeldae* GUTIERREZ. *a.* Habit, × 1/4, *b.* flower, nat. size, *c.* outer perianth segment, *d.* inner perianth segment, *e.* gynoecium, all × 1 1/2, *f.* fruit, nat. size, *g.* seed, × 12 (Redrawn from GUTIERREZ, Philip. J. Sc. 103, 1974, 3, fig. 1).

Filaments flattened, more or less connivent, free of the perianth; anthers dorsifixed, versatile, oblong, extrorse. *Ovary* superior, sessile, oblong, 3-celled, 3-angled; ovules axile, numerous; style columnar; with 3 spreading or recurved bifid branches. *Capsule* septicidal. Seeds oblong or ovoid.

Distr. Possibly *c.* 20 *spp.*, largely in Japan, also in Manchuria, Korea, throughout China to the Himalayas, Taiwan, and *North Malesia:* Philippines.

Notes. HUTCHINSON placed this genus in the tribe *Tricyrtideae* possibly with a South African genus *Sandersonia* as the only other member. KRAUSE placed it in the *Tricyrteae* with the closely related, possibly congeneric, *Brachycyrtis*. The genus appears to be taxonomically rather isolated, but probably closest to *Gloriosa* of the Malesian genera.

A thorough revision of the species is badly needed.

1. Tricyrtis imeldae GUTIERREZ, Philip. J. Sc. 103 (1974) 171, f. 1. — **Fig. 3.**

Stems erect to 70 cm high, unbranched, puberulous at first. *Leaves* thick and fleshy when fresh but becoming membranous when dried, acute, the lower narrowly elliptic-lanceolate, with cuneate base, the upper broadly lanceolate to elliptic, with cordate base, (6–)12–16 by (3–)4–5 cm, glabrous except for the main veins beneath. *Inflorescence* a terminal bifurcate raceme *c.* 18–20 cm, puberulous; pedicels 3–5 mm, puberulous. *Flowers* greenish-white with purple spots inside, to over 3 cm long, infundibuliform, glabrous, segments linear-oblong to oblong spathulate. *Filaments* 16–18 mm long; anthers 3 mm long, yellowish-brown. *Ovary* 10 mm long; style 8 mm, its branches 8 mm long, purple, spreading, tuberculate on the inner surface. *Fruit* *c.* 25–30 by 4–6 mm. *Seeds* flat, oblong, *c.* 2 mm long.

Distr. *Malesia:* S. Philippines (Mindanao: Tasaday, Cotabato), reported to be rather rare; only known from the type.

Ecol. Primary forest, along stream at *c.* 1300 m. *Fl.* Aug.

Vern. Philippines: *amutmagiso*, Tasaday.

Notes. I have only seen the type and have not been able to add to the description by GUTIERREZ.

He compared the species with the Formosan *T. stolonifera*, from which it chiefly differs in the shape and colouring of the perianth segments. Close study of more material and variability is needed to check the specific difference.

3. IPHIGENIA

KUNTH, En. Pl. 4 (1843) 213; BAKER, J. Linn. Soc. Bot. 17 (1880) 450; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 272; H.PERRIER, Fl. Madag. fam. 40 (1938) 136; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 612; OBERMEYER, Kirkia 1 (1961) 84, *nom. gen. cons.* — *Aphoma* RAF. Fl. Tellur. 2 (1836) 31, *nom. rejic.* — **Fig. 4.**

Erect, glabrous herbs. Corm enclosed in dry leaf bases; roots fibrous. Aerial stem annual, unbranched. *Leaves* cauline, with tubular, ensheathing bases; the lowest 1 or 2 often with a poorly developed lamina; the others decreasing in size from the lowest towards the uppermost, the uppermost often approaching the lowest bracts in size, *c.* 4–7; lamina flat, glabrous, sessile, entire, linear to lanceolate, acute. *Flowers* solitary, in a few-flowered cluster or in a raceme terminating the stem. *Pedicels* solitary, erect-spreading, not articulated. *Perianth* segments free, ± equal, spreading or reflexed, few-veined. *Filaments* flattened, attached to the receptacle; anthers dorsifixed or basifixed, extrorse. *Ovary* superior, sessile, ovoid, oblong or obovoid, 3-celled; ovules ∞, axile; styles 3, (free or) fused at the base only. *Capsule* globose, cylindrical or ellipsoid, loculicidal. Seeds globose or angular; perianth deciduous.

Distr. Southern and tropical Africa (5 *spp.*), Madagascar (2 *spp.*), SE. Asia (4 *spp.*), of which one species extends through *Malesia* to Australia, and New Zealand.

Ecol. Usually in open grassland, sometimes in damp areas.

1. Iphigenia indica (L.) A. GRAY *ex* KUNTH, En. Pl. 4 (1843) 213; MIQ. Fl. Ind. Bat. 3 (1859) 552; BTH. Fl. Austr. 7 (1878) 31; BAKER, J. Linn. Soc. Bot. 17 (1880) 450; E.v.M. Descr. Not. 6 (1885) 18; HOOK. *f.* Fl. Br. Ind. 6 (1892) 357; BAILEY, Queensl. Fl. 5 (1902) 1641; LAUT. Bot. Jahrb. 50 (1913) 292; MERR. En. Philip. 1 (1922) 202; BACK. Handb. Fl. Java 3 (1924) 51; KRAUSE, Bot. Jahrb. 59 (1925) 548; BACK. & BAKH. *f.* Fl. Java 3 (1968) 85. — *Melanthium indicum* LINNÉ, Mant. 2 (1771) 226. — *Anguillaria indica* (L.) R. BR. Prod. (1810) 273; WALL. Pl. As. Rar. 3 (1832) 37, t. 259. — **Fig. 4.**

Corm usually ± globose, 5–10 mm ∅. *Leaves* linear-lanceolate, often with a single conspicuous vein and 2–8 rather inconspicuous ones, the longest *c.* 10–40 cm long, up to 6 mm wide, the shortest often less than a quarter of the length of the longest; lower leaf bases sometimes pubescent, glandular pubescent or scabrid, especially on the veins. Flowers 1–3. *Pedicels* erect or erect-spreading 5–40 mm. *Perianth* segments ± spreading, narrowly oblanceolate (inner whorl sometimes narrower than the outer), 5–9 by up to 2 mm, dark-brown or red-brown, reddish, purplish or white, described by BACKER (1924) as having a green keel and apex. *Filaments* linear, up to half as long as the perianth, green basally, brown distally; anthers dorsifixed, *c.* $^1/_2$–1 mm long. *Ovary* obovoid to ovoid, *c.* $1^1/_2$–$2^1/_2$ mm long; styles recurved, *c.* 1 mm. *Capsule* *c.* 10–20 mm long; seeds *c.* $1^1/_2$ mm ∅.

Distr. Ceylon, India to Thailand, S. China, in *Malesia* rare: N. Sumatra (Lake Toba), Java (Indramayu in W, Surabaja and Madura I. in E), the Lesser Sunda Is. (Timor and Wetar), Philippines (Luzon, Mindanao), New Guinea, and Australia (W. Australia, Northern Territory and Queensland).

Ecol. A rather uncommon species of open, often poor grassland, always under seasonal climatic conditions. In Java only in the lowland but elsewhere also in the hills, in N. Sumatra at *c.* 1000 m. Flowers are reported by BACKER (1924) to occur for a short period during the rainy period (Dec.–Jan.) in Java, with fruit ripening in March, after which the aerial parts soon wither and disappear. Elsewhere other flowering dates have been noted from July to August, N of the equator, where seasons are reversed.

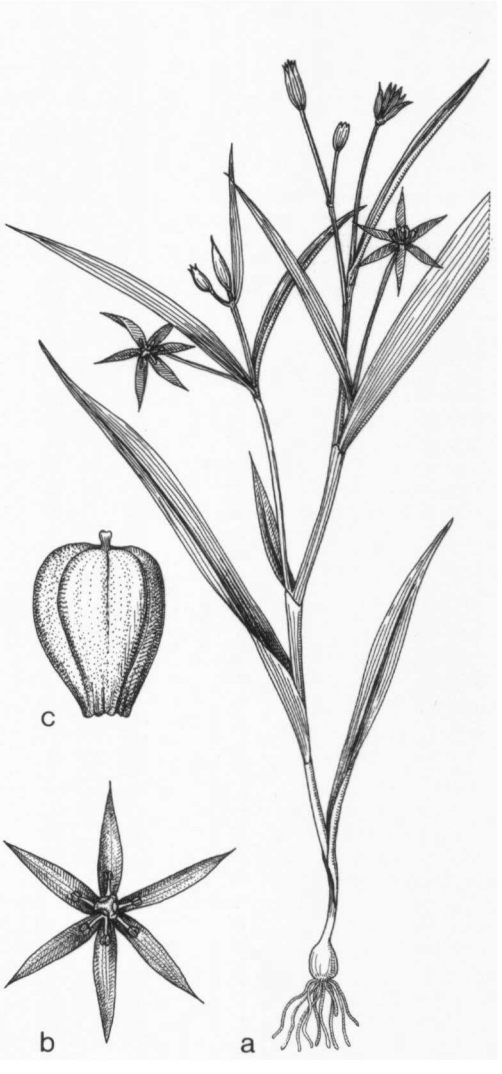

Fig. 4. *Iphigenia indica* (L.) A. GRAY *ex* KUNTH. *a.* Habit, nat. size, *b.* flower, *c.* fruit, both × 2 (Partly after WALLICH, Pl. As. Rar. 3, 1832, t. 259).

4. PETROSAVIA

BECC. Nuov. Giorn. Bot. Ital. 3 (1871) 7, t. 1; RIDL. J. Str. Br. R. As. Soc. *n.* 24 (1891) 170; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 256; HUTCH. Kew Bull. (1933) 156; STEEN. Trop. Natuur 23 (1934) 52; NAKAI, J. Jap. Bot. 17 (1941) 191; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 546. — *Protolirion* RIDL. Ann. Bot. 9 (1895) 45; GROOM, *l.c.*; RIDL. Fl. Mal. Pen. 4 (1924) 322; KRAUSE in E. & P. Nat.

Pfl. Fam. ed. 2, 15a (1930) 257, f. 87; NAKAI, J. Jap. Bot. 17 (1941) 191. — *Miyoshia* MAKINO, Bot. Mag. Tokyo 17 (1903) 144; NAKAI, J. Jap. Bot. 17 (1941) 191. — **Fig. 5.**

Erect, glabrous, saprophytic, pale yellow or cream coloured, herbs lacking chlorophyll. *Rhizome* slender, simply or sparsely branched, bearing alternate, often imbricate scale-leaves. Aerial stems 1 or less often up to 3 or more, unbranched. *Leaves* scale-like, spiral, sessile, entire; the base usually partly embracing the stem, rather well-spaced. *Raceme* terminal, usually simple, sometimes corymbose. *Pedicels* solitary, with 0–2 alternate bracteoles near the centre or in the lower half (often concealed by the subtending bract), not articulated, in the axils of bracts resembling the scale-leaves. *Perianth* segments erect-spreading, with a single vein, cream-coloured to yellow; the outer 3 distinctly inserted outside the inner 3, even in the open flower, and narrower and shorter. *Filaments* sublinear attached to the receptacle or to the base of the perianth segments; anthers basifixed, introrse or dehiscing laterally. *Ovary* superior or semi-inferior; the 3 carpels free above the receptacle; styles 1 on each carpel, capitate or subcapitate; ovules attached to ventral surface, numerous, in 3–*c.* 6 rows. *Fruit* dry, dehiscing along the ventral suture; the 3 segments spreading. *Seeds* numerous, ovoid, with longitudinal ridges; perianth persistent.

Distr. Japan (Prov. Mino), China (Kwangsi and Taiwan), Indo-China (Tonkin), in *Malesia:* Malaya, N. half of Sumatra, Borneo (Sabah, Sarawak), and Central Celebes.

In addition to the two species from Malesia and Japan, a third has been described from Tonkin and S. China (Kwangsi): *Petrosavia sinii* (KRAUSE) KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 257; GAGNEP. Fl. Gén. I.-C. 6 (1934) 802, f. 78 (10–13); (Anonymous) Icon. Corm. Sin. 5 (1976) 424, f. 7677. — *Protolirion sinii* KRAUSE, Notizbl. Berl.-Dahl. 10 (1929) 806.

It is highly probable that this is a synonym of *P. sakuraii* and would thus neatly fill a gap in the range of that species.

Ecol. Saprophytes on the forest flora, in Malesia in the hills at 1000–2000 m.

Notes. This genus has been placed in the *Liliaceae* (*Liliales*) by KRAUSE (1930), the *Petrosaviaceae* (*Alismatales*) by HUTCHINSON (1959) and the *Miyoshiaceae* (*Miyoshiales*) by NAKAI (1941). Both in being saprophytic and in having 2- or multi-seriate ovules it is anomalous in either the *Liliales* (*sensu* HUTCHINSON) or the *Alismatales*. ERDTMAN (Pollen Morph. & Pl. Taxon., Angiosp., 1952, 235) described the pollen as 1-sulcoidate which is unknown in the *Scheuchzeriaceae* or *Alismataceae* (*Alismatales*) but present, although uncommon, in the *Liliaceae*. M. Y. STANT (Bot. J. Linn. Soc. 63, 1970, Suppl. 1, 147) investigated the anatomy of *P. stellaris* and found it to be indistinguishable from that in the (saprophytic) *Triuridaceae* (*Triuridales*). Although here retained in the *Liliaceae* it is admitted that further investigation may show it to be better placed elsewhere.

The roots lack root-hairs but contain an endotrophic mycorrhiza (GROOM, 1895).

KEY TO THE SPECIES

1. Inflorescence corymbose; pedicels all arising close to the peduncle apex, usually 10 mm or more long **1. P. stellaris**
1. Inflorescence racemose; pedicels spaced along the peduncle, usually 8 mm or less long **2. P. sakuraii**

1. Petrosavia stellaris BECC. Nuov. Giorn. Bot. Ital. 3 (1871) 8, t. 1; RIDL. J. Str. Br. R. As. Soc. *n.* 24 (1891) 171; GROOM, Ann. Bot. 6 (1892) 380; HUTCH. Kew Bull. (1933) 156; STEEN. Trop. Natuur 23 (1934) 52, f. 12 right; NAKAI, J. Jap. Bot. 17 (1941) 191; HEND. Mal. Wild Flow. Monoc. (1954) 178, f. 103; STANT, Bot. J. Linn. Soc. 63 (1970) Suppl. 1, 147, anat. — *Protolirion paradoxum* RIDL. Ann. Bot. 9 (1895) 56; GROOM, *l.c.* 45, pl. 3; RIDL. Mat. Fl. Mal. Pen. Monoc. 2 (1907) 87; Fl. Mal. Pen. 4 (1924) 322, f. 195; NAKAI, J. Jap. Bot. 17 (1941) 191. — **Fig. 5a.**

Aerial stems (4–)6–11 cm high. Scale-*leaves* of rhizome ovate, *c.* 2–5 mm long, their base amplexicaul, often forming a closed sheath. Scale-leaves of aerial stem narrowing gradually to the acute apex, 3–6 mm long, their base partly embracing the stem. *Raceme* simple, corymbose, with 1–12 flowers.

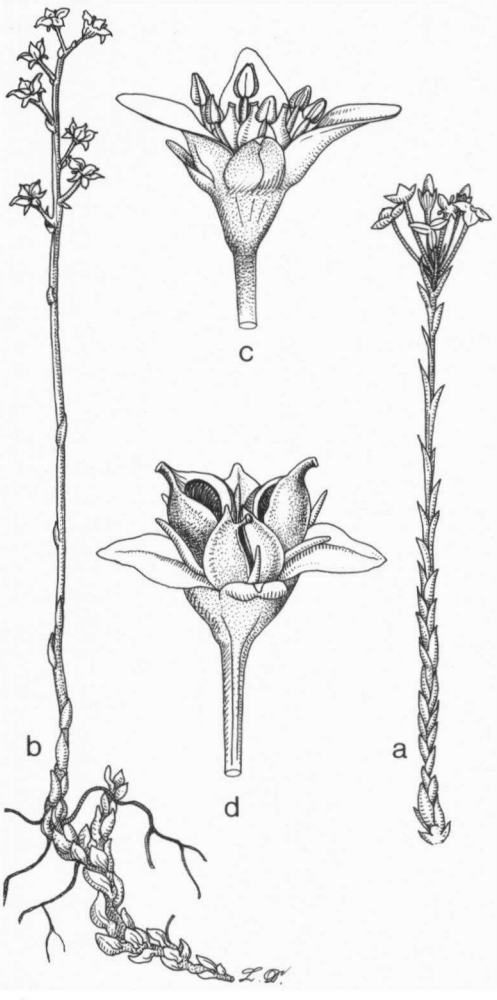

Fig. 5. *Petrosavia stellaris* BECC. *a.* Habit, nat. size (Redrawn from HUTCHINSON, Fam. Fl. Pl. 2, 1959, fig. 347). — *P. sakuraii* (MAKINO) J. J. SMITH *ex* STEEN. *b.* Habit, nat. size, *c.* flower, *d.* flower in fruit, both × 10 (Redrawn from MAKINO, Bot. Mag. Tokyo 17, 1903, pl. 5).

Pedicels all arising close to the apex of the stem, usually less than 1 mm apart, (5–)10–16(–20) mm. Outer *perianth* segments ovate to lanceolate, acute, 1–2 by *c.* $^1/_2$ mm. Inner perianth segments ovate, ± acute, $2^1/_4$–$3^1/_2$ by $1^1/_2$–2 mm. *Filaments* c. 2 mm; anthers less than $^1/_2$ mm long. *Ovary* ± superior; styles up to 1 mm long. *Capsule* segments 3–4 mm long. Seeds *c.* $^3/_4$ mm long.

Distr. *Malesia:* Sumatra (West Coast Res.), Malay Peninsula, Borneo (Sarawak, Sabah), and Central Celebes (Masamba: Mt Kambuno).

Ecol. Recorded by RIDLEY (1924) "in dry woods at the foot of *Dacrydiums*" and by EYMA (EYMA 1305, L) from "forest, rather dark, without undergrowth". Other records refer to sandy forest, mossy forest and among bamboos. Recorded between 100 and 1000 m. *Fl.* usually Febr.–Sept.

2. Petrosavia sakuraii (MAKINO) J. J. SMITH *ex* STEEN. Trop. Natuur 23 (1934) 52. — *Miyoshia sakuraii* MAKINO, Bot. Mag. Tokyo 17 (1903) 144, pl. 5; *l.c.* 208. — *Protolirion miyoshia-sakuraii* MAKINO, Bot. Mag. Tokyo 17 (1903) 208, *nomen err. et provis., illeg.*; PILG. in E. & P. Nat. Pfl. Fam. Nachtr. 3 (1908) 44, f. 8, *ditto.* — *Protolirion sakuraii* (MAKINO) DANDY, J. Bot. 69 (1931) 53. — **Fig. 5b–d.**

Aerial stems (5–)10–21(–27) cm high. Scale-*leaves* of rhizome ovate, *c.* 2–5 mm long, their base amplexicaul, often forming a closed sheath. Scale-leaves of aerial stem narrowing gradually to the acute apex, 4–6 mm long, their base partly embracing the stem or rarely completely amplexicaul. *Raceme* simple or with few-flowered branches towards the base, elongate, with (3–)6–25(–30) flowers. *Pedicels* of mature flowers usually at least 2 mm apart, 3–8 mm. Outer *perianth* segments ovate to lanceolate, acute, $1^1/_2$–2 by $^1/_2$–1 mm. Inner perianth segments ovate, ± acute, 2–3 by $1^1/_4$–$1^3/_4$ mm. *Filaments* c. 2 mm; anthers less than $^1/_2$ mm long. *Ovary* superior to semi-inferior; styles up to 1 mm. *Capsule* segments 2–3 mm long. Seeds *c.* $^3/_4$ mm long.

Distr. Japan (Prov. Mino), Formosa, Burma and *Malesia:* northern half of Sumatra (Gajo-lands; Westcoast Res.).

Ecol. Along forest paths and on flat forest ridges, 1000–2000 m. *Fl.* March-July, Nov.

5. SCHELHAMMERA

R. BR. Prod. (1810) 273; BTH. Fl. Austr. 7 (1878) 31; BAKER, J. Linn. Soc. Bot. 17 (1879) 466; BAILEY, Queensl. Fl. 5 (1902) 1642; MAIDEN & BETCHE, Cens. N.S.W. Pl. (1916) 40, as *Schellhammera*; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 266; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 606, as *Schelhammeria*; *nom. gen. cons.* — **Fig. 6.**

Erect, mainly glabrous herbs. *Rhizome* rather thick; roots fibrous. Aerial stems annual, simple or with 1–3 branches, often slightly swollen at the nodes; branches erect. *Leaves* cauline, alternate, flat, with many veins and usually a strong midrib, sessile or shortly petioled, lanceolate to ovate, often at least partly amplexicaul, obtuse or cuneate at the base, acute at apex. Leaves on rhizome and lower parts of aerial stems and branches scale-like. *Inflorescence* terminal, consisting of a sessile or peduncled umbel or of a single flower. *Pedicels* straight, articulated or not. *Perianth* segments free, equal, spreading to shallowly campanulate, with several usually inconspicuous veins. *Filaments* flattened, tapering from the base, attached to the base of the perianth segments; anthers basifixed, linear-oblong, extrorse. *Ovary* superior, sessile, obovoid, globose or oblong, often fairly deeply 3-lobed, 3-celled; ovules axile, few (*c.* 4–12) per locule; style filiform, with 3 deeply divided branches. *Capsule* somewhat fleshy.

Distr. Three *spp.* in eastern Australia, one of which also in *East Malesia:* New Guinea.

Ecol. Most records suggest a preference for rain-forest, but also recorded in scrub and on open slopes in the lowland and hills.

1. Schelhammera multiflora R. Br. Prod. (1810) 274; F.v.M. Descr. Not. 4 (1876) 73; Bth. Fl. Austr. 7 (1878) 32; Laut. Bot. Jahrb. 50 (1913) 292; Hall. *f.* Nova Guinea 8 (1914) 989; Krause, Bot. Jahrb. 59 (1925) 548. — **Fig. 6.**

Stems 10–40 cm, rarely minutely and sparsely pubescent. *Leaves* 4–8 by 1–3 cm, usually minutely ciliate on the margin and veins towards the base; petiole usually absent, rarely up to 5 mm. Scale-leaves ovate to lanceolate, dry, sessile, amplexicaul, usually 5–10 mm long. *Pedicels* usually 5–30, articulated at base of flower, 1–3 cm. *Perianth* segments obovate, acute, with the sides turned up to form a gutter-shaped structure in which the anthers are partly enclosed, swollen on the abaxial surface at the base, $4^1/_2$–8 by *c.* 2 mm, white. *Filaments c.* 3 mm; anthers *c.* 2 mm long, brown or black. *Ovary* obovoid, 6-lobed, *c.* $1^1/_2$ mm long; style 3–4 mm, divided for at least half its length; branches adhering to one another rather firmly at first, later recurving; ovules few (*c.* 2–4) per locule. Fruit and seeds not seen.

