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FOLIA PARASITOLOGICA 35: 217–222, 1988.

A NEW CESTODE, WARDIUM GVOZDEVI SP. N. (CESTODA: HYMENOLEPIDIDAE), AND ITS BIOLOGY

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Abstract. A new species, *Wardium gvozdevi* sp. n., was described from a slender-billed gull (*Larus genei* Brême) in central Kazakhstan (Lake Tengiz). It was experimentally established that brine shrimps *Artemia salina*, abundant in the lake, are obligatory intermediate host of the cestodes. *Wardium gvozdevi* develops in the intermediate host (from an oncosfere to a cysticercoid) during 12—15 days under conditions of Lake Tengiz with the extremely salt water (65—80 per mill) and temperatures of 22—24 °C.

In July—August 1971, 1972, 1977, 1980, during ecological-parasitological investigations at Lake Tengiz (Central Kazakhstan), the author found younglings and adults of *Larus genei* Brême to be infected at 100 per cent with unknown cestodes. Their morphology corresponds to the diagnosis of the genus *Wardium* Mayhew, 1925, but they differ distinctly from the previously known species of the genus. Therefore the cestodes from *Larus genei* are described as a new species, *Wardium gvozdevi* sp. n. Brine shrimps *Artemia salina* inhabiting the lake proved to be infected with cysticercoids of the cestodes as well (1.5—3 %). The fact that cysticercoids from brine shrimps belong to *W. gvozdevi* was verified by comparing them with those received in the experimental infection of *Artemia salina* with mature eggs of this cestode.

W. gvozdevi is apparently specific of *Larus genei*. Other gulls examined at the same time at Lake Tengiz were not infected.

MATERIALS AND METHODS

Nine younglings and three adults of a slender-billed gull *Larus genei* were studied with the help of the helminthologic dissection method. The infection of the birds with *W. gvozdevi* was 100 % with the intensity of invasion reaching several hundreds of strobilae in a bird.

The intermediate host of *W. gvozdevi* was revealed by means of an experimental infection of brine shrimps *Artemia salina* (reared from eggs in the aquarium) with mature eggs of the cestode. The experiment was carried out under conditions near natural (extremely salt water of Lake Tengiz and appropriate temperature). The number of brine shrimps in the experiment was not large (25) according to the small number of the cestode infectious eggs. All of them were infected with the larvae of *W. gvozdevi* with the intensity of invasion 1—3 and 5—7 (in two cases) cysticercoids in a brine shrimp. The number of the cestode larvae parasitizing simultaneously naturally infected brine shrimps was not more than 3 cysticercoids in a specimen.

The cestodes were studied with the aid of an "Ergaval" microscope on permanent balsam preparations mounted of strobilae stained with sour milk carmine. Temporary unstained water-glycerine (1 : 2) preparations were used to study the character of the scolex armament, the rostellum hooks' structure and the cestode larvae.

Drawings were made with the help of an apparatus RA-4.

DESCRIPTIONS

Wardium gvozdevi sp. n. Figs. 1, 2

Definitive host: *Larus genei* Brême.
Localization: small intestine.
Locality: USSR (Central Kazakhstan, Lake Tengiz, July—August 1971, 1972, 1977, 1980).
Type specimens: holotype coll. no. 5600, 25 July 1972 (Institute of Zoology AS KazSSR); paratype (IPCAS).
No. of specimens collected: 1471 from 12 individuals.
No. of specimens measured: 21.

