Anisakidae infection in five commercially important fish species from the State of Rio de Janeiro, Brazil*

Danuza Pinheiro Bastos Garcia Mattos[1], Leila Maria Silva Lopes[2], Maurício Afonso-Verícimo[3], Thiago Silveira Alvares[4] and Sérgio Carmona de São Clemente[5+]

ABSTRACT. Mattos D.P.B.G., Lopes L.M.S., Verícimo M.A., Alvares T.S. & São Clemente S.C. **Anisakidae larvae infection in five commercially important fish species from the State of Rio de Janeiro, Brazil.** [Infecção por larvas Anisakidae em cinco espécies de peixes comercialmente importantes do Rio de Janeiro, Brasil.] *Revista Brasileiro de Medicina Veterinária, 36(4):375-379, 2014.* Laboratório de Inspeção e Tecnologia de Pescado, Faculdade de Veterinária, Universidade Federal Fluminense, Rua Vital Brazil, 64, Santa Rosa, Niterói, RJ 24230-340, Brasil. E-mail: scsc@vm.uff.br

From March 2009 to March 2012, 213 teleostei fish were obtained from fish markets and fishermen from Niteroi and Cabo Frio municipalities, Rio de Janeiro State, Brazil. The fish belonged to the species *Micropogonias furnieri* (107); *Trichiurus lepturus* (35); *Centropomus undecimalis* (22); *Genypterus brasiliensis* (18); *Pagrus pagrus* (18); *Pomatomus saltatrix* (7) e *Merluccius hubbsi* (6). Nematode larvae of Anisakidae were found in *P. saltatrix* (85.71%); *T. lepturus* (71.42%), *P. pagrus* (55.55%), *G. brasiliensis* (50.00%), and *M. furnieri* (0.93%). The prevalence rates raised as fish size increased. The highest mean intensity was observed in *T. lepturus* parasitized by *Contracaecum* sp. (30.50 larvae per fish). The sites of infection were only mesenteries, hepatic capsule and gastric serosa. No larvae were found in flesh, however, the high prevalence and intensity observed in some species, could represent a risk to human health by the larvae migration to flesh.

KEY WORDS. Anisakidae, prevalence, teleostei.

RESUMO. Entre março de 2009 e março de 2012 foram obtidos 213 peixes teleósteos de mercados de peixe e de pescadores dos municípios de Niterói e Cabo Frio, no Estado do Rio de Janeiro, Brasil. Os peixes pertenciam às espécies *Micropogonias furnieri* (107); *Trichiurus lepturus* (35); *Centropomus undecimalis* (22); *Genypterus brasiliensis* (18); *Pagrus pagrus* (18); *Pomatomus saltatrix* (7) e *Merluccius hubbsi* (6). Foram encontradas larvas de anisaquídeos em *P. saltatrix* (85.71%), *T. lepturus* (71.42%), *P. pagrus* (55.55%), *G. brasiliensis* (50.00%), and *M. furnieri* (0.93%). As taxas de prevalência se elevaram conforme o aumento do tamanho dos peixes. A maior intensidade média foi observada em *T. lepturus* parasitados por *Contracaecum* sp. (30.50 larvas por peixe). Os locais de parasitismo foram apenas mesentério, cápsula hepática e serosa gástrica. Nenhuma larva foi encontrada na musculatura, entretanto a alta prevalência e intensidade de parasitismo observadas em algumas espécies poderiam representar um risco à saúde humana pela migração das larvas para o músculo.

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[1] Médico-veterinário, MSc, Departamento de Microbiologia e Parasitologia, Instituto Biomédico, Universidade Federal Fluminense (UFF), Rua Hernani de Mello, 101, São Domingos, Niterói, RJ 24210-130, Brasil. E-mail: danuzamattos@vm.uff.br

[2] Médico-veterinário, DSc. Laboratório de Inspeção e Tecnologia de Pescado, Faculdade de Veterinária, UFF, Rua Vital Brazil, 64, Santa Rosa, Niterói, RJ 24230-340. E-mail: leilamsl@ig.com.br

[3] Médico-veterinário, DSc. Departamento de Imunobiologia, Instituto de Biologia, Valonguinho, (UFF), Outeiro São João Batista, Centro, Niterói, RJ 24210-150. E-mail: vericimo@vm.uff.br

[4] Nutricionista, DSc. Laboratório de Análises Avançadas em Bioquímica e Biologia Molecular, Instituto de Química, Universidade Federal do Rio de Janeiro (UFRJ), Av. Athos da Silveira Ramos, 149, Ilha do Fundão, Rio de Janeiro, RJ 21941-909. E-mail: alvares@iq.ufrj.br

[5] Médico-veterinário, DSc. Departamento de Tecnologia de Alimentos, Faculdade de Veterinária, (UFF), Rua Vital Brazil, 64, Santa Rosa, Niterói, RJ 24230-340. +Author for correspondence, E-mail: scsc@vm.uff.br

PALAVRAS-CHAVE. Anisakidae, prevalência, teleósteos.

