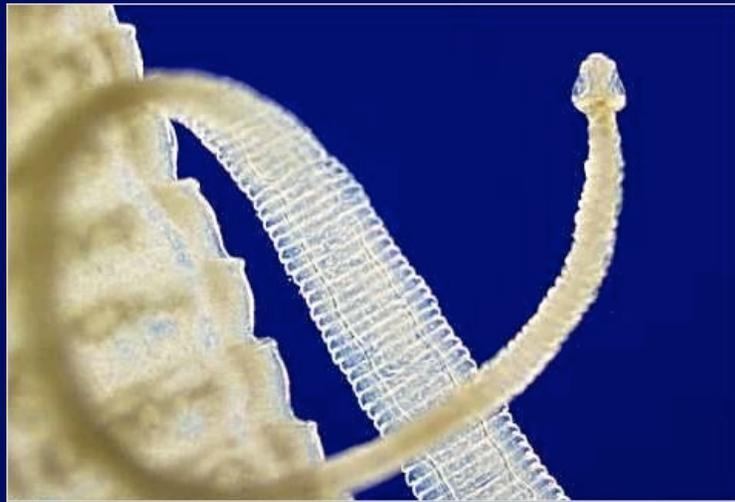


# Ecological Parasitology

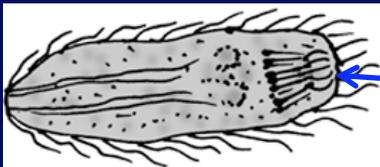


Lab 7: Cestodes (Tapeworms)

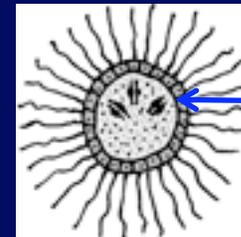
Spring 2011

# Classification

- Kingdom: Animalia
  - Phylum: Platyhelminthes- flatworms, lack body cavity and specialized respiratory/ circulatory organs
    - Class: Cestoda/Cestoidea- tapeworms
      - Subclasses
        - » Cestodaria (decacanth, 1 set genitalia, primitive fish)
        - » Eucestodaria (hexacanth, multiple sets genitalia, many vertebrates, we'll focus here)
          - Order Pseudophyllidea
          - Order Cyclophyllidea



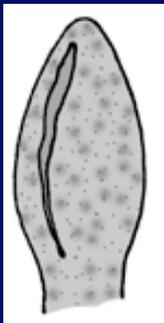
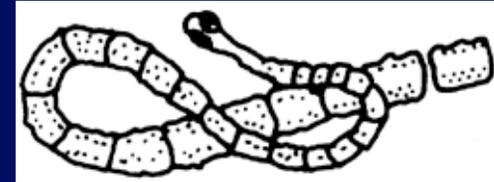
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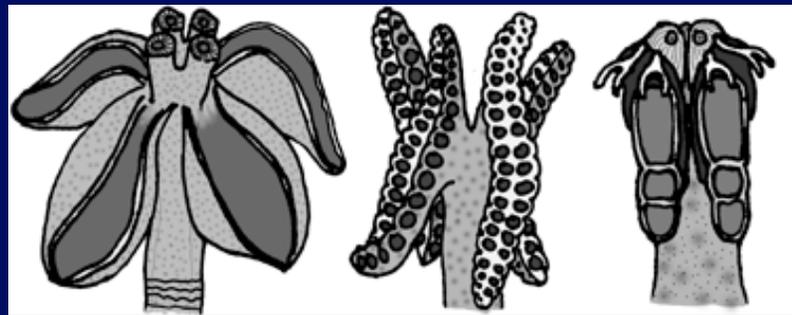
6

# Morphology (adult)

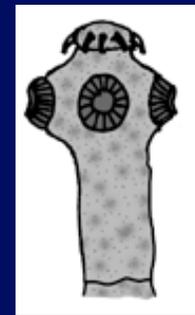
- Segmented body form
  - Scolex- holdfast organ
  - Neck- high mitotic activity- growing region
  - Strobila- segmented region with proglottids
    - Proglottids contain male and female reproductive organs, mature posteriorly



