

CONTRIBUTIONS TO THE BRYOPHYTE FLORA OF KOPAONIK MTS (SERBIA, SERBIA-MONTENEGRO)

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During field work carried out in July 2002 in Kopaonik Mts (Serbia, Serbia-Montenegro) we collected 229 bryophyte taxa (48 liverworts and 181 mosses). Among them 19 species are reported for the first time in Serbia. Three species are included in the Red Data Book of European Bryophytes (ECCB 1995); one species in the rare (R) category: *Lophozia ascendens*, and two (*Drepanocladus lycopodioides*, *Pseudoleskea saviana*) are regionally threatened (RT).

Key words: bryophyte flora, Kopaonik Mts, red-listed species, Serbia

INTRODUCTION

Comprehensive treatments of the bryophyte flora of former Yugoslavia were published by MARTINČIĆ (1968) and PAVLETIĆ (1955, 1968). According to these works, some regions have been studied more intensely than others, depending on the residence of bryologists (MARTINČIĆ in Ljubljana, PAVLETIĆ in Zagreb) or attractiveness of the areas to foreign visitors. Slovenia is the best-known part of the former federal state. Some parts of Croatia are also well explored, but the northern part of this country is only very poorly known. Bosnia-Herzegovina was visited by many foreign collectors in the beginning of the 20th century, but it was neglected later on. The most understudied regions are Serbia, Montenegro and the former Yugoslavian Republic (FYR) Macedonia. From the latter very few data exist (SABOVLJEVIĆ *et al.* 2001).

In recent years, collecting trips were organised by the Hungarian Natural Museum and the Institute for Nature Conservation of Serbia, to explore the cryptogam flora of some national parks and protected areas of Serbia-Montenegro. The bryological results of two former field trips have already been published (PAPP and SABOVLJEVIĆ 2001, 2002). As a result of this field research, 51 bryophyte species were added to the checklists of Serbia (SABOVLJEVIĆ and STEVANOVIĆ 1999, SABOVLJEVIĆ 2000).

THE INVESTIGATED AREA

Kopaonik Mts are situated in the central part of the Balkan peninsula (Fig. 1). This mountain range extends in NW–SE direction between 20°35' and 21°18' N, and 42°43' and 43°23' E. It is separated from the surrounding massifs of Rogozina, Golija and Željin by the deep river valleys of Ibar, Sitnica, Jošanica, Lab, Rasina, Toplica and Morava (Vasović 1988).

On a larger scale, Kopaonik is separated in the south from the Scardo-Pindos by the Kosovo and Metohija depressions, in the east from the Balkan massif by the Morava basin, and in the west from the Dinaric Alps by the valley of the Ibar river.

The Kopaonik range is 82 km long and is divided geographically as well as administratively into two parts. (1) Flat Kopaonik is situated in the central and northern part of the mountain range, its highest peaks are Pančić vrh, Gobelja, Karaman and Suvo Rudište; this part is in Central Serbia. (2) The southern part of Kopaonik, with the peaks of Oštro Koplje and Šatorica, belongs to the province of Kosovo.

Structurally Kopaonik Mts are a part of the Vardar geotectonic unit of the Rhodopean–Balkan system, but concerning its origin and geology, it belongs to the Inner Dinarids.

Kopaonik Mts are very rich geologically. There are three basic rock types: sediments, magmatites and metamorphites. Vasović (1988) distinguished three main rock formations: schists, limestones and dolomites, and green rocks. All these formations have various subtypes and this makes Kopaonik even more interesting.

The geomorphology of Kopaonik Mts has been formed by many endogenic processes such as folding, raising, degradation, magmatic intrusions, volcanic outlet and very often seismic shaking (Vasović 1988). The highest peak of Kopaonik Mts reaches 2,017 m a.s.l.

In the upper region, Kopaonik Mts have many springs, which give rise to many streams and rivulets and create a very dense hydrological network. The main rivers are Samokovska, Jošanica, Duboka, Brzečka, and Gobeljska. In the territory of Kopaonik Mts peat bogs of various size are found, usually between 1,500 and 1,800 m a.s.l. There are also three smaller lakes in the upper region.

The climate of Kopaonik Mts is continental-montane. It receives much sunshine and in winter a high amount of snow. Due to the high altitude of Kopaonik, six subclimate types can be found, which are characterised by different vegetation. Starting with lower altitudes these are the following:

1. warm temperate climate with sub-Mediterranean influence (*Quercion frainetto*)
2. temperate climate (*Quercion petraeae-cerris*)

3. humid temperate climate (Fagion moesiaceae)
4. cold temperate-temperate transitional climate (Vaccinio-Piceion)
5. cold temperate climate (Juniperion sibiricae and Vaccinion myrtilli)
6. subboreal climate (subalpine meadows of the Poion violaceae type).

