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A GENERAL SURVEY OF BLOOD PARASITES OF BIRDS FROM KUWAIT

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Abstract. Seven hundred birds of 84 species or subspecies (from 40 genera, 22 families and 11 orders) were collected from various regions in Kuwait, from January, 1971 to September, 1973, and examined for haematozoa. Blood parasites were detected in 259 birds (37%) harbouring 306 infections (221 pure, 28 double and 10 triple): *Haemoproteus (sensu lato)* in 223 birds (31.8%) belonging to 33 species or subspecies (19 genera, 10 families and 5 orders). *Leucocytozoon (s. lato)* in 22 birds (3.14%) belonging to 12 species or subspecies (9 genera, 5 families and 3 orders); *Plasmodium, Lankesterella* and *Trypanosoma* were detected only in birds of the order Passeriformes : *Plasmodium* in 19 birds (2.71%) belonging to 10 species (9 genera and 5 families), *Lankesterella* in 13 birds (1.85%) belonging to 8 species (5 genera of 4 families), and *Trypanosoma* in 3 birds (0.43%) belonging to 3 species (3 genera of 2 families); "Microfilariae" in 26 birds (3.7%) belonging to 17 species (13 genera, 7 families and 3 orders).

Comparisons were made regarding the relative incidence of haematozoa in general and of the various genera of parasites in the various orders of birds concerned and in the various families of the Passeriformes. Again, results of the present survey are analysed in various ways and compared with those of certain selected surveys especially from Egypt, Norway, United States, Labrador, Panama and Australia. Relevant comments and plausible inductions are presented. The data obtained seem to confirm that, other factors being equal, the migration of a bird increases its chances to acquire infection with blood parasites.

All parasitic infections reported in the present paper are new host and parasite records for Kuwait.

INTRODUCTION

A summary of results of the first general survey of blood parasites of birds from Kuwait is presented in this paper. In addition to furnishing essential basic knowledge for teaching and research, urgently needed in the rapidly developing University of Kuwait, the value of such a study certainly extends beyond local interests. It helps to complete the general picture of the world distribution of genera and species of parasites concerned and also leads to the discovery of new organisms and gaining new facts. All parasitic infections reported in the present work are new host and parasite records for this region. Detailed studies, including the recording of new genera or species of hosts for certain parasites as well as the description of some new parasites, will be published in other papers to follow.

MATERIAL AND METHODS

Birds were obtained from various regions in Kuwait over a period of more than thirty months (January, 1971 to September, 1973). They were mostly captured alive by trapping or netting, but a few were shot. One to five, usually three, blood films were prepared from each bird and, whenever possible, smears of internal organs were also prepared from recently dead or sacrificed birds. Some birds were regularly examined for the duration of their captivity. Air-dried films and smears were fixed in absolute methanol and stained in Giemsa's stain according to procedures recommended by Mohammed (1958) which generally implied a longer staining period and/or a more concentrated staining solution than those generally recommended. Material treated as such invariably showed clear contrast between parasites and cells of the host and revealed more structural details with no undesirable overstaining.

A stained blood-film from each case was examined for at least 20 minutes, under an oil-immersion objective and using both 10X and 12.5X oculars before being discarded as negative. However, most positive slides were examined for much longer periods of time in search for mixed infections or for detailed study. Sometimes, films smeared with oil were scanned with a dry medium-power objective for the detection of the relatively larger parasites. Occasionally, fresh blood preparations were also examined.

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Results

Table 1 gives a summary of the numerical data related to the incidence of haematozoa in the 700 birds examined and reported on in the present paper. The table lists 83 species (or subspecies) of birds related to 40 genera representing 22 families belonging to 11 orders. Thus, this collection exhibits a wide range of variety of hosts. As to the parasites, the table includes data related to them only as genera (or "provisional" groups).

Out of these 700 birds, 259 (or 37%) were found by the methods adopted, harbouring blood stages of haematozoa. Owing to the presence of mixed infections in some cases, these 259 positive cases included in fact 306 infections (221 pure, 28 double and 10 triple infections).

Haemoproteus (sensu lato) was by far the most prevalent parasite while all the other haematozoa follow after a very wide gap: Microfilariae, *Leucocytozoon (sensu lato), Plasmodium, Lankesterella* and *Trypanosoma* - in this descending order. If we consider the number of species or subspecies found infected by these six groups of parasites, their descending order will be the same as precedent, with the single exception of *Plasmodium* and *Lankesterella* exchanging their places. Naturally, 194 of the 221 pure infections were *Haemoproteus,* i.e. gametocytes of these parasites were the only haematozoa detected in about 31.8% of the birds examined. *Haemoproteus* was again a common factor in all the double and triple mixed infections.

