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Short communication

Botrychium matricariifolium, a new fern species for the flora of Montenegro

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Abstract – In this short communication we report a new fern for Montenegro – *Botrychium matricariifolium* (Döll) A. Braun ex W.D.J. Koch, known as the chamomile grape-fern. Up to now, the only *Botrychium* species in the flora of Montenegro was *B. lunaria* (L.) Sw., a typical species for montane to alpine grasslands and meadows. One individual of *B. matricariifolium* was found in a forest opening on the mountain Babji zub. *B. matricariifolium* was accompanied by numerous individuals of *B. lunaria.* These species are clearly distinguished by the lamina, which is in *B. matricariifolium* 2-pinnatifid, while in *B. lunaria* it is 1-pinnate with trapezoid to flabellate pinnae. Although chamomile grape-fern has a large range of distribution, it is everywhere a rare species that has some kind of protection status in the most European countries. In order to define the protection status of the species in Montenegro, further investigation is needed.

Keywords: *Botrychium,* ferns, Montenegro

Introduction

The genus *Botrychium* belongs to the fern family Ophioglossaceae, easily recognizable by separate sporophore and trophophore leaf structures, limited secondary growth in the rhizome, sheathing leaf bases, circular bordered pits, subterranean and non-chlorophyllous gametophytes, and the absence of circinate venation, root hairs, and sclerenchyma (Wagner 1990, Dauphin et al. 2014). In narrow sense the genus contains 30 species (Hauk et al. 2003, Dauphin et al. 2014), distributed throughout Europe, North America, Asia, Australia, Africa (Atlas Mountains), the Pacific Islands, New Zealand, and Patagonia (South America) (Mayer and Horvatić 1967, Ellis 2014). It mainly inhabits grasslands, meadows, forests and is often associated with light to moderate disturbance (Farrar and Johnson-Groh

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1990). Classification of *Botrychium* has been complicated by the high incidence of polyploidy, which has resulted from hybridization among members of the twelve diploids (Dauphin et al. 2014). Species of the genus are considered of interest not only to phylogeny (Clausen 1938, Kato 1987, Dauphin et al. 2014) but also to conservation. Out of 7 species represented in Europe (*B. boreale* Milde, *B. lanceolatum* (S. G. Gmel.) Ångstr., *B. lunaria* (L.) Sw., *B. matricariifolium* (Döll) A. Braun ex W. D. J. Koch, *B. multifidum* (S. G. Gmel.) Rupr., *B. simplex* E. Hitchc. and *B. virginianum* (L.) Sw. (Euro+Med 2006), three species are on the Bern convention appendix I. In the European Red list of vascular plants, the following status is given: NT (near threatened) *B. matricariifolium* and *B. simplex,* and DD (data deficient) *B. multifidum* (Bilz et al. 2011).

Materials and methods

The species was identified using Rothmaler (1964), Mayer and Horvatić (1967), Farrar (2006). Due to the fact that only one individual was found, no herbarium specimen was collected. The species was photographed and accordingly documented and presented in this paper (Fig. 2). Site geocoding was done by GPS device, Garmin e-Trex Vista C. In identification of the vegetation type, Lakušić (1966) was used.

Results and discussion

According to Rohlena (1942) and Mayer and Horvatić (1967) the only *Botrychium* species in the flora of Montenegro is *B. lunaria* (L.) Sw. This species is quite widespread on the meadows and grasslands from the montane to the alpine zone. During a field trip on the mountain Babji Zub on July the 21th, 2014, in a forest opening at the locality Katunine (N42.87436°, E19.38503°, Fig. 1), we recorded one individual of *Botrychium matricariifo-*

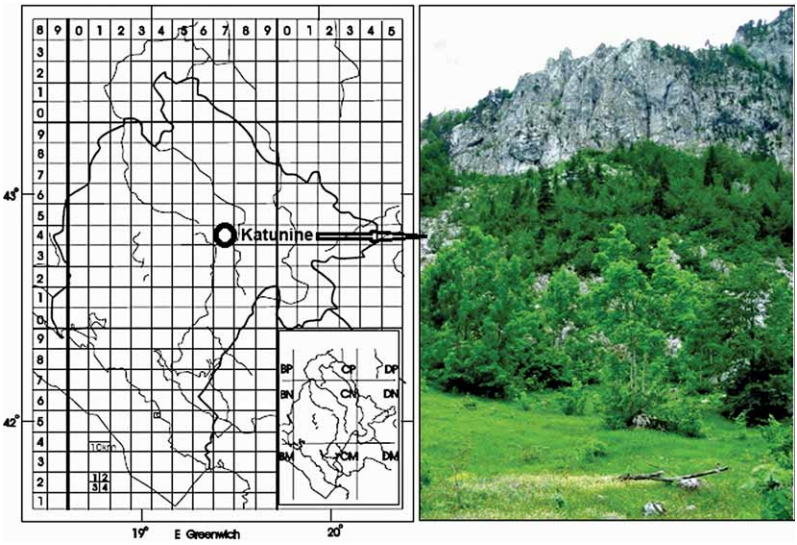

Fig. 1. Position of the site Katunine (Mt Babji zub), where *Botrychium matricariifolium* was found (base map, UTM grid map of Montenegro), and image of the site (photo: D. Stešević).