The vegetation types covering Kopaonik Mts are correlated with its diverse geology and various soils. Lakušić (1993) enumerated 97 different phytocenoses of association rank and many subassociations. In the high mountain zone of Kopaonik 825 vascular plant species were recorded, while the corresponding number for the whole area of the mountain is 1,350 vascular species with 91 endemic and 82 subendemic vascular plants and many relic species (LAKUŠIĆ 1993). A comprehensive work on the lichen flora of the mountain was published by SAVIĆ (1996). This list of 120 lichen species is based on literature data and the evaluation of herbarium material. Bryological records from the territory are summarised by LAKUŠIĆ (1996). In that paper, besides of 1,603 species and 160 subspecies of vascular plants, a preliminary list of 155 bryophytes was given from Kopaonik Mts on the basis of floristical investigations and data published in the literature. According to these sources Kopaonik Mts are known as the locality of an endemic moss species of Serbia, *Encalypta serbica*, described by KATIĆ (1906). The taxonomic status of this taxon, however, requires further consideration (PAVIĆ *et al.* 1998, SABOVLJEVIĆ *et al.* 2001). Some species included in the Red Data Book of European Bryophytes were also reported from Kopaonik Mts by LAKUŠIĆ (1996), among them *Buxbaumia viridis*, *Dicranum viride* and *Hamatocaulis vernicosus*.

METHODS

The field survey was made in July 2002. Our collecting sites were situated mainly in the upper zone of the mountain range between 1,100–1,800 m a.s.l. Main habitat types such as fens, stream valleys, forests, and grasslands developed on various bedrocks were visited, and bryophytes were collected from different substrates (soil, calcareous and non-calcareous, exposed and shady rock, tree bark and decaying wood).

The specimens are preserved in the Herbarium of the Hungarian Natural History Museum, Budapest (BP) and in the private herbarium of Peter Erzberger, Berlin.

Nomenclature of the species follows ERZBERGER and PAPP (2004) and KOPERSKI *et al.* (2000).

SITE DETAILS

1. Serbia, Kopaonik Mts, Samokovska reka, near Jankove bare, granodiorit rocks, 1,810 m, 43°19,069'N, 20°45,907'E, 09.07.2002.

2. Serbia, Kopaonik Mts, Jankove bare, *Sphagnetum* and *Piceetum*, 1,800 m, 43°19,114'N, 20°46,546'E, 09.07.2002.

3. Serbia, Kopaonik Mts, Vodopad Jelovarnik, *Fagetum*, 1,250 m, 43°16,202'N, 20°51,433'E, 10.07.2002.

4. Serbia, Kopaonik Mts, Duboka potok, near Čelici village, 1,150 m, 43°16,679'N, 20°52,324'E, 10.07.2002.

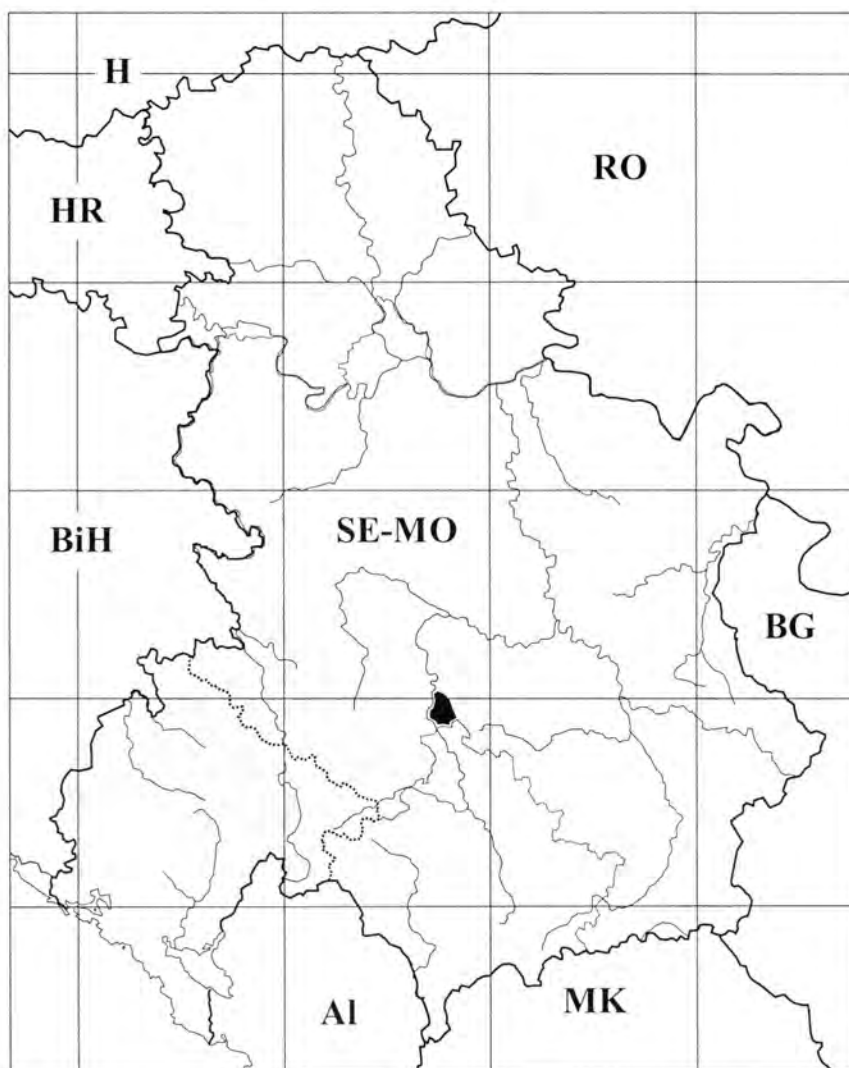


Fig. 1. The location of Kopaonik National Park (black patch). (H = Hungary, RO = Romania, HR = Croatia, BiH = Bosnia-Herzegovina, SE-MO = Serbia-Montenegro, BG = Bulgaria, MK = FYR Macedonia, Al = Albania).

