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Gastrointestinal parasites of some captive birds in Alipore zoological garden, India

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Abstract
The present study was carried out to investigate the gastro intestinal parasitic fauna of some captive birds at Alipore Zoological Garden, Kolkata, West Bengal, India. Out of total 392 faecal samples collected, 176 (44.89% prevalence) were found to be positive for helminthic and protozoan parasites, as single or mixed infections. The present study documented 9 different gastrointestinal parasites viz, *Capillaria* sp. (11.73%); *Ascaridia* sp. (32.90%); *Heterakis* sp. (9.69%); *Hymenolepis* sp. (1.02%); *Eimeria columbae* (1.27%); *E. mayurai* (1.78%); *E. labbeana* (3.06%); *E. pavonis* (1.78%); *Isospora mayuri* (1.02%), from different captive birds of this zoological garden. Among helminth infections, 119 (30.35%) faecal samples were found to have mono infection with one species of helminths (i.e either Cestodes or nematodes) and 57 (14.54%) samples show multiple infection. The enteric protozoan infections were lesser in magnitude (2.80%) when compared to helminth infections.

Keywords: Gastro-intestinal parasites; prevalence; captive zoo birds; alipore zoological garden, India

1. Introduction
The gastro-intestinal parasites have always been a problem causing severe parasitism in Zoo animals where the herds of animals are kept in small-range of area [1, 2]. Wild animals in nature, live on large areas and consequently have a low genetic resistance against parasitic infections because of low exposure [3]. When herds of wild animals are kept in captivity in zoological gardens, the problem of parasitic infections increases and cause a serious threat to the endangered species, occasionally causing sudden and unexpected local declines in abundance [3]. This is because captivity alters the environment and life of wild animals, causes stress, reduces resistance and may increase the incidence of diseases, particularly parasitic diseases among them [4]. Birds are an integral part of virtually every ecosystem and it is not surprising that they are commonly found in households and zoos all over the world. Birds can be parasitized by a wide variety of endoparasites, that is, nematodes, trematodes, cestodes, acanthocephalans, and protozoa [5]. Due to an increased risk of exposure, these parasites can lead to serious problems or even to death in birds [5]. So, the knowledge of their diseases needs to be gained, especially when bread for re-introduction in the wild [6].
The Alipore Zoological garden is one of the oldest zoo of India and it displays a large varieties of wild bird species. Although regular de-worming program is reportedly carried out at the Alipore Zoo randomly- twice annually for birds in a year. In addition to this, a random stool test for the presence of parasites is also performed. In spite of this there still remains the threat of occurrence of these parasites that may cause serious health problems in captive animals. In the wild, animals might have a natural resistance against parasitic infections or live in a balanced system with their parasites [11]. Parasitic diseases are one of the main causes of death in wild animals in captivity and some parasites are zoonotic and are a risk to human health [7, 8, 9, 10]. Again, the frequent use of anti-helmintics often cause resistant strains to evolve. Moreover, the nutritional status of captive animals can also enhance or diminish their resistance to disease [12].
Thus, the present study was conducted to study the prevalence of gastro intestinal parasitic fauna of the selected 25 species of different wild birds at Alipore Zoological Garden, Kolkata, West Bengal, India in order to create an effective preventive measure for the particular parasites could be taken for the proper management of their health.

2. Materials and Methods
The present study was carried out during August, 2011- February, 2012 to observe 25 species

of different wild birds harboured in the artificial niches of Alipore Zoological Garden. These birds belongs to 5 orders *vitz*, Columbiformes (including Green Imperial pigeon, Pigeon homer, Spotted dove, White dove); Psittaciformes (including Gray parrot, Blue and yellow macaw, Red and blue macaw, Hill myna, Baired - Eye Cokatoo, Cokatiel, Greater sulphur crested cockatoo, Lesser sulphur crested cockatoo, Goffin's cockatoo, Moluccan cockatoo, Citron crested cockatoo); Galliformes (including Bhutan pheasant, Green pheasant, Reeve's pheasant, Nepal pheasant, Golden pheasant, Chinese pheasant, Lady Amherst's pheasant, Common peafowl); Anseriformes (including Goose common) and Pelecaniformes (including Spoonbill).

The faecal samples galleries of respective birds of the Alipore Zoological Garden. For estimation of prevalence of parasitic load, the faecal samples were collected randomly and pooled together in separate glass bottles and zipped plastic bags from the respective bird galleries. Sampling was done in the morning with the assistance of the bird handlers from.

The collected faecal samples were subjected to Formalin Ether Sedimentation Technique [13] in order to detect the helminth eggs and protozoan oocysts. All measurements are in micrometer unless otherwise stated. The helminth eggs were identified up to the genus level following Soulsby [13]. The identification of the Coccidian oocysts was done up to the generic and specific level following Pellerdy [14], Levine *et al.* [15], Levine [16], Levine and Ivens [17].

Faecal egg counts were calculated following Stoll's Dilution method [12]. Prevalence were calculated following Bush *et al.* [18]:

Prevalence (P) = the number of infected stool sample with one or more individuals of a particular parasite species (or taxon) divided by number of stool sample examined (expressed as percentage).

