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Ectoparasites Communities from *Oreochromis niloticus* Cultivated in the State of Santa Catarina, Brazil

[1]Luciana Ghiraldelli, [1]Maurício Laterça Martins, [1]Gabriela Tomas Jerônimo,
[1]Marcela Maia Yamashita and [2]Washington de Barros Adamante
[1]Laboratory of Diagnosis and Pathology in Aquaculture,
[2]Laboratory of Biology and Culture of Freshwater Fishes
Department of Aquaculture UFSC, Florianópolis, SC, Brazil

Abstract: Ectoparasites of *Oreochromis niloticus* farmed in three regions in the State of Santa Catarina, Brazil were analized. In the farms A and C of Blumenau (Blum) region the animals were fed with ration, fish entrails and restaurant scraps. In Ituporanga (Itupo) the consorted system with pig manure was common while Joinville (Joinv) fish production by using dry ration predominated. Prevalence, mean intensity and mean relative dominance were compared between the facilities in each region. *Trichodina magna* and *Trichodina truncata* were the most dominant parasites followed by *Cichlydogyrus sclerosus*, *Cichlydogyrus* sp. and *Gyrodactylus* sp., *Lernaeidae* gen. sp. (copepodids), *Lamproglena* sp., *Argulus spinulosus* and *Piscinoodinium pillulare*. Fish from the regions of Blumenau and Joinville showed higher prevalence and mean intensity of trichodinids and Monogenoidea in the gills than those maintained in Ituporanga. In fish skin mucus trichodinids were more prevalent than Monogenoidea and once more Joinville showed the highest values of prevalence and mean intensity of parasites. Ninety percent of examined fish from the facility A of Blumenau were parasitized by *Lamproglena* in the gills. The authors discuss about the importance of the environment in the composition of the ectoparasites communities.

Key words: Tilapia, ectoparasites, trichodinid, monogenoidea, *Lamproglena*

Introduction

With the rapid development of freshwater aquaculture in Brazil, fish farmers have experimented the occurrence of infectious or parasitic diseases and in some cases severe fish mortalities, as related by Martins *et al*. (2001). Nutritional deficiency, poor water quality, infectious and parasitic diseases may cause unbalance in the host/parasite/environment system that provoke fish mortalities (Moraes and Martins, 2004) and affect the growth of the host (Barker *et al*., 2002; Ranzani-Paiva and Silva-Souza, 2004).

According to Martins *et al*. (2002) the principal fish parasites reported in Southeast Brazil are *Piscinoodinium pillulare* (Schäperclaus, 1954) (Dinoflagellida); trichodinids, *Ichthyophthirius multifiliis* Fouquet, 1876 (Ciliophora); *Henneguya piaractus* Martins and Souza 1997 (Myxozoa); *Anacanthorus penilabiatus* Boeger, Husak and Martins, 1995; *Lernaea cyprinacea* Linnaeus, 1758 (Copepoda) and more recently *Lamproglena* von Nordmann, 1832 as the second important copepod parasite in freshwater fish (Piasecki *et al*., 2004). Nile tilapia, *Oreochromis niloticus* (Linnaeus, 1758) (Cichlidae) is widely reared in the tropics representing the second species cultivated over the world

Corresponding Author: Maurício Laterça Martins, Departamento de Aqüicultura, CCA,
Universidade Federal de Santa Catarina, C P 476, 88040-900, Florianópolis, SC, Brazil
Tel: 55 48 3331 9923 Fax: 55 48 3331 5473

(Cavichiolo *et al*., 2002). Consequently, in the Southeast region tilapia showed 40% incidence of diseases followed by the hybrid tambacu with 31% and other fish species with lower percentages (Martins *et al*., 2002).

