Ectoparasites and Gastro-Intestinal Helminths of Black-Billed Wood Dove (*Turtur abyssinicus*) and Vinaceous Dove (*Streptopelia vinacea*) Hartlaub and Finsch 1870 in Zaria, Nigeria.

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ABSTRACT

A total sample of 50 birds consisting of 40 Black-billed Wood Doves (Turtur abyssinicus) and 10 Vinaceous Doves (Streptopelia vinacea) Hartlaud and Finsch 1870 trapped from the wild in Zaria, Nigeria, were examined for ectoparasites and gastro-intestinal helminths, to determine the prevalence, intensity, and mean intensity of infestation and infection. The bodies of the birds were brushed onto a white sheet of paper placed in a tray for the collection of ectoparasites, while the gastro-intestinal tracts of the birds were examined for helminths.

Three species of ectoparasites, *Menopon gallinae* Linnaeus 1758 1 (2.5%), *Columbicola columbae* Linnaeus 1758 5 (12.5%), and *Argas persicus* Oken 1818 2 (5.0%) were collected from Black-billed Wood Dove while *Menopon gallinae* Linnaeus 1758, 2 (20.0%), *Columbicola columbae* Linnaeus 1758 19 (10.0%), and *Pseudolynchia canariensis* Macquart 1840 1 (10.0%) were collected from Vinaceous Dove.

Single and double infestations were found in 6 (15.0%) and 1 (2.5%) birds respectively in Black-billed Wood Dove, while only double type infestations were found in 2 (20.0%) Vinaceous Doves.

The sex-specific infestation rates were 5 (20.8%) in males and 2 (12.5%) in females in Black-billed Wood Dove and 1 (25.0%) in males and 1 (16.7%) in females in Vinaceous Dove. There was no significant difference (P> 0.05) in the infestation rates between the sexes.

Five species of cestodes were collected from the gastro-intestinal tracts of Black-billed Wood Doves and three from Vinaceous Doves. The cestodes were *Raillietina tetragona* Molin, 1858 1 (2.5%), *Raillietina cesticillus* Molin, 1858 4 (10.0%), *R. magninumida* Jones, 1930 3 (7.5%), *R. echinobothrida* Megnin, 1881 5 (12.5%), *Amoebotaenia cuneata* Linstow, 1872 1 (2.5%), and *R. cesticillus* Molin, 1858 2 (20.0%), *Hymenolepis carioca* Magalhaes, 1898 1 (10.0%) and *Hymenolepis cantaniana* Polonio, 1860 1 (10.0%), respectively.

Only a single infection type was observed in Black-billed Wood Dove while Vinaceous Dove had single and double infections in the order 2 (20.0%) and 1 (10.0%), respectively. The sex-specific infection rates were 11 (45.8%) in males and 3 (18.8%) in females in Black-billed Wood Dove and 1 (25.0%) in males and 2 (33.3%) in females in Vinaceous Dove.

This study implicated the Black-billed Wood Dove and the Vinaceous Dove as a probable definitive host of some ectoparasites and helminths.

(Keywords: ectoparasites, gastrointestinal helminths, prevalence, mourning dove, *Streptopelia decipiens,* Zaria, Nigeria)

INTRODUCTION

The Black-billed Wood Dove and the Vinaceous Dove are two dove species common to the Zaria area of the Nigerian northern guinea savanna (Fry, 1965). Their habits and dependence on human activities for food (Rowan, 1983),

predispose the birds to being easily trapped or killed, as they visit newly tilled farms to feed on spilled seeds during planting or on some invertebrates/animal materials exposed during the tilled process (Adang, 1999). They also visit the farms during harvesting season to feed on spilled seeds. These dove species are widely sold or traded in Nigerian markets to augment income. Some people keep them as pets because of their interesting calls. The doves are also of culinary interest and their very tasty meat (bush meat) which is widely accepted as a cheap substitute to other animal protein sources, perhaps explains why the demand for the birds is on the increase (Adang, 1999).

Although the birds are not presently endangered, over-hunting could pose a threat to their survival. A complete knowledge of the parasitology of these birds, could aid in the development of possible control measures, which may help in enhancing their survival and complement efforts towards public enlightenment.

