

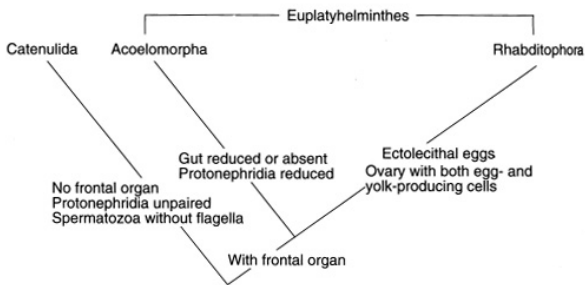
BIO 475 - Parasitology Spring 2009

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Northern Arizona University

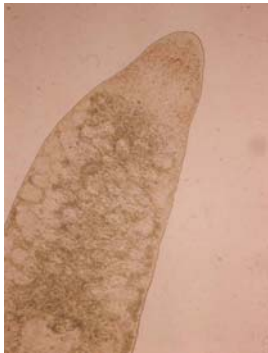
<http://www4.nau.edu/isopod>

Lecture 12

Platyhelminth Systematics-New



Euplatyhelminthes



Superclass Acoelomorpha

- Simple pharynx, no gut.
- Usually free-living in marine sands.
- Also parasitic/commensal on echinoderms.

Euplatyhelminthes

2. Superclass Rhabditophora - with rhabdites

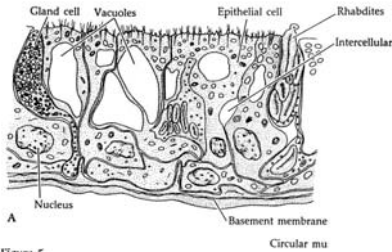
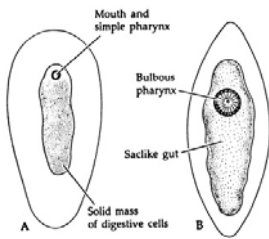


Figure 5
Turbellarian epidermis and body wall structure. A, Epidermis of the polyclad *Thysanozoon broochii*. B, Body wall and cellular epidermis of the triclad *Geoplana*. (A after C. Bedini and F. Papi, in Riser and Morse 1974; B after Bayer and Ocwre 1968.)

Euplatyhelminthes

2. Superclass Rhabditophora - with rhabdites

- a. Class Rhabdocoela
 - 1. Rod shaped gut (hence the name)
 - 2. Often endosymbiotic with Crustacea or other invertebrates.



Euplatyhelminthes

3. Example: *Syndesmis*

- a. Lives in gut of sea urchins, entirely on protozoa.

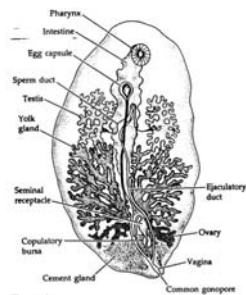


Figure 10
Syndesmis, a rhabdocoel from the gut of a sea urchin. (After Hyman 1951.)

Euplathyhelminthes

Class Temnocephalida

a. *Temnocephala*

1. Ectoparasitic on crayfish

5. Class Tricladida

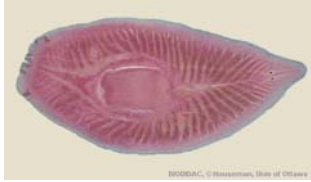
a. like planarians

b. *Bdelloura*

1. live in gills of *Limulus*



Temnocephala sp.