Table 2 presents the data obtained related to the orders to which the birds examined belong. Since the order Passeriformes includes most of the birds surveyed (573 out of 700) which were also the hosts for a full range of variety of parasites, this order is split into the families concerned in Table 3.

Discussion and Conclusions

The numerical data presented in Tables 1, 2 and 3 should be interpreted with due reservation. Due to various natural or practical reasons, the number of birds obtained from certain species, or indeed of some higher taxa, was too small to allow for the induction of significant generalisations. However, this is not the case with certain species of the Columbiformes and Passeriformes, as will be discussed below. Again, due to various reasons the recorded incidence of haematozoa is only relative. The number of parasites falls greatly in the later chronic phases of infection so that they may be overlooked even after a careful and lengthy examination. Moreover, certain parasites have a special preference for certain tissues or organs of the body. During the present survey the two cases of microfilariae recorded from the Masked Shrike, *Lanius nubicus,* and the Great Reed Warbler, *Acrocephalus arundinaceus,* were detected only in lung smears. Huizinga *et al.* (1971) found microfilariae and adult worms within the walls of the pulmonary arteries in about 20% of house sparrows examined by them in Illinois, U.S.A. However, in such cases a nocturnal rhythm of appearance in peripheral blood is most probably involved.

Interests of surveyors, scopes set up and techniques adopted by them vary so widely that only a few surveys are comparable with the present one. Nevertheless, such comparisons, wherever possible, are of great value and may lead to significant generalisations. Table 4 shows a comparison between the relative incidence of haematozoa in the present survey and five selected ones. The latter were made in the continents of Asia, Africa, Europe, as well as North and South America. (Unfortunately the presentation of the extensive survey made by Mackerras and Mackerras (1960) of the haematozoa from Australian birds, does not allow for its inclusion in the table). This selection also brings together a wide variety of habitats ranging between arid coastal conditions with scattered low vegetation in Kuwait, the lower part of the Nile Valley surrounded by desert areas in Egypt, an evergreen broad-leaf tropical forest in Panama, a locality in Norway with abundant mosquitoes, black flies and biting midges, etc. The fact that Kuwait and Egypt are passage or wintering grounds for migratory birds calls for special attention.

With the single exception of the Norwegian survey, the general incidence of haematozoa in the present survey is the highest. The determining factor in the latter was the relative incidence of *Haemoproteus,* which was the highest among all the surveys compared. Reviewing eighteen surveys, Mohammed (1958) found that *Haemoproteus* was "by far the commonest haemosporidian parasite in birds." The incidence of *Leucocytozoon* in the Norwegian and the Canadian surveys was exceptional. However, such markedly high rates of *Leucocytozoon* could not possibly be related to any variation in technique, but may be attributed to favourable transmission conditions, particularly the abundance of suitable

vectors. Bennett (1972) found that species of *Leucocytozoon* were the most commonly encountered parasites in birds from Labrador and this suggested to him that simuliids were the dominant vectors in that region. On the other hand, the very low incidence of *Leucocytozoon* in Egypt (0.5%) was thought by Mohammed (1958) to be due to the absence of simuliids in the area surveyed.

The relative incidence of *Plasmodium* in the present survey is one of the lowest records for the genus. As will be mentioned at the end of this discussion, the plasmodial infections in the house sparrow must have been acquired in Kuwait, since this bird is a well-known resident. Even in this case, other causes, such as climatic conditions and low vector potential of the culicine mosquitoes concerned, could be the limiting factors.

With the exception of the Norwegian and Canadian surveys, the incidence of *Trypanosoma* is very low, though lowest in Kuwait. In contrast to the case of *Leucocytozoon,* the high incidence of *Trypanosoma* in the former two surveys is apparently mainly due to the techniques of investigations adopted. Thus "..... cultural work in progress", mentioned by Eide *et al.* (1969) may explain the high incidence of trypanosomes in the Norwegian survey.

Lankesterella was recorded only in the Egyptian and Kuwaiti surveys. Since these parasites have been recorded from various parts of the world, their absence in the other four surveys tabulated here may be attributed to the fact that these parasites are usually detectable in smears of internal organs and rarely in peripheral blood, and frequently after lengthy microscopical examinations. Similarly, but in a different way, detection of microfilariae depends on the method of examination. These relatively larger organisms are better detectable through scanning by a medium-power magnification, a procedure usually neglected as stained and uncovered blood films are examined by an oil immersion objective.

