

## An annotated checklist of Egyptian mosses

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**T**he presented list of Egyptian mosses includes 181 taxa in 56 genera, 17 families and 10 orders. Synonyms reported only from Egypt are given in a separate list. The distribution of the 181 mosses in the 11, hitherto, surveyed phytogeographic territories of Egypt shows that S, Mm, Cai and Di are the richest territories regarding the number of recorded taxa. Pottiaceae, Bryaceae and Funariaceae dominate the flora. *Pohlia lescuriana* (Sull.) Ochi is a new record to Egypt. Other relevant annotations are also given.

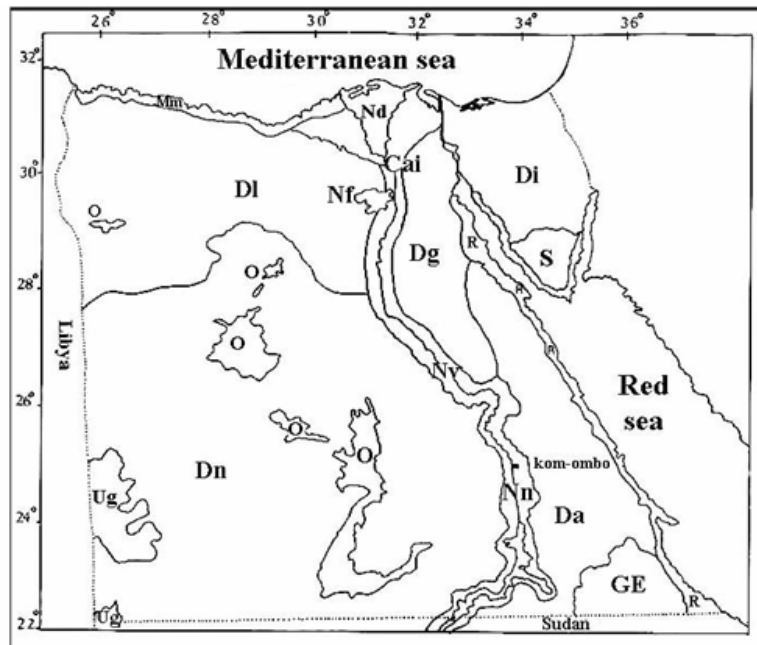
**Key words:** Checklist, Egypt, Mosses, *Pohlia lescuriana*.

### Introduction

The increasing interest in the taxonomy of the bryophytes, especially aimed at biodiversity conservation has stimulated the elaboration of updated and corrected checklists (Cortini 2001). During the last five decades six checklists of Egyptian mosses had been published by: Imam & Ghabbour (1972); EL-Saadawi and Abou EL-Kheir (1973); El-Saadawi & Badawi (1977); El-Saadawi *et al.* (1999); El-Saadawi *et al.* (2003) and Ros *et al.* (2013). Naturally the number of recorded mosses increased with time and the last list included 166 taxa.

Recently five new papers (El-Saadawi *et al.* 2013 a, b; Ibrahim *et al.* 2013; El-Sakaty *et al.* 2014 and Ibrahim 2014) appeared, adding 14 records to the moss flora of the country. This paper, further adds *Pohlia lescuriana* (Sull.) Ochi as a new record to the country bringing the total number of mosses known from Egypt to 181 taxa (Table 1). These taxa belong to 56 genera (Table 1) in 17 families and 10 orders (Table 2); and collected from 11 out of the 15 phytogeographical territories of Egypt (Fig. 1).

To bring the new data on Egyptian mosses together in one piece of literature the present checklist was established appended by annotations and a list of synonyms. The presented data, as well, throw more light on the moss flora of each of the 11 surveyed phytogeographic territories of Egypt, the matter that was not covered in the latest published list (i.e. Ros *et al.* 2013).



**Fig. 1.** A map showing phytogeographical territories of Egypt (after El-Saadawi *et al.* 2003; with little modification). **Cai:** Cairo area; **Da:** Arabian desert; **Dg:** Galala Desert; **Di:** Isthmic Desert; **DI:** Libyan Desert; **Dn:** Nubian desert; **GE:** Gebel Elba; **Mm:** western Mediterranean coastal land (Mareotic sector); **Nd:** Nile Delta; **Nf:** Nile Fayoum; **Nn:** Nile Nubia, from Kom Ombo southwards to Egyptian boundaries with the Sudan including the areas now inundated by the waters of Lake Nasser since 1965; **Nv:** Nile Valley, from Cairo-Giza to Kom Ombo; **O:** Oasis of the Nubian and Libyan Desert; **R:** Red Sea coastal plains; **S:** Southern Sinai massive (Sinai proper i.e. relatively high mountains, south of Isthmic desert); **Ug:** Gebel Uweinat.

**Table 1.** Distribution of the 181 moss taxa belonging to 56 genera in the 11 surveyed phytogeographic territories of Egypt. + = Present; \* = New record; ° = Reported without reference to any locality; ☐ = Recorded only from greenhouses and gardens, ◆ = Doubtful record. Abbreviations of names of territories are as given in Fig. 1.

