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HELMINTH PARASITES OF THE GASTROINTESTINAL TRACT OF THE DOUBLE-SPURRED FRANCOLIN, *FRANCOLINUS ICALCARATUS* (LINNAEUS) IN ZARIA, NORTHERN NIGERIA

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ABSTRACT

The gastrointestinal tracts of 105 double-spurred Francolins (Francolinus bicalcaratus Linnaeus) shot in the wild by hunters in Zaria and its environs were examined for helminth parasites. Forty-one (39.05%) of the birds were infected by five helminth parasites. The prevalence of the nematode parasites in the birds was Subulura brumpti 31 (29.52%), Heterakis gallinarum 19(18.09%), Ascaridia galli 2 (1.90%) and A.numidae 1(0.95%). The only cestode Raillietina tetragona,had a prevalence of 2(1.90%). Twenty-eight(26.67%) of the birds had single infection, 12(11.43%) had double infections and 1 (0.95%) had triple infection. There was no significant difference ($P > 0.05$) in the infection rates between the sexes. The implication of the findings to the birds are discussed.

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Key words: Helminths, parasites, Francolin, Francolinus bicalcaratus

Introduction

The Francolins are wild African birds commonly called bush fowl. *Francolinus bicalcaratus* is the most abundant of the seven species of francolins in Nigeria (Elgood *et al.*, 1994). In the Zaria area of northern Nigeria, *F. bicalcararus* is widespread and are hunted or trapped by man to satisfy his culinary appetite for its palatable meat, to supplement animal protein sources and or traded to augment income (Onyenekwe, 1988; Mbinkar *et al.*2001).

Several helminth parasites have been implicated in causing morbidity and mortality in domestic and wild birds (Cheng, 1973; Soulsby, 1982; Ruprah *et al.*, 1986), and are also considered as the greatest impediments to poultry production in Nigeria (Lawal *et al.*, 2001). Available information on helminth parasites of *F. bicalcaratus* in Nigeria include the study by Akande and Dipeolu (1981) in the humid forest of Ibadan, southern Nigeria and a preliminary survey based on 28 birds in Zaria, northern Nigeria by Oniye *et al.* (2000). This information on the bird is rather scanty if compared to enormous literature available on parasites of domestic chicken.

However, the knowledge of the parasites of wild and domesticated birds are essential for management purposes. This study was therefore designed to investigate the species composition, prevalence and distribution of helminth parasites in the gut of male and female *F. bicalcaratus* in the Zaria area of northern Nigeria.

Materials and Methods

Between July 2000 and May 2001, 105 specimens of *F. bicalcaratus* shot by local hunters in Zaria (11° 03′ N, 07° 42′ E) area of Kaduna State, Nigeria, were purchased and examined for intestinal parasites. The birds were dissected in the laboratory to expose the gastrointestinal tract (GIT). The GIT was removed and the

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various sections, namely the oesophagus, crop, proventriculus, gizzard, duodenum, jejunum, ileum, caecum and rectum were separated into petri dishes containing physiological saline. The mucosa of the proventriculus was scrapped and examined against a black background, under a stereoscopic microscope, using a desk lamp illumination. The horny layer of the gizzard was peeled off to expose embedded parasite. Longitudinal slits were made into the other parts of the GIT to expose the content of their lumen. The tissues were teased gently to dislodge parasites, which were isolated, counted and preserved in 10% neutral buffered formalin. Parasites were identified microscopically, and by using the texts of Cheng (1973), Soulsby (1982), Ruff (1984), Ruprah *et al.* (1986) and Smyth (1994). Confirmatory identification was carried out at the Department of Veterinary Parasitology and Entomology, Ahmadu Bello University, Zaria, Nigeria.

Prevalence and mean intensity were applied as defined by Margolis *et al.*(1982). Chi-square test was employed to determine possible association in parasite prevalence between sexes.

