

## FSA contributions 16: Sphenocleaceae

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Annual glabrous hygrophytic herbs. *Stems* erect or decumbent, somewhat succulent and spongy, usually swollen with aerenchymatous tissue at base, lower submerged part with a pithy covering. *Leaves* alternate, simple, entire, venation pinnate, particularly visible on lower surface; stipules absent. *Inflorescences* terminal, densely spicate, acropetal. *Flowers* small, bisexual, regular, subtended by 1 bract and 2 bracteoles. *Calyx* persistent; tube hemispherical, adnate to ovary; lobes 5, rounded, shortly connate, imbricate. *Corolla* campanulate-urceolate, perigynous, caducous; lobes 5, imbricate. *Stamens* 5, inserted on corolla tube, alternating with petals; filaments very short, dilated at base; anthers short, free, suborbicular, 2-theous, dehiscing longitudinally. *Ovary* semi-inferior, 2-locular; style 1, very short, glabrous; stigma capitate, slightly 2-lobed; ovules very numerous, anatropous, attached to a large spongy stipitate axile placenta. *Fruit* a membranous, 2-locular, depressed-globose, circumscissile capsule (pyxidium); operculum carrying away calyx lobes. *Seeds* very numerous, minute, oblong; testa irregularly plicate-costate; endosperm scanty or absent; embryo axile, straight, subterete.

A close relationship between *Sphenoclea* and the Campanulaceae has been suggested for a long time. Most systematists have treated the genus either as a member of the Campanulaceae (Dahlgren 1983), or as a closely related monogeneric family (Monod 1980; Cronquist 1988). *Sphenoclea* is separable from the Campanulaceae by the imbricate aestivation of the corolla lobes, the circumscissile capsule, the absence of a secondary pollen presentation mechanism, the glabrous style, and by the apparent absence of latex canals.

Airy Shaw (1948, 1968) regarded this family as an isolated group, probably marginally related to the Centrospermae, e.g. *Phytolacca* (habit, anatomy) and perhaps also to the Primulaceae (circumscissile capsules). However, Subramanyam (1950) had shown that embryological and anatomical features reveal important differences between *Sphenoclea*, Phytolaccaceae and Primulaceae. Cosner *et al.* (1994) suggested a position for *Sphenoclea* near the Hydrophyllaceae in the Solanales-Boraginales, but that family has a late sympetaly. Erbar (1995) did SEM-investigations on the floral development of *S. zeylanica* and concluded that the early sympetalous corolla justifies a position of the Sphenocleaceae near the Campanulales-Asterales, to which the family is usually aligned, whereas it is separable from these orders by the absence of a secondary pollen presentation mechanism. Secondary pollen presentation is one of the characters that help to define the Campanulales-Asterales complex. The family may be more

primitive than the Campanulaceae and Gustafsson & Bremer (1995) suggested that *Sphenoclea* does not belong in or near the Asterales, but rather in the other main branch of the Asteridae. The Angiosperm Phylogeny Group (led by K. Bremer, M.W. Chase & P.F. Stevens) concluded in 1998 that the Sphenocleaceae, together with the Convolvulaceae, Hydroleaceae, Montiniaceae and Solanaceae form the Solanales which belong to the Euasterids I; this seems to be strongly supported by molecular data.

### 8680000 SPHENOCLEA

***Sphenoclea* Gaertn.**, De fructibus et seminibus plantarum 1: 113, t. 24/5 (1788) nom. cons.; Hemsl.: 480 (1877); Hepper: 307 (1963); Airy Shaw: 1 (1968); Thulin: 1 (1973); C.D.K.Cook *et al.*: 533 (1974); R.A.Dyer: 643 (1975); Thulin: 116 (1983); C.D.K.Cook: 217 (1990); Retief & P.P.J.Herman: 624 (1997). Type: *Sphenoclea zeylanica* Gaertn.

#### Characters of the family.

Two species have been described, namely *S. zeylanica* Gaertn., which is almost pantropical but probably introduced and naturalised in the Americas and southeast Asia, and *S. dalzielii* N.E.Br. (1912) which is endemic to West Africa from Senegal to the Central African Republic. This species, like *S. zeylanica*, grows in wet places, but is a straggly herb with sessile obovate-elliptic leaves. The generic name *Sphenoclea* (Greek) is derived from *spheno* (wedge-shaped, sphenoid) and *kles* (abundance of), presumably referring to the flowers, while the species name *zeylanica* refers to Ceylon (Sri Lanka) where the type was collected. Common name: soapweed; Clark 482 (PRE).

