

SCYPHOSTEGIACEAE (C. G. G. J. van Steenis, Leyden)

1. SCYPHOSTEGIA

STAPP, Trans. Linn. Soc. Lond. II, Bot. 4 (1894) 217, t. 17; HUTCHINSON, Fam. Fl. Pl. 1 (1926) 229, f. 168; BAEHNI, C.R. Soc. Phys. Hist. Nat. Genève 54 (1937) 91–92; Ber. Schweiz. Bot. Ges. 48 (1938) 22–28, f. 1–3; SWAMY, Proc. Nat. Inst. Sc. India 19 (1953) 127–142, f. 1–38; METCALFE, Reinwardtia 4 (1956) 99.—Fig. 1.

♂ Erect, glabrous, dioecious shrub or small tree. Twigs 4-angular, rhomboid in section, more or less zigzag, pithy; pith in young twigs \pm terete, in older ones cross-like in section; medullary rays very regular, finely radial-parallel. *Leaves* simple, alternate, bifarious, flat in flush, shortly petioled, crenulate-dentate, nigrescent, penninerved, veins transversal, ultimate veins partly blind in the inter-venal areoles. Stipules small, acute, their lower part persistent and hardened. *Inflorescences* terminal, in their lower part leafy, bracteate, consisting of a raceme of peduncled, spike-like racemes with telescoped tubular bracts sustained at the base by 1 bract and 2 stipules. Bracts persistent, accrescent, truncate, veined lengthwise, the uncovered part thicker, each 1-flowered except the terminal one which is 2-flowered. *Flowers* in each raceme developing from the base upwards, on a flattened, persistent pedicel. *Perianth* connate, rather fleshy, corollar, consisting of 6 lobes, imbricate in bud, 3 inner and 3 outer ones, in the ♀ about equal, in the ♂ the inner ones smallest. ♂ *Flowers*: perianth segments shorter than the tube, inner ones spaced, spathulate; extrastaminal disk glands 3, blunt, oblong, fleshy at the base of the sulcate filaments; filaments connate in a column opposite the inner tepals; anthers 2-celled, dehiscing lengthwise, extrorse; connective produced above the anthers, rounded; pollen grains 3-colpate. ♀ *Flowers*: perianth \pm persistent, perianth-lobes longer than the tube, about equal; disk glands absent (but possibly disk-like tissue of receptacular origin participating in the ovarial wall); ovary urceolate, thickened fleshy at the mouth and with recurved margin, 9–12-sulcate, the apical part possibly representing a glandular-stigmatic surface depressed in the centre and through a distinct (?style-)canal giving free entrance to the ovarial cavity. Ovules ∞ , crowded on the flat base of the ovary, linear, erect, on a minute funicle, anatropous. *Fruiting receptacle* \pm globose to broad-cylindric, fleshy, accrescent, 9–12-ribbed or -sulcate, breaking up at the mouth. *Seeds* ∞ , densely packed, their needle-like bases surrounded by and partly connate with a spongy tissue of scarious lamellae of placental origin; seeds terete, narrow ob-lanceolate, with a blunt, obliquely cut, concave apex, shortly erect-patent pubescent over its whole surface; testa black, brittle-chartaceous; endosperm attached at the apex of the testa, cylindric, outer cell layer brown, enveloping the embryo. Embryo straight in the basal part of the seed the rootlet pointing downward, rootlet slightly compressed, cotyledons oblong, flat, thin-foliaceous, somewhat longer than the rootlet.

Distr. Monotypic, in *Malaysia* (Borneo).

Notes. All recent authors agree that the genus represents a distinct family. Difficulties in settling its taxonomic position have partly been due to some inadequate observations in the past which led to unsatisfactory interpretation. Originally described as scandent, it appears to be an erect shrub or treelet. Hitherto all authors agree on the absence of stipules which I find are distinctly present on innovations, leaving knob-like traces on the mature twigs.

