PLECTOGNATHOTREMA (ALLOPLECTOGNATHOTREMA) TSUSHIMAENSE N. SUBG., N. SP. (TREMATODA: CEPHALOPORIDAE, PLECTOGNATHOTREMATINAЕ N. SUBFAM.), FROM INTESTINE OF MARINE FISH, NAVODON MODESTUS.

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ABSTRACT: Plectognathotrema (Alloplectognathotrema) tsushimaense n. sp. is described from the intestine of Navodon modestus caught near Tsushima Island, Sea of Japan. Eight adhesive organs sui generis were found in the acetabulum. Cephaloporidae Travassos, 1934 to which this parasite belongs is briefly reviewed. Plectognathotrema Layman was placed in a new subfamily Plectognathotrematinae.

INTRODUCTION

The genus Plectognathotrema was created by Layman (1930) for a species, cephalopore, from the intestine of Cantherinus modestus* collected at Peter the Great Bay, Sea of Japan, and it was placed in Paramphistomidae Fischoder, 1901.

MATERIAL AND METHODS

A single fresh specimen was taken from the intestine of Navodon modestus on July 29, 1969 at Nishidomari Bay, Tsushima Island, Sea of Japan. The parasite was slightly pressed on the slide glass dorsoventrally, fixed with acetic sublimate and stained with Heidenhain's Hæmatoxylin. In order to examine both side of the body, ventral and dorsal, under high power magnification, the worm was mounted in balsam between two cover glasses of different size.

Plectognathotrema (Alloplectognathotrema) tsushimaense n. subg., n. sp. (Figs. 2, 3, 4, 7 and 8)

Host: Navodon modestus (Günther)
Location: Intestine

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* The host fish Cantherinus modestus is now transferred to Navodon according to Dr. Tokiharu Abe’s personal communication.

Locality: Tsushima Island, Sea of Japan.
Number: One specimen from one host.
Specimen: Holotype deposited in Meguro Parasitological Museum, No. 16380.
Description: Based on single gravid specimen. Body small, pear-shaped, with smooth cuticle, 1.07 mm long by 0.67 mm wide. No prepharynx. Dumbbell-shaped pharynx 92 μ long by 87 μ wide. Esophagus 0.2 mm long, bifurcating at end of first one-third of body. Acetabulum enormous, 0.63 mm in diameter, almost as wide as body itself, situated closer to posterior extremity than to anterior. Eight

Fig. 1. Showing the localities where the parasites were collected.
adhesive organs *sui generis* were found in the acetabulum. They are 135 µ in diameter and located in two slightly arcuate transverse rows (fig. 3) on the ventral side of the acetabulum, 4 in the anterior row and 4 in the posterior. Each organ has a ventral central opening 22 µ in diameter. It is made up of 12 large claviform glandular cells which are 50 µ long by 20 µ wide and filled up with fine granules. These cells are arranged radially and horizontally just beneath the ventral surface of the acetabulum, so that they are rosette-shaped. In the space among these cells several longitudinal muscle bundles are seen. These muscles run dorsoventrally from the central portion of the dorsal side of this organ, some of them being attached to the margin of the pore on the ventral surface of the acetabulum, whereas the others are attached to the ventral surface of the acetabulum individually. Circular muscle fibers run around the pore. No other particular cells were detected among these glandular cells. The inner margin of the pore of

**EXPLANATION OF FIGURES**

Figs. 2-4: *P. (Alloplectognathotrema) tsushimaense* n. sp. (all figures were drawn with the aid of camera lucida); 2. entire worm, adhesive organs of acetabulum omitted, dorsal view; 3. acetabulum, showing symmetrical position of adhesive organs, ventral view; 4. an adhesive organ, showing glandular cells, longitudinal muscle bundles, circular muscles, and cuticular serration along margin of central opening. Fig. 5. *Cephaloporus moncanthi* Yamaguti, 1934, ventral view, after Yamaguti, 1934. Fig. 6. *Plectognathotrema lobatum* Ozaki, 1937, ventral view, after Ozaki, 1937.

