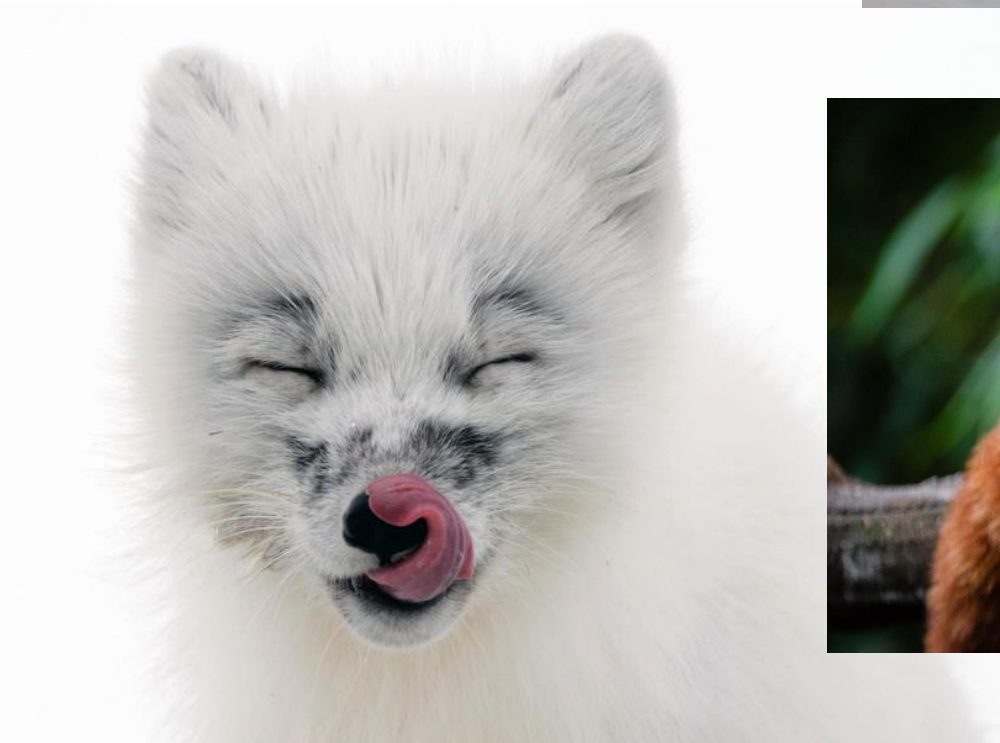
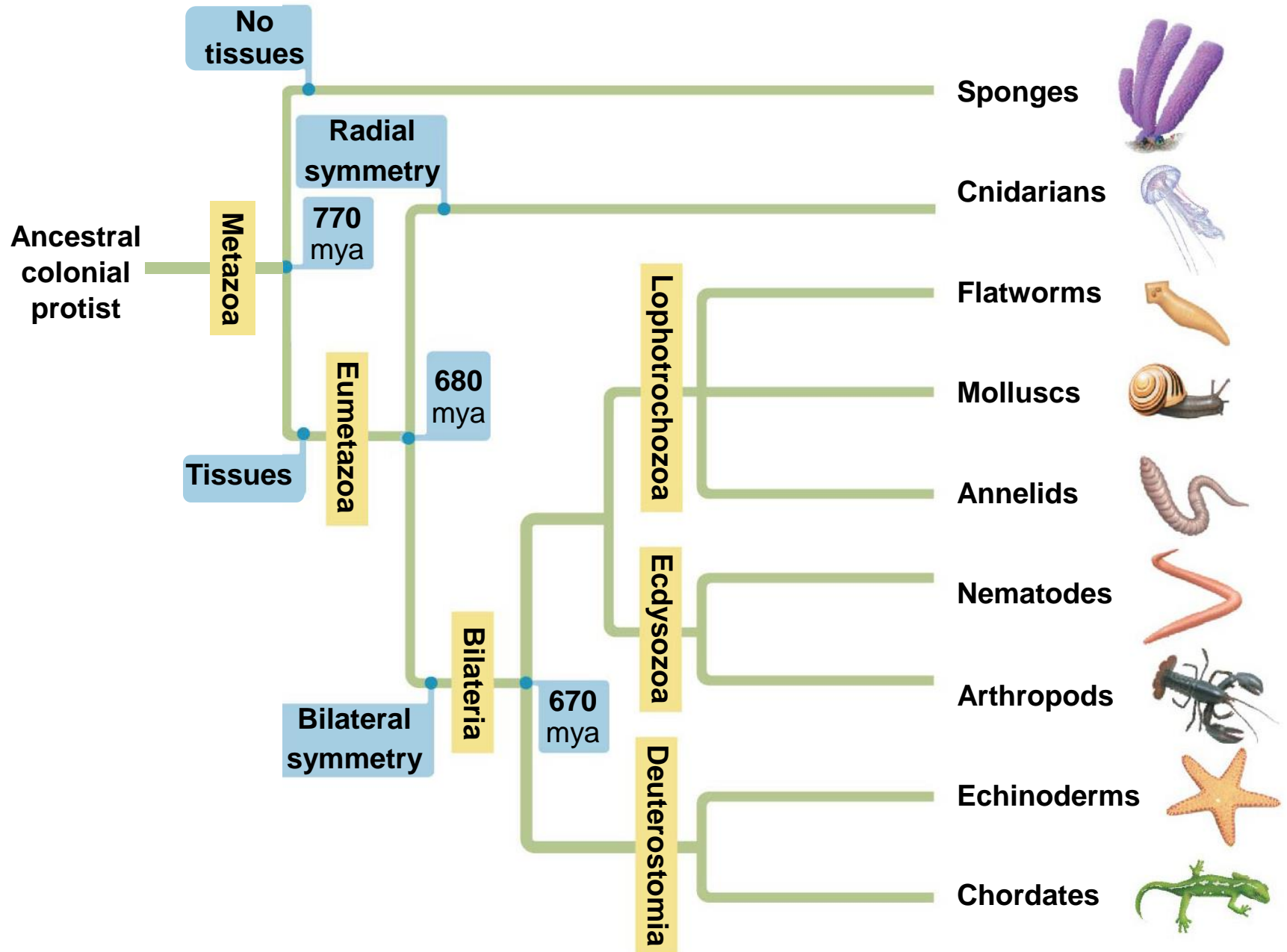