INTRODUCTION

The fish production of Rio de Janeiro State has been increasing over the years, reaching more than 82,000 tons in 2007 (IBAMA 2007). The per capita consumption of fish in the metropolitan area exceeds the national average and is calculated at 18.5 kg of whole fish / inhab. / year (Barroso & Wiefels 2010).

Some species like *Micropogonias furnieri, Pagrus pagrus*, *Pomatomus saltatrix*, *Trichiurus lepturus*, *Genypterus brasiliensis*, *Merluccius hubbsi* and *Centropomus undecimalis* are widely commercialized in Rio de Janeiro State. Together, they represented more than 12% of the total marine fish locally caught in 2005, among more than 80 varieties of local fish (Barroso & Wiefels 2010).

Micropogonias furnieri, also known as whitemouth croaker, is found in coastal waters up to 60m depth of the Atlantic Ocean from the Gulf of Mexico to Argentina (Figueiredo & Menezes 2000). It feeds on components of the demersal and benthic communities. It is one of the main species marketed in Rio de Janeiro, with their representation increasing over the years and responding to 70% of the volume of fish sold in the main warehouses in the region (Barroso & Wiefels 2010). Also is an important resource at Southern Brazil, and according to Vasconcellos et al. (2007), it corresponds to 28.1% of local catch and 16.7% of the industrial landings in the marine coast of the region.

The bluefish (*Pomatomus saltatrix*) and the atlantic cutlassfish (*Trichiurus lepturus*) are pelagic carnivorous fish with wide geographic distribution and great commercial importance in Rio de Janeiro (Meyer & Smale 1991, Martins & Haimovici 1997, Figueiredo & Menezes 2000, Barroso & Wiefels 2010).

Red porgy (*Pagrus pagrus*) is a benthopelagic demersal fish which feeds on fish, crustaceans and molluscs. It has a wide geographical distribution, being found in the east and west coasts of the Atlantic and Mediterranean Sea. Whereas, pink Cusk-eel, *Genypterus brasiliensis*, is a demersal fish found at South Atlantic Ocean from Rio de Janeiro until Uruguay, living between 60 and 200 meters deep (Figueiredo & Menezes 2000).

The common snook (*Centropomus undecimalis*) lives in coastal waters of western Atlantic Ocean from Florida (USA) to Rio de Janeiro (Brazil), inhabiting also estuaries and lagoons, penetrating into freshwater. They feed mainly on fish but also eat crustaceans, molluscs and insects (Rojas 1975, Vasconcellos Filho et al. 1980). *Merluccius hubbsi* (hake) is a comercially important demersal-pelagic fish in Brazil that can be found since Rio de Janeiro until South region of Argentina (Figueiredo & Menezes 2000).

Parasitism is a frequent phenomenon in marine and freshwater fish, particularly by those belonging to the Anisakidae family (Olivero-Verbel et al. 2011, Martins et al. 2005). Among Anisakidae, *Anisakis* sp. and *Contracaecum* sp. stand out and are often found in marine fish of the coast of Rio de Janeiro State, Brazil. Both have fish-eating birds as definitive hosts, living in the gastric and gut lumen. Fish and copepods participate as intermediate or paratenic hosts. Fish hosts present the larvae (L2 or L3) in the abdominal cavity, visceral serosa or abdominal and somatic muscles (Martins et al. 2005, Tavares & Luque 2006).

The presence of parasites in fish products indicates a harmful sanitary problem since some species can be associated to several diseases in humans like zoonosis, allergy and anaphylactic reactions (Audicana et al. 1995, Del Pozo et al. 1999, Lopez-Serrano et al. 2000, Antón et al. 2008, Hoshino & Narita 2011). Even products undergoing physical processes such as refrigeration and freezing, or salting may represent a risk to consumer health. Some parasites as Anisakidae can cause damages to the human health yet that only dead larvae are consumed (Audicana et al. 2002, Caballero & Moneo 2004, Audicana & Kennedy 2008). The risk of several pathological conditions is most accentuated for populations whose main diet is composed by regular fish ingestion (Olivero-Verbel et al. 2006).

