

Original papers

Heterakis isolonche Linstow, 1906 – a new nematode species found in ornamental pheasants in Poland

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ABSTRACT. Studies were carried out on 25 pheasants belonging to 13 Phasianinae species of the Phasianidae family. The research material was collected from private breeders – both Polish and from abroad. The results confirm that the most frequent nematode is *Heterakis gallinarum*, while for the first time in the country – in two of the examined birds of Polish flocks – the occurrence of *Heterakis isolonche* was found.

Key words: nematodes, *Heterakis isolonche*, pheasants, alien species

Introduction

Helminth infection, among the exotic pheasants, is one of the most frequent causes of health depression, and often also deaths [1]. The popularity of keeping and breeding exotic pheasants – mainly Asian species – is steadily growing in Poland [2]. Up to now, there are no detailed studies on the composition of parasitic fauna of these birds, as well as on the potential threat of introducing alien species of parasites. Ornamental pheasants, maintained in aviaries and often originating from breeds located in other countries of Europe or Asia, pose a high risk of parasites spread (including alien species) into free-living populations of related species, i.e. common pheasant (*Phasianus colchicus*), partridge (*Perdix perdix*), or quail (*Coturnix coturnix*). *Heterakis* is one of the genera of nematodes often found in pheasant farms [3,4]. So far, only one species of *Heterakis gallinarum* (syn. *H. gallinae*, *H. vesicularis*) has been recorded from this host group in Poland [5]. Meanwhile, in the natural area of ornamental pheasants occurrence, as well as in some European countries and both Americas [6–14], nematode *H. isolonche* (syn. *H. bonasae*, *H. lanei*, *H. neoplastica*) characterized by considerable pathogenicity is also frequently recorded. Due to the potential threat of the appearance of a foreign

parasitic species, the aim of the work was to recognize the species composition of nematodes of the genus *Heterakis* in the national ornamental pheasants population.

Materials and Methods

The research was carried out from September 2015 to May 2018. The parasitological sections of the digestive tract of 25 fallen birds – belonging to 13 species of ornamental pheasants, and originating from private farms located in Poland, as well as in Belgium, the Czech Republic and Germany (Table 1) – were made [6]. Nematodes were identified to the species on the basis of characteristic features related particularly to the morphology of the male reproductive organs [11–13,15].

Results

Nematodes from the genus *Heterakis* were found in 13 of the 25 birds examined (Table 2). *H. gallinarum* (Fig.1) occurred in 12 birds (*Tragopan caboti*, *T. satyra*, *T. temminckii*, *Syrnaticus soemmerringii*, *Chrysolophus amherstiae* and *Polyplectron chalcurum*) from breeding farms situated in Poland, Germany and Belgium, while *H. isolonche* (Fig. 2) was found only in two birds from Polish

Table 1. Species and number of dissected birds

Species of pheasant	Number of examined birds	Country of origin
<i>Tragopan caboti</i>	2	Poland
<i>Tragopan satyra</i>	2	Belgium
<i>Tragopan temminckii</i>	7	Poland
<i>Syrnaticus humiae</i>	2	Poland
<i>Syrnaticus soemmerringii</i>	1	Poland
<i>Syrnaticus mikado</i>	1	Belgium
<i>Catreus wallichii</i>	1	Poland
<i>Chrysolophus pictus</i>	1	Czech Republic
<i>Chrysolophus amherstiae</i>	2	Poland, Germany
<i>Polyplectron chalcurum</i>	1	Germany
<i>Polyplectron emphanum</i>	1	Germany
<i>Lophura swinhoii</i>	2	Poland
<i>Lophophorus impejanus</i>	2	Poland

breeding flocks, i.e. in *T. temminckii* – as the only helminth species, and in *Ch. amherstiae* – in co-infection with *H. gallinarum*. The dimensions of *H. isolonche* male specimens were as follows: body length: 7.66–12.05 mm, length of copulatory bristles 908.5–1692.0 μm , pre-anal sucker diameter 71.1–124.0 μm . Overall, the level of infection with *Heterakis* spp. was low, and the mean intensity of infection equalled 18 (2–75) nematodes per host. Nodular typhlitis characteristic of the infection of *Heterakis* spp. was not observed during the dissections.

Discussion

According to Deeley [16], the most pathogenic species in pheasants are nematodes *Syngamus trachea*, *Capillaria* spp., *Heterakis isolonche* and *Ascaridia* spp., which are common both in wild and captive birds. In the coprological studies from 2000–2004 made in Slovakia, the common pheasants were carriers of *Capillaria* spp., *Syngamus trachea*, *Heterakis isolonche*, *Ascaridia* spp. and *Trichostrongylus tenuis* [17]. Ornamental pheasants kept in breeding flocks in Western Europe

