

## Original papers

## Extension of occurrence area of the American fluke *Fascioloides magna* in south-western Poland

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**ABSTRACT.** Liver fluke *Fascioloides magna* is a typical parasite of American cervids. The reason for *F. magna* to appear in Poland territory was bringing the American wapiti deer to those forests around 1850. Along with these deer the aforementioned fluke was also introduced. The aim of this study was to present the case of finding of this species in cervids in Bory Zielonogórskie. Samples of deer feces were collected in February 2015 in Forest District Krzystkowice. A total of 16 samples of feces were examined, 7 of which came from the red deer, 4 from roe deer and 2 samples from fallow deer. Three grams of feces from each sample were examined for the presence of trematode eggs using the decantation method. Eggs of *F. magna* were detected in 2 of 7 examined samples from red deer, in the first sample it were found 3 eggs, and in the second one 46 eggs. Moreover, flukes eggs were found in 3 out of 4 roe deer faecal samples, in numbers of 1, 3 and 58 eggs respectively in each sample. Also, in faecal samples from two fallow deer were found in one of them 17 eggs *F. magna*. The results of this study extend the range of occurrence of the trematodes *F. magna* on the neighboring Lower Silesia Forest complex of Bory Zielonogórskie which are distant about 50 km. Fallow deer and roe deer were considered to be new in Poland definitive hosts of *F. magna*.

**Key words:** *Fascioloides magna*, Cervidae, Bory Zielonogórskie

### Introduction

Liver fluke *Fascioloides magna* is a typical parasite of American cervids. The role of the definitive host act wapiti deer (*Cervus elaphus nelsoni*), white-tailed deer (*Odocoileus virginianus*), caribou (*Rangifer tarandus*), mule deer (*Odocoileus hemionus hemionus*) and black-tailed deer (*Odocoileus hemionus columbianus*) [1]. For the first time this species was not detected and described in America, but in Europe. In 1875 in Italy in the royal game preserve in Torino this parasite was the cause of a number of illness of deer, which led to the fall of many animals. The source of the invasion were imported to the zoo American wapiti deer [2]. On the American continent fluke was found several years later in cattle [3], and then also in other domestic and wild ruminants [1]. In

subsequent years, *F. magna* was recorded at the red deer, fallow deer and roe deer in several European countries: Germany, Czech Republic, Slovakia, Austria, Hungary and Croatia [4–10].

To all of these countries in the nineteenth century were introduced in the deer from America.

The development cycle the parasite is typical for the family Fasciolidae. In the eggs excreted in the faeces within 28–30 days hatch in miracidia. Intermediate hosts of *F. magna* are aquatic snails belonging to the family Limnidae, inter alia *Galba truncatula* and *Radix peregra*. Miracidia actively penetrate deep into the tissues of snail, where after 12–20 hours turn into another larval form – sporocysts. In the sporocysts after 10–15 days from the embryonic balls develops the next generation of larvae – parent rediae and in each of them daughter rediae. In the daughter rediae arise cercariae, which

