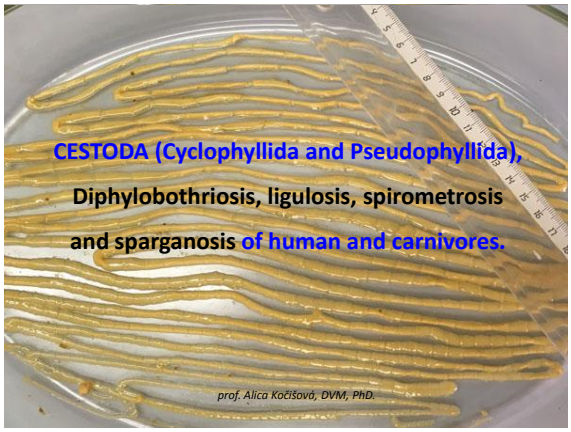
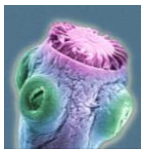


CESTODA (Cyclophyllida and Pseudophyllida), Diphylobothriosis, ligulosis, spirometrosis and sparganosis of human and carnivores.

prof. Alica Kočišová, DVM, PhD.

1. Morphology and classification of CYCLOPHYLLIDA
2. Life cycle and description of larval stages of Cyclophyllida
3. *Taenia saginata* and bovine cysticercosis
4. *Taenia solium* and swine cysticercosis
5. Coenurosis of animals
6. Cysticercosis of the herbivores and omnivores
7. Echinococcosis (hydatidosis)
8. Alveococcosis (*Echinococcus multilocularis*)
9. Cestodoses of dogs, cats, and other carnivorous animals
10. Cestodoses of horses
11. Cestodoses of ruminants and rabbits
12. Cestodoses of poultry
13. Cestodoses of man and rodents
14. Morphology, classification and life cycle of PSEUDOPHYLLIDA
15. Diphyllobothriosis, sparganosis and ligulosis

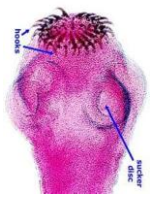


Class: CESTODA (Tape worms)

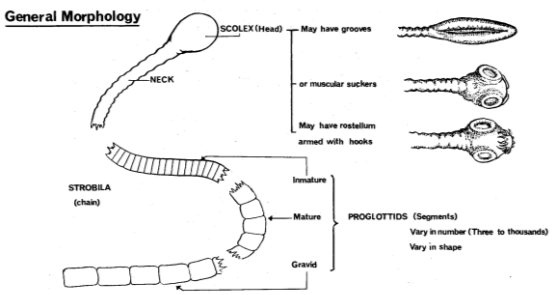
Order	Family	Genus
PSEUDOPHYLLIDEA	Diphyllobothriidae	*Diphyllobotrium, Ligula, Spirometra, Schistocephalus, Diplogonophorus*
	Botriocephalidae	*Bothriocephalus*
	Triaenophoridae	*Eubothrium, Triaenophorus*
CYCLOPHYLLIDEA	Anoplocephalidae - Anoplocephalinae - Thysanosomatinae	*Anoplocephala, Paranoplocephala, Moniezia, Mozgovoyia, Citotaenia, Bertella, Killigrewia, ...* *Avitellina, Stilesia, Thysaniezia, Thysanosoma, ...*
	Davaineidae	*Davainea, Raillietina*
	Mesocestoididae	*Mesocestoides*
	Hymenolepididae	*Hymenolepis, Drepanidotaenia, Fimbriaria, Dicranotaenia, Diorchis, Echinocotyle, Echinolepis, Gastrotaenia, Microsomacanthus, Rodentolepis, Sobolevicanthus, Vampirolepis*
	Dilepididae	*Amoebotaenia, Choanotaenia*
	Dipylidiidae	*Dipylidium, Diplopylidium, Joyeuxiella*
	Taeniidae	*Taenia, Echinococcus,*

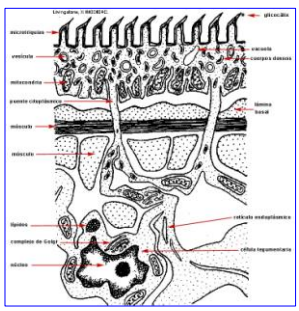
General characteristics of the class

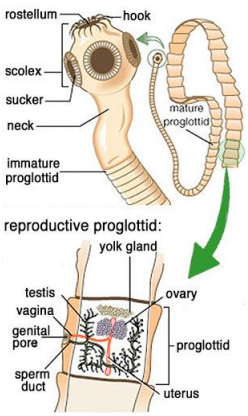
- Dorsoventrally flattened body, ranging from a few millimetres to tens of meters; fixation - suckers/grooves + hooks + rostellum
- Location: small intestine
- **Hermaphrodite** (PROTANDRIC HERMAPHRODITISM);
- LC indirect (biohelminths) - IH



