PARASITIC DISEASES OF FRESHWATER ORNAMENTAL FISHES COMMERCIALIZED IN FLORIANÓPOLIS, SANTA CATARINA, BRAZIL

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ABSTRACT

The parasitic fauna of ornamental fish from Florianópolis, SC, Brazil was evaluated from June 2004 through June 2005. *Xiphophorus maculatus* (n=88), *Xiphophorus helleri* (n=27), *Poecilia sphenops* (n=20), *Macropodus opercularis* (n=20), *Trichogaster tricopterus* (n=9), *Beta splendens* (n=8), *Puntius conchonius* (n=7), *Carassius auratus* (n=6), *Gymnocorymbus ternetzi* (n=4) were analyzed. From a total of 189 examined fishes, 65 (34%) were parasitized: 15.3% with metacercariae of *Ascocotyle* (Digenea); 15.3% with Monogenoidea; 6.9% with *Piscinoodinium pillulare* (Dinoflagellida); 4.7% with *Trichodina acuta* (Ciliophora); 3.7% with *Ichthyophthirius multifiliis* (Ciliophora); 2.6% with cestodes; 2.6% with *Camallanus maculatus* (Nematoda); 2.1% with *Lernaea cyprinacea* (Crustacea) and 0.5% with *Chilodonella* sp. (Ciliophora). The largest mean intensities of infection were 335 and 205, respectively to *X. maculatus* and *X. helleri* infected by metacercariae in the gills.

Key words: ornamental fish; parasites; diseases; prevalence; infection

DOENÇAS PARASITÁRIAS DE PEIXES ORNAMENTAIS DE ÁGUA DOCE COMERCIALIZADOS EM FLORIANÓPOLIS, SANTA CATARINA, BRASIL

RESUMO

A fauna parasitária de peixes ornamentais de Florianópolis, SC, Brasil foi avaliada entre junho de 2004 e junho de 2005. *Xiphophorus maculatus* (n=88), *Xiphophorus helleri* (n=27), *Poecilia sphenops* (n=20), *Macropodus opercularis* (n=20), *Trichogaster tricopterus* (n=9), *Beta splendens* (n=8), *Puntius conchonius* (n=7), *Carassius auratus* (n=6), *Gymnocorymbus ternetzi* (n=4) foram analisados. De 189 peixes analisados, 65 (34%) estavam parasitados: 15,3% com metacercárias de *Ascocotyle* (Digenea); 15,3% com Monogenoidea; 6,9% com *Piscinoodinium pillulare* (Dinoflagellida); 4,7% com *Trichodina acuta* (Ciliophora); 3,7% com *Ichthyophthirius multifiliis* (Ciliophora); 2,6% com cestóides; 2,6% com *Camallanus maculatus* (Nematoda); 2,1% com *Lernaea cyprinacea* (Crustacea) e 0,5% com *Chilodonella* sp. (Ciliophora). As maiores intensidades médias de infecção foram de 335 e 205 parasitos, respectivamente em *X. maculatus* e *X. helleri* infectados por metacercárias nas brânquias.

Palavras-chave: peixes ornamentais; parasitos; enfermidades; prevalência; infecção

