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PRELIMINARY RESULTS ON THE HELMINTHOFAUNA OF THE EURASIAN LYNX (*LYNX LYNX*) IN LATVIA

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Abstract. In the article, preliminary data on the helminthofauna of the Eurasian lynx (*Lynx lynx*) in Latvia are presented. Material for the research on the helminthofauna was collected and investigated from 1999 to 2002. A total of 42 individuals was examined for helminths. Helminth species occurring most frequently in the Eurasian lynx and helminths dangerous to people were established. Six helminth species belonging to the following taxonomic groups were found: one species (*Taenia pisiformis*) of Cestoda and five species (*Toxocara mystax*, *Thominx aerophilus*, *Trichinella* sp., *Capillaria felis-cati*, and *Nematoda* sp.) of Nematoda.
Key words: Eurasian lynx (*Lynx lynx*), helminths, Latvia

Introduction

Investigation into the Eurasian lynx (*Lynx lynx*) is difficult due to a cryptic life style of these animals. Although information about the Eurasian lynx is quite abundant, there are some contradictions and inadequacies regarding certain questions. There is lack of information about Eurasian lynx diseases, parasites, and mortality. It is known that rabies is detected in the Eurasian lynx. In addition, Eurasian lynx is often infected with helminths (Danilov & Rusakov 1979; Breitenmoser *et al*. 2001). Some carnivore species can be distributors of many helminthoses dangerous to people, wildlife, and domestic animals (Kazlauskas & Prūsaitė 1976), but only in some countries a related detailed research has been conducted. Therefore, investigation into the helminthofauna of Eurasian lynx is not only of a theoretical but also of a practical significance.
The aim of this paper is to present results of research on the helminthofauna of the Eurasian lynx, estimate the intensity and extensity of the parasites and their impact on the host.

Material and methods

Material for the research on the helminthofauna of the Eurasian lynx was collected from 1999 to 2002 throughout the territory of Latvia (Fig. 1). A total of 42 legally hunted Eurasian lynx, of which 21 were male, 17 – female, and four of unknown sex, was examined for helminths.
Hunted animals were delivered from forestries to Riga and stored frozen until examination.
The examination of the helminthofauna was carried out at the Laboratory of Parasitology of the Division of Zoology and Animal Ecology of the Department of Biology at the University of Latvia.
A complete helminthological analysis described by Skryabin (1928) was used, including investigation into the gastro-intestinal tract, liver, gall bladder, lungs, trachea, spleen, kidneys, and urinary bladder. At first, helminths were detected macroscopically and then – microscopically using binocular magnifying glasses and a microscope.
Trichinella sp. were detected at the State Veterinary Medicine Diagnostic Centre. Eurasian lynx' tissues were examined for trichinellosis there too. A digestion method, recommended within the European Union, was used. Muscle tissue is digested with artificial digestive fluid. This releases live trichinae from muscle capsules. The digestion method is one of the methods from VVMDC–T–012–003–1998 methodology. It has been accredited and described in the OIE Manual of Standards for Diagnostic Tests and Vaccines (2000).
Detected helminths were preserved on microscopic slides (Bykhovskaya-Pavlovskaya 1985).
Thirty nine carcasses were examined for helminths completely and the remaining – only partially due to lack of the majority of internal organs.