Bothria  
(Order Pseudophyllidea)

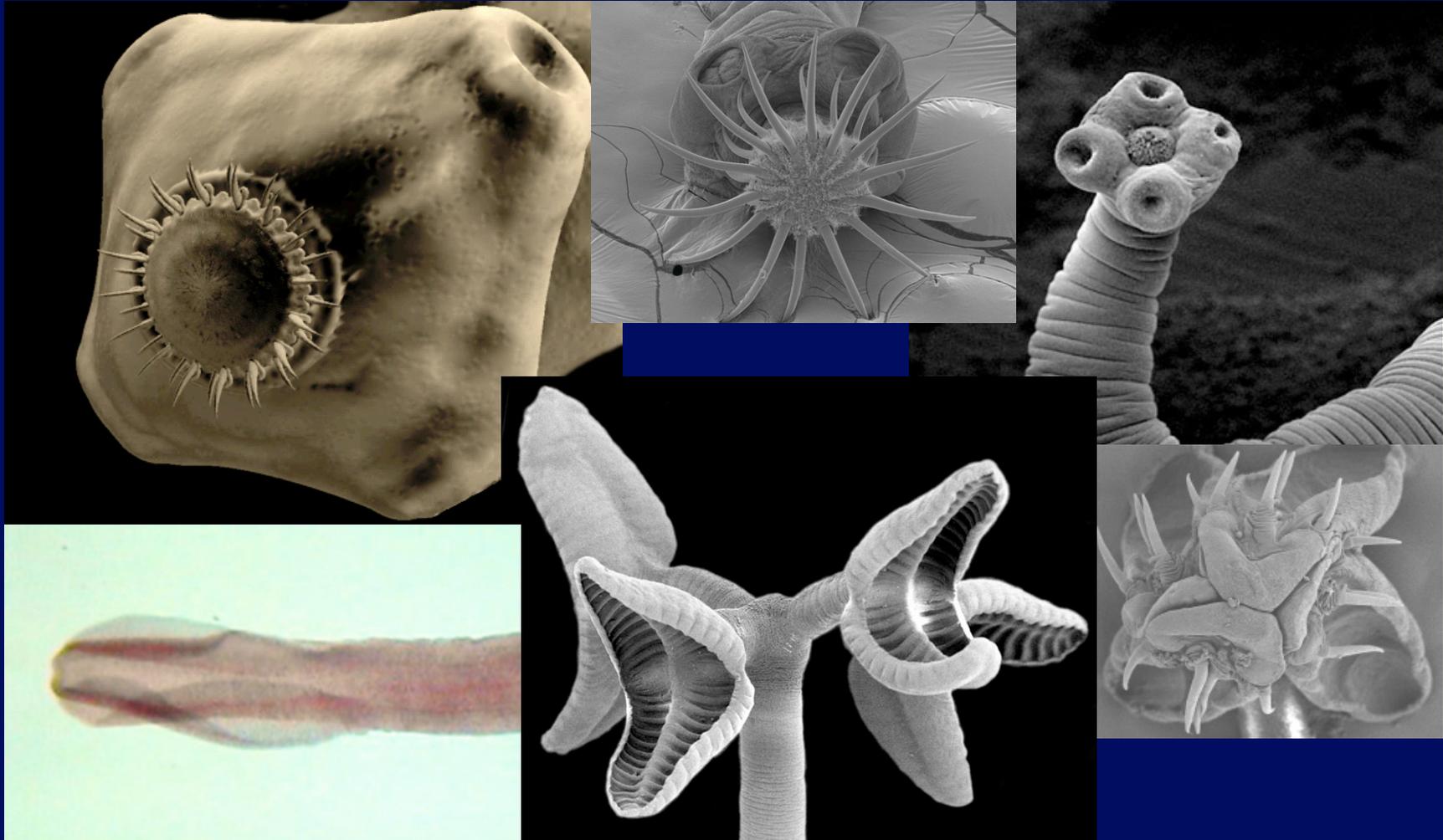


Bothridia  
(Order Tetraphyllidea and others)

