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Haemoproteids and microfilariae in hawfinches in the Czech Republic

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Summary

One to three out of four different species of protozoan parasites were detected in ten individual hawfinches (*Coccothraustes coccothraustes* Linnaeus, 1758) as follows: *Haemoproteus fringillae* (Labbé, 1894), *Leucocytozoon dubreuili* Mathis et Léger, 1911, *L. fringillinarum* Woodcock, 1910, and *L. majoris* (Laveran, 1902). In addition, one hawfinch brought to the veterinary clinic was also examined but this bird died after three days. The following parasites were found in the blood sample of this bird: *H. fringillae*, *L. dubreuili*, *L. fringillinarum* and microfilaria *Ornithofilaria mavis* Leiper, 1909. Blood count examination revealed leukocytosis (heterophilia, basophilia and monocytosis). This bird might have died of the infection with the nematode *Ornithofilaria mavis*.

Key words: haematology; *Haemoproteus*; *Leucocytozoon*; *Ornithofilaria mavis*; *Coccothraustes coccothraustes*

Introduction

Hawfinch (*Coccothraustes coccothraustes* Linnaeus, 1758) is a bird regularly nesting in the Czech Republic. In some places its occurrence is common, which applies especially to lower altitudes. The populations of hawfinch in the Czech Republic are predominantly migratory. In March and April the hawfinches arrive from their wintering grounds, which are located especially in Italy (Hudec, 1983). No detailed studies related to haematology and/or blood parasites have been carried in the hawfinch so far.

The studies in other wild birds living in the Czech Republic revealed different blood parasites: haematozoa of the genera *Leucocytozoon* and *Haemoproteus* (Apicomplexa: Coccidea: Haemosporida), *Trypanosoma* (Euglenozoa: Kinetoplastida) (Kučera, 1981a, b, c; Svobodová and Votýpka, 1998), and exceptionally also nematode larval stages – microfilariae (Hauptmanová *et al*., 2002).

Viviparous filariids (Nematoda: Splendidofilariidae) parasitizing the birds are not frequent and are characteristic by the low species richness all over Europe (Yamaguti, 1961; Sonin, 1966). There are different opinions on the classification of the subfamily Splendidofilariinae Chabaud et Choquet, 1953, into different genera, as well as on the separate classification of the genera *Splendidofilaria* Skrjabin, 1923, versus *Ornithofilaria* Gönnert, 1937 (Anderson, 1961; Sonin, 1965; López-Caballero and Jimenéz-Millan, 1979a, b). Nevertheless the following review of data from literature clearly shows that the species *Ornithofilaria mavis* (Leiper, 1909), with its probably conspecific *O. böhmi* Supperer, 1958 (Sonin, 1966), represents a characteristic European species parasitizing in passerine birds (Passeriformes). This species has been so far reported from the United Kingdom (Leiper, 1909), Germany (Gönnert, 1937), France (Chabaud and Golvan, 1956), Spain (López-Caballero, 1978a), Austria (Supperer, 1958), and Poland (Okulewicz, 1981) as a parasite of the hosts from the genus *Turdus* (*T. philomelos*, *T. pilaris*, *T. merula*, *T. iliacus*) with the adult nematodes located in the leg joints. Microfilariae of this species were found repeteadly in blood of the same hosts in Spain (Jimenéz-Millan and López-Caballero, 1975; López-Caballero, 1978b; Cano-Martil *et al.*, 1989; López-Caballero *et al.*, 1992). This species has not yet been found in the Czech Republic (Baruš, 1992).

The present work deals with the blood count and the monitoring of a noteworthy high occurrence of blood parasites in hawfinches at the beginning of their nesting period after the arrival from the wintering grounds (March to April), as well as with possible consequences of these infections for the health status of the birds. The work presents a first study of the composition of the parasite population in this particular host.

Material and Methods

The examinations took place in the hawfinches caught into ornithological mist nets located at the bird feeding box in a city park in Brno. The birds were caught during the period

of March to April 2001 and 2002. In total 13 hawfinches were caught. The birds showed no apparent pathological changes. The birds were weighed, examined, ringed and a blood sample was taken from each bird before its release. The condition of the hawfinches was good with the mean weight of 52.9 ± 3.36 g. Ticks in the area around the beak were found in five birds.

