

Ph. Cnidaria

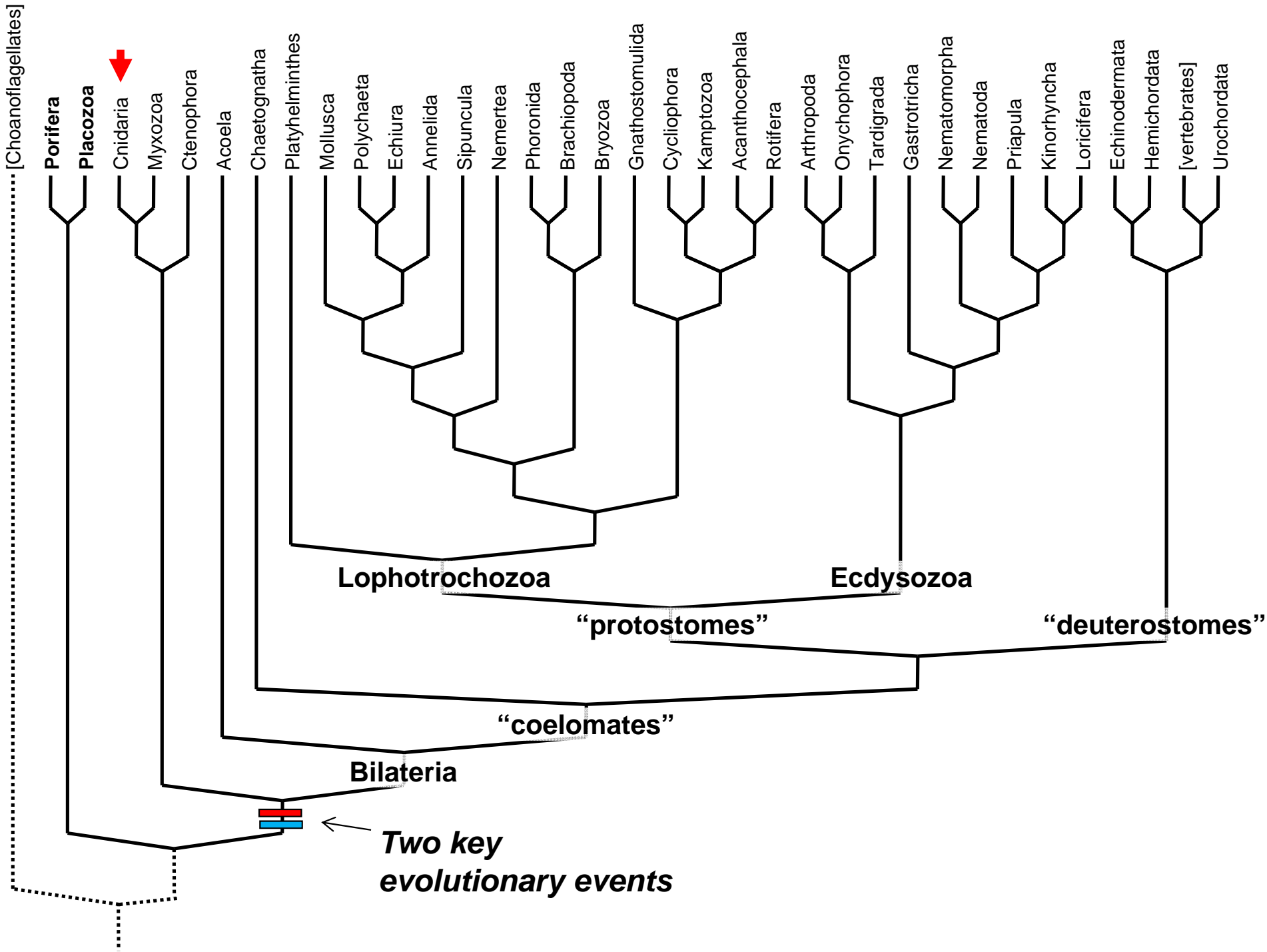
- Cl. Hydrozoa
- Cl. Anthozoa
- Cl. Scyphozoa
- Cl. Cubozoa



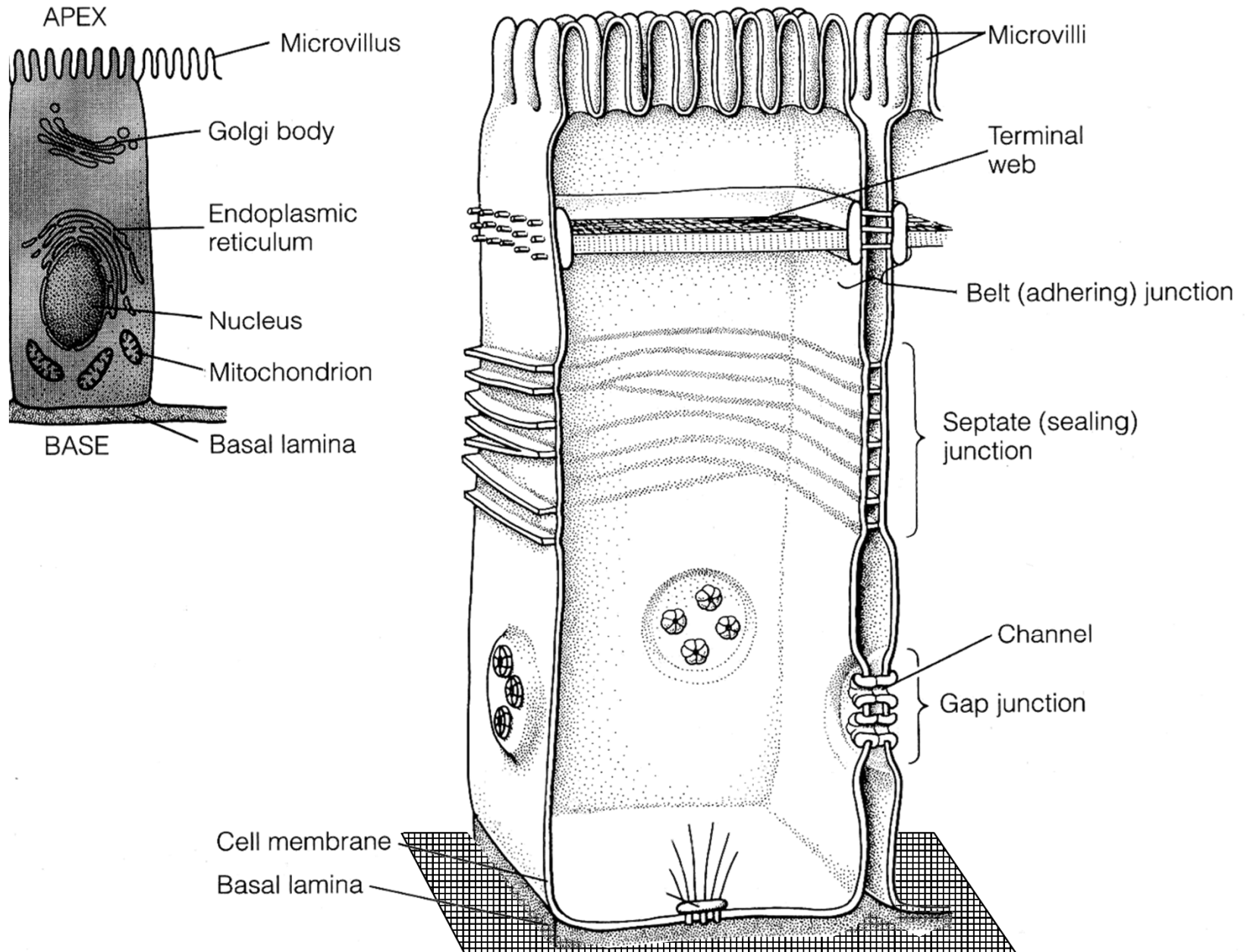
modular colonies



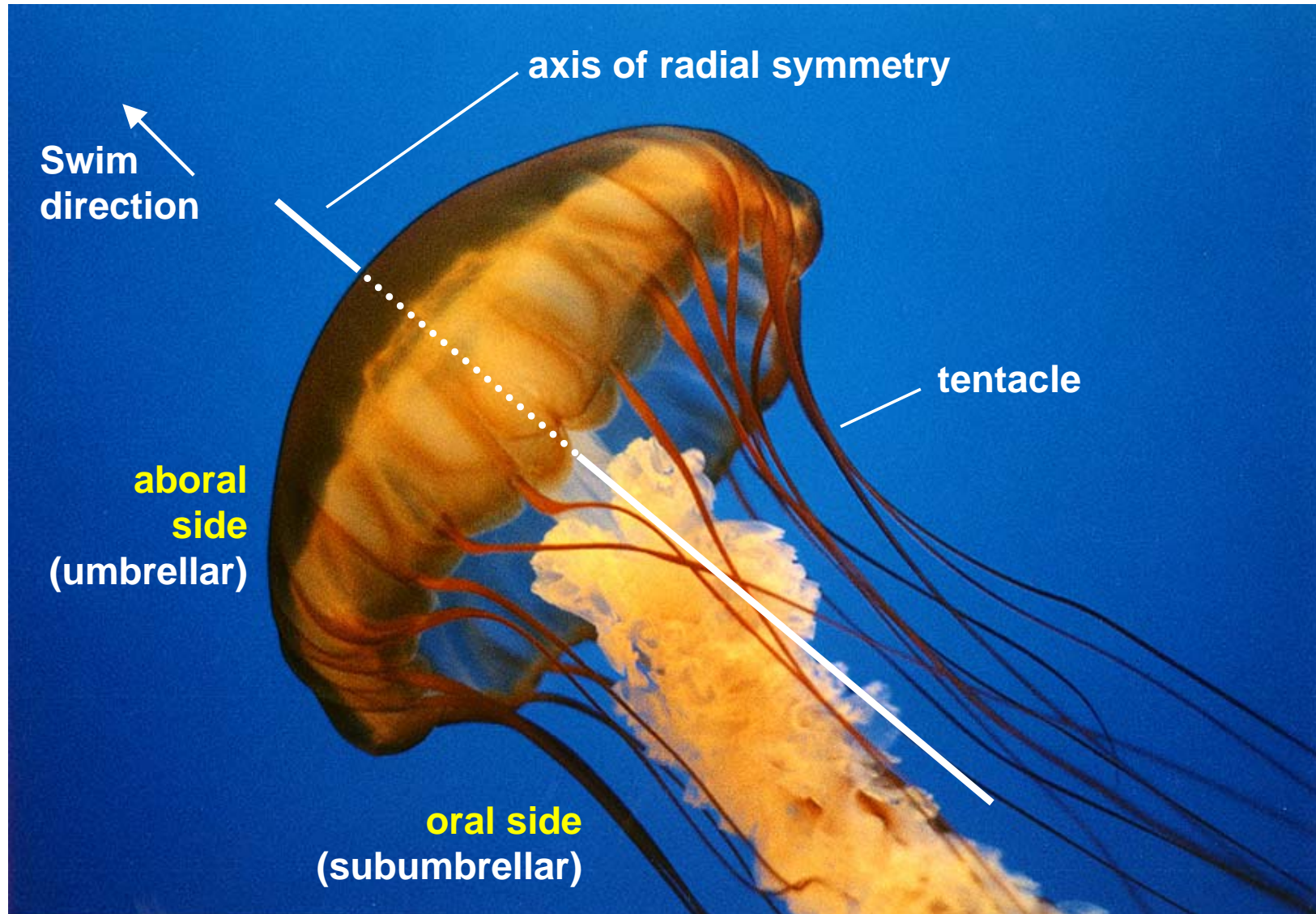
variation in a complicated life cycle



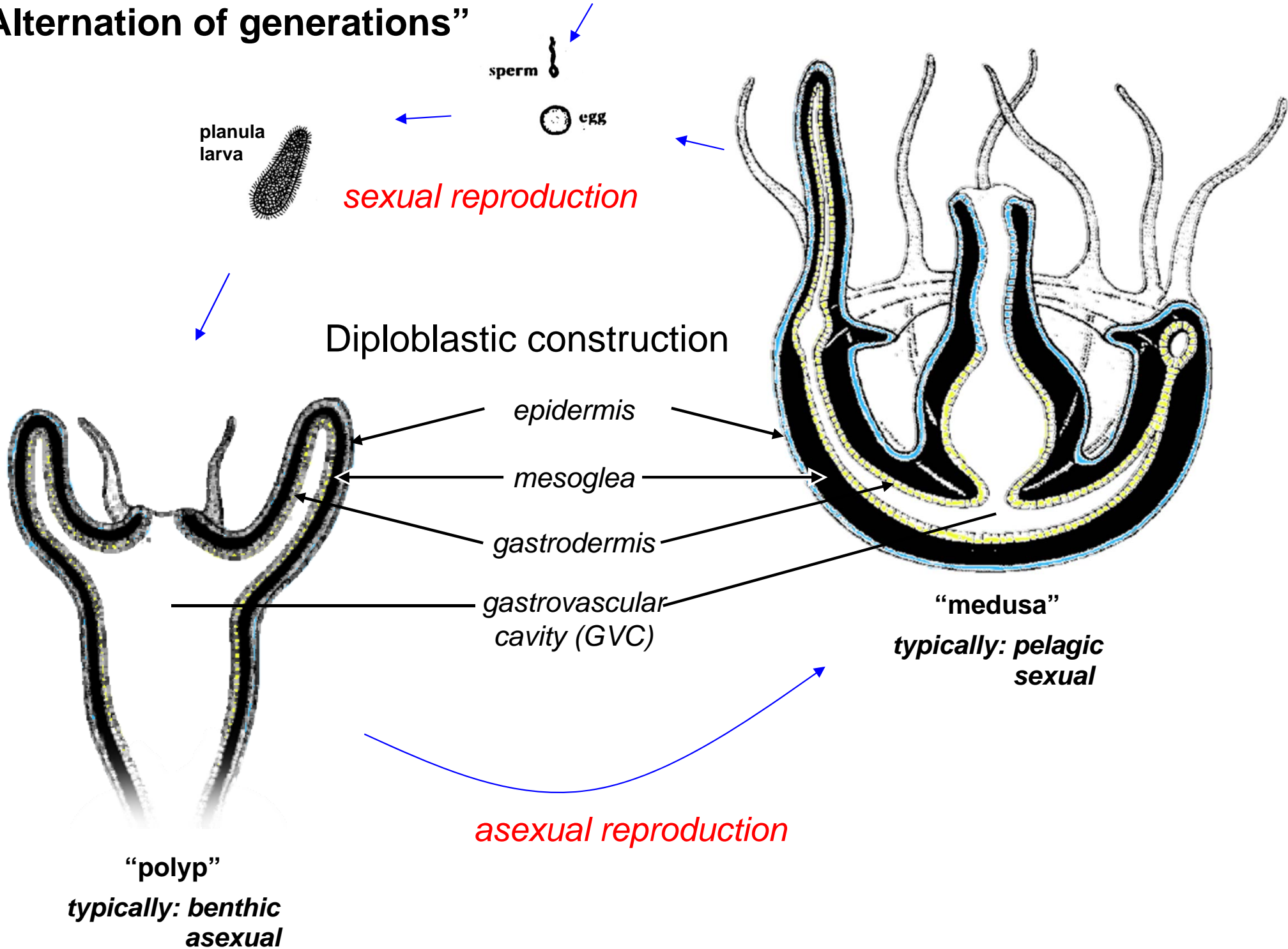
— Major event #1: evolution of epithelia



— Major event #2: evolution of a body axis



“Alternation of generations”



sexual reproduction

Diploblastic construction

epidermis

mesoglea

gastrodermis

gastrovascular cavity (GVC)

