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Blood Parasites of Passerine Birds from Central Spain

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ABSTRACT: Sixteen species of passerine birds captured during a 2.5 yr period in Central Spain were examined for hematozoa. *Haemoproteus* spp., *Leucocytozoon* spp., *Trypanosoma* spp., *Plasmodium* spp., and microfilariae were observed. The most prevalent species were in the genus *Leucocytozoon*. The majority of the records are new for Spain and some represent new host records. More than one-half of the birds examined were infected with at least one parasite species. These records are similar to those reported from other areas in northern Europe and the Iberian Peninsula.

Key words: Avian hematozoa, *Haemoproteus* spp., *Leucocytozoon* spp., microfilariae, *Plasmodium* spp., prevalence, survey, trypanosomes.

Since the pioneering work by Orbaneja Agüero (1934), Rey Vila (1945) Covaleda Ortega and Gallego Berenguer (1946, 1950), and other studies on microfilariae (López Neyra and Medina Blanco, 1951; Jiménez Millán and López Caballero, 1975; López Caballero, 1980), there have been few subsequent studies on avian hematozoa in Spain (Cordero del Campillo, 1980; Peirce, 1981). However, this is not due to absence of infection or low prevalences in birds in the Iberian Peninsula, as the recent studies of Merilä et al. (1995), Merino and Potti (1995), and Merino et al. (1996) have shown. Herein, we present data on some passerine species that were sampled for blood parasites in Central Spain.

Birds were sampled for blood parasites in Sierra de Ayllón (La Hiruela, Madrid and El Cardoso de la Sierra, Guadalajara) in the spring 1993 to 1995, Santa María de la Alameda (Madrid) in March–April 1995, vicinity of Alcalá de Henares (Madrid) from September 1993 to January 1996, and Ventorrillo Scientific Station (Madrid) in winter 1995 (Table 1). Coordinants for sampling sites were located between 40°38′ to 41°04′N and 03°02′ to 04°28′W. Blood smears were prepared from a drop of blood via brachial vein, fixed with absolute ethanol and stained with Giemsa. For some birds sampled post mortem (Table 1) blood was obtained from the heart or liver. Extracellular parasites (trypanosomes, microfilariae) and some large intracellular parasites (*Leucocytozoon* spp.) were found by scanning one-half of the symmetrical smear at 200× magnification (about 300 fields scanned, one-half being chosen at random). Although most infections with intraerythrocytic parasites were noted at 200× magnification, we checked another 20 fields at 400× (about 20,000 erythrocytes) in an area with homogeneus distribution of cells in the other one-half of the smear (the part not scanned at 200×). Subsequently, we used the oil immersion objective to count at least 2,000 erythrocytes. When low intensity infections were involved, we counted 10,000 erythrocytes under the oil immersion objective lens. When an uneven distribution of parasites or blood cells were noted, replicates of the 20 fields scanned at 400× and cell counts under the oil immersion lens were performed in different areas of the smear. The number of parasites per 2,000 erythrocytes were counted in a high intensity of infection of *Leucocytozoon* sp. (see below). All slides were examined by the same individual (S.M.). The species of parasites were identified based in host family specificity and parasite morphological characteristics (Bennett et al., 1991, 1993, 1994).

Representative slides of the blood parasites we collected were deposited in the Museo Nacional de Ciencias Naturales de

TABLE 1. Prevalence of blood parasites in birds from central Spain.

Hosts	Prevalence		Parasite species[a,d]				
	Infected	Examined	HP	LZ	TR	MR	PL
Certhiidae							
Certhia brachydactyla[e]	2	7[i]			2[b]		
Corvidae							
Cyanopica cyana[f]	9	10		9[c,1]	2	1[b]	
Pica pica[f]	1	1		1[1]	1		
Fringillidae							
Serinus serinus[e]	1	1	1[c,2]				
Fringilla coelebs[e]	3	4	3[3]		1		
Muscicapidae							
Phylloscopus bonelli[e]	2	6		1[4]	1		1[b,5]
Sylvia atricapilla[e,g,j]	5	10	4[6]	1[4]			
Sylvia borin[e,g]	3	7	3[6]	1[4]			
Erithacus rubecula[e]	4	8	2[7]	2[8]			
Turdus merula[e,f]	3	3		2[9]	1	1[c,10]	
Turdus philomelos[e]	2	2	1[11]	1[9]	1	1[c,10]	
Paridae							
Parus ater[e]	6	7[i]		6[12,13]	2		
Parus caeruleus[e,j]	11	16[i]		9[12,13]	2		
Parus major[e]	3	8[i]		3[12,13]	1		
Prunellidae							
Prunella modularis[e,j]	1	1	1[14]				
Sittidae							
Sitta europaea[e,h]	2	4[i]	1[15]	1[16]	1		
Total	58	95	16	37	15	3	1
Prevalence (%)	61		17	39	16	3	1

[a] HP = *Haemoproteus*, LZ = *Leucocytozoon*, TR = *Trypanosoma*, MR = microfilariae, PL = *Plasmodium*.

