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Ectoparasites of *Streptopelia senegalensis* Linnaeus, 1766 (laughing dove) and *Columba livia domestica* Gmelin, 1789 (domestic pigeon) in Zaria, Nigeria

Hamza, J.[1]* and Ndams I. S.[1]
[1]Department of Zoology, Faculty of Life Sciences. Ahmadu Bello University, Zaria.
*Corresponding author: Joseph Hamza. jhmbaya@gmail.com

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Abstract

Seventy-one (71) each of *Streptopelia senegalensis* and *Columba livia domestica* were collected from the wild and the market, and examined for ectoparasites. The result showed that 7(9.86%) *S. senegalensis* and 43(60.56%) *C. livia domestica* were infested with ectoparasites. *Streptopelia senegalensis* was infested by two species, *Goniodes* species (7.04%) and *Columbicola columbae* (2.82%) while *C. livia domestica* was infested by three species, *Goniodes* sp. (25.35%), *Columbicola columbae* (19.72%) and *Pseudolynchia canariensis* (11.27%). *Streptopelia senegalensis* had ectoparasite prevalence of 5.63% and 4.23% in the wet and dry seasons, respectively while *C. livia domestica* had prevalence of 29.58% and 30.99% in the wet and dry seasons, respectively. Males of *S. senegalensis* and *C. livia domestica* had respective ectoparasite prevalence of 7.32% and 22.54%, while the females had prevalences of 13.33% and 38.04%, respectively. The weight of the birds did not appear to influence parasite prevalence in either the wet or the dry season. The prevalences of parasite infestation of *C. livia domestica* were significantly higher than those of *S. senegalensis* $p<0.05$. The market or home cages of the domestic pigeons should be cleaned routinely to minimize reinfestation by ectoparasites.

Introduction

Birds are widely distributed worldwide and are found in all seven continents. They live and breed in terrestrial habitats (Newton 2003). It is believed that the highest bird diversity occurs in the tropical regions of the world. It was also earlier thought that high diversity was a result of higher speciation rates in the tropics (Serle *et al* 1977). Birds are one of the largest sources of animal protein eaten by humans (Oladele 2012). The Laughing dove *Streptopelia senegalensis,* is distinguished from all other doves by a black spotted reddish fore-neck, vinous head, brown mantle, dark-grey rump, and vinous under-parts, which become white on the belly (Serle *et al* 1977). It is called the Laughing Dove because of its distinctive coo vocalization that is reminiscent of human laughter.

This species is semi-tame, abundant in villages and towns, such as Shika, Zaria and Kaduna and spends much of its time on the ground, feeding on fallen grains or seeds (Adang *et al* 2008). According to Oniye *et al* (2000), doves are hunted and eaten in Nigeria and recently the intensity has increased probably as a result of the harsh economic situation, coupled with increased demand for protein.

Domestic pigeons like *Columba livia domestica* are ubiquitous and associated with humans in many places around the world. These pigeons often occupy the premises of people and contaminate surroundings with their droppings (Sivajothi *et al* 2015). They are used by humans as food, experimental animals, pets, and as cultural and religious symbols (Serle *et al* 1977). Domestic pigeons do not migrate but if taken far away and released, they return to their nest from long distances, due to their good homing ability.

Birds can be infested by a wide variety of ectoparasites such as lice, ticks, fleas, bugs, mites, etc. (Sivajothi *et al* 2014). Pigeons and doves can carry many parasites and pathogens to different flocks, thereby constituting a major source of infection and transmission of diseases (Marques *et al* 2007 and Opara *et al* 2012). They can also serve as a source for different zoonotic diseases (Soulsby 1982). Parasitic infections in pigeons and doves can be affected by food supply, geographic location, climatic conditions, and their interaction with other birds (Sivajothi *et al* 2015). In Nigeria, investigations on the parasites of columbids are scanty compared to the large volume of information available on the parasites of other birds such as chicken, guinea fowl, turkey, and duck (Abdu *et al* 2002; Marques *et al* 2007; Opara *et al* 2012; Sivajothi *et al* 2014). Domestic pigeons and laughing doves are among the largest sources of animal protein eaten by people in Zaria, laughing doves have potentials for domestication (Haruna *et al* 1997); therefore, there is need for extensive study on their ectoparasites for their management and documentation.