On 7 April 2001 a sick adult hawfinch was brought to the Small Animal Clinic of the University of Veterinary and Pharmaceutical Sciences in Brno. The bird was found in the city, unable to fly, apathetic and emaciated. The weight of the bird was 51.3 g. Five ticks *Ixodes ricinus* were found around the beak. The ticks were removed. The bird was put into a cage with unlimited access to water and feed (sunflower seed). Haematological examination was carried out (see below). Coprological examination (with flotation method) detected sporadic occurrence of *Isospora* sp. oocysts. After three days and temporary improvement of the health status the bird died. Autopsy revealed no macroscopic pathological lesions. Impression specimens of the lungs and the liver were taken during the autopsy. The specimens were stained with the same method as the haematological smears.

All blood smears were examined for the occurrence of parasites (*Trypanosoma* spp., *Haemoproteus* spp., *Plasmodium* spp., *Leucocytozoon* spp., microfilariae). We have checked and counted the parasites on the part of the smear containing at least 10^5 erythrocytes at the magnification of 400 × (microfilariae) and 1000 × (blood protozoa) (Garvin *et al.*, 1993).

Haemosporida were identified according to Valkiūnas (1997) on the basis of morphology of blood stages of the parasites. The development stage of the parasite in blood cells was studied together with the shape, structure and size of the parasite, shape and size of the affected cell and its nucleus. All measurements are given in micrometres as means with standard deviation (± SD).

Microfilariae were thoroughly studied in stained impression specimens of the lungs of the dead bird, because their morphology was unclear in the blood smears. A light microscope equipped with differential interference contrast and Digital Image Analysis (ProPlus 1.3 for Windows 95) was used to take the measurements of 10 microfilariids. All measurements are given in micrometres as the appropriate range and mean value. The data of Gönnert (1937), Chabaud and Golvan (1956), Supperer (1958), López-Caballero (1978b), Cano-Martil *et al.* (1989), and López-Caballero *et al.* (1992) were used for the determination of the parasites.

Heparinized blood was collected from all birds (Heparin, Léčiva a.s., Prague, Czech Republic). Haematocrit and total erythrocyte and leukocyte counts were determined. In the blood smears the calculation of relative proportions of different types of leukocytes was carried out and the blood parasites were searched. The erythrocyte and leukocyte counts were determined in Bürker chamber using the dilution with Natt-Herrick solution (Natt and Herrick, 1952). Haematocrit was determined by centrifugation in microhaematocrit capillaries. Relative counts of different types of leukocytes were determined in blood smears stained according to May-Grünwald and Giemsa-Romanowski (Lucas and Jamroz, 1961).

The determination of the genus and the species of haemoproteids and microfilariae was carried out according to the morphology of blood stages of the parasites and according to the host range of the species that have been described until now.

Results

Haematozoa were found in blood smears in 10 out of 13 healthy hawfinches. Haematozoa and microfilariae were found in the blood smears of the sick hawfinch.

Our findings of parasites from genus *Haemoproteus* morphologically matched with *H. fringillae* (Fig. 1, Table 1). The gametocyte never encircles the whole nucleus of the erythrocyte and the nucleus is never pushed out of the affected cell either. Young gametocytes are just touching the nucleus of the erythrocyte and gradually grow, which results in their enlargement along the nucleus and towards the cytoplasmic membrane. The growing gametocytes touch the nucleus and the cytoplasmic membrane. In the central part a free space sometimes remains between the gametocyte and the cytoplasmic membrane. A mature gametocyte almost never fills the poles of the affected erythrocyte. The affected cells sometimes show deformities of shape. Gametocytes slightly push the nucleus of the affected cell out of the central position (Valkiūnas, 1997).

