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# Parasitological monitoring of European bison in the West Pomeranian voivodeship on the basis of coproscopical examination*

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Summary

**The aim of the study was to determine the level of parasitic infections in West Pomeranian European bison on the basis of coproscopic examinations. A total of 172 faecal samples of European bison from the Mirosławiec, Drawsko and Jałowcówka herds were examined by the flotation and sedimentation methods as well as the Baermann technique. Faecal examinations revealed the presence of gastrointestinal nematode eggs belonging to the family Trichostrongylidae and the genera *Nematodirus*, *Aonchotheca*, *Trichuris* and *Strongyloides*, eggs of tapeworms of the genus *Moniezia*, trematodes *Fasciola hepatica* and *Paramphistomum cervi* as well as larvae of the lungworm *Dictyocaulus viviparus* and seven species of coccidia of the genus *Eimeria* (*E. bovis*, *E. pellita*, *E. zuernii*, *E. auburnensis*, *E. cylindrica*, *E. ellipsoidalis*, and *E. brasiliensis*). The composition of parasite species in the population of European bison in the West Pomeranian voivodeship was similar to that observed in other free-living European bison populations in Poland.**

**Keywords: parasites, European bison, West Pomeranian voivodeship, coproscopic studies**

The European bison (*Bison bonasus*) is the largest mammal living in Europe, saved from extinction by the efforts of several generations of Polish naturalists, foresters and veterinarians. The first eight animals in western Poland were reintroduced from the Białowieża Forest to the Wałcz Forest District in 1980. The herd, currently estimated at about 85 animals, migrated and eventually inhabited the Mirosławiec Forest District. Another herd inhabiting the Drawsko Training Area originated from 16 animals reintroduced from Białowieża, Pszczyna and Niepołomice in 2008-2009. In 2014, the size of the herd was estimated at about 70 animals. Due to poor exchange of animals between the two herds, a third herd was established for genetic purposes in the Jałowcówka Forestland of the Drawsko Forest District in 2015. It consisted of European bison relocated from the two already existing groups and was supposed to be a „buffer" between one herd and the other. The population of West Pomeranian European bison has been gradually increasing and reached 265 animals in 2018 – currently it comprises more than 330 (21, 22, 24, 25).

Parasitic diseases are an important factor affecting the health and condition of wild ruminants. The most common parasites of European bison are gastrointestinal nematodes, lung nematodes and liver flukes, whose pathogenic effects result from feeding on the host's tissues and body fluids, mechanical damage of the host's tissues and organs, as well as the secretion of toxic metabolic products (3).

The species composition of European bison parasites as well as their prevalence and intensity of infection are well described in the Białowieża Forest, where parasitological studies have been conducted for over 100 years (8, 9, 13-15, 17, 18, 26). Recently, parasitological monitoring has been carried out in other regions inhabited by free-living European bison populations: the

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Knyszyn and Borki Forests as well as the Bieszczady Mountains (4, 6, 7, 11, 12). However, until now, there have been no data on parasitic infections in the West Pomeranian European bison.

Therefore the aim of this study was to identify parasites of European bison inhabiting the West Pomeranian voivodeship on the basis of coproscopic examinations.

## Material and methods

A total of 172 faecal samples were collected from European bison during the spring (May) and autumn (November) of 2018 in West Pomeranian voivodeship: 96, 34 and 42 from the Mirosławiec, Drawsko and Jałowcówka herds respectively. The samples were examined by coproscopic methods under laboratory conditions. For each method, 3 grams of faeces were used, i.e. the weight of each sample was at least 9 grams.

Eggs of gastrointestinal nematodes and oocysts of coccidia were detected by direct flotation in a sucrose solution (SG = 1.27) according to Taylor et al. (23). The faecal sample was added to 10 ml of the flotation solution and mixed. Then the suspension was poured into a tube, complemented with a sucrose solution, and a coverslip was placed on top of the tube. After 20 minutes, the coverslip was placed on the slide, which was examined under a Jenaval light microscope (Carl Zeiss Jena, Germany) at 125 × magnification.

The presence of trematode eggs was determined by the sedimentation method. Faeces were strained through a 0.25 mm mesh sieve into tap water. The material was left to sediment for about 20 minutes and decanted about 3-4 times until the supernatant was transparent. Then the sediment was poured on a petri dish and examined under a stereoscopic microscope (PZO, Poland) at 40 × magnification.

