

Check-list of the liverworts and hornworts of Southeast Europe

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Abstract. The article presents the first compilation list of liverworts and hornworts from Southeast Europe. The region of Southeast Europe includes up to date 272 species (5 hornworts and 267 liverworts), or ca. 59.9% of the hepatic flora of Europe. The countries with the richest hepatic flora within the region are Romania and Bulgaria. The level of knowledge on liverworts and hornworts occurring in each of the countries of Southeast Europe is different and some regions stand out as extremely poorly known. The number of hepatic species is expected to increase with further investigations within Southeast Europe.

Key words: by-country distribution, check-list, hornworts, liverworts, Southeast Europe

Introduction

Biogeographically, Southeast Europe (designated hereafter as SE Europe) is a highly interesting area and one of the regions with the richest flora in Europe. The areas of Serbia and the mountainous parts of Bulgaria are two of the six biodiversity centres in Europe (IUCN1987). Such high biodiversity is determined by the various climatic and edaphic conditions in the area and its geographic location. SE Europe exhibits almost all European climatic types, with many local variants and microclimates. The relief is extremely varied, ranging from coastal (sea level) zones and inland steppe areas to mountain ranges above 2000 m in altitude. The main mountain systems in SE Europe are the Rilo-Rhodopean massive, the Carpathians, the Balkan Range, the Dinaric Alps, and the Scardo-Pinds. Geology is complex: from old volcanic granite and metamorphic rocks to Triassic and Jurassic lime-

stone, with many transitional types. The drainage network is well but unevenly developed in various parts. SE Europe contains all major European vegetation types, ranging from Mediterranean deciduous forests and steppe areas, to deciduous nemoral and coniferous boreal forests, and high mountain alpine and arctic-alpine ecosystems. Furthermore, SE Europe is situated at the crossroad of biogeographic influences from North Africa, West Asia, Central and North Europe.

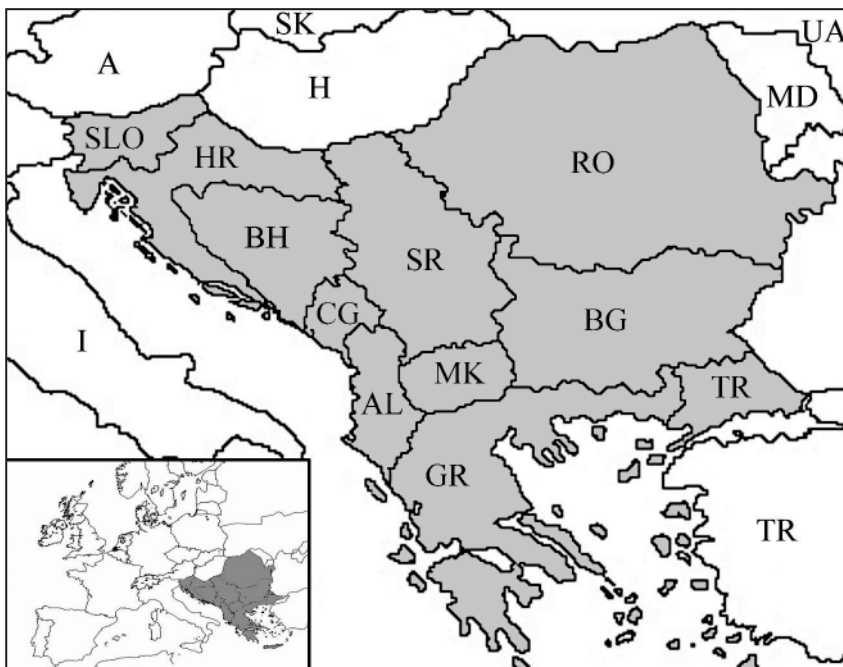
All these specificities of the region of SE Europe had set preconditions for a rich bryophyte flora. It is estimated that the number of species will reach ca. 1500, with a total of about 2000 taxa, including intraspecific taxa (Sabovljević & al. 2001). However, the bryophyte flora of SE Europe still remains very poorly known, as compared to other regions of Europe (Sabovljević 2004). The reasons are complex but we shall mention only a few. Historically there have been few resident bryologists, a tendency that is even more evident to-

day. Coupled with the large number of relatively small in size states, this has encumbered further the bryo-florestic studies. Data on the bryophyte flora of SE Europe are scattered in various small publications. Few of the SE European countries have recent national check-lists of liverworts and hornworts, e.g. Greece (Düll 1995), Serbia and Montenegro (Sabovljević 2000), Croatia (Sabovljević 2003), Albania (Colacino & Sabovljević in press), Bulgaria (Ganeva & Natcheva 2003), and Macedonia (Cekova 2005). Considering that in groups of good dispersers like bryophytes a regional approach is most appropriate with respect to both biodiversity studies and conservation, a comprehensive list of the species occurring in the entire region is greatly needed. Therefore, we present the first part of a check-list of the bryophytes of SE Europe, dealing with the liverworts and hornworts in the region.

Methods

Study area

In the present paper SE Europe is regarded in a political sense, as comprising the states of Albania, Bulgaria, Bosnia-Herzegovina, Croatia, Greece, Macedonia (FYR), Romania, Serbia and Montenegro, Slovenia, and the European part of Turkey (the Turkish Thrace) (Fig. 1). Thus, as a geographical unit, it covers a greater area than the Balkan Peninsula, which is defined as the land south of rivers Krka, Sava and the Danube.



