27-4 Mollusks

What Is a Mollusk?

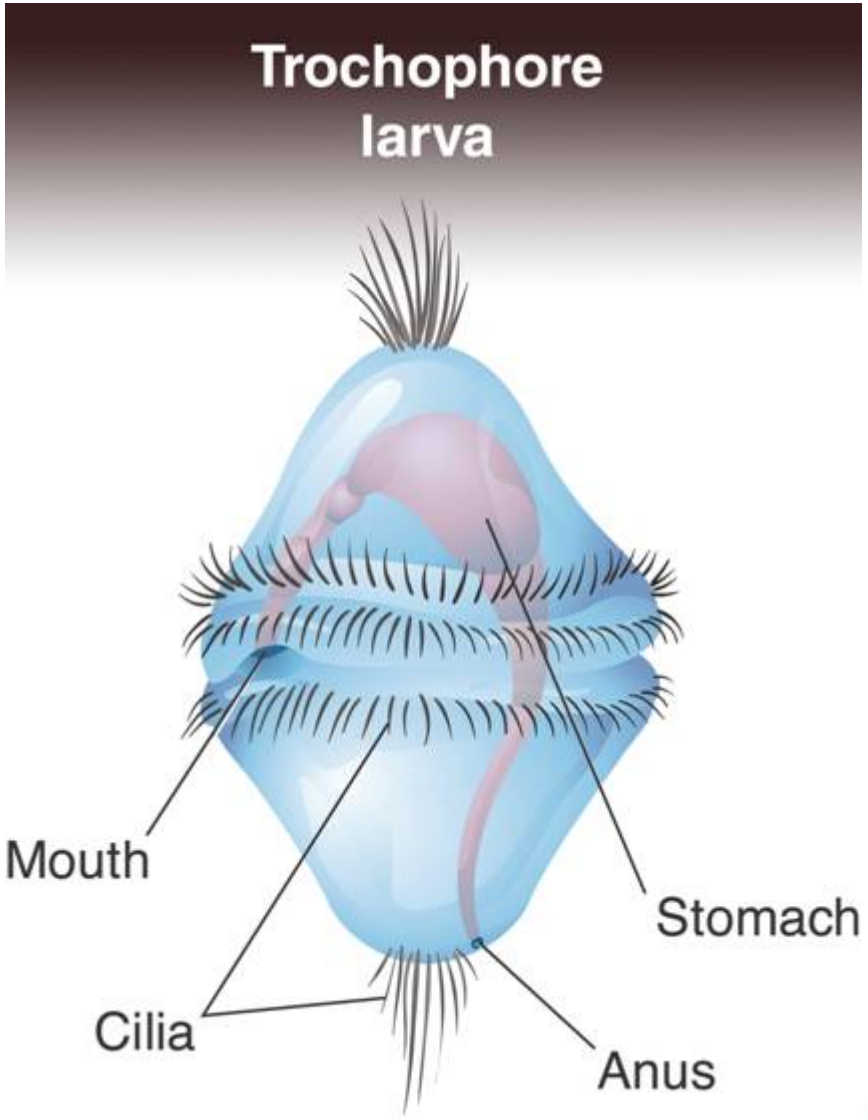



- **Mollusks** are **soft-bodied animals** that usually have an **internal or external shell.**
- Mollusks include snails, slugs, clams, squids, octopi...
- They are group together because many mollusks share similar developmental stages.

Mollusks form the **2nd largest animal phylum** ~ 100,000 species (after arthropods).

Many aquatic mollusks have a free-swimming larval stage called a **trochophore**.

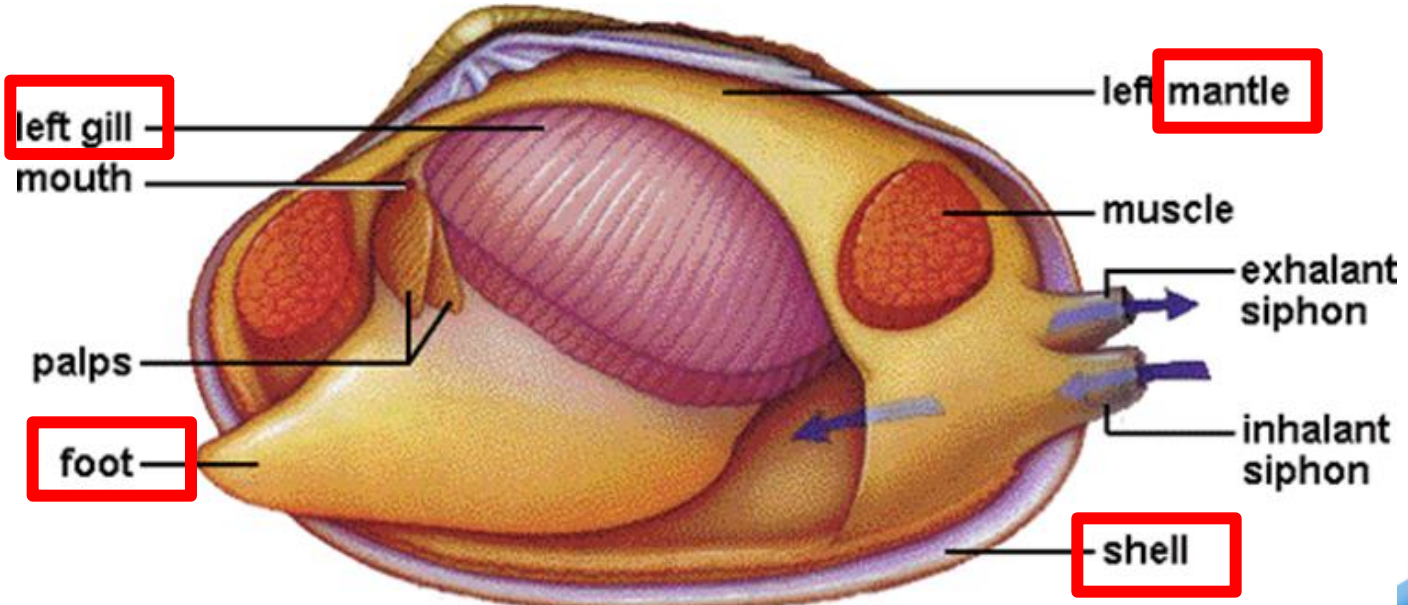
The trochophore larva is also characteristic of annelids, indicating that these two groups may be closely related.



