

Review articles

Helminths in migrating and wintering birds recorded in Poland

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ABSTRACT. Among 544 species of helminths recorded in birds on the territory of Poland, probably some (17 species of Digenea, 21 Cestoda, 13 Nematoda and 5 Acanthocephala) do not belong to the native fauna. These are helminths obtained in mature stage from birds shortly after their arrival from wintering grounds, or from foreign populations wintering with us, or being in the course of spring or autumn migration through the area of our country. In general, these helminth species have been recorded sporadically in the examined birds.

Key words: helminths, Digenea, Cestoda, Nematoda, Acanthocephala, migratory birds, wintering birds, Poland

The number of bird species included in the list of the Polish avifauna 31 December 2012 amounted to 450 (according to the Faunistics Commission of the Polish Zoological Society, Ornithological Section). Among them there are breeding and wintering species, passage migrants or visiting birds, sometimes only occasionally or exceptionally. In our country there are about 240 nesting species. Almost all (the exception are two species of sparrows – the house sparrow and Eurasian tree sparrow, some corvids – such as magpie and common raven, some species of tits and other small birds, most species of owls, grouse – black grouse, western capercaillie, hazel grouse, and woodpeckers) move for the winter, nearer or further away, towards the west, south-west, south or south-east depending on the species or population. In a number of bird species the phenomenon of population switching is observed, namely the Polish breeding populations of certain species fly away for the winter to other countries (although departures do not always cover 100% of the native population), and in their place birds from the north, north-east or east arrive to overwinter with us (e.g.: jackdaw, rook, hooded crow, some birds of prey and some species of tits). In addition to the breeding species, about 160 further species appear regularly in Poland migrating, wintering or visiting. The birds come

from areas situated to the east, north-east or north of Poland [1].

On account of high mobility of birds, it is often difficult to determine which parasites collected from them belong to the native fauna. The information not only about the site from which the host comes from is important, but also about its age (adult, juvenile, chick) and the year (month) of conducting parasitological section.

According to the list of helminths and their hosts from 2007 [2], 187 species of Digenea, 171 Cestoda, 124 Nematoda and 18 Acanthocephala were recorded in 173 species of birds examined in our country. Within consecutive four years the list was updated with 40 additional species: 14 Digenea, 19 Cestoda and 7 Nematoda [3]. Subsequent works revealed the presence of two species of tapeworms [4,5] and 2 species of nematodes not yet recorded [6]. At present, according to available data, the total number of species of helminths in birds amounts to 544 (201 Digenea, 192 Cestoda, 133 Nematoda and 18 Acanthocephala).

Definitely, most of the species of helminths recorded in birds in our country to date belong to the native fauna. This applies to parasites of resident birds, commonly occurring, repeatedly investigated and obtained throughout the year. However, there are species of helminths found in birds being in the

course of spring or autumn migrations (e.g. Turridae), or after the flight to the breeding grounds (the *Phalacrocorax carbo* cormorants), or coming from the north and spending the winter in Poland (the loons *Gavia stellata*, wild ducks). The native fauna does not probably comprise the trematodes and cestodes collected from flamingos *Phoenicopterus ruber* nesting in the delta of the Rhone, at the Caspian Sea, the Persian Gulf, in Africa, and occasionally visiting Poland [7,8].

The available data show that to date in migratory birds in the area of our country there have been found 17 species of Digenea, 21 Cestoda, 13 species of Nematoda and 5 Acanthocephala (Table 1), which probably do not belong to the native fauna and their development cycles are not closed here.

Some data about the hosts are incomplete, and if they concern birds migrating long distances, and information about the host age and the season of the year in which they were obtained is missing, then it can only be assumed that the parasites were brought to the area. Therefore, nematodes and digenetic trematodes obtained by Gundlach [9] from the white stork *Ciconia ciconia* and black stork *C. nigra* have been marked in the table as *probably*. These helminths were found in individual birds, and their distribution range covers Africa – the wintering grounds of our storks.