MORPHOLOGY

The mature strobila consists of 385 (182—385) proglottids 18 (12.6—18.3) mm in length, reaching the maximum width of 0.462 (0.275—0.462) mm in hermaphrodite and mature proglottids. The cone-shaped scolex measures 0.168×0.147 (0.147 to 0.168×0.155—0.160) mm. Suckers are oval, 0.076×0.063 (0.071—0.084×0.055 to 0.063) mm, unarmed. The cylindrical rostellum is well-developed, 0.168×0.042 (0.168—0.210×0.025—0.055) mm, armed with 10 hooks resembling these of the "diorchis" type (the blade, handle, and guard are well developed). The hooks measure 0.042 mm, the blade — 0.025 mm. The well-developed handle and the guard are nearly equal in length (0.014 mm, 0.0126 mm). The rostellum sac is two-walled, wide, and measures 0.306×0.060 (0.231—0.306×0.063—0.092) mm. It fills up the whole area between the suckers reaching beyond the back edge of the suckers into the collum. The collum is 0.273 (0.273—0.420) mm long, and 0.075 (0.063—0.075) mm wide. The proglottids are trapeziform, relatively long — 0.168 (0.134—0.168) mm, not wide — 0.422 (0.302—0.422) mm, not closely adhering to each other. The length: width ratio of the proglottids is 1 : 2.5.

The genital pores are unilateral, opening to the deep cloaca (0.063×0.021 mm) surrounded with accumulated glandulous cells. The genital system develops gradually. At first male genitals develop, beginning with 83—92 proglottids from the scolex in the form of the accumulation of large cells. Then developed young testicle and the cirrus bursa appear in the proglottids 107—110. The hermaphrodite proglottids (10—12) containing both male (testicles, cirrus bursa) and young female (ovary, vitelline gland) genitals, begin to appear approximately in the middle of the strobila length. Female proglottids with the completely developed ovary and vitelline gland follow them. The last 7 (5—7) proglottids are filled with the mature uterus containing a few large eggs.

The genitals are localized at the posterior end of the proglottid slightly aporal of the middle strobila line. Three fully developed testicles measure 0.042×0.050 mm. The localization of the testicles in the same strobila varies: at an obtuse angle apex backward (type Y), and more frequently in a line along the back edge of the proglottid (type YII). The cirrus bursa is cigar-shaped, 0.155×0.025 (0.147—0.155×0.017 to 0.025) mm large, with well developed longitudinal musculature. Its bottom reaches the aporal excretory vessels. At the bottom of the cloaca at the base of the bursa, there is a distinct sclerotic brownish ring-shaped evagination, 0.025 mm in diametre, characteristic of the species. The inner wall of the ring, "muff", is slightly ribbed. The fully evaginated cirrus is very small, 0.021 mm in length and 0.0042 mm in, diametre, nipple-shaped, unarmed. The external seminal vesicle measuring 0.063×0.042 (0.063—0.071×0.042—0.050) mm is over the bottom of the cirrus bursa. The internal seminal vesicle fills up almost the whole bursa cavity.

Female genitals are localized at the level of the middle and poral testicles. The ovary (0.029×0.084 mm) is in the area of the hermaphrodite proglottids; it consists of three relatively smooth lobes. The vitelline gland is compact, oval, 0.021×0.042 mm. In the female proglottids there is a quite developed three-lobed ovary (0.071×0.118 mm) with 4—6 secondary fan-shape lobes. The vitelline gland is these proglottids becomes

