



## Neotropical Helminthology



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### HELMINTH ASSEMBLAGE OF AQUATIC BIRDS (PELECANIFORMES: ARDEIDAE) OF SOUTHERN RIO GRANDE AND A CHECKLIST OF HELMINTHS OF HERONS OF BRAZIL

### ENSAMBLAJE DE HELMINTOS DE AVES ACUÁTICAS (PELECANIFORMES: ARDEIDAE) DEL SUR DE RIO GRANDE DEL SUR Y UN LISTADO DE HELMINTOS DE GARZAS DE BRASIL

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## ABSTRACT

We examined 44 bird specimens belonging to nine species of Ardeidae from the most south region of Brazil, close to Uruguay boundaries. The aim of the study was to report the occurrence of species of helminths for the aquatic birds, quantify the infections by host species as well as to present a revision of helminths of Ardeidae of Brazil. The aquatic birds were parasitized by helminths from 18 taxa: five Nematoda, nine Trematoda, and four Acanthocephala. New records of helminths for Ardeidae in Brazil have been reported, and *Ardea cocoi* and *Ardea alba* stood out by the number of associated species.

**Keywords:** Acanthocephala – Ardeidae – Brazil – Digenea – Helminths – Nematoda

## RESUMEN

Se examinaron 44 ejemplares pertenecientes a las nueve especies de Ardeidae del extremo sur del estado de Rio Grande do Sul. El objetivo del estudio fue relatar la ocurrencia de las especies de helmintos para las aves, cuantificar las infecciones por especie hospedadora, además de presentar una revisión de helmintos de Ardeidae de Brasil. Las aves acuáticas fueron positivas para 18 tasas, cinco Nematoda, nueve Trematoda y cuatro Acanthocephala. Los nuevos registros de helmintos para Ardeidae en Brasil fueron reportados. *Ardea cocoi* y *Ardea alba* se destacaron por el número de especies asociadas.

**Palabras-claves:** Acanthocephala – Ardeidae – Brasil – Digenea – Helmintos – Nematoda

## INTRODUCTION

Parasitism is considered to be one of the most successful lifestyles exhibited by living organisms (Poulin, 2000). The parasites represent a large proportion of the existing diversity (Price, 1980) and they can be used as biological markers of the host's eating habits, the environment in which they live, and even their migration routes (Amato & Amato, 2010).

According to Piacentini *et al.* (2015) the world bird diversity is estimated in more of 9,021 species. Brazil has one of the three countries richest avifauna in the world with 1,919 species, divided into approximately 33 orders, among them Pelecaniformes Sharpe, 1891, which include: Ardeidae Leach, 1820, Pelecanidae Rafinesque, 1815, and Threskiornithidae Poche, 1904.

Ardeidae is composed of more than 60 species, is one of the largest and most representative families of birds with characteristics adapted to wet and flooded areas (Scherer *et al.*, 2006). At South Brazil, in state of Rio Grande do Sul, 13 species are recorded: *Tigrisoma lineatum* (Boddaert, 1783), *Botaurus pinnatus* (Wagler, 1829), *Ixobrychus exilis* (Gmelin, 1789), *Ixobrychus involucres* (Vieillot, 1823), *Nycticorax nycticorax* (Linnaeus, 1758), *Nyctanassa violacea* (Linnaeus, 1758), *Butorides striata* (Linnaeus, 1758), *Bubulcus ibis* (Linnaeus, 1758), *Ardea cocoi* Linnaeus, 1766, *Ardea alba* Linnaeus, 1758, *Syrigma sibilatrix* (Temminck, 1824), *Egretta thula* (Molina, 1782) and *Egretta caerulea* (Linnaeus, 1758) (Bencke *et al.*, 2010).

The predominant ecosystem is the Pampa Biome which integrates part of Argentina, all of Uruguay and a large part of the territory of the state of Rio Grande do Sul (62.2%) (Boldrini *et al.*, 2010). The extreme southern region of Rio Grande do Sul presents several protected wetlands, such as “Estação Ecológica do Taim” (ESEC-Taim) and the “Parque Nacional da Lagoa do Peixe”, natural areas that shelter a unique diversity of wading birds that use this environment for rest, reproduction and feeding. Ardeidae occupy the top of the food chain and their diet is composed by amphibians, reptiles, insects and molluscs (Efe, 2001; Belton, 2004), which may serve as intermediate or paratenic hosts

of helminths species.

Information on helminths of Ardeidae in Brazil was carried out by Travassos, (1926), Yamaguti (1959), Travassos *et al.* (1969), Vicente *et al.* (1995a), Vicente *et al.* (1995b), Arruda *et al.* (2001, 2002), Barros *et al.* (2002), Pinto & Noronha (2003), Pinto *et al.* (2004), Muniz-Pereira *et al.* (2004), Pinto *et al.* (2012), Pinto *et al.* (2013) and Fernandes *et al.* (2015) however, in the state of Rio Grande do Sul, studies with helminths were not performed. In this sense, the objective of the present study was to determine the helminths that parasitize Ardeidae in this biogeographical area and to quantify the infections by host species, also a revision of the helminths is presented.

## MATERIAL AND METHODS

Were examined 44 hosts belonging to the Ardeidae: *Ardea alba* (n=6), *Ardea cocoi* (n=5), *Butorides striata* (n=4), *Bubulcus ibis* (n=4), *Egretta thula* (n=6), *Ixobrychus involucris* (n=6), *Nycticorax nycticorax* (n=4), *Syrigma sibilatrix* (n=7) and *Tigrisoma lineatum* (n=2) from the natural environment of extreme southern Rio Grande do Sul, Brazil. From the municipalities: Arroio do Padre, Pelotas, Capão do Leão and Rio Grande (-31°26'34"S -52°25'19"W; -31°46'19"S -52°20'34"W; -31°45'46"S -52°29'02"W; -32°2'6"S -52°5'56"W), respectively. The birds were donated by the “Núcleo de Reabilitação da Fauna Silvestre and Centro de Triagem de Animais Silvestres from the Universidade Federal de Pelotas” (NURFS-CETAS/UFPel), where they died during the period of 2006 at 2015. Hosts were conditioned individually, and forwarded at the “Laboratório de Parasitologia de Animais Silvestres” (LAPASIL/UFPel) and frozen until processing.

To collect helminths, these birds are necropsied and their organs (mouth, esophagus, proventriculus, gizzard, cecum, small and large intestines, trachea, lungs, heart, liver, gall bladder, pancreas, reproductive system, kidneys, cloaca and air sacs) were separated, opened and washed with running water through a 150  $\mu$ m mesh. The helminths were fixed in AFA for 24 hours and were stored in accordance with the protocol proposed by

Amato & Amato (2010). Trematoda and Acanthocephala were stained with Langeron's carmine and Nematoda were clarified with Aman's lactophenol. They were mounted on permanent and semi-permanent slides.

Morphological identification was performed in accordance with Travassos *et al.* (1969), Dubois (1970), Gibson *et al.* (2002), Johnson *et al.* (2004), Jones *et al.* (2005), Bray *et al.* (2008) for Trematoda (Digenea), Measures (1988), Vicente *et al.* (1995b), Anderson (2000), Shamsi *et al.* (2009), Gibbons (2010) and Shafey (2012) for Nematoda and McDonald (1988) for Acanthocephala. The term assemblage, was utilized according to concept Fauth *et al.* (1996). The parameters calculated were prevalence (P%), mean abundance of infection (MA) and mean intensity of infection (MI), according Bush *et al.* (1997). The voucher specimens were deposited in the "Coleção do Instituto Oswaldo Cruz (CHIOC)," from Rio de Janeiro, Brasil" (numbers 35942-35946 and 37957-37962) and in the "Coleção de Helmintos do Laboratório de Parasitologia de Animais Silvestres" from Instituto de Biologia, Universidade Federal de Pelotas (CHLAPASIL/UFPel) (numbers 351-471 and 623-631).