The present survey may be compared with a few others in another respect; namely, the relative incidence of multiple infections (Table 5). It is clear from this table that although the relative incidence of blood parasites in the Kuwaiti survey is about equal to that in the Egyptian survey, it should be noted that both have reached this level in two different ways: in the Egyptian survey through a higher incidence of multiple infection, while in the Kuwaiti survey through a general higher incidence of infection. However, both are considerably higher as regards the general percentage of infection than the Columbian survey.

Five out of seven birds of the Falconiformes (or 71.4%) were found positive for *Haemoproteus*. However, the incidence was 100% in two species of *Falco* found as hosts for *Haemoproteus*. Mohammed (1958) recorded an incidence of 18% for this genus of parasites in this order of birds in Egypt, but the incidence mounted to 91.0% for *Falco n. naumanni,* in particular. Stabler and Holt (1965) found an incidence of 48.3%* for blood parasites in the Falconiformes in Colorado but the incidence of *Haemoproteus* in this order was 29.5%. In the extensive survey made by Galindo and Sousa (1966) in birds from Panama, the positive cases among the Falconiformes were 28.6%, of which 19% were *Haemoproteus*. It should be mentioned that in the three surveys mentioned above, parasites other than *Haemoproteus* were also recorded.

For the order of pigeons and doves, the Columbiformes, the relative incidence of blood parasites was rather low (17.9% - Table 2), but if we exclude 38 domestic pigeons and 9 collared doves (which were all negative), we shall find that the incidence is actually remarkably high among the turtle doves (60%) which harboured *Haemoproteus, Leucocytozoon* and microfilariae. On the other hand, Mohammed (1958) found that 70% of the domestic pigeons he examined in Egypt were positive for *Haemoproteus columbae*. In a rather extensive survey of columbids in Colorado, Stabler and Holt (1961) found that 73.5% of 464 birds examined harboured blood parasites (mostly *Haemoproteus*). In Panama, Galindo and Sousa (1966) recorded an incidence of 34.1% (again mostly with *Haemoproteus*).

In the order Coraciiformes all 5 hoopoes and the two Persian bee-eaters examined were negative, while all 3 rollers and 2 out of 3 European bee-eaters examined were positive; the general relative incidence in birds of this order was 41.6%. The incidence in these birds was 18.3% in Egypt (Mohammed 1958) and 23.1% in Panama (Galindo and Sousa 1966).

The present survey, as well as many surveys in other countries, is virtually one of the Passeriformes, since more than 80% of the birds examined and about 37.3% of the species repre-

* In this and many other instances mentioned here, the incidence is calculated from data given by the original authors.

sented belong to this large and widely spread group of birds. This good representation makes the results more reliable than in other orders of birds. However, the wide variety of praasites detected (belonging to all groups concerned) does not seem to be the result of only raising the chance of their incidence in the large number of birds examined; the order seems to be particularly susceptible. It may be noted that in the present survey *Plasmodium, Lankesterella* and microfilariae were recorded only in birds of this order. Compared to the 41.1% incidence of haematozoa recorded here in Kuwaiti passerine birds (573) are the following: 45.0% (of 342 passerines) in Egypt (Mohammed 1958), 27.5% (of 2687 passerines) in Panama (Galindo and Souza 1966), 51% (of 1361 passerines) from Colorado (Stabler and Kitzmiller 1970).

Because of the large number of samples available, four families of the Passeriformes (Table 3) deserve special attention: the Turdidae, Sylviidae, Laniidae and Passeridae. In the first three the incidence was relatively high and the variety of parasites was wide. In the first two, all types of haemtozoa concerned were detected, while in the third (Laniidae) only trypanosomes were not observed. On the contrary, the fourth family (Passeridae) had a very low incidence and with only one genus of parasites (*Plasmodium*). In the Turdidae, the incidence of infection was 77.7% in Colorado (Stabler and Kitzmiller 1970), but the corresponding figure was 13.8% in Panama (Galindo and Sousa 1966). In Kuwait the incidence in that family was nearer to the higher figure (being 47.6%). However, in the Sylviidae, the picture is very different. This group of birds was very poorly represented in the Colorado and Panama surveys and the incidence was nil (as compared to 36.1% in Kuwait).

