

CARYOPHYLLACEAE

(Kai Larsen, Aarhus, Denmark)¹

Annual or perennial herbs, rarely dwarf shrubs or small bushes. Stems often thickened at the nodes. Leaves opposite, rarely spirally arranged, sometimes apparently in whorls, entire, often connate at the base; stipules present or more commonly absent. Inflorescence cymose, usually dichasial, sometimes monochasial, lax, or condensed, many- or few-flowered, rarely flowers solitary. Flowers actinomorphic, bisexual or sometimes unisexual (dioecious, monoecious, or polygamous), 5- or 4-merous. Perianth hypogynous or more rarely perigynous, often with a prolonged internode between calyx and corolla. In some genera petals, stamens, and ovary are borne on an anthophore. Calyx consisting of (4–)5 free or connate sepals, green or scarious; a varying but isomerous number of bracteoles (epicalyx scales) often present just below the calyx. Petals (4–)5, free, differentiated in a short or long claw, a limb, and sometimes coronal scales; aestivation contorted or imbricate; in species with small, chorisepalous flowers the petals are sometimes absent. Stamens in two whorls of 5, sometimes fewer, often apparently obdiplostemonous; filaments often basally adnate to the petals or to the gynophore, or inserted in a nectary disc surrounding the ovary, or the episepalous ones with a nectarial gland at the base; anthers dithecal, tetrasporangiate, opening with lengthwise slits. Gynoecium syncarpous, consisting of 2–5 carpels, ovary mostly unilocular, at least in upper part, while partitions in lower half are found in many genera; sometimes on a gynophore; placentation free, central or basal, or more rarely axile; ovules bitegmic, hemitropous to campylotropous, the inner integument forming the micropyle, nucellus somewhat curved. Fruit most often a capsule, dehiscent by teeth, rarely a berry or an achene. Seeds few to many, rarely one, small; embryo curved, rarely spiral or almost straight.

Endosperm straight, nuclear and mostly used during the development of the embryo, while a large perisperm is formed and acts as storage tissue.

For practical reasons the perianth is here referred to as consisting of sepals and petals. For a discussion of these structures see below, under Morphology.

DISTRIBUTION

The family consists of about 85 genera and 2,200 species. More than half of the species belong to one of the six large genera, *Silene* (700), *Dianthus* (300), *Arenaria* (150), *Gypsophila* (150), *Stellaria* (150), and *Cerastium* (100), all of which are represented in Malesia by indigenous or introduced species. The greatest diversity is found in the temperate and subtropical zones of the northern hemisphere, with many representatives in the montane and alpine regions and with main centres in the Mediterranean and in the dryer parts of West Asia. They are generally rare in the tropics, and among the 16 genera represented in Malesia, at least 6 are introduced. There are some rare endemisms (see *Cerastium*, *Polycarpon*, *Sagina*), particularly in the mountains of New Guinea.

1) With a contribution of R.W.J.M. van der Ham, Leiden (pollen morphology).

FOSSILS

Fossil records from the Tertiary or earlier have not been reported with certainty. The earliest is from the middle Oligocene of New Zealand where pantoporate pollen has been found and described as *Caryophyllidites polyoratus*. Mai (1995) mentions that fossil seeds of the following genera have been recorded from the Miocene: *Moehringia*, *Myosoton* and *Stellaria*, and from the Pliocene also *Gypsophila*, *Lychnis* and *Minuartia*.

The upper Cretaceous *Cretacaeiporites* from Africa (Gabon) has been compared with pollen of *Paronychia* and *Stellaria*, but according to Muller (1981) it is doubtful whether it belongs to *Caryophyllaceae*.

References: Mai, D.H., Tertiäre Vegetationsgeschichte Europas. Gustav Fischer Verlag (1995). — Muller, J., Fossil pollen records of extant angiosperms. *Caryophyllaceae*. Bot. Rev. 47 (1981) 33.

HABITAT AND ECOLOGY

The family is found in a variety of biotopes, but there are no records from the lowland tropical rain forests. Many of the species belong to light, open localities, such as grasslands and savannahs, and even semi-deserts. Some, particularly among the *Alsinoideae*, are cushion plants at high altitudes, as e.g. some species of *Arenaria* and *Sagina*, others mainly occur on exposed rocks and in rock crevices, a number are weedy along waysides as *Polycarpaea* and *Polycarpon*. There are ombromorphic species in the genera *Drymaria*, *Myosoton* and *Stellaria*. Few are adapted to saline conditions, as *Honckenia* and *Spergularia*, but none of these occur in Malesia.

POLLINATION

The flowers are rarely homogamous as in e.g. *Scleranthus*. In most genera the flowers are dichogamous and protandrous. There are, however, considerable variations also within the species. Centripetal as well as centrifugal movements of the filaments have been demonstrated, first by the antisepalous stamens, later by the antipetalous ones. These movements will often lead to selfpollination.

The *Alsinoideae* usually have small, unspecialised, white or greenish flowers in which the nectar is easily accessible. Protandry is common but protogyny has been observed in e.g. *Drymaria*. There is a wide range of visiting insects, even if bees and flies are dominant pollinators. Many of the very small-flowered species in genera as e.g. *Sagina* and *Arenaria* are rarely visited and selfpollination must be predominant. In many species of *Cerastium*, *Sagina* and *Spergularia* the flowers remain closed in cold and overcast weather and autogamy is then the rule, but also in sunny weather this is common through the staminal movements. Cleistogamous flowers have been found in very few species of *Holosteum*, *Minuartia* and *Stellaria*. In the *Paronychioideae* similar modes of pollination occur; here also autogamy and cleistogamous flowers have been found.

In the *Caryophylloideae*, with their \pm long tubular calyx, the nectar is placed deep down in the flower and is only accessible for insects with a long proboscis, furthermore the entrance may be closed by the coronal scales. The flowers are larger and showy in white or red colours, and often the plants produce a considerable amount of flowers at

one time. Many species have also a strong scent particularly in the evening, thus attracting *Lepidoptera*. But also bees and some *Syrphidae* and even mosquitos have been found as pollinators. From North America bird pollination has been reported. For *Silene otites* wind pollination has been suggested.

DISPERSAL

Most *Caryophyllaceae* have no particular dispersal mechanisms, the seeds are simply shed from the open capsule over a longer period. In some *Silenoideae* the capsules open and close periodically according to the weather conditions; they close under moist conditions. In several species the pedicel is curved back after anthesis. In some species of *Moehringia* the seeds have a strophium that functions as an elaiosome; these species have myrmecochory. Splash-cup dispersal is reported in *Sagina* species in which the capsules open when wetted. Anemochory is found in species with inflated calyx and in species of e. g. *Spergularia* with winged seeds. In some small-flowered species of *Paronychia* and related genera parts of the infructescence break off and are dispersed in \pm spherical, entangled bodies (windrollers). In species with a viscid persistent calyx, as e. g. within the *Silenoideae*, dispersal by various animals may be of importance. The rare berry-fruited taxa (not found in Malesia) have endo-ornithochorous dispersal. The seeds of some species of *Drymaria* are provided with stellate hairs and hooks and probably have epizooic dispersal.

MORPHOLOGY

Growth habit — The most common life forms in *Caryophyllaceae* are those of annual or perennial herbs. There are numerous therophytes in the drier regions of the subtropical zones. Quite a number of species have a slightly woody base, a few are low bushes and *Sanctambrosia manicata* from Chile is a small tree that reaches a height of about 2 m. Several are montane and alpine cushion plants with a robust taproot and a strongly woody base. The stem is often swollen at the nodes due to an anomalous growth of the concentric rings of xylem and phloem. This is of importance for geotropic movements. In many species the stems are rooting from the nodes. They are often covered by the joined leaf bases or by the stipules. Interpetiolar stipules occur in few species. Rhizomes are present in several genera.

Leaves — The leaves are opposite and decussate with very few exceptions; they are undivided and usually have an entire margin. They are sessile or petiolate, free at the base (*Paronychioideae*) or connate (in *Caryophylloideae* and some *Alsinoideae*). In many *Alsinoideae* and *Paronychioideae* they are apparently whorled due to the production of axillary short-shoots. Succulent leaves are found in several genera. There is a wide range of leaf shapes from grass-like to needle-shaped and thorny to broadly ovate and circular, but the narrow leaf type is the most common. The buds in the axil of a leaf pair develop often unequally and frequently a single leaf instead of a leaf pair is found under the flower or the inflorescence. Stipules are found in the *Paronychioideae* but wanting in the two other subfamilies; they are usually scarious, white or brownish.

Inflorescences — The inflorescences are always cymose. Rarely the stem is terminated by a single flower as in some species of *Dianthus* and *Silene* as the result of reduction. Usually the inflorescence is a thyrse composed of dichasia. This again may be lax or dense and head-like. Through suppression the inflorescence may become spike-like as in e.g. *Silene gallica*. Bracts are usually present. In *Dianthus* an epicalyx is formed by several pairs of bracteoles subtending the flower.

Flowers — The flowers are always actinomorphic with the single exception of the Mediterranean *Drypis spinosa* in which the flower is slightly zygomorphic. Many small-flowered species, particularly in the *Paronychioideae*, are \pm perigynous, while the *Caryophylloideae* and most of the *Alsinoideae* are hypogynous. The flowers have been interpreted as containing a perianth, the outer leaves of which are the green or scarious sepals, followed by a whorl arisen by 'dédoublement' of the outer whorl of the androecium. They alternate with the sepals and are divided into an exterior petaloid part, here named the petals, and an inner part being the normal, fertile stamens. In some genera the stamens of the outer staminal whorl are attached to the 'petals'. In this revision the terms sepals and petals have been used throughout and stamens with reduced, non-functional anthers are called staminodes.

The sepals in the *Paronychioideae* are often provided with a dorsal, subapical appendage. In *Caryophylloideae* the sepals are connate and form a tube with shorter or longer free apical parts (teeth). The petals are entire or deeply bilobed or lacerate (*Dianthus*). The taxa with large flowers have usually two whorls of stamens, while many small-flowered species, particularly in the groups with free sepals, have reductions in the androecium to one whorl opposite the sepals; in this whorl again reductions can take place. Some small-flowered species e.g. in the genera *Scleranthus* and *Stellaria* have a variable number of stamens.

The ovary is composed of 2–5 (–10) carpels, alternating or opposite to the stamens of the inner whorl; it is sometimes borne on a gynophore. It is usually unilocular, but may be divided in the lower part. The placentation is central or basal.

Fruits and seeds — In the majority of the species the fruit is a capsule that opens by apical teeth. The dehiscence may be loculicidal or septicidal, or, as in most members of the *Alsinoideae* and *Caryophylloideae*, the capsule opens by 10 teeth or valves, i. e. twice the number of carpels. In *Paronychioideae* 1-seeded indehiscent dry fruits occur, and berry-like fruits are found in *Cucubalus*.

Seeds are small, in most genera about 1 mm or less. They are often reniform, pyriform, or orbicular, laterally compressed with a facial hilum, rarely winged (*Spergula*). The testa is rarely smooth, most often rugose with concentric rings of papillae. The embryo is usually curved around the starchy perisperm, in few cases it is almost straight as in *Dianthus* or spiral as in *Spergula*.

VEGETATIVE ANATOMY

One of the most remarkable characters that the *Caryophyllaceae* share with many other families within the *Caryophyllales*, is the presence of concentric rings of xylem and phloem or of distinct vascular bundles occurring in roots and stems. These features have

been found in *Polycarpaea*, *Polycarpon*, *Silene*, and *Spergula* among the genera found in Malesia.

The stomata belong in general to the so-called caryophyllaceous or diacytic type, i. e. the stoma is enclosed by a pair of subsidiary cells whose common wall is at right angles to the guard cells. There are, however, many exceptions in genera as e.g. *Arenaria*, *Cerastium*, and *Stellaria*, where stomata in some species are found to belong to the cruciferous or anisocytic type, in which the stoma is surrounded by three cells of which one is distinctly smaller than the other two.

The family shares a number of ultrastructural and micromorphological characters with the other members of the *Caryophyllales*. Thus the sieve-element plastids belong to a type containing protein but no starch. The protein is arranged partly as concentric threads, partly as a central crystalloid body.

Literature: Metcalfe, C.R. & L. Chalk, Anatomy of the Dicotyledons. 1. Caryophyllaceae (1950) 148–153.

POLLEN MORPHOLOGY

(R. W. J. M. van der Ham)

The pollen of the relatively stenopalynous family *Caryophyllaceae* is well known (Thanikaimoni & Van der Ham 1999). Comprehensive recent treatments, including also many references to earlier accounts, are those by Nowicke (1994; mainly ultrastructure) and Punt & Hoen (1995; light and scanning electron microscopy). A concise, not illustrated family description is given by Bittrich (1993).

Pollen grains of the family *Caryophyllaceae* are usually spheroidal (polypantoperturates), sometimes more or less angular (4–6-pantoperturates) or suboblate to subprolate (3-aperturates). Polyaperturate grains are mostly medium-sized (22–70 μm), while 3–10-aperturate grains are clearly smaller (10–32 μm). The apertures are always simple, usually ectopori, sometimes ectocolpi. Rarely, pori and colpi occur in a single genus (*Corrigiola*). The aperture membranes are covered by scabrate ectexinous material or a well-delimited operculum. The aperture number ranges from 3–10 (colpi or pori, zono- or pantoperturate) up to 45 (always pantoporate). Pori are surrounded by a massive exine zone ('annulus'), apparent only using light microscopy. The exine is usually thick and consists of a relatively thin nexine (foot layer + thin to seemingly absent endexine), a distinct columellate infratectum (columellae often not reaching the nexine) and a relatively thick, finely perforate to microreticulate scabrate (spinulose) tectum. Sometimes the exine is rather thin, with indistinct columellae.

Subfamily *Paronychioideae* has small, 3-zonocolpate or -porate, 4–12-pantocolpate or 4–9-pantoporate pollen with a rather thin exine, while nearly all members of the subfamilies *Alsinoideae* and *Caryophylloideae* have medium-sized to large, 12–45-pantoporate pollen with a thick exine. Rarely, small 3-colpate pollen occurs in the alsinoideous genera *Minuartia* (subg. *Rhodalsine*) and *Pycnophyllum* (McNeill & Bassett 1974; Erdtman 1952).

Pollen morphology supports the traditional circumscription of the *Caryophyllales* (*Centrospermae*). Pollen of the *Molluginaceae*, besides the *Caryophyllaceae* the only anthocyanin-pigmented family in the order, is small (14 μm) 3-colpate or rarely 25 μm large

12-pantocolpate (Nowicke 1975), and seems to link best with that of subfamily *Paronychioideae*.

References: Bittrich, V., in K. Kubitzki, J.G. Rohwer & V. Bittrich, Families and genera of vascular plants 2 (1993) 206–236. — Erdtman, G., Pollen morphology and plant taxonomy (1952). — McNeill, J. & I.J. Bassett, Can. J. Bot. 52 (1974) 1225–1231. — Nowicke, J.W., Grana 15 (1975) 51–77; in H.D. Behnke & T.G. Mabry, Caryophyllales: evolution and systematics (1994) 167–221. — Punt, W. & P.P. Hoen, Review Palaeobot. Palynol. 88 (1995) 83–272. — Thanikaimoni, K. & R.W.J.M. van der Ham, Publ. Dép. Ecol. Inst. Fr. Pondichéry 39 (1999).

CYTOLOGY

The *Caryophyllaceae* of the temperate and subtropical zones of the northern hemisphere are well known with regard to their chromosome numbers, but none of the endemic, montane and alpine Malesian (New Guinean) species have been studied cytologically. A long series of basic chromosome numbers have been found from $x = 5$ to $x = 19$, the most common numbers being $x = 6$ or 12 . Polyploidy as well as aneuploidy have been demonstrated in numerous genera, and infraspecific polyploidy has been found in many species. There is also a considerable variation in chromosome morphology. Most commonly, however, the chromosomes are rather small and undifferentiated. Within the *Paronychioideae* the most common basic numbers are $x = 8$ and $x = 9$. In the *Caryophylloideae* most genera have $x = 12$. Most variable are the *Alsinoideae* where almost all basic numbers between 6 to 19 have been reported. High numbers have been found in *Silene*, where $2n = 192$ and in *Cerastium*, where $2n = 144$ have been counted. All introduced and weedy species in Malesia have been studied. Sex chromosomes have been found in *Silene* sect. *Melandrifformes* and accessory chromosomes in *Silene* and *Vaccaria*.

PHYTOCHEMISTRY AND CHEMOTAXONOMY

Chemically the *Caryophyllaceae* are deviating from most other members of the order *Caryophyllales* in having anthocyanins instead of betalains. In several genera saponins have been found, e.g. in *Saponaria*. Calcium oxalate is usually accumulated in the form of large conspicuous cluster-crystals, but also crystal-sand and solitary crystals are found. Other chemical characters, which the family shares with other *Caryophyllales*, are the occurrence of ferula acid and pinitol.

Literature: Hegnauer, R., Chemotaxonomie der Pflanzen 3 (1964) 378–392; 8 (1989) 13–16.

TAXONOMY

The *Caryophyllaceae* have traditionally been divided into three subfamilies. Often the *Paronychioideae* are treated as a separate family *Paronychiaceae*. The principal differences between the three have been defined as follows.

- 1) *Paronychioideae:* Leaves stipulate. Sepals free or only joined at the base, often with a small, dorsal, subapical appendage. Petals small or absent. Stamens usually free to the base, the nectary usually forming a ring below the filament base and placed in the wall of the hypanthium. Styles often fused at the base or for more than 1/2. In Malesia: *Drymaria*, *Polycarpaea*, *Polycarpon*, and *Spergularia*.

- 2) *Alsinoideae*: Leaves exstipulate. Sepals free or rarely joined at the base, without dorsal appendages. Petals usually present, with a short or inconspicuous claw; episealous stamens often with a nectary gland at the abaxial base. Styles usually free. In Malesia: *Arenaria*, *Cerastium*, *Myosoton*, *Sagina*, *Scleranthus*, and *Stellaria*.
- 3) *Caryophylloideae* (*Silenoideae*): Leaves exstipulate. Sepals joined to a tubular calyx for most of their length, without any apical appendage. Petals large, divided into a long claw and a distinct lamina; episealous stamens without nectary glands at the abaxial base. Anthophore often present in the form of a prolonged internode between calyx and corolla. Styles free. In Malesia: *Dianthus*, *Gypsophila*, *Lychnis*, *Saponaria*, *Silene*, and *Vaccaria*.

Several recent authors working on the taxonomy and phylogeny of the family are, however, of the opinion, that the distinction between the two first subfamilies cannot be maintained, and various authors circumscribe them differently.

Several authors have studied the affinities of the order *Caryophyllales* during the last decades. There is little doubt that the family *Caryophyllaceae* should be included in the order even if it lacks the characteristic betalains and instead produces anthocyanins. This is also the case with the small family *Molluginaceae* which several authors have taken as a sign of relationship between the two. However, Retting et al. (1992), in their phylogenetic analysis of the *Caryophyllales*, find that even if these two families are the only ones in the order that do not produce betalains, "they are neither closely allied nor basal to other elements of the order."

Literature: Bittrich, V., in K. Kubitzki, J.G. Rohwer & V. Bittrich, Families and genera of vascular plants 2 (1993) 206–236. — Chaudhri, M.N., A revision of the Paronychiinae. Meded. Bot. Mus. Rijksuniv. Utrecht (1968) 1–440. — Chaudhri, M.N., J.A. Ratter & K.H. Rechinger, Caryophyllaceae I, Paronychioideae; in: K.H. Rechinger (ed.), Fl. Iranica 144 (1980) 1–38, tab. 1–12. — Davies, P.H. (ed.), Caryophyllaceae, Illecebraceae; in Fl. Turkey 2 (1967) 15–265. — Friedrich, H.C., Illecebraceae, Caryophyllaceae; in G. Hegi, Illus. Fl. Mitteleur. III, 1, 2 (1969) 749–762, 763–1182. — Greuter, W., H.M. Burdet & G. Long (eds.), Caryophyllaceae; in MED-Checklist 1 (1984) 159–289. — Jonsell, B. (ed.), Fl. Nordica 2, Caryophyllaceae (2001) 83–216. — Larsen, K., Caryophyllaceae; in Fl. Cambodge, Laos & Vietnam 24 (1989) 60–87. — McNeill, J., Taxonomic studies in the Alsinoideae. Notes Roy. Bot. Gard. Edinburgh 24 (1962) 79–155 & (1963) 241–404. — Pax, F. & K. Hoffmann, Caryophyllaceae; in A. Engler & K. Prantl, Nat. Pflanzenfam. ed. 2, 16c (1934) 275–364. — Rechinger, K.H., V. Melzheimer, W. Möschl & H. Schiman-Czeika, Caryophyllaceae, Alsinoideae & Silenoideae; in K.H. Rechinger (ed.), Fl. Iranica 163 (1988) 11–528, tab. 1–504. — Retting, J.H., H.D. Wilson & J.R. Manhart, Phylogeny of the Caryophyllales. Taxon 41 (1992) 201–209. — Tang Changlin (ed.), Caryophyllaceae; in Fl. Reip. Pop. Sin. 26 (1996) 47–449. — Turritt, W.B., Caryophyllaceae (incl. Illecebraceae); in Fl. Trop. East Afr. (1956) 1–37. — Wadhwa, B.M., in Fl. Ceylon 10 (1996) 54–71. — Walters, S.M., in Fl. Europaea ed. 1, 1 (1964) 115–204; ed. 2, 1 (1993) 139–246; in Eur. Gard. Fl. 3 (1989) 177–195. — Wu Zhengyi & P. Raven (eds.), Fl. China 6, Caryophyllaceae (2001) 1–113. — Ying, in Fl. Taiwan ed. 2, 2 (1996) 342–381.

USES

Few species in this large family have any economic importance. Some species within the *Caryophylloideae* have been the base for breeding a number of very popular ornamentals mostly grown in temperate or subtropical climates, and species of *Silene* and

Dianthus have found their way to Malesian gardens at higher altitudes. The presence of saponins in genera as *Saponaria* has been exploited particularly in earlier times; there is, however, no record of such uses in Malesia as far as known to the author. The seeds of *Spergula* and *Spergularia*, rich in starchy perisperm, have been used in the diet in pre-historic times in some parts of the world, but not in Southeast Asia.

KEY TO THE GENERA

- 1a. Stipules present (*Paronychioideae*) 2
- b. Stipules absent 5
- 2a. Leaves broad, ovate-orbicular **Drymaria** (p. 19)
- b. Leaves linear-narrowly elliptic 3
- 3a. Styles 5 (or 3), free **Spergula** (p. 43)
- b. Styles joined, at least at the base 4
- 4a. Sepals carinate, green with scarious margin **Polycarpon** (p. 31)
- b. Sepals not carinate, entirely scarious (except for a green midnerve in *P. zollingeri*)
..... **Polycarpaea** (p. 27)
- 5a. Sepals free, petals short clawed (*Alsinoideae*) 6
- b. Sepals connate, petals usually long-clawed (*Caryophylloideae*) 11
- 6a. Styles 2 7
- b. Styles 2–5, flowers always hypogynous, if styles 2 then petals divided 8
- 7a. Flowers perigynous, small, petals absent **Scleranthus** (p. 38)
- b. Flowers hypogynous, petals usually present **Arenaria** (p. 9)
- 8a. Capsule opening with undivided valves in the same number as styles
..... **Sagina** (p. 32)
- b. Capsule opening with more or less deeply divided teeth, so that the number is twice
that of styles 9
- 9a. Styles 2–3 **Stellaria** (p. 44)
- b. Styles 5 10
- 10a. Capsule ovoid, dehiscent by 5 bifid valves, styles alternating with the sepals, petals
divided to the base **Myosoton** (p. 25)
- b. Capsule cylindrical, dehiscent by 10 equal or subequal teeth, styles opposite the
sepals, petals undivided or divided halfway down **Cerastium** (p. 10)
- 11a. Calyx 5-winged, styles 2 **Vaccaria** (p. 50)
- b. Calyx not winged, styles 2, 3, or 5 12
- 12a. Styles 3–5 13
- b. Styles 2 14
- 13a. Styles 3 (4–5), capsule-teeth twice as many as styles **Silene** (p. 40)
- b. Styles 5, capsule-teeth as many as styles **Lychnis** (p. 24)
- 14a. Calyx teeth with scarious commisures **Gypsophila** (p. 22)
- b. Calyx teeth without scarious commisures 15
- 15a. Epicalyx scales present **Dianthus** (p. 16)
- b. Epicalyx scales absent **11. Saponaria** (p. 38)

ARENARIA

Arenaria L., Sp. Pl. 1 (1753) 423; Gen. Pl. ed. 5 (1754) 193; Pax & Hoffm. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2, 16c (1934) 315; McNeill, Notes Roy. Bot. Gard. Edinb. 24 (1962) 102; (1963) 245; Bittrich in Kubitzki et al., Fam. Gen. Vasc. Pl. 2 (1993) 225. — Type: *Arenaria serpyllifolia* L.