The literature review of Ardeidae for Brazil was constructed (checklist format) based on the researches carried out in different places in Brazil (Travassos, 1926; Yamaguti, 1959; Travassos *et al.*, 1969; Vicente *et al.*, 1995a; Vicente *et al.*, 1995b; Arruda *et al.*, 2001, 2002; Barros *et al.*, 2002; Pinto & Noronha, 2003; Pinto *et al.*, 2004; Muniz-Pereira *et al.*, 2004; Pinto *et al.*, 2012; Pinto *et al.*, 2013).

## RESULTS AND DISCUSSION

Of the 44 hosts (belong nine species), P% = 97.72 were parasitized by at least one *taxon*. Were identified 18 *taxa*, five Nematoda: *Contracaecum microcephalum* (Rudolphi, 1809) (Ascaroidea: Anisakidae) (P%=63.3; AM=17.6; IM=26.8), *Desportesius invaginatus* (Linstow, 1901) (Acuaroidea: Acuariidae) (P%=36.6; AM= 2.3; IM=6.3), *Desmidocercella ardeae* (Nawrotzky,

1914) Yorke & Maspletone, 1926 (Aproctoidea: Desmidocercidae) (P%=20.4; AM=1.1; IM=5.3), *Baruscapillaria* sp. (Trichinelloidea: Capillaridae) (P%=13.6; AM=0.45; IM=3.3) and *Eustrongylides ignotus* Jägerskiöld, 1909 (Dioctophymatoidea: Dioctophymatidae) (P%=9.1; AM=0.9; IM=10.2). Nine species of Trematoda (Digenea): *Amphimerus interruptus* (Opisthorchiidae) (Braun, 1901) Barker, 1911 (P%=2.3; AM=0.06; IM=3.0), *Apharyngostrigea ardearum* (Lutz, 1928) Dubois, 1968 (Syn. *Apharyngostrigea brasiliensis* Szidart, 1929 segundo Labriola & Suriano 1998 (Strigeidae) (P%=36.6; AM=17.7; IM=48.9), *Ascocotyle* sp. (Heterophyidae) (P%=22.7; AM=61.4; IM=270.4), *Clinostomum marginatum* (Rodolphi, 1819) (P%=29.54; AM=1.1; IM=3.6), *Ithyclinostomum dimorphum* (Diesing, 1850) Witenberg, 1926 (Clinostomidae) (P%=4.5; AM=0.1; IM=2.5), *Episthmium proximum* Travassos, 1922 (P%=20.4; AM=1.0 IM=4.8), *Nephrostomum limai* Travassos, 1922 (P% = 15.90; AM = 1.36; IM = 8.6) (Echinostomatidae), *Ribeiroia ondatrae* (Price, 1931) Price, 1942 (Cathaemasiidae) (P%=11.3; AM=3.1; IM=27.4) and *Stomylotrema* sp. (Stomylotremidae) (P%=11.3; AM=0.27; IM=2.4) and four Acanthocephala: *Acanthocephalus* sp. (Echinorhynchidae) (P%=2.3; AM=0.02; IM=1.0), *Andracantha* sp. (P%=29.5; AM=11.6; IM=39.5), *Arhythmorhynchus* sp. (P%=4.5; AM=0.1; IM=2.5) and *Polymorphus* sp. (Plagiorhynchidae) (P% = 25.0; AM = 5.5; IM = 21.9). The parasitological indexes by host specie are presented in Table 1. Were found pregnant proglottids of Cestodes of hosts (P% = 29.5), but not possible identified because scolex were absent. The literature review of Ardeidae for Brazil is shown in Table 2.

*Contracaecum microcephalum* presented the highest prevalence value (P%=63.3), followed by the trematode *Apharyngostrigea ardearum* (P%=36.6) and the acanthocephalan *Andracantha* sp. (P%=29.54). Concerning to mean abundance of infection, the same helminthes *C. microcephalum*, *A. ardearum* and *Andracantha* sp. had the highest indexes (AM = 17.6, 17.7 and 11.6, respectively), however, the highest mean intensity of infection value was presented by *Ascocotyle* sp. (IMI = 270.4) (Table 1). Among the species of Acanthocephala, there was the association between *Andracantha* sp. and *Polymorphus* sp. in

100% of the infected hosts by the species. The value highest of mean intensity of infection of Acanthocephala was presented in *Ardea cocoi* (IMI=86.6), while the highest number of Acanthocephala species occurred in *Ardea alba* (three species) according (Table 1). *Bubulcus ibis* and *T. lineatum* were no infected for Acanthocephala.

The nematodes *Contraecaecum microcephalum* and *D. invaginatus* parasited eight of nine species of Ardeidae analyzed; *Desmidocercella ardeae*, *A. ardearum*, *Andracantha* sp. and *Polymorphus* sp. infected seven species of birds (7/9); *C. marginatum* six (6/9); *Ascocotyle* sp. and *N. limai* five (5/9); *Stomylotrema* sp. four (4/9); *E. proximum* and *R. ondatrae* three (3/9); *Baruscapillaria* sp., *E. ignotus* and *Arhythmorhynchus* sp. two (2/9), and only one species of Ardeidae (1/9) was infected by *A. interruptus*, *I. dimorphum* and *Acanthocephalus* sp. (Table 1).

In relation to the Nematoda life cycles identified, *C. microcephalum* involves two intermediate hosts: copepods (Crustacea) as first intermediate hosts and second intermediate host, young freshwater fish. The definitive hosts become infected from consuming fish containing larvae (Anderson, 2000). *Desportesius invaginatus* that is found under the gizzard lining, has as second intermediate host *Discoglossus* (Amphibia: Anura) or fish (Cyprinidae) (Anderson, 2000).

Capillariidae parasite birds, mammals and fishes, have monoxenous or heteroxenous biological cycles (Anderson, 2000). *Eustrongylides* spp. were found on the wall of proventriculus and gizzard, form large tunnels on the surface of serosa or still in the intestine. The infection may cause high mortality mainly in young birds because due to high pathogenicity (Spalding *et al.* 1993; Xiong *et al.* 2009). Ingestion of aquatic Oligochaeta (intermediate hosts) or fish (paratenic hosts) with infective larvae are responsible for host infection (Anderson, 2000).

The species of Trematoda have complex cycles of development, involving one or more intermediate hosts (Olsen, 1974). Some species identified in the present study were more specific (*A. interruptus* and *I. dimorphum*) and others species most

generalists, as *A. ardearum*. Acanthocephala is a group of parasites obligate utilize Arthropoda as intermediate hosts and vertebrate as definitive hosts for complete their life cycle (Near, 2002). These parasites are strongly linked to the aquatic environment, and general aquatic birds and marine mammals are definitive (McDonald 1988; Luque *et al.* 2010).

