

Gastrointestinal parasites of exotic birds living in captivity in the state of Sergipe, Northeastern Brazil

Parasitos gastrointestinais de aves exóticas que vivem em cativeiro no estado de Sergipe, Nordeste do Brasil

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Abstract

Brazil has a wide diversity of exotic birds that were brought to this country during the European colonization. These animals are kept in captivity and, in some cases, in inadequate facilities, which may facilitate the introduction of pathogens, including gastrointestinal parasites. The purpose of this study was to identify the main gastrointestinal parasites that affect exotic birds living in captivity in the state of Sergipe, Northeastern Brazil. Fecal samples (n = 362) from exotic birds were analyzed by direct examination and by the Willis-Mollay technique. Eggs of *Amidostomum* sp., *Ascaridia* sp., Capillarinae, *Heterakis* sp., Trichostrongylidae, and oocysts of coccidians were identified in nine different bird species. This is the first report in Brazil of infection by *Ascaridia* sp. and *Heterakis* sp. in *Nymphicus hollandicus*; by Trichostrongylidae in *Serinus canaria* and *Streptopelia risoria*.

Keywords: Columbiformes birds, *Amidostomum*, *Ascaridia*, *Heterakis*, Trichostrongylidae.

Resumo

O Brasil possui uma grande diversidade de aves exóticas que foram trazidas para o país durante a colonização europeia. Estes animais são mantidos em cativeiros, os quais muitas vezes são inadequados, proporcionando o surgimento de doenças provocadas por parasitas gastrointestinais. Objetivou-se neste estudo, realizar avaliação coproparasitológica de fezes de aves ornamentais mantidas em cativeiros no estado de Sergipe, região Nordeste do Brasil. Amostras fecais (n = 362) de aves exóticas foram analisadas através do exame direto a fresco e técnica de Willis-Mollay. Ovos de *Amidostomum* sp., *Ascaridia* sp., Capillarinae, *Heterakis* sp., Trichostrongylidae, e oocistos de coccídeos foram encontrados em nove diferentes espécies de aves. Aqui, destacamos, os primeiros registros no Brasil de *Ascaridia* sp. e *Heterakis* sp., parasitando *Nymphicus hollandicus*; Trichostrongylidae em *Serinus canaria* e *Streptopelia risoria*.

Palavras-chave: Aves columbiformes, *Amidostomum*, *Ascaridia*, *Heterakis*, Trichostrongylidae.

Several exotic bird species, especially some originating from Europe, were introduced into Brazil in the 16th century, and became well adapted to the conditions of their new environment (AMAE, 2013).

Today, these bird species are kept in captivity during part of or their entire life. In captivity, these animals need a comfortable environment, free of stress, predators and disease, with sufficient space to fly freely, and high quality bird feed (SANTOS et al., 2008). However, inadequate facilities may facilitate the introduction of pathogens such as gastrointestinal nematodes and coccids, which cause different clinical manifestations (MARIETTO-GONÇALVES et al.,

2009). In general, birds infected with gastrointestinal parasites present diarrhea, apathy, prostration, abdominal enlargement and neurological signs, which, if left untreated, may lead to death (JOSEPH, 2003; GOMES et al., 2009; AGUIAR & LUCIANO, 2011).

Inadequate management of these animals, as well as lack of information of their owners, contributes to the occurrence of these parasitic diseases, which are often diagnosed only during postmortem examination (MARIETTO-GONÇALVES et al., 2009; GOMES et al., 2009). For this reason, information for coproparasitological diagnosis is still limited, which may hinder the *in vivo* detection of eggs and/or oocysts. Therefore, the purpose of this study was to identify the main gastrointestinal parasites that affect exotic birds living in the state of Sergipe, Northeastern Brazil.

