ISSN 1809-127X (online edition)

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Lists of Species

Ichthyofaunal survey of the Riacho Goulart, tributary of the Tietê River (upper Paraná basin)

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Abstract: Fishes assessed in the present study were collected in the Riacho Goulart, a small tributary of Tietê River, upper Paraná basin. In order to sample different habitats, four collection sites were selected. A total of 1,241 individuals belonging to 30 species, 15 families, and six orders were captured. The list of fish species presented herein is important for the knowledge of the biodiversity of low Tietê basin.

Introduction

South America is the continent with the richest freshwater fish fauna in the world, especially in the Amazon and Paraná-Paraguay river basins. The Amazon basin covers an area of approximately 7,000,000 km^2, and is estimated to have 2,700 species (Junk *et al*. 2007). The Paraná-Paraguay covers an area of 2,600,000 km^2 (Latrubesse *et al*. 2005) and has approximately 600 species (Bonetto 1986). The upper Paraná basin covers 900,000 km^2, and are estimated to have from 130 species (Bonetto 1986) to approximately 310 species (Langeani *et al*. 2007).

On the other hand, in the upper Paraná basin, most rivers, streams and adjacent landscapes are going through extremely diverse changes due to decrease of native vegetation and pollution of waters, which can cause the loss of species, faunal homogenization, and reduction of ichthyic biomass (Casatti 2010). In the northwestern region of São Paulo state, only 3.3% of the natural vegetation remains, arranged in small fragments (mostly up to 10 ha), which characterizes it as one of the most degraded areas of the Brazil (Ferreira and Casatti 2006).

Recent environmental inventories of the headwaters streams of the upper Paraná basin, especially in the state of São Paulo (Casatti *et al*. 2001; Castro and Casatti 1997; Castro *et al*. 2003; 2004; 2005; Langeani *et al*. 2005a, b), have recorded the occurrence of a very diverse fauna, 6-15% of which can be ascribed to undescribed species (Castro *et al*. 2003; 2004; 2005). Similar results were also obtained through the review of ichthyological collections and other independent studies, reinforcing the fact that the surveys in the Upper Paraná are biased (Agostinho and Gomes 2005) and showing the importance of increasing data collection efforts in the area (Langeani *et al*. 2007).

Some fish community surveys have been performed in the lower Tietê basin. Torloni *et al*. (1993) recorded 42 species in the main canal of the Rio Tietê and some of its tributaries. Vidotto and Carvalho (2007) described the occurrence of 40 species in the rio Santa Bárbara, a tributary of the right margin of the rio Tietê. Ferreira and Casatti (2006) collected 28 species in a tributary of the rio São José dos Dourados. This study provides a list of fish species with the intention of contributing to the knowledge of the biodiversity in upper Paraná basin.

Materials and Methods

Study Area

The Riacho Goulart is a small tributary of the Tietê River located approximately 450 meters above sea level (m.a.s.l.). Its headwaters are located in Birigui, São Paulo. Currently, this stream is silted and its margins are mostly occupied by grass, used in cattle farms. The main course of Riacho Goulart has approximately 26 km long. In order to sample diverse number of environments, four collection sites along the Riacho Goulart were selected (Figure 1), **G1** (21°13'00.99" S, 50°21'10.15" W): margins are occupied by grass; **G2** (21°11'36.75" S, 50°20'36.87" W): margins are mostly occupied by grass and few trees; **G3** (21°09'47.56" S, 50°19'31.11" W): margins are mostly occupied by grass and macrophytes; **G4** (21°07'34.55" S, 50°19'23.34" W): margins are mostly occupied by grass and little stones.

Fish sampling

The sampling was done during six months (from December 2004 to May 2005), and two kinds of fishing gear were used: casting-nets (mesh size of 30 mm between adjacent knots, 1,5 m of mouth) and sieve (mesh size of 2 mm, 1 m of length, 0,6 m of depth). In each collection event five times casting-net throws were released (ten meters upstream the place where we used the sieve) and the sieve was used on the bank vegetation in stretches of 30 meters for 60 minutes.

Fishes were fixed with 10% formalin and, after 48 hours, transferred to a 70% ethanol solution. Species

