

***Wardium mackoifusa* sp. n. (Cestoda, Cyclophyllidea), a parasite of the little gull (*Larus minutus* Pall.) from Ukraine**

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Summary

The new cyclophyllidian species *Wardium mackoifusa* sp. n. (Aploparksidae Mayhew 1925), in the little gull (*Larus minutus* Pall.) from Ukraine is described. The species is characterized by 10 aploparaksoid hooks, each 13–15 µm long. It noticeably differs from all of the species of this genus by the shape and the armament of the cirrus and the presence of polar delicate filaments on the embryophore of eggs.

Keywords: *Larus minutus* Pall.; *Wardium mackoifusa* sp. n.; Cestoda; Aploparksidae; Ukraine

Introduction

Two aploparaksoid cestode species were previously found in a little gull (*Larus minutus* Pall.) in Ukraine: *Hymenolepis* (s.l.) *fusus* (Krabbe, 1869) Bondarenko, Kontriamavichus, 2004 (Syn. *Wardium fusa* (Krabbe, 1869) Spassky, 1961) and *Wardium spasskii* Shigin, 1961 (Smogorjewska, 1976; Smogorjewska et al., 1978; Grushchinskaja, 1978; Ryzhikov et al., 1985). The first is a parasite of various gulls, the second – a parasite of the little gull and sometime of common tern (*Sterna hirundo* L.). In 1964 Macko, when describing cestodes of gulls in Slovakia, presented also the figure of «atypical» cirrus of *W. fusa* from the little gull (Macko, 1964). Bondarenko and Pyatkavichute (1998), Bondarenko and Kontriamavichus (2004) showed that *H. (s.l.) fusus* is a parasite of various gulls (Family Laridae Rafinesque, 1815), however the little gull was not its host.

We re-examined cestode specimens from the little gull, which was collected on the territory of Ukraine and was previously identified as *H. (s.l.) fusus*. We found specimens of the genus *Wardium* (Mayhew, 1925) differing morphologically from both *H. (s.l.) fusus* and *W. spasskii* as well as from other known specimens of this genus. The shape and armament of the cirrus of the specimens of the

little gull from Ukraine appeared to be identical to the shape and armament of «atypical» cirrus *W. fusa* of the little gull (Macko, 1964) from Slovakia. We consider them as belonging to a new species, *Wardium mackoifusa* sp. n. which is described herein. A new species is belonging to the genus *Wardium* on the presence 10 aploparaksoid-type hooks and three testes.

Material and methods

All material was collected from little gull, seven birds examined by Smogorzhevskaya on the Sasyk Lake (Crimea) in May of 1955, seventeen birds examined by Korniyushin in district Potiyivka (Black Sea Biosphere Reserve, Kherson Oblast) in May and August of 1964, sixteen birds examined by Grushchinskaja on the Kremenchug reservoir (Poltava Oblast) in July 1974. The tape-worms were fixed in 70 % alcohol, stained with Mayer's haematoxylin and acetocarmine, dehydrated in an ascending alcohol series, cleared in clove oil and mounted in Canada balsam. Morphology of the scolex and cirrus was studied in Berlese's medium.

The new species was found in all three localities. Prevalence and intensity of the little gull infection by *W. mackoifusa* sp. n. was 5/7, 1 – 37 specimens on the Sasyk Lake; 64.7 %, 1 – 38 specimens in Potiyivka and 43.8 %, 1 – 22 specimens on Kremenchug reservoir.

All measurements are in micrometers unless otherwise stated. In the description of *W. mackoifusa* sp. n., the measurements given before the parenthesis are those of the holotype.

