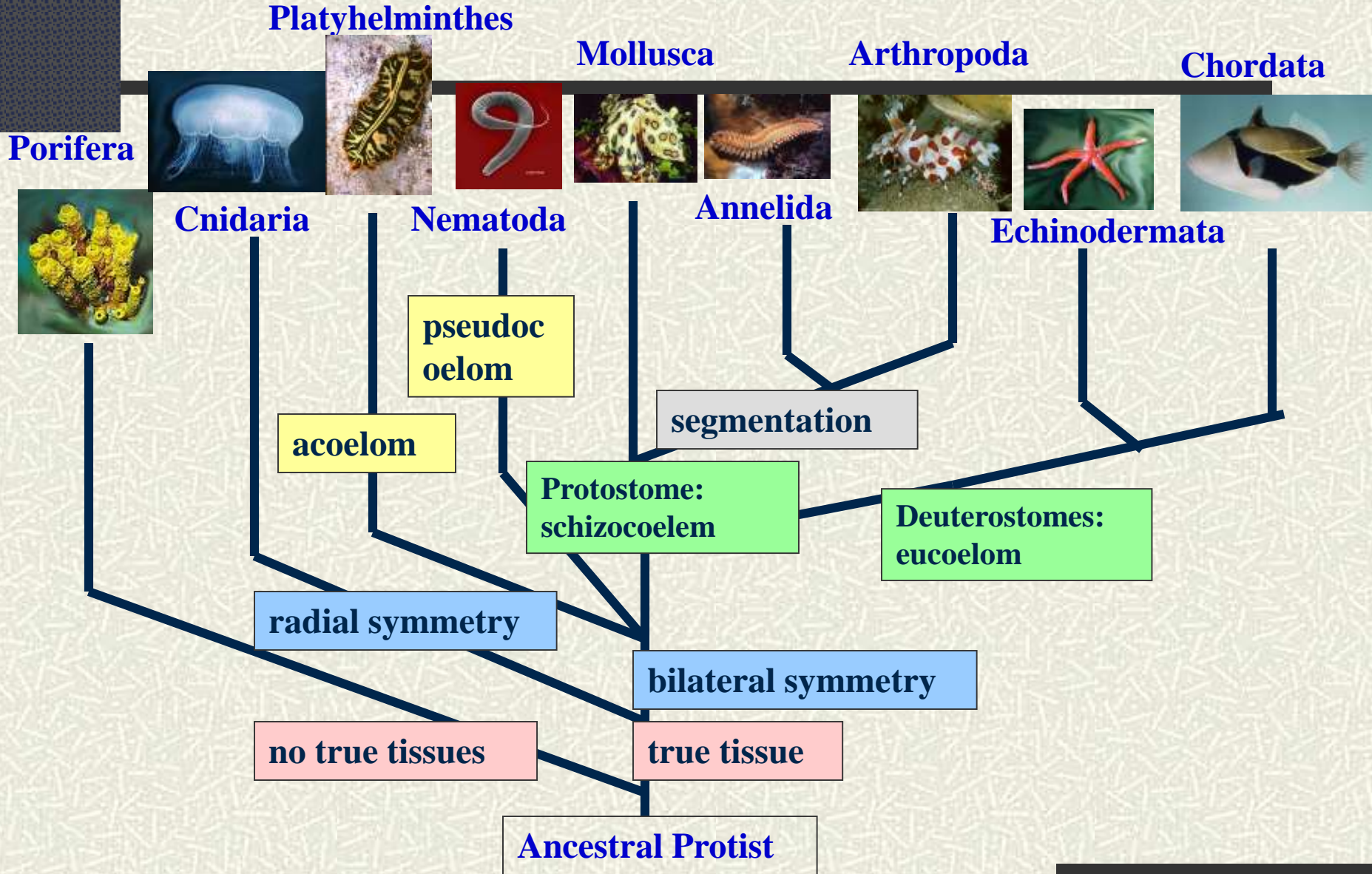




Phylum Mollusca



Phylogeny



Phylum Mollusca

Class
Polyplacophora

chitons

Class
Gastropoda

Snails
Sea slugs
nudibranchs

Class
Bivalvia

clams

Class
Cephalopoda

Squid
Octopus
Cuttlefish
Nautilus

Phylum Mollusca (mollis, soft)

- # Over 90,000 living species
 - # 70,000 fossil species
 - # Some are herbivorous grazers
 - # Some are predaceous carnivores
 - # Many are filter feeders
 - # Some are parasites
 - # Mostly marine but some terrestrial and freshwater
-

Phylum Mollusca: Economics

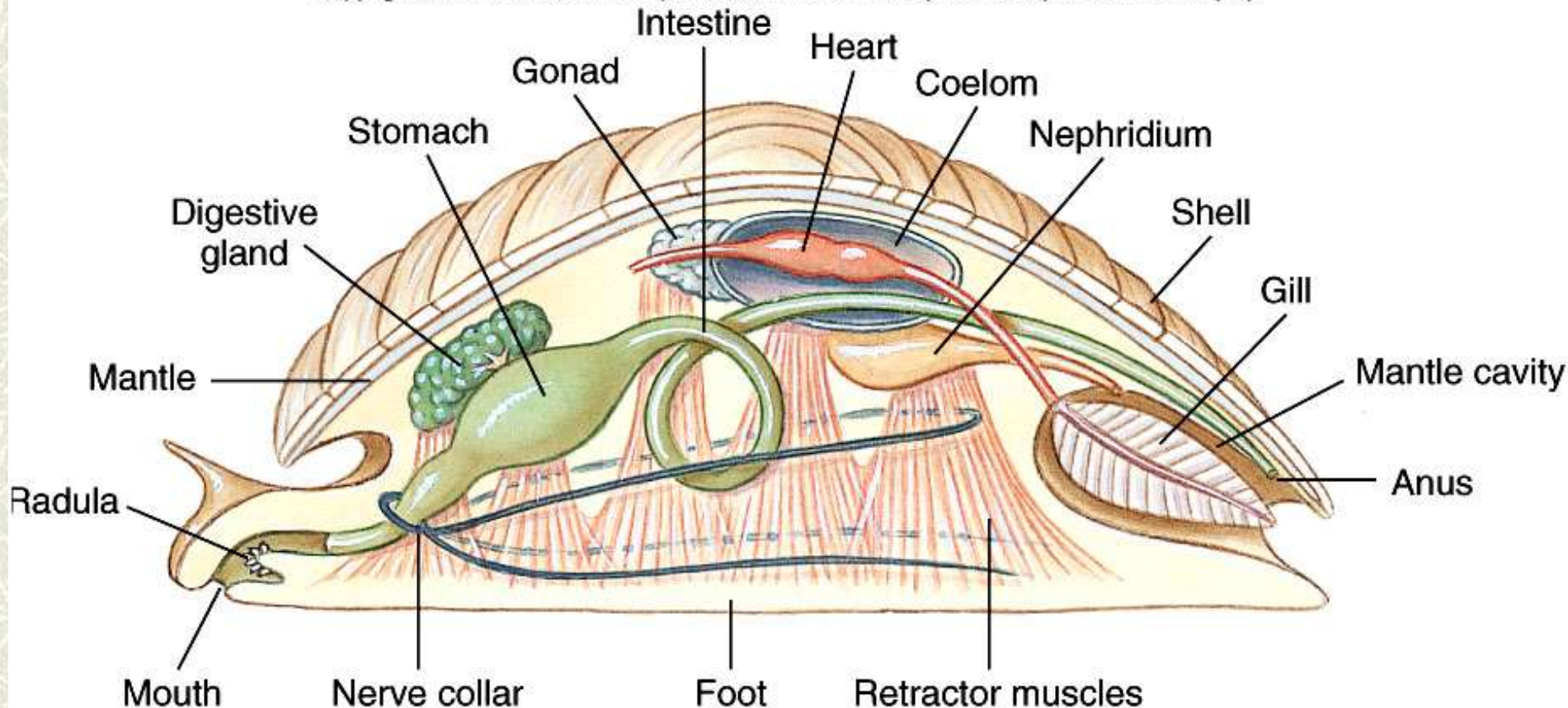
- # Many are used as food
 - # Culturing of pearls
 - # Shipworms burrow into wood destroying ships and wharves
 - # Snails and slugs are garden pests
 - # Some snails are intermediate host for parasites
-

