

FLAGELLARIACEAE (C. A. Backer, Heemstede)

Erect, ascending, climbing or floating perennials, often robust, stoloniferous or not. *Leaves* spirally arranged or bifarious, subsessile or distinctly stalked, ovate-lanceolate or oblong-lanceolate-linear, with or without a spirally coiled, tendril-like apex; their sheaths embracing the stem, either closed all round or more or less deeply split on the anterior side. Blade closely longitudinally nerved or sub-penninerved; nerves connected by numerous short, often oblique transverse veinlets. *Flowers* arranged in terminal, sessile or peduncled panicles, sessile, actinomorphic, ♂ or unisexual, rather small. Perianth hypogynous, calycine or corolline. Tepals 6, 2-seriately imbricate, free or shortly connate, persistent. Stamens in ♂ and ♂ 6, free; anthers basifixed, 2-celled; cells bursting by an introrse longitudinal slit. Ovary in ♂ and ♀ superior, sessile, 3-celled; cells with a solitary ovule in the inner angle; stigmas 3 or one deeply 3-lobed stigma, sessile. *Fruit* drupaceous, indehiscent. Seeds or kernels 1-3; albumen copious; embryo small.

Distr. Genera 3, in the tropics of the Old World, all of them in *Malaysia*.

Ecol. Inhabitants of damp forests, thickets, morasses and slowly moving parts of rivers.

Uses. Unimportant. Stems used for basket-work; stems and runners sometimes eaten raw; leaves and roots occasionally used for medicinal purposes.

KEY TO THE GENERA

1. Flowers bisexual. Leaves sessile or very shortly stalked. Terrestrial, not stoloniferous.
2. Erect. Stem fistular. Leaves very distinctly longitudinally plicate, apex not tendril-like, base acute. Perianth calycine 1. *Joinvillea*
2. Climbing. Stem solid. Leaves not plicate, tips (except the very lowest) tendril-like, base rounded or subcordate, abruptly contracted into a very short petiole. Perianth corolline, white 2. *Flagellaria*
1. Flowers unisexual, ♂ with a small rudimentary ovary crowned by 3 short stigmas; ♀ with 6 anatherous small staminodes and a well-developed ovary with a sessile, depressed, deeply 3-lobed stigma. Stem solid. Lower leaves on rather long petioles, sprouting from a cleft basal sheath. Aquatic or terrestrial, at a somewhat advanced age stoloniferous 3. *Hanguana*

1. JOINVILLEA

GAUD. Voyage Bonite (1846) t. 39, 40 (*absque diagn.*); BRONGN. & GRIS, Bull. Soc. Bot. Fr. 8 (1861) 264.

Robust, reed-like herbs. Stem enclosed to up or near the panicle by closed leaf-sheaths. *Leaves* spread, lanceolate or linear from a tapering base, herbaceous but hard and stiffish; the transverse veinlets rather distant. Panicle broad, rather lax, pubescent. *Flowers* solitary, distant, small, ♀. Bracts minute, deciduous. Perianth small, calycine. Tepals of about equal length, the outer ovate, acute, inner oblong, obtuse or rounded. Stamens 6 (occasionally 1 aborted?); anthers with a bifid base. Ovary conic; style none or very short; stigmas 3, linear, rather long. *Drupe* broadly ovoid-globose; exocarp thin, succulent; endocarp bony, 2-3-seeded. Seeds globose or ovoid, testa membranous.

Distr. Species 3, closely allied, one in *West Malaysia*, extending from Sumatra across the Malay Peninsula and N. Borneo to Palawan (Philippines), the others far remote in the New Hebrides, N. Caledonia, Fiji, Samoa, and Hawaii.

Ecol. Plants of light forest on a non-swampy soil.

