



## Notes on Early Land Plants Today. 69. Circumscription of Plagiophilaceae (Marchantiophyta) with a preliminary infrageneric subdivision of *Plagiochila*

LARS SÖDERSTRÖM<sup>1\*</sup>, ANDERS HAGBORG<sup>2</sup> & MATT VON KONRAT<sup>2</sup>

<sup>1</sup> Department of Biology, Norwegian University of Science and Technology, N-7491 Trondheim, Norway; [lars.soderstrom@ntnu.no](mailto:lars.soderstrom@ntnu.no)

<sup>2</sup> Department of Science and Education, The Field Museum, 1400 South Lake Shore Drive, Chicago, IL 60605-2496, USA; [hagborg@pobox.com](mailto:hagborg@pobox.com), [mvonkonrat@fieldmuseum.org](mailto:mvonkonrat@fieldmuseum.org)

\*Author for correspondence

### Abstract

Plagiophilaceae is here circumscribed to include 10 genera, *Acrochila*, *Chiastocaulon*, *Dinckleria*, *Pedinophyllopsis*, *Pedinophyllum*, *Plagiochila*, *Plagiochilidium*, *Plagiochilion*, *Pseudolophocolea* and *Xenochila*. For the forthcoming world checklist of hornworts and liverworts we here summarize the current knowledge and identify the sections of *Plagiochila* that are currently recognized by morphological and molecular studies. *Plagiochila* is provisionally divided into 28 sections based on recent morphological and molecular studies. *Plagiochila ecuadorica* and *Plagiochila sciophila* subsp. *ciliigera* are new combinations, *Plagiochila umbrosioides* is a nomen novum.

### Circumscription of Plagiophilaceae

The family Plagiophilaceae Müller (1956: 877) was originally circumscribed to include the genera *Mylia* Gray (1821: 693), *Pedinophyllum* (Lindberg 1874: 366) Lindberg (1875: 504) and *Plagiochila* (Dumortier 1831: 42) Dumortier (1835: 14). *Mylia* was transferred to Jungermanniaceae by Grolle (1962) forming a new subfamily, subfam. Mylioideae Grolle (1962: 15), which was later elevated to its own family, Myliaceae Schliakov (1975: 308). Later, several genera, mostly segregates from *Plagiochila* were established and referred to the family. Crandall-Stotler *et al.* (2009) included *Acrochila* Schuster (1963: 285), *Chiastocaulon* Carl (1931a: 58), *Dinckleria* Trevisan (1877: 421), *Pedinophyllopsis* R.M.Schust. et Inoue in Schuster & Engel (1981: 311), *Pedinophyllum*, *Plagiochila*, *Plagiochilidium* Herzog (1931: 186), *Plagiochilion* Hattori (1947: 7) and *Xenochila* Schuster (1959a: 15). Söderström *et al.* (2013) moved the genus *Pseudolophocolea* R.M.Schust. et Inoue in Schuster & Engel (1982: 71) from Lophocoleaceae Vanden Berghen (1956: 208) to Plagiophilaceae. Plagiophilaceae is related to Lophocoleaceae and several genera have shifted positions between the families. Other genera that have been included in Plagiophilaceae in various publications are either synonyms with any of the mentioned genera, or now included in other families. In addition to *Plagiochila*, the following genera are now recognized within the family.

*Acrochila* was established to accommodate *Acrochila simpsonii* (W.Martin & E.A.Hodgs. in Martin 1950: 497) Schuster (1963: 285) [= *Acrochila biserialis* (Lehm. et Lindenb. in Lindenberg 1843: 126) Grolle (1964a: 236)] and *Acrochila etesseana* (Stephani 1908: 152) Schuster (1963: 285) [= *Acrochila caledonica* (Stephani 1908: 32) Inoue 1967: 182], two segregates from *Plagiochila*. The genus was included in the molecular study of Groth (2005) with conflicting results. One marker placed it in Plagiophilaceae and another marker as a sister to *Adelanthus* Mitten (1864: 243). However, we here retain it in Plagiophilaceae until further studied.

*Chiastocaulon* was established to accommodate *Chiastocaulon dendroides* (Nees 1830: 77) Carl (1931a: 59), *Chiastocaulon flagelliferum* Stephani (1918: 155) Carl (1931a: 60) and *Chiastocaulon minutifolium* Stephani (1921: 185) Carl (1931a: 60). All three species were united to one species by Dugas (1929) who considered it a *Plagiochila* species. This view was followed by most authors until Groth & Heinrichs (2003) in a molecular study showed it to be distinct from *Plagiochila*.

*Dinckleria* was established to include only one species, *Dinckleria pleurata* (Hooker & Taylor 1844a: 372) Trevisan (1877: 421). This name had generally been synonymized with *Plagiochila* until the new genus *Proskauera* Heinrichs et J.J.Engel in Heinrichs *et al.* (2006: 235) was described with two species, *Proskauera pleurata* (Hook. f. et Taylor) Heinrichs et J.J.Engel in Heinrichs *et al.* (2006: 235) and *Proskauera fruticella* (Hooker & Taylor 1844c: 565) Heinrichs et J.J.Engel (2006: 237) overlooking the older name *Dinckleria*. This was corrected in Engel & Heinrichs (2008). The close relationship to *Plagiochila* and inclusion in Plagiochilaceae has never been challenged.

*Pedinophyllopsis* was established to accommodate *Pedinophyllopsis abdita* (Sullivant 1850: 317) R.M.Schust. et Inoue in Schuster & Engel (1981: 311). It was originally placed in Geocalyceaceae, but it was noted to be a very isolated in the family and He-Nygrén & Piippo (2003) showed that it is better placed in Plagiochilaceae.

*Pedinophyllum* was established to accommodate *Pedinophyllum pyrenaicum* (Spruce 1847: no. 9) Lindberg (1875: 504) [= *Pedinophyllum interruptum* (Nees 1833: 165) Kaalaas (1893: 190)] and now includes four species (although some not universally recognized). Although recognized as close to *Plagiochila* its position within Plagiochilaceae has sometimes been questioned, but Feldberg *et al.* (2010b) showed it belongs there.

*Plagiochilidium* was described with one species, *Plagiochilidium borneensis* Herzog (1931: 186) [= *Plagiochilidium bidentulum* (Stephani 1905e: 1134) Grolle (1988: 408)]. It was described as closely related to *Jamesoniella* (Spruce 1876: 230) Carrington (1881: 25) and originally placed in Lophozioaceae Cavers (1910: 293) together with *Plagiochila*. Buch *et al.* (1937) then transferred it to Plagiochilaceae.

*Plagiochilion* was originally established to include two species, *Plagiochilion oppositum* (Reinwardt *et al.* 1824: 226) Hattori (1947: 7) and *Plagiochilion braunianum* (Nees 1830: 80) Hattori (1947: 7) in the Plagiochilaceae. Later, several other species have been referred to the genus. Fourteen species are recognized at present.

*Pseudolophocolea* was established to accommodate *Pseudolophocolea denticulata* Schuster & Engel (1982: 73). It was originally described as being closely related to *Pedinophyllopsis*. The authors even speculated that the two genera might be regarded as subgenera of a single genus. Although both genera were placed in Geocalyceaceae subfam. Leptoscyphoideae Schuster (1980: 267), an affinity with the plagiochiloid *Pedinophyllum* was also noted. He-Nygrén & Piippo (2003) showed that *Pedinophyllopsis* is best placed in Plagiochilaceae, a hypothesis further supported by the molecular studies of Groth (2005). Based on the morphological similarities of *Pseudolophocolea* with *Pedinophyllopsis* and *Pedinophyllum* detailed in Schuster & Engel (1982), *Pseudolophocolea* was placed in Plagiochilaceae by Söderström *et al.* (2013).

*Xenochila* was established to accommodate *Xenochila paradoxa* (Stephani 1921: 197) Schuster (1959a: 15) [= *Xenochila integrifolia* (Mitten 1861: 96) Inoue (1963: 373)]. It was assumed to be related to *Plagiochilidium* by Inoue (1963).

### **Infrageneric structure of *Plagiochila***

*Plagiochila* is a large genus with almost 3,000 names out of which some 700 species are recognized today (ELPT database). Over one hundred subdivisions (mostly sections) have also been described. The genus has never been completely monographed although several regional revisions exist. Lindenberg (1839, 1840, 1844) was the first to publish a study including a considerable number of species. He was also the first to classify them into sections. Spruce (1885) described a large number of species, but only South American taxa. He divided them in two main groups, “Divisio I” *Cauliflorae* Spruce (1885: 453) and “Divisio II” *Ramiflorae* Spruce (1885: 460). Those groups were further divided into 5 subgroups (both levels unranked). Schiffner (1900a) recognized seven sections among the 23 taxa he recognized on Java. Stephani (1902a, b, c, 1903a, b, c, d, e, f, g, 1904a, b, c, d, e, f, 1905a, b, c, d, e) was the first to include all species he knew from all around the world, but apart from the two main categories recognised by him, *Patulae* and *Ampliatae*, he separated them further on geographical basis only. He recognized almost 800 species. Dugas (1929) mentioned just over 400 species in her study of the genus mainly from the Paris herbarium. Carl (1931b) also presented a classification that in large part was geographically based.

During the past 50–60 years some important revisions trying to classify the genus into subgenera and sections have appeared. It is worth mentioning the works by Schuster (1959a, b, 1960, 1980) for North America, Jones (1962) for Africa, Inoue & Schuster (1971) for Tasmania and New Zealand, Inoue (1986) for mainland Australia, Hässel (2004, 2006, 2008a, b, 2009) for southern South America and So (2001a) for China, in addition to the series of studies by H. Inoue spanning over 25 years leading to his summary of the genus in southeast Asia (Inoue 1984). All these studies are morphological and the subdivisions of the genus have mostly been done based on the taxa in the region under study.

The first study also including molecular methods appeared early this century (Heinrichs *et al.* 2002a). Subsequent molecular studies have used a broader spectrum of taxa from various parts of the world, although southeast Asia and Australasia are still under-represented compared to Europe, North America, South America and Africa. All taxa have been revised for Africa (Heinrichs *et al.* 2005a), North America (Heinrichs *et al.* 2004a) and Europe (although there is no synopsis published for the European taxa). All these studies, and several more, have shown that there are several subdivisions that should be recognized. However, a global synthesis of the genus has not been undertaken including information from any molecular study or recent morphological studies.

For the forthcoming world checklist of hornworts and liverworts (Söderström *et al.*, *in press*) we here summarize the current knowledge and identify the sections that currently are recognized by morphological and molecular studies. The format of this note follows Söderström *et al.* (2012) and a series of notes directly associated with the worldwide checklist, most recently He *et al.* (2014), Long *et al.* (2014), Qui *et al.* (2014), Shu & Zhu (2014) and Váňa *et al.* (2014).

***Plagiochila* sect. *Adianthoideae* Lindenb., *Monogr. Hep. Gen. Plagiochilae*: xx, 1844 [1843] (Lindenberg 1844) “*Adiantoideae*”. Type (ICN Art. 22.6):—*Plagiochila adianthoides* (Swartz 1788: 142) Lindenberg (1840: 77).**

≡ *Plagiochila* sect. *Grandifoliae* Spruce, *Trans. & Proc. Bot. Soc. Edinburgh* 15: 455, 1885 (Spruce 1885), *nom. illeg.* (ICN Art. 52.1; earlier name included). Type:—*Plagiochila adianthoides* (Swartz 1788: 142) Lindenberg (1840: 77).

= *Plagiochila* sect. *Cristatae* Spruce, *Trans. & Proc. Bot. Soc. Edinburgh* 15: 461, 1885 (Spruce 1885). Type (ICN Art. 22.6):—*Plagiochila cristata* (Swartz 1788: 143) Lindenberg (1839: 33). Note:—Heinrichs (2002) placed the section in synonymy with *Plagiochila* sect. *Adianthoideae*.