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From January to August 2014, pool fecal samples (n = 32) were collected from exotic birds (n = 362) of different species, ages and gender. The birds used in this study belonged to three different Orders: Columbiformes (n = 109), Psittaciformes (n = 197) and Passeriformes (n = 56) (Table 1). The animals were distributed in 32 cages of iron (150 cm × 100 cm × 100 cm), containing a double-feeder and a single water cooler drinking fountain, where about 12 birds of the same species were kept. They were fed with grains, fruits and vegetables. These animals were from six private commercial breeding located in the municipalities of metropolitan region of Aracaju, in the state of Sergipe, northeastern Brazil.

All samples were collected only after the responsible for each breeding facility signed a Free and Informed Consent Form. All the birds' case histories were recorded and they were subjected to a physical examination, and pooled fecal samples were collected (n = 32) from the floor of each cage. The fecal material was placed in plastic bags, labeled and stored at 8 °C for later laboratory processing.

Each pool was analyzed individually by three copromicroscopic methods: i) direct examination, ii) the Willis-Mollay technique and iii) spontaneous sedimentation of Hoffman, Pons and Janer.

Table 1 lists the different exotic bird species assessed in this study. Gastrointestinal parasites were detected in 69% (22/32) of the analyzed pools; 73% (16/22) of the positive samples were positive for nematode eggs and 60% (13/22) for unsporulated oocysts. In particular, 36.4% (8/22) were detected through the direct examination, 77.3% (17/22) by the method of Hoffman, Pons and Janer, and 95.5% (21/22) by the Willis-Mollay technique. Eggs of

Heterakis sp., *Amidostomum* sp., Trichostrongylidae, *Ascaridia* sp., Capillarinae, and unsporulated oocysts herein detected are shown in Table 2 and Figure 1.

Co-infections were detected in 45% (10/22) of the positive samples, with some samples showing more than five types of co-infections. The most frequent co-infections were Trichostrongylidae + Capillarinae + Coccidians (27.2%), then Capillarinae + *Ascaridia* sp. + Coccidians (18.2%), Trichostrongylidae + *Ascaridia* sp. + Coccidians (9.1%), Trichostrongylidae + Coccidians (9.1%), *Ascaridia* sp. + *Heterakis* sp. (9.1%), and *Ascaridia* sp. + Coccidians (9.1%).

The largest number of positive samples (59%; 13/22) was found in the order Columbiformes. On the other hand, the positivity rates found in the Psittacidae, Cakatuidae, Fringillidae and Estrildidae families were 13.6% (3/22), 13.6% (3/22), 9.3% (2/22), and 4.5% (1/22), respectively. All eggs and oocysts were identified based on morphological features provided in Bowman et al. (2006) and Taylor et al. (2010).

This research involved a study of the gastrointestinal parasite fauna of exotic birds living in northeastern Brazil. The overall positivity rate (69%; 22/32) reported here was higher than rates detected in previous studies. For instance, a study conducted in the state of Paraná, Brazil, reported a prevalence of gastrointestinal parasites of 54% (127/228) in fecal samples of wild birds using the Hoffman sedimentation technique and the Willis flotation method as diagnostic tools (SNAK et al., 2014). Conversely, a low positivity rate (19.6%; 40/207) was detected in exotic birds in the state of São Paulo (MARIETTO-GONÇALVES et al., 2009). It is important to note that the differences in positivity

Table 1. Taxonomic classification, origin and number of specimens evaluated.

Order	Familie	Scientific name	Place of origin	Number of specimens
Columbiformes	Columbidae	<i>Columba livia</i> (Gmelin, 1789)	Africa, Asia e Europe	74
		<i>Geopelia cuneata</i> (Latham, 1801)	Oceania	08
		<i>Streptopelia risoria</i> (Linnaeus, 1758)	Africa	27
Psittaciformes	Psittacidae	<i>Melopsittacus undulatus</i> (Shaw, 1805)	Oceania	131
	Cacatuidae	<i>Agapornis fischeris</i> (Reichenow, 1887)	Africa	19
		<i>Nymphicus hollandicus</i> (Kerr, 1792)	Oceania	47
Passeriformes	Fringillidae	<i>Poephila guttata</i> (Reichenbach, 1862)	Africa and Oceania	15
	Estrildidae	<i>Serinus canaria</i> (Linnaeus, 1758)	Europe	18
		<i>Lonchura oryzivora</i> (Linnaeus, 1758)	Asia e Oceania	23
Total				362

Table 2. Number of positive pools for bird species.