1. *Joinvillea borneensis* BECCARI, Nelle For. Born. (1902) 198; Wand. (1904) 128; MERR. En. Born. (1921) 109; En. Philip. 1 (1925) 190; BURK. & HOLTZ. Gard. Bull. 3 (1923) 86; MERR. Contr. Arn. Arb. 8 (1934) 18.—*J. malayana* RIDL. Str. Br. R. As. Soc. 44 (1905) 199; MERR. Philip. J. Sc. 1 (1906)

Suppl. 181; RIDL. Fl. Mal. Pen. 4 (1924) 368, t. 209
Often several-stemmed, 1½-4½ m tall. Stems subterete, hard, glabrous, reedlike. *Leaves* subsessile, tapering to a long point, usually along the margins and on both surfaces rough by the presence of numerous rather distant very short, stiff

hairs, sometimes, barring the margins, subglabrous, 35–75 by 5–7½ cm. Leaf-sheaths of a firm texture with well-developed, thinner apical auricles appressed against the stem, faintly and closely longitudinally nerved; nerves at the top converging into the leaf-base. *Panicle* erect, sessile or stalked, 12–35 cm long, 2–3 times branched, rather densely clothed with erecto-patent, short, stiff hairs; branches comparatively thin, widely patent, distinctly sinuous, especially the thinner ones; ultimate branchlets bearing a few distant flowers.

Flowers sessile on a thickening of the rachis. Perianth membranous, glabrous, ± 3 mm long. Filaments filiform. Styles erect or erecto-patent. Drupe broadly ovoid-globose, glabrous, dull red, 2–3-seeded.

Distr. *Malaysia*: N. Sumatra, Malay Peninsula, N. Borneo, Philippines (Palawan, Jolo).

Ecol. Jungles, light forest, forest-borders, often on mountain-ridges, 650–1700 m.

Vern. *Rotan bini* (Mal. Pen.). Philippines: *odyung* (Tagb.).

2. FLAGELLARIA

LINNÉ, Sp. Pl. (1753) 333; Gen. Pl. ed. 5 (1754) no 450.

Robust, climbing, entirely glabrous herbs with terete, solid, hard stems. *Leaves* bifarious, subsessile, tapering towards the top and there, barring the very lowest, ending in a dorsally flattened, hard tendril, which is coiled in the shape of a watch-spring and thickens after having grasped a support, firmly herbaceous, densely longitudinally nerved, with numerous rather faint, short, oblique cross-nervules, not plicate. Leaf-sheaths tubular, in the Malaysian species closed up to the very apex. Panicles most variable as to size. *Flowers* ♀. Tepals free, coloured, membranous, 3 inner largest, persistent. Filaments filiform, at last exerted; anthers linear or linear-oblong, inserted with a bifid base. Ovary narrow, obtusely triangular; style very short; stigmas rather long, linear-clavate, at last exerted. Drupe subglobose; exocarp succulent, thin; endocarp bony, 1- or rarely 2-seeded. Seeds globose or, by mutual pressure, more or less flattened; testa crustaceous.

Distr. Species 4, one widely spread from tropical Africa, through tropical Asia, and *Malaysia*, to Polynesia and N. Australia, the 2nd in N. Caledonia, the third confined to the Samoa and Fiji Islands and the Bismarck Arch., and a fourth undescribed species of colossal dimensions in San Cristoval Island (Solomon Isl., L. J. BRASS 2835).

Ecol. Plants of humid but not constantly swampy forests.

Note. To make out whether the tropical African species is a variety of *F. indica*, as sometimes assumed, falls beyond the scope of the present revision.

KEY TO THE SPECIES

1. Panicle with long, erect, lower main branches and erect secondary branches, fastigate in habit, peduncled, 30–50 cm long. Flowers inserted at distinct intervals. Drupes 12 mm long, endocarp sulcate, pyrenes 8 mm long 2. *F. gigantea*

1. Panicle with short divaricate branches, not fastigate in habit, hardly peduncled, up to 30 cm long. Flowers very densely packed, without intervals between their insertions. Drupes ± 6 mm long, endocarp smooth, pyrenes 5 mm long 1. *F. indica*