= *Plagiochila* subsect. *Notidophilae* Carl, *Ann. Bryol., Suppl.* 2: 63, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila notidophila* Spruce (1885: 473) (= *Plagiochila adianthoides*; cf. Heinrichs *et al.* 1998).

Note:—*Plagiochila* sect. *Adianthoides* has been included in molecular studies and was recognized by Heinrichs *et al.* (2003) and subsequent studies. The type species of all three sections have also been included in molecular studies and proved to belong here.

***Plagiochila* sect. *Africanae* Heinrichs, *Taxon* 54: 319, 2005 (Heinrichs *et al.* 2005a). Holotype:—*Plagiochila colorans* Stephani (1911: 116).**

Note:—The section was first recognized in the molecular and morphological study by Heinrichs *et al.* (2005a).

***Plagiochila* sect. *Arrectae* Carl, *Ann. Bryol., Suppl.* 2: 52, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila arrecta* Gottsche (1864: 115) [= *Plagiochila bifaria* (Swartz 1788: 145) Lindenberg 1843: 127].**

= *Plagiochila* sect. *Bidentes* Carl, *Ann. Bryol., Suppl.* 2: 46, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila bidens* Gottsche (1857: 322). Note:—Groth *et al.* (2002) placed the section in synonymy with *Plagiochila* sect. *Arrectae*.

= *Plagiochila* sect. *Choachinae* Carl, *Ann. Bryol., Suppl.* 2: 81, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila choachina* Gottsche (1864: 95) [= *Plagiochila punctata* (Taylor 1844: 179) Taylor (1846: 261) cf. Heinrichs *et al.* (2005b)]. Heinrichs (2002) placed the section in synonymy with *Plagiochila* sect. *Arrectae*.

= *Plagiochila* sect. *Chilenses* Carl, *Ann. Bryol., Suppl.* 2: 124, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila chilensis* Stephani (1900a: 27) [= *Plagiochila rubescens* (Lehmann 1834: 63) Lindenberg (1840: 46), cf. Hässel (2008a)]. Note:—Heinrichs *et al.* (2005b) showed that the section can be placed in synonymy with *Plagiochila* sect. *Arrectae*.

= *Rhodoplagiochila* R.M.Schust., *Phytologia* 39 (4): 247, 1978 (Schuster 1978). Holotype:—*Rhodoplagiochila rosea* Schuster (1978: 247) [= *Plagiochila bifaria* var. *rosea* (R.M.Schust.) Heinrichs *et al.* (2004b: 112)]. Note:—Heinrichs *et al.* (2004b) referred the type species to *Plagiochila bifaria*, which is the type species of *Plagiochila* sect. *Arrectae*.

Note:—Recognition of the section is supported by several molecular studies, e.g. Groth (2005) and Heinrichs *et al.* (2006).

***Plagiochila* sect. *Caducifoliae* J.J.Engel et G.L.Merr., *Nova Hedwigia* 96 (3/4): 407, 2013 (Engel & Smith Merrill 2013). Type (ICN Art. 22.6):—*Plagiochila caducifolia* Inoue & Schuster (1971: 71).**

Note:—The single species of the section has never been included in any molecular study, but the section was recognized by Engel & Smith Merrill (2013) on morphological evidence.

***Plagiochila* sect. *Cardotiae* Inoue, *Bull. Natl. Sci. Mus. Tokyo (n. ser.)* 8 (3): 386, 1965 (Inoue 1965b) “*Cardotii*”. Type (ICN Art. 22.6):—*Plagiochila cardotii* Stephani (1903a: 116) [= *Plagiochila pseudorenitens* Schiffner (1899: 132), cf. Grolle & So (1999a)].**

Note:—Inoue (1965b) stated that the section is close to *Plagiochila* sect. *Ciliatae* (= *Plagiochila* sect. *Cucullatae*). No species has been included in any molecular study, but the section was recognised by So (2001a).

***Plagiochila* sect. *Cobanae* Carl, *Ann. Bryol., Suppl.* 2: 79, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila cobana* Stephani (1918: 138).**

Note:—The section was recognized by Inoue (1984) and So (2001b), which also included *Plagiochila* sect. *Trabeculatae*, the latter with species included in molecular studies. However, since *Plagiochila cobana* is so poorly known and not included in any molecular study, Groth *et al.* (2004) and Heinrichs *et al.* (2004a) kept them separate.

***Plagiochila* sect. *Cucullatae* Schiffn., *Hep. Fl. Buitenzorg*: 107, 1900 (Schiffner 1900a). Lectotype (Grolle 1976):—*Plagiochila sandei* Sande Lacoste (1856: 5).**

= *Plagiochila* sect. *Ciliatae* Schiffn., *Hep. Fl. Buitenzorg*: 107, 1900 (Schiffner 1900a), **syn. nov.** Type (ICN Art. 22.6):—*Plagiochila ciliata* Gottsche (1857: 334) [= *Plagiochila sciophila* Lindenberg (1840: 100), cf. Inoue (1984)]. Note:—Heinrichs *et al.* (2004a) showed that the type of the section belongs to *Plagiochila* sect. *Cucullatae*.

= *Plagiochila* sect. *Subplanae* Carl, *Ann. Bryol., Suppl.* 2: 76, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila subplana* Lindenberg (1840: 73). Note:—The section was placed in synonymy with *Plagiochila* sect. *Cucullatae* by Heinrichs (2002).

= *Plagiochila* sect. *Acanthophyllae* Carl, *Ann. Bryol., Suppl.* 2: 104, 1931 (Carl 1931b), **syn. nov.** Type (ICN Art. 22.6):—*Plagiochila acanthophylla* Gottsche (1868: 38) [= *Plagiochila sciophila* Lindenberg (1840: 100), cf. Inoue (1984)]. Note:—Heinrichs *et al.* (2004a) showed that the type of the section belongs to *Plagiochila* sect. *Cucullatae*.

= *Plagiochila* subg. *Metaplagiochila* Inoue, *Gen. Plagiochila SE Asia*: 27, 1984 (Inoue 1984). Holotype:—*Plagiochila sandei* Sande Lacoste (1856: 5).

Note:—Recognition of *Plagiochila* sect. *Cucullatae* is supported by several molecular studies, e.g. Groth (2005) and Heinrichs *et al.* (2006). The types of all synonyms have been included in molecular studies confirming their position.

***Plagiochila* sect. *Denticulatae* Schiffn., *Hep. Fl. Buitenzorg*: 106, 1900 (Schiffner 1900a). Lectotype (So & Grolle 2000a):—*Plagiochila nobilis* Gottsche (1858: 37).**

= *Plagiochila* sect. *Alternantes* Carl, *Ann. Bryol., Suppl.* 2: 75, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila alternans* Gottsche *et al.* (1847: 648). Note:—Groth (2005) and Heinrichs *et al.* (2006) showed that the section should be placed in synonymy with *Plagiochila* sect. *Denticulatae* although they used the later name *Alternantes*.

= *Plagiochila* sect. *Minutidentes* Carl, *Ann. Bryol., Suppl.* 2: 72, 1931 (Carl 1931b), **syn. nov.** Type (ICN Art. 22.6):—*Plagiochila minutidens* Stephani (1916: 205) [= *Plagiochila ovata* Gottsche *et al.* 1847:656], cf. Müller *et al.* 1999]. Note:—Groth (2005) and Heinrichs *et al.* (2006) showed that the section should be placed in synonymy with *Plagiochila* sect. *Alternantes* which is a later synonym of *Plagiochila* sect. *Denticulatae*.

= *Plagiochila* sect. *Nobiles* Carl, *Ann. Bryol., Suppl.* 2: 102, 1931 (Carl 1931b), **nom. superfl.** (ICN Art. 52.1). Type (ICN Art. 22.6):—*Plagiochila nobilis* Gottsche (1858: 37).

= *Plagiochila* sect. *Obcuneatae* Carl, *Ann. Bryol., Suppl.* 2: 123, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila obcuneata* Stephani (1900: 30) [= *Plagiochila subpectinata* Bescherelle & Massalongo (1886: 628), cf. Hässel 1983]. Note:—Heinrichs *et al.* (2006) placed the section in synonymy with *Plagiochila* sect. *Alternantes* which is a later synonym of *Plagiochila* sect. *Denticulatae*.



- = *Plagiochila* sect. *Equitantes* Carl, *Ann. Bryol., Suppl.* 2: 127, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila equitans* Gottsche (1857: 331). Note:—Heinrichs *et al.* (2006) placed the section in synonymy with *Plagiochila* sect. *Alternantes* which is a later synonym of *Plagiochila* sect. *Denticulatae*.
- = *Plagiochila* sect. *Robustae* Carl, *Ann. Bryol., Suppl.* 2: 131, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila robusta* Stephani (1900: 31) [= *Plagiochila hookeriana* Lindenberg (1840: 81) cf. Hässel 2004]. Note:—Heinrichs *et al.* (2006) placed the section in synonymy with *Plagiochila* sect. *Alternantes* which is a later synonym of *Plagiochila* sect. *Denticulatae*.
- = *Plagiochila* sect. *Banksianae* Carl, *Ann. Bryol., Suppl.* 2: 138, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila banksiana* Gottsche (1857: 329). Note:—Groth *et al.* (2004) placed the section in synonymy with *Plagiochila* sect. *Alternantes* which is a later synonym of *Plagiochila* sect. *Denticulatae*.
- = *Plagiochila* sect. *Giganteae* Carl, *Ann. Bryol., Suppl.* 2: 143, 1931 (Carl 1931b). Type:—*Plagiochila gigantea* Lindenberg (1840: 115). Note:—Heinrichs *et al.* (2006) placed the section in synonymy with *Plagiochila* sect. *Alternantes* which is a later synonym of *Plagiochila* sect. *Denticulatae*.
- = *Plagiochila* sect. *Stramineae* Carl, *Ann. Bryol., Suppl.* 2: 133, 1931 (Carl 1931b), **syn. nov.** Type:—*Plagiochila straminea* Stephani (1900: 32) [= *Plagiochila chonotica* Taylor (1846: 260), cf. Hässel & Rubies (2009)]. Note:—Heinrichs *et al.* (2006) showed that the section should be placed in synonymy with *Plagiochila* sect. *Alternantes* which is a later synonym of *Plagiochila* sect. *Denticulatae*.
- = *Plagiochila* sect. *Ansatae* H.Buch, *Ann. Bryol.* 7: 5, 1934 (Buch 1934) *nom. inval.* (ICN Art. 38.1(a)), **syn. nov.** Type (ICN Art. 22.6):—*Plagiochila ansata* (Hooker & Taylor 1844b: 457) Gottsche *et al.* (1847: 649). Note:—Heinrichs *et al.* (2006) showed that the section should be placed in synonymy with *Plagiochila* sect. *Alternantes* which is a later synonym of *Plagiochila* sect. *Denticulatae*.
- = *Plagiochila* sect. *Fragmentissimae* (Inoue et R.M.Schust.) R.M.Schust., *Hepat. Anthocerotae N. Amer.* 4: 449, 1980 (Schuster 1980), **syn. nov.** Basionym:—*Plagiochila* subsect. *Fragmentissimae* Inoue et R.M.Schust., *J. Hattori Bot. Lab.* 34: 154, 1971 (Inoue & Schuster 1971). Type:—*Plagiochila fragmentissima* Inoue & Schuster (1971: 154). Note:—The type species has not been included in any molecular study, but the section is provisionally placed here as the type species is similar to *Plagiochila gregaria* and possibly conspecific with it (M.L. So and D. Glenny, pers. comm.).

Note:—The types of all sections except *Plagiochila* sect. *Fragmentissimae* have been included in molecular studies. *Plagiochila nobilis* has usually been placed in *Plagiochila* sect. *Plagiochila* on morphological evidence (e.g. Inoue 1984, So 2000), but Groth (2005) and Heinrichs *et al.* (2006) have shown that *Plagiochila* sect. *Denticulatae* is an independent lineage within *Plagiochila* and not closely related to *Plagiochila* sect. *Plagiochila*. Most studies, also those recognizing *Plagiochila nobilis* in the section, have used the name *Plagiochila* sect. *Alternantes*, but the earliest name is *Plagiochila* sect. *Denticulatae*.

