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**Prevalence and Intensity of Blood Parasites in Wild Pigeons and Doves  
(Family: Columbidae) from Shasha Forest Reserve, Ile-Ife, Nigeria**

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**Abstract:** A total of 248 wild pigeons and doves representing seven species, mist-netted between March 2006 and February 2007, were examined for parasitemia using thin blood smears. Seventy-seven individuals (31.0%) harboured blood parasites. The identified blood parasites included *Haemoproteus* (6.5% prevalence); *Plasmodium* (12.1%), *Trypanosoma* (6.9%), *Microfilariae* (6.0%) and *Leucocytozoon* (2.0%). The highest prevalences of *Haemoproteus* (11.6%), *Plasmodium* (28.57%), *Trypanosoma* (21.43%), *Microfilariae* (50.0%) and *Leucocytozoon* (10.0%) were found in Laughing Dove *Streptopelia senegalensis*, Red-eyed Dove *Streptopelia semitorquata*, Bronze-naped Pigeon *Columba malherbii*, Grey wood pigeon *Columba uncinata* and Green Fruit Pigeon *Treron australis*, respectively. The lowest prevalences for the blood parasites were found in Tambourine Dove *Turtur tympanistria* (3.45% for *Haemoproteus*), *Columba uncinata* (4.55% for *Plasmodium*), *Turtur tympanistria* (1.72% each for *Trypanosoma* and *Microfilariae*) and *Streptopelia semitorquata* (7.14% for *Leucocytozoon*). The highest intensities of infection in terms of mean parasitemias were found in *Streptopelia senegalensis* (11.6±4.73 *Haemoproteus*), *Turtur tympanistria* (9.31±3.57 *Plasmodium*), *Streptopelia semitorquata* (13.5±7.11 *Trypanosoma*), *Columba uncinata* (20.4±8.16 *microfilariae*) and *Treron australis* (3.44±0.65 *Leucocytozoon*). The Blue-headed Dove *Turtur brehmeri* was the only species without any obvious parasitemia.

**Key words:** Columbidae, prevalence, intensity, parasitemia, Shasha, Nigeria

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## INTRODUCTION

Over 20 species of pigeons and doves are a cosmopolitan group which have long been subject of intense ornithological and parasitological study. Protozoan blood parasites are common in passerine birds, but poorly studied in West African birds. The annual variability of these parasites and how they impact on the fitness of their avian host are unknown. This is rather unfortunate given the potential cost of blood parasites to their avian host (Bennett *et al.*, 1988, 1993; Atkinson *et al.*, 2000, 2001). Haematozoa of the genera *Plasmodium* and *Leucocytozoon* are common among wild birds in the Northern hemisphere with their fauna and morphology relatively well established in Western and Northern Europe and North America (Pierce and Mead, 1977, 1978; Kucera, 1981; Bennett *et al.*, 1982; Bishop and Bennett, 1992; Valkuinas, 1997; Krone *et al.*, 2001; Garvin *et al.*, 2004). It is known that vectors of *Leucocytozoon* are dipterans of the family Simuliidae (Valkuinas, 1997) and the vectors of *Plasmodium* and microfilariae are some species mosquitoes belonging to the family Culicidae. Hippoboscids flies are incriminated vectors of *Haemoproteus* sp. of Columbiformes while *Trypanosoma* sp. are vectored by Tse-tse flies. In cited publications the occurrence of blood parasites in birds, particularly migratory species, is from surveys conducted on breeding grounds where infections are believed to be acquired (Bennett *et al.*, 1974). Although the ornithological fauna of West Africa is highly diverse, the blood parasites have had only limited study (Bennett *et al.*, 1977; Kirkpatrick and Smith, 1988; Wink and Bennett, 1976). More recent studies showed that 76.5% of

pigeons sampled were infected with species of *Haemoproteus* (Dranzoa *et al.*, 1999) and in South Africa new species of *Haemoproteus* and other haemotozoa from South African birds were identified (Bennett *et al.*, 1995). The screening blood smears from 964 birds representing 121 species of 21 families from Cameroon, Equatorial Guinea and Ivory Coast showed that 277 individuals (28.6%) harboured protozoan blood parasites from the genera *Haemoproteus*, *Plasmodium*, *Trypanosoma*, *Leucocytozoon* and microfilariae of filariid nematodes (Sehgal *et al.*, 2005).

The general purpose of this investigation is to determine which common blood parasites are present in the wild pigeons and doves from southern Nigeria but specifically, this study will provide data on the prevalences and intensities of the blood parasites.

