

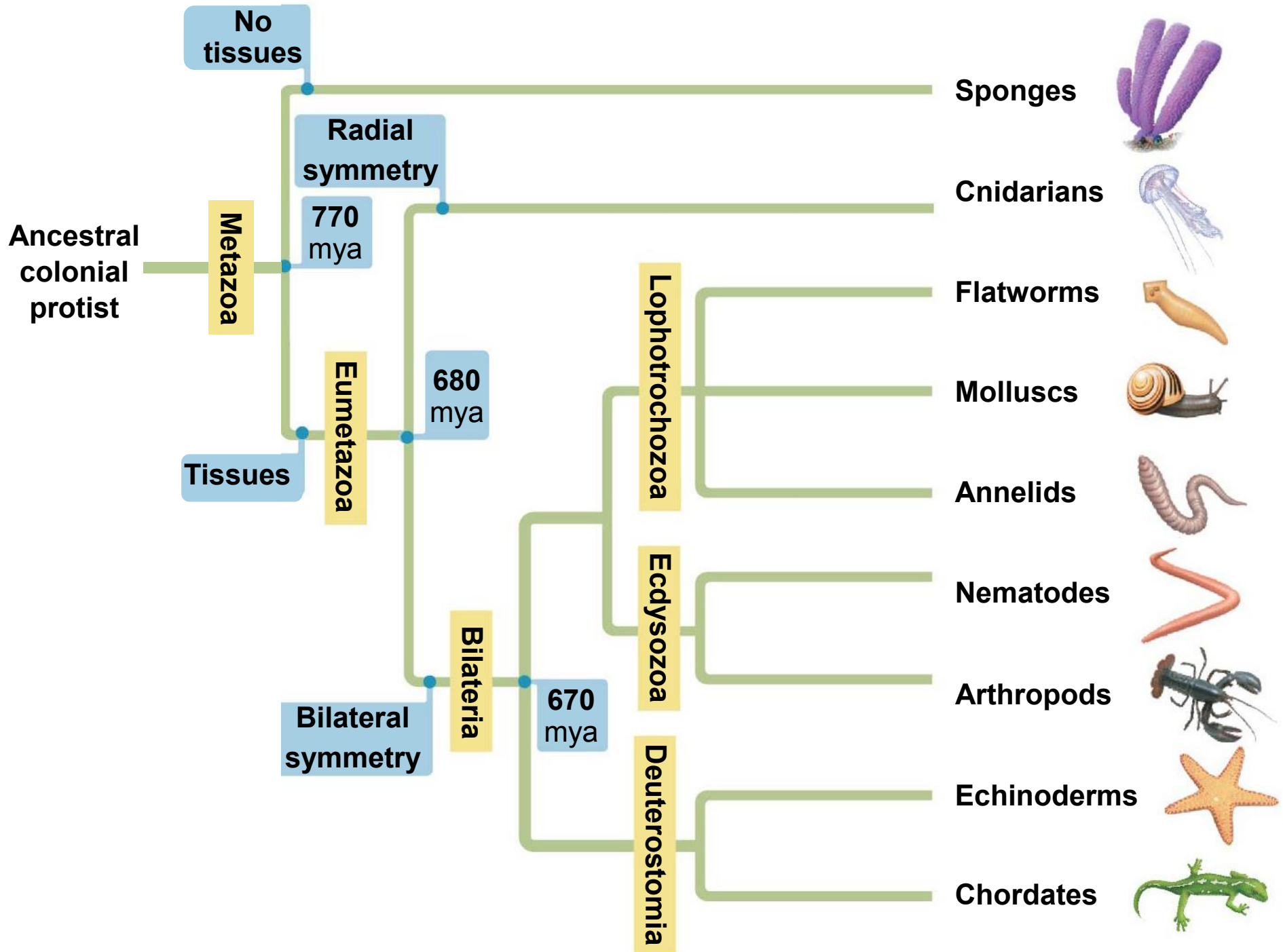
1/24/23

# Animals – invertebrates

be able to assign characteristics to  
each group so that I can distinguish  
difference b/w each phylum



# The animal phylogenetic tree





# Phylum Porifera – the sponges

- Simplest animals
- Lack of symmetry in many
- No tissues
  - Choanocytes, amoebocytes, and spongin skeleton
- Adults are sessile, larvae swim with cilia

↳ 1st animals (probably)