***Plagiochila* sect. *Durae* Carl, *Ann. Bryol., Suppl.* 2: 123, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila dura* De Notaris (1855: 214).**

- = *Plagiochila* sect. *Hirtae* Carl, *Ann. Bryol., Suppl.* 2: 122, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila hirta* Mitten (1852:134) [= *Plagiochila acanthocaulis* Sullivant (1850: 317), cf. Hässel (1983)]. Note:—The section was placed in synonymy with *Plagiochila* sect. *Durae* by Heinrichs *et al.* (2006).
- = *Plagiochila* sect. *Angulatae* Carl, *Ann. Bryol., Suppl.* 2: 129, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila angulata* (Stephani 1900: 26). Note:—The section has not been included in any molecular study, but Hässel (2006) placed it in synonymy with *Plagiochila* sect. *Hirtae*.
- = *Plagiochila* sect. *Deltoideae* E.A.Hodgs., *Trans. & Proc. Roy. Soc. New Zealand* 73 (4): 271, 1944 (Hodgson 1944), *nom. inval.* (ICN Art. 39.1; no Latin description). Type (ICN Art. 22.6):—*Plagiochila deltoidea* Lindenberg (1843: 132). Note:—The section was placed in synonymy with *Plagiochila* sect. *Durae* by Groth *et al.* (2004).
- = *Plagiochila* sect. *Ramosissimae* Inoue et R.M.Schust., *J. Hattori Bot. Lab.* 34: 202, 1971 (Inoue & Schuster 1971), **syn. nov.** Type (ICN Art. 22.6):—*Plagiochila ramosissima* (Hooker 1818: tab. 92) Lindenberg (1840: 87). Note:—Groth (2005) resolved the type of the section within *Plagiochila* sect. *Durae*.
- = *Plagiochila* sect. *Hodgsoniae* J.J.Engel et G.L.Merr., *Nova Hedwigia* 96 (3/4): 403, 2013 (Engel & Smith Merrill 2013), “*Hodgsonia*”, *nom. inval.* (ICN Art. 38.1(a); no description), **syn. nov.** Holotype:—*Plagiochila deltoidea* Lindenberg (1843: 132). Note:—Engel & Smith Merrill (2013) did not describe the section, but apparently tried to validate it with a reference to *Plagiochila* sect. *Gigantea* subsect. 2 Carl (1931b: 145). However, the latter does not have any description either. In addition, they included two sections as synonyms that were available as names. They considered *Plagiochila* sect. *Deltoideae* to be illegitimate as Hodgson (1944) included the type of the older *Plagiochila* sect. *Banksianae* in it. However, as Engel &

Smith Merrill (2013) deliberately excluded that element, the name became available. However, *Plagiochila* sect. *Deltoidea* is not validly published as Hodgson failed to provide a Latin description. Engel & Smith Merrill's (2013) "typification" of *Plagiochila* sect. *Deltoideae* with *Plagiochila banksiana* must also be rejected as the section should be automatically typified with *Plagiochila deltoidea* (ICN Art. 22.6). The other older section name included as a synonym is *Plagiochila* sect. *Fragmentissimae*, a section we provisionally treat as a synonym of *Plagiochila* sect. *Denticulatae*.

Note:—Recognition of *Plagiochila* sect. *Duriae* is supported by several molecular studies (Groth 2005, Heinrichs *et al.* 2005a, 2006). The types of all synonymized sections, except *Plagiochila* sect. *Angulatae* have been included in molecular studies confirming their position.

***Plagiochila* sect. *Duseniae* Carl, *Ann. Bryol., Suppl.* 2: 126, 1931 (Carl 1931b), "*Dusenii*".** Type (ICN Art. 22.6):—*Plagiochila dusenii* Stephani (1904f: 979).

Note:—Recognition of the section is supported by the study by Groth (2005) and Heinrichs *et al.* (2006).

***Plagiochila* sect. *Flexicaules* Carl, *Ann. Bryol., Suppl.* 2: 127, 1931 (Carl 1931b).** Type (ICN Art. 22.6):—*Plagiochila flexicaulis* Gottsche *et al.* (1847: 629).

Note:—No species of this section has been included in any molecular study, but the section was recognized by Hässel (2008b).

***Plagiochila* sect. *Fruticosae* Inoue, *Gen. Plagiochila SE Asia*: 50, 1984 (Inoue 1984).** Type (ICN Art. 22.6):—*Plagiochila fruticosa* Mitten (1861: 94).

Note:—Recognition of the section is supported by several molecular studies (*e.g.* Groth 2005, Heinrichs *et al.* 2006).

***Plagiochila* sect. *Fuscoluteae* Carl, *Ann. Bryol., Suppl.* 2: 46, 1931 (Carl 1931b).** Type (ICN Art. 22.6):—*Plagiochila fuscolutea* Taylor (1846: 263).

= *Plagiochila* sect. *Bursatae* Carl, *Ann. Bryol., Suppl.* 2: 65, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila bursata* Lindenberg (1840: 88) [= *Plagiochila aerea* Taylor (1846: 263), *cf.* Stotler *et al.* (1998)]. Note:—The section was placed in synonymy with *Plagiochila* sect. *Fuscoluteae* by Heinrichs (2002).

= *Plagiochila* sect. *Caversiae* Carl, *Ann. Bryol., Suppl.* 2: 68, 1931 (Carl 1931b) "*Caversii*". Type (ICN Art. 22.6):—*Plagiochila caversii* Stephani (1916: 194) [= *Plagiochila longiramea* Stephani (1916: 204), *cf.* Heinrichs & Gradstein (1999)]. Note:—The section was placed in synonymy with *Plagiochila* sect. *Fuscoluteae* by Heinrichs & Gradstein (1999).

= *Acrobolbus* subg. *Xenopsis* R.M.Schust., *Phytologia* 39 (4): 249, 1978 (Schuster 1978), *nom. inval.* (ICN Art. 38.1(a); no description). Type:—*Acrobolbus laceratus* Schuster (1978: 249) [= *Plagiochila tabinensis* Stephani (1902b: 862), *cf.* Heinrichs *et al.* (2001)]. Note:—Heinrichs (2002) placed the subgenus in synonymy with *Plagiochila* sect. *Fuscoluteae*.

Note:—Recognition of *Plagiochila* sect. *Fuscoluteae* including its synonyms is supported by several molecular studies (*e.g.* Heinrichs *et al.* 2005a, Groth 2005).

***Plagiochila* sect. *Glaucescentes* Carl, *Ann. Bryol., Suppl.* 2: 70, 1931 (Carl 1931b).** Type (ICN Art. 22.6):—*Plagiochila glaucescens* Stephani (1902b: 885) [= *Plagiochila diversifolia* Gottsche *et al.* (1847: 640), *cf.* Heinrichs *et al.* (2000)].

Note:—The section was identified by Heinrichs *et al.* (2000) and was supported by the molecular studies by Heinrichs *et al.* (2002a) and later authors.

***Plagiochila* sect. *Hylacoetes* Carl, *Ann. Bryol., Suppl.* 2: 50, 1931 (Carl 1931b) "*Hylaeoetes*".** Type (ICN Art. 22.6):—*Plagiochila hylacoetis* Spruce (1885: 496) [= *Plagiochila vincentina* Lindenberg (1840: 39) *cf.* Heinrichs (2002)].

= *Plagiochila* subg. *Cucullifoliae* Carl, *Ann. Bryol., Suppl.* 2: 38, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila cucullifolia* Jack & Stephani (1892: 24).

- ≡ *Plagiochila* sect. *Cucullifoliae* (Carl) Inoue (1984: 25).
- ≡ *Szweykowskia* Gradstein & Reiner-Drehwald (1995: 33). Note:—The subgenus was placed in synonymy with *Plagiochila* sect. *Hylacoetes* by Heinrichs (2002).
- = *Plagiochila* sect. *Superbae* Carl, *Ann. Bryol., Suppl.* 2: 59, 1931 (Carl 1931b), *nom. illeg.* (ICN Art. 52.1; earlier name included [cf. *Plagiochila annotina*; type of sect. *Annotinae*]). Type (ICN Art. 22.6):—*Plagiochila superba* (Sprengel 1827: 326) Montagne (1839: 81). Note:—Heinrichs (2002) placed it in synonymy with *Plagiochila* sect. *Hylacoetes*, a position confirmed by several later studies.
- = *Plagiochila* subsect. *Macrotrichae* Carl, *Ann. Bryol., Suppl.* 2: 60, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila macrotricha* Spruce (1885: 476) [= *Plagiochila superba* var. *macrotricha* (Spruce) Heinrichs (2002: 114)]. Note:—Heinrichs (2002) placed the subsection in synonymy with *Plagiochila* sect. *Hylacoetes*.
- = *Stereochila* Inoue, *Mem. New York Bot. Gard.* 45: 279, 1987 (Inoue 1987). Holotype:—*Stereochila ecuadorica* Inoue (1987: 279) [= *Plagiochila dimorpha* var. *ecuadorica* (Inoue) Heinrichs (2002: 87)]. Note:—Heinrichs (2002) placed the genus in synonymy with *Plagiochila* sect. *Hylacoetes*, a position confirmed by later studies.

Note:— The types of all synonyms of *Plagiochila* sect. *Hylacoetes* have been included in molecular studies and the recognition of *Plagiochila* sect. *Hylacoetes* as circumscribed by Heinrichs (2002) is well supported by several studies.

***Plagiochila* sect. *Jacquintotiae* Hässel**, *Nova Hedwigia* 89: 85, 2009 (Hässel (2009)). Type (ICN Art. 22.6):—*Plagiochila jacquintotii* Montagne (1845a: 273).

Note:—The section was recognized morphologically by Hässel (2009).

***Plagiochila* sect. *Kaalaasiae* Carl**, *Ann. Bryol., Suppl.* 2: 103, 1931 (Carl 1931b) “*Kaalaasii*”. Type (ICN Art. 22.6):—*Plagiochila kaalaasii* Stephani (1903f: 971) [= *Plagiochila amboynensis* Taylor (1846: 260), cf. Inoue (1984)].

Note:—The section was recognized by Inoue (1984), but no species has been included in any molecular study.

***Plagiochila* sect. *Longiflorae* Carl**, *Ann. Bryol., Suppl.* 2: 130, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila longiflora* Gottsche *et al.* (1847: 651).

Note:—The section was recognized by Hässel (2008b), but no species has been included in any molecular study.

***Plagiochila* sect. *Oligodontes* Carl**, *Ann. Bryol., Suppl.* 2: 130, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila oligodon* Montagne (1845a: 348) [= *Plagiochila lophocoleoides* Montagne (1845a: 348), cf. Hässel (1983)].

Note:—The section was recognized by Hässel (2008b), but the sole species has not been included in any molecular study.

***Plagiochila* sect. *Peculiares* Schiffn.**, *Hep. Fl. Buitenzorg*: 107, 1900 (Schiffner 1900a). Type (ICN Art. 22.6):—*Plagiochila peculiaris* Schiffner (1900a: 157).

≡ *Plagiochila* subg. *Paraplagiochila* Inoue, *Gen. Plagiochila SE Asia*: 44, 1984 (Inoue 1984). Holotype:—*Plagiochila peculiaris* Schiffner (1900a: 157).

= *Plagiochila* sect. *Zonatae* Carl, *Ann. Bryol., Suppl.* 2: 97, 1931 (Carl 1931b), **syn. nov.** Type (ICN Art. 22.6):—*Plagiochila zonata* Stephani (1894: 225). Note:—Species of the section were resolved within *Plagiochila* sect. *Peculiares* by Heinrichs *et al.* (2006), but the type was not included in the study. However, Heinrichs *et al.* (2004c) placed the type as sister to *Plagiochila magna* Inoue (1965a: 216) which was included and shown to belong to *Plagiochila* sect. *Peculiares* in the 2006 study.

