

ELATINACEAE (C. A. Backer, Heemstede)

Annual herbs. *Leaves* stipulate, opposite or verticillate, simple. *Flowers* axillary, solitary, glomerate or fascicled, actinomorphic, ♀, small or minute; *sepals* 2–5, free or shortly connate, imbricate in bud, pellucid or with pellucid margins, 1-nerved or nerveless, persistent. *Petals* the same number as sepals, not or slightly surpassing them, imbricate in bud, free, membranous, persistent. Disk absent. Stamens as many as petals (and alternating with them) or more, but not more than twice their number, persistent; anthers dorsifixed, small, 2-celled; cells bursting longitudinally. Ovary superior, 2–5-celled, isomerous (except in *Bergia trimeria*); cells ∞-ovuled. Ovules in the inner angles of the cells. Styles equal in number to the cells, free, short, persistent. *Capsule* small, septicidally dehiscent. Seeds many, minute, oblong, straight or curved, in transverse section terete; embryo straight or curved; cotyledons short; no endosperm.

Distr. Genera 2, in the temperate and tropical zones of both hemispheres, both of them in *Malaysia*.

Ecol. Inhabitants of permanently or seasonally swampy or inundated localities. In some extra-Malaysian *spp.* the leaves are heteromorphous, the submerged ones being much divided. Vegetatively several *Elatinaceae* are rather plastic as is the case with many other waterplants, e.g. *Callitrichaceae*. In some *Elatines* flowers are not rarely cleistogamous, cf. *E. triandra* (cf. NIEDENZU, E. & P. ed. 2, 21, 1925, 272).

Vern. No reliable names.

Note. At first sight *Elatinaceae* might be confused with representatives of some other families with opposite leaves and minute axillary flowers. Easily perceptible differentiating characters against *Callitrichaceae* and *Aizoaceae* are the presence of a calyx and corolla, *Halorrhagaceae*, *Nyctaginaceae* and *Rubiaceae* the superior ovary, *Scrophulariaceae* the free corolla segments, *Lythraceae* the free calyx lobes, *Amaranthaceae* the at least 2-celled ovary, and *Urticaceae* bisexual flowers and alternipetalous stamens.

KEY TO THE GENERA

1. Flowers (in the Malaysian species) glomerate or fascicled, 5-merous. Sepals acute, with a strongish midrib 1. *Bergia*
1. Flowers (in the Malaysian species) solitary, 3-merous. Sepals obtuse, nerveless. Very small plants. 2. *Elatine*

1. BERGIA

LINNÉ, Mant. 2 (1771) 152, no 1309.

Annual herbs, erect, ascending or decumbent. *Leaves* opposite, shortly petioled, finely serrate. Stipules persistent. *Flowers* (in the Malaysian species) fascicled or glomerate, 5-merous. Sepals free, acutely acuminate, keeled by the strongish midrib, with broad pellucid nerveless margins. Petals oval-oblong, thinly membranous. Stamens the same number as petals or more, but not more than 10. Ovary and *capsule* globose or ovoid, 5-celled; stigmas capitate. Seeds oblong, with rounded ends, faintly curved, with a faint or strong, scalariform reticulation.

Distr. Species ± 20; in *Malaysia* 2, inhabitants of the lower regions, mostly in anthropogenic localities.

KEY TO THE SPECIES

1. Entire plant glabrous; stems thick, succulent, not fistular but divided by radiating septa into a peripheral whorl of rather wide air-vessels. Pedicels 1/2–3 mm long. Sepals 1 1/2–2 mm long. Petals slightly exceeding the sepals. Stamens 10. Seeds strongly reticulated 1. *B. capensis*
1. Stems glandular-pubescent, hard, not succulent, fistular but not divided by radiating septa into a whorl of air-chambers. Leaves glandular-pubescent beneath. Pedicels glandular-pubescent, 2–22 mm long. Sepals glandular-pubescent, 3–4 mm long. Petals slightly shorter than the sepals. Stamens in the Malaysian specimens 5–10. Seeds very faintly reticulated 2. *B. ammannioides*

1. *Bergia capensis* LINNÉ, Mant. 2 (1771) 241; COOKE, Fl. Bomb. 1 (1901) 74; BACK, Onkr. Suiker. (1930) 453, t. 427; Bekn. Fl. Java, em. ed. 4 (1942) fam. 53, p. 1; D'ALMEIDA, J. Bomb. Nat. Hist. Soc.