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INTRODUCTION

In the last years, ornamental fish culture in Brazil has shown a rapid development, but scarce information on the parasites that may jeopardize its production is known. The ornamental fish industry over the world is available at US$ 900 million (EVANS and LESTER, 2001) while in Africa this activity is estimated in US$ 15 million (Britz, 1994, *apud* MOUTON *et al*., 2001). When the ornamental fishes suffer of a disease they are rapidly treated and the real agent cannot be observed. Not only to ornamental fish but also to native fish the National and International transference are the main causes of parasites dissemination. The presence of parasites in this kind of activity was reported in China (KUO *et al*., 1994), Germany (MORAVEC *et al*., 1999), Australia (DOVE and ERNST, 1998; EVANS and LESTER, 2001), South Africa (MOUTON *et al*., 2001), France (MICHEL *et al*., 2002), Korea (KIM *et al*., 2002), Norway (LEVSEN *et al*., 2003) and Sri Lanka (THILAKARATNE *et al*., 2003). In the State of São Paulo, GARCIA *et al*. (2003) observed ectoparasites of *Xiphophorus* spp. as the main consequence of inadequate handling and the negative correlation of the occurrence of *Urocleidoides* sp. (Monogenoidea) with the water pH, temperature and conductivity. In Colombia, CONROY *et al*. (1981) identified parasites that have affected the fish health condition, as follows: *Gyrodactylus* von Nordmann, 1832 (92%) and *Dactylogyrus* Diesing, 1851 (90%) (Monogenoidea), *Ichthyophthirius multifiliis* Fouquet, 1876 (82%) (Protozoa: Ciliophora), trichodinids (70%) (Ciliophora), nematodes (70%), myxosporean (70%), *Ichthyobodo necator* (Henneguy, 1883) (60%) (Flagellata), *Chilodonella* Strand, 1928 (52%) (Ciliophora), *Apiosoma* Blanchard, 1883 and *Epistylis* Ehrenberg, 1830 (42%) (Ciliophora) and larvae of digenean helminths (28%). *Argulus* Müller, 1785 (Crustacea: Branchiura) and *Lernaea cyprinacea* Linnaeus, 1758 (Copepoda) showed a great importance because of the lesions that they provoke (CARNEVIA, 1993). Nematodes of the genus *Camallanus* Railliet and Henry, 1915 are widely distributed over the world in ornamental fish. They are found in the intestines of native fishes (FERRAZ and THATCHER, 1990; MORAVEC, 1994), in salmonids (TORRES *et al*., 1990) and poecilids (KIM *et al*., 2002).

Because of the lack of information on the ornamental fish parasites, this work studied some species commonly commercialized in Florianópolis, SC, Brazil. Parasitological evaluation considered the prevalence, mean intensity of infection, distribution frequency and frequency of dominance of the most concurrent ornamental fish parasites.

MATERIAL AND METHODS

During the period of June 2004 through June 2005, ornamental freshwater fishes in a total of 189 specimens were examined from a commercial supplier in Florianópolis, SC, Brazil, that had not been treated due to diseases. After sacrifice, the body mucus and pieces of organs were compressed between a glass slide and a coverslip with a drop of 0.65% saline solution for microscopic observation (Ethic Committee nº 23080011129-38/CEUA/UFSC). The intestines were opened and observed in a Petri dish containing saline solution. The parasites were fixed and processed according to EIRAS *et al*. (2000) and MARTINS and YOSHITOSHI (2003). The identification of trichodinid followed the recommendations of LOM (1958) and of VAN AS and BASSON (1989). Monogenoidea quantification was performed directly on wet mounts of the body mucus and gills under microscopy. Protozoan parasites were counted between a glass slide and a coverslip under microscopy. Parasite prevalence and mean intensity were calculated according to BUSH *et al*. (1997) and the frequency of dominance and mean relative dominance, according to ROHDE *et al*. (1995). It was established the prevalence of the parasites assemblage constituted by *Trichodina acuta*, *I. multifiliis*, *Chilodonella*, *Piscinoodinium pillulare*, Monogenoidea, metacercariae, cestodes, nematodes and crustaceans in each fish species.

RESULTS AND DISCUSSION

From a total of 189 examined fishes, 65 (34%) were parasitized (Table 1). *Xiphophorus maculatus* was the most intensively parasitized fish with a total prevalence of 16%, followed by *Xiphophorus helleri* (6%), *Poecilia sphenops* (4%), *Beta splendens*, *Carassius auratus* and *Gymnocorymbus ternetzi* (2%) and *Puntius conchonius* (1%). *Macropodus opercularis* and *Trichogaster trichopterus* were not parasitized. The most frequently analyzed fishes were *X. maculatus* (n=88), *X. helleri* (n=27), *M. opercularis* (n=20) and *P. sphenops* (n=20) (Table 1).

