Arch. Biol. Sci., Belgrade, 58 (3), 187-194, 2006.

BRYOPHYTE FLORA OF THE UVAC RIVER GORGE (SOUTHWEST SERBIA)

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Abstract – In the examined area, 165 taxa were found and identified: 139 taxa from the class Bryopsida and 26 taxa from the class Marchantiopsida. Nine species are red-listed in Serbia. Material was collected from 62 localities, which were analyzed for similarity of chorological and ecological features using the Jaccard similarity index. Analysis of floristic elements and phytogeographic distribution showed that the greatest number of taxa are temperate elements with Holarctic distribution. Results of ecological analysis showed that in regard to the substratum aspect, terricolous, basophilous, and indifferent species were dominant. In relation to the ecological parameter humidity, most species were mesophilous. The majority of identified bryophytes were sciophilous taxa.

Key words: Bryophyte flora, ecology, Uvac River Gorge, Serbia.

UDC 582.32 (497.11-14)

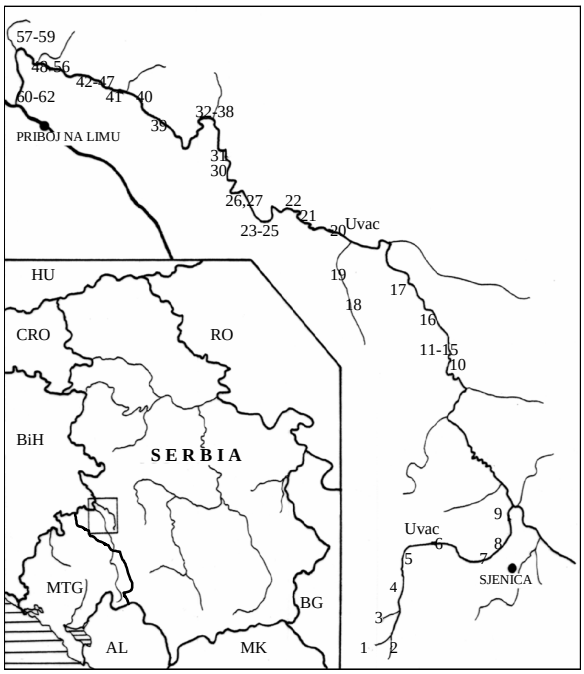
INTRODUCTION

The Uvac River originates on Ozren Mountain, 14 km southwest of Sjenica (at 1,400 m a.s.l.) and joins the Lim River downstream from the town of Priboj. It is 119 km long and has a watershed with surface area of 1,334 m^2. It flows through the southwestern part of Serbia (Map 1). Along the course of river, three artificial water bodies have been constructed – the Sjeničko, Zlatarsko and Radoinjsko Lakes.

This area is in a zone between the humid temperate-continental type of climate and the humid alpine type and has average annual precipitation of 700-950 mm. During the year, there are 98 days with persisting snow. The average monthly temperatures range from -4.6ºC to 17.7ºC. Average annual temperature is 7ºC and the relative humidity is 71 – 85%.

During previous bryological investigations in Southwest Serbia, 83 species and infraspecific taxa were recorded (K o š a n i n, 1908, 1909; Č e r n j a v s k i, 1929; R a j e v s k i, 1951; P a v l o v i ć, 1951; B l e č - i ć and T a t i ć, 1962; P a v l o v i ć, 1962; P e t k o v - i ć *et al*. 1988; P e t k o v i ć and T a t i ć, 1989; G a - j i ć, 1989; V e l j i ć *et al.* 2001a, 2001b, 2004.

Because the bryoflora of this region has not been sufficiently investigated and in view of its climate and hydrological characteristics, the given area was chosen for further research.



Map 1. Examined area, with localities 1-62 and its location within Serbia (insert).

MATERIAL AND METHODS

Bryological investigation along the Uvac River were carried out in the period from May 1998 to July 2000. Material was collected from 62 localities, from the source to the delta (Map 1). The collection is deposited in the herbarium of the Department of Plant Morphology and Systematics, Institute of Botany, and Jevremovac Botanical Garden, Faculty of Biology, Belgrade.

The relevant European literature was used for determination. The nomenclature is in accordance with Corley *et al.* (1981); Grolle (1983); Corley and Crundwell (1991), and Grolle and Long (2000). Floral elements and distribution were determined in accordance with Duell (1983) and Duell *et al.* (1999) and ecological parameters in accordance with Boros (1964).

RESULTS AND DISCUSSION

During examination of the bryophyte flora along the Uvac River, 165 species and infraspecific taxa from the classes Bryopsida and Marchantiopsida were recorded from 62 localities (Table 1).

