

Phylum - Ctenophora

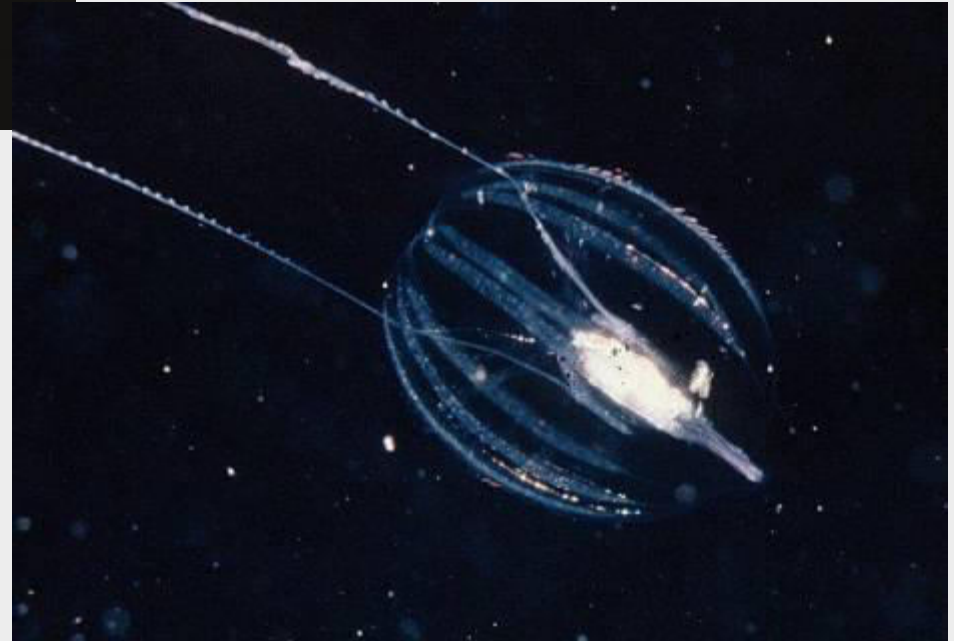
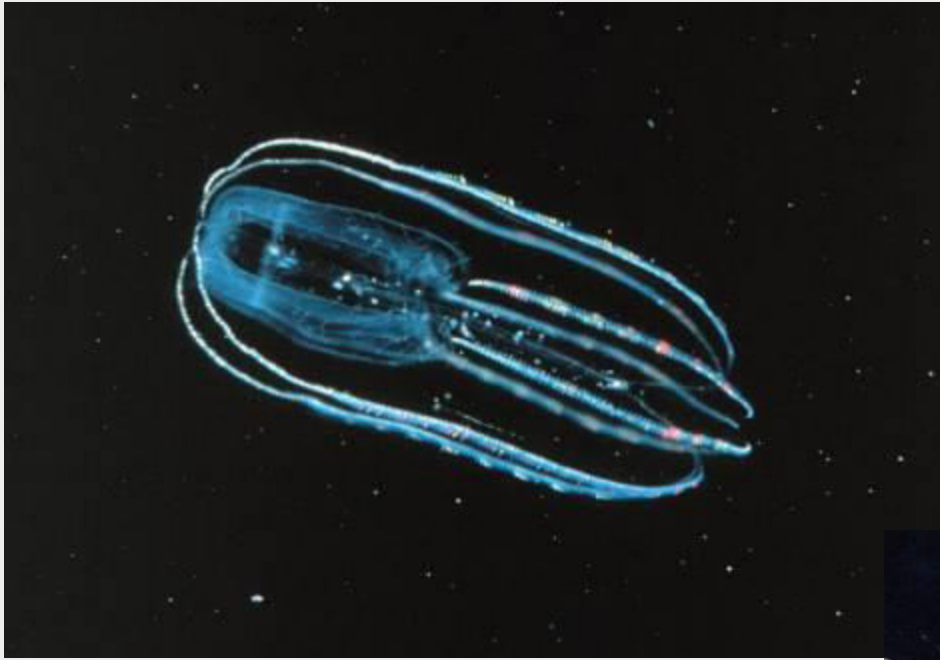
Structure and Affinities

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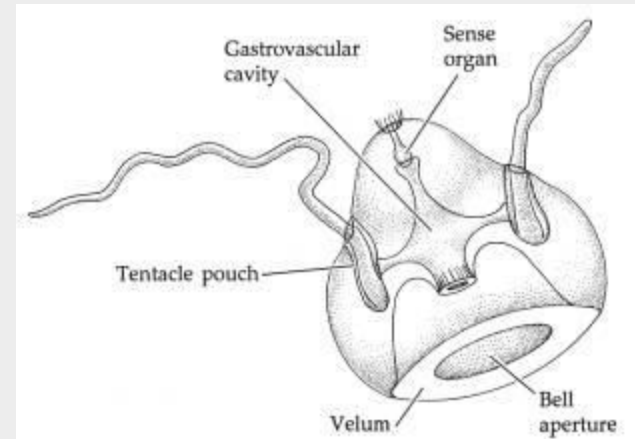
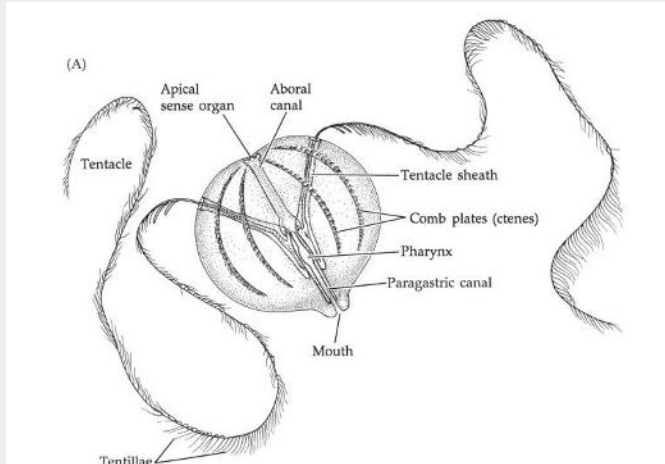
- **Phylum Ctenophora**
 - ★ **Phylogeny/Evolutionary relationships**
 - ★ **Bauplan**
 - **Overview**
 - **Feeding**
 - **Nervous system/movement**
 - **Reproduction**
 - ★ **Ecology**
 - ★ **Diversity**

