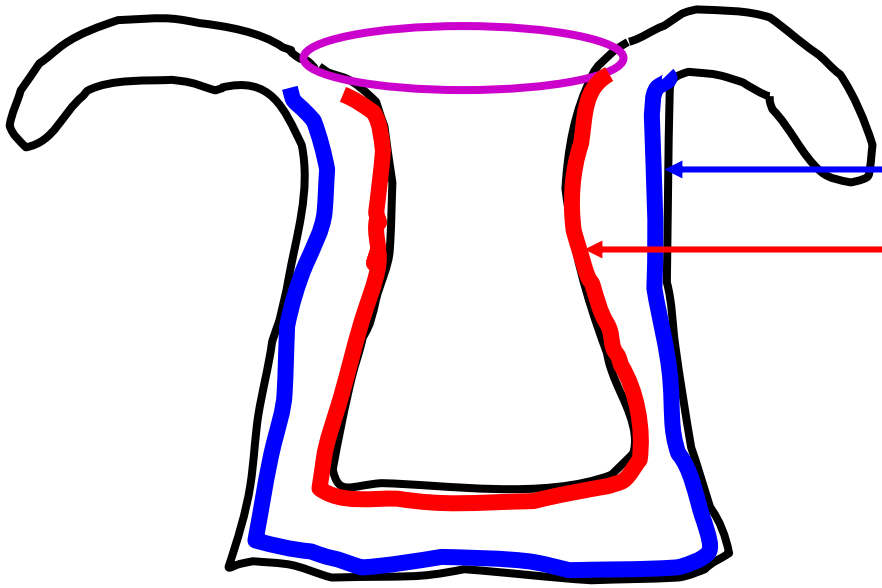
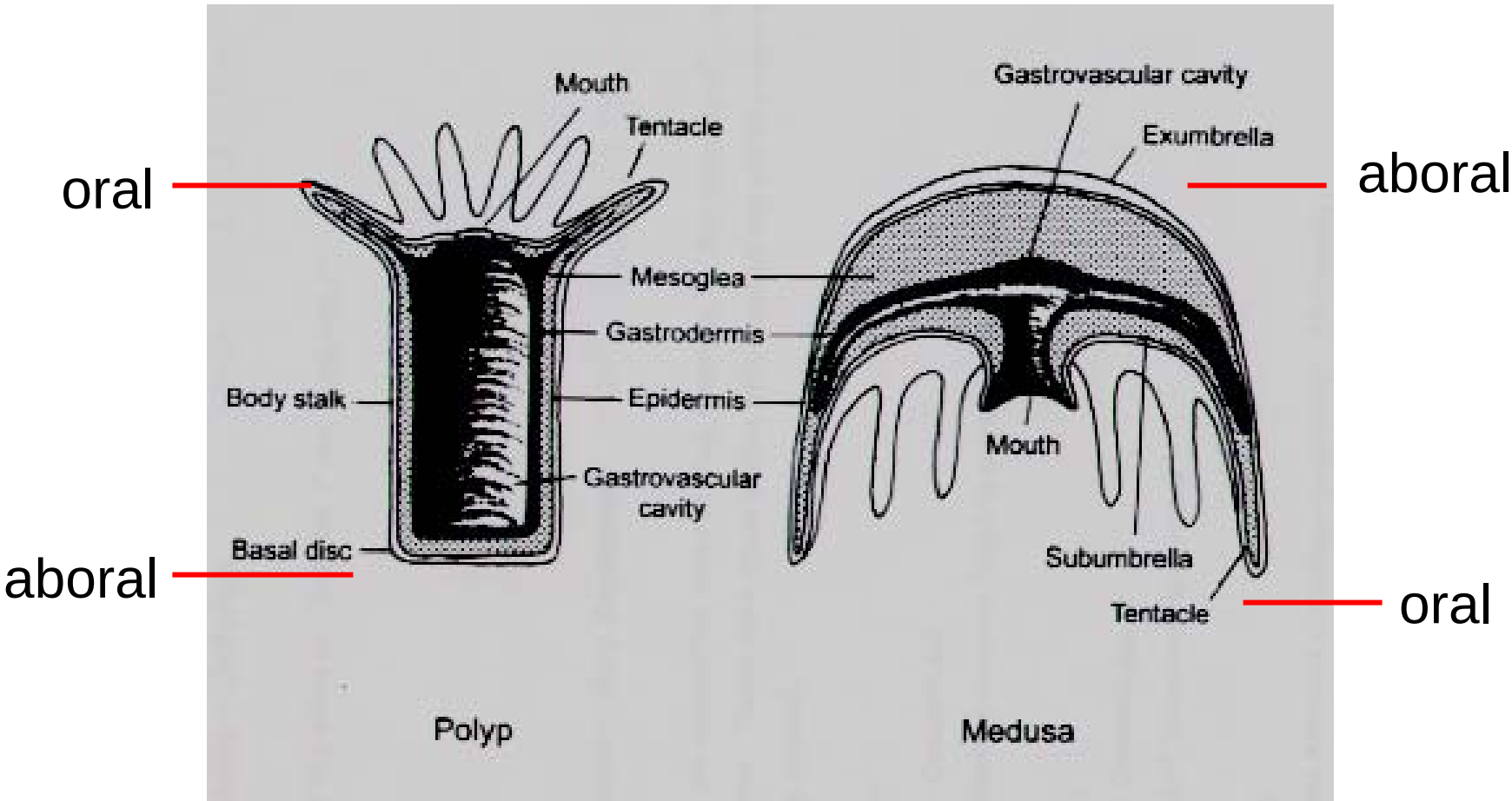
General Body Plan



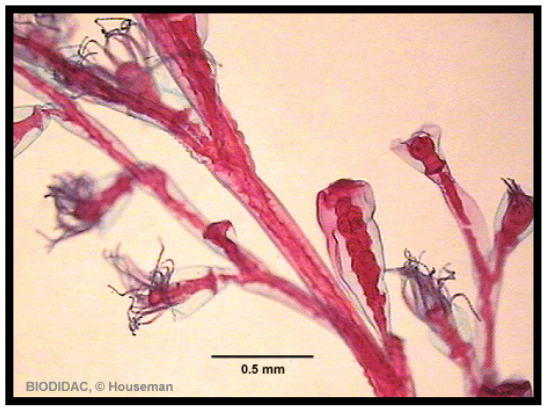
- Diploblastic
  - epidermis
  - gastrodermis
- Tissue
- Radially symmetrical
- Cnidocytes

General Body Plan

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



3 Classes



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

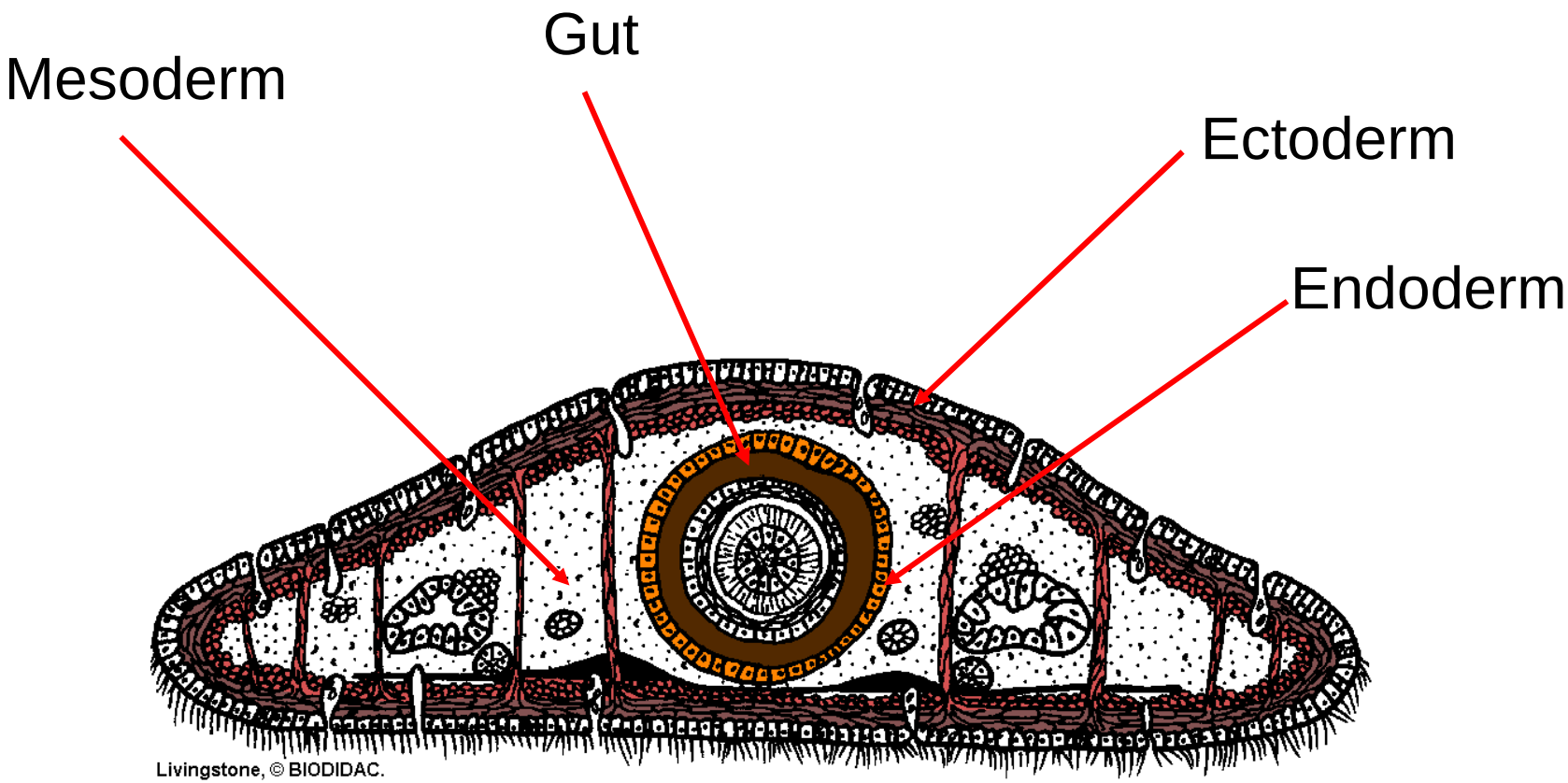
The Acoelomates

- Trploblastic animals without a coelom

Acoelomate Characteristics: Triploblastic

3 Embryonic Germ Layers	3 Tissue Layers
endoderm →	gastrodermis
mesoderm →	mesoderm
ectoderm →	epidermis

Acoelomate Characteristics: Triploblastic

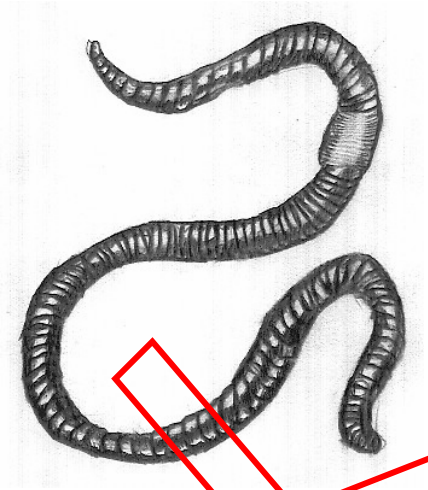


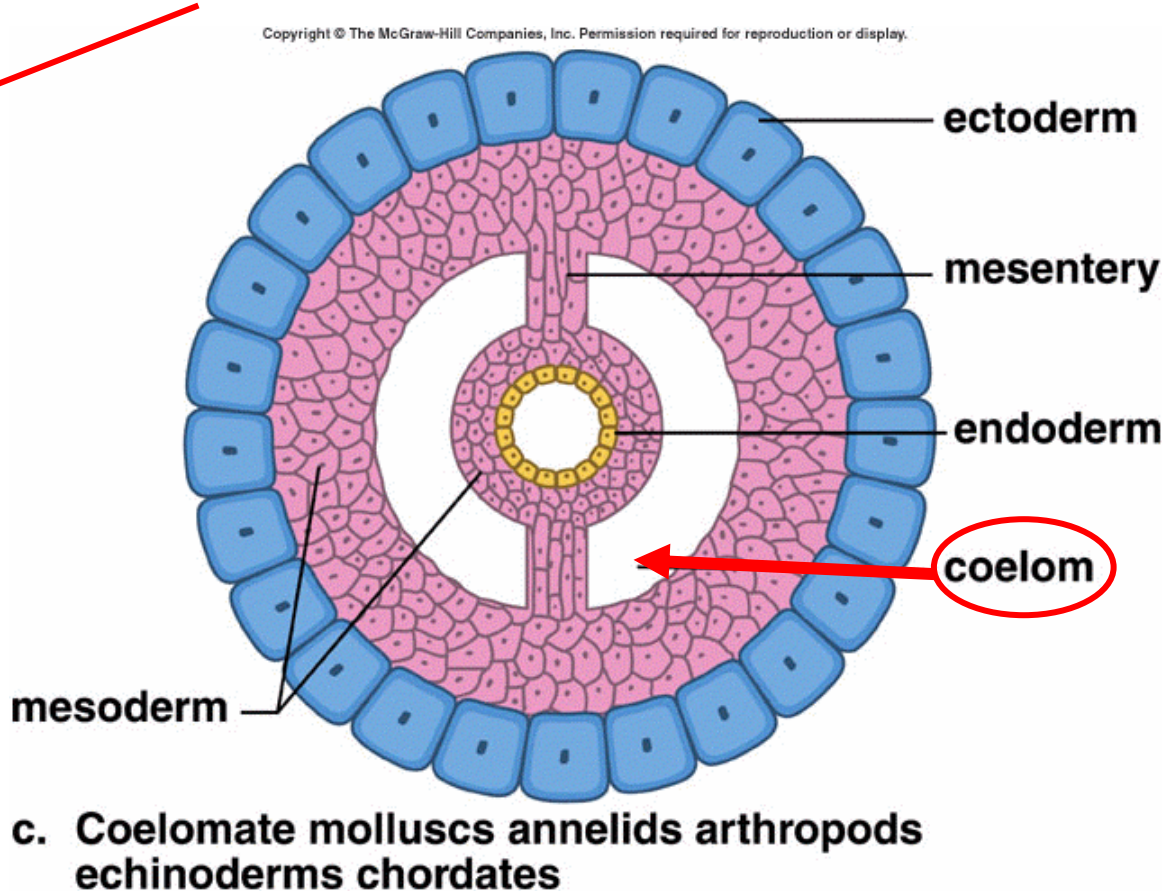
Acoelomate Characteristics: No coelom

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.

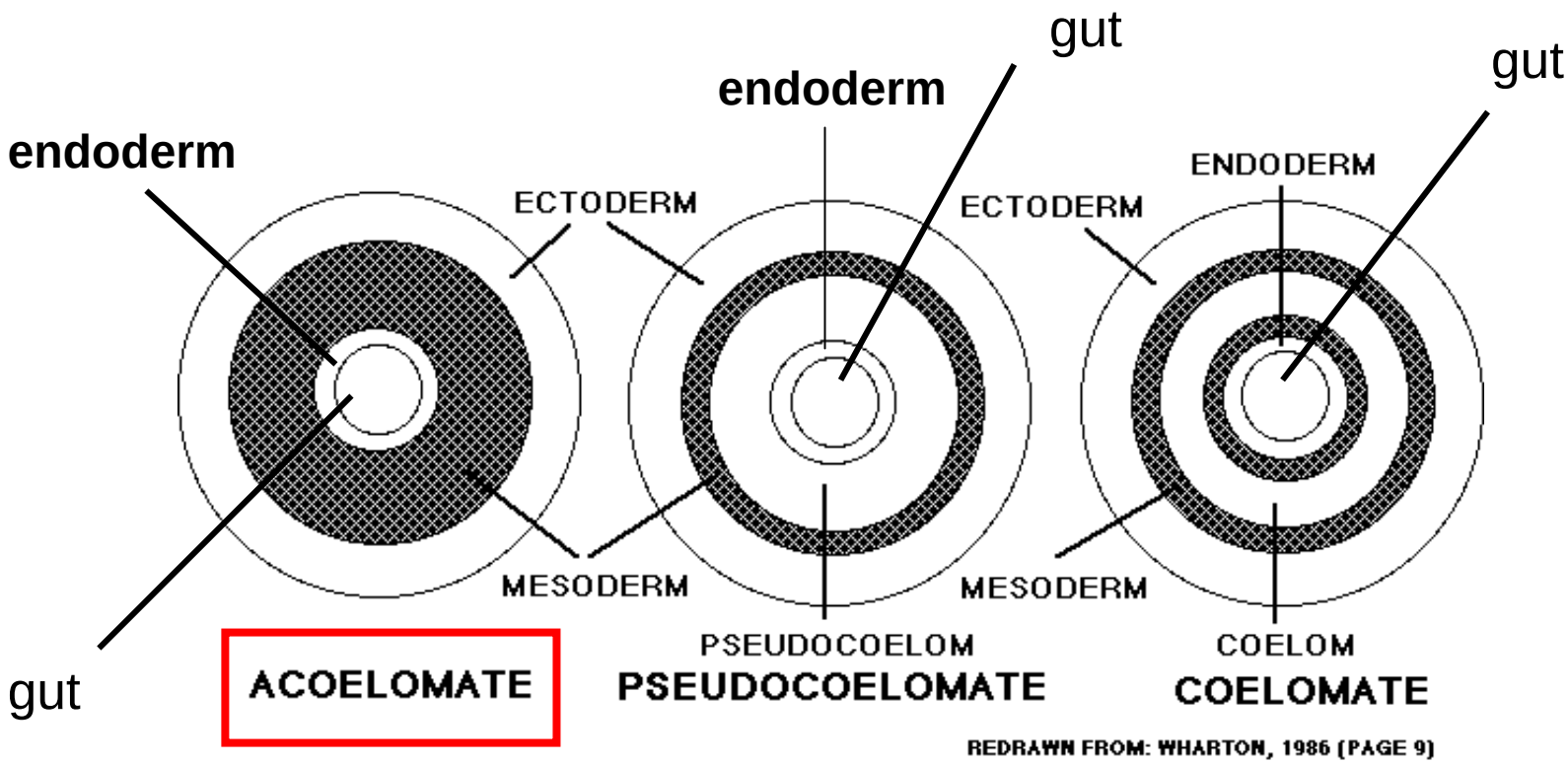
What is a coelom?