Species listing

The published records were intensively searched through for liverworts and hornworts in SE Europe. Some recent collections have also been checked. The list presents by-country distribution of the liverwort and hornwort species in SE Europe, allowing a quick reference to the general distribution of each species as well as to the total species diversity of each country. No extensive list of references will be presented in this study due to space limitation, but the main references which include most earlier records and some recent references with newly made records, not cited elsewhere, are provided (Müller 1951-1958; Ade & Kope 1955; Pavletić 1955; Pavletić & Grom 1958; Pavletić & Zabijakin 1960; Pócs 1960; Grom 1963, 1969; Duda 1965; Váňa & Duda 1965; Popović 1966; Boros 1968; Grolle 1970; Erdeši 1971; Bischler & Jovet-Ast 1973; Hébrard 1975; Petrov 1975; Pavletić & Pulević 1980; Düll 1983, 1995; Grgić 1983, 1989; Petrov & Ganeva 1996; Kürschner & Parolly 1997; Sabovljević 1998, 1999, 2000, 2003; Blockeel & al. 1999, 2002, 2004; Düll & al. 1999; Jakab 2000; Stefanut 2000, 2003, 2004; Papp & Sabovljević 2001, 2002, 2003; Veljić & al. 2001; Sabovljević & Sérgio 2002; Balint & Orban 2003; Dragičević & al. 2003; Ganeva & Natcheva 2003; Lüth 2003; Sabovljević & Cvetić 2003; Stefanut & Stefanut 2003; Papp & al. 2004; Cekova 2005; Papp & Erzberger 2005; Colacino & Sabovljević in press).

Nomenclature.

The nomenclature follows Grolle & Long (2000) and Söderström & al. (2002). A list of synonyms found in earlier sources is provided, with reference to the currently accepted names (Appendix 1).

Fig. 1. The SE Europe and its position in Europe. Country abbreviations: A – Austria; AL – Albania; BG – Bulgaria; BH – Bosnia & Herzegovina; CG – Montenegro; GR – Greece; H – Hungary; HR – Croatia; I – Italy; MD – Moldova; MK – Macedonia (FYR); RO – Romania; SK – Slovakia; SLO – Slovenia; SR – Serbia; TR – Turkey; UA – Ukraine.

Results and discussion

The present check-list includes a total of 272 species reported in SE Europe (Table 1). Of these, five are hornworts and 267 are liverworts. Thus the flora of liverworts and hornworts of SE Europe comprises 59.9% of the total hepatic flora of Europe and Macaronesia, or 63.3% if only continental Europe is considered. The number of species falls within the range of hepatic diversity found in the other two major South European peninsulas, the Iberian with 264, and the Apennine with 271 species (Sabovljević 2004), and is slightly lower than in Scandinavia (ca. 290, Damsholt 2002). The Balkan Peninsula is among the regions in greatest need of investigation, and it is anticipated that a high number of liverwort species will be found there (Söderström & al. 1998). Considering that generally there is less information on the bryophyte flora of SE Europe as compared to other parts of Europe, it could be expected that the number of species will further increase with some more thorough field investigations.

On a national level, the countries with richest floras are Romania, followed by Bulgaria, Slovenia, Greece and Croatia. The great difference in the species num-

bers among the various countries (ranging from 27 up to 197) only partly reflects the real difference in species diversity. Forty-one species are known in only one of the 11 SE European countries, while 31 are recorded in only two of them. This also indicates a difference in the state of knowledge of their liverwort and hornwort floras. Particularly underestimated is the number of species e.g. in Montenegro, Macedonia and Albania. A higher number of local experts and a better cooperation between the bryologists from the SE European countries are needed to improve our knowledge on national and regional level.

Thirty six species occurring within the region of SE Europe are of conservation interest for Europe (ECCB 1995). For good dispersers such as bryophytes, a regional approach to conservation is the most appropriate one with respect to actual protection and resource efficiency. In this context, more detailed knowledge on the distribution of species within each country of SE Europe is required, in order to evaluate the actual threats and to set targets for liverwort and hornwort conservation on regional and national level. A detailed check-list is the first step towards the achievement of these goals.

Table 1. Check-list of the liverworts and hornworts of SE Europe. Abbreviations and symbols: AL – Albania; BG – Bulgaria; BH – Bosnia & Herzegovina; CG – Montenegro; GR – Greece incl. Crete; HR – Croatia; MK – Macedonia (FYR); RO – Romania; SB – Serbia; SLO – Slovenia; TR – Turkey (European part only); ? – presence uncertain; (●) – record without precise locality; * – species in the European Red List (ECCB 1995).

| Species | AL | BG | BH | CG | GR | HR | MK | RO | SR | SLO | TR |
|---|----|----|----|----|----|----|----|----|----|-----|----|
| Anthocerotae | | | | | | | | | | | |
| <i>Anthoceros agrestis</i> Paton | | ● | | | ● | | ● | ● | | | |
| <i>A. punctatus</i> L. | ● | ● | | | ● | | | ● | | ● | |
| <i>Phaeoceros bulbiculosus</i> (Brot.) Prosk. | ● | | | ● | ● | ● | | | | | |
| <i>Ph. carolinianus</i> (Michx.) Prosk. | | | | | | | | ● | | | |
| <i>Ph. laevis</i> (L.) Prosk. | ● | ● | | | ● | ● | | ● | | ● | |
| Hepaticae | | | | | | | | | | | |
| <i>Anstrepta ocardensis</i> (Hook.) Schiffn. | | | | | | | | ● | | | |
| <i>Anastrophyllum hellerianum</i> (Nees ex Lindenb.) R.M. Schust. | | | | | | | | ● | ● | ● | |
| <i>A. michauxii</i> (F. Weber) H. Buch | | ● | ● | | | ● | | ● | | ● | |
| <i>A. minutum</i> (Schreb.) R.M. Schust. | | ● | | | | ● | | ● | ● | ● | |
| <i>A. saxicola</i> (Schrad.) R.M. Schust. | | | | | | | | ● | | | |
| <i>Aneura pinguis</i> (L.) Dumort. | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| <i>Anthelia julacea</i> (L.) Dumort. | | | | | | | | ● | | | |
| <i>A. juratzkana</i> (Limpr.) Trevis. | | ● | | | | ● | ● | ● | | ● | |
| <i>Apometzgeria pubescens</i> (Schrank) Kuwah. | | ● | ● | ● | | ● | ● | ● | ● | ● | |
| <i>Arnellia fennica</i> (Gottsche) Lindb.* | | | | | | | | | | ● | |
| <i>Asterella gracilis</i> (F. Weber) Underw. | | | ● | | | | ● | ● | | ● | |
| <i>A. lindenbergiana</i> (Corda ex Nees) Arnell | | ● | ● | | | | | ● | | ● | |
| <i>A. saccata</i> (Wahlenb.) A. Evans* | | | | | ? | | ● | ● | | | |
| <i>Athalamia hyalina</i> (Sommerf.) S. Hatt. | ● | ● | | ● | ● | ● | | ● | | ● | |
| <i>A. spathysii</i> (Lindenb.) S. Hatt.* | ● | | | | ● | | | | | | |
| <i>Barbilophozia attenuata</i> (Mart.) Loeske | | ● | ● | ● | | | | ● | ● | ● | |
| <i>B. barbata</i> (Schmidel ex Schreb.) Loeske | ● | ● | ● | | ● | ● | ● | ● | ● | ● | |
| <i>B. floerkei</i> (F. Weber & D. Mohr) Loeske | | ● | | ● | | | ● | ● | ● | ● | |