Table 1. List of recorded taxa with localities (VU – vulnerable; LR – low risk; DD – data deficient)

BRYOPSIDA

Amblystegium serpens (Hedw.) B., S. & G. - 1, 5, 8, 13, 16, 28, 39, 42, 58
[LR]*Amblystegium tenax* (Hedw.) C. Jens. - 2, 15, 16, 23, 38
Amblystegium varium (Hedw.) Lindb. - 17, 28
Anomodon attenuatus (Hedw.) Hüb. - 5, 6, 9, 16, 19, 24, 26, 27, 28, 29, 30, 32, 37, 39, 40, 42, 44, 47, 48, 51, 57, 58, 62
Anomodon viticulosus (Hedw.) Hook. & Tayl. - 9, 11, 15, 16, 17, 21, 23, 24, 25, 26, 27, 29, 30, 31, 36, 37, 38, 39, 40, 43, 44, 45, 46, 48, 49, 51, 53, 57, 58, 62
Antitrichia curtipendula (Hedw.) Brid. - 31
Atrichum undulatum (Hedw.) Beauv. - 6
Barbula unguiculata Hedw. - 6, 13, 33, 34, 37, 44, 51, 62
Bartramia pomiformis Hedw. - 31
Brachythecium albicans (Hedw.) B., S. & G. - 2, 6, 22, 51
Brachythecium glareosum (Spruce) B., S. & G. - 12, 18, 28
Brachythecium mildeanum (Schimp.) Schimp. ex Milde - 4, 29, 51
Brachythecium populeum (Hedw.) B., S. & G. - 4, 47
Brachythecium rivulare B., S. & G. - 4, 5, 6, 7, 8, 17, 18, 19, 27, 28, 29, 30, 31, 32, 33, 34, 37, 40, 41, 42, 44, 48, 49, 51, 54, 62
Brachythecium rutabulum (Hedw.) B., S. & G. - 1, 3, 5, 6, 7, 8, 13, 15, 16, 17, 18, 19, 20, 21, 24, 25, 28, 36, 37, 43, 45, 48, 49, 57, 58
Brachythecium velutinum (Hedw.) B., S. & G. - 2, 6, 10, 12, 18, 28, 43
Bryoerythrophyllum recurvirostrum (Hedw.) Chen - 4, 5, 6, 19, 22, 24, 25, 27, 28, 30, 33, 34, 44, 45, 51, 52, 58, 62

Table 1. Continued.

Bryum alpinum With. - 35, 55, 56
Bryum argenteum Hedw. - 3, 13, 15, 18, 20, 24, 56, 60, 62
Bryum caespiticium Hedw. - 13
Bryum capillare Hedw. - 2, 5, 6, 11, 13, 16, 18, 19, 23, 24, 25, 27, 28, 29, 30, 31, 38, 43, 47, 48, 49, 51, 56, 59
Bryum pallens Sw. - 13, 52, 57
Bryum pallescens Schleich. ex. Schwaegr. - 2, 13, 28, 40, 42
Bryum pseudotriquetrum (Hedw.) Gaertn., Mayer & Scherb. - 1, 2, 3, 4, 16, 19, 29, 30, 32, 40, 41, 44, 52, 54, 55, 57, 58
Bryum torquescens B. & S. - 1, 2, 3, 4, 13, 25, 27
Bryum turbinatum (Hedw.) Turn. - 1
Calliergon cordifolium (Hedw.) Kindb. - 18
Calliergonella cuspidata (Hedw.) Loeske - 1, 2, 4, 7, 8, 9, 13, 15, 16, 17, 18, 19, 20, 21, 22, 24, 25, 28, 44, 46, 51, 52, 53, 54, 55, 58, 60, 62
Campylium calcareum Crundw. & Nyh. - 27, 47
Campylium chrysophyllum (Brid.) J.Lange - 1, 4, 12, 14, 17, 20, 21, 29, 34, 43, 48, 51, 58
[VU]*Campylium polygamum* (B.,S& G.) J.Lange & C. Jens. - 1
Campylium stellatum (Hedw.) J. Lange & C. Jens. var. *protensum* (Brid.) Bryhn. - 1, 4, 6, 13, 21, 30, 36, 37, 44, 51, 55, 57, 58
Campylium stellatum (Hedw.) J. Lange & C. Jens. var. *stellatum* - 1, 2
Ceratodon purpureus (Hedw.) Brid. var. *purpureus* - 2, 4, 20, 29, 56
Cinclidotus fontinaloides (Hedw.) P. Beauv. - 5, 15, 16, 17, 32, 35, 37, 38, 42, 44, 49, 57
Cirriphyllum crassinervium (Tayl.) Loesce & Fleisch. - 6, 51
Cirriphyllum tenuinerve (Lindb.) Wijk & Marg. - 27
Climacium dendroides (Hedw.) Web. & Mohr - 1, 19, 58
Cratoneuron filicinum (Hedw.) Spruce var. *filicinum* - 1, 2, 3, 4, 5, 6, 7, 8, 10, 13, 15, 16, 17, 19, 24, 27, 28, 30, 31, 32, 33, 34, 36, 37, 41, 42, 43, 44, 47, 48, 49, 52, 54, 55, 57, 58, 62
Ctenidium molluscum (Hedw.) Mitt. - 4, 6, 8, 9, 12, 13, 14, 15, 16, 17, 19, 20, 21, 22, 24, 25, 26, 27, 28, 29, 30, 31, 32, 37, 38, 41, 42, 43, 44, 48, 51, 54, 57, 58
Dicranella heteromalla (Hedw.) Schimp. - 18
Dicranum polysetum Sw. - 39, 43, 51, 53
Dicranum scoparium Hedw. - 1, 19, 31, 32, 37, 38, 41, 44, 49, 50, 51, 54, 55, 57
Didymodon acutus (Brid) K. Saito - 5, 10
Didymodon fallax (Hedw.) Zander - 2, 13, 14, 15, 17, 21, 37, 38, 44, 53, 56, 58
[DD]*Didymodon ferrugineus* (Schimp. ex Besch.) M. Hill - 12, 13, 32
Didymodon rigidulus Hedw. - 6, 12, 14, 19, 22, 23, 24, 25, 27, 28, 51, 52
Didymodon vinealis (Brid.) Zander - 6, 7, 19, 20, 51, 57, 60, 62
Distichium inclinatum (Hedw.) B., S. & G. - 4, 5, 14, 15, 17, 20, 21, 22, 24, 25, 27, 28, 36, 37, 43, 48, 51, 52, 53, 57, 58
Ditrichum flexicaule (Schwaegr.) Hame - 6, 8, 9, 11, 13, 14, 16, 20, 22, 23, 28, 29, 31, 34, 41
Drepanocladus aduncus (Hedw.) Warnst. - 24, 61
Encalypta streptocarpa Hedw. - 4, 5, 6, 8, 9, 11, 13, 14, 15, 16, 17, 19, 20, 22, 24, 25, 28, 29, 34, 35, 41, 42, 44, 46, 48, 50, 51, 52, 56, 57, 58, 60
Entodon concinnus (De Not.) Par. - 1, 2, 20, 31
Eucladium verticillatum (Brid.) B., S. & G. - 19
Eurhynchium angustirete (Broth.) T. Kop. - 18, 19
Eurhynchium hians (Hedw.) Sande Lac. - 1, 2, 6, 8, 13, 15, 18, 19, 25, 28, 29, 31, 42, 43, 44, 47, 48
Eurhynchium speciosum (Brid.) Jur. - 21
Eurhynchium striatulum (Spruce) B., S. & G. - 52