***Sphenoclea zeylanica* Gaertn.**, De fructibus et seminibus plantarum 1: 113, t. 24/5 (1788); Hemsl.: 481 (1877); Hepper: 307, t. 272 (1963); Roessler: 138 (1966); Airy Shaw: 1, t. 1 (1968); Thulin: 2, t.1 (1973); Thulin: 116, t. 20 (1983); C.D.K.Cook: 363, t. 367 (1996); Retief & P.P.J.Herman: 624 (1997). Type: Ceylon, collector unknown (L, holo.).

*Roots* numerous, long, cord-like, tenuous, orange. *Stems* stout, hollow, erect, up to 1.5 m tall, often much branched. *Leaves* pale grey-green, linear-lanceolate to oblong-lanceolate, base attenuate, apex acute to obtuse, up to 50 × 150 mm; petiole up to 30 mm long. *Spikes* cylindrical-conical, ± 10 mm diam. and up to 120 mm long, but usually much shorter, narrowed at apex; peduncle up to 80 mm long. *Bracts* and *bracteoles* spatulate to oblanceolate-spatulate, tips arched over flowers except at anthesis. *Flowers* densely crowded, though usually only a few open at a time, rhomboid or hexago-

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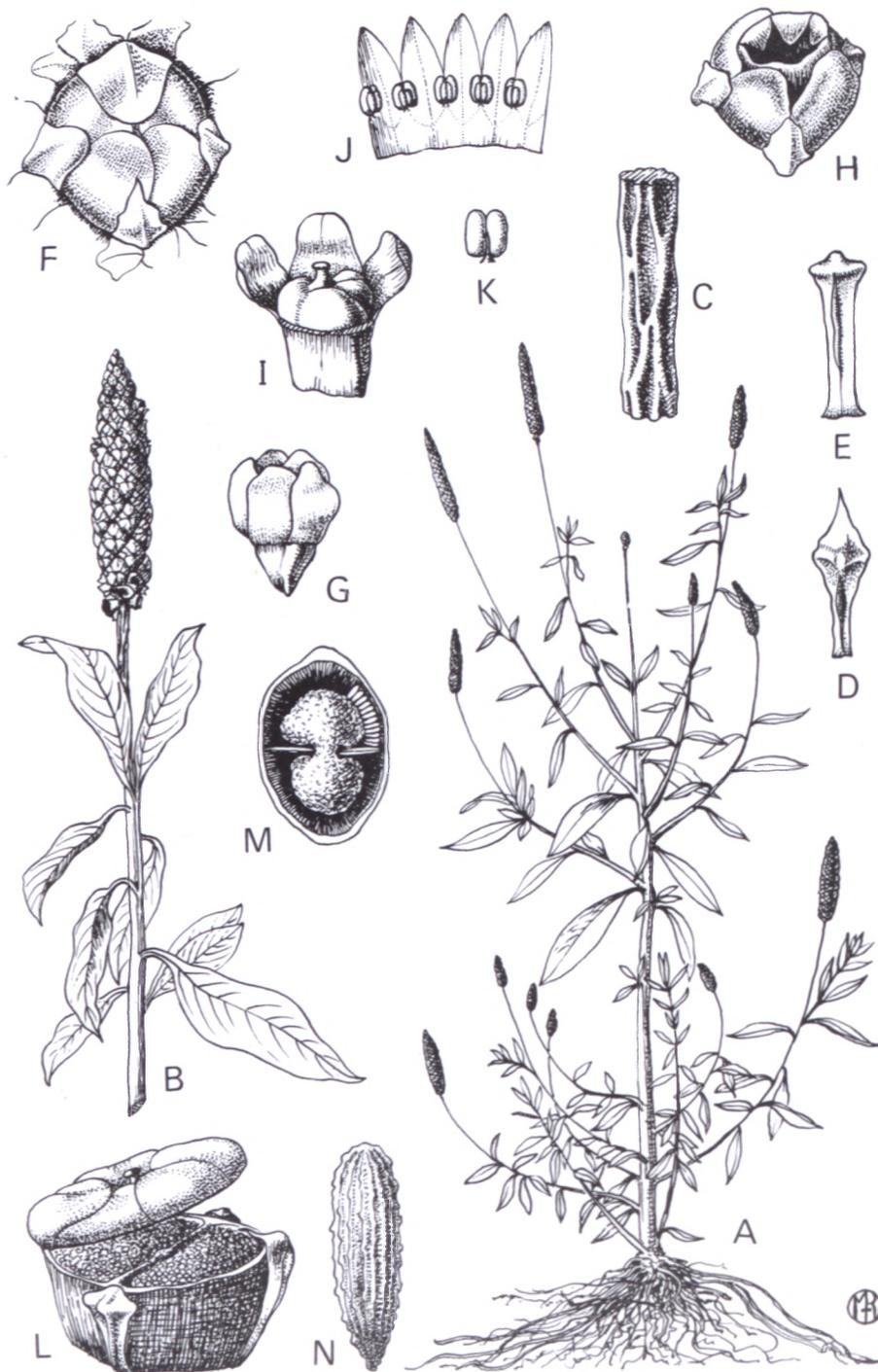