Scientific name	Positive pools	<i>Ascaridia</i> sp.	Capillarinae	Trichostrongylidae	<i>Amidostomum</i> sp.	<i>Heterakis</i> sp.	Coccidians
<i>Streptopelia risoria</i>	03	-	-	02	01	-	02
<i>Columba livia</i>	10	05	10	03	01	-	04
<i>Melopsittacus undulates</i>	01	-	-	-	-	-	01
<i>Agapornis fischeris</i>	02	02	01	-	-	-	01
<i>Nymphicus hollandicus</i>	03	01	-	-	-	02	01
<i>Poephila guttata</i>	01	-	-	-	-	-	01
<i>Serinus canaria</i>	01	-	-	01	-	-	01
<i>Lonchura oryzivora</i>	01	-	-	-	-	-	01
Absolute Frequency (n)	22	08	11	06	02	02	12
Relative Frequency (%)	100	36.5	50	27.2	9.1	9.1	54.5

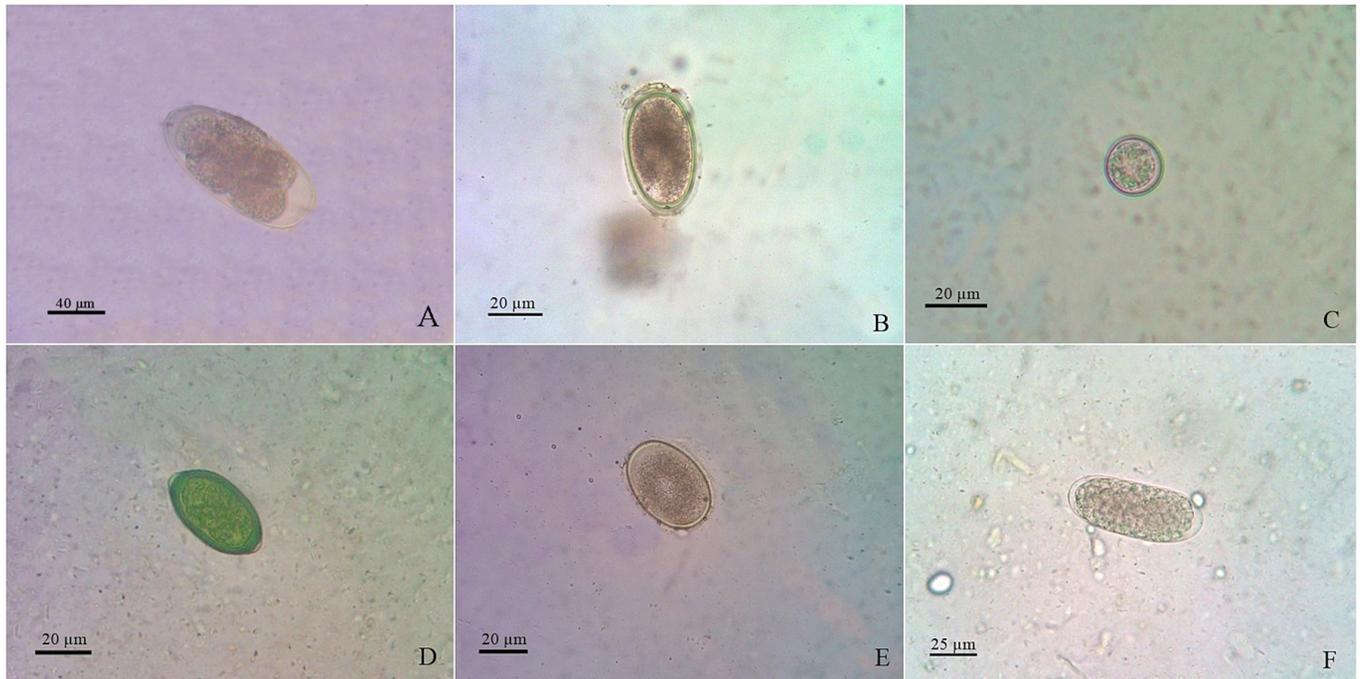


Figure 1. Eggs of gastrointestinal parasites detected in exotic birds. (A) Egg of *Amidostomum* sp.; (B) Egg of *Ascaridia* sp.; (C) Oocyst of coccidia unsporulated; (D) Egg of Capillarinae; (E) Egg of *Heterakis* sp. and (F) Egg of Trichostrongylidae.

rates found in distinct studies may be attributed to the sensitivity and specificity of the copromicroscopic technique, as well as the parasitic load of each animal (SANTOS et al., 2008; COSTA et al., 2010). In addition, proper sample collection and conservation are essential to avoid misdiagnosis, and consequently different results (SNAK et al., 2014).

The parasites most frequently found in this study were *Ascaridia* sp., Capillarinae, Trichostrongylidae and coccids. These species are among the most common gastrointestinal parasites of exotic birds living in captivity (FREITAS et al., 2002). *Ascaridia* sp., Capillarinae and Trichostrongylidae are parasites frequently reported in the gastrointestinal tract of birds, mainly immunosuppressed Columbiformes and Psittaciformes (FREITAS et al., 2002; MARQUES et al., 2007). Similarly, coccid species, especially those belonging to the genera *Eimeria* and *Isospora*, have been detected extensively parasitizing birds, being the coccidiosis is recognized as the parasitic disease that has the greatest economic impact on poultry production, due to mortality, morbidity, and poor feed conversions of birds, representing the annual worldwide cost is estimated at about \$800 million (WILLIAMS, 1998; ALLEN & FETTERER, 2002; CARNEIRO et al., 2011). This study detected, for the first time, *Nymphicus hollandicus* parasitized by *Ascaridia* sp. plus *Heterakis* sp., and *Serinus canaria* and *Streptopelia risoria* parasitized by Trichostrongylidae.