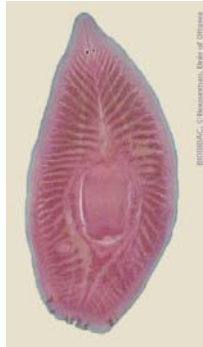
BIDDISAIC, © Rosenham, Univ of Ottawa

Class Temnocephalida

4. Life cycles are poorly known.

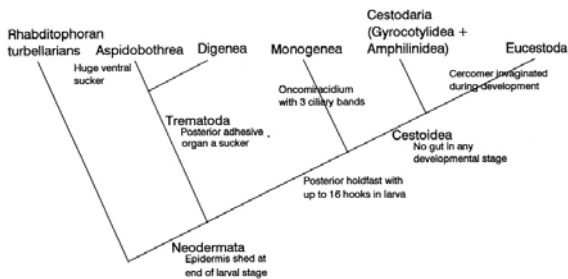
a. Seem to have slightly increased reproductive capacity.

b. Retain many morphological characters that permit free-living existence.



BIDDISAIC, © Rosenham, Univ of Ottawa

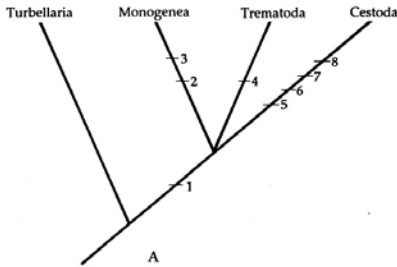
Euplathyhelminth Systematics



Parasitic Platyhelminthes Old Scheme

Characters:

1. Tegumental cell extensions
2. Prohaptor
3. Opisthaptor



Superclass Neodermata

a. Loss of characters associated with free-living existence.

1. Ciliated larval epidermis, adult epidermis is **syncytial**.

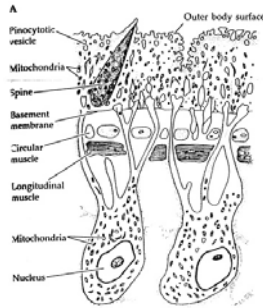


Figure 7
A, The tegument and underlying body wall of a digenetic fluke: *Fasciola hepatica*; longitudinal section. B, The tegument and body wall of a cestode (cross section). (A after L. T. Threadgill, 1963, Q. J. Microsc. Sci. 104; B after Barth and Bronsbeens 1982.)

Superclass Neodermata

b. Major Classes - will consider each in detail:

1. **Class Trematoda**

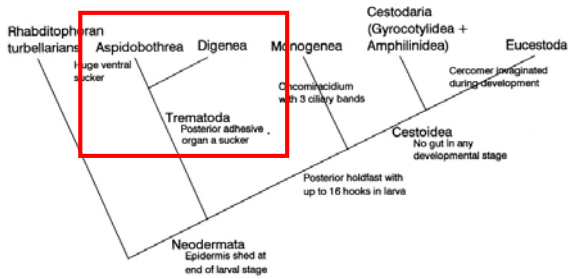
a. Subclass Aspidobothrea

b. Subclass Digenea

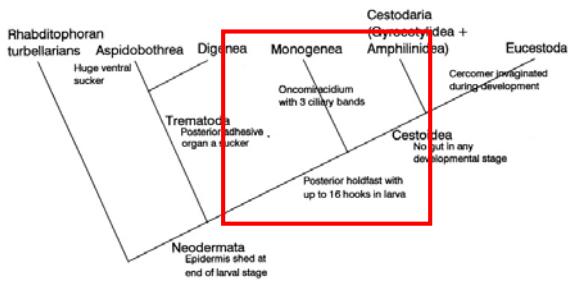
2. **Class Monogenea**
3. **Class Cestoidea**



Euplathyelminth Systematics



Euplathyelminth Systematics

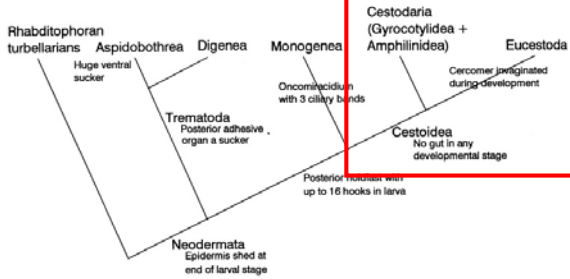


Class Cestoidea

- Two Subclasses:
- a. Subclass Cestodaria
 1. Order Gyrocotylidea
 2. Order Amphilinidea
 - b. Subclass Eucestoda



Euplathyelminth Systematics



Parasitic Flatworms

- a. Relative abundance related to variety of parasitic habitats.
- b. Evidence that such characters lead to great speciation
- c. isolated populations, unique selective environments.

