

A New Cestode, *Atelemerus major* n. sp. Found in a Marine Fish in Japan
(Pseudophyllidea: Echinophallidae)

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Key words: *Atelemerus major* n. sp., tapeworm, *Pagrus major*, marine fish, Japan

Introduction

During the course of investigating the endoparasite of sea fishes, five specimens of tapeworm were found in the intestine of a sea bream (*Pagrus major* Temmink et Schlegel) bred in Kumamoto, Kyushu, Japan.

Although these worms had common morphological characteristics of the family Echinophallidae, they were morphologically distinguishable from other known species of two genera belonging to Echinophallidae (Schumacher, 1914; Yamaguti, 1934, 1952 and 1959; Guiart, 1935; Ichihara, 1974; Korotaeva, 1975).

They are reported here as a new species.

Materials and Methods

Five tapeworms were found at the upper to middle part of the intestine of a bred sea bream, weighing 1.0 kg, obtained from Kumamoto, Kyushu, Japan in February, 1979. All worms were fixed with acetic alcohol (Acetic acid 1:Anhydrous alcohol 3) at 4°C for 24 hr. and preserved in 70% alcohol (Takao, 1983). Four of them which were damaged in various parts during excision of

the fish-gut in physiological salt solution, were used for the preparations of flattened whole-mount and serial sections. One of them, which was slightly damaged in the posterior body, was divided into two parts at the level of the 24th segment for a whole-mount preparation (Holotype). Three of four worms damaged were specified as paratypes.

The flattened specimens were prepared as follows: After swollen and extended by transferring from 70% alcohol to 45% acetic acid, the worms were reformed and flattened by putting them between two slide glasses, and refixed with 70% alcohol. They were stained with hydrochloric carmine. Some of them were double-stained with hydrochloric carmine and hematoxylin. Specimens embedded in paraffin were sectioned in 0.01 mm thick, and stained with hematoxylin and eosin. Serial sections were made for the immature, the 4th to 8th segments, and for the mature segments.

Eggs were collected from the intestine of the fish and from ten different uterine sacs. Fifty eggs of each group were measured.

Atelemerus major n. sp.

Description (All measurements given are in millimeters).

The external surface of the worm (based on the flattened specimens): Strobilae 90-

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110 long, comprised of 60–85 segments, maximum width 9.0–9.2 at the level of the 11th to the 13th segments. Terminal segment about 6.0 wide. Segmentation incomplete in some parts of the body (Photo. 1).

Pseudoscolex 0.2–0.25 long by 0.3 wide, without bothrium or additional organ. Neck absent. Body width abruptly increase up to 6.5 (5.5–6.0 wide in raw specimen) from the first segment to the 5th segment (Photo. 2).

The strobilar margins from the 5th segment to the 20th serrate due to the protrusion of the rear corner of each segment (Photo. 1 and Fig. 1).

Four protuberances spread like a penguin-wing over the following segment, at the rear corner of each segment on both ventral and dorsal surfaces, measuring 2.0–2.6 long and 0.5–1.0 thick at the most bulging part near the median (Photos. 3 and 5). The thick parenchyma of the anterior body, 1.0–1.2 at medial, getting thinner as the genital organ develops. Spines (0.015–0.020 long, 0.0033–0.0043 wide and 0.0018–0.0020 thick) grown densely

in about 10 rows on the protuberances and on the posterior border of the secondary subdivided segments. Spinous regions extend more than 2.0 long by less than 0.03 wide on the protuberances and less than 1.0 long by less than 0.03 wide on the secondary subdivided segments.

Spines and thicker cuticles on the spinous regions prone to exfoliate from the basement membrane (Photos. 12 to 15).