Distr. Australia (Queensland) and *E. Malesia:* S. New Guinea (Merauke area: Okaba; Fly R. area).

Ecol. In lowland grassland on open slopes, subject to a strong or distinct dry season, in Queensland also in open forest, obviously a rare species, below 400 m. *Fl.* March–Sept.

Note. The two further Australian species are *S. undulata*, which has larger solitary flowers, and *S. pedunculata*, which has peduncled umbels.

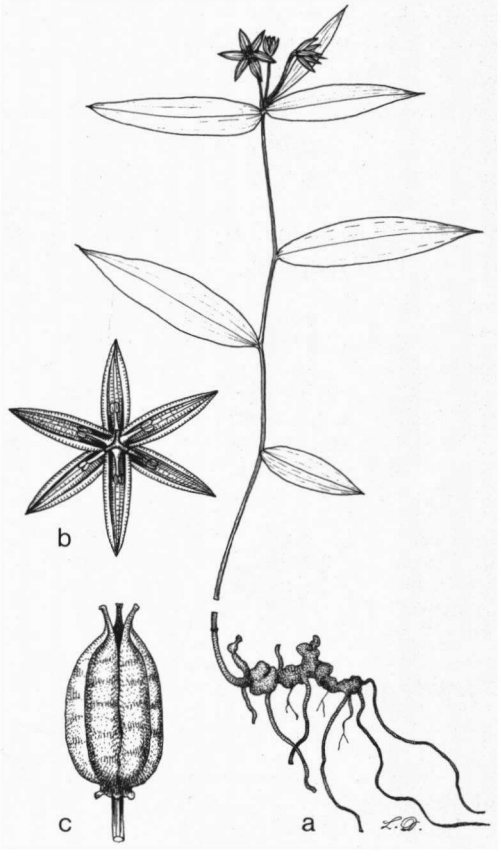

Fig. 6. *Schelhammera multiflora* R. Br. *a.* Habit, × $^1/_2$, *b.* flower, *c.* capsule, both × 2.

6. ARTHROPODIUM

R. BR. Prod. (1810) 276; BAKER, J. Linn. Soc. Bot. 15 (1876) 351; BTH. Fl. Austr. 7 (1878) 55; BAILEY, Queensl. Fl. 5 (1902) 1629; EWART, Fl. Vict. (1930) 292; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 286; BLACK, Fl. S. Austr. 1 (1943) 193; PAYENS, Nova Guinea n.s. 8 (1957) 388; SCHLITTLER, Mitt. Bot. Mus. Un. Zürich 207 (1957) 6, map; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 598. — *Dichopogon* KUNTH, En. Pl. 4 (1843) 622; BAKER, J. Linn. Soc. Bot. 15 (1876) 318; BTH. Fl. Austr. 7 (1878) 58; BAILEY, Queensl. Fl. 5 (1902) 1631; EWART, Fl. Vict. (1930) 291; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 285; BLACK, Fl. S. Austr. 1 (1943) 193; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 598. — **Fig. 7.**

Stemless herbs. *Rhizome* very short. Roots fibrous or somewhat fleshy, often producing well-defined, distant tubers. *Leaves* basal, linear to lanceolate, gradually expanding towards the base to form (apparently dry and membranous) open sheaths, sometimes ciliate or with bristles along the margins; veins of the sheaths sometimes persisting on an outer zone of fibres. *Inflorescence* a raceme or panicle. *Pedicels* 1–3(–5)-nate, in the axils of bracts and usually associated with a few smaller bracts also apparently in the axil of the principal bract, articulated usually in the distal half, rather long and filiform. *Perianth* segments usually free, the inner whorl broader, with 3 or less often 5 veins, spreading. *Filaments* linear-filiform, usually attached to the base of the perianth segments; anthers basifixed, oblong to linear, often strongly arcuate, dehiscing laterally or introrsely; papillose or pubescent appendages always present, usually adnate to the filaments and often also to the anthers. *Ovary* superior, sessile, subglobose to ellipsoid, 3-celled; ovules axile, 2–10 in each locule; style filiform, simple, minutely capitate. *Capsule* dehiscing loculicidally; perianth segments adhering, marcescent, not twisting after flowering. Seeds angular.

Distr. Madagascar (1 *sp.*), New Zealand (2 *spp.*), New Caledonia (1 *sp.*), and *c.* 9 *spp.* in Australia, of which one extends into *Malesia:* New Guinea (South Papua).

Ecol. Usually in open grassland or open woodland, often at rather low altitudes (below 250 m).

Species have been described as having chocolate or vanilla scents.

Notes. PAYENS (1957) made a strong case for combining *Dichopogon* with *Arthropodium*. Nevertheless, authors (*e.g.* BURBIDGE and GRAY, Fl. A.C.T., 1970) have continued to separate these genera principally on whether the papillose or pubescent staminal appendages are adnate to the filaments (in *Arthropodium*) or to the anthers (in *Dichopogon*). An examination of species represented at Leyden and Adelaide has convinced me that these two genera cannot be separated. A particularly significant form is *A. neocaledonicum* in which the appendages are attached to both filaments and anthers such that it would be difficult to assign this species to a genus. In most of the material of *Dichopogon* the appendages are also distinctly adnate to the filaments as well as to the anthers. *Dichopogon strictus* and *Arthropodium capillipes*, although placed in separate genera, have almost indistinguishable stamens.

1. Arthropodium strictum R. BR. Prod. (1810) 276; F.v.M. Descr. Not. 6 (1885) 17; LAUT. Bot. Jahrb. 50 (1913) 292; KRAUSE, *ibid.* 59 (1925) 548; PAYENS, Nova Guinea n.s. 8 (1957) 390; EICHLER, Suppl. Fl. S. Austr. (1965) 83. — *Dichopogon strictus* (R. BR.) BAKER, J. Linn. Soc. Bot. 15 (1876) 319; BTH. Fl. Austr. 7 (1878) 58; BAILEY, Queensl. Fl. 5 (1902) 1631; EWART, Fl. Vict. (1930) 291; GARDNER, En. Pl. Austr. Occ. (1931) 18; BLACK, Fl. S. Austr. 1 (1943) 194. — **Fig. 7.**

Roots bearing distant tubers *c.* 1–1½ cm long. *Leaves* 3–12, suberect, sublinear but narrowing gradually towards the apex and sometimes also towards the basal sheath where they again become broader, glabrous or minutely ciliate on the margins, 20–45 cm by 3–7 mm; veins of leaves not forming fibrous sheaths at base of plant. Peduncle simple or more often with 1–4 ascending branches, (20–)30–60(–110) cm high. Bracts rarely up to 6 cm long at the base of the lowest branch, but usually

5–15 mm long, ovate to lanceolate, narrowing gradually to the apex, partly scarious. *Pedicels* solitary or less often 2- or 3-nate, erect-spreading, 12–20 mm. *Perianth* segments purple, 9–14 by *c.* 3–3$^1/_2$ mm. *Filaments c.* 1$^1/_2$–2 mm; anthers 3–5 mm long; appendages less than 1 mm long, free of or only shortly adnate to filaments. *Ovary* globose-ellipsoid, 1$^1/_2$–4 mm long; ovules 8–10 in each locule; style 6–7 mm. *Capsule* subglobose, *c.* 5 mm ⌀, with several seeds; perianth marcescent or rarely persistent.

Distr. Australia (all states but not yet from the Northern Territory) and *Malesia:* SE. New Guinea (Port Moresby area).

Ecol. Open grassland and open woodland at low altitude, subject to a long dry season.

Vern. *Chocolate lily*, E (Australia).

Note. PAYENS (1957) stated that the perianth segments are connate for 1 mm. This was not confirmed by me for material he had examined.

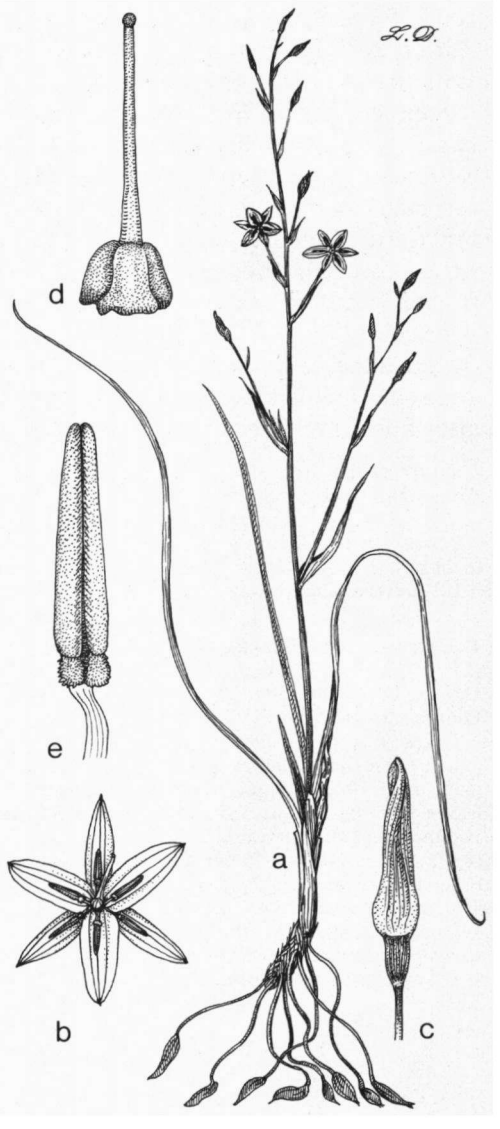

Fig. 7. *Arthropodium strictum* R. BR. *a.* Habit, × 1/2, *b.* flower, × 2, *c.* withered flower, × 3, *d.* gynoecium, × 7, *e.* anther, × 10 (C. R. ALCOCK 2875, S. Australia).

7. CAESIA

R. BR. Prod. (1810) 277; BAKER, J. Linn. Soc. Bot. 15 (1876) 357; BTH. Fl. Austr. 7 (1878) 46; BAKER, Fl. Cap. 6 (1897) 400; BAILEY, Queensl. Fl. 5 (1902) 1632; EWART, Fl. Vict. (1930) 289; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 288; BLACK, Fl. S. Austr. 1 (1943) 192; PHILLIPS, Gen. S. Afr. Fl. Pl. ed. 2 (1951)

1002; PAYENS, Nova Guinea n.s. 8 (1957) 383; SCHLITTLER, Mitt. Bot. Mus. Un. Zürich 207 (1957) 6, map; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 596; OBERMEYER, Bothalia 11 (1973) 122. — **Fig. 8.**

Stemless herbs. *Rhizome* very short. Roots fibrous, fleshy or tuberous. *Leaves* basal, subulate to linear, expanded at the base to form a sheath. *Inflorescence* a raceme or more often a panicle. *Pedicels* 1–3-nate, in the axils of bracts and usually associated with a few smaller bracts also apparently in the axil of the principal bract, articulated usually in the distal half. *Perianth* segments free or shortly connate, subequal, 3-veined, spreading. *Filaments* filiform or linear, glabrous, attached to the receptacle or to the base of the perianth segments; anthers basifixed, oblong, dehiscing introrsely. *Ovary* superior, sessile, globose or subglobose, 3-celled; ovules axile, 2 in each locule; style filiform, simple, minutely capitate. *Capsule* dehiscing loculicidally; perianth segments adhering, marcescent, twisting spirally after flowering. Seeds angular or globose, usually solitary in each locule.

Distr. Madagascar (1 *sp.*), South Africa (2 *spp.*; Cape Province) and Australia (7–9 *spp.*), of which one species also occurs in *Malesia:* S. Papua New Guinea (W. Distr.: Wassi Kussa area).

Ecol. Usually in the open, but also in savanna.

Note. Generically this group is regarded as well-defined by the spirally-twisting perianth and 2-ovuled locules. The South African monotypic genus *Nanolirion* BTH. (1883) was formerly distinguished by having a 1–3-flowered inflorescence (PHILLIPS, 1951), but OBERMEYER (1973) placed it under *Caesia*.

1. Caesia setifera BAKER, J. Linn. Soc. Bot. 15 (1876) 359; BTH. Fl. Austr. 7 (1878) 47; EWART & DAVIES, Fl. North. Terr. (1917) 71; PAYENS, Nova Guinea n.s. 8 (1957) 384, f. 1. — **Fig. 8.**

Roots bearing distant spindle-shaped tubers *c.* 1–1½ cm long. *Leaves* 2–4, suberect, filiform, glabrous, *c.* 10–25 cm long, *c.* 1 mm broad; veins of leaves forming fibrous sheaths at base of plant. Peduncle thin and wiry, usually with 1 or 2 ascending branches, (17–)25–45 cm high. Bracts bearing branches or pedicels in their axils, rarely up to 5 mm long, ovate to lanceolate, partly scarious. *Pedicels* 1–6-nate, usually erect-spreading, (3–)5–10 mm. *Perianth* segments blue, linear-oblong, 6–8 by 1–1½ mm. *Filaments* 3–4 mm (the outer up to 1 mm longer than the inner); anthers yellow, *c.* ½–¾ mm long. *Ovary c.* ¾–1 mm long; style 4–5 mm. *Capsule* subglobose, deeply 3-lobed, *c.* 3 mm ∅.

Distr. Australia (Queensland and Northern Territory); in *Malesia:* S. Papua New Guinea: Western District, Wassi Kussa area: Morehead, Weam, Arufi, Tarara.

Ecol. In the Wassi Kussa area scattered on open, grass-sedge plains on thin sand over clay, in maintained savanna grassland, in savanna with *Melaleuca* and *Acacia*, on wet flats in savanna forest, on sour grey soils, at very low altitudes subject to a long dry season. *Fl.* July–Aug., Dec.–Jan.

A field note recorded that usually one flower is opening in sequence.

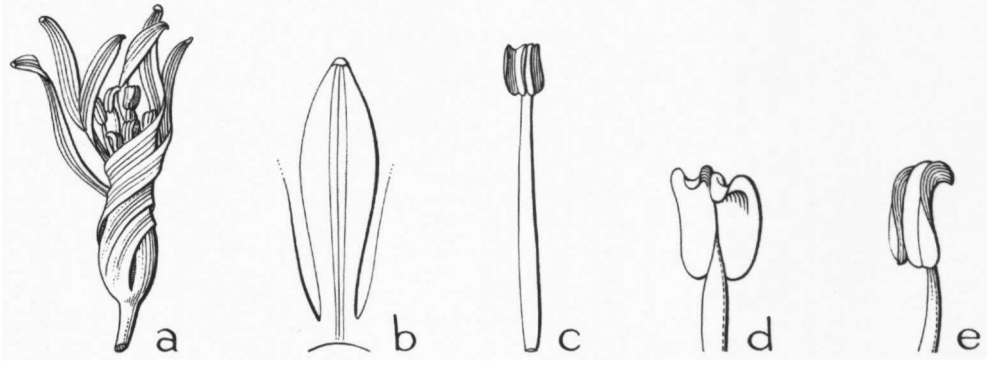

Fig. 8. *Caesia setifera* BAKER. *a.* Flower after anthesis, with persistent twisted perianth, *b.* sepal inside, *c.* stamen, aii × 6, *d–e.* anther, dorsal and lateral, × 15 (*a* BRASS 8599, *b–e* BRASS 8560).

8. CHLOROPHYTUM

KER-GAWL. Bot. Mag. 27 (1808) t. 1071; BAKER, J. Linn. Soc. Bot. 15 (1876) 321; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 284; POELLN. Ber. Deut. Bot. Ges. 61 (1943) 126; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 598; DRESS, Baileya 9 (1961) 29; OBERMEYER, Bothalia 7 (1962) 690; BACK. & BAKH. *f.* Fl. Java 3 (1968) 86; CHAROENPHOL, Thai For. Bull. 7 (1973) 67; PANIGRAHI, Kew Bull. 30 (1975) 563; MARAIS & REILLY, Kew Bull. 32 (1978) 653.

Perennial stemless herbs. *Rhizome* horizontal, often very short. Roots fibrous, or fleshy or tuberous. *Leaves* basal, usually rosulate, linear to lanceolate, often with a fimbriate margin, expanding towards the base to form a sheath. *Inflorescence* a raceme or a panicle. *Pedicels* 1–6-nate, in the axils of bracts and associated with a few small bracts also apparently in the axil of the principal bract, articulated usually near or below the middle. *Perianth* segments free, subequal, with 3 or 5 veins, most frequently spreading or reflexed. *Filaments* filiform, glabrous or papillate, attached to the receptacle; anthers basifixed, linear-oblong, introrse. *Ovary* superior, sessile or shortly stipitate, globose or obovoid, 3-lobed, 3-celled; ovules axile, 2 or more in each locule; style filiform, simple, minutely capitate. *Capsule* dehiscing loculicidally; perianth segments adhering, marcescent, not twisting after flowering. Seeds flat, suborbicular.

Distr. Especially in Africa (mainly southern and tropical), Madagascar and Asia (especially India) to Australia (2 *spp.*); in *West Malesia* two non-endemic species.

The total number of species is estimated by KRAUSE (1930) at *c.* 100 and by OBERMEYER (1962) at nearly 300.

Ecol. Species of *Chlorophytum* occur in a wide range of habitats from coastal to montane regions. They grow in many soil types and in rock crevices, and in open grassland and dense forest.

Notes. OBERMEYER (1962) recorded that in species with fascicled flowers plants do occasionally occur in which the flowers are borne spirally on a distinct but very short lateral branch of the inflorescence. This supports the theory that fascicled flowers and their associated bracts represent an abbreviated lateral shoot.

She also discussed the difficulty encountered in separating *Chlorophytum* from *Anthericum* L. (1753). She was only able to find a single character on which these genera could always be separated: the seeds of *Chlorophytum* are flat, but of *Anthericum* angular and smaller. Several other characters were found to be generally, but not universally, of value in separating them.

KEY TO THE SPECIES

1. Perianth segments 3–5 mm long. Anthers less than 1 mm long. Leaves usually 4–8 mm broad **1. C. laxum**

1. Perianth segments 7–12 mm long. Anthers 4–5 mm long. Leaves usually 10–50 mm broad **2. C. malayense**

1. Chlorophytum laxum R. BR. Prod. (1810) 277; HOOK. *f.* Fl. Br. Ind. 6 (1892) 336; BACK. Handb. Fl. Java 3 (1924) 52, *incl. f. javanicum* (HASSK.) BACK.; GAGNEP. Fl. Gén. I.-C. 6 (1934) 804; BACK. & BAKH. *f.* Fl. Java 3 (1968) 86; HUTCH. & DALZ. Fl. W. Trop. Afr. ed. 2, 3 (1968) 100. — *C. laxiflorum* BAKER, J. Linn. Soc. Bot. 15 (1876) 328, *nom. illeg.* — *Nolina javanica* HASSK. Tijd. Nat. Gesch. Phys. 10 (1843) 120; MIQ. Fl. Ind. Bat. 3 (1859) 554.

Roots often bearing tubers *c.* 1–5 cm long (absent in material I have seen from Malesia and stated by BACKER & BAKHUIZEN VAN DEN BRINK *f.* to be absent in Javanese plants). *Leaves* 4–12 or rarely more, linear to lanceolate, usually channelled especially towards the base, with a rather prominent midrib; suberect, glabrous, 10–30(–50) cm by 4–8(–12) mm, rarely forming fibrous sheaths round the base of the plants; the outer arcuate and recurved; the inner often straight. Peduncle straight

or flexuous, unbranched or rarely with a single branch, (5–)15–35(–60) cm. Lower bracts 3–12 mm long, usually lanceolate-acuminate, partly scarious. *Pedicels* solitary or, less often, 2-nate, often erect-spreading but recurving in fruit, 3–12 mm. *Perianth* segments white or 'greenish white', linear-oblong, 3–5 by *c.* 1 mm. *Filaments* (1¹/₂–)2–3 (–4) mm long (the outer often longer than the inner); anthers up to ¹/₂ mm long. *Ovary c.* 1 mm long, obovoid or globose; style less than 2 mm; ovules 2 per locule. *Capsule* usually obovoid, less often globose or depressed-globose, 3-lobed, 5–10 mm long.

Distr. Tropical Africa (*e.g.* Senegal, Liberia, Ghana, Nigeria, Zambia, Ethiopia), S. Asia (*e.g.* India, Indo-China, Thailand), China (incl. Hainan); in *Malesia:* N. Sumatra (Eastcoast Res.), Malay Peninsula, W. and Central Java, and SE. Borneo (Bandjermasin), extending to N. Australia (Queensland and Northern Territory).

Ecol. Recorded from a variety of localities including rock crevices and in sandy soils, but usually a species of shady places (including bamboo forest, deciduous forest and a coconut grove), usually below 1000 m. *Fl.* Jan.–Dec.

Notes. BACKER (1924) and BACKER & BAKHUIZEN VAN DEN BRINK *f.* (1968) treat the Javanese plants as belonging to *forma javanicum* (HASSK.) BACK. They give no reason for this decision and in the absence of a monograph of this species I would prefer not to uphold this form.

Extra-Malesian synonyms are omitted from the references.

2. Chlorophytum malayense RIDL. Fl. Mal. Pen. 5 (1925) 341; PANIGRAHI, Kew Bull. 30 (1975) 565. — *C. orchidastrum* (*non* LINDL. Bot. Reg. 10 (1824) t. 813) RIDL. Mat. Fl. Mal. Pen. Monoc. 2 (1907) 92; Fl. Mal. Pen. 4 (1924) 327; GAGNEP. Fl. Gén. I.-C. 6 (1934) 806; CHAROENPHOL, Thai For. Bull. 7 (1973) 67.

Roots sometimes bearing tubers 3–4 mm or more long. *Leaves* 3–10, sublinear or indistinctly petioled and with a lanceolate lamina, channelled towards the base, with a rather prominent midrib, suberect, glabrous, (10–)25–60 by (¹/₂–)1–5(–10) cm, never forming fibrous sheaths round the base of the plant. Peduncle glabrous or less often glandular pubescent, with 0–~ branches (30–)40–50(?–90) cm high. Lower bracts up to 9 cm long, usually narrowly lanceolate-acuminate, usually partly scarious; the lowest usually sterile. *Pedicels* usually 2–3-nate, less often solitary, erect-spreading, not recurving in fruit, 3–10 mm. *Perianth* segments white, elliptic to linear-oblong, 7–12 by 2–3 mm. *Filaments* occasionally minutely pubescent, 4–5 mm (not always similar in length but neither whorl regularly longer than the other); anthers 4–5 mm long. *Ovary c.* 1¹/₂–2 mm long, obovoid or globose; style 3–4(–8, GAGNEPAIN, 1934) mm; ovules 4–6 per locule. *Capsule* globose, strongly emarginate and very deeply 3-lobed, *c.* 5–8 mm ⌀.

Distr. Indo-China, Thailand and *Malesia:* Malay Peninsula (Perak and Perlis).