Materials and methods

Study area

The study was conducted in Zaria, which is located at approximately latitude 11˚3' North of the equator and longitude 7˚42' East of the Greenwich Meridian in

Kaduna State, Nigeria. The dry season in Zaria lasts for a period of six months (November to April), and the rainy season is from May to October (Hore 1970).

Ethical clearance
Ethical clearance was obtained from the Committee on Animal Use and Care, Ahmadu Bello University Zaria, with approval number ABUCAUC/2016/028.

Bird collection
Domestic pigeons (*Columba livia domestica*) were purchased for the period of six months (three months each of rainy and dry seasons) from Sabon-gari and Samaru Markets in Zaria. Laughing doves *(Streptopelia senegalensis*) were trapped during a six-month period (three in the rainy and three in the dry season) from the wild at various locations in Zaria, using locally made baited traps placed on trees, rooftops, and on the ground. The birds were taken to the Parasitology and Entomology Laboratory of the Department of Zoology, Faculty of Life Sciences, Ahmadu Bello University Zaria, for identification and examination for parasites.

Examination of birds in the laboratory
Identification of birds
The trapped and purchased birds were identified with reference to Serle *et al* (1977) and the sex of each bird was determined by examining the cloaca for presence or absence of a cloacal protuberance, indicating the male and female sex respectively (Miller and Wagner 1955).

Screening for ectoparasites
The plumage of each bird was thoroughly brushed onto a white tray for the collection of any ectoparasites. The feathers of the head, the neck, under the wings, body, legs and around the cloaca were raised and thoroughly examined with a hand lens for ectoparasites. Ectoparasites such as mites and ticks attached to the body parts, which could not be removed by brushing, were gently dislodged with a pair of forceps. The ectoparasites were counted, fixed and preserved in 70% alcohol in accordance with Beck and Devis (1981). Later, the ectoparasites were mounted on microscope slides in a drop of glycerine under a dissecting microscope and then examined with a stereo microscope. The parasites were identified with reference to the text in Soulsby (1982).

Data analysis
Descriptive statistics, Student's *t*-test and Odd's Ratio were used to analyse the data obtained.

Results

Among the seventy-one (71) each, of *Streptopelia senegalensis* and *Columba livia domestica* examined for ectoparasites, a total of 12 arthropods (two species) were recovered from the former, and a total of 165 arthropods (three species) were recovered from the latter (Table 1).

Two ectoparasite species, *Goniodes* sp. 5(7.04%) and *Columbicola columbae* 2(2.82%) were recovered from *Streptopelia senegalensis*, whereas three species, *Goniodes* sp. 18(25.35%), *Columbicola columbae* 14(19.72%) and *Pseudolynchia canariensis* 8(11.27%) were recovered from *Columba livia domestica* (Table 2).

Descriptions of the parasites

Gonoides sp**.** Linnaeus, 1758

Body brownish, dorsoventrally flattened, slender; total length 210.37µm, head 52.59µm long, abdomen 128.71µm long, maximum width at mid-abdomen, 102.42 µm (Plate 1).

Columbicola columbae Melcomson, 1937

Body brownish, dorsoventrally flattened, wingless, longer than wide, pair of setae on the anterior part of the head, total length 249.74µm, head 57.09µm long, abdomen 151.38µm long, maximum width at mid abdomen 45.85µm (Plate 2).

Pseudolynchia canariensis Macquart, 1839

Body grey-brown, dorsoventrally flattened, wings two, transparent, 690.85µm long, head 174.15µm long, abdomen 473.66µm long, maximum width at mid-abdomen 364.45µm (Plates 3 and 4).