Considering the parasitological diversity presented in study, Trematoda was the *taxa* predominant composed for nine species, followed by five species of Nematoda and four of Acanthocephala corroborating with researches with helminths of Ardeidae realized by Chipev & Kostandinova (1995) in Bulgaria; Labriola & Suriano (1998) and Drago & Lunaschi (2011) in Argentina; Nogueserola *et al.* (2002) in Spain; Al-Salim & Ali (2010) in Iraq; Sitko (2012) in Czech republic; Violante-González *et al.* (2012) in México; Shafey (2012) in Egypt and Santoro *et al.* (2016) in Italy. In present study, there was difference in the composition of helminths associated with host species. *Ardea cocoi* was parasitized by 14 species of helminths, *A. alba* and *N. nycticorax* by 12 species, *E. thula* and *S. sibilatrix* by 10 species, *B. striata* by seven species, *B. ibis* and *I. involucris* by six species and *T. lineatum* by two species of helminths.

The diversity of helminths and differences in parasitic loads among Ardeidae may be related to the variety of items consumed, quantity, behavioral peculiarities and strategies of dispersion of parasites. *Ardea cocoi* and *A. alba* had the highest number of associated helminth species, these birds are the largest Ardeidae occurring in Rio Grande do Sul and usually share the feeding resources. Infections are likely to have occurred by ingestion of intermediate and paratenic hosts such as fish, amphibians, reptiles, mollusks and insects, as these constitute the diet of Ardeidae (Efe, 2001; Belton, 2004).

Researches with helminths associated with Ardeidae in state of Rio Grande do Sul had not been realized, therefore the work is pioneering in this sense, being for the first time in the state reported the *taxa*: *Contraecaecum microcephalum*, *Desportesius invaginatus*, *Desmidocercella ardeae*, *Baruscapillaria* sp., *Eustrongylides ignotus* (Nematoda); *Amphimerus interruptus*,

**Table 1.** Parasitological indexes for Ardeidae host's species from the state of Rio Grande do Sul, Brazil.

Ardeidae species	Parasites	P (%)	MA	MI
<i>Ardea alba</i> (n=6)	<b>Nematoda</b>			
	<i>Contracaecum microcephalum</i>	83.3	28.3	34.0
	<i>Desmidocercella ardeae</i>	16.6	2.5	15.0
	<i>Desportesius invaginatus</i>	33.3	10.3	31.0
	<b>Trematoda</b>			
	<i>Apharyngostrigea ardearum</i>	83.3	31.6	38.0
	<i>Ascocotyle</i> sp.	50.0	12.6	25.3
	<i>Clinostomum marginatum</i>	50.0	3.0	6.0
	<i>Ephistmium proximum</i>	66.6	3.8	5.75
	<i>Nephrostomum limai</i>	16.6	0.3	2.0
	<i>Ribeiroia ondratae</i>	50.0	14.6	29.3
	<b>Acanthocephala</b>			
	<i>Acantoccephalus</i> sp.	16.6	0.16	1.0
	<i>Andracantha</i> sp.	50.0	5.3	10.6
<i>Polymorphus</i> sp.	33.3	1.2	3.5	
<i>Ardea cocoi</i> (n=5)	<b>Nematoda</b>			
	<i>Contracaecum microcephalum</i>	100.0	34.0	34.0
	<i>Desmidocercella ardea</i>	60.0	3.4	5.6
	<i>Desportesius invaginatus</i>	40.0	1.0	2.5
	<i>Baruscapillaria</i> sp.	40.0	1.2	3.0
	<i>Eustrongylides ignotus</i>	60.0	6.8	11.3
	<b>Trematoda</b>			
	<i>Apharyngostrigea ardearum</i>	80.0	42.8	53.5
	<i>Ascocotyle</i> sp.	60.0	111.8	186.3
	<i>Clinostomum marginatum</i>	80.0	4.6	5.7
	<i>Ephistmium proximum</i>	40.0	0.8	2.0
	<i>Ithyoclinostomum dimorphum</i>	40.0	1.0	2.5
	<i>Nephrostomum limai</i>	20.0	1.4	7.0
	<i>Ribeiroia ondratae</i>	20.0	7.0	35.0
<b>Acanthocephala</b>				
<i>Andracantha</i> sp.	60.0	52.0	86.6	
<i>Polymorphus</i> sp.	40.0	16.8	42.0	
<i>Butorides striata</i> (n=4)	<b>Nematoda</b>			
	<i>Contracaecum microcephalum</i>	100.0	8.5	8.5
	<i>Desmidocercella ardeae</i>	25.0	2.7	11.0
	<i>Desportesius invaginatus</i>	50.0	1.2	2.5
	<b>Trematoda</b>			
	<i>Amphimerus interruptus</i>	25.0	0.75	3.0
	<i>Clinostomum marginatum</i>	50.0	2.5	5.0
	<b>Acanthocephala</b>			
	<i>Andracantha</i> sp.	50.0	42.5	85.0
	<i>Polymorphus</i> sp.	50.0	0.5	2.0

Continuation Table1.

Ardeidae species	Parasites	P (%)	MA	MI
<i>Bubulcus ibis</i> (n=4)	<b>Nematoda</b>			
	<i>Contracaecum microcephalum</i>	50.0	3.5	7.0
	<i>Desportesius invaginatus</i>	25.0	0.2	1.0
	<b>Trematoda</b>			
	<i>Apharyngostrigea ardearum</i>	50.0	9.5	19.0
	<i>Ascocotyle</i> sp.	25.0	7.0	28.0
	<i>Nephrostomum limai</i>	25.0	2.0	8.0
	<i>Stomylotrema</i> sp.	25.0	2.5	10.0
	<i>Egretta thula</i> (n=6)	<b>Nematoda</b>		
<i>Contracaecum microcephalum</i>		66.6	1.5	2.2
<i>Desmidocercella ardeae</i>		16.6	0.2	1.0
<i>Desportesius invaginatus</i>		50.0	0.6	1.3
<i>Baruscapillaria</i> sp.		66.6	2.3	3.5
<b>Digenea</b>				
<i>Apharyngostrigea ardearum</i>		16.6	21.1	127.0
<i>Clinostomum marginatum</i>		16.6	0.3	2.0
<i>Ephisthium proximum</i>		50.0	2.8	5.6
<i>Stomylotrema</i> sp.		16.6	0.2	1.0
<b>Acanthocephala</b>				
<i>Andracantha</i> sp.		16.6	1.0	6.0
<i>Polymorphus</i> sp.		16.6	0.6	4.0
<i>Ixobrychus involucris</i> (n=6)	<b>Nematoda</b>			
	<i>Contracaecum microcephalum</i>	83.3	42.6	51.2
	<i>Desmidocercella ardeae</i>	16.6	0.16	1.0
	<i>Desportesius invaginatus</i>	33.3	2.0	6.0
	<b>Trematoda</b>			
	<i>Clinostomum marginatum</i>	16.6	0.3	2.0
	<b>Acanthocephala</b>			
	<i>Andracantha</i> sp.	16.6	0.2	1.0
	<i>Polymorphus</i> sp.	33.3	0.2	0.5

*Apharyngostrigea ardearum*, *Ascocotyle* sp., *Clinostomum marginatum*, *Ithyclinostomum dimorphum*, *Episthium proximum*, *Nephrostomum limai*, *Ribeiroia ondatrae*, *Stomylotrema* sp. (Trematoda); *Acanthocephalus* sp., *Andracantha* sp., *Arhythmorhynchus* sp. and *Polymorphus* sp. (Acanthocephala) and their indexes parasitological.