Trichodinids, *I. multifiliis* and Monogenoidea helminthes are among the most important fish parasites in eel and trout farms (Mellergaard and Dalsgaard, 1987; Buchmann *et al*., 1995). In Brazil, Martins *et al.* (2002) found *P. pillulare* trichodinids, *I. multifiliis*; *Henneguya piaractus* Martins and Souza 1997 (Myxozoa); *A. penilabiatus*; *Lernaea cyprinacea* Linnaeus, 1758 and *Lamproglena* sp. (Copepoda) as the main cause of freshwater fish diseases.

Nile tilapia, *Oreochromis niloticus* (Linnaeus, 1758) (Cichlidae) are among the most cultivated fish over the world (Cavichiolo *et al*., 2002). Békési (1992) and Tavares-Dias *et al*. (2001ab) studied the parasitic fauna of cultured fish confirming that ectoparasites were the most important disease agents, respectively in the States of Ceará and São Paulo. On this point of view, Vargas *et al*. (2000) found trichodinids parasitizing the fish skin mucus and Monogenoidea in the gills of *O. niloticus* in the State of Paraná. On the other hand, Fortes *et al*. (1998) have reported *L. cyprinacea* in fish from Porto Alegre.

In the State of Santa Catarina little is known on the parasitic fauna of freshwater cultivated fish. However, Azevedo *et al*. (2006) found trichodinids, Monogenoidea and *Lamproglena* as the most important infracommunities in the skin mucus and gills of tilapia maintained in fish farming of the Santa Catarina State. The information on the relation of cultivated freshwater fish in the different facilities that use different source of feeding is scarce as well. By this fact, we have continued the study of such relation by analysing the ectoparasites population in Nile tilapia from three different regions of the Santa Catarina State.

Materials and Methods

A total of 137 specimens of Nile tilapia (weight 401.7±141.3 g and length 265.6±38.2 mm) were examined from four facilities situated at Itajaí Valley, Blumenau City (26°55'10''S, 49°03'58''W) and North of State, Joinville City (26°18'16''S, 48°50'44''W) and three from High Valley of Itajaí, Ituporanga City (27°24'52''S, 49°36'09''W), between October 2004 and June 2005 in the State of Santa Catarina.

In the days of each sampling, the water temperature, dissolved oxygen, pH, alkalinity and transparency were measured. After sacrifice (Ethic Committee No. 23080.017229/2004-78/UFSC) and biometrical evaluation the fish were examined for parasitological investigation. Parasitological examination of body mucus and pieces of the organs were performed on wet mounts with a drop of 0.65% saline solution. The intestines were opened and observed in a Petri dish containing saline solution. For counting and parasites identification the gills were placed in flasks containing water at 60°C, which were shacked and the contents fixed in 5% formalin solution. For body surface mucus the same procedure was followed.

The number of protozoan parasites was obtained from the mixed contents of the body or gill, five samples having been collected for counting in Mc Master chamber. The total number of Monogenoidea was performed in Petri plates under stereoscopic microscope. Prevalence and mean intensity were calculated according to Bush *et al*. (1997) and the relative dominance according to Rohde *et al*. (1995). The parasites were treated according to Eiras *et al*. (2000) and identified based on Thatcher (1991) and Kritsky *et al*. (1994). For identification of trichodinids skin mucus and gill smears containing parasites were prepared on slides, stained by Giemsa or impregnated with Klein's dry silver impregnation method for adhesive disc observation as suggested by Lom (1958).

The results were analyzed by variance analysis (ANOVA) and when significant compared by Tukey test at 5% probability. The data of prevalence and mean intensity were compared between the regions and facilities. The mean relative dominance of each parasite assemblage was compared in each region and between the parasites in the same region.

Results

Handling characteristics in each facility where the fish were captured is shown in the Table 1. It has been observed that A and C from Blumenau not only the ration, but also fish entrails, cooked rice and restaurant scraps were utilized as source of feeding to fish. On the other hand, the High Valley of Itajaí utilized the pattern of integrated system with pig manure as the main source of feeding and commercial dry ration is offered only at the finish of rearing. It has been also observed that a few numbers of owners do the water monitoring.

