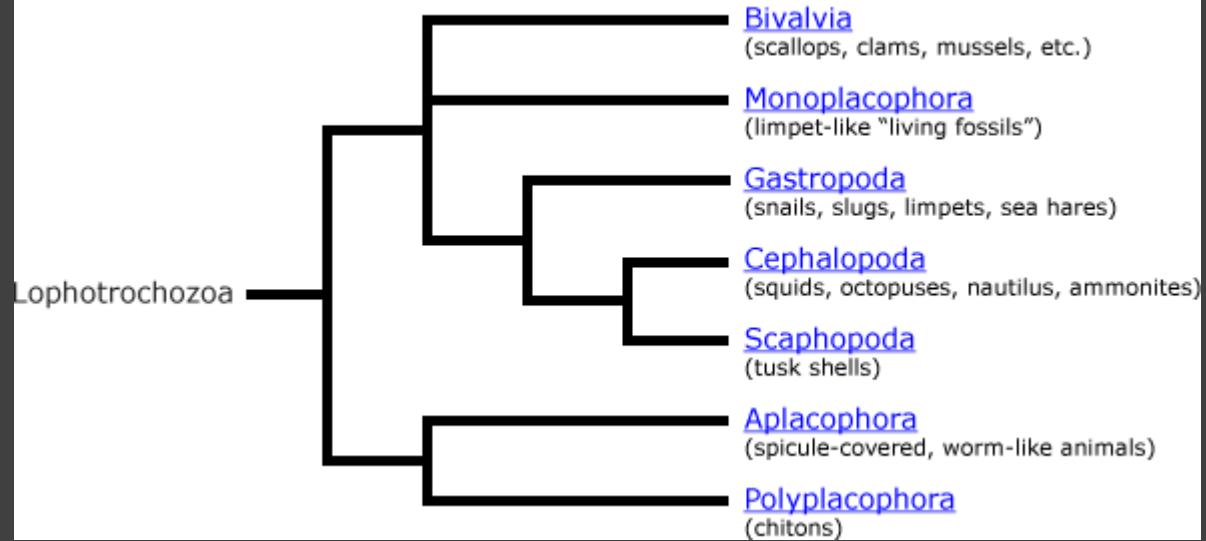


MOLLUSCA



Molluscs

BENILDA RAMOS-BUTRON



Dentalium



Chiton



Octopus



Unio



Sepia



Limnaea



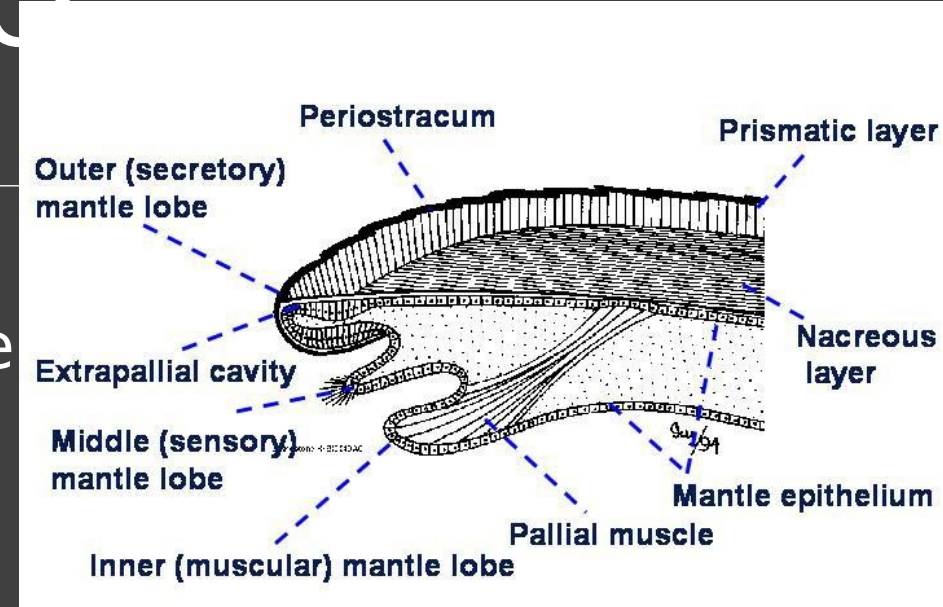
Pearl Oyster



Land Snail

General Characteristics

- Includes clams, snails, and octopuses
- Shells made of calcium carbonate in protein matrix
- Parts of the shell:
 - Periostracum – thin outer organic layer
 - Nacreous layer – thin, innermost calcareous
 - Prismatic layer – thick, calcareous middle layer
- Mantle – tissue that secretes the component of the shell
- Most have foot
- Ctenidia – molluscan gills and exit site for the excretory, digestive and reproductive system



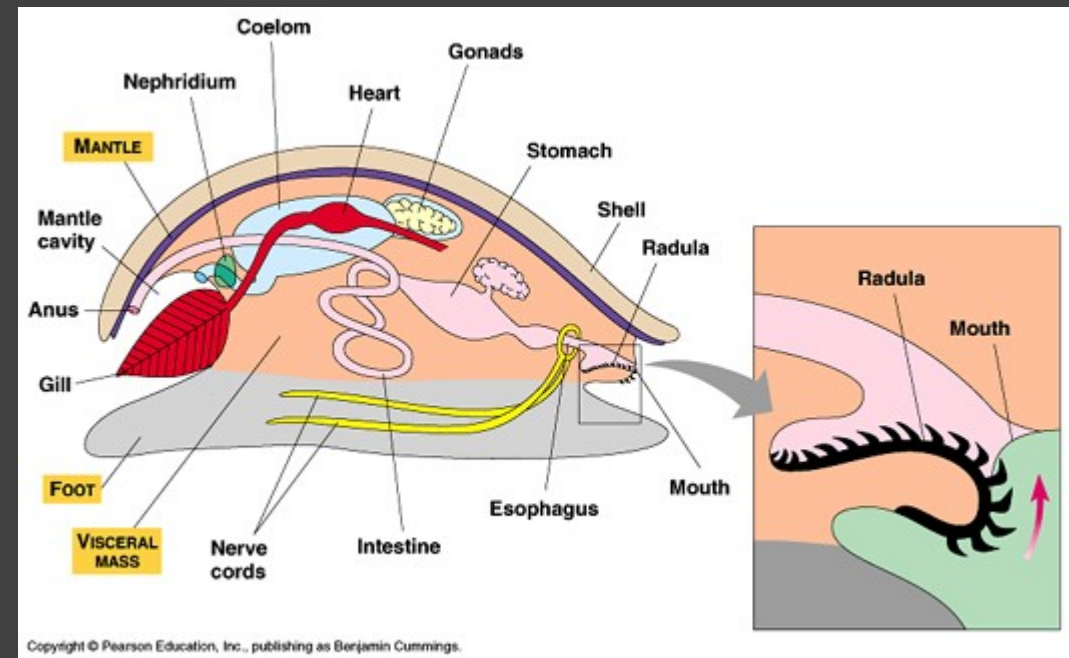
General Characteristics

Ospharidium – chemoreceptors or tactile receptor

Hemocoel – “blood cavity,” serves as a hydrostatic skeleton

Radula – feeding structure

Buccal mass – odontophore-radular assembly + musculature



Class Polyplacophora

Known as the chitons

Found close to shore in hard substrate

Most distinguished feature is the shell, series of 8 overlapping and articulating plates covering the dorsal surface