A purple tube sponge



*Scypha*



An azure vase sponge



larva



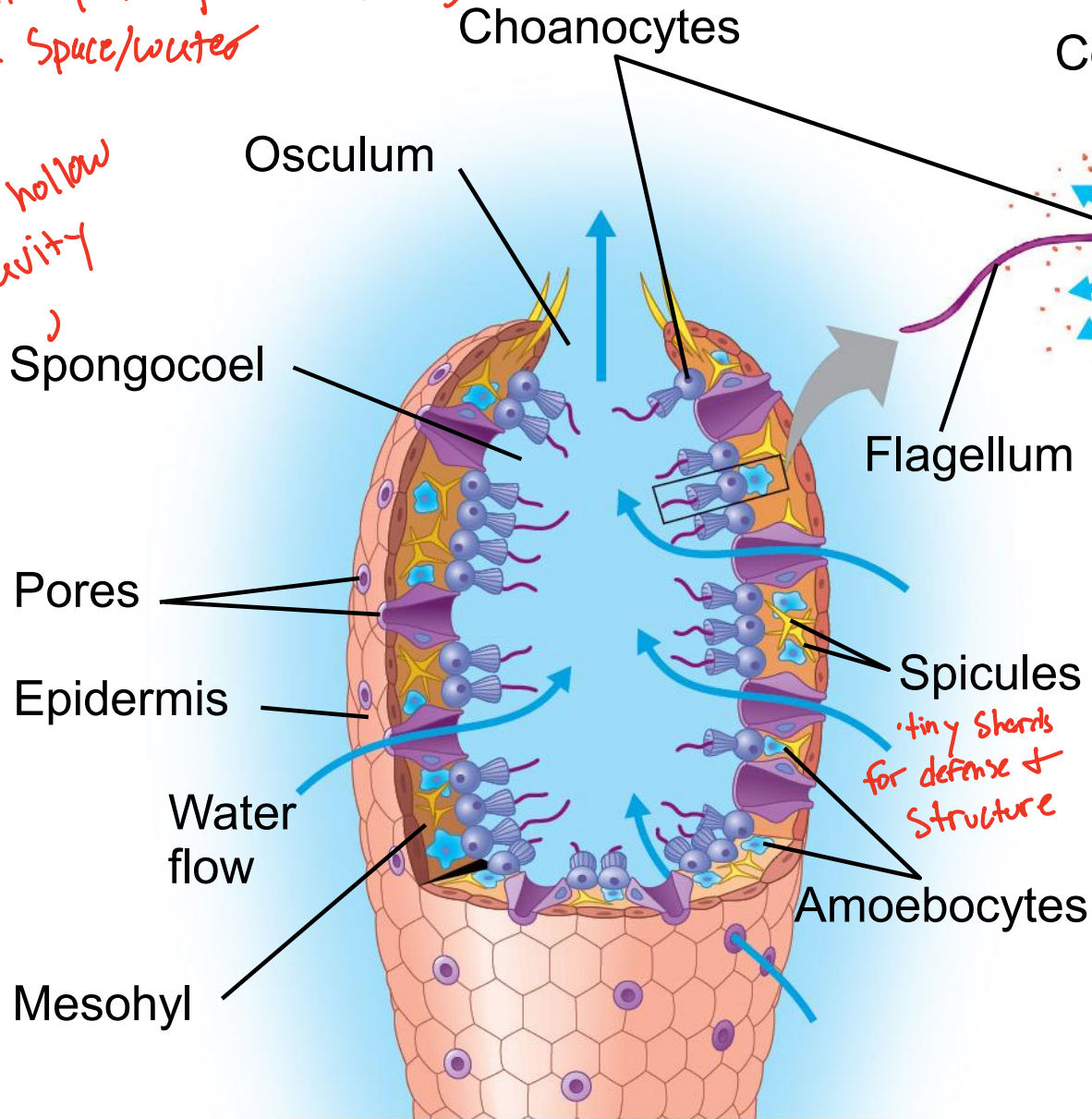
# How sponges make a living

## Suspension feeders

picks up food particles floating in space/water

Water flow  
 • through Pores (carrying food particles)  
 • Out through Osculum

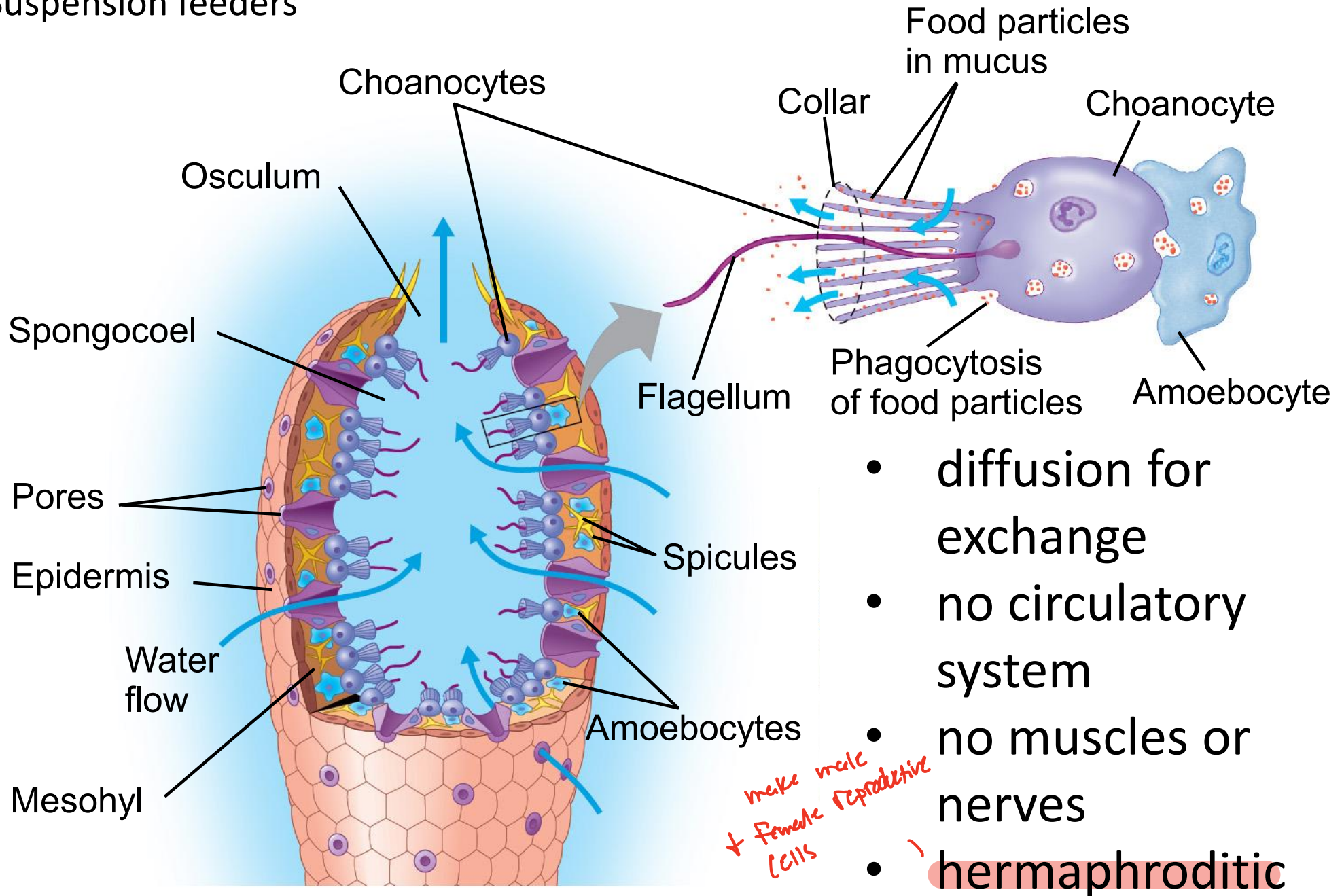
the hollow cavity



**Azure vase sponge**  
*(Callyspongia plicifera)*

# How sponges make a living

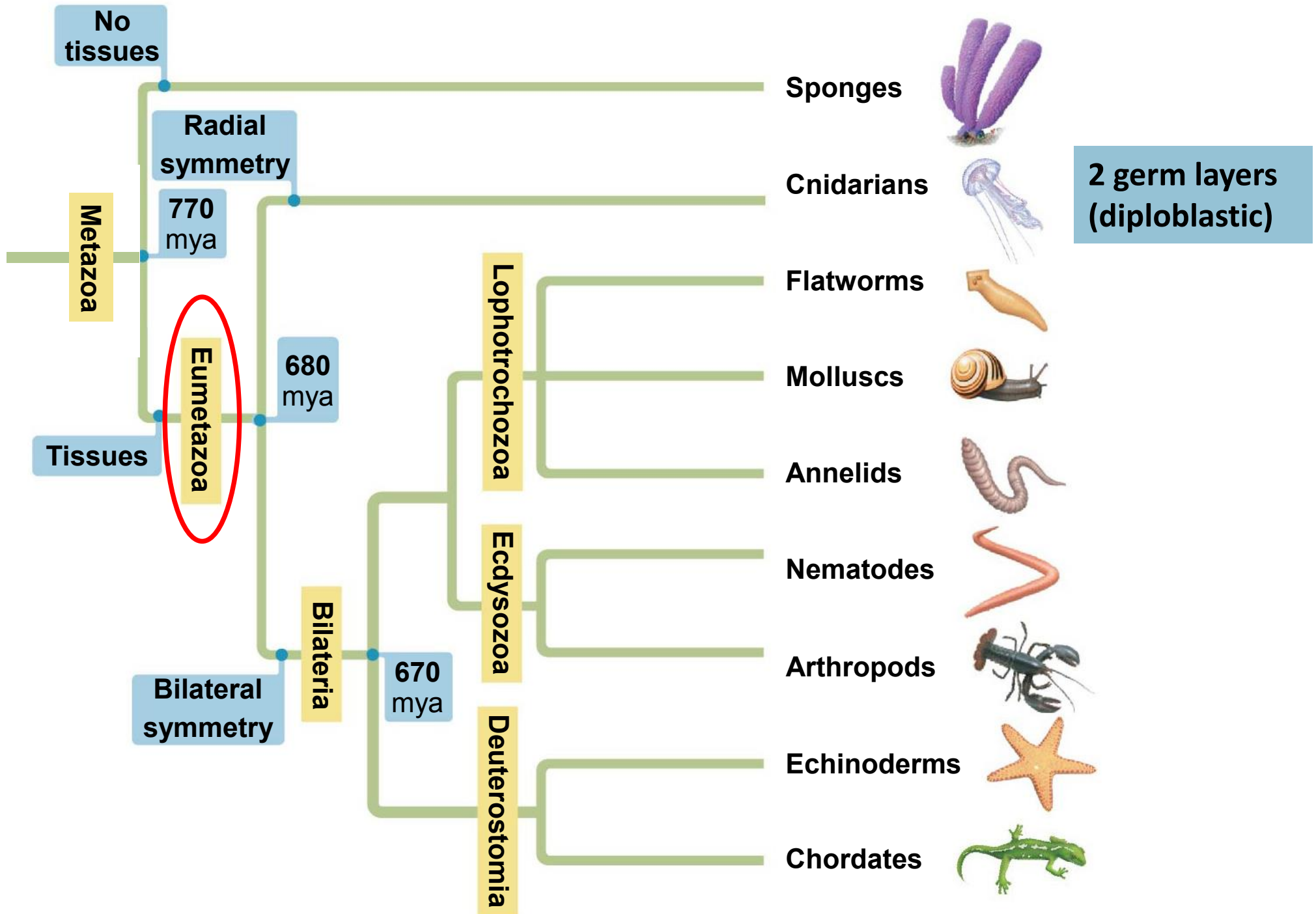
Suspension feeders



- diffusion for exchange
- no circulatory system
- no muscles or nerves
- hermaphroditic

*make male + female cells*

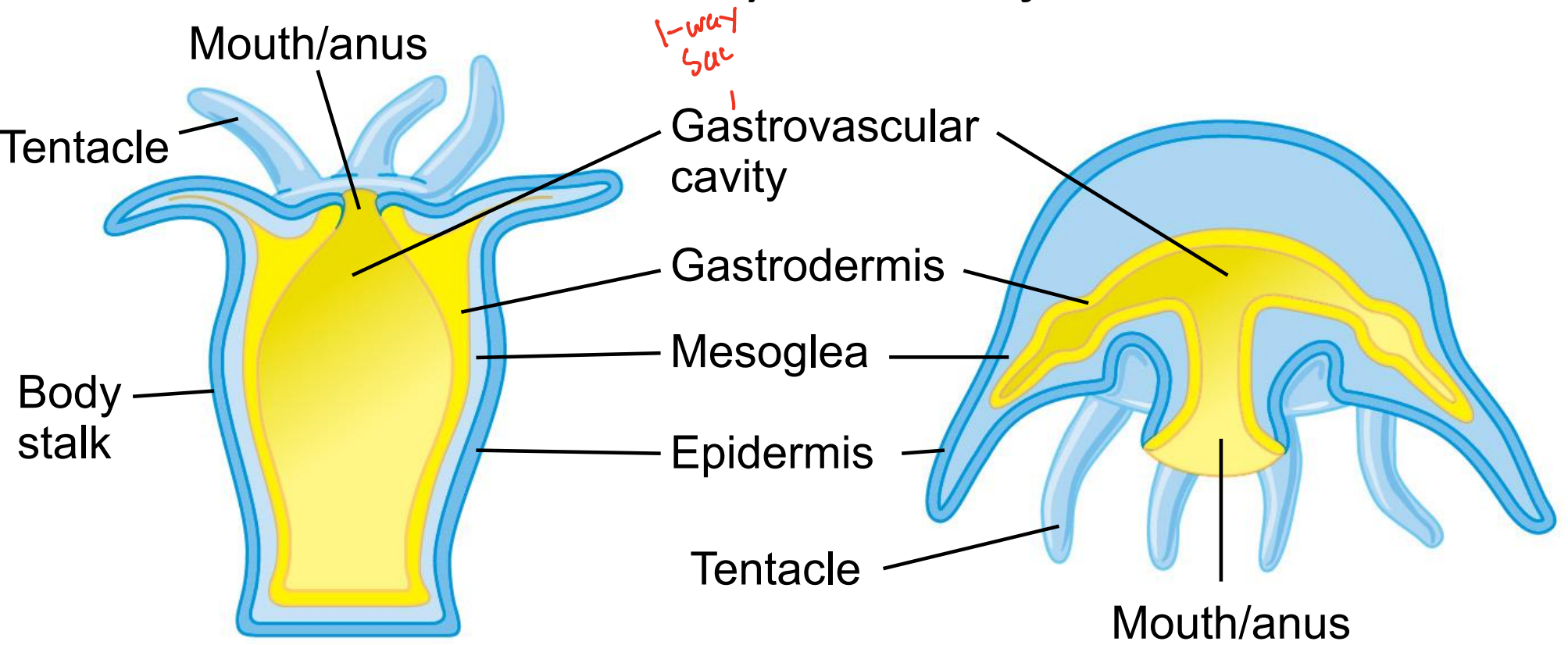
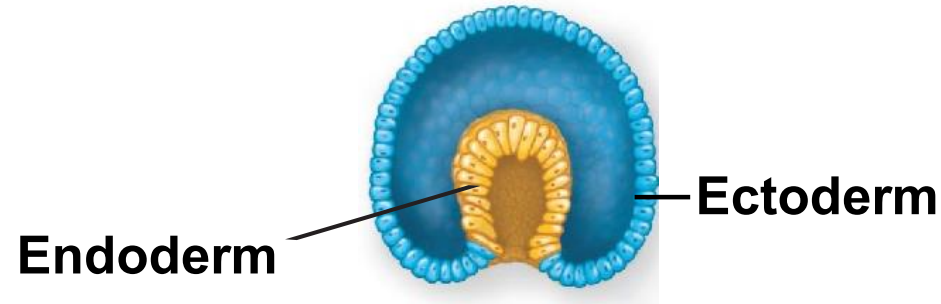
# The animal phylogenetic tree





# Phylum Cnidaria

- Diploblastic
- Radial symmetry
- Contractile tissue and nerve net!
- Gastrovascular cavity
- Sea anemones, corals, hydras, and jellies



**Polyp (cross section)**

**Medusa (cross section)**

• Cnidarian that is anchored in Place

• Cnidarian that can float in Space

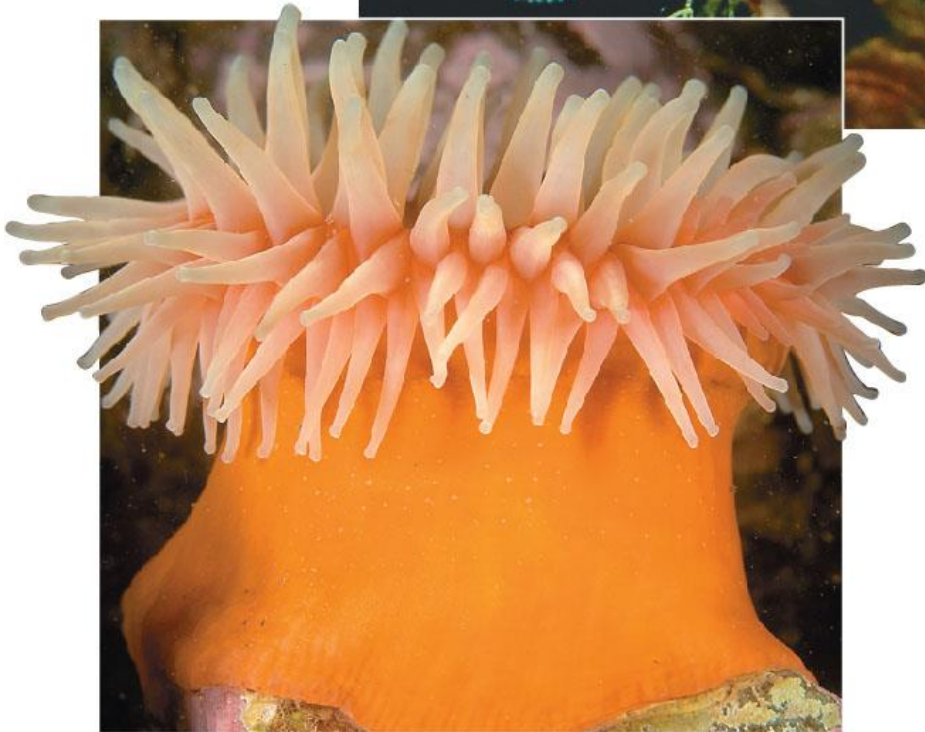
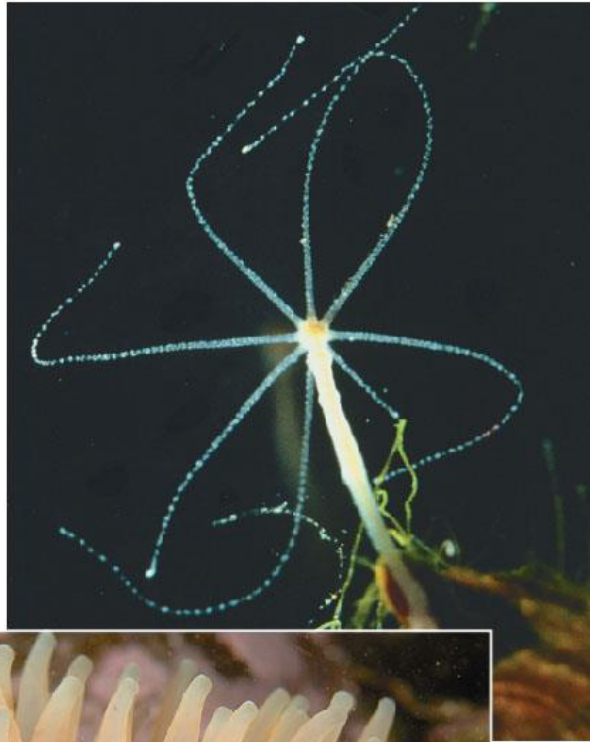
# Complete vs incomplete digestive tract

- Incomplete
  - One opening (mouth/anus)
  - Gastrovascular cavity
    - digestion
    - diffusion for exchange
    - hydrostatic skeleton
- Complete - *more efficient in Nutrient Absorption*
  - Two openings (mouth and anus)
  - Separation of function along a tube (anterior and posterior)



# Polyp body plan

A hydra  
(about  
2 mm tall)



