CAPPARIDACEAE (M. Jacobs, Leyden)

Herbs or shrubs, often climbing, rarely trees. Indument, if present, consisting of simple (unicellular or multicellular) hairs (sometimes capitate-glandular), stellate hairs, or appendages (*Cleome*). *Leaves* spirally arranged, petioled, simple, palmately dissected, or compound, entire, penninerved, in *Stixis* pellucid-dotted. *Stipules* thorny, or minute, or wanting. *Inflorescences* racemose, terminal or lateral, rarely the flowers axillary, or sometimes serial. Bracts, if present, small and caducous, rarely with stipular bracteoles. *Flowers* bisexual but sometimes the gynoecium reduced (in extra-Mal. *spp.* staminodes may occur), actinomorphic with a tendency towards zygomorphism, especially in the receptacle and in the position of the petals, mostly in bud until anthesis, but in *Crateva* opening at a very early stage. *Sepals* 4, either equal or in 2 whorls of 2 and then the outer pair enveloping the bud and slightly different from the inner pair, or (in *Stixis*) in 2 equal whorls of 3, free, rarely the outer pair connate in bud. *Petals* 4 or (in *Stixis*) absent, free, often unguiculate, equal, or sometimes 2 of the petals slightly asymmetrical and adjoining at the base. Receptacle more or less conical, often with peculiar protrusions, such as (in Malaysia) a small anterior disk in *Capparis*, or a long anterior tubular gland in *Cadaba*, or a ring in *Crateva*. *Stamens* (4–)6 to ∞, in Malaysian genera all fertile, either free or their base connate with the gynophore in a very short to very long androgynophore; anthers dorsifixed, often near the base, introrse, 2-locular, dehiscent lengthwise, connective inconspicuous. *Ovary* generally on a long gynophore, to sessile, ovoid to cylindrical, with a small, simple, sessile stigma, 2–6-carpellate, in Malaysia 1–3-locular. Ovules mostly ∞, on parietal, rarely axillary placentas, campylotropous, with 2 integuments, a third, thin, innermost seed-coat of tracheal tissue being present at least in certain examined cases. *Fruit* a capsule, or a berry with tough exocarp. *Seeds* ∞, rarely 1 (*Stixis*), mostly coiled-reniform, poor in endosperm; embryo curved, horseshoe-shaped or coiled, the cotyledons mostly involute or plicate, or coiled, or one partly enveloping the other; testa in seeds of dry fruits mostly sculptured and sometimes with an elaiosome, otherwise smooth.

Distribution. About 45 genera and approximately 700 *spp.* in tropical and subtropical regions. The largest genera are *Capparis* (over 250 *spp.*), *Cleome* (over 150 *spp.*), *Maerua* (over 50 *spp.*), and *Boscia* (over 35 *spp.*). *Capparis* and *Cleome* are both best-represented in the neotropics; another large centre is Africa. Monotypic genera are extremely numerous in this family: of the 45 genera acknowledged by PAX & HOFFMANN 20 (44 %) are monotypic. Even if some might be reduced in future studies the figure will remain remarkably high. SE. Asia and Australia are the poorest in monotypic genera, either area having 3; it is not certain that all these six monotypic genera can be upheld. These six monotypic genera are also endemic and only SE. Asia has one more endemic genus. On account of these facts, I presume that the family occupied these parts of the world later than Africa and the neotropics.

Of the 5 Malaysian genera, *Crateva*, *Capparis*, and *Cleome* are pantropic. *Cadaba* extends from Africa to Australia, and only *Stixis* is limited to the SE. Asian rain-forest area.

Ecology. Most of the *Capparidaceae* are *xerophilous*, and it is the world's drier regions that are richest in representatives. In Malaysia *Cadaba* and partly *Capparis* show such a xerophilous distribution. It is notable how many species of *Capparis* avoid the everwet Sunda shelf land and are distributed around it. This tendency also holds for *Cadaba*, but not for *Crateva* and *Stixis*.

Most *Capparidaceae* are *heliophilous*. Next to the above-mentioned tendency to xerophily, adaptations to other conditions occur. A few *Capparis spp.* prefer more or less light forest, as do the species of *Stixis*. *Crateva* seeks the proximity of rivers, both in the everwet and monsoon areas. *Cleome* seems in Malaysia anthropochorous. Most *Capparidaceae* are lowland plants; a few ascend as high as 1500 m or slightly higher.

Pollination. The type of flower with numerous radiating stamens, as it occurs in *Capparis*, is, flower-biologically, likely to represent the basic condition in this family. The production of nectar seems

to represent a later development. RADLKOFER, who gave an extensive description of the flower of *Capparis micracantha*, found that the sweet nectar excreted by the disk can only be reached through a very small slit nearly halfway up between the upper petals (Sitz. Ber. Bay. Ak. Wiss. 14, 1884, 111–116). Fig. 17a, d. This, the great distance between the anthers and the nectar, and the difficulty for insects to land on the flower, especially at nocturnal anthesis, renders this species apt to be pollinated by Sphingids, as has been repeatedly stated to occur in *Capparis*. In *C. micracantha* and *C. pubiflora* the basal median part of the upper petals has a red, pink, or yellow honey-guide. The nocturnal flowers of *C. spinosa* and *C. lucida* are sweet-scented and produce nectar. *Cadaba capparoides*, with its long, tubular, nectar-hiding gland and dark, versatile anthers, possesses indeed the most perfect adaptations in this field. Fig. 26, 27.

Since the *Rhoeadales* apparently lack the potentiality of producing a style, a gynophore became necessary to elevate the ovary into the sexual zone. The peculiar position of the petals, which are all pointing upwards (in *Cadaba*, in *Cleome p.p.*, in *Crateva* there being a tendency to it) seems useful to form a showier beacon to the nocturnal butterflies.

Next to the above described sphingophilous type (as here found in *Cleome gynandra*, *C. speciosa*, and *C. spinosa*, all noctiflorous), another type has developed in the *Cleomoideae* where the stamens are not exceeding the petals; this type is better adapted to pollination by bees (the other Mal. *spp.*).

It is noteworthy that in extra-Malaysian species of *Cleome* and of *Cadaba* ornithophily was observed, and in the South African *Cleome natalensis* psychophily, *i.e.* pollination by diurnal butterflies.

Thanks are due to Dr L. VAN DER PIJL, who supplied most of the above information.

Dispersal. RIDLEY cites very few facts about dispersal of *Capparidaceae*. It seems certain that *Crateva* fruits are dispersed by water. The berries of *Capparis*, which can attain considerable size in some species, have sometimes a lively colour (yellow, orange, or bluish-black) and dispersal by birds and/or bats seems likely. Several species of *Cleome* have seeds provided with an elaiosome and are supposed to be dispersed by ants. Their seeds are sometimes provided with small bristles on the sculptured testa and easily adhere to cloth *etc.* and seem therefore fit for epizoic dispersal.

Morphology. M. Y. ORR (Notes Bot. Gard. Edinb. 12, 1921, 249–257) found that in several genera of *Capparidaceae*, *i.a.* in *Cleome*, *Polanisia* (notably in our *spp. Cleome viscosa* and *C. chelidonii*), *Capparis* and *Crateva*, the embryo is completely enveloped by a thin sheath of parenchymatic cells with such thickenings in the wall as there are found in the water-conducting tracheal tissue. It is assumed that this layer plays a part in the water supply of the embryo. In the cells of this third innermost seed-coat the tracheal thickenings are found in the periclinal walls in the *Cleomoideae*, and in the anticlinal walls in the *Capparidoideae*. The same phenomenon was found (*l.c.* 259) in seeds of the *Resedaceae*. It may be of value with regard to classification and judgment of relationships.

The phenomenon of partial sterility is worthy of attention and of closer study. We can observe here the beginning of an evolutionary development which may finally lead to a complete segregation of the sexes as in monoecious or dioecious plants. In nearly all Malaysian *Capparidaceae* only a small part of the flowers set fruit, except in *Cleome spp.* where the fertility is complete or almost so. Apparently some flowers, though not obviously different in structure, are more fit to produce a ripe fruit than others. In the Bogor Botanic Gardens I could observe three ligneous species, all represented by a single plant; of these *Capparis lucida* regularly produced fruits with viable seeds, whereas in *Capparis pubiflora* and in *Crateva nurvala* not one fruit ever developed. Since all three are native in Java, I am not inclined to believe that effective pollinators would be absent. Rather I think that the two non-fruiting plants are self-sterile. Experimental work is needed to reach a conclusion.

In several extra-Malaysian *Capparidaceae* reductions in the androecium occur. In several Malaysian species we see reductions in the gynoecium. In part of the flowers of *Crateva* the whole gynophore with ovary is shed in an early stage of development. *Capparis micracantha* and *C. scortechinii* produce some flowers with a very short gynophore and a deaf ovary. In *Cleome gynandra* it is mostly the apical flowers of a raceme that possess a much smaller, sessile and sterile ovary (see also p. 105).

STOUDT published a valuable study on alternation of sexes and intermittent production of fruits in *Cleome spinosa*, dealing with the intricate pattern of reductions both in gynoecium and androecium (Am. J. Bot. 10, 1923, 57–66).

Phytochemistry. Characteristic features for the *Capparidaceae* are the following: presence of myrosin cells, isothiocyanates (mustard-oils) and their parent glucosides (glucocapparin), the frequent occurrence of deposits of calcium salts (carbonate, sulfate, oxalate) and the absence of leucoanthocyanins and tannin-like compounds in leaves and stems. These features point to a distinct affinity with the *Cruciferae*. This is strengthened by the fact that in both families there is found accumulation of quaternary ammonium compounds (*e.g.* tetramin in *Capparidaceae*, sinapin in the *Cruciferae*). If sinapin and erucic acid (in seed oil) could be demonstrated in *Capparidaceae* this would suggest still closer affinity between the two families. HUTCHINSON's evaluation in ascribing the agreement to parallelism is very improbable from a phytochemical point of view.—R. HEGNAUER.

Taxonomical affinity. The hitherto generally acknowledged place of the *Capparidaceae* is in the order *Rhoeadales*, with the *Cruciferae*, *Resedaceae*, *Tovariaceae*, *Moringaceae*, *Papaveraceae*, and *Fumariaceae*; the hierarchic pattern of these relationships varies only slightly with different authors.

HUTCHINSON in his concept of two main trends of affinity in the angiosperms, the divisions *Herbaceae* and *Lignosae*, has recently proposed to break up the *Rhoeadales* (Fam. Fl. Pl. ed. 2, 1, 1959, 224). He

separated the herbaceous *Cruciferae*, *Resedaceae*, *Papaveraceae*, and *Fumariaceae* from the largely ligneous *Capparidaceae*, admitting only a superficial resemblance with the *Cruciferae*, due to parallel evolution. In his circumscription the order *Capparidales* comprises the *Capparidaceae*, *Tovariaceae*, and *Moringaceae*; it is related to *Pittosporales*, *Tamaricales*, *Violales*, and *Polygalales*.

The anatomical evidence relating to the affinity of *Capparidaceae* and *Cruciferae* is meagre but significant, as METCALFE & CHALK note that the "presence of myrosin cells in certain genera suggests that the *Capparidaceae* and *Cruciferae* may have affinities with one another, and also with the *Resedaceae* where similar cells occur" (Anat. Dic. 1, 1950, 94).

As pointed out above by Dr HEGNAUER the phytochemical data run parallel with the anatomical and taxonomical evidence. This agreement can in our opinion not be interpreted by parallel development. It seems likely that the *Capparidaceae* are a tropical, probably old stratum from which the *Cruciferae* represent a specialized branch. This could also well agree with the geographical distribution pattern of the families, the *Capparidaceae* being mostly tropical, the *Cruciferae* mostly temperate.

Wood anatomy. DEN BERGER, Determinatietabel houtsoorten van Malesië, Veenman, Wageningen (1949) 48 (*Crateva*) & 51 (*Capparis*); DESCH, Mal. For. Rec. 15[1] (1941) 70 (hand lens); METCALFE & CHALK, Anat. Dic. 1 (1950) 91; MOLL & JANSSONIUS, 1 (1906) 175.—C.A.R.-G.

Uses. No plant of appreciable economic significance is found among the *Capparidaceae*. Some minor uses will be dealt with under the species.

Notes. Collectors are requested to pay attention to flower biology. In *Crateva* too little is known about the mature fruit and its properties, and of the variability in leaves on one and the same tree. As to *Capparis*, a search in the Malay Peninsula and North Sumatra will yield much to complete our knowledge of certain species. It is highly desirable to make field observations on the structure of flowers in most species, and to mention the state of maturity whenever fruits are collected. Some *Capparis* species produce juvenile or sterile twigs different from the flowering ones; these are badly known and of much importance.

KEY TO THE GENERA

1. Leaves simple. Plants ligneous.
2. Stamens free, *i.e.* not connate with the gynophore and consequently after anthesis leaving no scars on its base. Fruit a berry with leathery pericarp . . . . . **2. Capparis**
2. Stamens at the base connate with the gynophore, leaving scars which remain still distinctly visible in fruit.
3. Androgynophore 10 mm or longer. Stamens 5–7. Sepals not reflexed. Petals with a long claw. Fruit cylindrical, ∞-seeded. . . . . **3. Cadaba**
3. Androgynophore 1 to a few mm long. Stamens ∞. Sepals reflexed. Petals absent. Fruit ellipsoid, 1-seeded . . . . . **4. Stixis**
1. Leaves palmately compound or dissected.
4. Ligneous plants. Leaves compound. Flowers opening in a very early stage. Fruit globular to ellipsoid, indehiscent, fleshy . . . . . **1. Crateva**
4. Herbaceous plants. Leaves dissected. Flowers mostly in bud until anthesis. Fruit cylindrical, dehiscent, dry . . . . . **5. Cleome**

1. CRATEVA

LINNÉ, Gen. Pl. ed. 5 (1754) 203; Sp. Pl. 1 (1753) 444; HAMILTON, Trans. Linn. Soc. 15 (1827) 116 (*Crataeva*); KURZ, J. Bot. 12 (1874) 193; CORNER, Gard. Bull. S. S. 10 (1939) 15.—**Fig. 1–4.**

Small to medium-sized trees, facultatively shortly deciduous and then flowering when bare; glabrous. *Branchlets* terete with distinct leaf-scars. Stipules small, caducous. *Leaves* 3-foliolate, the top of the long petiole sometimes bearing gland-like appendages on the upper surface. Leaflets sessile to shortly stalked, the lateral ones basiscopically asymmetrical, sometimes with more or less distinct pellucid dots. *Raceme* terminal, corymbiform, either with arrested growth or growing through and developing into a leafy twig with lateral flowers. Flowers sustained by bracts, rarely by leaves, pedicelled, opening at a very early stage of development, floral parts not persistent. Bracts stipulate. Receptacle wide; disk dish-shaped and incurved. *Sepals* equal, ovate-spathulate, green. *Petals* equal, unguiculate, more or less ovate to rhomboid with narrowed base, first white, later cream-coloured, the lower (anterior) pair tending to take a transversal (horizontal) position.

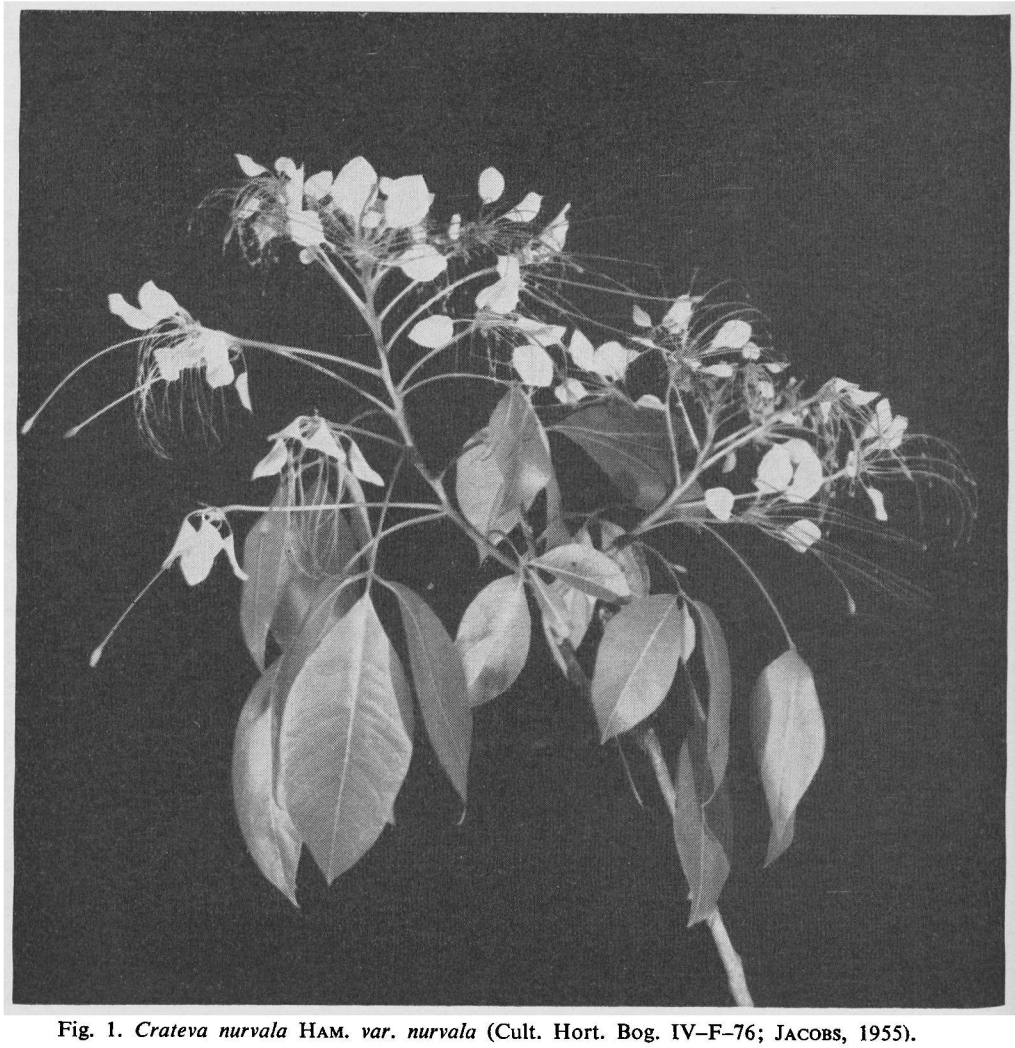

Fig. 1. *Crateva nurvala* HAM. *var. nurvala* (Cult. Hort. Bog. IV–F–76; JACOBS, 1955).

Stamens (8–)12–30, filaments at the very base connate with the gynophore, long, filiform, spreading. *Gynophore* approximately as long as the stamens. Ovary 1-locular, the 2 placentas sometimes intruding to about halfway the lumen but not coalescent. Stigma conspicuous, flat, soon after anthesis obsolete. In fruit pedicel, torus and gynophore woody and more or less thickened, the last with a whorl of filament-scars near the base; the gynophore mostly not stretching. *Berry* large, 1-celled, with tough, sometimes papillate skin. Seeds densely packed; embedded in pulp, horseshoe-shaped, smooth or crested, one cotyledon larger, curved round the other.

Distr. A genus of *c.* 6 *spp.*, pantropical but neither in Australia nor in New Caledonia, the area of the 3 Indo-Malaysian *spp.* extending from Ceylon, Western India, South China, South Japan, the Ryukyus, Formosa, and Hainan, through Malaysia to Tahiti.

Ecol. Mostly in periodically inundated lowland forest near rivers, below 700 m. In dry regions shortly deciduous, the flowers then appearing simultaneously with the flush. Also cultivated for ornamental purposes and presumably occasionally introduced.

Notes. In part of the flowers the gynophore is shed shortly before anthesis, leaving a scar. In some specimens only the apical flowers remain bisexual. Few flowers set fruit.

It appears to me that there are, in Indo-Malaysia, only few species, widely distributed, which show in many respects a considerable variability, for example in the size of the floral parts and, to a less degree, in the sculpture of the seed.

Several authors stated that in some cases the ovary is 2-celled, and they attributed specific value to this 'character'. The matter is, however, that the two parietal placentas intrude into the lumen to a varying degree, sometimes so deeply as to divide it seemingly into 2 locules, but as far as known, the placentas do never actually fuse.

KEY TO THE SPECIES[1]

1. Leaflets with fewer than 11 pairs of nerves. Rachis up to 10 cm long, with up to 20, rarely 40, flowers.
2. Leaflets generally sessile or subsessile, occasionally on petiolules up to 5 mm, very rarely 13 mm. Blade thin-herbaceous, green when dry, (5½–)8½–16(–27) cm. Fruit 6–12(–15) cm long, papillate, greyish when dry . . . . . **1. C. religiosa**[1]
2. Petiolules 4–5(–6) mm. Blade herbaceous to subcoriaceous, mostly red-brownish when dry, 5½–10 (–14) cm. Fruit 3½–4 cm long, smooth, red-brownish when dry . . **2. C. odora** *f.* **axillaris**
1. Leaflets with (7–)10–15(–22) pairs of nerves. Rachis 10–16 cm, 20–90-flowered. Leaflets below paler and duller than above, firmly herbaceous to subcoriaceous. Fruit *c.* 5 cm long, papillate, finally more or less smooth, greyish when dry . . . . . **3. C. nurvala** *var.* **nurvala**

1. Crateva religiosa FORST. *f.* Pl. Escul. Ins. Oc. Austral. (1786) 45, (*Crataeva*); Fl. Ins. Austral. Prod. (1786) 35; DC. Prod. 1 (1824) 243, *p.p.*; *non* HOOK. *f.* Fl. Br. Ind. 1 (1872) 172; LAUT. Bot. Jahrb. 52 (1914) 110; MERR. Philip. J. Sc. 11 (1916) 272; WALKER, Imp. Trees Riukiu (1954) 95, f. 45.—*C. membranifolia* MIQ. Sum. (1861) 387, 158; Illustr. (1870) 21; KOORD. Minah. (1898) 343; LAUT. Bot. Jahrb. 52 (1914) 111; MERR. En. Born. (1921) 280; CORNER, Wayside Trees (1940) 181.—*C. macrocarpa* KURZ, J. Bot. 12 (1874) 195, t. 148 f. 8–10; KING, J. As. Soc. Beng. 58, ii (1889) 397; RIDL. Fl. Mal. Pen. 1 (1922) 125; MERR. Philip. J. Sc. 29 (1926) 371; CORNER, Gard. Bull. S.S. 10 (1939) 16 (*Crat. B*).—*C. hansemannii* K. SCH. Bot. Jahrb. 9 (1888) 201; K. SCH. & HOLLR. Fl. Kais. Wilh. Land (1889) 50; WARB. Bot. Jahrb. 13 (1891) 318; K. SCH. & LAUT. Fl. Schutzgeb. (1901) 335, *p.p.*; VALETON, Bull. Dép. Agric. Ind. Néerl. 10 (1907) 15; LAUT. Bot. Jahrb. 52 (1914) 110.—*C. speciosa* VOLKENS, Bot. Jahrb. 31 (1901) 463; KANEH. J. Dep. Agr. Kyushu Imp. Univ. 4 (1935) 321.—**Fig. 2a.**

Tree (1–)5–15(–30) m. Stipules ½–1 mm, subulate *Leaflets* thin-herbaceous, when dry on both sides of the same greenish colour, much varying in size on one and the same tree, (5½–) 8½–16(–27) by (3–)4–10½ cm, central leaflet oblong, obovate, the base narrowly decurrent, the apex shortly (incidentally up to 2½ cm) acuminate, often mucronulate; nerves 7–11 pairs; petiole (3½–)6½–10 cm, on sterile twigs often longer, up to 22 cm; petiolules 0–5(–13) mm. *Flowers* with a few to over a dozen; rachis 3–5(–14) cm; lower flowers inserted above the axil of normal leaves, the others subtended by an early caducous bract. Pedicels 2–9 cm. Bracts 10 by 1–1½ mm, 3–5 mm petioled. *Sepals* ovate, obtuse to acute, 4–7 by 1½–3 mm. *Petals* once recorded orange, 5–20 mm stalked, blade broadly ovate to elliptic, acute to obtuse, upper pair 2–3(–4) by 1–2(–2.3) cm, lower pair 1½–2 by 1–1½ cm, nerves 4–6 pairs. *Stamens* (10–)13–18(–30); filaments 4½–11½ cm, pink or purple towards the top; anthers 2½–6 by 1½ mm, sometimes recurved. *Gynophore* 4–7 cm; ovary 4–6 by 1½–2½ mm, subcylindrical, sometimes ovoid, contracted below the stigma 1½ mm in diam. Pedicel in fruit (4–)5–7½(–8) cm, 3–4(–5) mm thick; torus 7–11 mm wide; gynophore 5½–8½(–14) cm long, sometimes cylindrical, *c.* 3–5 mm diam., or gradually thickened and up to 1 cm thick at the top. *Fruit* subglobular to (ob-) ovoid, 6–12(–15) by 5½–9½ cm, wall in the unripe stage up to 7 mm thick, at maturity probably not thicker than 1–1½ mm, smooth when very young but soon covered with flat, pale, dry papillae,

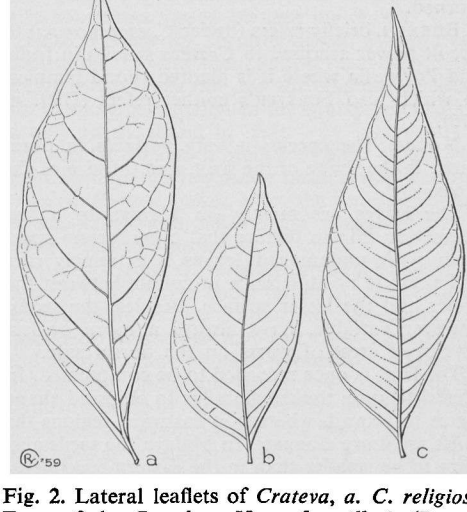

Fig. 2. Lateral leaflets of *Crateva*, *a. C. religiosa* FORST. *f.*, *b. C. odora* HAM. *f. axillaris* (PRESL) JACOBS, *c. C. nurvala* HAM. *var. nurvala*, all × 2/5.

(1) See also 4. *C. hygrophila*, under imperfectly known species.

sometimes giving the impression of a thin, dull, yellowish grey crust. *Seeds* more or less asymmetrically cordate, 10–19 by 5–17 mm diam. and 4–8 mm thick, dorsally with a keel rather narrow and sparsely tuberculate to very broad and densely tuberculate (sometimes rather smooth), the sides smooth to shallowly grooved.

Distr. India (E. Himalaya), Burma, Lower Siam, Indo-China, Ryukyus, through Micronesia (Marianes & Carolines) and Melanesia (Solomons) to Polynesia (Fiji, Samoa, Society Is., Gambier Is.); in *Malaysia:* Sumatra, Riouw Arch., Malay Peninsula, W. Java (twice collected), Borneo (also Banguey I.), S. Philippines (Palawan, Sulu Arch.), Celebes (also Kabaena and Muna Is), Moluccas (Talaud, Sula, Buru, E. Ceram, Ambon, Kai, Aru, and Tanimbar), New Guinea (also Normanby I. and Salawati), New Ireland.

Ecol. The species seems to be frequent in Borneo, New Guinea, and the Solomon Is where it is often found in periodically inundated forest along rivers, rarely in secondary or primary dryland forest; one record from the beach in Sarawak, where it seems to attain smaller size. Mostly below 100 m, but up to 700 m. *Fl. fr.* in all months. Incidentally cultivated.

Vern. *Kĕpayan* (*ayĕr*), Malaya, *ujesta*, S, *tigarun*, *tjigaron*, S. and W. Borneo, *kĕnohan sĕguntu*, Kutei, *makendem alus*, *malasut*, *sangkiauw*, Minahasa, *tjandaule*, SE. Celebes: Tokolaki, *kamfooiju*, Mangoli, *bala-lehe*, Muna, *papangi-nasu*, Talaud, *ombo-ombo*, SW. New Guinea, *ai-yumba*, *bam-baimovi*, Solomons, *pua veoveo*, Tahiti.

Uses. In the Solomon Is the leaves are heated and applied in case of ear-ache, and the fruits are used against constipation. In Yap the fruits are eaten. The raw fruit is used as fish-bait in W. Borneo.

BURKILL briefly refers (under *C. macrocarpa*) to occult power ascribed to *Crateva* species in India and Polynesia where it is planted round temples, to which also FORSTER's epithet refers (Dict. p. 676).

Notes. The species is very variable in floral parts, in the shape of the fruit, and the size of the seeds.

The leaves are mostly (in Malaya to a less degree) so thin in texture that a herbarium specimen with undamaged leaves is extremely rare and there is no difference in colour between the upper and the lower surface. Besides, the seeds, however variable, have always a more or less developed crest of warts on the dorsal side.

The fruit is once recorded to be compressed. In West Malaysia the subglobular to ellipsoid shape seems to prevail, whereas in eastward regions the fruits are more elongate. In Malaya the seeds also seem to be smaller than in the eastern specimens. From the Solomon Is the fruit is reported to be sausage-shaped 14 by 4 cm, with unpleasant odour when cut; in W. New Guinea VAN ROYEN noted that "the smell of the fruit fills the forest with a soury scent not unlike durian". From Yap VOLKENS mentioned a fruit 18 by 10 cm and added that a variety exists with fruits as small as a thumb's length. Another record about such small fruits could not be found. The few field notes give the colour of the young fruit as pale green, once dark mauve, and of the ripe fruit white. According to VAN ROYEN in New Guinea the fruits are light green with yellowish scales, hard pericarp, spongy endocarp, and possess floating capacity. In Bornean specimens seeds were measured 1 by ¾–1 cm in diam. and ½ cm thick; in one specimen from Java the seeds were 1½ by 1–1¼ cm in diam. and ½ cm thick.

About the identity of the Palawan specimens I am not certain. The material available, ELMER 12650 and CENABRE *c.s.* FB 27861, is not in a very good state and seems to be intermediate in characters between *C. religiosa* and *C. odora*. Provisionally, on account of the large seeds, the comparatively large leaflets with a base somewhat decurrent on the petiolule and a short-acuminate top, I assume them to belong to *C. religiosa*, notwithstanding the brownish colour of the leaves in the ELMER specimen and the almost smooth surface of the seeds.

Mr N. G. BISSET observed in Tanimbar that the fruit pulp had a burning taste, and that the seeds contained a very high amount of alkaloids, while starch was practically absent.

