

Endoparasitofauna of some wild birds of hunting interest from the Republic of Moldova

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Abstract

The result of the parasitological examination from pheasants (*Phasianus colchicus* L.) showed a high level of their infestation with various parasitic agents: Trematoda Class one species (*Prosthogonimus ovatus*); Secernentea Class 6 species (*Capillaria annulata*, *Syngamus tracheia*, *Heterakis isolonche*, *Ascaridia galli*, *Heterakis gallinarum* and *Trichostrongylus tenuis*) and Conoidasida Class 3 species (*Eimeria colchici*, *E. duodenalis* and *E. phasiani*). Parasitological research taken from quails (*Coturnix coturnix* L.), revealed their infestation with various parasitic agents: Trematoda Class 2 species (*Echinostoma revolutum*, *Prosthogonimus ovatus*); Secernentea Class 4 species (*Capillaria caudinflata*, *Syngamus tracheia* with *Ascaridia galli* and *Heterakis gallinarum*); Class Cestoda with one species (*Raillietina tetragona*), and Conoidasida Class 3 species (*Eimeria wear*, *E. batteries*, and *E. coturnicis*). Parasitological research from guineafowls (*Numida meleagris* L.), revealed their infestation with various parasitic agents: Trematoda Class one species (*Prosthogonimus ovatus*); Secernentea Class 4 species (*Capillaria annulata*, *Syngamus tracheia*, *Ascaridia galli*, and *Heterakis gallinarum*); and Conoidasida Class 2 species (*Eimeria numidae* and *E. adenoides*). Out of the total of 10 species of parasites identified at pheasant, 4 species (*Prosthogonimus ovatus*, *Syngamus tracheia*, *Ascaridia galli*, *Heterakis gallinarum*), are also specific for quail, 5 species are specific for guineafowl (*Prosthogonimus ovatus*, *Capillaria annulata*, *Syngamidia tracheia*, *Heterakis gallinarum*), 5 species are specific for chickens (*Prosthogonimus ovatus*, *Syngamus tracheia*, *Ascaridia galli*, *Heterakis gallinarum*, *Trichostrongylus tenuis*) and only 2 species are specific for turkeys (*Ascaridia galli*, *Heterakis gallinarum*). Out of the total of 10 species of parasites identified at quails, 4 species (*Prosthogonimus ovatus*, *Syngamus tracheia*, *Ascaridia galli*, *Heterakis gallinarum*) are also common at pheasants, 4 species are specific at guineafowl (*Prosthogonimus ovatus*, *Syngamus tracheia*, *Ascaridia galli*, *Heter*), 5 species are specific for chickens (*Prosthogonimus ovatus*, *Syngamus tracheia*, *Ascaridia galli*, *Heterakis gallinarum*, *Raillietina tetragona*) and 4 species are specific for turkeys (*Capillaria caudinflata*, *Ascaridia galli*, *Heterakis gallinarum*, *Raillietina echinobothrida*). Out of the total of 7 species of parasites identified at guineafowl, 4 species (*Prosthogonimus ovatus*, *Syngamus tracheia*, *Ascaridia galli*, *Heterakis gallinarum*) are common at pheasants, quails and chickens, and 3 species are specific for turkeys (*Ascaridia galli*, *Heterakis gallinarum*, *Raillietina tetragonal*).

Keywords: wild birds, endoparasitofauna, parasitic species.

Introduction

Wild birds of hunting interest contribute essentially to the preservation of natural outbreaks of parasites, common to wild, domestic animals and to humanity. In this context, the study of their parasitofauna has a special importance both from theoretical and practical point of view. Knowledge of parasitic fauna in birds of hunting interest is especially important in order to avoid the spread of parasitic agents, both among other wild and domestic animals and in humans (1, 2, 5).

The common pheasant (*Phasianus colchicus* L.) is the most important bird from the hunting avian fauna of the Republic of Moldova, both by its numerical weight and degree of spread as well as by its hunting prospects. Analyzing the dynamics of pheasant herds during the last years in the Republic of Moldova, an ascent of its acclimatization dynamics was highlighted, thanks to the complex measures of protection and its permanent repopulation in nature from the specialized breeders. The breeding stock of the pheasant in the spring of 2018 was estimated at about 42 thousand specimens, with an annual increase of 75-90%. Notwithstanding the above, the number of pheasants from year to year is increasing by only 13-18%, signaling a drastic decrease in their number in the cold period of the year. The multiple measures aimed at increasing the number of

animals of hunting interest will not be enough, because parasitic diseases not only slow down their growth and development, but also cause their mortality [5, 9, 11, 12].