A sea anemone  
(about 6 cm in diameter)

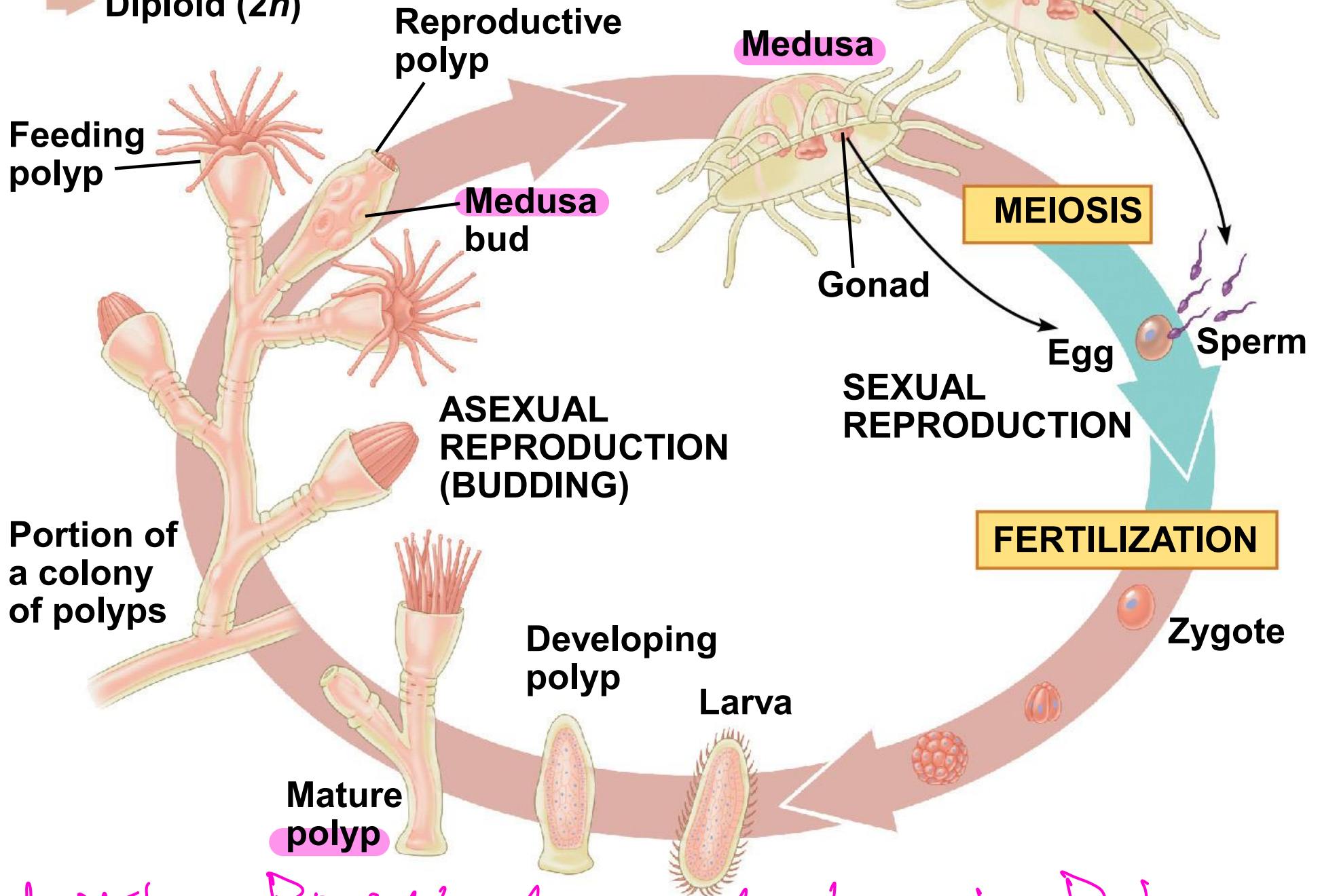
# Medusa body plan



A marine jelly  
(about 6 cm in diameter)

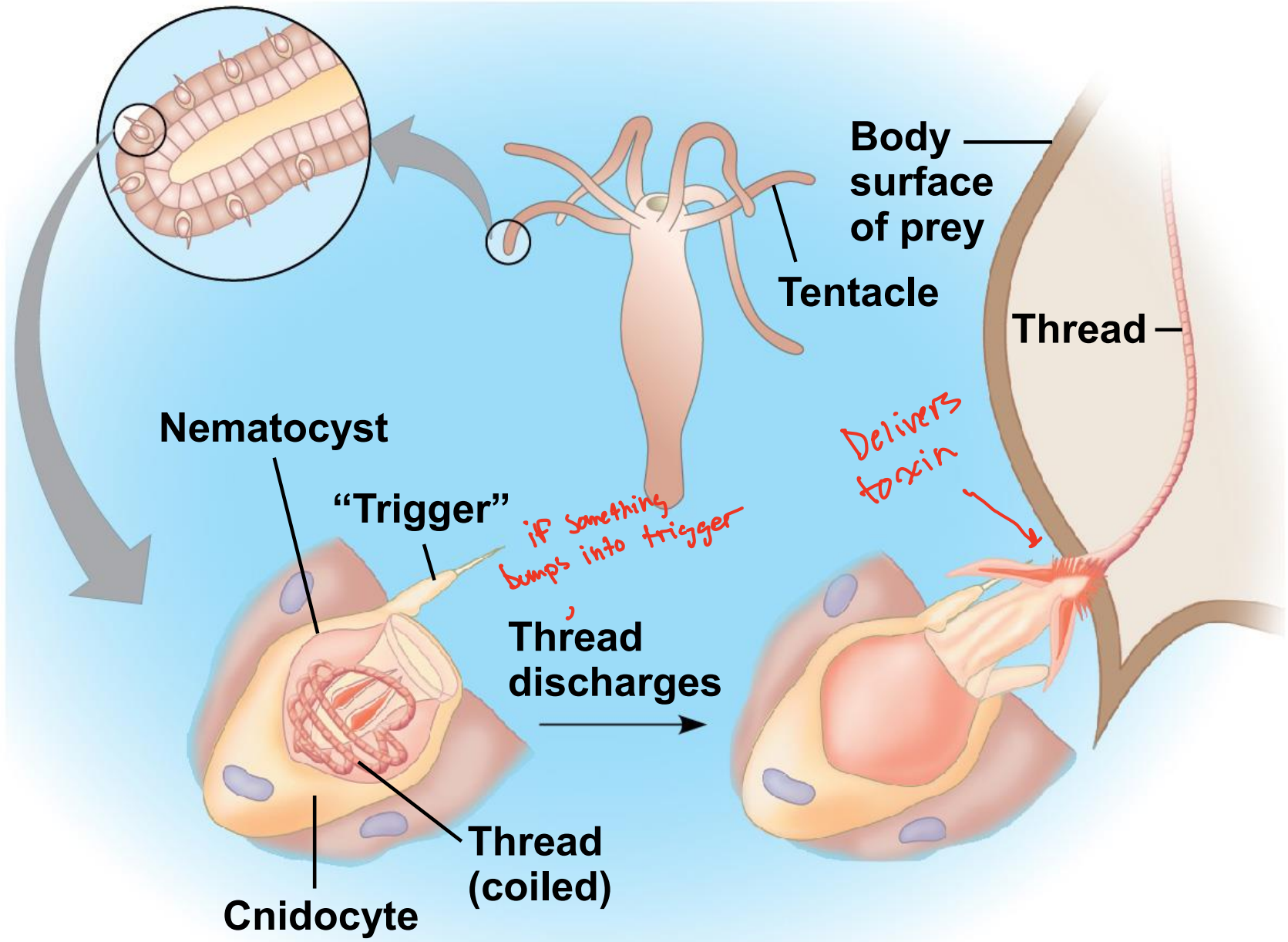
Some alternate

➡ Haploid ( $n$ )  
➡ Diploid ( $2n$ )



\* The Process makes Medusa & Polyp

# How cnidarians make a living





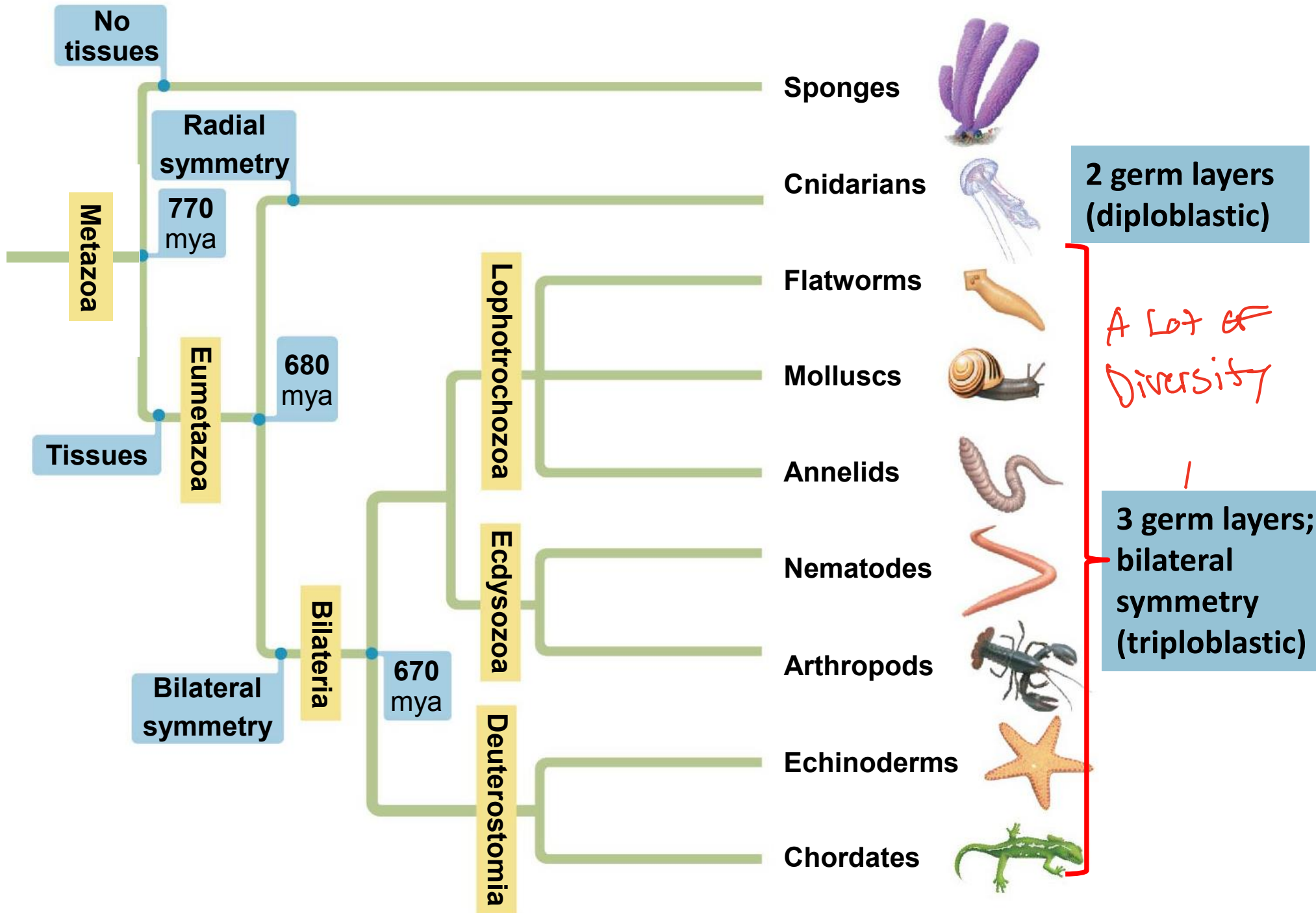
# Coral animals and symbiosis

- Dinoflagellates
- exoskeleton = reef
- ecosystem architects
- threatened by warming seas and ocean acidification

