

Macrophytic flora and vegetation of the rivers Svrljiški and Beli Timok (Eastern Serbia)

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Abstract:

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Floristic and phytocoenological investigations of macrophytic vegetation of the rivers Svrljiški and Beli Timok in Eastern Serbia were performed. Analysis of the collected plants showed that the hydrophilous flora contains 26 species from 17 families and 21 genera. Phytocoenological analysis showed 5 different associations from 3 alliances, 3 orders and 3 classes. Aquatic vegetation is represented by the associations *Myriophyllo-Potametum* and *Potametum nodosi*, moor vegetation by associations *Scirpetum lacustris* and *Sparganietum erecti*, while nitrophilous vegetation is represented by association *Polygono-Bidentetum tripartitae*. These associations have formed three clear vegetation belts: submerged, floating and emerged vegetation.

Key words: aquatic and moor vegetation, macrophytic flora

Introduction

The rivers Svrljiški and Beli Timok are located near the Knjaževac town, between the mountains Stara planina (Balkan Mountain), Tresibaba and Tupižnica in Eastern Serbia (**Fig. 1**). Regarding phytogeography, they belong to the eastern Moesian province of the Balkan floristical subregion.

There are only few informations about the flora and vegetation of these rivers and they refer to the gorge of Svrljig Timok river (Bogosavljević et al., 2007). The surrounding mountains are floristically and phytocoenologically relatively well explored, especially Mt. Stara planina (Mišić et al., 1979). Macrophytic flora and vegetation of these rivers has not been investigated so far.

During the period 2008-2010 we investigated the aquatic, moor and nitrophilous flora and vegetation from the riparian zone of these rivers.

Material and methods

The plants collected in the field were determined using Tutin et al., eds. (1968-1980) and Josifović, ed. (1970-1976) and nomenclature was updated following Global Plant Checklist (IOPI, 2005) and Serb-Check list (Niketić, Tomović, 2009). Collected material is deposited in the herbarium of the Faculty of Sciences and Mathematics, University of Niš (HMN).

Life forms were determined according to Stevanović (1992).

Phytocoenological investigation was carried out following the method of Braun-Blanquet (1965). Abundance and cover of taxa was estimated using the nine-grade scale according by van der Maarel (1979) The nomenclature of the syntaxa is in accordance with the Code of Phytosociological Nomenclature (Weber et al., 2000).

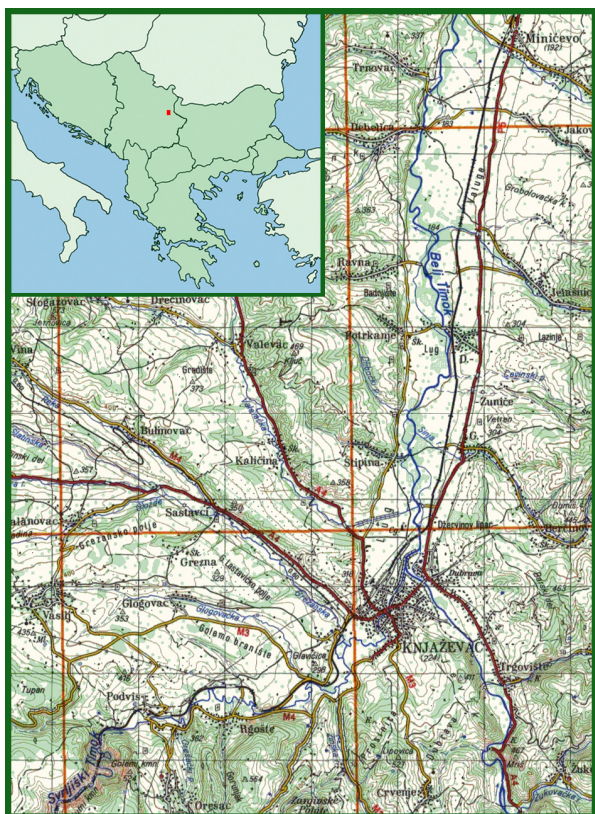


Fig. 1. Map of investigated area

A classification dendrogram has been constructed from the original table of 24 relevées (Tab. 2) as a total of 26 species and infraspecies taxa (Fig. 2) using the UPGMA algorithm and the coefficient of chord distance by means of the software FLORA (Karadžić, Marinković, 2009).

Results and discussion

Flora of aquatic and moor habitats along the rivers Svrliški and Beli Timok contains 26 species of spermatic plants, which are divided into two classes: Magnoliopsida (17 species) and Liliopsida (9) (Tab. 1). True aquatic plants are presented with a very small number of species. Species *Potamogeton crispus* and *Myriophyllum spicatum* belong to the group of submersed hydrophytes, while *Potamogeton nodosus* and *Lemna minor* belong to the group of floating hydrophytes. *Sparganium erectum*, *Scirpus lacustris* ssp. *tabernaemontani* and *Alisma plantago-aquatica* belong to the group of emergent hydrophytes. Most other plants are characteristic for wetlands, with the exception of *Polygonum aviculare*, which is usually found in ruderal habitats.

