Abstract

During investigations into four regions of Montenegro (Rumija Mts, Lovćen Mts, the coastal area around Kotor, Durmitor National Park) and one of Serbia (Stara Planina Mts) carried out in 2003-2005, 28 bryophyte taxa new to Montenegro and 22 new to Serbia were collected. Two of these, Cynodontium gracilescens and Pohlia nutans subsp. schimperi, are new to the Balkan peninsula and four additional species were not known to occur in the whole territory of former Yugoslavia: Encalypta microstoma, Grimmia dissimulata, G. torquata, and Orthotrichum urnigerum. An annotated catalogue of the new records is presented, including notes on substrates and associated bryophytes. Bryogeographic relations are discussed with reference to some ecological characteristics of the regions investigated.

Key words: Musci, Hepaticae, Balkan peninsula, bryoflora, bryophyte ecology, bryogeography.

Introduction

Within the last decades, former Yugoslavia has undergone a process of political transformation, which resulted in the formation of several new entities within the former federal territory. As a consequence of these changes, recent bryoflora have now to bear reference to these smaller geographical units, whereas formerly such works treated the whole of Yugoslavia (e.g. Pavletić 1955). As far as Montenegro and Serbia are concerned, Sabovljević & Stevanović (1999) and Sabovljević (2000a) have achieved the task of compiling first checklists of bryophytes on the basis of records published between 1923 and 1998. Since these regions were not in the focus of bryologists, the species catalogue in these compilations must necessarily be rather incomplete. This is clearly demonstrated by the large numbers of taxa new to Montenegro and Serbia that were published recently on the basis of field research (Sabovljević 1998, 1999, 2000b, 2002, 2003a-b, Sabovljević & Stevanović 2000a-b, Sabovljević & al. 1999, Milikić & al. 2001, Papp & Sabovljević 2001, 2002, Papp & al. 2004, Papp & Erzberger 2005, Pócs & al. 2004, Sabovljević & Cvetić 2001, 2003, Cvetić & Sabovljević 2005, Grdović 2005, Dragicević 2004, Dragicević & al. 2001, 2003, Veljić & al. 2001, Martinčić 2006). Parts of these records have been incorporated into more recent checklists (Dragičević & Veljić 2006, Sabovljević & Natcheva 2006).
The present paper represents another contribution towards the knowledge of the bryophyte floras of Montenegro and Serbia. Resulting from field work organized by the Hungarian Natural History Museum in Budapest and, in part, jointly with the Institute for Protection of Nature in Serbia, 28 taxa new to Montenegro and 22 new to Serbia are enumerated and discussed.

Study area

The Rumija Mts, as well as the Lovćen Mts, form part of the Dinaric range and are made up of Triassic and Jurassic limestone. The Rumija Mts are situated between the Mediterranean coast and Lake Skadar near the border to Albania. Maximum elevation is 1593 m.

The Lovćen Mts are protected as a national park, covering 64 km². They extend from 985 m to 1749 m altitude. In these mountain ranges, Mediterranean climate meets the moderately continental climate of the mountain belt. The carboniferous rocks of the Lovćen Mts give rise to many karst formations.

The coastal area of Kotor Bay is on the UNESCO List of Cultural and Natural Heritage. It covers the narrow strip between the sea and the adjacent mountain belt. The climate is Mediterranean with dry, sunny summers and high levels of precipitation during winter.

Durmitor National Park (established in 1978, and also on the UNESCO List of World Natural Heritage) is situated in the NE of Montenegro near Žabljak, the highest town of the Balkan peninsula at 1450 m. It covers an area of 320 km² and comprises the central part of the Durmitor massif as well as part of the canyon of the river Tara. The bedrock is made of Triassic and Jurassic limestone deposits over 2000 m thick in the western part of the massif, giving rise to rugged peaks (highest elevation Bobotov Kuk, 2523 m), and of Cretaceous limestone in the northern and eastern part, there forming a landscape of rounded domes and broader valleys. The climate is characterized by winters with much snow and cool summers (average monthly temperatures of January: -5.4 °C, of July: 13.2 °C), and annual precipitation varying between 1500 mm and 1750 mm according to elevation (Cerović 1986).

The Stara Planina Mts in SE Serbia at the border to Bulgaria are made up mostly of Permian red sandstone and schists, and Mt Midžor (2169 m) is one of the highest elevations of Serbia. They are the westernmost extension of the Balkan mountain range and the area of a planned nature park and a biosphere reserve. They are also the object of an agreement of cooperation between ministries of Bulgaria and Serbia for the formation of a transboundary protected area (Mandić 1999).

Material and methods

The field excursions on which the present paper is based were carried out in October 2003 (Montenegro: Rumija Mts, Lovćen Mts and Bay of Kotor), October 2004 (Montenegro: Durmitor Mts and Tara Canyon) and July 2005 (Serbia: Stara Planina). The complete floristic results of these investigations will be published elsewhere. The data were evaluated on the basis of the checklists and reports on new records mentioned in the introduction. Concerning distribution in former Yugoslavia, Düll & al. (1999) was also consulted.

Nomenclature of liverworts follows Söderström & al. (2002), that of mosses Hill & al. (2006). Specimens collected by the first author are kept in the herbarium Berlin-Dahlem (B), those collected by the second author are deposited in the herbarium of the Hungarian Natural History Museum in Budapest (BP).

