

Original papers

Setaria tundra in roe deer (*Capreolus capreolus*) – new findings in Poland

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ABSTRACT. *Setaria tundra* is a filarioid nematode transmitted by mosquitoes, which is sporadically observed in Poland. Some ecological factors, such as the synurbisation of some wild ungulates and the climate changes observed in recent years, could affect the possibility of infection, especially with parasites transmitted by arthropod vectors. The study was conducted to evaluate the presence of *Setaria* sp. in roe deer populations in different environments. Parasitological dissections of 53 roe deer were performed. The animals were taken from the area of the Cracow agglomeration, and from arable and forest lands near the city. During the autopsy, nematode specimens (one to twelve per host) were found only in the abdominal cavity of roe deer from the urban area. All parasites were classified to *Setaria tundra* species on the basis of morphology and dimensions. The infection observed was probably associated with the specific environmental conditions of the urban area.

Key words: *Setaria tundra*, roe deer, urban environments, Poland

Introduction

Knowledge of the occurrence of parasitic nematodes from the order Spirurida, superfamily Filarioidea is limited, especially in Poland. They are common parasites occurring in humans, mainly in warm climates, as well as in other vertebrate hosts, irrespective of the prevailing climate. Their life cycle is complex, and various dipteran species serve as intermediate hosts of the parasites [1].

Within the superfamily Filarioidea, the Onchocercidae family includes four subfamilies: the Splendidofilariinae which infect mainly birds, and the Dirofilariinae, Setariinae and Onchocerciinae, which are parasites of humans and mammals. Within the Setariinae subfamily is the *Setaria* genus, comprising 43 species [1]. These parasites occur primarily in ungulates, including hoofed animals (Artiodactyla), odd-toed ungulates (Perissodactyla), and mammals of the order Hyracoidea. In Poland, in wild and domestic ruminants, three species of the *Setaria* genus have so far been recorded, namely *S. cervi*, *S. digitata*, and *S. labiatopapillosa* [2]. One of our previous studies has also confirmed the presence of *S. equina* in horses [3].

The aim of this study was to determine the presence in roe deer of *S. tundra*, a representative of *Setaria* which is rarely recorded in Poland.

Materials and Methods

Post-mortem examinations of 53 roe deer *Capreolus capreolus* were conducted during the years 2009–2013 in the Małopolska province, southern Poland. The cervids originated from two types of habitat: five specimens had been killed by road collisions in urban habitats, while the remaining specimens were obtained by hunting from arable and forestry habitats. The sections were carried out according to standard procedures established for ruminants [4].

During the diagnostic dissections carried out to

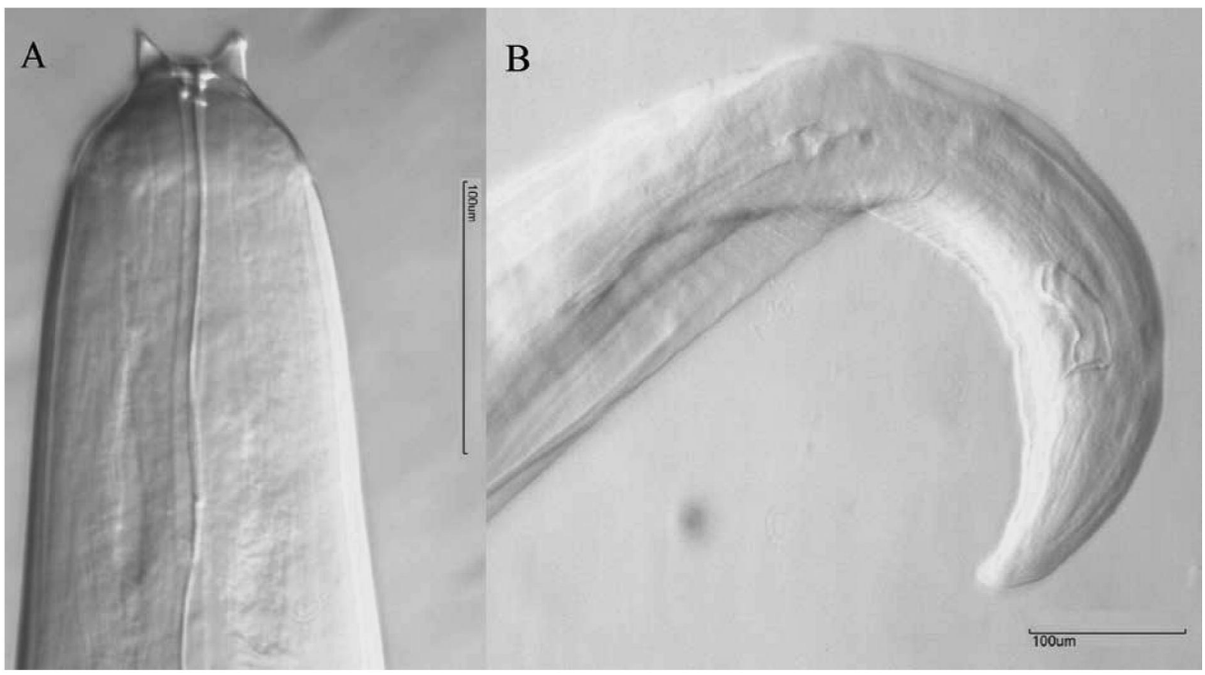

Fig. 1. Morphology of observed specimens of *Setaria tundra*: A – anterior end of female with peribuccal crown, B – posterior end of male with characteristic shaped, different measured spicules.

determine the parasitic infection of the respiratory and gastrointestinal tracts, the presence of nematodes was confirmed in the abdominal cavity on the surface of the intestine, or in the area of the visceral and parietal peritoneum of the hosts. Following preservation in 70% alcohol with 5% glycerol, the helminths were classified to species under a light microscope, and photographic documentation was taken using Motic Image Plus 2.0 software.