Results

Out of the 105 birds examined, 41(39.05%) were infected by five species of gastrointestinal helminth parasites that comprised of four nematodes and a cestode. The nematodes, number of birds infected and their respective prevalences were *Subulura brumpti* 31(29.52%), *Heterakis gallinarum* 19(18.09%), *Ascaridia galli* 2(1.90%) and *A. numidae* 1(0.95%); while *Raillietina tetragona* 2(1.90%) was the only cestode (Table 1).

The predilection sites for the nematodes were the small intestine and caeca, while the cestode was restricted to the small intestine.

Table 1: Prediction site and Prevalence of Helminth Parasites in the gut of *Francolinus bicalcaratus*

Parasites	Location	No. of birds examined	No. of birds infected	Prevalence (%)	No. of helminths recovered	Mean intensity ± SE
S. brumpti	Small intestine & caeca	105	31	29.52	119	3.84 ± 0.07
H. gallinarum	Caeca	105	19	18.09	65	3.42 ± 1.05
A. galli	Small intestine & caeca	105	2	1.90	2	1.0 ± 0.00
A. numidae	Small intestine	105	1	0.95	1	1.0 ± 0.00
R. tetragona	Small intestine	105	2	1.90	5	2.50 ± 1.50

The birds had higher prevalence of single infection (26.67%) compared with double (11.43%) and triple (0.95%) infections, whilst 60.95% of the birds were uninfected (Table 2). The differences in the prevalence of single, double and triple infections were significant ($P<0.05$). The male birds had only three species of nematode parasites (Table 3), while the females had four nematodes and a cestode species (Table 4). The mean intensity of infection with *S.brumpti* and *H. gallinarum* were higher in male than female birds (Tables 3 and 4). The Chi-square test

revealed lack of significant difference ($P > 0.05$) in the prevalence of infection between the male and female birds.

Table 2: Pattern of helminth species infection in the gut of *Francolinus bicalcaratus* (n=105)

S/No	Parasites	Frequency of occurrence	
		Total	Percentage
A	**Uninfected birds**	64	60.95
B	**Infected birds**		
	Single parasite infections		
	Heterakis gallinarum	9	
	Subulura brumpti	18	
	Ascaridia galli	1	
	Subtotal	**28**	**26.67**
	Mixed parasite infections (two parasites)		
	Heterakis gallinarum + Subulura brumpti	9	
	Raillietina tetragona + Subulura brumpti	2	
	Ascaridia numidaee + Subulura brumpti	1	
	Subtotal	**12**	**11.43**
	(Three parasites)		
	Subulura brumpti + Ascaridia galli + Heterakis gallinarum	1	**0.95**
	Subtotal	**1**	**0.95**
	Total infected birds	**41**	**39.05**
	Grand total	**105**	**100**

Table 3: Prevalence of Helminth Parasites of Male Double-spurred Francolins

Parasites	Location	No. of birds examined	No. of birds infected	Prevalence (%)	No. of helminths recovered	Mean intensity ± SE
S. brumpti	Small intestine & caeca	41	11	26.83	55	5.0 ± 1.90
H. gallinarum	Caeca	41	8	19.51	41	5.13 ± 2.33
A. galli	Small intestine & caeca	41	1	2.44	1	1.0 ± 0.00

Table 4: Prevalence of Helminth Parasites of Female Double-spurred Francolins

Parasites	Location	No. of birds examined	No. of birds infected	Prevalence (%)	No. of helminths recovered	Mean intensity ± SE
S. brumpti	Small intestine & caeca	64	20	31.25	64	3.20 ± 1.08
H. gallinarum	Caeca	64	11	17.19	24	2.18 ± 0.54
A. galli	Small intestine & caeca	64	1	1.56	1	1.0 ± 0.00
A. numidae	Small intestine	64	1	1.56	1	1.0 ± 0.00
R. tetragona	Small intestine	64	2	3.13	5	2.50 ± 1.50

Discussion

The prevalence of helminth infection in *F. bicalcaratus* in this study shows moderate parasitism of the birds, unlike the 50% earlier reported for the bird in the same area by Oniye *et al.* (2000). In Zaria area, as high as 88.59% helminth prevalence had been reported in another game bird, the Helmented Guinea fowl (Nfor, 1998). The low prevalence in this study could be due to low incidence of the infective stages of the parasites and or reduced susceptibility of the birds to infection.