**ABBREVIATIONS USED IN FIGURES**

| AC | acetabulum                  | I  | intestine                  | PH | pharynx |
| AO | adhesive organ             | LC | Laurer’s canal            | PR | cuticular process |
| CP | cirrus pouch               | LM | longitudinal muscle bundle| T  | testis   |
| CS | cuticular serration        | M  | metraterm                 | U  | uterus   |
| E  | esophagus                  | OS | oral sucker               | V  | vitellaria|
| EV | excretory vesicle          | OV | ovary                     |    |          |
| GC | glandular cell             | P  | pore of adhesive organ    |    |          |
Table 1. Differences and resemblances between *Plectognathotrema* and *Alloplectognathotrema*.

<table>
<thead>
<tr>
<th>Type species</th>
<th><em>Plectognathotrema</em></th>
<th><em>Alloplectognathotrema</em></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>P. cephalopore</em> Layman, 1930</td>
<td><em>A. tsushimense</em> n. sp.</td>
</tr>
<tr>
<td>Host:</td>
<td><em>Cantharinus modestus</em> (Monacanthidae)</td>
<td><em>Navodon modestus</em> (Monacanthidae)</td>
</tr>
<tr>
<td>Locality:</td>
<td>Peter the Great Bay</td>
<td>Tsushima Island</td>
</tr>
<tr>
<td>Habitat:</td>
<td>intestine</td>
<td>intestine</td>
</tr>
<tr>
<td>Shape:</td>
<td>pear-shaped</td>
<td>pear-shaped</td>
</tr>
<tr>
<td>Length x Width:</td>
<td>0.90−0.999×0.671−0.68mm</td>
<td>1.07×0.67mm</td>
</tr>
<tr>
<td>Spines:</td>
<td>absent</td>
<td>absent</td>
</tr>
<tr>
<td>Adhesive organs:</td>
<td>absent</td>
<td>present</td>
</tr>
<tr>
<td>Testes:</td>
<td>Entire, dorsal to acetabulum</td>
<td>Entire, at posterior end of body</td>
</tr>
<tr>
<td>Seminal vesicle:</td>
<td>unipartite</td>
<td>bipartite</td>
</tr>
<tr>
<td>Ovary:</td>
<td>Entire, postequatorial</td>
<td>Entire, postequatorial</td>
</tr>
<tr>
<td>Receptaculum seminis:</td>
<td>absent (? )</td>
<td>absent</td>
</tr>
</tbody>
</table>
| Vitellaria:                | Large follicles extending from behind pharynx to posterior border of testes.        | Relatively large follicles extending from behind pharynx to level of anterior part of testes.

... these organs have clear, partly serrated, cuticular lining. In one of these organs a papilla-like process is seen inside the pore (fig. 8). Under low power magnification they give a papilla- or sucker-like appearance (fig. 7).

Testes oval to elliptical, 270−290 μ long by 125−160 μ wide, situated symmetrically at posterior end of body. Each vas efferens runs about one-third of the body length and empties into the seminal vesicle at the end of the cirrus pouch. Cirrus pouch well developed, 335 μ long by 170 μ wide covered with longitudinal muscle fibers, extending from anterior margin of acetabulum where esophagus bifurcates, containing bipartite seminal vesicle 40 μ wide, pars prostatica, prostate cells and eversible ductus ejaculatorius.

