

## ITEACEAE

### TAXONOMIC AND NOMENCLATURAL NOTES ON THE GENUS *CHORISTYLIS*

Since the description of the sub-Saharan African *Choristylis* and its only species, *C. rhamnoides* by Harvey in 1842, the family position of this woody shrub or small tree has been uncertain. We review the taxonomic

status and family position of the genus and summarize its nomenclatural history. Harvey (1862), Hooker (1865), Mildbraed (1934), Boutique (1964) and Liben (1969) referred *Choristylis* to Saxifragaceae, and Engler

(1891, 1930) placed it in Saxifragaceae subfamily Escalloniaceae. Other authors, including Hutchinson (1969), Verdcourt (1973, 1983), Brummitt (1992), Jordaan (2000), Lötter (2002), Coates Palgrave (2002) and Boon (2010) included *Choristylis* in the Escalloniaceae. Airy Shaw (1973) was the first to associate *Choristylis* with *Itea* in the small family Iteaceae J.G. Agardh (sweet-spire family), a step followed by Takhtajan (1996) and Kubitzki (2006). This is the family placement followed here.

Saxifragaceae are exclusively herbaceous with exstipulate leaves. Escalloniaceae are trees with exstipulate leaves and a parietal placentation, whereas in the woody Iteaceae the leaves are always stipulate, placentation is axile and the pollen grains are unusual in being 2-porate and subsopolar (Erdtman 1955; Agababian 1960). Pollen in Escalloniaceae is shed as monads and the grains are isopolar and 3–5-colporate. Iteaceae also differ from Escalloniaceae in their bitegmic and crassinucellate ovules. Escalloniaceae have unitegmic and tenuinucellate ovules. The crassinucellate condition was determined in both *Itea* and *Choristylis* (Mauritzon 1933, *vide* Kubitzki 2006). APG III (2009) place Escalloniaceae in an order of its own, the Escalloniales. Fossil flowers resembling those of Iteaceae and dating from the Turonian stage of the Late Cretaceous have been found in the Raritan Formation, New Jersey, and leaves ascribed to Iteaceae and dating to the Eocene have been described from the Klondike Mountain Formation, Washington (Hermsen *et al.* 2003; Friis *et al.* 2011).

Molecular analyses place *Itea* and *Choristylis* in the core Saxifragales, sister to *Pterostemon* Schauer (Pterostemonaceae) (Savolainen *et al.* 2000; Fishbein *et al.* 2001). Pterostemonaceae (Engl.) Small is a monogeneric family of two species of shrubs native to tropical and subtropical Mexico. This family, formerly associated with Grossulariaceae *s.l.*, Escalloniaceae, and Hydrangeaceae by some authors, is currently included in Iteaceae by APG III (2009). Studies done by Bohm *et al.* (1999) showed that the flavonoid profiles of *Pterostemon* consist of *C*-glucosylflavones and 3-*O*-glycosides of quercetin, which resembles very closely that observed in *Itea*. The presence of *C*-glucosylflavones in these two genera provides additional support for the closeness of their relationship. In contrast, Saxifragaceae, Crassulaceae, and other members of the Saxifragales are characterized by flavonol production (Bohm *et al.* 1988).

Kubitzki (2006) relegates *Choristylis* to the synonymy of *Itea*, a genus with about 19 species, of which 15 species (ten endemic) occur in south and southeast Asia and Malaysia (Jin & Ohba 2001), one in Pakistan (Siddiqi 2005), one in Japan (Ohwi 1965), one in North America (Morin 2009) and one species in Africa (Verdcourt 1973, 1983). Members of Iteaceae have spirally-arranged or alternate, glandular-dentate, serrate to spinose leaves with superposed axillary buds, paniculate to racemose inflorescences with rather small 5-merous flowers, and septicidally dehiscent fruits, with the valves often remaining attached by the stigma. The flowers have a hypanthium, the corolla is valvate, and there are only two carpels. Flowers of Saxifragaceae have four or five free sepals and petals, with stamens as many as or twice as many as the sepals, and the pistil consisting of

2–5 united carpels. Although the carpels of Iteaceae are free initially, they become partly or completely united along the style (Ge *et al.* 2002; Kubitzki 2006).