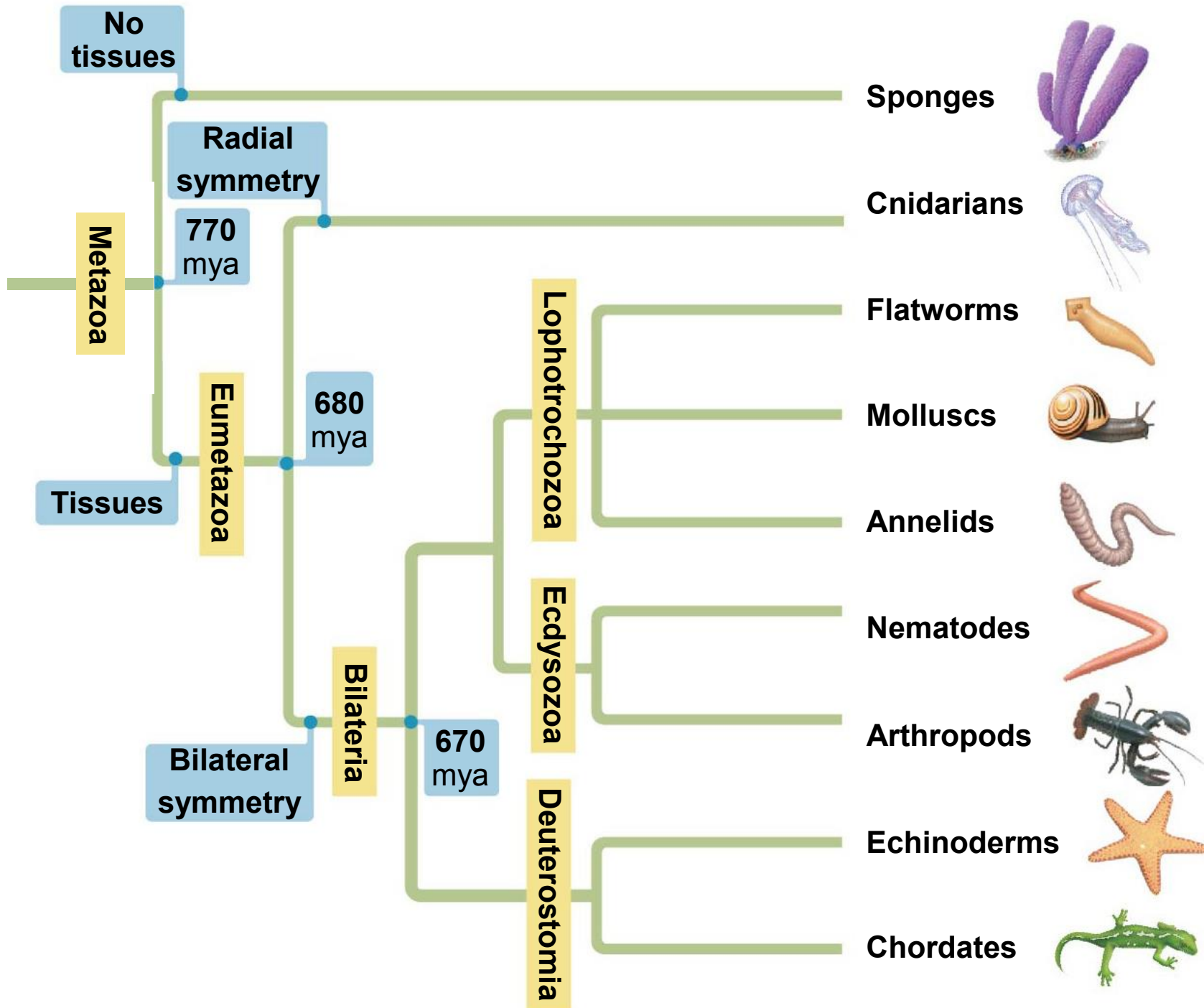
Thousands of  
Polyps



# The animal phylogenetic tree



# The animal phylogenetic tree

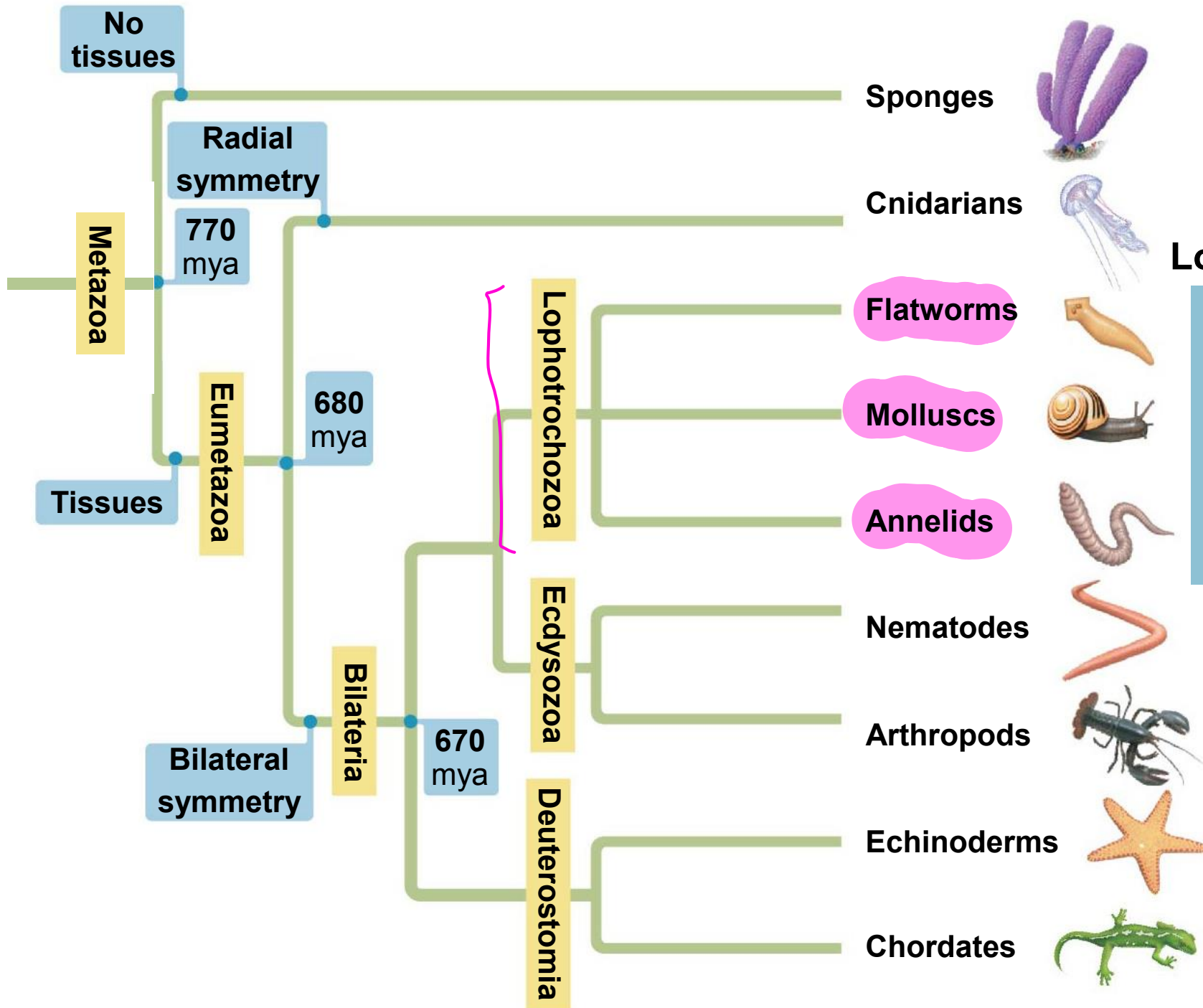


Protostomes:  
formation of  
mouth, 1<sup>st</sup>,  
anus 2<sup>nd</sup>

Deuterostomes:  
Formation of  
mouth, 2<sup>nd</sup>, anus  
1<sup>st</sup>

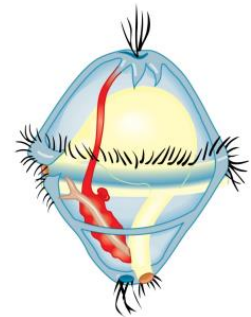


# The animal phylogenetic tree



## Lophotrochozoa

- lophophore
- trochophore larva in molluscs and annelids
- high diversity



# Phylum **Platyhelminthes** the flatworms

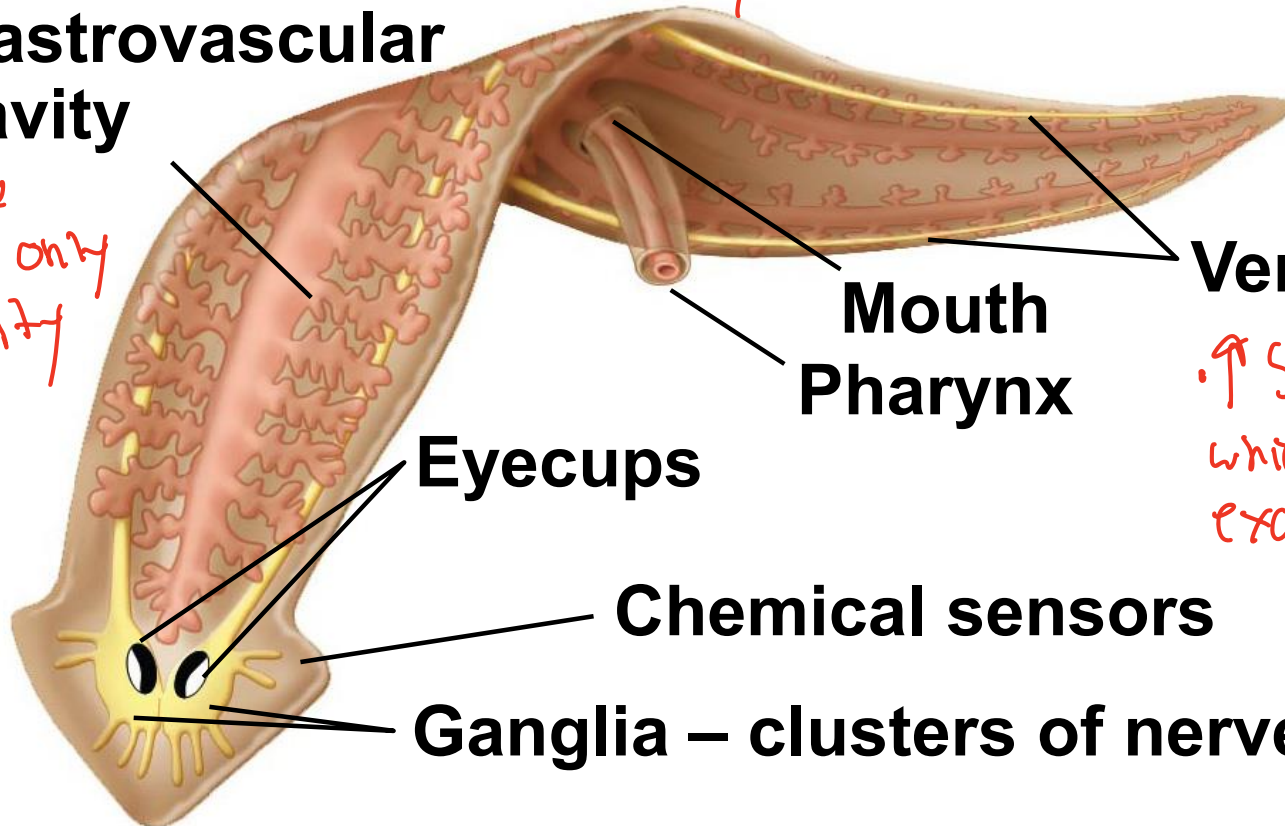
- **Triploblastic** acoelomates *↳ 3 Layers ↩*
- **Bilateral symmetry**
- Free-living flatworms (planarians)
  - Predators
  - Scavengers



**Gastrovascular cavity**

*Dorso ventrally flattened*

*↳ it's only cavity*



**Ventral nerve cords**

*↑ Surface Area ↓ Volume  
which makes Gas + food  
exchange good*

**Eyecups**

**Mouth  
Pharynx**

**Chemical sensors**

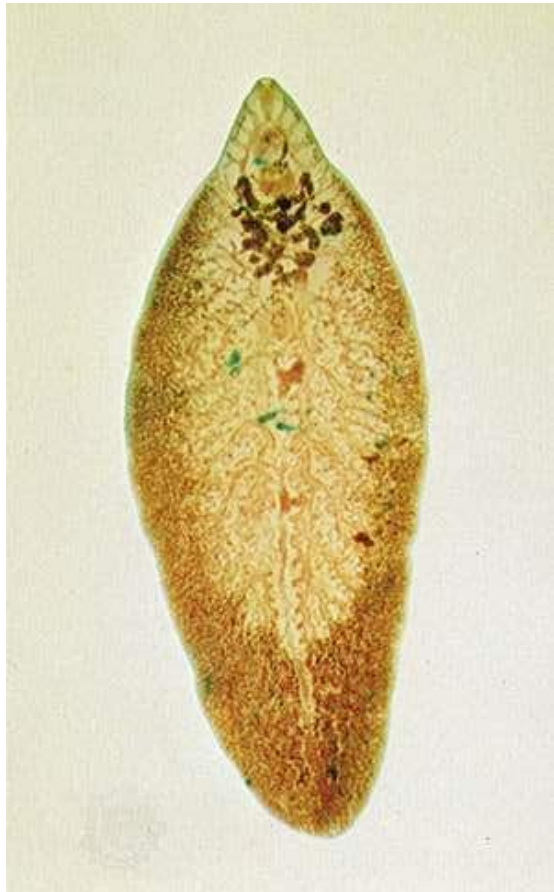
**Ganglia – clusters of nerve tissue**

Simple cephalization and centralization in nervous system

# Other types: Parasites

How do they make a living?