A total of 41 male and 30 female *Streptopelia senegalensis* were examined out of which 3(7.32%) males and 4(13.33%) females were infested. Although more females than males were infested, the difference in infestation was not statistically significant ($p > 0.05$). Out of 32 males and 39 female *Columba livia domestica* examined, 16 (50.00%) males and 27(69.23%) females were infested. The difference in infestation prevalence between male and female *Columba livia domestica* examined was statistically significant ($p< 0.05$) (Figure 1).

Ectoparasites were recovered in both the wet and dry seasons from *Streptopelia senegalensis*; the prevalence in the wet season 4(12.12%) and 3(7.89%) in the dry season were relatively low and the slight difference between the two seasons was not significant ($p>0.05$). Similarly, in *Columba livia domestica,* a slightly higher prevalence occurred in the dry season 22(62.86%) than wet season 21(58.33%); however, the difference were not significant ($p > 0.05$) (Figure 2).
Infestation with only one species of parasite had a prevalence of 6(8.45%) versus 15(21.13%), and with two species, 1(1.41%) versus 17(23.94%) on *Streptopelia senegalensis* and *Columba livia domestica,* respectively (Table 3).

Table 1: A summary of arthropods infestation of *Streptopelia senegalensis* and *Columba livia domestica* (n=71)

Bird species	No. of parasite species	No. of birds infested (%)	No. of parasites recovered	Range	Mean intensity ± SD
S. senegalensis	2 spp.	7 (9.86)	12	1-4	1.7±1.89
C. livia domestica	3 spp	43 (60.57)	165	1-47	3.8±7.11

Table 2: Ectoparasites recovered from *Streptopelia senegalensis* and *Columba livia domestica* (n=71)

Bird species	Parasites	No. infested (%)	No. of parasites	Range	Intensity (Mean ±SD)
S. senegalensis	*Goniodes* sp.	5 (7.04)	8	1-3	1.6±1.0
	Columbicola columbae	2 (2.82)	4	1-2	2.0±1.4
C. livia domestica	*Goniodes* sp.	18 (25.35)	75	2-6	4.2±2.6
	Columbicola columbae	14 (19.72)	66	1-4	4.7±2.2
	Pseudolynchia canariensis	8 (11.27)	24	2-4	3.0±1.9

Table 3: Single and mixed infestation of ectoparasites of *S. senegalensis* and *C. livia domestica* (n=71)

Birds species	Infestation type	Parasites	No. infested	Prevalence (%)
S. senegalensis	Single	*Goniodes* sp.	4	8.45
		Columbicola columbae	2	
	Double	*Goniodes* sp.		
		Columbicola columbae	1	1.41
C. livia domestica	Single	*Goniodes* sp.	9	
		Columbicola columbae	6	21.13
		Pseudolynchia canariensis	0	
	Double	*Goniodes* sp.		
		Columbicola columbae	12	
		Pseudolynchia canariensis		23.94
		Columbicola columbae	5	
	Triple	*Goniodes* sp.		
		Columbicola columbae		
		Pseudolynchia canariensis	4	5.63

Plate 1. Ventral view of *Gonoides* sp. Scale-bar = 120µm

Plate 2: Ventral view of *Columbicola columbae.* Scale-bar =130µm

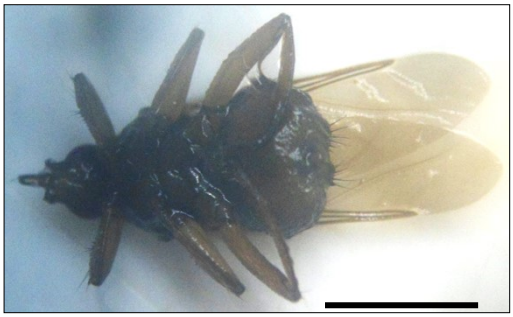

Plate 3. Ventral view of *Pseudolynchia canariensis.* Scale-bar = 230µm

Plate 4. Dorsal view of *Pseudolynchia canariensis* Scale-bar = 230µm

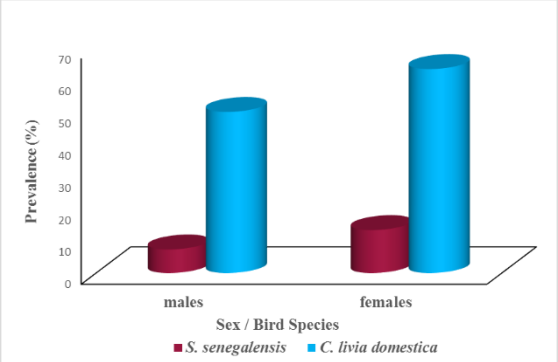

Figure 1. Prevalence of ectoparasites on male and female *Streptopelia senegalensis* and *Columba livia domestica*

