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Ecto- and helminths of *Columba livia* and *Streptopelia roseogrisea* in Alimosho community, Lagos State, Nigeria

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Abstract

Fifty wild columbids (25 each of *Columba livia* and *Streptopelia roseogrisea*) were trapped in Alimosho, Lagos State, Nigeria from January to June 2022 and examined for ectoparasites and intestinal helminths following standard procedures. Three (6%) of the birds were infested with two species of ectoparasites. Prevalence and mean intensity of infection were: *Gonoides gigas* 6% and 0.34±SD; *Columbicola columbae* 6% and 0.14±SD respectively. Thirty-two (64%) of the birds were infected with helminths, represented by three species of cestodes and one species of nematode. The prevalence and mean intensity of infection of the cestodes were as follows: *Raillientina echinobothrida* 50% and 25±SD), *Raillientina tetragona* 40% and 20±SD and *Raillientina cesticillus* 20% and 10±SD, while the nematode recovered was *Ascarida galli* with prevalence and mean intensity of infection of 4% and 2±SD. Only 9.4% of the birds studied harboured triple infections, while 6.3% of the birds had double infection. The prevalence of gastro intestinal helminths within *Streptopelia roseogrisea* was higher for cestodes ($p< 0.05$) and for ectoparasitic infestation, *Gonoides gigas* had the highest prevalence (6%; $p< 0.05$). The overall prevalence (64.00%) of parasitic infection among columbids in this study was high, with *Raillientina sp,* a zoonotic parasite, dominating the infections. This demands for control, considering the close proximity of pigeons to man.

Introduction

Streptopelia roseogrisea (Doves) and *Columba livia* (pigeons) are wild birds, which belong to the Family Columbidae. The columbids are a large order of free roaming birds, which live on trees in rainforest; a few are ground dwellers living in close proximity to man (Sibley and Monroe 1990). They are commonly called pigeons or doves. The term pigeon is usually used for larger species and doves for smaller ones. They move in small groups or in couples, and they feed on seeds, fruits and as well as on food discarded by humans. When foraging they can be seen frequently in the company of other bird species such as *Hirudo nigrita*, *Ploceus cuculatus* (Clayton *et al* 1999). These birds are found in Africa in countries that include South Africa, Ghana, Ethiopia, Gambia and Nigeria. (Waldenstron *et al* 2002). In Lagos State, Nigeria, they are found throughout the year and occur in attitudes less than 800m, their interactions with man and domestic and other wild birds portend them as a potential carrier of zoonotic parasites.

It has been reported that ectoparasites and helminths affect the health, and productivity of these birds. Ectoparasites initiate excessive preening, which interrupts feeding as these birds spend much time preening rather than being involved in other essential life activities (Clayton *et al* 1999). The helminths affect the gastro-intestinal tract causing disease, which seldom leads to death, but heavy burdens of these parasites may reduce the vigour of the bird and also serve as predisposing factor for other disease agents (Simpson *et al* 1996).

Recent reports of the outbreak of the parasites of these birds in children from Asia and Australia continents increase the awareness of these parasites as an emerging disease in man. Therefore, the need to study the prevalence and mean intensity of the parasites in these birds is recently advocated by avian parasitologists worldwide. However, there is limited knowledge of the parasitic fauna of *S. roseogrisea* and *Columba livia* in Nigeria, thus the aim of the present study is to identify the ectoparasites and helminths that parasitize these bird species as well as their prevalence and mean intensity.

Materials and methods

Study area

The study was conducted in Alimosho Local Government Area, Lagos State, Nigeria, which is located in a rainforest zone with longitudes and latitudes of 06º35.60′N and 03º 30.10′E, respectively (Figure 1), from January to June 2022**.** The area is characterized with an annual rainfall of 1420.06mm and average temperature of about 28-34ºC. It is a peri-urban area with residential buildings, abattoirs, poultry farms, with scattered trees and shrubs.

Procedure for collection and preparation of parasites

A total of 50 wild birds (25 *Streptopelia roseogrisea* and 25 *Columba livia*) were caught using baits and traps and were transported in cages to the Parasitology Laboratory, University of Lagos. Prior to examination, the birds were left to acclimatize for a period of one hour.

