

SUMMARY

The anthropogenic salinisation of inland waters is a factor that is causing major changes in aquatic ecosystems around the world. Its importance has grown significantly in recent decades. Waters with a high level of salinity are often found in industrialised, urbanised and hard coal mining areas. Previous studies on benthic macroinvertebrates in waters with increased salinity have primarily been conducted in rivers, and only occasionally in stagnant waters, especially those of an anthropogenic origin.

The lack of comprehensive studies on the zoobenthos in anthropogenic reservoirs that have a large salinity gradient was the reason for undertaking the presented research. Its aim was to assess the diversity of benthic macroinvertebrate communities in water bodies with different salinity levels in the mining area of the Upper Silesian Coal Basin. The research concerned the impact of selected environmental factors (water parameters, substrate type, grain size of bottom sediments, organic matter and selected heavy metal content in the bottom sediments) on the density, biomass and structure of the functional feeding groups of benthic macroinvertebrates with a particular emphasis on the molluscs and oligochaetes that are dominant in the fauna as well as on the presence of alien species.

During the study period, a total of 102 128 macroinvertebrates belonging to 67 families were collected. The diversity of the zoobenthos was the highest in the subhaline water bodies and the lowest in the hypohaline ponds. A positive correlation was found between the water salinity and the density and biomass of macroinvertebrates, which was caused by the abundance of the invasive alien species, *Gammarus tigrinus* and *Potamopyrgus antipodarum*, in the ponds with the highest salinity levels. The results of the conducted research indicate that the anthropogenic salinisation of stagnant inland waters not only facilitates the invasion of alien species, but also enables the colonisation of these habitats by halophilic oligochaete species such as *Paranais litoralis* and macrophytes, *Ruppia maritima*, which had only been known from the Baltic Sea coast, and the water bug, *Sigara assimilis*, whose presence in one of the saline coal mine settling pond is the first record of this species in Poland.

The conducted research showed that a high level of water salinity is a significant threat to benthic fauna, and contributes to a decrease in its diversity including oligochaetes and molluscs. No molluscs were found in waters with a mineralisation above 17.1 g/L. Only the

invasive alien species *Potamopyrgus antipodarum* was present in the hypohaline waters. Among the oligochaetes in the hypohaline ponds, four species were found. In waters with the highest salinity, only *Paranais litoralis* was present in large populations.

In the investigated anthropogenic water bodies, the structure of benthic macroinvertebrates, besides salinity, was affected by the content of biogens in the water and the organic matter in the bottom sediments. The structure of mollusc and oligochaete communities was also significantly affected by the alkalinity and the type of substrate. In the case of molluscs, the pH of the water, the content of iron and the grain size of the bottom sediments also had an impact.

The obtained results contribute to a better understanding of the factors that affected the macrozoobenthos in reservoirs with a large salinity gradient in the areas associated with hard coal mining, which could be a source of knowledge that can be used in monitoring of waters that are under the influence of the mining industry as well as for assessing the losses and threats from mining to biodiversity in aquatic ecosystems.

Global climate change and human activity related to the discharge of large loads of salt into surface waters may result in the enlargement of the areas that are at risk of secondary salinisation. Therefore, the research should be continued by extending it to water bodies and related watercourses, which are quite numerous on the area of the Upper Silesian Coal Basin in order to monitor any changes in the aquatic biocenoses and dispersions of invasive alien species.