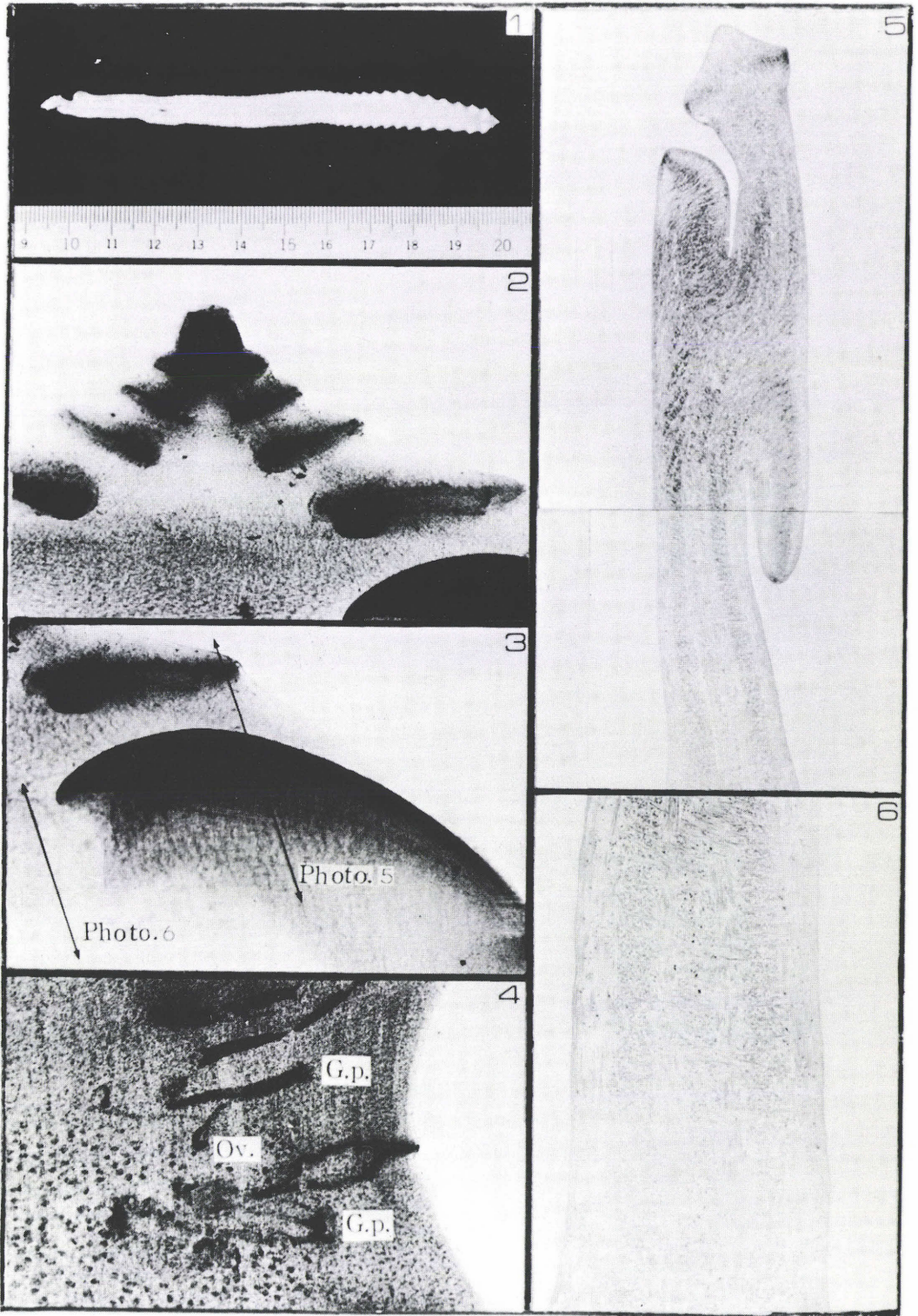
The internal structure of the worm (based on the flattened specimens): Genital primordium visible in the 14th segment, cirrus sac and uterus in about the 20th segment and the secondary segmentation in about the 20th to 30th segments. In each mature segment two sets of genital organs present, one at each lateral. In an incompletely subdivided segment four sets of genital organs present, i.e. portion two sets in tandem on each lateral side, where younger set lies in the anterior portion and the older one in the posterior portion (Photo. 4).