The map shows the location of the areas investigated (Fig. 1).

Site details

03-03. Montenegro, between Nikšić and Podgorica, 1-2 km before the road to Zagorak, 275 m, 42°37′50.9″N, 19°00′34.1″E, 7.10.2003.

03-04. Montenegro, Rumija Mts, at Lake Skadar, at Vučedabici village near Virpazar, 458 m, 42°07′40.1″N, 19°13′28.7″E, 8.10.2003.
03-07. Montenegro, Rumija Mts, at Vladimir village near Sasko jezero, maquis, 28 m, 41°59'12.4"N, 19°19'29.4"E, 8.10.2003.
03-08. Montenegro, Rumija Mts, near Limljani village, at a stream, 557 m, 42°10'14.4"N, 19°06'17.7"E, 9.10.2003.
03-09. Montenegro, Rumija Mts, at the mountain pass along the road from Virpazar to Bar, around the ruins of a castle, and at mountains above, 910-1164 m, 42°09'27.8"N, 19°06'37.3"E, and 42°09'33.7"N, 19°06'42.4"E, 9.10.2003.
03-11. Montenegro, at the northwestern part of Lake Skadar, near Mihaljevići village, 110-135 m, 42°18'13.6"N, 19°02'56.6"E and 42°19'05.9"N, 19°02'59.4"E, 10.10.2003.
03-13. Montenegro, at the northwestern part of Lake Skadar, at Rijeka Crnojevića village, 10 m, 42°21'10.1"N, 19°02'07.9"E, 10.10.2003.
03-14. Montenegro, Lovćen Mts, near Njeguši village, along the road to the Mausoleum of Njegoš, Fagetum, 1030 m, 42°25'18.2"N, 18°48'20.8"E, 11.10.2003.
03-16. Montenegro, Lovćen Mts, along the road from Njeguši village to the Mausoleum of Njegoš, at a stream, 1300 m, 42°22'50.8"N, 18°49'37.0"E, 11.10.2003.
03-17. Montenegro, Lovćen Mts, near Dolovi village, 1255 m, 42°22'17.5"N, 18°49'24.1"E, 11.10.2003.
03-19. Montenegro, on the peninsula west of Kotor, near Trojica fortress, maquis at a southwest facing slope, 290 m, 42°24'23.5"N, 18°45'22.8"E, 12.10.2003.
03-20. Montenegro, Lovćen Mts, along the road from Njeguši village to Kotor, 350-370 m, 42°23'57.6"N, 18°46'12.5"E and 42°23'50.1"N, 18°45'59.6"E, 13.10.2003.
03-23. Montenegro, along the road from Kotor to Perast, at the pension Stari Mlini before Perast, stream, 0-10 m, 14.10.2003.

04-01. Montenegro, Durmitor Mts, Durmitor NP, Žabljak, between Crno jezero and Poljana, Piceo-Abietum, limestone, 1421 m, 43°08'52.0"N, 19°05'48.0"E, 5.10.2004.

04-02. Montenegro, Durmitor Mts, Durmitor NP, Žabljak, between Crno jezero and Poljana after the path to Meded, grasslands, limestone, 1566 m, 43°07'59.0"N, 19°06'00.8"E, 5.10.2004.

04-06. Montenegro, Durmitor Mts, Durmitor NP, Žabljak, on the bank of Crno jezero and rivulet from Ivan do, 1430 m, 43°08'56.6"N, 19°05'41.5"E, 7.10.2004.

04-07. Montenegro, Durmitor Mts, Durmitor NP, Žabljak, Mlinski potok, 1434 m, 43°08'58.2"N, 19°05'23.8"E, 7.10.2004.

04-09. Montenegro, Durmitor Mts, Durmitor NP, Žabljak, between Momčilov grad restoran and Jablan bara, limestone, 1808 m, 43°10'00.0"N, 19°03'51.3"E, 8.10.2004.

04-12. Montenegro, Durmitor Mts, Durmitor NP, Žabljak, Barno jezero, peat wetland, 1506 m, 43°09'19.6"N, 19°05'25.8"E, 10.10.2004.

04-14. Montenegro, Durmitor Mts, Durmitor NP, Žabljak, between Momčilov grad and Titova peć, 1449 m, 43°08'31.7"N, 19°05'07.7"E, 10.10.2004 & 12.10.2004.


05-01. Serbia, Stara Planina, Babin Zub, Fagetum at the basis of great rocks, Permian red sandstone, 1581 m, 43°22'28.8"N, 22°36'59.1"E, 25.6.2005.


05-03. Serbia, Stara Planina, Babin Zub, open subalpine grassland and rock outcrops, Permian red sandstone, 1741 m, 43°22'16.8"N, 22°36'46.5"E, 25.6.2005.


05-05. Serbia, Stara Planina, Babin Zub, road to Jabučko ravnište, 1581 m, 43°22'28.8"N, 22°36'59.1"E, 25.6.2005.

05-07. Serbia, Stara Planina, valley of Crnovska reka, above Balta Berilovac, black schistose sandstone, 488 m, 43°24'03.3"N, 22°29'44.0"E, 27.6.2005.

