

A close-up photograph of a nudibranch, a type of mollusk without a shell. The nudibranch has a bright purple body with a distinct yellow-orange border along its edges. It is crawling on a textured, brownish substrate that appears to be coral or a similar marine organism. The text "Triploblastic, Acoelomate Body Plan" is overlaid in large, bold, black letters.

Triploblastic, Acoelomate Body Plan

Benilda Ramos-Butron

Introduction

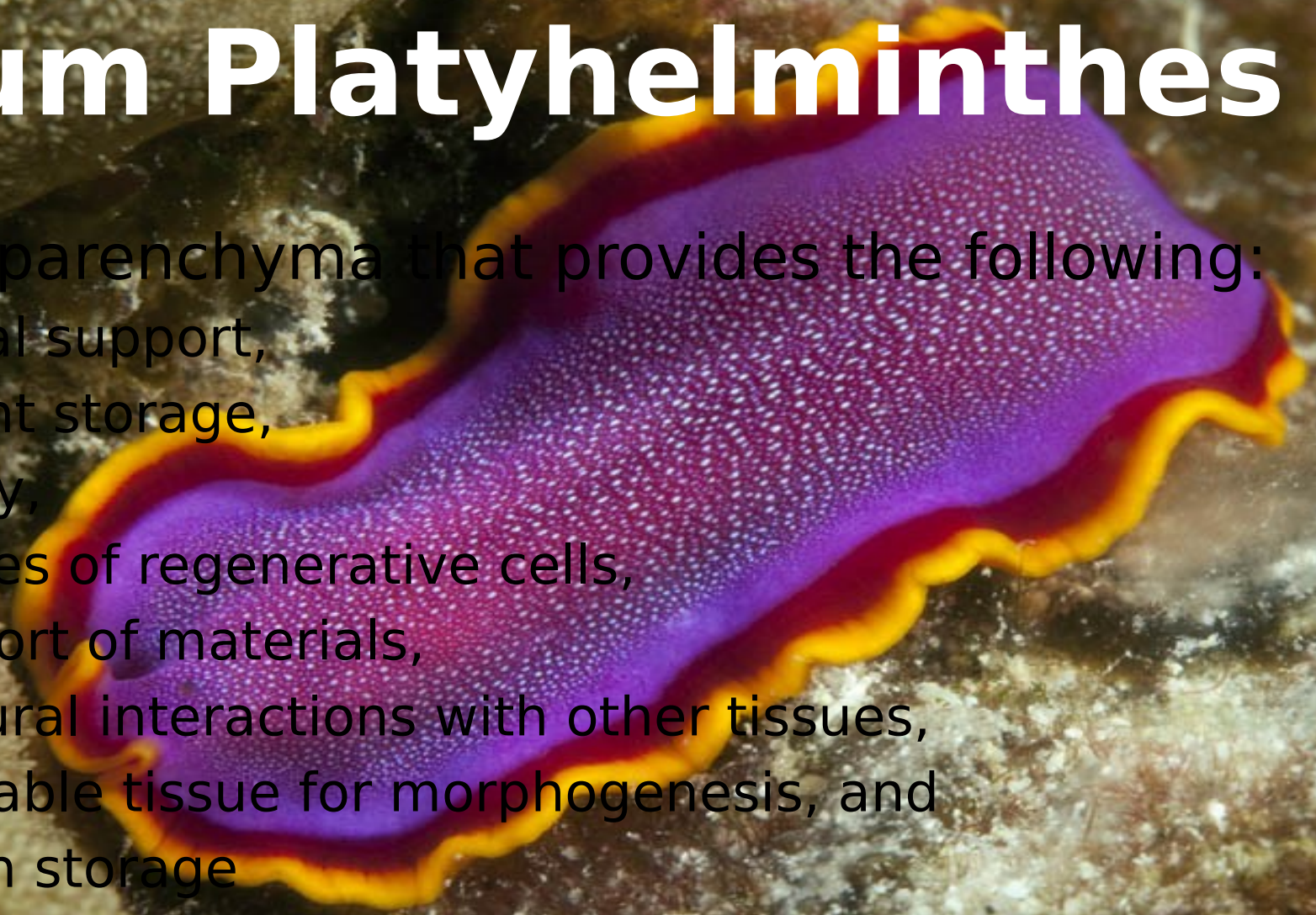
- Represented by three phyla: Platyhelminthes, Nemertea and Gastrotrichia
 1. Bilateral symmetry
 2. True mesoderm that gives rise to muscles and other organs
 3. Nervous system with a primitive brain and nerve cord
- Mesoderm mass fills the area between the outer epidermis and digestive tract
- Dorsoventrally flattened
- Class Turbellaria are free-living
- Phylum Nemertea contains marine, elongate, burrowing worms

Evolutionary Perspective

- First animals to exhibit bilateral symmetry
- Body organization more complex than the cnidarians
- *Triploblastic acoelomate body plan is important intermediate between the radial, diploblastic plan and the triploblastic coelomate plan*

Phylum Platyhelminthes

- Contains parenchyma that provides the following:
 1. skeletal support,
 2. nutrient storage,
 3. motility,
 4. reserves of regenerative cells,
 5. transport of materials,
 6. structural interactions with other tissues,
 7. modifiable tissue for morphogenesis, and
 8. oxygen storage