Form and Function: Head-foot

- # Head foot contains feeding, cephalic sensory and locomotor organs at the anterior end.
 - # The head foot contains digestive, circulatory, respiratory and reproductive organs in the visceral mass
-

Generalized Mollusc Anatomy

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Mantle Cavity

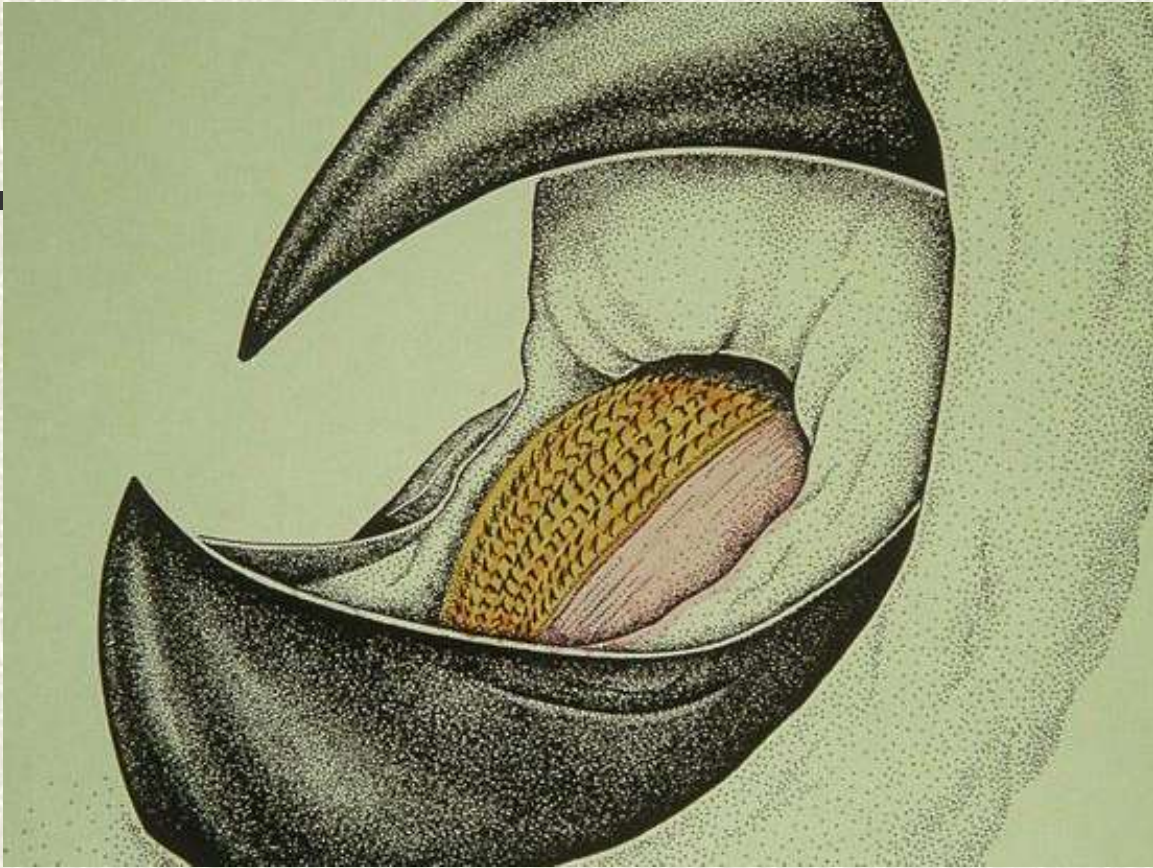
- # Body usually an anterior head, **ventral foot** and a dorsal **visceral mass**.
 - # Covered by a fleshy outgrowth of the body wall called a **mantle or pallium**.
 - # Space between mantle and body is the mantle cavity.
-

Head-Foot

- # Well developed head with mouth and sensory organs.
 - # Photosensory receptors range from simple to complex eyes.
 - # Tentacles may be present.
 - # Posterior to the mouth is the locomotor organ, the foot.
-

Radula

- # Rasping tongue like organ
 - # Rows of tiny teeth-up to 250,000-pointed backward.
 - # Rasps off fine particles of food from surface.
 - # Acts as a conveyor belt to move particles to the digestive tract.
-



Foot

- # The foot is usually ventral.
 - # May be used for attachment to substratum
 - # May be used for locomotion
 - # Free-swimming forms have modified the foot into a wing or a fin-like swimming agents.
-

Mantle and Cavity

- # Mantle is a sheath of skin on side of body. Secretes shell when present.
 - # Houses the gills or lungs.
 - # Exposed surface of mantle serves for gaseous exchange.
 - # Cephalopods use the head and mantle cavity to create jet propulsion
-

Shell

- # Secreted by mantle and lined by it.
 - # Periostracum is outer horny layer, composed of conchiolin a tanned protein.
 - # Middle prismatic layer has closely packed prisms of calcium carbonate
 - # Inner nacreous layer is next to the mantle.
Nacre is layed down in thin layers.
-