2. Crateva odora HAM. Trans. Linn. Soc. 15 (1827) 118.

f. **axillaris** (PRESL) JACOBS, *stat. nov.*—*C. tapia* (*non* L.) BL. Bijdr. 2 (1825) 54; MIQ. Fl. Ind. Bat. 1, 2 (1858) 102.—*C. axillaris* PRESL, Rel. Haenk. 2 (1835) 85; F.-VILL. Nov. App. (1880) 10.—*C. religiosa* (*non* FORST. *f.*) BLANCO, Fl. Filip. (1837) 399, ed. 2 (1845) 279, ed. 3, 2 (1878) 154, t. 176; F.-VILL. Nov. App. (1880) 10; VIDAL, Sinopsis Atlas (1883) 13, t. 6 f. C; Phan. Cuming. (1885) 94; Rev. Pl. Vasc. Filip. (1886) 48; MERR. Sp. Blanc. (1918) 158; En. Philip. 2 (1923) 210; QUIS. Med. Pl. Philip. (1951) 341.—*C. tumulorum* MIQ. Illustr. (1870) 21, t. 11; K. & V. Bijdr. 4 (1896) 269; BACK. Schoolfl. (1911) 64; Bekn. Fl. Java (em. ed.) 4A (1942) fam. 45, p. 6.—**Fig. 2b, 3.**

Small tree, 3–10(–30?) m. Stipules falcate, small. *Leaflets* on slender stalks 4–5(–6) mm long, herbaceous to subcoriaceous, in herb. dull, redbrownish; 5½–10(–14) by 2½–5(–7) cm, elliptic to oblong, rarely lanceolate; base cuneate, top abruptly acutely *c.* 1–1½ cm acuminate; central leaflet mostly the largest, broadest at or somewhat above, rarely below the middle; lateral leaflets strongly asymmetrical; nerves generally 5, sometimes up to 7, rarely up to 10 pairs; petiole slender, (3½–)6–8(–10) cm, on top occasionally with a triangular gland. *Inflorescences* on small twigs, afterwards whether or not growing through, flower-bearing part *c.* 3(–10) cm long, with a few to about forty flowers partly above the axils of young leaves or bracteate. Pedicels 4–5(–7) cm. *Sepals* ovate, acute, *c.* 4–6 by 1½–2½ cm. *Petals* suborbicular to broadly ovate-elliptic, (1½–) 2½–3 by 1–2 cm, the top blunt to rounded or

Fig. 3. *Crateva odora* HAM. *f. axillaris* (PRESL) JACOBS. Sumbawa, 1934 (DE VOOGD 1911).

sometimes notched, base rounded and (rather) abruptly narrowed into the stalk 6–10 mm. *Stamens* 21–25, 3–4 cm long, anthers *c.* 3 by 1 mm, recurved. *Gynophore* (2–)3–4(–6½) cm, ovary subglobular to oblong, *c.* 2–5 by 2 mm, constricted below the stigma *c.* 1½ mm broad. In fruit the gynophore slightly thicker than the pedicel, *c.* 2–3 mm thick all over, torus *c.* 7 mm wide. *Fruit* globular, (up to?) 3½–4 cm diam. (in Indo-Chinese specimens up to 6 cm), pericarp leathery, *c.* 1 mm thick, smooth during the whole development, at maturity probably red when fresh, brownred when dry. Seeds rather irregularly horseshoe to deeply kidney-shaped, about 6 by 2 mm, smooth.

Distr. The species occurs throughout India, Ceylon, Burma, Indo-China, S. China, Formosa, and Hainan, the *Malaysian* form in S. India (Coimbatore), Ceylon, Malay Peninsula (Malacca: cultivated), Java (W. and E. part, cultivated), Madura, Kangean Arch., Lesser Sunda Is. (Sumbawa), Philippines (N. Palawan, Mindoro, Luzon, most provinces, Guimaras, Mindanao).

There are far more collections from Luzon than from any other locality. It looks as if the species is native in the Philippines. It cannot be verified whether it is introduced or native in Kangean and Sumbawa; in Madura, Java, and Malaya there is little doubt that it has been introduced long ago; it is sometimes found planted on graves.

Ecol. Prefers dry, shrubby places. Mostly deciduous, the flowers then appear just before the young leaves break out, but the blossoming seems not to show periodicity. In the Malay Peninsula it is only rarely found in fruit.

Uses. QUISUMBING, Med. Pl. Philip. (1951) 341, mentioned quite a few minor medical applications.

Vern. *Sĕmpal wadak*, J (for the genus, reliable); *kĕmalo-kĕmalowan, sĕkar bulan*, Kangean, *salingbogog*, Tag. (Philip.).

Notes. From *C. religiosa* distinguished vegetatively by its leaves being firmer in texture, often red-brownish in the herbarium, especially the specimens from Java and the Lesser Sunda Is., and giving a more graceful impression, due to the smaller size, the slender distinct petiolule, and the acute longer tip of the leaflets. In fruit it is different by its shorter gynophore and by the surface of the fruit which is smooth and not papillate; this character being more reliable than those provided by the (often immature) seeds.

In one specimen, cultivated in Hort. Bog. under IV-F-81, the largest leaflet was 17 by 9 cm. Its adult leaves were only slightly reddish tinged, the tip being more or less abortive or absent. This seems to prove once more that species may show

deviations unknown from the wild state merely by cultivation in a botanic garden.

The closest affinity is with the African *C. adansonii* DC. which could even be looked upon as a subspecies. In *C. adansonii* the inflorescence rachis is ± 4–5 cm, and finally set with the thick callous scars of the shed pedicels; this top of the rachis often starts to grow again vegetatively afterwards. The petals are about 2–3 by 1–2 cm in all, the stamens 15–20, *c.* 3 cm long, the fruit greenish and not reddish in the dry state. On account of these differences it seems appropriate to keep them apart.

3. Crateva nurvala HAM. Trans. Linn. Soc. 15 (1827) 121, (*Crataeva Nürvala*); W. & A. Prod. 1 (1834) 23; KURZ, J. Bot. 12 (1874) 195; GAGN. Not. Syst. 8 (1939) 213; Fl. Gén. I.-C. Suppl. 1 (1939) 157, t. 14 f. 8.

var. **nurvala.**—*C. nurvala* HAM. *l.c.*; MIQ. Illustr. (1870) 20; K. & V. Bijdr. 4 (1896) 266; BACK. Schoolfl. (1911) 64; HALL. *f.* in Winkl. Bot. Jahrb. 49 (1913) 369; MERR. En. Born. Pl. (1921) 280; BACK. Bekn. Fl. Java (em. ed.) 4A (1942) fam. 45, p. 6.—*Nürvala* RHEEDE, Hort. Malab. 3 (1682) 49, t. 42.—*C. religiosa* (*non* FORST. *f.*) BL. Bijdr. 2 (1825) 54; RIDL. Fl. Mal. Pen. 1 (1922) 125; RENDLE, J. Bot. 63 Suppl. (1924) 5.—*C. magna* [*an* (LOUR.) DC.?] HASSK. Pl. Jav. Rar. (1848) 179; MIQ. Fl. Ind. Bat. 1, 2 (1858) 102; Sum. (1862) 158, 387.—*C. religiosa non* FORST. *f. var. nurvala* (HAM.) HOOK. *f.* & THOMS. Fl. Br. Ind. 1 (1872) 172, *p.p.*—*C. lophosperma* KURZ, J. Bot. 12 (1874) 195, t. 147 f. 4–6, *an var. propria*?; CORNER, Gard. Bull. S.S. 10 (1939) 16 (*Crat. A*); Ways. Trees (1940) 181, f. 48.—**Fig. 1, 2c, 4.**

Tree, (8–)10–15(–20) m, to 40 cm diam. *Branchlets* slightly zig-zag. Stipules minute, late caducous, acute with broad base. *Leaflets* firmly herbaceous to subcoriaceous, (0–)3–6(–10) mm stalked, mostly lanceolate, sometimes oblong, rarely linear, (4½–)9–15(–28) by (1½–)3–5(–6½) cm; base acute, top acuminate, tip acute; central leaflet broadest about or below, rarely above the middle, lateral ones more or less symmetrical; nerves (7–)10–15(–22) pairs; surface below duller and paler than above, sometimes on both sides with minute grey-brown scattered papillae. Petiole (4–)5½–9½(–14) cm, vigorous, broadly sulcate, on top bearing numerous pale to light brown gland-like appendages up to 1 mm long. *Inflorescence* ultimately *c.* 10–16 cm long, bearing 20–100 flowers. Bracts early caducous, 5–9 by ¾–1½ mm, acute, their stipules minute, longer persistent. Pedicels 4–7 cm. *Sepals* 2–3½ by 1¼–1½ mm, ovate, acute, somewhat narrowed at the base. *Petals* 5–12 mm stalked, blade (8–)15–30 by (5–)15–22 mm, suborbicular or subrhomboid to elliptic, ovate, base rounded, abruptly narrowed into the stalk, top obtuse. *Stamens* 15–25, 3½–4½(–6) cm; filaments purple; anthers *c.* 2–3 by 1 mm. Ovary ellipsoid to cylindrical, *c.* 5–6 by 2½ mm; stigma dark purple. *Gynophore* 3½–5½ cm, in fruit probably not or hardly lengthened (rarely up to 10 cm), 3–4(–5) mm thick, only slightly thicker towards the top; pedicel mostly thinner, torus 7–8 mm wide. *Fruit* unknown in fully mature state, ellipsoid, rarely ovoid, (up to?) 5–5½ by 4–4½ cm, pericarp 4–5 mm thick, covered with a thin, dull, yellow-

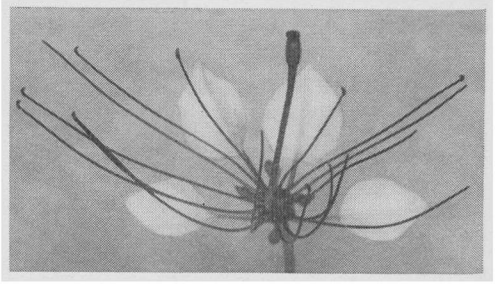

Fig. 4. *Crateva nurvala* HAM. *var. nurvala*. Flower, front view (Cult. Hort. Bog. IV–F–76; JACOBS, 1955).

greyish crust breaking into minute particles which seem to peel off sooner or later, leaving the surface smoothish. *Seeds* deeply horseshoe-shaped, 6–9 mm long and wide, 2–3 mm thick, dorsally with a crest of sharp irregular protrusions.

Distr. India (Deccan, Sikkim, Assam), Burma, S. China (Yunnan, Kweichow?), Hainan, Indo-China, Siam; in *Malaysia:* Sumatra (P. Weh, East and West Coast Res., Palembang), Malay Peninsula, W. to E. Java, and Borneo. Cultivated throughout the area, for ornamental or magic purposes.

Another variety occurs in India (mainly in the Northeast), Burma, Siam, Indo-China, S. China (Yunnan, Kwangtung, Fukien), Hainan, and S. Japan (probably this species).

Ecol. Mostly along streams in shady places, sometimes behind the sea-shore, at low altitudes up to 600 m. Seems to be rare everywhere. Flowering and fruiting time irregular.

Vern. *Si baluak*, Sumatra, *badat*, *dala(h)*, *dalur*, Mal. Pen., *barun(d)aj*, *ki howe*, S, *djaranan*, *sĕmpal wada*, J, *pingos*, *sasagah*, *sĕbĕlu*, *tigarun*, Borneo.

Uses. The wood seems to find local application as timber. In Malaya the root, leaf, or bark are boiled with oil and applied externally in case of 'sakit angin'. In Siam the fruit is used as fish-bait and the young leaves are pickled in salt. See BURKILL (Dict. 1, p. 676) for other minor uses. According to FILET, *cf.* HEYNE, Nutt. Pl. p. 682, the bark contains an acrid, bitter substance and is pounded in water, used as a skin-irritant against high fever, *etc.*

Notes. This species is vegetatively characterized by its nerf-pattern: the leaves have underneath a typical aspect by the thin but vigorous and prominent nerves, more numerous than in other species, while the insertions of the intermediate veins on the midrib are also far more distinct. Besides, the lower surface is more pale, dull, and greyish or glaucous than the upper, the difference

being far greater than in the other *Cratevas*.

In none of the herbaria consulted any type material of *C. lophosperma* was found. KURZ named as type specimen "GUSTAV MANN, from banks of the Koolsee River, Kamroop, Assam, *Fr.* July." From the description it is clear that one of the two varieties of *C. nurvala* was meant; probably it was *var. nurvala*. CORNER's interpretation of KURZ's species as *C. nurvala s. lat.* was correct; his cited material no doubt belongs to *var. nurvala*, but perhaps KURZ himself had HAMILTON's '*C. unilocularis*' at hand, which is more frequent in Assam than *var. nurvala*.

Imperfectly known

4. Crateva hygrophila KURZ, J. As. Soc. Beng. 41, ii (1872) 292; J. Bot. 12 (1874) 196, t. 148 f. 6, 7; J. As. Soc. Beng. 48, ii (1874) 33; Fl. Burm. 1 (1877) 67.

Leaves herbaceous, dull reddish brownish, largest leaflet 12½ by 3½ cm, leaflets sessile, not much asymmetrical, narrowed towards base and top; nerves ± 6–7 pairs, as the midrib narrow, prominent above. *Inflorescence* rachis practically none. *Flowers* unknown. Pedicels in fruit 5½–6½ cm, *gynophore* 4¾–5¾ cm, both blackish, woody, ± 2–2½ mm in diam. *Fruit* (immature) cylindrical umbonate, ± 9 by 2½ cm, dull brown-purplish with numerous white lenticel-like specks, *c.* 1½ mm thick. *Seeds* irregularly horseshoe-shaped, ± 11 by 8 by 3 mm, the outer side with some coarse sculpture.

Distr. Burma (Pegu); in *Malaysia:* Penang (KING's Coll. 1412).

Note. There are only two collections; both are inadequate but match very well. They come nearest to *C. religiosa*, but I feel reluctant to refer them to this species. They may represent an abnormal, deviating form.

Excluded

Crateva marmelos L. Sp. Pl. (1753) 444 = *Aegle marmelos* (L.) CORREA in Trans. Linn. Soc. 5 (1800) 223 (*Rutaceae*).

2. CAPPARIS

TOURN. *ex* LINNÉ, Gen. Pl. ed. 5 (1754) 222; Sp. Pl. 1 (1753) 503; LAMK, Encycl. 1 (1785) 604; DC. Prod. 1 (1824) 245; MIQ. Illustr. (1870) 22–36, t. 12–19; GAGN. in Morot, J. Bot. 21 (1908) 53; PAX & HOFFM. in E. & P. Pfl. Fam. ed. 2, 17b (1936) 172.—*Busbeckea* ENDL. Fl. Norfolk. (1833) 64.—**Fig. 5–25.**

Shrubs, often sprawling or climbing, rarely small trees, mostly hairy but glabrescent. *Leaves* simple, with a pair of stipular *thorns* which are occasionally wanting, sometimes these persistent on knobs on the main stems; nerves arcuating fairly regularly and interlooping near the margin. *Flowers* pedicelled, arranged in serial, supra-axillary rows (flowering basiscopically!), or in racemes with the pedicels subumbellately conferted towards the top, the subumbels sometimes paniculate, or more rarely flowers solitary, axillary. Bracts mostly present but early caducous, rarely 2 basal bracteoles. *Sepals* biseriate, mostly imbricate, the outer pair mostly strongly concave, the inner pair flattish, rarely (in *sect. Busbeckea*) the outer pair connate in bud. *Petals* 4, variously imbricate, rather delicate, not unguiculate, the two adaxial ones (upper pair) with asymmetrical base coherent and surrounding a small disk, the two abaxial ones (lower pair) quite free. Receptacle (torus) slightly thickened, ± conical, with a more or less developed adaxial disk. *Stamens* ∞, rarely (7–)8(–12) free, radiating, longer than the petals, glabrous; anthers small. *Gynophore* about as long as the stamens, sometimes longer, not or very little stretching in fruit, exceptionally abortive, irregularly coiled in bud. Ovary 1-locular, placentas 2–6, mostly 4, with ∞ ovules; stigma sessile, small. *Berry* in Mal. globular to ellipsoid, rarely elongate, with leathery or corky pericarp, 1-celled. Seeds (1–)∞, embedded in pulp, obliquely reniform, rather large, with circinnate embryo.

Distr. Presumably about 250 *spp.* in the tropics and subtropics of both hemispheres, especially in America and Africa. Another centre of development, with *c.* 40 *spp.*, is found in Burma and Indo-China. In *Malaysia* 23 *spp.* are recognized, among which only a few are confined to one island or province, the development being richest in the Philippines where also the infraspecific variability is greater than in other islands. A few species are shared by SE. Malaysia and northern Australia. There are only few species which are chiefly distributed in the large rain-forest area of western Malaysia (Malaya, Sumatra, W. Java, and Borneo) and most species avoid that area because of their preference for dry and seasonal climatic conditions. Fig. 6.

Ecol. Only few *spp.* are adapted to primary rain-forest conditions; they are most frequent in heliophilous, warm and dry habitats under seasonal climatic conditions, for example in coastal vegetation, in savannahs, hedges, light forest, secondary forest, thickets, and forest borders, in the lowlands and hills, the highest record being 1700 m.

Disp. The often large pulpy fruits may have various colours at maturity, for instance bluish-black in *C. lanceolaris* DC., deep-yellow in *C. trinervia* HOOK. *f.*, orange in *C. floribunda* WIGHT, and are likely to be eaten and (?)dispersed by animals. In the last-named species ELMER noted "fruits opened and seed eaten by birds".

Pollination. Though the flowers are often scented and the inflorescences are in several species very showy, no observations on flower visitors have come to my knowledge. The honey is very much concealed under the coherent asymmetrical bases of the adaxial petals which surround a small disk.

Two species, *viz C. lucida* (BANKS *ex* DC.) BENTH. and *C. spinosa var. mariana* (JACQ.) K. SCH., are known to be noctiflorous. *C. erycibe* HALL. *f.*, *C. micracantha* DC., and *C. pubiflora* DC. were observed to flower in the daytime; they may be open and scenting during the night as well.

Indument. The characters of the hairs covering at least the young parts of many species are often of specific value. In Asiatic species the indument consists only of hairs, but for instance in *C. breynia* JACQ. of tropical America the young parts are densely scaly like a *Durio* twig. Short-stalked, stellate hairs, with 3–4 arms arising from a 1-cellular base are found in 10. *C. sepiaria* and 20. *C. quiniflora* (also having many hairs with 2 arms, like the malpighiaceous balance-hairs); 14. *C. pubiflora* (hairs very long and silky); 15. *C. pyrifolia* (hairs slender, glassy, with unequal arms); 19. *C. zeylanica* (hairs thicker, less regularly shaped); 22. *C. spinosa var. mariana* (hairs small, white, soft, irregularly stellate, the arms somewhat twisted; hook-like hairs as depicted in E. & P. Pfl. Fam. 17b, f. 78A, were not seen in my limited material). Simple hairs, patent unless stated otherwise, occur in: 1. *C. scortechinii* (hairs soft, mostly straight, more or less erect); 2. *C. trinervia* (hairs rather long and straight, but near the base bent in an arbitrary direction); 8. *C. floribunda f. induta* (hairs soft and somewhat twisted); 7. *C. lanceolaris* (like the last, but straighter and generally shorter); 9. *C. lobbiana* (hairs stiff, straight, and very unequal); 6. *C. longestipitata* (hairs appressed, singularly short and thin); 5. *C. cantoniensis* (hairs appressed, mostly unbranched, small, soft, twisted); 23. *C. lucida* (hairs small, somewhat twisted). Species not mentioned above are glabrous or almost so.

Taxon. A complete subdivision cannot yet be given, because the Old World species need further study. If we follow DE CANDOLLE's subdivision, then *spp.* 1–22 come into the *sect. Capparis* (*Eucapparis* PLUM. *ex* DC.), with imbricate sepals.

Of these, *spp.* 4–15 fall into *subsect. Corymbosae* DC. with the flowers in subumbels, *spp.* 16–20 into *subsect. Seriales* DC. (incl. *sect. Monostichocalyx* RADLK.) with the flowers in supra-axillary rows, *sp.* 22 into *subsect. Pedicellares* DC. with axillary flowers.

Sp. 23 is the only Malaysian representative of the Australian *sect. Busbeckea* (ENDL.) B. & H. with the outer pair of sepals connate in bud.

Spp. 1, 2, 3, and 21 are as yet difficult to place in this classification.

Note. There are a few field observations that the completely mature fruit would dehisce by valves in some species. I have not seen any material confirming this.

KEY TO THE SPECIES

1. Flowers solitary in the leaf axils.
 2. Leaves oblong. Sepals 5–7 mm long . . . . . **21. C. larutensis**
 2. Leaves suborbicular. Sepals longer than 10 mm . . . . . **22. C. spinosa**
1. Flowers in serial rows, in axillary subumbels or panicles, or in terminal racemes or panicles (rarely depauperated to 1 flower in 23. *C. lucida*).
 3. Inflorescences exclusively terminal on *normal* twigs.
  4. Sepals longer than 7 mm. Gynophore longer than 2½ cm.
   5. Pedicels ½–1 cm. Fruit *c.* 10 cm diam. Gynophore *c.* 5 cm. . . . . **1. C. scortechinii**
   5. Pedicels 1–6 cm.
    6. Sepals in bud connate, 10–15 mm long, glabrous. Leaves shorter than 9 cm, base acute. **23. C. lucida**
    6. Sepals in bud imbricate. Leaves longer than (6–)10 cm.
     7. Plant glabrous. Leaves oblong to lanceolate, coriaceous.

8. Gynophore 3–4½ cm. Sepals 8–12 mm long. Leaves with a hardened tip. **12. C. callophylla**
8. Gynophore 2–3½ cm. Sepals 5–6(–10) mm long. Leaf-tip not particularly thickened. **13. C. zippeliana**
7. Innovations hairy, glabrescent. Leaves obovate, subcoriaceous, subtriplinerved, (6–)10–14 cm long . . . . . **2. C. trinervia**
4. Sepals shorter than 7 mm. Gynophore shorter than 2½ cm.
9. Flowers in a panicle. Leaves longer than (8–)10 cm.
10. Gynophore 4–12 mm. Fruit 1½ cm diam. . . . . **4. C. erycibe**
10. Gynophore 2–3½ cm. Fruit *c.* 3½ cm in diam. . . . . **13. C. zippeliana**
9. Flowers in simple subumbels. Leaves shorter than 8 cm. Gynophore shorter than 2 cm.
11. Stamens 30–45. Gynophore (5–)6–10(–13) mm. Twigs vigorous, hairy, zig-zag, mostly with strong thorns . . . . . **10. C. sepiaria**
11. Stamens 12–15. Gynophore *c.* 15 mm. Twigs slender, glabrescent, straight, with weaker thorns. **11. C. diffusa**
3. Inflorescences axillary or supra-axillary, sometimes *also* terminal.
12. Pedicels (or their scars) serial, in supra-axillary rows.
13. Sepals glabrous or ciliate. Young leaves glabrous.
14. Sepals shorter than 5 mm, glabrous. Fruit tuberculate. Thorns, if present, recurved. **16. C. buwaldae**
14. Sepals longer than 5 mm, ciliate. Fruit smooth. Thorns patent . . **18. C. micracantha**
13. Sepals puberulous outside.
15. Young leaves hairy, at least underneath. Fruit ± globular.
16. Fruit smaller than 12 mm. Thorns directed upwards, straight or slightly curved. Sepals 4–5 mm long . . . . . **15. C. pyrifolia**
16. Fruit larger than 15 mm. Thorns, if present, recurved.
17. Stamens more than 30. Sepals longer than 6 mm . . . . . **19. C. zeylanica**
17. Stamens 7–8. Sepals shorter than 5 mm . . . . . **20. C. quiniflora**
15. Young leaves glabrous. Fruit elongate. . . . . **17. C. cucurbitina**
12. Flowers in sessile racemes or in subumbels or panicles.
18. Flowers in short, sessile, axillary racemes.
19. Gynophore at anthesis hairy all over. Rachis of the inflorescence inconspicuous. **14. C. pubiflora**
19. Gynophore at anthesis glabrous. Rachis of the inflorescence thick, 1–2½ cm long. **3. C. brachybotrya**
18. Flowers in subumbels or in panicles, rarely in a small leafy raceme.
20. Leaves (8–)13–20(–26) cm long, often reddish tinged when dry.
21. Gynophore 3–4½ cm. Sepals 8–12 mm long. Leaves with a hardened tip. **12. C. callophylla**
21. Gynophore 2–3½ cm. Sepals 5–6(–10) mm long. Leaf-top not particularly thickened. **13. C. zippeliana**
20. Leaves (2–)4–12(–16) cm long, green to yellowish when dry.
22. Gynophore at anthesis hairy all over. Fruit up to 2 cm long . . . **14. C. pubiflora**
22. Gynophore at anthesis glabrous, at least in the upper half.
23. Gynophore shorter than 1½ cm. Fruit ½–2 cm diam.
24. Stamens *c.* 8. Sepals 3–4 mm long. Fruit 1½–2 cm diam. . . . **8. C. floribunda**
24. Stamens ∞. Sepals 4–5 mm long. Fruit 1½ cm or smaller.
25. Twigs stout, markedly zig-zag, greyish-hairy, with vigorous thorns. Leaf-top rounded, notched. Midrib flattish above . . . . . **10. C. sepiaria**
25. Twigs slack, approximately straight, glabrescent, with weaker thorns. Leaf-top acuminate. Midrib narrowly sulcate above . . . . . **5. C. cantoniensis**
23. Gynophore longer than 1½ cm. Fruit (1½–)2–3½ cm diam.
26. Twigs glabrous or with appressed pubescence. Thorns, if present, recurved.
27. Leaves 6½–12(–16) cm long, the margin somewhat recurved. Sepals at least 6 mm long. Fruit 2–3½ cm diam. . . . . **7. C. lanceolaris**
27. Leaves 5–6 cm long, flat. Sepals *c.* 3 mm long. Fruit unknown . **6. C. longestipitata**
26. Twigs generally with short, patent pubescence. Leaves 4–8(–13) cm long, ovate, subcordate. Fruit *c.* 1½ cm diam. Thorns, if present, straight . . . . . **9. C. lobbiana**

1. **Capparis scortechinii** KING, J. As. Soc. Beng. 58, ii (1889) 394; Ann. R. Bot. Gard. Calc. 5 (1896) 118, t. 135; RIDL. Fl. Mal. Pen. 1 (1922) 122. Climbing shrub, 2–10 m. Twigs straight, angular and pubescent, terete and glabrescent when older; internodes 1–3 cm. *Thorns* strong, recurved, 2–4 mm. *Leaves* (sub)coriaceous, pubescent when young, soon glabrescent, ovate to obovate, 2–5 times as long as broad, 6½–12(–21) by 1½–5 (–7½) cm; base narrowed, acute; top rounded to narrowed, more or less acuminate, dark-mucronate; midrib flat above; nerves *c.* 5–6 pairs;

Fig. 5. *Capparis zeylanica* L. *a.* Flowering twig, the leaves still young, × ⅔, *b.* flower, nat. size, *c.* fruiting branch with adult leaves, the fruit opened, × ⅔.

petiole *c.* 1 cm, brown pubescent, late glabrescent. Raceme terminal, 2½–10 cm long, brown pubescent all over. Bracts 10 by 1½–2 mm, sometimes larger and resembling small leaves. Pedicels 5–10 mm, leaving a prominent scar, in fruit woody. *Sepals* densely pubescent outside, with membranous, ciliate margin 1 mm broad, outer pair coriaceous, orbicular, 8–11 mm diam., inner pair subcoriaceous, ovate, 2–6 by 4½ mm, densely pubescent outside. *Petals* pink, *c.* 8–9 by 4½–6 mm, obovate, notched, with cuneate base, sparsely pubescent inside, or glabrous. *Stamens* 35–50, *c.* 15 mm. *Gynophore* *c.* 5–6½ cm (occasionally abortive), in fruit transversely wrinkled, woody, thickened up to 16 mm; ovary ovoid, 1¾ by ¾ mm. *Fruit* globular, *c.* 10(–12½) cm diam., pericarp woody, 2–2½ cm thick, smooth, yellow. Seeds ∞, *c.* 2⅓ by 1¾–2½ by *c.* 1 cm.

Distr. *Malaysia:* ? Banka, Malay Peninsula (Perak, Trengganu, Pahang, Selangor, and Penang).

Ecol. In rain-forests, up to 1400 m.

Vern. *Mĕnawul*, Banka, *susoh bĕruga*, Pahang.

Note. An entirely glabrous sterile specimen collected by TEYSMANN s.n. (Bo) in Banka, probably belongs here. In KING's type collection both flowers with an abortive and a developed gynophore are represented.

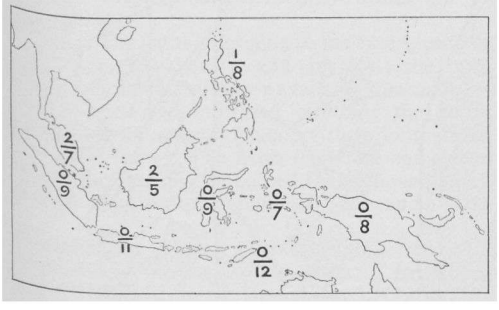

Fig. 6. Species density of the genus *Capparis* in Malaysia. The number above the hyphen refers to the number of endemic species, that below the hyphen to the number of other species in each province. *C. longipes* MERR. (incompletely known; from the P.I.) has not been incorporated.

2. Capparis trinervia HOOK. *f.* & TH. Fl. Br. Ind. 1 (1872) 175; KURZ, Fl. Burm. 1 (1874) 64; GAGN. Fl. Gén. I.–C. 1 (1908) 193; Suppl. 1 (1939) 168. — *C. kunstleri* KING, J. As. Soc. Beng. 58, ii (1889) 396; RIDL. Fl. Mal. Pen. 1 (1922) 122.

Climber or shrub, up to 4 m. Young parts ferruginous-tomentose, soon glabrescent. Twigs almost straight, often angular, internodes *c.* 3–5 cm; *thorns* 1–2(–3) mm, patent or slightly recurved. *Leaves* subcoriaceous, elliptic to oblong, slightly obovate, (6–)10–14 by (2¾–)3½–5½ cm; base cuneate, often subtriplinerved, top acuminate with acute tip *c.* ¾ cm; midrib above sulcate in the basal part; nerves (6–)7–8(–10) pairs, glabrous to early glabrescent; petiole (7–)10–14(–18) mm, hairy as the twig. *Flowers* (3–)5–10(–15) in a terminal raceme. Pedicels rather vigorous, in the axils of the upper leaves or in the axils of very

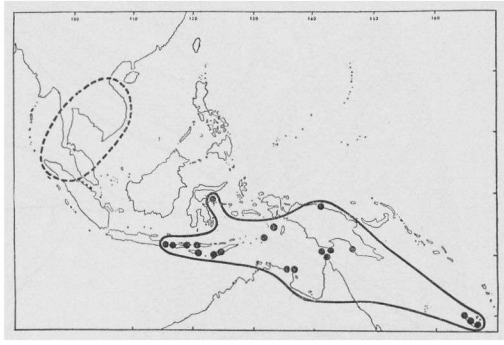

Fig. 7. Approximate area of distribution of *Capparis trinervia* HOOK. *f.* & TH. (broken line) and localities of *C. quiniflora* DC. (dots within continuous line), the latter also in Fiji.

soon caducous *c.* 4 mm long narrow bracts, *c.* 2–4 cm long, widened at the top, hairy. Buds approximately globular, pointed. *Sepals* *c.* 9–12 by 11 mm, outside densely orange-yellow puberulous, the outer pair coriaceous, the inner pair thinner, flattish, suborbicular, with membranous margin. *Petals* light red, obovate, *c.* 12–15 by 8–9 mm, puberulous towards the base on both sides, the margins crisp, except at the base. Torus *c.* 5(–6) mm wide, flattish. *Stamens* *c.* 60–70, *c.* 27 mm long, whitish. *Gynophore* 2¾–4½ cm long, light red, glabrous, ovary ellipsoid to ovoid, 2½ mm long, with umbonate stigma, green, glabrous. *Fruit* globular, deep yellow, 3½ cm in diam., pericarp soft-woody, 4 mm thick. Seeds 15–17 by 14 by 6 mm.