Girdle – thick lateral mantle of the chiton

Bipectinate ctenidia*

Locomotion by pedal waves

Generates suction and mucus secretion**

Class Polyplacophora

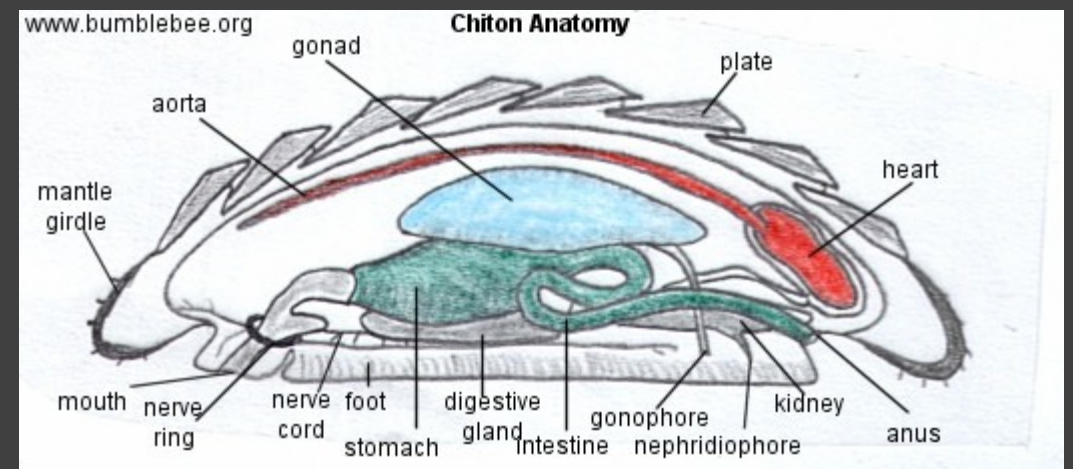
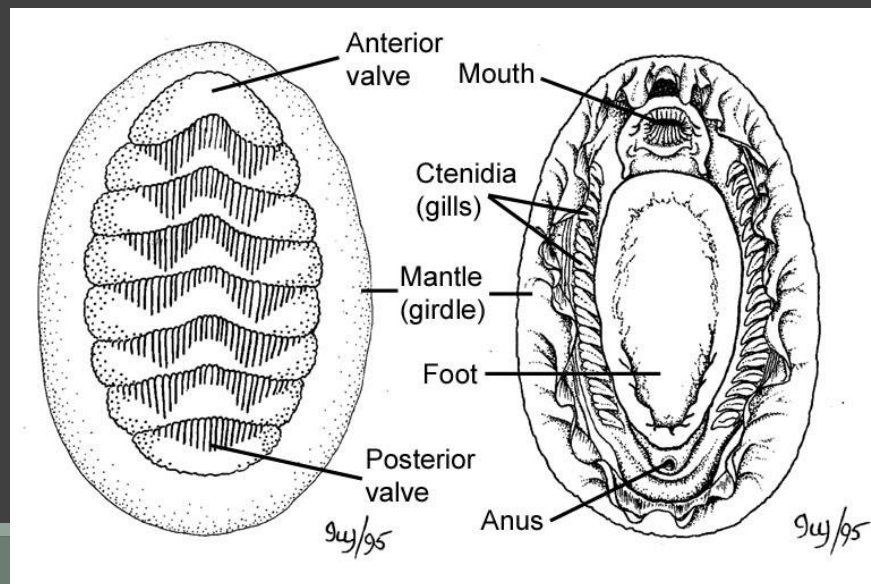
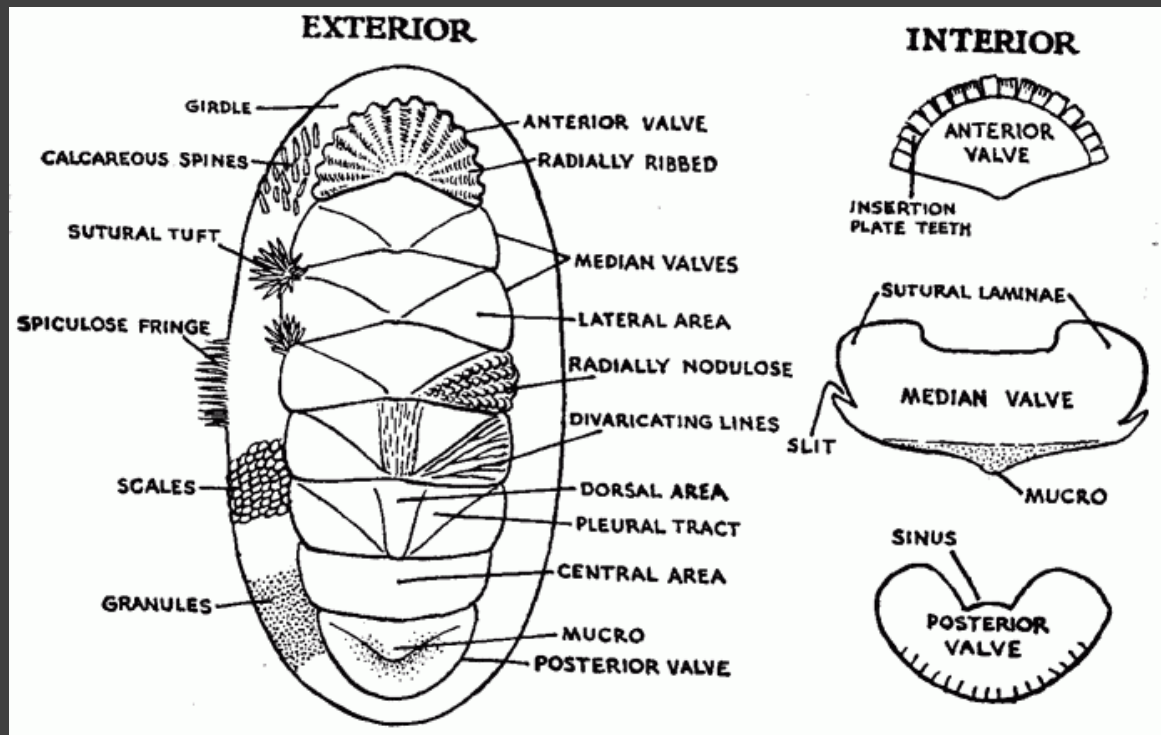
Nervous system is simple and ladder-like

Sensory systems reduced: lack statocysts, tentacles and eyes

Aesthetes – known as “light receptors” or, “secretion of materials for periostracum”

Mouth and anus at opposite ends

Sugar glands – release amylase-containing secretions into the stomach



Class Aplacophora

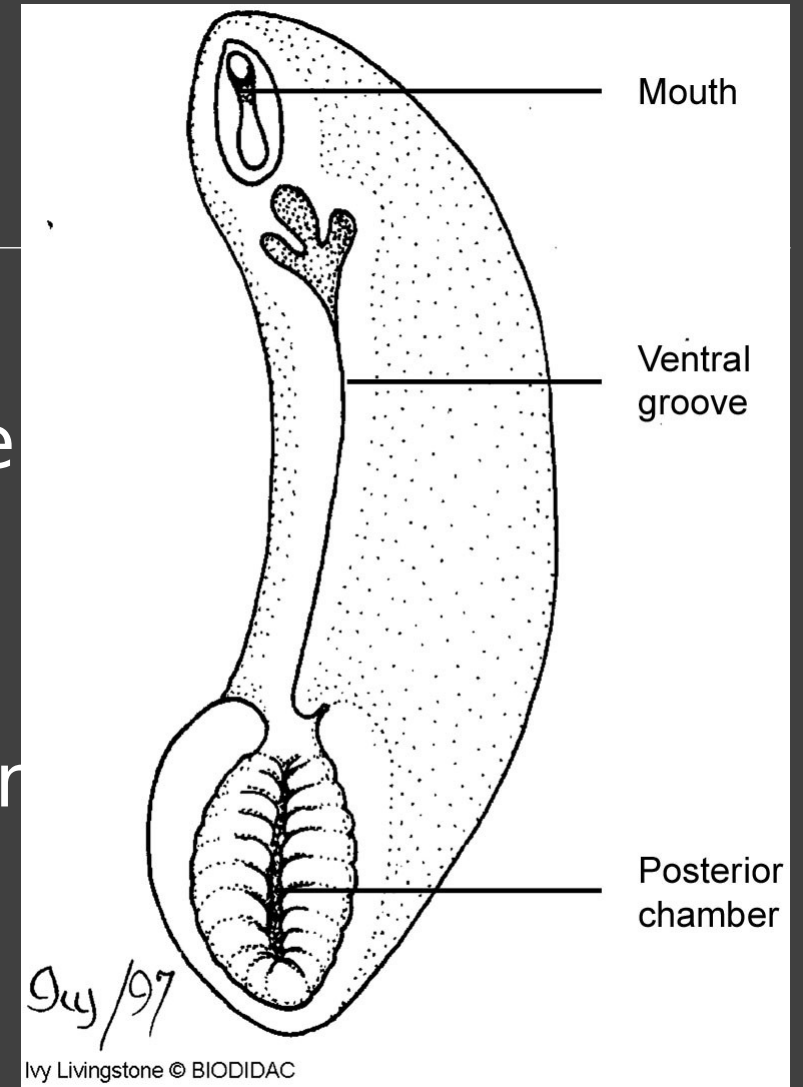
Worm-shaped (vermiform)

