

# The Description of a Marine Fishes Cestode with the Discussion on the Third Nutrition Manner

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**Abstract** The authors investigated the marine fish cestodes in Zhanjiang 2000s at the coast of South China Sea. Many specimen of fish cestodes were collected, in which 27 samples collected from *Navodon* sp. are belonging to Genus *Anchistrocephalus*. The description of the cestode is as follows: middle worm, with a length of 10~382, proglottids numbered 35~931. Biggest width of the worm is 4.28. Scolex Rectangle, measured 0.478~0.612×0.350~0.484, with an apical disc, 0.197~0.313 near to the disc there are 10 rows of staggering hooks. Neck absent. Taped structure with distinct segmentation, the ratio of width and length of proglottid is not definite. Immature proglottid measured 0.201~0.823×0.331~1.187, while mature proglottids 0.473~0.909×0.829~2.561, gravid proglottid 0.196~0.702×1.483~3.505. Male organs: numerous testes irregularly shaped located in medullary abdomen both side and gathered in the end of the proglottid; cirrus sac is liking a long peared shaped, 0.447 ~ 0.535×0.123 ~ 0.145, cirrus pore alternated both sides irregularly. The cirrus slender, measured 0.330~0.434, with denseness spines on it. The diameter of cirrus is 0.063, open hole, 0.048. Female organs: ovary posterior, measured 0.290~0.388×0.190~0.308, medullary. Vitelline glands distributed both side near the discharge tube follicle, the uterus is tube like, opens in the central abdomen and did not contact the genital pore, numbered 39~84, measured 0.052 ~ 0.062×0.031~ 0.037. For lacking documents the species cannot be identified to species. The special condition of the cestode is that it discharge eggs rather than gravid proglottids and the empty proglottids keep on the body and are absorbed gradually. And this would be a new nutrition manner for Animalia, and it is called “autotrophy” by the authors. As we know animal nutrition manners are mainly phytotrophic and heterotrophic at present shown by all scientific documents, but the authors stated here the third one which is suggested to be named as autotrophy (self-absorption) based on the research. Many animals such as sea squirt, frog even human being carried on this nutrition manner.

**Keywords:** cestoda, anchistrocephalus, animal nutrition, phytotrophy, heterotrophy, autotrophy

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## 1. Introduction

It is quite weak for fish's cestode research in China [1,2]. In 2000s the authors studied on marine parasites of fishes in South China Sea and collected 27 specimens, which resemble the cestode *Anchistrocephalus microcephalus* from *Mola mola* by Rudolphi(1819) [3,4,5] very much, from *Novodon* sp. But for the lack of original paper [6,7] as contrast we cannot determine the exact species of the samples, so we call them authors' sample here. We found it is quite different from the original description of the type genus species and there was at least an error in the cestode scolex description: the scolex has bothrium or not, armed or unarmed [3], even has other special paradoxical characteristics. Our samples have 2 bothria and are armed with a circle of about 10 rows of hooks on scolex which is the main characteristics for the genus [5,6] but its end part (end of gravid proglottids) is

also slender so that Rudolphi (1819) might take this part of the worm also as some kind of scolex too. This phenomenon is rather similar as Chinese ancestor took the gravid proglottids as the whole worm of *Taeniarhynchus saginatus* [8,9]. How did this situation happen? Our study reveals that the cestode specimen preparation played an important role in leading to the confusion. At the last step, the samples are usually sealed on the slide with a cover slide on the top of specimen. In doing so, we need to cut the long cestode specimens into small pieces, therefore we may not remember which one is the first part and the middle or the end of the cestode. But it was carefully observed by authors here and it is found that this special worm did not discharge gravid proglottids but eggs and then the empty proglottids are absorbed by the worm itself as an energy income of worm.

## 2. Objectives

The early purpose of the study is to discover the species of the cestode biodiversity in South China Sea, but the research calls the authors' attention to more important scientific meaning that is what described here mainly. Therefore the main purpose of the paper is to tell the third nutrition manner which is self-absorption of Animalia, or autotrophy.

### 3. Methods

The method we used is general method for cestode collect and reserve. We can do it as the following steps [10]:

#### 3.1. Step 1: Obtain Gastrointestinal Tract of Hosts

Open the abdominal cavity, from anus, and anteriorly. Cut the digestive system at the level of the anus and oesophagus; if necessary, cut additional attachments.

Extract all organs and put them on a flat container of appropriate size (a dish for small animals, or a plastic tray). Discard liver, spleen and pancreas: keep only the tubular digestive system.