Ecol. This is usually a forest (including bamboo, oak, pine) species, often associated with limestone, 50–1500 m. *Fl.* Jan.–Dec.

Notes. GARRETT (*in sched.*) recorded that the plant is night-flowering in Thailand.

RIDLEY (1925) gave the new name *C. malayense* to what he had previously identified as *C. orchidastrum* LINDL. However, he gave no characters by which these species could be separated.

In the neighbouring territories of Thailand and Indo-China CHAROENPHOL (1973) and GAGNEPAIN (1934) have continued to recognize *C. orchidastrum*, but I am following PANIGRAHI (1975) who considers that *C. orchidastrum sensu stricto* is confined to Africa, that the Indian material should be referred to *C. nimmonii* and *C. glaucum*, and that the SE. Asian material is *C. malayense*. Our species can, according to PANIGRAHI, be recognized *inter alia* by drying greenish brown or glaucous, in the leaves not being distinctly petioled and 3–5 cm broad, in the scape being up to 50 cm long and shorter than the leaves and in the bracts being up to 9 cm long. Few collections have been made of *C. malayense* and further field work is needed to confirm its status.

C. longissimum RIDL. (J. Str. Br. R. As. Soc. *n.* 49, 1907, 209) was described from Trang, Peninsular Thailand, close to the Malesian border. It closely resembles *C. malayense*. CHAROENPHOL distinguished these species on whether the inflorescence is erect and sometimes branched (*C. malayense*) or trailing on the ground and never branched (*C. longissimum*). The type of *C. longissimum* has not been seen, but specimens at Kew identified as such, and agreeing with the type description, are possibly sufficiently characterized by these inflorescence characters to retain it as a distinct taxon. Whether the differences are sufficient for specific rank must be left to future examination; it is provisionally kept distinct. It was not discussed by PANIGRAHI.

9. DIANELLA

LAMK [Encycl. 2 (1786) 276, *nom. inval.*] *ex* JUSS. Gen. Pl. (1789) 47; BAKER, J. Linn. Soc. Bot. 14 (1875) 574; BTH. Fl. Austr. 7 (1878) 13; BACK. Handb. Fl. Java 3 (1924) 53; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930)

295; SCHLITTLER, Mitt. Bot. Mus. Un. Zürich 163 (1940) 256; Blumea 6 (1948) 200; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 606. — *Rhuacophila* BL. En. Pl. Jav. (1827) 13. — **Fig. 9.**

Erect or climbing glabrous herbs. *Rhizome* short to stoloniferous. Roots fibrous. *Leaves* usually cauline and distichous or basally rosulate, linear, distally dorsiventral, in the lower parts sometimes laterally compressed and keeled and often forming a closed sheath at the base. *Inflorescence* a panicle. *Pedicels* solitary or few, usually in the axils of bracts, articulated immediately below the flower. *Perianth* segments free, 3–7-nerved, spreading or recurved, equal or subequal. *Filaments* filiform or linear, often swollen in the distal half, glabrous, attached to the receptacle or the inner whorl attached to the perianth segments; anthers basifixed, linear to oblong, dehiscing by an apical pore or by a slit which is initiated in an apical pore. *Ovary* superior, more or less sessile, globose, 3-celled; ovules axile, 4–8 in each locule; style filiform, simple, minutely capitate. *Fruit* a berry, usually shiny blue; perianth segments adhering, marcescent, not twisting after flowering; base of style persistent. Seeds globose or angled.

Distr. Continental Africa (one record), Madagascar, through India into China, throughout Malesia and Australia to New Zealand and the Pacific Islands (New Caledonia, Sandwich Is., Norfolk and Fiji).
Estimates of the number of species vary widely; there are possibly 20–30 *spp.* in all.
Ecol. Both in forest and in more open localities.

KEY TO THE SPECIES

1. Leaf bases strongly compressed and keeled. Leaves usually with minute teeth or prickles along the margin and abaxial surface of the midrib. Fertile bracts differing considerably in size from even the smaller leaves. Filaments strongly thickened at the apex under the anther . . . . . **1. D. ensifolia**
1. Leaf bases obtuse in section, not keeled. Leaves always smooth. Fertile bracts grading into the leaves. Filaments widened about the middle . . . . . **2. D. javanica**

1. Dianella ensifolia (L.) DC. in Redouté, Liliac. 1 (1802) t. 1, *cf.* CODE in Bosser *c.s.* Fl. Mascar. Lil. (1978) 32; MIQ. Fl. Ind. Bat. 3 (1859) 560; HEMSL. Rep. Chall. Bot. 1, 3 (1884) 201; RIDL. Mat. Fl. Mal. Pen. Monoc. 2 (1907) 92; LAUT. Bot. Jahrb. 50 (1913) 293; HALL. *f.* Nova Guinea 8 (1914) 995; MERR. En. Born. (1921) 114; En. Philip. 1 (1922) 203; RIDL. Fl. Mal. Pen. 4 (1924) 329; KRAUSE, Bot. Jahrb. 59 (1925) 551; MERR. Contr. Arn. Arb. 8 (1934) 18; WILD, Kew Bull. 8 (1953) 251; M. R. HENDERSON, Mal. Wild Flow. Monoc. (1954) 186, f. 110; BACK. & BAKH. *f.* Fl. Java 3 (1968) 87; STEEN. Mt. Fl. Java (1972) t. 28–1. — *Gladiolus odoratus indicus* RUMPH. Herb. Amb. 5 (1747) 185, t. 73. — *Dracaena ensifolia* LINNÉ, Mant. (1767) 63. — *Dianella nemorosa* LAMK, Encycl. 2 (1786) 276, *nom. inval.*; Tabl. Enc. 2 (1792) 388, t. 250, *nom. illeg.*; SCHLITTLER, Mitt. Bot. Mus. Un. Zürich 163 (1940) 256; Blumea 6 (1948) 209, incl. many forms, *l.c.* 216–223. — *Dracaena ensata* THUNB. Diss. Bot. Drac. (1808) 4. — *Dianella montana* BL. En. Pl. Jav. 1 (1827) 12; HASSK. Tijd. Nat. Gesch. Phys. 11 (1844) 180; Pl. Jav. Rar. (1848) 114; MIQ. Fl. Ind. Bat. 3 (1859) 560; BACK. Handb. Fl. Java 3 (1924) 54. — *D. odorata* [RUMPH.] BL. En. Pl. Jav. 1 (1827) 13; HALL. *f.* Nova Guinea 8 (1914) 996; MERR. Int. Rumph. (1917) 136; KRAUSE, Bot. Jahrb. 59 (1925) 550; SCHLITTLER, Mitt. Bot. Mus. Un. Zürich 163 (1940) 258. — *D. revoluta* (*non* R. BR.) SCHAUER, Nov. Act. Ac. Nat. Cur. 19 (1843) Suppl. 1: 445; LAUT. Bot. Jahrb. 50 (1913) 293; MERR. En. Philip. 1 (1922) 203. — *D. bancana* MIQ. Fl. Ind. Bat. Suppl. (1861) 610; BACK. Handb. Fl. Java 3 (1924) 54. — *D. caerulea* (*non* SIMS, Bot. Mag. 15, 1801, t. 505) MERR. Philip. J. Sc. 2 (1907) Bot. 266; *ibid.* 5 (1910) Bot. 337; HALL. *f.* Nova Guinea 8 (1914) 993; GIBBS, Arfak (1917) 100; MERR. En. Philip. 1 (1922) 202; KRAUSE, Bot. Jahrb. 59 (1925) 552; HOLTHUIS, Blumea 5 (1942) 167. — *D. robusta* ELMER, Leafl. Philip. Bot. 5 (1913) 806. — *D. bambusifolia* HALL. *f.* Nova Guinea 8 (1914) 995, t. 182; KRAUSE, Bot. Jahrb. 59 (1925) 550. — *D. flabellata* HALL. *f. l.c.* 997, t. 183; KRAUSE, *l.c.* 549. — *D. carinata* HALL. *f. l.c.* 999, t. 186; KRAUSE, *l.c.* 550. — *D. parviflora* ZIPP. *ex* HALL. *f. l.c.* 998, t. 184; KRAUSE, *l.c.* 551. — *C. albiflora* HALL. *f. l.c.* 998, t. 185; KRAUSE, *l.c.* 551. — *D. monophylla* HALL. *f. l.c.* 1000, t. 188; KRAUSE, *l.c.* 551. — *D. serrulata* HALL. *f. l.c.* 1000, t. 187; KRAUSE,

Fig. 9. *Dianella javanica* (BL.) KUNTH, on Mt Kaba, S. Sumatra (Photogr. DE VOOGD).

l.c. 549. — *D. parviflora* RIDL. J. Fed. Mal. St. Mus. 6 (1915) 186. — *D. pullei* KRAUSE, Nova Guinea 14 (1924) 175; Bot. Jahrb. 59 (1925) 553. — *D. ledermannii* KRAUSE, Bot. Jahrb. 59 (1925) 549. — *D. monticola* KRAUSE, *l.c.* 553. — ? *D. levis* (*non* R. BR.) C. T. WHITE, Proc. Linn. Soc. N.S.W. 51 (1926) 298. — *D. sparsiflora* SCHLITTLER, Mitt. Bot. Mus. Un. Zürich 163 (1940) 262. — *D. ensata* (THUNB.) R. J. HENDERSON, Taxon 26 (1977) 136.

Stem 0–1 m high, unbranched, rarely with a few branches. *Rhizome* horizontal, moderately branched. *Leaves* basal, scattered along the stem or in a terminal rosette, distichous, with a sheathing lower part, (25–)30–60(–100) cm by (4–)8–30 mm; above the base keeled and with the sides of the lamina becoming firmly appressed to one another and fused to form an isobilateral portion; distally with a dorsiventral linear or linear-lanceolate

lamina which is sometimes absent from the lower leaves, almost always with minute serrations or prickles along the midrib on the lower surface, with a conspicuous midrib and numerous smaller veins. *Inflorescence* exceeding the leaves, lax or with short terminal branches often *c.* 1–2 cm long, bearing up to 20 pedicels. Lower bracts usually narrowly linear-lanceolate and bilaterally compressed above the basal sheath like the leaves; bracts subtending pedicels 1–4(–7) mm long or rarely absent. *Pedicels* 4–15(–22) mm. *Perianth* segments blue, white, lilac or yellow, spreading, (4–)5–8(–9) mm long. *Filaments* often more than half as long as the perianth segments, filiform or narrowly linear, white or yellow with a yellow or orange, glabrous swelling below the anther. *Ovary* green, $1^1/_2$–2 mm long; ovules 4 in each locule; style green, white or blue, 4–6 mm long. *Fruit* shiny blue, 6–8(–11) mm ∅. Seeds several, 3–4 mm long.

Distr. Continental Africa (WILD, 1953), Madagascar, continental Asia (Himalayas, Burma, Thailand, Indo-China) to southern China (Yunnan, Hainan), Japan and Formosa, throughout *Malesia* to Australia (Northern Territory, Queensland, New South Wales), Tasmania, New Zealand and many Pacific islands.

Ecol. A highly adaptable species, occurring in habitats ranging from open grassland to primary forest, from sea-level to over 3000 m. *Fl.* Jan.–Dec.

Vern. Malaya: *benjuang*, *satagit*, *senjuang*, *siak-siak jantan*; Sumatra: (*akar*) *tu(n)daun*, *mentuntil*, *tengari*, *ukop*, Banka, *siak-siak*, Riouw, *sieuh*, Djambi, *sitanggit*, Batak, *sesiah*, Pasemah, *sitangie*, Indragiri; Java: *djamaka*, *d. putih*, *suliga*, S, *tegari*, J; Borneo: *labeh-labeh*, Dusun Penampang dial., *angkup-angkup*, Bokan dial., *tembalong tipoh*, Dusun dial.; Philippines: *ablâas*, Bag., *bariubáriu*, *oyon-óyon*, P.Bis., *duñgau*, Ig., *hogangan*, If.; Moluccas: *mariuü*, Talaud; New Guinea: *suruma*; *bururl*, *tirambaramp*, Mendi, *buru-buru*, Biak dial., *moalengen*, Aiome, *tanglenu*, Wigote, Wapi lang., *sinda*, Mumuni, Orokaiva lang., *tsiri kande kande*, Hagen Subdistr., *bonkaige*, Sinasina lang., Nimai dial., *pfifiriki*, Kutubu lang., *kili-kili*, Bembi, *kikipatia*, Koroba Subdistr., *sabetari*, Rawa, *kilina*, Kaigorin, *sarpeim*, Miwaute, Wapi lang., *pengeh-pengeh*, Maipa, Mekeo lang., *baibigehgi*, Utukap, Miniafi lang.

Notes. BACKER (1924, 1968) recognized two species, *D. montana* and *D. bancana*, to include the material from Java, which he distinguished mainly on flower colour, venation of petals, and inflorescence form. However, the large number of intermediates makes this separation impracticable.

SCHLITTLER (1940) recognized 3 *spp.* in Malesia (*D. odorata*, *D. nemorosa* and *D. sparsiflora*), but in 1948 he reduced these to a single one under the name *D. nemorosa*, with 24 forms in Malesia.

Being a common species over a large area, *D. ensifolia* is exceptionally well represented in herbaria and, despite its variability, I doubt that even with intensive field work distinct subspecific taxa can be defined.

2. Dianella javanica (BL.) KUNTH, En. Pl. 5 (1850) 52; MIQ. Fl. Ind. Bat. 3 (1859) 561; HALL. *f.* Nova Guinea 8 (1914) 995; MERR. En. Born. (1921) 114; En. Philip. 1 (1922) 203; RIDL. Fl. Mal. Pen. 4 (1924) 328; BACK. Handb. Fl. Java 3 (1924) 53; KRAUSE, Bot. Jahrb. 59 (1925) 549; MERR. Contr. Arn. Arb. 8 (1934) 19; SCHLITTLER, Blumea 6 (1948) 206, *incl. f. stenophylla*, *alba et rubra* SCHLITTLER, *l.c.* 208; Mitt. Bot. Mus. Un. Zürich 207 (1957) 6, 11, map, 25; BACK. & BAKH. *f.* Fl. Java 3 (1968) 87; STEEN. Mt. Fl. Java (1972) t. 28–2. — *Rhuacophila javanica* BL. En. Pl. Jav. (1827) 14; RIDL. J. Linn. Soc. Bot. 42 (1914) 166; J. Fed. Mal. St. Mus. 6 (1915) 186. — *Rhuacophila celebica* BL. En. Pl. Jav. (1827) 14. — *Eustrephus javanicus* (BL.) D. DIETR. Syn. Pl. 2 (1840) 1117. — *Eustrephus celebicus* (BL.) D. DIETR. *l.c.* — *D. celebica* (BL.) KUNTH, En. Pl. 5 (1850) 45; MIQ. Fl. Ind. Bat. 3 (1859) 561. — *D. austro-caledonica* SEEM. Fl. Vit. (1868) 312; LAUT. Bot. Jahrb. 50 (1913) 294. — **Fig. 9.**

Stem always present, up to 2 m high, unbranched or branched. *Rhizome* horizontal, moderately branched. *Leaves* concentrated towards the ends of the branches, distichous, 12–35(–40) by $^3/_4$–$2^1/_2$ cm, with a sheathing but not closed base which is continuous with the lamina, lacking a compressed and fused intermediate portion, lacking serrations or prickles; midrib usually more conspicuous than the many other veins. *Inflorescence* lax, exceeding the leaves. Bracts subtending branches of the inflorescences grading gradually in size into the foliage leaves, up to 25 by 3 cm, ovate to lanceolate not bilaterally compressed; bracts subtending the pedicels $^1/_2$–3(–5) mm long or absent. *Pedicels* 6–20 mm. *Perianth* segments blue (usually pale), white to yellow or lilac, spreading, (6–)8–12 mm long; outer whorl strongly cucullate at the apex. *Filaments* usually less than half as long as the perianth segments, white or yellow, filiform, usually with a distinct papillose fusiform swelling about the middle. *Ovary* green, *c.* 2 mm long; ovules *c.* 8–10 in each locule; style white or green 2–5 mm. *Fruit* green or yellow at first, sometimes (at least) becoming black, ellipsoid, 8–15 mm long, with up to 10 seeds. Seeds *c.* $1^1/_2$ mm ∅.

Distr. Throughout *Malesia*, also in New Caledonia and Ile des Pins, and Fiji Is. (Viti Levu).

Ecol. Grows in a wide variety of habitats, including mossy forests, thickets, forest borders, on narrow open ridge-crests, in debris of craters, among rocks, on stream banks and in exposed places, locally common, (1000–)1500–3000 m. *Fl.* Jan.–Dec.

Vern. Java: *hadjèra*, S; Philippines: *kallawad*, If., *apilug*, *sapiláu*, *uráya*, Ig., *talobatub*, Bon.

Fig. 10. *Thysanotus tuberosus* R. BR. *a*. Habit, × 1/4, *b*. flower, × 5, *c*. sexual organs, × 10, *d*. fruit in persistent perianth, × 5. — *T. chinensis* BTH. *e*. Habit, × 1/2 (*a–d* BRASS 6517, *e* VAN ROYEN & SLEUMER 5632).

10. THYSANOTUS

R. BR. Prod. (1810) 282; BAKER, J. Linn. Soc. Bot. 15 (1876) 334; BTH. Fl. Austr. 7 (1878) 36; RIDL. Fl. Mal. Pen. 4 (1924) 328; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 285; EWART, Fl. Vict. (1930) 288; BLACK, Fl. S. Austr. 1 (1943) 190; PAYENS, Nova Guinea n.s. 8 (1957) 386; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 598, *nom. gen. cons.* — *Chlamysporum* SALISB. Parad. Lond. (1808) t. 103. — *Halongia* JEANPLONG, Act. Bot. Ac. Sc. Hung. 16 (1970) 293, f. 1–6. — **Fig. 10.**

Stemless herbs. *Rhizome* horizontal, very short. Roots fibrous or tuberous. *Leaves* basal, rosulate, filiform or linear, glabrous, expanding towards the base to form a sheath. *Inflorescence* a raceme, panicle or umbellate, erect or twining. *Pedicels* 1–7-nate, in the axils of bracts and associated with a few small bracts also apparently in the axil of the principal bract, or umbellate, articulated often in the median third. *Perianth* segments free, 3–5-nerved, spreading; outer whorl green; inner whorl usually blue to purple or violet, fringed. *Stamens* usually 6, rarely 3. *Filaments* linear, glabrous, attached to the perianth segments, bent over to one side of the ovary (BLACK, 1943); 3 often shorter; anthers basifixed, linear, curved dehiscing introrsely. *Ovary* superior, sessile, oblong to globose, 3-celled; ovules axile, 2 in each locule; style filiform, simple, minutely capitate. *Capsule* dehiscing loculicidally; perianth segments adhering, marcescent, twisting after flowering; style persistent. Seeds angled, with a fleshy white or orange strophiole.

Distr. Up to 30 *spp.*, all in Australia (all states, but especially Western Australia); in *Malesia:* 2 of these *spp.*, one in New Guinea and another throughout Malesia as far as Thailand, Indo-China and southern China.

Ecol. A wide range of mostly open habitats from grasslands and sandy heaths to open forests, including both *Eucalyptus* savanna and pine forest.

Notes. The fleshy appendage of the seed has been referred to as a caruncle (*e.g.* BLACK, 1943), but it appears to be derived from the funicle rather than from the testa and I am, therefore, using the term strophiole as done by PAYENS (1957).

The term 'cluster' is sometimes used in preference to umbel as in some material the inflorescence appears umbellate but in other material the pedicels arise from a short but distinct axis.

KEY TO THE SPECIES

1. Roots lacking tubers. Inflorescence a simple umbel . . . . . **1. T. chinensis**
1. Roots with tubers. Inflorescence a panicle, the branches terminated by umbels . . **2. T. tuberosus**

1. Thysanotus chinensis BTH. Fl. Hongk. (1861) 372; BAKER, J. Linn. Soc. Bot. 15 (1876) 337; HALL. *f.* Nova Guinea 8 (1914) 994; MERR. En. Philip. 1 (1922) 202; KRAUSE, Bot. Jahrb. 59 (1925) 548; GARDN. En. Pl. Austr. Occid. (1931) 18; SCHLITTLER, Mitt. Bot. Mus. Un. Zürich 207 (1957) 6, map; PAYENS, Nova Guinea n.s. 8 (1957) 386; STEEN. Blumea 20 (1972) 433. — *T. chrysantherus* F.v.M. [in BTH. Fl. Hongk. (1861) 372, *nomen*] Fragm. 5 (1866) 202; BTH. Fl. Austr. 7 (1878) 40; NAVES, Nov. App. (1880) 266; VIDAL, Phan. Cuming. (1885) 153; BAILEY, Queensl. Fl. 5 (1902) 1629. — *Chlamysporum chrysantherum* (F.v.M.) O. K. Rev. Gen. Pl. 2 (1891) 708. — *T. siamensis* RIDL. J. Str. Br. R. As. Soc. *n.* 59 (1911) 209; Fl. Mal. Pen. 4 (1924) 328. — *Halongia purpurea* JEANPLONG, Act. Bot. Ac. Sc. Hung. 16 (1970) 296, f. 1–6. — **Fig. 10e.**

Roots fibrous. *Leaves c.* 5 to numerous, erect, often shallowly channelled, usually 15–40 cm, up to *c.* 1 mm wide. Peduncle about as long as the leaves, straight, unbranched, terminating in a 2–6(–12)-flowered cluster. Bracts with scarious margins, 2–4 mm long. *Pedicels* 1–2 cm, articulated in the basal third, erect in bud, usually spreading or recurving in fruit. Outer *perianth* segments (? always) green, with a scarious, white margin, 6–9 by 2–3 mm; inner segments pale blue to purple or light violet, with inturned usually fringed margins, 6–9 by 3–5 mm. *Filaments* $1^1/_2$–2 mm,

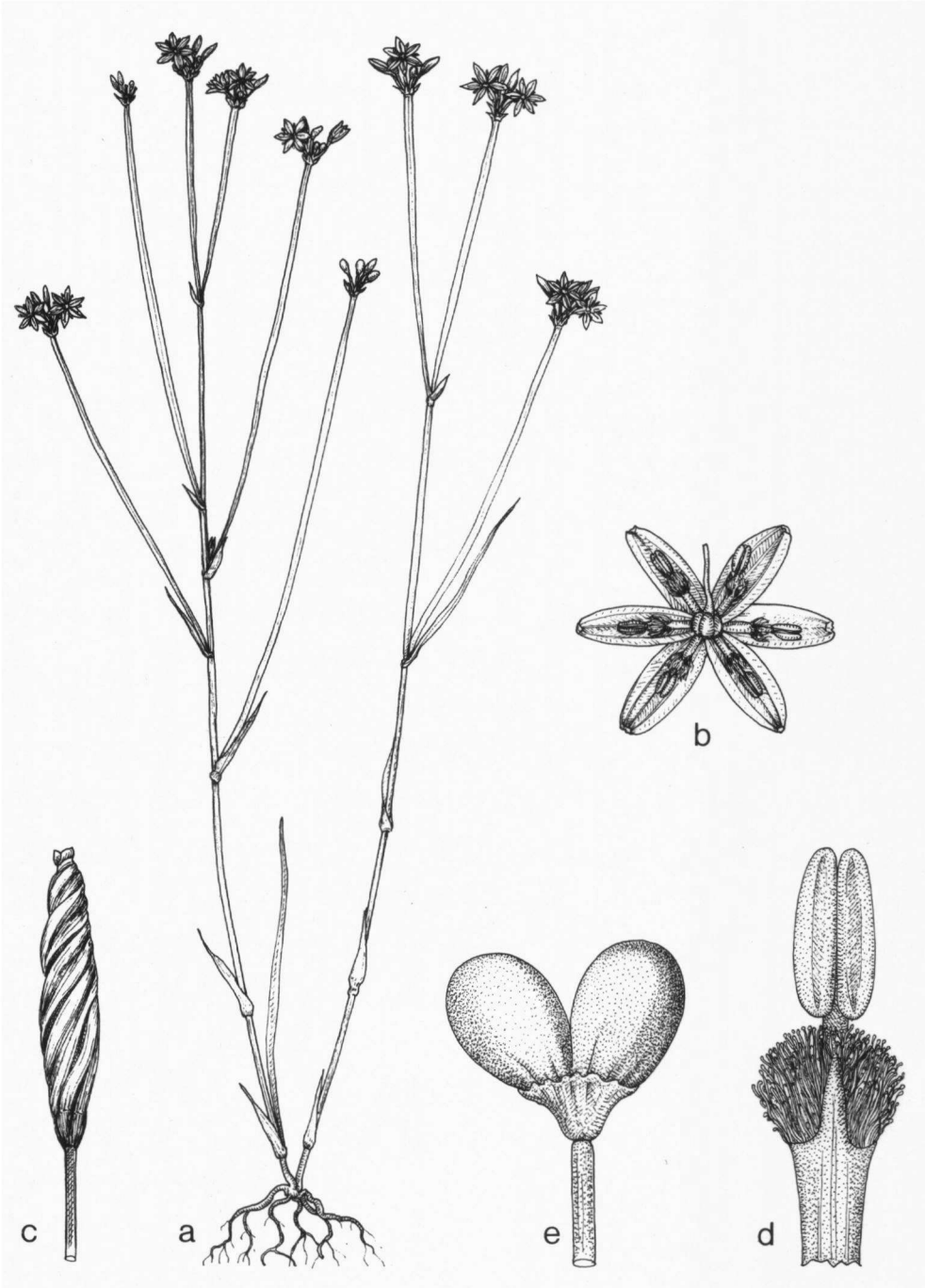

Fig. 11. *Tricoryne platyptera* RCHB. *a.* Habit, × 1/4, *b.* flower, × 2, *c.* withered flower, × 4, *d.* stamen, × 20, *e.* fruit, × 5 (NGF 38690, PULLEN 7090).

the outer whorl shorter than the inner; anthers $1^1/_2$–3 mm long, the outer shorter than the inner. *Ovary* c. 1 mm long; style c. 3–4 mm. *Capsule* oblong, 4–5 mm long. Seeds c. $1^1/_2$ mm long.