Table 1. Continuation

| Species | AL | BG | BH | CG | GR | HR | MK | RO | SR | SLO | TR |
|--|----|-----|----|----|----|----|----|----|----|-----|----|
| <i>F. tamarisci</i> (L.) Dumort. | • | • | • | • | • | • | • | • | • | • | |
| <i>F. tenerifae</i> (F. Weber) Nees | | | | | | | | | | • | |
| <i>Geocalyx graveolens</i> (Schrad.) Nees | | | | | ? | | | • | | | |
| <i>Gongylanthus ericetorum</i> (Raddi) Nees | • | | | | • | • | | | | | |
| <i>Gymnocolea inflata</i> (Huds.) Dumort. | | • | | | • | | • | • | | • | |
| <i>Gymnomitrium apiculatum</i> (Schiffn.) Müll.Frib. | | • | | | | | | | | • | |
| <i>G. concinnatum</i> (Lightf.) Corda | | • | | | | | | • | | • | |
| <i>G. corallioides</i> Nees | | • | | | | | | • | | • | |
| <i>Haplomitrium hookeri</i> (Sm.) Nees* | | | | | | | | • | | | |
| <i>Harpanthus flotovianus</i> (Nees) Nees | | | | | | | | • | | • | |
| <i>H. scutatus</i> (F. Weber et D. Mohr) Spruce | | (•) | • | | | • | | • | | • | |
| <i>Jamsoniella autumnalis</i> (DC.) Steph. | | • | | | | • | | • | • | • | |
| <i>Jungermannia atrovirens</i> Dumort. | • | • | • | • | • | • | | • | • | • | • |
| <i>J. borealis</i> Damsh. & Vána | | | | | | | | • | | | |
| <i>J. caespiticia</i> Lindenb. | | • | | | | | | • | | | |
| <i>J. confertissima</i> Nees | | • | | | | | | • | ? | ? | |
| <i>J. exertifolia</i> Steph. | | • | | | | | | • | | | |
| <i>J. gracillima</i> Sm. | • | • | • | | • | • | • | • | • | • | |
| <i>J. handelii</i> (Schiffn.) Amakawa* | | | | | • | | | | | | |
| <i>J. hyalina</i> Lyell | • | • | • | | • | • | | • | • | • | |
| <i>J. leiantha</i> Grolle | • | • | • | • | • | • | • | • | • | • | |
| <i>J. obovata</i> Nees | | • | | | | | | • | • | | |
| <i>J. polaris</i> Lindb. | • | | | • | • | • | | • | | • | |
| <i>J. pumila</i> With. | | • | • | | | | | • | | • | |
| <i>J. sphaerocarpa</i> Hook. | | • | | • | | | | • | • | • | |
| <i>J. subelliptica</i> (Lindb. ex Kaal.) Levier | | | | | | | | • | | • | |
| <i>J. subulata</i> A. Evans* | | | | | | | | • | | • | |
| <i>Kurzia pauciflora</i> (Dicks.) Grolle | | | | | | | | • | | • | |
| <i>Leiocolea badensis</i> (Gottsche) Jörg. | • | | • | | • | • | | • | • | • | |
| <i>L. bantriensis</i> (Hook.) Jörg. | | • | | | | | • | • | • | | |
| <i>L. collaris</i> (Nees) Schljakov | • | • | • | • | • | • | • | • | • | • | |
| <i>L. gillmanii</i> (Austin) A. Evans | | | | | | | | • | | | |
| <i>L. heterocolpos</i> (Thed. ex Hartm.) H. Buch | | • | | • | • | | | • | • | • | |
| <i>L. turbinata</i> (Raddi) H. Buch | • | | • | • | • | • | • | • | • | • | • |
| <i>Lejeunea cavifolia</i> (Ehrh.) Lindb. | • | • | • | • | • | • | | • | • | • | • |
| <i>Lepidozia cupressina</i> (Sw.) Lindenb. | | (•) | | | | | | | | | |
| <i>L. reptans</i> (L.) Dumort. | | • | • | • | • | • | | • | • | • | |
| <i>Lophocolea bidentata</i> (L.) Dumort. | • | • | • | • | • | • | | • | • | • | |
| <i>L. heterophylla</i> (Schrad.) Dumort. | • | • | • | • | • | • | | • | • | • | |
| <i>L. minor</i> Nees | • | • | • | | • | • | • | • | • | • | |
| <i>Lophozia ascendens</i> (Warnst.) R.M. Schust.* | | • | | | | • | | • | • | | |
| <i>L. bicrenata</i> (Schmidel ex Hoffm.) Dumort. | | | | | • | • | | • | • | • | |
| <i>L. decolorans</i> (Limpr.) Steph.* | | • | | | | | | | | | |
| <i>L. elongata</i> Steph.* | | | | | | | | | | • | |
| <i>L. excisa</i> (Dicks.) Dumort. | • | • | • | • | • | • | • | • | • | • | |
| <i>L. incisa</i> (Schrad.) Dumort. | • | • | • | | • | • | | • | • | • | |
| <i>L. latifolia</i> R.M.Schust.* | | | | | | | | | • | | |
| <i>L. longidens</i> (Lindb.) Macoun | | • | | | | | | • | • | | |
| <i>L. longiflora</i> (Nees) Schiffn. | | • | • | | | • | | • | | • | |
| <i>L. obtusa</i> (Lindb.) A. Evans | | • | | • | • | | | • | • | | |
| <i>L. opacifolia</i> Culm. ex Meyl. | | | | | | | | • | | | |
| <i>L. polaris</i> (R.M. Schust.) R.M. Schust. & Damsh. | | | | | | | • | | | • | |
| <i>L. sudetica</i> (Nees ex Huebener) Grolle | | • | | | | | • | • | • | • | |
| <i>L. ventricosa</i> (Dicks.) Dumort. | • | • | • | • | • | • | • | • | • | • | |
| <i>L. wenzelii</i> (Nees) Steph. | | • | | | • | | | • | | | |
| <i>Lunularia cruciata</i> (L.) Lindb. | • | • | • | • | • | • | • | • | • | • | • |
| <i>Mannia androgyna</i> (L.) A. Evans | • | • | • | • | • | • | | • | | | |
| <i>M. fragrans</i> (Balbis) Frye & L. Clark | | • | • | | | • | • | • | • | • | |
| <i>M. pilosa</i> (Hornem.) Frye & L. Clark | | • | | | | | | • | | • | |
| <i>M. triandra</i> (Scop.) Grolle* | • | • | • | • | | • | • | • | | • | |
| <i>Marchantia paleacea</i> Bertol.* | • | • | | • | • | • | • | • | • | • | |
| <i>M. polymorpha</i> L. | • | • | • | • | • | • | | • | • | • | • |
| <i>Marchesia mackaii</i> (Hook.) Gray* | | | | | | • | | | | | |
| <i>Marsupella adusta</i> (Nees emend. Limpr.) Spruce* | | • | | | | | | | | | |
| <i>M. alpina</i> (Gottsche ex Husn.) Bernet | | • | | | | | | | | | |