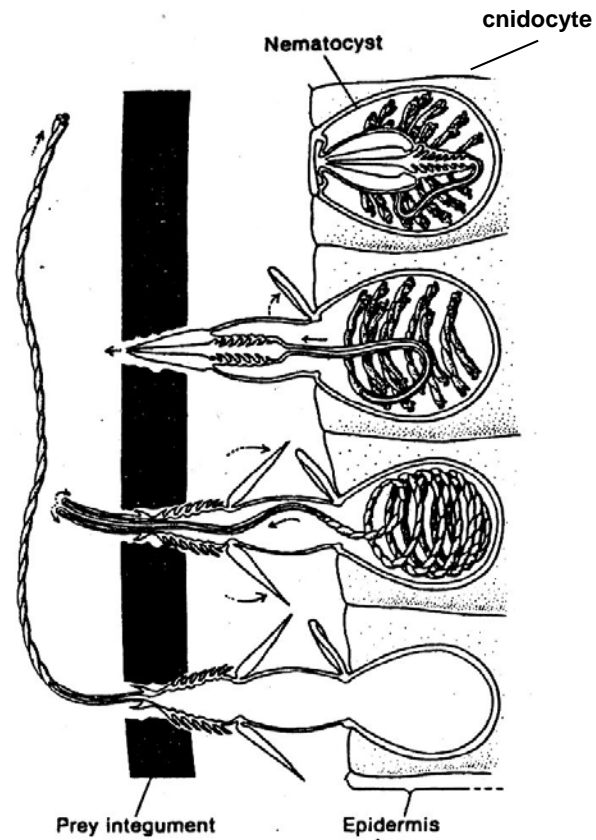
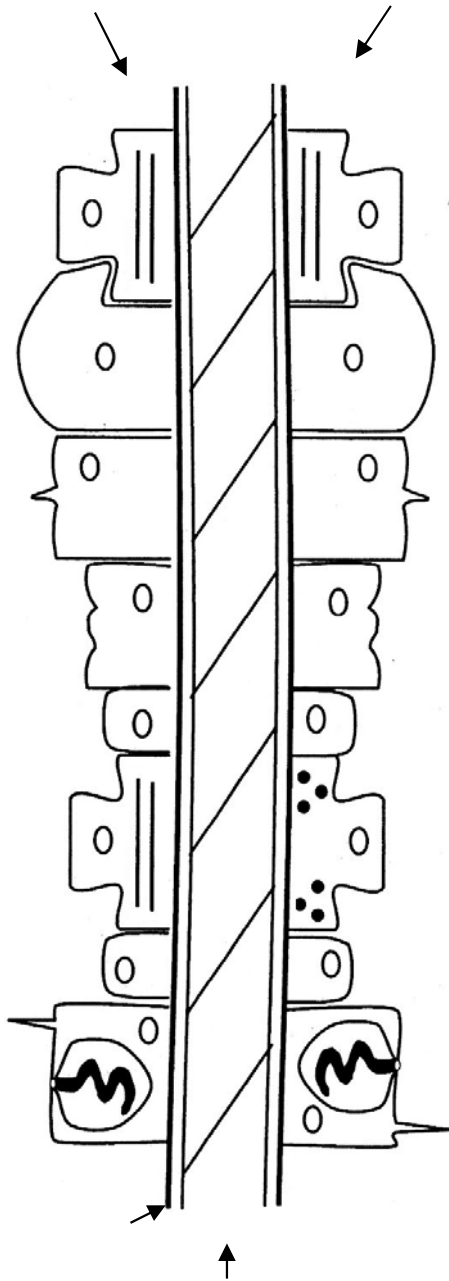
“medusa”

typically: pelagic sexual

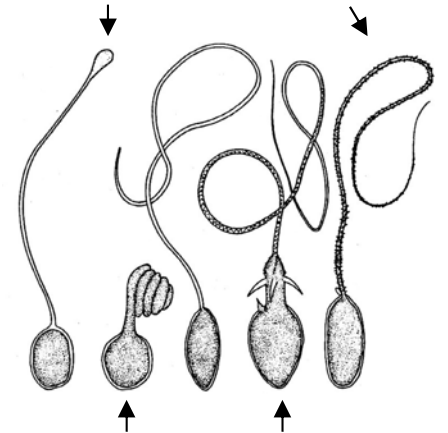
asexual reproduction

“polyp”

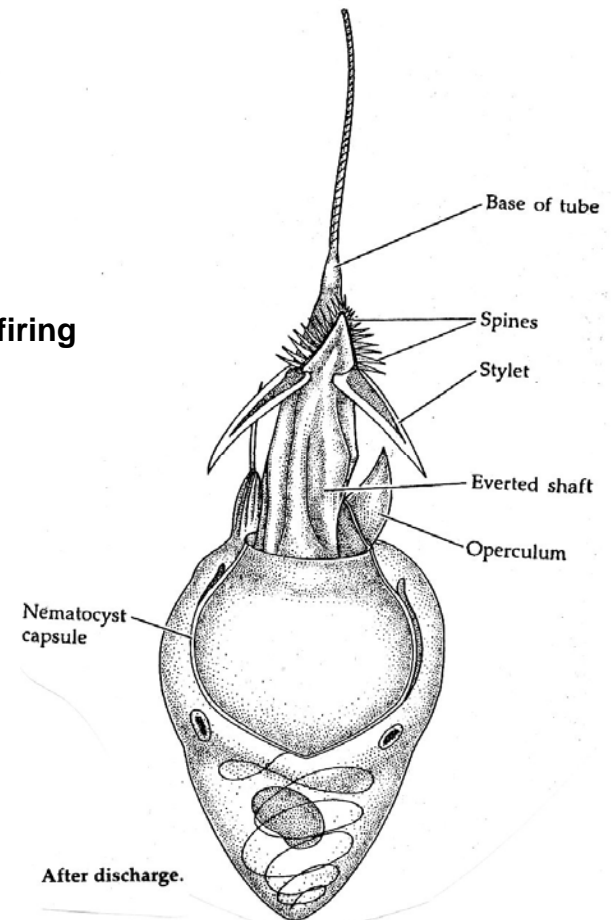
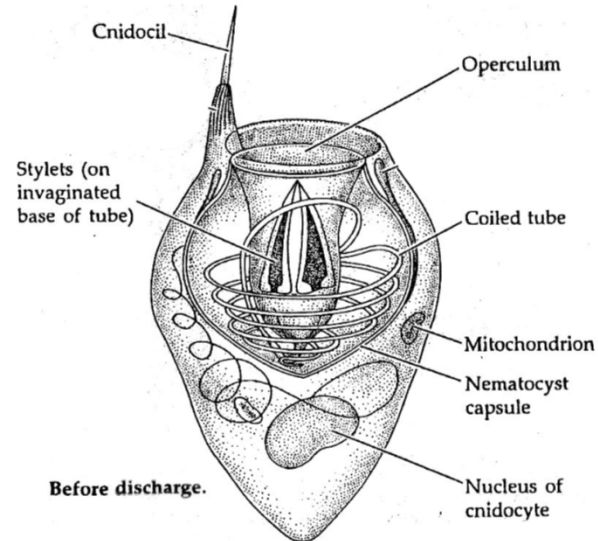
typically: benthic asexual



nematocyst types



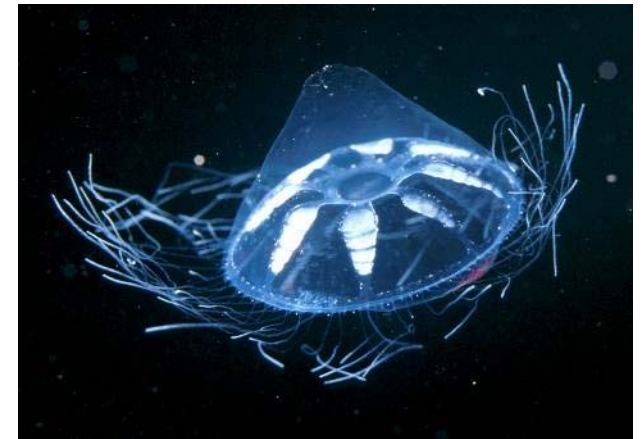
nematocyst firing



Ph. Cnidaria

Cl. Hydrozoa

- colonial hydroids
 - smaller jellyfish
- siphonophores



Cl. Anthozoa

- sea anemones
corals
sea pens



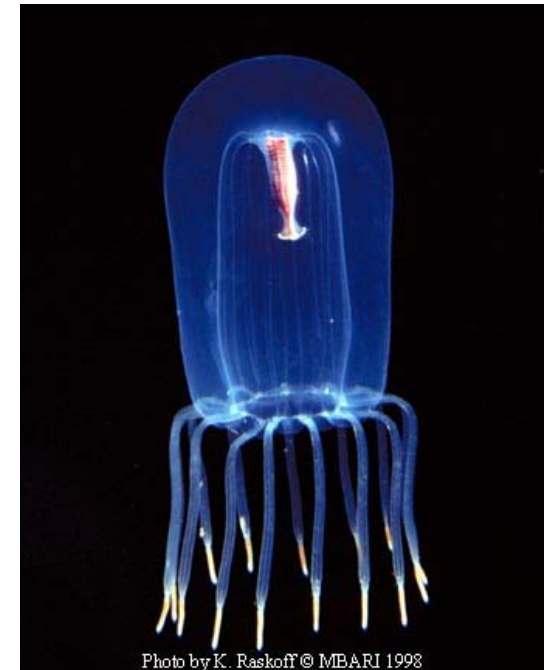
Cl. Scyphozoa

- large jellyfish
stauromedusae

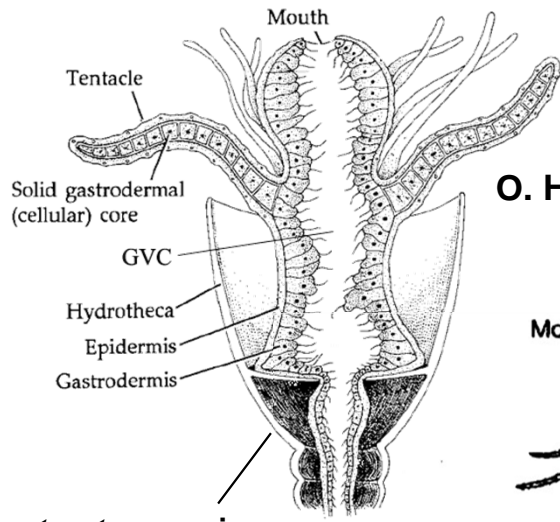


Cl. Cubozoa

- sea wasps



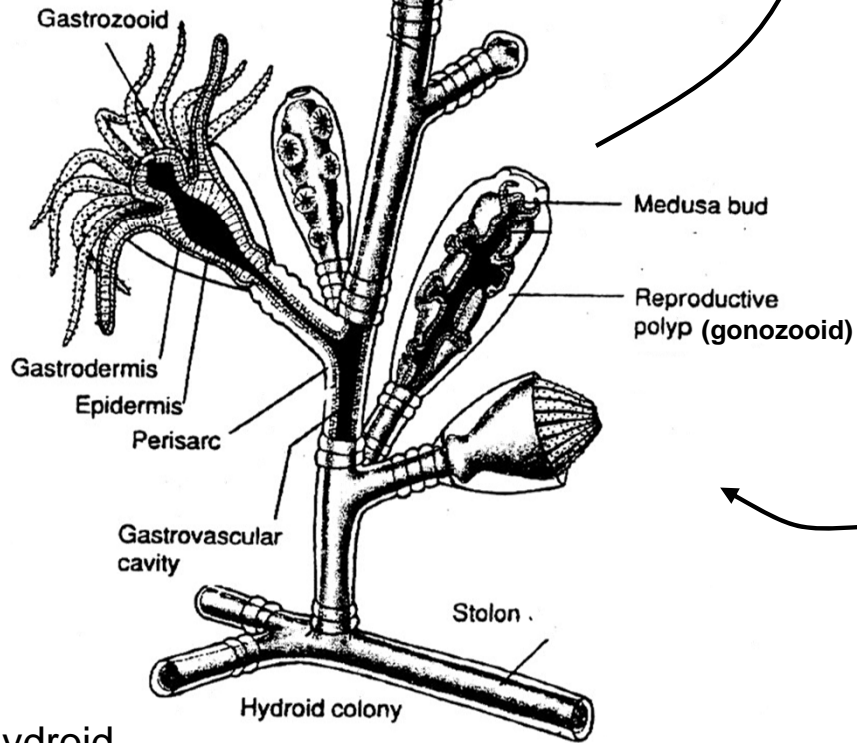
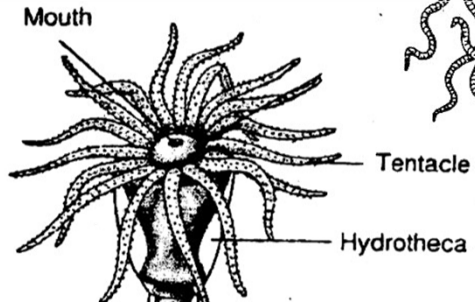
Cl. Hydrozoa: anatomy and "typical" life cycle



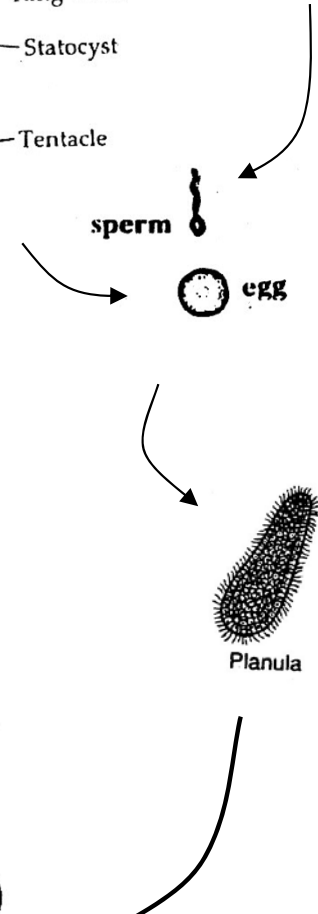
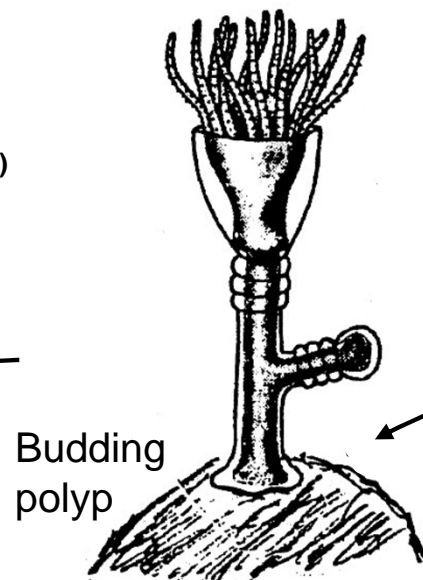
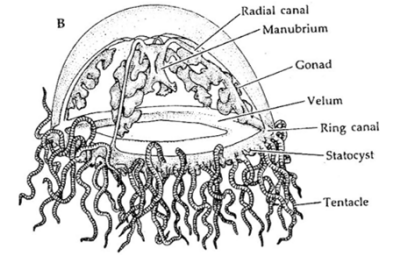
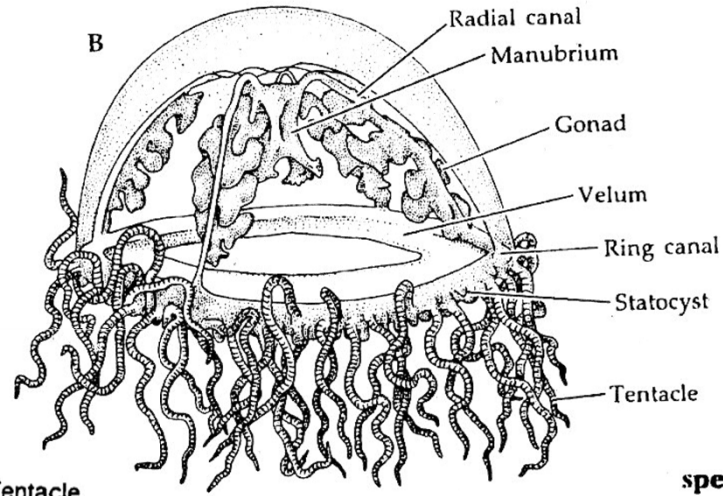
structure: perisarc

