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## BLOOD PARASITES OF BRITISH BIRDS AND NOTES ON THEIR SEASONAL OCCURRENCE AT TWO RURAL SITES IN ENGLAND

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**Abstract:** During 1972 and 1973, 309 blood smears were taken from 281 birds caught in Yorkshire and in Hampshire. A seasonal variation in the prevalence of blood parasites with a peak in May was observed. The percentage of birds infected in different months ranged from 3.8 to 15.9. A number of new host records for avian haemoprotozoa were found and these, together with previously unpublished results, are presented in a table which brings the check-list of known British hosts up to date. Details are given of hippoboscids collected from the birds.

### INTRODUCTION

Recently Baker<sup>1</sup> has reviewed the occurrence of avian haematozoa in Britain and Bennett, Mead and Barnett<sup>5</sup> have reported on their prevalence in samples from Tring (Hertfordshire) and Gibraltar Point (Lincolnshire). Between 10 May 1972 and 14 April 1973 we took blood smears from birds caught for ringing at two sites: one in Yorkshire and the other in Hampshire. The results of this survey, together with some additional records from southern England, are presented. We have revised Baker's list of the parasites from 19 species of birds<sup>1</sup> to include 31 species of known British hosts.

### MATERIALS AND METHODS

Birds were caught with mist-nets and blood samples were taken from the brachial veins by R.A.C. Smears were prepared in the field using the simple equipment described by Bennett,<sup>3</sup> air-dried and fixed in 100% methanol. They were later

stained in Giemsa's solution (diluted 1:10 at pH of 7.2 for one hr) prior to microscopical examination. All smears were screened by both R.A.C. and M.H., while M.A.P. examined those that were positive.

All birds were ringed, with the exception of four House Sparrows (scientific names are given in the Tables or in later text) to identify individual birds when retrapped. The majority were caught at Black Fen in Bramham Park near Wetherby in Yorkshire (53°51' N, 1°22' W). Mist-nets were placed in a gap between deciduous woodlands near a stream, in a young conifer plantation, and amongst woodland which adjoins a large bank of rotting potatoes covering a rubbish tip. At this latter site large numbers of Dunnocks came to feed which accounts for their high prevalence in the sample. The site in Hampshire was a large garden adjoining a pasture field at Bramley near Basingstoke (51°19' N, 1°05' W).

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## RESULTS AND DISCUSSION

309 smears of the blood of 281 different birds were examined. The sample of 35 different species of birds, 9 of which harboured parasites (Table 1), included representatives of 15 families. The following species showed no infections and the figures after each name in the list refer to the numbers of smears examined, first from Bramham and then from Bramley. When this is different from the number of individual birds involved, the latter figure is given in brackets. Wood Pigeon, *Columba palumbus* 1/0; Jay, *Garrulus glandarius* 1/0; Great Tit, *Parus major* 6(3)/12(11); Coal Tit, *P. ater* 2/1; Marsh Tit, *P. palustris* 6(5)/0; Willow Tit, *P. montanus* 2/0; Long-tailed Tit, *Aegithelos caudatus* 0/2; Nuthatch, *Sitta europaea* 0/2; Treecreeper, *Certhia familiaris* 3/0; Wren, *Troglodytes troglodytes* 6(5)/0; Mistle Thrush, *Turdus viscivorus* 0/1; Redstart, *Phoenicurus phoenicurus* 1/0; Whitethroat, *Sylvia communis* 1/0; Willow Warbler, *Phylloscopus trochilus* 16(15)/0; Chiffchaff, *P. collybita* 2/1; Goldcrest, *Regulus regulus* 3/2; Tree Pipit, *Anthus trivialis* 1/0; Starling, *Sturnus vulgaris* 0/3; Greenfinch, *Carduelis chloris* 7/1; Goldfinch, *C. carduelis* 0/1; Redpoll, *Acanthis flammea* 4/0; Bullfinch, *Pyrrhula pyrrhula* 2/0; Yellowhammer, *Emberiza citrinella* 5/0; Reed Bunting, *E. schoeniculus* 2/0; House Sparrow, *Passer domesticus* 0/4; and Tree Sparrow, *P. montanus* 2/0.

