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Paucity of Hematozoa in Colombian Birds

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ABSTRACT: Sixty-four birds of 43 species were caught at six localities in Colombia during the dry season in March 1998 and investigated for hematozoa by microscopic examination of stained blood films. *Haemoproteus coatneyi, Plasmodium vaughani, Leucocytozoon* sp., and microfilariae were identified. The overall prevalence of infection was 8%. Prevalences of infection for *Haemoproteus* spp., *Plasmodium* spp., *Leucocytozoon* spp., and microfilariae were 3%, 2%, 2%, and 3%, respectively. All hemosporidian infections encountered were of low intensity (<1% of infected erythrocytes). The low prevalences and intensities of hemosporidian parasites in this study are in accord with other records from the Neotropics.

Key words: Avian hematozoa, Colombia, *Haemoproteus, Leucocytozoon,* microfilariae, *Plasmodium.*

Although numerous surveys have been conducted on hematozoa of Neotropical birds (see reviews by White et al., 1978; Sousa and Herman, 1982; Woodworth-Lynas et al., 1989; Young et al., 1993; Valkiūnas, 1997), some regions of South America remain insufficiently studied. Relatively little is known about blood parasites of birds from Colombia (Bennett and Borrero, 1976), a country of particular interest because of its diverse endemic avifauna, the strong influences on the avifauna of both Nearctic and austral migrants, and its severe conservation problems. Because surveys of avian blood parasites in Colombia are uncommon, our objective was to obtain first information on the presence and distribution of hematozoa across the northern Andes of this country.

Between 1 and 28 March 1998 (dry season), 64 birds (17 juveniles, 43 adults, and four of unknown age) of 43 species were surveyed for blood parasites. Age was determined by skull ossification. Most of the birds sampled represented resident species. The birds were caught with mist nets at six localities: 1) the eastern slope of the Andes at Villavicencio, Meta Department (4°N, 74°W; 200 m above sea level, $n=7$) and 2) at Mocoa, Putumayo Department (1°N, 77°W; 1,000 m, $n=7$); 3) the western slope of the Western Cordillera at Tambito, Cauca Department (77°N, 2°W; 2,500 m, $n=18$); 4) Eastern Cordillera, near Bogota (74°N, 5°W; 2,500 m, $n=5$); v) Magdalena valley, near Ibagué, Tolima Department (4°S, 75°W, 1,000 m, $n=17$); and 5) Santa Marta mountains in northern Colombia (11°S, 74°W, 1,200 m, $n=10$). Blood was taken by clipping the tip of a claw. All birds were ringed and released alive. Blood smears were air-dried, fixed in methanol in the field, and then treated with Giemsa's stain by conventional methods in the laboratory. Approximately 120–150 fields were examined at low magnification (400×), and then at least 100 fields were studied at high magnification (1,000×). Intensity of infection was estimated as a percentage by actual counting the number of parasites per 1,000 erythrocytes or per 10,000 erythrocytes if infections were very light (Godfrey et al., 1987). Hemosporidian parasites (Haemosporida) were identified according to Valkiūnas (1997). The representative blood films are deposited in the Instituto de Ciencias Naturales, Bogota, Colombia (accession numbers 17, 36, 65, 68, 69, Series 98).

The prevalence of hematozoa in Colombian birds was low (Table 1). Only five (7.8%) birds of five species were found to harbor hematozoa. All recorded hemosporidian infections were light (<1%) and were thus classified as chronic. *Haemoproteus coatneyi* was identified in slate-throated whitestart (*Myioborus miniatus*; intensity of infection 0.1%) and blue-necked tanager (*Tangara cyanicollis*; 0.3%), *Plasmodium* (*Novyella*) *vaughani* in bluish

TABLE 1. Occurrence of hematozoa in birds from Colombia, 1998.

Bird species and family	Number examined	Number infected	Parasite present[a]			
			H	P	L	M
Momotus momota (Momotidae)	1	1				1
Catharus ustulatus (Turdidae)	2	1			1	
Myioborus miniatus (Parulidae)	2	1	1			
Diglossa caerulescens (Thraupidae)	1	1		1		
Tangara cyanicollis	1	1	1			1
Uninfected species[b]	57					
Totals	64	5	2	1	1	2
Prevalence (%)		8	3	2	2	3

[a] Number of birds with each parasite. H=*Haemoproteus* sp.; P=*Plasmodium* sp.; L=*Leucocytozoon* sp.; M=Microfilaria.
[b] Uninfected species (number of individuals examined): Columbidae: *Claravis pretiosa* (1); Trochilidae: *Ocreatus underwoodii* (1); Dendrocolaptidae: *Dendrocincla fuliginosa* (1), *D. tyrannina* (1); Furnariidae: *Automolus rubiginosus* (2); Thamnophilidae: *Drymophila caudata* (1); Rhinocrytidae: *Scytalopus subcinereus* (1); Tyrannidae: *Mecocerculus leucophrys* (3), *Mionectes oleaginea* (2), *M. olivaceus* (4), *Myiodynastes maculatus* (1), *Myiozetetes cayanensis* (1), *Ochthoeca diadema* (1), *Pyrrhomyias cinnamomea* (2); Pipridae: *Manacus manacus* (2), *Machaeropterus regulus* (1); Troglodytidae: *Henicorhina leucophrys* (3), *Thryothorus rufalbus* (2), *Troglodytes aedon* (1); Turdidae: *Platycichla flaviceps* (2), *Turdus leucomelas* (1), *T. nudigenis* (2); Parulidae: *Myioborus ornatus* (1); Thraupidae: *Anisognathus lacrymosus* (1), *Chlorospingus flavigularis* (2), *Diglossa albilatera* (2) *D. cyanea* (1), *D. sittoides* (1); *Euphonia laniirostris* (1), *Hemispingus verticalis* (1), *Tangara cyanoptera* (1), *T. xanthocephala* (1); Emberizidae: *Atlapetes albofrenatus* (1), *A. melanocephalus* (1), *A. schistaceus* (2), *Oryzoborus angolensis* (2), *Saltator albicollis* (1), *S. maximus* (2).

flower-piercer (*Diglossa caerulescens*; 0.4%), and *Leucocytozoon* sp. in Swainson's thrush (*Catharus ustulatus*; <0.01%). Microfilarial infections of more than 30 larvae were found in blood smears of blue-crowned motmot (*Momotus momota*) and blue-necked tanager.