In the hawfinches examined in our study the parasites of the genus *Leucocytozoon* were determined as *L. dubreuili*, *L. fringillinarum* and *L. majoris* (Table 2, Figs. 2 – 4). The

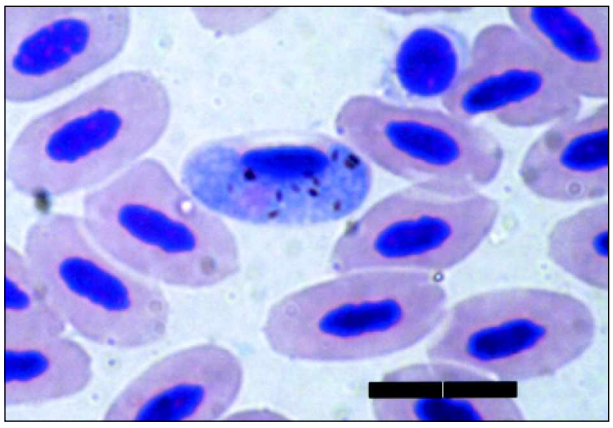

Fig. 1. *Haemoproteus fringillae* (Labbé, 1894)
Scale bar = 10 µm

cells infected with *L. majoris, L. fringillinarum* and *L. dubreuili* have typical oval shape and the nucleus is pushed to the periphery of the affected cell. In case of *L. majoris* infection the nucleus of the affected cell shows more or less the same width along its longitudinal axis. In case of in-

Table 1. Morphometric characteristics of *Haemoproteus fringillae* Labbé, 1894 found in a hawfinch (*C. coccothraustes*)

		Own measurements (sick hawfinch) Mean ± SD	Valkiūnas 1997 Mean ± SD
		n = 20	n = 31
Healthy erythrocyte	length	12.6 ± 0.7	11.8 ± 0.6
	width	5.6 ± 0.5	6.4 ± 0.2
Nucleus	length	6.2 ± 0.5	5.5 ± 0.4
	width	1.8 ± 0.3	2.5 ± 0.2
Macrogametocyte		n = 20	n = 31
Affected erythrocyte	length	14.5 ± 0.9	12.9 ± 0.8
	width	5.9 ± 0.8	6.1 ± 0.3
Erythrocyte nucleus	length	5.9 ± 0.5	5.3 ± 0.3
	width	1.9 ± 0.3	2.4 ± 0.2
Macrogametocyte	length	14.4 ± 1.4	11.2 ± 0.4
	width	2.1 ± 0.5	1.7 ± 0.2
Macrogametocyte nucleus	length	1.9 ± 0.4	2.6 ± 0.4
	width	1.6 ± 0.3	1.8 ± 0.2
Number of pigment granules		10.8 ± 2.5	14.1 ± 1.6
Nuclear displacement ratio		0.8 ± 0.2	0.6 ± 0.1
Microgametocyte		n = 11	n = 31
Affected erythrocyte	length	14.5 ± 0.7	12.6 ± 0.8
	width	5.9 ± 0.7	6.1 ± 0.4
Erythrocyte nucleus	length	5.9 ± 0.4	5.4 ± 0.4
	width	1.9 ± 0.2	2.4 ± 0.2
Microgametocyte	length	13.5 ± 1.7	11.6 ± 0.6
	width	2.1 ± 0.6	2.1 ± 0.2
Microgametocyte nucleus	length	5.7 ± 2.2	7.6 ± 0.4
	width	1.4 ± 0.4	2.1 ± 0.2
Number of pigment granules		8.0 ± 2.6	13.4 ± 1.6
Nuclear displacement ratio		0.8 ± 0.2	0.7 ± 0.2

