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TOWARDS THE BRYOPHYTE FLORA OF THE SUTJESKA NATIONAL PARK (THE REPUBLIC OF SRPSKA, BOSNIA AND HERZEGOVINA)

PRILOG FLORI BRIOFITA NACIONALNOG PARKA SUTJESKA (REPUBLIKA SRPSKA, BOSNA I HERCEGOVINA)

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Abstract

Old literature data together with recent field research were combined in order to present bryophyte checklist of the Sutjeska National Park. A total of 261 taxa were found within the park area, out of which 40 are liverwort and 221 moss taxa. Bearing in mind a huge lack of bryological research in Bosnia and Herzegovina during last decades, 41 species were refound after more than fifty years, and 92 new for the park area as well. Additionally, seven species are included in the candidate list of the new Red data book of European bryophytes. These are: *Anoectangium aestivum, Buxbaumia viridis, Cinclidotus aquaticus, Fontinalis hypnoides, Orthotrichum patens, Pseudocampylium radicale* and *Schistidium helveticum*.

Key words: Balkans, bryoflora, liverworts, mosses, red-listed species

1. INTRODUCTION / UVOD

Bosnia and Herzegovina is situated in the Balkan peninsula, one of the least bryologically known areas of Europe. Bryological research in the Balkan peninsula revived in the last two decades, with many bryofloristic papers being published. However, the bryophyte research in the western Balkans was mainly focused to the areas of Serbia (e.g. Sabovljević, 2003, 2006; Sabovljević & Marka, 2009; Papp et al., 2014, 2016a), Croatia (e.g. Papp et al., 2013a, 2013b; Alegro et al., 2014, 2015; Ellis et al., 2015), Macedonia (e.g. Papp et al., 2011; Papp et al., 2016b, 2016c), and Montenegro (e.g. Papp & Erzberger, 2011; Papp et al., 2013c; Ellis et al., 2016). Although the region of Bosnia and Herzegovina was bryologically investigated in the past, it remained neglected within the new bryological wave in the Balkans.

1.1 Main characteristics of the Sutjeska National Park / Osnovne karakteristike Nacionalnog parka Sutjeska

The National Park Sutjeska is the largest National Park in Bosnia and Herzegovina. It is located in the southeast region of this country at the boundary with Montenegro (Figure 1) and occupies an area of ca 16 000 hectares. The relief of the Park is very dynamic, with the high mountains (Maglić – the highest in Bosnia and Herzegovina, Volujak, Zelengora) and deep canyons and gorges of the Sutjeska, Hrčavka and Jabučica rivers. The biological and geological diversity is imposing, with a large number of plant and animal species as well as geological substrates and soil types.

The area of the National Park Sutjeska has an influence of moderate-continental, montane and sumbediterranean climate types (Milosavljević, 1969). Mean annual temperature varies from 9.5 °C at Tjentište (700 m) to -1.3 °C at alpine zone of the Maglić Mt (2386 m.s.l.). Humid period is present at spring, autumn and winter, while in the summer there is a strong influence of arid climate (Redžić et al., 1987). Main ecological factors indicate good conditions for development of forest vegetation in montane zone as well as subalpine forests and alpine grasslands in high altitudes, which have high diversity of flora and vegetation of the National Park.

1.2 Earlier research / Ranija istraživanja

Bosnia and Herzegovina has good historical base on bryophyte flora since there are rather many records compared to some other Balkan countries. Thus, before the Second World War the bryoflora of the country was numbered 523 species, gathered from more than 40 references, mainly thanks to research of Beck (1886, 1889), Protić (1899, 1903, 1904, 1906) and Głowacki (1906, 1907a, 1907b). In the period from the Second World War to the last decade of XX century, the most significant contributions to bryoflora of Bosnia and Herzegovina were given by Schumacher (1952), Wraber (1958), Grgić (1972, 1980, 1982), Ritter-Studnička (1973, 1974) and Hebrard (1975). In that period there was the first overview of the bryoflora of Bosnia and Herzegovina as a part of Prodromus of bryophytes of Yugoslavia (Pavletić, 1955), where the author had compiled all records of bryophytes as well as revised bryophyte material of the State museum in Sarajevo, collected mainly by Karlo Maly. At present, these are very old and some of them even uncertain in view of recent nomenclature and non-existence of historical referred bryophyte collections (e.g. cited species complex and/or aggregates without proper physical material left). In the recent time there is a lack of bryologists and new data, hence recent surveys of bryoflora of Bosnia and Herzegovina (Sabovljević & Natcheva 2006; Sabovljević et al., 2008; Ros et al., 2007, 2013) are based mainly on those old data.

The first contribution to the bryoflora of the Sutjeska National Park date from the beginning of the 20th century (Glowacki, 1907a). During his studious excursion throughout of Bosnia and Herzegovina, Glowacki passed across Zelengora and Maglić and collected bryophytes from several localities: around Orlovačko lake, Orlovača, Kapični do, Nabojne, Javorak, Gonje bare, from Suha to Prijevor and Maglić Mt. On those localities he recorded 129 brophyte species. Among them there were 7 species recorded for a first time for the bryoflora of Bosnia and Herzegovina. Same year, Glowacki (1907b) published paper consolidating the material collected by F. Straka from wider area of Foča, including many bryophytes collected from Treskavica and Maglić. Some of them (35 species) were collected from eastern border of the National Park at several localities: Ždrijelo, Ždrijelo-Ulobić and upper parts of Maglić Mt.

After this contribution given by Glowacki there were several papers about vegetation of Sutjeska National Park, where some mosses were cited too (Fukarek, 1956; Stefanović, 1964; Lakušić et al., 1987), but without novelties. The wildlife of Sutjeska NP was systematically investigated in the period 1967–1969 resulting in a comprehensive study focused to different orders of Insecta and vegetation of meadows and pastures (Lakušić et al., 1969). In this study authors stated 1426 species of vascular plants and 155 bryophytes for the territory of the Park, but without any list provided. After that, second important contribution to bryoflora was published by Grgić (1972). Studying the epiphytic and lignicolous synusia of bryophytes of Perućica virgin forest he recorded 42 bryophytes, with six species new for the bryoflora of Bosnia and Herzegovina.

1.3 Aims of the paper / Ciljevi rada

This paper has two main goals:

- to gather all records from the literature of the bryophyte flora of the Sutjeska National Park;
- to provide the first checklist of bryoflora of the Sutjeska National Park (included new records made during research of bryoflora alongside watercourses).

2. MATERIAL AND METHODS / MATERIJAL I METODE

The bryoflora of the Sutjeska National Park has been studied through two main steps: gathering the literature data and field research carried out alongside watercourses in the Park. The literature records are sorted chronologically and georeferenced using ARC-GiS 10.0, while the coordinates of the new localities were taken in the field using "Garmin" GPS handle device.

Every locality is characterized by the locality name, habitat type (if available), coordinates in WGS1984, altitude (given by author within certain reference), author name with year of the data publishing and collecting date (if available). The collecting field trips to the National Park Sutjeska were carried out in July–August 2014 and June–July of 2015. Main focus of the field research was on hardly accessible and rather virgin Sutjeska and Hrčavka river canyons (Figure 1). All main habitat types along the water flow sides were examined (Figures 2–5), and bryophytes were collected from different substrates (soil, exposed and shady rocks, tree bark and decaying wood). Actually, mosses were studied through floristical records and phytocoenological research in many microlocalities, but some localities which lie close to each other, have been merged considering that they do not significantly contribute to the distribution of the species.

Voucher specimens were deposited in Belgrade University Herbarium (BEOU).

Nomenclature follows Ros et al. (2007) for liverworts and Ros et al. (2013) for mosses.

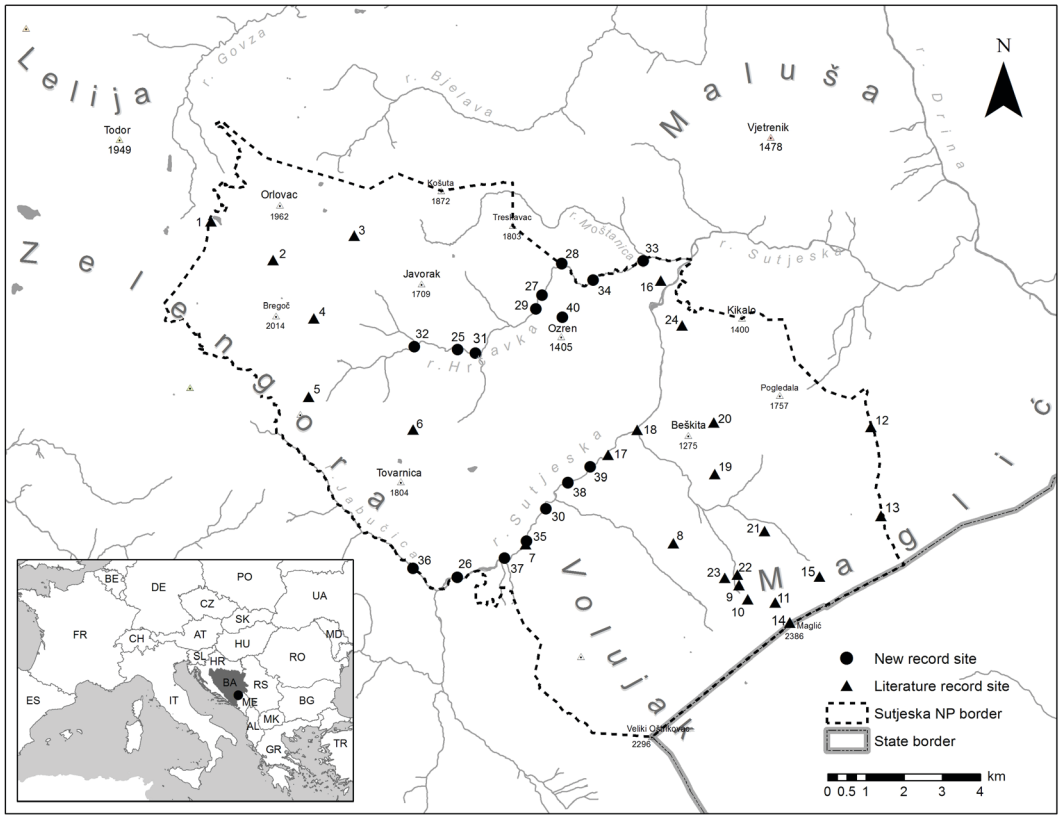

Figure 1. Position of investigated sites within the Sutjeska National Park / **Slika 1**. Položaj istraživanih lokaliteta u Nacionalnom parku Sutjeska

Figure 2. Vegetation of limestone cliffs at Vratar in Sutjeska river canyon / **Slika 2.** Vegetacija krečnjačkih stijena u Vrataru u kanjonu Sutjeske (© Đ. Milanović)

Figure 3. Tufa formations at Skakavac in Hrčavka river canyon / **Slika 3**. Sedrene naslage na Skakavcu u kanjonu Hrčavke (© Đ. Milanović)

Figure 4. Bryophyte synusias at shaded rocks and tree base at Hršova vrela in Sutjeska river canyon / **Slika 4**. Sinuzije na zasjenjenim stijenama i osnovi drveća na Hršovim vrelim u kanjonu Sutjeske (© J. Pantović)

Figure 5. Riverine galleries of *Alnus glutinosa* in Hrčavka valley / **Slika 5**. Trakaste galerije crne jove u dolini Hrčavke (© Đ. Milanović)

3. RESULTS / REZULTATI

According to the methodology of the work, gathering data from the literature as well as systematic field research resulted in the checklist of bryoflora of the Sutjeska National Park (Table 1) recorded from 40 localities scaterred throughout the study area (Appendix 1, Figure 1). The new record sites include 16 new localities alongside the watercourses, while 24 sites include the historical records obtained from the literature (Appendix 1).