Results

Order Cyclophyllidea van Beneden in Braun, 1900
Superfamily Hymenoleridoidea Spassky, 1949
Family Aploparksidae Mayhew, 1925

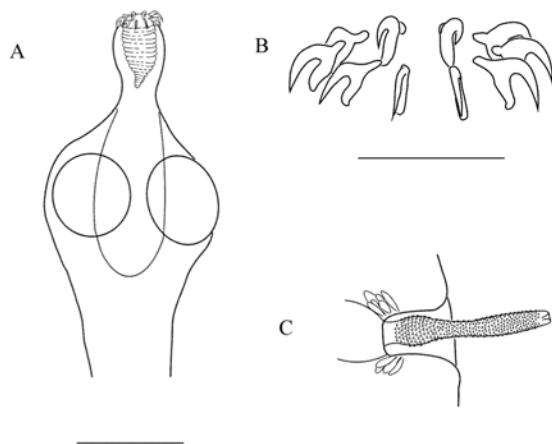


Fig. 1. *Wardium mackoifusa* sp. n. Holotype: A – scolex; B – crown of rostellar hooks; C – cirrus. Scale bars: A – 100 µm; B, C – 20 µm.

Wardium mackoifusa sp. n.

Type host: little gull, *Larus minutus* Pall., (Aves: Laridae). Site: Small intestine.

Type locality: Ukraine, Kherson Oblast, BSBR, district Potiyivka ($46^{\circ} 07' N$; $32^{\circ} 17' E$).

Other localities: Ukraine (Crimea, Sasyk Lake; Poltava Oblast, Kremenchug reservoir), Slovakia.

Type specimens: Holotype (CH 34) from *L. minutus*, № 303 – 5 a, 28.05.1964; paratypes (CP 34.1 – CP 34.4), of the same host (4 specimens), (CP 34.5 – CP 34.7) from *L. minutus* № 320 – 15, 30.05.1964 (3 specimens), (CP 34.8) from *L. minutus* № 317 – 14, 30.05.1964 (1 specimen).

The type material is stored in the helminthological collection of the Institute of Zoology of the National Academy of Sciences of Ukraine, Kyiv.

Etymology: The species name is given in honour to the prominent cestodologist Dr. S. Macko who first recorded the atypical form of the cirrus of *W. fusa* from the little gull.

Description of the type-specimens (Fig. 1, 2, 3, 4).

Length of immature specimen 90 mm (holotype), total length of mature specimens – up to 108 mm. Maximum width at level of gravid proglottids 1.3 mm. Scolex 240 (170 – 200) in length and 145 (130 – 150) in diameter at level of suckers. Suckers oval 60 – 70 × 70 – 80 (50 – 70 × 70 – 80). Rostellar sheath sac-like 143 × 70 (130 – 140 × 45 – 55), crossing posterior suckers margin. Small muscular rostellum 50 (45 – 70) long and 40 (30 – 40) in diameter at level of hooks. Rostellum armed by 10 aplopaksoïd hooks with noticeable handle (Fig. 5. A). Total length of hooks 13 – 15 (13 – 15), depending on position in slide. Length of blade 6.3 – 7 (6.3 – 7.5); length of base with guard 10 (8 – 11); length of guard 4.5 – 5 (5 – 7); length of handle 3.8 – 4 (3.8 – 4.5). Neck width is 80 (70 – 80) wide. Strobila delicate. Genital pores unilateral opening in anterior third of lateral proglottid margin. Longitudinal musculature consisting of 4 large bundles on each (dorsal and ventral) surface of strobila and of numerous small bundles. Osmoregulatory canals 2 pairs; transverse anastomoses not observed. Diameter of ventral osmoregulatory canals 30, of dorsal canals 5 – 7.

Development of proglottids protandrous. Male system forms and develops earlier than female. Three testes rounded 35 – 55 (20 – 50) in diameter or slightly oval 30 – 50 × 40 – 55. In male proglottids, they are situated behind the cirrus-sac in a transverse row in median field of the proglottid, between the osmoregulatory canals. Cirrus-sac long and narrow, 160 – 210 × 22 – 30 (130 – 220 × 20 – 25). In male proglottids, it crosses the median line of the proglottid and reaches aporal osmoregulatory canals. Cirrus-sac becomes relatively shorter with the development of the strobila. In young female proglottids, it crosses median line of the proglottid, but does not reach aporal osmoregulatory canals. In gravid proglottids, cirrus-sac is relatively short, not crossing the middle of proglottide. Internal seminal vesicle occupies almost the whole space of the cirrus-sac. External seminal vesicle oval 60 – 100 × 45 – 70 (40 – 105 × 30 – 80), or rounded 30 – 60, in diameter. It is situated near the antiporal region of the cirrus-sac or at some distance from cirrus-sac, leaning on its dorsal side. Fully-evaginated cirri were absent in the studied specimens (Fig. 5. B). Cirrus length of holotype 38.8. Maximum cirrus length 60 (paratype). Its form is approximately spindle-shaped. Basal part of cirrus 10 – 13 (8 – 13) in length and 6 – 7 (5 – 10) in diameter, thickly covered with small spines. This part of cirrus is situated within the genital atrium. Median part of cirrus narrow 20 – 23 (15 – 25) in length and 5 – 5.5 in diameter, covered with smaller spines. Then follows a dilation about 7 in diameter and then distal part.

