

## STEMONACEAE

(Brigitta E. E. Duyfjes, Leiden, The Netherlands)

Twining (to several metres long), trailing or erect perennial herbs, mostly with fasciculate tubers, or with a short rhizome. Plants glabrous, or with uniseriate hairs. *Leaves* papyraceous when dry, alternate, or opposite, or verticillate (China, Japan); blade (elliptic-)ovate or broad-ovate, nerves basal or lateral, curved, shallowly depressed above, secondary intervention finely trabeculate, leaf margin entire; petiole at base pulvinate (*Stemona*), or slightly sheathing (*Stichoneuron*). *In florescences* axillary, sessile, or peduncled cincinnae, appearing as short racemes, rarely one-flowered; flowers and bracts often dotted with raphides; bracteoles absent. *Flowers* consisting of 4 similar segments, representing two rows of two tepals, these free, valvate, out-curved at anthesis, persistent; pedicel articulated. *Stamens* 4, epitepalous; filaments short, adnate to base of tepals, at base mutually free or shortly connate; anthers consisting of two ovoid or elongate thecae, each opening by a longitudinal lateral slit; the thecae situated on top of the filament, either without (*Stichoneuron*) or with an apically enlarged tepal-like appendage of the connective, moreover the connective with a median longitudinal ridge separating the thecae, the ridge either smooth and thin, or fleshy and with a brain-like wrinkled structure, the thecae themselves in addition often protruding into a common sterile appendix, 1–8 mm long, of which the tips may be fused, thus forming a crown-like structure over the stigma (*Stemona*). *Ovary* superior or half superior, small, one-celled, ovules few to many, basally (*Stemona*) or apically (*Stichoneuron*) attached, anatropous or semi-anatropous; style absent; stigma inconspicuous, roundish, papillose. *Fruit* a 2-valved capsule; seeds few to many, broad-ellipsoid, faintly or conspicuously longitudinally ridged; funicle long, with a coralloid, or lobed, hollow, wide-celled aril (*Stemona*), or aril in the form of uniseriate hairs (*Stichoneuron*). Endosperm present.

**Taxonomic position** — An isolated family because of various special morphological features of the flower. Its affinity has generally been accepted as being with the *Liliaceae* s.l., although not closely. Burkill (1960) and Ayensu (1964) suggested an affinity with *Dioscoreaceae*.

**References:** Ayensu, E.S., Bot. Gaz. 129 (1968) 160–165. — Burkill, I.H., J. Linn. Soc. Bot. 56 (1960) 319–412. — Dahlgren, R.M.T., H.T. Clifford & P.F. Yeo, The families of the Monocotyledons (1985) 121. — Duyfjes, B.E.E., Blumea 36 (1991) 239–252. — Krause, K., in A. Engler, Nat. Pflanzenfam. ed. 2, 15a (1930) 224–227. — Prain, D., J. As. Soc. Beng. 73 (1904) 39–44. — Rogers, G.K., J. Arnold Arbor. 63 (1982) 327–336. — Steenis, C.G.G.J. van, Blumea, 28 (1982) 151–163.

**Distribution** — Three genera, two of which occur in Indo-Malesia; *Stemona* (c. 20 species) occurs in Japan and Continental Asia, extending through Malesia to northern Australia, *Stichoneuron* (2 species) in continental SE Asia and the Malay Peninsula. The genus *Croomia* (c. 3 species) has a disjunct distribution in eastern China, southern Japan, and SE United States (Florida, Georgia). The genus *Pentastemona*, described by Van Steenis (1982) in *Stemonaceae*, has been removed from this family and raised to family-rank (see under *Pentastemonaceae*).

**Habitat & Ecology** — Members of *Stichoneuron* and *Croomia* are small, delicate forest dwellers at low altitudes. *Stemona* species mostly prefer a seasonal climate and can be found in rather dry places, often rocky habitats and in seasonal forests, generally not very far from the coast, at altitudes below 500 m.

**Floral morphology** — The early development of the stamens in *Stemona* and *Stichoneuron* is similar in spite of significant differences in the adult stages. A thorough comparison of the floral morphology of *Stemona*, *Stichoneuron* and *Pentastemona* (see *Pentastemonaceae*, p. 395) supports the exclusion of the genus *Pentastemona* from *Stemonaceae*.

*Reference:* Heel, W.A. van, *Blumea* 36 (1992) 481–499, pl. 1–5.

**Seeds** — The seeds are distinctly ridged and have a well-developed raphe and chalaza. Dispersal is probably zoochorous.

*Reference:* Bouman, F. & N. Deventer, *Blumea* 36 (1992) 501–514, pl. 3–5.

**Leaf anatomy** — Crystals are present as styloids and raphides (*Stemona*), or as raphides only (*Croomia*). In *Stichoneuron caudatum* irregular crystalline conglomerates ('clustered needle-shaped + diamond-shaped + irregularly shaped crystals', somewhat related to raphide bundles but not identical) are present, but styloids are absent. In *Stichoneuron membranaceum* the same rather undefined crystals occur together with raphide bundles.

*Reference:* Baas, P., in C.G.G.J. van Steenis, *Blumea* 28 (1982) 159.

**Chromosomes** — *Stemona japonica*:  $2n = 14$  (Suzuka & Koriba 1949); *Stichoneuron caudatum*:  $2n = 18$  and *Croomia pauciflora*:  $2n = 24$  (counted by Gitte Peterson, Copenhagen, unpubl.). Dahlgren et al. (1985) mentioned for the family  $x = 7$ .

