

COMPARATIVE STUDY OF CESTODE AND NEMATODE FAUNA OF THE GASTROINTESTINAL TRACT OF MALLARDS (*ANAS PLATYRHYNCHOS* L., 1758) FROM THREE DIFFERENT POLISH ECOSYSTEMS

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Abstract. The Mallard (*Anas platyrhynchos*) is the most acquired and, at the same time, the most common wetland game birds in Poland, occurring on the territory of almost the whole country. The habitat of this bird is constituted by most shallow water reservoirs, rivers, lakes and ponds situated in mid-fields. The aim of this study was to compare the composition of cestode and nematode fauna of the gastrointestinal tract of Mallards acquired from three different Polish ecosystems (BzuraValley, the area of Warta Mouth National Park and reservoirs around Szczecin). The research material was constituted by tapeworms and nematodes found in gastrointestinal tracts of 211 Mallards. Fixed slides of tapeworms stained with acetocarmine were made, and nematodes were cleared in lactic acid. 30 species of parasites were determined – 23 tapeworms and 7 nematodes. Differences were indicated between helminth faunas of Mallards from the whereabouts of Borów, Słońsk and Szczecin. The most helminth species were noted in the gastrointestinal tract of Mallards acquired near Szczecin, and the least from Mallards from the whereabouts of Borów.

Key words: Anas platyrhynchos, helminths, Mallard, Poland

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INTRODUCTION

The Mallard (*Anas platyrhynhcos* L., 1758) is a breeding bird species common in Europe, North America and Asia, belonging to the surface-feeding ducks tribe (Anatini). The Mallard's winter habitats are usually the coasts of the North Sea and the Baltic Sea (except the years with harsh winters), although this bird can also reach the Mediterranean Sea and the Black Sea. In Poland, the Mallard is the most often acquired, and, at the same time, the most common wetland game bird occurring on the territory of almost the whole country [Tomiałojć and Stawarczyk 2003, Okarma and Tomek 2008]. The habitat of this bird is constituted by most shallow water reservoirs, rivers, lakes and ponds situated in mid-fields. Outside breeding season, the Mallard resides on sheltered banks of fresh water reservoirs. The species is increasingly more common in built-up areas [Tomiałojć and Stawarczyk 2003], and especially in large cities [Sikora et al. 2007]. The Mallard is an omnivorous species, although its diet is dominated by plants. It occasionally feeds on land and aquatic invertebrates [del Hoyo et al. 1992, Scott and Rose 1996].

Helminth fauna of the Mallard is relatively well known in Poland. The first complex research addressing the species' helminth fauna were conducted in southeastern Poland in the fifties [Bezubik 1956] and concerned Mallards from Lubelskie and Białostockie provinces. In the sixties, research of helminth fauna of Mallards from different regions of Poland were conducted by Czapliński [Czapliński et al. 1992]. *A. platyrhynchos* endoparasite studies in north-western Poland were started by Kavetska in 1999.

The aim of this work, which is a continuation of the research started by Kavetska, was to compare the composition of cestode and nematode fauna in gastrointestinal tracts of Mallards from the West Pomeranian region (where abouts of Szczecin and Słońsk) and the area of Bzura Valley (Borów).

MATERIAL AND METHODS

The research material was constituted by tapeworms and nematodes acquired from gastrointestinal tracts of 211 Mallards, originating from three different Polish ecosystems. The research was conducted in the years 2009–2011.

The majority of ducks (170 specimens) came from north-western Poland. These Mallards were shot by hunters, with respect for hunting seasons, in the floodlands of Warta Mouth National Park near Słońsk (Lubuskie province, sulęciński district) – 79 specimens, and in reservoirs in the whereabouts of Szczecin (Zachodniopomorskie province) – 91 specimens. The remaining ducks (n = 41)

were acquired in the area of central Poland in the middle part of Bzura Valley, the section between Sobota and Pęcławice (Borów, Łódzkie province, łowicki district).

Among the mentioned areas of bird acquisition, the most varied in terms of reservoirs is the area of the whereabouts of Szczecin (river Odra, Szczecin Lagoon, Dąbie Lake, mid-field post-glacial ponds). The most scarce reservoirs were found in the whereabouts of Borów(only Bzura River). The whereabouts of Słońsk encompassed Warta River with many floodlands, which was different from Bzura Valley.