Table 1. Continuation

| Species | AL | BG | BH | CG | GR | HR | MK | RO | SR | SLO | TR |
|---|----|----|----|-----|----|-----|----|----|-----|-----|----|
| <i>M. boeckii</i> (Austin) Kaal. | | | | | | | | • | | | |
| <i>M. brevissima</i> (Dumort.) Grolle | | • | | | | | | • | | | |
| <i>M. commutata</i> (Limpr.) Bernet | | | | | | | | • | | | |
| <i>M. emarginata</i> (Ehrh.) Dumort. | | • | • | | • | • | • | • | | • | |
| <i>M. funckii</i> (F.Weber & D. Mohr). Dumort. | | • | | | • | • | | | • | • | |
| <i>M. ramosa</i> Müll.Frib. | | | | | | | | • | | | |
| <i>M. sparsifolia</i> (Lindb.) Dumort. | | • | | | | | | | | | |
| <i>M. sphacelata</i> (Gieseke ex Lindenb.) Dumort. | | • | | | • | | | • | | | |
| <i>M. sprucei</i> (Limpr.) Bernet | | • | | | | | | • | | • | |
| <i>Metzgeria conjugata</i> Lindb. | | • | • | • | • | • | • | • | • | • | |
| <i>M. fruticulosa</i> (Dicks.) A. Evans | | | | (•) | | • | | • | | • | |
| <i>M. furcata</i> (L.) Dumort | • | • | • | • | • | • | • | • | • | • | • |
| <i>M. simplex</i> Lorb. ex Müll.Frib.* | | • | | | | | | • | | • | |
| <i>M. temperata</i> Kuwah. | | | | | | | | | • | | |
| <i>Microlejeunea ulicina</i> (Taylor.) A. Evans | | | | • | | | | | • | • | |
| <i>Moerkia blyttii</i> (Moerch) Brockm. | | | | | | | | • | | | |
| <i>M. hibernica</i> (Hook.) Gottsche | | | | | ? | | | • | | • | |
| <i>Mylia anomala</i> (Hook.) Gray | | • | • | | | | | • | | • | |
| <i>M. taylorii</i> (Hook.) Gray | | | | | | • | | • | • | • | |
| <i>Nardia compressa</i> (Hook.) Gray | | • | | | ? | | | | • | | |
| <i>N. geoscyphus</i> (De Not.) Lindb. | | • | | | • | | | • | | • | |
| <i>N. insecta</i> Lindb. | | | | | | | | • | | | |
| <i>N. scalaris</i> Gray | | • | | | • | • | | • | • | • | |
| <i>Nowelia curvifolia</i> (Dicks.) Mitt. | | • | • | • | • | • | | • | • | • | |
| <i>Odontoschisma denudatum</i> (Mart.) Dumort. | | | | | | • | | • | | • | |
| <i>O. sphagni</i> (Dicks.) Dumort. | | • | | | | | | • | | • | |
| <i>Oxymitra incrassata</i> (Brot.) Sérgio & Sim-Sim | • | • | | • | • | • | | • | | | |
| <i>Pallavicinia lyellii</i> (Hook.) Carruth.* | | | | | • | | | • | | | |
| <i>Pedinophyllum interruptum</i> (Nees) Kaal. | • | • | • | • | • | • | • | • | • | • | |
| <i>Pellia endiviifolia</i> (Dicks.) Dumort. | • | • | • | • | • | • | • | • | • | • | • |
| <i>P. epiphylla</i> (L.) Corda | | • | • | • | • | • | • | • | • | • | |
| <i>P. neesiana</i> (Gottsche) Limpr. | | • | | | • | • | • | • | • | • | |
| <i>Peltolepis quadrata</i> (Saut.) Müll.Frib. | | | • | | | • | | • | | • | |
| <i>Petalophyllum ralfsii</i> (Wils.) Nees & Gottsche* | | | | | • | | | | | | |
| <i>Plagiochasma rupestre</i> (J. R. Forst. & G. Forst) Steph. | • | | | • | • | • | • | | | | |
| <i>Plagiochila asplenioides</i> (L. emend. Taylor) Dumort. | • | • | • | • | • | • | • | • | • | • | |
| <i>P. porelloides</i> (Torrey ex Nees) Lindenb. | • | • | • | • | • | • | • | • | • | • | • |
| <i>Pleurocladula albescens</i> (Hook.) Grolle | | | | | | • | | • | | | |
| <i>Porella arboris-vitae</i> (With.) Grolle | • | • | | • | • | • | | • | • | • | |
| <i>P. baueri</i> (Schiffn.) C.E.O. Jensen* | • | • | | • | • | • | | • | • | • | |
| <i>P. cordeana</i> (Huebener) Moore | • | • | • | • | • | • | • | • | • | • | |
| <i>P. obtusata</i> (Taylor) Trevis. | | • | | • | | • | | • | | • | |
| <i>P. pinnata</i> L. | | • | | | | | | | | | |
| <i>P. platyphylla</i> (L.) Pfeiff. | • | • | • | • | • | • | • | • | • | • | • |
| <i>Preissia quadrata</i> (Scop.) Nees | • | • | • | • | • | • | • | | | • | |
| <i>Ptilidium ciliare</i> (L.) Hampe | • | • | • | • | • | • | | • | • | • | |
| <i>P. pulcherimum</i> (Weber) Vain. | | • | • | • | | • | | • | • | • | |
| <i>Radula complanata</i> (L.) Dumort. | • | • | • | • | • | • | • | • | • | • | • |
| <i>R. lindenbergiana</i> Gottsche ex C. Hartm. | • | • | • | • | • | • | | • | | • | • |
| <i>Reboulia hemisphaerica</i> (L.) Raddi | • | • | • | • | • | • | • | • | • | • | |
| <i>Riccardia chamedryfolia</i> (With.) Grolle | | • | • | | • | • | | • | | • | |
| <i>R. incurvata</i> Lindb. | | • | | | | | | • | • | | |
| <i>R. latifrons</i> (Lindb.) Lindb. | | • | • | • | • | • | | • | • | • | |
| <i>R. multifida</i> (L.) Gray. | • | • | • | • | • | • | | • | (•) | • | |
| <i>R. palmata</i> (Hedw.) Carruth. | • | • | • | • | | • | | • | • | • | |
| <i>Riccia atromarginata</i> Levier | | | | | • | | | | | | |
| <i>R. beyrichiana</i> Hampe ex Lehm. | | | | | | • | | | | | |
| <i>R. bicarinata</i> Lindb. | • | | • | • | • | • | | | | • | |
| <i>R. bifurca</i> Hoffm. | • | | | | • | • | • | • | | • | |
| <i>R. canaliculata</i> Hoffm. | | | | | • | | | | | | |
| <i>R. cavernosa</i> Hoffm. | | | | | | (•) | | | | | |
| <i>R. ciliata</i> Hoffm. | • | • | | • | • | • | • | • | | • | |
| <i>R. ciliifera</i> Link ex Lindenb. | • | • | • | • | • | • | • | • | | | |
| <i>R. crinita</i> Taylor | | | • | • | • | • | • | | • | | |
| <i>R. crozalsii</i> Levier | • | | • | • | • | • | | | | | • |

