

Original papers

Morphological and ecological characteristic of *Dicranotaenia stenosacculata* Macko, 1988 (Cestoda, Hymenolepididae) recorded in Poland

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ABSTRACT. During the parasitological examination of 288 wild ducks from north-western Poland, 18 tapeworms were found in the intestines (jejunum, ileum and rectum) of six birds, which, based on the structure of the scolex, internal organs and the presence of cirrus with an internal additional sac, were determined as *Dicranotaenia stenosacculata* Macko, 1988. Tapeworms were found in two young females *Bucephala clangula*, one young female *Aythya marila* as well as two adult males *Aythya fuligula*. The aim of the study was to present the morphological and ecological characteristics of the species, recently discovered for the first time in the fauna of Poland.

Keywords: *Dicranotaenia stenosacculata*, Cestoda, Hymenolepididae, Poland

Introduction

Tapeworms of the genus *Dicranotaenia* (Railliet, 1892) inhabit the intestine of the Anseriformes [1–3]. Four of the 9 known species in Europe have been found in Poland so far: *D. coronula* (Dujardin, 1845), *D. sacciperium* (Mayhew, 1925), *D. synsacculata* Macko, 1988 and *D. varsoviensis* (Sinitzin, 1896) [4–7]. Tapeworms of this genus are characterized by a rostellum with hooks *coronulus* type and four unarmed suckers. In the hermaphroditic proglottid there are three testis arranged in a line or arranged in a triangle. A characteristic feature is also a sacculus accessorius internus often covered with spikes, appearing next to the cirrus. The ovary is multi-lobular and the uterus is baggy.

Studies on cestodes of wild ducks in north-western Poland, conducted since 2001, showed the presence of several species new in the fauna of our country [6,8–12]. One of them is *Dicranotaenia stenosacculata* Macko, 1988 (synonym: *Dicranotaenia coronula stenosacculata* Macko, 1988). These

tapeworms, in our own research, were found in six hosts representing three species: *Bucephala clangula* (the common goldeneye), *Aythya fuligula* (the tufted duck) and *A. marila* (the greater scaup) [11,12]. For the first time, the tapeworm was described as a parasite of the tufted duck small intestine in eastern Slovakia [13].

The purpose of this work is to present morphological and ecological characteristics of *D. stenosacculata* found in wild ducks in Poland. The first report on the identification of this parasite in Polish fauna (without detailed description) is included in the doctoral dissertation entitled „Ecological conditions of the formation of the cestodofauna of diving ducks Aythyini in West Pomerania” [12] and in conference reports.

Materials and Methods

The research material were tapeworms isolated from the digestive tracts of 288 wild ducks representing three species (32 specimens of

Table 1. Ecological description of *D. stenosacculata* Macko, 1988 population

Host	Own material			Macko [12]	
	<i>A. fuligula</i> n=174	<i>A. marila</i> n=82	<i>B. clangula</i> n=32	<i>A. fuligula</i> n=9	<i>A. nyroca</i> n=35
Cestoda total	12917	1817	126	–	–
Number of <i>D. stenosacculata</i>	5	4	9	75	
Number of infected birds	2	2	2	6	2
Prevalence (%)	1.15	2.44	9.37	66.60	5.71
Intensity	mean	2.50	2.00	4.5	–
	range	2 and 3	2 and 2	2 and 5	3–238
Relative density	0.03	0.05	0.28	–	–
Index of domination	0.0003	0.0012	0.0175	–	–

Bucephala clangula, 174 specimens of *Aythya fuligula* and 82 *A. marila*). Birds were taken as dead from fishing nets set on Dąbie Lake, where they died during feeding in subsequent winter periods in the years 2006–2010. The isolated parasites were preserved and stored in 70% ethanol, and then preparations coloured in acetokarmine were prepared according to the recipe of Goergiev et al. [14]. Parasites were identified based on available keys.

The ecological characteristics of tapeworms were made by specifying the values of the following parameters: frequency, prevalence, intensity, relative density, index of domination.

Results and Discussion

Ecological characteristic

Dicranotaenia stenosacculata is a species very rarely recorded in the cestode fauna of wild ducks. Its occurrence to date has been noted in four host species (*A. fuligula*, *A. marila*, *B. clangula* and *A. nyroca*) in Slovakia and Poland [12,13]. In own studies, as many as 14,860 tapeworms were isolated from the gastrointestinal tracts of 288 examined birds, of which only 85 (0.6%) were included in the genus *Dicranotaenia*. Of these, 18 individuals (21.2%) were designated as *D. stenosacculata* Macko, 1988. The frequency of this species in cestodofauna of *A. fuligula* amounted to 0.04%, while in *A. marila* 0.22%. Definitely higher frequency of *D. stenosacculata* was reached in *B. clangula* (7.14%), which is probably related to a

small number (as compared with tufted duck and scaup) of the total number of isolated tapeworms. The ecological characteristics of tapeworms are presented in Table 1.