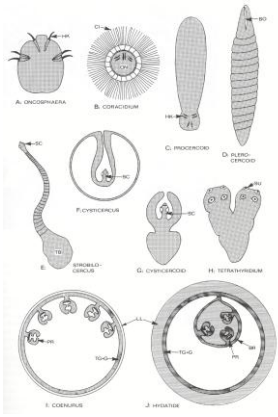
MORPHOLOGY





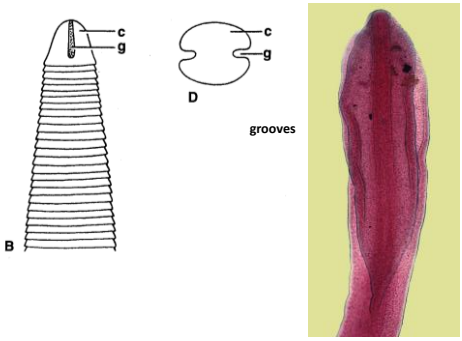


METACESTODA –
larval stages cestodes

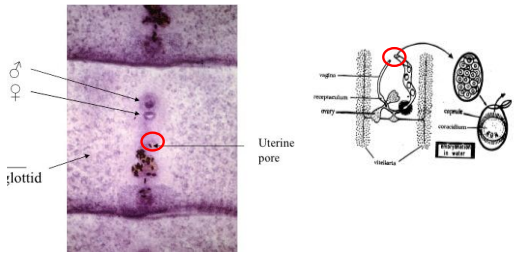


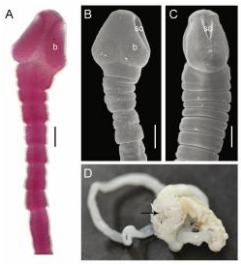
Order	Family	Genus
PSEUDOPHYLLIDEA	**Diphyllobothriidae**	***Diphyllobotrium, Ligula, Spirometra,*** *Schistocephalus, Diplogonophorus*
	Botriocephalidae	***Bothriocephalus***
	Triaenophoridae	***Eubothrium, Triaenophorus***