Distr. Indo-China (Tonkin, Laos, Annam), Burma (Tenasserim); in *Malaysia:* NE. Sumatra (Tinggiradja, N of lake Toba), Malay Peninsula (Perak: G. Booboo). Fig. 7.

Ecol. A creeper reported clinging to trees in dense jungle, and from dry, almost bare lime-cinder ledges, at low altitude.

Note. The Malaysian specimens differ slightly from those of Indo-China where the leaves have 3–5 pairs of nerves and the buds are not pointed.

3. Capparis brachybotrya HALL. *f.* in Fedde, Rep. 2 (1906) 59; LAUT. Bot. Jahrb. 52 (1914) 112.

Branchlets stout, terete, slightly zig-zag, glabrous, internodes 2½–5 cm. *Thorns* slightly recurved, minute to 2 mm long. *Leaves* coriaceous, elliptic, oblong or sublanceolate, light green when dry, glabrous, 13–21½ by 5–10½ cm; base obtusely acutish to rounded; top rounded and ?–10 mm acuminate, with a dark and stiff tip; nerves (6–)7–9(–10) pairs, depressed above. Petiole stout,

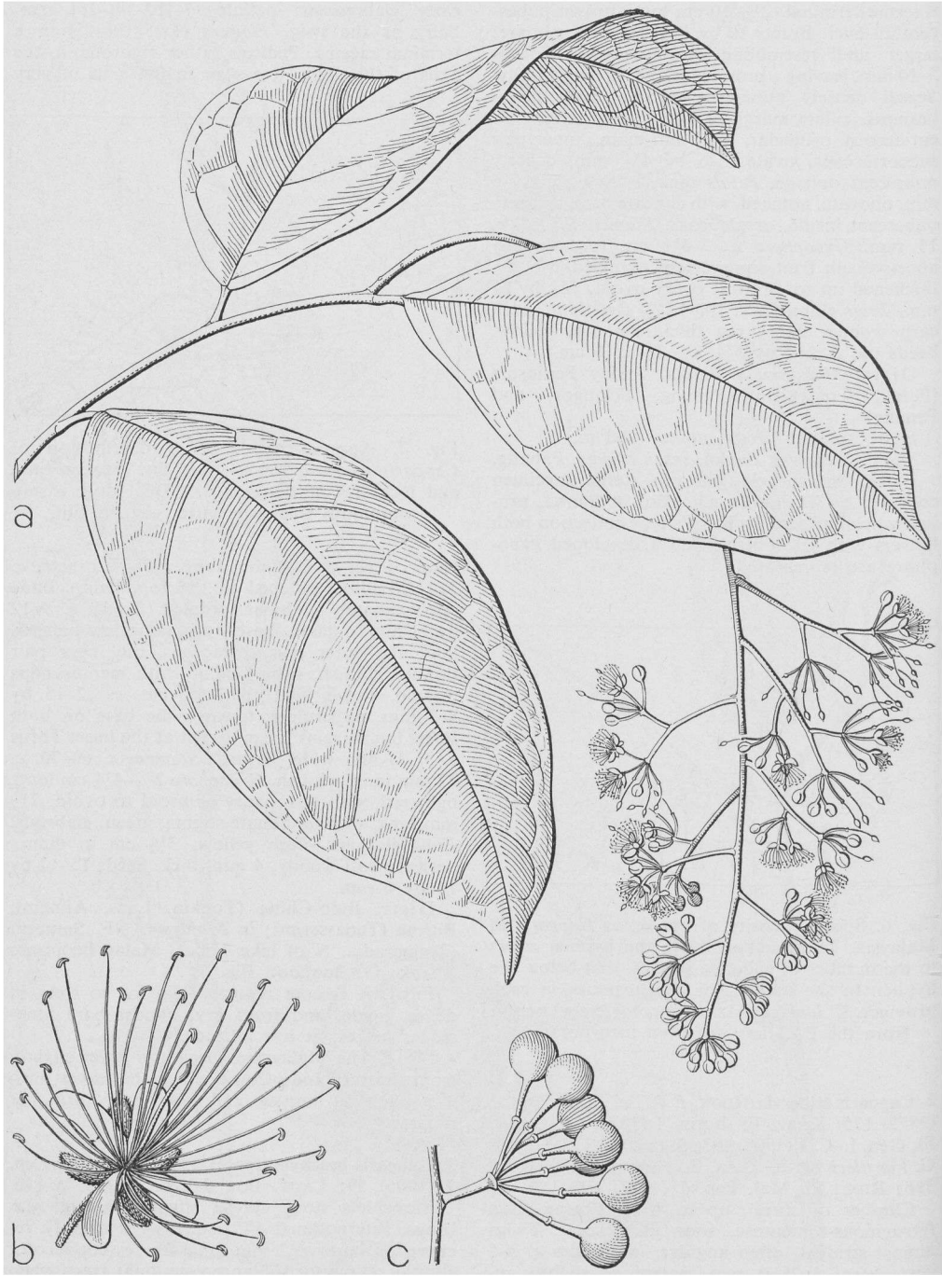

Fig. 8. *Capparis erycibe* HALL. *f. a.* Habit, × ⅔, *b.* flower, × 6, *c.* fruits, × ⅔ (after JACOBS 4838).

1–1½ cm. Racemes axillary, sometimes serially in twos; rachis stout, (1–)2½ cm, up to 20-flowered, pale-puberulous, glabrescent, at the very base surrounded by conferted bracts. Bracts subulate, small, early caducous; bracteoles stiff, subulate, minute, later caducous. Pedicel 1–2½ cm, slightly thickened towards the top, puberulous, glabrescent. *Flowers* (pinkish) white, scented. Buds subglobular, occasionally apiculate, 1 cm diam. *Sepals c.* 11–14 by 6–10 mm, more or less mucronulate, outer ones subglabrous, inner ones outside puberulous along the margin. *Petals* 12–20 by 6–10 mm, outside puberulous, especially in the upper part; upper petals the smallest, in the basal median part densely puberulous inside; lower petals glabrous inside. Disk fleshy, *c.* 1 mm diam., glabrous. *Stamens* (80–)100–160, 25–35 mm long, filaments white. *Gynophore* 2–3½ cm; ovary ovoid, 2–3 by 1 mm, stigma ½ mm, all glabrous.

f. **brachybotrya.**

Leaves elliptic, 1.7–2.1 times as long as broad, 14–22 by 7½–10½ cm, with rounded base. *Fruit* on a gynophore 1½–2¼ cm, ellipsoid with narrowed base and short, abruptly acuminate top, 4–5½ by 3¼ cm, pericarp leathery. Seeds ∞, *c.* 10 by 7 by 5 mm, light brown.

Distr. *Malaysia:* Moluccas (Kai Is), New Guinea (Vogelkop and Batanta Is).

Ecol. Primary and secondary forest, up to 250 m.

Note. The fruits belonging to the type specimen were separated from it and got lost; the only collection of ripe fruits now available was made by VAN ROYEN. He informed me that the short peduncle with several fruits on their long stalks was quite showy. The fresh fruits are somewhat larger than the dry ones, red, smooth, and they possess the abruptly pointed base and apex.

f. **angustifolia** (HALL. *f.*) JACOBS, *stat. nov.*—*C. brachybotrya var. angustifolia* HALL. *f.* in Fedde, Rep. 2 (1906) 60; LAUT. Bot. Jahrb. 52 (1914) 112. —**Fig. 9.**

Leaves oblong, 2.4–3.3 times as long as broad, 13–21½ by 5–7 cm, with obtusely acutish to rounded base. *Gynophore* 4½ cm; *fruit* (almost mature?) elongate, 4 by 1½ cm, pericarp thin. Seeds ∞, *c.* 8 by 7 by 4 mm.

Distr. *Malaysia:* Celebes (Pangkadjene, Minahasa), New Guinea (Vogelkop).

Ecol. Coastal forest.

Note. In sterile state very similar to *C. micracantha*, but easily distinguished by the axillary inflorescence with a thick rachis, *C. micracantha* having a supra-axillary row of pedicels or their scars.

4. Capparis erycibe HALL. *f.* Bull. Herb. Boiss. 6 (1898) 216; BACK. Schoolfl. (1911) 62; KOORD. Exk. Fl. Java 2 (1912) 294; BACK. Bekn. Fl. Java (em. ed.) 4A (1942) fam. 45, p. 10.—*C. paniculata* RIDL. J. Fed. Mal. St. Mus. 10 (1920) 129; RIDL. Fl. Mal. Pen. 1 (1922) 124; BAKER, J. Bot. 63 Suppl. (1924) 5.—**Fig. 8.**

Climber, about 1½(–14?) m. Twigs slack, brownish, brown-puberulous, especially when young, slightly zig-zag; internodes about 3–5 cm.

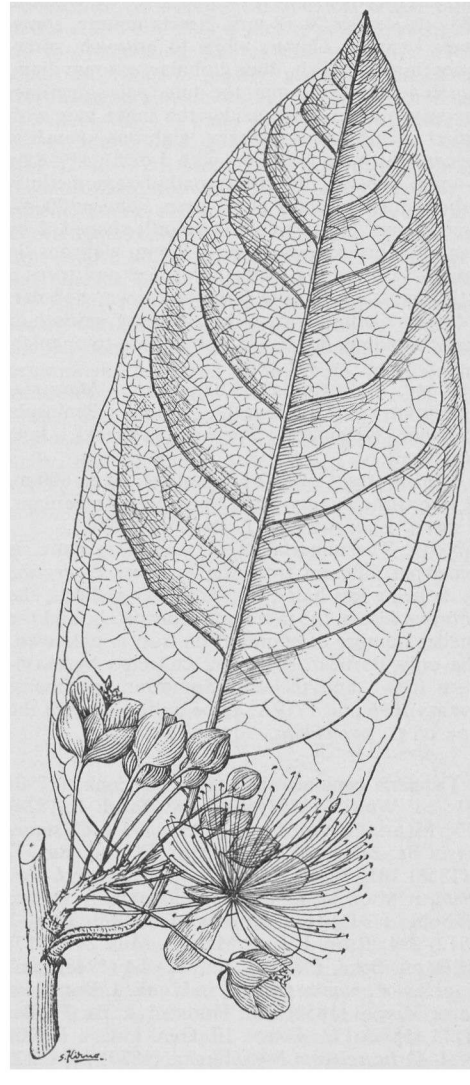

Fig. 9. *Capparis brachybotrya* HALL. *f. f. angustifolia* (HALL. *f.*) JACOBS, node with leaf and inflorescence, × ⅔ (KOSTERMANS 2819).

Thorns up to 2 mm long, recurved, mostly wanting. *Leaves* herbaceous to subcoriaceous, often reddish brown when dry, glabrous above, glabrescent beneath, broadest above, sometimes at the middle, 1.8–2.5(–2.8) times as long as broad, (9½)–12–16 (–20) by 4½–8½ cm, base mostly narrowed, sometimes rounded, acute to obtuse; top rounded to acuminate, mucronate; midrib above mostly

narrowly sulcate; nerves *c.* 6–8 pairs, glabrous above, glabrescent beneath; petiole 4–10 mm, brown-pubescent, late glabrescent. Panicle mostly brown-puberulous on a *c.* 5–10 cm long, slender peduncle terminal on a twig of which the upper part has mostly lost its leaves, *c.* 10–20 by 5–15 cm. Pedicels slender, 4–18 mm. Bracts minute, sometimes wanting. *Flowers* white to greenish, sometimes tinged reddish. Buds globular, *c.* 4 mm diam. *Sepals* 4–6 by 2½–3 mm, the outer pair sometimes sparsely puberulous outside; the inner pair with broad membranous margin, glabrous. *Petals* 4 (occasionally single flowers with 5 or 6), 4½–6 by 1–4 mm, suborbicular to subspathulate, sometimes puberulous, especially at the base. *Stamens* 20–40, 5–6(–8) mm. Ovary ovoid to spindle-shaped, 2 by 1 mm, glabrous; *gynophore* 2–5 mm, glabrous, in fruit 4–12 mm long, with the pedicel and torus a little incrassate. Mature *fruit* not known, globular, *c.* 1½ cm diam., pericarp thin, leathery, smooth or finely papillate. Seeds 1–4, subglobose to angular, 9–10 by 7–9 by 4–5 mm.

Distr. Indo-China (Annam), *in Malaysia:* S. Sumatra (Lampongs), Malay Peninsula (Pahang, Kelantan), Borneo (Sarawak), Java (scattered).

Ecol. Forests, often on limestone, up to 600 m. *Fl.* Dec.-June, *fr.* July–Nov. Apparently a rare plant.

Vern. *Endog-dogan*, J, *lortĕloran*, Md.

Note. The material of *C. paniculata* RIDL. is somewhat different from the Javanese *C. erycibe* by its being less hairy, by the longer pedicels, the glabrous sepals, the more orbicular petals, and the smaller number of stamens; its fruit is unknown. The only Bornean specimen, collected by HAVILAND (SAR), and the only Sumatran specimens, FORBES 1696 and 1719A, agree quite well with the type of *C. paniculata.*

5. Capparis cantoniensis LOUR. Fl. Coch. (1790) 331; ed. WILLD. (1793) 404; DC. Prod. 1 (1824) 253; MERR. Comm. Lour. (1935) 173.—*C. salaccensis* BL. Bijdr. (1825) 54; MIQ. Fl. Ind. Bat. 1, 2 (1858) 101; Illustr. (1870) 23, t. 12A (*excl. var. celebica* MIQ., *quae est C. lanceolaris*); BACK. Schoolfl. (1911) 61; KOORD. Exk. Fl. Java 2 (1912) 294; RIDL. J. Fed. Mal. St. Mus. 84 (1917) 15; BACK. Bekn. Fl. Java (em. ed.) 4A (1942) fam. 45, p. 9.—*C. pumila* CHAMP. in Hook. J. Bot. Kew Gard. Misc. 3 (1851) 260; HOOK. *f.* & TH. Fl. Br. Ind. 1 (1872) 177; GAGN. Fl. Gén. I.–C. 1 (1908) 188.—*C. hasseltiana* MIQ. Illustr. (1870) 24, t. 13. —*C. celebica* MIQ. *l.c.* 26.

Slack climber, 3–20 m. Twigs almost straight, angular and puberulous when young, terete and glabrescent when older; internodes *c.* 1½–4 cm. *Thorns* patent to recurved, 2–5 mm long, especially on flowering branches minute or wanting. *Leaves* subcoriaceous, oblong to lanceolate, (2.3–)2½–4(–5) times as long as wide, sometimes ovate, rarely obovate, above glabrous, beneath sparsely puberulous but soon glabrescent, young leaves salmon-reddish, (4–)5½–10½ by (1½–)2–3½(–4) cm; base obtuse to acutish, top narrowed, acuminate, tip often blunt, sometimes slender and acutish, mucronate; midrib above sulcate all over; nerves inconspicuous, 6–9(–11) pairs; petiole 5–6(–10) mm, hairy as the twig. *Flowers* sometimes fragrant, in axillary subumbels which are often arranged in a terminal panicle *c.* 15–20 cm long, each a few cm peduncled, sparsely hairy. Pedicels slender, ½–2 cm. Bracts subulate, 1–2 mm long, caducous; bracteoles basal, minute, sometimes wanting. Buds globular, 4–5 mm diam. Outer *sepals* 4½–6(–7) mm diam., sometimes sparsely puberulous at the base outside, inner sepals elliptic to obovate, 5–7(–8) by 4–6 mm, with membranous, ciliate margin. *Petals* white (sometimes greenish or pinkish?), (3½–)5–6½ by 2–3(–4) mm, mostly obovate, pubescent. *Stamens* 20–45, 15–25(–32) mm long, filaments white. *Gynophore* 4–12 mm, ovary approximately ellipsoid, 1½ by 1 mm, both glabrous. *Fruit* globular to ellipsoid, 1–1½ cm diam., pericarp thin, leathery, smooth. Seeds one to few, globular and 5–6 mm to elliptic and 10 by 7 by 5 mm.

Distr. India (Sikkim, Khasia, and Assam), Burma (Dawna Range), S. China, Hainan, Indo-China, and the Andamans; in *Malaysia:* Central Sumatra, Java, Lesser Sunda Islands (Bali, Lombok), Celebes, Philippines (Mindanao), Moluccas (Sula Is: Mangoli, Buru). Fig. 10.

Ecol. Forests and forest edges, frequently in the shade, seems to prefer moist places. *Fl. fr.* Jan.–Dec.

In the Himalaya, Sumatra, and Java it is found between (700–)1200 and 1750(–2000) m. In Hong Kong and vicinity it occurs near sea-level, and the same is probably the case in the Philippines and the Sula Is.

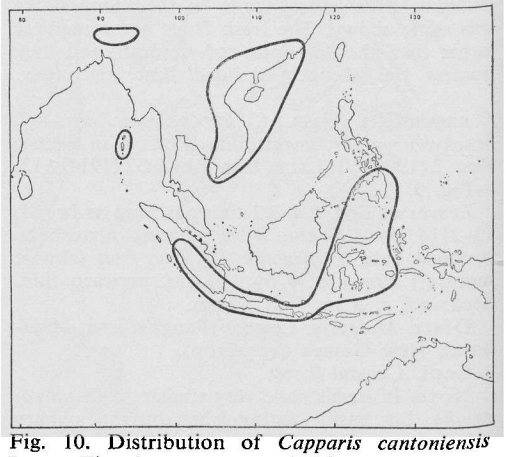

Fig. 10. Distribution of *Capparis cantoniensis* LOUR. The three areas north of Malaysia form one whole.

Vern. *Ĕndog ĕndogan, kidjĕruk, sĕgore tjalot* (?), *sigar djalak*, J, *sanik lakik*, Md.

Notes. In the two Lombok specimens, collected by ELBERT, the leaf-top is rounded to acutish.

A few specimens from Mindanao were originally identified as *C. sepiaria*, and indeed show resemblance to that species, as the leaves are compara-

tively small with a slightly notched top. On account of the midrib, however, which is narrowly sulcate, I reckon them to belong here. They are from altitudes below 300 m.

o. **Capparis longestipitata** HEINE, Mitt. Bot. Staatssamml. Münch. Heft 6 (1953) 210; Pfl. Samml. Clemens (1953) 41.

Young parts with a greyish, very short indument, glabrescent; twigs terete, straight, internodes *c.* 1½ cm; *thorns* hardly or not developed. Mature *leaves* firmly herbaceous, glabrous, oblong to slightly obovate, *c.* 5–6 by 2½(–3) cm, base rounded, top acuminate, tip 4–7 mm long, acute; midrib above sulcate in the basal half, otherwise flat; nerves 5–7 pairs, thinly prominent on both sides, reticulation distinct; petiole *c.* 1 cm long, hairy as the twig. Subumbels *c.* 15-flowered, in the axils of the higher leaves and some terminal, *c.* 1½–2½ cm peduncled. Pedicels *c.* 8–15 mm, on small distinct cushions; bracts subulate, few mm long, very soon caducous. Buds globular, *c.* 3 mm diam. Outer pair of *sepals c.* 3 mm diam., outside densely greyish puberulous, the inner ones smaller and flattish and hairy only in the centre. *Petals c.* 4 by 2 mm, glabrous, white. *Stamens c.* 20–30, *c.* 7 mm long. *Gynophore* 20–25 mm, glabrous; ovary spindle-shaped, subovoid, 1½ mm long, glabrous with a knob-shaped stigma. *Fruit* unknown.

Distr. Indo-China (Nhatrang in S. Annam, once coll.); in *Malaysia:* North Borneo (Mt Kinabalu, once coll.).

Ecol. In forest, at 1000 and 1500 m respectively.

Note. The Indo-China specimen, CHEVALIER 38671, differs slightly in having thorns 3–4 mm, the leaves $^3/_4$–$1^1/_2$ cm acuminate and brown-puberulous on the midrib underneath, the sepals 5–$5^1/_2$ by $3^1/_2$–4 mm, the petals 6 by 2 mm and puberulous inside, ± 18 stamens $1^1/_2$–2 cm, and the gynophore 3 cm long.

I have compared *C. longestipitata* with *C. cantoniensis* but its gynophore is longer, its midrib is only grooved in the basal half, and it has hardly any thorns. From *C. lanceolaris* it differs by the far smaller flowers.

7. **Capparis lanceolaris** DC. Prod. 1 (1824) 248; MIQ. Fl. Ind. Bat. 1, 2 (1858) 101; BACK. Schoolfl. (1911) 62; KOORD. Exk. Fl. Java 2 (1912) 294; BACK. Bekn. Fl. Java (em. ed.) 4A (1942) fam. 45, p. 9.—*C. subspinosa* ROXB. Fl. Ind. ed. CAREY 2 (1832) 568.—*C. roxburghii* (*non* DC.) SPAN. Linnaea 15 (1841) 166.—*C. elliptica* SPAN. *l.c.*—*C. platyacantha* TURCZ. Bull. Soc. Nat. Moscou 27, 2 (1854) 323.—*C. callophylla* (*non* BL.) MIQ. Pl. Jungh. (1855) 397; Fl. Ind. Bat. 1, 2 (1858) 101, *p.p.*—*C. salaccensis var. celebica* MIQ. Illustr. (1870) 23, t. 12b.—*C. oblongata* MERR. Gov. Lab. Publ. Philip. *n.* 35 (1906) 15; Philip. J. Sc. 1 (1906) Suppl. 58; En. Philip. 2 (1923) 212.—*C. copelandii* ELMER, Leafl. Philip. Bot. 2 (1910) 680; MERR. En. Philip. 2 (1923) 210.—*C. torricellensis* LAUT. Bot. Jahrb. 52 (1914) 112.—*C. viridis* ELMER, Leafl. Philip. Bot. 8 (1919) 3076.

Scandent shrub, few (up to 20?) m high, rarely self-supporting and *c.* 1½ m high. Twigs mostly overhanging, straight, fulvous to red-brownish puberulous when young, sooner or later (rarely not) glabrescent but nearly always vestiges of the pubescence persistent near the leaf axils; internodes *c.* 2–5 cm. *Thorns* mostly present, recurved, up to 7 mm long. *Leaves* subcoriaceous, above glabrous, beneath mostly glabrous, sometimes fulvous-puberulous, whether or not glabrescent, (1.5–)2.0–4.0(–4.7) times as long as broad, broadest in the middle, (3½–)6½–12(–16) cm long, (1¾–)2–4(–7) cm broad; base acutish to rounded or subcordate, top acuminate, rarely rounded to subemarginate, tip mostly acute-mucronate, margin often markedly recurved, especially towards the top; midrib above sulcate mostly all over, rarely flat; nerves 6–10 pairs, hardly visible; petiole (½–)¾–1(–1½) cm, hairy as the twigs. Subumbels mostly axillary, sometimes terminal, mostly simple, sometimes branched; peduncle 2–7 cm, occasionally leafy and up to 15 cm, more or less glabrescent. Pedicels (1¼–)2–2½(–3) cm, glabrous, sometimes each with a pair of distinct thorns at the base. Bracts small, caducous, narrow, hairy. Buds globular, 5–6(–8) mm diam. *Flowers* white, yellow-white, pink or red, whether or not

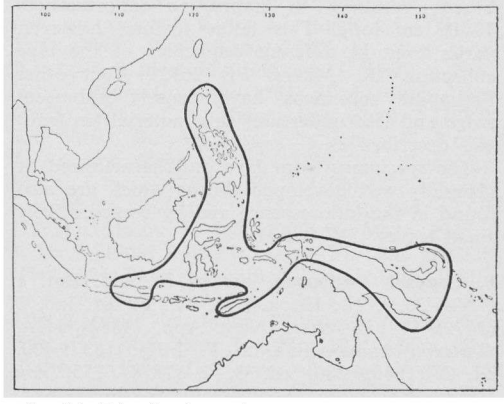

Fig. 11. Distribution of *Capparis lanceolaris* DC.

fragrant. *Sepals c.* 6–7(–10) by 5 mm, with membranous margin, glabrous; outer pair herbaceous, inner pair flatter and thinner, rarely minutely ciliate. *Petals* obovate, somewhat oblique, thin, 8–11 by 4–6 mm, puberulous towards the base, especially inside. *Stamens c.* 20 (–40), 2–3 cm. *Gynophore* (2–)3–4(–5) cm, ovary ellipsoid, 1–2 mm long, both glabrous. Fruits few; pedicel, torus, and gynophore but little incrassate. *Fruit* (sub)globular, 2¼–3½ cm, bluish black. Seeds 3 or more, *c.* 8 by 6 by 5 mm.

Distr. *Malaysia:* M.-E. Java (also Nusa Barung), Madura, Lesser Sunda Islands (Timor, Damar, Jamdena), Celebes (also Salajar and Buton), Philippines (not known from Palawan), Moluccas (Ceram, Nusa Laut), New Guinea (N. part from Manokwari to the Sepik and Papua, also Schouten I.), New Ireland. Fig. 11.

Ecol. Secondary (or primary) forests, thickets, or hedges, mostly on dry, calcareous, rocky soil, also in coastal vegetation, up to 700 m, once at 1650 m.

Vern. *Gagaan, tjantĕlan*, J, *kengkeng*, Md, *nonoh mukeh*, Timor; Philippines: *sulu-súlu*, Bag., *kamit-kabag*, Dum.

Notes. In sterile state very similar to *C. floribunda*, but this species has commonly somewhat longer petioled, mostly ovate leaves narrowing gradually towards the apex, whereas a sharply acuminate leaf tip is typical for *C. lanceolaris*, especially in the Philippines. Some sterile New Guinean specimens resemble *C. zippeliana* (see there).

In the Philippines some deviating specimens have been described as distinct species, *C. oblongata*, *C. viridis*, and *C. copelandii*. In the first two the innovations are glabrous to early glabrescent, the leaf base is obtuse to subcordate, the apex is narrow and sharply acuminate, the sepals are 9–10 mm long, the inner pair being sometimes minutely ciliate; sometimes also small thorns are found in the inflorescence! Besides, in some specimens identified as *C. oblongata*, the subumbels are conferted towards the end of the twigs and are merely subtended by minute puberulous bracts, resulting in impressive inflorescences 10–15 cm long. This latter feature, however, varies even in different duplicates of the type collection (R. MEYER FB 2632). Two other Philippine specimens have densely pubescent twigs and leaf underside; this material (in fruit) was described as *C. copelandii*.

The specimens from Java are characterized by generally well developed thorns which are also found in the inflorescence and by comparatively small leaves (3½–8 cm).

8. Capparis floribunda WIGHT, Ill. Ind. Bot. 1 (1840) 35, t. 14; HOOK. *f.* & TH. Fl. Br. Ind. 1 (1872) 177; F.-VILL. Nov. App. (1880) 11.—*Crataeva octandra* BLANCO, Fl. Filip. (1837) 400, ed. 2 (1845) 280, ed. 3, 2 (1878) 155, *non Capparis octandra* JACQ.—*C. luzonensis* TURCZ. Bull. Soc. Imp. Nat. Mosc. 27,2 (1854) 324; MERR. Sp. Blanc. (1918) 159; En. Philip. 2 (1923) 212, *incl. var. ampla* MERR. *l.c.*—*C. andamanica* KING, Ann. R. Bot. Gard. Calc. 5 (1896) 119, t. 137. —*C. oligostema* HAY. Ic. Pl. Form. 3 (1913) 22.

***f.* floribunda.**

Young parts glabrous, rarely very soon glabrescent.—Shrub or climber (?), few m high. Twigs straight or slightly zig-zag, terete, smooth, internodes 2–5 cm; *thorns* small, recurved, mostly wanting. *Leaves* firmly herbaceous, broadest at the middle or sometimes below, mostly narrowed in the upper half, mostly 2½–3 times as long as wide, (4–)6–10(–13) by (1½–)2½–4(–6) cm; base mostly rounded and more or less acute, top variable; midrib above often narrowly sulcate; nerves 7–9 pairs; margin often slightly recurved; petiole ½–1½(–2) cm. *Flowers* numerous, white, fragrant, in small subumbels, *c.* 1–2 cm stalked, arranged in a terminal panicle up to 15 by 10 cm, with some additional smaller axillary panicles. Bracts linear, 2–6 mm, sooner or later caducous. Buds globular, 3–4 mm diam. *Sepals* 2–4 by 1½–2½ mm, ovate, patent and persistent for some time after anthesis, outer ones patent, not or narrowly membranous-margined, inner ones sometimes broader, with a broad, membranous margin. *Petals* very thin, oblong or ovate, 3–5 by 1½–2 mm. *Stamens* 7–9(–12), 6–8 mm. *Gynophore* 4–6 mm (in Ceylon up to 10 mm); ovary ovoid, acutish, 1–1½ by ½–1 mm, both glabrous. In fruit the pedicel, torus and gynophore only slightly thickened. *Fruit* globular, ± 1½–2(–2½) cm diam., soft, fleshy, pericarp coriaceous, smooth orange. Seeds 1–3, ± 13 by 10 by 6 mm.

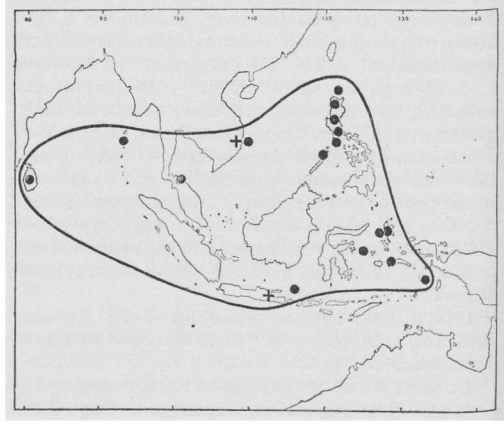

Fig. 12. Localities of *Capparis floribunda* WIGHT (•) and of its *f. induta* JACOBS (+). The locality near the Malay Peninsula (Koh Ha) is approximate. Also in the Deccan and Formosa.

Distr. Ceylon, Deccan, Indo-China (Annam), Formosa, Peninsular Siam, Andamans; in *Malaysia:* Java (only Kangean Arch.), Philippines (Debangan I. near Palawan, Babuyan I., Luzon), Moluccas (Halmaheira, Tidore, Sula Is, W. Ceram, Kai Is). Fig. 12.

Ecol. This showy plant seems to prefer dry country and rocky soil, sometimes in coastal vegetation, in the lowlands; once at 1600 m. *Fl. fr.* Jan.–Dec.

ELMER found "many fruits opened and seeds eaten by birds".

***f.* induta** JACOBS, *f. nova.*

A f. floribunda differt indumento denso fulvo puberulo in partibus juvenilibus.