Annual, biennial, or perennial herbs, rarely low, spiny shrubs or cushion plants. Leaves exstipulate, more or less joined at the base, suborbicular to linear or setaceous. Inflorescences cymose, axillary or more often terminal, few- or many-flowered, flowers sometimes solitary. Sepals 5 (or 4), free, herbaceous with a narrow or wide scarious margin, persistent, 1- or 3-nerved with a prominent midrib. Petals 5 (0), white to pinkish, entire or slightly emarginate. Stamens mostly 10, the 5 outer ones with basal glands. Ovary of 3 (2–5) carpels with as many short styles. Capsule opening with twice as many teeth or, more rarely, bifid valves. Seeds usually numerous, black, rarely reddish brown, spherical to reniform, tuberculate.

Distribution — About 150 species widely distributed on the northern hemisphere from the arctic to the subtropical zone, on the southern hemisphere in montane regions in East Africa and South America. In *Malesia* one species.

Habitat & Ecology — Most species are components of the upper montane flora and belong to the group of flowering plants which reach the highest altitude, e.g. above 6000 m in the Himalayas.

Taxonomy — See J. McNeill, Taxonomic studies in the Alsinoideae. 1. Generic and infra-generic groups. Notes Roy. Bot. Gard. Edinb. 24 (1962) 79–155; 2. A revision of the species in the Orient. Ibid. (1963) 241–404.

***Arenaria serpyllifolia* L.**

Arenaria serpyllifolia L., Sp. Pl. 1 (1753) 423; Edgew. & Hook. f. in Hook. f., Fl. Brit. India 1 (1874) 239; Merr. & Rolfe, Philipp. J. Sc., Bot. 3 (1908) 97; Merr., Philipp. J. Sc., Bot. 5 (1910) 346; Enum. Philipp. Flow. Pl. 2 (1923) 138; Ying in Fl. Taiwan ed. 2, 2 (1996) 342, f. 157; Chater & Halliday in Fl. Eur. ed. 2, 1 (1993) 146; Majumdar, N.C., in Fl. India 2 (1993) 515, f. 102; Zhou Lihua & Wu Zhengyi in Fl. Reip. Pop. Sin. 26 (1996) 169, f. 36, 1–7; in Fl. China 6 (2001) 45. — *Alsine serpyllifolia* (L.) Crantz, Instit. 2 (1766) 319. — *Stellaria serpyllifolia* (L.) Scop., Fl. Carn. 2, 1 (1772) 319. — Type: Herb. Cliff. 173, *Arenaria* 2 (BM).

Arenaria wallichiana Ser. in Wall. Cat. no. 638 (1829), nom. nud.

Arenaria petiolata Hayata, Icon. Pl. Form. 3 (1913) 38.

For further synonymy see Chater & Halliday, l.c.

Annual or biennial herb, puberulous to glandular pubescent in upper part, up to 25 cm, usually richly branched from the base, ascending or erect. Lower leaves petiolate, spatulate, early withering, the upper leaves ovate-triangular, acute to acuminate, sessile, 3–5-veined, 3–7 mm long, greyish green hairy. Inflorescence often monochasial, few- to many-flowered; bracts foliaceous; pedicels 2–7 mm. Sepals ovate-narrowly elliptic, acute to acuminate, 3–4 mm, 3–5-veined. Petals ovate, shorter than sepals. Capsule ovoid-conical to subglobose, abruptly narrowed towards apex, walls rather brittle. Seeds tuberculate, less than 1 mm diameter.

Distribution — Widely distributed on the northern hemisphere, from the Arctic throughout the temperate and subtropical zone, also recorded from the central African high mountains. Found in India, Taiwan, Japan, China and Australia. In *Malesia* only found in the Philippines where, according to Merrill, l.c., it seems to be indigenous to Luzon (Benguet).

CERASTIUM

Cerastium L., Sp. Pl. (1753) 437; Gen. Pl. ed. 5 (1754) 199; Pax & Hoffm. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2, 16c (1934) 323; Söllner, Ber. Schweiz. Bot. Ges. 64 (1954) 221; Bittrich in Kubitzki et al., Fam. Gen. Vasc. Pl. 2 (1993) 226. — Type: *Cerastium arvense* L.

Annual or perennial herbs, often glandular hairy, rather small, often caespitose, erect, procumbent or prostrate. Stems terete or slightly quadrangular. Leaves exstipulate, sessile or shortly petiolate. Flowers solitary or in few- to many-flowered dichasia, axillary or terminal. Sepals 5 (or 4), free, often with scarious margin. Petals 5 (or 4), white, emarginate to bifid up to nearly half their length, rarely absent. Stamens 5 or most often 10 (or 8) inserted on a disc. Ovary (3–)5-carpellate, with numerous ovules; styles (3–)5. Capsule with twice as many teeth as there are styles, often curved and exerted from the calyx; opening by (6–)10 teeth, not more than 1/3 of the capsule length. Seeds reniform, spherical to broadly ovoid or compressed, verrucose. — Fig. 1, 2, 4: 7–12.

Distribution — About 100 species worldwide but mainly in the northern temperate zone, about 60 in Europe.

Habitat & Ecology — Occurring in many plant communities; some weedy, a few grown as ornamentals.

Taxonomy — See P.D. Sell & F.H. Whitehead, Feddes Rep. 69 (1964) 14; Jalas, Jackson, Sell & Whitehead in Fl. Eur. ed. 2, 1 (1993) 164.

KEY TO THE SPECIES

- 1a. Petals subemarginate; intermediate leaves more than 4 times longer than wide **3. C. indicum**
- b. Petals deeply emarginate to bifid; intermediate leaves 1.5–4 times longer than wide **2**
- 2a. At least the upper bracts with membranaceous margin **1. C. fontanum**
- b. Upper bracts green **3**
- 3a. Pedicels in both flower and fruit much longer than calyx; stamen with a gland at the base of the filament **4. C. papuanum**
- b. Pedicels shorter than or as long as calyx, 1–3 mm in flower, 2–6 mm in fruit; no glands at the base of the filaments **2. C. glomeratum**

1. *Cerastium fontanum* Baumg.

Cerastium fontanum Baumg., Enum. Stirp. Transsilv. 1 (1816) 425; Möschl, Mem. Soc. Brot. 16 (1964) 56; Hara in Hara & Williams, Enum. Flow. Pl. Nepal 2 (1979) 53; Jalas in Fl. Eur. ed. 2, 1 (1993) 171; Wadhwa in Fl. Ceylon 10 (1996) 60. — Type: Romania. Neotype (E): see Jackson, Nordic J. Bot. 20 (2001) 531.

- Cerastium holosteoides* Fries, Nov. Fl. Suec. 4 (1817) 52; Backer & Bakh. f., Fl. Java 1 (1963) 208; Pham-hoàng Hô, Illus. Fl. Vietnam 1 (1991) 936, f. 2630.
Cerastium viscosum L., Sp. Pl. (1753) 437, p.p., nom. ambig.
Cerastium vulgatum L., Sp. Pl. ed. 2 (1762) 627, non L., Fl. Suec. ed. 2 (1755) 627.

In *Malesia* only one of the several subspecies:

subsp. **vulgare** (Hartm.) Greuter & Burdet

- Cerastium fontanum* Baumg. subsp. *vulgare* (Hartm.) Greuter & Burdet, Willdenowia 12 (1982) 37; Jalas in Fl. Eur. ed. 2, 1 (1993) 171; Lu Dequan & J.K. Morton in Fl. China 6 (2001) 35. — *Cerastium vulgare* Hartm., Handb. Skand. Fl. (1820) 182. — Type: *Hartman* (UPS), Sweden.
Cerastium caespitosum Gilib. A. *eucaespitosum* Graebner & B. *glandulosum* Graebner in Asch. & Graebner, Syn. Mitteleur. Fl. 5 (1) (1918) 643.
Cerastium fontanum Baumg. subsp. *triviale* (Link) Jalas, Arch. Soc. Zool. Bot. Fenn. Vanamo 18 (1963) 63; K. Larsen in Fl. Camb., Laos & Vietn. 24 (1989) 84, f. 11: 7–12; N.C. Majumdar in Fl. India 2 (1993) 523; Ke Ping in Fl. Reip. Pop. Sin. 26 (1996) 86, f. 20: 1–6. — *Cerastium triviale* Link, Enum. Hort. Berol. 1 (1821) 433; Gagnepain, Fl. Gén. Indo-Chine., Suppl. 1 (1943) 240. — *Cerastium vulgare* Hartm. subsp. *triviale* (Link) Murb., Bot. Not. (1898) 252. — *Cerastium vulgatum* L. var. *triviale* (Link) Edgew. & Hook. f., Fl. Brit. India 1 (1874) 228.
 For further synonymy see Jalas, Il. cc. and Greuter, Burdet & Long, MED-Checklist 1 (1984) 178.

Annual or perennial herb, 10–30 cm, in loose tufts with numerous leafy stems and no flowering shoots at the base, velutinous to nearly glabrous, often with some glandular hairs particularly in the upper part. Leaves sessile, grass-green to bluish green, lower ones obovate-spathulate, higher ones ovate to narrowly elliptic, 10–25 by 3–10 mm, obtuse to acute, often narrowed towards the base, soft-hairy on both sides. Inflorescence most often lax. Flowers small, not surpassing 9 mm length, diameter 3–8 mm, elongating to 16 mm in fruit; bracts green, the upper ones with scarious margin. Sepals narrowly elliptic, 3–7 mm, velvety hairy outside, with glabrous, scarious margin. Petals obovate, emarginate or bilobed, as long as the sepals or shorter, sometimes absent. Stamens shorter than the sepals, anthers orbicular. Ovary ovoid, ovules numerous. Capsule cylindrical, slightly curved, 9–12 mm, dehiscent by 10 teeth. Seeds orbicular, 0.4–0.8 mm, reddish brown, finely verrucose. — **Fig. 4: 7–12.**

Distribution — Cosmopolitan in temperate and subtropical regions, rare in the tropics. Widely distributed throughout northern India, China, Taiwan, Korea and Japan. In *Malesia* recorded from Java (Mt Panggerango and Cibodas), the Philippines, and Papua New Guinea (Mt Kaindi).

Habitat & Ecology — Roadsides and grassland in the wet zone, 2400–3000 m altitude. In the Himalayas up to 5000 m.

Taxonomy — See J. Jalas & J. Suominen, Atlas Fl. Eur. 6 (1983) 104, map 884.

Note — A polymorphous taxon in which several taxa of lower rank have been described.

2. *Cerastium glomeratum* Thuill.

- Cerastium glomeratum* Thuill., Fl. Par. ed. 2 (1799) 226; Backer, Schoolfl. Java (1911) 82; Miq., Fl. Ned. Ind. 1 (1855) 1056; Backer & Bakh. f., Fl. Java 1 (1963) 208; Möschl, Mem. Soc. Brot. 16 (1964) 60; Mizush. in Fl. E. Himal. (1966) 79; Hara in Hara & Williams, Enum. Flow. Pl. Nepal

2 (1979) 53; P. Royen, *Alpine Fl. New Guinea* 3 (1982) 2358; Grierson in *Fl. Bhutan* 1, 2 (1984) 205; Greuter, Burdet & Long, *MED-Checklist* 1 (1984) 179; Sell & Whitehead in *Fl. Eur.* ed. 2, 1 (1993) 173; N.C. Majumdar in *Fl. India* 2 (1993) 523; Wadhwa in *Fl. Ceylon* 10 (1996) 60; Ke Ping in *Fl. Reip. Pop. Sin.* 26 (1996) 83; Lu Dequan & J.K. Morton in *Fl. China* 6 (2001) 33. — *Cerastium vulgatum* L. var. *glomeratum* (Thuill.) Edgew. & Hook. f., *Fl. Brit. India* 1 (1874) 228; Merr., *Enum. Philipp. Flow. Pl.* 2 (1923) 138. — Type: *Thuillier s.n.* (P), France.

Cerastium viscosum L., *Sp. Pl.* (1753) 437, p.p., nom. ambig.

Cerastium vulgatum L., *Fl. Succ.* 2 (1755) 158, nom. illeg.; Wight & Arn., *Prodr.* (1835) 43; Wight, *Icon.* (1845) 948; Miq., *Pl. Jungh.* (1855?) 395; Merr., *Enum. Philipp. Flow. Pl.* 2 (1923) 138. — Type not designated.

Annual herb. Stems ascending to erect, patently hairy with some glandular hairs intermixed, 5–30 cm. Leaves light green or yellowish green, lower ones obovate-spathulate, higher ones elliptic to obovate, obtuse or acute, pilose. Inflorescences many-flowered, congested when young, later more lax; bracts completely herbaceous; pedicels 1–3 mm, glandular scarious, in fruit elongating to 6 mm, pilose. Sepals 3–5 mm, oblong-narrowly elliptic, with or without a scarious margin, glandular-pilose and with a tuft of long eglandular hairs at apex. Petals 3.5–4 mm, rarely longer and rarely absent, claws with a few cilia. Capsule 6–8 mm, opening by teeth with revolute margins. Seeds pale brown, finely tuberculate, c. 0.5 mm.

Distribution — Cosmopolitan in temperate and subtropical climates, rare in the tropics. In *Malesia* only found in a few places on Java (Tengger, Cibodas, Mt Lawu), the Philippines, and Papua New Guinea (Morobe Province).

Habitat & Ecology — Weedy in fields and gardens, 1250–2600 m altitude.

Note — This species has been divided into several infraspecific taxa based on European material. A revision of the Asian material is still much needed. In *Malesia*, where most material can be referred to forma *apetalum* (Dum.) Murbeck, both introduced and indigenous populations may occur.

3. *Cerastium indicum* Wight & Arn.

Cerastium indicum Wight & Arn., *Prodr.* (1834) 43; Miq., *Fl. Ned. Ind.* 1 (1855) 1056; Edgew. & Hook. f., *Fl. Brit. India* 1 (1875) 227; Backer, *Schoolfl. Java* (1911) 82; Möschl, *Mem. Soc. Brot.* 7 (1951) 53, 86; Backer & Bakh. f., *Fl. Java* 1 (1963) 208; Steenis, *Mount. Fl. Java* (1972) pl. 8, f. 4; N.C. Majumdar in *Fl. India* 2 (1993) 524; Wadhwa in *Fl. Ceylon* 10 (1996) 59. — Type: *Wight 149* (K), India.

Erect, perennial, ascending, somewhat viscid herb. Stems 30–100 cm, patently villous, leaf pairs distant. Leaves narrowly elliptic, acute, sparsely villous, (8–)15–65 by 2–10 mm, sessile, in the middle of the stems more than 4 times longer than wide. Inflorescence lax, few-flowered, glandular pubescent; bracts herbaceous; pedicels densely glandular pubescent, 1–10 mm long, elongating in fruiting stage to 15–35 mm. Flowers 4- or 5-merous. Sepals 3–4 mm, obtuse, herbaceous or membranaceous at the very apex, glandular pubescent. Petals slightly longer than sepals, submarginate. Capsule straight, 4–6 mm; teeth erect, recurved, with incurved or flat margins. Seeds 1–1.5 mm.

Distribution — From East Africa and Madagascar throughout India to Australia. In *Malesia*: Java, Timor, Celebes and Papua New Guinea.

Habitat & Ecology — In shaded or moist places, open forests or grassy slopes, 2400–3300 m altitude. Some collections from limestone rocks.

Note — There is a considerable variation in height and leaf size evidently due to environmental conditions. Möschl, l.c., described three varieties, of which var. *ruwenzoriense* (Williams) Möschl matches the material from Java. There are also collections matching var. *parvifolium* Möschl. We do not find it necessary to maintain formal sub-specific classification due to the polymorphy of the species, and therefore follow the treatment of Wadhwa, l.c.



Fig. 1. *Cerastium papuanum* Mattf. — Parts of the inflorescence: 1 subsp. *papuanum* 'var. *dispersiflorum*', 2 subsp. *keysseri*; eglandular hair: 3; glandular cells on glandular hairs: 4–6; petals and stamens: 7 subsp. *phaenops* 'var. *eciliatum*', 8 subsp. *phaenops*, 9 & 10 subsp. *papuanum*, 11–13 subsp. *keysseri*; walls of mature capsules in cross section beneath the capsular teeth: 14; placentas: 15 & 16 subsp. *keysseri*, 17 subsp. *papuanum*, 18 subsp. *phaenops*; seed: 19; thickened verrucose lines on seed: 20. — Reproduced from W. Möschl, *Blumea* 24 (1978) 160.

4. *Cerastium papuanum* Mattf.

Cerastium papuanum Schltr. ex Mattf. in Diels, Bot. Jahrb. Syst. 62 (1929) 477; 69 (1938) 269; Möschl, *Blumea* 24 (1978) 157; P. Royen, *Alpine Fl. New Guinea* 3 (1982) 2358, f. 702–705, pl. 168. — Type: *Keysser s. n.* (B holo, ?destroyed), *Möschl 18765* (BM lecto), Papua New Guinea, Mt Saruwaket.

Cerastium keysseri Schltr. ex Mattf. in Diels, Bot. Jahrb. Syst. 62 (1929) 478; 69 (1938) 270; Merr. & Perry, *J. Arnold Arbor.* 23 (1942) 387; Hoogland, *Blumea*, Suppl. 4 (1958) 228. — Type: *Keysser 33* (B holo, ?destroyed, no isotypes), Papua New Guinea, Mt Saruwaket.

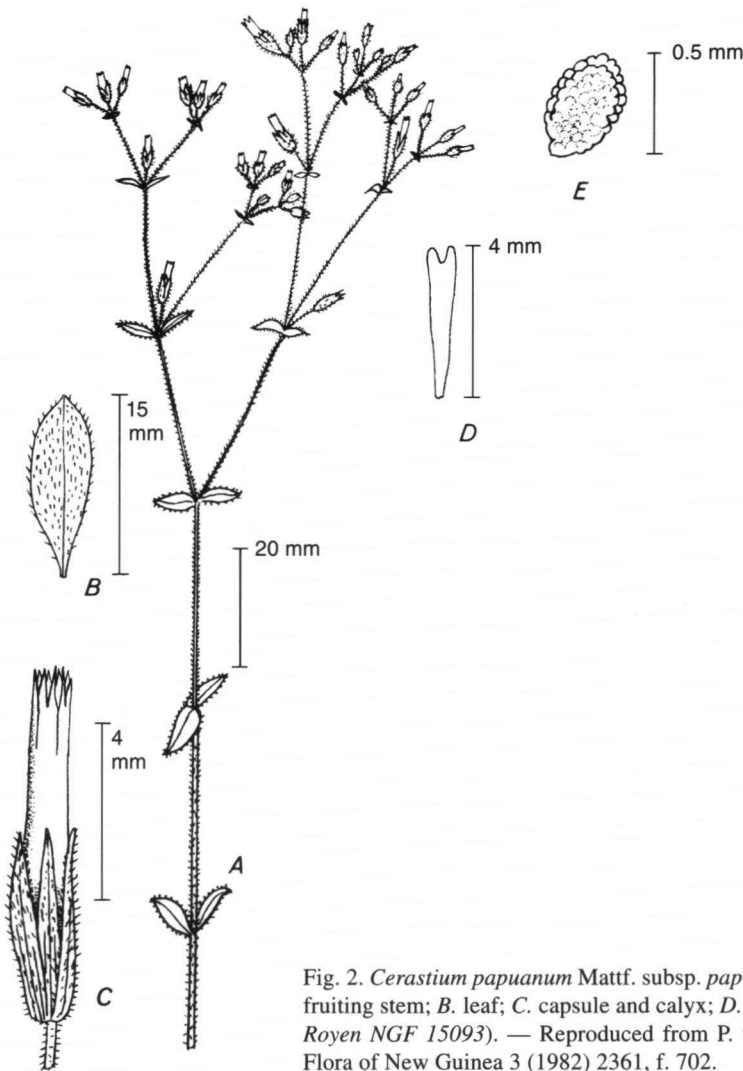


Fig. 2. *Cerastium papuanum* Mattf. subsp. *papuanum*. — A. Part of fruiting stem; B. leaf; C. capsule and calyx; D. petal; E. seed (van Royen NGF 15093). — Reproduced from P. van Royen, *Alpine Flora of New Guinea* 3 (1982) 2361, f. 702.

Perennial herb, very variable, from small to medium-sized, slender, lax or sometimes caespitose, tufted or growing in cushions, up to 60 cm. Stems usually decumbent or prostrate, rarely entirely erect, sometimes purple, terete to slightly quadrangular or winged, young stems rather densely white hairy and sometimes also with glandular hairs in upper part, older stems more sparsely hairy with the hairs often in lines, at last almost glabrous. Leaves densely together or widely spaced, varying in shape, 2–8 by 1–6 mm, with rounded to acutish apex, usually sessile, rather densely long-hairy on both sides when young, later subglabrous on the upper side. Flowers 4- or 5-merous, solitary or in 2–12-flowered, dense or lax dichasia; pedicels much longer than calyx, woolly, sometimes with glandular hairs; bracteoles herbaceous, \pm hairy. Sepals ovate, narrowly ellip-

tic or oblong, 2–8 by 1.5–2.5 mm, obtuse or acute, with scarious margin, variously hairy outside, glabrous inside. Petals white to pale green, hairy along margin, emarginate to bifid, 1.5–11 by 0.8–3.5 mm. Stamens 2.5–9 mm, filaments with a gland at the base, anthers oblong. Ovary glabrous, globose to broadly ellipsoid, 1.5–3.5 by 0.7–3 mm, 10-ribbed or crested, styles 4 or 5. Capsule opening with 4 or 5 bifid valves, 4–6 by 1.5–2 mm. Seeds reniform or discoid, rugose, 0.7–1 mm. — **Fig. 1, 2.**

Distribution — In *Malesia*: endemic to New Guinea.

Habitat & Ecology — Common in several localities in the alpine zone in both Irian Jaya and Papua New Guinea. Found in grassland, roadsides, forest margins, scree and similar light open places from 1500 to 4500 m. Flowering seems to occur all year round.

Note — Mattfeld, l.c., divided this very polymorphous species into several subspecies, varieties, forms and subforms. His illustration on page 160 (here Fig. 1) gives a good impression of the variability of the floral parts; it also clearly demonstrates that these characters show a clinal variation. In this treatment, therefore, the somewhat simplified subdivision by Van Royen, l.c., has been followed and three subspecies maintained. At the same time it should also be observed, that Van Royen in his concluding remarks on the variability emphasises that further field studies may reveal that even these subspecies cannot be maintained. We have abstained from presenting a key to these doubtful taxa.

a. subsp. *papuanum*

Cerastium papuanum Schltr. ex Mattf. subsp. *geminiflorum* Mattf. in Diels, Bot. Jahrb. Syst. 69 (1938) 269. — Type: *Brass 4309* (NY, iso A), Papua New Guinea, Mt Albert Edward.