Phylum Ctenophora: **comb jellies**



Ctenophora: Phylogeny

- Hydrozoan origins?
 - ★ Similarity to certain Hydrozoa (Trachylina)

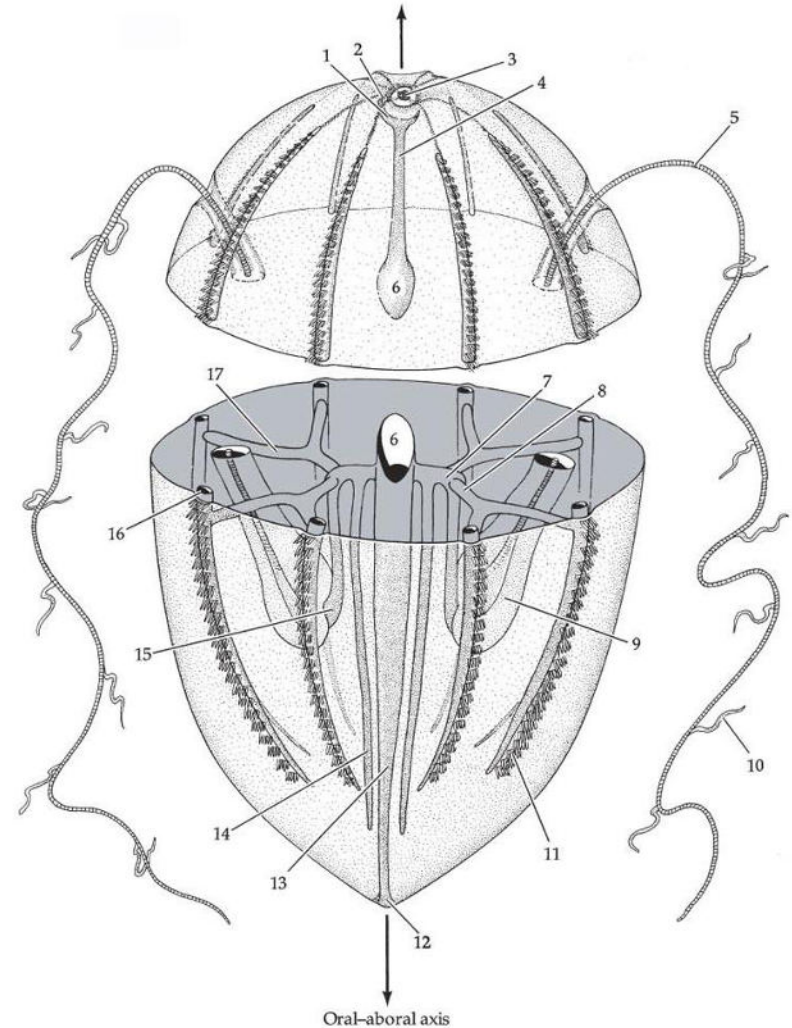


- Related to Platyhelminthes?
 - ★ Based on muscles, aspects of development
- The first animal?
 - ★ Recent molecular evidence

Ctenophora: Bauplan overview

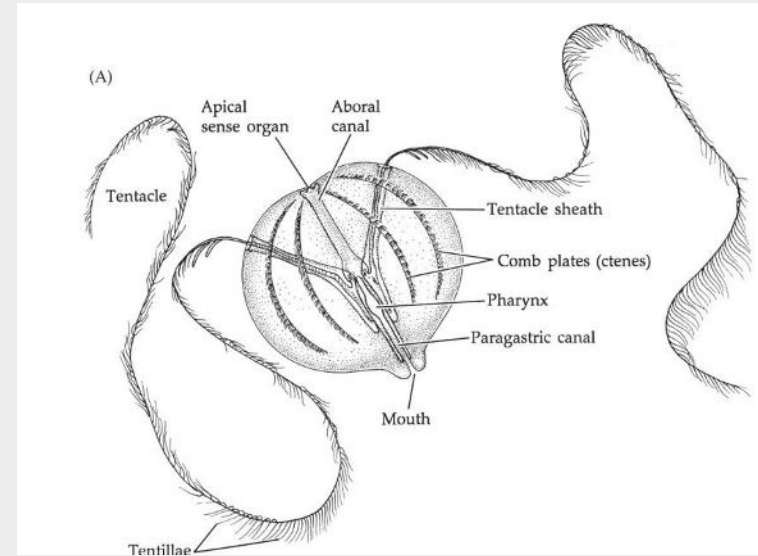
■ Distinctive features

- ★ Eight comb rows
- ★ Apical sense organ
- ★ Tentacles (some)



