

**** CESTODA**

CESTOIDEA

CESTODEA

CLASS OF CESTODA

GENERAL DEFINITION: They are hermaphrodite, Cestodes are exclusively hermaphrodites, with both male and female reproductive systems in each body.

Platyhelminthes whose bodies are dorso-ventrally flattened, generally elongated, without digestive systems.

Their bodies consist of many similar units, known as proglottids

It is typically a four-sided knob, armed with suckers or hooks or both

Cestoda is a class of parasitic worms in the flatworm phylum (Platyhelminthes).

GENERAL SYSTEMATIC:

Phylum: PLATYHELMINTHES

Class: CESTODA (CESTODEA = CESTOIDEA)

Subclass: CESTODARIA

Subclass: EUCESTODA (EUCESTODIA)

CESTODARIA	EUCESTODA
Monozoic (No Ring = No Segments)	Polyzoic (Ringed = Segmented) (Except Caryophyllidae)
Scolex = no head	Have scolex
There is a reproductive organs	Each unit (proglottids) has one or more sets of reproductive organs
There are 5 double-hooked larvae in their eggs (DECACANTH)	There are 3 pairs of anchor larvae in their eggs (HEXACANTH)
Found in Fish and Amphibians	It is found in Fish, Amphibian, Reptiles, Bird and Mammals.

Polyzoik cestod
Taenia pisiformis →

← **Monozoik cestod**
Amphilina foliacea

Subclass:

EUCESTODA

Order:

PSEUDOPHYLLIDA

CYCLOPHYLLIDA

Family:

Diphyllobothriidae

Anaplocephalidae

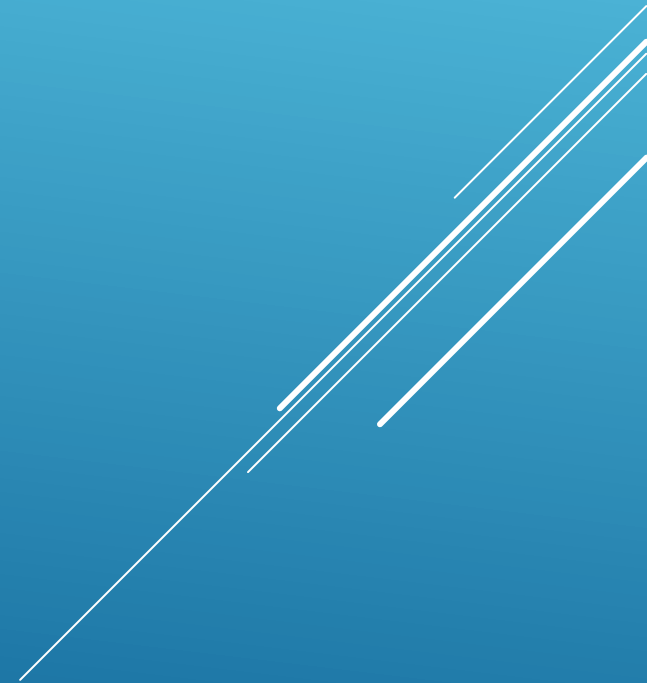
Taeniidae

Davaineidae

Dilepididae


Hymenolepididae

Mesocestoididae



DIFFERENCES BETWEEN THE PSEUDOPHYLLIDA AND CYCLOPHYLLIDA ORDERS

	Order: PSEUDOPHYLLIDA	Order: CYCLOPHYLLIDA
Egg	<p>Covered</p> <ul style="list-style-type: none"> - 3 pairs of hooked larvae (oncospheres) develop later. 	<ul style="list-style-type: none"> - Without cover - Oncospheres developed state
Morphology	<p>Scolex is almond shaped. Adhesion organelle is BOTHRIUM (2 pieces).</p> <p>Proglottid, immature / mature</p> <p>The genital pore is on the ventral of the segment (proglottid).</p> <p>There is a uterine hole</p>	<ul style="list-style-type: none"> - Round, oval - a) ACETABULUM (4 pieces) - b) ROSTELLUM - Proglottid immature / mature / gravid - Laterally / Laterally (except Mesocestoididae) - No
Biology	<p>Uses 2 intermediate hosts</p> <p>Larval shapes 3</p>	<ul style="list-style-type: none"> - Uses a single intermediate host (except Mesocestoididae) - Larval shapes 6

