ZOOBENTHIC STRUCTURE OF THE TOPOLOG RIVER

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Abstract. The paper presents data referring to the comparative structure of the benthic invertebrate fauna of the Topolog River in five sampling site. On the basis of relative abundance, the dominancy of the invertebrate groups is highlighted. In particular, it is analysed the community structure of the mayflies larvae being presented the list of the taxa, ecological spectrum, relative abundance, frequency and other ecological characteristics of the mayflies fauna.

Keywords: benthic invertebrate fauna, Topolog River, mayflies.

Rezumat. Structura zoocenozei bentonice a Râului Topolog. Lucrarea prezintă date referitoare la structura faunei de nevertebrate bentonice a Râului Topolog în cinci staţii de cercetare. Sunt evidenţiate grupele dominante pe baza abundenţei relative din macrozoobentos. În mod particular este analizată structura comunităţilor de efemeroptere, fiind prezentată lista taxonilor, spectrul ecologic, abundenţa relativă, frecvenţa şi alte caracteristici ecologice ale faunei de efemeroptere din Râul Topolog.

Cuvinte cheie: fauna de nevertebrate bentonice, Râul Topolog, efemeroptere.

INTRODUCTION

Situated in the Olt hydrographic basin, the Topolog river springs from the southern slope of Făgăraş Mountains, crosses the counties of Argeş and Vâlcea, having a length of 88.8 km and flows into the Olt river, in Galicea, being one of its main left tributaries (ROŞU, 2007). The Topolog hydrographic basin is situated in the central-southern region of the country, in the Carpathians EcoRegion, with a length of 547 km² and an average width of 6.5 km. The Topolog is considered a mountain stream due to the high average altitude of about 772 m and steep average slope of 20.4‰, falling within the typology of water-courses in the mountains, piedmont and highlands (RO01) (P.M.B.H.O., 2009).

The anthropogenic impact on the Topolog river is particularly felt in the upper and middle course, by building a chain of five micro-hydropower stations (MHS) and creating a water feed pipe to additionally supply Vidraru Dam, leading to significant changes in both hydromorphological parameters of the water-course and the structure of water biocoenosis.

The research conducted and presented in this paper aimed to highlight the impact of hydro-technical harnessing on the structure of benthic zoocoenosis by making the inventory of important taxa of benthic invertebrate fauna in the Topolog River, highlighting the dominant groups based on their relative abundance, identifying Ephemeroptera species and determining the water quality of the Topolog River based on Ephemeroptera species distribution.

MATERIAL AND METHODS

In the period August 2010 – April 2011, zoobenthic samples were taken periodically in August, November and April. To determine the structure of benthic zoocoenosis, there were established four sampling stations in the sector Vadul Frumos – Galicea. Vadul Frumos station (S1) is situated upstream of micro-hydropower stations, in an area with minimal anthropogenic impact. Sălătrucul de Jos station (S2) is situated in the middle chain of micro-hydropower stations, upstream of Şuici Dam. Poienari de Argeş (S3) and Galicea (S4) stations were situated downstream of hydro-technical harnessing, the latter being situated at the river mouth (Fig. 1).

On each sampling site, the benthos samples were taken using a Surber–sampler, which covered a surface of 0.16 m^2 (mesh-size: 200 μm). The stones were washed in the stream and brushed. The samples were preserved on the field in 8% formalin solution. The retained material was separated into groups by a Zeiss stereomicroscope in the Hydrobiology lab of the University of Pitesti and removed in ethanol 70%. European identifications keys were used (ELLIOTT *et al*., 1988; BAUERNFEIND & HUMPESCH, 2001; GODEANU, 2002).

RESULTS AND DISCUSSIONS

As far as the benthic invertebrate fauna is concerned, in the research period representatives from eight taxa groups were identified. The analysis of the resulted data reveals that the mayflies are the best represented in all the sample stations, followed by stoneflies. In the upstream stations the chironomids are dominant, especially in the samples taken in April, while the caddisflies are relatively constant in number.