Likewise, the quail population in 2018 was estimated, at the initial phase of nesting with an average density of about 40 quails per 100 thousand ha, thus gathering a herd of over 160 thousand quails. By autumn, a local population estimated at about 400,000 quails [7, 13, 15].

The study of parasitic fauna in wild birds presents a major interest, in that they in a short period of time travel long distances from one continent to another while transporting in / on their body a rich range of external parasitic agents (malophages, fleas, mites) and internal (nematodes, trematodes, cestodes, etc.). Thus, wild birds can maintain and transport these species of parasites [2,4,12,13].

Gastrointestinal helminths (cestodes, trematodes, nematodes) are considered to be an important cause not only of productivity losses, but also of diseases and often even mortality. Associated polyparasitism is frequently recorded in wild birds of hunting interest [3, 6, 8, 14, 16].

The prevalence and abundance of infestations at birds of hunting interest can be influenced by many factors such as: distribution of intermediate and complementary hosts, age, sex, their infestation rate, number of eggs and infesting larvae, etc. It is found that birds of hunting interest are more vulnerable in their first year of life, when their mortality can reach the limit of about 90% and being determined by the association of infectious and parasitic diseases with helminthic specificity [1, 3, 6, 10].

Research methods

In order to identify the various species of endoparasites, biological samples were collected from wild birds of hunting interest (pheasants, guineafowls, quails) from the hunting grounds of Ialoveni district, Chisinau municipality and from various natural and man-made biotopes of the North-Central Republic of Moldova. Biological samples were also collected from domestic birds from 38 households (chickens, turkeys). The investigations took place during the years 2015-2019, in which a total of 354 samples were taken and examined: of which 153 samples from chickens (*Gallus gallus domesticus* L.); 78 - pheasants (*Phasianus colchicus* L.); 39- turkeys (*Meleagris gallopavo* L.); 48 - quails (*Coturnix coturnix* L.) and 36 - guineafowl (*Numida meleagris* L.).

In the parasitological diagnosis were used methods copro-ovoscopic (Fulleborn, Darling), copro-larvoscopic (Popov, Baermann), partial parasitological investigations (after K.I. Skriabin) and successive washing. The parasitological evaluation was performed by determining the degree of spread (prevalence,%) using the Novex Holland B ob microscope. 20-40 WF 10x Din / 20mm. The results were statistically processed in the Excel program.

Parasitological investigations were performed in the Parasitology and Helminthology Laboratory of I.P. Institute of Zoology

Results and discussions

The result of the parasitological examination of 78 samples collected from pheasants (*Phasianus colchicus* L.) showed a high level of their infestation with various parasitic agents: Trematoda Class species (*Prosthogonimus ovatus* with EI 12.4% and II-2.8 eg.); Secernentea Class 6 species (*Capillaria annulata* with EI-5.1%, II-6.6 eg., *Syngamus tracheia* with EI-9.5,1%, II-3.7eg., *Heterakis isolonche* with EI-10.3% , II-8.4 eg., *Ascaridia galli* with EI-82.3%, II-14.4 eg., *Heterakis gallinarum* with EI-21.8%, II-11.9 eg. and *Trichostrongylus tenuis* with EI-11.1%, II-3.6 eg.) and Conoidasida Class 3 species (*Eimeria colchici* with EI-11.9%, II-19.4 eg., *E. duodenalis* with EI-27,0%, II-14.7 eg. and *E. phasiani* with EI-9.3%, II-15.2 eg.) (tab. 1).

