SHORT COMMUNICATION

Blood Parasites in Some Birds from Eastern Plains of Colombia

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A total of 315 birds representing 75 species (23 families) from Villavicencio and San Miguel (Meta, Colombia) were examined for haematozoa. Fifty birds (15.9%) harbored blood parasites. Microfilariae were the most common haematozoans encountered, followed by species of the genera Haemoproteus, Plasmodium *and* Trypanosoma. *This survey included 15 new host-parasite records and 8 species of birds that were examined for haematozoa for the first time. The prevalence registered in this research was similar to others recorded in the Neotropical region, but in sharp contrast with the prevalence of blood parasites in other major land masses.*

Key words: birds - haematozoa - Colombia

Although the ornithological fauna of Colombia is among the most diverse of the world, the blood parasites of this avifauna have had only limited study. Blood parasites of Colombian birds have been recorded in a few small surveys, carried out by Renjifo et al. (1952), Bennett and Borrero (1976) and Ayala et al. (1977). The purpose of this study was to record the prevalence of blood parasites in some birds from the eastern plains of Colombia, giving new directions for research into the epizootiology of hematozoan infections in Colombian birds. This report summarizes and briefly discusses the results of this survey and compares the obtained results with those previously recorded by Renjifo et al. (1952).

Birds were collected from two sites in the Meta Department, eastern plains of Colombia, from June to September 1999. The first was in the Jardín Botánico de Villavicencio: (73°39' W; 4°0.9' N), at an elevation of 640 m above sea level, with a mean annual temperature of 26°C and an annual rainfall close to 2,500-3,000 mm. The area is a second growth tropical rainforest and contained patches of 20-30 m tall forest. The second site was in Fundación Yamato; San Miguel, (71° 31' W; 4°31' N). The area is about 130 m above sea level, with an annual temperature of 28.7°C and an annual rainfall of 2,000 mm. The vegetation is dominated by dry savanna and gallery forests.

The birds were mist-netted. Three thin smears from each of 315 birds were made from blood obtained by toenail clip. Smears were fixed in 100% methanol and stained with Giemsa stain pH 7.2. In order to determine the prevalence of haematozoa each smear was scanned double blind, under low magnification for 10 min and under oil immersion for 20 min.

The 315 birds, represented 75 species, 23 families and 7 orders. Fifty birds (15.9%) were infected with parasites of one or more genera of haematozoa (Table I). This is higher than the 10.5% prevalence reported by White et al. (1978) for the Neotropical region, but clearly lower than the 36.9% recorded for North America (Greiner et al. 1975). The 75 species of birds examined included 8 species that were examined for blood-parasites for the first time; 15 new host-parasites records were established from this sample (Table I).

The most common blood parasites found were microfilariae, which occurred in 26 birds, 17 species (8.2 %) representing 48.2% of the total infection. The proportion of microfilariae infections in the sample is exceptionally high, substantially higher than any other region, a feature that agrees with other studies in the Neotropics. The next most frequently found parasites were members of the genus *Haemoproteus* (6.7%) followed by *Plasmodium* (0.6%), *Trypanosoma* (0.9%) and others (0.6%).

Species of Haematozoa - Haemoproteus columbae Kruse 1890 was found in *Columbina passerina* and *Zenaida auriculata*. Macro and mi-

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TABLE I

Blood parasites of some birds from eastern plains of Colombia

Bird family and species	Birds total	Birds infected	*H*	*P*	*T*	M	O
ALCEDINIDAE							
Chloroceryle americana	5	2				2	
Chloroceryle inda	6	1				1	
COEREBIDAE							
Dacnis cayana	4	2				2	
COLUMBIDAE							
Columbina passerina	3	2	2				
Leptotila verreauxi	2	2	2				
Scardafella squammata	1	1	1				
Zenaida auriculata	1	1	1				
FRINGILLIDAE							
Paroaria gularis	1	1				1	
Saltator maximus	5	1				1	
Sicalis columbiana	4	2				2	
Tiaris obscura	1	1				1	
THRAUPIDAE							
Ramphocelus carbo [a]	39	6	3			3	1
Tangara cayana	3	1				1	
Tangara cyanicollis [a]	10	4	4			1	
Thraupis episcopus [a]	5	1	1			1	
TROCHILIDAE							
Amazilia versicolor	3	1				1	
Chalybura buffonii	8	1	1				
Phaethornis hispidus	5	1					1
TROGLODYTIDAE							
Thryothorus rufalbus	10	4				4	
TURDIDAE							
Turdus ignobilis	4	1				1	
Turdus nudigenis	2	1		1			
TYRANNIDAE							
Elaenia chiriquensis	9	2			2		
Elaenia parvirostris	5	1				1	
Megarhynchus pitangua	5	1				1	
Mionectes oleaginea	21	2				2	
VIREONIDAE							
Cyclarhis gujanensis	3	1		1			
Vireo olivaceus [a]	7	6	6		1		
Negative birds (see below)	265						
Total	315	50	21	2	3	26	2
% infected		15.9	6.7	0.6	0.9	8.2	0.6