= *Plagiochila* sect. *Renitentes* Carl, *Ann. Bryol., Suppl.* 2: 114, 1931 (Carl 1931b), **syn. nov.** Type (ICN Art. 22.6):—*Plagiochila renitens* (Nees 1830) Lindenberg (1840: 90). Note:—The type of the section was resolved within *Plagiochila* sect. *Peculiares* by Heinrichs *et al.* (2005a) but its position in the study by Groth (2005) was unclear. The synonymization here is thus preliminary.

= *Plagiochila* sect. *Hamulispinae* Carl, *Ann. Bryol., Suppl.* 2: 113, 1931 (Carl 1931b), **syn. nov.** Type (ICN Art. 22.6):—*Plagiochila hamulispina* Herzog in Nicholson *et al.* (1930: 19) [= *Plagiochila durelii* Schiffner (1899: 131), cf. Grolle & So (1999b)].

Note:—The type of the section has not been included in any molecular study, but Grolle & So (1999b) placed it in synonymy with *Plagiochila* sect. *Zonatae*.

= *Plagiochila* subsect. *Alatae* Inoue, *Bull. Natl. Sci. Mus. Tokyo (n.ser.)* 8 (3): 380, 1965 (Inoue 1965b), **syn. nov.** Type (ICN Art. 22.6):—*Plagiochila alata* Inoue (1965b: 383) [= *Plagiochila durelii* Schiffner (1899: 131), cf. Grolle & So (1999b)].

Note:—The type of the section has not been included in any molecular study, but Grolle & So (1999b) placed it in synonymy with *Plagiochila* sect. *Zonatae*.

Note:—Only the types of *Plagiochila* sect. *Peculiares*, *Plagiochila* sect. *Renitentes* and *Plagiochila* sect. *Zonatae* have been included in molecular studies. Grolle & So (1999b) placed *Plagiochila* sect. *Hamulispinae* and *Plagiochila* subsect. *Alatae* in synonymy with *Plagiochila* sect. *Zonatae* on morphological evidence. The robustness of this chain of synonyms remains to be tested. However, *Plagiochila* sect. *Peculiares* is well supported in several molecular studies (Heinrichs *et al.* 2004a, 2005a, 2006, Groth 2005).

***Plagiochila* sect. *Plagiochila***, *Naturgesch. Eur. Leberm.* 3: 515, 1838 (Nees 1838). Type:—*Plagiochila asplenioides* (Linnaeus 1753: 1131) Dumortier (1835: 14).

***Plagiochila* sect. *Poeltiae* Inoue**, *Bull. Natl. Sci. Mus. Tokyo (n.ser.)* 8 (3): 394, 1965 (Inoue 1965b). Type (ICN Art. 22.6):—*Plagiochila poeltii* Inoue et Grolle in Grolle 1964b).

= *Plagiochila* sect. *Carringtoniae* Inoue, *Bull. Natl. Sci. Mus. Tokyo (n.ser.)* 8 (3): 377, 1965 (Inoue 1965b) “*Carringtonii*”. Type (ICN Art. 22.6):—*Plagiochila carringtonii* (Carrington 1870: 380) Grolle (1964b: 656)

Note:—The section was placed in synonymy with *Plagiochila* sect. *Poeltiae* by Groth *et al.* (2004).

Note:—The type species of both sections have been included in molecular studies (*e.g.* Groth *et al.* 2004, Heinrichs *et al.* 2004a) and the section *Poeltiae* is well supported.

***Plagiochila* sect. *Rutilantes* Carl**, *Ann. Bryol., Suppl.* 2: 83, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila rutilans* Lindenberg (1840: 47).

= *Plagiochila* sect. *Permistae* Carl, *Ann. Bryol., Suppl.* 2: 73, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila permista* Spruce (1885: 481) [= *Plagiochila trichostoma* Gottsche (1864: 113), cf. Heinrichs *et al.* 2002a]. Note:—The section was placed in synonymy with *Plagiochila* sect. *Rutilantes* by Heinrichs (2002).

= *Plagiochila* sect. *Caducilobae* Inoue, *J. Hattori Bot. Lab.* 39: 339, 1975 (Inoue 1975). Type (ICN Art. 22.6):—*Plagiochila caduciloba* Blomquist (1939: 114). Note:—The section was placed in synonymy with *Plagiochila* sect. *Rutilantes* by Groth *et al.* (2002).

Note:—The type species of both sections have been included in molecular studies supporting the synonymy and recognition of *Plagiochila* sect. *Rutilantes*.

***Plagiochila* sect. *Strombifoliae* Inoue et R.M.Schust.**, *J. Hattori Bot. Lab.* 34: 130, 1971 (Inoue & Schuster 1971).

Type:—*Plagiochila strombifolia* Lehmann (1844: 5).

Note:—The type species has not been included in any molecular study, but Engel & Smith Merrill (2013) recognized the section.

***Plagiochila* sect. *Tayloriae* Carl**, *Ann. Bryol., Suppl.* 2: 140, 1931 (Carl 1931b), “*Taylori*”. Type (ICN Art. 22.6):—*Plagiochila taylorii* Stephani (1904e: 781) [= *Plagiochila fuscella* (Hooker & Taylor 1844a: 373) Gottsche *et al.* (1847: 648), cf. Engel & Smith Merrill (2013)].

= *Plagiochila* sect. *Annotinae* Carl, *Ann. Bryol., Suppl.* 2: 143, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila annotina* Lindenberg (1839: 34). Note:—Groth (2005) placed the section in synonymy with *Plagiochila* sect. *Tayloriae*.

= *Plagiochila* sect. *Capillares* Carl, *Ann. Bryol., Suppl.* 2: 90, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila capillaris* Stephani (1918: 137) [= *Plagiochila corticola* Stephani (1894: 224), cf. So & Grolle 2000b]. Note:—The type has not been included in any molecular study, but So (2001a) included the type in *Plagiochila* sect. *Firmae*.



- = *Plagiochila* sect. *Deflexifoliae* Carl, *Ann. Bryol., Suppl.* 2: 139, 1931 (Carl 1931b), **syn. nov.** Type (ICN Art. 22.6):—*Plagiochila deflexifolia* Stephani (1918: 145) [= *Plagiochila circinalis* Lehmann (1832: 64) Lindenberg (1843: 124), cf. Inoue & Schuster (1971)]. Note:—The type species was included in the molecular studies by Groth (2005) and Heinrichs *et al.* (2006).
- = *Plagiochila* sect. *Firmae* Carl, *Ann. Bryol., Suppl.* 2: 112, 1931 (Carl 1931b), **syn. nov.** Type (ICN Art. 22.6):—*Plagiochila firma* Mitten (1861: 95) [= *Plagiochila gracilis* Gottsche *et al.* (1847: 632), cf. Inoue (1984)]. Note:—The type species has not been included in any molecular study, but *Plagiochila gymnoclada* Sande Lacoste (1856: 6), which Grolle & So (1999b) placed in *Plagiochila* sect. *Firmae*, is nested within *Plagiochila* sect. *Tayloriae* in Groth (2005).
- = *Plagiochila* sect. *Fuscae* Carl, *Ann. Bryol., Suppl.* 2: 116, 1931 (Carl 1931b), **syn. nov.** Type (ICN Art. 22.6):—*Plagiochila fusca* Sande Lacoste (1854: 417). Note:—Groth (2005) placed the type of the section in *Plagiochila* sect. *Tayloriae*.
- = *Plagiochila* sect. *Radiculosae* Inoue *et R.M.Schust.*, *J. Hattori Bot. Lab.* 34: 115, 1971 (Inoue & Schuster 1971). Type (ICN Art. 22.6):—*Plagiochila radiculosa* Mitten (1852: 132). Note:—The type species has not been included in any molecular study, but Engel & Smith Merrill (2013) placed the section in synonymy with *Plagiochila* sect. *Annotinae*.
- = *Plagiochila* subsect. *Obscurae* Inoue *et R.M.Schust.*, *J. Hattori Bot. Lab.* 34: 160, 1971 (Inoue & Schuster 1971), **syn. nov.** Type (ICN Art. 22.6):—*Plagiochila obscura* Colenso (1887: 281) [= *Plagiochila stephensoniana* Mitten (1852: 133), cf. Engel & Smith Merrill (1887)]. Note:—Groth (2005) placed the type species of the subsection in *Plagiochila* sect. *Taylorae*.
- = *Plagiochila* sect. *Mitteniae* J.J.Engel *et G.L.Merr.*, *Nova Hedwigia* 96 (3/4): 401, 2013 (Engel & Smith Merrill 2013), “*Mittenia*”, **syn. nov.** Holotype:—*Plagiochila stephensoniana* Mitten (1852: 133). Note:—Groth (2005) placed the type species of the section in *Plagiochila* sect. *Tayloriae*.
- = *Plagiochila* sect. *Colensoae* J.J.Engel *et G.L.Merr.*, *Nova Hedwigia* 96 (3/4): 406, 2013 (Engel & Smith Merrill 2013), “*Colensoa*”, **syn. nov.** Holotype:—*Plagiochila colensoi* Taylor (1846: 269). Note:—Groth (2005) placed the type species of the section in *Plagiochila* sect. *Tayloriae*.

Note:—Groth (2005) recognized *Plagiochila* sect. *Tayloriae*, but did not include the type species in the study.

***Plagiochila* sect. *Trabeculatae* S.Hatt. ex Inoue, *J. Hattori Bot. Lab.* 20: 75, 1958 (Inoue 1958). Type (ICN Art. 22.6):—*Plagiochila trabeculata* Stephani (1903a: 103).**

Note:—The section is recognized since the type and two other species of the section have been included in molecular studies (e.g. Groth 2005, Heinrichs *et al.* 2006). Some authors (Inoue 1984, So 2001b) have synonymized it with *Plagiochila* sect. *Cobanae*, but Groth *et al.* (2004) and Heinrichs *et al.* (2004a) abstained from combining the two until *Plagiochila* sect. *Cobanae* has been studied closer.

***Plagiochila* sect. *Vagae* Lindenb., *Monogr. Hep. Gen. Plagiochilae*: xv, 1844 [1843] (Lindenberg 1844). Lectotype (Heinrichs *et al.* 2002b: 7):—*Plagiochila patula* (Swartz 1806: 1844) Lindenberg (1839: 21).**

- = *Carpolepidum* P.Beauv., *Fl. Oware* 1 (3): 21, 1805 (Palisot de Beauvois 1805), *nom. rejic.* Type (only species included):—*Carpolepidum dichotomum* Palisot de Beauvois (1805: 23) [= *Plagiochila dichotoma* (P. Beauv.) Nees & Montagne (1836: 53)]. Note:—Heinrichs *et al.* (2005a) placed the type species in *Plagiochila* sect. *Vagae*. The genus is rejected against *Plagiochila*.
- = *Plagiochila* sect. *Spinulosae* Spruce, *Trans. & Proc. Bot. Soc. Edinburgh* 15: 454, 1885 (Spruce 1885). Lectotype (Heinrichs *et al.* 2002b: 8):—*Plagiochila distinctifolia* Lindenberg (1839: 17). Note:—Heinrichs *et al.* (2002b) synonymized the section.
- = *Plagiochila* sect. *Frondescientes* Spruce, *Trans. & Proc. Bot. Soc. Edinburgh* 15: 460, 1885 (Spruce 1885). Lectotype (Heinrichs *et al.* 2002b: 8):—*Plagiochila montana* Spruce (1885: 487) [= *Plagiochila patula* (Swartz 1806: 1844) Lindenberg (1839: 21), cf. Heinrichs *et al.* 1998]. Note:—The type species was considered conspecific with the type species of *Plagiochila* sect. *Vagae* by Heinrichs *et al.* (1998) and Heinrichs *et al.* (2002b) synonymized the sections.
- = *Plagiochila* sect. *Abietinae* Schiffn., *Hep. Fl. Buitenzorg*: 106, 1900 (Schiffner 1900a), **syn. nov.** Type (ICN Art. 22.6):—*Plagiochila abietina* (Nees 1830: 76) Montagne (1839: 81). Note:—Groth (2005) included the type in his study and showed that it should be included in *Plagiochila* sect. *Vagae*.
- = *Plagiochila* sect. *Dentatae* Schiffn., *Hep. Fl. Buitenzorg*: 106, 1900 (Schiffner 1900a), **syn. nov.** Lectotype (**here designated**):—*Plagiochila obtusa* Lindenberg (1840: 42). Note:—Inoue (1984) placed the section in synonymy with sect. *Contiguae* and the lectotype was included in the molecular study by Groth (2005) where it is nested within *Plagiochila* sect. *Vagae*.
- = *Plagiochila* sect. *Contiguae* Carl, *Ann. Bryol., Suppl.* 2: 81, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila contigua* Gottsche (1863: 30). Note:—Heinrichs *et al.* (2002b) placed the section in synonymy with *Plagiochila* sect. *Vagae*.
- = *Plagiochila* sect. *Crispatae* Carl, *Ann. Bryol., Suppl.* 2: 48, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila crispata*