## Trematodes - Flukes



Often use an intermediate host



## Tapeworms

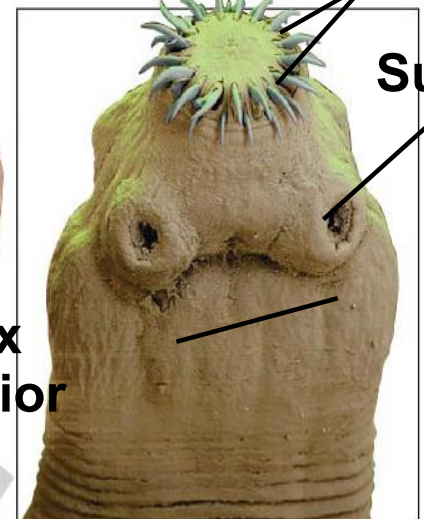
- No mouth
- No digestive system

Proglottids (units with Reproductive structures)

Hooks

Sucker

Scolex  
(anterior end)



Colorized SEM 65x



# Phylum Mollusca

- Small coelom around heart and hemocoel
- Complete digestive tract - *So no gastrovascular cavity*
- Basic body anatomy = foot, visceral mass, and mantle
- Shells of calcium carbonate
- Radula common
- Open circulatory system = hemolymph
- Most are aquatic

3 Groups:

## 1) **Gastropods**

- snails and slugs
- shell present or none
- aquatic or terrestrial
- eyes on tentacles

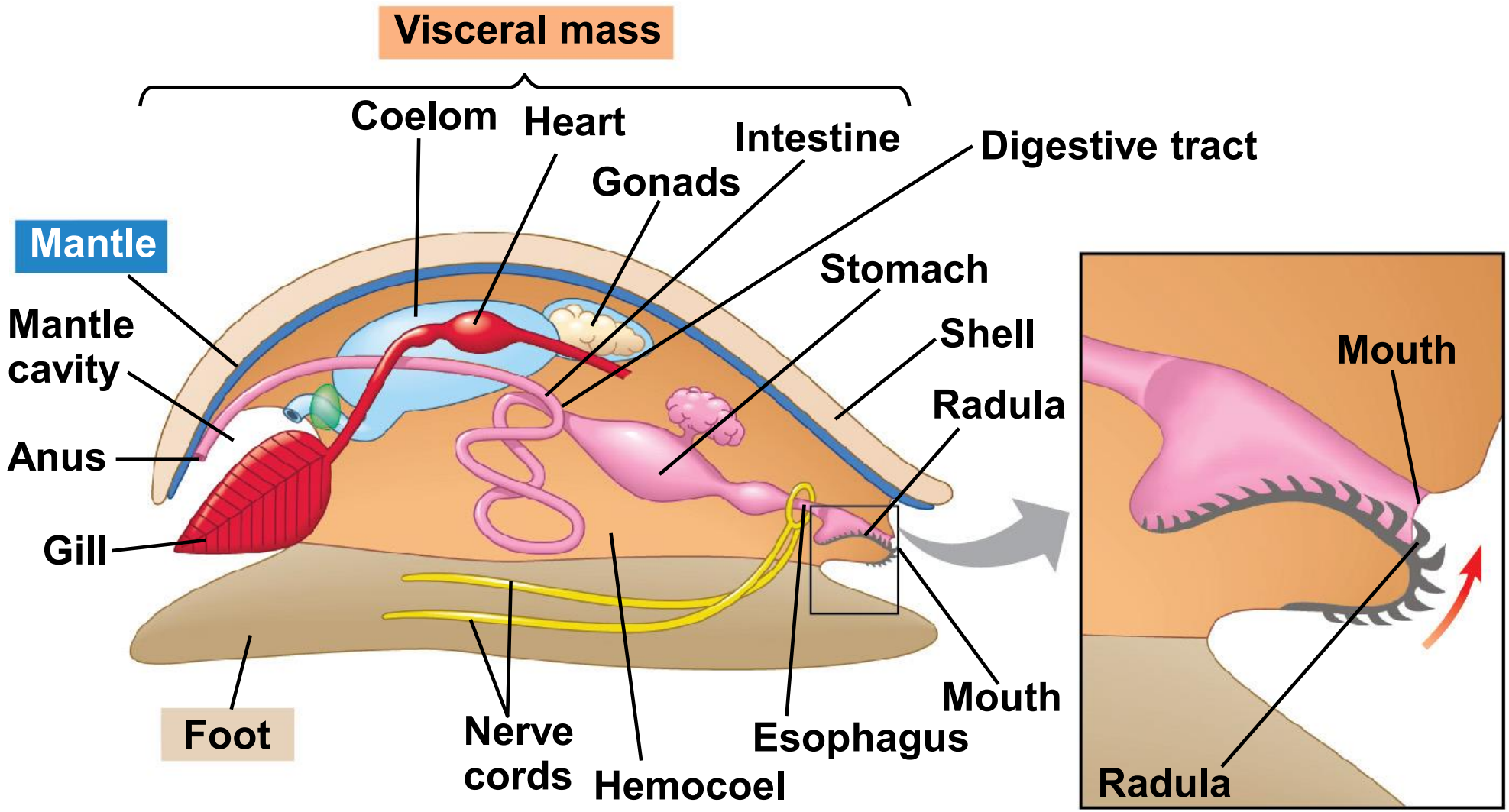


A sea slug  
(about 5 cm long)



A land snail

# Basic mollusc anatomy

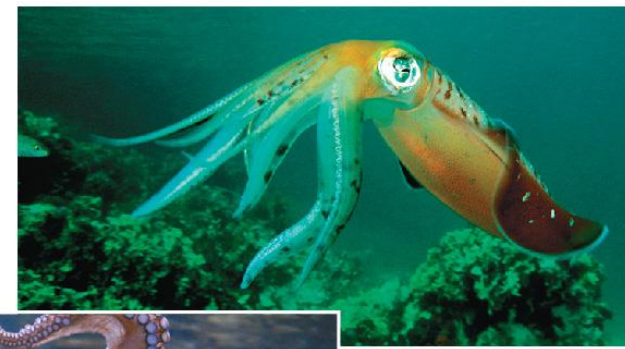




## Bivalves

- suspension feeders
- 2 shells
- Strong adductor muscles  
ex.) scallop, mussels, clams

▶ Squid



◀ Octopus

▶ Chambered nautilus



## Cephalopods

- octopus, nautilus, squid
- closed circulatory system
- internal shell or none
- complex brains

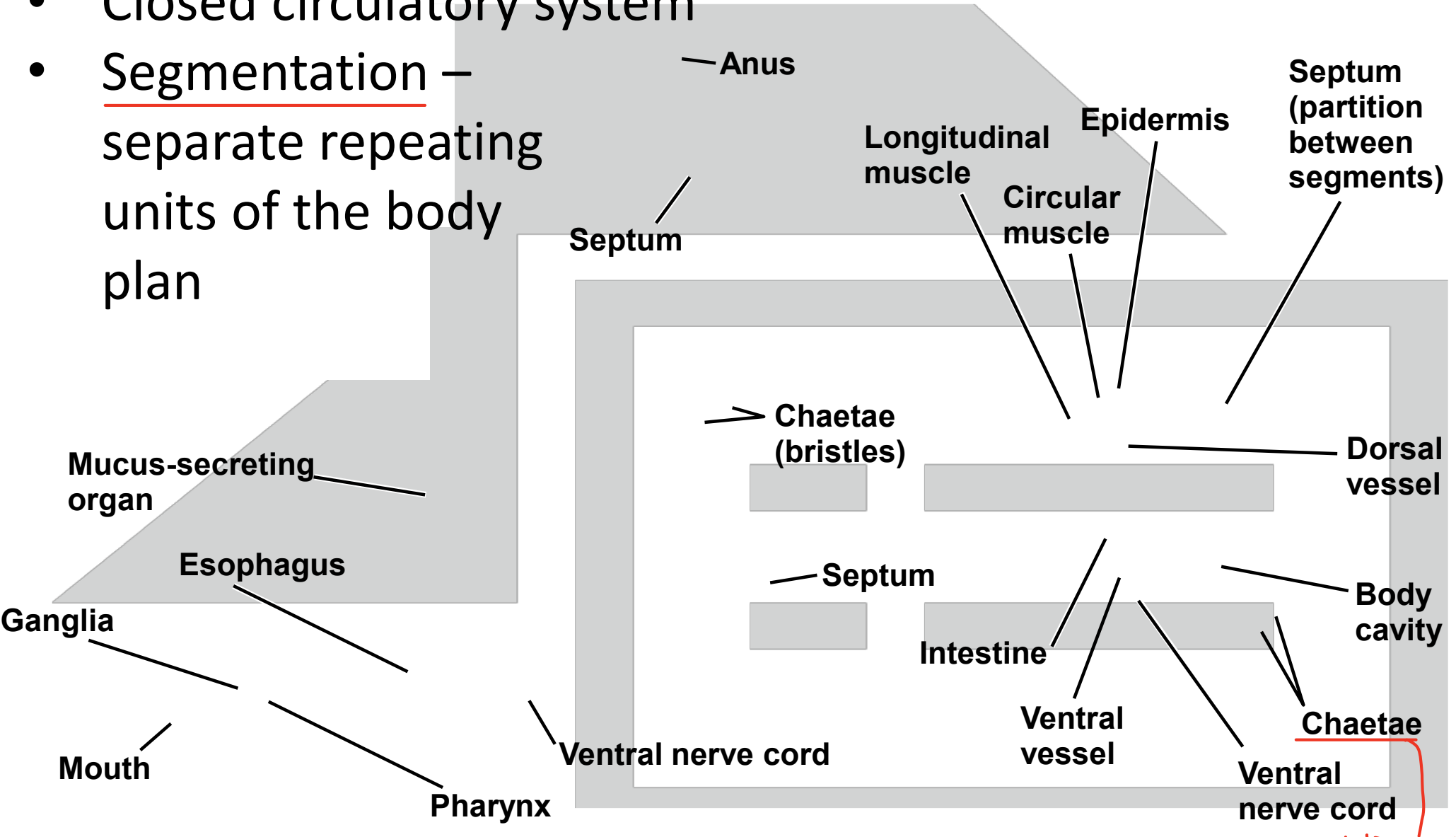
• Successful  
Predator  
• Mantle is for  
shell + movement



# Phylum **Annelida** the segmented worms

- Larger coelom (no hemocoel)
- Complete digestive tract
- Closed circulatory system
- Segmentation – separate repeating units of the body plan