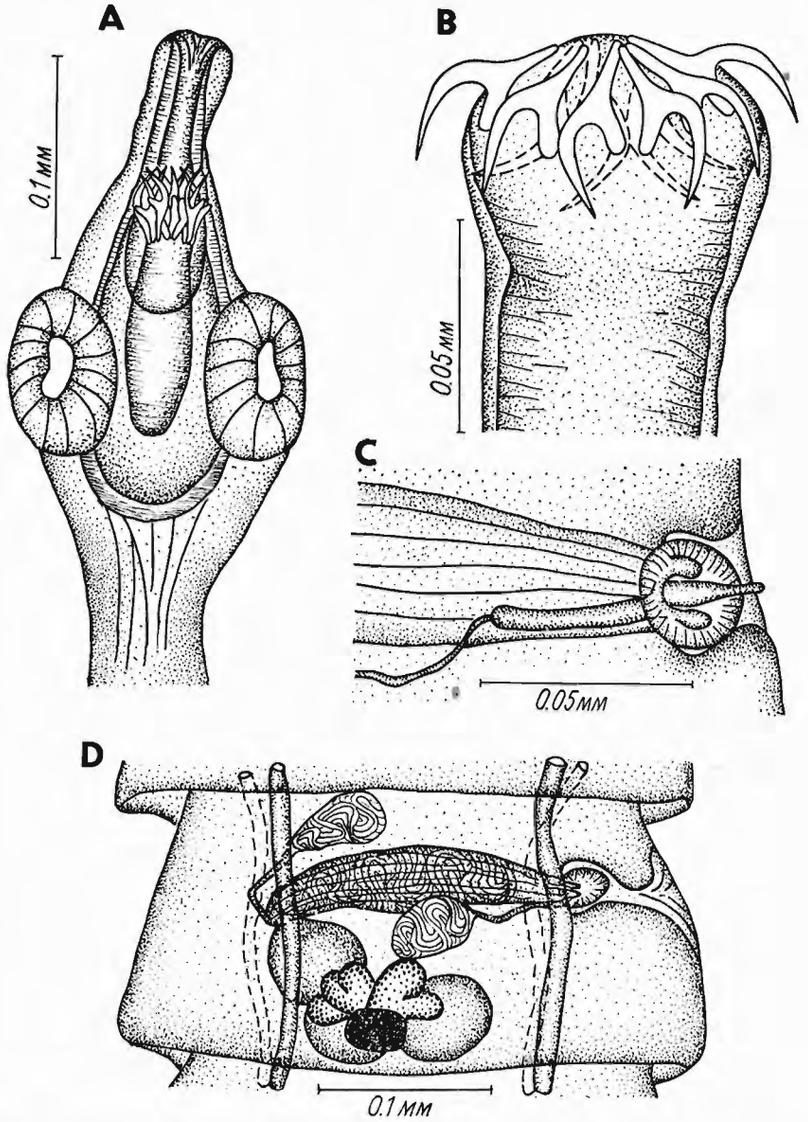

Fig. 1. *Wardium gvozdevi* sp. n. from a slender-billed gull *Larus genei* Brême: a — scolex; b — distal part of rostellum with hooks; c — copulatory apparatus; d — hermaphroditic proglottid.

uneven, irregularly oval, 0.034×0.059 mm. The small tube-shaped thin-walled vagina (0.0294×0.004 mm) turns gradually into a narrow seminal duct. The seminal receptacle is oval, 0.050×0.034 (0.042—0.050×0.033—0.040) mm.