Body Plan

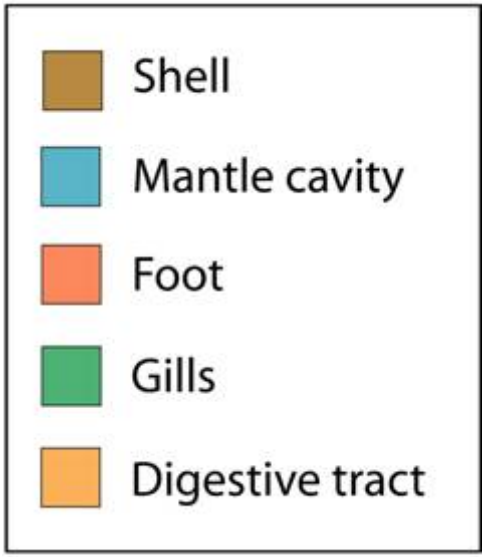
All mollusks have:

- A **mantle** - a soft, outer layer of their bodies which generally produces a protective **shell**
- A muscular **foot** - used for locomotion or attachment
- **Visceral mass** - contains most of the internal organs (digestive, excretory, circulatory, nervous systems)
- **Gills or lungs** - enclosed within the mantle cavity



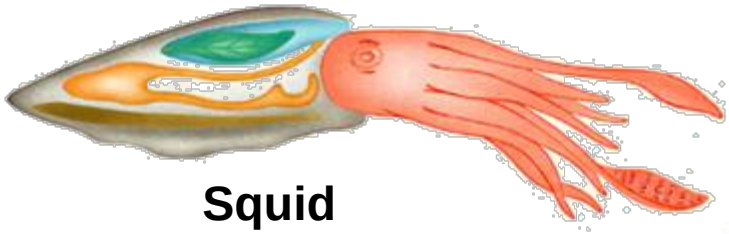
The muscular **foot** takes many forms

- flat structures for crawling
- spade-shaped structures for burrowing
- tentacles for capturing prey