Distr. Australia (Western Australia and Northern Territory); in *Malesia:* New Guinea (West New Guinea and Papua), SE. Moluccas (Aru Is.: Tranggan), Celebes (Masamba), Philippines (Luzon, Mindanao), Lesser Sunda Is. (Flores), onto continental SE. Asia: S. Peninsular Thailand (Setul), Indo-China (Tonkin), S. China (incl. Hong Kong).

Ecol. Open grassland, in grassy pine forest, most frequently in open savanna, in New Guinea of *Melaleuca, etc.*, in places subject to a moderate to strong dry season, from close to sea-level up to 1600 m. *Fl.* Dec.–Aug.

2. Thysanotus tuberosus R. BR. Prod. (1810) 282; BAKER, J. Linn. Soc. Bot. 15 (1876) 335; BTH. Fl. Austr. 7 (1878) 41; EWART, Fl. Vict. (1930) 289; GARDN. En. Pl. Austr. Occid. (1931) 18; BRASS, J. Arn. Arb. 19 (1938) 190; BLACK, Fl. S. Austr. 1 (1943) 191; PAYENS, Nova Guinea n.s. 8 (1957) 387; BURB. & GRAY, Fl. A.C.T. (1970) 102. — *Chlamysporum tuberosum* (R. BR.) O. K. Rev. Gen. Pl. (1891) 708. — **Fig. 10a–d.**

Roots partly fibrous, bearing spindle-shaped distant tubers 10–25 mm long. *Leaves* 2–6, erect, linear to terete, 20–50 cm by up to c. 1 mm broad. Peduncle about as long as the leaves or up to 50% longer, usually with 1–6 branches; main axis and branches each terminating in a 2–6(–20)-flowered cluster; 1–3(–8) flowered fascicles of flowers usually also present in the axils of bracts along the main axis and branches. Bracts usually with scarious margins, the lowest 3–60(–80) mm long; the upper shorter. *Pedicels* 7–17 mm, articulation usually below the centre, erect to spreading. Outer *perianth* segments purple with a scarious pale margin, 7–14 by 2–3 mm; inner segments purple with inturning fringed margin, 7–15 by $2^1/_2$–5 mm. *Filaments* 1–2 mm, those of the outer whorl often shorter than the inner; anthers 2–4 mm long; outer often shorter than the inner. *Ovary* 1–$1^1/_2$ mm long; style (2–)3–5 mm. *Capsule* oblong, c. 5–6 mm long. Seeds up to 2 mm long.

Distr. Australia (all states except Tasmania) and S. Papua New Guinea (Western District: Wassi Kussa; Mabaduan).

Ecol. Common grass associate in lowland savanna forest on poorly drained flats, subject to a distinct dry season. *Fl.* Dec.–April. In Australia found in exposed localities up to 500 m.

Notes. VAN ROYEN recorded in Queensland that the outside of the flowers was white with a green midrib and the anthers dark purplish green.

PAYENS (1957) recognized two varieties separable on flower size. Both occur in Australia but only *var. parviflora* BTH. in Papua. The material available is insufficient to justify recognition of these varieties.

Six other synonyms based on *extra*-Malesian material are omitted from the synonymy.

11. TRICORYNE

R. BR. Prod. (1810) 278; BAKER, J. Linn. Soc. Bot. 15 (1876) 361; BTH. Fl. Austr. 7 (1878) 50; BAILEY, Queensl. Fl. 5 (1902) 1636; EWART, Fl. Vict. (1930) 287; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 287; BLACK, Fl. S. Austr. 1 (1943) 192; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 602. — **Fig. 11.**

Erect, glabrous or variously hairy herbs; stems green, terete, angled or flattened and leaf-like. *Rhizome* horizontal or erect, often very short; roots thick or fibrous. *Leaves* basal and/or cauline, more or less linear or reduced to scales, alternate, often amplexicaul at the base. *Inflorescence* of terminal umbels surrounded by small scarious bracts and outer larger, sometimes leaf-like bracts. *Pedicels* articulated just below the flower. *Perianth* segments free or shortly connate, equal or subequal, with 3 or 5 (less often 7) prominent veins, spreading. *Filaments* filiform, with a dense tuft of hairs in the distal part, attached to the receptacle; anthers basifixed, linear to oblong; introrse. *Ovary* superior, sessile, deeply 3-lobed, 3-celled; ovules basal, 2 in each locule; style filiform, simple, minutely capitate. *Fruit* consisting of (1–)3 indehiscent nutlets; perianth segments adhering, marcescent, twisting spirally after flowering. Seeds subglobose.

Distr. In Australia (all states) 6 *spp.*, of which one in *Malesia:* S. Papua New Guinea.

Ecol. Low altitude plant. BAILEY recorded most of the Queensland species from 'sandy shores' and specimen annotations suggest a preference for sandy soils in grassland or savanna.

Note. The terms 'stem' and 'leaves' give some difficulty as the aerial shoot might be better regarded as an inflorescence often bearing leaf-like bracts rather than as a vegetative shoot with leaves.

1. Tricoryne platyptera RCHB. Syst. Pflanzenk. (1871) 72; BTH. Fl. Austr. 7 (1878) 51; BAILEY, Queensl. Fl. 5 (1902) 1636; Compr. Cat. Queensl. Pl. (1913) 559, f. 539; BRASS, J. Arn. Arb. 19 (1938) 190; PAYENS, Nova Guinea n.s. 8 (1957) 385. — *T. pterocaulon* BAKER, J. Linn. Soc. Bot. 15 (1876) 363. — **Fig. 11.**

Virgate, erect or subscandent herb. Stems and branches strongly flattened (winged), terete towards the base of the plant, glabrous, 25–80 cm high; flattened portions with a prominent midrib, *c.* 2–8 mm broad. *Rhizome* short; roots rather thick. *Leaves* cauline, narrowly triangular, scale-like, up to 12(–25) mm long. Bracts 1–4 mm long. *Pedicels* usually 5–12(–15) in number, (2–)4–12 mm. *Perianth* segments yellow, oblong or elliptic-oblong, with a scarious margin, 6–8(–10) by up to *c.* 3 mm; those of the outer whorl usually with (3–)5(–7) veins; those of the inner whorl slightly narrower, with 3 veins. *Filaments* $2^1/_2$–3 mm, yellow; anthers *c.* 1–$1^1/_4$ mm long. *Ovary c.* $^1/_2$ mm long; style $3^1/_2$–4 mm. Nutlets green.

Distr. Australia (tropical Queensland) and *Malesia:* S. Papua New Guinea (Western District: Wassi Kussa area), Thursday I.

Ecol. In New Guinea in savanna with *Melaleuca* and *Acacia*, in lowland savanna-woodland on sour grey soil and in grass of creek flats, subject to a strong dry season. *Fl.* Dec.–Jan., July–Aug.

In N. Queensland found up to 950 m.

12. LILIUM

LINNÉ, Sp. Pl. (1753) 302; Gen. Pl. ed. 5 (1754) 143; BAKER, J. Linn. Soc. Bot. 14 (1875) 225; ELWES, Monogr. genus *Lilium* (1880); WILSON, Lilies of E. Asia (1925); KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 329; DRYSDALE WOODCOCK & STEARN, Lilies of the World (1950); SEALY, Kew Bull. 5 (1950) 273; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 609.

Erect, usually glabrous herbs. Bulb scaly; roots thick, produced from below the bulb and in some species from the base of the aerial stem. Aerial stem annual, erect, usually unbranched. *Leaves* cauline, alternate or verticillate, linear or broadly flattened, usually sessile, sometimes with bulbils in their axils. *Flowers* solitary and terminal, or in a racemose inflorescence of solitary flowers in the axils of the often leaf-like bracts. *Pedicels* erect to cernuous, not articulated. *Perianth* segments free, ± equal, infundibuliform or campanulate, sometimes clawed, sometimes adhering and forming a tube, spreading or recurving distally, with a nectariferous longitudinal furrow towards the base. *Filaments* filiform or subulate, attached to the receptacle or to the base of the segments; anthers dorsifixed, linear, introrse, versatile. *Ovary* superior, sessile, oblong to obovoid, 3-celled; ovules axile, ∞; style terete sometimes clavate, 3-lobed. *Capsule* coriaceous, loculicidal, perianth deciduous. Seeds flat.

Distr. Widespread with possibly 80 *spp.* in the temperate regions of North America, Europe and Asia (also Taiwan); in *Malesia:* Philippines.

Ecol. The species occupy a wide range of habitats, including open areas and woods.

Note. Many species are of horticultural importance.

KEY TO THE SPECIES

1. Leaves 6–15 mm broad. Nectariferous furrow on perianth segments glabrous . . **1. L. longiflorum**
1. Leaves 2–4 mm broad. Nectariferous furrow on perianth segments papillose . **2. L. philippinense**

1. Lilium longiflorum THUNB. Trans. Linn. Soc. 2 (1794) 333; ELWES, Monogr. genus *Lilium* (1880) t. 7; MERR. En. Philip. 1 (1922) 204; BACK. Handb. Fl. Java 3 (1924) 62; WILSON, Lilies of E. Asia (1925) 23; DRYSDALE WOODCOCK & STEARN, Lilies of the World (1950) 253; HATUS. Mem. Fac. Agric. Kagoshima Un. 5 (1966) 62, *err. longifolium*; BACK. & BAKH. *f.* Fl. Java 3 (1968) 90.

Bulb usually subglobose, often yellowish, up to $6^1/_2$ cm ∅; scales closely imbricate. Stem 30–90 (–100) cm high, smooth, green, producing roots above the bulb. *Leaves* alternate, 20–40(–60), sessile, lanceolate or oblong-lanceolate, attenuate, with up to 20 or more veins of which up to 7 are usually more conspicuous, the largest on each plant up to 15 by $1^1/_2$ cm, usually much smaller distally. *Flowers* often solitary, but up to at least 7, white, horizontal, (12–)15–20 cm long, infundibuliform, the tube (in dried material) 9–12 mm ∅. *Perianth* segments not clawed, reflexed distally; nectariferous furrow glabrous. *Filaments* filiform above, linear below, in dried material 9–14 cm; anthers 7–12 mm long; pollen yellow. *Style* 8–12 cm; stigma deeply 3-lobed. *Capsule c.* 4–6 cm long.

Distr. China, Japan and Taiwan; in *Malesia:* Philippines: Batan Is. and Y'ami (N of Luzon), *cf.* MERRILL and HATUSIMA.

Native country not exactly known, possibly naturalized over part of its range.

Ecol. Open grassy slopes at low altitude.

Vern. *Easter lily*, E; *teppo-yuri*, Japan; Philippines: *vonltan*, Iv.

Note. Stated by DRYSDALE WOODCOCK & STEARN to be commercially the most important species of *Lilium*, with numerous cultivated forms.

2. Lilium philippinense BAKER, Gard. Chron. (1873) 1141, f. 243; J. Linn. Soc. Bot. 14 (1875) 228 ('*philippense*'); CURTIS, Bot. Mag. III, 32 (1876) t. 6250; ELWES, Monogr. genus *Lilium* (1880) t. 3; MERR. Philip. J. Sc. 5 (1910) Bot. 337; En. Philip. 1 (1922) 204; WILSON, Lilies of E. Asia (1925) 20; DRYSDALE WOODCOCK & STEARN, Lilies of the World (1950) 311.

Bulb subglobose, whitish, *c.* $3^1/_2$–4 cm ∅; scales unknown. Stem 30–90 cm high, smooth, green or mottled with purple, producing roots above the bulb. *Leaves* alternate, 30–40, linear, attenuate, with up to 7 veins of which 1 or 3 are more conspicuous, 8–17 cm by 2–4 mm. *Flowers* 1 or 2, white, with green and reddish outside towards the base, horizontal, (10–)14–25 cm long, infundibuliform, the tube (in dried material) 8–12 mm ∅. *Perianth* segments not clawed, spreading distally; nectariferous furrow papillose. *Filaments* linear in dried material, 13–17 cm; anthers 5–15 mm long; pollen yellow. *Style* $10^1/_2$–16 cm; stigma deeply 3-lobed. *Capsule c.* 5 cm long.

Distr. Taiwan and *Malesia:* Philippines: North Luzon (Bontoc, Benguet and Pangasinan Prov.).

Ecol. Open grassy slopes in the pine region, 1100–2300 m. *Fl.* May, *fr.* Oct.

Vern. Philippines: *kanyon*, Ilk., *luplúpak*, *soyasoi*, *tubtubkau*, Ig., *tuktukpáu*, Bon.

Note. Except for the presence of papillae on the nectariferous furrow hard to distinguish in flower from *L. longiflorum*.

13. ASPARAGUS

LINNÉ, Sp. Pl. (1753) 313; Gen. Pl. ed. 5 (1754) 147; BAKER, J. Linn. Soc. Bot. 14 (1875) 594; BTH. Fl. Austr. 7 (1878) 17; BAKER, Fl. Trop. Afr. 7 (1898) 425; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 362; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 608; JESSOP, Bothalia 9 (1966) 31; BACK. & BAKH. *f.* Fl. Java 3 (1968) 92. — *Asparagopsis* KUNTH, Abh. K. Ak. Wiss. Berlin (1842) 35.

Climbing or erect, glabrous or pubescent, softly woody plants usually with bisexual flowers, rarely dioecious. *Rhizome* perennial; roots mostly thick and often tuberous. Aerial stems annual or perennial, usually much-branched; branches sometimes similar to the main stems and sometimes morphologically distinct. *Leaves* cauline, alternate, scale-like, usually brown and at least partially scarious, often with a spine from the abaxial surface; leaves of the rhizome scale-like, lacking a spine. Leaf-like structures (*cladodes*) solitary or fascicled, flat, angled or terete, arising in the axils of cauline leaves but sometimes absent from flower-bearing branchlets. *Pedicels* solitary or fascicled in the axils of the cauline leaves, articulated. *Perianth* segments free or minutely connate, equal or subequal, 1-veined, white or nearly so, often with a green longitudinal band on the abaxial surface, spreading or less often reflexed. *Filaments* flattened, attached to the perianth segments; anthers dorsifixed, oblong, introrse. *Ovary* superior, ± sessile, 3-celled; ovules axile, 2 to few; style usually filiform with 3 short branches, less often divided

nearly to the base. *Fruit* usually a red 1- to few-seeded berry; perianth not usually persistent. Seeds globose or partly angled.

Distr. Widespread in Europe, Africa, Madagascar, and Asia; in Malesia 2 *spp.*, one of which is widespread in the Old World and the single one known from Australia.

There are probably fewer than 100 *spp.*, but the taxonomy of the genus is poorly understood.

Ecol. Species have a preference for arid areas in the open and for savanna, but some occur in damp forests.

Notes. The morphology of the spines has been discussed by CUSSET & TRAN (Bull. Soc. Bot. Fr. 113, 1966, 151). The nature of the leaf-like organs (cladodes) is controversial. They are most frequently treated as axillary structures, *i.e.* modified branches (*e.g.* KAUSSMANN, Bot. Stud. 3, 1955), and my own work confirms this. However, ARBER (Monocotyledons: a morphological study, 1925) believed that in a few species they were in fact leaves, while SCHLITTLER (Bot. Jahrb. 79, 1959, 428) concluded that they are leaves in all species.

KEY TO THE SPECIES

1. Flowers unisexual, borne at normal vegetative nodes. Cladodes usually flat, less often triquetrous **1. A. cochinchinensis**

1. Flowers bisexual, usually on branches lacking cladodes. Cladodes triquetrous . . **2. A. racemosus**

1. Asparagus cochinchinensis (LOUR.) MERR. Philip. J. Sc. 15 (1919) Bot. 230; En. Philip. 1 (1922) 206; GAGNEP. Fl. Gén. I.-C. 6 (1934) 780; MERR. Comm. Lour. (1935) 108; MAKINO, Ill. Fl. Japan (1954) 735. — *Melanthium cochinchinense* LOUR. Fl. Coch. (1790) 216. — *A. lucidus* LINDL. Bot. Reg. 30 (1844) Misc. 29; BAKER, J. Linn. Soc. Bot. 14 (1875) 605; MERR. & ROLFE, Philip. J. Sc. 3 (1908) Bot. 96, *incl. var. dolichocladus* MERR. & ROLFE.

Plant dioecious. Stems glabrous, erect, procumbent or climbing, shallowly ridged; branches numerous, usually simple, arising singly, less than 10(–30) cm long, spreading or erect-spreading, often straight. Roots with distant, elongate tubers. Scale-*leaves* with scarious portion less than 5(–8) mm long; spines absent on branches, poorly developed or up to 5 mm long on main axes. *Cladodes* present on branches and towards the ends of stems, flat, or 3-angled, 1–3-nate, linear-arcuate, 5–15(–40) by $^1/_2$–$1^1/_2$ mm. *Pedicels* 1- or 2(–3)-nate, arising from the axils of scale-leaves subtending cladodes, articulated near or above the middle, 2–3(–6) mm long. *Perianth* segments yellow-green, pale green or white, spreading similar, oblong-elliptic, *c.* 2–$3^1/_2$ mm long. — ♂ *Flowers*: filaments shorter than the perianth segments, cuneate from a broad base; anthers nearly 1 mm long (one specimen); ovary rudimentary. — ♀ *Flowers:* filaments *c.* half the length of the perianth segments; anthers rudimentary; ovary obovoid, $1^1/_2$–2 mm long; style *c.* $^1/_2$ mm, with 3 stigmatic ridges; ovules 2 per locule. *Berry* green when ripe, *c.* 4–7 mm ∅. Seeds 1–4, globose or angled, *c.* 2–3 mm ∅.

Distr. Korea, Japan, Ryu Kyu Is., S. China, Indo-China, Taiwan; in *Malesia:* Philippines (N. Luzon: Benguet Prov.), one record (LOHER 1928), probably from above 1200 m.

Ecol. There are several records from within the spray zone on coral or limestone substrates; also in bush up to at least 200 m, but no ecological details known from the Philippines.

Notes. The recorded flower colours may be misleading. It is possible that the segments are white with a green or yellow-green band.

GAGNEPAIN recorded that the flowers were unisexual. I have seen insufficient material to determine whether the plants are always dioecious or to confirm that the flowers are always functionally unisexual, but in all flowers I examined one sex appeared to be rudimentary.

2. Asparagus racemosus WILLD. Sp. Pl. 2 (1799) 152; BAKER, J. Linn. Soc. Bot. 14 (1875) 623; BTH. Fl. Austr. 7 (1878) 17; ENGL. Bot. Jahrb. 7 (1886) 448; RIDL. Fl. Mal. Pen. 4 (1924) 331; BACK. Handb. Fl. Java 3 (1924) 72; HEYNE, Nutt. Pl. (1927) 444; H. PERRIER, Fl. Madag. fam. 40 (1938) 21; STEEN. Atlas Trop. Nederl. (1938) map 7^2; JESSOP, Bothalia 9 (1966) 72; HUTCH. & DALZ. Fl. W. Trop. Afr. ed. 2, 3 (1968) 93; BACK. & BAKH. *f.* Fl. Java 3 (1968) 93. — *A. dubius* DECNE, Nouv. Ann. Mus. Paris 3 (1834) 363; Herb. Timor. Descr. (1835) 35; SPAN. Linnaea 15 (1941) 476, added *A. penduliflorus* ZIPP., *nomen, in syn.* — *Asparagopsis decaisnei* KUNTH, En. Pl. 5 (1850) 103, *nom. illeg.*; ZOLL. Syst. Verz. 1 (1854) 67; MIQ. Fl. Ind. Bat. 3 (1859) 562; RIDL. in Forbes, Wand. (1885) 520. — *Asparagopsis schoberioides* KUNTH, En. Pl. 5 (1850) 70; IL'IN, Fl. U.S.S.R. 4 (1968) 328. — *Asparagopsis javanica* KUNTH, En. Pl. 5 (1850) 100; ZOLL. Syst. Verz. 1 (1854) 67; MIQ. Fl. Ind. Bat. 3 (1859) 562.