Another noteworthy finding is the identification of *Amidostomum* sp. eggs in fecal samples of *S. risoria* and *Columba livia*. Although this parasite has rarely been detected in Brazilian birds, it is frequently reported parasitizing wild ducks in Europe (KAVETSKA et al., 2011). In South America, the occurrence of this parasite species has been reported in wild birds living in captivity in Colombia (CORREDOR et al., 2013).

From an epidemiological standpoint, helminthic (e.g., *Ascaridia* sp.) and protozoan (e.g., coccidians) infections pose a serious threat to the health of commercially bred exotic birds, especially when they present high parasitic loads and clinical signs such as diarrhea, weight loss, apathy, reproductive disorders and death (VICENTE et al., 1995; MARIETTO-GONÇALVES et al., 2009; AMARAL & OTUTUMI, 2013). It should be noted that although some nematode species (e.g., *Heterakis* sp.) are considered of minor pathogenic importance, sudden death has been reported frequently in recent years (SANTOS et al., 2008).

In fact, it is known that the presence of gastrointestinal parasites in commercially bred birds is often related to the absence of a quarantine period. In addition, the size of breeding facilities, type of floor, population density in each cage, and absence of diagnostic and treatment protocols, contribute to the introduction and dissemination of gastrointestinal parasites (MARIETTO-GONÇALVES et al., 2009; FIGUEIREDO et al., 2010; SNAK et al., 2014).

This study identifies the gastrointestinal parasites of exotic birds living in state of Sergipe, northeastern Brazil and offers the first report of parasitism of *N. hollandicus* by *Ascaridia* sp. and *Heterakis* sp., of *S. canaria* and *S. risoria* by Trichostrongylidae in this country.

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