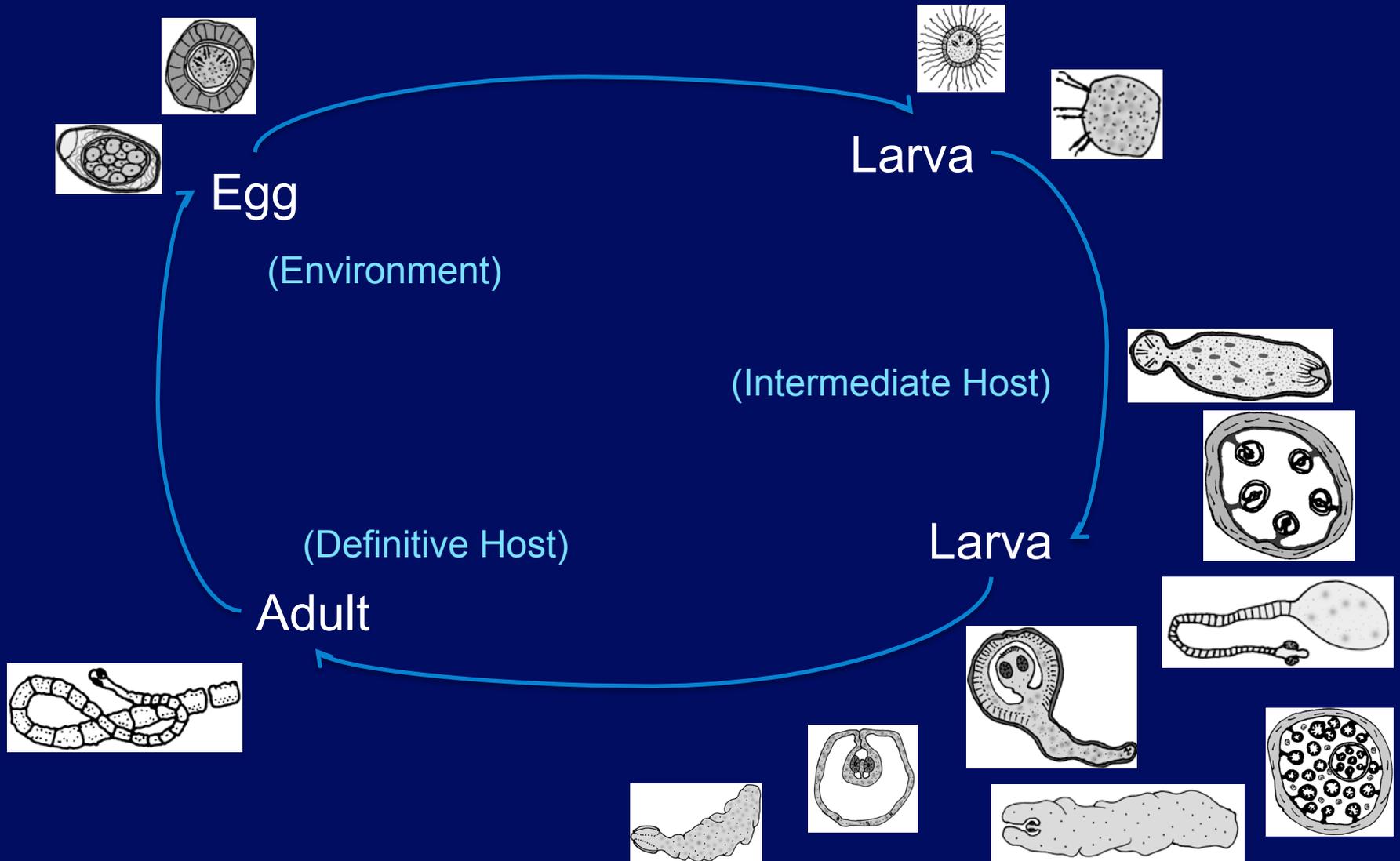


Acetabulate  
(Order Cyclophyllidea)

