

Reappearance of matrinxã *Brycon orthotaenia* (Characiformes: Bryconidae) in the lower São Francisco river, Brazil

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Abstract. This study aimed to record the capture of matrinxã, *Brycon orthotaenia* in the lower São Francisco 40 years after his last report. Four specimens were collected near Porto Real do Colégio (Alagoas state) and Propriá (Sergipe state). The reappearance of *B. orthotaenia* probably is the result of re-stocking program made by CERAQUA in lower São Francisco since 2012. The size of the specimens ranged from 19 cm to 26.5 cm in total length. Measures for environmental restoration will provide better conditions for the establishment of migratory species that are object of recovery programs of the fish fauna in the lower São Francisco.

Key Words: re-stocking, fingerling, conservation, migration, Bryconinae.

Introduction. Fishing is an important economic activity for riverine communities, mainly because they do not require any academic qualifications. In the São Francisco river basin the practice of fishing has occurred since the Indians (Silva et al 2000). The importance of river and fish abundance was registered at the beginning of the last century in some reports. As an example of this abundance, Carneiro (1921) reported the capture of 6,000 surubim catfish, *Pseudoplatystoma corruscans* (Spix & Agassiz 1829) weighing between 5 and 50 kg in a single trawl in a marginal lagoon at Xique-Xique (BA). In the medium São Francisco at Pirapora region, Minas Gerais state, Godinho et al (1997) recorded in the 1980s a fishing production of around 12 kg fisherman⁻¹ day⁻¹. At the end of the 1990s signs of decline in fishing were appointed with production of 4 kg fisherman⁻¹ day⁻¹ (Godinho et al 2003).

The construction of hydroelectric power plants has been considered as one of the main impacts for the decline of fish stocks in the São Francisco basin, especially for migratory species that are responsible for most of the commercial fish (Sato & Godinho 2003; Arantes et al 2011; Domingos et al 2012; Weber et al 2013). The artificial barrier stops the migration route, alters the natural river flow and affects the reproductive events with consequences in the recruitment (Sato et al 2005; Weber et al 2013). At the main channel of the São Francisco river were built nine large dams (one in the upper; two in the submedium; and six in the lower São Francisco basin) (CHESF 2015).

Some migratory actions to restore the fish stocks in Brazilian impounded rivers are being conducted. Attempts to produce self-sustaining populations by re-stocking programs were misguided (Agostinho et al 2007). Nevertheless, this action is the principal strategy by hydroelectric and environmental agencies mainly influenced by politic pressure even with low return of re-stocking and dependence on endemic species in the fisheries.

The matrinxã, *Brycon orthotaenia* Günther, 1864 is an endemic migratory fish of the São Francisco river basin with importance in the commercial fishing (Sato & Godinho

2003; Sanches et al 2012). It presents seasonal reproduction associated with rainy period (Gonçalves et al 2006). Its conservation status is Vulnerable (A2cd) (IUCN 2016) and their stocks are significantly reduced in some areas of the São Francisco basin (Sato & Godinho 2003). A re-stocking program of *B. orthotaenia* has been conducted at lower São Francisco basin by Companhia de Desenvolvimento dos Vales do São Francisco e Parnaíba (CODEVASF) since 2012. After 40 years absent in the local fishing, this study reports the reappearance of *B. orthotaenia* in the lower São Francisco river and proposes actions to improve the efficiency of re-stocking programs.

Material and Method. Four sites were sampled between August 2012 and May 2015 in the lower São Francisco river in the stretch between Porto Real do Colégio (Alagoas state) and Propriá (Sergipe state) municipalities (Figure 1). For samples were used gillnets (20 m x 1.5 m) with different mesh (15 mm to 80 mm), which were set between 16:00h and 06:00h. Captured specimens were packed in bags and transported to Centro Integrado de Recursos Pesqueiros e Aquicultura de Itiúba (CERAQUA), technological center of the Companhia de Desenvolvimento dos Vales do São Francisco e Parnaíba (CODEVASF).

