

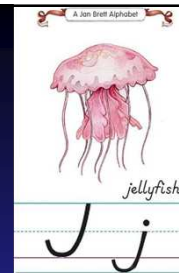


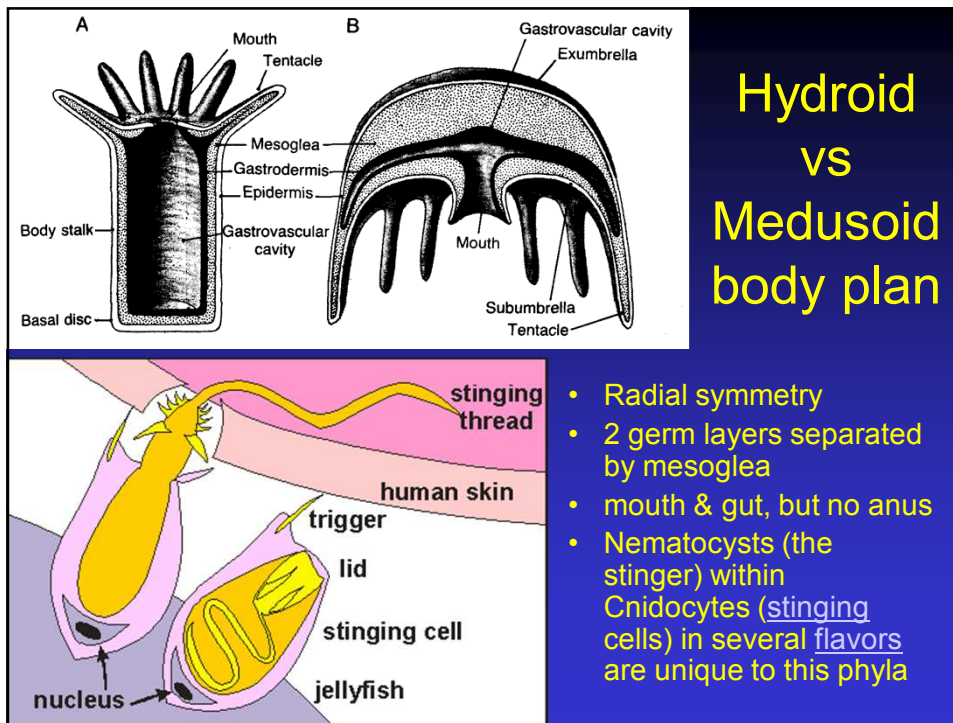
Cnidaria

- Only zooplankter recognized by the public (why?)
- Phylum is primarily marine, very few FW
- Considered the most primitive metazoan phyla
 - (note: sponges are parazoa not metazoa)
- Characterized by specialized stinging cells called cnidocytes
- Traditionally 3 major subgroups recognized, now split into 4

Subphylum Anthozoa (devoid of medusae phase)

- Superclass Anthozoa – corals and anemones
 - ~6000 species, all benthic except for ciliated planula larvae





Hydroid vs Medusoid body plan

- Radial symmetry
- 2 germ layers separated by mesoglea
- mouth & gut, but no anus
- Nematocysts (the stinger) within Cnidocytes (stinging cells) in several flavors are unique to this phyla

Cnidaria 2

Subphylum Medusozoa

(medusae phase present)

- Superclass Scyphozoa (true jellyfish)
 - ~200 species in 3 orders (Cormatae, Semaestomeae, Rhizostomeae)
 - *Gonads gastrodermal*
- Superclass Cubozoa (box jellies or Cubomedusae)
 - ~15 species, 1 order - 4 tentacles VERY potent venom
- Superclass Hydrozoa
 - ~700 species
 - (diversity # a **very** traditional estimate)
 - *Gonads ectodermal, a colonial phase often present*
 - Class Siphonophora (3 orders) Cystonectae, Physonectae, Calycophorae
 - Class Hydroidmedusae (6 subclasses) Anthomedusae, Leptomedusae, Liangiomedusae, Limnomedusae, Narcomedusae, Trachymedusae

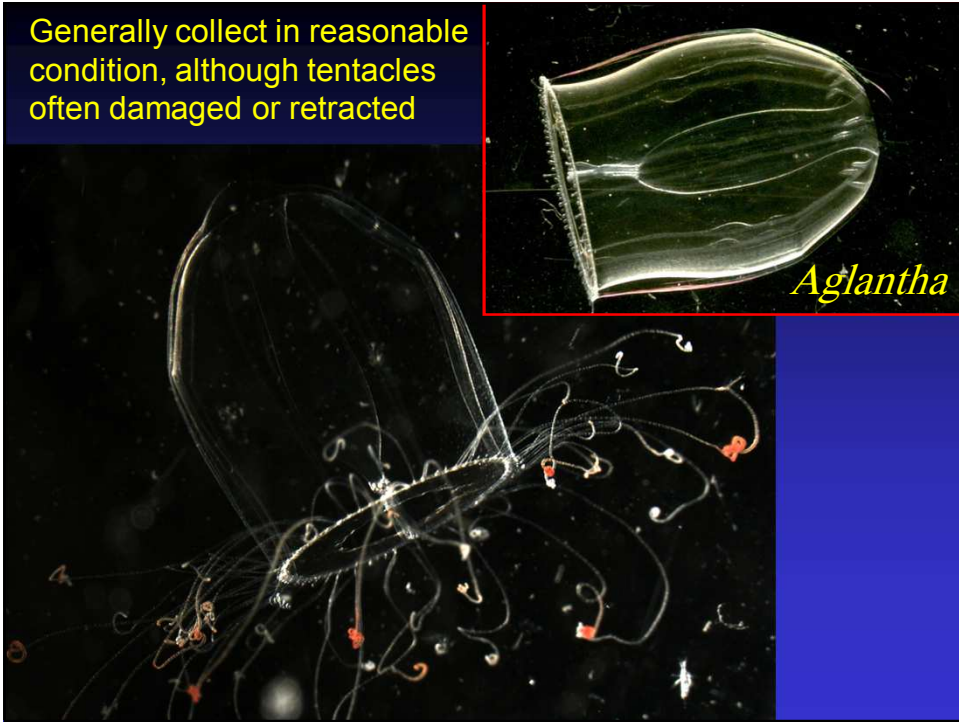
Ecology of Planktonic phase

- Group is primarily predatory, swim by pumping of “bell”, and generally drift with currents
- Hunting strategy ranges from “lie and wait” for animals to blunder into deployed tentacles, to active swimming to increase probability of meeting prey
- A few scyphozoans are specialized to harbor symbiotic algae, that produce anywhere from a modest amount to as much as the entire energy needs of the animal (similar to corals)
- They are found in all oceans, at all depths from coastal to oceanic provinces - the open waters beyond the continental shelf
- They are frequently the top planktonic predator on both inverts and smaller fishes, although some species appear to feed primarily on heterotrophic protists

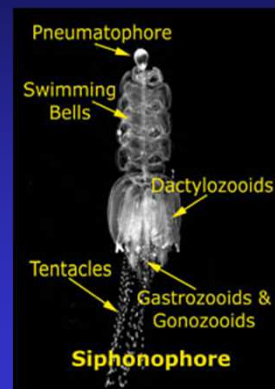
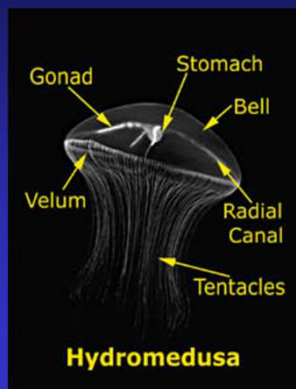
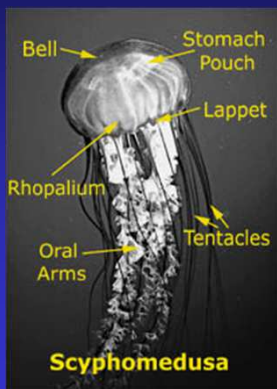
Planktonic Phase 2