material: chitin

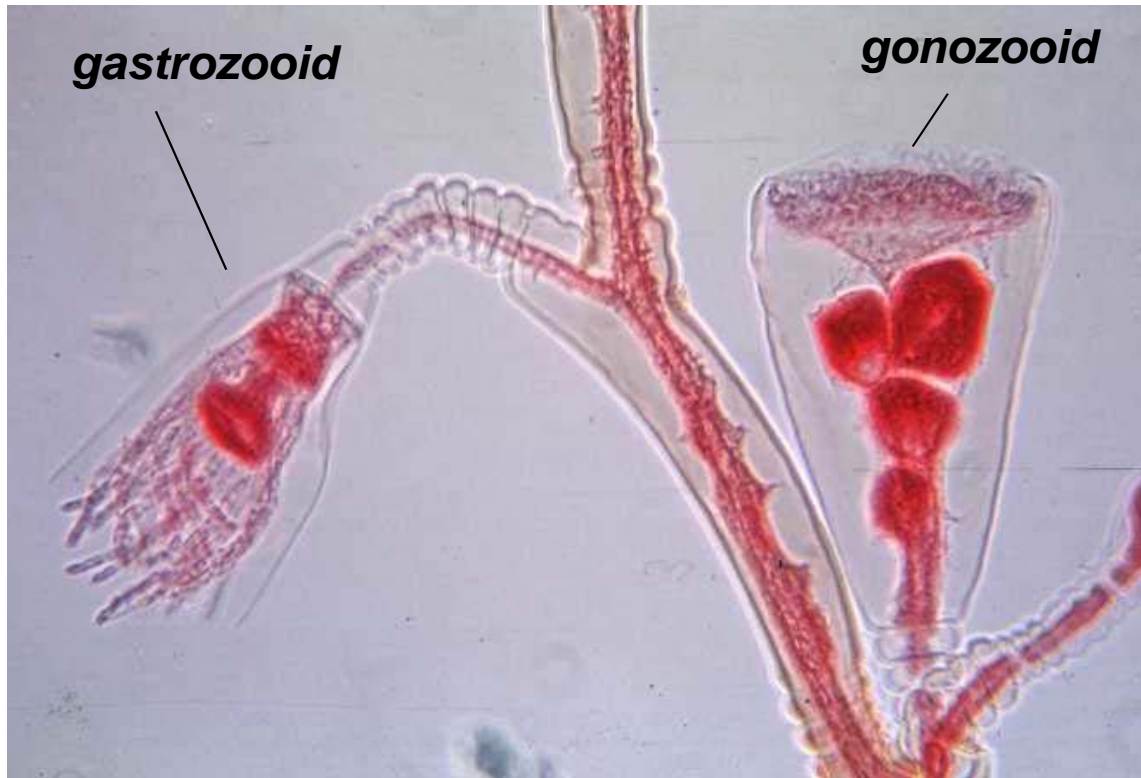
O. Hydroida



Obelia,
"thecate" hydroid



Polymorphism and zooid specialization in hydroid colonies



polymorphic (*Gonothyrea* sp.)
separate gastrozoid and gonozoid



monomorphic (*Tubularia larynx*)
medusoids on single zooid type

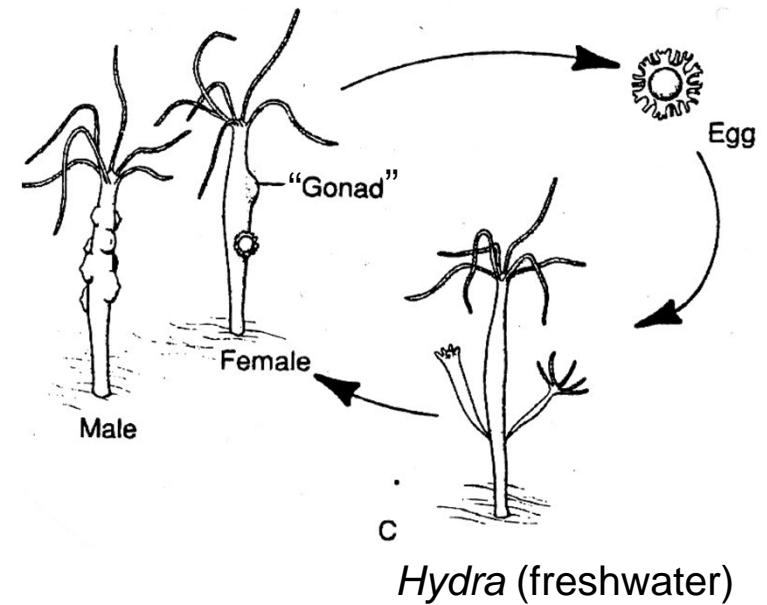
Cl. Hydrozoa: some life cycle alternatives

Are medusa and polyp...

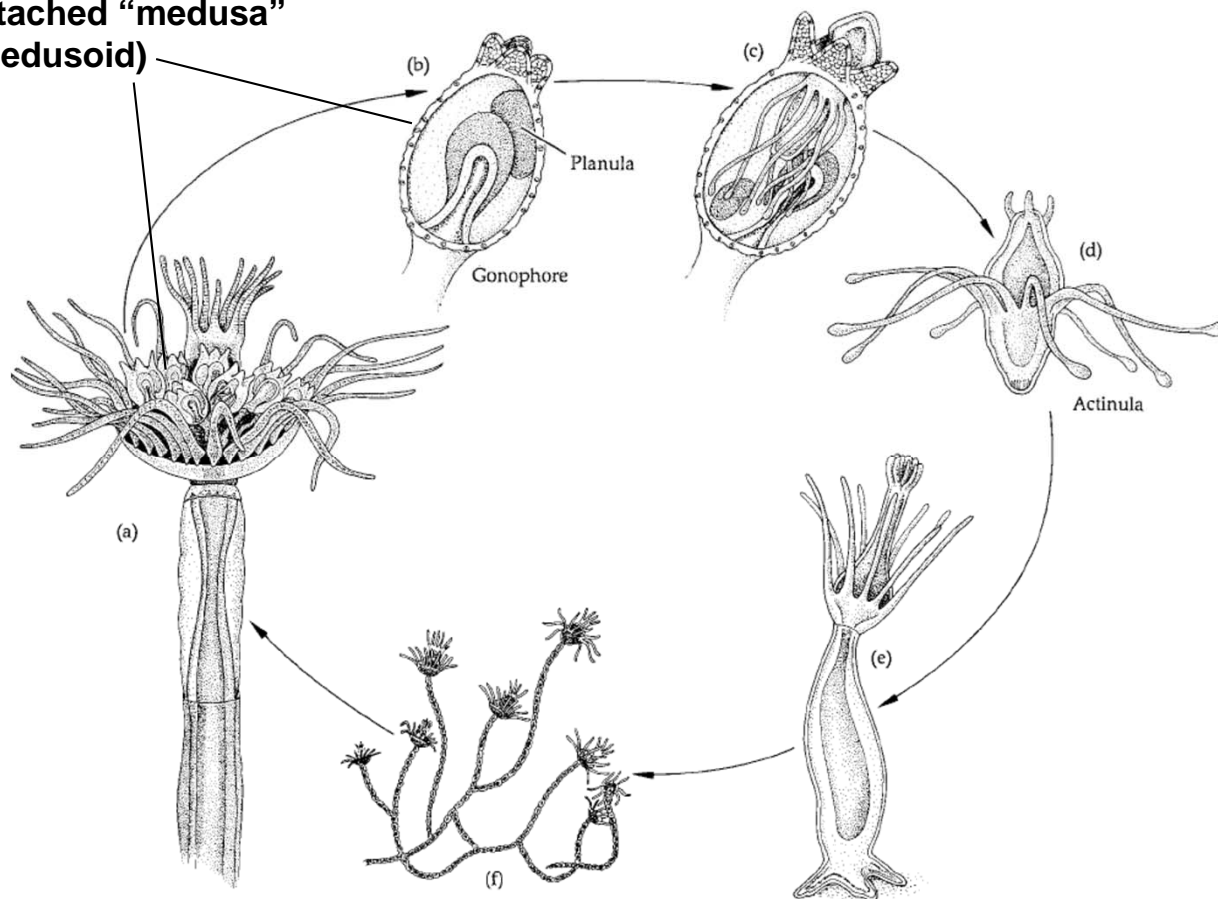
- present or absent?
- sexual or asexual?
- pelagic or benthic?

Is the species...

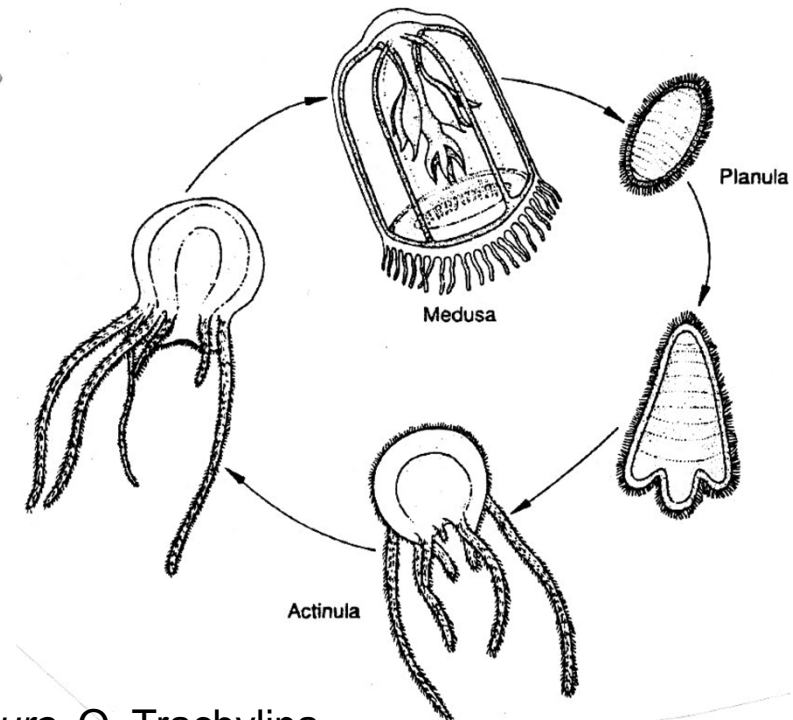
- if polyp, solitary or colonial?
- if colonial, polymorphic or monomorphic?



Attached "medusa"
(medusoid)



Tubularia,
"athecate" hydroid



Aglaura, O. *Trachylina*

Ph. Cnidaria

Cl. Hydrozoa

- colonial hydroids
- smaller jellyfish
- siphonophores

Cl. Anthozoa

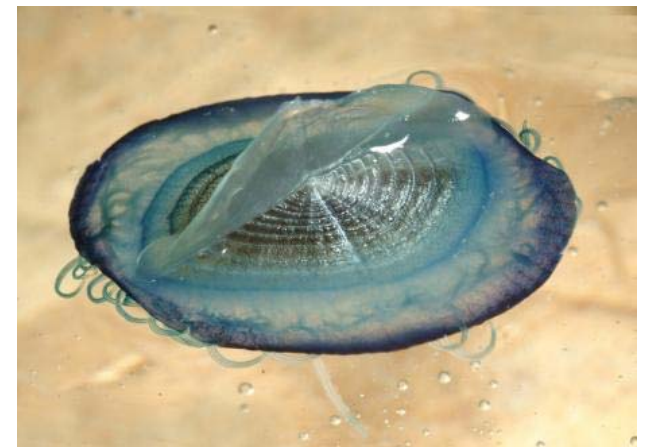
- sea anemones
- corals
- sea pens

Cl. Scyphozoa

- large jellyfish
- stauromedusae

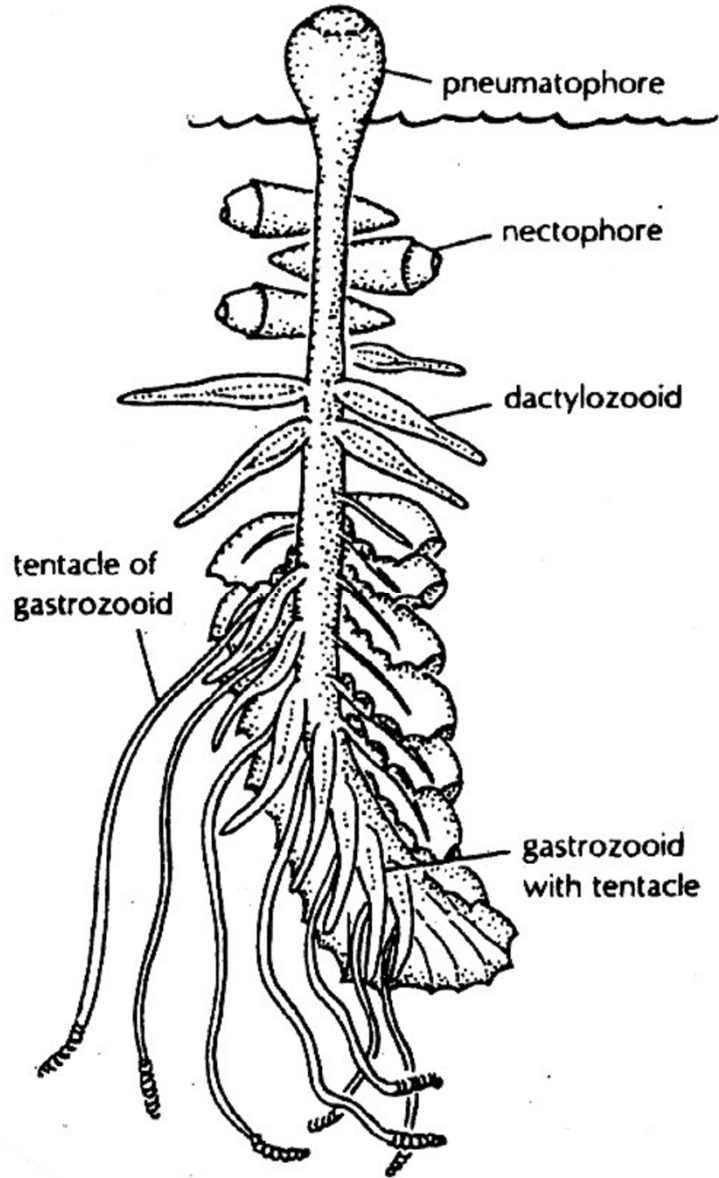
Cl. Cubozoa

- sea wasps

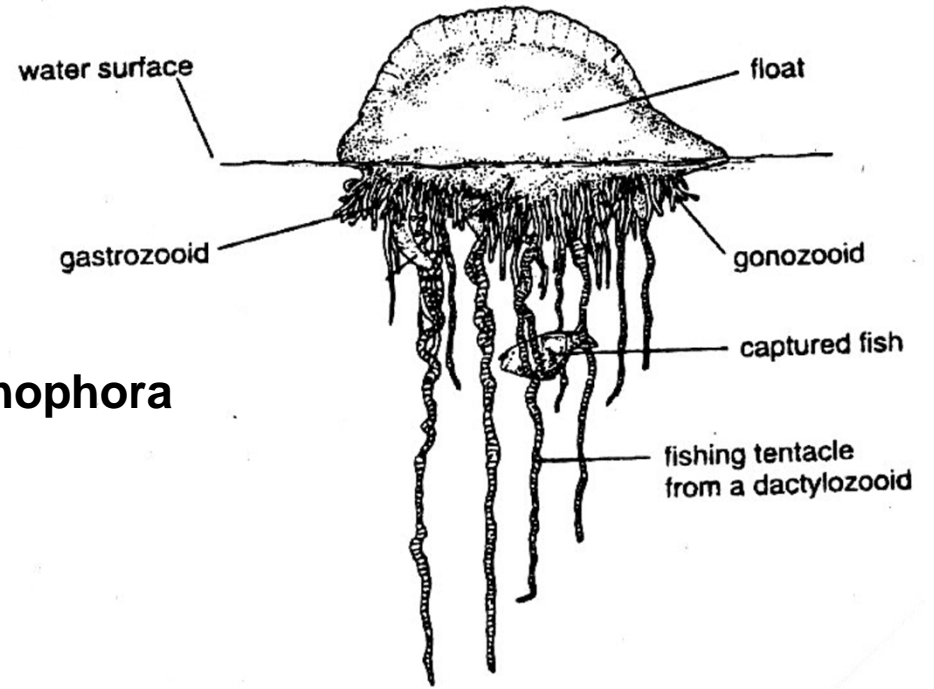


- chondrophores

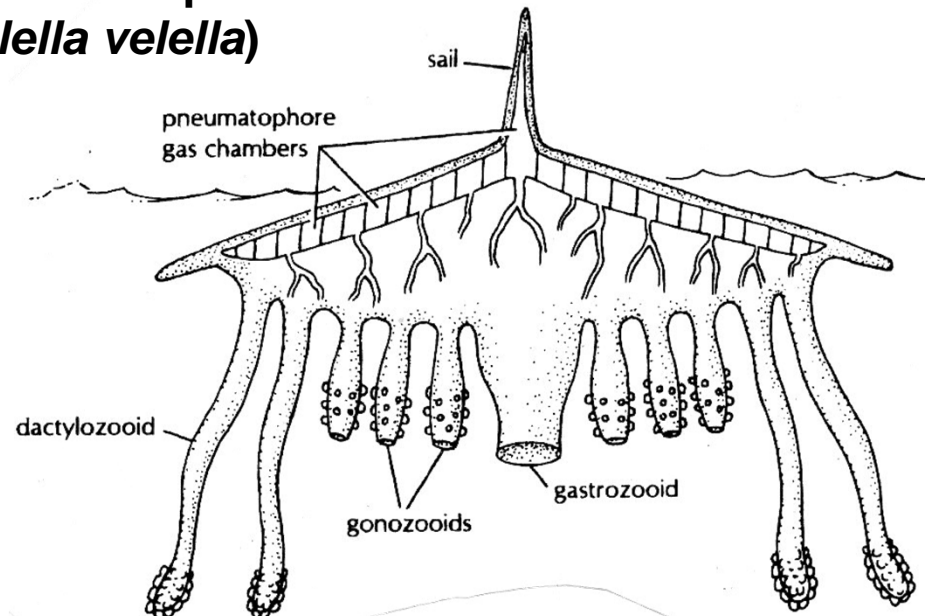
Cl. Hydrozoa: polymorphic pelagic colonies