Table 1. Review of macrophytic flora and life forms of plants

Species	Family	Life form
MAGNOLIOPSIDA		
<i>Berula erecta</i> (Hudson) Coville	Apiaceae	H scap
<i>Bidens tripartita</i> L.	Compositae	T scap
<i>Epilobium hirsutum</i> L.	Oenotheraceae	H scap
<i>Lycopus europaeus</i> L.	Labiatae	H scap
<i>Lythrum salicaria</i> L.	Lythraceae	H scap/emer HydG rhiz
<i>Mentha aquatica</i> L.	Labiatae	H scap
<i>Mentha longifolia</i> (L.) Hudson	Labiatae	H scap
<i>Myriophyllum spicatum</i> L.	Halorrhagidaceae	rad sbm HydT
<i>Polygonum amphibium</i> L.	Polygonaceae	G rhiz-scap nat HydG
<i>Polygonum aviculare</i> L.	Polygonaceae	T rept
<i>Polygonum hydropiper</i> L.	Polygonaceae	T scap
<i>Polygonum mite</i> Schrank	Polygonaceae	T scap
<i>Potentilla reptans</i> L.	Polygonaceae	H rept
<i>Rumex hydrolapaum</i> Huds.	Rosaceae	H scap
<i>Scrophularia alata</i>	Polygonaceae	H scap
<i>Symphytum officinale</i> L.	Scrophulariaceae	H scap
<i>Veronica beccabunga</i> L.	Boraginaceae	H scap
LILIOPSIDA		
<i>Alisma plantago-aquatica</i> L.	Alismataceae	emer HydT
<i>Echinochloa crus-galli</i> (L.) Beauv.	Gramineae	T caesp
<i>Juncus effusus</i> L.	Juncaceae	G rhiz caesp
<i>Lemna minor</i> L.	Lemnaceae	er nat Hyd T
<i>Poa palustris</i> L.	Gramineae	H caesp
<i>Potamogeton crispus</i> L.	Potamogetonaceae	rad sbm Hyd T
<i>Potamogeton nodosus</i> Poiret	Potamogetonaceae	rad nat HydT
<i>Scirpus lacustris</i> L. ssp. <i>tabernaemontani</i> (C. C. Gmel.) Syme	Cyperaceae	G rhiz caesp
<i>Sparganium erectum</i> L.	Sparganiaceae	emer HydG rhiz

Table 2. Phytocoenological table of associations (characteristics species marked with bold characters)

Association	<i>Myriophyllo-Potametum</i>				<i>Potametum nodosi</i>					<i>Scirpetum tabernaemontani</i>					<i>Sparganietum erecti</i>					<i>Polygono-Bidentetum</i>				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Number of area	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Surface (m ²)	10	14	10	20	30	25	10	13	14	10	12	10	14	15	12	12	10	20	10	10	14	14	15	12
Locality	ST	ST	ST	BT	ST	ST	ST	ST	ST	ST	ST	BT	BT	BT	ST	ST	ST	ST	ST	ST	ST	ST	ST	ST
Number of species	6	8	7	6	6	8	5	9	8	8	4	6	5	7	10	11	8	10	8	6	9	11	9	8
<i>Myriophyllum spicatum</i>	4	5	2	2	+	+	+	1	+	+	.	+	+	.	+	+	+	.	.	.	.	.	.	.
<i>Potamogeton crispus</i>	1	1	3	4	+	1	+	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Polygonum amphibium f. natans</i>	+	.	+	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Potamogeton fluitans</i>	+	1	+	1	5	5	5	4	4	+	+	+	+	+	+	+	+	.	+	.	.	.	.	.
<i>Lemna minor</i>	.	.	+	1	.	+	1	1	+	+	.	+	.	+	+	+	.	.	.	.	.	.	.	.
<i>Scirpus lacustris ssp. tabernaemontanus</i>	1	1	1	+	+	+	.	+	+	4	3	4	3	5	1	+	+	1	1	.	.	.	.	.
<i>Sparganium erectum</i>	.	1	.	.	+	+	.	+	+	1	+	+	1	+	5	5	4	2	2	+	+	+	+	+
<i>Mentha aquatica</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	+	3	1	1	5	4	.	+	+	+	+
<i>Polygonum mite</i>	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	4	4	2	3
<i>Bidens tripartita</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	2	+	.	1	.
<i>Poa palustris</i>	.	.	.	+	.	.	.	.	.	+	.	.	.	.	1	+	2	+	+	+	2	2	2	2
<i>Berula erecta</i>	+	.	.	.	.	.	.	+	+	+	.	.	+	.	+	.	+	+	1	.	.	+	1	1
<i>Veronica beccabunga</i>	.	+	.	.	+	+	+	+	1	1	.	.	.	.	+	+	.	.	.	.	1	+	2	+
<i>Polygonum amphibium</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	+	.	.	.	+
<i>Polygonum aviculare</i>	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Alisma plantago-aquatica</i>	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	+	.	.	.	.	+	+	.	.
<i>Lythrum salicaris</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.
<i>Lycopus europaeus</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.
<i>Rumex hydrolapathum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
<i>Epilobium hirsutum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.
<i>Symphytum officinale</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
<i>Scrophularia alata</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
<i>Potentilla reptans</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
<i>Mentha longifolia</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.
<i>Polygonum hydropiper</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+
<i>Echinochloa crus-galli</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.
<i>Juncus effusus</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.