Entirely found in deep marine water

No true shell*

No conspicuous foot

Chitons + Aplacophorans = Amphipleurans



Class Monoplacophora

Deep marine water

Single, unhinged shell is present

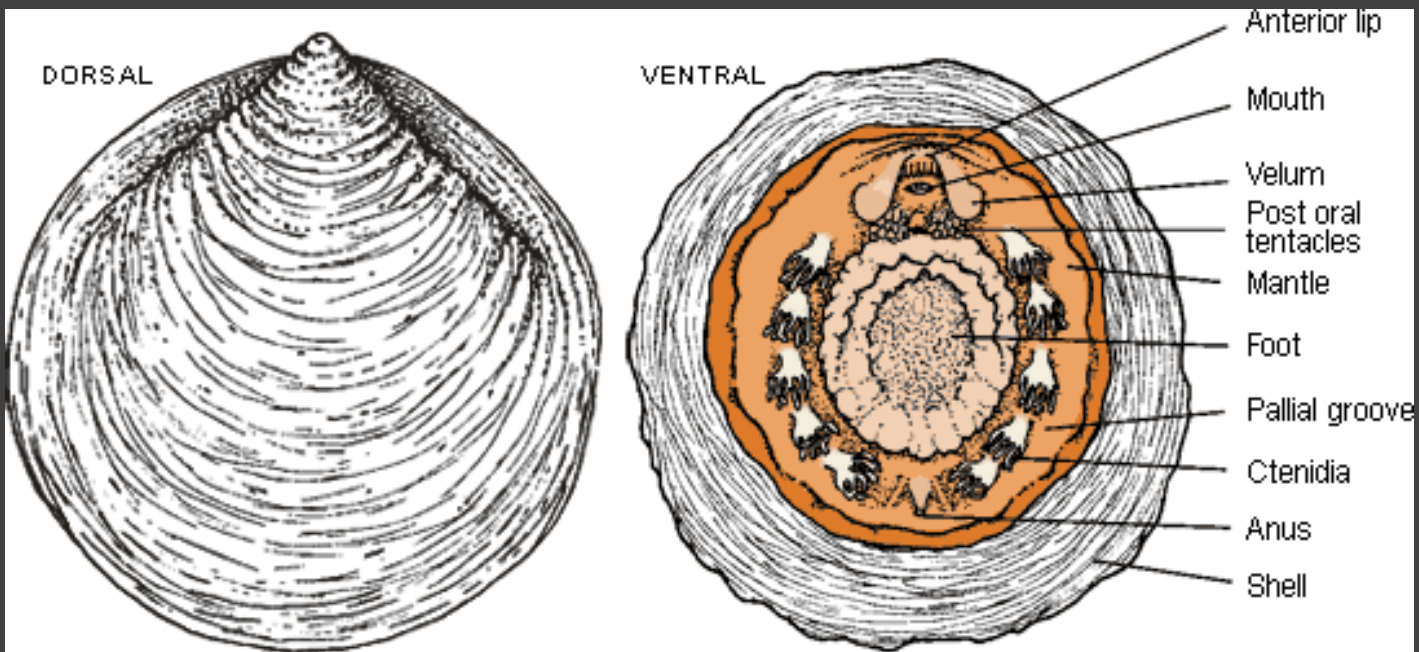
Larval shell is spiral but adult shell is flattened

Flat foot

Radula and crystalline style are present

Gut linear

Mouth anterior and anus posterior



Class Gastropoda

Largest molluscan class (75-80%)

Marine, freshwater and terrestrial

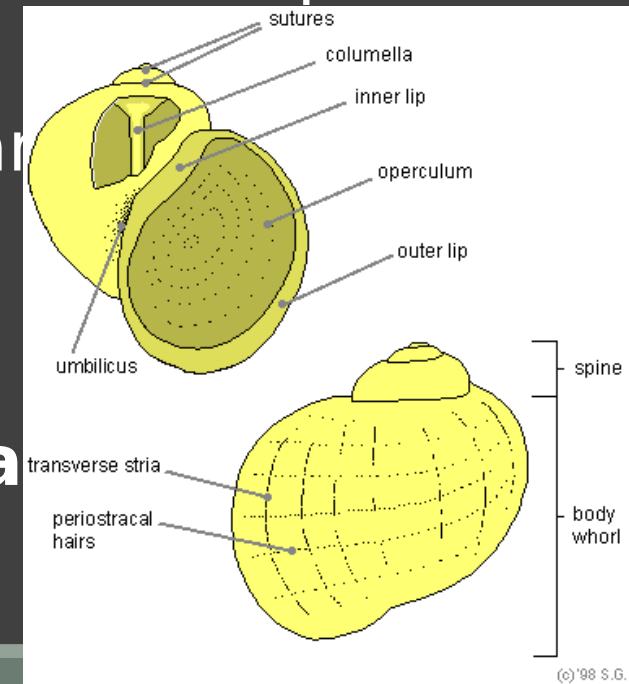
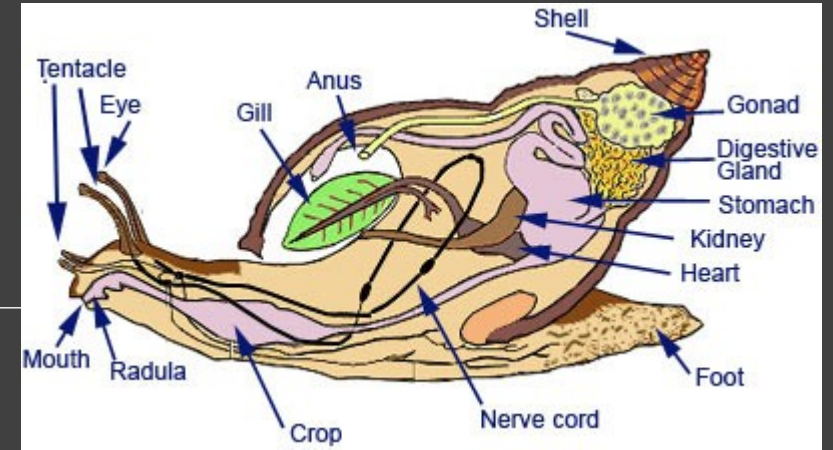
Suspension feeding, carnivorous, herbivorous, deposit feeding and ectoparasitic