The prevalence of ectoparasites and helminths among species of wild birds has been studied to a great extent. However, little or no information is available on the ectoparasites and helminths of Black-billed Wood Dove and Vinaceous Dove in the Zaria area of northern Nigeria. This study was therefore designed to determine the species composition and prevalence of ectoparasites and helminths of Black-billed Wood Dove and Vinaceous Dove in the Zaria area of northern Nigeria.

MATERIALS AND METHODS

Area of Study: Zaria, the study area, lies in the northern Guinea Savanna Zone, within 11º 03¹N, 07º 42¹E, a region that has a tropical savanna climate with distinct wet (May to October) and dry (November to April) seasons. The mean annual rainfall is about 1,047.08mm (Happold, 1987). The dusty, dry, cold Harmattan wind is observed between November and January. Zaria is characterized by mainly open woodland vegetation (Hore, 1970).

Birds: Fifty (50) doves comprising of 40 Black-billed Wood Doves (*Turtur abyssinicus)* and 10 Vinaceous Doves (*Streptopelia vinacea)* Hartlaub and Finsch 1870, were trapped from the wild in Zaria between March, 2002 to February, 2004. The birds were taken to the Postgraduate Laboratory of the Department of Biological Sciences, Ahmadu Bello University, Zaria, Nigeria. Each bird was placed in a glass jar containing cotton wool soaked with 10ml of chloroform and covered for 4 to 5 mins. The euthanasized birds were then examined for ectoparasites and helminths.

Examination for Ectoparasites: The plumage of the bird was thoroughly brushed onto a white tray for the collection of ectoparasites. The feathers of the head, the neck, under the wings, body, legs and cloaca were raised and thoroughly examined with a hand lens for ectoparasites. Attached ectoparasites such as mites and ticks, which could not be removed by brushing, were gently dislodged with a pair of thumb forceps and their sites noted. The ectoparasites were prepared for identification by relaxing and dehydrating them in 70% alcohol (Beck and Davis, 1981) and later mounting them on a microscopy slide under a dissecting microscope, and a light microscope.

After mounting, the ectoparasites were counted and preserved in labeled vials containing 70% alcohol (menthanol) and a drop of glycerine (Soulsby, 1982; Loomis, 1984). The ectoparasites were identified using standard texts by Faust *et al*. (1962), Soulsby (1982), and Cheesbrough (1990).

Examination of GIT for Helminths: The gastrointestinal tract (GIT) of each bird was cut out and the various sections ligated, then severed and placed in saline solution in petri dishes for 20 mins to facilitate detachment of any attached worms. The sections GIT were slit open longitudinally and examined under a dissecting microscope for helminths. The horny layer of the gizzard was peeled off to expose embedded parasites.

Parasitic nodules were teased gently to dislodge embedded parasites. Helminths found were detached gently with a pair of forceps. All the helminths isolated were treated with a few drops of hot lacto-phenol for rapid clearance of the internal organs (Raymond, 1943). Temporary mounts of the helminths were examined by microscopy at magnifications of 400 and 1000 for identification by using texts of Cheng (1973), Soulsby (1982), Ruff (1984), and Ruprah *et al.* (1986). After counting, the helminths were counted and preserved in labeled universal bottles containing 5% formalin.

Confirmatory identification of the ectoparasites and helminths was performed at the Entomology and Helminthology Laboratories, respectively, of the Department of Veterinary Parasitology and Entomology, Ahmadu Bello University, Zaria, Nigeria. The voucher specimens were deposited in the Biological Sciences Laboratory, Department of Biological Sciences, Gombe State University, Gombe, Nigeria.

The terms prevalence, intensity and mean intensity were applied as defined by Margolis *et al.* (1982). Chi-square test was employed to determine possible association between parasite prevalence and the sexes. All tests were performed using the SPSS® computer software (SPSS,1999).

RESULTS

Ectoparasites: Out of the 40 Black-billed Wood Doves and 10 Vinaceous Doves examined, 7 (17.5%) Black-billed Wood Doves and 2 (20.0%) Vinaceous Doves were infested with ectoparasites.

Three species of ectoparasites, *Menopon gallinae* Linnaeus 1758 1 (2.5%), *Columbicola columbae* Linnaeus 1758 5 (12.5%), and *Argas persicus* Oken 1818 2 (5.0%) were collected from Black-billed Wood Dove while *Menopon gallinae* Linnaeus 1758, 2 (20.0%), *Columbicola columbae* Linnaeus 1758 19 (10.0%), and *Pseudolynchia canariensis* Macquart 1840 1 (10.0%) were collected from Vinaceous Dove (Table 1).