Aythya fuligula seems to be a typical host of the tapeworm [13]. In the own research, it was noted in four representatives of the Aythyini tribe (two *A. fuligula* and two *A. marila*) and in two *B. clangula*, representative of the Mergini tribe. On the basis of the dominance index, it can be concluded that *D. stenosacculata* acts as a satellite in a tapeworms community of *A. fuligula* and *A. marila* while in cestodofauna of *B. clangula* tapeworm is a rare species (WD <0.1). It is worth emphasizing that *D. stenosacculata* creates with *A. marila* and *B. clangula* new parasite-host systems.

It was also observed that tapeworm showed strict topospecificity. In the digestive tract *A. fuligula* and *A. marila* inhabited the ileum. It was located differently in *B. clangula* in which it preferred the jejunum and rectum. Macko noted the occurrence of *D. stenosacculata* in the jejunum *A. fuligula* and *A. nyroca* [13].

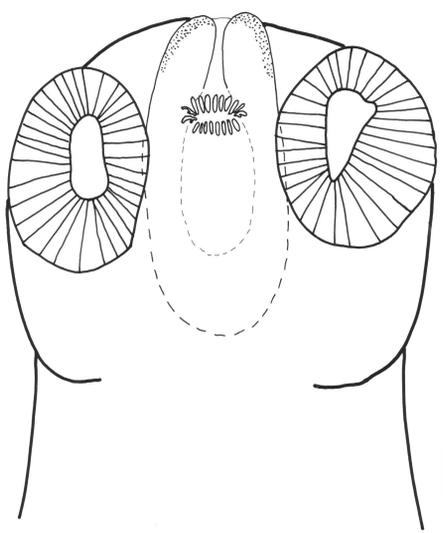
Morphological characteristic

During identifying tapeworms, particular attention was paid to the dimensions and shape of internal organs as well as the presence of sacculus accessorius internus (SAI) fused with cirrus. Of the 18 isolated individuals, only one had a scolex. The results of measurements of the most specific species structures are summarized in Table 2.

Strobila. Strobila consists of craspedote

Table 2. Morphological features of *D. stenosacculata* Macko, 1988 (μm)

Feature	Macko [13]	Own material
Body length (cm)		7.5-9.0
Scolex diameter	182.0-296.0	162.0-197.0
Scolex length×width	–	115.0×150.0
Sucker diameter	74.0-109.0	62.0-67.0
Rostellum width	56.0-66.0	50.0
Number of rostellar hooks	19-27	visible 11
Type of rostellar hooks	coronuloid	coronuloid
Rostellar hooks length	13.0-14.5	10.0-15.0
Blade of hook length	10.2-10.5	10.0
Processus radialis of hook length	5.0-6.5	6.0-7.5
Handle of hook length (gladius)	7.3-7.8	invisible
Rostellar hook width	5.7-6.5	5.2-6.2
Hermaphroditic proglottid length×width	–	108.0-180.0×1710.0-2178.0
Male proglottid length×width	–	108.0-150.0×1110.0-1296.0
Uterine proglottid length×width	–	252.0-400.0×2140.0-3060.0
Testis length×width	–	100.0-198.0×50.0-108.0
Seminal vesicle diameter	–	5.25-60.0
Cirrus sac length×width	288.0-438.0×25.0-67.0	260.0-425.0×50.0-70.0
Cirrus length×width	36.0-75.0×13.0-23.0	45.0-62.0×15.0-27.0
SAI sacculus accessorius internus length×width	11.0-28.0×10.0-22.0	7.5-25.0×5.0-8.7
Copulatory organ width	12.0	15.0-20.0
Ovary length	197.0-258.0	198.0-280.0
Vitellarium length×width	117.0-237.0	108.0-180.0×55.0-80.0
Uterus length×width	–	242.0-396.0×2100.0-3020.0
Egg's diameter	deformed	20.0-32.5

Fig. 1. Scolex of *D. stenosacculata* Macko, 1988. Scale bar: 50.0 μm

proglottids with rounded back corners. In the studied individuals, the strobila reached a maximum of 9 cm in length. The largest body width was noted at the uterine proglottids and it amounted to 3060.0 μm . The front part of the body is very long and consists of small sterile proglottids. Genital atrium open unilaterally at a distance of 1/3 of the width of the edge of the mature proglottids.

Scolex (Fig. 1). Of the 18 tapeworms analyzed, only one was isolated with scolex and then sunk in Faure's liquid. The scolex is round and very small compared to the strobila. Its diameter varies from 162.0 to 197.0 μm . The scolex reaches 150.0 μm in width and 115.0 μm in length. Onto it, there are four suckers with a diameter from 62.0 to 67.0 μm . On the top of rostellum 11 rostellar hooks type *coronulus* were observed with length from 10.0 to 15.0 μm and width 5.2 to 6.2 μm (Fig. 2). On the