Cerastium papuanum Mattf. subsp. *papuanum* var. *papuanum*, see Möschl, Blumea 24 (1978) 166.

Cerastium papuanum Mattf. subsp. *papuanum* var. *dispersiflorum* Möschl, Blumea 24 (1978) 166.

— Type: *Vink 16340* (L lecto, LAE), Papua New Guinea, Kubor Range.

Usually taller herbs, sometimes forming open cushions, without glandular hairs. Inflorescence richly branched, many-flowered, sometimes reduced to 1 or 2 flowers. Flowers usually 5-merous. Petals 3–4 mm, obtuse, shorter than the sepals, always longer than the episepalous filaments. Pedicels of capsules thickened only at the base or up to 1/3–1/2 of its length. — **Fig. 2.**

b. subsp. *keysseri* (Mattf.) Möschl

Cerastium papuanum Schltr. ex Mattf. subsp. *keysseri* (Schltr. ex Mattf.) Möschl, Blumea 24 (1978) 167. — *Cerastium keysseri* Schltr. ex Mattf. in Diels, Bot. Jahrb. Syst. 62 (1929) 478. — Type: *Keysser 33* (BM lecto).

Usually densely cushion-shaped or very low mat-forming herbs. Inflorescence reduced to 1 or 2 flowers. Flowers usually 4-merous. Petals as long as or shorter than episepalous filaments, emarginate or entire, sometimes lacking. Pedicels of capsule usually up to 1/3–1/2 of its length, thickened.

c. subsp. *phaenops* Mattf.

Cerastium papuanum Schltr. ex Mattf. subsp. *phaenops* Mattf. in Diels, Bot. Jahrb. Syst. 69 (1938) 269; Möschl, Blumea 24 (1978) 167. — Type: *Brass 4757* (lecto NY), Papua New Guinea, Owen Stanley Range, Murray Pass, 2840 m.

Cerastium papuanum Schltr. ex Mattf. subsp. *phaenops* Mattf. var. *eciliatum* Mattf. in Diels, Bot. Jahrb. Syst. 69 (1938) 269; Möschl, Blumea 24 (1978) 168. — Type: *Brass* 4402 (NY lecto, A), Papua New Guinea, Mt Albert Edward, incl. forma *glandulosum* Möschl, l.c. 168 (type: *Veldkamp* & *Stevens* 5573, holo L), Papua New Guinea, Mt Suckling, and subforma *columnare* Möschl, l.c. 168 (type: *Stevens* & *Veldkamp* 54268, holo L; CANB, LAE).

Plants usually tall and lax, rarely somewhat cushion-forming, with or without glandular hairs. Inflorescence few- to many-flowered. Flowers 5-merous. Petals longer than sepals. Pedicels of capsules thickened only at the base.

DIANTHUS

Dianthus L., Sp. Pl. (1753) 409; Pax & Hoffm. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2, 16c (1934) 356; Schischkin in Fl. U.R.S.S. 6 (1936) 803; Weissmann-Kollmann, Israel J. Bot. 14 (1965) 141; Reeve in Fl. Turkey 2 (1967) 99; Friedrich in Hegi, Ill. Fl. Mitteleur. ed. 2, III, 3 (1979) 984; Hamilton & Walters in Eur. Gard. Fl. 3 (1989) 185; Tutin & Walters in Fl. Eur. ed. 2, 1 (1993) 227; Bittrich in Kubitzki et al., Fam. Gen. Vasc. Pl. 2 (1993) 232. — Type: *Dianthus caryophyllus* L.

Annual or perennial herbs, often with woody base. Stems usually thickened at the nodes. Leaves opposite, narrow, leaf pairs connate at the base. Flowers solitary or in few- to many-flowered cymes, lax or dense, forming heads. Calyx surrounded by 2–4 or more epicalyx scales. Calyx cylindrical, of varying length, up to 35 mm, finely striate, 5-dentate. Petals with a long narrow claw widening into a broadly ovate or fan-shaped lamina, entire, dentate, fimbriate or deeply dissected; coronal scales absent. Stamens 10. Styles 2. Capsule mostly cylindrical, dehiscent with 4 teeth. Anthophore usually present. Seeds peltate, with a facial hilum, embryo straight.

Distribution — About 300 species from arctic to subtropical Eurasia, particularly in the Mediterranean region.

Habitat & Ecology — In open, often dry, sunny habitats. Many cultivated ornamentals; many hybrids and polyploids.

Note — None of the species are indigenous in Malesia and even if some are frequently grown in gardens, mostly at higher altitudes, they seem never to become naturalised. It is beyond the scope of this work to describe in detail the cultivated *Dianthus* species. Few collections are found in herbaria and the key presented here may not satisfy the horticulturist, maybe not even a taxonomist specialised in this genus. For further literature the interested reader is advised to consult Hamilton & Walters, l.c., where also an extensive list of literature can be found.

KEY TO THE SPECIES

- 1a. Annual or biennial herbs with slender stock and roots; without non-flowering shoots **3. *D. chinensis***
- b. Perennials with stout stock and root; non-flowering shoots usually present at flowering time **2**
- 2a. Bracteoles as long as calyx or longer; leaves narrowly elliptic to elliptic, at least some leaves (lower) obtuse or subobtuse **1. *D. barbatus***
- b. Bracteoles much shorter than calyx; leaves narrowly elliptic to linear, all leaves acute or acuminate **3**

- 3a. Leaves linear-narrowly elliptic, flat, 3–6 mm broad; petal blades narrow, not touching below, divided more than halfway down into very narrow, hair-like lobes **5. *D. superbus***
- b. Leaves linear, 1–3 mm broad, petal blades divided one third to halfway down into narrow but not thread-like lobes **4**
- 4a. Whole plant not more than 35 cm tall; leaf pairs above the rosette 1–4, leaves about 1 mm broad **4. *D. plumarius***
- b. Whole plant 50–80 cm tall; leaf pairs above the rosette 5–7; leaves 2–3 mm broad, nearly flat **2. *D. caryophyllus***

1. *Dianthus barbatus* L.

Dianthus barbatus L., Sp. Pl. (1753) 409; Edgew. & Hook. f., Fl. Brit. India 1 (1874) 215; Backer, Schoolfl. Java (1911) 81; Backer & Bakh. f., Fl. Java 1 (1963) 213; Grierson in Fl. Bhutan 1, 2 (1987) 199; Pham-hoàng Hô, Ill. Fl. Vietnam 1 (1991) 932, f. 2618; Lu Dequan in Fl. Reip. Pop. Sin. 26 (1996) 411, f. 107: 1–3; Lu Dequan & N.J. Turland in Fl. China 6 (2001) 103. — Type: *Clifford Herb. 165, Dianthus 6* (BM lecto).

Perennial, ± tufted, erect herb, up to 60 cm. Some stems flowering, some sterile, usually unbranched, subglabrous or shortly pubescent near the base. Leaves on flowering shoots grass-green, narrowly elliptic, often shortly petiolate, finely serrate-ciliate, 6–12 by 1.2–4 cm, the lower obtuse, the upper acuminate to acute. Flowers many together in a head, most often very dense, but sometimes with more elongate branching; pedicels 0.5–2 mm; bracts herbaceous, as long as or longer than inflorescence; bracteoles 4(–6), as long as calyx or longer, finely serrate-ciliate, the outer narrow, the inner long acuminate from a broad base. Calyx 15–18 mm long, cylindrical, teeth 8–9 mm, acute to obtuse, long aristate. Petals pink to dark red, 10–15 mm long, fine and irregularly dentate, finely barbate, very variable in cultivated forms.

Distribution — Indigenous to the mountains of central and submediterranean Europe. In *Malesia*: cultivated in Java as an ornamental in the montane regions.

Vernacular name — Sweet William (English).

2. *Dianthus caryophyllus* L.

Dianthus caryophyllus L., Sp. Pl. (1753) 410; Roxb., Fl. Ind. ed. Carey 2 (1832) 446; Edgew. & Hook. f., Fl. Brit. India 1 (1874) 214; Backer, Schoolfl. Java (1911) 81; Backer & Bakh. f., Fl. Java 1 (1963) 213; Pham-hoàng Hô, Ill. Fl. Vietnam 1 (1991) 932, f. 2620; N.C. Majumdar in Fl. India 2 (1993) 528; Lu Dequan in Fl. Reip. Pop. Sin. 26 (1996) 420, f. 108: 7–10. — Type not designated.

Perennial herb, somewhat woody at the base, loosely caespitose, usually glaucous, up to 80 cm. Plants without sterile shoots at the base, but some floriferous stems may bear sterile side-branches. Leaf pairs 5–7 above the rosette. Leaves glaucous, glabrous, linear-narrowly elliptic, 2–3 mm broad, rather rigid, almost flat. Inflorescence an open cyme with few, rather large, strongly fragrant flowers. Epicalyx scales 4, about 1/4 as long as the calyx, broadly ovate, cuspidate. Calyx 2.5–3 cm long, subcylindrical, teeth c. 5 mm, acuminate to subobtuse. Petals white, pink or red, or yellow, with dentate lamina.

Distribution — The origin of the cultivated carnation is uncertain, but it is an old Mediterranean ornamental grown all over the world in temperate to subtropical regions,

often in double-flowered cultivars. In *Malesia* grown as ornamental in the montane regions of Java.

Vernacular names — Carnation, clove pink (English).

Note — Hybrids between this species and *D. chinensis* are also grown as ornamentals.

3. *Dianthus chinensis* L.

Dianthus chinensis L., Sp. Pl. (1753) 411; Burm., Fl. Ind. (1763) 105; Roxb., Fl. Ind. ed. Carey 2 (1832) 446; Edgew. & Hook. f., Fl. Brit. India 1 (1874) 213; Backer, Schooffl. Java (1911) 81; Backer & Bakh. f., Fl. Java 1 (1963) 213; Mizush. in Fl. E. Himal. (1966) 80; Grierson in Fl. Bhutan 1, 2 (1987) 199; Pham-hoàng Hô, Ill. Fl. Vietnam 1 (1991) 932, f. 2619; N.C. Majumdar in Fl. India 2 (1993) 528, f. 107; Lu Dequan in Fl. Reip. Pop. Sin. 26 (1996) 414, f. 108: 1–6; Lu Dequan & N.J. Turland in Fl. China 6 (2001) 104. — Type not designated.

Dianthus chinensis L. var. *giganteus* Regel, Gartenflora 8 (1859) 33, t. 248. — *Dianthus heddeiwigii* Benary, Hamb. Gart. Bl. Zeitschr. 16 (1860) 28. — Type: Regel t. 248.

Annual or biennial, glabrous or somewhat hairy herb, with slender stock and roots. Stems erect, often branched, basal leaves withering before anthesis. Leaves green (not glaucous), flat, narrowly elliptic with smooth margin, up to 8 by 1 cm, apex acute. Flowers solitary or few together, not fragrant. Epicalyx scales 4–6, about half as long as the calyx. Calyx 15–25 mm long with acute lobes. Petals red or white, lamina c. 15 mm, obovate, coarsely dentate to deeply fringed.

Distribution — The origin of this cultivated species is uncertain. In *Malesia* cultivated in Java up to 1600 m altitude, often in double-flowered specimens. Also reported by Merrill as occasionally cultivated in the Philippines.

Vernacular names — English: Chinese pink, Japanese pink (*D. heddeiwigii*), Clavel (Philippines).

Note — A polyploid cultivar probably originating from eastern Asia. There is a great variation in the shape of the petals, particular the lamina, which can be deeply divided and fringed. *Dianthus heddeiwigii* was originally introduced to St. Petersburg from Japan. Hybrids with other species, e.g. *D. barbatus* and *D. superbus*, are also in cultivation.

4. *Dianthus plumarius* L.

Dianthus plumarius L., Sp. Pl. (1753) 411; Backer, Schooffl. Java (1911) 81; Backer & Bakh. f., Fl. Java (1963) 213. — Type: described from Europe.

Perennial, polymorphous cushion plant with a strong primary root. Plants with several sterile shoots at the base. Floriferous stems quadrangular, glabrous, with 4–5 internodes above the basal rosette leaves, up to 35 cm. Leaves linear, stiff, erect, c. 1 mm broad, 3-nerved. Flowers fragrant, solitary or 2–3 together. Epicalyx scales mostly 4, about 1/4 as long as the calyx. Calyx 2–3 cm long, subcylindrical, green or slightly purple, teeth narrowly elliptic to ovate, obtuse or acute, with scarious margin. Petals white, red or spotted, the lamina irregularly divided into 1/4–1/2, with narrow lobes, usually bearded.

Distribution — Indigenous to the eastern part of the European Alps. In *Malesia* occasionally cultivated in Java as an ornamental, but not flowering well at lower altitudes.

Vernacular name — Clove pink (English).

5. *Dianthus superbus* L.

Dianthus superbus L., Fl. Suec. ed. 2 (1755) 146; Backer & Bakh. f., Fl. Java 1 (1963) 213; Pham-hoàng Hô, Ill. Fl. Vietnam 1 (1991) 933, f. 2621; Lu Dequan in Fl. Reip. Pop. Sin. 26 (1996) 424, f. 111: 1–5; Lu Dequan & N.J. Turland in Fl. China 6 (2001) 106. — *Caryophyllus superbus* (L.) Moench, Meth. (1794) 59. — Type: *Linnean Herb. 581-21* (LINN lecto).

Perennial, glabrous herb. Flowering stems erect or ascending, up to 70 cm from a basal tuft of vegetative shoots. Leaves grass-green, rather flaccid, narrowly elliptic, 4–12 by 0.3–0.6 cm, 1-nerved. Inflorescence a lax cyme with 2 or more flowers. Epicalyx scales 2–4, 1/4–1/3 the length of the calyx. Flowers fragrant. Calyx 2–3 cm long, narrowed towards the apex. Petals 15–35 mm, claw and lower part of lamina yellowish green to white, rest of lamina pale violet, sometimes white, lower part of lamina narrow, not touching, divided more than halfway down into very narrow, hair-like lobes.

Distribution — Widely distributed in temperate to subarctic Eurasia, in East Asia indigenous in E China, Japan and Taiwan. In *Malesia* introduced in Java, near Bogor, but probably not persistent. Not cultivated.

DRYMARIA

Drymaria Willd. ex Schultes in Roemer & Schultes, Syst. Veg. 5 (1819) 31, 406; Pax & Hoffm. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2, 16c (1934) 306; Duke, Ann. Missouri Bot. Gard. 48 (1961) 173; Backer & Bakh. f., Fl. Java 1 (1963) 209; N.C. Majumdar, Bull. Bot. Surv. India 10 (1969) 293; Bittrich in Kubitzki et al., Fam. Gen. Vasc. Pl. 2 (1993) 220. — Type: *Drymaria arenarioides* Humb. & Bonpl. ap. Willd. ex Roem. & Schultes.

Annual or perennial, glabrous or pubescent herbs. Stems slender, prostrate or erect, sometimes rooting at the nodes. Leaves opposite, stipulate, glabrous to villose or glandular; petioles short or long; stipules small, filiform, often caducous; lamina ovate-reniform with hydathodes. Inflorescence a dichasial cyme, rarely an axillary cluster or flowers solitary. Flowers hypogynous or subperigynous. Sepals (4 or) 5, free, with scarious margins. Petals (3–)5, white, usually bifid, rarely wanting. Stamens 2–5, often some of them reduced to staminodes, filaments ± flattened, anthers versatile. Ovary shortly stipitate, styles 3, rarely 2 or 4, ± united in lower part; ovules few to many. Capsule spherical, dehiscing by 3 valves. Seeds usually tuberculate or verrucose. — Fig. 3.

Distribution — About 50 species, mostly neotropic, one species (*D. cordata*) pantropical.

Note — The taxonomic position of the genus is uncertain. It shows many characters of the *Alsinoideae* and the stipules are of a peculiar type different from those found in other members of the *Paronychioideae*.

KEY TO THE SPECIES

- 1a. Pedicels glandular hairy; petals shorter than calyx; capsule 1–few-seeded, shed with the pedicel; leaves glabrous **1. *D. cordata***
- b. Pedicels finely pilose to subglabrous; petals as long as calyx; capsule with numerous seeds, persistent until seeds shed; leaves ± hirsute **2. *D. villosa***

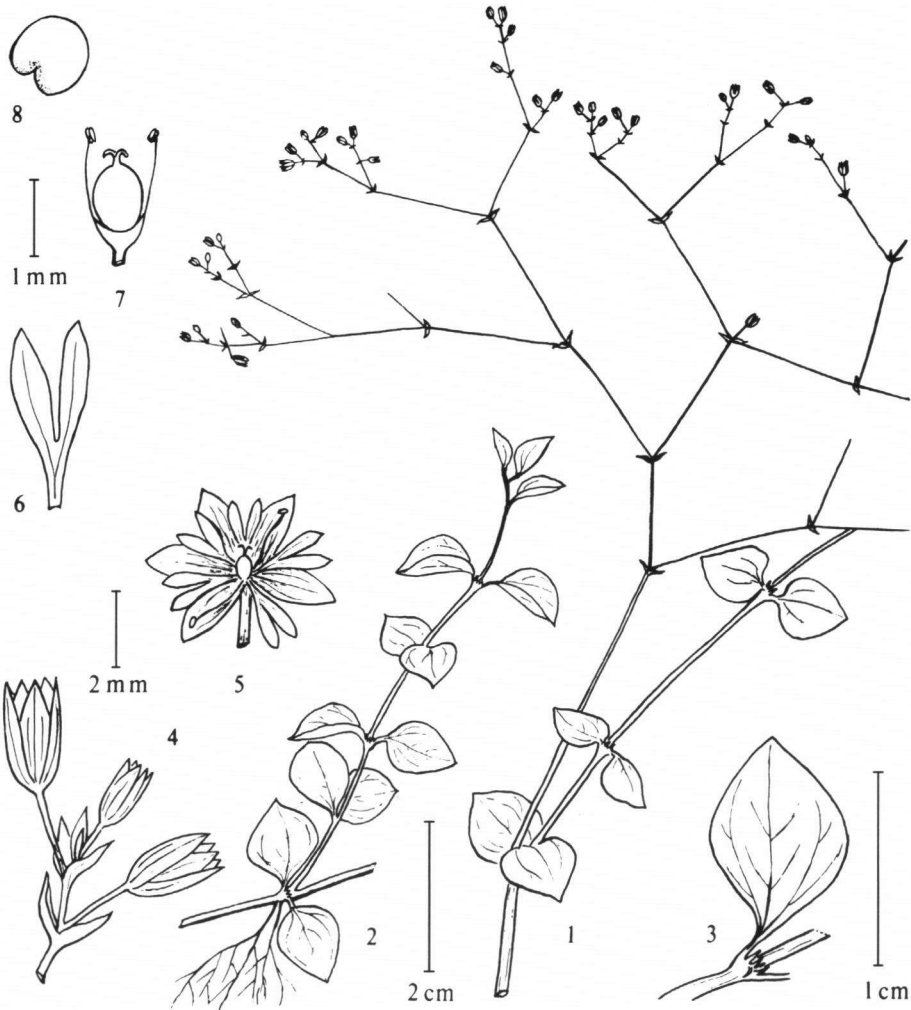


Fig. 3. *Drymaria cordata* (L.) Roem. & Schultes subsp. *diandra* (Blume) Duke. — 1. Flowering branch; 2. young shoot; 3. leaf with stipules; 4. partial inflorescence; 5. flowers; 6. petal; 7. stamens and ovary; 8. seed. — Reproduced from *Flora of Thailand* Fl. Thailand 5 (1992) 414, f. 92

1. *Drymaria cordata* (L.) Roem. & Schultes

Drymaria cordata (L.) Roem. & Schultes, *Syst. Veg.* 5 (1819) 406; Miq., *Pl Jungh.* (1851) 52; *Fl. Ind. Bat.* 1 (1858) 1053; *Fl. Ned. Ind., Suppl.* 1, Sumatra (1860) 150; Edgew. & Hook. f., *Fl. Brit. India* 1 (1874) 244; Merr., *Philipp. J. Sc., Bot.* 3 (1908) 77; Gagnepain in *Fl. Gén. Indo-Chine* 1 (1909) 266, f. 26; *Suppl.* 1 (1943) 242; Backer, *Schoolfl. Java* (1911) 83; Ridl., *Fl. Malay Penins.* 1 (1922) 150; Merr., *Enum. Philipp. Flow. Pl.* 2 (1923) 139; Craib, *Fl. Siam. Enum.* 1 (1925) 108; Mizush., *J. Jap. Bot.* 32 (1957) 69; Backer & Bakh. f., *Fl. Java* 1 (1963) 209; K. Larsen, *Dansk Bot. Ark.* 23 (1963) 61; Pham-hoàng Hô, *Fl. III. S. Vietnam* ed. 2 (1970) 555, f. 1407; Lu Dequan & M. G. Gilbert in *Fl. China* 6 (2001) 6. — *Holosteum cordatum* L., *Sp. Pl.* (1753) 88. — Lectotype: *Linnean Herb.* 109-1 (LINN).

subsp. *diandra* (Blume) Duke

Drymaria cordata (L.) Roem. & Schultes subsp. *diandra* (Blume) Duke, Ann. Missouri Bot. Gard. 48 (1961) 253, f. 18; Mizush., J. Jap. Bot. 38 (1963) 150; Liu & Ying in Fl. Taiwan 2 (1976) 334; N. C. Majumdar, Bull. Bot. Surv. India 10 (1983) 294; Grierson in Fl. Bhutan 1, 2 (1987) 216; Ke Ping in Fl. Reip. Pop. Sin. 26 (1996) 61. — *Drymaria diandra* Blume, Bijdr. (1825) 62; Mizush., J. Jap. Bot. 32 (1957) 79; in Fl. E. Him. 1 (1966) 80; Ohba in Fl. E. Him., Third Report (1975) 31; Hara, Enum. Flow. Pl. Nepal 2 (1979) 54; K. Larsen in Fl. Camb., Laos & Vietnam 24 (1989) 64, f. 8–13; in Fl. Thailand 5 (1992) 414, f. 92; Pham-hoàng Hô, Ill. Fl. Vietnam 1 (1991) 933, f. 2623; N. C. Majumdar in Fl. India 2 (1993) 533, f. 108; Ying in Fl. Taiwan ed. 2, 2 (1996) 360, f. 167. — *Drymaria gerontogea* F. Muell., Descr. Not. Papuan Pl. 1 (1877) 87. — Type: Blume (L lecto), Java.

Drymaria retusa Wall. ex Wight & Arn., Prodr. (1834) 359. — Type: ?Wight 152 (G, L).

Drymaria cordata (L.) Roem. & Schultes forma *indica* Miq., Pl. Jungh. (1855?) 395. — Type: Junghuhn (L).

Drymaria extensa Wall. ex Edgew. & Hook. f., Fl. Brit. India 1 (1874) 244. — Type: Wallich 647 (K lecto).

Prostrate or ascending annual or perennial herb. Stems elongate, up to 1 m, creeping, richly branched, ± glandular hairy to almost glabrous. Stipules membranaceous, 1–4 mm, splitting into thin whitish setae. Leaves glabrous or almost so, ovate to reniform or suborbicular, apex rounded, often apiculate, base ± cordate, obtuse or truncate, 5–25 by 3–25 mm; petioles 3–8 mm long. Inflorescence lax. Flowers pedicellate; pedicels slender, 1–5 mm, glandular hairy; bracts scarious, narrowly elliptic, 1–2 mm long. Sepals glandular, particularly along the raised veins, margins inflexed, oblong, green, c. 3 mm long, with scarious margin. Petals narrowly obovate-elliptic, shorter than the sepals, bifid, usually to about the middle. Stamens 5, sometimes fewer. Styles 3, connate at the base, hairy in the upper part. Capsule ovoid, 2–2.5 mm long, opening by 3 valves. Seeds few, dark brown, papillate, 1.5–2 mm. — Fig. 3.

