

New and interesting bryophytes of Albania and Montenegro

Branko ANĐIĆ, Christian BERG & Danijela STEŠEVIĆ*

Abstract: ANĐIĆ B., BERG C. & STEŠEVIĆ D. 2018: New and interesting bryophytes of Albania and Montenegro. – *Herzogia* 31: 436–443.

A variety of recordings of interesting species were obtained for Albania and Montenegro based on bryology surveys in the catchment area of the Cijevna river. Some of them have not yet been registered thus far, such as *Leptobryum pyriforme* in the bryoflora of Montenegro, or *Anoetangium aestivum*, *Didymodon cordatus*, *Fissidens rufulus*, *Heterocladium heteropterum*, *Homalia trichomanoides*, and *Tortula caucasica*, in the bryoflora of Albania. Other interesting records are *Grimmia crinita* (for Montenegro) and *Blepharostoma trichophyllum*, *Nowellia curvifolia*, *Taxiphyllum wissgrillii*, and *Tetraphis pellucida* (for Albania).

Zusammenfassung: ANĐIĆ B., BERG C. & STEŠEVIĆ D. 2018: Neue und interessante Moosfunde aus Albanien und Montenegro. – *Herzogia* 31: 436–443.

Ausgehend von bryologischen Untersuchungen im Einzugsgebiet des Cijeva-Flusses berichten wir über neue und interessante Moose für Albanien und Montenegro. *Leptobryum pyriforme* ist neu für die Bryoflora Montenegros, *Anoetangium aestivum*, *Didymodon cordatus*, *Fissidens rufulus*, *Heterocladium heteropterum*, *Homalia trichomanoides* und *Tortula caucasica* sind neu für Albanien. Zweitfunde sind *Grimmia crinita* für Montenegro, sowie *Blepharostoma trichophyllum*, *Nowellia curvifolia*, *Taxiphyllum wissgrillii* und *Tetraphis pellucida* für Albanien.

Key words: New national records, liverworts, mosses, distribution

Introduction

Although the first bryological records in Montenegro (WEISS 1866) and Albania (HÖHNEL 1893) date from the second half of the 19th Century, research involving bryofloras has been neither systematic nor continual (SABOVLJEVIĆ et al. 2001, DRAGIĆEVIĆ & VELJIĆ 2006). Over the past several decades, bryophyte research has been intensified in both countries. The first checklist of Montenegro bryophytes was published in 2006. It included 729 species, subspecies, varieties and forms (613 mosses, 115 liverworts and 1 hornwort, DRAGIĆEVIĆ & VELJIĆ 2006). To date the list has been supplemented with 50 liverworts and 74 mosses (ROS et al. 2007, PAPP & ERZBERGER 2005, PAPP & ERZBERGER 2007, ERZBERGER & PAPP 2007, PAPP & ERZBERGER 2010, DRAGIĆEVIĆ 2008, ERZBERGER et al. 2008, PAPP & ERZBERGER 2011, ANĐIĆ et al. 2013, ANĐIĆ et al. 2016, VULEVIĆ et al. 2017, DRAGIĆEVIĆ et al. 2017, PETERKA et al. 2017). The preliminary checklist of Albanian bryophytes was also published in 2006 (COLACINO & SABOVLJEVIĆ 2006), and included 327 species, subspecies, varieties and forms (238 mosses, 86 liverworts and 3 hornworts). To date the list has been supplemented with

* Corresponding author

around 300 taxa (BLOCKEEL et al. 2007, COLACINO & MARKA 2009, BLOCKEEL et al. 2009, PAPP et al. 2010, MARKA & SABOVOLJEVIĆ 2011, MARKA & XHULAJ 2011, ELLIS et al. 2012, MARKA et al. 2013, VAN ZANTEN 2013, MARKA 2014, MARKA et al. 2018).

Nevertheless, some localities in both countries remain completely unexplored and therefore the cataloguing of bryophytes cannot be considered complete. Ecology and vulnerability data are also incomplete, as well as distribution data. The conservation status of bryophytes in Montenegro is documented in two ways: (1) the decision to place specific plant and animal species under protection (OGM 2006) and (2) the Red List of Serbia and Montenegro (SABOVOLJEVIĆ et al. 2004). In order to highlight the “Albanian Red list bryophyte candidates” (which may need to be included in further natural heritage conservation initiatives) the preliminary version of the Red list of Albanian bryophytes included 16 liverwort species and 64 moss species (MARKA et al. 2012).

Detailed investigations of the transboundary area of the Cijevna river basin have been initiated in order to contribute to the broader understanding of the bryoflora of both countries. In this paper we are presenting seven new species and six second records for the bryophyte flora of Montenegro and Albania.