Taxa	Nn	Nv	Nd	Nf	Cai	Dg	Di	S	GE	O	Mm
<b>1. Aloina Kindb. (Pottiaceae)</b>											
<i>A. aloides</i> (Koch ex Schultz) Kindb.							+	+			+
<i>A. ambigua</i> (Bruch & Schimp.) Limpr.							+	+			+
<i>A. bifrons</i> (De Not.) Delgad.							+				+
<i>A. breviostris</i> (Hook. & Grev.) Kindb.											+
<i>A. rigida</i> (Hedw.) Limpr.							+			+	+
<b>2. Anoetangium Schwägr. (Pottiaceae)</b>											
<i>A. handelii</i> Schiffn.								+			
<b>3. Archidium Brid. (Archidiaceae)</b>											
<i>A. alternifolium</i> (Hedw.) Mitt.			+								+
<b>4. Barbula Hedw. (Pottiaceae)</b>											
<i>B. arcuata</i> Griff				+							
<i>B. bolleana</i> (Müll. Hal.) Broth.	+	+	+	+	+			+			+
<i>B. convoluta</i> Hedw.	+		+			+		+			
<i>B. convoluta</i> var. <i>sardoa</i> Schimp.			+								
<i>B. indica</i> (Hook.) Spreng.		+	+		+						
<i>B. unguiculata</i> Hedw.		+	+	+	+	+					+
<b>5. Brachytenium Schwägr. (Bryaceae)</b>											
<i>B. exile</i> (Dozy & Molk.) Bosch. & Sande Lac.							+	+		+	+
<b>6. Brachythecium Ignatov &amp; Huttunen (Brachytheciaceae)</b>											
<i>B. velutinum</i> (Hedw.) Ignatov & Huttunen								+			
<i>B. velutinum</i> var. <i>salicinum</i> (Schimp.) Ochyra & Żarnowiec								+			
<b>7. Brachythecium Schimp. (Brachytheciaceae)</b>											
<i>B. rivulare</i> Schimp.			+		+						
<i>B. umbilicatum</i> Jur. & Milde								+			
<b>8. Bryum Hedw. (Bryaceae)</b>											
<i>B. apiculatum</i> Schwägr.			+							+	
<i>B. argenteum</i> Hedw.					+	+	+	+		+	+
<i>B. cellulare</i> Hook.					+	+			+		
<i>B. dichotomum</i> Hedw.		+	+	+	+	+	+	+		+	+
<i>B. elegans</i> Nees								+		+	
<i>B. funkii</i> Schwägr.						+	+	+		+	
<i>B. gemmiparum</i> De Not.				+	+			+		+	+
<i>B. kunzei</i> Hornsch.					+						+
<i>B. radiculosum</i> Brid.			+		+		+	+		+	+
<i>B. ruderale</i> Crundw. & Nyholm								+			
◆ <i>B. sauteri</i> Bruch & Schimp.					+						
<i>B. schleicheri</i> DC.								+			
<i>B. subapiculatum</i> Hampe		+			+			+		+	

Taxa	Nn	Nv	Nd	Nf	Cai	Dg	Di	S	GE	O	Mm
<i>B.turbinatum</i> (Hedw.) Turner								+		+	+
<b>9- <i>Ceratodon</i> Brid. (Ditrichaceae)</b>											
<i>C. purpureus</i> (Hedw.) Brid.				+							
<b>10. <i>Cinclidotus</i> P.Beauv. (Pottiaceae)</b>											
<i>C. riparius</i> (Host ex Brid.) Arn.								+			
<b>11 .<i>Crossidium</i> Jur. (Pottiaceae)</b>											
<i>C. aberrans</i> Holz. &E.B.Bartram							+	+			+
<i>C. crassinervium</i> (De Not.) Jur.							+			+	+
<i>C. geheebii</i> (Broth.) Broth.							+	+			
<i>C. laevipilum</i> Thér. &Trab.							+				+
<i>C. laxefilamentosum</i> W.Frey&Kürschner							+				+
<i>C. squamiferum</i> (Viv.) Jur.							+	+		+	
<i>C. squamiferum</i> var. <i>pottioideum</i> (De Not.) Mönk.								+			
<b>12. <i>Dialytrichia</i> (Schimp.) Limpr. (Pottiaceae)</b>											
<i>D. mucronata</i> (Brid.) Broth.								+			
<b>13. <i>Dichodontium</i> Schimp. (Rhabdoweisiaceae)</b>											
<i>D. pellucidum</i> (Hedw.) Schimp.						+				+	
<b>14. <i>Dicranella</i> (Müll.Hal.) Schimp. (Dicranaceae)</b>											
<i>D. rufescens</i> (Dicks.) Schimp.				+							
<b>15. <i>Didymodon</i> Hedw. (Pottiaceae)</b>											
<i>D. acutus</i> (Brid.) K.Saito							+	+			+
<i>D. australasiae</i> (Hook. & Grev.) R.H.Zander							+	+	+		
<i>D. cordatus</i> Jur.											+
<i>D. fallax</i> (Hedw.) R.H.Zander			+	+			+	+		+	+
<i>D. ferrugineus</i> (Schimp. ex Besch.) M.O.Hill											+
<i>D. insulanus</i> (De Not.) M.O.Hill			+				+				+
<i>D. luridus</i> Hornsch.			+	+	+	+		+			+
<i>D. rigidulus</i> Hedw.								+	+	+	+
<i>D. sinuosus</i> (Mitt.) Delogne				+							+
<i>D. spadiceus</i> (Mitt.) Limpr.							+		+		
<i>D. tectorum</i> (Müll.Hal.)K.Saito.											+
<i>D. tophaceus</i> (Brid.) Lisa	+	+	+	+	+	+		+	+	+	+
<i>D. umbrosus</i> (Müll.Hal.) R.H.Zander								+			
<i>D. vinealis</i> (Brid.) R.H.Zander			+					+		+	+
<b>16. <i>Drepanocladus</i> (Müll.Hal.) G.Roth (Amblystegiaceae)</b>											
<i>D. aduncus</i> (Hedw.) Warnst.								+			
<b>17. <i>Encalypta</i> Hedw. (Encalyptaceae)</b>											
<i>E.intermedia</i> Jur.								+			
<i>E.vulgaris</i> Hedw.								+			
<b>18. <i>Entosthodon</i> Schwägr. (Fuariaceae)</b>											
<i>E.attenuatus</i> (Dicks.) Bryhn								+	+		

