Metazoan parasite fauna of *Pimelodus maculatus* La Cépède, 1803 (Siluriformes, Pimelodidae) from the Guandu river, Rio de Janeiro State, Brazil

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ABSTRACT. Sixty specimens of *Pimelodus maculatus* from the Guandu River in Rio de Janeiro State were examined to describe their parasitofauna, in the period from August 1999 to February 2001. Specimens of twelve metazoan parasite species were collected, allocated into seven taxonomic groups - Monogenoidea: *Demidospermus uncusvalidus* Gutiérrez and Suriano, 1992, *D. paravalenciennesi* Gutiérrez and Suriano, 1992, *D. majusculus* Kritsky and Gutiérrez, 1998 and *Scleroductus* sp.; Digenea: *Austrodiplostomum compactum* (Lutz, 1928); Eucestoda: *Nomimoscolex* sp.; Nematoda: *Cucullanus pinnai* Travassos, Artigas and Pereira, 1928 and *Procamallanus* sp. (young specimen); Hirudinea: *Helobdella* sp.; Myxozoa: *Henneguya* sp. and *Myxobolus absonus* Cellere, Cordeiro and Adriano, 2002, along with one unidentified species of Acanthocephala (cystacanth). There was a correlation between the host sex and the prevalence and abundance of *D. paravalenciennesi*. The most dominant species in the parasite community of *P. maculatus* from the Guandu River was *D. uncusvalidus* (50%), followed by *C. pinnai* (18,3%). This study is the first report of *D. majusculus* and *Henneguya* sp. in *P. maculatus,* while it expands the known geographic distribution of *D. uncusvalidus*, *D. paravalenciennesi*, *D. majusculus*, *Scleroductus* sp., *Nomimoscolex* sp., *C. pinnai*, *Procamallanus* sp., *Helobdella* sp., *Henneguya* sp. and *M. absonus*.

Key words: *Pimelodus maculatus*, *Demidospermus* spp., *Scleroductus* sp., *Henneguya* sp., *Myxobolus absonus*, Guandu river.

RESUMO. Fauna de parasitos metazoários de *Pimelodus maculatus* La Cépède, 1803 (Siluriformes, Pimelodidae) do rio Guandu, Estado do Rio de Janeiro, Brasil. Sessenta espécimes de *Pimelodus maculatus* provenientes do rio Guandu, Estado do Rio de janeiro, foram examinados para estudo de sua parasitofauna, no período de agosto de 1999 a fevereiro de 2001. Foram coletados espécimes de doze espécies de parasitos metazoários alocados em sete grupos taxonômicos - Monogenoidea: *Demidospermus uncusvalidus* Gutiérrez and Suriano, 1992, *D. paravalenciennesi* Gutiérrez and Suriano, 1992, *D. majusculus* Kritsky and Gutiérrez, 1998 e *Scleroductus* sp.; Digenea: *Austrodiplostomum compactum* (Lutz, 1928); Eucestoda: *Nomimoscolex* sp.; Nematoda: *Cucullanus pinnai* Travassos, Artigas and Pereira, 1928 e *Procamallanus* sp. (jovem); Hirudinea: *Helobdella* sp.; Myxozoa: *Henneguya* sp. e *Myxobolus absonus* Cellere, Cordeiro e Adriano, 2002, além de uma espécie de Acanthocephala (cistacanto) não identificada. Houve correlação entre o sexo do hospedeiro com a prevalência e com a abundância de *D. paravalenciennesi*. A espécie mais dominante na comunidade parasitária de *P. maculatus* do rio Guandu foi *D. uncusvalidus* (50%), seguida de *C. pinnai* (18,3%). *Demidospermus majusculus* e *Henneguya* sp. constituem primeiro registro em *P. maculatus*. *Demidospermus uncusvalidus*, *D. paravalenciennesi*, *D. majusculus*, *Scleroductus* sp., *Nomimoscolex* sp., *C. pinnai*, *Procamallanus* sp., *Helobdella* sp., *Henneguya* sp. e *M. absonus* apresentam ampliada sua distribuição geográfica conhecida.