1. *Flagellaria indica* LINNÉ, Sp. Pl. (1753) 333; in STICKMAN, Herb. Amb. (1754) 20; BURM. f. Fl. Ind. (1768) 85; SPAN. Linnaea 15 (1841) 477; BLANCO, Fl. Filip. ed. 2 (1845) 196; ed. 3, 1 (1877) 347; HASSK. Pl. Jav. Rar. (1848) 104; ZOLL. Syst. Verz. (1854) 66; MIQ. Fl. Ind. Bat. 3 (1856) 249; Sum. (1860) 260; F.V.M. Descr. Not. 4 (1876) 73; RIDL. J. Bot. 24 (1886) 358; K. SCH. Fl. Kais. Wilh. Land (1889) 15; HOOK. f. Fl. Br. Ind. 6 (1892) 391, *incl. var. minor* (BL.); KOORD. Minah. (1898) 305; K. SCH. & LAUT. Fl. D. Schutzgeb. Süds. (1901) 215; RENDLE, J. Bot. 39 (1901) 177; BAILEY, Queensl. Fl. 5 (1902) 1658, *incl. var. gracilicaulis* BAIL.; MERR. Govt Lab. Publ. Manila 27 (1905) 87; WINKL. Bot. Jahrb. 44 (1910) 526; KOORD. Exk. Fl. Java 1 (1911) 269; LAUT. Bot. Jahrb. 50 (1913) 289; GIBBS, J. Linn. Soc. 42 (1914) 167; DOMIN, Bibl. Bot. 20 (1915) 504; RIDL. Trans. Linn. Soc.

Bot. II, 9 (1916) 231; MERR. Sp. Blanc. (1918) 93; Int. Herb. Amb. (1917) 133; En. Born. (1921) 109; KRAUSE, Bot. Jahrb. 59 (1921) 544; WHITE, Proc. R. Soc. Queensl. 34 (1922) 17, *incl. var. minor*; MERR. En. Philip. 1 (1923) 191; RENDLE, J. Bot. 61 (1923) Suppl. 57; KRAUSE, Nova Guin. 14 (1924) 180; RIDL. Fl. Mal. Pen. 4 (1924) 368; BACKER, Handb. 3 (1924) 3; HEYNE, Nutt. Pl. (1927) 426; WHITE, J. Arn. Arb. 10 (1929) 203, *incl. var. minor*; RIDL. Disp. (1930) 320; BURK. Dict. (1935) 1024; LAM, Blumea 5 (1942) 166; HATUSIMA, Tokyo Bot. Mag. 56 (1942) 421, *incl. var. gracilis*; BACKER, Bekn. Fl. Java em. ed. 10 (1949) fam. 212, p. 1.—*Palmijuncus laevis* RUMPH. Herb. Amb. 5 (1741) 120, t. 59, f. 1.—*Fl. minor* BL. in ROEM. & SCHULT. Syst. 7, 2 (1830) 1493; ZOLL. Syst. Verz. (1854) 66; MIQ. Fl. Ind. Bat. 3 (1856) 249; Sum. (1860) 260, 598, *incl. var. linearifolia* MIQ.; KURZ, Nat. Tijd.