Table 1
Diversity of parasitic fauna at wild birds of hunting interest
in the Republic of Moldova

Parasite species	The parasitic host									
	Pheasants		Quails		Guinea fowl		Chickens		Turkeys	
	EI (%)	II (eg.,)	EI (%)	II (eg.,)	EI (%)	II (eg.,)	EI (%)	II (eg.,)	EI (%)	II (eg.,)
Trematode class										
<i>Echinostoma revolutum</i> (Frohlich, 1802)	-	-	14.5	3.4	-	-	1.3	2.5	-	-
<i>Prosthogonimus ovatus</i> (Rud., 1803)	12.4	2.8	10.4	5.6	2.77	7.3	3.26	5.4	-	-
Secernentea class										
<i>Capillaria caudinflata</i> (Zeder, 1800)	-	-	8.3	4.3	-	-	-	-	5.12	4.7
<i>Capillaria annulata</i> (Molin, 1858)	5.1	6.6	-	-	47.2	9.8	-	-	-	-
<i>Capillaria gallinae</i> (Cheng, 1982)	-	-	-	-	-	-	25.4	13.6	-	-
<i>Syngamus tracheia</i> (Montagu, 1811)	9.5	3.7	2.08	2.3	2.77	3.7	1.0	1.5		
<i>Heterakis isolonche</i> (Linstow, 1906)	10.3	8.4	-	-	-	-	-	-	-	-
<i>Ascaridia galli</i> (Schrank, 1788)	82.3	14.4	64.6	18.3	41.6	11.2	45.7	15.6	76.9	12.3
<i>Heterakis gallinarum</i> (Schrank, 1788)	21.8	11.9	60.4	14.3	16.6	12.4	44.4	16.4	94.8	14.6
<i>Trichostrongylus tenuis</i> (Mehlis, 1846)	11.1	3.6	-	-	-	-	1.3	2.6	-	-
Cestoda Class										
<i>Raillietina echinobothrida</i> (Megnin, 1818)	-	-	-	-	-	-	3.9	3.4	-	-
<i>Raillietina tetragona</i> (Molin, 1858)	-	-	22.9	5.8	-	-	17.6	9.9	66.6	13.3

Conoidasida Class										
<i>Eimeria numidae</i> (Pellerdy, 1962)	-	-	-	-	51.5	15.6	-	-	-	-
<i>E. meleagridis</i> (Tyzzer, 1929)	-	-	-	-	-	-	-	-	46.1	13.2
<i>E. tenella</i> (Railliet & Lucet, 1891)	-	-	-	-	-	-	31.9	14.6	-	-
<i>E. necatrix</i> (Johns on, 1930)	-	-	-	-	-	-	34.1	15.6		
<i>E. adenoides</i> (Moore and Brown, 1951)	-	-	-	-	32.1	16.8	-	-	28.2	13.6
<i>E. acervulia</i> (Tyzzer, 1929)	-	-	-	-	-	-	41.0	15.4	-	-
<i>E. brunetti</i> (Levine, 1942)	-	-	-	-	-	-	25.4	15.5	-	-
<i>E. maxima</i> (Tyzzer, 1929)	-	-	-	-	-	-	20.9	17.3	-	-
<i>E. uzura</i> (Tsunoda and Muraki, 1971)	-	-	14.5	15.6	-	-	-	-	-	-
<i>E. bateri</i> (Bhatia, Panday and Pande, 1965)	-	-	20.8	12.4	-	-	-	-	-	-
<i>E. coturnicis</i> (Chakravarty & Kar 1947)	-	-	35.4	17.6	-	-	-	-	-	-
<i>Eimeria colchici</i> (Norton, 1967)	11.9	19.4	-	-	-	-	-	-	-	-
<i>E. duodenalis</i> (Norton, 1967)	27.0	14.7	-	-	-	-	-	-	-	-
<i>E. phasiani</i> (Tyzzer, 1929)	9.3	15.2	-	-	-	-	-	-	-	-
Totally researched	78		48		36		153		39	

From the total of 78 samples examined from pheasants, it was shown that 24 samples (30.7%) were infested in the form of monoinvasions, and 54 samples (69.3%) were mixtinvasions (fig.1).

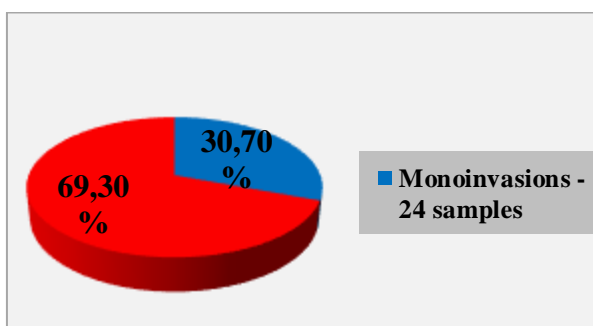


Fig.1. Monoinvasions and mixtinvasions identified at pheasant.

