Class Crustacea: Senses, Development and more Taxonomy

A big day in 310

Crustacean Senses

- **Mechanoreception**
  - Touch, “hearing,” **proprioception**
  - **Proprioception**: different from other senses because it provides internal feedback – i.e. limb position, movement, cuticular stress
- **Chemoreception**
- **Photoreception**

Crustacean Sense Organs

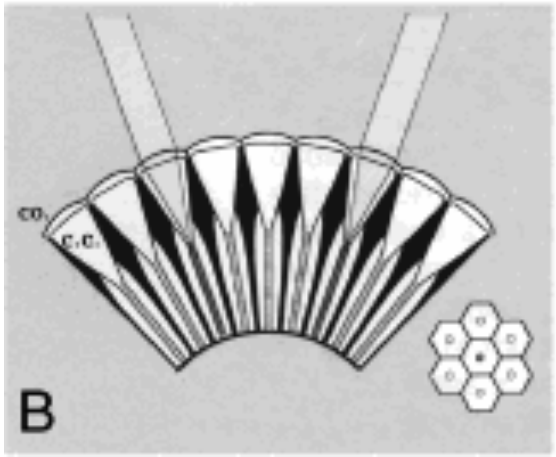
- Eyes (photoreception)
- Sensory Setae (Mechanoreception and Chemoreception)
- Statocysts (balance)

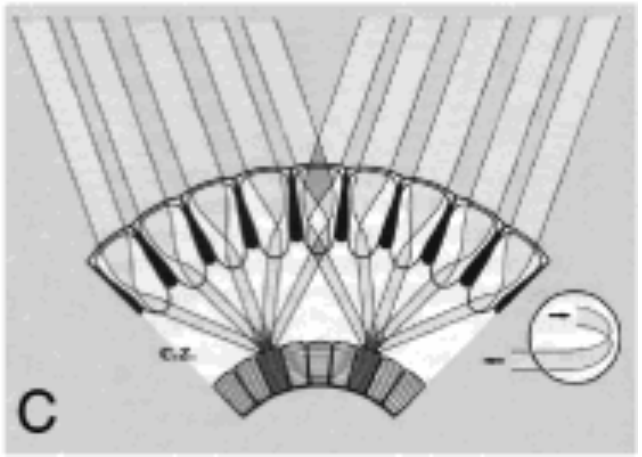
Crustacean Eyes

- Most have two compound eyes
- **Compound eye**
  - Independent photoreception unit containing cornea, lens, and cells to distinguish brightness and color
  - **Ommatidia:** single visual unit of compound eye
- **Naupliar Eye**
  - Does not form images
  - Determines direction of light source