Animals – invertebrates



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



larva



A purple tube sponge



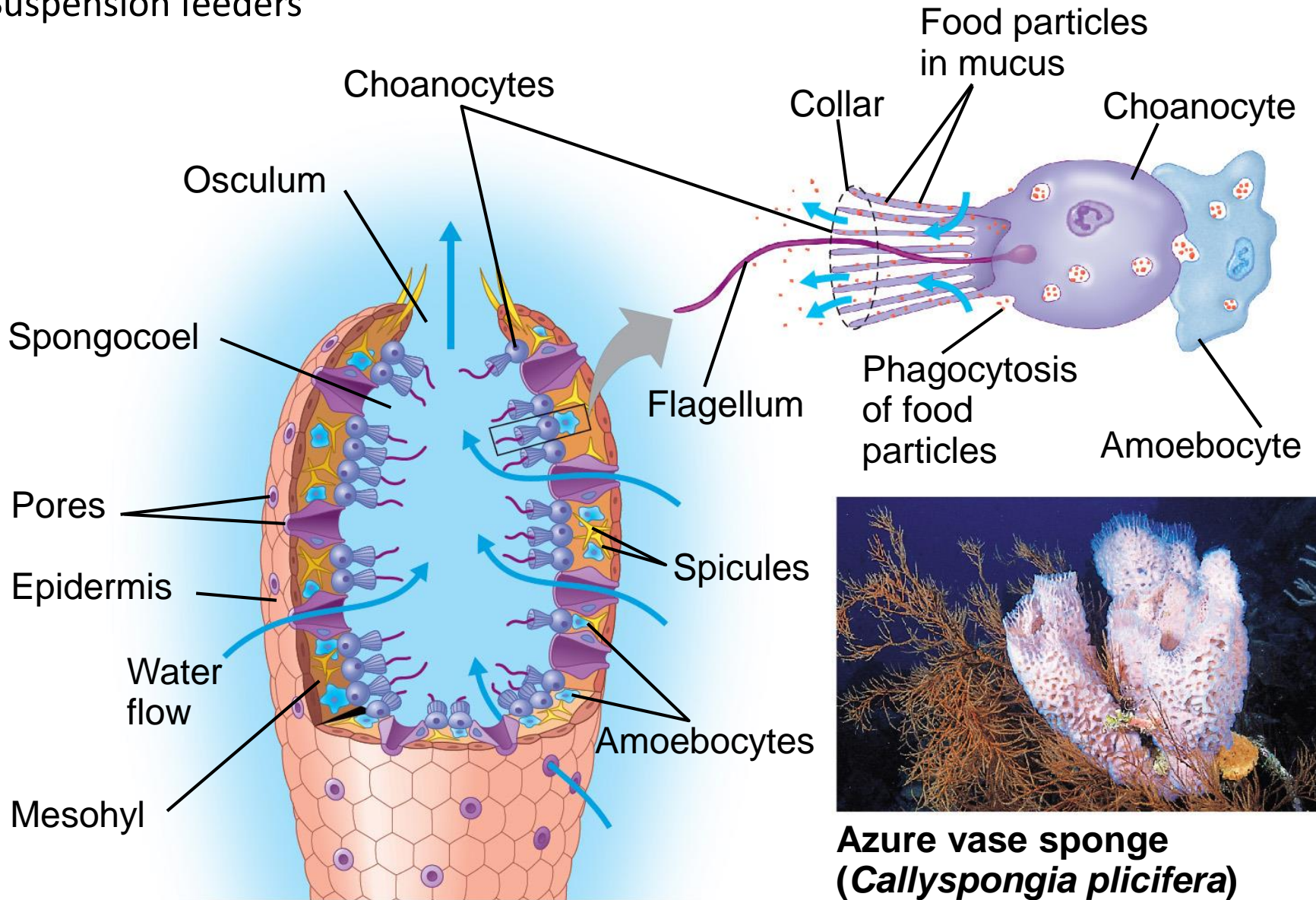
An azure vase sponge



Scypha

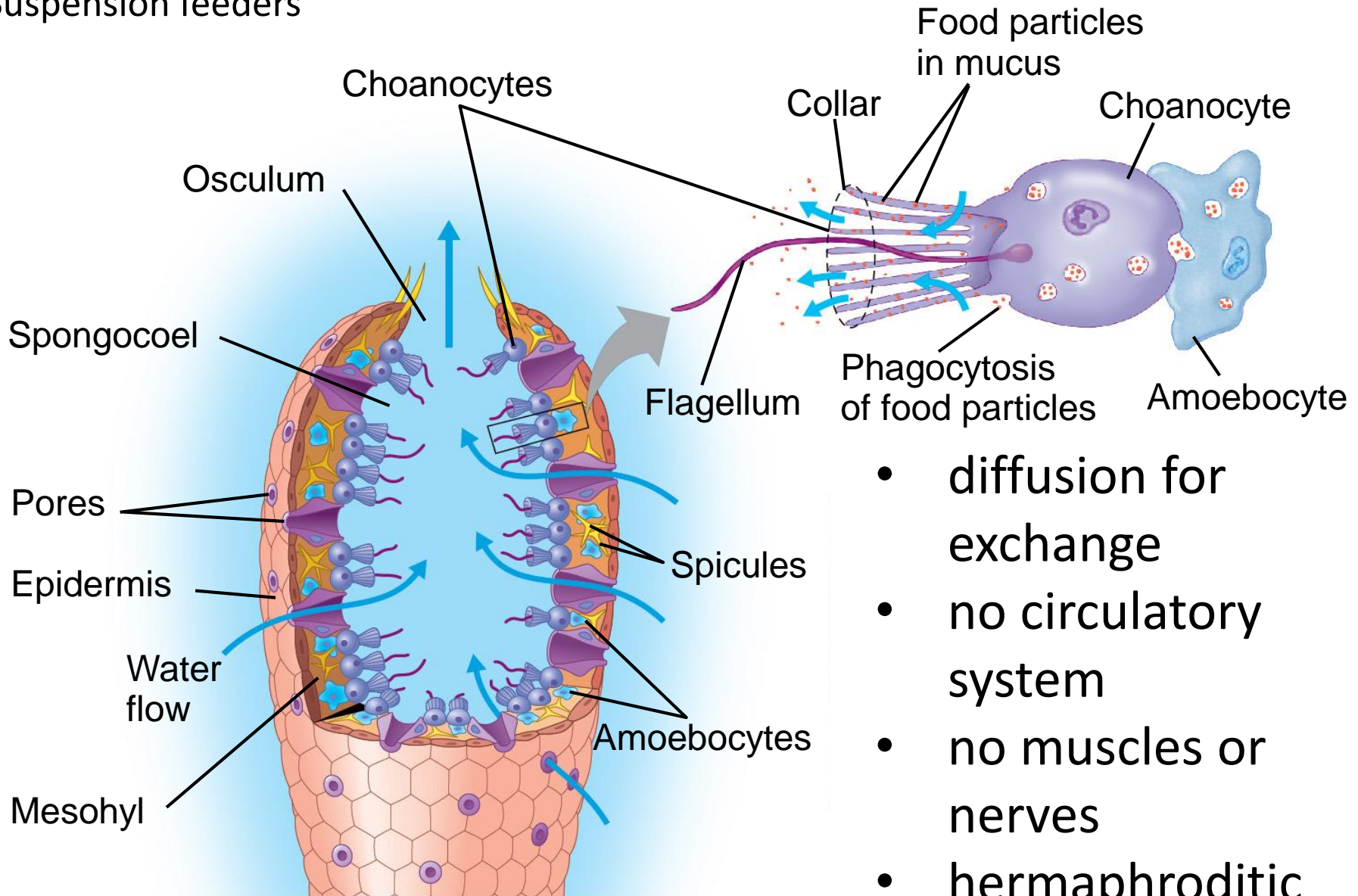
How sponges make a living

Suspension feeders



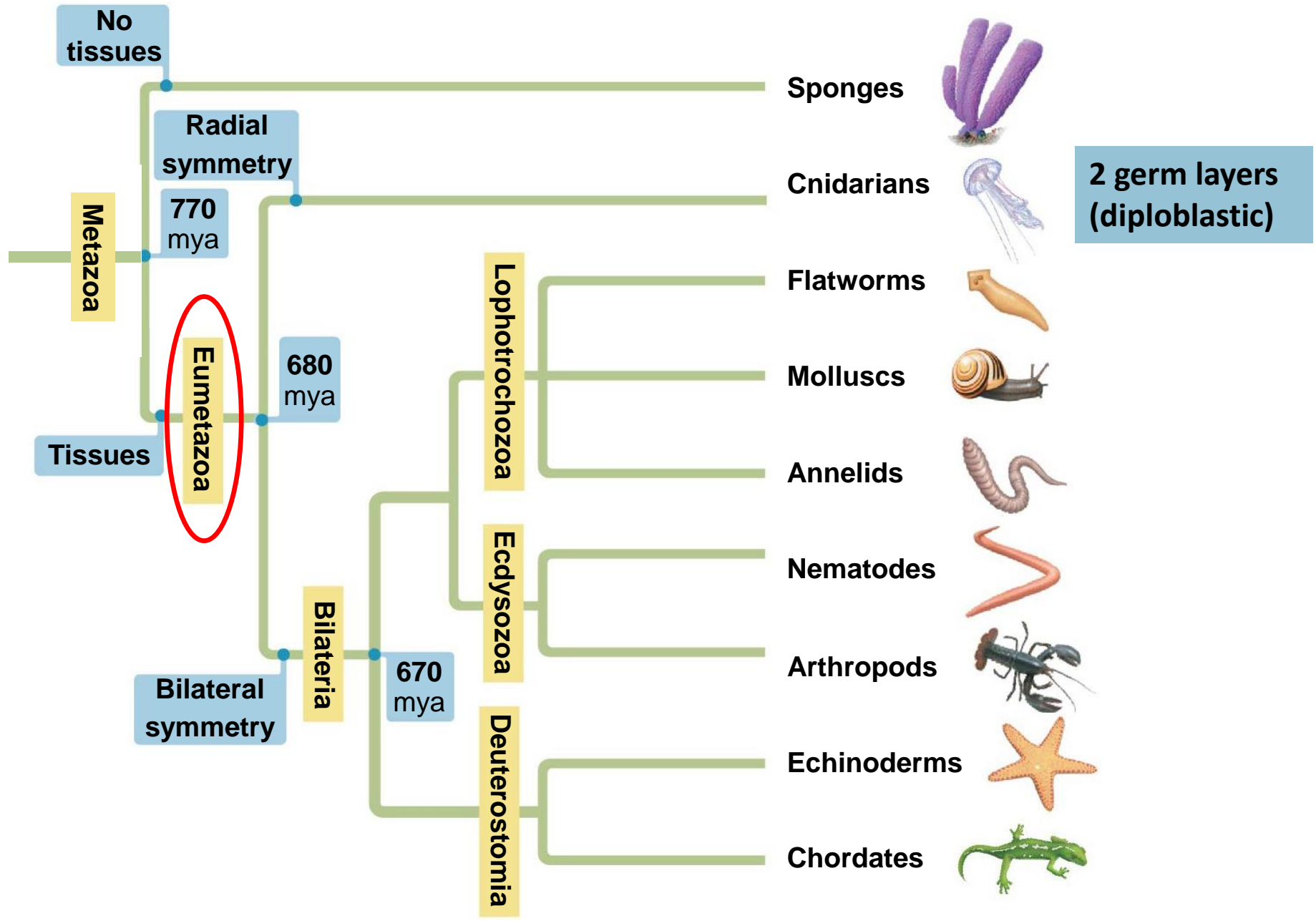
How sponges make a living

Suspension feeders



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

The animal phylogenetic tree

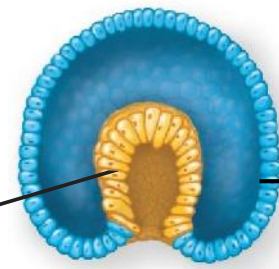


Phylum Cnidaria

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

Endoderm

Ectoderm



Mouth/anus

Tentacle

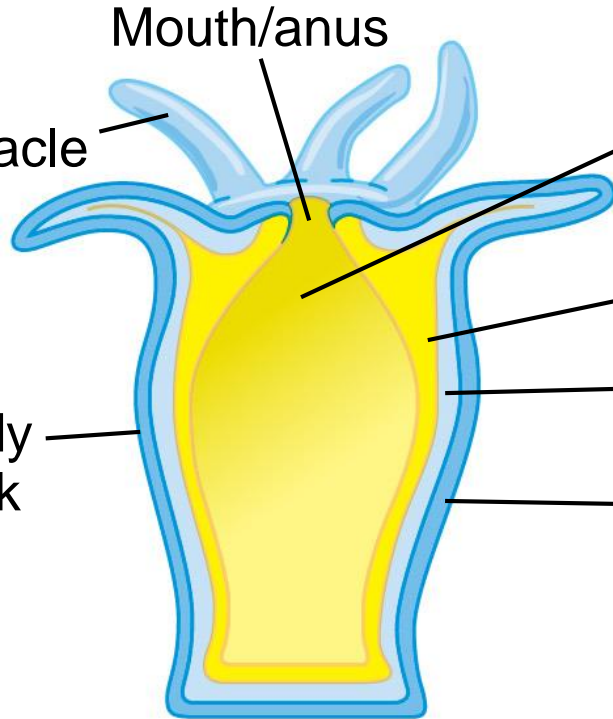
Gastrovascular cavity

Gastrodermis

Mesoglea

Epidermis

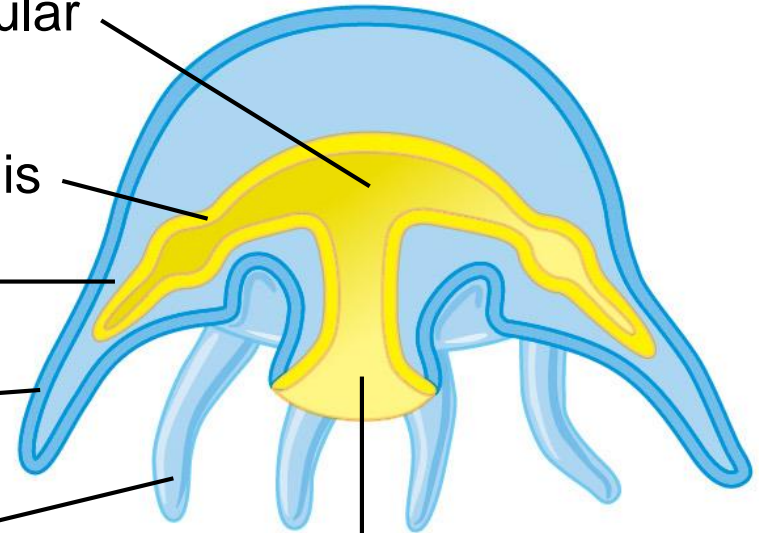
Body stalk



Polyp (cross section)