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Taxa	Nn	Nv	Nd	Nf	Cai	Dg	Di	S	GE	O	Mm
<i>E.cf. commutatus</i> Durieu& Mont.											+
<i>E.convexus</i> (Spruce) Brugués								+			
<i>E.curvi-apiculatus</i> Müll.Hal.		+									
<i>E.durieu</i> Mont.					+		+	+	+		
<i>E.fascicularis</i> (Hedw.) Müll.Hal.					+		+	+			
<i>E.handelii</i> (Schiffn.) Laz.					+	+					
<i>E.muhlenbergii</i> (Turner) Fife					+			+	+		
<i>E.niloticus</i> Schimp.					+	+					
<i>E.obtus</i> (Hedw.) Lindb.					+						
<i>E.planconvexus</i> (E.B. Bartram) Grout							+				
<i>E.pulchellus</i> (H.Philib.) Brugués							+	+	+		
<b>19.Eucladium Bruch &amp; Schimp. (Pottiaceae)</b>											
<i>E.verticillatum</i> (With.) Bruch & Schimp.					+			+			
<b>20.Fissidens Hedw. (Fissidentaceae)</b>											
<i>F.arnoldii</i> R.Ruthe							+	+	+		
<i>F.bryoides</i> Hedw.			+		+	+	+				+
<i>F.crassipes</i> Wilson ex Bruch & Schimp.					+		+				
<i>F. crassipes</i> subsp. <i>warnstorffii</i> (M.Fleisch.) Brugg.-Nann.		+	+		+						+
<i>F.crispus</i> Mont.		+			+			+			+
<i>F.fontanus</i> (Bach.Pyl.) Steud.											
<i>F.gymnandrus</i> Büse				+							
<i>F.viridulus</i> (Sw.) Wahlenb.	+	+	+	+	+	+			+		+
<i>F. viridulus</i> var. <i>viridulus</i>					+						
<b>21.Fontinalis Hedw. (Fontinalaceae)</b>											
<i>F.hypnoides</i> C.Hartm.	+										
<b>22.Funaria Hedw. (Funariaceae)</b>											
<i>F.anomala</i> Jur.					+						
<i>F.hygrometrica</i> Hedw.	+	+	+	+	+	+	+	+		+	+
<i>F.limbata</i> (Müll. Hal.) Broth.			+								
<i>F.microstoma</i> Bruch ex Schimp.										+	
<i>F.nubica</i> Müll.Hal.	+										
<i>F.sickenbergeri</i> Müll.Hal.										+	
<b>23.Grimmia Hedw. (Grimmiaceae)</b>											
<i>G.anodon</i> Bruch & Schimp.								+			
<i>G.crinita</i> Brid.								+			
<i>G.laevigata</i> (Brid.) Brid.								+			
<i>G.orbicularis</i> Bruch ex Wilson								+			
<b>24.Gymnostomum Nees &amp; Hornsch. (Pottiaceae)</b>											
<i>G.aeruginosum</i> Sm.			+	+	+			+		+	
<i>G.calcareum</i> Nees&Hornsch.		+	+	+		+		+	+		+
<i>G.mosis</i> (Lorentz) Jur. & Milde							+	+			
<i>G.vridulum</i> Brid.		+			+	+	+	+			+
<b>25.Gyroweisia Schimp. (Pottiaceae)</b>											
<i>G.reflexa</i> (Brid.) Schimp.			+		+	+		+			









Taxa	Nn	Nv	Nd	Nf	Cai	Dg	Di	S	GE	O	Mm
<i>Z. obtusifolius</i> Hook.				+							
<b>Total</b>	9	17	36	22	51	30	46	95	11	32	65

### Annotations

A. Based on Table 1 above, the following annotations were listed.

- The phytogeographic territories of Egypt can be arranged, regarding their relative richness in moss species in descending order as follows: S, Mm, Cai, Di, Nd, O, Dg, Nf, Nv, GE and Nn.
- *Fontinalis hypnoides* (Fontinalaceae) was recorded only once from River Nile during its course in the Nile Nubia.
- The most widespread species in the moss flora of Egypt are *Didymodon tophaceus* and *Funaria hygrometrica* (10 territories each), *Bryum dichotomum* (9 territories), *Fissidens viridulus* (8 territories), *Barbula bolleana*, *Gymnostomum calcareum* and *Ptychostomum imbricatum* (7 territories each), *Barbula unguiculata*, *Bryum argenteum*, *Bryum radiculosum*, *Didymodon fallax*, *Didymodon luridus*, *Gymnostomum viridulum* and *Physcomitrium niloticum* (6 territories each), *Bryum gemmiparum*, *Didymodon vinealis*, *Fissidens bryoides*, *Gymnostomum aeruginosum*, *Philonotis hastata*, *Ptychostomum capillare* and *Tortula muralis* (5 territories each).
- *Bryum sauteri*, *Hygroamblystegium varium* and *Pleuridium subulatum* are the only mosses recorded here from only green houses and gardens.
- *Fissidens fontanus* and *Sciuro-hypnum plumosum* (= *Brachythecium plumosum*) were not referred to any particular locality in the original publications (Brotherus 1924; Bilewsky 1965); cited only as Egypt and Sinai respectively, therefore given the symbol ° in the present list.
- According to Ros *et al.* (2013) Bilewsky (1965) reported *Brachythecium plumosum* (Hedw.) Schimp. from Sinai (Northern Sinai, i.e. Di) without locality and included *Brachythecium umbilicatum* Jur. & Milde as a synonym of this species. At present both species are accepted taxonomically, but only *Brachythecium umbilicatum* has been reported from Egypt, by Geheeb (1904). Therefore, the presence of *Sciuro-hypnum plumosum* (= *B. plumosum*) in Egypt is doubtful, therefore given the symbol ♦ in the present list.
- During the preparation of the present list, it was noticed by a mere chance (while surveying earlier works on Egyptian mosses) that

illustrations given for *Bryum elegans* from Nf by Badawi *et al.* (1987) are quite different from those in other published reference works, therefore we re-examined carefully the specimen of Nf and found that it belongs in fact to *Pohlia lescuriana* which represents a new record to Egypt as reported in the present list.

