

# **COMPOSITION, STRUCTURE AND DISTRIBUTION OF THE MACROZOOBENTHOS IN THE RIPAL ZONE OF THE BULGARIAN SECTION OF THE DANUBE RIVER SECTION UNDER ANTHROPOGENIC IMPACT AND PRESSURE**

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## **SUMMARY**

For the protection of waters in the European Union, the Water Framework Directive (Directive 2000/60/EC) has been introduced. One of its objectives is to achieve 'good ecological and chemical status' (or potential) for all inland surface waters. The study and assessment of the state of the waters of the Danube River are key for its conservation, as they reflect the anthropogenic pressure and the stress factors to which it is subjected. Habitats in the Danube ripal zone maintain higher taxonomic diversity and the macrozoobenthos community responds more strongly to environmental changes than organisms in the deep zone.

This paper presents the results of a three-year study of the composition, structure and distribution of macrozoobenthos communities in the ripal zone of the Bulgarian Danube River section, in the context of the existing anthropogenic pressure.

The results of the analysis of the structure of the bottom substrate, fluctuations of water levels, water temperature, pH, electrical conductivity, concentrations of dissolved oxygen, nutrients in water and sediments, and heavy metals and arsenic in water and sediments are also presented. The percentage distribution of the substrate plays a leading role in the distribution of macrozoobenthos communities, with primary aquatic organisms

showing significant association with a greater number of substrate types compared to secondary aquatic organisms. The greater the fluctuations in water levels and the longer the period before sampling in which they occur, the more significant is the relationship with the change in the number of organisms. The hydrological regime has a strong impact on the concentrations of dissolved oxygen and phosphorus in the water, and at high water levels, the incoming dissolved organic matter from the floodplain on the one hand increases turbidity, and on the other hand, the entry of phosphorus related to organic matter into the water increases. Organic pollution is reported more strongly in the presence of city upstream the station than in the presence of a tributary. Heavy metal and arsenic pollution in water is equally high at stations after tributaries and after cities, while their accumulation in sediments is greater at stations after tributaries. On the other hand, tributaries and cities have a stronger impact on the loading of water with nutrients than with heavy metals and arsenic.

High water levels and their sharper fluctuations cause less favorable conditions for the development of benthic organisms in the ripal zone. In conditions of low water levels, the communities of the stations in the sidearms of the islands have a more stable structure than those in the main riverbed. Despite the large number of species identified in the modern period (2012 – 2014), the abundance of supraspecific taxa remains lower than observed in retrospect even during a period of high impact, immediately after the construction of the Iron Gate I hydroelectric power plant for the area of the Bulgarian section of the Danube River. Changes in the taxonomic composition, abundance and distribution of members of the Gastropoda, Bivalvia, Malacostraca, Trichoptera and Chironomidae groups reflect changes in habitat status to a greater extent than those of other groups. The stations in the arms of the islands, as well as the stations before Novo Selo, Dolni Tsibar, Svishtov and Ruse from the main riverbed, stand out as the least affected by anthropogenic pressure.

The assessment of the ecological potential according to the proposed modification of the methodology for calculating the

mRBA, standardized in the national legislation for monitoring the Danube River, showed that in low water conditions (the period during which the standard hydrobiological monitoring should be carried out) the predominant part of the stations in the arms of the islands and a considerable part of those in the main bed fall within the "Good" ecological potential. The performance of the index calculated according to the proposed modification of the methodology for calculating the mRBA index is also confirmed by the reliable correlations with a significant number of environmental variables that have an impact on the composition, structure and distribution of macrozoobenthos communities.