



## Notes on Early Land Plants Today. 58. Historical circumscription of Schistochilaceae (Marchantiophyta) and a new combination in *Schistochila*

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The family Schistochilaceae Buch (1928: 9) consists of approximately 80 extant species. More than two-thirds of its diversity occurs in temperate to subantarctic South America and Australasia, and nearly one third in the tropical mountain forests of Southeast Asia and the western Pacific Islands. The plants of Schistochilaceae are usually robust and form a prominent component of the ground layer of cool temperate forests or upper montane tropical forests, commonly forests in which *Nothofagus* is a dominant genus. The first species of the family, published as *Jungermannia appendiculata* Hooker (1818: tab. 15), *Jungermannia glaucescens* Hooker (1818: tab. 39), *Jungermannia lamellata* Hooker (1818: tab. 49), *Jungermannia nobilis* Hooker (1818: tab. 11), *Jungermannia sphagnoides* Schwägrichen (1814: 23) and *Jungermannia thouarsii* Hooker (1818: tab. 48), were described during 1814–1818. Dumortier established the genus *Schistochila* Dumortier (1835: 15) to accommodate the above mentioned species except *Jungermannia glaucescens* and *Jungermannia sphagnoides*, but he also added one new species, *Schistochila pinnatifolia* Dumortier (1835: 15) *nom. inval.* (ICN Art. 38.1(a); no description; McNeill *et al.* 2012). The definition of Schistochilaceae has remained largely unchanged since it was separated from Scapaniaceae Migula (1904: 479) by Buch (1928) and then later Balantiopsaceae Buch (1955: 23). The presence of magenta rhizoids, winged and complicate-bilobed leaves with smaller dorsal lobes, a shoot calyptra elaborated into a well-developed coelocaul, and a cylindrical sporophyte capsule with straight valves generally defines the family. These features, to a great extent, isolate Schistochilaceae from the rest of the leafy liverworts. Therefore, taxonomic rearrangements or revisions, based on morphological investigations, have mostly been at generic level or below (Grolle 1966, 1968, Hässel 1973, Schuster 1971a, Schuster & Engel 1977, 1985). So far, taxonomic revisions have only been done at regional scales, a study at global scale is under way (Glenny *et al.*, unpublished).

Schistochilaceae initially comprised only a single genus *Schistochila*. *Gottschea* Nees ex Montagne (1843: 245) was published in 1843 because the author was unaware of the already published name *Schistochila*. No other genera were proposed until the 1960s, when *Paraschistochila* Schuster (1963: 259), *Fulfordistria* Miller (1970: 320), *Schistochilaster* Miller (1970: 317), *Tegulifolium* Hässel (1973: 252), and *Pachyschistochila* Schuster & Engel (1982: 177) were published. Grolle & Zijlstra (1984) pointed out that *Gottschea* is validly published and its type is *Gottschea aligera* (Nees et Blume in Blume & Nees 1823: 135) Nees in *Gottsche et al.* (1844: 17), resulting in *Schistochilaster* being a synonym of *Gottschea*, as it is based on the same type species. *Fulfordistria* was synonymised with *Schistochila* by Schuster (1971a). Even though the argument of Grolle & Zijlstra (1984) over the type of *Gottschea* has often been accepted, various authors chose to recognise only *Schistochila* giving as a reason the close similarities of *Schistochila* and *Gottschea* (Grolle & Piippo 1984, So 2003a, 2003b).

Grolle (1966), Schuster (1971a) and Schuster and Engel (1977, 1985) elaborated a system of subgenera and sections for the family. In Grolle's revision on New Guinean *Schistochila*, he proposed various sections for the genus (Grolle 1966). For the southern hemisphere species, Schuster (1971a) divided *Schistochila* into the subgenera *Protoschistochila* Schuster (1971a: 618), *Austroschistochila* Schuster (1971a: 619), *Isoschistochila* Schuster (1971a: 620), *Metaschistochila* Schuster (1971a: 638) and *Pachyschistochila* Schuster (1971a: 614) in addition to the subgenus *Schistochila*, and sections were also proposed for the subgenera *Metaschistochila*, *Pachyschistochila* and *Schistochila*. Schuster (1971a) also divided species in his *Paraschistochila* into the subgenera *Paraschistochila*, *Nothoschistochila* Schuster (1971a: 642) and *Acroschistochila* Schuster (1971a: 647). The subgenus *Pachyschistochila*, a group of small

alpine species sharing a number of distinctive features, was later raised to genus level (Schuster & Engel 1982: 177). Although Schuster and Engel (1985) presented the most complete classification of the family so far attempted, they did not study Asian and Pacific species. They adapted one of Grolle's sections, *Schistochila* sect. *Volantes* Grolle (1966: 243), but their *Paraschistochila* subgen. *Dendroschistochila* Schuster & Engel (1985: 432) is based on the same type as Grolle's *Schistochila* sect. *Philippinenses* Grolle (1966: 250).