O. Siphonophora



O. Chondrophora (*Velella velella*)



Ph. Cnidaria

Cl. Hydrozoa

colonial hydroids
smaller jellyfish
siphonophores

Cl. Anthozoa

- sea anemones

scleractinian corals
sea pens

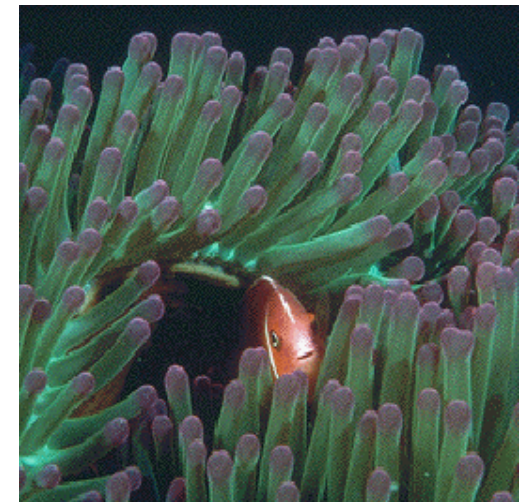
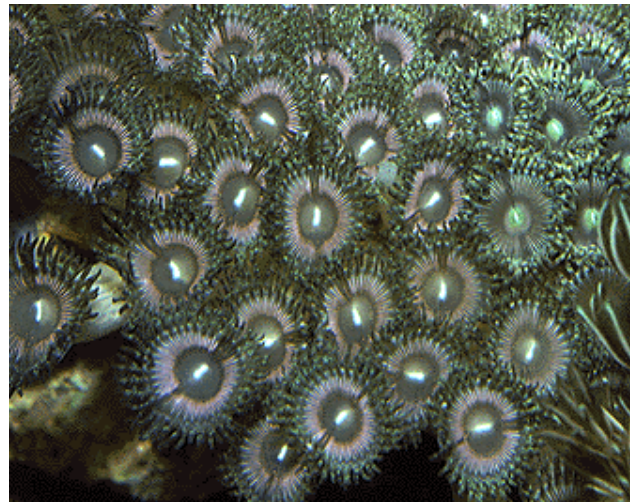
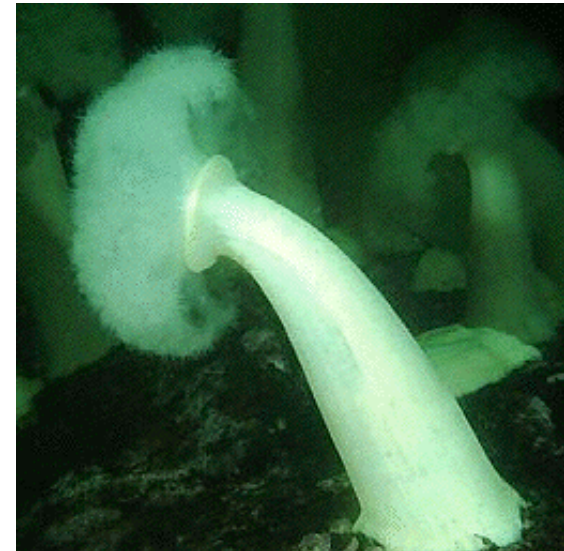
Cl. Scyphozoa

large jellyfish
stauromedusae

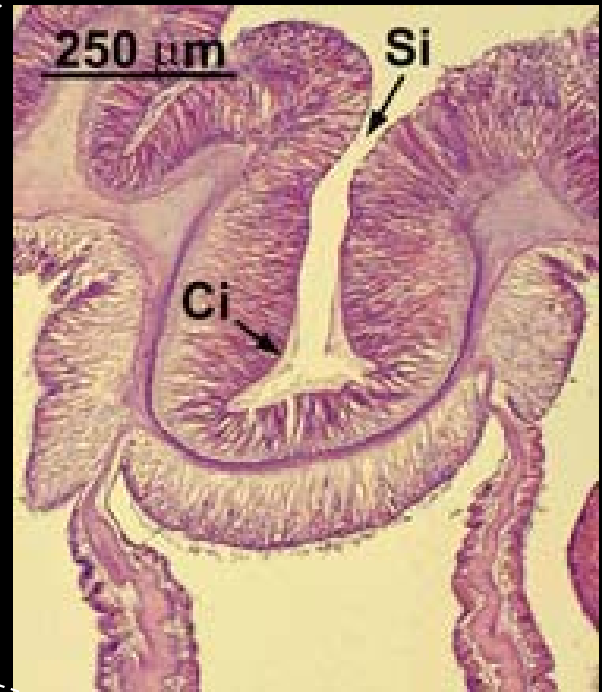
Cl. Cubozoa

sea wasps

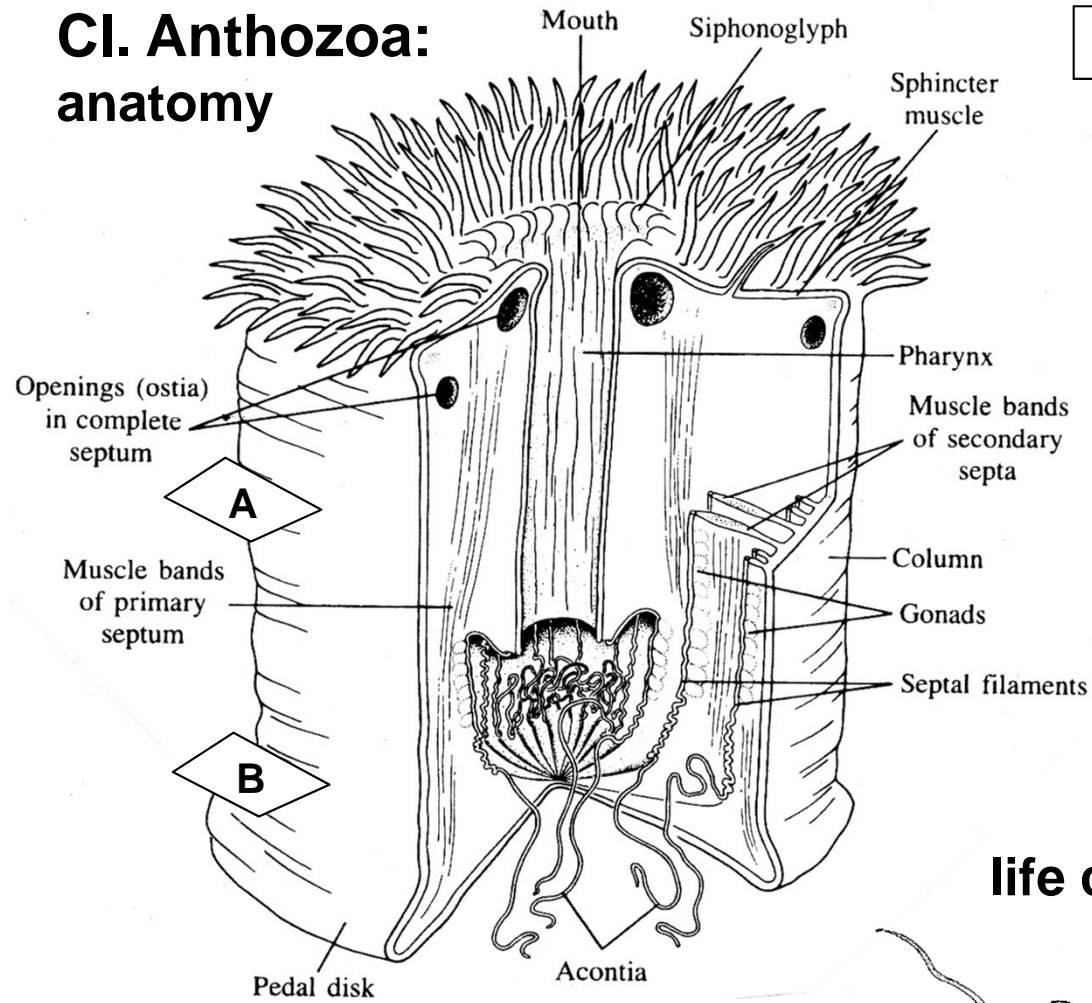
Subcl. Hexacorallia (= Subcl. Zoantharia)



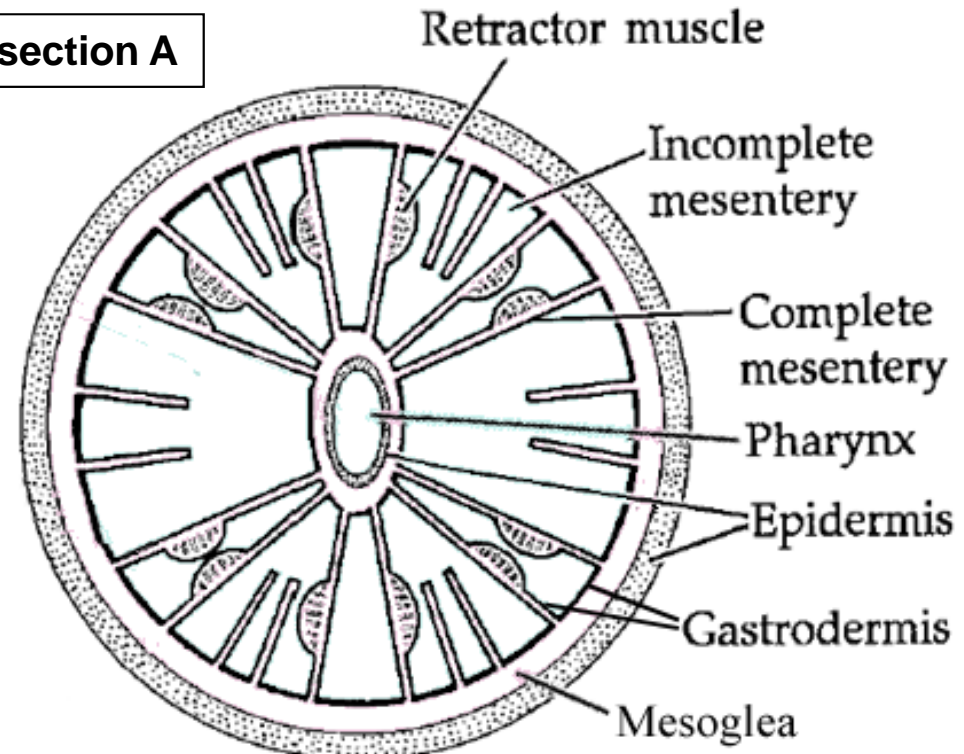
siphonoglyphs



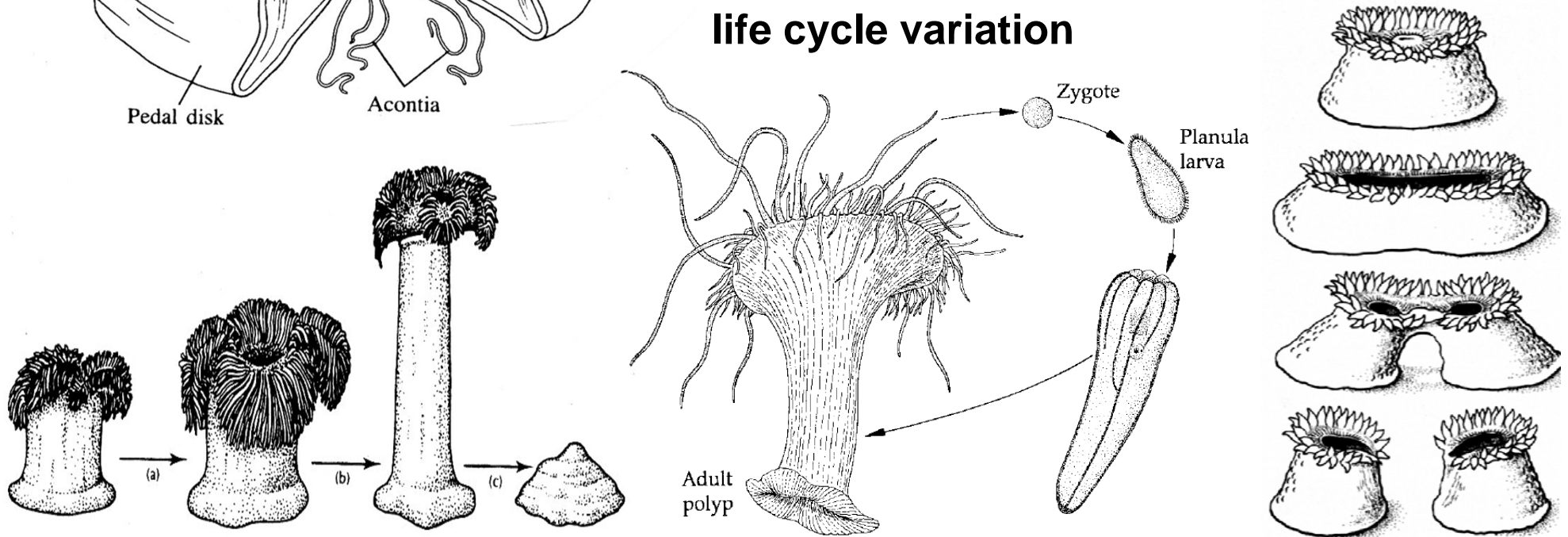
Cl. Anthozoa: anatomy



x-section A



life cycle variation



Ph. Cnidaria

Subcl. Hexacorallia (= Zoantharia)

Cl. Hydrozoa

colonial hydroids
smaller jellyfish
siphonophores

Cl. Anthozoa

sea anemones

- scleractinian corals

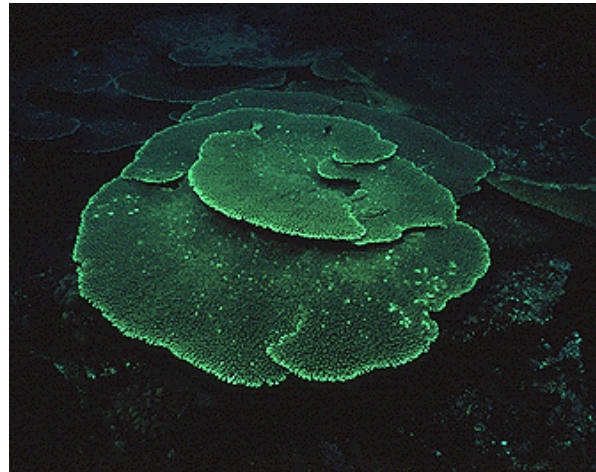
soft corals, sea pens, etc.

Cl. Scyphozoa

large jellyfish
stauromedusae

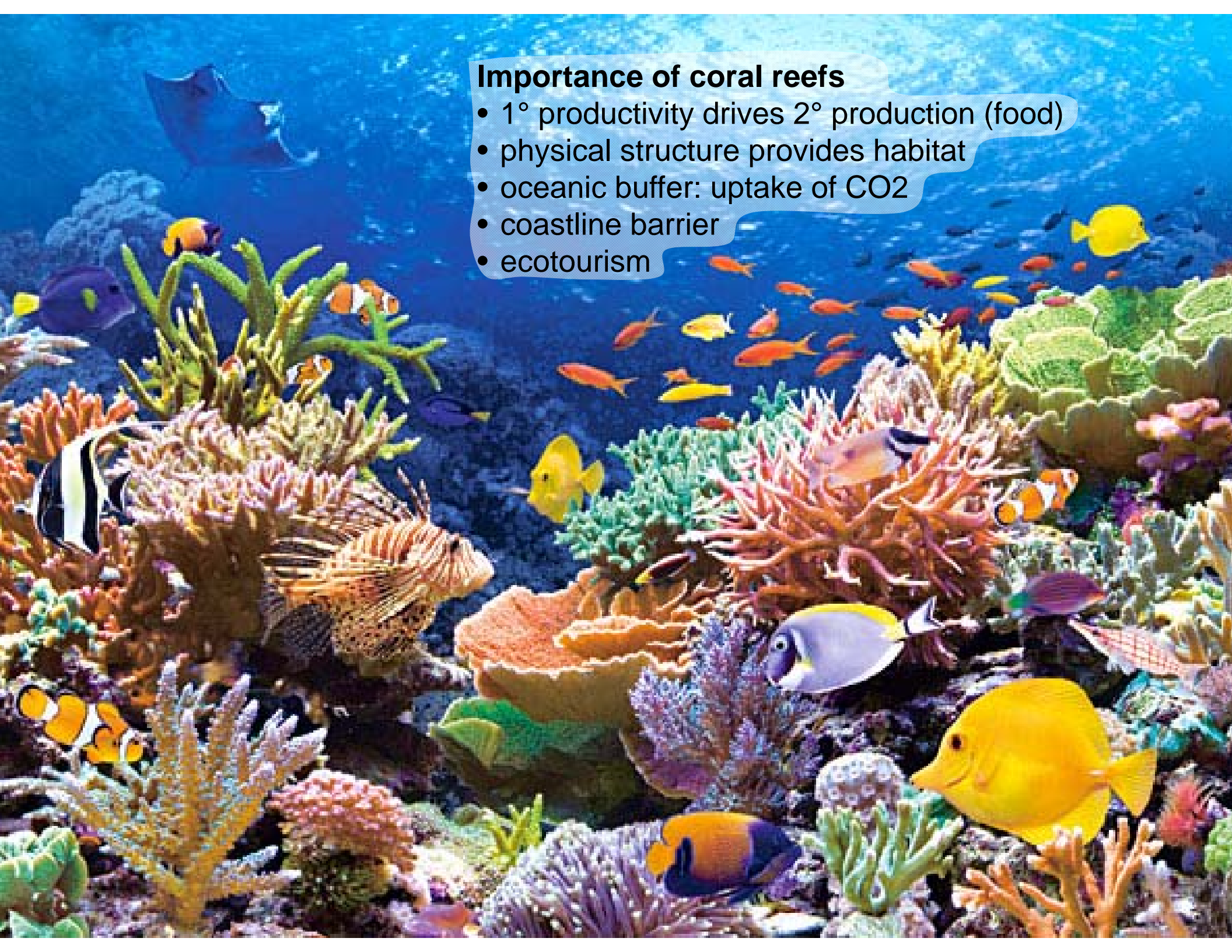
Cl. Cubozoa

sea wasps



Importance of coral reefs

- 1° productivity drives 2° production (food)
- physical structure provides habitat
- oceanic buffer: uptake of CO₂
- coastline barrier
- ecotourism



Q: Why are tropical coral reef waters so clear?