- In the list published by El-Saadawi *et al.* (2003) *Splachnobryum obtusum* was mentioned as occurring in Nf, however, this is incorrect, therefore this species is excluded from Nf territory in the present list.
  - The report of *Bryum subapiculatum* in the present list as occurring in Cairo is recorded for the first time in this territory after Farag (2015).
  - Eighty-six out of the 181 taxa were recorded in only one territory each. While only 21 taxa were recorded in five or more territories each. This may be attributed to the great variation of both physical and chemical properties of microhabitats in different territories of Egypt (Taha 2010) and probably also to the rarity of sporophyte production (Abd El-Khaleq 2004) by Egyptian mosses.
- B. Based on Table 2 below, the following annotations were listed.
- The bryologically distinguished territories are S (the only territory for Encalyptales and Grimmiiales) and Nf (the only territory for Dicranaceae).
  - Three families (Pottiaceae, Bryaceae and Funariaceae) are represented in the 11 territories while Fissidentaceae is represented in 10 territories. The remaining thirteen families are relatively poorly represented (1-5 territories each).
  - The largest family is Pottiaceae followed by Bryaceae.
  - The 10 orders can be arranged in a descending order regarding the number of taxa representing each as follows: Pottiales- 84, Bryales- 37, Funariales- 23, Hypnales- 12, Fissidentales- 9, Grimmiiales- 7, Dicranales- 4, Encalyptales- 2, Orthotrichales- 2 and Archidiales- 1.



**List of synonyms of moss taxa reported only from Egypt, based on El-Saadawi *et al.* (1999) and Ros *et al.* (2013) arranged alphabetically**

*Aloina aloides* (Schultz) Kindb. var. *ambigua* (Bruch & Schimp. & W. Gümbel) E.J. Craig. = ***Aloina ambigua*** (Bruch & Schimp.) Limpr.

*Aloina pilifera* (De Not.) H.A. Crum & Steere = ***Aloina bifrons*** (De Not.) Delgad.

*Aloina rigida* (Hedw.) Limpr. var. *ambigua* (Bruch & Schimp. & W. Gümbel) E.J. Craig. = ***Aloina ambigua*** (Bruch & Schimp.) Limpr.

*Aloina rigida* (Hedw.) Limpr. var. *pilifera* (De Not.) Limpr. = ***Aloina bifrons*** (De Not.) Delgad.

*Amblystegium burnatii* J.J. Amann. = ***Microeurhynchium pumilum*** (Wilson) Ignatov & Vanderpoorten

*Amblystegium riparium* (Hedw.) Bruch, Schimp. & W. Gümbel = ***Leptodictyum riparium*** (Hedw.) Warnst.

*Amblystegium varium* (Hedw.) Lindb. = ***Hygroamblystegium varium*** (Hedw.) Mönk.

*Anisothecium rufescens* (With.) Lindb. = ***Dicranella rufescens*** (Dicks.) Schimp.

*Astomum crispum* (Hedw.) Hampe = ***Weissia longifolia*** Mitt.

*Barbula aaronis* (Lorentz) Hilp. = ***Didymodon australasiae*** (Hook. & Grev.) R.H. Zander

*Barbula acuta* (Brid.) Brid. = ***Didymodon acutus*** (Brid.) K. Saito.

*Barbula alexandrina* Lorentz = ***Tortella nitida*** (Lindb.) Broth.

*Barbula aloides* (Koch ex Schultz) Bruch = ***Aloina aloides*** (Koch ex Schultz) Kindb.

*Barbula beschernellei* Sauerb. = ***Didymodon rigidulus*** Hedw.

*Barbula cylindrica* (Taylor) Schimp. = ***Didymodon insulanus*** (De Not.) M.O. Hill

*Barbula ehrenbergii* (Lorentz) M.Fleisch. = ***Barbula bolleana*** (Müll. Hal.) Broth.

*Barbula gracilis* (Schleich.) Schwägr. var. *viridis* Bruch & Schimp. = ***Didymodon acutus*** (Brid.) K. Saito.

*Barbula hornschuchiana* Schultz = ***Pseudocrossidium hornschuchianum*** (Schultz) R.H. Zander

*Barbula inermis* [Lorentz] = ***Tortula inermis*** (Brid.) Mont.

*Barbula membranifolia* Hook. = ***Crossidium squamiferum*** (Viv.) Jur.

*Barbula muralis* var. *alexandrina* Müll. Hal. = ***Tortella nitida*** (Lindb.) Broth.

- Barbula muralis* var. *incana* Bruch, Schimp. & W. Gümberl = *Tortula muralis* Hedw.
- Barbula nitida* Lindb. = *Tortella nitida* (Lindb.) Broth.
- Barbula reflexa* (Brid.) Brid. = *Didymodon ferrugineus* (Schimp. ex Besch.) M.O. Hill
- Barbula sardoa* (Schimp.) J.P. Frahm = *Barbula convoluta* var. *sardoa* Schimp.
- Barbula sinuosa* (Mitt.) Grav. = *Didymodon sinuosus* (Mitt.) Delogne.
- Barbula tectorum* Müll. Hal. = *Didymodon tectorum* (Müll. Hal.) K. Saito.
- Barbula tophacea* (Brid.) Mitt. = *Didymodon tophaceus* (Brid.) Lisa
- Barbula unguiculata* fo. *cuspidata* (Schultz) Mönk. = *Barbula unguiculata* Hedw.
- Barbula unguiculata* fo. *obtusifolia* Mönk. = *Barbula unguiculata* Hedw.
- Barbula unguiculata* fo. *robusta* (Lindb.) Podp. = *Barbula unguiculata* Hedw.
- Barbula unguiculata* var. *cuspidata* (Schultz) Brid. = *Barbula unguiculata* Hedw.
- Barbula unguiculata* var. *robusta* Lindb. = *Barbula unguiculata* Hedw.
- Barbula vinealis* Brid. = *Didymodon vinealis* (Brid.) R.H. Zander
- Barbula vinealis* (Brid.) subsp. *cylindrica* (Taylor) Podp. = *Didymodon insulanus* (De Not.) M.O. Hill
- Barbula vinealis* var. *cylindrica* (Taylor) Boulay nom. illeg. = *Didymodon insulanus* (De Not.) M.O. Hill
- Barbula vinealis* var. *flaccida* Bruch & Schimp. = *Didymodon insulanus* (De Not.) M.O. Hill
- Brachythecium velutinum* (Hedw.) (Bruch & Schimp. & W. Gümberl) = *Brachytheciastrum velutinum* (Hedw.) Ignatov & Huttunen
- Brachythecium velutinum* (Hedw.) (Bruch & Schimp. & W. Gümberl) var. *venustum* (De Not.) Arcang. = *Brachytheciastrum velutinum* var. *salicinum* (Schimp.) Ochyra & Zarnowiec
- Brachythecium venustum* (De Not.) De Not. = *Brachytheciastrum velutinum* var. *salicinum* (Schimp.) Ochyra & Zarnowiec
- Bryum alpinum* Huds. ex With subsp. *gemmiparum* (De Not.) Kindb. = *Bryum gemmiparum* De Not.
- Bryum alpinum* Huds. ex With. = *Imbribryum alpinum* (Huds. ex With.) N. Pedersen
- Bryum alpinum* Huds. ex With. var. *viride* Husn. = *Imbribryum alpinum* (Huds. ex With.) N. Pedersen