c. Coelomate molluscs annelids arthropods echinoderms chordates

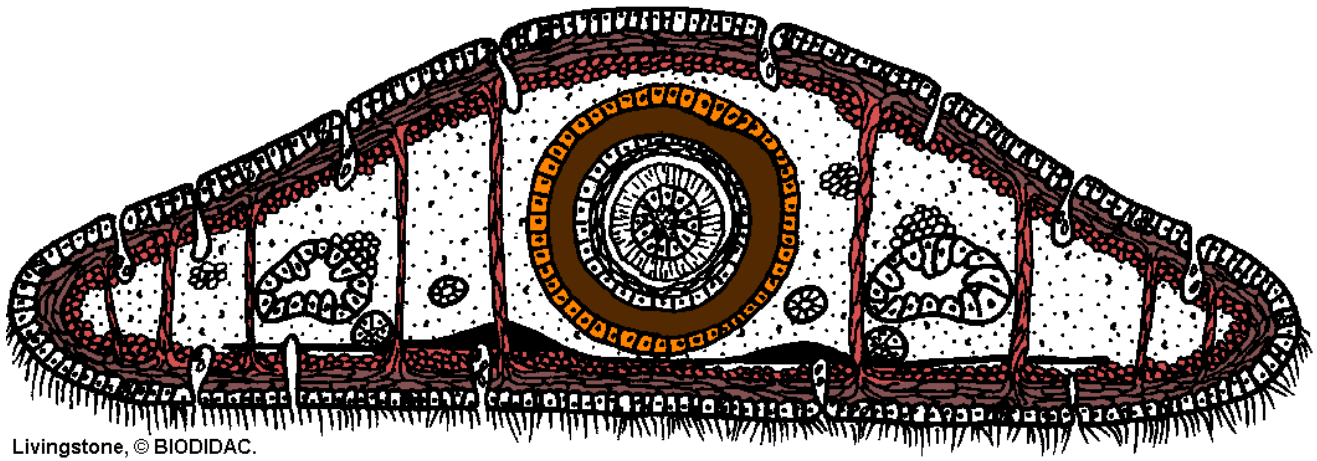
Acoelomate Characteristics: No coelom



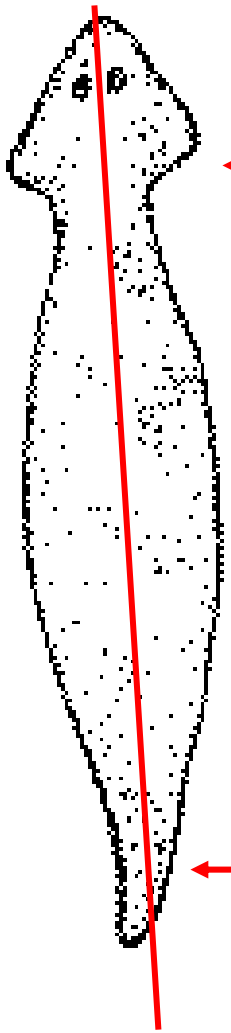
Acoleomate Characteristics:Level of Organization

Organ

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



Acoleomate Characteristics:Body Plan

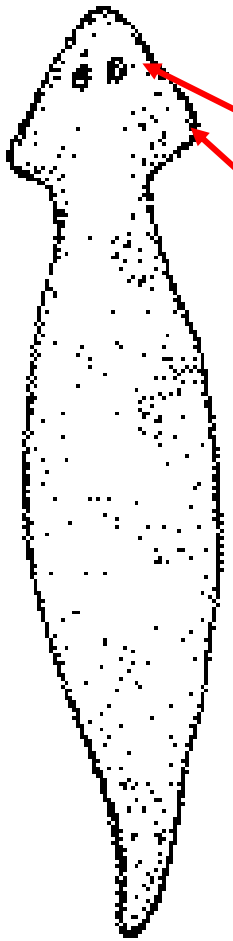


Bilateral Symmetry

Anterior: toward the front of the body

Posterior: toward the rear of the body

Body Plan



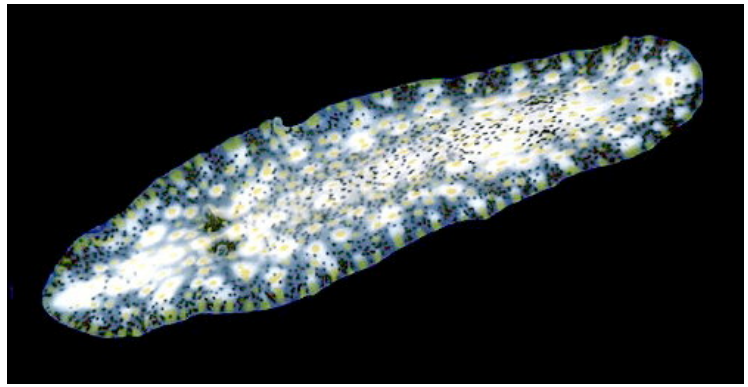
Cephalization: the concentration of sensory organs in the head of the animal

Eye spots: photosensitive organs

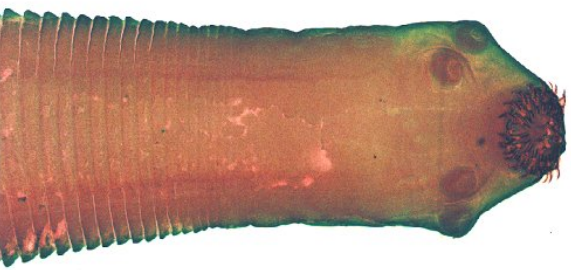
Auricles: chemoseneory organs

Acoelomate Phyla

1. Gnathostomulida
2. **Platyhelminthes**
3. **Nemaertea**



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 sever meters long.
- Many are endoparasites of vertebrates.

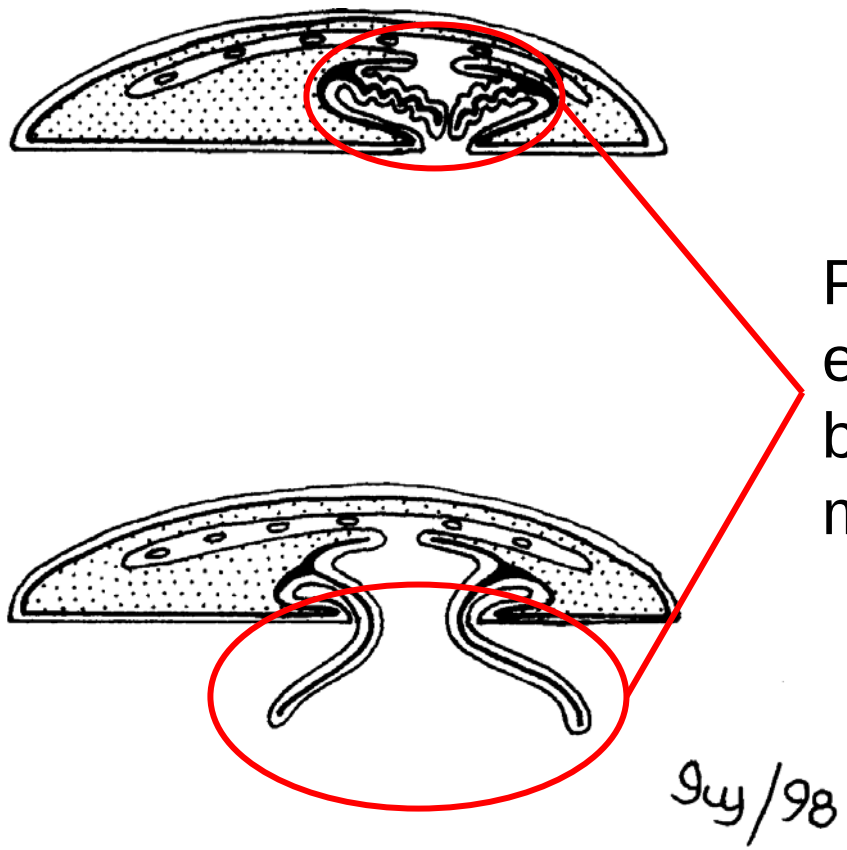
Feeding and Digestion

Feeding

– Free-living, carnivorous

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

Feeding and Digestion

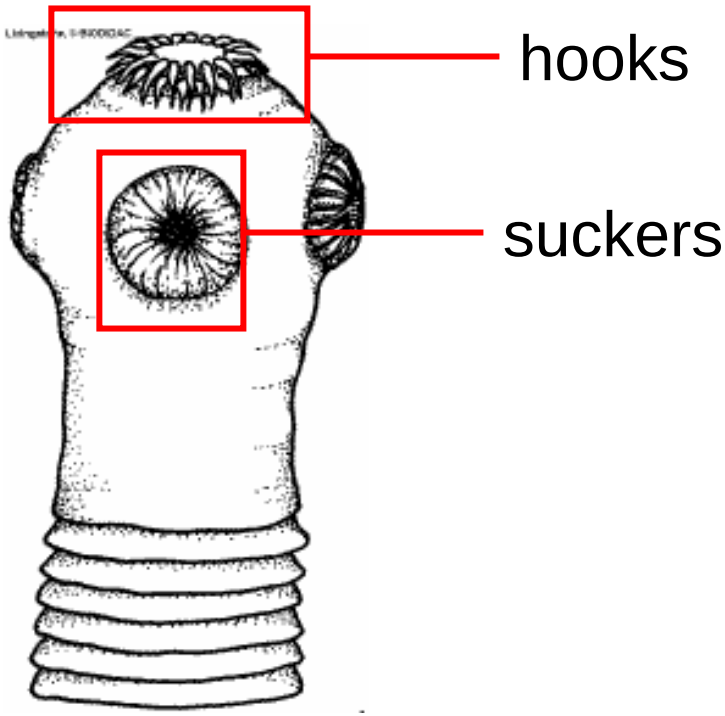


Pharynx: the pharynx is an extension of the gut that can be extruded though the mouth.

Feeding and Digestion

Feeding

– parasitic

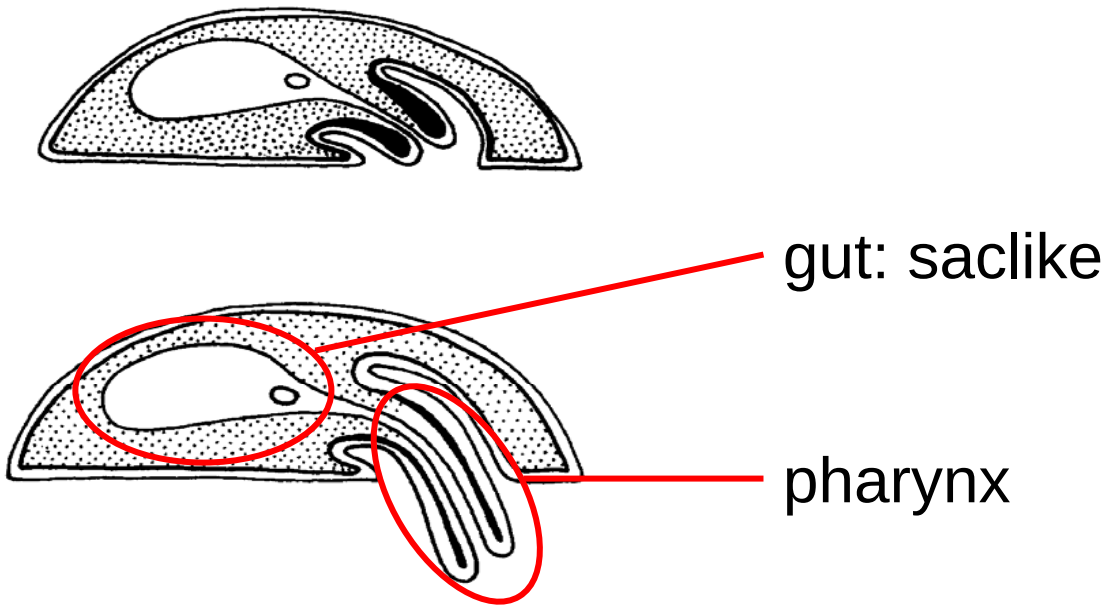


Parasitic forms often have modified feeding structures (e.g. the anterior end of a tapeworm)

Feeding and Digestion

Digestion

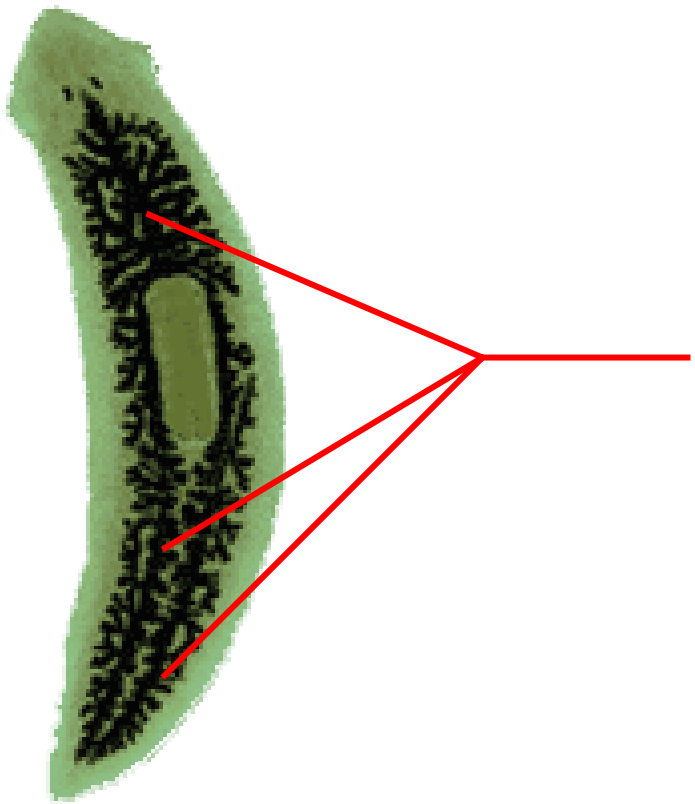
– incomplete digestive system



Feeding and Digestion

Digestion

– many forms have a branched gut



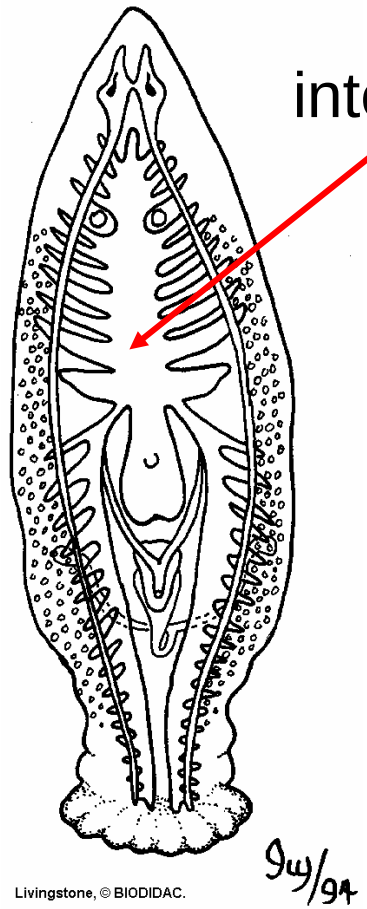
The trilobed gut of a planarian.

Feeding and Digestion

Digestion

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

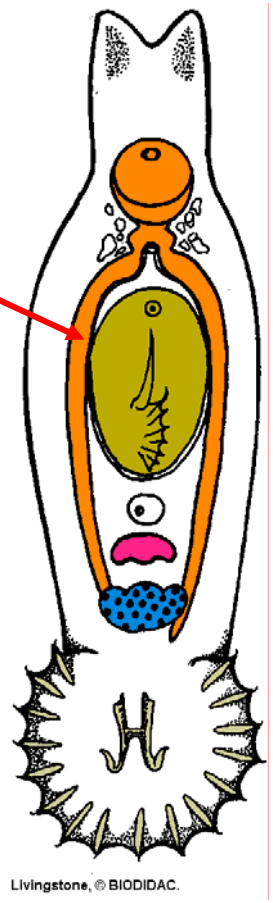
Feeding and Digestion



intestine

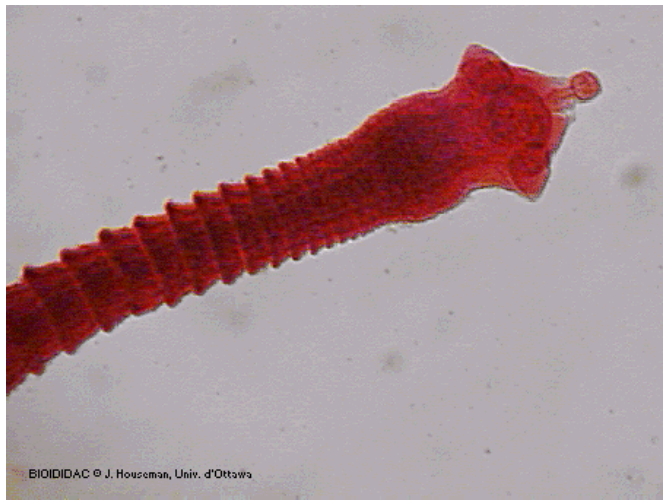
Bdelloura candida

Free-living:
branched gut



Grylodactylus

liver fluke:
relatively
unbranched gut



Taenia pisiformis

intestinal parasite

NO DIGESTIVE SYSTEM !