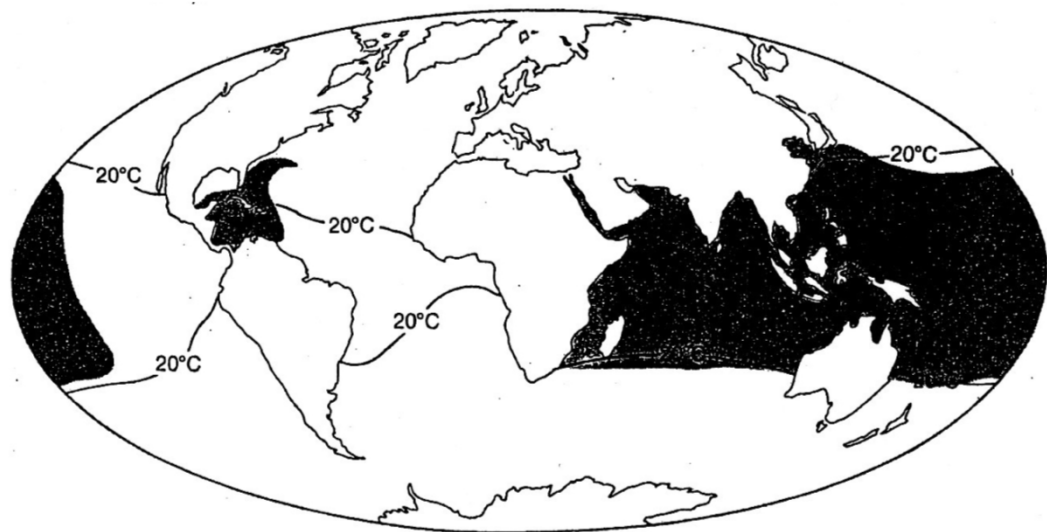
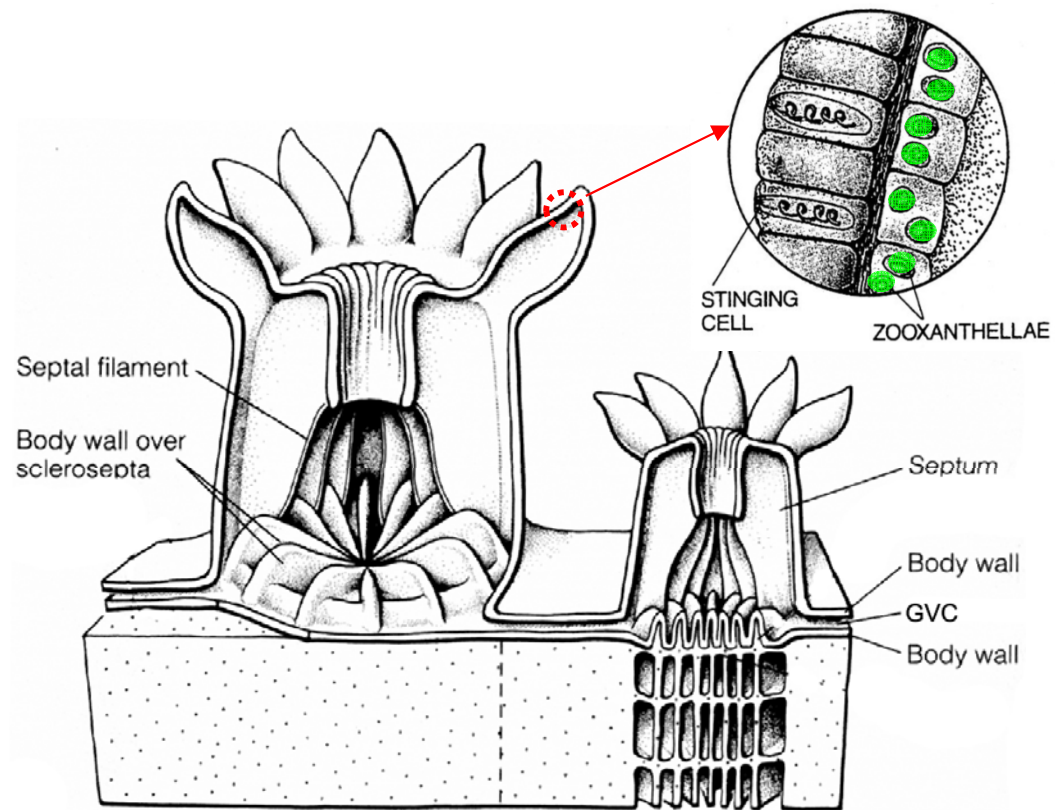
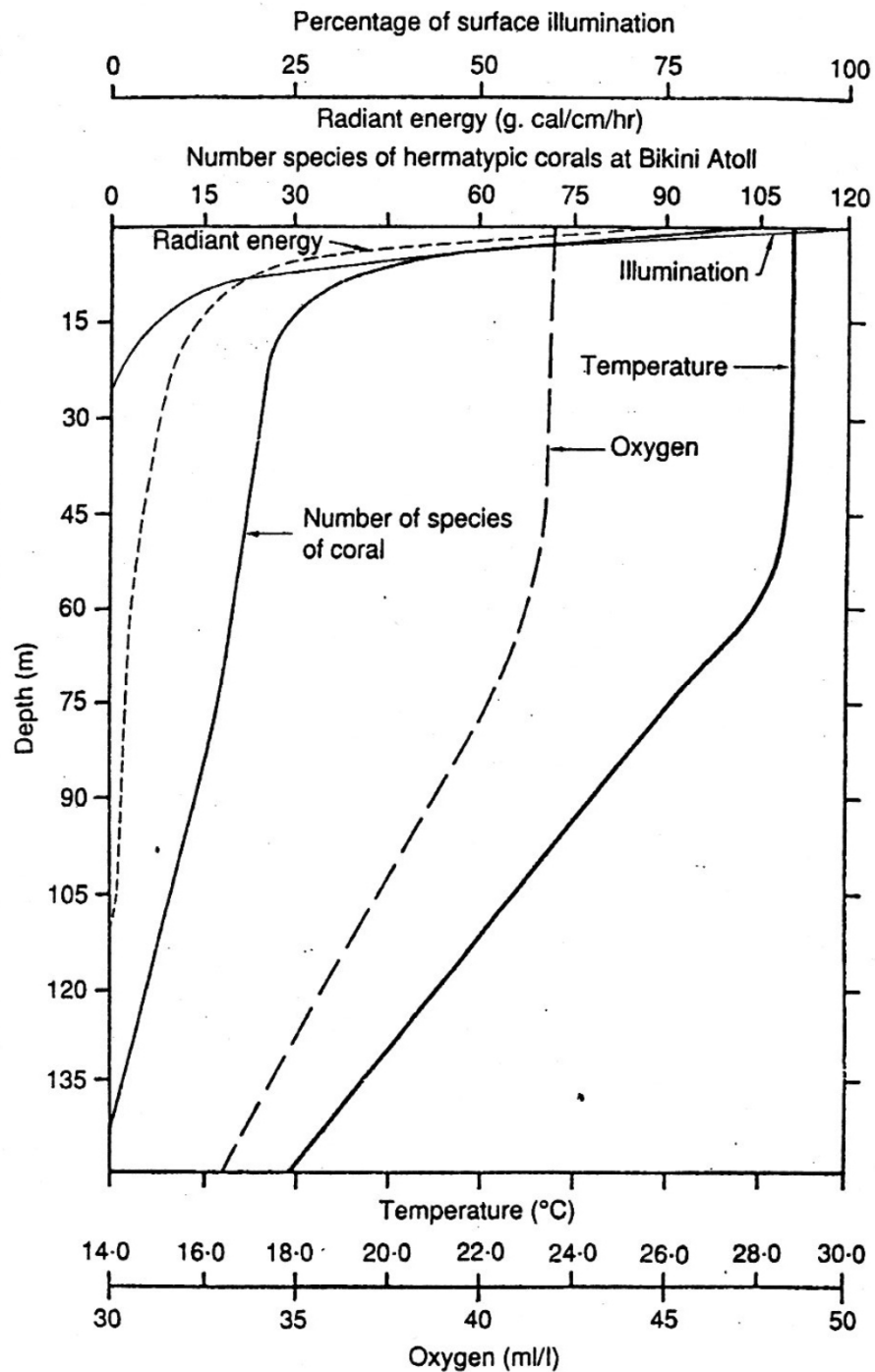


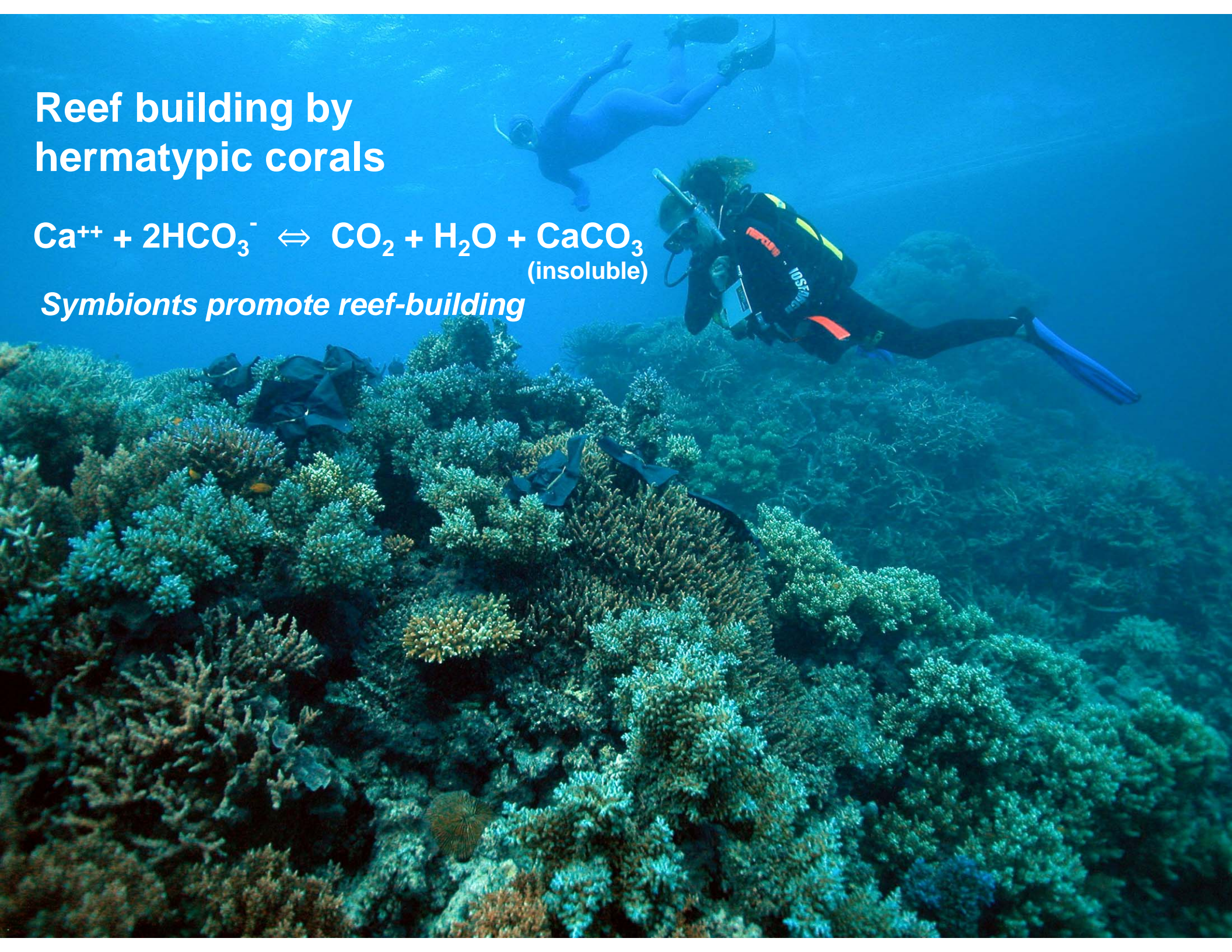
FIGURE 4-59 Distribution of coral reefs today (heavy shading).



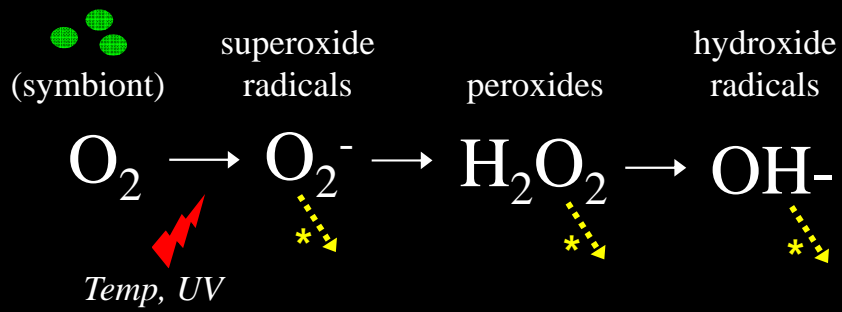
Reef building by hermatypic corals



Symbionts promote reef-building



Coral bleaching



* anti-oxidants



Ph. Cnidaria

Cl. Hydrozoa

colonial hydroids
smaller jellyfish
siphonophores

Cl. Anthozoa

sea anemones
corals

- sea pens, gorgonians etc.