3. Results

During the present survey a total of 392 faecal sample were collected, out of which 176 (44.89% prevalence) samples were positive for parasitic infection, of which 141(35.96% prevalence) samples were positive for only helminthic infection, 11 (2.80%prevalence) faecal samples show protozoan oocysts and 24 (6.12% prevalence) samples show mixed infection with both helminths and protozoan infection (Table 1).

The present study recorded 9 different gastrointestinal parasites viz, *Capillaria* sp. (48.5-56.1µm in length x 24.6-26.0µm in breadth); *Ascaridia* sp. (72.25- 92.1 µm in length x 50.0- 52.8µm in breadth); *Heterakis* sp. (69.3- 85.8 µm in length x 35.0 - 53.1µm in breadth) ; *Hymenolepis* sp. (80.2-89.8 µm in length x 63.7- 68.5 µm in breadth); *Eimeria columbae* (17.0-20.15 µm long and 13.5-15.0µm wide, and with a of 1.25-1.4); *E. mayurai* (21.0-27.0 x 14.0-18.5µm in size, shape index of 1.4-1.6); *E. labbeana* (14.0-23.5x 13.0-21.8µm in size, shape index of 1.07-1.18); *E. pavonis* (21.0-27.0 µm in length and 15.0-19.0 µm in width, shape index of 1.3-1.5); *Isospora mayuri* (22.0-29.0 µm in length and 18.0-22.0 µm in width, shape index of 1.1-1.31), from different captive birds of this zoological garden (Table 1). The most commonly detected gastrointestinal parasitic infection in the captive birds was the ova of *Ascaridia* spp. (32.90%) followed by *Capillaria* sp. (11.73%); *Heterakis* sp (9.69%); oocysts of *Eimeria* spp. (7.90%); *Isospora* sp. (1.02%) and ova of *Hymenolepis* sp. (1.02%). Beside these, Common peafowl shows highest parasitic load (90% prevalence) and lowest by Reeve's pheasant (15% prevalence) as depicted in Table 1. When compared to helminth infections, the enteric protozoan infections were lesser in magnitude. Moreover, no trematode infection was noticed among the birds during the present study. Lastly, all of the host species were found infected except Moluccan cockatoo, citron crested cockatoo, red and blue macaw who were negative for parasitic infections (Table 1).

4. Discussion

The present study observed out of the total faecal sample collected, 176 (44.89% prevalence) samples were positive for parasitic infection, out of which 141(35.96% prevalence) samples were positive for only helminthic infection, 11 (2.80%prevalence) faecal samples show protozoan oocysts and 24 (6.12% prevalence) samples show mixed infection with both helminths and protozoan infection (Table 1). The present study recorded 9 different gastrointestinal parasites viz, f *Ascaridia* spp., *Capillaria* sp., *Heterakis* sp, oocysts of *Eimeria* spp.; *Isospora* sp., and ova of *Hymenolepis* sp.

The present study recorded 44.89% of parasitic infection which was also supported by earlier workers who reported intestinal parasitic infections varying from 25.0 – 99.0% in zoo birds from Baranga Zoo, Orissa [19], Lucknow Zoo, Uttar Pradesh, India [20], Lucknow and Delhi Zoo, India [21], Mysore Zoo, India [22]; Bennerghatta National Park, Bangalore [23]; Ahmedabad and Baroda Zoo, Gujarat, India [24], Sakkarbagh Zoo, Junagarh, Gujarat [25]; Kamala Nehru Zoo and Ahmedabad & Sayyajibaug Zoo, Vadodara, Gujarat, India [26], Shri Sayaji Baug Zoo, Vadodara, India [27, 28], Kamala Nehru Zoological Garden, Kankaria Zoo, Ahmedabad [29, 30].

During the present study, the avian hosts were found infected with higher occurrence of helminthes (30.01%) compared to protozoa (1.57%). This result is also supported by Parsani *et al.* [25] at Sakkarbagh Zoo, Junagarh, Gujarat; Patel *et al*. [25] in Kamala Nehru Zoo and Ahmedabad & Sayyajibaug Zoo, Vadodara, Gujarat, India; Parsani and Momin [29] at Shri Sayaji Baug Zoo, Vadodara, India.

The present study shows that the birds belonging to the family Columbiformes, Galliformes, Columbiformes and Anseriformes were found infected mainly with the *Ascaridia* sp., *Heterakis* sp. and *Capillaria sp., Hymenolepis* sp. and coccidian oocysts, while Patnaik and Acharjya [19]; Chauhan *et al*. [21]; Islam [31]; Reddy *et al*. [23]; Patel *et al*. [24]; Parsani *et al*. [25, 32]; Parsani and Momin [28]; Borghare *et al*. [33] and Bante *et al*. [34] reported nematode infection mainly with *Ascaridia* sp. and *Capillaria* sp. in Galliformes and Columbiformes birds.

