Beiträge zur
JAGD
&WILD
forschung · 41

Boris V. Romashov & Natalia B. Romashova, Voronezh/Russia

Helminths as an ecological factor that affects the mammal population levels

Key words: Helminths, Ungulates, Voronezh region, Russia

A significant number of helminth species represent an ecological factor that affects animal populations. Recent findings on parasitology show that helminths worms seem to indicate host population levels.

We have carried out a long-term study of fecal samples from wild ungulates. They were collected in Voronezh Region (Central Russia), which is located in the forest-steppe belt. One of the peculiar characteristics of the area is forest islands amidst the steppes. This area is currently a natural habitat of 4 species of ungulates: the red deer, the elk, the roe deer and the wild boar.

The wild ungulates had inhabited the area by the end of the 1950s as a result of their big eastward habitat expansion. Modern helminth fauna of wild ungulates that inhabit Voronezh region was formed in 1960–1970. These animals are actively involved in the circulation of some natural focal infestations.

Material and methods

Helminth fauna of wild ungulates, which inhabit the Voronezh region, has been studied since the 1940s. The samples for analysis were collected in the territory of Voronezh Reserve and its surrounding territories. We have analyzed archival and actual data, which are based on fecal samples from more than 1,000 individuals of wild ungulates.

Findings. Wild ungulates currently host 36 helminth species 27 of which are species of nematode, 6 – species of trematode and 3 – species of cestode (Fig. 1). The most common helminth species in ungulates are those that parasitize two or more host species and have high prevalence and infestation intensity indexes.

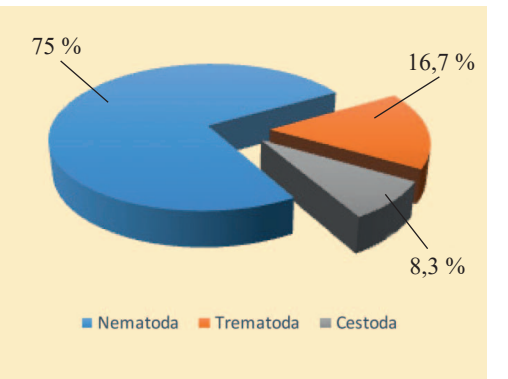

Fig. 1 The ratio of major groups of helminths of wild ungulates (Voronezh region, Russia)

The most pathogenic species of trematode parasites are those that live in the bile ducts within the liver of wild ungulates. Having high infestation intensity index, they cause significant pathogenic changes [3, 4]. The *Dicrocoelium*

lanceatum trematoda has been detected in all species of wild ungulates: the roe deer (with the extensity of infestation 59.5 %), the red deer (infestation extensity 38.5 %), the wild boar (infestation extensity 37.5 %), elk (infestation extensity 13.3 %) [3, 4]. Hotbeds of dicroceliosis circulate steadily in natural ecosystems and in the Voronezh Region; the dominating species in this process are the roe deer and the wild boar.

Fasciola hepatica has been registered within all the species of wild ungulates. The extensivity of infestation extensity rates are the following: 8.1 % for the roe deer, 6.3 % for the elk, 2.8 % for the red deer and 0.3 % for the wild boar. The most likely way of trematoda infestation of wild ungulates is their contacts with anthropogenic environments such as pastures. Thus, the anthropogenic factor is of vital importance for the natural circulation of fasciolasis in Voronezh Region.

The obligate host of the *Parafasciolopsis fasciolaemorpha* trematode is the elk (infestation extensity 85.3 %). In the 1980s an increase in the number of elks in the territory was reported, thus leading to a high concentration of invasive *P. fasciolaemorpha* elements in the environment. Other host species were infested as well, with the infestation extensity rate of 30.8 % for the red deer and 8.1 % for the roe deer. Pockets of parafastsiolopsozis circulate sustainably in natural ecosystems in the Voronezh Region.

Among the trematodes registered within wild ungulates in the region of interest we have identified two types that can be considered as the most pathogenic ones: *P. fasciolaemorpha* and *D. lanceatum*. They circulate in forest ecosystems of the Voronezh Region as natural hotbeds.