Consists of a visceral mass, and muscular foot

Univalve shell that is usually coiled

Has columellar muscle*

Shells coiled either **dextrally** or **sinistrally**



Class Gastropoda

Adaptations Against Predation

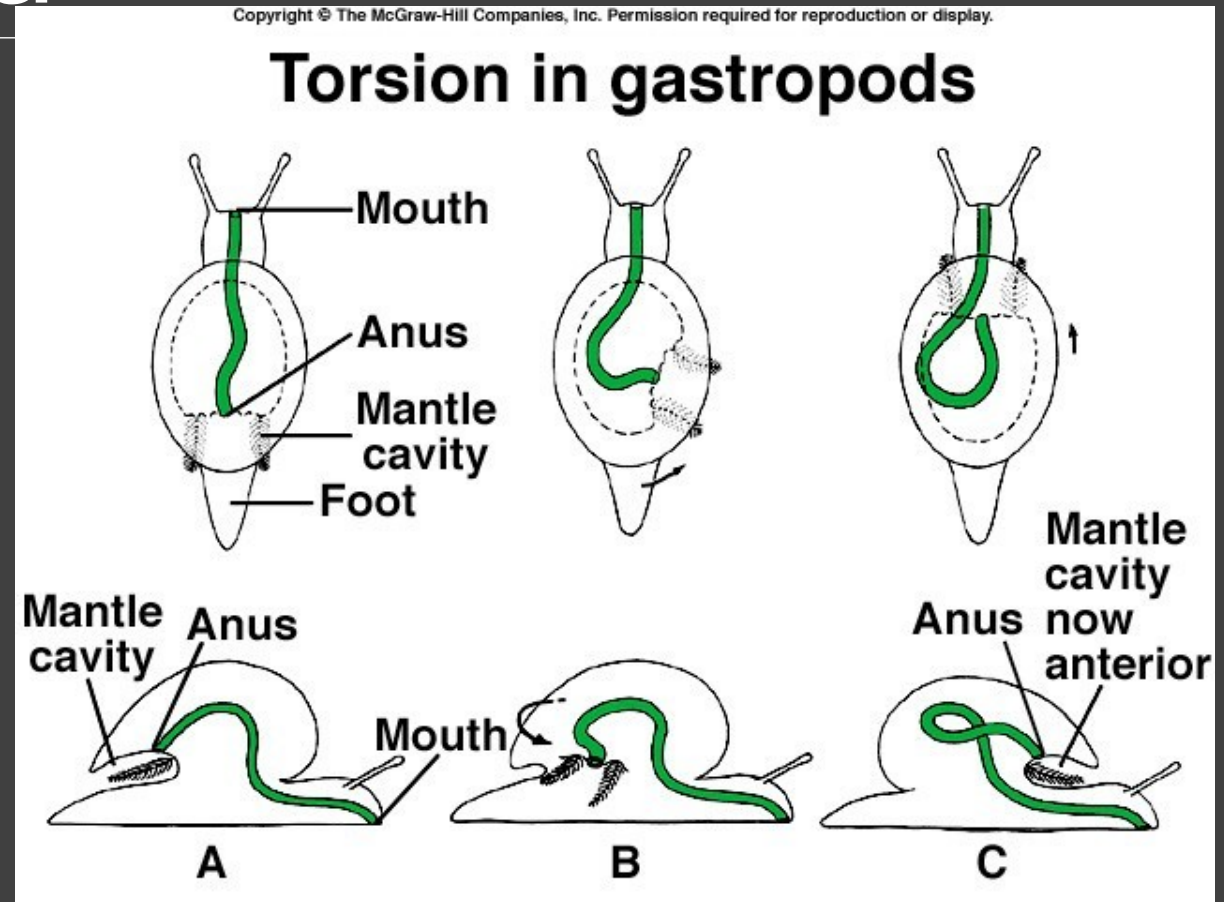
1. Senses the presence of potential predators, either chemically or by touch
2. Chemically senses the presence of injured individuals of its own species
3. Accumulates noxious organic compounds

Class Gastropoda

Torsion – anticlockwise twisting of most of the body through 180 degrees during early development

Ctenidia and osphradia are in the front

Anus over the head



Class Gastropoda

Subclass Prosobranchia

- Largest of the three gastropod subclasses
- Mostly marine
- Mostly free-living and mobile
- Herbivores, deposit feeders, omnivores, suspension feeders or carnivores
- Most primitive group
- Possess a well-developed shell, mantle cavity, osphradium and radula
- Foot with operculum

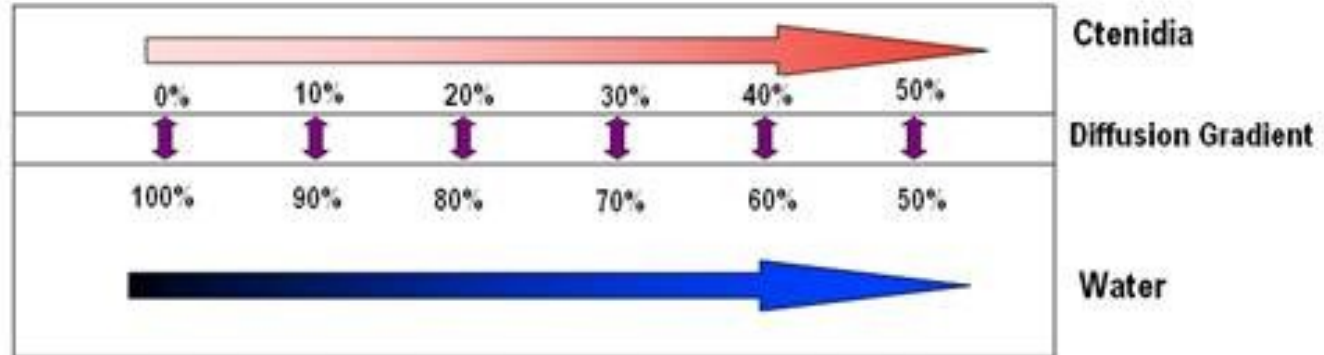


Class Gastropoda

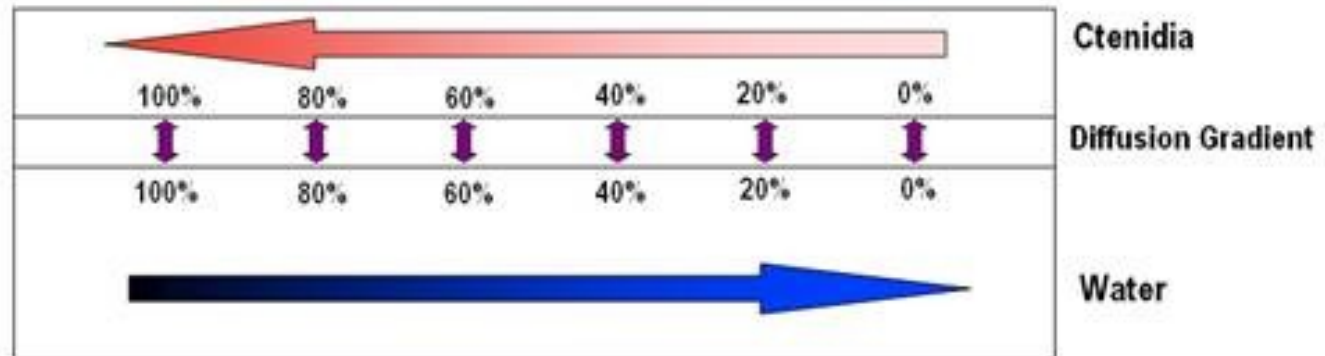
Subclass Prosobranchia

- Ctenidium
- Enters □ Afferent blood vessel □ Ctenidium □ Auricle □ Efferent blood vessels
- Siphon – cylindrical extension of the mantle*
- Water flow across the molluscan gill is unidirectional**
- Countercurrent Exchange System
 - ❖ Increases the efficiency of gas exchange between the ctenidium and the water