# Scoleces (holdfast organs)

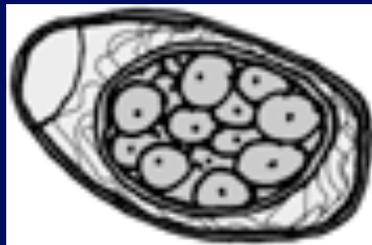


# Life Cycle



# Life Cycle: Egg

- Egg
  - Order Pseudophyllidea- operculate
  - Order Cyclophyllidea- thick and resistant



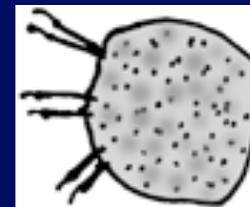
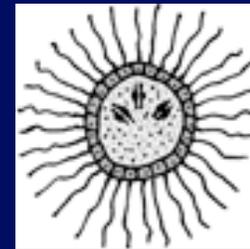
Pseudophyllidean



Cyclophyllidean

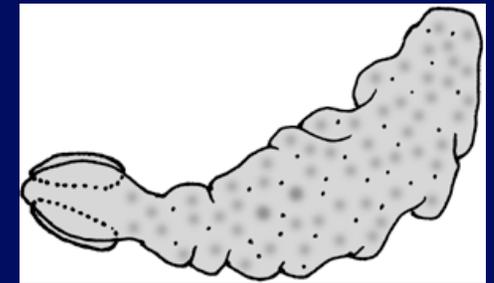
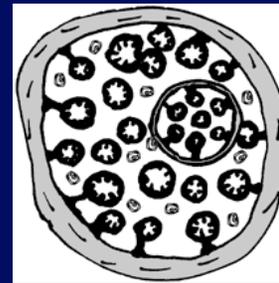
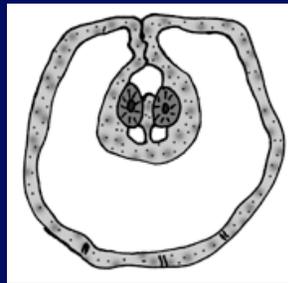
# Life Cycle: First Larval Stage

- Order Pseudophyllidea:  
**Coracidium**
  - Freeswimming
  - Sheds cilia once ingested
  - Penetrates intestine using hooks
- Order Cyclophyllidea:  
**Oncosphere**
  - Penetrates intestine using hooks



# Life Cycle: Second Larval Stage

- Metacestode- many types
  - Cysticercoid
  - Cysticercus
  - Hydatid cyst
  - Plerocercoid



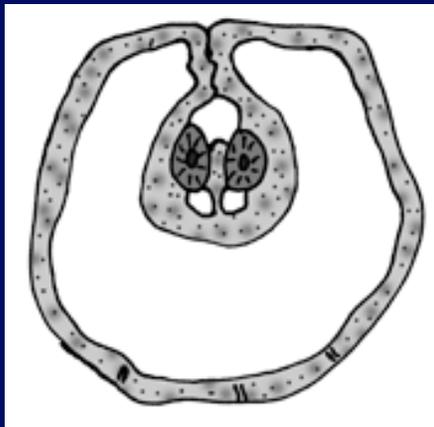
# Metacestodes: Cysticercoid

- Vesicular larva- common
- Scolex and neck bud from bladder
- Inverted in bladder
- Caudal appendage- sometimes with oncosphere hooks