The sex-specific infestation rates were 5 (20.8%) in males and 2 (12.5%) in females in Black-billed Wood Dove and 1 (25.0%) in males and 1 (16.7%) in females in Vinaceous Dove (Table1)
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There was no significant difference (P> 0.05) in the infestation rates between the sexes. Single and double infestations were found in 6(15.0%) and 1(2.5%) birds respectively in Black-billed Wood Dove and only double type infestation was observed in 2(20.0%) Vinaceous Doves (Table 3).

Helminths: Fourteen (35.0%) Black-billed Wood Doves and 3(30.0%) Vinaceous Doves were infected with helminths that showed predilection for the small intestine (Ileum). Five species of cestodes *Raillietina tetragona* Molin, 1858 1 (2.5%), *Raillietina cesticillus* Molin, 1858 4 (10.0%), *R. magninumida* Jones, 1930 3 (7.5%), *R. echinobothrida* Megnin,1881 5 (12.5%), *Amoebotaenia cuneata* Linstow, 1872 1 (2.5%) were identified from Black-billed Wood Dove and three species *R. cesticillus* Molin, 1858 2 (20.0%), *Hymenolepis carioca* Magalhaes, 1898 1 (10.0%) and *Hymenolepis cantaniana* Polonio, 1860 1 (10.0%) were identified from Vinaceous Dove (Table 2).

The sex-specific infection rates were 11 (45.8%) male Black-billed Wood Doves infected with helminths compared to 3 (18.8%) females while 1 (25.0%) males Vinaceous Doves were infected with helminths compared to 2 (33.3%) females (Table 2). There was however an insignificant difference (P>0.05) in the prevalence of infection between male and female birds.

Only a single infection type was observed in Black-billed Wood Dove while Vinaceous Dove had single and double infections in the order 2 (20.0%) and 1 (10.0%), respectively (Table 3).

DISCUSSION

The prevalence of ectoparasites and helminths among species of wild birds has been studied to a great extent. However, no specific study has been carried out as it relates to ectoparasites and gastrointestinal of *Turtur abyssinicus* and *Streptopelia vinacea* in Zaria area of Nigeria northern guinea savanna. This study therefore provides baseline information on the subject in this area.

Information on this subject in other parts of the globe is lacking or unavailable to the authors. Insects (lice and flies) and arachnids (ticks) observed in this study have been incriminated in the transmission of some haemoparasitic organisms (Petrak, 1969). *M. gallinae* transmits *Chlamydia* organism that causes ornithosis, *P. canariensis* transmits *Haemoproteus columbae* causing avian malaria and *A. persicus* transmits Borrelia, the cause of Spirochaetosis.

These haemoparasites cause diseases and mortality in wild birds (Owen, 1972), while the ectoparasites themselves affect the health and productivity of the birds by initiating excessive preening which disrupts feeding. Invertebrates which constitute the diet of doves (Adang *et al.*, 2008a) have been identified by Soulsby (1982) as intermediate hosts of helminths.

Table 1: Prevalence, Mean Intensity and Predilection Site of Ectoparasites on *T. abyssinicus* and *S. vinacea* in Zaria, Nigeria.

