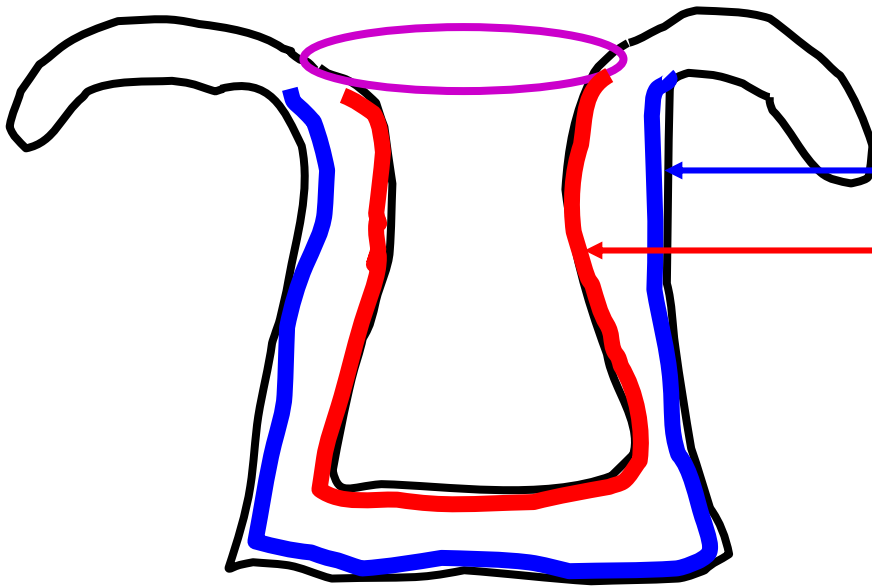


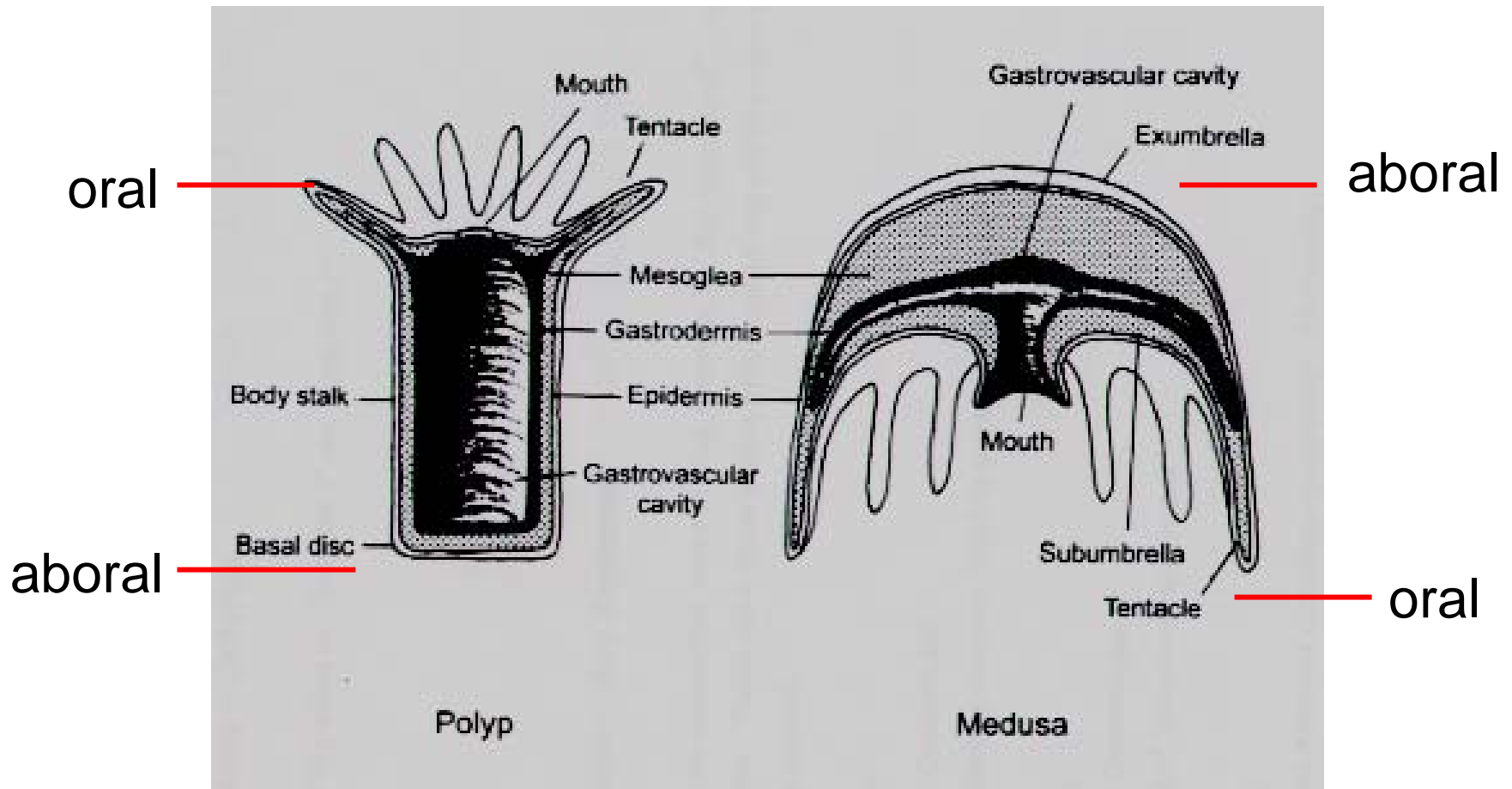
General Body Plan



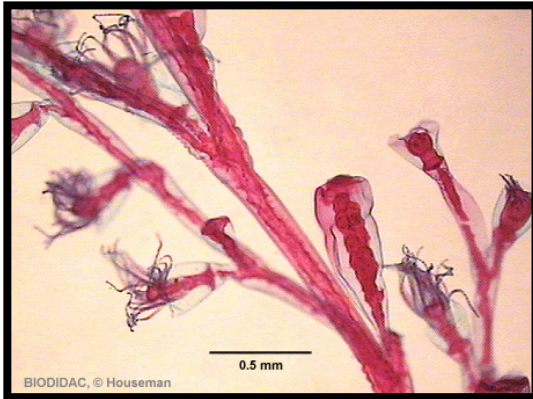
- Diploblastic
 - epidermis
 - gastrodermis
- Tissue
- Radially symmetrical
- Cnidocytes

General Body Plan

Dimorphism: 2 different body forms are usually present in the life cycle:



3 Classes



- Hydrozoa: polyp dominant
- Scyphozoa: medusa dominant
- Anthozoa: no medusa



The Acoelomates



- Trploblastic animals without a coelom



Acoelomate Characteristics: Triploblastic

3 Embryonic Germ Layers

endoderm 

mesoderm 

ectoderm 

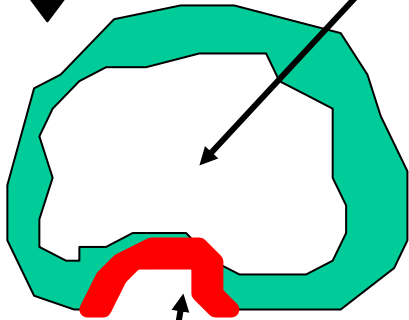
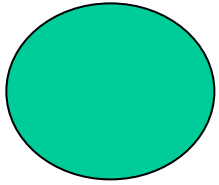
3 Tissue Layers

gastrodermis

mesoderm/
mesenchyme

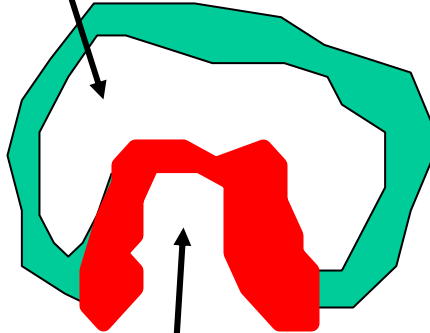
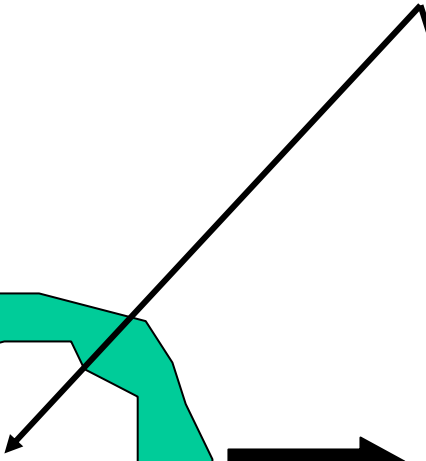
epidermis

zygote

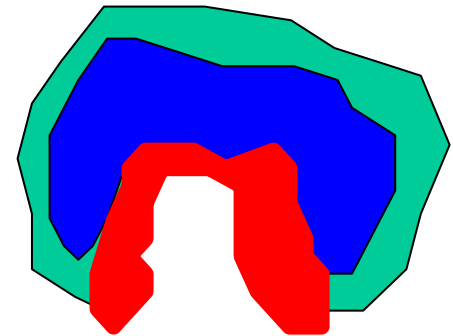
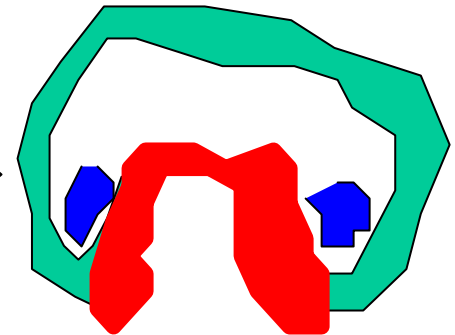


blastopore

blastocoel



archenteron

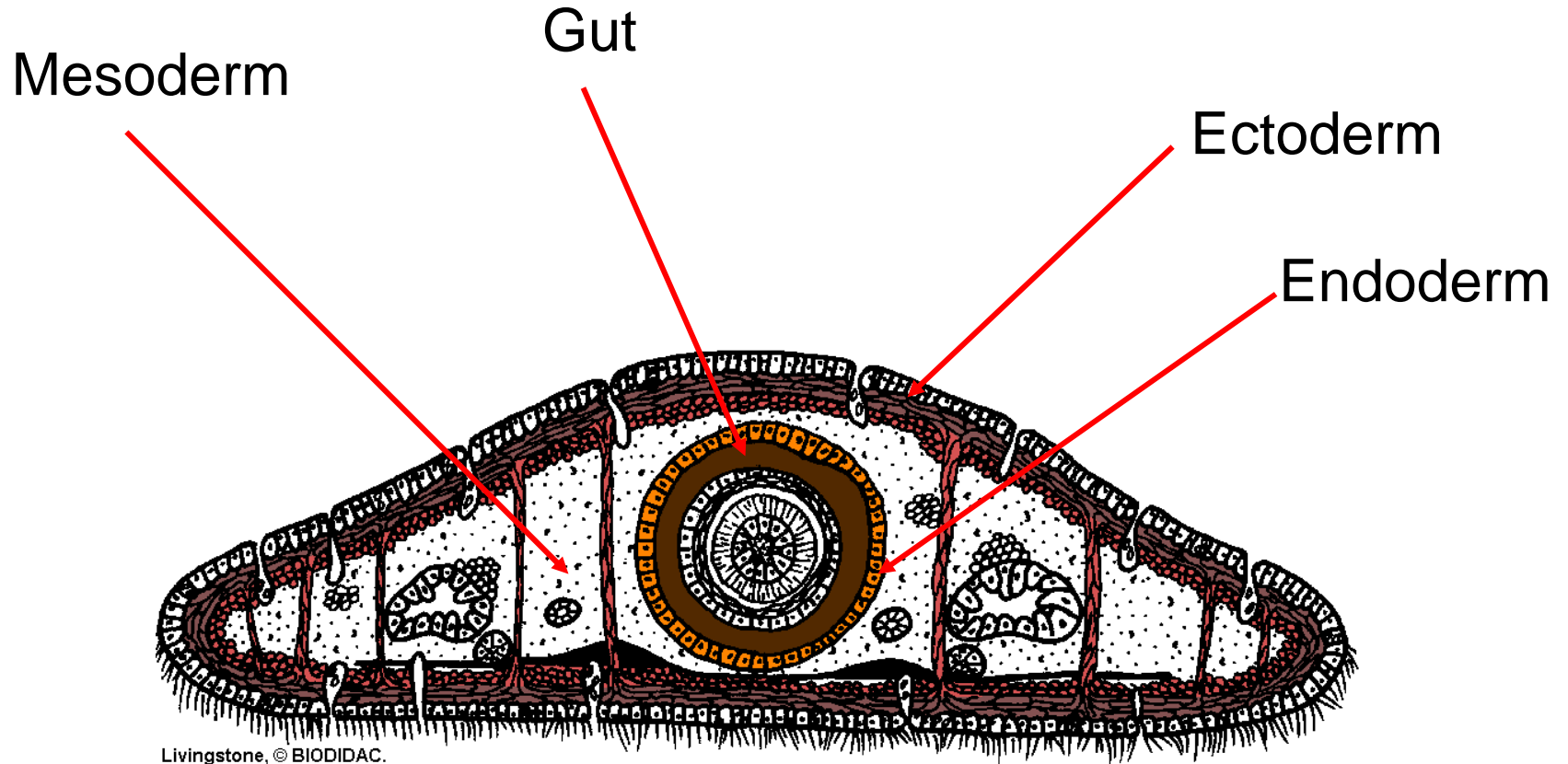


ectoderm

endoderm

mesoderm

Acoelomate Characteristics: Triploblastic



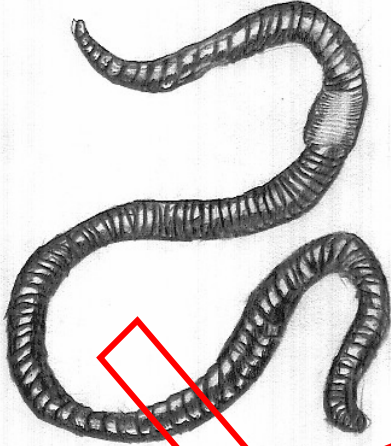
Acoelomate Characteristics:

No coelom

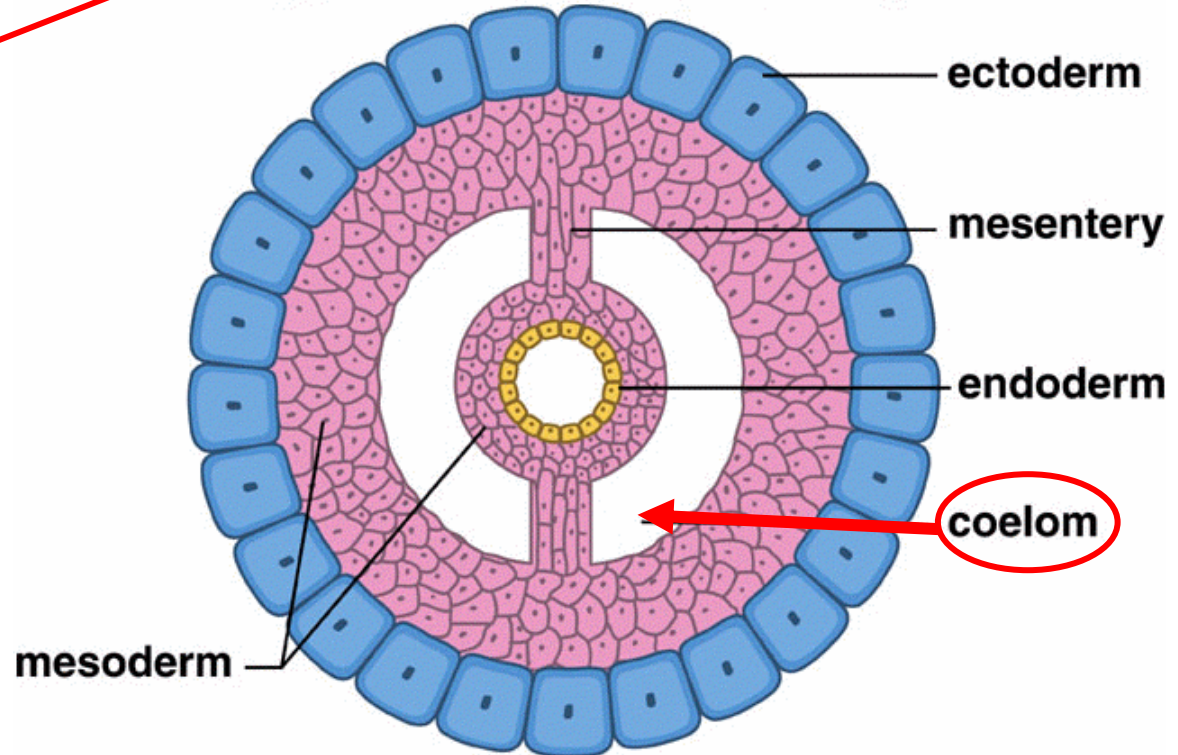
What is a coelom?

A body cavity that is completely surrounded by mesodermal tissue. A coelom is not open to the outside of the animal.

What is a coelom?