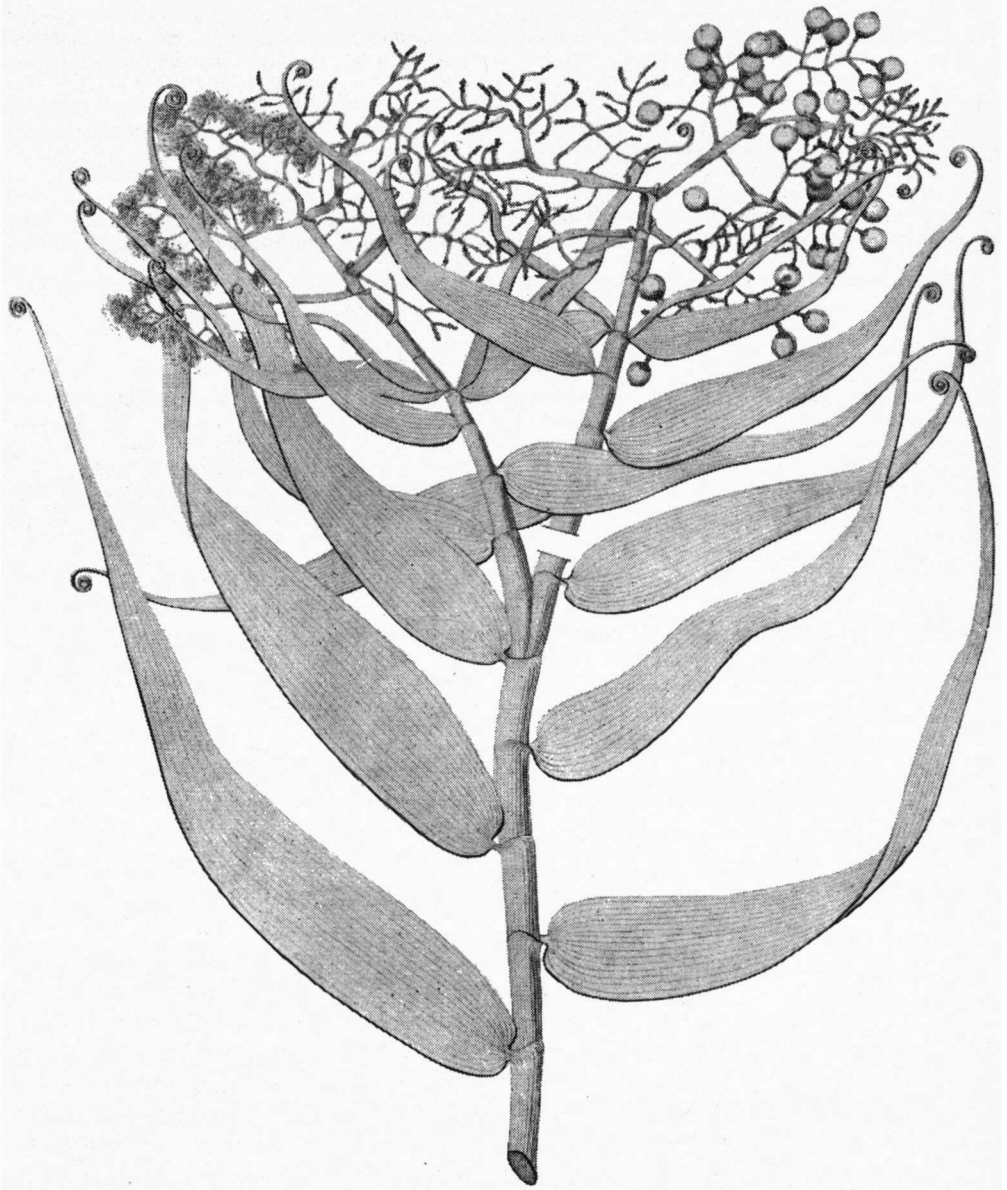


Fig. 1. *Flagellaria indica* L., $\times 1/2$ (the right branch of the fork has been drawn in fruit, in its natural position)

N.I. 27 (1864) 221.—*Fl. philippinensis* ELM. Leaf. 1 (1908) 274.—Fig. 1.

Perennial climber, 2–15 m long, rarely longer. Stem in the basal part often more or less woody, higher up herbaceous but hard. *Leaves* bifarious, ovate to lanceolate or linear, base rounded or slightly cordate, abruptly contracted into a dorsally flattened petiole 3–10 mm long, firmly herbaceous, most variable as to size, 3–50 by $1/2$ – $6\frac{1}{2}$ cm; sheath terete, 1–7 cm long, subtruncate, faintly herbaceous,

on both sides of the petiole with a very narrow thinner apical rimlike auricle, longitudinally ribbed; ribs at the top converging into the petiole. Panicle erect, mostly forked and consisting of 2 main branches, widely branched (often from the very base), 3–30 cm long, bearing on its short ultimate branchlets the sessile flowers in very short, dense spikes. *Flowers* solitary, subtended by a short, broad, bract, white, odorous. *Tepals* erect, oval, rounded, thinly membranous, 2– $2\frac{3}{4}$ mm long, stamens and

stigmas at last far exerted. Ovary narrow; stigmas erecto-patent. *Drupe* subglobose, smooth, pink, \pm 6 mm diam., mostly with a single fertile 1-seeded cell and 2 minute empty ones, rarely with 2 fertile and 1 empty cell.