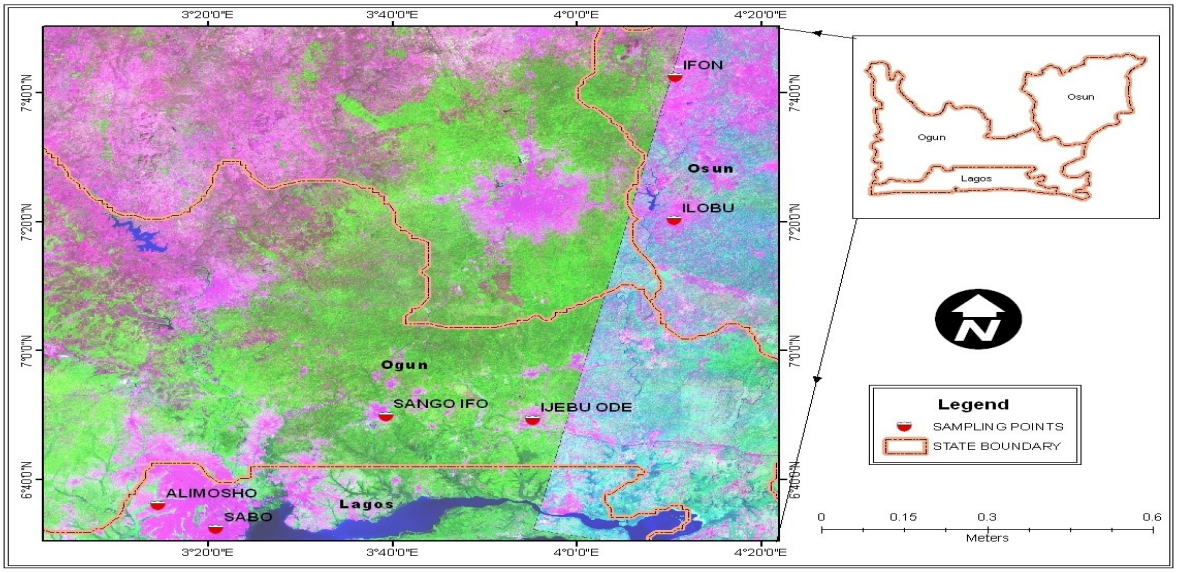


Figure 1. Map of Southwest, showing the study area (extracted from lagos State town planning catalogue)

Laboratory procedures

Ectoparasites: The birds were euthanized in large jar containing chloroform for 3 minutes, lice and mites were collected by brushing the bases of the feathers with fine thick brushes. The recovered parasites were then boiled in dilute potassium hydroxide for 2 minutes, washed in distilled water and dehydrated in ethanol series 50%, 70%, 90% and absolute. It was then cleared with xylene and mounted in Canada balsam for microscopic examination (Adang *et al.* 2008).

Helminth parasites: The gastro-intestinal tract was removed and put in Petri-dish containing normal saline and examined under a dissecting microscope, Nematodes isolated were fixed in warm 70% alcohol and preserved in the same medium and later cleared in lactophenol before examination. Cestodes were flattened under cover slip pressure on a microscope slide and fixed in 10% formal-saline. Permanent mounts of the worms were stained in aceto carmine and dehydrated in ethanol series (50: 70: 90: 100%) cleared in xylene before mounting. Identification of ectoparasites and helminths parasites followed Soulsby (1986). Confirmatory slides were sent to the London history of natural museum and voucher specimen was deposited in the University of Lagos zoological garden with voucher number ZLY/P/073/22.

Data analysis

One-way ANOVA and Kruskal-wallace test for significance of infection were performed using the SPSS(R) computer software package version 19.00 (SPSS, 1999).

Results

The prevalence and mean intensity of the parasites from the fifty wild bird species examined revealed that a total of 32 (64.00%) of the birds were infected with 198 parasites: Cestodes 64.00% (3.36±0.02), Nematodes 4.0% (0.04±0.01) and Ectoparasites 6.0% (0.48±0.01) respectively (Tables 1 and 2). The difference in parasitic infection between the bird species was not statistically significant ($p>0.05$), however, the difference between the number of parasites in individual bird species was statistically significant ($p<0.05$) for *S. roseogrisea* (Table 1).