Feeding and Digestion

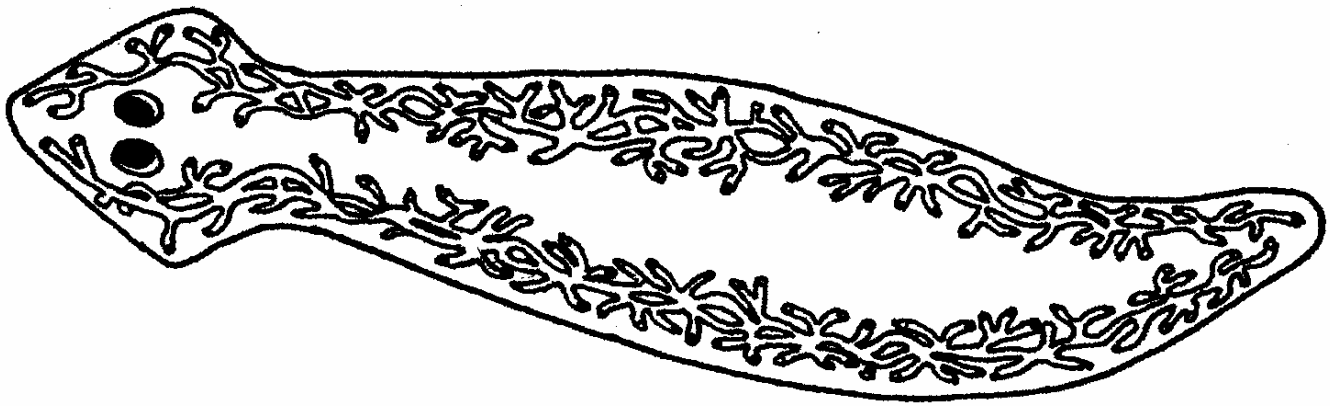
Digestion

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

Osmoregulation and Excretion

Osmoregulation

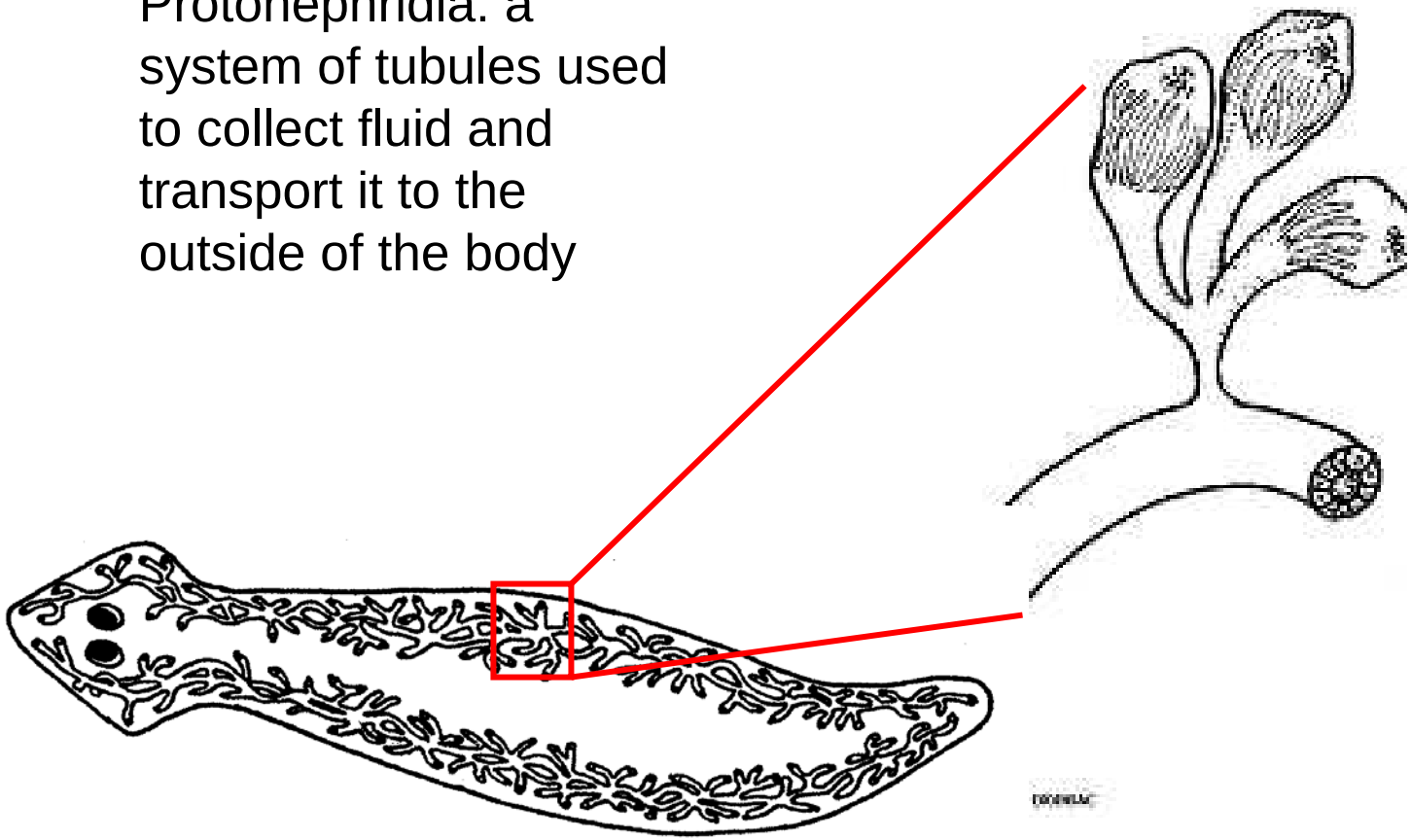
– Protonephridia and flame cells



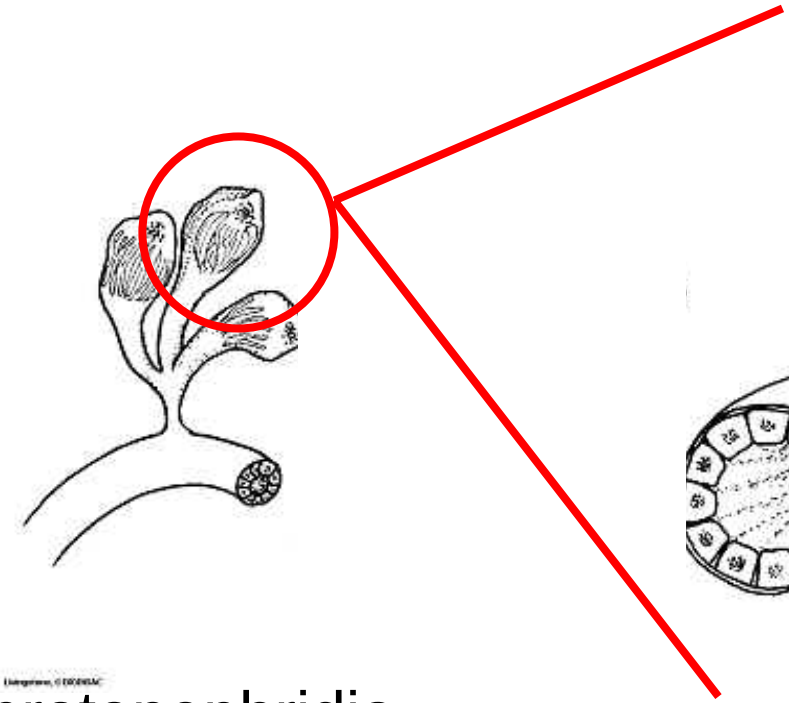
Osmoregulation and Excretion

Protonephridia

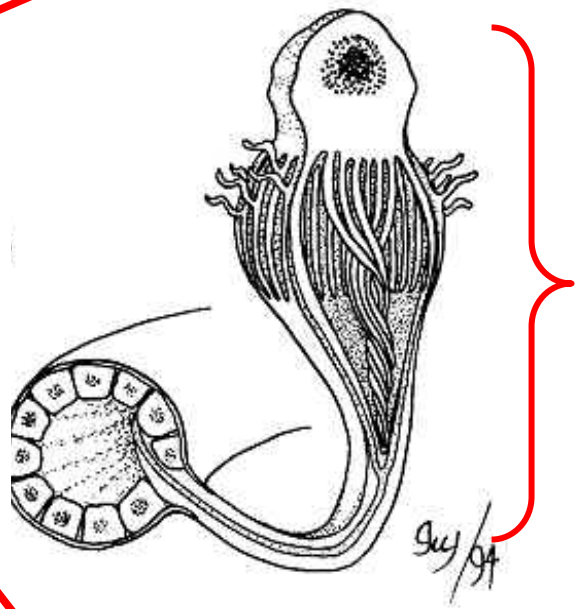
Protonephridia: a system of tubules used to collect fluid and transport it to the outside of the body



Osmoregulation and Excretion



protonephridia

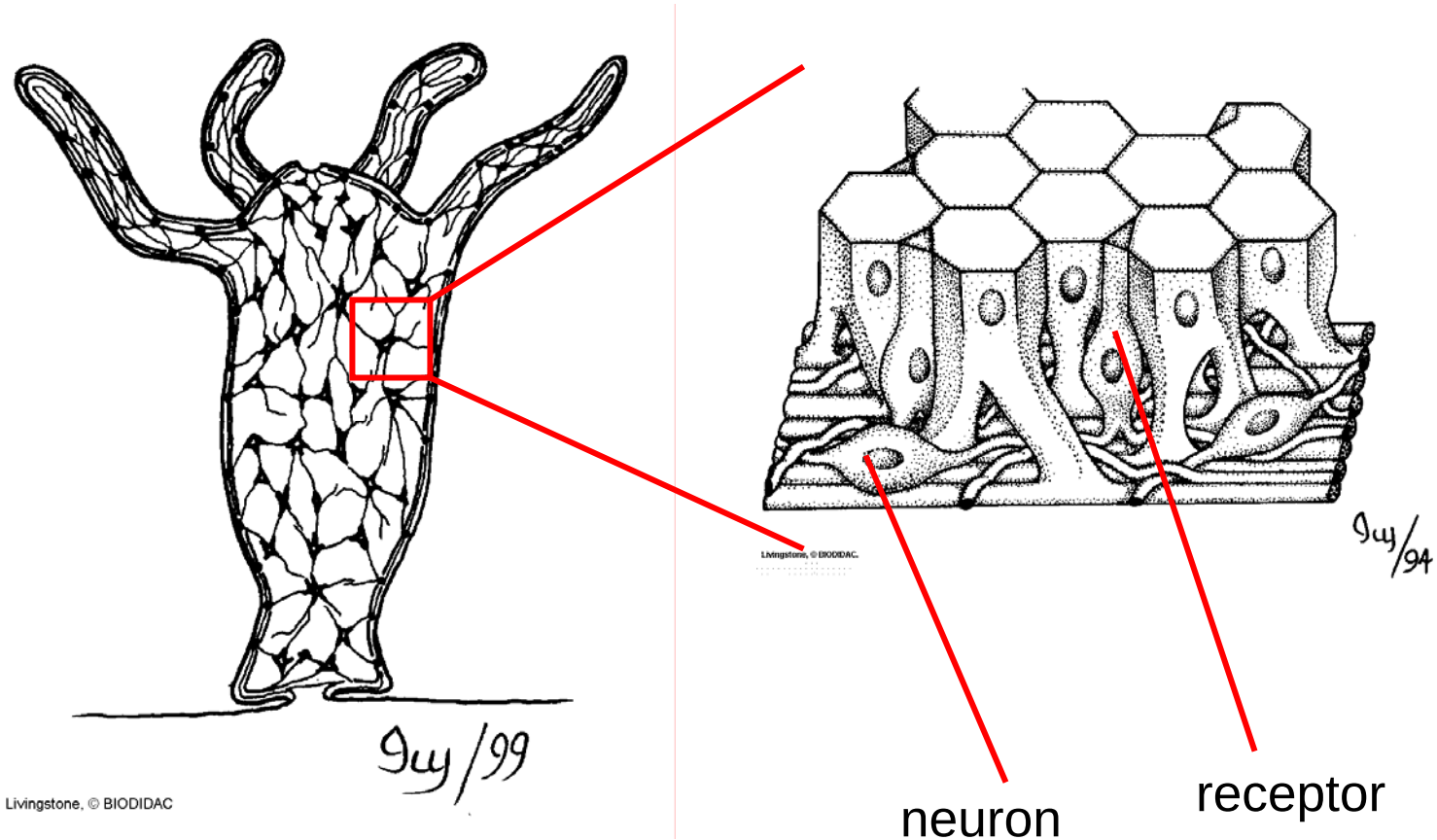


flame cell

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

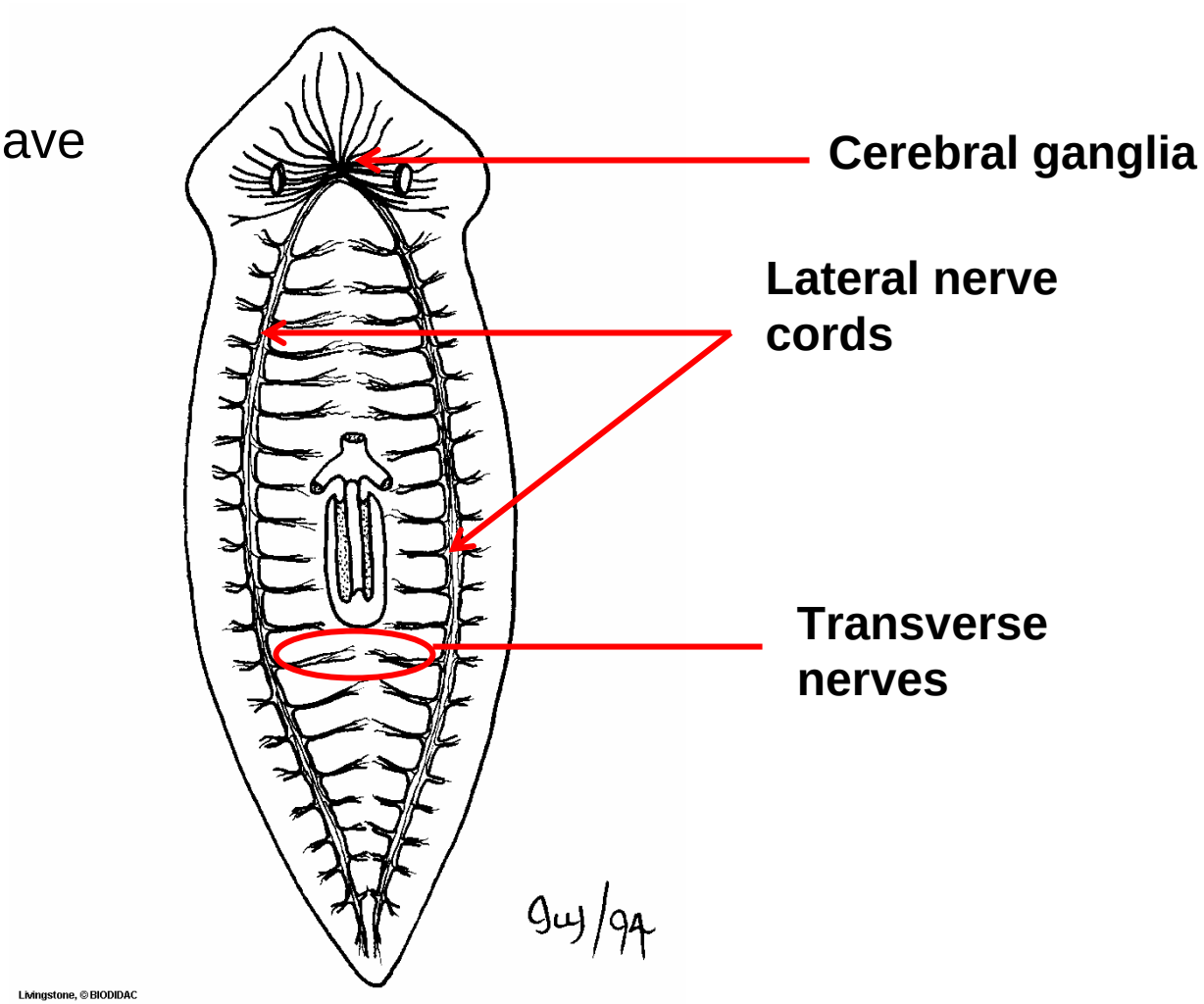
Nervous System

The Cnidarian nerve net:

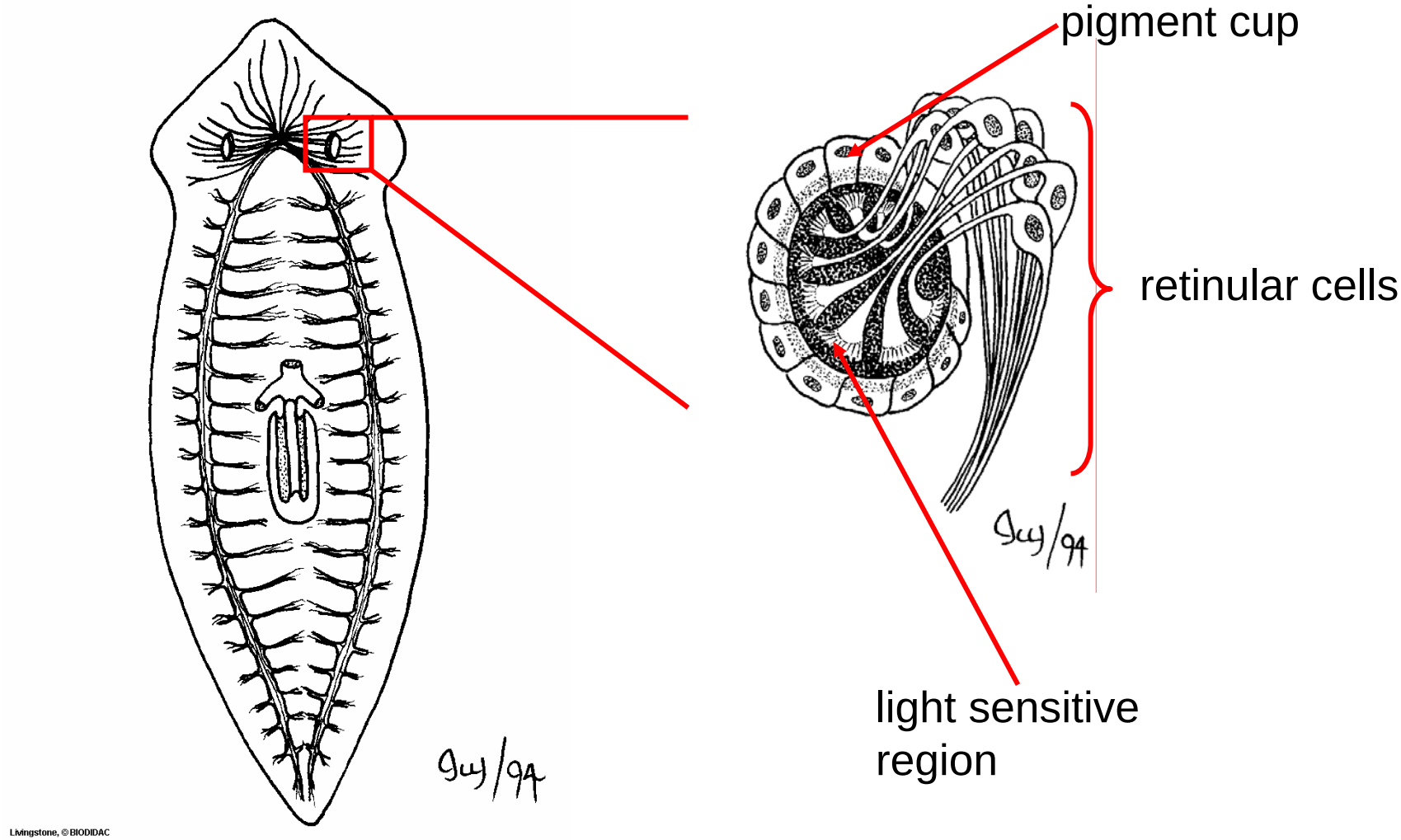


Nervous System

Platyhelminthes have a more complex nervous system



Nervous System



Support and Locomotion

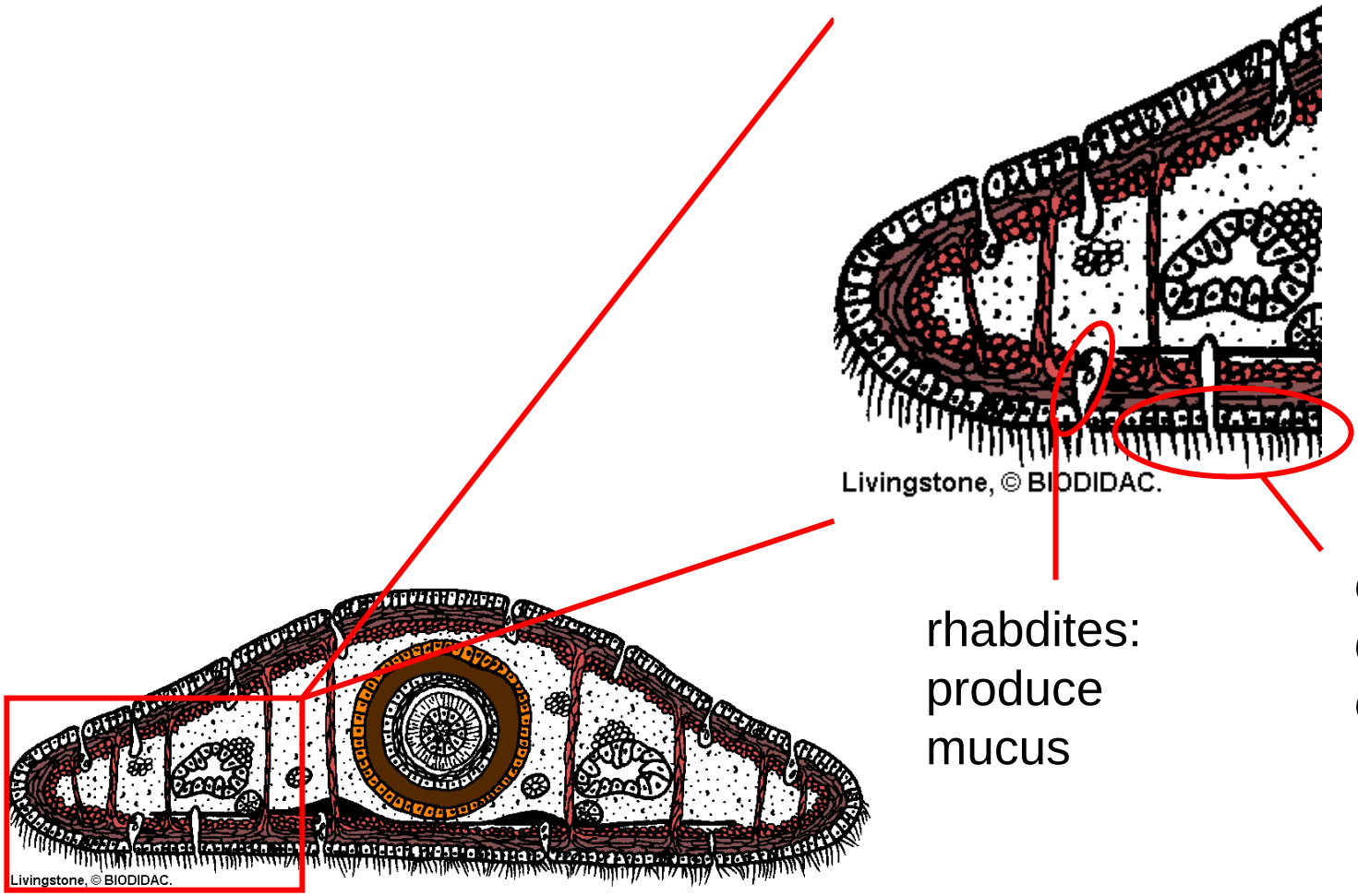
Skeletal System

- No skeletal system

Locomotion

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

Locomotion



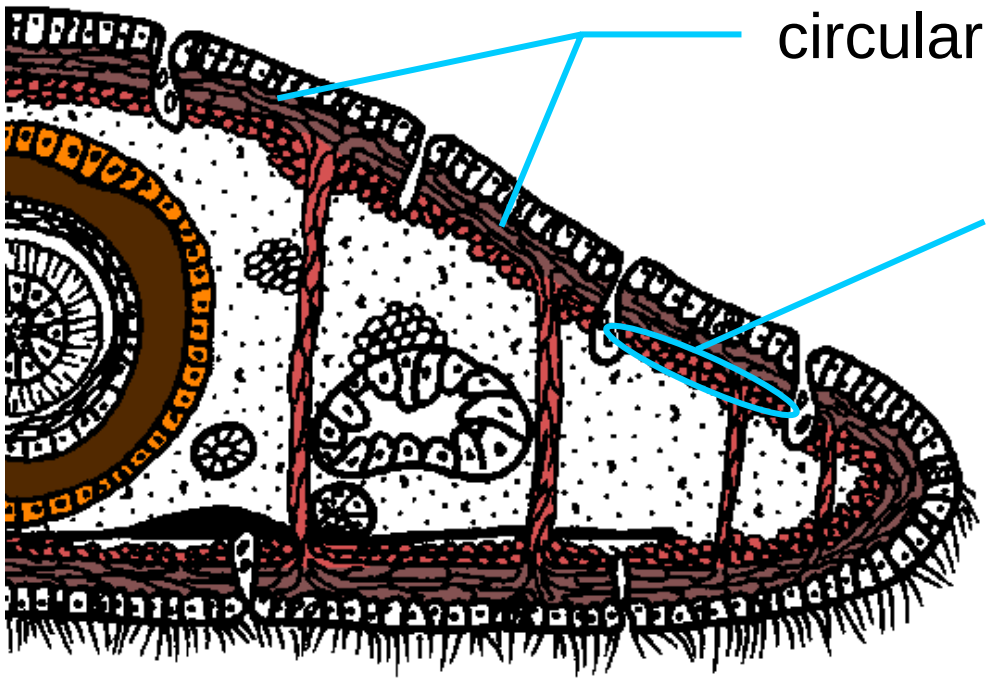
rhabdites: produce mucus

cilia on the dorsal epidermis

Locomotion

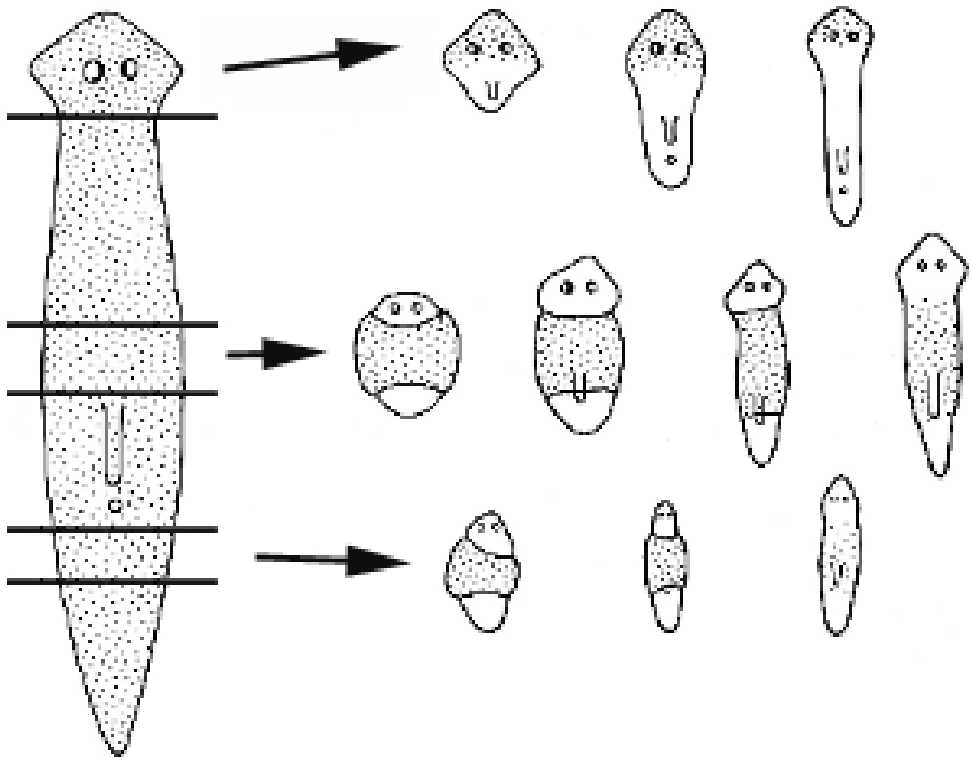
Large species use circular and longitudinal muscles to swim.

Locomotion



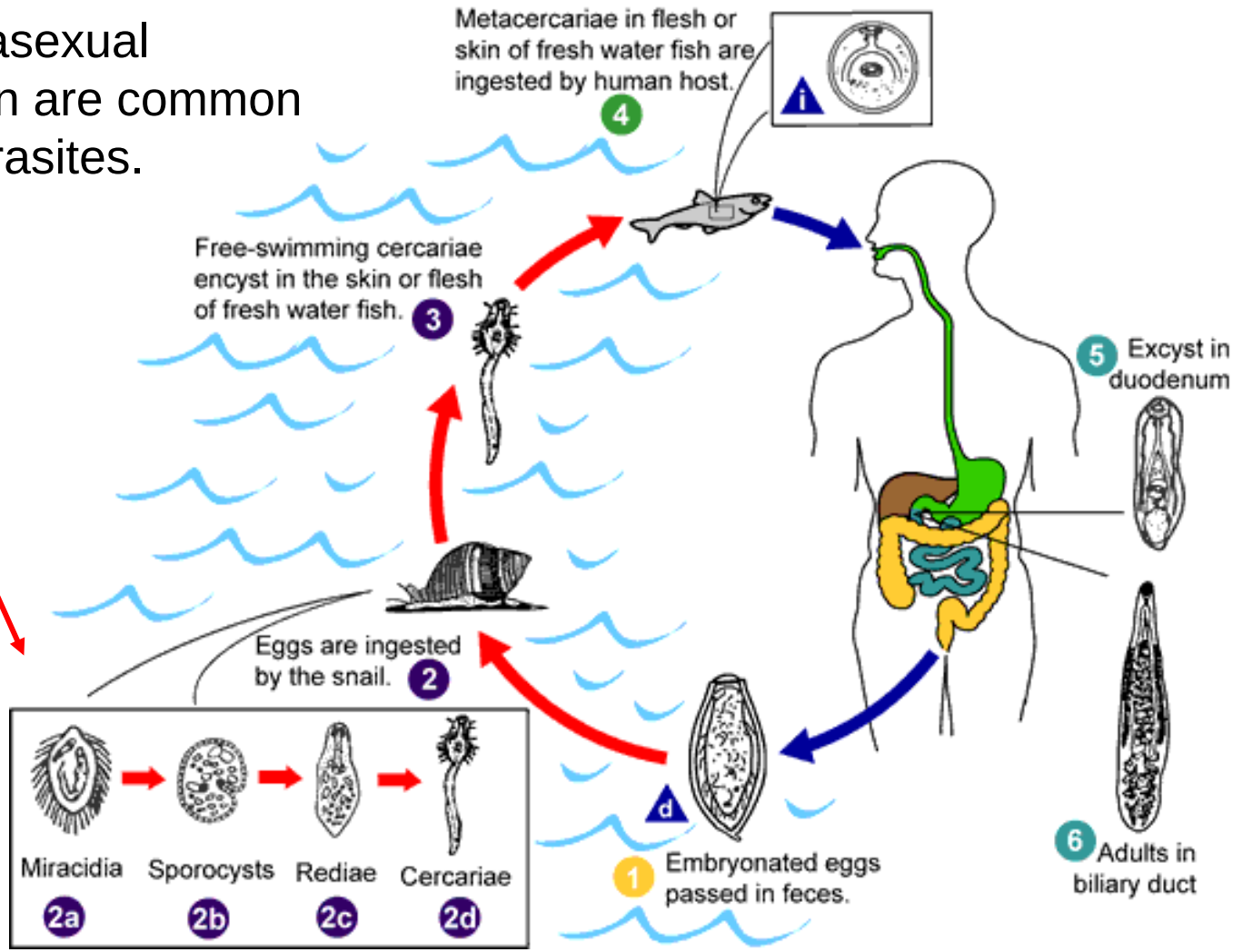
Reproduction

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

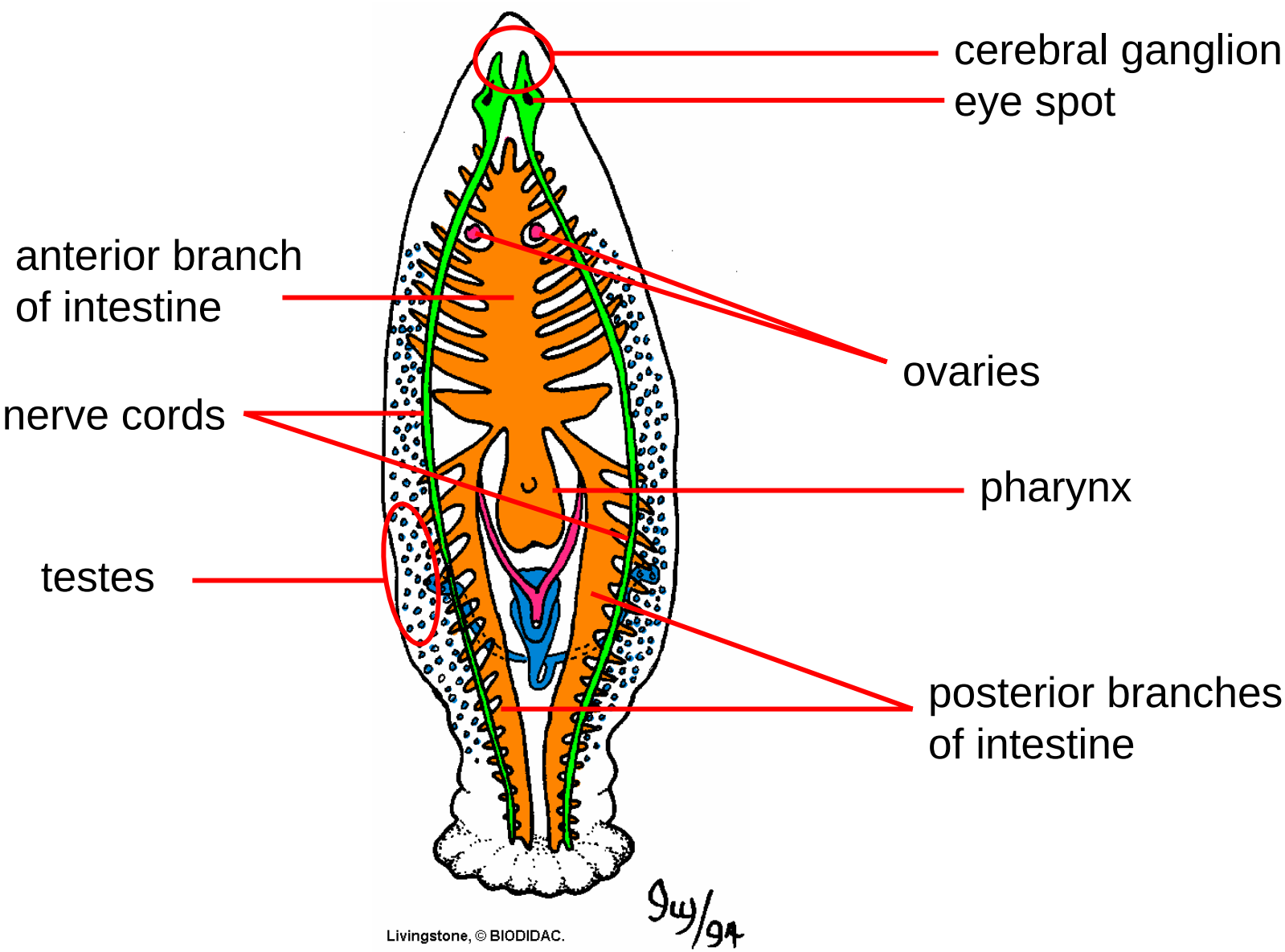
Class Cestoda

} parasitic

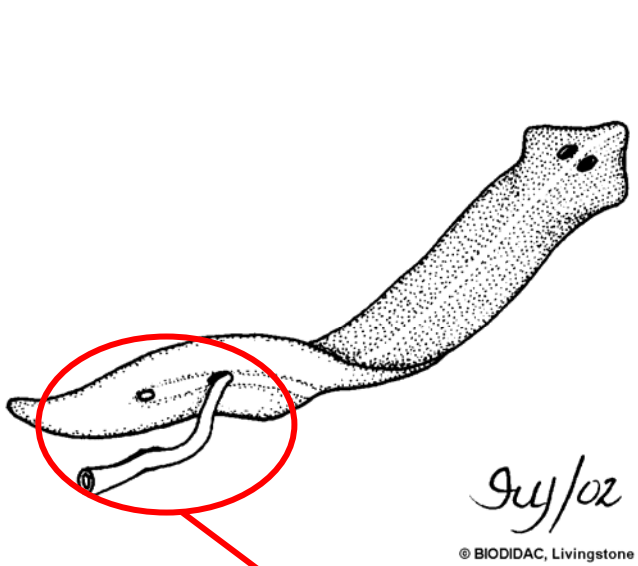
Class Turbellaria

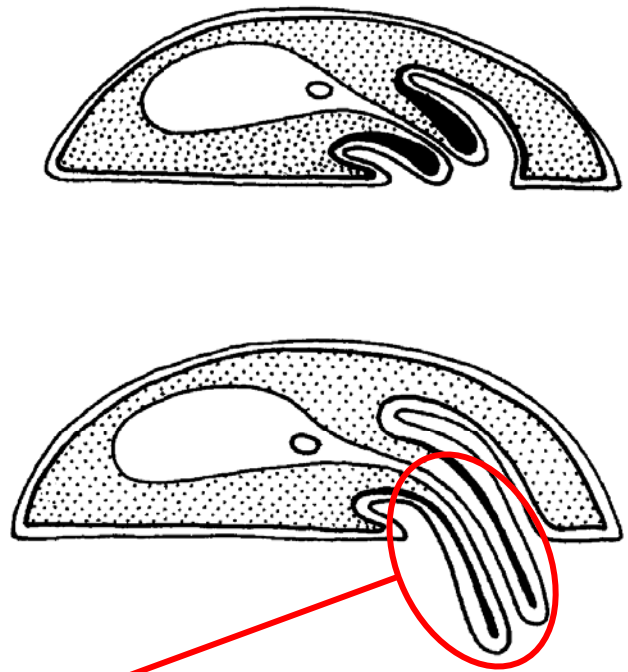
Free-living flatworms

Body Plan


cerebral ganglion
eye spot
anterior branch of intestine
ovaries
nerve cords
pharynx
testes
posterior branches of intestine
Livingstone, © BIODIDAC.