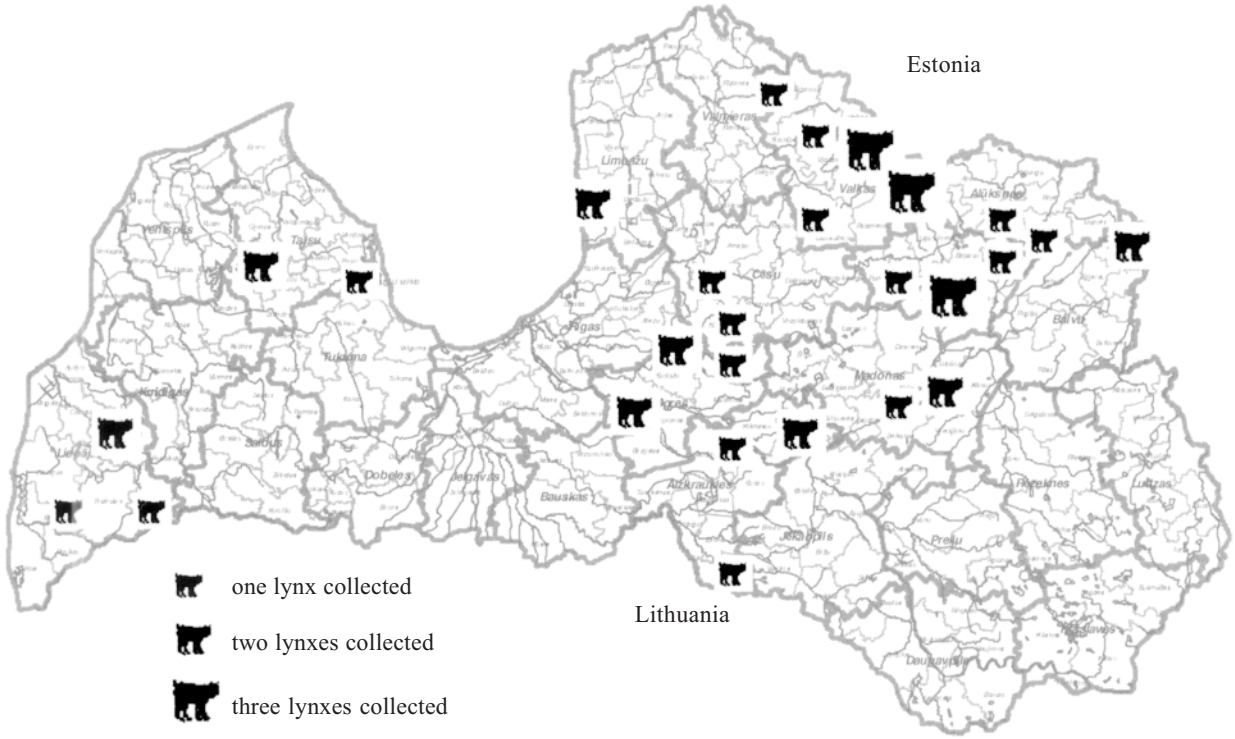

Figure 1. Sites where animals were collected.

Results

A total of six helminth species belonging to the following taxonomic groups was found (Table 1): one species (*Taenia pisiformis*) of Cestoda and five species (*Toxocara mystax*, *Thominx aerophilus*, *Capillaria felis-cati*, *Trichinella* sp., and *Nematoda* sp.) of Nematoda. Two of them, *Taenia pisiformis* and *Toxocara mystax*, were detected in the gastro-intestinal tract. *Thominx aerophilus* was found in the trachea and bronchi, *Capillaria felis-cati* – in the urinary bladder, *Trichinella* sp. – in the diaphragm, and *Nematoda* sp. – in the gall bladder. The taxonomic position of the latter two parasites is under determination.

All of the investigated Eurasian lynx were infected with at least one parasite species.

The cestoda *Taenia pisiformis* was a helminth species occurring most frequently. Its invasion prevalence was 100% and invasion intensity was from two to 61 specimens per animal. The nematoda *Toxocara mystax* was the second most frequent helminth species. Its invasion prevalence was 76.9% and invasion intensity was from one to 52 specimens per animal.

Trichinella sp. can be considered as frequently occurring and dangerous to people as well. Almost half of the investigated animals (46.4%) were infected with *Trichinella* sp. Their invasion intensity varied from a rare to mass occurrence of helminth caterpillars in the sample.

Table 1. The helminthofauna of the Eurasian lynx in Latvia.