Phylum Platyhelminthes

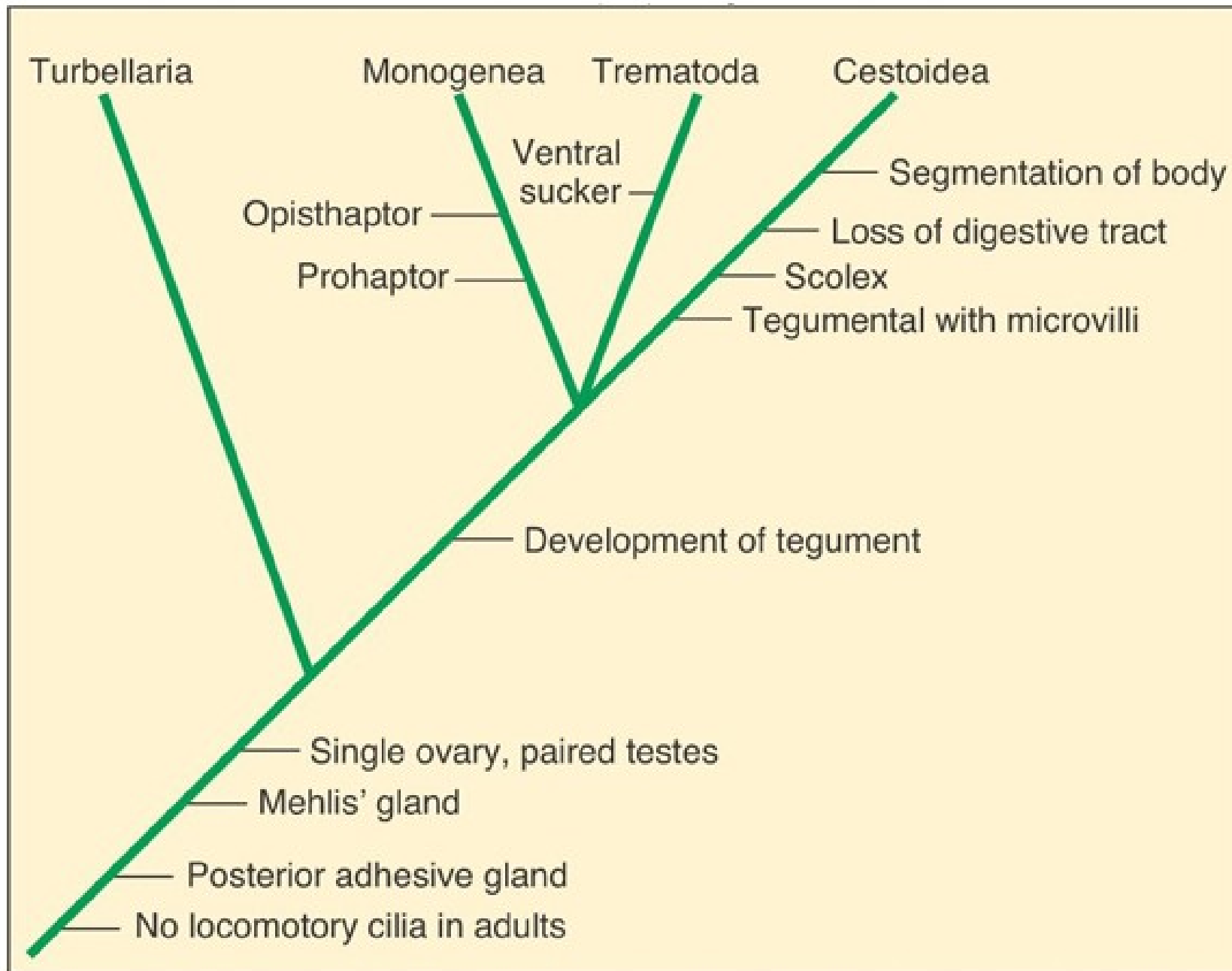
- Four classes

1. Turbellaria – free-living flatworms
2. Monogenea
3. Trematoda
4. Cestoda

- General Characteristics

1. Dorsoventrally flattened, triploblastic, acoelomate, bilateral symmetry
2. Unsegmented
3. Incomplete gut
4. Partially cephalized, with anterior cerebral ganglion and longitudinal nerve cord
5. Protonephridia as excretory/osmoregulatory structures
6. Hermaphroditic; complex reproductive system





Class Turbellaria: The Free-Living Flatworms

- Mostly free-living bottom dwellers in freshwater and marine environments

- Predators and scavengers

□ BODY WALL

- Contains epidermis (sometimes with cilia or microvilli), circular, longitudinal or oblique muscles, and gastrodermis
- Glands on the ventral surface
 - *Rhabdites* – rodlike cells that swell and form a protective mucous sheet
 - *Adhesive glands* – opens to the epithelial surface and produce chemical for attachment
 - *Releaser glands* – release chemicals to dissolve attachment

Class Turbellaria: The Free-Living Flatworms

❑ Locomotion

- Glide over substrate
- Move using cilia and muscular undulations

❑ Digestion and Nutrition

- Simple, unbranched to highly branched to lobed digestive tracts
- Pharynx functions as an ingestive organ which can project out of the mouth when feeding
- Planaria can be scavengers or herbivores
- Planaria has chemoreceptor to detect food
- Food digestion is partially extracellular with pharyngeal glands secreting digestive enzymes



Class Turbellaria: The Free-Living Flatworms

- Exchanges with the Environment
 - DO NOT have respiratory organs
 - Metabolic waste is ammonia
 - *Protonephridia* are network of fine tubules that run the length of the turbellarian that are used for osmoregulation
 - *Flame cells* – tiny enlargements on the fine side branches of the tubule
 - *Nephridiopore* – minute openings of the tubules going outside

Class Turbellaria: The Free-Living Flatworms

□ Nervous System and Sense Organs

- Order Acoela has the most primitive type among the member of the phylum with a subepidermal nerve plexus
- *Statocyst* – found in the anterior end that functions for mechanoreception
- Others have a more centralized nerve net with cerebral ganglia
- *Commissures* – points of union of the lateral nerve cord
- Turbellarian nervous system has a ladderlike appearance
- Many tactile and sensory cells distributed over the body to detect touch, water currents, and chemicals

Class Turbellaria: The Free-Living Flatworms

- *Auricle (sensory lobe) may project from the side of the head*
 - *Chemoreceptors that aid in food location are dense in here*
- *Ocelli – two simple eyespots which orient the animal to the direction of light*
- ☐ Reproduction and Development
 - Transverse fission producing *zooids*
 - Monoecious
 - Male has testis, sperm ducts, seminal vesicles, and penis
 - Female has ovaries and oviducts opening outside through genital pore
 - Cross fertilize

