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Research Note

The first record of *Spirocerca lupi* (Rudolphi, 1809) (Spirocercidae, Nematoda) from Poland based on faecal analysis of wolf (*Canis lupus* L.)

J. SZCZĘSNA, M. POPIOŁEK

Department of Zoology and Ecology, Wrocław University of Environmental and Life Sciences, Kożuchowska 5b, 51- 631 Wrocław, Poland, E-mail: *justyska13@poczta.fm*

Summary

During studies on the helminth fauna of wolves inhabiting natural ecosystems of Poland, 86 scats were examined. All the samples were collected in the autumn of 2005. *Spirocerca lupi* was detected with decantation and flotation techniques. The prevalence was 2.32 %. This is the first record of the parasite from Poland and the third case of its occurrence in the wolf (*Canis lupus* L.) within its distribution range.

Keywords: *Spirocerca lupi*; nematode; wolf; Poland

Introduction

Spirocerca lupi (Rudolphi, 1809) is a nematode commonly found in dogs in tropical and subtropical zones. Less often, definitive hosts are other species, especially of the family *Canidae*, and wild representatives of *Felidae* (Bowman & Lynn, 1999; Anderson, 2000; Segovia *et al.*, 2004). Experimental studies point also to the domestic cat as a definitive host (Gundłach & Sadzikowski, 2004). Besides the canids and felids, the nematode has also been recorded in some representatives of Mustelidae (Shimalov & Shimalov, 2001, 2002) and Viverridae (Perez & Palma, 2001). The literature on the occurrence of the species in dogs is rather abundant, especially that relating to its pathogenicity (e.g. Lobetti, 2000; Minnaar & Krecek, 2001; Mazaki-Tovi *et al.,* 2002; Minnaar *et al.*, 2002; Ranen *et al.*, 2004). In Europe, according to the database „Fauna Europea", records of *Spirocerca lupi* in dogs come from Greece, Belaruss, Bulgaria, Hungary, Italy, Portugal, The Netherlands, Spain, Ukraine and the European parts of Russia and Turkey. Contrary to dogs, information on the occurrence of *S. lupi* in wild canids is scarce and fragmentary. For example, Henke *et al.* (2002) found the nematode in the coyote (*C. latrans*) in Texas, USA. It was found in foxes only in the Iberian Peninsula (Gortazar *et al*., 1998; Perez & Palma, 2001; Segovia *et al.,* 2001, 2004), and a review of the world literature on the helminth fauna of the wolf (Craig & Craig, 2005) shows that, apart from the studies in Canada, Belaruss and Spain (Choquette *et al.*, 1973; Shimalov & Shimalov, 2000; Dominguez & De la Torre, 2002), there are no data on the occurrence of *S. lupi* in that host.

Material and methods

Within the monitoring of the wolf helminth fauna we analysed 86 samples of faeces from 11 selected populations in Poland: (1) Silesian Beskidy and the Żywiecki Beskidy Mountains, (2) Tatra Mountains, (3) Bieszczady Mountains, (4) Roztocze, and (5) Sobibór and Włodawa Forests (6) Bialowieża Primaeval Forest, (7) Augustów Primaeval Forest, (8) Pisz Primaeval Forest, (9) Romincka Primaeval Forest, (10) Krajeńskie Forests, and (11) Rzepin Primaeval Forest (Fig. 1.). All the samples (2 – 4 g) were collected during one season (autumn 2005), and their age was estimated as 1 – 4 days. The material was placed in plastic vials, preserved with 4 % formalin and subject to standard coprological examination. To avoid confusion between faeces of fox or other carnivores (domestic or feral dogs) and wolf faeces, only scats that were typical for wolf (more than 3 cm in diameter, containing large pieces of bones, hooves and hair, of characteristic smell) were collected, or faeces found near other evidence of wolf presence, e.g. wolf tracks in mud or wolf prey. Because of the selective character of the commonly applied techniques, the eggs were isolated with two methods: decantation, with tap

water as decanting liquid, and flotation, with saturated solution of zinc sulphate as flotation liquid. Egg identification was based on morphological characters (shape and shell structure) and measurements. The prevalence and intensity of infection were calculated according to Bush *et al.* (1997).