In addition the morphological interpretation of the floral parts, specially in the ♀ has varied. The gland-like appendages in the ♂ flowers (fig. 1f) have been accepted by BAEHNI (*l.c.* p. 23–24) as representing a corolla which should then be homologous with the corona-like or diaphragm-like outgrowth in the ♀ flower (fig. 1g).



Fig. 1. *Scyphostegia borneensis* STAFF. a. Habit of a flowering ♂ twig, $\times 2\frac{1}{3}$, b. ditto, ♀ twig, $\times 2\frac{1}{3}$, c. ♂ raceme with an immature flower at the top, $\times 2\frac{1}{2}$, d. tubular bract, opened, showing persistent pedicel, $\times 2\frac{1}{2}$, e. upper two bracts, terminal one with 2 flowers, $\times 3$, f. opened ♂ flower, $\times 3$, g. young ♀ raceme with open flower, $\times 2$, h. ♀ raceme with opened bracts showing persistent pedicel, $\times 2$, i. tangentially cut young ♀ flower, $\times 4$, j. three ovules, $\times 12$, k. fruit with reflexed calyx, \pm nat. size, l. seed, $\times 3$, m. ditto, cut lengthwise and in sequence showing testa, albumen, and embryo, $\times 5$ (a, c-f from CLEMENS 26361, b, h-j from CLEMENS 26062, k AMDJAH 545, l-m after STAFF).

The scarios, scale-like outgrowths surrounding the stipes of the achenes were too schematically drawn by STAFF as 3 distinct lobes (in contrast with what he says in his text). HUTCHINSON accepted them to represent a floral perianth. On this basis, he interpreted the ♀ flower as an inflorescence not homologous with the ♂ flower, taking the thick outer lobes and corona of the ♀ flower together as a receptacular outgrowth comparable to that of the inflorescence in *Ficus*. This presentation is rightly disputed; BAEHNI has definitely shown (*l.c.* p. 25) that the scarios, connate, bract-like outgrowths on the ♀ receptacle have the nature of trichomes and not of a perianth, an opinion already advanced by STAFF. The exact homology of ♂ and ♀ flowers is also shown in the exactly comparable insertion of the ♀ flowers on a single, flattened, persistent pedicel inside each of the remarkable tubular bracts.

STAFF referred the genus to the *Monimiaceae*. This was disputed by PERKINS & GILG (Pfl. R. Heft 4, 1901, p. 117) and later by PERKINS (Gatt. Monim. 1925, p. 55). MONEY, BAILEY & SWAMY (J. Arn. Arb. 31, 1950, 373, 395) also reject this view, partly on account of the absence of the secretory pellucid dots in the leaves containing essential oil. They say that the 3-colpate pollen structure excludes the genus from relationship with most woody ranalian families, but they did not offer much of a positive alternative. A distinct difference against *Monimiaceae* is further the presence of stipules and of bifarious alternate leaves.

HUTCHINSON's opinion of affinity with *Moraceae* has to be abandoned definitely; ERDTMAN (Pollen Morph. & Tax. 1952, 405) says that it cannot belong to that affinity on account of the 3-colpate pollen. The apocary and absence of latex also does not point to *Moraceae*.

Recently SWAMY gave an entirely new interpretation of the structure of the ♀ flower in accepting the urceolate structure of the ♀ flower to represent an ovary with numerous basal ovules. His drawing of the ovule during anthesis is very convincing (*l.c.* p. 129, fig. 6): anatropous, with a pedestal funicle and 2 integuments. Though I have accepted this interpretation, the occurrence of analogous structures in *Monimiaceae* is remarkable: 1) trichome or hair-like outgrowths of the receptacle in many spp., 2) seed with stiff erect-patent hairs (e.g. in *Glossocalyx*), 3) sulcate rim of receptacle in many spp., 4) inclusion of ovaries and achenes within a receptacle identical in shape (in *Hennecartia*, cf. PERKINS, Gatt. Monim. 1925, fig. 35H).

Ochrea-like bracts showing a superficial resemblance to those in *Scyphostegia* are found in *Garryaceae* which are certainly not related.

