

Ecological survey of helminth fauna in European bison living in freedom under the Vologda region conditions

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Abstract: Coproscopic studies of European bison feces revealed that animals were infected by *Fasciola hepatica*, *Monezia expansa*, Strongylata in gastrointestinal tract as well as by *Dictyocaulus viviparus*, and some of intestine protozoa. To determine conditions facilitating E. bison infection by helminthes, to establish the possibility of mutual infections between E. bison and other wild and farm animals living on the same territory, ecological conditions of the home range of E. bison in this area were analyzed.

Keywords: bison, helminthes fauna, the Vologda region, *Fasciola hepatica*, *Monezia expansa*, Strongylata.

European bison as one of the largest animals of Europe requires vast areas of home ranges. Nowadays in Russia a number of territories suitable for preserving this species in nature has been identified. So far in Russia, E. bison were released to various areas like: Orlov, Bryansk, Kaluga, Vladimir, and Vologda.

Now, population of E. bison living in freedom increased in the Vologda region and requires urgent solution. In 1991, three individuals were released into the Kirillov district forests. Gradually E. bison population had been increasing due to subsequent transfers from Ryazan and Orlov regions, and natural reproduction at the site. According to the Department of Security, Control and Regulation of Fauna management in the Vologda region, the population of this endangered species in the region has increased to 57 animals in the beginning of 2015.

The Vologda region is the farthest northeast site inhabited by E. bison in the world. These animals proved to be able to find food, survive and reproduce actively in the forests of this region. However many factors influence there the growth of E. bison and other animals populations, including parasitic diseases.

According to literature data, 47 species of parasitic worms were found to infect E. bison in Russia (Anisimova 2008; Demiaszkiewicz *et al.* 2012). Analyses of their helminthes' fauna did not identified any specific parasite species. Parasites found in

the E. bison originate mainly from other Bovidae and partially Cervidae inhabiting the same biotopes. (Treboganova 1997; Anisimova 2008; Subbotin 2011; Demiaszkiewicz *et al.* 2012). During acclimatization in new biocenosis E. bison together with other herbivores begun participating in the circulation of local helminthes species. According to Treboganova (1997), cattle has the greatest importance in forming helminthes fauna in E. bison through creating high concentration of invasive form of parasites at pastures utilized by both host species.

The study on the helminthosis in E. bison living in freedom at the territory of the Vologda region, has been initiated in the 1990s in the laboratory of the Epizootiology and Microbiology Chair of the Vereshchagin Vologda State Dairy Farming Academy (Shumov 1940).

Materials and methods

As European bison is listed in the Red Book and its shooting is prohibited, only *in vivo* diagnostic methods (coproscopic studies) could be used to determine the invasion rate of those animals with helminthosis. Feces sample collection has been done in warm and cold periods of the year.

The study was performed with floatation (Brez method) and sedimentation method (successive washings method).

Results

In almost all species of parasites found in E. bison, the development of invasive larvae is connected with soil and water conditions, and the pasture grazing regime. Therefore, in this context, for the analysis of factors facilitating parasite invasions, the knowledge on local habitat conditions is essential.

At the territory of the Vologda region, E. bison live within the area of 2,300 ha which can be divided into two zones: the zone of permanent presence (about 1,200 ha) and the zone of incidental attendance having no definite borders (Mosenkov 2011). The habitat there is a highly mosaic consisting of mixed forests, fields, and agricultural lands. This area includes also many floodplain meadows which provide favorable environment for some invasive helminthes. Grassy vegetation prevails in the summer diet of E. bison in Ustie-Kubenskoe district of the Vologda region. In winter and especially in the beginning of spring, increases the consumption of woody forage. Additionally, at feeding points E. bison are additionally fed with silage, hay and concentrates. However, they utilize not only feeding points dedicated for wildlife, but they also use open silos prepared for cattle feeding, so in a consequence they destroy its contents and also leave their feces there. Hence the silage in such silos becomes unsuitable for feeding cows which is an economic loss to local animal farms.

The E. bison habitats at the territory of the Vologda region are also inhabited by other ungulates. Among them the elk takes an advantage from living next to E. bison. Those animals often travel along E. bison paths. They are also attracted by salt licks prepared for E. bison. Elks living next to bison herd are not disturbed by hunters. They have more chances to hide their presence and smell among E. bison footprints, from wolves and hounds. Elk laying sites are often situated next to those of E. bison (Mosenkov 2011). Furthermore, E. bison often visit pastures intended for cattle, goats and sheep, which increases a possibility of helminthes exchange between them and other species of ruminants living in the same area.

The list of parasites (the eggs of intestinal and pulmonary worms, and intestinal protozoa cysts) found in E. bison feces are presented in Table 1.

Table 1. Species composition of intestinal and pulmonary worms, and intestinal protozoa found in E bison living in freedom at Vologda region.

Systematic group of parasites	Genus	Species	
Helminthes	<i>Fasciola</i>	<i>Fasciola hepatica</i>	
	<i>Moniezia</i>	<i>Monezia expansa</i>	
	п/о <i>Strongylata</i> :	п/о <i>Strongylata</i> :	
	<i>Dictyocaulus</i>		<i>Dictyocaulus viviparus</i>
			<i>Dictyocaulus filaria</i>
	<i>Bunostomum</i>	<i>Bunostomum</i> sp.	
	<i>Cooperia</i>	<i>Cooperia</i> sp.	
	<i>Oesophagostomum</i>		<i>Oesophagostomum radiatum</i>
			<i>Oesophagostomum columbianum</i>
	<i>Chabertia</i>	<i>Chabertia ovina</i>	
<i>Nematodirus</i>	<i>Nematodirus</i> sp.		
Protozoa	<i>Entamoeba</i>	<i>Entamoeba coli</i>	
	<i>Endolimax</i>	<i>Endolimax nana</i>	

According to our data, the invasion of elks with *Strongylata* and *Monezia expansa* in the Vologda region is possible only, when elks while feeding take plants with their roots directly from the surface of the soil. Such type of foraging is more common in the late autumn and also in the early spring (Shestakova et al. 2012). We suppose that the invasion of E. bison with these worms takes place in the same way, and in the same periods of the year while eating grassy feeds contaminated with soil.

We also found that the larvae of *Strongylata* keep their vitality and activity after four-months of freezing. Therefore we consider that over-wintered larvae may cause the early spring invasion of E. bison with *Strongylata*.

Conclusions

The parasitic fauna of free-ranging E. bison includes such helminthes like *Fasciola hepatica*, *Monezia expansa*, Strongylata which are typical to infect animals grazing at the pasture.

E. bison may take part in the circulation of some species of Trematodes, *Monezia expansa* and Strongylata common for cattle and elks, living in the same area of Vologda region.

The possibility of parasitic fauna exchange between E. bison and other domestic and wild ungulates as well as carnivorous animals is still not sufficiently recognised and requires further studies.

Literature

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Ocena ekologiczna parazytofauny żubrów bytujących w wolnym stadzie w rejonie Wołogdy

Streszczenie: Na podstawie badań koproskopowych przeprowadzonych w stadzie żubrów bytującym w rejonie Wołogdy stwierdzono w przewodzie pokarmowym obecność *Fasciola hepatica*, *Monezia expansa*, Strongylata jak również *Dictyocaulus viviparus* i jelitowe pierwotniaki. W celu określenia warunków w jakich przebywają żubry oraz ustalenia szans dwukierunkowej inwazji pomiędzy żubrem a innymi dzikimi i gospodarskimi kopytnymi żyjącymi na tym samym terenie przeanalizowano środowisko arealu występowania żubrów w tym rejonie.