Tentacle

Mouth/anus



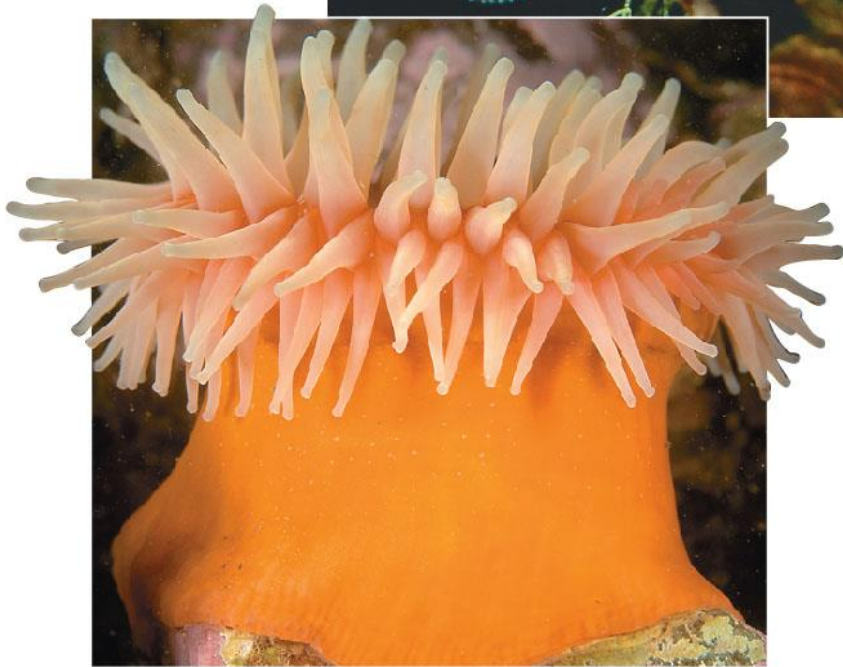
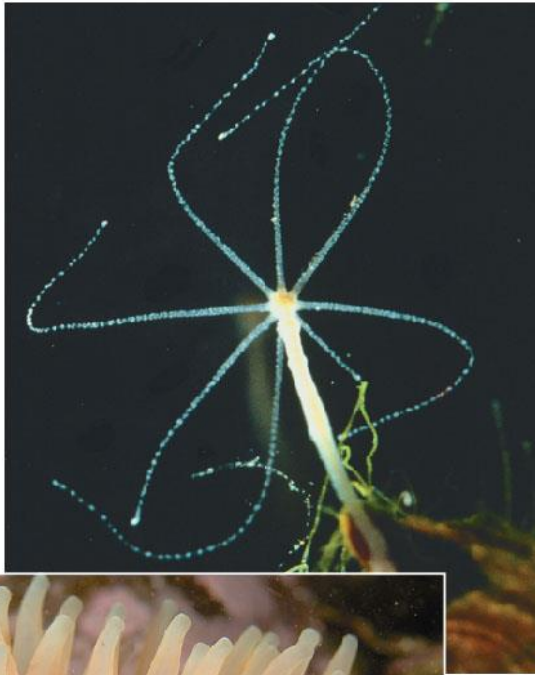
Medusa (cross section)

Complete vs incomplete digestive tract

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

Polyp body plant

A hydra
(about
2 mm tall)



A sea anemone
(about 6 cm in diameter)

Medusa body plant

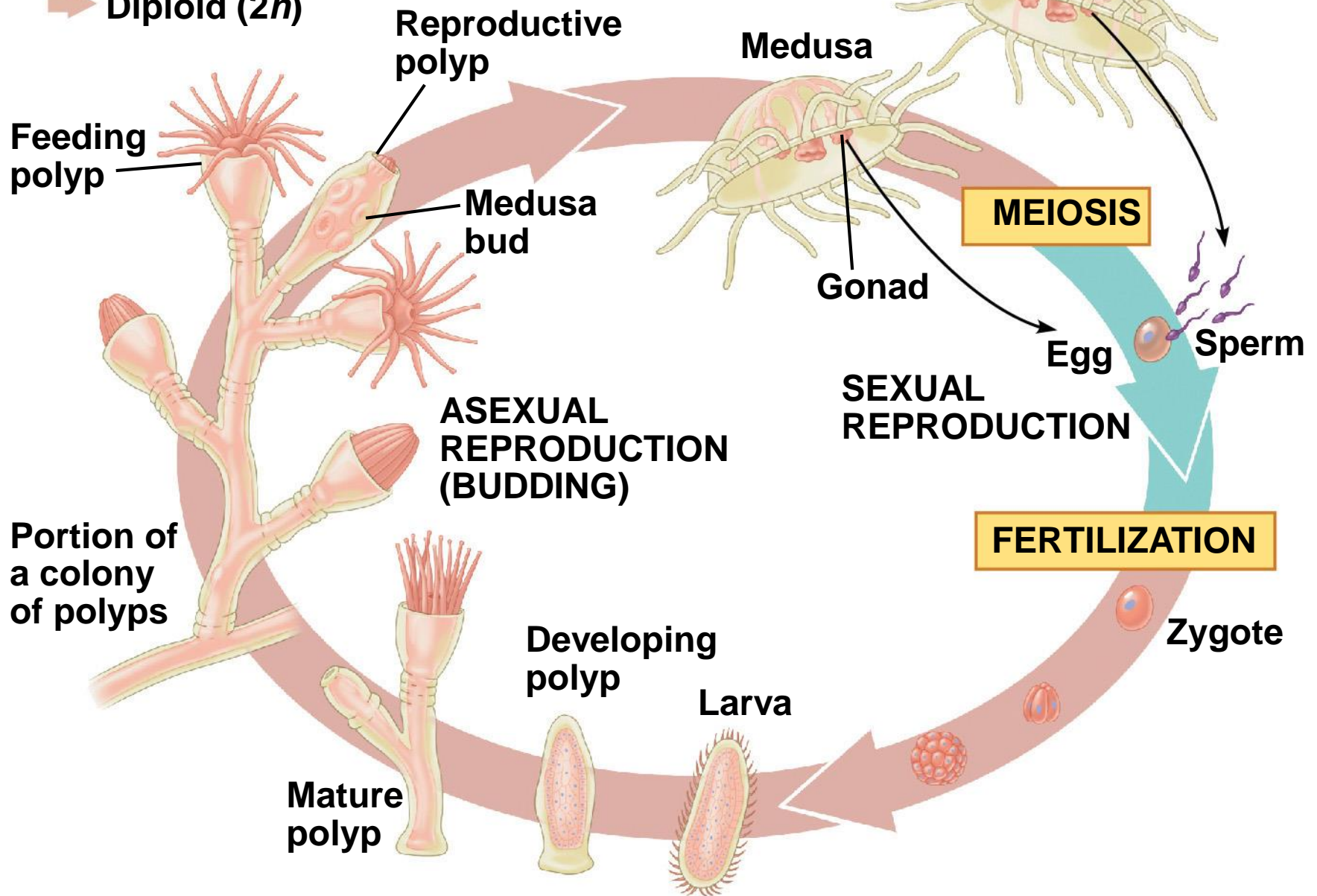


A marine jelly
(about 6 cm in diameter)

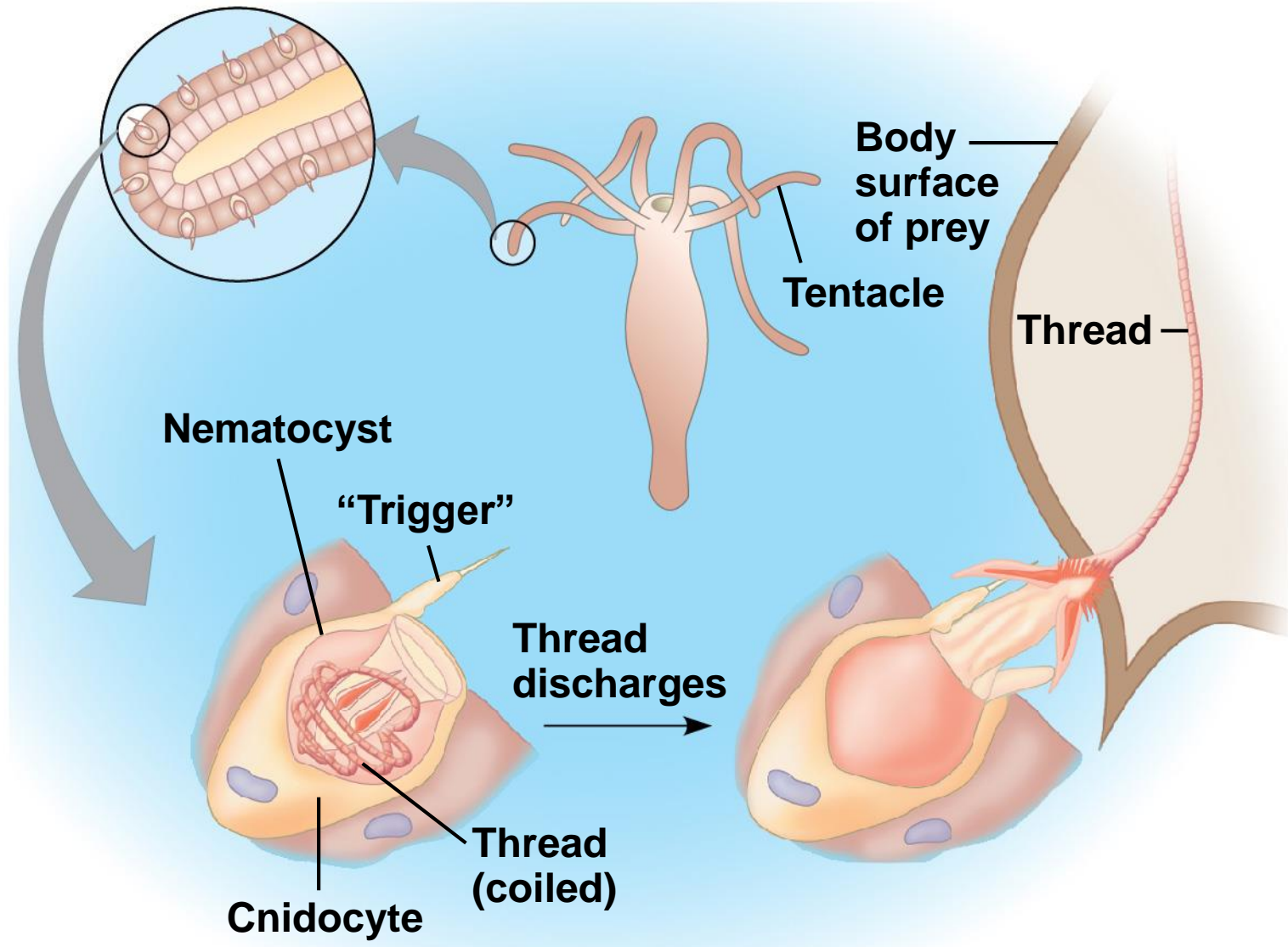
Some alternate

→ Haploid (n)

→ Diploid ($2n$)