The structure of benthic zoocoenosis in August (Fig. 2) showed a clear dominance of Ephemeroptera, Plecoptera and Chironomida species. Ephemeroptera maximum number of individuals/m^2 was recorded in station 2 (1,733 ind./m^2); the other three stations had approximately equal values (950 ind./m^2 on average). The maximum density of Plecoptera was recorded in station 3 (1,449 ind./m^2), the other values being below 600 ind./m^2, with a minimum of 273 ind./m^2 in station 4. As Plecoptera, Chironomida species were best represented in station 3 (1,049 ind./m^2), the other values being below 300 ind./m^2.

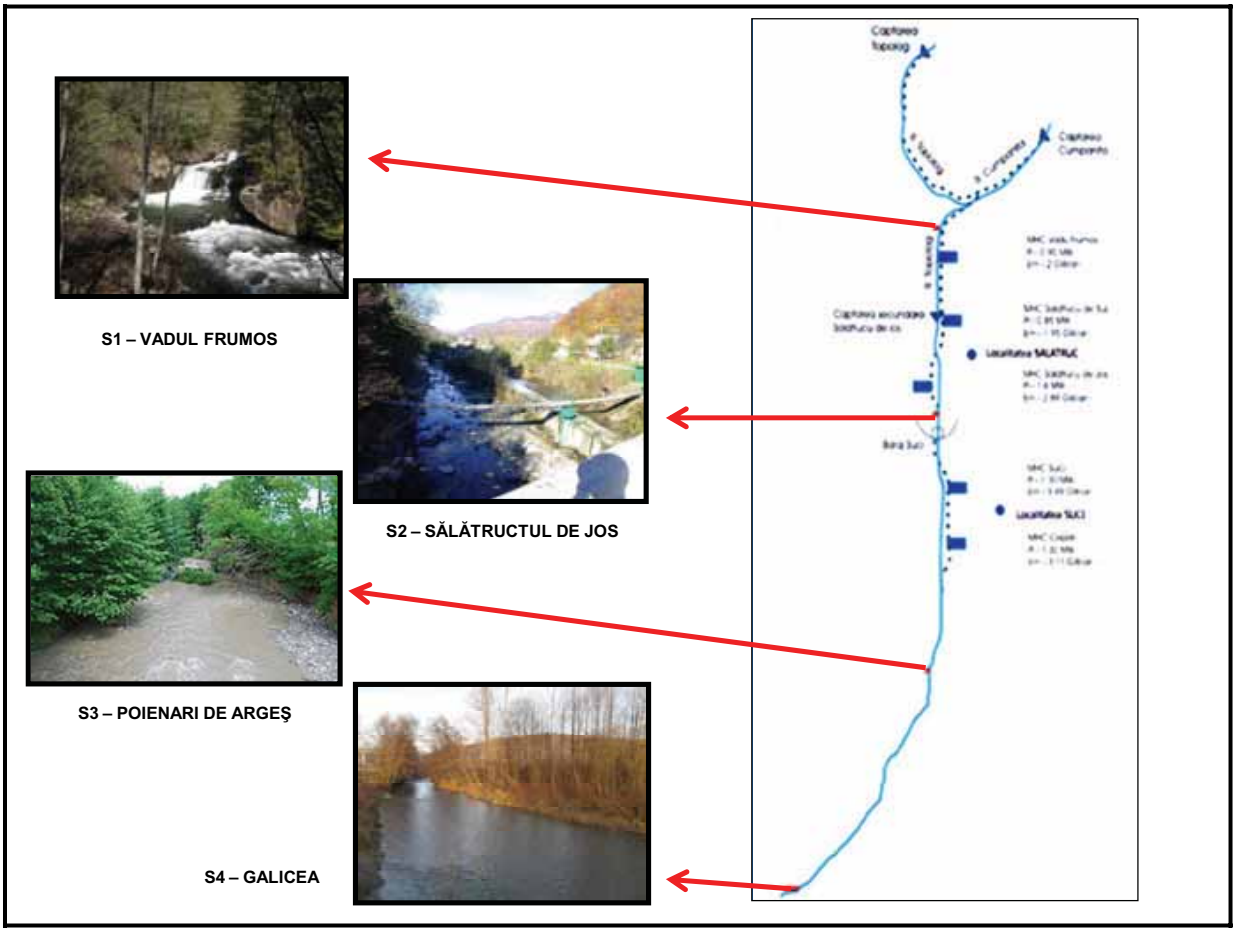

Figure 1. Location of the sampling sites (original photos).
Figura 1. Localizarea staţiilor de prelevare (foto originale).