Fig.1. Distribution of sampling sites. Numbers of sites on the map correspond with the numbers in the text. Circles with the dot inside mark localities where eggs of *S. lupi* were found.

Results and discussion

The nematode eggs found in the samples were identified as *S. lupi*. The general prevalence of infection was low and amounted to 2.32 %, the mean intensity of invasion was 3 eggs per sample. Comparing the two methods, decantation proved more effective than flotation (4.65 % and 2 vs. 2.32 % and 1). The infected wolf populations came from two distant regions of Poland: Rzepin Primeval Forest and Roztocze.

The size of the eggs of *S. lupi* was 39 – 50 x 17 – 22 μm; the eggs were moderately elongate in shape, had a thin shell and smooth surface, and mostly contained a formed larva of I stage (Fig. 2). The morphology of the eggs was compatible with that reported by other authors, but the biometrical data depart from the literature information. For example, Foreyt (2001) reported a slightly smaller size (40 x 12 μm), while Gundłach & Sadzikowski (2004): 30 – 37 x 11 – 15 μm. It appears, however, that considering the similarity of the remaining morphological characters and the very characteristic shape, the biometrical differences are only an expression of intraspecific variation, thus increasing the variability range of the egg size for the species.

The low prevalence observed by us (2.32 %) seems to confirm the generally sporadic character of the occurrence of *S. lupi* in the wolf. Despite the different methods, the resulting indices can be compared with those obtained by Choquette *et al.* (1973) from Canada and by Shimalov & Shimalov (2000) from Belarus. Choquette *et al.* (1973) dissected 171 digestive tracts of the wolf and found the presence of *S. lupi* in only one case. Dissection of 52 wolves from the Belarussian Polesie showed a higher prevalence of infection in the studied population (7.7 %). Likewise, Dvir *et al.* (2001) studied the occurrence of *S. lupi* in dogs in South Africa, based on dissection, endoscopy and coproscopic analysis (flotation method). Coproscopy confirmed spirocercosis in only 1 of 30 cases. Only Mazaki-Tovi *et al.* (2002), who studied the same problem in dogs from Israel, reported 80 % success of diagnosing this nematodosis with a flotation method. The differences in the frequency of detecting this parasite between the boreal areas and, for example, the south of Europe, result from the climate and especially temperature.

In view of the conservation status of the wolf in most countries, coproscopic analysis seems to be the best method of detecting *S. lupi*. According to Markovics & Medlinski (1996) flotation technique is the most effective, which was not confirmed in our studies.

Because of the short geographical distance and similar climatic conditions between Poland and Belaruss, the prevalence of infection in the Polish populations of the wolf may be expected to be higher than the values obtained with coproscopic examination. According to Mazaki-Tovi *et al.* (2002) a lower detectabilty of eggs may be associated, among other factors, with passage of an adult female to the alimentary tract, difficulty to estimate the time of appearance of eggs in the faeces in relation to the rather short adult life of the female, and inefficiency of laboratory techniques resulting from the small size of the eggs.

Finding *S. lupi* in wolf populations from two remote regions of Poland suggests a possibility of a more or less stable presence of the parasite and its transmission to or from domestic dogs. The transmission may be further facilitated by the wide range of intermediate hosts (coprophagous insects), and especially parathenic hosts (e.g. lizards, newts, mice, hedgehogs, bird chicks), which form a part of the diet of wild canids and, occasionally, of feral dogs (Anderson, 2000). Diagnosing spirocercosis by veterinarians could well have been omitted from differential

Fig. 2. *S. lupi*, egg with larva

diagnoses because of the generally negligible frequency of occurrence of the species in Northern Europe. Symptoms including depression, difficulties to swallow food, tendency to vomit, regurgitation or anorexia may indicate this parasitosis (Gundłach & Sadzikowski, 2004; Ranen *et al.*, 2004).

Except *S. lupi*, in examined samples we observed until now eggs of following species of parasites belong to taxa: Digenea (*Alaria alata*); Cestoda (eggs of tapeworms identified to family Taeniidae); Nematoda (*Ancylostoma caninum, Eucoleus aerophilus, Toxocara canis, Uncinaria stenocephala* and *Trichuris vulpis*).

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