## MATERIALS AND METHODS

Samples of pigeons and doves were collected from Shasha forest Reserve (7°00' to 7°10' N, 4°20' to 4° 40' E), Ile-Ife between March 2006 and February, 2007. The birds were captured throughout the year using various baited cages and mist nets. Once captured, they were sexed and marked with serially numbered bands. Blood was collected by pricking the brachial vein (Smith *et al.*, 1997; Sehgal *et al.*, 2001) and drawing blood (~50 µL) into an unheparinized capillary tube and then released at the point of capture. Three thin blood smears per captured bird were prepared on site and air-dried (Kirkpatrick and Smith, 1988), then fixed in absolute methanol for 5 min upon return to the laboratory. Slides were stained in 3% Giemsa stain for 50 min and examined for parasites with an Olympus BH Compound Microscope by scanning under 1,000 X magnification under oil immersion. Parasites were only counted in fields with homogenous distribution of erythrocytes, which most frequently occurred at the tails of the smears. The level of parasitemia (intensity) was reported as the number of parasites or infected erythrocytes per 1000 erythrocytes (P/1000) and was established following counts made from 50 microscopic fields (approximately 20,000 erythrocytes). Mean parasitemia was calculated from all sampled birds (Bush *et al.*, 1997). The parasite species were identified by comparison with haemoproteid parasites of columbids described in the literature (Bennett and Pierce, 1990).

## RESULTS

A total of 744 thin blood smears from 248 wild pigeons and doves, consisting of six species (3 smears specimen<sup>-1</sup>) were examined for parasites. Table 1 shows the species of birds and the number of each species infected with different blood parasites. Of the birds examined 31.0% were infected with blood parasites. Six point five percent (6.5%) were infected with *Haemoproteus* sp., 12.1 % with *Plasmodium* sp., 6.9% with *Trypanosoma* sp., 6.0% with Microfilariae and 2.0% with *Leucocytozoon* sp. Infections with multiple genera were found in 18 (7.3%) of the 248 birds examined making up 23.4% of the 77 infected birds.

Table 1: Blood parasites of 248 wild pigeons and doves from Shasha Forest reserve, Ile-Ife, Nigeria

Common names	Bird species	No. examined	No. infected	No. with multiple infection	No. infected with <sup>a</sup>				
					H	P	T	M	L
Bronze-naped pigeon	<i>Columba malherbii</i>	14	4.0	1.0	0.0	0.0	3.0	2.0	0.0
Grey wood pigeon	<i>Columba unicincta</i>	22	15.0	4.0	2.0	1.0	2.0	11.0	0.0
Red-eyed dove	<i>Streptopelia semitorquata</i>	42	27.0	2.0	1.0	12.0	7.0	1.0	3.0
Laughing dove	<i>Streptopelia senegalensis</i>	86	19.0	7.0	10.0	8.0	4.0	0.0	0.0
Green fruit pigeon	<i>Tyreron australis</i>	20	3.0	1.0	1.0	0.0	0.0	0.0	2.0
Blue-headed dove	<i>Turtur brehmeri</i>	6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tambourine dove	<i>Turtur typanistris</i>	58	9.0	3.0	2.0	9.0	1.0	1.0	0.0
Total: 7 species		248	77.0	18.0	16.0	30.0	17.0	15.0	5.0
Total infected (%)			31.0	7.3	6.5	12.1	6.9	6.0	2.0

<sup>a</sup>: H = *Haemoproteus*, P = *Plasmodium*, T = *Trypanosoma*, M = *Microfilariae*, L = *Leucocytozoon*

Table 2: Prevalence and intensity of blood parasites in 248 wild pigeons and doves from Shasha forest reserve, Ile-Ife, Nigeria

Bird species	No. examined	Percentage infected	Percentage infected (Prevalence) <sup>(b)</sup> with				
			H	P	T	M	L
<i>Columba malherbii</i>	14	28.57	-	-	21.43	14.29	-
<i>Columba unicincta</i>	22	68.18	9.09	4.55	9.09	50.00	-
<i>Streptopelia semitorquata</i>	42	64.29	2.38	28.57	16.67	2.38	7.14
<i>Streptopelia senegalensis</i>	86	22.09	11.60	9.30	4.65	-	-
<i>Treron australis</i>	20	15.00	5.00	-	-	-	10.00
<i>Turtur brehmeri</i>	6	0.00	-	-	-	-	-
<i>Turtur tympanistria</i>	58	15.52	3.45	15.52	1.72	1.72	-

  

Bird species	No. examined	Percentage infected	Mean parasitemia (intensity)±SE				
			H	P	T	M	L
<i>Columba malherbii</i>	14	28.57	-	-	8.00±2.16	2.7±0.12	-
<i>Columba unicincta</i>	22	68.18	2.40±1.31	1.20±0.85	2.21±1.40	20.4±8.16	-
<i>Streptopelia semitorquata</i>	42	64.29	0.70±0.21	8.10±2.73	13.50±7.11	0.3±0.95	1.3±0.92
<i>Streptopelia senegalensis</i>	86	22.09	11.60±4.73	2.32±0.54	1.10±0.86	-	-
<i>Treron australis</i>	20	15.00	2.75±0.07	-	-	-	3.4±0.65
<i>Turtur brehmeri</i>	6	0.00	-	-	-	-	-
<i>Turtur tympanistria</i>	58	15.52	0.70±0.40	9.31±3.57	0.20±0.02	0.3±0.12	-

