

## Rapid Communication

## First records of the European catfish, *Silurus glanis* Linnaeus, 1758 in the Americas (Brazil)

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### Abstract

The European catfish, *Silurus glanis* is one of the largest freshwater fish worldwide. Although it originally inhabited rivers of Eastern Europe and Western Asia, this species is spreading within Europe, due to its popularity among anglers and interest in it as a potential species for aquaculture. This species has never been recorded in America until now. In August 2006, in the State of Santa Catarina, Southern Brazil, the local newspaper “Diário Catarinense” reported, with a photograph, the capture of a huge catfish by an amateur fisherman in the Itajaí-Açu River, which was identified as *S. glanis*. In March, 2010, the Laboratory of Ecology, Ichthyology and Fisheries (LEPI) of the Federal University of Paraná received another individual of *S. glanis* that had died in a small pond next to the Piquiri River, in the State of Paraná. Our aim is to report these two independent and geographically separate records of *S. glanis* in South America, as well as highlight our concerns about the illegal transport of aquatic organisms, which is a serious threat to the conservation of natural resources, especially in megadiverse regions such as Brazil.

**Key words:** non-native species, large size top-predator, aquaculture, recreational fishing, Siluriformes

### Introduction

The human-mediated introduction of non-native species is one of the greatest global threats to fishes (e.g. species extinction, Clavero and Garcia-Berthou 2005), particularly the introduction of large top-predators in freshwater ecosystems (Vitule et al. 2009; Paolucci et al. 2013). The establishment success of these large non-native top-predators used in sports fishing activities is especially dependent on the assistance of anglers or on recreation facilities. This is a subject of great concern, because: i) freshwater ecosystems are heavily invaded by non-natives (Strayer 2010) and ii) due to globalization, the introduction rate of non-native fishes has rapidly increased in recent years (Copp et al. 2007; Gozlan et al. 2010). Since a large body size is an important

characteristic linked to both game fish and invasive success (Donaldson et al. 2011; Vitule et al. 2012), the introduction of a large non-native consumer might result in negative effects, even before the establishment phase of the invasion process (Blackburn et al. 2011). Effects include the local extirpation of native species or individual-level sub-lethal impacts such as feeding behavior disturbances (Baxter et al. 2004) and parasite transmission (Pretender et al. 2004) that are difficult to detect. The potential negative effects on native species can be high, due to high longevity and more importantly, because of the lack of co-evolutionary history with native assemblages (Leopold 1939; Paolucci 2013).

The European catfish, *Silurus glanis* Linnaeus, 1758, also known as wels or sheatfish is one of the largest freshwater fish worldwide with recorded

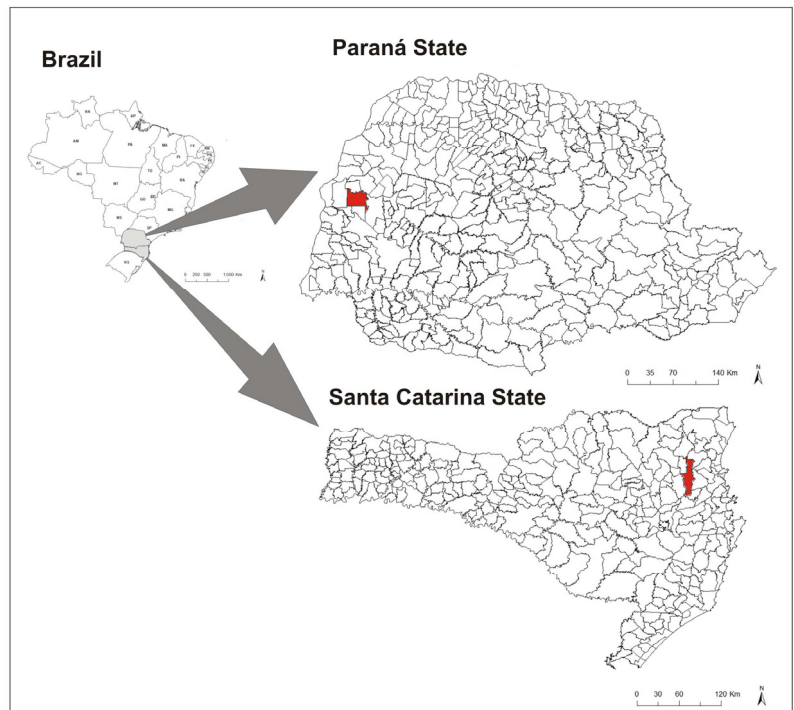


**Figure 1.** Article published on 15 August 2006 in the newspaper "Diário Catarinense", reporting the capture of a huge catfish (1.85 m long and 86 kg) by an amateur fisherman in the Itajaí-Açu River, in the Municipality of Blumenau in the State of Santa Catarina, Brazil.

