

Digenea in the Surubim *Pseudoplatystoma corruscans* (Spix and Agassiz, 1829) (Siluriformes: Pimelodidae) of the Upper São Francisco River, State of Minas Gerais, Brazil

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ABSTRACT

The specimens of surubim, *Pseudoplatystoma corruscans* (Spix and Agassiz, 1829), an important food fish with high commercial value in the Upper São Francisco River, were collected downstream from the Três Marias Dam, in the municipality of Três Marias, State of Minas Gerais, Brazil. Thirty-six individuals were examined and among the parasites, four species of Digenea were found: *Witenbergia witenbergi* Vaz, 1932 and *Tylodelphys* sp. (*metacercarie*), both with prevalence above 10%, followed by *Acanthostomum gnerii* (Szidat, 1958) and *Acanthostomum* sp.. The total length of the hosts did not influence the parasite prevalence. *Witenbergia witenbergi* occurred only in female hosts and the abundance of *Tylodelphys* sp. was higher in the males. These Digenea were recorded for the first time in *P. corruscans*, and their known geographic distribution has been expanded to the São Francisco Basin in Brazil.

Key words: *Acanthostomum* spp., Digenea, *Pseudoplatystoma corruscans*, São Francisco River *Tylodelphys* sp., *Witenbergia witenbergi*

INTRODUCTION

Pimelodidae include highly diversified types of freshwater fishes with nocturnal habits and varied diets (Britski et al., 1984). *Pseudoplatystoma corruscans* (Spix and Agassiz, 1829) is an important food fish (Tavares, 1997) that occurs in the Plata and São Francisco basins, where it is known by the popular names of pintado and surubim, respectively (Tavares, 1997, Petreire, 1995). It is a migratory fish (Sato and Godinho, 2003), a carnivore that mainly eats other fish (Sato

et al., 1997), and is among the largest fish in the São Francisco basin, reaching more than 100 kg (Tavares, 1997).

The fishing and biology of *P. corruscans* are well documented (Miranda and Ribeiro, 1997), although few articles are available on its endoparasitic fauna (Machado et al., 1994, 1995, 1996, Brasil-Sato, 2003). In this work we expand the information on the parasites of this host in the São Francisco River, recording for the first time species of Digenea and relating them to the size and sex of the fish. The cultivation of this species

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has been done at the Três Marias Hydrobiology and Fish Farming Station and parasite studies are important for the formation of breeding stocks and maintenance of the healthy hatchlings.

MATERIALS AND METHODS

The specimens of *P. corruscans* were collected from the Upper São Francisco River (18°12'32"S, 45°15'41"W), in the municipality of Três Marias, Minas Gerais, about 500 meters downstream from the Três Marias Dam, from June to September 1999 and June to October 2004, using the round nets. The fishes were identified according to Britski et al. (1984). The total lengths and weights of the eight male specimens were 88.7±21.9cm (66-125cm) and 6,763±6,188g (1,610-17,800g). The measures for the 28 females were 119.4±28.5cm (35.5-175cm) and 16,574±10,980g (2,400-54,000g). The parasites were collected and prepared according to Amato et al. (1991) and Eiras et al. (2000). The infrapopulations statistical analysis were according to Zar (1996). Student's *t* test was used to assess the possible differences in the total length and weight between the males and females and the parasite abundance in relation to the host sex. The Fisher's exact test was carried out to assess the parasite prevalence in relation to the host sex and Pearson's correlation coefficient (*r*) and Spearman's rank correlation coefficient (*r_s*) to analyze the possible influence of the host size on the prevalence and parasite abundance, respectively. The significance level was *P*<0.05. The statistical tests for the infrapopulations of the Digenea were applied when the prevalence were above 10% (Bush et al., 1990), and employed the terminology used by Bush et al. (1997). The

voucher specimens were deposited in the Coleção Helmintológica do Instituto Oswaldo Cruz (CHIOC), Rio de Janeiro, Brazil.