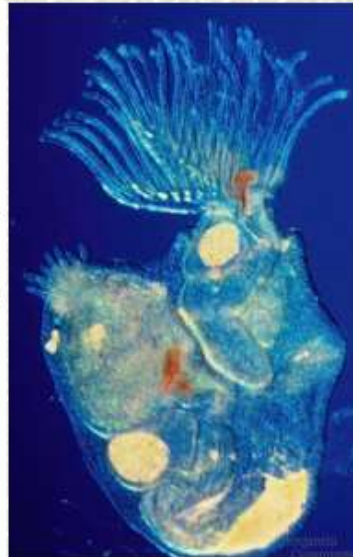
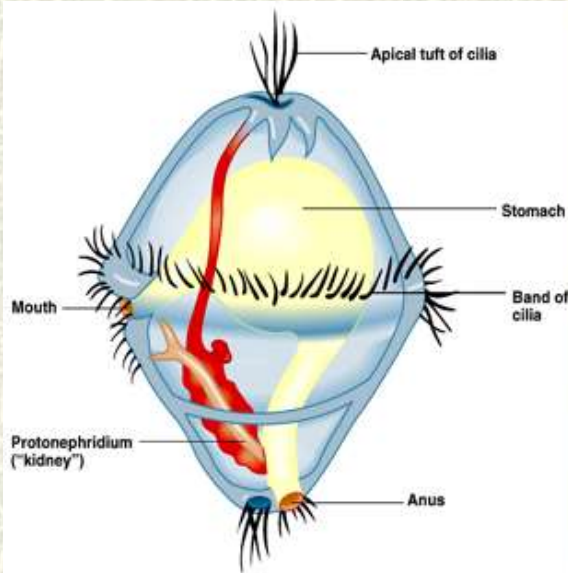
Internal Structure and Function

- # Open circulatory system includes a pumping heart, blood vessels and blood sinuses. (cavity or hole)
 - # Most cephalopods have a closed system with a heart, vessels and capillaries.
 - # Sense organs vary and may be highly specialized.
-

Reproduction and life history

- # Most dioecious
 - # Some hermaphroditic
 - # Egg hatches and produces a free swimming trochophore larvae.
 - # In some gastropods and bivalves an intermediate larval stage the veliger is a derived state.
-

Trochophore and Veliger larva



Systems

- ✦ **Skeletal**- Mantle may secrete a **shell**. Use **hydrostatic pressure** for ventral muscular foot.
 - ✦ **Muscles** - **Ventral muscular** foot and other muscles present.
 - ✦ **Digestive**- complete complex with salivary glands, **digestive gland** and Rasing tongue (**Radula**).
 - ✦ **Circulatory** - Open except for Cephalopoda. Dorsal heart, usually in a pericardial cavity.
 - ✦ **Respiratory** - Ctenidia (**gills**) in mantle cavity, respiratory pigment is **copper**.
-

Systems

- ✦ **Excretory**- by **nephridia** usually connecting to the pericardial cavity,
 - the coelom is usually reduced to the cavities of the nephridia, gonads and pericardium.
 - ✦ **Nervous** - Nerve ring with various pairs of ganglia—two pairs of nerve cords, one innervating the foot, the other the visceral mass (modified **ventral ladder-like system**)
 - ✦ **Integumentary** - **Mantle**
 - ✦ **Endocrine** - nervous systems produces hormones.
 - ✦ **Reproductive** - varied- monoecious, protandric, or **dioecious**. Larva in marine = **trochophore** and **veliger**, in freshwater clam is **glochidium**.
-

Taxonomy

Mouse click on any underlined taxon to go to information of that taxon

Classes:

- [Monoplacophora](#) (no specimens)
 - [Polyplacophora](#)
 - [Scaphopoda](#)
 - [Gastropoda](#)
 - [Bivalvia](#)
 - [Cephalopoda](#)
-

Class: Gastropoda

- # Univalves, Shell usually spiral, distinct head, scraping radula.
- # Visceral mass typically turned 180° counterclockwise = **torsion**. And the visceral mass is coiled in shell.
- # Representatives
 - [Garden snail \(*Helix*\)](#), [Whelks \(*Busycon*\)](#), [Conch](#), [Cowries](#), [Sea hare](#), Nudibranchs, [Slugs](#), and [abalone](#).

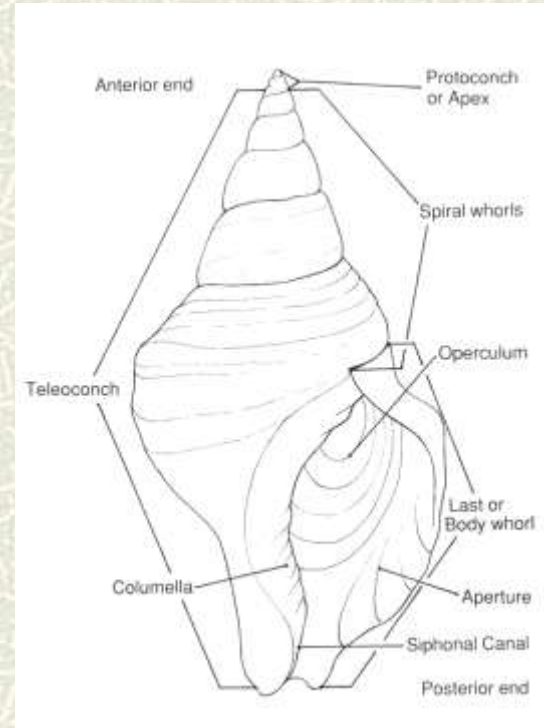


Class Gastropoda (stomach foot)

- # 70,000 living species
 - # 15,000 fossil species
 - # Snails, limpets, slugs, whelks, conches, periwinkles, Sea slugs, sea hares, sea butterflies
 - # Primitive marine forms to air breathing terrestrial snails and slugs.
-

Gastropod Shell

- # One piece univalve, coiled or uncoiled
- # Apex is the smallest whorl
- # Whorls become larger and spiral around the central axis or columella
- # Giant marine gastropods can have a shell up to 60 cm



Gastropods continued

- # Typically sluggish or sedentary
- # Shell is a form of defense.
- # Some produce distasteful or toxic secretions.
- # Operculum may cover the aperture (opening.)
- # May serve as host to parasites and may be harmed by larval stages.



