cryptogamie
Bryologie
2020 • 41 • 3

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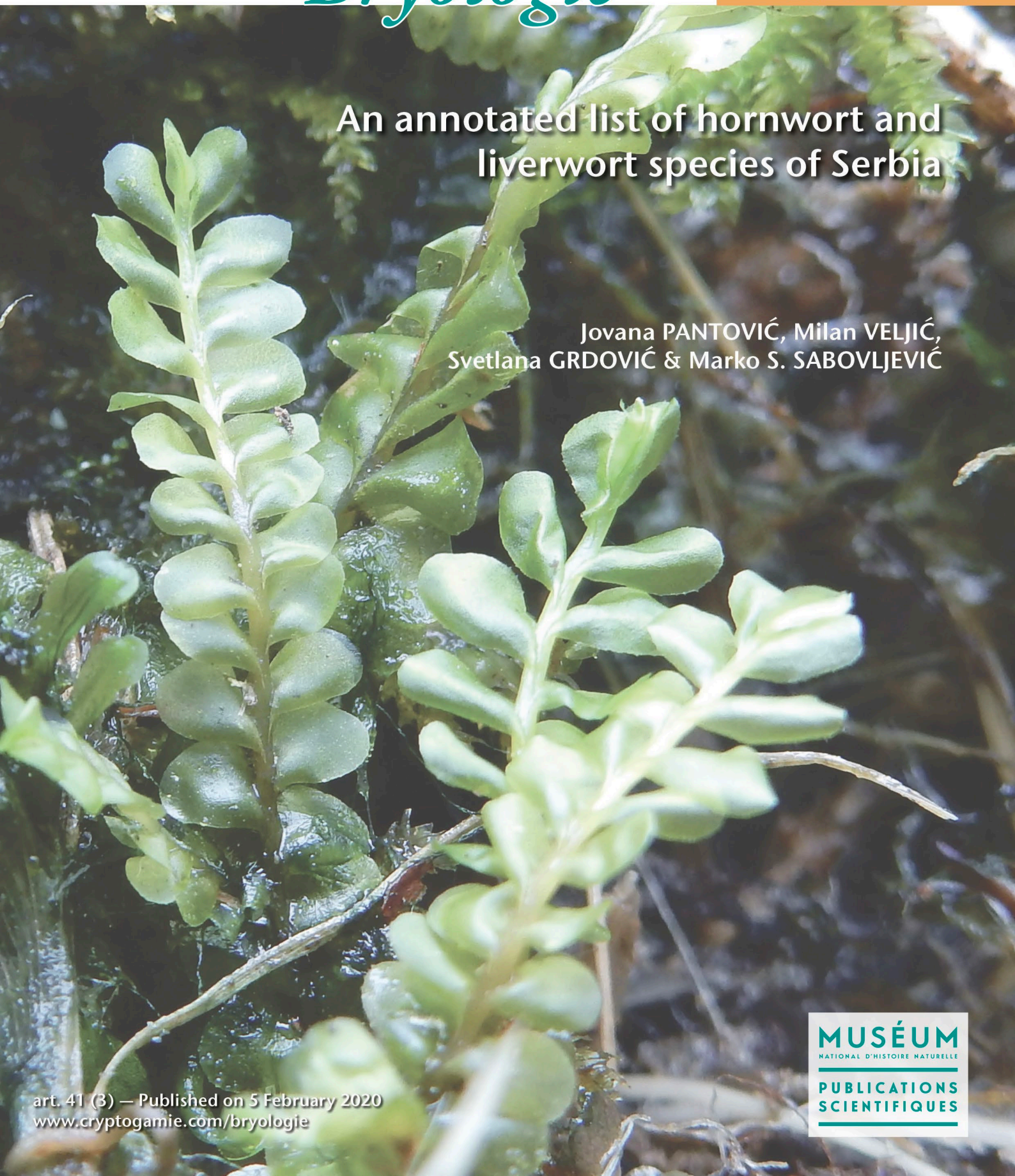

art. 41 (3) — Published on 5 February 2020
www.cryptogamie.com/bryologie

MUSÉUM
NATIONAL D'HISTOIRE NATURELLE
PUBLICATIONS
SCIENTIFIQUES

Couverture / *Cover* :

Pedinophyllum interruptum (Nees) Kaal. by / de Marko S. Sabovljević

Cryptogamie, Bryologie est indexé dans / Cryptogamie, Bryologie *is indexed in:*
– Biological Abstracts
– Current Contents
– Science Citation Index
– Publications bibliographiques du CNRS (Pascal).

Cryptogamie, Bryologie est distribué en version électronique par / Cryptogamie, Bryologie *is distributed electronically by:*
– BioOne® (http://www.bioone.org)

Cryptogamie, Bryologie est une revue en flux continu publiée par les Publications scientifiques du Muséum, Paris
Cryptogamie, Bryologie *is a fast track journal published by the Museum Science Press, Paris*

Les Publications scientifiques du Muséum publient aussi / *The Museum Science Press also publish:*
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CP 41 – 57 rue Cuvier F-75231 Paris cedex 05 (France)
Tél. : 33 (0)1 40 79 48 05 / Fax : 33 (0)1 40 79 38 40
diff.pub@mnhn.fr / http://sciencepress.mnhn.fr

ISSN (imprimé / *print*) : 1290-0796 / ISSN (électronique / *electronic*) : 1776-0992

An annotated list of hornwort and liverwort species of Serbia

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Submitted on 24 December 2018 | Accepted on 27 November 2019 | Published on 5 February 2020

Pantović J., Veljić M., Grdović S. & Sabovljević M. S. 2020. — An annotated list of hornwort and liverwort species of Serbia. *Cryptogamie, Bryologie* 41 (3): 35-48. https://doi.org/10.5252/cryptogamie-bryologie2020v41a3. http://cryptogamie.com/bryologie/41/3

ABSTRACT
The level of knowledge on the hornwort and liverwort flora of Serbia has increased in recent decades. Based on a thorough review of the literature and herbarium data, an updated list of the hepatic and liverwort taxa present in Serbia is compiled and presented. Taking into account recent taxonomic and nomenclatural changes, totals of 133 species and six infraspecific taxa are reported for the country. An additional eight species are rejected with explanatory annotations. The list includes data on the presence of taxa in separate regions and counties of the country.

