

Echinobothrium reesae (Cestoda : Diphyllidea)
from the sting rays of Waltair coast.

(*Echinobothrium reesae* (Cestoda : Diphyllidea)
des Pastenagues de la côte de Waltair.)

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Résumé

L'auteur décrit une nouvelle espèce du genre *Echinobothrium* Van Beneden 1849, provenant de la valve à spirale des pastenagues, *Trygon walga*, Muller et Henle et *T. uarnak* Muller et Henle à quelque distance de la côte de Waltair.

Les détails anatomiques de la musculature et des systèmes reproductifs mâles et femelles sont donnés.

Echinobothrium reesae n. sp. est comparé et séparé des autres espèces, qui ont été décrites jusqu'ici.

L'absence complète des épines dorsales sur le pédoncule céphalique et le nombre des crochets apicaux (13 + 4) sur la rostellum du scolex, justifient l'établissement de la nouvelle espèce *E. reesae*.

Summary

A new species of the genus *Echinobothrium* Van Beneden 1849, obtained from the spiral valve of sting rays, *Trygon walga*, Muller & Henle and *T. uarnak* Muller & Henle off Waltair coast, is described.

Anatomical details of musculature, male and female reproductive systems are furnished.

Echinobothrium reesae n. sp. is compared and separated from other species hitherto described.

The complete absence of the spines on the cephalic peduncle and the number of apical hooks (13 + 4) on the rostellum of the scolex, justify the establishment of the new species *E. reesae*.

Introduction

Investigations into cestode parasites of marine fishes of Waltair coast revealed that the sting rays *Trygon walga* Muller and Henle and *T. uarnak* Muller and Henle serve as hosts to an undescribed diphyllid referable to a new species. The characters of these specimens do not agree with the hitherto described species of the genus *Echinobothrium* Van Beneden, 1849. In this paper a description and definition of the new form are furnished.

Material and Methods

Host fishes were brought to the laboratory from the fish landing site at Lawson's Bay in a minimum of time. These were immediately opened and the spiral valve laid in a dish containing saline. Some specimens were slightly flattened under cover slip pressure and fixed in 5% formaldehyde. Whole mounts were stained with alum carmine. Specimens for sectioning were fixed in Susa or Bouin's fluid. Transverse and sagittal sections cut at 10 μ thickness were stained with Heidenhain's azan, iron haematoxylin, PAS or alcian blue techniques. Most of the measurements have been made from fixed and stained preparations. All measurements are in mm.

Observations

The scolex has a short peduncle and the strobila contains fifteen to twenty proglottids. The exact number of proglottids could not be estimated correctly. After opening the spiral valve of the host and laying it in saline medium, most of the gravid proglottids are found detached. Thus it was found difficult not only to count the exact number of proglottids but also to measure accurately the length of the worm. Approximately the length is estimated to be between 10 and 15. Segmentation is very apparent.

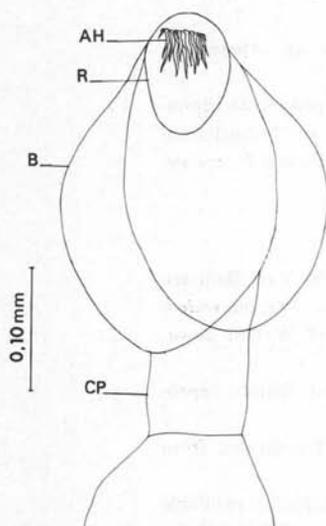


FIG. 1. — Scolex; showing apical hooks on the rostellum

The scolex measures 0.351 in length. It consists of the head proper and a cephalic peduncle. The head bears the dorsal and ventral bothridia each of which is oval, flattened, sessile and attached almost throughout its length to the anterior end of cephalic peduncle. The bothridia are usually wider at mid length and slightly narrow at the posterior end and measure 0.223 in length and 0.175 in maximum width. The bothridia are usually broader than the scolex. Thus they project beyond it laterally and occupy almost the whole length of the scolex. The anterior end of the scolex is bluntly rounded (fig. 1).