- Sizes range from 0.5 mm to 1 m in bell diameter, tentacles can stream up to 10 m behind animal, colonial forms (i.e. siphonophores) may be as long as 30m
- Larger forms often inhabited by specialized commensals
- Distribution is often very irregular, and sporadic, sometimes huge blooms
- Impact of blooms on tourism and aquaculture receiving increased \$\$\$/research attention
- Poorly studied; sampling techniques generally inappropriate

Generally collect in reasonable condition, although tentacles often damaged or retracted

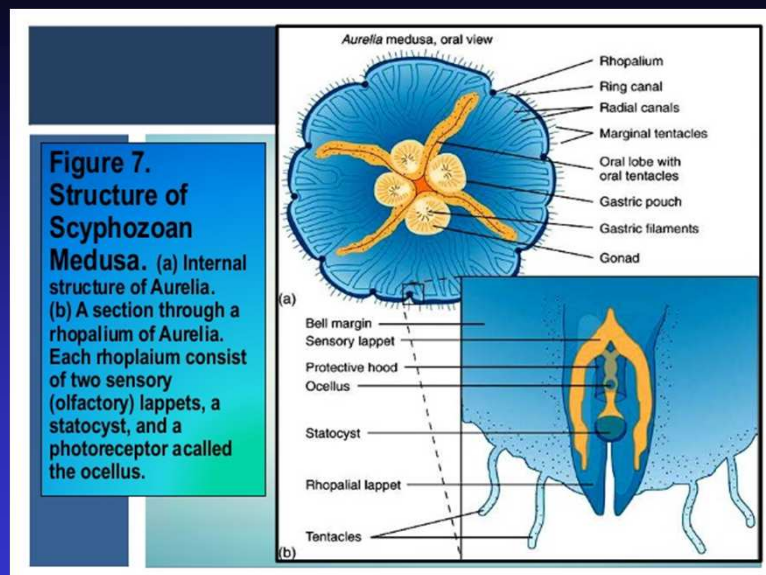


Body form

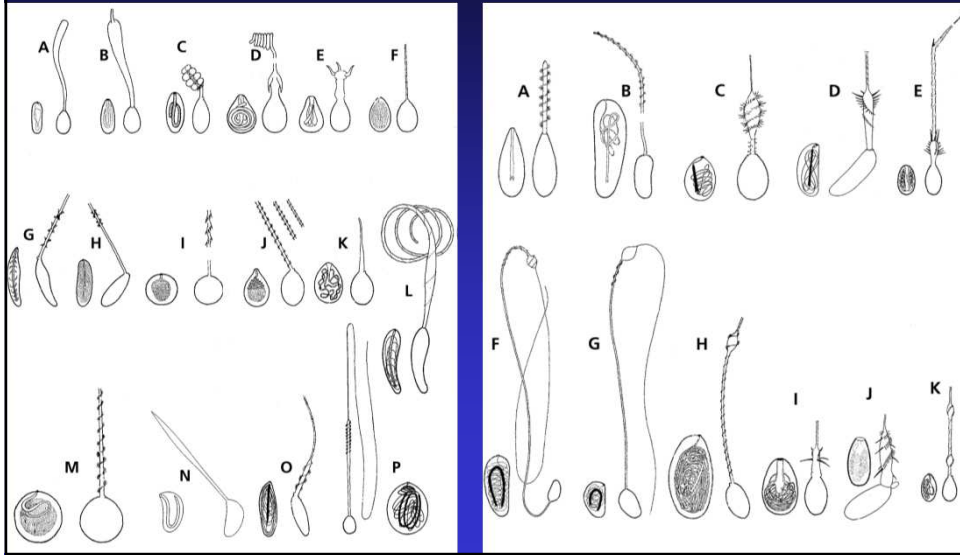


Taxonomy (pelagic phase)

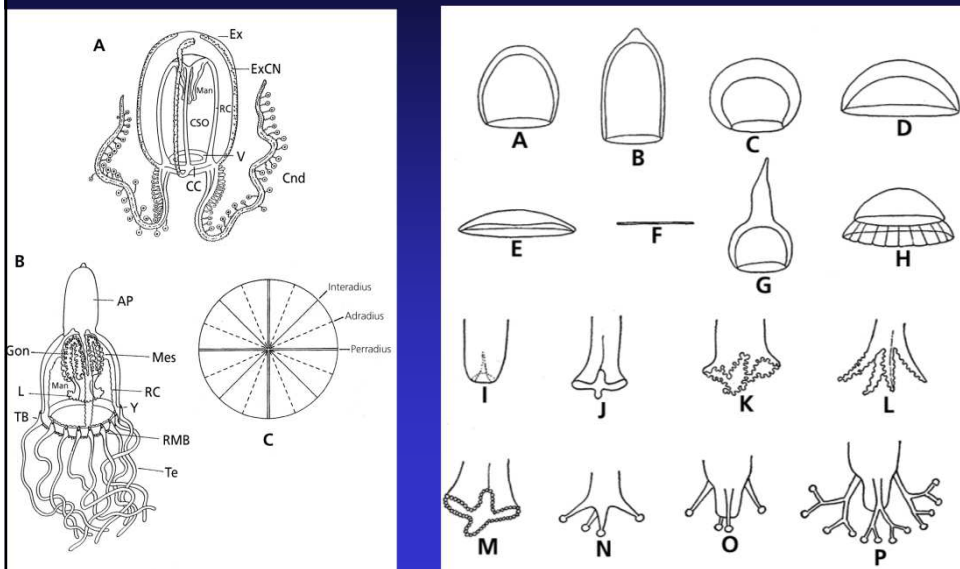
- Based on number, size and arrangement of tentacles, radial canals, stomach pouches, statocysts (balance sensor), and Rhopalium (light sensors).
- Rhopalia (singular rhopalium) are sensory structures of jellyfish of the class Scyphozoa. They include specialized structures for sensing light (ocelli), or movement or direction with respect to gravity (statoliths). The 'eyes' are most complex in the Cubozoa, resembling the image-forming eyes of squid, octopuses, and vertebrates.
- In Aurelia they lie in marginal indentations (hollow) around the bell and are bordered by rhopalial lappets
- Morphology of manubrium (mouth) and gonads
- Types of and arrangement of nematocysts on body but especially on tentacles
- Ultra-structure of nematocysts
- Pigmentation
- In colonial forms, on the morphology of each type of individual, but especially on the swimming ones



Nematocysts range from simply adhesive (stickily) to penetrant, many with toxins

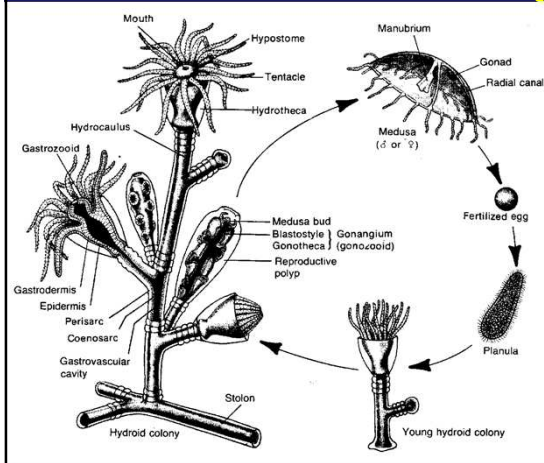


Morphology



Typical Hydrozoan life cycle

Note that the benthic stage is colonial and “vegetative”, with specialized individuals