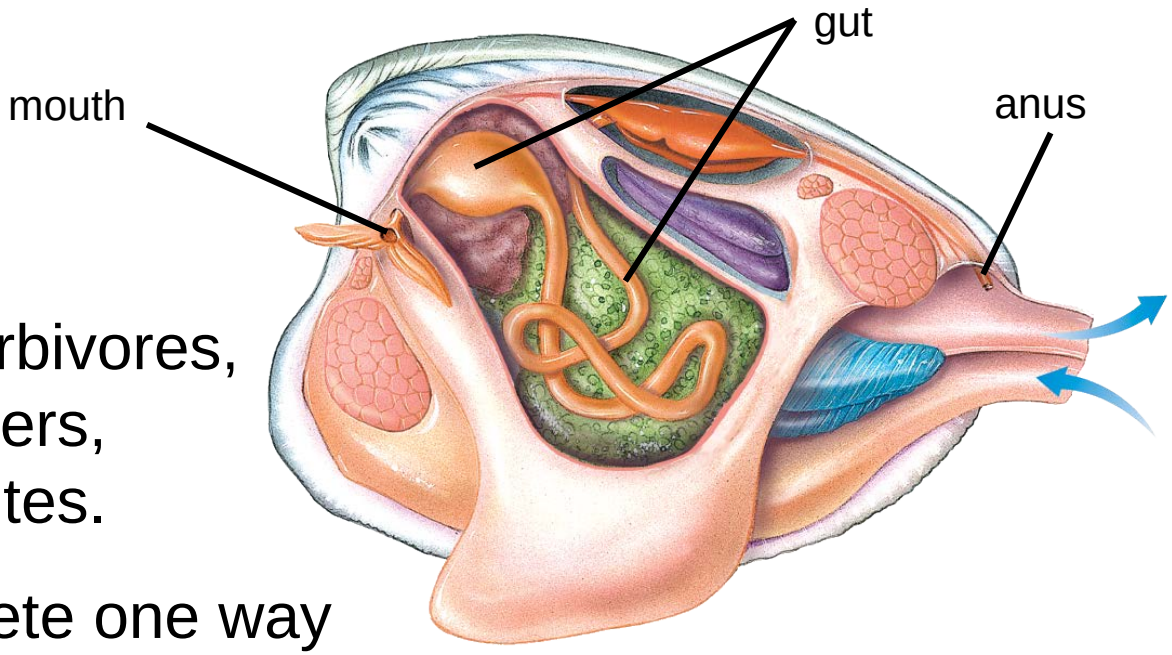


Snail

Clam



Squid



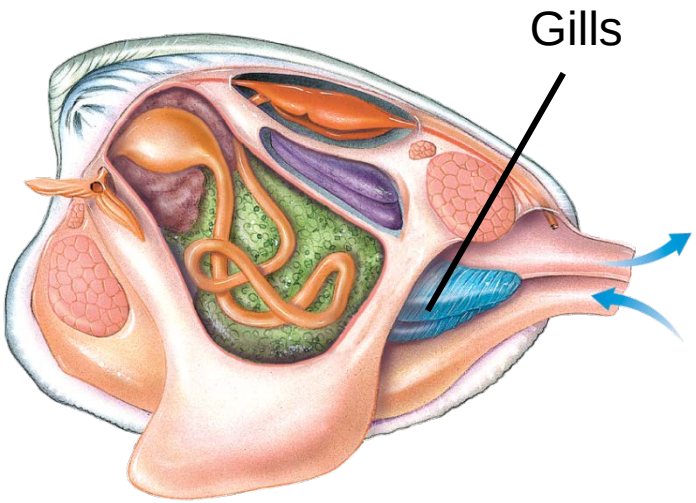
Feeding

- Mollusks can be herbivores, carnivores, filter feeders, detritivores, or parasites.
- They have a complete one way digestive tract.

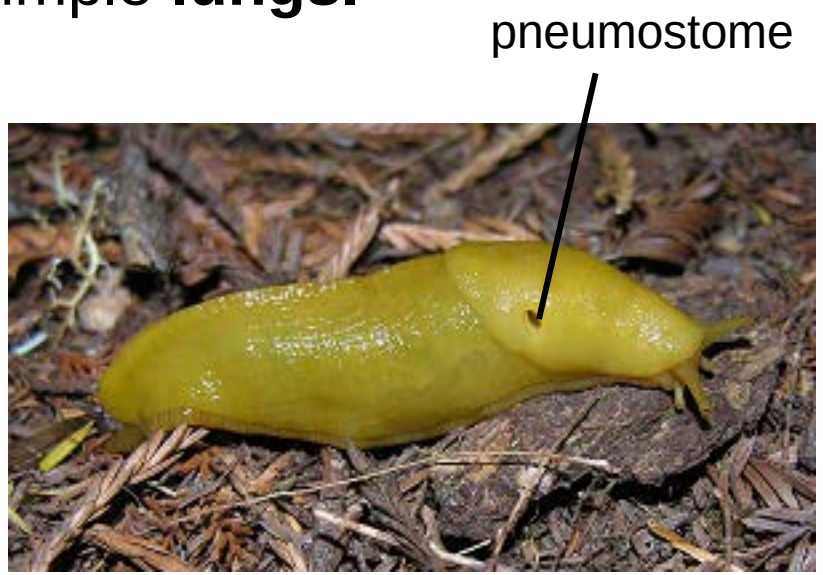
Nautilus Eating a Crab

Respiration

Aquatic mollusks breathe using **gills** inside their mantle cavity.