Gastrointestinal tracts were dissected as a whole, and then divided into 9 anatomical sections (esophagus, proventriculus, gizzard, jejunum, ileum, rectum, cecum and cloaca with bursa of Fabricius). Helminths were acquired from each section, which were then cleaned of food remains and preserved in 70% ethanol. Fixed slides were made from tapeworms stained with acetocarmine, and nematodes were cleared in lactic acid. The specimens' species belonging was determined on the basis of available identification keys and original works.

RESULTS AND DISCUSSION

Presented research results indicated 30 species of parasitic helminthes: 23 species of tapeworms (Cestoda) and 7 species of nematodes (Nematoda).

Cestoda

Tapeworm fauna of the researched *A. platyrhynchos* was represented by 23 species belonging to two families: Dilepididae (one species) and Hymenolepididae (22 species) (Table 1).

Only one species from the Dilepididae family was found in the Mallard – *Platyscolex ciliata* (Fuhrmann, 1913). This species was present in Mallards from Słońsk and whereabouts of Szczecin. It was not found in Mallards from Borów. The intermediate host of *Platyscolex ciliata* can be, among others, a small crustacean – *Daphnia pulex* (Leydig, 1860), which lives in stagnant water reservoirs. There is a probability, that ducks acquired from the middle section of Bzura Valley (Borów) were not infected by *Platyscolex ciliata* because there was no potential intermediate host for the tapeworm in this area [Ryshikov et al. 1985].

The family Hymenolepididae in the researched ducks was represented by 22 species (Table 1). In the composition of cestode fauna of Mallards from the whereabouts of Szczecin, 19 species from this family were noted. 14 species were found in Mallards from Słońsk, and only 10 species from Hymenolepididae family were found in ducks from Borów. These results show that significantly more species of tapeworms are found in Mallards acquired from aquatic ecosystems (stagnant and flowing water) in north-western Poland, than in Mallards acquired from flowing water ecosystems in central part of the country.

Table 1. Cestodes of the Mallard in Poland in own other studies

			Own recearch			
Taneworms	Pojmańska et al. 2007	Kavetska et al. 2008	Badania własne 2011			
Tasiemce			Słońsk	okolice Szczecina	Borów	
Dilphyllobothriidae						
Schistocephalus solidus (Muller, 1776)	+					
Dilepididae						
Platyscolex ciliata (Fufrmann, 1913)	+	+	+	+		
Hymenolepididae						
Aploparaksis furcigera (Rudolphi, 1819)	+	+	+	+	+	
Cloacotaenia megalops (Nitzsch in Creplin, 1829)	+	+	+	+		
Dicranotaenia coronula (Dujardin, 1845)	+	+	+	+		
Diorchis diorchis (Fuhrmann, 1913)	+					
D. inflatus (Rudolphi, 1819)	+					
D. nyrocae Yamaguti 1935	+					
D. ransomi Johri, 1939	+					
D. stefanskii Czapliński, 1956	+	+	+	+		
Echinocotyle rosseteri Blanchard, 1891		+		+		
Fimbriaria fasciolaris (Pallas, 1781)	+	+	+	+	+	
Fimbriarioides Fuhrmann, 1932		+		+	+	
Gastrotaenia dogieli (Gynezynskaja, 1944)		+	+			
Microsomacanhus abortiva (von Linstow, 1904)	+	+		+		
M. baeri Czapliński & Vaucher, 1977		+	+	+	+	
M. compressa (Linton, 1892)	+	+		+	+	
<i>M. pachycephala</i> (von Linstow, 1872)		+		+		
M. paracompressa (Czapliński, 1956)		+	+	+	+	
M. paramicrosoma (Gasowska, 1931)	+	+	+			
M. parvula (Kowalewski, 1904)	+	+	+	+		
M. spiralibursata (Czapliński, 1956)	+	+	+	+		
Monotestilepis tadornae Gvozdev, Maksimova &		+		+		
Kornyushin, 1971						
Retinometra giranensis (Sugimoto, 1934)		+		+	+	
R. venusta (Rosseter, 1897)	+	+	+	+	+	
Sobolevicanthus aculeostyleticus Birova & Macko,		+	+		+	
1991						
S. gracilis (Zeder, 1803)	+	+		+	+	
S. krabellus (Hughes, 1940)	+	+		+		
S. octacanthus (Krabbe, 1869)	+					

