

DESCRIPTION OF CYSTICERCOID OF *CORONACANTHUS VASSILEVI* GENOV, 1980 (CESTODA : HYMENOLEPIDIDAE)

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Summary :

Genus *Coronacanthus* Spassky, 1954 contains three species – *C. integra* (Hamann, 1891), *C. omissa* (Baer et Joyeux, 1943) and *C. vassilevi* Genov, 1980 – but larval stages of only first two species were described before. During 1991-1993 cysticercoïds of all three species were found from gammarid crustaceans in Eastern Carpathians. The article contains an illustrated description of the cysticercoïd of *C. vassilevi*. It differs considerably from the formerly known *Coronacanthus* larvae by the egg-shaped (not lens-shaped) form of the cyst, absence of marginal thickening of the cyst wall, by the shape and length of cercomer and, besides, by the invagination of the anterior part of the scolex. Microvilli on the cyst surface were not detected with light microscope. Cercomer of *C. vassilevi* is narrow and very long as for mammalian hymenolepidid (4.7 to 8 times longer than cyst). The number (37-38), length (8-9 µm) and shape of rostellar hooks well correspond to those of adult worms (Genov, 1980).

KEY WORDS : Hymenolepididae. *Coronacanthus vassilevi* Genov, 1980. cysticercoïd. gammarid crustaceans.

INTRODUCTION

Larval stages of only 23-24 species of hymenolepidid cestodes parasitizing insectivores (out of more than 150 known) were described up to now. 10 of them (out of 14-15 known) are represented by parasites of water shrews of genus *Neomys* (Hamann, 1891; Baer, Joyeux, 1943; Spassky, Andrejko, 1968; Prokopic *et al.*, 1970; Valkounova, 1983, 1985; Matsaberidze *et al.*, 1986; Tkach, 1991, etc.). Cestodes of the genus *Coronacanthus* Spassky, 1954, like all hymenolepidids specific to water shrews, use gammarid crustaceans as intermediate hosts. The genus contains three species – *C. integra* (Hamann, 1891), *C. omissa* (Baer et Joyeux, 1943) and *C. vassilevi* Genov, 1980, but larval stages of only first two species were described earlier.

During 1991-1993 investigations in Eastern Carpathians (Ukrainian part) we have found larvae of all three species mentioned, along with the larvae of other five species of cestodes adults of which parasitize water shrews. Cysticercoïd of *C. vassilevi* differs sufficiently from the formerly known *Coronacanthus*

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Résumé : DESCRIPTION DU CYSTICERCOÏDE DE *CORONACANTHUS VASSILEVI* GENOV, 1980 (CESTODA : HYMENOLEPIDIDAE).

Le genre *Coronacanthus* Spassky, 1954 est composé de 3 espèces : *C. integra* (Hamann, 1891), *C. omissa* (Baer et Joyeux, 1943) et *C. vassilevi* Genov, 1980. Les stades larvaires des 2 premières espèces étaient les seuls connus jusqu'à présent. Au cours des années 1991-1993, les cysticercoïdes des 3 espèces ont été récoltés chez des Gammarides des Carpates orientales. L'article décrit et illustre celui de *C. vassilevi*. Il se distingue aisément des autres larves de *Coronacanthus* décrites par la forme ovale de son kyste, sa paroi non épaissie, par l'invagination de la partie antérieure du scolex, et enfin par la forme et la longueur du cercomère. Ce dernier est très étroit et remarquablement long parmi les Hyménolépididés de mammifères (4.7 à 8 fois plus long que le kyste). Le nombre (37-38), la longueur (8-9 µm) et la configuration des crochets rostraux correspondent à ceux des cestodes adultes (Genov, 1980).

MOTS CLÉS : Hymenolepididae. *Coronacanthus vassilevi* Genov, 1980. cysticercoïde. gammaride.

larvae by the structure of the cyst, scolex and cercomer. For these reasons the present paper includes description of the cysticercoïd of *C. vassilevi* and comments on some specific features of its morphology in comparison with larvae of other species.