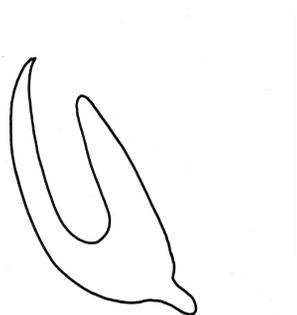


Fig. 2. Rostellar hook of *D. stenosacculata* Macko, 1988. Scale bar: 10.0 μm

preparation rostellar hooks they are arranged very close to each other, which makes it difficult to make precise measurements of individual elements. The blade of hook length is 10.0 μm , the processus radialis of hook length is 7.5 μm , while the handle of hook was invisible. The dimensions of rostellar

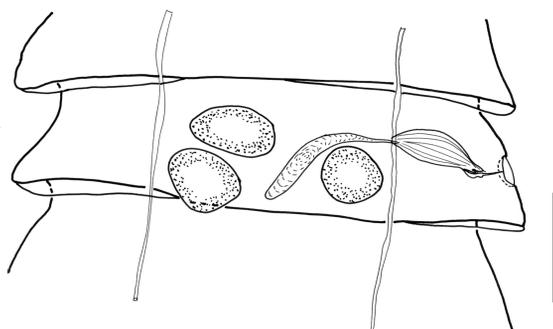


Fig. 3. Male proglottid of *D. stenosacculata* Macko, 1988. Scale bar: 100.0 μm

hooks are close to the dimensions given by Macko [13].

Male reproductive system. The male proglottid (Fig. 3), with dimensions 75.0–200.0 \times 936.0–1200.0

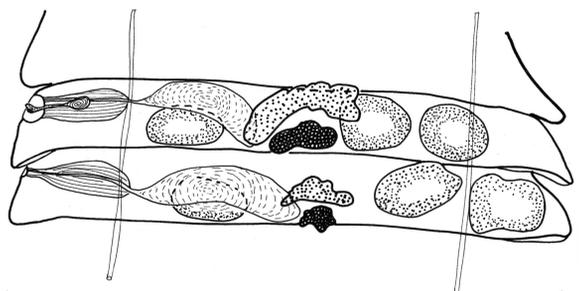


Fig 4. Hermaphroditic proglottid of *D. stenosacculata* Macko, 1988. Scale bar: 100.0 μm

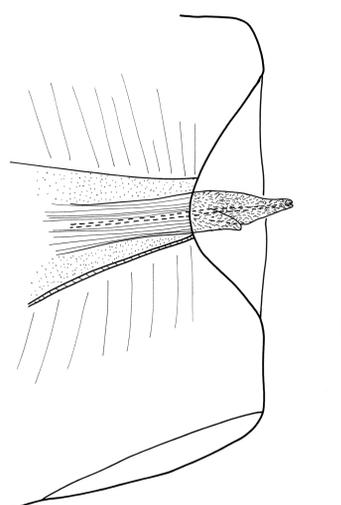


Fig. 5. Protruded cirrus of *D. stenosacculata* Macko, 1988. Scale bar: 50.0 μm

μm , contain three oval testis arranged in a triangular or obtuse triangle. The hermaphroditic proglottid with dimensions 180.0–234.0 \times 1440.0–2000.0 μm . Testes in hermaphroditic proglottids are arranged in one line (Fig. 4) with dimensions 100.0–198.0 \times 50.0–108.0 μm . Cylindrical cirrus, armed with small spines, connects with sacculus accessorius internus (SAI), creating copulatory organ with width at the base from 15.0 to 20.0 μm (Figs 5,6) and it is bigger to the dimensions given by available sources (Table 2). According to Macko [13], copulatory organ can create different shapes depending on the degree of cirrus excretion. Cirrus may protrude from the site of the connection with SAI for different lengths, in the tested specimens it reached the length from 45.0 to 62.5 μm , and its width in the middle of its length

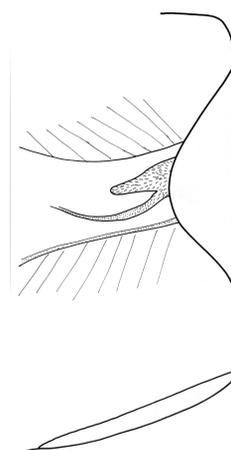


Fig. 6. Unprotruded cirrus *D. stenosacculata* Macko, 1988. Scale bar: 10.0 μm

is 15.0 to 27.0 μm . The sacculus accessorius internus is small, its length is from 7.5 to 25.0 μm and width from 5.0 to 8.7 μm . Long cirrus sac with dimensions from 260.0 to 425.0 μm length and from 50.0 to 70.0 μm width, does not reach half of the proglottid.

Female reproductive system. The middle part of the proglottid occupies the layered ovary with length from 198.0 to 280.0 μm (Fig. 4). Below the ovary there is a layered, relatively small vitellarium with dimensions 108.0–180.0×55.0–80.0 μm . The length of uterine proglottid is greater than the hermaphroditic one and is 252.0 to 400.0 μm , whereas its biggest width is 3060.0 μm . A fully mature uterus fills the whole segment. Round eggs with a diameter of from 20.0 to 32.5 μm . The dimensions of organs of the female reproductive system are close to the dimensions given by Macko [13].

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