*References:* Dahlgren, R.M.T., H.T. Clifford & P.F. Yeo, The families of the Monocotyledons (1985) 121. — Suzuki & Koriba, *Jap. J. Pharmacog.* 3 (1949) 68.

**Palynology** — Pollen grains of *Stemonaceae* are small to medium-sized (19–40  $\mu\text{m}$ ), ellipsoidal to spheroidal, and monosulcate or inaperturate. The exine is distinctly stratified (tectum, infratectal layer, nexine). Ornamentation is diverse. Exine thickness ranges from 0.5 to 1.5  $\mu\text{m}$  at the proximal side. Pollen of the Malesian species of *Stemona* can be easily distinguished from *Stichoneuron* pollen, even with light microscopy. Exine ornamentation is rugulate to scabrate in *Stemona javanica*, *S. lucida*, *S. parviflora* and *S. tuberosa*, fossulate in *S. curtisii*, psilate/perforate in *S. australiana*, and microreticulate in *Stichoneuron*. A few *Stemona* species from Thailand (*S. kerrii*, *S. phyllantha*) may be difficult to separate because of their similar microreticulate ornamentation. *Stemona* pollen is monosulcate and *Stichoneuron* pollen is inaperturate. However, the latter frequently shows a sulcus-like crack. Pollen of *Stemona* is also distinct on account of its granular/columellate infratectal layer. In *Stichoneuron* it is columellate. Pollen of *Croomia* (SE United States, Japan, China) resembles *Stichoneuron* pollen (reticulate ornamentation, columellate infratectum, monosulcate). *Pentastemona*, formerly included in the *Stemonaceae*, is pollen-morphologically quite different from *Croomia*, *Stemona* and *Stichoneuron* (see *Pentastemonaceae*, p. 396).

*References:* Steenis, C.G.G.J. van, *Blumea* 28 (1982) 151–163. — Ham, R.W.J.M. van der, *Blumea* 36 (1991) 127–159.

R.W.J.M. van der Ham

**Phytochemistry** — As far as I am aware nothing is known about the chemistry of the genera *Pentastemona* and *Stichoneuron*. The roots of several species of *Stemona* are used in Southeast Asia, China and Japan as insecticides and therapeutical agents (e. g. Perry & Metzger 1980). The chemistry and the chemotaxonomic aspects of *Stemona* and *Croomia* were discussed twice during the past 30 years (Hegnauer 1963, 1986). In these two treatises many references are available. Subterranean parts of both genera contain several insecticidal alkaloids which represent a special type hitherto only known from these taxa. Tuberostemonin,  $C_{22}H_{33}NO_4$ , is the best known of the *Stemonaceae* alkaloids. It was originally isolated from roots of *Stemona tuberosa* and also occurs in other *Stemona* taxa and is accompanied by a series of biogenetically related bases. Stems and leaves of *S. japonica* yielded the alkaloids stemofoline and stemospiroline and roots and rhizomes of *Croomia heterosepala* contain croomine. Recently roots of *Stemona* species growing in the Southwest of China are investigated for insecticidal and therapeutically useful alkaloids: *Stemona mairei* (Wen-Han Lin et al. 1992), *S. parviflora* (Wen-Han Lin et al. 1991, 1992), *S. sessilifolia* (Dongliang Cheng et al. 1988) and *S. tuberosa* (Gwangdong Prov.; Wen-Han Lin et al. 1992).

Hitherto *Stemonaceae* were thoroughly investigated for alkaloids only. All other classes of secondary metabolites were neglected, including their phenolic compounds. Apparently there is one exception to this statement. In 1974 isolation of three non-prenylated munduserone-type rotenoids from a Thai medicinal crude drug ascribed to *S. collinsae* was reported (Shiengthong et al. 1974); these compounds were called stemonacetal, stemonal and stemonone. Later, however, Taguchi et al. (1977) investigated the same crude drug purchased on the Bangkok market and found it to be free of alkaloids, but yielding the known rotenoid stemonacetal and a new one, clitoriactal. These workers detected that the Thai medicinal crude drug used to treat skin diseases and called 'Non-tai-yak' or 'Non-tai-yaak' has two different botanical sources, namely roots of *Stemona burkillii*, *collinsae* and *tuberosa* on the one hand, and roots of *Clitoria macrophylla* (= *C. hanceana*) on the other; pharmacognostical investigation of their crude drug sample convinced them that they were working with roots of the papilionaceous substitute *Clitoria macrophylla*. This makes it highly probable that also Shiengthong et al. (1974) investigated *Clitoria macrophylla* and not a *Stemona* taxon. Therefore, statements that *Stemonaceae* contain rotenoids (Shiengthong et al. 1974; Hegnauer 1986; Ponglux et al. 1987) are suspicious.

Saponins were recorded for roots of *S. cochinchinensis* which also contain alkaloids. Unfortunately the chemistry of these saponins is still unknown. If *Stemonaceae* are remotely connected with *Dioscoreaceae* (e. g. Van Steenis 1982) or belong to *Asparagales* (Huber 1991) one would guess that *Stemona* saponins are of the steroidal type, i. e. have a  $C_{27}$ -sapogenin.