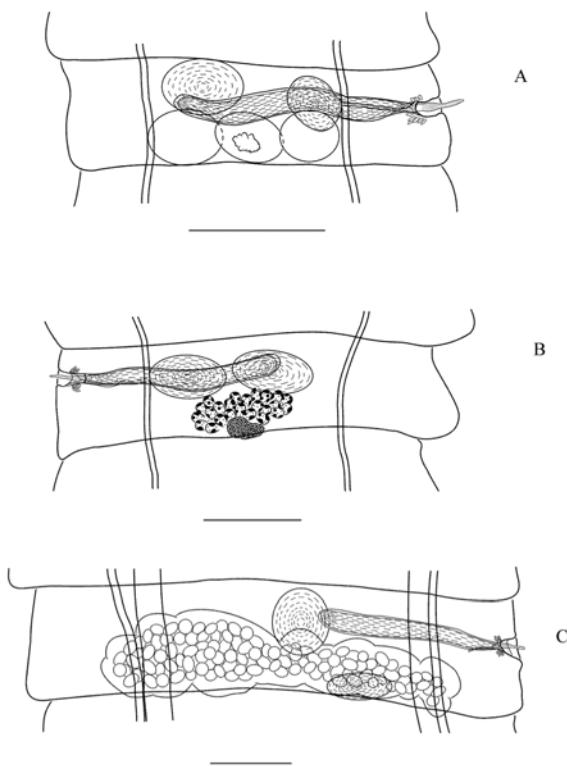


Fig. 2. Proglottids of *Wardium mackoifusa* sp. n. (Holotype): A – male proglottid; B – female proglottid; C – gravid proglottid. Scale bar 100 µm.

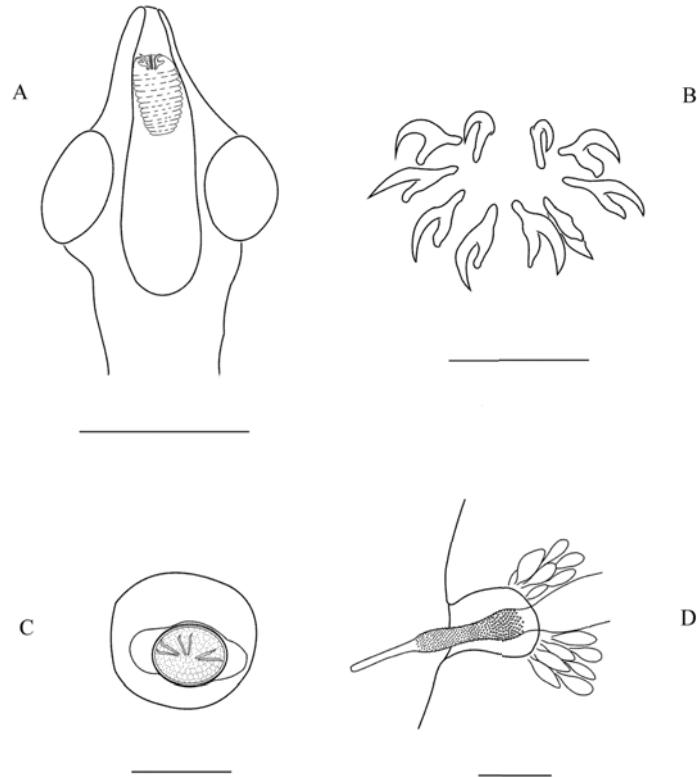


Fig. 3. *Wardium mackoifusa* sp. n. Paratype: A – scolex; B – crown of rostellar hooks; C – egg; D – cirrus.
Scale bars: A – 100 μm ; B – 20 μm ; C – 50 μm .