In Kuwait, the family of shrikes showed a high incidence (56.4%), though the number of birds was small. A somewhat similar result was obtained in the Colorado survey (33.3%), but the Panama survey did not include any representative of the family. In Egypt, the incidence of infection was 14.3% in the great grey shrike, the only representative examined (Mohammed 1958). It should be mentioned, however, that the comparisons pointed to above should be considered with due reservation, since the genera of birds involved were mostly very different. However this is not the case with the house sparrow (family Passeridae) in which the incidence of infection in Kuwait was very low, while the corresponding figure was much higher in many other surveys. This point is also relevant to the question of incidence in migratory and non-migratory species of birds.

Migration of birds is a marvellous phenomenon that has attracted the attention of scientists in many respects. Garnham (1966) stated that the cosmopolitan and varied distribution of avian malaria could easily be explained by the vast migratory flights of birds. Mohammed (1958) discussed the relation between the migratory habits of birds and the incidence of blood parasites in them. He pointed to a theory presented earlier by Manwell and Herman (1935) stating that migratory birds were much more frequently hosts to blood protozoa than were non-migratory species. Micks (1949) criticised this conclusion on the account of the fact that while 7% was the average incidence of malarial parasites (in 9577 birds studied in 24 surveys by various authors), 11% of non-migratory birds studied by him were found infected with Plasmodia. Garnham (1966) again noticed that Manwell and Herman's conclusion was not supported by the results of all surveys, "either in North America or in the Old World; Mohammed (1958) observed an almost equal incidence of blood parasites in the two groups of birds in Egypt." As a matter of fact the matter needs further elucidation, since Mohammed (1958) also noticed that if only species of both groups, known to harbour blood parasites were considered, the incidence would be significantly higher in migratory birds. Mohammed also pointed to the fact that Micks had not taken into consideration the difference in natural susceptibility of various species of migratory and nonmigratory birds to infection with blood parasites. Furthermore, Mohammed argued: "One can imagine, however, that if a number of English sparrows were forced to migrate to different environments, they would acquire more infections than an equal number of their own species left in their breeding home locality would do".

However, the results obtained in the present survey may be used to test these various hypotheses. We may select the house sparrow and the domestic pigeon as two species undoubtedly non-migratory and also represented by a reasonably large number of samples. The domestic pigeon is well known to harbour *Haemoproteus columbae* in various parts of the world and in very high rates of infection in many localities. On the other hand, none of 38 pigeons examined in Kuwait showed any blood parasites. Pigeon flies were not found on those pigeons or in places where they were bred. As a matter of fact no

hippoboscid flies were found on any of the birds collected and examined in the present survey.

The house sparrow is also well known to be susceptible to a variety of blood parasites. Mohammed (1958) found that about 60% of these birds in Egypt had blood parasites; the incidence rose to over 80% in adult birds and mixed infections were common (with *Plasmodium, Haemoproteus, Lankesterella, Trypanosoma* and microfilariae). Mackerras and Mackerras (1960) found that 10 out of 180 house sparrows examined by them in Australia had *Plasmodium relictum.* Box (1966) found that 42% of house sparrows in Texas were infected with *Plasmodium,* and 20% with *Lankesterella.* (The latter figure rose to about 95% in birds examined after autopsy). Stabler and Kitzmiller (1970) found that out of 69 house sparrows from Colorado examined by them only three were infected with haematozoa (trypanosomes, *Haemogregarina sensu lato* and microfilaria). In Kuwait, only 6 out of 84 house sparrows were found to harbour *Plasmodium.*

This comparison would point to the following fact: A species of non-migratory birds, well known to be susceptible for a wide variety of blood protozoa, shows such a great qualitative and quantitative variation in its blood parasites. Of course various subspecies of house sparrows are involved, but it seems that the determining factors are those related to the local environment in which the birds live. Susceptible non-migratory birds would acquire the infection from birds migrating to their habitats but only if suitable vectors were present and other ecological conditions were favourable (Mohammed 1958; Garnham 1966).

The chances for a migratory bird to acquire infection with blood parasites seem greater, but this would naturally depend on when, and from and to whence it migrates. To elucidate this point we may consider the observations made by Manwell (1955) on sparrows in Syracuse, New York. The high incidence of malaria in the migratory song sparrow seemed to have been acquired during their wintering in the south, while the relative freedom of the non-migratory house sparrow from blood parasites seemed to be due to its permanent residence in the north. Manwell noticed that malaria rate had been found much higher among house sparrows in warmer climates, both in the New and Old World. However, we may add that although avian malaria and the suitable vector(s) are present in Kuwait, yet the very low incidence in the house sparrow suggests that climatic and other ecololigal conditions are not favourable for the wide diffusion of malaria among these birds.