Concurrent Exchange



Counter Current Exchange



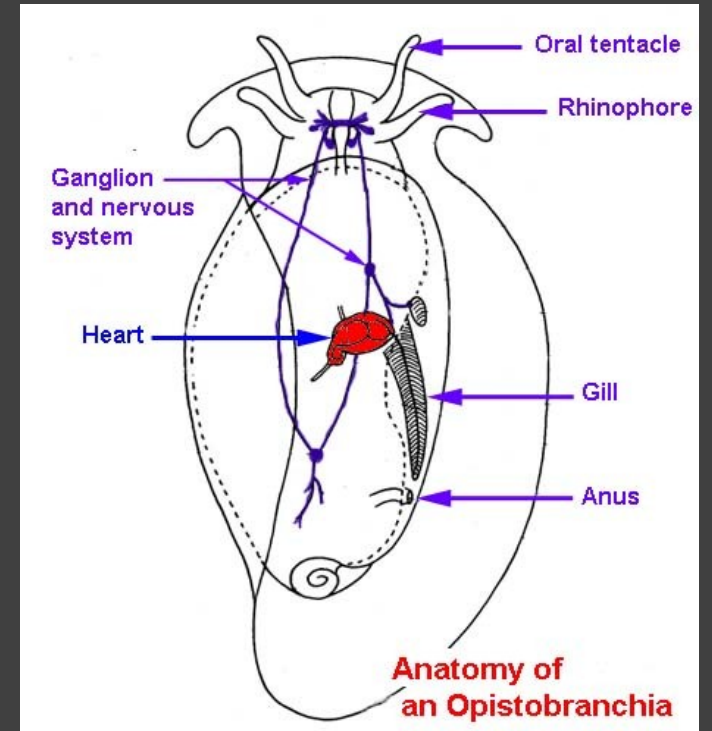
Class Gastropoda

Subclass Prosobranchia

- evolution: changes in gill numbers and orientation of gill filaments (bipectinate and monopectinate)

Subclass Opisthobranchia

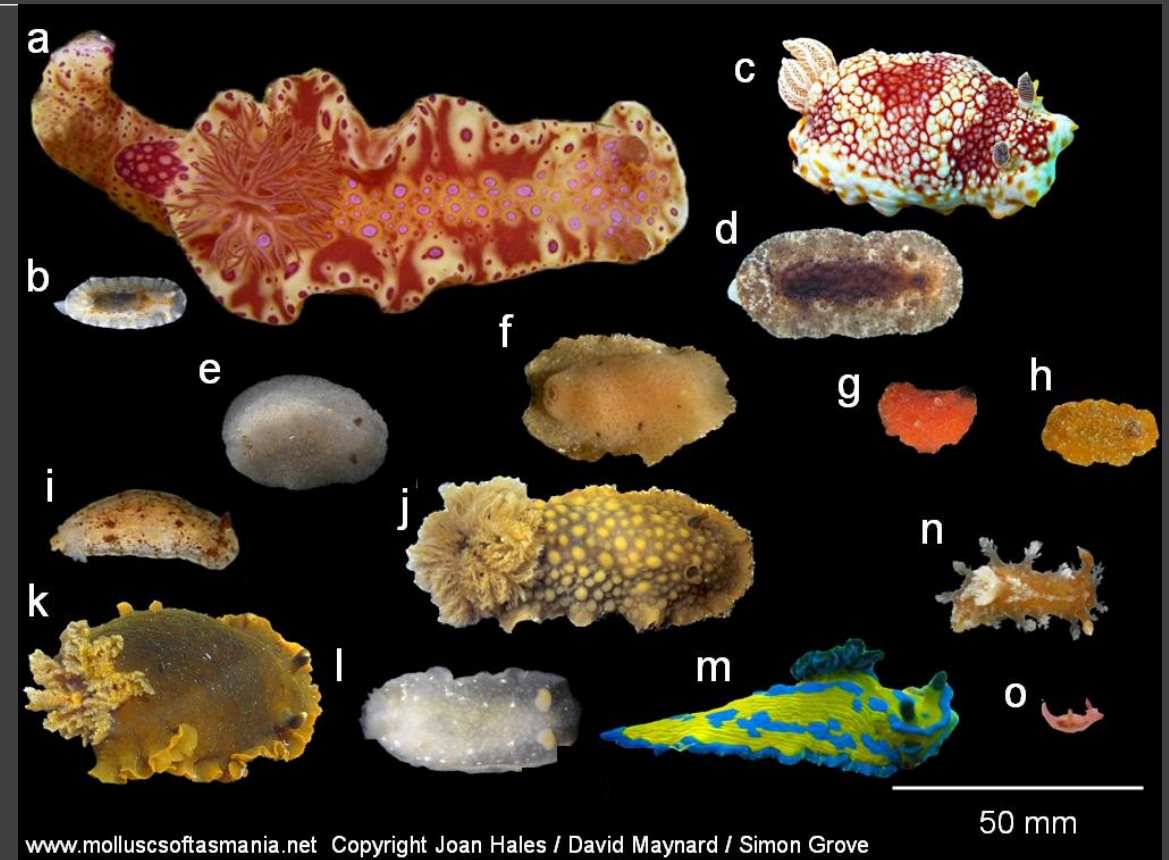
- Sea hares, sea slugs, and bubble shells
- All marine
- Characteristics
 1. Trend toward reduction or loss of the shell
 2. Reduction or loss of the operculum
 3. Limited torsion during embryogenesis
 4. Reduction or loss of the mantle cavity
 5. Reduction or loss of the ctenidia*



Class Gastropoda

Subclass Opisthobranchia

- For defense: nematocysts, chemical defense
- Rhinophores - 2nd pair of head tentacles, chemosensory
- Differences among Orders:
 - ❖ Order Aplysiacea
 - Have a mantle cavity (with gill and osphradium) as adults, and most adults have shell
 - ❖ Order Nudibranchia
 - Adult have no mantle cavity, ctenidia, osphradium, shell or operculum, no torsion
 - ❖ Order Cephalaspidea
 - Mantle cavity well developed, shell reduction or loss