Ectoparasite types	Types of Columbids								
	T. abyssinicus (♂= 24, ♀=16, n= 40)				*S. vinacea* (♂= 4, ♀= 6, n=10)				
	No. infested (%)	No. of parasites recovered (%)	Mean intensity ±SE	Range	No. infested (%)	No. of parasites recovered (%)	Mean intensity ±SE	Range	Site of recovery
Menopon Gallinae	1(2.5) ♂1(4.2) ♀0(0.0)	2(3.1) ♂2(3.1) ♀0(0.0)	2.0±0.00 ♂2.0±0.00 ♀0.0±0.00	1-2 (♂,♀)	2(20.0) ♂1(25.0) ♀1(16.7)	8(32.0) ♂4(16.0) ♀4(1.0)	4.0±0.00 ♂4.0±0.00 ♀4.0±0.00	1-4 (♂,♀)	♂ and ♀ Body, head and neck
Columbicola columbae	5(12.5) ♂4(16.7) ♀1(6.3)	60(92.3) ♂56(86.2) ♀ 4(6.2)	12±4.5 ♂14±5.23 ♀ 4 ±0.00	1-4 (♂,♀)	1(10.0) ♂1(25.0) ♀0(0.0)	15(60.0) ♂15(60.0) ♀ 0(0.0)	15.0±0.00 ♂1.0±0.00 ♀0.0±0.00	1-15 (♂,♀)	Quill feathers of wings & tail
Pseudolynchia canariensis	0(0.0) (♂,♀)	0(0.0) (♂,♀)	0.0±.0.00 (♂,♀)	0-0 (♂,♀)	1(10.0) ♂0(0.0) ♀1(16.7)	2(8.0) ♂0(0.0) ♀2(8.0)	2.0±0.00 ♂0.0±0.00 ♀2.0±0.00	1-2 (♂,♀)	Down and contour feathers
Argas Persicus	2(5.0) ♂1(4.2) ♀1(6.3)	3(4.6) ♂1(1.5) ♀2(3.1)	1.5±0.51 ♂1.0±0.00 ♀2.0±0.00	1-2 (♂,♀)	0(0.0) (♂,♀)	0(0.0) (♂,♀)	0.0±0.00 (♂,♀)	0-0 (♂,♀)	Wing web
Total	7(17.5) ♂5(20.8) ♀2(12.5)	65(100) ♂59(90.8) ♀ 6(9.2)	9.3±3.3 ♂11.0±4.32 ♀ 3.0±1.01	1-24 (♂,♀)	2(20.0) ♂1(25) ♀1(16.7)	25(100) ♂19(76.0) ♀ 6(24.0)	12.5±2.95 ♂19±5.56 ♀6.0±1.01	1-15 (♂,♀)	Plumage

Table 2: Prevalence and Mean Intensity of Gastrointestinal Helminths in *Turtur abyssinicus* and *Streptopelia vinacea* in Zaria, Nigeria.

Helminth types	Types of Columbids							
	T. abyssinicus (♂=24,♀=16, n=40)				*S. vinacea* (♂= 4,♀= 6, n=10)			
	No. infested (%)	No. of parasites recovered (%)	Mean intensity ±SE	Range	No. infested (%)	No. of parasites recovered (%)	Mean intensity ±SE	Range
Raillietina tetragona	1(2.5) ♂1(4.2) ♀0(0.0)	4(11.8) ♂4(15.4) ♀0(00.0)	4.0±0.00 ♂4.0±0.00 ♀0.0±0.00	1-4 (♂,♀)	0(0.0) (♂,♀)	0(0.0) (♂,♀)	0.0±00 (♂,♀)	0-0 (♂,♀)
Raillietina cesticillus	4(10.0) ♂3(12.5) ♀1(6.3)	8(23.5) ♂6(23.1) ♀2(25.0)	2.0±0.41 ♂2.0±0.42 ♀2.0±0.00	1-2 (♂,♀)	2(20.0) ♂1(2.5) ♀1(16.7)	5(31.3) ♂3(18.8) ♀2(15.4)	2.5±0.71 ♂ 3.0±0.00 ♀ 2.0±0.00	1-2 (♂,♀)
Raillietina magninumida	3(7.5) ♂2(8.3) ♀1(6.3)	8(23.5) ♂6(23.1) ♀2(25.0)	2.7±0.68 ♂3.0±1.01 ♀2.0±0.00	1-2 (♂,♀)	0(0.0) (♂,♀)	0(0.0) (♂,♀)	0.0±00 (♂,♀)	0-0 (♂,♀)
Raillietina. echinobothrida	5(12.5) ♂4(16.7) ♀1(6.3)	12(35.3) ♂ 8(30.8) ♀ 4(50.0)	2.4±0.41 ♂2.0±0.00 ♀4.0±0.00	1-4 (♂,♀)	0(0.0) (♂,♀)	0(0.0) (♂,♀)	0.0±0.00 (♂,♀)	0-0 (♂,♀)
Amoebotaenia cuneata	1(2.5) ♂1(4.2) ♀0(0.0)	2(5.9) ♂2(7.7) ♀0(0.0)	2.0±0.00 ♂2.0±0.00 ♀0.0±0.00	1-2 (♂,♀)	0(0.0) (♂,♀)	0(0.0) (♂,♀)	0.0±0.00 (♂,♀)	0-0 (♂,♀)
Hymenolepis carioca	0(0.0) (♂,♀)	0(0.0) (♂,♀)	0.0±0.00 (♂,♀)	0-0 (♂,♀)	1(10.0) ♂0(00.0) ♀1(16.7)	7(43.8) ♂0(00.0) ♀7(53.8)	7.0±0.00 ♂0.0±0.00 ♀7.0±0.00	1-7 (♂,♀)
Hymenolepis cantaniana	0(0.0) (♂,♀)	0(0.0) (♂,♀)	0.0±0.00 (♂,♀)	0-0 (♂,♀)	1(10.0) ♂0(00.0) ♀1(16.7)	4(25.0) ♂0(00.0) ♀4(30.8)	4.0±0.00 ♂0.0±0.00 ♀4.0±0.00	1-4 (♂,♀)
Total	14(35.0) ♂11(45.8) ♀ 3(18.8)	34(100) ♂26(76.5) ♀ 8(23.5)	2.4±1.01 ♂2.4±0.28 ♀2.7±0.00	1-4 (♂,♀)	3(30.0) ♂1(2.5) ♀2(18.8)	16(100) ♂ 3(18.8) ♀13(81.2)	5.3±1.11 ♂3.0±0.00 ♀6.5±2.08	1-11 (♂,♀)

