RECORD OF NILE TILAPIA IN THE MANDIRA RIVER, CANANÉIA, SÃO PAULO STATE

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ABSTRACT

The present short communication reports the occurrence of Nile Tilapia (*Oreochromis niloticus*) in the Mandira River, in the extractive reserve in the Cananéia estuary, São Paulo State. In May 2014, using dip nets, we collected five specimens of *O. niloticus* in the estuary, with length ranging from 1.4 to 2.5 cm and weight between 0.8 and 2.3 g. Samplings performed in July indicated the presence of additional four specimens of *O. niloticus* in other stretches of the same river. The occurrence of alien species in conservation areas has high ecological importance, as they can cause environmental and biodiversity alterations; in Brazil, the introduction of alien species is usually related to economic activities, such as the Nile tilapia aquaculture.

Key words: Atlantic rainforest; alien species; bioinvasion; *Oreochromis niloticus*

REGISTRO DA TILÁPIA-DO-NILO NO RIO MANDIRA, CANANÉIA, ESTADO DE SÃO PAULO

RESUMO

A presente nota registra a ocorrência de tilápia-do-nilo (*Oreochromis niloticus*) na Reserva Extrativista do Rio Mandira, localizada no munícipio de Cananéia, São Paulo. Em maio de 2014, foram coletados por meio de puçás, cinco exemplares de *O. niloticus* no estuário, com comprimentos variando entre 1,5 a 2,5 cm e peso entre 0,8 e 2,3 g. Coletas realizadas em julho evidenciaram a presença de mais quatro espécimes de *O. niloticus* em outros trechos do rio estudado. A ocorrência de espécies exóticas em unidades de conservação é de extrema relevância ecológica, uma vez que pode modificar o ambiente e a biodiversidade de uma região, sendo que no Brasil, a introdução de espécies exóticas encontra-se tipicamente vinculada às atividades de interesse socioeconômico, como é o caso do cultivo de tilápia-do-nilo.

Palavras-chave: Mata Atlântica; espécie exótica; bioinvasão; *Oreochromis niloticus*

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INTRODUCTION

Nile tilapia, *Oreochromis niloticus* (Linnaeus, 1758) is a freshwater fish of the family Cichlidae that is originally from coastal rivers of Israel, Nile River, Chad Lake Basin, and Niger, Benue and Senegal rivers (INSTITUTO HÓRUS, 2016). It was introduced in Brazil in 1971 (PROENÇA and BITTENCOURT, 1994) in the Northeast region by the National Department for Works Against Drought/DNOCS, in order to provide a source of animal protein for the poor (BITTENCOURT, 2012).

Currently, the tilapia farming is widespread in Brazil, especially the Nile tilapia (ANDRADE and YASUI, 2003), quite common in the Ribeira Valley, São Paulo State.

Because tilapia has special characteristics, including high tolerance to variations in environmental factors, such as salinity, dissolved oxygen, temperature and pH, this species has facility to occupy diverse habitats, and can become potential competitor against native species (PÉREZ *et al.*, 2004). Moreover, Nile tilapia has trophic and phenotypic plasticity, ecological adaptability, high reproductive efficiency, parental care of eggs and offspring, semi-permanent reproduction and earliness, making possible the occupation of various ecological niches (BWANIKA *et al.*, 2006).

During farming, there may occur accidental escapes, especially during classification, fish capture and storage of juveniles, however, deliberate releases eventually occur (AZEVEDO-SANTOS *et al.*, 2011), providing its introduction into new environments.

According to BOTARO *et al.* (2011), *O. niloticus* may be widespread in several countries, mainly in Brazil, given the tropical climate that supports the production and growth of the species throughout the year. Moreover, it is likely that the production of tilapia exponentially increase until 2025, since the Food and Agriculture Organization of the United States (FAO) estimates the need for an increase of 50 million tons of fish; Brazil being responsible for production of about 20 million tons per year of this total (FAO, 2013).

Environmental losses arising from the introduction and/or invasion of Nile tilapia have been documented in several countries, like Mexico, Australia, United States, Philippines, Madagascar (CANÔNICO *et al.*, 2005), Venezuela (SOLÓRZANO *et al.*, 2001) and Chile (PÉREZ *et al.*, 2004). Meanwhile, in Brazil, there are few studies that discuss or record the occurrence of Nile tilapia in conservation areas. Thus, this short communication reports the occurrence of *Oreochromis niloticus* in the Mandira River, located in the Extractive Reserve of Mandira, municipality of Cananéia, São Paulo state.

Study area

The Extractive Reserve (RESEX) of Mandira (Figure 1) was created by the Federal Decree of December 13rd, 2002 in order to ensure the sustainable use and conservation of natural resources, protecting the livelihoods and culture of the local extractivist population, in addition to preserving the regional biodiversity (BRASIL, 2002). It is part of the estuarine lagoon complex of Iguape-Cananéia-Paranaguá, located in the border coastal area between the states of Paraná and São Paulo, with an area of approximately 1.175 hectares (ICMBIO, 2010).