Plant with bisexual flowers. Stems glabrous, usually climbing, up to 2–3 m high or more, smooth or grooved, in their lower part unbranched; branches numerous and branched; solitary; final branches usually 1–4-nate, up to 5(–10) cm long, spreading or ascending, straight. Roots with distant, elongate tubers. Scale-*leaves*

with scarious portion up to 5(–10) mm long and spine usually absent on final branches, up to 5(–10) mm long. *Cladodes* present mainly on branches and towards the ends of stems, triquetrous, linear-crenate, 1–3(–4)-nate, (7–)10–25 (–40) mm long, rarely over 1 mm broad. *Pedicels* 1- or 2-nate, usually on branches 2–6 mm long lacking cladodes, less often on normal branches, articulated usually near the middle, 3–5 mm long. *Flowers* bisexual, scented. *Perianth* segments white with a green band, spreading similar oblong to obovate-oblong, 2–3(–4) mm long. *Filaments* shorter than or about the same length as the perianth segments; anthers *c.* 0.2–0.3 mm long. *Ovary* obovoid, *c.* $1^1/_2$ mm long; style *c.* $^1/_2$ mm, with 3 stigmatic ridges or 3 short branches; ovules 2 per locule. *Berry* red when ripe, *c.* 4–6 mm ⌀. Seeds 1–3, globose or angled, *c.* 2–3 mm ⌀.

Distr. Widespread in Africa including the southern Cape, Guinea and Madagascar, through southern Asia into China, in South Malesia and the northern states of Australia; in *Malesia:* Malay Peninsula (Langkawi, on limestone rocks), Java (in the western half only on the Northcoast, in E on both sides; also Madura and Kangean Is.), Lesser Sunda Is. (Lombok, Sumba, Sumbawa, Flores, Timor), and SE. Moluccas (Tenimber Is.).

The range in Malesia is distinctly disjunct on both ends which is due to its drought preference; it is absent from the Sundaland rain-forest core.

Ecol. In Malesia a distinct drought-loving plant and bound to the seasonal areas, in Java to the zone with at most 20 rainy days in the 4 driest consecutive months of the year, mostly in coastal areas, in sunny thickets and on dunes, in monsoon forest with *Bambusa spinosa*, *Acacia leucophloea*, *etc.*, predominantly in the lowland, but ascending to *c.* 1150 m (BACKER). *Fl.* mostly Aug.–Jan.

Vern. *Christusdoorn*, D; *bek bun*, Chinese; Java: *sangga langit*, J; Timor: *niesie saub*, *nônôsan*; Tenimber Is.: *skikirie*, Saumlak.

Notes. There are many synonyms from Africa, Asia and Australia, but none are known to have been used for the Malesian area.

A. racemosus is closely allied to *A. cochinchinensis* and can only be distinguished by a combination of characters. In Malesia they are geographically separated but until a revision of the genus, at least in Asia, is undertaken the taxonomy of this group must remain uncertain.

Excluded

According to MERRILL (En. Philip. 1, 1922, 206) NAVES (Nov. App. 1880, 264) has credited *A. declinatus* L. and *A. racemosus* WILLD. to the Philippine flora, but both were apparently admitted on erroneous identifications.

14. DISPORUM

SALISB. Trans. Hort. Soc. 1 (1812) 331; D. DON, Trans. Linn. Soc. Lond. 18 (1841) 513; BAKER, J. Linn. Soc. Bot. 14 (1875) 588; HOOK. *f.* Fl. Br. Ind. 6 (1894) 359; BACK. Handb. Fl. Java 3 (1924) 73; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 368. — *Lethea* NORONA, Verh. Bat. Gen. ed. 1, 5 (1790) Art. 4, 2, *nomen.* — *Drapiezia* BL. En. Pl. Jav. (1827) 8. — **Fig. 12.**

Glabrous rhizomatous herbs. Aerial stems annual, erect, branched. *Leaves* cauline; the lower brown and scale-like with a sheathing base; the others alternate becoming opposite distally, flat, with many veins, petioled, usually ovate, obtuse at base. *Peduncles* terminating vegetative branches, not articulated, bearing 1–6 nutant flowers in an umbel. *Perianth* segments free, equal or subequal, erect or distally recurved, several-veined, usually saccate or spurred at the base. *Filaments* linear to lanceolate, attached to the receptacle or the base of the perianth; anthers dorsifixed, linear-oblong, extrorse. *Ovary* superior, sessile, ovoid to obovoid, 3-celled; ovules axile, 2 per cell; style filiform, with 3 recurved stigmatic branches. *Fruit* a 1–3-seeded berry.

Distr. Approximately 30 *spp.* currently recognized in the western U.S.A. and Canada, Japan, China, northern Deccan Peninsula, through Thailand to *West Malesia:* Malay Peninsula, Sumatra, Java, and Bali.

In my opinion it is highly unlikely that more than half of these will be recognized after critical revision.

Ecol. Typical forest plants.

Note. BACKER *l.c.* pointed to the peculiar sympodial structure of the stem.

1. Disporum cantoniense (LOUR.) MERR. Philip. J. Sc. 15 (1919) 229; MERR. Comm. Lour. (1935) 109. — *Fritillaria cantoniensis* LOUR. Fl. Coch. (1790) 206. — *Uvularia chinensis* KER-GAWL. Bot. Mag. (1806) t. 916. — *D. pullum* SALISB. Trans. Hort. Soc. 1 (1812) 331; HASSK. Pl. Jav. Rar. (1848) 105; MIQ. Fl. Ind. Bat. 3 (1859) 552; BAKER, J. Linn. Soc. Bot. 14 (1875) 589; HOOK. *f.* Fl. Br. Ind. 6 (1892) 360; RIDL. J. Fed. Mal. St. Mus. 4 (1909) 82, *incl. var. multiflorum* RIDL.; KOORD. Fl. Tjib. 1 (1922) 47; RIDL. Fl. Mal. Pen. 4 (1924) 338; HEND. Mal. Wild Flow. Monoc. (1954) 185, f. 109; CHAROENPHOL, Thai For. Bull. 8 (1974) 89. — *Drapiezia multiflora* BL. En. Pl. Jav. (1827) 8; (1974)89. — *Drapiezia multiflora* BL. En. Pl. Jav. (1827) 8; JUNGH. Java ed. 2 (neerl.) 1 (1853) 522; ZOLL. Syst. Verz. 1 (1854) 66, *incl. var. albiflora* ZOLL. — *D. leschenaultianum* D. DON, Proc. Linn. Soc. 1 (1839) 45; Trans. Linn. Soc. 18 (1841) 518; MERR. Contr. Arn. Arb. 8 (1934) 19. — *D. horsfieldii* D. DON, Proc. Linn. Soc. 1 (1839) 45 (WALLICH 5088D). — *Streptopus multiflorus* (BL.)

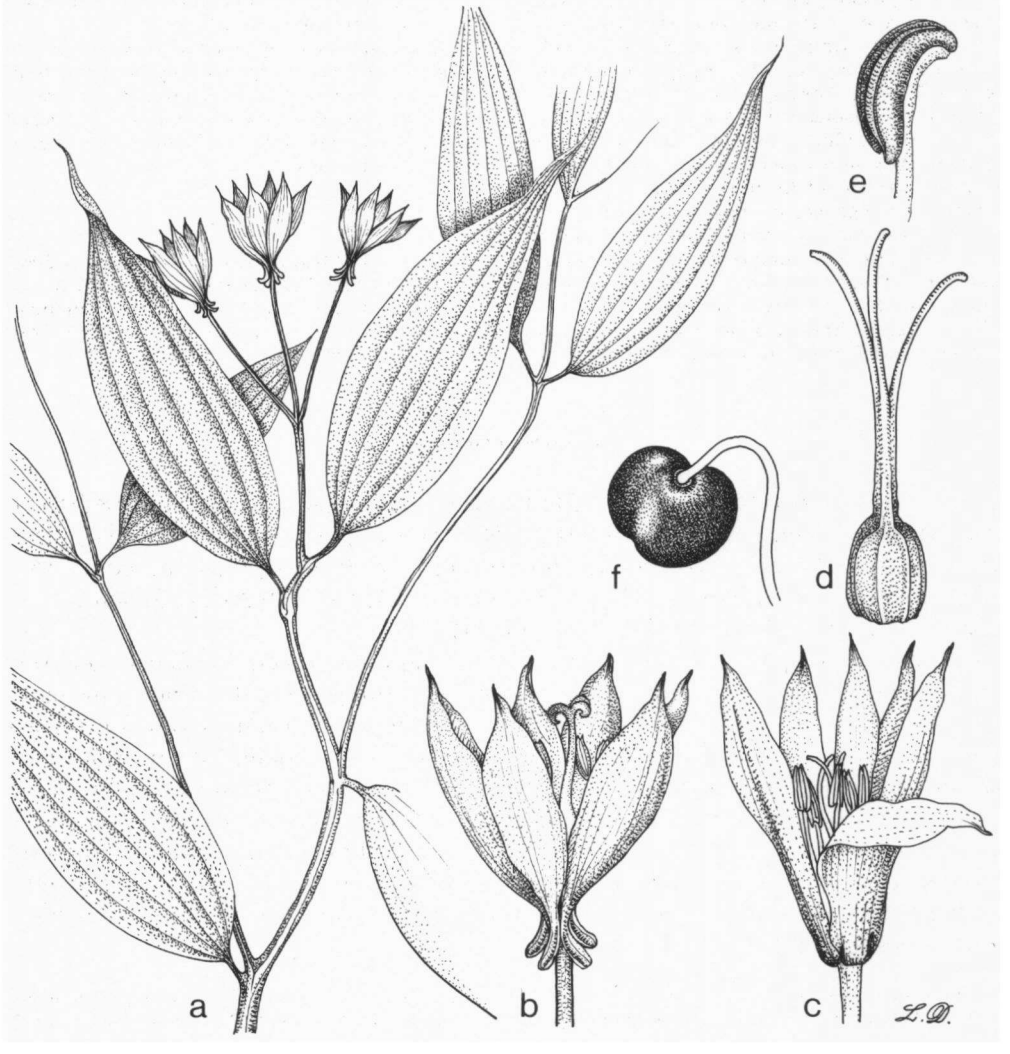

Fig. 12. *Disporum cantoniense* (LOUR.) MERR. *a.* Habit, × ³/₄, *b.* flower of the spurred form, *c. ditto* of the non-spurred form, both × 2¹/₂, *d.* gynoecium, *e.* stamen, both × 5, *f.* fruit, × 1¹/₂ (drawn from various collections).

D. DIETR. Syn. Pl. 2 (1840) 1121. — *D. multiflorum* (BL.) D. DON, Trans. Linn. Soc. 18 (1841) 518; MIQ. Fl. Ind. Bat. 3 (1859) 552. — *D. calcaratum* D. DON, Trans. Linn. Soc. 18 (1841) 516; BAKER, J. Linn. Soc. Bot. 14 (1875) 588; HOOK. *f.* Fl. Br. Ind. 6 (1892) 359; CHAROENPHOL, Thai For. Bull. 8 (1974) 89. — *Uvularia multiflora* (BL.) KUNTH, En. Pl. 4 (1843) 207. — *D. chinense* (KER-GAWL.) O. K. Rev. Gen. Pl. 2 (1891) 708; BACK. Handb. Fl. Java 3 (1924) 73; DOCT. v. LEEUWEN, Verh. Kon. Ak. Wet. A'dam sect. II, 31 (1933) 147; BACK. & BAKH. *f.* Fl. Java 3 (1968) 94. — **Fig. 12.**

Stems erect, often 45–80 cm high, up to $2^1/_2$ m, branched only in the upper half; branches erect-spreading, becoming flexuose distally. Roots fibrous or slightly thickened but not tuberous. *Leaves* usually ovate, less often oblong or lanceolate, rarely suborbicular, acuminate, $6^1/_2$–17 by $2^1/_2$–9 cm, with 5–9 veins prominent on the lower surface and numerous finer veins; petiole to 8 mm. *Inflorescence* an umbel of 2–7 flowers terminating a short branch which arises opposite a leaf and bears a single sometimes somewhat reduced leaf; peduncle 0–$3^1/_2$ cm; pedicels 1–4 cm. *Perianth* segments lanceolate to oblanceolate, acute, keeled below and usually saccate or less often with a spur to 5 mm long at the base, white, greenish to purple, 1–2(–$2^1/_2$) cm long. *Filaments* linear to lanceolate, often less than half as long as the perianth; anthers bright yellow, $2^1/_2$–4 mm long. *Berry* bluish black, 7–10 mm ⌀. Seeds *c.* 3 mm ⌀.

Distr. SE. Asia from the northern Deccan Peninsula to southern China and Japan; in *Malesia:* Malay Peninsula (Perak, Pahang) and throughout Sumatra, Java, and Bali.

Ecol. In both primary and secondary forest, rarely in the open, (700–)1000–2550 m; especially common in W. Java. *Fl.* Jan.–Dec. DOCTERS VAN LEEUWEN *l.c.* observed the flowers to be protogynous; self-pollination is possible but bumblebees also regularly visit the flowers.

Vern. Java: *baradja lintang, kamalakian, kibeunteur areuj, (ki)tamiang, lili leuweung, radja lintang, tangkal milon,* S, *ègèr ègèr, glinggangan, lenguk, srintil, tombagan,* J; N. Sumatra: *si-demsapo, sumbul sumbul,* Karo-Batak, *kayu (si-mar)soma-soma,* S.

Notes. Variation in the length of the spur has been used in segregating species, but BACKER recognized the continuity of this gradation in Javanese material. Some Javanese plants have spurs as long as those in typical '*D. calcaratum*'.

Branching is partly sympodial. Short terminal axes bear the umbel. Continuation of growth of the aerial shoot is by a branch arising in the axil of the second leaf below the umbel. The node separating two leaves associated with the inflorescence is sometimes so short that the leaves appear opposite.

15. DISPOROPSIS

HANCE, J. Bot. 21 (1883) 278; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 370; NAKAI, J. Jap. Bot. 12 (1936) 147; CHANG & HSU, Taiwania 19 (1974) 64. — **Fig. 13.**

Glabrous rhizomatous herbs. Aerial stems annual, erect, unbranched. *Leaves* cauline, alternate, flat, with many veins, petioled, entire, ovate to oblong, obtuse or subcuneate at the base; brown scale-like leaves on the rhizome, less often also at the base of the aerial stems. *Flowers* solitary in the axils of the leaves, nutant. *Pedicels* articulated. *Perianth* campanulate; segments 3–5, fused, equal, viscid, saccate at the base. *Filaments* expanded to form a corona attached to the perianth; anthers dorsifixed, sagittate, introrse. *Ovary* superior, sessile, ovoid, 3-celled; ovules axile, 4–6 per cell; style short and thick, with simple or 3-lobed stigma. *Fruit* a 1–5-seeded berry.

Distr. Probably 4 or 5 *spp.* from Thailand, Indo-China, southern China, Taiwan; in *Malesia:* Philippines.

Ecol. Forests, usually in the mountains.

1. Disporopsis fusco-picta HANCE, J. Bot. 21 (1883) 278. — *Disporum pullum* (*non* SALISB.) MERR. Philip. J. Sc. 1 (1906) Suppl. 182. — *Disporum luzoniense* MERR. Philip. J. Sc. 5 (1910) Bot. 338; En. Philip. 1 (1922) 206. — **Fig. 13.**

Stems erect, 25–45 cm. Roots fibrous or slightly thickened but not tuberous. *Leaves* 6–9, ovate to oblong, obtuse or subcuneate at the base, acuminate, 6–$12^1/_2$ by $2^1/_2$–5 cm, with usually 7 veins prominent on the lower surface and numerous finer veins; petiole (3–)5–12 mm. *Flowers* in the axils of the lower leaves. *Pedicels* 1–$2^1/_2$ cm. *Perianth* seg-

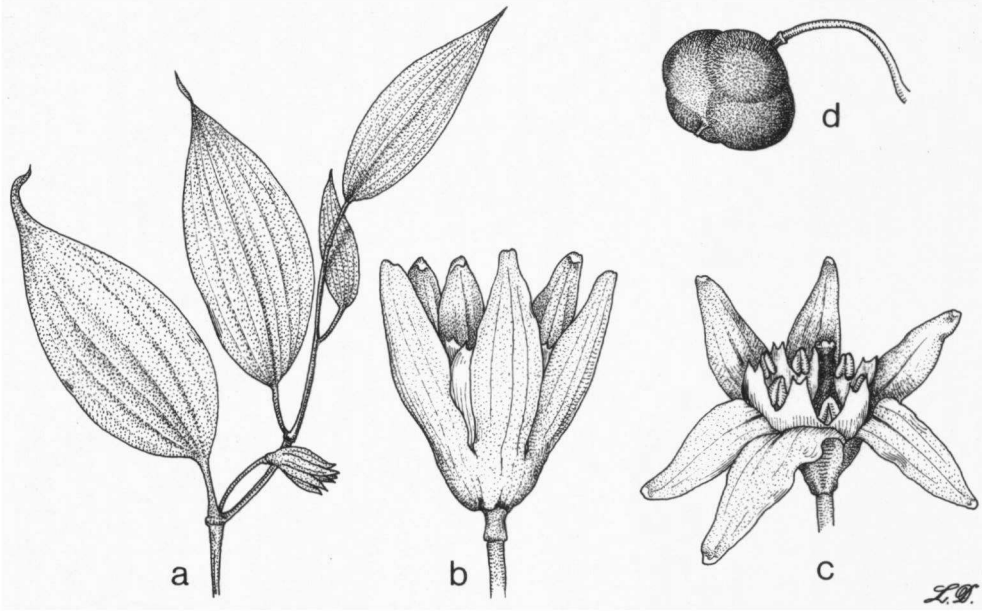

Fig. 13. *Disporopsis fusco-picta* HANCE. *a.* Habit, × ½, *b.* flower, *c. ditto*, laid open showing corona and stamens, both × 2½, *d.* fruit, × 2 (*a–c* STEINER 2147, *d* PNH 7471).

ments fused below middle, 13–15 by 2–3 mm, lanceolate, obtuse, shallowly saccate at the base, white with (always?) dull purple inside. *Corona* attached close to perianth sinus, *c.* 4 mm long, its lobes emarginate. *Anthers* sessile on the corona, *c.* 1 mm long, very shallowly sagittate. *Berry* becoming purple, blue or black, *c.* 1 cm ∅. Seeds *c.* 4 mm ∅.

Distr. Southern China, Taiwan, in *Malesia:* Philippines (N. Luzon: Lepanto, Bontoc and Benguet Prov.).

Ecol. Mossy forest, 1700–2500 m, with one record of association with (the secondary pyrogenous savanna of) *Pinus insularis*. *Fl.* rarely recorded: May–June, or later.

16. TRICALISTRA

RIDL. J. Fed. Mal. St. Mus. 4 (1909) 83; Fl. Mal. Pen. 4 (1924) 330. — *Tupistra sensu* HUTCH. Fam. Fl. Pl. ed. 3 (1973) 749, in part. — **Fig. 14d.**

Stemless herbs. *Rhizome* horizontal, woody; roots thick and fleshy. *Leaves* large, basal, caespitose, petioled, expanding towards the base to form a sheath, with a strong main vein and numerous finer veins. *Inflorescence* a spike. Flowers numerous, each in the axil of a bract. *Perianth* segments 6, fleshy, fused for about half their length, campanulate, equal. *Stamens* 6, attached to the perianth; anthers subsessile, dorsifixed, oblong, dehiscing introrse-laterally. *Ovary* superior, sessile, subcylindrical, 3-lobed, 1-celled, containing (2 or) 4 discord ovules but with traces of two further carpels; stigmas 3, hippocrepiform, sessile. *Fruit* a drupe, green when unripe, globose, 1-seeded.

Distr. Monotypic. *Malesia:* Malay Peninsula.

Note. Regarded as a synonym of *Tupistra* by HUTCHINSON and recognized, but with some doubt, by AIRY SHAW (Willis Dict. ed. 8, 1973). The only consistent difference is that *Tricalistra* has no style, consistently 6 stamens, and a 3-lobed stigma, a set of characters of equal standing as those separating other genera in the *Aspidistreae*.

1. Tricalistra ochracea RIDL. J. Fed. Mal. St. Mus. 4 (1909) 83; Fl. Mal. Pen. 4 (1924) 331. — **Fig. 14d.**

Scale-like leaves several, sessile, lanceolate to 5 cm long. Foliage *leaves* few, broadly lanceolate to oblanceolate, acuminate, cuneate at the base; dark green, chartaceous, 30–40 cm long when in flower, lengthening in fruit, 8–11 cm broad; petiole poorly differentiated, sometimes winged, 12–20 cm. *Inflorescence* 12–15 cm long when in flower, lengthening in fruit, with 25–35 flowers. Bracts ovate, obtuse, caducous, to 3 mm long. *Perianth* fleshy, *c.* 5 mm long, lobes as long as the tube, recurved, ovate, acute, dull ochreous yellow. *Anthers* united below the mouth of the perianth tube, thecae divaricate at base, less than 1 mm long. *Ovary c.* 3 mm long. *Fruit* to *c.* 2 cm long.

Distr. *Malesia:* Malay Peninsula (Pahang: Cameron Highlands).

Ecol. One collection annotated 'on rocks in open places', 1000 m. *Fl.* Nov. (one record), *fr.* April.

Note. Syntypes collected by RIDLEY (13692) are in SING and K. RIDLEY referred to the leaf having 6 veins. However, leaves on both type specimens have at least 100 of which about 13 are more conspicuous than the others. The only other collection (NUR SF 32725) agrees with the type.

17. TUPISTRA

KER-GAWL. Bot. Mag. 39 (1814) t. 1655; BL. Tijd. Nat. Gesch. Phys. 1 (1834) 67; BAKER, J. Linn. Soc. Bot. 14 (1875) 580; HOOK. *f.* Fl. Br. Ind. 6 (1892) 324; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 372. — **Fig. 14a–c.**

Stemless herbs. *Rhizome* tuberous or horizontal, thick and woody; roots thick and fleshy. *Leaves* large, basal, scattered or distichous, usually distinctly petioled, expanding towards the base to form a sheath, with a strong main vein and numerous finer veins. *Inflorescence* a spike. Flowers numerous, each in the axil of a bract. *Perianth* segments 6 or 8, fleshy, fused, campanulate, equal. *Anthers* sessile or subsessile, inserted in tube, dorsifixed, oblong or ovoid, introrse. *Ovary* superior, sessile, subglobose or not externally differentiated from style, 3(–4)-celled; ovules 2 in each locule; style cylindrical; stigma large, peltate or capitate, entire or variously lobed. *Fruit* a globose berry, usually 1-seeded; seeds turgid; perianth persisting below the fruit.