New records of Nematoda to Ardeidae hosts in Brazil were: *C. microcephalum* in *A. cocoi*, *B. ibis*, *I. involucris*, *N. nycticorax* and *S. sibilatrix*;

*Desportesius invaginatus* in *A. alba*, *A. cocoi*, *B. ibis*, *B. striata*, *I. involucris*, *N. nycticorax* and *S. sibilatrix*; *Desmidocercella ardeae* in *B. striata*, *E. thula*, *I. involucris*, *S. sibilatrix* and *T. lineatum*; *Baruscapillaria* sp. in *A. cocoi* and *E. thula*. For the Trematoda the new records were: *Ascocotyle* sp. in *A. alba*, *A. cocoi*, *B. ibis*, *N. nycticorax*, and *S. sibilatrix*; *Apharyngostrigea ardearum* in *A. alba*, *A. cocoi*, *B. ibis*, *E. thula*, *N. nycticorax*, *S. sibilatrix* and *T. lineatum*; *Clinostomum marginatum* in *E. thula* and *I. involucris*; *Episthium proximum* in *A. alba* and *E. thula*;

Continuation Table 1.

Ardeidae species	Parasites	P (%)	MA	MI
<i>Nycticorax nycticorax</i> (n=4)	<b>Nematoda</b>			
	<i>Contracaecum microcephalum</i>	50.0	30.5	61.0
	<i>Desportesius invaginatus</i>	25.0	0.2	1.0
	<i>Eustrongylides ignotus</i>	25.0	1.7	7.0
	<b>Trematoda</b>			
	<i>Apharyngostrigea ardearum</i>	25.0	9.25	37.0
	<i>Ascocotyle</i> sp.	50.0	448.7	897.5
	<i>Clinostomum marginatum</i>	75.0	2.7	3.6
	<i>Nephrostomum limai</i>	50.0	10.0	20.0
	<i>Ribeiroia ondatrae</i>	25.0	3.5	14.0
	<i>Stomylotrema</i> sp.	25.0	0.2	1.0
	<b>Acanthocephala</b>			
	<i>Andracantha</i> sp.	50.0	10.2	20.5
	<i>Arhythmorhynchus</i> sp.	25.0	0.2	1.0
<i>Polymorphus</i> sp.	50.0	4.0	8.0	
<i>Syrigma sibilatrix</i> (n=7)	<b>Nematoda</b>			
	<i>Contracaecum microcephalum</i>	28.5	0.3	1.0
	<i>Desmidocercella ardeae</i>	14.3	0.3	2.0
	<i>Desportesius invaginatus</i>	42.8	1.6	3.6
	<b>Trematoda</b>			
	<i>Apharyngostrigea ardearum</i>	28.5	24.4	85.5
	<i>Ascocotyle</i> sp.	14.3	35.1	246.0
	<i>Nephrostomum limai</i>	28.6	0.4	1.5
	<i>Stomylotrema</i> sp.	28.6	0.4	1.5
	<b>Acanthocephala</b>			
	<i>Andracantha</i> sp.	14.3	0.43	3.0
	<i>Arhythmorhynchus</i> sp.	14.3	0.6	4.0
	<i>Polymorphus</i> sp.	14.3	18.1	127.0
	<i>Tigrisoma lineatum</i> (n=2)	<b>Nematoda</b>		
<i>Desmidocercella ardeae</i>		50.0	0.5	1.0
<b>Trematoda</b>				
	<i>Apharyngostrigea ardearum</i>	50.0	2.5	5.0

*Nephrostomum limai* in *A. alba*, *A. cocoi*, *B. ibis* and *N. nycticorax*; *Ribeiroia ondatrae* in *A. alba*, *A. cocoi* and *N. nycticorax*; *Stomylotrema* sp. in *B. ibis*, *E. thula* and *N. nycticorax*. For to Acanthocephala: *Acanthocephalus* sp. in *A. alba*; *Arhythmorhynchus* sp. in *N. nycticorax* and *S. sibilatrix*; *Andracantha* sp. in *A. alba*, *A. cocoi*, *B. striata*, *E. thula*, *I. involucris*, *N. nycticorax* and *S.*

*sibilatrix*; *Polymorphus* sp. in *A. alba*, *A. cocoi*, *B. striata*, *E. thula*, *I. involucris*, *N. nycticorax* and *S. sibilatrix*.

The records, and indexes as well as the presentation of the Ardeidae helminth checklist aim to contribute to existing knowledge in Brazil.

**Table 2.** Checklist from helminths from Ardeidae (Aves: Pelecaniformes) in Brazil.

Ardeidae species	Taxon	Reference
	<b>Cestoda</b>	
Ardeidae sp.	<i>Jardugia</i> sp.	Arruda <i>et al.</i> (2001)
	<b>Trematoda</b>	
Ardea sp.	<i>Clinostomum marginatum</i> (Rudolphi, 1819)	Travassos <i>et al.</i> (1969)
	<i>Parastrigea cincta</i> (Brandes, 1888)	Travassos <i>et al.</i> (1969)
	<b>Trematoda</b>	
<i>Agami agami</i> (Gmelin, 1789)	<i>Posthodiplostomum grande</i> (Diesing, 1850)	Travassos <i>et al.</i> (1969)
	<i>Posthodiplostomum microsicya</i> Dubois, 1936	Travassos <i>et al.</i> (1969)
	<i>Sphincterodiplostomum musculosum</i> Dubois, 1936	Travassos <i>et al.</i> (1969)
<i>Ardea alba</i> Linnaeus, 1758	<b>Trematoda</b>	
	<i>Apharyngostrigea ardearum</i> (Lutz, 1928)	present study
	<i>Ascocotyle</i> sp.	present study
	<i>Clinostomum detruncatum</i> Braun, 1899	Travassos <i>et al.</i> (1969)
	<i>Clinostomum marginatum</i> (Rudolphi, 1819)	Travassos <i>et al.</i> (1969); Pinto <i>et al.</i> (2004)
	<i>Clinostomum marginatum</i> (Rudolphi, 1819)	present study
	<i>Ephishmium proximum</i> Travassos, 1922	present study
	<i>Ignavia venusta</i> Freitas, 1948	Travassos <i>et al.</i> (1969)
	<i>Ithyoclinostomum dimorphum</i> (Diesing, 1850)	Pinto <i>et al.</i> (2004)
	<i>Nephrostomum limai</i> Travassos, 1922	present study
	<i>Opisthorchis</i> sp.	Travassos <i>et al.</i> (1969)
	<i>Philophthalmus lacrymosus</i> Braun, 1902	Travassos <i>et al.</i> (1969)
	<i>Posthodiplostomum grande</i> (Diesing, 1850)	Travassos <i>et al.</i> (1969)
	<i>Ribeiroia insignis</i> Travassos, 1939	Travassos <i>et al.</i> (1969)
	<i>Ribeiroia ondatrae</i> (Price, 1931) Price, 1942	present study
	<b>Nematoda</b>	
	Spiruroidea	Arruda <i>et al.</i> (2001)
	<i>Contraecum</i> sp.	Vicente <i>et al.</i> (1995b)
	<i>Contraecum microcephalum</i> (Rudolphi, 1819)	Vicente <i>et al.</i> (1995b)
	<i>Contraecum microcephalum</i> (Rudolphi, 1819)	present study
	<i>Contraecum multipapillatum</i> (Drasche, 1882)	Pinto <i>et al.</i> (2004)
	<i>Desmidocercella ardeae</i> (Nawrotzki, 1914)	Pinto <i>et al.</i> (2004)
	<i>Desmidocercella ardeae</i> (Nawrotzki, 1914)	present study
	<i>Desportesius invaginatus</i> (Linstow, 1901)	present study
	<i>Eustrongylides</i> sp.	Vicente <i>et al.</i> (1995b)
	<i>Eustrongylides perpapillatus</i> Jägerskiöld, 1909	Vicente <i>et al.</i> (1995b)
	<i>Eustrongylides ignotus</i> Jägerskiöld, 1909	Pinto <i>et al.</i> (2004)
	<i>Porrocaecum reticulatum</i> (Linstow, 1899)	Vicente <i>et al.</i> (1995b)



