



MACROPHYTE-BASED ASSESSMENT OF MOUNTAIN AND SEMI-MOUNTAIN RIVERS IN SOUTH BULGARIA

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INTRODUCTION

Aquatic macrophyte communities reply to anthropogenic pressures (e.g. alteration of depth, velocity, substrate type, flow types and flow variability) through loss of species, replacement of the original dominants and relative abundance.

Moreover bryophyte communities, character for mountain rivers, exhibited strong reduction in abundance and disappearance along physical disturbance gradient (Gecheva et al. 2017).



METHODOLOGY

The study was carried out at 24 sites along mountain and semi-mountain rivers during the main vegetation season in 2020.

In each site approximately 100 m long section was studied. The macrophyte sampling covered the whole river channel and banks following European standardization legislation (EN 14184: 2014, EN 14996: 2006).

The nomenclature followed Hill et al. (2006) for mosses and Delipavlov et al. (2003) for vascular plants.

The abundances of all single species were registered using a semi-quantitative five-level scale (Kohler 1978), similar to the commonly used DAFOR scale (Dominant, Abundant, Frequent, Occasional, Rare).

Macrophyte relative abundance was quantified based on percent frequency of occurrence at 24 sampling sites. Reference Index (RI) which defines type-specific reference and non-specific disturbance indicating taxa, and transformation into ecological quality ratio (EQR) were calculated after Gecheva et al. (2013).

RESULTS

1. Species composition

Table 1. Registered taxa, abundance and group.

	Relative abundan ce, %	Average abundan ce	Group
Mosses			
<i>Brachythecium rivulare</i> Schimp.	40	3	Mosses
<i>Cratoneuron filicinum</i> (Hedw.) Spruce	4	3	Mosses
<i>Fontinalis antipyretica</i> Hedw.	44	2	Mosses
<i>Leptodictum riparium</i> (Hedw.) Warnst.	4	3	Mosses
<i>Platyhypnidium riparioides</i> (Hedw.) Dixon	20	2	Mosses
Vascular plants			
<i>Alisma lanceolatum</i> With.	4	2	Helophytes
<i>Bidens tripartitus</i> L.	12	2	Hygrophytes
<i>Carex</i> sp.	4	2	
<i>Ceratophyllum demersum</i> L.	12	3	Hydrophytes
<i>Cyperus fuscus</i> L.	4	1	Helophytes
<i>Cyperus longus</i> L.	8	2	Hygrophytes
<i>Echinochloa crus-galli</i> (L.) P. Beauv.	12	2	Helophytes
<i>Elodea canadensis</i> Michx.	4	2	Hydrophytes
<i>Epilobium hirsutum</i> L.	8	2	Hygrophytes
<i>Equisetum fluviatile</i> L.	4	2	Pteridophytes
<i>Glyceria fluitans</i> (L.) R. Br.	8	3	Helophytes
<i>Juncus effusus</i> L.	20	2	Helophytes
<i>Lemna minor</i> L.	4	3	Hydrophytes
<i>Lycopus europaeus</i> L.	12	2	Helophytes
<i>Lythrum salicaria</i> L.	16	3	Helophytes
<i>Mentha aquatica</i> L.	20	2	Helophytes
<i>Mentha longifolia</i> (L.) L.	28	2	Helophytes
<i>Myosoton aquaticum</i> (L.) Moench	4	1	Helophytes
<i>Myriophyllum spicatum</i> L.	48	3	Hydrophytes
<i>Paspalum paspalodes</i> (Michx.) Scribn.	16	3	Hygrophytes
<i>Petasites hybridus</i> (L.) G. Gaertn. & al.	12	3	Hygrophytes
<i>Phalaris arundinacea</i> L.	4	3	Helophytes
<i>Phragmites australis</i> (Cav.) Steud.	12	2	Helophytes
<i>Polygonum hydropiper</i> L.	4	4	Helophytes
<i>Polygonum lapathifolium</i> L.	20	3	Hygrophytes
<i>Potamogeton crispus</i> L.	8	3	Hydrophytes
<i>Potamogeton nodosus</i> Poir.	4	2	Hydrophytes
<i>Ranunculus aquatilis</i> L.	8	2	Hydrophytes
<i>Ranunculus repens</i> L.	16	2	Hygrophytes
<i>Ranunculus trichophyllus</i> Chaix	4	4	Hydrophytes
<i>Rumex</i> sp.	4	2	
<i>Sparganium erectum</i> L.	12	2	Helophytes
<i>Stachys palustris</i> L.	4	1	Helophytes
<i>Typha angustifolia</i> L.	4	3	Helophytes
<i>Typha latifolia</i> L.	8	2	Helophytes
<i>Veronica beccabunga</i> L.	4	2	Helophytes