Table 1. Continued.

Fissidens adianthoides Hedw. - 1, 30
Fissidens cristatus Wils. et Mitt. - 3, 9, 21, 28, 29, 31, 33, 37, 38, 41, 42, 47, 48, 51, 54, 55
Fissidens taxifolius Hedw. ssp. *taxifolius* - 2, 16, 19, 25, 28, 43
[LR]*Fontinalis antipyretica* Hedw. var. *antipyretica* - 5, 7, 9, 15, 16, 17, 27, 29, 34, 44, 48, 51, 54
Funaria hygrometrica Hedw. - 2, 13, 17, 20, 21, 29, 33, 37, 43, 57, 58, 59
Grimmia orbicularis Bruch ex Wils. - 2, 3
Grimmia pulvinata (Hedw.) Sm. - 1, 2, 3, 4, 5, 9, 10, 15, 20, 22, 23, 24, 28, 31, 37, 39, 40, 42, 46, 48, 49, 51, 53, 57, 60, 61
Grimmia trichophylla Grev. - 5
Gyroweisia tenuis (Hedw.) Schimp. - 4, 41, 57
Hedwigia ciliata (Hedw.) P. Beauv. - 2, 12, 20, 33, 48, 49, 50
Homalothecium lutescens (Hedw.) Robins. - 1, 6, 8, 9, 10, 11, 12, 13, 15, 16, 17, 19, 20, 22, 24, 25, 26, 27, 28, 29, 32, 33, 37, 43, 51, 57, 58, 59, 60
Homalothecium philippeanum (Spruce) B., S. & G. - 9, 24, 28
Homalothecium sericeum (Hedw.) B., S. & G. - 1, 9, 13, 17, 18, 20, 23, 24, 27, 28, 31, 32, 36, 38, 43, 44, 45, 46, 47, 48, 49, 51, 53, 58, 61
Homomallium incurvatum (Brid.) Loeske - 9, 23, 29, 42, 43
Hygrohypnum luridum (Hedw.) Jenn. - 5, 19, 25, 27, 29, 32, 42, 44, 48, 49, 54, 58
Hylocomium splendens (Hedw.) B., S. & G. - 1, 2, 3, 9, 12, 14, 15, 17, 18, 19, 21, 22, 24, 26, 27, 28, 31, 32, 37, 38, 39, 41, 47, 49, 50, 51, 53, 54, 55, 59
Hymenostylium recurvirostrum (Hedw.) Dix. - 4, 42
Hypnum cupressiforme (Tayl.) Chimp. var. *resupinatum* (Tayl.) Schimp. - 6, 8, 18, 19, 44, 59
Hypnum cupressiforme Hedw. var. *cupressiforme* - 1, 2, 3, 4, 5, 6, 8, 11, 12, 13, 15, 17, 18, 19, 21, 22, 24, 25, 27, 28, 29, 30, 31, 32, 33, 34, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 62
Hypnum cupressiforme Hedw. var. *lacunosum* Brid. - 2, 4, 6, 21, 22, 24, 34, 48
Hypnum pratense (Rabenh.) W. Koch ex Hartm. - 6
Isothecium alopecuroides (Dubois) Isov. - 31, 42, 47, 59
Isothecium myosuroides Brid. - 23, 25
Leskea polycarpa Hedw. - 6, 8, 15, 16, 17, 20, 22, 29, 39, 40, 42, 45, 46, 48, 62
Leucodon sciuroides (Hedw.) Schwaegr. var. sciuroides - 4, 5, 8, 9, 10, 11, 17, 28, 29, 30, 31, 32, 33, 36, 37, 38, 39, 40, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 56, 58, 59, 60, 61, 62
Mnium marginatum (With.) P. Beauv. - 5, 6, 15, 16, 19, 25, 28, 44, 46
Mnium stellare Hedw. - 16, 28, 37
Mnium thomsonii Schimp. - 9, 15, 17, 27, 28, 31, 42, 44
Neckera complanata (Hedw.) Hüb. - 9, 14, 15, 16, 17, 19, 21, 23, 24, 27, 28, 29, 31, 32, 37, 42, 43, 44, 47, 48, 59, 62
Neckera crispa Hedw. - 9, 15, 17, 26, 27, 28, 31
[DD]*Neckera pumila* Hedw. - 18
Orthothecium intricatum (Hartm.) B., S.& G. - 4
Orthotrichum affine Brid. - 1, 4, 8, 10, 18, 20, 28, 34, 42, 46, 59, 62
Orthotrichum anomalum Hedw. - 1, 9, 10, 13, 15, 17, 20, 21, 22, 29, 32, 33, 37, 43, 48, 60, 61
Orthotrichum cupulatum Brid. - 6, 7, 18, 33, 37
[VU]*Orthotrichum obtusifolium* Brid. - 62
Orthotrichum rupestre Schleich. ex. Scwaegr. - 32, 38, 43, 48
Orthotrichum speciosum Nees - 30, 31
Orthotrichum stramineum Hornsch. ex Brid. - 1, 27, 28
Orthotrichum striatum Hedw. - 1