<sup>b</sup>: H = *Haemoproteus*, P = *Plasmodium*, T = *Trypanosoma*, M = *Microfilaria*, L = *Leucocytozoon*

Table 2 shows that Laughing dove (*Streptopelia senegalensis*) had a prevalence of 11.6% with *Haemoproteus* sp., while the Grey wood pigeon (*Columba unicincta*) had 9.09% infected. *Plasmodium* species were found in 28.57% of the Red-eyed dove (*Streptopelia semitorquata*) and 15.52% of the Tambourine dove (*Turtur tympanistria*). *Trypanosoma* infected 21.43% of the Bronze-naped Pigeon (*Columba malherbii*), 16.67% of the Red-eyed dove and 9.09% of the Grey wood pigeon. Microfilariae infected 50.00% of the Grey wood pigeon and 14.29% of the Bronze-naped pigeon and *Leucocytozoon* infected 10.00% of the Green fruit pigeon (*Treron australis*).

Most of the birds sampled showed low mean intensities of infection, with parasitemia less than 10 haemoparasite each per 1000 erythrocytes. However, few others like the Grey wood pigeon had 20.4±8.16 mean microfilaria intensity. The Laughing dove had 11.6±4.73 mean *Haemoproteus* intensity and the Red-eyed dove had 13.5±7.11 mean *Trypanosoma* intensity. The lowest mean parasitemia of 0.7±0.40 and 0.2±0.02 with *Haemoproteus* and *Trypanosoma* were found in Tambourine dove. The lowest mean parasitemia of *Plasmodium* (1.2±0.85) was found in the Grey wood pigeon and the lowest mean parasitemia of Microfilariae (0.3±0.12) in the Tambourine dove. The blue-headed dove, *Turtur brehmeri* was the only species without any recognizable parasitemia.

## DISCUSSION

The results of this study provide an indication of the prevalence and intensity of blood parasites in some bird species of the family Columbidae found in Shasha forest reserve of South Western Nigeria. The overall prevalence of 31.0% of the individuals infected with blood parasites is relatively high compared to a study in Senegal where an overall prevalence of 11.5% was recorded for all bird species sampled (Bennett *et al.*, 1979). The result is closer to those got for birds in Ghana (21.5%) Wink and Bennett (1976) and Uganda (28.2%) (Bennett *et al.*, 1977). However, the overall prevalence was lower than the overall prevalence of 48.2% found in Balmoral, Zambia (Pierce, 1984). The Grey wood pigeon and the Red-eyed dove had very high overall prevalences and intensities of parasitization than other members of the Columbidae. The reasons for these differences are unknown but as suggested may involve behavioural aspects or some physiological condition intrinsic to the species that may make host more or less susceptible to the parasite (White *et al.*, 1978). Similarly the higher prevalences of

*Haemoproteus*, *Plasmodium*, *Trypanosoma* and *Microfilaria* in the Laughing dove, Red-eyed dove, Bronze-naped pigeon and Grey wood pigeon suggest that in addition to behavioural aspects physiological factors may also be involved in the parasite-host-vector relationship. This fact was equally noticed in the prevalence and intensity of *Haemoproteus columbae* in three species of wild doves in Brazil (Adriano and Cordeiro, 2001). It was further stated that apart from rainfall and differences in habitat composition, differences in parasite prevalences may be influenced by proximity to breeding areas for vectors, relative levels of host resistance, local temperature differences, time of collection during the day and age of host among others (Sehgal *et al.*, 2005).

However, the total prevalence of *Plasmodium* infection rates (12.5%) were on the average comparable to 13.6% found in Moroccan birds (Gaud and Petitot, 1945) and 13.0% in Egyptian birds (Mohammed, 1958) but higher than those recorded for other members of the family Columbidae in Cameroon, Equatorial Guinea and Ivory Coast (Sehgal *et al.*, 2005). The total prevalence of *Leucocytozoon* in these pigeons and doves is lower than 12.4-13.0% got in Poland (Dymonska and Zukowski, 1968; Ramisz, 1965; Shurulinkov and Golemansky, 2003) and in 6.0% recorded in Central Europe, but was comparable to 2.2% found in passerines in South Eastern Kazakhstan (Jakumin, 1972).

Although there is some evidence that heavy infections of avian parasitemia can be pathogenic (Garnham, 1950; Markus and Oosthuizen, 1972), little is known of their effects. None of the infected birds handled in the present study showed any signs of ill-health. The presence of suitable vectors could bring about ecological changes such as shifts in bird migration patterns that could have considerable influence on the parasite fauna of Nigerian birds. In addition blood parasites may be responsible for the restricted distribution of some bird species (Markus, 1974; White *et al.*, 1978). The Blue-headed dove was the only species without any obvious parasitemia and this may be due to the fact that its foraging activities was largely confined to the forest canopy and rarely descended to the level of the mist-nets where infections may be acquired from insect vectors of the various parasites.

It is hoped that this study will stimulate interest in, not only the prevalence but also the intensity of infection of West African wild birds (Resident and migratory) with blood parasites, so that a comprehensive data base could be generated.

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