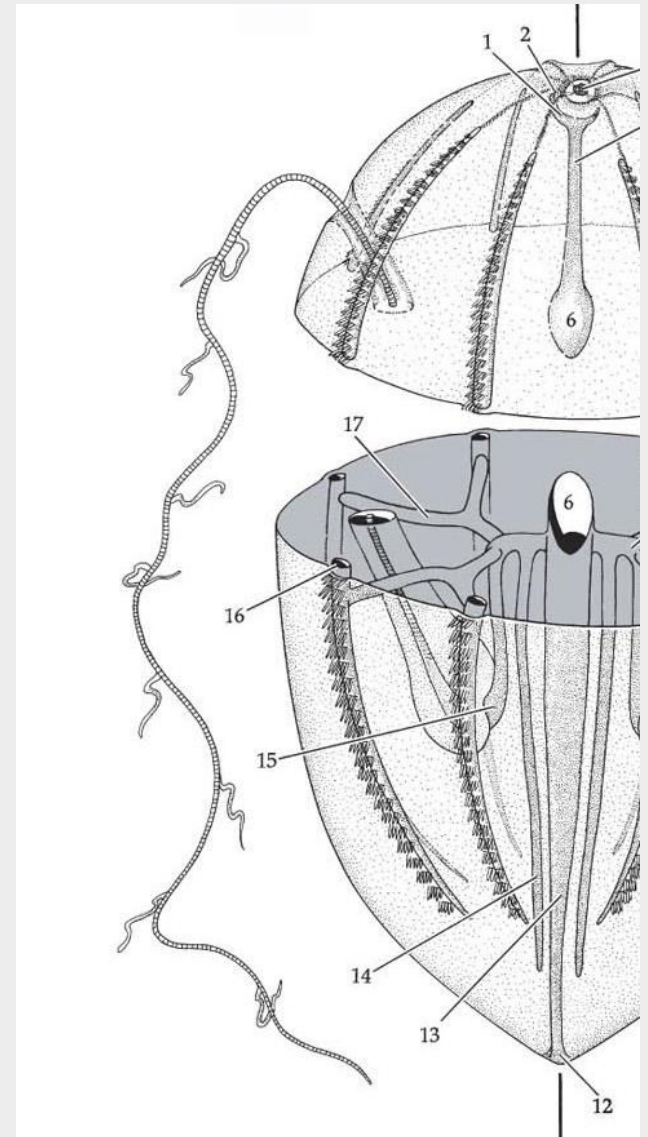
Ctenophora: Bauplan overview

- Tissues: diploblastic or triploblastic?
 - ★ Have ectoderm and endoderm
 - ★ Smooth muscles develop from mesenchyme cells
 - Sometimes considered as triploblasty
- Symmetry is “biradial”



Feeding (*Pleurobrachia*)

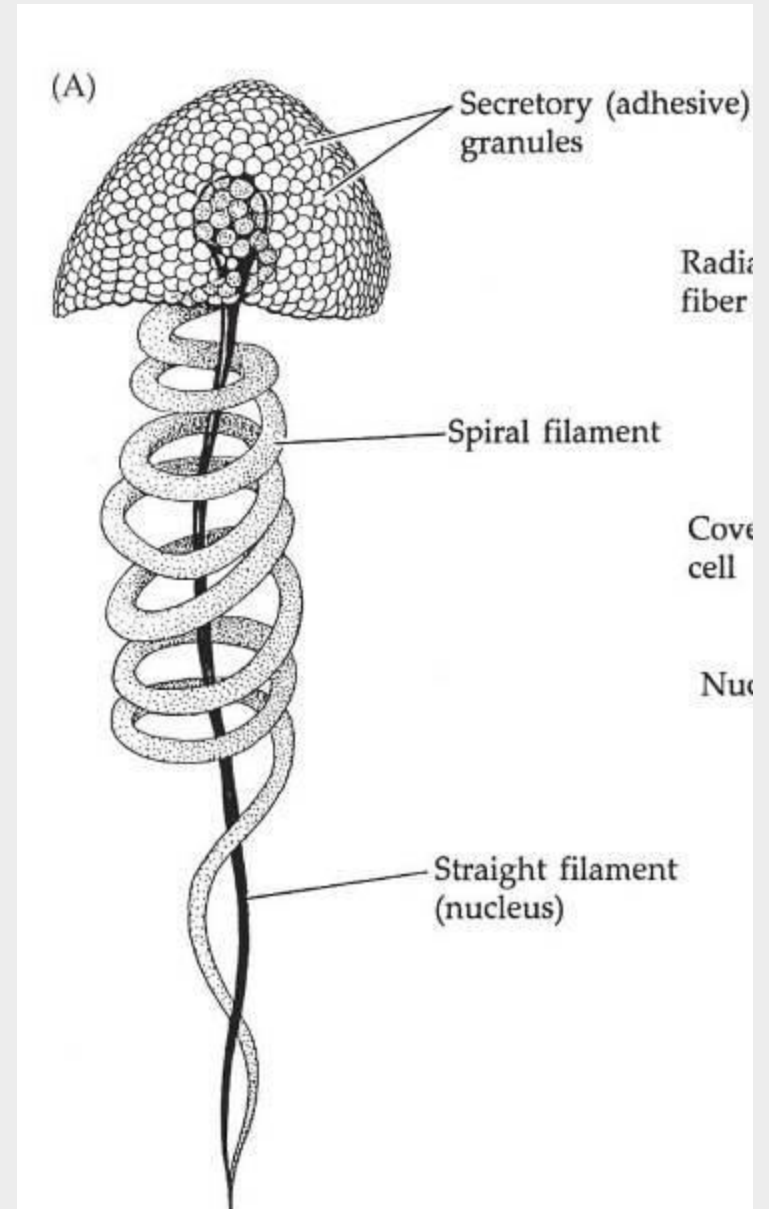
- **Predatory!**
- **Tentacles**
 - ★ **Extend up to 100X their body length**
 - ★ **Retract into sheaths**
 - ★ **Food sticks to them, and then they wipe them off in their mouth**
 - **What causes food to stick?**