A dense, fulvous-puberulous indument on twigs, young leaves, and inflorescences. Outer sepals at the base somewhat hairy and petals slightly ciliate.

Distr. Indo-China (Annam); in *Malaysia:* E. Java (Surabaja Residency, Muning, fl. ix-1927, DE VOOGD 673 (L, type; Bo)).

Vern. *Wangon lanang*, J. Fig. 12.

Notes. The species is characterized by the glabrous appearance, with small or without thorns, the large number of small flowers with 8 stamens, subpersistent sepals, and a short gynophore which is more vigorous than in *C. sepiaria*; the latter species has also a lighter coloured fruit.

The only specimen known from the mainland of Java is the specimen described as *f. induta* JACOBS. In sterile state it can look like *C. lanceolaris* (see there).

The leaves are variable in width. TURCZANINOW *C. luzonensis* on the specimen with the narrowest leaves that I have seen, the leaf index being 3.7–4.1. MERRILL's *var. ampla* actually represents the normal leaf-shape; intergrading specimens are by no means rare.

9. Capparis lobbiana TURCZ. Bull. Soc. Nat. Moscou 27, 2 (1854) 323; ROLFE, J. Bot. 23 (1885) 210; VIDAL, Rev. Pl. Vasc. Filip. (1886) 47.—*C. sepiaria var. acuta* VIDAL, *l.c.*—*C. littoralis* MERR. Philip. J. Sc. 7 (1912) Bot. 270; En. Philip. 2 (1923) 211.—*C. loheri* MERR. Philip. J. Sc. 7 (1912) Bot. 270; En. Philip. 2 (1923) 211.—*C. palawanensis* MERR. Philip. J. Sc. 10 (1915) Bot. 304; En. Philip. 2 (1923) 212.—*C. ilocana* MERR. Philip. J. Sc. 13 (1918) Bot. 13; En. Philip. 2 (1923) 211.—**Fig. 13.**

Climber 1½–3(–4) m high. Twigs slender, straight or slightly zig-zag, with leaves not seldom in two rows, densely clothed with up to ½ mm long, straw-coloured hairs, rarely almost glabrous or soon glabrescent; internodes 1–2(–3) cm. *Thorns* almost straight, up to 2, rarely 5 mm, thin, dark, with lighter base, pointing upwards, exceptionally downwards. *Leaves* herbaceous, broadest below, rarely at the middle, (1.5–)1.8–2.5 (–4.3) times as long as wide, glabrous or sparsely hairy above, hairy beneath, especially on the nerves, 4–8(–15) by 2–3½(–5) cm; base cuneate, sometimes rounded, rarely acute, top narrowed, acute to (rarely long-) acuminate, often with a nerf-tip; midrib above shallowly sulcate in the lower part, yellowish, sparsely hairy underneath; nerves 6–8 pairs; petiole 2–4(–12) mm, hairy as are the twigs. Subumbels axillary; peduncle ½–6 cm, thin, bearing sometimes one or more small leaves, hairy. Pedicels slender, 1½–3 cm, mostly with distant hairs, rarely glabrous. Bracts inconspicuous, narrow. Buds globular to depressed-globular, 5–6 mm diam. *Flowers* white or pale pink. *Sepals* persistent for a short time, outer pair 5–6 mm diam., herbaceous, hairy (or rarely glabrous), inner sepals 6–7 mm diam., thinner, ciliate. *Petals* very thin, ovate, 2–4 by 2½–3 mm, ciliate. *Stamens* 15 to 60, 8–12 mm long, anthers 1–1½ by ½–1 mm. Torus obscure. *Gynophore* 1½–3(–4¾) cm. glabrous; ovary ovoid, *c.* 2 by 1 mm. In fruit the pedicel, torus, and gynophore only slightly incrassate. *Fruit* globular, *c.* 1½ cm diam., pericarp leathery, thin, smooth, glossy, blackish. Seeds few, subellipsoid, *c.* ½ cm long.

Distr. *Malaysia:* Endemic in the Philippines (not known from the Sulu Arch.).

Ecol. Prefers dry, rocky conditions, also in primary forests, bamboo thickets, *etc.*, up to 600 m.

Vern. *Manungal-lalaki*, Mindoro.

Notes. A variable species which can always be distinguished from *C. lanceolaris* by the straight, though sometimes little developed thorns.

Capparis palawanensis MERR. represents a form with unusually large leaves, but transitions with the average leaf-size occur. *C. littoralis* MERR. represents obviously a glabrous form; in some specimens of typical *lobbiana* the leaves are also soon glabrescent. There is but poor material of *C. ilocana* MERR.; the type and another specimen agree mutually very well and seem to represent another glabrous paramorph with almost abortive thorns and subcoriaceous leaves.

10. Capparis sepiaria LINNÉ, Syst. Nat. ed. 10, 2 (1759) 1071; Sp. Pl. ed. 2, 1 (1762) 720; BURM. *f.* Fl. Ind. (1768) 118; DC. Prod. 1 (1824) 247, *incl. β glabrata*; ROXB. Fl. Ind. 2 (1832) 568; W. & A. Prod. 1 (1834) 26; DECNE, Nouv. Ann. Mus. Hist. Nat. Paris 3 (1834) 427; Herb. Timor. Descr. (1835) 99; SPAN. Linnaea 15 (1841) 166; JACQUEM. Voy. Ind. Bot. 4 (1844) 21, t. 24; GRAY, U.S. Expl. Exp. Bot. 1 (1854) 70; MIQ. Fl. Ind. Bat. 1, 2 (1858) 101; Sum. (1860) 159; Illustr. (1870) 27; HOOK. *f.* & TH. Fl. Br. Ind. 1 (1872) 177, *incl. var. vulgaris*; KURZ, Fl. Burm. 1 (1877) 66; FERN.-VILL. Nov. App. (1880) 11, *cum var.*; NAVES in Blanco, Fl. Filip. ed. 3 (1880) t. 209; VIDAL, Phan. Cuming. (1881) 94; Sinopsis Atlas (1883) 13, t. 6 f. A; HEMSL. Bot. Chall. 3 (1884) 120; VIDAL, Rev. Pl. Vasc. Filip. (1886) 47; KING, J. As. Soc. Beng. 58, ii (1889) 393; KURZ *ex* PRAIN, J. As. Soc. Beng. 59, ii (1890) 277, *incl. var. grandifolia*; *ibid.* 60, ii (1891) 302; *ibid.* 62, ii (1893) 65; BACK. Fl. Bat. (1907) 59; MERR. Philip. J. Sc. 3 (1908) Bot. 77; GAGN. Fl. Gén. I.-C. 1 (1908) 191; BACK. Schoolfl. (1911) 61; RIDL. J. Str. Br. R. As. Soc. *n.* 59 (1911) 68; KOORD. Exk. Fl. Java 2 (1912) 294; MERR. Fl. Manila (1912) 215; RIDL. Fl. Mal. Pen. 1 (1922) 122; MERR. En. Philip. 2 (1923) 212, *excl. var. acuta* VIDAL *in synon., quae est C. lobbiana*; CRAIB, Fl. Siam. En. 1 (1925) 83; C. T. WHITE, J. Arn. Arb. 10 (1929) 217; GAGN. Fl. Gén. I.-C. Suppl. 1 (1939) 165; BACK. Bekn. Fl. Java (em. ed.) 4A (1942) fam. 45, p. 9.—*C. umbellata* R. BR. *ex* DC. Prod. 1 (1824) 247; C. T. WHITE, Proc. Roy. Soc. Queensl. 34 (1922) 31.—*C. emarginata* PRESL, Rel. Haenk. 2 (1835) 85, *non* A. RICH.; FERN.-VILL. Nov. App. (1880) 11; MERR. En. Philip. 2 (1923) 211.—*C. retusella* THW. En. Pl. Zeyl. (1864) 16 = *C. sepiaria var. retusella* THW. *l.c.* 400; FERN.-VILL. Nov. App. (1880) 11. —*C. subacuta* MIQ. Illustr. (1870) 35, *p.p., quoad specim. halmah.* —*C. trichopetala* VAL. Bull. Dép. Agr. Ind. Néerl. 10 (1907) 14 = *C. sepiaria var. trichopetala* VAL. *l.c.* 72; LAUT. Bot. Jahrb. 52 (1914) 112.—*C. affinis* MERR. Philip. J. Sc. 10 (1915) Bot. 303; En. Philip. 2 (1923) 210.

Wide, much-branched shrub, few m high, sometimes climbing. Young shoots densely fulvous or greyish puberulous, sooner or later glabrescent;

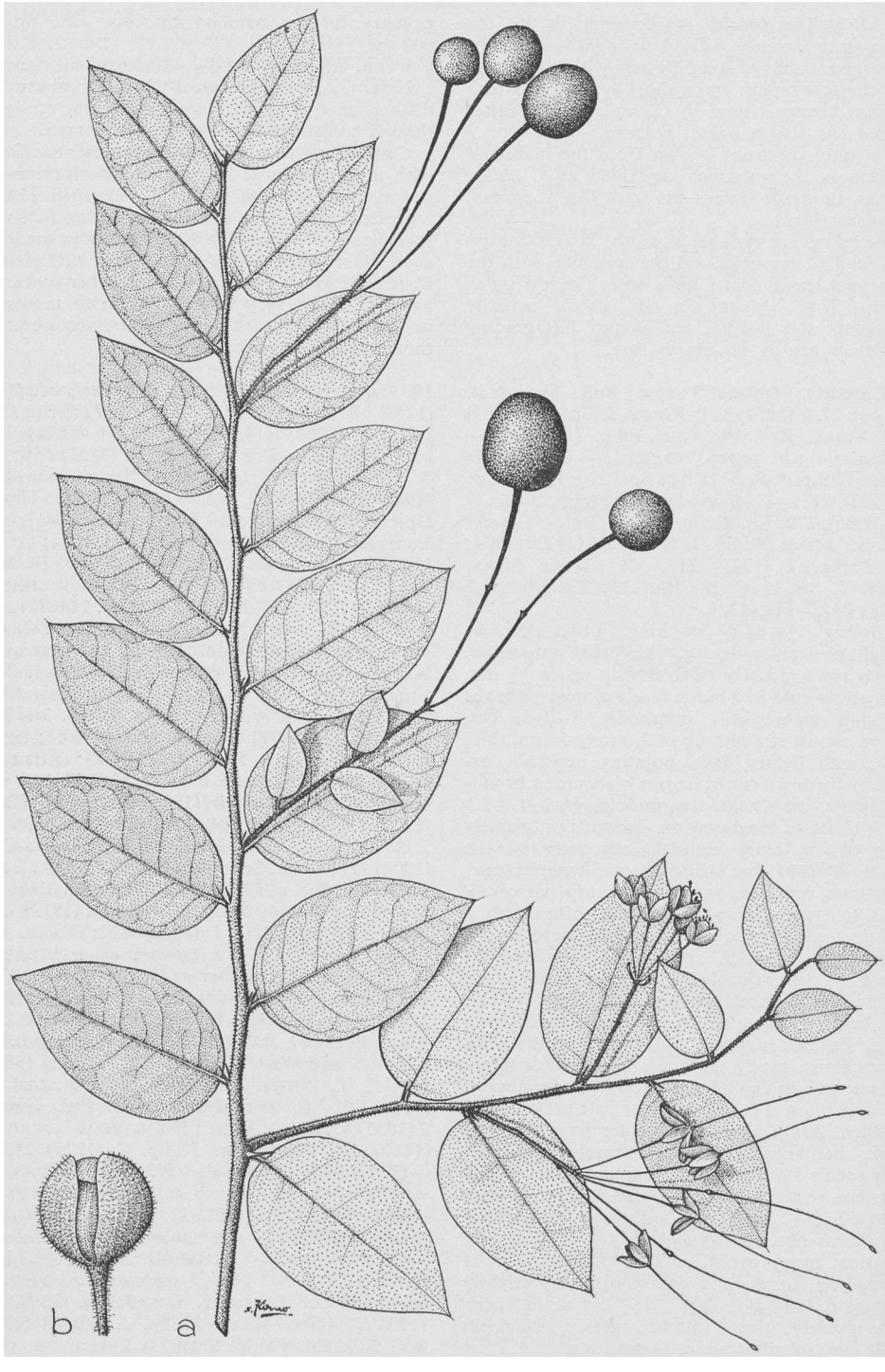

Fig. 13. *Capparis lobbiana* TURCZ. *a.* Branch with fruits and flowers, × ⅔, *b.* bud, × 3 (WILLIAMS 382 and BS 85241).

twigs stout, zig-zag, terete; internodes 1½–3½ cm. *Thorns* generally vigorous, recurved, 3–5 mm long. *Leaves* firmly herbaceous to subcoriaceous, when dry mostly greyish green (in some Philippine specimens brownish), elliptic, sometimes obovate, or ovate, exceptionally linear, hairy as the twigs, upper surface glabrescent first, often with scattered minute warts, (1½–)1.8–2.3(–4) times as long as wide, (1½–)3½–5½(–10) by (1–)1½–2½(–4) cm; top mostly rounded, nearly always notched, rarely blunt; midrib flattish above, sometimes slightly sulcate at the base; nerves 4–6(–8) pairs, not very distinct; petiole 2–4(–7) mm. Subumbels few- to 20-flowered, at the end of small lateral twigs, rarely terminal. Bracts small, hairy, early caducous. Pedicels ¾–2(–2½) cm, glabrous. Buds globular, 4(–5) mm diam. *Sepals* ovate, 4–6 by 3–5 mm, occasionally finely ciliate, outer pair herbaceous with narrow membranous margin; inner pair somewhat smaller, very thin, membranous towards the margin. *Petals* 4½–7½ by 1¼–3 mm, very thin, white, more or less pubescent, especially outside at the base of the upper pair. Torus inconspicuous. *Stamens* 30–45, 7–12 mm, filaments white, anthers 1½ by 1 mm. *Gynophore* (4–)6–10(–13) mm, glabrous; ovary ovoid, 1½–2 by 1 mm, glabrous. In fruit the torus and gynophore somewhat incrassate, the pedicel hardly so. *Fruit* rather fleshy, (sub-)globular, 1–2-seeded, 1–1½ cm diam., pericarp subcoriaceous, smooth, whitish-yellowish to almost blackish. Seeds ± 8 by 5 by 4 mm.

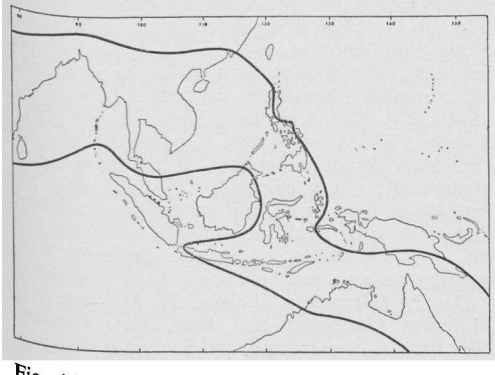

Fig. 14. Distribution of *Capparis sepiaria* L. in Malaysia.

Distr. Ceylon, India (Deccan, Sind, Punjab) to SW. Burma (Diamond I.), Andamans, SE. China (Kwangtung), Indo-China, Siam, and Hainan to Australia (Arnhem Land, Queensland, and New South Wales to *c.* 32° SL), in *Malaysia:* Malay Peninsula (Kedah, Kelantan), North Borneo, Java (in W only twice found at the N. coast), Madura, Kangean Arch., Lesser Sunda Islands (Bali, Nusa Penida, Sumbawa, Alor, Timor, Leti, Babar, Wetar), Celebes (also Salajar I. and Buton), throughout the Philippines, Moluccas (Halmaheira, Buru, Ambon, Kai Is), New Guinea (near Merauke, S. Papua). Fig. 14.

Ecol. Drier places in thickets, hedges, teak-forests, *etc.*, in the lowlands, often near the seaside, solitary or in groups, obviously bound to seasonal climatic conditions. When in fruit, often a good deal of the leaves is shed.

Vern. *Poka(n)*, Md.

Uses. The plant is said to be have some medicinal use (*cf.* QUISUMBING, Med. Pl. Philip. 340).

Notes. It seems not unlikely that this species occurs also in Africa under the names *C. corymbosa* LAMK and *C. tomentosa* LAMK, but this question deserves further research.

In the eastern part of Malaysia specimens are found which are intergrading between typical *C. sepiaria* and the Australian *C. umbellata*; they have straighter stems with less developed or often wanting thorns, larger, ovate, soon glabrescent leaves, fewer flowers in a shorter stalked and more often terminal and (sub)sessile subumbel. In a few specimens the midrib is sulcate all over.

C. sepiaria and *C. cantoniensis* are easily distinguished by the midrib, flattened in the former and narrowly sulcate in the latter.

In one sterile specimen collected by GAUDICHAUD near Manila the leaves are extremely narrow, *viz c.* 10 times as long as wide (6–7 mm). A similar phenotypic variation was found in *C. quiniflora.*

11. Capparis diffusa RIDL. J. Str. Br. R. As. Soc. *n.* 59 (1911) 68; Fl. Mal. Pen. 1 (1922) 122; HENDERS. J. Mal. Br. R. As. Soc. 18 (1939) 35.

Shrub or climber; twigs slender, sparsely brown-puberulous when young; internodes 2–4 cm. *Thorns* recurved, 1–3 mm long. *Leaves* elliptic, ovate to obovate, *c.* 5–8 by 2½–4 cm; base rounded to blunt, top blunt, minutely retuse, sometimes subacuminate; midrib above subprominent, sulcate at the base, brown-puberulous when young on both surfaces, or glabrous; nerves 5–6 pairs, thin; petiole 3–4 mm, sulcate above, brown-puberulous when young. Umbel terminal, sessile, 3–5-flowered. Bracts minute, caducous. Pedicels filiform, 2–5 cm, glabrous. Buds globular, 3–4 mm diam. *Sepals c.* 4 mm long, outer pair glabrous; inner pair elliptic, ciliate. *Petals* white, oblong, *c.* 4–5 mm, hairy inside. *Stamens* 12–15, *c.* 1¼ cm, anthers small, white. *Gynophore c.* 1½ cm, glabrous; ovary subglobular, acute, *c.* 1 mm long. *Fruit* unknown.

Distr. *Malaysia:* N. Sumatra (P. Weh), Malay Peninsula (Perlis), twice collected.

Ecol. On (limestone) rocks. *Fl.* Dec.

12. Capparis callophylla BL. Bijdr. 2 (1825) 53; KOORD. Minah. (1898) 342; BACK. Schoolfl. (1911) 62; Bekn. Fl. Java (em. ed.) 4A (1942) fam. 45, p. 10.—*C. tylophylla* SPRENG. Syst. Nat. 4 (1827) 204; MIQ. Choix (1864) t. 2; Fl. Ind. Bat. 1, 2 (1858) 101; Illustr. (1870) 22; KOORD. Exk. Fl. Java 2 (1912) 294; MERR. En. Philip. 2 (1923) 213.—*C. cumingii* MERR. & ROLFE, Philip. J. Sc. 3 (1908) Bot. 101.—*C. turczaninowii* ELMER, Leafl. Philip. Bot. 5 (1913) 1755.—*C. mucronata* ELMER, *l.c.* 1757.—*C. robusta* HEINE, Mitt. Bot. Staats-

samml. Münch. Heft 6 (1953) 211; Pfl. Samml. Clemens (1953) 41.

Climbing, glabrous shrub, few m high. Twigs stout, (reddish-)brown when dry; internodes 2–7 cm. *Thorns* often wanting, if present recurved, up to 5 mm long. *Leaves* coriaceous, often reddish brown when dry, broadest in the middle, (1½–)2–3(–3½) times as long as wide, (8–)14½–20(–26) by (3½–)5–9(–14) cm; margin slightly recurved; base more or less acute to rounded, sometimes subcordate, top rounded (or emarginate) and mostly with a hardened tip or shortly and bluntly acuminate; midrib above flat to sulcate; nerves *c.* 6–7 pairs, subprominent above; petiole 1–2(–2½) cm, stout, dark-coloured, rough. Inflorescence a more or less leafy, terminal panicle of subumbels. Pedicels 2–4½ cm. Bracts early caducous. Buds globular, 8–12 mm diam. *Flowers* white, pink or red-brown. Outer *sepals* coriaceous, subpersistent, 10–13 by 8 mm, rough; inner sepals subcoriaceous, 12–14 by 6–10 mm, thinner towards the margin. *Petals* oblong to obovate-subspathulate, 22–35 by 6–11 mm. Torus 4–5 mm broad. *Stamens c.* 50–80, filaments light red, 3½–4½ cm, anthers 2–3 by 1 mm. *Gynophore* 3–4½ cm, ovary ellipsoid, *c.* 4 by 2–3 mm, both glabrous. In fruit the pedicel (especially towards both ends), the torus, and the gynophore towards the top, considerably incrassate. *Fruit* globular to ellipsoid, 5–6½ cm long, pericarp 2–5 mm thick, smooth, yellowish orange. Seeds ∞, *c.* 1 by ½ cm.

Distr. Formosa (a variety), in *Malaysia:* Sumatra (Palembang), W. Java, Madura, North Borneo, Celebes, and throughout the Philippines. Fig. 15.

Except in the Philippines, the species seems to be rare.

Ecol. Mostly on dry, often calcareous soil, but also in moister habitats, in secondary forest, *etc.*, from the lowland up to 700, in N. Borneo up to 1700 m. *Fl. fr.* Jan.–Dec.

Vern. *Manunggal*, Mindoro, *sani*, Minahasa.

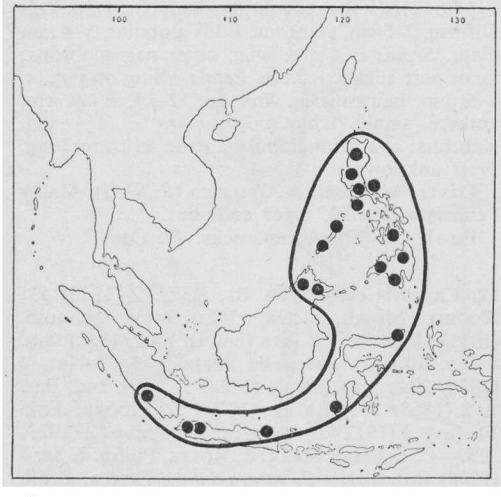

Fig. 15. Localities of *Capparis callophylla* BL.; a variety in Formosa.

13. Capparis zippeliana MIQ. Illustr. (1870) 25, t. 14; SCHEFF. Ann. Jard. Bot. Btzg 1 (1876) 5; K. SCH. & HOLLR. Fl. Kais. Wilh. Land (1889) 49; K. SCH. & LAUT. Fl. Schutzgeb. (1900) 336; LAUT. Bot. Jahrb. 52 (1914) 114, f. 1a–d, *incl. var. novohibernica*, f. 1e, *et var. novobritannica*, f. 1f; PAX & HOFFM. in E. & P. Pfl. Fam. ed. 2, 17b (1936) 178, f. 90.—*C. dahlii* GILG & K. SCH. Notizbl. Berl.-Dahl. 1 (1896) 208; K. SCH. & LAUT. Fl. Schutzgeb. (1900) 335.—*C. carolinensis* KANEH. Bot. Mag. Tokyo 48 (1934) 919, f. 6.

Small climber. Twigs slender, fairly straight, glabrous, rarely glabrescent; internodes 2–5 cm. *Thorns* mostly wanting, if present slightly recurved, up to 3 mm. *Leaves* firmly herbaceous, often dull red-brownish when dry, broadest in the middle, (1.7–)2.2–2.8(–3.5) times as long as wide, (8–)13–20(–26) by (4½–)5–8(–10) cm, glabrous or rarely thinly puberulous below; margins subrevolute; base rounded or acutish or subcordate, top (rarely sharply) acuminate, or rarely emarginate; midrib above mostly sulcate in the basal part, to flat; nerves 5–9 pairs; petiole (¾–)1–1½(–1¾) cm, sulcate above, glabrous, rarely glabrescent. Subumbels up to 10-flowered, mostly sparsely puberulous, sometimes axillary but mostly arranged in a terminal panicle, slender, 2–7(–12) cm peduncled. Pedicels 1–4½(–6) cm. Bracts small, subulate, hairy, caducous. Buds globular, 5–6(–10) mm diam. *Sepals* subpersistent, outside sparsely hairy or glabrous, with membranous margin, 5–6(–12) mm diam.; outer pair subcoriaceous, one often initially enveloping the bud for ⅔; inner pair suborbicular, herbaceous. *Petals* thin, obovate, 6–8 by 2½–4 mm, white, minutely puberulous on both sides, base narrowed, top rounded (sometimes crisped?). *Stamens c.* 25–45, (1½–)2½–3 cm long, white or pale pink; anthers 1½–2½ by ½ mm. *Gynophore* 2–3½(–4) cm, often thinly puberulous at the base, soon glabrescent; ovary ellipsoid, 1½ by 1 mm. In fruit the pedicel, torus, and gynophore are rather incrassate. *Fruit* ovoid or ellipsoid, *c.* 4½ by 3½ cm, top sometimes umbonate, pericarp thin, leathery, smooth, red. Seeds ∞, *c.* 12 by 9 by 6 mm.

Distr. Micronesia (Palau), in *Malaysia:* S. Moluccas (Tanimbar and Kai), New Guinea, New Britain, New Ireland, and Solomons (Ulawa). Fig. 20.

Ecol. Primary and secondary rain-forests, sometimes on rocky soil, below *c.* 1200 m alt. *Fl. fr.* Jan.–Dec.

Vern. *Dschiriguh*, Constantinhafen, *wendos*, Manokwari, *walakenaru*, Solomons.

Note. In the sterile state much resembling *C. lanceolaris*, though the different average leaf-size is generally a good character; besides, *C. lanceolaris* is pubescent on the mature twig near the leaf-insertion which is glabrous in *C. zippeliana*.

14. Capparis pubiflora DC. Prod. 1 (1824) 246; DECNE, Nouv. Ann. Mus. Hist. Nat. Paris 3 (1834) 246; Herb. Timor. Descr. (1835) 98; DELESS. Ic. Pl. 3 (1837) t. 12; SPAN. Linnaea 15 (1841) 165; MIQ. Fl. Ind. Bat. 1, 2 (1858) 100; Illustr. (1870) 27, t. 15,

incl. var. sumatrana et var. moluccana MIQ. *l.c.* 28; KING, J. As. Soc. Beng. 58, ii (1889) 394, *incl. var. perakensis* SCORT.; HALL. *f.* in Koord. Minah. (1898) 343; RIDL. J. Fed. Mal. St. Mus. 10 (1920) 129; BACK. Bekn. Fl. Java (em. ed.) 4A (1942) fam. 45, p. 13.—*C. nigricans* SPAN. Linnaea 15 (1841) 165; MIQ. Fl. Ind. Bat. 1, 2 (1858) 100.—*C. cerasifolia* A. GRAY, U.S. Expl. Exp. Bot. 1

Fig. 16. *Capparis pubiflora* DC. (Cult. Hort. Bog. XV–J–B–II–6; JACOBS, 1956).

(1854) 71; C. MUELLER in Walp. Ann. 7 (1868) 189 (*crassifolia, sphalma*); MERR. Philip. J. Sc. 3 (1908) Bot. 77; En. Philip. 2 (1923) 210.—*C. brachyscias* TURCZ. Bull. Soc. Nat. Moscou 27, 2 (1854) 323. —*C. lasiopoda* TURCZ. *l.c.* 322; FERN.-VILL. Nov. App. (1880) 11; VIDAL, Phan. Cuming. (1885) 94; Rev. Pl. Vasc. Filip. (1886) 48.—*C. myrioneura* HALL. *f.* in Fedde, Rep. 2 (1906) 60, *p.p.*—*C. dealbata* (*non* DC.) BACK. Schoolfl. (1911) 62.—*C. perakensis* (SCORT. *ex* KING) RIDL. Fl. Mal. Pen. 1 (1922) 124.—*C. borneensis* MERR. Pl. Elm. Born. (1929) 91.—**Fig. 16–17.**

Shrub 2–5 m high. Young shoots densely fulvous-tomentose, soon (rarely late) glabrescent; twigs often zig-zag, terete; internodes 1–3 cm. *Thorns* straight or slightly curved upwards, patent, 3–6 mm (wanting or very small in the Philippine specimens). *Leaves* herbaceous to subcoriaceous, glabrous with yellowish nerves, (1.7–)2.7–3(–4.4) times as long as wide, often obovate, rarely ovate, (5–)8–16(–27½) by 2½–6 (–9) cm; base acute to blunt, sometimes rounded, top acuminate, tip up to 2 cm, acute to blunt; midrib sometimes sulcate above; nerves (6–)7–9 (–13) pairs, reticulations distinct; petiole 5–8 (–11) mm. *Flowers* either 1–5(–10) in short, axillary racemes, with a persistent, densely tomentose, subulate bract and 2 smaller basal bracteoles, or sometimes this inflorescence replaced by a short young twig with axillary flowers; racemes and young twigs with a number of minute subulate bract-like leaves at the base. Pedicels ½–3(–5) cm, glabrescent. Buds globular to ovoid, *c.* 5 mm long. *Sepals* herbaceous, concave, 4½–7 by 2½–4 mm, outside puberulous, outer pair acute or blunt, sometimes slightly cucullate, inner pair with blunt or rounded top. *Petals* thin, mostly obovate, 7—10 by 3–4 mm, outside soft-hairy at top and margins. Torus conical, disk *c.* 1 mm. *Stamens* 20–30(–50), filaments 15–20(–25) mm, anthers elliptic, 1 by ½ mm. *Gynophore* 15–25 mm, densely tomentose, in fruit glabrescent; ovary ellipsoid, 2½ by 1½ mm, hairy as the gynophore, the small, knob-shaped stigma glabrous. Pedicel and gynophore not much incrassate in fruit. *Fruit* subellipsoid, 12–21 by 10–19 mm, shortly umbonate, pericarp leathery, verruculose, glabrous, black, sometimes with a reddish or bluish tinge. Seeds 5–15(–25), *c.* 6 by 5 by 4 mm, smooth.

Distr. Siam, Indo-China, Hainan, in *Malaysia:* Central & S. Sumatra (Gajo Lands, once collected), Malay Peninsula (Perak, Kelantan, Pahang, Selangor), North Borneo, Java (E of Lembang, also Nusa Barung), Madura, Lesser Sunda Islands (Bali, Lombok, E. Sumbawa, Timor), Celebes, Philippines (Palawan, Luzon, Mindanao with Pujada I.), Moluccas (Ceram, Ambon, Halmaheira), New Guinea (Vogelkop). Fig. 18.