05-11. Serbia, Stara Planina, between Babin Zub and Midžor, subalpine grassland with sandstone rock outcrops and small temporary streams, 1593 m, 43°22'45.1"N, 22°37'39.5"E, 28.6.2005.

05-12. Serbia, Stara Planina, between Babin Zub and Midžor, 1812 m, 43°23'37.5"N, 22°38'00.4"E, 28.6.2005.


05-14. Serbia, Stara Planina, valley between Babin Zub and the village Topli Dol, Rekitska gora, Fagetum, 1396 m, 43°22'05.6"N, 22°37'50.3"E, 29.6.2005.

05-16. Serbia, Stara Planina, between Babin Zub and Midžor, at the peak of Tupanar, temporary small pool in subalpine grassland, 1903 m, 43°24'00.9"N, 22°38'55.5"E, 30.6.2005.

**Results and discussion**

Fifty bryophyte taxa representing new national records to Montenegro or Serbia were collected. Two taxa are new to the Balkans: *Cynodontium gracilescens* and *Pohlia nutans* subsp. *schimperi*. Another four species are new to the whole territory of former Yugoslavia, but do occur in Bulgaria or Greece. These are *Eucalypta microstoma*, *Grimmia dissimulata*, *G. torquata* and *Orthotrichum urnigerum*. 28 records are new to Montenegro and 22 records new to Serbia. An additional four records could be new records to Serbia as well, but due to ambiguities or
doubtful records in the literature, this is not evident at present. In any case, our results contribute to clarifying the situation.

Although a bryogeographical evaluation of our floristic inventory will be published elsewhere, some remarks on the geographical relations of the new records seem to be appropriate.

Not unexpectedly, bryophytes of (sub)Mediterranean affinity were collected in Montenegro, in the coastal area between Kotor and Herceg-Novi (Scorpiurium deflexifolium, S. sendneri, Weissia longifolia var. angustifolia), or in the Rumija and Lovćen Mts not far inland (Fossombronia pusilla, Frullania inflata var. illyrica, Dicranella howei, Schistidium brunescens subsp. griseum, Syntrichia handelii). On the other hand, shaded calcareous rocks in karstic depressions (dolinas) of the Lovćen Mts are home to some boreal-montane species such as Barbilophozia barbata, Scapania nemorea, Ditrichium gracile and Orthothecium intricatum. With the exception of Scapania nemorea, these were also collected in Durmitor.

The number of new records resulting from our first Montenegrine excursion is exceeded by that of our collecting trip to Durmitor National Park, Montenegro. Diversity of bryophytes, especially taxa of boreal and montane affinities, is very high in this area due to the presence of a great number of suitable biotopes. The rich fen vegetation of Barno jezero deserves special mention, with noteworthy records of Riccardia multifida, six species of Sphagnum (S. fallax, S. inundatum, S. russowii, S. subsecundum, S. subnitens, S. teres), Tometypnum nitens, Scorpidium cossonii (the latter probably recorded earlier as S. (= Drepanocladus) revolvens) and Straminergon stramineum. Other bryophytes we observed at this fascinating site, such as Pseudocalliergon trifurium, Dicranum bognerianum, Hamatocaulis vernicosus, Scorpidium scorpioides, Sphagnum subnitens, had already been reported by Birks & Walters (1972) in their study of the vegetation of Barno jezero. Under the prevailing climate, montane coniferous forest with a high proportion of rotting wood is a different type of biotope rich in bryophytes, among them three species hitherto undetected: Cephalozia lunulifolia, Lophozia incisa, Fissidens gymnandrus. Another epixylic species with strong populations in Durmitor, Buxbaumia viridis, is of special conservation interest. Climate, and obviously microclimate, in the vicinity of lakes (Crno jezero) and streams create optimal conditions for the development of epiphytic vegetation on coniferous and broad-leaved trees, especially old beech and sycamore, with Antitrichia curtipendula, Ulota crispa and many species of Orthotrichum; Frullania fragilifolia (on Abies) was not previously recorded. Of the rich bryoflora of calcareous rocks and soils, the dominant type of substrate in Durmitor massif and Tara canyon, the following species (five of them representing new records) deserve special mention: Leicolea bantriensis, Barbula crocea, Campylium thalictroides, C. halleri, Ditrichum gracile, Earlyynchium angustirete, Orthothecium intricatum, Schistidium robustum, Seligeria pusilla, Timmia austriaca, T. bavarica. The rare occurrence of subneutral soils enables the growth of some bulbiliferous species of Pohlia: P. andalusica, P. annotina, P. camptotrachela, P. proliger a, a group of species obviously neglected in the region.

Nearly one half of our new records comes from the Stara Planina Mts in S Serbia. Since this area is one of the highest mountain regions of Serbia, it is not surprising that many taxa of (sub)boreal affinities were found: Gymnomitron concinnatum, Leiocolea heterocolpos, Cynodontium gracielescens, Dicranum spadiceum, Encalypta microstoma, Grimmia elatior, G. unicolor, Hymnnum hamulosum, Pohlia longicolla, P. nutans subsp. schimperi, Timmia bavarica.