Among the most pathogenic nematodes we identify the group of nematodes which parasitize the lung of wild ungulates. For the wild boar these are the Metastrongilidae with the utmost degree of infestation. We have registered three species of this genus: *Metastrongylus elongatus, M. pudendotecfus, M. salmi*. The prevalence index of these nematodes attains the utmost values (98–100%). There are from 140 to 1,500 specimens of nematodes found in the lungs.

We register mortality of the young stock caused by this particular infestation, especially in the prevernal season. The cause of mortality is often pneumonia which is due to nematodes' parasitizing in the lung. Metastrongylosis overtakes nearly the whole of the young population of wild boars, this fact being conditioned by their feeding habits. Young boars need protein feed so they typically consume earthworms rather often which leads to metastrongylidae infestation. We can also see the increase in metastrongylidae infestation rate of the young stock resulted from the growth of wild boar population. The results of long-term studies allow us to conclude that metastrongylidae can be regarded as the most important ecological factor that regulates the number of wild boars in the Voronezh Region.

Within the wild ungulates of the territory there have been found three species of cestode, two of them being the larval forms. Material on larval cestodosis within wild ungulates was collected in the territory of the Voronezh Reserve in the periods from 1960 to 1970 and from 1980 to 2000 [1, 2]. In recent years this work has been of nature monitoring character. The dynamics of the infestation rate of wild ungulates with larval forms of cestodes depends on fluctuations in their number and the wolf population dynamics in the territory observed.

Among all the species of cestodes found in wild ungulates such larval forms as *Taenia hydatigena* (larvae) and *Eshinococcus granulosus* (larvae) are the most significant ones. The major ecological factor in the circulation of these species is the number of intermediate (Artiodactyla) and definitive (Canidae) hosts. All the species of wild ungulates host *T. hydatigena* (larvae). Long-term annual average prevalence indexes of *T. hydatigena* (larvae) are the following: the deer – 19.9 %, the elk – 86.2 %, the roe – 24.3 %, the wild boar – 25.3 %.

Therefore, the most important hosts in the circulation of larval forms of this cestode are the deer, the roe and the wild boar (Fig. 2).

The wolf appears to be the main definitive host of *T. hydatigena* on the territory (extensivity of infestation – 50–65 %). Larval echinococcosis (*E. granulosus*) was discovered in three species of wild ungulates: the deer – 4.2 %, the elk – 1.5 %, the wild boar – 2.9 % (Fig. 3). Previously, these indexes didn't exceed 1%. The reason why more wild ungulates were infested with

