Executive Summary

D1.2 Risk classification of European lampreys and fish species

Aim

After having analysed the species-specific sensitivity against mortality, i.e. the species' intrinsic resilience, this study aimed to characterise the potential impacts of hydropower on fish. The main objective was to analyse the principal operation related impacts of hydropower and identify species most at risk. The results provide the operation related component or baseline for developing a fish population hazard index for the European fish fauna.

Methods

Three principal operation related impacts of hydropower have been identified: i) migration barrier, ii) mortality, and iii) habitat loss due to impoundments. Migration barriers notably affect diadromous fish, which are obligatory migrants, moving between freshwater and marine environments. Mortality has been quantified and classified primarily during turbine passage. Other types of hydropower induced mortality, e.g. at trash racks, could not be quantified. Habitat loss due to impoundments has been attributed to hydromorphological processes and related habitat characteristics. Correspondingly, lithophilic, i.e. gravel spawning species were identified experiencing the highest impacts of habitat loss due to impounding rivers.

Species were classified at very high risk from hydropower operations, if at least three of the four following conditions were fulfilled: i) belonging to the high or highest sensitivity class, ii) having high or highest mortality risk during turbine passage, iii) being diadromous, and iv) being lithophilic.

Species were classified as high risk in hydropower environments, if two of the conditions mentioned above were fulfilled, and they were classified as lower risk, if only one or none of the conditions were fulfilled.

Results

The sensitivity matrix contains 148 native European fish and lamprey species occurring in European waters. Of these, 18 species were classified as having the highest sensitivity and 29 with high sensitivity. Twenty two of the classified species are diadromous. The habitat degradation and loss in the impoundment particularly affect lithophilic fish, which represent a total of 76 species.

The mortality was empirically derived from turbine passage studies. Data were gathered for 42 species in total, of which 20 had a sufficient sample size. The data could be used to derive a model to assess the length dependent potential mortality risk for data deficient species. However, here only the empirical data for the 36 species occurring in more than one study with more than one specimen provided in Table 4 were used for identifying species' mortality risk.

Combining the intrinsic sensitivity of species and the operation related impacts of hydropower, as mentioned above, 21 and 25 species face a very high and high risk, respectively. Among the species at very high risk, there are several candidate species to be considered for environmental impact assessment, as well as mitigation for various river types, e.g., the diadromous salmonids or the large bodied cyprinids, like barbel, nase, asp, and ide, but also the smaller bodied dace.

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 727830.

Specific spatial and habitat requirements have been compiled for a range of riverine species, although data availability was very heterogeneous and for most species very limited and data quality highly incoherent among different studies.

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