The water quality did not show difference between the facilities and was maintained as follows: in the region of Blumenau the water temperature was 26.2±3.3°C; dissolved oxygen 8.0±1.4 mg L^{-1}; pH 7.2±0.9; ammonia 1.2±0.9 mg L^{-1}; alkalinity 66.7±25.2 mg L^{-1} and transparency 27.5±3.3 cm. In Joinville the water temperature was 30.2±15.8°C; dissolved oxygen 6.0±1.9 mg L^{-1}; pH 7.1±0.6; ammonia 1.1±1.3 mg L^{-1}; alkalinity 37.5±9.6 mg L^{-1} and transparency 30.0±15.8 cm. In Ituporanga the water temperature was 24.5±1.4°C; dissolved oxygen 8.8±0.3 mg L^{-1}; pH 6.2±0.8; ammonia 1.2±0.3 mg L^{-1} 1; alkalinity 60.0±10.0 mg L^{-1} and transparency 20.0±5.0 cm.

Parasitological examination showed the presence of trichodinids *Trichodina magna* Van As and Basson, 1989, *Trichodina truncata* Ghiraldelli, Martins, Adamante and Yamashita, 2005 and *Epistylis* Ehrenberg, 1830 (Protozoa: Ciliophora); *P. pillulare* (Dinoflagellida); *Cichlydogyrus sclerosus* Paperna and Thurston, 1969, *Cichlydogyrus* Paperna, 1960 (Monogenoidea: Dactylogyridae) and *Gyrodactylus* von Nordmann, 1832 (Gyrodactylidae); crustacean copepodids; *Argulus spinulosus* Silva, 1980 and *Lamproglena* sp. (Crustacea: Lernaeidae).

Neither prevalence nor the mean intensity of parasites was significantly different between the regions and facilities (Table 2). However, it can be observed that *Oreochromis niloticus* collected from Blumenau and Joinville showed higher prevalence and mean intensity of trichodinids and Monogenoidea in the gills than that observed in Ituporanga. It can be inferred that fish from A and C of Blumenau, D of Joinville and A and C of Ituporanga showed the largest values in the mean intensity of trichodinids in its gills. Crustacean copepodids and *Lamproglena* were noted in only one facility

Table 1: Handling characteristics in the facilities of Blumenau (Blum), Joinville (Joinv) and Ituporanga (Itupo) in the State of Santa Catarina, Brazil

Locality	Culture system/feeding	Stocking density	Water monitoring	Aeration	Water flow
Blum/A	Feefishing/dry ration, complemented with fish entrails and cooked rice	2.0 fish/m²	No	Yes	Little
Blum/B	Feefishing/dry ration once a day	-	No	Only in emergency	Little
Blum/C	Fish production/homemade ration cooked (bone meal, corn, barley, soybean) and restaurant scraps	1.6 fish/m²	No	Only in emergency	No
Blum/D	Fry production/dry ration once a day	1.0 fish/m²	No	No	Renewal
Joinv/A	Fry production/dry ration	-	Yes	Yes	Little
Joinv/B	Fish production/dry ration three times a day	1.6 fish/m²	No	Yes	Little
Joinv/C	Fish production/dry ration twice a day	1.2 fish/m²	No	Yes	Little
Joinv/D	Fee fishing/dry ration once a day, received a great quantity of fish from the other localities	-	No	Yes	Little
Itupo/A	Fish production/consorted with pigs	3.2 fish/m²	Yes	Yes	No
Itupo/B	Fee fishing /dry ration complemented with corn meal	-	No	No	Little
Itupo/C	Fish production/consorted with pigs	4.0 fish/m²	Yes	Yes	No

Table 2: Prevalence rate (P), mean intensity (MI) and variation amplitude in parentheses of gill parasites in *Oreochromis niloticus* from the facilities of Blumenau (Blum), Joinville (Joinv) and Ituporanga (Itupo) in the State of Santa Catarina, Brazil. Different capital letters indicate significant difference between the regions and small letters between the parasites within the region ($p<0.05$). PF: parasitized fish; EF: examined fish