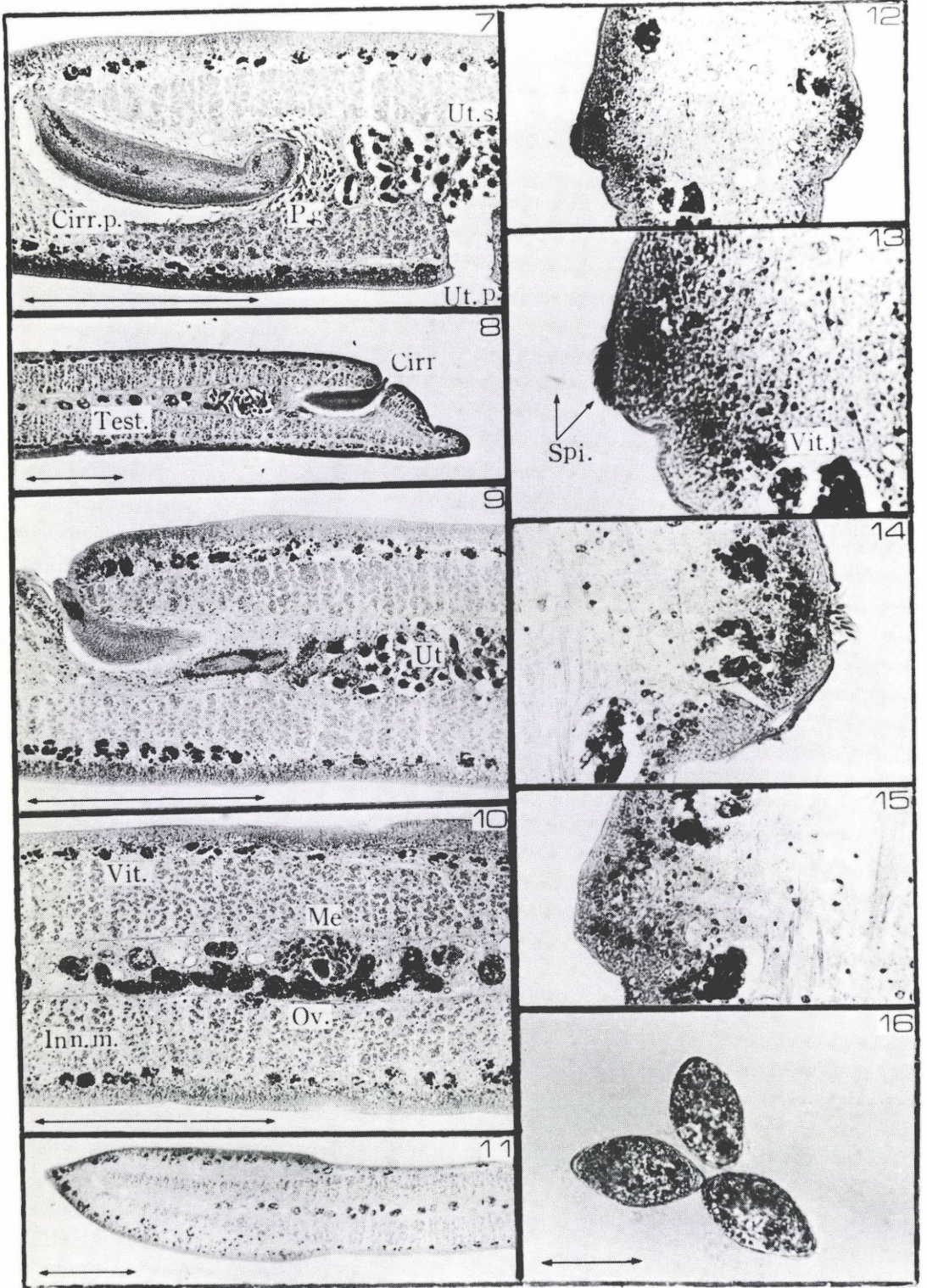
Male genital organ: Testes spherical, 0.05–

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- Photo. 1 Whole body, adult worm (Paratype).
 Photo. 2 *Pseudoscolex* (Holotype).
 Photo. 3 The 4th and the 5th segments.
 Photo. 4 The secondary segmentation, dorsal view.
 Photo. 5 Sagittal section of the 4th and the 5th segments.
 Photo. 6 Sagittal section of the 5th segment (middle field).
 Photo. 7 Portion of a transverse section to show details of the uterine pore and prostate glands.
 Photo. 8 Transverse section passing through the genital pore.
 Photo. 9 Portion of a transverse section to show details of the genital pore.
 Photo. 10 Transverse section passing through the ovary and Mehlis' glands.
 Photo. 11 Transverse section passing through a segmental joint. (Photos. 7 to 11, Scale: 0.5 mm)
 Photos. 12–15. Segmental spine, sagittal section.
 Photo. 16 Eggs (Scale: 0.05 mm).

