



A PRELIMINARY ASSESSMENT OF GUT HELMINTHS OF TWO SYNANTHROPIC FORAGERS, CATTLE EGRET (*Bubulcus ibis*), AND THE AFRICAN PIED CROW (*Corvus albus*), ON A UNIVERSITY CAMPUS, GHANA

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ABSTRACT

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Objective: This study was carried out in Legon, Accra to determine the occurrence of parasitic helminths infecting the cattle egret and the African pied crow. Methods: Between January and April of 2019, the two bird species were trapped, and their gastrointestinal contents and droppings examined for adult parasites and ova. Results: Identified GIT parasites included adult worms (adult tapeworm and adult *Strongyloides* sp) and ova (hookworm, *Trichuris*, *Trichostrongylus*, *Strongyloides*, *Paragonimus*, and *Diphyllobothrium* species). With regards to GIT examination, 38 *Trichuris* species ova (mostly in the gizzard) and five (5) adult tape worms (in the ileum and colon) were detected in the African pied crows. In the cattle egret, four (4) *Trichuris* sp ova, three (3) hookworm ova and one (1) adult *Strongyloides* sp were detected in the ileum and colon only. Forty-one (41) ova (six of the types above) were detected in the 45 cattle egret droppings processed. *Trichuris* sp (31.7%, 13/41) and hookworm (26.8%, 11/41) constituted the majority. Conclusion: Overall, helminth richness was found to be higher in the cattle egret compared to the African pied crow. The outcome of this study provides preliminary information on helminth types in these two birds, and has negative public health implications.

Contribution/Originality: This study contributes to the existing literature by providing a nonspecific evidence of helminth genera in two birds, which could be common to or potentially cross to humans. This knowledge on infectious diseases in birds will help foresee outbreaks that may occur in the future due to zoonotic pathogens.

1. INTRODUCTION

The cattle egret (*Bubulcus ibis*) and the African pied crow (*Corvus albus*) are two ecologically important birds that feed on both domestic and agricultural pests [1-5]. The pecking habit of the egret has proven very relevant in the bio-control of cattle pests [6]. This type of control has been utilized to reduce significantly the associated irritation by dipterous cattle pests [7, 8]. Their feeding activities at solid municipal waste dumps, significantly reduces houseflies (*Musca domestica*) and blue bottle fly (*Calliphora spp.*) maggots, which are vectors of causative

agents of typhoid, dysentery, cholera and poliomyelitis [2]. Pied crows on the other hand are known to be intelligent, omnivorous, and it is suggested that they could be outcompeting other bird species for food including insects, fruits, eggs of other birds, carcasses, and domestic wastes in Ghana [9, 10].

Regardless of these beneficial roles, both have been associated with the transmission of different diseases. The egret for instance is linked with heartwater, infectious bursal disease and Newcastle disease [11, 12]. It has been documented that it is an important reservoir and the “amplifier host” for Japanese encephalitis virus [13]. They thus pose significant public health risk to both humans and other mammalian livestock [13, 14].

Knowledge on infectious diseases in birds will help foresee outbreaks that may occur in the future due to zoonotic pathogens [15]. There is a suggestion that birds and their droppings can carry over 60 different diseases. This is especially worrisome in places of human residence as many of these diseases are transmitted by air and is transmissible to human beings just by their presence around the droppings [16]. The rising and evolving of nouvelle communicable diseases in wildlife and the possible transmission to man has influenced a huge amount of interest in considering birds as vectors of infectious agents, not forgetting the roles they play when it comes to epidemiology [17].

The ubiquitous presence of these birds in Accra, Ghana has serious public health implications. It is also worth noting that their droppings, which is a probable source of diseases cannot be monitored and controlled by man. Droppings on trees and on the ground remain there until they dry up, break down into soil or blown away by the wind. Most parasite eggs can remain viable in soil for months or years. People or other animals may become infected through fecal-oral exposure to this soil [18]. Knowledge on gastro-intestinal helminths diseases of birds would be useful in predicting future outbreaks of zoonotic pathogens [15]. This study therefore presents a preliminary assessment on two most common large birds on the University of Ghana campus, which has trees, green environments, and built-up structures that serve as unintended habitats.