Continuation Table 2

Ardeidae species	Taxon	Reference	
<i>Ardea alba</i> Linnaeus, 1758	<b>Cestoda</b>		
	<i>Deudrouterina pillerodiae</i> Mahon, 1956	Arruda <i>et al.</i> (2001)	
	<i>Valipora mutabilis</i> Linston, 1927	Pinto <i>et al.</i> (2004)	
	<b>Acanthocephala</b>		
	<i>Acanthocephalus</i> sp.	present study	
	<i>Andracantha</i> sp.	present study	
	<i>Centrorhynchus spinosus</i> (Kaiser, 1893)	Travassos (1926)	
	<i>Polymorphus</i> sp.	present study	
	<i>Polymorphus mutabilis</i> (Rudolphi, 1819)	Travassos (1926)	
	<i>Polymorphus striatus</i> (Goeze, 1782)	Travassos (1926)	
	<b>Acanthocephala</b>		
	<i>Polymorphus striatus</i> (Goeze, 1782)	Travassos (1926)	
	<i>Ardea cinerea</i> Linnaeus, 1758	<b>Trematoda</b>	
		<i>Amphimerus interruptus</i> (Braun, 1909)	Arruda <i>et al.</i> (2001)
<i>Apharyngostrigea ardearum</i> (Lutz, 1928)		present study	
<i>Ascocotyle</i> sp.		present study	
<i>Ascocotyle (Phagicola) longa</i> Ransom, 1920		Barros <i>et al.</i> (2002); Pinto <i>et al.</i> (2004)	
<i>Cladocystis trifolium</i> (Braun, 1901)		Travassos <i>et al.</i> (1969)	
<i>Clinostomatopsis sorbens</i> (Braun, 1899)		Travassos <i>et al.</i> (1969)	
<i>Clinostomum detruncatum</i> Braun, 1899		Travassos <i>et al.</i> (1969)	
<i>Clinostomum marginatum</i> Rudolphi, 1819		Travassos <i>et al.</i> (1969); Pinto <i>et al.</i> (2004)	
<i>Clinostomum marginatum</i> (Rudolphi, 1819)		present study	
<i>Ardea cocoi</i> Linnaeus, 1766	<i>Clinostomum heluans</i> Braun, 1899	Travassos <i>et al.</i> (1969)	
	<i>Episthmium oscari</i> Travassos, 1922	Travassos <i>et al.</i> (1969)	
	<i>Episthmium proximum</i> Travassos, 1922	Travassos <i>et al.</i> (1969)	
	<i>Episthmium proximum</i> Travassos, 1922	present study	
	<i>Ithyoclinostomum dimorphum</i> (Diesing, 1850)	Travassos <i>et al.</i> (1969); Pinto <i>et al.</i> (2004)	
	<i>Ithyoclinostomum dimorphum</i> (Diesing, 1850)	present study	
	<i>Nephrostomum limai</i> Travassos, 1922	present study	
	<i>Phagicola angrense</i> (Travassos, 1916)	Arruda <i>et al.</i> (2001)	
	<i>Proctobium proctobium</i> (Travassos, 1918)	Arruda <i>et al.</i> (2001)	
	<i>Prorrocaecum reticulatus</i> (Linstow, 1899)	Vicente <i>et al.</i> (1995b)	
	<i>Ribeiroia ondatrae</i> (Price, 1931) Price, 1942	present study	
	<b>Nematoda</b>		
	<i>Baruscapillaria</i> sp.	present study	
	<i>Contraecum</i> sp.	Vicente <i>et al.</i> (1995b)	
	<i>Contraecum multipapillatum</i> (Drasche, 1882)	Vicente <i>et al.</i> (1995b); Pinto <i>et al.</i> (2004)	
	<i>Contraecum microcephalum</i> (Rudolphi, 1819)	present study	

Continuation Table 2

Ardeidae species	Taxon	Reference
<i>Ardea cocoi</i> Linnaeus, 1766	<b>Nematoda</b>	
	<i>Desmidocercella ardeae</i> (Nawrotzki, 1914)	Vicente <i>et al.</i> (1995b)
	<i>Desmidocercella ardeae</i> (Nawrotzki, 1914)	present study
	<i>Desportesius invaginatus</i> (Linstow, 1901)	present study
	<i>Eustrongylides ignotus</i> Jagerskiold, 1909	Vicente <i>et al.</i> (1995b); Pinto <i>et al.</i> (2004)
	<i>Prorrocaecum</i> sp.	Vicente <i>et al.</i> (1995b)
	<b>Cestoda</b>	
	<i>Anomotaenia</i> sp.	Arruda <i>et al.</i> (2001)
	<i>Deudrouterina</i> sp.	Arruda <i>et al.</i> (2001)
	<i>Drepanidotaenia</i> sp.	Arruda <i>et al.</i> (2001)
<i>Ardea herodias</i> Linnaeus, 1758	<b>Acanthocephala</b>	
	<i>Andracantha</i> sp.	present study
	<i>Polymorphus</i> sp.	present study
	<b>Nematoda</b>	
<i>Ardea leuca</i>	<i>Contraecaecum perpapillatus</i> Jagerskiold, 1909	Vicente <i>et al.</i> (1995b)
	<b>Acanthocephala</b>	
	<i>Polymorphus obtusus</i> Van Cleave, 1918	Travassos (1926)
<i>Ardea purpurea</i> Linnaeus, 1766	<b>Nematoda</b>	
	<i>Eustrongylides multipapillatus</i> Jagerskiold, 1909	Vicente <i>et al.</i> (1995b)
<i>Ardea purpurea</i> Linnaeus, 1766	<b>Acanthocephala</b>	
	<i>Arhythmorhynchus macrourus</i> Bremser, 1821	Travassos (1926)
<i>Butorides</i> sp.	<b>Trematoda</b>	
	<i>Phagicola angrense</i> (Travassos, 1916)	Arruda <i>et al.</i> (2001)
	<b>Cestoda</b>	
<i>Botaurus pinnatus</i> (Wagler, 1829)	<i>Drepanidotaenia</i> sp.	Arruda <i>et al.</i> (2001)
	<b>Trematoda</b>	
	<i>Posthodiplostomum microsicya</i> Dubois, 1936	Travassos <i>et al.</i> (1969)
	<b>Nematoda</b>	
<i>Botaurus lentiginosus</i> (Rackett, 1813)	<i>Eustrongylides ignotus</i> Jagerskiold, 1909	Vicente <i>et al.</i> (1995b)
	<b>Acanthocephala</b>	
	<i>Arhythmorhynchus pumidirostris</i> Cleave, 1916	Travassos (1926)
	<i>Polymorphus breves</i> Cleave, 1916	Travassos (1926)
	<b>Acanthocephala</b>	
<i>Botaurus stellaris</i> (Linnaeus, 1758)	<i>Polymorphus striatus</i> (Goeze, 1782)	Travassos (1926)
	<i>Prosthorhynchus spiralis</i> (Rudolphi, 1809)	Travassos (1926)
	<b>Trematoda</b>	
<i>Butorides striata</i> Linnaeus, 1758	<i>Ascocotyle (Phagicola) angrense</i> (Travassos, 1916)	Pinto <i>et al.</i> (2013)
	<i>Ascocotyle (Phagicola) pindoramensis</i> (Travassos, 1928)	Pinto <i>et al.</i> (2013)
	<i>Amphimerus interruptus</i> Braun, 1901	Travassos <i>et al.</i> (1969)