Land mollusks breathe with simple **lungs.**

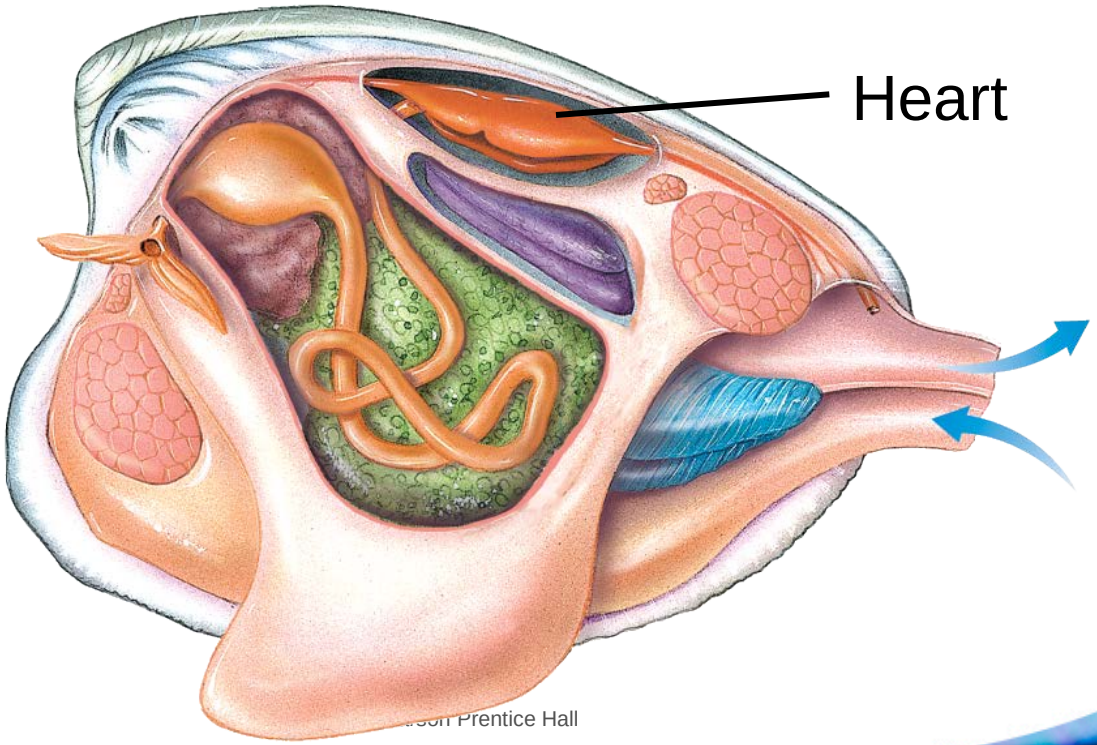


The pneumostome accesses to the respiratory lungs, reproductive organs and anus

Circulatory system

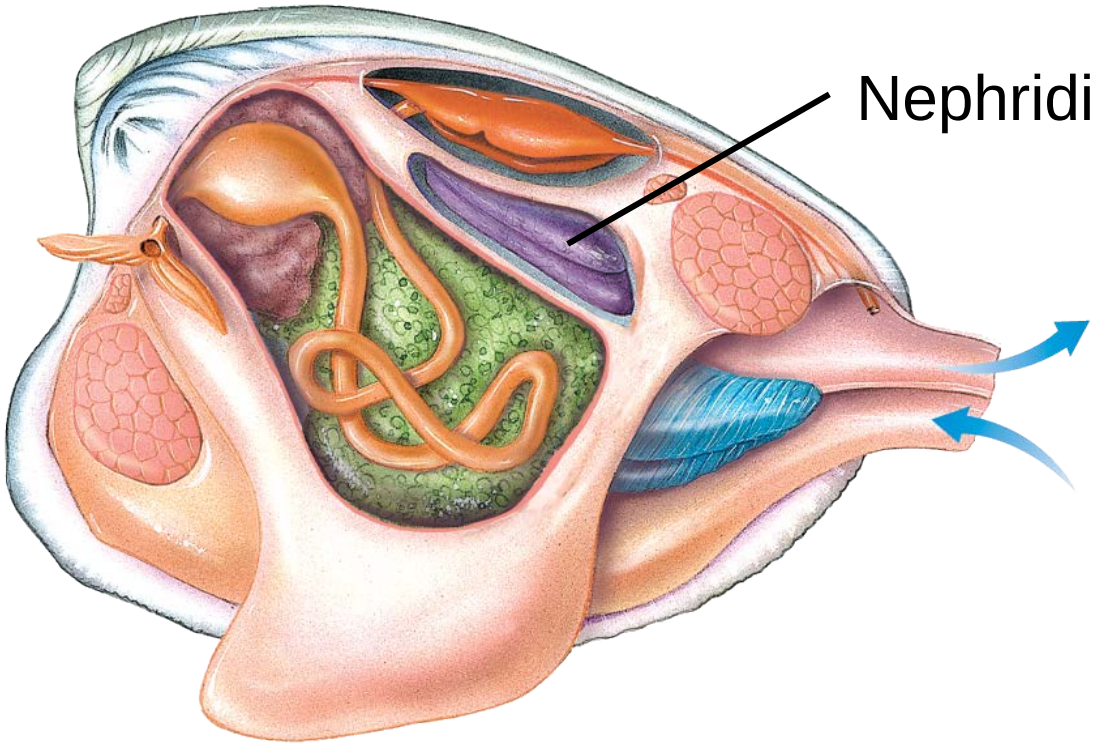
Mollusks have an **open circulatory system** (except cephalopods)**:** There is no distinction between interstitial fluid and blood (hemolymph is the fluid in the circulatory system)

- Blood is pumped through vessels by a simple heart.