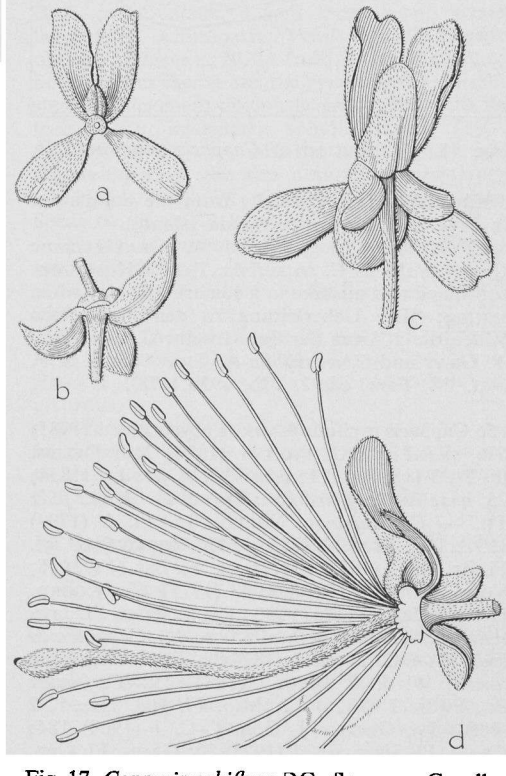

Fig. 17. *Capparis pubiflora* DC., flower. *a.* Corolla, front view, stamens and gynophore removed, × 6/5, *b.* calyx (one sepal removed) and disk, × 2, *c.* calyx and corolla from the back, × 2½, *d.* flower, near-longitudinal section, × 2½ (after living plant, Cult. Hort. Bog. XV–J–B–II–6).

Ecol. More or less dry places, such as hedges, roadsides, teak forests, brushwood, jungle, up to 400(–600) m. *Fl.* June–July, *fr.* March.

Vern. (*Daun*) *poka*, *saneg-sanegan*, Md, *djĕnggotan*, *waan-waanan*, J, *bangol bangol*, Bali; Minahasa: *maha-limu*, Ratahan, *malemo*, Tonsawang, *tutunean woring*, Tontemboan, *sahamuntei*; *wama pusu*, Halmaheira, *holiboi*, Mbo.

Notes. Some specimens from Sumatra and the Malay Peninsula, and generally those from Celebes, the Moluccas, and the Philippines, have markedly larger, obovate leaves; they cannot be

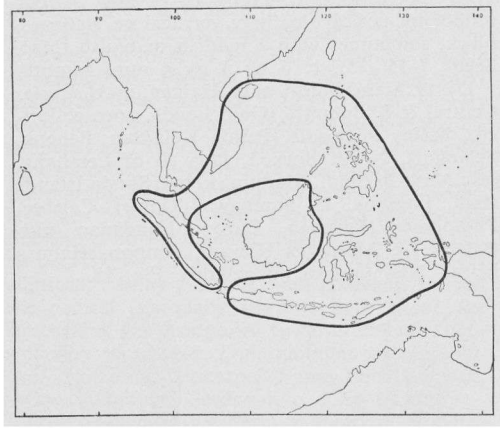

Fig. 18. Distribution of *Capparis pubiflora* DC.

distinguished taxonomically from the population in Java and the Lesser Sunda Islands.

C. MUELLER, *l.c.*, copied A. GRAY's name *C. cerasifolia* as *C. crassifolia*. PAX & HOFFMANN continued this mistake in a remarkable way when stating: "Die Ueberleitung zu den Philippinen bilden die 2 Arten der Sulu-Inseln: *C. cerasifolia* A. GRAY und *C. crassifolia* A. GRAY" (in E. & P. Nat. Pfl. Fam. ed. 2, 17b, 1936, 178).

15. Capparis pyrifolia LAMK, Encycl. Bot. 1 (1785) 606, *quoad* α; DC. Prod. 1 (1824) 246; DELESS. Ic. Pl. 3 (1837) t. 11; *non* W. & A. Prod. 1 (1834) 25, *quae est C. grandiflora* WALL. *ex* HOOK. *f.* & TH. — *C. acuminata* WILLD. Sp. Pl. 2 (1799) 1131; DC. Prod. 1 (1824) 247; HOOK. *f.* & TH. Fl. Br. Ind. 1 (1872) 178; BACK. Fl. Bat. (1907) 56; Voorl. (1908) 13; Schoolfl. (1911) 63; KOORD. Exk. Fl. Java 2 (1912) 293; BACK. Bekn. Fl. Java (em. ed.) 4A (1942) fam. 45, p. 7.—*C. zeylanica* (*non* L.) DC. Prod. 1 (1824) 247, *quoad specim. javan.*; W. & A. Prod. 1 (1834) 25.—*C. foetida* BL. Bijdr. 2 (1825) 52; MIQ. Fl. Ind. Bat. 1, 2 (1858) 99; GAGN. Fl. Gén. I.–C. 1 (1908) 184; CRAIB, Fl. Siam. En. 1 (1925) 80; GAGN. Fl. Gén. I.–C. Suppl. 1 (1939) 161.—*C. dasypetala* TURCZ. Bull. Soc. Nat. Moscou 27, 2 (1854) 322.—*C. oxyphylla* MIQ. Pl. Jungh. 4 (1855) 397; Fl. Ind. Bat. 1, 2 (1858) 100.—*C. horrida* (*non* L. *f.*) MIQ. Illustr. (1870) 34, *pro var.* α *pro parte et synon. C. foetida et C. oxyphylla.*

Shrub, sometimes climbing, 1½–2½(–3½) m; twigs straight, terete, with minute, stellate, ferruginous hairs, glabrescent; internodes 2–5 cm. *Thorns* patent, straight or slightly curved upwards, 1–3(–4) mm. *Leaves* on lateral branches mostly distichous, more or less firmly herbaceous, elliptic, when young with minute, stellate, fulvous-ferruginous indument giving it a farinaceous aspect, glabrescent, (1.2–)1.7–2.2(–3) times as long as wide, often ovate, sometimes obovate, 5–9½ (–15) by 2½–4½(–6½) cm; base rounded to blunt, top acuminate with a mostly blunt tip ½–1½ cm long; nerves yellow to light-brown, midrib sometimes sulcate above; nerves *c.* 5 pairs, veins reticulate; petiole *c.* ½ cm, densely greyish brown tomentellous. *Flowers* 2–4, serial. Pedicels (1–) 1½–2(–2½) cm, thin, densely hairy, glabrescent except for the somewhat broadened top. Buds globular, 4–5 mm diam. *Sepals* elliptic-ovate, 4–5 by 2½–4 mm, minutely hairy outside, 3-nerved, outer pair (especially the posterior one surrounding the disk) slightly larger and more obtuse than the inner. *Petals* elliptic to oblong, 6–8 by 2–4 mm, very thin, on both sides floccose-hairy, white tinged pale yellow, green, or violet, upper pair mostly slightly smaller than the lower pair, the base thickened with a mostly yellow-coloured, later red honey-guide. Disk bilobed, fleshy, roundish, up to 2 mm diam. *Stamens c.* 20, 15–23 mm long, filaments pale, anthers 1 mm, sordidly blue. *Gynophore* 18–20(–25) mm; ovary 1 by ¾ mm, stigma obtusely conical, ½ mm high, both glabrous. In fruit neither the pedicel, nor the gynophore much incrassate. *Fruit* about globular, 8–12 mm diam.; pericarp minutely rugose when dry, glossy, black when ripe (once reported red), glabrous. Seeds 2–6, 6 by 3–4 by 2 mm, smooth, glossy brown.

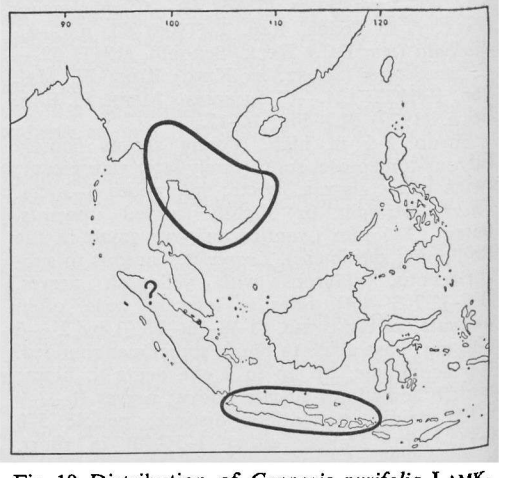

Fig. 19. Distribution of *Capparis pyrifolia* LAMK.

Distr. Siam, Indo-China (Annam, Cochinchina); in *Malaysia:* N. Sumatra (Laubalang?), Java, Kangean Arch., Madura, Lesser Sunda Islands (Bali, E. Sumbawa). Fig. 19.

Ecol. In the lowlands and hills in dry places, in teak forests, brushwood, hedges, on limestone hills, fairly common in Java, up to *c.* 850 m. *Fl.* especially Sept., no flowers collected Febr.–May; *fr.* July–Febr.

Vern. *Kaju tudjuh*, S, *gagahan, gĕdangan, kĕdĕling, lorowan, risini, tjantĕlan, waan-waanan, wan-uwanan*, J, *sanek, sanik-lakek*, Md, *kaloang-kaloangan, pokak-pokaän*, Kangean.

Uses. According to HEYNE (Nutt. Pl. 1927, 982) the white wood is sold in Djakarta as 'kaju tudjuh' against bile and stomach ache, and an extract of the rasped wood is taken against dizziness. Fruit once reported to be sweet and edible.

Notes. It cannot always easily be observed that the flowers are serial because the row is sometimes very short. This could lead to confusion with *C. pubiflora*, which is characterized, however, by the hairy gynophore and a fruit over 12 mm diam.

16. Capparis buwaldae JACOBS, *sp. nov.*

Glabra. Spinae stipulares breves, recurvatae. Folia ± 6 mm petiolata, oblongata, apice acute acuminata; costa nervique majores supra sulcati. Flores 2–4 in serie supraaxillare dispositi, minores; alabastra globosa acuta 3 mm diametro; pedicellus gynophoriumque fructiferum vix incrassatum. Fructus globosus vel ellipsoideus, umbonatus, 2–4 cm longus, irregulariter tuberculatus; semina majora.

Typus: HALLIER *f.* 2573 (Bo, holotype; L, isotype).

Climbing shrub or liana, 2–15 m high, glabrous; twigs terete, slightly zig-zag; internodes 1–8 cm. *Thorns* recurved, 1–3 mm long, often wanting. *Leaves* firmly herbaceous, oblong, sometimes ovate or obovate, (2.2–)2.4–4(–5) times as long as wide, 6–13(–23½) by (1½–)2½–4½(–8) cm; base rounded to acute, top narrowed, acuminate, tip acute, often mucronulate, 3–20 mm long; midrib sulcate above; nerves (4–)6–9 pairs, conspicuously looped-arcuating; petiole 4–7(–10) mm. *Flowers* white, as a rule on slender, short, lateral twigs, serial, 2–4, supra-axillary. Pedicels slender, 1–3(–4) cm long, glabrous. Buds globular, acute, *c.* 3 mm diam. *Sepals* ovate, 3–5 by 2–3 mm, with a slightly thickened and more or less acute top, outer pair almost glabrous at the margins, inner pair slightly ciliate. *Petals* very thin, 4–6 by 2–3 mm, white, outside more pubescent than inside, often minutely ciliate. Disk bilobed, fleshy, 1 by 1½ mm. *Stamens* 20–30, *c.* 2 cm long. *Gynophore* 13–20 mm, ovary ellipsoid to globular, *c.* 1½ by ¾–1 mm, smooth, stigma ½ mm long, all glabrous. In fruit the pedicel hardly incrassate and the gynophore slightly so. *Fruit* orange or red, globular to ellipsoid, 3–5½ by 2½–3½ cm, shortly umbonate at the top and sometimes also at the base; pericarp woody to coriaceous, 2–3 mm thick, more or less tuberculate. Seeds ∞, embedded in whitish pulp, 10 by 6–8 by 5–6 mm, smooth, brown.

Distr. *Malaysia:* throughout Borneo (also P. Laut).

Ecol. Forests, jungle, along rivers, from the lowland up to *c.* 1600 m. *Fl. fr.* Jan.–Dec.

Vern. *Dunggol manok*, Sarawak.

Uses. Two collectors mention the fruit(pulp) to be edible.

Note. In vegetative characters much resembling *C. micracantha ssp. korthalsiana* but distinguished by the recurved thorns, the narrower leaves with long and slender tip, and the nerves being more prominent towards the margin.

17. Capparis cucurbitina KING, J. As. Soc. Beng. 58, ii (1889) 395; Ann. R. Bot. Gard. Calc. 5 (1896) 119, t. 136; RIDL. Fl. Mal. Pen. 1 (1922) 124.

Scandent, 6–10 m high; twigs slightly zig-zag, (nearly) glabrous; internodes *c.* 2 cm. *Thorns* recurved, 2–3 mm long, sharp. *Leaves* herbaceous, obovate, *c.* 2½ times as long as broad, glabrous, *c.* 9–18½ by 3½–7½ cm; base generally rather abruptly rounded and acute, top rounded and rather abruptly acuminate, tip narrow and acute, 1–1½ cm; midrib above sulcate in the basal part; nerves 6–8 pairs, thinly subprominent above, reticulations distinct on both sides; petiole ½–¾ cm. *Flowers* in mature state unknown, pale green, yellow inside, 2–3, serial. Pedicels 2–3 cm. Buds ovoid, acute, 4 mm long. *Sepals* ovate-lanceolate, acuminate. *Petals* broadly elliptic, obtuse. *Stamens c.* 20. In fruit neither the pedicel nor the torus incrassate, the *gynophore* 11–17 mm, slightly thickened, obviously articulated with the fruit. *Fruit* irregularly spindle-shaped, (3½–) 5½–7½ by 1½–2½ cm, the base slightly acuminate-tapering, the top umbonate; pericarp 1 mm thick, leathery, yellow to glossy orange. Seeds ∞, ovoid, 9 by 7 by 7 mm.

Distr. *Malaysia:* Malay Peninsula (Perak), few collections.

Ecol. Dense mixed lowland jungle, up to 200 m.

Notes. The only flowering material which we have is KING's Coll. 8824 (CAL). Contrary to KING I found the sepals not puberulous but glabrous.

Differs vegetatively from *C. micracantha ssp. korthalsiana* in that the leaves of the latter are much coarser, and thicker, while in *C. cucurbitina* the leaf tip is longer and more slender.

18. Capparis micracantha DC. Prod. 1 (1824) 247.

KEY TO THE SUBSPECIES

1. Ripe fruit (sub)globular. Stamens *c.* 20–35(–60). Sepals mostly obtuse . . ***ssp.* micracantha**
1. Ripe fruit elongate, acute. Stamens 60–100. Sepals acute to acuminate. West Malaysia. ***ssp.* korthalsiana**

***ssp.* micracantha.**—*C. micracantha* DC. Prod. 1 (1824) 247; BL. Bijdr. 2 (1825) 52; SPRENG. Syst. Veg. 4, 2 (1827) 204 (*micrantha, sphalma, non* A. RICH.); MIQ. Fl. Ind. Bat. 1, 2 (1858) 99; HOOK. *f.* & TH. Fl. Br. Ind. 1 (1872) 179; KURZ, J. As. Soc. Beng. 43, ii (1874) 31; RADLK. Sitz.

Ber. Bayer. Ak. Wiss. 14 (1884) 118, 128; VIDAL, Rev. Pl. Vasc. Filip. (1886) 47; KING, J. As. Soc. Beng. 58, ii (1889) 394; PAX in E. & P. Pfl. Fam. 3, 2 (1891) 231; BRANDIS, Ind. Trees (1906) 36; MERR. Philip. J. Sc. 1 (1906) Suppl. 58; BACK. Fl. Bat. (1907) 57, *incl. var. callosa* (BL.) HALL. *f.*; GAGN. Fl. Gén. I.–C. 1 (1908) 186; BACK. Schoolfl. (1911) 63; RIDL. J. Str. Br. R. As. Soc. *n.* 59 (1911) 68; HALL. *f.* Med. Rijksherb. 12 (1912) 18; KOORD. Exk. Fl. Java 2 (1912) 293; MERR. Fl. Manila (1912) 215; Sp. Blanc. (1918) 160; RIDL. Fl. Mal. Pen. 1 (1922) 123, f. 11; W. H. BROWN, Min. Prod. Philip. For. 2 (1921) 282; MERR. En. Philip. 2 (1923) 212; PARKINS, For. Fl. Andam. (1923) 82; GEERTS-RONNER, Trop. Natuur 13 (1924) 167, f. 8; CRAIB, Fl. Siam. En. 1 (1925) 82; MERR. Philip. J. Sc. 29 (1926) 371; GAGN. Fl. Gén. I.–C. Suppl. 1 (1939) 162; CORNER, Ways. Trees (1940) 180, f. 47; BACK. Bekn. Fl. Java (em. ed.) 4A (1942) fam. 45, p. 7; QUIS. Med. Pl. Philip. (1951) 339.—*C. billardierii* DC. Prod. 1 (1824) 247; MIQ. Fl. Ind. Bat. 1, 2 (1858) 99.—*C. callosa* BL. Bijdr. 2 (1825) 53; MIQ. Fl. Ind. Bat. 1, 2 (1858) 99; Illustr. (1870) 29, t. 16; NAVES in Blanco, Fl. Filip. ed. 3 (1877–83) t. 180; RADLK. Sitz. Ber. Bayer. Ak. Wiss. 14, 1 (1884) 131; K. & V. Bijdr. 4 (1896) 262; KOORD. Gedenkb. Jungh. (1910) 167.—*C. flexuosa* BL. Bijdr. 2 (1825) 53; *non* L., *nec* VELLOZO; HASSK. Pl. Jav. Rar. (1848) 178; MIQ. Analecta 3 (1852) 1; Fl. Ind. Bat. 1, 2 (1858) 98; Illustr. (1870) 30; RADLK. Sitz. Ber. Bayer. Akad. Wiss. 14, 1 (1884) 101, 129.—*C. odorata* BLANCO, Fl. Filip. (1837) 439, ed. 2 (1845) 305, ed. 3, 2 (1878) 201; FERN.-VILL. Nov. App. (1880) 11; MERR. Philip. J. Sc. 3 (1908) Bot. 77.–*C. forsteniana* MIQ. Illustr. (1870) 32, t. 18, *excl. syn. C. ovalifolia* ZIPP., *quae est C. zeylanica* L.; HALL. *f.* in Koord. Minah. (1898) 343.—*C. roydsiaefolia* KURZ, J. As. Soc. Beng. 39, ii (1870) 62.—*C. myrioneura* HALL. *f.* in Fedde, Rep. 2 (1906) 60, *p.p., excl.* KOORD. 16341, *excl. var. latifolia.*—*C. venosa* MERR. Philip. J. Sc. 10 (1915) Bot. 305, *ex descr.*; En. Philip. 2 (1923) 213.

Stout shrub or small tree, rarely climbing, 2–6(–10) m; trunk greyish, finely fissured and set with small knobs each surmounted by a thorn; branchlets terete, mostly zig-zag, when young sparsely pubescent; internodes *c.* 2½–4 cm. *Thorns* 2–4(–7) mm long, patent or directed upwards, straight or slightly curved. *Leaves* (sub-) coriaceous, glabrous, 1.7–2.9(–4.1) times as long as wide, mostly broadest about halfway, sometimes below, or rarely above the middle, 8–18(–24) by 4–8(–12½) cm; base mostly rounded, sometimes blunt to subcordate or acute, top broader or narrower rounded, sometimes slightly emarginate, or acute, rarely acuminate, dark-tipped; midrib subprominent above, nerves 5–7(–10) pairs, light green when dry; petiole 6–10(–15) mm. *Flowers* up to 6, serial. Pedicels 1(–2) cm. Buds ellipsoid, acute, 5–12 mm long. *Sepals* firmly herbaceous, 5½–13 by 2½–5½ mm, ± boat-shaped, ovate to oblong, the margins mostly hairy. *Petals* very thin, oblong to lanceolate, 10–25 by 3–7 mm, white, honey-guide yellow, turning dark red or brownish, or dark violet. Disk bilobed, *c.* 1 mm. *Stamens c.* 20–35(–60); filaments 18–30 mm, white; anthers 1½–2½ by ½ mm, grey or bluish. *Gynophore* 15–30(–35) mm, ovary ovoid to ellipsoid, *c.* 3 by 2 mm, both glabrous, sometimes vestigial. In fruit the gynophore 4–6 mm diam., the pedicel thinner. *Fruit* globular to ellipsoid, with 4 longitudinal sutures, 3–6½ by 3–4½ cm, yellow, orange, or red; pericarp smooth, 2 mm thick, when dry woody-coriaceous, pulp juicy. Seeds *c.* 6–8 by 4½–7 by 3–5 mm, red to shiny black, smooth.

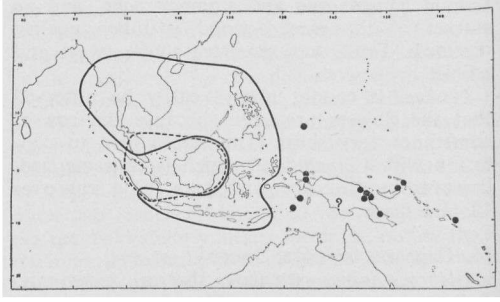

Fig. 20. Distribution of *Capparis micracantha* DC. *ssp. micracantha* (continuous line, add Formosa) and of *ssp. korthalsiana* (MIQ.) JACOBS (broken line). Localities of *C. zippeliana* MIQ. (dots).

Distr. Burma, Siam, Indo-China, S. China, Formosa (a variety), Hainan, Andamans, in *Malaysia:* S. Sumatra, Malay Peninsula (except in the S. corner), Java (in W only a few coastal localities, also Prinsen I., Nusa Kembangan), Madura, Kangean Arch., Lesser Sunda Islands (Bali, Lombok, E. and W. Sumbawa, W. Flores, Komodo, Alor, Timor, Wetar), North Borneo (also Banguey), throughout the Philippines, Celebes, Moluccas (Halmaheira). Fig. 20.

Ecol. Especially in light shade (monsoon, teak, or evergreen forest) on dry, often calcareous soil, also in thickets, savannahs, hedges, *etc.*, not seldom coastal, mostly below 500 m, highest record 1400 m. *Fl. fr.* Jan.–Dec.

Anat. RAGHAVAN investigated the vascular supply of the floral parts in a '*C. flexuosa*' from Java, cultivated at Kew (the plant was no longer living in 1959) (J. Linn. Soc. Bot. 52, 1939, 247).

MOLISCH stated that nearly all the parenchyma cells of the petiole, the leaves, and the stem contain a strongly refractive crystal of lime. Also bodies of silicon are sometimes found (Ber. Deut. Bot. Ges. 34, 1916, 154–160).

Note. *C. billardierii*, *C. flexuosa*, and *C. roydsiaefolia* have been described on specimens with a vestigial gynophore and ovary. RADLKOFER's *sect. Monostichocalyx* comprised *C. flexuosa* BL., *C. callosa* BL., and *C. micracantha* DC. which are in my opinion all synonyms.

ssp. **korthalsiana** (MIQ.) JACOBS, *stat. nov.*—*C. korthalsiana* MIQ. Illustr. (1870) 31, t. 17; MERR. En. Born. Pl. (1921) 280.—*C. finlaysoniana* WALL. [Cat. (1832) 6992 B, *nomen*] *ex* HOOK. *f.* & TH.

Fl. Br. Ind. 1 (1872) 179; KING, J. As. Soc. Beng. 58, ii (1889) 395; RIDL. Fl. Mal. Pen. 1 (1922) 124; Kew Bull. (1925) 77.

Fruit oblong, *c.* 6–17 by 2½–3¾ cm, tapering to the top and sometimes to the base. *Leaves* acuminate, not mucronate, mostly recurved, never cordate at the base. *Sepals* very acute and slightly cucullate at the top, the buds therefore (sub-) acuminate. *Flowers* comparatively large. *Stamens* very numerous (up to 100).

Distr. *Malaysia:* Malay Peninsula (Perak, Pahang, Johore, Singapore), Central and S. Sumatra, Borneo. Nowhere common. Fig. 20.

19. **Capparis zeylanica** LINNÉ, Sp. Pl. ed. 2 (1762) 720; DC. Prod. 1 (1824) 247, *quoad specim. Ceyl.*; DUNN, Kew Bull. (1916) 62; *non* HOOK. f. & TH. Fl. Br. Ind. 1 (1872) 174, *quae est C. brevispina* DC. — *C. horrida* L. *f.* Suppl. (1781) 264; DC. Prod. 1 (1824) 246; WIGHT, Ic. Pl. Ind. Or. 1 (1839) t. 173; MIQ. Illustr. (1870) 34, *quoad var. β erythrodasys*; HOOK. *f.* & TH. Fl. Br. Ind. 1 (1872) 178; FERN.–VILL. Nov. App. (1880) 11; VIDAL, Rev. Pl. Vasc. Filip. (1886) 48; MERR. Philip. J. Sc. 1 (1906) Suppl. 58; GAGN. Fl. Gén. I.–C. 1 (1908) 185; BACK. Schoolfl. (1911) 63; RIDL. J. Str. Br. R. As. Soc. *n.* 59 (1911) 69; KOORD. Exk. Fl. Java 2 (1912) 294; MERR. Fl. Manila (1912) 215; Sp. Blanc. (1918) 159; W. H. BROWN, Min. Prod. Philip. For. 2 (1921) 282; MERR. En Philip. 2 (1923) 211; CRAIB, Fl. Siam. En. 1 (1925) 81; GAGN. Fl. Gén. I.–C. Suppl. 1 (1939) 161; BACK. Bekn. Fl. Java (em. ed.) 4A (1942) fam. 45, p. 8; QUIS. Med. Pl. Philip. (1951) 338.—*C. dealbata* DC. Prod. 1 (1824) 246; DECNE, Nouv. Ann. Mus. Hist. Nat. Paris 3 (1834) 426; Herb. Timor. Descr. (1835) 98; SPAN. Linnaea 15 (1841) 165; MIQ. Fl. Ind. Bat. 1, 2 (1858) 100; Illustr. (1870) 27.—*C. zeylanica* (*non* L.) ROXB. Fl. Ind. ed. CAREY 2 (1832) 567; GAMBLE, Fl. Pres. Madras 1 (1915) 18.—*C. aurantioides* PRESL, Reliq. Haenk. 2 (1835) 86; GRAY, U.S. Expl. Exp. Bot. 1 (1854) 70; FERN.–VILL. Nov. App. (1880) 11.—*C. linearis* (*non* JACQ.) BLANCO, Fl. Filip. (1837) 438, ed. 2 (1845) 305, ed. 3, 2 (1878) 200.—*C. nemorosa* (*non* JACQ.) BLANCO, Fl. Filip. (1837) 438.—*C. micracantha* (*non* DC.) BLANCO, Fl. Filip. ed. 2 (1845) 305, ed. 3, 2 (1878) 200, t. 188.—*C. rufescens* TURCZ. Bull. Soc. Nat. Moscou 27, 2 (1854) 321.—*C. erythrodasys* MIQ. Pl. Jungh. (1855) 397; Fl. Ind. Bat. 1, 2 (1858) 99.—*C. ovalifolia* ZIPP. ex MIQ. Illustr. (1870) 33.—*C. viminea* (*non* HOOK. *f.* & TH.) FERN.–VILL. Nov. App. (1880) 11.—*C. myrioneura var. latifolia* HALL. *f.* in Fedde, Rep. 2 (1906) 61.—**Fig. 5.**

Climbing shrub 2–5(–10) m. Innovations brownred to greyish-tomentose; branchlets mostly zigzag, glabrescent; internodes 2–7 cm. *Thorns* recurved, 3–6 mm long. *Leaves* subcoriaceous, (1.2–)1.7–2.3(–2.9) times as long as broad, ovate or elliptic, rarely obovate, above soon glabrescent then glossy, beneath later or not glabrescent, and dull, 4–10(–18) by 3–5½(–9) cm; base rounded, sometimes subcordate, rarely acute, top acute to rounded, rarely slightly acuminate, generally with a recurved, stiff, darker mucro up to 3 mm; midrib subdepressed above; nerves 3–8 pairs; petiole ½–1½(–2) cm, glabrescent. *Flowers* developing before the leaves on young twigs, conspicuous, 2–6, serial. Pedicels 4–20(–28) mm, hairy. Buds globular, *c.* 8 mm diam. *Sepals* subcoriaceous, outside more or less densely tomentellous, outer pair orbicular to elliptic, mostly acute, 6–11 by 5–9 mm, the posterior one (surrounding the disk) the largest; inner pair elliptic to oblong with more rounded top, 6–10 by 3–7 mm. *Petals* very thin, oblong with rounded top, 9–12(–16) by 3½–5 mm, white, turning pink, largely glabrous; upper pair with a pinkish to reddish basal-median spot, hairy at the base. Disk *c.* 1 mm diam. *Stamens* 30–45(–70), 20–30(–35) mm, white, turning red; anthers oblong, slightly broader at the base, *c.* 2 by 1 mm, bluish grey. *Gynophore* slightly exceeding the stamens, up to 4½(–5½) cm, basal part pale pubescent, otherwise glabrous; ovary ellipsoid, 1½–2½ by 1–1½ mm, stigma ½ mm long. In fruit the pedicel sometimes still hairy, gynophore glabrous, up to 5½ cm by 3–6 mm, as thick as the pedicel. *Fruit* globular to ellipsoid, up to 5 by 4 cm, pericarp *c.* 2 mm thick, woody-coriaceous, smooth, reddish, orange or purple. Seeds ∞, 5–7 by 5–4½ mm, brown.

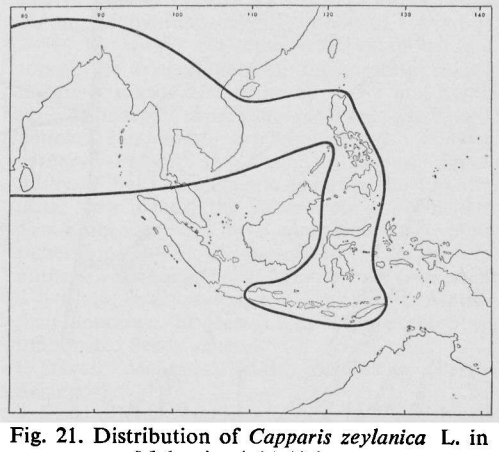

Fig. 21. Distribution of *Capparis zeylanica* L. in Malaysia. Add Hainan.

Distr. Ceylon, India (largely E of the line Bombay-Delhi-Dehra Dun, S of the Himalaya), Burma, Siam, Indo-China, Hainan, Andaman Islands, in *Malaysia:* Java (east of Djokjakarta), Lesser Sunda Islands (Lombok, Sumbawa, Semau, Timor), Celebes (also Salajar I.), Philippines (Mindoro, Luzon, Mindanao, Sulu Arch.). Uncommon in Indonesia, common in the Philippines. Fig. 21.

Ecol. Forest edges, bushes, savannahs, hedges, limestone hills, obviously bound to seasonal climatic conditions, mainly in the lowlands, up to 700 m. *Fl. fr.* Jan.–Dec.

Uses. Of less importance; see QUIS. *l.c.*

Vern. Philippines: *Manunggal laláki*, Mindoro, *baraláuik*, Ibn., *dauag*, *halubágat-báging*, Tag., *laginau*, Bis., *talakták*, *tarabtáb*, Ilk.