The species of hemosporidians found in this work are common in the New World, and *P. vaughani* is cosmopolitan (Bennett et al., 1982; Valkiūnas, 1997). The records of these parasites in Colombian birds are thus not unexpected. With the exception of *Leucocytozoon* sp., all the hematozoa recorded were in indigenous bird species and thus likely to be transmitted in Colombia. Gametocytes of *Leucocytozoon* sp. were seen in one juvenile Swainson's thrush, a Nearctic migrant that winters in Colombia. Bennett and Borrero (1976) also recorded *Leucocytozoon dubreuili* in one individual of that thrush in Colombia. The *Leucocytozoon* sp. infection could have been acquired on the Nearctic breeding grounds where the overall prevalence of leucocytozoids exceeds 40% in the Swainson's thrush (Greiner et al., 1975). The slate-throated whitestart and blue-necked tanager are new hosts for *H. coatneyi,* and the bluish flower-piercer is a new host for *P. vaughani.* All infected bird species (Table 1) reported herein, except Swainson's thrush, are new host records for Colombia.

Haemoproteus sp. infection was recorded in the Magdalena valley (one bird infected, $n=1$) and eastern slope of the Andes ($n=1$), *Plasmodium* sp. on the eastern slope of the Andes ($n=1$), *Leucocytozoon* sp. in the Eastern Cordillera ($n=1$), and microfilariae on the eastern slope of the Andes ($n=1$) and Magdalena Valley ($n=1$). Perhaps, due to the low prevalences of infection and the small sample, no differences were discernible in the distribution of infected birds among different localities and at different elevations from sea level. Bennett and Borrero (1976) found no significant differences in the prevalences of hematozoan infections among birds sampled at various elevations from 100–2,140 m.

The low overall prevalence of hematozoa in this study is in accord with results from an earlier survey by Bennett and Borrero (1976) who found only 7.1% of birds infected with blood parasites in the environs of Cali, Colombia. There were no

significant differences in prevalences of all recorded hematozoan infections in these two studies. *Trypanosoma* spp. were not recorded in either study, and only light infections were observed. Transmission of tropical hematozoa varies seasonally, being most prevalent in wet season when most birds breed and vectors are active (Young et al., 1993; Valkiūnas, 1997). Bennett and Borrero (1976) investigated birds both during dry and wet seasons, and we sampled birds only during the dry season. The close similarities in the prevalence and intensity of infection between these two samples indicate that hematozoan parasites are rare in Colombian birds.

The low overall prevalence of hematozoa in Colombia is typical for the Neotropics where the prevalence of blood parasites (approximately 10%) is significantly less than that in any other zoogeographical region (Greiner et al., 1975; White et al., 1978; Valkiūnas, 1997). Species of *Haemoproteus, Plasmodium, Leucocytozoon,* and *Trypanosoma* have been found in resident indigenous species of birds in the Neotropics (White et al., 1978; Sousa and Herman, 1982; Young et al., 1993; Valkiūnas, 1997) and thus are transmitted there. The reason for the paucity of hematozoan infections in this region is unclear. Low availability of dipteran vectors (ornithophilic black flies, Simuliidae) may explain the rarity of *Leucocytozoon* spp. infections (Bennett and Borrero, 1976; White et al., 1978; Sousa and Herman 1982; Young et al., 1993). However, biting midges (Ceratopogonidae) and mosquitoes (Culicidae), the primary vectors known for *Haemoproteus* and *Plasmodium* spp., respectively, are common in the Neotropics (Garnham, 1966, 1980; Linley, 1985; Valkiūnas, 1997) and unlikely to limit dispersal of blood parasites. Low prevalences and intensities of hematozoa may be due, in part, to bias in the sampling of infected birds (Valkiūnas, 1998). Birds with heavy parasitemias are less likely to be captured in mist nets because host movements decrease during the primary acute stage of infection. Small passerines are weakly mobile and secretive at the peak of primary hemosporidian parasitemia (Valkiūnas, 1993). They rarely enter mist nets but may be shot or obtained by other methods (Valkiūnas, 1997, 1998). If birds survive the primary acute attack of parasites, the infections become chronic and, host activity returns to normal. Consequently, only low chronic infections, which are relatively benign, are recorded for avian hosts captured in mist nets (Valkiūnas, 1998).

Prevalence data reflect the strength and duration of the infection (Valkiūnas, 1997). Neotropical strains of hemosporidian parasites may be more virulent and kill more birds than other strains elsewhere, as was shown for *Plasmodium juxtanucleare* in domestic chickens (Garnham, 1980), which would explain the rarity of heavy parasitemias and the low prevalences in mist-netted Neotropical birds. In this regard, the high prevalence (>50%) and intensity (up to 80%) of malarial parasites in chicks of ciconiiform birds, as well as the high mortality among the chicks with malaria in Venezuela are worth noting (Gabaldon and Ulloa, 1980). Population field studies supplemented by experimental work on vectors, epidemiology, and virulence are needed to explain the paucity of blood parasites and to determine their significance in the Neotropics.

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