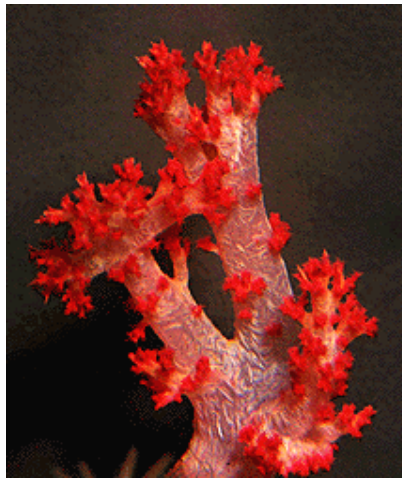
Cl. Scyphozoa

large jellyfish
stauromedusae

Cl. Cubozoa

sea wasps

Subcl. Octacorallia (= Alcyonaria)



soft corals



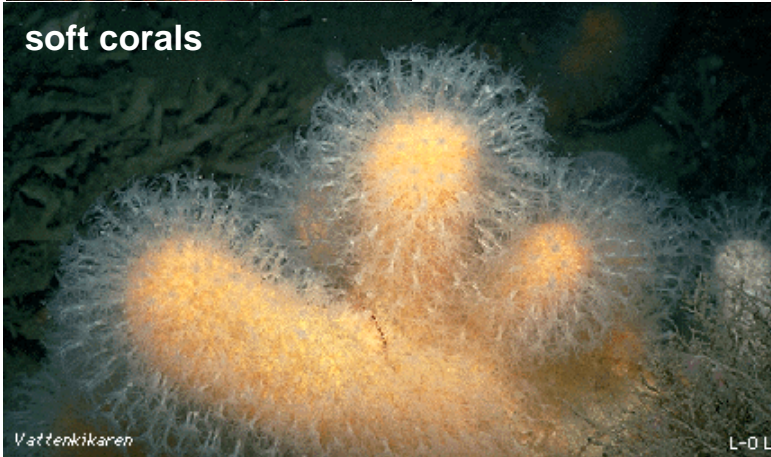
sea pen



sea whip



sea fan



Vattenkikaren

L-O-L

Ph. Cnidaria

Cl. Hydrozoa

colonial hydroids
smaller jellyfish
siphonophores



Cl. Anthozoa

sea anemones
corals
sea pens

Cl. Scyphozoa

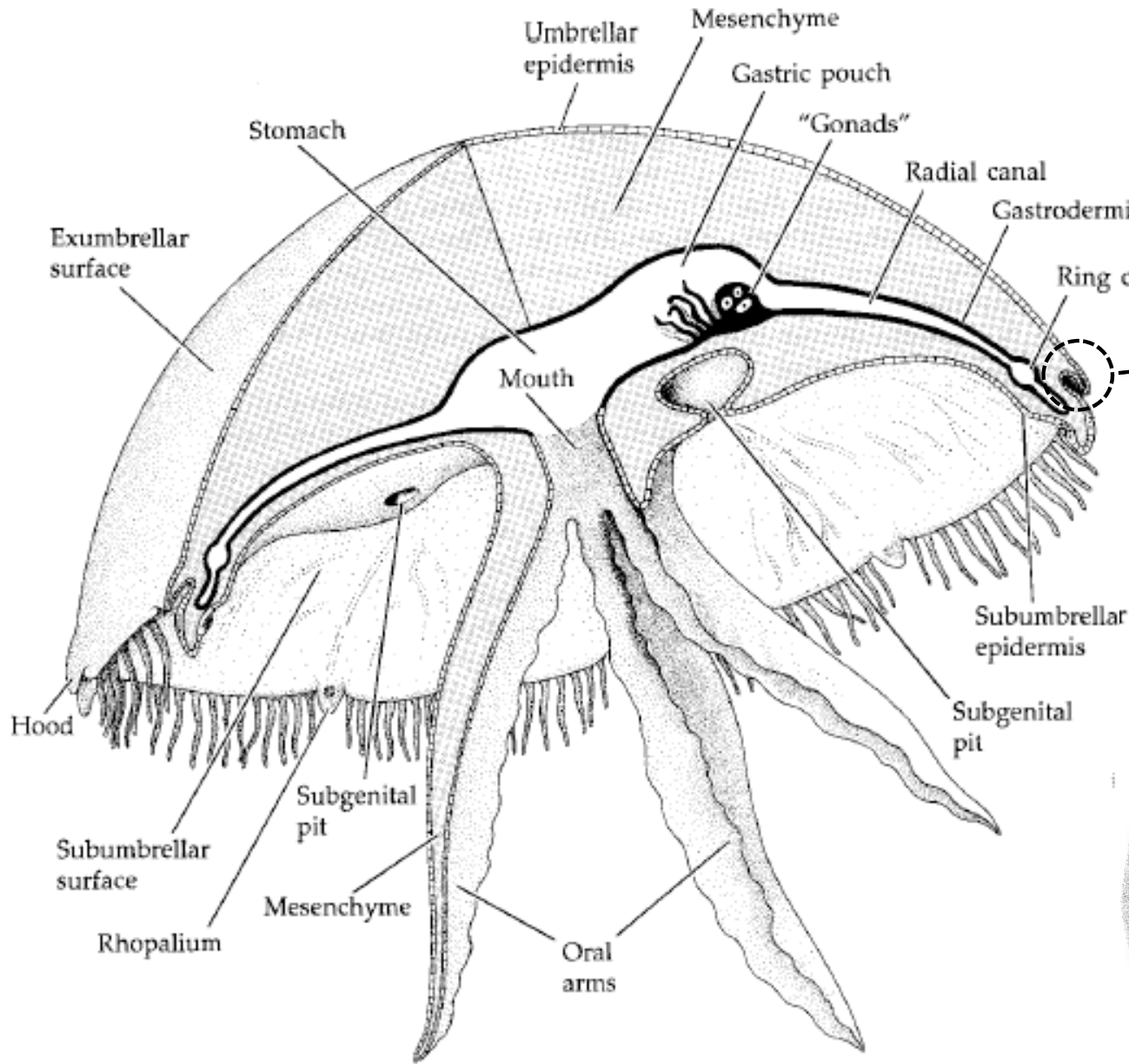
• large jellyfish
stauromedusae



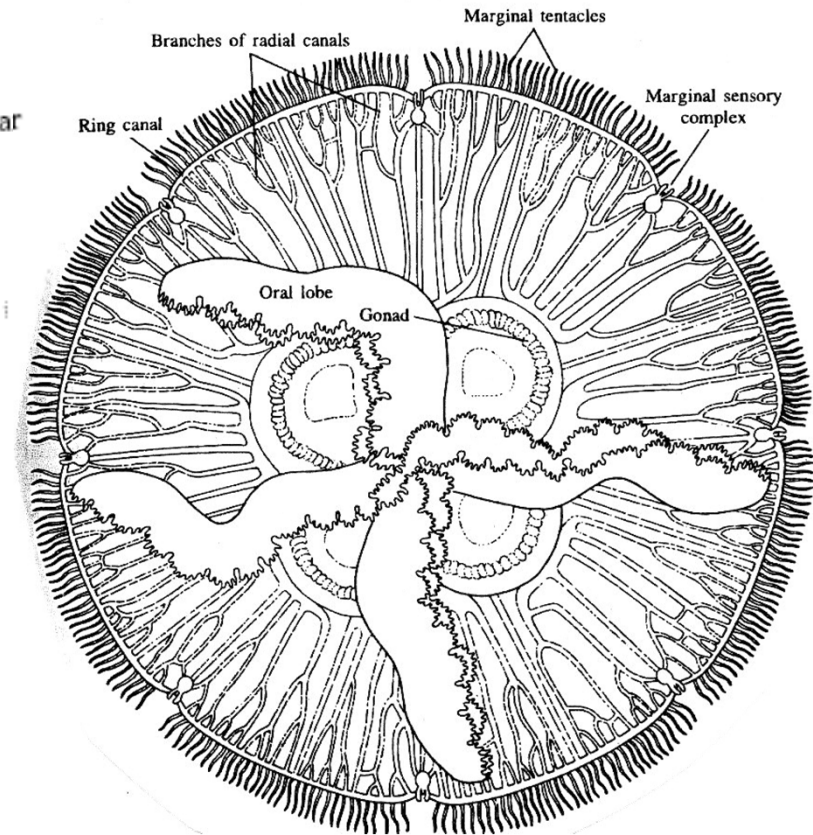
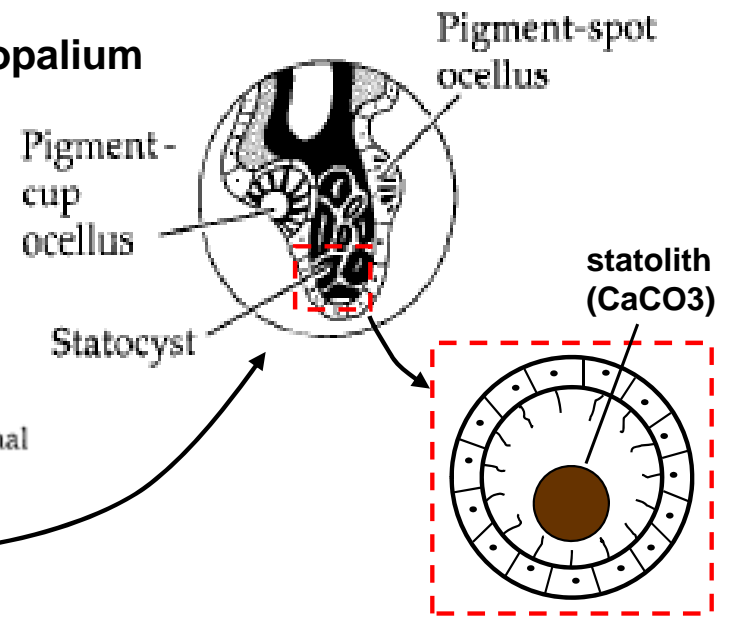
Cl. Cubozoa

sea wasps

Cl. Scyphozoa: anatomy



Rhopalium



Cl. Scyphozoa

asexual reproduction: transverse division of entire polyp



scyphistoma
(polyp phase)

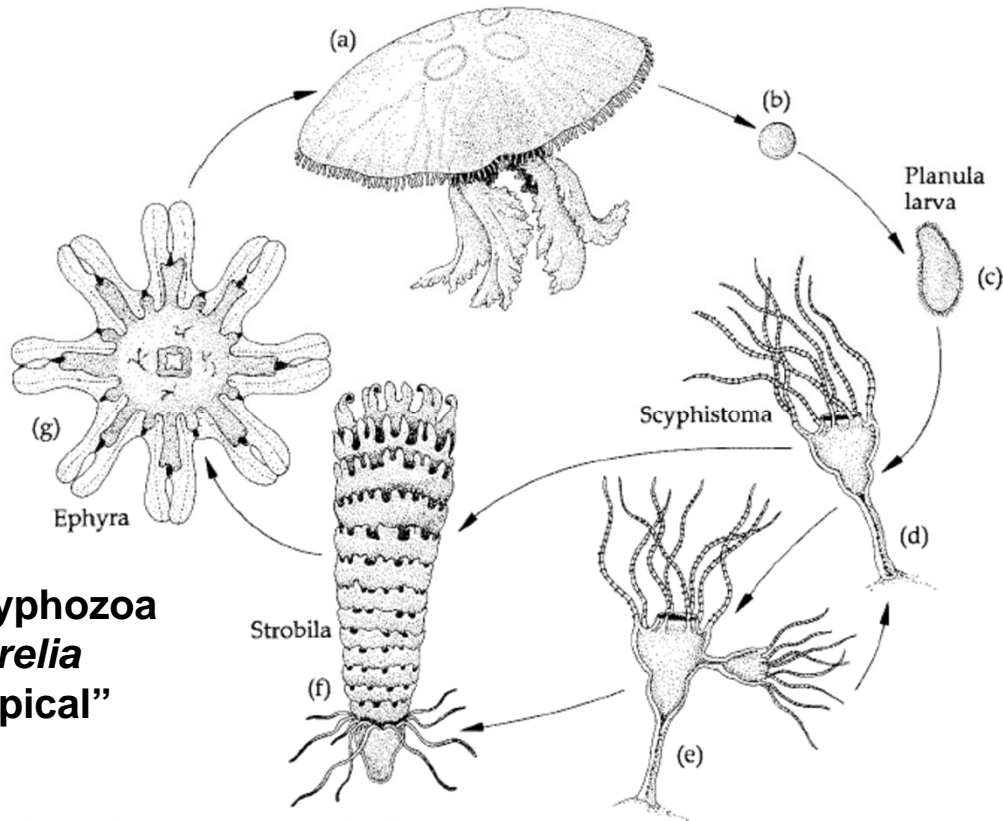


strobilation
(transverse division)

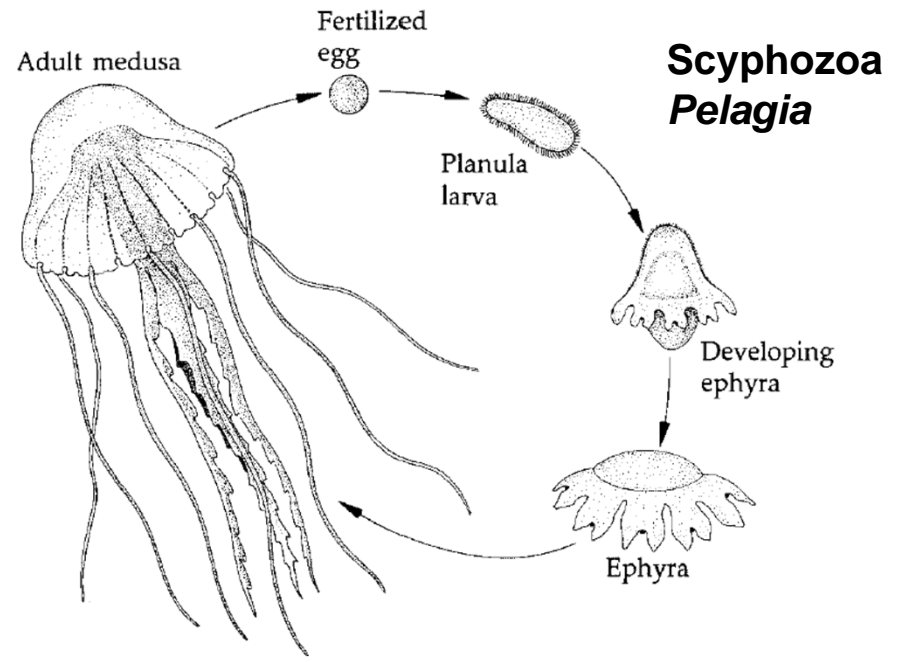


ephyrae
(young medusae)

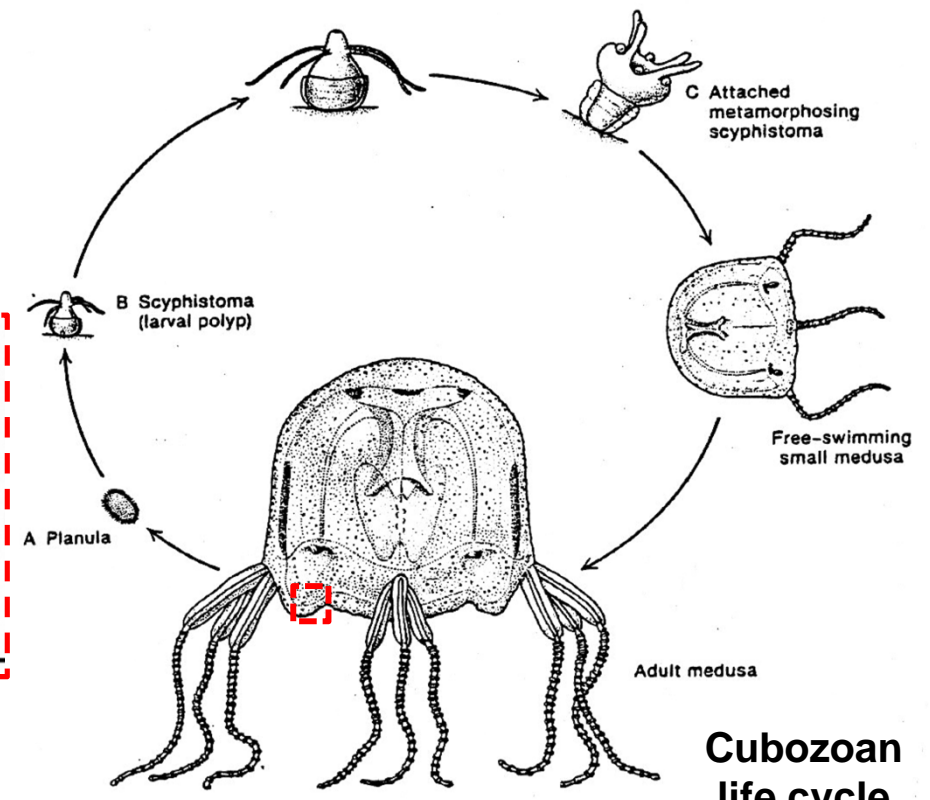
Scyphozoan/Cubozoan life cycle variation



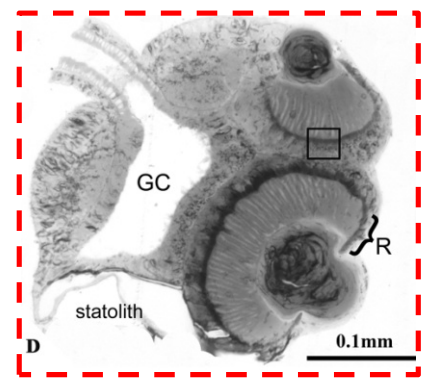
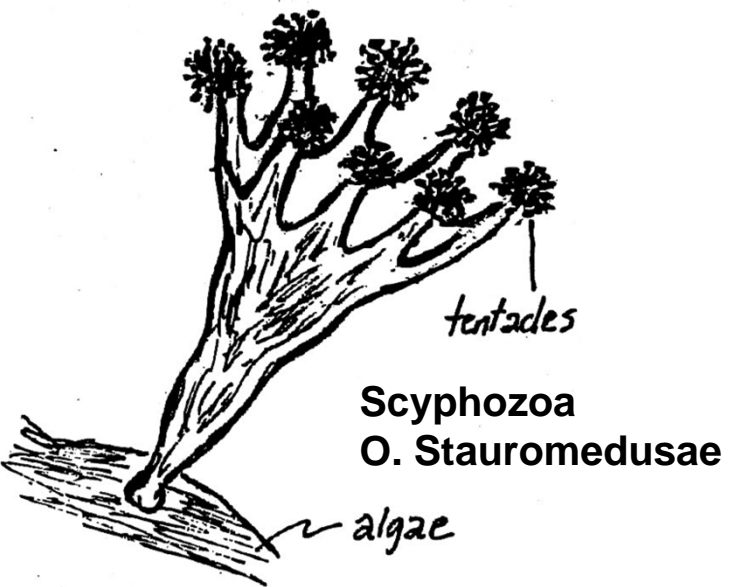
**Scyphozoa
Aurelia
 "typical"**