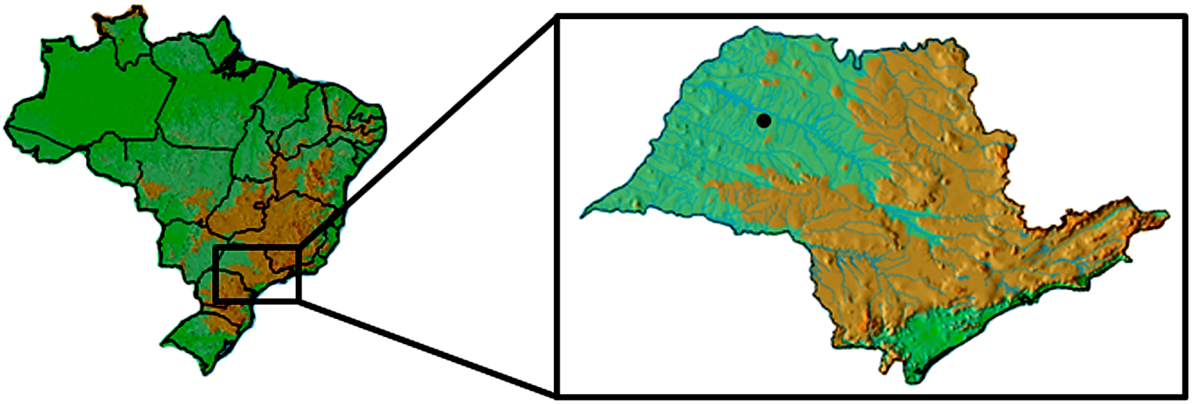
were identified by specialists. Voucher specimens were deposited in the zoological collection of the Laboratório de Zoologia da Faculdade de Filosofia Ciências e Letras Departamento de Ciências Biológicas (FAFIPE), Penápolis, São Paulo and Laboratório de Biologia e Genética de Peixes (LBP), Departamento de Morfologia da Universidade Estadual Paulista (UNESP) Botucatu, São Paulo. The taxonomic classification follows Reis *et al.* (2003) and Langeani *et al.* (2007).

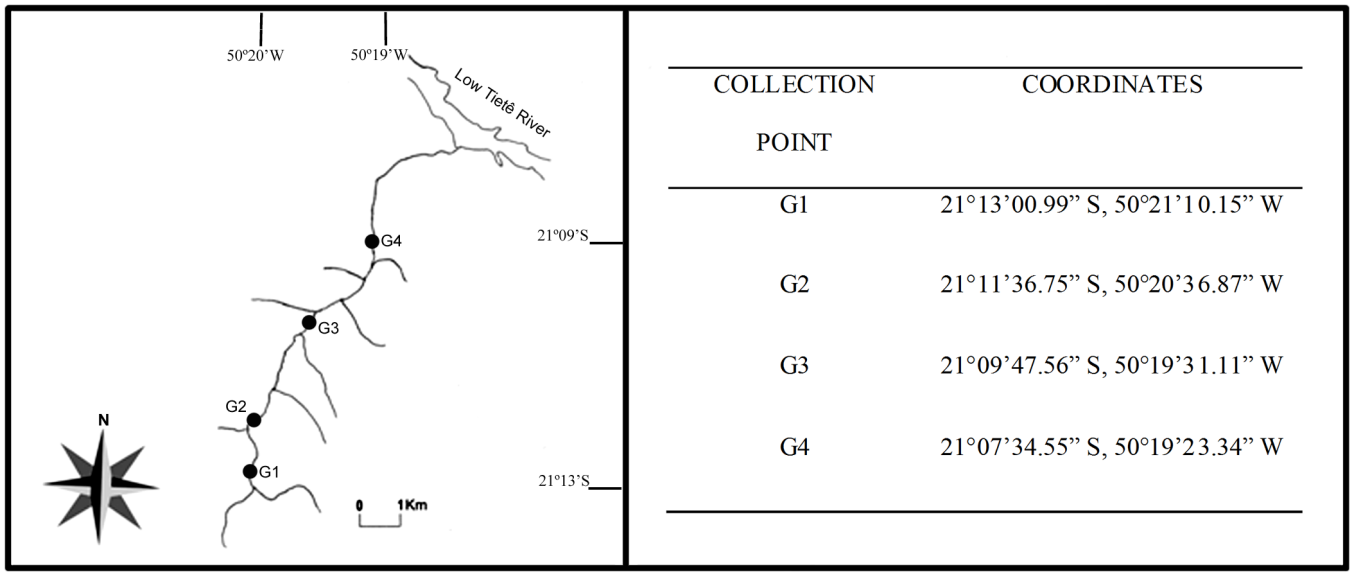
Results and Discussion

A total of 1,241 individuals belonging to 30 species, distributed in 15 families and six orders, were collected (Table 1). Most species collected in the Riacho Goulart belongs to the orders Characiformes and Siluriformes (76.66%), corroborating the findings reported by Castro *et al.* (2003; 2004), Langeani *et al.* (2007) and Esguícero and Arcifa (2011) for other Neotropical streams.

The present results were coincident with other similar studies for sharing many species reported by them. Thirteen of the 30 species sampled in the Riacho Goulart were also reported by Vidotto and Carvalho (2007) in the Santa Bárbara River. Similarly, 13 of the 28 species reported by Ferreira and Casatti (2006) in the Riacho Água Limpa (São José dos Dourados basin) were also sampled in the Riacho Goulart. These results show that complementary surveys are important for having a comprehensive inventory of a specific area of study.