The dimensions are given in µm

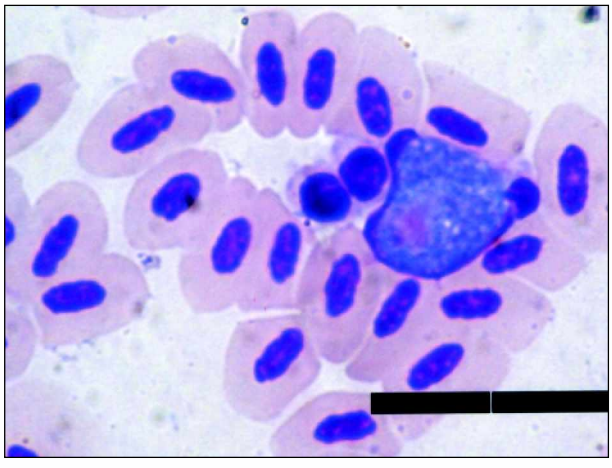

Fig. 2. *Leucocytozoon dubreuili* Mathis et Léger, 1911
Scale bar = 20 µm

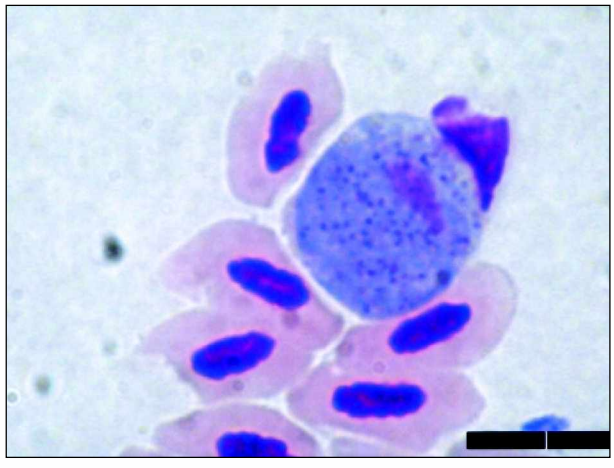

Fig. 3. *Leucocytozoon fringillinarum* Woodcock, 1910
Scale bar = 10 µm

Table 2. Morphometric characteristics of *Leucocytozoon* spp. macrogametocytes found in hawfinches (*C. coccothraustes*)

		Own measurements Mean ± SD	Valkiūnas 1997 Mean ± SD
L. dubreuili Mathis et Léger, 1911		n = 9	n = 18
Affected cell	length	17.6 ± 2.5	
	width	11.8 ± 1.1	
Affected cell nucleus	length	24.7 ± 2.7	26.7 ± 3.7
	width	3.2 ± 1.1	
Macrogametocyte	length	13.5 ± 2.1	11.1 ± 1.6
	width	11.0 ± 0.9	10.1 ± 1.7
Macrogametocyte nucleus	length	3.2 ± 1.4	3.2 ± 0.6
	width	2.4 ± 0.4	2.5 ± 0.7
L. fringillinarum Woodcock, 1910		n = 10	n = 44
Affected cell	length	16.0 ± 1.4	
	width	10.5 ± 1.8	
Affected cell nucleus	length	9.0 ± 3.3	12.7 ± 2.9
	width	2.8 ± 1.5	
Macrogametocyte	length	12.4 ± 1.5	13.1 ± 2.4
	width	10.1 ± 1.0	12.4 ± 2.0
Macrogametocyte nucleus	length	2.6 ± 1.0	3.6 ± 0.8
	width	2.1 ± 0.7	2.7 ± 0.7
L. majoris (Laveran, 1902)		n = 13	n = 11
Affected cell	length	16.1 ± 1.5	
	width	14.1 ± 1.6	
Affected cell nucleus	length	29.4 ± 2.1	25.3 ± 3.6
	width	1.8 ± 0.7	
Macrogametocyte	length	12.8 ± 1.4	10.9 ± 1.3
	width	10.8 ± 1.1	10.5 ± 1.3
Macrogametocyte nucleus	length	4.1 ± 1.6	4.2 ± 1.0
	width	2.8 ± 1.7	2.5 ± 0.8