Digestive System

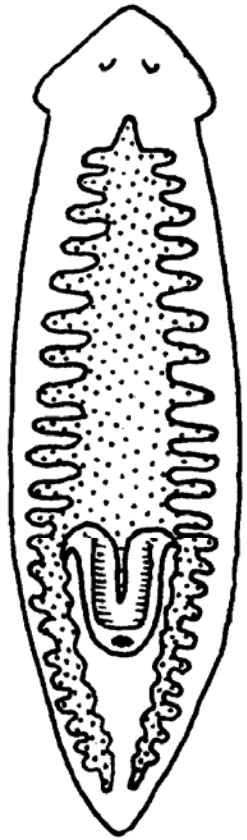


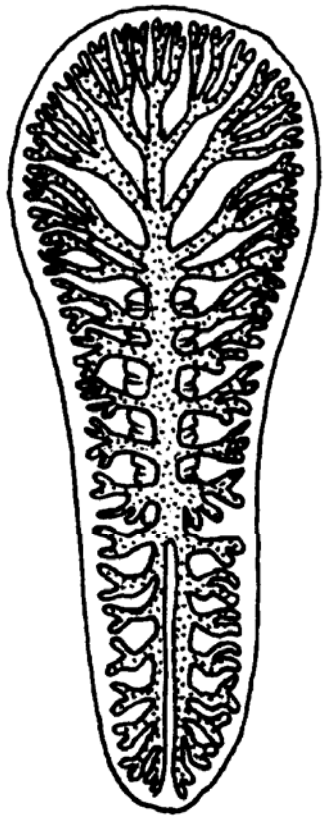


pharynx

Digestive System

triclad



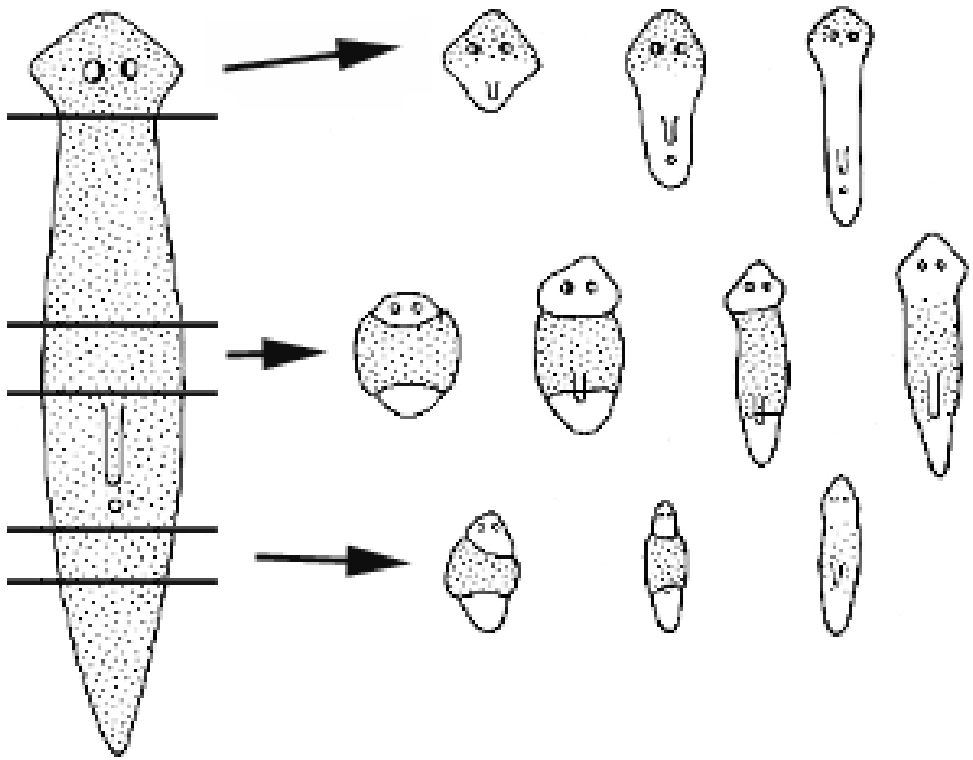


polyclad

July/98

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

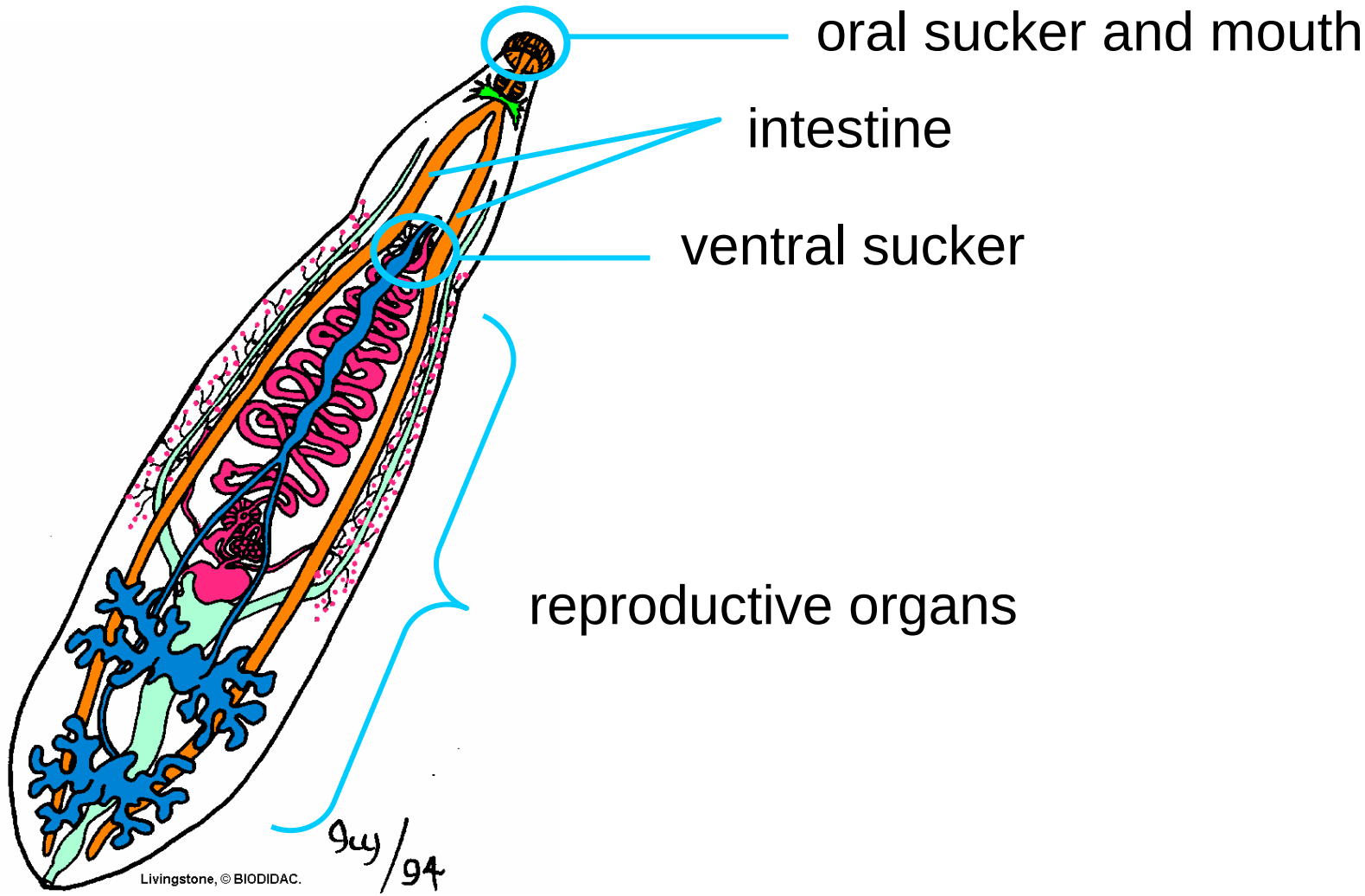
Resistant cuticle

Complex life cycles

Class Trematoda

Parasitic Flukes
Endoparasites of many animals

Body Plan

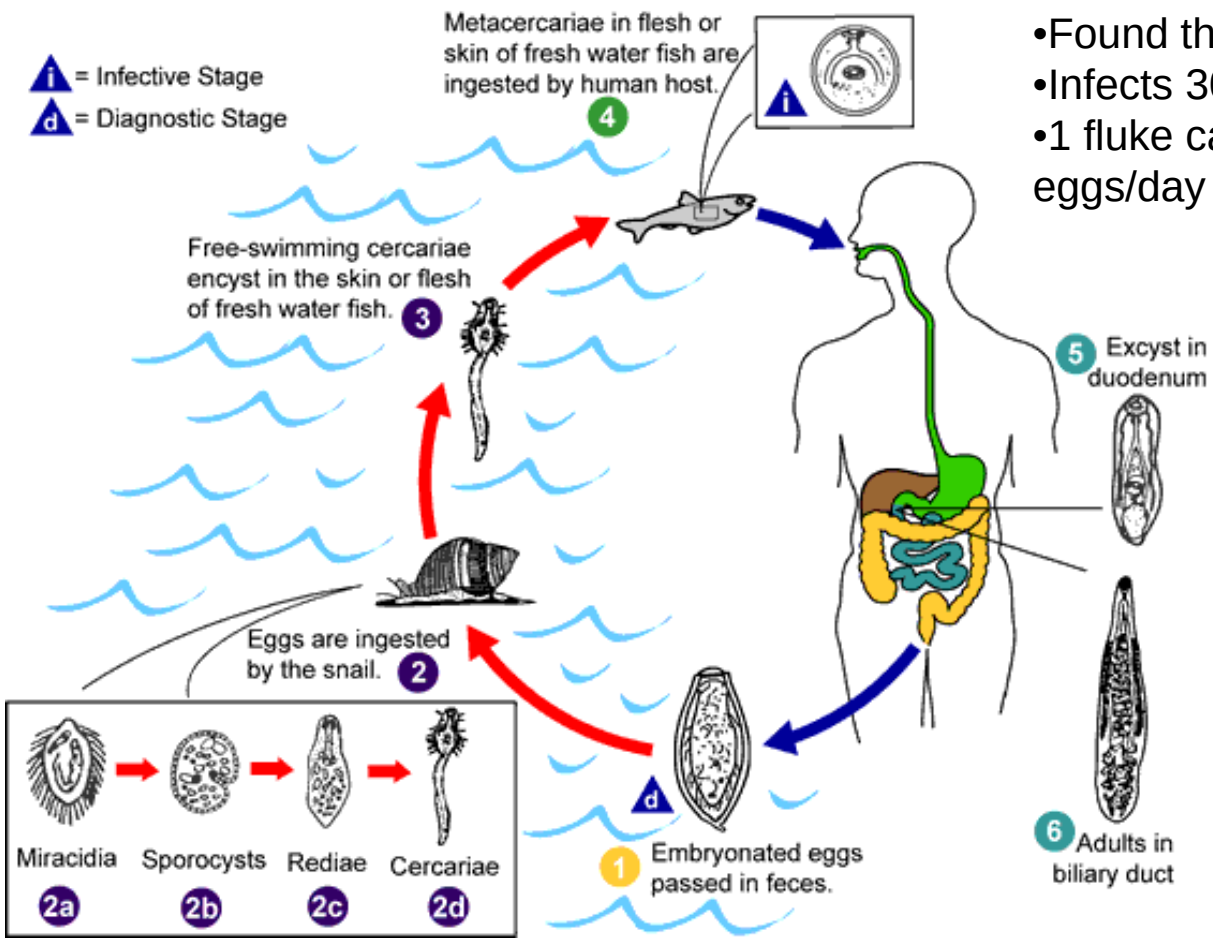

oral sucker and mouth
intestine
ventral sucker
reproductive organs
Livingstone, © BIODIDAC.

Complex Life Cycle

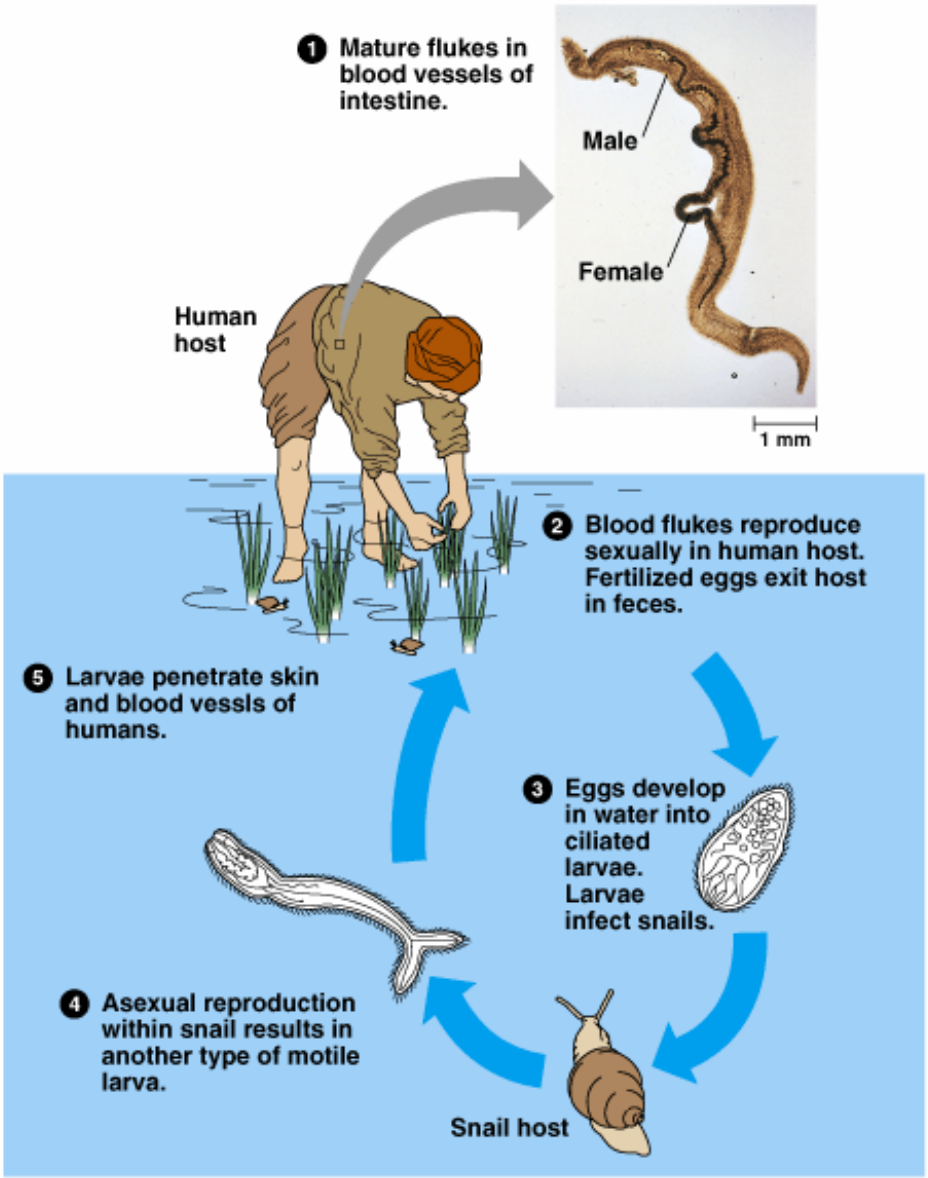
Most Trematodes have at least two hosts in their life cycle: e.g. the Chinese liver fluke

Clonorchis:

- Found throughout Asia
- Infects 30 million people
- 1 fluke can produce 4000 eggs/day