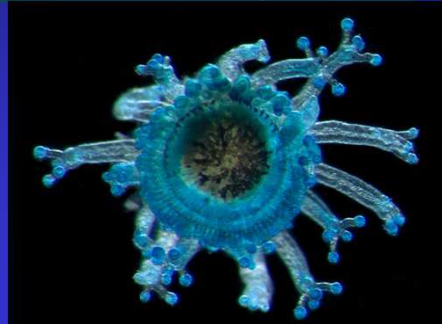
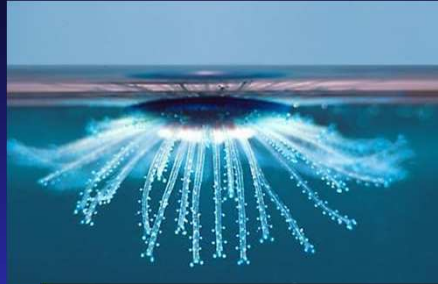
Usually, reproductive phase is a single planktonic individual

In some genera, hydroid is absent with planula developing directly into medusae

In some genera, medusae is absent with hydroid producing the egg

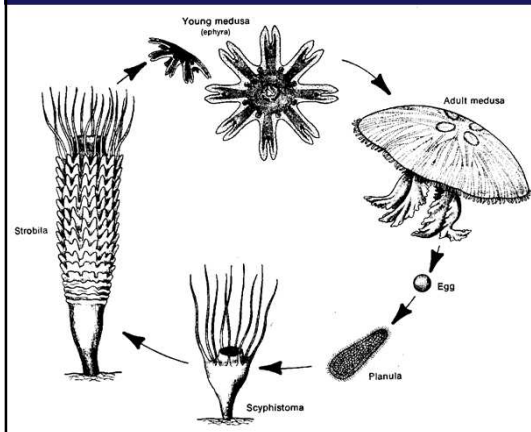
A few have a colonial plankton phase, but still produce medusae for reproduction

Colonial planktonic “hydroid” phases

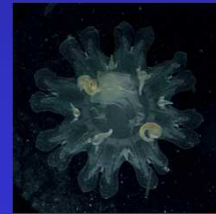


Typical Scyphozoan life cycle

Note that the vegetative stage is usually a single individual



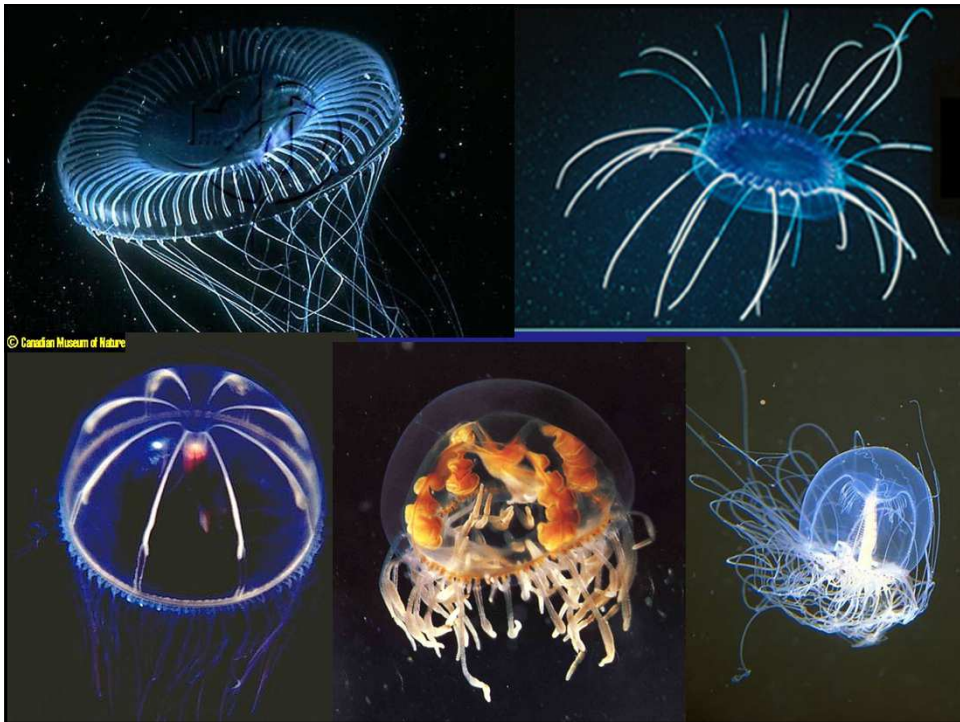
- Reproductive phase the planktonic individual
- In some genera, egg/planula develops directly into medusae
- In some genera, larvae or even scyphistome is retained in specialized cysts or within the gastric pouch

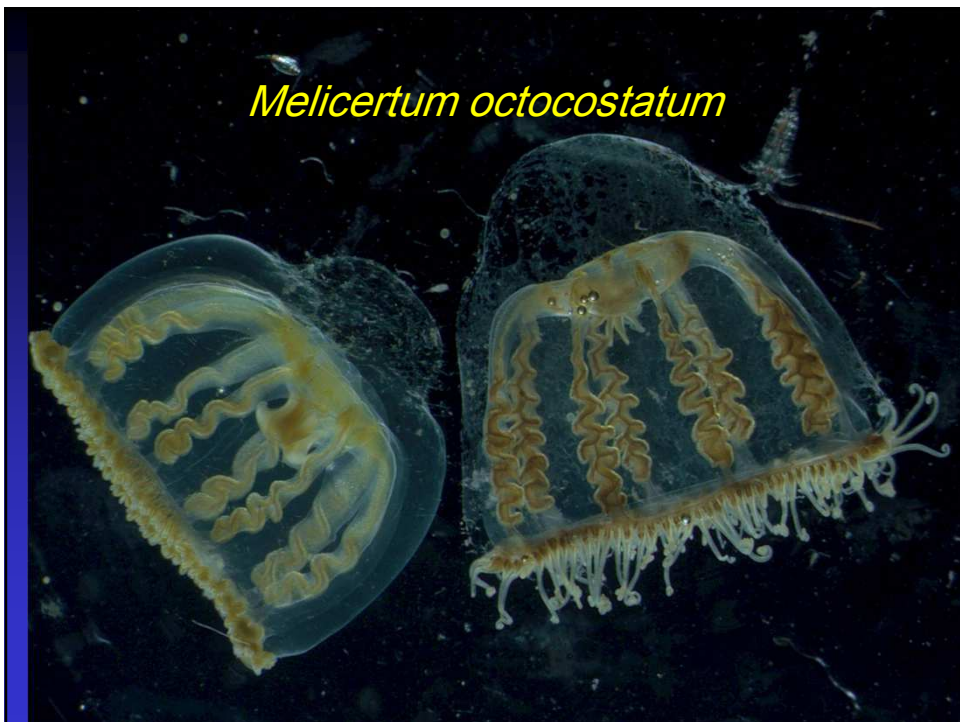
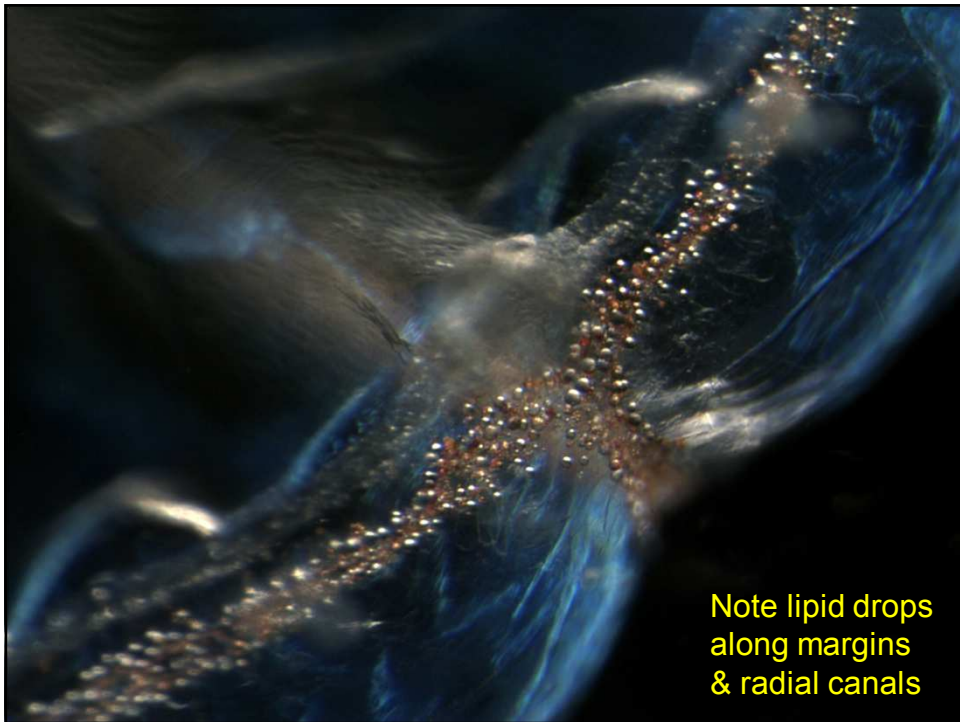