43 (1943) 93, pl. 1–3; MILNE-REDHEAD, Kew Bull. 1948, 450 (1949).—*B. verticillata* WILLD. in LINNÉ, Sp. Pl. ed. 4, 2 (1799) 770, *nom. illegit.*; ROXB. Fl. Ind. 2 (1832) 456; DALZ. & GIBS. Bomb.



Fig 1. *Bergia capensis* L. Habit, $\times \frac{1}{2}$. Courtesy Pasuruan Exp. Station.

Fl. (1861) 14; OLIVER, Fl. Trop. Afr. 1 (1868) 152; TH. DYER in HOOK. f. Fl. Br. Ind. 1 (1874) 252; TRIMEN, Fl. Ceyl. 1 (1893) 92; BACK. Voorl. Schoolfl. (1908) 19; Schoolfl. (1911) 86; KOORD. Exk. Fl. 2 (1912) 623.—*B. aquatica* ROXB. Corom. Pl. 2 (1798) 22, t. 142, *nom. illegit.*—*B. repens* BL. Bijdr. (1825) 62.—*Elatine verticillata* W. & A. Prod. (1834) 41.—Fig. 1.

Herb with a creeping, 8–50 cm long main stem and ascending branches; stems terete, red or pink, faintly shining. Stipules erect, ovate-triangular, long-acuminate, acute, dentate, membranous, 2–3 mm long. *Leaves* subsessile, oblong-lanceolate or lanceolate, from an acute base, acute, finely serrulate, with red teeth, 1½–5 by ¾–2½ cm; petiole 1–5 mm. *Flowers* in many-flowered, dense clusters, 5-merous. Sepals erect, broadly elliptic, shortly acuminate, acute, light green, tipped with red, 1½–2 mm long. Petals at first erect, afterwards widely patent or recurved, oblong or subspatulate, white, transparent. Filaments thin, filiform from a slightly broadened base. Ovary subglobose; styles erect-recurved, ¼–½ mm long. *Capsule* subglobose, with 5 longitudinal furrows, ± 2½ mm diam. Seeds slightly less than ½ mm long.

Distr. Hindustan, Ceylon, in *Malaysia*: Java.

Ecol. Inhabitant of swampy localities: muddy paddy-fields, humid grassland, shallow pools, riverbanks. Fl. (in Java) Febr.–June.

2. *Bergia ammann(i)oides* ROXB. (Hort. Beng. 1814, 34, *nomen nudum*) ex ROTH, Nov. Pl. Sp. (1821) 219; DC. Prod. 1 (1824) 390; ROXB. Fl. Ind. 2 (1832) 457; DALZ. & GIBS. Bomb. Fl. (1861) 14; BTH. Fl. Austr. 1 (1863) 180; OLIV. Fl. Trop. Afr. 1 (1868) 132; DYER in HOOK. f. Fl. Br. Ind. 1 (1874) 251; TRIMEN, Fl. Ceyl. 1 (1893) 92; BAILEY, Queensl. Fl. 1 (1899) 100; COOKE, Fl. Bomb. 1 (1901) 73; BACK. Fl. Bat. 1 (1907) 82 (*excl. syn. B. repens* BL.); Voorl. Schoolfl. (1908) 19; Schoolfl. (1911) 86; KOORD. Exk. Fl. 2 (1912) 623; MERR. Sp. Blanc. (1918) 273; En. Philip. 3 (1923) 103.—*Elatine ammann(i)oides* W. & A. Prod. (1834) 41; SPAN. Linnaea 15 (1841) 167 (*excl. syn. B. repens* BL.); MIQ. Fl. Ind. Bat. 1, 2 (1859) 119 (*excl. syn. B. repens* BL.); BRITTEN in FORB. Nat. Wand. (1885) 500.—*Tillaea rubella* BLANCO, Fl. Filip. (1837) 75, ed. 2 (1845) 56, ed. 3, 1 (1877) 106.—*Bergia serrata* BLANCO, Fl. Fil. (1837) 273; MERR. Philip. J. Sc. 2 (1907) Bot. 431; Fl. Manila (1912) 333; Sp. Blanc. (1918) 273; En. Philip. 3 (1923) 103.—*Spergula serrata* BLANCO,