- Gottsche (1863: 71) [= *Plagiochila undata* Gray (1846: 73), cf. Schuster (1960)]. Note:—Heinrichs *et al.* (2002b) placed the section in synonymy with *Plagiochila* sect. *Vagae*.
- = *Plagiochila* sect. *Hypnoides* Carl, *Ann. Bryol., Suppl.* 2: 55, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila hypnoides* Lindenberg (1840: 37) [= *Plagiochila montagnei* Nees & Montagne (1836: 53), cf. Heinrichs & Gradstein 2000]. Note:—Heinrichs & Gradstein (2000) placed the section in synonymy of *Plagiochila* sect. *Crispatae*, now considered a synonym of sect. *Vagae*.
- = *Plagiochila* sect. *Paralellae* Carl, *Ann. Bryol., Suppl.* 2: 78, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila parallela* Stephani (1902a: 686). Note:—Groth *et al.* (2004) placed the section in synonymy with *Plagiochila* sect. *Vagae*.
- = *Plagiochila* sect. *Subtropicae* Carl, *Ann. Bryol., Suppl.* 2: 102, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila subtropica* Stephani (1899: 46). Note:—Groth *et al.* (2004) synonymized the section with *Plagiochila* sect. *Vagae*.
- = *Plagiochila* sect. *Belangerianae* Carl, *Ann. Bryol., Suppl.* 2: 117, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila belangeriana* Lindenberg (1840: 109) [= *Plagiochila arbuscula* (Lehmann 1832: 63) Lindenberg (1839: 23), cf. Inoue & Schuster (1971)].
- ≡ *Plagiochila* subsect. *Belangerianae* (Carl) Inoue, *J. Hattori Bot. Lab.* 20: 67, 1958 (Inoue 1958). Note:—The type species has been included in several molecular studies confirming the placement in *Plagiochila* sect. *Vagae*.
- = *Plagiochila* sect. *Latifoliae* Carl, *Ann. Bryol., Suppl.* 2: 108, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila latifolia* Stephani (1905b: 742). Note:—No species from the section has been included in any molecular study, but Grolle & So (1999c) placed the section in synonymy with *Plagiochila* sect. *Contiguae*.
- = *Plagiochila* sect. *Villosae* Carl, *Ann. Bryol., Suppl.* 2: 106, 1931 (Carl 1931b). Type (ICN Art. 22.6):—*Plagiochila villosa* Stephani (1921: 239) [= *Plagiochila obtusa* Lindenberg (1840: 42), cf. Inoue (1984)]. Note:—Groth (2005) placed the type species in *Plagiochila* sect. *Vagae*.
- = *Plagiochila* sect. *Yokogurenses* Inoue, *J. Hattori Bot. Lab.* 20: 86, 1958 (Inoue 1958). Type (ICN Art. 22.6):—*Plagiochila yokogurensis* Stephani (1897: 104) [= *Plagiochila parvifolia* Lindenberg (1839: 28), cf. Grolle & So (1999a)]. Note:—Groth (2005) placed the type species of the section in *Plagiochila* sect. *Vagae*.

***Plagiochila* sect. *Zanteniae* (Inoue) Inoue**, *Gen. Plagiochila SE Asia*: 45, 1984 (Inoue 1984), “*Zantenii*”. Basionym:—*Plagiochila* subsect. *Zanteniae* Inoue, *J. Hattori Bot. Lab.* 32: 109, 1969 (Inoue 1969), “*Zantenii*”. Type (ICN Art. 22.6):—*Plagiochila zantenii* Inoue, *J. Hattori Bot. Lab.* 32: 107, 1969 (Inoue 1969). Note:—The placement of this section is unclear. Inoue (1984) placed it as a section under his *Plagiochila* subg. *Paraplagiochila* (= *Plagiochila* sect. *Peculiares*).

## Nomenclatural novelties

***Plagiochila ecuadorica* (Inoue) L.Söderstr., comb. nov.** Basionym:—*Steereochila ecuadorica* Inoue, *Mem. New York Bot. Gard.* 45: 279, 1987 (Inoue 1987). Type:—ECUADOR. Carchi: Cordillera Occidental, Tulcán-Maldonado road, 1983, *Steere 26580*. (NY, holotype; TNS, isotype). ≡ *Plagiochila dimorpha* var. *ecuadorica* (Inoue) Heinrichs, *Bryophyt. Biblioth.* 58: 87, 2002 (Heinrichs 2002). Note:—Heinrichs (2002) showed that *Steereochila ecuadorica* is a *Plagiochila* close to *Plagiochila dimorpha* Lindenberg et Gottsche in Gottsche *et al.* (1847: 327) and treated it as a variety. However, in Heinrichs (2002) *Plagiochila dimorpha* and *Plagiochila ecuadorica* do not form a monophyletic lineage, but a polytomy including also *Plagiochila turgida* Herzog (1932: 196), or a paraphyletic group with the latter nested in the group. Although there are some morphological similarities between *Plagiochila dimorpha* and *Plagiochila ecuadorica*, we prefer to treat it on the same level as *Plagiochila turgida* until studied further, and as *Plagiochila ecuadorica* was previously recognized as a separate genus, we prefer to keep them apart at species level instead of variety level.

***Plagiochila sciophila* subsp. *ciliigera* (R.M.Schust.) L.Söderstr., comb. nov.** Basionym:—*Plagiochila japonica* subsp. *ciliigera* R.M.Schust., *Amer. Midl. Naturalist.* 62: 354, 1959 (Schuster 1959b). Type:—USA. Arkansas: Stone Co., Sylamore National Forest, *Anderson* (DUKE, holotype). Note:—Inoue (1982) synonymized *Plagiochila japonica* Sande Lacoste (1864: 290) with *Plagiochila sciophila* Nees ex Lindenberg (1840: 100) without transferring or synonymizing the American subspecies. Schuster (1959b) described the subspecies with minor but clear differences from *Plagiochila japonica* subsp. *japonica*. Until further studied, given the morphological differences and the wide geographical separation of the two taxa we prefer to recognize them at subspecific level for now, although *Plagiochila sciophila* subsp. *ciliigera* may warrant recognition at specific level.

*Plagiochila umbrosioides* Steph. ex L.Söderstr., *nom. nov. pro Plagiochila umbrosa* Steph., *Sp. Hepat. (Stephani)* 6: 235, 1921 (Stephani 1921), *nom. illeg.* (ICN Art. 53.1; hom. illeg.). Type:—MEXICO. *Arsène* 7729, *herb. Stephani* no. 18141 (G-00061563, holotype [<http://www.ville-ge.ch/musinfo/bd/cjb/chg/adetail.php?id=127411&lang=en>]). Blocking name:—*Plagiochila umbrosa* Schrader (1797: 5) Nees (1838: 525).

## Acknowledgement

We thank Jörn Hentschel (Jena) and Matt Renner (Sydney) for valuable comments. The Early Land Plants Today project (ELPT) has been generously supported in part by the Global Biological Information Facility (GBIF) Seed Money Award No.2007-41, activities facilitated in part by funding from the Biodiversity Synthesis Center of the Encyclopedia of Life (BioSynC), partial funding from the National Science Foundation (Award No's 0749762, 1115002), the Warwick Foundation, and the Negaunee Foundation.

## References

- Bescherelle, É. & Massalongo, C.B. (1886) Hepaticae novae Americanae-australis. *Bulletin Mensuel de la Société Linnéenne de Paris* 1: 626–640.
- Blomquist, H.L. (1939) A new species of *Plagiochila* from southern Appalachian Mountains. *Bryologist* 42: 113–117.  
<http://dx.doi.org/10.2307/3239827>
- Buch, H. (1934) Verzeichnis der von H. Roivainen in Südchile während der Auer'schen Feuerlandsexpedition im Jahre 1929 gesammelten *Plagiochila*-arten. *Annales Bryologici* 7: 1–5.
- Buch, H., Evans, A.W. & Verdoorn, F. (1937) A preliminary check list of the Hepaticae of Europe and America (North of Mexico). *Annales Bryologici* 10: 3–8.
- Carl, H. (1931a) Morphologische Studien an *Chiastocaulon* Carl, einer neuen Lebermoosgattung. *Flora* 126: 45–60.
- Carl, H. (1931b) Die Arttypen und die systematische Gliederung der Gattung *Plagiochila* Dum. *Annales Bryologici* 2(Supplement): 1–170.
- Carrington, B. (1870) On two new British Hepaticae. *Transactions of the Botanical Society of Edinburgh* 10: 378–382.  
<http://dx.doi.org/10.1080/03746607009468722>
- Carrington, B. (1881) Hepaticae. In: Lees, F.A. (Ed.) *The London catalogue of British mosses and hepatics*. 2<sup>nd</sup> Edition. London, pp. 21–26.
- Cavers, F. (1910) The interrelationships of the Bryophyta. *New Phytologist* 9: 269–304.  
<http://dx.doi.org/10.1111/j.1469-8137.1910.tb05577.x>
- Colenso, W. (1887) A description of some newly-discovered cryptogamic plants, being a further contribution toward making known the botany of New Zealand. *Transactions and Proceedings of the New Zealand Institute* 19: 271–301.
- Crandall-Stotler, B.J., Stotler, R.E. & Long, D.G. (2009) Phylogeny and classification of the Marchantiophyta. *Edinburgh Journal of Botany* 66: 155–198.  
<http://dx.doi.org/10.1017/S0960428609005393>
- De Notaris, G. (1857) *Jungermanniarum americanarum pugillus*. *Memorie della reale accademia delle scienze di Torino, Serie 2* 16: 211–238.
- Dugas, M. (1929) Contribution à l'étude du genre "*Plagiochila*" Dum. *Annales des Sciences Naturelles; Botanique, Série 10* 11: 1–199.
- Dumortier, B.C. (1831) *Sylloge Jungermannidearum Europae indigenarum*. J. Casterman, Tournay, 100 pp.
- Dumortier, B.C. (1835) *Recueil d'Observations sur les Jungermanniacées*. J.-A. Blanquart, Tournay, 27 pp.  
<http://dx.doi.org/10.5962/bhl.title.731>
- Engel, J.J. & Heinrichs, J. (2008) Studies of New Zealand Hepaticae. 39. *Dinckleria* Trevis. an older name for *Proskauera* Heinrichs and J.J.Engel. *Cryptogamie, Bryologie* 29: 193–194.
- Engel, J.J. & Smith, M., Gary, L. (2013) Austral Hepaticae. 49. New section names and synonymy in *Plagiochila*, with reference to New Zealand species [Plagiochilaceae (Jörg.) K. Müll.]. *Nova Hedwigia* 96 (3/4): 399–408.  
<http://dx.doi.org/10.1127/0029-5035/2013/0085>
- Feldberg, K., Váña, J., Zhu, R.-L. & Heinrichs, J. (2010) The systematic position of *Pedinophyllum* (Marchantiophyta: Jungermanniales). *Cryptogamie, Bryologie* 31: 125–133.