During recent field investigation, altogether 175 taxa was found; 35 liverworts and 140 moss taxa were collected in the area of the National Park. Together with the historical literature data, bryoflora of the Park numbers 261 bryophytes: 40 liverworthh and 221 moss taxa. Out of these, 161 taxa are previously known from the area, while 92 are new for the territory of the National Park. These new taxa are indicated by bold names within the species list. Due to the long absence in bryophyte exploration, even 14 liverworts and 27 mosses were recorded after more than 50 years, and these species are marked with an asterisk (*). Three species from this collection were previously published elsewhere, as new records for Bosnia and Herzegovina, two liverworts - *Porella arboris-vitae* and *Cololejeunea rossettiana*, and one moss species *Fissidens serrulatus* (Pantović et al., 2016).

In the following species list, name of the taxa is followed by the site number and substrate. Additionally, the literature source and original taxon name are given in brackets (Table 1).

Table 1. The list of bryophytes of the Sutjeska National Park / **Tabela 1**. Lista briofita Nacionalnog parka Sutjeska

No	**Species** / Vrsta	**Locality and habitat** / Lokalitet i stanište
	Liverworts / Jetrenjače	
1	***Apometzgeria pubescens*** (Schrank) Kuwah.	28: limestone rock, 36: tree bark
2	*Blepharostoma trichophyllum* (L.) Dumort.	21, 22 - rotten wood (Grgić, 1972)
3	****Cephalozia catenulata*** (Huebener) Lindb.	39: limestone rock
4	****Cephaloziella stellulifera*** (Taylor ex Spruce) Schiffn.	28: rotten wood
5	****Chiloscyphus pallescens*** (Ehrh. ex Hoffm.) Dumort	39: limestone rock
6	****Chiloscyphus polyanthos*** (L.) Corda	28: shaded limestone rock, 38: wet soil
7	****Cololejeunea calcarea*** (Lib.) Schiffn.	28: limestone rock, 32: wet shale rock
8	*Cololejeunea rossettiana* (C. Massal.) Schiffn.	28: wet shale rock (Pantović et al., 2016)
9	***Conocephalum conicum*** (L.) Dumort.	28: humid soil, 31: limestone rock, 32: wet shale rock
10	***Conocephalum salebrosum*** Szweyk., Buczkowska & Odrzykoski	34: soil
11	*Frullania dilatata* (L.) Dumort.	18, 19, 21 - *Acer* and *Fagus* bark (Grgić, 1972), 30: rotten wood, 31: *Acer* bark, *Fagus* bark, tree bark, 33: *Alnus* bark, 35: rock, 37: *Prunus* bark
12	***Frullania tamarisci*** (L.) Dumort.	28: shaded limestone rock, 38
13	*Jungermannia atrovirens* Dumort.	22: rotten fir wood (Grgić, 1972, sub *Haplozia lanceolata*), 32: wet shale rock
14	****Jungermannia hyalina*** Lyell	38: rock
15	****Leiocolea heterocolpos*** (Thed. ex Hartm.) H. Buch	33: *Alnus* bark
16	***Lejeunea cavifolia*** (Ehrh.) Lindb.	28: shaded limestone rock, *Fagus* bark, limestone boulder, 38: tree base
17	****Lophocolea bidentata*** (L.) Dumort.	36: rotten wood
18	*Lophocolea heterophylla* (Schrad.) Dumort.	18, 19, 21, 22 - rotten wood (Grgić, 1972), 28: rotten wood, 31: rotten wood, 36: rotten wood
19	***Lophocolea minor*** Nees	28: rotten wood, 31: rotten wood, 33: rotten wood
20	***Marchantia polymorpha*** L.	25: flysch rock, 28: shaded limestone rock, 29: shaded limestone rock
21	*Metzgeria conjugata* Lindb.	18, 19, 21 - *Fagus* and *Acer* bark, rotten beech wood (Grgić, 1972)
22	***Metzgeria furcata*** (L.) Dumort.	27: wet limestone rock, 29: shaded limestone rock, 32: *Alnus* bark, 38: wet limestone rock, 40: shaded limestone rock, rotten wood, *Fagus* bark
23	*Nowellia curvifolia* (Dicks.) Mitt.	18, 19, 21 - rotten fir and beech wood (Grgić, 1972), 28: rotten wood, 31: rotten wood, 36: rotten wood

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No	Species / Vrsta	Locality and habitat / Lokalitet i stanište
24	***Pedinophyllum interruptum*** (Nees) Kaal.	28: shaded limestone rock, 33: rock by the stream, 34: limestone rock in beech forest, 38: humid limestone rock, 39: limestone rock
25	***Pellia epiphylla*** (L.) Corda	32: wet shale rocks, 37: rocks, 40: soil
26	*Plagiochila asplenioides* (L. emend. Taylor) Dumort.	19: *Acer* bark (Grgić, 1972), 27: wet limestone rock, 31: wet soil, 34: limestone rock in beech forest, 38
27	***Plagiochila porelloides*** (Torrey ex Nees) Lindenb.	25: flysch rocks, 27: wet limestone rock, 28: shaded limestone rock, 29: shaded limestone rock, 30, 33: *Alnus* bark, 34: limestone rock in beech forest, 35: rock, 36, 38: on rocks, 39: limestone rock, 40
28	*Porella arboris-vitae* (With.) Grolle	27: wet limestone rock, 28: sandstone boulder, 29: shaded limestone rock (Pantović et al., 2016)
29	*Porella cordaeana* (Huebener) Moore	22: *Fagus* bark (Grgić, 1972, sub *Madotheca cordeana*), 30, 31: on tree base, 35: *Alnus* bark, 36, 39: limestone rock
30	*Porella platyphylla* (L.) Pfeiff.	18, 19, 21, 23 - *Fagus* and *Acer* bark, rotten beech wood (Grgić, 1972, sub *Madotheca platyphylla*), 30: on tree base, 34: *Alnus* bark, 37, 38: limestone rock
31	***Preissia quadrata*** (Scop.) Müll. Frib.	32: wet shale rocks
32	*Ptilidium pulcherrimum* (Weber) Vain.	19, 21: *Abies* bark and rotten wood (Grgić, 1972)
33	*Radula complanata* (L.) Dumort.	18, 19, 21, 23: *Fagus* and *Acer* bark (Grgić, 1972), 30: rotten wood, 31: rotten wood, *Acer* bark, tree bark, 33: *Alnus* bark, 37: *Cornus* bark
34	***Radula lindenbergiana*** Gottsche ex C. Hartm.	28: shaded limestone rock, *Fagus* bark, 31: rotten wood
35	***Reboulia hemisphaerica*** (L.) Raddi	40: limestone rock
36	***Riccardia chamedryfolia*** (With.) Grolle	32: wet shale rocks
37	*Riccardia multifida* (L.) Gray	18: rotten beech wood (Grgić, 1972, sub *Aneura multifida*)
38	***Scapania aspera*** Bernet & M. Bernet	28: shaded limestone rock, 31: limestone rock, 34: limestone rock, 35: on rock, 38: limestone rock, 39: limestone rock
39	***Scapania nemorea*** (L.) Grolle	34: limestone rock in beech forest
40	*Scapania umbrosa* (Schrad.) Dumort.	23: rotten fir wood (Grgić, 1972)
	Mosses / Mahovine	
1	*Abietinella abietina* (Hedw.) M. Fleisch.	12 (Glowacki, 1907b, sub *Thuidium abietinum*), 29: sandstone, 31: siliceous rock
2	*Alleniella besseri* (Lobarz.) S. Olsson, Enroth & D. Quandt	19: *Acer* bark (Grgić, 1972, sub *Neckera besseri*), 27: limestone rock, 28: shaded limestone rock, limestone crevices

No	**Species** / Vrsta	**Locality and habitat** / Lokalitet i stanište
3	*Alleniella complanata* (Hedw.) S. Olsson, Enroth & D. Quandt	7 (Glowacki, 1907a, sub *Neckera complanata*), 17, 18, 19, 21 - *Acer* and *Fagus* bark (Grgić, 1972, sub *Neckera complanata*), 28: shaded limestone rock, limestone boulder, 30, 31: *Fagus* bark, limestone rock, tree bark, 33: limestone rock, 36, 37: rotten wood; 38: tree base
4	*Amblystegium serpens* (Hedw.) Schimp.	7 (Glowacki, 1907a, sub *Amblystegium rigescens*), 33: tree bark, 37: limestone rock
5	***Amblystegium varium*** (Hedw.) Lindb.	31: on shaded rocks, 33: soil
6	***Amphidium mougeotii*** (Bruch & Schimp.) Schimp.	38: limestone rock
7	***Anoectangium aestivum*** (Hedw.) Mitt.	40: soil
8	*Anomodon attenuatus* (Hedw.) Huebener	7 (Glowacki, 1907a), 28: shaded limestone rock, 29: shaded limestone rock, 30: limestone rock, 33: tree bark, limestone rock, 38: limestone rock, 39: limestone rock
9	****Anomodon longifolius*** (Schleich. ex Brid.) Hartm.	39: limestone rock
10	*Anomodon rugelii* (Müll. Hal.) Keissl.	18, 19 - *Fagus* and *Acer* bark (Grgić, 1972)
11	*Anomodon viticulosus* (Hedw.) Hook. & Taylor	5, 7 (Glowacki, 1907a), 12 (Glowacki, 1907b), 28: shaded limestone rock, 33: concrete wall, tree bark, *Alnus* bark, 38: *Fagus* bark, rocks; limestone rock, 39: limestone rock
12	***Antitrichia curtipendula*** (Timm ex Hedw.) Brid.	31: tree bark
13	*Atrichum flavisetum* Mitt.	8 (Glowacki, 1907a, sub *Catharinaea hausknechtii*)
14	***Atrichum undulatum*** (Hedw.) P. Beauv.	33: *Alnus* bark, 35: rotten wood
15	*Barbula convoluta* Hedw.	2, 7 (Glowacki, 1907a)
16	**Barbula crocea* (Brid.) F. Weber & D. Mohr	7 (Glowacki, 1907a, sub *Barbula paludosa*), 33: soil, 38: wet soil
17	*Barbula unguiculata* Hedw.	7 (Glowacki, 1907a), 31: siliceous rock, on gravel, limestone rock, 36: soil
18	***Bartramia halleriana*** Hedw.	27: wet limestone rock
19	*Bartramia ithyphylla* Brid.	1, 9, 11 (Glowacki, 1907a)
20	***Bartramia pomiformis*** Hedw.	28: shaded limestone rock, 33: *Alnus* bark, 38: humid limestone rock
21	*Brachytheciastrum velutinum* (Hedw.) Ignatov & Huttunen	2, 8, 9, 11 (Glowacki, 1907a, sub *Brachythecium velutinum*), 18, 19, 21, 22 - rotten beech wood (Grgić, 1972, sub *Brachythecium velutinum*), 36, 39: limestone rock
22	*Brachythecium cirrosum* (Schwägr.) Schimp.	3 (Glowacki, 1907a, sub *Eurhynchium cirrhosum*)
23	*Brachythecium geheebii* Milde	18, 19, 20, 23 - rotten wood (Grgić, 1972)
24	****Brachythecium mildeanum*** (Schimp.) Schimp.	33: limestone rock
25	*Brachythecium rivulare* Schimp.	1, 7, 9 (Glowacki, 1907a), 25: limestone rock, 28: limestone rock, 33: rock by the stream, limestone rock, 35: sandstones by the stream, 38: limestone rock, wet limestone rock, 39: limestone rock