RESULTS

A total of 36 specimens of *P. corruscans* were examined, of which 8 (22.22%) were males and 28 (77.78%) were females. The males were smaller (*t*=2.774, *p*=0.009) and lighter than the females (*t*=2.404, *p*=0.022). Ten individuals (27.8%) were parasitized by the Digenea, and were collected 325 specimens: 18 (5.54%) *Witenbergia witenbergi* Vaz, 1932, (Opisthorchiidae - CHIOC 36564a-b), 33 (10.15%) *Tylodelphys* sp. (metacercariae, Diplostomidae - CHIOC 36568, 36569), 252 (77.54%) *Acanthostomum gnerii* (Szidat, 1958) (Acanthostomidae - CHIOC 36566a-b, 36567) and 22 (6.77%) *Acanthostomum* sp. (CHIOC 36565a-b). Eight *P. corruscans* were infected by one species of Digenea (three with *W. witenbergi*, two with *Tylodelphys* sp., two with *A. gnerii* and one with *Acanthostomum* sp.), one with two species (*Tylodelphys* sp.-*Acanthostomum* sp.) and one with three species (*Witenbergia witenbergi*-*Tylodelphys* sp.-*Acanthostomum gnerii*).

The most prevalent parasites were *W. witenbergi* and *Tylodelphys* sp., and the highest abundance was of *A. gnerii*. The parasite indices and place of the infection of the Digenea species in *P. corruscans* are presented in Table 1. The prevalence and abundance of the Digenea were not influenced by the total fish lengths. The abundance of *Tylodelphys* sp. was highest in the male hosts (Table 2) and *W. witenbergi* occurred only in the female hosts.

Table 1 - Prevalence (P) expressed as a percentage, amplitude of intensity (AI), mean intensity (MI), mean abundance (MA), and place of infection of the parasites of *Pseudoplatystoma corruscans* (Spix and Agassiz, 1829) from the Upper São Francisco River, Brazil.

Digenea	P(%)	AI	MI	MA	Place of infection
<i>Witenbergia witenbergi</i>	11.1	3-5	4.5±1.0	0.5±1.5	Middle and posterior intestine
<i>Tylodelphys</i> sp. (metacercariae)	11.1	1-15	8.2±5.7	0.9±3.1	Anterior and middle intestine and air bladder
<i>Acanthostomum gnerii</i>	8.3	31-145	84.3±57.4	7.0±27.3	Middle and posterior intestine
<i>Acanthostomum</i> sp.	5.6	4-18	11±9.9	0.6±3.0	Middle and posterior intestine

Table 2 - Analysis of the prevalence (r and p^F , respectively) and abundance (r_s and t , respectively) of the Digenea in relation to total length and sex of *Pseudoplatystoma corruscans* (Spix and Agassiz, 1829) from the Upper São Francisco River, Brazil.

Digenea	Total length				Sex		
	r	p	r_s	p	p^F	t	p
<i>Witenbergia witenbergi</i>	0.019	0.795	0.104	0.544	0.555	-	-
<i>Tylodelphys sp.</i> (metacercariae)	0.081	0.584	-0.126	0.462	0.207	2.109	0.042

Pearson's correlation coefficient: r ; Spearman's rank correlation coefficient: r_s ; Fisher's exact test: p^F ; Student's t test: t .
Significance level: $P < 0.05$.

DISCUSSION

The Digenea species found in *P. corruscans* can enter in these hosts by active or passive transmission. The three Digenea species represented by the adult specimens (*W. witenbergi*, *A. gnerii* and *Acanthostomum sp.*) lived their larval stage in winkles, which possibly were eaten by the fish, while the metacercariae of *Tylodelphys sp.* must have actively infected *P. corruscans*. The higher abundance of *Tylodelphys sp.* in all the male hosts might not have biological significance, considering the type of the transmission of these parasites and the different sample size of the male and female hosts examined in this study. Besides the distribution in the fishes, the finding of these parasites in *P. corruscans* could be very important, because they can will harm the hosts' health. According to Eiras (1994), cercariae penetrated the fishes through any part of their bodies, and metacercariae of *Tylodelphys sp.* have similar behavior as *Diplostomum spp.*, causing formation of cataracts and even death of the fish. *Tylodelphys sp.* were recorded in the brains of *Basilichthys microlepidotus* (Jennyns, 1841), *B. perugiae* (Evermann and Kendall) and *Austroatherina smitti* (Lahille) (= *Odonthestes perugiae* Evermann and Kendall, 1906 and *Odonthestes smitti* (Lahille, 1929) according to Dyer (2003)), respectively, coming from the Uruguay River, Plata basin, Argentina (Travassos et al., 1969). These authors indicated the possibility that these metacercariae might extend to Brazilian territory. In this study, the occurrence of *Tylodelphys sp.* in Brazil has been demonstrated, and in a new intermediate host, since it matured in the gut of fish-eating birds.