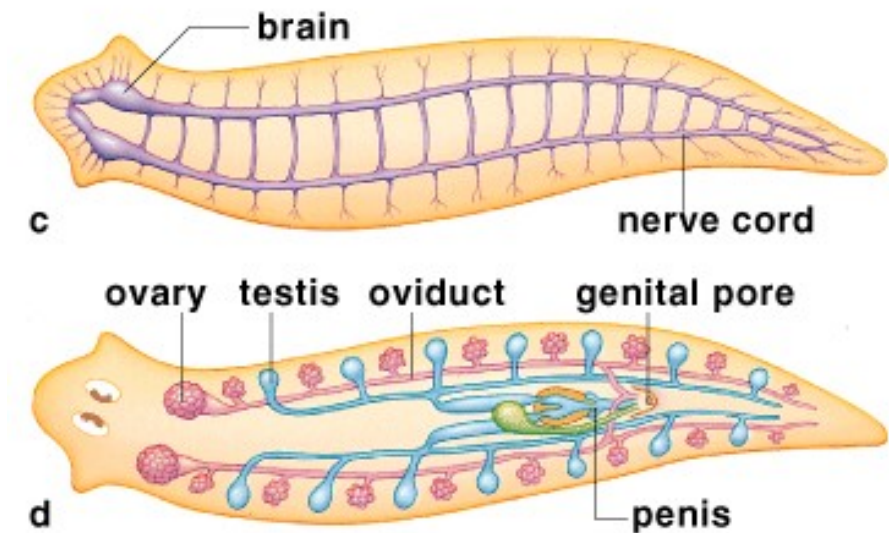


Class Turbellaria: The Free-Living Flatworms

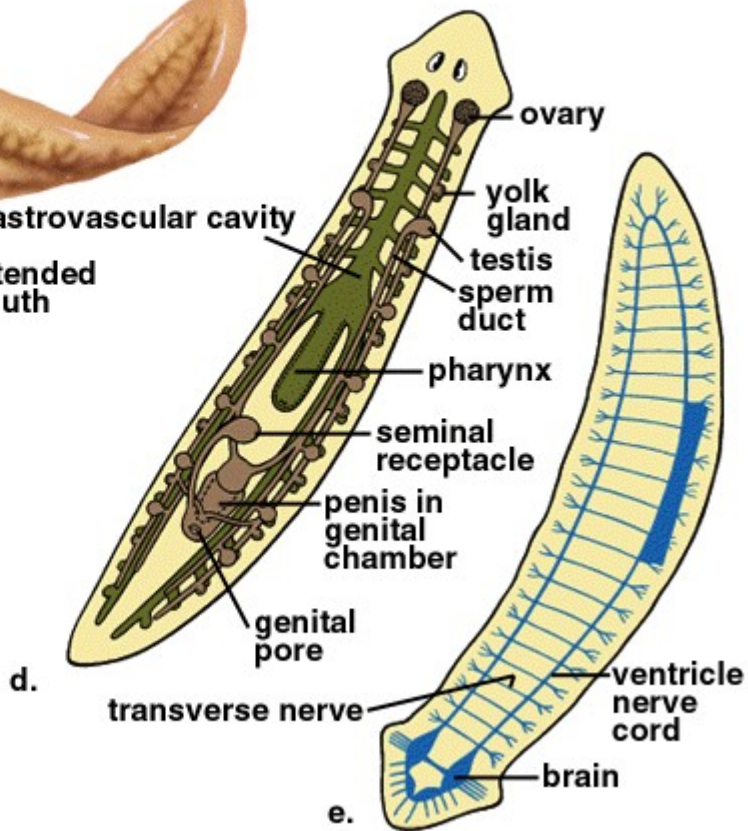
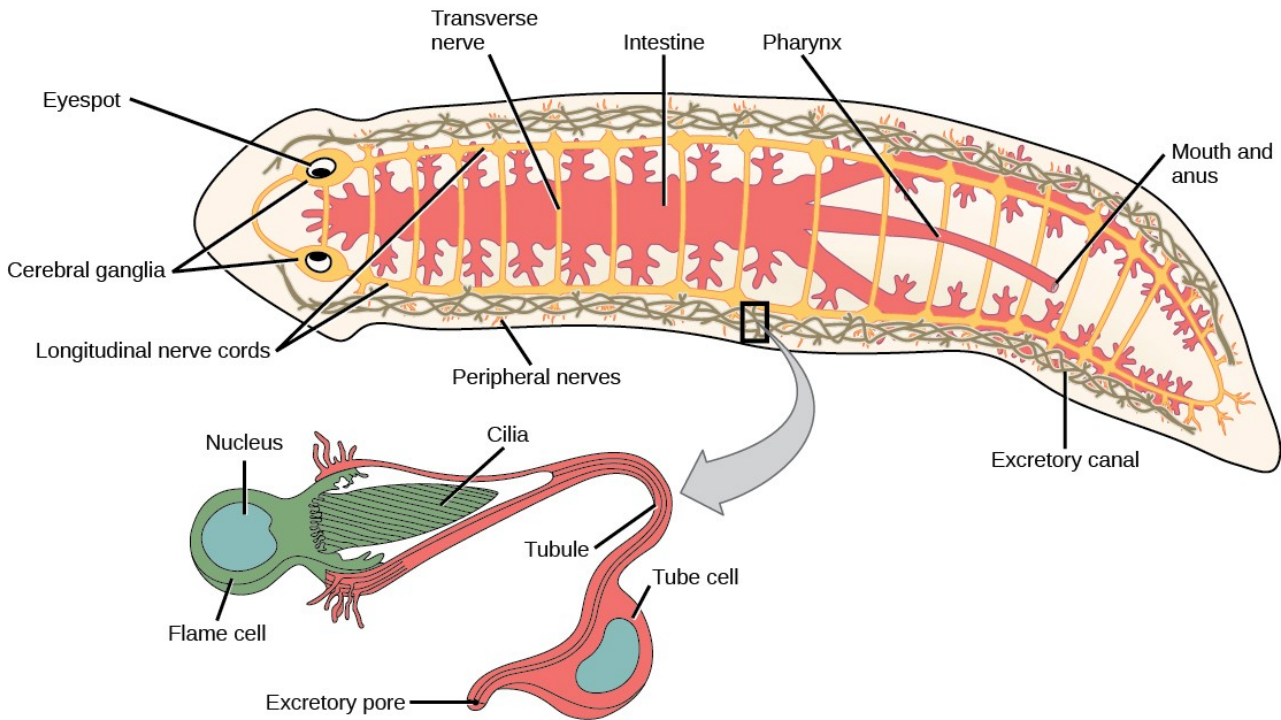
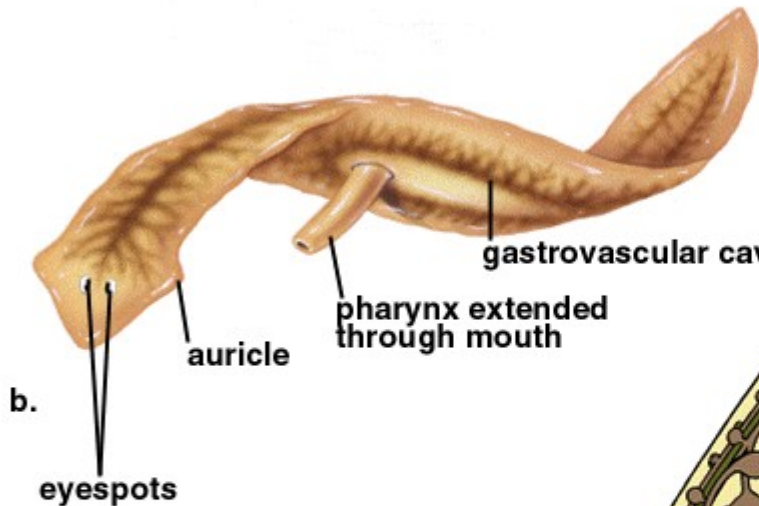
- Eggs laid with or without gel-like mass but enclosed in a cocoon
 1. Summer capsule – hatch in 2 to 3 weeks and immature animals emerge
 2. Autumn capsule – have thick walls that can resist freezing and drying; hatch after overwintering
- Direct development
- Some have free-swimming *Muller's larva*