Untangle the intestine (usually better done with fingers than with metal instruments).

#### 3.2. Step 2: Open Gastrointestinal Tract

Open the whole digestive system longitudinally (from anus to oesophagus, or vice versa, including stomach) with scissors. If pyloric caeca are present, try to open at least some of them. Discard large undigested food items, especially those found in stomach. Check the content of the digestive system to find the cestode specimens.

#### 3.3. Step 3: Get the Cestode Specimens

If a white cestode specimen is found then put them in a disc for cleaning up, pay attention to keep the whole worm, especially don't lose the scolex. Pour saline in and rinse it. Put the specimens in between the glass plates and add 10% Formalin to fix.

#### 3.4. Step 4: Slide Make

After 3 months or more fixation we may stain the specimen in carmine. cut the specimen in small pieces carefully in order to remember the sequences. dehydrate with alcohol in sequence till 100% alcohol. Seal the specimens in slides by arabic gum and put a cover slide on it. Then the worms can be observed by microscope. All measurement units are mm except those mentioned.

### 4. Results

By identification the 27 cestode samples collected from *Navodon* sp. are belonging to Genus *Anchistrocephalus*, Triaenophoridae, Pseudophyllidea. The description of the cestode is as follows [11]: middle worm, with a length of 10~382 proglottids numbered 35~931(include scolex). Biggest width of the worm is 4.28. Neck absent. Taped structure with distinct segmentation, the ratio of width and length of proglottid is not definite (either length bigger

than width or width than length). Immature proglottids measured  $0.201\sim0.823\times0.331\sim1.187$ , while mature proglottids  $0.473\sim0.909\times0.829\sim2.561$  (Figure 1-Figure 3), gravid proglottid  $0.196\sim0.702\times1.483\sim3.505$  (Figure 1-Figure 4).

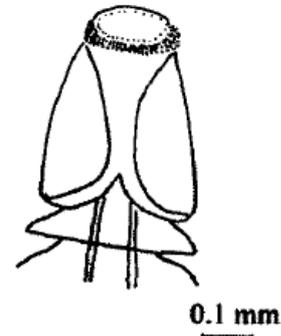


Figure 1. *Anchistrocephalus* sp. A marine fish cestode from *Novodon* sp (Scolex)

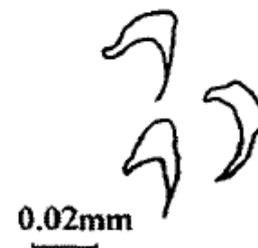


Figure 2. *Anchistrocephalus* sp. A marine fish cestode from *Novodon* sp (hooks)

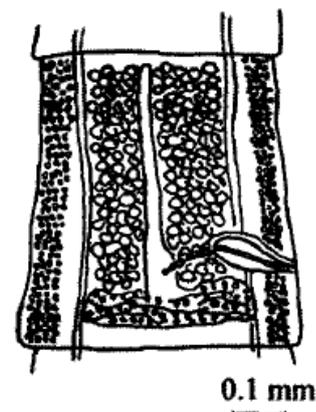


Figure 3. *Anchistrocephalus* sp. A marine fish cestode from *Novodon* sp (mature proglottid)

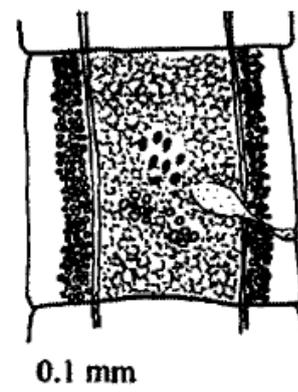


Figure 4. *Anchistrocephalus* sp. A marine fish cestode from *Novodon* sp (gravid proglottid)

#### 4.1. Scolex

Scolex Rectangle, measured  $0.478\sim 0.612\times 0.350\sim 0.484$ , with an apical disc,  $0.197\sim 0.313$  near to the disc there are 10 rows of staggering hooks (Figure 1, Figure 2) in a whole circle, there are a few hooks laterally, smaller dorsally, measured  $0.026\sim 0.029$ .

#### 4.2. Male Organs

Numerous testes irregularly shaped located in medullary abdomen both side and gathered in the end of the proglottid; cirrus sac is like a long pear shaped,  $0.447\sim 0.535\times 0.123\sim 0.145$ , cirrus pore alternated both sides irregularly. The cirrus slender, measured  $0.330\sim 0.434$ , with denseness spines on it. The diameter of cirrus is  $0.063$ , open hole,  $0.048$ .