A muscular rostellum 0.085 in length and 0.07 in dorso-ventral diameter, is embedded in the anterior end

of the scolex. It has the shape of a laterally compressed hemisphere. Dorsal and ventral groups of apical hooks lie in a semicircle on the anterior end of the rostellum. Each group consists of 13 large hooks and four small hooks. The large hooks are arranged in two close alternating rows. Of the thirteen large hooks seven are present in the anterior row, their roots touching one another and six in the posterior row with their roots touching the one third part of the anterior row of hooks from top. The size of hooks is variable. The seven hooks in the anterior row measure 0.0312, 0.027, 0.031, 0.031, 0.027, 0.023 and 0.0195 respectively. While the six hooks in posterior row measure 0.019, 0.03, 0.0312, 0.023, 0.02, 0.0195 respectively. The small hooks on each side of the main row measure 0.007. Each hook has a wavy appearance with a straight pointed apex. The hook is wider for about one third of its length from the root and then it gradually converges to the apex. Usually the roots of the hooks are embedded in small pits. The shape of the hooks varies largely (fig. 2).

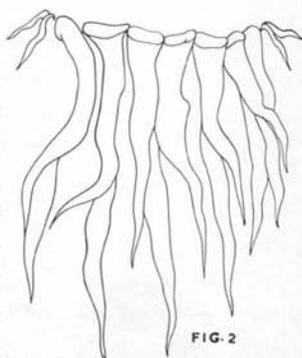


FIG. 2
Fig. 2. — Group of apical hooks, two small hooks on either side

The head proper is followed by a short cephalic peduncle, which measures 0.109 in length and 0.097 in maximum diameter. Segmentation is very distinct and starts immediately posterior to the cephalic peduncle. The strobila is cylindrical in unflattened specimens and acraspedote in character. Most of the proglottids in strobila are gravid in nature. The two segments immediately posterior to the scolex are immature, broader than long measuring 0.117 in length and 0.241 in breadth. The rudiment of genitalia is apparent in the third proglottid which is square measuring 0.29. The subsequent proglottids are longer than broad. The genitalia are well developed in the fourth proglottid (fig. 4). This development continues upto the 8th and 10th proglottid. The remaining gravid proglottids occur free in the spiral valve of the host.

MUSCULATURE :

A thin tegument covers the scolex and strobila. Body muscles could be divided into two groups. The superficial musculature consists of a layer of longitudinal muscles lying beneath the basement membrane throughout the scolex and strobila. The deep musculature consists of transverse, radial, dorso-ventral and longitudinal muscles.

In the scolex a few delicate transverse muscle fibres pass across the head from the dorsal to the ventral sides. The transverse muscles behind the rostellum are well developed. They extend into the bothridia. At the lateral margins these muscles penetrate into the basement membrane. A few fibres of dorso-ventral muscles