MATERIAL AND METHODS

The material was collected during September 1993 in the territory of Carpathian National Park, Nadvornyansky district, Ivano-Frankovsk region. 1172 specimens of gammarid crustaceans from seven mountainous streams were examined for cestode larval stages. Larvae of seven cestode species were found (overall prevalence 3.16%). Among them, 18 cysticercoïds of *Coronacanthus vassilevi* were found in a single specimen of *Gammarus (Rivulogammarus) balcanicus* Schaf. taken from the stream near the Mikulichin village. Cysticercoïds were preserved in 70% ethanol.

Morphological structure of the cysticercoïds was studied in living state and on total coloured preparations mounted permanently in Canada balsam. The water stains (alumic carmine or Boemer's haematoxylin)

and four gradually increasing concentrations of eugenol were used to prevent compression of the larvae, which frequently occurs if acid stains and only pure eugenol are used. Some of the cysticercoids were preserved in Berlese medium which facilitated precise study of the rostellar hooks shape, size and number. Drawings were made with aid of camera lucida.

DESCRIPTION OF THE CYSTICERCROID

Measurements of the specimen represented on Fig. 1A are given, data concerning all the sample are in Table 1. All measurements are in micrometres if otherwise not stated.

Larvocyst is a typical cysticercoid, which consists of a tailed cyst, the cavity of which contains the scolex with invaginated fore part and the neck. General length of the cysticercoid is 2.02 mm (1.49-2.36 mm). The cyst is small, while the cercomer is long (4.7-8 times longer than cyst).

The cyst is egg-shaped (or oval), somewhat compressed from the sides, its length is 270, width (« front view ») : 170, thickness (« profile view ») : 140. Microvilli on its surface were not detected with the light microscope. The cyst wall has very thin outer limiting membrane-like layer, not dyeing with common stains (carmine, haematoxylin) and could be absent, probably due to mechanical damages during recovering larvae from the crustacean or their laboratory processing. The wall is thin, it is seen 3-layer on the total preparations. Thickness of the wall varies from 8 in the middle portion of the cyst to 15 in the apical end around the invagination funnel, but it also can be equal in different parts of the cyst. The outer layer is 4, consists of a dense amorphous substance, which refracts light and is not dyeing with common stains. The middle layer (subtegument of the cyst) is 2-3 thick, granulated, with numerous interweaving fibres. The granulation which is seen in the total preparations, most probably derives from the bodies of numerous fibroblasts. The inner layer, fibrinous, 4-8 thick, represented by the tissues of larva itself, more exactly its neck, is surrounding the scolex and adhering to the cyst wall. The cyst wall does not develop marginal thickening along the cyst edge like that described in cysticercoids of other *Coronacanthus*.

The cyst cavity contains scolex with neck. The neck taper is behind the scolex and can exceed it in length. Scolex is situated in the anterior part of the cavity, its length being 150 and width 110. As in all representatives of *Coronacanthus*, anterior part of the scolex forms deep invagination and, as a result, suckers are situated on the inner surface of the scolex cavity and rostellum on its bottom. Specific feature of *C. vassilevi* larvae is that the fore portion of the scolex can invagi-

nate more and anterior edges of the scolex cavity fold inside. As a result, the suckers find themselves inside the fold formed by the inner wall of the scolex and its folded part. At the same time the bottom of the scolex cavity does not change its position. The suckers, 66-68, round in frontal view. The rostellum is retracted into rostellar sheath. Anterior surface of the rostellum also can invaginate a little. Rostellum of flattened shape measures 17 × 48. It bears a simple crown of 37-38 small hooks measuring 8-9 in length (Fig. 1E, F). Handle is very short, less than 2, blade thin, sharp, slightly curved, 6 in length, parallel to the guard, which is somewhat shorter : 5. The shape of the hooks resembles the aploparaksoid type, but details of their morphology (particularly, position of the handle) indicate their fraternoid origin. Movement of the rostellum is, probably, a result of contraction of the rostellar sheath walls, because proboscis is completely reduced. Rostellar sheath with muscular walls, 62 × 92.

Cercomer begins from the funnel-like mouth at the posterior end of the cyst. Cercomer is narrow, 70-100 in width, and long, 1.25-2.10 mm. Its tegument is very thin and its tissue consists of large cells. Some of the embryonic hooks (presumably lateral ones) were found in the middle portion of cercomer, their length is 10.