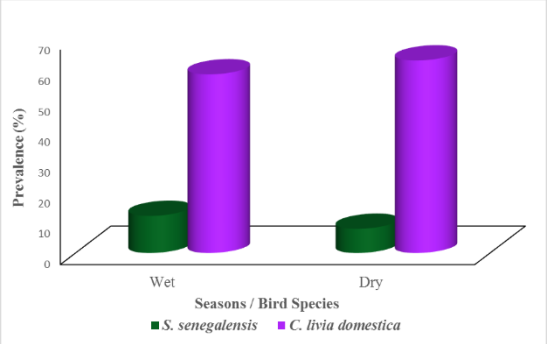

Figure 2. Seasonal prevalence of Ectoparasites of *Streptopelia senegalensis* and *Columba livia domestica*

Discussion

The three species of ectoparasitic arthropods recovered from the laughing dove and domestic pigeons during this study have previously been reported in similar studies and surveys around the world (Senlik *et al* 2005; Marques *et al* 2007; Sabuni *et al* 2010; Borji *et al* 2012) and in the study area (Shotter 1978; Oniye *et al* 2001; Adang *et al* 2008; Natala *et al* 2009). The parasites were found infesting different body parts of the birds with their prevalence varying from species to species. The three ectoparasites (*Gonoides* sp., *Columbicola columbae* and *Pseudolynchia canariensis*) recovered in this study have been previously reported in Zaria by (Shotter 1978; Adang *et al* 2008; Natala *et al* 2009).

In addition to these three ectoparasites, Adang *et al* (2008) found two others, *Argas persicus* Oken, 1818 and *Menopon gallinae* Linnaeus, 1758, which had also been reported by other researchers in Zaria (Shotter 1978 and Natala *et al* 2009). Soulsby (1982) noted that all five ectoparasites (*Gonoides* sp., *Columbicola columbae*, *Pseudolynchia canariensis, Argas persicus* and *Menopon gallinae*) were among the major ectoparasites of doves and pigeons. Reports have shown that the pigeon fly *Pseudolynchia canariensis* has been recorded on a lizard buzzard from Lake Kariba in Zimbabwe (Shotter 1978). This implies that although it is called the pigeon fly, it is not only restricted to pigeons but has a wide host range.

The fact that *C. livia domestica* in this study had more species of ectoparasites than *S. senegalensis* may be related to the former exploiting a wider range for feeding, roosting, nesting, and territoriality, thereby exposing it to more areas where it would come in contact with these parasites, as suggested by Goodwin (1983). This can also be attributed to the extent of interaction with other domestic birds such as chicken, turkey, guinea fowl and duck. It might also be linked to homes/cages of these *C. livia domestica* when un-kept which might serve as breeding grounds for these parasites considering their prolific nature.

The overall ectoparasite prevalence of 60.56% and 9.86% obtained on *C. livia domestica* and *S. senegalensis* respectively, are lower than what was recorded in Zaria, Nigeria (73.8%) by Adang *et al* (2008) on *C. livia domestica* and other parts of the world, 72.0% of Senlik *et al* (2005) on *C. livia domestica* in Bursa province, Turkey. The environment, climatic conditions and number of birds examined (71 versus 240 and 100) might explain the reason for the variation. Adang *et al* (2009) obtained a similar prevalence of 60.0% when he examined 30 speckled pigeons as obtained in *C. livia domestica,* in this study (60.56%). Likewise, Adang *et al* (2008) also recorded a higher prevalence of ectoparasites (73.8%) on *C. livia domestica.* This might be attributed to the number of *C. livia domestica* examined (71 versus 240).