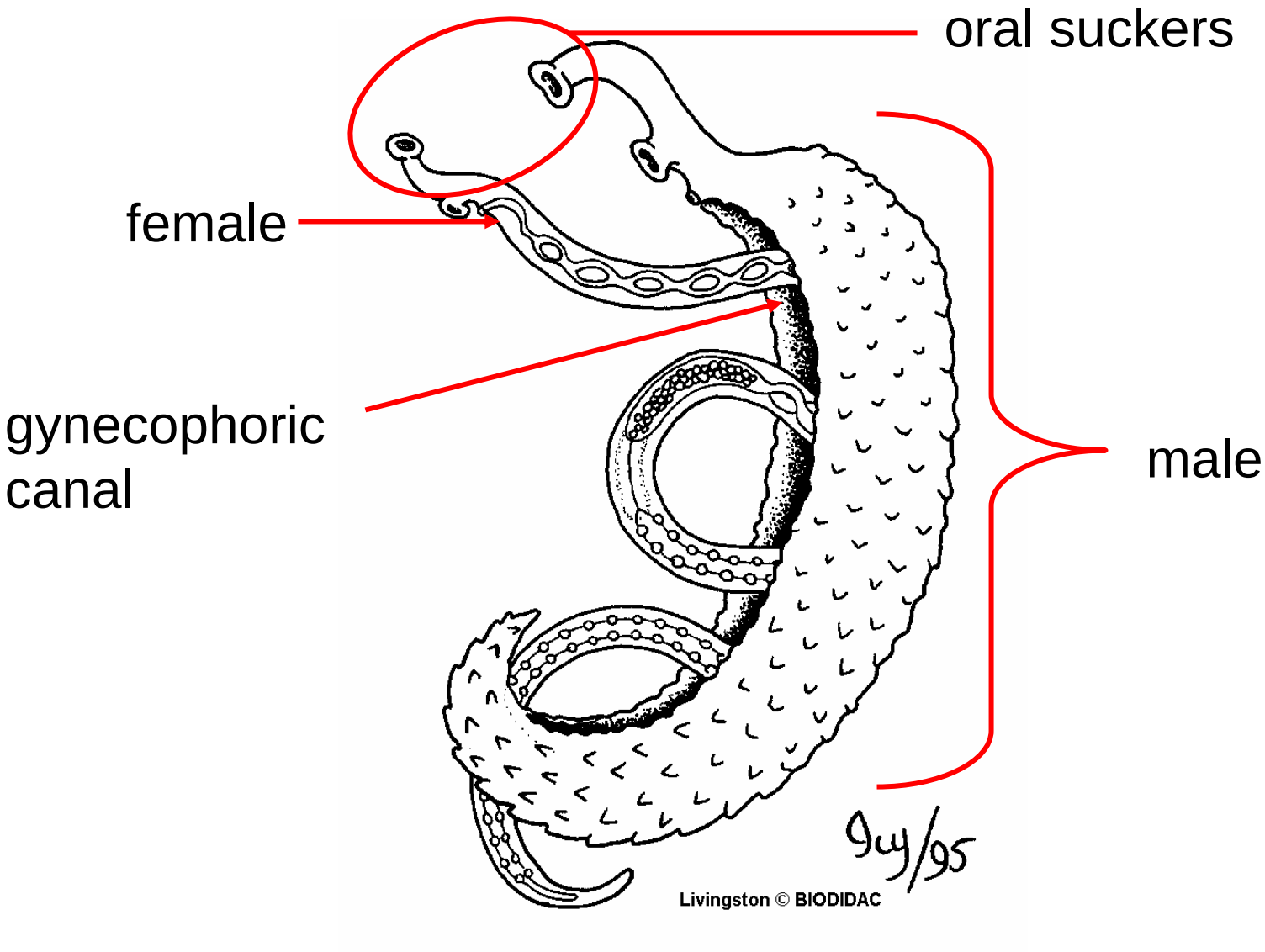
Complex life cycles: another example



Schistostoma:

•Found throughout Africa and South America

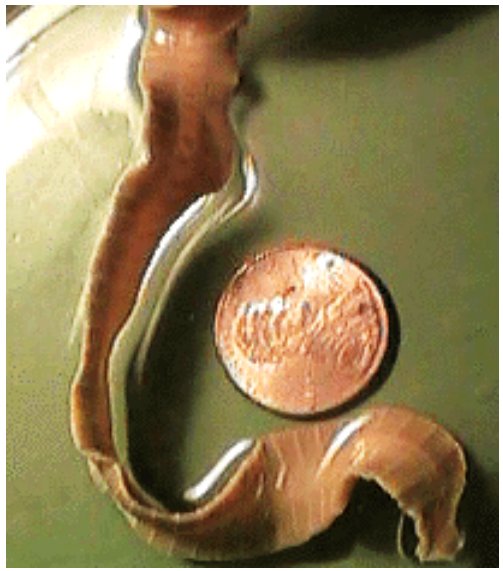
•Infects 200 million people


oral suckers
female
gynecophoric canal
male
9y/95
Livingston © BIODIDAC

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

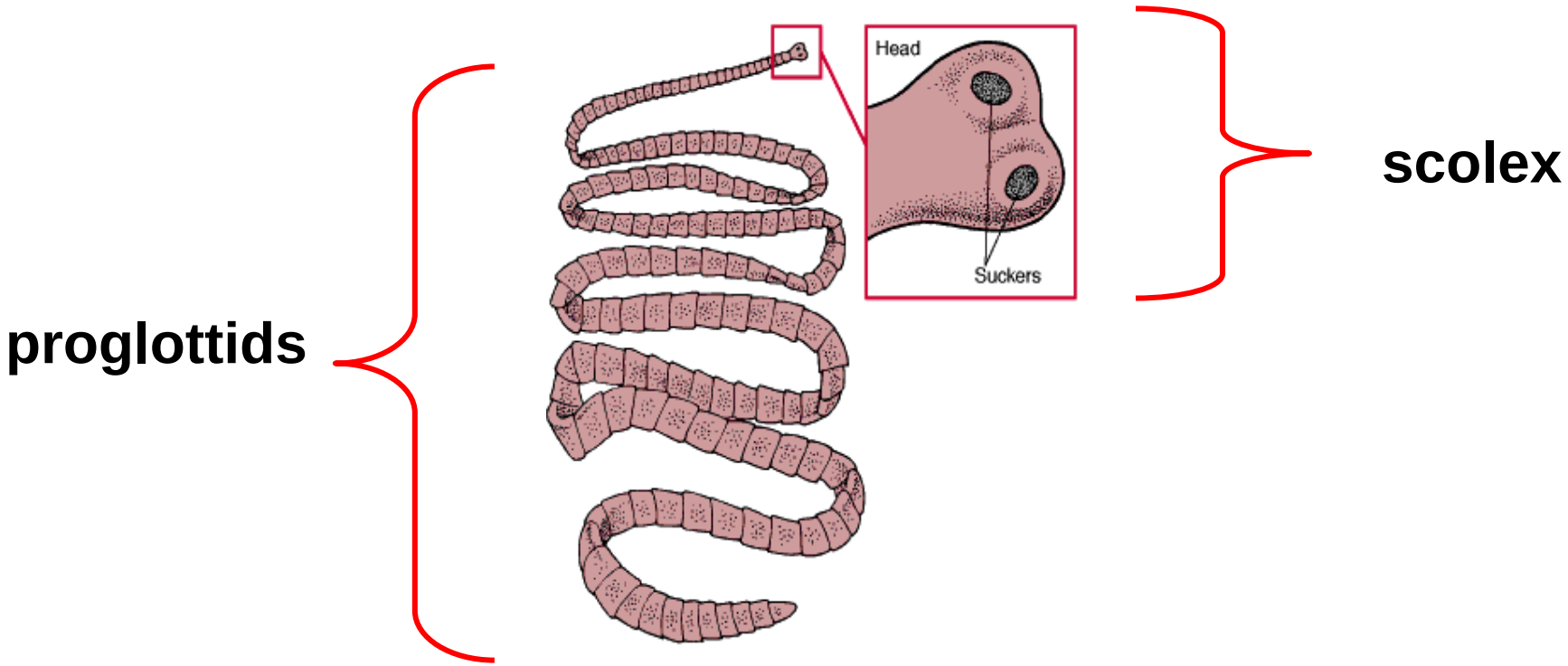
About 50 % of Egyptians living near the dam are now infected.

Class Cestoda

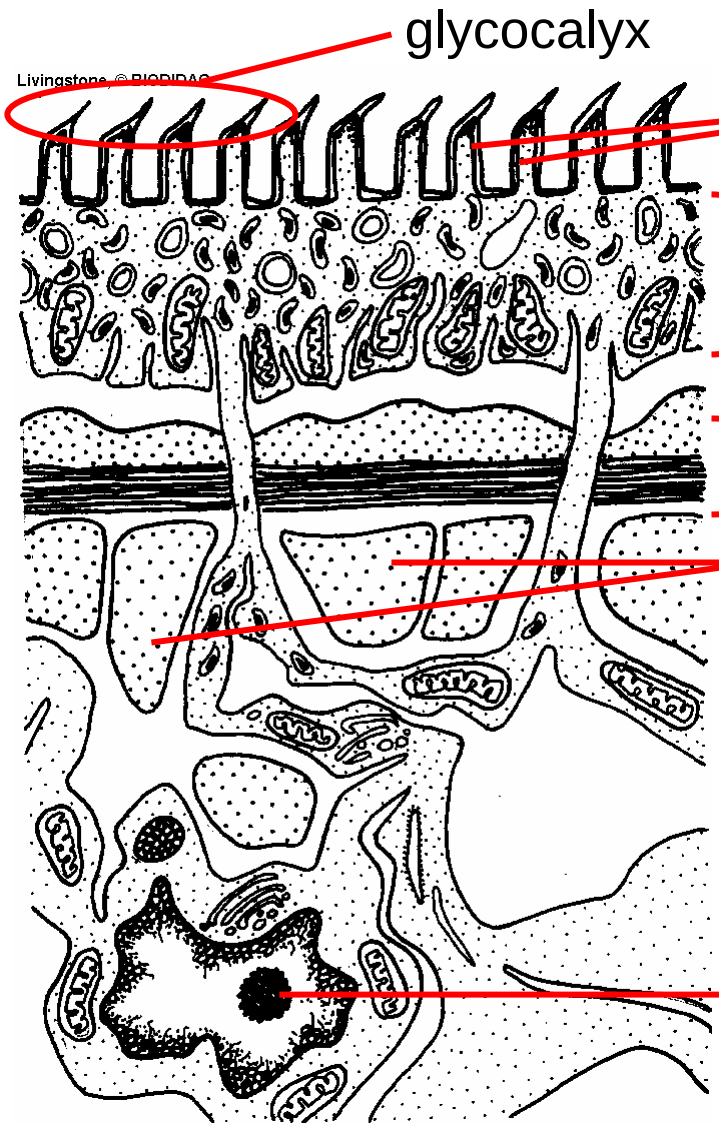


Body Plan

2 body regions: scolex and proglottids

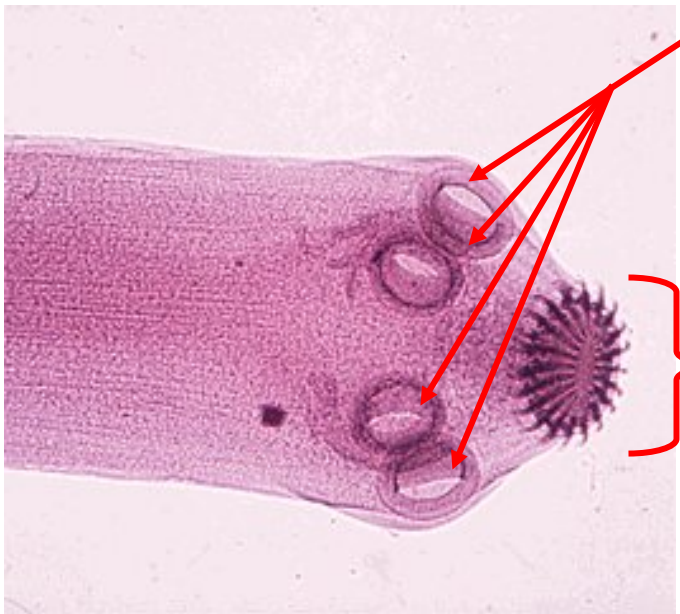


Body Plan: tegument

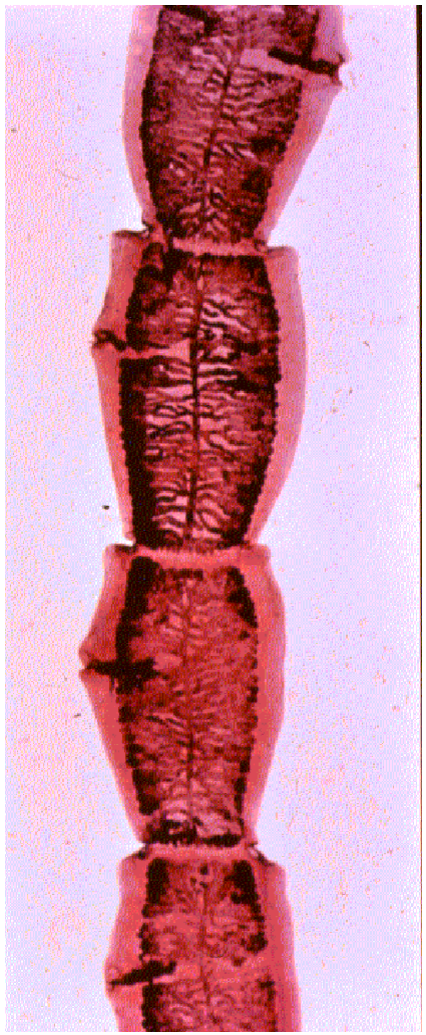


Body Plan

Scolex



Body Plan



Proglottids

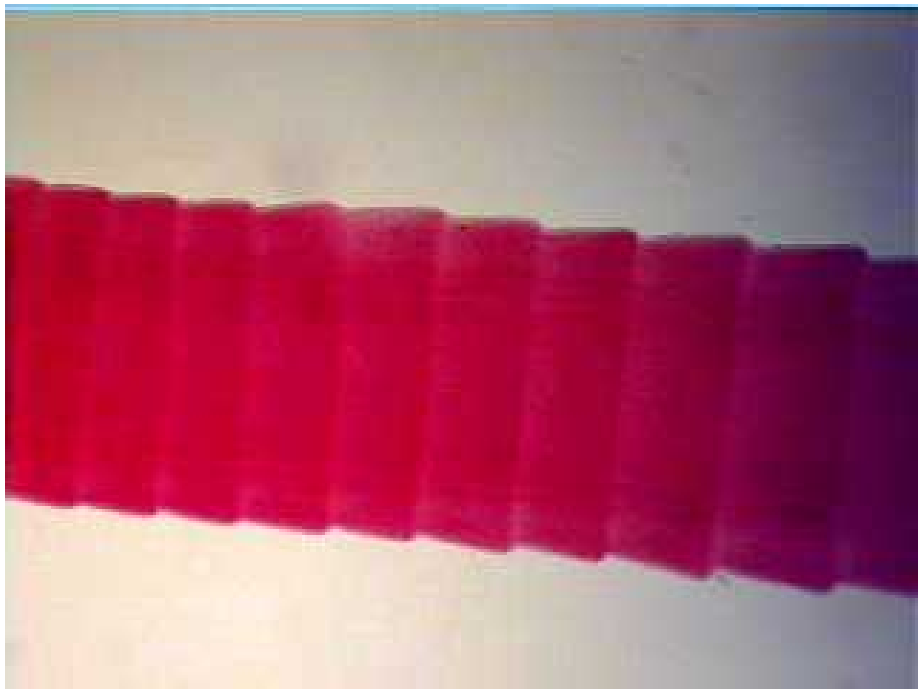
repeating segments containing reproductive organs

May be immature, mature, or gravid

Class Cestoda

Immature proglottids

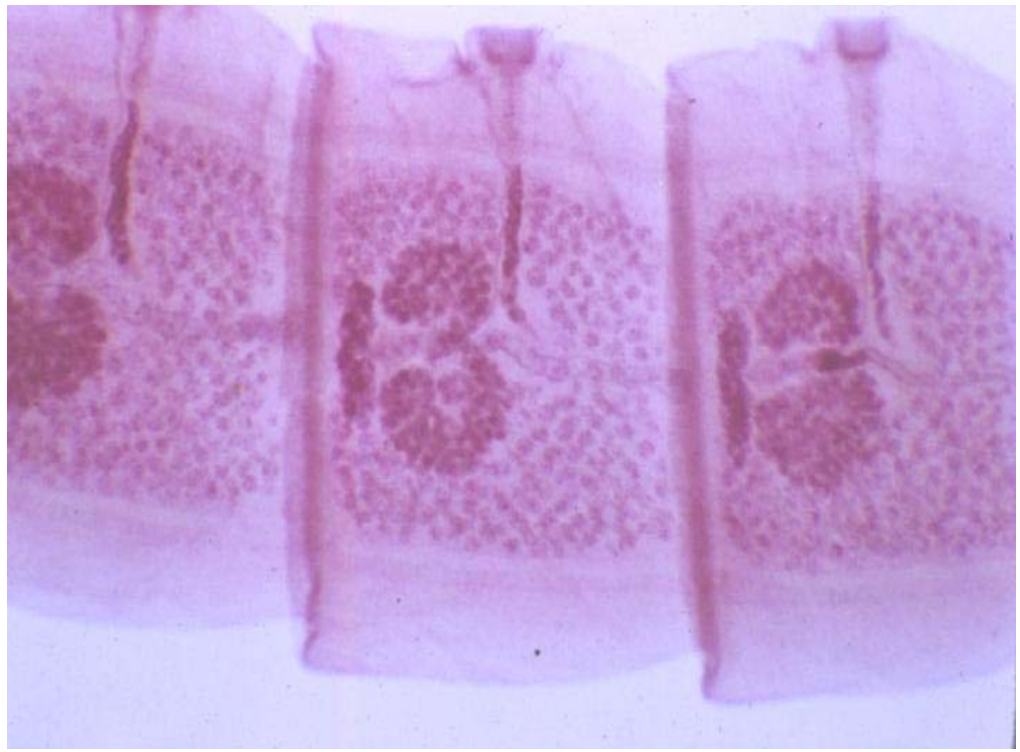
Immature proglottids are found at the anterior end of the tapeworm and contain no noticeable sex organs