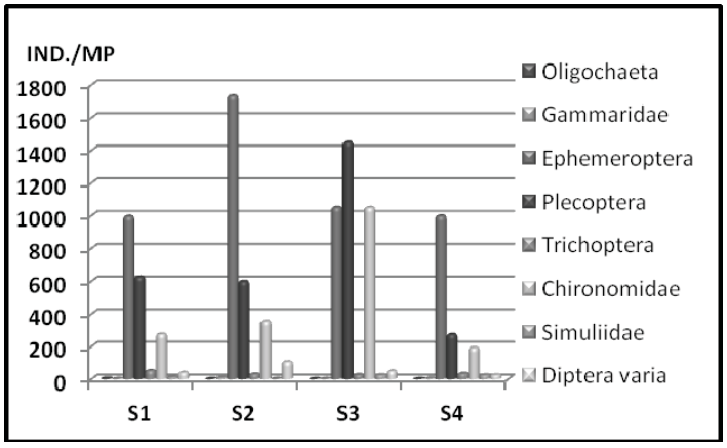

Figure 2. The zoobenthical structure of the Topolog River – August 2010.
Figura 2. Structura zoocenozei bentinice a Râului Topolog – August 2010.

The analysis of benthonic zoocoenosis structure in November (Fig. 3) highlighted the clear dominance of Ephemeroptera in all four stations, followed by Plecoptera, the other groups being underrepresented. Numerical density of ephemeroptera ranged between 425 ind./m^2 in station 2, and 744 ind./m^2 in stations 3 and 4. The maximum number of ind./m^2 for Plecoptera was 306 ind./m^2 in station 3, the other values being comparable and much lower. Chironomida recorded low values, below 50 ind./m^2.

April recorded an extraordinarily high numerical density for Chironomida group, in all stations, with values ranging between 246 ind./m^2 in station 3 and 2,671 ind./m^2 in station 2 (Fig. 4). The maximum number of individuals/m^2 for ephemeroptera was recorded in station 4 (2,163 ind./m^2), maintaining high values in all stations. For Plecoptera, the situation was similar to Ephemeroptera, with no high differences in all four stations, from a minimum of 775 ind./m^2 (station 2), to a maximum of 1,075 ind./m^2 (station 4).

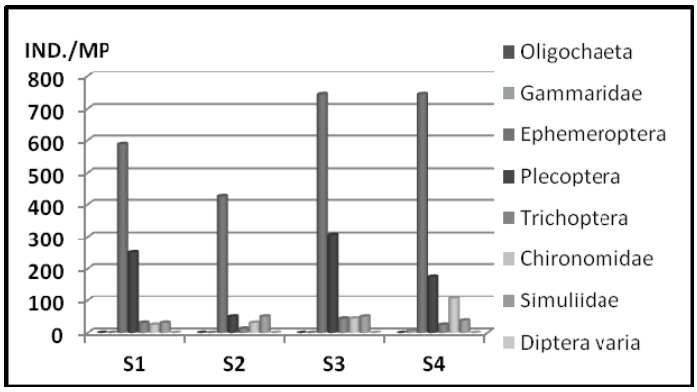

Figure 3. The zoobenthical structure of the Topolog River – November 2010.
Figura 3. Structura zoocenozei bentinice a Râului Topolog – Noiembrie 2010.