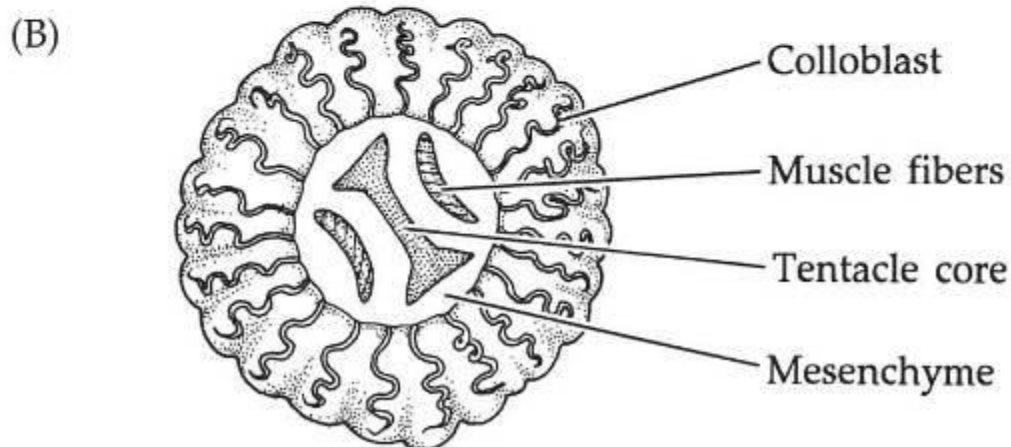
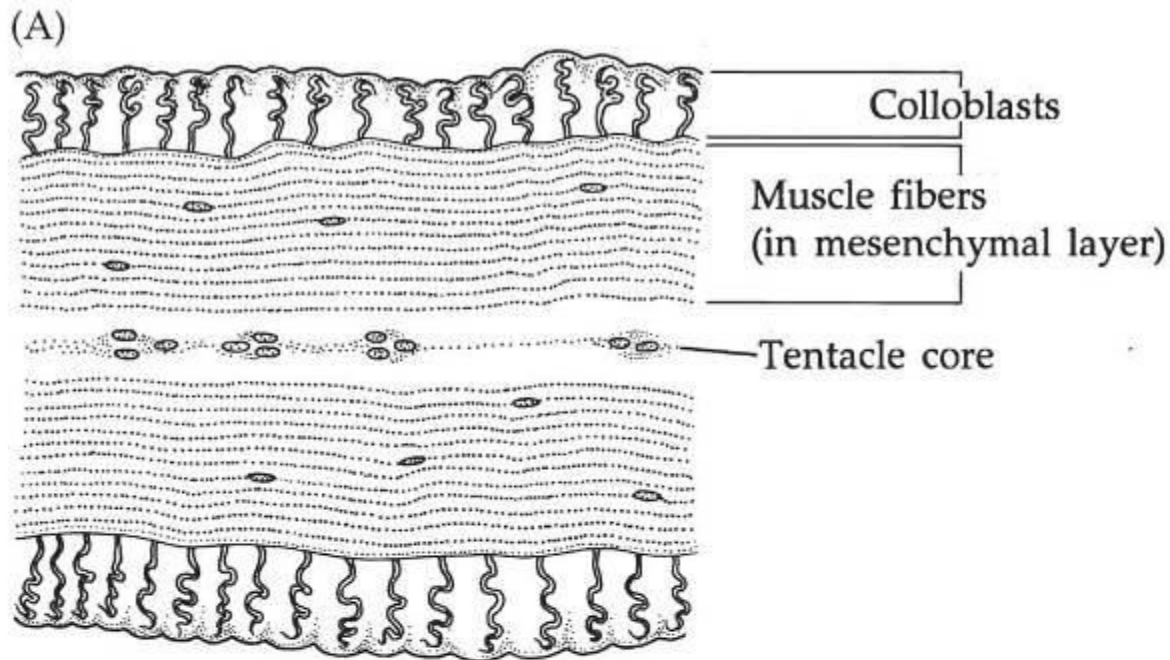
Feeding (*Pleurobrachia*)

■ Colloblasts

- ★ On tentacles
- ★ Near/on mouth
- ★ Anchored in muscle
- ★ Structure
 - Straight filament
 - Spiral filament
 - Head with adhesive granules
 - Associated neuron
- ★ Granules replaced