The dimensions are given in µm

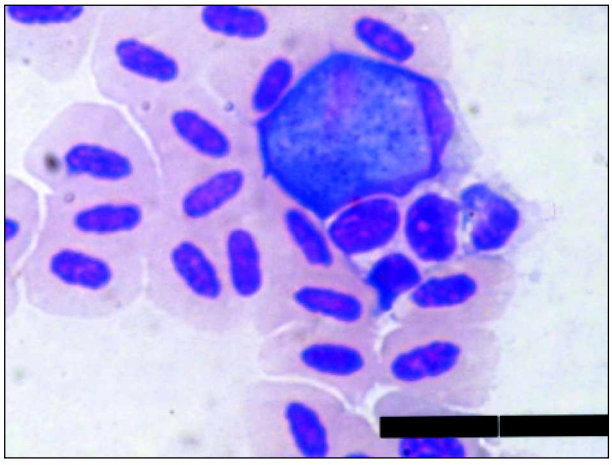

Fig. 4. *Leucocytozoon majoris* (Laveran, 1902)
Scale bar = 20 µm

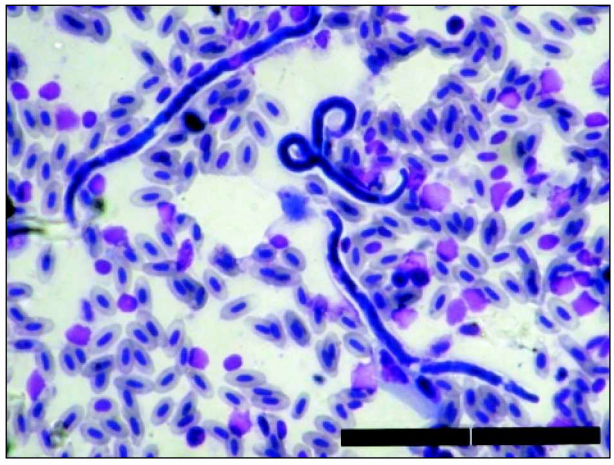

Fig. 5. Group of microfilariae *Ornithofilaria mavis* (Leiper, 1909)
Scale bar = 80 µm

Table 3. Occurrence of blood parasites in blood smears of hawfinches (*C. coccothraustes*)

	Healthy hawfinches (n = 13)		Sick hawfinch
	No. of infected birds (prevalence) in %	Infection intensity	Infection intensity
H. fringillae	9 (69)	40 ± 26	22
L. dubreuili	3 (24)	2 ± 1	4
L. fringillinarum	1 (8)	1 ± 0	2
L. majoris	1 (8)	5 ± 0	0
Ornithofilaria mavis	0	-	7

Mean ± SD; the infection intensity is given as the number of parasites per 10^5 erythocytes

smear. It is possible to observe the nucleus and nucleolus in the centre of the gametocyte, and sometimes also vacuoles or pseudopigment granules (Valkiūnas, 1997).

Out of thirteen hawfinches examined the parasites were found in ten birds. In some of them a mixed infection with several species of parasites was confirmed. The prevalence and intensity of infection with haemoproteids are presented in Table 3.

The impression specimens of the sick hawfinch showed large numbers of microfilariae (Fig. 5) of a characteristic shape (Figs. 6, 7). In the unsheathed microfilariae, the cuticle appears not to be transversely striated. The body length was 101.9 – 158.0 (mean = 128.3) µm, maximum body width 3.9 – 5.8 (mean = 4.5) µm. Front and rear end of the body were clearly rounded. The width of the front

Table 4. Body length and the distance of the fixed points from the anterior end expressed as a percentage (%) of the body length of microfilariae *O. mavis* (Leiper, 1909) and *O. böhmi* Supperer, 1958

	Own measurements n = 10		*O. mavis* (Gönnert, 1937)	*O. mavis* (Cano-Martil *et al.*, 1989)	*O. böhmi* (Supperer, 1958)
Body length (µm)	101 – 157		121 – 137	116.1	155 – 166
Distance of the fixed points	Mean	Range	Mean	Mean	Mean
Cephalic space	3.0	2.2 – 3.8	–	6.8	–
Nerve ring	17.6	13.1 – 26.1	21.7	23.34	17.9
Excretory pore	29.1	21.8 – 35.7	32.3	36.35	27.6
„Innen Körper“	57.1	54.0 – 60.2	55.8 (49.7 – 61.9)	53.48	55.3 (50.3 – 60.27)
Anal pore	83.9	82.2 – 85.1	81.3	84.05	–

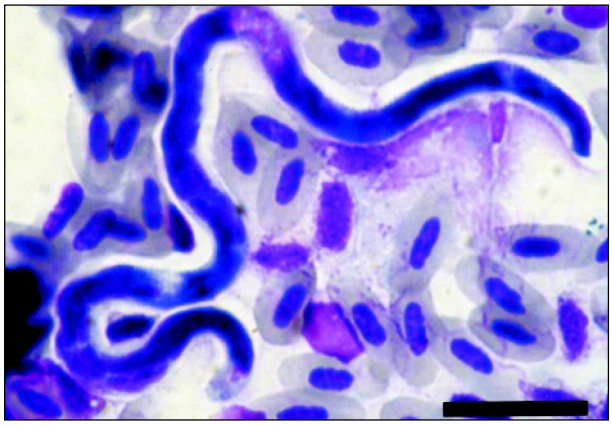

Fig. 6. Microfilaria *Ornithofilaria mavis* (Leiper, 1909)
Scale bar = 20 µm

fection with *L. fringillinarum* the shape of the affected cell varies and encircles less than one half of the gametocyte perimeter. The nuclei of the cells infected with *L. dubreuili* are elongated with both ends thicker and encircle more than one half of the gametocyte perimeter. Sometimes the gametocyte takes up the whole host cell but most frequently some remaining cytoplasm can be still found in the