Planarian anatomy

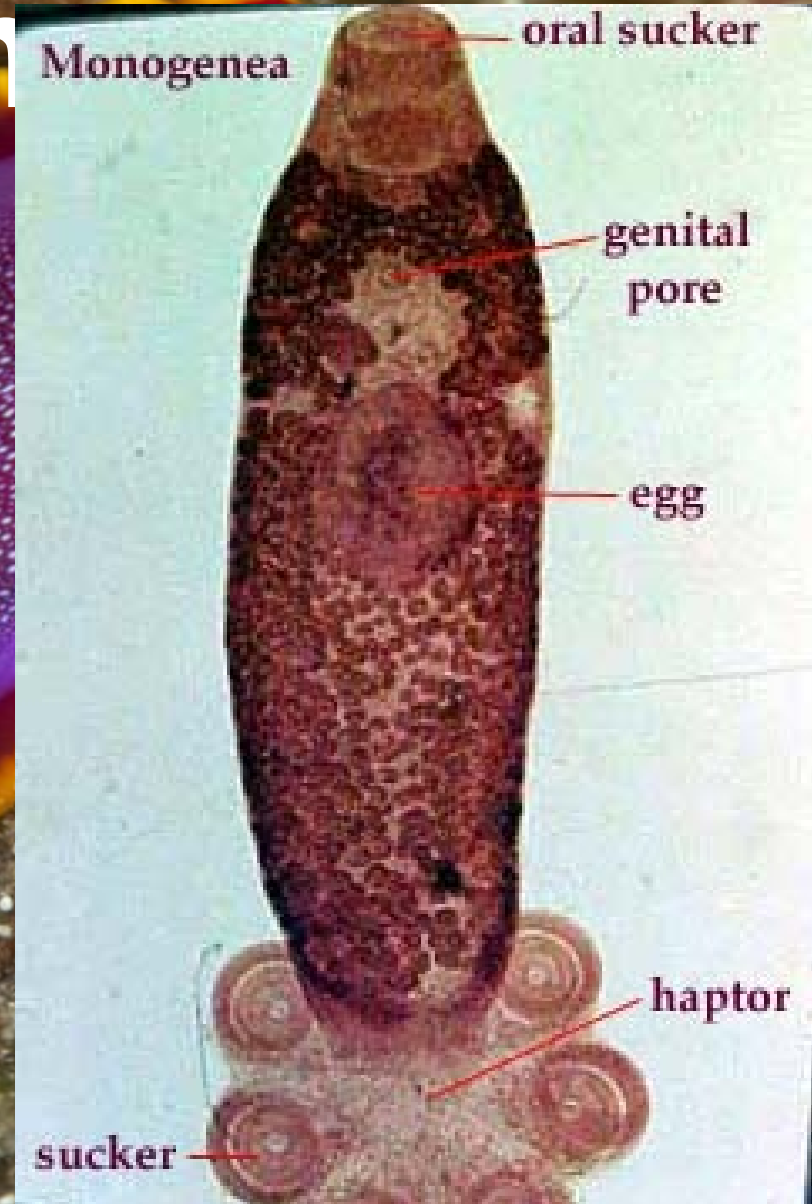


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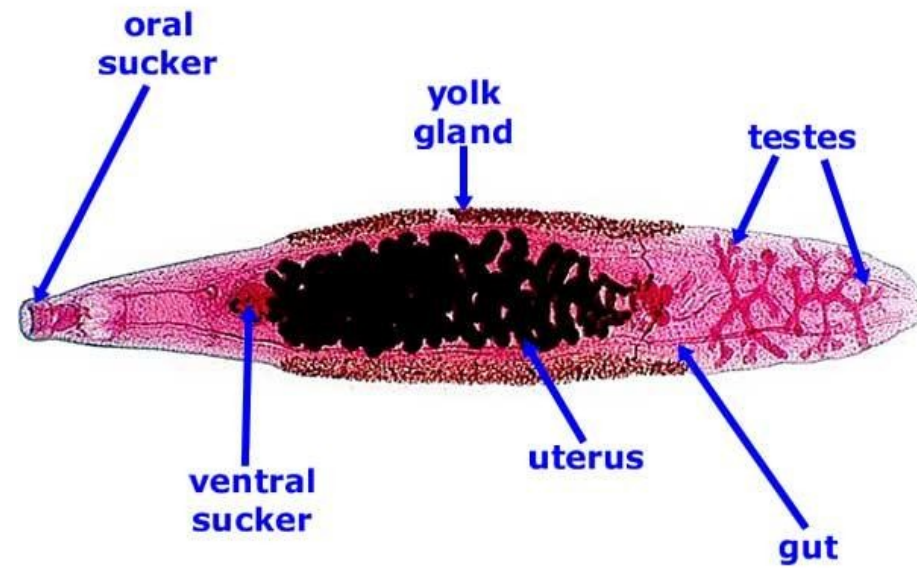
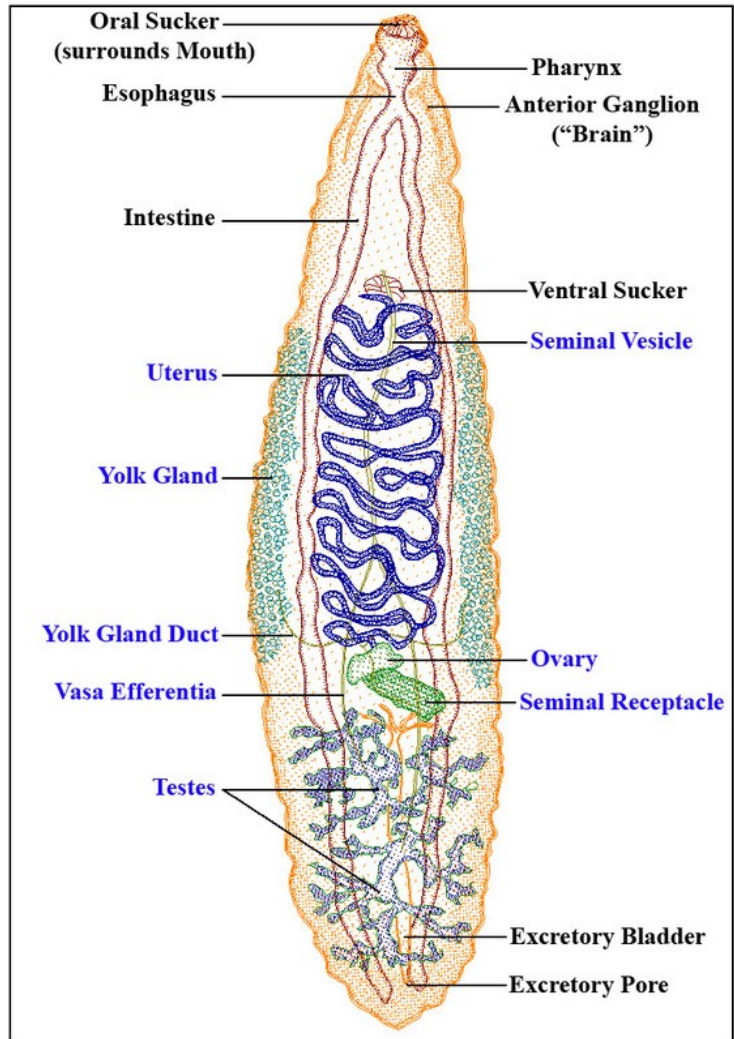
Class Monogenea

- One generation in their life cycle
- External parasite of freshwater and marine fishes
- *Opisthaptor* – large, posterior attachment organ
- *Oncomiracidium* – ciliated larva from the hatched egg



