

Short notes

The occurrence of avian acanthocephalan *Polymorphus minutus* (Goeze, 1782) in raccoons (*Procyon lotor* L.) introduced to Europe

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ABSTRACT. Acanthocephalan larvae were found during parasitological sections in intestines of four out of 84 individuals of raccoon (*Procyon lotor* L.) from eastern Czech Republic. They were identified as cystacanths of *Polymorphus minutus* (Goeze, 1782). Because water birds are the proper hosts of this parasite, this record is among the rare ones. For this reason we present the morphological description, biometric data and photographs of the parasites, as well as a discussion of similar cases reported in the literature.

Key words: *Polymorphus minutus*, Acanthocephala, raccoons, *Procyon lotor*, Czech Republic

Introduction

Adult forms of acanthocephalans of the genus *Polymorphus* are common and frequently recorded intestinal parasites of numerous species of aquatic birds, mainly anseriform, while their larvae occur in freshwater and marine gammarids (Gammaridae) which are their intermediate hosts. The wide host spectrum of *P. minutus* includes birds of various orders: Anseriformes, Galliformes, Gruiformes, Charadriiformes, Procellariiformes and Ciconiiformes [1–3] which places it among generalist parasites. Records of members of *Polymorphus* from non-bird hosts are infrequent but such cases have been described. *P. minutus* was found in the European water-shrew (*Neomys fodiens*) in the former Czechoslovakia [4], in the muskrat (*Ondatra zibethicus*) in the former USSR [5] and in the Arctic fox (*Vulpes lagopus*) from St. Lawrence Island on the Bering Sea [6]. *Polymorphus paradoxus* was recorded in the Canadian beaver (*Castor canadensis*), muskrat [7] and the meadow vole (*Microtus pennsylvanicus*) [8], and *Polymorphus meyeri* was found in the Arctic fox from Iceland [9]. *Polymorphus magnus* was recorded in the muskrat from the former USSR [10], *P. brevis* in the American mink (*Neovison vison*), and *Polymorphus*

sp. in the red fox (*Vulpes vulpes*), the Arctic fox [11–14], muskrat [15] as well as in the Western European hedgehog (*Erinaceus europaeus*) [16].

A preliminary report on the occurrence of *P. minutus* in the raccoon introduced in Europe comes from 2013 [17]. More information on the problem, with the description of the isolated acanthocephalan is presented in this paper.

Materials and Methods

During an extensive study on the ecology of parasites of the raccoon (*Procyon lotor*) from central and eastern Europe, we did parasitological sections of 84 raccoons from the environs of Tovačov in the eastern part of the Czech Republic. The animals obtained in 2012–2017 were shot by the local hunters. The alimentary tract was divided into anatomical parts which were dissected separately. All the fragments were cut lengthwise and macroscopically examined for the presence of parasites. Then their contents was washed in 0.9% physiological salt, decanted and microscopically examined. The internal organs (lungs, liver, heart, kidneys, as well as urinary and gall bladders) were cut along the blood vessels to the maximum narrowing of their lumen, and their contents were