The statistically significant difference in prevalence between the ectoparasites of *C. livia domestica* and *S. senegalensis* all through the period of study, is attributable to the extent of interaction of the two birds with each other and domestic birds such as chickens, turkeys, and ducks (Natala *et al* 2009); the former are domesticated and usually raised commercially in large numbers to which the extent of managing/attention given to them might be poor when compared to the number of *S. senegalensi* in the wild. The handling of these birds in the market and how they were observed to be kept between cages of other domestic birds coming from different places, might probably have contributed to the higher prevalence recorded in this study.

The comparatively higher prevalence of ectoparsites on male *C. livia domestica* than on male *S. senegalensis* (50.00% versus 7.32%), and female *C. livia domestica* than female *S. senegalensis* (69.23% versus 13.33%) could be attributed to the close interaction of *C. livia domestica* with other domestic birds such as chickens, ducks, turkeys and to the ectoparasites that might have remained for long in their cages thereby causing re-infestation.

Prevalence of mixed and single infestations on *C. livia domestica* were similar (23.94% and 21.13% respectively) but in *S. senegalensis,* single infestation was more prevalent (8.45%) than the double infestation (1.41%). The slightly higher prevalence of single than mixed infestation in *S. senegalensis* may probably be due to the absence of aggregation and much interaction with other birds, unlike the case in *C. livia domestica,* where they have the habit of aggregation and interaction with other birds. Similar observations have been reported by Petryszak *et al* (2000), Mushi *et al* (2000) and Senlik *et al* (2005).

Conclusion

The occurrence of ectoparasites in *S. senegalensis* and *C. livia domestica* in Zaria is certain. The ectoparasites of *S. senegalensis* are: *Gonoides* sp. and *Columbicola columbae* while those of *C. livia domestica* are *Goniodes* sp., *Columbicola columbae* and *Pseudolynchia canariensis.* The prevalences was 9.86% and 60.56%, on *Streptopelia senegalensis* and *Columba livia domestica* respectively. Ectoparasites were not significantly associated with the sex of the birds even though there was a statistically significant difference between the prevalence of ectoparasites on *C. livia domestica* and *S. senegalensis* in the wet and dry seasons, and male and female birds ($p<0.05$). Therefore, the rate of interaction between *S. senegalensis*, *C. livia domestica* and other domestic birds should be managed properly to minimize cross infestation by these ectoparasites. Likewise, the market or home cages of these birds should be cleaned routinely to mitigate reinfestation by these ectoparasites.

Conflict of interest

Authors declare no conflicts of interest.

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References

Abdu, P.A., Sa'idu, L. and George, B.D.J. 2002. Diseases of local poultry in Nigeria. *Dis. Inn. 14* (1/2): 107-118.

Adang, K.L., Oniye S.J., Ezealor, A.U., Abdu, P.A., Ajanusi, O. J. and Yoriyo, K. P. 2008. Ectoparasites of the laughing dove *Streptopelia senegalensis* (Linnaeus, 1766) (Aves: Col.) in Zaria, Nigeria. *Lundiana. 9*(*18*): 67-71.

Adang, K.L., Oniye, S.J., Ezealor, A.U., Abdu P.A., Ajanusi O.J. and Yoriyo, K.P. 2009. Ectoparasites and intestinal helminths of Speckled Pigeon (*Columba guinea* Linnaeus 1958) in Zaria Nigeria. *Sci. W. J. 4*(*2*): 1-5.

Borji H., Moghaddas E., Razim G.R. and Azad M. 2012. A survey of ectoparasites of domestic pigeons (*Columba livia*) in Mashhad, Iran. *Iranian J. Vet. Sci. Technol. 4*(*2*): 37-42.

Davis, J.W., Anderson, R.C., Karstad, L. and Trainer, D.O. 1971. Infectious Parasitic Diseases of Wildbirds. Iowa State University Press, Iowa, 145pp.

