

***Myurella sibirica*, a moss species new to Montenegro and Serbia: its range extension towards south-eastern Europe**

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Abstract – The moss species *Myurella sibirica* (Müll. Hal.) Reimers is reported for the first time from Serbia and Montenegro. The new records significantly extend the known European range of this Europe-wide endangered species into the southeast. The species was found in limestone rock crevices in mountain to high mountain areas.

Bryophytes / Balkans / flora

INTRODUCTION

The Balkan peninsula is one of the major centres of European biodiversity (e.g. Stevanović *et al.*, 2003). However, not all groups of living organisms in this region are well known and/or sufficiently documented. Bryophytes remain under-recorded within the region (Sabovljević *et al.*, 2001, 2011) and the general area contains many locations worthy of extensive field investigations focusing on these plants. As it is well known from geohistory, the high-mountain areas of the Balkans have undergone severe glaciations over the ages, and the particular relief and orography, rich in high mountain habitats and deep canyons, have preserved a surprisingly rich biological diversity. Thus, the Balkan peninsula is home to many organisms that survived millenia of different geological and climatic periods of life history (Griffiths *et al.*, 2004). In addition to the Iberian and Apennine peninsulas, the Balkan peninsula is one of the three major south European refuge areas, and certainly one of the most important in Europe (Griffiths *et al.*, 2004; Sabovljević, 2004).

The high-mountain belt of the Balkans is noted for the presence of many endemic and relic species of vascular plants. We focus our bryological investigations on such high-altitudinal areas of the central Balkans. Many new species for the region have been discovered as well as new country records have been accumulated during the past decade, significantly increasing the knowledge of bryoflora not only for some specific countries, but for the whole of the Balkan

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peninsula (e.g. Blockeel *et al.*, 2002; Erzberger *et al.*, 2008; Papp & Sabovljević, 2009; Sabovljević *et al.*, 2010; Papp *et al.*, 2012, 2013; Marka *et al.*, 2013). These recent investigations also helped to build a good documentation on the condition of many bryophyte populations and establish the threat status of certain species/populations (Sabovljević *et al.*, 2001; Papp *et al.*, 2009).

In this study we present the new records of the moss species *Myurella sibirica*, a subarctic, alpine element (Düll, 1985) located in Serbia and in Montenegro, new to the bryophyte flora for both countries. It is European wide rare species. According to the Red Data Book of European Bryophytes (Schumacker & Martiny, 1995), it is considered endangered (E) in Europe, but in a more recent online update, it is considered as vulnerable (VU) (<http://www.bio.ntnu.no/ECCB>).

It is known only from a few countries in Europe; in Austria it is considered as potentially endangered (Saukel & Köckinger, 1999), and in Slovakia as endangered (EN) (Kubinská *et al.*, 2001).

In Southern Europe it is known only from Italy, Slovenia and Bosnia-Herzegovina (Sabovljević *et al.*, 2008; Puglisi *et al.*, 2011). From the latter country *Myurella sibirica* has only one report based on collections published before 1962 (Ros *et al.*, 2013). This holarctic species is also known in European Russia from the northern and southern part of the Ural region, and from the Caucasus (Ignatov *et al.*, 2006).

MATERIAL AND METHODS

Samples of the species in concern were collected in Durmitor Mts, Montenegro and Pešter plateau, Serbia. The voucher specimens are deposited in the Bryophyte Collection of the Hungarian Natural History Museum, Budapest (BP). SEM photographs were taken from uncoated specimens by a HITACHI S-2600 VP-SEM using low vacuum (15-25 Pa, 15-20kV) mode. LM photographs were taken by a Nikon E 600 microscope (magnification 20×, 40×) connected to a Spot-JR digital camera and QCapturePro software was used the image processing.

RESULTS AND DISCUSSION

Hereby we provide the records of three moss populations of *Myurella sibirica*, one from Serbia and two from Montenegro.

Localities

Serbia, Pešter plateau at Sjenica ski centre, shaded limestone rocks in a dolina, 43°13'37,4"N, 19°57'40,0"E, 1230 m, *B. Papp s.n.*, 01.06.2012, conf. L. Meinunger, **BP186653**.

Montenegro, Durmitor Mts, Žabljak, Otoka potok stream valley, 43°09'13,9" N, 19°06'04,0" E, 1430 m, *B. Papp s.n.*, 06.10.2004, **BP 187072**.