Development cycle may indicate the foreign origin of the fluke *Heterophyes heterophyes* obtained from *C. nigra*, because the first intermediate host of this parasite is the snail *Pirenella conica* occurring in Egypt [7]. Similarly, helminths (1 species of flukes, 1 of tapeworms, 3 of nematodes, and 1 species of acanthocephalans) obtained from house martin *Delichon urbica* and barn swallow *Hirundo rustica* were recognized as probably introduced [10,11]. These parasites were collected throughout the nesting period of birds, which amounts to only about four months, and the helminths were found in individual hosts (amongst

119 examined). The foreign origin of *Acuaria attenuata* may be indicated by finding the nematode only in the spring months (April, May) in swallows, wagtails and flycatchers in the vicinity of Kaliningrad [12]. *Pseudoprocta decorata* is an Asian species, in Europe recorded only in Moldova [11]. Also the parasite of falcons – the nematode *Serratospiculum tendo* is common in Asian birds of prey and hence the supposition that it belongs to introduced species [13].

Finding a mature helminth in an adult migratory bird in spring months (April, May) with a very high probability indicates that it is a foreign parasite with which the bird became infected on the wintering grounds. An example can be, obtained recently [6] in the spring months, the nematodes *Diplotriaeana ozouxi* (Diplotriaeidae) from the western yellow wagtail *Motacilla flava* and *Viguiera euryoptera* (Habronematidae) from red-backed shrike *Lanius collurio*, small passerine birds, typically migratory, wintering along the Mediterranean Sea and in Africa.

An exceptional phenomenon is the acquisition of up to six species of tapeworms from one dead Eurasian woodcock *Scolopax rusticola*, accidentally found in the centre of Warsaw during autumn migration [14]. All species of helminths brought by migratory birds are characterized by heteroxenous life cycle, because the nematodes found in them belong exclusively to the order Spirurida characterized by a complex cycle. Intermediate hosts of these parasites are invertebrates – usually terrestrial insects or their larvae, less frequently aquatic crustaceans. Most development cycles, however, are not yet known.

Perhaps the above list is incomplete, but it has been created on the basis of the available published data. On account of the lack of precise information about the hosts, especially in some of the earlier works, it is likely that some helminths may have been omitted.

Table 1. List of helminth species of migratory birds recorded in Poland

	Parasite species	Host	Season	References
Digenea				
Echinostomida Echinostomatidae	<i>Pegosomum spiniferum</i> Ratz, 1903	<i>Ciconia ciconia</i>	probably spring migration	Gundlach 1969 [9]
Notocotylidae	<i>Notocotylus linearis</i> (Rudolphi, 1819)	<i>Phoenicopterus ruber</i>	autumn migration	Stammer 1936 in Sulgostowska & Czaplińska 1987 [7]
Psilostomidae	<i>Psilotornus confertus</i> Machalska, 1974	<i>Turdus iliacus</i> <i>T. philomelos</i>	spring migration	Machalska 1974 [15]