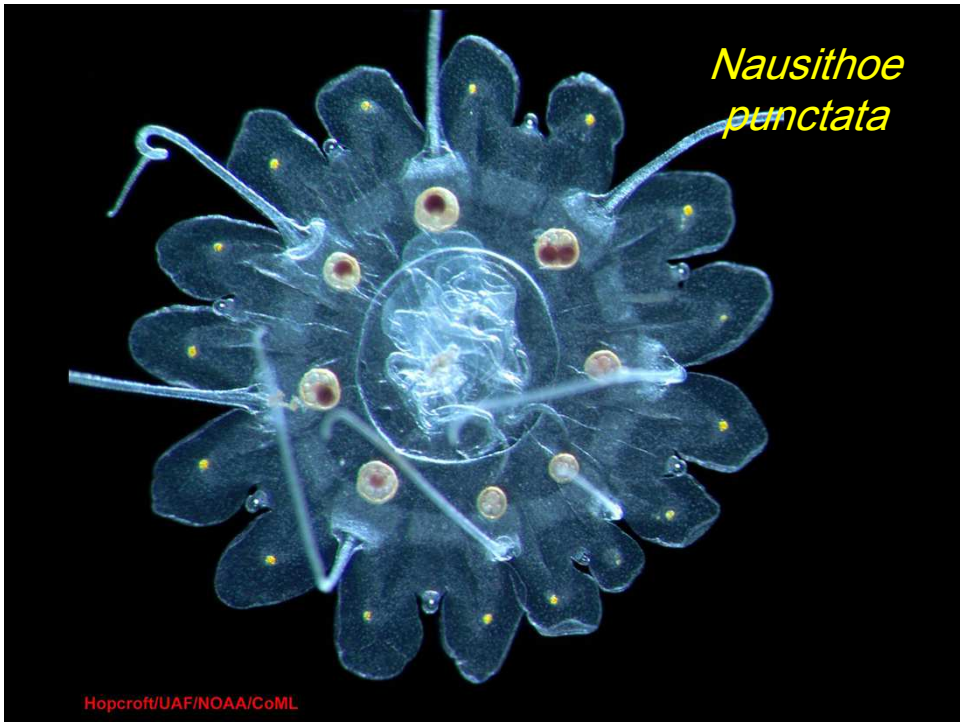
Class HYDROIDOMEDUSA

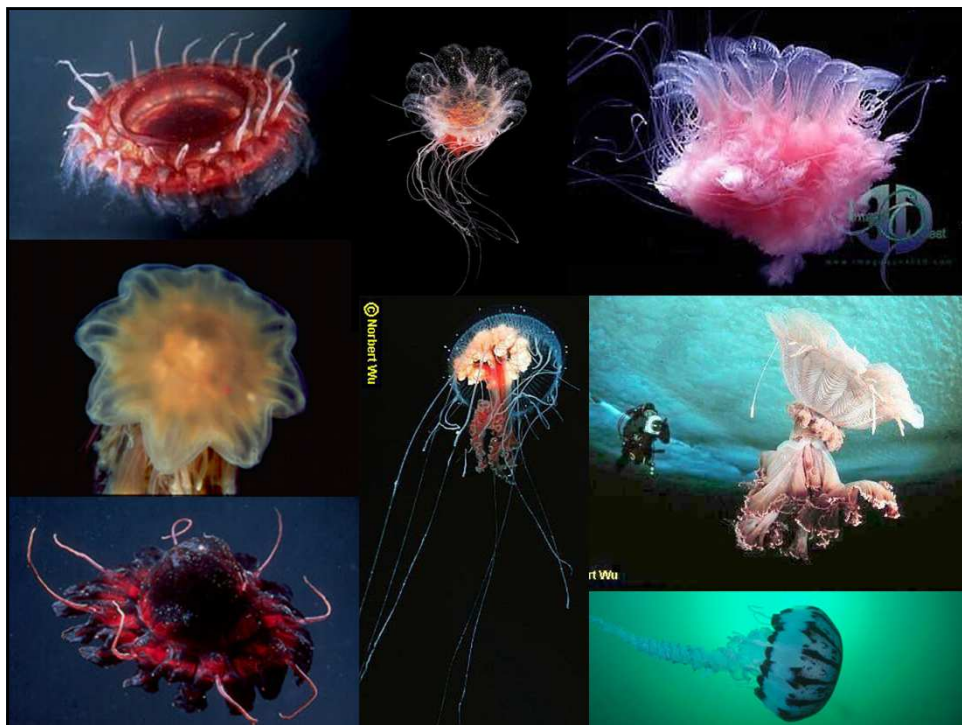
Anthomedusae; Laingiomedusae; Leptomedusae; Limnomedusae; Siphonophorae