Table 1. Continuation

| Species | AL | BG | BH | CG | GR | HR | MK | RO | SR | SLO | TR |
|--|-----------|------------|------------|-----------|------------|------------|-----------|------------|------------|------------|-----------|
| <i>R. crustata</i> Trab.* | | • | | | | | | | | | |
| <i>R. crystalina</i> L. emend. Raddi | • | • | | | • | • | | • | • | | |
| <i>R. fluitans</i> L. | | • | • | • | • | • | • | • | • | • | |
| <i>R. frostii</i> Austin* | | • | | | | • | | • | • | | |
| <i>R. glauca</i> L. | • | • | • | | • | • | | • | • | • | |
| <i>R. gougetiana</i> Durieu & Mont. | | • | • | | • | • | • | • | | | |
| <i>R. lamellosa</i> Raddi | | | | | • | | | | | | |
| <i>R. macrocarpa</i> Levier | • | | | | • | • | | | | | |
| <i>R. michelii</i> Raddi | • | | • | • | • | • | | | | | |
| <i>R. nigrella</i> DC. | • | • | • | • | • | • | | | | | • |
| <i>R. papillosa</i> Moris | • | • | • | • | • | • | | • | | | |
| <i>R. perennis</i> Steph. | | | | | • | | | | | | |
| <i>R. sommieri</i> Levier* | | | | | • | | | | | | |
| <i>R. sorocarpa</i> Bisch. | • | • | • | • | • | • | • | • | • | • | |
| <i>R. subbifurca</i> Warnst. ex Corz. | • | | | • | • | • | | | | | |
| <i>R. trabutiana</i> Steph.* | • | | | | • | | | | | | |
| <i>R. warnstorffii</i> Limpr. ex Warnst. | | | | | | • | | | | | |
| <i>Ricciocarpos natans</i> (L.) Corda | | • | • | | • | | • | • | (•) | | |
| <i>Riella notarisii</i> (Mont.) Mont.* | | | | | • | • | | | | | |
| <i>Sauteria alpina</i> (Nees) Nees | | | | • | | | | • | | • | |
| <i>Scapania aequiloba</i> (Schwägr.) Dumort. | • | • | • | • | • | • | | • | • | • | |
| <i>S. apiculata</i> Spruce | | • | | | | • | | • | | • | |
| <i>S. aspera</i> Bernet & M. Bernet | • | • | • | • | • | • | | • | • | • | |
| <i>S. calcicola</i> (Arnell & J. Press.) Ingham | • | • | • | | • | • | | • | • | • | |
| <i>S. compacta</i> (A. Roth) Dumort. | • | • | • | • | • | • | | | | • | • |
| <i>S. crassiretis</i> Bryhn | | | • | | | | | | | • | |
| <i>S. curta</i> (Mart.) Dumort. | | • | • | | • | • | | • | • | • | |
| <i>S. cuspiduligera</i> (Nees) Müll.Frib. | | | | | | | | • | | • | |
| <i>S. gracilis</i> Lindb. | | | | | • | | | • | | | |
| <i>S. helvetica</i> Gottsche* | | • | | | | | | • | | • | |
| <i>S. irrigua</i> (Nees) Nees | | • | • | • | | | • | • | • | • | • |
| <i>S. lingulata</i> H. Buch | | | | | | | | | • | | |
| <i>S. mucronata</i> H. Buch | | • | | | | | | • | • | | |
| <i>S. nemorea</i> (L.) Grolle | • | • | • | | • | • | • | • | • | • | |
| <i>S. paludicola</i> Loeske & Müll.Frib. | | • | | | | | | • | | | |
| <i>S. paludosa</i> (Müll.Frib.) Müll.Frib. | | | | | | | | • | • | | |
| <i>S. scandica</i> (Arnell & H. Buch) Macvicar | | • | | | | | | • | • | | |
| <i>S. subalpina</i> (Nees ex Lindenb.) Dumort. | | • | | | • | | | • | • | • | |
| <i>S. uliginosa</i> (Sw. ex Lindenb.) Dumort. | | | | | | | | • | | | |
| <i>S. umbrosa</i> (Schrud.) Dumort. | • | • | • | • | | • | • | • | • | • | |
| <i>S. undulata</i> (L.) Dumort. | | • | | • | • | • | • | • | • | • | |
| <i>S. verrucosa</i> Heeg* | | • | • | | | • | | • | | • | |
| <i>Southbya nigrella</i> (De Not.) Henriq. | • | | • | • | • | • | | | | • | |
| <i>S. topfacea</i> (Spruce) Spruce | • | | | • | • | • | | | | • | |
| <i>Sphaerocarpos michelii</i> Bellardi | | | | | • | • | | | | | |
| <i>S. texanus</i> Austin | | | | | • | • | | | | | |
| <i>Targionia hypophylla</i> L. | • | • | • | • | • | • | • | • | | • | |
| <i>T. lorbeeriana</i> Müll.Frib. | | | | | • | • | | | | | |
| <i>Trichocolea tomentella</i> (Ehrh.) Dumort. | | • | | | | • | • | • | • | • | |
| <i>Tritomaria exsecta</i> (Schmidel) Loeske | | • | • | | | • | | • | | • | |
| <i>T. exsectiformis</i> (Breidl.) Loeske | | • | • | | • | | | • | | • | |
| <i>T. polita</i> (Nees) Jörg. | | | | | | | | • | | • | |
| <i>T. quinquedentata</i> (Huds.) H. Buch | • | • | | | | • | • | • | • | • | |
| <i>T. scitula</i> (Taylor) Jörg. | | • | | | | | | • | | | |
| Total SE Europe = 272 | 91 | 170 | 105 | 88 | 144 | 157 | 69 | 197 | 118 | 167 | 27 |
| Proportion from the total of SE European hepatic flora | 35.1 | 64.4 | 38.6 | 31.9 | 52.9 | 57.9 | 25.3 | 75.4 | 43.5 | 61.6 | 9.9 |
| Proportion from the total of European hepatic flora (SE Europe 59.9%) | 20.8 | 38.5 | 22.9 | 19.0 | 31.6 | 34.6 | 15.2 | 44.9 | 25.9 | 36.8 | 5.9 |

Appendix 1.

Major synonyms found in the bryological literature concerning SE Europe, with reference to the currently accepted names (in bold).