Distal part of the cirrus is pipette-like, 2.5 (2.5 – 3) in diameter unarmed. Maximum length of cirrus distal part in the paratype is about 22.

Genital atrium simple, feebly muscular. Sometimes it tightens, forming tube. Clumps of glandular cells near opening of cirrus-sac usually present.

Female genitalia develop from rounded primordium in the proglottids with well-developed testes. The primordium is situated at posterior margin of proglottid in the middle. Developed ovary knobbed or weakly lobed, situated in postero-central part of median field. It has 3 implicit lobes. Testes in these proglottids are inconspicuous. Maximum length of ovary 140 (210). Vitellarium oval, 35 – 40 \times 25 – 35 (25 – 70 \times 15 – 50), rarely of irregular shape. It is situated posteriorly and ventrally to the centre of ovary. Vagina opens into genital atrium posteriorly or ventrally to male pore. Copulatory part of vagina funnel-shaped, 10 – 15 (10 – 17) in diameter. Conductive part of vagina tubular, narrow 2.5 in diameter. Its length varies. In some proglottids oval seminal receptacle, 55 – 135 \times 50 – 75 (35 – 110 \times 35 – 60) is seen. Seminal receptacle is situated under the cirrus-sac or shifts to aporal end of the cirrus-sac, towards antiporal osmoregulatory canals. Seminal receptacle can remain in gravid proglottids.

Saccular uterus starting its development in place of female gonads (Fig. 5. C). It grows in width and enters lateral fields outside osmoregulatory canals, thus filling entire proglottid. Mature eggs spherical 60–80 in diameter, embryophore oval 55 – 70 \times 35 – 40 (observed in paratypes). Oncosphere 35 – 40 \times 25 – 28. Embryonic hooks 13 – 15.

Minor delicate filaments are visible at poles of egg embryophore after maceration of fixed material in water during a day (Fig. 5. D).

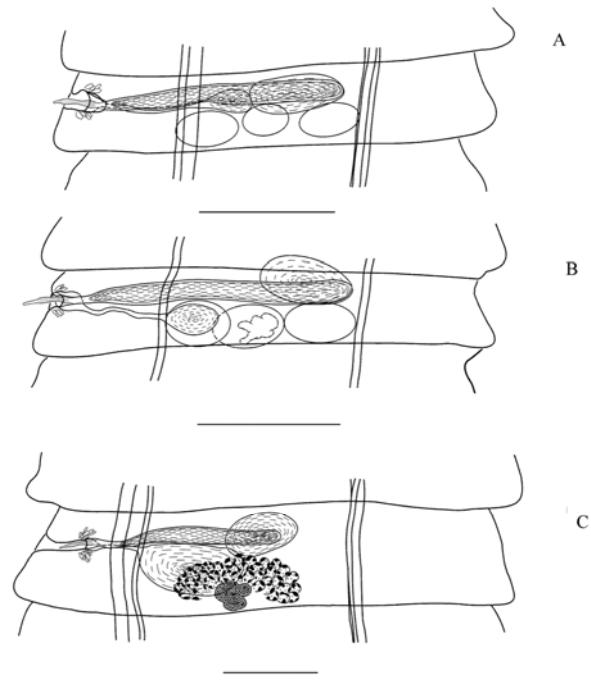


Fig. 4. Proglottids of *Wardium mackoifusa* sp. n. (Paratype): A – male proglottid; B – proglottid with female anlage; C – female proglottid.
Scale bar 100 μm .

Taxonomic remarks

By the length of relatively small rostellar hooks *W. mackoifusa* sp. n. is similar to the following members of the genus *Wardium*: *Wardium cervotestis* (Ahern et Schmidt, 1976) Bondarenko, 1999, *Wardium collariella* (Coil, 1956) Bondarenko et Kontrimavichus, 2006, *Wardium paraclavicirrus* Oschmarin, 1963.