Larvae of lungworms were detected by the Baermann technique (23). Faeces were wrapped in gauze and placed in a funnel of 5 cm diameter plugged at the end and filled with tap water. The samples were incubated for 24 hours at room temperature. Subsequently, aliquots of 2 ml were poured from the end of the funnel into a watch glass and examined under a stereoscopic microscope (PZO, Poland) at 40 × magnification.

The eggs, oocysts and larvae were identified to the family, genus or species level on the basis of their morphometrical features (20, 22).

## Results and discussion

The faeces were found to contain eggs of gastrointestinal nematodes of the genus *Aonchotheca*, *Nematodirus*, *Trichuris* and *Strongyloides*, as well as eggs of the family Trichostrongylidae, larvae of lung nematodes *Dictyocaulus viviparus*, eggs of tapeworms of the genus *Moniezia*, oocysts of coccidia of the genus *Eimeria* belonging to seven species (*E. bovis*, *E. zuernii*, *E. auburnensis*, *E. brasiliensis*, *E. cylindrica*, *E. ellipsoidalis* and *E. pellita*) and eggs of liver flukes *Fasciola hepatica* and rumen flukes of the genus *Paramphistomum*.

The most prevalent were Trichostrongylidae eggs, found in 100% of faecal samples from all herds, with only a slightly lower prevalence in the Drawsko herd during autumn, reaching 82.6%. The mean number of Trichostrongylidae eggs found in 3 g of faeces was also the highest and ranged from 202.4 to 270. The prevalence of nematodes of the genus *Nematodirus* ranged from 21.4% to 31% in the Mirosławiec and Jałowcówka herds, but was much lower in the Drawsko herd, ranging from 4.3% to 9%. Eggs of nematodes of the genus *Trichuris* were detected in all three herds, with a prevalence ranging from 7% to 21.7%. Nematodes of the genus *Aonchotheca* occurred in the herds of Mirosławiec and Jałowcówka with a prevalence of 4% to 7.1%, and nematodes of the genus *Strongyloides* were found only in the Drawsko herd with a prevalence of 4.3%. Lung nematodes *D. viviparus* were detected in all herds with a prevalence ranging from 8% to 32.1%. Trematode infection differed significantly between the three regions: eggs of *F. hepatica* and *Paramphistomum* spp. were found in the Drawsko herd in 81.8% and 63.6% of samples respectively, whereas both parasites were present in only about 7% of samples from the Jałowcówka herd and were not detected at all in the European bison from Mirosławiec.

Tapeworms of the genus *Moniezia* were found in animals from all three areas, with a prevalence ranging from 5.6% to 17.3%. Seven species of coccidia of the genus *Eimeria* were detected in the Mirosławiec Forest District, whereas only three coccidian species were detected in each of the two other bison herds. The dominant species was *E. bovis*, reaching a maximum prevalence of 85.9% in the Mirosławiec herd. The remaining coccidia species were observed sporadically. Detailed results are presented in Table 1.

The composition of parasite species in European bison in the West Pomeranian voivodeship was similar to that observed in other free-living populations in Poland, including the Białowieża, Borki and Knyszyn Forests, as well as the Bieszczady Mountains. The most prevalent parasites in all three bison herds were Trichostrongylidae nematodes together with trematodes in the Drawsko herd and *E. bovis* in animals from the Mirosławiec Forest District. The prevalence of other parasitic infections was generally low and probably did not produce any clinical signs of the disease.

Eggs of Trichostrongylidae nematodes were more intensively excreted in the spring. It might be related to the spring rise phenomenon, characteristic of gastrointestinal nematodes and associated with the increased faecal shedding of parasite eggs during spring time (3, 12). The Trichostrongylidae family includes one of the most pathogenic parasites of European bison, *Ashworthius sidemi*, which might be a cause of extensive inflammatory, necrotic and atrophic changes in the gastrointestinal tract of infected animals (10, 19) as well as significant deterioration of some haematologi-