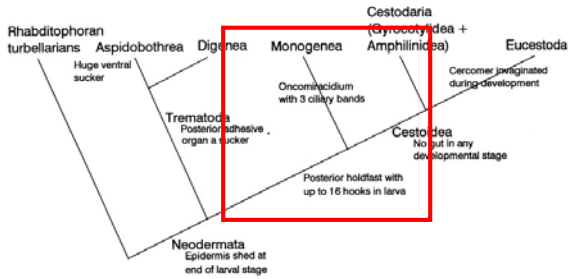


Parasitic Flatworms



- d. Also, very good organisms for examination of:
 1. Complex life cycles; selection favoring them
 2. Probability of transfer; details of parasite evolution.

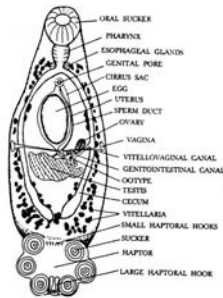
Euplathyelminth Systematics



Class Monogenea

Characteristics:

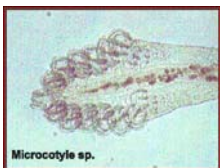
1. Reduced oral suckers, well developed posterior ones.
2. Usually ectoparasitic, occasionally endoparasitic, but usually on ectodermal structures.
3. On frogs, turtles, fish.
 - a. Usually a single host in life cycle.



Class Monogenea

Two major subclasses

- a. **S.C. Monopisthocotylea** - simple posterior sucker.
 1. Appear to be related to Aspidogastreaans.
- b. **S.C. Polyopisthocotylea** - complex sucker.





Monopisthocotylea entobdellae from a sole; *Polyopisthocotylea polystoma* from a frog; *Gyrodactylus* sp.; *Diplozoon paradoxum* from fish.

Class Monogenea

Life cycle examples:

a. *Dactylogyrus*, much like *Gyrodactylus*

1. infects the gills of bottom-feeding fish (Carp)

2. adult -> zygote to bottom -> hatches to

oncomiracidium -> swims to host -> adult.

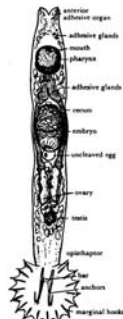


FIG. 8-5. *Gyrodactylus*. (From Roman, after Mueller and Van Chiem. *Giardiasis of McGraw-Hill*.)

Class Monogenea

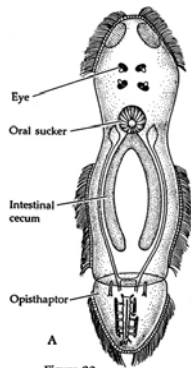
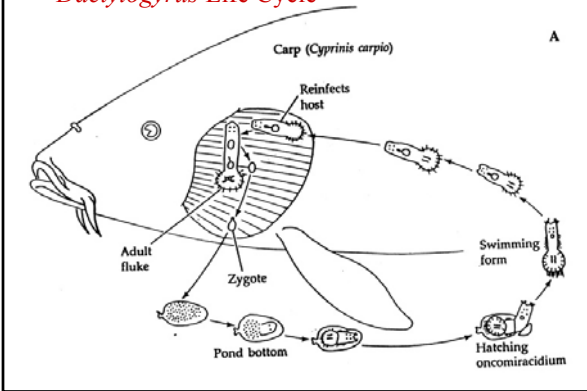