Palavras-chave: *Pimelodus maculatus*, *Demidospermus* spp., *Scleroductus* sp., *Henneguya* sp., *Myxobolus absonus*, Rio Guandu.

Introduction

The type locality of *Pimelodus maculatus* La Cépède, 1803 is the Rio de la Plata, Argentina, and it is also found in Brazil and other South American countries. It is a freshwater fish popularly known as "mandi", "mandi-amarelo" and "bagre pintado",

among other names (Fowler, 1951). It can reach 50 cm in length and 2 kg in weight (Ihering and Wright, 1935). It is an important commercial and game fish in various river systems (Bonetto *et al*., 1963).

In the Guandu River it is caught and eaten or sold by local subsistence fishermen. An ovuliparous fish spawns in the summer, from December to February, in successive layings (Godinho *et al.*, 1977). *Pimelodus maculatus* is a bottom dweller, and Gneri and Angelescu (1951) include it as a carrier-preparer organism, considering it to be a pre-mineralizer in the material cycle of aquatic environments.

The parasite fauna of *P. maculatus* in some South American watersheds is relatively well known. Gutiérrez and Martorelli (1999) reported *Demidospermus uncusvalidus* Gutiérrez and Suriano, 1992, *D. armostus* Kritsky and Gutiérrez, 1998, *D. paravalenciennesi* Gutiérrez and Suriano, 1992, *D. bidiverticulatum* (Suriano and Incorvaia, 1995) and *Scleroductus yuncensi* Jara and Cone, 1989 in the Rio de La Plata, in Argentina. Gil de Pertierra (1995) described *Nomimoscolex pimelodi* in this same river.

In Brazil, in relation to ectoparasites, Cellere *et al.* (2002) described *Myxobolus absonus* from the Piracicaba River, São Paulo State. About endoparasites, Kohn and Fróes (1986) reported *Creptotrema creptotrema* Travassos, Artigas and Pereira, 1928, *Crepidostomum platense* Szidat, 1954 and *Parspina argentinensis* (Szidat, 1954) in the Guaíba River estuary in the state of Rio Grande do Sul and Kohn *et al*. (1990) reported *Thometrema overstreeti* (Brooks *et al.*, 1979) in the same place. Pavanelli and Machado dos Santos (1992) described *Monticellia loyolai* in the Paraná River. Also, Vicente and Pinto (1999) compiled *Cucullanus* sp., *C. pinnai pinnai* Travassos, Artigas and Pereira, 1928 and *Procamallanus* (*Spirocamallanus*) sp. from Mogi Guaçú River, Cachoeiras das Emas, in São Paulo State; *C. debacoi* Sarmento, Fortes and Hoffman, 1995 and *C. fabregasi* Fortes, Hoffman and Sarmento, 1993 from Guaíba River, Rio Grande do Sul State, *C. patoi* Fortes, Hoffman and Sarmento, 1992 and *C. riograndensis* Fortes, Hoffman and Sarmento, 1992 from Guaíba Lake, Rio Grande do Sul State; *Dichelyne pimelodi* Moravec, Kohn and Fernandes, 1997 from Itaipú Reservoir, Paraná and *Goezia spinulosa* (Diesing, 1839) from Paraná River Paraná State.

Recently ectoparasites have been recorded in *P. maculatus* from the São Francisco River, such as copepods of the genera *Ergasilus* Nordmann, 1832; *Therodamas* Kroyer, 1863; *Vaigamus* Thatcher and Robertson, 1984 and *Gamispinus diabolicus* Thatcher and Boeger, 1984; isopods of the genus *Telotha* Schiodte and Meinert, 1884; hirudineae of the genera *Helobdella* Blanchard, 1896 and *Myzobdella* Leidy, 1851, along with monogenoideans of the genera *Demidospermus* Suriano, 1993; *Vancleaveus* Kritsky, Thatcher and Boeger, 1986 and *Pavanelliela pavanelli* Kritsky and Boeger, 1998 (Brasil-Sato, 2003; Brasil-Sato and Pavanelli, 2000; Brasil-Sato *et al*., 2000).