*Perform Gas Exchange across their skin*



# Sedentarians

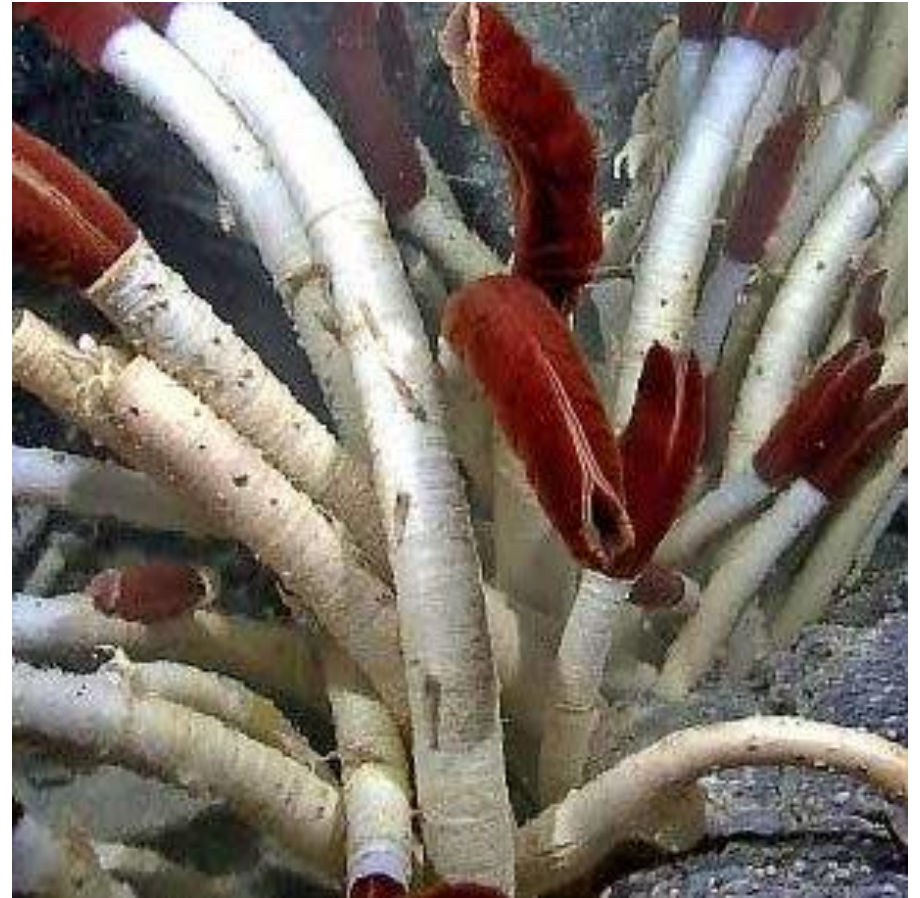
help  
w/ movement



earthworms

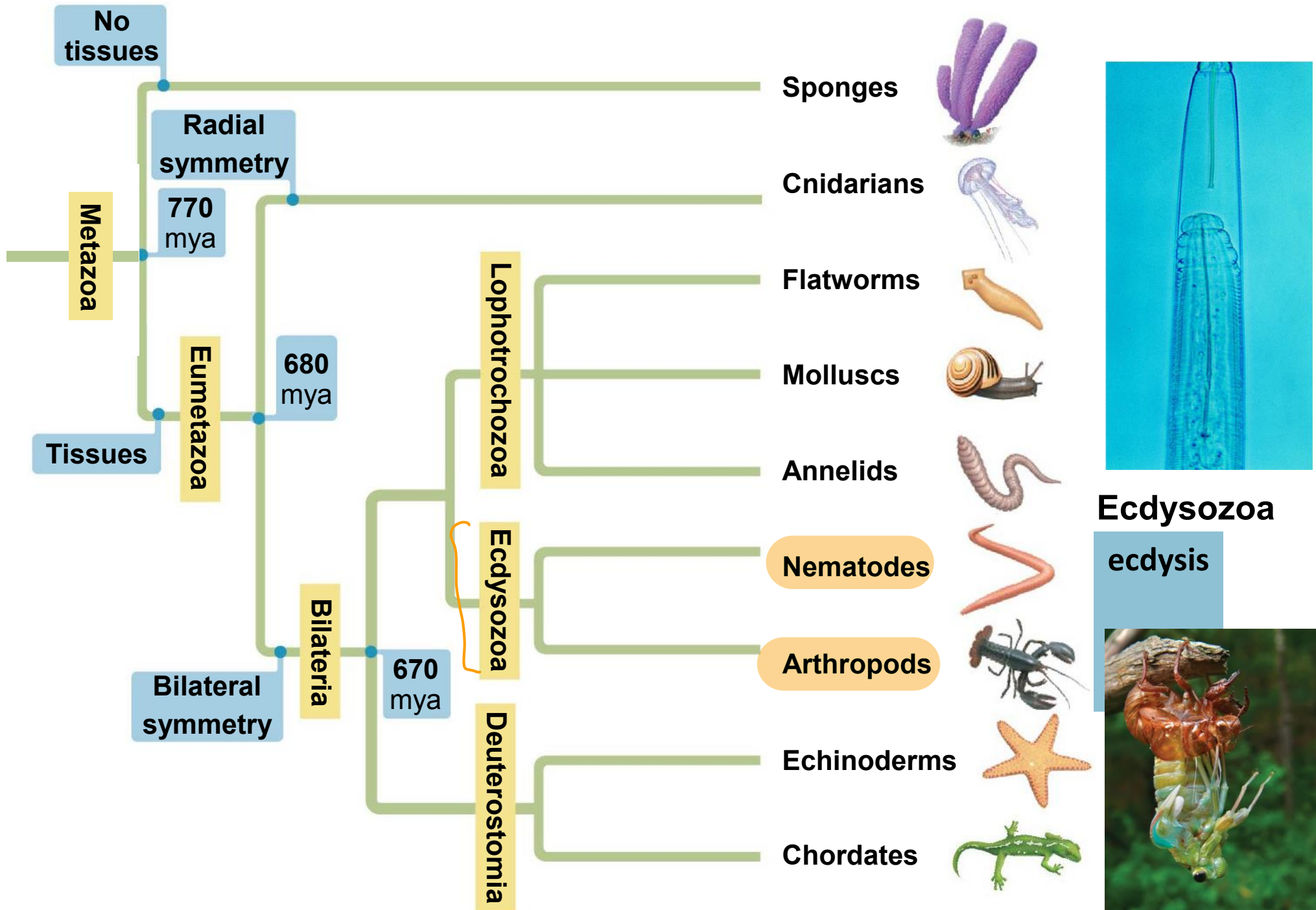


leeches



tubeworms

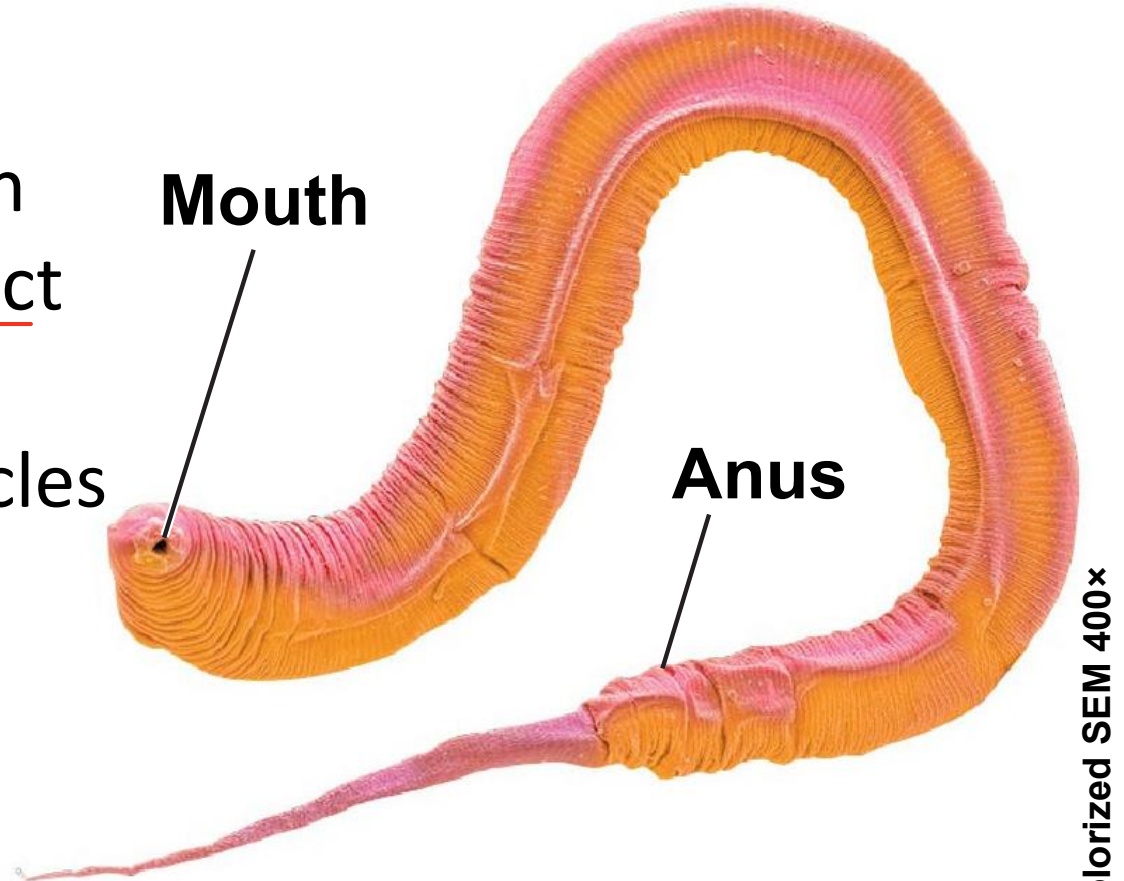
# The animal phylogenetic tree





# Phylum **Nematoda** the round worms

- Hemocoel
- No circulatory system
- No segmentation
- Cuticle = exoskeleton
  - protection
  - hydrostatic skeleton
- Complete digestive tract
- Ecdysis
- Only longitudinal muscles
- Free-living or parasites



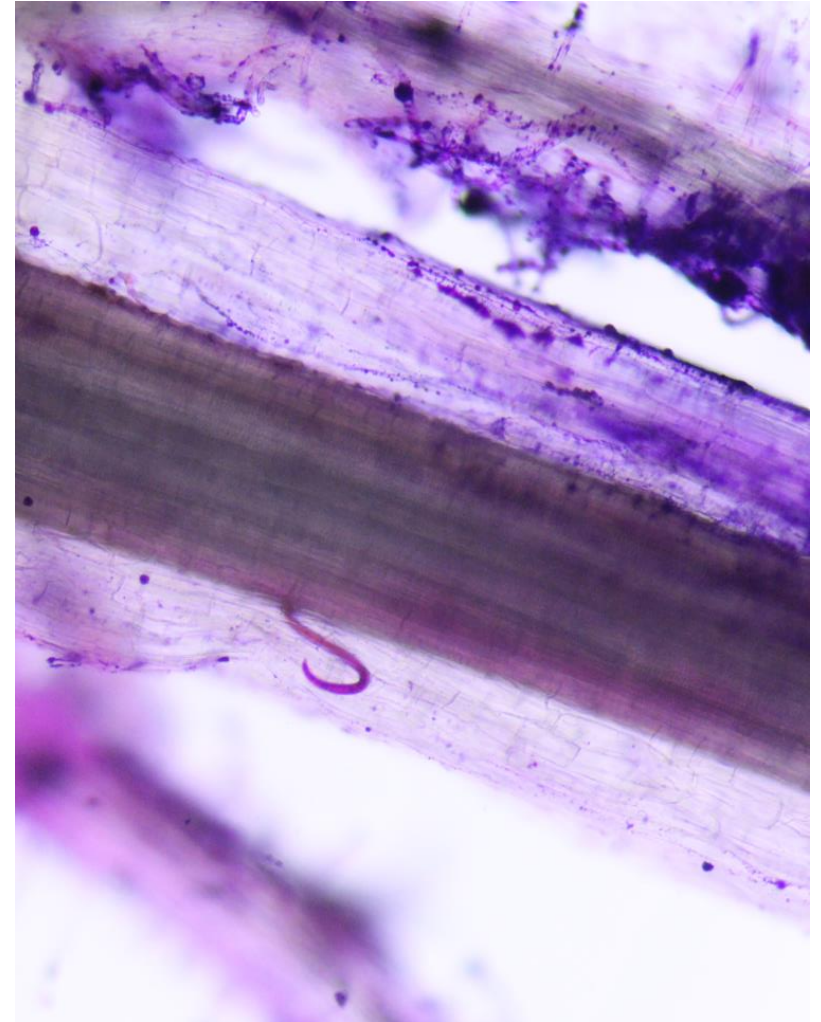
Colorized SEM 400x

• to ↑ in size in must shed the  
(cuticle exoskeleton)

