Abstract

River Network Connectivity—An Holistic Approach to Improve the Sustainability of Fish Populations †

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Abstract: Rivers are intrinsically linked with human settlement and civilization development. This has forced upon rivers a multitude of pressures. Arguably, one of the most pervasive pressures is river network fragmentation. The consequent loss of longitudinal connectivity has long-lasting disruptive effects on ecosystem functioning. Fish are among the most affected organisms, as they are unable to freely disperse along river networks, affecting the tenuous population and meta-community balance. To tackle fragmentation problems, it is important to evaluate the degree of fragmentation, understand the impacts, develop and apply cost-effective prioritization procedures of connectivity restoration, and design connectivity enhancement solutions that may be applied to different barrier types. In this work, we demonstrate how one should take a holistic approach to river network connectivity studies by presenting the key findings and take-home messages of a 15-year research path focused on river network connectivity. This encompasses theoretical and laboratory-controlled experiments and fieldwork, ranging from historical fish occurrences to predictions of future distributions and from fish passage research to management and planning solutions to enhance connectivity. This global analysis intends to demonstrate that the optimal way to address river network connectivity issues is to establish a holistic perspective, taking overarching approaches at multiple spatial and temporal scales.

Keywords: fishways; river barriers; graph theory; functional connectivity; ecohydraulics

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