No	Species	Localisation	Invasion prevalence (%)	Invasion intensity		
				mean	min.	max.
	Cestoda					
1.	*Taenia pisiformis*	Gastro-intestinal tract	100.0	16.5	2	61
	Nematoda					
2.	*Toxocara mystax*	Gastro-intestinal tract	76.9	12.8	1	52
3.	*Thominx aerophilus*	Trachea, bronchi	33.3	3.2	1	10
4.	*Nematoda* sp.	Gall bladder	3.1		1	1
5.	*Trichinella* sp.	Musculature	46.4		rare	massive
6.	*Capillaria felis-cati*	Urinary bladder	4.0		1	1

Within the framework of our study, it was impossible to estimate the influence of the parasites 'invasion on animals' condition, because only internal organs were available.

Discussion

The Eurasian lynx population in Latvia is characterised by a comparatively low number of helminth species; the rate of infection is variable.

While comparing the results of this study with those from other countries (Breitenmoser *et al*. 2001; Gvozdev 1982; Kozlov 1977; Kazlauskas & Prūsaitė 1976; Mituch 1974 cited by Okarma 2000; Sosnovski 1973 cited by Stubbe 1989; Geptner & Sludsky 1972; Vasili & Decei 1964 cited by Stubbe 1989; Fagasinski 1961 cited by Stubbe 1989), it turned out that in Latvia of 10 Cestoda species parasiting in the Eurasian lynx in general only one was found. On the other hand, of 22 Nematoda species parasiting in the Eurasian lynx, five species were found. In the Eurasian lynx population of Latvia, no parasites from the Trematoda class were found. Literature sources indicate just one Trematoda species parasiting in the Eurasian lynx (Kozlov 1977).

A comparatively important research on the helminthofauna of the Eurasian lynx was conducted in Lithuania; a dissection of 17 Eurasian lynx carcasses revealed eight parasite species. *Toxocara mystax* (prevalence of the parasite was 93.3%), *Trichinella spiralis* (50%), *Hydatigera taeniformis* (26.6%), *Taenia pisiformis* (20%), *Taenia karabbei*, *T. laticollis*, and *Thominx aerophilus* (each 6.6%) were helminths occurring most frequently (Kazlauskas & Prūsaitė 1976). In Poland, however, 81% of all the investigated Eurasian lynx carcasses (n = 31) were infected with helminths. Four Cestoda and eight Nematoda species were detected. Eurasian lynx were infected with *Toxocara cati* (51%), *Trichinella spiralis* (41%), *Hydatigera taeniformis* (35%), *Unicaria stenocephala* (9.6%), and *Taenia hidatigena* (6.4%) most frequently (Okarma 2000).

While comparing data from Lithuania and Poland with our results, it was found out that in Latvia the Cestoda class was represented just by one species, *Taenia pisiformis*. It could be concluded that there is a total invasion of *T. pisiformis* in the Eurasian lynx population of Latvia, as all of the investigated animals were infected with this helminth. In Lithuania, the invasion intensity of Cestoda compared to Latvia (Table 1), is lower, i.e. two specimens per investigated object (prevalence 20%; Kazlauskas & Prūsaitė 1976).

Facultative hosts of *T. pisiformis* are rabbits and hares (Kozlov 1977). As the hare is a preferred prey of the Eurasian lynx (Jędrzejewski *et al*. 1993), it is possible that the Eurasian lynx gets infected with this helminth by consuming this prey. In Latvia, roe deer (*Capreolus capreolus*) is a preferred prey (in winter time; Valdmann *et al*. in prep.); it is quite possible that the roe deer can be the host of *T. pisiformis* as well. Unfortunately, there are no published data about research on Latvia's ungulate helminths.

Toxocara mystax is established as the most frequently occurring helminth of Nematoda species in the Eurasian lynx population of Latvia. The Eurasian lynx invasion with *T. mystax* is higher in Lithuania (Kazlauskas & Prūsaitė 1976) than in Latvia (Table 1). For example, 93.3% of all Eurasian lynx were infected with *T. mystax* in Lithuania, and infection intensity was more discernible (from one to 139 specimens per animal).