Schuster described a monotypic *Pleurocladopsis* Schuster (1964a: 279), endemic to Chile, based on an earlier poorly known species *Cephalozia simulans* Massalongo (1885: 236). The phylogenetic position of the species was uncertain until the discovery of fertile material with sporophytes, revealing its close affinity to the complicate-bilobed and distichous Schistochilaceae (Schuster 1971b). Based on the shared characters, including the scattered purplish rhizoids, the presence of a coelocaul of the gynoecium, the sporophyte capsule shape and wall thickening patterns, and also spore and elater anatomy, Schuster (1971b) conclusively placed *Pleurocladopsis* in Schistochilaceae and later elevated it as an independent subfamily Pleurocladopsoideae Schuster (1972: 364), contrasting to another subfamily Schistochiloideae possessing a distichous leaf organization (Schuster 1972, Schuster & Engel 1977, 1985, Hässel & Rubies 2009). Schuster (1972) hypothesised that the family Schistochilaceae evolved directly from *Pleurocladopsis*-like ancestors, using the evidence of characters present in *Pleurocladopsis*, such as the tristichous and nearly isophyllous leaf organization and the bracteolar antheridia.

The only family thought closely related to Schistochilaceae was Perssoniellaceae R.M.Schust. ex Grolle (1972: 216), first proposed by Schuster (1963) for the monotypic genus *Perssoniella* Herzog (1952: 268). The New Caledonian endemic *Perssoniella vitreocincta* Herzog (1952: 265) possesses various unique characters, and Schuster (1963, 1964b) proposed a new suborder Perssoniellineae to accommodate Perssoniellaceae and Schistochilaceae. Schuster (1964b) stated that the two families shared the possession of a shoot calyptra, poorly defined androecia, long-stalked antheridia, a cylindrical capsule with straight valves, and the absence of asexual reproduction. However, asexual reproduction in Schistochilaceae was later described (Schuster & Engel 1977, 1985).

By 1985, Schuster and Engel (1985) were able to state that the family Schistochilaceae was “now much better known than any other group of Hepaticae—not only because of our intensive concern with the group, ... but because the group is unique in the hepatics in offering a wealth of phylogenetically and taxonomically useful criteria for exploitation in both the n and 2n generations”. However, recent molecular systematic investigations of Schistochilaceae have largely altered the long-standing hypothesis on phylogenetic relationships within the family (He & Glenn 2010, He & Sun 2013, Sun *et al.* 2014). He & Glenn (2010) and He & Sun (2013) revealing the derived positions of *Perssoniella vitreocincta* and *Pleurocladopsis simulans* within the Schistochilaceae, and revealed synonymised the generic names with *Schistochila* respectively. These authors pointed out that the two genera were established solely based on autapomorphic characters, thus obscuring their actual phylogenetic relationship with *Schistochila* and that these characters are later derived rather than ancestral. These studies showed that the phylogenetic structure of the family did not match units that resulted from morphologically-based investigations. Many of the genera, subgenera, and sections are recognisable as clades, but their membership is often rather different. Therefore, a revised classification for the family with a division of *Schistochila* into several genera or subgenera is in progress (Glenn *et al.* unpublished). However, for the coming world checklist of hornworts and liverworts (Söderström *et al. in prep.*) we use the broad concept of He & Glenn (2010) and He & Sun (2013) to treat Schistochilaceae as comprising the single genus *Schistochila*. One new combination is thus needed.

## Formal treatment

The format of this note follows what is outlined in Söderström *et al.* (2012).

***Schistochila conchophylla* var. *multidentata*** (J.J.Engel) Xiao L.He et Glenn, **comb. nov.** Basionym:—*Gottschea conchophylla* var. *multidentata* J.J.Engel, *Nova Hedwigia* 93 (3-4): 407, 2011 (Engel 2011). Type:—NEW ZEALAND. South I: Canterbury, Arthurs Pass, Engel & von Konrat 27243 (F, holotype; CHR, isotype).

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