Ovary oval, submedian, 193 μ in diameter, situated at postequatorial level. Germiduct arising from dorsosinistral surface of ovary, giving off Laurer’s canal which runs backward to open outside dorsally, in median line at level of transverse vitelline duct. Vitellaria consisting of large follicles 100−110 μ long, lateral to caeca (12 on left and 8 on right), extending from midlevel of esophagus to posterior end of acetabulum, partly overlapping testes. Transverse vitelline ducts posterior to ovary. Vitelline reservoir tubular, running forward to join germiduct at midlevel of ovary. No receptaculum seminis. Uterus first ascending to intestinal bifurcation in median field, descending to posterior end of body on right side, ascending on left side to middle of esophagus, then transversely across cirrus pouch dorsally to form metraterm. Metraterm well differentiated, strongly muscular, parallel to cirrus pouch, emptying into genital pore along with cirrus. Genital pore opening on left side dorsosubmarginally at level of oral sucker. Eggs oval, 20−23×12−15 μ in uncollapsed condition in balsam. Excretory vesicle, normally succular or short V-shaped, pressed backwards by posteriormost uterus and flattened anteroposteriorly at caudal end of body. Pore terminal.

Discussion: In his description of *Plectognathotrema cephalopore*, Layman stated “Auf lebendigen Exemplaren ist zu beobachten, dass der hintere Saugnapf mit dem Körper des Parasititen mittels einem speziellen Stiele verbunden ist”, and gave a figure drawn in dorso-
lateral view (No. 9). In this figure there is no such “Stiele” in the acetabulum.

The acetabulum of the present trematode is enormous though shallow, and has a wide opening; it seems to have less adhesive power than they are in some other digenetic trematodes with large acetabulum such as Magnacetabulum, Prosogonotrema and amphistomids. For this reason the adhesive organs might secrete some sort of mucous substance to aid the parasite to stick fast to the host. It is necessary to examine these organs by means of the serial sectioning and chemical mucin reaction which may reveal their real function, but this was not possible for the present due to shortage of materials.

**Brief review of the family Cephaloporidae Travassos, 1934**

Layman (1930) placed Plectognathotrema in the family Paramphistomidae Fischöder, 1901.

Yamaguti (1934) proposed the genus Cephaloporus for a species, monacanthi, found in the oviduct of Monacanthus cirrhifer at Mutu Bay, Japan and created Cephaloporinae for this genus because of fundamental differences between Cephaloporus and Plectognathotrema. They were first placed in Paramphistomidae.

Travassos (1934) proposed the family Cephaloporidae for the subfamily Cephaloporinae Yamaguti, 1934 and placed it in the superfamly Paramphistomoidea Stiles and Goldberger, 1910, and transferred the genus Plectognathotrema from Paramphistomidae to this family.

Price (1937) discussed these genera and on the genus Cephaloporus he stated that “This form is in writer’s opinion an aberrant representative of the Zoogonidae, and the family Cephaloporidae Travassos should be regarded as a synonym of Zoogonidae.”. On the other genus Plectognathotrema, Price also stated that “This genus seems to have closer affinities with representatives of the family Fellodistomidae than with those of the Paramphistomidae, and apparently should be included as an aberrant member of that family.”

Ozaki (1937) reported a second species belonging to the genus Plectognathotrema from the ovary of Monacanthus cirrhifer at Shimonoseki, Sea of Japan and placed it in the family Cephaloporidae. Ozaki (1937) discussed these genera (pp. 205—210) and excluding the Cephaloporidae from Paramphistomoidea mentioned “Cephaloporidae seems related to the family Plagiorchiidae, having closest resemblance to Proshogoninus,”.

Southwell and Kirshner (1937) erroneously suppressed the family Cephaloporidae and assigned the genera and species to the different subfamily Opisthoplectidae Fukui, 1929 included in the family Paramphistomidae, assuming that the body spines decrease in number with age, without paying much attention to their taxonomic importance. They just simply referred the genera to another family on account of the different location of the genital pore. In Southwell and Kirshner’s proposed classification, however, Plectognathotrema did not appear in the key to subfamilies and genera (p. 235).

Freitas & Lent (1938) followed Travassos (1934) in his classification.