5. Serbia, Kopaonik Mts, Reservat Jelak, *Piceetum*, 1,100 m, 43°18,336'N, 20°51,648'E, 10.07.2002.
6. Serbia, Kopaonik Mts, Brzecka reka, *Fagetum*, 1,140 m, 43°18,274'N, 20°51,480'E, 10.07.2002.
7. Serbia, Kopaonik Mts, Samokovska reka in Kozje stene Reservat, Djorov most, *Fagetum*, 810 m, 43°21,335'N, 20°44,642'E, 11.07.2002.
8. Serbia, Kopaonik Mts, towards Kozje stene in Mt Kukavica, *Juniperetum* and grassland on volcanic bedrock, 1,650 m, 43°19,437'N, 20°44,944'E and 43°19,878'N, 20°44,397'E, 11.07.2002.
9. Serbia, Kopaonik Mts, Pančić vrh, grassland and meadows, spring mires, 1,990 m, 43°16,346'N, 20°49,219'E, 12.07.2002.
10. Serbia, Kopaonik Mts, Brzecka reka in Metodje Reservat, towards a geyser, 1,490 m, 43°18,710'N, 20°51,001'E, 12.07.2002.
11. Serbia, Kopaonik Mts, Žljeb by the hotel Srebrnac, grassland with calcareous rocks, 1,775 m, 43°18,792'N, 20°50,188'E, 13.07.2002.
12. Serbia, Kopaonik Mts, Jaram under Karaman vrh, by the hotel Rtanj, *Piceetum*, 1,810 m, 43°18,248'N, 20°49,757'E and 43°17,434'N, 20°49,209'E, 13.07.2002.

RESULTS

Floristical results

Altogether 229 bryophyte taxa (48 liverworts and 181 mosses) were collected during our field trip. Twelve species (viz. *Lophozia bicrenata*, *Riccardia incurvata*, *Scapania scandica*, *Bryum violaceum*, *Ditrichum crispatisimum*, *Drepanocladus lycopodioides*, *Grimmia anomala*, *Pohlia andalusica*, *P. ludwigii*, *Racomitrium affine*, *Seligeria donniana*, *Sphagnum inundatum*) are recorded for the first time in the country (Serbia-Montenegro). Further 7 species (viz. *Barbilophozia floerkei*, *Cephalozia bicuspidata*, *Grimmia alpestris*, *G. tergestina*, *Gyro-weisia tenuis*, *Schistidium rivulare*, *Weissia longifolia*) have been reported only from Montenegro, hence they are new to the territory of Serbia. The last species was reported from Tara Mts (W Serbia) (PAPP and SABOVLJEVIĆ 2002), but that specimen was recently revised to *Weissia levieri*, which is also the first record of that species in Serbia. 144 species are new to Kopaonik Mts, as they were not listed in the paper of LAKUŠIĆ (1996).

In the following record the species name is followed by the site number and substrate. Species which were not reported in the paper of LAKUŠIĆ (1996) are marked by an asterisk.