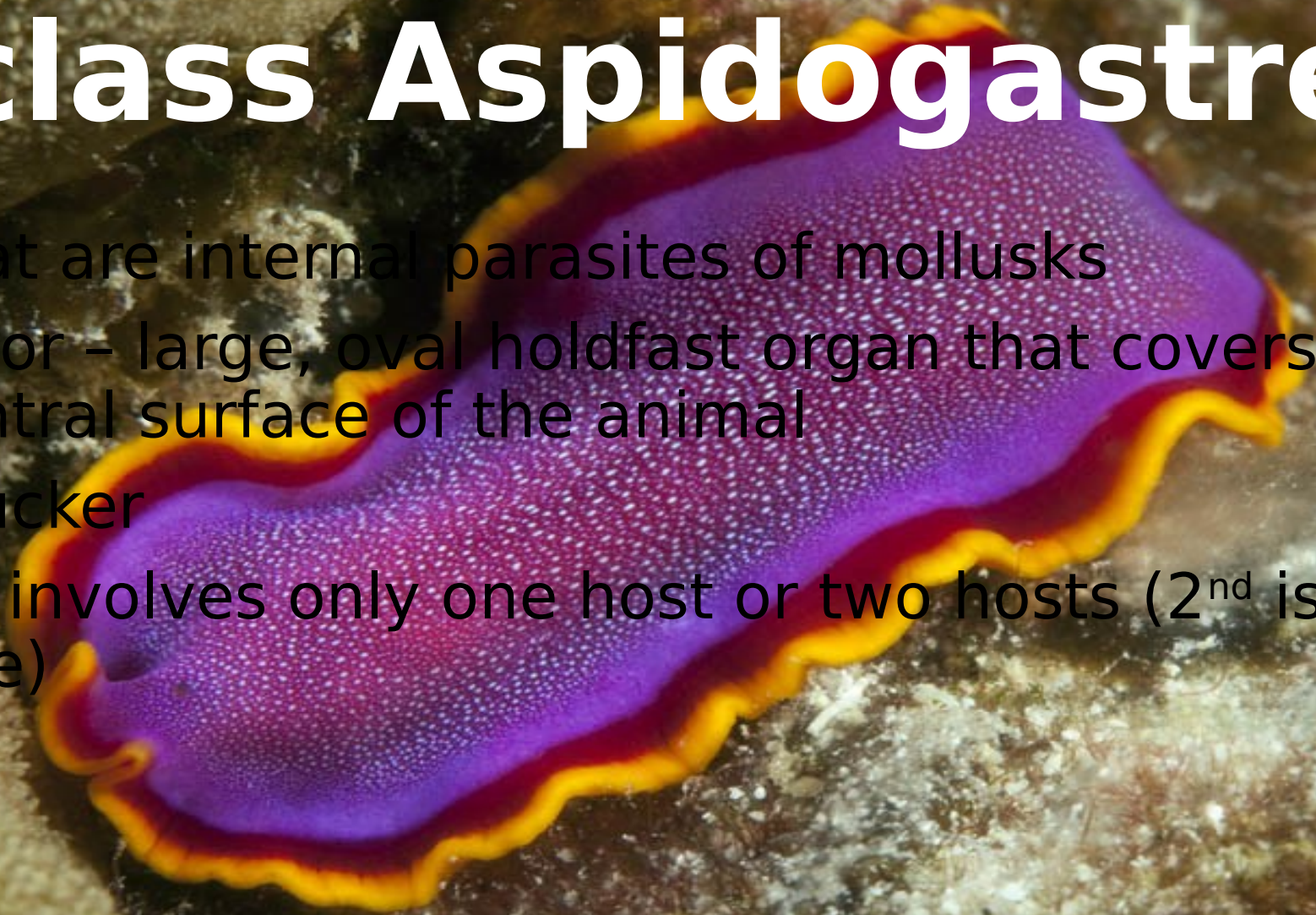
Class Trematoda

- Collectively called “flukes” (flat and oval to elongate)
- Parasites of vertebrates or invertebrates
- Feed on host cells and cell fragments
- Digestive tract includes a mouth and a muscular, pumping pharynx □ posterior to the pharynx divides into 2 blind-ending cecae
- Epidermis contain *tegument* (outer layer) which forms a *syncytium* (continuous layer of fused cells) covered with *glycocalyx*



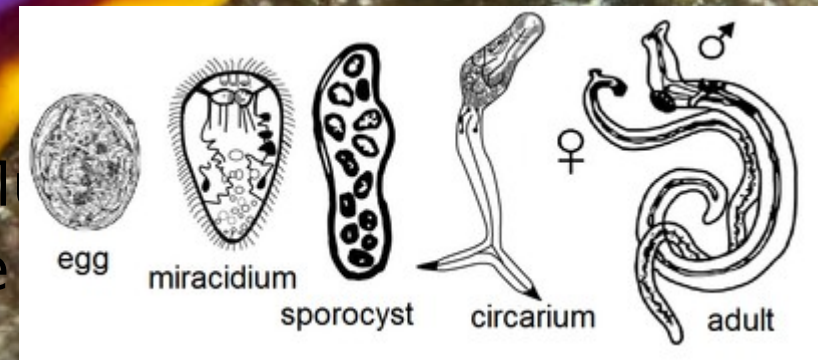
Subclass Aspidogastrea

- Flukes that are internal parasites of mollusks
- Opisthaptor – large, oval holdfast organ that covers the entire ventral surface of the animal
- No oral sucker
- Life cycle involves only one host or two hosts (2nd is vertebrate)



Subclass Digenea

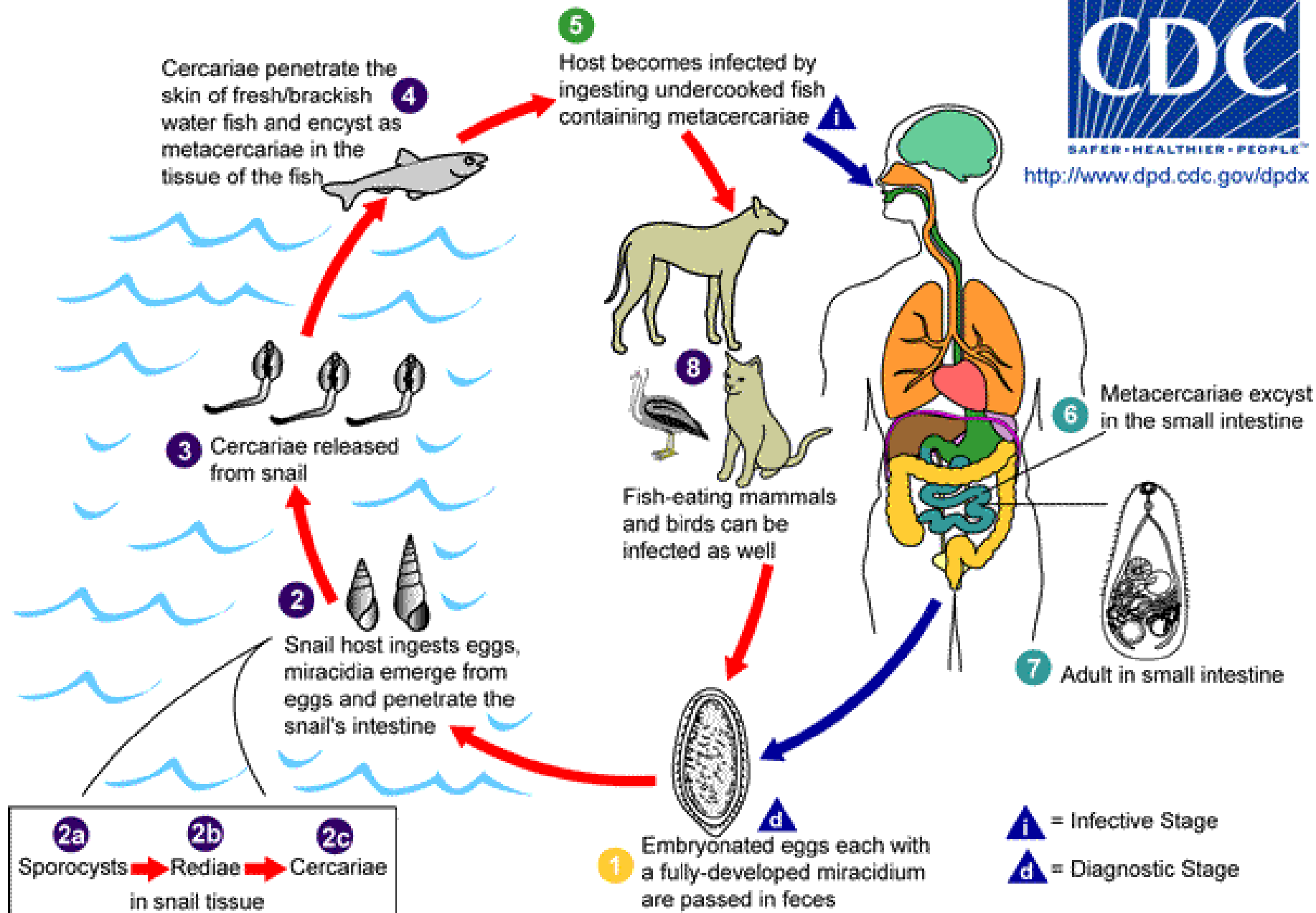
- At least two different forms exists, an adult and one or more larval stage
- Most complex life cycle in the animal kingdom
- 2 adhesive organs: oral sucker and acetabulum
- Eggs have operculum → miracidium → sporocyst → rediae → cercariae → metacercariae → adult
- Important Trematode Parasite:
 1. *Clonorchis sinensis* – Chinese liver fluke
 2. *Fasciola hepatica* – sheep liver fluke
 3. *Schistosoma* sp. – blood flukes