# Nematodes rule! — *Most Common Animal*

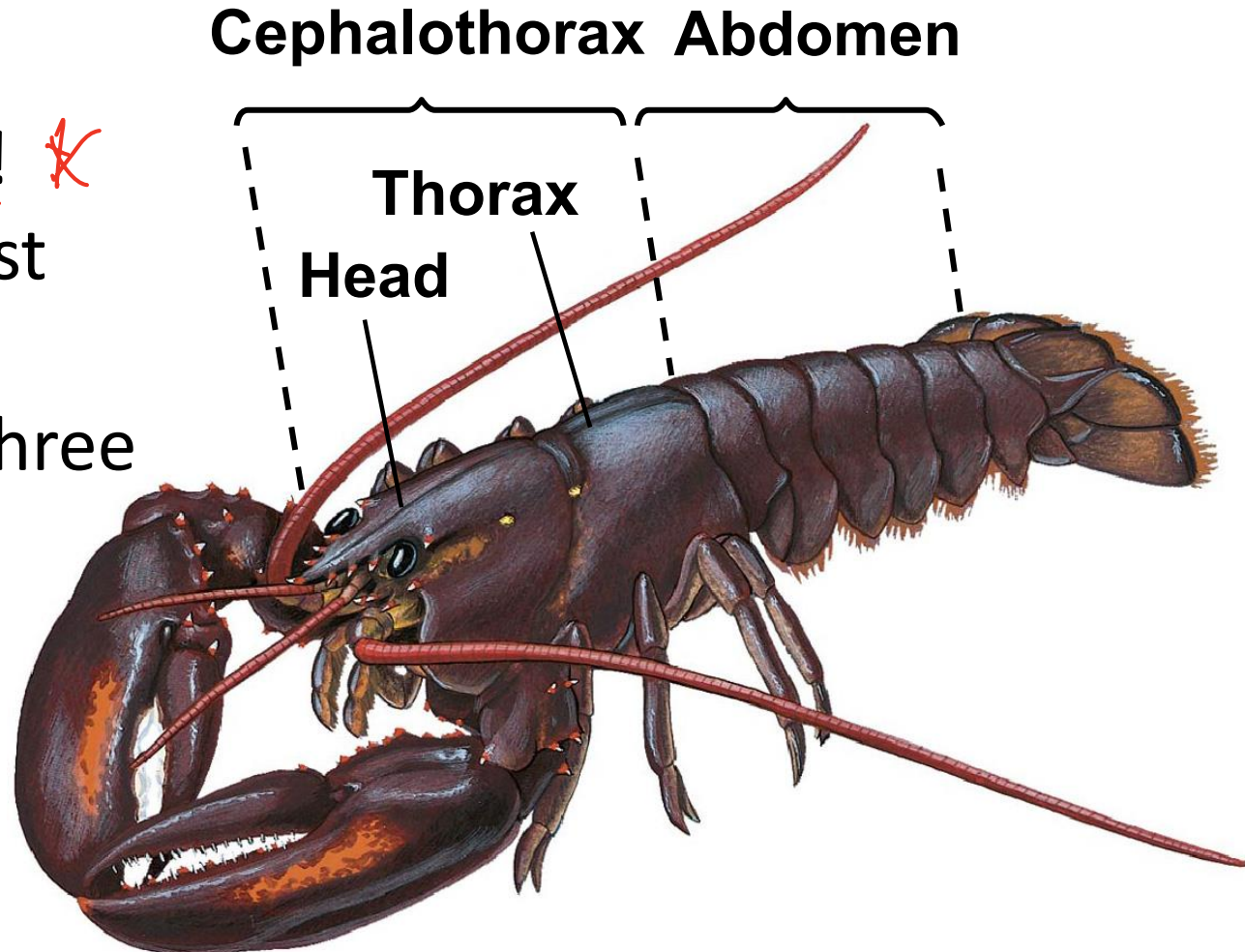
"If all the matter in the universe except the nematodes were swept away, our world would still be dimly recognizable ... we should find its mountains, hills, vales, rivers, lakes, and oceans represented by a film of nematodes. The location of towns would be decipherable, since for every massing of human beings, there would be a corresponding massing of certain nematodes. Trees would still stand in ghostly rows representing our streets and highways."

-Nathan A. Cobb, 1915



# Phylum Arthropoda

- Coelomate
- Complete digestive tract
- Cuticle = exoskeleton
- Ecdysis
- Jointed appendages
- Most diverse group!
- Segmentation = most have groups of segments fused in three main units
  - Head
  - Thorax
  - Abdomen





# Segmentation

- Body regions specialized for a function - For arthropods
  - Walking *whiteannelida*
  - Feeding
  - Swimming
- Division of labor
- Changes to one may not affect the others



Sub-categories



# Myriapods

- 1) Millipedes
  - Two legs per segment
  - Detritovore
- 2) Centipedes
  - One leg per segment
  - Carvinore





# Chelicerates

- Cephalothorax and abdomen
- No antennae
- Claw-like feeding appendage called chelicerae

*Group 1*



Horseshoe crab

## Arachnids

*has 4 groups*



Scorpions



Spiders

Mites



Ticks

Four pair of walking legs



# Pan crustaceans - crustaceans

1st Group

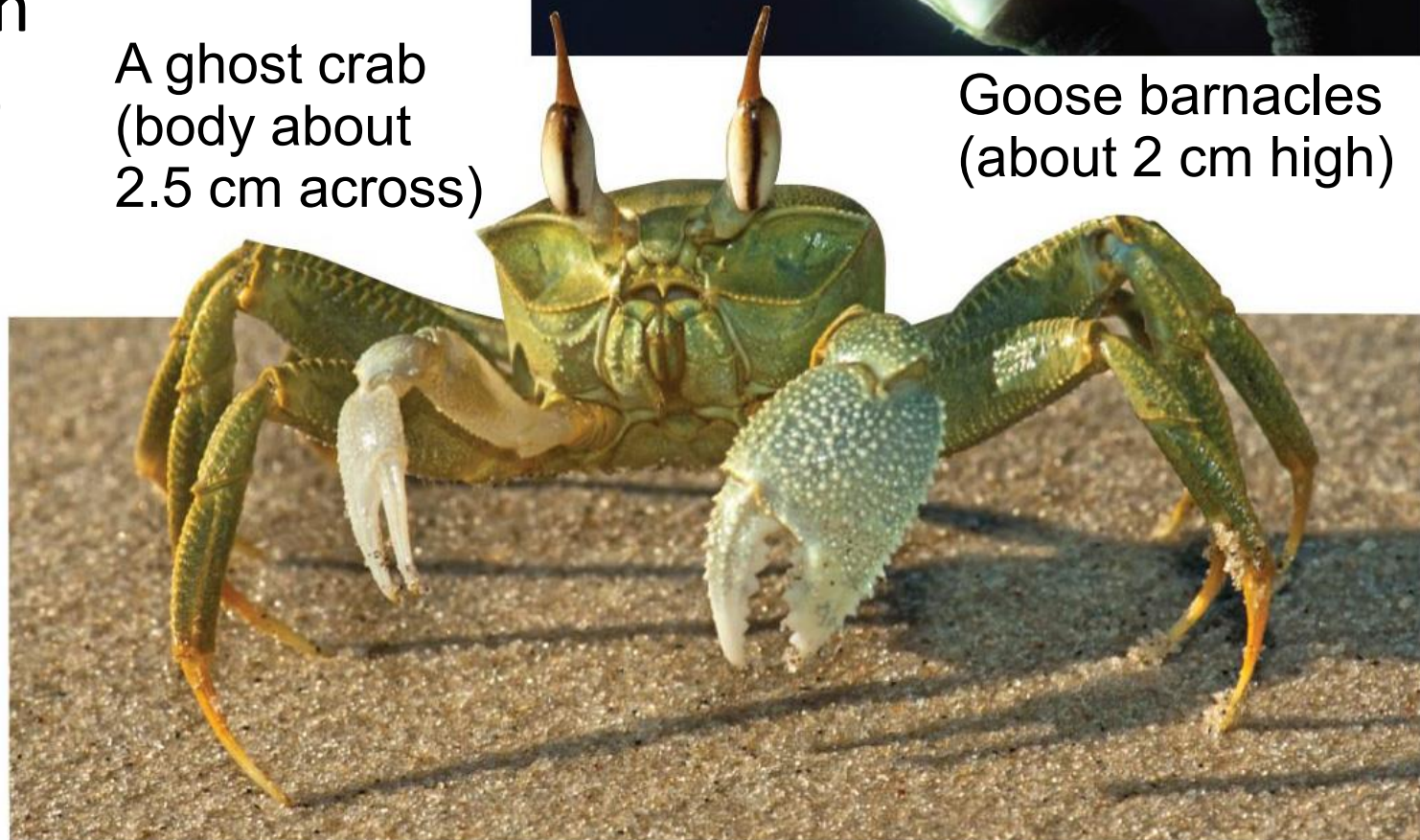
- Mostly aquatic
  - Barnacles
  - Decapods
    - Lobsters
    - Crayfish
    - Shrimp
    - Crabs

5 pairs of walking legs



Goose barnacles (about 2 cm high)

A ghost crab (body about 2.5 cm across)



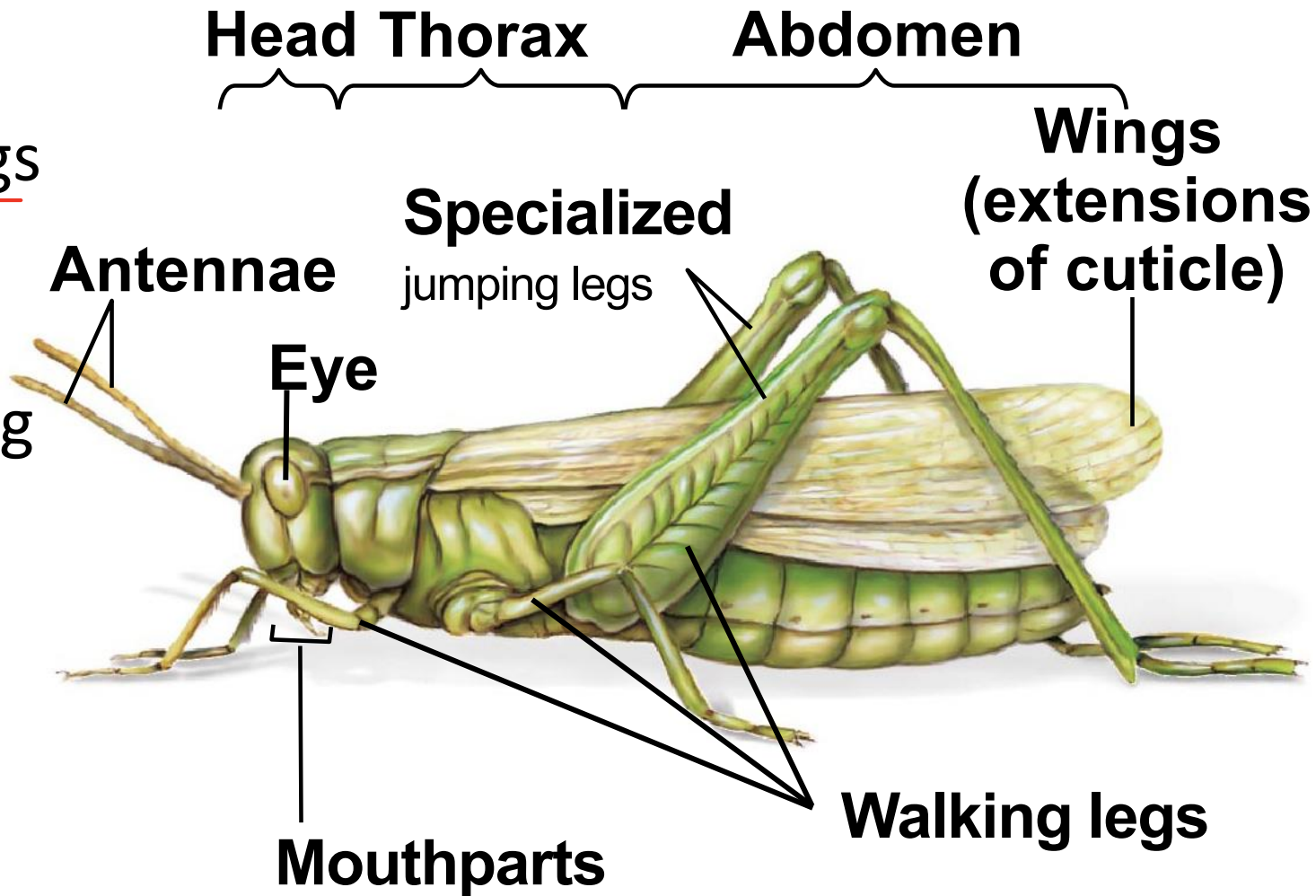
\* Marine +  
[Coastal]  
Environment

# Pancrustaceans - Insects

*2nd GROUP*

*Arthropod's Diversity Stems From*

- 75% of animal species
- Freshwater and terrestrial environments
- Highly specialized segments
- Six walking legs
- Antennae
- Flight!
- Water proofing