DISCUSSION

Among the three species of *Coronacanthus*, *C. integra* and *C. omissus* are known to be widely spread in Central and Eastern Europe and Caucasus, whereas *C. vassilevi* has not been found anywhere after the description from *Nemys fodiens* and *N. anomalus* in Bulgaria (Genov, 1980, 1984). T. Genov also has suggested that material of J. Mituch (1964) from Slovakia could contain the species under the name *Coronacanthus anacetabulata* (though the data on hook number and length given by J. Mituch are intermediate between *C. omissus* and *C. vassilevi*). It can be supposed that *C. vassilevi* is really not so extremely rare and further investigations and revision of old collection materials may essentially widen the known range of the species. It is necessary to note that the number and size of rostellar hooks are enough discriminative features for easy differentiation of *Coronacanthus* species. But *C. vassilevi* and *C. integra* can be misidentified on total coloured preparations on which it is usually impossible to observe and count very small (of the same size or smaller than embryonic hooks) and numerous rostellar hooks. These two species can be easily distinguished on total preparations or in living state on the basis of rostellum which is of very characteristic flattened form in *C. vassilevi* (Fig. 1C, D). Size of ros-

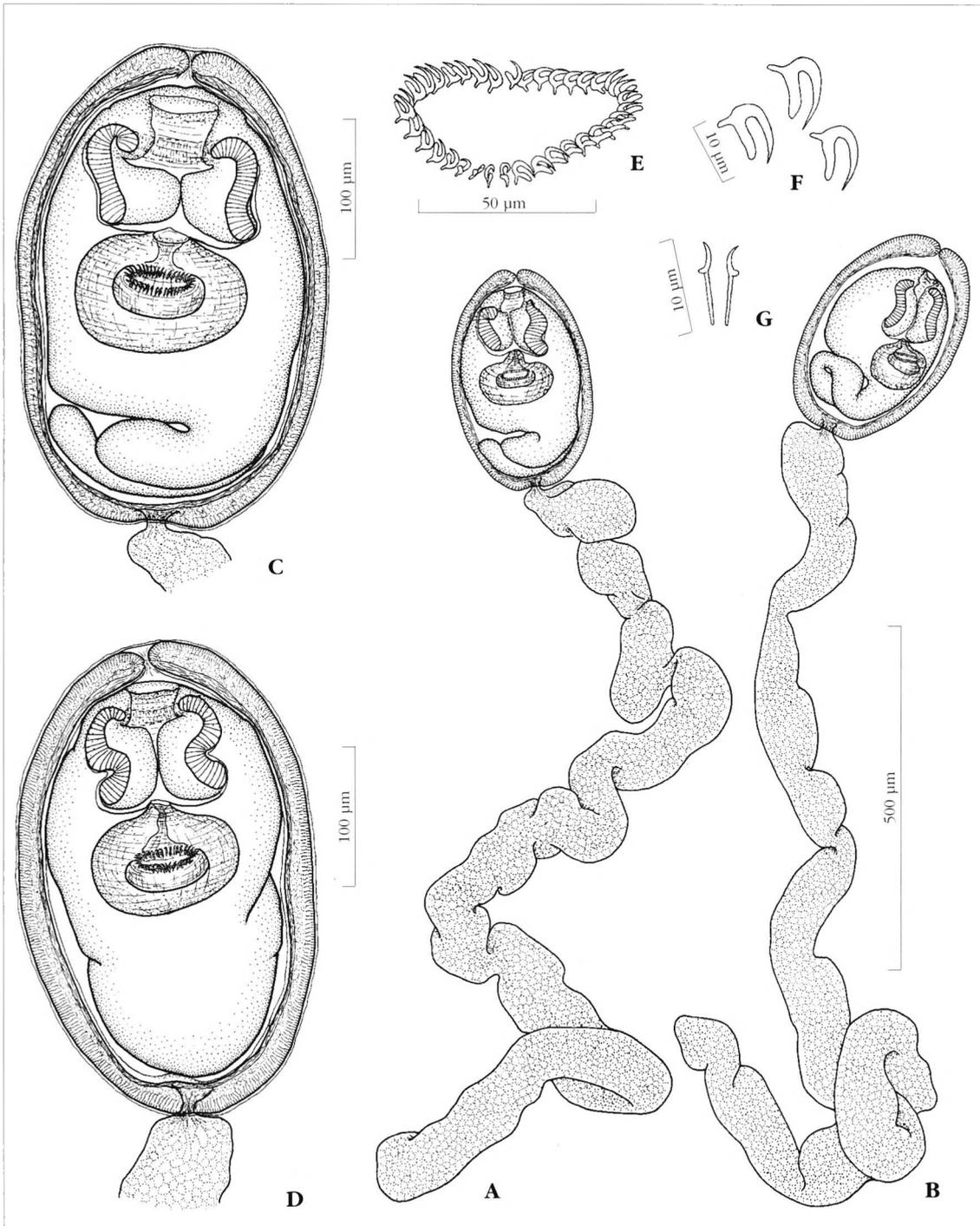


Fig. 1 – Cysticercoids of *Coronacanthus vassilevi*

A, B : total view of larvae ;
 C, D : cysts containing scoleces ;
 E : complete crown of hooks ;
 F : rostellar hooks ;
 G : embryonic hooks.

MORPHOLOGICAL CHARACTERS	BASIC STATISTICS (N = 8)				
	Min-Max	Mean	Std. Err.	Std. Dev.	CV
Cyst length	260-290	271	4.77	11.69	4.29
Cyst width	160-190	172	5.83	13.03	7.56
Cercomer	1230-2100	1596	152.3	340.6	21.34
Cyst wall	9-20	13.2	1.19	2.66	20.15
Scolex length	140-187	158	8.11	18.15	11.45
Scolex width	110-160	129	8.81	19.70	15.20
Rostellum length	12.5-18.0	15.6	1.04	2.32	1.49
Rostellum width	40-52	44.2	2.45	5.49	1.24
Hook length	8-9	8.2	0.16	0.46	5.61
Rostellar sheath : length	47-65	56	4.41	8.83	15.86
width	65-92	81	5.87	11.74	14.50
Suckers	52-68	61	3.89	7.78	12.76

Table I. – Most important measured characters of cysticercoids of *C. vassilevi* (µm)