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No	Species / Vrsta	Locality and habitat / Lokalitet i stanište
26	***Brachythecium rutabulum*** (Hedw.) Schimp.	28: limestone rock, 31: rotten wood, 33: tree bark, 35: rotten wood, 36: tree bark, 38: limestone rock, 39: limestone rock
27	*Brachythecium salebrosum* (Hoffm. ex F. Weber & D. Mohr) Schimp.	12 (Glowacki, 1907b), 18, 19, 23 - *Abies* and *Fagus* bark (Grgić, 1972), 40: limestone rock
28	****Brachythecium tommasinii*** (Sendtn. ex Boulay) Ignatov & Huttunen	28: sandstone boulder, 31: shaded rock, 37: rotten wood
29	*Bryoerythrophyllum recurvirostrum* (Hedw.) P.C. Chen	3, 11 (Glowacki, 1907a, sub *Didymodon rubellus*), 28: limestone rock
30	*Bryum elegans* Nees	7 (Glowacki, 1907a, sub *Bryum elegans* var. *ferchelii*), 12 (Glowacki, 1907b, sub *Bryum elegans* var. *ferchelii*)
31	*Bryum schleicheri* DC.	1 (Glowacki, 1907a)
32	*Buxbaumia viridis* (Moug. ex Lam. & DC.) Brid. ex Moug. & Nest.	21: rotten fir wood (Grgić, 1972, sub *Buxbaumia indusiata*), 31: rotten wood
33	*Calliergonella cuspidata* (Hedw.) Loeske	1 (Glowacki, 1907a, sub *Acrocladium cuspidatum*), 33: soil
34	*Calliergonella lindbergii* (Mitt.) Hedenäs	18, 19, 20, 21, 22 - *Acer* and *Abies* bark, rotten beech wood (Grgić, 1972, sub *Bredileria arcuata* f. *demissa*)
35	*Campyliadelphus chrysophyllus* (Brid.) R.S. Chopra	3 (Glowacki, 1907a, sub *Hypnum chrysophyllum*), 14 (Glowacki, 1907b, sub *Hypnum chrysophyllum*)
36	****Campylidium calcareum*** (Crundw. & Nyholm) Ochyra	36: rock
37	*Campylium protensum* (Brid.) Kindb.	1 (Glowacki, 1907a, sub *Hypnum protensum*)
38	***Campylium stellatum*** (Hedw.) Lange & C.E.O. Jensen	36: soil
39	*Campylophyllum halleri* (Hedw.) M. Fleisch.	19, 21 - rotten fir tree (Grgić, 1972)
40	*Campylophyllum sommerfeltii* (Myrin) Hedenäs	7 (Glowacki, 1907a, sub *Hypnum sommerfeltii*), 14 (Glowacki, 1907b, sub *Hypnum sommerfeltii*)
41	*Ceratodon purpureus* (Hedw.) Brid.	1, 8, 9, 11 (Glowacki, 1907a)
42	***Cinclidotus aquaticus*** (Hedw.) Bruch & Schimp.	28: limestone rock, 31: rock by the stream, 34: wet limestone rock, 35: limestone rock by the stream, 38: limestone rock, wet limestone rock
43	*Cinclidotus fontinaloides* (Hedw.) P. Beauv.	7 (Glowacki, 1907a), 28: limestone rock, 29: sandstone, 30: wet limestone rock, 35: limestone rock by the stream, sandstones by the stream, 38: limestone rock, 39: limestone rock
44	***Cinclidotus riparius*** (Host ex Brid.) Arn.	28: limestone rock, 35: limestone rock by the stream, sandstones by the stream
45	*Cirriphyllum crassinervium* (Taylor) Loeske & M. Fleisch.	3, 5, 7 (Glowacki, 1907a, sub *Eurhynchium crassinervium*), 31: shaded rock, 33: limestone rock, 36: tree base, 36, 38: limestone rock, 39: limestone rock
46	*Cirriphyllum piliferum* (Hedw.) Grout	12 (Glowacki, 1907b, sub Eurhynchium piliferum Schreb.)

No	**Species** / Vrsta	**Locality and habitat** / Lokalitet i stanište
47	*Cratoneuron filicinum* (Hedw.) Spruce	1, 3, 7 (Glowacki 1907a, sub *Amblystegium filicinum*), 19, 22, 23 - *Acer* and *Fagus* bark (Grgić, 1972), 28: tufa, 31: soil, 34: wet limestone rock, 38: wet limestone rock
48	*Ctenidium molluscum* (Hedw.) Mitt.	3, 7, 11 (Glowacki, 1907a, sub *Hypnum molluscum*), 12, 14 (Glowacki, 1907b, sub *Hypnum molluscum*), 10: mountain pine formations (Lakušić et al., 1987), 25: limestone rock, flysch rocks, 28: shaded limestone rock, sandstone boulder, 29: shaded limestone rock, sandstone, 30: wet limestone rock, 31: siliceous rock, limestone rock, 34: limestone rock in beech forest, 38: limestone rock
49	*Dichodontium pellucidum* (Hedw.) Schimp.	1, 3 (Glowacki, 1907a)
50	***Dicranella varia*** (Hedw.) Schimp.	35: limestone rock; 40: soil road, soil
51	*Dicranodontium denudatum* (Brid.) E. Britton	8 (Glowacki, 1907a, sub *Dicranodontium longirostre*)
52	***Dicranum polysetum*** Sw. ex anon.	25: flysch rocks, 29: shaded limestone rock
53	*Dicranum scoparium* Hedw.	1, 9, 11 (Glowacki, 1907a), 12 (Glowacki, 1907b), 15: mountain pine formations (Fukarek, 1956), 16: sessile oak forest (Stefanović, 1964), 21, 22 - rotten fir wood (Grgić, 1972), 24: sessile oak forest (Lakušić et al., 1987), 30, 40: rotten wood
54	*Dicranum tauricum* Sapjegin	12 (Glowacki, 1907b, sub *Dicranum strictum*)
55	**Didymodon acutus* (Brid.) K. Saito	12 (Glowacki, 1907b, sub *Barbula gracilis*), 36: soil in meadow
56	*Didymodon fallax* (Hedw.) R.H. Zander	7 (Glowacki, 1907a, sub *Barbula fallax*)
57	***Didymodon ferrugineus*** (Schimp. ex Besch.) M.O. Hill	31: exposed soil, 35: rock
58	*Didymodon rigidulus* Hedw.	3, 7, 11 (Glowacki, 1907a), 13 (Glowacki, 1907b), 28: sandstone boulder, 35: on sandstone
59	*Didymodon sinuosus* (Mitt.) Delogne	7 Glowacki, 1907a, sub *Barbula sinuosa*)
60	*Didymodon spadiceus* (Mitt.) Limpr.	3 (Glowacki, 1907a)
61	***Didymodon tophaceus*** (Brid.) Lisa	39: limestone rock
62	*Distichium capillaceum* (Hedw.) Bruch & Schimp.	14 (Glowacki, 1907b)
63	*Distichium inclinatum* (Hedw.) Bruch & Schimp.	14 (Glowacki, 1907b)
64	*Ditrichum flexicaule* (Schwägr.) Hampe	2, 7 (Glowacki, 1907a), 12, 14 (Glowacki, 1907b)
65	***Ditrichum gracile*** (Mitt.) Kunze	31: limestone rock, on gravel, 35: soil, 38: rock
66	***Ditrichum heteromallum*** (Hedw.) Britt.	35: soil
67	*Ditrichum pusillum* (Hedw.) Hampe	1 (Glowacki, 1907a, sub *Ditrichum tortile*)
68	*Encalypta streptocarpa* Hedw.	2, 3, 11 (Glowacki, 1907a, sub *Encalypta contorta*), 13 (Glowacki, 1907b, sub *Encalypta contorta*), 28: limestone rock, 31: limestone rock, siliceous rock, 35: rock
69	***Entodon concinnus*** (De Not.) Paris	30: soil, 31: limestone rock

continued / nastavak na sljedećoj stranici

continuation of Table 1 / nastavak Tabele 1

No	**Species** / Vrsta	**Locality and habitat** / Lokalitet i stanište
70	***Eucladium verticillatum*** (With.) Bruch & Schimp.	37: wet calcareous rocks
71	*Eurhynchiastrum pulchellum* (Hedw.) Ignatov & Huttunen	7, 11 (Glowacki, 1907a, sub *Eurhynchium strigosum*), 28: limestone rock, 39: limestone rock
72	*Eurhynchiastrum pulchellum* (Hedw.) Ignatov & Huttunen var. *praecox* (Hedw.) Ochyra & Żarnowiec	11 (Glowacki, 1907a, sub *Eurhynchium strigosum* var. *praecox*)
73	*Eurhynchium striatum* (Hedw.) Schimp.	24: sessile oak forest (Lakušić et al., 1987); 25: flysch rocks, 28: shaded limestone rock, 30: wet limestone rock, 31: shaded rock, 33: limestone rock, 34: limestone rock in beech forest, 38: rocks, humid limestone rock, 39: limestone rock;
74	*Exsertotheca crispa* (Hedw.) S. Olsson, Enroth & D. Quandt	7 (Glowacki, 1907a, sub *Neckera crispa*), 18, 19 - *Fagus* and *Abies* bark (Grgić, 1972, sub *Neckera crispa*), 25: limestone rock, flysch rocks, 27: wet limestone rock, 28: shaded limestone rock, 29: shaded limestone rock, 30: wet limestone rock, 31: rotten wood, 34: limestone rock, 39: *Fagus* bark
75	***Fissidens dubius*** P. Beauv.	28: shaded limestone rock, limestone boulder, 29: shaded limestone rock, 31: on tree base, 32: wet shale rocks, 33: soil, 38: limestone rock
76	*Fissidens pusillus* (Wilson) Milde	3 (Glowacki, 1907a)
77	*Fissidens serrulatus* Brid.	40: soil road (Pantović et al., 2016)
78	***Fissidens taxifolius*** Hedw.	31: limestone rock, 33: soil, 35: rock, soil, 40: soil
79	***Fontinalis antipyretica*** Hedw.	38: rock
80	****Fontinalis hypnoides*** C. Hartm.	33: soil
81	*Grimmia hartmanii* Schimp.	3, 9 (Glowacki, 1907a, sub *Grimmia hartmanni* var. *montenegrina*)
82	*Grimmia muehlenbeckii* Schimp.	9 (Glowacki, 1907a)
83	*Grimmia pulvinata* (Hedw.) Sm.	7 (Glowacki, 1907a), 13 (Glowacki, 1907b), 35: rock
84	*Gymnostomum aeruginosum* Sm.	7 (Glowacki, 1907a, sub *Gymnostomum rupestre*), 28: shaded limestone rock, 32: wet shale rocks, 35: limestone rock
85	*Gymnostomum calcareum* Nees & Hornsch.	7 (Glowacki, 1907a)
86	***Gymnostomum viridulum*** Brid.	35: limestone crevices
87	***Gyroweisia tenuis*** (Hedw.) Schimp.	35: on sandstone
88	***Hedwigia ciliata*** (Hedw.) P. Beauv.	28: shaded limestone rock
89	*Herzogiella seligeri* (Brid.) Z. Iwats.	8, 9 (Glowacki, 1907a, sub *Plagiothecium silesiacum*), 28: rotten wood, 31: rotten wood, 35: rotten wood, 37: rotten wood, 40: rotten wood
90	*Heterocladium dimorphum* (Brid.) Schimp.	1, 8, 11 (Glowacki, 1907a, sub *Heterocladium squarrosulum*)