Figure 29
A, An oncomiracidium larva

Dactylogyrus Life Cycle

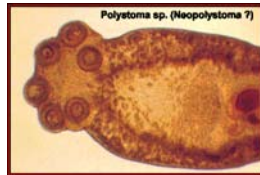


Class Monogenea

Life cycle examples:

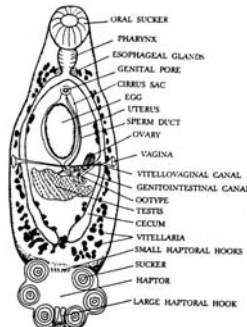
- b. *Polystoma*,
Polystomoides,
Polystomoidella (turtles)

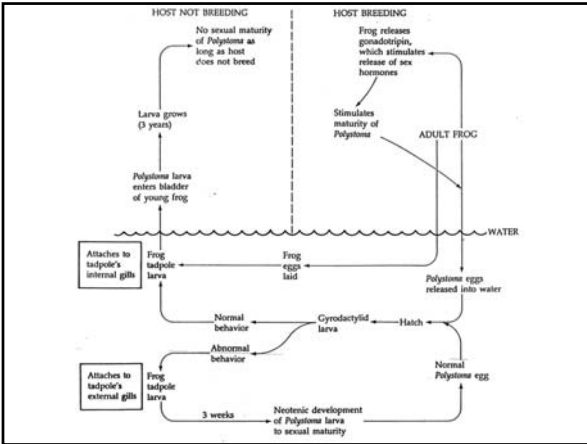
1. infects gills and bladder of frogs.
2. when frogs get ready to breed, worms do too
 - a. eggs into water when frog eggs go in.



Polystoma Life Cycle

- b. Larvae can either attach to larvae and develop with frog OR attach to tadps and accelerate their development.
 - a. "Abnormal" behavior seems to promote rapid reproduction.
- c. Note high probability of transfer to definitive host.





Choriocotyle Life Cycle

parasite of whiting (Scotland); also NA fish.

1. Most monogeneans have copulation
2. This one doesn't - gametes released into blood of host, find their way to seminal receptacle.

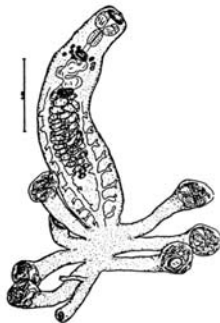


FIG. 8-8. *Choriocotyle lousinensis*, from the gills of southern whiting. (From Hargis. Courtesy of the Transactions of the American Microscopical Society.)

Diplozoon Life Cycle

A parasite of fish

1. forms permanent copulatory pairs.
2. Begins in larvae - knob forms that becomes attached to ventral sucker of another larva.
3. As they grow, penises enter vaginas and the worms are bonded for life.

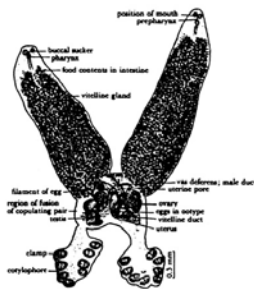


FIG. 8-6. Two *Diplozoon ghanense* in permanent copulation. (From Thomas. Courtesy of the Journal of the West African Science Association.)

Arinoides raphidoma

A parasite of Gulf of Mexico fish.

1. Note **opisthaptor**; adapted for broad attachment of host gill filaments.

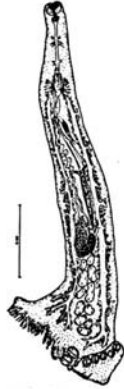
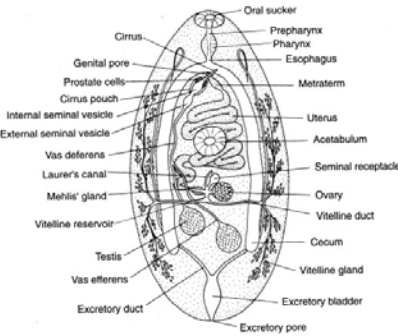