	Trichodinids			Monogenoidea		
Locality	PF/EF	P (%)	MI	PF/EF	P (%)	MI
Blum/A	9/10	90	483.0 (82-1,764)	5/10	50	1.2 (1-2)
Blum/B	1/10	10	400.0 (400)	7/10	70	5.1 (1-16)
Blum/C	3/15	20	62.7(35-87)	2/15	13	35.5 (3-68)
Blum/D	5/13	38	18.3 (33-59)	13/13	100	48.2 (7-102)
Average		39±35A	241.0±234.7A		58±36A	22.5±23.0A
Joinv/A	1/20	5	81 (81)	20/20	100	95.5 (25-200)
Joinv/B	6/16	37	75 (42-152)	16/16	100	9.0 (1-23)
Joinv/C	15/18	83	177 (35-672)	6/18	33	1.3 (1-2)
Joinv/D	7/9	78	2,155 (99-6,258)	9/9	100	32.0 (2-160)
Average		51±37A	621.9±1,022.9A		83±33A	34.5±42.7A
Itupo/A	1/12	8	90 (90)	0/12	0	0
Itupo/B	0/13	0	0	3/13	23	2.0 (1-3)
Itupo/C	2/10	20	75 (67-83)	6/10	60	1.8 (1-3)
Average		10±9A	55.1±48.3A		28±30A	1.3±1.1A
	Copepodids			*Lamproglena*		
Locality	PF/EF	P (%)	MI	PF/EF	P (%)	MI
Blue/A	8/10	80	7.5 (5-15)	9/10	90	3.1 (1-6)
Blum/B	0/10	0	0	0/10	0	0
Blum/C	0/15	0	0	0/15	0	0
Blum/D	0/13	0	0	0/13	0	0
Average		20±40A	1.8±3.7A		22±45A	0.8±1.6A
Joinv/A	0/20	0	0	0/20	0	0
Joinv/B	0/16	0	0	0/16	0	0
Joinv/C	0/18	0	0	0/18	0	0
Joinv/D	8/9	89	2.4 (1-7)	1/9	11	1.0 (1)
Average		22±44A	0.6±1.2A		3±6A	0.3±0.5A
Itupo/A	0/12	0	0	0/12	0	0
Itupo/B	1/13	8	1.0 (1)	0/13	0	0
Itupo/C	0/10	0	0	0/10	0	0
Average		3±4A	0.3±0.6A		0A	0

of each region studied. The highest mean intensity of copepodids and *Lamproglena* occurred in the facility A from Blumenau. Three out of nine, examined tilapia from Joinville D were parasitized by *Argulus* in the gills with 33% of prevalence and mean intensity of 1.7 parasites per host. From thirteen fish examined in Ituporanga B, only one showed *P. pillulare*. From 9 examined tilapia of Joinville D 5 were parasitized by *P. pillulare*, 2 by copepodids with mean intensity 1.5. *Argulus* was observed in one specimen of Blumenau C with mean intensity 1.0.

When analysing the body surface mucus of *O. niloticus* trichodinids were more prevalent than Monogenoidea (Table 3). Not only the prevalence rate, but also the mean intensity of infestation showed the highest values in the facilities of Joinville. In spite of the clearly visible high number of trichodinids in fish from Joinville no significant difference occurred between the facilities. The protozoan *Epistylis* was observed in 2 out of 48 examined fish from Blumenau and in 5 out of 63 examined fish from Joinville.

In the majority of facilities trichodinids showed the highest mean relative dominance with values up to 0.726 in the gills and until 1.000 on body surface (Table 4). On the other hand, Monogenoidea had comparatively lower mean relative dominance with values of 0.274 to 0.959 in the gills of tilapia. Trichodinids were the most dominant ectoparasite in the region of Blumenau and Joinville.