Even more taxa belong to boreal and montane elements: Tritomaria exsecta, Bryum neodamense, Cynodontium strumiferum, Grimmia torquata, Hymnnum capressiforme var. subjulacea, Lescurea saxicola, Orthotrichum urnerianum, Paraleucobryum sauteri, Racotritium lanuginosum, Schistidium confertum, S. papillosum. Gymnocoela inflata and Radula lindenbergiana represent the northern or montane suboceanic element. Sub-Mediterranean species were collected in the subalpine region (Riccia gougetiana) or in a valley (Tortula atrovirens), together with other species of similar geographical affinities, e.g. Crossidi um squamiferum.

Our records from Stara Planina show a high proportion of taxa not previously known from Serbia, some are even new to the whole territory of former Yugoslavia or the Balkans. This fact underlines the importance of this bryologically rich area as a meeting point of southern and northern elements and emphasizes the necessity of preferably international conservation measures.
Catalogue of bryophytes new to Montenegro or Serbia

Liverworts and mosses are listed separately, each in alphabetical order. Numbers in brackets following the number of the locality are the authors’ collection numbers (the second author’s numbers are preceded by “BP”). After the data on substrates and associate bryophytes, information on the distribution of the taxa in surrounding countries is quoted from Düll & al. (1999) for former Yugoslavia and from Ganeva & Natcheva (2003) and Natcheva & Ganeva (2005) for Bulgaria (only for the records from Stara Planina). For distribution in Montenegro and Serbia, Sabovljević & Stevanović (1999) and Sabovljević (2000a) and more recent reports (see introduction) are also consulted. Flora element and general distribution are given according to Hill & Preston (1998) or other sources (Blom 1996, Düll 1983, 1984, 1985, Düll & al. 1999, Nyholm 1998, Smith 2004).

Records new to Montenegro or Serbia are denoted by ME or RS, respectively; brackets indicate that there have been previous doubtful reports or that the literature is not unequivocal. Geographical abbreviations (according to ISO 3166-1): BG = Bulgaria, BA = Bosnia and Herzegovina, ME = Montenegro, HR = Croatia, MK = Macedonia, RS = Serbia, SI = Slovenia.

Hepaticae

ME – Barbilophozia barbata (Schreb.) Loeske – Lovčen 03-14 (BP48951/H, 9791, 9808) on soil and on calcareous stones at the edge of beech forest, with Hypnum cupressiforme, Pseudoscleropodium purum, Campyliadelphus chrysophyllus, Fissidens dubius, Homalothecium lutescens; Durmitor 04-01 (10424a), 04-17 (10718) on soil at banks of lakes Crno Jezero and Mali Crno Jezero, with Bartramia ithyphylla, Brachytheciastrum velutinum, Saelania glaucescens; BA, HR, MK, RS, SI; boreal-montane circumpolar

ME – Cephalozia lunulifolia (Dumort.) Dumort. – Durmitor 04-01 (10357) on rotten wood, with Plagiothecium laetum var. curvifolium, Nowellia curvifolia, Riccardia palmata, Scauthorium umbrosa, Blepharostoma trichophyllum subsp. trichophyllum; BA, HR, RS, SI; in Serbia only recently found in the Golija Mts (Papp & Erzberger 2005); boreo-temperate circumpolar

ME – Cephalozia divaricata (Sm.) Schiffn. – Rumija 03-07 (BP48952/H), 03-19 (9853, BP48953/H) on soil in maquis; Durmitor 04-09 (10542) on soil overlying siliceous rock, with Pogonatum aloides, Pohlia annotina, Ditrichum heteromallum, Ceratodon purpureus; BA, HR, MK, RS, SI; in Serbia only recently found in the Golija Mts (Papp & Erzberger 2005); boreo-temperate circumpolar

ME – Fossombronia pusilla (L.) Nees – Rumija 03-04 (9712) on soil at the edge of Quercus forest, with Reboulia hemisphaerica, Entosthodon pulchellus; HR, RS, SI; Mediterranean suboceanic

ME – Frullania fragilifolia (Taylor) Gottsche & al. – Durmitor 04-12 (10588) conf. Váňa, on the bark of young Abies, with Ptyelidium pulcherrimum; BA, HR, RS, SI; temperate suboceanic

ME – Frullania inflata var. illyrica (Grolle) R. M. Schust. – Rumija 03-09 (BP48954/H), Lovčen 03-20 (9861) conf. Váňa, on calcareous rock near temporary creek; Düll (1983): relictual Mediterranean-montane; var. inflata: relictual sub-Mediterranean-montane. Frullania inflata var. illyrica was known as an Albanian endemic (Bisang & al. 1988) and differs from the typical variety by fewer and larger oil bodies, but this character was considered by Grolle & Long (2000) to be variable and therefore var. illyrica was synonymized with var. inflata. Our material shows the characteristics of var. illyrica and we prefer this name pending further research. In Europe, F. inflata is known from seven countries (Albania, Austria, Czech Republic, Hungary, Italy, Slovenia). It was rated vulnerable (Schumacker & Martigny 1995), but is presently considered near threatened only, since about 15 recent localities are known from Austria (Váňa 2001) and a new locality has also been detected in Hungary (Papp & Erzberger 2006). The present record is therefore very significant on a European scale.
RS – Gymnocolea inflata (Huds.) Dumort. – Stara Planina 05-03 (10922d) det. Váňa, on outcrops of sandstone in open subalpine grassland, with Grimmia funalis and G. hartmanii; SI; northern-suboceanic disjunct holarctic