Helix (garden snail)



Helix, dorsal view



Helix, ventral view

Return to Gastropoda



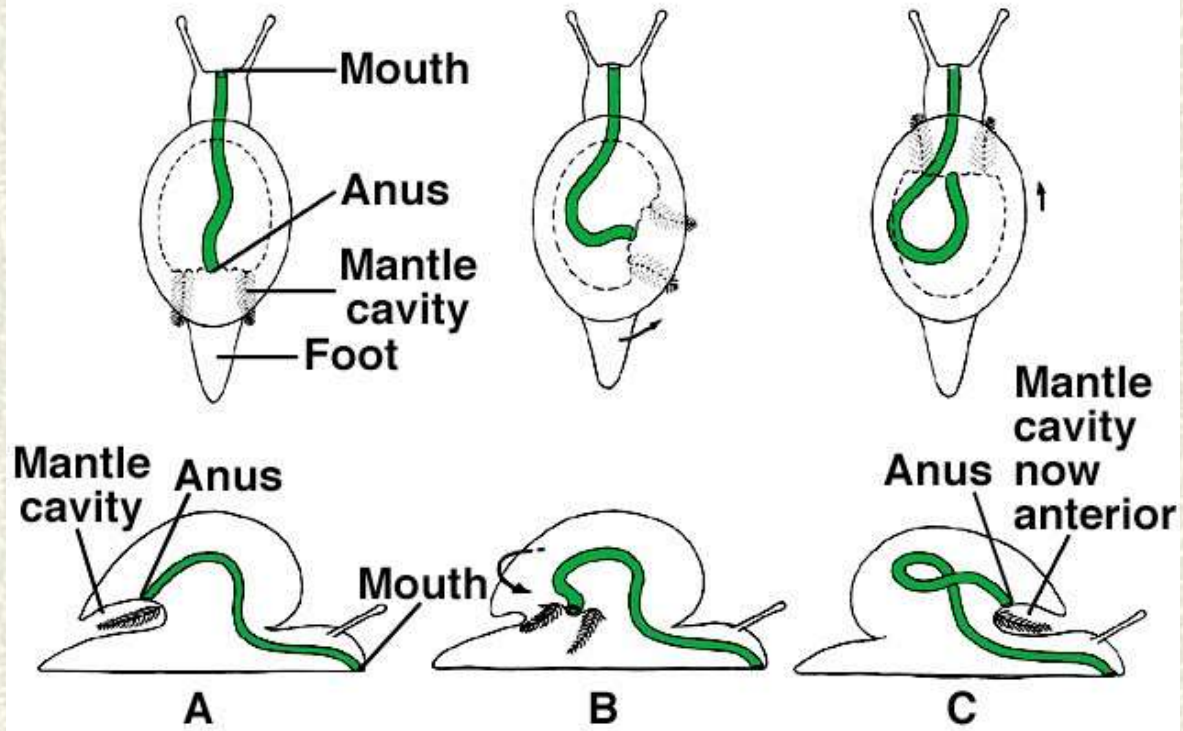
Helix, side view

Gastropods-Torsion

- # Only Gastropods undergo torsion
 - # Torsion moves the mantle cavity from the posterior to the front of body.
 - # This twists the visceral organs 90 to 180 degrees while in the veliger larvae stage.
 - # The anus cavity and mantle cavity move from posterior to anterior opening above the head.
 - # Advantage is that head can be retracted into shell because of available space.
 - # Disadvantage is that waste is release by anus over the gill which causes “fouling”
-

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Torsion in gastropods



Gastropoda Coiling

- ✦ Coiling or spiral winding of the shell and visceral mass is not the same as torsion.
 - ✦ It occurs at the same larval stage as torsion but has a separate origin.
 - ✦ Shifting the shell upward and back helped balance the uneven weight distribution.
 - ✦ However, the gill, auricle and kidney of the right side are lost in most species.
 - ✦ Loss of the right gill allows one solution to the problem of fouling; Wastes expel to the right.
-

Feeding Habits

- # Adaptations of the radula provides much variation.
 - # Many are herbivorous feeding on plankton
 - # Some scavenge on decaying flesh; others are carnivorous
 - # Some collect debris as a mucus ball to ingest; sea butterflies secrete a mucus net.
 - # Cone snail
-

Return to Gastropoda

Busycon (Whelk)



Busycon (shell removed)



Busycon eggs



Busycon shells

Other Gastropods (continues)



Sea Hair (ventral view)



Sea Hair side view



Slug

Return to Gastropoda

Other Gastropods



Conch



Abalone shells



Examples of gastropoda

Polyplacophora

[Return to Polyplacophora](#)

representative genera.

Katherina



Katherina ventral surface



Katherina dorsal surface

Class Bivalvia

- # Shell of **two lateral valves**, with dorsal hinge.
- # Mantle of flattened right and left lobes. Posterior margin commonly forming **siphons**
- # Labial palps beside mouth
- # No head
- # **No radula**

Representative bivalves

Representatives of Bivalvia

- # *Anadonta* (Freshwater clam)
- # *Teredo* (Shipworm)
- # Rock boring clam
- # *Ostrea* (Oyster)
- # *Pecten* (Scallop)
- # Giant clam
- # Freshwater clam dissection



Anadonta



Dissection

Teredo (shipworm) and the Rock boring worm

[Return to Representatives](#)



Teredo



Teredo in wood



Rock boring clam

Return to Representatives

Oyster and Scallop



Scallop shells



Oyster cluster



Oyster shells

Freshwater Clam Dissection

- # External shell
 - # Mantle
 - # One mantle flap removed.
 - # Visceral Mass (not dissected)
 - Dissected Visceral Mass I
 - Dissected Visceral Mass II
 - # Dorsal Heart
 - Dorsal heart I(showing auricle or atrium)
 - Dorsal heart II(showing ventricle)
 - Dorsal heart III (ventricle)
 - # Internal shell
(showing muscle scars and pallial line)
-