- ▶ **DEFINITION:** Tapeworms - They are hermaphrodite Platyhelminthes, whose bodies are dorso-ventrally flattened, segmented, elongated, ribbon-shaped, digestive systems absent.
 - ▶ **SETTLEMENT PLACE IN THE LAST/FINAL HOSTS:** The cestodes locate in the intestines of the last (definitive) hosts.
 - ▶ It is rarely found in the bile and pancreatic ducts
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- ▶ **SIZES:** It ranges from a few mm to meters in length.

Diphyllobothrium latum

3 – 10 m., 25 m.

Taenia saginata 4 – 12 m.

Taenia solium 2 - 4 m.

Echinococcus granulosus : 2 – 6 mm.

Amoebotaenia cuneata : 2 – 4 mm.

Davainea proglottina : 1,5 – 5 mm.

SEGMENT (PROGLOTTID) NUMBERS: Correlated with length.

**D.latum 2000 – 4000 segment
(proglottid)**

T.saginata 1200 – 2000 segment (proglottid)

T.solium 700 – 1000 segment (proglottid)

E.granulosus - 3 segments (proglottid)

Amoebotaenia cuneata – 12 segments (proglottid)

Davainea proglottina - 4 – 9 segments (proglottid)

BODY SECTIONS IN CESTODS (BODY SEGMENTATION)

A mature cestode has three different morphological and physiological parts.

These;

- 1) Scolex (Head)
- 2) Proliferation zone (Neck)
- 3) Strobila (Chain)


- ▶ **SCOLEX:** Located on the front end.
- ▶ Adhesion organelles;
- ▶ 2 Bothrium (Bothria) in Pseudophyllida
- ▶ 4 Acetabulum (Acetabula) in Cyclophyllida (suckers and rostellum)


D.latum (2 bothria)

T.solium (Rostellum ve 4 suckers)

T.saginata (Rostellum
absent, 4 suckers)

Dipylidium caninum (There are
rostellum and suckers.
Rostellum moving back and
forward).


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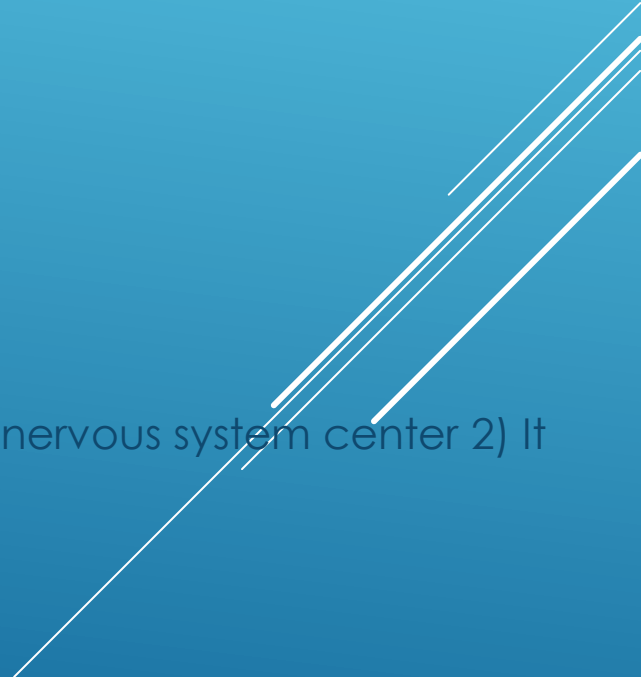
- ▶ **NECK (PROLIFERATION ZONE):** It is the part where the strobila/segments (proglottids) are formed, not divided into strobila immediately after the scolex.
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- ▶ **STROBILA/PROGLOTTIDS:** It is the part that comes after the neck. Proglottid = It consists of segments.
- ▶ Proglottids; Immature / Mature, in Pseudophyllida order
- ▶ the proglottids are in the form of Immature / Mature / Gravid In the Cyclophyllida order.
- ▶ **Immature proglottids:** These are the proglottids that come right after the neck, smaller than the other rings, and have not yet developed reproductive organs.
- ▶ **Mature proglottids:** It comes after the immature proglottids, in which the reproductive organs develop in a certain order. Generally, in the proglottids, the male organs first mature, the sperms are formed and stored, the female organs develop later and fertilization occurs. This is called PROTANDRY = ANDROGYNY.
- ▶ **Gravid proglottids:** The reproductive organs are atrophied in these rings. The ring is characterized by the uterus filled with eggs or eggs.