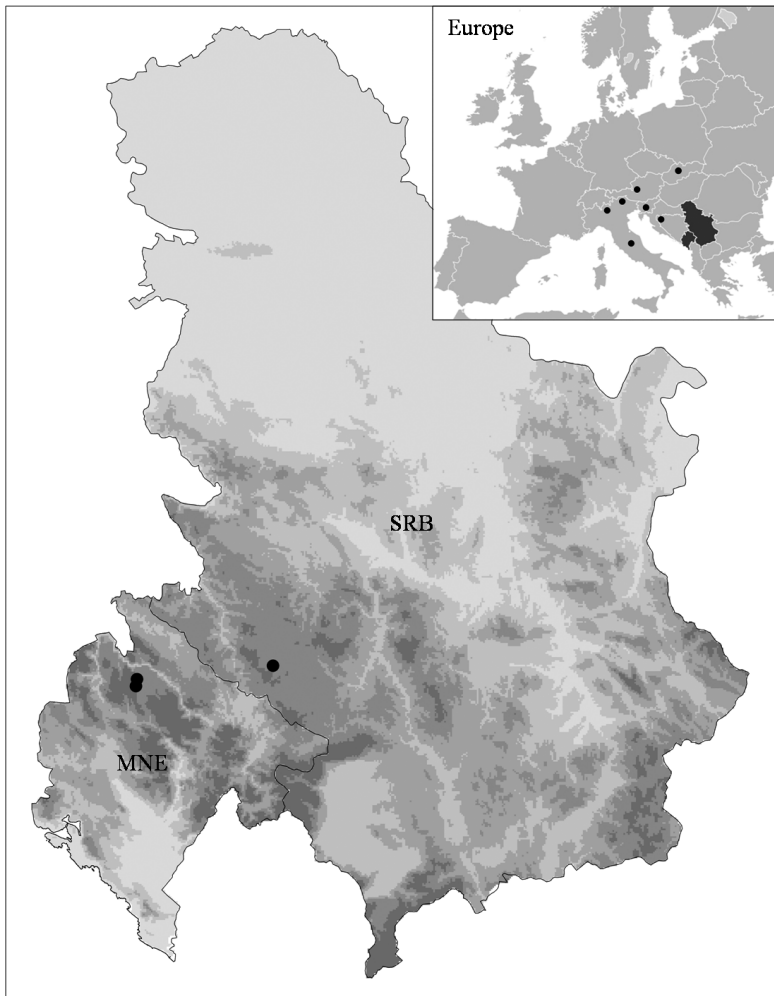


Fig. 1. The distribution of *Myurella sibirica* in Serbia and Montenegro.

Montenegro, Durmitor Mts, Žabljak, between Poljana and Savin kuk, limestone, subalpine and alpine zone, 43°07'15,8" N, 19°05'44,1" E, 1630-2000 m, *B. Papp s.n.*, 06.10.2004, **BP187073**.

These localities are in mountain to high mountain areas (Fig. 1). The species was collected from limestone rocks, in rock crevices. In the Serbian collection a few individuals were creeping on an *Encalypta streptocarpa* Hedw. patch. In the Durmitor Mts (Montenegro) it occurred together with *M. julacea* (Schwägr.) Schimp. At Otoka potok valley (Fig. 2) the patches were mixed with *Tortella tortuosa* (Hedw.) Limpr., *Pohlia cruda* (Hedw.) Limpr. and *Mnium thomsonii* Schimp. In the alpine zone between Poljana and Savin kuk a clear, loose patch of 1 cm² was found.

