

**CONTRIBUTION TO KNOWLEDGE OF ZOOPLANKTON
IN THE RIVERS OF SERBIA:
SUMMER ASPECT OF ROTATORIA IN MORAVA
AND WESTERN MORAVA**

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ABSTRACT. Investigations of the zooplankton community during the summer months in the Morava and Western Morava Rivers revealed relatively great diversity of Rotatoria. In comparison with earlier investigations, greater diversity was recorded. Most of the species are common and are also encountered in other Serbian rivers. Continuous and long-term investigations would provide a more precise picture of the status of zooplankton in the indicated rivers.

INTRODUCTION

The fauna of zooplankton in Serbia has still been inadequately studied. The majority of studies deal with the faunistic composition of zooplankton in lakes and reservoirs [5]. There are considerably fewer data on the composition and structure of zooplankton in rivers. The Danube has been studied in greatest detail [10, 12, 14, 19], the Tisza [9, 11, 13] and Sava [4] to a lesser extent. As far as rivers entirely within the territory Serbia are concerned, most of the investigations on them involved sampling conducted only once [1, 2, 6, 7, 8, 16, 17], although more detailed studies have also been occasionally carried out [15].

The largest such river is the Morava, for which data were obtained during May and September of 1986 near its confluence with the Danube [12], while more thorough investigations were performed on the Western Morava and its tributaries during the period of 1984-1985 [3].

MATERIAL AND METHODS

One-time hydrobiological investigation of the rivers Morava and Western Morava and its drainage area was carried out during the summer months of 2001. Sampling was conducted at 10 localities (Table 1). Sampling was done by standard methods, and samples were fixed with 4% Formalin at the sites where they were taken. Qualitative and quantitative analysis of the collected material was performed in the laboratory at the Institute of Biology and Ecology of the University of Kragujevac Faculty of Science (qualitative analysis was carried out to the level of species or to the genus level where it was impossible to identify the species).

In comparing the faunistic composition of zooplankton during these two periods, we used the Sørensen similarity index [18]:

$$S = \frac{2C}{A+B}$$

where A is the number of species present in one population, B is the number of species present in the other population, and C is the number of species present in both populations.

The present work represents a contribution to knowledge on distribution of the fauna of Rotatoria in rivers on the territory of Serbia.

RESULTS AND DISCUSSION

Table 1 gives results of faunistic analysis of Rotatoria in the Morava and Western Morava Rivers, including data on the Međuvršje Reservoir. Altogether, 61 taxa were recorded at the level of species (and lower) or genus, one of which was determined to the family level (Philodonidae - identification made difficult by the fixed state of the material). The Morava had the most taxa (49), 32 taxa were recorded in the Međuvršje Reservoir, and 21 were recorded in the Western Morava. In comparison with earlier investigations [3, 12], significantly more taxa were recorded in both the Morava (49 versus 17) and the Western Morava (21 versus 17), as well as in the Međuvršje Reservoir (32 versus 29).

Certain differences are discernible in regard to the percentage representation of individual taxa (Table 1). In the Morava, dominance of species of the genus *Brachionus* is pronounced, followed by species of the genera *Keratella*, *Polyarthra*, and *Cephalodella*. In the Međuvršje Reservoir, species of the genera *Polyarthra* and *Keratella* are the most frequent. In the Western Morava, species of the genera *Polyarthra* and *Colurella* are dominant, while participation of species of the genus *Keratella* and the species *Filinia longiseta* is somewhat weaker.

Differences in domination of certain species can be partly explained on the basis of physical characteristics of the investigated ecosystems (analyses of chemical parameters have not been carried out). The Morava is a larger river than the Western Morava and therefore has conditions more favorable for development of those species of Rotatoria that are typical inhabitants of the plankton (the genera *Polyarthra*, *Keratella*, and *Brachionus*), although some of those Rotatoria are also frequent in the Western Morava. However, species of the genus *Colurella*--which are common and dominant forms in smaller rivers [2, 8]--are frequent in the Western Morava. The Međuvršje

Reservoir, although a reservoir of the flow-through type, has conditions favorable for development of euplanktonic species (species of the genera *Polyarthra* and *Keratella* are dominant).

Use of the Sørensen similarity index [18] gave the expected results (Table 2).

Table 2. Sørensen similarity index in the Morava, Western Morava and Međuvršje Reservoir

	Western Morava	Međuvršje Reservoir	Morava
Western Morava		52.53	62.85
Međuvršje Reservoir	52.53		46.91
Morava	62.85	46.91	

The greatest value of the similarity index was obtained in comparing the Morava and the Western Morava, which is understandable since they are both large rivers, while the least similarity was observed between the faunistic composition of Rotatoria of the Morava and that of the Međuvršje Reservoir. The lowest value of the similarity index in comparing the Morava and the Međuvršje Reservoir is a consequence of (among other things) the fact that the given reservoir was formed on the Western Morava.

The results obtained in analyzing the composition and structure of the Rotatoria fauna in the Morava and Western Morava Rivers represent a contribution to knowledge of the inadequately studied fauna of Rotatoria in the rivers of Serbia. However, continuous investigations of these and other rivers are needed in order to obtain a complete picture of the zooplankton fauna on the territory of Serbia.