Hepaticae

- **Aneura pinguis* (L.) Dumort. – 10: limestone rocks at a spring
- **Barbilophozia floerkei* (F. Weber et D. Mohr) Loeske – 9: decaying wood
- **Barbilophozia lycopodioides* (Wallr.) Loeske – 12: on soil
- **Blasia pusilla* L. – 1: on soil
- **Blepharostoma trichophyllum* (L.) Dumort. – 2: decaying wood
- Calypogeia azurea* Stotler et Crotz – 12: on soil
- **Calypogeia muelleriana* (Schiffn.) Müll. Frib. – 2, 9: on soil
- **Cephalozia bicuspidata* (L.) Dumort. – 2: decaying wood, on soil; 9: on soil, decaying wood; 12: on soil
- **Cephaloziella rubella* (Nees) Warnst. – 1: on soil
- Chiloscyphus pallescens* (Hoffm.) Dumort. – 2: on soil
- Chiloscyphus polyanthos* (L.) Corda – 1: granite rock in the stream, 2: on soil; 3, 7: limestone rock in the stream
- **Cololejeunea calcarea* (Lib.) Schiffn. – 7: shaded limestone rocks
- Conocephalum conicum* (L.) Dumort. – 3: limestone rock; 6, 7: shaded limestone rocks; 10: bark of *Fagus* tree
- **Diplophyllum obtusifolium* (Hook.) Dumort. – 1, 2: on soil
- Frullania dilatata* (L.) Dumort. – 4, 7, 10: bark of *Fagus* tree; 6: bark of *Abies* tree
- **Jungermannia gracillima* Sm. – 1, 2: on soil
- **Jungermannia leiantha* Grolle – 2: on soil
- **Leiocolea badensis* (Gottsche) Jörg. – 2, 12: on soil; 6: shaded limestone rocks; 11: exposed limestone rocks
- **Leiocolea bantriensis* (Hook.) Jörg. – 7: shaded limestone rocks
- **Lejeunea cavifolia* (Ehrh.) Lindb. – 6: shaded limestone rocks; 7: limestone rock in the stream
- Lepidozia reptans* (L.) Dumort. – 2: on soil; 10: decaying wood
- **Lophocolea heterophylla* (Schröd.) Dumort. – 2: on soil; 5, 10: decaying wood
- **Lophozia ascendens* (Warnst.) R. M. Schust. – 2, 10, 12: decaying wood
- **Lophozia bicrenata* (Schmid. ex Hoffm.) Dumort. – 9: on soil
- **Lophozia obtusa* (Lindb.) A. Evans – 2: on soil
- **Lophozia ventricosa* (Dicks.) Dumort. – 9: on soil
- Marchantia polymorpha* L. – 1: on soil; 3: limestone rock
- Marchantia polymorpha* L. subsp. *ruderalis* Bischl. et Boisselier – 1: granite rock in the stream
- Metzgeria conjugata* Lindb. – 7: shaded limestone rocks, bark of *Fagus* tree
- Metzgeria furcata* (L.) Dumort. – 6: shaded limestone rocks, decaying wood; 7: bark of *Fagus* tree
- **Nardia scalaris* S. F. Gray – 1, 9, 12: on soil
- **Pedinophyllum interruptum* (Nees) Kaal. – 6, 7: shaded limestone rocks
- **Pellia endiviifolia* (Dicks.) Dumort. – 2, 9: on soil; 4: volcanic rock in the stream; 3, 7: shaded limestone rocks; 9: decaying wood
- Plagiochila asplenioides* (L. emend. Taylor) Dumort. – 2: on soil; 6: shaded limestone rocks
- **Plagiochila porelloides* (Torrey ex Nees) Lindenb. – 3: limestone rocks; 6, 10: shaded limestone rocks; 7: limestone rocks at a spring, shaded limestone rocks; 8: rocky soil; 11: exposed limestone rocks
- **Porella cordaeana* (Huebener) Moore – 3: limestone rock
- Porella platyphylla* (L.) Pfeiff. – 7: bark of *Fagus* tree; 11: limestone rocks
- **Preissia quadrata* (Scop.) Nees – 3, 6, 10, 11: shaded limestone rocks
- **Prilidium pulcherrimum* (Weber) Vain. – 2, 10: decaying wood

- Radula complanata* (L.) Dumort. – 6: decaying wood; 7: shaded limestone rocks, bark of *Fagus* tree
 **Reboulia hemisphaerica* (L.) Raddi – 3: limestone rock; 7: shaded limestone rocks
 **Riccardia incurvata* Lindb. – 1: on soil
 **Riccardia palmata* (Hedw.) Carruth. – 5, 10: decaying wood
 **Scapania calcicola* (Arnell et J. Perss.) Ingham – 11: exposed limestone rocks
 **Scapania irrigua* (Nees) Nees – 1, 9: on soil; 2: granite rock, on soil; 6: shaded limestone rocks
 **Scapania scandica* (Arnell et H. Buch) Macvicar – 3: limestone rock; 9: on soil, decaying wood
Scapania undulata (L.) Dumort. – 1, 2: granite rock in the stream; 9, 12: on soil
 **Tritomaria quinqueidentata* (Huds.) H. Buch – 8, 9: rocky soil