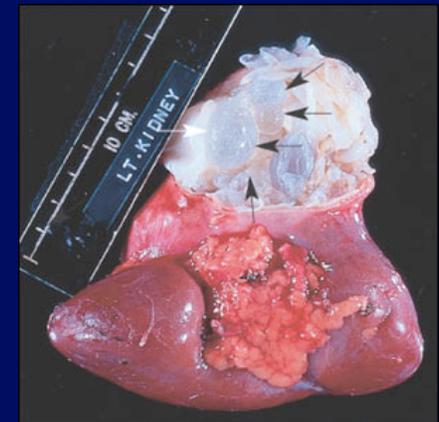
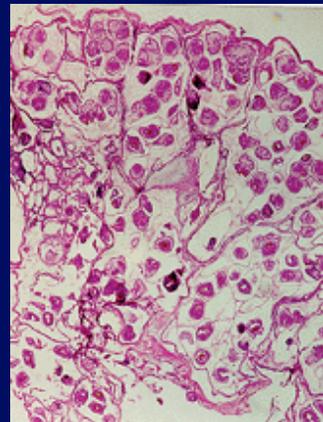
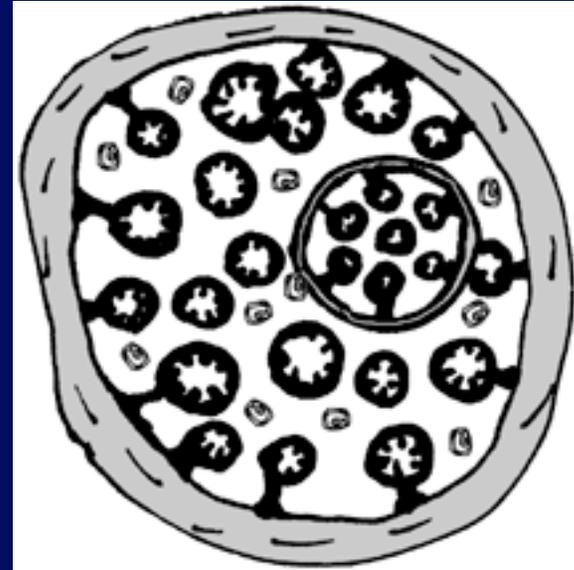
# Metacestodes: cysticercus

- “bladderworms”- common
- Football shaped
- 1 scolex, hangs in bladder
- Fluid filled cyst, usually in muscle



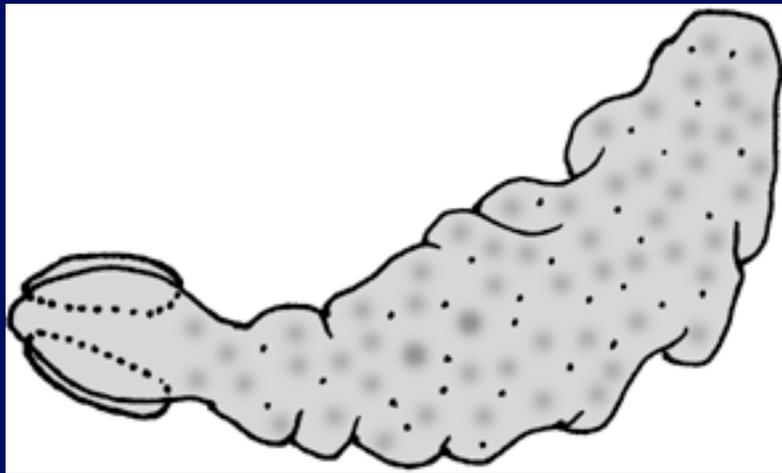
# Metacestodes: hydatid cyst

- Large cyst
- Contains many brood capsules
  - Each contains 1-100s scoleces
- Free scoleces- hydatid sand
- Daughter cysts spread throughout body
- Genus *Echinococcus*
- Very harmful to herbivore or human intermediate host



# Metacestodes: plerocercoid

- Pseudophyllidean stage
- Small bothrium (scolex) at anterior end



# Today's parasites

- Order Cyclophyllidea
  - *Hymenelopsis*
  - *Dipylidium*
  - *Echinococcus*
  - *Taenia*
- Order Pseudophyllidea
  - *Diphyllobothrium*