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TABLE 1. The relative incidence of haematozoa in birds from Kuwait

Birds		Infections													
Systematic Position and Scientific Name	Common English Name	Total			Haemoproteus		Leucocytozoon		Plasmodium		Lankesterella		Trypanosoma		Microfilariae	
		Ex.	Positive													
			No.	%	No.	%	No.	%	No	%	No.	%	No.	%	No.	%
Ord. PELECANIFORMES																
Fam. Phalacrocoracidae																
Phalacrocorax sp.	Cormorant	1	0	0.0												
Ord. CICONIFORMES																
Fam. Ardeidae																
Ardea purpurea L.	Purple Heron	1	0	0.0												
Ixobrychus minutus (L.)	Little Bittern	5	0	0.0												
Nycticorax nycticorax (L.)	Night Heron	1	0	0.0												
Ord. FALCONIFORMES																
Fam. Falconidae																
Hieraaëtus fasciatus (Vieillot)	Bonelli's Eagle	1	0	0.0												
Falco biarmicus Schlegal	Lanner Falcon	1	0	0.0												
Falco naumanni Fleischer	Lesser Kestrel	2	2	100.0	2	100.0	—		—		—		—		—	
Falco tinnunculus L.	Kestrel	2	2	100.0	2	100.0	—		—		—		—		—	
Eagle ?		1	1	100.0	1	100.0	—		—		—		—		—	
Ord. GALLIFORMES																
Fam. Phasianidae																
Coturnix coturnix L.	Quail	1	0	0.0												
Francolinus francolinus (L.)	Black Partridge	1	0	0.0												
Ord. RALLIFORMES																
Fam. Rallidae																
Crex crex (L.)	Corn-crake	3	0	0.0												
Gallinula chloropus (L.)	Moorhen	1	0	0.0												
Porzana porzana (L.)	Spotted Crake	6	0	0.0												
Ord. CHARADRIIFORMES																
Fam. Charadriidae																
Charadrius alexandrinus L.	Kentish Plover	8	0	0.0												
Charadrius dubius Gmelin	Little Ringed Plover	1	0	0.0												
Fam. Scolopacidae																
Tringa hypleucos L.	Common Sand Piper	2	0	0.0												
Fam. Laridae																
Larus canus L.	Common Gull	1	0	0.0												
Larus ridibundus L.	Black-headed Gull	3	0	0.0												
Sterna albifrons Pallas	Little Tern	1	0	0.0												
Sterna anaethetus fullgula Lichtenstein	Bridled Tern	1	0	0.0												
Ord. COLUMBIFORMES																
Fam. Columbidae																
Columba livia domestica (Zarudny & Loudon)	Domestic Pigeon	38	0	0.0												
Streptopelia decaocto (Frivaldszky)	Collared Dove	9	0	0.0												
Streptopelia t. arenicola (L.)	Turtle Dove - Eastern Form	1	1	100.0	1	100.0	—		—		—		—		—	
Streptopelia t. turtur (L.)	Turtle Dove	19	11	57.9	11	57.9	2	10.5	—		—		—		2	10.5