- Gottsche, C.M. (1857) Pugillus novarum hepaticarum. *Annales des Sciences Naturelles; Botanique, Série 4* 8: 318–348.
- Gottsche, C.M. (1858) Uebersicht und kritische Würdigung der seit dem Erscheinen der Synopsis Hepaticarum bekannt gewordenen Leistungen in der Hepaticologie. *Botanische Zeitung, Berlin, Beilage* 16: 1–54.
- Gottsche, C.M. (1863) *De Mexikanske Levermosser*. Bianco Lunos Bogtrykkeri, Kjøbenhavn, 285 pp.
- Gottsche, C.M. (1864) Hepaticae. In: Triana, J.J. & Planchon, J.E. (Eds.) *Prodromus Florae Novo-Granatensis. Annales des Sciences Naturelles; Botanique, Séries 5* 1: 95–198.
- Gottsche, C.M., Lindenberg, J.B.W. & Nees von Esenbeck, C.G. (1847) *Synopsis Hepaticarum, fasc. 5*. Meissner, Hamburg, pp. 625–834. <http://dx.doi.org/10.5962/bhl.title.15221>
- Gradstein, S.R. & Reiner-Drehwald, M.E. (1995) *Szweykowskia*, a new genus of Plagiochilaceae (Hepaticae) from tropical America. *Fragmenta Floristica et Geobotanica* 40: 31–38.
- Gray, S.F. (1821) *Natural arrangement of British Plants. Vol. 1*. Baldwin, Craddock, and Joy, London, 824 pp. <http://dx.doi.org/10.5962/bhl.title.43804>
- Gray, A. (1846) Sullivant's Muscology. *American Journal of Science and Arts, Series 2* 1: 70–81.
- Grolle, R. (1962) Monographie der Lebermoosgattung *Leptoscyphus* Mitt. *Nova Acta Leopoldina, New Series* 25: 1–143.
- Grolle, R. (1964a) Miscellanea hepaticologica 21–30. *Journal of Japanese Botany* 39: 236–241.
- Grolle, R. (1964b) *Jamesoniella carringtonii* – eine *Plagiochila* in Nepal mit Perianth. *Transactions of the British Bryological Society* 4 (4): 653–663. <http://dx.doi.org/10.1179/006813864804812227>
- Grolle, R. (1976) Verzeichnis der Lebermoose Europas und benachbarter Gebiete. *Feddes Repertorium* 87 (3/4): 171–279.
- Grolle, R. (1988) Miscellanea hepaticologica 261–270. *Journal of the Hattori Botanical Laboratory* 65: 403–410.
- Grolle, R. & So, M.L. (1999a) Studies of *Plagiochila* sect. *Subtropicae* in Asia. *Bryologist* 102 (1): 67–75. <http://dx.doi.org/10.2307/3244462>
- Grolle, R. & So, M.L. (1999b) On the *Plagiochila* species of sect. *Zonatae* with paraphyllia or mamilliose stems (Hepaticae). *Systematic Botany* 24: 297–310. <http://dx.doi.org/10.2307/2419690>
- Grolle, R. & So, M.L. (1999c) Studies on *Plagiochila* sect. *Contiguae* in east and south Asia. *Bryologist* 102: 294–303. <http://dx.doi.org/10.2307/3244367>
- Groth, H. (2005) *Molecular phylogeny and morphological reconstructions of Plagiochilaceae (Jungermanniopsida) with hypotheses on biogeography and divergence times*. Thesis, Göttingen, 178 pp.
- Groth, H. & Heinrichs, J. (2003) Reinstatement of *Chistiocaulon* Carl (Plagiotheciaceae), based on evidence from nuclear ribosomal ITS and chloroplast gene *rps4* sequences. *Plant Biology* 5: 615–622. <http://dx.doi.org/10.1055/s-2003-44716>
- Groth, H., Helms, G. & Heinrichs, J. (2002) The systematic status of *Plagiochila* sects. *Bidentes* Carl and *Caducilobae* Inoue (Hepaticae) inferred from nrDNA ITS sequences. *Taxon* 51: 675–684. <http://dx.doi.org/10.2307/1555022>
- Groth, H., Lindner, M. & Heinrichs, J. (2004) Phylogeny and biogeography of *Plagiochila* (Plagiochilaceae) based on nuclear and chloroplast DNA sequences. *Monographs in Systematic Botany from the Missouri Botanical Garden* 98: 365–387.
- Hässel, G.G. (1983) Informaciones nomenclaturales sobre las especies del género *Plagiochila* (Hepaticae) de Argentina y Chile. *Boletín de la Sociedad Argentina de Botánica* 22: 87–129.
- Hässel, G.G. (2004) Andinopatagonian species of *Plagiochila* (Plagiochilaceae, Marchantiophyta) sectio *Obcuneatae* Carl. *Revista del Museo Argentino de Ciencias Naturales, Nueva Serie* 6: 197–208.
- Hässel, G.G. (2006) Andinopatagonian species of *Plagiochila* (Plagiochilaceae, Marchantiophyta). I sectio *Hirtae* and II sectio *Angulatae*. *Journal of the Hattori Botanical Laboratory* 100: 101–118.
- Hässel, G.G. (2008a) Andinopatagonian species of *Plagiochila* (Plagiochilaceae, Marchantiophyta) Sectio *Chilenses* Carl. *Nova Hedwigia* 86: 169–199. <http://dx.doi.org/10.1127/0029-5035/2008/0086-0169>
- Hässel, G.G. (2008b) Andinopatagonian species of *Plagiochila* (Plagiochilaceae, Marchantiophyta) I. Sectio *Oligodontes* Carl, II. Sectio *Flexicaules* Carl and III. Sectio *Longiflorae* Carl. *Revista del Museo Argentino de Ciencias Naturales, Nueva Serie* 10: 1–15.
- Hässel, G.G. (2009) Andinopatagonian species of *Plagiochila* (Plagiochilaceae, Marchantiophyta) Sectio I. *Duseniae* Carl emend. Hässel and sectio II. *Jacquiniotiae* Hässel sect. nov. *Nova Hedwigia* 89: 71–95. <http://dx.doi.org/10.1127/0029-5035/2009/0089-0071>
- Hässel, G.G. & Rubies, M.F. (2009) Catalogue of Marchantiophyta and Anthocerotophyta of southern South America. *Beihefte zur Nova Hedwigia* 134: 1–672.
- Hattori, S. (1947) [Five new genera of Hepaticae]. *Biosphaera* 1: 3–7.



- He, X., Glenny, D., Söderström, L., Hagborg, A. & von Konrat, M. (2014) Notes on Early Land Plants Today. 58. Historical circumscription of Schistochilaceae (Marchantiophyta) and a new combination in *Schistochila*. *Phytotaxa* 173 (1): 91–94.  
<http://dx.doi.org/10.11646/phytotaxa.173.1.10>
- He-Nygrén, X.-L. & Piippo, S. (2003) Phylogenetic relationships of the generic complex *Chiloscyphus-Lophocolea-Heteroscyphus* (Geocalyceae, Hepaticae): Insights from three chloroplast genes and morphology. *Annales Botanici Fennici* 40: 317–329.
- Heinrichs, J. (2002) A taxonomic revision of *Plagiochila* sect. *Hylacoetes*, sect. *Adiantoides* and sect. *Fuscoluteae* in the Neotropics with a preliminary subdivision of neotropical Plagiochilaceae into nine lineages. *Bryophytorum Bibliotheca* 58: 1–184.
- Heinrichs, J. & Gradstein, S.R. (1999) On *Plagiochila longiramea* Steph. (Hepaticae), a poorly known species of Bolivia. *Candollea* 54: 73–81.
- Heinrichs, J. & Gradstein, S.R. (2000) A revision of *Plagiochila* sect. *Crispatae* and sect. *Hypnoides* (Hepaticae) in the Neotropics. I. *Plagiochila disticha*, *P. montagnei* and *P. raddiana*. *Nova Hedwigia* 70: 161–184.
- Heinrichs, J., Gradstein, S.R. & Grolle, R. (1998) A revision of the neotropical species of *Plagiochila* (Dumort.) Dumort. (Hepaticae) described by Olof Swartz. *Journal of the Hattori Botanical Laboratory* 85: 1–32.
- Heinrichs, J., Anton, H., Gradstein, S.R. & Mues, R. (2000) Systematics of *Plagiochila* sect. *Glaucescetes* Carl (Hepaticae) from tropical America: a morphological and chemotaxonomical approach. *Plant Systematics and Evolution* 220: 115–138.  
<http://dx.doi.org/10.1007/BF00985374>
- Heinrichs, J., Anton, H., Holz, I. & Grolle, R. (2001) The andine *Plagiochila tabinensis* Steph. and the identity of *Acrobolbus laceratus* R.M.Schust. (Hepaticae). *Nova Hedwigia* 73: 445–452.
- Heinrichs, J., Groth, H., Holz, I., Rycroft, D.S., Renker, C. & Pröschold, T. (2002a) The systematic position of *Plagiochila moritziana*, *P. trichostoma*, and *P. deflexa* based on ITS sequence variation of nuclear ribosomal DNA, morphology, and lipophilic secondary metabolites. *Bryologist* 105: 189–203.  
[http://dx.doi.org/10.1639/0007-2745\(2002\)105\[0189:TSPOPM\]2.0.CO;2](http://dx.doi.org/10.1639/0007-2745(2002)105[0189:TSPOPM]2.0.CO;2)
- Heinrichs, J., Sauer, M. & Grolle, R. (2002b) Lectotypification and synonymy of *Plagiochila* sect. *Vagae* Lindenb. (Hepaticae) *Cryptogamie, Bryologie* 23 (1): 5–9.  
[http://dx.doi.org/10.1016/S1290-0796\(02\)85003-9](http://dx.doi.org/10.1016/S1290-0796(02)85003-9)
- Heinrichs, J., Gradstein, S.R., Groth, H. & Lindner, M. (2003) *Plagiochila cucullifolia* var. *anomala* var. nov. from Ecuador, with notes on discordant molecular and morphological variation in *Plagiochila*. *Plant Systematics and Evolution* 242: 205–216.  
<http://dx.doi.org/10.1007/s00606-003-0063-5>
- Heinrichs, J., Lindner, M. & Groth, H. (2004a) Sectional classification of the North American *Plagiochila* (Hepaticae, Plagiochilaceae). *Bryologist* 107 (4): 489–496.  
[http://dx.doi.org/10.1639/0007-2745\(2004\)107\[489:SCOTNA\]2.0.CO;2](http://dx.doi.org/10.1639/0007-2745(2004)107[489:SCOTNA]2.0.CO;2)
- Heinrichs, J., Lindner, M. & Pócs, T. (2004b) nrDNA internal transcribed spacer data reveal that *Rhodoplagiochila* R. M. Schust. (Marchantiophyta: Jungermanniales) is a member of *Plagiochila* sect. *Arrectae* Carl. *Organisms, Diversity and Evolution* 4: 109–118.  
<http://dx.doi.org/10.1016/j.ode.2004.01.001>
- Heinrichs, J., Groth, H., Lindner, M., Renker, C., Pócs, T. & Pröschold, T. (2004c) Intercontinental distribution of *Plagiochila corrugata* (Plagiochilaceae, Hepaticae) inferred from nrDNA ITS sequences and morphology. *Botanical Journal of the Linnean Society* 146: 469–481.  
<http://dx.doi.org/10.1111/j.1095-8339.2004.00340.x>
- Heinrichs, J., Lindner, M., Gradstein, S.R., Groth, H., Buchbender, V., Solga, A. & Fischer, E. (2005a) Origin and subdivision of *Plagiochila* (Jungermanniidae: Plagiochilaceae) in tropical Africa based on evidence from nuclear and chloroplast DNA sequences and morphology. *Taxon* 54: 317–333.  
<http://dx.doi.org/10.2307/25065360>
- Heinrichs, J., Lindner, M., Groth, H. & Renker, C. (2005b) Distribution and synonymy of *Plagiochila punctata* (Taylor) Taylor, with hypotheses on the evolutionary history of *Plagiochila* sect. *Arrectae* (Plagiochilaceae, Hepaticae). *Plant Systematics and Evolution* 250: 105–117.  
<http://dx.doi.org/10.1007/s00606-004-0220-5>
- Heinrichs, J., Lindner, M., Groth, H., Hentschel, J., Feldberg, K., Renker, C., Engel, J.J., von Konrat, M.J., Long, D.G. & Schneider, H. (2006) Goodbye or welcome Gondwana? – insights into the phylogenetic biogeography of the leafy liverwort *Plagiochila* with a description of *Proskauera*, gen. nov. (Plagiochilaceae, Jungermanniales). *Plant Systematics and Evolution* 258 (3/4): 227–250.  
<http://dx.doi.org/10.1007/s00606-006-0411-3>
- Herzog, T. (1931) Hepaticae. In: Irscher, E. (Ed) Beiträge zur flora von Borneo. *Mitteilungen aus dem Institut für allgemeine Botanik in Hamburg* 7 (3): 182–216.
- Herzog, T. (1932) Beiträge zur Kenntnis der Gattung *Plagiochila* 1. Neotropische Arten. *Hedwigia* 72: 195–242.
- Hodgson, E.A. (1944) A review of New Zealand species of *Plagiochila* (New Zealand Hepaticae III). *Transactions and Proceedings of the*

*Royal Society of New Zealand* 73: 270–296.