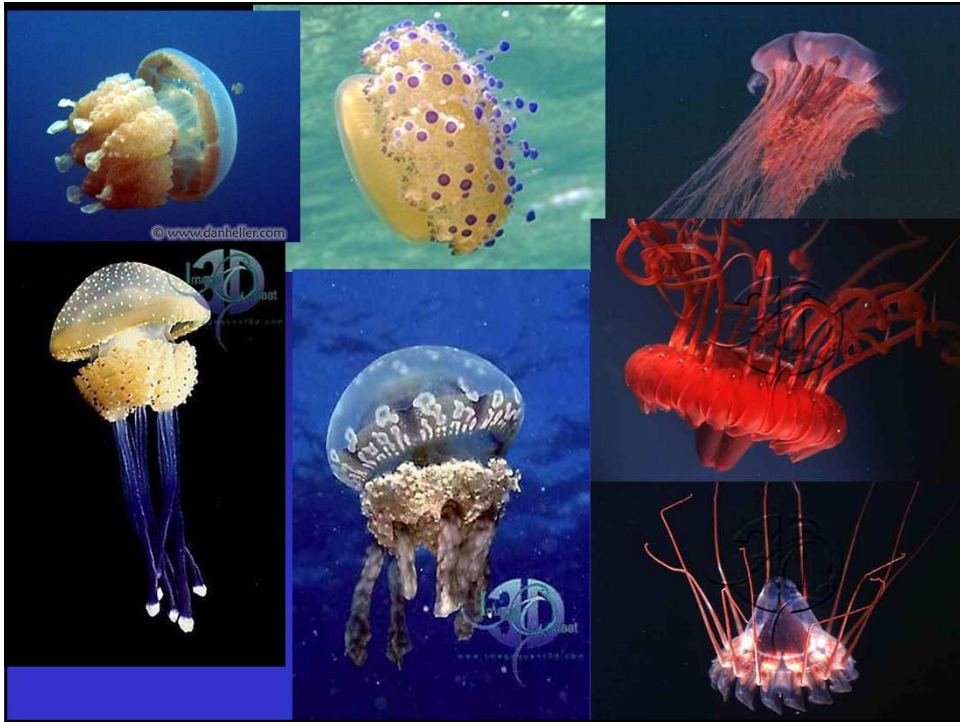
- Hydrozoa usually undergoing indirect development through a succession of distinct stages
- The “planula”, a ciliated motile gastrula, typically developing into a benthic stage
- Polyps giving rise, by asexual budding, to planktonic, free-swimming and solitary hydromedusae, representing the sexual adult.
- The Hydroidomedusa may also form pelagic, swimming or floating









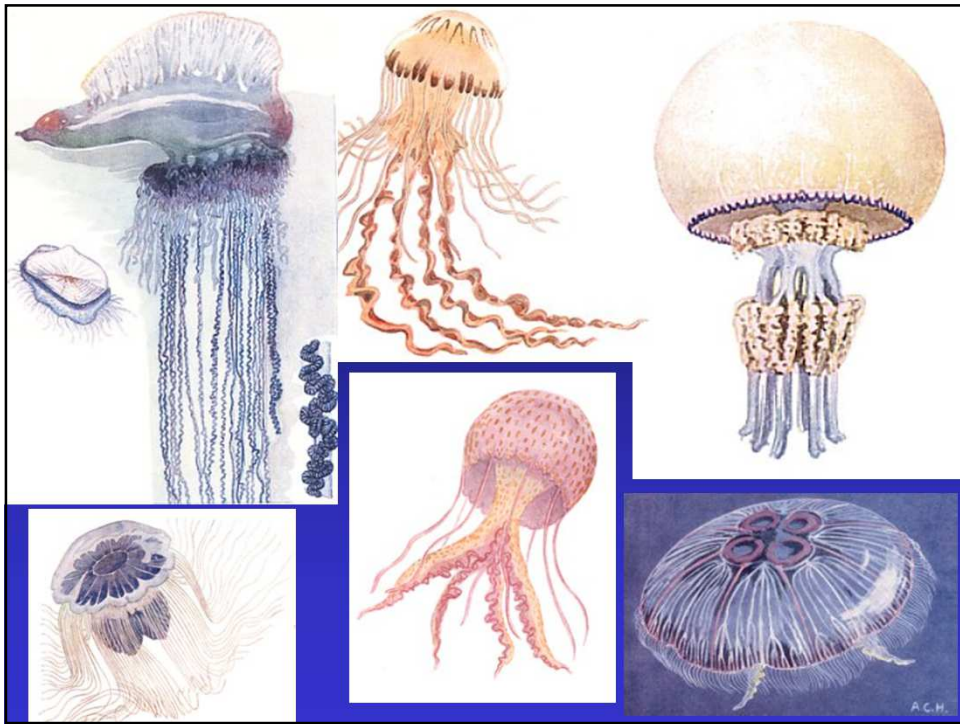












H. B. Bigelow
Medusae from the Maldive Islands.

Click here

Bulletin of the Museum of Comparative Zoology
AT HARVARD COLLEGE
Vol. XXXIX, No. 9
April 1904

<http://www.mbl.edu/publications/books/Bigelow/>

The illustration plate features several anatomical drawings of jellyfish, including a long, thin, ribbon-like structure, a pair of small, oval structures, a sunburst-like structure, and a large, bell-shaped jellyfish. A portrait of H. B. Bigelow is shown in the bottom right corner. The text is written in a cursive font, and the overall background is a light greenish-yellow.

Portuguese man-of-war

- **Color:** Purplish-blue
- **Usual size:** Float to 2 inches; tentacles to 30 feet.
- **Location:** Windward beaches during tradewinds; leeward beaches during Kona winds
- **Treatment for sting:** Pluck off; rinse; ice for pain.

Box jellyfish

- **Color:** Clear, nearly transparent.
- **Usual size:** 1 to 3 inches tall; tentacles to 2 feet long.
- **Location:** Leeward beaches 8 to 10 days after full moon. Occasional strays at other times.
- **Treatment for sting:** Douse with vinegar; rinse; ice for pain.