# Pancrustaceans - Insects

- Life cycle (metamorphosis)
  - Complete
  - Incomplete



①



②

③

adult



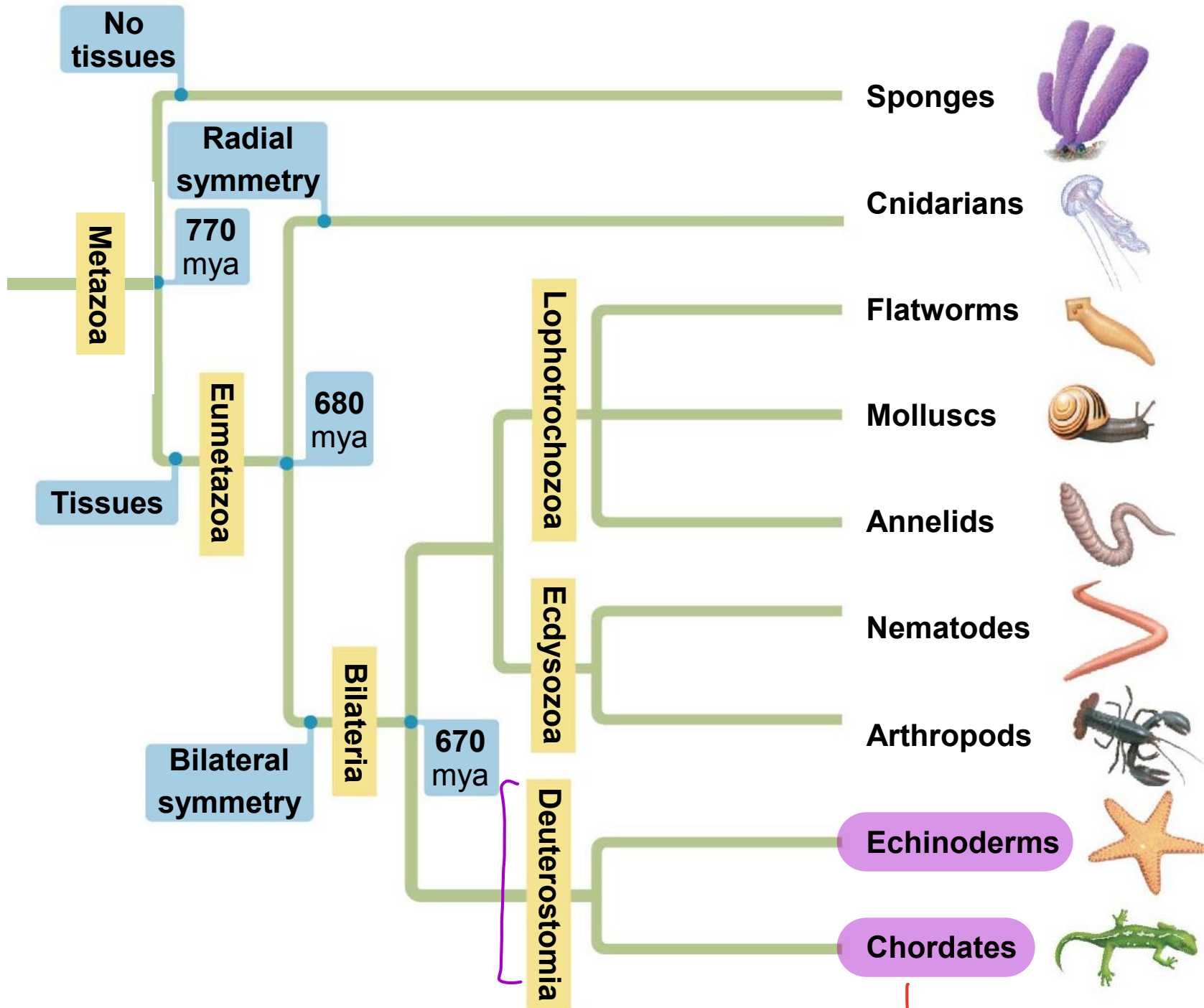
① must molt to grow  
• loses wings



②



# The animal phylogenetic tree



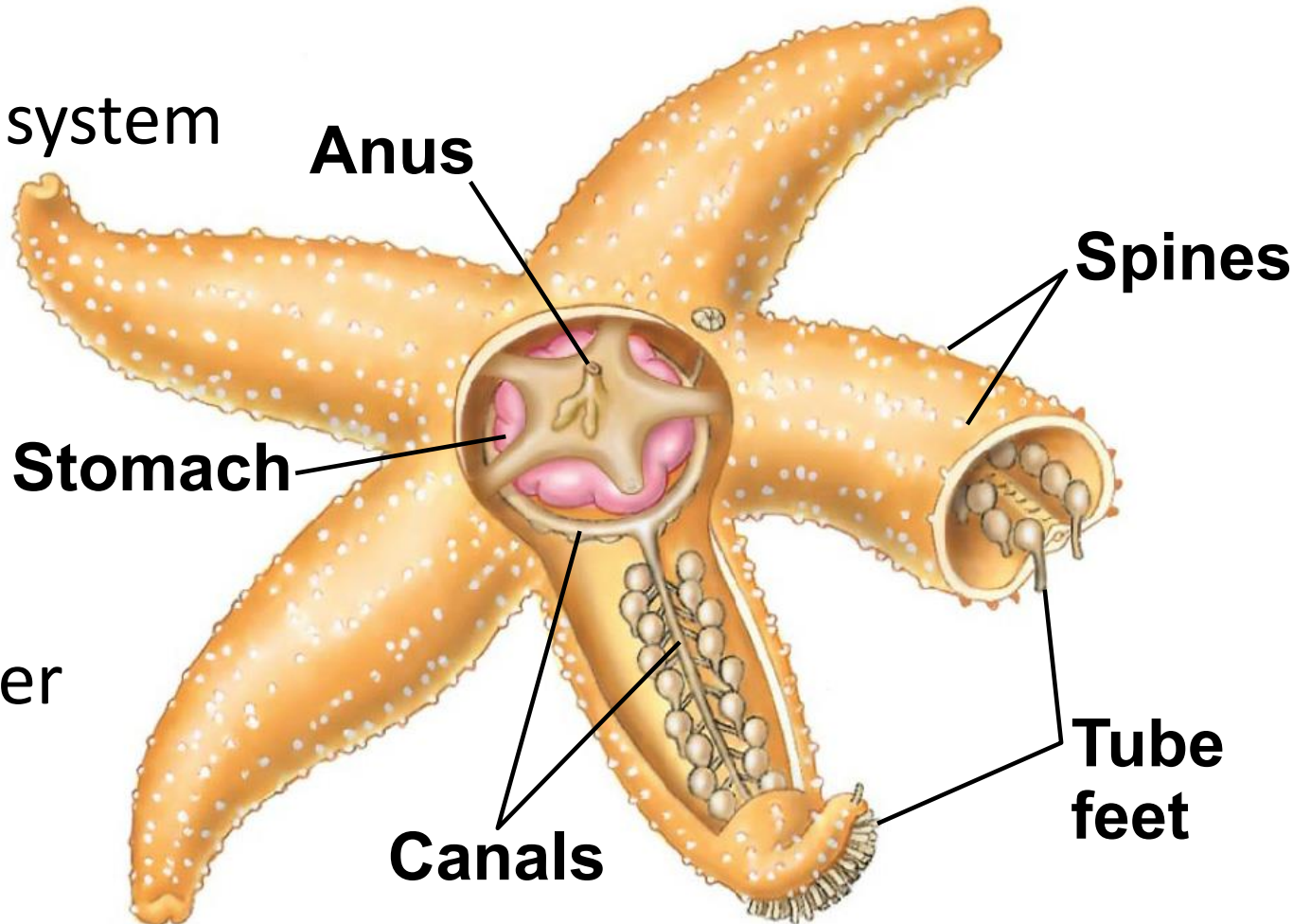
Protostomes:  
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Formation of  
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1<sup>st</sup>

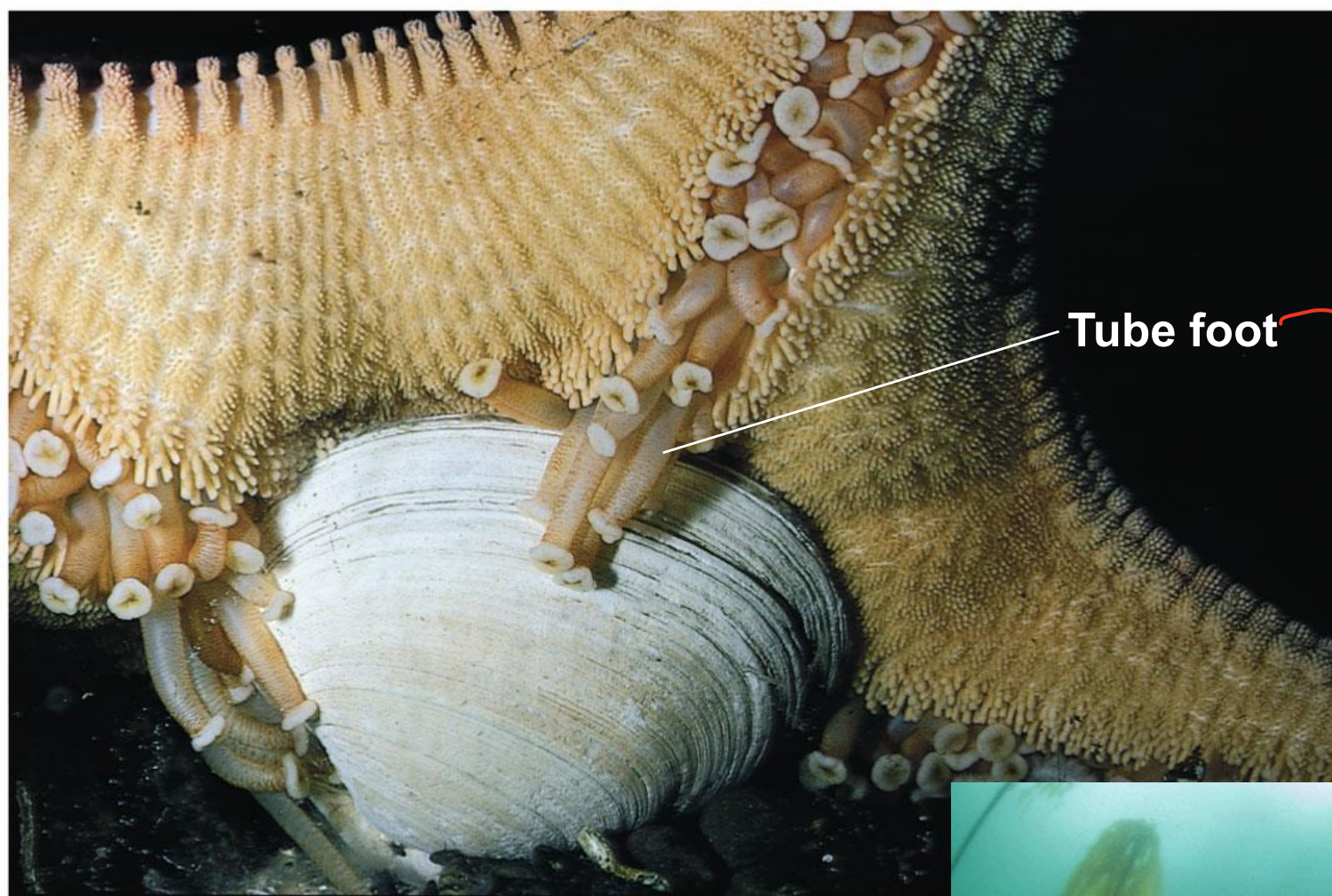
↳ We tell under here

# Echindodermata

- Deuterostomes
- Adults with radial-ish symmetry (larvae are bilateral)
- Endoskeleton
- Water vascular system with tube feet
- Examples
  - Sea urchin
  - Starfish
  - Brittle stars
  - Sea cucumber
  - Sand dollars







**Tube foot**

Adhesion created by chemicals

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