Table 3: Prevalence rate (P), Mean Intensity (MI) and variation amplitude of body surface parasites in *Oreochromis niloticus* from the facilities of Blumenau (Blum), Joinville (Joinv) and Ituporanga (Itupo) in the State of Santa Catarina, Brazil. Different capital letters indicate significant difference between the regions and small letters between the parasites within the region ($p<0.05$). PF: Parasitized Fish; EF: Examined Fish

	Trichodinids			Monogenoidea		
Locality	PF/EF	P (%)	MI	PF/EF	P (%)	MI
Blum/A	0/10	0	0	0/10	0	0
Blum/B	9/10	90	77.6 (10-254)	0/10	0	0
Blum/C	0/15	0	0	0/15	0	0
Blum/D	12/13	92	17.0 (1-54)	0/13	0	0
Average		45.6±52.6A	23.6±36.8A		0A	0A
Joinv/A	5/20	25	12.4 (1-26)	0/20	0	0
Joinv/B	12/16	75	11.8 (1-24)	1/16	6	1 (1)
Joinv/C	17/18	94	65.0 (4-357)	0/18	0	0
Joinv/D	9/9	100	196.6 (61-692)	5/9	55	4.8 (1-13)
Average		73.6±34.1A	71.5±87.1A		15.5±26.9A	1.5±2.3A
Itupo/A	0/12	0	0	0/12	0	0
Itupo/B	5/13	38	17.3 (1-46)	0/13	0	0
Itupo/C	6/10	60	54.4 (9-255)	0/10	0	0
Average		32.8±30.4A	23.9±27.8A		0A	0A

Table 4: Mean relative dominance of body surface and gill parasites in *Oreochromis niloticus* from the facilities of Blumenau (Blum), Joinville (Joinv) and Ituporanga (Itupo) in the State of Santa Catarina, Brazil. Different capital letters indicate significant difference between the regions and small letters indicate difference between the parasites within the region ($p<0.05$)

	Gills				Body surface	
Locality	Trichodinids	Monogenoidea	Copepodids	Lamproglena	Trichodinids	Monogenoidea
Blum/A	0.979	0.001	0.014	0.006	0	0
Blum/B	0.917	0.083	0	0	1.000	0
Blum/C	0.726	0.274	0	0	0	0
Blum/D	0.278	0.722	0	0	1.000	0
Average	0.725±0.317Aa	0.270±0.322Aab	0.004±0.007Ab	0.002±0.003Ab	0.500±0.577Aa	0Aa
Joinv/A	0.041	0.959	0	0	1.000	0
Joinv/B	0.759	0.241	0	0	0.993	0.007
Joinv/C	0.997	0.003	0	0	1.000	0.000
Joinv/D	0.980	0.019	0.001	0	0.987	0.013
Average	0.694±0.449Aa	0.306±0.449Aab	0.000±0.001Ab	0Ab	0.995±0.005A	0.005±0.006Ab
Itupo/A	1.000	0	0	0	0	0
Itupo/B	0	0.857	0.143	0	1.000	0
Itupo/C	0.932	0.068	0.000	0	1.000	0
Average	0.644±0.559Aa	0.308±0.479Aa	0.048±0.083Aa	0Aa	0.667±0.577Aa	0Ab

Discussion

Trichodinids are considered ectocommensals feeding on the skin surface and gill epithelium. Despite the fact that their presence is directly related to water quality, its mode of attachment on body surface and gill filaments may favour other infections (Moraes and Martins, 2004). Ogut and Palm (2005) have reported trichodinids as pollution indicators. We found that trichodinids was the most dominant parasite on body surface and gills, corroborating the findings of Nikolic and Simonovic (1999) and Özer and Erdem (1999).