Distribution — From tropical Africa throughout tropical Asia to Australia, Oceania, Hawaii. In *Malesia* known from Sumatra, Java, Philippines (N Luzon to Mindanao), Celebes, Lesser Sunda Islands (Lombok, Sumbawa, Flores, Timor), Moluccas (Ceram), and New Guinea. All material seen from West Malaysia belong to subsp. *pacifica*.

Habitat & Ecology — Among herbs in open forests, along waysides and in grasslands in wet places, from the lowlands (300 m in Sumatra) to the montane regions (2500 m in New Guinea), most common from about 1000 to 2000 m altitude.

Note — *Drymaria cordata* var. *pacifica* Mizush. [J. Jap. Bot. 32 (1957) 78; Duke, Ann. Missouri Bot. Gard. 48 (1961) 251] is vegetatively very similar to subsp. *diandra*; the petals are glabrous, shining, scarious, with faint veins, and the margins not inflexed. Ovary with styles divided almost to the base. Seeds 0.8–1.5 mm. It seems that most material from West Malaysia belongs here, but in Thailand transition forms occur. Mizushima treats *D. cordata* and *D. diandra* as separate species. *Drymaria cordata* he divides into two varieties: var. *cordata* and var. *pacifica*, the distribution of which he gives as continental South America, West Indies, Central America, Florida and Africa (Tanzania). Duke, in connection with his revision of the genus *Drymaria* (1961), went through the material of the species in L and annotated several specimens from Java, Sumatra, and West Malaysia as var. *pacifica*. In his final treatment, however, he hesitates to recognise this taxon formally. At present we join this viewpoint.

2. *Drymaria villosa* Cham. & Schldl.

Drymaria villosa Cham. & Schldl., *Linnaea* 5 (1830) 232; Backer & Bakh. f., *Fl. Java* 1 (1963) 210; Mizush. in *Fl. E. Himal.* (1966) 80; Duke, *Ann. Missouri Bot. Gard.* 48 (1961) 226, f. 12; Ohba in *Fl. E. Him., Third Report* (1975) 31; Grierson in *Fl. Bhutan* (1987) 216; N. C. Majumdar in *Fl. India* 2 (1993) 533; Ke Ping in *Fl. Reip. Pop. Sin.* 26 (1996) 60, f. 10: 8–12; Lu Dequan & M. G. Gilbert in *Fl. China* 6 (2001) 6. — Type: *Schiede & Deppe 505* (B holo, destroyed?, LE lecto). Peru.

Drymaria hirsuta Bartl. in Presl, *Reliq. Haenk.* 2 (1831) 8. — Type: *Haenke s.n.* (PR holo), Peru.

Drymaria ciliaris Hort. Berol. ex C. A. Mey., *Ind. Sem. Hort. Petrop.* 9 (1843) 71. — Not typified.

Drymaria stylosa Backer, *Bull. Jard. Bot. Buitenzorg II*, 12 (1913) 15. — Type: no types mentioned, probably *Backer 12940* (lecto BO or L), Java. Not found in L.

For further synonymy referring to neotropic literature, see Duke, l.c.

Prostrate or ascending annual herbs. Stem usually richly branched, spreading, erect or creeping, up to 40 cm, villous to hirsute. Leaves 3–12 mm long, villous or hirsute particularly when young, orbicular to reniform with rounded apex and cordate or truncate base; petiole 1–12 mm. Stipules entire, up to 1.5 mm long, scarcely distinguishable from the indumentum. Inflorescence terminal, axillary cymes; peduncles 1–5 cm; bracts up to 1.5 mm, pedicels 2–15 mm, finely pubescent to nearly glabrous. Sepals ovate-elliptic, finely pilose to nearly glabrous, 2–3.5 mm long. Petals as long as sepals, obtuse or shallowly divided. Stamens (3–)5, the filaments 2–3 mm long, shallowly connate at the base. Style trifid in the upper half, finally much exerted from the calyx. Capsule ovoid to ellipsoid, 2–3.5 mm long. Seeds numerous, cochleate, rough with minute papillae.

Distribution — Originating from Central and South America, introduced in tropical Asia and the Himalayas; in *Malesia* found in Sumatra, Java, Celebes and Flores.

Habitat & Ecology — Found in many places in Java as a garden weed, from about 250 m (Bogor) to c. 2000 m altitude. There are numerous collections from Cibodas, while the highest records are from the Dieng Plateau.

Note — Duke, l.c., refers the Malesian material to subsp. *villosa* and notes that the specimens usually have glabrous sepals.

GYPSOPHILA

Gypsophila L., *Sp. Pl.* (1753) 406; Edgew. & Hook. f., *Fl. Brit. India* 1 (1874) 216; Pax & Hoffm. in *Engl. & Prantl, Nat. Pflanzenfam.* ed. 2, 16c (1934) 351; Stroh, *Beih. Bot. Centralbl.* 59 (1937) 455; Barkoudah, *Wentia* 9 (1962) 1; Huber-Morath in *Fl. Turkey* 2 (1967) 149; in *Fl. Eur.* ed. 2. 1 (1993) 219; Friedrich in *Hegi, Ill. Fl. Mitteleur.* III, 1, 2 (1969) 955; Bittrich in *Kubitzki et al., Fam. Gen. Vasc. Pl.* 2 (1993) 230. — Type: *Gypsophila repens* L.

Annual or perennial herbs, often suffruticose, with or without glandular hairs. Stems terete, thickened at the nodes. Leaves linear-narrowly elliptic, often somewhat succulent, opposite; petioles short, dilated at the base, opposite pairs shallowly connate at the base. Flowers small, mostly numerous in dichasial cymes. Calyx gamosepalous, without commissural nerves, 5-lobed, at least halfway down. Petals 5, white to pink, often with darker veins, patent, short-clawed, without coronal scales, gradually widening into the lamina. Stamens 10 (5), shorter than corolla. Styles 2 (or 3). Capsule subglobose, longer than calyx, dehiscent by 4 valves almost to the base. Seeds auriculate, verrucose or echinate.

Distribution — About 150 species, from Europe throughout subtropical Asia to Australia and New Zealand. The greatest diversity is found in the eastern Mediterranean region. In *Malesia* no indigenous species occur, but two are sometimes cultivated, mostly as double-flowered cultivars.

Habitat & Ecology — Most species occur on dry grassland on sandy soil; many are cushion plants in montane regions of W Asia; some species are grown as ornamentals. One species has been found to be a copper indicator.

KEY TO THE SPECIES

- 1a. Annual; calyx 3–5 mm long **1. *G. elegans***
 b. Perennial; calyx 1–2.5 mm long **2. *G. paniculata***

1. *Gypsophila elegans* M. Bieb.

Gypsophila elegans M. Bieb., Fl. Taur.-Cauc. 1 (1808) 319; Backer & Bakh. f., Fl. Java 1 (1963) 212; Lu Dequan in Fl. Reip. Pop. Sin. 26 (1996) 447. — Type: *Bieberstein* (n.v.), Caucasus.
Gypsophila producta Stapf, Denk. Akad. Wiss. Wien, Math.-Nat. Kl. 51 (1886) 280.
Gypsophila ceballosii Pau & Vicioso, Bol. Soc. Esp. Hist. Nat. 19 (1919) 493.
Gypsophila elegans M. Bieb. var. *latipetala* Barkoudah, Wentia 9 (1962) 135, t. 14, f. 1–6.

Glabrous annual up to 60 cm. Stems erect, branched in upper part. Leaves linear to linear-narrowly elliptic, acute, 10–50 by 2–10 mm. Inflorescence a loosely branched panicle with rather large flowers; bracts triangular, scarious. Pedicels capillary, 10–35 mm. Calyx 3–5 mm, campanulate, divided to halfway down, with ovate, obtuse teeth. Petals white, often with dark veins, 6–12 mm, cuneate, emarginate. Capsule ellipsoid, 3–4.5 mm, longer than calyx. Seeds c. 1 mm, black, rugose, with obtuse tubercles.

Distribution — From southern Russia throughout the Middle East. Widely cultivated. In *Malesia* particularly cultivated in Java and the Philippines.

Note — Several colour varieties are in cultivation.

2. *Gypsophila paniculata* L.

Gypsophila paniculata L., Sp. Pl. (1753) 407; Lu Dequan in Fl. Reip. Pop. Sin. 26 (1996) 442, f. 115: 1–6. — *Saponaria paniculata* (L.) Neumeyer, Osterr. Bot. Zeitschr. 91 (1942) 236. — Type: *Linnean Herb.* 579-5 (LINN lecto).

Perennial, usually glabrous, glaucous herb with stout, deep root-system. Stems up to 90 cm, diffusely branched, in lower part quadrangular, hairy, upwards glabrous. Leaves narrowly elliptic, acute or acuminate, 20–70 by 3–20 mm. Inflorescence a richly branched panicle with numerous small flowers; bracts linear-narrowly elliptic, small; pedicels up to 4 mm. Calyx 1–2.5 mm, divided halfway down, teeth ovate, obtuse with broad scarious margin. Petals white or pink, 3–4 mm, linear-spathulate, at last reflexed. Capsule ± spherical, about as long as the calyx. Seeds light brown with obtuse tubercles, 0.3–0.4 mm.

Distribution — East and Central Europe, West Asia. Widely cultivated as ornamental. In *Malesia* grown in Java.

Note — There are numerous cultivars, some with double flowers. A hybrid *G. paniculata* × *repens* is often also grown as ‘Rosenschleier’.

LYCHNIS

Lychnis L., Sp. Pl. (1753) 436; Pax & Hoffm. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2, 16c (1934) 339; Bittrich in Kubitzki et al., Fam. Gen. Vasc. Pl. 2 (1993) 233. — Type: *Lychnis chalconica* L.

Coronaria L., Gen. Pl. ed. 1 (1737) 135; Guettard, Hist. Acad. Sci. (Paris) Mém. 1750.
Viscaria Bernardhi, Syst. Verz. (1800) 261. — Type: *Lychnis viscaria* L.

Perennial herbs. Stems erect. Leaves sessile or shortly petioled. Inflorescence dense or lax dichasial cymes. Flowers mostly bisexual, 5-merous, with contorted aestivation. Calyx cylindrical, spherical or campanulate, with 10 veins and 5 short teeth. Petals long-clawed, with coronal scales. Stamens 10. Ovary unilocular or at the base 5-locular. Styles 5, free, opposite the calyx segments. Capsule sessile or stipitate, ± spherical to ellipsoid, enclosed in the calyx, opening by 5 undivided teeth. Seeds reniform, flat.

Distribution — About 25 species in the temperate and arctic regions of the northern hemisphere.

Habitat & Ecology — Open sandy or gravelly soil or grassland. Many species are rosette plants.

Note — The genus is morphologically and also in cytology close to *Silene* and is sometimes included in that genus. The oldest name, however, is *Lychnis* and so far no author has proposed the numerous new combinations that would be the consequence of the amalgamation of the two genera.

KEY TO THE SPECIES

- 1a. Leaves hispid; petals bifid for 1/3 **1. *L. chalconica***
 b. Leaves and stems densely villous with white hairs; petals entire or emarginate . . .
 **2. *L. coronaria***

1. *Lychnis chalconica* L.

Lychnis chalconica L., Sp. Pl. (1753) 436; Backer & Bakh. f., Fl. Java 1 (1963) 211; Pham-hoàng Hô, Ill. Fl. Vietnam 1 (1991) 933, f. 2622; Tang Changlin in Fl. Reip. Pop. Sin. 26 (1996) 272, f. 65: 6–10; Lu Dequan, M. Lidén & B. Oxelman in Fl. China 6 (2001) 101. — Type: *Clifford Herb. 174* (BM lecto).

Perennial herb up to 60 cm, rarely more. Stems erect, stout, unbranched, hispid. Leaves sparsely hispid, sessile, cordate amplexicaul, ovate-oblong, acute. Inflorescences capitulate, 10–50-flowered; pedicels short. Calyx 15–20 mm long, with subulate teeth. Petals bright scarlet, sometimes white, long-clawed, bifid for 1/3 of the lamina; coronal scales inserted on convexity of petal, oblong-narrowly elliptic. Carpophore 6 mm. Capsule light brown, ellipsoid, as long as calyx or slightly longer. Seeds black, reniform, coarsely tuberculate, c. 1 mm diameter.

Distribution — Eastern Europe to temperate central Asia including China. Widely cultivated. In *Malesia* grown as an ornamental in Java.

2. *Lychnis coronaria* (L.) Desr.

Lychnis coronaria (L.) Desr. in Lam., Encycl. 3 (1792) 643; Edgew. & Hook. f., Fl. Brit. India 1 (1874) 222; N.C. Majumdar in Fl. India 2 (1993) 542, f. 111; Tang Changlin in Fl. Reip. Pop.

Sin. 26 (1996) 270, f. 65: 1–5; Lu Dequan, M. Lidén & B. Oxelman in *Fl. China* 6 (2001) 100. — *Agrostemma coronaria* L., *Sp. Pl.* (1753) 436. — *Silene coronaria* (L.) Clairv., *Man. Herbor. Suisse* (1811) 145. — Type: *Linnean Herb. 601-2* (LINN lecto), Italy.
Lychnis coriacea Moench, *Meth.* (1794) 709. — *Coronaria coriacea* (Moench) Schischk. in *Fl. U.S.S.R.* 6 (1936) 699. — Type not designated.
Coronaria tomentosa A. Braun (1843) from Backer & Bakh. f., *Fl. Java* 1 (1963) 211.

Perennial but short-lived herb, up to 1 m. Stems erect, with a rosette at the base, together with leaves densely villose-lanate. Rosette leaves spatulate, 10–20 cm long; leaves along the stems oblong to narrowly elliptic, acute, petioled in lower part, sessile in upper part. Inflorescences lax, few-flowered dichasia. Flowers with up to 12 cm long pedicel. Calyx ellipsoid-campanulate, 15–20 mm long, hairy as the leaves; teeth narrowly acute. Petals deep red, rarely white; lamina obovate, entire, mucronate or emarginate; coronal scales acute, hard. Carpophore c. 2 mm. Capsule ellipsoid, acute, as long as calyx. Seeds reniform, black, finely tuberculate, slightly more than 1 mm diameter.

Distribution — From eastern Europe to western Asia, further with isolated occurrences in Kashmir. Widely cultivated. In *Malesia* grown as an ornamental in Java.

MYOSOTON

Myosoton Moench, *Meth.* (1794) 225; Friedrich in Hegi, *Ill. Fl. Mitteleur.* ed. 2, III, 3 (1979) 901; K. Larsen in *Fl. Camb., Laos & Vietnam* 24 (1989) 82; in *Fl. Thailand* 5 (1992) 422; Bittrich in Kubitzki et al., *Fam. Gen. Vasc. Pl.* 2 (1993) 227. — Type: *Myosoton aquaticum* (L.) Moench.
Larbrea A. St.-Hil., *Mém. Mus. Hist. Nat.* 2 (1815) 287.
Myosanthus Desv., *J. Bot. Agric.* 3 (1816) 227.
Malachium Fries, *Fl. Halland.* 1 (1817) 77 ('*Malachia*'); Reichenb., *Fl. Germ. Excurs.* (1832) 795; Pax & Hoffm. in *Engl. & Prantl, Nat. Pflanzenfam.* ed. 2, 16c (1934) 323.

Monotypic genus.

Myosoton aquaticum (L.) Moench

Myosoton aquaticum (L.) Moench, *Meth.* (1794) 225; Jalas & Suominen, *Atlas Fl. Eur.* 6 (1983) 122; K. Larsen in *Fl. Camb., Laos & Vietnam* 24 (1989) 82, f. 11: 1–6; in *Fl. Thailand* 5 (1992) 422; Pham-hoàng Hô, *Ill. Fl. Vietnam* 1 (1991) 934, f. 2625; N.C. Majumdar in *Fl. India* 2 (1993) 548; Ke Ping in *Fl. Reip. Pop. Sin.* 26 (1996) 74, f. 16: 1–9; Lu Dequan & M.G. Gilbert in *Fl. China* 6 (2001) 38. — *Cerastium aquaticum* L., *Sp. Pl.* (1753) 439. — *Stellaria aquatica* (L.) Scop., *Fl. Carn.* ed. 2, 1 (1772) 319; Edgew. & Hook. f., *Fl. Brit. India* 1 (1874) 229; Mizush. in *Fl. E. Himal.* (1966) 82; Hara, *Enum. Flow. Pl. Nepal* 2 (1979) 57; Ying in *Fl. Taiwan* ed. 2, 2 (1996) 373, f. 174. — *Malachia aquatica* (L.) Fries, *Fl. Halland.* 1 (1817) 78; Gagnepain, *Fl. Gén. Indo-Chine* 1 (1909) 263; *Suppl.* 1 (1943) 240. — *Stellularia aquatica* (L.) Aschers. var. *aquatica* Kuntze, *Rev. Gen. Pl.* 1 (1891) 52. — Type: *Linnean Herb. 603-23* (LINN), Europe.
 For further synonymy see Jalas & Suominen, l.c.

Perennial or annual prostrate or erect herbs. Stems quadrangular, up to 1 m long, swollen at the nodes, sometimes rooting, glabrous in lower part, glandular hairy in upper part. Leaves thin, ovate to elliptic, 15–65(–80) by 5–30 mm, base obtuse or cordate, apex acuminate, nerves 3, the lower ones subsessile or with a short petiole up to c. 8 mm; upper ones sessile. Inflorescence a terminal open cyme with 5–20 flowers; peduncles 5–25 mm long; pedicels 1–15 mm, fragile, velutinous glandular, reflexed at anthesis;

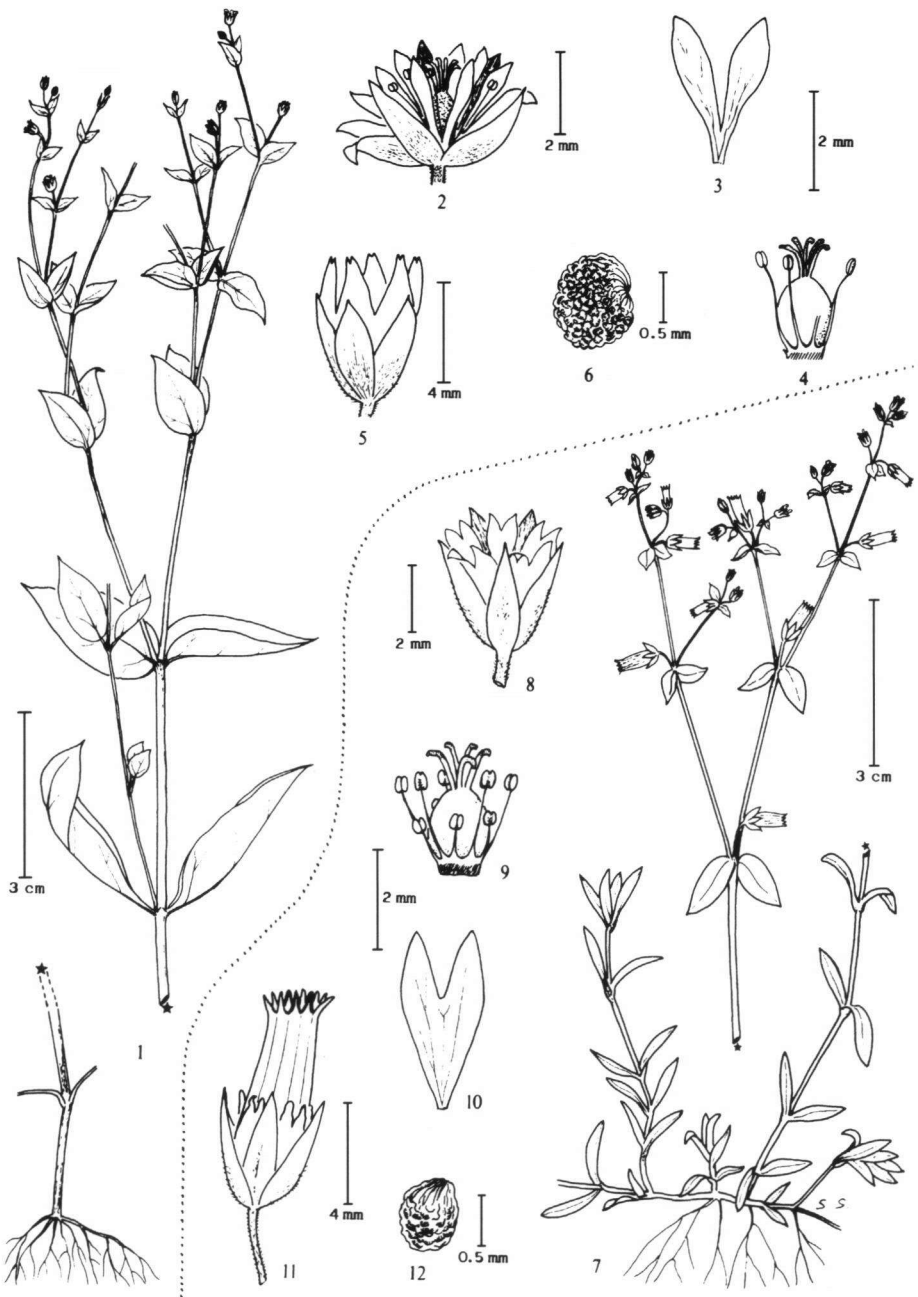


Fig. 4. *Myosoton aquaticum* (L.) Moench. — 1. Habit; 2. flower; 3. petals; 4. ovary; 5. open capsule (1–6: Demange in Debeaux s. n., 1902; 5, 6: Pételot 5716). — *Cerastium fontanum* Baumg. subsp. *vulgare* (Hartm.) Greuter & Burdet. — 7: Habit; 8. flower; 9. ovary; 10. petals; 11. open capsule; 12. seed (7–12: Pételot 5717). — Reproduced from Flore du Cambodge, Laos et Vietnam 24 (1989) 82, f. 11.

bracts similar to the leaves but the base not cordate, diminishing upwards. Flowers 10–15 mm diameter. Sepals 5, free, ovate, c. 4.5 by 2.5 mm, with scarious margin, acute mucronate, outside glandular hairy. Petals 5, white, divided almost to the base, slightly longer than the sepals. Stamens 10, filaments dilated at the base, anthers orbicular, yellowish or pale violet, sometimes abortive. Ovary unilocular; styles 5, free, alternisepalous. Capsule ovoid, longer than calyx, opening by 5, shortly bifid, blunt teeth. Seeds up to 20 per capsule, small, reniform, tuberculate, brown. — **Fig. 4: 1–6.**

Distribution — Temperate Eurasia, widely introduced in tropical Asia to China, Japan, Korea, Vietnam, and Thailand. In *Malesia* only recorded from northern Sumatra (Aceh, Berastagi).

Habitat & Ecology — Moist and shady places, forest swamps, lakesides, etc., up to 1500 m altitude. On Sumatra between 1000 and 1300 m, in rice fields and swamps.

Uses — Locally used as a vegetable.

Note — Some authors include this species in the genus *Stellaria*. Here the viewpoint of Bittrich, l.c., and other recent floristic works in Europe and Asia have been followed.

POLYCARPAEA

Polycarpaea Lam., J. Hist. Nat. 2 (1792) 3 (sphalm. '*Polycarpea*'), nom. cons.; Pax & Hoffm. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2, 16c (1934) 308; Bittrich in Kubitzki et al., Fam. Gen. Vasc. Pl. 2 (1993) 221. — Type: *Polycarpaea teneriffae* Lam.