Methods

The field investigation of the Cijevna river basin was carried out from 2010 to 2017. Voucher specimens were deposited in the Herbarium collection of the University of Montenegro (TGU). Nomenclature follows SÖDERSTRÖM et al. (2016) for liverworts and ROS et al. (2013) for mosses. HODGETTS (2015) is taken as the basis for new records, because the author summarized all data on European bryophytes.

Study area

The basin of the Cijevna river extends from the spring, located in the Albanian Alps (on 1294 m altitude), to the confluence with the river Morača (14 m altitude), in the territory of Montenegro. The total length of the Cijevna river is 58.8 km, of which 32.3 kilometers are in Montenegro, and 26.5 kilometers are in Albania, thus it has a huge gradient along the longitudinal profile. The river is the southernmost tributary of the Morača River, which belongs to the Adriatic watershed (KABO 1991, ŠEHIĆ 2005). Six different locations of the study area are pictured in figs. 2A–2F.

Numerous geomorphologic phenomena and forms typical of the karstic areas characterize the basin of the Cijevna river (Figure 2). The geological substrate is composed of Mesozoic rocks, mainly carbonate limestones from the Upper Jurassic and fluvioglacial Quaternary sediments. In the lowland (Ćemovsko polje), fluvioglacial sediments are bounded and cemented with carbonate binders and form conglomerates in which a large number of smaller and larger half-caves and caves are formed (BULIĆ 1994, RADOJIČIĆ 1996). Soil types are rather diverse. Very shallow and eroded soils are developed on the steep slopes (black soils and rendzina). Brown soils are dominant on the flysch terrain, while the alluvial and deluvial soils prevail along the watercourse. Terra rossa is also a significant soil type, typical for fluvial terraces in canyons and in the Ćemovsko polje (FUŠTIĆ & ĐURETIĆ 2000). According to Köppen criteria (KÖPPEN 1918), the lower part of the catchment area climate is of Csa subtype – Mediterranean climate with a hot summer. It changes into transitional type between the Mediterranean and humid

temperate climate (Cs/s“/b) towards the upper part of the stream, and in the source zone the climate is humid continental with a warm summer (Dfb, BURIĆ et al. 2014). The water level of Cijevna river is predominantly affected by precipitation in the upper part of the course (ca. 2500 mm/yr). The average flow peaks in May (24.9 m³/s) and is its lowest in August (4.6 m³/s). The river dries up during the summer part of its flow through Čemovsko polje (RADULOVIĆ 1976).

The basin of the Cijevna river exhibits high floristic and vegetation diversity. According to the studies of BULIĆ (1994), HADŽIABLAHOVIĆ (2004a, 2004b, 2010), HADŽIABLAHOVIĆ & BULIĆ (2004) the vascular flora of the Cijevna river basin includes 813 species. Approximately 40 species are endemic to the South-east Dinaric Alps and the Balkan Peninsula, and 36 are protected by national and international legislation. Vegetation is represented with 32 associations, 4 subassociations, 20 alliances, 18 orders and 14 classes. The refugial character and biogeographical position of the basin enables the occurrence of various plant communities of mediterranean, submediterranean and continental type. The most specific plant communities of refugial character are: *Adiantum-Pinguicula hirtiflora* Stevanović & Bulić 1989, *Geranium dalmaticum-Ramondia serbica* Stevanović & Bulić 1989, *Valeriana-Ramonda* Stevanović & Bulić 1991 (BULIĆ 1994).

Due to the extraordinary biodiversity values in the Montenegrinian part of the Cijevna River, it is recognized as an Important Plant Area (PETROVIĆ 2009), Important Bird Area (URL#1), an ‘EMERALD area’ (‘ME0000008’, see URL#2), and a Monument of Nature (OGM 2017). The entire border area between Albania and Montenegro, including the Cijevna River Canyon, is part of the European Green Belt (URL#3, URL#4).