2. MATERIALS AND METHODS

2.1. Study Area

The main University of Ghana campus is located at Legon, in the Greater Accra Region of Ghana. It is situated about 12 kilometers (7.5 mi) north-east of Accra (latitude 5°38'59.99"N, longitude 0°10'60.00"E), and has a total land area of about 250,000 m². The University has a population of about 40,000 resident and non-resident students. Crows are widely distributed in this region and can be found in almost all parts of the campus. They can be found in aggregations, as a “murder of crows” at refuse sites, around lecture halls, and the various hostels. Likewise, the cattle egrets are mostly found in the University’s Botanical garden, the residential areas and the open spaces such as the Soccer fields.

2.2. Ethical Approval

Permission was obtained from the Wildlife Division of the Forestry Commission of Ghana for this study. Approval was granted to trap and kill five pied crows and five cattle egrets for gut content examination. The remaining trapped birds were to be released after collecting their fresh droppings in captivity.

2.3. Trapping of Birds

Four shelf 12 m by 15 m mist nets were set close to the Vaughan Dam in the Botanical garden, under the trees where the birds were observed to roost. These were inspected every four hours to ensure that birds captured did not struggle for too long and die in the traps. Birds were placed in a perforated box and transported to the laboratory for further processing. However, the five (5) crows used in the study were caught with mist nets set at a water hydrant near the University’s Guest Centre. Unfortunately, unlike the cattle egrets, only these five birds were captured and thus, examination of droppings from other captured birds could not be carried out.

2.4. Cattle Egret Droppings

Cattle egrets were kept in separate perforated boxes until they passed their droppings. After collecting droppings, birds were marked by cutting the ends of their primary feathers to avoid resampling. Birds were sent back to the Vaughan Dam and released. In total, 45 stool samples were collected between the periods of January and April, 2019. Five of these trapped birds were randomly selected and dissected for gut content examination, as permitted.

2.5. Processing of Droppings from Cattle Egrets

Only droppings from cattle egrets collected and stored in sterile screw-capped stool plastic bottles labeled with time and date of collection were processed. These were later examined for parasite eggs and larvae. The Kato-Katz technique (cellophane faecal thick smear) was employed to get approximately 1g of fresh stool sample [19]. This was then transferred into in a tube containing 5ml of physiological saline. The tube was corked and the contents mixed by gently turning the tube up and down until it was homogenized. Following this, the mixture was sieved through a mesh of pore size 80µm, into a 5ml test tube and centrifuged at 1500 rpm (revolutions per minute) for 2 minutes. Supernatant was discarded and deposit transferred onto a labeled microscope glass slide, and examined microscopically for parasite eggs and/or ova.

2.6. Processing and Examination of Gut Contents

All birds were processed by experienced laboratory technicians at the Department of Animal Biology and Conservation Sciences, University of Ghana. The guts were sectioned and contents emptied and flushed with physiological saline, aimed at dislodging ova, larva, and adult worms. This was transferred immediately into labeled petri dishes containing physiological saline. The mixture was mixed with a stirrer until it was homogenized. The mixture was then transferred into 10 ml tubes using a funnel, and centrifuged at 1500 rpm for two minutes. After this, the supernatant was discarded. Five milliliters (5 ml) of Zinc Sulphate ($ZnSO_4$, 33% v/v, specific gravity 1.180) solution was added and capped [20]. The mixture was then reconstituted and centrifuged for two minutes at 1500rpm. Following this, a Pasteur pipette was used to collect part of the topmost supernatant onto a microscope glass slide, covered with a cover slip, and observed under a light microscope with X10 and X40 for ova. Parasites detected were confirmed by a chief microscopist. Absolute counts of adult parasites, larvae and ova (frequencies and percentages) were performed and tabulated (Table 1).

2.7. Limitations of the study

Birds used for the study are protected, and therefore, we were restricted on the number that could be captured for the study. The pied crows were difficult to capture because they may have over time, developed a sense of threat and danger around their environment and hence, have become extremely cautious than normal.

3. RESULTS

3.1. Ova and Adult Worms in Pied Crow

Seven parasite genera were detected in the birds dissected and examined. The colons of both birds had all the types of parasites detected compared to the other sections. Two parasite genera, *Trichuris sp* and an adult tape worm were found in the gastrointestinal tract (GIT) of the pied crow. Thirty eight *Trichuris* ova were counted in addition to five adult tapeworms. Twenty three of the *Trichuris* ova were observed in the gizzard, while the remaining were found in the ileum or the colon (Table 1).