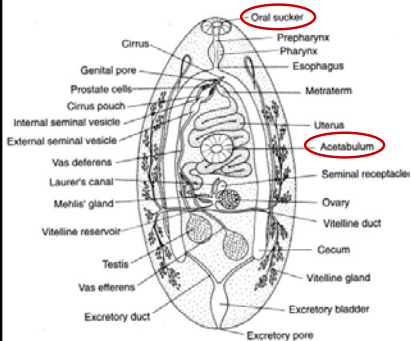
FIG. 8-7. *Arinoides raphidoma*, a monogenetic trematode from Gulf of Mexico fish. (From Hargis, Courtesy of the Proceedings of the Helminthological Society of Washington.)

Class Trematoda

1. Parasitic flukes with many hosts in life cycle.
2. **Endoparasitic** with complex life cycles
3. Over 9000 spp among 2 classes



Class Trematoda



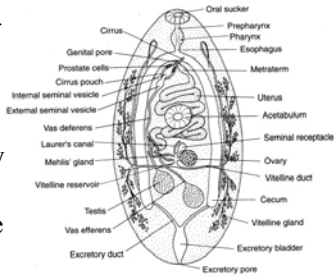
2. General Characteristics:
 - a. Two suckers: oral and ventral (acetabulum).

Class Trematoda

b. Very complicated reproductive tracts.

1. Usually asexual reproduction in intermediate hosts.

2. HUGE fecundity
 a. seems to be associated with life cycles with unpredictable transfer to next stage.



Class Trematoda

5. Internal parasites
 a. integument is specialized for absorption

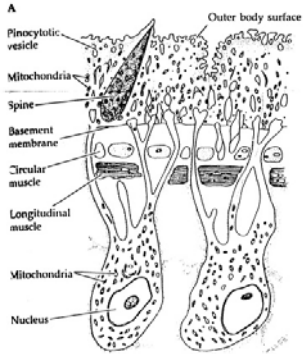
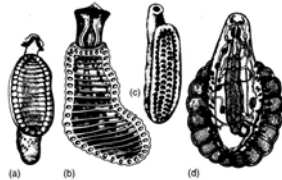


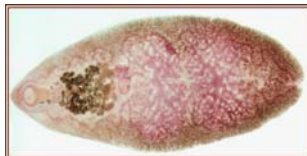
Figure 7
 A, The tegument and underlying body wall of a digenetic fluke *Fasciola hepatica*; longitudinal section). B, The tegument and body wall of a cestode (trans section). (A after L. T. Threadgold, 1965, Q. J. Microsc. Sci. 104; B after Barth and Brodskars 1962.)

Two Major Subclasses

1. **SC. Aspidogastrea** (Aspidobothrea) - single host; occasionally 2, with large sucker.



2. **SC. Digenea** - 2-3 hosts in life cycle usually mollusc, vertebrate, sometimes a plant.



Subclass Aspidogastrea

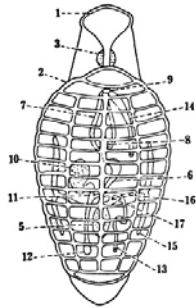
Two major families:

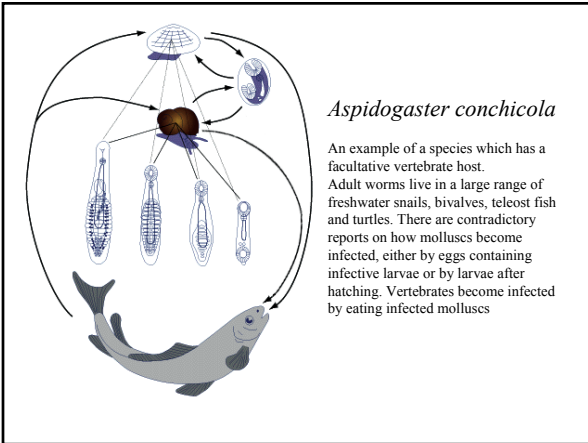
a. Family

Aspidogastridae -
round ventral sucker

1. *Cotlyaspis*,
Aspidogaster- usually
mantle parasites of
clams.