CV – coefficient of variation

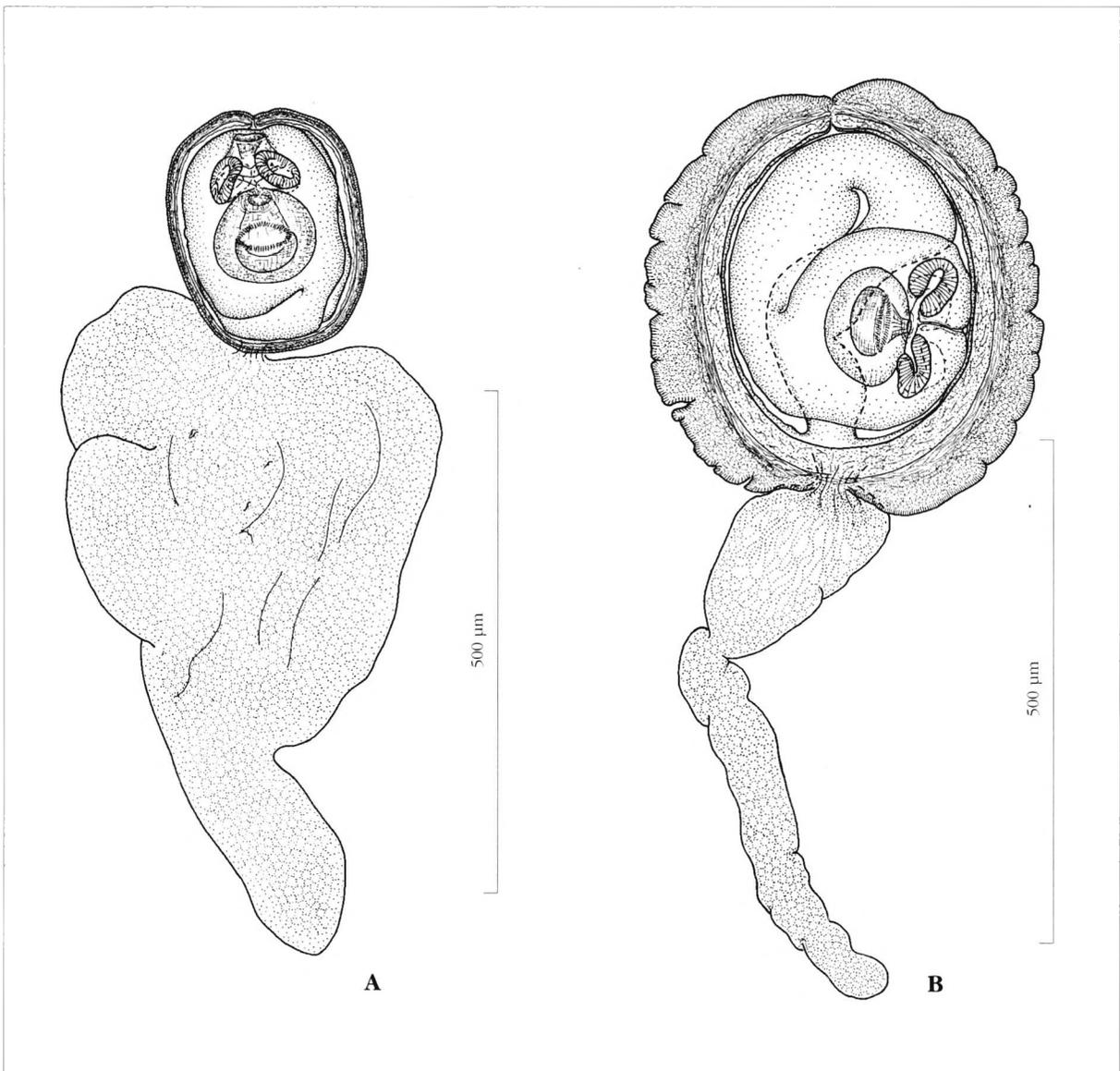


Fig. 2. – Different age forms of cisticercoids of *Coronacanthus integra* from Carpathian gammarids.

A : - oval - form;
B : - lens-shaped - form.

tellum is the most stable measured character in scolex of *C. vassilevi* with coefficient of variation only 1.24-1.49 (Table 1). It must be noted that in the first description of the species (Genov, 1980) there is a disagreement between the text where the rostellum is presented as nearly round (0.047-0.060 × 0.055-0.074) and drawing, where it clearly flattened.

A comparison of the scolex morphology in cysticercoids and adult worms of *C. vassilevi* has shown that the scolex and suckers are smaller in cysticercoids whereas the diameter of the rostellum and the size of rostellar hooks of larvae are well corresponding to those of adult worms (Genov, 1980).

The cysticercoid of *C. vassilevi* essentially differs by its morphology from the larvae of *C. integra* and *C. omissus*, which were described by many authors (literature cited above). We had a possibility for comparison because cysticercoids of all three species are present in our collections (overall about two hundred specimens).

The first very characteristic feature of cysticercoids of *C. vassilevi* is a long cercomer which is 4.7 to 8 times longer than a cyst. Cercomer in both *C. integra* (Fig. 2) and *C. omissus* cysticercoids is much shorter. Unfortunately, little attention was paid to the shape of the cercomer because nobody did consider it as a taxonomically important feature in mammalian hymenolepidids.

