

New indices for assessment of hydromorphological alteration of rivers and their evaluation with benthic invertebrate communities; Alpine case study

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ABSTRACT

1. According to the EU Water Framework Directive, methodologies have to be developed for evaluating the ecological status of every water body. The aim of this study was to develop a methodology (SI_HM method) for assessing the hydromorphological status and to test the developed method with benthic invertebrate community characteristics.
2. In Slovenia 26 different national river types have been identified in the hydroecoregion Alps. Data from 126 sites belonging to 22 river types, affected by a range of hydromorphological alteration, have been analysed.
3. Inventory of the hydromorphological features was made according to the River Habitat Survey (RHS), but for the assessment of the hydromorphological status, modified SI_HM variables were developed. Some of them (SI_HM variables) were based on principles developed in the RHS methodology and were only slightly modified in order to emphasize the characteristics of local river features, whereas others, took into consideration features not included in the RHS.
4. For the assessment of morphological status River habitat quality index (RHQ) and River habitat modification index (RHM) were developed. For hydrological changes the presence of dams and distances from them were considered and for assessment of hydrological status a Hydrological modification index (HLM) was developed.
5. Multimetric indices were developed out of these hydromorphological indices for assessment of Hydromorphological modification index (HMM) and Hydromorphological quality and modification index (HQM).
6. In order to maximise the number of comparable sites, sites from different national stream types were grouped together and tested using one-way ANOVA. According to the results of the test, the selected river types were grouped in two different hydromorphological types. Correlations (Spearman rho) between hydromorphological alteration and benthic invertebrate metrics within those types were tested, but were not sufficiently strong ($r < 0.6$). Subsequently correlations between hydromorphological parameters and benthic invertebrate metrics were tested within individual national river type, and these correlations were statistically significant ($p < 0.001$) and higher, reaching values of more than $r > 0.9$.

KEY WORDS: Assessment, benthic invertebrates, habitat quality, hydrological modifications, hydromorphological indices, impoundments, RHS, SI_HM.