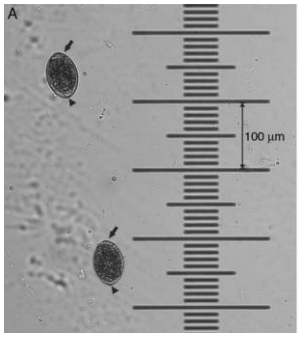
Order: PSEUDOPHYLLIDA - *scolex*

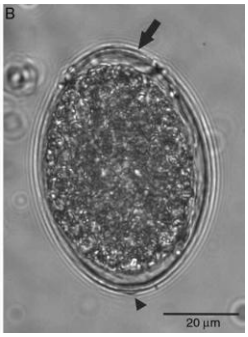


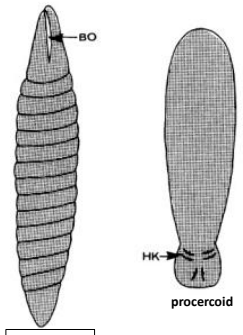
Order: PSEUDOPHYLLIDA





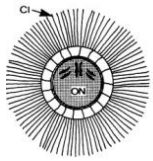






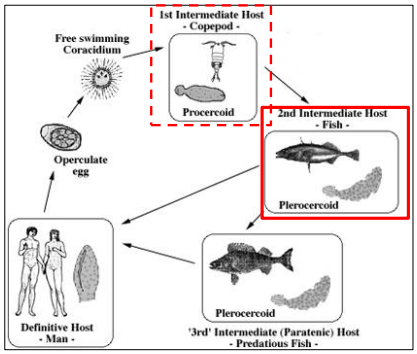
Larval stages PSEUDOPHYLLIDA

Life cycle – **2 IH**



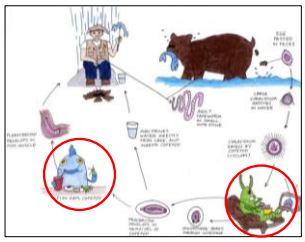
embryo: **Coracidium**

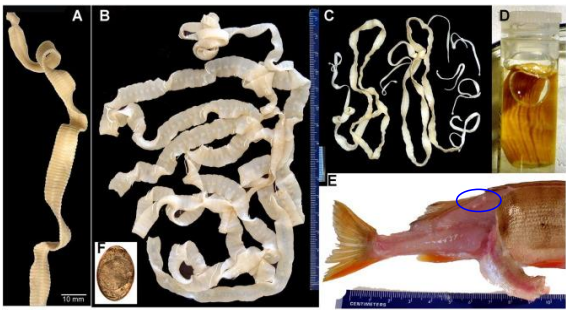
PSEUDOPHYLLIDA – life cycle



Diphyllobotriidae:

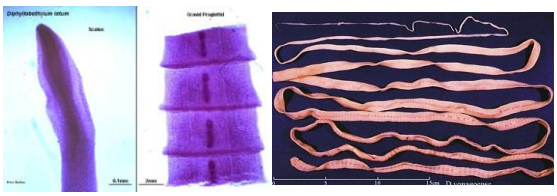
- *Adenocephalus pacificus* - seal
- *Diphyllobotrium alascense* - dog
- *Dh. cameroni* - seal
- *Dh. cordatum* - seal
- *Dh. dalliae* – fox, dog
- ***Dh. dendriticum*** – birds, mammals
- *Dh. elegans* - seal
- *Dh. hians* - seal
- *Dh. lanceolatum* - seal
- ***Dh. latum*** - man
- *Dh. nihonkianse* – bear, fox
- *Dh. orcini* - whale
- *Dh. scoticum* - seal
- *Dh. stemmacephalum* - dolphin
- ***Dh. ursi*** - bear
- *Diplogonophorus balaenopterae* - whale
- ***Ligula***/*Digramma* – fish eating birds
- *Pyramicocephalus phocarum* - seal
- *Schistocephalus solidus* – fish eating birds



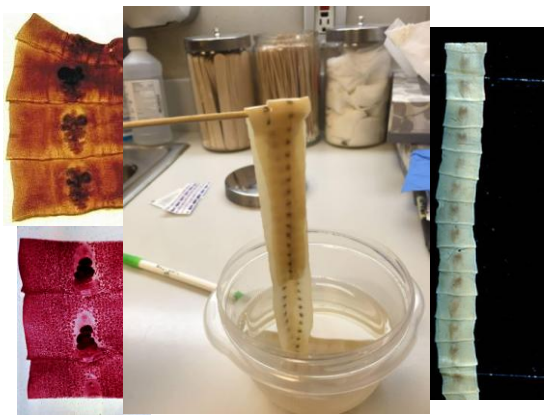


A. *Diphyllobothrium dendriticum* (man);
B, E, F. *Diphyllobothrium latum* (B - man); (E – plerocercoid – fish); (F – embryonated egg – man/faeces);
C. *Adenocephalus pacificus* (seal);
D. *Diplogonoporus brauni* (= *Ligula interrupta*) (man);

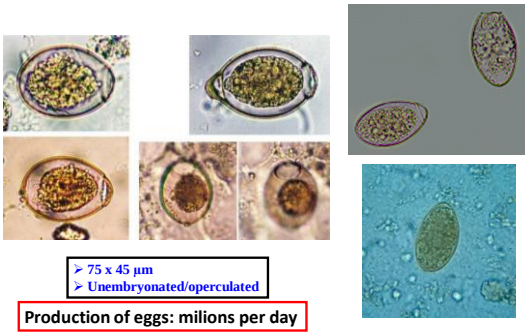
Diphyllobothrium latum/Diphylobothriosis



FH – man and fish eating mammals (dog, cat, pig, bear)



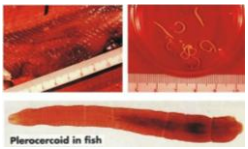
Diphylobothrium latum - eggs

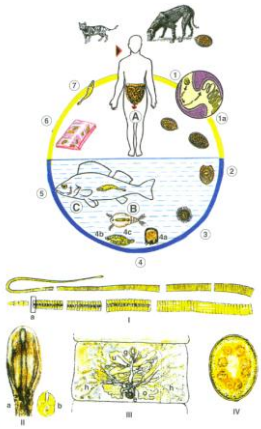


- 75 x 45 µm
- Unembryonated/operculated

Production of eggs: milions per day

Diphylobothrium latum – life cycle



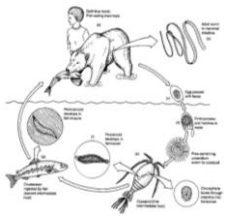


Diphylobothrium latum - epizootiology

Consumption of raw or undercooked fish

Plerocercoid - 5 – 20 mm

Low host specificity
(fish eating animals; man)