Types of Compound Eyes

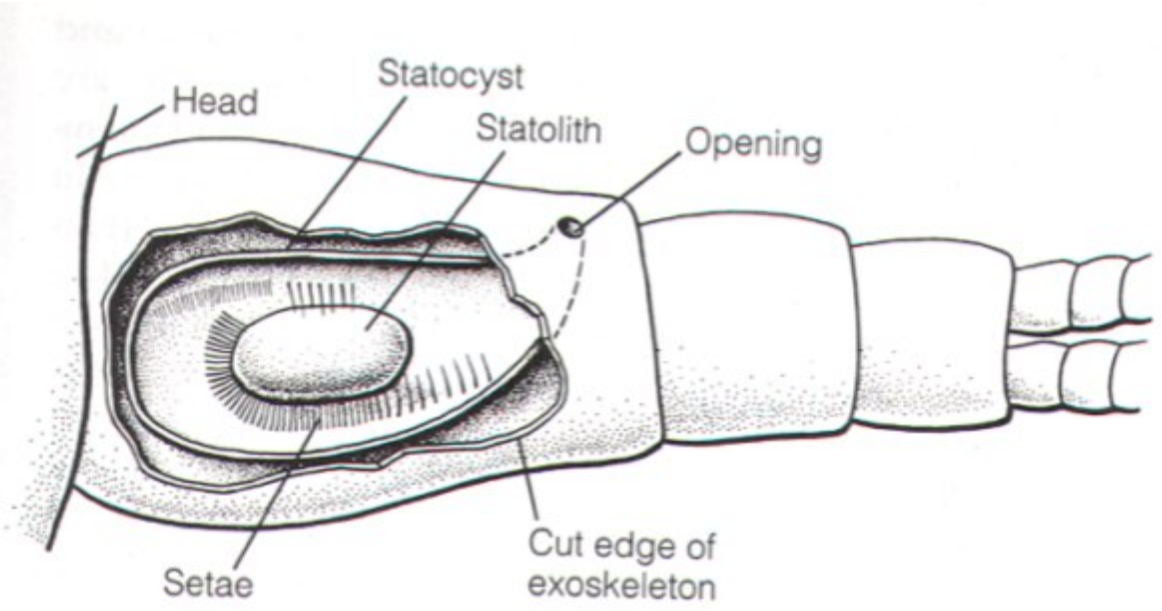
- **Apposition Eye**
  - Each lens is directly apposed to the **rhabdom** (photo receptor, light sensing).
  - Each lens is very small; each rhabdom receives very little light
  - Works best in bright light
- **Superposition Eye**
  - Numerous ommatidia combine to direct their light onto a single rhabdom
  - Animals can see better in dim light





Statocysts

- The equilibrium receptor (balance)
- Cavity with heavy particle, **statolith** rests on setae that detect displacement



Setae

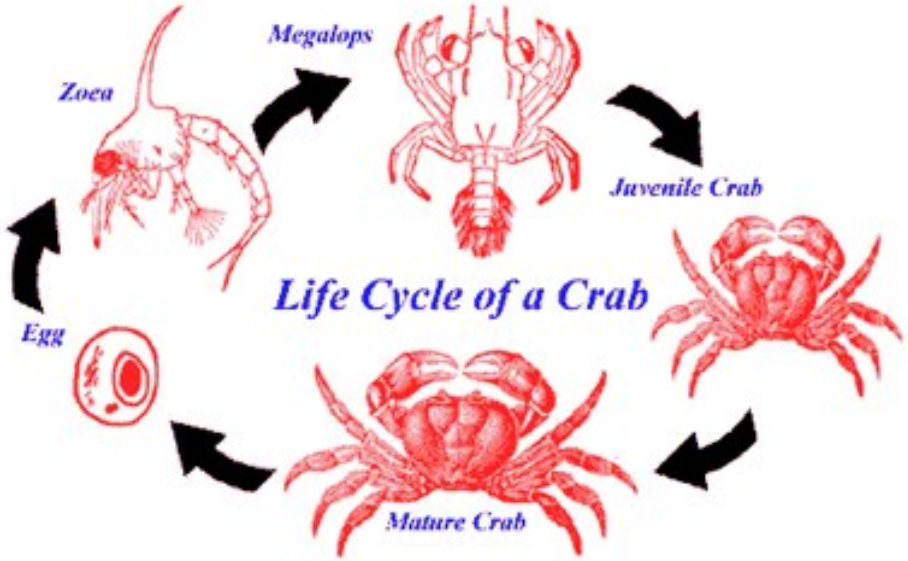
- Hair like structures used for mechano and chemo reception (and other)
- Extend through exoskeleton—linked to the nervous system
- **Aesthetascs:**
  - Patches of sensory setae usually found on first antennae
  - Important for locating food and mates

Senses: in lab

- We'll examine chemoreception by counting antennal flicks before and after adding a food smell to the water
- We'll look at setae: both sensory and other
- We'll look at crustacean eyes