Ex. = Examined

No. = Number

TABLE 1 (Cont'd). The relative incidence of haematozoa in birds from Kuwait

Birds		Infections															
Systematic Position and Scientific Name	Common English Name	Total			Haemoproteus		Leucocytozoon		Plasmodium		Lankesterella		Trypanosoma		Microfilariae	
		Ex.	Positive													
			No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Ord CAPRIMULGIFORMES																
Fam. Caprimulgidae																
Caprimulgus europaeus L.	Nightjar	3	0	0.0												
Ord. CORACIIFORMES																
Fam. Meropidae																
Merops apiaster L.	European Bee-eater	3	2	66.6	1	33.3	—		—		—		—		1	33.3
Merops superciliosus persicus Pallas	Persian Bee-eater	2	0													
Fam. Coraciidae																
Coracias garrulus L.	Roller	3	3	100.0	3	100.0	3	100.0	—		—		—		2	66.6
Fam. Upupidae																
Upupa e. epops L.	Hoopoe	5	0	0.0												
Ord. PICIFORMES																
Fam. Picidae																
Jynx torquilla L.	Wryneck	1	1	100.0	1	100.0	—		—		—		—		—	
Ord. PASSERIFORMES																
Fam. Alaudidae																
Alaemon alaudipes (Desfontaines)	Bifasciated Lark	6	1	16.6	—		—		1	16.6	—		—		—	
Galerida cristata (L.)	Crested Lark	6	1	16.6	—		—		1	16.6	—		—		—	
Fam. Oriolidae																
Oriolus oriolus (L.)	Golden Oriole	2	0	0.0												
Fam. Turdidae																
Irania gutturalis (Guerin)	White-throated Robin	4	0	0.0												
Luscinia megarhynchos Brehm	Nightingale	21	19	90.5	19	90.5	1	4.76	—		—		1	4.76	2	9.5
Monticola saxatilis (L.)	Rock Thrush	5	3	60.0	3	60.0										
Oenanthe deserti atrogularis Blyth	Desert Wheatear	2	0	0.0												
Oenanthe hispanica (L.)	Black-eared Wheatear	2	0	0.0												
Oenanthe isabellina (Temminck)	Isabelline Wheatear	1	0	0.0												
Oenanthe leucura Heuglin	Black Wheatear	1	0	0.0												
Oenanthe lugens (Lichtenstein)	Mourning Wheatear	1	1	100.0												
Oenanthe oenanthe (L.)	Wheatear	14	0	0.0	—		—		—		1	100.0	—		—	
Oenanthe pleschanka (Lepechin)	Pied Wheatear	5	0	0.0												
Phoenicurus ochruros (Gmelin)	Black Redstart	1	0	0.0												
Phoenicurus phoenicurus (L.)	Redstart	85	44	51.7	39	45.88	5	5.88	5	5.88	—		1	1.17	2	2.3
Saxicola rubetra (L.)	Whinchat	3	3	100.0	2	66.6	1	33.3	1	33.3	—		—		1	33.3
Saxicola torquata (L.)	Stonechat	1	0	0.0												
Turdus philomelos Brehm	Song Thrush	1	0	0.0												
Fam. Sylviidae																
Acrocephalus arundinaceus L.	Great Reed Warbler	7	2	28.57	1	14.28	1	14.28	—		1	14.28	—		2	28.6
Acrocephalus schoenobaenus (L.)	Sedge Warbler	3	2	66.6	1	33.3	—		1	33.3	1	33.3	—		—	
Acrocephalus scirpaceus (Hermann)	Reed Warbler	1	0	0.0												
Cettia cetti orientalis (Tristram)	Cettis Warbler	1	1	100.0	1	100.0	—		—		—		—		—	
Erythropygia galactotes (Jemminck)	Rufous Warbler	2	0	0.0												
Hippolais olivetorum Strickl	Olive-tree Warbler	3	1	33.3	1	33.3										
Hippolais pallida (Lindermayer)	Olivaceus Warbler	3	1	33.3	—		1	33.3	—		—		—		1	33.3