Tabela 1. Tasiemce krzyżówki w Polsce w badaniach własnych i innych autorów

This fact can be justified by different types of habitats of these ducks. The area of north-western Poland, from which the Mallards with richer cestode fauna were acquired, is more abundant with water reservoirs like Dabie Lake, Szczecin Lagoon, Odra Valley, mid-field post-glacial ponds, floodlands of Warta Mouth National Park near Słońsk, than the area of łowicki district, Łódzkie province (river ecosystem), from which the birds with less diverse tapeworm species composition were acquired. Depending on the habitat type, the ducks' diet may differ, which fact can affect their contact with potential intermediate parasite hosts, and can therefore lead to differences in tapeworm species composition. This situation indicates high significance of the encounter and compatibility filters in the host-parasite relationship [Combes 1999]. As it has been indicated, the cause of this situation is probably a different set of habitat conditions in the three geographical regions of Poland analyzed here.

Five species of tapeworms: *Aploparaksis furcigera* (Rudolphi, 1819), *Fimbriaria fasciolaris* (Pallas, 1781), *Microsomacanthus baeri* (Czapliński & Vaucher, 1977), *M. paracompressa* (Czapliński, 1956) and *Retinometra venusta* (Rosseter, 1897) were noted in Mallards from Zachodniopomorskie, Lubuskie and Łódzkie provinces. *Gastrotaenia dogieli* (Gynezynskaja, 1944) and *Microsomacanthus paramicrosoma* (Gasowska, 1931) were found only in Mallards from Słońsk, and 8 species of tapeworms were found only in ducks from the whereabouts of Szczecin, and not those from Słońsk and Borów (Table 1).

According to Pojmańska et al. [2007] 20 species of tapeworms were indicated in *A. platyrhynchos* in Poland until 2007, belonging to three families: Diphyllobothriidae, Dilepididae and Hymenolepididae. In the research conducted on the area of north-western Poland [Kavetska et al. 2008] 23 species of tapeworms were found in Mallards, belonging to two families: Dilepididae and Hymenolepididae (Table 1). From among the species found in Mallards in defferent parts of Poland [Pojmańska et al. 2007], we have found 6 in our research: *Schistocephalus solidus* (Muller, 1776), *Diorchis diorchis* (Fuhrmann, 1913), *D. inflatus* (Rudolphi, 1819), *D. ransomi* (Johri, 1939) and *Sobolevicathus octacanthus* (Krabbe, 1869).

Nematoda

Nematodes in the Mallard's helminth fauna were represented by 7 species belonging to 6 families: Amidostomatidae, Ascarididae, Tetrameridae, Acuariidae, Dioctophymatidae, Capillariidae and one taxon of genus rank, *Epomidiostomum* sp. (Table 2). 7 species of nematodes were found in Mallards from Słońsk. 5 species and one indeterminate specimen of *Epomidiostomum* sp. were found in Mallards from the whereabouts of Szczecin. Similarly to tapeworms, the least species (4) were noted in Mallard specimens from Borów (Table 2).

Four species of nematodes: Amidostomum acutum (Lundahl, 1848), Tetrameres fissispina (Diesing, 1861), Echinuria uncinata (Rudolphi, 1819) and Eucoleus contortus (Creplin, 1839) were noted in Mallards from Warta Mouth National Park near Słońsk, Mallards from the whereabouts of Szczecin and the ducks from Borów. Two species of nematodes: *Porrocaecum crassum* (Deslongchamps, 1824) and *Hystrichis tricolor* (Dujardin, 1845) were found in one Mallard specimen from the whereabouts of Słońsk. In the life cycle of these two species of nematodes there are intermediate hosts, which belong to the Oligochaeta subclass, including *Criodrilus lacuum*, which inhabits muddy bottoms of fresh water reservoirs [Baruš et al. 1978]. The whereabouts of Słońsk are one of the most important wetlands in Europe, stretching over a few thousand hectares, which are a sanctuary for thousands of water and wetland birds. A statement that only in this region of Poland proper environmental conditions existed to open the so-called encounter and compatibility filters, leading to infection of the Mallards with *P. crassum* and *H. tricolor* nematode species, seems fully justified.

The distribution of nematode fauna in the researched ducks was probably influenced by: their diet, habitat type and geographical region. These factors were discussed in detail in the tapeworm fauna distribution section.