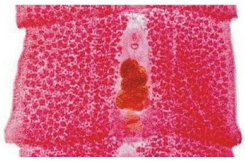


DIPHYLOBOTHRIOSIS,
- **endemic helmintozoonosis** tied to the consumption of raw and semi - raw fish; **Prepatent period: 5-6 weeks**

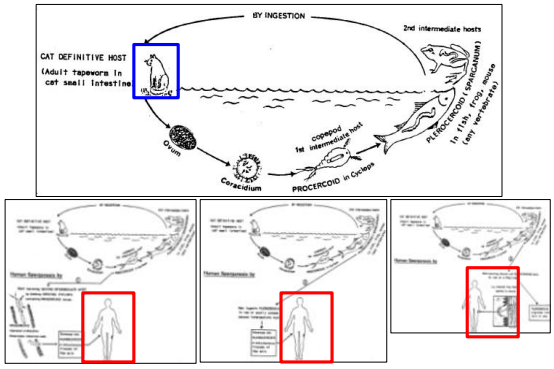
Diphylobothrium latum - *pathogenesis*

- **Macrocytic hypochromic anaemia**
- **Malignant (pernicious) anemia – caused by comsumption of vitamin B_{12} by tapeworm**
- **Trombocytopenia, leucopenia**

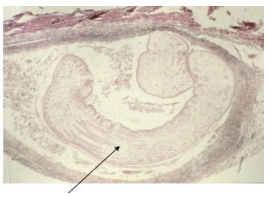
Diphyllobothrium (Spirometra) mansonoides



plerocercoid

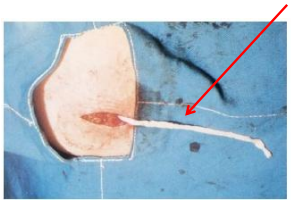


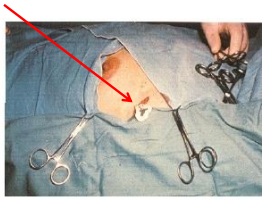
(*Diphylobotrium*) ***Spirometra mansonoides***



Procercoid - water crustacean

Plerocercoid - subcutaneous localization





SPARGANOSIS (PLEROCERCOIDOSIS) –

tissue cestodosis caused by the larval stage of **plerocercoid**

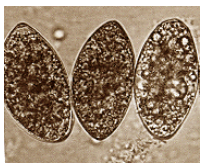
Diphyllobothrium theileri, D. pretoriensis;

- **Plerocercoids** develop in amphibians, mouse rodents, buffalo, zebras, etc.

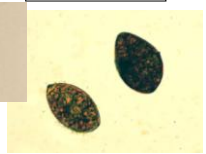
Spirometra eprinacei europaei,
S. mansonoides

- Small to medium-sized (10-100 cm) tapeworms with narrow spoon-shaped scolex, botries are flat
- **IH_1:** cyclops, crustaceans
- **sparganum** - occurrence in amphibians, birds, mammals, man - IH_2
- **FH** – cat, dog

Spirometra mansoides



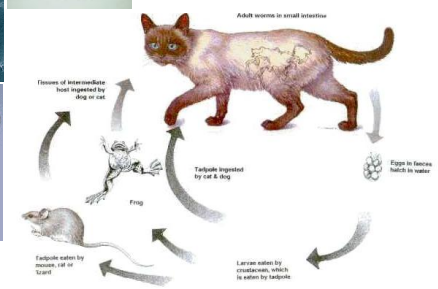
eggs: 57 x 39 µm



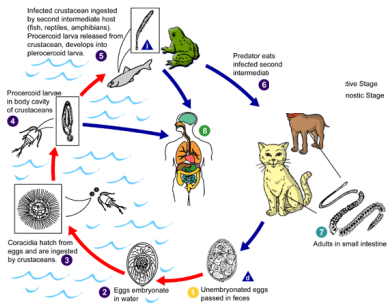
Adult: 60-75 cm

FH – dog, cat, other carnivores

Spirometra erinacei

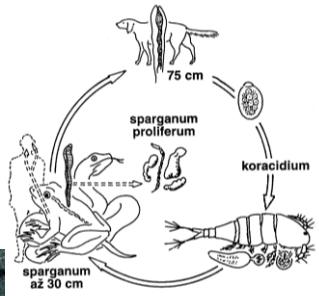


- Disease characterized by **enteritis** and **abscess formation**
- ***Spirometra erinacei europaei*** – small intestines of carnivores and larval stages ***plerocercoid*** in man and swine