How cnidarians make a living

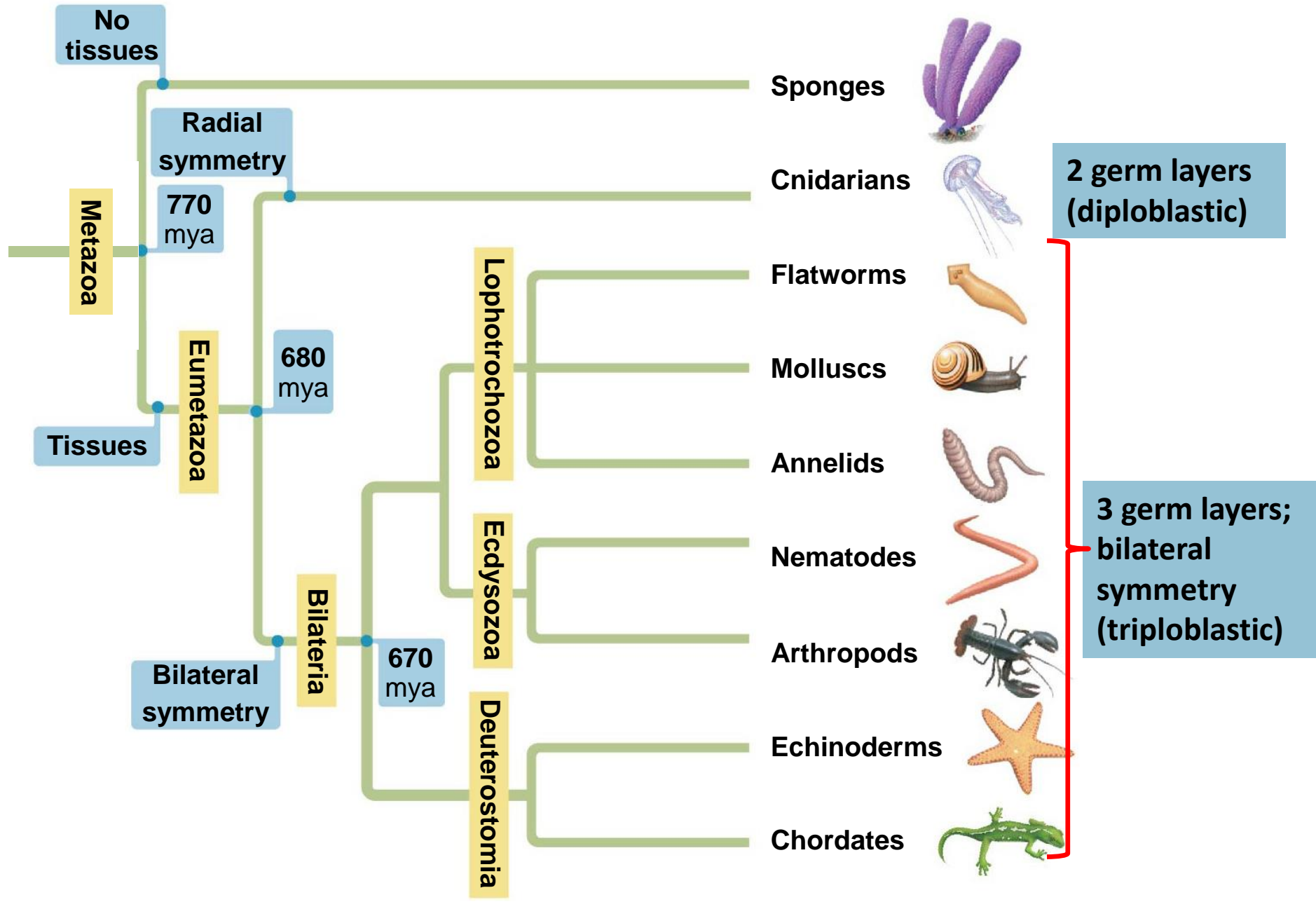


Coral animals and symbiosis

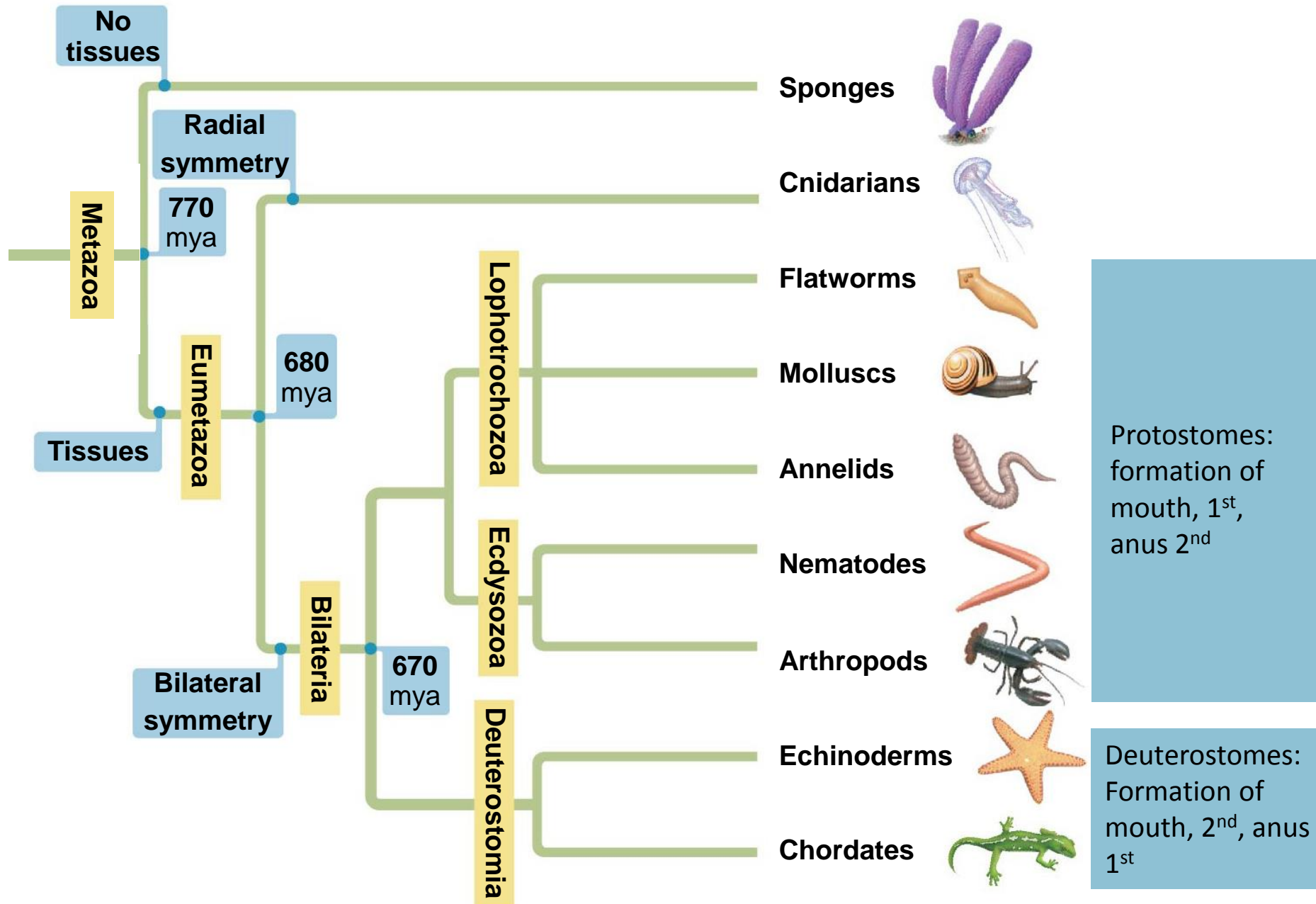
- Dinoflagellates
- exoskeleton = reef
- ecosystem architects
- threatened by warming seas and ocean acidification