*Haemoproteus turtur*<sup>10</sup> is recorded from the Turtle Dove in Britain for the first time. The two infected Chaffinches were parasitised by *H. fringillae*. The species of *Haemoproteus* found in both the Blackbirds and the Song Thrushes appears to be the same but it is not *H. fallisi* which has been recorded from Blackbirds in England.<sup>4</sup> The latter is characterized by large distinct pigment granules but those reported here are noticeable for the virtual absence of any pigment and are slightly larger, with some displacement of the host cell's nucleus. *Leucocytozoon dubreuilii* was found in Blackbirds and *L. majoris* in Blue Tits. One Garden Warbler harboured a mixed infection with *L.*

*fringillinarum*, *Trypanosoma fringillinarum*, and an unidentified species of *Haemoproteus*. Scanty infections or the presence only of immature stages prevented specific identification of other parasites.

Dr. M. B. Markus supplied 25 blood smears taken from birds at Silwood Park, Berkshire, in May and July 1972. A *Haemoproteus* sp. which was present in one of two Great Tits was not *H. machlolphi* the only species hitherto described from the Paridae, but it resembled *H. orizivora*. Of three smears from Blackbirds, one was parasitized with *H. fallisi* and another with *P. merulae*, which is considered to be a subspecies of the *P. vaughani* complex.<sup>7</sup> Five of seven smears from House Sparrows were infected with *Haemoproteus*. A smear from a Chaffinch contained immature forms of a *Haemoproteus* sp. but no parasites were seen in Starling (5), Robin (4), Blue Tit (1) or Green Woodpecker *Picus viridis* (2). Markus also took 10 smears from birds at Staplecross in Sussex in June 1975. *Atoxoplasma* was present in one of four smears from House Sparrows. *H. fallisi* (?) occurred in one of two Blackbirds, the other being parasitised by both *L. dubreuilii* and trypanosomes. The latter resembled *T. corvi*, which previously has been recorded from Blackbirds in S.E. England.<sup>1</sup>

The list of haematozoa known from British birds (Table 2) is compiled from data in the present paper and from those by Baker<sup>1,2</sup> and Bennett *et al.*<sup>5</sup> Also included are unpublished records (M. A. Peirce) of *Plasmodium matutinum* in Robin, *Plasmodium* sp. in Great Tit, *Haemoproteus* sp. in Peregrine, Magpie and Greenfinch, *Lankesterella* in Dunsack, and microfilariae in Blue Tit.

If the data from Bramham and Bramley are combined, and the prevalences for the different parasite species are collated, then percentage parasitaemias by month of sampling are as follows:— February 4.2, March 3.8, May 15.9, June 10.9, July 11.8, September 11.4, October 3.8 and December 5.5. The infection rates for Silwood Park (May) and Staplecross (June) were 38% and 30% respectively.

TABLE 1. Species found with infections at Bramham and Bramley.

n = no. of smears examined (figures in brackets refer to numbers of individual birds, if different); +ve = no. of birds with infections. L = *Leucocytozoon*; Hg = Haemogregarines; Hp = *Haemoprotoeius*; P = *Plasmodium*; T = Trypanosomes. The percentages are calculated on the basis of the number of birds sampled.

	BRAMHAM						BRAMLEY					
	n	+ve	L	Hg	Hp	T	n	+ve	L	Hg	Hp	P
Turtle Dove, <i>Sireptopelia turtur</i>	1	1			1							
Blue Tit, <i>Parus caeruleus</i>	20(19)	3	3				14(13)	1	1			
Song Thrush, <i>Turdus philomelos</i>	9	2			2		2					
Blackbird, <i>T. merula</i>	17(13)	4	3		1		10(8)	3	2		2	1
Robin, <i>Erithacus rubecula</i>	18(17)	1		1			6	1		1		
Blackcap, <i>Sylvia atricapilla</i>	4	1				1						
Garden Warbler, <i>S. borin</i>	5	3	1		3	1						
Duncock, <i>Prunella modularis</i>	93(81)	3			3		2					
Chaffinch, <i>Fringilla coelebs</i>							5	2			2	
Other species (see text)	73(67)						30(29)					
Totals	240(216)	18	7	1	11	1	69(65)	7	3	1	4	1
Percentages		8.3	3.2	0.5	5.1	0.5	10.8	4.6	1.5	6.1	1.5	

TABLE 2. List of British wild birds from which protozoa parasitic in the blood have been reported.

A = "atoplasms" (haemogregarines including *Lankesterella*);

H = *Haemoproteus* (or *Parahaemoproteus*); L = *Leucocytozoon*;

P = *Plasmodium*; T = *Trypanosoma*.