Musci

- Amblystegium serpens* (Hedw.) Schimp. var. *serpens* – 3: bark of *Pyrus* tree; 5: decaying wood, exposed limestone rocks
Amblystegium subtile (Hedw.) Schimp. (= *Platydictia subtilis* (Hedw.) H. A. Crum) – 6: decaying wood
 **Amblystegium tenax* (Hedw.) C. E. O. Jensen – 3: limestone rock in the stream
Anomodon attenuatus (Hedw.) Huebener – 7: bark of *Fagus* tree
Anomodon viticulosus (Hedw.) Hook. et Taylor – 6, 7: shaded limestone rocks
 **Atrichum tenellum* (Röhl.) Bruch et Schimp. – 1: on soil
Atrichum undulatum (Hedw.) P. Beauv. – 1: on soil, granite rock in the stream
Aulacomnium palustre (Hedw.) Schwägr. – 2: on soil
 **Barbula convoluta* Hedw. var. *commutata* (Jur.) Husn. – 3: limestone rock
Barbula unguiculata Hedw. – 2, 3, 12: on soil; 5: exposed limestone rocks
 **Brachythecium albicans* (Hedw.) Schimp. – 1: on soil
 **Brachythecium glareosum* (Spruce) Schimp. – 7: shaded limestone rocks; 9, 10, 12: on soil
 **Brachythecium plumosum* (Hedw.) Schimp. – 7: limestone rock in the stream
Brachythecium populeum (Hedw.) Schimp. – 3: limestone rock, bark of *Pyrus* tree; 6, 7: shaded limestone rocks
 **Brachythecium rivulare* Schimp. – 1: granite rock in the stream; 2, 9: on soil; 4: volcanic rock at the stream; 10: limestone rocks at a spring
Brachythecium rutabulum (Hedw.) Schimp. – 2: on soil; 6: decaying wood
Brachythecium velutinum (Hedw.) Schimp. – 2: on soil; 3: limestone rock; 6, 10: shaded limestone rocks
 **Bryoerythrophyllum recurvirostrum* (Hedw.) P. C. Chen – 5: exposed limestone rocks; 10: on soil
 **Bryum alpinum* Huds. ex With. – 8: rocky soil
Bryum argenteum Hedw. – 3, 11: limestone rock; 4: volcanic rock; 10: limestone rock
 **Bryum bicolor* Dicks. – 1: on soil
Bryum caespitium Hedw. – 8: rocky soil; 9, 10, 12: on soil; 11: exposed limestone rocks
Bryum capillare Hedw. – 10: on soil
 **Bryum pallens* Sw. – 1, 2, 9: on soil
Bryum pseudotriquetrum (Hedw.) P. Gaertn., B. Mey. et Scherb. – 2, 5, 9: on soil; 10: limestone rocks at a spring
 **Bryum schleicheri* DC. – 9: on soil
 **Bryum laevifilum* Syed – 3: limestone rock; 4: bark of *Fagus* tree; 10: shaded limestone rock
 **Bryum violaceum* Crundw. et Nyholm – 5: exposed limestone rocks

- Calliergon cordifolium* (Hedw.) Kindb. – 2: on soil
 **Calliergon stramineum* (Brid.) Kindb. – 2: on soil
Calliergonella cuspidata (Hedw.) Loeske – 2: on soil; 8: wet meadow
 **Campylium chrysophyllum* (Brid.) Lange – 10: shaded limestone rock
Ceratodon purpureus (Hedw.) Brid. – 1, 2, 9, 11, 12: on soil
Climacium dendroides (Hedw.) F. Weber et D. Mohr – 2: on soil
 **Coscinodon cribrosus* (Hedw.) Spruce – 4: volcanic rock in the stream
Cratoneuron filicinum (Hedw.) Spruce – 3, 7: limestone rock in the stream; 4: volcanic rock in the stream
Ctenidium molluscum (Hedw.) Mitt. – 6, 7: shaded limestone rocks
 **Dichodontium pellucidum* (Hedw.) Schimp. – 7: limestone rock in the stream
 **Dicranella heteromalla* (Hedw.) Schimp. – 2: on soil
Dicranella palustris (Dicks.) Crundw. ex E. F. Warb. – 1, 9: on soil
Dicranella varia (Hedw.) Schimp. – 3: on soil
Dicranoweisia crispula (Hedw.) Milde – 2: granite rock, on soil; 9: decaying wood; 12: rocky soil
Dicranum scoparium Hedw. – 2: decaying wood, on soil; 6, 12: decaying wood; 8: rocky soil
Dicranum tauricum Sapjegin – 1, 9, 12: decaying wood; 2: granite rock, decaying wood, on soil
 **Didymodon fallax* (Hedw.) R. H. Zander – 10: shaded limestone rock, on soil
 **Didymodon ferrugineus* (Schimp. ex Besch.) M. O. Hill – 10: on soil
 **Didymodon rigidulus* Hedw. – 3, 5, 10, 11: shaded limestone rock; 4: volcanic rock
 **Didymodon tophaceus* (Brid.) Lisa – 2: on soil
 **Didymodon vinealis* (Brid.) R. H. Zander – 10: on soil; 11: exposed limestone rocks
 **Distichium capillaceum* (Hedw.) Bruch et Schimp. – 3, 11: limestone rock; 6, 10: shaded limestone rocks
 **Ditrichum crispatisimum* (Müll. Hal.) Par. – 6: shaded limestone rocks
 **Ditrichum flexicaule* (Schwägr.) Hampe – 8: rocky soil; 10, 11: exposed limestone rocks
 **Ditrichum heteromallum* (Hedw.) E. Britton – 1, 9: on soil
 **Drepanocladus lycopodioides* (Brid.) Warnst. – 2: on soil
 **Dryptodon patens* (Hedw.) Brid. – 2: granite rock
Encalypta streptocarpa Hedw. – 5, 11: exposed limestone rocks; 7, 10: shaded limestone rocks
Encalypta vulgaris Hedw. – 5: exposed limestone rocks
 **Eurhynchium angustirete* (Broth.) T. J. Kop. – 10: shaded limestone rocks
 **Eurhynchium hians* (Hedw.) Sande Lac. – 3: limestone rock; 6, 10: shaded limestone rocks
 **Eurhynchium hians* (Hedw.) Sande Lac. var. *rigidum* (Boulay) Düll – 7: limestone rocks at the stream
 **Eurhynchium meridionale* (Schimp.) De Not. – 12: on soil
 **Eurhynchium pulchellum* (Hedw.) Jenn. var. *diversifolium* (Schimp.) C. E. O. Jensen – 8: rocky soil
 **Eurhynchium striatulum* (Spruce) Schimp. – 7: shaded limestone rocks
 **Fissidens bryoides* Hedw. – 3: limestone rock
Fissidens dubius P. Beauv. – 6, 7, 11: shaded limestone rocks
 **Fissidens gracilifolius* Brugg.-Nann. et Nyholm – 6, 7: shaded limestone rocks
 **Fissidens taxifolius* Hedw. – 7, 10: shaded limestone rock
Fontinalis antipyretica Hedw. – 1: granite rock in the stream
 **Grimmia alpestris* (F. Weber et D. Mohr) Schleich. – 9: on soil, 12: granite rock
 **Grimmia anodon* Bruch et Schimp. – 11: exposed limestone rocks
 **Grimmia anomala* Hampe ex Schimp. – 1: granite rocks
 **Grimmia hartmanii* Schimp. – 2, 3, 12: granite rock
 **Grimmia orbicularis* Bruch ex Wilson – 10: limestone rock