**Tab. 1. Prevalence of parasitic infections in European bison from the Mirosławiec, Drawsko and Jałowcówka herds (n – number of animals examined)**

| Parasite | Prevalence (%) | | | | | |
|---|---|---|---|---|---|---|
| | Mirosławiec | | Drawsko | | Jałowcówka | |
| | Spring (n = 71) | Autumn (n = 25) | Spring (n = 11) | Autumn (n = 23) | Spring (n = 14) | Autumn (n = 28) |
| Trichostrongylidae | 100.0 | 100.0 | 100.0 | 82.6 | 100.0 | 100.0 |
| *Aonchotheca* sp. | 5.6 | 4.0 | – | – | 7.1 | – |
| *Nematodiurus* sp. | 31.0 | 24.0 | 9.0 | 4.3 | 21.4 | 28.5 |
| *Trichuris* sp. | 7.0 | – | 9.0 | 21.7 | 7.1 | 21.4 |
| *Strongyloides* sp. | – | – | – | 4.3 | – | – |
| *Eimeria bovis* | 85.9 | 8.0 | – | 8.6 | 14.2 | 14.2 |
| *E. zuernii* | 11.2 | – | – | – | 7.1 | – |
| *E. auburnensis* | 14.0 | – | – | – | – | 3.5 |
| *E. pellita* | 1.4 | – | 9.0 | – | – | – |
| *E. cylindrica* | 1.4 | – | 9.0 | – | – | – |
| *E. ellipsoidalis* | 2.8 | – | – | – | – | – |
| *E. brasiliensis* | 4.2 | – | – | – | – | – |
| *Paramphistomum* spp. | – | – | 63.6 | 56.5 | 7.1 | – |
| *Fasciola hepatica* | – | – | 81.8 | 26.0 | 7.1 | – |
| *Dictyocaulus viviparus* | 18.0 | 8.0 | 27.2 | 8.6 | 14.2 | 32.1 |
| *Moniezia* sp. | 5.6 | – | – | 17.3 | – | 17.3 |

cal parameters (16). Although *A. sidemi* has not been detected in European bison in the West Pomeranian voivodeship so far, its presence in that population cannot be excluded.

The prevalence of *Aonchotheca* sp. did not exceed several percent, similarly to that in European bison in the Bieszczady mountains. The parasite was detected more often in forests of north-eastern Poland, with a prevalence ranging from 15% to 53.2% (4, 6, 7). The species *A. bilobata* is a common parasite of cattle in India and Vietnam. European bison probably contracted it during their stay in zoos and game parks (5).

Nematodes of the genus *Nematodirus* were found in 4.3% to 31% of West Pomeranian European bison, in 0.7% to 10.6% of animals in the Bieszczady Mountains, in 0.5% to 4% of those in the Białowieża Forest and in 9% to 28% of those in the Borki Forest, but they were not detected in the Knyszyn Forest. The prevalence of infection with nematodes of the genus *Trichuris* in the West Pomeranian voivodeship ranged from 7% to 21.4% and was higher than that observed in the Bieszczady Mountains or forests of north-eastern Poland. In the West Pomeranian voivodeship, 4.3% of European bison were infected with rare nematodes of the genus *Strongyloides*, recorded so far only in animals from the Knyszyn and Białowieża Forests (17).

The prevalence of *D. viviparus* larvae in European bison in the West Pomeranian voivodeship was similar to that in the Bieszczady Mountains and the Białowieża Forest, but only half as large as that in the Knyszyn Forest.

*F. hepatica* liver flukes are considered to be the most pathogenic parasites of European bison. The percentage of West Pomeranian European bison infected with *F. hepatica* ranged from 7.1% to 81.8%, with the highest prevalence in the Drawsko herd. The occurrence of the trematode is closely related to the spread of its intermediate host, the aquatic snail *Galba truncatula* (1, 2). Thus the high percentage of wetlands in the Drawsko voivodenship might be one of the reasons for the higher prevalence of the parasite in European bison inhabiting that area. The parasite is commonly detected in forests of north-eastern Poland, but no trematodes were found in European bison in the Bieszczady Mountains.

Seven species of coccidia were found in West Pomeranian European bison, which is similar to findings in the Bieszczady Mountains as well as in the Borki and Knyszyn Forests. The highest diversity of coccidia, comprising 11 species, was observed in European bison inhabiting the Białowieża Forest (20). *Eimeria bovis* was the most common species in all populations studied (4, 7), and so it was in the West Pomeranian voivodeship.

The prevalence of parasitic infections in West Pomeranian European bison was similar to that in other free-living populations in Poland. Nevertheless, it is necessary to perform parasitological monitoring of European bison by regular coproscopic examinations twice a year (in spring and autumn), which is an easy and non-invasive method of estimating the type of parasitic infections in protected animal species.

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