- Alicularia compressa* (Hook.) Nees = ***Nardia compressa***
Alicularia geoscypha De Not. = ***Nardia geoscyphus***
Alicularia scalaris (Schrader) Corda = ***Nardia scalaris***
Anastrophyllum myriocarpum (Carrington) Schust. ex Váňa = ***Eremonotus myriocarpus***
Aneura latifrons Lindb. = ***Riccardia latifrons***.
Aneura multifida (L.) Dumort. = ***Riccardia multifida***
Aneura palmata (Hedw.) Dumort. = ***Riccardia palmata***
Aneura sinuata (Dicks.) Dumort. = ***Riccardia chamedryfolia***
Anthoceros dichotomus Raddi = ***Phaeoceros bulbiculosus***
Anthoceros husnotii Steph. = ***Anthoceros punctatus***
Anthoceros laevis L. = ***Phaeoceros laevis***
Aplosia lanceolata (Schrad.) Dum. = ***Jungermannia leiantha***
Barbilophozia gracilis (Schleich. ex Steph.) = ***Barbilophozia attenuata***
Barbilophozia hatcheri (A. Evans) Loeske = ***Lophozia hatcheri***
Bazzania denudata auct. = ***Bazzania flaccida***
Calypogeia trichomanis auct. = ***Calypogeia azurea***
Cephalozeilla bifidioides Doiun = ***Cephaloziella rubella***
Cephalozeilla latzeliana Schiffn. = ***Cephaloziella divaricata***
Cephalozia affinis Lindb. ex Steph. = ***Cephalozia lunulifolia***
Cephalozia fluitans (Nees) Spruce = ***Cladopodiella fluitans***
Cephalozia lammerisiana (Huebener) F. Lees = ***Cephalozia bicuspidata***
Cephalozia media Lindb. = ***Cephalozia lunulifolia***
Cephaloziella limprichti Warnst. = ***Cephaloziella stellulifera***
Cephaloziella miriantha (Lindb.) Schiffn. = ***Cephaloziella rubella***
Cephaloziella papillosa (Douin) Schiffn. = ***Cephalozeilla divaricata***
Cephaloziella starkei (Funck.) Schiffn. = ***Cephaloziella divaricata***
Chiloscyphus fragilis (A. Roth) Schiffn. = ***Chiloscyphus pallescens***
Chiloscyphus polyanthos var. *pallescens* (Ehrh. ex Hoffm.) C. Hartm. = ***Chiloscyphus pallescens***
Chiloscyphus rivularis (Schrad.) Hazsl. = ***Chiloscyphus polyanthos***
Clevea hyalina (Sommerf.) Lindb. = ***Athalamia hyalina***
Corsinia marchantioides Raddi = ***Corsinia coriandrina***
Crossocalyx hallerianus (Nees ex Lindenb.) Meyl. = ***Anastrophyllum hallerianum***
Dichyton calyculatum (Durieu & Mont.) Schiffn. = ***Cephaloziella calyculata***
Eucalix hyalinus (Lyell.) Breidl. = ***Jungermannia hyalina***.
Eucalix obovatus (Nees) Breidl. = ***Jungermannia obovata***
Eucalyx subellipticus (Lindb. ex Kaal.) Breidl. = ***Jungermannia subelliptica***
Fegatella conica Corda ex Opiz = ***Conocephalum conicum***
Fimbriaria lindenberghiana Corda ex Nees = ***Asterella lindenberghiana***
Fimbriaria pilosa Taylor = ***Asterella gracilis***
Fossombronia loitlesbergi Schiffn. = ***Fossombronia wondraczekii***
Fossombronia verrucosa Lindb. = ***Fossombronia caespitiformis***
Frullania illyrica Grolle = ***Frullania inflata***

Continuation *Appendix 1.*

- Frullania nervosa* Mont. = ***Frullania tamarisci***
Grimaldia dichotoma Raddi = ***Mannia androgyna***