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Table 1. Qualitative composition and % participation of Rotatoria in Morava and Western Morava during the summer of 2001.g. (1-Western Morava, above Kraljevo; 2-Western Morava, below Kraljevo; 3- Western Morava, above Kruševac; 4- Western Morava, below Kruševac; 5-Međuvršje Reservoir, centre; 6- Međuvršje Reservoir, near dam; 7-Morava, near Paraćin; 8-Morava, near Ribare; 9.-Morava, near Svilajnac; 10-Morava, near Požarevac)

Taxa \ Locality	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
<i>Asplancha</i> sp.					2,1	4,7	0,5	0,9	1,4	0,5
<i>Brachionus angularis</i> Gosse	0,4		1,4	3,2		0,2	12,3	12,3	7,1	13,2
<i>Brachionus bennini</i> (Leissling)								0,4	0,5	2,0
<i>Brachionus budapestinensis</i> Daday									0,9	1,2
<i>Brachionus calyciflorus anuraeiformis</i> Brehm					0,1	0,2				
<i>Brachionus calyciflorus calyciflorus</i> Pallas						0,2				
<i>Brachionus diversicornis diversicornis</i> (Daday)									0,5	
<i>Brachionus leydigii</i> Cohn		2,8					0,5	5,5	0,9	0,9
<i>Brachionus quadridentatus ancylognathus</i> Schmarda									0,5	
<i>Brachionus quadridentatus brevispina</i> Ehrb.				3,2				4,3	1,9	0,9
<i>Brachionus quadridentatus cluniorbicularis</i> Skor.			1,4	1,6				7,2	9,0	2,2
<i>Brachionus quadridentatus quadridentatus</i> Herm.						0,2	1,8	6,4	4,7	11,6
<i>Brachionus quadridentatus rhenasus</i> Laut.								0,4		
<i>Brachionus urceus</i> (Linnaeus)								0,4		
<i>Cephalodella gibba</i> (Ehrb)					0,1	2,8				
<i>Cephalodella globata</i> (Gosse)						1,7				
<i>Cephalodella</i> sp.	7,2	15,5	15,7	1,8		0,9	10,0	1,7	1,4	7,7
<i>Colurella adriatica</i> Ehrb.	2,3	2,8	10,0	1,6		0,2		1,3	4,7	1,0
<i>Colurella colurus</i> Ehrb.	5,7	5,6	17,1	22,6	0,1	0,6	1,8	5,1	7,1	1,0
<i>Colurella obtusa</i> Gosse	1,1	2,8	8,6	1,6	0,1	0,2	0,9	0,9	0,5	
<i>Colurella uncinata</i> (O.F. Müller)	0,4	0,4				0,4			1,4	0,2
<i>Dicranophorus</i> sp.						0,2			0,5	
<i>Epiphanes macroura</i> Barois et Daday							0,5	0,9	0,5	
<i>Epiphanes</i> sp.							2,1	1,3	1,4	0,7
<i>Euchlanis dilatata</i> Ehrb.		1,4		4,8		0,4			0,5	
<i>Filinia brachiata</i> (Rouss.)										3,2
<i>Filinia longiseta</i> (Ehrb.)	12,8	9,9			9,2	4,1		3,0	1,9	3,8
<i>Filinia passa</i> (O.F. Müller)									0,5	0,9
<i>Kellicotia longispina</i> (Kellicot)					0,2					
<i>Keratella cochlearis</i> (Gosse)	8,7	8,5	2,9	1,6	15,1	19,2	0,5	1,7	1,4	0,5
<i>Keratella cochlearis macracantha</i> Laut.						0,6				

Table1. Continue

Taxa \ Locality	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
<i>Keratella cochlearis tecta</i> Gosse	11,0	4,2		4,8	8,3	8,4	8,9	5,5	11,3	12,8
<i>Keratella tropica reducta</i> Fad.						0,2				
<i>Lecane (M.) bulla</i> Gosse							0,5	0,9		
<i>Lecane (M.) closterocerca</i> Schmarda		1,4				0,4	0,9	1,3		
<i>Lecane (M.) cornuta</i> (O.F. Müller)						0,2		0,9		
<i>Lecane (M.) hamata</i> Stokes						0,2				
<i>Lecane (M.) lunaris</i> (O.F. Müller)	0,4								0,5	0,2
<i>Lecane (M.) quadridentata</i> Ehrb.							0,4			
<i>Lecane</i> sp.	0,4									
<i>Lepadella patella biloba</i> Hauer								0,8		
<i>Lepadella patella patella</i> (O.F. Müller)	2,7	7,0	5,7	12,9		2,1	2,7	0,9	3,8	0,9
<i>Mytilina</i> sp.						0,2		0,4		
Philodinidae	3,0	8,5	1,4	3,2		2,1	1,4	8,1	4,2	1,0
<i>Platyas polyacanthus</i> (Ehrb.)										0,2
<i>Polyarthra dolichoptera</i> Idelson					14,9	6,0	5,5		1,9	
<i>Polyarthra major</i> Burck.							6,4	1,7	4,2	10,4
<i>Polyarthra remata</i> Skorikov						21,1	6,3	0,9	0,4	1,4
<i>Polyarthra vulgaris</i> Carlin						1,4				3,8
<i>Polyarthra</i> sp.	37,7	12,8	17,1	3,2	0,8	1,5				
<i>Pompolyx sulcata</i> Hudson									0,9	
<i>Scaridium longicaudum</i> (O.F. Müller)						0,2				
<i>Synchaeta</i> sp.					0,3		3,7			
<i>Testudinella parva</i> (Ternetz.)										0,3
<i>Testudinella patina</i> (Hermann)				1,6				0,9		
<i>Testudinella</i> sp.									0,5	
<i>Trichocerca brachyura</i> (Gosse)									0,5	0,2
<i>Trichocerca inermis</i> (Linder)							4,5	1,3		
<i>Trichocerca pusilla</i> (Jenn.)									1,4	0,9
<i>Trichotria tetractis</i> Ehrb.			2,9					0,4		
<i>Trichotria</i> sp.								1,3		
Total Rotatoria	14	14	11	14	14	31	20	32	35	29