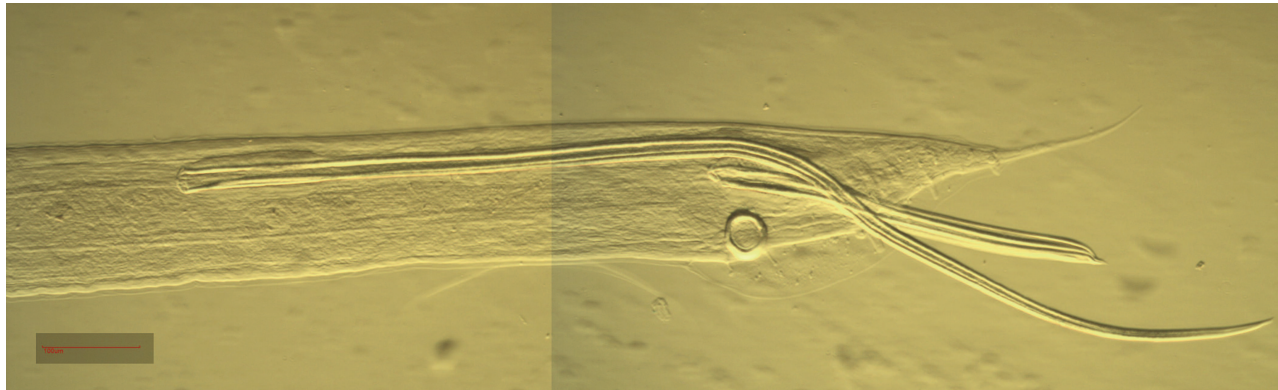
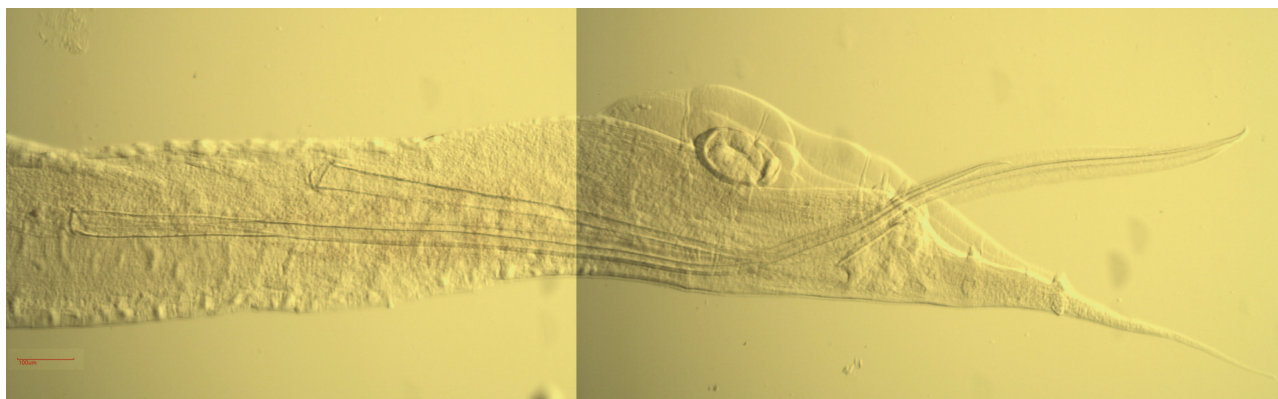
Fig. 1. Posterior end of *Heterakis gallinarum* male (scale bar = 100 μm)Fig. 2. Posterior end of *Heterakis isolonche* male (scale bar = 100 μm)

Table 2. Infection of pheasants with nematodes of the genus *Heterakis*

Host	<i>H. gallinarum</i>	<i>H. isolonche</i>	Females <i>Heterakis</i> sp.
<i>Tragopan caboti</i>	2/2* 13 (11–15)	–	2/2 16 (12–20)
<i>Tragopan satyra</i>	2/2 2 (2–3)	–	2/2 5 (2–9)
<i>Tragopan temminckii</i>	4/7 3 (1–7)	1/7 7	5/7 9 (1–21)
<i>Syrnaticus soemmerringii</i>	1/1 6	–	1/1 7
<i>Chrysolophus amherstiae</i>	2/2 1	1**/2 4	2/2 1
<i>Polyplectron chalcurum</i>	1/1 10	–	1/1 65
Total	12/25 5 (1–15)	2/25 5 (4–7)	13/25 13 (1–65)

*In the top row, the number of infected/examined birds is given; in the bottom row, the mean (min-max) number of nematodes per an infected host; **co-infection with *H. gallinarum*

are most often the hosts of nematodes *Heterakis gallinarum* and *Syngamus trachea*, as well as flagellates *Histomonas meleagridis*, *Trichomonas gallinae*, and coccidia of the genus *Eimeria* [18]. In addition, the authors point out that the infection usually occurs in autumn and winter. Mostly young birds are infected. Infection is most common in birds that are kept on unpaved paddocks where earthworms are found in the ground [16]. In this way, they are especially infected with nematodes from the genus *Heterakis* and *Capillaria*, highest infection occurs among young birds up to the age of two months, and in autumn [18]. During this period the weather conditions are conducive to the multiplication of parasites.

The results obtained in our work did not reveal the presence of *H. meleagridis*, which very often occur together with *H. gallinarum* [15]. In the eggs of *H. gallinarum*, the infective form of *H. meleagridis* can survive up to four years [6], whereas in the eggs of *H. isolonche* there is probably no potential transfer of *H. meleagridis* [19], although this situation does not limit their co-occurrence [9].

Although *H. gallinarum* infection produces some clinical signs, including inflammation and neoplasia – the second due to immature stages of this species [13], the major and the most severe clinical symptoms occur in the case of *H. isolonche* [20–22]. *H. isolonche* larvae may have a tissue phase before becoming adult worms, and the development time is 24–30 days [6]. Infections may produce nodular

thyplitis, affected birds may lose weight and have diarrhea, and high mortality in pheasants may be up to 50% [15]. Additionally, co-infections of *H. gallinarum* and *H. isolonche* are more pathogenic than single species infection [23].

Heterakis isolonche nematode found in pheasants should be classified as a potentially alien invasive species. In the case of its introduction into the population of wild phasianids, it could have a significant influence on the condition and health of the common pheasants. A much smaller risk is caused by the infection of quails and partridges, in the course of which there are no pathological changes observed in the caecum of the birds [15].

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