These parasites can act in the structure of the host communities and can be important in modeling the parasite communities (Poulin, 1999). The values of the parasite indices indicate the importance of

this group of parasites in the composition and structure of the parasite community of *P. corruscans* in the Upper São Francisco, although there are few reports of Digenea in these fishes in other watersheds. *Witenbergia witenbergi* was recorded in *P. tigrinum* (Valenciennes, 1840) from the Amazon basin (Travassos et al., 1969). In *P. corruscans* from the Paraná River, *Clinostomum marginatum* (immature form) was found in the stomach (Fernandes and Kohn, 2001). Because of its habit of eating arthropods, and other fishes, other species of helminths are favored in its parasite fauna. This sheds light on why cestodes and nematodes occur in the parasite fauna of *P. corruscans* in the Paraná River, with predominance of cestodes (Machado et al., 1994), and the various reports of cestodes species in *P. corruscans* and in similar hosts in South America (Rego and Pavanelli, 1992). While necropsying the *P. corruscans*, some nematodes were also found, but in the quantitative results of the parasite community, the cestodes continued to be the dominant parasite group in this host.

The fact that *W. witenbergi* was found only in the females might indicate the diet selection in these fishes, although this result could have been purely accidental in the studied sample or influenced by the higher number of the females examined. *Acanthostomum gnerii* is cited as occurring in *Rhamdia quelen* (Quoy and Gaimard, 1824) (Travassos et al., 1969) and in *R. quelen* and *R. rogersi* Regan, 1907 - junior synonym of *R. laticauda* (Kner, 1857) according to Dyer (2003) - in Costa Rica and Argentina (Thatcher, 1993). Other similar parasites have been cited in the reptiles by these authors. The higher number of spines ($n=27-28$) on the anterior extremity of *Acanthostomum sp.* of *P. corruscans* from the São Francisco River sets it apart from the taxa recorded in the hosts in Brazil. Hence, there is a need to intensify taxonomic research in this group.

Muzall and Bullock (1980) highlighted the direct variation of the endoparasite fauna of the fishes with their access to different food items during the migration, which could be the case of the surubim in the São Francisco, with their parasite fauna varying by accumulating the parasites from more preferred and/or available food items during their migratory travels.

In this study, *W. witenbergi*, *Tylodelphys sp.*, *Acanthostomum gnerii* and *Acanthostomum sp.* were recorded in *P. corruscans* for the first time and the known geographic distribution of this species were expanded to the drainage basin of the São Francisco River in Brazil.

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RESUMO

Espécimes de surubim, *Pseudoplatystoma corruscans* (Spix e Agassiz, 1829), importante peixe na pesca profissional e de maior valor comercial, do Alto Rio São Francisco, foram coletados à jusante da barragem de Três Marias, município de Três Marias, Minas Gerais. Foram examinados 36 indivíduos e dentre outros parasitos, foram encontradas quatro espécies de Digenea: *Witenbergia witenbergi* Vaz, 1932 e *Tylodelphys sp.* (metacercárias) ambas com prevalência superior a 10%, seguidas por *Acanthostomum gnerii* (Szidat, 1958) e *Acanthostomum sp.*. O comprimento total dos hospedeiros não influenciou a prevalência e a abundância parasitária. *Witenbergia witenbergi* ocorreu apenas em hospedeiros fêmeas e a abundância de *Tylodelphys sp.* foi mais elevada nos hospedeiros machos. Esses Digenea foram registrados pela primeira vez em *P. corruscans* e tiveram sua distribuição geográfica conhecida ampliada para a bacia do São Francisco, Brasil.

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