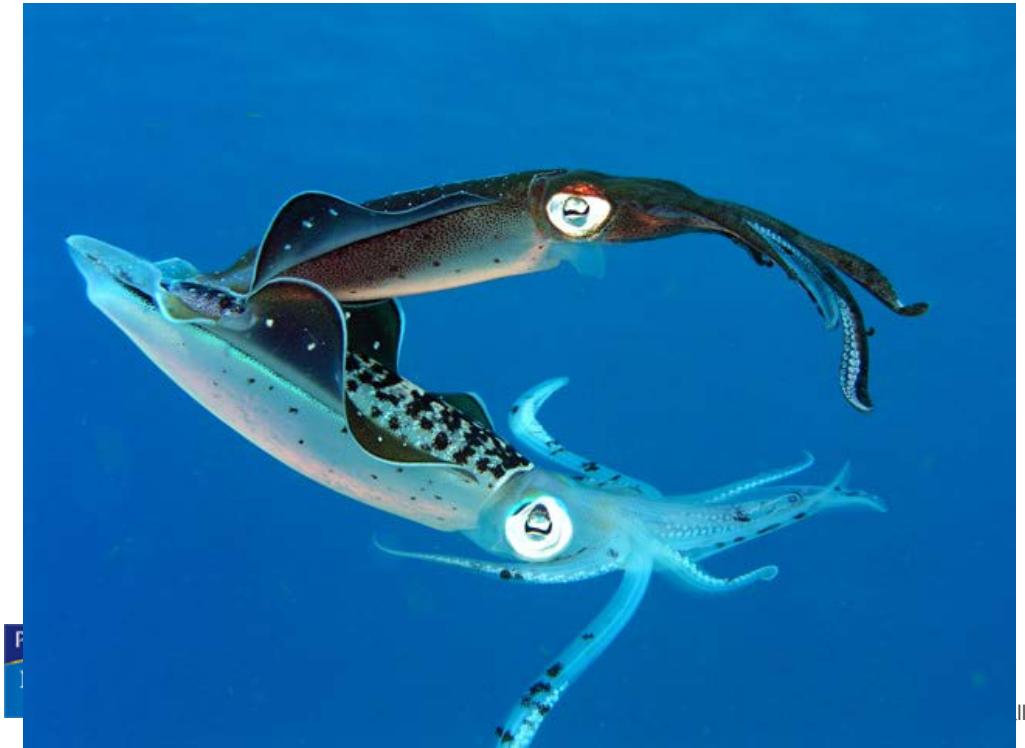
Excretion system

Nephridia remove ammonia from the blood and release it outside the body.



Reproduction

- Mollusks reproduce sexually
- They are mostly separated sexes
- Some are hermaphrodites



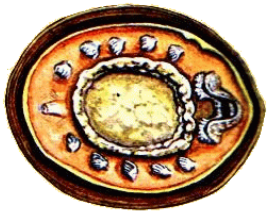
Groups of Mollusks

The three major classes of mollusks are

- **gastropods**
- **bivalves**
- **cephalopods**

also, 3 other classes

- Polyplacophores (chitons)
- monoplacophores (extinct)
- scaphopods



Gastropods

- Gastropods are **shell-less or single-shelled** mollusks that move by using a muscular foot located on the ventral side.
- Many gastropods have a single shell that protects their bodies.
- When threatened, they can pull completely into their shells.
- They form the largest class of mollusks

Gastropods include

- pond snails
- land slugs
- sea butterflies
- sea hares
- limpets
- nudibranchs

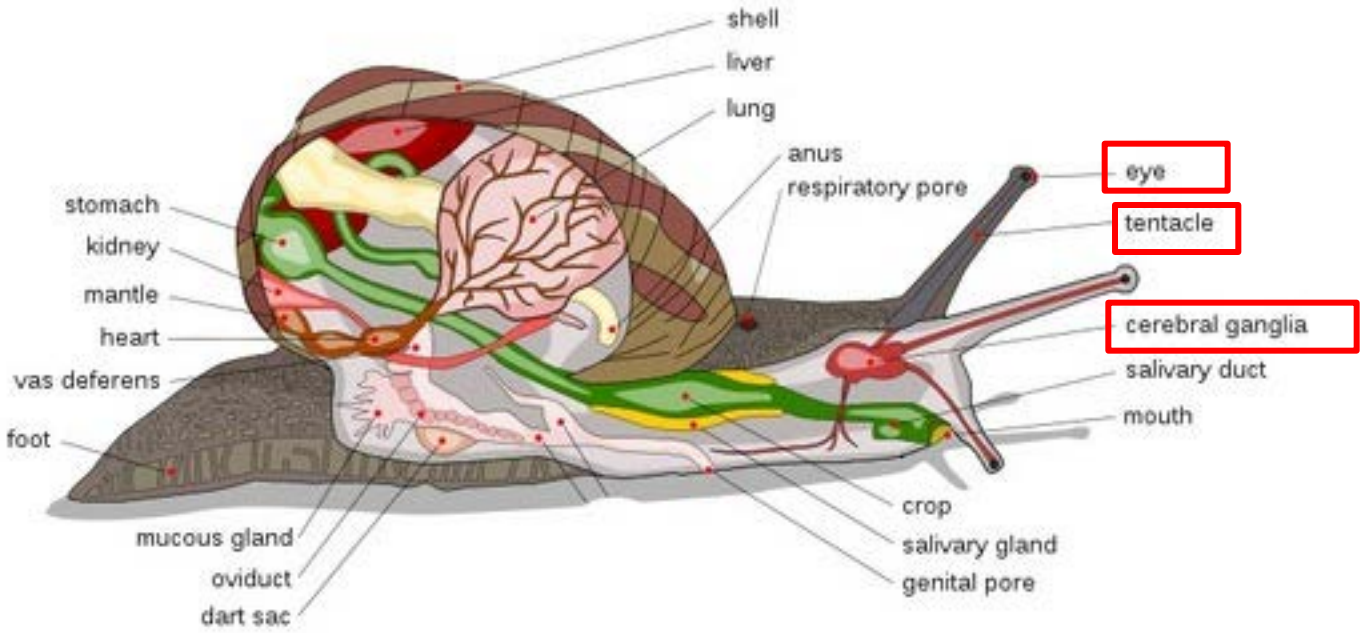
Many gastropods have an external shell that protect their soft body.