Wardium mackoifusa sp. n. differs from *W. cervotestis* (hooks 13 – 16 long), a parasite of *Recurvirostra americana*, by the shape of rostellar hooks, relatively smaller cirrus-sac, the cirrus shape and morphology of eggs. Hooks of *W. cervotestis* have thinner blade. Cirrus sac of *W. cervotestis* 95 – 205 × 16 – 37 in size, reaches only poral test, cirrus sac of *W. mackoifusa* sp. n. (60 – 120 × 20 – 50), crosses the median field of proglottid. Cirrus of *W. cervotestis* is cigar-shaped. Its median part is slightly widened, armed with small spines. Unarmed distal part of cirrus gradually tapers. Cirrus of *W. mackoifusa* sp. n. has two enlargements with different spines. Oncosphere in eggs of *W. cervotestis* is oriented along major axis of embryophore. Oncosphere in eggs of *W. mackoifusa* sp. n. is ordinarily oriented (Ahern & Schmidt, 1976; Bondarenko & Kontrimavichus, 2006).

Wardium collariella (hooks 15 – 16 long) had been described from *Charadrius collaris* in Mexico and has not been reported thereafter. *Wardium mackoifusa* sp. n. differs from *W. collariella* by the shape of rostellar hooks, size and armament of cirrus, absence of testes in proglottis with mature female genitalia. Rostellar hook of *W. macko-*

fusa sp. n. has a handle and the hook handle of *W. collariella* is not noticeable. *Wardium mackoifusa* sp. n. has shorter cirrus (cirrus length 32.5 – 50 vs 143 in *W. collariella*) with spines on it (Coil, 1956; Bondarenko & Kontrimavichus, 2006).

Wardium paraclavicirrus (hooks 16 long), specific parasite of snipes (*Gallinago* spp.), differs from *Wardium mackoifusa* sp. n. by the shape of rostellar hooks, size, shape and armament of cirrus. Hook blade of *W. paraclavicirrus* is longer. Cirrus of *W. paraclavicirrus* is large, 240 – 260 long, with maximum width of 57 in its distal part, leaf-shaped, armed by small homogeneous spines, whereas the cirrus of *W. mackoifusa* sp. n. is armed by heterogeneous spines. It has massive swelling in median part (Oschmarin, 1963; Bondarenko & Kontrimavichus, 2006).

There are another hymenolepidid cestodes with apoparaksoid-type hooks and three testes in a proglottid, that are parasites of different gulls. These are the members of the genus *Branchiopodataenia* Bondarenko et Kontrimavichus, 2004, as well as the some species of the genus *Hymenolepis* s.l. By the length of rostellar hooks *W. mackoifusa* sp. n. is similar to the following three species of genus *Branchiopodataenia*: *Branchiopodataenia arctowskii* (Jarecka et Ostas, 1984) Bondarenko et Kontrimavichus, 2004 (hooks 14 – 20 long), *Branchiopodataenia haldemani* (Schiller, 1951) Bondarenko et Kontrimavichus, 2004 (hooks 12 – 14 long) and *Branchiopodataenia pacifica* (Spassky et Jurpalova, 1968) Bonda-