Fl. Fil. ed. 2 (1845) 271; ed. 3, 2 (1878) 140.—*Bergia glandulosa* TURCZ. Bull. Soc. Nat. Moscou 27²(1854) 371; ROLFE, J. Bot. 23(1885) 210.—*Bergia oryzetorum* FENZL in ZOLL. Syst. Verz. Heft 3 (1855) 62; BACK. Onkr. Suiker. (1930) 453, t. 428; Bekn. Fl. Java, em. ed. 4 (1942) fam. 53, p. 1.

Annual, often branched from the base, erect, ascending or decumbent and then with erect, suberect or ascending branches, frequently somewhat woody at the base, 8–50 cm long; stems terete. Stipules erect, narrowly triangular, very acute, along the margins and on the back of the midrib rather thinly beset with short or rather longish glandular or subglandular hairs, membranous, 2½–5 mm long. *Leaves* elliptic-oblong, oblong or obovate-oblong, from an acute or contracted base, acute, very shortly dentate-serrate and remotely gland-ciliate, sparingly finely hairy or glabrous above, 10–40 by 2–15 mm; petiole 2–5 mm. *Flowers* in few- to many-flowered fascicles. Pedicels thin, very variable as to length, usually 2–12 mm, sometimes up to 22 mm long. *Sepals* in *Malaysia* always 5 (in Hindustan and Ceylon usually 3), ovate-oblong, rather long- and narrowly acuminate, concave, keeled by the strong green midrib, otherwise thinly membranous and transparent, shortly ciliate, 3–4 mm long. *Petals* the same number as sepals, slightly shorter than these, oval-oblong, obtuse, thinly membranous, white, 2½–3 by 1–1¼ mm. Stamens usually as many as sepals (in Java always so), narrowly subulate (in the Philippine specimens often 7–10) and the supernumerary of these then much narrower than the others, subfiliform (in dried materials often difficult to observe), rather long. Ovary ovoid. Styles in *Malaysia* 5, erect-recurved, ± ½ mm long (thick stigmas included). *Capsule* ovoid, ± 2 mm long. Seeds numerous, with a faintly prominent reticulation, light brown, ± ½ mm long.

Distr. Tropical Africa, Afghanistan, Persia, tropical Asia and Ceylon to S. China, Formosa and Australia, in *Malaysia*: Java, Madura, Timor, Philippines (Luzon).

Ecol. Dry regions, from the plains up to ± 100 m above sea-level, in seasonally inundated and again dried out localities, especially in fallow paddy-fields, also on road-sides and railway-embankments, locally often very numerous.

Note. Philippine specimens with long pedicels and some supernumerary stamens have been described as *Bergia serrata* BLANCO. They strikingly resemble typical plants.

2. ELATINE

LINNÉ, Sp. Pl. (1753) 367; Gen. Pl. ed. 5 (1754) no 451.

Small glabrous herbs of swampy, muddy or inundated localities. *Leaves* in the Malaysian species opposite, shortly stalked. *Flowers* solitary, minute, 2–4-merous. Sepals shortly connate at the base, obtuse, nerveless. *Petals* exceeding the sepals, broadly oval, white or pink. Stamens as many as petals or twice their number. Ovary globose. *Fruit* globose with an impressed apex and a very thin transparent wall. Seeds numerous, straight or curved, with a scalariform reticulation.

Distr. Species \pm 12, throughout the area of the family.

Note. The small size and habitat of *Elatine* are probably the major causes for its scarcity in the herbaria. A special search would doubtless reveal many additional localities outside Sumatra and Java; the late Dr P. J. EYMA collected a specimen near the Wissel Lakes, SW. New Guinea (EYMA 4455) at ca 1700 m alt., but unfortunately the material at hand does not permit critical naming.