Continuation Table 2

Ardeidae species	Taxon	Reference
	<b>Trematoda</b>	
<i>Butorides striata</i> Linnaeus, 1728	<i>Amphimerus interruptus</i> Braun, 1901	present study
	<i>Apharyngostrigea brasiliana</i> (Szidat, 1929)	Arruda <i>et al.</i> (2001)
	<i>Centrocestus formosanus</i> (Nishigori, 1924)	Pinto <i>et al.</i> (2013)
	<i>Clinostomum marginatum</i> (Rudolphi, 1819)	present study
	<i>Clinostomum marginatum</i> Rudolphi, 1819	Travassos <i>et al.</i> (1969); Pinto <i>et al.</i> (2013)
	<i>Clinostomum heluans</i> Braun, 1899	Pinto <i>et al.</i> (2013)
	<i>Diplostomum</i> sp.	Arruda <i>et al.</i> (2001)
	<i>Echinostoma</i> sp.	Travassos <i>et al.</i> (1969)
	<i>Episthmium oscar</i> Travassos, 1922	Travassos <i>et al.</i> (1969)
	<i>Gynaecotyla adunca</i> (Linton, 1905)	Arruda <i>et al.</i> (2001); Muniz-Pereira <i>et al.</i> (2004)
	<i>Maritrema</i> sp.	Arruda <i>et al.</i> (2001)
	<i>Mesostephanus infecundus</i> Lutz, 1935	Arruda <i>et al.</i> (2001)
	<i>Phagicola angrense</i> (Travassos, 1916)	Travassos <i>et al.</i> (1969)
	<i>Posthodiplostomum nanum</i> Dubois, 1937	Travassos <i>et al.</i> (1969); Pinto <i>et al.</i> (2013)
	<i>Prosthogonimus ovatus</i> (Rudolphi, 1803)	Pinto <i>et al.</i> (2013)
	<b>Nematoda</b>	
	<i>Contracaecum</i> sp.	Vicente <i>et al.</i> (1995b)
	<i>Contracaecum multipapillatum</i> (Drasche, 1882)	Pinto <i>et al.</i> (2004)
	<i>Contracaecum microcephalum</i> (Rudolphi, 1809)	Vicente <i>et al.</i> (1995b)
	<i>Contracaecum microcephalum</i> (Rudolphi, 1819)	present study
	<i>Desmidocercella ardeae</i> (Nawrotzki, 1914)	present study
	<i>Desportesius invaginatus</i> (Linstow, 1901)	present study
	<i>Pelecitus</i> sp.	Pinto & Noronha (2003)
	<i>Thelazia aquilina</i> Baylis, 1934	Vicente <i>et al.</i> (1995b)
	<b>Cestoda</b>	
	<i>Diploposthe bifaria</i> Siebold, 1946	Arruda <i>et al.</i> (2001)
	<i>Drepanidotaenia</i> sp.	Arruda <i>et al.</i> (2001)
	<i>Valipora minuta</i> (Coil, 1950)	Pinto <i>et al.</i> (2012)
	<b>Acanthocephala</b>	
<i>Butorides striata</i> Linnaeus, 1758	<i>Andracantha</i> sp.	present study
	<i>Polymorphus</i> sp.	present study
	<i>Polymorphus mutabilis</i> (Rudolphi, 1819)	Travassos (1926)
<i>Butorides virescens</i> (Linnaeus, 1758)	<b>Cestoda</b>	
	<i>Raillietina macrocolecina</i> (Fuhrmann, 1908)	Yamaguti (1959)
	<b>Acanthocephala</b>	
	<i>Polymorphus mutabilis</i> (Rudolphi, 1819)	Travassos (1926)
	<b>Trematoda</b>	
<i>Bubulcus ibis</i> (Linnaeus, 1758)	<i>Apharyngostrigea ardearum</i> (Lutz, 1928)	present study

Continuation Table 2

Ardeidae species	Taxon	Reference
	<b>Trematoda</b>	
Bubulcusibis <i>Linnaeus, 1758</i>	<i>Ascocotyle</i> sp.	present study
	<i>Nephrostomum limai</i> Travassos, 1922	present study
	<i>Stomylotrema</i> sp.	present study
	<b>Nematoda</b>	
	<i>Contraeaecum microcephalum</i> (Rudolphi, 1819)	present study
	<i>Desportesius invaginatus</i> (Linstow, 1901)	present study
	<b>Nematoda</b>	
<i>Cochlearius cochlearius</i> (Linnaeus, 1766)	<i>Contraeaecum multipapillatum</i> (Drasche, 1882)	Vicente <i>et al.</i> (1995b); Pinto <i>et al.</i> (2004)
	<i>Contraeaecum</i> sp.	Vicente <i>et al.</i> (1995b)
	<i>Prorrocaecum</i> sp.	Vicente <i>et al.</i> (1995b)
	<b>Trematoda</b>	
<i>Egretta thula</i> (Molina, 1782)	<i>Apharyngostrigea ardearum</i> (Lutz, 1928)	present study
	<i>Ascocotyle felipei</i> Travassos, 1928	Travassos <i>et al.</i> (1969)
	<i>Clinostomum</i> sp.	Travassos <i>et al.</i> (1969)
	<i>Clinostomum marginatum</i> (Rudolphi, 1819)	present study
	<i>Episthmium proximum</i> Travassos, 1922	present study
	<i>Ignavia venusta</i> Freitas, 1948	Travassos <i>et al.</i> (1969)
	<i>Opisthorchis</i> sp.	Travassos <i>et al.</i> (1969)
	<i>Proctobium proctobium</i> (Travassos, 1918)	Arruda <i>et al.</i> (2001)
	<i>Stomylotrema</i> sp.	present study
	<b>Nematoda</b>	
	<i>Baruscapillaria</i> sp.	present study
	<i>Contraeaecum</i> sp.	Vicente <i>et al.</i> (1995b)
	<i>Contraeaecum microcephalum</i> (Rudolphi, 1819)	Vicente <i>et al.</i> (1995b)
	<i>Contraeaecum microcephalum</i> (Rudolphi, 1819)	present study
	<i>Desmidocercella ardeae</i> (Nawrotzki, 1914)	present study
	<i>Desportesius invaginatus</i> (Linstow, 1901)	Vicente <i>et al.</i> (1995b)
	<i>Desportesius invaginatus</i> (Linstow, 1901)	present study
	<i>Porrocaecum</i> sp.	Vicente <i>et al.</i> (1995b)
	<i>Porrocaecum reticulatum</i> (Linstow, 1899)	Vicente <i>et al.</i> (1995b)
	<b>Cestoda</b>	
	<i>Anomotaenia aurita</i> (Rudolphi, 1819)	Yamaguti (1959)
	<i>Dilepis fuhrmanni</i> Railliet & Henry, 1909	Arruda <i>et al.</i> (2001)
	<b>Acanthocephala</b>	
	<i>Andracantha</i> sp.	present study
	<i>Polymorphus</i> sp.	present study
	<i>Polymorphus mutabilis</i> (Rudolphi, 1819)	Travassos (1926)
	<b>Trematoda</b>	