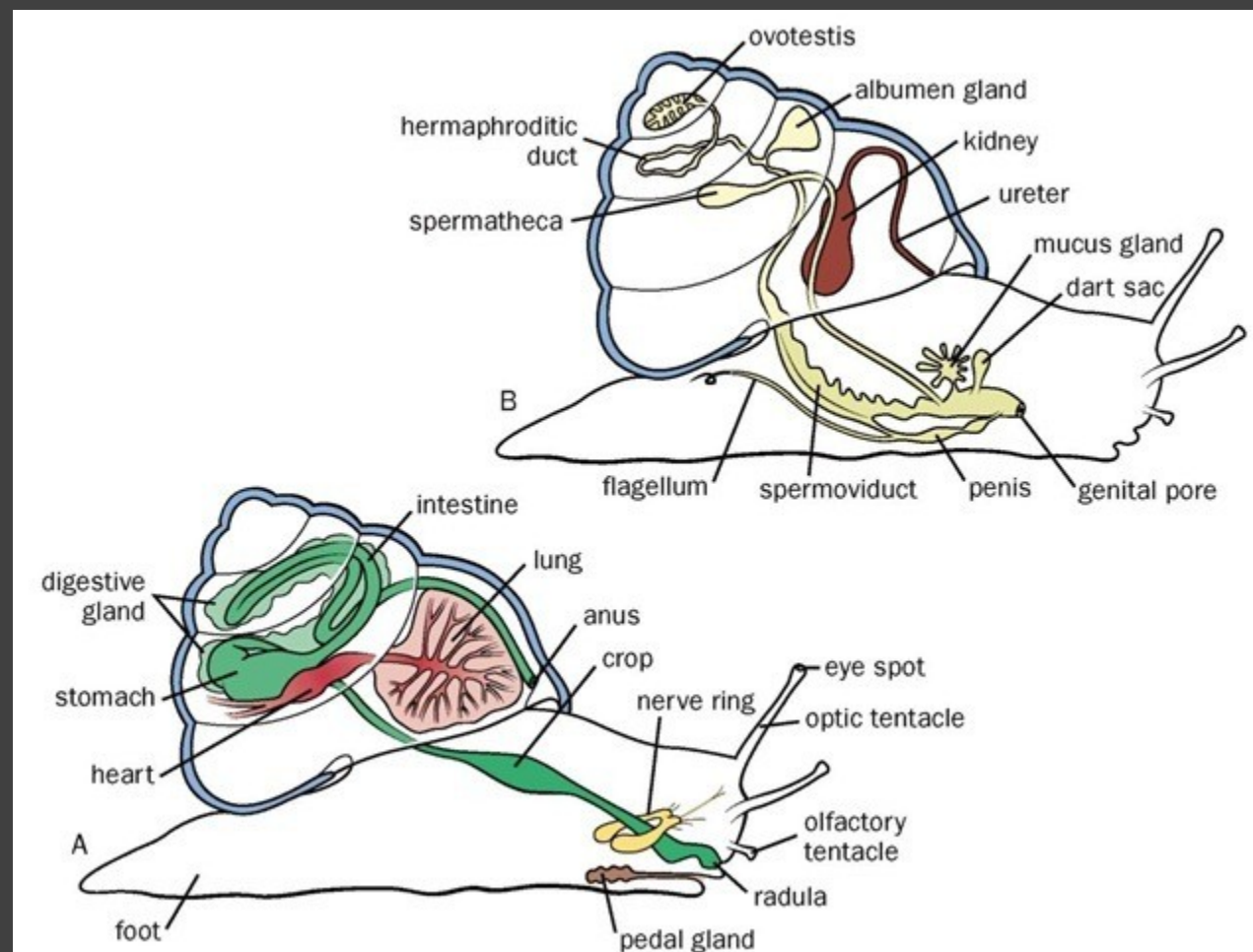
Class Gastropoda

Subclass Opisthobranchia

- Locomotion: cilia and pedal waves*

Subclass Pulmonata

- Marine, intertidal and estuary (few), terrestrial or freshwater
- Slugs and escargot
- Possess long radula and 2 pairs of tentacles on the head
- Vascular mantle cavity**
- Pneumostome – opening that allows entrance or exit of air or water in and out of the lung





Variation in shell morphology in some marine gastropods: Clockwise from top left, *Calliostoma antonii* from off the Pacific coast of Panama; the dovesnail *Columbella strombiformis* from offshore near San Carlos, Mexico; the moonsnail *Natica elenae* from the Gulf of Panama; *Oliva peruviana* from shallow water near Iquique, Chile; the turbinid *Guildfordia triumphans* from Wakayama, Japan; the muricid *Vokesimurex elenensis* from the Pacific coast of Mexico; a wentletrap, *Epitonium scalare*, from the Phillippines; and another muricid, *Pteropurpura trialata*, from offshore near Los Angeles, California.



Assorted vetigastropods: from left, abalone; *Puncturella longifissa*, a keyhole limpet — note the hole or "keyhole" just above the apex of the shell through which water is expelled; *Margarites marginatus*, a trochid; and the radula of the vetigastropod snail *Sinezona rimuloides*, greatly magnified.



Assorted caenogastropods: clockwise from top left, the cowrie *Cypraea leucodon* from the Philippines, about 7.3 cm in length; the moon snail *Bulbus fragilis* from off the Aleutian Islands; the ranellid *Charonia lampas* from the Canary Islands; the apple snail *Pomacea gigas*, 14 cm in width, from a riverbank in Peru; the conid *Conus bullatus* from the Marquesas Islands; the volute *Arctomelon tamikoae* and the muricid *Boreotrophon alakanus*, both from off the Aleutian Islands;

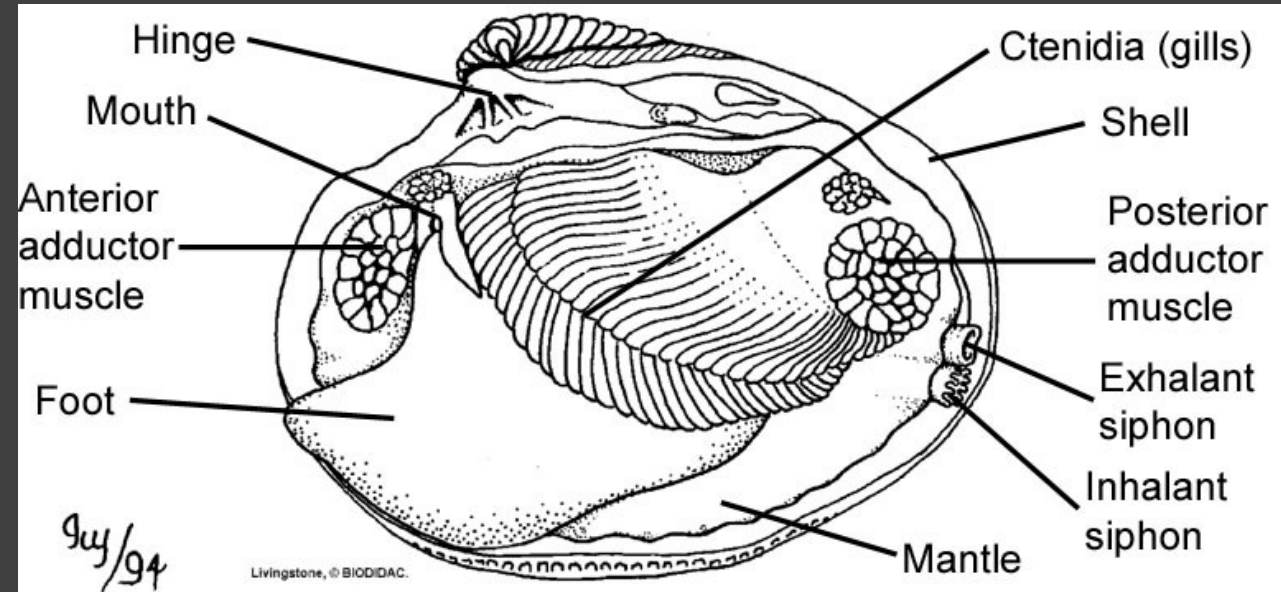
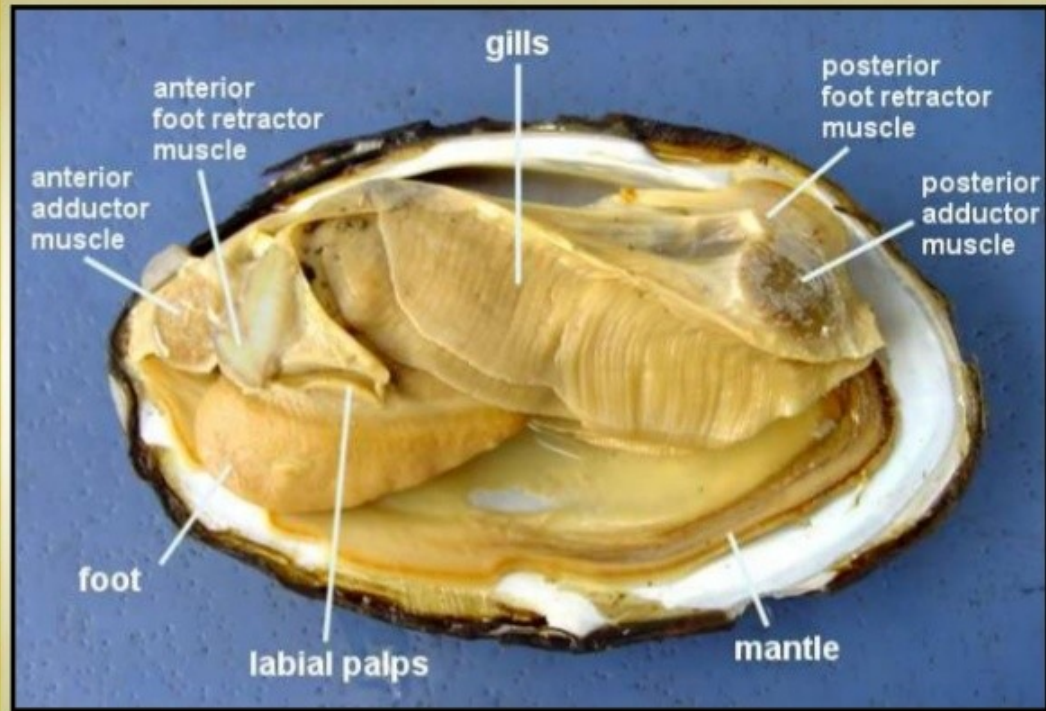
Class Bivalvia