*Bryum alpinum* subsp. *gemmiparum* f. *sinaica* Podp.= ***Bryum gemmiparum***  
De Not.

*Bryum alpinum* With var. *gemmiparum* (De Not.) Lindb. = ***Bryum gemmiparum*** De Not.

*Bryum argenteum* Hedw. var. *lanatum* (P. Beauv.) Hampe = ***Bryum argenteum*** Hedw.

*Bryum aschersonii* Müll. Hal. = ***Ptychostomum capillare*** (Hedw.)  
D.T.Holyoak & N.Pedersen

*Bryum atropurpureum* Wahlenb.= ***Pohlia atropurpurea*** (Wahlenb.) H.  
Lindb.

*Bryum atrovirens* Brid. = ***Bryum subapiculatum*** Hampe

*Bryum badium* (Brid.) Schimp. = ***Ptychostomum imbricatum*** (Müll.Hal.)  
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*Bryum bicolor* Dicks.,1801= ***Bryum dichotomum*** Hedw.

*Bryum caespiticium* Hedw. = ***Ptychostomum imbricatum*** (Müll.Hal.)  
D.T.Holyoak & N.Pedersen

*Bryum caespiticium* Hedw. subsp. *comense* (Schimp.) J.J. Amann =  
***Ptychostomum imbricatum*** (Müll.Hal.) D.T.Holyoak & N.Pedersen

*Bryum caespiticium* Hedw. var. *badium* Brid. = ***Ptychostomum imbricatum***  
(Müll.Hal.) D.T.Holyoak & N.Pedersen

*Bryum caespiticium* Hedw. var. *comense* (Schimp.) Husn. = ***Ptychostomum imbricatum***  
(Müll.Hal.) D.T.Holyoak & N.Pedersen

*Bryum caespiticium* Hedw. var. *imbricatum* Bruch , Schimp. & W. Gümbe  
= ***Bryum kunzei*** Hornsch.

*Bryum capillare* (Hedw.) subsp. *elegans* (Nees) Lindb. = ***Bryum elegans***  
Nees

*Bryum capillare* Hedw. = ***Ptychostomum capillare*** (Hedw.) D.T.Holyoak &  
N.Pedersen

*Bryum capillare* Hedw. subsp. *torquescens* (De Not.) Kindb. =  
***Ptychostomum torquescens*** (Bruch & Schimp.) Ros&Mazimpaka

*Bryum comense* Schimp. = ***Ptychostomum imbricatum*** (Müll.Hal.)  
D.T.Holyoak & N.Pedersen

*Bryum creberrimum* Taylor = ***Ptychostomum creberrimum*** (Taylor) J.R.  
Spence & H.P. Ramsay

*Bryum gemmiparum* De Not. var. *sinaica* Geh.= ***Bryum gemmiparum*** De  
Not.

*Bryum inclinatum* (Brid.) Bland = ***Ptychostomum archangelicum*** (Bruch  
& Schimp.) J.R.Spence