This study revealed higher prevalence of nematode than cestode parasites; an indication of a higher availability of infective stages of nematodes than cestodes. This contradicts the study of Oniye *et al.* (2000), in which more cestodes than nematodes were implicated as major cause of helminthosis in *F. bicalcaratus*. This contradiction could be resolved in differential seasonal prevalence of the two groups of parasitic organisms in the study area. Whilst a majority (83%) of the birds examined in this study were obtained in the dry season (January to March), those worked on by Oniye *et al.* (2000) were obtained in the wet season (April to August).

Subulura brumpti had the highest number (119) of the nematodes recovered, closely followed by *Heterakis gallinarum* (65). The implicated intermediate hosts of *S. brumpti* are various species of bugs, beetles and ants (Cheng, 1973) that also constitute food organisms of the birds (Mbinkar, 2002). Although the earthworm which is an intermediate host of *H.gallinarum* (Soulsby, 1982) was not recorded as part of the food organisms of *F. bicalcaratus* by Mbinkar (2002), the omission might have been caused by beak grating of the soft tissues during pecking and maceration in the gizzard of the birds. Such treatments are necessary for the release of the infective second larval stage of the parasite (Lund *et al.*, 1966) into the intestine and to initiate the infection observed in *F.bicalcaratus* in this study. Kennedy (1975) opined that changes in feeding habits of birds and their diet might be responsible for favourable transmission of parasites and determine the composition of parasitic fauna.

The predilection sites for all the nematodes were the small intestine and caeca, where semi-digested food and debris abound, and these favour the establishment of nematodes (Smyth, 1976). Intestinal nematodes are known to cause serious

brompti was reported as mildly pathogenic but when present in large numbers, inflammation of definitive host's caecum may occur; while *H. gallinarum* is non-pathogenic, but it is a vector for *Histomonas meleagridis* which is the highly pathogenic "black-head" disease causing flagellate that is lethal to chickens, turkey, pheasants and other fowls (Cheng, 1973). Infection by *A. galli* may cause intestinal obstruction, severe haemorrhagic enteritis and consequently reduced egg production (Soulsby, 1982). *Raillietina tetragona* was the only cestode encountered in the small intestine, where the microhabitat favours its survival, and the absence of a digestive system and the structural adaptation of cestode, as well as the presence of digested nutrients in the intestine of host may influence their restriction to the small intestine. The aforementioned cestode has been reported to cause obstruction of the intestine, weight loss and decreased egg production in laying birds (Soulsby, 1982).

The parasites of *F. bicalcaratus* may cause severe debility, morbidity, and mortality may occur in extreme case. In domesticated birds, parasite composition and population of infective stages are likely to increase and different from those in the wild. Different species of parasites have been associated with deficiencies in vitamins A, B_1 and B_{12}, minerals, carbohydrates and proteins (Cheng, 1973; Soulsby, 1982; Smyth, 1994). All the single species infections were nematodes with populations higher than double and triple infections. It is plausible that the higher prevalence of single species infection depends on the order of initiation of infection in the host as the first to infect host may acquire higher microhabitat and establishment advantage thus rendering it less suitable for late entrants. While this may suggest a form of competition, Kennedy (1975) argued that food preference at a particular time may determine the establishment of either single or mixed parasite, and older wild birds tend to challenge parasites immunologically. This may also be responsible for lower occurrence of mixed infections in the birds. The statistically similar mean intensity of infection by *S. brumpti* and *H. gallinarum* among the male and female birds indicates that both sexes were equally exposed to the same risk of acquiring infections.

In conclusion, the number of *S. brumpti* and *H. gallinarum* indicates that *F. bicalcaratus* may serve as reservoir host for these parasites. For a successful domestication of this bird, its helminth parasite must be considered for effective administration of an appropriate antihelminthic therapy.

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