Hilmy (1948) created the genus Khalilloossia for a species ali-ibrahimi found in the caecum of a bird, Himantopus h. himantopus L. at Cairo and placed in Cephaloporidae in Paramphistomoidea. Hilmy stated that “Though quite differente from Plectognathotrema, the new species is closely related to Cephalopus, but can not be properly referred to it”. Cephaloporidae was so emended by Hilmy as to include Khalilloossia in this family. This genus was, however, synonymized by Yamaguti (1958) with Stonylotrema Looss, of the family Stomyrotrematidae Poché, 1926, which is a group of intestinal parasites of birds. These two genera, Khalilloossia and Stonylotrema, having identical internal anatomy and habitat, the author agrees with Yamaguti in this
synonymity.

Skrjabin (1953) did not accept Price's opinion because it was based on morphology alone, and gave a key to the genera of the Cephaloporidae Travassos, 1934 which included three genera, Cephaloporus, Plectognathotrema and Khalilloossia. Plectognathotrema lobatum Ozaki, 1937 was not mentioned by Skrjabin (1953).

Cable (1954) expressed his opinion that "the Cephaloporidae is an aberrant group of the Plagiorchioidea."

Yamaguti (1953, 58) placed this family as amphistomatous Digenea next to Paramphistomidae.

On the basis of the author's material of P. (Alloplectognathotrema) tsushimaense Layman, 1930, the resemblances and differences between the two subgenera, Plectognathotrema and Alloplectognathotrema are shown in Table 1. Plectognathotrema lobatum Ozaki, 1937 differs from P. cephalopore Layman, 1930, in the ovary and testes being lobate, in the acetabulum being in the midregion of the posterior half of the body, and in the vitellaria terminating in front of the testes.

Plectognathotrema can be split into two subgenera as shown in the following key.

Acetabulum with conspicuous adhesive ventral glands; seminal vesicle bipartite; ceca halflong

................. Alloplectognathotrema

Acetabulum without adhesive ventral glands; seminal vesicle unipartite; ceca longer ................. Plectognathotrema

Alloplectognathotrema n. subg.

Subgeneric diagnosis: Plectognathotrema. Body smooth, pyriform. Acetabulum enormous, closer to posterior extremity than to anterior. Ceca halflong, terminating in front of testes. Testes symmetrical, at posterior end of body. Cirrus pouch strongly developed, containing bipartite seminal vesicle, well developed prostatic complex and cirrus. Genital pore at level of oral sucker. Ovary entire, dorsal to acetabulum. Vitellaria consisting of coarse follicles extending as far backward as anterior part of testes. Uterine coils reaching to posterior end of body; metraterm strongly muscular; eggs small, not embryonated. Excretory vesicle pressed against posterior end of body. Parasitic in intestine of marine fish.

Type species: A. tsushimaense n. sp.

Plectognathotrematinae n. subfam.

Subfamily diagnosis: Cephaloporidae. Body small, pyriform, smooth or spined. Oral sucker terminal; no prepharynx; pharynx present. Esophagus moderately long. Ceca terminating near or far away from caudal end of body. Acetabulum enormous, practically ventral, with or without adhesive organs inside. Testes entire or lobate, situated symmetrically at or near posterior end of body. Cirrus pouch large, claviform, reaching backward beyond intestinal bifurcation, containing unipartite or bipartite seminal vessel, pars prostatica, prostate cells and eversible ejaculatory duct. Ovary entire or lobate, submedian, equatorial or post-equatorial. Vitellaria consisting of coarse follicles, or bunch-like, in lateral fields from esophagus to near posterior extremity or terminating in front of testes. No seminal receptacle. Laurer's canal present. Uterus reaching to caudal end of body. Metraterm well differentiated. Genital pore opening dorsosubmarginally at level of oral sucker. Eggs oval, small. Excretory vesicle saccular (?). Parasitic in intestine of marine fish.

Type and only genus: Plectognathotrema Layman, 1930.

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LITERATURE