Haruna, E.S., Musa, U., Lombin, L.H., Tah., P.B., Shamaki, D., Okewole, P.A. and Molokwu, J.U. 1997. Introduction of quail production in Nigeria. *Nig. Vet. J. 18*:104-107.

Hore, P.N. 1970. Weather and climate of Zaria. *In*: Zaria and its Regions. Oxford, 256pp.

Marques, S.M., Quadros, R.M. Da Silva, C.J. and Baldo M. 2007. Parasites of pigeons (*Columba livia*) in urban areas of Langes, Southern Brazil. *Parasitol lit.* 62:183-187.

Miller, W.J. and Wagner, F.H. 1955. Sexing mature Columbiformes by cloacal characters. *Auk*: *72*:79.

Mushi, F.Z., Binta, M.G., Chabo, R G., Ndebele, R. and Panzirah, R. 2000. Parasites of domestic pigeons (*Columba livia domestica*) in Sabele Garborone. Botswana. *J. S. Afr. Vet. Ass. 71*(*4*):249-250.

Natala A.J., Asemadahun N.D., Okubanjo O.O., Uliya Y. H., Owolabi I.D., and Yusuf K H. 2009. A survey of parasites of domestic pigeons (*Columba livia domestica*) in Zaria, Nigeria. *Int. J. sof. comp. 4*(*4*): 148-150.

Newton, I. 2003. *The Speciation and Biography of Birds*. Academic Press, Amsterderm, 463pp.

Oladele, S. B., Enam. S.J. and Okunbanjo, O.O. 2012. Pathogenic Heamoparasites and antibody to Newcastle Disease virus from apparently healthy wild Birds in Zaria, Nigeria. *Vet. World 5*(*1*): 13-18.

Oniye, S. J., Audu P.A., Adebote, D.A., Kwaghe, B.B., Ajanusi, O.J. and Nfor, M.B. 2001. Survey of Helminth Parasites of Laughing Dove (*Streptopelia senegalensis*) in Zaria, Nigeria. *Afr. J. Nat. Sci. 4*: 65-66.

Opara M.N., Ogbuewu, L.P., Iwuji C.T., Njoku, L., Ihesie, E.K. and Etuk, I.F. 2012. Blood characteristics, microbial and gastrointestinal parasites of street pigeons in Owerri Imo state, Nigeria. *J. Ani. Sci. 1*:14-21.

Petryszak, A., Rosciszewska, M., Bonczar, Z. and Pospiech, N. 2000. Analyses of the population structures of Mallophaga infesting urban pigeons. *Wiad Parasit. 46*(*1*): 75-85.

Sabuni, Z.A. Mbuthia, P.G., Maingi, N., Nyaga, L.W., Bebora, L.C and Michieka, J.N. 2010. Prevalence of Ectoparasites Infestation in Indigenous Free-Ranging Village Chickens in Different Agro-Ecological Zones in Kenya. *Liv. Re. Rur. Dev. 22* (*11*): 11-17.

Senlik, B., Gulegen, E. and Akyol, V. 2005. Ectoparasites of Domestic pigeons *(Columba livia domestica*) in Bursa Province Turkey. *Tur. Para. Der. 29*(*2*): 100-102.

Serle, W., Morel, G. J. and Hartwig, W. 1977. A Field Guide to the Birds of West Africa. Collins, Grafton Street, London. 351pp.

Shotter, R.A. 1978. Aspects of the biology and parasitology of the Speckled pigeon *Columba guninea* L. from Ahmadu Bello University, Zaria, North Central State, Nigeria. *Zool. J. Lin. Soc. 62*: 2158-2167.

Sivajothi, S. and Sudhakara R. 2015. A study on the gastro-intestinal parasites of Domestic pigeons in YSR Kadapa District in Andhara Pradesh, India. *J. D. Vet. Ani. Res*. 2(*6*): https://doi.org/10.15406/jdvar.2015.02.00057.

Soulsby, E.J.L. 1982. Helminths, Arthropods and Protozoa of Domesticated Animals (7th ed.). Bailliere Tindall, London 777pp.

ORCID
Joseph Hamza: https://orcid.org/0009-0008-6465-1714