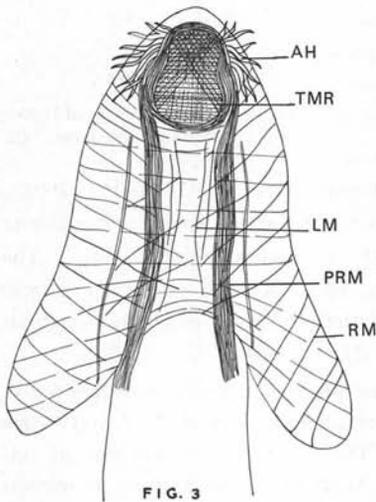


FIG. 3

Fig. 3. — Scolex; lateral view showing musculature

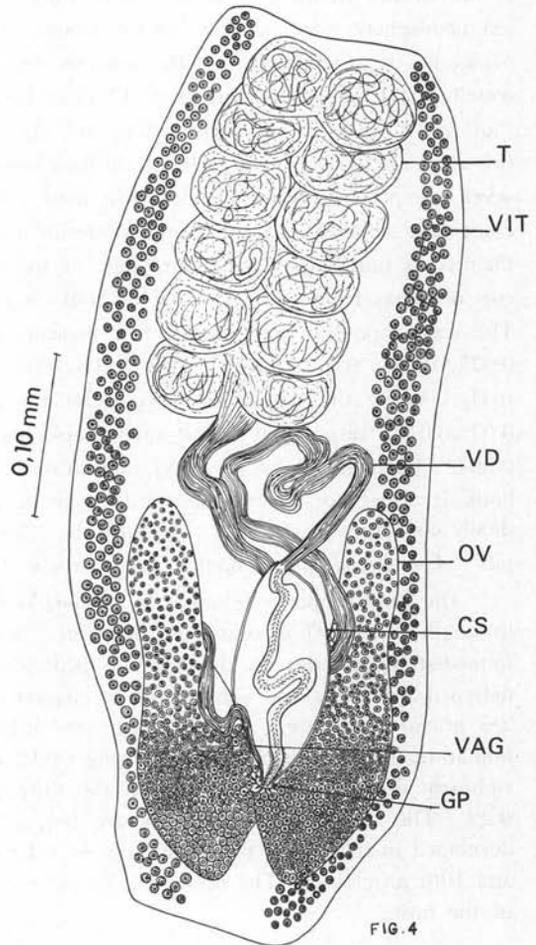


FIG. 4

Fig. 4. — Mature proglottid; ventral view showing reproductive system

are present laterally on either side and in between the excretory vessels. Some of them extend into the cephalic peduncle. The radial muscles are confined to the lateral free part of the bothridia throughout their length. A few isolated longitudinal muscles are present in the scolex. In the scolex two bundles of protractor muscles are present. One of them extends into the dorsal and the other into the ventral sides. Anteriorly each bundle passes peripherally to the rostellum. In the rostellum the transverse muscles are more extensive than the longitudinal and dorsoventral muscles. In the proximal end of the rostellum the laterodorsal and lateroventral

muscles have few socket like formations into which the roots of hooks are anchored (fig. 3).

The musculature in the strobila is very poorly developed. Below the superficial musculature is a layer of subcuticular cells, which is not so deep, Each cell has a clear nucleus and cytoplasm. No calareous corpuscles are present in the strobila. The transverse and longitudinal muscles are scattered irregularly below the subcuticular cell layer, and are very poorly developed. The entire medullary region is filled with parenchyma. There is no clear demarcation between medullary and cortical layers in the proglottid.

The excretory system consists mainly of four longitudinal vessels, two dorsal and two ventral. These vessels extend to the whole length of strobila on each side.

Reproductive System

A single set of reproductive organs is present in each proglottid. The vagina opens behind the cirrus in the genital atrium, situated in the posterior quarter of the segment. There is no uterine pore.

MALE REPRODUCTIVE SYSTEM :

Testes are found clearly in young proglottids. These are present in the anterior half of the proglottid. They are arranged in two longitudinal rows, each consisting of 6 testes. The vesicles extend from the anterior end of the proglottid to the level of ovary. They are closely packed and transversely elongated in young proglottids. With the increase of developmental stage, the testes become spherical in shape. In mature proglottids where the ovary is well developed all the testes appear as a coiled cord, with indefinite borders. The number of testes in the coiled cord decreases as the uterus enlarges. In the mature proglottid the testes measure 0.183 in maximum diameter.

The vas deferens is in the form of a mass of coils, lying dorsally in the central part of the proglottid i.e., between the testes and anterior lobes of ovary. It opens into the anterior end of cirrus sac which is oval in shape and measures 0.312 in diameter. On entering the cirrus sac, the vas deferens is thrown into a long coiled cirrus recognizable by the spines, which in invaginated state line the cavity. The protrusible cirrus is armed all over with hooks. Finally it is evaginated through the armed genital atrium present on the ventral side in median line of the posterior quarter of the segment.

FEMALE REPRODUCTIVE SYSTEM : (fig. 5)

In young proglottids where the testes are fully developed the ovary is in a rudimentary stage consisting of two transversely elongated oval lobes. In a mature proglottid the ovary is bilobed lying in the posterior part of the proglottid. Each lobe of the ovary is broad at the posterior end and narrow at the anterior end. It is exactly U-shaped measuring 0.65 in length 0.17 in posterior width and 0.09 in

anterior width. The two lobes are connected at the posterior one third of the ovary by a narrow isthmus. Each oocyte measures 0.008-0.011 in diameter and consists of a large nucleus and a distinct nucleolus. The cytoplasm of the oocyte presents a homogeneous texture.