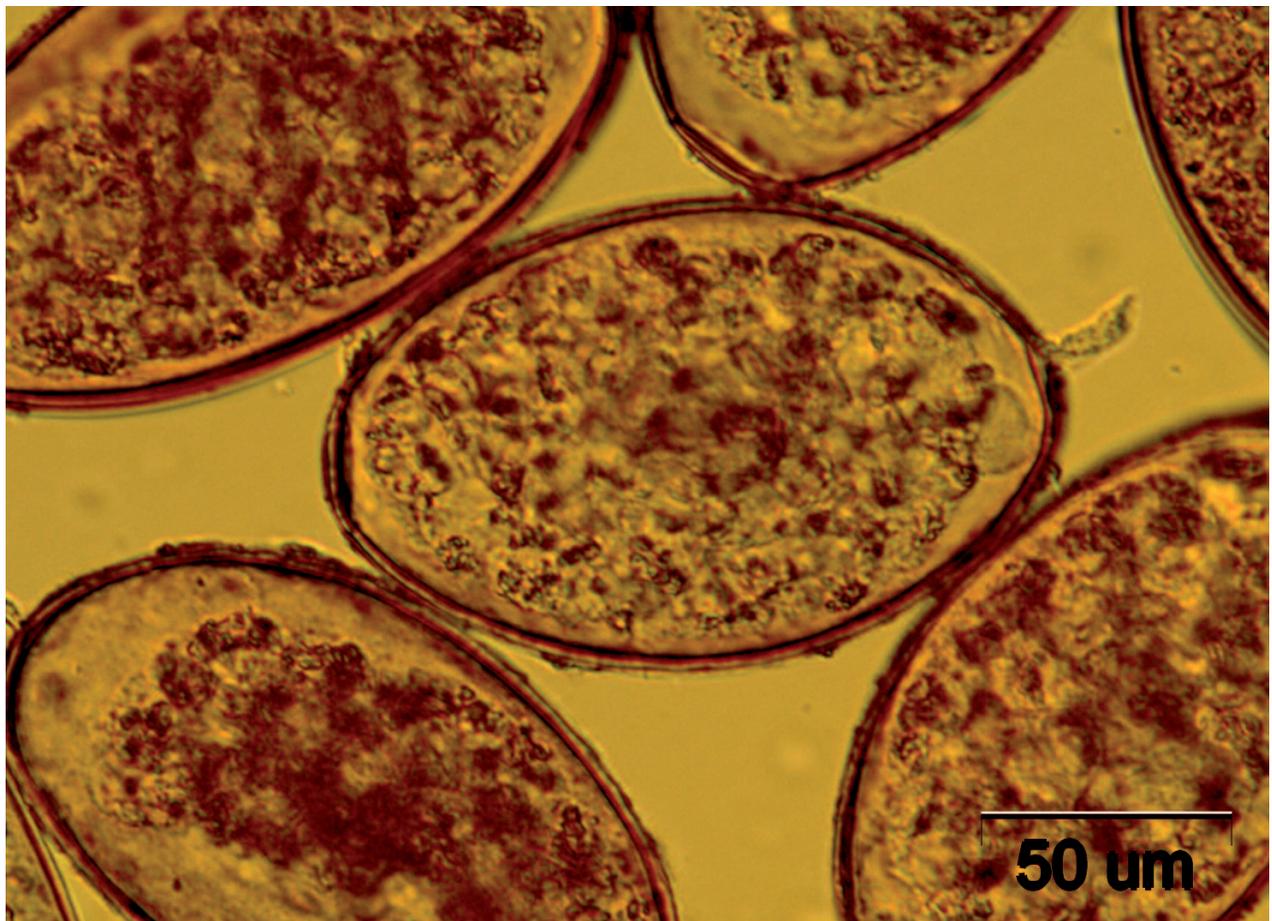
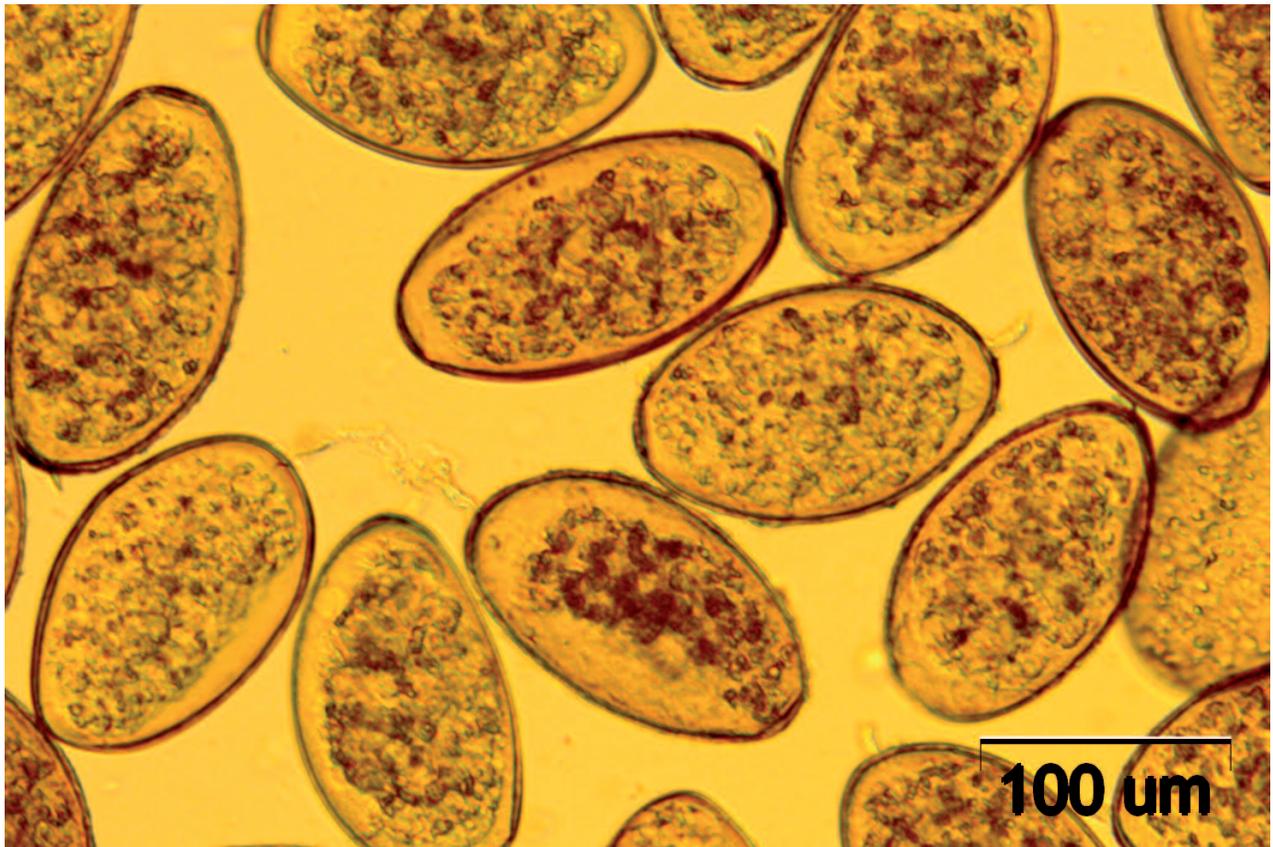