Monoinvasions at pheasants consisted of: *Ascaridia galli* - 8 samples (33.4%); *Eimeria duodenalis* - 6 samples (25.0%); *Prosthogonimus ovatus* - 4 samples (16.6%); *Heterakis gallinarum* - 3 probes (12.5%); *Trichostrongylus tenuis* - 2 samples (8.3%) and one sample (4.2%) with *Eimeria colchici*.

Out of the total of 54 polyparasitic samples, the parasitological examination performed at pheasants allowed to highlight polyparasitic associations consisting of 2 species - 18 samples (33.3%) and composed of: *Ascaridia galli* + *Eimeria duodenalis* - 7 samples (38.9%); *Ascaridia galli* + *Heterakis gallinarum* - 5 samples (27.8%); *Ascaridia galli* + *Prosthogonimus ovatus* - 3 samples (16.6%); *Trichostrongylus tenuis* + *Ascaridia galli* - 2 samples (11.1%) and one sample (5.6%) *Ascaridia galli* + *Eimeria colchici*.

Polyparasitic associations at pheasants constituted of 6 species of parasites were identified in 2 samples (3.7%) and being composed of: *Ascaridia galli* + *Heterakis gallinarum* + *Syngamus tracheia* + *Capillaria annulata* + *Eimeria duodenalis* + *E. phasiani* - one sample (50.0%) and one sample (50.0) consisting of *Ascaridia galli* + *Heterakis gallinarum* + *Prosthogonimus ovatus* + *Trichostrongylus tenuis* + *E. duodenalis* + *E. colchici*.

Most species of helminths identified at pheasant - 5 species (71.4%) (*Syngamus tracheia*, *Heterakis isolonche*, *Ascaridia galli*, *Heterakis gallinarum*, *Trichostrongylus tenuis*) are in the development cycle without using another complementary host, belonging to the category geohelminths, however 2 species (28.6%) (*Prosthogonimus ovatus*, *Capillaria annulata*) achieve their development cycle through another complementary species, thus belonging to the category of biohelminths.

Out of the total of 10 species of parasites identified at pheasant, 4 species (*Prosthogonimus ovatus*, *Syngamus tracheia*, *Ascaridia galli*, *Heterakis gallinarum*), are also specific for quail, 5 species are specific for guineafowl (*Prosthogonimus ovatus*, *Capillaria annulata*, *Syngamidia tracheia*, *Heterakis gallinarum*), 5 species are specific for chickens (*Prosthogonimus ovatus*, *Syngamus tracheia*, *Ascaridia galli*, *Heterakis gallinarum*, *Trichostrongylus tenuis*) and only 2 species are specific for turkeys (*Ascaridia galli*, *Heterakis gallinarum*).

Parasitological research performed at 48 samples taken from quails (*Coturnix coturnix L.*), revealed their infestation with various parasitic agents: Trematoda Class 2 species (*Echinostoma revolutum* with EI 14.5% and II-3.4 eg., *Prosthogonimus ovatus* with EI 10.4% and II-5.6 eg.); Secernentea Class 4 species (*Capillaria caudinflata* with EI-8,3%, II-4,3eg., *Syngamus tracheia* with EI-2.0%, II-2.3 eg., *Ascaridia galli* with EI-64.6%, II-18.3 eg. and *Heterakis gallinarum* with EI-60.4%, II-14.3 eg.); Class Cestoda with one species (*Raillietina tetragona* with EI-22.9%, II-5.8 eg.), and Conoidasida Class 3 species (*Eimeria wear* with EI-14.5%, II-15.6 eg., *E. batteries* with EI-20.8%, II-12.4 eg., and *E. coturnicis* with EI-35.4%, II-17.6 eg.) (tab. 1).

Out of the total of 48 samples examined from quails, it was shown that 17 samples (35.4%) were infested in the form of monoinvasions, and 31 samples (64.6%) were with mixed invasions.

Monoinvasions at quails consisted of: *Ascaridia galli* - 5 samples (29.4%); *Heterakis gallinarum* - 4 samples (23.5%); *Raillietin tetragon* - 3 samples (17.6%); *Capillaria caudinflata* - 2 samples (11.8%); *E. coturnicis* - 2 samples (11.8%) and *E. bateri* - one sample (5.9%).