Slugs and nudibranchs have no shell. Sea hares have a special weapon for defense (Video, 1m32):

https://www.youtube.com/watch?v=2vDY9KI8KEI

Gastropod nervous system

- They have a pair of ganglia connected by nerves
  - Sense organs contracted in the head region
  - Pair of tentacles and stalked eyes

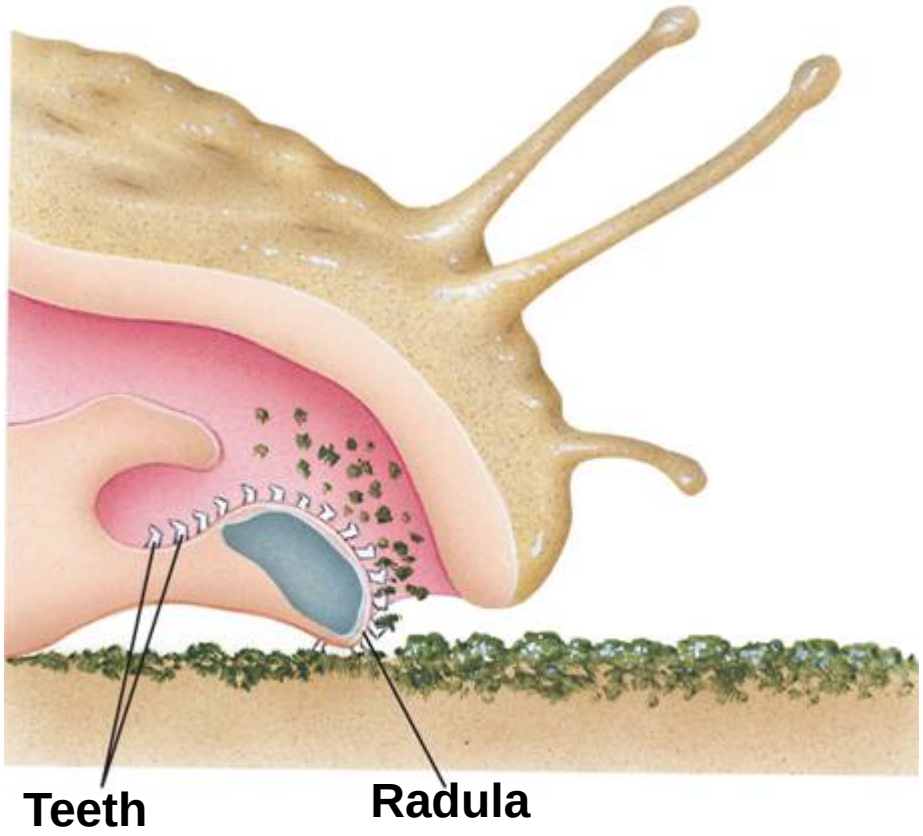


Feeding : Gastropods

Snails and slugs feed using a flexible, tongue-shaped structure known as a **radula.**

Hundreds of tiny teeth are attached to the radula.

The radula is used to scrape algae off rocks or to eat the soft tissues of plants.



Feeding : Gastropods

Some snails are deadly predators, even to humans. Don’t touch these guys!

Video The killer cone snail (2min19):

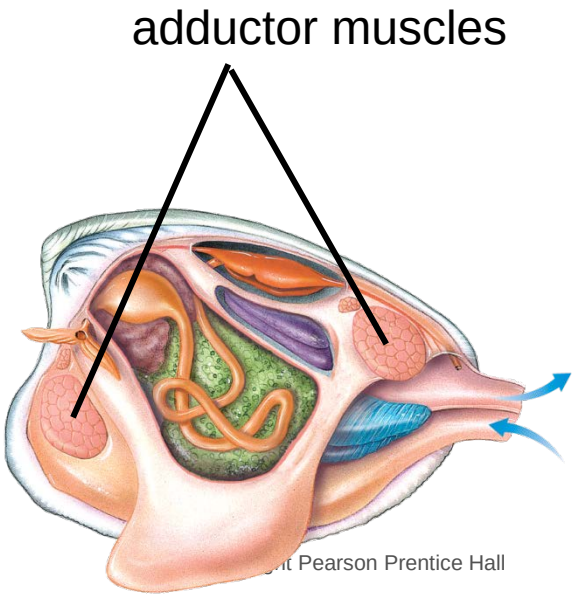
https://www.youtube.com/watch?v=zcBmMPJrrKk

Bivalves

Bivalves have **two shells** that are held together by one or two **powerful muscles**.