Polia Lour., Fl. Cochinch. 97 (1790) 164.

Hagea Vent., Tab. 3 (1799) 240; Pers., Syn. Pl. 1 (1805) 262 ('*Hagea*').

Mollia Willd., Hort. Berol. 11 (1806) tab. 11.

Lahaya Roem. & Schultes, Syst. Veg. 5 (1819) 402.

Hyala L'Hér. ex DC., Prodr. 3 (1828) 373.

Annual or perennial herbs. Stems erect or ascending, often richly branched, sometimes lignified at the base. Leaves stipulate, small, opposite or pseudovercillate in lower part. Stipules scarious. Inflorescences terminal, dense or lax. Flowers small, bisexual, sometimes perigynous; the bracts scarious. Sepals entirely scarious, white, not carinate. Staminodes often present, usually minute. Petals 5, entire, emarginate or denticulate. Stamens 5 (sometimes fewer), filaments inserted below a disc. Ovary unilocular, ovules few to many; style short or long, filiform, stigma shortly trilobed, capitate or indistinct. Fruit a capsule dehiscent by 3 valves. Seeds tiny, reniform, translucent. — **Fig. 5: 8–15.**

Distribution — About 50 species, mostly in tropical Africa, throughout southern Asia to Australia. In *Malesia* four species.

Habitat & Ecology — On sandy or gravelly soil in sunny habitats, on open ground in deciduous forests. One Australian species has been found to be a copper indicator.

Note — The present treatment has been based on the revision by K. Bakker, Acta Bot. Neerl. 6 (1957) 48–53.

KEY TO THE SPECIES

- 1a. Sepals with a c. 0.5 mm broad, 3-nerved, pubescent, greenish median band not reaching the apex **4. *P. zollingeri***
 b. Sepals entirely scarious or with a narrow, glabrous, purple midrib of varying length **2**

- 2a. Sepals with midrib reaching 1–1.5 mm below apex; petals narrowly oblong; anthers oblong, style 1.2–2 mm **2. *P. sumbana***
 b. Sepals without midrib or midrib only visible to c. 1 mm from the base; anthers orbicular; style 0.2–0.5 mm 3
- 3a. Sepals without midrib; petals minute, 0.5–1 mm long, apex not bifid **1. *P. corymbosa***
 b. Sepals with a 1 mm long midrib visible at the base; petals 1.2–2 mm long, apex often bifid **3. *P. timorensis***

1. *Polycarpaea corymbosa* (L.) Lam.

Polycarpaea corymbosa (L.) Lam., Ill. Gen. Encycl. 2 (1797) 129; Wight, Icon. (1843) 712; Benth., Fl. Austr. 1 (1863) 166; Edgew. & Hook. f., Fl. Brit. India 1 (1874) 245; F.-Vill., Noviss. App. (1880) 15; Gagnepain, Fl. Gén. Indo-Chine 1 (1909) 267; Suppl. 1 (1943) 243; Merr., Philipp. J. Sc., Bot. 5 (1910) 347; Enum. Philipp. Flow. Pl. 2 (1923) 139; Craib, Fl. Siam. Enum. 1 (1925) 190; Auct. mult., Icon. Cormoph. Sin. 1 (1972) 620, f. 1240; K. Larsen, Dansk Bot. Ark. 23 (1963) 61; in Fl. Camb., Laos & Vietnam (1989) 70, f. 9: 8–15; in Fl. Thailand 5 (1992) 417, f. 93: 8–15; Pham-hoàng Hô, Ill. Fl. Vietnam 1 (1991) 936, f. 2632; N.C. Majumdar in Fl. India 2 (1993) 549; Wadhwa in Fl. Ceylon 10 (1996) 66; Ke Ping in Fl. Reip. Pop. Sin. 26 (1996) 63, f. 13: 4–7; Lu Dequan & M.G. Gilbert in Fl. China 6 (2001) 7. — *Achyranthes corymbosa* L., Sp. Pl. (1753) 205. — Type: *Herb. Hermann* (BM lecto), Ceylon.

Usually erect, polymorphous annual. Stems sometimes branched from the base, but often with a single stiff stem up to 40 cm, glabrous or greyish velutinous when young, particularly at the internodes. Leaves linear, 5–30 by 0.5–1 mm, acute, often mucronate, glabrous when fully grown. Stipules triangular, 3–6 mm, long acuminate. Inflorescence terminal, dense; pedicels filiform, glabrous or woolly hairy; bracts scarious, white or pale reddish brown. Sepals triangular, long-acuminate, scarious, 1.5–3 mm long, midrib only present as a dark spot at the base. Petals scarious, ovate-orbicular, truncate, c. 1 mm, brownish. Stamens with filaments shorter than petals; anthers orbicular, c. 0.2 mm; staminodes very minute or absent. Ovary almost spherical, c. 10-ovuled, c. 0.5 mm; style shorter than ovary; stigma 3-lobed. Capsule obovoid. Seeds reniform, reticulate, yellowish brown. — Fig. 5: 8–15.

Distribution — Widely distributed in the Old World tropics, throughout continental Southeast Asia to Australia. In *Malesia* recorded from the Philippines (Luzon), Lesser Sunda Islands (Sumba), Moluccas (Taliabu Island), and Papua New Guinea.

Habitat & Ecology — On gravelly, often poor soil in exposed places as waysides, grassland, from sea level up to 1500 m altitude. Also found in *Eucalyptus* savannah near Port Moresby.

2. *Polycarpaea sumbana* K. Bakker

Polycarpaea sumbana K. Bakker, Acta Bot. Neerl. 6 (1957) 52. — Type: *Iboet 51* (L. holo, BO), Sumba.

Annual herb up to 15 cm. Stems thin, erect, densely pubescent to almost glabrous. Leaves sessile, linear, sparsely pubescent, 3–6 by 0.7 mm, apex mucronate. Stipules scarious, ovate-oblong, acute, apex irregularly fimbriate, 2.5 by 0.7 mm. Bracts scarious with nearly amplexicaul base, ovate-elliptic, acute-acuminate, with minutely serrate

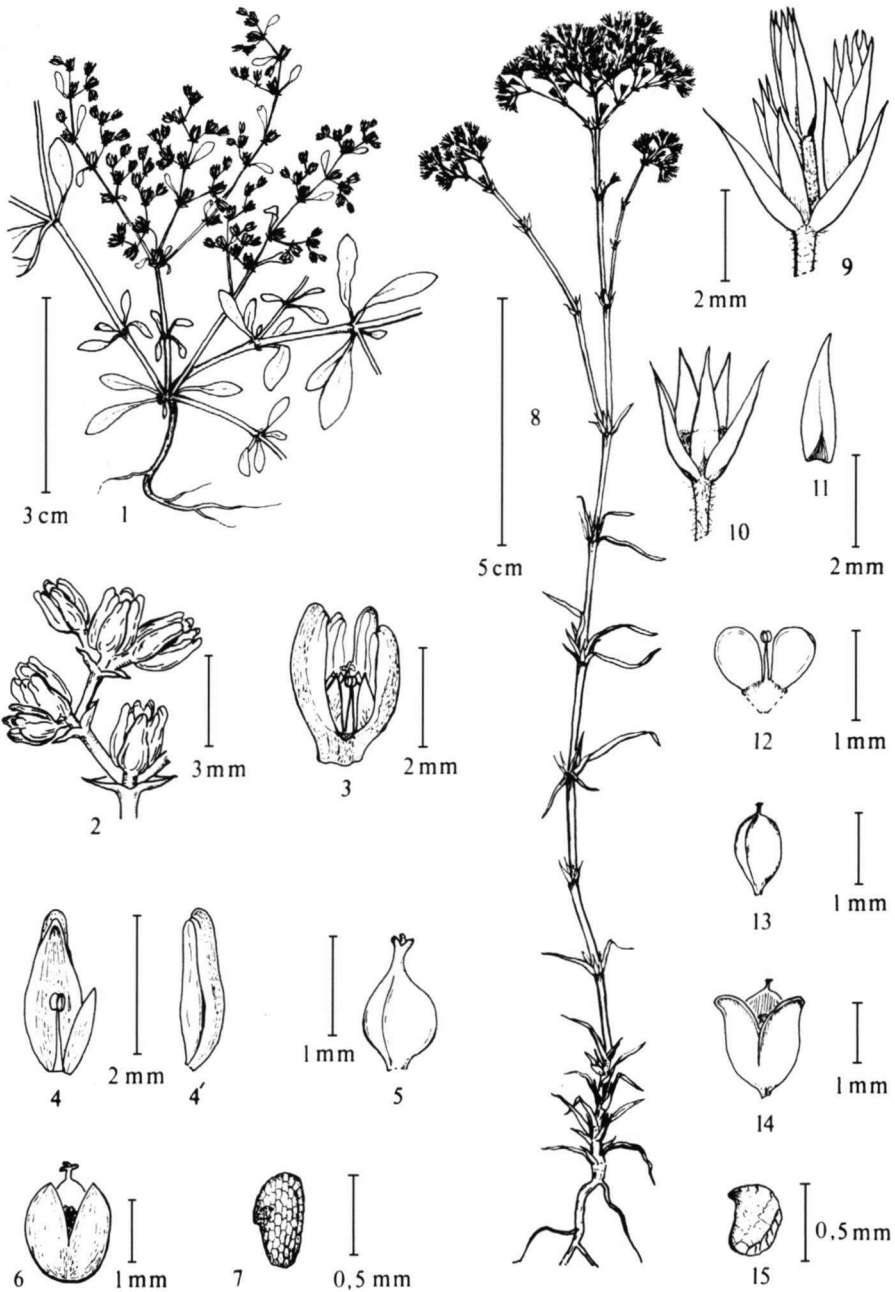


Fig. 5. *Polycarpon prostratum* (Forssk.) Asch. & Schweinf. — 1. Flowering branch; 2. partial inflorescence; 3. flower, one sepal removed; 4. sepal with petal and stamen; 4'. sepal in side view; 5. ovary; 6. open capsule; 7. seed. — *Polycarpaea corymbosa* (L.) Lam. — 8. Habit; 9. partial inflorescence; 10. flower; 11. sepal; 12. petals and stamen; 13. ovary; 14. fruit; 15. seed. — Reproduced from Flora of Thailand 5 (1992) 417, f. 93.

margin, 2.5–3 by 1.5 mm; pedicels c. 1 mm. Sepals 5, scarious, ovate-oblong, acute, glabrous, 3–4.5 by 1–1.5 mm, with midrib 1–1.5 mm from the base. Petals scarious, free, narrowly oblong, 2.5–3 by 0.5–0.7 mm, usually with clearly 2-dentate apex. Stamens 2.5–3 mm long; anthers oblong, 0.5 mm. Ovary ellipsoid. Capsule ellipsoid, 1.7 mm long. Seeds c. 8, subreniform, 0.5 mm, light brown.

Distribution — Endemic to the Lesser Sunda Islands (Sumba).

Habitat & Ecology — Found on dry limestone rocks, in old clearings and along the coast in *Pandanus* vegetation.

3. *Polycarpaea timorensis* K. Bakker

Polycarpaea timorensis K. Bakker, Acta Bot. Neerl. 6 (1957) 53. — Type: *Walsh 351* (L holo, BM, BO), W Timor, Mt Mutis.

Annual herb up to 10 cm. Stems thin, erect, densely pubescent, glabrescent. Leaves sessile, linear, mucronate, 3–6 by 0.5–0.7 mm, with acute apex. Stipules scarious, oblong, 2 by 0.7 mm, acute-acuminate, with irregularly incised margin. Bracts scarious, convex with almost amplexicaul base, ovate-oblong, acute, 2–2.5 by 1–1.5 mm; pedicels 1–2 mm. Sepals scarious, ovate-oblong, acute, c. 3 by 1 mm, midrib visible 1 mm up from the base. Petals 1-nerved, elliptic-oblong, 1.2–2 by 0.3–0.7 mm, apex broadly rounded, bidentate or irregularly dentate. Stamens 5, c. 1.5 mm; anthers orbicular, 0.2 mm. Staminodes 5, minute scales. Ovary ellipsoid, c. 0.5 mm or less; style short, 0.3–0.5 mm, stigma 3-lobed. Capsule short-stalked, ellipsoid, 1.5–2 by 0.7–1 mm. Seeds c. 6, reniform, c. 0.5 mm.

Distribution — Endemic to Timor, Lesser Sunda Islands, only known from the type locality, at 1200 m altitude.

4. *Polycarpaea zollingeri* (Fenzl) K. Bakker

Polycarpaea zollingeri (Fenzl) K. Bakker, Acta Bot. Neerl. 6 (1957) 52. — *Aylmeria zollingeri* Fenzl in Zoll., Syst. Verz. (1855) 141, nomen; Nat. Tijd. Ned. Ind. 14 (1857) 163; Miq., Fl. Ned. Ind. 1 (1855) 1052. — Type: *Zollinger HZ 1096* (P holo, BO), Sumbawa, Mt Tabora.

Slender, erect, pubescent annual. Leaves sessile, narrowly elliptic to linear, mucronate, pubescent, 2–7 by 1–2 mm. Stipules narrowly ovate-oblong, 4 by 0.7 mm including a 2 mm thread-like apex; apex not quite entire. Bracts triangular-ovate, with a truncate stem-clasping base, 2.5–3 by 1–1.5 mm, apex acute, lacerate with a few linear slips; pedicels c. 1 mm, pubescent. Sepals scarious, ovate-oblong, acute, 3.5–4 by 1.3 mm, central part c. 0.5 mm wide, green, herbaceous, appressedly hairy, disappearing c. 1 mm below apex, with 3 anastomosing nerves. Petals scarious, oblong-elliptic, with blunt apex, slightly erose or bifid, 1.5–2.5 by 0.7–1 mm, midrib well-marked, disappearing c. 1 mm below apex. Stamens 1–2 mm; anthers oblong, 0.5–0.7 mm; staminodes minute, triangular-acute or thread-like and hardly visible. Ovary ellipsoid, 1 by 0.5–0.7 mm; style slender, 1–1.5 mm; stigma punctate. Capsule ellipsoid, 2 by 1 mm, brownish striate in upper part. Seeds numerous, reniform, light brown with darker spots, 0.3–0.5 mm.

Distribution — Endemic to the Lesser Sunda Islands. Besides the type collection from Mt Tabora, there is a slightly deviating collection from Flores. It has bifid petals and a shorter style.

Habitat & Ecology — Sandy places between sea level and 1800 m altitude.

POLYCARPON

Polycarpon L., Syst. Nat. ed. 10 (1759) 859 ('*Polycarpa*'), 881, 1360; Pax & Hoffm. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2, 16c (1934) 308; Bittrich in Kubitzki et al., Fam. Gen. Vasc. Pl. 2 (1993) 221. — *Polycarpum* Scop., Intr. Hist. Nat. (1777) 330. — *Polycarpus* Post & Kuntze, Lexic. Gen. Phanerog. (1903) 453, p.p. — Type: *Polycarpon tetraphyllum* (L.) L.
Arversia G. Don, Gen. Hist. 3 (1834) 92.
Hapalosia Wight & Arn., Prodr. (1834) 358.

Small annual or perennial herbs. Stems richly branched from the base. Leaves opposite, small or pseudo-verticillate. Stipules scarious. Inflorescence in dense or loose cymes. Flowers small. Bracts small, scarious. Sepals 5, free, green, carinate with scarious margin. Petals 5 or fewer, shorter than sepals. Stamens 5 or fewer, opposite to the sepals; minute staminodes sometimes present; filaments ± united at the base. Ovary unilocular; ovules few to many. Style with 3-lobed stigma. Capsule shorter than sepals, splitting almost to base into 3 spirally twisting valves. Seeds ovoid to lenticular. — Fig. 5: 1–7.

Distribution — About 18 closely related species distributed throughout the Mediterranean region, 2 species in South America, 2 species in tropical Asia.

***Polycarpon prostratum* (Forssk.) Asch. & Schweinf.**

Polycarpon prostratum (Forssk.) Asch. & Schweinf., Osterr. Bot. Zeitschr. 39 (1889) 128; Milne-Redhead, Kew Bull. 3 (1948) 451; Turrill, Fl. Trop. E. Afr., Caryophyll. (1956) 5; Grierson in Fl. Bhutan 1, 2 (1987) 216; K. Larsen in Fl. Camb., Laos & Vietnam (1989) 67, f. 9: 1–7; in Fl. Thailand 5 (1992) 415, f. 93: 1–7; Pham-hoàng Hô, Ill. Fl. Vietnam 1 (1991) 938, f. 263; N.C. Majumdar in Fl. India 2 (1993) 553, f. 114; Wadhwa in Fl. Ceylon 10 (1996) 62; Ke Ping in Fl. Reip. Pop. Sin. 26 (1996) 62, f. 13: 1–3; Lu Dequan & M.G. Gilbert in Fl. China 6 (2001) 6. — *Alsine prostrata* Forssk., Fl. Aegypt.-Arab. (1775) 207. — *Polycarpaea prostrata* (Forssk.) Decne., Ann. Sci. Nat., sér. 2, Bot., 3 (1835) 263. — *Robbireia prostrata* (Forssk.) Boiss., Fl. Orient. 1 (1867) 735, p.p. — *Polycarpa prostrata* (Forssk.) Kuntze, Rev. Gen. Pl. 1 (1891) 51. — Type: *Forsskål* (C holo), Cairo.

Pharnaceum depressum L., Mant. 2 (1771) 562. — *Polycarpaea depressa* (L.) DC., Prodr. 3 (1828) 357. — *Arversia depressa* (L.) Klotzsch., Peters. Mossamb. Bot. 1 (1861) 140. — *Polycarpum depressum* (L.) Rohrb. in Martius, Fl. Bras. 14, 2 (1872) 257. — Type not designated.

Loeflingia indica Retz., Obs. Bot. 4 (1786) 38, nom. illeg. — *Polycarpon indicum* (Retz.) Merr., Philipp. J. Sc., Bot. 10 (1915) 302; Enum. Philipp. Flow. Pl. 2 (1923) 139, nom. illeg.

Polycarpaea memphitica Del., Descr. Egypt. Hist. Nat. 2 (1813) 211, t. 24. — *Arversia memphitica* (Del.) Webb, Fragm. Fl. Aethiop.-Aegypt. (1854) 40. — Type not designated.

Polycarpon apurense Kunth, Nov. Gen. et Sp. 6 (1823) 40. — Type not designated.

Arversia frankenioides Cambess. in A. St. Hil., Fl. Bras. Merid. 2 (1829) 184, t. 112. — Type not designated.

Hapalosia loeflingiae Wight & Arn., Prodr. 1 (1834) 358, nom. illeg. — *Arversia loeflingiae* (Wight & Arn.) Walp., Rep. 1 (1842) 263. — *Polycarpon loeflingii* (Wight & Arn.) Benth. in Benth. & Hook. f., Gen. Pl. 1 (1862) 153; Edgew. & Hook. f., Fl. Brit. India 1 (1874) 245; Merr., Govt. Lab. Publ. (Philipp.) 27 (1905) 19; Gagnepain, Fl. Gén. Indo-Chine 1 (1909) 271; Suppl. 1 (1943) 246. — Type: *Wallich 6962* (K), India.

Polycarpon polyphyllum Blanco, Fl. Filip. (1837) 53; ed. 2 (1845) 36; ed. 3, 1 (1877) 66. — Type not designated.

Polycarpa pusilla Hiern, Cat. Afr. Pl. Welw. 1 (1896) 50, nom. illeg.

Polycarpon loeflingii (Wight & Arn.) Benth. var. *tonkinense* Gagnepain, Fl. Gén. Indo-Chine 1 (1909) 272. — Type: *Bon 1537* (P lecto), Vietnam.

Polycarpon brachypetalum Gagnepain, Bull. Soc. Bot. France 56 (1909) 37. — Type: *Talmy 275* (P lecto), Vietnam.

Annual herb. Stems usually richly branched from the base, ascending, up to 40 cm, glabrous or pubescent. Leaves spatulate to narrowly elliptic, 5–20 by 2–3 mm, with acute apex; sessile or shortly petiolate. Inflorescence axillary or terminal leafy cymes; peduncles 5–10 mm, pubescent; bracts 2–3 mm; pedicels very short. Sepals 1–2(–2.5) mm, carinate with a broad scarious margin. Petals 3–5 (or 0), white or pink, narrowly elliptic, hyalinous, much shorter than sepals, very fragile. Stamens 5, sometimes fewer, shorter than sepals. Ovary ovoid, short; ovules numerous. Capsule enclosed by persistent sepals. Seeds numerous, oblong-cylindrical, reticulate, 0.5 by 0.2 mm. — **Fig. 5: 1–7.**

Distribution — Probably Mediterranean in origin, now cosmopolitan in tropical and subtropical regions. In *Malesia* only recorded from the Philippines; no material seen in L.

Habitat & Ecology — On sandy soil along rivers, also weedy in rice fields after the harvest, and along roadsides.

SAGINA

Sagina L., Sp. Pl. (1753) 128; Gen. Pl. ed. 5 (1754) 62; Pax & Hoffm. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2, 16c (1934) 326; Mizush., J. Jap. Bot. 35 (1960); G.E. Crow, *Rhodora* 80 (1978) 1. — Type: *Sagina procumbens* L.

Annual or perennial, usually small herbs, glabrous or glandular hairy, richly branched, forming loose tufts or mats, or dense cushions. Stems often filiform. Leaves exstipulate, very narrow, opposite, slightly connate at the base, with or without ciliate margin. Flowers axillary, solitary or in few-flowered cymes; pedicels glabrous or hairy, very thin. Sepals 4 or 5, erect or patent. Petals white, 4 or 5, entire, ovate or obovate, sometimes minute or absent. Stamens 4–5 or 8–10, the inner episealous with a nectarial gland at the base. Ovary ovoid; ovules numerous; styles same number as sepals. Capsule ovoid to cylindrical, opening \pm to the base by 4 or 5 valves. Seeds numerous, very small (0.2–0.5 mm), dark brown, reniform, papules. — **Fig. 6.**

Distribution — About 25 species, widely distributed particularly in the temperate zone of the northern hemisphere. In America especially along the Cordillera in both North and South America. In Africa besides the Mediterranean region occurring in Ethiopia. Several species in the Himalayan region, through China to Japan, New Guinea, New Zealand and Hawaii. In *Malesia* 7 species.

Habitat & Ecology — Mountain plants, mostly from higher altitudes, in grassland, scree and other open habitats. Few species have become weedy; particularly *S. procumbens* has become a cosmopolitan weed with a wide ecological amplitude.

Taxonomy — About 25 species; the specific delimitation, however, is in many cases uncertain. There is no recent monograph and the genus is in need of a thorough revision. The arctic-alpine species were dealt with by Gams, *Phyton* 5 (1953) 107.

Note — An unpublished study by J.F. Veldkamp (L), Dutch, and Indonesian students from Herbarium Bogoriense (BO) and University Padjadjaran, Bandung (FMIPA) has been a great help in the revision of this genus.

KEY TO THE SPECIES

- 1a. Sepals and petals always 4 **5. *S. procumbens***
 b. Sepals and petals usually 5 2
 2a. Leaves not densely imbricate, stems clearly visible 3
 b. Leaves densely imbricate, stems not visible 4
 3a. Sepals shorter than petals; pedicels \pm densely pubescent 5
 b. Sepals longer than petals; pedicels glabrous **1. *S. belonophylla***
 4a. Leaves erect; pedicels 6–20 mm; sepals with apex obtuse to cucullate **6. *S. rupestris***
 b. Leaves patent; pedicels 4 mm; sepals with apex acute **2. *S. donatioides***
 5a. Flowers axillary, solitary; leaves not more than 15 mm long 6
 b. Flowers 2–4 in a terminal monochasium; leaves on non-flowering shoots 8–45 mm long **3. *S. monticola***
 6a. Sepals not strongly nerved, only slightly white-dotted; capsule longer than sepals **7. *S. saginoides***
 b. Sepals strongly white-dotted, prominently nerved; capsule shorter than sepals **4. *S. papuana***

1. *Sagina belonophylla* Mattf.