1. **Scolex**
2. **Immature proglottids**
3. **Mature proglottids**
4. **Gravid proglottids**

- ▶ The formation of young proglottids from the anterior (neck area) is called **STROBILATION**. And the proglottid moves posteriorly to the end of the segment/chain, replacing another one. Therefore, those close to the neck are the youngest, and those at the end of the proglottids are the oldest.
- ▶ When it comes to the posterior, it is separated from the cestode filled with eggs, excreted with feces (Expl: *Taenia spp.*) or shredded, the eggs are mixed with the feces and removed (Expl: *Hymenolepis spp.*). This event is called **APOLYSIS**.
- ▶ Since there are no gravid proglottids in some cestodes (Exmpl: *Diphyllobothrium spp.*), in mature proglottids, eggs are released from the uterine pore and go out with feces. In these, the proglottid is thrown out when it gets tired or old. This is called **PSEUDOAPOLYSIS**.
- ▶ Rarely, in some cestodes, the proglottids leave the chain early before they mature, and mature while in the intestines. This is called **HYPERAPOLYSIS**.

- ▶ **BODY LAYERS:** The body of cestodes is covered with a cuticle layer just like trematodes. This is called a tegument.
 - ▶ There are microscopic finger-like protrusions on the tegument. These are also called MICROTRIX = MICROVILLUS.
 - ▶ Duties:
 - ▶ 1) By increasing the absorption surface, it ensures the intake of more digested foods.
 - ▶ 2) In addition to attractants or similar structures, it has an effect to increase adhesion by coming into contact with microvilli on the mucosa cells of the host intestine.
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- ▶ **DIGESTIVE SYSTEM:** None. They supply their nutrients by osmotic absorption on the whole-body surface.
 - ▶ **RESPIRATORY SYSTEM:** None.
 - ▶ **CIRCULATION SYSTEM:** None.
 - ▶ **NERVOUS SYSTEM:** Not well developed. 1) The group of ganglion that we can call the nervous system center 2) It consists of nerves.
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➤ **EXCRETORY SYSTEM:** This is also called *osmoregulator system*. The residues in the parenchyma are collected by protonefridium type cells called FLAMECELL = FLAME CELLS and are connected to the main collector channels by joining them into small channels.



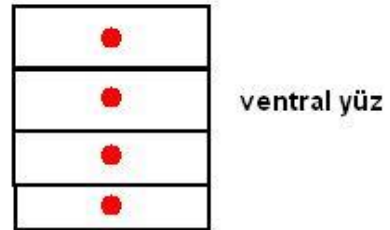
- ▶ **REPRODUCTION SYSTEM:** Each proglottid has one or two sets of reproductive organs. They are hermaphrodite (with both male and female reproductive systems in each body) and there is **protandry**.

