



Notes on some rare and interesting bryophytes of Slovenia

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ABSTRACT: Four interesting bryophyte species, namely three mosses *Syntrichia papillosa*, *Buxbaumia viridis*, *Rhodobryum ontariense* and a liverwort *Lunularia cruciata* considered to be rare or under threat in Slovenia were recorded recently in new localities. Here, we report the current distribution in Slovenia as well as potential threats.

KEY WORDS: bryophyte, flora, mosses, liverwort, rare, Slovenia

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INTRODUCTION

Bryophytes are usually badly presented in the plant conservation initiatives. There are a few reasons for this: they are easily overlooked due to their size and biomass; they are hard to distinguish; they remain unnoticeable at environmental changes (SABOVLJEVIĆ *et al.* 2001). Besides, significantly fewer bryologists are present compared with botanists. Thus, our knowledge on the presence of some bryophyte taxa is often superficial and knowledge of its biology and ecology is scarce and there is no monitoring of threatened species.

However, bryophytes as all other living beings are subject to threat in a rapidly changing environment and need both active and passive measures of protection (ROWNTREE *et al.* 2011). Even though Slovenia is a European country with an extraordinary bryophyte richness (SABOVLJEVIĆ 2004, SABOVLJEVIĆ *et al.* 2001, 2011a; SKUDNIK *et al.* 2013), many species remain recorded more than 50-60 years ago (PAVLETIĆ 1955; MARTINČIČ 1968, 2003a, 2011;

DÜLL *et al.* 1999; SABOVLJEVIĆ & NATCHEVA 2006 2008; SÖDERSTRÖM *et al.* 2002, 2007; ROS *et al.* 2007, 2013). However, new bryophyte species for the country can still be recorded (BABIJ & JOGAN 2001, BLOCKEEL *et al.* 2009; SABOVLJEVIĆ *et al.* 2010).

Here, we deal with the presence, distribution and the threat facing four bryophyte species, namely mosses *Syntrichia papillosa* (Wilson) Jur., *Buxbaumia viridis* (DC.) Moug. & Nestl., *Rhodobryum ontariense* (Kind.) Kindb. and a liverwort *Lunularia cruciata* (L.) Dum. ex Lindb., considered to be threatened and/or rare in Slovenia (MARTINČIČ 1992, 1996; ECCB 1995) (Fig. 1).

MATERIAL AND METHODS

To check for the presence and distribution of *Buxbaumia viridis*, *Lunularia cruciata*, *Rhodobryum ontariense* and *Syntrichia papillosa* we did transect methods in randomly selected areas of Slovenia. In the selected areas, we investigated likely habitats.

RESULTS AND DISCUSSION

Syntrichia papillosa

The moss *S. papillosa* is a perennial acrocarpous epiphytic plant. The tufts of this moss are easy to recognize by many 2-4 celled rounded gemmae along the costa on the upper leaf surface. It is considered rare in Europe, mainly due to its sensitivity to air pollution. However, it is present in many tree barks situated by water surfaces or in places with high air humidity. Tree species from the genus *Salix*, *Populus* or *Acer* are the most common phorophytes for this species, though it was also recorded on some other tree species in Slovenia.

In Slovenia, it is considered a rare species according to the national red list (MARTINČIČ 1992, 1996). In the region of SE Europe it is also red-listed in Serbia and Bulgaria (SABOVLJEVIĆ *et al.* 2004, NATCHEVA *et al.* 2006).

New records in the wild have been reported also in other countries (e.g. Serbia, BLOCKEEL *et al.* 2000; Bulgaria, NATCHEVA *et al.* 2007). BESEDNIK *et al.* (2008) reported a recent record of this species in the vicinity of Branik (Slovenia).

