Abstract
Should I Stay or Should I Go? Fish Passability in a Rock Weir (Tagus River) under Climate Change Scenarios †

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Abstract: Iberian rivers often face annual periods of flow intermittence during the dry season, when habitat availability for freshwater organisms is drastically reduced. Climate change and the presence of small barriers such as weirs may further exacerbate this lack of suitable habitat, particularly for freshwater and migratory fish that perform seasonal movements to complete their life cycle, by narrowing the submersed area and their possibilities of overcoming these barriers. Using the River2D model, we investigated how the current released flows from a nearby large hydropower plant in the Tagus River affect the passability of native fish species at a downstream rock weir (Pego), equipped with a nature-like fish ramp. Using mean daily flow data from gauging stations, we compared the passability of six fish species under low flow conditions (Q90), considering a historical period (1991–2005), and two flow datasets based on climate change projections until the end of the century (2071–2100) for the Tagus River Basin (“moderate” RCP 4.5 and “extreme” RCP 8.5). Target species included three migratory guilds: (i) anadromous—Allis shad (Alosa alosa), twaite shad (Alosa fallax) and sea lamprey (Petromyzon marinus); (ii) catadromous—European eel (Anguilla anguilla) and thlinlip grey mullet (Chelon ramada); and (iii) potamodromous species—Iberian barbel (Luciobarbus bocagei). Overall, our results show that the passability of all fish species may only be ensured with a minimum flow of 3 m s⁻¹ and by using a fish ramp. Furthermore, the passability for all species was found to be significantly lower in the RCP scenarios when compared to the historical period. Our study suggests that climate change is expected to reduce the passability of native fish species in weirs in Iberian rivers, highlighting the importance of considering future flow conditions for a proper management of fish populations in the presence of weirs and other barriers.

Keywords: nature-like fishway; rock weir; climate change; low flows; habitat suitability


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