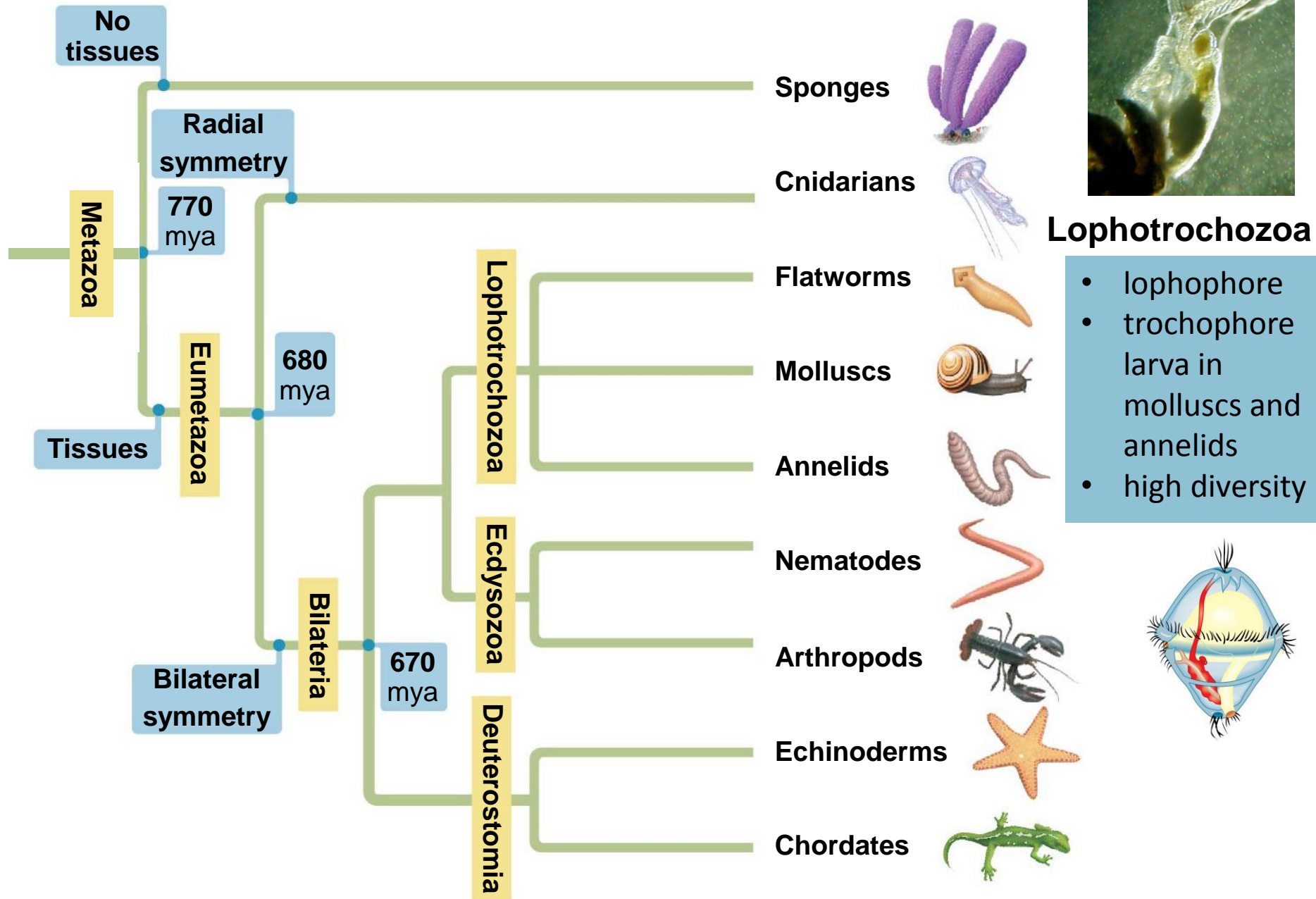
The animal phylogenetic tree



The animal phylogenetic tree



The animal phylogenetic tree

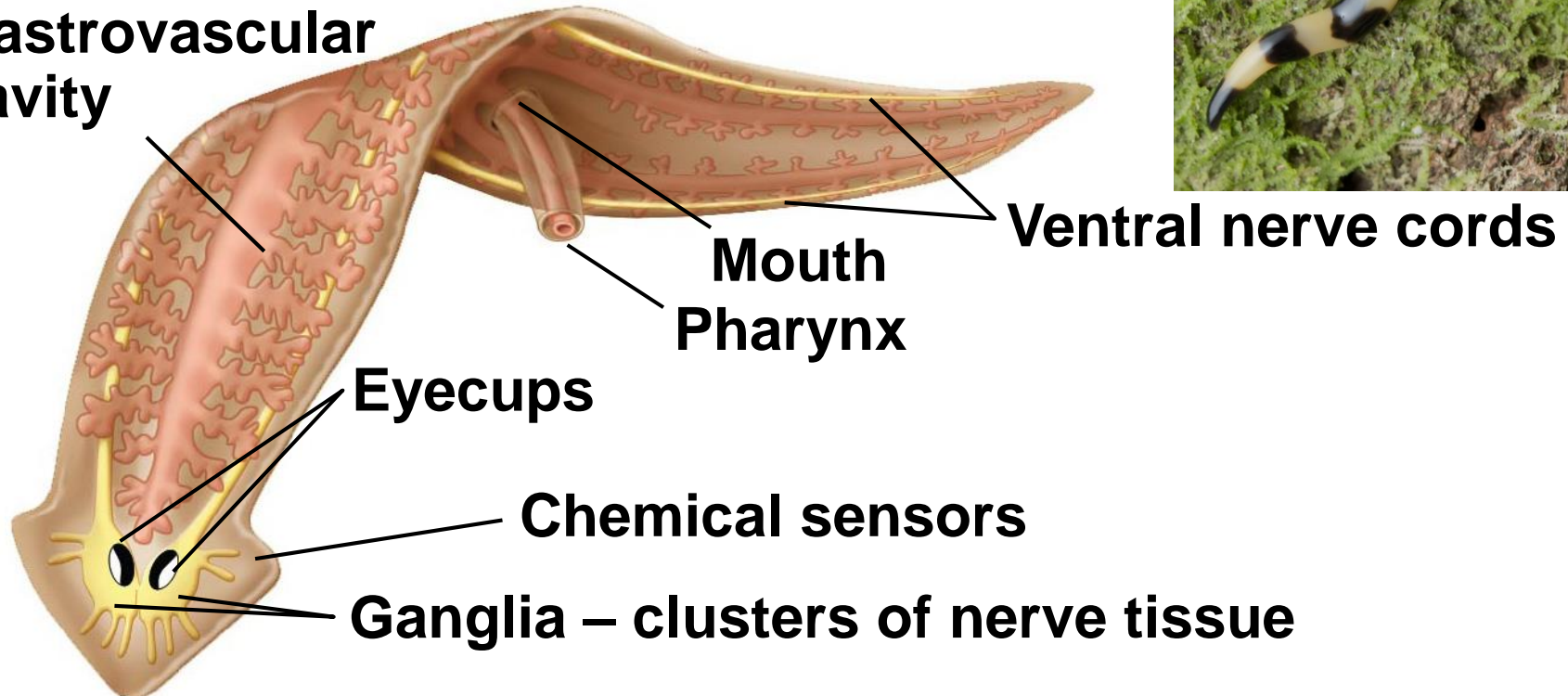


Phylum Platyhelminthes the flatworms

- Triploblastic acoelomates
- Bilateral symmetry
- Free-living flatworms (planarians)
 - Predators
 - Scavengers



Gastrovascular cavity



Simple cephalization and centralization in nervous system

Other types: Parasites

How do they make a living?

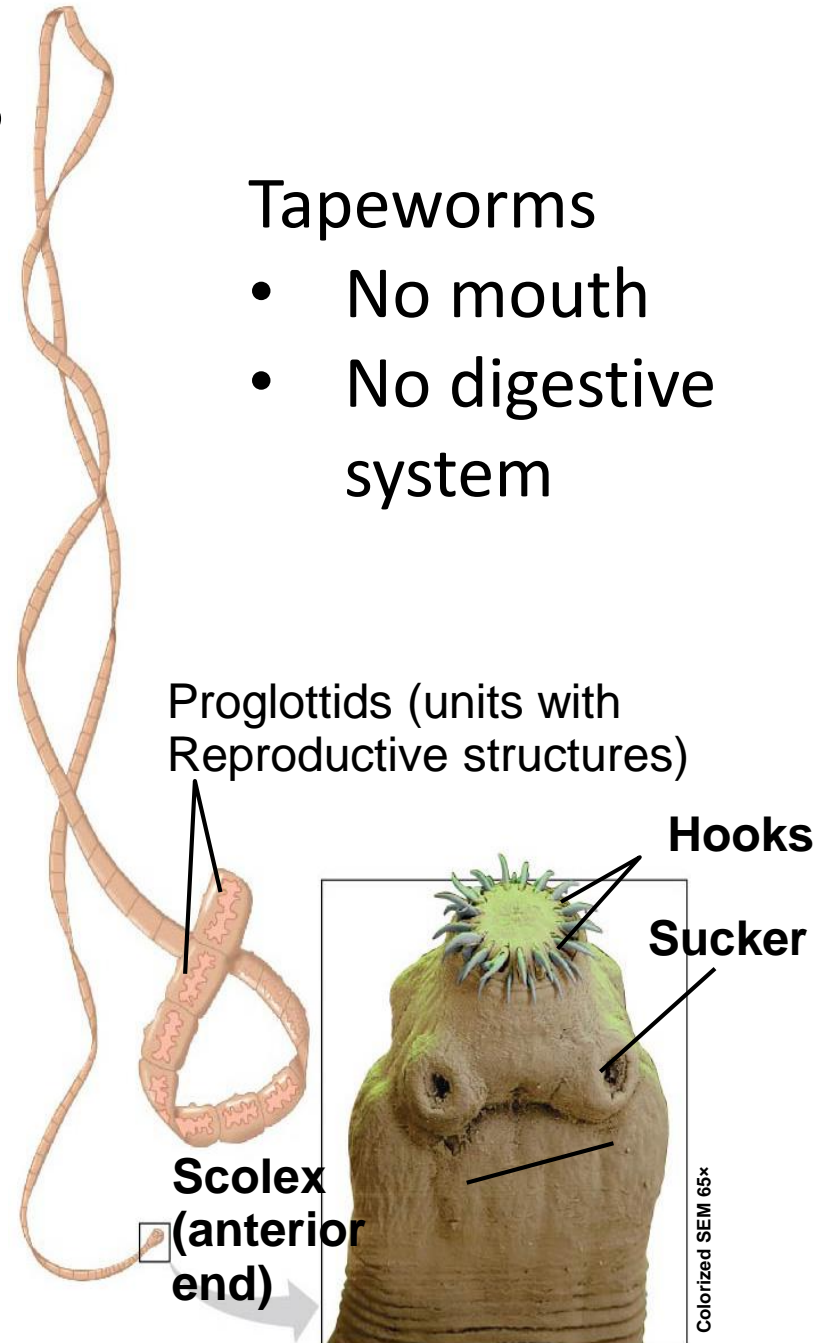
Trematodes - Flukes



Often use an intermediate host

Tapeworms

- No mouth
- No digestive system



Phylum Mollusca

- Small coelom around heart and hemocoel
- Complete digestive tract
- Basic body anatomy = foot, visceral mass, and mantle
- Shells of calcium carbonate
- Radula common
- Open circulatory system = hemolymph
- Most are aquatic

Gastropods

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

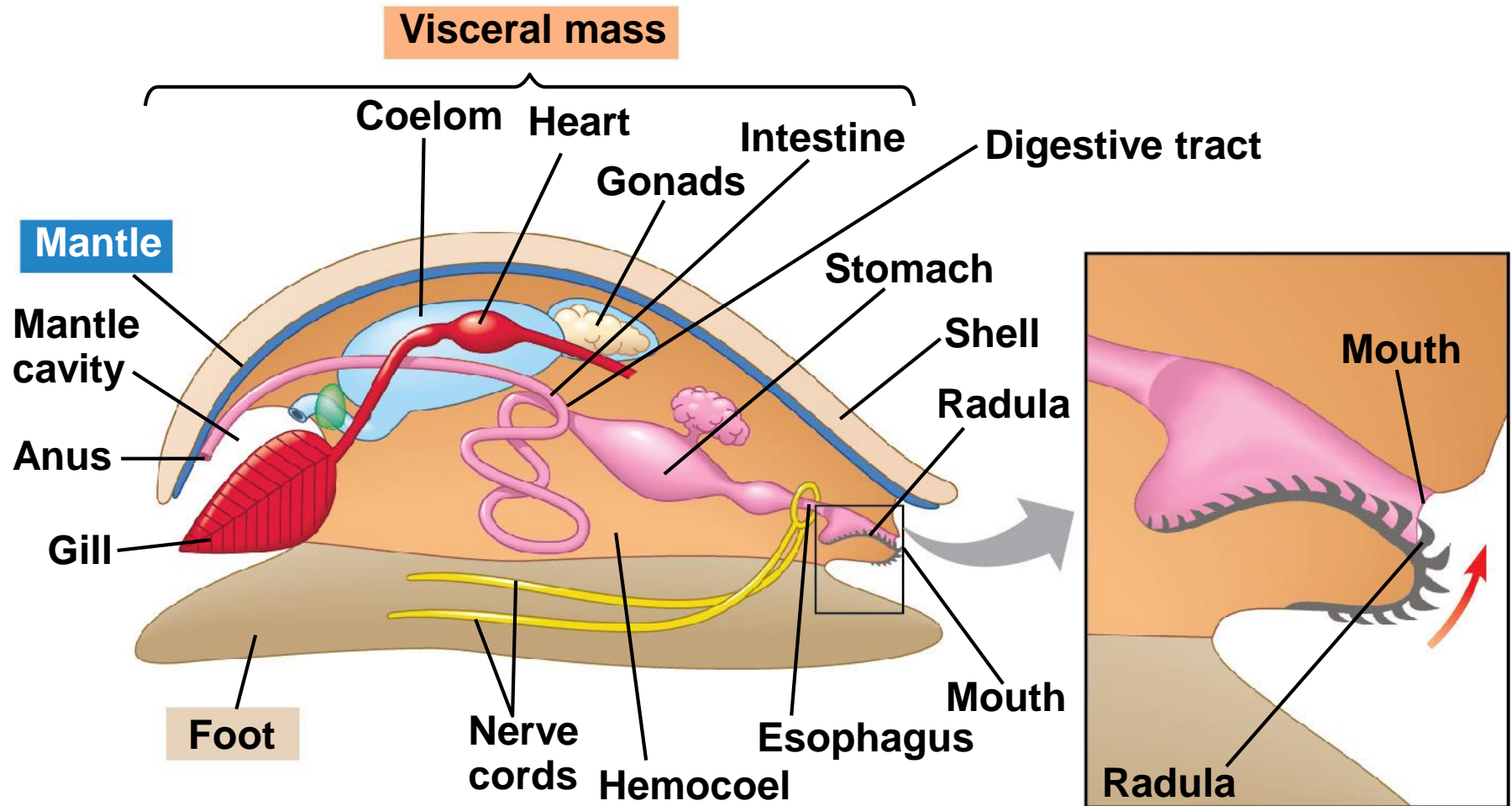


A sea slug
(about 5 cm long)