Ex. = Examined

No. = Number

TABLE 1 (Cont'd). The relative incidence of haematozoa in birds from Kuwait

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Systematic Position and Scientific Name	Common English Name	Total			Haemoproteus		Leucocytozoon		Plasmodium		Lankesterella		Trypanosoma		Microfilariae	
		Ex.	Positive													
			No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No	%
Ord. PASSERIFORMES (Cont'd)																
Fam. Sylviidae (Cont'd)																
Locustella luscinioides (Savi)	Savi's Warbler	1	0	0.0												
Luscinioia melanpogen mimica Madarasz	Moustached Warbler	12	6	50.0	5	41.66	—		—		—		—		2	16.6
Phylloscopus collybita (Vieillot)	Chiffchaff	5	3	60.0	1	20.0	—		—		2	40.0	—		1	20.0
Phylloscopus sibilatrix (Bechstein)	Wood Warbler	3	2	66.6	1	33.3	—		—		—		1	33.3	—	—
Phylloscopus trochilus (L.)	Willow Warbler	19	6	31.57	5	26.31	—		1	5.26	—		—		2	10.52
Sylvia atricapilla (L.)	Blackcap	3	1	33.3	—		1	33.3	—		—		—		—	
Sylvia borin (Boddaert)	Garden Warbler	7	2	28.57	—		—		—		2	28.57	—		—	
Sylvia communis (Latham)	Whitethroat	19	6	31.57	4	21.05	1	5.26	—		1	5.26	—		2	10.5
Sylvia curruca (L.)	Lesser Whitethroat	4	2	50.0	2	50.0	1	25.0	—		—		—		—	
Sylvia hortensis (Cretzschmar)	Orphean Warbler	1	0	0.0												
Sylvia hortensis crassirostris (Cretzschamr)	Orphean Warbler	3	2	66.6	2	66.6	—		—		—		—		—	
Sylvia nana (Henptich & Ehrenberg)	Desert Warbler	6	1	16.60			—		1	16.6	—		—		—	
Sylvia nisoria (Bechstein)	Barred Warbler	5	1	20.0	1	20.0	—		—		—		—		—	
Fam. Muscicapidae																
Muscicapa striata (Pallas)	Spotted Flycatcher	8	6	75.0	6	75.0	—		—		—		—		—	
Fam. Motacillidae																
Anthus campestris (L.)	Tawny Pipit	1	1	100.0	—		—		—		—		—		1	100.0
Anthus cervinus (Pallas)	Red-throated Pipit	6	1	16.6	1	16.6	—		—		—		—		—	
Anthus pratensis (L.)	Meadow Pipit	1	0	0.0												
Anthus spinoletta Savigny	Water Pipit	2	0	0.0												
Motacilla flava L.	Yellow Wagtail	7	1	14.28	1	14.28	—		—		—		—		—	
Fam. Laniidae																
Lanius cristatus collurio L.	Red-backed Shrike	138	82	59.42	78	56.52	4	2.89	1	0.72	4	2.9	—		1	0.72
Lanius c. isabellinus (Hemprich & Ehrenberg)	Isabelline Shrike	19	10	52.63	10	52.63	—		—		—		—		—	
Lanius c. phoenicuroides (Schalow)	Rufous Red-tailed Shrike	4	2	50.0	2	50.0	1	25.0	—		—		—		—	
Lanius excubitor L.	Great Grey Shrike	1	0	0.0												
Lanius minor Gmelin	Lesser Grey Shrike	11	3	27.27	2	18.18	—		1	9.1	1	9.1	—		1	9.0
Lanius nubicus (Lichtenstein)	Masked Shrike	6	6	100.0	6	100.0	—		—		—		—		2	33.3
Lanius senator L.	Woodchat Shrike	16	7	43.75	7	43.75	—		—		—		—		1	6.25
Fam. Ploceidae = Passeridae																
Passer domesticus bibilicus Hartert	House Sparrow	84	6	7.14	—		—		6	7.14	—		—		—	
	TOTAL	700	259	37.0	223	31.8	22	3.14	19	2.71	13	1.85	3	0.43	26	3.71

Ex. = Examined

No. = Number

TABLE 2. The relative incidence of haematozoa in the orders of birds from Kuwait

ORDER	Birds					Infections											
	No. of spp. or subspp.		No. Examined	Positive		Haemoproteus		Leucocytozoon		Plasmodium		Lankesterella		Trypanosoma		Microfilariae	
	Represented	+ve		No	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Pelecaniformes	1	0	1	0	0.0												
Ciconiformes	3	0	7	0	0.0												
Falconiformes	5	3	7	5	71.4	5	71.4	—		—		—		—		—	
Galliformes	2	0	2	0	0.0												
Ralliformes	3	0	10	0	0.0												
Charadriiformes	7	0	17	0	0.0												
Columbiformes	4	2	67	12	17.9	12	17.9	2	2.90	—		—		—		2	2.9
Caprimulgiformes	1	0	3	0	0.0												
Coraciiformes	4	2	12	5	41.6	4	33.3	3	25.00	—		—		—		3	25.0
Piciformes	1	1	1	1	100.0	1	100.0			—		—		—		—	
Passeriformes	53	34	573	236	41.1	201	35.0	17	2.90	19	3.31	13	2.20	3	0.52	21	3.6
TOTAL	84	42	700	259	37.0	223	31.8	22	3.14	19	2.70	13	1.85	3	0.43	26	3.7

TABLE 3. The relative incidence of haematozoa in families of the order Passeriformes in Kuwait

FAMILY	Birds					Infections											
	No. of spp. or subspp.		No. Examined	Positive		Haemoproteus		Leucocytozoon		Plasmodium		Lankesterella		Trypanosoma		Microfilariae	
	Represented	+ve		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Alaudidae	2	2	12	2	16.60	—		—		2	16.60	—		—		—	
Oriolidae	1	0	2	0	0.0												
Turdidae	15	5	147	70	47.60	63	42.80	7	4.8	6	4.10	1	0.68	2	1.30	5	3.4
Sylviidae	21	16	108	39	36.10	25	23.10	5	4.6	3	2.70	7	6.48	1	0.92	10	9.2
Muscicapidae	1	1	8	6	75.00	6	75.00	—		—		—		—		—	
Motacillidae	5	3	17	3	17.64	2	11.70	—		—		—		—		1	5.8
Laniidae	7	6	195	110	56.40	105	53.80	5	2.5	2	1.02	5	2.50			5	2.5
Passeridae	1	1	84	6	7.10	—		—		6	7.10	—		—		—	
TOTAL	53	34	573	236	41.10	201	35.00	17	2.9	19	3.30	13	2.20	3	0.52	21	3.6