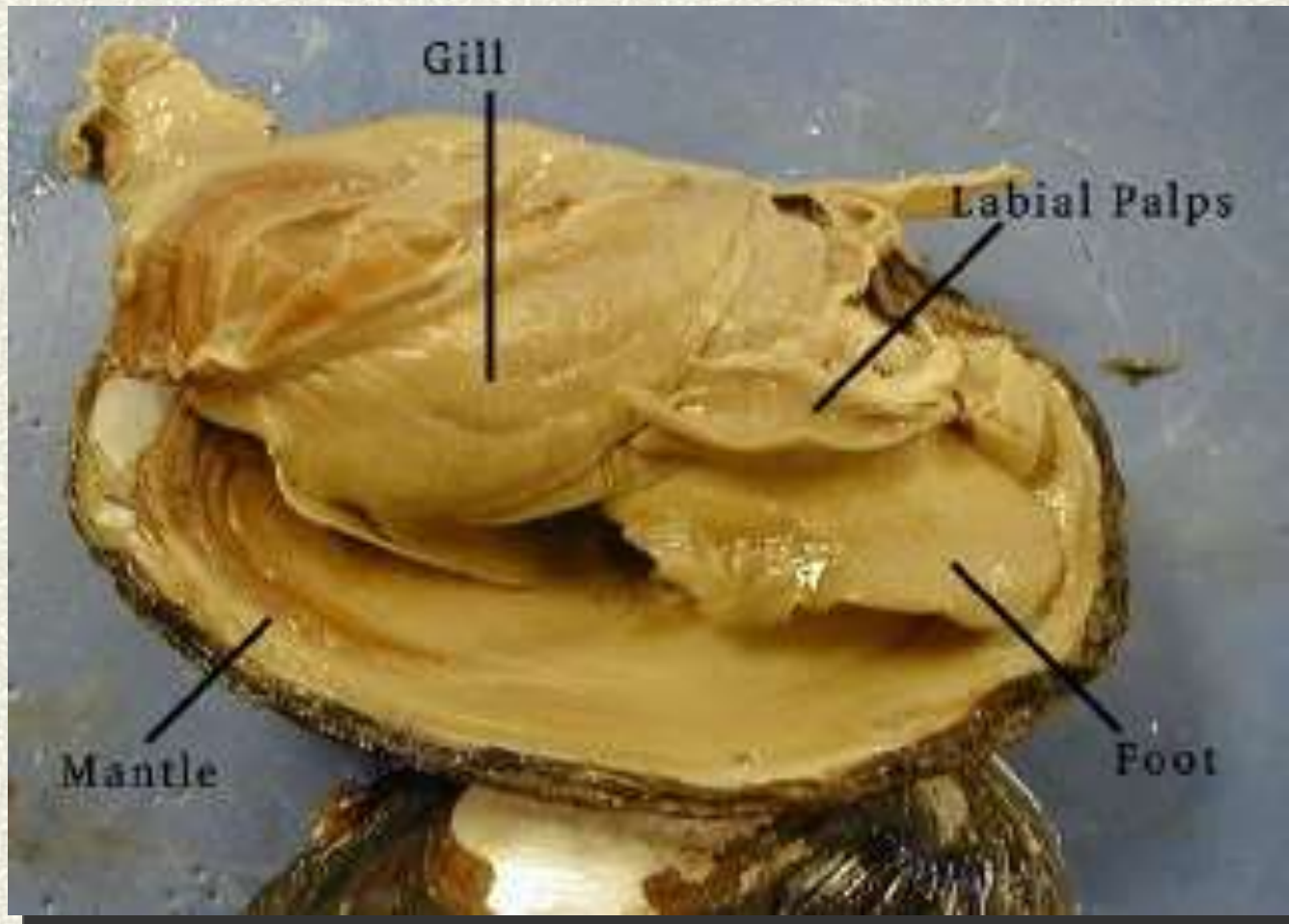
External Shell



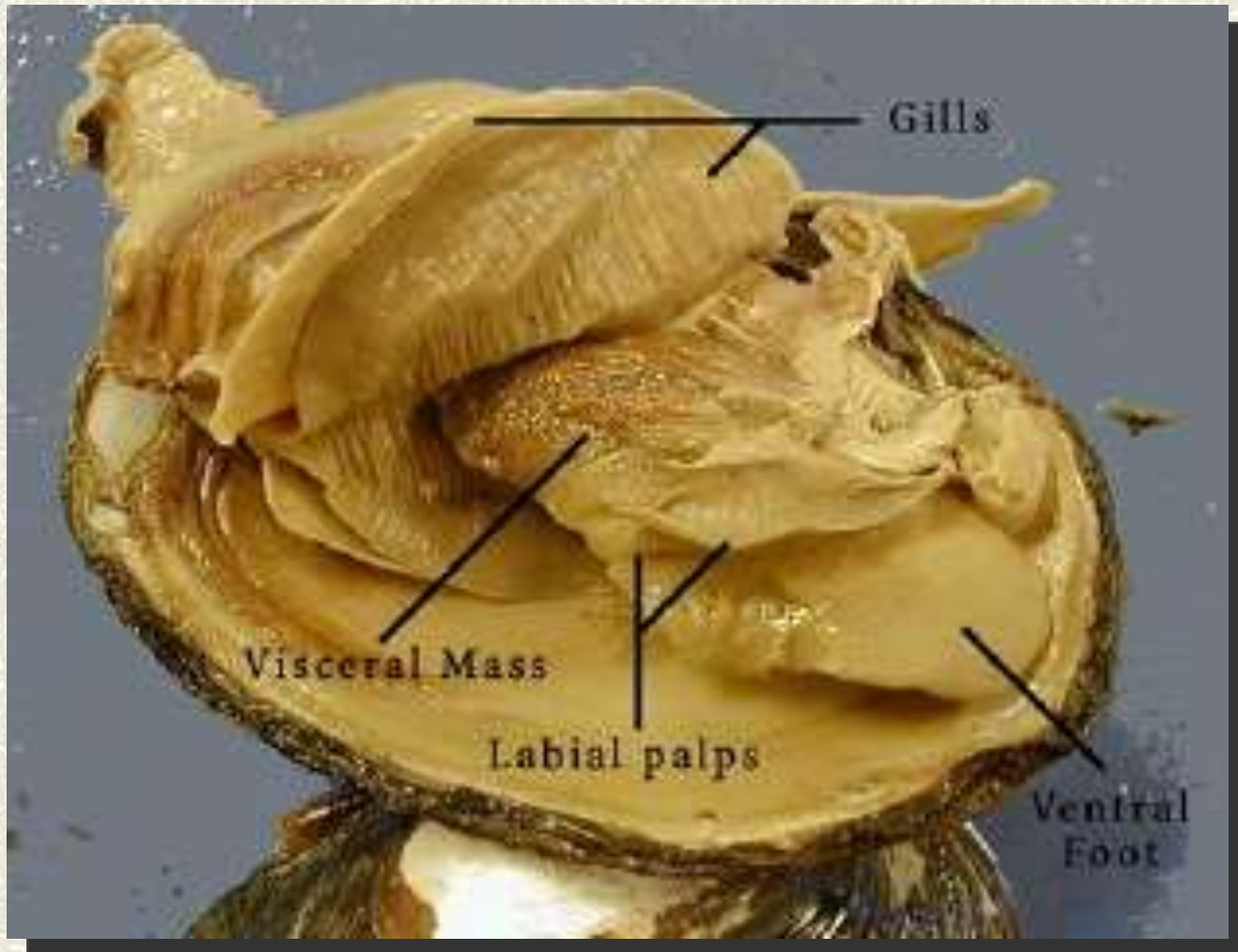
Mantle



