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Short communication

First record of *Silurus glanis* Linnaeus, 1758 in Portugal (Iberian Peninsula)

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Introduction

Species introductions worldwide are becoming more widespread and their impacts more harmful, especially regarding the introduction of predatory fish (Cox and Lima, 2006). Freshwater fish invasions are related to ecosystem consequences, namely, the decline of native species, and contribute to biotic homogenization on a global scale (McKinney and Lockwood, 1999; Villéger et al., 2011). The Mediterranean region freshwater ecosystems have a high number of endemic species but are under threat mainly due to non-native fishes (NNF), which currently represent more than 50% of the fish diversity (Smith and Darwall, 2006; Leprieur et al., 2008; Hermoso and Clavero, 2011). Iberian rivers are among the most invaded ecosystems within the Mediterranean region, with more than 25 NNF confirmed in Spain and 16 in Portugal (Elvira and Almodóvar, 2001; Ribeiro et al., 2009; Ribeiro and Veríssimo, 2014). It is predicted that further Iberian invasions will occur given the prevalent European invasion route (García-Berthou et al., 2005; Leprieur et al., 2008; Ribeiro et al., 2009).

The wels catfish *Silurus glanis* Linnaeus, 1758 is among the largest freshwater fishes worldwide, being native to Eastern Europe and Western Asia and introduced to seven European countries (Copp et al., 2009). *Silurus glanis* exhibits rapid growth rates and attains a large body size (*c*. 500 cm total length and 306 kg), characteristics highly appreciated by anglers (Slavík et al., 2007; Copp et al., 2009). In recent years recreational fishermen have reported several captures of putative *S. glanis*; however, species identification lacks confirmation in Portugal. In the present paper, a first observation of the wels catfish *S. glanis* is confirmed in Portugal.

Materials and methods

On 15 April 2014, a local fisherman captured a *S. glanis* individual of approximately 1180 mm and 14.4 kg by gillnet in Aldeia das Caneiras, Santarém (39°13′59″N, 8°39′59″W), in the Tagus River (Portugal) lowlands. However, only a tissue sample was kept and preserved in absolute ethanol. A second specimen was collected on 26 April 2014 at the same location and brought to the laboratory for morphological identification, following Kottelat and Freyhof (2007). A tissue sample was also collected and preserved in absolute ethanol for species identification using cytochrome *c* oxidase I (COI) gene sequencing (Hebert et al., 2003; Ratnasingham and Hebert, 2007). The individuals and the tissue samples from both specimens were deposited in the zoological collections 'Museu Bocage' of the Museu Nacional de História Natural e da Ciência (MUHNAC; University of Lisbon, Portugal): MB05-003455, individual in the Fish Collection; MB85-015872 and MB85-015873, samples in the Tissue and DNA Collection. Measurements of total length (TL ± 1 mm), standard length (SL ± 1 mm) and total weight (TW ± 0.1 g) were determined. Fish was dissected to determine sex, maturity stage, gonad weight (GW ± 0.1 g) and total fecundity.

Genomic DNA was extracted from both preserved tissue samples following a standard phenol-chloroform protocol adapted from Sambrook et al. (1989). DNA quality and concentration were accessed using the NanoDrop Spectophotometer ND-1000 v3.2.1. and standardized to 50 ng μl^{-1} per sample. The COI-5P fragment was PCR-amplified using the primer cocktail C_FishF1t1-C_FishR1t1 (tailed version of the primers VF2_t1, FishF2_t1, FishR2_t1 and FR1d_t1; Ivanova et al., 2007) and following PCR reactions and cycling conditions according to Ivanova et al. (2007) and Costa et al. (2012). PCR products were visualized on a 1% agarose gel, purified using the EXO-SAP clean-up protocol (Werle et al., 1994) and sequenced by STABVIDA (http://www.stabvida.com/) from both 5′ and 3′ ends using the primers M13F and M13R (Ivanova et al., 2007). Forward and reverse sequences of COI-5P were edited, aligned, and consensus sequences were generated using SEQUENCHER™ 4.8 (Gene Codes Corporation). A 655 bp COI-5P sequence was recovered for both samples and submitted to The Barcode of Life Data System (BOLD) and GenBank (accession numbers: KP237864 and KP237865). To accomplish species identification, the COI-5P sequences from both samples were included in a query search using GenBank's Basic Local Alignment Search Tool (BLAST; Altschul et al., 1990, 1997) and BOLD Identification System (IDS; species level option).

Results

The morphological and meristic features and body coloration of the second captured individual led to the unequivocal identification of the fish as *S. glanis*. The specimen was a female of 826 mm TL, 755 mm SL and body weight of 3.690 kg. The Gonadosomatic Index (GSI) was 12.2% and total fecundity was about 76 500 eggs. For both tissue samples, COI-5P sequences search using BLAST and BOLD IDS retrieved maximum percentage of sequence similarity with database entries of the species *S. glanis* (99–100%). The next high values of sequence similarity recovered in BLAST and in BOLD IDS dropped to 92% and matched database entries of *Silurus asotus* Linnaeus, 1758.

Discussion

This confirmation of *S. glanis* in Portugal increases the number of invaded countries to eight (Copp et al., 2009). The catfish was initially introduced to the Iberian Peninsula in 1974 at the Mequinenza-Ribarroja Reservoir (Ebro drainage), most likely from French populations (Doadrio, 2002). Secondary introductions were reported later in the Catalonia coastal watersheds (Carol et al., 2003; Benejam et al., 2007), in the mid-Tagus drainage (Doadrio, 2002; Pérez-Bote and Roso, 2009), and recently in the Guadalquivir River (Moreno-Valcárcel et al., 2013). Most likely the wels catfish reached Portugal through downstream dispersal along the Tagus River from source populations in Spain (*c.* 200 km upstream). However, fishermen translocations cannot be excluded, given that this has been the main vector of fish introductions into new drainages in the Iberian Peninsula. Moreover, previous unconfirmed records for the Tagus drainage were in large reservoirs disconnected from the source populations. Similar to other NNF invasion routes (Gante and Santos, 2002; Ribeiro et al., 2006, 2007; Ribeiro and Veríssimo, 2014), the wels catfish has expanded its distribution from the eastern to the central part of the peninsula due to human mediated introductions, and passively spreading westward downstream through international rivers.

According to the age data (Copp et al., 2009; Alp et al., 2011), the specimens had an approximate age of 5–6 (TL = 828 mm) and 8 years (TL = 1180 mm), respectively. This suggests that the wels catfish arrived in Portugal within the past 8 years, and that impacts on native biota should be investigated. A high growth rate, longevity, voracious and versatile feeding habit, high fertility and parental care of the offspring, as well as ability to withstand high water temperatures (Carol et al., 2009; Copp et al., 2009) makes *S. glanis* a potential threat to autochthonous fish species. In the 20th century, most of the NNF introduced to the Iberian Peninsula came from North America and Asia (Holčik, 1991; García-Berthou et al., 2005; Rabitsch et al., 2013), but recent NNF introductions have their origins in Europe (e.g. Vinyoles et al., 2007; Aparicio et al., 2013). Management measures should be undertaken to prevent the biotic homogenization of the Iberian fish fauna by the European NNF, and to curb established species such as the wels catfish from becoming even more widespread inside Iberia.

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