- **Grimmia ovalis* (Hedw.) Lindb. – 8: rocky soil
Grimmia pulvinata (Hedw.) Sm. – 4: volcanic rock
 **Grimmia tergestina* Tonn. ex Bruch et Schimp. – 11: exposed limestone rocks
 **Gymnostomum aeruginosum* Sm. – 3: limestone rock in the stream; 7: shaded limestone rocks; 10: limestone rocks at a spring
 **Gymnostomum calcareum* Nees et Hornsch. – 6: shaded limestone rocks
 **Gyroweisia tenuis* (Hedw.) Schimp. – 2: on soil
Herzogiella seligeri (Brid.) Z. Iwats. – 2, 5, 10: decaying wood
 **Homalia besseri* Lohr. – 7: shaded limestone rocks, bark of *Fagus* tree
Homalothecium lutescens (Hedw.) H. Rob. – 11: exposed limestone rocks; 12: on soil
 **Homalothecium philippeanum* (Spruce) Schimp. – 3: limestone rock; 7: shaded limestone rocks; 10: bark of *Fagus* tree
Homalothecium sericeum (Hedw.) Schimp. – 4: volcanic rock
 **Homomallium incurvatum* (Brid.) Loeske – 3, 4, 6: limestone rock
 **Hygrohypnum duriusculum* (De Not.) D. W. Jamieson – 1: granite rock in the stream
 **Hygrohypnum luridum* (Hedw.) Jenn. – 3: limestone rock; 7: limestone rocks in the stream
Hylocomium splendens (Hedw.) Schimp. – 2, 9: on soil
Hypnum cupressiforme Hedw. var. *cupressiforme* – 4: bark of *Fagus* tree; 6: decaying wood
 **Hypnum cupressiforme* Hedw. var. *lacunosum* Brid. – 8: rocky soil
 **Hypnum vaucheri* Lesq. – 10, 11: exposed limestone rocks
Isoetecium alopecuroides (Dubois) Isoet. – 2: granite rock, decaying wood; 6: decaying wood; 7, 10: shaded limestone rocks, bark of *Fagus* tree
Leucodon sciuroides (Hedw.) Schwaegr. – 4, 6, 7, 10: bark of *Fagus* tree
 **Mnium marginatum* (Dicks.) P. Beauv. – 3: limestone rock; 6, 7, 10: shaded limestone rocks
Mnium spinulosum Bruch et Schimp. – 12: on soil
 **Mnium stellare* Hedw. – 3: limestone rock; 7: shaded limestone rocks
 **Mnium thomsonii* Schimp. – 6: shaded limestone rocks
 **Myurella julacea* (Schwägr.) Schimp. var. *scabrifolia* Lindb. ex Limpr. – 11: exposed limestone rocks
Neckera complanata (Hedw.) Huebener – 7: shaded limestone rocks
Neckera crispa Hedw. – 7: shaded limestone rocks
 **Oligotrichum hercynicum* (Hedw.) Lam. et DC. – 9: on soil
 **Orthotrichum cupulatum* Hoffm. ex Brid. – 8: volcanic rock
 **Orthotrichum pallens* Bruch ex Brid. – 3: bark of *Pyrus* and *Fagus* tree; 6: bark of *Sambucus*; 10: bark of *Fagus* tree
 **Orthotrichum stramineum* Hornsch. ex Brid. – 4, 7, 10: bark of *Fagus* tree; 6: bark of *Abies* tree
 **Orthotrichum striatum* Hedw. – 3, 4, 10: bark of *Fagus* tree; 6: bark of *Sambucus* and *Abies* tree
Palustriella commutata (Hedw.) Ochyra var. *commutata* – 1: granite rock in the stream; 4: volcanic rock in the stream; 10: limestone rocks at a spring
 **Palustriella commutata* (Hedw.) Ochyra var. *falcata* (Brid.) Ochyra – 5: on limestone rock; 10: limestone rocks at a spring
 **Palustriella decipiens* (De Not.) Ochyra – 9: on soil
 **Philonotis caespitosa* Jur. – 1: on soil
 **Philonotis calcarea* (Bruch et Schimp.) Schimp. – 10: limestone rocks at a spring
Philonotis fontana (Hedw.) Brid. – 1, 2: on soil; 8: wet meadow
 **Philonotis seriata* Mitt. – 1, 2, 9, 12: on soil
 **Plagiobryum zierii* (Hedw.) Lindb. – 3, 10: limestone rock
 **Plagiomnium affine* (Blandow) T. J. Kop. – 2, 3, 12: on soil