individuals of 5 m in length and 306 kg in weight (see Copp et al. 2009; Hogan 2011). This species is used for recreational and commercial fishing, as well as for aquaculture, because they show rapid growth and are hardy and physiologically robust (Copp et al. 2009). This species is native to rivers of Eastern Europe and Western Asia, but is currently spreading throughout Europe and the world due to its popularity among anglers and interest in it as a potential species for aquaculture (Alp et al. 2011). The FAO Database of Introduced Aquatic Species – DIAS (FAO 2013), notes that *S. glanis* has been introduced into the UK, Denmark, The Netherlands, Cyprus, Italy, Spain, Algeria, Tunisia, Belgium, Germany, France, Kazakhstan, Croatia, Turkey, Syria and China, mainly by anglers and aquaculture activities, with records of self-sustainable populations in more than 80% of the countries to which it has been introduced.

The European catfish is an opportunistic predator and has also been considered to be a scavenger (Hickley and Chare 2004). Cucherousset et al. (2012) observed the behavioral strategies

developed by *S. glanis* in the river Tarn (Southwestern France), and reported a beaching behavior to capture birds on land, similar to many mammalian marine predators, and termed them "freshwater killer whales". Such behavior leads to a high level of trophic variability among individuals, suggesting that this new predation behavior might represent an extreme example of the ability of *S. glanis* to adapt to a new environment that could have unexpected implications for consumer-resources dynamics and ecosystem functioning. Therefore, these important occurrences should be reported, given the huge indirect effects associated with the introduction of apex predators in general (Estes et al. 2011), even before they establish (Blackburn et al. 2011). More importantly, the most influential global databases such as the FAO and Fishbase or GISDI do not report the presence of *Silurus* species in the Americas, especially in South America and Brazil. In this context, the aims of this note are to report two independent and geographically separate records of *S. glanis* in South America, as well as



**Figure 2.** Geographic location of the site of *Silurus glanis* capture (red mark) in the municipality of Palotina, Paraná State, Southern Brazil (24°17'02"S 53°50'24"W) and in the municipality of Blumenau, Santa Catarina State, Southern Brazil (26°54'32"S 49°04'20"W).

to raise awareness concerning the illegal transport of aquatic organisms, which is a serious threat to the conservation of natural resources, especially in megadiverse countries such as Brazil.

## Methods

We reviewed local and international databases and used reports from a local newspaper with a photograph and an individual fish specimen donated by local people. The fish that was donated to the Laboratory of Ecology, Ichthyology and Fisheries (LEPI) of the Federal University of Paraná, was measured and taxonomically identified by Dr. Weferson Junio da Graça (Maringá State University, Research Nucleus in Limnology, Ichthyology and Aquaculture, Brazil) and deposited in the LEPI/UFPR. Additionally we contacted expert researchers in biological invasion to verify that there were no previous occurrences of *Silurus* species on the American continent.

## Results

Although there is to date, no official record of *Silurus* species on the American continent, in August 2006, in the state of Santa Catarina, southern Brazil, the newspaper "Diário Catarinense"

published a report of the capture of a huge catfish by an amateur fisherman (Figure 1) in the Itajaí-Açu River, in the Municipality of Blumenau in State of Santa Catarina, Brazil (26°54'32"S, 49°04'20"W, Figure 2). We identified as *S. glanis* from the published image, due to its morphology, size and weight. According to Froese and Pauly (2013), only two species of *Silurus* have a maximum length that exceeds 150 cm; *S. glanis* and *S. soldatovi*. Moreover, in 1988, juveniles of *Silurus glanis* were imported from Hungary to the Regional University of Blumenau for artificial spawning studies and some specimens weighing 2 kg escaped into the Itajaí-Açu River via the tank overflow due to heavy rain. It is assumed that the catfish captured, weighing more than 60 Kg and 1.80 m in Blumenau, could be one of these escaped specimens (Dr Pedro Bertelli, personal communication).