Abbreviation used in photographs and figures.

Test. :	Testis	Vag. :	Vagina
P.g. :	Prostate glands	Sph. :	Sphincter
S.v. :	Seminal vesicle	S.r. :	Seminal receptacle
Cirr.p. :	Cirrus pouch	Me. :	Mehlis' gland
Cirr. :	Cirrus	Ov. :	Ovary
G.p. :	Genital pore	Ut.p. :	Uterine pore
E.d. :	Ejaculatory duct	Vit. :	Vitellarium
Sper. :	Spermatozoon	Ut. :	Uterine coils
Ex. :	Excretory canal	Ut.s. :	Uterine sac
Inn.m. :	Inner longitudinal muscle	Spi. :	Spine





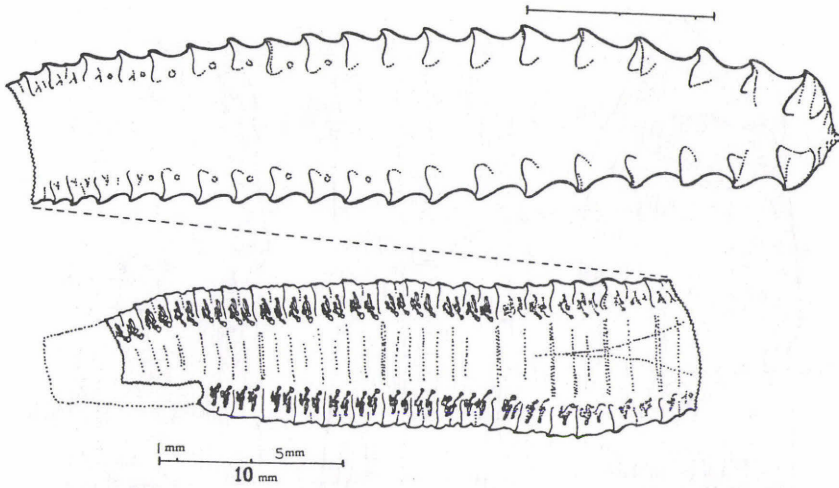


Fig. 1 Holotype of *Ateremerus major*.

0.06 in diameter, 550–750 per segment distributed almost evenly in the medulla and absolutely inside of longitudinal line of the genital pore, no distinct border line between testes in the neighboring two segments (Fig. 3). Seminal vesicle enclosed by prostates, 0.15 in diameter and extended to about 0.3 on average. Cirrus sac cylinder like, 0.8 long by 0.2 wide in diameter. Cirrus average 0.04 long by 0.02 in diameter, lying at the top of the cirrus sac, sparsely covered with spinule much smaller than the surface spines. Seminal vesicle, vas deferens and cirrus sac occupied by sperms emerged out of the testes. Genital pores located dorsally, close to the middle of segment margin, on opposite side of the ventral uterine pore (Photo. 7 and Figs. 2 and 3). Genital atrium about 0.08 in diameter, into which cirrus pore and vaginal pore open together.

Female genital organ: In vagina the sphincteric muscle present at about 0.2 inwards from vaginal pore, and ootype at about 0.5 inwards further. Seminal receptacle absent, the portion between the sphincteric muscle and ootype seems to play a role of the seminal receptacle. Ovary 0.7 by 0.3 on average, consisting of two lobes around the ootype and situated at the ventral side in the medulla of the sectioned specimens (Photo. 10 and Fig. 2). Uterus extended about 0.2 from ootype along seminal

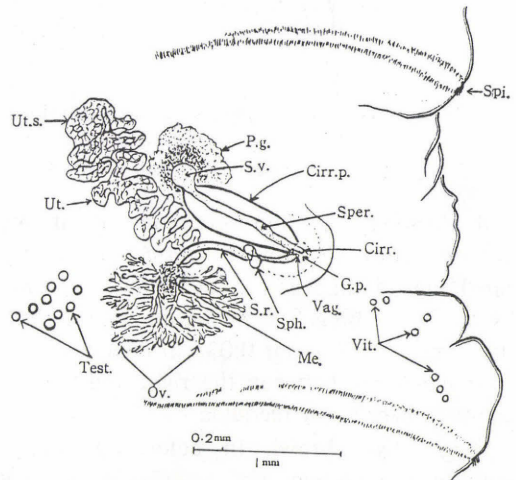


Fig. 2 Mature segment, dorsal view, showing the position of the genital organ.

receptacle, turning antero-interiorly and continually meanderingly to the front of the genital pore, forming uterine sac in the mature segment. Uterine pore opened ventrally, opposite to the dorsal genital pore (Photo. 7 and Figs. 2 and 3). Vitelline gland small, vesicular, 0.02–0.04, distributed near the surface of the body and outside of longitudinal and circular muscles, especially abundant at the bilateral margins and at the border of segments.