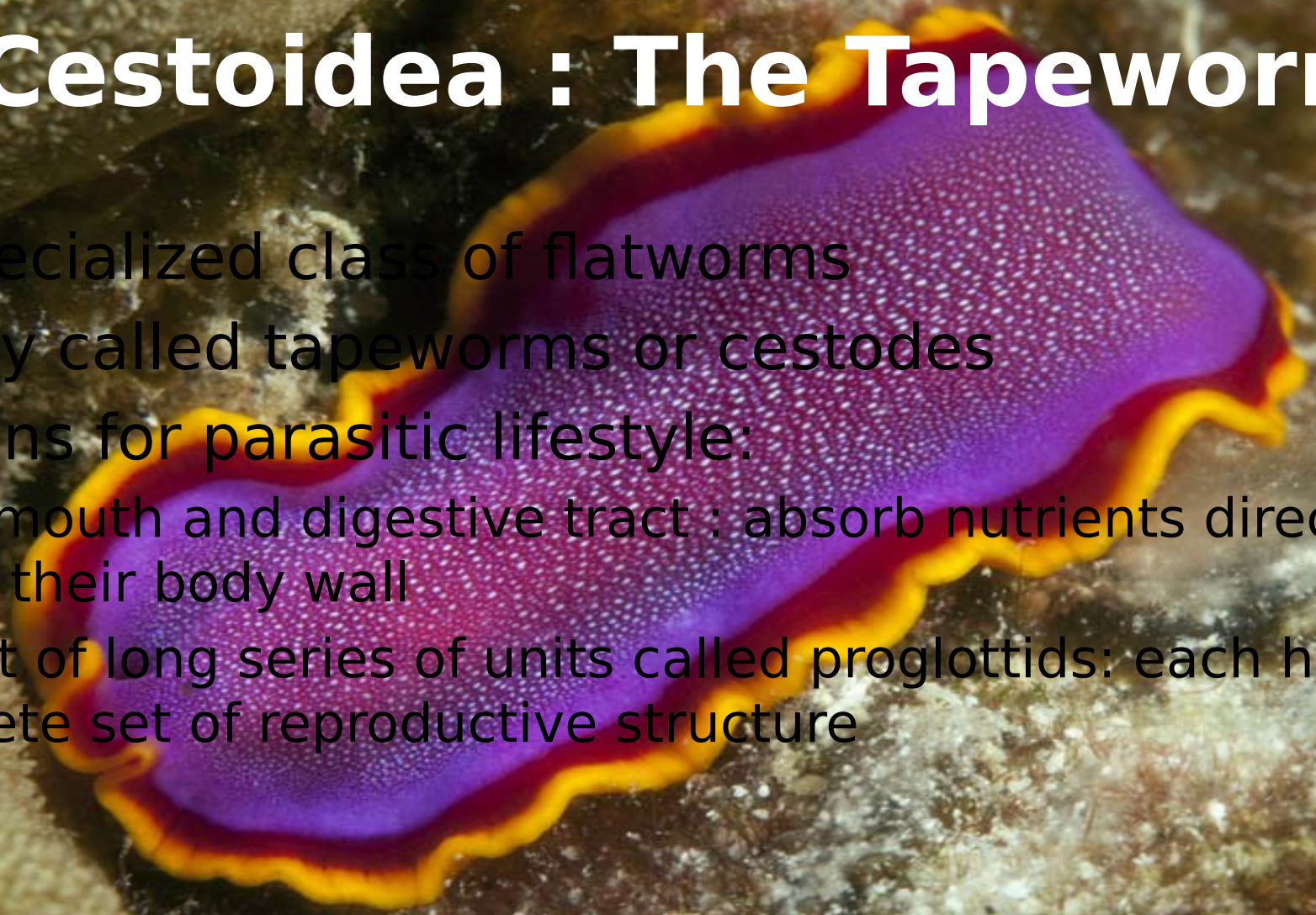
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Class Cestoidea : The Tapeworms

- Highly specialized class of flatworms
- Commonly called tapeworms or cestodes
- Adaptations for parasitic lifestyle:
 1. Lacks mouth and digestive tract : absorb nutrients directly across their body wall
 2. Consist of long series of units called proglottids: each have a complete set of reproductive structure

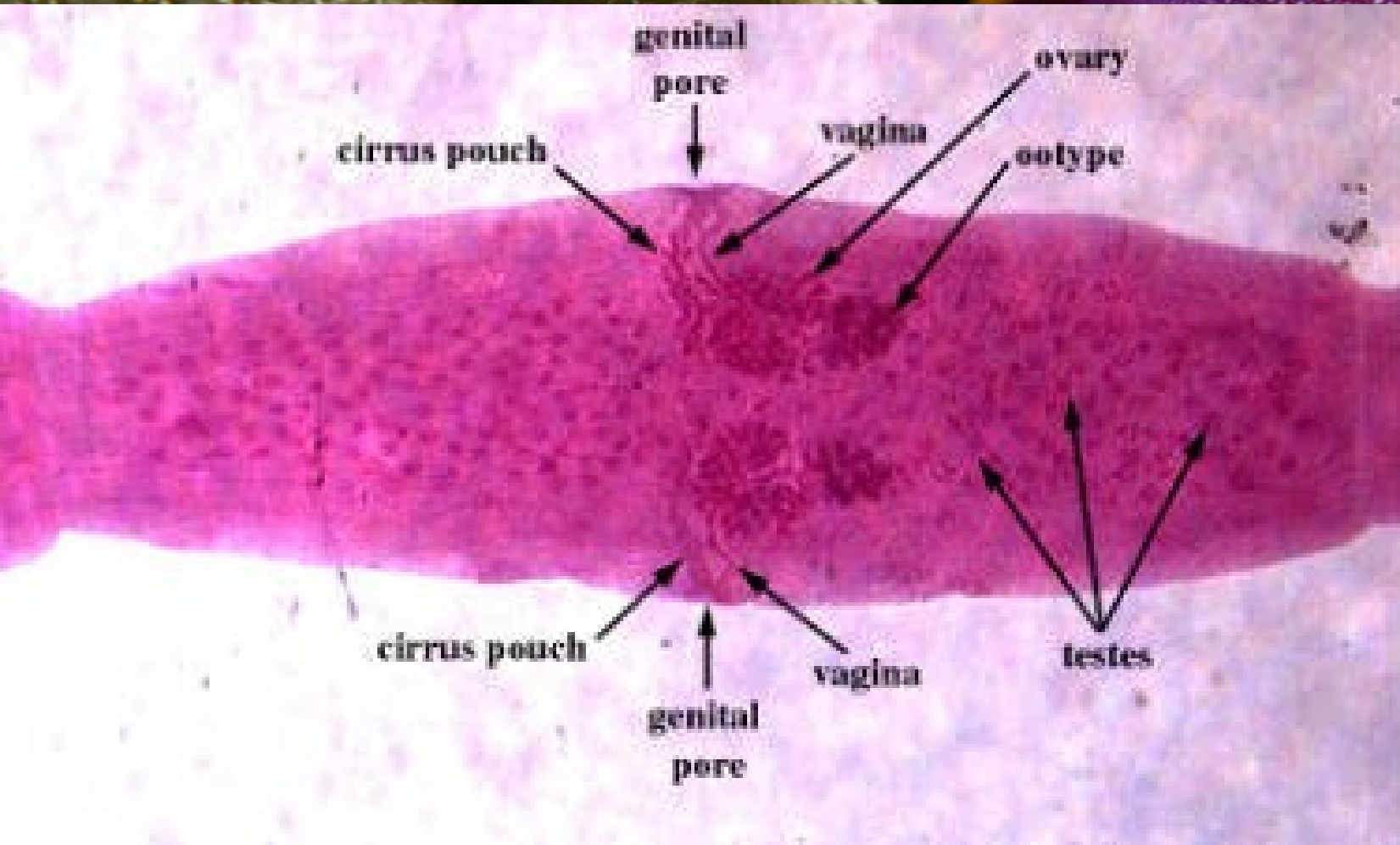
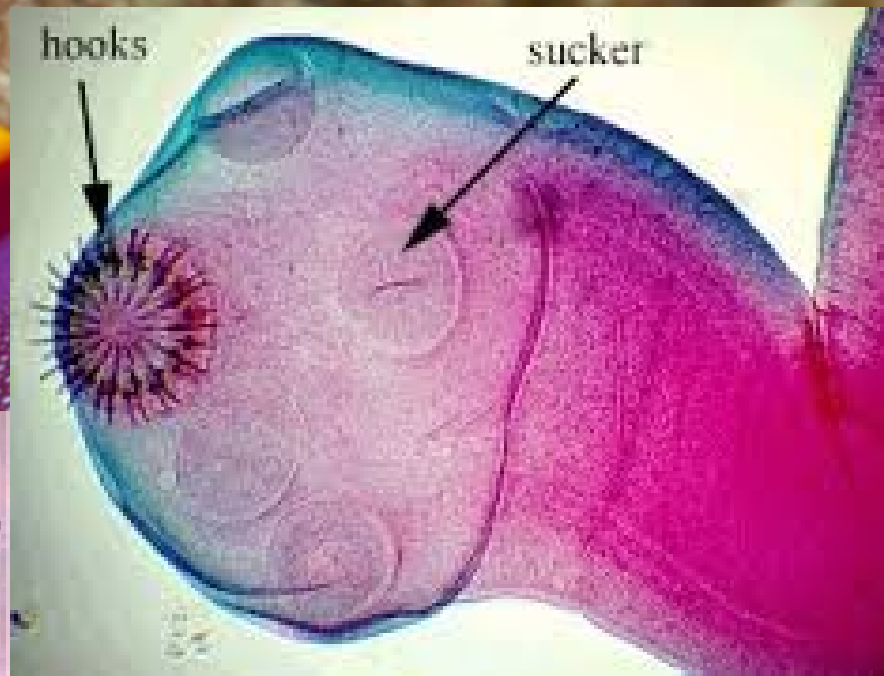


