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A methodical approach to analyze the effect of river morphology and hydrology on fish fauna in the inner-Alpine space

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River ecosystems are diverse and dynamic habitats which are strongly influenced by direct and indirect consequences of human interventions. Several initiatives have been started all over Europe to fulfill the European guidelines for the protection of the local water bodies, but a standardized procedure fulfilling all relevant aspects and parameters of the Water Framework Directive (WFD) does not exist. To evaluate water quality, the WFD predefines biotic and abiotic parameters, such as morphology, hydrology, water chemistry as well as biological quality components, including fish fauna. In this context, we propose a new methodological approach based on salmonid fish populations to assess river quality. Our approach is based on European standardization of the Austrian and Italian methods and it has been tested in the context of an international fish project in 81 stream sections in the European Alps, having homogeneous morphological characteristics. The assessment procedure is composed of a set of 11 indicators, which were selected to evaluate longitudinal and lateral morphological and hydrological conditions: stream passability, reproduction sites, riverine dynamic, shoreline, shoreline vegetation, structure, substrate and degree of hydrological disturbance, a descent speed indicator as well as discharge conditions of hydropeaking. The indicators were then combined to 3 indices, namely: morphology index (I_M), hydrology index (I_H) and hydromorphology index (I_{HM}), to create a holistic picture of the total stream conditions. The indicator and index definition, the compilation and practical testing of the data entry form in the field, as well as the calculation of the values, were carried out jointly by a team of experts. The combination of that created a new hydromorphology index (I_{HM}) for Alpine streams. The application of the proposed method was shown in 31 river streams in South Tyrol (Italy) and Tyrol (Austria) covering a wide range of different anthropogenic changes and pressure degree, which enabled the trial of the methodology and the refinement of the indicators and indices. The outcomes of our study lead to interesting insights regarding applicability, strengths and weaknesses of the proposed approach.