Continuation Table 2

Ardeidae species	Taxon	Reference
	<b>Trematoda</b>	
<i>Egretta caerulea</i> (Linnaeus, 1758)	<i>Ascocotyle felypei</i> Travassos, 1928	Travassos <i>et al.</i> (1969)
	<i>Clinostomum heluans</i> Braun, 1899	Travassos <i>et al.</i> (1969)
	<i>Gynaecotyla adunca</i> (Linton, 1905)	Arruda <i>et al.</i> (2001); Muniz-Pereira <i>et al.</i> (2004)
	<i>Maritrema nicolli</i> Travassos, 1920	Arruda <i>et al.</i> (2001)
	<b>Cestoda</b>	
	<i>Dilepis papillifera</i> Fuhrmann, 1908	Yamaguti (1959)
	<b>Acanthocephala</b>	
	<i>Polymorphus corynosoma</i> Travassos, 1915	Travassos (1926)
	<b>Trematoda</b>	
<i>Ixobrychus exilis erythromelas</i> Vieillot, 1817	<i>Ascocotyle felypei</i> Travassos, 1929	Travassos <i>et al.</i> (1969)
	<i>Phagicola angeloi</i> (Travassos, 1929)	Travassos <i>et al.</i> (1969)
	<i>Phagicola angrense</i> (Travassos, 1916)	Travassos <i>et al.</i> (1969)
	<i>Pygidiopsis pindoramensis</i> Travassos, 1929	Travassos <i>et al.</i> (1969)
	<b>Nematoda</b>	
	<i>Porrocaecum</i> sp.	Vicente <i>et al.</i> (1995b)
	<b>Trematoda</b>	
<i>Ixobrychus exilis</i> (Gmelin, 1789)	<i>Ascocotyle (Phagicola) rara</i> Arruda, Muniz-Pereira & Pinto, 2002	Arruda <i>et al.</i> (2002)
	<i>Drepanidotaenia</i> sp.	Arruda <i>et al.</i> (2001)
	<b>Trematoda</b>	
<i>Ixobrychus involucris</i> (Vieillot, 1823)	<i>Clinostomum marginatum</i> (Rudolphi, 1819)	present study
	<b>Nematoda</b>	
	<i>Contraecum microcephalum</i> (Rud., 1819)	present study
	<i>Desmidocercella ardeae</i> (Nawrotzki, 1914)	present study
	<i>Desportesius invaginatus</i> (Linstow, 1901)	present study
	<b>Acanthocephala</b>	
	<i>Andracantha</i> sp.	present study
	<i>Polymorphus</i> sp.	present study
	<b>Acanthocephala</b>	
<i>Ixobrychus minutus</i> (Linnaeus, 1766)	<i>Polymorphus striatus</i> (Goeze, 1782)	Travassos (1926)
	<i>Prosthorhynchus spiralis</i> (Rudolphi, 1809)	Travassos (1926)
	<b>Trematoda</b>	
<i>Nycticorax</i> Forster, 1817	<i>Ithyoclinostomum dimorphum</i> (Diesing, 1850)	Arruda <i>et al.</i> (2001)
	<b>Acanthocephala</b>	
	<i>Polymorphus corynosoma</i> Travassos, 1915	Travassos (1926)
	<b>Trematoda</b>	
<i>Nycticorax nycticorax</i> (Linnaeus, 1758)	<i>Amphimerus interruptus</i> (Braun, 1909)	Arruda <i>et al.</i> (2001)
	<i>Apharyngostrigea ardearum</i> (Lutz, 1928)	present study

Continuation Table 2

Ardeidae species	Taxon	Reference
<i>Nycticorax nycticorax</i> (Linnaeus, 1758)	<b>Trematoda</b>	
	<i>Ascocotyle</i> sp.	present study
	<i>Clinostomum marginatum</i> Rudolphi, 1819	Travassos <i>et al.</i> (1969); Pinto <i>et al.</i> (2004)
	<i>Clinostomum marginatum</i> (Rudolphi, 1819)	present study
	<i>Episthmium proximum</i> Travassos, 1922	Travassos <i>et al.</i> (1969)
	<i>Ithyoclinostomum dimorphum</i> (Diesing, 1850)	Pinto <i>et al.</i> (2004)
	<i>Levinseniella</i> sp.	Arruda <i>et al.</i> (2001)
	<i>Nephrostomum limai</i> Travassos, 1922	present study
	<b>Trematoda</b>	
	<i>Pygidiopsis pindoramensis</i> Travassos, 1929	Arruda <i>et al.</i> (2001)
<i>Nycticorax nycticorax</i> (Linnaeus, 1758)	<i>Ribeiroia ondatrae</i> (Price, 1931)	present study
	<i>Stomylotrema</i> sp.	present study
	<b>Nematoda</b>	
	<i>Avioserpens</i> sp.	Arruda <i>et al.</i> (2001)
	<i>Contraecaecum</i> sp.	Vicente <i>et al.</i> (1995b)
	<i>Contraecaecum microcephalum</i> (Rudolphi, 1819)	present study
	<i>Contraecaecum multipapillatum</i> (Drasche, 1882)	Pinto <i>et al.</i> (2004)
	<i>Desportesius invaginatus</i> (Linstow, 1901)	present study
	<i>Eustrongylides ignotus</i> Jagerskiold, 1909	Pinto <i>et al.</i> (2004)
	<i>Eustrongylides ignotus</i> Jagerskiold, 1909	present study
<i>Pelecitus</i> sp.	Pinto & Noronha (2003)	
<i>Tetrameres cochleare</i> Travassos, 1917	Arruda <i>et al.</i> (2001)	
<b>Cestoda</b>		
<i>Valipora mutabilis</i> Linston, 1927	Pinto <i>et al.</i> (2004)	
<b>Acanthocephala</b>		
<i>Andracantha</i> sp.	present study	
<i>Arhythmorhynchus</i> sp.	present study	
<i>Polymorphus</i> sp.	present study	
<i>Polymorphus striatus</i> (Goeze, 1782)	Travassos (1926)	
<b>Trematoda</b>		
<i>Nycticorax nycticorax hoacli</i> (Gmelin, 1789)	<i>Clinostomum marginatum</i> (Rudolphi, 1819)	Travassos <i>et al.</i> (1969)
	<i>Ephishmium proximum</i> Travassos, 1922	Travassos <i>et al.</i> (1969)
<b>Nematoda</b>		
<i>Avioserpens</i> sp.	Arruda <i>et al.</i> (2001)	
<i>Capilaria brasiliiana</i> Freitas, 1933	Vicente <i>et al.</i> (1995b)	
<i>Contraecaecum</i> sp.	Vicente <i>et al.</i> (1995b)	
<i>Contraecaecum multipapillatum</i> (Drasche, 1882)	Vicente <i>et al.</i> (1995b)	
<i>Contraecaecum plagiatium</i> Lent & Freitas, 1948	Vicente <i>et al.</i> (1995b)	
<i>Porrocaecum reticulatum</i> (Linstow, 1899)	Vicente <i>et al.</i> (1995)	