The present study aimed to evaluate the parasitism by Anisakidae nematodes in different commercially important fish from Rio de Janeiro State, Brazil.

MATERIAL AND METHODS

Specimens of marine fish were obtained from fish markets and fishermen from Niterói and Cabo Frio municipalities, State of Rio de Janeiro, at early hours between March 2009 and March 2012. A total of 213 specimens belonging to seven different fish species with varied food habits were collected and transported inside isothermic bags with ice for examination at the Laboratório de Inspeção e Tecnologia de Pescado at the Veterinary School of Universidade Federal Fluminense. Fish specimens belonged to: *Micropogonias furnieri* (n=107; 24.0 to 65.0cm); *Trichiurus lepturus* (n=35; 94.0 to 138.0cm); *Centropomus undecimalis* (n=22; 27.0 to 56.0cm); *Genypterus*

brasiliensis (n=18; 39.0 to 88.0 cm); *Pagrus pagrus* (n=18; 29.0 to 67.0cm); *Pomatomus saltatrix* (n=7; 57.0 to 76.0cm) e *Merluccius hubbsi* (n=6; 31.0 to 38.0cm).

The fish specimens were measured, identified according to Figueiredo and Menezes (2000) and submitted to necropsy at the laboratory. Parasite recovery was performed following the methodology proposed by Eiras et al. (2006). Taxonomic identification of nematode larvae was based on Rego et al. (1983) and Petter & Maillard (1988). The collected larvae were also compared with those recovered from *Micropogonias furnieri* (CHIOC 33841), *Trichiurus lepturus* (CHIOC 33901, 34400), *Genypterus brasiliensis* (CHIOC 34650, 35535) and *Pagrus pagrus* (CHIOC 34436, 33437) deposited in the helminthological collection of the Instituto Oswaldo Cruz, confirming the identification.

Descriptive statistics are used to describe the parasite prevalence, intensity, mean intensity, mean abundance and infection range of the samples according to Bush et al. (1997).

RESULTS AND DISCUSSION

A total of 1259 larvae were recovered at five of the seven fish species analyzed. From 213 fish specimens, 23.94% were parasitized by Anisakidae. Prevalence, intensity and infection range of the fish parasites were presented in Table 1 and 2. Mostly larvae were located in the intestinal mesenteries or hepatic capsule. The Anisakidae nematodes were identified as *Contracaecum* sp. (19.71 %) and *Anisakis* sp. (9.85%).

Morfometric and parasitic parameters measured in *G. brasiliensis*, *T. lepturus*, *P. pagrus* and *Pomatomus saltatrix* are presented in Table 3.

Barros & Amato (1993), São Clemente et al. (1995), Luque & Chaves (1999), Silva et al. (2000) and Carvalho & Luque (2011) observed prevalence higher rates of anisakidae larvae in *T. lepturus* of Rio de Janeiro coast. The present results are similar to those results reported by São Clemente et al. (1995) and Silva et al. (2005), with predominance of *Contracaecum* sp larvae in comparison to other anisakidae. Shih (2004), Jakob & Palm (2006) also observed the parasitism of *T. lepturus* by anisakidae larvae in other regions of the world such as Taiwanese coast and Southern Java coast, respectively. However, at both investigations *Anisakis* sp was the anisakidae most prevalent and none *Contracaecum* sp larva was observed. The high prevalence and intensity of parasitism observed now and previously in *Trichiurus lepturus* may be related to its carnivorous feeding habits (Meyer & Smale 1991, Martins & Haimovici 1997). The high frequency of anisakidae larvae may indicate the involvement of *T. lepturus* in the food chain of the region serving as prey for birds and marine mammals, definitive hosts of anisakidae nematodes (Silva et al. 2000).

Lower prevalence rates of anisakidae larvae in *G. brasiliensis* was previously observed by Alves et al. (2002) and Knoff et al. (2007) in Rio de Janeiro State, but the differences may be due to the diverse sample size.

Anisakidae larvae have been observed in *Micropogonias furnieri* of South America, however, the present results analyzed a bigger sample size and only one fish showed nematode larvae. Other parasites with sanitary importance including Trypa-

Table 1. Prevalence (P), intensity and mean intensity (I/MI), mean abundance (MA), infection range (IR) and infection site of *Anisakis* sp. recovered from marine fish of Rio de Janeiro State from March/2009 to March/2012.