Musclature and excretory canal (based on the sagittal sections): Longitudinal, circular

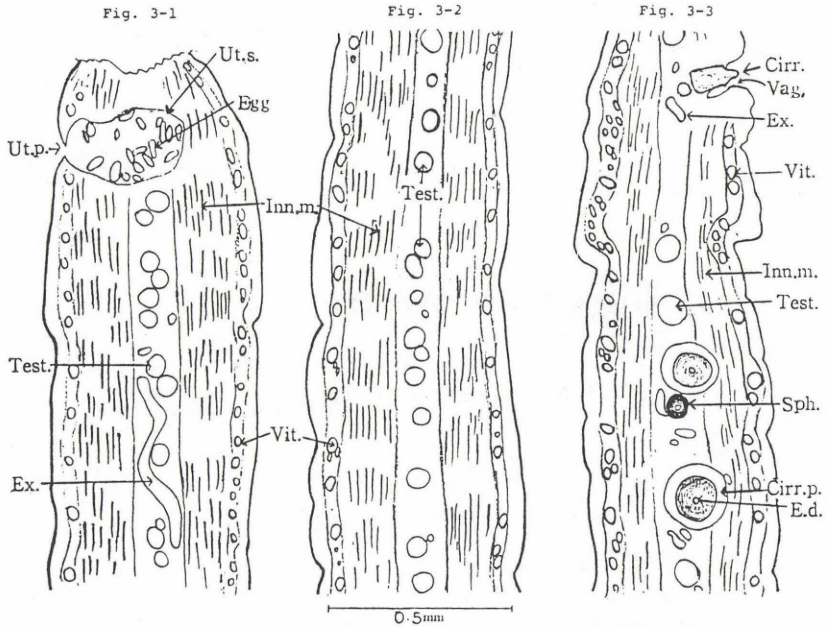


Fig. 3-1 Sagittal section passing through the uterine pore.

Fig. 3-2 Sagittal section of middle region.

Fig. 3-3 Sagittal section passing through the genital pore and cirrus sac (cirrus pouch).

and dorso-ventral muscles abundant at the anterior body (Photos. 5 and 6). Excretory canal meandering, connected with each other by transverse branches. In the mature segment, the largest canal about 0.035 in diameter (Fig. 3), meandering between the right and the left genital organs in the medulla.

Eggs: Eggs brown in color, opeculated, containing an ovum and vitelline cells. Eggs from the intestine of the fish measured 0.063–0.074 by 0.037–0.041 (average 0.067 by 0.038) and from the uterine sac 0.067–0.074 by 0.035–0.037 (average 0.071 by 0.037). The opeculum 0.0173–0.0180 (average 0.0178) wide, 0.0065–0.0079 (average 0.0073) high in diameter (Photo. 16).

Holotype: No. 79-01, Paratype: No. 79-02, -03, -04, -05.

Host: *Pagrus major*

Habitat: Intestine

The type specimens are deposited in the collection of Department of Parasitology, Kurume University School of Medicine, Kurume 830, Fukuoka, Japan.

Discussion

This worm belongs apparently to Echinophallidae on the bases of the following characteristics: the presence of pseudoscolex, cirrovaginal pore submarginal and two sets of reproductive organs in one segment (Yamaguti, 1959). In this family, two genera, *Atelemerus* (one species) and *Echinophallus* (three species), have been known according to Yamaguti (1959). Recently, *Echinophallus* sp. by Ichihara (1974), and *Echinophallus seriolellae* by Korotaeva (1975) were added in the genus.

This worm belongs to the genus *Atelemerus* because of the following characteristics: pseudoscolex, incompletely segmented strobila, often with secondary segmentation, posterior border of segments spinose, genital pores dorsal, and close to the segment margin, and uterine pores ventral.

