
بسم الله الرحمن الرحيم

PHYLUM MOLLUSKA

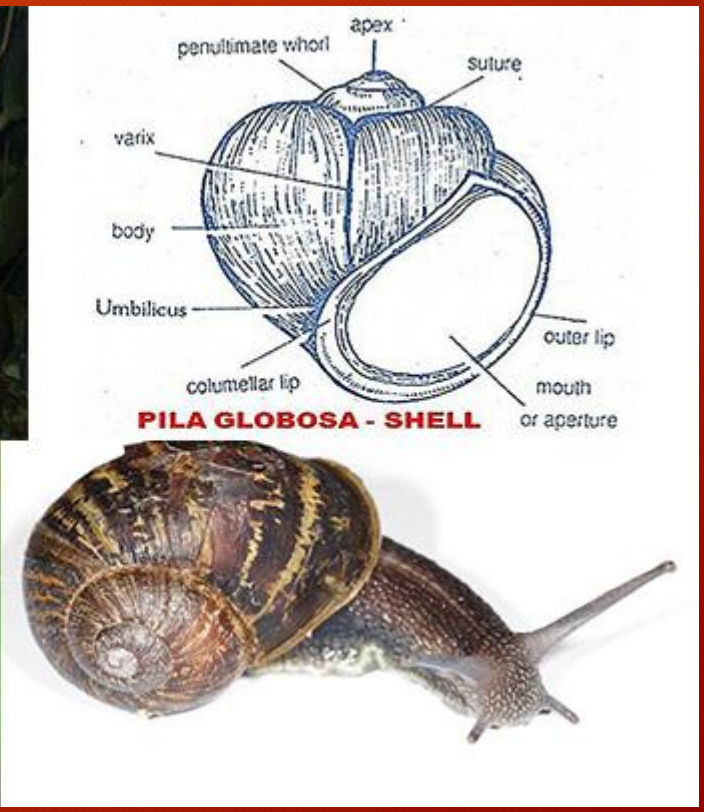
Phylum Mollusca

Introduction

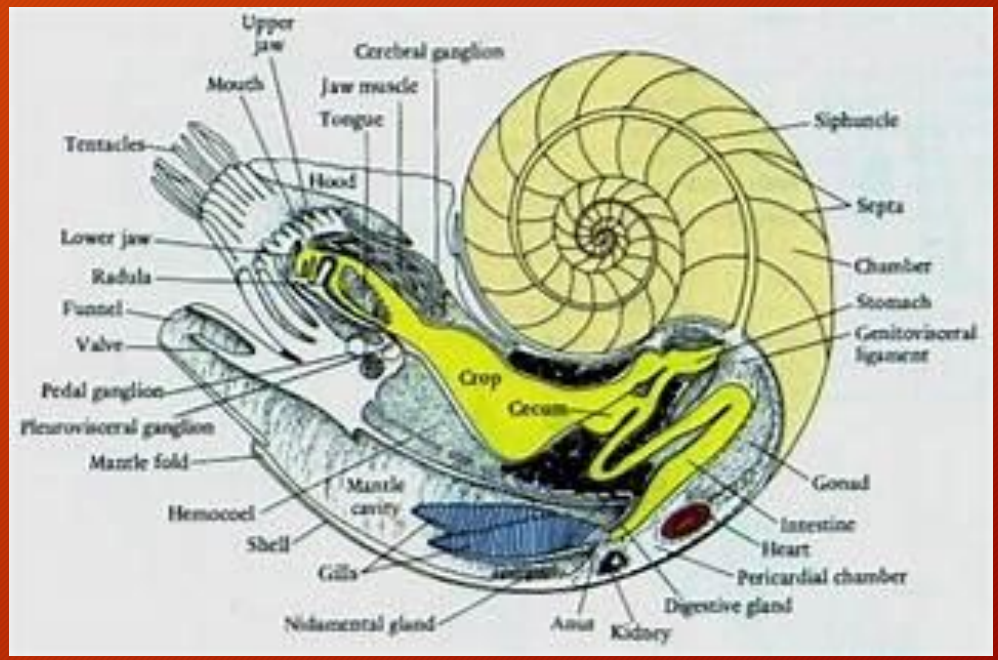
- The Phylum Mollusca includes the snails, oyesters, clams,octopuses, and squids.
- Latin word mollis means – soft body.
- Molluscans are characterised by a soft body,a shell and bilateral symmetry.
- Close relatives of Annelids.
- Malacology.
- Scientists have been interested in studying Molluscans because of their used as food, in jewellery, vectors of diseases and as pests.