According to Madsen *et al*. (2000) who divided trichodinid infestation in three categories, we can to infer that fish gills from Blumenau A and B and Joinville D belongs to category 3 comprehending in 100 to 1,000 trichodinids per host. On the other hand, in the majority of analyzed fish the infestation was in category 2 (11 to 100 parasites per host). Especially in the regions of Blumenau and Joinville the prevalence rates were similar to that observed in carp fingerlings (Pilarczyk, 1987), in fish-pond reared carp (Nikolic and Simonovic, 1998; Özer and Erdem, 1999), in *Neogobius melanostomus* Pallas, 1811 and *Gasterosteus aculeatus* Linnaeus, 1758 in the Sinop Coast, Turkey (Özer, 2003a),

in mugilids (Özer and Öztürk, 2004), but higher than that related in several cultivated freshwater fish species in the States of Ceará (Békési, 1992), Paraná (Vargas *et al*., 2000) and São Paulo, Brazil (Tavares-Dias *et al*., 2001a; Martins *et al*., 2002).

The mean intensity of trichodinids in the studied tilapia was higher than that related in *G. aculeatus* parasitized by *Trichodina domerguei* Wallengren, 1897 and *Trichodina tenuidens* Fauré-Fremiet, 1944 (Özer, 2003b), in mugilids by *Trichodina lepsii* Lom, 1962 and *Trichodina puytoraci* Lom, 1962 (Özer and Öztürk, 2004), in fish from polluted site in Turkey (Ogut and Palm, 2005) and lower than that observed in farmed carp infested by *Trichodina acuta* Lom, 1961 and *Trichodina nigra* Lom, 1960 (Özer and Erdem, 1999). On the other hand, present results were similar to that found in carp infested by *T. acuta*, *T. nigra* and *Trichodina mutabilis* Kazubski and Migala, 1968 (Özer and Erdem, 1998) and in *N. melanostomus* by *T. domerguei* (Özer, 2003a). When comparing the mean intensity of trichodinids here observed with other findings in Brazil, Tavares-Dias *et al*. (2001a) related larger values depending on the fish species. In this study the mean intensity of infestation in tilapia from Blumenau A and B and Joinville D was higher than that observed by Tavares-Dias *et al*. (2001a) in the same fish captured from the sport fishing facility and that found by Azevedo *et al*. (2006) in tilapia analyzed in other localities of the State of Santa Catarina. In fact, the highest mean intensities observed in those facilities may be explained by the handling characteristics that fish were fed with fish entrails, cooked rice or with a great flow of fish entrance without any health control. This hypothesis is supported by the fact that trichodinids reproduction is favoured by high organic matter contents, as supposed by Madsen *et al*. (2000).

Monogenoidea helminthes are among one of the most common parasites in cultivated fish (Békési, 1992; Vargas *et al*., 2000; Tavares-Dias *et al*., 2001b; Martins *et al*., 2002; Varella *et al*., 2003). Its reproduction is, in part, related to water quality and fish stocking density, but several times the parasite is well adapted to their hosts causing few health problems (Thoney and Hargis, 1991). On the other hand, when fish are exposed to adverse stress situation the disease occurs (Buchmann and Bresciani, 1997). This group of parasites developed different modes of attachment associated with mechanical and chemical factors to the specific host (Buchmann and Lindenstrom, 2002).

In this research, Monogenoidea was the second most dominant fish gill parasite. It has been observed that the facilities C and D of Blumenau, A of Joinville and B of Ituporanga showed values varying from 0.274 to 0.857 of relative dominance. As related by Tavares-Dias *et al*. (2001b) Monogenoidea comprehended the most dominant metazoan parasite in fish from sport fishing. Present results showed higher prevalence rates and mean intensity of infestation in tilapia from these facilities of Santa Catarina State than those observed in the São Paulo State by Tavares-Dias *et al*. (2001b). Similar prevalence rate was also reported by Varella *et al*. (2003) in pond-reared *Colossoma macropomum* Cuvier, 1818 parasitized by *Anacanthorus spatulatus* Kritski, Thatcher and Kayton, 1979 and *Linguadactyloides brinkmanni* Thatcher and Kritski, 1983, but in some cases, the mean intensity was higher.