Distr. ?Trop. Africa, Ceylon, tropical SE. Asia, throughout *Malaysia*, Melanesia, and Polynesia to N. Australia.

Ecol. Moist (not swampy) forests from the sea-coast up to 1500 m, frequent in forest-borders along the inner margin of the mangrove. *Fl. fr.* Jan.–Dec.

Uses. Stems sometimes used for basket-work as a rather poor substitute for rotan (rattan). Young stems and leaves used for making hair-wash. Various medicinal applications are recorded.

Vern. Very many local names of which may be mentioned: *lumpui*, S, *owar*, S, Md, *kokrok*, *wowo*, *wala(n)*, J, *rotan* (with diverse additions such as *dapit*, *dini*, *kroh*, *laki*, *lanang*, *manchik*, *marouw*, and several others in Malay-speaking regions), *rotang da ursa* (Sum. E.C.), *oewát'a* (Talaud), *róma* (Morotai), *paikat laki* (Dayak), *mung* (Finschhafen), *monggan* (Konstantinhafen). Philippines: *Anuád*, *iñguái*, *uái-ti-uák* (Ilk.), *aráyan*, *iñgúla* (Tag.), *baling-uái* (Tag., Pamp.), *auái* (Ig.), *auái-si-gáyang*,

venagalang (Is.), *boboáya*, *ouag-ouág* (Mbo.), *hodg-uái*, *ouág-oi* (Bik.), *huág* (S. L. Bis., Mbo.), (*h)uák* (Bis.), *inúal* (Pang.), *kala-uái*, *kala-uaiuai*, *tiniung* (Ibn.), *páua*, *sagákap*, *taud* (P. Bis.), *uág* (Sul., Bis., Bag., Bik.).

Note. A small-leaved form has been described as *Fl. minor* BL., a large-leaved one as *Fl. philippinensis* ELM. Between these and the normal forms all intergrades occur; they can not even claim varietal rank.

Sterile specimens show a faint resemblance with *Gloriosa superba* L., which has subsimilar leaves, but may be at once recognized by the not-bifarious sheathless leaves.

Fl. neocaledonica SCHLTR. is different by its size, dorsally keeled sheaths, a cordate leaf-base, &c.

2. *Flagellaria gigantea* HOOK. f. *Ic. Plant.* 15 (1883) t. 1429; LAUT. *Bot. Jahrb.* 45 (1911) 358; KRAUSE, *ibid.* 50 (1913) 289; *ibid.* 59 (1925) 546.

Distr. Fiji, Samoa, and the Bismarck Arch. (New Ireland), might occur also in New Guinea.

Certainly distinct from the preceding species, in which also coarse specimens and broad cordate-based leaves occur. REINECKE 264 from Samoa exactly matches the original description.

3. HANGUANA

BLUME, *En. Pl. Java* (1827) 15.—*Susum* BL. in SCHULT. *Syst.* 7 (1830) xcv, 1493.—*Veratronia* MIQ. *Fl. Ind. Bat.* 3 (1859) 553.