KEY WORDS
Hepatics, flora, rejected taxa, distribution, Balkans.

RÉSUMÉ
Une liste annotée des espèces de anthocérotes et hépatiques de Serbie.
Le niveau de connaissance de la flore des anthocérotes et des hépatiques de Serbie a augmenté au cours des dernières décennies. Sur la base d'un examen approfondi de la littérature et des données d'herbiers, une liste mise à jour des taxons hépatiques présents en Serbie est compilée et présentée. Compte tenu des récents changements taxonomiques et nomenclaturaux, un total de 133 espèces et six taxons infraspécifiques est reconnu pour le pays. La présence en Serbie de huit espèces n'est pas acceptée. La liste précise la présence des taxons dans les régions et les comtés distincts du pays.

MOTS CLÉS
Hépatique, flore, taxons refusés, distribution, Balkans.

INTRODUCTION

Serbia is a country situated in SE Europe and in the central part of the Balkan peninsula. Part of the country also belongs to central Europe (north from the Sava and Danube rivers). The climate of Serbia is divergent; overall it can be considered as moderate-continental, but regionally it varies from submediterranean in the SE of Serbia with steppic-continental areas in the north, to boreo-montane and alpine in the highest mountains (Smailagić *et al.* 2013). Winters are cold and summers hot. Precipitation follows different patterns by region, and it ranges from 600 mm in the dryer northern and eastern parts of the country, to 1200 mm in the wetter western region. Generally, the western regions receive more rainfall than the eastern ones, but the vegetation types also depend on the distribution of precipitation through the year, since many areas receive most of their precipitates in late spring. Serbia has also very different patterns of geology and hydrology. All these variations in ecological conditions are the reasons for the very high biodiversity in a European and even a world context (e.g. Stevanović *et al.* 2003).

However, biodiversity is not equally well documented in Serbia for all biological entities. Bryophytes belong to the group that has not been well studied historically in Serbia (Sabovljević *et al.* 2001; Pantović & Sabovljević 2017a). After a long period of sporadic and unsystematic bryological research during the 20th century, bryophyte field investigation in Serbia revived at the beginning of the 1990s (the so-called modern period in Serbian bryological research, starting from 1990 to the present). This resulted in many new floristic studies, producing not only recent information on the distribution of species but also numerous new records for the country. Recently the BRYO database of Serbian bryophytes was established, enabling more thorough study of the bryophyte flora and species distributions in the country (Pantović & Sabovljević 2017a). The database includes all published records, and all available data from the national herbarium (BEOU). In Serbia not very many bryological data can be found in historical herbaria since the country has had a very turbulent history. Many data came from foreign bryologists, and many collections have been destroyed. The country has changed its borders rather often and a new critical approach in citing bryophyte data was needed. Nevertheless, it is clear that Serbia is a bryologically rich territory (e.g. Pavić *et al.* 1998; Sabovljević 2004; Sabovljević *et al.* 2011).

Since the beginning of the modern period, updates to the list of Serbian bryophytes was published in several checklists, but these appeared mostly within regional (Düll *et al.* 1999; Sabovljević 2000; Sabovljević & Natcheva 2006; Ros *et al* 2007) or even European publications (Hodgetts 2015). During the modern period a total of 69 new liverwort taxa were reported for the country (Pantović & Sabovljević 2017a).

The detailed database has allowed us to summarize current knowledge of the hornworts and liverworts of Serbia, examine available collections critically, assess doubtful records for the country, and ultimately reject certain taxa from the list. Here, we present an updated checklist of the hornwort and liverwort species known to be present in Serbia, which should serve as basis for planning and encouraging future investigation on the Serbian hepatic flora.

MATERIAL AND METHODS

Both published data and available herbarium specimens have been used to compile the present hepatic check-list of Serbia. The taxon that was published but could not be proven by herbarium specimens (material does not exist), and whose presence phytogeographycally and ecologically seem to be possible, is consider to exist in Serbia, unless stated differently.

Nomenclature for the hornwort and liverworts follows Hodgetts (2015), based on the synonymy in Ros *et al.* (2007). In the present list *Chiloscyphus coadunatus* (Sw.) J. J. Engel & R. M. Schust. is considered as a synonym of *Lophocolea bidentata* (L.) Dumort. Also, *Riccia sorocarpa* Bisch. var. *heegii* Schiffn. is considered a good taxon, following Ros *et al.* (2007).

The presence of taxa within organizational territorial units – the regions and counties of Serbia - is presented in Appendix 1.

Fifteen regions of Serbia (Fig. 1) are defined by Marković (Marković 1970) and modified by Stevanović (Sarić 1992). Altogether 30 counties (Fig. 2) are defined by the Law on state administration (Official Gazette of the Republic of Serbia 79-05/2005). Our treatment is based on 13 regions and 25 counties, with the addition of Kosovo, which previously included five counties and two regions, but is now treated separately as a single unit. A detailed list of the bryophytes of Kosovo is given elsewhere (Pantović & Sabovljević 2017b). The official administrative units of Serbia (regions and counties) are included to help local authorities to consider bryophyte (i.e., liverwort) diversity alongside other organisms.

The reported presence (Appendix 1) of hornwort and liverwort taxa in a territory of Serbia is marked by one of the following symbols: 1) ● Records made after the 1990; 2) ○ Records made before 1990; 3) ◑ Records made both before and after 1990 ; and 4) - rejected record.