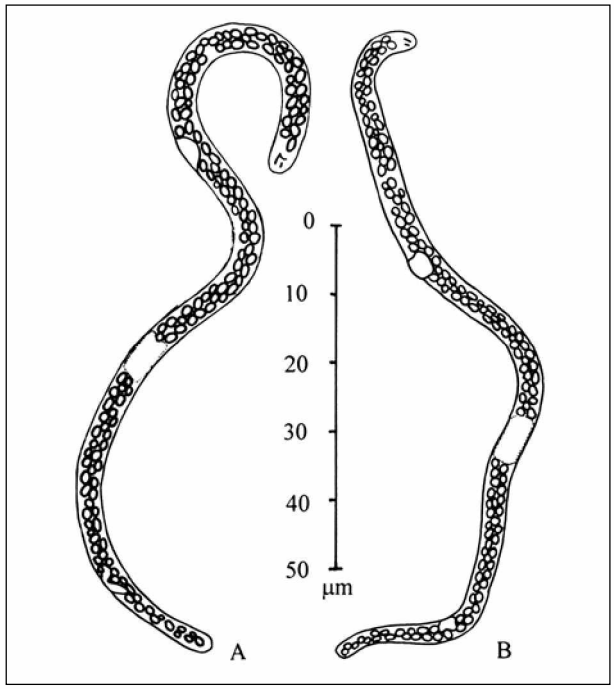

Fig. 7. *O. mavis* Leiper, 1909 – microfilaria
A, B – total view (orig.)

Table 5. Results of haematological examination of hawfinches (*C. coccothraustes*)

Parameter	Units	Healthy hawfinches (n = 12) Mean	±	SD	Sick hawfinch
Haematocrit	l/l	0.56	±	0.06	0.51
Erythrocytes	$\times 10^6/\mu l$	5.62	±	0.49	6.64
Leukocytes	$\times 10^3/\mu l$	3.71	±	2.33	15.0
Lymphocytes	$\times 10^3/\mu l$	2.11	±	1.23	1.95
Heterophils	$\times 10^3/\mu l$	1.44	±	1.08	12.15
Eosinophils	$\times 10^3/\mu l$	0.03	±	0.07	0.00
Basophils	$\times 10^3/\mu l$	0.07	±	0.10	0.45
Monocytes	$\times 10^3/\mu l$	0.1	±	0.10	0.45
Lymphocytes	%	59	±	8	13
Heterophils	%	37	±	8	81
Eosinophils	%	1	±	1	0
Basophils	%	2	±	3	3
Monocytes	%	1	±	1	3

end was 3.0 – 4.6 (mean = 3.7) µm, and of the rear end 2.4 – 3.4 (mean = 2.9) µm. Some individuals showed slightly narrowed tail before its end, with the width of 2.0 – 2.9 (mean = 2.5) µm. Cephalic space is about as long as the body width at that point, i.e. 2.9 – 4.6 (mean = 3.7) µm. The nuclear column is 2 – 3 cells thick in the main body. The thickness of the column behind the anal pore, where the body begins to slightly taper, is 1 – 2 cells. The nuclei of the column appear to be very much alike. They take up the stain with approximately the same intensity and vary in shape only a little. An oblique break in the nuclear column is located 14.2 – 27.4 (mean = 22.0) µm from the cephalic area and indicates the position of the nerve ring. This clear area which does not take up the stain is regularly observed in all specimens. The excretory pore in the form of a break in the nuclear column is situated 31.2 – 46.5 (mean = 36.8) µm from the anterior end almost fills the entire width of the microfilaria. The "innen Körper" is a relatively clear space of varying size located approximately at the rear limit of the central third of the body length, at the distance of 58.9 – 92.8 (mean = 74.3) µm from the anterior end. This part of the microfilaria never takes up any stain. The anal pore is similar in structure to the excretory pore, but it is considerably smaller, situated at the distance of 86.6 – 129.8 (112.8) µm from the head. The distances of the above-mentioned fixed points from the anterior end of the body are given in Table 4. The values are expressed as percentages of the total body length.