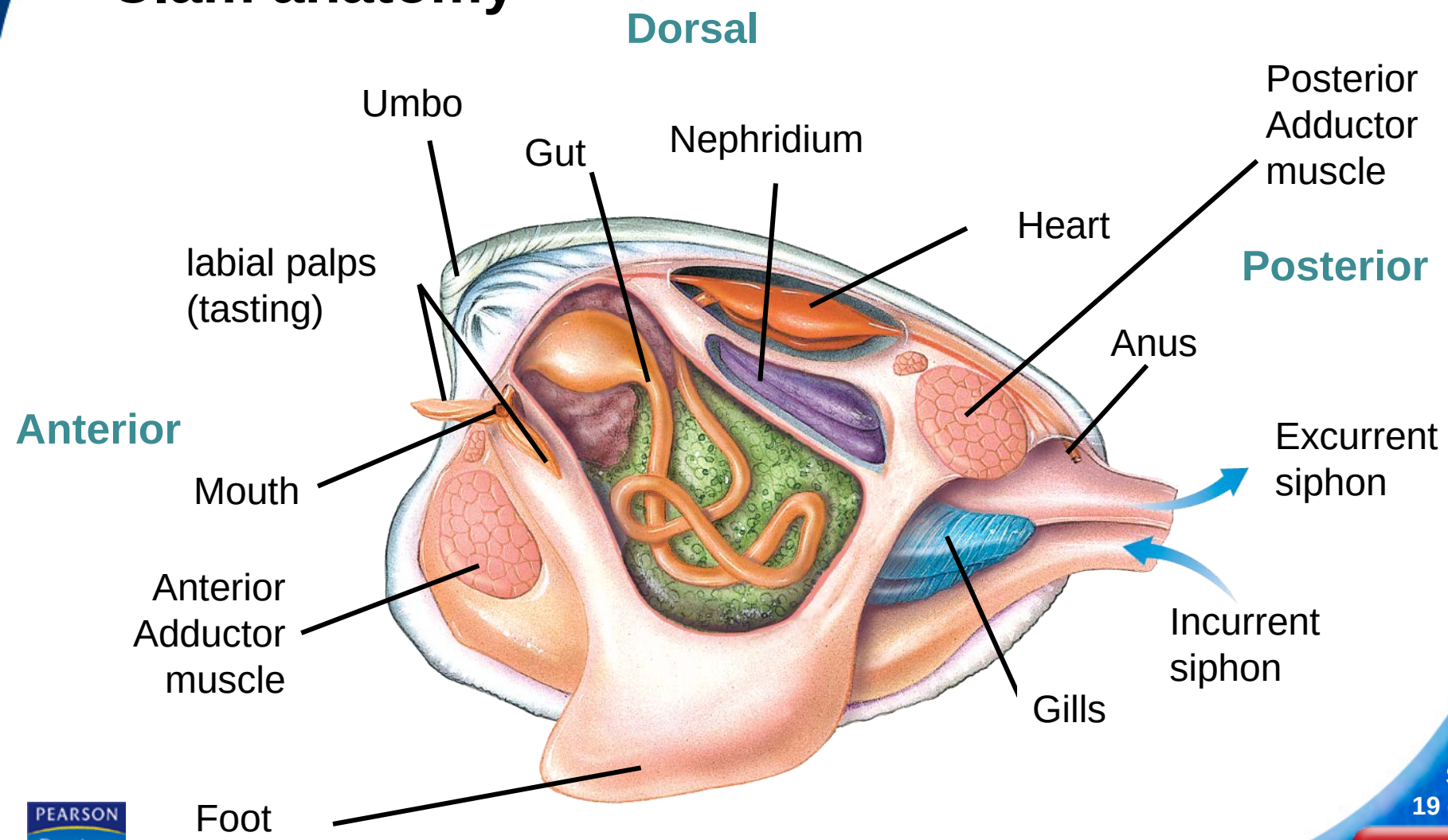
Common bivalves include:

- clams
- oysters
- mussels
- scallops



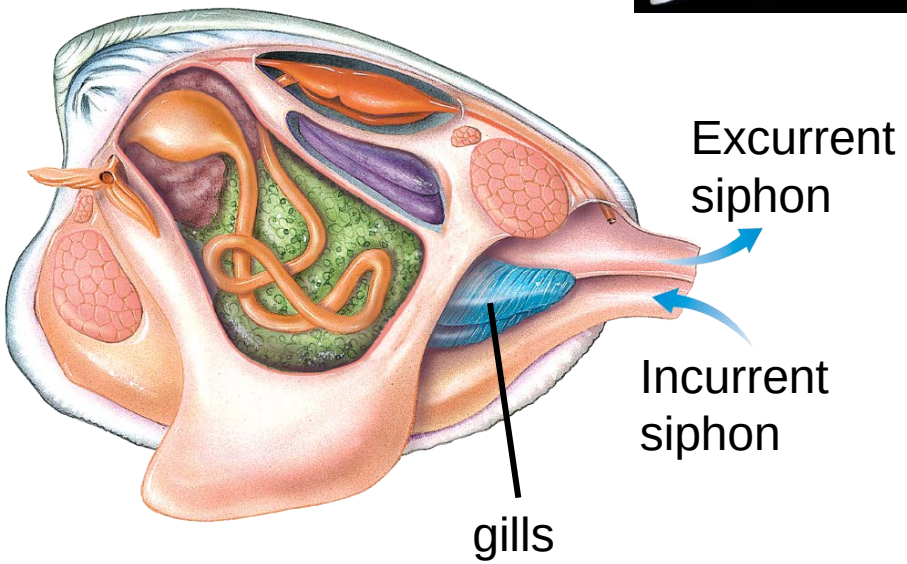
End Show

Clam anatomy



Feeding : Bivalves are filter feeders

- Cilia on the gills bring water in via incurrent siphon
- Food particles stick to mucus on gills
- Respiration takes place concurrently
- Wastes and water leave through the excurrent siphon



Bivalve sense receptors

- Bivalves have sense receptors on a line edge near the opening between the shells.
- Scallops have about 100 simple eyes on the edge of their shells!

Bivalve mobility

- Slow moving (ex. clams)
- Sessile (ex. oysters)
- Some swim! (ex scallops)

  Video Scallop swimming (1m38):

  https://www.youtube.com/watch?v=QzT2L5CsiA8

Cephalopods

Cephalopods are typically soft-bodied mollusks in which the **foot, fused to the head**, is divided into **tentacles** or **arms**.

Cephalopods include:

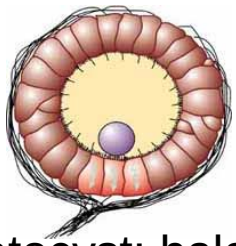
- Squid
- Octopus
- Nautilus
- Cuttlefish

Cephalopods nervous system

Cephalopods are the most intelligent invertebrates.