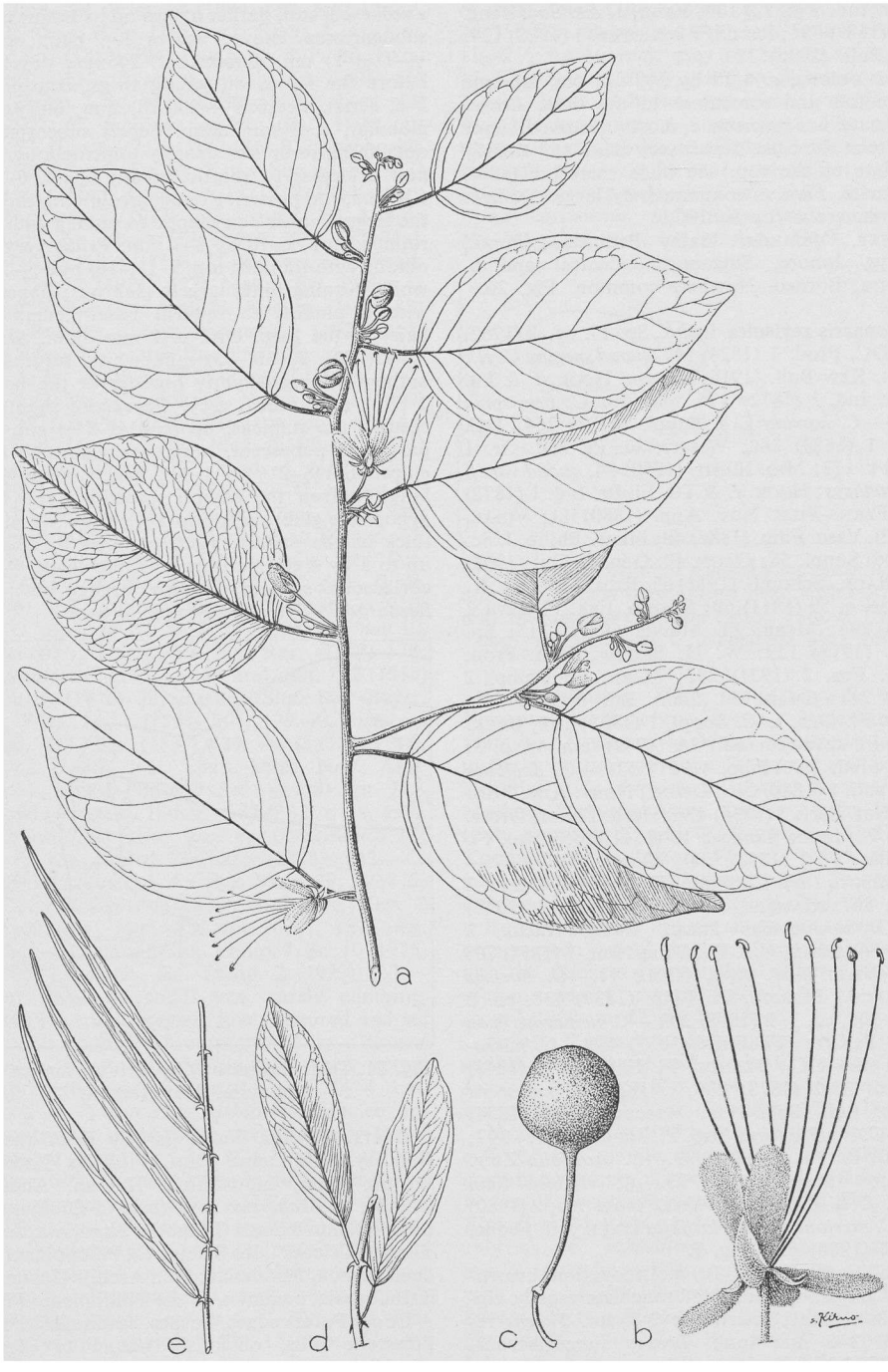

Fig. 22. *Capparis quiniflora* DC. *a*. Flowering branch, × ⅔, *b*. flower from the back, × 2, *c*. fruit, × ⅔, *d–e*. narrow leaves, × ⅔ (*a–b* SPECHT 697 from N. Austr., *c* JAHERI 238, *d* ELBERT 3827, *e* SOEHANDA exp. DE JONG 272).

Note. From *C. pyrifolia* and *C. micracantha* easily distinguished by the recurved thorns.

20. Capparis quiniflora DC. Prod. 1 (1824) 247; BENTH. Fl. Austr. 1 (1863) 94; F. v. M. Descr. Not. Pap. Pl. 1[1] (1875) 5; BAILEY, Queensl. Fl. 1 (1899) 57; LAUT. Bot. Jahrb. 52 (1914) 112; DOMIN, Bibl. Bot. Heft 89 (1925) 685.—*C. trapeziflora* SPAN. Linnaea 15 (1841) 165; MIQ. Fl. Ind. Bat. 1, 2 (1858) 99.—*C. subcordata* SPAN. Linnaea 15 (1841) 166; MIQ. Fl. Ind. Bat. 1, 2 (1858) 99; Illustr. (1870) 34.—*C. richii* A. GRAY, U.S. Expl. Exp. Bot. 1 (1854) 69; SEEM. Fl. Vit. (1865) 6.—**Fig. 22.**

Climbing shrub; twigs slightly zig-zag, densely minutely grey or ferruginous-tomentose, sometimes glabrescent; internodes up to 9 cm. *Thorns* recurved, *c.* 1–2(–3) mm, sharp, sometimes wanting, especially on flowering twigs. *Leaves* subcoriaceous to coriaceous, often brownish green when dry, ovate to (rarely) obovate, 1.6–4.3 times as long as wide, initially densely minutely ferruginous-tomentose, soon glabrescent and glossy above, (5½–)7–9(–12) by 1¾–4(–7½) cm; base rounded, subcordate, blunt, or acute, top mostly attenuate and acuminate, rarely blunt, acumen up to ½ cm, acutish with a minute, thickened mucro; midrib flat to shallowly sulcate above; nerves 6–8(–11) pairs under an angle of *c.* 45°; intermediate veins often wanting, reticulations distinct; margin sometimes crinkled; petiole 5–17 mm, hairy as the twigs. *Flowers* white, serial, sometimes developing before the leaves at the end of young twigs, 2–10 in a row 2–12 mm long, pedicels 6–17 mm, hairy as the twigs, finally glabrescent; floral leaves sometimes abortive. Buds *c.* 4 mm diam. *Sepals* herbaceous, acute, ferruginous-tomentellous outside, outer pair *c.* 4–5 by 2–3 cm, the inner pair narrower and flattish. *Petals* ovate to elliptic, 5–7 by 2–4 mm, slightly unequal, puberulous on both sides. Disk up to 1 mm long. *Stamens* 7–8(–12), filaments 20–27 mm. *Gynophore* 2–2½ cm but sometimes abortive and only a few mm, glabrous or glabrescent at the base; ovary ovoid, *c.* 1½ by 1 mm, stigma knob-shaped. Pedicel, torus, and gynophore slightly incrassate. *Fruit* (sub)globular, *c.* 2–2¾ by 2–2½, pericarp corky-leathery, *c.* 1½–2½ mm thick, with small scattered warts. Seeds ∞, up to 7–8 by 5–6 by 4 mm.

Distr. Pacific (Fiji and New Caledonia), North Australia to Cape York Peninsula, in *Malaysia*: SE. Celebes, Lesser Sunda Islands (Lombok, Sumbawa, Flores, Semau, Timor), Moluccas (Kai and Tanimbar Is), New Guinea (NW. part; Papua; islands in Torres Strait). Fig. 7.

Ecol. Prefers obviously coastal habitats in drier areas, rambling on shore trees, bound to a seasonal climate, in the lowland.

Notes. Although in fertile material the leaves are variable in shape, the venation (see fig. 22a, d–e) is constant and very characteristic.

The Australian specimens are much more uniform in leaf index than those of Malaysia, where it does not exceed 1.8.

In the material described by A. GRAY from Fiji as *C. richii* the leaf-shape is remarkably variable, one specimen having the average leaf-index, the second having leaves 9½–11 by 1½–1¾ cm, the third having linear leaves *c.* 4–10 cm by 1–4 mm. In West Flores a similar, also sterile linear-leaved specimen was collected (SOEHANDA, exp. DE JONG 272, Bo, K, L); its thorns are strongly recurved, 1–3 mm, the leaves measure 4–10 by 0,1–0,4 cm. As I observed in several other species of *Capparis* such sterile shoots have larger thorns than the fertile twigs. Might it be that such shoots have been developed under exceptionally dry weather conditions?

The only collection from Bali is a duplicate specimen from Bogor in Paris with a ZOLLINGER label "Leg. Teysmann, Balie, Buleling". As no other sheets were seen from Bali, the location seems to be erroneous.

21. Capparis larutensis KING, J. As. Soc. Beng. 58, ii (1889) 393; Ann. R. Bot. Gard. Calc. 5 (1896) 118, t. 134; RIDL. Fl. Mal. Pen. 1 (1922) 122.

Climber, 10–13 m. Twigs straight, brown-puberulous, more or less glabrescent; internodes 1–2 cm. *Thorns* vigorous, recurved, 3–4 mm long, glabrous, with darker, glossy, very sharp top. *Leaves* firmly herbaceous to subcoriaceous, oblong, sometimes slightly obovate, glabrous, 2–3½ by ¾–1¾ cm, base acute to subcordate, top obtuse to acuminate, tip finely retuse; midrib narrowly sulcate above; nerves 4–5 pairs, hardly visible; margin somewhat recurved when dry; petiole 3–6 mm, brown-pubescent. *Flowers* axillary. Pedicel 1½–2 cm, glabrous. *Sepals* fleshy, 7 by 5 mm, ciliate towards the top, the outer pair ovate, the inner pair suborbicular. *Petals* obovate, *c.* 8 by 5 mm, white then pink, puberulous inside. *Stamens* (10?–)30, 2½ cm, anthers 2 mm long. Torus 2 mm broad. *Gynophore* 3½–4 cm; ovary ovoid, *c.* 1½ mm long. Mature *fruit* unknown, at least 13 by 10 mm, globose, umbonate. Seeds several.

Distr. *Malaysia:* Malay Peninsula (Perak, Selangor).

Ecol. Dense jungle, clinging to trees, below 200 m. *Fl.* Sept., Nov.

22. Capparis spinosa LINNÉ, Sp. Pl. 1 (1753) 503; HEMSL. Bot. Chall. 3 (1885) 120 (*var.*).

var. **mariana** (JACQ.) K. SCH. Bot. Jahrb. 9 (1888) 201; K. SCH. & LAUT. Fl. Schutzgeb. (1901) 335; LAUT. Bot. Jahrb. 52 (1915) 111.—*C. cordifolia* LAMK, Encycl. 1 (1785) 609; MERR. Philip. J. Sc. 7 (1912) Bot. 235; Fl. Manila (1912) 216; Sp. Blanc. (1918) 159; En. Philip. 2 (1923) 210; DE VOOGD, Trop. Natuur 25a (Jub. Uitg.) (1936) 72, f. 9; MERR. Philip. J. Sc. 9 (1914) Bot. 84.—*C. mariana* JACQ. Hort. Schoenbr. 1 (1797) 57, t. 109; DC. Prod. 1 (1824) 245; DECNE, Nouv. Ann. Mus. Hist. Nat. Paris 3 (1834) 426; Herb. Timor. Descr. (1835) 98; SPAN. Linnaea 15 (1841); BLANCO, Fl. Filip. ed. 2 (1845) 305; MIQ. Fl. Ind. Bat. 1, 2 (1858) 100; TEYSM. Nat.

Tijd. N.I. 34 (1874) 359; NAVES in Blanco, Fl. Filip. ed. 3, 2 (1878) 201, t. 179; FERN.-VILL. Nov. App. (1880) 11; SAFFORD, Contr. U.S. Nat. Herb. 9 (1905) 212; BURK. Dict. 1 (1935) 443.— *C. sandwichiana* DC. Prod. 1 (1824) 245; A. GRAY, U.S. Expl. Exp. Bot. 1 (1854) 69; DEGENER, Fl. Hawaii. 1 (1937) fam. 142, with plate.—*C. baducca* (*non* L.) BLANCO, Fl. Filip. (1837) 438. —**Fig. 23–24.**

Tree? or shrub, mostly prostrate. Twigs terete, mostly zig-zag; internodes 1–3 cm; innovations whitish-tomentose, glabrescent. *Thorns* wanting in Mal.. *Leaves* suborbicular, rarely elliptic, often ovate, (1½–)2½–6(–7½) cm diam., subcoriaceous (fleshy when fresh); base truncate to rounded, top rounded, seldom minutely emarginate to acute; midrib above shallowly depressed in the basal part, otherwise flat; nerves *c.* 5–7 pairs, thin, subprominent on both surfaces; petiole ¾–1¼ cm. *Flowers* axillary. Pedicel 4½–7½ cm, glabrescent. Buds conical when young, later bulging at the posterior base, sometimes acuminate, finally 2–2½ cm diam. *Sepals c.* 25–28 mm long, fulvously pubescent towards the base, glabrescent, ovate, outer pair 8–18 mm wide, the posterior one the larger and strongly saccate, sometimes slightly keeled, inner pair equal, slightly larger than the outer pair, 11–20 mm wide, with broad-membranous margin. *Petals* pure white, sometimes slightly emarginate, upper pair more or less rhomboid, (3–)3½–4½ by 2–4 cm, with thick fleshy base, lower pair 3–3½ by 1½–1¾(–3¼) cm. Torus conical, 4–5 mm broad, the disk *c.* 4 by 5 mm. *Stamens* more than 100, white, 4½–5 cm, anthers 4 by ¾ mm, brownish. *Gynophore* 6–7 cm, subpubescent towards the base; ovary oblong, 5–8 by 1–2 mm, glabrous. In fruit the gynophore incrassate until it is as thick as the pedicel, and sometimes coiled as a pig's tail. *Fruit* ellipsoid to spindle-shaped, *c.* 5 by 1½ cm, narrowed towards the apex, with 5 nerves. Seeds ∞, subglobular, *c.* 4 mm through.

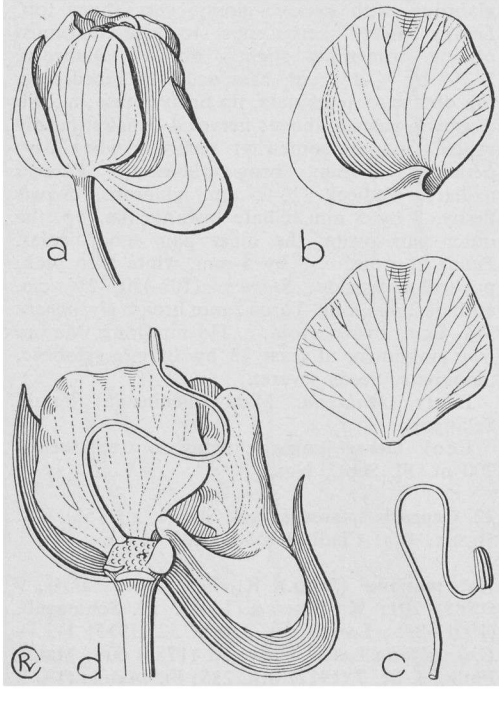

Fig. 23. *Capparis spinosa* L. *var. mariana* (JACQ.) K. SCH. *a.* Bud, just before anthesis, from the left, × ⅔, *b.* left petals, of the upper (adaxial) and the lower pair, as seen from within, nat. size, *c.* stamen as it is in bud, × ⅓, *d.* bud opened, the outer sepals cut medianly, one inner sepal, the left petals and the stamens removed, nat. size (DEGENER 26425 from Hawaii).

Distr. Scattered over the Pacific within the quadrangle formed by the Sandwich Is, Marianas (Guam), Solomon Is, and Henderson I. (ENE of Pitcairn, 24°20'S, 128°20'W), NW. Australia (once coll.); a different form of the species in Australia (see notes), in *Malaysia:* Lesser Sunda Islands (Semau, Timor, Leti, *n.v.*), Philippines (Luzon, cultivated in a few localities; Bohol, spontaneous along the sea-shore), New Ireland, and New Britain (*n.v.*).

C. spinosa, the well-known caper bush, has a wide distribution from the Mediterranean through the Near East to India (Sind and the Punjab). Several varieties have been distinguished, *cf.* BOISSIER (Fl. Orient. 1, 1867, 420).

Ecol. Prefers semi-arid or seasonal conditions, dry lavas, limestone, coastal stations, *etc.* A noctiflorous species, in the lowland up to *c.* 350 m.

In Timor and locally in the Philippines obviously quite capable of maintaining itself in suitable places and thoroughly naturalized (*vide infra*). It can be propagated by suckers or seed.

Vern. *Alcaparras*, Philippines, *acapares*, Guam, both corruptions of the Spanish *alcaparro*.

Uses. In Malaysia none. According to SAFFORD, *l.c.*, it appeared from the archives at Agaña in Guam that some of the early governors of Guam exported the pickled unripe capsules in considerable quantities, employing the natives to gather them. This is at variance with the common habit of pickling the flower buds, and probably the latter were meant. From Guam the plant would have been introduced into the Philippines.

Notes. The Malaysian and Pacific population is markedly uniform in appearance and has a coherent area, taxonomically and geographically well separated from the population in India, where it occurs eastwards to about 90° E long. It is absent between India and Timor.

Many paramorphs have been described in *C. spinosa*. The *var. mariana* is distinct by a combination of the following characters: twigs unarmed, not too densely tomentose and glabrescent, leaves comparatively large and orbicular, lacking an apical spine, flowers very large with one saccate sepal. *Capparis galeata* FRESEN. of Arabia and E. Africa has similar flowers, the odd sepal

being even more irregularly shaped, but this plant has strong stipular thorns and an apical leaf-spine.

The species is taxonomically widely different from all native *Capparis* in Malaysia and Australasia and it had and has a distinctly economic significance in the Mediterranean. From this it appears probable that the species was introduced in the Indo-Pacific as a cultigen in post-Columbian time. The first records from the Pacific-E. Malaysian area are:

Marianas, *via* SONNERAT[1] between 1774 and 1781,
Sandwich Is, MENZIES, Vancouver Exp. 1792,
Timor, CUNNINGHAM, 1818,
Society Is, BEECHEY's Voyage, 1826,
Philippines, BLANCO, before 1837.

The dates of this list are significant, because it appears clearly that it had not been collected during the earliest Pacific expeditions such as 'Cook's Voyages' and the 'Boudeuse et l'Etoile', 1768–1770, on which such trained botanists collected as BANKS, SOLANDER, the FORSTERS, COMMERSON, *etc.*, who did not discriminate between cultivated, introduced, and native plants, as MERRILL rightly observed in his account of Cook's Voyages (Chron. Bot. 14, 1954, 173). They travelled widely in Central Polynesia, but did not visit Guam and the northern islands. Obviously the species was then not in Central Polynesia.

Its spreading in the Pacific, notwithstanding its use, and its early abundance in Guam, must have taken more than a century, because already onwards of 1520 there had been a connection by Spanish ships between Acapulco in West Mexico (from where, however, the species is not known) and Manila via Guam in the Marianas; the regular galleon route was initiated, for return voyages, in 1565, with 1–2(–3) ships yearly in either direction, to be abandoned in 1815 (MERRILL, *l.c.* 193). It is remarkable that the species has never been reported from Mexico.

In this respect it appears significant that the earliest record from the Pacific, 1774–1784, is from the Marianas, from where is also the very early record of its being cultivated and exported.

In the Philippines there is the indication that it has been imported there from Guam.

RUMPHIUS makes no mention of it, though he frequently referred to plants from islands outside the Moluccas proper.

In Timor there is no indication of such import, but it is not far-fetched to assume its introduction by the Portuguese. One may question why it has not further spread in arid places in East Malaysia and the Lesser Sunda Islands. It may well be that the capers, this well-known delicacy to Mediterranean people, did not appeal to the native taste and were therefore not further dispersed.

In conclusion, there remains hardly any doubt of its introduction at an early date from presumably seeds from the Mediterranean into the Marianas and dispersal by man from thence into E. Malaysia and Polynesia, as suggested by HEMSLEY, *l.c.*

It seems likely that introduction took place once only, because of the variability pattern of the species: repeated introduction would presumably have caused a greater variation of the population.

Fig. 24. *Capparis spinosa* L. *var. mariana* (JACQ.) K. SCH. Flower (VAN DER PIJL).

In addition it should be stated that the species occurs also on the west coast of Australia and in Queensland, from where it has been described as *C. nummularia* DC., a name also taken up by BENTHAM. It has, probably rightly, been reduced to *C. spinosa* by F. v. MUELLER (Syst. Cens. Austr. Pl. 1882, 5; 2nd ed. 1889, 8) and considered to represent a variety of *C. spinosa* by F. M. BAILEY (*var. nummularia* (DC.) F. M. BAILEY, Syn. Queensl. Pl. 1883, 15). It has even been found in arid places in Central Australia. The Australian plants look hardly different from those of the Mediterranean and they are distinctly thorny. But there is one specimen from NW. Australia (PRITZEL 284) which matches the Polynesian material. For this reason it seems likely that the Australian form is an introduction which took place independently from that in the Pacific. As a

(1) LAMARCK stated to have received his material from SONNERAT, but the latter never visited the Marianas (see vol. 1, p. 494). He attached himself, however, to COMMERSON and worked with him for three years in Mauritius, Bourbon, and Madagascar. JACQUIN also described the plant from the Marianas but did not mention the collector's name. Therefore it remains obscure who brought plants or seeds from the Marianas; it was obviously not brought by some early botanical explorer. But the seeds may have been derived from the Spanish export from Guam and have been cultivated in Mauritius where SONNERAT obtained his specimens.

matter of fact the case of the rather early record of this European or West Asian plant in Australia is matched by some other examples. In all these cases the Australian population is (mostly slightly) deviating and Dr VAN STEENIS has suggested this convivial or racial differentiation to be due to the effect of selection through isolation (this Flora I, 4, 1949, lii). Different imports of a cultigen will likely lead to slightly different racial development.

How the introduction in Australia has taken place is dubious; it could be surmised that occasionally ships or life-boats thrown out of their way touched these coasts or that they resulted from ship-wrecks. There may have been more than one introduction.

It seems to me that *C. spinosa* offers an interesting opportunity for introducing experimental taxonomical investigation into ethnobotany.

23. Capparis lucida (BANKS *ex* DC.) BENTH. Fl. Austr. 1 (1863) 96; BAILEY, Queensl. Fl. 1 (1899) 60; BRITTEN, Ill. Austr. Pl. 1 (1900) 6, t. 6; DOMIN, Bibl. Bot. Heft 89 (1925) 688; C. T. WHITE, J. Arn. Arb. 10 (1929) 217.—*Thylachium lucidum* BANKS *ex* DC. Prod. 1 (1824) 254.—*C. subacuta* MIQ. Fl. Ind. Bat. 1, 2 (1858) 101; Illustr. (1870) 35, t. 19, *quoad specim. javan.* (*vide sub C. sepiaria*); K. & V. Bijdr. 4 (1896) 260; BACK. Schoolfl. (1911) 63; KOORD. Exk. Fl. Java 2 (1912) 293 (*acuta*, *sphalma*); BACK. Bekn. Fl. Java (em. ed.) 4A (1942) fam. 45, p. 10.—*C. nobilis* (*non* BENTH.) F. v. M. Descr. Not. Pap. Pl. 2[8] (1886) 41.

Tree or shrub, *c.* 2–12 m. Twigs terete, straight, densely fulvous pubescent, sooner or later glabrescent; internodes less than 2 cm. *Thorns* in flowering specimens nearly always wanting, if present up to 2 mm. *Leaves* coriaceous, ovate to obovate, glabrous above, mostly very soon glabrescent beneath 1.7–2.5(–3.5) times as long as wide, (3–)5½–7(–9) by (2–)2½–3 cm; base acute to cuneate, top rounded to obtuse, sometimes mucronate; midrib above subprominent, nerves 5–9 pairs, subprominent on both sides; petiole ½–1½ cm, hairy as the twigs. *Raceme* pubescent, terminal, with up to a dozen of sweet-scented flowers, the lower in the axils of small leaves. Bracts proper, if present, small, acute. Pedicels 1½–6 cm. Buds ovoid, *c.* 1½ cm long, often with umbonate top. Outer pair of *sepals* coriaceous, initially connate and completely enveloping the bud, then splitting more or less regularly, patent at anthesis, *c.* 10–15 by 10 mm, acuminate, glabrous; inner pair rather thin, flat, ovate, *c.* 11–13 by 5–6 mm, shortly acuminate. *Petals* subobovate, 18–30 by 10 mm, pubescent inside and outside towards the base, white to yellowish. Torus comparatively broad, short-conical, with a small posterior disk. *Stamens c.* 50–70, 2½–5 cm, filaments white, anthers *c.* 2½ mm long. *Gynophore* 2½–7 cm, mostly thinly woolly in the basal half, glabrescent; ovary ellipsoid, acuminate, *c.* 3–4 mm long, glabrous, stigma dark-purple. In fruit the pedicel, the torus, and the gynophore somewhat incrassate. *Fruit* globular, 2½–4½ cm diam., pericarp *c.* 3 mm thick, soft, leathery, smooth, dull purplish brown, pulp spongy. Seeds 7–30, sometimes subangular, *c.* 9 by 6 by 5 mm.

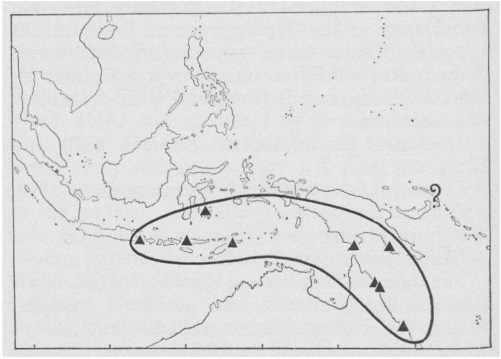

Fig. 25. Localities of *Capparis lucida* (BANKS *ex* DC.) BENTH. From the New Hebrides one unconfirmed record. In Australia several other localities to 30° S, and one unspecified locality "Gulf of Carpentaria".

Distr. Australia: NW. coast (BENTHAM), and NE. coast of Queensland to 20° S. lat.; in *Malaysia* a rare plant: E. Java (one locality), Lesser Sunda Islands (Komodo, Pada, Timor), SE. Celebes, New Guinea (Papua), Booby I. in Torres Strait, ?Bismarck Arch. Fig. 25.

Ecol. Chiefly coastal, but also in savannahs. *Fl. fr.* Jan.–Dec.

The sweet-scented, white or pale lemon-yellow flowers are typically nocturnal. KOORDERS noted that the fruit pulp has a sourish stench, like that of rotten fish. In a living plant in Kebun Raya Indonesia (II–Q–17) I found the spongy, yellow pulp tasting and smelling as insipid mango. They might be eaten by bats which could add to their dispersal.

Notes. In the Bogor Gardens another specimen is cultivated (XI–B–V–117); it is a tree, 5 m by 15 cm; it stands in deep shade and never flowers. The leaves of its long, overhanging twigs tend to have a distichous position and are subtended by straight thorns 2–2½ mm long.

Seeds sown from *n.* II–Q–17 produced seedlings of which the shoot is very similar to those of the just mentioned sterile tree. And though I have not observed the transitional stage wherein the seedling gets unarmed twigs with normal leaves I consider the unarmed sterile tree as a retarded juvenile stage through the effect of shade.

The occurrence of a sterile juvenile stage with thorns seems to be typical for the mainly Australian *sect. Busbeckea:* BENTHAM reported it in *C. canescens* BANKS *ex* DC. and I observed it in several specimens of *C. nobilis* F. v. M. and *C. mitchellii* LINDL.

DE CANDOLLE referred this species to the genus *Thylachium* on account of lacking petals; this error is perhaps due to their being very easily caducous.

Incompletely known species

Capparis longipes MERR.[1] Philip. J. Sc. 13 (1918) Bot. 12; En. Philip. 2 (1923) 211.

Scandent, glabrous shrub, branches slender, terete, brownish or olivaceous, the ultimate branchlets *c.* 1 mm diam. *Thorns* straight, usually 2–4½ mm. *Leaves* lanceolate, membranaceous to chartaceous, green or greenish-olivaceous when dry, somewhat shining, 7–11 by 2–3 cm, narrowed upwards to the very slender apex, sharply acute-acuminate, base acute; nerves *c.* 15 pairs, slender, distinct on both surfaces, anastomosing, primary reticulations lax, ultimate ones close, both distinct; petiole 2–3 mm. *Infructescences* axillary, very slender, sparingly branched, up to 20 cm long, each branch bearing a single fruit, its pedicel *c.* 3 cm. *Fruit* globose, brown when dry, glabrous, *c.* 12 mm in diam.

Distr. *Malaysia:* Philippines (Luzon: Abra), only known from the type BS 26980 RAMOS (US, K; L, photogr.).

Notes. The identity of this specimen could not be established with certainty, as the holotype in Manila has been lost, and the isotypes have no fruit. From the description by MERRILL (*vide supra*) and the completely sterile isotypes it is not possible to form an adequate idea about the structure of the inflorescence.

Though MERRILL did not mention the bract-like minute scales towards the base of the shoots which are typical for *C. pubiflora* I am inclined to compare the material with that species, with which it agrees in the greyish pubescence of the innovations, the straight thorns, and the venation pattern. It may represent a deviating form (teratological or developed in shade?) though I have as yet not seen any comparable paramorph in *C. pubiflora.*

Excluded

Capparis carandas BURM. *f.* Fl. Ind. (1768) 118, 119. MERRILL reduced this to *Carissa carandas* L., *cf.* Rumph. Herb. Amb. (1917) 425. Dr BAEHNI kindly sent me BURMAN'S authentic material in the Geneva Herbarium on loan. The entry on p. 118 may refer to one sheet which is most probably a *Carissa*; the entry on p. 119 refers to four other sheets belonging to *Carissa carandas* L. Mant. 1 (1767) 12 (*Apocynaceae*). According to the labels the material was derived from cultivated plants in Java.

Capparis versicolor GRIFF. Notul. 4 (1854) 577; HOOK. *f.* & TH. Fl. Br. Ind. 1 (1872) 175. Recorded from Tenasserim and from Java by HOOKER, who suggested its possible identity with *C. salaccensis* BL.

I have seen the type in the Calcutta Herbarium and agree that it is vegetatively similar to *C. cantoniensis*; the buds have disappeared but are assumed to have measured *c.* 12 mm diam. on pedicels *c.* 3 cm.

3. CADABA

FORSK. Fl. Aegypt.-Arab. (1775) 67; PAX & HOFFM. in E. & P. Pfl. Fam. ed. 2, 17b (1936) 185.—**Fig. 26–27.**

Shrubs, often glandular-pubescent (or with scales), occasionally with stipular thorns. *Leaves* simple (or 3-merous, or wanting). Racemes terminal (or flowers solitary, axillary). *Sepals* 4, in 2 whorls, unequal, caducous, outer pair enveloping the bud, valvate, inner pair apert. *Petals* mostly 4 and equal, unguiculate. Receptacle with an adaxial, cylindrical gland. *Stamens* 4–8, their base connate with the gynophore (androgynophore); anthers comparatively large. *Ovary* on a long gynophore, 1-celled; placentas 2–4; ovules ∞, 2-seriate; stigma sessile, indistinct. *Fruit* mostly cylindrical, dehiscent with 2 coriaceous valves (or an indehiscent berry). Seeds ∞, subglobose, with a cartilaginous, sculptured testa; cotyledons incumbent-convolute; radicle conical.