No	**Species** / Vrsta	**Locality and habitat** / Lokalitet i stanište
91	*Homalothecium lutescens* (Hedw.) H. Rob.	2, 7, 11 (Glowacki, 1907a, sub *Camptothecium lutescens*), 12 (Glowacki, 1907b, sub *Camptothecium lutescens*), 28: shaded limestone rock, 29: sandstone, 35: limestone rock, on sandstone, 37: shale rocks
92	*Homalothecium lutescens* (Hedw.) H. Rob.var. *fallax* (H. Philib.)	5 (Glowacki, 1907a, sub *Camptothecium lutescens* var. *fallax*)
93	*Homalothecium philippeanum* (Spruce) Schimp.	3 (Glowacki, 1907a,), 28: shaded limestone rock, 29: shaded limestone rock, sandstone, 36: rock, 37: rock, 38: humid limestone rock, limestone rock, 39: limestone rock
94	*Homalothecium sericeum* (Hedw.) Schimp.	7 (Glowacki, 1907a), 14 (Glowacki, 1907b); 28: sandstone boulder, 31: siliceous rock, limestone rock, 35: limestone rock
95	*Homomallium incurvatum* (Schrad. ex Brid.) Loeske	3 (Glowacki, 1907a, sub *Hypnum incurvatum*), 21, 22, 23 - *Fagus* bark (Grgić, 1972), 31: siliceous rock, 39: limestone rock
96	*Hygroamblystegium tenax* (Hedw.) Jenn.	7 (Glowacki, 1907a, sub *Amblystegium irriguum*)
97	*Hygroamblystegium varium* (Hedw.) Mönk.	7 (Glowacki, 1907a, sub *Amblystegium varium*)
98	*Hygrohypnum luridum* (Hedw.) Jenn.	3 (Glowacki, 1907a, sub *Hypnum subnerve*), 28: shaded limestone rock, 31: limestone rock, 35: limestone rock, 38: limestone rock by the stream
99	*Hylocomium splendens* (Hedw.) Schimp.	10: mountain pine formations (Lakušić et al., 1987), 11 (Glowacki, 1907a), 12 (Glowacki, 1907b), 15: mountain pine formations (Fukarek, 1956), 21: rotten fir wood (Grgić, 1972), 24: sessile oak forest (Lakušić et al., 1987), 26: soil, 27: wet limestone rock, 29: shaded limestone rock, 30: soil in beech forest, 31: soil, 36: soil in beech forest
100	*Hymenoloma crispulum* (Hedw.) Ochyra	9 (Glowacki, 1907a, sub *Dicranoweisia crispula*)
101	*Hymenostylium recurvirostrum* (Hedw.) Dixon	7 (Glowacki, 1907a, sub *Hymenostylium curvirostre*)
102	***Hypnum andoi*** A.J.E. Sm.	33: limestone rock
103	*Hypnum cupressiforme* Hedw.	7 (Glowacki, 1907a), 15: mountain pine formations (Fukarek, 1956), 16: sessile oak forest (Stefanović, 1964), 19: rotten fir wood (Grgić, 1972, sub *Hypnum cupressiforme* f. *uncinatulum*), 25: flysch rocks, 28: sandstone boulder, 29: sandstone, 30, 31: shaded rock, on tree base, siliceous rock, 33: *Alnus* bark, 35: limestone rock, 40: rock
104	***Hypnum cupressiforme*** Hedw. var. ***lacunosum*** Brid.	36: soil in meadow, 40
105	***Hypnum jutlandicum*** Holmen ex E. Warncke	35: rock
106	****Hypnum recurvatum*** (Lindb.) & Arnell) Kindb.	31: siliceous rock, 38: limestone rock
107	***Imbribryum alpinum*** (Huds. ex With.) N. Pedersen	35: soil
108	*Isothecium alopecuroides* (Lam. ex Dubois) Isov.	11 (Glowacki, 1907a, sub *Isothecium myurum* var. *robustum*), 17, 18, 19, 21, 22, 23 - *Acer*, *Abies* and *Fagus* bark (Grgić, 1972), 28: rotten wood, 31: rock, 36, 38: limestone rock, 39: *Fagus* bark, 40: rock

continued / nastavak na sljedećoj stranici

No	**Species** / Vrsta	**Locality and habitat** / Lokalitet i stanište
109	*Isothecium myosuroides* Brid.	8 (Glowacki, 1907a)
110	*Kindbergia praelonga* (Hedw.) Ochyra	12 (Glowacki, 1907b, sub *Eurhynchium stockesii*)
111	****Leptodon smithii*** (Hedw.) F. Weber & D. Mohr	30: tree bark, 35: *Tilia* bark, 38: rock
112	*Lescuraea incurvata* (Hedw.) E. Lawton	2, 3, 4, 6, 8, 9, 10, 11 (Glowacki, 1907a, sub *Pseudoleskea atrovirens* and *Pseudoleskea atrovirens* var. *brachyclados*), 12 (Glowacki, 1907b, sub *Pseudoleskea atrovirens*)
113	*Lescuraea mutabilis* (Brid.) Lindb. ex I. Hagen	9 (Glowacki, 1907a, sub *Lescuraea striata*), 12 (Glowacki, 1907b, sub *Lescuraea striata*); 28: *Fagus* bark, 31: on tree base
114	*Leucodon sciuroides* (Hedw.) Schwägr.	17, 18, 19, 20, 21, 22, 23 - *Acer* and *Fagus* bark (Grgić, 1972), 31: *Salix* bark, siliceous rock, 37: *Cornus* bark, rotten wood
115	***Mnium hornum*** Hedw.	29: shaded limestone rock
116	*Mnium lycopodioides* Schwägr.	12 (Glowacki, 1907b)
117	*Mnium marginatum* (Dicks. ex With.) P. Beauv.	14 (Glowacki, 1907b, sub *Mnium serratum*)
118	*Mnium spinulosum* Bruch & Schimp.	8 (Glowacki, 1907a), 21: rotten beech wood (Grgić, 1972), 28: shaded limestone rock, 33: *Alnus* bark; 38: wet soil, humid limestone rock
119	*Mnium stellare* Hedw.	3, 5 (Glowacki, 1907a), 12 (Glowacki, 1907b), 28: sandstone boulder, 36, 40: soil
120	***Mnium thomsonii*** Schimp.	28: shaded limestone rock, 138
121	*Myurella julacea* (Schwägr.) Schimp.	14 (Glowacki, 1907b)
122	****Neckera pumila*** Hedw.	28: sandstone boulder
123	***Orthothecium rufescens*** (Dicks. ex Brid.) Schimp.	31: limestone rock
124	*Orthotrichum affine* Schrad. ex Brid.	1 (Glowacki, 1907a, sub *Orthotrichum fastigiatum*), 31: *Acer* bark, 33: *Alnus* bark, *Fraxinus* bark, 36: tree bark
125	***Orthotrichum anomalum*** Hedw.	35: limestone rock
126	*Orthotrichum cupulatum* Hoffm. ex Brid.	7 (Glowacki, 1907a)
127	*Orthotrichum pulchellum* Brunt.	18: rotten beech tree (Grgić, 1972)
128	****Orthotrichum patens*** Bruch ex Brid.	37: *Prunus* bark
129	***Orthotrichum rupestre*** Schleich. ex Schwägr.	28: shaded limestone rock
130	*Orthotrichum shawii* Wilson	23: *Fagus* bark (Grgić, 1972)
131	*Orthotrichum stramineum* Hornsch. ex Brid.	1, 9 (Glowacki, 1907a)
132	*Orthotrichum striatum* Hedw.	1, 9 (Glowacki, 1907a, sub *Orthotrichum leiocarpum*), 20, 22, 23 - *Acer* and *Fagus* bark (Grgić, 1972)
133	***Orthotrichum tenellum*** Bruch ex Brid.	37: *Carpinus* bark

No	**Species** / Vrsta	**Locality and habitat** / Lokalitet i stanište
134	***Oxyrrhynchium hians*** (Hedw.) Loeske	28: shaded limestone rock, 31: limestone rock, 33: soil
135	****Oxystegus tenuirostris*** (Hook. & Taylor) A.J.E. Sm.	39: limestone rocks
136	*Palustriella commutata* (Hedw.) Ochyra	1 (Glowacki, 1907a, sub *Hypnum subsulcatum*), 31: soil, 32: wet shale rocks, 34: wet limestone rock, 37: rocks, wet calcareous rocks, 38: wet limestone rock
137	*Palustriella decipiens* (De Not.) Ochyra	1 (Glowacki, 1907a, sub *Hypnum decipiens*)
138	**Palustriella falcata* (Brid.) Hedenäs	1 (Glowacki, 1907a, sub *Hypnum falcatum*), 38: wet limestone rock
139	*Paraleucobryum longifolium* (Ehrh. ex Hedw.) Loeske	3 (Glowacki, 1907a, sub *Dicranum longifolium*), 21, 22, 23 - rotten wood (Grgić, 1972, sub *Paraleucobryum longifolium* subsp. *sauteri*)
140	*Philonotis calcarea* (Bruch & Schimp.) Schimp.	1 (Glowacki, 1907a)
141	*Philonotis fontana* (Hedw.) Brid.	1 (Glowacki, 1907a)
142	*Plagiomnium affine* (Blandow ex Funck) T.J. Kop.	19: mixed beech-fir forest (Lakušić et al., 1987, sub *Mnium affine*)
143	***Plagiomnium cuspidatum*** (Hedw.) T.J. Kop.	33: tree bark
144	****Plagiomnium elatum*** (Bruch & Schimp.) T.J. Kop.	28: shaded limestone rock
145	**Plagiomnium medium* (Bruch & Schimp.) T.J. Kop.	12 (Glowacki, 1907b, sub *Mnium medium*), 39: limestone rock
146	*Plagiomnium rostratum* (Schrad.) T.J. Kop.	1, 3 (Glowacki, 1907a, sub *Mnium rostratum*), 38: wet soil
147	*Plagiomnium undulatum* (Hedw.) T.J. Kop.	19: mixed beech-fir forest (Lakušić et al., 1987, sub *Mnium undulatum*), 24: sessile oak forest (Lakušić et al., 1987, sub *Mnium undulatum*), 27: wet limestone rock, 28: tufa, 29: shaded limestone rock, 30: soil, 33: soil, 34: wet limestone rock, 38: wet soil
148	*Plagiopus oederianus* (Sw.) H.A. Crum & L.E. Anderson	12 (Glowacki, 1907b, sub *Plagiopus oederi*), 30: shaded limestone rock
149	*Plagiothecium cavifolium* (Brid.) Z. Iwats.	9 (Glowacki, 1907a, sub *Plagiothecium roeseanum*)
150	*Plagiothecium denticulatum* (Hedw.) Schimp.	11 (Glowacki, 1907a)
151	***Plagiothecium nemorale*** (Mitt.) A. Jaeger	33: *Alnus* bark
152	*Plasteurhynchium striatulum* (Spruce) M. Fleisch.	7 (Glowacki, 1907a, sub *Eurhynchium striatulum*)
153	*Platydictya jungermannioides* (Brid.) H.A. Crum	3 (Glowacki, 1907a, sub *Amblystegium sprucei*)
154	*Pleurozium schreberi* (Willd. ex Brid.) Mitt.	11 (Glowacki, 1907a, sub *Hylocomium schreberi*), 15: mountain pine formations (Fukarek, 1956, sub *Hypnum schreberii*)
155	***Pogonatum aloides*** (Hedw.) P. Beauv.	40: soil
156	****Pohlia annotina*** (Hedw.) Broth.	32: wet shale rocks
157	****Pohlia cruda*** (Hedw.) Lindb	40: soil
158	**Pohlia drummondii* (Müll. Hal.) A.L. Andrews	1 (Glowacki, 1907a, sub *Webera commutata*), 32: wet shale rocks
159	*Pohlia nutans* (Hedw.) Lindb.	1 (Glowacki, 1907a, sub *Webera nutans*),