A second particular feature of *C. vassilevi* larvae is the folding of the edges of its « tulip-like » scolex into the scolex cavity.

And the third specific feature of *C. vassilevi* is the oval or rather egg-shaped form of the cyst (width and thickness of the cyst are nearly equal) while in other two species the cyst is lens-shaped (flattened shape with circular marginal thickening of the cyst wall). Besides that, no microvilli were detected on the surface of the cyst of *C. vassilevi* in the light microscope. But, as shown by J. Valkounova (1983) for *C. integra*, the absence/presence of the cyst wall thickening and the length of the microvilli are most likely a matter of age variation. On the material from spontaneously infected crustaceans, J. Valkounova has indicated that on younger stage of cysticercoid development the cyst of *C. integra* is oval and lacks microvilli, but fully developed cysticercoid possesses both the marginal thickening and microvilli. Unfortunately, the oval form of cysticercoid was not figured by the author mentioned. We have found many specimens of both forms (or stages) of *C. integra* (Fig. 2), which really cannot be differentiated on the basis of scolex morphology. According to this, our material on *C. vassilevi* can be considered at the moment as a younger stage with obviously fully developed scolex but not

completely developed cyst. The question of the age changes in *Coronacanthus* larvae will be finally solved only after an experimental study of the life cycle of at least one representative of the genus.

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