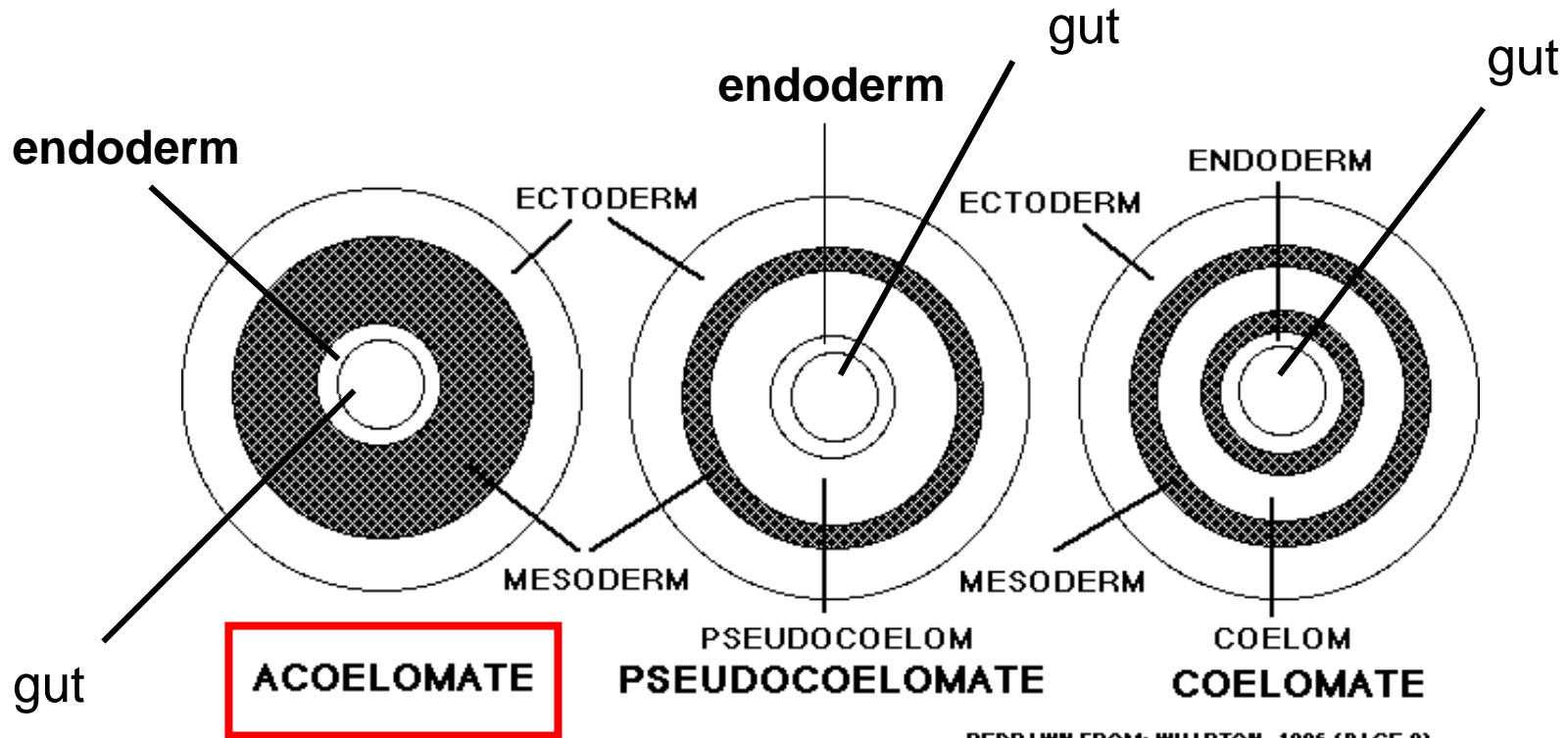


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c. Coelomate molluscs annelids arthropods
echinoderms chordates

Acoelomate Characteristics: No coelom

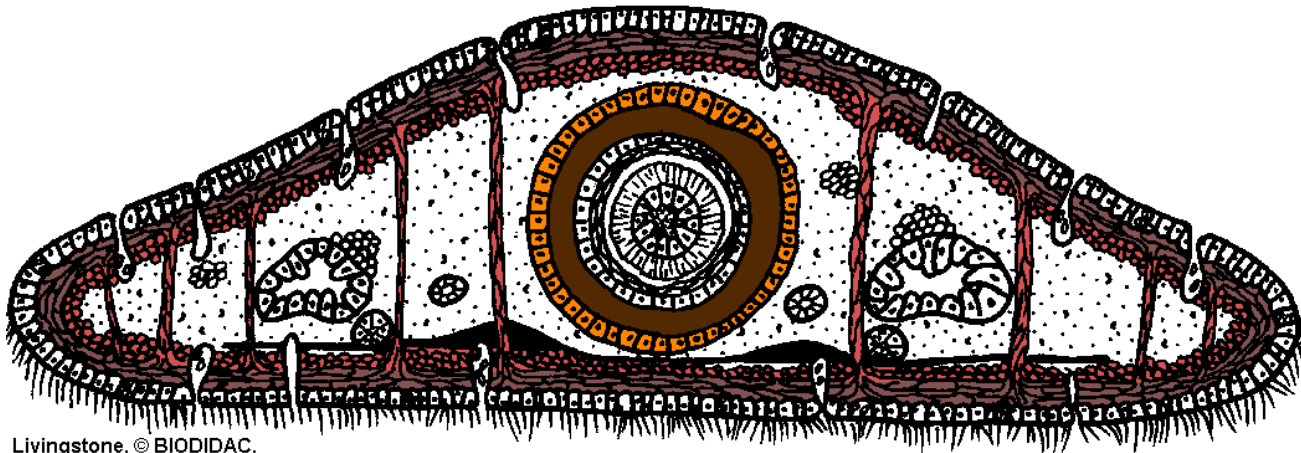


REDRAWN FROM: WHARTON, 1986 (PAGE 9)

Acoelomate Characteristics: Level of Organization

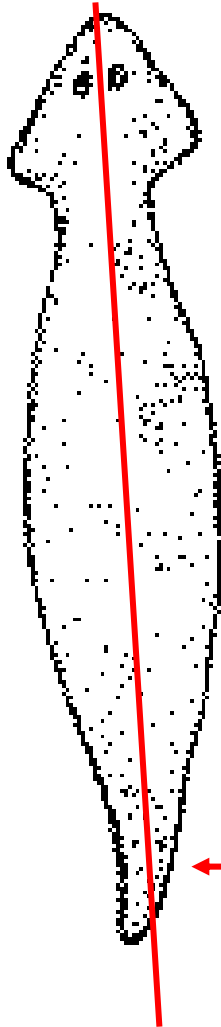
Organ

- Tissues are organized into organs
- mesodermal tissue gives rise to many organs



Acoelomate Characteristics: Body Plan

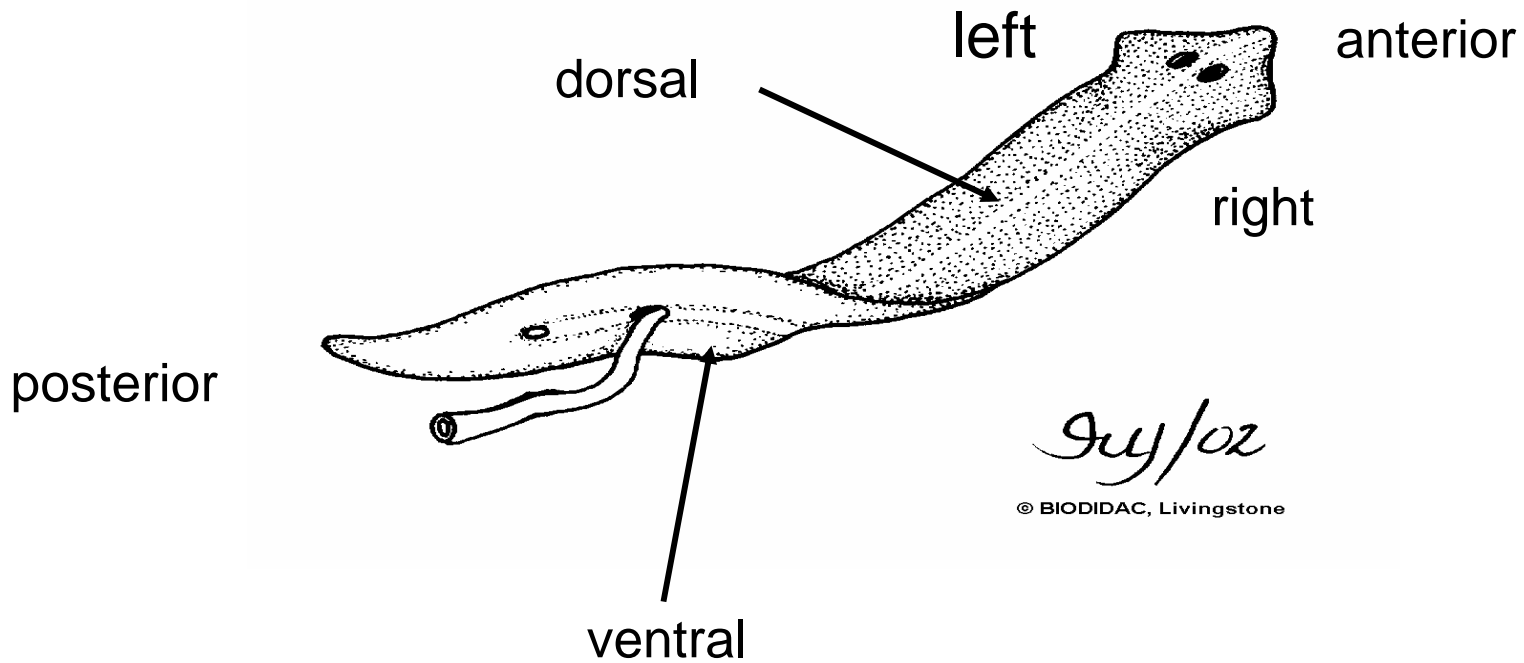
Bilateral Symmetry



← Anterior: toward the front of the body

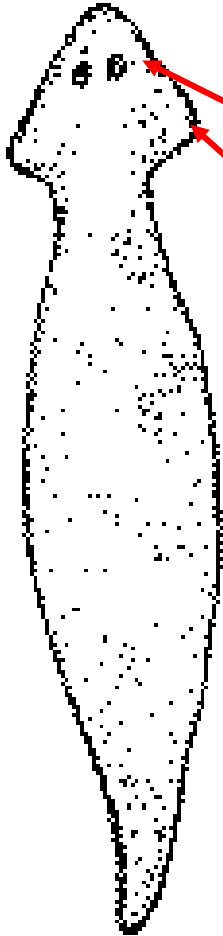
← Posterior: toward the rear of the body

Acoelomate Characteristics: Body Plan



Body Plan

Cephalization: the concentration of sensory organs in the head of the animal

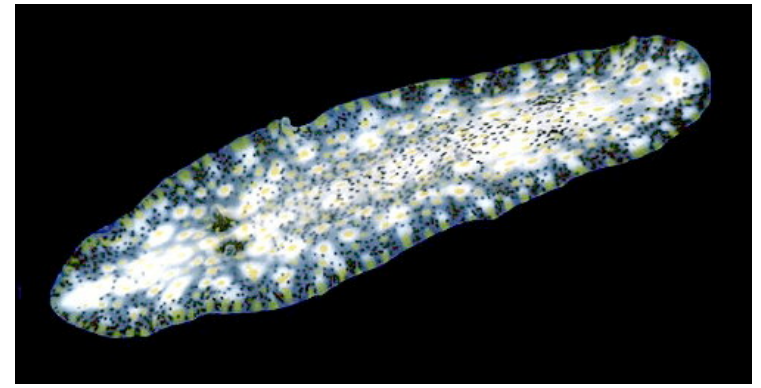


Eye spots: photosensitive organs

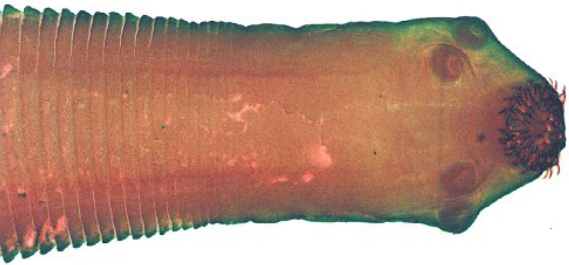
Auricles: chemosensory organs

Acoelomate Phyla

1. Gnathostomulida
2. **Platyhelminthes**
3. **Nemaerthea**



Phylum Platyhelminthes



the flatworms



Phylum Platyhelminthes:



- Mostly aquatic, although there are a few terrestrial species.
- Most are small (a few mm), but some can grow to be several meters long.
- Many are endoparasites of vertebrates.

Feeding and Digestion

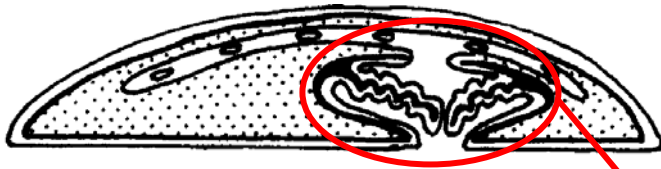
Feeding

- Free-living, carnivorous

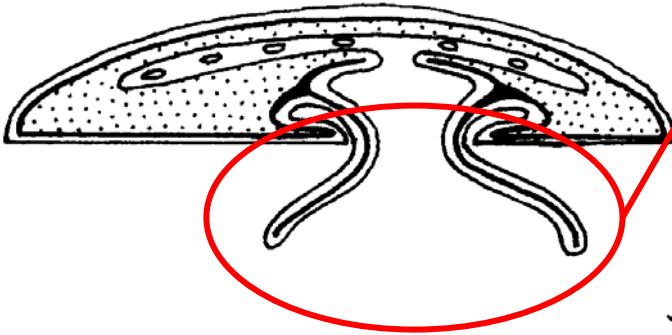


Many predatory forms have a pharynx that is used to capture prey

Feeding and Digestion



Pharynx: the pharynx is an extension of the gut that can be extruded through the mouth.

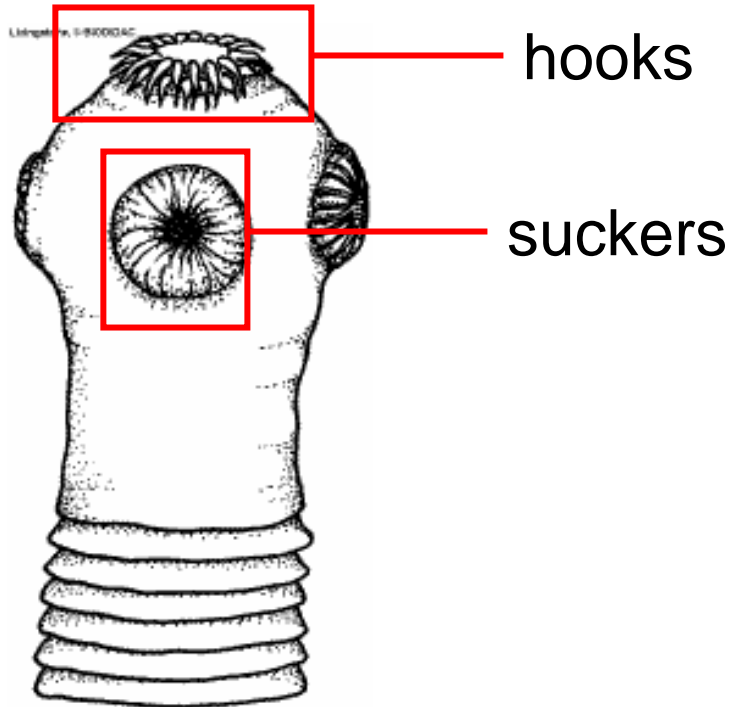


9/4/98

Feeding and Digestion

Feeding

– parasitic

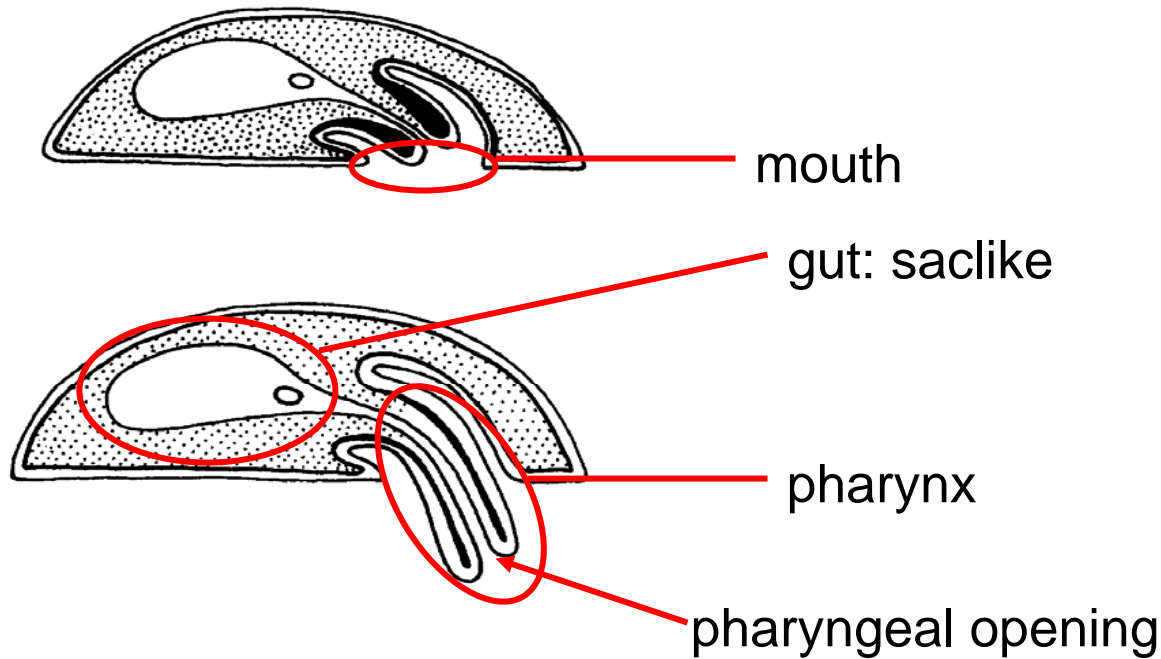


Parasitic forms often have modified feeding structures (e.g. the anterior end of a tapeworm)

Feeding and Digestion

Digestion

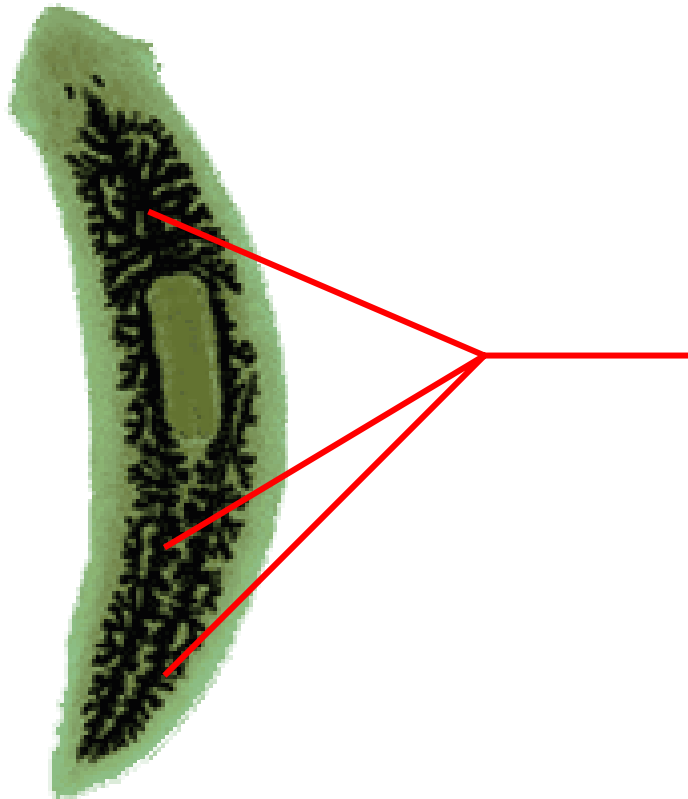
– incomplete digestive system



Feeding and Digestion

Digestion

– many forms have a branched gut



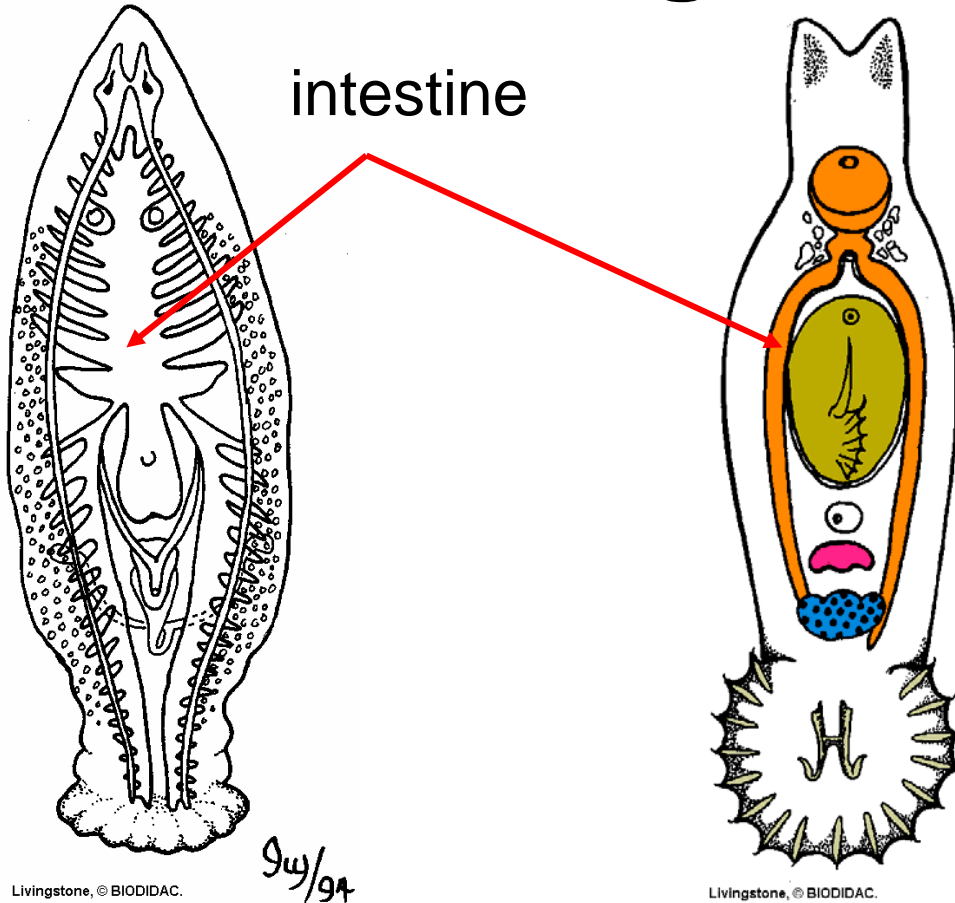
The trilobed gut of a planarian.