- Bryum korbianum* Müll. Hal. = *Pohlia korbiana* (Müll. Hal.) Wijk & Margad.
- Bryum murorum* (Schimp.) Berk. = *Bryum radiculosum* Brid.
- Bryum pseudotriquetrum* (Hedw.) P. Gaertn., G. Mey. & Scherb. = *Ptychostomum pseudotriquetrum* (Hedw.) J.R.Spence & H.P.Ramsay
- Bryum pseudotriquetrum* (Hedw.) P. Gaertn., G. Mey. & Scherb. var. *bimum* (Brid.) Lilj. = *Ptychostomum pseudotriquetrum* var. *bimum* (Schreb.) D.T.Holyoak & N.Pedersen
- Bryum sacrum* (Lorentz) Müll. Hal. = *Bryum turbinatum* (Hedw.) Turner
- Bryum syriacum* Lorentz = *Bryum turbinatum* (Hedw.) Turner
- Bryum syriacum* var. *humile* Schiffn. = *Bryum turbinatum* (Hedw.) Turner
- Bryum torquescense* Bruch ex De Not. = *Ptychostomum torquescens* (Bruch & Schimp.) Ros&Mazimpaka
- Bryum turbinatum* Hedw. = *Bryum turbinatum* (Hedw.) Turner
- Bryum turbinatum* Sw. = *Bryum turbinatum* (Hedw.) Turner
- Cinclidotus mucronatus* (Brid.) Machado-Guim. = *Dialytrichia mucronata* (Brid.) Broth.
- Crossidium chloronotos auct. non* (Brid.) Limpr. = *Crossidium crassinervium* (De Not.) Jur.
- Desmatodon convolutus* (Brid.) Grout = *Tortula atrovirens* (Sm.) Lindb.
- Desmatodon plinthobius* Sull. & Lesq. = *Tortula plinthobia* (Sull. & Lesq.) Broth.
- Dichodontium pellucidum* (Hedw.) Schimp. fo. *fagimontanum* C.E.O. Jensen = *Dichodontium pellucidum* (Hedw.) Schimp.
- Dichodontium pellucidum* (Hedw.) Schimp. var. *fagimontanum* (Brid.) Schimp. = *Dichodontium pellucidum* (Hedw.) Schimp.
- Didymodon aaronis* (Lorentz) J. Guerra = *Didymodon australasiae* (Hook. & Grev.) R.H. Zander
- Didymodon acutus* (Brid.) K. Saito f. *viridis* (Bruch, Schimp. & W. Gümbel) Podp. = *Didymodon acutus* (Brid.) K. Saito.
- Didymodon ceratodentus* (*ceratodonteus*) (Müll. Hal.) Dixon = *Didymodon tophaceus* (Brid.) Lisa
- Didymodon ehrenbergii* (Lorentz) Kindb. = *Barbula bolleana* (Müll. Hal.) Broth.
- Didymodon fallax* var. *reflexus* (Brid.) R.H.Zander = *Didymodon ferrugineus* (Schimp. ex Besch.)
- Didymodon haussknechtii* (Jur. & Milde) Broth. = *Didymodon australasiae* (Hook. & Grev.) R.H. Zander

- Didymodon rigidulus* Hedw. var. *gracilis* (Schleich. ex Hook. & Grev.) R.H. Zander = ***Didymodon acutus*** (Brid.) K. Saito.
- Didymodon trifarius* (Hedw.) Röhl. = ***Didymodon luridus*** Hornsch.
- Didymodon trivialis* (Müll. Hal.) J. Guerra = ***Didymodon umbrosus*** (Müll. Hal.) R.H. Zander
- Encalypta vulgaris* Hedw. var. *mediolanensis* Warnst. = ***Encalypta intermedia*** Jur.
- Entosthodon niloticus* (Delile) Schimp. = ***Entosthodon niloticus*** Schimp.
- Entosthodon pallescens* Jur. = ***Entosthodon duriaei*** Mont.
- Entosthodon pallescens* Jur. fo. *foliis solidioribus* = ***Entosthodon duriaei*** Mont.
- Entosthodon templetonii* (Sm.) Schwägr. = ***Entosthodon attenuatus*** (Dicks.) Bryhn
- Eucladium verticillatum* forma [Lorentz] = ***Eucladium verticillatum*** (With.) Bruch & Schimp.
- Eucladium verticillatum* L. = ***Eucladium verticillatum*** (With.) Bruch & Schimp.
- Eurhynchium pumilum* (Wilson) Schimp. = ***Microeurhynchium pumilum*** (Wilson) Ignatov & Vanderpoorten
- Fissidens alexandrinus* Lorentz = ***Fissidens crassipes*** subsp. *warnstorffii* (M.Fleisch.) Brugg.-Nann.
- Fissidens bambergeri* Schimp. ex Milde = ***Fissidens viridulus*** (Sw. ex anon.) Wahlenb. var. ***viridulus***
- Fissidens bambergeri* var. *aegyptiacus* Renauld & Cardot = ***Fissidens crassipes*** subsp. ***warnstorffii*** (M.Fleisch.) Brugg.-Nann.
- Fissidens bryoides* Hedw. var. *gymnandrus* (Büse) R. Ruthe = ***Fissidens gymnandrus*** Büse
- Fissidens bryoides* Hedw. subsp. *viridulus* (Sw.) Kindb. = ***Fissidens viridulus*** (Sw.) Wahlenb.
- Fissidens crassipes* Wilson ex Bruch, Schimp. & W. Gumbel var. *philibertii* Besch. = ***Fissidens crassipes*** subsp. ***warnstorffii*** (M.Fleisch.) Brugg.-Nann.
- Fissidens cyprius* Jur. = ***Fissidens crispus*** Mont.
- Fissidens impar* Mitt. = ***Fissidens viridulus*** (Sw.) Wahlenb.
- Fissidens julianus* (Sav.) Schimp. = ***Fissidens fontanus*** (Bach. Pyl.) Steud.
- Fissidens limbatus* Sull. = ***Fissidens crispus*** Mont.
- Fissidens mnevidis* J.J. Amann = ***Fissidens crassipes*** subsp. ***warnstorffii*** (M.Fleisch.) Brugg.-Nann.