Sparganosis, plerocercoidosis – life cycle

Ulcerations on the skin of frogs



Sparganum mansoni

The larvae are encysted in large nodes in the subcutaneous tissue

Sparganosis - epidemiology

- **Alimentary way** - accidental consumption of water crustaceans with procercoids (drinking water). The procercoid migrates to the subcutaneous tissue where it develops into a plerocercoid;
- **Alimentary way** - consumption of plerocercoids in 2.IH - raw / under-heat-processed meat of fish, poultry, domestic swine, wild boar etc.
- Called: **folk medicine** - treatment of wounds and eyes by frogs

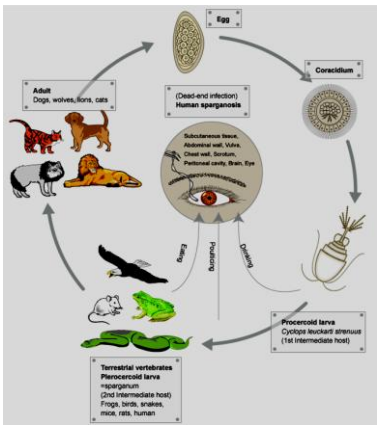
Frogs and so-called. seafood on Thai market

Sparganosis - pathogenesis

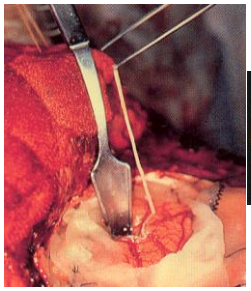
Sparganum is a tape-like, cream-colored body, measures 30x3 mm, live larvae are movable, actively elongate and contract, can migrate through tissues;

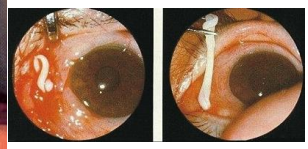
Spargana (plerocercoid) in humans migrates - primarily into subcutaneous tissue = inflammation, urticaria, oedema and eosinophilia;

- **EYE FORM**
- **HYPODERMIC FORM**
- **VISCERAL FORM**
- **NEURAL FORM**



Sparganosis - pathogenesis





sparganosis in the brain - 10 cm long larva

Sparganosis - pathogenesis

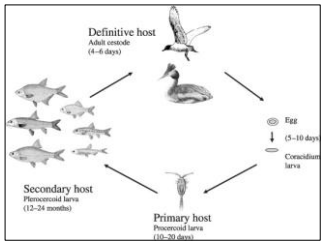
sparganum in a nodule – plerocercoid is walled by a intense cellular and fibrotic reaction

Ligula intestinalis/LIGULOSIS

FH - fish-eating water birds (gull, dipper ect.)

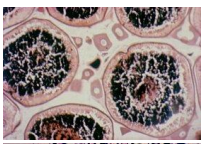
- 1 m long tapeworm
- Findings in humans are sporadic in the form of larval forms

MH_1 – cyclops (procercoid)
MH_2 – freshwater fish - carp (plerocercoid)

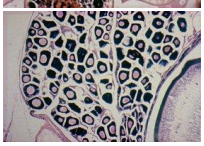


Ligulose-attacked fish cannot dive, only helplessly circling on the surface and attracting fishy predators ...

Ligula intestinalis – pathogenesis MH_2



Ovary of non-infected fish



Ovary of infected fish

atrophy of the gonads due to a derangement in hormonal balance

Ligula intestinalis

Damage: intestine

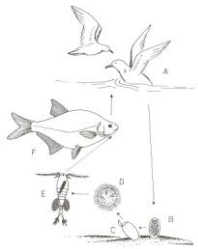
Susceptible species: carp fish

Conditions: presence of an intermediate host (cyclop, birds of prey)

Symptoms: loss of appetite, enlargement of body cavity, large tapeworms

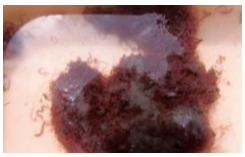
Therapy: medicated food Taenifugin carp (0.7% piperazine)