One of dangerous parasites found in the Eurasian lynx and pathogenic to people is the genus *Trichinella*. Investigation (Yushkov 1986) shows that dogs (Canidae), martens (Mustelidae), cats (Felidae), and bears (Ursidae) can host species of genus *Trichinella*. Humans may get infected with it by consuming infected bear and Eurasian lynx meat. Other carnivores serve as supporters of infection in the wild and may carry this parasite in populated areas, thereby involving animals of sinantrophic and agricultural territories in transmission of this parasite.

Humans are just a deadlock of distribution of this parasite, because the life cycle of *Trichinella* does not change a host's organism. Therefore, by the sheer nature of things, the existence in human body is fatal for *Trichinella* (Dogels 1986).

In the trachea and bronchi, one parasite species was established, which by its auxiliary characteristic features (Kozlov 1977) is defined as *Thominx aerophilus*. The prevalence of this parasite was 33.3% (Table 1), although it could be higher because not all of the investigated animal carcasses had the respiratory system with other internal organs. It could be claimed, however, that *T. aerophilus* occurs frequently in the Eurasian lynx population of Latvia.

Compared to Lithuania, the prevalence of this helminth is 6.6%, and invasion intensity is characterised as low (Kazlauskas & Prūsaitė 1976).

The nematoda *Capillaria felis-cati* found in the urinary bladder is the only established specimen in the Eurasian lynx population of Latvia at the moment. Available data are insufficient for characterising the invasion of this parasite in Latvia. The investigation in Lithuania showed the domestic cat as the only member of the cat family infected with *Capillaria felis-cati* (Kazlauskas & Prūsaitė 1976).

In the present study, there is no disparity in the numbers

of parasite species between male and female Eurasian lynx. Similar data can be found in other authors' papers, too (Rodriguez & Carbonell 1998).

It has been described that adult animals have a higher degree of invasion compared to juveniles (Rodriguez & Carbonell 1998). In this study, just four of 42 Eurasian lynx were juveniles, which is not sufficient to draw valid conclusions.

Morphological parameters of helminths used for species identification, especially body size, very often differ from those mentioned in literature (Kozlov 1977). In such cases, it would be worthwhile to compare our data and those from other countries, but there is lack of information about differences of morphological parameters within the range of parasite species. It is difficult to make conclusions about geographical variability of a species.

There are some detailed data on a pathogenic influence of parasites on an animal's physical condition. Research carried out in Spain confirms that there is a negative correlation between invasion intensity and an animal's physical condition (Rodriguez & Carbonell 1998). It is possible that invasion intensity influences an animal's physical condition and thereby its ability to survive. Although as a result of evolutionary processes relations between a parasite and a host have been established, a parasite is not 'interested' in its host's death.

At present it can be considered that the helminthofauna of the Eurasian lynx population of Latvia has been ascertained in general, but further investigation is required, which will be carried out in order to obtain extensive information.

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Preliminarūs duomenys apie lūšies (*Lynx lynx*) helmintofauną Latvijoje

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Santrauka

Straipsnyje pateikiami preliminarūs duomenys apie lūšies (*Lynx lynx*) helmintofauną Latvijoje. Medžiaga helmintofaunos tyrimui rinkta ir tyrinėta 1999–2002 m. Iš viso helmintologiškai ištirtos 42 lūšys. Rasti šešių rūšių helmintai, priklausantys šioms taksonominėms grupėms: viena cestodų rūšis (*Taenia pisiformis*) ir penkios nematodų rūšys (*Toxocara mystax*, *Thominx aerophilus*, *Trichinella* sp., *Capillaria felis-cati*, and *Nematoda* sp.). *Trichinella* sp. yra pavojinga ir žmogui.

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