Includes clams, scallops, mussels and oysters

Based on gill structure: Protobranchia and Lamellibranchia;
Septibranchia

Major characteristics

1. Hinged shell*
2. Lateral compression of the body and foot
3. Virtual absence of a head and associated sensory structures
4. Spacious mantle cavity
5. Sedentary lifestyle
6. Absence of radula/odontophore complex



Class Bivalvia

Gill – gas exchange or food collection (in some)

- Lateral cilia – driving water through the mantle cavity
- Frontal cilia – cleaning the gill of sediment and debris

Subclass Lamellibranchia

- Family Unionidae – contains most freshwater lamellibranchs
- Crystalline style – rotating translucent rod connected at one end to a ciliated style sac, other end abrades against gastric shield
- Byssal threads – proteinaceous secretions for attachment
- Scallops can swim in short distances
- Adductor muscles and pedal retractor muscles



Class Bivalvia

Subclass Protobranchia

food collection by PALP PROBOSCIDES (long, thin, muscular extension of the tissue surrounding the mouth)

LABIAL PALPS – attached to PP that sort particles and transport particles to the mouth and heavy particles to the margins of the palps

PSEUDOFECES – rejected heavy particles

DEPOSIT FEEDERS

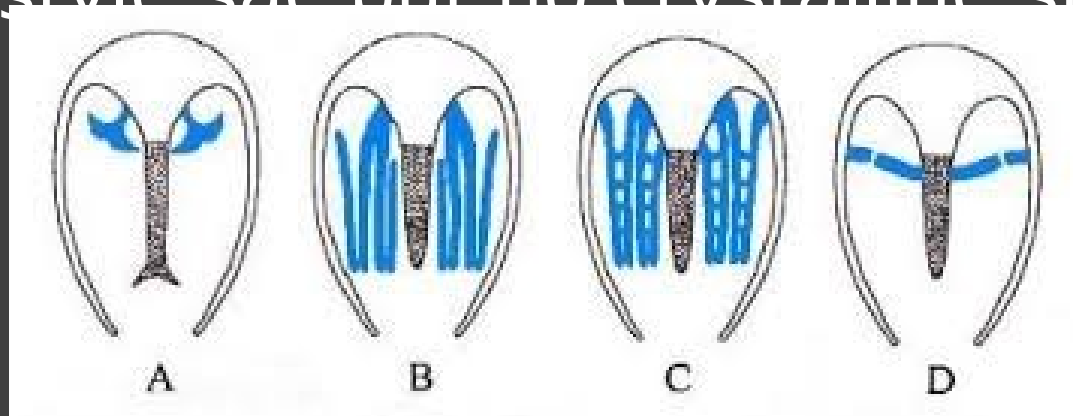
Class Bivalvia

Subclass Septibranchia

Small group of carnivorous bivalves

Feeds on small planktonic animals and decomposing animal tissue

Reduced style sac but no crystalline style



Class Scaphopoda

Ancestor: rostroconchs

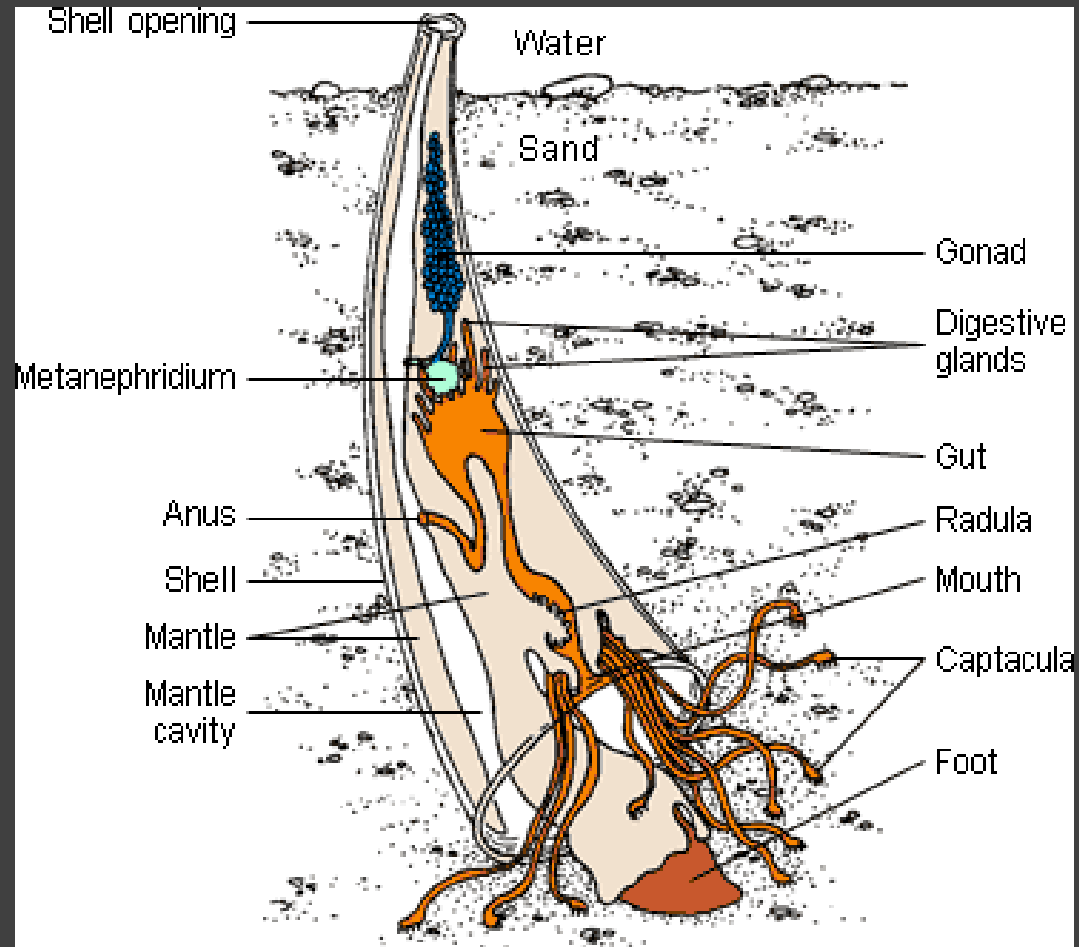
Marine and live sedentary in sand or mud

Typical features: foot, mantle tissue, mantle cavity, radula and shell

Shell is linear and hollow, curved tube □ “tooth shell,”
“tusk shell”