Table 2.	Nematodes (of the	Mallard	in	Poland in	own	and	other stud	ies
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	Pojmańska et al. 2007	Kavetska et al. 2008	Own research				
Nematodes			Ba	Badania własne 2011			
Nicienie			Słońsk	okolice Szczecina	Borów		
Amidostomatidae							
Amidostomum acutum (Lundahl, 1848)	+	+	+	+	+		
A. anseris (Zeder, 1800)	+						
Epomidiostomum sp.				+	+		
E uncinatum (Lundahl, 1848)	+						
Syngamidae							
Cyathostoma variegatum (Creplin, 1849)	+						
Trichostrongylidae							
Trichostrongylus tenuis (Mehlis, 1846)	+						
Ascarididae							
Porrocaecum crassum (Deslongchamps, 1824)	+	+	+				
Ascaridia gali (Schrank, 1788)	+						
Heterakis gallinarum (Schrank, 1788)	+						
Tetrameridae							
Tetrameres fissispina (Diesing, 1861)	+	+	+	+	+		
Acuariidae							
Echinuria uncinata (Rudolphi, 1819)	+	+	+	+	+		
Streptocara crassicauda (Creplin, 1829)	+		+	+			
Dioctophymatidae							
Hystrichis tricolor Dujardin, 1845	+	+	+				
Capillariidae							
Eucoleus contortus (Creplin, 1839)	+	+	+	+	+		
Capillaria anatis (Schrank, 1790)	+	+					
Baruss capillaria mergi (Madsen, 1945)	+						
Pseudocapillaria mergi (Madsen, 1945)		+					

Tabela 2. Nicienie krzyżówki z Polsce w badaniach własnych i innych autorów

According to the information provided by Pojmańska et al. [2007], until 2007 the nematode fauna of Mallards in Poland was composed of 15 species belonging to 8 families. Subsequent studies of nematode fauna conducted by Kavetska [2008] indicated the presence of 8 species from 6 families in Mallards from northwestern Poland. In the material studied by us, we did not discover the presence of Syngamidae and Trichostrongylidae families representatives (Table 2), which were noted earlier in Poland, and a typical host for which is fowl (hens, turkeys).

CONCULUSIONS

- 1. Comparative studies of the Mallard's gastrointestinal tract helminth fauna, with specimens from three different Polish ecosystems, have shown the presence of 30 parasitic species of helminthes: 23 species of tapeworms and 7 species of nematodes.
- 2. The most parasitic helminth species were noted in the gastrointestinal tracts of Mallards acquired from the whereabouts of Szczecin (an area with numerous stagnant, as well as flowing water reservoirs), and the least were noted in Mallards from the middle section of Bzura Valley (flowing water).
- 3. The differences in helminth fauna composition between the studied ducks from the researched ecosystems were probably influenced by the nourishment they were getting, their habitat, and their migrations.

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PORÓWNAWCZE BADANIA FAUNY TASIEMCÓW I NICIENI PRZEWODU POKARMOWEGO KRZYŻÓWKI (*ANAS PLATYRHYNCHOS* L., 1758) Z TRZECH ODMIENNYCH EKOSYSTEMÓW POLSKI

Streszczenie. Krzyżówka (*Anas platyrhynchos*) jest najczęściej pozyskiwanym i zarazem najpospolitszym wodno-błotnym ptakiem łownym w Polsce, występującym na terenie niemal całego kraju. Środowiskiem życia tego ptaka jest większość płytkich zbiorników wodnych, rzek, jezior oraz śródpolnych oczek wodnych. Celem pracy było porównanie składu cestodofauny i nematofauny przewodu pokarmowego krzyżówki pozyskanej z trzech odmiennych ekosystemów Polski (Dolina Bzury, obszar Parku Narodowego "Ujście Warty" i akweny wodne okolic Szczecina). Materiał do badań stanowiły tasiemce i nicienie pozyskane z przewodów pokarmowych 211 krzyżówek. Wykonano preparaty stałe z tasiemców barwionych acetokarminem, a nicienie prześwietlono w kwasie mlekowym. Oznaczono 30 gatunków pasożytów – 23 gatunki tasiemców i 7 gatunków nicieni. Wykazano różnice w helmintofaunie krzyżówki pozyskanej z okolic Borowa, Słońska i Szczecina. Najwięcej gatunków pasożytniczych helmintów zanotowano w przewodzie pokarmowym krzyżówki pozyskanej z okolic Szczecina, a najmniej u krzyżówki z okolic Borowa.

Słowa kluczowe: Anas platyrhynchos, helminty, krzyżówka, Polska

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