#### 4.3. Female Organs

Ovary posterior, measured  $0.290\sim 0.388\times 0.190\sim 0.308$ , medullary, vitelline glands distributed both side near the discharge tube follicle, the uterus is tube like, opens in the central abdomen and did not contact the genital pore, numbered 39~84, measured  $0.052\sim 0.062\times 0.031\sim 0.037$ . Oval eggs with ovum operculum, thin-shelled, without embryo after discharge. Eggs are present mainly in gravid proglottid and may be discharged after mature and the proglottid still connected with the worm until it is absorbed by the worm.

The authors' specimens collected from Wailuo have 2 bothria and are armed with a circle of about 10 rows of hooks on scolex which is the main characteristics for the genus *Anchistrocephalus* but its end part (end of gravid proglottids) is also slender. It cannot be identified till species level for these specimens as lacking of documents. The authors found that the worm became slender in the end of gravid proglottid part, and there are no eggs in these "elder" proglottids.

### 5. Discussion

It was thought these proglottids indicating that the eggs were discharged to serve as reproduction but the worm absorbs other tissues of the empty proglottids of itself as a nutrition manner.

And it is not the only case of animal development. Taking frog as an example: tadpoles have tails which will disappear in the development then they become frogs after the tail gone off and become mature, no doubt that the tail part is taken as a part of nutrition and energy income for the frog development.

Sea squirt which developed almost the same as the frog but its body quite like a bucket after the tail disappears. This is the lower stage of vertebrate cases; on the other hand, human develops also like them because the embryo of human being has a tail and it disappears after the embryo has developed for a period of time and we seldom see a baby with a tail behind its anus after born, it is because the tail has been absorbed as nutrition income of the embryo development, this is the highest stage of animal.

Nowadays scientists deal with nutrition "autotrophy" or "heterotrophy" are mostly doing ecological research

works [13,14]. No much people pay attention to how many nutrition manners there are in the Animalia.

So the authors conclude here that except for the common nutrition manners of phytotrophy and heterotrophy, there is the third one, i.e. self-absorption. For the word "autotrophy" is the same meaning as phytotrophy the authors would like to suggest here that the word "autotrophy" should be replaced with the third nutrition manner: self-absorption. So there are 3 nutrition manners for Animalia: first- phytotrophy, the second- heterotrophy and the third- autotrophy. This would not only change ideas of people to a truth situation but also influence the research of the life greatly, leading to changes in the general zoology textbook [15] as well as the new direction for zoological science research.

As we all know the hibernation is a state of inactivity and metabolic depression in endotherms. It refers to a season of heterothermy that is characterized by low body temperature, slow breathing and heart rate, and low metabolic rate. Beside hibernation there is still aestivation which happens in summer and dry season. For these instances all those animals are under a state that they neither take any food nor photosynthesize. That was to say that they take autotrophy which is the third manner of nutrition, in these cases the lipocytes stored in the body are often absorbed for necessary metabolism otherwise the animals would not survive.

The other interesting phenomenon in Chinese taoists is that they stop diet except drinking water, it means that they keep away from cereal food as a path to enlightenment for their body health. Under this condition these people are also "autotrophy" at the special period. Therefore the third nutrition manner we called "autotrophy" here is very common phenomenon in Animalia.

At present many biologists are studying apoptosis of cells, and the above animals should be very good samples to do this research except that human embryo should be cautiously conducted for ethical reason although the authors don't know what they really use in their studies. Here the authors think about the famous Chinese scientist Tung T. C. who had done great research work which took amphibians as experimental materials, such as *Bufo Bufo gargarizuas*, *Rana nigromaculata* and *Rana chensinensis* [16]. These samples should also be very classical experimental materials today.

By the way, the authors would like to mention: the autotrophy for cestodes is of great importance because they might die with the host if they take too much nutrition from their hosts. Therefore, autotrophy is useful to reduce ravening and is also an adaptation for selection.

### 6. Conclusion

Hence the authors get an idea that there are more nutrition manners than we know now by the studies on the cestode *Anchistrocephalus* sp. Except for the common nutrition manners phytotrophy and heterotrophy, there is another one which is named as autotrophy instead of "self-absorption" in Animalia. Here the authors proposed the third nutrition manner: autotrophy. So there are 3 nutrition manners for Animalia: 1. phytotrophy; 2. heterotrophy; and 3. autotrophy.

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