**Scyphozoa
*Pelagia***



**Cubozoan
 life cycle**



Ph. Cnidaria

Cl. Hydrozoa

colonial hydroids
smaller jellyfish
siphonophores

Cl. Anthozoa

sea anemones
corals
sea pens

Cl. Scyphozoa

large jellyfish
• **stauromedusae**

Cl. Cubozoa

sea wasps



Ph. Cnidaria

Cl. Hydrozoa

colonial hydroids
smaller jellyfish
siphonophores

Cl. Anthozoa

sea anemones
corals
sea pens

Cl. Scyphozoa

large jellyfish
stauromedusae

Cl. Cubozoa

sea wasps

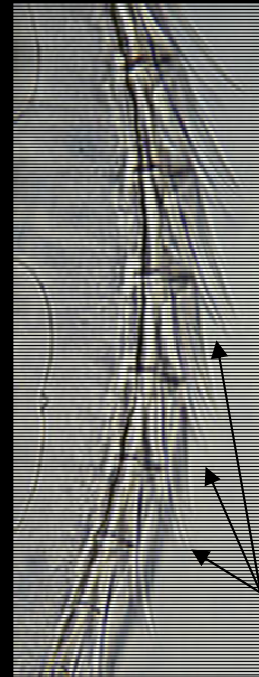


Ph. Ctenophora

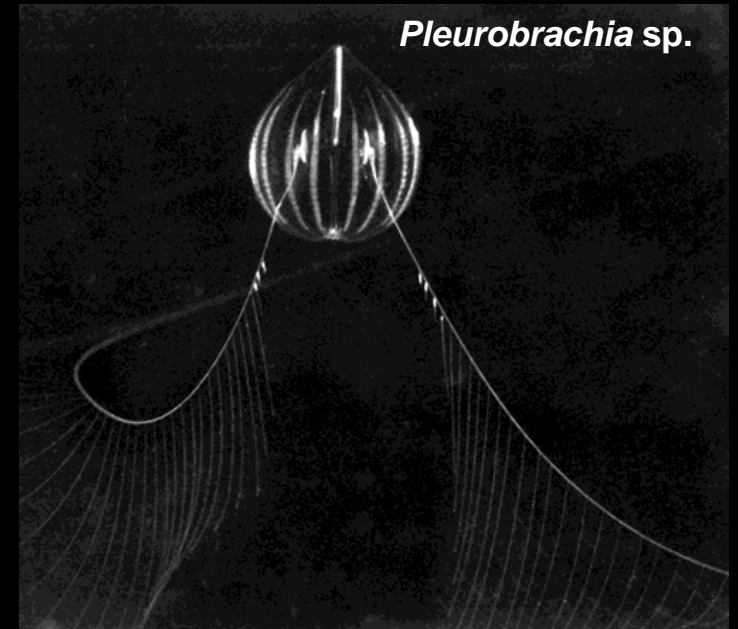
Cl. Tentaculata



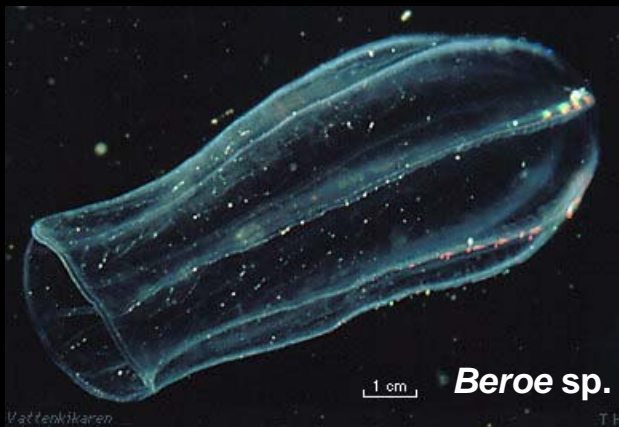
ctenes



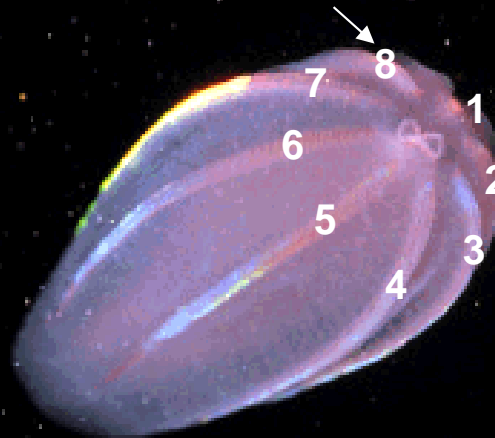
ctenes



Cl. Nuda

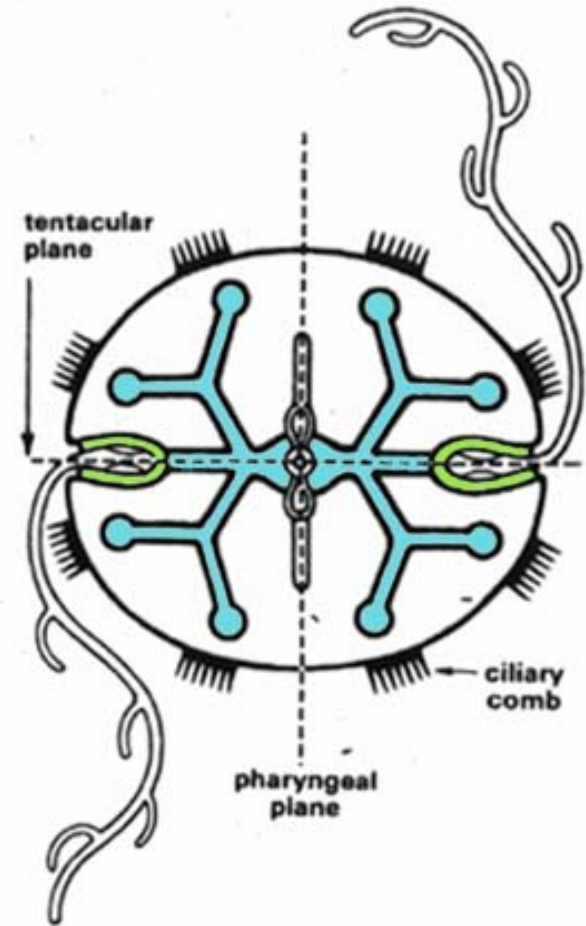
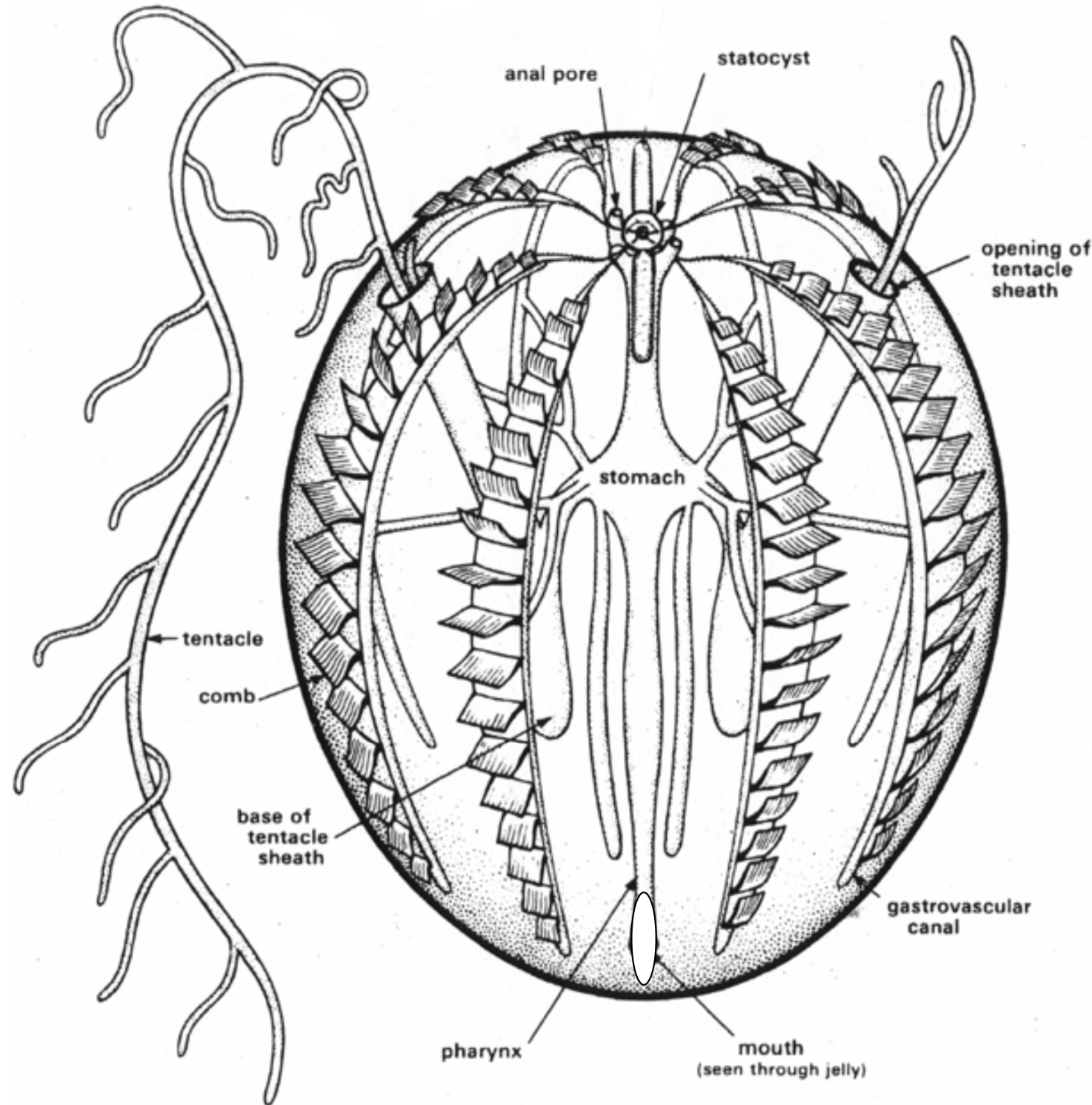


ctene rows



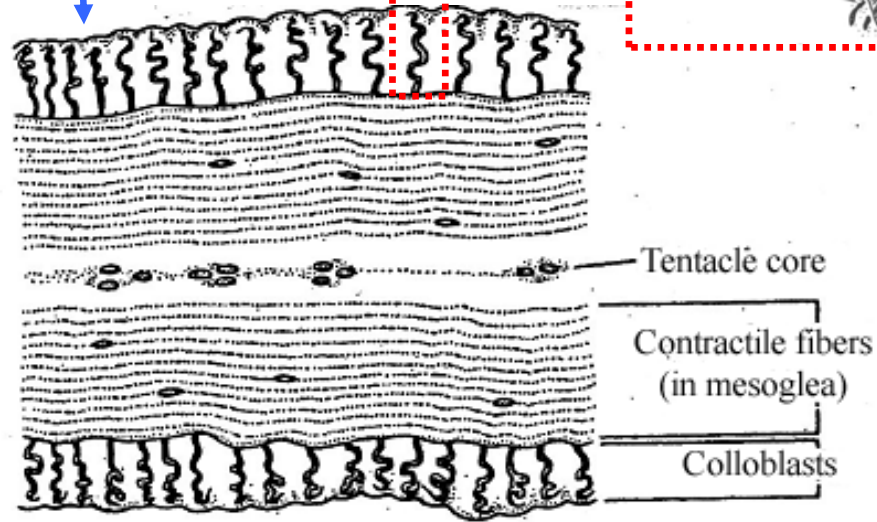
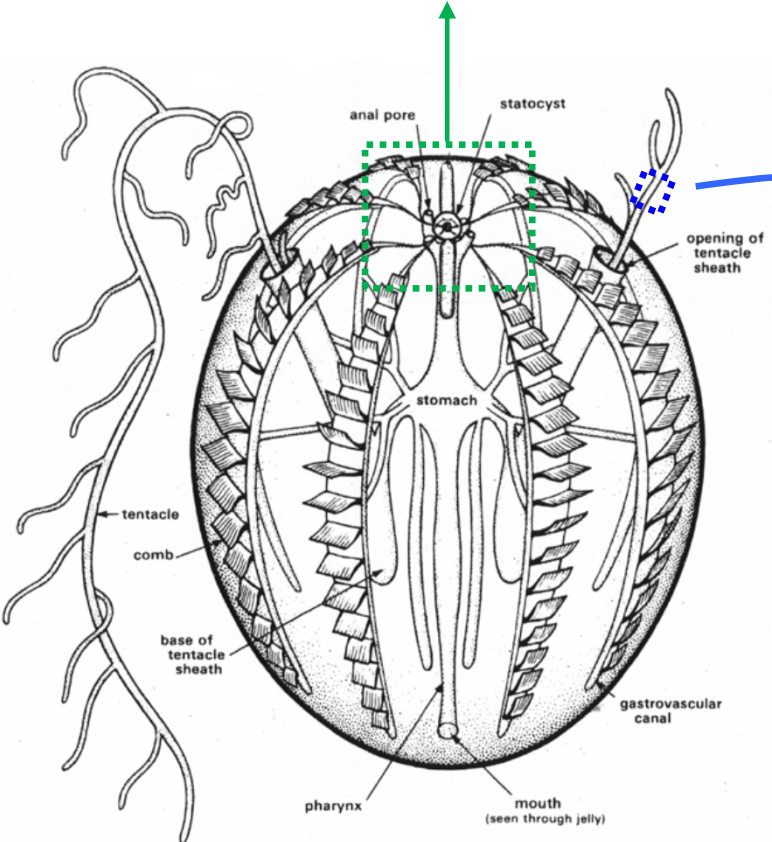
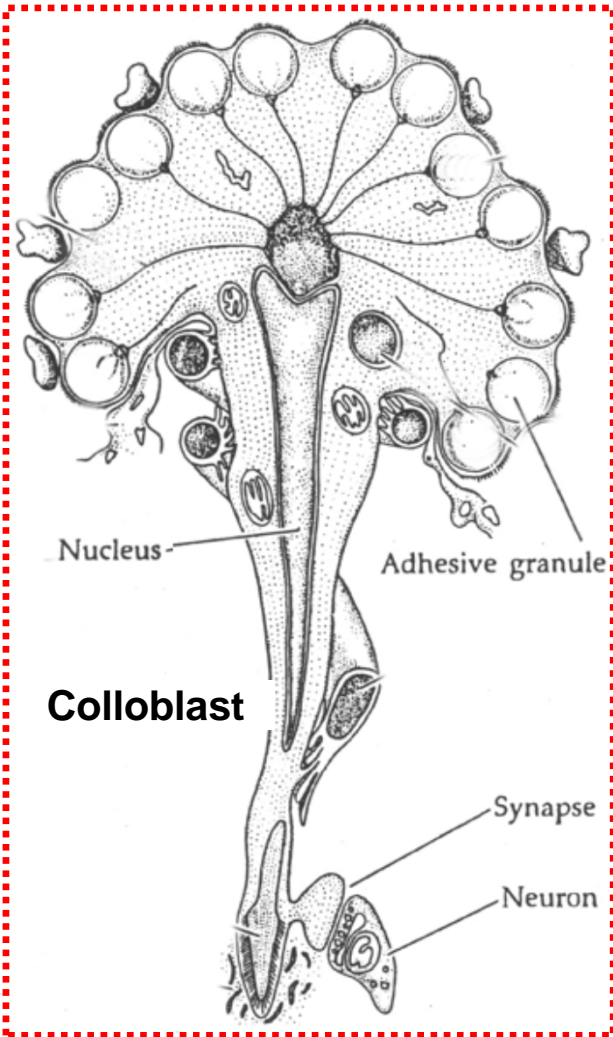
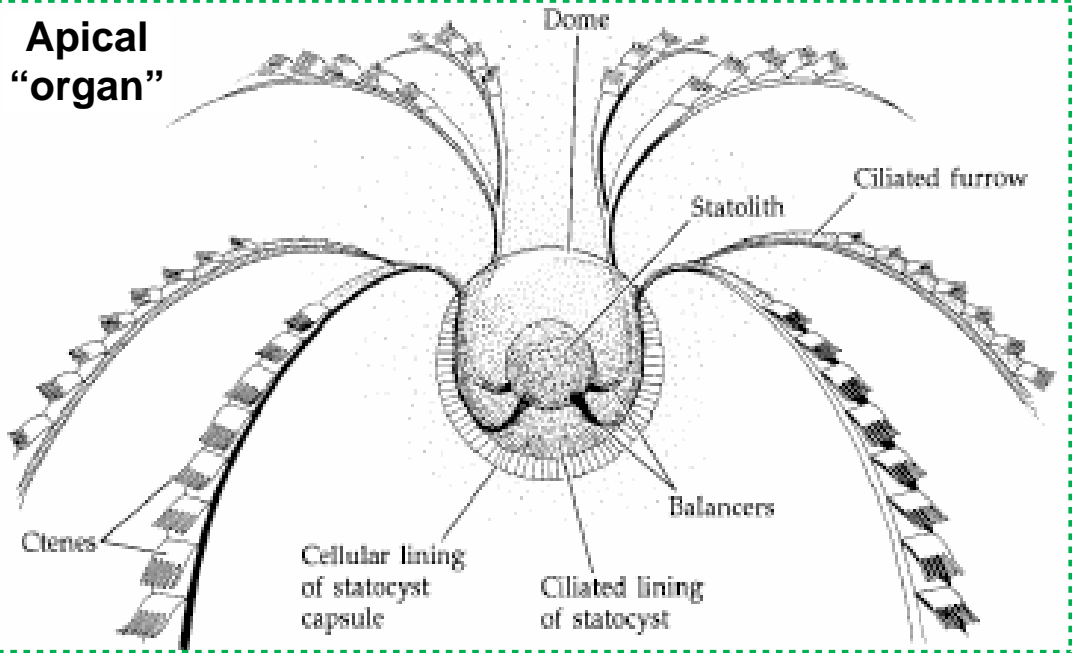
Ph. Ctenophora