Peregrine, <i>Falco peregrinus</i>	H*
Red Grouse, <i>Lagopus scoticus</i>	HL
Moorhen, <i>Gallinula chloropus</i>	L
Wood Pigeon, <i>Columba palumbus</i>	HLT
Turtle Dove, <i>Streptopelia turtur</i>	H*
Little Owl, <i>Athene noctua</i>	HT
Tawny Owl, <i>Strix aluco</i>	L
House Martin, <i>Delichon urbica</i>	T
Carrion Crow, <i>Corvus corone</i>	L
Rook, <i>C. frugilegus</i>	ALT
Jackdaw, <i>C. monedula</i>	LPT
Magpie, <i>Pica pica</i>	H*
Jay, <i>Garrulus glandarius</i>	HLT
Great Tit, <i>Parus major</i>	H*P*
Blue Tit, <i>P. caeruleus</i>	LA*
Song Thrush, <i>Turdus philomelos</i>	HLPT
Blackbird, <i>T. merula</i>	HLPT
Robin, <i>Erithacus rubecula</i>	A*P*
Sedge Warbler, <i>Acrocephalus schoenobaenus</i>	H
Blackcap, <i>Sylvia atricapilla</i>	H*
Garden Warbler, <i>S. borin</i>	H*L*T*
Willow Warbler, <i>Phylloscopus trochilus</i>	H
Spotted Flycatcher, <i>Muscicapa striata</i>	HLT
Pied Flycatcher, <i>Ficedula hypoleuca</i>	H
Dunnock, <i>Prunella modularis</i>	A*H*
Starling, <i>Sturnus vulgaris</i>	HL
Greenfinch, <i>Carduelis chloris</i>	H*
Redpoll, <i>Acanthis flammea</i>	T
Chaffinch, <i>Fringilla coelebs</i>	HLT
Yellowhammer, <i>Emberiza citrinella</i>	T
House Sparrow, <i>Passer domesticus</i>	AHP

\* From this paper; other records are from Baker<sup>1,2</sup> and Bennett *et al.*<sup>5</sup>

The results show an expected low patency during the winter, when most infections follow a chronic phase, and can also be related to the activities of vectors.<sup>2</sup> These are poorly documented in the British Isles although *Simulium angustitarse* has been shown to transmit *L. sakharoffi* in England.<sup>1</sup> In addition *Ornithomya avicularia* is known to be a vector of *T. avium* and *H. palumbis* in Britain<sup>1</sup> and is most abundant in July and August,<sup>11</sup> and so the following records of this and other species of hippoboscid flies taken from birds in the present study are of interest. Those host species marked with an asterisk were not recorded as such by Hill.<sup>10</sup> At Bramham, *O. avicularia* were taken from Blackbird and Song Thrush, while *O. fringillina* occurred on Blackcap, Robin and Dunnock. At Bramley *O. fringillina* were taken from Great Tit, Blue Tit, Wren\*, Robin and Treecreeper\*; *Crataerina (Stenopteryx) hirundinis* were recorded from House Martins and *O. avicularia* were taken from Blackbird, House Sparrow, Song Thrush and Collared Dove\*, *Streptopelia decaocto*.

It is possible that any seasonal trends in the prevalence of the blood parasites may be reflecting latent periods. Since relapses of *L. dubreuilii* infections in American Robins, *Turdus migratorius* are known to occur,<sup>12</sup> and are not pathogenic,<sup>13</sup> the results of series of smears from two infected Blackbirds are of interest. One bird was infected with *Leucocytozoon* on 10 May 1972 but no parasites were detected in smears on 3 June and 2 September 1972, although a light

infection was noted on 25 February 1973. The bird was still present at Bramham on 19 August 1974, but no smear was taken. The second Blackbird which was trapped at Bramley with heavy *L. dubreuilii* infections on 13 May and 19 September 1972, was caught again on 30 December 1975 when a scanty infection of *L. dubreuilii* and schizonts of a *Plasmodium* sp. were found.

Although there is some evidence that heavy infections of avian haemoprotozoa can be pathogenic,<sup>9,15</sup> little is known of their effects. None of the infected birds handled in the present study showed any signs of ill-health. Although some parasites, *H. palumbis* in Britain for example,<sup>2</sup> are host specific others such as *P. (Haemamoeba) relictum* have been recorded from 150 different host species.<sup>9</sup> Therefore, if suitable vectors are present, ecological changes such as shifts in bird migration patterns could have considerable influence on the parasite fauna of British birds. Markus<sup>14</sup> has suggested that blood parasites may be responsible for the restricted distribution of some bird species such as those confined to tropical montane forests.

Bennett *et al.*<sup>5</sup> drew attention to the low levels of avian haemoprotozoa in England and Wales compared with their prevalence in North America. The results presented here also suggest that English birds are not heavily parasitised. Nevertheless such broad generalisations should be treated with caution in the light of variations in infection rates according to season.

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