	Parasite species	Host	Season	References
Plagiorchida				
Dicrocoeliidae	<i>Lutztrema monenteron</i> (Price et McIntosh, 1935)	<i>Turdus iliacus</i> <i>T. merula</i> <i>T. pilaris</i>	spring and autumn migration	Machalska 1980 [16]
	<i>Lyperosomum clathratum</i> (Deslongchamps, 1824)	<i>Delichon urbica</i> <i>Hirundo rustica</i>	no data	Jaroń 1969 [10]
Heterophyidae	<i>Heterophyes heterophyes</i> (von Siebold, 1853)	<i>Ciconia nigra</i>	probably spring migration	Gundlach 1969 [9]
Lecithodendriidae	<i>Mosesia pavlovskii</i> Khotenovsky, 1967	<i>Motacilla flava</i>	spring migration	Okulewicz J. 1993 [17]
Ophisthorchiidae	<i>Euamphimerus pancreaticus</i> Baer, 1960	<i>Turdus merula</i>	spring migration	Okulewicz J. 1982 [18]
Renicolidae	<i>Nephromonorchia lari</i> (Timon-David, 1933)	<i>Larus canus</i>	probably spring migration	Malczewski 1964 [19]
Strigeida				
Brachylaimidae	<i>Brachylaima arcuata</i> (Dujardin, 1845)	<i>Turdus iliacus</i> <i>T. merula</i> <i>T. philomelos</i> <i>T. pilaris</i>	spring and autumn migration	Machalska 1980 [16]
	<i>Brachylaima mesostoma</i> (Rudolphi, 1803)	<i>Turdus viscivorus</i>	autumn migration	Machalska 1980 [16]
Clinostomidae	<i>Clinostomum complanatum</i> (Rudolphi, 1810)	<i>Ardea cinerea</i>	spring migration	Grabda-Kazubska 1974 [20]
	<i>Euclinostomum heterostomum</i> (Rudolphi, 1809)	<i>Ardea cinerea</i>	spring migration	Grabda-Kazubska 1974 [20]
Cyclocoelidae	<i>Cyclocoelum polonicum</i> Machalska, 1980	<i>Turdus merula</i> <i>T. philomelos</i>	spring and autumn migration	Machalska 1980 [21]
Panopsitidae	<i>Michajlovia migrata</i> Pojmańska, 1973	<i>T. philomelos</i>	spring migration	Machalska 1980 [16]
Strigeidae	<i>Apatemon somataeriae</i> Dubois, 1948	<i>Somateria mollissima</i>	wintering	Grytner-Zięcina & Sulgostowska 1978 [22]
	<i>Cardiocephaloides longicollis</i> (Rudolphi, 1819)	Laridae	no data	Niewiadomska 2003 [23]
Cestoda				
Cyclophyllidae	<i>Fernandezia spinosissima</i> (Linstow, 1894)	<i>Turdus merula</i>	probably spring migration	Salamatin et al. 2010 [24]
Davainceidae	<i>Emberizotaenia raymondi</i> (Gigon et Beuret, 1991)	<i>Turdus philomelos</i>	autumn migration	Okulewicz J. 1991 [25]
	<i>Fuhrmannolepis scolopacina</i> (Lopez-Neyra, 1944)	<i>Scolopax rusticola</i>	autumn migration	Salamatin et al. 2009 [14]
	<i>Hirundinicola chelidonariae</i> (Spasskaja, 1957)	<i>Delichon urbica</i>	no data	Jaroń 1969 [10]
	<i>Monopylidium caenodex</i> (Mettrickett Beverley-Burton, 1962)	<i>Turdus merula</i>	probably spring migration	Salamatin et al. 2007 [26]
	<i>Sobolevitaenia verulami</i> (Mettrick, 1958)	<i>Turdus merula</i>	probably spring migration	Salamatin et al. 2010 [24]
	<i>Spasspasskya dubinini</i> (Bauer, 1941)	<i>Turdus merula</i>	probably spring migration	Salamatin et al. 2007 [26]
Hymenolepididae	<i>Aploparaksis demshini</i> Bondarenko et Kontrimavichus, 2005	<i>Scolopax rusticola</i>	autumn migration	Salamatin et al. 2009 [14]
	<i>Aploparaksis kornyushini</i> Bondarenko et Kontrimavichus, 2006	<i>Scolopax rusticola</i>	autumn migration	Salamatin et al. 2009 [14]
	<i>Aploparaksis pseudofilum</i> (Clerc, 1902)	<i>Scolopax rusticola</i>	autumn migration	Salamatin et al. 2009 [14]
	<i>Aploparaksis scolopacis</i> Yamaguti, 1935	<i>Scolopax rusticola</i>	autumn migration	Salamatin et al. 2009 [14]
	<i>Aploparaksis sinensis</i> Tseng-Shen, 1933	<i>Scolopax rusticola</i>	autumn migration	Salamatin et al. 2009 [14]