Grimaldia fragrans (Balbis) Corda = ***Mannia fragrans***
Grimaldia pilosa (Hornem.) Lindb. = ***Mannia pilosa***
Grimaldia rupestris (Nees) Lindb. = ***Mannia triandra***
Haplozia atrovirens (Schleich.) Dumort. = ***Jungermannia atrovirens***
Haplozia crenulata (Mitt.) Müll.Frib. = ***Jungermannia gracilima***
Haplozia pumila (With.) Dumort. = ***Jungermannia pumila***
Haplozia riparia (Taylor) Dumort. = ***Jungermannia atrovirens***
Haplozia schiffneri Loitl. = ***Jungermannia polaris***
Haplozia sphaerocarpa (Hook.) Dumort. = ***Jungermannia sphaerocarpa***
Isopaches decolorans (Limpr.) Buch = ***Lophozia decolorans***
Jungermannia atrovirens Dumort. = ***Jungermannia lanceolata***
Jungermannia crenulata Sm. = ***Jungermannia gracillima***
Jungermannia eucordifolia Schljak. = ***Jungermannia exsertifolia* ssp. *cordifolia***
Jungermannia karlmuelleri Grolle = ***Jungermannia pumila***
Jungermannia lanceolata auct. = ***Jungermannia leiantha***
Jungermannia pendletonii (Pearson) A. Evans = ***Jungermannia exsertifolia* subsp. *cordifolia***
Leiocolea mülleri (Nees ex Lindb.) Dumort. = ***Leiocolea collaris***
Leiocolea obtusa (Lindb.) H. Buch = ***Lophozia obtusa***
Lejeunea ulicina (Taylor) Gottsche & al. = ***Microlejeunea ulicina***
Lepidozia setacea (Web.) Mitten = ***Kurzia pauciflora***
Leptoscyphus anomalus (Hook.) Lindb. = ***Mylia anomala***
Leptoscyphus taylori (Hook.) Mitt. = ***Mylia taylorii***
Lophocolea alata Mitt. ex Larter = ***Lophocolea bidentata***
Lophocolea cuspidata (Nees) Limpr. = ***Lophocolea bidentata***
Lophozia kiaeri Jörg. = ***Lophozia excisa***
Lophozia porphyroleuca auct. = ***Lophozia longiflora***
Lophozia alpestris (Schleich.) Evans = ***Lophozia polaris***
Lophozia attenuata (Mart.) Dumort. = ***Barbilophozia attenuata***
Lophozia bantriensis (Hook.) Steph. = ***Leiocolea bantriensis***
Lophozia barbata (Scmidel ex Schreb.) Dumort. = ***Barbilophozia barbata***
Lophozia collaris (Nees) Dumort. = ***Leiocolea collaris***
Lophozia confertifolia Schiffn. = ***Lophozia wenzelii***
Lophozia ehrhartiana (F. Weber) Inoue & Steere = ***Lophozia ventricosa***
Lophozia floerkei (F. Weber & D. Mohr) Loeske = ***Barbilophozia floerkei***
Lophozia guttulata (Lindb.) Evans = ***Lophozia longiflora***
Lophozia heterocolpos (Thed. ex Hartm.) Howe = ***Leiocolea heterocolpos***
Lophozia lycopodioides (Wallr.) Cogn. = ***Barbilophozia lycopodioides***
Lophozia mülleri (Nees) Dumort. = ***Leiocolea collaris***
Lophozia quadriloba (Lindb.) Evans = ***Barbilophozia quadriloba***
Lophozia quinquedentata (Huds.) Cogniaux = ***Tritomaria quinquedentata***
Lophozia silvicola H. Buch = ***Lophozia ventricosa***
Lophozia turbinata (Raddi) Steph. = ***Leiocolea turbinata***
Madotheca baueri Schiffn. = ***Porella baueri***
Madotheca cordeana (Huebener) Dumort. = ***Porella cordeana***
Madotheca lavigata (Schrad.) Dumort. = ***Porella arboris-vitae***