H: *Haemoproteus*; *P*: *Plasmodium*; *T*: *Trypanosoma*; M: Microfilariae; O: Others; *a:* species with double infection. Negative birds (number examined in parentheses): ALCEDINIDAE: *Ceryle torquata* (1); *Chloroceryle amazona* (2). COEREBIDAE: *Coereba flaveola* (1); *Chlorophanes spiza* (1). COLUMBIDAE: *Leptotila rufaxila* (5). CORVIDAE: *Cyanocorax violaceus* (1). COTINGIDAE: *Pachyramphos polychopterus* (2). CUCULIDAE: *Coccyzus melacoryphus* (1); *Crotophaga ani* (6). DENDROCOLAPTIDAE: *Xiphorynchus picus* (1). FORMICARIDAE: *Cercomacra nigrescens* (1). FRINGILLIDAE: *Coryphospingus pileatus* (1); *Ammodramus aurifrons* (1); *Arremon taciturnus* (5); *Arremonops conirostris* (1); *Emberizoides herbicola* (1); *Orizoborus angolensis* (6); *Sporophila intermedia* (9); *S. minuta* (2); *Sporophila nigricollis* (3); *Volatinia jacarina* (2). FURNARIIDAE: *Automolus ochrolaemus* (1); *Synallaxis gujanensis* (1). GALBULIDAE: *Galbula tombacea* (3). HIRUNDINIDAE: *Neochelidon tibialis* (1). MIMIDAE: *Mimus gilvus* (1). PARULIDAE: *Setophaga ruticilla* (2). PHASIANIDAE: *Colinus cristatus* (3). PICIDAE: *Melanerpes cruentatus* (1). PIPRIDAE: *Manacus manacus* (26). THRAUPIDAE: *Euphonia chlorotica* (1); *E. laniirostris* (2); *E. xanthogaster* (1); *Euphonia* sp. (1); *Schistoclamis melanopis* (1); *Thraupis palmarum* (4). TROCHILIDAE: *Amazilia fimbriata* (2); *Glaucis hirsuta* (1); *Polytmus guainumbi* (3). TROGLODYTIDAE: *Troglodytes aedon* (6); TURDIDAE: *Turdus leucomelas* (1). TYRANNIDAE: *Camptostoma obsoletum* (2); *Elaenia flavogaster* (2); *Elaenia* sp. (3); *Myiozetetes cayenensis* (5); *M. similis* (1); *Myiopagis gaimardii* (1); *Phaeomyias murina* (2); *Pitangus lictor* (3); *P. sulphuratus* (3); *Tolomyias sulphurecens* (1); *Tyrannus melacholichus* (5)

crogametocytes were found in both columbids *Scardafella squammata* and *Leptotila verreauxi*. Features such as shape, pigment granules and length were very similar to those described for *H. columbae*. Other features did show some differences: width (4.5-5 µm), nuclear displacement ratio (NDR = 0.3-0.2) and a grossly erythrocyte hypertrophy. These results do not agree with the constancy of morphological characters observed in *H. columbae* by Bennett and Pierce (1990). *H. thraupi* was found in the thraupiids *Ramphocelus carbo*, *Tangara cyanicollis* and *Thraupis episcopus*. With the exceptions of *H. columbae* and *H. thraupi* cited above, which were sufficiently numerous and characteristic to leave little doubt as to their identity, all other haemoproteid infections had parasitemia so low that species identification was not possible. In *Vireo olivaceus* 1-6 infected cells were found per 20,000 RBC. The parasites encountered were similar to *H. vireonis* as described by Bennett et al. (1986) but a diagnosis based on a few gametocytes can not be made with certainty. *Plasmodium* infections included the subgenus *Novyella* in *Turdus nudigenis* and *Plasmodium* (*Haemamoeba*), probably *relictum*, in *Cyclarhis gujanensis*. An unidentified parasite was found in the trochilid *Phaethornis hispidus*. It consisted of a small inclusion body in the erythrocyte and it could have been the earliest invasive merozoites of either *Haemoproteus* or *Plasmodium*. In the absence of mature forms even a generic diagnosis was not possible. Trypomastigotes were found in *Elaenia chiriquensis* and *V. olivaceus*, however, only one to three specimens were found in each bird. Since, microfilariae can only be identified when associated with the adult filarial worms and no adult was collected, the parasites could not be further identified. In *R. carbo* a possible blood stage of *Hepatozoon* was observed in erythrocytes. Finally, this survey showed absence of the genus *Leucocytozoon*.

Distribution by avian host - The largest number of birds were Passeriformes (253), followed by Apodiformes (22) and Coraciiformes (14). All other orders were represented in small number. Blood parasites occurred with greater frequency in certain families of birds than in others (Table I). The Vireonidae (70% primarily with *Haemoproteus*) was the most frequently parasitized family, followed by the Columbidae (50% with *Haemoproteus*). Other families (Thraupidae, Alcedinidae) had an intermediate prevalence. A number of families showed low parasite prevalence, including the Pipridae and Tyrannidae. All the other families had low prevalence levels: however, all were represented by one to three blood samples.