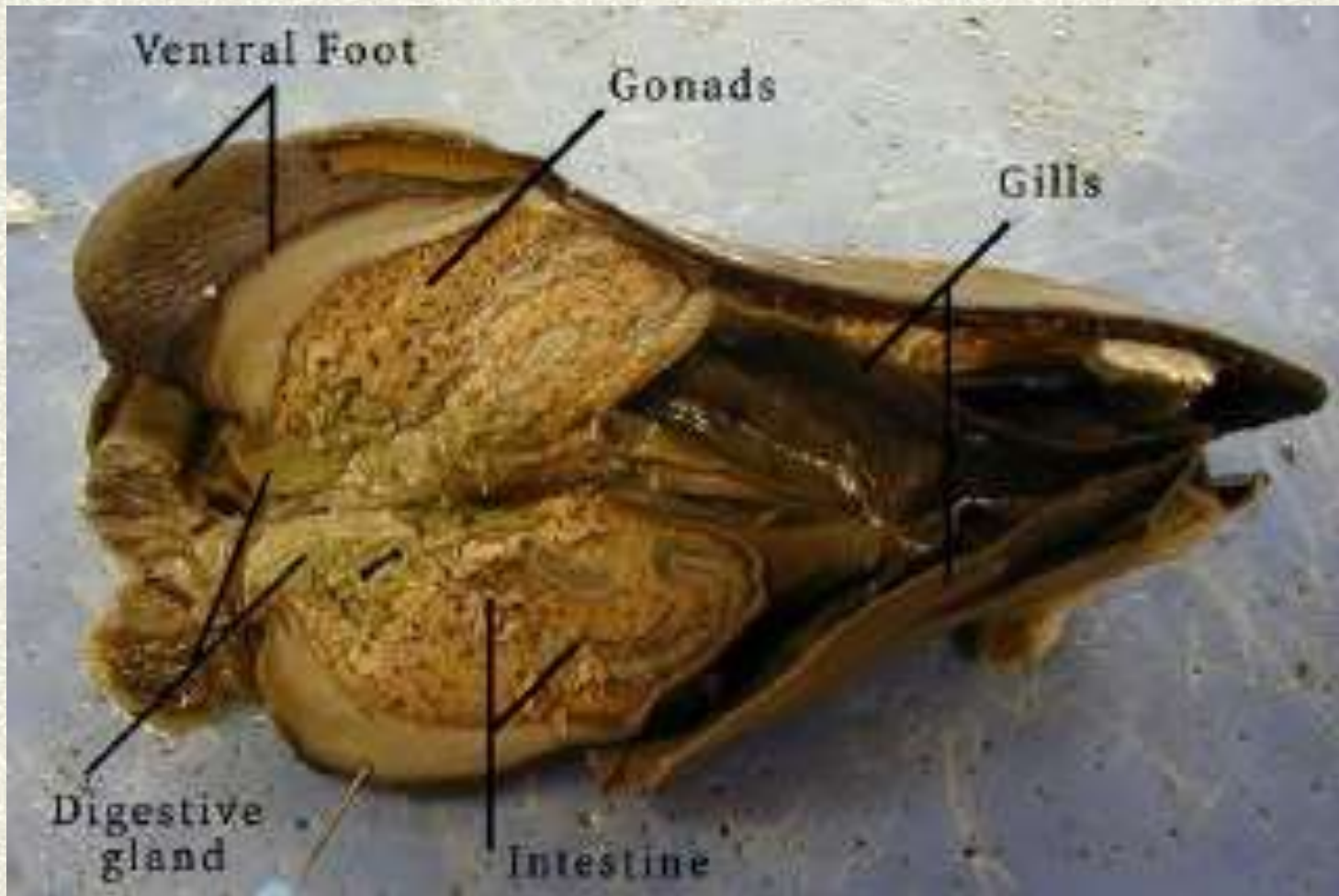
One side of mantle removed



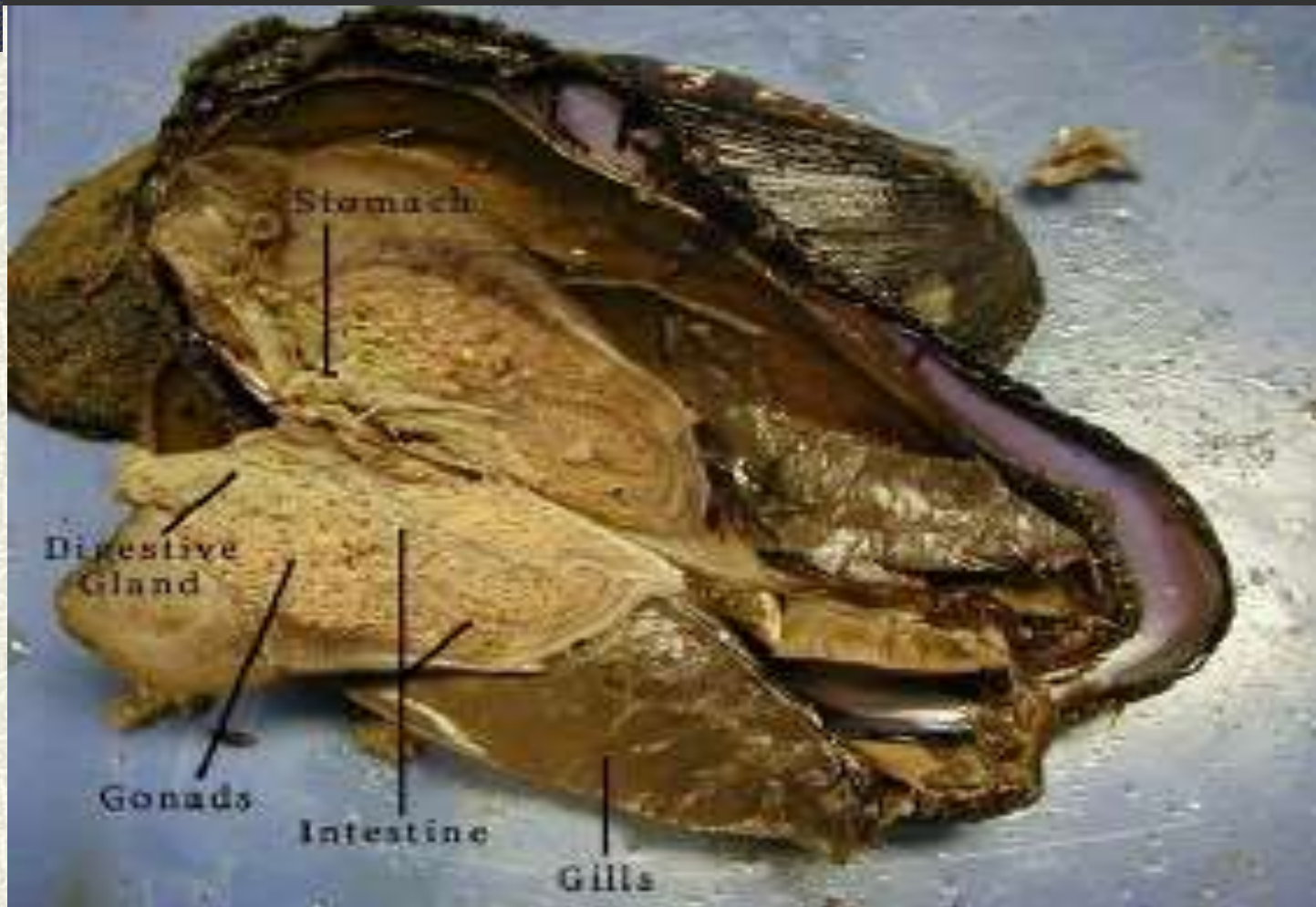
Visceral Mass