Fourty-one species were registered, 39 to species level and 2 to genus level. Aquatic mosses were represented by 5 species. One taxa belonged to pteridophytes. The most common aquatic macrophytes were *Fontinalis antipyretica* and *Myriophyllum spicatum* (relative abundance 44 and 48%, Table 1). Riparian vegetation was represented by 18 helophytes and 7 hygrophytes. The most common helophyte was *Mentha longifolia*, while from the hygrophyte group - *Polygonum lapathifolium*.

2. Ecological status

Table 2. Studied sites, river type, geographical coordinates and calculated RI and EQR. Legend: * HMWB - Highly Modified Water Body; MD - Macrophyte depopulation.

River/Site	Type	Coordinates			
		N	E	RI	EQR
Chepelarska, before Yugovska River	R3	41.91133	24.80275	0	0.5
Chepelarska, after Yugovska River	R3	41.91855	24.82081	19	0.6
Chepelarska, Bachkovo village	R3	41.9444	24.85281	0	0.5
Chepelarska, after Bachkovo village	R3	41.96389	24.86444	30	0.7
Chepelarska, before Asenovgrad	R3	41.99444	24.87445	0	0.5
Yugovska, before Lucki town	R3	41.82444	24.83889	43	0.7
Yugovska, after Lucki town	R3	41.83845	24.83381	0	0.5
Yugovska, mouth	R3	41.90917	24.80024	44	0.7
Chinardere	R3	41.92236	25.02083	-20	0.4
Yadenitsa	R3	42.10111	23.88944	77	0.9
Maritsa, before Dolna Banya	R3	42.31527	23.73389	77	0.9
Marista, Raduil village	R3	42.16315	23.40469	91	1
Chepelarska, after Chepelare town	R3	41.73509	24.68886	MD	MD
Asenovska, before Sliven town	R3	42.68390	26.2961	-100	0
Bezbojka, before mouth	R3	41.81945	23.61996	0	0.5
Topolnitsa, Dragor village	R5	42.23517	24.28573	-56	0.2
Parvenetska, after Hrabrino village	R5	42.06583	24.65527	75	0.9
Stryama, Banya village	R5	42.5203	24.84706	-56	0.2
Bunovshtitsa, before Topolnitsa River	R5	42.61449	24.00443	-100	0
Stryama, before Slatina village	R5	42.69028	24.56917	50	0.8
Chepelarska, Kemera*	R5	42.1457	24.87722	0	0.5
Tundzha, Yagodina village	R5	42.54504	25.56117	-100	0
Struma River near the boarder (bridge for Topolnitsa village)*	R5	41.41695	23.31831	-100	0
Struma River before inflow of Belishka River*	R5	41.63416	23.19624	-100	0

CONCLUSIONS

- ❖ The applied RI illustrated that the prevailing part of the sites were in high and good status (62%). These locations were characterized by communities of aquatic mosses *Brachythecium rivulare*, *Fontinalis antipyretica*, *Platyhypnidium riparioides*, *Cratoneuron filicinum*, *Leptodictyum riparium*.
- ❖ Three sites were assessed in moderate and 5 in poor status, where macrophyte communities were dominated by vascular plants *Ceratophyllum demersum*, *Myriophyllum spicatum*, *Ranunculus* sp.
- ❖ Macrophyte-based assessment revealed that river sites under anthropogenic pressure represented almost 40% of the studied locations.

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