- Hooker, W.J. (1818) *Musci Exotici. Vol. 1.* Longmans, London, 96 pp.
- Hooker, J.D. & Taylor, T. (1844a) Hepaticae Antarcticae. I. species of Lord Auckland's and Campbell's Islands. *London Journal of Botany* 3: 366–400.
- Hooker, J.D. & Taylor, T. (1844b) Hepaticae Antarcticae. II. Species of the Falkland Islands, Cape Horn, and of Kerguelen's Land. *London Journal of Botany* 3: 454–481.
- Hooker, J.D. & Taylor, T. (1844c) Hepaticae Novae-Zelandiae et Tasmaniae. III. Species of New Zealand. *London Journal of Botany* 3: 556–577.
- Inoue, H. (1958) The family Plagiogchilaceae of Japan and Formosa. II. *Journal of the Hattori Botanical Laboratory* 20: 54–106.
- Inoue, H. (1963) Contributions to the knowledge of Plagiogchilaceae of southeastern Asia. IV. The genus *Xenochila*. *Bulletin of the National Science Museum, Tokyo, New Series* 6: 372–377.
- Inoue, H. (1965a) Contributions to the knowledge of the Plagiogchilaceae of southern Asia. VI. Studies on the *Plagiogchila semidecurrens* complex. *Journal of the Hattori Botanical Laboratory* 28: 209–218.
- Inoue, H. (1965b) Contributions to the knowledge of the Plagiogchilaceae of southeastern Asia. VII. Synopsis of *Plagiogchila* Dum. in the Himalayan region. *Bulletin of the National Science Museum, Tokyo, New Series* 8: 375–403.
- Inoue, H. (1967) Taxonomic miscellany on the Plagiogchilaceae. *Journal of Japanese Botany* 42: 182–187.
- Inoue, H. (1969) Contributions to the knowledge of Plagiogchilaceae of southern Asia XIII. New species of *Plagiogchila* with notes on sect. *Abietinae* and sect. *Peculiares*. *Journal of the Hattori Botanical Laboratory* 32: 99–115.
- Inoue, H. (1975) Notes on the Plagiogchilaceae, IV. Sectio *Caducilobae* (sect. nov.) of the genus *Plagiogchila* Dum. *Journal of the Hattori Botanical Laboratory* 39: 339–343.
- Inoue, H. (1982) Studies on Taiwan Hepaticae. IV. Plagiogchilaceae. *Bulletin of the National Science Museum, Tokyo. Series B, Botany* 8 (4): 125–144.
- Inoue, H. (1984) *The genus Plagiogchila (Dum.) Dum. in southeast Asia.* Academia Scientific Book, Tokyo, 142 pp.
- Inoue, H. (1986) Notes on the Plagiogchilaceae. XIII. Review of the genus *Plagiogchila* (Dum.) Dum. in mainland Australia. *Journal of the Hattori Botanical Laboratory* 60: 357–378.
- Inoue, H. (1987) *Steereochila*, a new genus of the Plagiogchilaceae from the neotropics. *Memoirs of the New York Botanical Garden* 45: 279–282.
- Inoue, H. & Schuster, R.M. (1971) A monograph of New Zealand and Tasmanian Plagiogchilaceae. *Journal of the Hattori Botanical Laboratory* 34: 1–225.
- Jack, J.B. & Stephani, F. (1892) Hepaticae Wallisiana. *Hedwigia* 31: 11–27.
- Jones, E.W. (1962) African Hepatics XV. *Plagiogchila* in Tropical Africa. *Transactions of the British Bryological Society* 4: 254–325. <http://dx.doi.org/10.1179/tbbs.1962.4.2.254>
- Kaalaas, B. (1893) Levermosernes udbredelse i Norge. *Nyt Magazin for Naturvidenskaberne* 33 : 1–192.
- Lehmann, J.G.C. (1832) *Novarum et minus cognitarum stirpium pugillus quartus.* Meissner, Hamburg, 64 pp.
- Lehmann, J.G.C. (1834) *Novarum et minus cognitarum stirpium pugillus sextus.* Meissner, Hamburg, 72 pp.
- Lehmann, J.G.C. (1844) *Novarum et minus cognitarum stirpium pugillus octavus.* Meissner, Hamburg, 56 pp.
- Lindberg, S.O. (1874) Manipulus muscorum secundus. *Notiser ur Sällskapet pro Fauna et Flora Fennica Förhandlingar* 13: 351–417.
- Lindberg, S.O. (1875) Hepaticae in Hibernia mense Julii 1873 lectae. *Acta Societatis Scientiarum Fennicae* 10: 465–559.
- Lindenberg, J.B.W. (1839) *Species hepaticarum, fasc. 1.* Henry & Cohen, Bonn, pp. 1–36.
- Lindenberg, J.B.W. (1840) *Species hepaticarum, fasc. 2–4.* Henry & Cohen, Bonn, pp. 37–120.
- Lindenberg, J.B.W. (1843) *Species hepaticarum, fasc. 5.* Henry & Cohen, Bonn, pp. 121–164.
- Lindenberg, J.B.W. (1844 [1843]) *Monographia hepaticarum generis Plagiogchilae.* Henry & Cohen, Bonn, 29 pp.
- Linnaeus, C. (1753) *Species plantarum. 1<sup>st</sup> Edition.* Laurentii Salvii, Holmiae [Stockholm], 1200 pp.
- Long, D.G., Söderström, L., Hagborg, A. & von Konrat, M. (2014) Notes on Early Land Plants Today. 56. Validation of *Asterella* sect. *Wallichianae* (Aytoniaceae, Marchantiophyta). *Phytotaxa* 173 (1): 87–87. <http://dx.doi.org/10.11646/phytotaxa.173.1.8>
- Martin, W. (1950) The bryophytes of Stewart Island – part II. *Transactions and Proceedings of the Royal Society of New Zealand* 78: 485–501.
- Mitten, W. (1852) Nat. Ord. CI. Hepaticae, L. In: Hooker, J.D. (Ed.) *The Botany of the Antarctic Voyage of H. M. discovery ships Erebus and Terror in the years 1839-43. II. Flora Novae Zeelandiae* 2. Reeve, London, pp. 125–160.
- Mitten, W. (1861) Hepaticae Indiae Orientalis: An enumeration of the Hepaticae of the East Indies. *Journal of the Proceedings of the Linnean Society, Botany* 5: 89–128.
- Mitten, W. (1864) A new genus of Hepaticae. *Journal of the Proceedings of the Linnean Society. Botany* 7: 243–244.
- Montagne, J.F.C. (1839) Sertum Patagonicum. Cryptogames de la Patagonie. In: d'Orbigny, A. (Ed.) *Voyage dans l'Amérique Méridionale. Tome Septième.* Bertrand, Paris, pp. 1–19.

- Montagne, J.F.C. (1845) Plantes cellulaires. In: Hombron, M.M. & Jacquinot, H. (Ed.), *Voyage au Pole Sud et dans l'Océanie sur les corvettes l'Astrolabe et la Zélée, exécuté par ordre du roi pendant les années 1837-1838-1839-1840, sous le commandement de M. J. Dumont d'Urville. Botanique. vol. 1.* Gide & Cie, Paris, pp. 1–349.
- Müller, K. (1956) *Die Lebermoose Europas (Dr. L. Rabenhorst's Kryptogamen-Flora von Deutschland, Österreich und der Schweiz, 3 Aufl., 6 Band), 2 Abth., 6 Lieferung.* Akademische Verlagsgesellschaft, Leipzig, pp. 757–916.
- Müller, J., Heinrich, J. & Gradstein, S.R. (1999) A revision of *Plagiochila* sect. *Plagiochila* in the Neotropics. *Bryologist* 102: 729–746. <http://dx.doi.org/10.2307/3244259>
- Nees, C.G. (1830) *Enumeratio plantarum cryptogamicarum Javae.* Grass, Barth & Co., Breslau, 86 pp.
- Nees, C.G. (1833) *Naturgeschichte der Europäischen Lebermoose. Vol. 1.* August Rücker, Berlin, 347 pp.
- Nees, C.G. (1838) *Naturgeschichte der Europäischen Lebermoose. Vol. 3.* Grass, Barth & Co., Breslau, 593 pp.
- Nees, C.G. & Montagne, J.F.C. (1836) *Jungermanniarum herbarii Montagneani species. Annales des Sciences Naturelles; Botanique, Série 2* 5: 52–72.
- Nicholson, W.E., Herzog, T. & Verdoorn, F. (1930) Hepaticae. In: Handel-Mazetti, H.M. (Eds.) *Symbolae Sinicae, Botanische Ergebnisse der Expedition der Akademie der Wissenschaften in Wien nach Südwest-China. 1914/1918. Part 5. Hepaticae.* Springer Verlag, Berlin, pp. 1–60.
- Palisot de Beauvois, A.M.F.J. (1805) *Flore d'Oware et de Benin en Afrique 1 (3).* Fain et Compagnie, Paris, pp. 17–82.
- Qui, Q., Wei, Y.-M., Cheng, X.-F. & Zhu, R.-L. (2014) Notes on Early Land Plants Today. 57. *Cheilolejeunea boliviensis* and *Cheilolejeunea savesiana*, two new synonyms in *Lejeunea* (Marchantiophyta, Lejeuneaceae). *Phytotaxa* 173 (1): 88–90. <http://dx.doi.org/10.11646/phytotaxa.173.1.9>
- Reinwardt, C.G.C., Blume, C.L. & Nees von Esenbeck, C.G. (1824) Hepaticae iavanicae. *Nova Acta Physico-Medica Academiae Caesareae Leopoldino-Carolinae Naturae Curiosorum* 12: 181–238.
- Sande Lacoste, C.M. van der (1854) Novae species hepaticarum ex insula Java detexit Dr. F. Junghuhn. *Nederlandsch Kruidkundig Archief. Verslagen en Mededelingen der Nederlandsche Botanische Vereeniging* 3: 415–424.
- Sande Lacoste, C.M. van der (1856) Hepaticae. In: Dozy, F. (Ed) *Plagiochila sandei* Dz. Jac. Hazenberg Corn. fil., Leiden, pp. 5–12.
- Sande Lacoste, C.M. (1864) Hepaticae. *Jungermanniae archipelagi indici. Annales Musei Botanici Lugduno-Batavi* 1: 287–314.
- Schiffner, V. (1899) Beiträge zur Lebermoosflora von Bhutan (Ost-Indien). *Österreichische Botanische Zeitschrift* 49: 127–132. <http://dx.doi.org/10.1007/BF01794513>
- Schiffner, V. (1900) *Die Hepaticae der Flora von Buitenzorg. I. Band.* E. J. Brill, Leiden, 220 pp.
- Schliakov, R.N. (1975) Zametki po sistematike pečenočnikov (Hepaticae s.str.) [Notulae systematicae de hepaticis s.str.]. *Novosti Sistematiki Nizših Rastenij* 12: 307–317.
- Schrader, H.A. (1797) *Systematische Sammlung Cryptogamischer Gewächse, Zweyte Lieferung.* J. C. Dietrich, Göttingen, 16 pp.
- Schuster, R.M. (1959a) A monograph of the Nearctic Plagiochilaceae. Part. I. Introduction and sectio I. *Asplenioides. American Midland Naturalist* 62: 1–166. <http://dx.doi.org/10.2307/2422546>
- Schuster, R.M. (1959b) A monograph of the Nearctic Plagiochilaceae. Part. II. Sectio *Zonatae* through Sectio *Parallelae*. *American Midland Naturalist* 62: 257–395 <http://dx.doi.org/10.2307/2422533>
- Schuster, R.M. (1960) A monograph of the Nearctic Plagiochilaceae. Part. III. Sectio *Contiguae* to conclusion. *American Midland Naturalist* 63: 1–130. <http://dx.doi.org/10.2307/2422932>
- Schuster, R.M. (1963) Studies on antipodal Hepaticae. I. Annotated keys to the genera of antipodal Hepaticae with special reference to New Zealand and Tasmania. *Journal of the Hattori Botanical Laboratory* 26: 185–309.
- Schuster, R.M. (1978) Studies on Venezuelan Hepaticae. I. *Phytologia* 39: 239–251.
- Schuster, R.M. (1980) *The Hepaticae and Anthocerotae of North America. IV.* Columbia University Press, New York, 1334 pp.
- Schuster, R.M. & Engel, J.J. (1981) Austral Hepaticae. XIII. Two new genera of Geocalycaceae (Lophocoleaceae). *Phytologia* 47: 309–312.
- Schuster, R.M. & Engel, J.J. (1982) Austral Hepaticae. XVI. Gondwanalandic Leptoscyphoideae (Geocalycaceae). *Lindbergia* 8: 65–74.
- Shu, L. & Zhu, R.-L. (2014) Notes on Early Land Plants Today. 59. *Leptolejeunea himalayensis* and *Leptocolea mirpurensis* (Marchantiophyta, Lejeuneaceae) synonymous with *Lejeunea cocoes* and *Cololejeunea raduliloba*, respectively. *Phytotaxa* 173 (1): 95–96. <http://dx.doi.org/10.11646/phytotaxa.173.1.11>
- So, M.L. (2000) *Plagiochila* sect. *Plagiochila* (Hepaticae) in SE Asia and Melanesia, with description of two new species. *New Zealand Journal of Botany* 38: 425–432. <http://dx.doi.org/10.1080/0028825X.2000.9512694>
- So, M.L. (2001a) *Plagiochila* (Hepaticae, Plagiochilaceae) in China. *Monographs in Systematic Botany* 60: 1–214.