continued / nastavak na sljedećoj stranici

continuation of Table 1 / nastavak Tabele 1

No	**Species** / Vrsta	**Locality and habitat** / Lokalitet i stanište
160	*Polytrichum commune* Hedw.	16: sessile oak forest (Stefanović, 1964); 19: mixed beech-fir forest (Lakušić et al., 1987)
161	*Polytrichum formosum* Hedw.	8 (Glowacki, 1907a), 24: sessile oak forest (Lakušić et al., 1987, sub *Polytrichum attenuatum*), 28: soil
162	*Polytrichum juniperinum* Hedw.	1, 11 (Glowacki, 1907a), 10: mountain pine formations (Lakušić et al., 1987), 12 (Glowacki, 1907b), 19: mixed beech-fir forest (Lakušić et al., 1987), 24: sessile oak forest (Lakušić et al., 1987)
163	***Pseudoamblystegium subtile*** (Hedw.) Vanderp. & Hedenäs	28: limestone rock
164	****Pseudocampylium radicale*** (P. Beauv.) Vanderp. & Hedenäs	31: shaded rock
165	***Pseudocrossidium hornschuchianum*** (Schultz) R.H. Zander	31: siliceous rock
166	*Pseudoleskeella catenulata* (Brid. ex Schrad.) Kindb.	1, 7, 8, 11 (Glowacki, 1907a, sub *Pseudoleskea catenulata*), 31: shaded rock, siliceous rock, 35: limestone rock, on sandstone
167	*Pseudoleskeella nervosa* (Brid.) Nyholm	4, 8, 11 (Glowacki, 1907a, sub *Leskea nervosa*); 39: wet limestone rock
168	*Pseudoscleropodium purum* (Hedw.) M. Fleisch.	24: sessile oak forest (Lakušić et al., 1987, sub *Scleropodium purum*), 30: soil in beech forest, 36: soil
169	*Pterigynandrum filiforme* Hedw.	1, 2, 3, 9, 10 (Glowacki, 1907a), 17, 18, 19, 21, 22, 23 - tree bark and rotten wood (Grgić, 1972), 31: *Fagus* bark, rotten wood, 36: tree bark, 37: *Prunus* bark, rotten wood, 40
170	***Ptychostomum archangelicum*** (Bruch & Schimp.) J.R. Spence	35: limestone rock
171	*Ptychostomum capillare* (Hedw.) Holyoak & N. Pedersen	5, 7 (Glowacki, 197a, sub *Bryum capillare*), 28: shaded limestone rock, 30: soil, 31: shaded rock, limestone rock, 33: soil;
172	*Ptychostomum compactum* Hornsch.	2 (Glowacki, 1907a, sub *Bryum pendulum* var. *compactum*)
173	*Ptychostomum imbricatulum* (Müll. Hal.) Holyoak & N. Pedersen	1, 11 (Glowacki, 1907a, sub *Bryum caespiticium*)
174	*Ptychostomum moravicum* (Podp.) Ros & Mazimpaka	3, 4 (Glowacki, 1907a, sub *Bryum capillare* var. *flaccidum*), 33: *Alnus* bark, 35: rotten wood, 36, 37: rotten wood
175	*Ptychostomum pallens* (Sw.) J.R. Spence	11 (Glowacki, 1907a, sub *Bryum fallax* var. *baldense*)
176	*Ptychostomum pseudotriquetrum* (Hedw.) J.R. Spence & H.P. Ramsay	1, 7 (Glowacki, 1907a, sub *Bryum pseudotriquetrum*), 34: wet limestone rock
177	****Racomitrium aquaticum*** (Brid. ex Schrad.) Brid.	38: limestone rock by the stream, 39: limestone rock

No	**Species** / Vrsta	**Locality and habitat** / Lokalitet i stanište
178	*Racomitrium canescens* (Hedw.) Brid.	1, 11 (Glowacki, 1907a), 12 (Glowacki, 1907b), 24: sessile oak forest (Lakušić et al., 1987)
179	*Racomitrium ericoides* (Brid.) Brid.	1 (Glowacki, 1907a, sub *Racomitrium canescens* var. *ericoides*)
180	*Rhizomnium punctatum* (Hedw.) T.J. Kop.	1, 3 (Glowacki, 1907a, sub *Mnium punctatum*), 21: rotten fir wood (Gegić, 1972, sub *Mnium punctatum*), 31: rotten wood, 33: rotten wood, 39: wet limestone rock
181	***Rhynchostegiella tenella*** (Dicks.) Limpr.	40: soil
182	*Rhynchostegium murale* (Hedw.) Schimp.	3 (Glowacki, 1907a), 39: limestone rock
183	***Rhynchostegium riparioides*** (Hedw.) Cardot	28: shaded limestone rock, 31: rock in stream, 33: rock by the stream, 34: wet limestone rock, 35: limestone rock by the stream, sandstones by the stream, 38: wet limestone rock
184	*Rhytidiadelphus loreus* (Hedw.) Warnst.	24: sessile oak forest (Lakušić et al., 1987)
185	*Rhytidiadelphus squarrosus* (Hedw.) Warnst.	11 (Glowacki, 1907a, sub *Hylocomium squarrosum*)
186	*Rhytidiadelphus triquetrus* (Hedw.) Warnst.	11 (Glowacki, 1907a, sub *Hylocomium triquetrum*), 12 (Glowacki, 1907b, sub *Hylocomium triquetrum*), 10: mountain pine formations (Lakušić et al., 1987); 26: soil, 27: wet limestone rock, 34: limestone rock, 36: soil
187	***Rhytidium rugosum*** (Ehrh. ex Hedw.) Kindb.	30: soil in beech forest, 40: soil in beech forest
188	*Sanionia uncinata* (Hedw.) Loeske	1, 11 (Glowacki, 1907a, sub *Hypnum uncinatum*)
189	*Sarmentypnum exannulatum* (Schimp.) Hedenäs	21: rotten fir and beech wood (Grgić, 1972, sub *Drepanocladus exannulatus*)
190	*Schistidium apocarpum* (Hedw.) Bruch & Schimp.	1, 3, 7, 11 (Glowacki, 1907a, sub *Grimmia apocarpa*), 13 (Glowacki, 1907b, sub *Grimmia apocarpa*), 29: sandstone, 33: limestone rock
191	*Schistidium brunnescens* Limpr.	7 (Glowacki, 1907a, sub *Grimmia brunnescens*)
192	*Schistidium confertum* (Funck) Bruch & Schimp.	1 (Glowacki, 1907a, sub *Grimmia conferta*)
193	***Schistidium crassipilum*** H.H. Blom	30: rock, 32: wet shale rocks, 35: limestone rock, 37: limestone rock, 40: rock
194	****Schistidium elegantulum*** Blom	28: shaded limestone rock, 30: rock, 31: siliceous rock, 33: rock by the stream, 35: on sandstone, 36: rock, 37: rock
195	****Schistidium flaccidum*** (De Not.) Ochyra	31: limestone rock
196	***Schistidium helveticum*** (Schkuhr) Deguchi	31: siliceous rock, 35: rock, 38: limestone rock
197	***Schistidium rivulare*** (Brid.) Podp.	28: limestone rock, 31: siliceous rock, limestone rock, 35: on sandstone, 37: shale rocks, 38: limestone rock
198	*Sciuro-hypnum flotowianum* (Sendtn.) Ignatov & Huttunen	3 (Glowacki, 1907a, sub *Eurhynchium velutinoides*)
199	*Sciuro-hypnum starkei* (Brid.) Ignatov & Huttunen	4, 6 (Glowacki, 1907a, sub *Brachythecium starkei*), 19, 21, 22, 23 - *Fagus* bark and rotten fir wood (Grgić, 1972, sub *Brachythecium starkei*)
200	*Seligeria trifaria* (Brid.) Lindb.	7 (Glowacki, 1907a, sub *Seligeria tristicha*)

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continuation of Table 1 / nastavak Tabele 1

No	**Species** / Vrsta	**Locality and habitat** / Lokalitet i stanište
201	*Serpoleskea confervoides* (Brid.) Kartt.	3 (Glowacki, 1907a, sub *Amblystegium confervoides*)
202	*Syntrichia laevipila* Brid.	23: *Fagus* bark (Grgić, 1972, sub *Syntrichia laevipila* var. *laevipiliformis*)
203	*Syntrichia montana* Nees	7 (Glowacki, 1907a, sub *Tortula montana*), 31: limestone rock
204	*Syntrichia ruralis* (Hedw.) F. Weber & D. Mohr	1, 2 (Glowacki, 1907a, sub *Tortula ruralis*), 12 (Glowacki, 1907b, sub *Tortula ruralis*), 19: rotten beech wood (Grgić, 1972), 31,35: limestone rock
205	***Thamnobryum alopecurum*** (Hedw.) Gangulee	25: flysch rocks, 27: wet limestone rock, 28: shaded limestone rock, 29: shaded limestone rock, 31: limestone rock
206	***Thuidium assimile*** (Mitt.) A. Jaeger	29: shaded limestone rock, 138
207	*Thuidium delicatulum* (Hedw.) Schimp.	8 (Glowacki, 1907a), 30, 31: on tree base, 33: rotten wood, 34: limestone rock, 39: limestone rocks
208	***Thuidium recognitum*** (Hedw.) Lindb.	30, 31: limestone rock, 36: soil, 37: soil
209	*Tortella fragilis* (Hook. & Wilson) Limpr.	1 (Glowacki, 1907a)
210	*Tortella tortuosa* (Hedw.) Limpr.	1, 2, 7, 11 (Glowacki, 1907a); 10: subalpine pastures (Lakušić et al., 1987), 12, 14 (Glowacki, 1907b), 19: mixed beech-fir forest (Lakušić et al., 1987), 25: flysch rocks, 27: wet limestone rock, 29: shaded limestone rock, 31: rotten wood, siliceous rock, limestone rock, 35: soil, limestone rock, 37: limestone rock, 39: limestone rock, 40: soil
211	*Tortella tortuosa* (Hedw.) Limpr. var. *fragilifolia* (Jur.) Limpr.	7 (Glowacki, 1907a)
212	****Tortula inermis*** (Brid.) Mont.	35: limestone crevices
213	*Tortula muralis* Hedw.	7 (Glowacki, 1907a), 31: siliceous rock, limestone rock, 35: limestone crevices
214	****Tortula schimperi*** M.J. Cano, O. Werner & J. Guerra	30: soil, 31: soil
215	*Tortula subulata* Hedw.	7 (Glowacki, 1907a), 35: rock, limestone rock
216	***Trichostomum brachydontium*** Bruch	32: wet shale rocks, 40: soil road
217	*Trichostomum crispulum* Bruch	7 (Glowacki, 1907a), 28: shaded limestone rock, 31: siliceous rock, 35: limestone rock, on sandstone, 37: shale rocks, 38: limestone rock
218	***Ulota crispa*** (Hedw.) Brid.	31: *Acer* bark, 33: *Alnus* bark, 38: tree bark, 39: *Acer* bark
219	*Weissia condensa* (Voit) Lindb.	7 (Glowacki, 1907a, sub *Hymenostomum tortile*)
220	*Weissia controversa* Hedw.	1, 7 (Glowacki, 1907a, sub *Weisia crispata*)
221	*Zygodon forsteri* (Dicks.) Mitt.	19, 22, 23 - *Fagus* bark (Grgić, 1972, sub *Zygodon forsteri* subsp. *sendtneri*)

4. DISCUSSION AND CONCLUSIONS / DISKUSIJA I ZAKLJUČCI

Along river and streamsides saxicolous aquatic, riparian species dominate, making specific assemblages in running water, on nearly vertical riversides, and wet rocks by the stream. These are temperate *Palustriella falcata, Platyhypnidium riparioides* (Figure 6), the sub-Mediterranean *Cinclidotus* species (*C. aquaticus, C. fontinaloides* and *C. riparius*), as well as rare European species *Fontinalis hypnoides* or boreal species like *Hygrohypnum luridum* and *Schistidium rivulare*. Associate hygrophytes species are Atlantic, sub-Mediterranean *Fissidens serrulatus* recently reported for the first time for Bosnia and Herzegovina, subboreal *Brachythecium rivulare* and temperate *B. rutabulum* and *Cratoneuron filicinum*.