Among the endoparasites that have been found in *P. maculatus* from the São Francisco River are the digenetic species *C. platense*, *C. creptotrema*, *Plehniella coelomica* Szidat, 1951, *Prosthenhystera obesa* (Diesing, 1850) and *T. overstreeti*; metacercariae of the genera *Clinostomum* Leidy, 1856 and *Austrodiplostomum compactum* (Lutz, 1928); cestodes species of *M. loyolai*, *Nomimoscolex* sp.; plerocercoids of the order Preoteocephalidea (Brasil-Sato, 2003; Brasil-Sato and Pavanelli, 2004).

Nematode larvae of the genera *Contracaecum* Railliet and Henry, 1912; *Eustrongylides* Jaegerskiold, 1909; *Hysterothylacium* (Rudolphi, 1802) and adults of *Dichelyne* Jaegerskiold, 1902; *Goezia* Zeder, 1800; *Philometra* Costa, 1845; *Cucullanus pinnai* Travassos, Artigas and Pereira, 1928 and *Spirocamallanus freitasi* Moreira, Oliveira and Costa, 1991 and the acanthocephala *Neoechinorhynchus pimelodi* Brasil-Sato and Pavanelli, 1998 were also found in *P. maculatus* from this same river (Brasil-Sato, 2003; Brasil-Sato and Pavanelli, 1998 and 1999).

While studies have been conducted of the parasite fauna of *P. maculatus* from other river basins, there is no such previous analysis in the Guandu River, although there are reports of parasites in some other fish species from this river. Padilha (1978) described *Zonocotyloides haroltravassosi* in *Curimata gilbert* (Quoy and Gaimard, 1824); Nickol and Padilha (1979) reported *Neoechinorhynchus paraguayensis* Machado, 1959 in *Geophagus brasiliensis* (Quoy and Gaimard, 1824); Kritsky *et al.* (1995) reported *Scleroductus* sp. in the siluriforms *Glanidium melanopterum* Miranda-Ribeiro, 1918, *Parauchenipterus striatulus* Steindachner, 1876, *Rhamdia quelen* Quoy and Gaimard, 1824 and a representative of *Pimelodella* Eigenmann and Eigenmann, 1988.

Abdallah *et al*. (2004) reported *Clinostomum complanatum* Rudolphi, 1814 and *Procamallanus* (*Spirocamallanus*) *hilarii* Vaz and Pereira, 1934 in *Astyanax bimaculatus* (Linnaeus, 1758) and in *Astyanax parahybae* Eigenmann, 1908 and *C. complanatum* and *Polymorphus* sp. in *Oligosarcus hepsetus* (Cuvier, 1829);

Abdallah *et al*. (2005) found *Diplostomum* (*Austrodiplostomum*) *compactum* Lutz, 1928, *Sphincterodiplostomum musculosum* Dubois, 1936, *Z. haroltravassosi*, the nematodes *Cosmoxynemoides aguirrei* Travassos, 1949, *Travnema araujoi* Fernandes, Campos and Artigas, 1983, *Raphidascaris* sp. and the hirudineae *Placobdella* sp. in *Cyphocharax gilbert* (Quoy and Gaimard, 1824).

In the present study, the parasite fauna of *P. maculatus* from the Guandu River is described and analyzed in relation to the possible influence of sex and total length of the host, and the data are compared with those reported in other South American river systems.