Continuation Table 2

Ardeidae species	Taxon	Reference
<i>Nycticorax nycticorax hoacli</i> (Gmelin, 1789)	<b>Acanthocephala</b>	
	<i>Polymorphus mutabilis</i> (Rudolphi, 1819)	Travassos (1926)
	<i>Polymorphus inermis</i> Travassos, 1923	Travassos (1926)
<i>Nyctanassa violacea</i> (Linnaeus, 1758)	<b>Trematoda</b>	
	<i>Apatemom globiceps</i> Dubois, 1937	Arruda <i>et al.</i> (2001)
	<i>Apharyngostrigea brasiliensis</i> (Szidat, 1929)	Arruda <i>et al.</i> (2001)
	<i>Clinostomum marginatum</i> Rudolphi, 1819	Arruda <i>et al.</i> (2001)
	<i>Diplostomum</i> sp.	Arruda <i>et al.</i> (2001)
	<i>Gynaecotyla adunca</i> (Linton, 1905)	Arruda <i>et al.</i> (2001); Muniz-Pereira <i>et al.</i> (2004)
	<i>Levinseniella</i> sp.	Arruda <i>et al.</i> (2001)
	<i>Levinseniella cruzi</i> Travassos, 1920	Arruda <i>et al.</i> (2001)
	<i>Maritrema</i> sp.	Arruda <i>et al.</i> (2001)
	<i>Maritrema nicolli</i> Travassos, 1920	Arruda <i>et al.</i> (2001)
	<i>Phagicola angrensis</i> (Travassos, 1916)	Arruda <i>et al.</i> (2001)
	<i>Philophthalmus lacrymosus</i> Braun, 1902	Arruda <i>et al.</i> (2001)
	<i>Proctobium proctobium</i>	Arruda <i>et al.</i> (2001)
	<i>Pygidiopsis pindoramensis</i> Travassos, 1929	Arruda <i>et al.</i> (2001)
	<i>Nyctanassa violacea</i> (Linnaeus, 1758)	<b>Nematoda</b>
<i>Acuaria</i> sp.		Arruda <i>et al.</i> (2001)
<i>Cheilospirura hamulosa</i> (Diesing, 1851)		Arruda <i>et al.</i> (2001)
<b>Acanthocephala</b>		
<i>Polymorphus mutabilis</i> (Rudolphi, 1819)		Travassos (1926)
<i>Polymorphus corynosoma</i> Travassos, 1915		Travassos (1926)
<i>Filicollis sphaerocephalus</i> (Bremser, 1819)		Travassos (1926)
<b>Trematoda</b>		
<i>Clinostomum heluans</i> Braun, 1899		Travassos <i>et al.</i> (1969)
<i>Clinostomum marginatum</i> (Rudolphi, 1819)		Travassos <i>et al.</i> (1969)
<i>Cloacitrema oswaldoi</i> Travassos, 1940	Travassos <i>et al.</i> (1969)	
<i>Echinostoma revolutum</i> (Froelich, 1802)	Travassos <i>et al.</i> (1969)	
<i>Lyperosomum sinuosum</i> Travassos, 1917	Travassos <i>et al.</i> (1969)	
<i>Parorchis proctobium</i> (Travassos, 1918)	Travassos <i>et al.</i> (1969)	
<i>Prohemistomum odhneri</i> Travassos, 1924	Travassos <i>et al.</i> (1969)	
<i>Stephanoprora singularis</i> (Lutz, 1924)	Travassos <i>et al.</i> (1969)	
<i>Nyctanassa violacea cayennensis</i> (Gmelin, 1789)	<b>Nematoda</b>	
	<i>Contraecum</i> sp.	Vicente <i>et al.</i> (1995b)
	<i>Tetrameres micropenis</i> Travassos, 1925	Vicente <i>et al.</i> (1995b)
<i>Pilherodius pileatus</i> (Boddaert, 1783)	<b>Trematoda</b>	
<i>Amphimerus interruptus</i> (Braun, 1909)	Arruda <i>et al.</i> (2001)	

Continuation Table 2

Ardeidae species	Taxon	Reference
	<b>Trematoda</b>	
<i>Pilherodius pileatus</i> (Boddaert, 1783)	<i>Ephishmium proximum</i> Travassos, 1922	Travassos <i>et al.</i> (1969)
	<b>Nematoda</b>	
	<i>Contracaecum plagiaticium</i> Lent & Freitas, 1948	Vicente <i>et al.</i> (1995b)
	<i>Contracaecum</i> sp.	Vicente <i>et al.</i> (1995b)
	<b>Cestoda</b>	
	<i>Dendroeurina pilherodiae</i> Mahon, 1956	Yamaguti (1959); Arruda <i>et al.</i> (2001)
	<i>Valipora</i> sp.	Arruda <i>et al.</i> (2001)
	<b>Trematoda</b>	
<i>Syrigma sibilatrix</i> (Temminck, 1824)	<i>Amphimerus interruptus</i> (Braun, 1909)	Arruda <i>et al.</i> (2001)
	<i>Apharyngostrigea ardearum</i> (Lutz, 1928)	present study
	<i>Ascocotyle</i> sp.	present study
	<i>Nephrostomum limai</i> Travassos, 1922	Travassos <i>et al.</i> (1969)
	<i>Nephrostomum limai</i> Travassos, 1922	present study
	<i>Stomylotrema</i> sp.	present study
	<i>Stomylotrema gratiosus</i> Travassos, 1922	Arruda <i>et al.</i> (2001)
	<b>Nematoda</b>	
	<i>Contracaecum microcephalum</i> (Rudolphi, 1819)	present study
	<i>Desmidocercella ardeae</i> (Nawrotzki, 1914)	present study
	<i>Desportesius invaginatus</i> (Linstow, 1901)	present study
	<i>Cheilospirura harmulosa</i> (Diesing, 1851)	Arruda <i>et al.</i> (2001)
	<i>Pelecitus</i> sp.	Arruda <i>et al.</i> (2001)
	<i>Pelecitus vuylstekae</i> (Molin, 1860)	Pinto & Noronha (2003)
	<i>Tetrameres</i> sp.	Vicente <i>et al.</i> (1995b)
	<i>Viktocara</i> sp.	Vicente <i>et al.</i> (1995b)
	<b>Acanthocephala</b>	
<i>Syrigma sibilatrix</i> (Temminck, 1824)	<i>Andracantha</i> sp.	present study
	<i>Arhytmorhynchus</i> sp.	present study
	<i>Polymorphus</i> sp.	present study
	<b>Nematoda</b>	
<i>Tigrisoma</i> sp.	<i>Contracaecum</i> sp.	Vicente <i>et al.</i> (1995b)
	<b>Trematoda</b>	
<i>Tigrisoma lineatum</i> (Boddaert, 1783)	<i>Amphimerus interruptus</i> (Braun, 1909)	Arruda <i>et al.</i> (2001)
	<i>Clinostomum marginatum</i> Rudolphi, 1819	Arruda <i>et al.</i> (2001)
	<i>Ithyoclinostomum dimorphum</i> (Diesing, 1850)	Arruda <i>et al.</i> (2001)
	<i>Apharyngostrigea ardearum</i> (Lutz, 1928)	present study
	<b>Nematoda</b>	
	<i>Pelecitus</i> sp.	Vicente <i>et al.</i> (1995b); Arruda <i>et al.</i> (2001)
	<i>Desmidocercella ardeae</i> (Nawrotzki, 1914)	present study



Continuation Table 2

Ardeidae species	Taxon	Reference
	<b>Trematoda</b>	
<i>Tigrisoma lineatum marmoratum</i> (Vieillot, 1817)	<i>Clinostomum detrunctum</i> Braun, 1899	Travassos <i>et al.</i> (1969)
	<i>Episthmium oscari</i> Travassos, 1922	Travassos <i>et al.</i> (1969)
	<b>Nematoda</b>	
	<i>Contraecum</i> sp.	Vicente <i>et al.</i> (1995b)
	<i>Eustrongylides</i> sp.	Vicente <i>et al.</i> (1995b)
	<i>Porrocaecum reticulatum</i> (Linstow, 1899)	Vicente <i>et al.</i> (1995b)

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