**References:** Cheng Dongliang et al., J. Nat. Prod. 51 (1988) 202. — Hegnauer, R. Chemotaxonomie der Pflanzen 2 (1963) 150, 436–439, 495; *ibid.* 7 (1986) 771–773. — Huber, H., Angiospermen. Leitfaden durch die Ordnungen und Familien der Bedecktsamer (1991), G. Fischer, Stuttgart. — Lin Wen-Han et al., Roy. Soc. Chem. Nat. Prod. Updates No 10684 (1991); No 13445 (1992) (*Stemona parviflora*); No 13740 (1992) (*Stemona mairei*). — Lin Wen-Han et al., J. Nat. Prod. 55 (1992) 571 (*Stemona tuberosa*). — Perry, L. M. & J. Metzger, Medicinal plants of East and Southeast Asia (1980), MIT Press, Cambridge,

Mass. (*Stemonaceae*, p. 397). — Ponglux, D., et al. (comp.), *Medicinal plants* (1987), Princess Congress I, Bangkok (*Stemona*, p. 243). — Shienghong, D., et al., *Tetrahedron Letters* (1974) 2015. — Steenis, C.G.G.J. van, *Blumea* 28 (1982) 151. — Taguchi, H., et al., *Chem. Pharm. Bull.* 25 (1977) 1026.

R. Hegnauer

#### KEY TO THE GENERA

- 1a. Leaves with basal nerves only. Anther dorsally attached to the base of long, petal-like outgrowth of the connective. Ovules rather numerous, inserted at the base of the ovary ..... *Stemona* (p. 402)  
 b. Leaves with lateral nerves. Anther at the top of short filament, without outgrowth of the connective. Ovules few, apically inserted ..... *Stichoneuron* (p. 408)

#### STEMONA

*Stemona* Lour., *Fl. Cochinchina* 1 (1790) 404; C.H. Wright, *J. Linn. Soc. Bot.* 32 (1896) 490; Prain, *J. As. Soc. Beng.* 73 (1904) 39; Merr., *Enum. Philipp. Flow. Pl.* 1 (1923) 202; Schltr., *Notizbl. Berlin-Dahlem* 9 (1924) 190; *Bot. Jahrb.* 59 (1925) 541; J.J. Smith, *Bull. Jard. Bot. Buitenzorg III*, 6 (1924) 73; Telford, in *Fl. Austral.* 46 (1986) 177. — Type species: name conserved.

Twining non-woody climbers, or trailing (N Australia) or erect herbs, mostly with perennial tubers. *Leaves* alternate, opposite, or verticillate (China, Japan); blades with curved basal nerves only; petioles not sheathing. *Inflorescences* sessile or peduncled, raceme-like, rarely one-flowered. *Flowers*: perianth small to rather large, tepals to 6 cm long, spreading at anthesis, the inner two petals slightly wider than the outer ones. *Anthers* with the thecae dorsally attached to the base of a long petaloid outgrowth of the connective, the thecae apically with or without a (conspicuous) common subulate appendix; filaments proportionally short, mostly connate, forming a ring or free. *Ovary* superior. *Fruit* pendulous, capsular, opening with two valves, few- to many-seeded. *Seeds* basally inserted, dangling on long funicles, with a coralloid or lobed, hollow aril. — **Figs. 1, 2.**

Distribution — Japan, Continental Asia, through Malesia to northern Australia; in *Malesia*: 5 species, apparently confined to coastal areas and areas with a more or less monsoon climate.

Note — The frequently purplish and greenish flowers have an unpleasant smell and may attract insect pollinators.

#### KEY TO THE SPECIES

- 1a. Leaves in distal parts of shoots all opposite; basal leaves often alternate ..... ***S. tuberosa***  
 b. Leaves alternate, rarely some leaves (sub)opposite ..... 2  
 2a. Inflorescence peduncled ..... 3  
 b. Inflorescence sessile ..... 4

3a. Thecae with an appendix (excluding the outgrowth of the connectivum)

4. *S. lucida*

b. Thecae without an appendix (excluding the outgrowth of the connectivum)

2. *S. curtisii*

4a. Ridge separating the thecae irregularly undulate and fleshy ..... 1. *S. australiana*

b. Ridge separating the thecae smooth and thin ..... 3. *S. javanica*

1. *Stemona australiana* (Benth.) C.H. Wright, J. Linn. Soc. Bot. 32 (1896) 496; Telford, in Fl. Austral. 46 (1986) 178. — *Roxburghia javanica ?australiana* Benth., Fl. Australiensis 7 (1878) 1. — Type: *Armstrong 628*, Port Es-sington (K holo, in Hb. Hookerianum).

*Stemona versteegii* Schltr., Bot. Jahrb. 59 (1925) 542. — Type: *Versteeg 1913*, Merauke (BO holo).

Slender glabrous twiner up to 2 m. *Roots* tuberous, dark brown, 2–10 cm long. *Leaves* alternate; blade lanceolate 8–14 by 1–5.5 cm, base cuneate, rounded, or shallowly cordate, apex acute, nerves 3–5; petiole 0.5–2.5 cm long. *Inflorescence* sessile, 1–8-flowered, usually one or two flowers in full bloom; bracts parchment-like, c. 2 mm long. *Flowers*: pedicel 5–40 mm long; tepals blackish-red or dark purple, 8–10 by c. 2 mm. *Stamens* c. 8 mm long; anthers 2–3.5 mm long, the ridge separating the thecae fleshy, brain-like structured, fissured and with bulging surface; appendix of thecae absent, staminode-like, or very short, up to 2 mm long. *Fruit* 10–15 by 5–10 mm, with a beak c. 3 mm, 1–6-seeded. *Seeds* elongate, rounded at the apex, 6–8 by 2–4 mm, the base surrounded by an aril consisting of hollow, finger-like appendages.