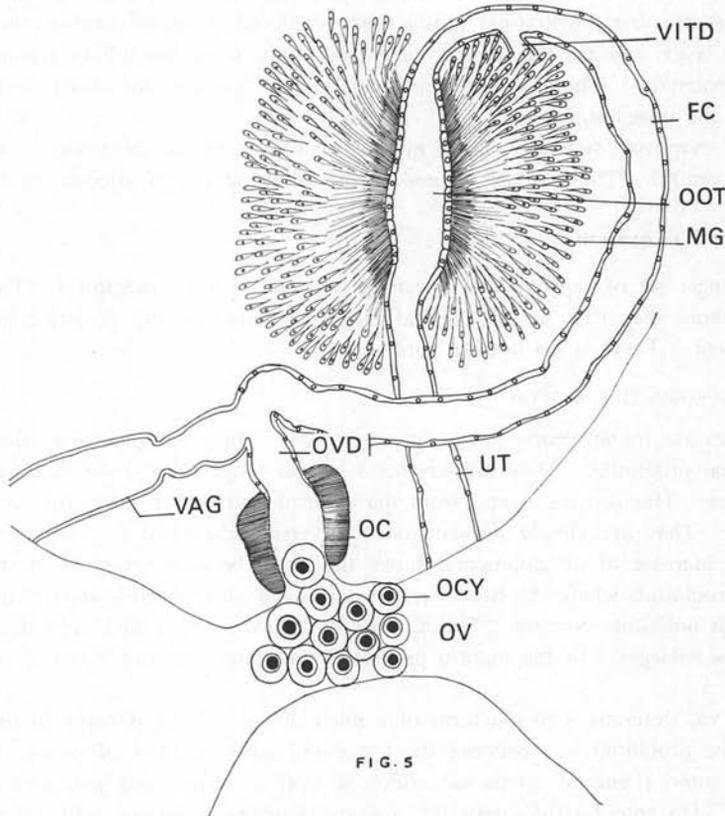


FIG. 5. — The female reproductive complex *Key to the Figurers.* — A.H.: Apical hooks, B: Bothridium, Cp: Cephalic peduncle; CS: Cirrus sac, F.C.: Fertilization canal, G.P.: Genital pore, L.M.: Longitudinal muscles, MG: Mehlis' gland, OC: Oocyst, OOCY: Oocyte, OOT: Ootype, OV: Ovary, OVD: Oviduct, PRM: Protractor muscles, R: Rostellum, RM: Radial muscles, T: Testes, TMR: Transverse muscles of rostellum, UT: Uterus, VAG: Vagina, VD: Vas deferens, VIT: Vitellaria, VIT. D: Vitelline duct

The oviduct arises from the oocyst which is almost spherical in shape and of an average diameter of 0.012. It is situated in the posterior median line between the two lobes of the ovary. It has a well developed muscular wall. The oviduct immediately beyond the oocyst is 0.015 in diameter. It proceeds forwards for a

short distance and receives the vagina. The vagina opens close behind the cirrus opening in the genital atrium on the ventral side. It continues forwards for a short distance and then turns backward taking an undulated course towards the ovary, where it joins the oviduct. There is no receptaculum seminis. The fertilization canal, after receiving the vagina, passes parallel to the isthmus for a short distance and then runs in a direction almost parallel to the lobes of the ovary up to its posterior end then it extends laterally. The fertilization canal occupies the area between the two posterior lobes of the ovary.

The common vitelline duct joins the dorsal end of the fertilization canal. From here the ootype passes toward the isthmus. The ootype is surrounded by a small and compact Mehlis' gland, which measures 0.07-0.08 in diameter. The thick walled ootype consists of a layer of distinct cells and from this the uterus emerges. The uterus opens into the uterine sac. There is no uterine pore, which is a characteristic feature of Diphyllidea.

The vitelline follicles are arranged laterally in the proglottid. Each vitelline cell measures 0.015-0.019 in diameter consists of a single nucleus and numerous small shell precursors in the peripheral region. The vitelline duct arises from the follicles on either side and they unite to form a median vitelline duct.

The eggs are spherical in shape and measure 0.031 in diameter. Even when the eggs are unembryonated the proglottids are released into the spiral valve.