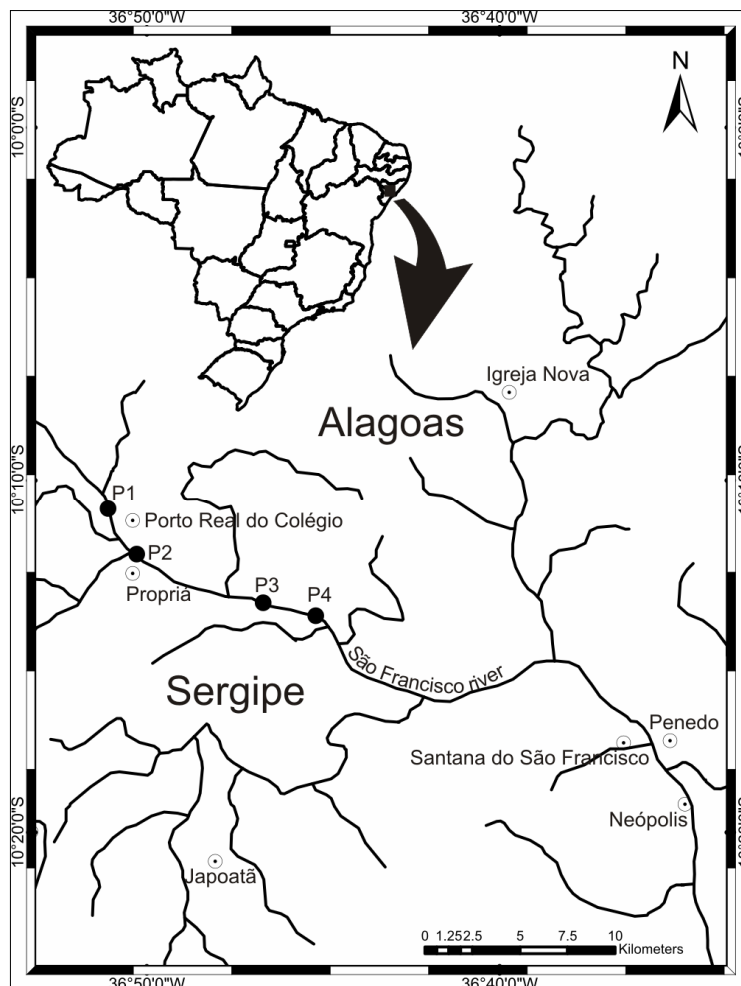


Figure 1. Sampled sites (black dots) in the lower São Francisco between Porto Real do Colégio (Alagoas state) and Propriá (Sergipe state) municipalities, Brazil.

In the laboratory the fishes had their taxonomic identity confirmed with the scientific literature (Britski et al 1984), measured (total length TL - cm) and weighed (g). The specimens were fixed in 4% formaldehyde and later preserved in 70% ethanol. Voucher specimens were deposited in the Coleção de Ictiologia da Universidade Federal de Sergipe (CIUFS).

Results and Discussion. Four specimens of *B. orthotaenia* (Figure 2) were collected in May 2015 at two sites, one (CIUFS 2189) near Porto Real do Colégio (P1) (mesh 35 mm) and three (CIUFS 2190) near mouth of the Itiúba river (P3) (meshes 20 mm and 35 mm). All specimens showed up health without morphological deformities. Smaller specimens were collected in the P3 site (TL 19 cm to 20.4 cm TL - 77 g to 97 g), and the largest in the P1 site (26.5 cm TL - 280 g). The size at first sexual maturity of *B. orthotaenia* in natural environment is 32 cm (standard length) for males and 40.5 cm (standard length) for females (Gonçalves et al 2006). Thus, all specimens collected were juvenile independent of sex.



Figure 2. Specimen of *Brycon orthotaenia* sampled in the lower São Francisco river, May 2015.

CERAQUA performs bimonthly ichthyologic monitoring in the lower São Francisco since 2009, and none of the previous samplings *B. orthotaenia* had been recorded. The reports obtained from local fishermen confirm the absence of *B. orthotaenia* in the lower São Francisco for at least 40 years. The return of *B. orthotaenia* in the lower São Francisco can be attributed to re-stocking program made by CERAQUA. Since 2012 were released in the lower São Francisco about 50,000 *B. orthotaenia* fingerlings with about 10 cm TL. Despite re-stocking fish does not represent an effective mitigatory action in several Brazilian reservoirs, this practice has shown positive results in other stretches of São Francisco basin. In the upper São Francisco above Três Marias Dam (Minas Gerais state) where *B. orthotaenia* was practically extinct, CODEVASF re-stocking program initiated in the early 1980s allowed the species reappearance in artisanal fishing, sports and experimental catches (Sato & Godinho 2003).

Nevertheless, the methodologies used in fish stocking are questioned (Vieira & Pompeu 2001), once several attempts were made without positive results (Agostinho et al 2007). In many cases, despite efforts of re-stocking, some species do not establish and several will not be captured (Vieira & Pompeu 2001). This occurs mainly due to environmental restrictions and biological requirement of stocked species. Particularly in the lower São Francisco the reduction of natural river flow, pollution, removal of riparian vegetation, drainage of wetlands and introduction of non-native species in the last years may be contributing to impede the establishment of *B. orthotaenia*. Other aspect to unsuccessful of re-stocking is the high predation of fishes favored by water transparency. In a present study this situation is minimized because *B. orthotaenia* fingerlings are released at larger sizes (10 cm TL).

The reappearance of *B. orthotaenia* in the lower São Francisco shows that despite all the harmful human actions, fish present resilience. To make re-stocking programs become effective, as well as efficient in the production of fingerlings of native species such as CERAQUA has shown in the lower São Francisco, other mechanisms are required for successful recolonization of these species, such as (i) mapping to choose better sites for fingerlings releasing, (ii) fingerlings release at places according to specific life history attributes; (iii) environmental restoration through the reestablishment of the connections between marginal lagoons and São Francisco river, increase of river flow during the rainy season, reforestation programs, basic sanitation to prevent release of domestic and/or industrial sewage directly in the water courses; (iv) involvement of riverine community through environmental programs showing the importance of preserving aquatic ecosystem; (V) long-term programs to evaluate the native fish dynamics.

Conclusions. The reappearance of *B. orthotaenia* at lower São Francisco river may be indicative that re-stocking fish programs with clear goals and previous studies may help restore fish stocks, even if the success will be slow and long-term for some species with higher conservation interest.

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