Finally, in the Riacho Goulart some species sampled were introduced from others basins, including *Satanoperca pappaterra* (Heckel, 1840), originally distributed in the Amazon basin (Kullander 2003), *Roeboides descalvadensis* Fowler, 1932 and *Metynnis mola* Eigenmann and Kennedy, 1903 originally distributed in the lower Paraná basin, and introduced after the construction of the Itaipu reservoir (Langeani *et al*. 2007).





COLLECTION POINT	COORDINATES
G1	21°13'00.99" S, 50°21'10.15" W
G2	21°11'36.75" S, 50°20'36.87" W
G3	21°09'47.56" S, 50°19'31.11" W
G4	21°07'34.55" S, 50°19'23.34" W

Figure 1. Hydrographic map of the Riacho Goulart, black circles correspond to sampled sites and geographic coordinates.

Table 1. List of the species captured in Riacho Goulart, following the taxonomic classification system by Reis *et al.* (2003) and Langeani *et al.* (2007). G1 corresponds to the first sampled site, G2 corresponds to the second sampled site, G3 corresponds to the third sampled site and G4 corresponds to the fourth sampled site.

TAXON	COLLECTION POINT	VOUCHER
CHARACIFORMES		
Parodontidae		
Parodon nasus Kner, 1859	G4	LBP 9915
Curimatidae		
Cyphocharax modestus (Fernández-Yèpez, 1948)	G1, G2,G4	LBP 11371, 11381
Anostomidae		
Leporinus friderici (Bloch, 1794)	G4	LBP 9916
Leporinus obtusidens (Valenciennes, 1836)	G1, G2,G4	LBP 11373, 9912
Crenuchidae		
Characidium zebra Eigenmann, 1909	G1,G2,G4	LBP 11397
Characidae		
Genera Incertae Sedis in Characidae		
Astyanax altiparanae Garutti and Britski, 2000	G1,G2,G3,G4	LBP 11390, 11383
Hemigrammus cf. *marginatus* Ellis, 1911	G1	LBP 11376
Moenkhausia intermedia Eigenmann, 1908	G1,G2,G4	LBP 11379
Moenkhausia sanctaefilomenae (Steindachner, 1907)	G1,G2,G3,G4	LBP 11391, 11382
Oligosarcus pintoi Campos, 1945	G4	LBP 11399
Piabina argentea Reinhardt, 1866	G1,G2,G4	LBP 11392, 9909
Characinae		
Roeboides descalvadensis Fowler, 1932	G2	LBP 11388
Serrasalminae		
Metynnis mola Eigenmann and Kennedy, 1903	G1,G3	LBP 11374
Serrasalmus marginatus Valenciennes, 1847	G1	LBP 11369
Acestrorhynchidae		
Acestrorhynchus lacustris (Lütken, 1875)	G1	LBP 11368
Erythrinidae		
Hoplerythrinus unitaeniatus (Agassiz, 1829)	G1,G2	LBP 11366
Hoplias malabaricus (Bloch, 1794)	G1,G2,G3,G4	LBP 11386
SILURUFORMES		
Callichthyidae		
Corydoras aeneus (Gill, 1858)	G1,G2,G3,G4	LBP 11377
Hoplosternum littorale (Hancock, 1828)	G3	LBP 11389
Loricariidae		
Hypostominae		
Hypostomus ancistroides (Ihering, 1911)	G1,G2, G3,G4	LBP 11380
Hypostomus cf. *paulinus* (Ihering, 1905)	G4	LBP 9910, 9914
Heptapteridae		
Pimelodella avanhandavae Eigenmann, 1917	G1,G4	LBP 11398
Rhamdia quelen (Quoy and Gaimard, 1824)	G1,G2,G3	LBP 11372
GYMNOTIFORMES		
Gymnotidae		
Gymnotus cf. *carapo* Linnaeus, 1758	G1, G2,G3,G4	LBP 9913, 11395
Sternopygidae		
Eigenmannia virescens (Valenciennes, 1847)	G1, G2,G3,G4	LBP 9911, 11394
CYPRINODONTIFORMES		
Poeciliidae		
Phalloceros harpagos Lucinda, 2008	G2,G4	LBP 11393, 11378
SYNBRANCHIFORMES		
Synbranchidae		
Synbranchus marmoratus Bloch, 1795	G1,G2	LBP 11375
PERCIFORMES		
Cichlidae		
Cichlasoma paranaense Kullander, 1983	G1,G2,G3	LBP 11384
Crenicichla britskii Kullander, 1982	G1,G2,G3,G4	LBP 11385, 11396
Satanoperca pappaterra (Heckel, 1840)	G1,G2,G3,G4	LBP 11387

Acknowledgments: We are grateful to FAFIPE for their support; to Dr Rodrigo Bráz de Castilho Almeida and Dr Artur Antonio Andreata for their collaboration, and to the anonymous reviewers for the suggestions proposed.

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Received: June 2011
Last Revised: September 2011
Accepted: September 2011
Published online: October 2011
Editorial responsibility: Javier A. Maldonado O.