TABLE 4. The relative incidence of blood parasites in the present and some other selected surveys

Author(s) and Locality	The Present Work Kuwait	Mohammed (1958) Egypt	Eide et al. (1969) Norway	Galindo and Sousa (1966) Panama	Hunninen & Young (1950) Columbia (U.S.A.)	Bennett and Fallis (1960) Canada
Total number Exd.	700.00	885.0	531.0	3634.0	737.0	1954.0
% +ve	37.00	31.0	70.0	25.5	27.5	?
Haemoproteus %	31.80	22.0	11.0	16.2*	11.0*	14.0
Leucocytozoon %	3.14	0.5	56.0	4.2*	3.5*	39.0
Plasmodium %	2.71	13.0	0.6*	6.4*	17.5	1.0
Trypanosoma %	0.43	1.0	30.0	1.4*	0.5*	29.0
Lankesterella %	1.85	1.5	—	—	—	—
Microfilariae %	3.71	0.7	1.7*	6.2*	—	4.0

* Calculated from figures given in the original.
Exd. : Examined.

TABLE 5. The phenomenon of multiple infection in Columbia, Egypt and Kuwait

Locality and Author	Total No. of birds examined	Positive		Infections		Multiple Infections			
		No.	%	No.	%	Double	Triple	Quadruple	Quintuple
Columbia (U. S. A.) : Hunninen & Young (1950)	737	203	27.50	250	33.92*	38	1	1	—
Egypt : Mohammed (1958)	885	277	31.29	393	44.77*	54	16	6	2
Kuwait : The present work	700	259	37.00	306	43.71	28	10	—	—

* Calculated from data given in the original

مسح عام لطفيليات الدم في طيور الكويت

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قسم علم الحيوان بجامعة الكويت

خلاصـــــة

يعرض هذا المقال خلاصة لنتائج اول بحث يجري لدراسة طفيليات الدم في الطيور الآبدة في الكويت أو التي ترتاده مهاجرة أو عابرة ، ومن ثم فان جميـع الطفيليـات وعوائلها مما أسفرت عنه هذه الدراسة يعتبر تسجيلات جديدة . والحاجة الى هذه النتائج ماسة لانها من أساسيات الدراسة والبحث العلمي في جامعة الكويت الآخـذة في النمو السريع ، فضلا عن ارتباطها الوثيق بكثير من المجالات الاكاديمية العامة .

وقد شمل البحث ٧٠٠ طائر من ٨٤ نوعا أو نويعا تنتمي الى ٤٠ جنسا و ٢٢ فصيلة و ١١ رتبة . وقد كانت نسبة الاصابة بها ٣٧٪ ، اما الطفيليات التي اكتشفت فيها فكانت كما يلي : هيموبروتيوس في ٢٥٩ طائرا (٣١ر٨٪) ، ليو كوسيتوزون في ٢٢ طائرا (٣ر١٤٪) ، يرقانات الميكروفيلاريا في ٢٦ طائرا (٣ر٧٪) ، بلازموديوم في ١٩ طائرا (٢ر٧١٪) ، لانكستيريلا في ١٣ طائرا (١ر٨٥٪) ، تريبانوسوما في ثـلاثة طيور وحسب (٠ر٤٣٪) .

وقد عقدت موازنات بين نسبة الاصابة بطفيليات الدم عامة ، وبكل من أجناسهـا المختلفة على حدة في رتب الطيور المختلفة ، وفي الفصائل المنتمية الى رتبةالعصفوريات بالذات . وكذلك وازن المؤلفان بين نتائج هذا البحث وبحوث مماثلة في بقاع مختلفـة من العالم ، وعلى الاخص في مصر والنرويج والولايات المتحدة الامـريكية ولابرادور وبناما وأستراليا ، ثم تناولا هذه الموازنات بالتحليل والتعليق ومحاولة استخـلاص النتائج المنطقية العامة . ويبدو أن الادلة الواردة في هذا البحث تؤيد النظرية القائلة بأن هجرة الطيور تزيد من فرص تعرضها للعدوى بطفيليات الدم المختلفة .

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