Out of the total of 31 polyparasitic samples, the parasitological examination performed at quails allowed to highlight polyparasitic associations consisting of 2 species - 12 samples (38.7%) and composed of: *Ascaridia galli* + *Heterakis gallinarum* - 4 samples (33.3%); *Ascaridia galli* + *Echinostoma revolutum* - 3 samples (25.0%); *Heterakis gallinarum* + *Raillietina tetragon* - 3 samples (25.5%); *Ascaridia galli* + *Eimeria coturnicis* - one sample (8.3%) and one sample (8.3%) *Heterakis gallinarum* + *Eimeria batteries*.

If we refer to the division of parasitic agents identified at quails, depending on how to achieve the parasitic development cycle, then 4 species (57.2%) are biohelminths, and 3 species (42.8%) are geohelminths.

Out of the total of 10 species of parasites identified at quails, 4 species (*Prosthogonimus ovatus*, *Syngamus tracheia*, *Ascaridia galli*, *Heterakis gallinarum*) are also common at pheasants, 4 species are specific at guineafowl (*Prosthogonimus ovatus*, *Syngamus tracheia*, *Ascaridia galli*, *Heter*), 5 species are specific for chickens (*Prosthogonimus ovatus*, *Syngamus tracheia*, *Ascaridia galli*, *Heterakis gallinarum*, *Raillietina tetragona*) and 4 species are specific for turkeys (*Capillaria caudinflata*, *Ascaridia galli*, *Heterakis gallinarum*, *Raillietina echinobothrida*).

Parasitological research performed to 48 samples taken from guineafowls (*Numida meleagris* L.), revealed their infestation with various parasitic agents: Trematoda Class a species (*Prosthogonimus ovatus* with EI-2.77% and II-7.3 eg.); Secernentea Class 4 species (*Capillaria annulata* with EI-47.2%, II-9.8 eg., *Syngamus tracheia* with EI-2.77%, II-3.7 eg., *Ascaridia galli* with EI-41.6%, II-11.2 eg., and *Heterakis gallinarum* with EI-16.6%, II-12.4 eg.); and Conoidasida Class 2 species (*Eimeria numidae* with EI-51.5%, II-15.6 eg., and *E. adenoeides* with EI-32.1%, II-16.8 eg.) (tab. 1).

From the total of 36 samples examined from guineafowl, it was highlighted that 11 samples (30.5%) were infested in the form of monoinvasions, and 25 samples (69.5%) were with mixtinvasions.

Monoinvasions at guineafowls consisted of: *Capillaria annulata* - 4 samples (36.3%); *Ascaridia galli* - 3 samples (27.3%); *Eimeria numidae* - 3 samples (27.3%) and *E. adenoeides* - one sample (9.1%).

Out of the total of 25 polyparasitic samples, the parasitological examination performed at guineafowls allowed to highlight polyparasitic associations consisting of 2 species - 9 samples (36.0%) and composed of: *Ascaridia galli* + *Eimeria numidae* - 3 samples (33.3%); *Ascaridia galli* + *Eimeria adenoeides* - 2 samples (22.2%); *Ascaridia galli* + *Capillaria annulata* - 2 samples (22.2%); *Ascaridia galli* + *Heterakis gallinarum* - one sample (11.1%) and one sample (11.1%) *Heterakis gallinarum* + *Eimeria numidae*.

If we refer to the division of the parasitic agents identified at guineafowls, depending on the way of accomplishing the parasitic development cycle, then 2 species (40.0%) are biohelminths, and 3 species (60.0%) are geohelminths.

Out of the total of 7 species of parasites identified at guineafowl, 4 species (*Prosthogonimus ovatus*, *Syngamus tracheia*, *Ascaridia galli*, *Heterakis gallinarum*) are common at pheasants, quails and chickens, and 3 species are specific for turkeys (*Ascaridia galli*, *Heterakis gallinarum*, *Raillietina tetragonal*).

Therefore, the parasitological results obtained, show that both domestic and wild birds are infested with various parasitic agents, dangerous for both hunting and domestic birds.