A land snail

Basic mollusc anatomy

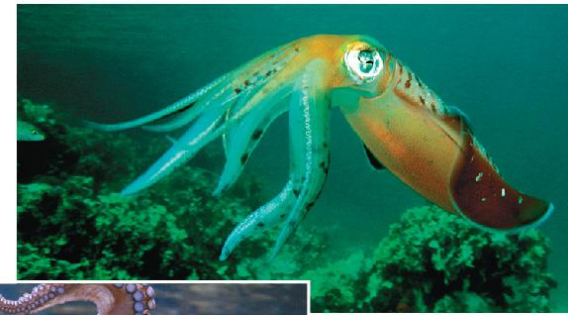




Bivalves

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

► Squid



◄ Octopus

► Chambered nautilus

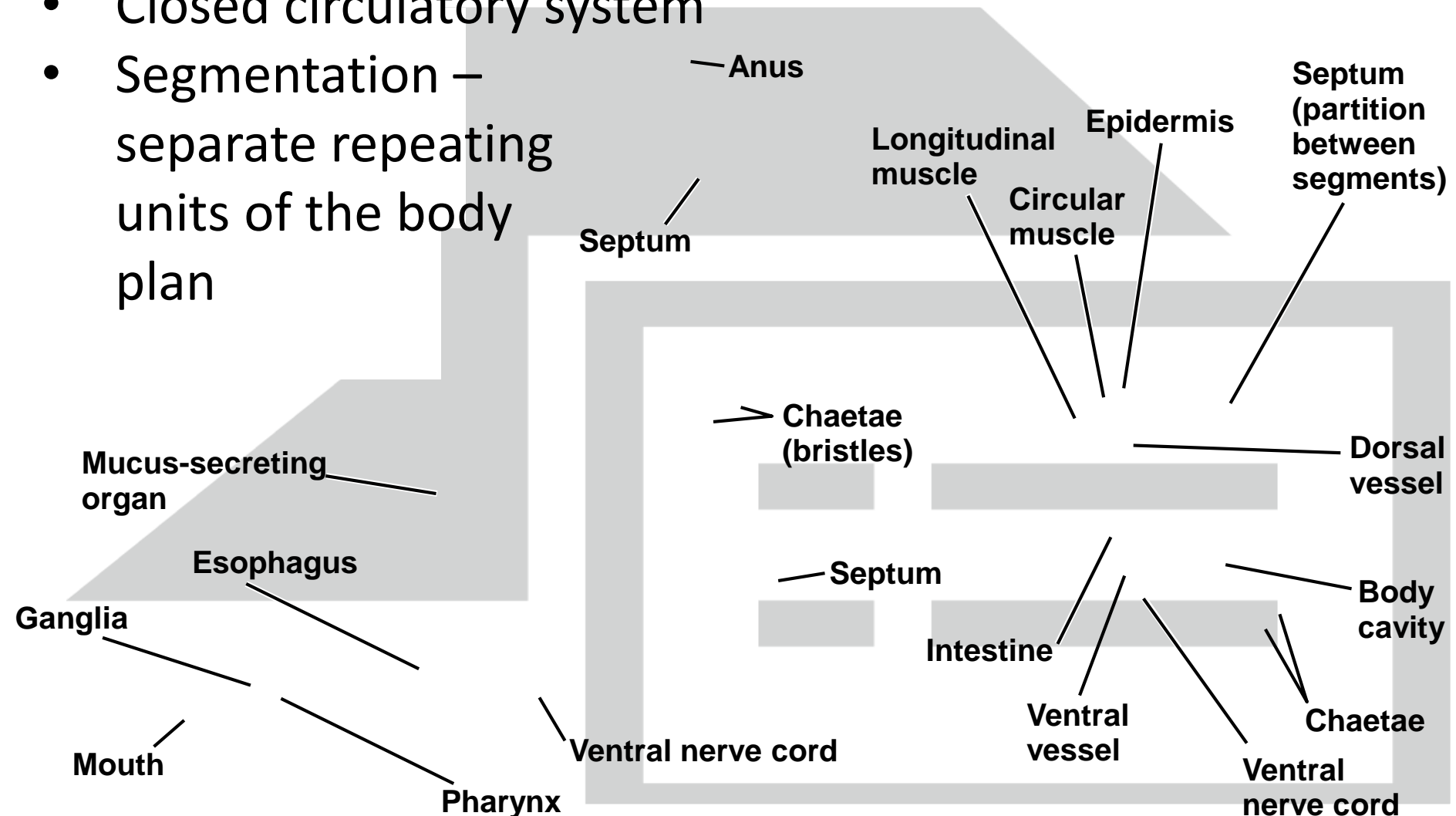


Cephalopods

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

Phylum Annelida the segmented worms

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



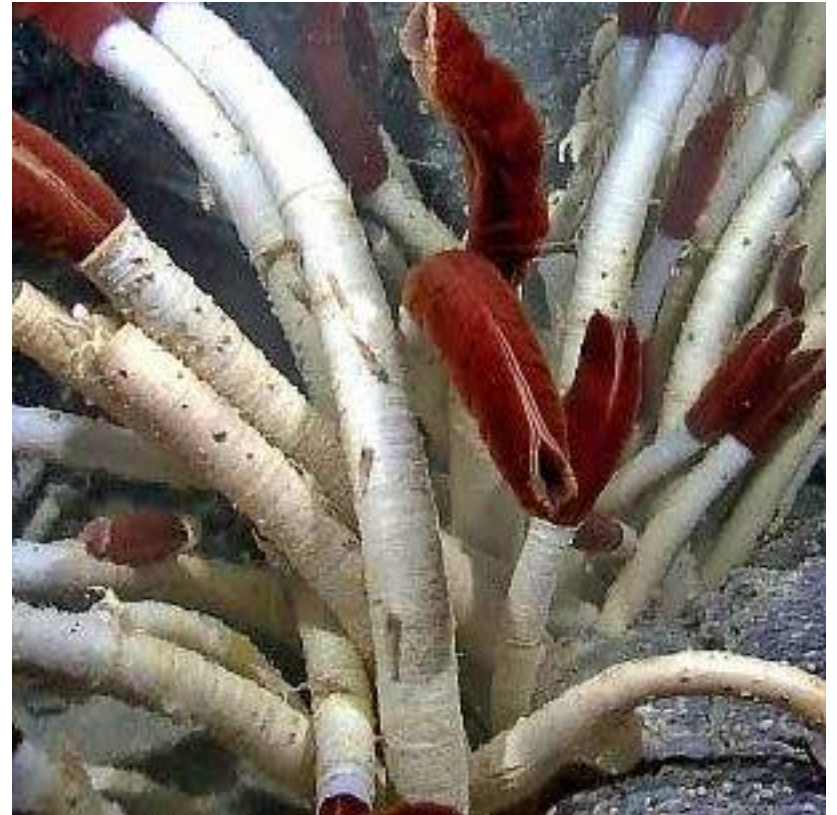
Sedentarians



earthworms

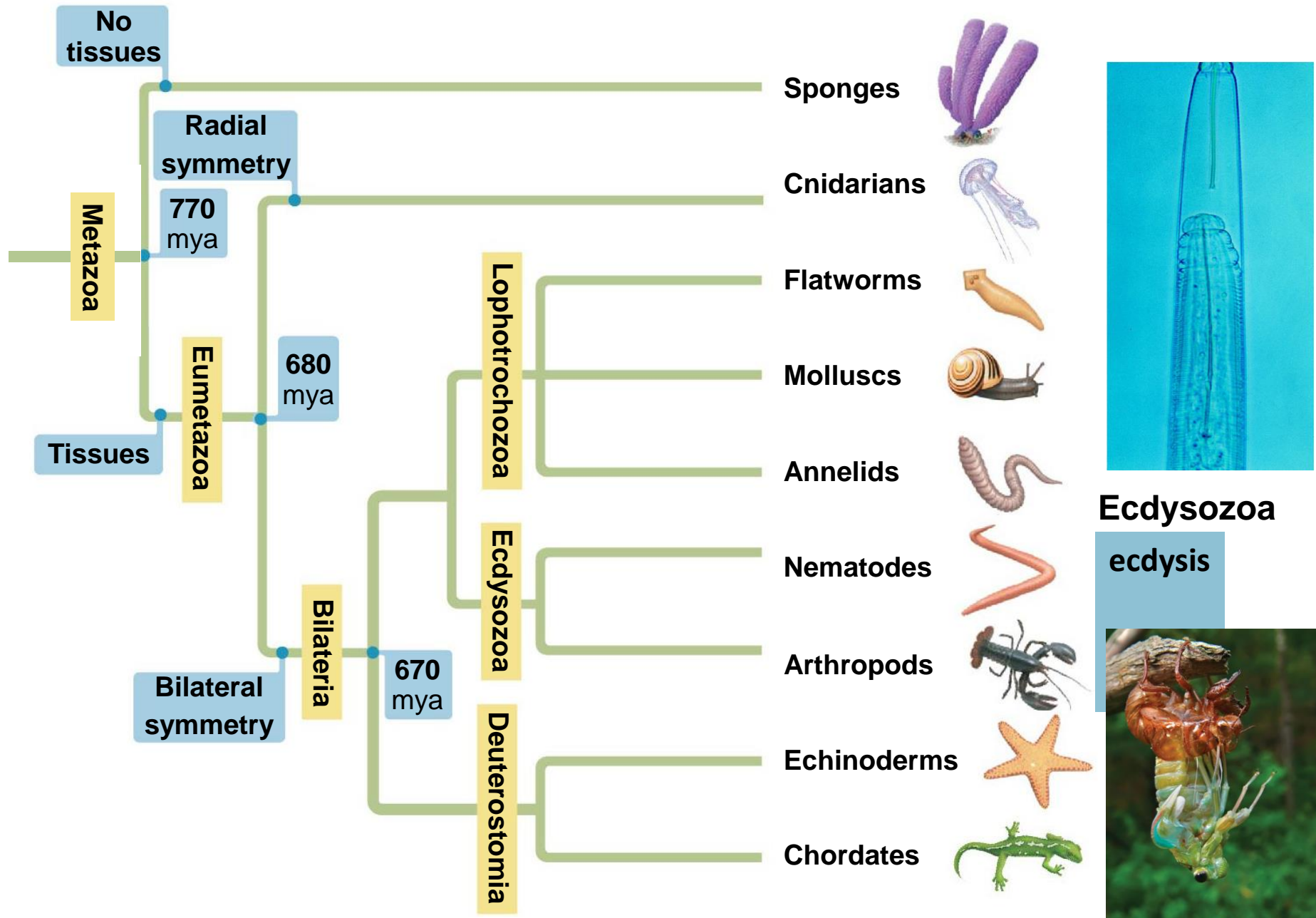


leeches



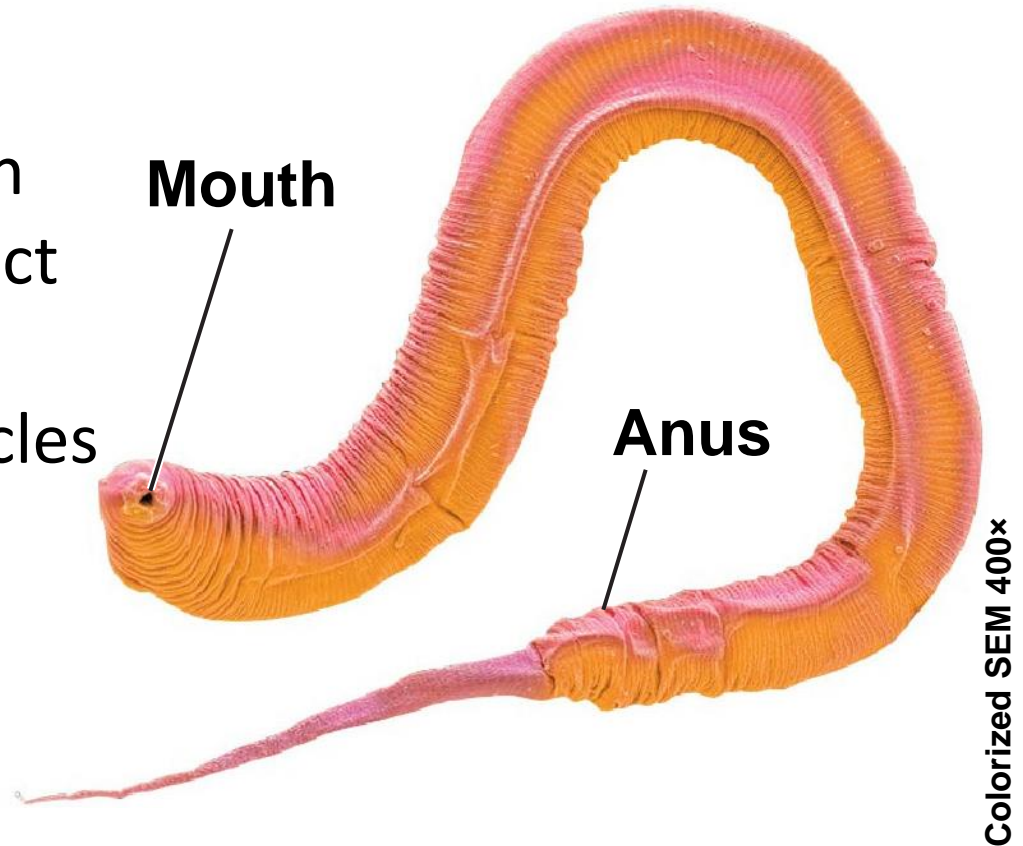
tubeworms

The animal phylogenetic tree



Phylum Nematoda the round worms

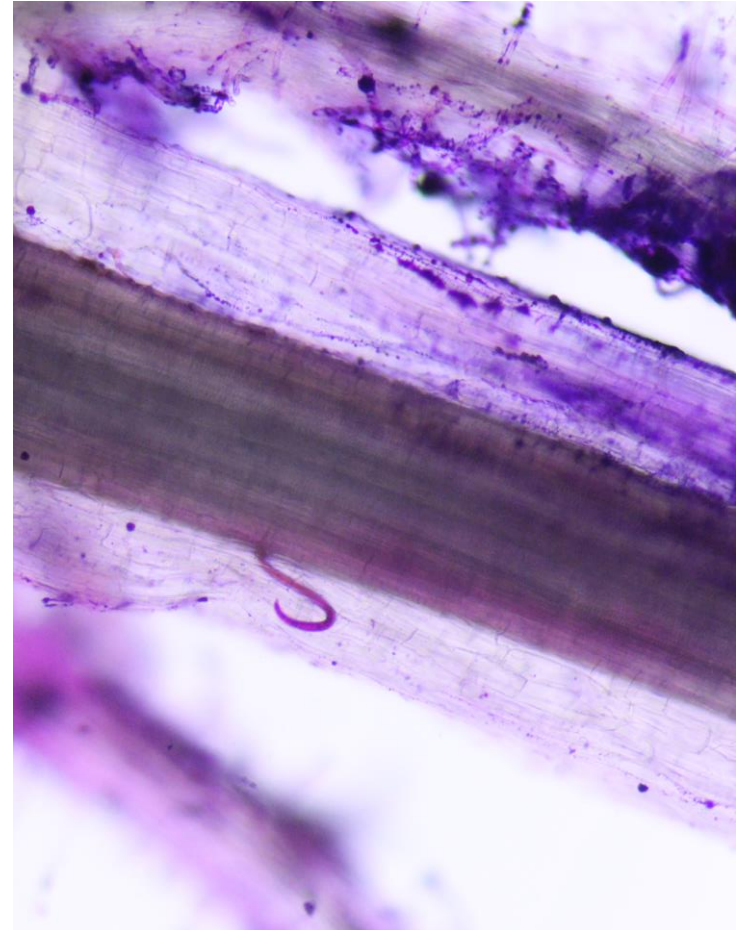
- Hemocoel
- No circulatory system
- No segmentation
- Cuticle = exoskeleton
 - protection
 - hydrostatic skeleton
- Complete digestive tract
- Ecdysis
- Only longitudinal muscles
- Free-living or parasites



Nematodes rule!