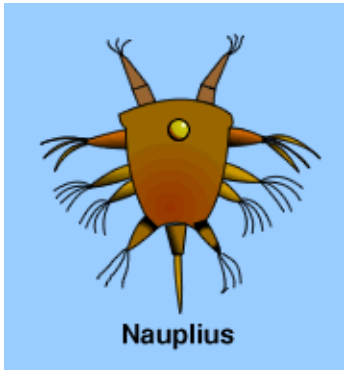
Crustacean Development

- Very complicated
- Number and type of larval stages varies considerably
- Crustacean larvae may look nothing like their parents



The Nauplius Larva

- Characteristic crustacean larval stage: **nauplius**
- The first crustacean larval form
- Many pass through this stage in the egg
- Has a head and a telson; the thorax and abdomen have not developed yet
- One eye
- Starts with three appendages but may add appendages after molting



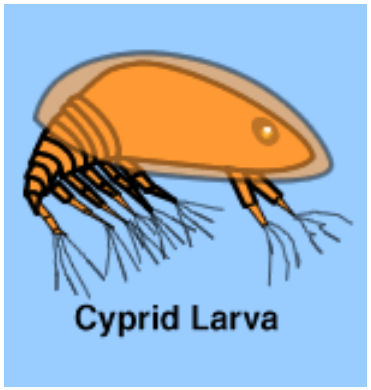
www.mesa.edu

Copepod :www.theseashore.org

Barnacle :www.microscopy-uk.org

Barnacle Development

- Barnacles are highly modified as adults, but the nauplii remain the same
- Barnacles spend weeks as a nauplius, undergo 4-6 nauplear molts before molting into a **cyprid**
- Cyprid larva is the final, non-feeding stage before settlement
- Cyprid use modified antennae to explore the benthos looking for an appropriate place to settle and metamorphose into an adult



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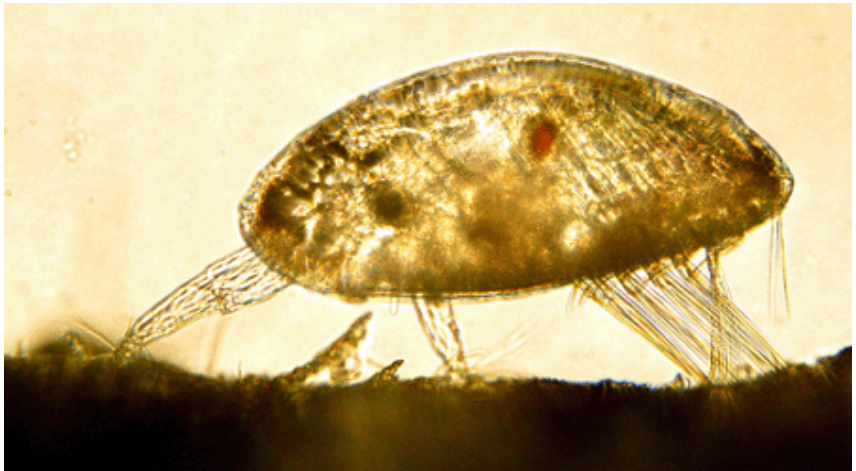
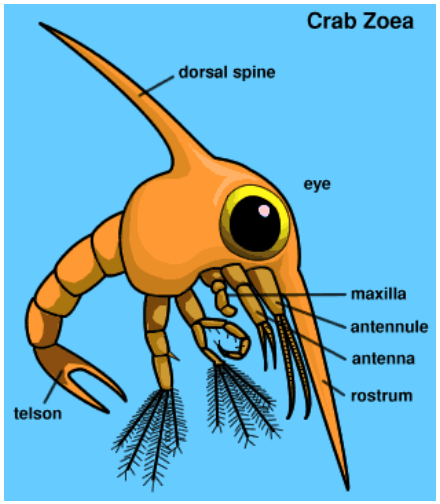


Decapod Development

- Decapods usually hatch as a **prezoea**
  - Not a true larval stage—a compact form still partially enclosed by the egg membrane
- Once membrane is shed (few minutes) the larva is called a **zoea**.
- The zoea's spines expand and harden—making it more difficult for predators to swallow!



