

MESO-SCALE HABITAT MODELING IN HIGH GRADIENT STREAMS

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Abstract:

The study aims to evaluate a possible methodology for habitat modelling in high gradient streams located within Apennine and Alps mountain range in North-Western Italy. The methodology is based on the meso-scale habitat modelling approach of the MesoHABSIM simulation system, and can support the environmental flows assessment and the definition of habitat restoration measures in such watercourses. Data coming from 34 study sites located within the mountainous areas of Valle d'Aosta, Piemonte and Liguria regions are used in the analysis. The use of the meso-scale approach shows several advantages in modelling habitat for fish in high gradient streams, encompassing a range of scales. Firstly, the applied meso-scale modelling uses GIS and mobile mapping techniques as a quick data collection strategy to describe and determine the spatial proportions of mesohabitats units in stream reaches. Considering biological models, the meso-scale approach employs the logistic regression, involving a large range of habitat variables (e.g. physical and chemical habitat attributes) and enabling understanding of the fish community behaviour at large spatial scale with a multivariate approach. From an hydraulic point of view, the meso-scale habitat models adapt particularly well to the high gradient watercourses not requiring hydraulic discharge simulation, being able to model the hydrodynamic and habitat variations over a range of discharges. Finally, as an example of results extrapolation, the study reports the upscaling of the environmental requirements for fish using a catchment grouping technique, splitting the study domain in homogeneous sub-regions distinct on both minimum environmental flows requirements and catchment/stream characteristics. Evaluating its application in several study sites, the proposed methodology seems to have some interesting potentials for further applications in defining environmental flows and habitat restoration measures for many mountainous rivers simultaneously.