Three birds (6.00%) were infected with two species of ectoparasites, namely: *Gonoides gigas* and *Columbicola columbae* with 3 (6.00%) infection rate each (Table 3). *Gonoides gigas* were found on the head, neck and body while *C. columbae* was found on the body and neck. Only *Streptopelia roseogrisea* was infected with ectoparasites. The difference in prevalence for the two ectoparasites recovered from *S. roseogrisea* was not statistically significant ($p>0.05$).

Thirty-two of the birds (64.00%) were infected with 3 species of cestode parasites which included: *Raillientina echinobothrida* from the large intestine, *Raillientina tetragona* from the large intestine and *Raillientina cesticillus* from the proventriculus, with prevalences of 50.01, 40.00 and 20.00%, respectively. *Ascarida galli* from the small intestine was the only nematode recovered from the 32 infected birds and was found in *Columba livia* with a prevalence rate of 4.00%. *Columba livia* had a mixed infection of *Ascarida galli, Raillientina echinobothrida, Raillientina tetragona, Raillientina cesticillus*.

Figures 2 and 7 shows the diagrams of the parasites.

Table 1: Prevalence and mean intensity of ectoparasites and helminths in Columbiformes from Alimosho, Lagos State.

Bird Species	No of Bird Examined (n)	No of birds infected	No of parasites	Prevalence (%)	Mean intensity ±SD 0.02
Streptopelia roseogrisea	25	20	126	80.00	5.04
Columba livia	25	12	76	48.00	2.88
Total	50	32	198	64.00	3.96

Table 2: Prevalence and mean intensity of the different classes of parasites in the Columbiformes from Alimosho, Lagos State.

Class of parasites	No of Bird Examined (n)	No of birds infected	No of parasites	Prevalence %	Mean intensity ±SD 0.01
Cestoda	50	32	163	64.01	3.36
Nematoda	50	02	02	04.00	0.04
Ectoparasites	50	03	24	06.00	0.48

Table 3: Prevalence and mean intensity of parasites species from *Streptopelia roseogrisea* (n=25) and *Columba livia* (n=25) the Columbiformes in Alimosho, Lagos State

Parasites species	Infected birds (% prevalence)	Parasites No. (Mean intensity±SD)	Infected Birds (% Prevalence)	Parasites No. (mean intensity±SD)	Infected Birds (% Prevalence)	Parasites No. (mean intensity±SD)
Raillientina echinobothrida	25 (50)	100 (2.00)	15 (60)	39 (1.56)	08 (32)	34 (1.36)
Raillientina tetragona	20 (40)	42 (0.84)	10(40)	40(1.4)	04(16)	20(0.8)
Raillientina cesticillus	10 (20)	26 (0.52)	07 (28)	28 (1.12)	05 (20)	16 (0.64)
Ascarida galli	02 (04)	04 (0.4)	=	=	02 (08)	02 (0.08)
Gonoides gigas	03 (06)	17 (0.34)	03 (12)	17 (0.68)	=	=
Columbicoa columbae	03 (06)	07 (0.14)	03 (12)	07 (0.28)	=	=

Discussion

This study provides baseline information on the ecto and helminth parasites of *S. roseogrisea* and *Columba livia* in Alimiosho, Nigeria. However, the prevalence of 64% of ecto- and helminths parasites of *Columba livia* and *S. roseogrisea Alimosho*, appears to be high, compared to 25.5%, 27% and 14% found in similar bird species by Marco *et al* (2009) in Brazil, South America, four helminthes and two ecto parasites were collected from *Columba livia* and *S. roseogrisea* in this study, compared to the three collected by Cunha *et al* (2008) in Brazil. The prevalence of 64% in Southern Nigeria, in this study, appears to be low compared with the findings of Adang *et al* (2008), who reported 73.3% prevalence for ectoparasites in *Columba livia* and also Adang *et al* (2009) that reported a prevalence of 83% for the ecto- and helminthes parasites of the *Columba livia*, *Streptopelia vinacea* and *Turtur abyssincus* in Zaria, Northern Nigeria. The differences in the prevalence of parasitic infection in the bird species in this study and the other studies in Nigeria may be related to many factors, which include: home range, behaviour, size, food/feeding and roosting habits of the birds.