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Blue king crab zoea: wikipedia

Decapod Development

- After weeks or months and several molts as a zoea, decapod larvae molt to the **megalops** stage

- Megalops can both swim and crawl— ideally suited for its sole function of finding good habitat before it settles and becomes a juvenile

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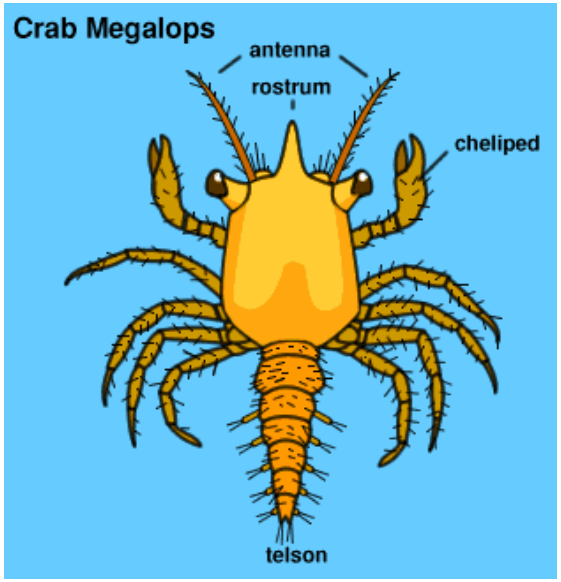
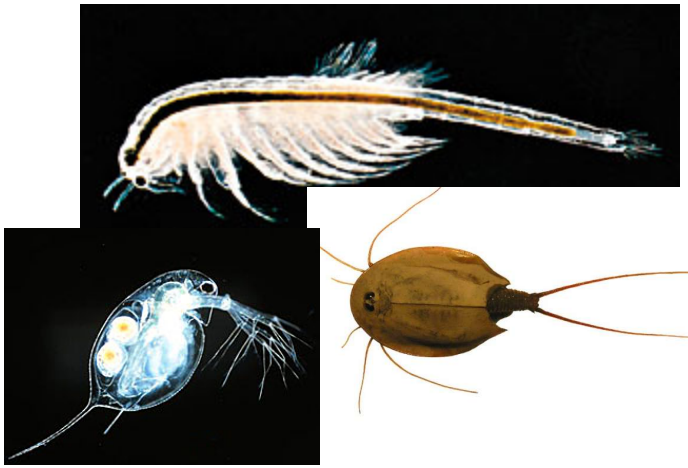


www.oceanexplorer.noaa.gov

Taxonomy: Subclass Branchiopoda

- Many adapted to ephemeral (temporary ponds) or extreme (hypersaline) environments—Maybe because unable to compete or avoid predation in more typical habitat
- Many produce cysts that survive long periods of dessication (sea monkeys—add water, hatch instantly)
- Characterized by paddle like thoracic appendages that are used for both locomotioin and gas exchange
- Composed of 4 orders
  - Anostroca
  - Notostraca
  - Cladocera
  - Conchostraca



Taxonomy: Subclass Copepoda

- Found in fresh, brackish, and marine environments
- Found in all marine environments from the surface to depths of over 5000m
- Often dominate the marine zooplankton and have incredible ecological importance
- May be free living or parasitic. Most free living in one of three orders:
  - Calanoida
  - Harpacticoida
  - Cyclopoida

Taxonomy: Shrimp and Shrimpy Taxa

- The term shrimp has been used for any crustacean that doesn't look like a crab, lobster or barnacle (i.e. brine shrimp)
- You will learn to identify true shrimp (Caridea) from all other "shrimp"
- You will look at coloration, feeding and behavior in a *Crangon*—a true shrimp

What we are doing today:

- We're looking at lots of different organisms, mostly under the scopes
- Have fun and ask lots of questions!!
- What not to do:
  - mix fresh and saltwater samples together
  - mix live and preserved dishes or pipettes