The African *Choristylis* is notably disjunct from other members of *Itea*, which are exclusively Northern Hemisphere in distribution, extending from south and southeast Asia from the Himalayas to China, Taiwan, Japan, Java, the Philippines, and southeast United States of America. *Choristylis*, however, is similar in habit, leaf, flower, fruit, and seed characters to *Itea*. Members of *Itea* have alternate or spirally arranged, glandular serrate or dentate to spinose-dentate leaf margins with the lateral or tertiary veins ending at the margin in a gland or spine (the same condition as in *Choristylis*) to rarely entire. The leaf venation is seemingly 3-veined from or near the base in *Choristylis* and pinnately veined in all species of *Itea*. Both genera have similar, small, 5-merous, creamy white or greenish yellow flowers borne in axillary or terminal panicles or racemes, often superposed in groups of two or three. In *Choristylis* the inflorescences are shorter than the leaves, up to 45 mm long, whereas most *Itea* species have long, drooping, elongated panicles or racemes, up to 60–200 mm long, much longer than the leaves (Jin & Ohba 2001; Siddiqi 2005; Morin 2009). The flowers in both genera have a turbinate or obconic calyx-tube adnate to the base of the ovary and with five lobes; the petals are valvate and persistent; the stamens are inserted at the margin of a hypogynous disc and are included or exerted; the ovary is 2-locular, superior to half-inferior; the styles are undivided or  $\pm$  deeply divided, but apically coherent at anthesis. The fruit is a septicidally dehiscent capsule with a persistent perianth in both genera. Given the general morphological similarity between the two genera and their identical pollen we agree with Kubitzki (2006) that the range of variation of characters, such as ovary position (nearly superior to half inferior), the degree of fusion of the styles (undivided or  $\pm$  deeply divided,) and ramification and length of inflorescences (terminal or axillary panicles or racemes), makes the maintenance of *Choristylis* impossible.

Bentham (1865) kept *Choristylis* and *Itea* separate when only a few species of *Itea* were known, and stated that the one *Itea* species from America (*I. virginica* L.) and one from Japan (*I. japonica* Oliv.) are deciduous and that their seeds are oblong and flattened, distinguishing them from the Asian species, which are evergreen trees and their seeds are fusiform. Since then many more species of *Itea* have been described and Engler (1891, 1930) consequently took up these characters mentioned by Bentham and used them to distinguish two sections in *Itea*, namely sect. *Deciduae* Engl. for the American and Japan species, and sect. *Sempervirentes* Engl. for the Asian species.

Although Kubitzki (2006) argued that Engler's sections (1891, 1930) in *Itea* could not be upheld with the inclusion of *Choristylis* within *Itea*, the seed morphology of *Choristylis* differs enough from the other species to warrant a section of its own in the genus *Itea*. *Choristylis* is an evergreen scrambling shrub or tree and the seeds are irregularly obovoid or oblong-obovoid, flattened, sculptured and slightly curved (Verdcourt 1973, tab. 1,13; Kubitzki 2006, fig. 70G). We accordingly

describe a new section within *Itea* to accommodate the single African species.

#### TAXONOMY

***Itea* L. sect. *Choristylis* (Harv.) Jordaan, sect. nov. et stat. nov. *Choristylis* Harv.: 19 (1842).** Similar to sect. *Sempervirentes* Engl. in its evergreen habit but differing in its leaves seemingly three-veined from or near

the base, short inflorescences less than 45 mm long, and seeds which are irregularly obovoid or oblong-obovoid, flattened, sculptured and slightly curved.

Type species: *Itea rhamnoides* (Harv.) Kubitzki. (= *Choristylis rhamnoides* Harv.)