Table 1. Continued.

Palustriella commutata (Hedw.) Ochyra var. *commutata* - 1, 3, 4, 19, 34, 42, 51
Philonotis calcarea (B. & S.) Schimp. - 13, 34
Philonotis marchica (Hedw.) Brid. - 4, 13
Plagiomnium affine (Bland.) T. Kop. - 1, 2, 22, 32, 44, 45, 47, 55
Plagiomnium cuspidatum (Hedw.) T. Kop. - 13, 16, 18, 24, 25, 28, 29, 31, 32, 37, 38, 39, 43, 45, 48, 49, 51, 57, 60, 61, 62
Plagiomnium elatum (B. & S.) T. Kop. - 5, 7, 19, 28, 29, 31, 39, 40, 42, 47, 49, 50, 55
Plagiomnium rostratum (Schrad.) T. Kop. - 1, 5, 6, 13, 18, 19, 24, 25, 26, 27, 28, 36, 37, 38, 42, 43, 44, 48, 51
Plagiomnium undulatum (Hedw.) T. Kop. - 7, 8, 10, 12, 15, 16, 18, 19, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 33, 34, 37, 38, 39, 42, 43, 44, 46, 48, 49, 50, 51, 53, 57, 58, 59, 62
Plagiopus oederiana (Sw.) Crun & Anderson - 9, 28, 31
Plagiothecium cavifolium (Brid.) Iwats. - 5
Platygyrium repens (Brid.) B., S. & G. - 19, 48, 59
Pleurochaete squarrosa (Brid.) Lindb. - 57, 62
Pleurozium schreberi (Brid.) Mitt. - 2
Pohlia nutans (Hedw.) Lindb. - 2, 9, 61
Polytrichum juniperinum Hedw. - 2, 4
Pseudocrossidium hornschuchianum (K. F. Schultz) Zander - 2, 4, 48
Pseudocrossidium revolutum (Brid.) Zander - 22
Pseudoleskeella catenulata (Schrad.) Kindb. - 5, 6, 8, 9, 11, 15, 16, 21, 25, 26, 27, 28, 29, 36, 37, 38, 46, 49, 58
Pseudoleskeella nervosa (Brid.) Nyh. - 5, 30, 31, 32, 45, 57
Pterigynandrum filiforme Hedw. - 18, 32
Pylaisia polyantha (Hedw.) Schimp. - 4, 5, 8, 10, 17, 18, 20, 30, 46
Racomitrium canescens (Hedw.) Brid. var. *canescens* - 5, 14, 22, 29, 32, 34, 35, 40, 43, 48, 51, 56
Racomitrium heterostichum (Hedw.) Brid. - 40, 42, 43
Rhynchostegium murale (Hedw.) B., S. & G. - 25
Rhytidiadelphus triquetrus (Hedw.) Warnst. - 2, 3, 9, 14, 16, 18, 19, 21, 22, 24, 26, 27 28, 31, 33, 37, 39, 44, 49, 50, 51, 54, 55
Rhytidium rugosum (Hedw.) Kindb. - 9, 11, 13, 14, 19, 20, 22, 51
Schistidium apocarpum (Hedw.) B. & S. var. *apocarpum* - 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 27, 28, 29, 30, 31, 32, 35, 36, 38, 40, 41, 42, 43, 44, 46, 47, 48, 49, 51, 54, 57, 58, 59, 60, 61, 62
Scleropodium purum (Hedw.) Limpr. - 2, 3, 12, 13, 19, 21, 22, 27, 31, 32, 33, 37, 38, 39, 41, 44, 49, 50, 51, 53, 54, 55, 59)
Thuidium abietinum (Hedw.) B., S. & G. - 8, 9, 10, 11, 13, 15, 16, 17, 19, 21, 22, 27, 33, 37, 39, 43, 44, 48, 57, 58, 60, 62
Thuidium erectum Duby - 12, 16, 19, 20, 28, 34, 38, 50, 51
Thuidium philibertii Limpr. - 2, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 24, 28, 29, 32, 33, 37, 39, 42, 43, 48, 49, 51, 60, 62
Thuidium recognitum (Hedw.) Lindb. - 1, 2, 6, 9, 13, 14, 18, 19, 20, 21, 22, 23, 26, 27, 28, 31, 32, 39, 40, 42, 43, 44, 46, 47, 48, 49, 50, 51, 53, 54, 55, 56, 58, 59, 60
Thuidium tamariscinum (Hedw.) B., S. & G. - 44, 51, 54, 55
Tortella flavovirens (Bruch) Broth. - 4, 22, 51, 52, 53
Tortella inclinata (Hedw.) Limpr. - 11, 15, 16, 20, 22, 24, 27, 29, 32, 35, 40, 48, 52, 56, 57, 58, 60, 62
Tortella tortuosa (Hedw.) Limpr. - 1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 24, 25, 27, 28, 29, 31, 32, 33, 34, 35, 36, 37, 38, 40, 41, 42, 43, 44, 47, 48, 51, 52, 55
Tortula inermis (Brud.) Mont. – 22
Tortula muralis Hedw. var. *muralis* - 4, 12, 14, 15, 17, 19, 20, 21, 23, 25, 57, 60, 61
Tortula ruralis (Hedw.) Gaertn., Mayer. & Scherb ssp. *ruralis* - 1, 8, 10,