Sagina belonophylla Mattf., Bot. Jahrb. Syst. 70 (1940) 468; Merr. & L.M. Perry, J. Arnold Arbor. 23 (1942) 387; P. Royen, Alpine Fl. New Guinea 3 (1982) 2349, f. 699. — Type: *Clemens 7561b* (B holo, destroyed?, L), Papua New Guinea, Mt Saruwaket.

Perennial herb forming dense cushions or mats up to 15 cm across. Stems glabrous, 1–8 cm long, densely leafed. Leaves aciculate, glabrous, sometimes seemingly whorled, 2–7 by 0.5–1 mm, apex mucronate, base widened. Flowers terminal, solitary; pedicels glabrous, 3–5 mm. Sepals 5, glabrous, oblong-elliptic, 2–4 by 1–1.5 mm, apex obtuse to subacute, 3-nerved. Petals 5, glabrous, spatulate, 2–2.8 by 1 mm, apex acute, base narrowed. Stamens 10, 2–2.5 mm, filaments connate at the base, glabrous, the episepalous with a small gland at the base. Ovary broadly ovoid-globose; styles 4 or 5. Capsule glabrous, 2–3 mm long, opening by 4 or 5 teeth. Seeds reniform, brown, finely granulate, c. 0.5 mm.

Distribution — In *Malesia*: endemic to New Guinea, occurring in Irian Jaya (Mt Trikora, Carstensz Mts) and Papua New Guinea (Star Mts, Mt Saruwaket).

Habitat & Ecology — In alpine grassland on moist rocks, in old grassy screes, 3650–4700 m altitude. Flowering Sep.–Dec.

2. *Sagina donatioides* F. Muell.

Sagina donatioides F. Muell., Trans. Roy. Soc. Vict. 1 (1889) 3; Mattf., Bot. Jahrb. Syst. 69 (1938) 271; P. Royen, Alpine Fl. New Guinea 3 (1982) 2347, f. 698. — Type: *MacGregor s.n.* (MEL holo, L), Papua New Guinea, Owen Stanley Range.

Perennial herb up to 1 cm, forming dense cushions, sometimes with a few longer shoots up to 3 cm. Stems glabrous, terete, densely leafed. Leaves linear, glabrous or ciliate along margin in lower part and on the lower side, 2–7 by 1–2 mm on the tufted, short branches, up to 12 by 1.5 mm on the elongate shoots; apex acute, mucronate, widened

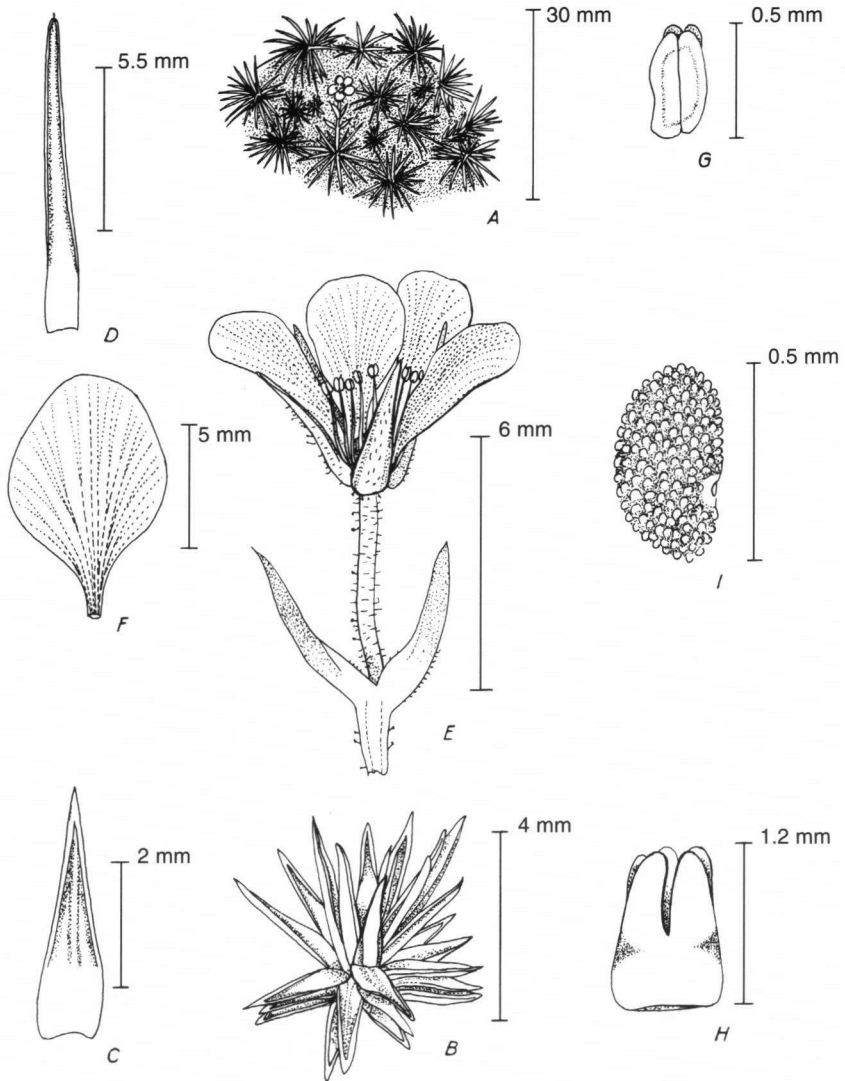


Fig. 6. *Sagina donatioides* F. Muell. — A. Part of cushion; B. tip of stem; C. leaf, upper side; D. leaf along more elongate stems; E. flower and bracteoles; F. petal; G. anther; H. capsule; I. seed (*MacGregor s.n.*). — Reproduced from P. van Royen, *Alpine Flora of New Guinea* 3 (1982) 2348, f. 698.

towards the base, membranaceous, with thickened margin. Flowers terminal, solitary; pedicels \pm pilose with scattered glandular hairs, 2–3.5 mm. Sepals 5, glabrous or with scattered hairs on the outer side, linear ovate, 4 by 2 mm, apex acute, base thickened and saccate, margins involute. Petals 5, glabrous, broadly ovate or suborbicular, 5–6 by 2.5–3 mm. Stamens 10, c. 3.5 mm, filaments glabrous, slender. Ovary glabrous, ovoid; styles 5, c. 3 mm. Capsule glabrous, ovoid-cylindrical, 2.5–3 mm long, opening by 5 obtuse valves. Seeds reniform, 0.5 mm, light brown with dark brown papillae. — Fig. 6.

Distribution — In *Malesia*: endemic to New Guinea, only known from the type locality and vicinity of Mt Victoria, Papua New Guinea.

Habitat & Ecology — Open, alpine grassland and in rock crevices, about 3500 m altitude. Flowering June–July.

3. *Sagina monticola* Merr. & Perry

Sagina monticola Merr. & L.M. Perry, *J. Arnold Arbor.* 30 (1949) 39; P. Royen, *Alpine Fl. New Guinea* 3 (1982) 2346. — Type: *Brass 11569* (iso seen from L), Irian Jaya.

Perennial herb; young shoots glandular, later glabrous. Lower leaves slightly succulent, linear, mucronate, up to 35 by 5 mm; ciliate at margin and on the midnerve; leaves diminishing upwards, at apex 3–4 mm long. Flowers 5-merous; pedicels 6–20 mm, glandular puberulous. Sepals glandular puberulous, elliptic, 3–4 by 2 mm, with obtuse apex, 3-nerved at the base. Petals white, oblong with rounded apex, slightly longer than sepals. Stamens 10, filaments 2–2.5 mm long. Ovary ovoid, c. 3 by 2 mm; styles 5. Capsule c. 4 mm long. Seeds obliquely subrotundate, 0.6–0.8 mm, finely muricate.

Distribution — In *Malesia*: endemic to New Guinea, only known from the type locality (Bele River, 18 km NE of Lake Habbema).

Habitat & Ecology — In crevices in limestone cliffs.

Note — The species was identified by Hayata in *J. Arnold Arbor.* 23 (1942) 388 as *S. echinisperma* Hayata. Dr H. Hara, however, as mentioned by Merrill & Perry, l.c., has shown that the New Guinean plant is different from the Taiwanese species, that has proven to be *S. japonica* (Sw.) Ohwi, a species common in Japan. No material has been found in L.

4. *Sagina papuana* Warb.

Sagina papuana Warb., *Bot. Jahrb. Syst.* 16 (1892) 14, 21; Schum. & Lauterb., *Fl. Schutzgeb. Südsee* (1900) 310; Mattf., *Bot. Jahrb. Syst.* 69 (1938) 270; Merr. & L.M. Perry, *J. Arnold Arbor.* 23 (1942) 388; Hoogland, *Blumea*, Suppl. 4 (1958) 228; P. Royen, *Alpine Fl. New Guinea* 3 (1982) 2351, f. 700, pl. 167. — Type: *Helwig 350* (B holo, destroyed?), Papua New Guinea, Finisterre. *Sagina keysseri* Mattf., *Bot. Jahrb. Syst.* 62 (1929) 475. — Type: *Keysser s.n.* (B holo, destroyed?), Papua New Guinea, Mt Saruwaket.

Polymorphous perennial herb often growing in loose mats or low, dense cushions. Stems glabrous, terete to angular, slender, short or up to 25 cm with long internodes. Leaves glabrous or with few hairs along the margin, linear to acicular, 4–13 by 1 mm, cuspidate at apex, with broadened sheath-like base. Flowers solitary, apparently axillary (but terminal on very short axillary shoots); pedicels slender, finely hairy, 3–20 mm, usually thickened below calyx. Sepals 3–5, herbaceous, ovate-oblong, 3–6 by 2–2.5 mm, apex obtuse, base truncate to subsaccate, 3-nerved. Petals (0), 4 or 5, oblong-ovate or oblong-narrowly elliptic, apex obtuse or mucronate. Stamens 8–10, 2.5–3 mm, filaments of episepalous stamens with a small basal gland. Ovary glabrous, broadly ovoid. Capsule glabrous, 3–6 by 3–4.5 mm, opening by 5 valves. Seeds reniform, dark reddish brown, smooth, c. 0.5 mm.

Distribution — In *Malesia*: Philippines (Luzon), Sulawesi, Moluccas (Ceram), New Guinea (Irian Jaya and Papua New Guinea). In New Guinea it is the most common species of *Sagina*.

Habitat & Ecology — Found in various plant communities in the montane to subalpine zone, as e.g. humid grasslands, old rock screes, open beds of streams, alpine bogs, moss cushions, and swamps, at 1000–4100 m altitude. Flowering throughout the year.

Note — This is a polymorphous species. Mattfeld, l.c. 270, mentions that the type has apetalous flowers, while other collections have 4 or 5 petals. There is also variation in life forms as some of the collections from about 3000 m altitude form dense mats and have small flowers with sepals only 3 mm and seeds 0.3–0.4 mm. Plants with pentamerous flowers often produce some 4-merous ones. In most collections the petals are said to be white, but in e.g. *Brass* 4388 they are described as pale pink.

5. *Sagina procumbens* L.

Sagina procumbens L., Sp. Pl. (1753) 128; Benth., Fl. Austr. 1 (1863) 160; Edgew. & Hook. f., Fl. Brit. India 1 (1874) 242; Merr. & Rolfe, Philipp. J. Sc., Bot. 3. (1908) 97; *ibid.*, Bot. 5 (1910) 346; Merr., Enum. Philipp. Flow. Pl. 2 (1923) 138; Mizush. in Fl. E. Himal. (1966) 81; Grierson in Fl. Bhutan 1, 2 (1987) 214; N.C. Majumdar in Fl. India 2 (1993) 558; Ke Ping in Fl. Reip. Pop. Sin. 26 (1996) 253, f. 61: 1; Lu Dequan & R.K. Rabeler in Fl. China 6 (2001) 10. — *Alsine procumbens* (L.) Crantz, Inst. Rei. Herb. 2 (1766) 404. — Type: Illus. in Séguier, Pl. Veron. 1 (1745) 421, t. 5, f. 3, lecto.

Sagina breviflora Gilib., Fl. Lit. Inch. 2 (1782) 148. — Type not designated.

Perennial, rarely annual or biennial herbs, forming dense or loose, 2–5 cm high tufts. Stems slender, glabrous, with a basal leaf rosette producing numerous procumbent, rooting sidebranches. Leaves linear subulate to almost filiform, glabrous or rarely ciliate, mucronate, 5–12 mm long, joined at the base. Flowers solitary in the leaf axils. Sepals 4, broadly ovate, obtuse, green, with a very narrow scarious margin, without visible veins. Petals 4, broadly ovate, half as long as the petals or less, rarely absent. Stamens 4, rarely 5, episepalous and shorter than sepals. Styles 4, shorter than ovary. Capsule about twice as long as the first appressed and later patent persistent sepals, opening by 4 obtuse valves. Seeds brown, c. 0.3 mm, papillose, with a dorsal furrow.

Distribution — Widely distributed on the northern hemisphere from the arctic zone southwards; now almost cosmopolitan. In *Malesia* only recorded from the Philippines (Luzon: Benguet) and from West Malaysia (twice collected in Genting Highlands around the Genting Hotel, c. 1800 m altitude). An easily overlooked species that could be expected elsewhere.

Habitat & Ecology — This very polymorphous species occupies a variety of habitats, in the tropics mainly found at higher altitudes as a weed. In Luzon on wet cliffs, seepage slopes from 1800 to 2700 m altitude.

Note — A large number of infraspecific taxa have been described, some of which have also been raised to specific rank.

6. *Sagina rupestris* K. Larsen

Sagina rupestris R.T.A. Schouten ex K. Larsen, Nordic J. Bot. 18 (1989) 421. — Type: *Veldkamp & Stevens* 5757 (L. holotype), Papua New Guinea, Mt Suckling.

Perennial tufted herb, up to 10 cm with upright stem. Leaves sessile, appressed to the stem, densely imbricate, bases of leaf pair joined to a short sheath, lamina 3–13 by 0.3–0.5 mm, 1-nerved, apex acute, pointed. Flowers solitary in the axils; pedicel erect, quad-

angular, densely hairy. Sepals 1-nerved, 2.5–3.5 mm long. Petals 5, twice as long as the sepals, with rounded apex. Stamens 10, shorter than petals. Ovary spherical; styles 5, free, c. 1.5 mm long; ovules many. Capsule ellipsoid, c. 3.5 by 2 mm, longer than the sepals. Seeds dark brown, papillate, c. 0.7 mm.

Distribution — In *Malesia*: endemic to New Guinea, only known from the type locality and its vicinity.

Habitat & Ecology — Barren stony flats mainly covered by short grasses and scattered coppices. Sometimes the species forms small tussocks in crevices and between gravel, altitude above 3000 m.

Note — This species was first recognised by Mr. R.T.A. Schouten during a Masters' course held by Dr. Veldkamp at the Herbarium, Leiden. Apart from the type collection there are three more collections from Mt Suckling made by Stevens & Veldkamp.

7. *Sagina saginoides* (L.) H. Karst.

Sagina saginoides (L.) H. Karst., Deutsche Fl. (1882) 539; Mizush., Fauna & Flora Nep. Himal. (1955) 124; J. Jap. Bot. 35 (1960) 194; Ohwi, Fl. Jap. (1965) 424; Hara, Enum. Flow. Pl. Nepal 2 (1979) 55; Grierson in Fl. Bhutan 1, 2 (1987) 214; K. Larsen, Fl. Camb., Laos & Vietnam 24 (1989) 86; Pham-hoàng Hô, Ill. Fl. Vietnam 1 (1991) 935, f. 2629; N.C. Majumdar in Fl. India 2 (1993) 559; Wadhwa, Fl. Ceylon 10 (1996) 55; Ke Ping in Fl. Reip. Pop. Sin. 26 (1996) 255, f. 13: 2–7; Lu Dequan & R.K. Rabeler in Fl. China 6 (2001) 10. — *Spergula saginoides* L., Sp. Pl. (1753) 441. — Type: *Linnean Herb.* 604-6 (LINN).

Sagina micrantha Bunge in Ledeb., Fl. Altaic. 2 (1830) 183. — Type not designated.

Sagina linnaei Presl, Reliq. Haenk. 2 (1831) 14. — Type not designated.

Sagina macrocarpa Maly, Enum. Pl. Phan. Austriac. (1848) 239; Backer & Bakh. f., Fl. Java 1 (1963) 209; Steenis, Mount. Fl. Java (1972) pl. 8, f. 5. — Type not designated.

Sagina procumbens auct. non L.: Edgew. & Hook. f., Fl. Brit. India 1 (1874) 242.

Sagina micrantha Boreau, Bull. Soc. Bot. France 22, Bibl. (1875) 186; Backer & Bakh. f., Fl. Java 1 (1963) 209, nom. nud.

Perennial polymorphous herb forming ± dense, 2–10 cm high mats or tufts. Stems erect or procumbent, rooting at the base, glabrous or glandular hairy in upper part. Leaves glabrous, linear-narrowly elliptic, mucronate, joined at the base, median nerve strongly marked on underside. Flowers usually solitary in the leaf axils, rarely two together; pedicel filiform, glabrous or glandular pubescent, up to 3 times longer than the corresponding internode, up to 25 mm in fruit, first erect, after anthesis curved downwards, later in the fruiting stage again erect. Sepals (4 or) 5, ovate-oblong, c. 3 mm long, glabrous or ± glandular pubescent, obtuse, with narrow scarious margin. Petals (4 or) 5, ovoid, obtuse, as long as or shorter than the sepals, rarely absent. Stamens 10, rarely fewer, as long as the petals. Ovary ovoid, glabrous. Capsule ± cylindrical to ovoid, about twice as long as the persistent calyx, opening to the base by (4 or) 5 valves. Seeds ± deltoid, 0.3–0.5 mm diameter, pale brown, finely verrucose or glabrous.

Distribution — Widely distributed on the northern hemisphere, e.g. in the Himalayan region, China, Japan, and N Vietnam. In *Malesia* only recorded from Java (Cibodas, Preanger and Tengger Mts).

Habitat & Ecology — Mainly confined to high mountains, in Java from 880–2000 m on soggy riverbanks, and in open wet places among moss; also found in ruderal places as e.g. factory yards, old walls, and abundant in flower pots in nurseries and in gardens.

Note — Backer & Bakhuizen f., l.c., divided the species into two but we are of the same opinion as Mizushima, l.c., that it is not possible to maintain this separation. The whole variation within the *Sagina saginoides*-complex is in need of a revision, as our present knowledge is mainly based on European and North American material.

SAPONARIA

Saponaria L., Sp. Pl. (1753) 408; Gen. Pl. ed. 5 (1754) 191; Simmler, Denkschr. Akad. Wiss. Wien Math.-Naturw. Kl. 85 (1910) 433; Pax & Hoffm. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2, 16c (1934) 361. — Type: *Saponaria officinalis* L.

Annual, biennial, or mostly perennial herbs, glabrous or hairy. Leaves of varying shape, sessile or petiolate. Inflorescences cymose, capitate or paniculate. Calyx cylindrical, many-nerved. Bracts herbaceous, bracteoles absent. Calyx cylindrical, 5-dentate. Petals with winged claw, lamina with or without coronal scales. Stamens 10. Ovary with many (rarely few) ovules. Styles 2 (or 3). Capsule dehiscent by 4(–6) short valves or teeth. Seeds reniform, flat, tuberculate.

Distribution — About 40 Eurasian species from the Mediterranean region to W Asia. In *Malesia* only one cultivated species.

Habitat & Ecology — Open grassland, mountain scree and in rock crevices.

Note — The genus is closely related to *Silene* and *Gypsophila*.

Saponaria officinalis L.

Saponaria officinalis L., Sp. Pl. (1753) 408; Backer, Schoolfl. Java (1911) 81; Backer & Bakh. f., Fl. Java 1 (1963) 213; Tang Changlin in Fl. Reip. Pop. Sin. 26 (1996) 429; Lu Dequan, M. Lidén & B. Oxelman in Fl. China 6 (2001) 108. — *Lychnis officinalis* (L.) Scop., Fl. Carn. ed. 2, 1 (1772) 303. — *Silene saponaria* Fries ex Willk. & Lange, Prod. Fl. Hisp. 3 (1880) 671. — Type: *Cliffort Herb. 165* (BM lecto).

Perennial herb with creeping rhizome. Stems erect, little branched, 0.5–2 m, glabrous or woolly hairy. Leaves oblong-elliptic or narrowly elliptic, acute or acuminate, up to 15 by 5 cm, lower ones petiolate, upper ones sessile, distinctly 3-nerved, subglabrous. Inflorescence terminal, short-peduncled, dense corymbs. Flowers fragrant. Calyx light green, cylindrical, in fruiting stage ± inflated, 20–25 mm, glabrous or pubescent, with 2 mm long acuminate teeth. Petals white to pink, claw narrow, mostly longer than calyx, lamina obovate with two, small coronal scales. Capsule oblong-ovoid, as long as calyx or slightly shorter. Seeds almost black, reniform to spherical.

Distribution — From central and southern Europe through Russia to Caucasus. Widely cultivated as an ornamental, also in the New World. In Java locally cultivated as an ornamental, mostly the form with double flowers. There is no material in L.

Vernacular name — Soapwort (English).

SCLERANTHUS

Scleranthus L., Sp. Pl. (1753) 406; Gen. Pl. ed. 5 (1754) 190; Pax & Hoffm. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2, 16c (1934) 336; Rössler, Österr. Bot. Zeitschr. 102 (1955) 30. — Type: *Scleranthus annuus* L.

Annual, biennial, or perennial herbs. Stems pubescent on one or two opposite sides, procumbent or erect. Leaves exstipulate, very narrow, joined at the base. Inflorescence mostly reduced dichotomous cymes, or flowers solitary in the leaf axils, at the base enveloped by two scarious bracts. Flowers perigynous; hypanthium urceolate, about as long as the sepals. Sepals 4 or 5, with scarious margin. Petals 0. Stamens 1–10, connate at the base, sometimes alternating with staminodes. Ovary 1-ovuled; styles 2 with 2- or 3-branched stigma. Fruit a membranaceous utricle surrounded by the thickened hard hypanthium. Seeds compressed, glabrous with thin testa. — Fig. 7.