- Plagiomnium cuspidatum* (Hedw.) T. J. Kop. – 7: shaded limestone rocks
Plagiomnium elatum (Bruch et Schimp.) T. J. Kop. – 2: on soil; 4: bark of *Fagus* tree
Plagiomnium rostratum (anon.) T. J. Kop. – 5: decaying wood; 6: shaded limestone rocks; 7: limestone rocks at a spring; 10: on soil, limestone rocks at a spring
Plagiomnium undulatum (Hedw.) T. J. Kop. – 2: on soil; 7: bark of *Fagus* tree; 10: shaded limestone rocks
**Plagiothecium cavifolium* (Brid.) Z. Iwats. – 10: on soil
Plagiothecium denticulatum (Hedw.) Schimp. – 12: on soil
**Plagiothecium laetum* Schimp. var. *curvifolium* (Limpr.) Mastracci et M. Sauer – 2: decaying wood, on soil
Plagiothecium nemorale (Mitt.) A. Jaeger – 7: shaded limestone rocks
**Plagiothecium succulentum* (Wilson) Lindb. – 3: limestone rock; 7, 10: shaded limestone rocks
Platyhypnidium riparioides (Hedw.) Dixon – 3, 5: limestone rock in the stream; 4: volcanic rock in the stream
Pleurozium schreberi (Brid.) Mitt. – 2, 12: on soil
Pogonatum aloides (Hedw.) P. Beauv. – 2: on soil
Pogonatum urnigerum (Hedw.) P. Beauv. – 9: on soil
**Pohlia andalusica* (Höhn.) Broth. – 1, 9: on soil
**Pohlia annotina* (Hedw.) Lindb. – 1: on soil
**Pohlia ludwigii* (Spreng. ex Schwägr.) Broth. – 9: on soil
**Pohlia melanodon* (Brid.) A. J. Shaw – 3, 7: limestone rock
Pohlia nutans (Hedw.) Lindb. – 1: decaying wood; 9: on soil
**Pohlia wahlenbergii* (F. Weber et D. Mohr) A. L. Andrews – 1: on soil
Polytrichum alpinum Hedw. – 9: on soil
Polytrichum commune Hedw. – 2: on peat
Polytrichum juniperinum Hedw. – 2, 12: on soil; 11: exposed limestone rocks
Polytrichum piliferum Schreb. ex Hedw. – 2: granite rock; 8: rocky soil; 9: on soil
**Pseudoleskea saviana* (De Not.) Latzel – 3: limestone rock; 12: bark of *Juniperus*
**Pseudoleskeella catenulata* (Brid. ex Schrad.) Kindb. – 3, 6: limestone rock; 11: exposed limestone rocks
Pseudoleskeella nervosa (Brid.) Nyholm – 3: bark of *Pyrus* tree; 4, 7: bark of *Fagus* tree
Pterigynandrum filiforme Hedw. – 2: granite rock; 3: limestone rock; 4, 10: bark of *Fagus* tree; 6: shaded limestone rocks; 7: shaded limestone rocks, bark of *Fagus* tree
**Racomitrium affine* (Schleich. ex F. Weber et D. Mohr) Lindb. – 1, 2: granite rock
Racomitrium canescens (Hedw.) Brid. – 2, 4: on soil; 8: rocky soil
**Rhizomnium pseudopunctatum* (Bruch et Schimp.) T. J. Kop. – 2: on soil
Rhizomnium punctatum (Hedw.) T. J. Kop. – 2, 9, 12: on soil; 4: bark of *Fagus* tree; 6: decaying wood; 10: shaded limestone rocks
Rhodobryum roseum (Hedw.) Limpr. – 12: on soil
**Rhynchostegiella tenella* (Dicks.) Limpr. – 5: exposed limestone rocks
**Rhynchostegium murale* (Hedw.) Schimp. – 3: limestone rock; 6, 10: shaded limestone rocks
Rhyidiadelphus squarrosus (Hedw.) Warnst. – 2, 12: on soil
Rhyidiadelphus triquetrus (Hedw.) Warnst. – 2, 12: on soil; 8: rocky soil
**Saelania glaucescens* (Hedw.) Broth. – 10: shaded limestone rocks; 11: rocky soil
Sanionia uncinata (Hedw.) Loeske – 2, 9: on soil; 6, 9: decaying wood
Schistidium apocarpum (Hedw.) Bruch et Schimp. s.l. – 3, 10: limestone rock; 4: volcanic rock; 7: limestone rock in the stream; 8: rocky soil; 11: exposed limestone rocks
**Schistidium atrofusum* (Schimp.) Limpr. – 11: exposed limestone rocks