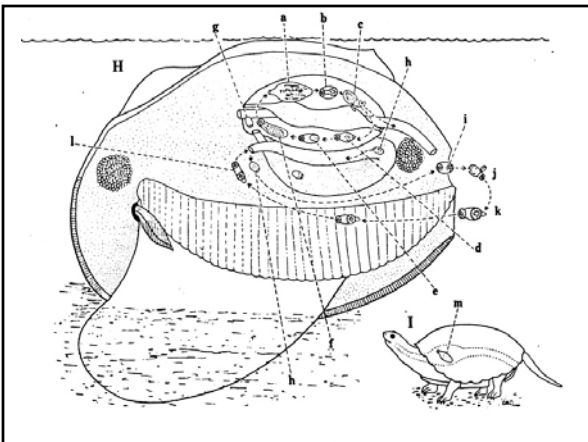
a. But also enter
turtles and frogs.





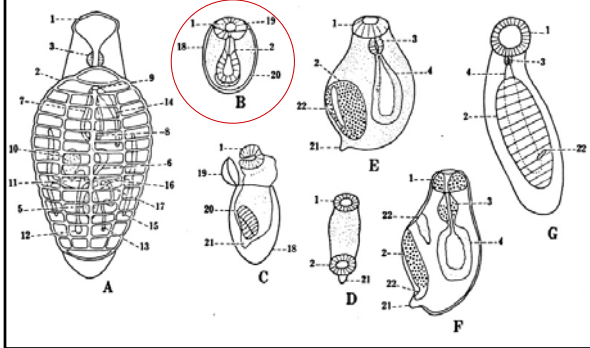
Aspidogaster conchicola

An example of a species which has a facultative vertebrate host. Adult worms live in a large range of freshwater snails, bivalves, teleost fish and turtles. There are contradictory reports on how molluscs become infected, either by eggs containing infective larvae or by larvae after hatching. Vertebrates become infected by eating infected molluscs

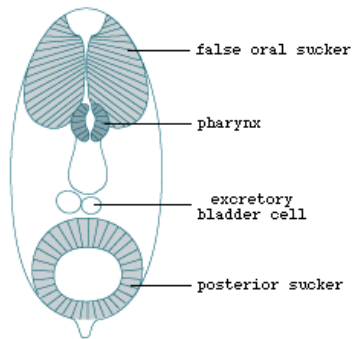


Subclass Aspidogastrea

b. larval stage: *cotylocidium*



Cotylocidium larva



Subclass Aspidogastrea

b. Family

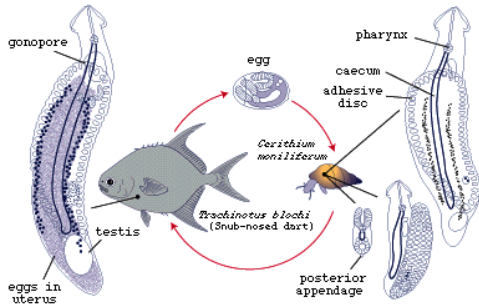
Stichocotylidae -
elongate, slender (10
cm!)

1. inhabit bile ducts
of skates

2. *Stichocotyle*



Life cycle of *Lobatostoma manteri*.

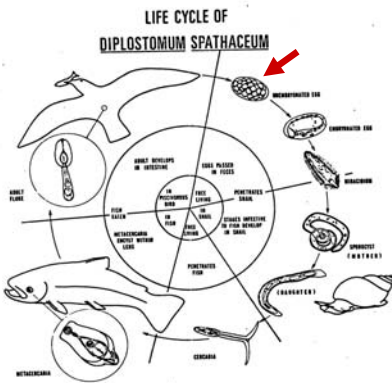


Subclass Digenea

1. 2-3 hosts in life cycle
usually mollusc,
vertebrate, sometimes a
plant.