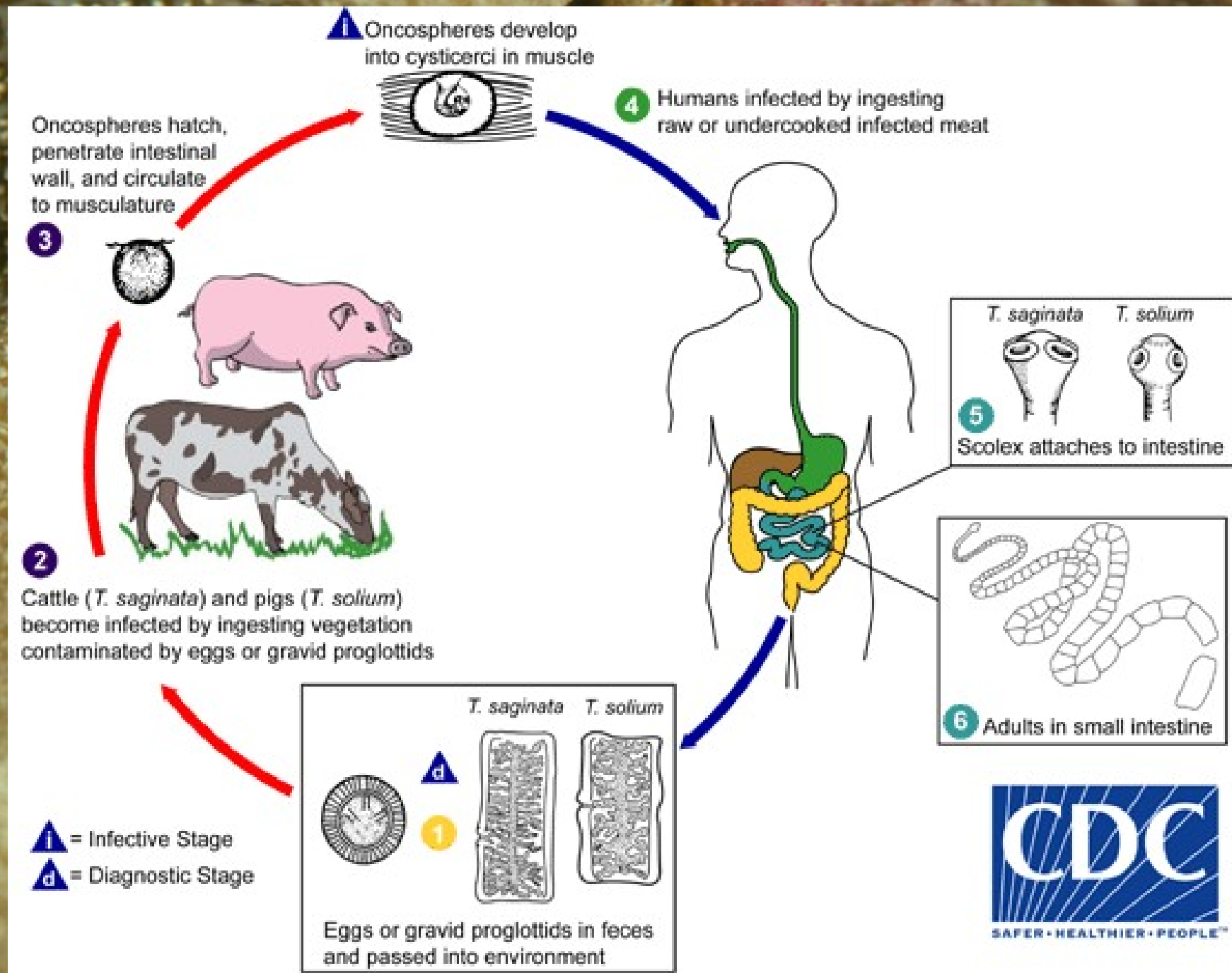
Subclass Eucestoda

- Called true tapeworm
- Body divisions into three: scolex, neck, strobila
- Scolex (holdfast structure) containing hooks
- No mouth, no digestive system
- Strobila – consist of proglottids which consists of reproductive units
- Gravid proglottids – proglottids that have accumulated eggs
- Outer body walls contains a tegument for nutrient and enzyme absorption
- Nervous system: a pair of lateral nerve cords that arise from a nerve mass in the scolex and extend the length of the strobili
- Protonephridial system runs the length of the tapeworm