Distribution — Australia (Northern Territory and N Queensland); in *Malesia*: Irian Jaya (near Merauke); Papua New Guinea (S coast).

Habitat & Ecology — In savanna and savanna forest, semideciduous bush, in *Imperata* fields; in N Queensland in the margin of rain forest and in coastal forest on sandy laterite; altitude sea level to c. 120 m.

Notes — According to the herbarium material seen, the inflorescences regularly produce fruits.

Superficially *S. australiana* resembles *S. javanica*, but the outgrowth of the connectivum separating the thecae in *S. australiana* is fleshy and of a brain-like structure whereas in *S. javanica* it is membranous and smooth.

*Brass 6039* recorded the species as rare on Daru Island. This also holds true for Papua New Guinea and Irian Jaya. Of the seven collections from these areas only one is collected after World War II.

2. *Stemona curtisii* Hook. f., Fl. Brit. India 6 (1892) 298; Curtis Bot. Mag. 48 (1892) t. 7254. — Type: *Curtis 1522*, Penang, waterfall (K holo).

*Stemona minor* Hook. f., Fl. Brit. India 6 (1892) 298, p. p. — Lectotype: *Glenie in Hb. Thwaites 3775*, Ceylon, Trincomalee, see note.

*Stemona tuberosa* auct. non Lour.: Ridley, Mat. Fl. Mal. Penins. 2 (1907) 86.

Glabrous twiner up to 3 m. *Roots* tuberous, c. 10 cm long, forming a bundle. *Leaves* alternate, seldom opposite; blade ovate-oblong, 6–21 by 2.5–10 cm, base sometimes shallowly, but more often broadly cordate, apex c. 2 cm acuminate, nerves 11–15; petiole 4–8.5 cm long. *Inflorescence* 2–many-flowered, on a peduncle 2.5–10 cm, not fused with the petiole; bracts narrow, 6–10 mm long. *Flowers* pendent; pedicels 8–10 mm long; tepals pink, brown pink or dark brownish red, 17–22 mm long. *Stamens* 13–18 mm long; anthers 7–10 mm long, the thecae preceding as sterile ridges up to the top of the tepaloid outgrowth of the connectivum, and separated by a smooth projecting ridge, 1–1.5 mm high, equally tapering off towards the top of the tepaloid connectivum. Additional appendix of thecae absent. *Fruit* 25–30 by c. 15 mm, shortly beaked, 2–6-seeded. *Seeds* 18–20 by 3–3.5 mm, the acuminate apex c. 5 mm, the base enveloped by an aril consisting of hollow, finger-like appendages.

Distribution — Sri Lanka (rare), Thailand; in *Malesia*: Malay Peninsula (Lepar Archipelago near Banka; one collection seen).

Habitat & Ecology — At low altitudes, not far from the coast, on sand and limestone; found near the shore, on riverbanks, near waterfalls, in thickets and scrub, also in secondary growth in rubber plantations.

Notes — The flowers of *S. curtisii* and *S. collinsae* Craib (Thailand) are identical, but *S. curtisii* is a rather tall climber while *S. collinsae* is a low, erect herb.

Ridley l.c. mentions opposite as well as alternate leaves in the same plant, but the occurrence of opposite leaves is rare; I have seen it in only one collection, *Ridley 10305*.

*Stemona minor* is based on three collections: *Wight 2821*, which is *S. tuberosa*, the above mentioned collection *Glenie in Hb. Twaites 3775* which is *S. curtisii*, and *Beddome 770* in BM., the latter not seen.

**3. *Stemona javanica* (Kunth) Engler in Engler & Prantl, Nat. Pflanzenfam. II, 5 (1878) 8; C. H. Wright, J. Linn. Soc. Bot. (1896) 495; J. J. Smith, Ic. Bog. 3 (1907) 107, t. 244; Backer & Bakh. f., Fl. Java 3 (1968) 154. — *Roxburghia javanica* Kunth, En. Pl. 5 (1850) 288. — Type: *Zollinger Plantae Javanicae 2441* (BM holotype).**

*Stemona asperula* J. J. Smith, Bull. Jard. Bot. Buitenzorg III, 6 (1924) 76. — Syntypes: *Beguini 2333, 2338* (both Halmahera).

*Stemona sulensis* J. J. Smith, Bull. Jard. Bot. Buitenzorg III, 6 (1924) 78. — Type: *Hulstijn (Atje) 182*, Mangoli Island (BO holotype).

*Stemona papuana* Schltr., Bot. Jahrb. 59 (1925) 542. — Type: *Peelk 839*, New Ireland (New Mecklenburg), Lemakot (B holotype).