RESULTS AND DISCUSSION

The present list includes 1 hornwort and total of 138 liverwort taxa (132 species, four subspecies and two varieties) reported for Serbia (Appendix 1). Eight species are rejected from the liverwort inventory for Serbia (these are annotated below).

The liverwort flora of Serbia comprises 23% of the total hepatic flora of Europe and Macaronesia, and 48,53% of the flora of South-Eastern Europe. Out of 138 liverwort taxa in the list, 4 are recorded only in the Northern Serbian province of Vojvodina and not in the rest of Serbia. These are *Oxymitra incrassata* (Brot.) Sergio & Sim-Sim, *Riccia crystallina* L. emend. Raddi, *R. frostii* Austin and *R. nigrella* DC. *Frullania fragilifolia* (Taylor) Gottsche *et al*. and *Mylia*

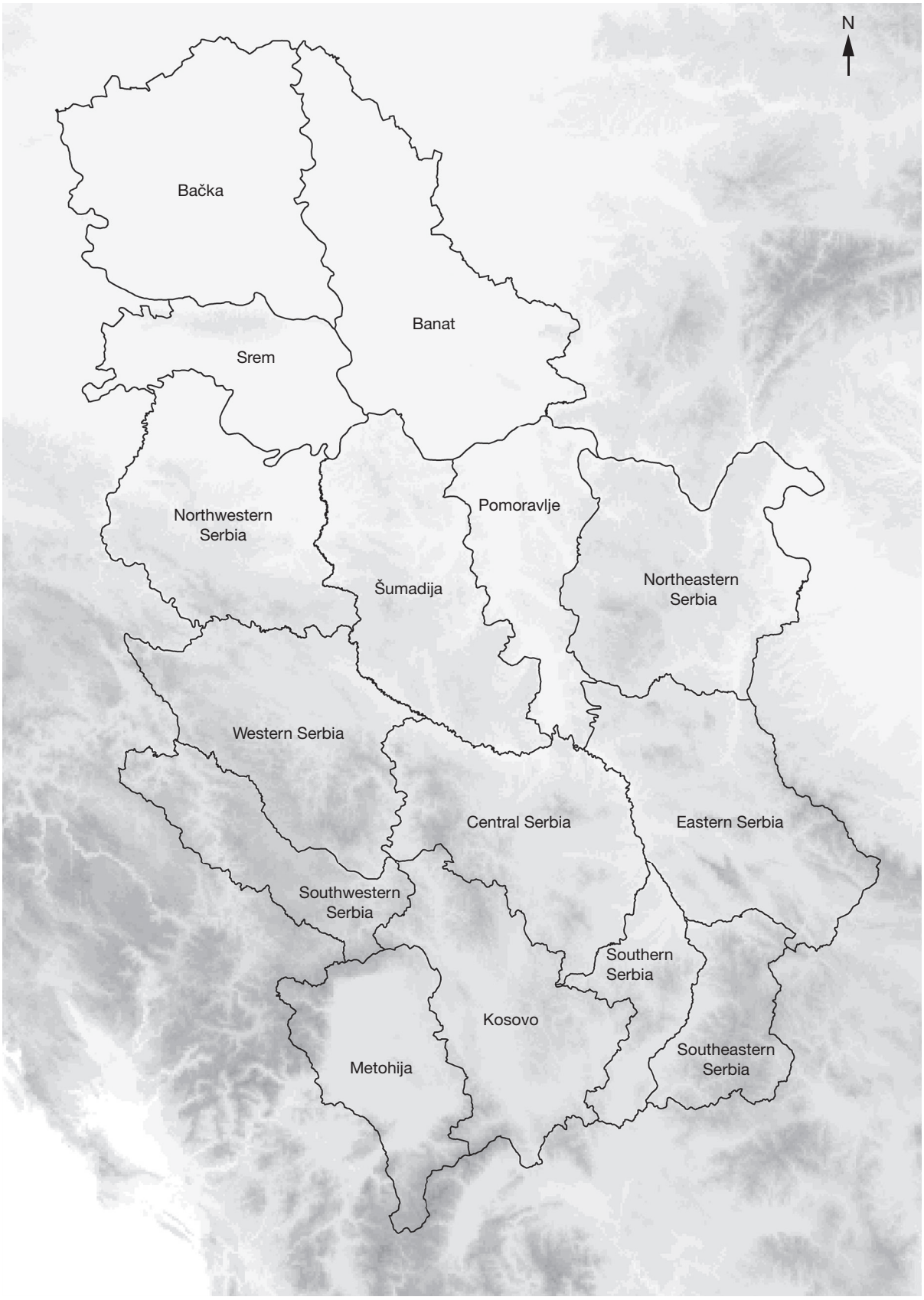

Fig. 1. — Regions of Serbia.

Fig. 2. — Counties (administrative units) of Serbia.

taylorii (Hook.) Gray are recorded exclusively in Kosovo and not in the rest of Serbia. A further 90 taxa are found in the region of Central Serbia, and not in the provinces of Kosovo and Vojvodina. The only Serbian record of a hornwort comes from the central part of Serbia.

Only twelve species are present in all three units of Serbia: *Aneura pinguis* (L.) Dumort., *Conocephalum conicum* (L.) Dumort., *Frullania dilatata* (L.) Dumort., *F. tamarisci* (L.) Dumort., *Lejeunea cavifolia* (Ehrh.) Lindb., *Marchantia polymorpha* L., *M. quadrata* Scop., *Metzgeria furcata* (L.) Dumort., *Pellia epiphylla* (L.) Corda, *Plagiochila porelloides* (Torrey ex Nees) Lindenb., *Porella platyphylla* (L.) Pfeiff., *Radula complanata* (L.) Dumort. Some of these represent the most widely recorded liverworts in Serbia (over 50 UTM squares 10 × 10 km).