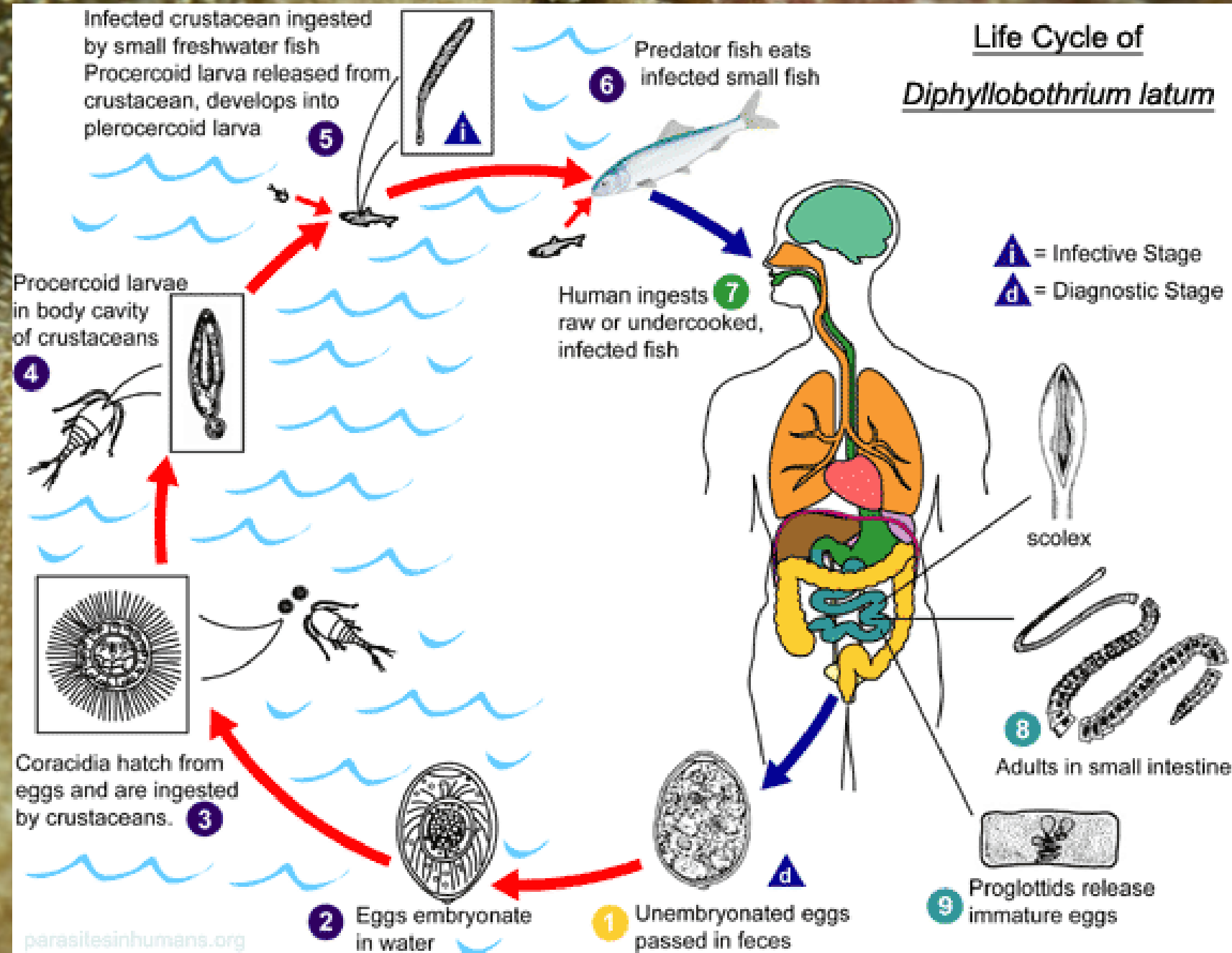
Subclass Eucestoda

- Monoecious
- Numerous testes are scattered throughout the proglottid
- Pair of ovaries in each proglottid that produce egg
- Cirrus – copulatory organ where sperm is delivered that opens to genital pore
- Male matures first before female
- Important Tapeworm Parasites:
 1. *Taeniarhynchus saginatus* – beef tapeworm
 2. *Taenia solium* – pork tapeworm
 3. *Diphyllobothrium latum* – fish tapeworm

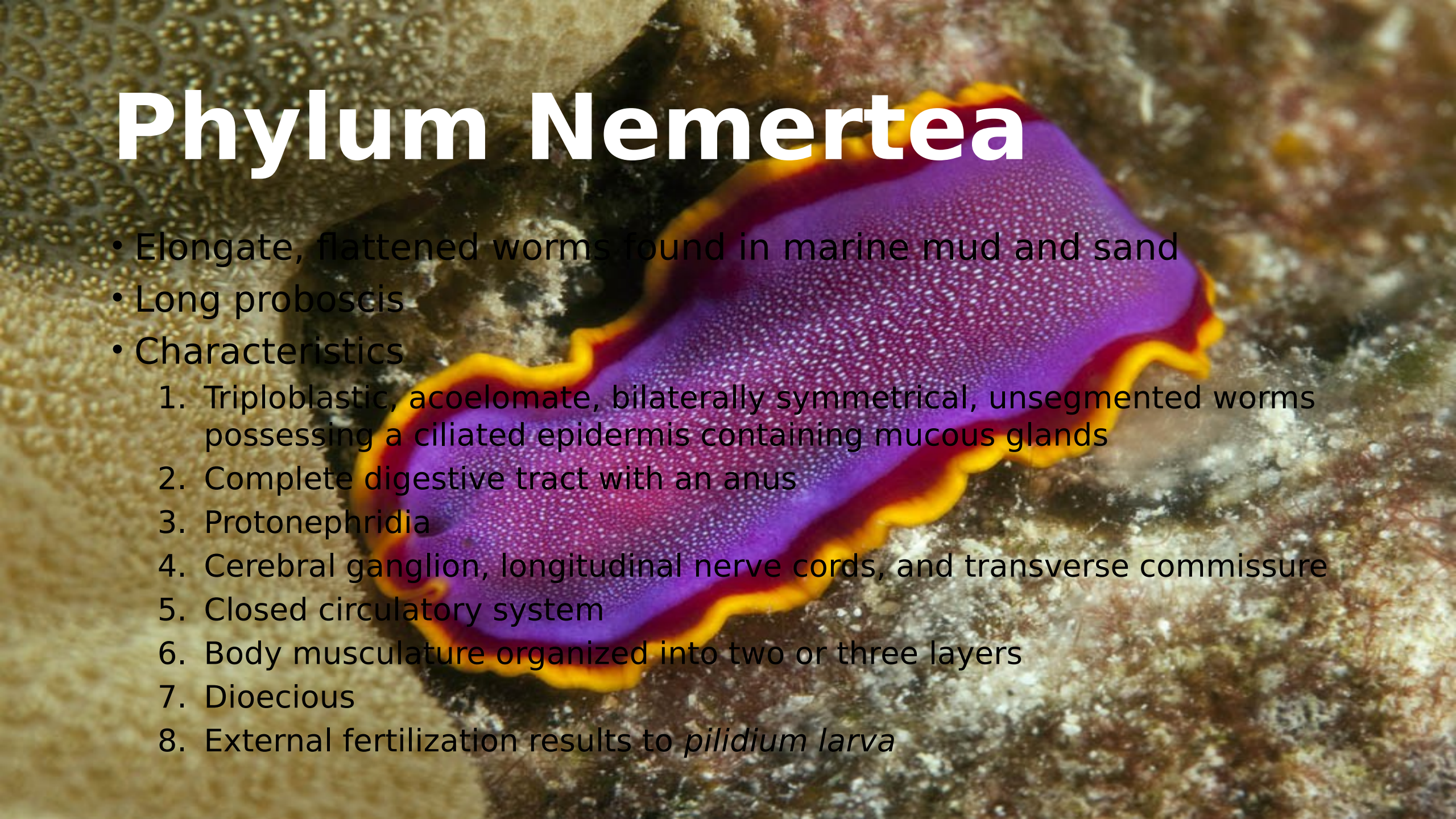




Life Cycle of *Diphyllobothrium latum*



Phylum Nemertea



- Elongate, flattened worms found in marine mud and sand
- Long proboscis
- Characteristics
 1. Triploblastic, acoelomate, bilaterally symmetrical, unsegmented worms possessing a ciliated epidermis containing mucous glands
 2. Complete digestive tract with an anus
 3. Protonephridia
 4. Cerebral ganglion, longitudinal nerve cords, and transverse commissure
 5. Closed circulatory system
 6. Body musculature organized into two or three layers
 7. Dioecious
 8. External fertilization results to *pilidium larva*



Phylum Gastrotrichia

- Dorsal cuticle contains scales, bristles, or spines and a forked tail
- Sensory structure includes tufts of long cilia and bristles on the rounded head
- Nervous system includes brain and a pair of lateral nerve trunks
- Digestive system is a straight tube with a mouth, muscular pharynx, stomach-intestine, and an anus
- Adhesive glands
- Paired protonephridia with flagellum in freshwater species
- Reproduction: sexual and are hermaphroditic (marine); parthenogenesis (freshwater)
- No larval stage
- Direct development

