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Abstract

Study of Exotic Ichthyofauna: The Particular Case of the Invasive Potential of *Phoxinus phoxinus* in Sousa River, North Portugal †

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† Presented at the XI Iberian Congress of Ichthyology, Vila Real, Portugal, 23–27 June 2026.
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Abstract

Introduction: Biological invasions constitute one of the main threats to freshwater ecosystems, causing significant ecological changes through the introduction of exotic species that compete with or prey upon native species. In Portugal, the introduction and spread of exotic species in lotic and lentic ecosystems, such as pike (*Esox lucius*), European catfish (*Silurus glanis*), and largemouth bass (*Micropterus salmoides*), all top predators, may have a big impact on autochthonous species. In contrast, bleak (*Alburnus alburnus*), European perch (*Perca fluviatilis*), and common carp (*Cyprinus carpio*) compete aggressively for food resources. In the Sousa River basin, gudgeon (*Gobio lozanoi*) is considered an exotic species with potential ecological impact, with the minnow (*Phoxinus phoxinus*) stand having been recently identified in Portugal and, so far, recorded only in this river basin, and not yet being classified as an invasive species in Portugal. Public knowledge regarding invasive aquatic biodiversity remains a significant bottleneck for conservation. Because recreational angling is a prominent dispersal vector, initiatives that directly target this community are relevant. **Objective:** The aim is to carry out a bibliographic review on the exotic ichthyofauna species present in the Sousa River, with special focus on the invasion potential of the minnow (*P. phoxinus*). **Methodology:** The literature review was conducted based on the ScienceDirect, Springer Nature Link, and Fauna Norvegica databases, selecting publications between 2006 and 2025 concerning relevant studies on the potentially invasive characteristics of the minnow (*P. phoxinus*). The methodology is based on the analysis of studies regarding the impacts caused on riparian ecosystems. **Results:** The species *P. phoxinus* presents a generalist diet and high adaptive capacity, allowing it to colonise new habitats and compete aggressively with native species for trophic resources. Its presence is associated with negative impacts on brown trout populations (*Salmo trutta*), reducing growth and productivity, especially in mountain ecosystems. Increased species density also causes a significant decrease in benthic macroinvertebrate biodiversity. Studies conducted in the Douro basin indicate that the arrival of minnow in Portugal resulted from human action, probably associated with its use as live bait in recreational fishing. Conservation programmes use diverse tactics to bridge the awareness gap. Recent initiatives feature electrofishing demonstrations to visually differentiate species, theatrical performances, and even culinary show-cooking events using invasive predators like the European catfish to promote harvesting. **Conclusions:** The potential transition of *P. phoxinus* into an exotic

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Academic Editor: Alberto Teodorico Correia

Published: 23 June 2026

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and invasive species may be associated with the ecological pressure exerted on native communities, particularly through competition for trophic resources, highlighting the need to assess its dispersion in the Sousa basin and its impacts on fish fauna and benthic macroinvertebrates. It is important to do more sampling to understand its real distribution in the Sousa Basin. Additionally is important to explain to recreational anglers and the general population the impacts of fish transfer and the adverse effects of invasive species on freshwater Portuguese ecosystems.

Keywords: *Phoxinus phoxinus*; exotic species; Sousa River; river ecosystem impact

Author Contributions: Conceptualisation, H.L., A.O., A.M. and J.S.C.; methodology, H.L. and A.O.; validation, H.L., A.O., A.M. and J.S.C.; formal analysis, H.L. and A.O.; investigation, H.L. and A.O.; resources, A.O., A.M. and J.S.C.; data curation, H.L. and A.O.; writing—original draft preparation, H.L. and A.O.; writing—review and editing, A.O., A.M. and J.S.C.; visualisation, H.L., A.O. and J.S.C.; supervision, A.O., A.M. and J.S.C. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Data sharing is not applicable for this abstract.

Conflicts of Interest: The authors declare no conflicts of interest.

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