	Parasite species	Host	Season	References
	<i>Dicranotaenia mergi</i> Yamaguti, 1940	<i>Mergus merganser</i>	wintering	Kavetska & Korniyushyn 2008 [27]
	<i>Dicranotaenia synsacculata</i> Macko, 1988	<i>Bucephala clangula</i>	wintering	Królaczyk et al. 2010 [28]
	<i>Dubininolepis rostellatus</i> (Abildgaard, 1790)	<i>Gavia arctica</i>	wintering	Bezubik 1956 [29]
	<i>Flamingolepis liguloides</i> (Gervais, 1874)	<i>Phoenicopterus ruber</i>	autumn migration	Stammer 1936 in Czapliński et al. 1992 [8]
	<i>Flamingolepis megalorchis</i> (Lühe, 1898)	<i>Phoenicopterus ruber</i>	autumn migration	Stammer 1936 in Czapliński et al. 1992 [8]
	<i>Microsomacanthus oidemiae</i> Spassy et Jurppalova, 1964	<i>Melanitta nigra</i>	wintering	Kavetska et al. 2008 [30]
	<i>Microsomacanthus tuvensis</i> Spasskaya et Spassky, 1961	<i>Aythya fuligula</i>	wintering	Królaczyk et al. 2009 [31]
	<i>Retinometra pittalugai</i> Lopez-Neyra, 1932	<i>Aythya fuligula</i>	wintering	Królaczyk et al. 2008 [32]
Progynotaeniidae	<i>Gynandrotaenia stammeri</i> Fuhrmann, 1936	<i>Phoenicopterus ruber</i>	autumn migration	Stammer 1966 in Czapliński et al. 1992 [8]
Nematoda				
Spirurida Acuariidae	<i>Acuaria attenuata</i> (Rudolphi, 1819)	<i>Delichon urbica</i> <i>Hirundo rustica</i>	no data	Jaroń 1969 [10]
	<i>Paracuaria tridentata</i> (Linstow, 1877)	<i>Gavia stellata</i>	wintering	Okulewicz A. 1989 [33]
	<i>Pseudaprocta decorata</i> Li, 1933	<i>Delichon urbica</i>	probably spring migration	Jaroń 1967 [11]
	<i>Stegophorus stellaepolaris</i> (Parona, 1901)	<i>Gavia stellata</i>	wintering	Okulewicz A. 1989 [33]
	<i>Streptocara formosensis</i> Sugimoto, 1930	<i>Bucephalus clangula</i> <i>Clangula hyemalis</i> <i>Melanitta fusca</i> <i>M. nigra</i> <i>Mergus albellus</i> <i>M. merganser</i>	wintering	Królaczyk & Kavetska 2010 [34]
Diplotriaeidae	<i>Dicheilonema ciconiae</i> (Schrank, 1788)	<i>Ciconia nigra</i>	probably spring migration	Gundlach 1969 [9]
	<i>Diplotriaeana obtusa</i> (Rudolphi, 1802)	<i>Delichon urbica</i> <i>Hirundo rustica</i>	no data	Jaroń 1969 [10]
	<i>Diplotriaeana ozouxi</i> Railliet Henry, 1909	<i>Motacilla flava</i>	spring migration	Okulewicz A. 2013 [6]
	<i>Diplotriaeana tridens</i> (Molin, 1858)	<i>Sylvia atricapilla</i> <i>Sylvia borin</i>	spring migration	Okulewicz A. 1982 [35]
	<i>Serratospiculum tendo</i> Nitzsch, 1857	<i>Falco cherrug</i> <i>F. peregrinus</i>	probably spring migration	Furmaga 1957 [13] Kalisińska et al. 2008 [36]
Habronematidae	<i>Viguiera euryoptera</i> (Rudolphi, 1819)	<i>Lanius collurio</i>	spring migration	Okulewicz A. 2013 [6]
	<i>Splendidofilaria mavis</i> (Leiper, 1909)	<i>Turdus merula</i>	spring migration	Okulewicz A. 1981 [37]
Thelaziidae	<i>Oxyspirura chabaudi</i> Barus, 1965	<i>Turdus merula</i>	spring migration	Okulewicz A. et al. 2007 [38]
Acanthocephala				
Polymorphida Polymorphidae	<i>Andracantha phalacrocoracis</i> (Yamaguti, 1939)	<i>Phalacrocorax carbo</i>	spring migration	Kanarek 2007 [39]
	<i>Corynosoma pyriforme</i> (Bremsler in Rudolphi, 1824)	<i>Turdus merula</i>	spring and autumn migration	Machalska 1981 [40]
	<i>Sphaerirostris lancea</i> (Westrumb, 1821)	<i>Turdus merula</i>	spring and autumn migration	Machalska 1981 [40]
	<i>Southwellina hispida</i> (Van Cleave, 1925)	<i>Ardea cinerea</i> <i>Phalacrocorax carbo</i>	spring migration	Kanarek & Rokicki 2005 [41]; Kanarek 2007 [39]
Gigantorhynchida Gigantorhynchidae	<i>Mediorhynchus micracanthus</i> (Rudolphi, 1819)	<i>Delichon urbica</i>	no data	Jaroń 1969 [10]

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