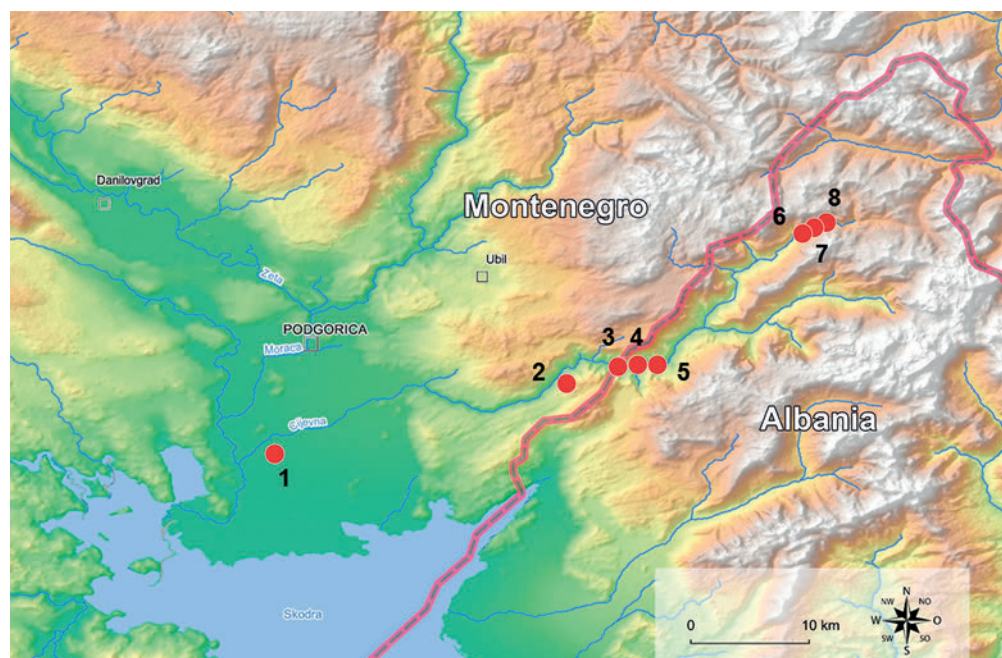


Figure 1: Position of the Cijevna river basin with numbers of collecting localities (Produced using Copernicus data and information provided by the European Union - EU-DEM layers).



Figure 2: The Cijevna river basin. – **A,B**) Upper part of the stream (in Albania). – **C,D**) Middle part of the stream (in Montenegro). – **E,F**) Lower part of the stream (in Montenegro). – [Photos: A,B,C,E,F by Danijela Stešević; D by Branko Andić].

Results and Discussion

New bryophyte record for Montenegro

Leptobryum pyriforme (Hedw.) Wilson was collected on moist soil in a *Carpinus orientalis*-shrubland (Fig. 1, No. 2, N 42.4140019, E 19.453676, 452 m, leg. D. Stešević and B. Andjić, 05.07.2010 det. B. Andjić, conf. C. Berg, Specimen ID 1215163). Until very recently, the species was not listed in Southeast European countries of Albania, Greece, Kosovo, Montenegro and the European part of Turkey (HODGETTS 2015). Within the Cijevna river basin fire, logging and the construction of roads presents possible threats to the survival of this species.

Interesting findings for the bryoflora of Montenegro

Grimmia crinita Brid. was collected from rocky outcrops in the dry rocky pastures of the Cijevna river basin, (Fig. 1, No. 1, N 42.363241 E 19.234656, 30 m, leg. D. Stešević and B. Andjić, 05.07.2010 det. B. Andjić, conf. C. Berg, Specimen ID 1215817). This habitat type corresponds with the NATURA 2000 habitat type 62A0 – Eastern sub-mediterranean dry grasslands – *Scorzoneratalia villosae* (PETROVIĆ et al. 2012). According to HODGETTS (2015) the species is not registered in Montenegro, but DRAGIČEVIĆ (2008) reported its presence in the Morača river (locality Smokovac, Podgorica). Consequently, prior to our finding *G. crinita* its presence had only been previously reported for a single locality in Montenegro. In Southeast Europe it is known from Albania, Bulgaria, Romania, Serbia and Slovenia (HODGETTS 2015). This species is a candidate for the new Red Data Book of European bryophytes (HODGETTS 2015). Due to the increase of anthropogenic pressure, urbanisation can be considered to be a potential threat to this population of *Grimmia crinita*.

New moss records for Albania

Fissidens rufulus Bruch & Schimp. was collected on the submersed rocks at the site that belongs to the Green Belt of Europe (Fig. 1, No. 3, N 42.423578, E 19.498456, 182 m, leg. D. Stešević and B. Andjić, 01.05.2017, det. B. Andjić, conf. C. Berg, Specimen ID 1215177). It co-occurs with *Hygrohypnum luridum* as the dominant species. BLOCKEEL et al. (2007) reported a similar moss community. Within Southeastern Europe it is not been registered in Albania, Bosnia-Herzegovina, Bulgaria, Crete, Kosovo, and Macedonia and (HODGETTS 2015). The species is a candidate for the new Red Book of European bryophytes (HODGETTS 2015).