Here we report the recent records in Slovenia:

9953/3: Botanical Garden, Ljubljana (leg./det. M. Skudnik & M. Sabovljević, 28.11.2012)

0149/4: Vipava (leg./det. M. Skudnik & M. Sabovljević, 06.12.2012)

0154/2: Izvir Krke & Poltarice (leg./det. A. Sabovljević & M. Sabovljević, 24.12.2012)

9953/1: Bežigrad, Ljubljana (leg./det. A. Sabovljević & M. Sabovljević, 24.06.2012)

9952/4: Mestni Log, Ljubljana by the stream Mali Graben (leg./det. A. Sabovljević & M. Sabovljević, 25.06.2012)

9749/2: Bohinjska Bistrica (leg./det. A. Sabovljević & M. Sabovljević, 04.07.2012; 03.08.2013)

0159/2: Sela pri Dobovi, Brežice (leg./det. A. Sabovljević & M. Sabovljević, 13.07.2012)

0349/4: Škocjanske Jame (leg./det. M. Skudnik & M. Sabovljević, 06.12.2012)

9953/3: Trnovo, Ljubljana (leg./det. M. Skudnik & M. Sabovljević, 01.12.2012; leg./det. M. Sabovljević 25.07.2012)

9650/2: Bled (leg./det. A. Sabovljević & M. Sabovljević, 04.12.2011; 14.07.2012)

0160/3: Mokrice (leg./det. A. Sabovljević & M. Sabovljević, 03.04.2012)

9752/3: Kranj (leg./det. A. Sabovljević & M. Sabovljević, 24.06.2012)

9952/4: Rožna dolina, Ljubljana (leg./det. M. Sabovljević, 28.06.2012)

0257/1: Novo Mesto (leg./det. A. Sabovljević & M. Sabovljević, 02.07.2012)

9952/4: Tivoli, Ljubljana (leg./det. M. Sabovljević, 04.07.2012)

0052/2: Črna Vas, Ljubljansko Barje (leg./det. M. Sabovljević, 08.07.2012)

9953/2: Dol pri Ljubljani (leg./det. M. Sabovljević, 10.07.2012)

0151/4: Hasberg by the river Unec (leg./det. M. Sabovljević, 19.07.2012)

0351/1: Pivka (leg./det. A. Sabovljević & M. Sabovljević, 20.07.2012)

9953/2: Brinje (leg./det. M. Sabovljević, 27.12.2012)

0352/2: Grad Snežnik (leg./det. F. Batič & M. Sabovljević, 29.05.2013)

0157/3: Otočec (leg./det. A. Sabovljević & M. Sabovljević, 31.05.2013)

9549/1: Gozd Martuljek (leg./det. A. Sabovljević & M. Sabovljević, 04.07.2012)

9953/3: Prule, Ljubljana (leg./det. A. Sabovljević & M. Sabovljević, 11.01.2013)

9953/3: Mesto, Ljubljana (leg./det. M. Skudnik & M. Sabovljević, 01.12.2012)

It is not clear if better quality of the air in Slovenia is the reason of many recent records or whether it has just been rather overlooked and under recorded in previous times.

Lunularia cruciata

The small talloid liverwort *L. cruciata* is an isolated member of the unique genus within the family *Lunulariaceae*, easy to recognize by its semi-lunar gemma cups. It grows on dump soils, paths and roadsides. It is common in the Atlantic-Mediterranean area of Europe, although recently more and more records have appeared in other European areas (SABOVLJEVIĆ & MARKA 2009). MARTINČIČ (2007) stated this species to be wide spreading due to its synanthropic character. In many countries it is adventive; it occurs in greenhouses and in the shaded parts of gardens. Thus, in Europe it is recorded in many places but not everywhere in the wild or spontaneous. The only regions of Europe it is not recorded either in glasshouses or in the wild are Iceland, the Faroe Islands, Svalbard, Monaco, Lichtenstein, Andorra and Gibraltar (SÖDERSTRÖM *et al.* 2002, 2007). It is recently recorded in the wild also in Slovakia (JANOVICOVA & SOMOGYI 1996), and in Serbia (SABOVLJEVIĆ & MARKA 2009). Even though it was recorded in all Southeast European countries (SABOVLJEVIĆ & NATCHEVA 2006), it is not a widespread species except in the Mediterranean belt.

However, according to ROS *et al.* (2007) and MARTINČIČ (2011) within the Mediterranean surroundings it has never been recorded from Syria and Egypt, while the records from Bosnia, Macedonia and Slovenia are from

before 1962. In Slovenia, its presence and distribution is questionable according to MARTINČIČ (2007). MARTINČIČ (2007) cited the only validated record in Slovenia for the Botanical Garden in Ljubljana, but it has not been seen for more than 70 years.