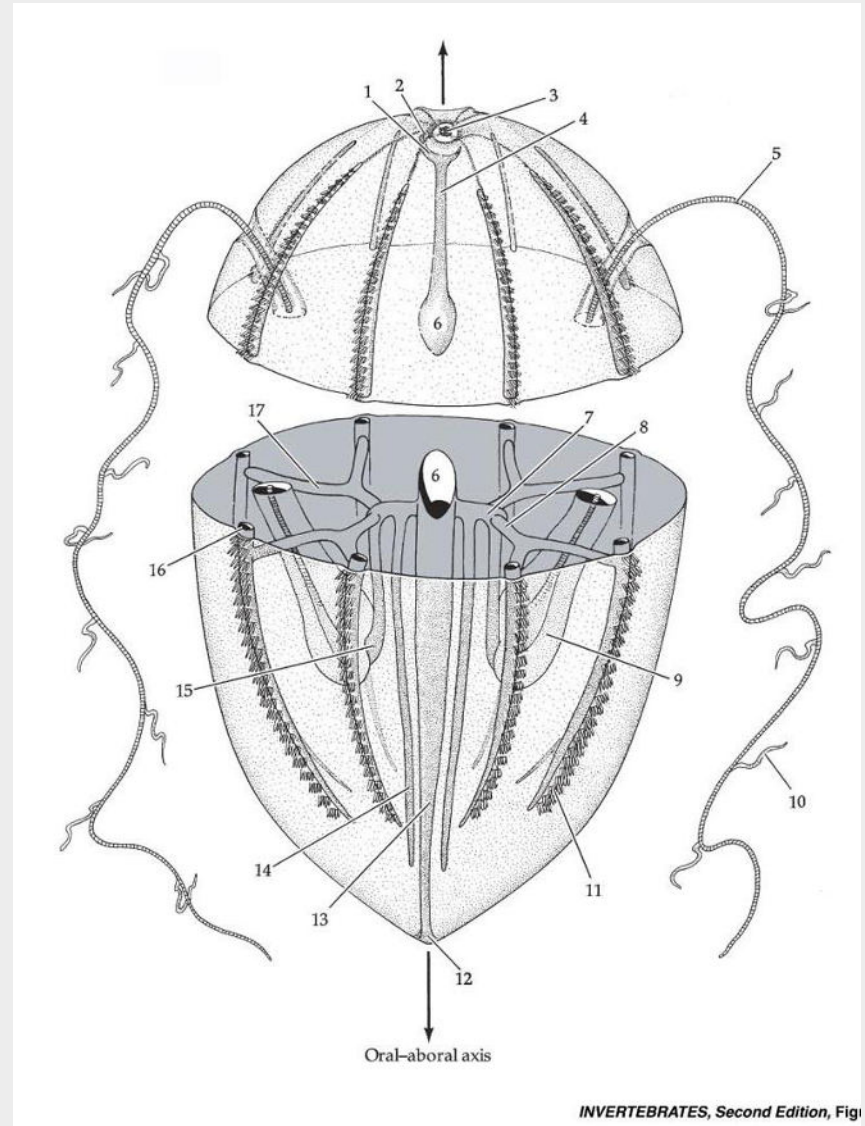


Colloblasts on tentacles



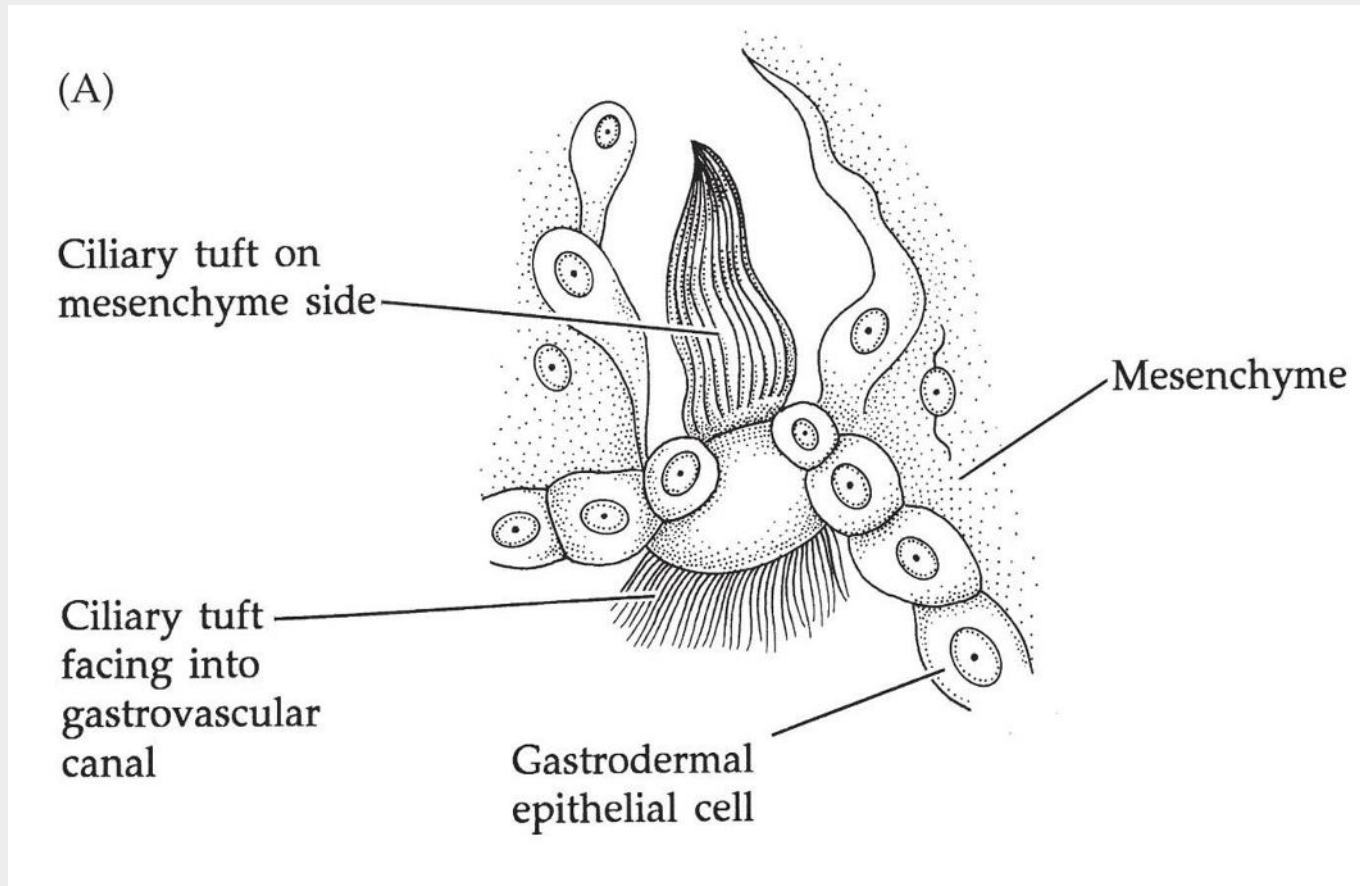
Feeding (*Pleurobrachia*)