Distr. Eastern Himalayas to southern China; in *Malesia:* Malay Peninsula and Sumatra.

The type of *T. squalida* (the type species) was described, undoubtedly in error, from Amboina.

About 25 *spp.* have been described, but many of these should probably be reduced to synonymy.

Ecol. Most frequently recorded from dry evergreen forest, often in deep shade and often from near streams.

Syst. It appears to me that in the *Aspidistreae* too many small genera are distinguished on insignificant characters.

Note. The Malesian species have been insufficiently collected for convincing taxonomic judgements to be made.

KEY TO THE SPECIES

1. Spike to 17 cm long; style and ovary up to 7 mm long; stigma usually $1^1/_2$–3 mm ∅ . **1. T. violacea**
1. Spike at least 20 cm long; style and ovary at least $7^1/_2$ mm long; stigma at least $4^1/_2$ mm ∅ **2. T. grandis**

1. Tupistra violacea RIDL. J. Str. Br. R. As. Soc. *n.* 41 (1904) 35; Mat. Fl. Mal. Pen. Monoc. 2 (1907) 93; Fl. Mal. Pen. 4 (1924) 330.

Leaves few, elliptic to oblanceolate, acute or acuminate, cuneate at the base; lamina 50–70 by $7^1/_2$–13 cm; petiole well-defined, to 40 cm. *Inflorescence* ascending to 17 cm long when in flower, lengthening in fruit, with 30–40 flowers. Bracts somewhat amplexicaul ovate, *c.* 5 by 3–8 mm. *Perianth* segments violet; the tube 5–6 mm long, $4^1/_2$–6 mm wide; lobes darker than tube, oblong to ovate, 4–$5^1/_2$ by 3–4 mm. *Anthers* sessile, attached in tube or throat, *c.* 1–$1^1/_4$ mm long. *Style* and *ovary* white, spotted violet, $3^1/_2$–7 mm long; stigma $1^1/_2$–4 mm ∅, obscurely lobed.

Distr. *Malesia:* Malay Peninsula (Perak: Bujong Malacca; Penang Highlands); probably also in Thailand.

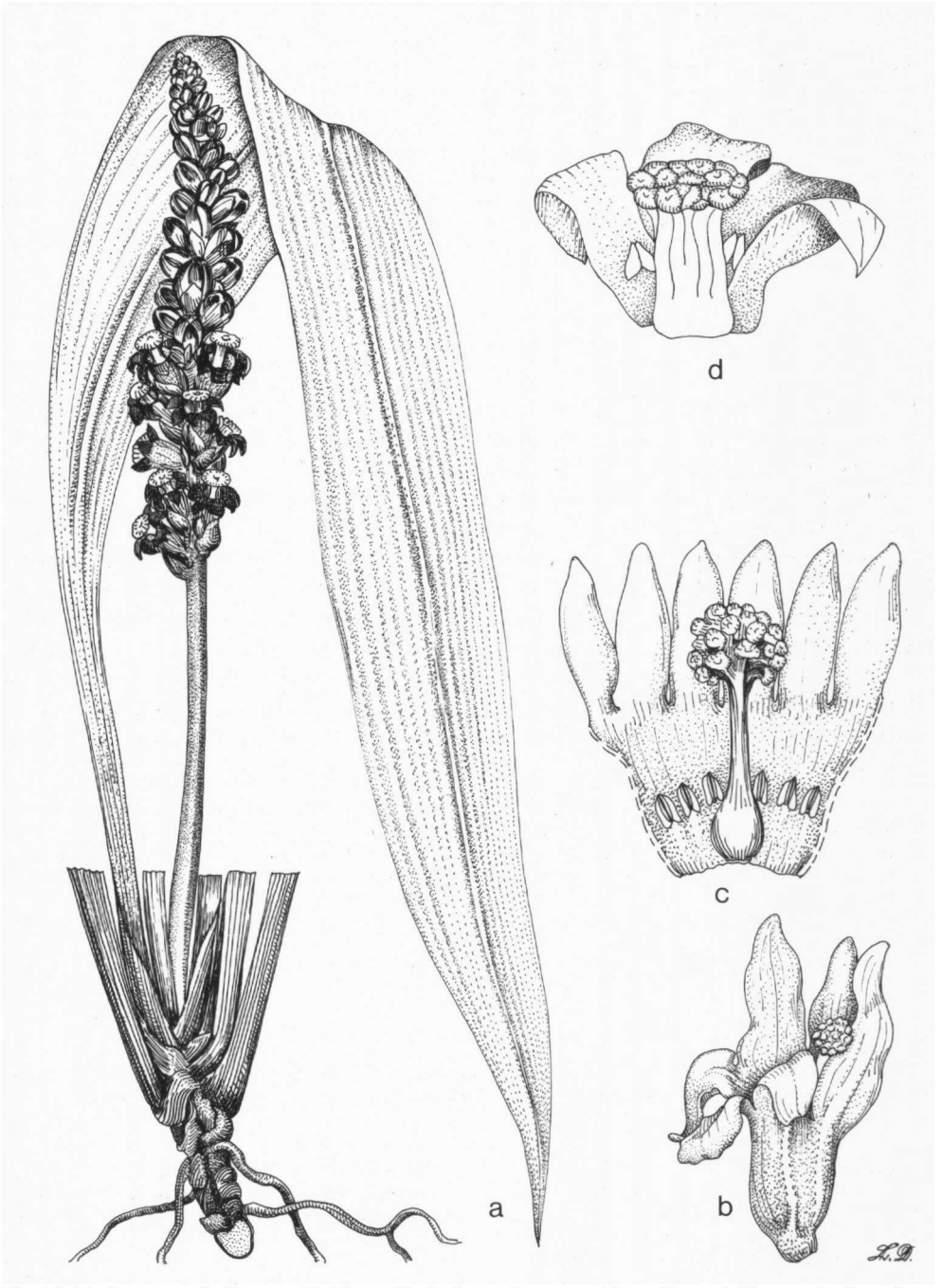

Fig. 14. *Tupistra grandis* RIDL. *a*. Habit, × ½, *b*. flower from outside, *c*. flower laid open, both × 2. — *Tricalistra ochracea* RIDL. *d*. Flower, halved, showing gynoecium, 3 tepals, to which stamens are attached, × 10 (*a–c* LÖRZING 8753, *d* RIDLEY 13692).

Ecol. Mountain forest, apparently rare and no collections made since 1901 have been seen. *Fl.* March, Dec.

Note. This species closely resembles *T. squalida*, the type species of the genus, from the Himalayas. Further study is needed to confirm that they should be kept separate. In the absence of recent collections much of the information here is taken from RIDLEY (1924). The scale-like leaves recorded for *T. gracilis* are likely to occur in *T. violacea*, but the basal part of the plant has not been preserved.

2. Tupistra grandis RIDL. J. Bot. (1900) 73; Mat. Fl. Mal. Pen. Monoc. 2 (1907) 93; Fl. Mal. Pen. 4 (1924) 330; B. M. ALLEN, Mal. Nat. J. 19 (1966) 303. — *T. perakensis* NICHOLS. Ill. Dict. Gard., Cent. Suppl. (1901) 722. — **Fig. 14a–c.**

Leaves few, surrounded by several sessile lanceolate scale-like leaves to 25(–40) cm long, elliptic or sublinear to oblanceolate, acute or acuminate, cuneate at the base; lamina (50–)70–150 by 6–14 cm; petiole often winged and poorly defined, to 40 cm. *Inflorescence* erect, 20–50 cm long when in flower, lengthening slightly in fruit, with up to 100 or more flowers, with a strong smell. Bracts somewhat amplexicaul, ovate, 5–10 by 2–6 mm. *Perianth* segments violet to dark purple; tube 5–11 mm long, 5–10 mm wide; lobes darker than tube, oblong to ovate, 4–14 by 3–5 mm. *Anthers* sessile, attached near top of tube, $1^1/_4$–2 mm long. *Style* and *ovary* white, $7^1/_2$–16 mm long; stigma $4^1/_2$–$12^1/_2$ mm ∅, peltate, flat to biconvex, sometimes rugulose or irregularly lobed.

Distr. *Malesia:* Malay Peninsula (Perak, Kelantan, Pahang, Selangor, Langkawi) and N. Sumatra (Tapanuli Res.: Karo Highlands); probably also in Thailand.

Ecol. In Malaya records suggest that it usually occurs in wet rocky places on limestone. In Sumatra it grows in forest at 600–1225 m, but in Malaya there is a record of 150 m in Perak. *Fl.* Jan.–Dec.

Vern. N. Sumatra: *singkut antu*, Karo-Batak.

Note. The Sumatran specimens tend to have longer spikes and larger flowers than the Malayan material. No characters have, however, been found on which to base taxonomic separation.

Excluded

Tupistra singapureana [WALL. Cat. *n.* 5195]; BAKER, J. Linn. Soc. Bot. 14 (1875) 581; HOOK. *f.* Fl. Br. Ind. 6 (1892) 325, was omitted from the genus by S. KURZ (J. As. Soc. Beng. 44, ii, 1875, 199) and has indeed appeared not to belong to *Liliaceae*. It was referred by RIDLEY (Mat. Fl. Mal. Pen. Monoc. 1, 1907, 232) to *Neuwiedia curtisii* ROLFE and by ROLFE (Kew Bull. 1907, 412) to *Neuwiedia singapureana* (BAKER) ROLFE.

According to DE VOGEL (Blumea 17, 1969, 331) = *Neuwiedia zollingeri* RCHB. *var. singapureana* (BAKER) DE VOGEL (*Orchidaceae*).

Tupistra squalida KER-GAWL. Bot. Mag. 39 (1814) t. 1655; EDWARDS, Bot. Reg. (1823) t. 704; LODDIGES, Bot. Cab. 6 (1821) t. 515; BL. Tijd. Nat. Gesch. Phys. 1 (1834) 67, t. IIIC; MIQ. Fl. Ind. Bat. 3 (1859) 569; BAKER, J. Linn. Soc. Bot. 14 (1875) 580; *cf.* HOOK. *f.* Fl. Br. Ind. 6 (1892) 324, *in nota sub T. nutans.* — *Rhodea tupistra* SCHULT. Syst. 7, 2 (1829) 173, *nom. illeg.*

The provenance of this species, the type of the genus, was given as 'Amboyna'. This is certainly erroneous. It was described from a cultivated plant in the nurseries of LODDIGES, and was obviously in the former century cultivated in several botanic gardens. The more curious it is that its proper identity and native country remains more or less uncertain.

BAKER *l.c.* reduced *T. nutans* WALL. (Bot. Reg. t. 1333) from India to this species, but HOOKER *f.* kept these two entities apart.

18. LIRIOPE

LOUR. Fl. Coch. (1790) 200; L. H. BAILEY, Gent. Herb. 2 (1929) 3; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 376; WANG & TANG, Act. Phytotax. 1 (1951) 331; HUME, Baileya 9 (1961) 135. — *Ophiopogon* (*non* KER-GAWL.) KUNTH, En. Pl. 5 (1850) 297, in part. — **Fig. 16d.**

Stemless or shortly caulescent, rhizomatous herbs. Roots thick, sometimes with tuberous swellings. *Leaves* usually basal, petioled or subpetioled linear to oblanceolate or lanceolate, many-nerved. *Inflorescence* a spike or raceme. Flowers solitary or fascicled in the axil of each bract. *Perianth* segments fleshy, campanulate, free or with a broad tube and short lobes, equal, with 1 vein, violet or white. *Anthers* 6–8, subsessile or pedicels short, attached near base of perianth, dorsifixed, introrse. *Ovary* superior, sessile, ovoid to subglobose, 3–4-celled; ovules axile, 2 in

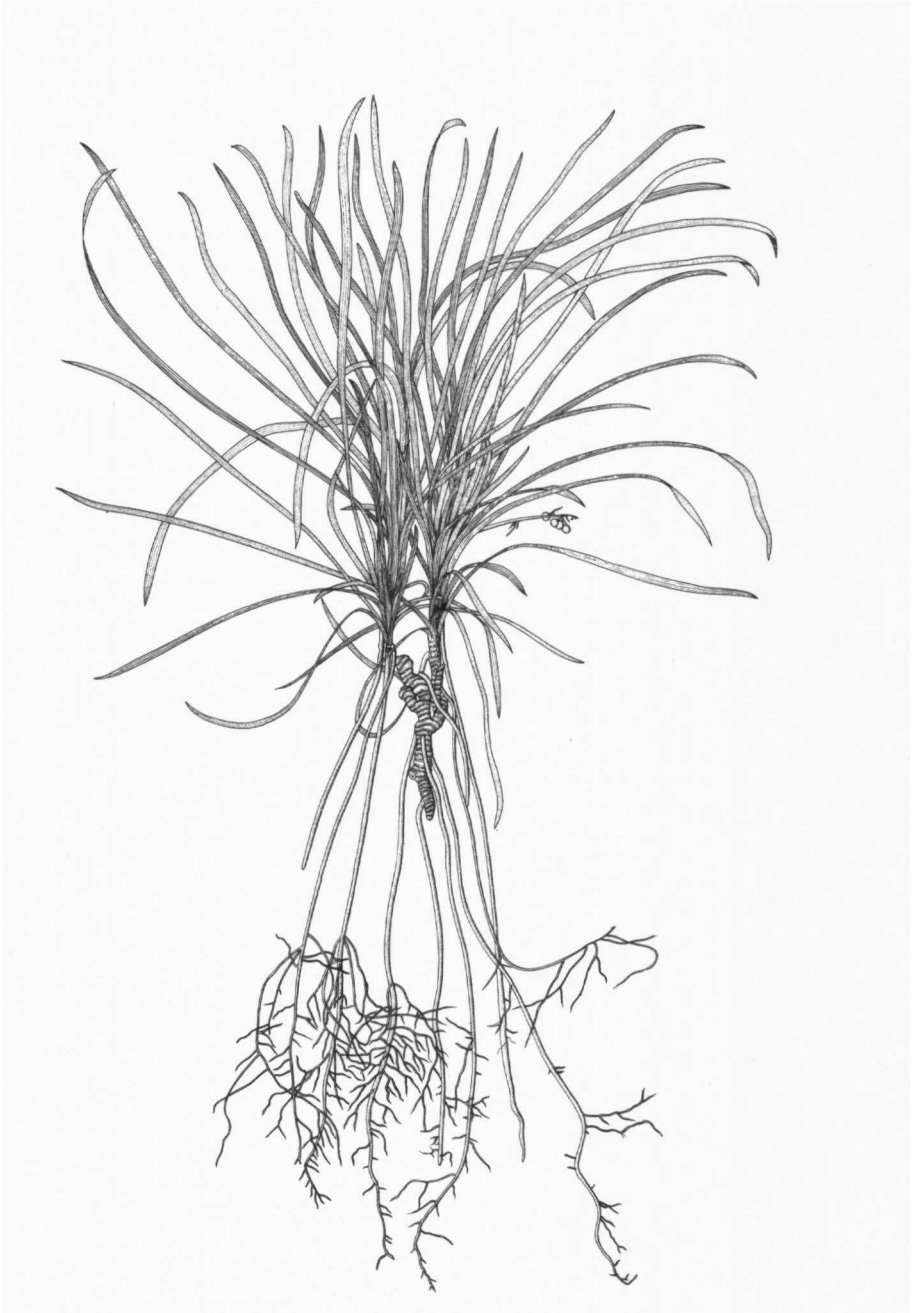

Fig. 15. *Ophiopogon caulescens* (BL.) BACK. Habit, with seed, × 1/4. In forest above mountain garden Tjibodas, Febr. 1936.

each locule; style short and thick; stigma capitate or peltate. Ovary wall rupturing early in the growth of the seeds which are therefore exposed during most of their development. *Seeds* black, globose or slightly elongate, with fleshy testa; perianth persistent.

Distr. About 5 *spp.*, in Japan, China, Indo-China and *North Malesia:* N. Philippines.
Note. Some species are widely grown as ornamentals.

1. Liriope graminifolia (L.) BAKER, J. Linn. Soc. Bot. 17 (1879) 499; MERR. En. Philip. 1 (1922) 207; HUME, Baileya 9 (1961) 150. — *Asparagus graminifolius* LINNÉ, Sp. Pl. ed. 2 (1762) 450. — *Dracaena graminifolia* (L.) LINNÉ, Syst. Nat. ed. 12 (1767) 275. — ? *L. spicata* LOUR. Fl. Coch. (1790) 201; L. H. BAILEY, Gent. Herb. 2 (1929) 33; MERR. Comm. Lour. (1935) 109; HUME, Baileya 9 (1961) 150, 152, 158. — ? *Ophiopogon spicatus* (LOUR.) KER-GAWL. Bot. Reg. 7 (1821) t. 593; NAVES, Nov. App. (1880) 264. — *Mondo graminifolia* (L.) KOIDZ. Tokyo Bot. Mag. 40 (1926) 333. — *L. muscari* [*non* (DECNE) L. H. BAILEY] HATUS. Mem. Fac. Sc. Kagoshima Un. 5, 3 (1966) 62. — **Fig. 16d.**

Rhizome horizontal, slender, moderately woody. Roots bearing distant tubers. *Leaves* basal, caespitose, linear to narrowly linear-oblanceolate, minutely denticulate on the margins, the central vein sometimes conspicuously larger than the others, expanded to form membranous wings towards the base, 25–90 cm long, 2–9 mm broad. Peduncle erect, (12–)30–50 cm long, shorter than leaves. Bracts deltoid, to 4 mm long. *Pedicels* 2–5-nate, 2–12 mm long, articulated at the base of the flower. Leafy shoots occasionally produced from axil of bracts on inflorescence. *Perianth* segments free, $3^1/_2$–4 mm long, violet. *Filaments* to 2 mm long; anthers *c.* 1 mm long. *Seeds* oblong (perhaps only when young) or globose, *c.* 5 mm long.

Distr. Japan, China and *North Malesia:* Philippines (Batan Is.; Mindoro and Luzon).

The paucity of collections suggests that this species is rare in the Philippines.

Ecol. Open slopes at *c.* 1400 m (MERRILL, *l.c.*), but obviously in the Batan Is. at low altitude.

Notes. The differences between *L. graminifolia* and *L. spicata* are not clear. HUME depended for their separation largely on the conspicuous membranous basal wings to the leaves of the former, associated with quantitative characters of the leaves and inflorescence. *L. graminifolia* is likely to remain the correct name for the Philippine species whether *L. spicata* is treated as a synonym or not.

L. muscari (DECNE) L. H. BAILEY (Gent. Herb. 2, 1929, 35) differs according to HUME by caespitose habit and stiffer and wider leaves (8–26 mm).

19. OPHIOPOGON

KER-GAWL. Bot. Mag. 27 (1807) t. 1063; HOOK. *f.* Fl. Br. Ind. 6 (1892) 267; RIDL. Fl. Mal. Pen. 4 (1924) 326; RODRIGUEZ, Bull. Soc. Bot. Fr. 75 (1928) 997; Fl. Gén. I.-C. 6 (1934) 655; BACK. & BAKH. *f.* Fl. Java 3 (1968) 95, *nom. gen. cons.* — *Mondo* ADANS. Fam. 2 (1763) 496; FARWELL, Amer. Midland Nat. 7 (1921) 41; L. H. BAILEY, Gentes Herb. 2 (1929) 17; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 377; OHWI in Fedde, Rep. 36 (1934) 45. — *Flueggea* RICH. Neues J. Bot. 2 (1807) 8 ('*Fluggea*'); BAKER, J. Linn. Soc. Bot. 17 (1879) 500. — *Chloopsis* BL. En. Pl. Jav. (1827) 14; HASSK. Flora 34 (1851) 481. — **Fig. 15, 16a–c.**

Stemless herbs. *Rhizome* sometimes very short; roots fibrous or fleshy, sometimes tuberous. *Leaves* basal, linear or petioled with a broad lamina, expanded at the base to form a conspicuous scarious sheath. *Inflorescence* a raceme. *Pedicels* 1–several-nate, in the axils of bracts and usually associated with a few smaller bracts also apparently in the axil of the principal bract, articulated usually in the distal half. *Perianth* segments free, equal, with 1 vein, spreading or campanulate, white or violet. *Filaments* often connate, short, thick, glabrous, attached to the base of the perianth segments or to the receptacle; anthers basifixed, linear-oblong, dehiscing introrsely. *Ovary* superior to inferior, 3-celled; ovules basal, 2(–6) in each locule;

style columnar, minutely 3-lobed. Ovary wall rupturing early in the growth of the seeds which are therefore exposed during most of their development. *Seeds* blue, often globose, with fleshy testa; perianth often wholly or partly persistent.

Distr. India through to southern China to Thailand, Indo-China, Japan and Taiwan; in *Malesia:* Malay Peninsula, Sumatra, Java, Borneo, and Philippines.

About 70 *spp.* of *Ophiopogon* have been described, but I doubt whether more than a third of these should be recognized.

Ecol. In forest.

Notes. RIDLEY recognized *O. malayanus*, *O. intermedius* and *O. prolifera* from the Malay Peninsula. No fertile material has been seen from this area and the only specimens seen (CORNER SF 37872, K & L, and SOEPADMO & MAHOMUD 1214, K) do not differ significantly from *O. caulescens*.

No Malayan material identified as *O. intermedius* or *O. prolifera* has been seen.

RIDLEY characterized *O. prolifera* by having the filaments connate, and distinguished *O. intermedius* from *O. malayanus* on its larger flowers (12 mm wide). He did not give a comparable figure for *O. malayanus* but recorded that the segments were 3 mm long.

The descriptions could all be of varieties of *O. caulescens*, falling within the morphological range known for that species from Java, except that the shortest perianth recorded for Java material is 4 mm long (almost 50% greater than the length recorded for *O. malayanus*).

O. malayanus has also been recorded from the Philippines and Borneo (MERRILL, 1922).

Material from continental Asia of *O. intermedius* resembles *O. japonicus*, but no material has been seen from the Malay Peninsula.

