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Abstract

Reproductive Strategies of the European Catfish at Its Southern Invasion Front: Insights from the Tagus River †

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Abstract

Introduction: The European catfish (*Silurus glanis*) has expanded rapidly across Europe, significantly impacting native freshwater biodiversity. Despite its well-documented ecological and economic effects as a top predator, reproductive biology data from non-native populations remain scarce, limiting the development of effective management strategies. **Objective:** This study examines key reproductive traits, sex ratio, size at first maturity, spawning period, fecundity, and oocyte diameter, of an invasive European catfish population in the Lower Tagus River (LTR), Portugal, approximately 15 years after its establishment. **Methodology:** A total of 674 individuals were collected monthly from January 2022 to November 2023 using electrofishing, gill nets, baited hook-lines, and catches from professional fishermen. Sex and reproductive stage were assessed via gonadal analysis. Size at first maturity was estimated using logistic regression. Fecundity was determined by the gravimetric method, and oocyte stage and diameter were assessed histologically. The gonadosomatic index (GSI) was used to characterise the reproductive cycle. **Results:** The sex ratio was significantly female-biased (1.4:1). Size at first maturity (TL_{50}) was 72.9 cm TL for females and 68.8 cm TL for males. The spawning season extended from February to June, coinciding with water temperatures of 11–23 °C, with the highest GSI values reported to date for this species (GSI max = 22.5%). Histological analysis confirmed asynchronous oocyte development. Absolute fecundity ranged from 8364 to 319,000 oocytes per female and was positively correlated with total length and body weight. Mean mature oocyte diameter ranged from 1.50 to 3.21 mm. **Conclusions:** The European catfish in the LTR exhibits high reproductive plasticity, early maturity, a prolonged spawning season, and elevated fecundity, likely facilitated by warm water temperatures and abundant prey resources. Crucially, these parameters reveal earlier maturation and greater reproductive investment relative to native populations, demonstrating an extreme phenotypic plasticity characteristic of successful invasions in southern European aquatic ecosystems. These findings provide essential biological parameters for targeted management, including selective removal of large females, intensified fishing effort during the spawning season, and population monitoring to prevent compensatory reproductive responses.

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