The results of haematological examinations of 13 healthy and 1 sick hawfinch are presented in Table 5. In the sick hawfinch leukocytosis due to heterophilia, basophilia and monocytosis was found. The other values were similar to those in healthy birds.

Discussion

Haemoprotozoa of the genera *Haemoproteus*, *Plasmodium* and *Leucocytozoon* (Valkiūnas, 1997) and *Trypanosoma* (Rintamäki *et al.*, 1999) occur regularly in wild birds all over the world (except for *Antarctica*). In some periods their prevalence is very high. During the winter months in the Czech Republic, on the contrary, no transmission of the in-fection through vectors takes place. The examination of blood smears from this period therefore shows infection in a low prevalence and the intensity of infection is also low (Kučera, 1981a, b, c; Valkiūnas, 1997, Hauptmanová *et al.*, 2002).

The high prevalence found in this study can be attributed to the period of catching the birds. The highest prevalence values are described during the nesting period. Likewise the infection intensity increases during the nesting period (Valkiūnas, 1997). This may be due to the high load for the organism of the passerine birds in this period and also due to suitable environmental conditions for the vectors of the parasites (Shutler *et al.*, 1999). The vector for haemoprotozoa of the genus *Haemoproteus* are blood-sucking insects of the order Diptera: Ceratopogonidae and Hippoboscidae. In case of the genus *Leucocytozoon* the vectors belong to the family Simuliidae (Valkiūnas, 1997). The ticks, which have been found by us in some of the birds examined, were not confirmed as vectors of haemoprotozoa of any of the genera mentioned above.

The occurrence and activity of insect vectors depends on the season of the year. The carriers are the blood-sucking adult forms (females), which development and subsequent activity are based on the conditions of the climate. During the period observed (March to April) the conditions for the activity of the vectors are not suitable. Both Simuliidae and Ceratopogonidae have their season of activity in Europe between May and August. It is therefore probable that the birds with confirmed haematozoa infection were actually infected during the preceding calendar year. The infection at the wintering grounds in Italy is less probable due to the climatic conditions during the period of winter stay of the birds (Fredeen and Mason, 1991). Consequently, during the period of our observation most probably only a reactivation of the latent infection persisting from the preceding year took place.

We have been able to detect haemoprotozoa in most of the hawfinches caught (10 of 13). Despite that the health status of the birds has not been apparently deteriorated. Their weight did not differ from the literature data either (Hudec, 1983). The intensity of infection was in some of these clinically healthy hawfinches higher than in the sick one. We do not suppose that haemoprotozoa of the species found in the hawfinches have a significant influence upon their current health status. Nevertheless the alteration of the health status might occur in case of activation of the infection, for instance as a result of immunosuppression of the host. Such situation is described in many bird species (Bennett *et al.*, 1992; Hauptmanová *et al.*, 2002). On the other hand, a strong patogenicity of some haemoprotozoa is described as well (Atkinson *et al.*, 1988; Peirce *et al.*, 1997; Shutler *et al.*, 1999). Based on the health status assessment in the hawfinches caught for this study with regard to the prevalence and intensity of infection with haemoprotozoa we as-

sume that in case of infection of hawfinches with these species no significant alteration of the birds' health status takes place.

Four species from three genera of haemoprotozoa were found in the hawfinches. The genus *Haemoproteus* is typical by the occurrence of pigment granules in gametocytes. The merogony stage is missing in the blood. The parasites attack erythrocytes. In the family Fringillidae the following species have been described until now: *H. fringillae* (Labbé, 1894); *H. globulosus* Covaleda Ortega et Gállego Berenguer, 1950; *H. macropigmentatus* Covaleda Ortega et Gállego Berenguer, 1950; *H. tartakovskyi* Valkiūnas, 1986; *H. dolniki* Valkiūnas et Iezhova, 1992; *H. magnus* Valkiūnas et Iezhova, 1992. Our findings morphologically matched with *H. fringillae*. It was found in many species of passerine birds. It is typically found in the family Fringillidae and has been already found in the hawfinch (Valkiūnas, 1997).