Glabrous, or slightly asperulous (Halmahera), twiner, up to 5 m. *Roots* tuberous. *Leaves* alternate; blade ovate or broadly ovate 6–18 by 2–12 cm, base cuneate to deeply cordate, nerves 7–11; petiole 1.5–6 cm long. *Inflorescence* sessile or subsessile, (1- or) few-many-flowered, bracts parchment-like 1.5–3 mm long, imbricately arranged and finally forming a pseudo-peduncle up to 1.5 cm long. *Flowers*: pedicel 1–4 cm long; tepals dark purple or purple-brown, 8–12 by 2–4 mm. *Stamens* purple or dark brown, c. 8 mm long; anthers 2–2.5 mm long, the thecae separated by a c. 1 mm high, wing-like ridge; appendix of thecae 0.5–1.5 mm long, fused at the tips, or appendix staminode-like, c. 1 mm long, not fused. *Fruit* 15–35 by c. 10 mm, beak c. 4 mm, 3–7-seeded. *Seeds* elongate, rounded at the apex, 5–16 by 2–4 mm, funicle c. 6 mm long, with an aril consisting of many translucent, hollow, finger-like appendages, reaching to the base of the seed.

**Distribution** — *Malesia*: S coast of Java, Halmahera, Sula Islands (Mangoli, Sanana), NE Irian Jaya, N Papua New Guinea, S coast of New Britain, and W New Ireland.

**Habitat & Ecology** — Apparently occurring only along and near the coast, up to 300 m altitude. In Java on sandy and rocky beaches, coastal forest (*Barringtonia*-formation), scrub vegetation, river borders and devastated forest. In the Sula Islands on karang (limestone) and in ladangs; in Halmahera, Irian Jaya and Papua New Guinea in rather open

primary forest, mixed lowland rain forest, forest edges, secondary forest and grassland.

**Notes** — The flowers have an unpleasant smell.

In Halmahera, Weda District, extract from the stem is given as a drink after childbirth for purification. In Sula Sanana (Moluccas) the tubers are used as fish-poison (*Bloembergen 4372*).

Specimens cultivated in the botanical garden at Bogor (origin not indicated) have whitish tuberous roots.

Some specimens from Halmahera have slightly asperulous stems and petioles.

**4. *Stemona lucida* (R. Brown) Duyfjes, Blumea 36 (1991) 243. — *Dioscorea lucida* R. Brown, Prod. (1810) 295. — Type: *Banks & Solander s.n.*, Endeavor R., Queensland (BM holotype; left-hand specimen).**

*Stemona philippensis* Merr., Bull. Philipp. Gov. Lab. 6 (1904) 16; Telford, in Fl. Austral. 46 (1986) 178. — Type: *Merrill 3061*, Philippines, Masbate Island (K holotype).

Slender, glabrous twiner, up to 7 m. *Roots* tuberous. *Leaves* alternate; blade variable in shape, ovate, lanceolate, hastate, or linear, 4–14 by 0.5–9 cm, with deeply cordate, truncate or narrowed base, nerves 3–11; petiole 1–3 cm long. *Inflorescence* 3–many-flowered; peduncle 1–9 cm long, not fused with the petiole; bracts 2–5 mm long, rather membranous. *Flowers*: pedicel 0.3–0.5 cm long; tepals dark purple, 8–14 by 2–3.5 mm. *Stamens* 8–12 mm long; anthers c. 3 mm long, ridge separating the thecae smooth; appendix of thecae 1.5–4 mm long, fused at the tips. *Fruit* 8–20 by 7–12 mm, c. 0.6 mm beaked, 2–9-seeded. *Seeds* elongate, rounded at the apex, 10 by 4 mm, surrounded at the base by a vesicular aril, c. 4 mm long.

**Distribution** — Australia (northern Queensland, Cook District); in *Malesia*: Philippines (Masbate, Ficao); Papua New Guinea (Normanby Island, Milne Bay Prov., Central Prov. in the surroundings of Port Moresby).

**Habitat & Ecology** — Rather dry places in monsoon areas, not far inland, in scrub, open forest, dry gallery forest, and on roadsides; at an altitude of 0–200 m.

**Notes** — The type material in BM exists of two specimens, belonging to different species. The left-hand specimen, the holotype, bears no flowers, but the two peduncles with the characteristic persisting pedicels leave no doubt about its identity. The right-hand specimen, which is sterile and without peduncles, is probably *S. australiana*.

Wright, in J. Linn. Soc. Bot. 32 (1896) 495, placed *Dioscorea lucida* in *S. javanica*. Telford (l.c.: 180) put it aside in *Stemona* as a doubtful name, because of an sterile isotype seen by him in NSW.

The inflorescences of the juvenile specimen in the collection *Blake 14540*, Queensland (Cook District), are situated in the lower part of the stem, in the axils of c. 5 mm long cataphylls. These leaves gradually change higher up the stem into lanceolate and hastate leaves.

**5. *Stemona tuberosa*** Lour., Fl. Coch. 1 (1790) 404, but cited literature p.p.; C.H. Wright, J. Linn. Soc. Bot. 32 (1896) 494. — Type: A specimen not found; lectotype: Rumph., Herb. Amb. 5 (1747) 365 "Ubi Gorita nigrum", with illustration t. 129.

*Roxburghia gloriosoides* Roxb., Pl. Corom. 1 (1795) 29, t. 32; Blume, En. Pl. Jav. 1 (1830) 9 ('*Roxburgia*'), for the description, the cited literature p.p. — Type: not known.

*Roxburghia viridiflora* J. Smith, Exot. Bot. 1 (1804/05) 111. — Type: *Wallich 5156* (K holo).