- Mouth
- Pharynx
 - ★ Epidermal lining
- Gastrovascular canals
 - ★ 4 → 8
 - ★ Underlie comb rows
- Digestion
 - ★ Extracellular
 - ★ Intracellular
- Waste exits via mouth, anal pores (minimal)



Excretory system

- Cell rosettes resemble “flame bulbs” of Platyhelminthes



Circulatory system & Respiratory System

1. Lack of efficient circulatory system

2. Lack of gas exchange system

Nervous system/movement

- **General movement**
 - ★ **Mouth (oral end) forward**
 - ★ **Move via comb rows**
 - ★ **Muscle contraction more important in some**

Nervous system/movement

- Control of comb rows: **apical sense organ**

- **Modified Statocyst^(c)**

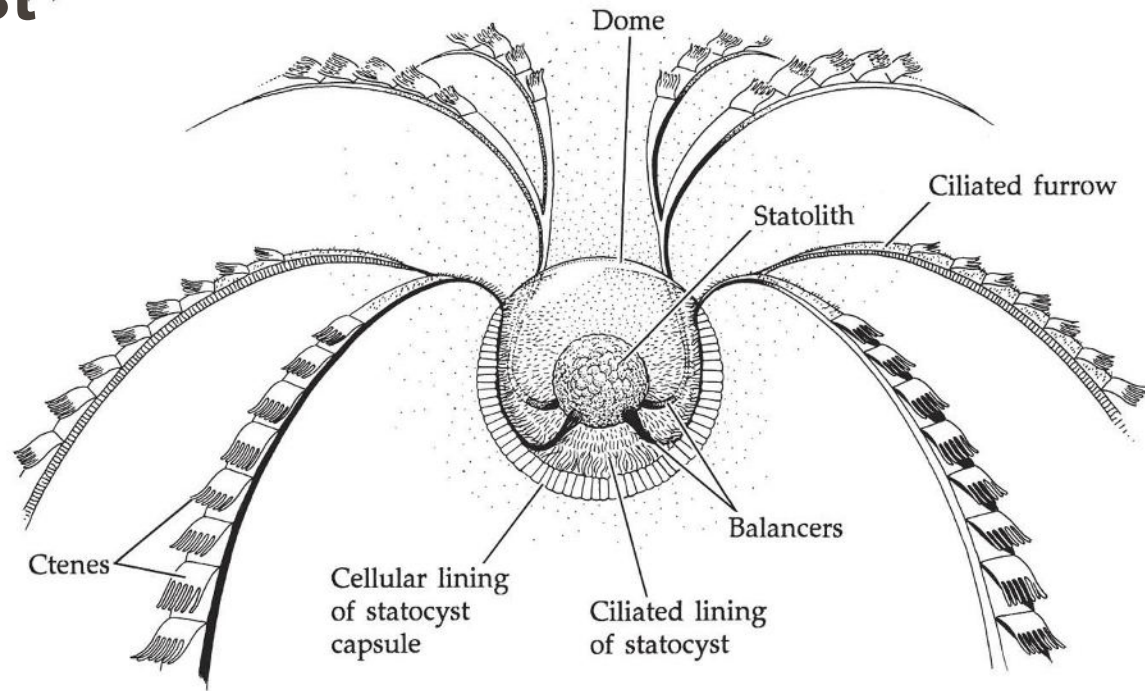
- ★ **Dome (from cilia)**

- ★ **Statolith**

- ★ **Balancers**

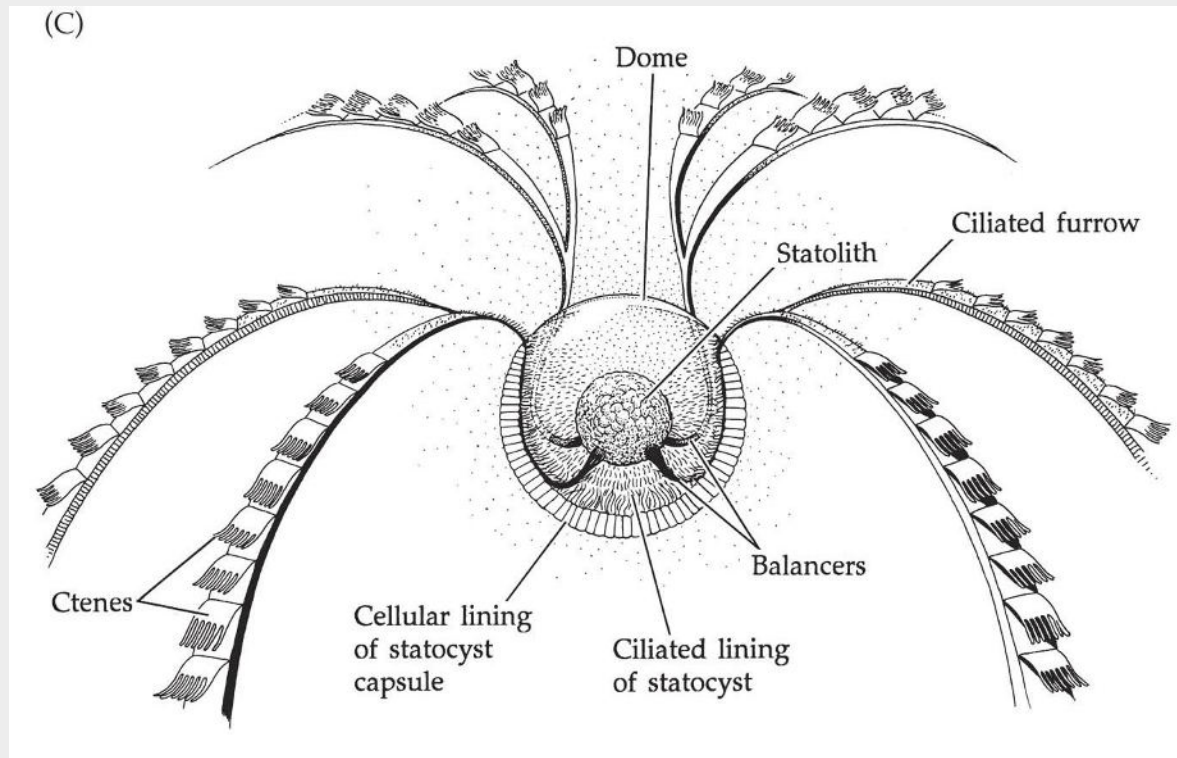
- ★ **Ciliated furrows**

- **One per comb row**



Apical sense organ: functioning