# Genus *Hymenolepis*

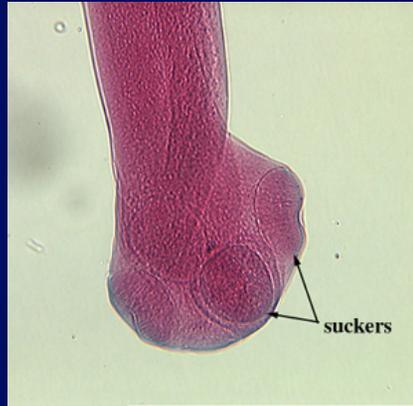
- *H. diminuta*
  - Long lived- up to 14 years!
  - Definitive host: rodents, sometimes humans
  - Intermediate host: insect
  - No hooks on scolex
  - Sculptured shell on egg
  - Cysticercoid
- *H. nana*
  - Short life cycle
  - Definitive host: rodents, humans
  - Intermediate host: insect or none!
  - Hooked scolex
  - Egg not sculptured
  - Cysticercoid
  - Small adult

# Hymenolepis

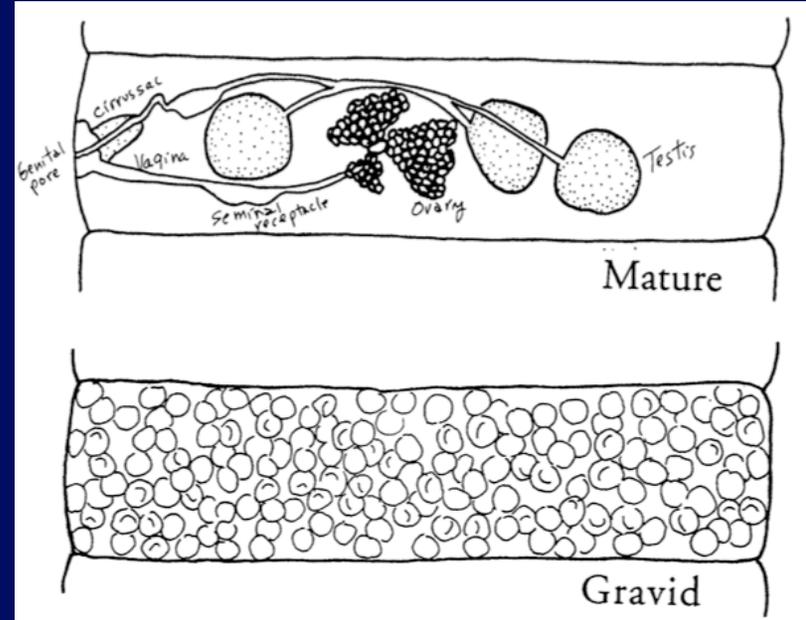
## Scolecex



*H. nana*



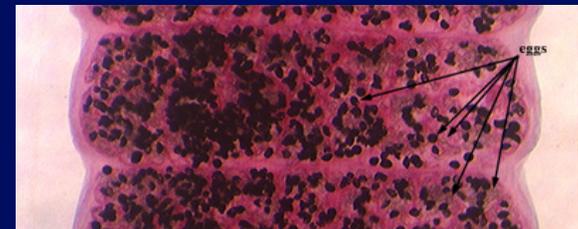
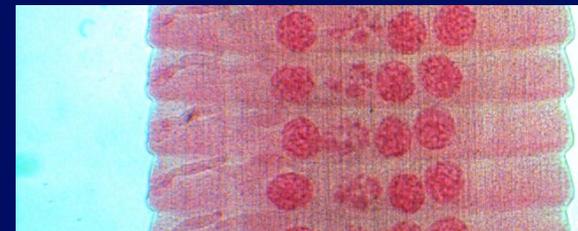
*H. diminuta*



Egg



Cysticercoid

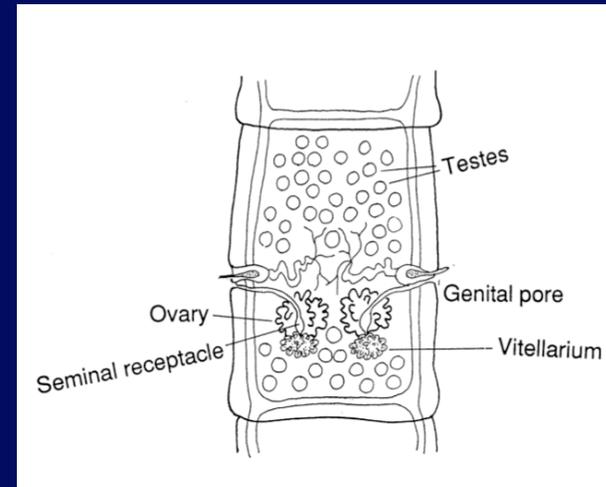


Proglottids

# *Dipylidium caninum*

- Definitive host: dogs and cats
- Intermediate host: fleas and lice
- Hooked eggs- in packets of 5-20
- Ripe proglottids look like pumpkin seed sized worms
- Adult
  - 1 foot long
  - Scolex with retractable hooks and 4 suckers