- So, M.L. (2001b) On *Plagiochila* section *Cobanae* Carl in Asia and Melanesia. *Cryptogamie, Bryologie* 22 (3): 179–186.
- So, M.L. & Grolle, R. (2000a) Studies on *Plagiochila* sect. *Plagiochila* (Hepaticae) in East and South Asia. *Journal of Bryology* 22: 17–28.  
<http://dx.doi.org/10.1179/jbr.2000.22.1.17>
- So, M.L. & Grolle, R. (2000b) Checklist of *Plagiochila* (Hepaticae) in Asia. *Journal of the Hattori Botanical Laboratory* 88: 199–243.
- Söderström, L., Hagborg, A. & von Konrat, M. (2012) Notes on Early Land Plants Today. *Phytotaxa* 65: 41–42.
- Söderström, L., Crandall-Stotler, B., Stotler, R.E., Váňa, J., Hagborg, A. & von Konrat, M. (2013) Notes on Early Land Plants Today. 36. Generic treatment of Lophocoleaceae (Marchantiophyta). *Phytotaxa* 97 (2): 36–43.  
<http://dx.doi.org/10.11646/phytotaxa.97.2.3>
- Söderström, L., Hagborg, A., von Konrat, M., Bartholomew-Began, S., Bell, D., Briscoe, L., Brown, E., Cargill, D.C., Costa, D.P., Crandall-Stotler, B.J., Cooper, E.D., Dauphin, G., Engel, J.J., Feldberg, K., Glenney, D., Gradstein, S.R., He, X., Ilkiu-Borges, A.L., Heinrichs, J., Hentschel, J., Katagiri, T., Konstantinova, N.A., Larrain, J., Long, D.G., Nebel, M., Pócs, T., Puche, F., Reiner-Drehwald, M.E., Renner, M.A.M., Sass-Gyarmati, A., Schäfer-Verwimp, A., Segarra Moragues, J.G., Stotler, R.E., Sukkharak, P., Thiers, B.M., Uribe, J., Váňa, J., Villarreal, J.C., Wigginton, M., Zhang, L., Zhu, R.-L. (2015) World checklist of hornworts and liverworts. *PhytoKeys*. [in press]
- Sprengel, C. (1827) *Systema vegetabilium. Editio decima sexta. Voluminis IV. Pars II.* Dieterich, Göttingen, 410 pp.
- Spruce, R. (1847) *Hepaticae pyrenaicae*. London, pp. 1–77.
- Spruce, R. (1876) On *Anomoclada*, a new genus of Hepaticae, and on its allied genera, *Odontoschisma* and *Adelanthus* (concluded). *Journal of Botany, British and Foreign* 14: 230–235.
- Spruce, R. (1885) Hepaticae amazonicae et andinae. II. *Transactions and Proceedings of the Botanical Society of Edinburgh* 15: 309–588.
- Stephani, F. (1894) Hepaticae chinenses. *Mémoires de la Société Nationale des Sciences Naturelles et Mathématiques de Cherbourg* 29: 207–228.
- Stephani, F. (1897) Hepaticae japonicae. *Bulletin de l'Herbier Boissier* 5: 76–108.
- Stephani, F. (1900) Beiträge zur Lebermoosflora Westpatagoniens und des südlichen Chiles. *Bihang till Kongliga Svenska Vetenskaps-Akademiens Handlingar* 26: 1–69.
- Stephani, F. (1902a) Species hepaticarum 2. *Bulletin de l'Herbier Boissier, Série 2 2*: 657–688.
- Stephani, F. (1902b) Species hepaticarum 2. *Bulletin de l'Herbier Boissier, Série 2 2*: 857–888.
- Stephani, F. (1902c) Species hepaticarum 2. *Bulletin de l'Herbier Boissier, Série 2 2*: 969–987.
- Stephani, F. (1903a) Species hepaticarum 2. *Bulletin de l'Herbier Boissier, Série 2 3*: 98–129.
- Stephani, F. (1903b) Species hepaticarum 2. *Bulletin de l'Herbier Boissier, Série 2 3*: 326–341.
- Stephani, F. (1903c) Species hepaticarum 2. *Bulletin de l'Herbier Boissier, Série 2 3*: 522–537.
- Stephani, F. (1903d) Species hepaticarum 2. *Bulletin de l'Herbier Boissier, Série 2 3*: 596–611.
- Stephani, F. (1903e) Species hepaticarum 2. *Bulletin de l'Herbier Boissier, Série 2 3*: 873–888.
- Stephani, F. (1903f) Species hepaticarum 2. *Bulletin de l'Herbier Boissier, Série 2 3*: 959–974.
- Stephani, F. (1904a) Species hepaticarum 2. *Bulletin de l'Herbier Boissier, Série 2 4*: 18–32.
- Stephani, F. (1904b) Species hepaticarum 2. *Bulletin de l'Herbier Boissier, Série 2 4*: 153–168.
- Stephani, F. (1904c) Species hepaticarum 2. *Bulletin de l'Herbier Boissier, Série 2 4*: 345–360.
- Stephani, F. (1904d) Species hepaticarum 2. *Bulletin de l'Herbier Boissier, Série 2 4*: 586–601.
- Stephani, F. (1904e) Species hepaticarum 2. *Bulletin de l'Herbier Boissier, Série 2 4*: 775–790.
- Stephani, F. (1904f) Species hepaticarum 2. *Bulletin de l'Herbier Boissier, Série 2 4*: 973–988.
- Stephani, F. (1904g) Species hepaticarum 2. *Bulletin de l'Herbier Boissier, Série 2 4*: 1197–1214.
- Stephani, F. (1905a) Species hepaticarum 2. *Bulletin de l'Herbier Boissier, Série 2 5*: 351–366.
- Stephani, F. (1905b) Species hepaticarum 2. *Bulletin de l'Herbier Boissier, Série 2 5*: 736–751.
- Stephani, F. (1905c) Species hepaticarum 2. *Bulletin de l'Herbier Boissier, Série 2 5*: 885–900.
- Stephani, F. (1905d) Species hepaticarum 2. *Bulletin de l'Herbier Boissier, Série 2 5*: 917–946.
- Stephani, F. (1905e) Species hepaticarum 3. *Bulletin de l'Herbier Boissier, Série 2 5*: 1129–1144.
- Stephani, F. (1908) Hépatiques de la Nouvelle-caledonie et du Tonkin. *Revue Bryologique* 35: 28–35.
- Stephani, F. (1911) Hepaticae. In: Mildbraed, J. (Ed.) *Wissenschaftliche Ergebnisse der Deutschen Zentral-Afrika-Expedition, 1907-1908. Band II: Botanik, Lief. 2.* Klinkhart & Biermann, Leipzig, pp. 111–134.
- Stephani, F. (1916) Hepaticae In: Herzog, T. (Ed.) *Die Bryophyten meiner zweiten Reise durch Bolivia. Bibliotheca Botanica* 87: 173–270.
- Stephani, F. (1918) *Species hepaticarum* 6. George & Cie, Genève & Bale, pp. 129–176.
- Stephani, F. (1921) *Species hepaticarum* 6. George & Cie, Genève & Bale, pp. 177–240.
- Stotler, R.E., Salazar Allen, N., Gradstein, S.R., McGuinness, W., Whittemore, A. & Chung, C. (1998) A checklist of the Hepatics and



- Anthocerotae of Panamá. *Tropical Bryology* 15: 167–195.
- Sullivant, W.S. (1850) Notices of several new species of mosses and hepaticae from Tierra del Fuego. *Hooker's Journal of Botany and Kew Gardens Miscellany* 2: 315–318.
- Swartz, O. (1788) *Nova genera et species plantarum, seu Prodromus*. Bibliopolio. I.G. Mülleriano, Lipsiae [Leipzig], 152 pp.
- Swartz, O. (1806) *Flora Indiae occidentalis, tomus 3*. J. Palm, Erlangae, pp. 1231–2018.
- Taylor, T. (1844) On two new species of *Jungermannia*, and another new to Britain. *Transactions of the Botanical Society of Edinburgh* 1: 179–181.  
<http://dx.doi.org/10.1080/03746604409467527>
- Taylor, T. (1846) New Hepaticae. *London Journal of Botany* 5: 258–284.
- Trevisan, V.B.A. (1877) Schema di una nuova classificazione delle Epatiche. *Memorie del Reale Istituto Lombardo de Scienze e Lettere, Serie 3, Classe di Scienze Matematiche e Naturali* 4: 383–451.
- Váňa, J., Feldberg, K., Heinrichs, J., Söderström, L., Hagborg, A. & von Konrat, M. (2014) Notes on Early Land Plants Today. 55. New taxa and synonyms in Adelanthaceae (Marchantiophyta). *Phytotaxa* 173 (1): 80–86.  
<http://dx.doi.org/10.11646/phytotaxa.173.1.7>
- Vanden Berghen, C. (1956) *Flore générale de Belgique, Bryophytes. Vol. 1. Fasc. 2*. Jardin Botanique de l'État, Bruxelles, pp. 133–270.