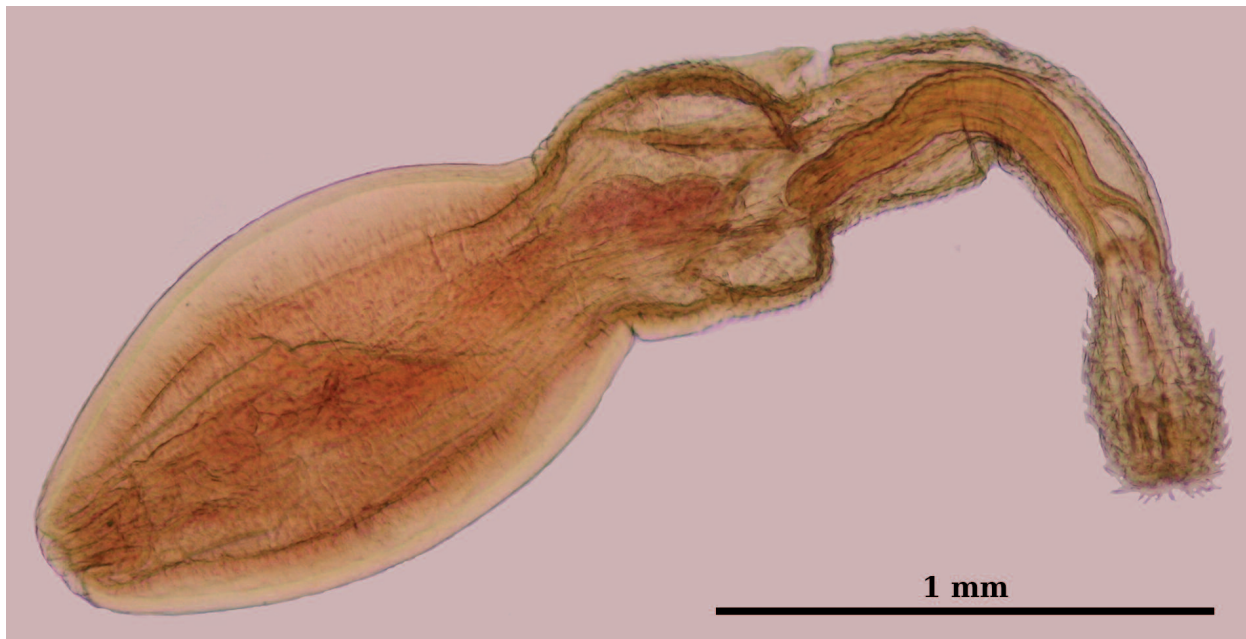


Fig. 1. Cystacanth female of *Polymorphus minutus*

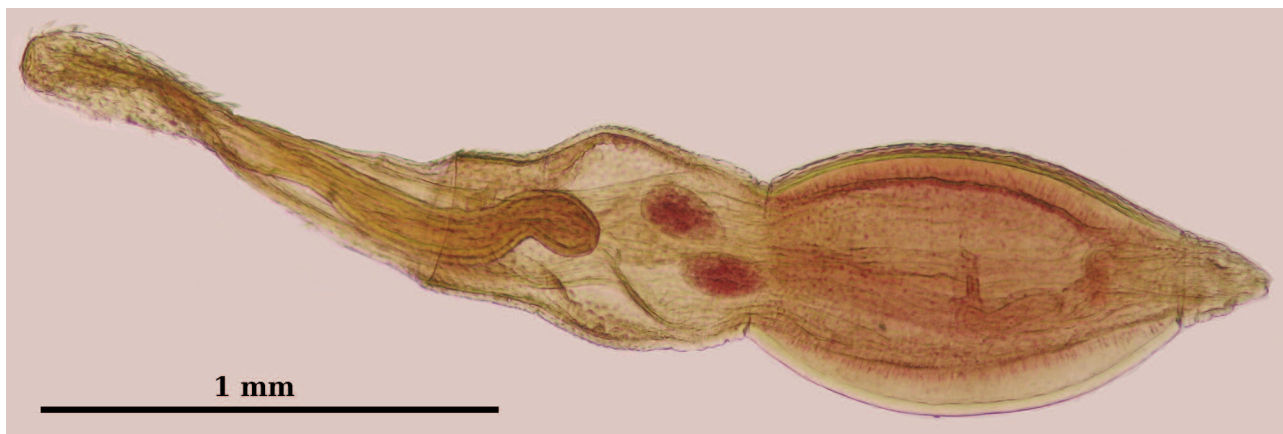


Fig. 2. Cystacanth male of *Polymorphus minutus*

decanted. The isolated helminths were preserved in 70% ethyl alcohol, stained with borax carmine, dehydrated, cleared and mounted on microscopic slides with Canada balsam.

Results and Discussion

The sections revealed the presence of 207 acanthocephalan cystacanths in the guts of four out of the 84 examined raccoons. They were identified as *P. minutus*.

Description. Cystacanths oval, elongate, with a characteristic constriction at half body length, dividing it in two parts (Figs 1,2). Anterior body part, before the constriction, covered with numerous small spines of 0.013–0.015 mm (Fig. 3). Maximum body width at the level of middle of posterior body

part. Proboscis receptacle much elongated and sac-like. Lemnisci elongate, poorly visible. Proboscis oval, with 16 to 17 longitudinal rows of hooks, with 8–9 hooks in each. The length of hooks decreases posteriorly from the tip of proboscis (Fig. 4).

Female (Fig. 1). Body length: 2.75–3.01 mm (mean: 2.85); maximum width: 0.55–0.60 mm (0.56). Proboscis measurements: 0.41–0.55 × 0.19–0.27 mm (0.48 × 0.20). Neck measurements: 0.31–0.56 × 0.17–0.23 mm (0.46 × 0.21). Measurements of proboscis receptacle: 0.56–0.86 × 0.10–0.12 mm (0.67 × 0.11). Length of anterior hooks: 0.052–0.066 mm (0.059); length of medial hooks: 0.047–0.51 mm (0.049); length of posterior hooks: 0.031–0.041 mm (0.036). Ovary, uterus and eggs not visible.

Male (Fig. 2). Body length: 2.70–2.90 mm

(mean: 2.82); maximum width: 0.50–0.60 mm (0.54). Proboscis measurements: 0.41–0.48×0.15 mm (0.44×0.15). Neck measurements: 0.48–0.53×0.20–0.22 mm (0.49×0.21). Measurements of proboscis receptacle: 0.55–0.88×0.11 mm (0.69×0.11). Length of anterior hooks: 0.052–0.055 mm (0.053); length of medial hooks: 0.050–0.52 mm (0.051); length of posterior hooks: 0.033–0.045 mm (0.038). Testes located in anterior body part, obliquely to each other; their measurements: 0.17–0.19×0.09–0.1 mm (0.18×0.09). Cement glands much elongated, poorly visible.

Both the morphology and the biometrics of the examined specimens agree with the literature descriptions of *P. minutus* [18–19]. The area of origin of the hosts includes meadows with some shrubs, situated on the shores of the Morava River which feeds a complex of fish ponds. The site is a habitat of both numerous aquatic and wetland bird species, and gammarids; it creates good conditions for life and development of the parasite. It also provides a good food basis for the local raccoon population, whose diet includes birds, chicks, but also invertebrates as a significant component. Cases of breaking the host barrier at the class level (birds/mammals) are not frequent, though all the isolated acanthocephalan specimens are at larval stages. The presence of *P. minutus* in the raccoons can be explained in two ways. One of the possible pathways is consuming cystacanth-infected gammarids by these omnivorous mammals; the gammarids are available in the area which abounds in water courses and periodically emptied fish ponds. The chance to continue the life cycle of the “bird” acanthocephalan and to reach sexual maturity in a mammal organism is, however, debatable though for example Platt [8], when describing invasion of *P. paradoxus* in the vole from Alberta in Canada, admitted such a possibility, explaining it by food stress resulting from weather anomalies. Another pathway, postulated by some authors, is consuming shot and cystacanth-infected birds which, for unknown reasons, may have been incompletely digested. In this case the record of *P. minutus* in the examined raccoons should be regarded as accidental.

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Fig. 3. Anterior, spine-covered and part of metasome of *Polymorphus minutus*



Fig. 4. Proboscis of *Polymorphus minutus*

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