Atelemerus acanthodes (Guiart, 1935) is a type species and only known species of *Atelemerus*. Morphological characters of the present specimen compared with *A. acanthodes* are

Table 1 Comparison of morphological characters between *Atelemerus acanthodes* and *A. major* n. sp.

	<i>A. acanthodes</i> (Guiart, 1935)	<i>A. major</i> n. sp. (present author)
Strobila length	15.0, 16.0, 27.0 & 30.0	90.0–110.0
Strobila maximum width	1.0–1.5	9.0–9.2
Pseudoscolex	Cupula terminal (funnel-shaped)	Cylindrical
length × width	0.13 × 0.36	0.20–0.25 × 0.30
Number of segment	No description	60–85
Mature segment		
length × width	0.3–0.5 × 1.0–1.5	1.0–1.2 × 7.5–8.0
Shape of anterior body (Parenchyma)	Sloping shoulders (Thin?)	Square shoulders (Thick)
Distance between two uretine pores	Shorter	Longer
Cirrus pouch	Cylinder like	Cylinder like
length × width	No description	0.75–0.8 × 0.18–0.20 (Elongate)
Testes form (Size)	No description	Spherical (0.05–0.06)
Number of testes	No description	550–750 (av. 680)
Eggs (length × width) (Average)	No description	0.063–0.074 × 0.037–0.041 (0.067 × 0.038)
Operculum of egg	Not operculated(?)	Operculated

(Measurements in mm.)

shown in Table 1.

The specimen is characterized by the longer and broader body, the cylinder shaped pseudoscolex, the longer distance between two uterine pores in a segment, square shoulders in the shape of anterior body due to abrupt increase of segmental width in anterior five segments, and four unique protuberances locating bilaterally on ventral and dorsal sides of a segment.

The protuberances and spine zones at the anterior body are considered to play a role of holdfast in the host intestine. Well-developed muscles seem to be associated with the movement of the worm.

As the genital organs develop, the circular and the dorso-ventral muscles get smaller and so does the longitudinal muscle in the peripherals. In a incompletely subdivided segment, four sets of genital organs are seen, arranging two sets in tandem at each lateral side of the

segment, and the set in the anterior portion is younger than the one in the posterior portion (Photo. 1 and Figs. 1 and 2).

The genital pore and the uterine pore open out oppositely upon dorsal surface and ventral surface.

Eggs are similar to those of *Diphyllobothrium erinasei*. Eggs collected from the uterine sac have longer and oval shape than those in the intestine of the fish.

Summary

A new species of cestode, *Atelemerus major* n. sp. (Cestoda: Echinophallidae) was described on the basis of specimens obtained from the intestine of a sea bream (*Pagrus major*) bred in Kumamoto, Kyushu, Japan. The new species is distinguished from *A. acanthodes* Guiart, 1935 in various aspects. The body size is

larger. The pseudoscolex is different in shape, having neither bothrium nor additional organ. The anterior body shows the shape of square shoulders due to abrupt increase in the size of segments. It has four unique protuberances like the penguin-wing. The distance between the two uterine pores is longer than that in other species. The genital pore and the uterine pore open out oppositely upon dorsal surface and ventral surface, respectively.

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熊本県産養殖マダイ (*Pagrus major*) から得た 1 新条虫 *Atelemerus major* について

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海産魚類の内部寄生虫を調査していたところ、熊本県産養殖マダイ 1 尾の腸管内に、未知種条虫が 5 条発見された。

5 条共外部計測後、酢酸アルコールにて固定し、圧平標本および切片標本にして、また一部分は染色後膨化・解剖して、その形態を詳細に観察した結果、Echinophallidae 科に属する *Atelemerus* 属の新種であることが判明した。

Atelemerus 属には、模式種である *A. acanthodes* Guiart, 1935 のみであり、これと本種を比較すると体長体幅がはるかに大きく、前体部の体肉が厚く怒り肩状を呈し、各片節後端には独特の隆起部がある。また 1 片節中の左右子宮孔間隔が広く、虫卵に小蓋があることなどの形態的差異から新種とした。

なお和名には本種の特徴を表わすため「偽頭有棘節条虫=ギトウユウキョクセツジョウチュウ」を提唱したい。