*Roxburghia gloriosa* Pers., Syn. Pl. 1 (1805) 412; Curtis Bot. Mag. 35 (1812) t. 1500; J.J. Smith, Bull. Jard. Bot. Buitenzorg III, 6 (1924) 75. — Type: not known.

Glabrous twiner to 4 m. *Roots* forming a fascicle of many thick, fleshy, yellow or black tubers, up to c. 10 cm long. *Leaves* opposite, but those in proximal part of shoots often alternate; blade ovate or broadly ovate, 9–19.5 by 3–14 cm, base shallowly cordate or cordate, top acuminate, nerves 9–13; petiole 1.5–7 cm long. *Inflorescence* (1–)2–6-flowered; peduncle 2–8 cm long, free or fused with the petiole for 5–30 mm; bracts 5–15 mm long. *Flowers*: pedicels 5–15 mm long; tepals outside green or yellow-green with dark green or purple stripes, green towards the tips, purple or browned inside with wine-red stripes, 25–50 by 4–10 mm. *Stamens* purple, 25–40 mm long; anthers 8–15 mm long, the thecae separated by a 1–1.5 mm high and smooth ridge; appendix of thecae 5–12 mm long, tips fused. *Fruit* green, pendent, 40–70 by 15–20 mm, 10–20-seeded. *Seeds* 9–17 mm long, acumen c. 4 mm, funicle c. 8 mm long, the base surrounded by a vesicular aril. — **Figs. 1, 2.**

*Distribution* — Widespread; for details see under the varieties.

## KEY TO THE VARIETIES

- 1a. Peduncle of the inflorescence axillary, free, not fused with the petiole . . . . **a. var. tuberosa**  
 b. Peduncle of the inflorescence fused with the petiole for 5–30 mm . **b. var. ternatensis**

**a. var. tuberosa**

*Distribution* — SE Continental Asia, Taiwan, Hainan; in *Malesia*: Philippines, Flores, Ambon.

*Notes* — For discussion and typification of the name *S. tuberosa*, see under var. *ternatensis*.

Apparently the type variety is rather rare in the Lesser Sunda Islands and Moluccas; from Flores I have seen only four collections. The species is described by Rumphius from Ambon, but later collections are unknown.

**b. var. ternatensis** (J.J. Smith) Duyfjes, Blumea 36 (1991) 243. — *Stemona moluccana* (Blume) C.H. Wright var. *ternatensis* J.J. Smith, Bull. Jard. Bot. Buitenzorg III, 6 (1924) 73. — Type *Beguín 1682*, Ternate (BO holo). — **Figs. 1, 2.** *Roxburghia moluccana* Blume, Fl. Jav. 1 (1827) 9 ('*Roxburghia*'), for the description only. — *Stemona moluccana* (Blume) C.H. Wright, J. Linn. Soc. Bot. 32 (1896) 494; J.J. Smith, Ic. Bogor. 3 (1907) 111, t. 245, 246. — Type: not known. *Stemona affinis* J.J. Smith, Bull. Jard. Bot. Buitenzorg III, 6 (1924) 74. — Type: *Beguín 1960*, Halmahera (BO holo).

*Distribution* — *Malesia*: Philippines, Bali (sterile), Lombok, Flores, Timor, Wetar, Jamdena I., Morotai, Halmahera, Ceram, Buru (sterile), Ambon, Irian Jaya (western part).

*Habitat & Ecology* — At low altitudes not far from the coast; found on loamy soils and sandy tuff; beach vegetation, coastal forest, undergrowth in thick scrub, primary forest along rivers, and on cultivated ground.

*Pollination* — Probably by small flies, belonging to the family *Longhaeidae*.

*Taxonomy* — Variety *ternatensis* seems related to *Stemona phyllantha* Gagnep., Bull. Soc. Bot. Fr. (1934) 147, from Thailand, but differs by the peduncle being partly fused with the petiole, and by a large perianth, with the tepals 60 mm or longer.

*Uses* — No uses are mentioned on the field labels, but Rumphius, l.c., gives extensive data on medicinal properties.

*Notes* — Loureiro added to the description of *Stemona tuberosa* only one reference: "Rumphius



Fig. 1. *Stemona tuberosa* Lour. var. *ternatensis* (J.J. Smith) Duyfjes. a. Leaf,  $\times 0.5$ ; b. inflorescence, the peduncle partly fused with the petiole,  $\times 1$ ; c. androecium,  $\times 1$ , d. front and lateral view of stamen,  $\times 2.5$  (after Icones Bogoriensis).