Discussion

The genus *Echinobothrium* was established by Van Beneden (1849) with *E. typus* from the spiral valve of *Raja clavata* L as type species. Van Beneden did not describe the genus at first in 1849 but later in 1859 he defined it as follows "a double rostellum with hooks, two big very mobile bothridia and a spiny neck". Now the genus has been described with twelve species and three larval forms.

The twelve species described under the genus *Echinobothrium* are: *E. typus* Van Beneden, 1849; *E. affine* Diesing, 1863; *E. musteli* Pintner, 1889; *E. brachysoma* Pintner, 1889; *E. rhinoptera* Shipley and Hornell, 1906; *E. longicolle* Southwell, 1925; *E. rajii* Heller, 1949; *E. mathiasi* Euzet, 1951; *E. coronatum* Robinson, 1959; *E. acanthinophyllum* Rees, 1961; *E. coenoforum* Alexander, 1963; and *E. heroniensis* Williams, 1964. In addition three larval forms are known namely *E. levicolle* Lespes, 1857; *E. benedeni* Ruzskowski, 1927, and *Echinobothrium* sp. Anantaraman, 1963. Rees' (1961) work on the genus and her modification of Euzet's (1951) key to the species has simplified the identification of the form.

The species dealt in this paper is included in the genus *Echinobothrium* with the characters; scolex consisting of a head proper bearing two bothridia one dorsal and one ventral and a rostellum with dorsal and ventral groups of apical hooks, followed by a cephalic peduncle. The present material can be distinguished from the adult

forms of all species of *Echinobothrium* in that the cephalic peduncle is completely unarmed. *E. affine*, *E. mathiasi*, *E. brachysoma*, *E. acanthinophyllum*, *E. coenorurum*, and *E. heroniensis* are separated from the present form in having partially or completely armed bothridia. The new species differs from *E. musteli* which has unarmed rostellum and from *E. rhinoptera* in having completely unarmed cephalic peduncle.

In the number of hooks and testes the present form comes very near to *E. affine* which has 11 large hooks flanked on either side by three small hooks, with the slight variation that the present form has 13 large hooks flanked by two small hooks on either side. The two species so far reported from India *E. affine* and *E. lateroporum* are distinguishable from *E. reesae* by the former having 11 and the latter 40 apical hooks and both having armed cephalic peduncle.

Of the larval forms, *E. levicolle* is described as having 20 hooks in each group which Pintner (1889) considers to be the larval stage of *E. musteli* but Southwell (1925) stated that his larva cannot be ranked as a species. Ruzkowski (1927) described another larval form from *Hippolyte varians* Leach. It has a cephalic peduncle without hooks and 26 long apical hooks. The post larva and immature form of *E. coenoforum* have a long unarmed cephalic peduncle. The larval form described by Anantaraman (1963) has 15 apical hooks of wavy shape and unarmed cephalic peduncle. It is evident that the scolex of the present adult form resembles that of the larval forms in having apical hooks and the cephalic peduncle without hooks.

As already stated the present species can be distinguished from the adult forms of all the other species of *Echinobothrium* by the absence of the characteristic "T" shaped hooks arranged in longitudinal rows on the cephalic peduncle.

It became clear that *E. reesae* sp. nov. can not be identified with any of the 8 species given in the key by Rees (1961) or with *E. coronatum* or with *E. coenoforum* or with *E. heroniensis*. The new species can be diagnosed as follows - Small worm of 10-15 length with 15-20 proglottids. Scolex with dorsal and ventral unarmed bothridia, well developed rostellum with dorsal and ventral groups of apical hooks. Short unarmed cephalic peduncle present. Neck absent. Strobila acraspedote and apolytic with distinct segmentation, cylindrical posterior segment twice or thrice the breadth. Two pairs of dorsal and ventral excretory vessels. Presence of six pairs of testes in young proglottids. The vagina opens behind the cirrus. The bilobed ovary and other reproductive organs develop well in the 4th and consequent proglottids. Most of the proglottids are gravid. No uterine pore. Parasites in the spiral valve of elasmobranch fishes. *Echinobothrium reesae* n. sp. is named in honour of Dr. Gwendolen Rees who contributed so much to our understanding of Diphyllidea.

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