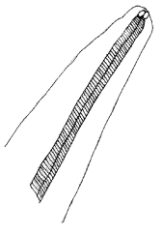
Many gastro-intestinal parasites are acquired by food ingestion and therefore diet may largely determine the number of parasites species to which the host is exposed (Poulin 1995). In *Columba livia* and *S. roseogrisea*, we found seeds and fruits in the crops and gizzards but more insects, especially coleopteran, ants of the genera *Pheidole* and *Tetramorium* were recovered from *Streptopelia roseogrisea*. The high number of arthropods in the diet of *S. roseogrisea* explains the probability of helminths recruitment because this study revealed *S. roseogrisea* to be the definitive host of most of the cestode parasites recovered. The high prevalence of cestode parasites in *S. roseogrisea* is as a result of the feeding pattern of these columbids on arthropods, which may serve as intermediate host for the cestodes. *Ascarida galli,* the only nematode recovered during this study was found in the small intestine of *Columba livia*. This portion of the GIT was swollen with a large quantity of mucous present, a pathology that matches that described by Urquhart *et al* (1998).

a

b

Figure 2. Scolex (a) and Proglotid (b) of Posterior end *Raillientina tetrgona* (Scale Bar: 54µm)

a



b

Figure 3. Anterior (a) and of male *Ascarida galli (*Scale Bar: 34µm)

a

b

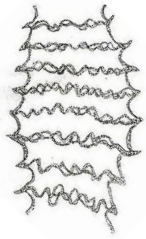


Figure 4. Scolex and (a) Proglotid (b) of *Raillientina echinobothrida* from columbids (Scale Bar: 45µm)

a

b

Figure 5. Scolex (a) and Proglotid (b) of *Raillientina cesticillus* from columbids (Scale Bar: 54µm)

Figure 6. *Gonoides gigas* Scale Bar: 0.03µm

Figure 7. *Columbicola columbae* (Scale Bar: 0.02µm

Seven other specimens of *Raillientina echinobothrida* and *Raillientina cesticillus* were found in the large intestine of the same bird. The double infection with *G. gigas* and *C. columbae* in *Stretopelia* species is related to the fact that ectoparasites can cohabit without causing any harmful effect on each other but with a detriment on the host. The fact that the prevalence of the parasite association between the two bird species studied was not statistically significant indicates that both birds are equally exposed to the acquisition of ecto- and helminths parasites and their related physiognomy may not confer any difference in infection. This study is in agreement with the observations of Kelly *et al* (2014) who found that mourning doves in four different states of America were found to be infected with different ecto- and helminths parasites and that the differences in the prevalence of parasitic infections was not statistically significant.

In other species of the columbiformes, there is a greater diversity of Ecto-and helminth parasites. The study of the ectoparasites fauna of *Columba livia* (Adang *et al* 2008) in Zaria, Northern Nigeria showed that lice, were more prevalent i.e. *Menopon gallinae* (3.1), *Columbicola columbae* (66.9), *Dermanysuss gallinae* (1.6), *Pseudolynchia canariensis* (38.6) and *Gonoides sp.* (10.3). In *S. vinacea*, *T. abyssinicus* and *C. Livia* also in Zaria Northern Nigeria, the helminthes *Amoeboetaenia cuneata, R. cesticulus, R. tetragona* and *Hymenolepis canatania* were abundant. Edosomwan *et al* (2012) implicated *Columba livia* to be host to four helminths and three ectoparasites, the parasites are; *R. ecinbothrida*, *R. tetragona*, *R. cesticillus, A. galli*, *Columbicola columbae*, *G. gigas* and *Chelopistes meleagridis.*

Conclusion

In our study, *S. roseogrisea and Columba livia* were infected with *Railientina echinobothrida*, *Raillientina tetragona* and *Raillientina cesticilus* which are reported for the first time in these hosts in Alimosho, Lagos State, southwest, Nigeria and also G. *gigas*, *C. columbae* and *A. galli*. Thus, this study confirms the prevalence of ecto-and helminths parasites in *S. roseogrisea and Columba livia* in Lagos State, Nigeria. The parasites comprise of lice, cestodes and nematode, which have been implicated as causative agents of disease in domestic birds

and emerging in man, thus it portrays *S. roseogrisea* and *Columba livia* as definitive host of these parasites. The ectoparasites encountered in this study are considered to be of veterinary and zoonotic importance and hence they require attention. In conclusion, birds such as *Columba livia* and *S. roseogrisea* should be treated alongside poultry since they live in close proximity to man and his domestic animals of economic importance.

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