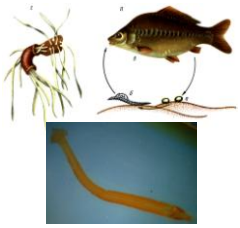
Prevention: preventive deworming of the stick before transport and withdrawal



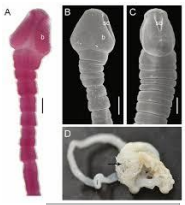
Kaviosis

- ***Khawia sinensis*** (fry carp)
- 4-15 cm
- ryba FH
- IH – nitrile (plerocerkoid)





Bothriocephalus acheilognathi



Damage: intestine

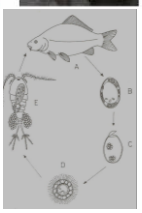
Susceptible species: carp, grass carp and other carp fish, especially fry

Conditions: presence of intermediate host (cyclop)

Symptoms: loss of appetite, swimming underwater, tape worms in the intestine

Therapy: medicated food Taenifugin carp

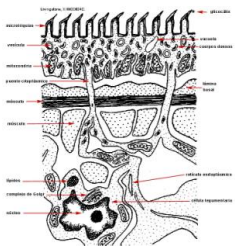
Prevention: preventive deworming of the stick before transport and withdrawal

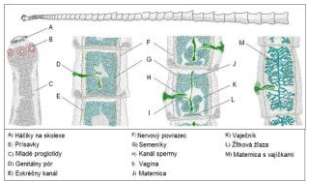


CYCLOPHYLLIDEA

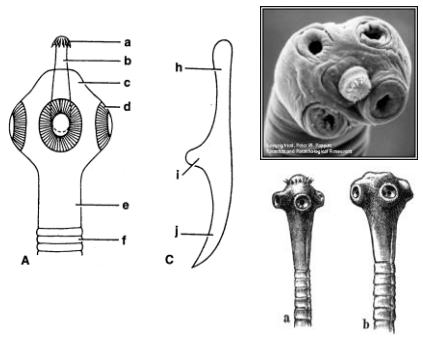
ORDER	FAMILY	GENUS
CYCLOPHYLLIDEA	**Anoplocephalidae** - Anoplocephalinae	***Anoplocephala, Paranoplocephala, Moniezia, Mozgovoyia, Citotaenia,*** *Bertella, Killigrewia, ...*
	- Thysanosomatinae	*Avitellina, Stilesia, Thysaniezia, Thysanosoma, ...*
	Davaineidae	***Davainea, Raillietina***
	Mesocestoididae	***Mesocestoides***
	Hymenolepididae	***Hymenolepis, Drepanidotaenia,*** *Fimbriaria, Dicranotaenia, Diorchis, Echinocotyle, Echinolepis, Gastrotaenia, Microsomacanthus, Rodentolepis, Sobolevicanthus, Vampirolepis*
	Dilepididae	***Amoebotaenia, Choanotaenia***
	Dipylidiidae	***Dipylidium,*** *Diplopylidium, Joyeuxiella*
	Taeniidae	***Taenia, Echinococcus,***

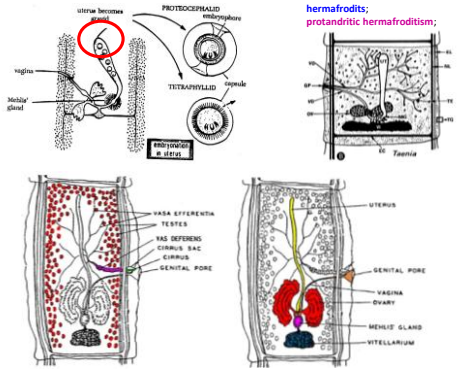
- The largest range of tapeworms
- 4 muscled suction cup, often with retractable rostellum with hooks
- compact yolk glands
- VC: biohelminty –1 MH (invertebrate, arthropod, vertebrate)



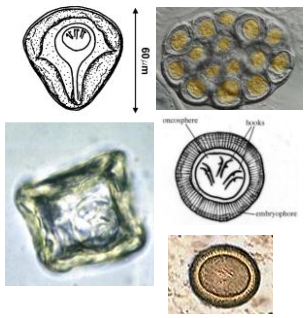


Scolex





Life cycle - Cyclophyllidea



- Eggs - embryonated - oncosphere (hexacanth stage);
- IH
- in IH, **larval stages** of so-called **metacestodes** are formed from oncosphere.
- FH is infected by the consumption of IH or its tissues with appropriate larvocysts;

LARVAL STADIES