WARNING

JELLYFISH
STINGS ARE PAINFUL,
STAY OUT OF THE WATER

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WHOLE ANIMAL

DISTAL PART OF SIPHOSOME

TENTILLUM

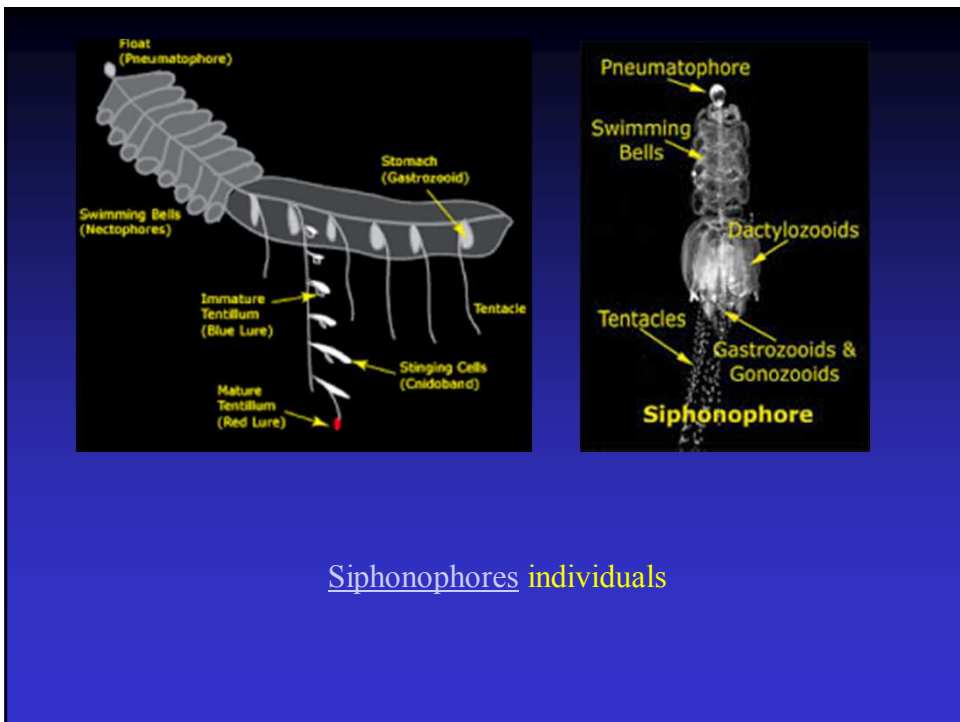
NECTOPHORE

lateral view

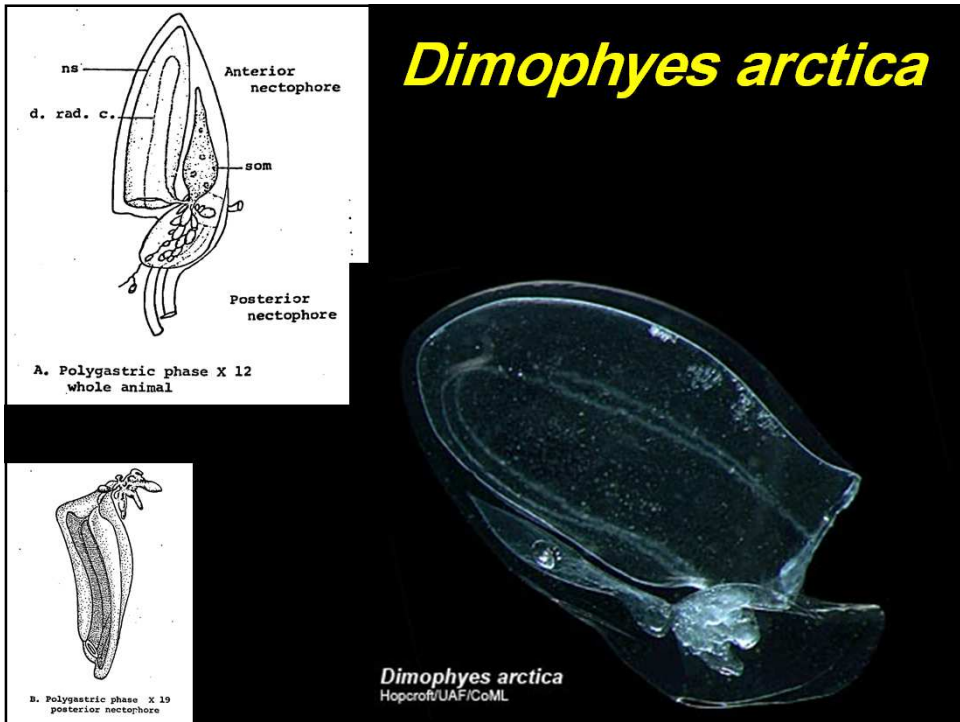
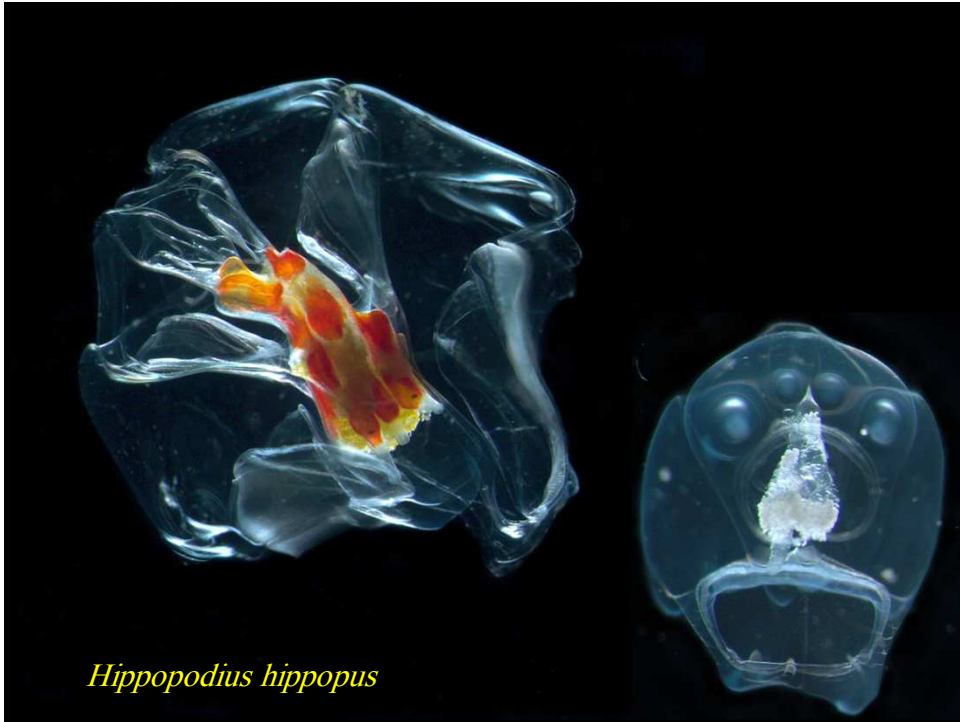
upper view

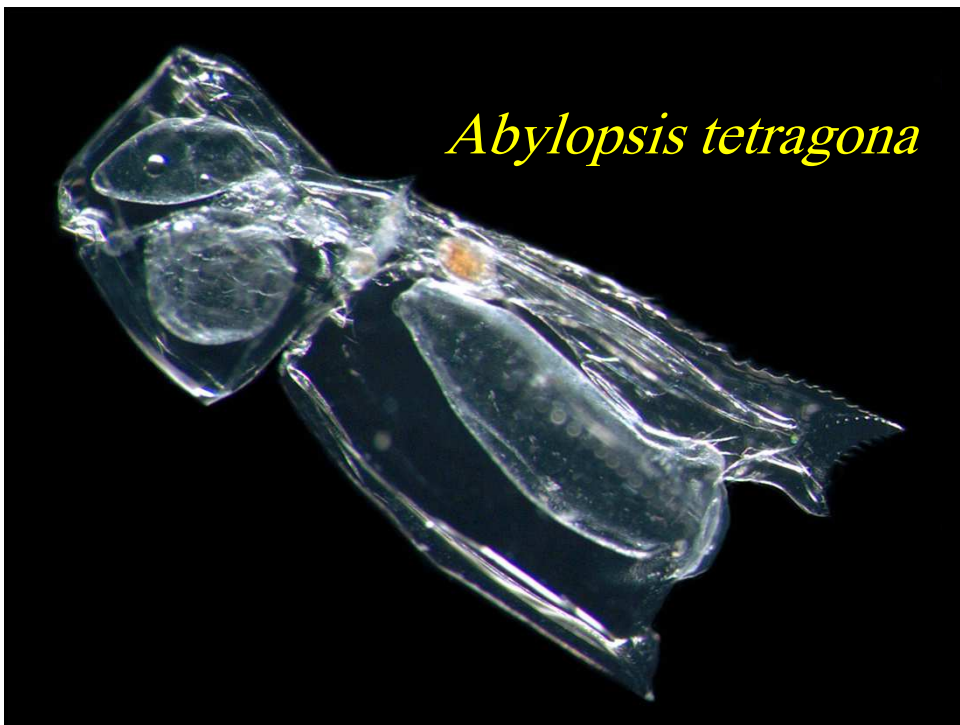
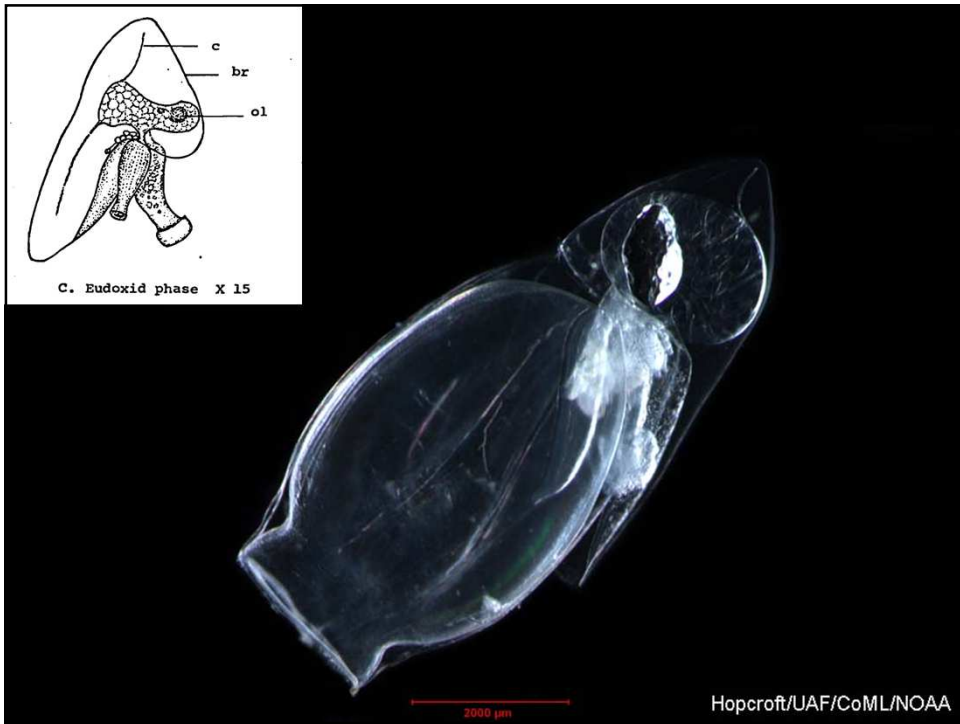
Siphonophores