- **Schistidium rivulare* (Brid.) Podp. – 1: granite rocks at the stream
- **Seligeria donniana* (Sm.) Müll. Hal. – 6: shaded limestone rocks
- **Seligeria pusilla* (Hedw.) Bruch et Schimp. – 6: shaded limestone rocks
- **Sphagnum girgensohnii* Russow – 2: on soil
- **Sphagnum inundatum* Russow – 2: on soil
- **Sphagnum obtusum* Warnst. – 2: on soil
- **Sphagnum subnitens* Russow et Warnst. – 9: on soil
- Sphagnum subsecundum* Nees – 2: on soil
- **Sphagnum teres* (Schimp.) Ångstr. – 9: on soil
- **Sphagnum warnstorffii* Russow – 2: on soil
- **Taxiphyllum wissgrillii* (Garov.) Wijk et Margad. – 3: limestone rock; 6, 7: shaded limestone rocks
- Tetrarhis pellucida* Hedw. – 2: decaying wood
- **Thamnobryum alopecurum* (Hedw.) Gangulee – 7: shaded limestone rocks
- Thuidium abietinum* (Hedw.) Schimp. – 10: exposed limestone rocks
- **Thuidium philibertii* Limpr. – 6: on soil
- **Tortella densa* (Lorentz et Molendo) Crundw. et Nyholm – 8: rocky soil; 11: exposed limestone rocks
- **Tortella inclinata* (R. Hedw.) Limpr. – 5, 10: exposed limestone rocks
- Tortella tortuosa* (Hedw.) Limpr. – 3: limestone rock; 4: volcanic rock; 6, 10: shaded limestone rocks; 8: rocky soil; 10, 11: exposed limestone rocks
- Tortula ruralis* (Hedw.) P. Gaertn., B. Mey. et Scherb. – 3: limestone rock; 4: volcanic rock, bark of *Fagus* tree; 8: rocky soil; 10: bark of *Fagus* tree; 11: exposed limestone rocks
- Tortula subulata* Hedw. var. *subulata* – 4: volcanic rock
- **Tortula virescens* (De Not.) De Not. – 5: rocky soil
- **Trichostomum crispulum* Bruch – 10: shaded limestone rock
- **Ulotia bruchii* Hornsch. ex Brid. – 10: bark of *Salix caprea* tree
- **Warnstorffia exannulata* (Schimp.) Loeske – 1, 2, 9: on peat
- **Weissia condensata* (Voit) Lindb. – 8: rocky soil; 11: exposed limestone rocks
- Weissia controversa* Hedw. – 8: rocky soil
- **Weissia longifolia* Mitt. – 8: rocky soil

NATURE CONSERVATION VALUE OF THE BRYOFLORA

Three species are included in the Red Data Book of European Bryophytes (ECCB 1995). Among them, one species is in the rare (R) category: *Lophozia ascendens*, and two of them are regionally threatened (RT), these are *Drepanocladus lycopodioides* and *Pseudoleskea saviana*.

Lophozia ascendens was collected for the first time in Serbia in the Tara Mts (PAPP and SABOVLJEVIĆ 2002). It lives on large, well-decayed logs in constantly humid forests; therefore, it is considered an indicator of old-growth forests. Another red-listed species in Europe with similar habitat requirements is *Buxbaumia viridis* reported from Kopaonik by LAKUŠIĆ (1996) and SABOVLJEVIĆ *et al.* (1999). In spite of thorough search in adequate habitats, this species was not found during our field trip.

Drepanocladus lycopodioides occurs in wet meadows with good water supply. This is its first record in Serbia. Another rare, European red-listed species with similar habitat requirement is *Hamatocaulis vernicosus*, also reported from Kopaonik Mts by LAKUŠIĆ (1996). That species was not found now in the investigated area.

Pseudoleskea saviana is a species of shaded volcanic rocks. It is a rare, continental-subalpine species. It can be found in the Alps and also more towards the east in Romania, Bulgaria, Greece and Turkey (DÜLL 1985).

The European red-listed *Dicranum viride* was reported by LAKUŠIĆ (1996) from the territory, but it was not found recently. However, the similar *Dicranum tauricum*, with a preference for decayed wood and tree bases, does not seem to be rare in the forests of Kopaonik Mts.

Grimmia anomala is an endangered species according to a Red Data List of European *Grimmia* species proposed by GREVEN (1995). This is its first record in Serbia. It is a rare, montane-subalpine species.

Ulota bruchii is a European endemic. It was reported earlier from the Tara Mts (PAPP and SABOVLJEVIĆ 2002); this is its second record in Serbia.

* * *

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