Shaded limestone rocks and boulders along riversides represent habitat suitable for many species. Amongst others, two sub-Mediterranean species, *Porella arboris-vitae* (Figure 7) and *Cololejeunea rossettiana*, which were previously, reported as new records for the country (Pantović et al., 2016). *C. rossettiana* was recently reported first time for the Macedonia as well (Papp et al., 2016b). Atlantic-Mediterranean species *Lepthodon smithii* (Figure 8), was found growing on limestone rocks, as well as on old and large treesalong riversides. This not very common European species was rediscovered in Bosnia and Herzegovina after more than fifty years, and it is red listed in some countries, e.g. Hungary (Papp et al., 2010) and Romania (Ştefănuţ & Goia, 2012).

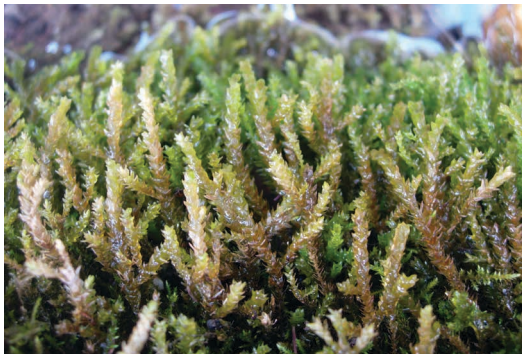

Figure 6. / **Slika 6**. *Platyhypnidium riparioides* (© M. Sabovljević)

Figure 7. / **Slika 7**. *Porella arboris-vitae* (© Đ. Milanović)

In the old forests surrounding rivers decaying logs are important habitat for numerous leafy liverwort species, like temperate *Lophocolea bidentata, L. heterophylla, L. minor*, or sub-Atlantic *Cephaloziella stellulifera* and *Nowelia curvifolia*. Also, these habitats are suitable for European important species, boreal *Buxbaumia viridis* and its common associate subboreal *Herzogiella seligeri* (Figure 9).

Following seven species are included in the candidate list of the new Red data book of European bryophytes (Hodgetts, 2015): *Anoectangium aestivum, Buxbaumia viridis* (Figure 10), *Cinclidotus aquaticus, Fontinalis hypnoides, Orthotrichum patens, Pseudocampylium radicale* and *Schistidium helveticum*.

Anoectangium aestivum is moss with Subarctic - Subalpine distribution (Düll, 1984). It grows on wet and sheltered soil and rocks (Dierßen, 2001). Although sporadically occurs almost throughout the world: in North, Central and South America, Africa, Eurasia and New Zealand (Zander & Eckel, 2007), in SE Europe, it is a very rare species, known from Romania (Sabovljević et al., 2008) where it is considered as near threatened (NT) species (Ştefănuţ & Goia, 2012). Recently it was found in Montenegro (Papp & Erzberger, 2011) and Croatia (Papp et al., 2013a).

Buxbaumia viridis is included in the Bern Convention and the European Union Habitats and Species Directives, and is VU (vulnerable) ac-

Figure 8. / **Slika 8**. *Leptodon smithii* (© J. Pantović)

Figure 9. / **Slika 9**. *Herzogiella seligeri* (© M. Sabovljević)

cording to the Red data book of European bryophytes (ECCB, 1995). It is known from all the Balkan countries and new population are being discovered, for example in Serbia (Papp et al., 2014; Papp et al., 2016a), Macedonia (Papp & Erzberger, 2012; Papp et al., 2016b), Croatia (Papp et al., 2013a, 2013b; Alegro et al., 2014).

Cinclidotus aquaticus is a rheophile species which grows on calcareous rocks and boulders, or man-made structures, completely to partially submerged, favoring more turbulent water flows (Price & Vivien, 2010). In SE Europe it is recorded in all countries except in Turkey (Sabovljević et al., 2008). In Romania it is included in Red List of Bryophytes as vulnerable (VU) species (Ştefănuţ & Goia, 2012).

Fontinalis hypnoides is a rare European species with subatlantic-subsediterranean (Düll, 1984) distribution, found on soil in the Hrčavka kanyon, near the Skakavac waterfall. It was rediscovered in Bosnia and Herzegovina after more than 50 years, since its only previous record was from the Pliva river near Jajce (Pavletić, 1955). In neighboring countries, it is known from Croatia, Macedonia, Montenegro and Slovenia (Ros et al., 2013); and it was recently reported for the first time in Serbia (Pantović et al., 2014).

Orthotrichum patens is subcontinental, montane species (Düll, 1992) distributed in Europe and Turkey (Lewinsky, 1993; Kürschner & Erdağ, 2005) living on bark of several tree and shrubs species in temperate-humid forests without summer drought (Lara et al., 2003). In SE Europe it is present in Bosnia and Herzegovina, Bulgaria, Croatia, Greece, Republic of Macedonia, Romania, Serbia, Slovenia and Turkey (Ros et al., 2013). In Bosnia and Herzegovina, it was found in couple localities, but all records are more than 50 years old (Pavletić, 1955). It is considered as rare, and in some countries it is included in the red lists, e.g. Luxembourg (Werner, 2003), Czech Republic (Kučera & Váňa, 2003), Serbia (Sabovljević et al., 2004), while in the European Red Data Book (ECCB, 1995) is considered as "Taxa apparently threatened but presenting taxonomic problems".

Pseudocampylium radicale is species living in wetlands of European temperate zone (Papp et al., 2012). In Bosnia and Herzegovina and Croatia only old records are known, while from other SE European countries newer records are known from Serbia, Romania, Slovenia (Sabovljević et al., 2008) and Republic of Macedonia (Martinčič, 2009). It is red listed in Romania (Ştefănuţ & Goia, 2012), and considered as rare (R) species in the Red data book of European bryophytes (ECCB, 1995).

Schistidium helveticum is a boreal, montane species (Düll, 1984) living on exposed calcareous, less frequently on igneous rocks (Dierßen, 2001). It is recorded in almost all SE European countries except Slovenia (Hodgetts, 2015).

According to the data from the literature, we have found some very interesting records of bryophytes for Bosnia and Herzegovina as well. Several species found in the Sutjeska National

Park were previously recorded in Bosnia and Herzegovina but not listed and probably overlooked or synonymized in recent check-lists (Sabovljević & Natcheva, 2006; Sabovljević et al., 2008; Ros et al., 2007, 2013; Hodgetts, 2015).

Thus, the liverwort *Leiocolea heterocolpos* recorded in Bosnia and Herzegovina by Schumacher (1952) was found in Jahorina Mt., *Hypnum recurvatum* (sub *Hypnum fastigiatum*) in Vlašić Mt. (Kummer & Sendtner, 1849), *Oxystegus tenuirostris* (sub *Didymodon cylindricus*) in canyon of Bistrički potok near Sarajevo (Beck, 1886), and *Tortula schimperi* (sub *T. subulata* var. *angustata*) (Glowacki, 1906) found in Paklenica mountain region.

In addition, there are following species omitted from Bosnia and Herzegovina inventories but previously and/or recently recoreded in area of the Sutjeska National Park: *Grimmia muehlenbeckii, Palustriella falcata* and *Racomitrium ericoides* (Glowacki, 1907a), and *Calliergonella lindbergii, Orthotrichum pulchellum, O. shawii, Syntrichia laevipila* and *Zygodon forsteri* recorded by Grgić (1972) in Perućica virgin forest.

Specific diversity of microclimatic conditions, variety of bedrock and more importantly, well preserved areas without large human influence, had led to high diversity of microhabitats suitable for bryophytes. Hence, canyons and virgin old forests surrounding the rivers are rich in diversity of bryophyte species, many of which are being rare and even European red listed. It is expected that further research will bring new important data on bryophytes, many of which are rare and even threatened species, as well as many new records for the country. Considering all of above mentioned, this area surely represent valuable and important area for bryophytes.

Figure 10. / **Slika 10**. *Buxbaumia viridis* (© J. Pantović)

References / Literatura

Alegro A., Papp B., Szurdoki E., Šegota V., Šapić I., Vukelić J. (2014). A contribution to the bryophyte flora of the Croatia III. Plitvička jezera National Park and adjacent areas. *Studia botanica hungarica* 45: 49–65.

Alegro A., Šegota V., Papp B. (2015). A contribution to the bryophyte flora of Croatia IV. Žumberačka Gora Mts. *Studia botanica hungarica* 46(1): 5–24.

Beck G. (1886). Flora von Südbosnien und der agrenzenden Hercegovina (Nach den Ergebnissen einer dahin im Jahre 1885 unternommenen Reise und den in der Literatur vorhandenden Angaben). *Annalen des K.K. Naturhistorischen Hofmuseums* 1: 271–325

Beck G. (1889). Flora von Südbosnien und der agrenzenden Hercegovina II. Band (IV. Theil) (Enthaltend die Ergebnisse einer dahin im Jahre 1888 unternommenen Forschungreise sowie die inzwischen in der Literatur verzeichneten Pflanzen dieses Gebietes). *Annalen des K.K. Naturhistorischen Hofmuseums* 4: 339–372

Dierßen, K. (2002). Distribution, ecological amplitude and phytosociological-characterization of European bryophytes. *Nova Hedwigia*, 74(3-4).

Düll R. (1984). Distribution of the European and Macaronesian mosses (Bryophytina) I. *Bryol. Beiträge* 4: 1–109.

Düll, R. (1992). Distribution of the European and Macaronsian mosses (Bryophytina), annotations and progress. Bryologische Beiträge 8/9: 1–223.

ECCB. (1995). Red Data Book of European Bryophytes. Trondheim, ECCB.

Ellis L. T., Ah-Peng C., Aranda S. C., Bednarek-Ochyra H., Borovichev E. A., Cykowska-Marzencka B., Duarte M. C., Enroth J., Erzberger P., Fedosov V., Fojcik B., Gabriel R., Coelho M. C. M., Henriques D. S. G, Ilina O. V., Gil-Novoa J. E, Morales-Puentes M. E., Gradstein S. R., Gupta R., Nath V., Asthana A. K., Koczur A., Lebouvier M., Mesterházy A., Mogro F., Mežaka A., Németh Cs., Orgaz J. D., Sakamoto Y., Paiva J., Sales F., Pande N., Sabovljević M. S., Pantivić J., Sabovljević A. D., Pérez-Haase A., Pinheiro da Costa D., Plášek V., Sawicki J., Szczecińska M., Chmielewski J., Potemkin A., Schäfer-Verwimp A., Schofield W. B., Sérgio C., Sim- Sim M., Sjögren S., Spitale D., Stebel A., Ştefănuţ S., Suárez G. M., Flores J. R., Thouvenot L., Váňa J., Yoon Y.-J., Kim J. H., Zubel R. (2015). New national and regional bryophyte records, 45. *Journal of Bryology* 37(4): 308–329.

