



## **Impact of alternative environmental flow prescriptions on hydropower production and fish habitat suitability**

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Anthropogenic activities along streams and rivers are increasingly recognised to be a major concern for fluvial ecosystems. The management of water resources, by means of e.g. flow diversions and dams, for industrial, agricultural, water-supply, hydropower production and flood protection purposes induces significant changes to the natural streamflow regime of a river. Indeed, the river flow regime is known to be a major abiotic factor influencing fluvial ecosystems. An established approach aimed at preserving the behaviour and distribution of fluvial species relies on the definition of minimum streamflow requirements (i.e. environmental flows) downstream of dams and diversion structures. Such environmental flows are normally identified through methodologies that have an empirical nature and may not be representative of local ecological and hydraulic conditions. While the effect of imposing a minimum discharge release is easily predictable in terms of e.g. loss of hydropower production, the advantages in terms of species preferences are often poorly understood and seldom assessed. To analyse the interactions between flow releases and the behaviour and distribution of fluvial species (i.e. from periphyton, to benthic invertebrate and fish), one may use a habitat suitability curve, which is a fundamental tool capable of describing species preferences influenced by any generic environmental variable. The outcomes of a real case study applied to several Italian rivers, located in the Marche administrative district in Central Italy ( $\sim 10000\text{km}^2$ ), in which we quantitatively assess the effects of alternative environmental flow scenarios on the existing hydropower network and on two fish species that are quite abundant in the study area (i.e. *Leuciscus cephalus cabeda* and *Barbus barbus plebejus*), will be presented and discussed. The proposed analysis, which can be easily adapted to different riparian habitats and hydrological contexts, is a useful tool to guide the derivation of optimal water resource management strategies in order to ensure both hydropower production and fluvial ecosystem protection.