RS – Gymnomitron concinnatum (Lightf.) Corda – Stara Planina 05-02 (BP48945/H, 10907, 10919) conf. Váňa, 05-03 (BP48946/H) on vertical faces of shaded, moist sandstone rock in fissures and between boulders in block scree, with Heterocladium dimorphum, Andreea rupestris, Pseudolekea radiocosa, Sciurop-hynum reflexum, Marsupella sp.; BG (from adjacent W Stara Planina), SI; arctic-montane circumpolar

ME – Junggermannia gracillima Sm. – Durmitor 04-02 (10423) conf. Váňa, on soil, with Pohlia andalusica; BA, HR, RS, SI; boreo-temperate European

RS – Junggermannia pumila With. – Stara Planina 05-04 (10952) det. Váňa, on irrigated sandstone in stream, with Radula complanata, Lejeunea cavifolia and Platyhypnidium riparioides; BG, BA, ME, SI; western-temperate montane disjunct holarctic

ME – Lophocolea minor Nees – Lovčen 03-17 (BP48955/H) on soil among limestone rocks; reported from all other SE European countries except of the European part of Turkey (Sabovljević & Natcheva 2006); subcontinental disjunct-holarctic (-bipolar)

ME – Lophozia incisa (Schrad.) Dumort. – Durmitor 04-06 (10472), 04-17 (10635) on rotten wood, with Blepharostoma trichophyllum subsp. trichophyllum, Lepidozia rexpons, Herzogiella seligeri, Leiocolea heterocelpos; BA, HR, RS, SI; boreal-montane circumpolar

RS – Radula lindenbergiana Gottsche ex C. Hartm. – Stara Planina 05-02 (BP48949/H) conf. Váňa, on vertical faces of shaded, moist, sandstone rock; BG, HR, ME, SI; suboceanic (-sub-Mediterranean)-montane holarctic-African

ME – Riccia multifida (L.) Gray – Durmitor 04-12 (10597) conf. Váňa, in calcareous rich fen, with Pseudocalliergon trifarium, Bryum pseudotriquetrum, Scorpidium cossontii, Campylium stellatum var. stellatum; BA, HR, RS, SI; boreo-temperate circumpolar

RS – Riccia gougétiana Durieu & Mont. – Stara Planina 05-11 (BP48950/H, 11022) conf. Váňa; on soil between sandstone rock outcrops in subalpine grassland, with Polytrichum juniperinum, Ceratodon purpureus; BG, HR, MK; sub-Mediterranean European W Central Asia African

RS – Trichomaria exsecta (Schmiedel) Loeske – Stara Planina 05-02 (10918/II, 10918b) conf. Váňa, on shaded sandstone rock, with Scapania aspera, Plagiozygium zierii, Anomodon rugelii, Ctenidium molluscum, Fissidens dubius, Grimmia funalis, G. torquata, Radula complanata, Lejeunea cavifolia, Distichium capillaceum, Campylium stellatum var. stellatum, 05-03 (10928, 10929) on sandstone rock outcrops in alpine meadow, with T. quinquedentata, Dicranum scoparium, Raccontrium lanuginosum, Pohlia nutans subsp. nutans, Polytrichastrum formosum, 05-12 (11043, 11055) on wind-swept ridge of sandstone rock, with T. quinquedentata, Anastrophyllum minutum, Hypnum cupressiforme, Plagiochila pelloroides, Ditrichum gracile, Isotrichium alopecuroides, Polytrichastrum alpinum, Pohlia nutans subsp. schimperi, Cynodontium strumiferum, Amphidium mugeotii, also collected in Bulgaria near the Serbian border (11077) in similar habitat and with similar associates; BG (Pirin Mts), BA, HR, SI; boreal-montane circumpolar

Musei

ME – Barbula crocea (Brid.) F. Weber & D. Mohr – Durmitor 04-22 (10688) on wet calcareous rocks in Tara canyon close to the river, with Preissia quadrata, Leiocolea alpestris, Campylium stellatum calcareum; BA, HR, RS, SI; sub-oceanic pre-alpine; European N African

RS – Bryum neodamense Itzigs. – Stara Planina 05-16 (BP173098) on the bank of a small pool with Warnstorffia exannulata, Aulacomnium palustre, Polytrichastrum formosum and Ceratodon purpureus; in Bulgaria known only from the Vitosha Mts (Natcheva & Ganeva 2005); HR, SI; boreal-montane circumpolar

RS – Cynodontium gracilescens (F. Weber & D. Mohr) Schimp. – Stara Planina 05-06 (BP173099) on shaded sandstone rock with Cynodontium tenellum, Encalypta ciliata, Dicra-
noweisia crispula and Brachytheciastrum velutinum; not known from Bulgaria (Natcheva & Ganeva 2005); not known in former Yugoslavia (Düll & al. 1999); arctic-alpine (Nyholm 1987). New to the Balkan Peninsula (Düll 1984).