Here, we report the recent records in Slovenia:

9953/3: Botanical Garden, Ljubljana (leg./det. M. Skudnik & M. Sabovljević, 28.11.2012)

0151/4: Hasberg by the river Unec (leg./det. M. Sabovljević, 19.07.2012)

0448/3: Koper (leg./det. M. Sabovljević, 29.12.2012)

9953/3: Grad, Ljubljana (leg./det. M. Skudnik & M. Sabovljević, 01.12.2012)

0447/4: Piran (leg./det. A. Sabovljević & M. Sabovljević, 23.12.2012)

9953/3: Prule, Ljubljana (leg./det. A. Sabovljević & M. Sabovljević, 11.01.2013)

9952/4: Rozna dolina, Ljubljana (leg./det. M. Sabovljević, 28.06.2012)

9952/4: Tivoli, Ljubljana (leg./det. M. Sabovljević, 02.04.2012)

9953/3: Trnovo, Ljubljana (leg./det. M. Skudnik & M. Sabovljević, 01.12.2012)

0149/4: Vipava (leg./det. M. Skudnik & M. Sabovljević, 06.12.2012)

This species seems to be spreading due to climate change (SABOVLJEVIĆ & MARKA 2009). However, as all the recent records in Slovenia were made for sterile plants, it is rather easy to overlook this species, when the plants are without gemma cups. Vegetative reproduction by gemmae is a rather frequent event and it is rather rare to record fertile plants of this species throughout Europe (KIRSCHNER *et al.* 2010).

Buxbaumia viridis

The moss *B. viridis* is very different from virtually all other mosses in that the only part that is visible in the field is the relatively large sporophyte. It grows on damp, dead, mainly conifer wood. Most stands are on medium to large logs composed of well-rotted wood. The capsule ripens during spring and the spores in the capsule are dispersed in early summer, the actual date depending on the microclimate at the site. The whole cycle from spore production to ripe sporophyte takes a minimum of two years.

It has a scattered distribution in montane and boreal habitats across the northern hemisphere from south-west Asia and China to western North America. It is sparsely distributed across Europe and appears on the Red List of most countries where it occurs. It is vulnerable in Europe (ECCB 1995) and it is listed in Annex II of the EC Habitats

and Species Directive and on Appendix 1 of the Council of Europe Bern Convention.

It is recently recorded in:

9649/4: Pokljuka (leg./det. A. Sabovljević & M. Sabovljević, 03.08.2013)

0365/1: Rajhenavski Rog (leg./det. M. Skudnik & M. Sabovljević, 12.08.2013)

0454/2: Kočevska Reka area (leg./det. M. Skudnik & M. Sabovljević, 12.08.2013)

This species needs active conservation measures and a monitoring program. In Slovenia, it was reported from 23 sites of which only one record has been made after 2000: in Rajhenavski Rog reserve (ODOR & VAN DORT, 2002). There we recorded in one site 3 sporophytes (N45°39'58", E15°00'11"). The records in Pokljuka were made by GLOWACKI (1910) in Barje Ribščica. The new records include 11 sporophytes in an area of 2 x 2 km not far from the hotel in Pokljuka (N46°21'06", E13°56'05"). The new records and new locality are in the Kočevska reka area (N45°35'28", E14°46'51") where only one sporophyte was recorded on the old stump of a spruce tree.

Rhodobryum ontariense

R. ontariense is a moss with a wide but very fragmented distribution (DIERSSEN 2001). It usually grows on dry, warm, calcareous soils and can be classified as subneutrophytic, meso- to moderately thermophytic, considerably adapted to shade (and therefore present in open, woodland formations), a nitrophytic and a hemerobous. The plant is dioecious. In Slovenia it has been reported recently (MARTINČIČ 2003b, 2004) when the material from LJU herbarium was revised and 9 records were reported of which only two were after 2000. It is well separated from the related *R. roseum* (Hedw.) Limpr. both morphologically and ecologically (SABOVLJEVIĆ & CVETIĆ 2001).

Here we report a new locality in the Ljubljana area (N46°05'27", E14°32'38"):

9953/1: Črnuče area, Ljubljana (leg./det. M. Skudnik & M. Sabovljević, 08.08.2013).

CONCLUSION

Syntrichia papillosa remains rare in Slovenian bryophyte flora. The main threats for this species are air pollution and climate change, especially the absence of high air humidity. Further investigation of its distribution and monitoring of the known population are needed.