- Colonies with polyps specialized for 4 typical tasks:
- Feeding
- Fighting
- Floating
- Reproduction









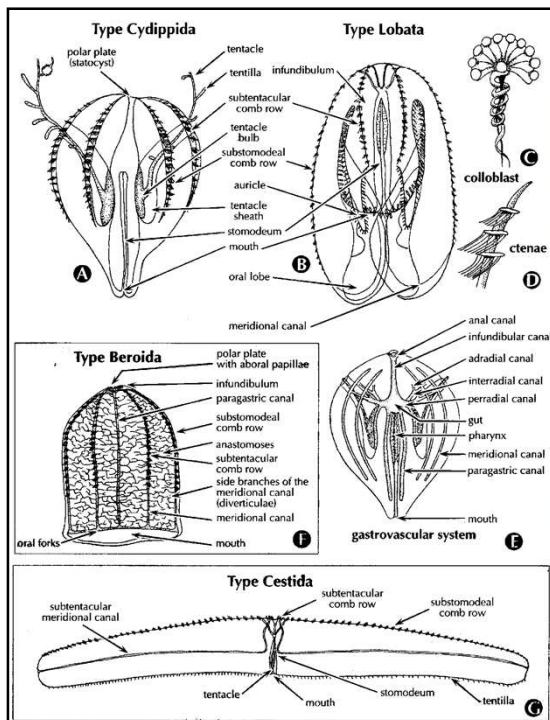
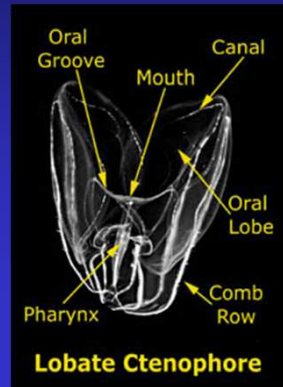
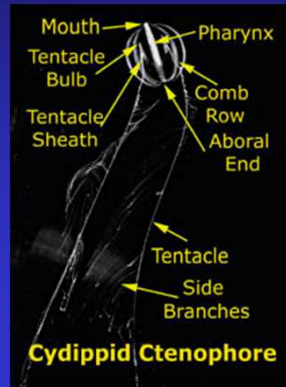


Ctenophores (comb jellies)

- Phylum entirely marine, ancient (earliest)
- Once grouped with cnidaria as “Coelenterates”
- Characterized by fused plates of cilia called ctenes
- Also distinguished from Cnidaria by adhesive colloblasts, rather than penetrant nematocytes
- Most of ~150 known species are pelagic (a few benthic)
- Distributed throughout all the oceans in all the depth ranges, coastal through oceanic
- They are generally the most fragile of the gelatinous zooplankton – some are impossible to preserve – In situ observations are key to understanding them

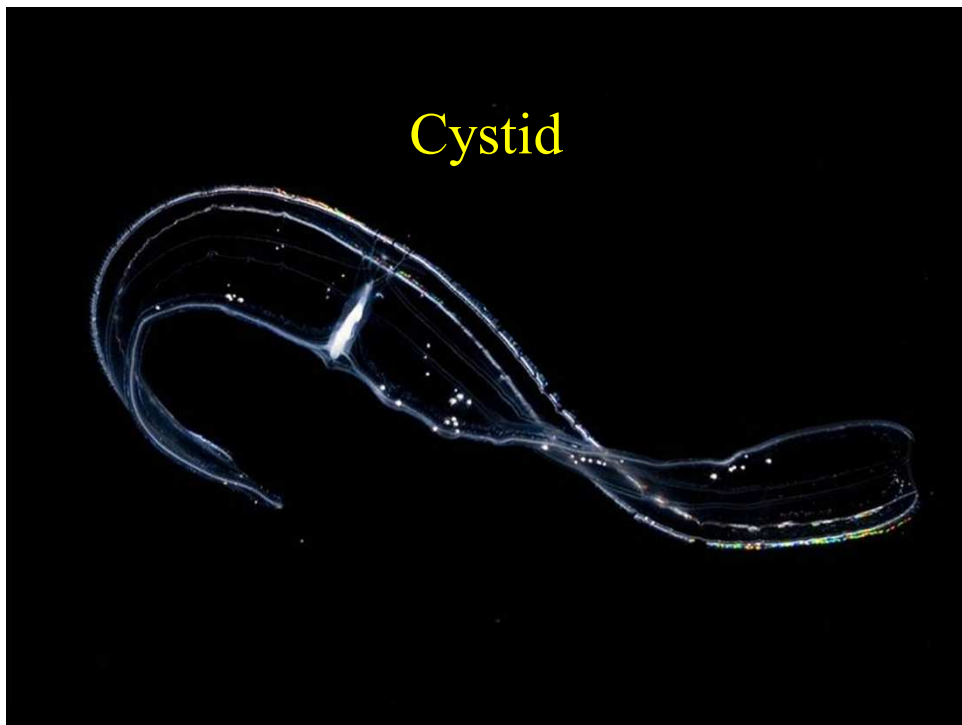
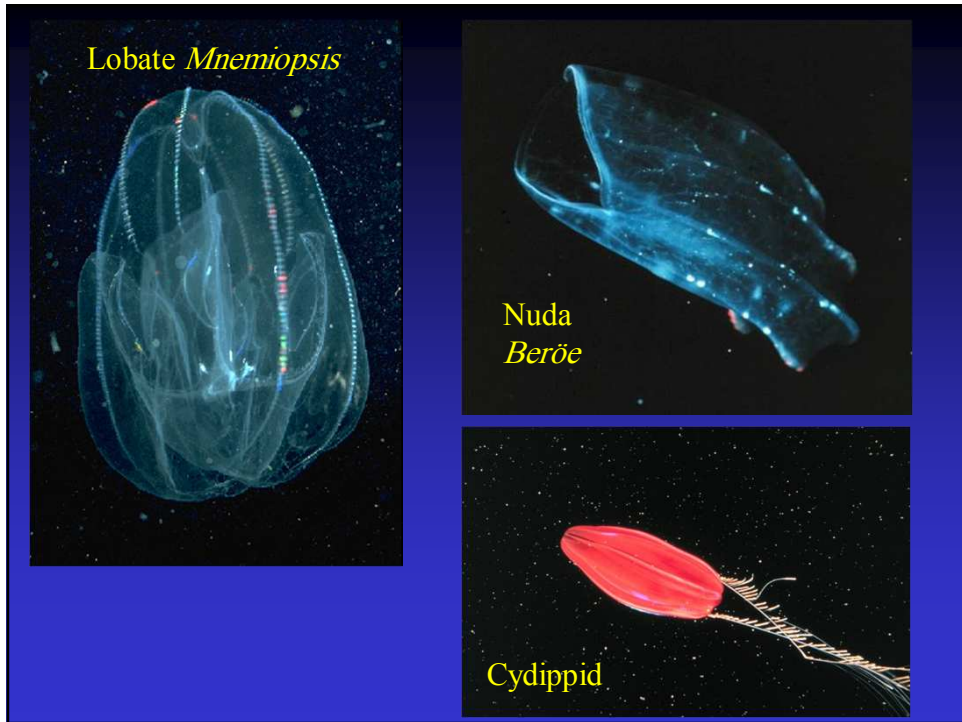
General Body form