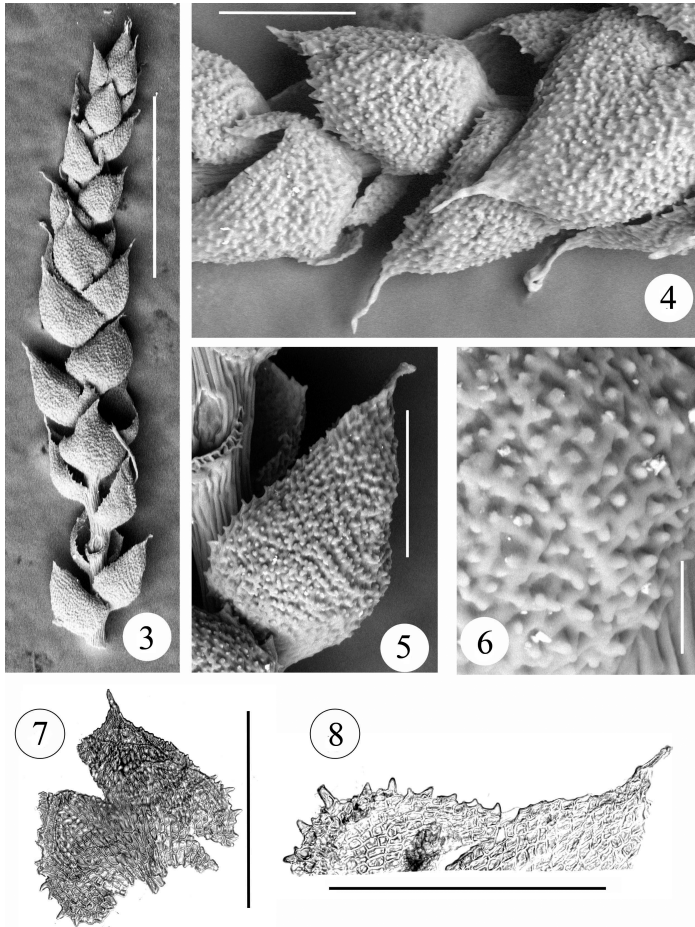


Fig. 2. Habitat of *Myurella sibirica* in Montenegro, Durmitor Mts, Žabljak, Otoka potok stream valley. Arrows indicate the exact places where the species was found in this locality.

In the field *Myurella sibirica* can be recognised by its tiny light green shoots bearing imbricate leaves with long apiculus; in microscopic examinations it is easily identified by its strong, echinate central papillae on the dorsal surface of leaf cells and the coarsely denticulate or ciliate leaf margins (Figs 3-8) (Ignatov & Ignatova, 2003).

Interestingly, Puglisi *et al.* (2011) made a recent record of *M. sibirica* in central Italy, and in the same study stated the strong amphiadriatic biogeographic links existing between the Apennines and the Balkans (supported also by elements of the vascular flora, e.g. Biondi *et al.*, 1999; Uzunov *et al.*, 2005), and also confirmed by the presence of *M. sibirica* in the montane belt of both peninsulas. The previous records of the species from the Balkans, such as those cited by Pavletić (1955) for Slovenia and Bosnia-Herzegovina, have come from altitudinal ranges of 270-2100 m. The wide altitudinal range of old and new records in fact is rather dubious considering that microhabitat conditions play a key role in the presence of the species. All confirmed locations are characterised by cool summers and long lasting winter frosts.

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Figs 3-8. SEM and LM photographs of *Myurella sibirica*. **3.** Upper part of shoot at SEM, (bar = 500 µm). **4.** Detail of shoot at SEM (bar = 100 µm). **5.** Leaf of shoot at SEM (bar = 100 µm). **6.** Dorsal side of leaf of shoot showing papillae at SEM (bar = 20 µm). **7.** Leaf of shoot at LM (bar = 0,25 mm). **8.** Part of leaf of shoot at LM (bar = 0,2 mm). All from BP 187072.

REFERENCES

- BIONDI E., BALLELLI S., ALLEGREZZA M., TAFFETANI F., FRATTAROLI A.R., GUITIAN J. & ZUCCARELLO V., 1999 — La vegetazione di Campo Imperatore. *Braun-Blanquetia* 16: 53-115.
- BLOCKEEL T.L., ROS R.M., SABOVLJEVIĆ M., CANO M.J., GALLEGU M.T. & MUÑOZ J., 2002 — New and interesting bryophyte records for Greece. *Cryptogamie, bryologie* 23: 149-155.
- DÜLL R., 1985 — Distribution of the European and Macaronesian mosses (Bryophytina) II. *Bryologische Beiträge* 5: 110-232.
- ERZBERGER P., PAPP B. & DRAGIĆEVIĆ S., 2008 — Notes on some newly recorded bryophytes from Montenegro. *Journal of bryology* 30: 167-170.
- GRIFFITHS H.I., KRYŠTUFEK B. & REED J.M. (eds.), 2004 — Pattern and process in the European hotspots. Dodrecht, Kluwer Academic Publishers.