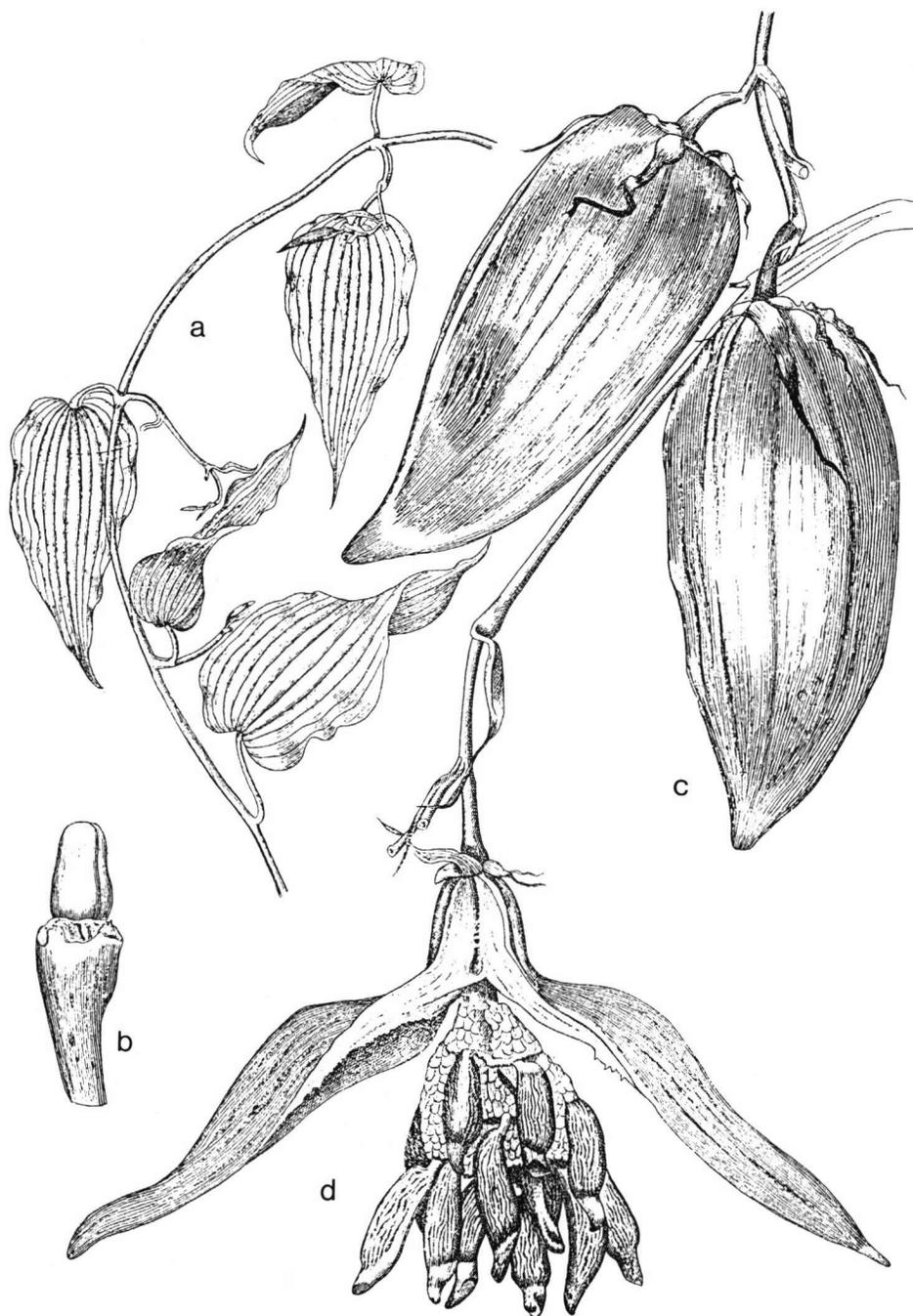


Fig. 2. *Stemona tuberosa* Lour. var. *ternatensis* (J.J. Smith) Duyfjes. a. Leafy stem,  $\times 0.25$ ; b. pedicel with ovary (tepals and stamens removed),  $\times 3$ ; c. fruits,  $\times 1$ , d. dehisced fruit,  $\times 1$  (after Icones Bogoriensis).

*Ubi* Polypoides, t. 129". There has been confusion in the interpretation of Rumphius' *Ubi* Polypoides or *Ubi Gorita*. Rumphius distinguished in *Ubi* Polypoides two taxa, viz.: "Album, seu vulgare *Ubi* Gorita" (*Ubi* with the white tuberous roots), and "Ubi Gorita nigrum" (*Ubi* with the black tuberous roots). The first, "Album, seu vulgare *Ubi* Gorita" is characterized i. a. by the peduncle being partly fused with the petiole. The habitats of this *Ubi* are given in detail, and it is evident that this taxon is the same as the present *S. tuberosa* var. *ternatensis*, which is a common plant in the Moluccas. The second, "Ubi Gorita nigrum", is clearly depicted on table 129, is characterized i. a. by the peduncle emerging from the leaf-axil, not fused with a part of the petiole. Of this *Ubi* Rumphius noted that it is found much less frequently than the *Ubi* with the

white tuberous roots. "Ubi Gorita nigrum" is the same taxon as *S. tuberosa* var. *tuberosa*, which was, as far as is known, never collected on Ambon after Rumphius' time. As the type of *S. tuberosa* could not be traced, I have indicated table 129, with the appropriate description, as lectotype of *S. tuberosa* var. *tuberosa*.

According to *Beguin 1725* from Halmahera, the plant has a bunch of thick fleshy roots, as also described by Rumphius, l.c. According to the label of *Museumtuin no 991* (ex Ambon) the roots are yellow on the outside and white within.

Rumphius, l.c., wrote that in young plants the leaves are alternate, in older plants opposite.

Flowers and open fruits have a disagreeable fetid odour and the plant, when crushed, has an unpleasant smell. *Miller NGF 9712* noted skin irritation caused by sap of the plant.

## STICHONEURON

*Stichoneuron* Hook. f. in Benth. & Hook. f., Gen. Pl. 3 (1883) 747. — Type species: *Stichoneuron membranaceum* Hook. f.