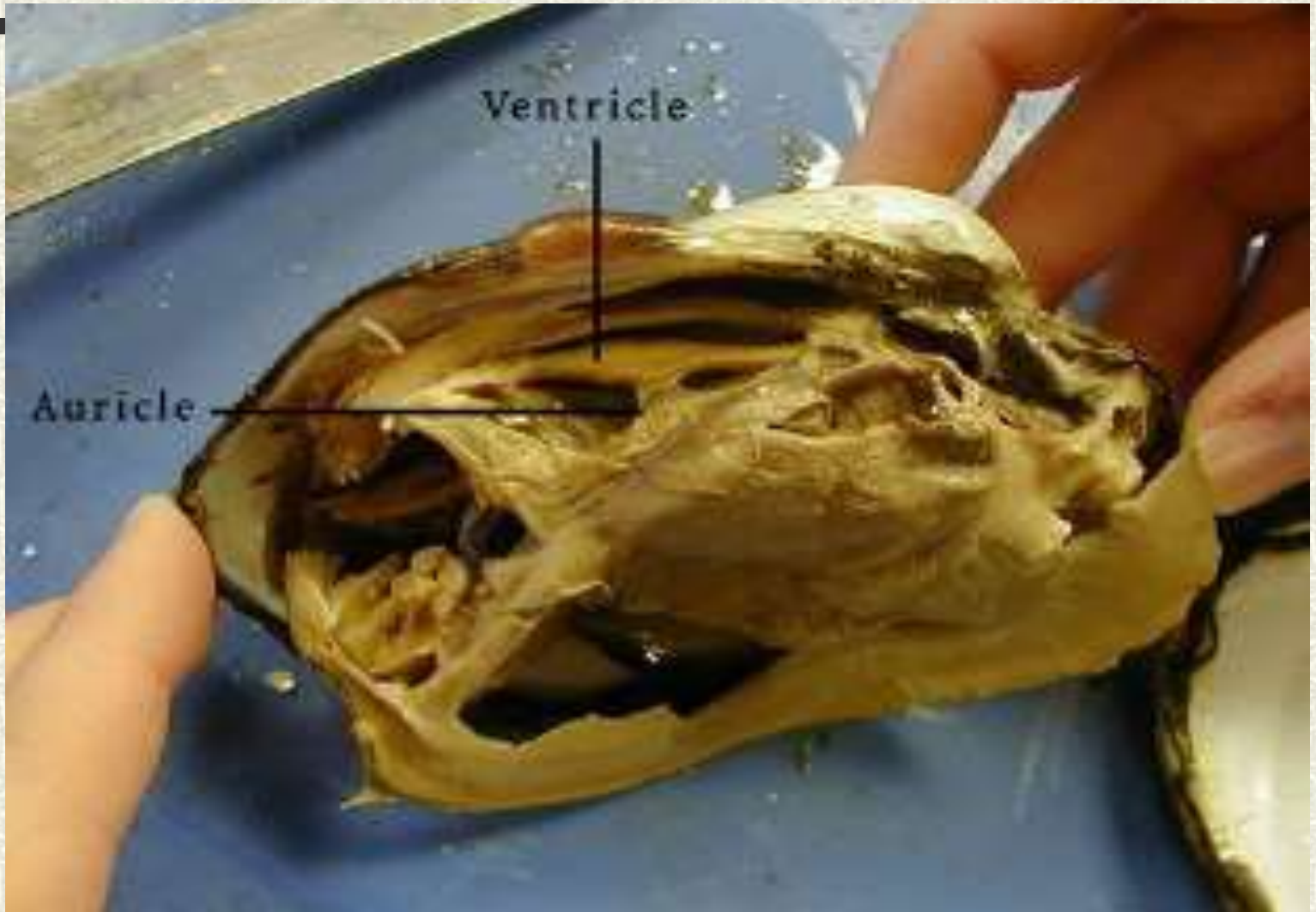
Dissected Visceral Mass (I)



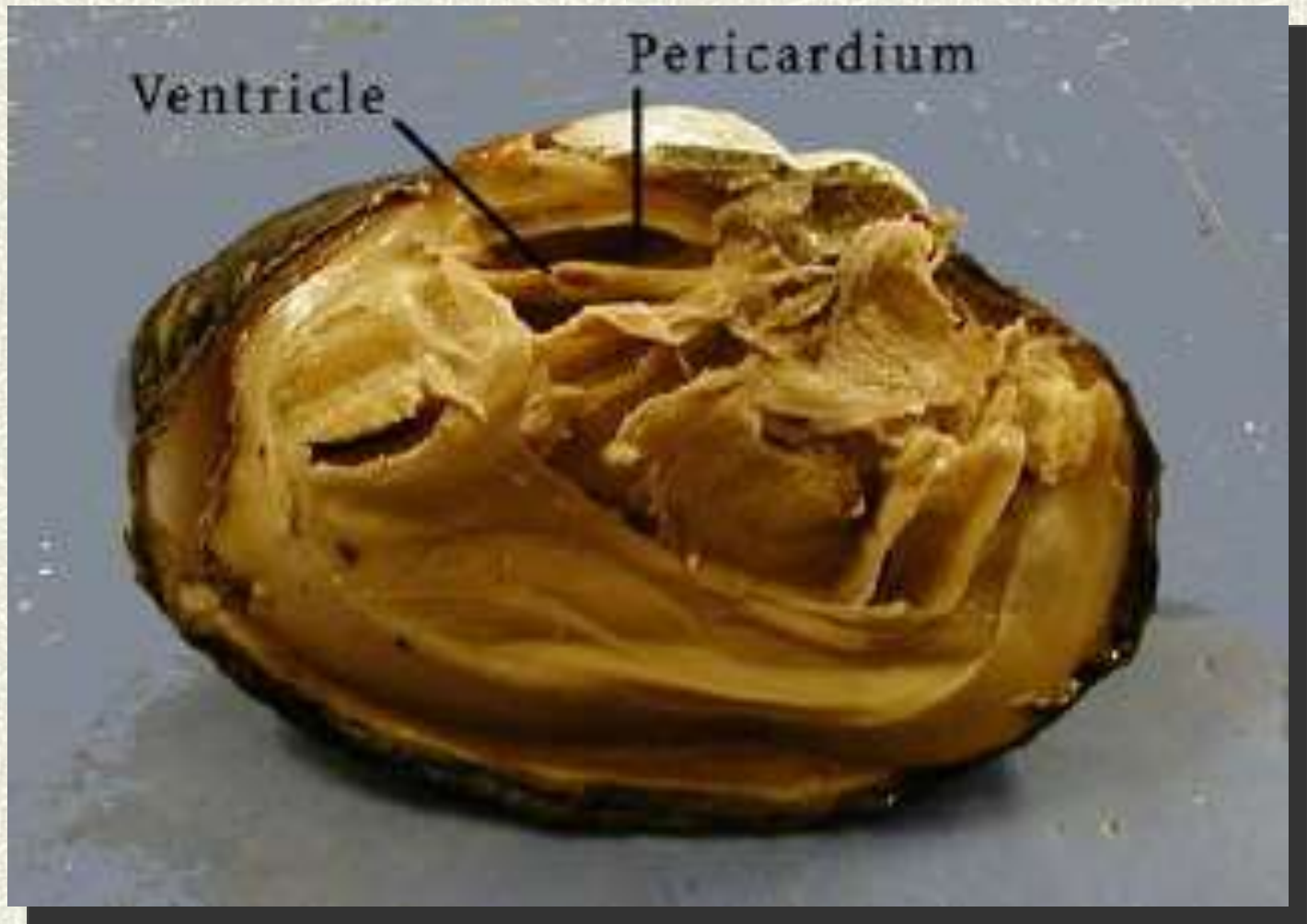
Dissected Visceral mass (II)