lium. This rather small forest opening (ca. 12,000 m²) is located in the beech-fir zone on the bottom of the steep mountain slopes of Gradišta and Babji Zub, at the elevation of ca 1,440 m. Toward the E, the plateau of Katunine is open to the Lipovo valley and faces onto Savine Grede. Under the Köppen climate classification the area belongs to the Dfs"bx" subtype of cold temperate climate or the boreal climate or humid taiga climate without arid period. The air temperature in the coldest month is below –3 °C, while the average air temperature of the warmest month is up to 22 °C. Total average annual precipitation is 1,500 mm. The primary precipitation maximum is in the autumn and the secondary is in the spring (Burić et al. 2014). On the brownized rendzina on the limestone crust, shallow (Fuštić and Đuretić 2000) vegetation of mesophyllic meadows is developed. With its floristic composition and significant participation of endemic species like *Pancicia serbica* Vis., *Silene sendtneri* Boiss., *Scrozonera rosea* Waldst. & Kit., *Gentianella crispata* (Vis.) Holub the meadow fits into the description of the endemic alliance Pancicion Lakušić 1964 of the order Arrhenatheretalia Pawl. 1928 (Lakušić 1966). In the past, when cattle breeding was more intensive, the forest opening at Katunine was frequently used for grazing. Nowadays, cattle breeding has been significantly reduced. That has allowed the regeneration of the woody vegetation and growth of pioneer saplings of *Acer heldreichii* Ophr. subsp. *visianii* K. Maly and *Rhamnus alpina* subsp. *fallax* (Boiss.) Maire & Petitmengin. Katunine is also popular for camping, but the camping area is rather small, placed near the forest edge and recognizable by the almost monodominant cover of *Plantago major* s. l. The single individual of *B. matricariifolium* was found on the open and sunny part of the meadow hidden among numerous *B. lunaria* individuals, associated with *Lotus corniculatus* L.*, Luzula multiflora*

Fig. 2. The image of *Botrichium lunaria* (A) and *Botrychium matricariifolium* (B) (photo: D. Stešević).

(Retz.) Lej., *Thesium alpinum* L., *Alchemilla xanthochlora* Rothm., *Carex humilis* Leyss., *Silene sendtneri, Pancicia serbica, Armeria canescens* (Host) Boiss., *Lilium albanicum* Griseb., *Polygonum viviparum* L., *Poa alpina* L. subsp. *badensis* (Haenke ex Willd.) Beck, *Polygala major* Jacg., *Ranunculus bulbosus* L., *Dianthus carthusianorum* L., *Galium verum* L., *Viola tricolor* L., *Viola montana* L., *Allium oleraceum* L., etc. These two *Botrychium* species can be distinguished clearly by the lamina and location of the sterile leaf part. In *B. lunaria* it is pinnate with pinnae being trapezoid to flabellate and is located in the middle of the aerial stem, while in *B. matricariifolium* it is 2-pinnate with pinnae and pinnulae ovate to oblong, and is located clearly above the middle of the aerial stem (Fig. 2). *B. matricariifolium* is an amphi-Atlantic species the distribution area of which covers the Eastern part of North America (Farrar 2006) and in Europe Albania, Austria, Bulgaria, Corsica, Czech Republic, Croatia, Denmark, Estonia, Finland, France, Germany, Switzerland, Netherlands, Spain, Hungary, Italy, Latvia, Lithuania, Norway, Poland, Central European Russia, Northern European Russia, Northwest European Russia, Romania, Slovakia, Slovenia, Serbia, Sweden, Ukraine (Euro+Med 2006). The species is considered as a Target species – Species of European concern (Ozinga and Schaminée 2005) and in different European countries it has different threat and protection status: i) the species is considered CR (critically endangered) in Austria (Witowski et al. 2003), Bulgaria (Petrova and Vladimorov 2009), Croatia (Borovečki-Voska 2011), Czech Republic (Klaudisová and Pohlová 2004), Estonia (Ryttäri et al. 2003), Hungary (Engyel 2009), Norway (Kålås et al. 2006), Serbia (Zlatković et al. 2009), EN (endangered) in Germany (Ludwig and Schnittler 1996), Poland (Jakowiak et al. 2007), VU (vulnerable) in Finland (Rassi et al. 2001), Sweden (Gärdenfors 2005), Ukraine (Witowski et al. 2003), DD (data deficient) in Slovenia (Skoberne 2004), RE (regionally extinct) in, Switzerland (Moser et al. 2002), ii) it is under protected of the Bern Convention Appendix I, iii) and it is under statutory protection in the Czech Republic (Klaudisová and Pohlová 2004), Germany (Jäger 2011), Poland (Jackowiak et al. 2007) and many other countries. The newly reported population of *B. matricariifolium* in Montenegro is considered very poor, thus it requires urgent conservation measures. In order to precisely determine its conservation status, further investigation is needed. It is possible that our and the recent record of B. *matricariifolium* in Croatia will after 30 years allow an optimistic view of the situation of the species in the western Balkan peninsula. According to the Analytical Flora of Yugoslavia (Mayer and Horvatić 1967), in the floras of neighboring countries following *Botrychium* species were recorded: *B. simplex* (in Herzegovina) and *B. multifidum* (Serbia); thus both species could be expected in the flora of Montenegro. In the near future, more attention should be paid to this genus, its diversity and distribution in Montenegro.

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