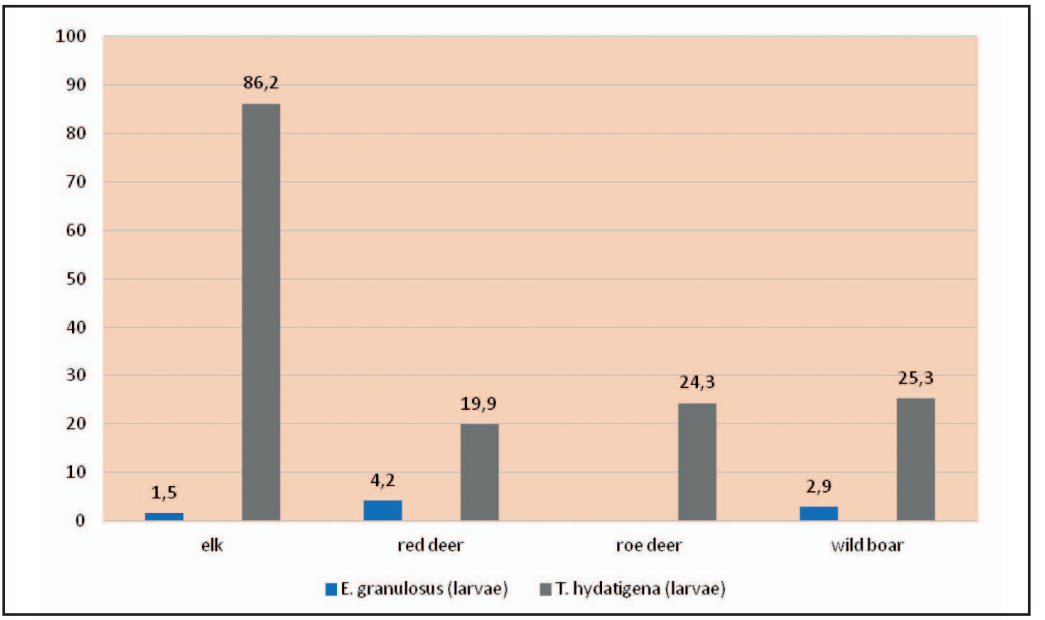

Fig. 2 The infestation of ungulates with two species of larval cestodes (%)

E. granulosus is an increase in the wolf population. This implies the existence of resistant natural hotbeds of echinococcosis in the forest islands of the Voronezh region.

Agents of echinococcosis and taeniasis are often found in domestic animals. Definitive host is the domestic dog, while intermediate hosts are usually domestic ungulates. This indicates active functioning of anthropogenic hotbeds of this infestation.

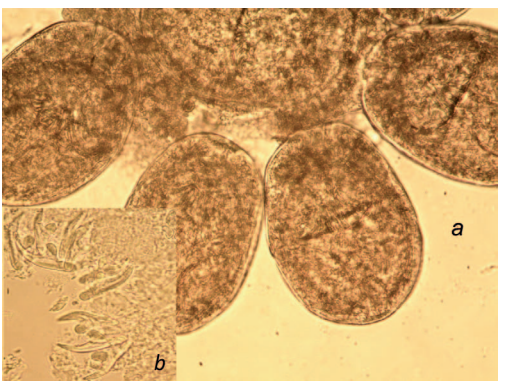

Fig. 3. E. granulosus, the host – a wild boar (a – protoscolex, magnification 40x; b – larval hooks, magnification 100x) (orig.)

Summary

Thus, we define the most pathogenic species of helminths that affect the dynamics and the productivity of wild ungulates populations. *D. lanceatum* is diagnosed in the red deer and the roe deer, *P. fasciolaemorpha* – in the elk, lung threadworms (metastrongylidae) – in the wild boar. The increase in the wolf population in the territory has led to a higher infestation index of wild ungulates with larval cestodes: *T. hydatigena* (larvae) and *E. granulosus* (larvae).

Literature

Romashov, V.A.; Romashov, B.V.; Nepyshnevskaya, V.V., Gorbunov, E.A., Rogov, M.V., Chubirko, M.I., Morozova, N.N., Popova, T.I. (2002): Dynamics of the major zoonotic diseases caused by helminths in the Voronezh Region. – Theory and practice of struggle against parasitic diseases (zoonoses). Materials report of the scientific. conf. Issue 3. Moscow: 259–262.

Romashov, B.V.; Semenov, V.A. (1999): The larval forms of cestodes wild mammals Voronezh Reserve and adjacent territories. – Theory and practice of struggle against parasitic diseases: Materials of the reports. scien. conf. Moscow: 239–241.

Romashova, N.B. (1997): Trematods-fasciolae (Trematoda: Fasciolata) wild ungulates of the Voronezh Nature Reserve. – Problems of preservation and assessment of the state of natural complexes and objects, Mater. scien. conf. Voronezh: 135.

Romashova, N.B.; Shaveleva, O.N. (2010): Main helminthiases of ungulates in Voronezh Region. – Theory and practice of control of parasitic diseases. Mater. scien. conf. Moscow. – Vol. **11**: 385–388.

Anschrift der Verfasser:

Prof. Dr. Boris V. Romashov
Dr. Natalia B. Romashova
Voronezhsky State Nature Biosphere Reserve,
Goszapovednik, Centralnaja usadba,
Voronezh, 394080, Russia.
E-Mail: bvrom@rambler.ru