Table 1. Continued.

13, 15, 16, 17, 18, 20, 22, 23, 24, 25, 27, 28, 29, 33, 34, 36, 37, 39, 40, 43, 46, 48, 57, 60
Tortula subulata Hedw. - 2, 4, 6, 13, 17, 18, 24, 42, 44, 51
Weissia controversa Hedw. var. *controversa* - 4, 48, 55, 57

MARCHANTIOPSIDA

Apometzgeria pubescens (Schrank) Kuwah. - 27, 28, 31
Barbilophozia barbata (Schmid. ex. Schreb.) Loeske - 8, 9, 27, 28, 31, 33, 37, 38, 42, 43, 44, 49, 50, 54, 57, 59
Chiloscyphus polyanthos (L.) Corda var. *polyanthos* - 42
Cololejeunea calcarea (Lib.) Schiffn. - 28
Conocephalum conicum (L.) Dumort. - 19, 44, 51
Frullania dilatata (L.) Dumort. - 11, 18, 21, 27, 28, 30, 31, 32, 33, 34, 37, 38, 39, 41, 42, 43, 44, 46, 47, 48, 49, 50, 51, 53, 57, 59, 61
Frullania tamarisci (L.) Dumort. - 9, 31, 33, 34, 37, 38, 41, 43, 49, 51, 59
Lejeunea cavifolia (Ehrh.) Lindb. - 3, 31, 47, 51
Lophocolea bidentata (L.) Dumort. var. *rivularis* (Raddi) Warnst. - 12, 18, 27, 28, 44, 51, 54, 55, 57, 58
Lophocolea heterophylla (Schrad.) Dum. - 34, 44
Lophocolea minor Nees. - 5, 6, 51
[VU]*Leiocolea collaris* (Nees) Schljakov - 1, 41, 42, 44
Marchantia polymorpha L. - 7, 13, 19, 27, 34, 35, 37, 42, 51
Metzgeria conjugata Lindb. - 21, 44
Metzgeria furcata (L.) Dumort. - 18, 19, 21, 28, 29, 31, 32, 43, 47
Pedinophyllum interuptum (Nees) Kaal. - 27, 41, 44, 59
Pellia epiphylla (L.) Corda - 7, 10, 19, 28, 30, 37, 42, 55
Plagiochila asplenioides (L. emend. Taylor) Dumort. - 5, 6, 9, 15, 17, 18, 19, 21, 24, 27, 28, 29, 31, 37, 38, 43, 44, 47, 51, 54, 59
[DD]*Porella x baueri* (Schiffn.) C.E.O. Jensen - 9, 11, 25, 26, 27, 28, 29, 34, 39, 40, 46, 47, 51
Porella platyphylla (L.) Pfeiff. 6, 30, 37, 38, 62
Ptilidium pulcherrimum (Weber) Vain. - 51
Radula complanata (L.) Dumort. - 3, 5, 6, 10, 11, 18, 19, 21, 23, 27, 28, 29, 30, 31, 32, 34, 37, 38, 39, 41, 42, 43, 44, 45, 46, 47, 58, 49, 51, 54, 56, 57, 59
Scapania aspera Bernet et M. Bernet - 5, 6, 15, 21, 24, 27, 28, 31, 38, 44, 51
[VU]*Scapania calcicola* (Arnel et J. Perss.) Ingham - 9, 13, 51
Scapania mucronata H. Buch - 6, 8, 13, 41, 51
Tritomaria quinquedentata (Huds.) H. Buch. - 3, 31, 38, 41

Genuine mosses were represented by 139 taxa from 23 families and 70 genera. The most numerous representatives were from the families Pottiaceae (with 22 taxa), Brachytheciaceae (with 20 taxa), Amblystegiaceae (with 14 taxa), Hypnaceae (with 13 taxa), and Bryaceae (with 10 taxa), which represents half of the bryophyte species identified in this study (Fig. 1). The genera with the largest number of species recorded were *Bryum* (nine), *Orthotrichum* (eight), *Brachythecium* (seven), *Dydimodon* (five), *Campylium* (five) and *Plagiomnium* (five). Other genera were represented with four or less taxa.