KEY TO THE SPECIES

1. Flowers sessile or obscurely pedicelled, often not expanding. Stamens in expanded flowers longer than the sepals. *E. triandra*
 1. Flowers on pedicels $1/2$ – $1\frac{1}{2}$ mm long, expanding. Stamens shorter than the sepals. *E. ambigua*

1. *Elatine triandra* SCHKUHR, Bot. Handb. 1 (1808) 345, fig. 109 b, f. 2, *sensu lato*.—*Peplis americana* PURSH, Fl. Am. Sept. 1 (1814) 238.—*E. americana* ARN. Edinb. Journ. Nat. & Geogr. Sc. 1 (1830) 431; BTH. Fl. Austr. 1 (1863) 178; DYER in HOOK. f. Fl. Br. Ind. 1 (1874) 251; BAILEY, Queensl. Fl. 1 (1899) 99; BACKER, Ann. J.B.B. Suppl. 3 (1909) 401; Schooff. (1911) 85; KOORD. Exk. Fl. 2 (1912) 623; BACKER, Bekn. Fl. Java, em. ed. 4 (1942) fam. 55, p. 2.

Delicate creeping herb, often much branched and forming dense patches, 1–15 cm long. Stipules minute, ovate-triangular, acutely acuminate, dentate, deciduous. *Leaves* opposite, ovate-oblong-lanceolate-spathulate, decurrent winglike along the petiole, obtuse, rounded or emarginate, entire, penninerved, with or without a row of distant glandlike hydathodes along the margin, $3\frac{1}{2}$ –15 by $1\frac{1}{2}$ –4 mm. *Flowers* sessile or obscurely pedicelled in one axil only of a pair of leaves; those of successive pairs alternately on the right and the left side of the stem. Sepals 2–3, half as long as the petals. Petals broadly oval, white or pink, 1– $1\frac{1}{4}$ mm long. Stamens 3, in expanded flowers longer than the sepals. Stigmas 3, almost sessile, punctiform. *Capsule* subglobose, $1\frac{1}{2}$ – $1\frac{3}{4}$ mm diam. Seeds oblong with rounded ends, faintly curved, yellowish brown, \pm $1/2$ mm long.

Distr. N. America, Europe, and Hindustan to Australia and New Zealand, in *Malaysia*: N. Sumatra, Java.

Ecol. In Java in the eastern part in shallow

lakes with very limpid water, and on inundated rice-fields, living quite submersed, forming dense patches on the bottom, locally very numerous, 500–2000 m. Many closed flowers seen, not a single expanded one.

Note. FASSETT accepts PURSH's taxon as a *var. americana* (PURSH) FASSETT of *E. triandra* (Rhodora 33, 1931, 72; *ibid.* 41, 1939, 373). FERNALD (*ibid.* 43, 1941, 208 *seq.*) maintains that there is an important difference between *E. triandra* and *E. americana* in the structure of the ovary, *viz* that in the first the seeds are borne the whole length of the central axis and are horizontally divergent, whereas in the latter the seeds are borne at the base of the central axis and stand vertically. The material at hand from Malaysia is insufficient to check this criterion.

2. *Elatine ambigua* WIGHT in HOOK. Bot. Misc. 2 (1831) 103, Suppl. t. 5; W. & A. Prod. (1834) 41; DYER in HOOK. f. Fl. Br. Ind. 1 (1874) 251; KOORD. Exk. Fl. 2 (1912) 623; BACK. Bekn. Fl. Java, em. ed. 4 (1942) fam. 55, p. 2.

Leaves $2\frac{1}{2}$ –5 mm long. Pedicels distinct, $1/2$ – $1\frac{1}{2}$ mm. Stamens shorter than the sepals. Otherwise quite like the preceding species and probably only a temporarily terrestrial form of it.

Distr. Hindustan, Fiji Islands, and *Malaysia*: Java. In W. Java at 250 m above sea-level in a single specimen, in E. Java at 1900 m in large numbers; in both localities on sandy mudbanks in and along riverbeds.