Among the collected parasites, a variable prevalence rate was observed (Table 2): Monogenoidea (15.3%), metacercariae of *Ascocotyle*

Looss, 1899 (15.3%), *Piscinoodinium pillulare* (Schäperclaus, 1954) Lom, 1981 (6.9%), *Trichodina acuta* Lom, 1961 (4.7%), *I. multifiliis* (3.7%), cestodes (2.6%), nematode *Camallanus maculatus* MARTINS *et al.*, 2005 (2.6%), *L. cyprinacea* (2.1%) and *Chilodonella* sp. (0.5%).

The most dominant parasite was the digenean metacercariae, reaching 7,844 specimens in 29 infected fish with mean intensity of one to 335.0±365.3 parasites per host (Table 2 and 4), when assuming the mean relative dominance C index > 0.25 (STONE and PENCE, 1978). However, Monogenoidea was the most occurring parasite: it has appeared in 29 out of 189 examined fish species (Table 2) with mean intensity of two to 31.7±26.7 parasites per host. As follows, trichodinids were observed in five fish species (Table 3) with mean intensity of one to 31.0±5.7 while *P. pillulare* occurred in three fish species with mean intensity of three to 13.0±14.2 parasites (Table 4).

The unique fish parasitized by all parasite species was *X. maculatus* (Table 3), reaching 35% of parasitized fish (Table 1). It could be assumed that the high number of examined *X. maculatus* provoked considerable difference in the results in comparison with the other parasites. This species is, in fact, the most common commercialized fish by the ornamental hobbyists.

Table 1. Ornamental fish species from Florianópolis, SC, Brazil, their common name and parasites prevalence. PF: parasitized fish; EF: examined fish; P^a: parasites prevalence in relation to the total number of each examined fish species; P^b: parasites prevalence in relation to the total number of examined fish

Species	Common name	PF/EF	P (%)[a]	P (%)[b]
Xiphophorus maculatus	Platyfish	31/88	35	16
Xiphophorus helleri	Swordtail	12/27	44	6
Poecilia sphenops	Molly	8/20	40	4
Macropodus opercularis	Paradise fish	0/20	0	0
Trichogaster trichopterus	Three spot gourami	0/9	0	0
Beta splendens	Beta	4/8	50	2
Puntius conchonius	Rosy barb	2/7	28	1
Carassius auratus	Goldfish	4/6	67	2
Gymnocorymbus ternetzi	Black tetra	4/4	100	2
Total	-	65/189	-	34

Table 2. Prevalence (P), frequency of dominance and mean relative dominance of parasites in ornamental freshwater fish from Florianópolis, SC, Brazil. PF: parasitized fish; EF: examined fish

Parasite	PF/EF	P (%)	Frequency of dominance	Mean relative dominance
Monogenoidea	29/189	15.3	446	0.052
Ascocotyle	29/189	15.3	7,844	0.907
Piscinoodinium pillulare	13/189	6.9	107	0.012
Trichodina acuta	9/189	4.7	107	0.012
Ichthyophthirius multifiliis	7/189	3.7	108	0.012
Cestodes	5/189	2.6	17	0.002
Camallanus maculatus	5/189	2.6	13	0.001
Lernaea cyprinacea	4/189	2.1	4	0.000
Chilodonella	1/189	0.5	3	0.000

Table 3. Distribution frequency of parasites in ornamental freshwater fishes from Florianópolis, SC, Brazil. Tric: *Trichodina acuta*, Ich: *Ichthyophthirius multifiliis*, Chil: *Chilodonella*, Pisc: *Piscinoodinium pillulare*, Mono: Monogenoidea, Asco: metacercariae of *Ascocotyle*, Cest: Cestodes, Cam: *Camallanus maculatus*, Lern: *Lernaea cyprinacea*