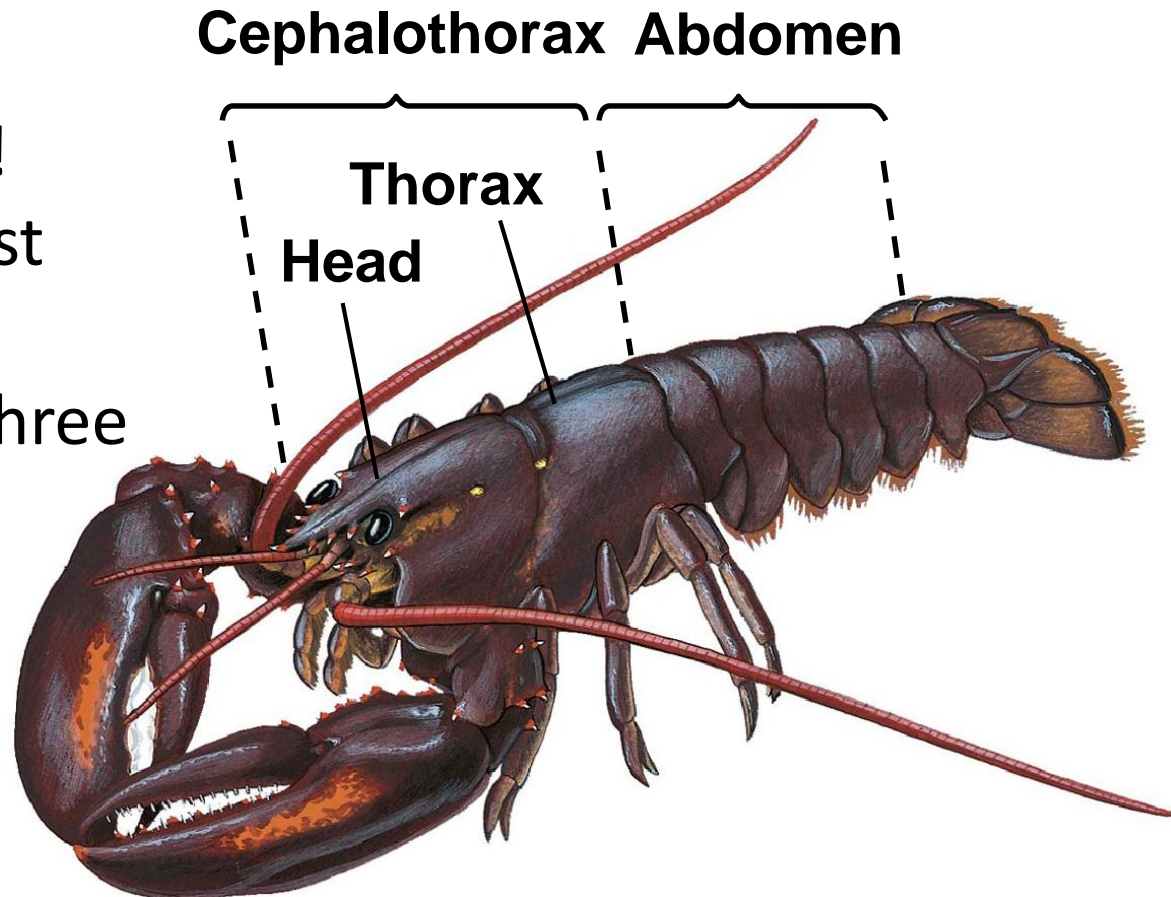
"If all the matter in the universe except the nematodes were swept away, our world would still be dimly recognizable ... we should find its mountains, hills, vales, rivers, lakes, and oceans represented by a film of nematodes. The location of towns would be decipherable, since for every massing of human 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
 - Walking
 - Feeding
 - Swimming
- Division of labor
- Changes to one may not affect the others



Myriapods

- Millipedes
 - Two legs per segment
 - Detritovore
- Centipedes
 - One leg per segment
 - Carvinore



Chelicerates

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



Horseshoe crab

Arachnids



Scorpions



Spiders

Mites



Ticks

Four pair of walking legs

Pancrustaceans - crustaceans

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



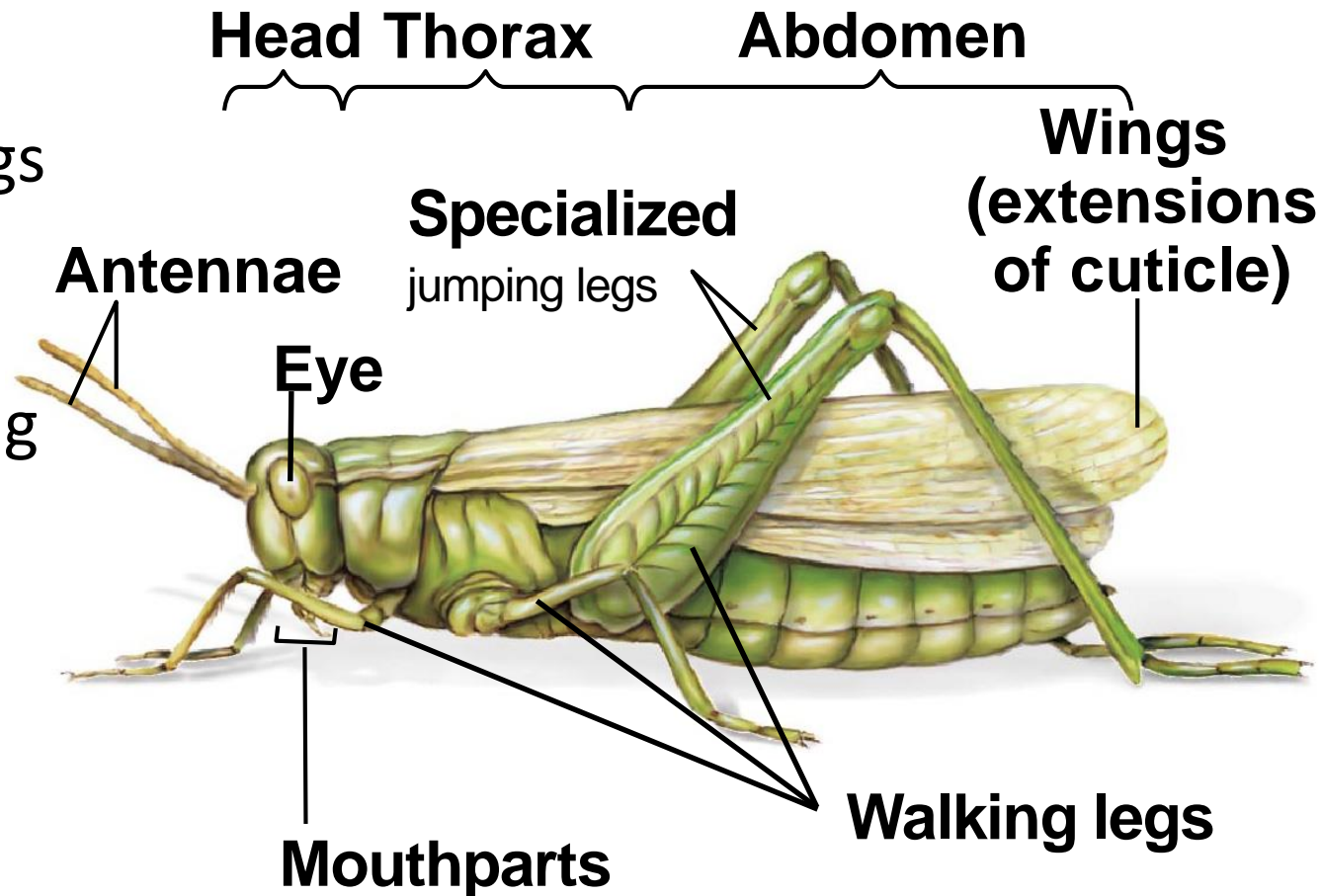
Goose barnacles
(about 2 cm high)