Fig. 1-2. Eggs of *Fascioloides magna*

come out into water and transform into metacercariae which are an invasive forms of the parasite. The development in the intermediate host lasts from 40 to 44 days [4,11]. From metacercariae ingested by animals with food or water get out juvenile flukes which penetrate the intestinal wall and get into the peritoneal cavity and then migrate to the liver, where they grow and reach maturity. In non specific host they can penetrate other tissues or organs, usually the lungs. The prepatent period of invasion lasts from 3 to 7 months. Flukes *F. magna* can live about 5 years [1,5,12,13].

Presence of trematodes *F. magna* in red deer in the Lower Silesian Wilderness led us to search the occurrence of this parasite in the neighboring forest complex. The aim of this study was to present the case of finding of this species in cervids in Bory Zielonogórskie.

## Materials and Methods

Fecal samples were collected from cervids in February 2015 in the southwest part of Poland (Bory Zielonogórskie, Forest District Krzystkowice). A total, sixteen samples were collected along fresh mud or snow tracks of individual animals. Seven samples came from the red deer, four from roe deer and two samples from fallow deer. Samples were wrapped in 20-ml labeled tubes and transported to the laboratory for further investigation. Three grams of each sample was examined for trematode eggs by method of decantation. Eggs were counted in small Petri dishes under microscope (magnification 40×). Measurement of eggs dimensions were done using Jenaval microscope at ×125 magnification.