KEY TO THE SPECIES

1. The broadest leaves on each plant more than 4 mm broad. Rhizome well-developed. Lowest bracts 12–25 mm long . . . . . **1. O. caulescens**
1. The broadest leaves on each plant less than 3 mm broad. Rhizome poorly developed. Lowest bracts 5–10 mm long . . . . . **2. O. japonicus**

1. Ophiopogon caulescens (BL.) BACK. Handb. Fl. Java 3 (1924) 74; VAN HELTEN, Med. Alg. Proefstation Landb. *n.* 16 (1924) 49 (*'gauliscens'*); RIDL. J. Bot. 43 (1925) Suppl. 122; DOCT. v. LEEUWEN, Verh. Kon. Ak. Wet. A'dam sect. II, 31 (1933) 252; BACK. & BAKH. *f.* Fl. Java 3 (1968) 95. — ? *O. intermedius* D. DON, Prod. Fl. Nep. (1825) 48; RIDL. J. Fed. Mal. St. Mus. 4 (1909) 81, *incl. var. macranthum* RIDL.; Fl. Mal. Pen. 4 (1924) 327. — *Chloopsis caulescens* BL. En. Pl. Jav. (1827) 14; ZOLL. Syst. Verz. 1 (1854) 67; MIQ. Fl. Ind. Bat. 3 (1859) 553. — *Chloopsis acaulis* BL. En. Pl. Jav. (1827) 14; MIQ. Fl. Ind. Bat. 3 (1859) 553. — ? *O. prolifera* LINDL. J. Hort. Soc. 1 (1846) 76; MIQ. Fl. Ind. Bat. 3 (1859) 568; RIDL. Mat. Fl. Mal. Pen. Monoc. 2 (1907) 91. — *Fluggea wallichiana* KUNTH, En. Pl. 5 (1850) 303. — *O. wallichianus* (KUNTH) HOOK. *f.* Fl. Br. Ind. 6 (1892) 268; RIDL. J. Fed. Mal. St. Mus. 8 (1917) 118. — *O. malayanus* RIDL. J. Str. Br. R. As. Soc. *n.* 41 (1904) 34; Mat. Fl. Mal. Pen. Monoc. 2 (1907) 91; MERR. En. Born. (1921) 115; En. Philip. 1 (1922) 207; Contr. Arn. Arb. 8 (1934) 19. — *Mondo malayanum* (RIDL.) FARWELL, Amer. Midland Nat. 7 (1921) 42. — *O. japonicus* (*non* (L. *f.*) KER-GAWL.) KOORD. Fl. Tjib. 1 (1922) 47. — *O. acaulis* (BL.) RIDL. J. Bot. 63 (1925) Suppl. 122. — **Fig. 15, 16b.**

Rhizome rather woody and well-developed, sometimes supported by several thick prop-roots; roots thick but not bearing tubers. *Leaves* numerous, linear to linear-oblanceolate, often slightly arcuate, subacute or narrowly obtuse, often with a prominent midrib, glaucous (waxy), or with glaucous stripes, on the lower surface, (15–)25–55(–65) cm by 3–10(–22) mm. Peduncle flattened, 10–35(–46) cm long. *Flowers* 3–12, ± secund. Lower bracts 12–25 mm long. *Pedicels* solitary or, less often, 2-nate, spreading or erect-spreading, articulated often near the centre, 3–8 mm. *Perianth* segments white or violet, oblong or ovate- or elliptic-oblong, usually obtuse, the inner often slightly smaller than the outer, free segments (5–)7–7½ by 2–3 mm. *Anthers* (2–)4–5½ mm long; filaments connate at the base, *c.* ½–2 mm, up to 1 mm broad at the base. *Ovary* inferior or semi-inferior; style terete, linear-obconic, (4½–)5–7(–9) mm, simple or minutely trifid; ovules 2 per locule. *Seeds* up to 6, glossy blue, globose or slightly ovoid or ellipsoid, 4–8 mm long.

Distr. Continental SE. Asia and *West Malesia:* Malay Peninsula (also Langkawi), Sumatra, all over Java, Sabah (Kinabalu area), S. Philippines (Sulu Is.: Jolo).

Ecol. Generally a forest species reported from 'rain forest' and 'primary forest'. Also recorded from screes, (650–)1000–2000 m. *Fl.* Jan.–Dec. DOCTERS VAN LEEUWEN *l.c.* stated that self-pollination is the rule.

Vern. Java: *suket alank*, J; Sabah: *ryran*, Murut dial.

Note. If it is shown that *O. intermedius* is synonymous with *O. caulescens*, it will become the correct name.

2. Ophiopogon japonicus (L. *f.*) KER-GAWL. Bot. Mag. 27 (1807) t. 1063; MERR. Philip. J. Sc. 1 (1906) Suppl. 35; *ibid.* 5 (1910) Bot. 338; En. Philip. 1 (1923) 207; HUME, Baileya 9 (1961) 142. — *Convallaria japonica* LINNÉ *f.* Suppl. (1781) 204. — *Mondo japonicum* (L. *f.*) FARWELL, Amer. Midland Nat. 7 (1921) 42. — *O. merrillii* MASAM. Bull. Soc. Bot. Fr. 84 (1937) 90. — **Fig. 16a.**

Rhizome poorly developed; roots fibrous with distinct tubers usually less than $1^1/_2$ cm long and 4 mm broad (not present in all herbarium material even where roots are well represented). *Leaves* numerous, linear, usually more or less straight, acute or subacute, usually minutely denticulate on vein and margin, usually with a distinct midrib, glaucous (waxy) on the lower surface, 18–60 cm by $1^1/_2$–$3(-3^1/_2)$ mm. Peduncle (10–)12–35 cm. Lower bracts 5–10 mm long. *Pedicels* solitary, spreading or erect-spreading, articulated near or below the middle, $2^1/_2$–3 mm. *Perianth* segments white or violet, oblong-elliptic or ovate, obtuse, the inner slightly smaller than the outer, free segments, $3^1/_2$–4 by 2–3 mm. *Anthers* 2–$2^1/_2$ mm long; filaments connate at the base, *c.* $^1/_4$ mm long and up to $^1/_4$ mm broad at the base. *Ovary* inferior or semi-inferior; style terete, sublinear, *c.* 3 mm, simple; ovules 2 per locule. *Seeds* up to 6, glossy blue, globose or slightly ellipsoid, *c.* 4 mm long.

Distr. Japan and *North Malesia:* Philippines (Luzon: Benguet Prov.; Mindanao: Mt Apo).

Ecol. Chiefly in mossy forest, rather common in the Mountain Province, 850–2400(–2900) m. *Fl.* May–July, *fr.* Dec.–Jan.

Vern. Philippines: *langigit*, Ig., *takadu*, Bon., *uli-uli*, Bag.

Note. A commonly cultivated garden plant in Java and other places in Malesia, especially for lining borders, but never flowering in the lowland.

20. PELIOSANTHES

ANDR. Bot. Repos. 10 (1810) t. 605; HASSK. Tijd. Nat. Gesch. Phys. 10 (1843) 121 ('*Piliosanthes*'); BAKER, J. Linn. Soc. Bot. 17 (1879) 503; HOOK. *f.* Fl. Br. India 6 (1892) 265; RIDL. Fl. Mal. Pen. 4 (1924) 323; RODRIGUEZ, Fl. Gén. I.-C. 6 (1934) 668; JESSOP, Blumea 24 (1976) 141. — *Teta* ROXB. [Hort. Beng. 1814, 24, *nomen*] Fl. Ind. ed. Carey 2 (1832) 165. — *Bulbisperma* REINW. *ex* BL. Cat. (1823) 59, *nomen.* — *Bulbospermum* BL. En. Pl. Jav. (1827) 15. — *Lourya* BAILL. Bull. Soc. Linn. Paris 1 (1888) 743. — *Neolourya* RODRIGUEZ, Bull. Mus. Hist. Nat. Paris II, 6 (1934) 96. — **Fig. 16e–g.**

Erect, stemless, perennial herbs. *Rhizome* usually very short and horizontal; roots thick. *Leaves* basal, usually distinctly petioled, the blade sublinear to ovate or obovate, many-nerved. Peduncles flattened, at least at the base, erect, usually solitary. Pedicels and inflorescence surrounded at the base by scarious scale-like leaves. *Inflorescence* a simple raceme. *Pedicels* articulated. Flowers 1–6-nate in the axils of each bract. *Perianth* segments fleshy, campanulate or subglobose, fused below, equal, 1-veined, white, green, blue, violet or purple. *Anthers* sessile, attached to a short annular tube (corona) arising from the perianth, introrse. *Ovary* superior to inferior, 3-celled; ovules basal, 2–5 in each locule; style simple, conical to cylindrical; stigma capitate or undifferentiated. Ovary wall rupturing early in the growth of the seeds which are therefore exposed during most of their development. *Seeds* blue, ellipsoid to pyriform, with fleshy testa; perianth often persistent.

Distr. Monotypic, widespread in continental SE. Asia, from the southern Deccan to NE. India and southern China, in *West Malesia:* Malay Peninsula, Sumatra, Java, Lesser Sunda Is. (Sumbawa) and Borneo.

Ecol. Usually in forest, from the lowland to the mountains.

Note. In the past far too many species were described. For an account of the taxonomic problems on specific delimitation, see JESSOP (1976).

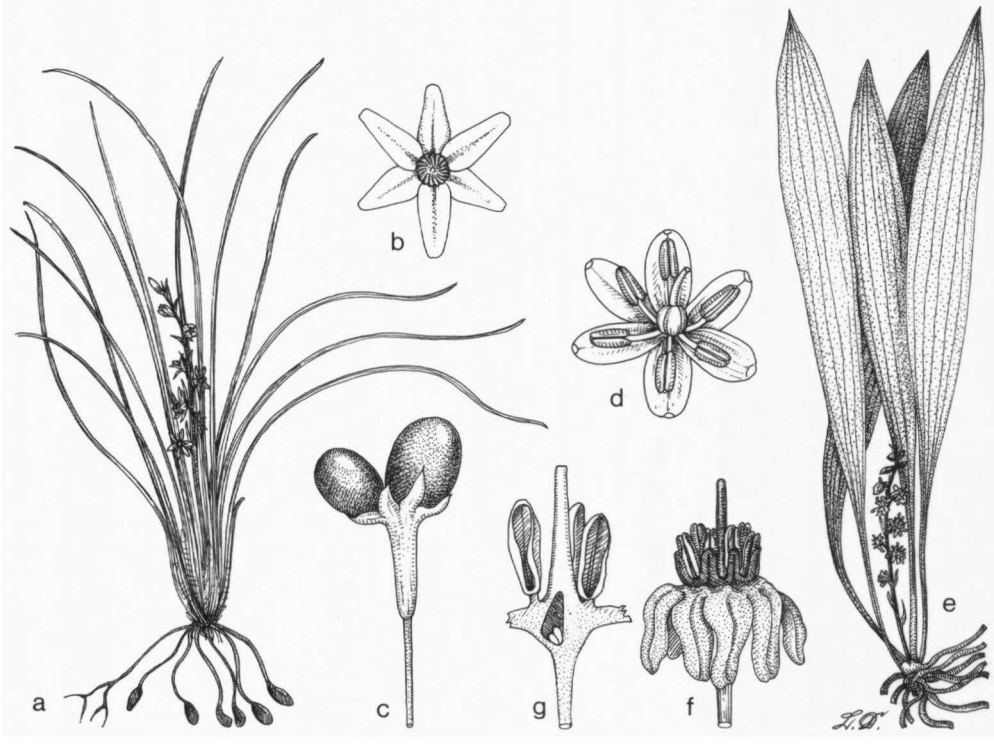

Fig. 16. *Ophiopogon japonicus* (L. *f.*) KER-GAWL. *a.* Habit, × 1/4. — *O. caulescens* (BL.) BACK. *b.* Flower, × 2. — *Ophiopogon sp. c.* Mature seeds, × 2. — *Liriope graminifolia* (L.) BAKER. *d.* Flower, × 4. — *Peliosanthes teta* ANDR. *ssp. humilis* (ANDR.) JESSOP. *e.* Habit, × 1/2, *f.* flower, perianth shown reflexed to reveal corona, × 3, *g.* LS of flower to show attachment of corona and position of ovary, × 7 (*a, c* SWINBURNE *s.n. ex* Hort. Adelaide, *b* after STEEN. Mt. Fl. Java pl. 28: 3b, *d* largely after E. & P. Nat. Pfl. Fam. ed. 2, 15a, fig. 153 '*O. spicata*', *e–g* SØRENSEN *c.s.* 2960).

1. Peliosanthes teta ANDR. Bot. Repos. 10 (1810) t. 605; BAKER, J. LINN. Soc. Bot. 17 (1879) 505; HOOK. *f.* Fl. Br. Ind. 6 (1892) 265; RIDL. Mat. Fl. Mal. Pen. Monoc. 2 (1907) 88; Fl. Mal. Pen. 4 (1924) 323; RODRIGUEZ, Fl. Gén. I.-C. 6 (1934) 669; JESSOP, Blumea 24 (1976) 154.

For synonyms see under the subspecies.

Leaves (2–)4–8(–12); leaf-blades (7 1/2–)12 1/2–47 1/2 by 1 1/2–8 1/2(–11 1/2) cm; petioles (4–)7 1/2–50 cm long, slightly compressed. Peduncles to 35(–75) cm high; lower sterile bracts 0–4(–15), to 15(–40) mm long; fertile bracts to 15(–30) mm long, smaller towards the apex of the raceme. *Flowers* 1–6-nate. *Pedicels* 1–6(–10) mm long, enlarging after flowering; articulation usually close to flower. *Perianth* segments suborbicular to linear, 1 1/2–6(–8) mm long. *Corona* forming a disk *c.* 3–4 mm ∅, entire or 6-toothed. *Anthers* usually rather closely adpressed to the style, *c.* 1/2–2 mm long. *Ovary* most frequently semi-inferior; style often 3- or 6-ridged or fluted, 3/4–1(–2) mm long. *Seeds* up to 10–12 mm long.

Distr. Tropical SE. Asia; in *Malesia:* Malay Peninsula, Sumatra, Java, Lesser Sunda Is. (Sumbawa), Borneo.

Ecol. Primarily in wet evergreen forest, from 0–3000 m above sea-level. A few records indicate that dry areas are also occasionally occupied, possibly in wet enclaves. The subspecies appear to grow in similar habitats.

Note. Grown as a garden ornamental or pot plant.

a. *ssp.* teta. — *Cf.* JESSOP, Blumea 24 (1976) 155. — *Teta viridiflora* ROXB. Fl. Ind. ed. Carey 2 (1832) 165. — *P. teta var. mantegazziana* PAMP. Nuovo Giorn. Bot. Ital. n.s. 11 (1904) 151; Bull. R. Soc. Toscana Ortic. III, 10 (1905) 50, f. 11. — *P. mantegazziana* (PAMP.) PAMP. Nuovo Giorn. Bot. Ital. n.s. 13 (1906) 138; MERR. & QUIS. Philip. J. Sc. 82

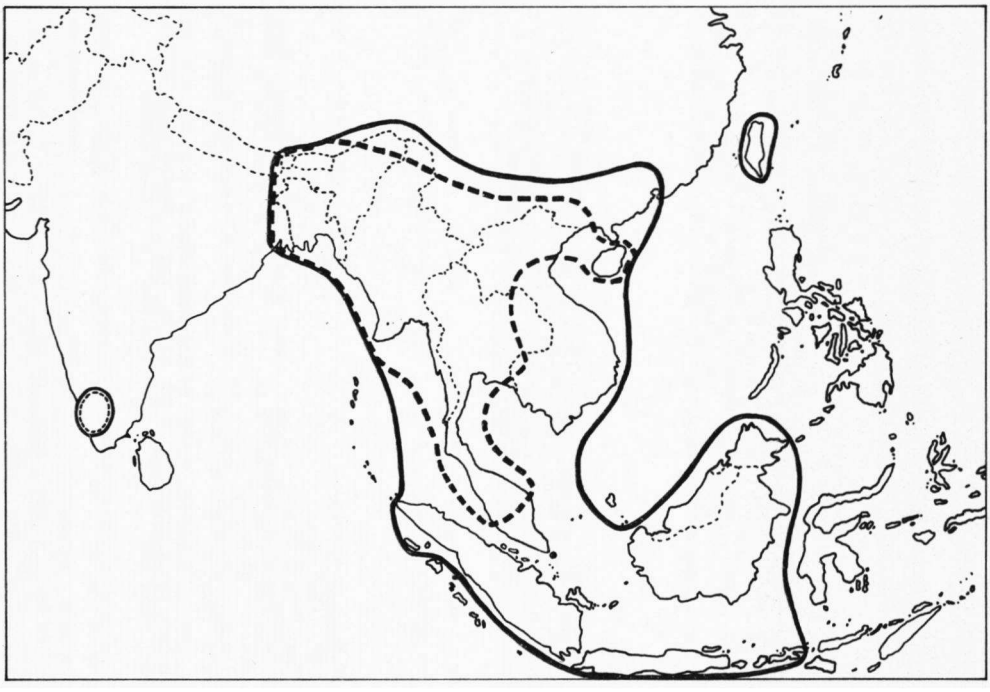

Fig. 17. Range of *Peliosanthes teta* ANDR. *ssp. teta* (broken line), and *ssp. humilis* (ANDR.) JESSOP (even line).

(1953) 323. — *P. graminea* RIDL. J. Str. Br. R. As. Soc. *n.* 59 (1911) 207. — *P. teta var. angustifolia* RIDL. *l.c.* — *P. tonkinensis* WANG & TANG, Bull. Fan Mem. Inst. Biol. Peiping, Bot. 7 (1936) 83.

Pedicels 2–6-nate. Leaf index 2–24(–34). Flowers usually green, rarely blue. Anthers *c.* 0.5–0.6 mm long.

Distr. India to southern China; in *Malesia:* Malay Peninsula (Pahang, Selangor, Penang and Langkawi Is.). Fig. 17.

b. *ssp.* humilis (ANDR.) JESSOP, Blumea 24 (1976) 155. — *P. humilis* ANDR. Bot. Repos. 10 (1811) t. 634; MIQ. Fl. Ind. Bat. 3 (1859) 568. — *Bulbisperma ovigera* REINW. *ex* BL. Cat. (1823) 59, *nomen.* — *Bulbospermum javanicum* BL. En. Pl. Jav. (1827) 15; ZOLL. Syst. Verz. 1 (1854) 68. — *P. javanica* (BL.) DIETR. Syn. Pl. 2 (1840) 1123; HASSK. Tijd. Nat. Gesch. Phys. 10 (1843) 121; Pl. Jav. Rar. (1848) 116; MIQ. Fl. Ind. Bat. 3 (1859) 568; BACK. Handb. Fl. Java 3 (1924) 75; BACK. & BAKH. *f.* Fl. Java 3 (1968) 95; STEEN. Mt. Fl. Java (1972) t. 28–4. — *P. violacea* WALL. *ex* BAKER, J. Linn. Soc. Bot. 17 (1879) 504; HEND. Mal. Wild Flow. Monoc. (1954) 184, f. 108. — *Lourya campanulata* BAILL. Bull. Soc. Linn. Paris 1 (1888) 743. — *P. albida* BAKER, Bot. Mag. 116 (1890) t. 7110; HOOK. *f.* Fl. Br. Ind. 6 (1892) 267; RIDL. Mat. Fl. Mal. Pen. Monoc. 2 (1907) 90; MERR. En. Born. (1921) 115; FISCHER, Kew Bull. (1932) 183. — *P. viridis* RIDL. J. Str. Br. R. As. Soc. *n.* 31 (1898) 95. — *P. lurida* RIDL. *l.c.* 95. — *P. grandifolia* RIDL. *l.c.* 97. — *P. stellaris* RIDL. *l.c.* 97. — *P. parviflora* RIDL. *ibid. n.* 61 (1912) 61. — *P. sumatrensis* RIDL. J. Fed. Mal. St. Mus. 8 (1917) 118. — *P. sessiliflora* RIDL. *l.c.* 118. — *P. hypogyna* RIDL. *ibid.* 10 (1920) 121. — *P. monticola* RIDL. *l.c.* 155. — *P. campanulata* (BAILL.) RODRIGUEZ, Bull. Mus. Hist. Paris II, 6 (1934) 96. — **Fig. 16e–g.**

Pedicels solitary in the axil of each bract. Leaf index 2–10. Flowers sometimes green, but often white, blue, violet or purple. Anthers *c.* $^1/_2$–2 mm long.

Distr. India to southern China; in *Malesia:* Malay Peninsula (throughout, incl. the Langkawi, Penang, Singapore and Tioman Is.), Sumatra (throughout, incl. Simalur and Billiton Is.), Java (throughout), Lesser Sunda Is. (Sumbawa) and Borneo (Sarawak, Southeast, Sabah, incl. the Anambas and Karimata Is.). Fig. 17.

21. ALETRIS

LINNÉ, Sp. Pl. (1753) 319; Gen. Pl. ed. 5 (1754) 149; Amoen. Acad. 3 (1756) 11 ('*Alethris*'); HOOK. *f.* Fl. Br. Ind. 6 (1892) 264; FRANCHET in Morot, J. de Bot. 10 (1896) 178, 195; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 378; HARA, J. Jap. Bot. 42 (1967) 312. — *Metanarthecium* MAXIM. Bull. Ac. St. Pétersb. 11 (1867) 438; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 260. — *Meta-aletris* MASAM. Trans. Nat. Hist. Soc. Formosa 28 (1938) 46. — **Fig. 18, 19.**

Erect, stemless, rhizomatous herbs. Roots fibrous. *Leaves* basal, linear or lanceolate, sessile, the veins of the decayed bases persisting as fibres at the base of the plant. *Inflorescence* a raceme or spike. Flowers solitary in the axils of the bracts, with a single bracteole. *Pedicels* not articulated. *Perianth* segments connate at the base, equal, with three (often indistinct) veins, ascending or reflexing, glabrous or pubescent, white or pink. *Filaments* subulate, shorter than and attached to perianth; anthers dorsifixed, oblong to ovoid, dehiscing introrsely. *Ovary* half-inferior, 3-celled; ovules axile, numerous; style simple or minutely 3-lobed. *Fruit* a capsule; perianth persistent. Seeds oblong.

Distr. North America (few *spp.*) and eastern Asia, from Japan to southern China (also Taiwan) and the Himalayas, in *Malesia:* only on the high mountains of the Philippines (N. Luzon), Sabah (Mt Kinabalu) and N. Sumatra (Gajolands and Westcoast Res.).

There are possibly fewer than 15 *spp.*, mostly in Asia, but HARA *l.c.* estimates the number at *c.* 30.

Ecol. Elfin forest and mossy mountain forest, but mostly in open, sometimes damp situations in sedge- or grasslands, crevices of rocks, and mountain heaths, locally often common, between (1000–)1600 and 3250 m.