NO ctenidia, heart and circulatory system

Captacula – specialized, thin tentacles for capturing prey



Class Cephalopoda

Exclusively marine

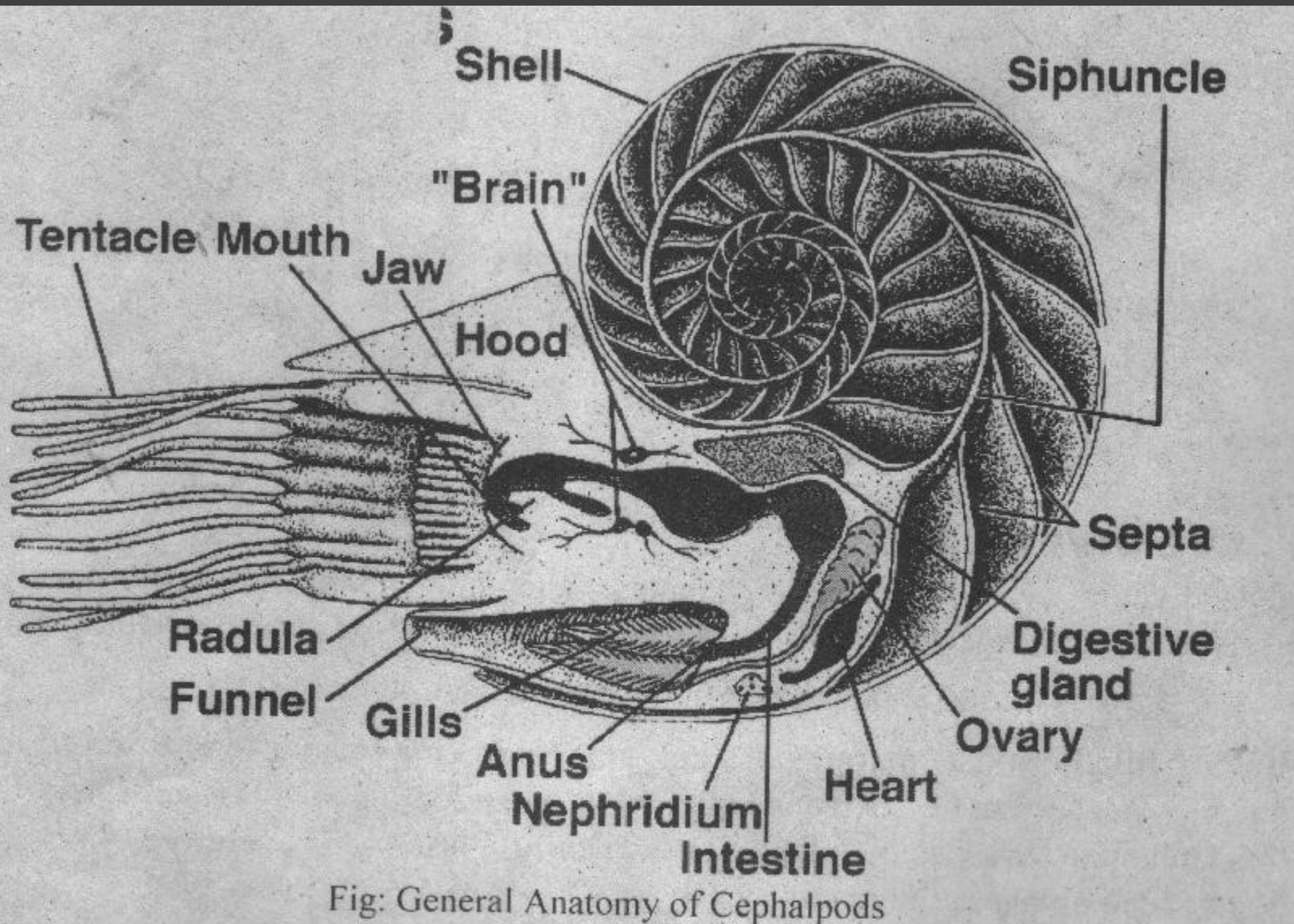
Ctenidia and radula are present

Extremely developed head

Nautilus – possess a true external shell divided by septa penetrated by the siphuncle (calcified tube)

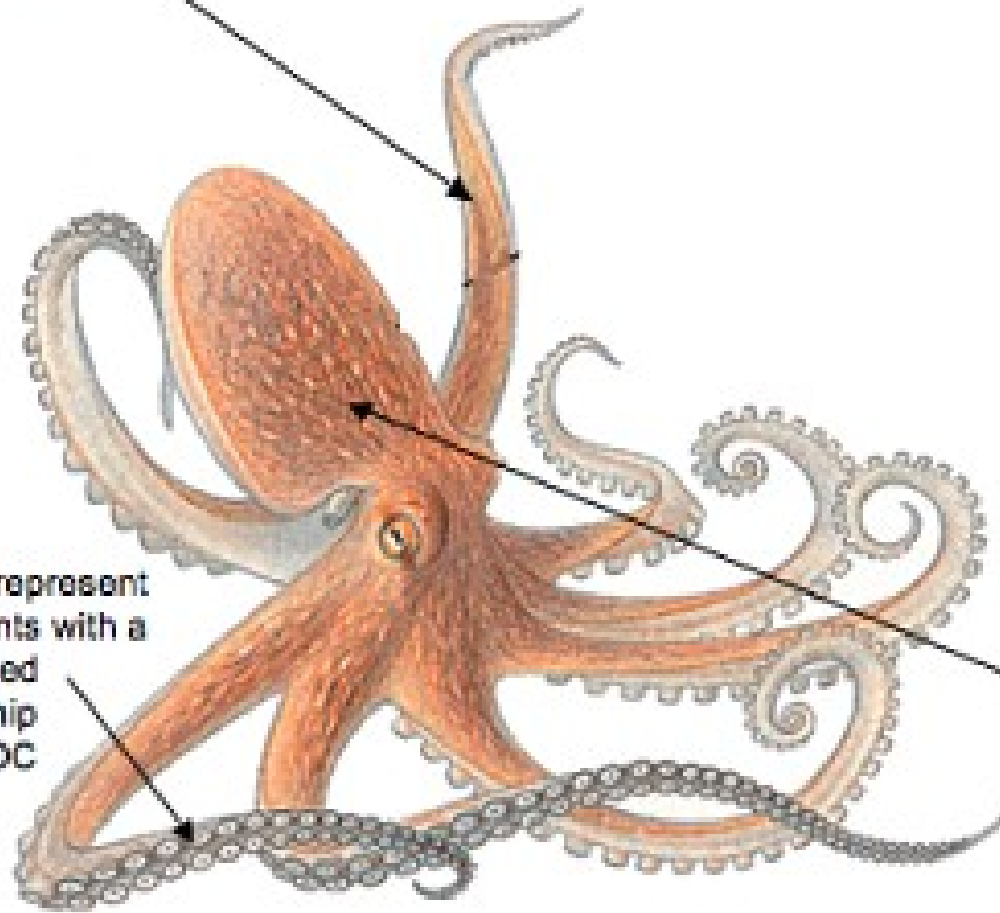
- Locomotion is by jet propulsion expelling water from the siphon or funnel*

Internal shell: cuttlefish (internal chambered shell for buoyancy) and squid (pen)



Tentacles represent the
DC terms which can be
refined.

Suckers represent
refinements with a
constrained
relationship
to other DC
terms.



Head of octopus
represents the rule that
a metadata record must
describe only one
resource.

Class Cephalopoda

Chromatophores – tiny colored cells

Iridocytes – reflective cells

Photophores – light organs

Ink sac – associated with digestive organ

Unciliated ctenidia

Completely closed circulatory system associated with systemic heart and branchial heart

Arms and tentacles

Cephalization

Reproduction in Mollusc

Parthenogenetic or dioecious

Hermaphrodite: protandric or simultaneous (ovotestis)

External fertilization

Internal fertilization for freshwater and terrestrial molluscs

Hectocotylus – modified arm of male species that transfer sperm to the female

Trocophore → veliger

Taxonomic Summary

Phylum Mollusca

- Class Polyplacophora – chitons
- Class Aplacophora
- Class Monoplacophora
- Class Gastropoda – snails and slugs
 - Subclass Prosobranchia
 - Subclass Opisthobranchia
 - Subclass Pulmonata
- Class Bivalvia (Pelecypoda) – clams, mussels, oysters, and shipworms
 - Subclass Protobranchia
 - Subclass Lamellibranchia
 - Subclass Septibranchia
- Class Scaphopoda – tooth shell, tusk shell
- Class Cephalopoda – squid, octopus, cuttlefish, and chambered nautilus

Check this out!

<http://www.ucmp.berkeley.edu/taxa/inverts/mollusca/mollusca.php>