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Abstract

Impact of Small Weirs on the Distribution, Abundance, and Habitat Use of the Threatened Species *Achondrostoma asturicense* †

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Abstract

Mediterranean rivers experience various pressures that cause native fish populations to decline. This is the case of *Achondrostoma asturicense*, a threatened endemic species recently classified as "endangered" (EN) by the Portuguese Red Book. In northeastern Portugal, the main populations occur in the Carvalhais (Tua basin), Maçãs, and Angueira (Sabor basin) rivers. This study aimed to evaluate the effect of small weirs on the distribution, abundance, and habitat use of *A. asturicense* populations along the longitudinal gradient of River Angueira. Three river zones (Z1 to Z3) affected by small weirs were selected along the watercourse. In each zone, four sampling sites were distributed relative to the weir, as follows: A1—200 m downstream; A2—immediately downstream; A3—under the influence of the reservoir; and A4—200 m upstream (reference). Sampling was carried out in three seasons: winter, spring, and summer 2025. Physical–chemical (water), hydromorphological (habitats), and biological (fish) elements were assessed in accordance with the protocols of the Water Framework Directive. The results revealed the worst water quality in the summer season due to flow reduction, dissolved oxygen depletion, elevated conductivity, and high nutrient (N, P) concentrations, leading to eutrophication phenomena. The distribution and abundance of *A. asturicense* were negatively influenced by the presence of small weirs, which were dominated by the non-native species *Lepomis gibbosus*. PERMANOVA analysis (two-way, $p < 0.05$) identified significant differences (Pseudo-F = 28.349, $p < 0.05$) between sampling sites and river zones, and paired similarity analysis tests (ANOSIM; one-way, $p < 0.05$) confirmed that these differences occur only between the weir reservoir (A3) and the remaining sampling sites. *A. asturicense* showed a maximum length (Lmax) of 135 mm, isometric growth only in the upstream zone (Z1), and significant differences in body condition ($0.75 < K < 0.84$). This species showed a preference for rheophilic habitats, with coarse substrate and diversity of currents and distinct cover mainly guaranteed by submerged aquatic macrophytes. *A. asturicense* populations are severely affected in the River Angueira by habitat fragmentation, riparian degradation, pollution, invasive alien species (e.g., *L. gibbosus*, *P. clarkii*, *N. vison*), and climate change, justifying the development of mitigation and restoration measures for the conservation of natural habitats and native threatened species.

Keywords: *Achondrostoma asturicense*; habitat fragmentation; habitat use; conservation

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