Continuation **Appendix 1.**

- Madotheca platyphylla* (L.) Dumort. = ***Porella platyphylla***
Madotheca platyphylloidea (Schwein.) Dumort. = ***Porella platyphylla***
Mannia dichotoma Udar & V. Chandra = ***Mannia androgyna***
Mannia rupestris (Nees) Frye & L. Clark = ***Mannia triandra***
Marsupella aquatica (Lindenb.) Schiffn. = ***Marsupella emarginata***
Marsupella pygmaea (Limpr.) Steph. = ***Marsupella funckii***
Marsupella varians (Lindb.) Müll.Frib. = ***Marsupella brevissima***
Marsupella hungariaca Boros & Vajda = ***Marsupella funckii***
Marsupella ustulata Spruce = ***Marsupella sprucei***
Metzgeria pubescens (Schrank) Raddi = ***Apometzgeria pubescens***
Neesiella pilosa (Horn.) Schiffn. = ***Asterella gracilis***
Neesiella rupestris (Nees) Schiffn. = ***Mannia triandra***
Orthocaulis floerkei (Web. & Mohr.) Buch. = ***Barbilophozia floerkei***
Oxymitra paleacea Bosch. ex Lindenb. = ***Oxymitra incrassata***
Pellia borealis Lorb. = ***Pellia epiphylla***
Pellia fabbroniana auct. = ***Pellia endiviifolia***
Peltolepis grandis Lindb. = ***Peltolepis quadrata***
Plagiochila major (Nees) S.W. Arnell = ***Plagiochila asplenoides***
Plectocolea hyalina (Lyell) Mitt. = ***Jungermannia hyalina***
Plectocolea obovata (Nees) Mitt. = ***Jungermannia obovata***
Porella laevigata (Schrad.) Lindb. var. *thuja* Nees = ***Porella obtusata***
Porella platyphylloidea (Schwein.) Lindb. = ***Porella platyphylla***
Preissia commutata Nees = ***Preissia quadrata***
Riccardia sinuata (Hook.) Trev. = ***Riccardia chamaedryfolia***
Riccardia pinguis (L.) S. Gray = ***Aneura pinguis***
Riccia bischoffi Hüb. = ***Riccia ciliifera***
Riccia commutata J.B. Jack ex Levier = ***Riccia warnstorffii***
Riccia henriquesii Lev. = ***Riccia bicarinata***
Riccia intumescens (Bisch.) Underw. = ***Riccia crinita***
Riccia latzeli Schiffn. = ***Riccia ciliifera***
Riccia levieri Schiffn. = ***Riccia beyrichiana***
Riccia minima L. = ***Riccia sorocarpa***
Riccia raddiana J.B. Jack & Levier = ***Riccia sorocarpa***
Riccia trichocarpa M. Howe = ***Riccia crinita***
Scapania dentata Dumort. = ***Scapania undulata***
Scapania obscura (H. Arn. & C. Jens.) Schiffn. = ***Scapania subalpina***
Solenostoma atrovirens (Dumort.) Müll.Frib. = ***Jungermannia atrovirens***
Solenostoma caespiticium (Lindenb.) Steph. = ***Jungermannia caespiticia***
Solenostoma cordifolium (Dumort.) Steph. = ***Jungermannia exsertifolia* ssp. *cordifolia***
Solenostoma crenulatum Mitt. = ***Jungermannia gracillima***
Solenostoma gracillimum (Sm.) R.M. Schust. = ***Jungermannia gracillima***
Solenostoma oblongifolium (Müll.Frib.) Müll.Frib. = ***Jungermannia pumila***
Solenostoma polare (Lindb.) R.M. Schust. = ***Jungermannia polaris***
Solenostoma pumilum (With.) Müll.Frib. = ***Jungermannia pumila***
Solenostoma schiffneri (Loitl.) Müll.Frib. = ***Jungermannia polaris***
Solenostoma sphaerocarpoideum (De Not.) Paton & E.F. Warb. = ***Jungermannia atrovirens***
Solenostoma sphaerocarpum (Hook.) Stef. = ***Jungermannia sphaerocarpa***

Continuation **Appendix 1.**

Solenostoma sphaerocarpum (Hook.) Steph. = ***Jungermannia sphaerocarpa***
Solenostoma triste (Nees) Müll.Frib. = ***Jungermannia atrovirens***
Southbya stilicidiorum (Raddi) Lindb. = ***Southbya tophacea***
Sphaerocarpos terrestris Sm. = ***Sphaerocarpos michelii***
Sphenobolus exsectus (Schmid.) Steph. = ***Tritomaria exsecta***
Sphenobolus hallerianus (Nees) Steph. = ***Anastrophyllum hallerianum***
Sphenobolus politus (Nees) Steph. = ***Tritomaria polita***
Sphenobolus hallerianus (Nees ex Lindenb.) Steph. = ***Anastrophyllum hallerianum***
Sphenobolus michauxii (Wes.) Steph. = ***Anastrophyllum michauxii***
Sphenobolus minutus (Schreb.) Berggr. = ***Anastrophyllum minutum***
Teeselina pyrmidata Dumort. = ***Oxymitra incrassata***

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