Additionally, 35 species of liverworts are known from only one site. This indicates the still insufficiently explored status of the liverwort flora of Serbia, with many parts of the country being completely un- or underexplored.

Annotated list

Cephalozia lacinulata J. B. Jack ex Spruce

Note
Sabovljević (2000) erroneously reports *Cephalozia lacinulata* J. B. Jack ex Spruce based on the inadequate synonymy of very old names given by Gajić *et al.* (1991). This suboceanic species is rare in Europe (see e.g. Hodgetts 2015). In neighboring countries its presence in Bulgaria is also uncertain, but it is certainly present in mountain areas of Romania (Stefanut 2008).

Cololejeunea minutissima (Sm.) Schiffn.

Note
This species was first reported for Serbia by Sabovljević & Natcheva (2006). This was erroneously copied from Sabovljević (2000) where it is cited for Montenegro within Yugoslavia and not Serbia, hence it should be rejected from the Serbian species list.

Mannia triandra (Scop.) Grolle

Note
The first citation of this species for Serbia was by Sabovljević *et al.* (2004), where it was erroneously marked in the column for Serbia instead of Montenegro. Subsequently, it was included in the Mediterranean (Ros *et al.* 2007) and European (Hodgetts 2015) liverwort lists for Serbia. However, to date, its presence in Serbia has not been confirmed, although it could be expected on the basis of its ecology. Thus, at present, it should be rejected from the Serbian species list.

Metzgeria consanguinea Schiffn.

Note
This species was rather recently reported for Serbia (Papp & Sabovljević 2002 sub *M. temperata* Kuwah). However, the revision of material in the BEOU bryophyte herbarium (BryoBEOU 00058) showed that this specimen belongs to the more common and related species *M. furcata.* Therefore, this species should be rejected from the Serbian liverwort list.

Lejeunea patens Lindb.

Note
This species was reported from Suva Mt. by Jurišić (1900). However, it is currently considered to be a hyperoceanic southern-temperate species (Blockeel *et al.* 2014), and thus not present in the east of Europe, though widespread in Northwestern and Western Europe. In the South-east, it has been reported from Romania and Slovenia, but rejected according to Hodgetts (2015). Papp & Erzberger (2009) studied the area mentioned by Jurišić (1900) but did not confirm the presence of this species. Thus we consider that it should be rejected from the present list of liverworts in Serbia.

Lophoziopsis propagulifera (Gottsche) Konstant. & Vilnet

Note
The first report of this species was given by Sabovljević & Natcheva (2006), sub *Lophozia latifolia* R. M. Schust. Subsequently, Ros *et al.* (2007) treated this report of an arctic taxon as most probably erroneous, most likely because of inadequate synonymy. However, Hodgetts (2015) reinstated this taxon as present in Serbia. Considering its ecology and European distribution, this report should be treated as incorrect, and the species rejected from Serbia.

Metzgeria violacea (Ach.) Dumort.

Note
This taxon is stated as present in Serbia by Hodgetts (2015). However, no other record of this species in Serbia was found in the literature, and it is probably in Hodgetts' list because of confusion with the previously cited *Metzgeria temperata* Kuwah. It should be rejected from the list of Serbian liverworts.

Solenostoma confertissimum (Nees) Schljakov

Note
This taxon is marked with a question mark for Serbia in the hepatic list of South-eastern Europe (Sabovljević & Natcheva 2006). In Ros *et al.* (2007) it is not marked, but Hodgetts