Ellis L. T., Aleffi M., Alegro A., Segota V., Asthana A. K., Gupta R., Singh V. J., Bakalin V. A., Bednarek-Ochyra H., Cykowska-Marzencka B., Benitez A., Borovichev E. A., Vilnet A. A., Konstantinova N. A., Buck W. R., Cacciatoro C., Sérgio C., Csiky J., Deme J., Kovács D., Damsholt K., Enroth J., Erzberger P., Fedosov V. E., Fuertes E., Gradstein S. R., Gremmen N. J. M., Hallingbäck T., Jukonienė I., Kiebacher T., Larraín J., Lebouvier M., Lüth M., Mamontov Yu. S., Potemkin A. D., Nemeth Cs., Nieuwkoop J. A. W., Nobis M., Węgrzyn M., Wietrzyk P., Osorio F., Parnikoza I., Virchenko V. M., Peralta D. F., Carmo D. M., Plášek V., Skoupá Z., Poponessi S., Venanzoni R., Puche F., Purger D., Reeb C., Rios R., Rodriguez-Quiel E., Arrocha C., Sabovljević M. S., Nikolić N., Sabovljević A. D., dos Santos E. L., Segarra-Moragues J. G., Ştefănuţ S., Stončius D. (2016). New national and regional bryophyte records, 48. *Journal of Bryology* 38(3): 235–259.

Fukarek P. (1956). Zajednica klekovine bora (*Pinetum mughi* Horvat) i neke njene razvojne tendencije na bosansko hercegovačkim planinama. *Šumarski list* 80(11-12): 343–357.

Glowacki J. (1906). Bryologische Beiträge aus dem Okkupationgebiete I. *Verhlandungen der Kaiserlich-Königlichen zoologisch-botanischen Gesellschaft in Wien* 56: 186–207.

Glowacki J. (1907a). Bryologische Beiträge aus dem Okkupationsgebiete II. *Verhlandungen der Kaiserlich-Königlichen zoologisch-botanischen Gesellschaft in Wien* 57: 19–33.

Glowacki J. (1907b). Bryologische Beiträge aus dem Okkupationsgebiete III-IV. *Verhlandungen der Kaiserlich-Königlichen zoologisch-botanischen Gesellschaft in Wien* 57: 223–244.

Grgić P. (1972). Epifitska i lignifilna vegetacija mahovina u području prašume Perućice u Bosni. *Godišnjak Biološkog instituta Univerziteta u Sarajevu* 25: 5–41.

Grgić P. (1980). Fitocenoze briofita na vertikalnom profilu Igmana i Bjelašnice. I Epilitska i terestrična vegetacija. *Godišnjak Biološkog instituta Univerziteta u Sarajevu* 33: 59–86.

Grgić P. (1982). Fitocenoze briofita na vertikalnom profilu Igmana i Bjelašnice. II Epifitska i lignifilna vegetacija. *Godišnjak Biološkog instituta Univerziteta u Sarajevu* 35: 47–70.

Hébrard J. P. (1975). Remarques sur la flore et la végétation bryologique de Bosnie-Herzégovine (Yougoslavie). *Revue bryologique et lichénologique* 41(4): 397–448.

Hodgetts N.G. (2015). *Checklist and country status of European bryophytes – towards a new Red List for*

Europe. – Irish Wildlife Manuals, No. 84. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland: 125 str.

Kučera J., Váňa J. (2003). Check- and Red List of bryophytes of the Czech Republic (2003). *Preslia, Praha* 75: 193–222.

Kummer F., Sendtner O. (1849). Eunumeratio plantarum in itinere Sendtneriano in Bosnia lectarum, cum definitionibus novarum specierum et adumbrationibus obscurarum varietatumque II. *Flora oder allgemeine botanische Zeitung* 7(48): 753–768.

Kürschner H., Erdağ A. (2005). Bryophytes of Turkey: an annotated reference list of the species with synonyms from the recent literature and an annotated list of Turkish bryological literature. *Turkish journal of botany* 29: 95–154.

Lakušić R., Bjelčić Ž., Šilić Č., Mišić Lj., Kutleša Lj., Grgić P. (1969). *Biološko upoznavanje prašumskog područja Perućice u kompleksu planina Maglić, Volujak i Zelengora*. Biološki institut Univerziteta u Sarajevu [Elaborat], 674 str.

Lakušić R., Redžić S., Muratspahić D., Omerović S. (1987). Struktura i dinamika fitocenoza na trajnim plohama Nacionalnog parka "Sutjeska". *Bilten Društva ekologa Bosne i Hercegovine - ekološke monografije* 4: 54–105.

Lara F., Blockeel T.L., Garilleti R., Mazimpaka V. (2003). Some interesting *Orthotrichum* species from mainland Greece and Evvia. *Journal of bryology* 25: 129–134.

Lewinsky J. (1993). A synopsis of the genus *Orthotrichum* Hedw. (Musci, Orthotrichaceae). *Bryobrothera* 2: 1–59.

Martinčić A. (2009). Contributions to the bryophyte flora of Republic of Macedonia. *Hacquetia* 8(2): 97–114.

Milosavljević R. (1969). O klimi slivnog područja rijeke Sutjeske. *Posebna izdanja Odjeljenja prirodnih i matematičkih nauka ANUBiH* 3: 51–63.

Pantović J. Grdović S., Sabovljević A., Sabovljević M. (2014). New and interesting bryophyte records for the flora of Serbia. *Archives of Biological Sciences* 66(2): 701–704.

Pantović J., Milanović, Đ., Sabovljević M. (2016). Three novelties for the bryophyte flora of Bosnia and Herzegovina. *Herzogia* 29: 801–804.

Papp B., Alegro A., Šegota V., Šapić I., Vukelić J. (2013a). Contributions to the bryophyte flora of Croatia I. Gorski kotar region (W Croatia). *Studia Botanica Hungarica* 44: 193–211.

Papp B., Alegro A., Šegota V., Šapić I., Vukelić J. (2013b). Contributions to the bryophyte flora of the Croatia II. The northern Velebit. *Studia botanica hungarica* 44: 213–228.

Papp B., Erzberger P. (2012). Contribution to the bryophyte flora of the former Yugoslav Republic of Macedonia. *Polish Botanical Journal* 57(1): 205–221.

Papp B., Erzberger P. (2011). Additions to the bryophyte flora of the Tara river canyon and the Durmitor area, Montenegro. *Studia botanica hungarica* 42: 31–39.

Papp B., Erzberger P., Dragićević S. (2013c). Contribution to the bryophyte flora of Bjelasica Mts (Montenegro). *Polish Botanical Journal.* 58(1): 293–318.

Papp B., Erzberger P., Ódor P., Hock Z., Szövényi P., Szurdoki E., Tóth, Z. (2010). Updated checklist and red list of Hungarian bryophytes. *Studia Botanica Hungarica*, 41: 31–59.

Papp B., Erzberger P., Tsakiri E. (2011). Contributions to the bryophyte flora of the Voras (Nidže) Mts (Greece and the Former Yugoslav Republic of Macedonia). *Studia botanica hungarica* 42: 51–76.

Papp B., Pantović J., Szurdoki E., Sabovljević M.S. (2016c). New bryophyte records for the Republic of Macedonia. *Journal of Bryology* 38(2): 168–171.

Papp B., Szurdoki E., Pantović J., Sabovljević M. (2014). Contribution to the bryophyte flora of the Pešter plateau, SW Serbia. *Studia botanica hungarica* 45: 33–47.

Papp B., Szurdoki E., Pantović J., Sabovljević M. (2016a). An insight into the bryophyte flora of the Ibar george and its surroundings (Central and SW Serbia). *Acta Botanica Hungarica* 58: 411–423.

Papp B., Szurdoki E., Pantović J., Sabovljević M. (2016b). Contributions to the bryophyte flora of the Mavrovo National Park. *Studia botanica hungarica* 47(2): 279–296.

Papp B., Szurdoki E., Sabovljević M. (2012). Bryophyte flora of lake Vlasina and its surroundings (SE Serbia). *Studia botanica hungarica* 43: 27–45.

Pavletić Z. (1955). *Prodromus flore briofita Jugoslavije*. Jugoslavenska Akademija znanosti i umetnosti: 578 str.

Price M., Vivien R. (2010). *Cinclidotus aquaticus* (Hedw.) Bruch & Schimp. (Cinclidotaceae) in the canton of Geneva. *Meylania* 45: 26–29.

Protić Đ. (1899). Prilog k poznavanju mahovina okoline Vareša. *Glasnik Zemaljskog muzeja u Bosni i Hercegovini* 11(3): 773–783.

Protić Đ. (1903). Peti prilog poznavanju flore okoline Vareša u Bosnia. *Glasnik Zemaljskog muzeja u Bosni i Hercegovini* 15(2): 273–318.

Protić (1904). Prilog k poznavanju flore kriptograma (tajnocvjetaka) okoline Sarajeva. *Glasnik Zemaljskog muzeja u Bosni i Hercegovini* 16(1): 61–90.

Protić Đ. (1906). Prilog k poznavanju flore mahovina Bosne i Hercegovine. *Glasnik Zemaljskog muzeja u Bosni i Hercegovini* 18(2): 129–135.

Redžić S., Lakušić R., Omerović S., Cvijović M., Sijarić R., Stanišić J. (1987). Ekoklimatske karakteristike Nacionalnog parka "Sutjeska". *Bilten Društva ekologa Bosne i Hercegovine – ekološke monografije* 4: 7–28.

Ritter-Studnička H. (1973). Die Pflanzendecke auf Granit und Gips in Bosnien. *Acta Botanica Academiae Scientiarum Hungaricae* 19(1–4): 305–316.

Ritter-Studnička H. (1974). Beiträge zur Moosflora Bosniens und der Hercegovina. *Nova Hedwigia* 25: 279–290.

Ros R. M., Mazimpaka V., Abou-Salama U., Aleffi M., Blockeel T. L., Brugues M., Cano M. J., Cros R. M., Dia M. G., Dirkse G. M., El Saadawi W., Erdağ A., Ganeva A., Gonzalez-Mancebo J. M., Herrnstadt I., Khalil K., Kurschner H., Lanfranco E., Losada-Lima A., Refai M. S., Rodrigez-Nunez S., Sabovljević M., Cergio C., Shabbara H., Sim-Sim M., Soderstrom L. (2007). Hepatics and Anthocerotes of the Mediterranean, an annotated checklist. *Cryptogamie, Bryologie* 28(4): 351–437.

Ros R. M., Mazimpaka V., Abou-Salama U., Aleffi M., Blockeel T. L., Brugues M., Cros R. M., Dia M. G., Dirkse G. M., Draper I., El Saadawi W., Erdağ A., Ganeva A., Gabriel R., Gonzalez-Mancebo J. M., Granger C., Herrnstadt I., Hugonnot V., Khalil K., Kurschner H., Losada-Lima A., Luis L., Mifsud S., Privitera M., Puglisi M., Sabovljević M., Sergio C., Shabbara H. M., Sim-Sim M., Sotiaux A., Tacchi R., Vanderpoorten A., Werner O. (2013). Mosses of the Mediterranean, an annotated checklist. *Cryptogamie, Bryologie* 34(2): 99–283.