- Fissidens obtusifolius* Wilson = ***Fissidens arnoldii*** R.Ruthe  
*Fissidens viridulus* subsp. *bambergeri* (Schimp.) Kindb. = ***Fissidens viridulus*** (Sw.) Wahlenb. var. ***viridulus***  
*Fissidens viridulus* (Sw.) Wahlenb. var. *bambergeri* (Schimp.) Waldh. = ***Fissidens viridulus*** (Sw.) Wahlenb. var. ***viridulus***  
*Funaria attenuata* (Dicks.) Lindb. = ***Entosthodon attenuatus*** (Dicks.) Bryhn  
*Funaria calcarea* Wahlenb. var. *mediterranea* (Lindb.) C.E.O. Jensen & Medelius = ***Entosthodon muhlenbergii*** (Turner) Fife  
*Funaria convexa* Spruce = ***Entosthodon convexus*** (Spruce) Brugués  
*Funaria curvi-apiculata* (Müll.Hal.) Broth. = ***Entosthodon curvi-apiculatus*** Müll. Hal.  
*Funaria dentata* Corme var. *mediterranea* (Lindb.) Limpr. = ***Entosthodon muhlenbergii*** (Turner) Fife  
*Funaria fascicularis* (Hedw.) Lindb. = ***Entosthodon fascicularis*** (Hedw.) Müll. Hal.  
*Funaria handelii* Schiffn. = ***Entosthodon handelii*** (Schiffn.) Laz.  
*Funaria hygrometrica* Hedw. var. *calvescens* (Schwägr.) Mont. = ***Funaria hygrometrica*** Hedw.  
*Funaria hygrometrica* Hedw. var. *intermedia* Warnst. = ***Funaria hygrometrica*** Hedw.  
*Funaria hygrometrica* Hedw. var. *minor* (Delile) Brid. = ***Funaria hygrometrica*** Hedw.  
*Funaria hygrometrica* Hedw. var. *muralis* Huebener = ***Funaria hygrometrica*** Hedw.  
*Funaria hygrometrica* Hedw. var. *patula* Bruch, Schimp. = ***Funaria hygrometrica*** Hedw.  
*Funaria mediterranea* Lindb. = ***Entosthodon muhlenbergii*** (Turner) Fife  
*Funaria minor* Delile = ***Funaria hygrometrica*** Hedw.  
*Funaria muhlenbergii* Turner = ***Entosthodon muhlenbergii*** (Turner) Fife  
*Funaria nilotica* Broth. = ***Entosthodon niloticus*** Schimp.  
*Funaria nilotica* (Schimp. ex Müll. Hal.) Broth. = ***Entosthodon niloticus*** Schimp.  
*Funaria obtusa* (Hedw.) Lindb. = ***Entosthodon obtusus*** (Hedw.) Lindb.  
*Funaria pallescens* (Jur.) Lindb. = ***Entosthodon duriaei*** Mont.  
*Funaria pulchella* H. Philib. = ***Entosthodon pulchellus*** (H. Philib.) Brugués  
*Grimmia alpicola* Sw. = ***Schistidium agassizii*** Sull. & Lesq.

- Grimmia anodon* var. *sinaïtica* Renauld & Cardot = ***Grimmia anodon*** Bruch & Schimp.
- Grimmia apocarpa* L. = ***Schistidium apocarpum*** (Hedw.) Bruch & Schimp.
- Grimmia campestris* Burch ex Hook. = ***Grimmia laevigata*** (Brid.) Brid.
- Grimmia leucophaea* Grev. = ***Grimmia laevigata*** (Brid.) Brid.
- Grimmia sinaïca* Bruch & Schimp. = ***Grimmia orbicularis*** Bruch ex Wilson
- Grimmia sinaïca* Hampe. = ***Grimmia crinita*** Brid.
- Gymnostomum calcareum* Nees & Hornsch. var. *muticum* Boulay = ***Gymnostomum calcareum*** Nees & Hornsch.
- Gymnostomum calcareum* Nees & Hornsch. var. *viridulum* (Brid.) Bruch & Schimp. = ***Gymnostomum viridulum*** Brid.
- Gymnostomum niloticum* Delile = ***Physcomitrium niloticum*** (Delile) Müll. Hal.
- Gymnostomum recurvirostre* Hedw. = ***Hymenostylium recurvirostrum*** (Hedw.) Dixon
- Gyroweisia aaronis* (Lorentz) Par. = ***Didymodon australasiae*** (Hook. & Grev.) R.H. Zander
- Gyroweisia mosis* (Lorentz) Paris = ***Gymnostomum mosis*** (Lorentz) Jur. & Milde
- Gyroweisia rohlfsiana* (Müll. Hal) Paris = ***Gymnostomum viridulum*** Brid.
- Hydrogonium ehrenbergii* (Lorentz) A. Jaeger = ***Barbula bolleana*** (Müll. Hal.) Broth.
- Hymenostylium rupestre* Schwägr. = ***Gymnostomum aeruginosum*** Sm.
- Hymenostylium verticillatum* [Hart] = ***Eucladium verticillatum*** (With.) Bruch & Schimp.
- Hyophila stanfordensis* (Steere) Smith & Whitehouse = ***Henediella stanfordensis*** (Steere) Blockeel
- Hypnum aduncum* L. = ***Drepanocladus aduncus*** (Hedw.) Warnst.
- Hypnum ruscifolium* Neck. = ***Rhynchostegium riparioides*** (Hedw.) Cardot
- Hypnum rusciforme* Neck. = ***Rhynchostegium riparioides*** (Hedw.) Cardot
- Hypnum tenellum* Dicks. = ***Rhynchostegiella tenella*** (Dicks.) Limpr.
- Hypnum velutinum* L. = ***Brachytheciastrum velutinum*** (Hedw.) Ignatov & Huttunen
- Microbryum starckeanum* (Hedw.) R.H. Zander var. *brachyodus* (Bruch, Schimp. & W. Gümbel) R.H. Zander = ***Microbryum starckeanum*** (Hedw.) R.H. Zander
- Micropoma niloticum* (Delile) Lindb. = ***Physcomitrium niloticum*** (Delile) Müll. Hal.