Feeding and Digestion

Digestion

- the digestive system is reduced (or absent) in many parasitic forms

Feeding and Digestion

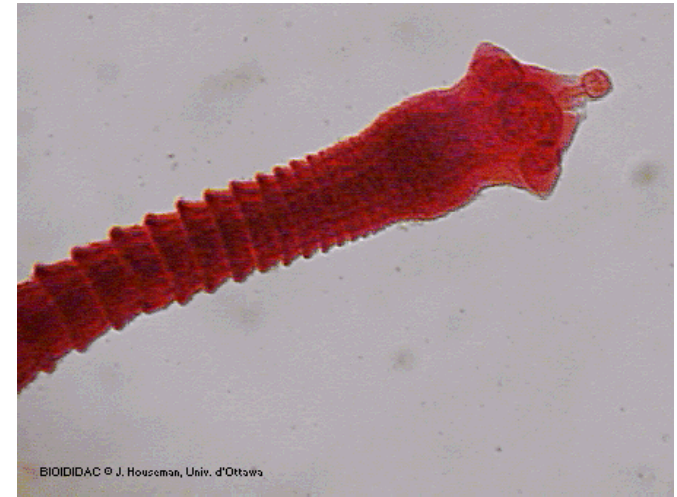


Bdelloura candida

Free-living:
branched gut

Grylodactylus

liver fluke:
relatively
unbranched gut



Taenia pisiformis

intestinal parasite

NO DIGESTIVE SYSTEM !

Feeding and Digestion

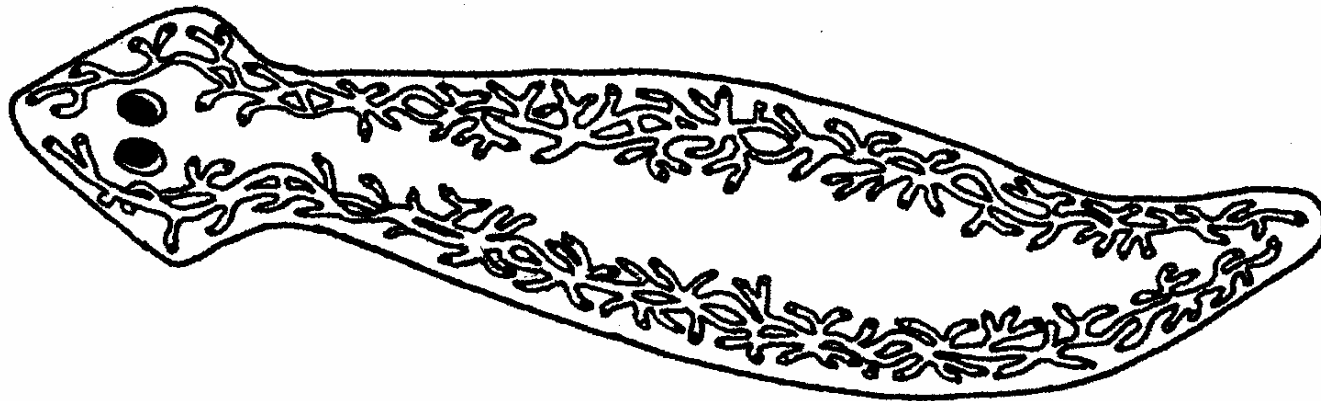
Digestion

- extracellular (in the intestine)
 - proteolytic enzymes released by gastrodermal tissues
- intracellular
 - phagocytosis by gastrodermal cells

Osmoregulation and Excretion

Osmoregulation: the maintenance of salt/water balance

- Protonephridia and flame cells



Osmoregulation and Excretion

Protonephridia

Protonephridia: a system of tubules used to collect fluid and transport it to the outside of the body

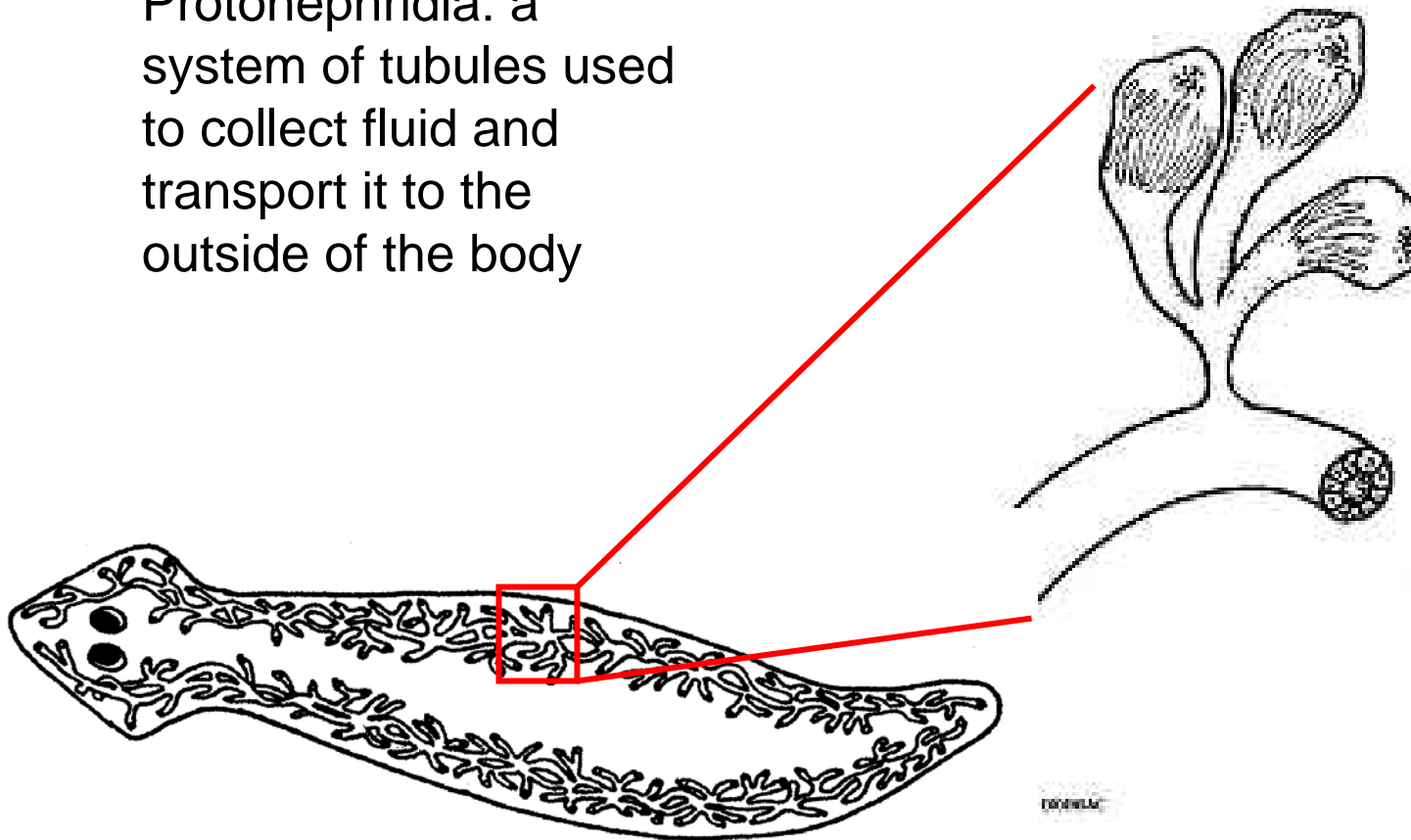
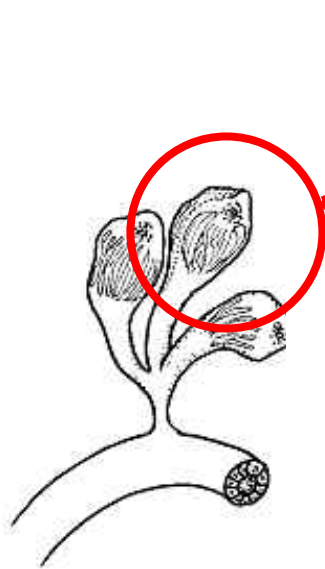


FIGURE 14.14

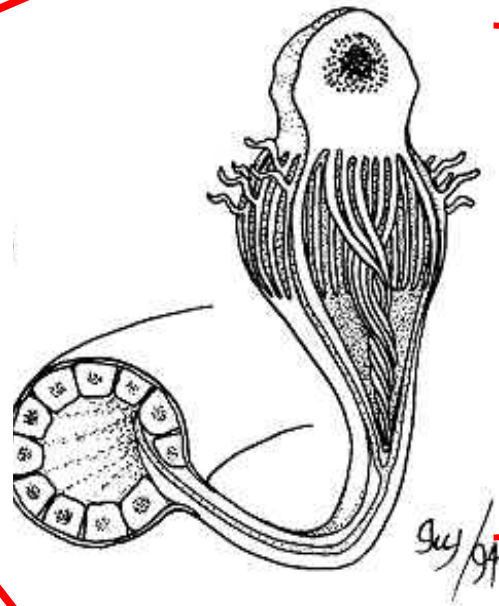
Bec/01

Stritch, © BIODIDAC

Osmoregulation and Excretion



Langenhove, © 2009/10/10
protonephridia



flame cell

The beating of the flame cell cilia creates negative pressure which pulls fluid out of the body

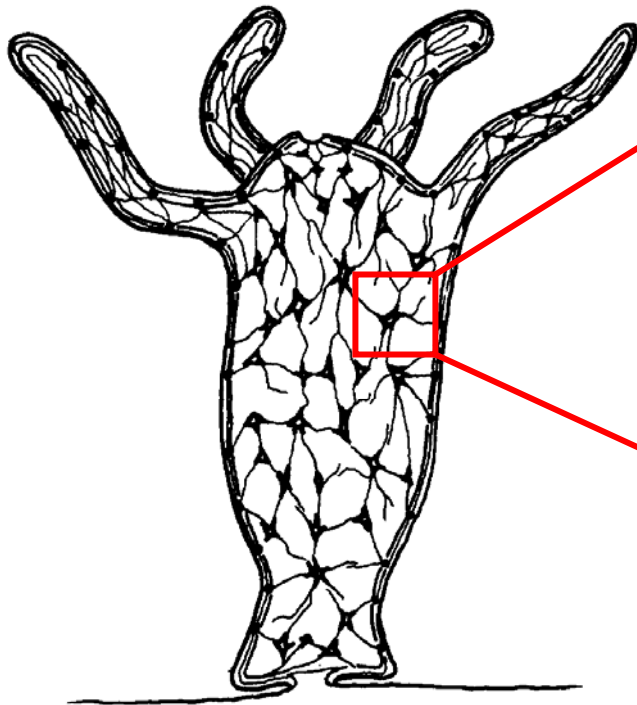
Osmoregulation and Excretion

Excretion

- Diffusion of waste

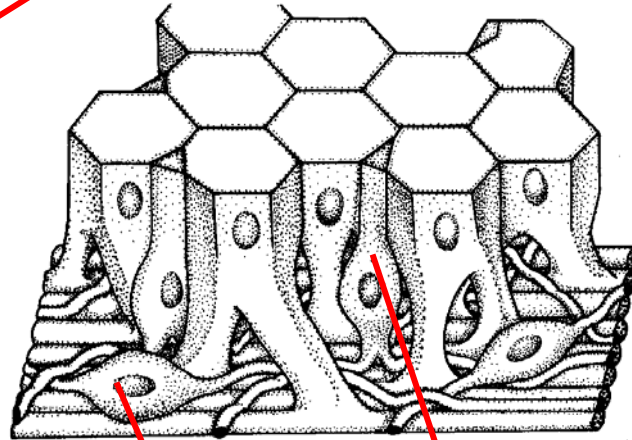
Nervous System

The Cnidarian nerve net:



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Livingstone, © BIODIDAC



Livingstone, © BIODIDAC

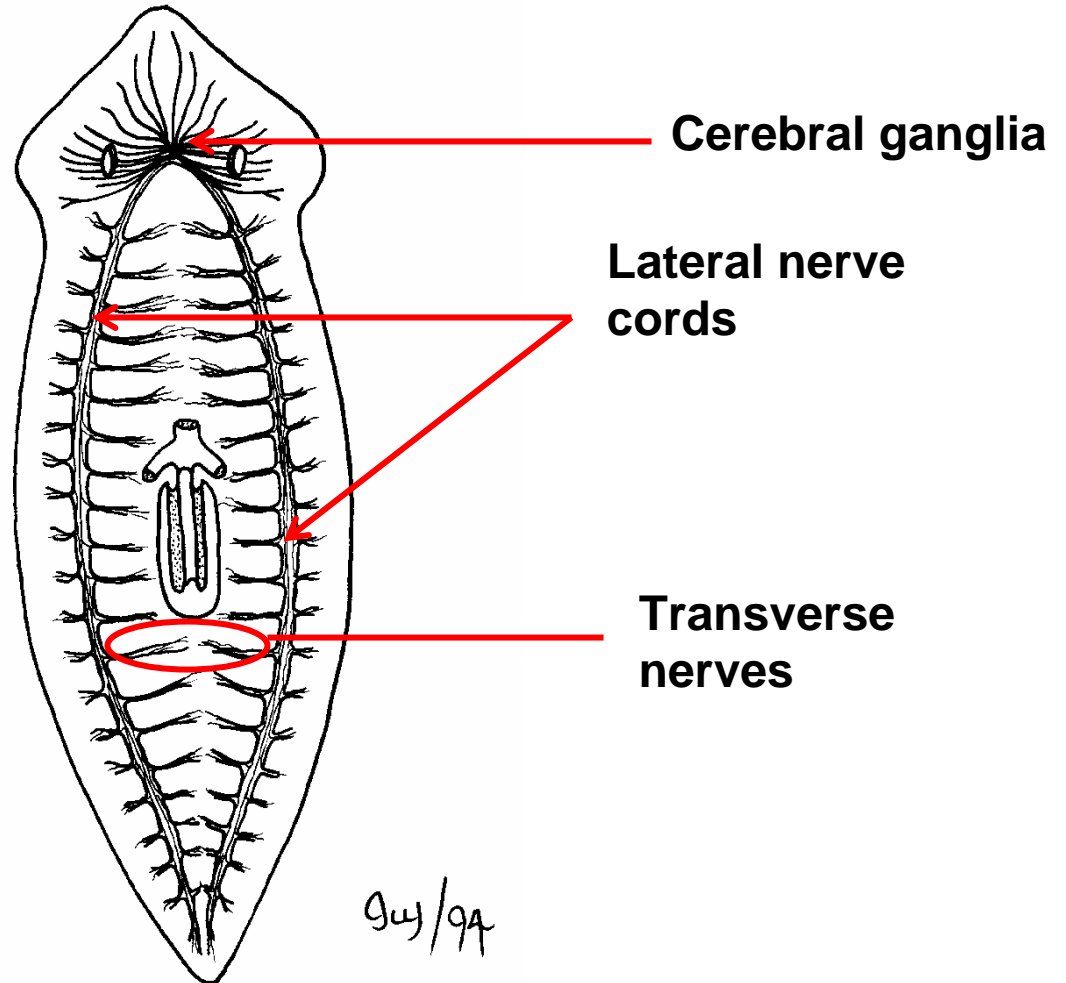
9/4/94

neuron

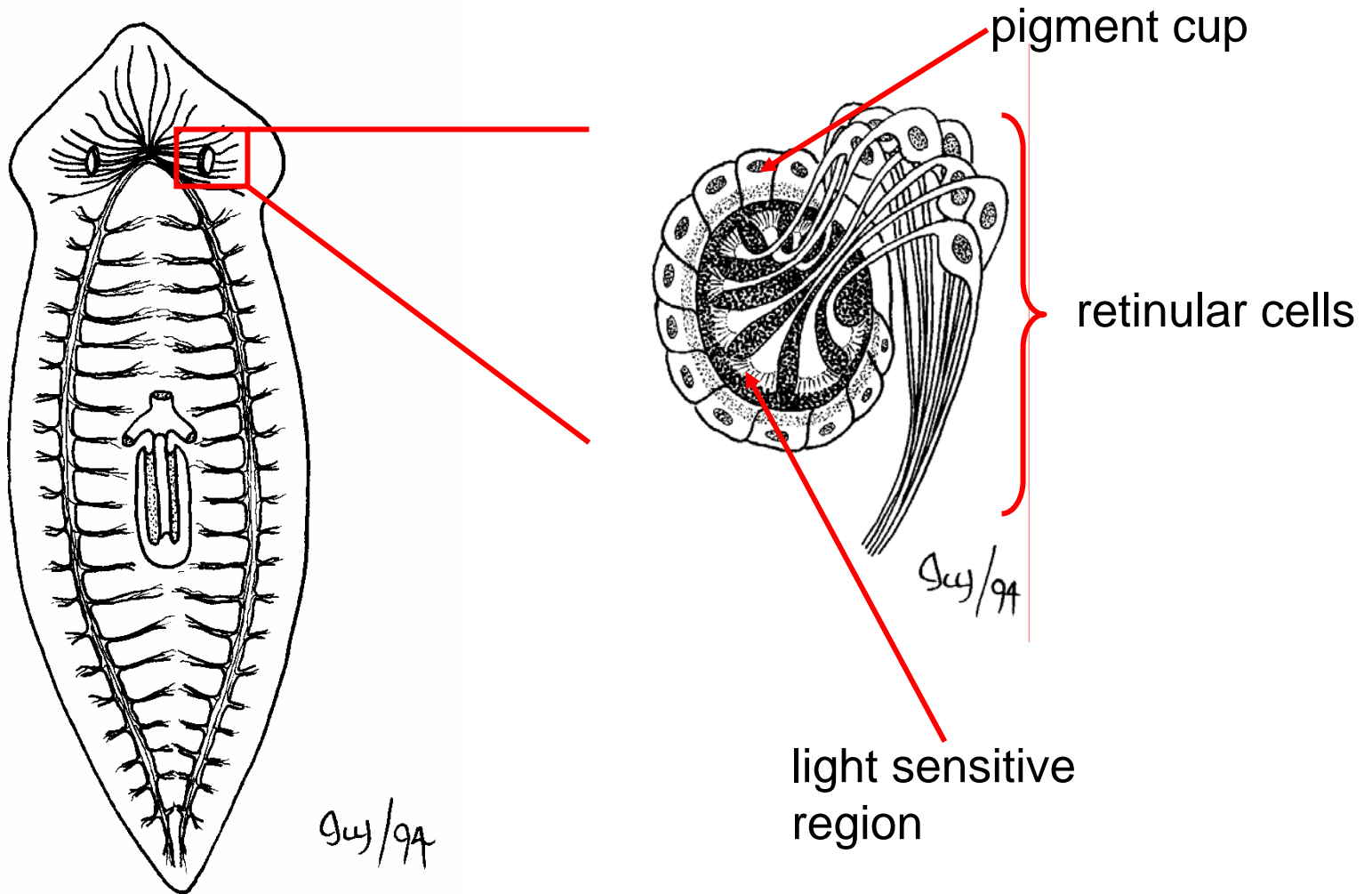
receptor

Nervous System

Platyhelminthes have a more complex nervous system



Nervous System



Support and Locomotion

Skeletal System

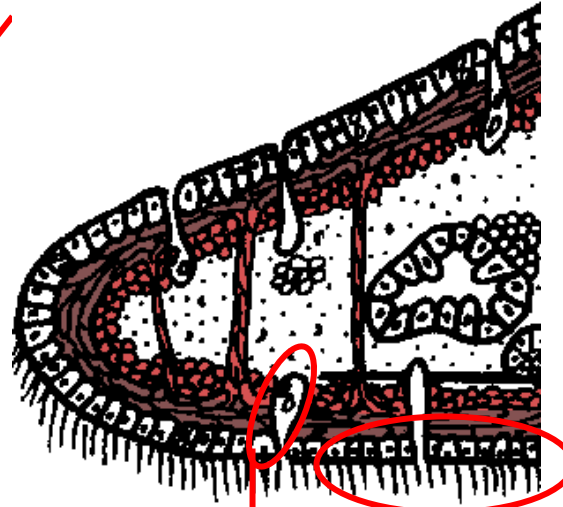
- No skeletal system

Locomotion

Many small flatworms crawl on “slime trails” using cilia.



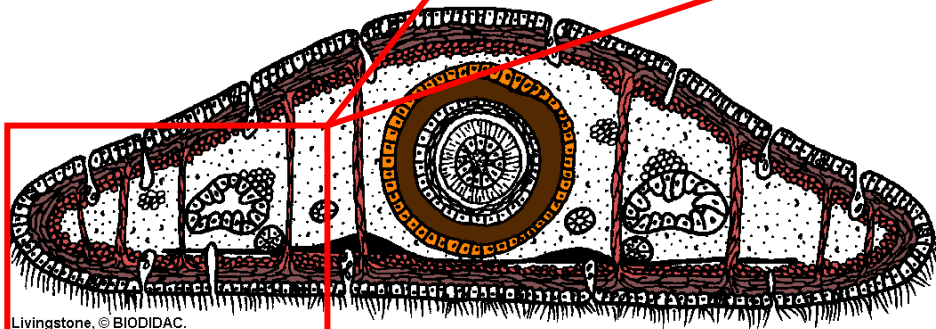
Locomotion



Livingstone, © BIODIDAC.

rhabdites:
produce
mucus

cilia on the
dorsal
epidermis



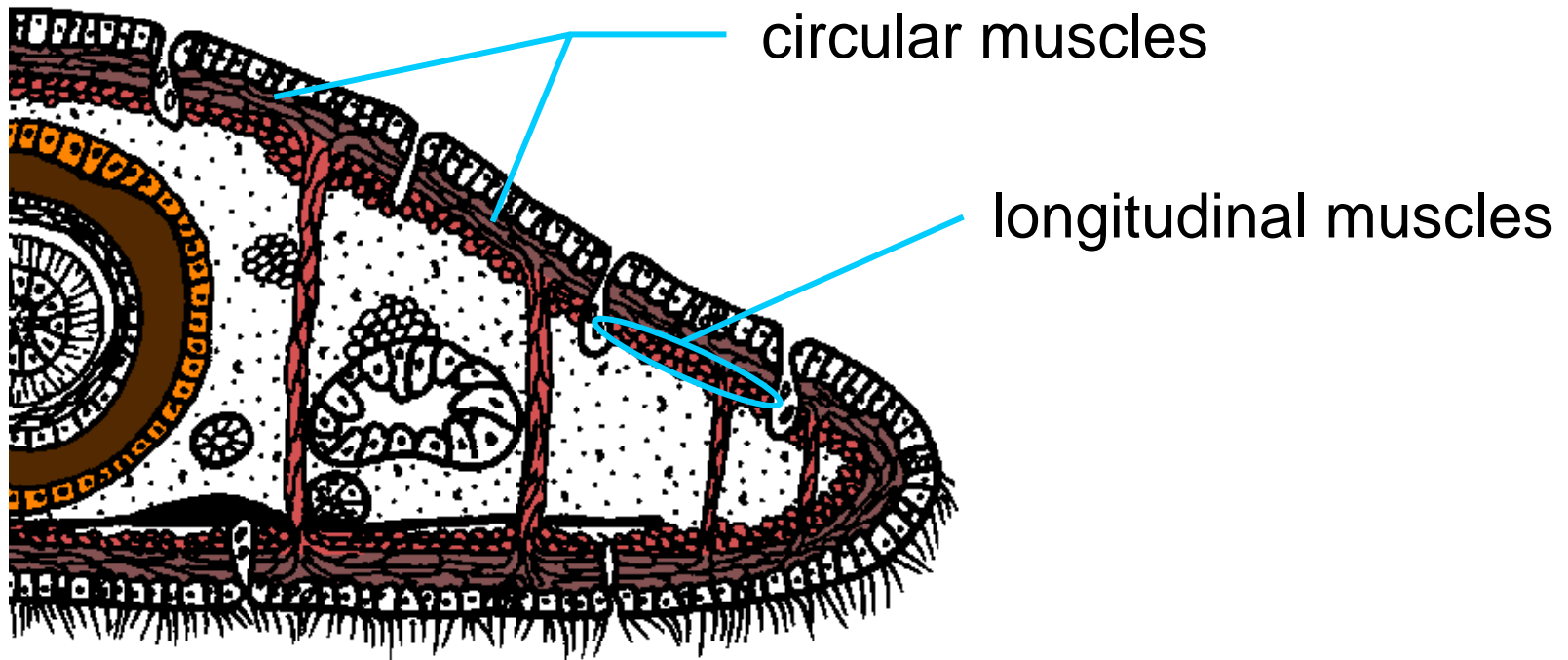
Livingstone, © BIODIDAC.

Locomotion

Large species use circular and longitudinal muscles to swim.



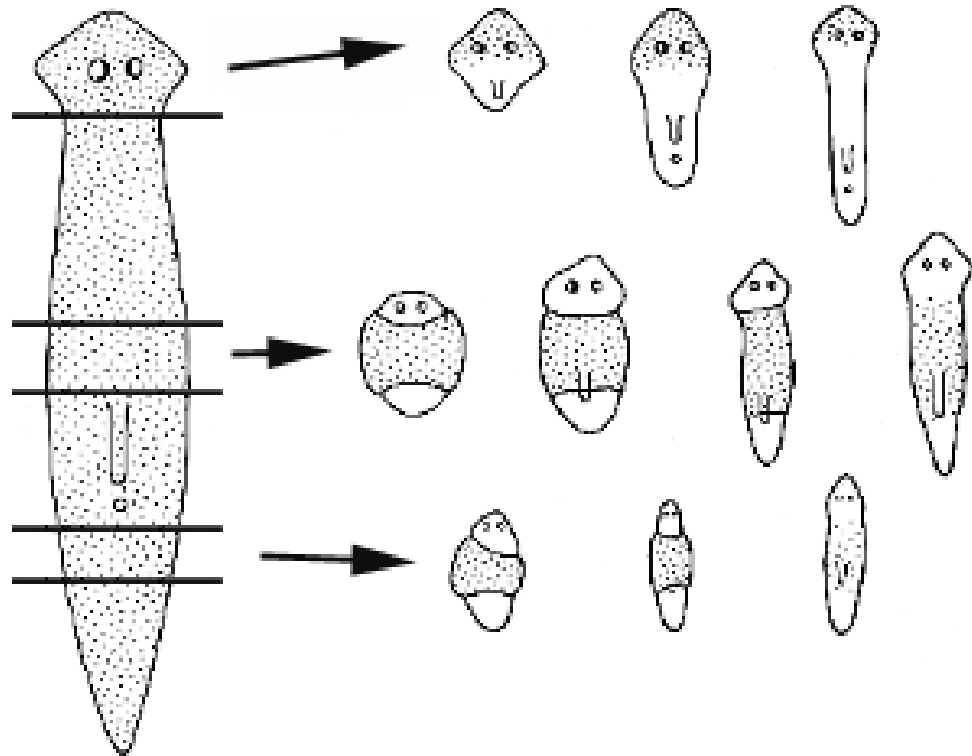
Locomotion



Reproduction

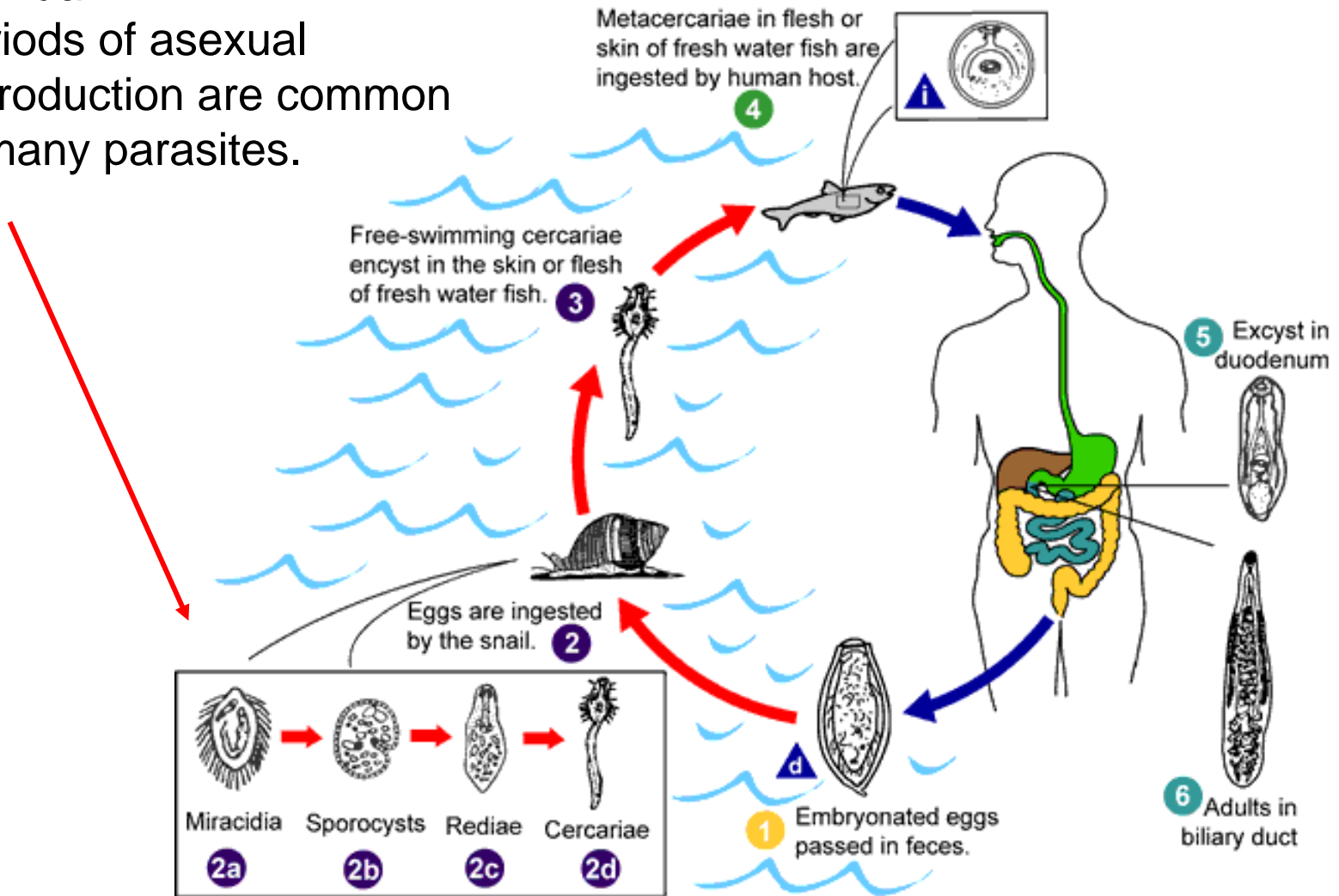
Asexual: fission

many flatworms are capable of reproducing asexually by constricting their bodies and separating into two individuals



Reproduction

Asexual
Periods of asexual
reproduction are common
in many parasites.



Reproduction

Sexual

- usually monoecious, but most must cross fertilize
- Internal fertilization (usually reciprocal sperm transfer)



Phylum Platyhelminthes

Class Turbellaria

Class Trematoda

Class Cestoda

} parasitic

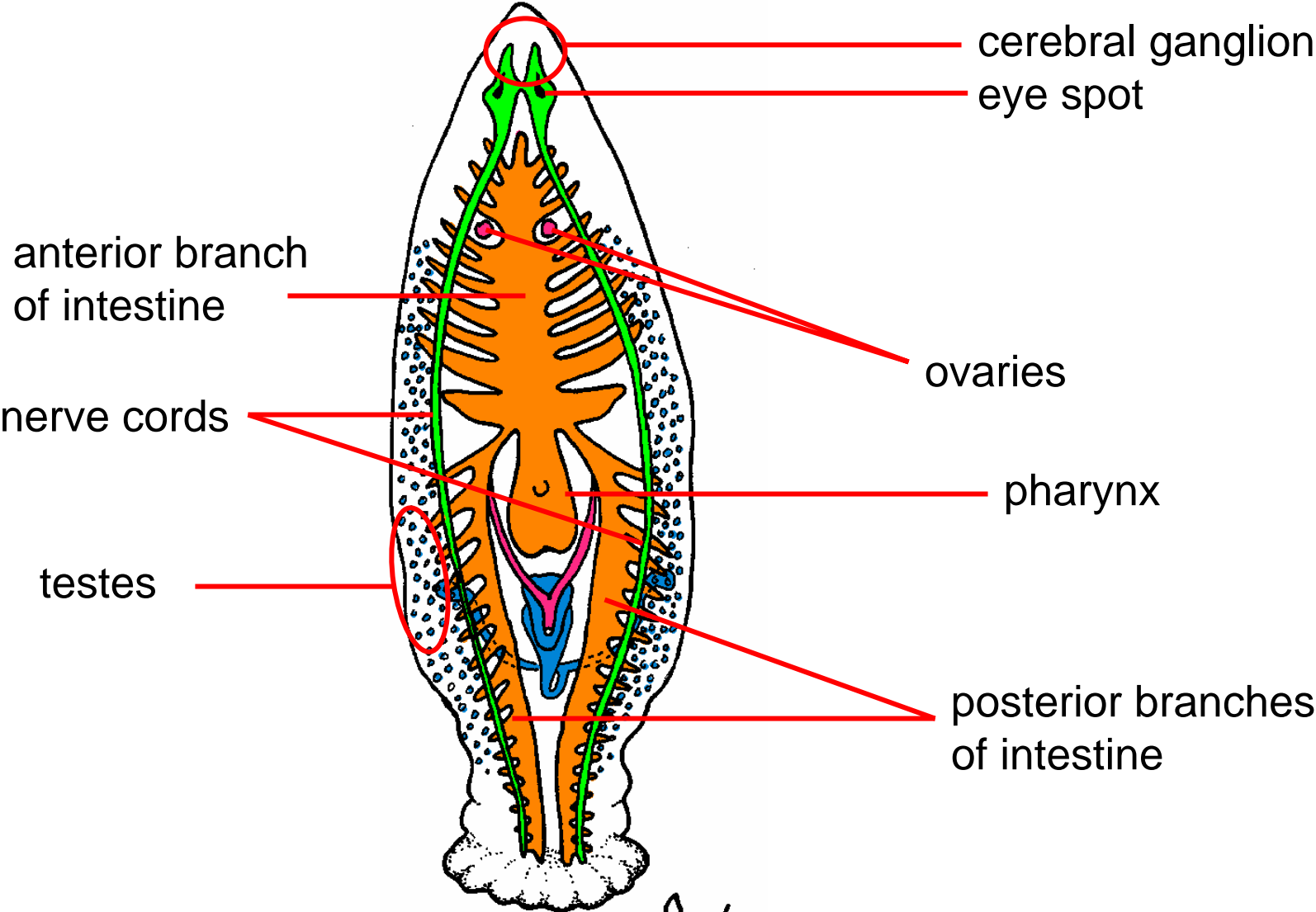
Class Turbellaria



**Free-living
flatworms**

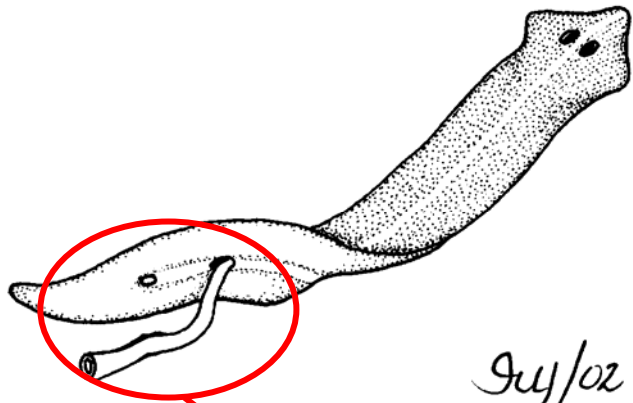


Body Plan

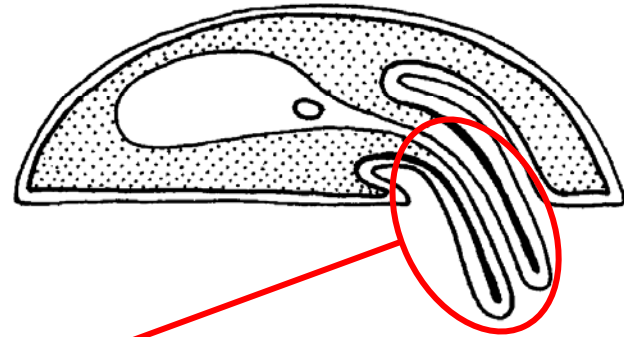
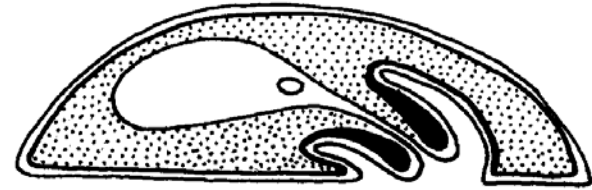