Distr. About 30 *spp.* in the drier regions of Africa, Madagascar, the Middle East, India, Ceylon, one *sp.* in South *Malaysia* and in N. Australia.

Taxon. There are 3 sections, distinguished by the leaves (simple, 3-foliolate, or wanting) and the number of petals and stamens. The Malaysian *sp.* belongs to *sect. Cadaba* (*Eu-cadaba* ENDL.). The other two sections are monotypic and occur in South Africa and the Deccan Peninsula respectively.

1. Cadaba capparoides DC. Prod. 1 (1824) 244; DECNE, Nouv. Ann. Mus. Hist. Nat. Paris 3 (1834) 427; Herb. Timor. Descr. (1835) 99; DELESS. Ic. Sel. Pl. 3 (1837) 5, t. 9; SPAN. Linnaea 15 (1841) 164; MIQ. Fl. Ind. Bat. 1, 2 (1858) 97; BENTH. Fl. Austr. 1 (1863) 92; MIQ. Illustr. (1870) 21; KOORD. Exk. Fl. Java 2 (1912) 295; BACK. Onkr. Suiker. (1931) 256, Atlas t. 266; PAX & HOFFM. in E. & P. Pfl. Fam. ed. 2, 17b (1936) 186, f. 806, 85 F–G; BACK. Bekn. Fl. Java (em. ed.) 4A (1942) fam. 45, p. 11.—**Fig. 26–27.**

Shrub, ⅓–3 m, procumbent to erect, very dense

(1) *C. longipes* STANDL. Contr. U.S. Nat. Herb. 23 (1922) 303, *non* MERR. 1918 = *C. discolor* STANDL. *op. cit.* 20 (1919) 182, *non* DONN. SMITH, 1897 = *C. renominata* JACOBS, *nom. nov.* It is a Mexican species.

Fig. 26. *Cadaba capparoides* DC. *a.* Habit, × ⅔, *b.* flower from the left, nat. size, *c.* pedicel with androgynophore, gynophore, fruit, × ⅔, *d.* seed, × 3 (*a–b* type specimen, LESCHENAULT *s.n.*, *c–d* TEYSMANN *s.n.*).

glandular-pubescent to almost glabrous. Twigs terete, straight; internodes ¾–2½ cm. *Thorns* straight to slightly recurved, 1½–4 mm, yellowish, sometimes small or wanting. *Leaves* simple, firmly herbaceous, ovate (to rarely obovate), (1.6–)2–3(–5.2) times as long as wide, (3½–)6–10 (–13½) by (1¾–)2½–4½(–8½) cm; base rounded to acute, sometimes obtuse, top narrowed, blunt to acutish, rarely rounded, mostly mucronate; nerves *c.* 7–9 pairs; petiole (¼–)½–4 cm. *Racemes* terminal, corymbiform; rachis 2–3 cm. Pedicels (1½–)2–3(–3½) cm. Bracts caducous, 2–5½ mm stalked, blade 6–10 by ½–2½ mm, lanceolate to ovate, acute, subtended by 2 minute thorns. Buds ovoid, acute. *Sepals* glandular-puberulous outside, boat-shaped, (8–)10–15(–20) by (3–)6–9(–12) mm,

ovate, acute to acuminate, inner pair somewhat smaller, flattish, sometimes up to 1 mm clawed, obovate, acute. *Petals* pure white on a green claw, all pointing upwards at the adaxial side, (4½–)8–15(–22) mm clawed, blade orbicular to broad-elliptic, 5–12 by 4½–7 mm. Gland green, 5½–15 by *c.* 1 mm; top yellow, flat, transverse, one-sided, lanceolate, 4½–6 mm long. *Stamens* (5–)6(–7), androgynophore 1–2½ cm; filaments 1–2 cm, anthers 3½–5 by ¾ mm, all glabrous. *Gynophore* 1½–2½ cm; ovary cylindrical, 4½–6 by ¾–1 mm, both sparsely glandular-puberulous; stigma knob-shaped, small; placentas 2. In fruit the pedicels hardly stretched or thickened, androgynophore (1–3–)2–3(–3½) cm, gynophore (1½–)2–3(–3½) cm, more or less densely glandular-puberulous. *Fruit* cylindrical, dull grey-brownish, (4½–)7–11 cm by 5–13 mm, ± glabrescent, dehiscing basiscopically, the filiform placentas persisting as a replum. Seeds up to *c.* 20, 3–4 by 2½–3 by 1½ mm, more or less deeply reniform, with shallow concentric ribs, dull dark brown.

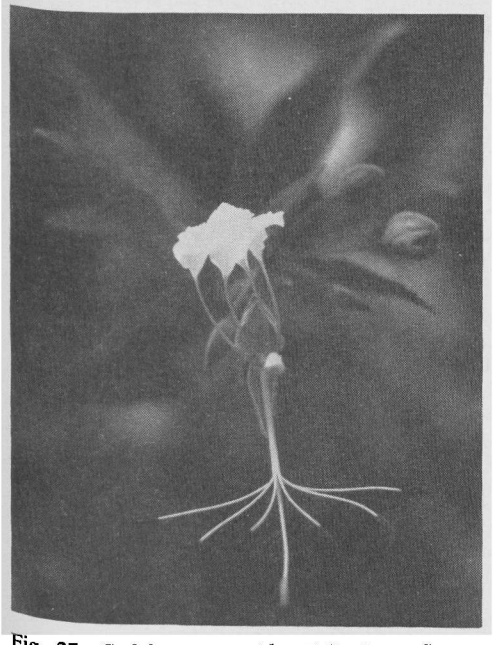

Fig. 27. *Cadaba capparoides* DC. Open flower. The gland is in the centre (VAN DER PIJL).

Distr. Australia (N. coast and Vansittart Bay), in *Malaysia:* E. Java (along the N. coast E of Surabaja), Lesser Sunda Islands (Bali, Sumbawa, Flores, Komodo, Timor, Leti). Fig. 29.

Ecol. Not rare in dry shrubby or grassy habitats, sometimes coastal, also reported from limestone, and once from periodically inundated coastal forest, at low altitude, a typical constituent of the flora of the monsoon area with a long dry season.

Vern. *Bangol bangol*, Bali (also in use for other *Capparidaceae*), *paumahatas*, Timor.

4. STIXIS

LOUR. Fl. Coch. (1790) 295, ed. WILLD. (1793) 361; PIERRE, Bull. Soc. Linn. Paris 1 (1887) 652.—*Roydsia* ROXB. Pl. Corom. 3 (1819) 87; HOOK. *f.* Fl. Br. Ind. 1 (1874) 180, 409.—*Covilhamia* KORTH. Ned. Kruidk. Arch. 1 (1848) 307.—**Fig. 28.**

Rather small, unarmed, woody climbers, rarely shrubs. Branches lenticellate. *Leaves* simple, acuminate, rather large, often with minute, whitish pustules along the midrib, finely pellucid-dotted; petiole incrassate at the apex. *Racemes* or *panicles* ∞-flowered, axillary or terminal, with caducous bracts. Pedicels short. *Sepals* mostly 6, in two whorls of 3, valvate, at the top of the bud the outer sepals covering the margins of the inner ones, more or less strap-shaped, densely fulvous-tomentose on both sides, inserted on the margin of a widened, dish-shaped, persistent torus. *Corolla* absent. *Stamens* on a short, ± cylindrical androgynophore, 20–50(-*c.* 100), unequal, the outer ones shortest, about as long as the sepals. *Gynophore* about equalling the filaments. *Ovary* subglobular, 3-celled, with 3 axillary placentas each bearing 5–8(–10) ovules; style simple or split into three arms. *Fruits* few, on a thick woody stalk, ellipsoid, 2½–5 cm long, sometimes with small persistent style, finally more or less lenticellate. Seed 1, large, embedded in pulp, with a thin testa; cotyledons unequal, one enclosing the other.

Distr. Seven *spp.*, in India (Khasia, Sikkim, Assam, Chittagong), Burma, Indo-China, Hainan, in *West Malaysia*: 3 *spp.* Fig. 29.

Taxon. HOOKER's division into *Roydsia* (style short or none, stigmas 3, free) and *Alytostylis* HOOK. *f.* (style long, with 3 minute terminal stigmas), brought by PIERRE to sectional level, is here abandoned. The division is, in my opinion, artificial, as it separates *S. suaveolens* (ROXB.) PIERRE and *S. philippinensis*

Fig. 28. *Stixis ovata* (KORTH.) HALL. *f. ssp. ovata. a.* Habit, × ⅔, *b.* flower, one inner sepal removed, × 4, *c.* pedicel, torus, gynoecium, × 4, *d.* cross-section through ovary, × 3, *e.* fruit, × ⅔ (*a* type specimen, KORTHALS *s.n.*, *b–d* CLEMENS 26647, *e* CLEMENS 26000).

which seem to be mutually closer related than *S. suaveolens* and *S. obtusifolia* (HOOK. *f.* & TH.) PIERRE, which two species would belong to § *Roydsia*. An examination of the division of the stigmas shows that this character is less qualitative than quantitative. A grouping according to the length of the androgynophore seems to be more satisfactory, it being considerably longer in *S. suaveolens* and *S. philippinensis* than in the rest of the species.

Anat. In leaf sections of *S. ovata*, made by Mr P. D. BURGGRAAF, we found that the whitish pustules are groups of sclerenchymatic cells in the mesophyll tissue; when the leaves are dried and the mesophyll shrinks these places become prominent.

KEY TO THE SPECIES

1. Gynophore longer than 6 mm, hairy. Leaves and ovary glabrous. Sepals 11–12 mm long. **1. S. philippinensis**

1. Gynophore shorter than 5 mm, glabrous. Sepals *c.* 4 mm long.
2. Adult leaves hairy underneath. Ovary hairy . . . . . **2. S. ovata** *ssp.* **ovata**
2. Adult leaves glabrous, occasionally with a few hairs underneath on the nerves only. Ovary glabrous. **3. S. scortechinii**

1. Stixis philippinensis (TURCZ.) MERR. Govt Lab. Publ. (Philip.) *n.* 35 (1906) 72; Philip. J. Sc. 1 (1906) Suppl. 58; En. Philip. 2 (1923) 213; ERDTMAN, Pollen Morph. (1952) 97.—*Roydsia philippinensis* TURCZ. Bull. Soc. Nat. Moscou 27, 2 (1854) 329; FERN.–VILL. Nov. App. (1880) 11; VIDAL, Sinopsis Atlas (1883) 13, t. 6 f. B; Phan. Cuming. Philip. (1885) 94; Rev. Pl. Vasc. Filip. (1886) 48.—*Roydsia floribunda* PLANCH. *ex* HOOK. *f.* Fl. Br. Ind. 1 (1874) 409.—*S. floribunda* (PLANCH. *ex* HOOK. *f.*) PIERRE, Bull. Soc. Linn. Paris 1 (1887) 655.

Climber (?), 6 m by 2 cm, glabrous except the inflorescence. *Leaves* subcoriaceous, elliptic to oblong, sometimes slightly obovate, 1.3–2.2 times as long as broad, (9–)13–21(–25) by (6–)8–10 (–11½) cm, smooth except for a few pustules above near the base of the midrib, top *c.* ½ cm acuminate; midrib above broadly sulcate; nerves 9–11 pairs; petiole 2–3 cm. *Panicle* ∞-flowered, terminal, *c.* 25 cm long; branches up to 15 cm, all axes angular and fulvous-puberulous. Bracts orbicular ½ mm to linear 3 mm. Pedicels ½ cm. Buds 10–11 mm long, with cylindrical base and somewhat swollen, acute top. Torus 1½–2 mm broad. *Sepals* during anthesis reflexed halfway, narrow-spathulate, blunt to acute, obscurely 3–5-nerved, the base not narrowed but slightly thickened. Androgynophore 2–3 mm, sometimes hairy at the top. *Stamens* *c.* 35–40(–48), glabrous, filaments 10–15(–16) mm. *Gynophore* 8–11 mm, densely puberulous; ovary subglobular, glabrous, *c.* 2 by 1½ mm; style 1½–2(–2½) mm, glabrous, with 3 small but distinct stigmatic lobes. Pedicel in fruit *c.* 1 cm, torus 4 mm broad, gynophore 3 mm thick, still hairy. *Fruit* (only some unripe and a few fragments of a ripe one are known) globular with persistent style, up to 3½ cm diam.; pericarp thin, leathery. Seed *c.* 2 by 1½ cm.

Distr. Philippines (Luzon: Bataan and Laguna Prov.; Basilan; Mindanao: Surigao, Cotabato, and Davao Prov.). Seems to be very local. Fig. 29.

Ecol. Forests at low and medium altitudes.

Fl. Jan.–Dec., *fr.* March–April.

2. Stixis ovata (KORTH.) HALL. *f.* Beih. Bot. Centralbl. 39. ii (1921) 35.—*Covilhamia ovata* KORTH. Ned. Kruidk. Arch. 1 (1848) 307; MIQ. Fl. Ind. Bat. 1, 2 (1858) 180; MERR. En. Born. (1921) 381.—*S. fasciculata var. borneensis* HEINE, Mitt. Bot. Staatssamml. München. Heft 6 (1953) 212.

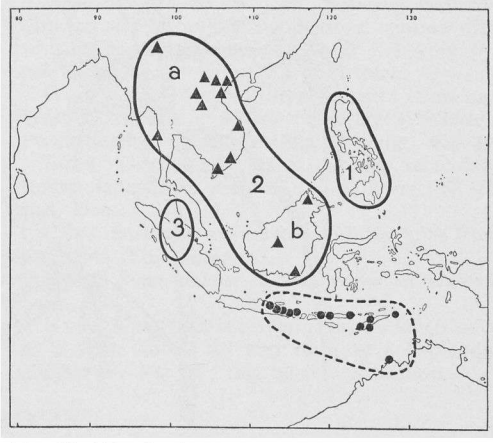

Fig. 29. Distribution of the Malaysian species of *Stixis* and of *Cadaba*.—1. *S. philippinensis* (TURCZ.) MERR., 2. *S. ovata* (KORTH.) HALL. *f.* (triangles representing localities), *a. ssp. fasciculata* (KING) JACOBS, *b. ssp. ovata*, 3. *S. scortechinii* (KING) JACOBS.—*Cadaba capparoides* DC. (dots representing localities).

ssp. **ovata.—Fig. 28.**

Branchlets fulvous-tomentose, finally glabrescent. *Leaves* firmly herbaceous, oblong to lanceolate, mostly somewhat obovate, rather narrow, ¾–1½ cm acuminate, fulvous-pubescent, glabrescent, (8–)12–17(–22) by 4–8(–11) cm; midrib above sulcate; nerves 7–9 pairs, mostly densely set with minute whitish pustules. Petiole 1–2(–2½) cm, hairy as the twigs. *Racemes* or *panicles* axillary (rarely a terminal panicle), 6–17 cm long, axes angular, fulvous-tomentose. Bracts linear, 2–3 (–4) mm, tomentose. Pedicels thin, *c.* ½ cm. Buds obovate, 4–5 mm long. *Flowers* greyish green. Torus 1 mm wide. *Sepals* reflexed, lanceolate, *c.* 4 by 1 mm, acutish, obscurely 3-nerved. Androgynophore *c.* ½ mm long and wide, glabrous. *Stamens* 26–34, filaments 2½–3½ mm, glabrous.

Fig. 30. *Cleome rutidosperma* DC. *a.* Flowering branch, × ⅔, *b.* flower, lower sepal and petals removed, right 3 stamens omitted, × 6, *c.* flower from the adaxial side, upper sepal, petals, two stamens removed, lower petals partly, other sepal and stamens omitted, × 6, *d.* front view of flower, × 2, *e.* flower, × 4, *f.* flower from the abaxial side, lower petal and 4 stamens removed, upper sepal, petals, and stamens omitted, × 6, *g–h.* seed with elaiosome, × 6 (living material, Bogor).

Gynophore 1–2 mm, glabrous; ovary ellipsoid, *c.* 1¼ by 1 mm, densely appressed-pubescent; style 1½–2 mm, slender, glabrous, stigma obscurely 3-lobed. *Fruit* on a woody stalk ¾ by ½ cm, ellipsoid, 3–3½ by 2¼–2½ cm; pericarp ¾–1 mm thick, leathery-corky, irregularly covered with whitish crust-like fragments, glabrous, crowned by the style base. Seed oblong, *c.* 2¾ by 1½ cm.

Distr. *Malaysia:* Borneo. Fig. 29.

Ecol. In forests, up to 1200 m.

Vern. *Sansang*, Dusun (N. Borneo).

Note. In continental Asia (Burma, Tenasserim, and Indo-China) another subspecies occurs, formerly distinguished as a separate species, which differs from the type subspecies in having the gynophore hirsute except at the base, flowers in terminal panicles 12–35 cm long or racemes over 12 cm long. Bract mostly 4 mm.

3. **Stixis scortechinii** (KING) JACOBS, *nov. comb.*—*Roydsia scortechinii* KING, J. As. Soc. Beng. 58, ii (1889) 397; Ann. R. Bot. Gard. Calc. 5 (1896) 120. t. 139; RIDL. Fl. Mal. Pen. 1 (1922) 121.—*Roydsia parviflora* (*non* GRIFF.) KING, J. As. Soc. Beng. 58, ii (1889) 396.

Shrub, often twining (to the left), (1–)3–4(–8) m. Branchlets downy puberulous, glabrescent. *Leaves* firmly herbaceous to subcoriaceous, elliptic to oblong, glabrous, *c.* (1.4–)2 times as long as broad, mostly obovate, (8–)10–16(–20) by 4–7(–9) cm, base more or less narrowed and acute, top rounded and abruptly acuminate with triangular, short, blunt tip; midrib above flat to finely sulcate, below mostly densely set with pustules; nerves 6–7(–8) pairs, reticulations prominent; petiole (1–)1½–2(–2½) cm. *Inflorescence* a terminal, slender, leafy, many-flowered panicle 15–20 cm long, densely downy-puberulous. Bracts linear, *c.* 3 mm. Pedicels 2–3(–5) mm. Buds obovoid, 2½–3 mm long. Flowers fragrant. Torus *c.* 1¼ mm wide. *Sepals* reflexed, strap-shaped, somewhat obovate, acute, inside pink, 3–4(–4½) by ¾–1¼(–1½) mm. Androgynophore hardly visible, glabrous. *Stamens* (20–)25–40; filaments 1½–3½ mm; anthers elliptic, *c.* ¾ mm long. *Gynophore* ¾–1¼ mm long; ovary ellipsoid to ovoid, *c.* 1–1¼ by 1mm, both glabrous; style 1–1½ mm, slender, glabrous, after anthesis somewhat recurved, stigmas obscure. *Fruit* on a woody stalk, 5–7 by 4–5 mm, ellipsoid *c.* 3–4 by 2–3 cm; pericarp leathery, thin, mostly smooth but sometimes spotted with whitish, crustlike fragments. *Seeds c.* by 1½ cm, embedded in pulp *c.* 3 mm thick.

Distr. *Malaysia:* Northern Sumatra (East and West Coast Res.), Malay Peninsula (Wellesley, Perak, Selangor, Negri Sembilan, Penang). Fig. 29.

Ecol. Dry sunny places, young secondary forest, landslides, jungles, 100–1100 m. *Fl. fr.* Jan.–Dec.

Uses. Sore eyes are treated with the juice from the roots (NE. Sumatra).

Vern. *Simar silaun*, Toba, *andor si bumbun*, Sum. E. C.

Note. KUNSTLER recorded it on his labels once as a "tree 40–50 ft" and once as a "splendid climber 80–100 ft"; this needs verification.

5. CLEOME

LINNÉ, Gen. Pl. ed. 5 (1754) 302; Sp. Pl. 2 (1753) 671; R. BR. in Oudney, Denh. & Clapp. Narr. Trav. Disc. Afr. (1826) App. 220; DC. Prod. 1 (1824) 238; SCHULTES, Syst. 7[1] (1829) 23; PAX & HOFFM. in E. & P. Pfl. Fam. ed. 2, 17b (1936) 210.—*Pedicellaria* SCHRANK in Roem. & Ust. Mag. Bot. 3, pt 7 (1790) 10.—*Polanisia* (*non* RAF.) *sensu* DC. Prod. 1 (1824) 242, *excl. spec. typ. P. gravèolens*, *cf.* ILTIS, Brittonia 10 (1958) 33; PAX in E. & P. Pfl. Fam. 3, 2 (1891) 224.—*Gynandropsis* DC. Prod. 1 (1824) 237; PAX & HOFFM. in E. & P. Pfl. Fam. ed. 2, 17b (1936) 217.—**Fig. 30–33.**

Annual (or perennial) herbs, often hairy, sometimes glandular-hairy. Stipules none or obsolete; seldom with stiff, recurved, thorn-like, stipular (?) enations at the base of the leaf. *Leaves* petioled, herbaceous, in the Mal. *spp.* palmately dissected into 3–7 leaflets. *Flowers* pedicelled, in leafy, terminal racemes or panicles, the leaves apically gradually reduced, mostly slightly zygomorphic in the position of the petals. *Sepals* 4, free. *Petals* (normally) 4, the base often clawed. Stamens 6 to ∞, in Mal. *spp.* all fertile, sometimes at the base connate with the *gynophore* to an *androgynophore*. Disk small. Ovary 1-celled, sometimes sessile but mostly on a gynophore; stigma knob-shaped or flattish, subsessile. *Capsule* linear, terete, 2-valved, beaked, dehiscing from the base or from the apex, the 2 placentae forming a persistent replum. *Seeds* ∞, orbicular to horseshoe-shaped (with a more or less open cleft), sometimes with a funicular elaiosome, on the dorsal side sculptured to scaly.

Distr. A pantropical and subtropical genus with over 150 *spp.*, many of them in America, in the Old World *c.* 65 *spp.* mostly in Africa and the Middle East; in Malaysia 8 *spp.*, of which 2 cultivated, and the others native or introduced. Several *spp.* have in recent time been introduced into other continents as aliens and are now widely spread weeds.

Ecol. In Malaysia most species are weeds along roadsides and in fields at low altitudes.

Uses. Two *spp.* are cultivated as ornamentals, especially *C. speciosa*. Some are used as vegetables and in primitive medicine.

Hairs. In all Malaysian *Cleomes* the hairs are simple and multicellular. They are densely set, patent, and glandular in *C. gynandra*, *C. spinosa*, *C. viscosa*, *C. aculeata*; in the last species the hairs are very small and non-glandular hairs are mixed with the glandular ones. *C. speciosa* is almost glabrous; its scarce vestiture resembles that of *C. aculeata*. In *C. chelidonii* the plants are covered, mostly densely, with appressed, stiff, glassy hairs with a more or less bulbous base. In *C. aspera* and *C. rutidosperma* there are sparse, subpatent, epidermal appendages, too large to be regarded as hairs in the strict sense.

Taxon. DE CANDOLLE (1824) distinguished *Cleome*, *Gynandropsis*, and *Polanisia*. R. BROWN (1826) suggested the reduction of *Gynandropsis* as a section to *Cleome*, except for *C. gynandra* on which he based a new section *Gymnogonia*. The SCHULTESES (1829) sunk all three genera into a single genus *Cleome* in which they distinguished four sections; their classification has still its merits and is preferred here to that of PAX & HOFFMANN which seems to be somewhat unbalanced. Their sections were: *sect.* A. *Gynandropses* (DC.) SCHULT., with an androgynophore, to which would belong *C. gynandra* and *C. speciosa*; *sect.* B. *Cleomes* (DC.) SCHULT., with 6 free stamens, which is subdivided into *subsect:* 1. *Pedicellaria* (DC.) SCHULT., with a long fleshy torus and a long gynophore, to which would belong *C. spinosa*, and *subsect.* 2. *Siliquaria* (FORSK.) SCHULT. with a small torus and a short or wanting gynophore, to which would belong *C. aspera*, *C. rutidosperma*, and *C. aculeata*; *sect.* C. *Polanisiae* (DC.) SCHULT., with more than 8 non-clavate stamens, to which would belong *C. viscosa*; *sect.* D. *Corynandrae* (SCHRAD.) SCHULT., with numerous, clavate stamens, to which would belong *C. chelidonii*.

According to ILTIS the Malaysian species are to be grouped as follows: *sect. Gymnogonia* R.BR.: *C. gynandra*; sect. *Tarenaya* (RAF.) ILTIS: *C. spinosa*, *C. speciosa*, *C. aculeata*; *sect. Ranmanissa* (ENDL.) GRISEB.: *C. viscosa*; *sect. Corynandra* (SCHRAD.) SCHULT.: *C. chelidonii*; *sect. Rutidosperma* ILTIS: *C. aspera*, *C. rutidosperma*.

Dr ILTIS (Brittonia 10, 1958, 33 and 12, 1960, *in the press*) is also of opinion that there are no good reasons to maintain the genus *Gynandropsis*, because the connation of the staminal base with the gynophore to form an androgynophore is merely a character of degree, of quantitative value. In this last conclusion ILTIS was preceded by WOODSON, who suggested to refer the bisexual species of *Gynandropsis* to *Cleome*, and proposed an emendation of the S. American genus *Podandrogyne* to incorporate the monoecious species of *Gynandropsis* (Ann. Mo. Bot. Gard. 35, 1948, 139–141).

As to *Polanisia*, ILTIS pointed out that it is satisfactory to restrict *Polanisia* to the original concept of RAFINESQUE, the type species being the N. American *P. graveolens* RAF. (= *P. dodecandra* (L.) DC.). DE CANDOLLE, followed by many later authors, had extended the concept with the cleomoid Old World species possessing more than 6 stamens, but these possess no large adaxial gland as in the type species. These should be referred to *Cleome*.

Thanks are due to Dr H. H. ILTIS, who kindly put his MS at my disposal and gave additional critical remarks, enabling me to take advantage of his extensive knowledge of the American and other species.

KEY TO THE SPECIES

1. Androgynophore longer than 5 mm.
 2. Gynophore in flower 1–2 mm, in fruit 4–10 mm. Petals 7–15 mm long, open in bud, white. **1. C. gynandra**
 2. Gynophore *c.* 6 cm. Petals 25–35 mm long, imbricate, pink . . . . . **2. C. speciosa**
1. Androgynophore none or at most 3 mm long.
 3. Gynophore *c.* 4 cm. Androgynophore 1–3 mm high. Plant with scattered prickles. **3. C. spinosa**
 3. Gynophore shorter than 1 cm, or none. Stamens free.
  4. Stamens more than 8. Ovary sessile.
   5. Stamens 30 or more, filaments club-shaped. Fruit with a narrowed base; valves parallel-nerved. Plant with stiff scaly hairs. Flowers pink . . . . . **4. C. chelidonii**
   5. Stamens less than 30, filaments almost filiform. Fruit hardly narrowed at the base, valves centripetal-nerved. Flowers yellow . . . . . **5. C. viscosa**
  4. Stamens 6. Ovary on a short gynophore.
   6. Plant with recurved stipular thorns, glabrous or glandular-puberulous. Flowers white to cream. **6. C. aculeata**
   6. Plant unarmed, with scattered, retrorse hair-like appendages, not glandular.
    7. Petals violet-blue, 9–12 mm long. Fruit 4 mm diam. Seeds with an open cleft. **7. C. rutidosperma**
    7. Petals white, 4–5(–7) mm long. Fruit 2 mm diam. Seeds orbicular, with a closed cleft. **8. C. aspera**

1. Cleome gynandra LINNÉ, Sp. Pl. 2 (1753) 671; C. B. ROBINS. Philip. J. Sc. 3 (1908) Bot. 182.–*Lagansa rubra* RUMPH. Herb. Amb. 5 (1747) 280, t. 96 f. 2.—*C. triphylla* LINNÉ, Sp. Pl. ed. 2 (1763) 938.—*C. pentaphylla* LINNÉ, *l.c.* 938; R. BR. in Oudney, Denh. & Clapp. Narr. Trav. Disc. Afr. (1826) 222.—*Pedicellaria pentaphylla* SCHRANK in Roem. & Ust. Mag. Bot. 3, pt 7 (1790) 11; MERR. Publ. Govt Lab. Philip. *n.* 27 (1905) 18.—*Gynandropsis pentaphylla* DC. Prod. 1 (1824) 238; MIQ. Pl. Jungh. (1854) 397; Fl. Ind. Bat. 1, 2 (1858) 96; Sum. (1860) 19; EICHL. Fl. Bras. 13, 1 (1865) 261, t. 58 f. 3; HASSK. Neu. Schlüss. Rumph. (1866) 263; MIQ. Illustr. (1870) 19; FERN.–VILL. Nov. App. (1880) 10; KING, J. As. Soc. Beng. 58, ii (1889) 392; MERR. Philip. J. Sc. 1 Suppl. (1906) 58; BACK. Fl. Bat. (1907) 53; Schoolfl. (1911) 60; MERR. Fl. Manila (1912) 216; LAUT. Bot. Jahrb. 52 (1915) 110; MERR. Int. Rumph. (1917) 241; Sp. Blanc. (1918) 158; RIDL. Fl. Mal. Pen. 1 (1922) 120; V. D. PIJL, Trop. Natuur 19 (1930) 162. —*Gynandropsis affinis* BL. Bijdr. 2 (1825) 51.—*C. affinis* SPRENG. Syst. Veg. ed. 16, 4, 2 (1827) 138, *non* DC. 1824.—*C. blumeana* SCHULT. Syst. Veg. 7[1] (1829) 23.—*C. alliacea* BLANCO, Fl. Filip. (1837) 522.—*C. blumeana* D. DIETR. Syn. Pl. 2 (1840) 1065.—*C. alliodora* BLANCO, Fl. Filip. ed. 2 (1845) 363, ed. 3, 2 (1879) 307, t. 233.—*Gynandropsis gynandra* BRIQ. Ann. Cons. Jard. Bot. Genève 17 (1914) 382; MERR. En. Philip. 2 (1923) 209; DOCTERS VAN LEEUWEN, Zoocecidia (1926) 211; HEYNE, Nutt. Pl. (1927) 681; OCHSE & BAKH. Ind. Groenten (1931) 96, f. 57; BACK. Onkr. Suiker. (1931) 253, Atlas t. 264; Trop. Natuur 22 (1933) 112; BURK. Dict. 1 (1935) 1119; PAX & HOFFM. in E. & P. Pfl. Fam. ed. 2, 17b (1936) 218; BACK. Bekn. Fl. Java (em. ed.) 4A (1942) fam. 45, p. 4; MERR. Pl. Life Pac. World (1946) 135, f. 119.