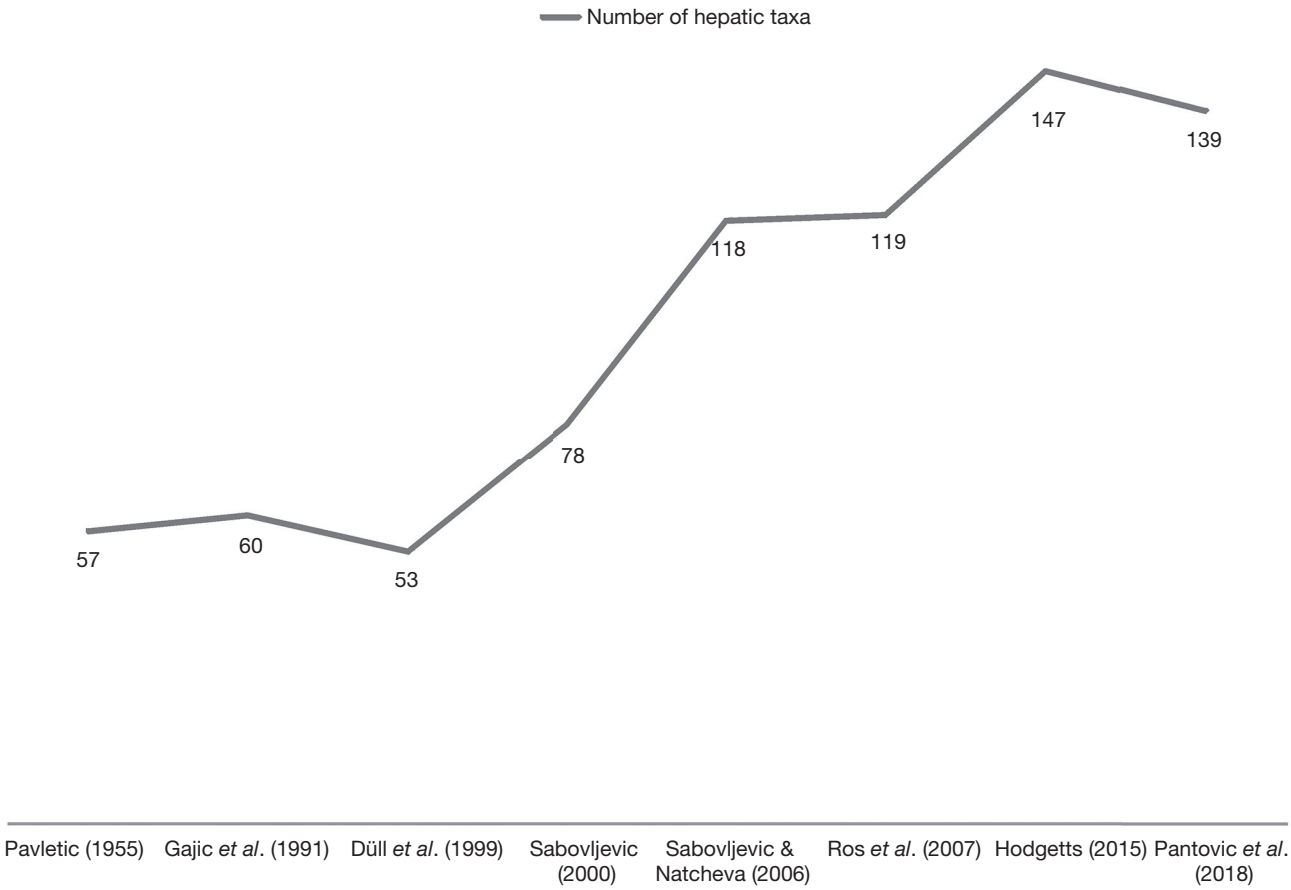

Fig. 3. — The graphical representation of total number of hornwort and liverworts present in Serbia in time.

(2015) cited it again for Serbia. According to database of Serbian bryophytes (Pantović & Sabovljević 2017a), this taxon is not recorded or documented in Serbia, and it should therefore be excluded from the list.

CONCLUSION

In the first ever made list of the Serbian bryophyte flora Pavletić (1955) cited 57 liverwort taxa. Later, Gajić *et al.* (1991) cited 60 taxa, while Düll *et al.* (1999) reported 53. In the following year the list of liverworts compiled by Sabovljević (2000) totalled 78 species. Sabovljević & Natcheva (2006) reported 118, and Ros *et al.* (2007) 119 taxa in Serbia. Hodgetts (2015) listed 147 taxa (Fig. 3). Pantović *et al.* (2014) recently found an overlooked old reference citing a record of a single hornwort.

At present, the bryophyte flora of Serbia includes one hornwort and 132 liverwort species. The total number of liverworts in Serbia excluding Kosovo is 130.

Acknowledgements
We acknowledge the anonymous referees for the constructive comments and improvement of the previous versions of the manuscript. This study was financially supported by the Serbian Ministry of Education, Science and Technological Development (grant No. 73030).

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Submitted on 24 December 2018;
accepted on 27 September 2019;
published on 5 February 2020.

Appendix 1. — List of hornwort and liverwort species.

	Vojvodina										Central Serbia																													
	Region			County							Region										County																			
	Bačka	Banat	Srem	**N. - Bački**	N. - Banatski	M. - Banatski	W. - Bački	Južnobački	Južnobanatski	Sremski	C Srbija	E Srbija	SE Srbija	SW Srbija	S Srbija	Pomoravlje	NE Srbija	NW Srbija	Šumadija	W Srbija	Borski	Braničevski	Belgrade	Jablanički	Kolubarski	Mačvanski	Moravički	Nišavski	Pčinjski	Pirotski	**Podunavski**	Pomoravski	Rasinski	Raški	Šumadijski	Toplički	Zaječarski	Zlatiborski	**Kosovo and Metohija**	**No precies locality**
Anthoceratophyta																																								
Phaeoceros laevis (L.) Prosk.													○																○											
Marchantiophyta																																								
Aneura pinguis (L.) Dumort.			●					●			●	◑	◑							◑				●			○		◑	○			●	○			●	●	◑	
Apopellia endiviifolia (Dicks.) Nebel & D. Quandt		◑	◑					◑	◑		●	●	●	●			●	●	◑	●		●	◑	●	●	●		●	●	●		●	●	●	○		●	●		
Barbilophozia barbata (Schmidel ex Schreb.) Loeske											○		○	●			●			●	●			○					○					●				●	●	
Barbilophozia hatcheri (A. Evans) Loeske												●	●											●				●	●								●		●	
Barbilophozia lycopodioides (Wallr.) Loeske											●	●					●					●											●				●		●	
Barbilophozia sudetica (Nees ex Huebener) L. Söderstr., De Roo & Hedd.												●								●							●										●			
Bazzania tricrenata (Wahlenb.) Lindb.												◑																○									●			
Bazzania trilobata (L.) Gray											●	○	○	●			○	●		●	○			○		●	●			○			●	●			○			
Blasia pusilla L.											●		◑																◑					●						
Blepharostoma trichophyllum (L.) Dumort.											●	◑	◑							●				○			●		●					●			◑	●		
Blepharostoma trichophyllum (L.) Dumort. subsp. *trichophyllum*																				●							●										◑			
Calypogeia azurea Stotler & Crotz										●	●		◑					●	◑				◑	○					◑				●						●	
Calypogeia fissa (L.) Raddi			○					◑			○	○	●						○	●			○						◑					○			○	●		
Calypogeia integristipula Steph.																				●							●											●		
Calypogeia muelleriana (Schiffn.) Müll. Frib.											●		○					●		●				○		●	●						●	●						
Calypogeia suecica (Arnell & J. Perss.) Müll. Frib.																				●																		●		
Cephalozia bicuspidata (L.) Dumort.											●		◑						○	●							●		◑				●	●	○					
Cephaloziella divaricata (Sm.) Schiffn.	●	◑			◑				●		●	●	●	●			●			●	●			●			●		●					●			●	●		
Cephaloziella rubella (Nees) Warnst.											●						●				●	●												●						
Cephaloziella stellulifera (Taylor ex Spruce) Schiffn.			●							●								●							●															

APPENDIX 1. — Continuation.