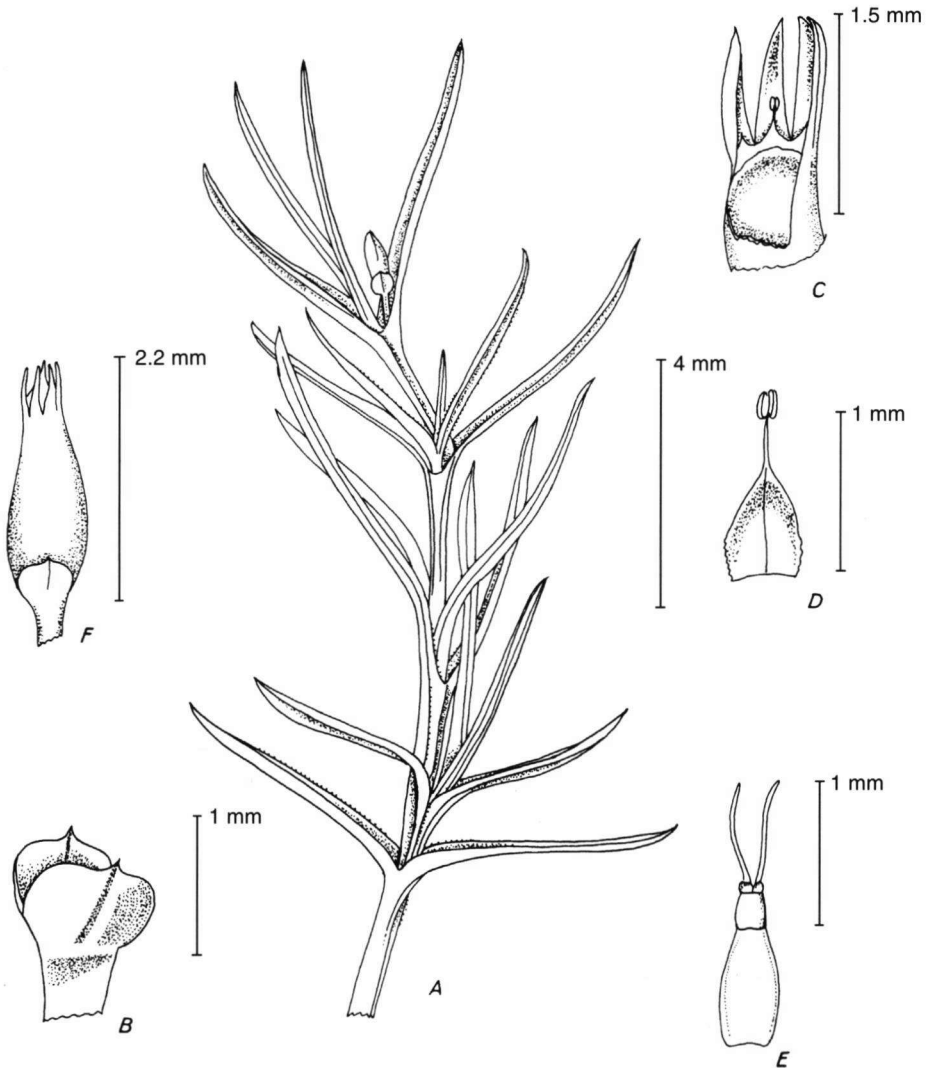


Fig. 7. *Scleranthus singuliflorus* (F. Muell.) Mattf. — A. Part of flowering stem; B. bracts; C. part of corolla; D. stamen; E. gynoecium; F. fruit (Coode & Stevens LAE 51444). — Reproduced from P. van Royen, *Alpine Flora of New Guinea* 3 (1982) 2371, f. 706.

Distribution — About 10 species, mainly in temperate and subtropical Europe and N Africa, also in Australia and New Zealand. In *Malesia* one species in New Guinea.

Habitat & Ecology — Open sandy or gravelly soil or in grassland.

Taxonomy — Several species are very polymorphous and particularly by earlier European authors divided into numerous segregate species, so that as many as 150 species have been described.

***Scleranthus singuliflorus* (F. Muell.) Mattf.**

Scleranthus singuliflorus (F. Muell.) Mattf., Bot. Jahrb. Syst. 69 (1938) 272; P. Royen, Alpine Fl. New Guinea 3 (1982) 2369, f. 706. — *Mniarium singuliflorum* F. Muell., Trans. Phil. Soc. Vict. 1 (1855) 13; Hook. J. Bot. & Kew Misc. 8 (1856) 69. — Type to be selected.

Scleranthus mniarioides F. Muell., Trans. Phil. Soc. Vict. 1 (1855) 13, in syn.; Pl. Col. Victoria (1860-62) 215, t. 12; Benth. Fl. Austr. 5 (1870) 259, nom. illeg.

Perennial, tufted, mat-forming herb. Stems terete to angular, glabrous, richly branched, rooting at the lower nodes. Leaves glabrous, linear, 4–7 mm long, acute to apiculate, 1-nerved, nerve \pm prominent on lower side, margin with scattered papillae, particularly in lower half. Flowers solitary, sessile to subsessile; peduncle elongating in fruit up to 18 mm; bracts glabrous, orbicular to broadly obovate, apiculate, joined at the base, c. 1 mm; pedicels glabrous, up to 1.5 mm. Hypanthium c. 1.5 mm, glabrous. Sepals glabrous, linear, apiculate, with scarious margin. Stamens 1–3, c. 0.8 mm, filaments filiform below the anthers, widening downwards forming a low filament cup, anthers minute. Ovary ellipsoid; styles 2. Utricle narrowly ovoid, c. 2 mm. — **Fig. 7.**

Distribution — Australia and *Malesia*: New Guinea (Irian Jaya and Papua New Guinea).

Habitat & Ecology — Forming dense masses and cushions on wet grassland, dominated by *Deschampsia*, and other swampy ground between 2600 and 4400 m altitude.

SILENE

Silene L., Sp. Pl. (1753) 416; Gen. Pl. ed. 5 (1754) 193; Rohrbach, Monogr. Gatt. *Silene* (1868); Pax & Hoffm. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2, 16c (1934) 343; Chowdhuri, Notes Roy. Bot. Gard. Edinb. 22 (1957) 221; Greuter, Burdet & Long, MED-Checklist 1 (1984) 248; Melzheimer in Fl. Iranica, Cont. 163 (1988) 341. — Type: *Silene gallica* L.

Annual, biennial or perennial herbs, rarely dwarfshrubs. Stems usually erect, glabrous or hairy, sometimes viscid. Leaves exstipulate, simple, opposite, not or only slightly connate at the base. Inflorescence cymose, few- or many-flowered, dense or lax, simple or compound. Epicalyx absent. Flowers 5-merous, mostly bisexual, sometimes unisexual. Calyx mostly consisting of 5 connate sepals, \pm tubular, to spherical, dilated or inflated, 10–20-, 30-, or 60-nerved. Petals 5, long-clawed, with or without coronal scales, lamina entire, emarginate or bifid. Stamens 10, rarely reduced in number in female or bisexual flowers. Ovary 3–5-partite in lower part, in upper part unilocular; styles filiform, usually 3 (rarely 4 or 5). Capsule dehiscent by 3–6 teeth; carpophore present. Seeds numerous, reniform to spherical, sometimes with a dorsal wing.

Distribution — About 700 species of which c. 600 in Eurasia, the remaining in North America and northern Africa. In *Malesia* no indigenous species.

KEY TO THE SPECIES

- 1a. Styles 5 2
 b. Styles 3 3
 2a. Flowers white; leaves ovate to narrowly elliptic or ovate 4. *S. latifolia*
 b. Flowers pink; leaves linear to narrowly elliptic 2. *S. coeli-rosa*
 3a. Plant entirely glabrous 1. *S. armeria*
 b. Stems and leaves pubescent 4
 4a. Calyx 20–30 mm long 5. *S. noctiflora*
 b. Calyx not more than 15 mm long 5
 5a. Lamina of petals 3–5 mm 3. *S. gallica*
 b. Lamina of petals 7–10 mm 6. *S. pendula*

1. *Silene armeria* L.

Silene armeria L., Sp. Pl. (1753) 420; Edgew. & Hook. f., Fl. Brit. India 1 (1874) 218; Backer & Bakh. f., Fl. Java 1 (1963) 210; Grierson in Fl. Bhutan 1, 2 (1987) 204; Wadhwa in Fl. Ceylon 10 (1996) 70; Tang Changlin in Fl. Reip. Pop. Sin. 26 (1996) 394, f. 13: 4–7. — Type: *Linnean Herb.* (LINN), England.

Polymorphous, annual or biennial, glaucous herb. Stems erect, up to 40 cm, viscid in upper part. Leaves spatulate in basal part, early withering; cauline leaves ovate-cordate to narrowly elliptic with acute apex. Inflorescence usually rather densely flowered, but often with two main branches. Calyx cylindrical, widened towards apex, 10–13 mm, teeth obtuse to acute. Petals usually pink, lamina obovate, emarginate, coronal scales narrowly elliptic, acute. Ovary ovoid. Capsule oblong, 7–10 mm, as long as or slightly longer than the carpophore. Seeds dark brown, reniform, rugose, c. 0.8 mm.

Distribution — From Central Europe. In *Malesia* cultivated in Java as an ornamental in the montane regions.

2. *Silene coeli-rosa* (L.) Godr.

Silene coeli-rosa (L.) Godr. in Gren. & Godr., Fl. Fr. 1 (1847) 221; Backer & Bakh. f., Fl. Java 1 (1963) 210. — *Agrostemma coeli-rosa* L., Sp. Pl. (1753) 436. — *Eudianthe coeli-rosa* (L.) Reichenb., Icon. Fl. Germ. Helv. 6 (1842–44) 55. — Type: *Linnean Herb.* (LINN), Sicily.

Annual, glabrous, usually richly branched, erect herb up to 50 cm, under dry conditions often low, single-stemmed, one- to few-flowered. Leaves linear-narrowly elliptic to linear in upper part. Flowers in lax dichasia, with few to several flowers; pedicels long, up to 10 cm, erect-patent to erect in upper part. Calyx 15–30 mm, clavate and contracted at mouth in fruit, deeply sulcate between veins, with transverse undulations on each side of the grooves. Petals pink, lamina 8–16 mm, obcordate or bifid to 1/3. Ovary ovoid with 5 styles. Capsule 7–15 mm; carpophore 7–12 mm, glabrous. Seeds 0.6–0.9 mm, reniform, tuberculate.

Distribution — From the West and Central Mediterranean region of Europe. In *Malesia* cultivated in Java as an ornamental in the montane regions.

3. *Silene gallica* L.

Silene gallica L., Sp. Pl. (1753) 417; Benth., Fl. Austr. 1 (1863) 155; Edgew. & Hook. f., Fl. Brit. India 1 (1874) 218; Backer & Bakh. f., Fl. Java 1 (1963) 211; N.C. Majumdar in Fl. India 2 (1993) 566; Greuter, Taxon 44 (1995) 102; Tang Changlin in Fl. Reip. Pop. Sin. 26 (1996) 400. — Type: *Linnean Herb. 583-11* (LINN), France.

Silene anglica L., Sp. Pl. (1753) 416. — Type: *Linnean Herb. 583-1* (LINN lecto).

Polymorphous annual. Stem erect, up to 40 cm, simple or branched, pubescent, viscid in upper part, rarely glabrous. Leaves narrowly obovate-elliptic to spatulate, pubescent. Flowers in one to several monochasial cymes with the appearance of a one-sided raceme. Calyx cylindrical to ovoid, hispid, 8–10 mm, elongating in fruit, divided into 1/4, teeth triangular, acute. Petals white or pink, often with dark red spot or dark veins, lamina entire or emarginate, 3–5 mm. Capsule ovoid, 5–10 mm; carpophore 1 mm. Seeds reniform, grey, brown or black, faces deeply concave, striate or minutely tubercled, c. 1 mm.

Distribution — Indigenous to the Mediterranean basin and the Middle East, from there spread as a weed to most warmer parts of the world. In *Malesia* recorded from Timor.

Habitat & Ecology — Weedy in waste places, roadsides and other open areas, e. g. grasslands, up to 2500 m altitude.

Note — Greuter, l. c., proposed to conserve the name *Silene gallica* against *S. anglica* L., *S. cerastioides* L., *S. lusitanica* L., and *S. quinquevulnera* L.

4. *Silene latifolia* Poir.

Silene latifolia Poir., Voy. Barb. 2 (1789) 165; Greuter & Burdet, Willdenowia 12 (1982) 189; Chater, Walters & Akeroyd in Fl. Eur. ed. 2, 1 (1993) 211 — Type not designated.

Lychnis alba Mill., Gard. Dict. ed. 8, no. 4 (1768). — *Melandrium album* (Mill.) Garcke, Fl. Deutschl. 4 (1858) 55. — *Silene alba* (Mill.) E.H.L. Krause in Sturm, Fl. Deutschl. ed. 2, 5 (1901) 98, nom. illeg. — Type not designated.

Silene pratensis (Rafin.) Godr. & Gren. in Fl. Fr. 1 (1847) 216; Tang Changlin in Fl. Reip. Pop. Sin. 26 (1996) 397, f. 102: 5–9. — Type not designated.

Diocious, annual or short-lived perennial, up to c. 80 cm, ± densely soft-hairy and glandular in upper part. Leaves ovate-narrowly elliptic or ovate, cauline leaves sessile. Inflorescence few-flowered. Flowers large, opening in the evening, faintly scented. Calyx of male flowers 15–20 mm, 10-veined, of female flowers 20–30 mm, 20-veined, inflated in fruit, glandular, calyx teeth long, acuminate. Petals usually white. Ovary ovoid; styles 5. Capsule ovoid, 10–20 mm, dehiscent with 10 erect teeth. Seeds with plane faces and obtuse tubercles.

Distribution — Originating from western Europe, spread as a weed and now almost cosmopolitan. In *Malesia* only recorded from Papua New Guinea as a wayside weed (seen from Chimbu Valley, 2300 and 2500 m altitude).

Note — The introduced material seems to belong to subsp. *alba* (Miller) Greuter & Burdet, Willdenowia 12 (1982) 189.

5. *Silene noctiflora* L.

Silene noctiflora L., Sp. Pl. 1 (1753) 419; Wight & Arn., Prodr. (1835) 42; Edgew. & Hook. f., Fl. Brit. India 1 (1874) 218; Tang Changlin in Fl. Reip. Pop. Sin. 26 (1996) 398, f. 103: 1–7; Zhou Lihua, Wu Zhengyi, M. Lidén & B. Oxelman in Fl. China 6 (2001) 83. — *Melandrium noctiflorum* (L.) Fries Bot. Not. (1843) 143. — Type: *LINN 183-17* (S lecto).

Coarse annual. Stems up to 50 cm, erect, robust, usually unbranched; densely hairy in lower part, viscid in upper. Leaves ovate to ovate-narrowly elliptic, 2.5–5 by 0.5–1.5 cm. Inflorescence few-flowered; pedicels usually short, rarely up to 2 cm. Flowers large, bisexual, scented in the evening. Calyx 2–2.5 cm, 10-nerved, teeth long, slender, 5–7 mm. Petals pink above, yellowish below, inrolled in daytime, opening in the evening, lamina 8–12 mm. Capsule ovoid-conical, 15–18 by 8–10 mm, shorter than calyx without teeth. Seeds dark brown to reddish brown, flattened orbicular, rugose, 0.8–1.1 mm.

Distribution — Indigenous to Europe and Central Asia. Widely distributed on the northern hemisphere. In *Malesia* introduced as an ornamental.

6. *Silene pendula* L.

Silene pendula L., Sp. Pl. (1753) 418; Backer & Bakh. f., Fl. Java 1 (1963) 210; Tang Changlin in Fl. Reip. Pop. Sin. 26 (1996) 400, f. 103: 8–13. — Type: *Linnean Herb.* 583-35 (LINN lecto), from 'Creta & Sicilia'.

Annual herb. Stems branched, glandular pubescent, procumbent to ascending, up to 40 cm. Leaves ovate to narrowly ovate, pubescent, 3–5 by 0.5–1.5 cm, apex rounded to acute, sometimes mucronate. Inflorescence a raceme-like, monochasial, lax cyme; pedicels first erect, later patent or deflexed, 5–10 mm. Calyx obovoid, viscid-pubescent, much inflated in fruit with hyaline bands between the prominent narrow veins, 10–15 mm long, 10–12 mm broad in fruit, teeth short, triangular, obtuse, c. 2 mm. Petals pink (to white). Capsule obovoid-conical, 10–12 mm; carpophore 3–6 mm. Seeds 1.3–1.5 mm, subglobose, dark brown, with convex faces, rugose.

Distribution — Indigenous to Italy. In *Malesia* commonly cultivated in the montane regions of Java as an ornamental, often in the form with filled flowers.

SPERGULA

Spergula L., Sp. Pl. (1753) 440; Pax & Hoffm. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2, 16c (1934) 311. — Type: *Spergula arvensis* L.

Annual, rarely perennial herbs. Stems usually richly branched at the base, often glandular. Leaves stipulate, linear, decussate, apparently whorled due to short, leafy shoots occurring in the leaf axils on both sides. Stipules scarious. Flowers subperigynous with short hypanthium. Sepals 5, free, green with scarious margin. Petals 5, white, entire. Stamens 10, rarely 5. Styles (3–)5. Capsule ovoid or spherical, dehiscent by (3–)5 valves. Seeds ± lenticular, often winged or keeled.

Distribution — Six species of which five are chiefly Mediterranean and one in Patagonia. *Spergula arvensis* is a weed worldwide, also found occasionally in *Malesia*.

Note — The genus is closely related to *Spergularia* and it has been suggested to combine the two genera. In that case *Spergula* will be the correct name.

Spergula arvensis L.

Spergula arvensis L., Sp. Pl. (1753) 440; Roxb., Fl. Ind. ed. Carey 2 (1832) 447; Miq., Pl. Jungh. (1855?) 395; Fl. Ned. Ind. 1 (1855) 1053; Edgew. & Hook. f., Fl. Brit. India 1 (1874) 243; Backer, Schoolfl. Java (1911) 83; Grierson in Fl. Bhutan 1, 2 (1987) 215; N. C. Majumdar in Fl. India 2

(1993) 578; Ke Ping in Fl. Reip. Pop. Sin. 26 (1996) 56, f. 12: 1–5; Wadhwa in Fl. Ceylon 10 (1996) 64; Lu Dequan & M.G. Gilbert in Fl. China 6 (2001) 4. — Type: *Linnean Herb. 604-I* (LINN), Europe.

Spergula vulgaris Boenn., Prod. Fl. Monast. Westph. (1824) 135. — Type not designated.

Spergula sativa Boenn., Prod. Fl. Monast. Westph. (1824) 135, nom. illeg.

Spergula maxima Weihe in Boenn., Prod. Fl. Monast. Westph. (1824) 136. — Type not designated.

Spergula linicola Bor., Mém. Soc. Acad. Maine Loire 20 (1865) 61. — Type not designated.

Very polymorphous annual. Stems up to 50(–70) cm, ± branched from the base, usually glandular hairy in upper part. Leaves linear, 1–4 cm long, apparently whorled, somewhat succulent, furrowed on the lower side. Inflorescences terminal and from the upper leaf axils, ± lax-flowered; pedicels 1.5–2 cm, reflexed after anthesis. Sepals ovate, with scarios margin, 3–5 mm. Petals white, obovate, obtuse, as long as or slightly longer than the sepals. Stamens 10 or 5. Capsule ovoid, up to twice as long as the calyx. Seeds 1–2 mm, greyish, spherical, keeled or with a narrow wing; testa varying in sculpture from almost smooth to papillose.

Distribution — Cosmopolitan. In *Malesia* only introduced in the Philippines in the beginning of last century, now naturalised at Pauai at about 2400 m altitude.

STELLARIA

Stellaria L., Sp. Pl. (1753) 421; Pax & Hoffm. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2, 16c (1934) 320, McNeill, Notes Roy. Bot. Gard. Edinb. 24 (1962) 84; Coode in Fl. Turkey 2 (1967) 69. — Type: *Stellaria holostea* L.

Small, annual or perennial herbs. Stems slender, often thickened at nodes, glabrous or hairy. Leaves exstipulate, sessile or petioled, glabrous or pubescent with simple or stellate hairs. Inflorescences in lax, dichotomous cymes. Flowers hypogynous or slightly perigynous. Sepals (4 or) 5, free, herbaceous, usually 3-nerved. Petals (4 or) 5, rarely absent, white, usually bifid, almost to the base. Stamens (3–)5 or 10, rarely more or absent. Nectarial glands present in the form of a disc or separate glands between or inside the stamens. Ovary unilocular; styles 2 or 3. Fruit a capsule opening by 4–6 valves. Seeds mostly numerous, rarely few to 1, reniform or spherical, rugose or verrucose. — **Fig. 8.**

Distribution — Between 150 and 200 species, with their main distribution in Eurasian mountains; some cosmopolitan.

Habitat & Ecology — The genus occupies a wide range of habitats: open grassland and swamps to forest communities and montane meadows and open gravelly soil.

Note — The genus is still lacking a modern taxonomic revision. An unpublished study by J.F. Veldkamp (L) and Indonesian students from Herbarium Bogoriense (BO) and University Padjadjaran, Bandung (FMIPA) has been a great help in the revision of this genus.

KEY TO THE SPECIES

- 1a. Stems and sepals glabrous; petioles absent 2
- b. Stems and sepals puberulous to pubescent; petioles present 3
- 2a. Stems ± quadrangular, grooved; leaves oblong; stamens 5, filaments c. 1 mm long; styles 0.3 mm long **1. S. alsine**

- b. Stems \pm quadrangular, winged; leaves linear; stamens 10, filaments 3–4 mm long; styles 2–2.5 mm long **4. *S. palustris***
- 3a. Hairs simple 4
- b. Hairs stellate **6. *S. vestita***
- 4a. Ovules many; several seeds in the capsule **3. *S. media***
- b. Ovules 3; one seed in the capsule 5
- 5a. Stems hirsute in two grooves; petioles 1–4 mm; stamens 5; styles 1 mm, finely puberulous; seeds spherical **2. *S. australis***
- b. Stems sparsely puberulous all around, glabrous in lower part; petioles 5–35 mm; stamens 10; styles 2 mm, glabrous **5. *S. pauciflora***

1. *Stellaria alsine* Grimm

Stellaria alsine Grimm, Nova Act. Phys.-Med. Acad. Leop.-Carol. Nat. Cur. 3 (App.) (1767) 313; Hand.-Mazz., Symb. Sin. 7 (1929) 191; Steenis, Bull. Jard. Bot. Buitenzorg III, 13 (1934) 181; Backer & Bakh. f., Fl. Java 1 (1963) 207; Mizush. in Fl. E. Himal. (1966) 82; Ohba in Fl. E. Him., Third Report (1975) 33; Chen Shilong & R.K. Rabeler in Fl. China 6 (2001) 21. — Type: described from Germany.

Stellaria uliginosa Murray, Prod. Stirp. Götting. (1770) 55; Edgew. & Hook. f., Fl. Brit. India 1 (1874) 233; Gagnepain, Fl. Gén. Indo-Chine 1 (1909) 265, f. 26; Suppl. 1 (1943) 241; Chater & Heywood in Fl. Eur. ed. 1, 1 (1964) 135; ed. 2, 1 (1993) 163; Hara, Enum. Flow. Pl. Nepal 2 (1979) 58; Grierson in Fl. Bhutan 1, 2 (1987) 208; K. Larsen, Fl. Camb., Laos & Vietnam (1989) 78, f. 10: 8–13; Pham-hoàng Hô, Ill. Fl. Vietnam 1 (1991) 935, f. 2628; N.C. Majumdar in Fl. India 2 (1993) 589; Wu Zhengyi & Ke Ping in Fl. Reip. Pop. Sin. 26 (1996) 128, f. 30: 1–5. — Type not designated.

Stellaria tetragona Blume, Bijdr. (1825) 63; Miq., Fl. Ned. Ind. 1 (1855) 1054; Backer, Schoolfl. Java (1911) 82. — Type: *Reinwardt* (L. holo), Java.

Stellaria thymifolia Wall., Cat. no. 636 (1829), nomen.

Stellaria aquatica auct. non Pollich: Wall., Cat. no. 635 (1829); Wight & Arn., Prodr. (1835) 42.

Stellaria japonica Miq., Ann. Mus. Bot. Lugd.-Bat. 2 (1866) 79. — Type: *von Siebold & Keiske* (L. 899.152-152), Japan.

Perennial herb, up to 40 cm, with thin rhizome. Stems numerous from the rhizome, erect or ascending, quadrangular, glabrous. Leaves elliptic to obovate, acute, 10–20 by 4–6 mm, glabrous, ciliate along margin at the base, glaucous, 1-nerved, sessile or subsessile. Inflorescence lax, few-flowered; pedicels filiform, 1–2 cm, enlarged below calyx, reflexed at anthesis, erect in fruit; bracts scarious, glabrous, whitish with a median green nerve. Sepals narrowly elliptic, acute, 3-nerved, c. 3 mm long, glabrous. Petals slightly shorter than sepals, rarely absent, divided almost to the base, with divergent lobes. Stamens 10. Ovary ovoid; styles 3, short. Capsule ovoid, as long as or slightly longer than calyx. Seeds reddish brown, finely tuberculate, c. 0.3 mm.