***Itea rhamnoides* (Harv.) Kubitzki** in K. Kubitzki, *The families and genera of vascular plants* 9: 203



FIGURE 1.—*Itea rhamnoides*, A, flowering twig,  $\times 1$ ; B, leaf with irregular glandular-serrated margin,  $\times 2$ ; C, young flower,  $\times 15$ ; D, mature flower,  $\times 15$ ; E, fruit,  $\times 15$ . A & C taken from *Thode* A318 (PRE); B taken from *Dahlstrand* 2669 (PRE); D taken from *Jordaan* 3938 (PRE); E taken from *Theron* 3648 (PRU). Artist: Daleen Roodt.

(2006). *Choristylis rhamnoides* Harv.: 19 (1842), 308 (1862). Type: South Africa, Eastern Cape, Katberg, *Brownlee s.n.* (TCD, holo.–Aluka image!; K, iso.).

*Choristylis shirensis* Baker f.: 13, t. 3/1–6 (1894). Type: Malawi, Mt. Milanji [Mulanje], 1891, *Whyte 53* (BM–Aluka image!, lecto., designated here; Z–Zürich Virtual Herbarium!, isolecto.). [*Whyte 53* in the British Museum is chosen as the lectotype as the best representative specimen among the available syntypes].

*C. ulugurensis* Mildbr.: 191 (1934). Type: Tanganyika [Tanzania], Uluguru Mts., southern slope of Lukwangule Peak, August 1933, *Schlieben 4293* (B *B100165111*–Aluka image!, lecto., here designated). [The type collection of *Schlieben 4239* on which Mildbraed (1934) based his name consists of two specimens, of which number *B100165111* is the better specimen with more flowering material and therefore chosen as lectotype].

Evergreen scrambling shrub or small tree up to 7 m tall, with slender trailing branches, single- or multi-stemmed; stems slender, diverging from base, angular-ribbed; young branchlets often purplish, covered with short hairs. *Bark* on stems splitting longitudinally. *Leaves* spirally arranged, glossy green above, paler and dull below, hairless or with sparse hairs on the main veins below and often with domatia; lamina ovate or oblong to ovate-lanceolate, 15–103 × 9–55 mm, apex acute to shortly acuminate or rarely rounded, base cuneate to unequally rounded; margins sharply and closely irregular glandular-serrate; seemingly 3-veined from base, but otherwise pinnately veined; midrib and main veins sunk above, prominent below, fine tertiary reticulate venation conspicuous; petioles often purple, up to 20 mm long, pubescent. *Stipules* small, deciduous. *Inflorescences* many-flowered panicles, shorter than leaves, finely hairy, up to 45 mm long, in dense clusters; bracts and bracteoles narrowly triangular, 0.5–1.5 mm long; peduncles 0–12 mm long. *Flowers* very small, reg-

ular, hermaphrodite or polygamous, 5-merous, creamy white or greenish yellow, sweetly scented; pedicels 1–2(–5) mm long. *Calyx tube* (hypanthium) short, ± 1.5 × 1.5 mm, adnate to ovary; lobes triangular, 0.5–2.0 × 0.3–0.5(–1.0) mm at base, ciliate. *Petals* ovate, 1.5–3.5 × 1–2 mm at base, 3-veined, hairy. *Stamens* slightly exserted, hairy; anthers ovoid, hairy. *Disc* annular. *Ovary* half-inferior, bicarpellate, carpels free initially, 2-locular; ovules numerous, biseriate, with axile placentation; styles 2, subulate, adherent or diverging, 0.5–1.0 mm long, yellowish, turning brown; stigmas ± 0.5 mm diam., free or sometimes cohering for a time. *Fruit* a septicidally dehiscent capsule, campanulate to turbinate below, conical above, 3–5(–6) × 3 mm, brownish, finely hairy, slightly ribbed, leathery. *Seeds* obovoid or oblong-obovoid, flattened, ± 1.0 × 0.5 mm, reticulate, brownish. Figure 1.