Conclusions

1. The result of the parasitological examination of 78 samples collected from pheasants (*Phasianus colchicus* L.) showed a high level of their infestation with various parasitic agents: Trematoda Class one species (*Prosthogonimus ovatus* with EI 12.4% and II-2.8 eg.); Secernentea Class 6 species (*Capillaria annulata* with EI-5.1%, II-6.6 eg., *Syngamus tracheia* with EI-9.5%, II-3.7eg., *Heterakis isolonche* with EI-10.3%, II-8.4 eg., *Ascaridia galli* with EI-82.3%, II-14.4 eg., *Heterakis gallinarum* with EI-21.8%, II-11.9 eg. and *Trichostrongylus tenuis* with EI-11.1%, II-3.6 eg.) and Conoidasida Class 3 species (*Eimeria colchici* with EI-11.9%, II-19.4 eg., *E. duodenalis* with EI-27.0%, II-14.7 eg. and *E. phasiani* with EI-9.3%, II-15.2 eg.);
2. Parasitological research performed at 48 samples taken from quails (*Coturnix coturnix* L.), revealed their infestation with various parasitic agents: Trematoda Class 2 species (*Echinostoma revolutum* with EI 14.5% and II-3.4 eg., *Prosthogonimus ovatus* with EI 10.4% and II-5.6 eg.); Secernentea Class 4 species (*Capillaria caudinflata* with EI-8.3%, II-4.3eg., *Syngamus tracheia* with EI-2.0%, II-2.3 eg., *Ascaridia galli* with EI-64.6%, II-18.3 eg. and *Heterakis gallinarum* with EI-60.4%, II-14.3 eg.); Class Cestoda with one species (*Raillietina tetragona* with EI-22.9%, II-5.8 eg.), and Conoidasida Class 3 species (*Eimeria wear* with EI-14.5%, II-15.6 eg., *E. batteries* with EI-20.8%, II-12.4 eg., and *E. coturnicis* with EI-35.4%, II-17.6 eg.);
3. Parasitological research performed to 36 samples taken from guineafowls (*Numida meleagris* L.), revealed their infestation with various parasitic agents: Trematoda Class one species (*Prosthogonimus ovatus* with EI-2.77% and II-7.3 eg); Secernentea Class 4 species (*Capillaria annulata* with EI-47.2%, II-9.8 eg., *Syngamus tracheia* with EI-2.77%, II-3.7 eg., *Ascaridia galli* with EI-41.6%, II-11.2 eg., and *Heterakis gallinarum* with EI-16.6%, II-12.4 eg.); and Conoidasida Class 2 species (*Eimeria numidae* with EI-51.5%, II-15.6 eg., and *E. adenoides* with EI-32.1%, II-16.8 eg.);
4. Out of the total of 10 species of parasites identified at pheasant, 4 species (*Prosthogonimus ovatus*, *Syngamus tracheia*, *Ascaridia galli*, *Heterakis gallinarum*), are also specific for quail, 5 species are specific for guineafowl (*Prosthogonimus ovatus*, *Capillaria annulata*, *Syngamidia tracheia*, *Heterakis gallinarum*), 5 species are specific for chickens (*Prosthogonimus ovatus*, *Syngamus tracheia*, *Ascaridia galli*, *Heterakis gallinarum*, *Trichostrongylus tenuis*) and only 2 species are specific for turkeys (*Ascaridia galli*, *Heterakis gallinarum*).
5. Out of the total of 10 species of parasites identified at quails, 4 species (*Prosthogonimus ovatus*, *Syngamus tracheia*, *Ascaridia galli*, *Heterakis gallinarum*) are also common at pheasants, 4 species are specific at guineafowl (*Prosthogonimus ovatus*, *Syngamus tracheia*, *Ascaridia galli*, *Heter*), 5 species are specific for chickens (*Prosthogonimus ovatus*, *Syngamus tracheia*, *Ascaridia galli*, *Heterakis gallinarum*, *Raillietina tetragona*) and 4 species are specific for turkeys (*Capillaria caudinflata*, *Ascaridia galli*, *Heterakis gallinarum*, *Raillietina echinobothrida*).
6. Out of the total of 7 species of parasites identified at guineafowl, 4 species (*Prosthogonimus ovatus*, *Syngamus tracheia*, *Ascaridia galli*, *Heterakis gallinarum*) are common at pheasants, quails and chickens, and 3 species are specific for turkeys (*Ascaridia galli*, *Heterakis gallinarum*, *Raillietina tetragonal*).

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