Sabovljević M. (2003). Bryophyte Flora of South Banat (Vojvodina, Yugoslavia). *Cryptogamie, Bryologie* 24(3): 241–252.

Sabovljević M. (2006). Contribution to the bryophyte flora of the Djerdap National Park (E Serbia). *Phytologia balcanica* 12(1): 51–54.

Sabovljević M., Cvetić T., Stevanović V. (2004). Bryophyte Red List of Serbia and Montenegro. *Biodiversity and conservation* 13: 1781–1790.

Sabovljević M., Marka J. (2009). The biological evidence of climate changes: a case study of liverwort *Lunularia cruciata* (L.) Dum. ex Lindb. in Serbia. *Botanica serbica* 33(2): 185–187.

Sabovljević M., Natcheva R. (2006). A check-list of the liverworts and hornworts of Southeast Europe. *Phytologia balcanica* 12(2): 169–180.

Sabovljević M., Natcheva R., Tsakiri E., Dihoru G., Dragićević S., Erdağ A., Papp B. (2008). Check-list of the mosses of SE Europe. *Phytologia Balcanica* 14: 207–244.

Sabovljević M., Alegro A., Sabovljević A., Marka J., Vujičić M. (2011). An insight into diversity of the Balkan Peninsula bryophyte flora in the European background. *Revue d'écologie* 66(4): 399–413.

Schumacher A. (1952). Die Moosflora der Ravna Planina (Jahorina) bei Pale - Sarajevo. *Godišnjak Biološkog instituta u Sarajevu* 5(1–2): 405–416.

Stefanović V. (1964). Šumska vegetacija na verfenskim pješčarima i glincima istočne i jugoistočne Bosne. *Radovi Šumarskog fakulteta i Instituta za šumarstvo i drvnu industriju u Sarajevu* 9(3): 4–86.

Ştefănuţ S., Goia I. (2012). Checklist and red list of the bryophytes of Romania. *Nova Hedwigia* 95(1–2): 59–104.

Werner J. (2003). Liste rouge des bryophytes du Luxembourg. Mesures de conservation et perspectives. *Ferrantia* 35: 10–71.

Wraber M. (1958). Biljnosociološki prikaz kestenovih šuma Bosne i Hercegovine. *Godišnjak Biološkog instituta Univerziteta u Sarajevu* 11(1–2): 139–175.

Zander H.R., P.M. Eckel (2007). *Anoectangium*. In: Zander, H.E. (ed.). Flora of North America. Vol. 27. Bryophytes: Mosses, part 1: 520–523.

Appendices / Prilozi

Appendix 1. List of studied localities in the Sutjeska National Park with description of habitat (if available), WGS1984 coordinates, elevation (if available), date (if available) and reference (for literature records) / **Prilog 1**. Pregled lokaliteta u NP Sutjeska sa opisom staništa (ako postoji), WGS1984 koordinatama, nadmorskom visinom (ako je poznata), datumom (ako je poznat) i referencom (samo za lokalitete iz literature)

Literature record sites / Lokaliteti iz literature

1. Zelengora Mt, Orlovačko jezero, pastures and source area, 18.547042, 43.377002, 1500–1600 m (Glowacki, 1907a).
2. Zelengora Mt, Orlovača, pastures, 18.567076, 43.367699, 1750 m (Glowacki, 1907a).
3. Zelengora Mt, Kapični do, pastures, 18.593335, 43.373372, 1500 m (Glowacki, 1907a).
4. Zelengora Mt, Nabojne, pasture, 18.580127, 43.353949, 1650 m (Glowacki, 1907a).
5. Zelengora Mt, Javorak, pasture, 18.578238, 43.335452, 1600 m (Glowacki, 1907a)
6. Zelengora Mt, Gornje bare, pasture, 18.61193, 43.32756, 1500 m (Glowacki, 1907a).
7. Sutjeska river canyon, Prosječenica vrata (Vratar), 18.647974, 43.300314, 700 m (Glowacki, 1907a).
8. Maglić Mt, Suha-Prijevor, 18.695638, 43.300276, 1300–1700 m (Glowacki, 1907a).
9. Maglić Mt, Prijevor, gendarmerie barrack, 18.71666, 43.290256, 1700 m (Glowacki, 1907a).
10. Maglić Mt, Prijevor, 18.719523, 43.286903, 1700–1800 m (Glowacki, 1907a; Lakušić et al., 1987).
11. Maglić Mt, ascent from Prijevor to the Maglić peak, 18.728349, 43.286064, 1800–2100 m (Glowacki, 1907a).
12. Maglić Mt, Ždrijelo above Igoče, 18.759769, 43.327275, 1300–1500 m (Glowacki, 1907b).
13. Maglić Mt, Ždrijelo-Ulobić, 18.762742, 43.306272, 1500–1600 m (Glowacki, 1907b).
14. Maglić Mt, peak of the mountain, 18.732986, 43.28134, 2000–2400 m (Glowacki, 1907b).
15. Maglić Mt, Crvene prljage, mountain pine formations, 18.742683, 43.292108 (Fukarek, 1956).
16. Tjentište, 18.692216, 43.362223, 640 m (Stefanović, 1964).
17. Sutjeska river gorge, Priboj, 18.674748, 43.321243, 640 m, 9/10/1970 (Grgić, 1972).
18. Sutjeska river gorge, confluence of Perućica brook, 18.684261, 43.327074, 600 m, 9/10/1970 (Grgić, 1972).
19. Perućica virgin forest, Dragoš sedlo, 18.709219, 43.316471, 1100–1220 m, 6/8/1970 (Grgić, 1972; Lakušić et al., 1987).
20. Dragoš sedlo-Ornica, 18.709032, 43.328694, 1140 m, 8/10/1970 (Grgić, 1972).
21. Perućica virgin forest, Stajišta, 18.725149, 43.302927, 1300 m, 8/10/1970 (Grgić, 1972).
22. Perućica virgin forest, Prijevor, 18.71624, 43.292684, 1560 m, 7/10/1970 (Grgić, 1972).
23. Perućica virgin forest, Prijevor, 18.712139, 43.291947, 1580 m, 7/10/1970 (Grgić, 1972).
24. Borovno above Tjentište, 18.69902, 43.351592, 750 m, 4/6/1985 (Lakušić et al., 1987).

New record sites / Novi lokaliteti

25. Hrčavka river gorge, below Jasika, 18.626468, 43.346358, 965 m, 26/7/2014.
26. Sutjeska river gorge, below Grab, 18.625786, 43.292608, 746 m, 29/8/2014.
27. Hrčavka river canyon, below Lipov do, 18.653894, 43.359018, 820 m, 30/8/2014.
28. Hrčavka river canyon, below Milin klade, Zagrađe, 18.660309, 43.366438, 740 m, 30/8/2014.
29. Hrčavka river canyon, 18.651829, 43.355875, 860 m, 30/8/2014.
30. Sutjeska river gorge, below Lunjice, 18.654576, 43.308603, 660 m, 31/8/2014.
31. Hrčavka river gorge, below Siljevice, 18.63224, 43.345507, 948 m, 25/6/2015.
32. Hrčavka river gorge, Duboki potok stream, 18.612507, 43.347142, 1075 m, 25/6/2015.
33. Hrčavka river valley, Polje, 18.686717, 43.366937, 563 m, 26/6/2015.
34. Hrčavka river canyon, Skakavac waterfall, 18.67043, 43.362489, 618m, 26/6/2015.
35. Sutjeska river canyon, Vratar, 18.64823, 43.30107, 711m, 27/6/2015 and 28/6/2015.
36. Jabučica river gorge, 18.611531, 43.29487, 773m, 27/6/2015.
37. Sutjeska river gorge, below Nišan, 18.64116, 43.297131, 769m, 27/6/2015.
38. Sutjeska river gorge, Hršova vrela sources, 18.664295, 43.315338, 650m, 29/6/2015.
39. Sutjeska river gorge, Priboj, 18.668977, 43.31844, 650 m, 29/6/2015.
40. Zelengora Mt, Milin klade, 18.66044, 43.35788, 966 m, 1/7/2015.

Sažetak

Prilikom terenskog istraživanja flore briofita Nacionalnog parka Sutjeska, glavni fokus bili su delovi uz vodotoke Hrčavke i Sutjeske (Slika 1). Briološki materijal je sakupljan sa različitih stanišnih tipova (Slike 2-5) i različitih supstrata (zemlja, kamenje, trulo drvo, kora drveta) te je deponovan u briološkoj zbirci Herbarijuma Univerziteta u Beogradu (BEOU). Ukupno 261 takson, odnosno 40 jetrenjača i 221 prava mahovina zabeleženi su na području Parka. Od toga, 97 taksona su po prvi put registrovani na području NP Sutjeska. 14 jetrenjača i 27 pravih mahovina konstatovano je nakon više od pedeset godina za prostor Bosne i Hercegovine, što je posledica zapostavljanja brioloških terenskih istraživanja u novije vrijeme. Sa ciljem da se formira jedinstvena i sveobuhvatna lista briofita Nacionalnog parka Sutjeska, pregledana je raspoloživa briološka literatura i ranije publikovani podaci objedinjeni su u listi vrsta. Nalazišta iz literature su georeferencirana i zajedno sa njima brioflora je izučavana na 40 lokaliteta (Slika 1).

Tokom ovog istraživanja pronađene su tri vrste nove za briofloru Bosne i Hercegovine (jetrenjače *Porella arboris-vitae* (Slika 7) i *Cololejeunea rossettiana*, i mahovina *Fissidens serrulatus*), što je ranije posebno publikovano (Pantović et al., 2016). Sedam zabeleženih vrsta se nalazi na kandidat listi nove Crvene knjige evropskih briofita: *Anoectangium aestivum, Buxbaumia viridis* (Slika 11), *Cinclidotus aquaticus, Fontinalis hypnoides, Orthotrichum patens, Pseudocampylium radicale* i *Schistidium helveticum*.

Temeljnim studiranjem dostupne literature konstatovano je da su neki navodi iz literature izostavljeni u ranijim listama brioflore Bosne i Hercegovine (Pavletić 1955; Sabovljević & Natcheva, 2006; Sabovljević et al., 2008; Ros et al., 2007, 2013; Hodgetts, 2015). Tu spada jetrenjača *Leiocolea heterocolpos* (Schumacher, 1952), kao i sledeće mahovine: *Hypnum recurvatum* (Kummer & Sendtner, 1849); *Oxystegus tenuirostris* (Beck, 1886); *Tortula schimperi* (Glowacki, 1906); *Grimmia muehlenbeckii, Palustriella falcata* i *Racomitrium ericoides* (Glowacki, 1907a); te *Calliergonella lindbergii, Orthotrichum pulchellum, O. shawii, Syntrichia laevipila* i *Zygodon forsteri* navedene od Grgića (1972) za prašumu Perućicu.

Na osnovu ovog istraživanja i prikazanih rezultata, može se konstatovati da NP Sutjeska ima izuzetno vrednu briofloru, bogatu vrstama, od kojih su mnoge retke i važne za zaštitu. Nova sistematska proučavanja mahovina na drugim stanišnim tipovima, naročito subalpijskim šumama, pašnjacima i rudinama te prelaznim tresavama, doprineće sveobuhvatnijem poznavanju brioflore NP Sutjeska, sa opravdanim očekivanjem da će ova istraživanja rezultovati novim nalazima kako za prostor Nacionalnog parka Sutjeska, tako i za Bosnu i Hercegovinu.

Ključne riječi: Balkan, brioflora, crvene liste, jetrenjače, mahovine