Material and methods

The *P. maculatus* specimens were collected from August 1999 to February 2001 from the Guandu River, in the municipality of Seropédica, Rio de Janeiro State, Brazil, netted by local fishermen. Out of the 60 fish collected, 24 were males, with total length of 24.05±2.05 cm (21.0 to 29.7 cm) and weight of 144.6±47.3 g (80 to 270 g), and 36 were females, with total length of 27.3±3.6 cm (22.0 to 35.0 cm) and weight of 246.2±115.3 g (100 to 525 g).

The females were significantly larger (t=4.06, p=0.0001) and heavier (t=4.09, p=0.0001) than the males. The fish were taken to the Fish Parasitology Laboratory of the Institute of Biology of Universidade Federal Rural do Rio de Janeiro, Seropédica, Rio de Janeiro State, where their weight, length and sex were recorded.

Specimens of Monogenoidea, Digenea, Eucestoda, Nematoda, Acanthocephala, Hirudinea and Myxozoa were fixed and processed according to Eiras *et al*. (2000).

The statistical analyses applied to the parasite infrapopulations followed Zar (1996). The data were found to be normal, allowing application of the statistical tests. Student's t test was used to evaluate the total length and weight between the male and female hosts. The Spearman's rank correlation coefficient, r_s, was used to assess the possible influence of total length of the fish on the parasite abundance, and the Pearson's correlation coefficient, r, was used to analyze the prevalence (after angular transformation of the data) in relation to the host size, estimated by Sturges' formula.

The log-likelihood (G) test, with Yates correction and a 2 x 2 contingency table was used to assess the effect of host sex on the parasite prevalence, along with the chi-square (X^2) test. Student's t test or the Mann-Whitney U test, were employed to evaluate the possible influence of host sex on the parasite abundance. The dominance of each component of the parasite infracommunities was determined by calculating the dominance frequency, shared dominance frequency and mean relative dominance, following the methodology of Rohde *et al*. (1995).

Ecological terminology used was that proposed by Bush *et al*. (1997). The statistical tests were applied only to the parasite species with prevalence above 10%, and the statistical significance level was $p \leq 0.05$ (Zar, 1996).

Results

Components of the parasite community

All the fish (100%) were parasited (95% by ectoparasites and 90% by endoparasites) by at least one species. A total of 3106 parasites were collected, falling into the seven taxonomic groups found, of which 2786 (89.7%) were Monogenoidea, 11 (0.35%) Digenea, 30 (0.97%) Eucestoda, 265 (8.53%) Nematoda, 1 (0.03%) Acanthocephala and 13 (0.42%) Hirudinea, besides cysts of Myxozoa (Table 1).

Table 1. Prevalence, number (n), mean intensity, mean abundance and place of infection/infestation of the metazoan parasites of *Pimelodus maculatus* La Cépède, 1803 of the Guandu River, Rio de Janeiro State, Brazil.

Parasite groups	Prevalence (%)	n	Mean intensity	Mean abundance	Place of infection/infestation
Monogenoidea	95.00	2786	48.87	46.43	Gills
Digenea (metacercariae)	16.66	11	1.10	0.18	Eyes
Eucestoda	21.66	30	2.30	0.50	Gut
Nematoda	85.00	265	5.19	4.41	Gut
Acanthocephala (cystacanth)	1.66	1	1.00	0.01	Gut
Hirudinea	6.66	13	3.25	0.21	Gills
Myxozoa (cysts)	13.33	9	1.12	0.15	Gills and pharyngeal plates

Monogenoidea and Nematoda were the most prevalent groups. Among the four species of Monogenoidea, *Demidospermus uncusvalidus* was most prevalent and most abundant as well, followed by *D. paravalenciennesi*, *D. majusculus* and *Scleroductus* sp. Among the Nematoda, *Cucullanus pinnai* was most prevalent and more abundant than *Procamallanus* sp. (Table 2).

Demidospermus uncusvalidus was the dominant species in the parasite community of *P. maculatus* from the Guandu River, followed by *C. pinnai*, *D. paravalenciennesi*, *D. majusculus* and *Nomimoscolex* sp. (Table 3).