RS – Cynodontium strumiferum (Hedw.) Lindb. – Stara Planina 05-12 (11045, 11048, 11055, 11067) all c. spg., on siliceous rock at wind-swept ridge, with Mnium thomsonii, Plagiochila pellioideae; Barbilophozia hatcheri, Dicranum scoparium, Sanionia ancinata, Tritomaria exsecta, T. quinquedentata, Amphidium mugeoetii, Pohlia nutans subsp. nutans, Blepharostoma trichophilum subsp. trichophilum; BG (Rila Mts), SI; boreo-arctic montane circumpolar

RS – Dicranum spadiceum J. E. Zetterst. – Stara Planina 05-12 (11050, 11058a) on siliceous rocks at wind-swept ridge, with Barbilophozia lycopodioides, Plagiochila pellioideae, Tritomaria quinquedentata, Sciuro-hypnum reflexum, Heterocladium dimorphum, Hylocomium splendens, Polytrichastrum alpinum, Pseudoleskea incurvata; also near the border at Mt Midzor in Bulgaria (11081) in similar habitat and with similar accompanying bryophytes, additional associates are Pohlia cruda, Anastrophyllum minutum, Mnium thomsonii, Plagiothecium lacteum; BG (Rila Mts), SI (Julijske Alpe); subarctic alpine; holarctic

RS – Encalypta microstoma Bals.-Crv. & De Not. – Stara Planina 05-11 (BP173100, 11004, 11016, 11017), 05-12 (11052) always c. spg., on flat rock outcrops in subalpine pastures, with Barbilophozia hatcheri, Metzgeria furcata, Radula complanata, Pohlia cruda, P. nutans, Pterigynandrum filiforme, Plagiothecium cavidiofilum, Hypnum cupressiforme; BG (Rila Mts), not known from former Yugoslavia (Düll & al. 1999); very rare in higher mountains of Europe (Nyholm 1998)

ME – Fissidens gymnanthus Büse – Durmitor 04-01 (10412) on moist soil near spring, with F. taxifolius, 04-09 (10526 c. spg.), on subneutral soil, with Weissia brachcarpa, 04-17 (10637, 10640) on rotten wood and on tree root under overhanging rock, with Chiloscyphus pallescens, Bryoerythrophyllum recurvirostrum; BA, HR, SI (Pavletić 1955), subcontinental; European E Asian North American

ME – Grimmia dissimulata E. Maier – Rumija 03-04 (9713a) on calcareous rock, with Tortella nitida, Syntrichia laevipila, 03-08 (9737b,c), 03-09 (9776), 03-13 (9788) on calcareous rock, with G. pulvinata, Tortella tortuosa, Schistidium sp., Orthotrichum anomalum, Bryum capillare, Syntrichia montana, Pterogonium gracile; all det./conf. E. Maier; described recently (Maier 2002), distribution (E. Maier, in litt.): Africa: Morocco; Asia: Syria, Turkey; Europe: Austria, Belgium, Cyprus, France, Germany, Great Britain, Greece, Hungary, Italy, Spain, Switzerland; see also Porley (2004) and Erzberger & Papp (2004).

RS – Grimmia eliator Bruch ex Bals.-Crv. & De Not. – Stara Planina 05-02 (10912), 05-03 (BP173101, 10921, 10926), 05-11 (11033), 05-12 (11051, 11061) all conf. E. Maier, on rock outcrops in subalpine pastures, with Syntrichia ruralis, G. funalis, Ceratodon purpureus, Homalothecium phillippenanum, Racotritium lunginosum, R. canescens, also collected in Bulgaria near the border at Mt Midzor (11090) in similar habitat; BG (W Stara Planina), BA, SI; boreal-montane circumpolar

RS – Grimmia torquata Drumm. – Stara Planina 05-02 (10913a, 10918/VIII) at the base of Babin Zub sandstone rock in fissures, with G. funalis, Amphidium mugeoetii, Bartramia pomiformis, Dicranum scoparium, Scapania aequiloba, Tritomaria exsecta, Plagiobryum zierii, Anomodon rugelii, Ctenidium molluscum, Fissidens dubius; BG (central Stara Planina, Rila Mts), not known from former Yugoslavia (Düll & al. 1999); boreo-arctic montane European

RS – Grimmia unicolor Hook. – Stara Planina 05-13 (BP173102) on rock outcrops in subalpine pastures; BG (central Stara Planina, Rila Mts), BA; subarctic-alpine, holarctic

RS – Hypnum cupressiforme Hedw. var. subjulaceum Molendo – Stara Planina 05-02 (BP173103), 05-12 (11052) sandstone rock outcrops at wind-swept ledge, with H. cupressiforme var. cupressiforme, Radula complanata, Schistidium papillosum, Encalypta microstoma, Isothecium alopecuroideis, I. myosuroides var. myosuroides, Tortella tortuosa; also collected in Montenegro
recently: Durmitor 04-17 (10702) on calcareous rock with Encalypta ciliata; BG (Düll 1985), BA, ME, SI (Pavletić 1955); boreal-montane; holarctic (-bipolar)

RS – Hypnum hamulosum Schimp. – Stara Planina 05-12 (11054a) on sandstone rock at wind-swept ridge, with H. revolutum var. revolutum; Düll & al. (1999): “SI?; has to be verified”; arctic-montane circumpolar

(RS) – Lescurea saxicola (Schimp.) Molendo – Stara Planina 05-01 (BP173104) at the base of a sandstone rock in Fagetum, 05-06 (BP173105) on rock at the base of a Fagus tree; BG; it is not clear, whether the record from the Prokletije Mts published in Martinčić (2006) refers to RS or ME; not known from other regions of former Yugoslavia (Düll & al. 1999); boreal-montane circumpolar