# *Dipylidium caninum*



Scolex



Eggs



Proglottid

# *Echinococcus granulosus*

- Most dangerous
- Hydatid cysts in multiple organs
  - If burst, can lead to death
  - Can contain up to 2 million scoleces!
- Definitive host: canids
- Intermediate hosts: humans, sheep, cattle, camels, moose, deer, horses, pigs, rabbits, etc.
- Adult
  - Scolex with double row of hooks and suckers
  - One mature proglattid at a time

# *Echinococcus granulosus*

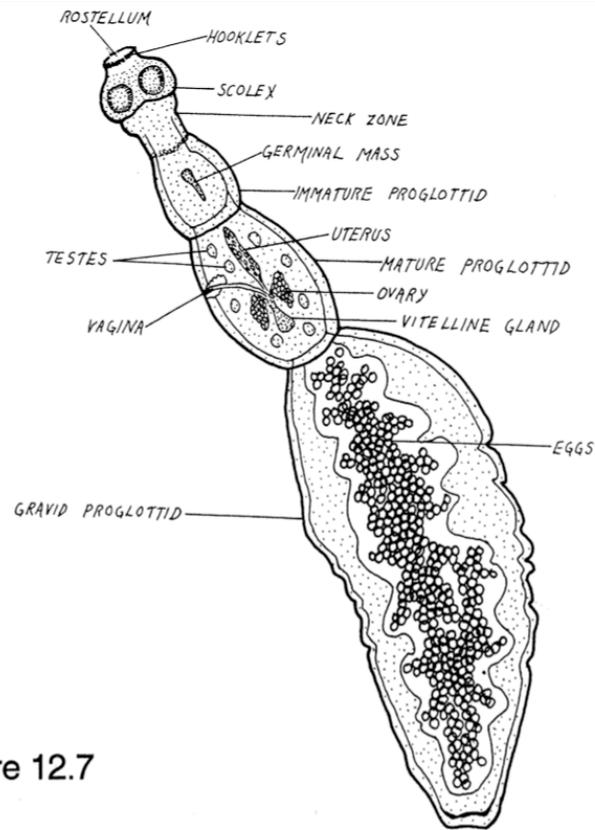
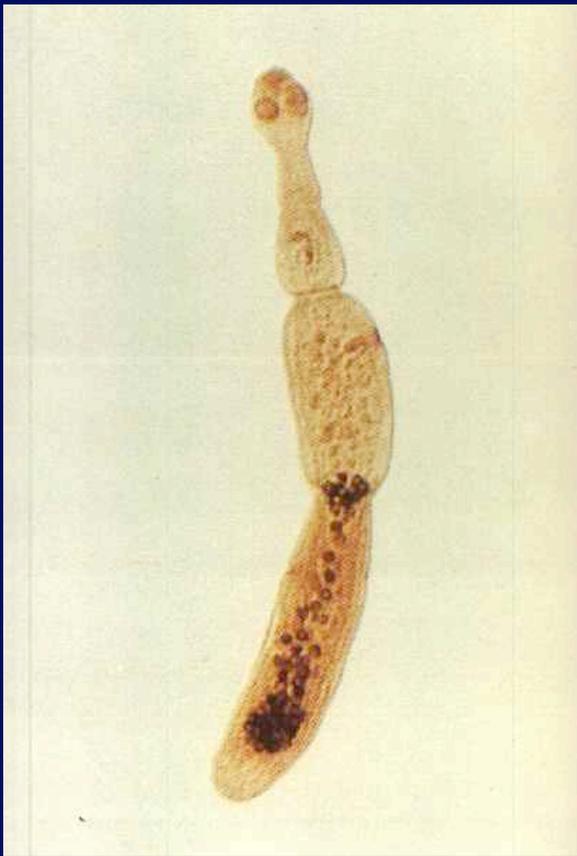
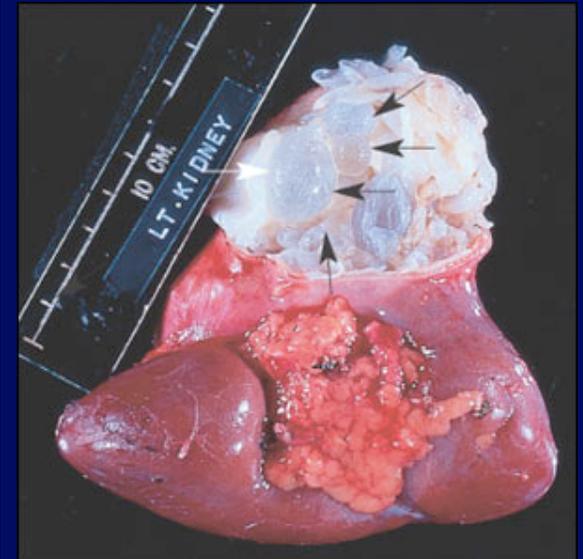