Table 2. Prevalence, mean intensity, intensity and mean abundance of the metazoan parasites of *Pimelodus maculatus* La Cépède, 1803 of the Guandu River, Rio de Janeiro State, Brazil.

Parasites species	Prevalence	Mean intensity	Intensity	Mean abundance
Monogenoidea				
Demidospermus uncusvalidus	76.66	34.58	1-615	26.51
Demidospermus paravalenciennesi	41.66	35.60	2-248	14.83
Demidospermus majusculus	21.66	19.46	2-69	4.21
Scleroductus sp.	10.00	2.00	1-3	0.20
Digenea				
Austrodiplostomum compactum (metacercariae)	16.66	1.10	1-2	0.18
Eucestoda				
Nomimoscolex sp.	21.66	2.30	1-7	0.50
Nematoda				
Cucullanus pinnai	85.00	5.17	1-19	4.40
Procamallanus sp. (young)	1.66	1.00	-	0.01
Acanthocephala				
Species not identified (cystacanth)	1.66	1.00	-	0.01
Hirudinea				
Helobdella sp.	6.66	3.25	1-6	0.21
Myxozoa				
Henneguya sp.	5.00	-	-	-
Myxobulus absonus	8.33	-	-	-

Table 3. Frequency of dominance, shared dominance and mean relative dominance of the metazoan parasites of *Pimelodus maculatus* La Cépède, 1803 of the Guandu River, Rio de Janeiro State, Brazil.

Parasites	Frequency of dominance (%)	Shared dominance (%)	Mean relative dominance
Demidospermus uncusvalidus	50	5	0.44±0.34
Demidospermus paravalenciennesi	13.3	1.7	0.16±0.25
Demidospermus majusculus	10	1.7	0.10±0.24
Scleroductus sp.	0	0	0.006±0.02
Austrodiplostomum compactum (metacercariae)	0	0	0.01±0.04
Nomimoscolex sp.	1.7	0	0.03±0.08
Cucullanus pinnai	18.3	5	0.25±0.27

The Monogenoidea were more abundant in female than in male hosts (Table 4), although only *D. paravalenciennesi* was significantly more prevalent and abundant in *P. maculatus* females (Table 5). There was no correlation between the host size and abundance of parasite species. Only the prevalence of metacercariae of *A. compactum* presented a significant (negative) correlation with the host size ranks (Table 5).

Table 4. Analysis of the influence of the sex of *Pimelodus maculatus* La Cépède, 1803 of the Guandu River, Rio de Janeiro State, on the parasite prevalence (*G*) and abundance (*U*) and the total length of these hosts on the parasite abundance (r_s).

Parasites groups	*G*	*U*		r_s	
		U	*p*	r_s	*p*
Monogenoidea	0.132	630	0.0029⋆	0.149	0.254
Digenea	0.122	459.5	0.6692	0.232	0.073
Eucestoda	0.037	433	0.9937	0.041	0.754
Nematoda	0.432	521	0.1812	0.121	0.356

Tests: G "log-likelihood"; "*U*" Mann Whitney; Spearman's rank correlation coefficient: r_s. Level of significance: $p<0.05$. (⋆) significant values.

Table 5. Analysis of the influence of the sex and the total length of *Pimelodus maculatus* La Cépède, 1803 of the Guandu River, Rio de Janeiro State, on the parasite prevalence (x^2; r_s) and abundance (*U*/*t*; *r*), respectively.