Fish species	Tric	Ich	Chil	Pisc	Mono	Asco	Cest	Cam	Lern
Xiphophorus maculatus	3	5	1	3	3	19	2	2	3
Xiphophorus helleri	1	1	0	0	8	7	1	0	0
Poecilia sphenops	1	1	0	3	4	0	0	3	1
Macropodus opercularis	0	0	0	0	0	0	0	0	0
Trichogaster trichopterus	0	0	0	0	0	0	0	0	0
Beta splendens	2	0	0	0	2	1	0	0	0
Puntius conchonius	0	0	0	0	0	0	1	0	0
Carassius auratus	1	0	0	1	3	0	0	0	0
Gymnocorymbus ternetzi	0	0	0	0	4	1	0	0	0
Total	8	7	1	7	24	28	4	5	4

Table 4. Mean intensity of parasites and variation amplitude (between parentheses) in ornamental freshwater fishes from Florianópolis, SC, Brazil. Tric: *Trichodina acuta*, Ich: *Ichthyophthirius multifiliis*, Chil: *Chilodonella*, Pisc: *Piscinoodinium pillulare*, Mono: Monogenoidea, Asco: metacercariae of *Ascocotyle*, Cest: Cestodes, Cam: *Camallanus maculatus*, Lern: *Lernaea cyprinacea*

Fish species	Tric	Ich	Chil	Pisc	Mono	Asco	Cest	Cam	Lern
X. maculates	10.3±12.7 (2-25)	2.0±1.73 (1-5)	3.0	7.0±9.5 (1-18)	2.0±1.0 (1-3)	335.0±365.3 (1-1070)	4.5±3.5 (2-7)	4.5±0.7 (3-4)	1.0
X. helleri	5.0	20.0	-	-	5.7±3.2 (1-10)	205.4±181.8 (80-313)	3.0	-	-
P. sphenops	1.0	98.0	-	13.0±14.2 (2-29)	4.7±3.0 (1-8)	-	-	2.0±1.0 (1-3)	1.0
M. opercularis	-	-	-	-	-	-	-	-	-
T. trichopterus	-	-	-	-	-	-	-	-	-
B. splendens	31.0±5.7 (27-35)	-	-	-	31.5±16.3 (20-43)	2.0	-	-	-
P. conchonius	-	-	-	-	-	-	4.0	-	-
C. auratus	7.0	-	-	3.0	31.7±26.7 (1-50)	-	-	-	-
G. ternetzi	-	-	-	-	27.7±28.1 (5-68)	1	-	-	-

Prevalence rates of *I. multifiliis*, *T. acuta*, Monogenoidea and nematodes observed in the present study were lower than that found by CONROY *et al.* (1981). On the other hand, *T. acuta*, *P. pillulare*, *I. multifiliis*, Monogenoidea and digenean helminths showed larger prevalence rates than those related by KUO *et al*. (1994). The cosmopolitan parasites, as trichodinids, *I. multifiliis* and *P. pillulare,* could proliferate if the water conditions are favorable. In this work, the mean intensity of these parasites varied depending on the fish health condition. In spite of the fact that *I. multifiliis* is a common ectoparasite of cultured fishes, severe infection was not observed. In fish cultured in the State of São Paulo, TAVARES-DIAS *et al*. (2001) related high infection rates with mean intensity of 442,100 parasites, while in this work a mean intensity of 98 in *P. sphenops* was reported. The limiting factors that favor its reproduction are low temperature, high fish stocking density and nutritional deficiencies.

As demonstrated by MORAES and MARTINS (2004), the reproduction of trichodinids is increased under high organic contents environment. This is confirmed by the observations of OGUT and PALM (2005) on *Trichodina* infection in fish from organic polluted environment. It is suggested that the number of 35 trichodinids per host (Table 4) could be related to the fish stocking density in the aquaria.