FIGURE 1.—*Sphenoclea zeylanica* Gaertn. A, habit; B, part of flowering branch; C, rachis of inflorescence, showing scars left by fallen capsules; D, bract; E, bracteole; F, flower bud, apical view; G, bud beginning to open, side view; H, flower, showing opening corolla, oblique view; I, gynoecium and calyx, with two sepals removed, showing cuculate base; J, corolla opened out; K, stamen; L, fruit partly dehiscent; M, *transverse* fruit; N, seed. B, N, Milne-Redhead & Taylor 7463; F, M, Jones FHI 18808; K, Deighton 132a. A,  $\times 0.2$ ; B,  $\times 0.9$ ; C–J, L, M,  $\times 5.2$ ; K,  $\times 10.4$ ; N,  $\times 52$ . Artist: Olive Milne-Redhead. Reproduced with permission of the Royal Botanic Gardens, Kew.

nal by compression, sessile, wedge-shaped below, attached longitudinally to rachis by a linear base. *Calyx* lobes grey, broadly triangular, apex obtuse, 1.0–1.5 mm long, ultimately slightly accrescent and connivent. *Corolla* green, tinged white, yellow, mauve or occasionally purple,  $\pm 4$  mm across; lobes 2–4 mm long, ovate-triangular, obtuse or acute, united about half-way, connivent. *Filaments* shorter than anthers; anthers  $\pm 0.5$  mm long. *Ovary* obovoid, 1.5–2.5 mm long, apex broad, free, truncate. *Capsule* 4–5 mm diam., dehiscent below calyx lobes, leaving scarious base persistent on rachis. *Seeds* yellowish brown,  $\pm 0.5$  mm long. Figure 1.

In Africa *S. zeylanica* is widespread south of the Sahara (excluding the NE Horn), extending south to northern Namibia, northern Botswana, Swaziland and

also eastern Mpumalanga and northern KwaZulu-Natal in South Africa. Also recorded from Madagascar. Figure 2.

It is autogamous but perhaps also sometimes pollinated by insects. The seeds are dispersed in muddy water and probably also by other means such as in the mud stuck to the feet of birds. In southern Africa, *S. zeylanica* has been recorded on black clay soil, greyish brown sandy clay-loam and also orange-grey sandy loam. It is common in swampy areas, in wet or dry mud on the margins of periodically inundated depressions and flood plains; it is often found along the banks of water courses such as tidal creeks and irrigation channels, also in still, shallow pools. It can be seasonally submerged, emergent or temporarily terrestrial and can tolerate brackish water. *S. zeylanica* has been recorded from grassland and also

among *Acacia* trees; it can be browsed by animals e.g. zebra. It is often gregarious, becoming a troublesome weed in rice fields, but it is also cultivated; young plants are eaten as a vegetable in Java (Indonesia). It grows from about sea level to 1 500 m altitude. *Flowering and fruiting time*: Dec. to May in southern Africa.

Vouchers: Clark 482 (PRE); Giess 15101 (PRE, WIND); Pooley 1609 (NU, PRE); Smith 3710 (PRE, SRGH); Van der Schijff 2593 (KNP, PRE).

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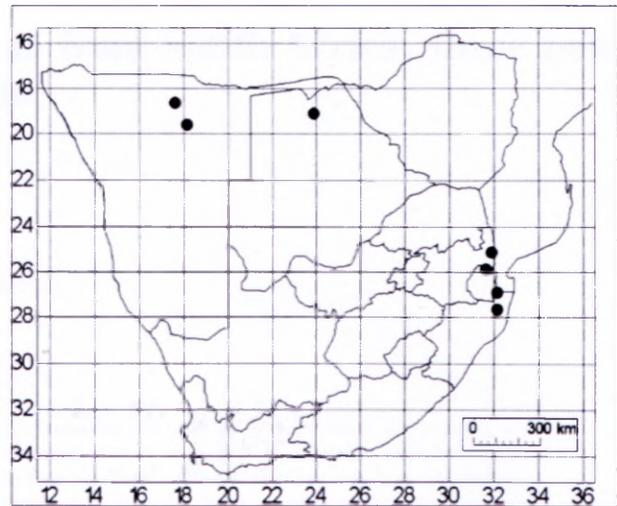


FIGURE 2.—Distribution of *Sphenoclea zeylanica* Gaertn. in South Africa