Erect, mostly widely branched, annual herb, 15–80 cm. Stem glandular-pubescent to glabrous. Normal *leaves* with 5 leaflets, lowest and upper with 3, towards and in the inflorescence diminishing in size; leaflets thinly herbaceous, about twice as long as wide, obovate, *c.* 2–7½ by 1–3¾ cm, base cuneate, top rounded and ± distinctly acuminate, ciliate to denticulate; nerves 5–8 pairs; petiole 2–10 cm, petiolules 1–3 mm, webbing at the base, densely glandular puberulous. *Flowers* in long, corymbose racemes, nocturnal. Pedicels thin, 1½–2½ cm, glandular-puberulous. *Sepals* 2½–5 by ½–1½ mm, acute, puberulous, ciliate. *Petals* with open aestivation, all pointed upwards towards the adaxial side, elliptic with narrowed base and rounded top, 1½–5 mm stalked, 7–15 mm long in all, 1½–4 mm broad. Androgynophore 9–16 mm. *Stamens* 6; filaments 1½–2 cm; anthers linear, 2–3 mm long. *Gynophore* 1–2 mm; ovary cylindric, *c.* 3 by ½ mm, in some flowers (especially the apical ones) sessile and reduced. In fruit pedicels 1–3 cm, androgynophore 13–20 mm, gynophore 4–10 mm. *Fruit* cylindrical, tapering to both ends, 2–11 cm by 3–4(–6) mm; beak 1–4 mm; valves with longitudinal, centripetal veins. *Seeds* depressed-globular, *c.* 1⅓ mm diam., with a shallow and narrow cleft, black-brown, with many superficial concentric ribs and numerous irregular distinct cross-ribs. No elaiosome.

Morph. RAGHAVAN found in this species (in S. India) that about 50 % of the ovaries are sessile and sterile with only vestiges of ovules being present (J. Linn. Soc. Bot. 52, 1939, 239).

MAURITZON studied the embryology (Ark. Bot. 26, *n.* 15, 1935, 1).

Distr. From Ceylon and the Punjab throughout SE. and E. Asia as far as Peiping; throughout *Malaysia*. Widely introduced in the New World.

Ecol. A weed, in dry rice-fields, along roadsides, near houses, from the lowlands up to *c.* 500 m. *Fl. fr.* Jan.–Dec.

Vern. *Maman(g)*, *mamam*, M, S, *bobowan*, *èntjèng-èntjèng*, J, *bhubhuwan*, Md; Philippines: *apoi-apoian*, *balabalanoian*, Tag.; *halaya*, *hulaya*, P. Bis., *tantandok*, *t.-a-dadakel*, Ilk.

Uses. Some minor medicinal applications are mentioned by BURKILL, *l.c.* and HEYNE, *l.c.* According to OCHSE, *l.c.*, the bitter leaves are prepared by boiling and salting as a vegetable, especially in Java.

2. Cleome speciosa RAF. Fl. Ludovic. (1817) 86; H.B.K. Nov. Gen. & Sp. Pl. 5 (1821) 84, t. 436. —*Gynandropsis speciosa* DC. Prod. 1 (1824) 238; HASSK. Nat. Tijd. N.I. 10 (1856) 118; Hort. Bog. Descr. (1858) 11; MIQ. Fl. Ind. Bat. 1, 2 (1858) 96; FERN.–VILL. Nov. App. (1880) 10; MERR. Philip. Govt. Lab. Publ. *n.* 6 (1904) 24, *n.* 27 (1905) 18; BACK. Fl. Bat. (1907) 54; GAGN. Fl. Gén. I.–C. 1 (1908) 174; BACK. Ann. Jard. Bot. Buit. Suppl. 3 (1910) 403; Schoolfl. (1911) 60; BRIQ. Ann. Cons. Bot. Genève 17 (1914) 384; SCHROO, Trop. Natuur 4 (1915) 108, f. 1–7; MERR. Sp. Blanc. (1918) 158; En. Philip. 2 (1923) 209; DOCTERS VAN LEEUWEN, Zoocecidia (1926) 211; HEYNE, Nutt. Pl. (1927) 681; BURK. Dict. 1 (1935) 1119; BACK. Bekn. Fl. Java (em. ed.) 4A (1942) fam. 45, p. 4. —*C. speciosissima* DEPPE *ex* LINDL. Bot. Reg. 14 (1831) t. 1312; BURK. Dict. (1935) 580.—*Gynandropsis pentaphylla* (*non* DC.) BLANCO, Fl. Filip. (1837) 523.—*C. gigantea* (*non* L.) BLANCO, *ibid.* ed. 2 (1845) 364, ed. 3, 2 (1879) 307, t. 234.

Little-branched herb, *c.* 1–1½ m, erect, glabrous or glabrescent. *Leaflets* 5–7, herbaceous, subsessile, slightly webbing at the insertion, narrowed towards base and top, lanceolate, *c.* 10–12(–18) by 2½–4½ cm; nerves 14–16(–25) pairs; petiole *c.* 8–12(–17) cm. Raceme up to 40 cm long. *Flowers* subtended by subsessile leaves upwards gradually simplified and diminishing in size. Pedicels thin, *c.* 2½–3½ cm. Buds cylindric, *c.* 2–2¼ cm by 3 mm; petals imbricate, androgynophore with the base of the filaments bulging out at the anterior side shortly before anthesis; flowers opening at dusk. *Sepals* patent, subulate, 5 mm, ciliate. Torus *c.* 1½ mm wide. *Petals* during anthesis pointing upwards adaxially, *c.* (25–)30(–35) by 5–8 mm, lanceolate, rounded, narrowed into a claw *c.* 5 mm, glabrous, pink or white (sometimes referred to as *f. alba*). Androgynophore 5–7(–9) mm, slightly incrassate towards base and top, glabrous. *Stamens* 6, glabrous, filaments filiform, *c.* 5–6 cm,

anthers *c.* 7 mm, linear. *Gynophore* *c.* 6 cm, glabrous, ovary cylindrical, few mm long, glabrous. *Fruit* cylindric, *c.* 8–9 cm by 3 mm, valves indistinctly parallel-nerved. Seeds *c.* 2¾ mm diam., 2 mm thick, with a fairly shallow cleft, light brown, the surface with small, pale, scattered scales; no elaiosome.

Distr. South America from Mexico to Peru and Guyana, cultivated as an ornamental in SE. Asia, up to 1500 m, in *Malaysia* collected in Sumatra (East Coast), Java, Borneo (Sarawak, W. Borneo), Philippines (Luzon), Moluccas (Aru Is). According to HASSKARL (1856, *l.c.* 119) introduced in Malaysia some years before 1855.

Ecol. SCHROO, *l.c.*, observed that in Java the flowers open between 4 and 5 p.m.; small stingless bees (*Apis indica*) collect pollen but do not touch the nectar; pollination would be effected by nocturnal butterflies.

3. Cleome spinosa JACQ. En. Pl. Carib. (1760) 26; LINNÉ, Sp. Pl. ed. 2 (1762) 939; DC. Prod. 1 (1824) 239; EICHL. Fl. Bras. 13, 1 (1865) 252; MERR. En. Philip. 2 (1923) 208; BACK. Bekn. Fl. Java (em. ed.) 4A (1942) fam. 45, p. 2.—*C. sandwicensis* A. GRAY, U.S. Expl. Exp. Bot. 1 (1854) 65.

Herb 1—1¼ m. Stems vigorous, glandular-pubescent. Stipular *thorns* minute (some petioles without) to 4 mm long, sharp, recurved. *Leaves* much reduced towards the inflorescence; leaflets 5–7, herbaceous, lanceolate, slightly webbed at the base, sparsely glandular-hairy, central leaflet largest, 6–8(–10) by 1¾–2¼(–3) cm; base cuneate, decurrent, top attenuate, acute, mucronate; nerves 10–15 pairs; petiole *c.* 5–10 cm, sometimes with scattered prickles as the midrib beneath. Racemes up to 40 cm. *Flowers* subtended by subsessile, ovate-oblong, sparsely glandular-hairy bracts, gradually diminishing in size from 2 to ½ cm. Pedicels 2–3 cm, short glandular-hairy. Buds cylindrical, *c.* 2¾ cm by 4 mm, glabrous; petals imbricate, androgynophore with the base of the stamens bulging out at the anterior side shortly before anthesis. *Sepals* patent, narrow-triangular, (4–)6–7 mm, glandular-hairy outside. *Petals* glabrous, on a filiform claw (5–)10–12 mm, blade oblong, ± asymmetrical, 10–17 by 4–6 mm, with cuneate base and rounded top. *Stamens* 6; androgynophore 1–2 mm, glabrous; filaments filiform, 3½–4 cm; anthers linear, 7–8 mm. *Gynophore* glabrous, in flower *c.* 4 cm, in fruit to 5½ cm; ovary linear, *c.* 4 mm, glabrous. *Fruits* patent, cylindrical, blunt at both ends, 5½–6½ cm by 4 mm, valves finely and densely nerved. Seeds asymmetrical, 2 mm diam., almost smooth, concentric and cross ribs subprominent; elaiosome not present.

Distr. Native in tropical America, also occasionally cultivated in the tropical to the temperate zones, in *Malaysia:* occasionally cultivated, known from Luzon and from Java, in the latter island once found run wild.

Note. According to ILTIS (*in litt.*) the Malaysian material would not belong to *C. spinosa*, but to the related *C. houtteana* SCHLECHT. (Linnaea 8, 1851, 669) which would be recognizable by glabrous buds and ovaries, and pink flowers.

4. Cleome chelidonii LINNÉ *f.* Suppl. (1781) 300; HOOK. *f.* & TH. Fl. Br. Ind. 1 (1872) 170.—*Polanisia chelidonii* DC. Prod. 1 (1824) 242; MIQ. Fl. Ind. Bat. 1, 2 (1858) 97; BACK. Schoolfl. (1911) 60; HEYNE, Nutt. Pl. (1927) 682; BACK. Onkr. Suiker. (1931) 254, Atlas t. 264; Bekn. Fl. Java (em. ed.) 4A (1942) fam. 45, p. 5.—*Polanisia angulata* DC. Prod. 1 (1824) 242; MIQ. Fl. Ind. Bat. 1, 2 (1858) 97; Illustr. (1870) 20.—**Fig. 31, 32a–b.**

Widely branched herb, 15–80 cm; tap-root stout, white. Stems angular, with sparse, appressed, pale, stiff hairs with a bulbous base. *Leaflets* firmly herbaceous, 6–7 below to apically only 3 or 1, obovate, mostly densely appressed-hairy, central leaflet largest, up to 4(–6) by 1¼(–1¾) cm; base cuneate, top rounded and subacuminate to acute; nerves 4–5 pairs; petioles upwards gradually decreasing in length from *c.* 8–10 cm to almost zero, hairy as the stem, apex and petiolules white. Raceme corymbiform, *flowers* subtended by reduced leaves, actinomorphic. Pedicels (1–)1½–3 cm, hairy as the stem. Buds ellipsoid, ± obovate, acute, 6–10 mm long. *Sepals* narrowly imbricate, appressed, elliptic (to obovate), acuminate, 2–4 mm long, sparsely scaly-hairy outside, margin membranous. *Petals* 4(–8), mostly obovate with narrowed base and rounded top, 7–12(–15, in India –21) by 3–5 mm, glabrous, light red-purple. *Stamens* 30–40(–55), somewhat shorter than the petals, glabrous; filaments with a thickened top; anthers *c.* 1 mm, yellow. Ovary linear, about as long as the stamens, glabrous. *Fruit* linear, parallel-nerved, narrowed at the very base, glabrous, *c.* 1–3 mm beaked. Seeds asymmetrical nearly 2 mm, cleft open, dull blackish, not ribbed but warty by scattered scales mainly on the dorsal side. Elaiosome wanting.

Distr. India, Burma and Siam (locally), in *Malaysia:* Central and East Java.

Anat. T. S. RAGHAVAN investigated the development of the female gametophyte, embryo, and seed, and the vascular supply of the floral parts (J. Linn. Soc. Bot. 51, 1937, 43–72; *ibid.* 52, 1939, 249).

Ecol. Fallow sawahs, sugarcane-fields on heavy clays, and marls periodically drying out during the pronounced dry season, in Java below 100 m, locally sometimes so abundant that the fields are coloured red-purple by the flowers (BACKER, 1931). *Fl. fr.* Jan.–Dec.

KOOPER defined a weed community characterized by *Polanisia chelidonii* on constantly moist, fairly to very heavy clay in sugarcane-fields (Rec. Trav. Bot. Néerl. 24, 1927, 84 *seq.*).

MIRASHI found it characteristic in the vegetation of freshwater swamps in India; he discussed also some anatomical details (Proc. Ind. Ac. Sc. 43B, 1956, 233–236).

Note. The type material of *Polanisia angulata* DC., hailing from Java, could not be located in

the Paris Herbarium; his description is vague, but he records a field note by LESCHENAULT "flowers violet". This character occurs only in

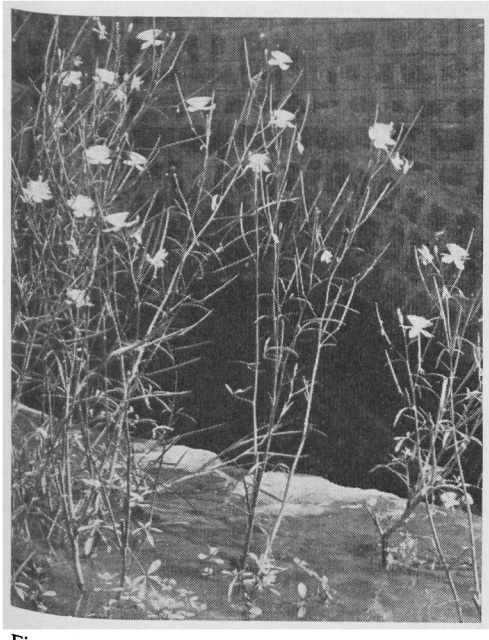

Fig. 31. *Cleome chelidonii* L. *f.* (India, Raipur, HEWETSON, 1950).

C. chelidonii; therefore, I agree with BACKER in referring it here.

5. Cleome viscosa LINNÉ, Sp. Pl. 2 (1753) 672; HOOK. *f.* & TH. Fl. Br. Ind. 1 (1872) 170; F. v. M. Descr. Not. Pap. Pl. 1[4] (1876) 52; RIDL. Fl. Mal. Pen. 1 (1922) 119.—*Lagansa alba* RUMPH. Herb. Amb. 5 (1747) 280, t. 96 f. 3.—*C. icosandra* LINNÉ, Sp. Pl. 2 (1753) 672; in Stickman, Herb. Amb. (1754) 21; BURK. Dict. 1 (1935) 581.—*Polanisia viscosa* DC. Prod. 1 (1824) 242; BL. Bijdr. (1825) 52; BLANCO, Fl. Filip. ed. 2 (1845) 364, ed. 3, 2 (1878) 308; MIQ. Fl. Ind. Bat. 1, 2 (1858) 97; Illustr. (1870) 20; FERN.-VILL. Nov. App. (1880) 10; VIDAL, Phan. Cuming. (1885) 94; BACK. Fl. Bat. (1907) 52, *quoad var.* α; MERR. Philip. J. Sc. 3 (1908) Bot. 407; BACK. Schoolfl. (1911) 60; MERR. Fl. Manila (1912) 216; Int. Rumph. (1917) 240; Sp. Blanc. (1918) 158; HEYNE, Nutt. Pl. (1927) 682; BACK. Onkr. Suiker. (1931) 255, Atlas t. 266, *quoad f. typica.*—*Polanisia icosandra* W. & A. Prod. (1834) 22; MERR. En. Philip. 2 (1923) 209; BACK. Bekn. Fl. Java (em. ed.) 4A (1942) fam. 45, p. 5, *quoad f. typica*; MERR. Plant Life Pac. World (1946) 135, f. 121; QUIS. Med. Pl. Philip. (1951) 344.—*C. acutifolia* ELMER, Leafl. Philip. Bot. 7 (1914) 2574.—*C. chelidonii* (*non* L. *f.*) BURK. Gard. Bull. S.S. 3 (1924) 280; Dict. 1 (1935) 580.—**Fig. 32c–d.**

Annual, mostly widely branched herb up to 1 m, glandular, yellowish hairy, viscid and stinking. *Leaflets* tinhly herbaceous, 5–3, diminishing upwards in size, subsessile, oblong, the central leaflet *c.* 1–3(–5½) by (¼–)½–1(–2) cm; base cuneate, top acute to obtuse; nerves 3–6 pairs; petiole (½–)1–3(–6) cm. *Racemes* corymbose; flowers in the axils of reduced leaves, largely actinomorphic, opening in the morning, closing in the afternoon, ephemeral. *Sepals* oblong, blunt to acute, (2½–)6–7(–8) by (½–)1–3 mm. *Petals* yellow (once reported white), thin, glabrous, oblong, (4–)7–12 by (1¼–)3–5 mm, base cuneate or ± clawed, top rounded. *Stamens* (8–)10–20 (–30), glabrous; filaments (3–)5–7 mm towards the abaxial side, gradually increasing in length by

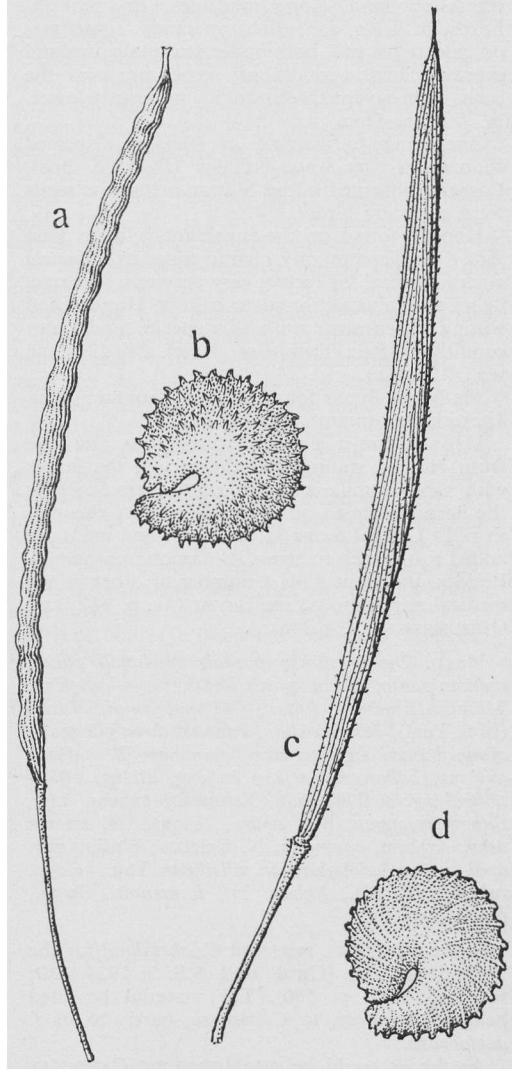

Fig. 32. Fruit and seed of *Cleome. a–b. C. chelidonii* L. *f.*, *c–d. C. viscosa* L. (*a*, *c* nat. size, *b*, *d* × 10).

1–2 mm, not or only very slightly swollen at the top; anthers linear, *c.* 1½–2 mm. Ovary sessile, *c.* 3–10 mm beaked, minutely glandular-hairy. *Fruit* erect, (⅓–)2–3(–4) cm pedicelled, (1½–)6–8 (–10) cm by (2–)3–4½ mm, beak 2½–4(–7) mm; valves with distinct centripetal nerves. Seeds *c.* 1¼ mm diam., 1 mm thick, red-brown, cleft narrow, with strong cross-ribs and faint concentric ribs. No elaiosome.

Distr. Native in the Old World, from tropical Africa and S. Arabia to tropical Australia; common throughout *Malaysia*, commonly adventive in the New World.

Ecol. A common, very tolerant, ruderal plant, on fallow land, along roadsides, on rubbish-heaps, in fields, *etc.*, often on sandy, sometimes on calcareous soil, both under seasonally dry and everwet climatic conditions, sometimes near the coast or in savannahs, up to 500 m, mostly lower. *Fl. fr.* Jan.–Dec.

According to RIDLEY in Malaya dispersed endozoically by water-buffalos (Disp. p. 368). FOSBERG observed in the Marianas that the seeds were eaten by birds.

KOOPER found on the sugarcane-fields in East Java a weed community, characterized by *Polanisia viscosa*, typical for recent, very pervious, volcanic, light soils valuable for sugar culture. He recorded wilting experiments with this species under dry conditions (Rec. Trav. Bot. Néerl. 24, 1927, 56 *seq.*, 218 *seq.*).

Mr N. G. BISSET found the seeds containing an appreciable amount of alkaloid.

Uses. There is a record from Java and one from Hainan stating that the sap of the leaves with water or milk is applied on the eyes. In Perak the herb is rubbed on the body against rheumatism. In Central Sumatra the leaves and seeds are added to tobacco to stress its narcotic properties. Besides, the plant finds a number of other minor medical applications; see HEYNE (*l.c.* p. 682) and QUISUMBING (*l.c.* p.346).

Vern. *Daun maman pantai, machmud panta, maman panta, maman patih*, Perak, *poko kutepeng*, Malacca, *maman hutan*, M, *nai velai*, Tamil (Mal. Pen.), *dek tau chan*, Penang, *daun gliengang ajam*, Palembang, *maman, mamman*, S, *antjang antjang, bobowan, èntjèng èntjèng, ètjèng, ètjèng tèmbèking*, J, *bhubhuan*, Kangean, *pupuan loke, tjongblèntjongan*, Md, *ahuru*, Nenusa Is, *susawi utan*, Ambon, *poompito*, N. Celebes; Philippines: *apoi-apoian, balabalanóian, silisilihan*, Tag., *huláya, tuláyag*, P. Bis., *kabáu*, Iv., *lampotaki*, Tagb., *tandandók*, Ilk.

Notes. BURKILL recorded *C. chelidonii* for the Malay Peninsula (Gard. Bull. S.S. 3, 1924, 280; see also Dict. p. 580). The material he cited belongs, however, to *C. viscosa*, partly to its *f. deglabrata*.

As far as could be established DE CANDOLLE was the first to combine *C. icosandra* and *C. viscosa* and, under *Polanisia*, he chose the epithet *viscosa* (1824).

f. **deglabrata** (BACK.) JACOBS, *stat. nov.*—*Polanisia viscosa var. deglabrata* BACK. Fl. Bat. (1907) 53; DOMIN, Bibl. Bot. Heft 89 (1925) 683.—*Polanisia icosandra f. deglabrata* BACK. Bekn. Fl. Java (em. ed.) 4A (1942) fam. 45, p. 5.

Differs from *f. viscosa* in being entirely glabrous; not with a distinct smell.

Distr. *Malaysia:* Malay Peninsula, Java.

6. Cleome aculeata LINNÉ, Syst. Nat. ed. 12, 3 (1768) 232; DC. Prod. 1 (1824) 241; HASSK. Nat. Tijd. N.I. 10 (1856) 119; Hort. Bog. Descr. (1858) 12; MIQ. Fl. Ind. Bat. 1, 2 (1858) 96; EICHL. Fl. Bras. 13, 1 (1865) 259, t. 58 f. 2; BACK. Ann. Jard. Bot. Buit. Suppl. 3 (1910) 398; Schoolfl. (1911) 59; RIDL. Fl. Mal. Pen. 1 (1922) 120; BACK. Bekn. Fl. Java (em. ed.) 4A (1942) fam. 45, p. 2.—*C. hulletii* KING, J. As. Soc. Beng. 58, ii (1889) 392; Ann. Bot. Gard. Calc. 5 (1896) 117, t. 133A. —**Fig. 33a.**

Erect, widely branched, annual herb, ¼–½ m, rather densely covered with minute, glandular hairs, neither viscid nor smelling. Stem with fulvous, recurved, stipular thorns *c.* 1½ mm. *Leaves* upwards gradually reduced in size, ultimately simple and subsessile. *Leaflets* 3, subsessile, thinly herbaceous, oblong, sometimes obovate, central leaflet *c.* 2½–3(–3½) by 1¼–1¾ (–2) cm; base acute to cuneate, slightly decurrent, top acute; nerves 5–8 pairs; petiole 2–3(–4½) cm. *Racemes* few-flowered, flowers subtended by simple, subsessile leaves. Pedicels 1½–2 cm. *Sepals* linear, 1½–2¼ by ¼–½ cm, minutely glandular-hairy outside. *Petals* 1¾–4 mm (incl. claw ¼–1 mm), obovate, pale yellowish. *Stamens* 6, slightly exceeding the petals, anthers 1½–2 mm. Ovary subsessile, cylindric, 2–3 mm long, glabrous. *Fruit* on a gynophore ½–2½ mm, cylindric but abruptly tapering to both ends, 3½–4 cm by 3 mm; valves finely parallel-nerved. Seeds asymmetrical, with closed cleft, 2–2¼ mm diam.; concentric ribs faint, obtuse, cross-ribs irregular, scattered, incomplete, distinctly prominent; elaiosome distinct.

Distr. Native from Mexico to N. Argentina, introduced in *Malaysia:* W. Java (Bogor and vicinity. According to HASSKARL (1856, *l.c.*) incidentally introduced with soil from Suriname into the Hortus Bogoriensis, whence it escaped before 1889), Malay Peninsula (Singapore), New Guinea (Papua: Kanosia, one record of 1935).

7. Cleome rutidosperma DC. Prod. 1 (1824) 241; ILTIS, Brittonia 12 (1960) *in the press.*—*C. ciliata* SCHUM. & THONN. Dansk Vid. Selsk. Afh. 4 (1828) 67; JOCHEMS, Trop. Natuur 17 (1928) 80, f. 1, 2; BEUMÉE, Trop. Natuur 18 (1929) 99; PAX & HOFFM. in E. & P. Pfl. Fam. ed. 2, 17b (1936) 213; BACK. Bekn. Fl. Java (em. ed.) 4A (1942) fam. 45, p. 3; JOHNSON & TAN, Gard. Bull. Sing. 17 (1959) 325–330, fig. 1–2.—**Fig. 30, 33b.**

Erect to spreading, widely branched, annual, odourless herb, ¼–1 m; stem, petioles, and the nerves underneath with sparse prickle-like, softish

appendages up to 2 mm long. *Leaflets* 3, upwards gradually reduced and subsessile, thinly herbaceous, ovate to subrhomboid or oblong-lanceolate, ciliate, central leaflet 3–3½(–5) by 1½–2½ cm; base cuneate, decurrent, top narrowed, acute to blunt; nerves 6–9 pairs; petiole generally 3–4(–5) cm, slightly webbing between the short petiolules. *Racemes* with reduced leaves. Pedicels filiform, 2–3 cm, in fruit *c.* 3 cm, rather densely set with minute, gland-like hairs. *Sepals* 3½–4 by ¼–¾ mm, ovate, acute to acuminate, hairy like the

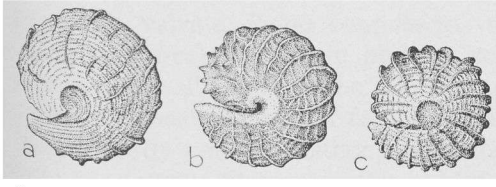

Fig. 33. Seeds of *Cleome*. *a. C. aculeata* L., *b. C. rutidosperma* DC., *c. C. aspera* KOEN. *ex* DC., all × 8.

nerves below. *Petals* violet-blue, all pointing upwards at the adaxial side, 9–12 mm (including a claw 2–3 mm) by 1½–2½ mm. *Stamens* 6, 7–10 mm; anthers linear, 2 mm, strongly curved after anthesis. *Gynophore c.* 1½ mm, ovary linear, *c.* 8–10 mm, slightly S-curved, minutely glandular, beak *c.* 1 mm. *Fruit* on a gynophore 4–8(–10) mm, cylindrical, tapering at both ends, 5–7½ cm by 4 mm, beak 1–4 mm, valves glabrous, parallel-nerved. Seeds dull black, asymmetrical, with a pale centre, with faint, obtuse concentric ribs and stronger cross-ribs, cleft open, 1¾ by 1½ mm; ribs sometimes with microscopical bristles; base of the seed with a white elaiosome.

Distr. West tropical Africa (from Guinea to Angola and the Congo), introduced in the Caribbean region and occasionally found in *Malaysia:* first records 1920: Belawan, Sumatra East Coast; 1924: Singapore; 1946: Java (Tandjung Priok); 1958: wide-spread from Sarawak to N. Borneo. In 1946 found in Siam (100 km NW. of Kanburi), in 1948 in Burma (Insein Distr.) and in Manila.

Ecol. A lowland ruderal in the course of extending its area with a tendency to become a common plant. BEUMÉE, *l.c.*, observed the plant growing in trees, where the seeds were obviously brought by ants attracted by the fatty elaiosome. About one third of the ovaries is 2–3 mm long and sterile.

Vern. *Sĕru walai*, Tamil (Malaya).

Note. The exact synonymy I owe to Dr ILTIS (unpublished) who found that the type specimen of *C. rutidosperma* must have actually come from Sierra Leone, Africa, but was erroneously labelled by DE CANDOLLE "Antilles" and described by him as from "Tabago".

8. Cleome aspera KOEN. *ex* DC. Prod. 1 (1824) 241; HOOK. *f.* & TH. Fl. Br. Ind. 1 (1872) 169; BACK. Onkr. Suiker. (1931) 252, Atlas t. 262; Bekn. Fl. Java (em. ed.) 4A (1942) fam. 45, p. 3. —**Fig. 33c.**

Erect, widely branched, annual, stinking herb, ¼–¾ m high. Stem, petioles, and nerves underneath sparsely set with small prickle-like, softish appendages. *Leaflets* 3(–5), upwards reduced and becoming subsessile, on short petiolules webbing at the insertion, thinly herbaceous, ovate-lanceolate, ciliate, central leaflet generally 2½–3 (–5½) by ¾–1(–1¼) cm; base cuneate, top blunt; nerves 4–9 pairs; petiole generally 1½–2½(–8) cm. *Racemes* with reduced leaves. Pedicels filiform, ½–1½ cm, 1½–2 cm in fruit, rather sparsely set with minute glandular hairs. *Sepals* 2–3 by ¼–½ mm, acuminate to obtuse, glandular-hairy. *Petals* white, 4–5(–7) (including claw 1–2 mm) by ¾–1½ mm, oblong-lanceolate, top rounded. *Stamens* 6(–7), 4–6 mm; anthers *c.* 1 mm, linear, curved after anthesis. *Gynophore c.* 1 mm; ovary 3–4 mm long, linear. *Fruit* on a gynophore 3–6(–10) mm, 3–6 cm by 2 mm, cylindrical, tapering to both ends, the beak 2–8 mm; valves parallel-nerved, glabrous. Seeds suborbicular, *c.* 1½ by 1¾ mm, dark-brown, with small paler centre, with very narrow-elevated, strongly prominent cross-ribs, and distinct obtuse concentric ribs, cleft closed; no elaiosome.

Distr. Native in India and Ceylon, in *Malaysia:* Central and East Java, Madura, and Bali.

The oldest Malaysian collection is by HORSFIELD from Java between 1802 and 1819; the second one is from Pekalongan, in 1912.

Ecol. Obviously bound to a distinctly seasonal climate.

Vern. *Èntjèng èntjèng-kĕbo*, J (in use for all *Cleomoideae*).