In this study cestode infection was observed only in Anseriformes (*Anser* sp.), while Psittaciformes and Passeriformes birds show the presence of *Ascaridia* sp. *Capillaria* sp. infection in this study which is supported by Parsani *et al*. [25]; Parsani and Momin [28]. Similar findings of the occurrence of coccidian oocysts such as *Eimeria* sp. in Galliformes and Columbiformes was earlier reported by Patel *et al*., [26]; Mehta *et al*. [27]; Parsani *et al*.[25]; Parsani and Momin [28] and the presence of *Isospora* sp. in Galliformes (Peafowl) was also supported by Subramanian *et al*. [35]. The presence of *Heterakis* sp. in Galliformes and Columbiformes was supported by Subramaniun *et al*. [35]; Parsani *et al*. [25, 32] and Columbiformes by Bhorghare *et al*. [33].

Lastly the most common species of parasitic infection observed during the present survey noticed were *Ascaridia* spp., *Capillaria* sp., *Heterakis* sp, Coccidian oocysts and this

observation were also supported by Hofstatter and Guaraldo [36]; Ilic *et al*.[37].

Table 1 : Prevalence of Parasitic infection in captive birds of Alipore zoological garden

Host Species	Scientific name	No. of faecal sample examined	Number of +ve samples	Prevalence (%)	Identification of gastro intestinal Parasites - egg/oocyst (*)
Green Imperial pigeon	*Ducula aenea* Linneus, 1766	20	15	75.00	*Ascaridia* sp (10); Mixed infection of *Ascaridia* sp. and *Eimeria columbae* (5)
Pigeon homer	*Columba* sp.Linneus, 1758	30	17	56.67	*Ascaridia* sp. (17)
Gray parrot	*Psittacus erithacus* Linneus 1758	20	9	45.00	*Ascaridia* sp.(9)
Blue and yellow macaw	*Ara ararauna* Linneus, 1758	10	3	30.00	*Capillaria* sp. (3)
Red and blue macaw	*Ara chloptera* Linneus, 1758	7	----	----	--------------
Hill myna	*Gracula religiosa* Linneus, 1758	15	3	20.00	*Capillaria* sp. (3)
Baired - Eye Cokatoo	*Cacatua sanguinea* Gould, 1843	10	4	40.00	*Ascaridia* sp. (4)
Cokatiel	*Nymphicus hollandicus* Kerr, 1792	8	2	25.00	*Ascaridia* sp. (2)
Greater sulphur crested cockatoo	*Cacatua galerita galerita* Latham, 1790	6	3	50.00	*Ascaridia* sp. (3)
Lesser sulphur crested cockatoo	*Cacatua sulphurea sulphurea* Gmelin, 1788	5	2	40.00	Mixed infection of *Ascaridia* sp. and *Capillaria* sp. (2)
Goffin's cockatoo	*Cacatua goffiniana* Roselaar & Michels, 2004	4	1	25.00	*Capillaria* sp. (1)
Moluccan cockatoo	*Cacatua moluccensis* Gmelin, 1788	5	----	----	--------------
Citron crested cockatoo	*Cacatua sulphurea citrinocristata* Fraser, 1844	7	----	----	--------------
Bhutan pheasant	*Polyplectron bicalcaratum* Linneus 1758	20	10	50.00	*Ascaridia* sp. (3) ; Mixed infection of *Capillaria* sp. and *Ascaridia* sp. (7)
Green pheasant	*Phasianus versicolor Vieillot, 1817*	20	2	20.00	*Ascaridia* sp. (2)
Reeve's pheasant	Syrmaticus reevesii Gray, 1829	20	3	15.00	*Capillaria* sp. (3)
Nepal pheasant	*Lophura leucomelanos Latham, 1790*	20	7	35.00	*Ascaridia* sp. (7)
Golden pheasant	*Chrysolophus pictus* Linneus, 1758	30	20	66.67	*Ascaridia* sp. (20)
Chinese pheasant	*Lophura nycthemera* Linneus, 1758	20	10	50.00	*Heterakis* sp. (5); Mixed infection of *Heterakis* sp. and *Capillaria* sp. (5)
Lady Amherst's pheasant	*Chrysolophus pictus* Leadbeater, 1829	20	5	25.00	*Ascaridia* sp. (5)
Common peafowl	*Pavo cristatus* Linneus 1758	30	27	90.00	*Isospora mayuri* (4); *E. pavonis* (7) ; Mixed infection of *Heterakis* sp. and *Ascaridia* sp. (9) ; Mixed infection of *Heterakis* sp. *E. mayurai* and *Ascaridia* sp. (7)
Spotted dove	*Streptopelia chinensis* Scopoli, 1768	20	12	60.00	Mixed infection of *Heterakis* sp., *E. labbeana* and *Capillaria sp.* (12)
White dove	*Streptopelia sp.*Scopoli, 1768	10	7	70.00	*Ascaridia* sp. (7)
Goose common	*Anser* sp. Brisson, 1760	20	4	20.00	*Hymenolepis* sp. (4)
Spoonbill	*Platalea leucorodia* Linneus 1758	15	10	66.67	Mixed infection of *Ascaridia* sp. and *Capillaria* sp. (10)
	Total	392	176	44.89	

* Figures in Parentheses indicate the number of infected faecal samples with the particular parasites

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