The group of liverworts was represented by 26 taxa

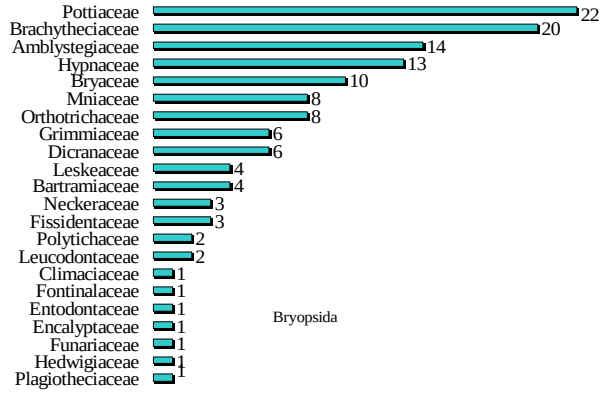


Fig. 1. Number of taxa from families of the class Bryopsida.

from 13 families and 19 genera. Half of the liverworts recorded were from the families Geocalycaceae, Metzgeriaceae, Lophoziaceae, and Scapaniaceae (Fig. 2).

The range of diversity varied from eight taxa in the delta of the Dobroselica River (locality 35) up to 53 taxa in the canyon downstream from the Radoinjska sluice (locality 28).

In all prior floristic examinations conducted in Southwest Serbia, 134 bryophyte taxa were recorded. A large number of taxa (70 genuine mosses and 12 liverworts) are here recorded for the first time in this region so far.

The most frequent taxa of real mosses were *Hypnum cupressiforme* var. *cupressiforme*, *Shistidium apocarpum* var. *apocarpum* and *Tortella tortuosa*. Among liverworts, only *Radula complanata* was recorded from 33 localities.

Nine species are red-listed in Serbia and Montene-

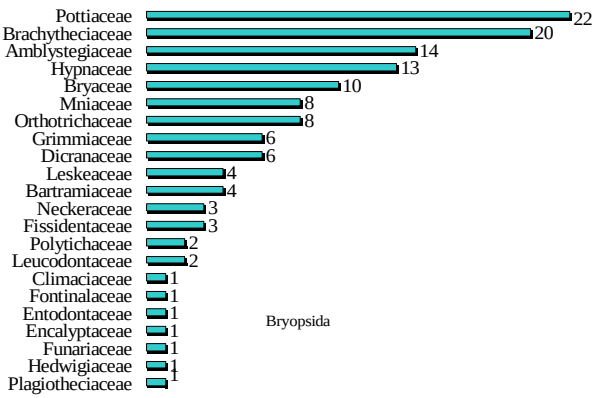


Fig. 2. Number of taxa from families of the class Marchantiopsida.

gro: *Campylium polygamum*, *Orthotrichum obtusifolium*, *Leiocolea collaris*, and *Scapania calcicola* (vulnerable - ^{VU}); *Amblystegium tenax* and *Fontinalis antipyretica* var. *antipyretica*, (low risk - ^{LR}); and *Didymodon ferrugineus*, *Neckera pumila*, *Porella x baueri* (data deficient - ^{DD}).

The Jaccard index (J a c c a r d, 1928) was used to analyze bryological similarity between localities was applied. The degree of similarity ranged from 0 to 0.60 (Fig. 3). The greatest index of similarity was recorded between localities 15 and 17, in the canyon at the very beginning of the Zlatarsko Lake. In regard to habitat, these two localities appear very different. However, because of the short distance between them, not a great floristic separation has occurred. This assumption is confirmed by the example of locality 16, which also has a high index of similarity with locality 15.

A high degree of similarity (over 45%) was recorded between most localities. Many of these localities are very close to each other, with similar vegetation and the same geological substratum.

We compared the bryophyte flora along the Uvac River with those of some other rivers which have been examined. Results from the Irigua River in Spain (M a r t i n e z and A b a i g a r, 1992) and Red River in the USA (S t u d l a r and S n i d e r, 1989) were used for comparison. On the Irigua River 123 taxa were identified: 80 real mosses and 43 liverworts. The number of species in common with the flora of the Uvac River is 46 and the similarity index is 0.19. On the Red River in the USA, 264 species and infraspecific taxa were recorded. There were 179 real mosses and 85 liverworts. The index of similarity with the bryophyte flora of the Uvac is 0.13.

Chorological analysis

Analysis of floristic elements in accordance with D u e l l *et al.* (1999) showed that the greatest number of taxa are temperate elements (40.61%), while the next most numerous group is made up of boreal floral elements (34.0%). These groups are the most numerous