## Results and Discussion

Eggs of *F. magna* were detected in 2 of 7 examined samples from red deer, in the first sample it were found 3 eggs, and in the second one 46 eggs. Moreover, flukes eggs were found in 3 out of 4 roe deer faecal samples, in numbers of 1, 3 and 58 eggs respectively in each sample. Also, in faecal samples from two fallow deer eggs *F. magna* were found; in one sample number of eggs reached 17. Light yellow eggs had granular structure inside and very small operculum. The length of the eggs was 0.136–0.185 mm and their width was 0.081–0.117 mm. The eggs had significantly greater dimensions than the eggs of the liver fluke *Fasciola hepatica*

(Fig. 1,2).

*F. magna* was detected for the first time on the territory of our country in 1953 in a liver of a deer shot in Lower Silesian Wilderness near Bolesławiec [14]. More than 23 years earlier exactly in the same forest complex that belonged to Germany back then the same species of flukes was found in the liver of the shot deer [15]. The distance in a straight line between the places where both deer were shot did not exceed 11 kilometers. Since that time *F. magna* was not registered in Poland. It is possible to assume that the anathomopathological changes in deer's liver caused by this fluke were mistakenly diagnosed by veterinarians as changes caused by *Fasciola hepatica*. The reason for *F. magna* to appear on this territory was bringing the American wapiti deer to those forests around 1850 [16]. Along with these deer the aforementioned fluke was also introduced. The interesting fact is that *F. magna* found the appropriate, suitable conditions for its development, intermediate hosts and survived in the hunting grounds until today for over 160 years.

In 2013 in the feces of red deer from the Lower Silesian Forest by decantation method were detected eggs of fluke with dimensions much larger than the eggs of *F. hepatica*. DNA isolated from the eggs were tested with molecular method. It was found that the ITS-2 sequence was identical to these sequences of *F. magna* derived from red deer and wapiti deer from Slovakia and fallow deer from US deposited in the GenBank [17]. This prompted us to do necropsies of red deer from this forest complex, leading to the detection of adult parasites *F. magna*. In 2014 were performed parasitological necropsies of 30 red deer (calves and hinds), shot in the winter in Ruszów Forestry in the Lower Silesian Forests. It was found that two hinds were infected with trematodes *F. magna*, so that the prevalence was 6.6%. In the liver of one doe were found 2 specimens of flukes and in the second one occurred 9 parasites. The length of the fluke ranged from 5.5 to 7.8 cm, and the width from 1.8 to 3.2 cm. The livers were enlarged, their edges rounded, and on the surface and cross section were observed dark brown or black mottled pigmentation and fibrinous deposits. Lymph nodes of hepatic bay were also enlarged and darkly pigmented. On the cross-section of the organ parenchyma had multiple cavities (pseudocysts) in contact with bile ducts. They were filled with bloody or dark brown liquid which contained trematodes. The liquid contained flukes eggs and cellular detritus. In the fecal

samples of those deer were found numerous eggs of the parasite [18].

These flukes are pathogenic for their hosts causing in the liver extensive pathological changes. In typical hosts – red deer can run subclinical parasitosis. However, in incidental hosts – roe deer, cattle, sheep and goats invasion may cause clinical symptoms as a loss of appetite, depression, emaciation and lead to falls of these animals [1,3,12,13]. The results of this study extend the range of occurrence of the trematodes *F. magna* on the neighboring Lower Silesia Wilderness complex of Bory Zielonogórskie which are distant about 50 km. Fallow deer and roe deer were considered to be new in Poland final hosts of *F. magna*. A large part of positive tests, although the examination of the small number of samples indicates the high prevalence of the parasite.

The presence of trematodes *F. magna* in red deer, fallow deer and roe deer is also a potential threat to the domestic ruminants and horses grazing on forest pastures. It is necessary to monitor the infection of deer in south-western Poland by trematodes *F. magna* and to establish the extent of foci of this danger parasitosis.