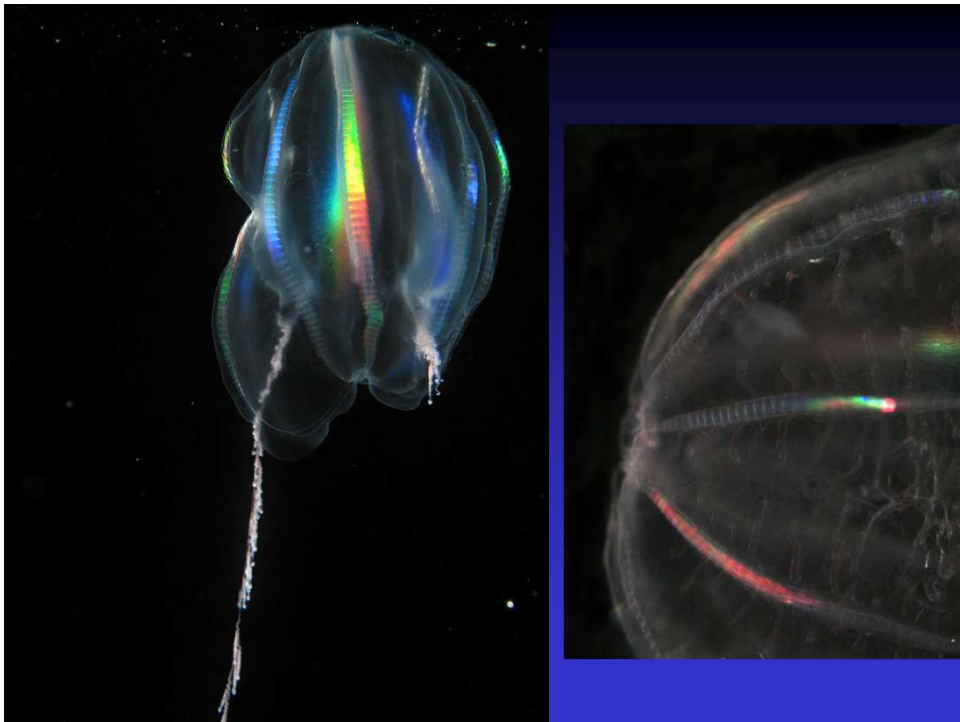
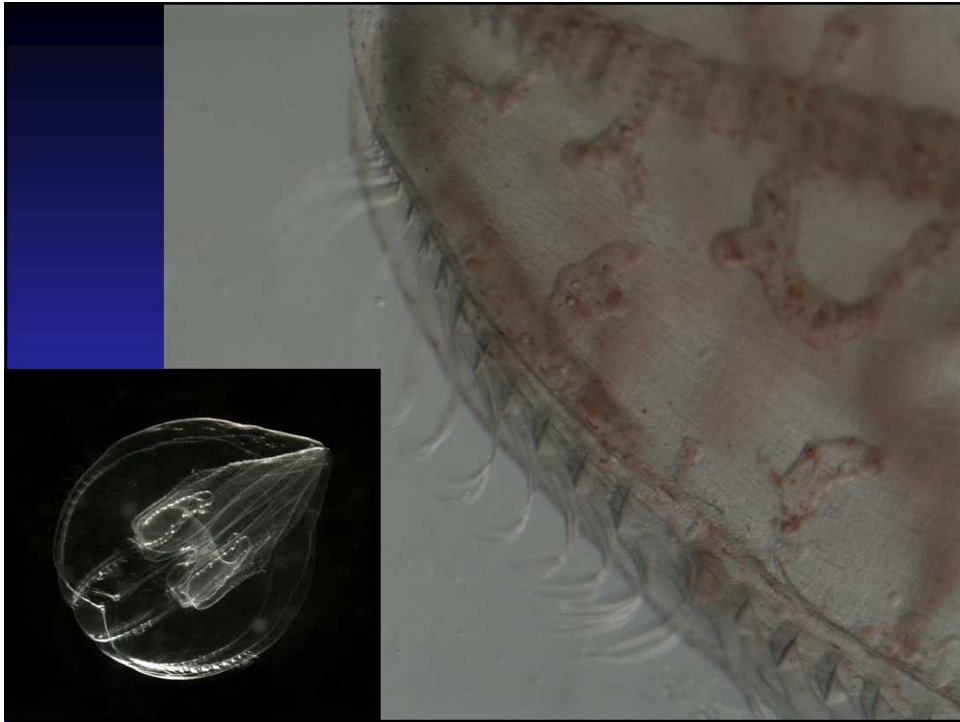
- Biradial symmetry
- 2 germ layers separated by mesoglea
- 8 rows of ctenes used for locomotion
- mouth & gut, generally a small anus
- aboral statocyst



Detail

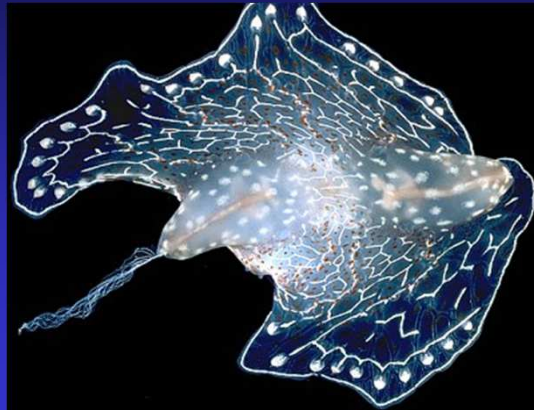
- In general, these are more fragile than cnidarians
- Often completely destroyed by nets....
- The tissue in some species is so watery that they are impossible to preserve...
- so even perfectly collected specimens cannot be maintained







A mesopelagic mystery
ctenophore



Benthic
ctenophores!