Table 3: Frequency Distribution of Single and Mixed Ectoparasite Infestations and Helminth Infections in *Turtur abyssinicus* and *Streptopelia vinacea* in Zaria, Nigeria.

Infestation / Infection Type	Parasite(s)	Frequency of occurrence (%)	
		Turtur abyssinicus **n = 40**	***Streptopelia senegalensis*** **n =10**
Ectoparasites			
None		33 (82.5)	8 (80.0)
Single	*Columbicola columbae* *Argas persicus*	4 (10.0) 2 (5.0)	0 (0.0) 0 (0.0)
Double	*M. gallinae* + *C. columbae* *M. gallinae* + *P. canariensis*	1 (2.5) 0 (0.0)	1 (10.0) 1 (10.0)
Total		7 (17.5)	2 (20.0)
Helminths			
None		26 (65.0)	7 (70.0)
Single	*Raillietina tetragona* *Raillietina cesticillus* *Raillietina magninumida* *Raillietina echinobothrida* *Amoebotaenia cuneata*	1 (2.5) 4 (10.0) 3 (7.5) 5 (12.5) 1 (2.5)	0 (0.0) 2 (20.0) 0 (0.0) 0 (0.0) 0 (0.0)
Double	*Hymenolepis carioca* + *Hymenolepis cantaniana*	0 (0.0)	1 (10.0)
Total		14 (35.0)	3 (30.0)

In heavy infections, helminths are known to be responsible for mortality and eventual death in wild birds (Owen, 1972). Parasites are thus a part of the whole spectrum of issues facing the wildlife manager and are a part of the management puzzle. The identified parasites may thus be responsible for a number of serious health problems among these doves, either directly or indirectly. The presence of these parasites on *T. abyssinicus* and *S. vinacea* may portray them as their natural or transient hosts.

The non-statistically significant association between sex, ectoparasite infestation, and helminth infection, indicates that both males and females are equally exposed to the acquisition of ectoparasites and their sex-related physiognomy may not confer any differences in infestation. This result is in agreement with the observations of Senlik *et al*. (2005) and Adang *et al*. (2008b), who reported no significant difference between male and female pigeons in overall ectoparasite infestation and helminth infections.

The high prevalence of single infestation/infection in *T. abyssinicus* compared to double infestation/infection, may suggest a form of competition (Kennedy, 1975) in which resources shared by the helminths may determine the establishment of single or mixed infections. This may also suggest an innate system strategy of the helminths to avoiding competition. While prevalence of double infestation/infection in Vinaceous Dove compared to single infestation/infection connotes that parasites can cohabit on the same host without causing any harmful effects on each other. However, the impact of parasites on the well-being of the doves was not investigated and further studies are needed to determine the effects of the parasites on the health and productivity of the doves.

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