3.2. Ova and Adult Worms in Egret

The cattle egret had four *Trichuris* sp ova, three hookworm ova and one adult *Strongyloides* sp in GIT. No parasite was detected in the gizzard of the egret. The ileum and colon had most types of parasites detected compared to the gizzard (Table 1).

Table-1. Parasites detected in sections of the GIT in pied crows and cattle egrets.

Bird type	Parasite species and stage	Section of GIT			Total (n)
		Gizzard (n)	Ileum (n)	Colon (n)	
Pied crow	<i>Trichuris</i> sp ova	23	9	6	38
	Adult tapeworm	-	1	4	5
Cattel egret	<i>Trichuris</i> sp ova	-	2	2	4
	Hookworm ova	-	2	1	3
	Adult <i>Strongyloides</i> sp	-	-	1	1

3.3. Images of Helminths Identified in the Two Bird Species

Images: Ova (1 – 6) and Adult parasite (7) identified in the study (x40 magnification).

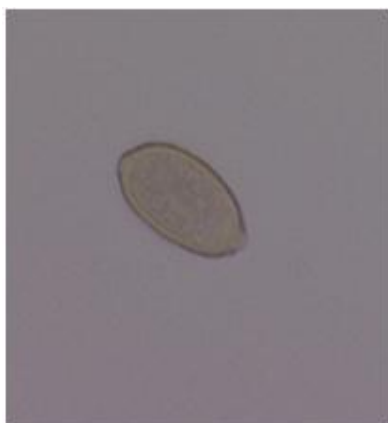


Figure-1. *Trichuris* sp ova identified.



Figure-2. Adult tapeworm. identified



Figure-3. Hookworm ova identified.



Figure-4. *Trichostrongylus* sp. identified.



Figure-5. *Diphillobothrium* sp. identified.

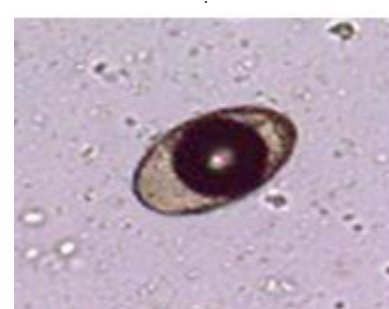


Figure-6. *Paragonimus* sp. identified.



Figure-7. Adult *Strongyloides* sp. identified.

3.4. Helminth Ova in Cattle Egret Droppings

Six parasite species were detected in egret droppings collected (Figure 8). Out of the 41 parasites counted, 31.7% (13/41) were *Trichuris* sp ova, while 26.8% (11/41) were hookworm ova. The relative abundance of the remaining parasite ova detected is shown in Figure 8.