The prevalence of 15.3% Monogenoidea was larger than in *P. reticulata* studied by DOVE and ERNST (1998). Similar results were also related by GARCIA *et al*. (2003) in *X. maculatus* from the ornamental fish farmer in the city of Araraquara, São Paulo. These authors observed prevalence rates of 20 to 100% of *Urocleidoides* sp. (Monogenoidea) with mean intensity of 1.7 to 16.8. Contrarily, in the present work it was reported the largest mean intensity of Monogenoidea varying from 2.0±1.0 to 31.7±26.7 as shown in table 4. As here recorded, these parasites are considered one of the most important, corroborating the findings of THONEY and HARGIS (1991), MARTINS *et al*. (2002) and GARCIA *et al*. (2003). Moreover, GARCIA *et al*. (2003) observed that the water quality may present negative correlation with the parasite number and that at low values of water conductivity the number of parasites increased. This shows that the prophylaxis with salt is a good strategy to avoid parasitosis. The water temperature may constitute a limiting factor in the Monogenoidea reproduction. In *Gyrodactylus bullatarudis* Turnbull, 1956, a common parasite of *P. reticulata,* the highest fecundity is at 25.5 °C as reported by SCOTT and NOKES (1984). In Brazilian ornamental fish this effect was not yet studied. In fact, it is a good line of future research to determine the best temperature for parasite reproduction. With this data, it is possible to handle the water temperature in order to decrease the fecundity of Monogenoidea not affecting the fish health status. In this work, the store in which the fishes were obtained maintains the water temperature at 28 °C that can favour the reproduction of parasites.

Diseases have caused economical losses of about 10 to 20% in cultured fish and are related to inadequate handling and fish maintenance by longer periods (THONEY and HARGIS, 1991). In the majority of the examined fish the number of Monogenoidea was considered high when assuming the size of ornamental fish. According to THONEY and HARGIS (1991), thirty to forty dactylogyrids can kill fingerlings 3 to 4 cm long. Following this view, according to the data of the present work it may be concluded that 68 Monogenoidea in *G. ternetzi* and 50 in *C. auratus* could really kill ornamental fish (Table 4).

Metacercariae are important fish parasite because of its mode of attachment in fish. *Ascocotyle* sp. showed the largest frequency of dominance with numbers of one to 1,070 cysts per fish (Table 4). Once more, *X. maculatus* and *X. helleri* were the most parasitized fish. TAMPIERI *et al*. (1999) recorded low prevalence rate (8.1%) in fish with metacercariae in the gills. According to VÉLEZ-HERNÁNDEZ *et al*. (1998), histological changes due to metacercarial cysts in the gills included hyperplasia, hyperemia and congestion. SCHOLZ and SALGADO-MALDONADO (2000) have observed *Centrocestus formosanus* Nishigori, 1924 metacercariae with mean intensity of 2,824 varying from 1 to 5,935 per host. In this work, the high number of metacercariae cysts in the gills could be a great problem to ornamental fish.

Sanitary handling must be applied in the facility to avoid diseases introduction among the cultured ornamental or food fish. This is especially true when analyzing *X. maculatus* and *X. helleri* that were the most parasitized fishes. For freshwater fish, THONEY and HARGIS (1991) suggested a bath of 10 minutes in a solution of 35 g sodium chloride/liter. It must be remembered that salt tolerance by fish may vary with the species and age. If the ornamental fishes are maintained in ponds, the authors of the present work suggest 60 to 100 mg of sodium chloride/L baths 8 to

12 hours with circulating water. In the practice it can avoid stress and dissemination of several parasites (MARTINS, 2004).

Some other measures must be commented, such as water monitoring to verify alterations that can induce parasite dissemination; regular monitoring of fish health status to check the normal parasitic fauna of the cultured species; earth and concrete ponds should be dried and disinfected to avoid reinfestation; aquaculturists must be readily encouraged to maintain new fishes in quarantine; prior transport fish should be certified free of important parasites by a qualified professional. Finally, with the efforts of technicians, owners and researchers the productivity and the expansion of the ornamental industry in Brazil may reach good performance.

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