Figure 12.7



# Genus *Taenia*

- 2 important for humans- *T. solium* and *T. saginata*
- Definitive host: humans
  - Eat undercooked meat
- Intermediate host: pigs/cattle
- Cysticercus in muscles of intermediate host
- Adult worm
  - 21 feet (*T. solium*), 80 feet (*T. saginata*)
  - Scolex
    - 2 rings hooks (*T. solium*), no hooks (*T. saginata*)

# Taenia



Egg

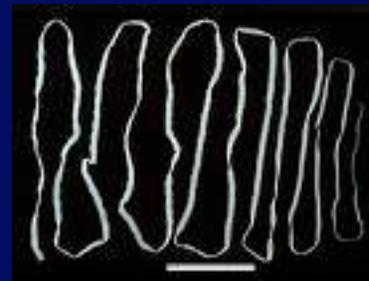
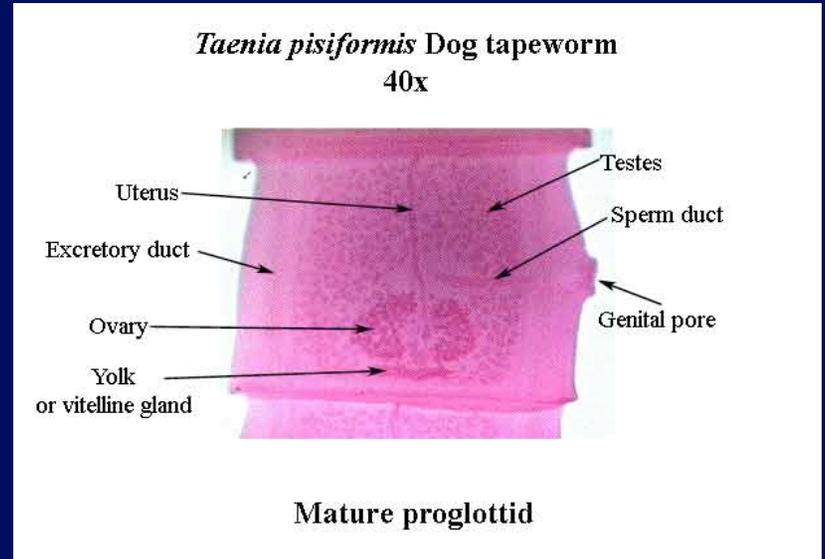


*T. saginata* scolex

muscle



cysticercus



# *Diphyllobothrium latum*

- Definitive host: mammals (including humans)
- Intermediate host: fish
- Longest human tapeworm- averages 10m!
- Scolex- bothrium
- Operculate eggs

# *Diphyllobothrium latum*