- IGNATOV M.S., & IGNATOVA E.A., 2003 — Moss flora of the Middle European Russia. Vol. 2: Fontinalaceae — Amblystegiaceae. Moscow, KMK Scientific Press Ltd (in Russian).
- IGNATOV M.S., AFONINA O.M., IGNATOVA E.A., ABOLINA A., AKATOVA T.V., BAIŠEVA E.Z., BELKINA O.A., BEZGODOV A.G., BOYCHUK M.A., CHERDANTSEVA V.Y., CZERNYADJEVA I.V., DOROSHINA G.Y., DYACHENKO A.P., FEDOSOV V.E., GOLDBERG I.L., IVANOVA E.I., JUKONIENE I., KANNUKENE L., KAZANOVSKY S.G., KHARZINOV Z.K., KURBATOVA L.E., MAKSIMOV A.I., MAMATKULOV U.K., MANAKYAN V.A., MASLOVSKY O.M., NAPREENKO M.G., OTNYUKOVA T.N., PARTYKA L.Y., PISARENKO O.Y., POPOVA N.N., RYKOVSKY G.F., TUBANOVA D.Y., ZHELEZNOVA G.V. & ZOLOTOV V.I., 2006 — Check-list of mosses of East Europe and North Asia. *Arctoa* 15: 1-130.
- KUBINSKÁ A., JANOVIČOVÁ K. & SOLTES R., 2001 — Updated checklist of liverworts, hornworts and mosses of Slovakia. *Bryonora* 28: 4-10.
- MARKA J., ERZBERGER P. & PAPP B., 2013 — New and interesting moss records from Albania. *Journal of bryology* 35: 152-155.
- PAPP B. & SABOVLJEVIĆ M., 2009 — Notes on some new and interesting bryophyte records from Croatia. *Journal of bryology* 31: 272-275.
- PAPP B., ERZBERGER P. & SABOVLJEVIĆ M., 2009 — European red-listed bryophyte species collected during the expeditions of the Hungarian Natural History Museum in Serbia between 2000–2006. In: Ivanova D. (ed.), *Plant, fungal and habitat diversity investigation and conservation*. Sofia, Proceedings of IV Balkan Botanical Congress, Sofia Institute of Botany, pp. 20-26.
- PAPP B., NATCHEVA R., ERZBERGER P. & SABOVLJEVIĆ M., 2012 — *Didymodon sicculus*, new to Bulgaria and Serbia and some notes on its ecology. *Nova Hedwigia* 95: 221-226.
- PAPP B., SZURDOKI E., PANTOVIĆ J. & SABOVLJEVIĆ M., 2013 — *Physcomitrium eurystomum* and *Pohlia prolifera*, new mosses in the bryophyte flora of Serbia. *Archives of biological sciences* 65: 703-706.
- PAVLETIĆ Z., 1955 — *Prodromus flore briofita Jugoslavije*. Zagreb, Yugoslav Academy of Sciences and Arts.
- PUGLISI M., PRIVITERA M. & DI PIETRO R., 2011 — New records of arctic montane and alpine mosses from central Italy. *Cryptogamie, Bryologie* 32: 75-81.
- ROS R.M., MAZIMPAKA V., ABOU-SALAMA U., ALEFFI M., BLOCKEEL T.L., BRUGUÉS M., CROS R.M., DIA M.G., DIRKSE G.M., DRAPER I., EL SAADAWI W., ERDAĀ A., GANEVA A., GABRIEL R., GONZÁLEZ-MANCEBO J.M., GRANGER C., HERRNSTADT I., HUGONNOT V., KHALIL K., KÜRSCHNER H., LOSADALIMA A., LUÍS L., MIFSUD S., PRIVITERA M., PUGLISI M., SABOVLJEVIĆ M., SÉRGIO 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: 99-283.
- SABOVLJEVIĆ M., GANEVA A., TSAKIRI E. & STEFANUT S., 2001 — Bryology and bryophyte protection in the south-eastern Europe. *Biological conservation* 101: 73-84.
- SABOVLJEVIĆ M., 2004 — Comparison of the bryophyte flora of the three southern European mainlands: the Iberian, the Apennine and the Balkan peninsulas. *Braun-Blanquetia* 34: 21-28.
- SABOVLJEVIĆ M., NATCHEVA R., DIHORU G., TSAKIRI E., DRAGIĆEVIĆ S., ERDAĀ A. & PAPP B., 2008 — Check-list of the mosses of SE Europe. *Phytologia Balcanica* 14: 207-244.
- SABOVLJEVIĆ M., PAPP B. & SZURDOKI E., 2010 — New bryophyte records to some countries of the South-Eastern Europe. *Cryptogamie, Bryologie* 31: 289-292.
- 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 (Terre et vie)* 66: 399-413.
- SAUKEL J. & KÖCKINGER H., 1999 — Rote Liste gefährdeter Lebermoose (Hepaticae) und Hornmoose (Anthocerotae) Österreichs. — In: Niklfeld, H. (ed.), *Rote Listen gefährdeter Pflanzen Österreichs, 2. Aufl.* Wien, Austria Medien Service, pp. 172-179.
- SCHUMACKER R. & MARTINY P., 1995 — Threatened bryophytes in Europe including Macaronesia. In: European Committee for Conservation of Bryophytes (ed.), *Red Data Book of European Bryophytes*. Trondheim, University of Trondheim, pp. 29-193.
- STEVANOVIĆ V., TAN K. & IATROU G., 2003 — Distribution of the endemic Balkan flora on serpentine I: obligate serpentine endemics. *Plant systematics and evolution* 242: 149-170.
- UZUNOV D., CONTI F., LAKUŠIĆ D. & GANGALE C., 2005 — Dati preliminari sulla fitogeografia, ecologia e conservazione delle specie Appennino-Balcaniche. *Informatore botanico Italiano* 37: 386-387.