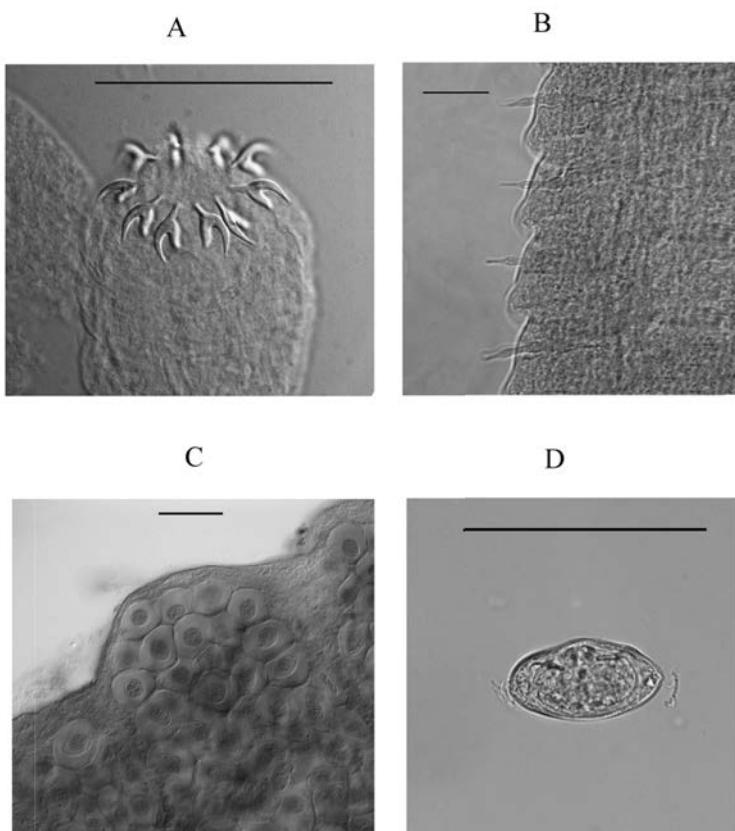


Fig. 5. Some peculiarities of *Wardium mackoifusa* sp. n. A – crown of rostellar hooks; B – cirri; C – fragment of gravid proglottid; D – egg after maceration of fixed material in water. Scale bars: A, B – 50 µm; C, D – 100 µm.

renko et Kontrimavichus, 2004 (hooks 16 – 18 long). However all these species have a latch-like structure in copulatory part of vagina, the specific morphological character of the genus (Bondarenko & Kontrimavichus, 2004). This feature is absent in *W. mackoifusa* sp. n.

Only three species of the genus *Hymenolepis* s.l. have rostellar hooks similar to the hooks of *W. mackoifusa* sp. n.: *Hymenolepis* (s.l.) *fusus*, *Hymenolepis* (s.l.) *neosouthwelli* Hughes, 1940 (syn. *Hymenolepis fusus* Southwell, 1930), *Hymenolepis pseudofusa* Skrjabin et Matevossian, 1942), *Hymenolepis* (s.l.) *paucispinosum* (Labriola et Suriano, 2000) Bondarenko et Kontrimavichus, 2004.

Hymenolepis s.l. *fusus* (hooks 16 – 18 long) was found in different gulls, *H. (s.l.) paucispinosum* (hooks 12 – 14 long) was described from *Larus maculipennis* (Lichtenstein, 1823) in Argentina. They differ from *W. mackoifusa* sp. n. by the shape and armament of cirrus and by development of genitalia. Cirrus of *H. (s.l.) fusus* is spindle-shaped with small distinct swelling that is densely covered by large spines. Cirrus of *H. (s.l.) paucispinosum* is larger (maximum length 90), it is cylindrical, with small basal enlargement. It is armed with thin long spines. Its narrowed distal end is unarmed. Genital atrium of *H. (s.l.) paucispinosum* is muscular. Male and female genitalia of *H. (s.l.) fusus* and *H. (s.l.) paucispinosum* develop simultaneously (Maksimova, 1987; Bondarenko & Petkevichiute, 1998; Labriola & Suriano, 2000; Bondarenko & Kontrimavichus, 2004).

Hymenolepis (s.l.) *neosouthwelli* (hooks 16 long) was described from a *Chroicocephalus brunneicephalus* (Jerdon, 1840) (Syn. *Larus brunneicephalus* Jerdon, 1840) in India. It differs from *W. mackoifusa* sp. n. by shorter handle and bent guard of rostellar hooks and by shorter cirrus sac (judging by the Fig. 291 in Southwell, 1930).

Discussion

All species listed in the remarks species, except for *H. (s.l.) fusus*, have not found in the little gull (*Larus minutus*). Most probably, *W. mackoifusa* sp. n. was mistakenly identified as *H. (s.l.) fusus* from the little gull. At least all collection specimens of *H. (s.l.) fusus* from the little gull from Ukraine appear to be the new species after revision. Since there is a number of sides of *H. (s.l.) fusus* from other gulls and the slides of *W. spasskii* from the little gull we could easily distinguish *W. mackoifusa* sp. n. from them.

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