The mean intensity of Monogenoidea in the gills of fish from the facilities C and D of Blumenau and A and D of Joinville was very high when compared to the findings of Azevedo *et al*. (2006) in tilapia from the other locality in the State of Santa Catarina. This fact may be explained by the different handling characteristics of these facilities. In the case of facilities C of Blumenau and D of Joinville the high number of parasites was possibly related to restaurant scraps as source of feeding and by a great flow of fish entrance, respectively. Despite the fact that fish from Ituporanga were fed with pig manure and the highest fish stocking densities, it can be added that Monogenoidea, in this case, was not directly affected by these types of organic matter contents. It must be remembered that the values of total ammonia was not high neither in Ituporanga nor in the other facilities. Koskivaara *et al*. (1991) have related high infection rates and mean intensities of gyrodactylids in *Rutilus rutilus* Linnaeus, 1758 captured in euthrophic environment. In this study the facility C of Blumenau that fed fish with

restaurant scraps showed slightly higher number of parasites. This fact is possibly related to water quality that confirmed the observations of Koskivaara *et al*. (1991). It appears that in this work the high mean intensity of Monogenoidea is related to fish stocking density in the fish production.

Lamproglena comprehends the second most important crustacean parasite of fish with more than 40 species (Piasecki *et al*., 2004). They occur in Malaysia (Leong, 1986), Philipinnes (Yambot and Lopez, 1997), Turkey (Saglam, 1998), Europe (Galli *et al*., 2001), Brazil (Martins *et al*., 2002; Azevedo *et al*., 2006) and Africa (Tsotetsi *et al*., 2004). The mean relative dominance of crustacean copepodids and *Lamproglena* was the lowest observed in this study. They appeared only in two facilities, Blumenau A and Joinville D, respectively with mean intensities of 3.1 and 1.0. Most investigators have focused on low effect of this parasite in fish. The mean intensity here observed was similar to that found in *Puntius binotatus* Valenciennes, 1842 with *Lamproglena minuta* Capart, 1943 (Leong, 1986), in tilapia with *Lamproglena monodi* Capart, 1944 (Yambot and Lopez, 1997), in *Capoeta trutta* Heckel, 1843 with *Lamproglena pulchella* von Nordmann, 1832 (Saglam, 1998) and in *Clarias gariepinus* Burchell, 1822 with *Lamproglena clariae* Fryer, 1956 (Marx and Avenant-Oldewage, 1996; Tsotetsi *et al*., 2004).

When comparing to the findings of Azevedo *et al*. (2006) in Nova Trento, Santa Catarina, the prevalence and mean intensity of *Lamproglena* was very high. Most of the researchers have shown that the number of *Lamproglena* is maintained in the majority of times between 1 and 3 parasites per host. In some cases this number may reach 4 or 5 (Marx and Avenant-Oldewage, 1996; Yambot and Lopez, 1997; Tsotetsi *et al*., 2004; Azevedo *et al*., 2004). As also related by Tsotetsi *et al*. (2004), in this work no influence was observed by water quality. This was contrary to that found by Marx and Avenant-Oldewage (1996) who observed negative effects of pollution on parasite reproduction. An important point that must be emphasized is that in the facility A of Blumenau *Lamproglena* was found in 90% of examined fish at a number of 6 per host. This high prevalence rate differs from the previous data and includes this parasite as having a great potential to disseminate in the State of Santa Catarina.

In contrast, Tavares-Dias *et al*. (2001b) did not observe *Argulus* and *Lamproglena* in tilapia from the facilities in São Paulo State. Neither copepodids nor dinoflagellate was related by Azevedo *et al*. (2006) in tilapia cultivated with pig manure. Dinoflagellates as *P. pillulare* may reach a great number and its effects on fish are directly related to water quality (Martins *et al*., 2001).

We were able to demonstrate that trichodinids constitute the most numerous and dominant parasite found in tilapia cultivated in the State of Santa Catarina followed by Monogenoidea. It seems that not much is known about the overall prevalence and spread of *Lamproglena* in Brazil. This work contributed to improve the understanding of this crustacean that has potential to cause disease when tilapia is reared in cages as well. In fact, this study was only one of the many efforts that might be made to have the attention of fish producers to improve the sanitary handling.

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