In trying to find a satisfactory relationship of *Scyphostegia* I have asked the help of Dr C. R. METCALFE, of the Jodrell Laboratory, Kew, who has studied the anatomical features on freshly preserved material from the living trees present in the Botanic Garden, Penang, and obtained through the courtesy of the curator Mr H. RITCHINGS. He confirmed (Nov. 1955) 'that there is little anatomical evidence for a relationship with either *Moraceae* or *Monimiaceae*, but that it exhibits a combination of characters that are also to be found in a number of genera and species that are well established as members of the *Flacourtiaceae*. Dr HUTCHINSON can well agree with this relationship and had come quite independently to a similar conclusion'. This again shows the remarkable strength of anatomical evidence. Also morphologically the combination: distichous, crenate leaves with stipules, dioecious 3-merous flowers with a deepened receptacle in ♀, a unilocular ovary with parietal ovules and a sessile stigma, connate stamens and extrastaminal disk glands (epipetalous in *Homalium*!) fits excellently with *Flacourtiaceae*.

1. *Scyphostegia borneensis* STAFF, Trans. Linn. Soc. Bot. 4 (1894) 218, t. 17; MERR. En. Born. (1921) 272; BAEHNI, Ber. Schweiz. Bot. Ges. 48 (1938) 22, f. 1-3.—Fig. 1.

Shrub or small tree, 3-10 m. *Leaves* oblong, to narrow-oblong or obovate-oblong, membranaceous to chartaceous, rather equal-sided, acute-acuminate (acumen often falcate), *c.* 2½-4 times as long as broad, 9-18 by 3-6¾ cm, smaller in the flowering part; nerves 6-11 pairs, petiole almost absent by the contracted decurrent blade under the rounded base to distinct and ¾ cm. Stipules acute, triangular, *c.* 1 mm. ♂ *Inflorescence* green or yellow-green, up to 30 cm, laxly set with racemes 1-2 cm, excl. peduncle ¼-1¼ cm. Tubular bracts up to *c.* 12, *c.* 5-10 by 2-3 mm, dark green. Pedicels scarios, lengthwise 2-veined, 4-6 by 1 mm. ♀ *Flowers*: perianth-tube *c.* 4-5 mm high; lobes oblong-rounded or more spatulate, distinctly thickened at the apex, the outer *c.* 3 by 2 mm, the inner 2 by 1½ mm; disk glands ¾ by ⅔ mm. Staminal column *c.* 2-3 mm, anthers *c.* 2 mm, connective ½ mm high. ♀ *Inflorescences* with fewer racemes than the ♂. Racemes 5-8 by 2-3 mm,

1½-3½ cm peduncled. Tubular bracts fewer and somewhat shorter than in ♂. ♀ *Flowers* pale greenish yellow, or bright green with yellowish margins. Pedicel 2 mm broad, shorter than in the ♂. Perianth-tube 2 mm high, lobes about equal, broad-elliptic, *c.* 6 by 4 mm, under the fruit recurved. Ovary in flower *c.* 4 by 4 mm, dark green at the base, apical grooved part pale green, in fruit accrescent to 1¼ by 1½ cm, 9-12-sulcate or ribbed, green. *Seeds* *c.* 3 mm stipitate, *c.* 5-6 by 4/5-1 mm.

Distr. Malaysia: Borneo, not yet recorded from the southern third part of the island.

Ecol. Rain-forest substage and low jungles, hill-sides and steep river-banks, also in secondary forest, 450-900 m, by RICHARDS (no 1603) recorded below 300 m on Dulit Range. *Fl.* March-Nov., *fr.* Sept.

Vern. Kata manok, tarukakang, Sg (N. Born.), *sangkurat*, Kedayan, *tulau*, Idahan, *loboh*, Tenggara.

Notes. Two specimens are cultivated in the Bot. Gardens, Penang. Introduction in the Singapore Botanic Gardens has failed, possibly on account of badly aerated soil.