Dorsal Heart I



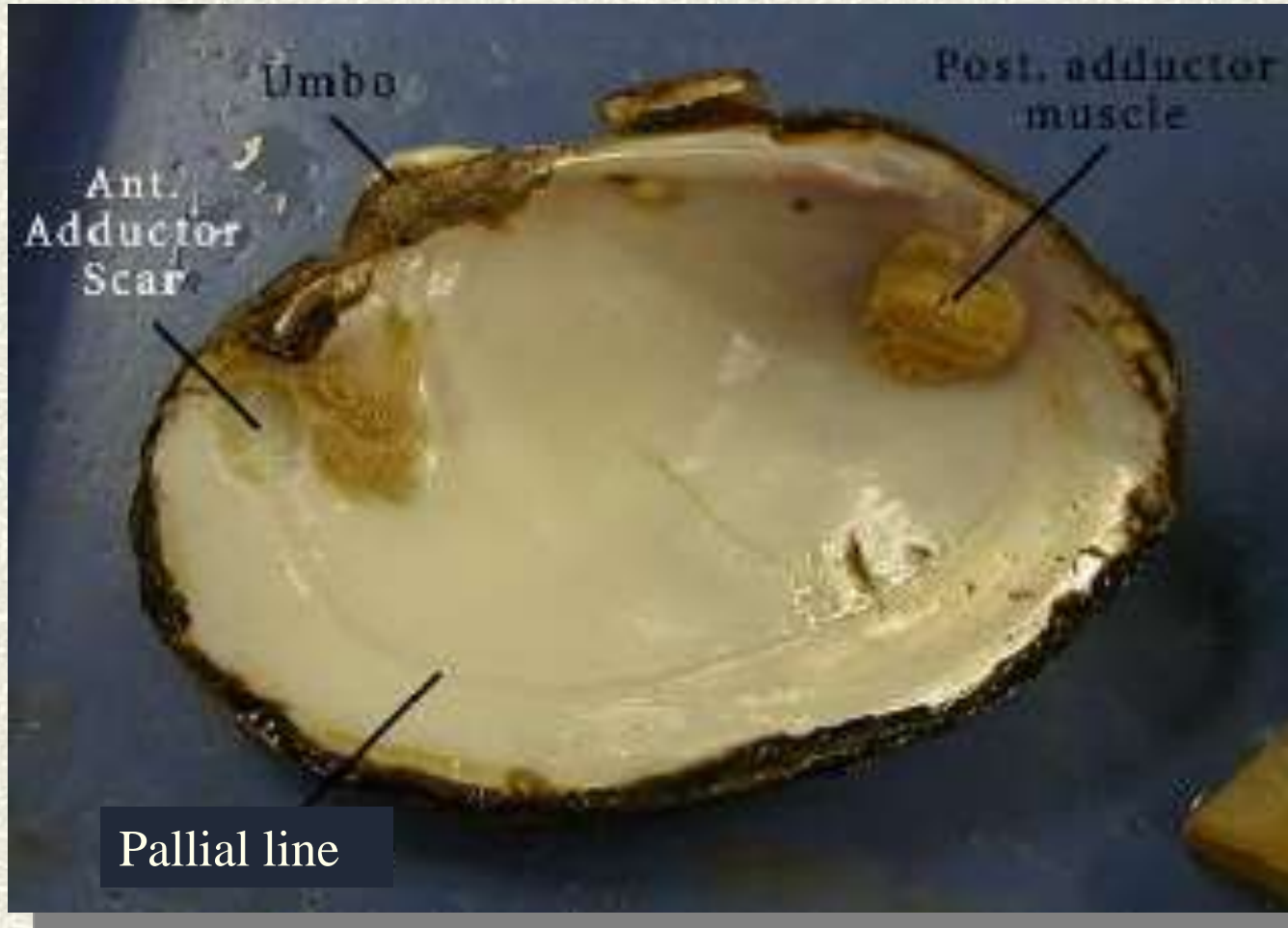
Dorsal Heart II



Dorsal Heart III



Internal parts of shell Shell



Class Cephalopoda

- # **Large head** with conspicuous eyes
- # **Ventral foot modified** into **tentacles**(are arms) with suckers.
- # Representative Cephalopods
 - *Nautilus*(Chambered Nautilus)
 - *Octopus* (Octopus)
 - *Loligo* (Squid) (*Giant Squid*)
 - *Sepia* (Cuttle fish)



Nautilus

(South Pacific and Indian Ocean)



Return to Cephalopoda

Octopus † Eight arms



Return to Cephalopoda

Loligo



Internal skeleton = Pen

Sepia

Cuttlebone (internal skeleton)



Class Monoplacophora

- # First 10 specimens of *Neopilina* were taken in 1952 from dark muddy clay at 3350 m(11,000 ft) off the coast of Costa Rica.
 - # Since then other species have been found in Indo-Pacific and South Atlantic Oceans.
 - # *Neopilina* is the only living genus
 - # *Neopilina* has segmented muscles
-

Class Scaphopoda

[Back to Taxonomy](#)

- # Tooth shells (or Tusk shells)
 - Shell and mantle slender, tubular, and slightly curved. It is **open at both ends**



Dentalium