KEY TO THE SPECIES

1. Perianth glabrous. Leaves mostly spreading, usually at least 4 mm broad . . . . . **1. A. foliolosa**
1. Perianth glandular-pubescent. Leaves usually erect, less than 4 mm broad . . . . . **2. A. spicata**

1. Aletris foliolosa STAPF, Trans. Linn. Soc. II, 4 (1894) 240; DOCT. v. LEEUWEN, Trop. Natuur 9 (1920) 98, fig.; MERR. En. Born. (1921) 115; DOCT. v. LEEUWEN, Verh. Kon. Ak. Wet. A'dam sect. II, 31 (1933) 251, f. 66 ('*foliosa*'). — *A. rigida* STAPF, Trans. Linn. Soc. II, 4 (1894) 241; GIBBS, J. Linn. Soc. Bot. 42 (1914) 164; MERR. En. Born. (1921) 115. — ? *Liriope brachyphylla* MERR. Philip. J. Sc. 2 (1907) Bot. 266; En. Philip. 1 (1922) 206. — ? *Metanarthecium brachyphyllum* (MERR.) MASAM. Bull. Soc. Bot. Fr. 84 (1937) 18. — *A. sumatrana* MASAM. *l.c.* 18. — *Meta-aletris sumatrana* (MASAM.) MASAM. Trans. Nat. Hist. Soc. Formosa 28 (1938) 46. — *Meta-aletris rigida* (STAPF) MASAM. *l.c.* 46. — **Fig. 18a–d, 19.**

Leaves glabrous, ascending at first but usually spreading when mature and finally recurved, to 6(–10) cm by 4–7(–10) mm; veins several, close to one another. Peduncles 1 or more, 6–65 cm high, glabrous, rigid, with 1–6 narrow-lanceolate, sterile bracts to 2 cm long; fertile bracts 4–20, lanceolate, 5–10 mm long; bracteoles similar to bracts but shorter. *Pedicels* 0–5 mm long in flower, sometimes over 1 cm in fruit, usually expanding gradually to the ovary. *Perianth* segments white, pink, yellow or brownish, glabrous, shortly connate, arising near the middle of the ovary, oblong, obtuse, $2^1/_2$–$3^1/_2$ by *c.* $^1/_2$–$^3/_4$ mm. *Anthers* yellow to red, $^1/_2$–1 mm long; filaments arising *c.* $^1/_2$ mm from base of perianth, the base conspicuously decurrent, $1^1/_2$–2 mm long. *Ovary* 3-lobed, 2–$2^1/_2$ mm long, ellipsoid or obovoid; style 1–$1^1/_2$ mm, simple or minutely 3-lobed, caducous. *Capsule* ellipsoid or ovoid, to 7 mm long.

Distr. *Malesia:* Sabah (Mt Kinabalu) and North Sumatra (Gajolands and some volcanoes of the Westcoast Res., especially Mt Singalang), possibly also in the Philippines (Mindoro: Mt Halcon).

STAPF's (1894) record from Malaya seems to be erroneous.

Ecol. Elfin and mossy forest, but mostly in the open mountain heath, both on stony ground and in boggy places, between moss-cushions, 2000–3450 m. *Fl.* (Jan.–)March–Sept.(–Dec.).

In West Sumatra DOCTERS VAN LEEUWEN *l.c.* observed that the flowers are proterogynous and self-pollination is the rule, all flowers setting fruit.

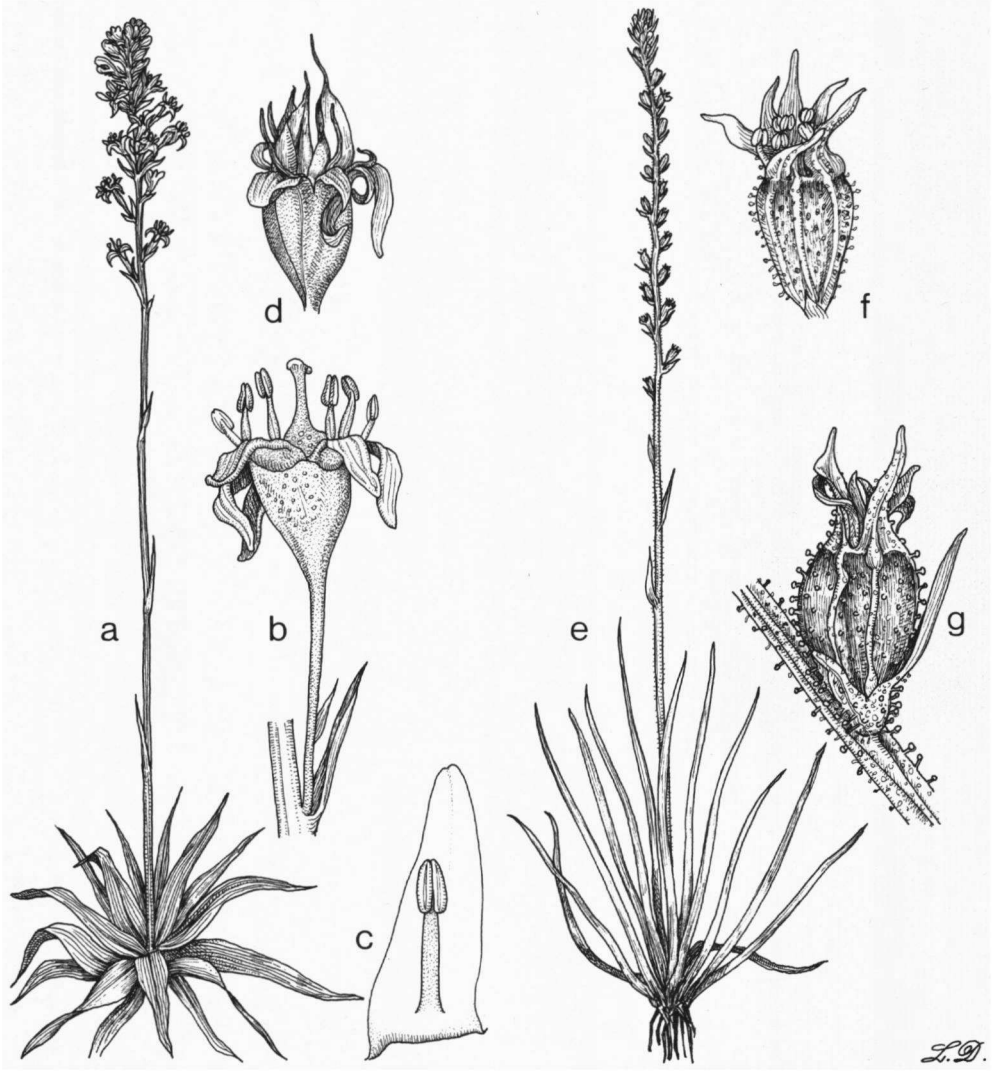

Fig. 18. *Aletris foliolosa* STAPF. *a*. Habit, × 1/2, *b*. flower, × 5, *c*. tepal with stamen, × 10, *d*. dehisced fruit, × 4. — *A. spicata* (THUNB.) FRANCH. *e*. Habit, × 1/4, *f*. flower, × 7 1/2, *g*. fruit, × 7 1/2 (*a–d* SCHIFFNER 1700, *e* CLEMENS 9178, *f–g* JACOBS 7426).

Notes. *A. foliolosa* and *A. rigida* were both originally described from Borneo, differing principally in size, but, as pointed out by several collectors in field notes (*e.g.* SINCLAIR and SLEUMER), the range of intermediates is such that the characters STAPF used to separate them break down. The smaller form tends to occur at higher altitudes (above 2700 m) and does not occur in Sumatra.

Plants from Sumatra often differ from those from Borneo in having longer pedicels, but this character is too variable to be of taxonomic significance.

Liriope brachyphylla MERR. is known only from the type collection from Mt Halcon in Mindoro (Philippines: MERRILL 5710). This collection falls within the above description of *A. foliolosa*, being

Fig. 19. *Aletris foliolosa* STAPF. In low vegetation on old lavas; Sumatra Westcoast Res., Mt Singalang, *c.* 2800 m altitude (W. MEIJER, 1956).

somewhat atypical in that the leaves appear softer and the flowers fewer (up to 7 per inflorescence) than usual. Further material is needed to decide on the identity of the Philippine material with certainty.

2. Aletris spicata (THUNB.) FRANCH. in Morot, J. de Bot. 10 (1896) 199; MERR. Philip. J. Sc. 1 (1906) Suppl. 182; *ibid.* 5 (1910) Bot. 338; En. Philip. 1 (1922) 207. — *Hypoxis spicata* THUNB. Fl. Jap. (1784) 136. — *A. japonica* LAMBERT, Trans. Linn. Soc. 10 (1811) 407, *non* THUNB. — **Fig. 18e–g.**

Leaves glabrous, usually erect, thinner than in *A. foliolosa*, usually 7–20 cm by 1–3 mm; veins 3, well-spaced. Peduncles 25–60 cm, glandular pubescent at least in the upper part, rigid, with 6–15 narrow-lanceolate sterile bracts to 5 cm long; fertile bracts 30–70, lanceolate, 3–8 mm long; bracteoles similar to the bracts but shorter; pedicels 0–1 mm, not greatly elongating in fruit, rather abruptly expanding to the base of the ovary. *Perianth* segments white, sometimes pink towards the tip, glandular pubescent, connate to one-third of their length, arising near the apex of the ovary, oblong, subacute, $2^1/_2$–3 by *c.* 1 mm. *Anthers* orange, to *c.* $^1/_2$ mm long, subsessile, attached near middle of perianth. *Ovary c.* 2 mm long, oblong to obovoid; style *c.* 1 mm, minutely 3-lobed. *Capsule* obovoid, 5 mm long.

Distr. Japan, southern China, Taiwan and *N. Malesia:* Philippines (N. Luzon: Abra, Benguet and Bontoc Prov.).

Ecol. Among grasses above (1000–)1600–2300 m, usually in pine forest, but often in open places. *Fl.* Jan.–Dec.

Vern. Philippines: *salenganga*, Ig.

22. ASTELIA

BANKS & SOLAND. *ex* R. BR. Prod. (1810) 291, *nom. gen. cons.*; BTH. Fl. Austr. 7 (1878) 11; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 360; SKOTTSB. Kongl. Svenska Vet. Ak. Handl. III, 14, 2 (1934) 1–106; VAN BALGOOY, Pac. Pl. Areas 2 (1966) 86, map 47; MOORE & EDGAR, Fl. New Zeal. 2 (1970) 27–38. — *Funckia* WILLD. Mag. Ges. Naturf. Fr. Berlin 2 (1808) 19, *nom. rejic.* — **Fig. 20.**

Stemless or short-stemmed, dioecious herbs. *Rhizome* usually well-developed; roots fibrous. *Leaves* rosulate, 3-ranked, linear to lanceolate, forming a closed sheath at the base. *Inflorescence* a panicle; peduncles 3-angled. *Pedicels* solitary in the axils of bracts, not articulated. *Perianth* segments connate, 1- or 3-nerved, erect, spreading or reflexed, the outer often larger than the inner. *Filaments* filiform or somewhat flattened, attached to the perianth segments; anthers dorsifixed, ovoid, introrse. *Ovary* superior, sessile, depressed-globose to ellipsoid, 1- or 3-celled; ovules few to numerous, axile or parietal; style thick or absent. *Fruit* a berry; perianth persistent. Seeds ovoid or angled, glossy.

Distr. About 20–30 *spp.* in the Pacific (13 in New Zealand) including Australia (Victoria, New South Wales and Tasmania), Mauritius and the Falkland Is.; in *E. Malesia:* New Guinea.

Ecol. Some species are epiphytic in forests; others grow on the ground or on rocks, usually in wet areas. Several occur in bogs and may contribute to peat formation. They are to be found from sea-level in the south but only at alpine altitudes near the equator.

1. Astelia alpina R. BR. Prod. (1810) 291; BTH. Fl. Austr. 7 (1878) 11; F.v.M. Trans. R. Soc. Vict. 1, 2 (1889) 35; BURKILL, Kew Bull. (1899) 113; RODWAY, Tasm. Fl. (1903) 212; LAUT. Bot. Jahrb. 50 (1913) 298; KRAUSE, Bot. Jahrb. 59 (1925) 559; SKOTTSB. Kongl. Svenska Vet. Ak. Handl. III, 14, 2 (1934) 26. — *A. papuana* SKOTTSB. *l.c.* 29, *incl. f. minor* SKOTTSB. *l.c.* 30; HOOGL. Blumea Suppl. 4 (1958) 235. — **Fig. 20.**

Erect herb, forming dense cushions. *Leaves* linear to narrowly lanceolate, often with a silvery film on the upper surface and densely covered by silvery scales on the lower surface or glabrescent, often with red margins, 3–13(–40) cm by 3–7 (–25) mm, with 1–3 major veins and several minor; leaf bases persistent and forming a silvery sheath round the rhizome. — ♂ *Panicle* densely covered by silvery scales, 2–8 cm long, with up to 3 simple branches subtended by bracts to 4(–12) cm long. Pedicels 3–6(–15) mm. Perianth segments green, pale yellow or brown, spreading or reflexed, $2^1/_2$–4 mm long, scaly on the outer surface. Filaments $^3/_4$–$1^1/_2$ mm; anthers *c.* $^1/_2$ mm long. Gynoecium sterile, green, $1^1/_2$–$2^1/_2$ mm long. — ♀ *Panicle* similar to the male but shorter, 1–5 cm long, bracts to 3(–7) cm long. Pedicels 2–4(–10) mm. Perianth segments green, pale yellow or brown, erect, 6–$7^1/_2$(–9) mm long, glabrescent on the outer surface. Staminodes $^3/_4$–$1^1/_4$ mm long. Gynoecium *c.* 6 mm long, ovoid; style not differentiated from

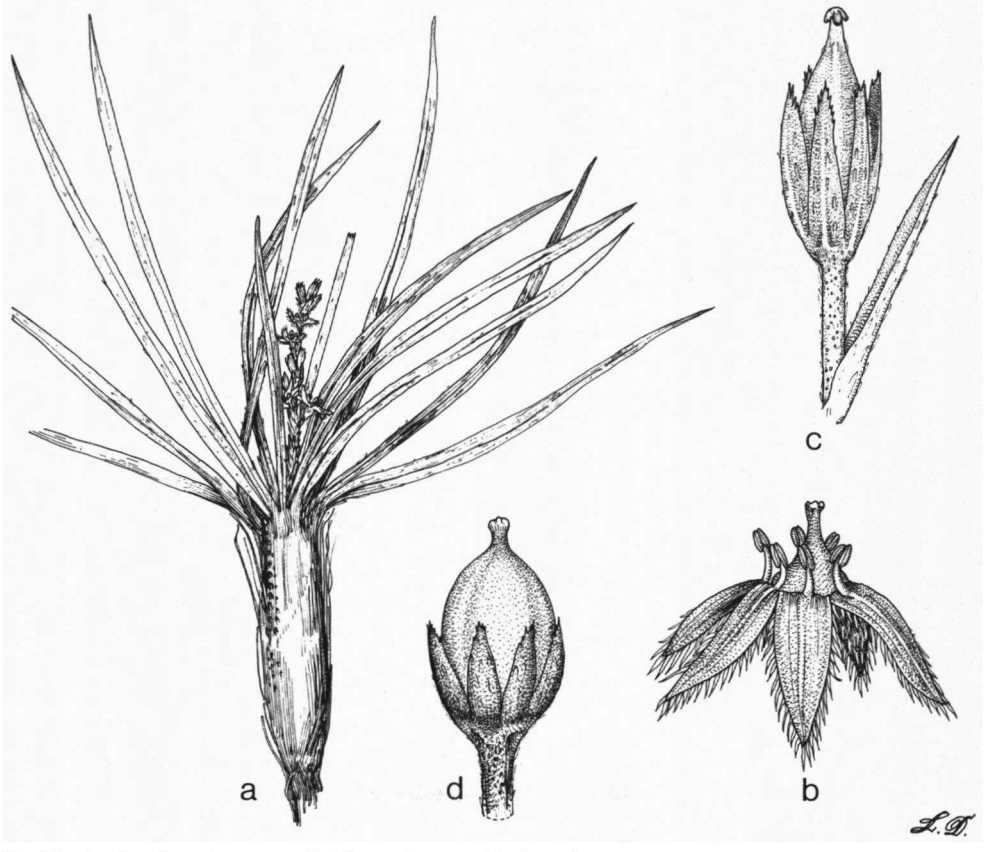

Fig. 20. *Astelia alpina* R. BR. *a.* Habit, ♂ plant, × $^1/_2$, *b.* ♂ flower, × 5, *c.* ♀ flower, × $2^1/_2$, *d.* fruit, × 2 (*a–b* BRASS 10332, *c* HOOGLAND & PULLEN 5782, *d* BRASS 10217).

ovary. *Berry* green, becoming bright red when ripe, ovoid or ellipsoid, *c.* 8–13 mm long. Seeds numerous, *c.* 2 mm ⌀.

Distr. Australia (Tasmania, Victoria, southern New South Wales) and *E. Malesia:* New Guinea (from Mt Wilhelmina in W through the highlands of Papua New Guinea to Mt Albert Edward in E).

Ecol. Alpine and subalpine grasslands forming tussocks to large solid cushions in bogs, sometimes forming almost pure communities in very wet areas (e.g. in Pindaunde Valley), 3225–4500 m. Fig. 21.

Vern. Papua New Guinea: *maunz*, Habi'inz dial., *pangjubank*, Enga lang., *pogwe*, *tudik*, Mendi lang., *waiamaia*, Chimbu, *whyameya*, Kundiawa Subdistr.

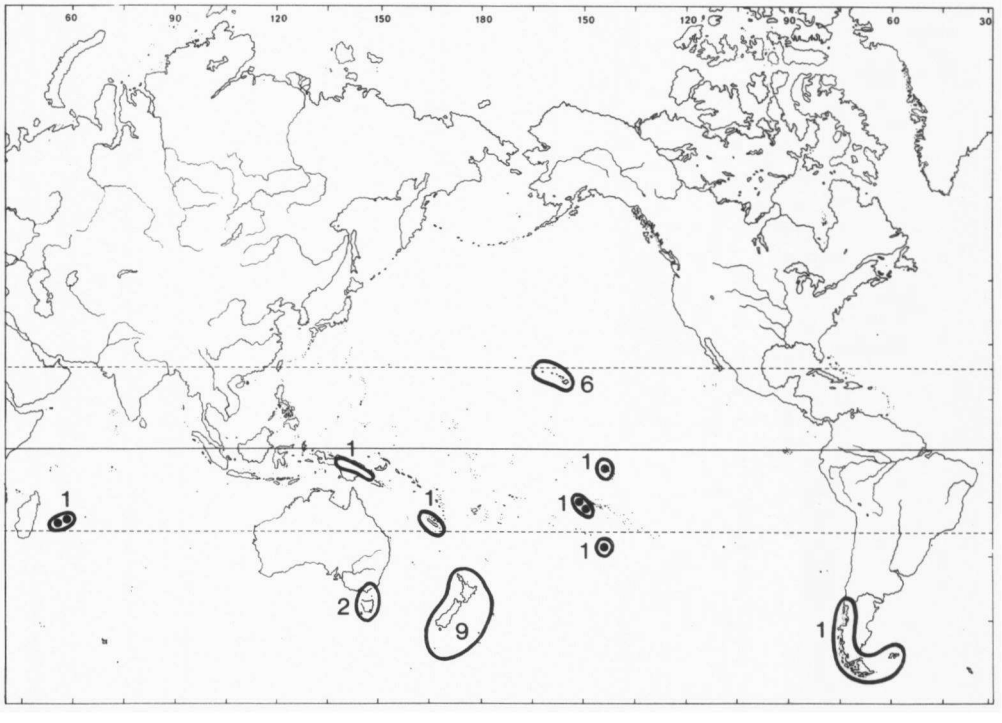

Fig. 21. Range of the genus *Astelia* (after VAN BALGOOY, in Pac. Pl. Areas 2, 1966, 87).

23. NOTHOSCORDUM

KUNTH, En. Pl. 4 (1843) 457, *nom. gen. cons.*; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 322; BACK. Handb. Fl. Java 3 (1924) 61; TRAUB, Plant Life 10 (1954) 123; BACK. & BAKH. *f.* Fl. Java 3 (1968) 132.

1. Nothoscordum inodorum (W. AIT.) G. NICHOLS. Ill. Dict. Gard. 2 (1885–89) 457; A. & G. Syn. Mitt. Eur. Fl. 3 (1905) 167; BACK. Handb. Fl. Java 3 (1924) 62; BACK. & SLOOT. Handb. Theeonkr. (1924) 89, fig.; TRAUB, Plant Life 10 (1954) 127; BACK. & BAKH. *f.* Fl. Java 3 (1968) 132. — *Allium inodorum* W. AIT. Hort. Kew. 1 (1789) 427. — *Allium fragrans* VENT. Jard. Cels. (1800) t. 26. — *N. fragrans* KUNTH, En. Pl. 4 (1843) 461.

Erect, inodorous, glabrous herb with a subterranean coated bulb. *Leaves* radical, linear, flat, somewhat glaucous, shorter than the peduncle, 15–45 by $^1/_2$–$1^1/_4$ cm. *Umbels* borne on an erect, 20–70 cm long peduncle, 6–17-flowered. Flowers fragrant. *Pedicels* $1^1/_2$–5 cm. *Tepals* basally shortly connate and green, 1–$1^1/_4$ cm, persistent, the segments oblong, 1-nerved, white, whether or not with a purple median streak. *Stamens* 6, inserted

on the base of the perianth; filaments ligulate with a subulate top; anthers medifixed. *Ovary* oblong-obovoid, sessile, 3-celled, each cell with ~ ovules; style filiform; stigma small. *Capsule* obovoid, membranous, loculicidally 3-valved, 8–9 mm long. Seeds several, black, often containing more than 1 embryo.

Distr. Native of subtropical North America, often cultivated and naturalized (*e.g.* in the Mediterranean), in Java sometimes cultivated as an ornamental, escaped from the Tjibodas Botanic Garden in West Java on Mt Gedeh.

Ecol. Locally naturalized, in W. Java (Priangan) sometimes occurring in great numbers in fields, tea-estates, and along roadsides; 1000–1500 m. *Fl.* Jan.–Dec. Easily propagating by bulbils and seed, difficult to eradicate.

Vern. Java: *babawangan*, S.

Excluded

Astelia novoguineensis KRAUSE, Bot. Jahrb. 59 (1925) 559 is according to SKOTTSBERG (Bot. Jahrb. 65, 1932, 260) = *Helmholtzia novoguineensis* (KRAUSE) SKOTTSB. (*Philydraceae*).

Laxmannia sessiliflora DECNE, Herb. Timor. Descr. (1835) 35, t. 16; SPAN. Linnaea 15 (1841) 477; MIQ. Fl. Ind. Bat. 3 (1859) 66; BTH. Fl. Austr. 7 (1878) 66. This was said by MIQUEL to occur both in West Australia and Timor, but the latter addition is a slip of the pen. *Cf.* STEEN. Bull. Jard. Bot. Btzg III, 17 (1948) 463.

Veratrum malayanum JACK, Mal. Misc. 1 (1820) 25; in Hook. Bot. Misc. 2 (1831) 74. — *Veratronia malayana* (JACK) MIQ. Fl. Ind. Bat. 3 (1859) 553 is, according to KURZ (Flora 56, 1873, 224) and MERRILL (*cf.* Fl. Males. I, 4, 1951, 249) = *Hanguana malayana* (JACK) MERR. (*Flagellariaceae*).

Xerotes arenaria R. BR. and *X. longifolia* R. BR. were cited by MIQUEL (Fl. Ind. Bat. 3, 1859, 248) to occur in Java, obviously both based on specimens collected by ZOLLINGER on Mt Salak, in West Java. *Cf.* ZOLLINGER, Syst. Verz. 1 (1854) 66. According to KURZ (Flora 56, 1873, 224) these are misidentifications for *Hypolytrum*, assumedly *H. nemorum* (VAHL) SPRENG. (*Cyperaceae*).