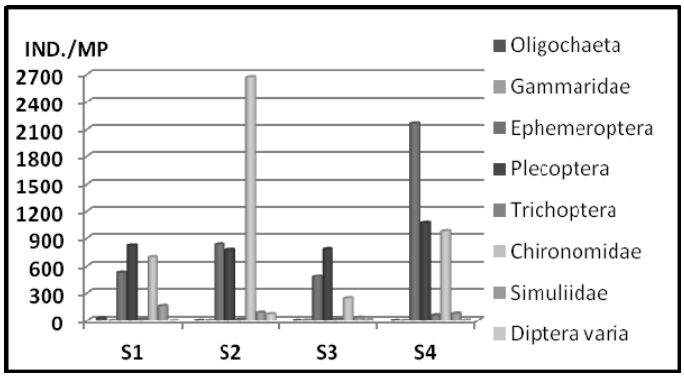

Figure 4. The zoobenthical structure of the Topolog River - April 2011.
Figura 4. Structura zoocenozei bentinice a Râului Topolog - Aprilie 2011.

In the case of mayflies, in the samples taken we identified fourteen species from seven genera belonging to six families from all the three suborders. Station 1 was the least rich in species, but with a considerably higher number of ind./m^2, on average, for each species (Table 1).

Baëtis alpinus (PICTET 1843–1845) was present in all samples, the number of ind./m^2 decreasing progressively from upstream to downstream, with decreasing flow speed, knowing that it is a rhitron species, an indicator for the waters in the oligosaprobic category; in most cases, the situation is similar to *Rhithrogena semicolorata* (CURTIS 1834); *Epeorus* EATON 1881 genus was present in all sampling stations, with a small number of individuals/m^2. *Ecdyonurus dispar* (CURTIS 1834), *Ephemera danica* MÜLLER 1764 and *Caenis macrura* STEPHENS 1835 appeared only in station 4, being relatively eurybiont species, which bear a slightly higher degree of organic load. *Baëtis muticus* (LINNAEUS 1758) and *Paraleptophlebia submarginata* STEPHENS 1835) were present only in station 3; *Ecdyonurus torrentis* KIMMINS 1942 was present sporadically in stations 1 and 3, as a water indicator in the rithron with high flow speed; *Ephemerella ignita* (PODA 1761) was permanently present in stations 3 and 4, as a water indicator in β – mesosaprobic category (Fig. 5).

Table 1. The distribution of the mayfly fauna of the Topolog River.
Tabel 1. Distribuţia faunei de efemeroptere a Râului Topolog.

Taxa	Sampling site			
	Vadul Frumos	Sălătrucul de Jos	Poienari de Argeş	Galicea
Baëtis alpinus (PICTET 1843 – 1845)	X	X	X	X
B. lutheri MÜLLER – LIEBENAU 1967	-	X	-	X
B. muticus (LINNAEUS 1758)	-	-	X	-
B. rhodani (PICTET 1843 – 1845)	-	X	X	X
B. vernus CURTIS 1834	-	X	X	-
Rhithrogena semicolorata (CURTIS 1834)	X	X	X	X
Ecdyonurus dispar (CURTIS 1834)				X
E. torrentis KIMMINS 1942	X	-	X	-
E. venosus (FABRICIUS 1775)	-	X	X	-
Epeorus sp. EATON 1881	X	X	X	X
Paraleptophlebia submarginata (STEPHENS 1835)	X	X	X	-
Ephemera danica MÜLLER 1764	-	-	-	X
Ephemerella ignita (PODA 1761)	-	-	X	X
Caenis macrura STEPHENS 1835				X