Even though the Neotropical region possesses the most diverse and richest avifauna of the world, this study indicated a low prevalence of blood parasites (15.9%), but represented a similar value to that recorded elsewhere in Central and South America (White et al. 1978, Bennett et al. 1980): it is far lower than that recorded for North America (Greiner et al. 1975). Furthermore, the low number of double infections (4 individuals) found in this study, agrees with other reports from the Neotropics (Bennett & Sousa 1980). Our results, in contrast to about 30% double infection of the total infected in North America, presumably indicate a low intensity of parasite attack in Colombia.

The distribution of the different genera of haematozoans among the avian hosts is very interesting. As noted by White et al. (1978) and Woodworth-Lynas et al. (1989), the haematozoans most frequently found in Neotropical birds are haemoproteids, followed by microfilariae and plasmodiids. Our Colombian sample closely approximates this general pattern, but microfilariae were more common than *Haemoproteus*, a finding similar to that recorded by Bennett et al. (1991) for Bolivia.

The number of birds infected with trypanosomes and microfilariae is comparatively higher than that seen elsewhere; these differences, as suggested by Bennett et al. (1991), could be explained by differences in vector composition and distribution patterns, compared to the rest of the world. Furthermore, the apparent absence of *Leucocytozoon* suggests a lack of suitable ornithophilic simuliid vectors for transmission of the parasite. The absence of members of *Leucocytozoon* can not be attributed to a lack of inocula, because North American migrant birds harboring the parasite, overwinter in the Neotropics (White et al. 1978).

It was possible to observe distribution trends among the different host families. The families with the highest prevalence in this study were essentially the same as those in other studies in the Neotropics (White et al. 1978), and the Neartic (Greiner et al. 1975). It would appear that some aspect or habit of these birds enhances parasitism by haematozoans. A possible interpretation is that certain families are inherently more susceptible to infection by blood parasites. It could also be interpreted that birds of these families have behavioral patterns (i.e. roosting sites) which bring them into more frequent contact with vectors. Bennett et al. (1980) made an interesting observation: families more closely related to the Caribbean and North America avifauna (i.e. Columbidae, Icteridae, Vireonidae), include the highest prevalence values, while those of presumed Neotropical origin (Trochilidae and Tyrannidae) have the lowest.

It is important to compare this survey with the results of Renjifo et al. (1952), in nearby localities

TABLE II

Prevalence of avian blood parasites on the different continental land masses

Region	Number of birds		Parasites					
	Examined	Infected	*H*	*L*	*P*	M	*T*	O
Neotropical	51,129	4,983 (9.8)	3,142 (6.2)	54 (0.1)	771 (1.5)	852 (1.7)	380 (0.7)	251 (0.5)
Neartic	57,026	21,048 (36.9)	11,112 (19.5)	10,093 (17.7)	2,185 (3.8)	1,777 (3.1)	2,247 (3.9)	357 (0.6)
West Europe	14,624	4,239 (29.6)	1,599 (10.9)	1,731 (11.8)	796 (5.4)	-	627 (4.3)	487 (3.3)
Sub-Saharan Africa	9,697	2,562 (26.4)	1,774 (18.3)	454 (4.3)	291 (3)	-	-	-
Eastern and South Asia	55,289	9,026 (16.3)	6,256 (11.3)	1,478 (2.7)	422 (0.8)	1,011 (1.8)	114 (0.2)	616 (1.1)
Colombia (Renjifo et al. 1952)	337	89 (26.4)	35 (10.38)	-	25 (7.4)	25 (7.4)	4 (1.2)	-

H: Haemoproteus; L: Leucocytozoon; P: Plasmodium; T: Trypanosoma; M: Microfilariae; O: others (*Atoxoplasma*, *Hepatozoon*, *Lankesterella* etc.) (adapted from Bennett et al. 1991)

of the same region. Although the prevalence obtained in our study is lower than that obtained by these authors (Table II), the avian hosts studied were different. These authors also analyzed different organs, which did not allow a direct comparison and discussion. Nevertheless, there are some trends in the distribution of haemotropic parasites. In both studies microfilariae were widely distributed among the avian families, with very similar prevalence values (Table II). The greatest difference observed was the low prevalence of the genus *Plasmodium*, compared with the higher value obtained by Renjifo et al. (1952) (Table II). A suitable hypothesis for these differences, could be attributed to the reduction of adequate environments for the development of the ornithophilic vectors (i. e. breeding sites). Both the urban growth and the use of savanna for cattle ranches, can be possible explanations for this reduction. It is necessary to explore this, and other possible hypotheses, that may explain the trends of distribution of blood parasites in avian hosts.

Identification of blood parasites using morphology of blood stages was not possible when the parasitaemias were very low, indicating the need for the development of others diagnostic techniques.

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