In March, 2010 the Laboratory of Ecology, Ichthyology and Fisheries (LEPI) of the Federal University of Paraná, received another individual of *S. glanis* (Figure 3) that had died in a fish pond connected into the Paraná River Basin, in a subbasin of the Piquiri River, in the municipality of Palotina, Paraná State, Southern Brazil (24°17'02"S, 53°50'24"W, Figure 2). This identification was based on the size and weight (1.70 m and 70 kg)



**Figure 3.** An individual of *Silurus glanis* received by the Laboratory of Ecology, Ichthyology and Fisheries (LEPI), in March, 2010. (A) lateral view; (B) frontal view; (C) head view. Photographs by Almir M. Cunico.

and morphological data, such as the number of anal soft rays. We counted 92 anal soft rays, the species norm being between 83 and 96 (Froese and Pauly 2013).

According to the fish farmer, he bought two specimens whilst on a trip to Europe and kept them for more than 10 years on his property.

## Discussion

This record of *Silurus* species in Brazil indicates a serious threat to the conservation of natural resources. Copp et al. (2009) suggest that the establishment of *S. glanis* is favored in warmer climates (e.g. Brazil) and exerts trophic pressure on native fish if human impacts are present. The Itajaí-Açu River and Parana River Basin encompass the industrialized and urbanized region of Brazil. The Parana River Basin in particular concentrates one third of the Brazilian population in urban centers and has the largest installed electricity generation capacity in the country, with >57 large reservoirs (Agostinho et al. 2007). Reservoirs are environments susceptible to the establishment of *S. glanis* and records of introduction in European reservoirs are related in the literature (see Benejam et al. 2007; Carol et al. 2009; Moreno-Valcárcel et al. 2013). In the same way, the challenges involved in preventing new invasions can be

particularly difficult for emerging or developing countries (Lövei et al. 2012). Brazil, for example, has a megadiverse and endemic native fish fauna, but aquaculture production is almost entirely based on non-native species (Vitule et al. 2009) providing an important vector for new introductions.

In this context it is important to assess when and why this transfer of *S. glanis* occurred and who was responsible for its translocation to Brazil. Although new studies should be performed to assess whether this record represent established populations, this information is important because the introduction of new invasive species associated with importing them for aquaculture and sport fishing is one key environmental challenge, especially because the huge negative impacts catalogue (e.g. Rahel 2000; Cambray 2003; Vitule et al. 2009; Cucherousset and Olden 2011; Diana et al. 2013). Even in rich and developed nations, the problems related to aquatic non-native species (e.g., sport fishing activities, the aquaculture industry and aquarium trade commerce) are complicated in terms of legislation (Copp et al. 2005). Current attention that has focused on increases in non-native species introductions has been accompanied by confusion surrounding regulations and definitions associated with non-native species because of political questions (Copp et al. 2005; Pelicice et al. 2013). Even in

some locations where there are reasonably secure biosecurity systems for animal production, all culture systems inherently include some risk of escape, and given the large number of organism transfers made during aquaculture production, as well as potential escapes during natural disasters such as floods and storms (Schofield et al. 2007), there is a high risk of escape for most cultured species. Similarly, the social and cultural values of recreational fishing usually represent a risk in terms of new introductions of highly invasive alien fishes, especially because in most cases, non-native sport fish (e.g. top predators in aquatic ecosystems) are introduced intentionally by government agencies to develop or improve recreational fisheries, as well as illegally by anglers or anonymous eco-vandals. We recognise that sport fish and aquaculture have important roles in modern human societies in terms of culture and economy; however these values have usually been considered as more important than conserving biodiversity (Cambray 2003), therefore, it is time for responsible fisheries and aquaculture to undertake risk assessment and other proper measures that take in account long term ecological processes and natural capital. In conclusion, our report constitutes new evidence for the potential expansion of this huge, invasive, non-native catfish and other similar top-predators into a new continent, South America.

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