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Digestive System



Juy/02
© BIODIDAC, Livingstone



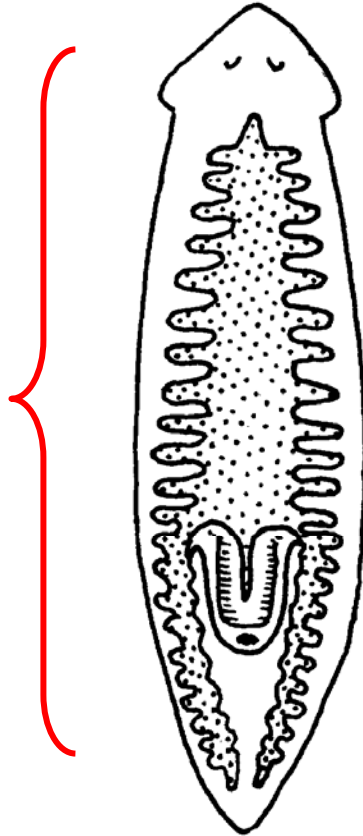
I. Livingstone © BIODIDAC

pharynx

Juy/98

Digestive System

triclad



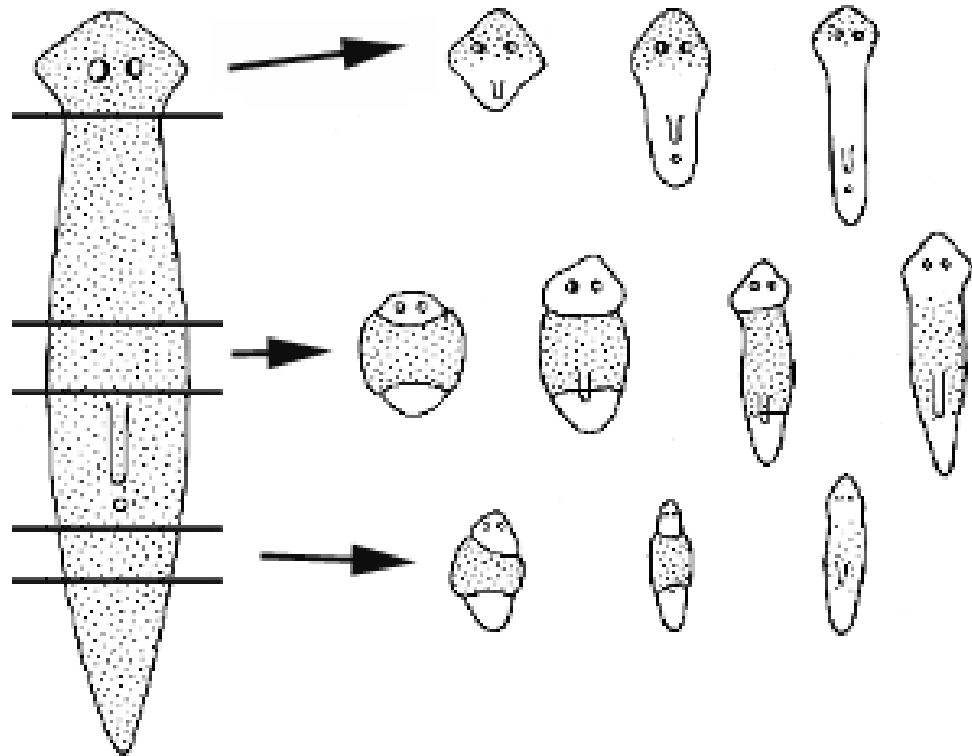
polyclad



Reproduction

Asexual: fission

many flatworms are capable of reproducing asexually by constricting their bodies and separating into two individuals



Reproduction

Sexual

- Internal fertilization
- Simple life cycle



Phylum Platyhelminthes

Class Turbellaria

Class Trematoda

Class Cestoda

} parasitic

Adaptations for Parasitism

Increased reproductive potential

The presence of adhesion organs

Poorly developed sensory systems

Reduced or absent digestive system

Resistant cuticle

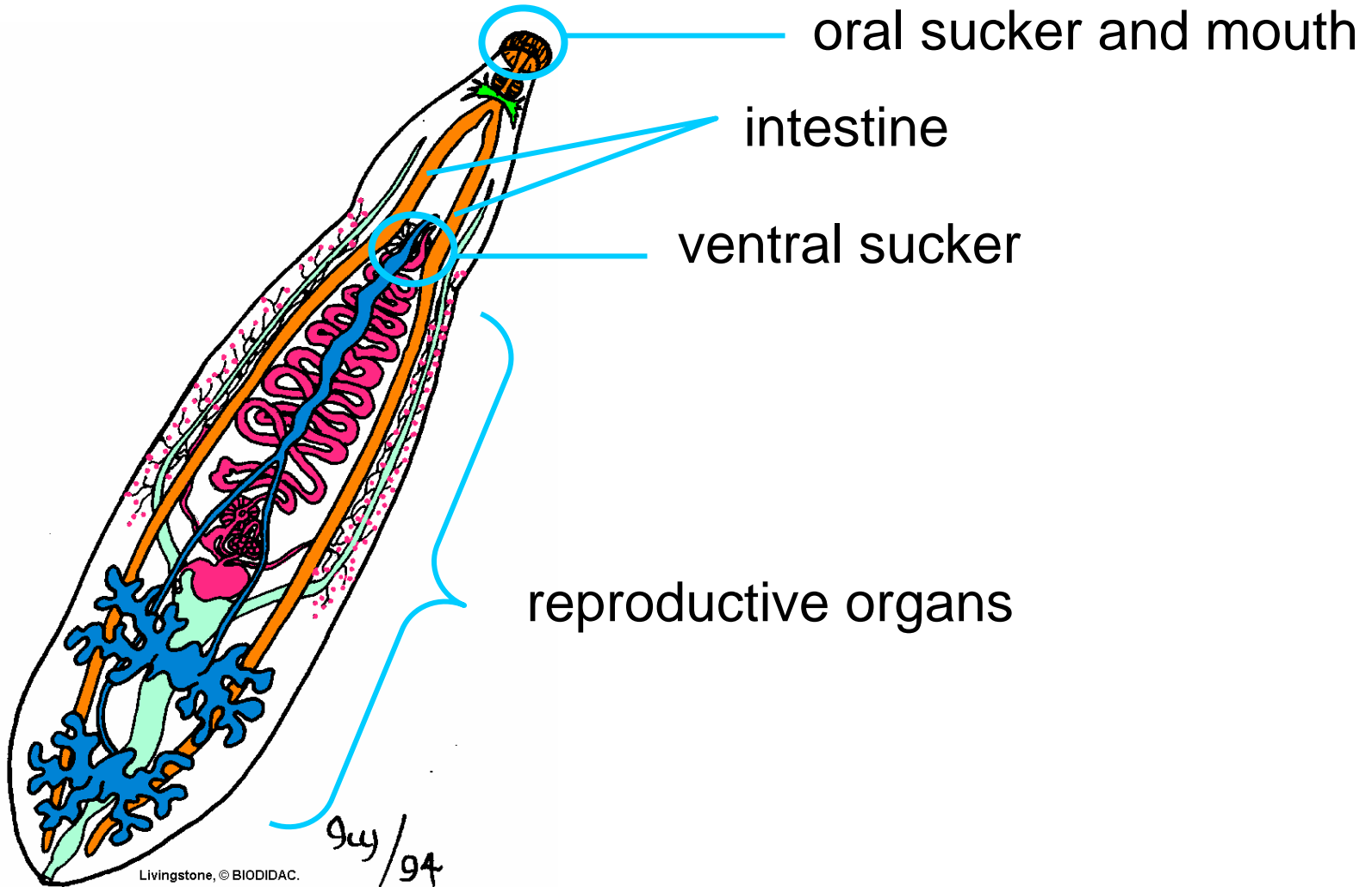
Complex life cycles

Class Trematoda

Parasitic Flukes
Endoparasites of many animals



Body Plan

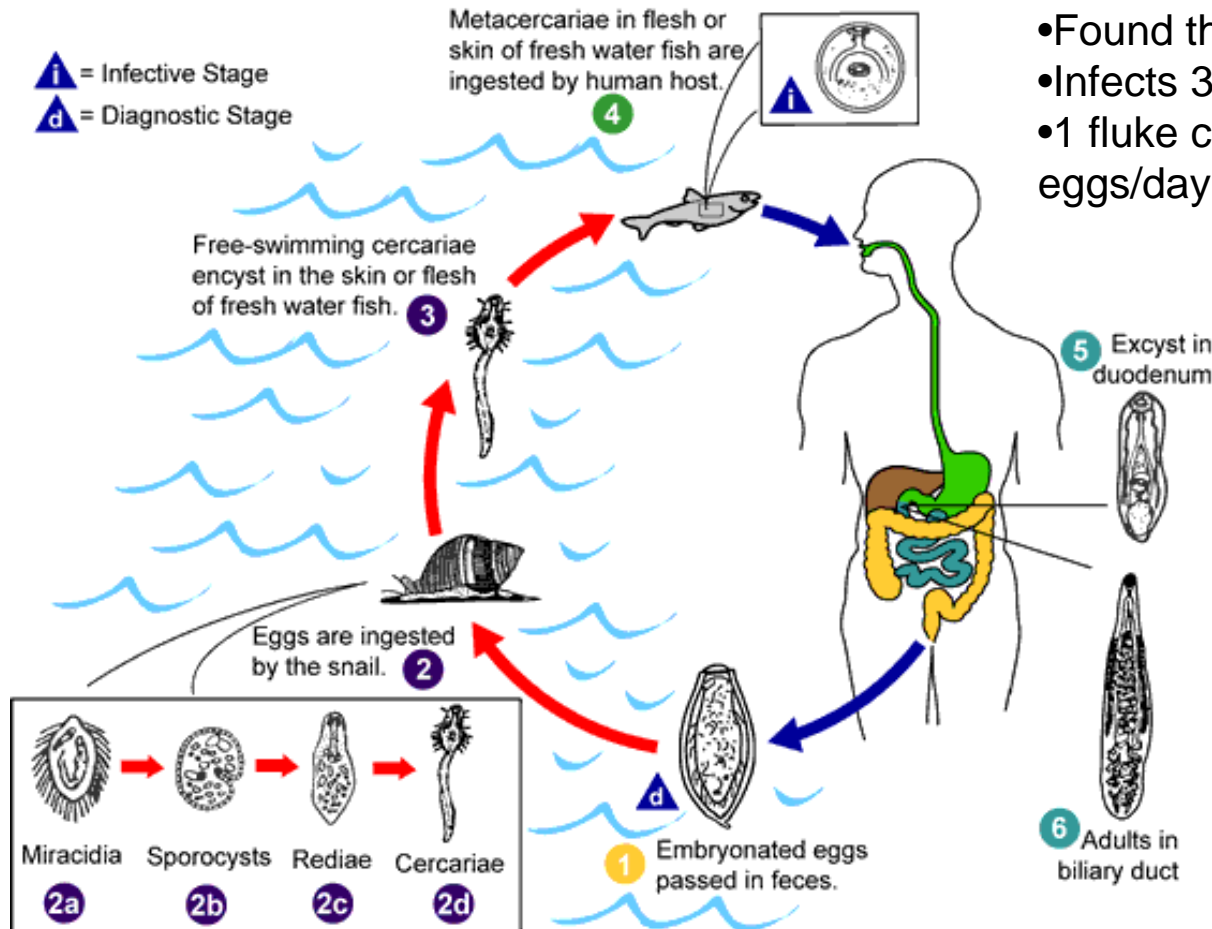


Complex Life Cycle

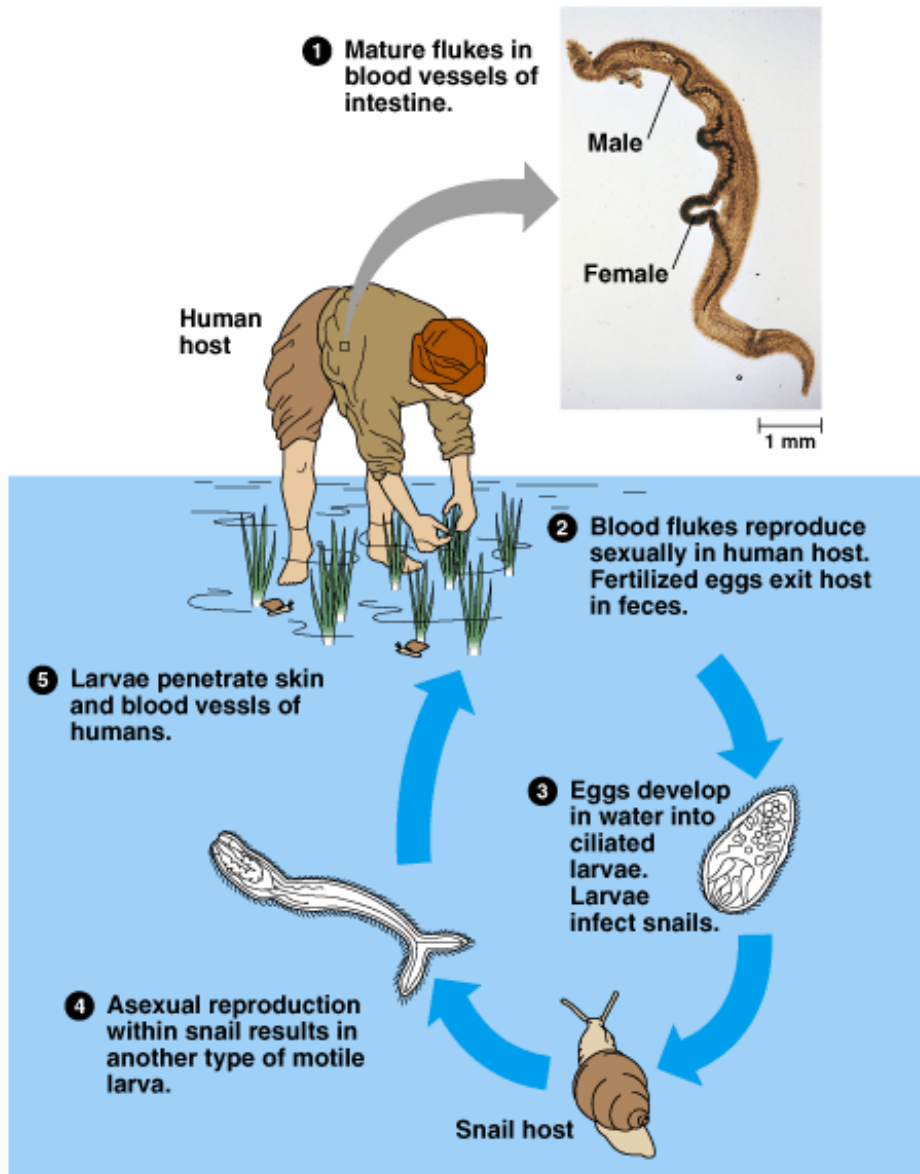
Most Trematodes have at least two hosts in their life cycle: e.g. the Chinese liver fluke

Clonorchis:

- Found throughout Asia
- Infects 30 million people
- 1 fluke can produce 4000 eggs/day and live for > 8 years

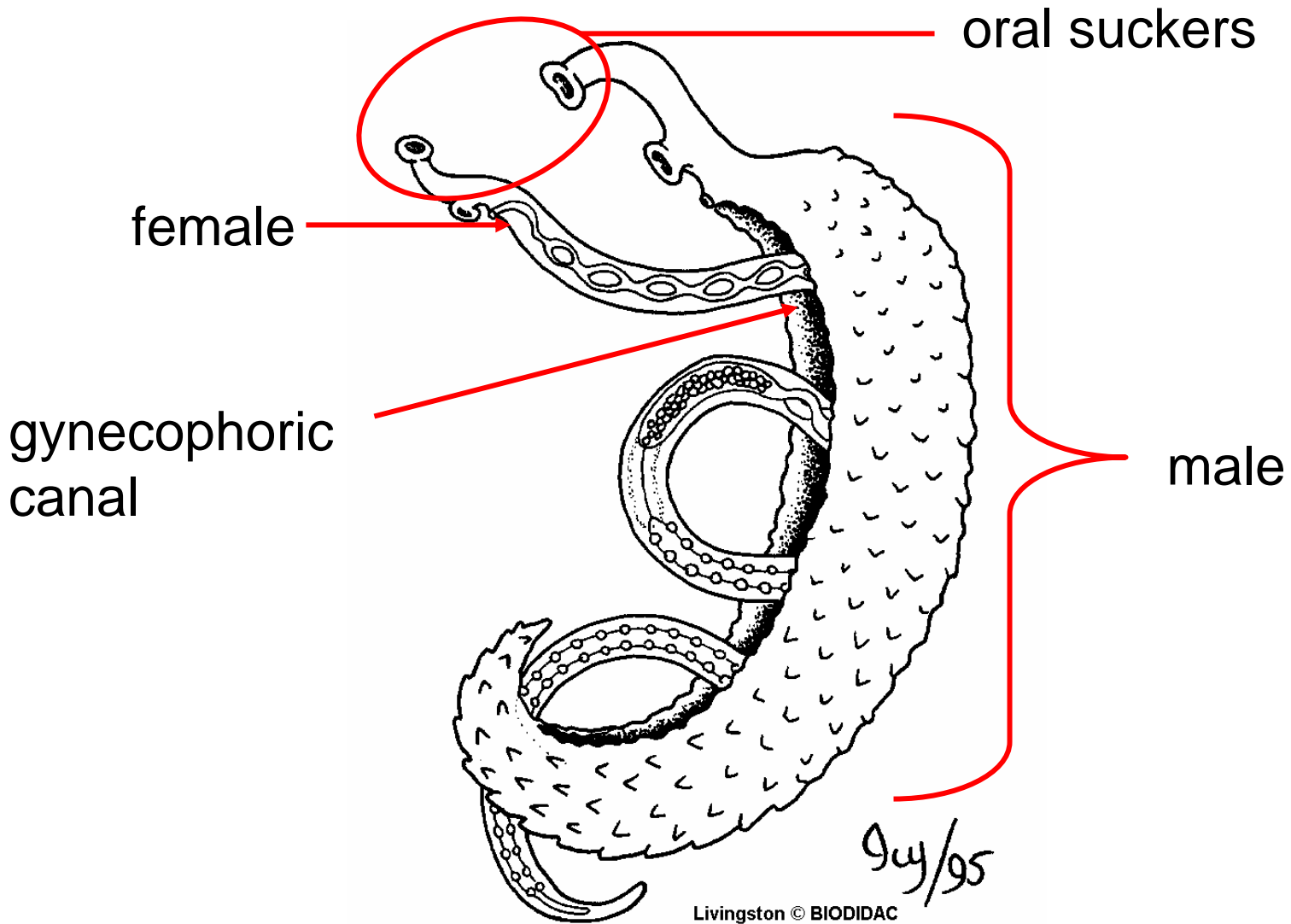


Complex life cycles: another example



Schistosoma:

- Found throughout Africa and South America
- Infects 200 million people

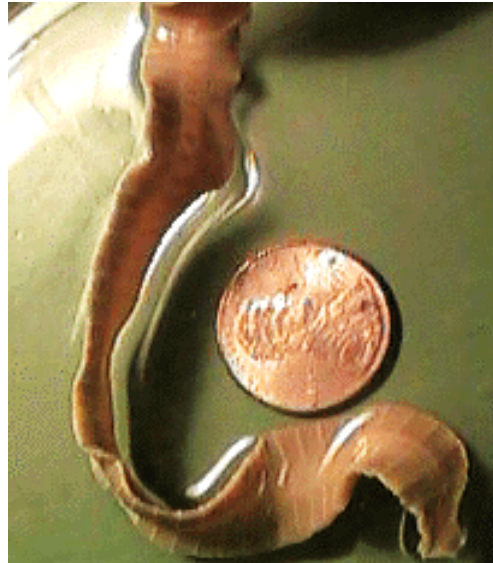




The creation of the Aswan Dam led to an epidemic of schistosomiasis.