Class Cestoda

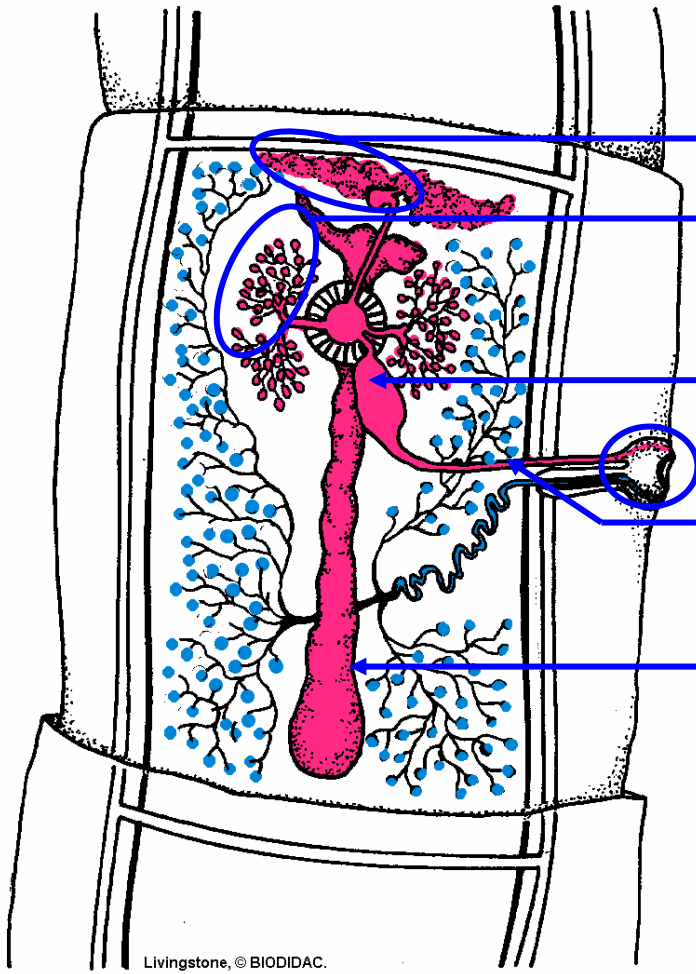
Mature proglottids

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



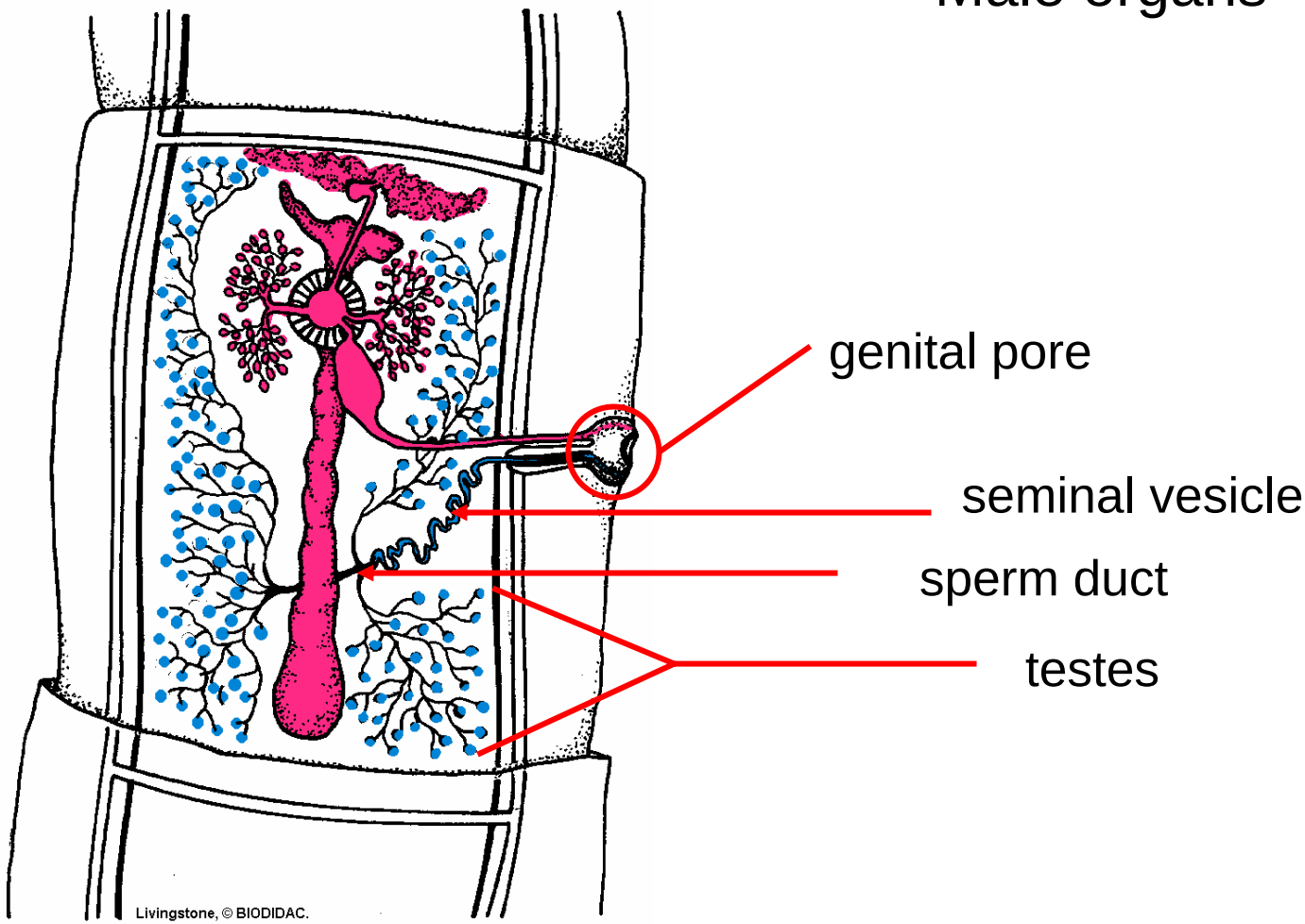
Class Cestoda

Female organs

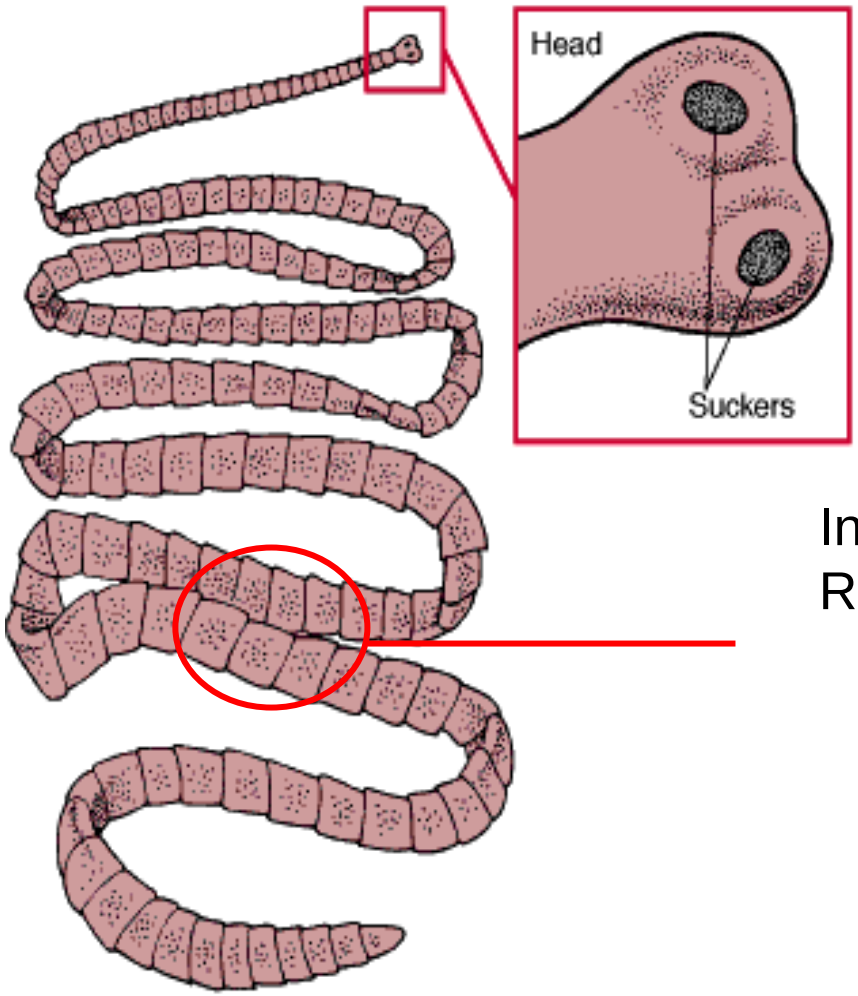


Class Cestoda

Male organs



Class Cestoda



Individuals are monoecious,
Reproduction is sexual

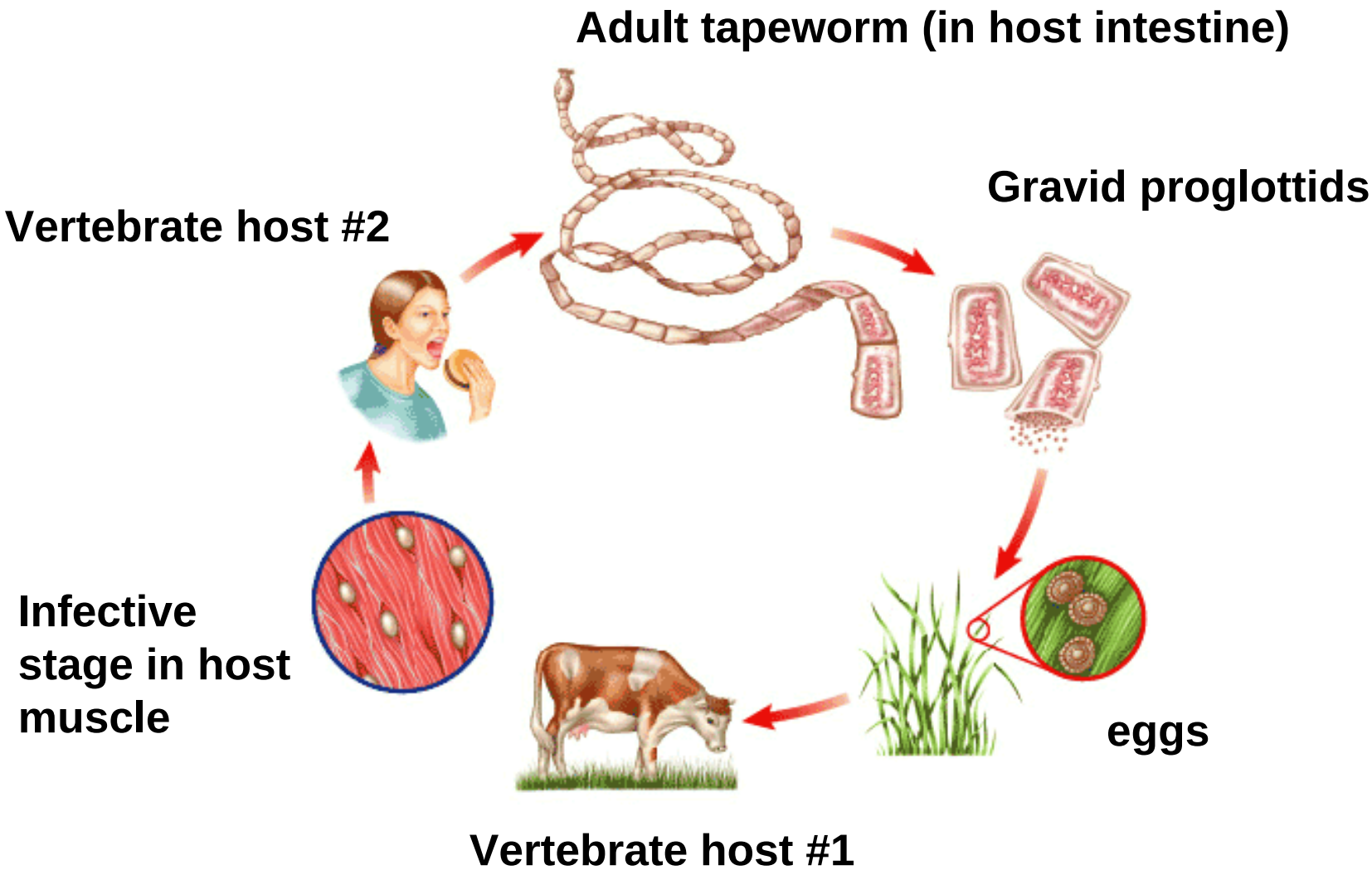
- •between proglottids on 1 individual
- •between individuals
- •Sperm do not usually fertilize eggs produced within the same proglottid

Class Cestoda

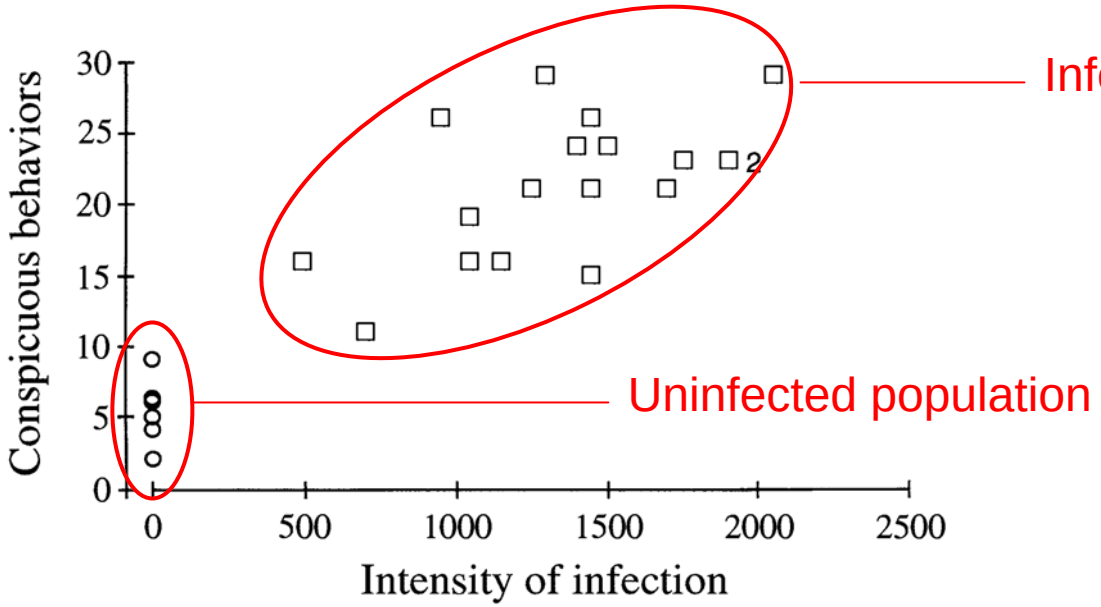
Gravid proglottids

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.