RS – Orthotrichum urnigerum Myrin – Stara Planina 05-11 (11034) c. spg., in clefts of sandstone rock outcrops in subalpine greenlands, with Encalypta streptocarpa, Tortula hypopnea, Pseudoleskea catenulata, Leuchodon sciuroides, 05-14 (11071) c. spg., on rock near creek, with Schistidium apocarpum, Cirriphyllum crassinervium, Platyzypnum riparioides; BG (only a pre-1956 literature record from the Vitosha Mts), not known from former Yugoslavia (Düll & al. 1999); oceanic-montane (Düll 1985)

RS – Paraleucobryum sauteri (Bruch & Schimp.) Loeske – Stara Planina 05-02 (10891) on sandstone boulder in block scree under Fagus; BG (only a pre-1956 literature record from the Vitosha Mts), BA, ME, HR, SI; sub-continental montane; European W Asian North American

ME – Pohlia andalusica (Höhn.) Brot. – Durmitor 04-02 (10423), 04-09 (10524, 10548) on subneutral soil, with Jungermannia gracillima, P. camptotrachela, P. proligera, Ditrichum heteromallum; missing in Düll & al. (1999); recent records from Serbia are from the Kopaonik Mts (Papp & al. 2004) and the Golija Mts (Papp & Erzberger 2005), also collected in Stara Planina 05-11 (11042, BP173120) on open soil in subalpine pasture, with P. bulbifera; boreal-montane suboceanic

ME – Pohlia annotina (Hedw.) Lindb. – Stara Planina 05-11 (11042) on soil overlying siliceous rock, with Pogonatum aloides, Ditrichum heteromallum, Ceratodon purpureus, Cephalozia divaricata; BA, RS, SI; boreo-temperate European

RS – Pohlia bulbifera (Warnst.) Warnst. – Stara Planina 05-11 (11042) on open soil in subalpine pasture, with P. andalusica; HR, SI; boreo-temperate circumpolar

ME – Pohlia camptotrachela (Renauld & Cardot) Broth. – Durmitor 04-09 (10524) on open soil, with P. andalusica, P. proligera; BA, RS, SI; boreal-montane suboceanic

RS – Pohlia longicolla (Hedw.) Lindb. – Stara Planina 05-02 (BP173106), 05-12 (BP173107, 11053, 11060) on wind-swept sandstone rock, with P. cruda, Bartramia sp., conf. H. Köckinger, 05-16 (BP173108) on sandstone rock at a temporary small pool; BG (only a pre-1956 literature record from the Vitosha Mts), ME, SI; subarctic subalpine; holarctic (?-bipolar)

RS – Pohlia nutans subsp. schimperi (Müll. Hal.) Nyholm – Stara Planina 05-02 (BP173109), 05-11 (BP173110, 11040) on sandstone outcrops in subalpine pastures, 05-12 (11043, 11046) on sandstone rock at wind-swept mountain ridge, with Anastrophyllum minutum, Tritomaria exsecta, T. quinquadentata, Plagiochila pellioioides, Ditrichum gracile, Hypnum cupressiforme, Isothecium alopecuroides, Polystichastrum alpinum, conf. H. Köckinger, 05-16 (BP173119) on sandstone rock at a temporary small pool. This taxon was neglected in Central Europe, but has recently been published from Poland, Czech Republic and Austria (Köckinger & al. 2005). The present record represents a considerable extension of its area. New to the Balkan Peninsula.

ME – Pohlia proligera (Kindb.) Lindb. ex Broth. – Durmitor 04-09 (10524, 10548), 04-17 (10636) on open soil, with P. andalusica, P. camptotrachela, Ditrichum heteromallum; SI; boreal-montane European

ME – Polytrichum commune var. perigionale (Michx.) Hampe – Durmitor 04-12 (10630) in rich fen, with Aulacornium palustre, Straminergon stramineum, Sphagnum subnitens; re-
cent record from Serbia in Papp & Erzberger (2005); HR, MK, RS, SI, subboreal; holarctic (-bipolar)
RS – *Racomitrium lanuginosum* (Hedw.) Brid. – Stara Planina 05-02 (*BP173111, 10904*) in block scree, 05-03 (*10928*) on sandstone rock outcrops in alpine meadow, with *Dicranum scoparium*, *Tritomaria exsecta, T. quinquedentata*, 05-12 (*11061b*) on wind-swept ridge of sandstone rock, with *Grimmia elatior*, *G. funalis*; BG, BA, SI; boreo-arctic montane circumpolar

ME – *Schistidium brunescens* subsp. *griseum* (Nees & Hornsch.) H. H. Blom – Lovćen 03-16 (9822) det. Schröder, on calcareous rock near a stream; BA, BG, HR, GR (Blom 1996); distribution imperfectly known, from S Scandinavia to S Europe and Turkey (Blom 1996)