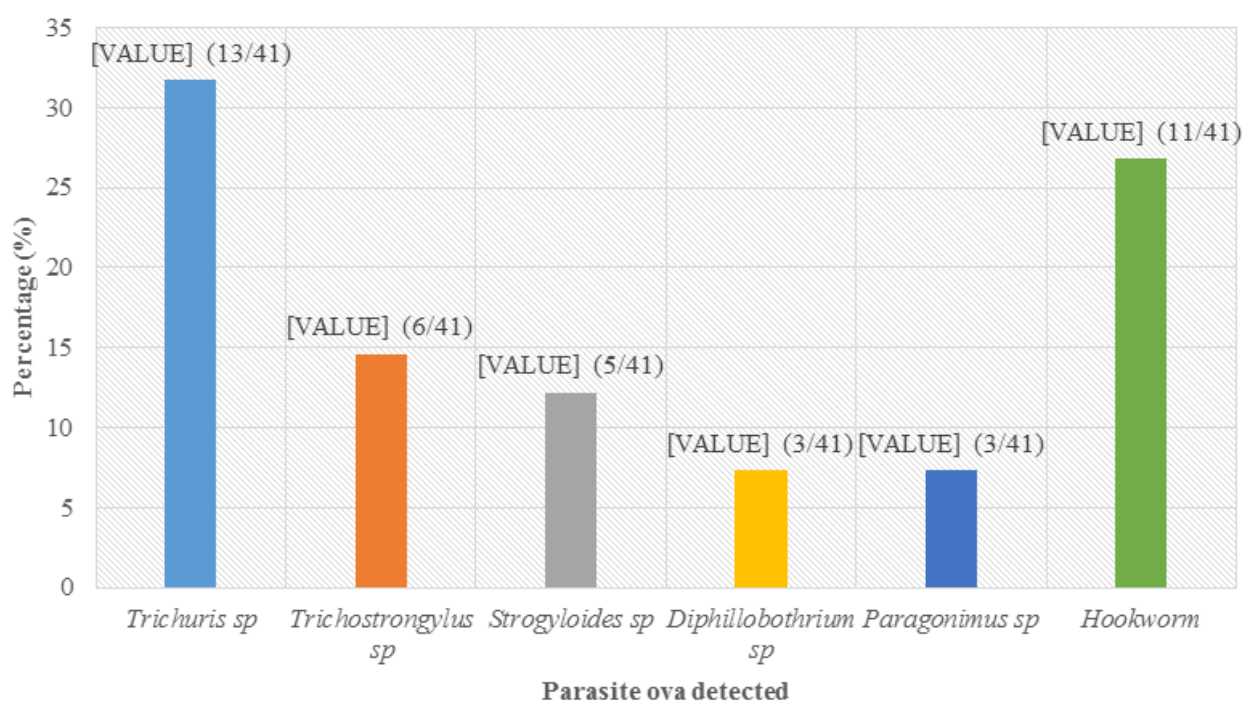


Figure-8. Parasites detected in droppings of cattle egret.

4. DISCUSSION

The prevalence of helminth parasites have been shown to vary considerably from one geographic region to another depending on the genera of helminth involved, the animal species, and local environmental conditions such as humidity, temperature, rainfall, vegetation and management practices [21]. A variety of invertebrates including slugs, snails and beetles may act as transport hosts for the transmission of helminthic parasites to these birds. The most common transport host is the earthworm, which forms part of the diet of the cattle egret, and fruits, eggs of other birds, carcasses, and domestic wastes in Ghana for the pied crow [10, 22].

In the present study, a variety of gastro-intestinal helminths were documented from both bird species. The specific parasites identified included *Trichuris*, hookworm, *Trichostrongylus*, *Strongyloides*, *Paragonimus*, tapeworm and *Diphylobothrium* species. The cattle egret had six of these parasites detected in them, while the pied crow had two, *Trichuris* sp, and the adult tapeworm exclusively.

Trichuris sp was the most common parasite ova detected in both birds, however, the pied crow had the most counts. The second most common ova detected was the hookworm, which was isolated exclusively from the cattle egret.

The diet and feeding behavior of the cattle egret may have contributed immensely to the diversity of parasites identified. The cattle egret feeds mostly on insects, although they have a broad feeding range, which includes earthworms, vegetable matter and fish [23]. Cattle egrets in Ghana have been observed foraging in several habitats such as lawns, pastures, croplands, silted drains and landfill sites [24]. Although they sometimes feed in shallow water, they are typically found in fields and dry grassy habitats, reflecting its greater dietary reliance on terrestrial insects rather than aquatic prey [25]. Although the pied crow has similar feeding habits, this study encountered limitations which impacted on the number of birds, which could be captured. This study is therefore unable to clarify the differences in GIT parasite diversity between the two birds.

Observations from the roosting sites of the cattle egrets revealed that these birds picked up feeds from the soil under the trees where they roost. This soil is soaked with stool and urine from these birds, hence could serve as the main source of these parasites, since they are easily transmitted through droppings.

The apparent healthy state of these birds, as observed at the time of capture is suggestive of their relatively asymptomatic status with the presence of these parasites. In our view, this makes them potential reservoirs for some of these parasites. Their increasing numbers, and continuous presence within human dwellings could enhance transmission to humans as well as domestic/farm animals.

Further studies are required to establish the presence of helminth parasites in other birds, domestic and farm animals. Also, molecular studies could identify the species and establish potential zoonosis. This will help document existing parasites, understand common transmission pathways, and establish control strategies.

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