Tortula caucasica Broth. [= *Pottia intermedia* (Turner) Fűrnr.] was collected both on the soil and the rocks, at the site that belongs to the Green Belt of Europe (Fig. 1, No. 3, N 42.423556, E 19.498650, 178 m, leg. D. Stešević and B. Andjić, 01.05.2017, det. B. Andjić, conf. C. Berg, Specimen ID 1215176). It has been registered in all Southeast European countries except for Kosovo and Crete (HODGETTS 2015).

Didymodon cordatus Jur. was collected on the rocks at the site belonging to the Green Belt of Europe (Fig. 1, No. 4, N 42.427196, E 19.507196, 215 m, leg. D. Stešević and B. Andjić, 01.05.2017, det. B. Andjić, conf. C. Berg, Specimen ID 1215178). DÜLL (1983) reported its presence in Albania, however the species was later excluded because of insufficient evidence of its occurrence (COLACINO & SABOVLJEVIĆ 2006). To date it has not yet been reported in SE Europe nor in Albania, Kosovo, Macedonia or the European part of Turkey (HODGETTS 2015). The species is a candidate for the new Red Book of European Bryophytes (HODGETTS 2015).

Homalia trichomanoides (Hedw.) Brid. was collected on rocks near the water (Fig. 1, No. 5, N 42.427907, E 19.519532, 212 m, leg. D. Stešević and B. Andjić, 01.05.2017, det. B. Andjić, conf. C. Berg, Specimen ID 1215170). In Southeast Europe the species is not reported in Albania, Kosovo and European part of Turkey (HODGETTS 2015, PAPP et al. 2013a).

Anoetangium aestivum (Hedw.) Mitt. was collected on rocks found near the water of a stream (Fig. 1, No. 6, N 42.530786, E 19.646303, 917 m, leg. D. Stešević and B. Andjić, 10.09.2016, det. B. Andjić, conf. C. Berg, Specimen ID 1215175). In Southeast Europe, the species has only been found in three countries: Croatia (PAPP et al. 2013b), Montenegro, and Romania (HODGETTS 2015). The species is a candidate for inclusion in the new Red Book of European Bryophytes (HODGETTS 2015).

Heterocladium heteropterum (Brid.) Schimp. was collected on a moist and shady rock near the water (Fig. 1, No. 8, N 42.533796, E 19.668063, 983 m, leg. D. Stešević and B. Andjić, 01.05.2017 det. B. Andjić, conf. C. Berg, Specimen ID 1215169). To date, the species has not been reported in the following parts of Southeast Europe including Albania, Greece, Kosovo, Macedonia and the European part of Turkey (HODGETTS 2015).

Interesting findings for the bryoflora of Albania

Blepharostoma trichophyllum (L.) Dumort. was collected on decaying wood (Fig. 1, No. 6, N 42.530910, E 19.646154, 928 m, leg. D. Stešević and B. Andjić, 16.04.2017, det. B. Andjić, conf. C.

Berg, Specimen ID 1215166), together with *Nowellia curvifolia* (Dicks.) Mitt. in Godman. (det. B. Andjić, conf. C. Berg, Specimen ID 1215167). Both species are reported in the majority of the SE Europe territory, with the exceptions of Kosovo, Crete and the European part of Turkey (HODGETTS 2015). In Albania, it has only been reported for Valbona Valey (MARKA et al. 2018).

Taxiphyllum wissgrillii (Garov.) Wijk & Margad. was collected on shaded limestone rocks (Fig. 1, No. 7, N 42.531234, E 19.653471, 1023 m, leg. D. Stešević and B. Andjić, 01.05.2017, det. B. Andjić, conf. C. Berg, Specimen ID 1215179). The species is registered in almost all Southeast European countries (HODGETTS 2015, PAPP et al. 2016, PAPP & TSAKIRI 2017, MARKA et al. 2018) except Kosovo. In Albania, it has only been reported for Valbona Valey (MARKA et al. 2018).

Tetraphis pellucida Hedw. was collected on decaying wood (Fig. 1. No. 8, N 42.534589, E 19.661495, 1058 m, leg. D. Stešević and B. Andjić, 10.09.2016, det. B. Andjić, conf. C. Berg, Specimen ID 1215173). It is distributed throughout the majority of Southeastern Europe, with the exception of Kosovo, Macedonia and the European part of Turkey (HODGETTS 2015, MARKA et al. 2018). In Albania, it has only been reported for Valbona Valey (MARKA et al. 2018).

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Addresses of the authors

Branko ANĐIĆ and Danijela STEŠEVIĆ, Faculty of Natural Sciences and Mathematics, University of Montenegro. – E-mails: brankoan@yahoo.com, danijela.stesevic@ac.me

Christian BERG, Institute of Biology, NAWI Graz, University of Graz, Holteigasse 6, 8010 Graz. – E-mail: christian.berg@uni-graz.at