A ghost crab
(body about
2.5 cm across)



Pancrustaceans - Insects

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



Pancrustaceans - Insects

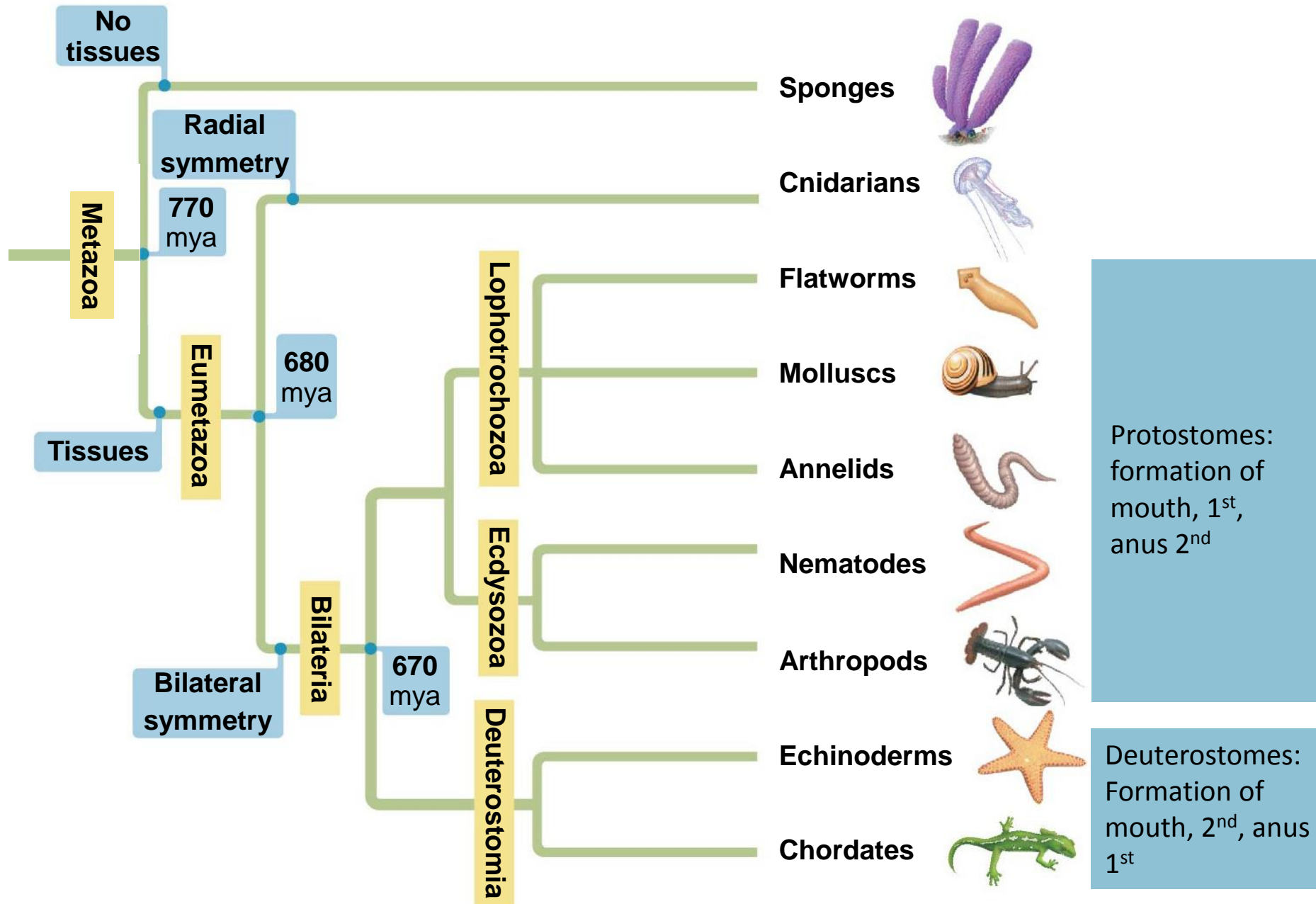
- Life cycle (metamorphosis)
 - Complete
 - Incomplete



adult

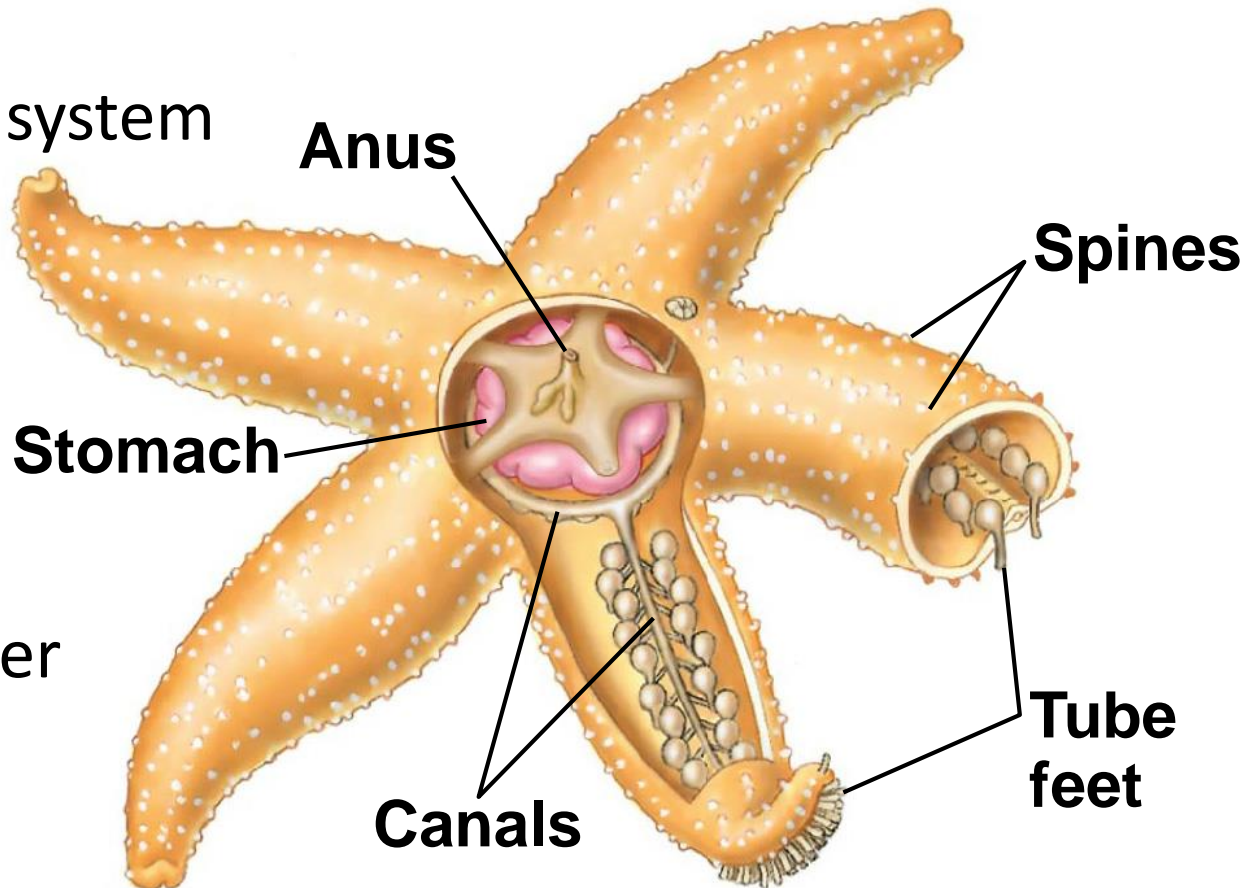


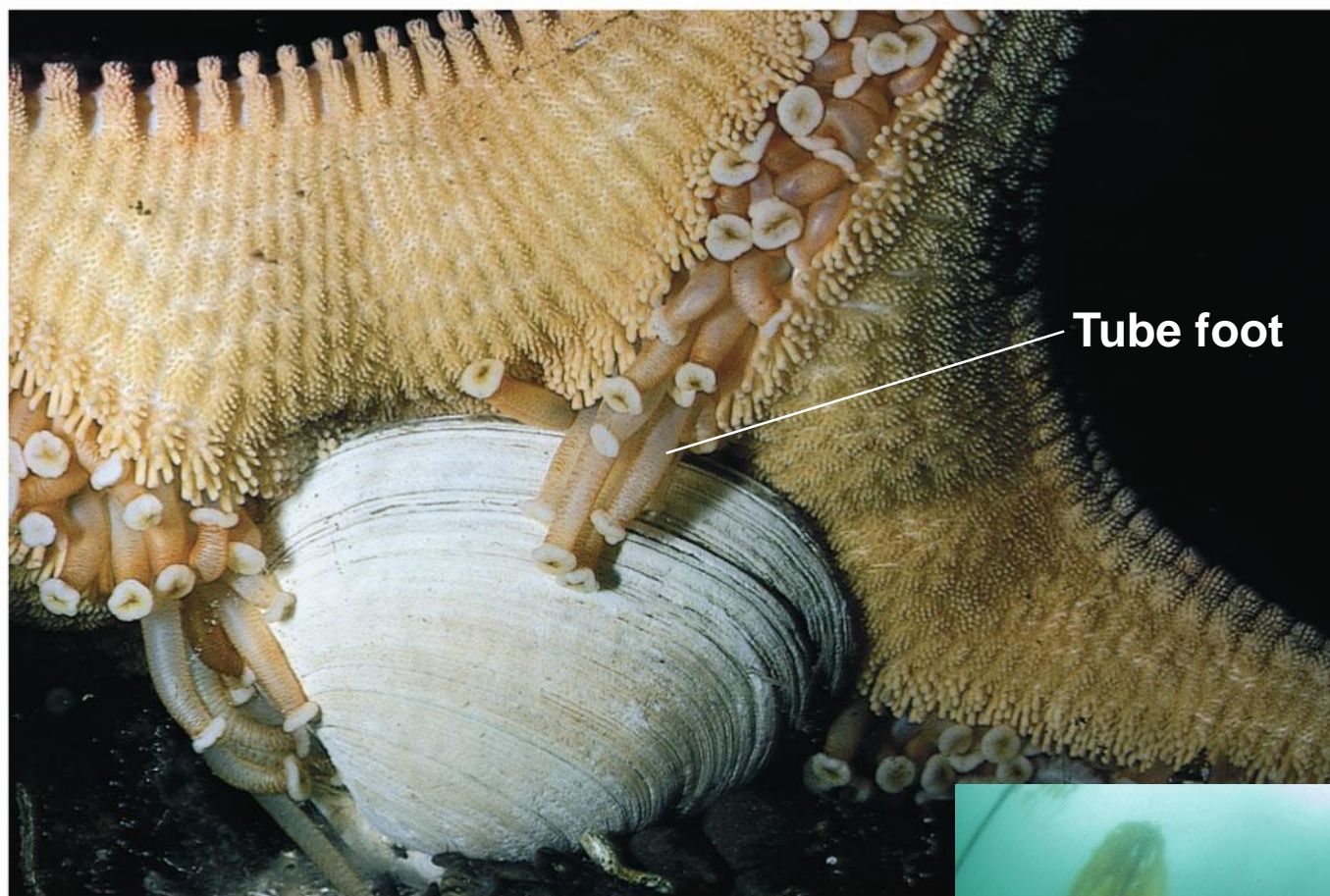
The animal phylogenetic tree



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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