(RS) – *Schistidium confertum* (Funck) Bruch & Schimp. – Stara Planina 05-03 (*BP173112, 05-11, *BP173113, 10995, 10998, 11005, 11009, 11021*) conf. Schröder, on sandstone rock outcrops and small stones in subalpine grassland, with *Hypnum lacunosum, Homalothecium lutescens, Pseudoleskea nervosa, Bartramia ithyphylla, Petrygiondrium filiforme*; BG (Rhodope Mts (Blom 1996), western Stara Planina), ME (Dragičević & Veljić 2006); according to Düll & al. (1999) also in BA, HR, MK, RS, SI, these data are, however, open to question, since they obviously refer to records made before Blom’s revision (Blom 1996); circumpolar boreo-temperate (Smith 2004)

ME – *Schistidium helveticum* (Schkuhr) Deguchi – Nikšić 03-03 (*BP173210, 03-13*) conf. Schröder, on exposed conglomerate rock; in SE Europe it is known from Greece (Düll 1995) and Serbia (Sabovljević 2003b); Mediterranean (Blom 1996)

(RS) – *Schistidium papillosum* (Schkuhr) Warnst. – Durmitor 03-03 (*BP173114*) on shaded sandstone rock, 05-11 (*BP173115, 11039*), 05-13 (*BP173116*) conf. Schröder, on sandstone rock outcrops in subalpine greenlands, with *Polytrichum piliferum, Ceratodon purpureus, Pohlia nutans* subsp. *nutans*, 05-12 (*11052, 11065*) on wind-swept ridge of sandstone rock, with *Radula complanata, Encalypta microstoma, Isothecium alopecuroides, Hypnum cupressiforme, I. myosuroides, H. cupressiforme var. subjulaceum, H. cupressiforme var. cupressiforme, Tortella tortuosa*; BG (Rila Mts only (Blom 1996), not known from former Yugoslavia (Düll & al. 1999, Sabovljević 2003b); Mediterranean European boreo-temperate (Smith 2004)

ME – *Schistidium robustum* (Nees & Hornsch.) H. H. Blom – Durmitor 04-01 (*10348*) conf. Schröder, on flat calcareous stone, shaded by *Abies*, 04-07 (*10503*) conf. Schröder, on concrete near mill at creek; HR (Blom 1996); European boreal-montane (Smith 2004)

ME – *Scorpiurium deflexifolium* (Solms) M. Fleisch. & Loeske – Lake Skadar 03-11 (*BP173211, 03-13, *BP173212*) conf. Schröder, on shaded sandstone rock (*BP173212, 03-13*), 05-03 (*BP173112*) on irrigated calcareous rock; BA, SI; Mediterranean-S European W Asian African

ME – *Seligeria pusilla* (Hedw.) Bruch & Schimp. – Durmitor 04-17 (*10643*) on calcareous rock; BA, HR, RS, SI; in Serbia only recently found in the Petnica region (Papp & Sabovljević 2001) and the Kopaonik Mts (Papp & al. 2004); boreo-temperate European

ME – *Sphagnum inundatum* Russow – Durmitor 04-12 (*10593*) in rich fen, with *Dicranum bonjeanii, Straminergon stramineum*; only recently discovered in Serbia in the Kopaonik Mts (Papp & al. 2004); and the Golija Mts (Papp & Erzberger 2005); BA, HR, RS, SI; boreo-arctic European

ME – *Sphagnum russowii* Warnst. – Durmitor 04-12 (*10608, 10610*) in rich fen, with *Calliergon stramineum*; BA, HR, RS, SI; boreo-arctic montane circumpolar

ME – *Sphagnum subsecundum* Nees – Durmitor 04-12 (*10611*) in rich fen; BA, HR, MK, RS, SI; boreo-montane circumpolar

ME – *Syntrichia handelii* (Schiffn.) S. Agnew & Vondr. – Lovćen 03-17 (*BP173214*) conf. Kučera, on calcareous rock; within SE Europe reported from Greece only (Düll 1995); E Mediterranean continental (Düll 1984)

(RS) – *Timmia bavarica* Hesl. – Stara Planina 05-02 (*BP173117, 10914b*) on sandstone rock, with *Dicranum scoparium, Pohlia nutans* subsp. *nutans*, 05-04 (*BP173118*) on shaded
sandstone rocks in Fagetum; according to Martinčić (1995, 2006) in Prokletije Mts, but it is not evident, if these records refer to Serbia as well as to Montenegro; found also in Durmitor 04-17 (10725 c. spg., 10731) on calcareous rock, with Distichium capillaceum, Leiocolea bantrensis, Brachythecium tommasini, Metaneckera menziesii; BG, BA, ME, HR, MK, SI; northern-subcontinental pre-alpine; holarctic (-bipolar)

**ME – Tomentypnum nitens** (Hedw.) Loeske – Durmitor 04-12 (10594, 10595, 10601, 10607, 10609, 10613) in rich fen, with Dicranum bonjeanii, Calliergon giganteum, Straminergon stramineum, Sphagnum teres, S. fallax, Bryum pseudotriquetrum, Campylium stellatum var. stellatum, Riccardia multifida, Aulacomnium palustre, Climacium dendroides, Calliergonella cuspidata, Plagiomnium ellipticum; BA, RS, SI; boreo-arctic montane circumpolar

**ME – Weissia longifolia** var. angustifolia (Baumgartner) Crundw. & Nyholm – Kotor 04-19 (9849) c. spg. on soil in scrub, with Scorpiurium circinatum; HR; oceanic sub-Mediterranean; European

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