Biotic indices in water quality assessment for reference rivers: A comparative analysis of bioindication indices of the Baitugan River (High Transvolga Region)

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Abstract

The comparative analysis of biotic indices and parameters was performed for assessing the water quality of small rivers. The small Baitugan River in the forest–steppe zone of the High Transvolga Region was studied as part of the environmental monitoring and singled out as a reference river based on its hydrochemical parameters. Using the specific combinatorial index of water pollution, it was found that the water quality of the Baitugan River at all reference sites corresponds to class II (slightly polluted). The methods and metrics of the EU Framework Water Directive (WFD) and the methods that are commonly applied in Russia were used for comparative analysis of the biotic indices. The statistical analysis of the indicator significance of the studied indices showed that the TBI (Trent Biotic Index) and the BMWP (Biological Monitoring Working Party Index) indices are mostly effective for bioindication due to their low variability in water quality assessment and consistency with hydrochemical analysis. These indices can be used for the purposes of hydrobiological monitoring of small rivers in the forest–steppe zone of the Lower Volga River basin.

Keywords: small river, reference site, macrozoobenthos, bioindication, biotic indices, EU Water Framework Directive

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Figure Captions
Fig. 1. Schematic map of the reference sites of the Baitugan River.

Fig. 2. Abundance (a) and biomass (b) ratio of macrozoobenthic taxa at the sites of the Baitugan River: 1 – Oligochaeta; 2 – Mollusca; 3 – Crustacea; 4 – Plecoptera; 5 – Ephemeroptera; 6 – Hemiptera; 7 – Trichoptera; 8 – Coleoptera; 9 – Chironomidae; 10 – other Diptera; 11 – other (Hirudinea, Hydrachnidia, Aranei).

Fig. 3. Biotic indices and parameters at the sites of the Baitugan River in June 2006 and July 2010: H – bit/ind., G-WI – %, other indices and metrics – scores.

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