They have:

- Large brain
- Extensive network of nerves: Allows for quick responses and excellent body control
- Advanced vision
- Statocysts to sense gravity (also in bivalves)

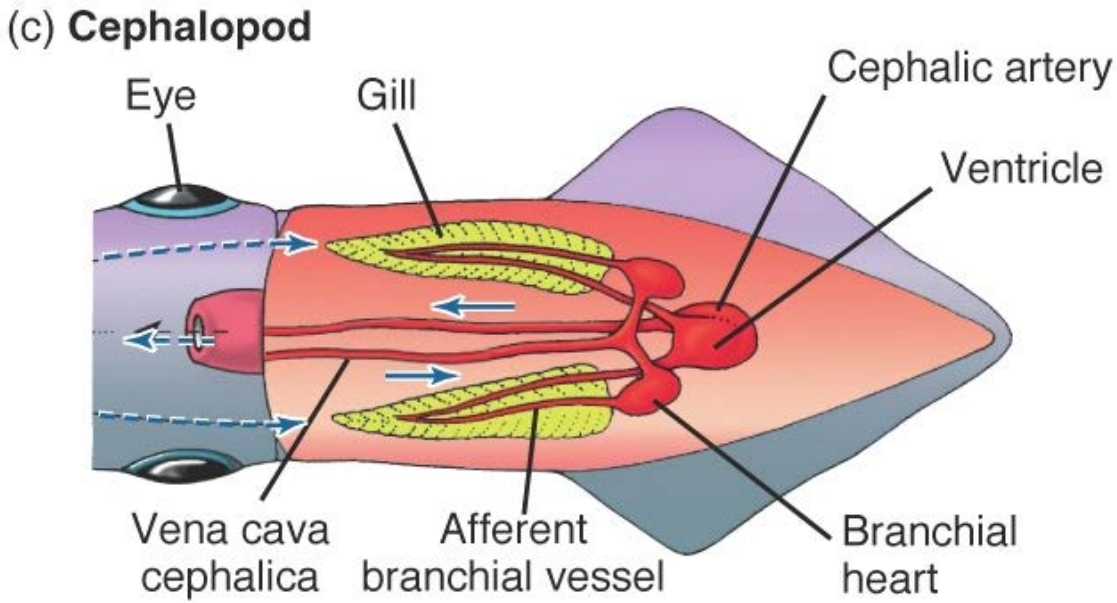


statocyst: balance sensory receptor

Cephalopods circulatory system

Cephalopods, counter to other mollusks, have a **closed circulatory system**:

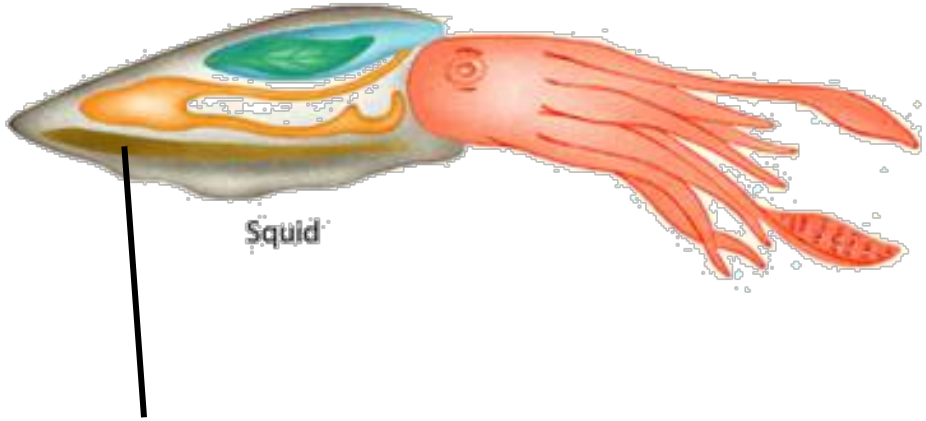
- Blood is separated from the rest of the other body fluids.



Cephalopods Shell

Shell can be

- external (nautilus)
- internal (squid, octopus, cuttlefish)



pen: internal shell (in brown)

Cephalopods Siphons

Cephalopods are **highly motile**

- Use **siphon** to shoot out water at high pressures (ie. Jet propulsion) and reproduce
- They use an **ink sac** to confuse predators by creating an ink screen released by their siphon

Octopus releases ink at an annoying diver (38sec):

https://www.youtube.com/watch?v=xjZ2k1Qm3bA

Cephalopods camouflage

- Cephalopods are kings of camouflage
- They change their skin colors with their chromatophores: pigment-containing and light-reflecting cells

Testing a cuttlefish camouflage capacities (3min):

https://www.youtube.com/watch?v=pgDE2DOICuc

27-4 Section QUIZ

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Section QUIZ

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1 The trochophore larva is a characteristic that mollusks share with

a. flatworms.

b. roundworms.

c. annelids.

d. flukes.

2 Water enters and leaves the body of a bivalve through

a. a siphon.

b. cilia.

c. a coelom.

d. a nephridium.

3 The most active group of mollusks is the

a. gastropods.

b. bivalves.

c. cephalopods.

d. shell-less gastropods.

4 Unlike the other mollusks, cephalopods have a(an)

a. closed circulatory system.

b. ventral blood vessel.

c. open circulatory system.

d. dorsal blood vessel.

5 The body plan of most mollusks includes all of the following EXCEPT a

a. foot.

b. mantle.

c. shell.

d. radula.