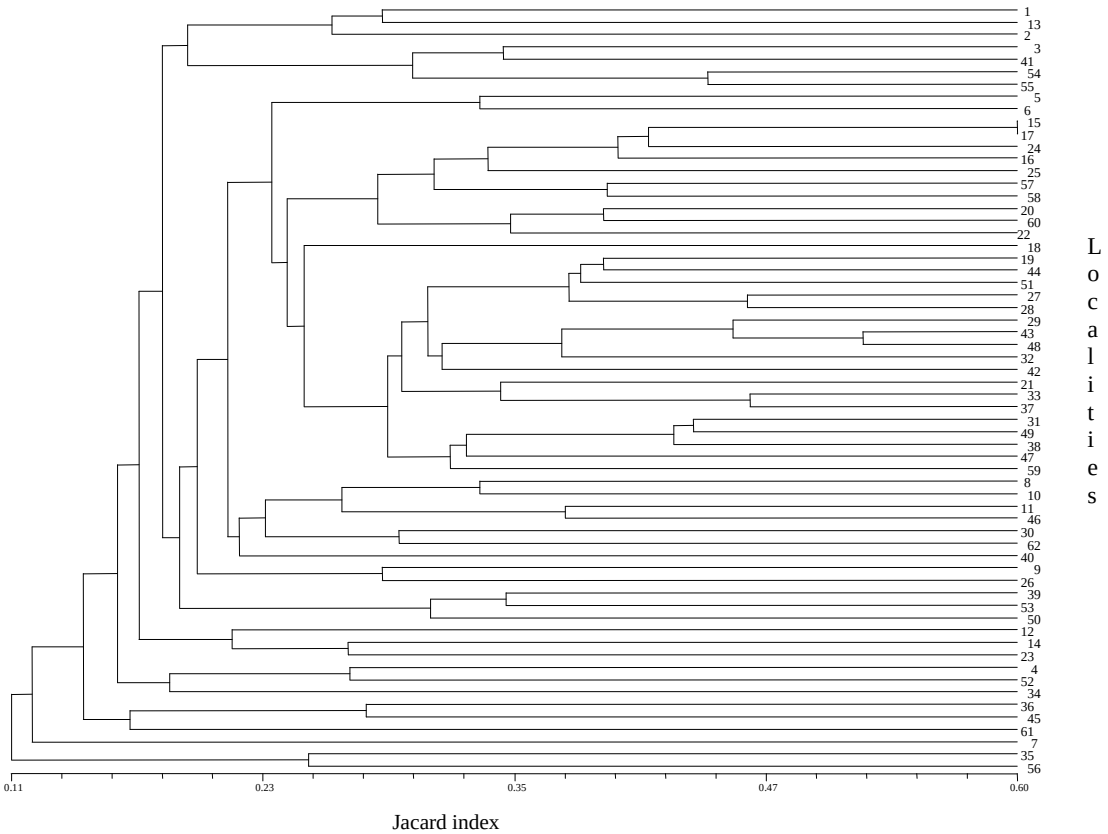


Fig. 3. Values of Jaccard similarity index, Dendrogram – UPGMA Software, NT-SYS 2.02

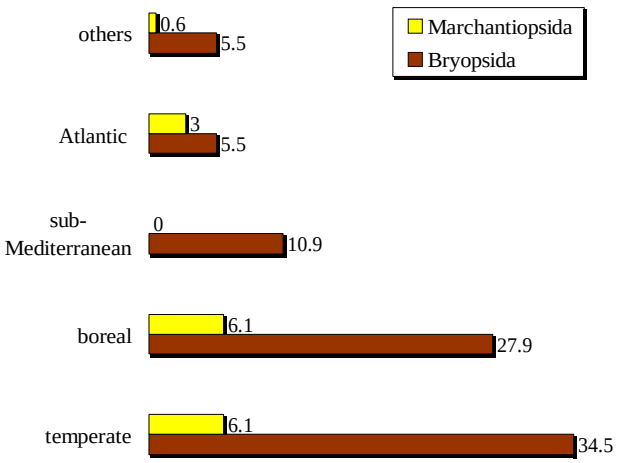


Fig. 4. Percentage of floral element groups present.

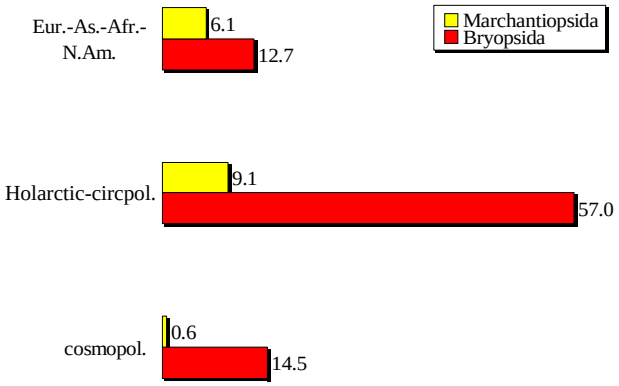


Fig. 5. Percentage of main distribution areas represented.

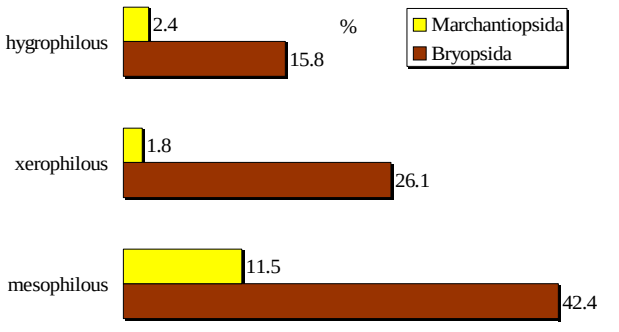


Fig. 6. Percentage of taxa in relation to humidity.

among both real mosses and liverworts (Fig. 4). Considering the geographical position of the examined area, between Central Europe and the Mediterranean, more representatives of the sub-Mediterranean bryoflora might be expected. However, if we take into account climatic factors, the hydrological situation, and the geological substratum of the examined area, the current situation is much clearer.