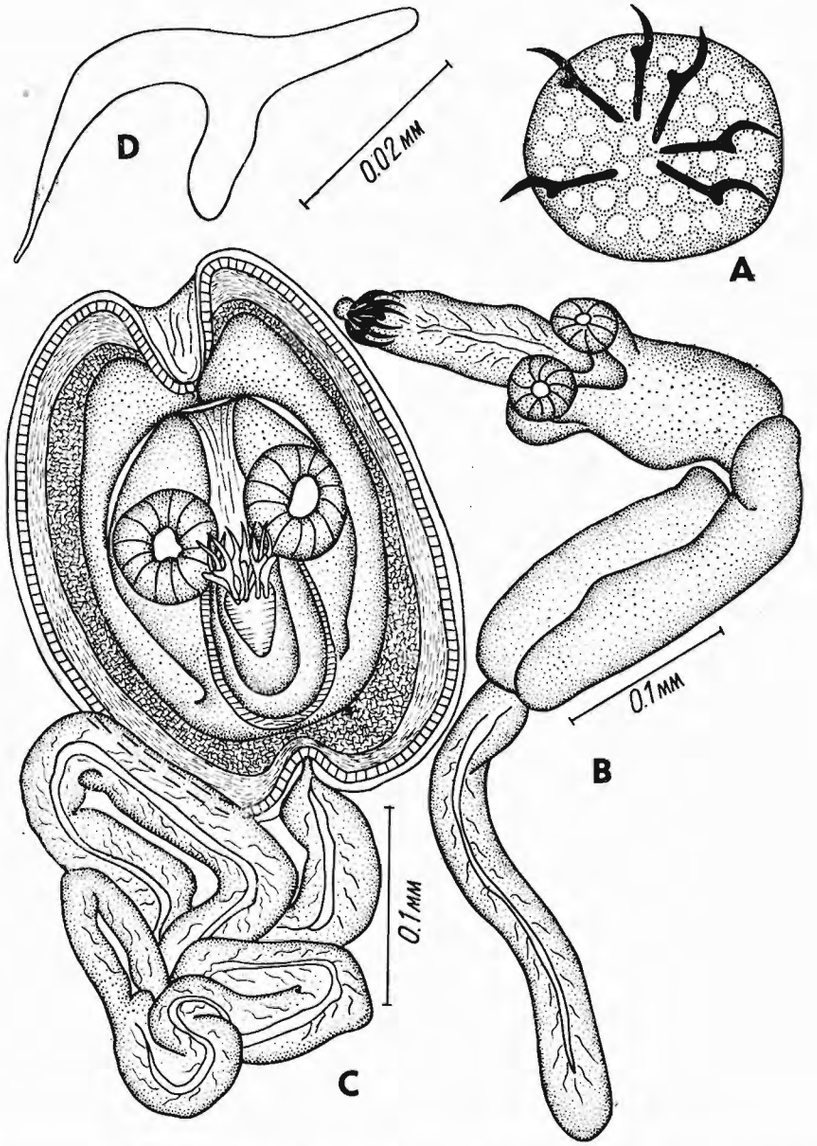

Fig. 2. Development of *Wardium gvozdevi* sp. n. in brine shrimp, *Artemia salina:* a — oncosphere; b — scolexogenesis stage before invagination; c — cysticercoid; d — rostellar hook.

The young uterus in the form of a transversal strip is mature, sack-shaped. Eggs are large, not numerous (35—40). The oncosphere (Fig. 2A) is oval, 0.034×0.025 mm. Embryonal hooks are 0.011—0.012 mm long.

The species *Wardium gvozdevi* sp. nov. was named in honour of Academician of the Kazakh Academy of Sciences E. V. Gvozdev who made a great contribution to the progress of helmonthologic science in Kazakhstan.

Differential diagnosis. Of the previously known species of the genus *Wardium*, the new species *W. gvozdevi* slightly resembles *W. haldemani* (Schiller, 1951), *W. yuconensis* (Schiller, 1954), *W. arctica* (Schiller, 1955), and *W. manubriatum* Spassky et Dao, 1963 in the characteristic morphological feature of the rostellar hooks (the handle is well developed). However, *W. gvozdevi* differs from the mentioned species in larger hooks (2—3 times the size) measuring 0.042 mm (*W. haldemani* — 0.011 mm, *W. yuconensis* and *W. arctica* — 0.015—0.017 mm, *W. manubriatum* — 0.019—0.020 mm). Besides, there is a characteristic sclerotized ring-shaped evagination at the base of the cirrus bursa of *W. gvozdevi*, which is missing in any of the other species compared. The structure of the cirrus and of other genital organs is different as well.

BIOLOGY

Intermediate host: *Artemia salina* (naturally — Lake Tengiz, July—August 1971, 1972, 1977, 1980 and experimentally — July 2—17, 1977).

The development of *W. gvozdevi* in the intermediate host *A. salina* from the oncosphere to the cysticercoid lasts 12—15 days under conditions of Lake Tengiz with the extremely salt water (65—80 per mill) and temperatures of 22—24 °C.