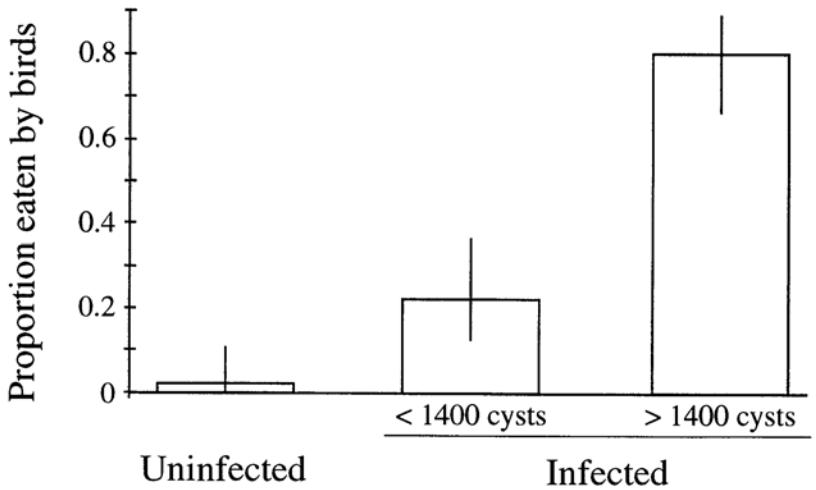
Cestoda Life Cycle

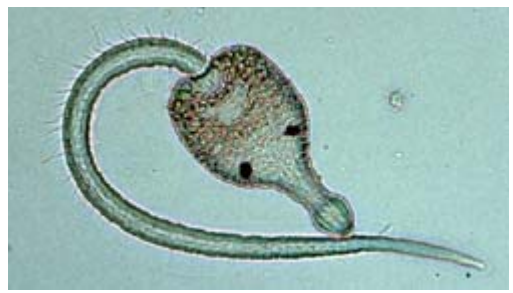


Trematodes and Host Behavior



Fundulus parvipinnis





Euhaplorchis califoniensis

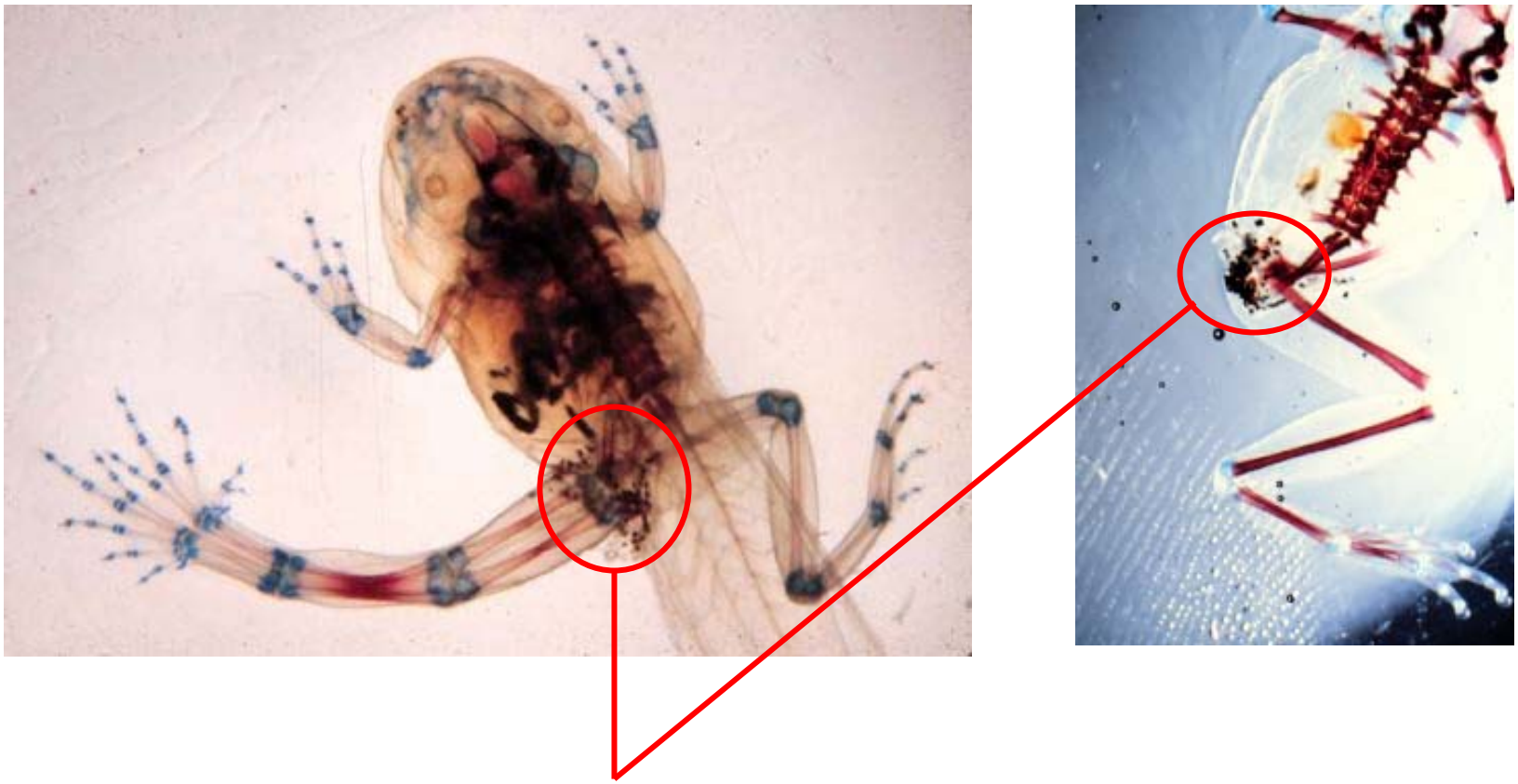
Lafferty and Morris 1996

Trematodes and Host Morphology

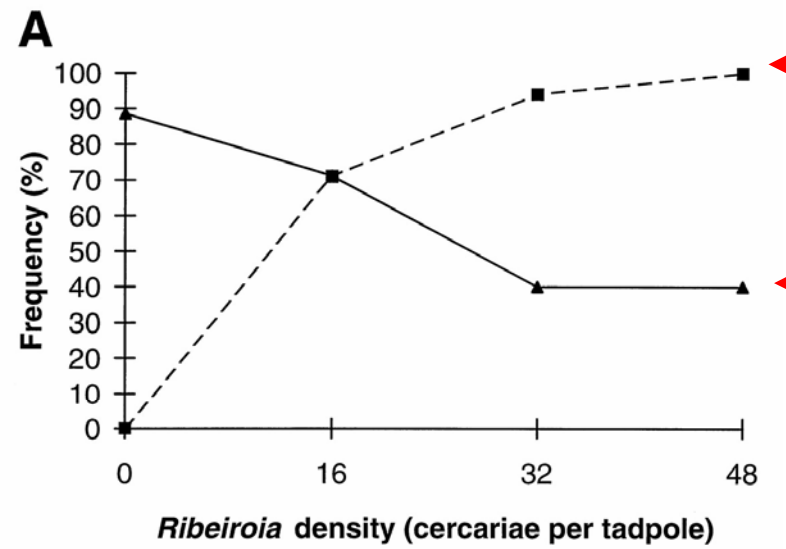
Limb deformities in amphibians have been recorded since the 1950's.

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…

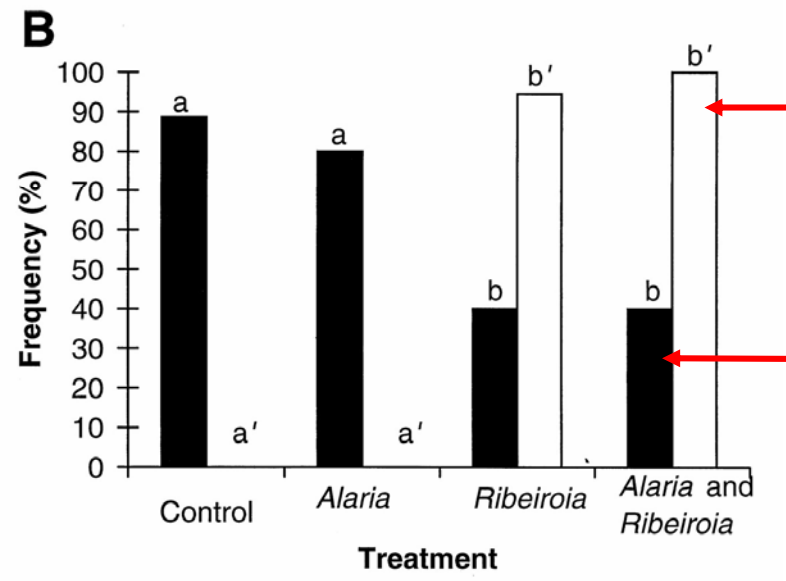


Cysts formed by the trematode, *Ribeiroia*



Deformities

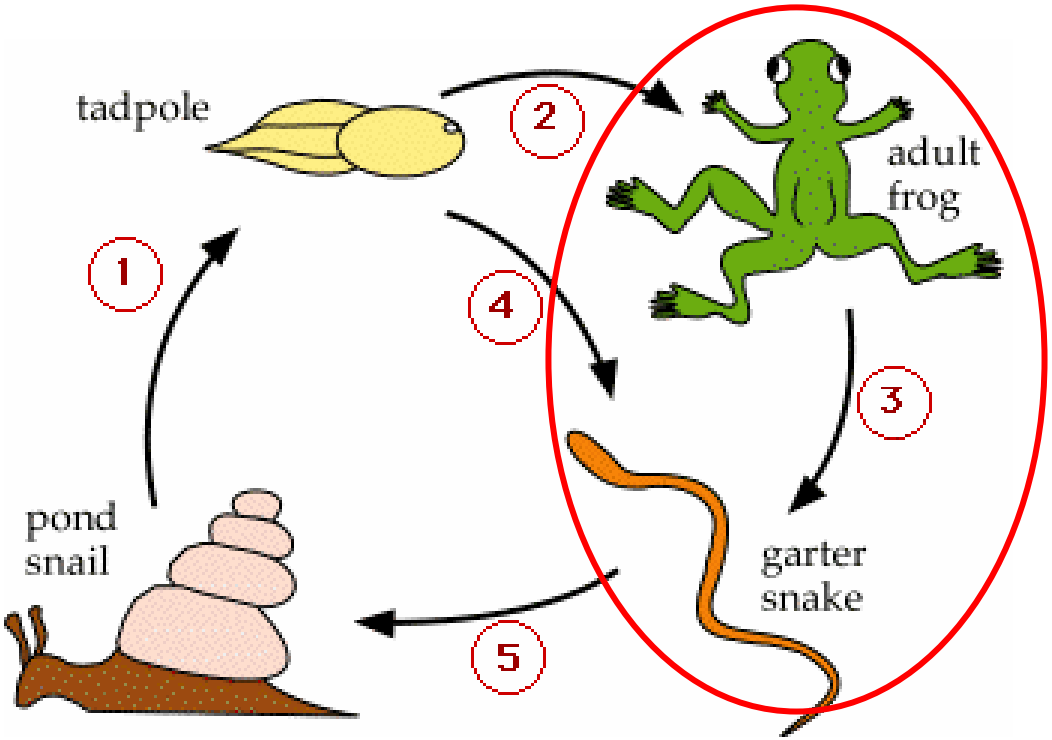
Survival



Deformities

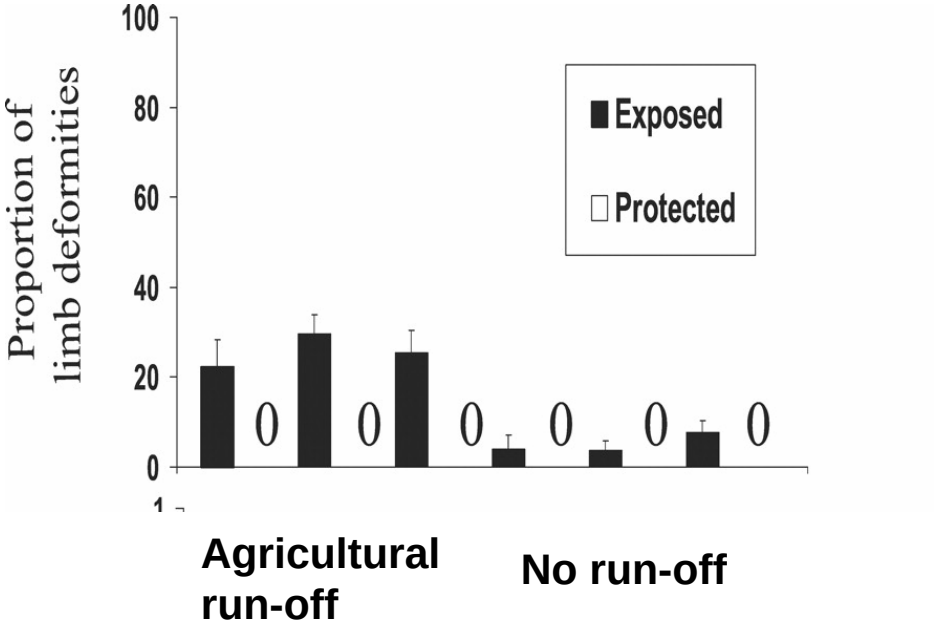
Survival

Johnson, et al. 1999



Ribeiroia life cycle

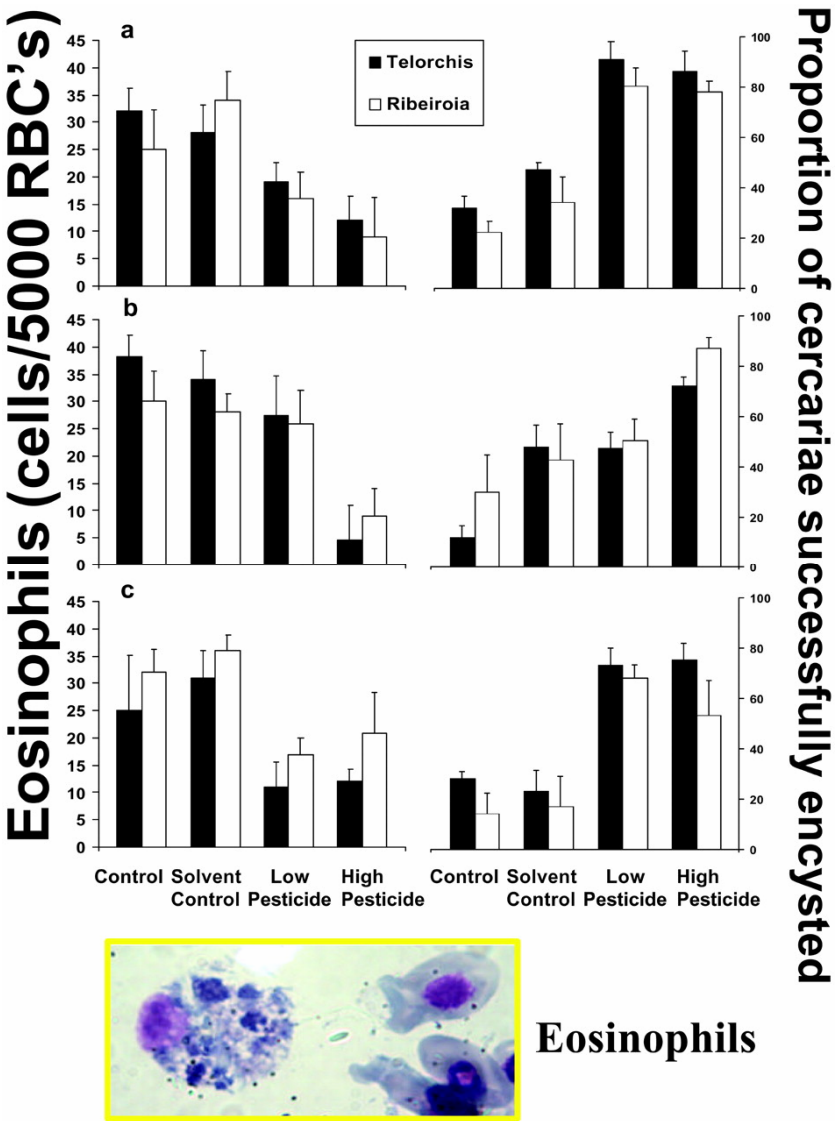
Are deformed frogs more likely to be eaten by snakes?



From Kiesecker 2002

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.

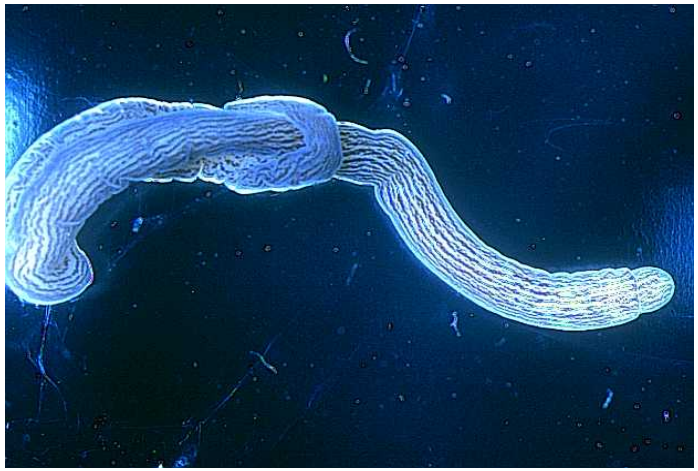
There might be more to the story than just parasites:

•Trematodes do not induce this type of deformity.

References:

Kiesecker, J. M. 2002. Synegism 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

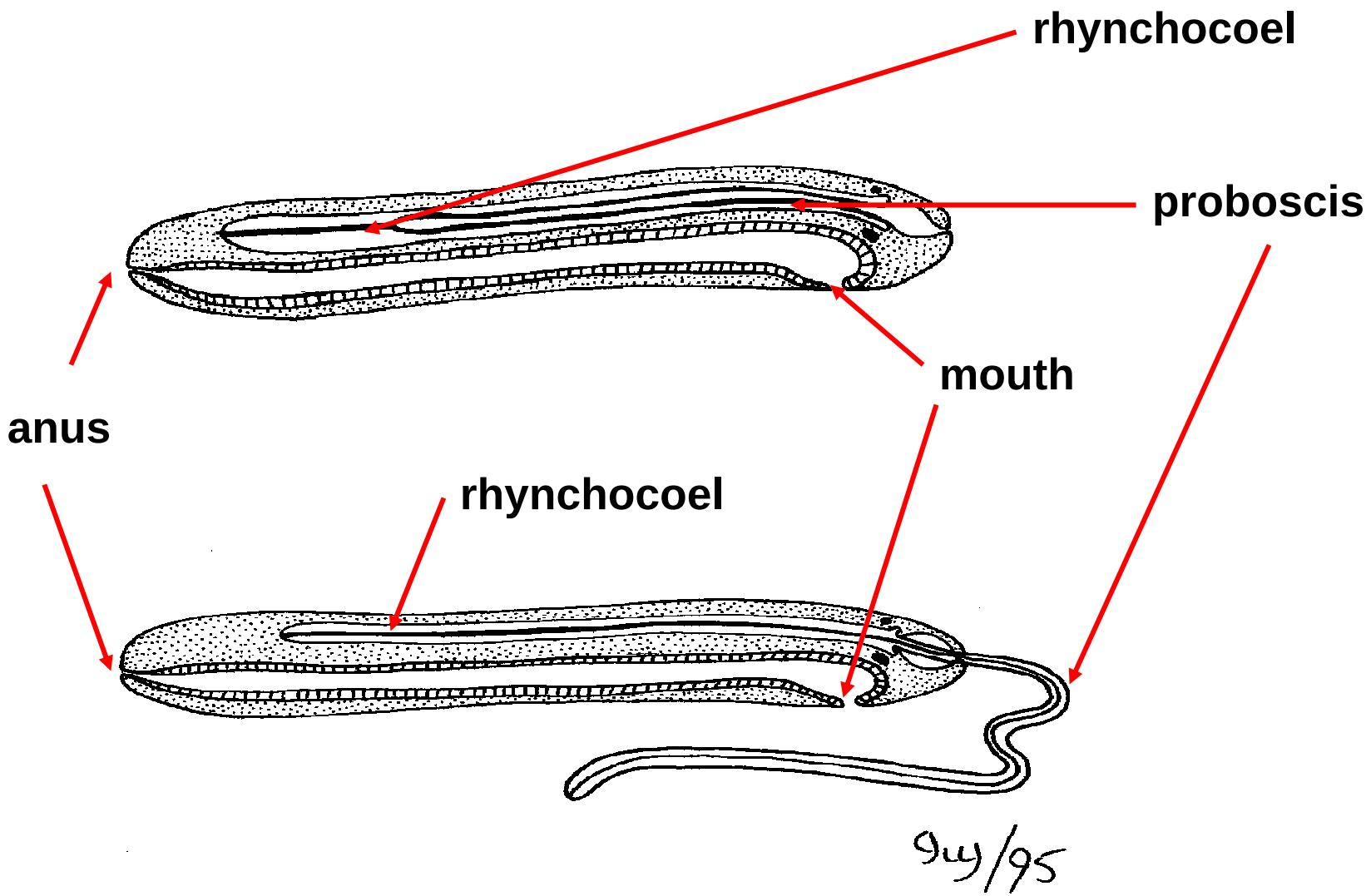
the ribbonworms

Physiology

Feeding

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

Physiology



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