Ascending herb, often robust, at a somewhat advanced age stoloniferous. Stem terete, solid. Stolons creeping or floating, often long, enveloped by appressed sheaths which finally dissolve into fibres. *Leaves* for the greater part crowded at the base of the plant, erecto-patent, lanceolate from an acute, often decurrent base, rather thick, densely longitudinally nerved, with numerous close-set thin cross-nervules, between the longitudinal nerves very densely and finely longitudinally striate, not plicate; lower leaves long-petioled; higher leaves much more remote, smaller, on shorter petioles; topmost ones sessile or subsessile with a broad base, small, passing into the primary bracts. Lower leaf-sheaths long and broad, stem-clasping, deeply split on the anterior side, gradually narrowed into the petiole. Panicles peduncled, 1–3 times patently branched; primary branches 1 to several in the axils of rather large bracts, usually branched again; ultimate branches spiciform. *Flowers* more or less distant, either solitary or in small clusters, sessile with a broad base in the axil of a short, broad bract, (σ) (φ). Tepals shortly connate at the base, green or yellowish or the inner dotted with red; 3 outer short; 3 inner considerably longer, vaulted.— σ : Branches of panicle usually thinner and longer than those of φ , often with a greater number of flowers. Stamens 6, on the base of the perianth, about as long as the inner tepals; filaments filiform from a broader base; anthers small, inserted in a basal cleft. Ovary rudimentary, small; stigmas 3, erect or erecto-patent, shortly clavate.— φ : Staminodes 6, inserted on the base of the perianth, anatherous; those opposite the outer sepals very minute, narrowly triangular; 3 others much longer and broader, rounded, dorsally compressed. Ovary broadly ovoid-globose; stigma sessile, deeply divided into 3 spreading broadish short arms. *Fruit* drupaceous; exocarp thick, fleshy; endocarp thin-walled, 3-celled, 1–3-seeded.

Distr. Monotypic, tropical SE. Asia to *Malaysia*, and Micronesia (Palau).

Note. The fruit is not baccate, as is often mentioned in literature. Dr G. ERDTMAN, Stockholm, finds the pollen much resembling that of some *Liliaceae*. KURZ, *l.c.*, also stresses this affinity.



Fig. 2. *Hanguana malayana* (JACK) MERR. Colony in Rawa Tembaga, E of Djakarta.

1. *Hanguana malayana* (JACK) MERR. Philip. J. Sc. 10 (1915) Bot. 3; En. Born. (1921) 109; En. Philip. Pl. 1 (1923) 191; KRAUSE, Nova Guin. 14 (1924) 180; Bot. Jahrb. 59 (1925) 546; BACK. Bekn. Fl. Java, em. ed. 10 (1949) fam. 212, p. 2, *incl. ssp. kassintu* (BL.) & *anthelmintica* (BL.); BAKH. v. D. BRINK Jr, Blumea 6 (1950) 399, *incl. var. anthelmintica*.—*Olox zeylanica* (non L.) GAERTN. Fruct. 2 (1791) 414, *cf.* HALL. f. Rec. Trav. Bot. Néerl. 15 (1918) 61.—*Veratrum malayanum* JACK, Mal. Misc. 1 (1820) 25; in HOOK. Bot. Misc. 2 (1831) 74.—*Hanguana kassintu* BL. En. Pl. Java (1827) 15; ed. 2 (1830) 15.—*Susum anthelminticum* BL. ex ROEM. & SCHULT. Syst. 7, 2 (1830) 1493; ZOLL. Syst. Verz. (1854) 66; MIQ. Fl. Ind. Bat. 3 (1856) 247; Sum. (1860) 259, 598; KURZ, Flora 56 (1873) 224; J. As. Soc. Beng. 45, ii (1875) 199; HOOK. f. Fl. Br. Ind. 6 (1892) 391; KOORD. Ekk. Fl. 1 (1911) 270; RIDL. Fl. Mal. Pen. 4 (1924) 369; Disp. Pl. (1930) 186; LANE-POOLE, For. Res. N.G. (1925) 77; BURK. Dict. 2 (1935) 2109.—*Veratrum malayana* MIQ. Fl. Ind. Bat. 3 (1859) 553.—*Susum minus* MIQ. Fl. Ind. Bat. Suppl. (1860) 260, 598.—*Susum malayanum* PLANCH. ex HOOK. f. Fl. Br. Ind. 6 (1892) 391; HUB. WINKL. Bot. Jahrb. 44 (1910) 526; LAUT. Bot. Jahrb. 50 (1913) 289; RIDL. Fl. Mal. Pen. 4 (1924) 369; BACK. Handb. 3 (1924) 3, *incl. f. sylvatica* & *aquatica*; HEYNE, Nutt. Pl. (1927) 427; VAN DEN ENDE, Trop. Natuur 26 (1937) 128 *seq.*, f. 2–6; BURK. Dict. 2 (1935) 2109.—*Susum kassintu* KURZ,

Flora 56 (1873) 224.—*Hanguana aquatica* KANEHIRA, Trans. Nat. Hist. Formosa 25 (1935) 8, f. 10; J. Dep. Agric. Kyushu Imp. Univ. 4 (1935) 286.—Fig. 2.