Description of *W. gvozdevi* sp. n. larva: A six-day larva at the scolexogenesis stage (Fig. 2B) is 0.702 mm long. The scolex measures 0.134×0.076 mm, the suckers are 0.034 mm in diametre, the rostellum is 0.122×0.034 mm. The length of the not quite developed rostellar hooks is 0.038 mm, of the blade 0.017 mm, of the guard 0.008 mm, and of the handle 0.012 mm. The larva collum measures 0.042×0.034 mm, the body of a developing cyst 0.168×0.084 mm, the cercomere — 0.236×0.029 mm.*

The cysticercoid (Fig. 2C) is large, oval, measuring 0.27—0.32×0.15—0.20 mm. It has 4 membranes: external hyaline 0.0010—0.0015 mm, basal cuticular — 0.0040 to 0.0042 mm, streching under fibrous — 0.006—0.009 mm, internal parenchymal — 0.008—0.013 mm thick. The scolex (0.151—0.160×0.084—0.120 mm) is surrounded with the larva collum. The suckers (0.060—0.065×0.042—0.050 mm) are not armed. The rostellum is 0.084—0.140 mm long, 0.038—0.050 mm in diametre, it is armed with 10 hooks measuring 0.042 mm in length; the blade is 0.021 mm, the guard — 0.012 mm, the handle — 0.013—0.014 mm long (Fig. 2D). The rostellum sac is large, 0.134 to 0.150×0.058—0.060 mm, two-walled. The cercomere is relatively short — 1.21 to 1.43 mm and thick — 0.040—0.042 mm; it is only 3—4 times longer than the cyst.

* Because of the small number of invasion material (mature cestode eggs) we did not manage to observe all the stages of larval development.

НОВАЯ ЦЕСТОДА *WARDIUM GVOZDEVI* SP. N. (CESTODA: HYMENOLEPIDIDAE) И ЕЕ БИОЛОГИЯ

А. П. Максимова

Резюме. Описан новый вид *Wardium gvozdevi* sp. n. от морского голубка *Larus genei* Brême из оз. Тенгиз (Центральный Казахстан). Экспериментальным путем установлено, что облигатными промежуточными хозяевами этой цестоды являются, в массе обитающие в этом же водоеме жаброногие рачки *Artemia salina*. Развитие *W. gvozdevi* в промежуточном хозяине — жаброногом рачке от онкосферы до инвазионной личинки-цистицеркоида в условиях горько-соленого оз. Тенгиз (65—80 промилле), при температуре 22—24 °C осуществляется за 12—15 дней.

Received 18 January 1985

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FOLIA PARASITOLOGICA 35: 222, 1988.

OCCURRENCE OF COPULATING PAIRS OF THE TICK IXODES RICINUS (L.) IN NATURE

Recently, Kolonin (1987: Med. parazitol. No. 3: 82—83) pointed out the scarcity of data on the occurrence of copulating pairs of *Ixodes persulcatus* Schulze collected on vegetation by dragging method, although more than 50 % of females may be fecundated already before attacking the host. A similar situation with missing data on copulating pairs in nature exists with *I. ricinus*.

We recorded their presence among other imagoes during our studies on the ecology of this species in the locality Poteplí in Central Bohemia during the years 1954—1955. In the course of regular tick collections on experimental areas situated in a forest biotope, 280 males and 244 females were obtained in 1954, and 203 males and 238 females in 1955. Among these 965 adults only 5 copulating females were found, all in 1954, i.e. 1.0 % of all collected females and 2.0 % of females collected in 1954. Three pairs were found in April (3.2 %), one pair in May and June (1.3 % and 1.7 %, respectively) and none from July to Octobre. In the year 1957 in various biotopes of another locality, Ruská Poruba in Eastern Slovakia, 220 males and 244 females were collected from April to August. Only 2 copulating females were found in April, i.e. 0.8 % of all females and 1.3 % of those collected in April.

These findings correspond roughly to those of Kolonin (1987), when most *I. persulcatus* mating pairs were collected in the period of mass occurrence of this tick species. Our data are based only on limited material because the numbers of copulating pairs are not regularly registered during field collecting. Therefore, more detailed observations are needed.

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