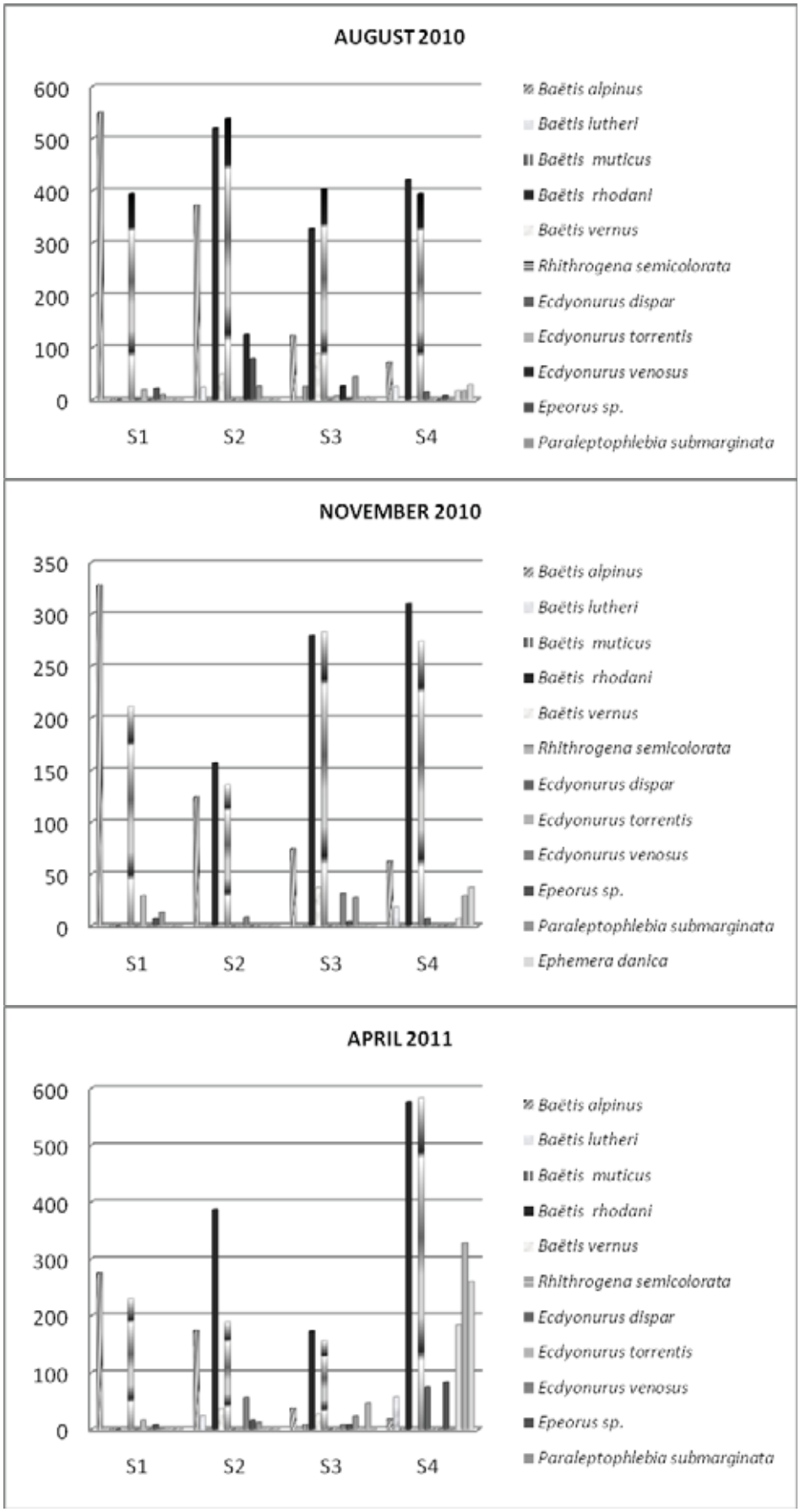

Figure 5. Numerical density of the mayfly fauna and its seasonal variation in the Topolog River.
Figura 5. Densitatea numerică a faunei de efemeroptere şi variaţia sezonieră a acesteia în Râul Topolog.

In terms of ecological spectrum (Fig. 6), it can be seen that Ecdyonuriidae family is best represented in upstream stations, having a weight of 60% in Vadul Frumos, but decreasing progressively to 31% in Galicea. Baetidae are well represented in Poenarii de Arges, where they are dominant (49%), maintaining high weight in the other downstream stations. *Leptophlebia* represent 20% of the ephemerofauna in Vadul Frumos station, their weight decreasing downstream to values below 13%. The other families have a weight below 10% in all stations.