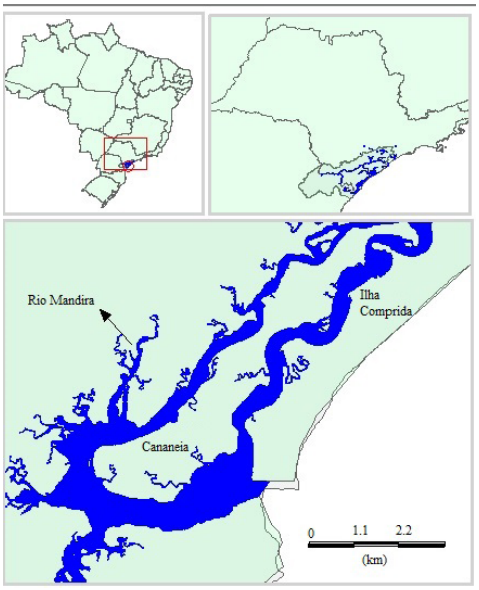

Figure 1: Study area (Mandira River). Source: Vector file provided by Geographic System of Ribeira de Iguape and Southern Coast (SIG_RB) Site: http://www.sigrb.com.*br*

The RESEX of Mandira is geographically in the Atlantic Rainforest domain, and therefore, has high biodiversity. According to Environmental System of São Paulo (SMA, 1990), in the region are found rare and/or endangered species, such as the fish *Mugil* spp. and *Centropomus* spp., crustaceans like

Litopenaeus Schmitti, *Farfantepenaeus paulensis* and *Farfantepenaeus brasiliensis* and molluscs, such as *Mytella* spp. and *Crassostrea* sp.

Although fishing is a traditional activity of families around the reserve, by 2010, it had no relevance as income-generating activity. However, future interests can undermine and threaten the conservation, since in the winter months, there is a natural increase in fish productivity, providing up to 70 kg of species, such as *Mugil* spp., allowing its use as a source of income for the region (ICMBIO, 2010).

METHODS

In May and July 2014, efforts were directed to capture freshwater prawns (Paleomolidae). Two samplings were conducted with circular net (50 cm of circle diameter and 2 mm of mesh) in different stretches of the Mandira River. The Mandira River have 9 meters wide and one meter deep. Hence, specimens of Nile tilapia were captured along with prawns. The weight was measured in an analytical balance (0.01 g) and the total length (in centimeters) with a ruler.

RESULTS AND DISCUSSION

During the samplings, we collected nine young specimens of *O. niloticus*, five in May and four in July, whose length varied between 1.4 and 2.5 cm and their weights between 0.8 and 2.3 g.

According to FROESE and PAULY (2015), the sexual maturity length of this species is 18.6 cm (range 6 – 28 cm). Therefore, the individuals collected could have escaped at very small length or it can indicating the possibility that the species has developed and reproduced, generating fertile descendants. CASTELLANI and BARRELLA (2005) characterized the fish farming in the Ribeira Valley region, the same study area of this work. They found that in 95% of farms occurred escape of exotic species, which Nile tilapia is the most frequent. Thus, it is possible that the introduction of specimens found are consequence of these escapes.

In Brazil, 436 invasive species have been recorded, according to the national database Hórus (HÓRUS, 2016). However, knowledge of the occurrence of invasive alien species in protected areas is still limited (BARBIERI *et al.*, 2007; SAMPAIO and SCHMIDT, 2013).

AZEVEDO-SANTOS *et al.* (2011) also reported the cage aquaculture as vector for the introduction of Nile tilapia in Furnas reservoir, in Minas Gerais, Brazil. The occurrence of fish escapes mostly accidental due to cage aquaculture. They also notified the escape by pass through the mesh when the juvenile organisms are stocked.

According to MARTIN *et al.* (2010), Nile tilapia can occupy estuaries for being tolerant to large fluctuations in salinity, temperature and oxygen and has rapid growth rate and high fecundity. WEYL (2008) confirmed the ability of Nile tilapia to settle quickly in new areas, through observations in the Chicamba Lake, Mozambique. In this work, one year after the introduction of *O. niloticus* were caught in the lake about 5.3 tons/month of the species.

In Brazil, MIRANDA *et al.* (2010) reported the presence of Nile tilapia at microbasin of Mato Grosso River, in Rio de Janeiro State, where 15 young specimens were collected. In a tributary of the Amazonas River, the species *O. niloticus* successfully colonized the basin after 12 years of its invasion, by pressing of the native species (BITTENCOURT *et al.*, 2014).

Once established, an invasive species can expand its distribution and can change the hydrology, biogeochemical and biotic cycles and composition of invaded ecosystems (STRAYER, 2010). These changes have been documented in Lake Valencia, Venezuela, in 1959, where the introduction of *Oreochromis mossambicus* led to the extinction of native fish Atherinella venezuelae (SOLÓRZANO *et al.*, 2001).

Effects on recruitment were also noted in lakes in the Caatinga, in which the presence of *O. niloticus* reduced zooplankton and water transparency, hindering the ability of native species in orienting visually to capture prey, especially at the early stages (ATTAYDE *et al.*, 2007).

Interspecific competition between *O. niloticus* and *Lepomis miniatus* was investigated in estuaries of the Gulf of Mexico, and results indicated that the release of *O. niloticus* could result in ecological damage to native species *L. miniatus* (MARTIN *et al.*, 2010).

Biological invasions have been a major cause of biodiversity loss worldwide (BARBIERI and MELO, 2006), being the subject of several studies, but the effects in Brazilian ecosystems have not been studied

systematically, remaining still unknown (MIRANDA *et al.*, 2010; BARBIERI *et al.*, 2016). Furthermore, there are few studies involving natural environments and environmental protection areas.

Considering that Brazil government has been motivated the cage fish farming, the cultivation of species with high adaptability, such as tilapia, should treated in carefully, since it is a protected area belonging to the Atlantic Rainforest biome. Thus, it is recommended an integrated assessment between existing fish farms in the region and fish escapes, in order to ensure the preservation of biodiversity of native species.

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