Therefore;

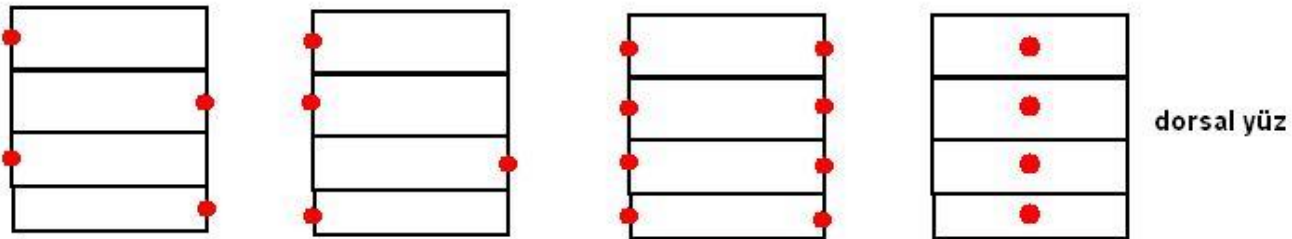
- 1) In the same proglottid of a cestod's
- 2) Between the separate proglottids of a cestod's
- 3) Fertilization can occur between the proglottids of two cestod's.

Though they are sexually hermaphroditic and cross-fertilization is the norm, self-fertilization sometimes occurs and makes possible the reproduction of a worm when it is the only individual in its host's gut. During copulation, the cirri of one individual connect with those of the other through the genital pore, and then spermatozoa are exchanged.

Pseudophyllida genital atrium



Cyclophyllida genital atrium



Pseudophyllida segment (proglottid)
(e.g.: *Diphyllobothrium latum*)

Cyclophyllida segment (proglottid)
(e.g.: *Dipylidium caninum*)

MALE REPRODUCTIVE ORGANS

Testis
Vasa efferentia
Vas deferens
Vesicula
Cirrus sac
Genital atrium

FEMALE REPRODUCTIVE ORGANS

Ovary
Oviduct
Ootype
Uterus
Vagina
Genital atrium

CESTOD EGGS

-Layers

- Capsule
- Outer layer
- Inner layer
- Embryophore
- Oncosphere membrane

Diphyllobothrium

Moniezia

Hymenolepis

Choanotaenia

Taenia

Dipylidium

Joyeuxiella

▶ **DEVELOPMENT OF CESTODS:**

- ▶ They develop indirectly (except *Hymenolepis nana*. This cestode develops both directly and indirectly.)
- ▶ There are two intermediate hosts in development in ***Pseudophyllida***.
- ▶ There is an intermediate host in development in the ***Cyclophyllida***. (Except for *Mesocestoides*. This cestode uses two intermediate hosts.)

▶ CESTOD LARVA TYPES:

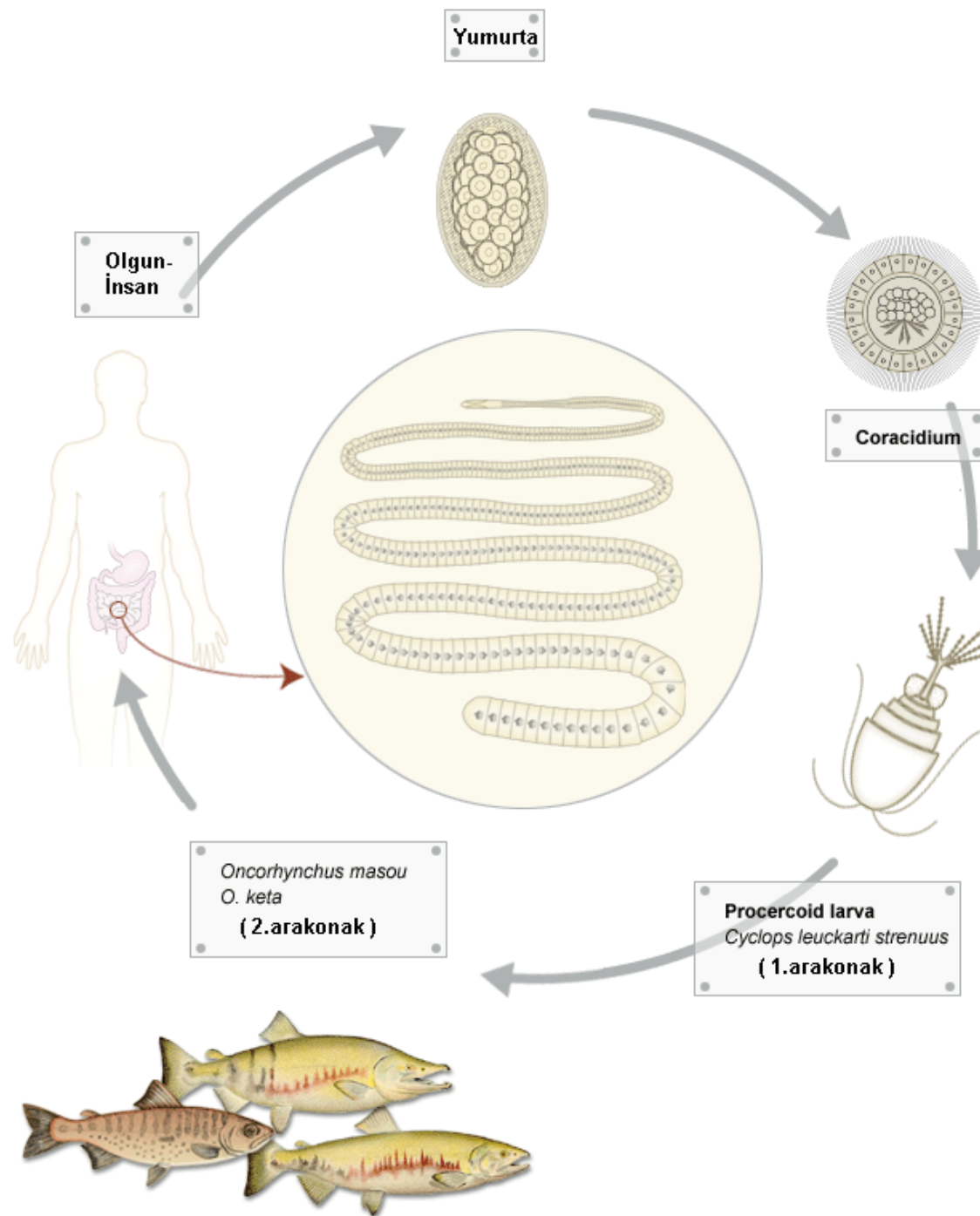
Pseudophyllida

- 1) Coracidium
- 2) Procercoid
- 3) Plerocercoid

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2

3



▶ **CESTOD LARVA TYPES:**

Cyclophyllida

1) Cysticercus

2) Coenurus

3) Hydatid Cyst

4) Cysticercoid

5) Strobilocercus

6) Tetrathyridium

Cysticercus

e.g.: *Taenia saginata* (human –small intestines)

Cysticercus bovis (cattle – muscle)

Coenurus

e.g.: *Taenia multiceps* (dog –small intestines)

Coenurus cerebralis (ruminant – brain)

Hydatid cyst (Cystic Echinococcosis)

e.g.: *E. granulosus* (dog – small intestines)

Hydatid cyst (mammalian – liver, lungs...)

Cysticercoid

e.g.: *Dipylidium caninum* (dog - small intestines)

Cysticercoid (flea, louse)

Strobilocercus

e.g.: *Taenia taeniaeformis* (dog- small intestines)

Strobilocercus fasciolaris (rodent - liver)

Tetrathyridium

e.g.: *Mesocestoides lineatus* (carnivor - small intestines)

Tetrathyridium elongatum (different vertebrate)

(2. larvae types)