generalized body plan



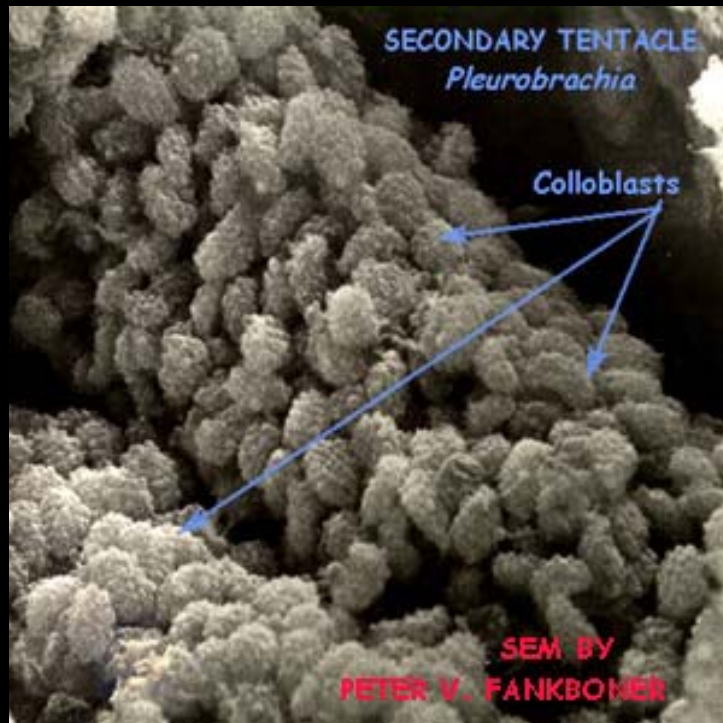
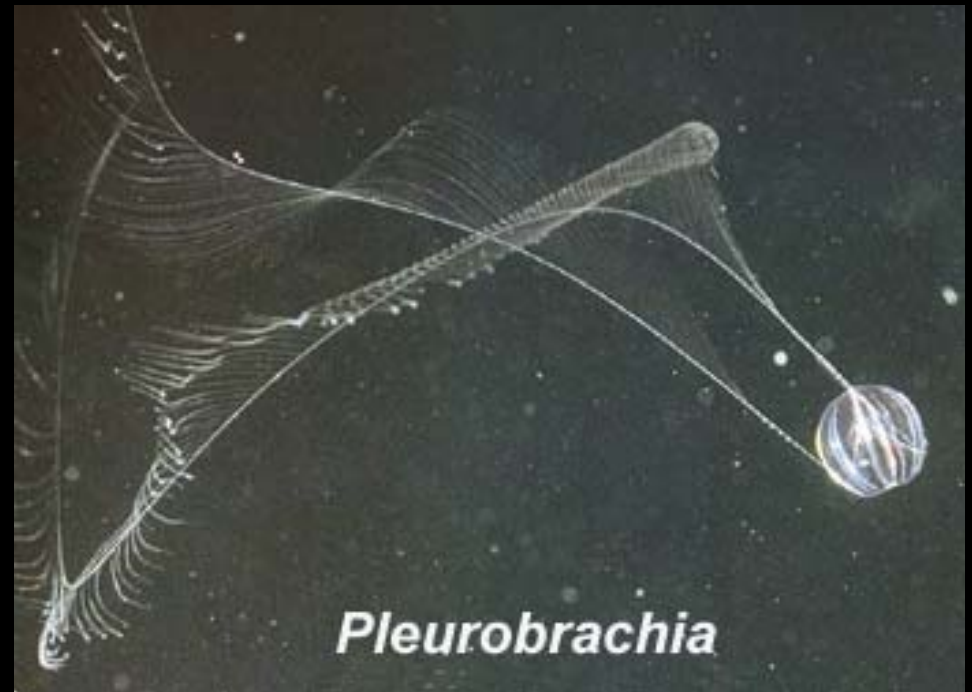
Biradial symmetry shown in a diagrammatic cross-section of *Pleurobrachia*. The dotted vertical line is the *pharyngeal plane*, in which pharynx and mouth are elongated. The dotted horizontal line is the *tentacular plane*. Pharyngeal halves are not equivalent to tentacular halves.

**Apical
"organ"**



Feeding

Cl. Tentaculata



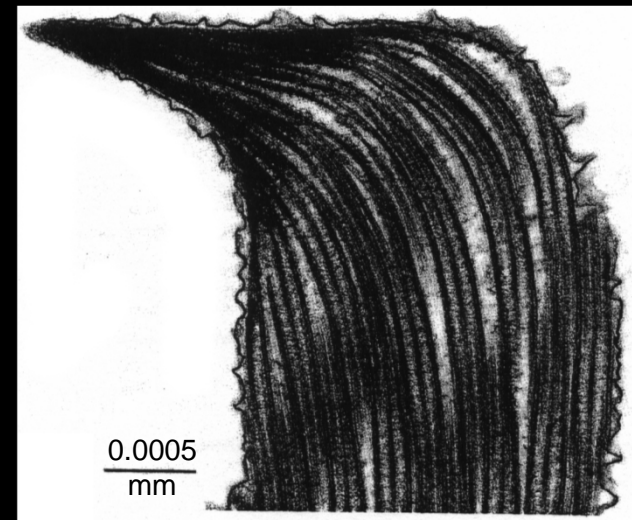
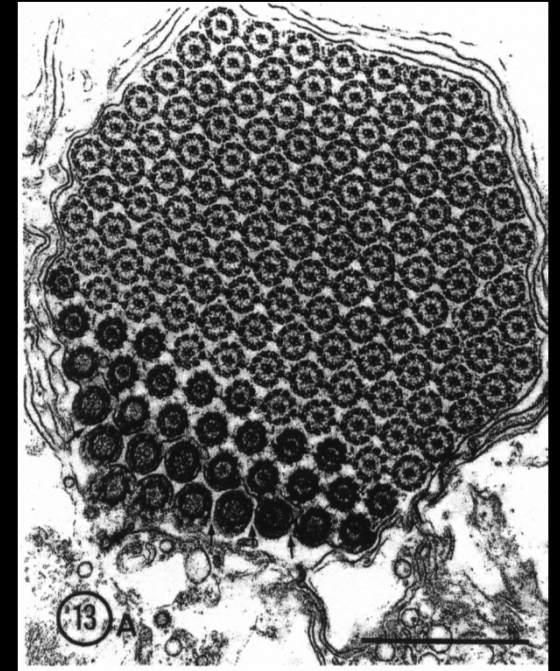
Feeding

Cl. Nuda (O. Beroidae)

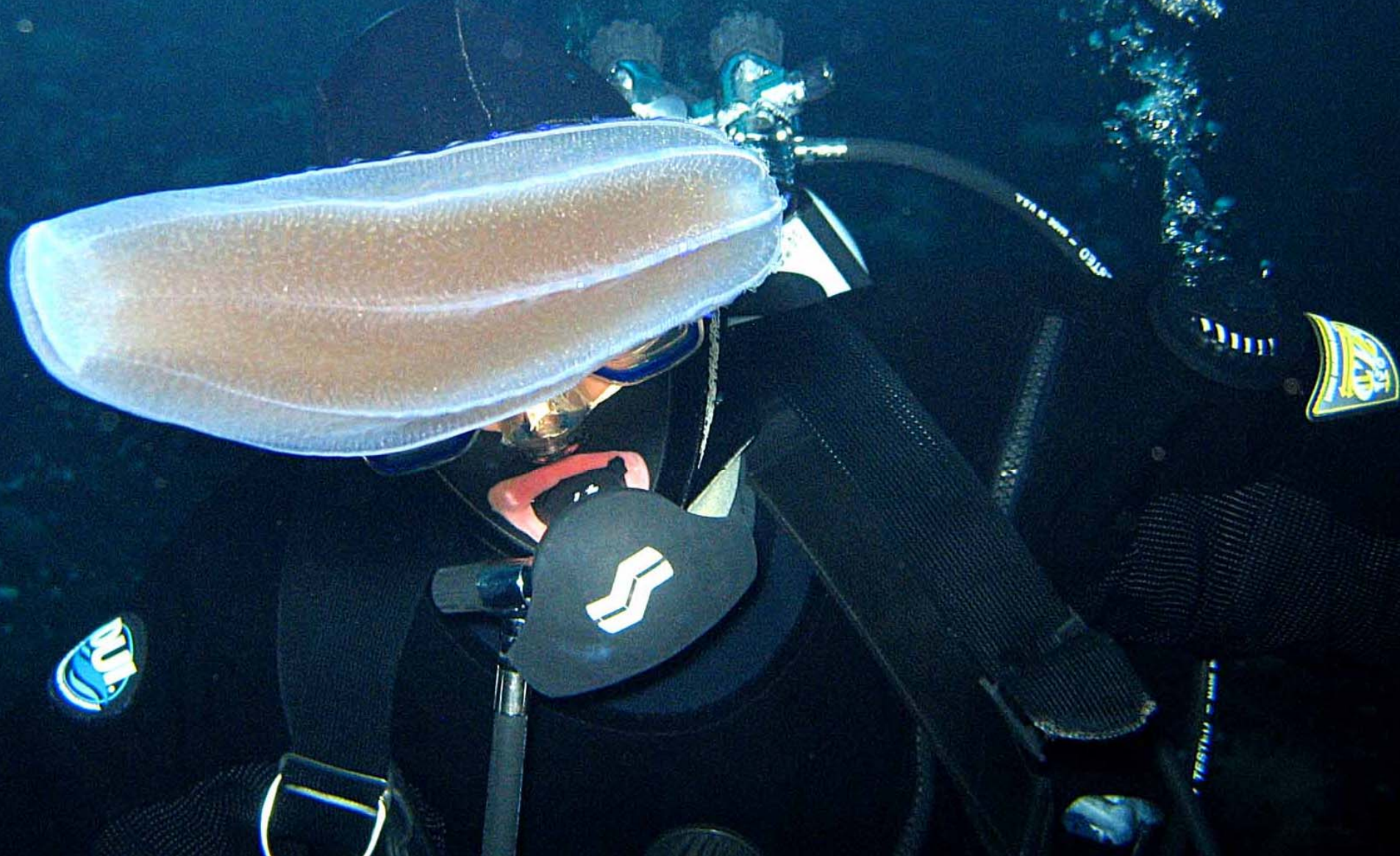


Zip-loc® lips!

Compound-ciliary teeth!

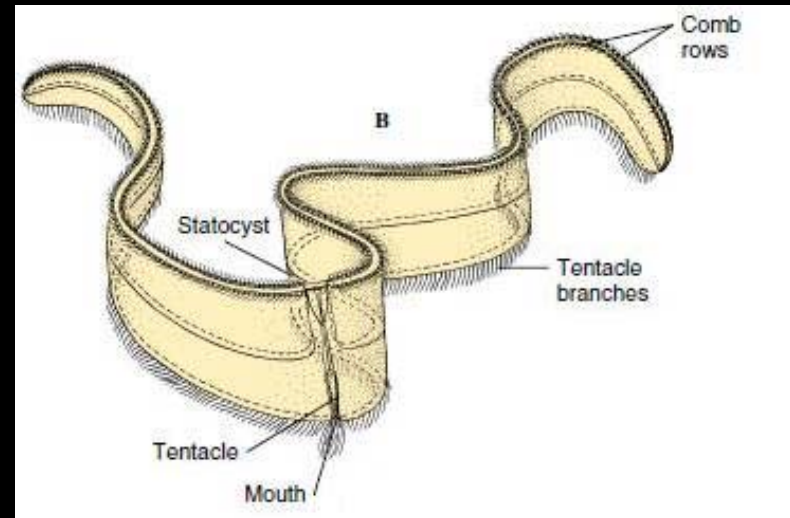
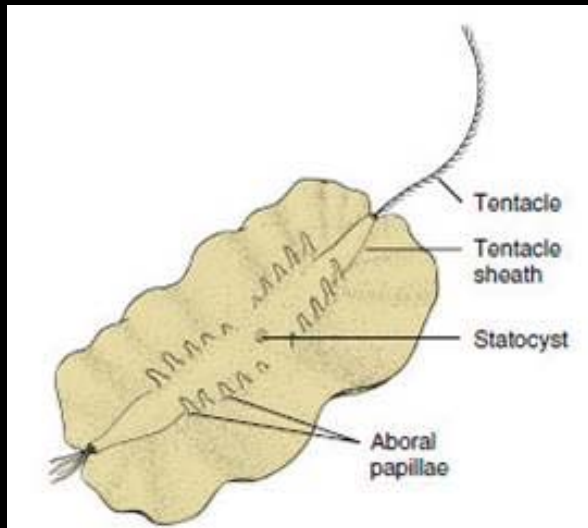
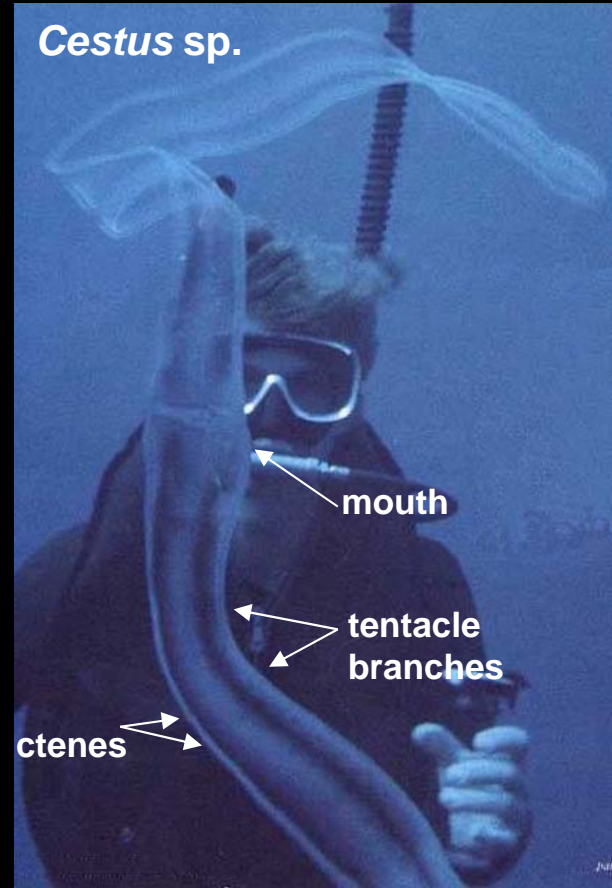


Giant antarctic ctenophore
Beroe cucumis



Unusual tentaculates

Coeloplana sp.



Jelly plankton:
*homology or
 homoplasy of habitat,
 transparency and
 feeding mode?*



Life cycle

Alternating generations

Typical

Swimming mechanism

“Muscular” contractions

Ciliary (8 ctene rows)

Symmetry

Radial

Biradial

“Muscle”

Epithelial

True fibers?

Food capture (cell)

Cnidocyte

Colloblast

(structure)

Nematocyst

Colloblast

(control)

Independent effectors

Nervous control

Larval development

Planula (indirect)

Cydropid (direct)

Cleavage

Indeterminate

Determinate