- Statocyst pushes against balancers →
- Beating of cilia in furrow → Beating of 1st comb
- Combs transmit waves mechanically
 - ★ How do we know this?
- Tilting → More vigorous beating in lower rows



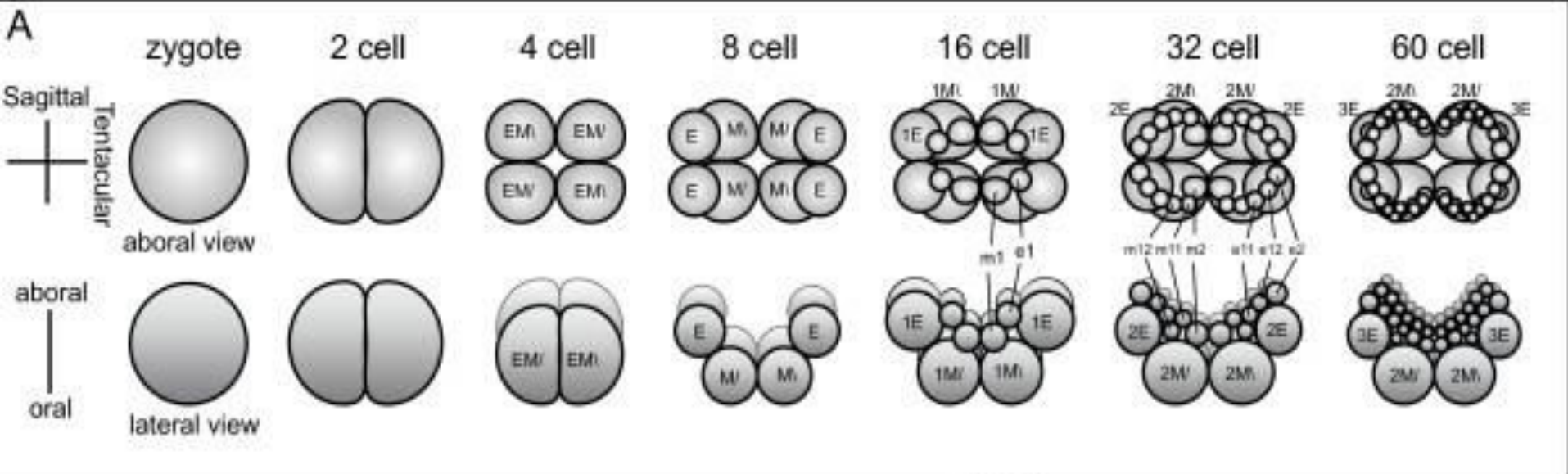
Nervous system/movement

- **Nerve net**
 - ★ Provides feedback to apical sense organ
 - ★ Helps coordinate beating between adjacent rows
 - ★ Controls muscles
- **Body receptive to touch, light, vibration, temperature, certain chemicals**
 - ★ Polar fields (ciliated regions) may be sensory
- **Muscles**
 - ★ Escape responses
 - ★ Key form of movement in some

Reproduction

- **Simultaneous hermaphrodites; may self-fertilize**
- **Gonads within the gastro vascular canals**
- **Eggs and sperm spawned via pores**
- **Adults generally die after spawning**
- **Polyspermy and female choice**
- ★ **Egg nucleus chooses the sperm nucleus!**