	Vojvodina Region			**Vojvodina** County							**Central Serbia** Region										**Central Serbia** County																			
Species	Bačka	Banat	Srem	**N. - Bački**	N. - Banatski	M. - Banatski	W. - Bački	Južnobački	Južnobanatski	Sremski	C Srbija	E Srbija	SE Srbija	SW Srbija	S Srbija	Pomoravlje	NE Srbija	NW Srbija	Šumadija	W Srbija	Borski	Braničevski	Belgrade	Jablanički	Kolubarski	Mačvanski	Moravički	Nišavski	Pčinjski	Pirotski	**Podunavski**	Pomoravski	Rasinski	Raški	Šumadijski	Toplički	Zaječarski	Zlatiborski	**Kosovo and Metohija**	**No precies locality**
Cephaloziella varians (Gottsche) Steph.												●																●												
Chiloscyphus pallescens (Ehrh. ex Hoffm.) Dumort.											◑	◑	◑	●			◑			●	○			○			●		◑	●		●		◑			◑	●		
Chiloscyphus polyanthos (L.) Corda											◑	◑	◑	●			●	●	◑	◑		●	◑	○	●		●		◑	◑			●	◑			◑	●	◑	
Cololejeunea calcarea (Lib.) Schiffn.											●	●					●			●	●	●						●					●	●				●		
Cololejeunea rossettiana (C. Massal.) Schiffn.												●					●	●	●	●	●	●	●		●			●										●		
Conocephalum conicum (L.) Dumort.			◑					●		○	◑	◑	◑	●	○		◑	●	◑	●	●	◑	◑	○	●	●	●	●	◑	●		●	●	◑	○	○	◑	●	●	
Conocephalum salebrosum Szweykowski, Buczkowska & Odrzykoski												●	●	●				●						●		●		●	●	●								●		
Crossocalyx hellerianus (Nees ex Lindenb.) Meyl.											○																						○							
Diplophyllum albicans (L.) Dumort.												●						●		●						●	●										●			
Diplophyllum obtusifolium (Hook.) Dumort.											●																							●					●	
Fossombronia pusilla (L.) Nees													○					●							●				○											
Fossombronia wondraczekii (Corda) Lindb.																			●				●																	
Frullania dilatata (L.) Dumort.	●	◑	◑		○	●		◑	●	●	◑	◑	◑	◑	○	●	●	●	◑	●	●	●	◑	◑	●	●	◑	●	◑	●		●	●	◑	○	●	◑	◑	○	
Frullania fragilifolia (Taylor) Gottsche *et al*.																																							○	
Frullania tamarisci (L.) Dumort.			◑					◑		●	○	●	◑	◑		○			◑	●			◑						◑			○	○	◑	○		●	◑	◑	
Fuscocephaloziopsis catenulata (Huebener) Váňa & L. Söderstr.																				●							●											●		
Fuscocephaloziopsis lunulifolia (Dumort.) Váňa & L. Söderstr.																				●							●													
Gymnocolea inflata (Huds.) Dumort.												●																									●			
Gymnomitrion concinnatum (Lightf.) Corda												●																									●			
Isopaches bicrenatus (Schmidel) H. Buch											●	●	●							●							●		●	●			●							
Jungermannia atrovirens Dumort.													●	●															●					●						
Jungermannia pumila With.												●																									●			

Appendix 1. — Continuation.

	Vojvodina										Central Serbia																													
	Region			County							Region										County																			
Species	Bačka	Banat	Srem	**N. - Bački**	N. - Banatski	M. - Banatski	W. - Bački	Južnobački	Južnobanatski	Sremski	C Srbija	E Srbija	SE Srbija	SW Srbija	S Srbija	Pomoravlje	NE Srbija	NW Srbija	Šumadija	W Srbija	Borski	Braničevski	Belgrade	Jablanički	Kolubarski	Mačvanski	Moravički	Nišavski	Pčinjski	Pirotski	**Podunavski**	Pomoravski	Rasinski	Raški	Šumadijski	Toplički	Zaječarski	Zlatiborski	**Kosovo and Metohija**	**No precies locality**
Lejeunea cavifolia (Ehrh.) Lindb.			●					●			●	◑	◑	●	○		●	●	●	●	●	●	●	○	●				◑	○			●	●			●	●	●	
Lepidozia reptans (L.) Dumort.											◑			●					○	◑							●						◑	◑	○			●		
Liochlaena lanceolata Nees											●		◑	●						●				○			●		●					●				●		
Lophocolea bidentata (L.) Dumort.			●							●	○	◑	◑	●			●	●	◑	◑	●	●	◑	◑	●	●	●		◑	◑				◑			○	◑		
Lophocolea heterophylla (Schrad.) Dumort.			●					●		●	●	●	●	●			●	●	◑	●	●	●	●	◑	●	●	●	●	●	●		○	●	●		●	●	●		
Lophocolea minor Nees											●	●	◑	●	○		●	●		●	●	●		○	●		●	●	◑	●				●		●	●	●		
Lophozia ascendens (Warnst.) R. M. Schust.											●	●		●						●							●						●	●			●	●		
Lophozia guttulata (Lindb. & Arnell) A. Evans																				●							●													
Lophozia ventricosa (Dicks.) Dumort.											●	●	◑							●							●		◑	●			●				●	●	●	
Lophozia wenzelii (Nees) Steph.													●																●											
Lophoziopsis excisa (Dicks.) Konstant. & Vilnet												●	○	●															○								●	●		
Lophoziopsis longidens (Lindb.) Konstant. & Vilnet											●	●								●							●			●			●				●		●	
Lunularia cruciata (L.) Lindb.																		●	●				◑		◑															
Mannia fragrans (Balbis) Frye & L. Clark																		●	●	●			○		○									●						
Marchantia paleacea Bertol.															○					-									○									-		
Marchantia polymorpha L.		○	◑		○			◑	○		◑	◑	◑	●			◑	◑	◑	◑	◑	◑	◑	◑	◑	○	●	●	◑	◑		●	◑	◑	○	●	◑	◑	◑	
Marchantia polymorpha L. subsp. *montivagans* Bischl. & Boisselier												◑	●							●				●			●		●	○							●			
Marchantia polymorpha L. subsp. *polymorpha*											○	◑	○	●			●			●	●			●			●	●	●	●				●			◑	●		
Marchantia polymorpha L. subsp. *ruderalis* Bischl. & Boisselier											●	●																		●				●			●			
Marchantia quadrata Scop.			●					●			●	●		●						●								●		●			●				●	●	○	
Marsupella emarginata (Ehrh.) Dumort.												●																		●										
Marsupella funcki (F. Weber & D. Mohr) Dumort.												●	○							●							●		○								●			

APPENDIX 1. — Continuation.