Erect, low, herbs with short rhizomes, probably dioecious. *Leaves* alternate; blades with curved lateral nerves; petioles slightly sheathing at base. *Inflorescences* raceme-like, short, with densely set stiff pedicels. *Flowers* small with recurved tepals. *Stamens* free, simple, without appendages, filaments longish, apically bearing an anther consisting of two dorsifixed thecae without appendage. *Ovary* semi-inferior, one-celled, ovules few, anatropous, apically attached. *Fruit* with one or two seeds. *Seeds* with a funicle, with a flimsy aril consisting of uniseriate hairs. — **Figs. 3, 4.**

Distribution — There are 2 species, *S. membranaceum* in SE Asia, India (Assam), and *S. caudatum* in Thailand and in *Malesia*: Malay Peninsula.

***Stichoneuron caudatum*** Ridley, J. Str. Br. Roy. As. Soc. 57 (1911) 107; Steenis, Blumea 28 (1982) 151, f. 2c, e, f. — Type: *Ridley 14582* (SING holo).

Slender, erect herbs, up to 60 cm, with few branches; stem, pedicels and leaves on lower surface hairy. *Leaves* alternate; blade elliptic, 7–12 by 2–5.5 cm, base rounded or cuneate, apex acuminate; petiole 0.5–1 cm long. *Inflorescence* few- or densely-flowered, with mostly one or two flowers in anthesis; bracts hyaline, c. 2 mm long, margins fringed. *Flowers* 6–8 mm in diameter (but see note); pedicel filiform and stiff, 3–10 mm long; tepals dull violet or reddish purple, c. 5 mm long, acuminate or with a filiform appendix up to 7 mm long, the outside glabrous or sparsely hairy, the

inside glabrous, papillose, or sparsely hairy. *Stamens* 1.5–2.5 mm long; base of filaments adnate to tepals, glabrous, papillose or densely hairy; thecae without appendices. *Ovary* and style minute. *Fruit* with thin pericarp, slightly flattened, slightly curved, 11–19 by 4–6 mm, the top caudate for a few millimetres, green; perianth persistent. *Seeds* 1 or 2, broad-ellipsoid, sharply ridged lengthwise, 5–7 mm long; funicle c. 3 mm, aril consisting of 5 or 6 wide-celled appendages surrounding the seed up to halfway. — **Figs. 3, 4.**

Distribution — Thailand; in *Malesia*: Malay Peninsula.

Habitat & Ecology — Evergreen forest; on forest floor, always near water; in swampy forest, rocky streams and on riverbanks; altitude up to 200 m.

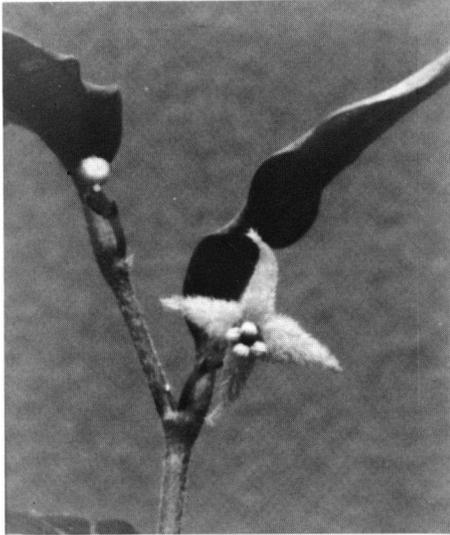


Fig. 3. *Stichoneuron caudatum* Ridley. Top of flowering shoot with two (young) inflorescences, each with one flower,  $\times 2.5$  (Photograph by J. Bogner).

Uses — The leaves of this species are eaten with betel as a tonic in convalescence; the Malay name 'kayu mati hidup' or 'expectation of death'-tree, suggests an abortifacient (Burkill, Dict. Econ. Prod. Mal. Penins. ed. 2, 1966, 2120).

Notes — Herbarium material often lacks flowers, whereas fruits are known from a few collections only; the description of the fruit and seed is after Van Steenis (l.c., who obtained the data from Dr. R. E. Holtum), and from *Bogner 1789* (cult).

The following description of the flower is based on living material, provided by J. Bogner, München: Perianth c. 6 mm long, c. 12 mm in diameter; tepals acute to acuminate, spreading, margins recurved, dirty white, the outside sparsely hairy, the inside densely set with white or carmine hairs. Stamens c. 2 mm long, filaments white, short and thick, densely beset with white or carmine hairs,

anthers free, yellow, without a conspicuous connectivum (see also Fig. 3).

Living material testifies that the petiole bases are slightly sheathing, a feature not easily seen in dried material.

Henderson (*SFN 29662*) noted that the species forms an almost pure stand as undergrowth in riverbank forest along the Gua Musang R. (Kelantan).

The flowers are rather variable: tepals may be acute or provided with a filiform appendix, the filaments and inside of tepals are densely hairy, papillose, or glabrous. The species is obviously closely related to *S. membranaceum* Hook. f., known only from a few collections in eastern India (Khasia).

All flowers seem to be hermaphroditic (but it is possible that they are functionally female or male). Field research is needed to explain the scantiness of well-developed ovaries and fruits in herbaria, suggesting poor fertility in the natural conditions.



Fig. 4. *Stichoneuron caudatum* Ridley. Older inflorescence showing the typical 'broom-like' arranged pedicels persistent after flowering; one fruit developed; c.  $\times 1$  (Photograph by J. Bogner).