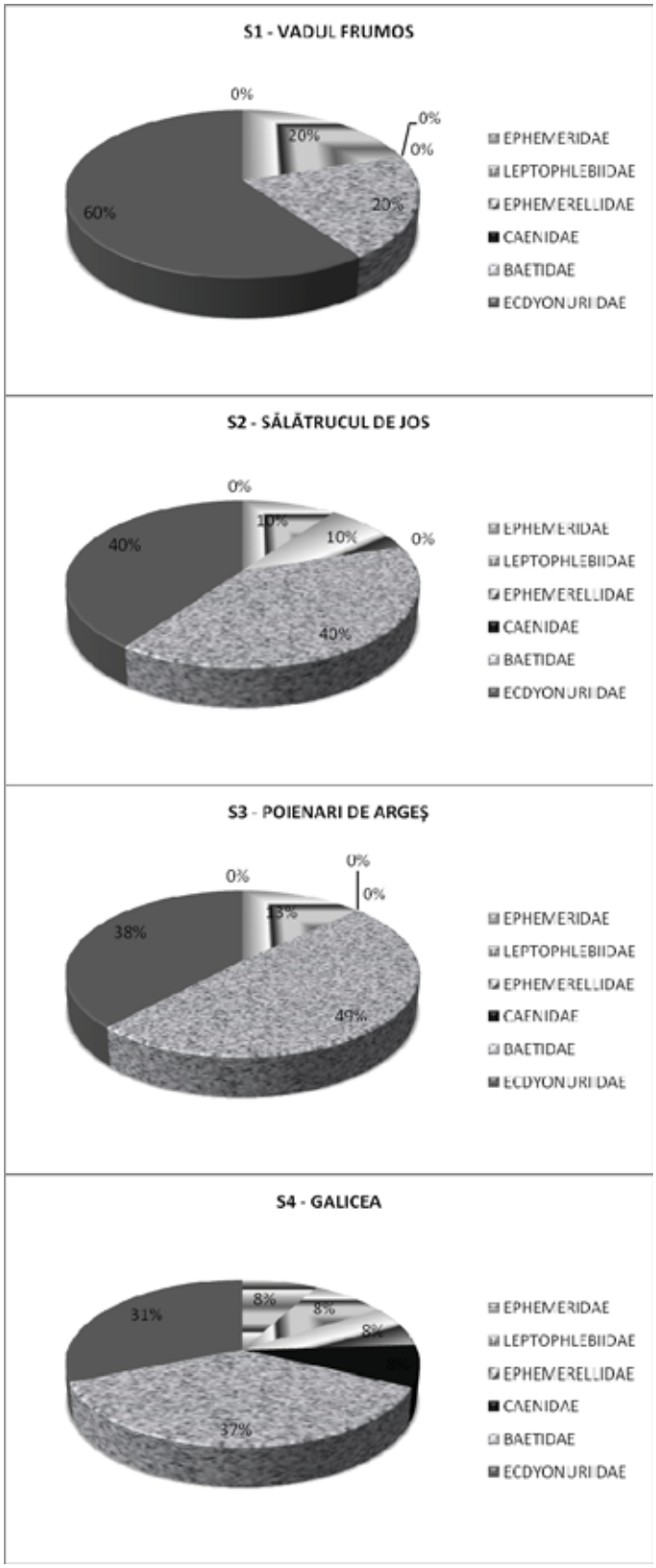

Figure 6. Ecological spectrum of the mayfly population in the Topolog River.
Figura 6. Spectrul ecologic al populaţiei de efemeroptere din Râul Topolog.

CONCLUSIONS

From the ecological zonation point of view (GÂLDEAN, 1992), the presence of the identified species points at the idea that the river where the research was undertaken is part of the area where the erosion phenomenon is predominant, alternating with small areas of sedimentation.

From the quality of the water, the identified species are indicators of the waters from the oligosaprobic and β – mezosaprobic categories (BREZEANU *et al*., 2011).

The hydrotechnical lay out did not significantly modify the structure of the benthic zoocoenosis; it has been reformed over the years.

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