Host	N	P (%)	I/MI	MA	IR	Site
Pomatomus saltatrix	7	0	0	0	0	-
Trichiurus lepturus	35	28.57	8.60	2.45	1-54	M
Pagrus pagrus	18	22.22	8.25	1.83	2-13	M, Hc
Genypterus brasiliensis	18	38.88	9.85	3.83	1-22	M
Micropogonias furnieri	107	0	0	0	0	-
Centropomus undecimalis	22	0	0	0	0	-
Merluccius hubbsi	6	0	0	0	0	-

M (Mesenteries); Hc (Hepatic capsule).

Table 2. Prevalence (P), intensity and mean intensity (I/MI), mean abundance (MA), infection range (IR) and infection site of *Contracaecum* sp. recovered from marine fish of Rio de Janeiro State from March/2009 to March/2012.

Host	N	P (%)	I/MI	MA	IR	Site
Pomatomus saltatrix	7	85.71	8.66	7.42	2-20	M, Hc,Gs
Trichiurus lepturus	35	68.57	30.50	20.91	1-120	M,Hc
Pagrus pagrus	18	50.00	27.55	13.77	1-85	M, Hc
Genypterus brasiliensis	18	11.11	15.50	1.72	15-16	M
Micropogonias furnieri	107	0.93	2*	0.018	2**	M
Centropomus undecimalis	22	0	0	0	0	-
Merluccius hubbsi	6	0	0	0	0	-

M (Mesenteries); Hc (Hepatic capsule); Gs (Gastric serosa)
*Intensity; **Only one fish parasitized.

Table 3. Prevalence of parasitism by anisakidae larvae in *Genypterus brasiliensis*, *Trichiurus lepturus*, *Pagrus pagrus* and *Pomatomus saltatrix* from Rio de Janeiro State, Brazil, according to size classes.

Host		Size (cm)	N	P (%)
Pomatomus saltatrix	Total	57-76	7	85.71
		≤62	3	66.66
		≥63	4	100.00
Trichiurus lepturus	Total	94-138	35	71.42
		≤99	6	66.66
		100-129	22	68.18
		≥130	7	85.71
Pagrus pagrus	Total	29-67	18	55.55
		≤35	10	50.00
		36–67	8	62.50
Genypterus brasiliensis	Total	39-88	18	50.00
		39-64	9	22.22
		65-88	9	77.77

norhyncha cestodes, had showed to be more frequent in this fish in previous studies (São Clemente 1986, Alves & Luque 2001, Tavares & Luque 2006, Luque et al. 2010).

No parasites were observed in 22 specimens of *Centropomus undecimalis* analyzed. There are few studies on parasitology of *Centropomus* sp and according to literature the parasites most frequently found are digeneans and monogeneans (Fujimoto et al. 2009), yet, Tavares & Luque (2004) also observed *Contracaecum* sp. larvae in juvenile specimens with a prevalence rate of 12.7%.

The present results for prevalence of *Contracaeucum* sp. (50.00%) and *Anisakis* sp (22.22%) in *P. pagrus* were lower than observed by São Clemente et al. (1994), Paraguassú et al. (2002) and higher than previously reported by Saad & Luque (2009), although in the last only flesh samples were analyzed.

Rego et al. (1983) and Luque & Chaves (1999) described a greater diversity of anisakidae in *Pomatomus saltatrix*, and despite our prevalence rate was higher, it may be due to the smaller sample size. Likewise the small sample size may have influenced the absence of parasites found.

Sardella & Timi (2004) in Argentinean coast and Tavares & Luque (2006) in Rio de Janeiro are few of the reports of anisakidae parasitism in *Merluccius* sp. Positive correlations between parasite indices and host length for Anisakidae larvae were observed in the present study as also observed Sardella & Timi (1996) in *Merluccius hubbsi*, Cremonte & Sardella (1997) in *Scomber japonicus*, Olivero-Verbel et al. (2006) in *Hoplias malabaricus*, and Lacerda et al. (2009) in freshwater fishes from Pantanal, Brazil. These results may be due to cumulative effect by eating habits and consequent continuous reinfections. However, Olivero-Verbel et al. (2006; 2011) observed that fish condition factor correlated negatively with parasitic intensity, suggesting that parasites should be somehow impacting the physiological functions related to growth and development of the hosts.

The presence of anisakidae larvae mostly in the mesentery and viscera serosa might limit their zoonotic potential. However, it is important to consider the high prevalence and intensity observed in some species, as well as the commercial importance of the fish. According to Smith & Wootten (1975), Marques et al. (1995) and Wharton et al. (1999), there is an important risk to human health in case of larvae migration to flesh (if fish were not frozen, eviscerated or filleted just after capture).

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