Buxbaumia viridis is a widely-threatened European plant, mainly due to its habitat destruction and specific biology. Considering that the species is dioecious,

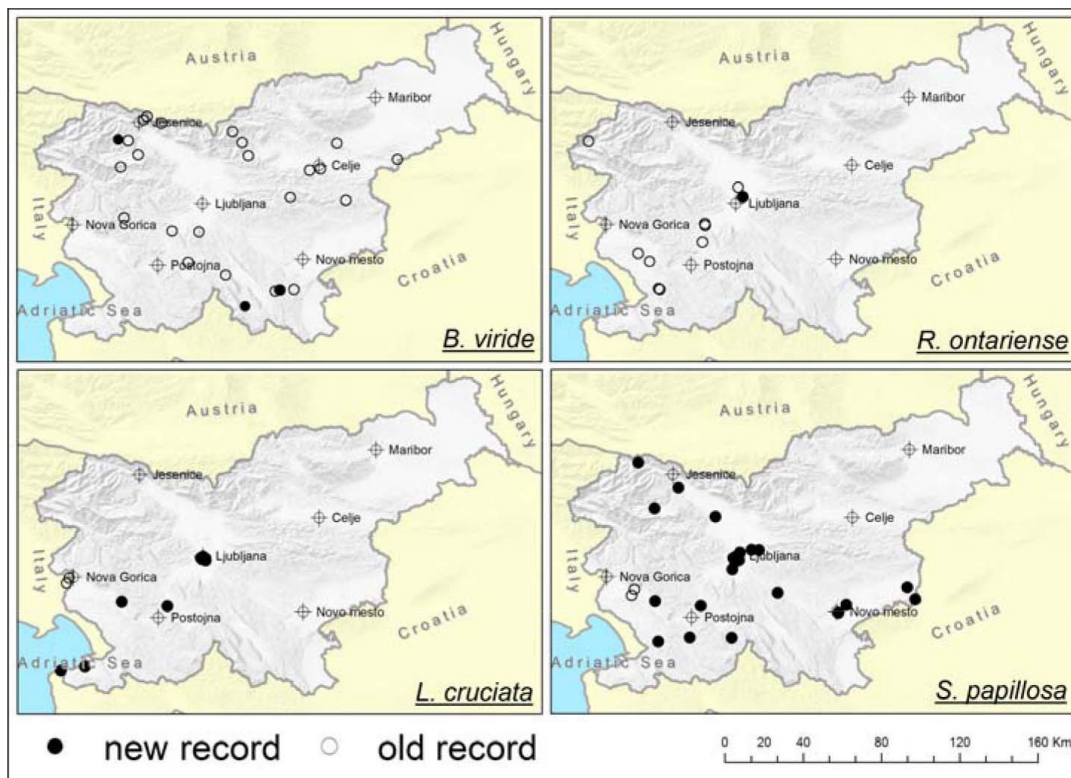


Fig. 1. The distribution of selected bryophyte species in Slovenia

the formation of sporophytes is an even more rare occurrence. The program of census taking, monitoring and assessment of this species' population(s) in Slovenia is urgently needed.

Rhodobryum ontariense is an interesting moss species, which can become more threatened due to its medicinal and pharmaceutical value (e.g. PEJIN *et al.* 2011a,b, 2012a, b, c, d, e). It is not clear how this stoloniferous plant is distantly spreading as no sexual reproduction and vegetative propagules were seen (SABOVLJEVIĆ *et al.* 2011b). It probably has wider but scatter distribution in Slovenia.

Lunularia cruciata remains rare, but this is rather the consequence of under-recording than a real threat. It is synanthropic and a species that spreads easily vegetatively. It probably has a wider but scatter distribution in Slovenia.

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Botánica SERBICA



REZIME

O retkim i interesantnim briofitama Slovenije

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Četiri interesantne briofite, tri mahovine *Syntrichia papillosa*, *Buxbaumia viridis*, *Rhodobryum ontariense* i jedna *Lunularia cruciata* koje su retke i/ili ugrožene u Sloveniji su konstatovane više puta na novim lokalitetima u Sloveniji. U radu su prikazana recentna saznanja o distribuciji ovih vrsta u Sloveniji i o mogućim faktorima ugrožavanja.

Cljučne reči: briofite, flora, mahovine, jetrenjače, retke vrste, Slovenija