*Diagnostic characters:* *Itea rhamnoides* can be recognized by its leaves, which are spirally arranged, ± 3-veined at or near the base, with glandular toothed margins and conspicuous tertiary reticulate venation. The ovary is half-inferior with two diverging styles, whence is derived the name *Choristylis*, from the Greek word *choris* = separate and *stylis* = style. The valves of the septicidally dehiscent capsules often remain attached by the stigma.

*Distribution and habitat:* *Itea rhamnoides* grows in the eastern parts of southern Africa, from the Katberg, Hogsback, Keiskammahoe, and Kentani in the Eastern Cape, northwards through KwaZulu-Natal, Swaziland and Mpumalanga to the Soutpansberg in the north. From here it extends further northwards through Zimbabwe, Mozambique, and Malawi along the mountains to the Democratic Republic of the Congo, Burundi, Uganda, and Tanzania along the East African Rift, but seems to be absent from the more recent volcanic mountains in East Africa (Kenya and Ethiopia) (Verdcourt 1983) (Figure 2). The distribution coincides with that of the archipelago-like Afromontane Region of Endemism (White 1978, 1983). It grows in forest, forest margins, riverine and valley forests, open hillsides, often along streams at medium to high altitudes.

*Synonymy:* Harvey (1862) considered *Baeobotrys rufescens* E.Mey. to apply to *Choristyles rhamnoides*, which De Candolle (1844) placed in the genus *Maesa*, based on a Drège specimen, and *Maesa palustris* Hochst. (1844), based on a Krauss specimen (*Krauss 152*), under *Choristylis rhamnoides*. These synonyms, however, belong to *Maesa lanceolata* Forssk. (Dyer 1963). Verdcourt (1973) was the first to place the tropical African *Choristylis shirensis* Baker f. (1894) from Malawi and *C. ulugurensis* Mildbr. (1934) from Tanzania in synonymy under *C. rhamnoides*. The name *Choristylis virescens* Baker f., which appears in *The International Plant Names Index* [IPNI] as published on the same page where Baker described *Choristylis shirensis* (Baker 1894) seems to be fictitious (Verdcourt 1983). We have checked Baker (1894) and also cannot find any mention of *C. virescens*. We conclude that it is a spelling error for *C. shirensis*.

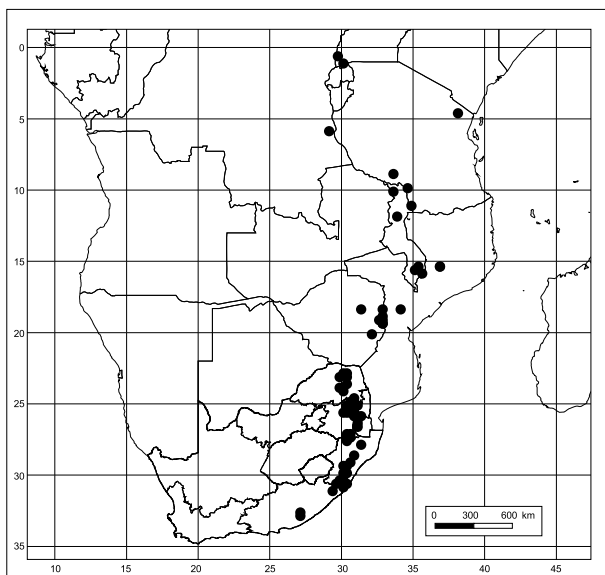


FIGURE 2.—Distribution of *Itea rhamnoides*, based on specimens housed in the National Herbarium, Pretoria, and in literature (Liben 1969 & Verdcourt 1973, 1983).

## ACKNOWLEDGEMENTS

I would like to thank Hester Steyn for preparing the distribution map, and the artist Daleen Roodt for the line drawing.

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MS. received: 2012-01-10.