## References

- [1] Pybus M.J. 2001. Liver flukes. In: *Parasitic diseases of wild mammals*. (Eds. W.M. Samuel, M.J. Pybus, A.A. Kocan). Manson Publishing/The Veterinary Press, Iowa State University Press: 121-149.
- [2] Bassi R. 1875. Sulla cachessia ittero-verminosa, o marciaia, causata dal *Distomum magnum*. *Medico Veterinario Torino* 4: 497-515.
- [3] Hassal A. 1891. *Fasciola americana* (Hassal, 1891). *American Veterinary Review NY* 15: 359.
- [4] Erhardová B. 1961. *Fascioloides magna* in Europe. *Helminthologia* 3: 91-106.
- [5] Erhardová-Kotrlá B. 1971. The occurrence of *Fascioloides magna* (Bassi, 1875) in Czechoslovakia. Academia, Prague.
- [6] Rajský D., Patus A., Bukovjan K. 1994. The first finding of *Fascioloides magna* Bassi, 1875 in Slovakia. *Slovenský Veterinársky Časopis* 19: 29-30.
- [7] Pfeiffer H. 1983. *Fascioloides magna*: Erster fund in Osterreich. *Wiener Tierärztliche Monatsschrift* 70: 168-170.
- [8] Majoros G., Sztojkov V. 1994. Appearance of the large American liver fluke *Fascioloides magna* (Bassi, 1875) in Hungary. *Parasitologia Hungarica* 27: 27-38.
- [9] Marinculić A., Dzakula N., Janicki Z., Hardy Z., Lucinger S., Zivicnjak T. 2002. Appearance of American liver fluke (*Fascioloides magna*, Bassi, 1875) in Croatia – a case report. *Veterinarski Arhiv* 72: 319-325.
- [10] Plötz K., Rehbein S., Bamler H., Pfister K., Scheuerle M.C. 2015. *Fascioloides magna* – epizootiology in a deer farm in Germany. *Berliner und Münchener Tierärztliche Wochenschrift* 128: Heft 5/6.
- [11] Faltynková A., Horačková E., Hirtová L., Novobilsky A., Modry D., Scholz T. 2006. Is *Radix peregra* a new intermediate host of *Fascioloides magna* (Trematoda) in Europe? Field and experimental evidence. *Acta Parasitologica* 51: 87-90.
- [12] Foreyt W.J., Leathers C.W. 1980. Experimental infection of domestic goats with *Fascioloides magna*. *American Journal of Veterinary Research* 41: 883-884.
- [13] Foreyt W.J., Todd A.C. 1976. Development of the large American liver fluke, *Fascioloides magna*, in white-tailed deer, cattle and sheep. *Journal of Parasitology* 62: 26-32.
- [14] Ślusarski W. 1955. Studia nad europejskimi przedstawicielami przywry *Fasciola magna* (Bassi, 1875), Stiles, 1894. I. Ponowne wykrycie ogniska inwazji u jeleni na Śląsku. *Acta Parasitologica Polonica* 3: 1-59.
- [15] Salomon S. 1932. *Fascioloides magna* bei deutschem Rotwild. *Berliner Tierärztliche Wochenschrift* 48: 627-628.
- [16] Bena W. 2012. Dzieje Puszczy Zgorzelecko-Osiecznickiej. F.H. Agat, Zgorzelec.
- [17] Pyziel A.M., Demiaszkiewicz A.W., Kuligowska I. 2014. Molecular identification of *Fascioloides magna* (Bassi, 1875) from red deer from South-Western Poland (Lower Silesian Wilderness) on the basis of internal transcribed spacer 2 (ITS-2). *Polish Journal of Veterinary Sciences* 17: 485-487.
- [18] Demiaszkiewicz A. W., Pyziel A. M., Kuligowska I., Lachowicz J. 2015. *Fascioloides magna* pasożytem jeleni w Borach Dolnośląskich. *Medycyna Weterynaryjna* (in press).

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