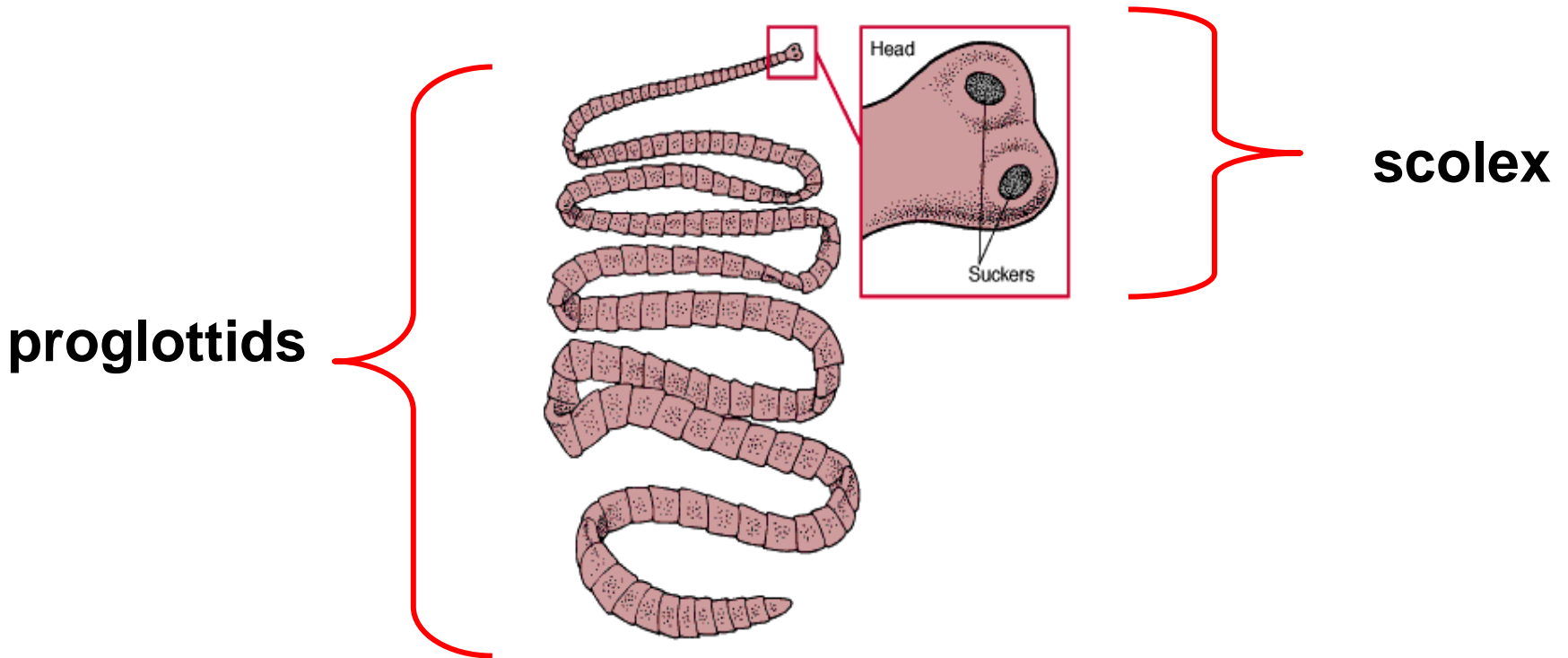
About 50 % of Egyptians living near the dam are now infected.

Class Cestoda

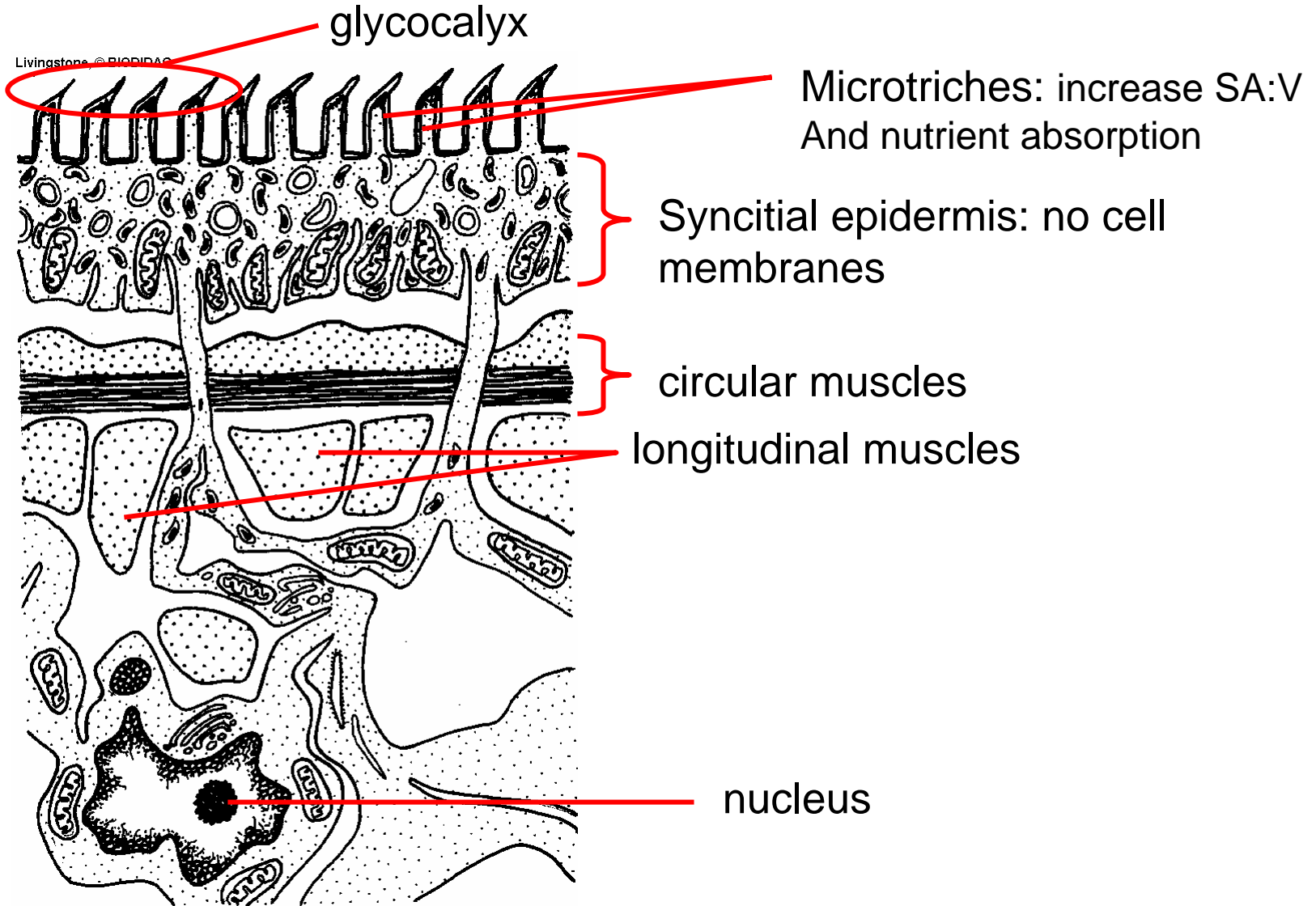


Body Plan

2 body regions: scolex and proglottids



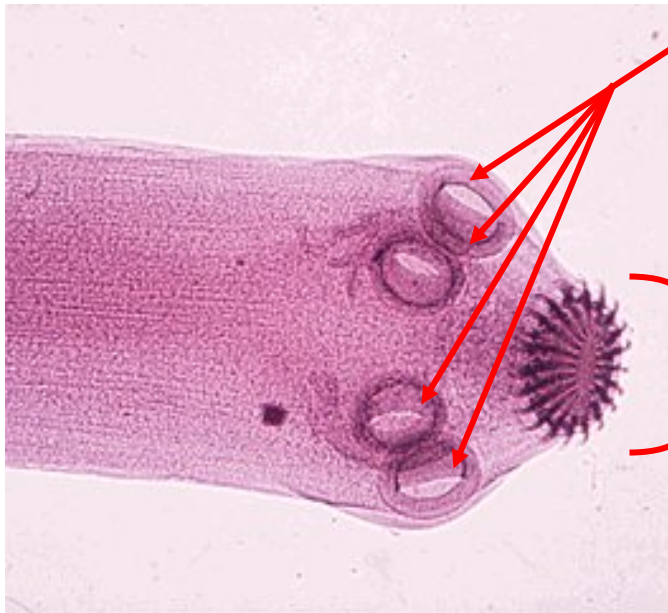
Body Plan: tegument



Body Plan

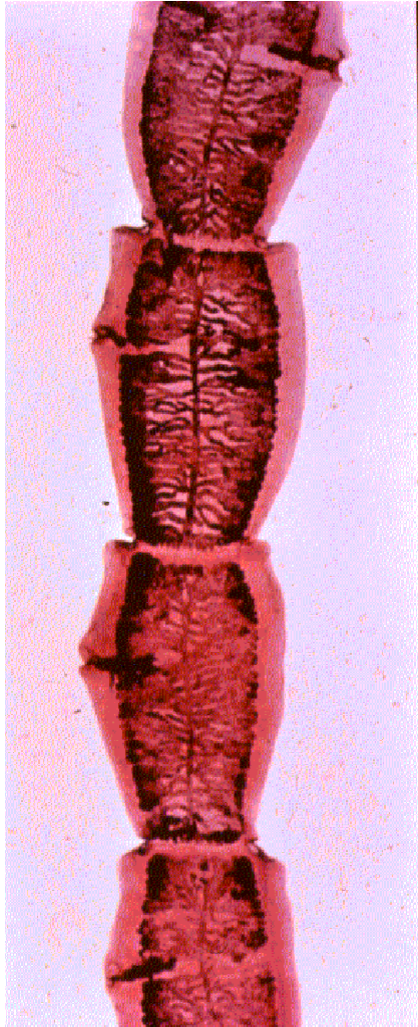
Scolex

suckers



rostellum

Body Plan



Proglottids

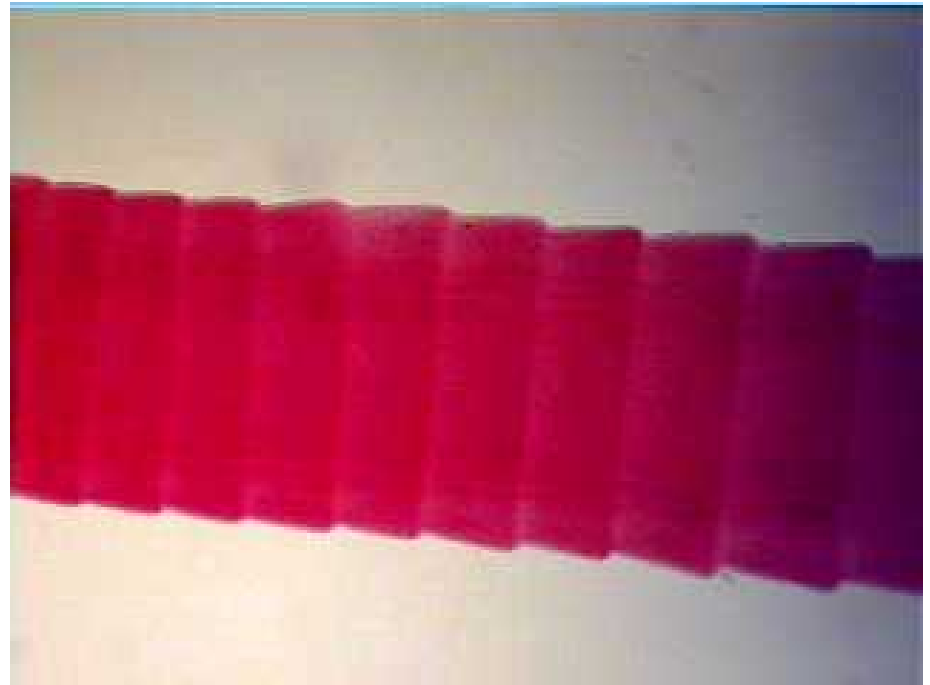
repeating segments containing reproductive organs

May be immature, mature, or gravid

Class Cestoda

Immature proglottids

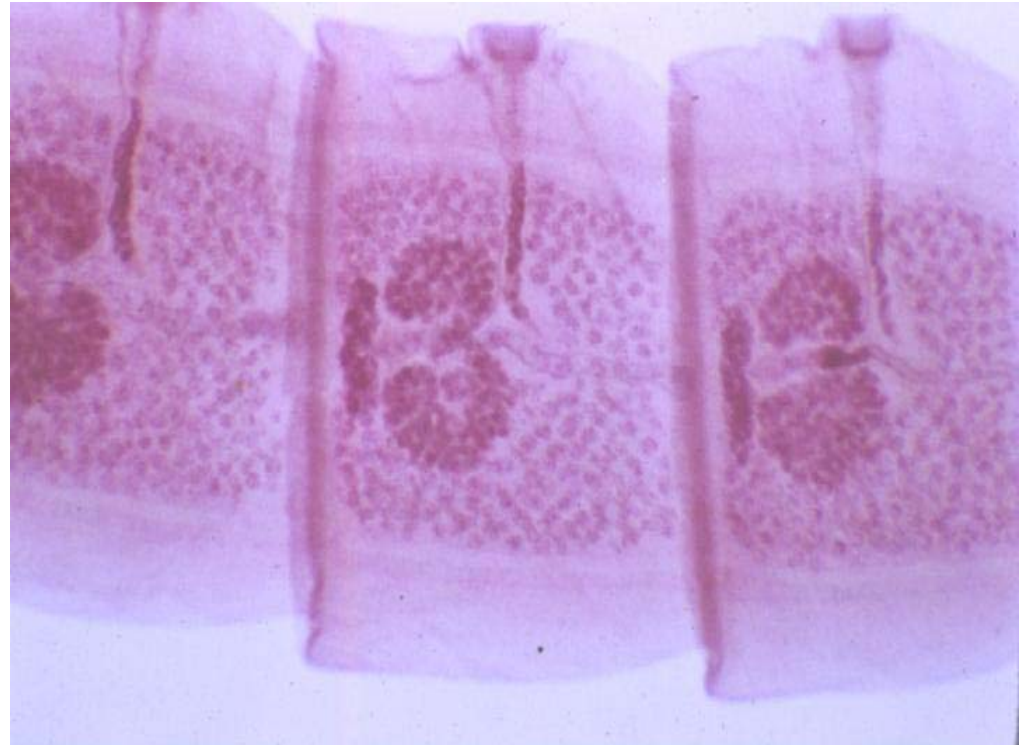
Immature proglottids are found at the anterior end of the tapeworm and contain no noticeable sex organs



Class Cestoda

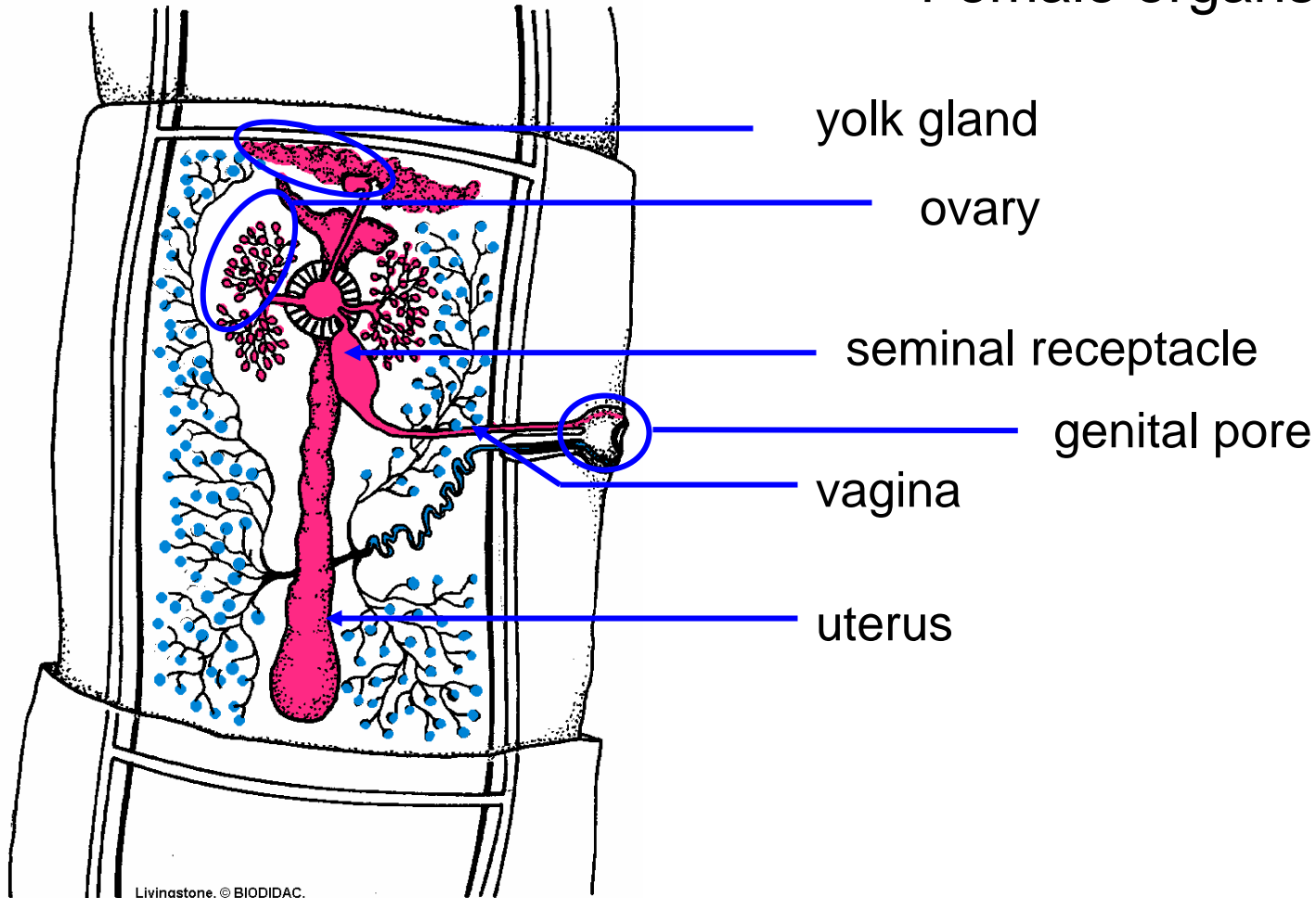
Mature proglottids

Mature proglottids are found in the middle of the tapeworm and contain noticeable sex organs