[b] New host record.

[c] New geograhic record.

[d] Parasite species encountered in bird families and subfamilies sampled on central Spain; taxonomic sources for identification are referenced in superscripts: [1] *Leucocytozoon sakharoffi*[a], [2] *Haemoproteus chloris*[b], [3] *Haemoproteus fringillae*[b], [4] *Leucocytozoon phylloscopus*[c], [5] *Plasmodium relictum*[d], [6] *Haemoproteus sylvae*[c], [7] *Haemoproteus* sp. (unnamed), [8] *Leucocytozoon* sp. (unnamed), [9] *Leucocytozoon dubreuili*[c], [10] *Splendidofilaria* sp. (unidentified), [11] *Haemoproteus fallisi*[c], [12] *Leucocytozoon majoris*[a], [13] *Leucocytozoon* sp. (unnamed), [14] *Haemoproteus* sp. (unnamed), [15] *Haemoproteus sittae*[f], [16] *Leucocytozoon* sp. (unnamed). ([a] Bennett and Peirce, 1992; [b] Burry-Caines and Bennett, 1992; [c] Bennett et al., 1991; [d] Greiner et al., 1975; [e] Bennett et al., 1993; [f] Bennett, 1989).

[e–h] Localities: [e] Sierra de Ayllón (Madrid and Guadalajara); [f] Santa María de la Alameda (Madrid); [g] Alcalá de Henares (Madrid and Guadalajara); [h] Ventorrillo Scientific Station (Madrid).

[i] Nestlings sampled (3 *C. brachydactyla*, 7 *P. ater*, 13 *P. caeruleus*, 4 *P. major*, 1 *S. europaea*).

[j] Birds sampled post-mortem. (one nestling of *Parus caeruleus*; 7 *Sylvia atricapilla*).

Madrid (Madrid, Spain; Accession numbers MNCN 35.01/5 to MNCN 35.01/16, MNCN 33.03/1 to MNCN 33.03/4 and MNCN 11.02/11). The terms prevalence and intensity are defined by Margolis et al. (1982). Bird taxonomy follows Howard and Moore (1991).

Results of our study are listed in Table 1. The majority of the records are new geographic records for Spain and three are new host records.

Leucocytozoon spp. were the most common blood parasites we collected. In contrast, Bennett et al. (1982b) indicated that *Haemoproteus* spp. were the most prevalent blood parasites of birds on a worldwide basis. Although this might be biased by the presence of nestlings in our sample

and by the high prepatent period for *Haemoproteus* spp. (Merino and Potti, 1995), when only adult birds are considered *Leucocytozoon* spp. remained as the most prevalent parasites (Table 1). In contrast, Merino and Potti (1995) reported 1% prevalence of *Leucocytozoon muscicapa* in a breeding population of pied flycatchers (*Ficedula hypoleuca*) from Sierra de Ayllon. However, the intensities of infections with *Leucocytozoon* spp. in our study are normally very low. Only one bird showed a high parasitaemia; 133 parasites per 2,000 erythrocytes were found in a nestling blue tit (*Parus caeruleus*).

There are some differences in hematozoan prevalence between birds sampled post mortem and those sampled alive; perhaps because we obtained blood from different organs in dead birds and from peripheral blood in living birds (see Fedynich et al. 1995). This may be especially relevant in the sample of *Sylvia atricapilla* since seven dead birds are included. Three of these birds were infected by *Haemoproteus sylvae*; two of three living birds were infected, one each by *Leucocytozoon* sp. and *H. sylvae*.

The data presented here and those of Merilä et al. (1995) and Merino and Potti (1995) showed a high prevalence of blood parasites in birds from Spain. This is similar to that reported in birds from Scandinavian by Bennett et al. (1982a) who hypothesized a temporal decrease in prevalence of blood parasites in birds in western Europe based on a review of the literature. This may be the result of the changing host-vector-habitat relationships due to altered or lost habitat in much of Europe since the 1930's. Low prevalences of hematozoa in birds from Spain were sampled from agriculturally changed habitats (Tella et al., 1996, Blanco et al., 1997). In addition, Merilä et al. (1995) showed that greenfinches (*Carduelis chloris*) had high prevalences of hematozoa in relatively unaltered habitats in Spain and Scandinavia, while birds from central Europe and other areas located near large human populations had low prevalences of hematozoa. Although our data do not support the proposed temporal decrease in hematozoan prevalence in birds from Spain, a larger sample than that obtained to date and from different habitats is necessary to confirm this hypothesis.

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