Parasites species	X^2		*r*		*U*/*t*		r_s	
	X^2	*p*	*r*	*p*	*U*/*t*	*p*	r_s	*p*
Demidospermus uncusvalidus	0.062	0.803	-0.719	0.068	536.5	0.116	0.155	0.237
Demidospermus paravalenciennesi	8.400	0.003⋆	-0.210	0.651	592.0	0.014⋆	0.232	0.073
Demidospermus majusculus	0.200	0.654	-0.540	0.210	469.0	0.567	0.036	0.783
Scleroductus sp.	0.625	0.429	-0.474	0.282	476.0	0.486	-0.085	0.514
Austrodiplostomum compactum	0.125	0.723	-0.784	0.036⋆	459.5	0.669	0.197	0.131
Nomimoscolex sp.	0.016	0.898	-0.400	0.372	1.050	0.297	-0.041	0.754
Cucullanus pinnai	0.441	0.506	-0.724	0.065	0.327	0.744	0.108	0.410

Tests: Chi-square: X^2; "*U*" Mann Whitney; Student's t: *t*; Spearman's rank correlation coefficient: r_s; Pearson's correlation: *r*. Level of significance: $p<0.05$. (⋆) significant values.

Discussion

There was some qualitative similarity in the Monogenoidea fauna found in the present study with that reported by Gutiérrez and Martorelli (1999) and Gutiérrez (2001) for *P. maculatus* and *P. albicans,* respectively, from the Rio de la Plata in Argentina. Gutiérrez and Martorelli (1999) recorded a higher prevalence of *D. paravalenciennesi*, followed by *D. uncusvalidus,* and Gutiérrez (2001) recorded a higher prevalence of *D. majusculus,* followed by *D. bidiverticulatum*. In the present work, the species with the highest prevalence value was *D. uncusvalidus*, followed by *D. paravalenciennesi*.

In the Monogenoidea community of *P. maculatus* from the Rio de la Plata, the species of *Demidospermus* were classified as central and *Scleroductus yuncensis* as a secondary species (Gutiérrez and Martorelli, 1999), while *D. majusculus* and *D. bidiverticulatum* were central species and *D. armostus*, *D. idolus* Kritsky and Gutiérrez, 1998 and *S. yuncensi* were considered secondary species in the parasite community of *P. albicans* from the same river (Gutiérrez, 2001).

In the present study as well, *D. uncusvalidus* was considered a central species, while *Scleroductus* sp., due to its lower prevalence, was considered a satellite species. This is the first report of *D. majusculus* parasiting *P. maculatus* and the Guandu River represents a new location, expanding the known geographic distribution of this species.

Kritsky *et al.* (1995) analyzed the morphometry of specimens of *Scleroductus* Jara and Cone, 1989 from four siluriform hosts from the Guandu River and questioned whether the morphogical and size variations could be specific values or might be the result of host influences and/or environmental factors, and preferred not to relate them to *S. yuncensis* or even to describe them as new species.

Scleroductus sp. expands the list of hosts for this river (Âncor - length: 69(68-71); shank: 46(45-48); point: 32(32-33) and base: 35(35-37)).

Although no ectoparasite species was recorded in *A. bimaculatus*, *A. parahybae* and *O. hepsetus* by Abdallah *et al.* (2004), the present study reinforces the ectoparasite richness in other fishes of the Guandu River. Hirudineae were found in *P. maculatus* and also in *C. gilbert* by Abdallah *et al.* (2005). Besides these, three more species of *Demidospermus* and one of *Scleroductus* were found in the present study, the latter of them already encountered in various Siluriforms by Kritsky *et al.* (1995).

Brasil-Sato and Pavanelli (2004) reported a higher prevalence of *A. compactum* in *P. maculatus* of São Francisco River than in the Paraná River. In the present study, these metacercariae presented low prevalence and adult Digenea were not found, in contrast to the results obtained by Brasil-Sato and Pavanelli (2004), who registered, besides metacercariae of *Austrodiplostomum* sp. and *Clinostomum* sp., four different species of Digenea in *P. maculatus* from the São Francisco River and five from the Paraná River.