Perennial herb, very variable as to the dimensions of all its parts (except those of the flowers), either aquatic (in morasses and slowly moving water) or terrestrial (in humid forests). Stem ascending, above the lower rooting or floating part rigidly erect, 1/2–2 m high (panicle included), at a somewhat advanced age emitting from the basal part one or more creeping or floating densely sheathed, often long runners which at their apex develop into a new plant behaving in the same way, especially those of the often very robust aquatic form, which frequently generate large, dense, nearly impenetrable masses, parts of which frequently separate, by a rise of the water, from the motherplant and form floating islands. The terrestrial form, as a rule, much less robust and forming fewer, shorter, feebler runners, not generating dense masses. Both forms, when young, usually more or less densely crispy hairy, afterwards glabrescent. *Leaves* stiff, 20–120 by 1 1/2–15 cm. Panicle (disregarding peduncle) 10–120 cm long, 1–3 times branched. Outer tepals 2–2 1/2 mm long, inner 2 1/2–3 mm. *Drupe* oblong, much surpassing the perianth, up to 2 cm long, shining red.

Distr. Ceylon, Indochina, Micronesia (Palau), in *Malaysia*: as yet not collected in the Lesser Sunda Islands and the Moluccas.

Ecol. From the plains up to \pm 1500 m, in morasses, along lake-shores and rivers, in slowly moving fresh water and in humid forests. See description of the species above. In the *Hanguana*-morasses this plant frequently suppresses all other species with the exception of a few orchids (e.g. *Vanda hookeriana* RCHB. f. which seems to have a predilection for such localities) and is able to form floating islands in lakes. The floating capacity is due to the air in the numerous air-vessels in the plant; a fresh rhizome 50 cm long, 10 cm diam. weighed hardly 1½ kg (VAN DEN ENDE, *l.c.*).

Uses. BLUME in ROEM. & SCHULT. *l.c.* p. 1494 states that the roots of the aquatic form (*anthelminthica*; see beneath) are used in Java by veterinary surgeons as a vermifuge. This statement has not been confirmed by any subsequent author. In New Guinea the stems and runners of this form are said to be eaten raw by the Papuans.

Vern. *Attu ara*, *sa humbang* (Sum. E.C.), *bahong* (Batak), *bakung ayer* (Banka), *bangkung* (Djambi), *kasintu*, *poar*, *S*, *tjakung*, *J*, *djeluwong rimbo*, *M*, *pui* (Dayak).

Note. The aquatic form has been described as *Susum anthelminthicum* BL. = *S. malayanum* PLANCH. f. *aquatica* BACK. = *Hanguana malayana* MERR. subsp. *anthelminthica* BAKH. f. The terrestrial form was described as *Hanguana kassintu* BL. = *Susum malayanum* PLANCH. f. *sylvatica* BACK. = *Hanguana malayana* MERR. subsp. *kassintu* BAKH. f. Though the typical aquatic and terrestrial forms look very different, the differences are, as a matter of fact, of very slight taxonomic value. The 2 forms differ mainly by their size and are connected by a series of intermediates; they can lay no claim to the rank of species or subspecies, not even to that of varieties, and are simply edaphic forms comparable to those of *Polygonum amphibium* in Europe.

VAN DEN ENDE, *l.c.*, maintains to have found all flowers σ in S. Sumatra, but I surmise he mistook the staminodes for stamens. At Bogor Bot. Gardens, and in the Rawa Lakbok, Central Java, I never found fruit in σ specimens.

The first who identified *Veratronia* with *Susum* was KURZ (1873) followed by BECCARI (Bull. Soc. Tosc.ortic. 8, 1884, 70, *cum tab.*).