Results

Setaria tundra was detected in the body cavity of five roe deer (Fig. 1). While all the animals originating from urban areas of the Cracow agglomeration were infected, the parasite was not found in any specimen from the arable and forestry habitats. The intensity of infection varied from 1 to 12 parasites per host.

Discussion

Nematodes from the *Setaria* genus were noted in roe deer for the first time in Poland by Dróżdż [4], who found *Setaria capreola* in 14% of the population studied. Afterwards, Bednarski et al. [5] noted *S. tundra* in the Lower Silesia region in 2010, verifying the presence of this nematode species in Poland. More recent studies conducted in Poland only report the incidence of *S. tundra* microfilariae in arthropod vectors [6,7].

In Europe, the occurrence of *Setaria tundra* in roe deer is incidental, which may derive from the belief that about low health significance of this species. *Setaria tundra* has been noted in Germany and Bulgaria [8,9], and in Italy [10], where this parasite was considered to be new species for local parasitic fauna. Nevertheless, *S. tundra* is recognized as a common parasite of reindeer (*Rangifer tarandus*) in the northern hemisphere, especially in Finland, where mass infection has occurred with a heavy disease course. Since the year 2000, the numbers of parasitic peritonitis and deaths of reindeer related to poor body condition have dramatically increased, and a combination of morphological and molecular studies have since confirmed the presence of *S. tundra* [11]. In subsequent years, a significant increase in the prevalence of the parasite in reindeer was noted, from 4.9% in 2001 to 40.1% in 2003, and the wider dispersal of the parasite to new areas was also observed. In addition, the severity of the incidence of histopathological lesions in the abdominal cavity caused by *S. tundra* was found to increase [12]. During this period, however, the presence of *S. tundra* in roe deer did not result in significant pathological peritoneal changes. In addition, the

presence of this nematode was demonstrated in moose (*Alces alces*) in the pre-adult form encapsulated in liver, which may indicate that *S. tundra* is not typical for this host [12]. The occurrence of *S. tundra* in only three species of cervid – roe deer, moose and reindeer – is interesting from the taxonomical point of view, as is the historical formation of a host-parasite relationship between the mentioned host species and only one subfamily, the Capreolinae [13].

The negative impact of *Setaria* species on their definitive hosts is not fully understood. Apart from the *Setaria tundra* infestation in Finnish reindeer mentioned above, most infections are generally asymptomatic due to the low intensity of infection [14]. In addition to dissection, an evaluation of the level of *S. tundra* infection could be based on the study of the presence of parasite larval stages, the microfilariae, which may be detected in the blood of definitive hosts or in the body of an insect vector. A study performed in Finland by Laaksonen et al. [15] found that microfilariae occurred more frequently in reindeer calves than in adults. The number of larval forms was higher in the first year of infection, and in subsequent years, the number of microfilariae in peripheral blood was observed to decline. The prepatent period of the parasite was determined to be four months, and the longevity of adult nematodes reached 14 months [15]. The study also notes that the presence of *S. tundra* larvae was confirmed in moose, free living reindeer and roe deer, with the prevalence 1.4–1.8%, 23% and 39%, respectively.

In rare studies conducted in Poland, the presence of *S. tundra* microfilariae was recognized in mosquitoes from the genus *Aedes* [6], especially *A. vexans* [7], whereas in neighbouring Germany, *A. vexans*, *Ochlerotatus sticticus, O. cantans,* and *Anopheles claviger* were considered as the potential vectors of this nematode [16]. Two genera of mosquitoes – *Anopheles* and, most often, *Aedes* – are the vectors of *S. tundra* in Finland [15]. The prevalence of microfilariae in these insects was generally low, ranging from 0.5 to 2.5%, and the highest concentration was observed in urban areas [15].

The level of intermediate host infection may depend largely on the ambient temperature. Infective larvae were present for 14 days in mosquitoes maintained at room temperature (21°C), but did not develop in those kept for 22 days at a temperature of 14.1°C. The largest number of parasite larvae in one vector specimen was 70 [15].

According to Laaksonen et al. [15,17], warm summers may extend the length of the larval stage of mosquitoes, especially in wet areas. Therefore, in Finland, the disease caused by the microfilariae, its symptoms and the consequent occurrence of adult *Setaria tundra* specimens, which cause peritonitis, was more frequent in the northern than the southern region of the country. The observed presence of the parasite species in Poland might also be related to variations in climate, i.e. temperature and humidity. The identification of *S. tundra* only in roe deer from urban areas, and not in the other areas studied, may confirm this phenomenon, which is probably connected with the greater development of the parasite in arthropod vectors living in disturbed environments. Roe deer from such areas might further expand the reservoir of infection.

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Received 18 October 2013
Accepted 20 November 2013