Distribution — Widely distributed in the temperate zone of Europe and Asia, in the Himalayan region, southern China, Korea, Japan, Taiwan, and northern Vietnam; also frequent in North America. In *Malesia* most probably introduced and only recorded from a few localities in Java and one locality in Sumatra (Aceh Laut).

Habitat & Ecology — In marshes, soggy and moist cultivated soil, 1500–2100 m altitude. Flowering probably all year round.

Note — It is a polymorphous species, highly variable due to environmental conditions. Van Steenis (1934) suggested that the species may be indigenous in Java but most probably they are introduced. It is the only known occurrence on the southern hemisphere.

2. *Stellaria australis* Zoll. & Mor.

Stellaria australis Zoll. & Mor., Nat. Geneesk. Arch. Ned. Ind. 2 (1845) 581; Miq., Pl. Jungh. (1855?) 395; Miq., Fl. Ned. Ind. 1 (1855) 1055; Backer, Schoolfl. Java (1911) 83; Backer & Bakh. f., Fl. Java 1 (1963) 208; Steenis, Mount. Fl. Java (1972) pl. 8, f. 6. — Lectotype: *Zollinger 2248* (n.v.).

Stellaria saxatilis auct. non D. Don: Koord., Exk. Fl. Java 2 (1912) 211, p.p.

Perennial or annual herb, rooting at the nodes, up to 80 cm. Young parts viscid, later glabrescent, hirsute in two grooves. Leaves glabrous to hirsute; petioles up to 4 mm; lamina ovate to oblong, 1.5–7.5 by 1–3 cm, base rounded to cuneate, apex acute to acuminate, margin fimbriate. Inflorescence few-flowered; pedicels up to 7 mm; bracts as the leaves, c. 3 mm long. Sepals ovate-oblong to narrowly elliptic, 3–4 mm long; the petals shorter than the sepals, bifid about 1/3 down. Stamens with filaments c. 2 mm, anthers yellow. Ovary with 3 ovules; the styles 1–1.5 mm long. Seed one per capsule, c. 1 mm, smooth.

Distribution — In *Malesia*: Java, Lombok, Celebes.

Habitat & Ecology — Found in montane forests in moist and moderately shaded places, also on open, swampy ground from 1500 to 2800 m altitude. In Lombok found in several places on the Rindjani Vulcan from 1350 to 2600 m in various plant communities.

Notes — 1. The one collection from Celebes deviates in the hairs placed in one line on the internodes, and the glabrous leaves.

2. *Stellaria australis* is closely related to *S. delavayi* Franch. from Yunnan and to *S. paniculata* Edgew. from the Himalayan region with its southern limit in northern Thailand and Indochina. A closer study of these species throughout their distribution range is needed.

3. *Stellaria media* (L.) Vill.

Stellaria media (L.) Vill., Hist. Pl. Dauph. 3 (1789) 615; Blume, Bijdr. (1825) 63; Wight & Arn., Prodr. (1835) 42; Wight, Icon. (1845) 947; Miq., Fl. Ned. Ind. 1 (1855) 1055; Pl. Jungh. (1855?) 395; Benth., Fl. Austr. 1 (1863) 159; Edgew. & Hook. f., Fl. Brit. India 1 (1874) 230; Beguinot, Nuovo Giorn. Bot. Ital. n.s. 17 (1910) 299, 348; Backer, Schoolfl. Java (1911) 82; Koord., Exk. Fl. Java 2 (1912) 11; Merr., Enum. Philipp. Flow. Pl. 2 (1923) 138; Ridl., Fl. Malay Penins. 5 (1925) 88; Backer & Bakh. f., Fl. Java 1 (1963) 207; Chater & Heywood in Fl. Eur. ed. 1, 1 (1964) 134; ed. 2, 1 (1993) 162; Mizush., J. Jap. Bot. 40 (1965) 94; in Fl. E. Himal. (1966) 82; Liu & Ying in Fl. Taiwan 2 (1976) 350; Stone et al., Malay Nat. J. 30 (1977) 106; P. Royen, Alpine Fl. New Guinea 3 (1982) 2355, f. 701; Grierson in Fl. Bhutan 1, 2 (1987) 207; Wadhwa in Fl. Ceylon 10 (1996) 57; Ying in Fl. Taiwan ed. 2, 2 (1996) 376, f. 176, 177; Wu Zhengyi & Ke Ping in Fl. Reip. Pop. Sin. 26 (1996) 104, f. 24: 6–9; Chen Shilong & R.K. Rabeler in Fl. China 6 (2001) 15. — *Alsine media* L., Sp. Pl. (1753) 272. — Type: *Linnean Herb. 388-1* (LINN), Europe.

Cerastium indicum auct. non Wight & Arn.: Koord., Natuurk. Tijdschr. Ned. Ind. 60 (1901) 247.

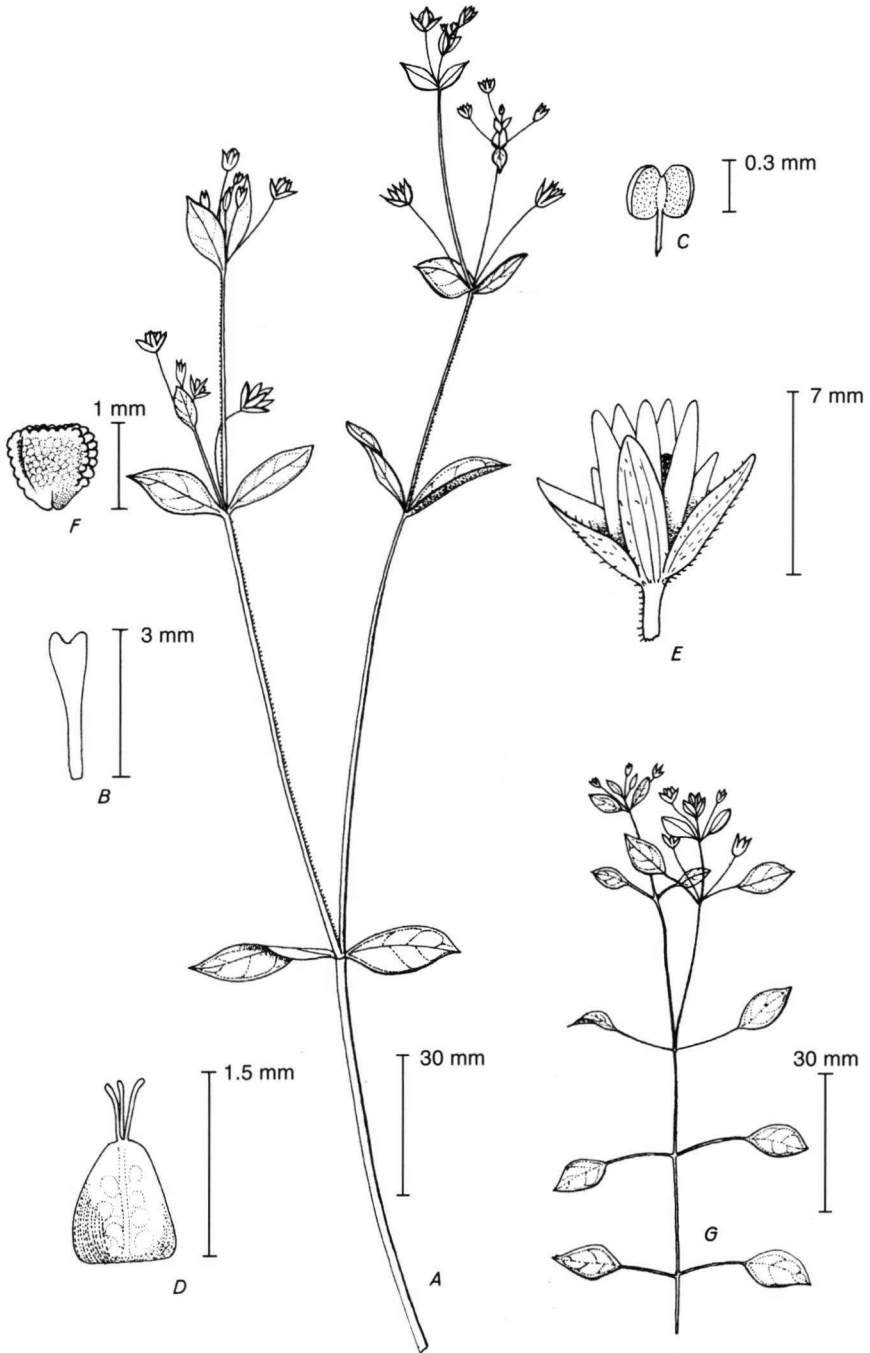


Fig. 8. *Stellaria media* (L.) Vill. — A. Part of flowering stem; B. petal; C. anther; D. ovary; E. fruit and calyx; F. seed; G. flowering stem (van Royen NGF 15191 except G after van Royen NGF 15088). — Reproduced from P. van Royen, *Alpine Flora of New Guinea* 3 (1982) 2356, f. 701.

Drymaria cordata auct. non Roem. & Schultes: Koord., Exk. Fl. Java 2 (1912) 214, pro *Koorders* 37353, 37354.

Stellaria pauciflora auct. non Zoll. & Mor.: Koord., Exk. Fl. Java 2 (1912) 212, pro *Koorders* 31803.

Polymorphous annual or biennial herb. Stems weak, decumbent or ascending, terete, with a single row of hairs on alternating sides of successive internodes. Leaves glabrous, or ciliate near the base, broadly ovate to ovate-elliptic, acute or acuminate, with a petiole of varying length, longest at the base, up to 12 mm, upper leaves subsessile, 5–30 by 3–20 mm. Flowers solitary or in lax cymes; pedicels filiform, 5–25 mm, glabrous or with one line of simple hairs, rarely glandular pubescent, after anthesis declinate, later in fruit erect. Sepals ovate-oblong, obtuse or acutish, 3–6 mm, often glandular hairy outside, particularly towards the base, 3-nerved. Petals (4 or) 5, rarely absent, slightly shorter than the calyx, spatulate, glabrous, deeply divided. Stamens 3–5, rarely more, 1–2.5 mm. Ovary ovoid to ellipsoid, c. 1 mm; styles 3, 1–1.5 mm. Capsule longer than calyx, opening by 4–6 valves. Seeds compressed, reniform, c. 1 mm, reddish brown or brown, tuberculate. — **Fig. 8.**

Distribution — Widely distributed on the northern hemisphere, now a cosmopolitan weed. In *Malesia* reported from Java, the Philippines, Timor, and New Guinea; probably introduced also elsewhere.

Habitat & Ecology — In open places, gardens, roadsides, nurseries. In the tropics at higher altitudes, in *Malesia* found from 250 to 3660 m. Locally common.

Uses — In New Guinea the species is locally eaten as a vegetable.

Note — This polymorphic species is treated here collectively. Quite a number of segregate taxa have been described on European material; for an overview of these see McNeill, *Notes Roy. Bot. Gard. Edinb.* 24 (1962) 8.

4. *Stellaria palustris* Hoffm.

Stellaria palustris Hoffm., *Deutsch. Fl.* (1791) 152; Ehrh. ex Retz., *Fl. Scand. Prod. ed.* 2 (1795) 106; Chater & Heywood in *Fl. Eur. ed.* 1, 1 (1964) 135; ed. 2, 1 (1993) 163; Wu Zhengyi & Ke Ping in *Fl. Reip. Pop. Sin.* 26 (1996) 133, f. 13: 4–7; Chen Shilong & R.K. Rabeler in *Fl. China* 6 (2001) 23. — Type: *Ehrh. Herb. Linn. no 35* (MW lecto).

Stellaria glauca With., *Arr. Br. Pl.* (1796) 420; Benth., *Fl. Austr.* 1 (1863) 158; Edgew. & Hook. f., *Fl. Brit. India* 1 (1874) 233. — Type: *Sibthorpe s.n.* (OXF holo), England.

Perennial herb. Branches weak, ascending, up to 60 cm long. Stems quadrangular, slightly winged, glabrous. Leaves glabrous, sessile, lamina linear, 10–15 by 1–2 mm, base cuneate, apex acute. Inflorescences few-flowered, glabrous; pedicels glabrous, 2–3 cm. Flowers erect. Sepals oblong, 3–4 mm long, with scarious margin. Petals elliptic-oblong, shorter than sepals, divided almost to the base. Stamens 10; filaments 3–4 mm. Ovules many per ovary; styles 2–2.5 mm long. Seeds many per capsule, lenticular, dark brown, rugose.

Distribution — Europe, Asia, Australia. In *Malesia* only found in a few places in New Guinea, both in Irian Jaya and in Papua New Guinea.

Habitat & Ecology — On wet soil and in swamps, from 1800 to 2800 m altitude. In the Western Highlands Province found in dense *Acorus* swamp in flushed area on organic mud.

5. *Stellaria pauciflora* Zoll. & Mor.

Stellaria pauciflora Zoll. & Mor., Syst. Verz. (1845-46) 30; Miq., Fl. Ned. Ind. 1 (1855) 1055; Briq., Ann. Cons. Jard. Bot. Genève 13-14 (1909-11) 378; Backer, Schoolfl. Java (1911) 82; Koord., Exk. Fl. Java 2 (1912) 211; Alston in Trimen, Handb. Fl. Ceylon 6 (1931) 17; Backer & Bakh. f., Fl. Java 1 (1963) 208; Steenis, Mount. Fl. Java (1972) pl. 8, f. 7; Wadhwa, Fl. Ceylon 10 (1996) 57. — *Stellularia pauciflora* Kuntze, Rev. Gen. Pl. 1 (1891) 55. — Type: *Zollinger 2003* (n.v.), Java.

Stellaria drymarioides Thw., Enum. Pl. Zeyl. (1858) 24; Edgew. & Hook. f., Fl. Brit. India 1 (1874) 229; Trimen, Handb. Fl. Ceylon 1 (1893) 86. — Type: *Thwaites 400* (PDA lecto; L), Sri Lanka.

Stellaria mannii Hook. f., J. Proc. Linn. Soc., Bot. 7 (1864) 183; Oliver, Fl. Trop. Afr. 1 (1868) 141; Hutch. & Dalz., Fl. W. Trop. Afr. ed. 2, 1 (1954) 129; Turrill, Fl. Trop. Afr. ed. 2 (1956) 24. — Type: *Mann 1940* (K holotype), Cameroon.

Annual herb. Stems quadrangular, glabrous in lower part, glandular pubescent above, decumbent at the base, rooting at the nodes, up to 45 cm high. Leaves broadly ovate, acute to cuspidate, sparsely pubescent to glabrous, petioles 0.5–3.5 cm, lamina ovate to narrowly elliptic with acute to acuminate, mucronate apex, 1–3 by 0.5–2.5 cm. Bracts scale-like, 5 mm. Inflorescence few-flowered, peduncles 3.5–5 cm, densely viscid pubescent. Flowers viscid pubescent, erect, nodding after anthesis; pedicels 4–5 mm, thickened upwards, viscid. Sepals oblong-elliptic, 4–7 mm, obtuse. Petals white, obtriangular, divided to the middle or less, about half as long as the sepals. Stamens (5–)10, with filaments 2–4 mm. Styles 3, c. 2 mm. Capsule ovoid to ellipsoid, 1-seeded. Seeds lenticular, 1 by 0.5–2 mm.

Distribution — Tropical Africa, Mauritius, Sri Lanka. In *Malesia* recorded from Sumatra, Java, Celebes, and the Lesser Sunda Islands (Bali).

Habitat & Ecology — In shaded, moist places, in forests and coffee plantations, in the montane zone, 900–2800 m altitude.

6. *Stellaria vestita* Kurz

Stellaria vestita Kurz, J. Bot. 11 (1873) 194; Backer & Bakh. f., Fl. Java 1 (1963) 207; Mizush., J. Jap. Bot. 38 (1963) 153; in Hara, Fl. E. Himal. 1 (1966) 85; Steenis, Mount. Fl. Java (1972) pl. 8, f. 8; Ohba in Fl. E. Himal., Third Report (1975) 35; Hara, Enum. Flow. Pl. Nepal 2 (1979) 58; Liu & Ying in Fl. Taiwan 2 (1976) 353; Hiepko & Schultze-Motel, Mensch, Kultur und Umwelt Zentr. Bergl. West-Neuguinea 7 (1981) 30; Grierson in Fl. Bhutan 1, 2 (1987) 206; K. Larsen, Fl. Camb., Laos & Vietnam 24 (1989) 81, f. 10, 14; in Fl. Thailand 5 (1992) 422; Pham-hoàng Hồ, III. Fl. Vietnam 1 (1991) 935, f. 2627; N.C. Majumdar in Fl. India 2 (1993) 590; Wu Zhengyi & Ke Ping in Fl. Reip. Pop. Sin. 26 (1996) 107, f. 25: 1–8; Chen Shilong & R.K. Rabeler in Fl. China 6 (2001) 16. — Type: *J. Anderson s.n.* (CAL lecto, K), Yunnan.

Stellaria saxatilis Buch.-Ham. ex D. Don, Prod. Fl. Nepal. (1825) 215, non Scop. (1772); Miq., Fl. Ned. Ind. 1 (1855) 1054; Edgew. & Hook. f., Fl. Brit. India 1 (1874) 232; Backer, Schoolfl. Java (1911) 83; Koord., Exk. Fl. Java 2 (1912) 211, p.p.; Craib, Fl. Siam. Enum. 1 (1925) 108; Merr. & Perry, J. Arnold Arbor. 23 (1942) 386; Gagnepain, Fl. Gén. Indo-Chine, Suppl. 1 (1943) 241; K. Heyne, Nutt. Pl. Indon. (1950) 614; Mizush., J. Jap. Bot. 32 (1957) 250; Ying in Fl. Taiwan ed. 2, 2 (1996) 379, f. 381. — Type: *Hamilton s.n.* (n.v.), Nepal.

Stellaria laxa Merr., Bull. Philip. Govt. Lab. Bur. 29 (1905) 12, non F. Behm (1887); Enum. Philipp. Flow. Pl. 2 (1923) 138. — Type: *Elmer 6612* (NY, PNH), Luzon.

Stellaria stellato-pilosa Hayata, J. Coll. Sci. Univ. Tokyo 26 (1908) 58; Icon. Pl. Form. 1 (1911) 71; Mizush., J. Jap. Bot. 32 (1957) 245; J. Jap. Bot. 34 (1959) 238; Backer & Bakh.f., Fl. Java 1 (1963) 207; Steenis, Mount. Fl. Java (1972) t. 8, f. 8. — Type: *Kawakami & Mori 2258* (TI lecto), Taiwan.

Stellaria hamiltoniana N.C. Majumdar, J. Ind. Bot. Sci. 44 (1965) 142. — Type unknown.

Perennial, richly branched herb. Stems quadrangular, creeping, reaching 2 m length, glabrous except for the apical part which is stellate pubescent. Leaves \pm sessile, ovate-oblong, narrowly elliptic, acute, stellately haired on both sides, (1–)3–3.5(–5) by 0.3–1.2 cm. Inflorescences terminal or axillary, lax cymes; peduncles 3–4 cm, stellately haired; bracts narrowly elliptic, 3–5 mm. Sepals ovate-narrowly elliptic to triangular, 4–6 mm, stellately haired and with scarious margin. Petals deeply bilobed with divergent lobes, as long as sepals or slightly shorter. Stamens 10, filaments enlarged towards the base, inserted on a disc, as long as sepals. Ovary spherical or ovoid; ovules few; styles as long as ovary. Capsule as long as calyx, dehiscent by 6 valves. Seeds reddish brown, oblong, 0.6 mm, rugose.

Distribution — Widely distributed from India in the Himalayan region, Russia (Siberia), Nepal, Bhutan, Myanmar, southern China to Japan, Taiwan, N Thailand and Vietnam. In *Malesia*: in Java (Mt Tengger and Semeru), the Philippines (Luzon), and New Guinea.

Habitat & Ecology — In montane grassland, 1650–2400 m altitude.

VACCARIA

Vaccaria Wolf, Gen. Pl. 3 (1776); Pax & Hoffm. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2, 16c (1934) 361; Ross, Acta Bot. Neerl. 15 (1966) 160; Rechinger in Fl. Iranica, Cont. 163 (1988) 337. — Type: *Vaccaria pyramidata* Medik. [= *Vaccaria hispanica* (Mill.) Rauschert].

Glabrous annual. Leaves exstipulate. Epicalyx absent. Calyx inflated below, whitish with 5 green wings. Petals 5, pink or purple, long-clawed with entire apex; coronal scales absent. Stamens 10. Ovary unilocular, except at the base where it is 2-locular; styles 2. Capsule ovoid to spherical, pericarp consisting of a thick papery exocarp, dehiscent with 4 teeth, and a thin endocarp, dehiscent irregularly. Seeds numerous, reniform or globose.

Distribution — Few species from the Mediterranean region to temperate Asia; elsewhere occasionally as a weed.

Note — The genus is closely related to *Saponaria*.

Vaccaria hispanica (Mill.) Rauschert

Vaccaria hispanica (Mill.) Rauschert, Wiss. Zeitschr. Martin-Luther-Univ. Halle, Math-Naturwiss. Reihe 14 (1965) 496; Lu Dequan, M. Lidén & B. Oxelman in Fl. China 6 (2001) 102. — *Saponaria hispanica* Mill., Gard. Dict. ed. 8 (1768) in erratis. — Type described from garden plants from Spain.

Vaccaria pyramidata Medik., Philos. Bot. 1 (1789) 96; K. Larsen in Fl. Thailand 5 (1992) 419; N.C. Majumdar in Fl. India 2 (1993) 593. — Type not designated.

Vaccaria parviflora Moench, Meth. (1794) 63, nom. illeg.

Vaccaria vulgaris Host., Fl. Austriaca 1 (1827) 518, nom. illeg.

- Vaccaria grandiflora* (Ser.) Jaub. & Spach, Ill. Pl. Orient. 3 (1850) t. 231. — Type not designated.
- Vaccaria segetalis* (Necker) Garcke & Aschers., Fl. Prov. Brandenb. 1 (1864) 84; Tang Changlin in Fl. Reip. Pop. Sin. 26 (1996) 406, f. 105: 1–5. — *Saponaria segetalis* Necker, Delic. Callo-Belg. 1(1768) 194. — Type not designated.
- Saponaria vaccaria* L., Sp. Pl. 1 (1753) 409, syn. subst.; Edgew. & Hook. f., Fl. Brit. India 1 (1874) 217. — *Gypsophila vaccaria* (L.) Sm., Fl. Graec. Prod. 1 (1809) 279b; Wight & Arn., Prodr. (1835) 42. — Type not designated.
- Saponaria perfoliata* Roxb., Fl. Ind. ed. Carey 2 (1832) 446. — *Vaccaria perfoliata* (Roxb.) Halácsy, Consp. Fl. Graec. 1 (1900) 189. — Type not designated.

Annual, glabrous, glaucous herb. Stem slender, erect, enlarged at the nodes, up to 60 cm. Leaves sessile, narrowly triangular, 2–9(–15) by 0.5–2 cm, diminishing upwards to small, scarious bracts in the distal part of the inflorescence. Inflorescence terminal, regularly dichasial, lax, richly branched; pedicels 4–5 cm. Calyx angular, 8–15 by 5–10 mm, with 1 mm broad wings, teeth ovate, acute. Petals pink(-white), lamina obovate, entire or emarginate, 6–8 by 5–7 mm. Seeds black, subglobose to reniform, 2–2.5 mm.

Distribution — Native of SE Europe and SW Asia. Cosmopolitan weed in the warmer parts of the world seen to be spreading in continental SE Asia. In *Malesia* reported from Java.