The metacercariae of *A. compactum* found in *P. maculatus* from Guandu River presented low mean abundance, a result similar to those obtained by Brasil-Sato and Pavanelli (2004) in this pimelodid from the São Francisco and Paraná rivers. Brasil-Sato and Pavanelli (2004) observed a significant increase in the prevalence of these metacercariae in larger hosts collected from the São Francisco River, while in the present study the metacercariae were significantly more prevalent in smaller hosts. The metacercariae of *A. compactum* found in the eyes of the *P. maculatus* specimens collected suggests the potential of this fish as an intermediate host. More studies need to be conducted in the fishes of Guandu River Basin to detect the presence or absence of the intermediate hosts of those digenetic species already recorded for other river systems in which *P. maculatus* is a definitive host.

Species of *Nomimoscolex* Woodland, 1934 have already been reported in *P. maculatus* by various authors (Rego *et al*., 1974; Brooks and Deardorff, 1980; Gil de Pertierra, 1995; Brasil-Sato, 2003) in other river systems. The occurrence of *Nomimoscolex* sp. in *P. maculatus* in the Guandu River Basin expands its known geographic distribution.

The high prevalence of *C. pinnai* observed in this study and the reports in fishes from other river systems (Hamann, 1985; Vicente *et al*., 1985; Vicente and Pinto, 1999; Brasil-Sato, 2003) indicate some specificity of this parasite to pimelodids. *Cucullanus pinnai* was the most prevalent species among the endoparasites, and was representative of the nematodes, since only one young specimen of *Procamallanus* sp. was found in *P. maculatus* from the Guandu River.

There is a only report of an Acanthocephala in *P. maculatus* from the São Francisco River (Brasil-Sato and Pavanelli, 1998). Here, the only cystacanth found fixed to the intestinal mucous of *P. maculatus*, suggests that this fish is a paratenic host.

The presence of *Helobdella* sp. is also a first for this parasite for the Guandu River. Brasil-Sato (2003) already recorded the hirudineae *Myzobdella* sp. and *Helobdella* sp. in *P. maculatus* from the São Francisco River. *Helobdella* sp. presented low intensity and mean abundance levels. There are reports of glossiphonid predators of chironomids and associated with them in various places (Schlenz and Takeda, 1993). Souza and Torres (1984) indicated that the preferred food source of *P. maculatus* in the Três Marias Reservoir was chironomid larvae. Although there has been no study analyzing the feeding habits of this fish in the Guandu Basin, the results obtained here indicate that the feeding habits/behavior of this species may favor infestation. According to Pavanelli *et al*. (1999) the main concern regarding the hirudineae is that they act as reservoirs of pathogens.

Myxozoa were not found by Brasil-Sato (2003) in *P. maculatus* from the São Francisco River, while in this study, specimens of *Henneguya* sp. and *Myxobolus absonus* Cellere, Cordeiro and Adriano, 2002 were registered. Cellere *et al*. (2002) described *M. absonus* collected from the opercular cavity of *P. maculatus* from the Piracicaba River, São Paulo State and recorded a low prevalence (8.33%) of this myxosporean species. Besides this, *M. stokesi* Pinto, 1928 was reported in *Pimelodella* sp. in Brazil (Eiras *et al*., 2005). The Guandu River is a new location for *Henneguya* sp. and *M. absonus,* and *P. maculatus* is a new host for *Henneguya* sp.

The study of the parasite fauna of *P. maculatus* from the São Francisco River by Brasil-Sato (2003) revealed parasite richness based on species of Monogenoidea, Digenea and Copepoda, although Hirudinea, Eucestoda, Nematoda and adult Acanthocephala were also reported. The parasite fauna of *P. maculatus* from the Guandu River presented Monogenoidea (four species) and Nematoda (two species) and absence of Crustacea and adults of Digenea and of Acanthocephala.

These results establish that the invertebrate fauna (intermediate hosts of Digenea and Acanthocephala,

at least) seem to be suffering, probably due to the anthropic interferences that continually degrade this river system (Bizerril and Primo, 2001). Despite this hostility, the force of coevolution still enables Monogenoidea fauna to prevail in *P. maculatus,* albeit with less richness than reported in other river systems.

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