CTENOPHORA – DEVELOPMENT



1. Form blastomeres – meridional cleavage

2. Third division – 8 macromeres

3. Fourth division – latitudinal and unequal - micromeres

4. Micromeres divide and spread over aboral pole and macromeres

5. Macromeres invaginate (gastrulation)

-micromeres become ectoderm

-macromeres become endoderm

6. Just before gastrulation –

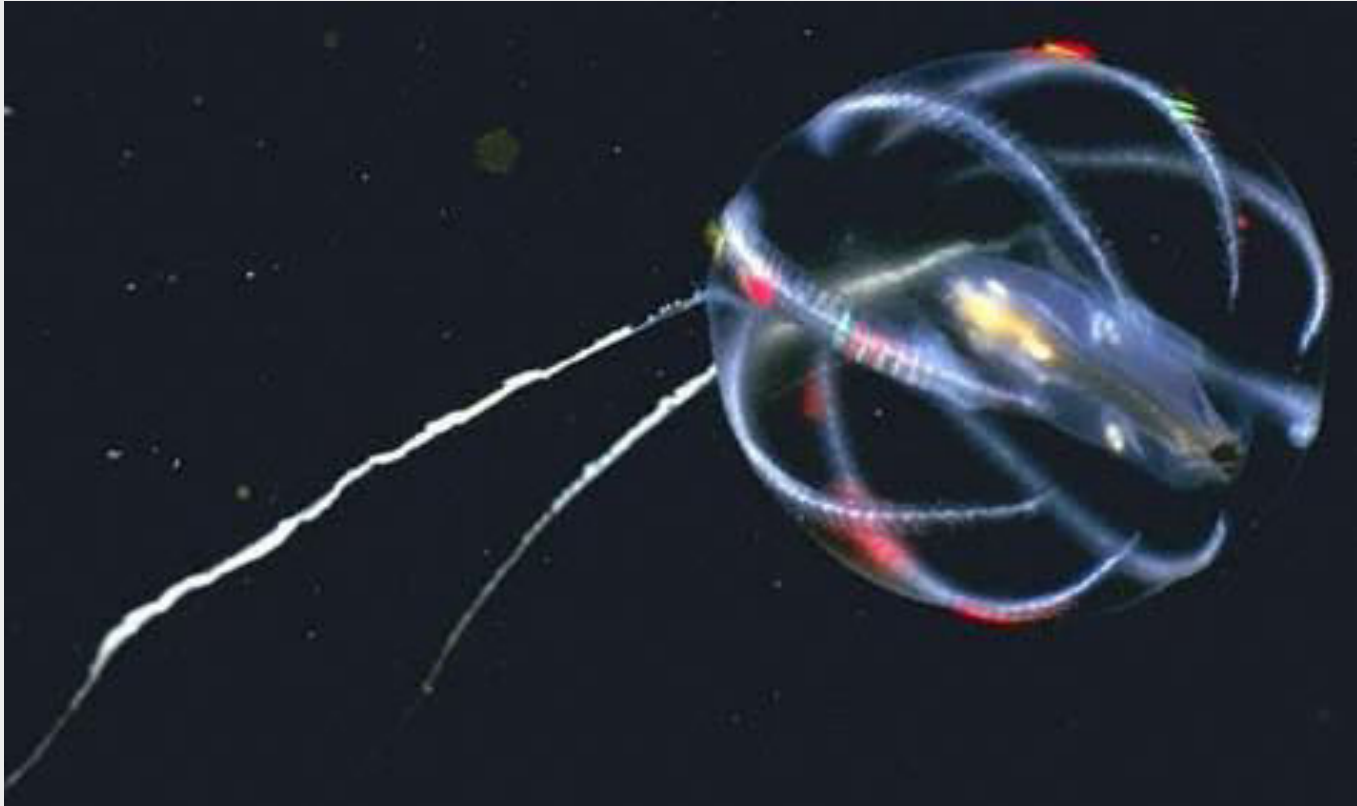
**- Produce additional micromeres on oral side –
invaginate to form stomatodeum**

Ecology

- ★ Solely marine, surface to deep ocean
- ★ Holoplankton
- ★ Larval fish and invertebrates
- ★ Consumes anchovy larvae and copepods
- ★ Potential for recovery
- ★ Bioluminescent
- ★ Potential for recovery

Diversity: a sampling...

- Order Cydippida: *Pleurobrachia* spp.



Diversity: a sampling...

- Order Beroida: *Beroe* spp.
 - ★ Engulf prey with their muscular lips.
 - ★ Feed on other ctenophores!



Diversity: a sampling...

- **Order Cestida: *Cestum* spp.**

- ★ **Compressed, ribbon-like body**
- ★ **Moves via muscular undulation & comb rows**
- ★ **Zooplankton trapped in mucus on body, propelled toward mouth via cilia**



Diversity: a sampling...

- Order Lobata: *Mnemiopsis* spp.
 - ★ Oral lobes for movement & food collection.
 - ★ Zooplankton trapped in mucus on body, propelled toward mouth via cilia (as in the Cestida)



COMPARISON BETWEEN CNIDARIA AND CTENOPHORE

CNIDARIA

Diploblastic with acellular mesoglea

Radial symmetry

Nematocysts

Gastrovascular body cavity

Nerve net

Musculature – extensions of epithelial cells

Alternation of generations

Planula larva

CTENOPHORA

Diploblastic (triploblastic?) with cellular mesenchyme

Biradial symmetry ;
oral/aboral axes

Colloblasts

Gastrovascular body cavity

More specialized nerve net

Musculature – from mesenchyme cells

No alternation of generations

Cydippid larva

Thank you