Generalized life
cycle – a gull
parasite.
Egg ->
miracidium ->
sporocyst ->
redia -> cercaria
->
metacercaria ->
adult.



Trematode Eggs

“Eggs” are really zygotes. They are assembled in the *ootype* (Mehlis’ gland).

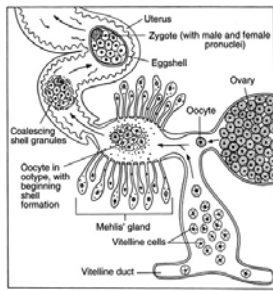
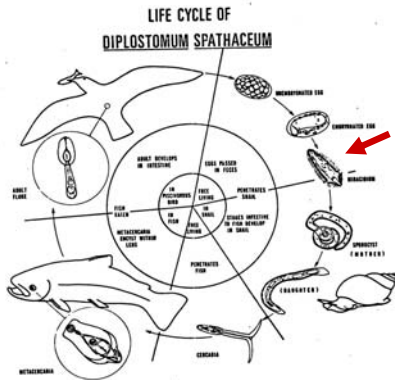


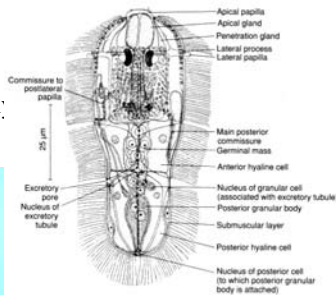
Figure 15.18 Schematic representation of the oogenotop of a digenetic trematode. Drawing by William Ober and Claire Gustison.

Generalized life cycle – a gull parasite.
 Egg -> miracidium -> sporocyst -> redia -> cercaria -> metacercaria -> adult.

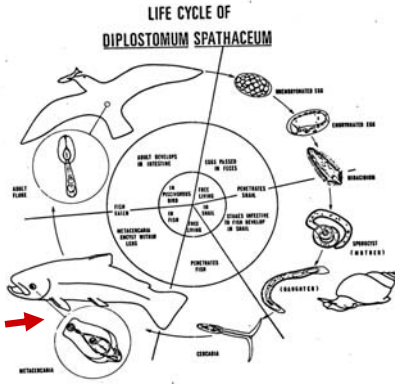


Miracidia

Hatch out of eggs, usually when they contact water; then locate a mollusc, usually a snail.

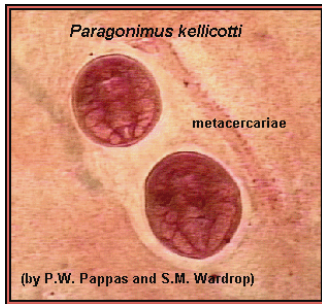


Generalized life cycle – a gull parasite.
 Egg ->
 miracidium ->
 sporocyst ->
 redia -> cercaria
 ->
 metacercaria ->
 adult.

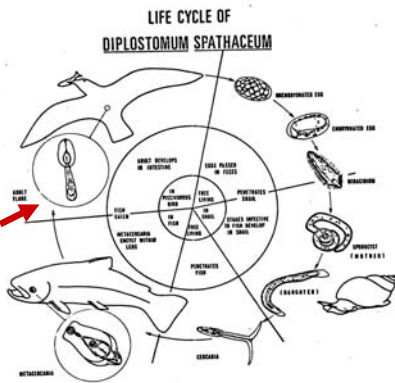


Metacercariae

Cercariae find a suitable host and form a resistant resting stage; cysts may form on or within the intermediate host.



Generalized life cycle – a gull parasite.
 Egg ->
 miracidium ->
 sporocyst ->
 redia -> cercaria
 ->
 metacercaria ->
 adult.



When the definitive host ingests the metacercaria, the metacercaria excysts and matures into an adult worm.

Adult Worm