In the genus *Leucocytozoon* only the gametogony stage occurs in the blood. Gametocytes do not contain pigment granules. The following species have been described in passerine birds: *L. majoris* (Laveran, 1902); *L. berestneffi* Sambon, 1908; *L. sakharoffi* Sambon, 1908; *L. fringillinarum* Woodcock, 1910; *L. dubreuili* Mathis et Léger, 1911; *L. maccluri* Greiner, 1976; *L. balmorali* Peirce, 1984; (Valkiūnas 1997). The species *L. berestneffi* and *L. sakharoffi* occur only in the birds of the family Corvidae. In case of infection with *L. maccluri* and *L. balmorali* the affected cells show not only typical oval but also spindle-shaped forms. However, we have not observed such forms in any of the hawfinches examined. We determined *L. fringillinarum*, *L. majoris* and *L. dubreuili* in the hawfinches from our study. *L. fringillinarum* is typical parasite of passerine birds from the family Fringillidae (Bennett *et al*., 1992). *L. majoris* is described most frequently in the family Paridae (Bennett and Pierce, 1992), *L. dubreuili* in Turdidae (Valkiūnas, 1997). In the species of the family Fringillidae the parasites *L. dubreuili* and *L. majoris* were found for the first time. All four species of haemoprotozoa found by us have been already detected in Europe earlier (Valkiūnas, 1997).

According to morphological and metrical parameters reported by Gönnert (1937), Chabaud and Golvan (1956), López-Caballero (1978b), Cano-Martil *et al.* (1989), and López-Caballero *et al*. (1992), the microfilariae found are identical to the species of *O. mavis* (Leiper, 1909), which has been so far reported in Europe in the hosts of the genus *Turdus*. It should be noted that for the process of comparison of body dimensions of microfilariae (especially of the body length) it is necessary to take into account that the size of microfilariae varies depending on the method of fixation and staining (Anderson, 1954; Kotcher, 1941).

We have studied the species *O. mavis* and *O. böhmi* (Table 6) by means of the comparison of mean values of fixed points according to Gönnert (1937), Supperer (1958), and Cano-Martil *et al*. (1989). The conclusion is that the dimensions are very close to each other or even identical (Table 6). Based on that we deduce that *O. böhmi* is most probably a taxon conspecific to *O. mavis*, as it was already presumed by Sonin (1966). The close realtionship of the both species is also proven by application of numeric taxonomy on the dendrogram (López-Caballero and Jimenéz-Millan, 1979b).

It should be also noted that the infection with viviparous filaria in the hawfinch has been found for the first time. Only two findings of unspecified filariids, *Filaria* sp., have been reported so far in passerine birds of the family Fringillidae in Europe (Koroleva, 1926; Vavilova, 1926). They were found in the chaffinch (*Fringilla coelebs*). There is also a closely related genus *Splendidofilaria*, where Anderson (1961) is of an opinion that it is in fact synonymous to *Ornithofilaria*. The findings of the parasites of this genus have been reported from the Asian parts of Russia (Primorskyi region and Kamchatka) in the common rosefinch (*Carpodacus erythrinus)*. Sonin (1966) reported *Splendidofilaria verrucosa* in this particular host. Microfilariae of this parasite are 0.12 mm long.

The nematode *O. mavis* was not detected on the territory of the Czech Republic and the Slovak Republic before our study (Baruš, 1992).

Unfortunately the autopsy missed the examination of the tendons in the legs where the adult forms of this parasite typically occur.

We presume that the cause of death of the sick bird was the infection with *O. mavis*. The findings of ornithofilariae are in general relatively rare compared to the frequency of findings of haematoprotozoa, which prevalence is very high in particular during the nesting period. The rarity of the findings may be due to the pathogenic effect of microfilariae maturing in the circulatory system. The pathogenic effect may be subsequently strengthened in case of high intensity of infection with microfilariae in the blood of the bird.

Blood count was also used for the evaluation of health status of the sick hawfinch. The values found in healthy hawfinches caught at the same location during the same period were used for reference. The haematological finding (leukocytosis) typical for parasitic infections (Maxwell and Robertson, 1998) suggests a strong reaction of the organism to the ongoing infection. Leukocytosis is usually found during inflammatory processes in the organism. The increase in heterophils accounted for the largest proportion of leukocytosis. Heterophilia occurs in connection with stress, acute inflammation (together with basophils) and parasitic infections, when heterophils have the phagocytic function like macrophages (monocytes) (Maxwell and Robertson, 1998).

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