	Bačka	Banat	Srem	**N. - Bački**	N. - Banatski	M. - Banatski	W. - Bački	Južnobački	Južnobanatski	Sremski	C Srbija	E Srbija	SE Srbija	SW Srbija	S Srbija	Pomoravlje	NE Srbija	NW Srbija	Šumadija	W Srbija	Borski	Braničevski	Belgrade	Jablanički	Kolubarski	Mačvanski	Moravički	Nišavski	Pčinjski	Pirotski	**Podunavski**	Pomoravski	Rasinski	Raški	Šumadijski	Toplički	Zaječarski	Zlatiborski	**Kosovo and Metohija**	**No precies locality**
	Vojvodina										**Central Serbia**																													
	Region			County							Region										County																			
Mesoptychia badensis (Gottsche ex Rabenh.) L. Söderstr. & Váňa											●	●					●			●	●									●			●	●				●		
Mesoptychia bantriensis (Hook.) L. Söderstr. & Váňa											●	●					●			●	●							●						●				●		
Mesoptychia collaris (Nees) L. Söderstr. & Váňa												●		●			●				●							●		●				●			●	●		
Mesoptychia heterocolpos (Thed. ex Hartm.) L. Söderstr. & Váňa												●																									●			
Mesoptychia turbinata (Raddi) L. Söderstr. & Váňa														●																				●						
Metzgeria conjugata Lindb.			●					+			◑	●	◑	●			◑	●		●	●	◑			●	●	●		◑					◑			●	●		
Metzgeria furcata (L.) Dumort.			◑					◑		○	◑	◑	◑	●	○		◑	●	◑	◑	◑	◑	◑	◑			◑	●	◑	◑			◑	◑		●	◑	●	◑	
Metzgeria pubescens (Schrank) Raddi											○	◑	○	●			○		○	●	○	○	○	○			●	●	○	○				○			◑	●		
Microlejeunea ulicina (Taylor.) A. Evans																		●								●														
Mylia taylorii (Hook.) Gray																																							●	
Nardia compressa (Hook.) Gray													○																										●	
Nardia scalaris Gray											●		○					●		●						●	●		○				●	●						
Neoorthocaulis attenuatus (Mart.) L. Söderstr., De Roo & Hedd.													○																○											
Neoorthocaulis floerkei (F. Weber & D. Mohr) L. Söderstr., De Roo & Hedd.			●							●	●	●																					●				●			
Nowellia curvifolia (Dicks.) Mitt.											●			●						●							●						●					●		
Obtusifolium obtusum (Lindb.) S.W. Arnell											●	●	○	●						●							●		○					●			●	●		
Oxymitra incrassata (Brot.) Sergio & Sim-Sim	●	●			●																																			
Pedinophyllum interruptum (Nees) Kaal.											●	●	○	●			●	●		●		●		○	●	●		●		●			●	●			●	●	●	
Pellia epiphylla (L.) Corda		○	○		○			○			○	◑	◑	●	○		◑		◑	◑		◑	◑	○			◑	○	◑	◑			○	◑		○	○	●	○	
Pellia neesiana (Gottsche) Limpr.	●					●					○		●				○			◑		○					◑		●					◑						
Plagiochila asplenioides (L. emend. Taylor) Dumort.											◑	○	◑	◑	○		◑	●	○	◑	○	●	○	◑	●		◑		◑	○		●	◑	◑	○	●	◑	◑	◑	
Plagiochila porelloides (Torrey ex Nees) Lindenb.			●					●			●	●	◑	●	○		●	●	◑	●	●	●	●	◑	●	●	●	●	●	●			●	●			●	●	●	

Appendix 1. — Continuation.