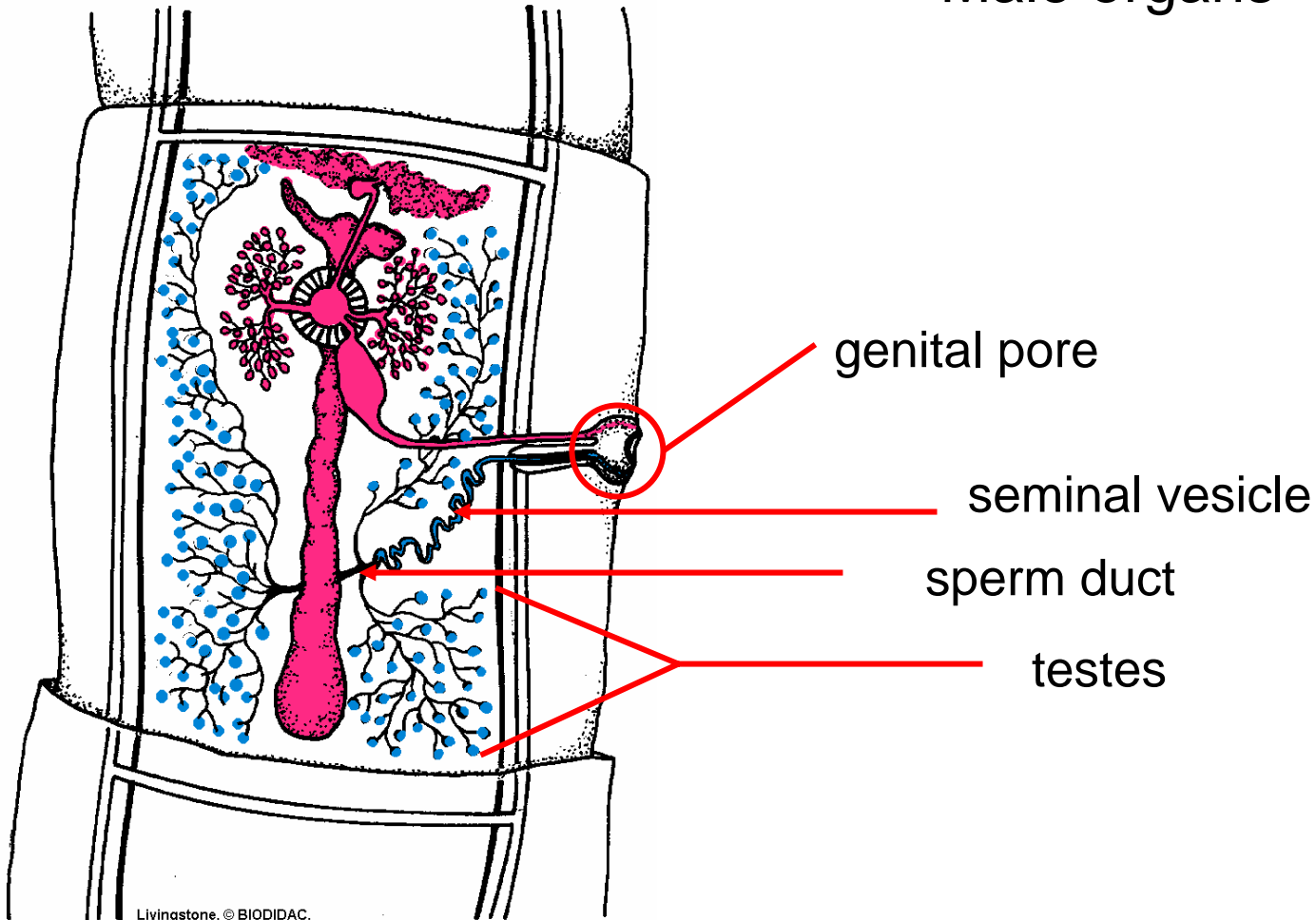
Class Cestoda

Female organs

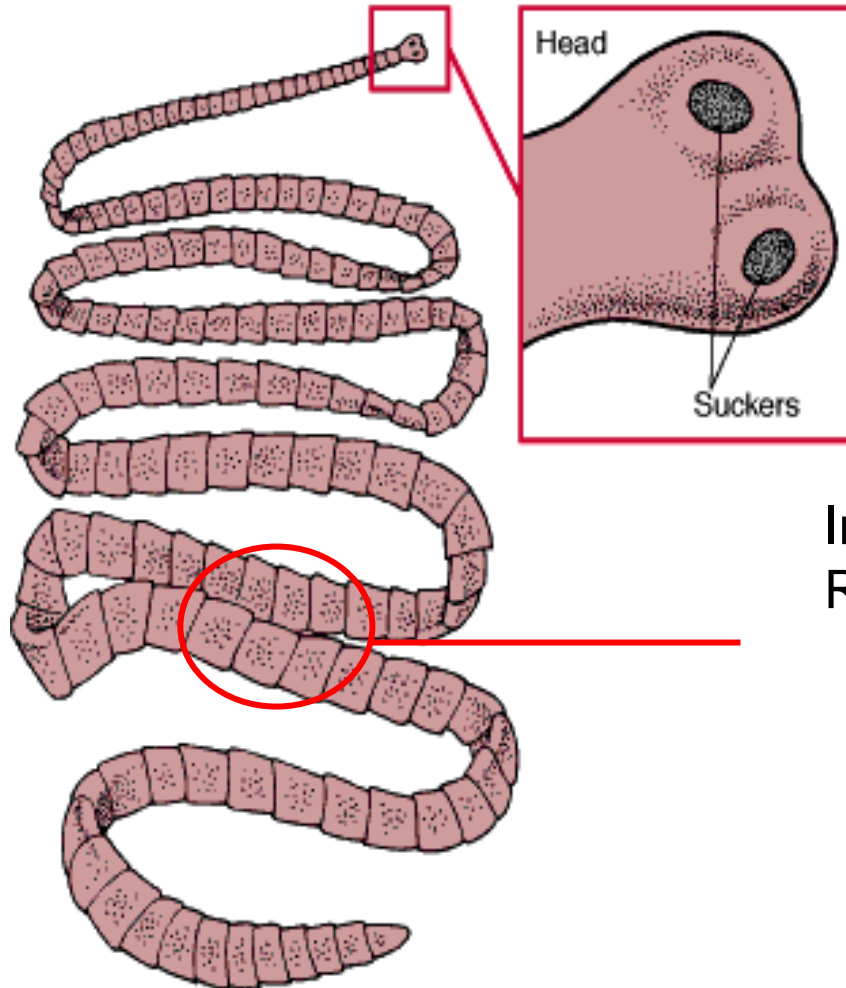


Class Cestoda

Male organs



Class Cestoda



Individuals are monoecious,
Reproduction is sexual

- between proglottids on 1 individual
- between individuals
- Sperm do not usually fertilize eggs produced within the same proglottid

Class Cestoda

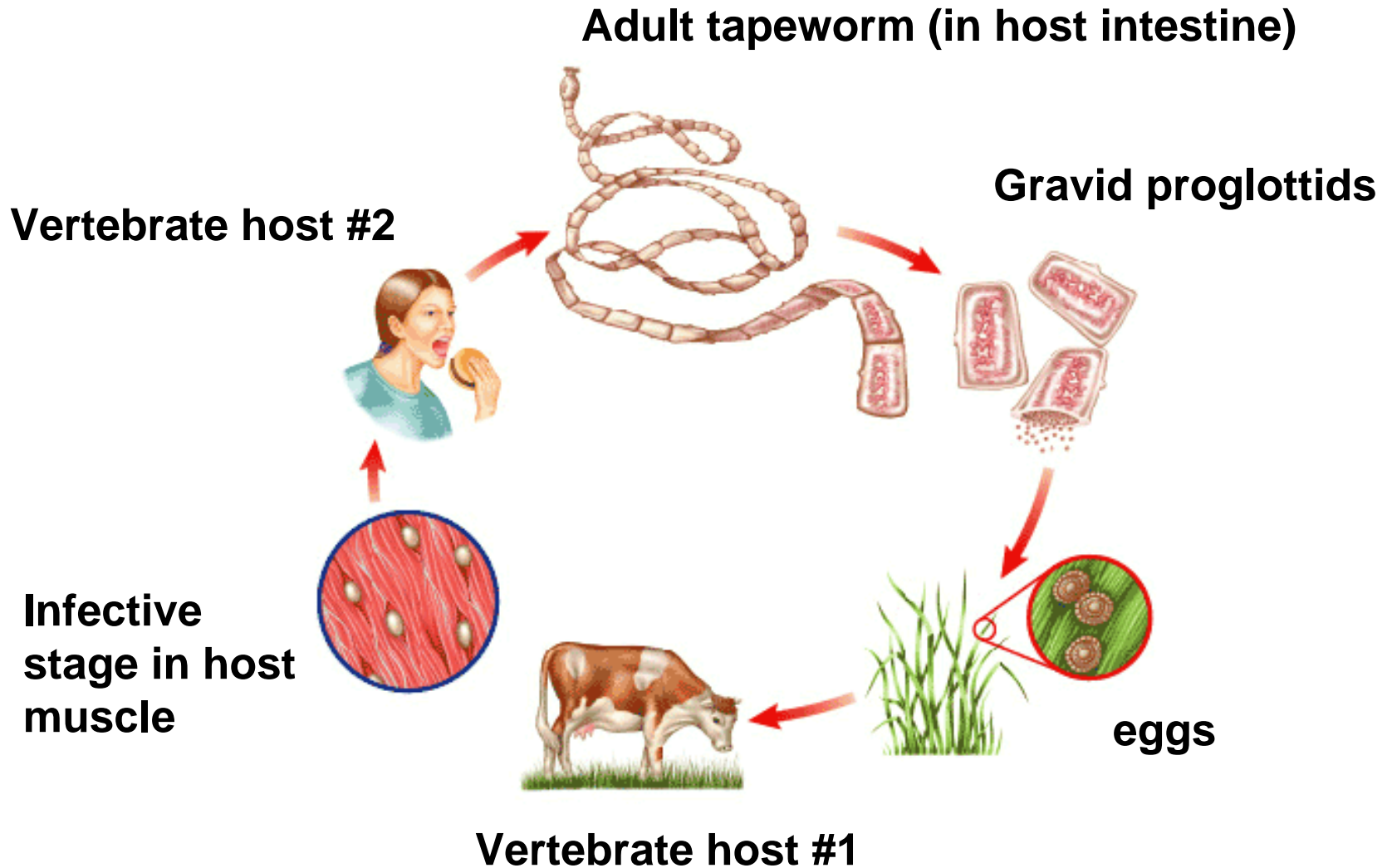
Gravid proglottids

Gravid proglottids are found at the posterior end of the tapeworm and are shed in the feces.

A single proglottid can contain thousands of eggs.

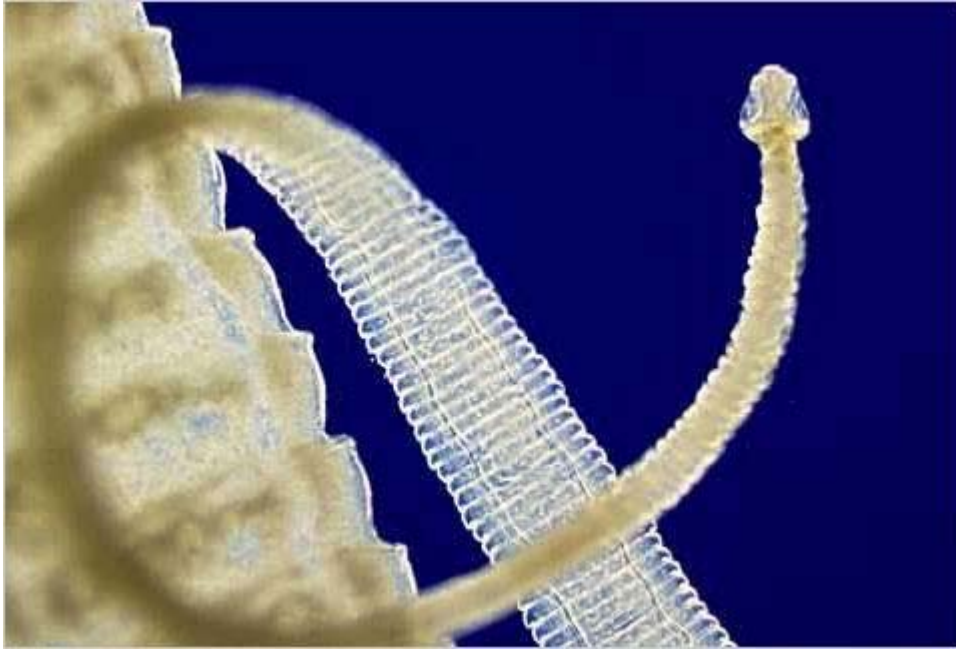


Cestoda Life Cycle



	+	-
+	Mutualism	Predation Herbivory Parasitism Disease
-	Predation Herbivory Parasitism Disease	Competition

How are these guys different from...



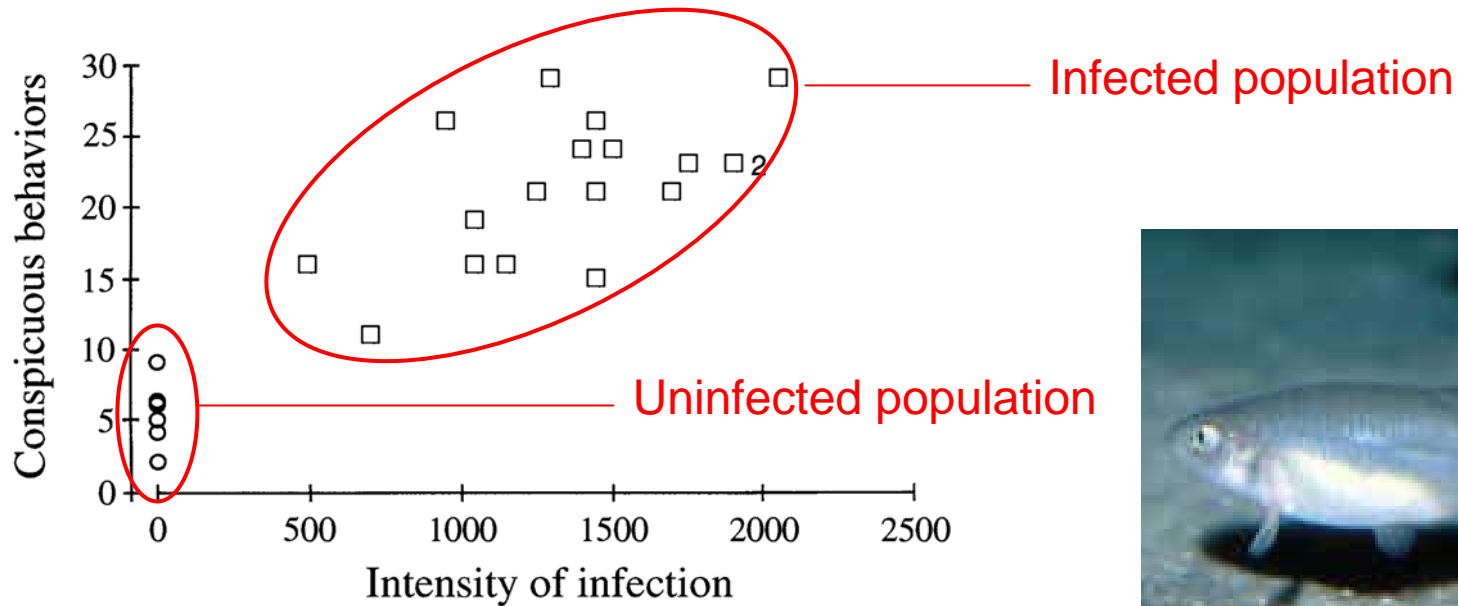
... these guys?



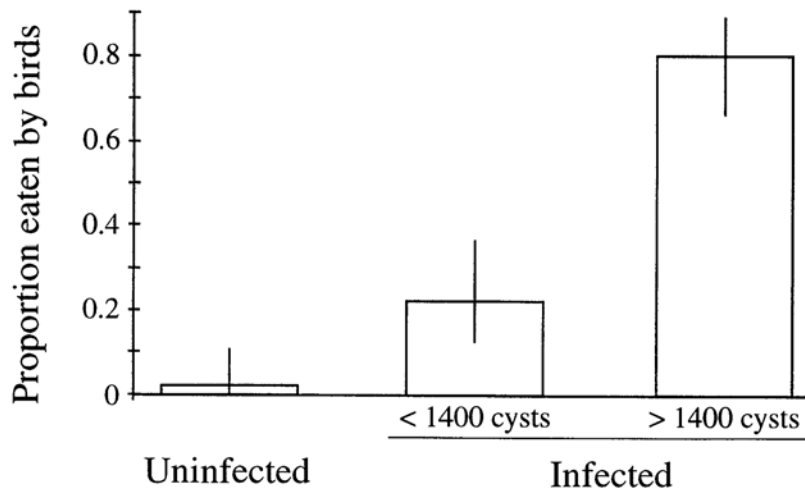
How are parasites and disease different from predators?