Classification method (UPGMA)

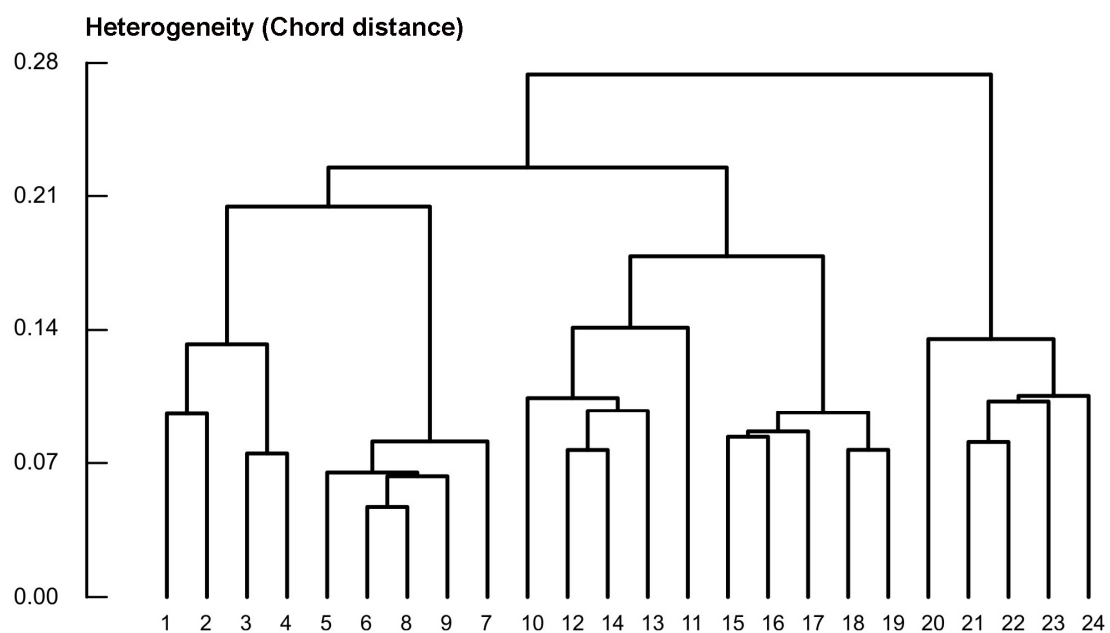


Fig. 2. Dendrogram of the macrophytic vegetation releves

Macrophytic vegetation is differentiated into three vegetation classes (see syntaxonomical scheme). Class Potametea includes aquatic vegetation, which is ecologically divided into submerged (ass. *Myriophyllo-Potametum*) and floating (ass. *Potametum nodosi*) vegetation. Submerse vegetation covers most of the bottom of rivers, while the floating vegetation develops near the coast, in places where water flow is slower. The fragmentary developed emersal vegetation is found along the coast and is presented by associations *Scirpetum lacustris* and *Sparganietum erecti*.

In the areas which are periodically flooded with water the nitrophilic vegetation from class *Polygono-Bidentetea* is developed. This vegetation type is characterized by the presence of numerous representatives of the genus *Polygonum*.

Syntaxonomical scheme

POTAMETEA R. Tx. et Preising 1942

POTAMETALIA W.Koch 1926

Potamion eurosibiricum W.Koch 1928

Myriophyllo-Potametum Soó 1934

subass. *potametosum crispum* Slavnić
1956

Potametum nodosi Soó (1928) 1960, Segal 1964

PHRAGMITO-MAGNOCARICETEA Klika in Klika et Novak 1941

PRAGMITETALIA COMMUNIS W.Koch 1926

Phragmition communis Koch 1926

Scirpetum lacustris (Allorge 1922) Chov. 1924

Sparganietum erecti Roll 1938

BIDENTETEA TRIPARTITI Tx. Lohm. et Prsg. 1950

BIDENTETALIA TRIPARTITI Br-Bl. et Tx. 1943

Bidentition tripartiti Nordh. 1940

Polygono-Bidentetum tripartitae (W.Koch
1926) Lohm 1950

Conclusion

Aquatic vegetation of the rivers Svrliški and Beli Timok is relatively poor in floristical sense. There are 26 plant species involved in the construction of five associations, two of which are typical aquatic vegetation, two belong to the vegetation of emergent plants, and one is nitrophilic vegetation in periodically flooded areas. Nitrophilic

vegetation developed to periodically flooded areas clearly indicates the increased content of nitrogen compounds in the water.

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