Taxon	Bačka	Banat	Srem	**N. - Bački**	N. - Banatski	M. - Banatski	W. - Bački	Južnobački	Južnobanatski	Sremski	C Srbija	E Srbija	SE Srbija	SW Srbija	S Srbija	Pomoravlje	NE Srbija	NW Srbija	Šumadija	W Srbija	Borski	Braničevski	Belgrade	Jablanički	Kolubarski	Mačvanski	Moravički	Nišavski	Pčinjski	Pirotski	**Podunavski**	Pomoravski	Rasinski	Raški	Šumadijski	Toplički	Zaječarski	Zlatiborski	**Kosovo and Metohija**	**No precies locality**
	Vojvodina										**Central Serbia**																													
	Region			County							Region										County																			
Porella arboris-vitae (With.) Grolle														●			●			◑		●																◑		
Porella cordaeana (Huebener) Moore			●					●			●	●	◑	●			●		○	◑	●	●	○	◑			●	●	◑	●			●	●			●	◑		
Porella obtusata (Taylor) Trevis.																				●																		●		
Porella platyphylla (L.) Pfeiff.		◑	◑		○			◑	◑	◑	◑	◑	○	●			◑	●	◑	◑	◑	◑	◑	○	●	●	◑	◑	○	◑			◑	◑	○		◑	●	◑	
Porella baueri (Schiffn.) C. E. O. Jens.			○											●			◑	●		●		●	○		●							◑					●	●		
Ptilidium cilliare (L.) Hampe														○					○																○			○		
Ptilidium pulcherimum (Weber) Vain.											●			◑			●	●		◑	●				●								●	●				◑		
Radula complanata (L.) Dumort.	●	◑	●		○	●		●	●	●	●	●	◑	●	○	●	●	●	●	●	◑	◑	◑	○	●	●	◑	●	◑	●		○	●	◑	○	●	◑	◑	●	
Radula lindenbergiana Gottsche ex C. Hartm.												●							●				●														●			
Reboulia hemisphaerica (L.) Raddi			●					●	○		●	◑	◑	●	○	○	○	●	○		○		○	●	●			◑	◑	●			●	●			●	●		
Riccardia incurvata Lindb.											●		●																●					●						
Riccardia latifrons (Lindb.) Lindb.																			○	●							●								○			●		
Riccardia multifida (L.) Gray.												●	●	●						●							●		●	●								●		
Riccardia palmata (Hedw.) Carruth.											●		◑						○	●							●		◑				●		○			●		
Riccia canaliculata Hoffm.													●	●															●					●						
Riccia ciliifera Link ex Lindenb.	●	◑			+	+								●																				●						
Riccia crinita Taylor																																								●
Riccia crystallina L. emend. Raddi	○							○		○																														
Riccia fluitans L.	◑	◑	●		○		●	○		◑			◑					○	◑				◑						◑											
Riccia frostii Austin		○			○																																			
Riccia glauca L.											○	●		●		○			○	●			○							●		○		●		○		●		
Riccia gougetiana Durieu & Mont.												●																		●							●			

APPENDIX 1. — Continuation.

	Vojvodina										Central Serbia																												Kosovo and Metohija	No precies locality
	Region			County							Region										County																			
	Bačka	Banat	Srem	**N. - Bački**	N. - Banatski	M. - Banatski	W. - Bački	Južnobački	Južnobanatski	Sremski	C Srbija	E Srbija	SE Srbija	SW Srbija	S Srbija	Pomoravlje	NE Srbija	NW Srbija	Šumadija	W Srbija	Borski	Braničevski	Belgrade	Jablanički	Kolubarski	Mačvanski	Moravički	Nišavski	Pčinjski	Pirotski	**Podunavski**	Pomoravski	Rasinski	Raški	Šumadijski	Toplički	Zaječarski	Zlatiborski		
Riccia nigrella DC	●	●			●																																			
Riccia sorocarpa Bisch.		◑			◑				●		●	●	○	●				●	●				●					●	○	●				●			●	●		
Riccia sorocarpa Bisch. var. *heegii* Schiffn.																																								
Riccia sorocarpa Bisch. var. *sorocarpa*														●																										
Ricciocarpos natans (L.) Corda	●	○	○		○		●	○											●				●																	
Scapania aequiloba (Schwägr.) Dumort.												●								●																	●	●		
Scapania aspera Bernet & M. Bernet														◑						◑																		◑		
Scapania calcicola (Arnell & J. Press.) Ingham											●	●		●						●								●		●			●					●		
Scapania curta (Mart.) Dumort.												○	○							●							●		○								○			
Scapania cuspiduligera (Nees) Müll. Frib.												●																●												
Scapania irrigua (Nees) Nees											●		●							●							●		●				●	●					●	
Scapania lingulata H. Buch												●								●										●								●		
Scapania mucronata H. Buch														●						●														●				●		
Scapania nemorea (L.) Grolle											●	●	○					●	●	●			●	○		●	●		○	●			●					●	●	
Scapania paludosa (Müll. Frib.) Müll. Frib.												○																									○			
Scapania praetervisa Meyl.														●																								●		
Scapania scandica (Arnell & H. Buch) Macvicar											●																						●							
Scapania subalpina (Nees ex Lindenb.) Dumort.												○																		○							○			
Scapania umbrosa (Schrad.) Dumort.											○									●							●						○	○						
Scapania undulata (L.) Dumort.											◑	◑	◑				○	●	◑	◑	○		○	○		●	●		◑	○			●	◑			◑	○	●	
Schistochilopsis incisa (Schrad.) Konstant.											●	●		●					○														●		○		●	●		
Solenostoma gracillimum (Sm.) R.M. Schust.											●		◑							●							●		◑				●	●					○	

Appendix 1. — Continuation.

Species	Bačka	Banat	Srem	**N. - Bački**	N. - Banatski	M. - Banatski	W. - Bački	Južnobački	Južnobanatski	Sremski	C Srbija	E Srbija	SE Srbija	SW Srbija	S Srbija	Pomoravlje	NE Srbija	NW Srbija	Šumadija	W Srbija	Borski	Braničevski	Belgrade	Jablanički	Kolubarski	Mačvanski	Moravički	Nišavski	Pčinjski	Pirotski	**Podunavski**	Pomoravski	Rasinski	Raški	Šumadijski	Toplički	Zaječarski	Zlatiborski	**Kosovo and Metohija**	**No precies locality**
	Vojvodina										**Central Serbia**																													
	Region			County							Region										County																			
Solenostoma hyalinum (Lyell) Mitt.												●	●							●							●		●	●										
Solenostoma obovatum (Nees) C. Massal.													○																○											
Solenostoma sphaerocarpum (Hook.) Steph.																	○				○																		○	
Sphenolobus minutus (Schreb.) Berggr.												●																									●		●	
Syzygiella autumnalis (DC.) K. Feldberg, Váňa, Hentschel & Heinrichs																				●							●													
Trichocolea tomentella (Ehrh.) Dumort.													○							●				○			●		○									●		
Trilophozia quinquedentata (Huds.) Bakalin											●	●		●						●										●			●	●			●	●		
Tritomaria exsecta (Schmidel) Loeske												●																									●			