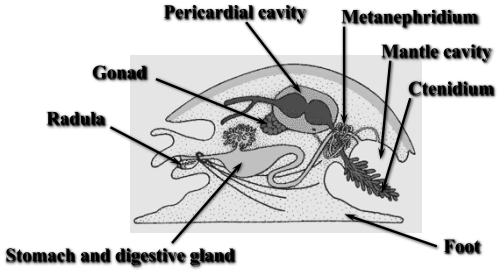
The Molluscan Body Plan

- The body plan is similar and distinct from all other phyla
- The Mollusca body plan includes:
  - A large muscular foot
  - A radula
  - Mantle and mantle cavity
  - Usually a small head
  - Soft unsegmented body
  - A hard non-living calcareous shell

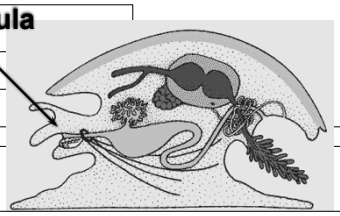
Body Plan – *Characteristics of the hypothetical ancestral mollusc*



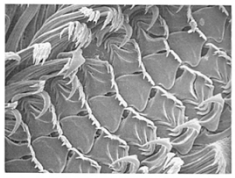
Phylum Mollusca

- Circulatory system
  - Heart (2 chambers)
  - Open system in most groups
  - Closed in cephalopods

Radula



Rasping tongue – scraping things off rocks



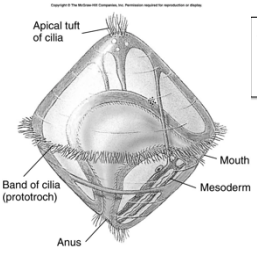
Reproduction

- Reproduction
  - Sexes are separate with fertilization occurring in the water column
  - Trochophore larvae
    - Free swimming which settles and metamorphoses into an adult

http://www.youtube.com/watch?v=KQdYDJU3JHM

http://www.youtube.com/watch?v=8ynjLPnF_2c&p=688A33FFB1266BA4&playnext=1&index=6

Trochophore Larva

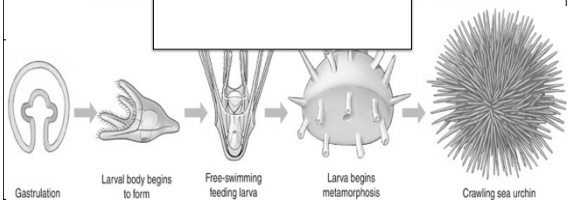


- Does this look anything like the adult?

Direct vs. Indirect Development

- When lots of nourishing yolk is present, embryos develop into a miniature adult.
  - **Direct development (Looks directly like adult)**
- When little yolk is present, young develop into larval stages that can feed.
  - **Indirect development (Does NOT look like adult)**
- Mammals have little yolk, but nourish the embryo via the placenta.

- Know the difference



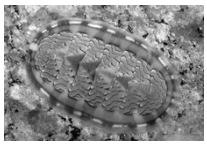
Phylum Mollusca

Class Polyplacophora	Class Gastropoda	Class Bivalvia	Class Cephalopoda
chitons	Snails Sea slugs nudibranchs	clams	Squid Octopus Cuttlefish Nautilus

More than 500,000 known species

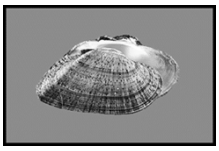
Class Polyplacophora – Chiton

- Eight dorsal plates
- Reduced head
- Radula reinforced with iron
  - Scrape algae from rocks



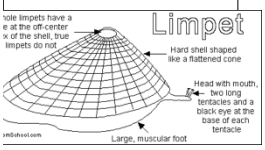
Class Bivalvia

- Two shells
- Most are filter feeders
- No head or radula
- Burrow
  - Sand, wood, rocks



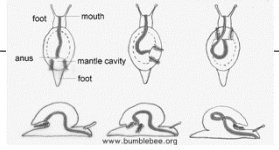
Class: Gastropoda
Snails, limpets slugs

- Terrestrail, marine
- Mantle cavity functions as lung



Features of the Class Gastropoda

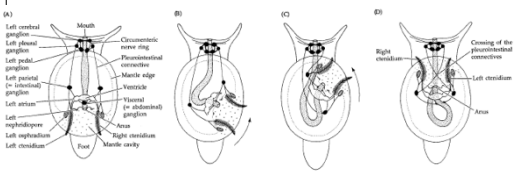
- Torsion – is the 180˚, counterclockwise twisting of the visceral mass, mantle and mantle cavity. This position twists the gills, anus, and openings from the excretory and reproductive systems just behind the head and nerve cord, and twists the digestive tract into a U shape.



More on Torsion in Gastropods

Torsion in gastropods

Takes place in development
Rotation of visceral mass and overlying mantle and shell 180° with respect to foot and head.
Gut ends up U-shaped and incipient organs are switched left to right.
Many gastropods remain torted.



3 Advantages of Torsion

- 1. Allows the head to retreat into the shell first. Allowing the gastropod to protect its head from predators first.
- 2. Allows clean water to enter the anterior of the mantle cavity.
- 3. Allows the snail's sensory organs to be orientated into the direction the snail is moving.

Disadvantage of Torsion

- The anus and nephridia empty dorsal to the head
  - The solution – some snails have notches or openings in the mantle that allow waste to exit posterior to the head
  - The solution – some snails undergo detorsion by untwisting 90° allowing the mantle cavity to open to the right side of the body.

Class Cephalopoda

- The most complex molluscs
- Anterior portion of their foot modified into a circle of arms used for
  - Prey capture
  - Attachment
  - Locomotion
  - Copulation

- Foot is also incorporated into a foot used for jet like locomotion

Class Cephalopoda - Cuttlefish

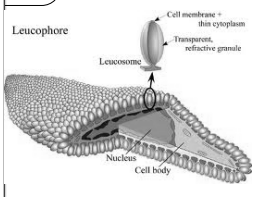
- Cuttlefishes have a small curved shell, completely enclosed by the mantle.

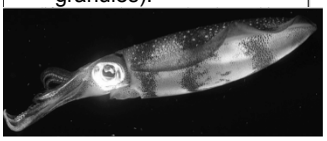
Class Cephalopoda – Feeding and Digestion

- All have jaws (beak like structure for tearing food) and radula (rasps food)

Class Cephalopoda – Communication

- Visual signals allow cephalopods to communicate.
  - Movement of body and arms
  - Color changes effected by **chromatophores** (cells in the skin containing pigment granules).





Chromoatophore – Form/Function

http://www.youtube.com/watch?v=2x-8v1mxpR0

Class Cephalopoda

- Most cephalopods have an **ink sac** that secretes **sepia**, a dark fluid containing the pigment melanin.
  - When a predator tries to attack, the animal ejects the ink into the water where it hangs between the animal and the predator screening a quick escape.

Sepia– Form/Function

Octopus with secretes sepia