- Microstegium niloticum* (Delile) Lindb. = ***Physcomitrium niloticum*** (Delile) Müll. Hal.
- Mniobryum carneum* (L.) Limpr. = ***Pohlia melanodon*** (Brid.) A.J. Shaw.
- Mniobryum delicatulum* (Hedw.) Dixon = ***Pohlia melanodon*** (Brid.) A.J. Shaw.
- Philonotis evanidinervis* M. Fleisch. = ***Philonotis hastata*** (Duby) Wijk & Marg
- Philonotis glabriuscula* kindb. pp. = ***Philonotis fontana*** (Hedw.) Brid.
- Philonotis glabriuscula* kindb. pp. = ***Philonotis marchica*** (Hedw.) Brid.
- Philonotula glabriuscula* Müll. Hal. = pp. ***Philonotis fontana*** (Hedw.) Brid.
- Philonotula glabriuscula* Müll. Hal. = pp. ***Philonotis marchica*** (Hedw.) Brid.
- Philonotula marchica* (Hedw.) Brid. fo. *rivularis* (Warnst.) Mönk. = ***Philonotis marchica*** (Hedw.) Brid.
- Philonotis obtusata* Müll. Hal. = ***Philonotis hastata*** (Duby) Wijk & Margad.
- Physcomitrium acuminatum* (Schleich.) Bruch, Schimp. & W. Gümbel = ***Physcomitrium eurystomum*** Sendtn.
- Physcomitrium eurystomum* Sendtn. fo. *acuminatum* (Bruch, Schimp. & W. Gümbel) Löske = ***Physcomitrium eurystomum*** Sendtn.
- Physcomitrium niloticum* (Delile) Müll. Hal. = ***Entosthodon niloticus*** Schimp.
- Physcomitrium niloticum* Lindb. = ***Physcomitrium niloticum*** (Delile) Müll. Hal.
- Physcomitrium sesostris* Lorentz = ***Physcomitrium niloticum*** (Delile) Müll. Hal.
- Platyhypnidium rusciforme* (Neck.) Fleisch. = ***Rhynchostegium riparioides*** (Hedw.) Cardot
- Pohlia carnea* (Schimp.) Lindb. = ***Pohlia melanodon*** (Brid.) A.J. Shaw.
- Pottia intermedia* (Turner) Fürnr. = ***Tortula caucasica*** Broth.
- Pottia mutica* Venturi = ***Microbryum starckeanum*** (Hedw.) R.H. Zander
- Pottia pallida* Lindb. = ***Tortula pallida*** (Lindb.) R.H. Zander
- Pottia pallida* Lindb. var. *longicuspis* Warnst. = ***Tortula pallida*** (Lindb.) R.H. Zander
- Pottia starckeanum* (Hedw.) Müll. Hal. = ***Microbryum starckeanum*** (Hedw.) R.H. Zander
- Pottia starckeanum* agg. (Hedw.) Müll. Hal. = ***Microbryum starckeanum*** (Hedw.) R.H. Zander

- Pottia venusta* Jur. = ***Tortula pallida*** (Lindb.) R.H.Zander  
*Pottia wilsonii* (Hook.) Bruch, Schimp. & W. Gumbel = ***Tortula wilsonii***  
(Hook.) R.H. Zander  
*Rhynchostegiella algiriana* (Brid.) Broth. = ***Rhynchostegiella tenella***  
(Dicks.) Limpr.  
*Rhynchostegium rusciforme* [Lorentz] = ***Rhynchostegium riparioides***  
(Hedw.) Cardot  
*Rhynchostegium tenellum* [Lorentz] = ***Rhynchostegiella tenella*** (Dicks.)  
Limpr.  
*Schistidium alpicola* (Hedw.) Limpr. = ***Schistidium agassizii*** Sull. & Lesq.  
*Semibarbula orientalis* (F. Weber) Wijk & Margad. = ***Barbula indica***  
(Hook.) Spreng.  
*Streblotrichum convolutum* (Hedw.) P.Beauv. = ***Barbula convoluta*** Hedw.  
*Syntrichia inermis* (Brid.) Bruch = ***Tortula inermis*** (Brid.) Mont.  
*Systegium crispum* (Hedw.) Hampe = ***Weissia longifolia*** Mitt.  
*Timmiella barbula* (Schwägr.) Limpr. = ***Timmiella barbuloidea*** (Brid.)  
Mönk.  
*Tortula fragilis* (Taylor) Ochyra = ***Syntrichia fragilis*** (Taylor) Ochyra  
*Tortula modica* R.H. Zander = ***Tortula caucasica*** Broth.  
*Tortula muralis* Hedw. fo. *incana* (Bruch, Schimp. & W. Gumbel)  
Sapjegin = ***Tortula muralis*** Hedw.  
*Tortula muralis* Hedw. fo. *obcordata* (Schimp.) Mönk. = ***Tortula muralis***  
Hedw.  
*Tortula muralis* Hedw. var. *obcordata* (Schimp.) Limpr. = ***Tortula muralis***  
Hedw.  
*Tortula muralis* Hedw. var. *incana* Bruch & Schimp. = ***Tortula muralis***  
Hedw.  
*Tortula pallida* (Lindb.) R.H. Zander var. *longicuspis* (Warnst.) R.H.  
Zander = ***Tortula pallida*** (Lindb.) R.H.Zander  
*Tortula plinthobia* (Sull. & Lesq.) Austin = ***Tortula plinthobia*** (Sull. &  
Lesq.) Broth.  
*Tortula rigescens* Broth. & Geh.= ***Syntrichia rigescens*** (Broth. &Geh.)  
Ochyra  
*Trichostomopsis aaronis* (Lorentz) S. Agnew & Tonwnsend = ***Didymodon***  
***australasiae*** (Hook. & Grev.) R.H. Zander  
*Trichostomum aaronis* Lorentz = ***Didymodon australasiae*** (Hook. & Grev.)  
R.H. Zander  
*Trichostomum aciculare* P. Beauv. = ***Racomitrium aciculare*** (Hedw.) Brid.

*Trichostomum cylindricum* (Brid.) C.Müll. = ***Oxystegus tenuirostris*** (Hook. & Taylor) Lindb.

*Trichostomum ehrenbergii* Lorentz = ***Barbula bolleana*** (Müll. Hal.) Broth.

*Trichostomum mosis* Lorentz = ***Gymnostomum mosis*** (Lorentz) Jur. & Milde

*Trichostomum tophaceum* fo. *foliis magis acuminatis* = ***Didymodon tophaceus*** (Brid.) Lisa

*Webera carnea* [Lorentz] = ***Pohlia melanodon*** (Brid.) A.J. Shaw.

*Webera sacra* Lorentz = ***Bryum turbinatum*** (Hedw.) Turner

*Webera sinaitica* Lorentz = ***Bryum turbinatum*** (Hedw.) Turner

*Weissia rohlfiana* Müll. Hal. = ***Gymnostomum viridulum*** Brid.

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