Analysis of phytogeographic distribution (in accordance with D u e l l *et al.*, 1999) showed a dominance of taxa with Holarctic distribution (Fig. 5) for both real mosses and liverworts.

Analysis of ecological parameters

For ecological analysis of the taxa recorded, the following characteristics were investigated: humidity, substrate type, substrate pH, and light. These characteristics were selected in accordance with B o r o s (1964).

Among bryophytes recorded along the Uvac River, mesophilous species dominated (Fig. 6). This applies to both real mosses and liverworts. Almost half of all recorded species of Bryopsida were mesophilous ones.

Though the soil cover near the Uvac River is relatively poor, particularly in the lower part of the river, species that prefer soil as a substrate were most numerous (40.6%). Taxa that prefer rocky habitats made up 38.2% (Fig. 7). The genuine mosses occured mostly on soil, while most of the liverworts were recorded on rocks. Taxa that prefer bark or are indifferent towards habitat were the least numerous.

In regard to substratum pH, basophilous species were dominant (38.8%), but there were also a number of taxa which are pH-indifferent (Fig. 8). Among real mosses, most of the taxa were ones that are basophilous or indifferent. Quite the opposite situation was observed among the liverworts, where acidophilous species were predominant. This situation was to be expected: basic substrata, mostly limestones, are drier. The liverworts prefer a more humid habitat, as can be seen from the humidity analysis (Fig. 6).

It is evident from Fig. 9 that the majority of recorded bryophytes were sciophilous species (48.5%). Among liverworts, with the exception of *Scapania aspera*, sciophilous species were absolutely dominant. This situation was to be expected for liverworts because most of their taxa prefer a mesophytic habitat.

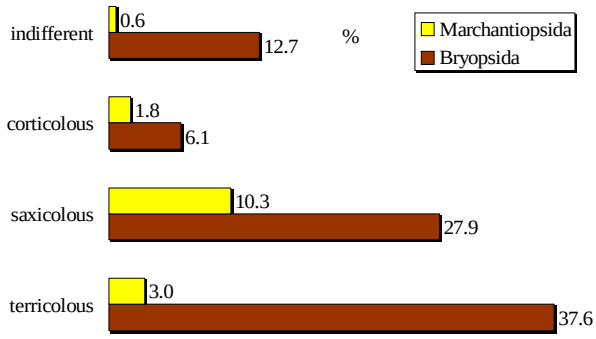


Fig. 7. Percentage of taxa in relation to substratum type.

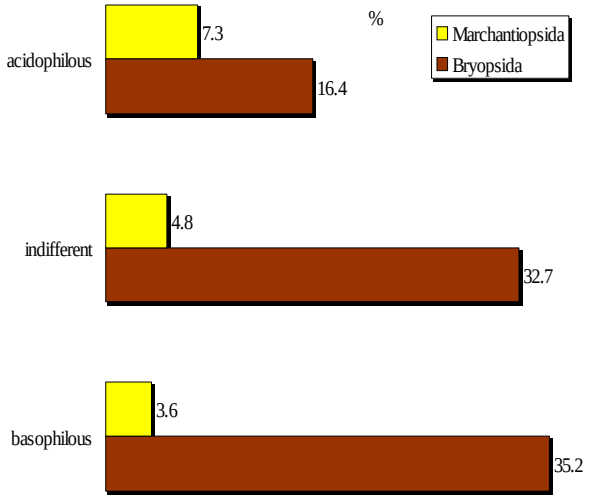


Fig. 8. Percentage of taxa in relation to substratum pH.

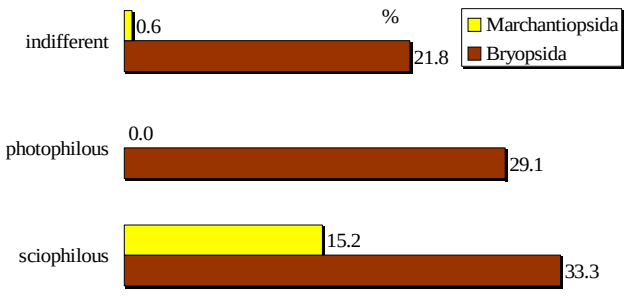


Fig. 9. Percentage of taxa in relation to light.

Acknowledgement - This research was supported by the Serbian Ministry of Science and Environment Protection (Grant No 143049).

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ФЛОРА МАХОВИНА КАЊОНА РЕКЕ УВАЦ (ЈУГОЗАПАДНА СРБИЈА)

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На истраживаном подручју је констатовано 165 таксона, 139 из класе Bryopsida и 26 из класе Marchantiopsida. Девет врста се наводе у црвеној листи маховина Србије. Материјал сакупљен са 62 локалитета анализиран је кроз индекс сличности по Jaccard-у, хоролошки и еколошки. Анализом флорних елемената и фитогеографске дистрибуције констатован је највећи број таксона умереног флорног елемента и холарктичког распростарањења. Резултати еколошке анализе показали су да, са аспекта pH супстрата, доминирају териколне, базофилне и индиферентне врсте. У односу на влажност као еколошки параметар, већина врста су мезофилне. Главнина од укупно идентификованих маховина припада скиофилним таксонима.