- Predators kill their prey, but hosts are usually not killed by parasites. Parasites affect hosts in more subtle ways.
- Some examples of non lethal effects of trematode parasites on their hosts.

Trematodes and Host Behavior



Fundulus parvipinnis



Euhaplorchis californiensis

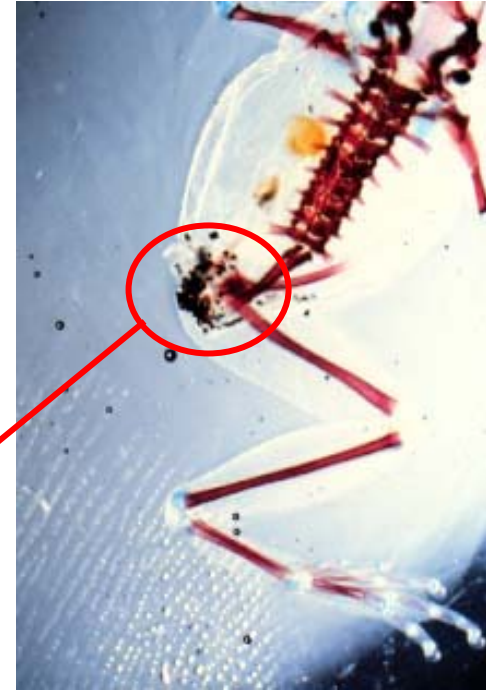
Trematodes and Host Morphology



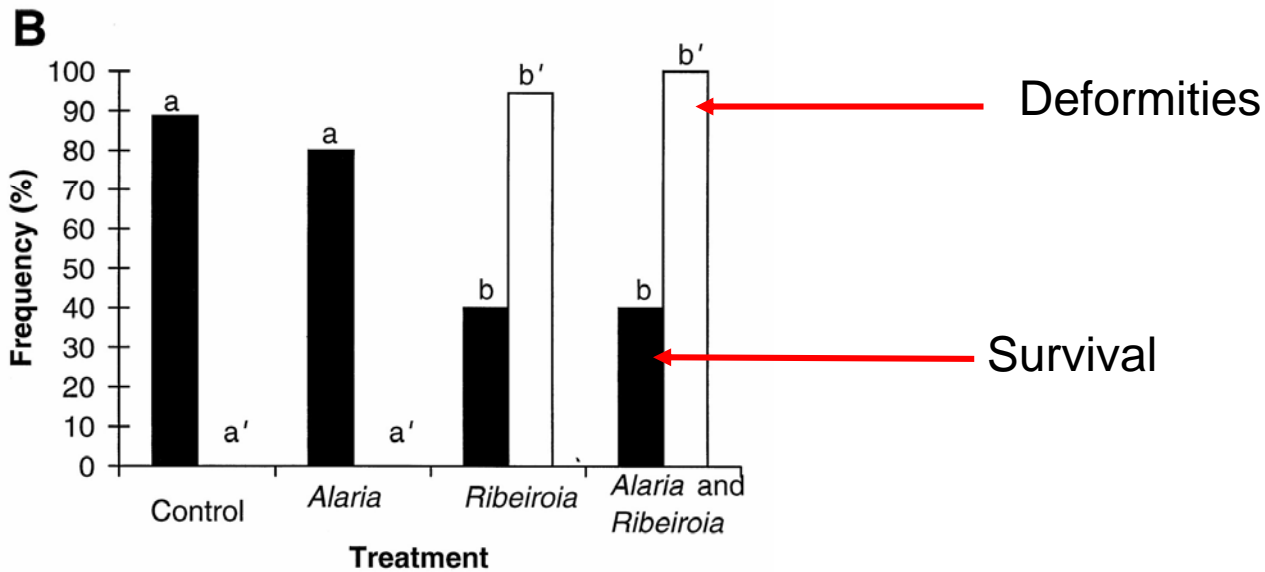
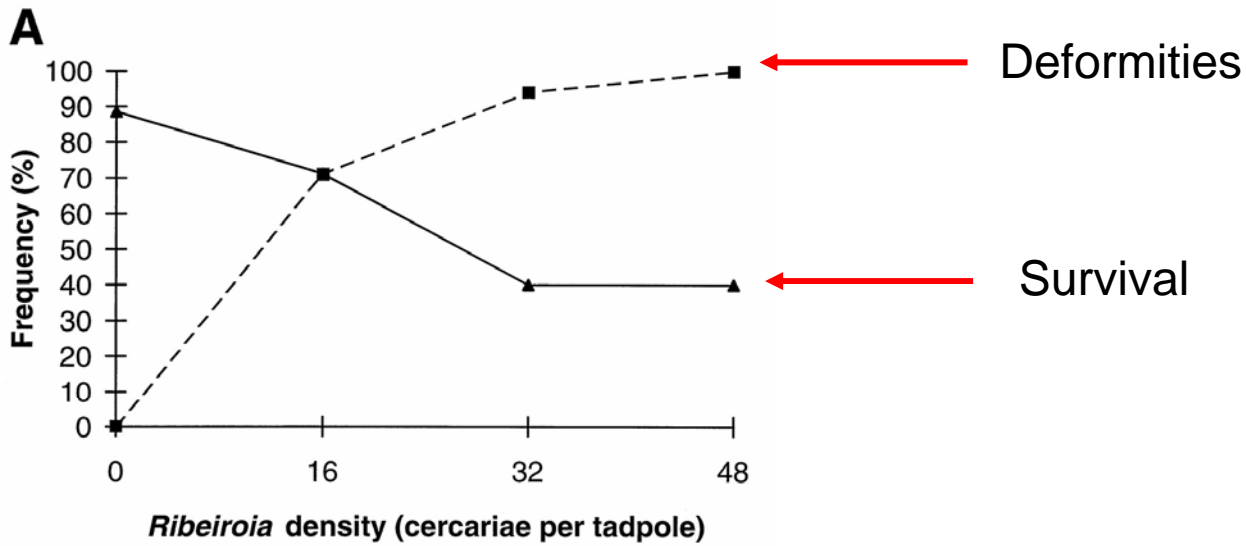
Limb deformities in amphibians have been recorded since the 1950's.

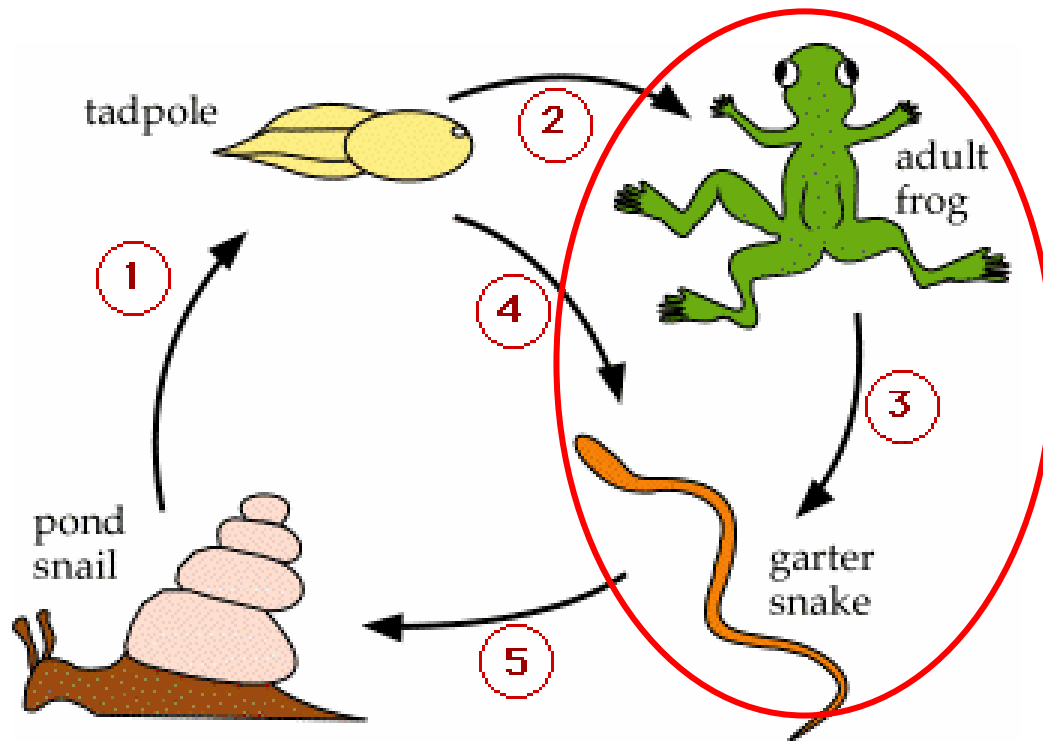
Since the early 1990s, there has been an apparent increase in the number of frogs found with limb deformities.

Several hypotheses have been proposed to explain these: Pesticides, UV, parasites...



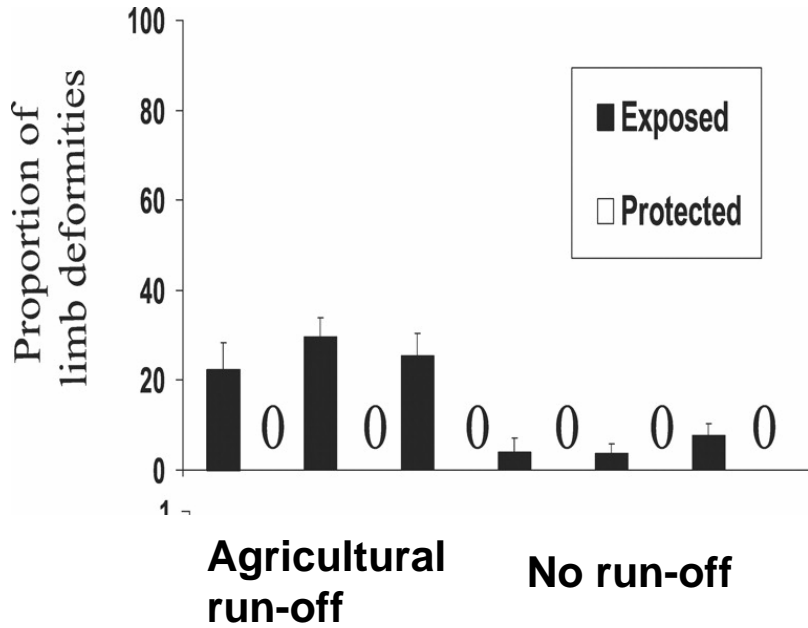
Cysts formed by the trematode, *Ribeiroia*





Are deformed frogs more likely to be eaten by snakes?

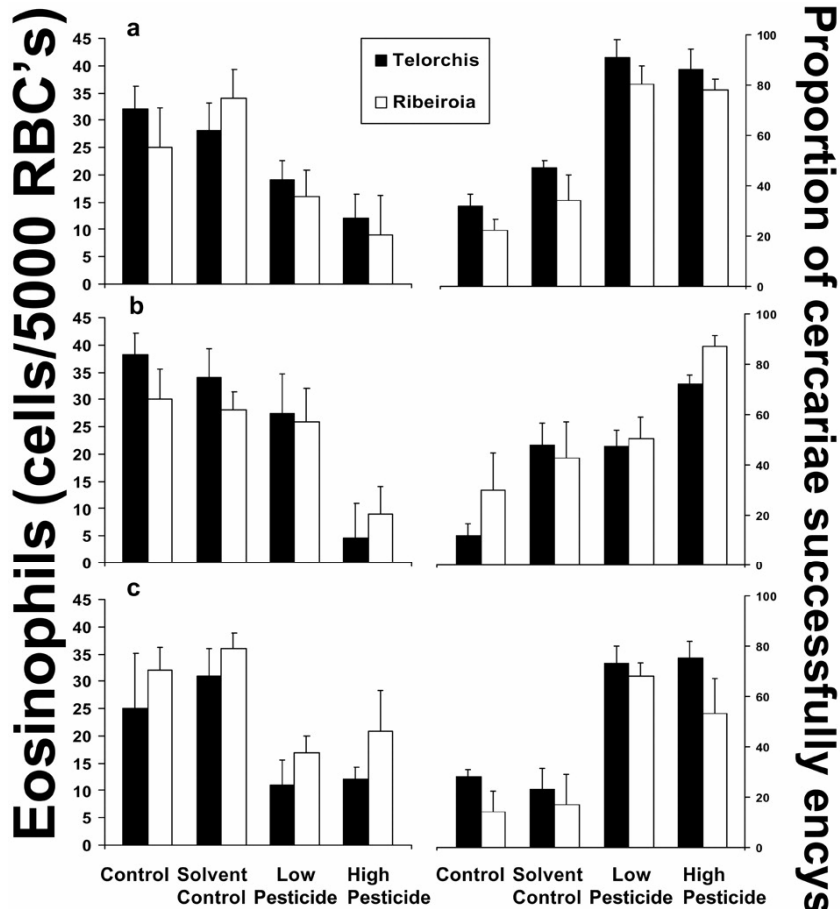
Ribeiroia life cycle



There might be more to the story than just parasites:

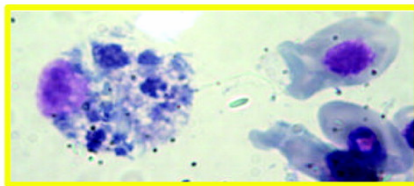
- Deformities are more common near agricultural run-off.

From Kiesecker 2002



There might be more to the story than just parasites:

- Pesticides affect a frog's immune response to the parasite.



Eosinophils



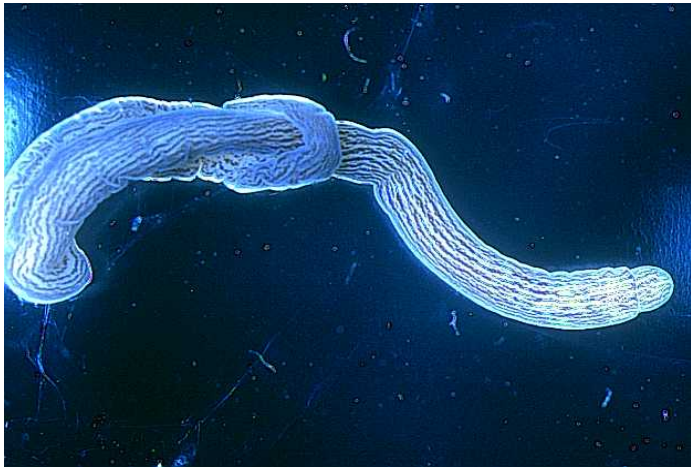
There might be more to the story than just parasites:

- Trematodes do not induce this type of deformity.

References:

Kiesecker, J. M. 2002. Synergism between trematode infection and pesticide exposure: a link to amphibian limb deformities in nature. PNAS 99(15): 9900-9904.

Johnson, P.T.J., et al. 1999. The effect of trematode infection on amphibian limb development and survivorship. Science 284: 802- 804.



Phylum Nemertea

the ribbonworms

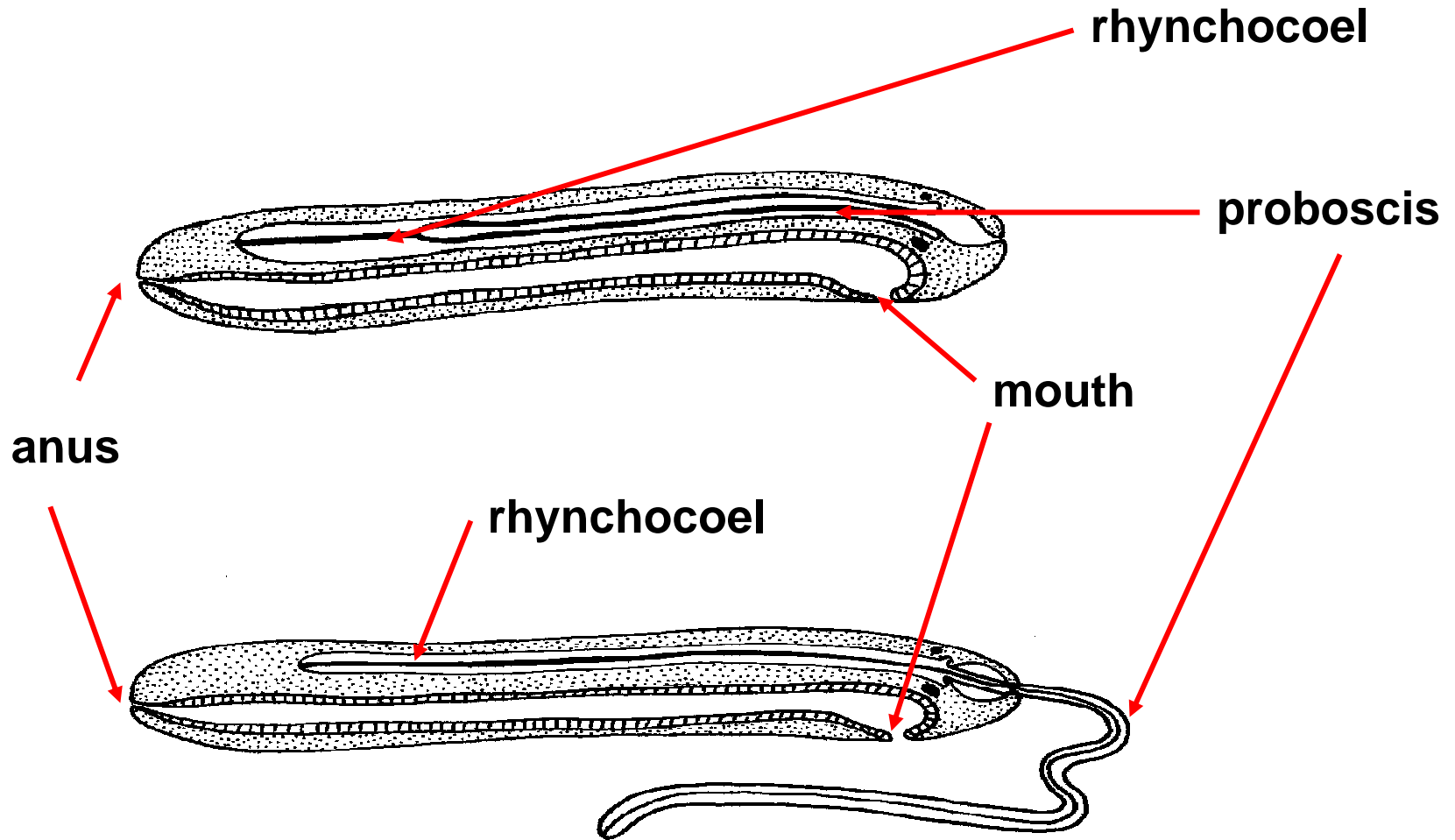


Physiology

Feeding

- Free-living, carnivorous
- Have an eversible proboscis that is not connected to the digestive system

Physiology



9/4/95

Physiology

Digestion

- extracellular (in the intestine)
- intracellular (by gastrodermal cells)
- intestine is unbranched
- complete system (mouth and anus)

Physiology

Reproduction

Asexual

- Some species are capable of reproducing asexually through fragmentation and regeneration

Physiology

Reproduction

Sexual

- usually dioecious
- Internal fertilization