General Characters

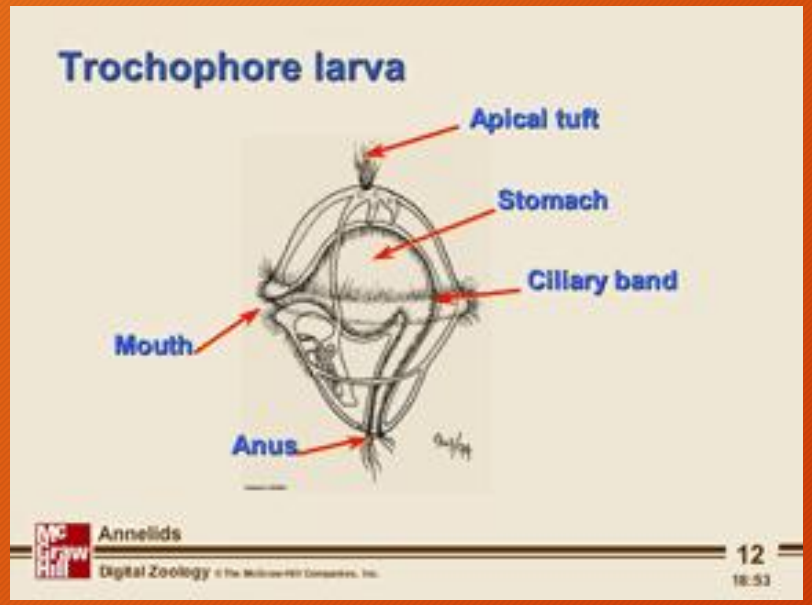
- Inhabitants of fresh water and few are terrestrial.
- Mostly free living and few are parasitic.
- Size and shape varied – microscopic to huge and long.
- Unsegmented body bilaterally symmetrical.
- Body devided as head, visceral mass, and muscular foot.
- Body covered by mantle and shell(internl,external or absent).
- Respiration by gills in mental cavity, lungs in terrestrial forms.

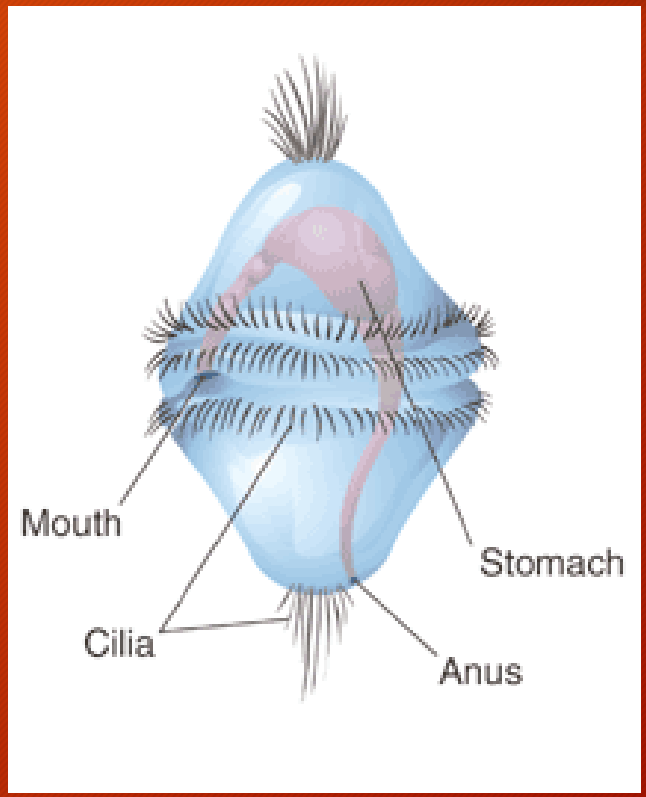


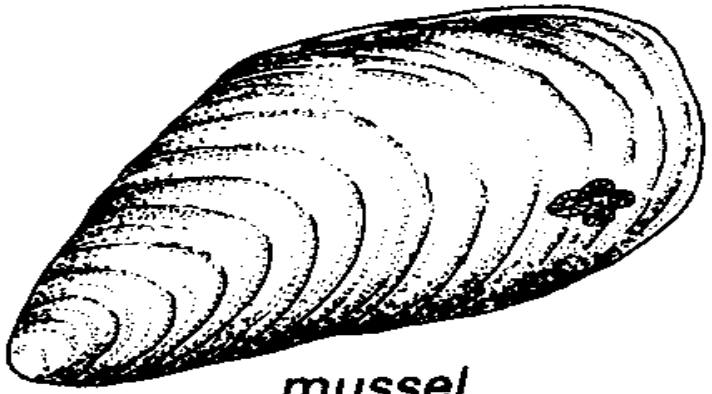
- Complete and developed digestive system
- **Circulatory system** is open type (except cephalopoda) with a heart and an aorta
- **Excretion** takes place by paired sac like kidneys(Metanephridia)
- **Nervous system** consists of three pair of ganglia(cerebral, visceral and pedal)
- Stalked eyes, statocysts and osphradium are sense organs
- Sexes are normally separate but some may be hermaphrodite
- Fertilization may be external or internal
- Development is direct or indirect by trochophore larvae.



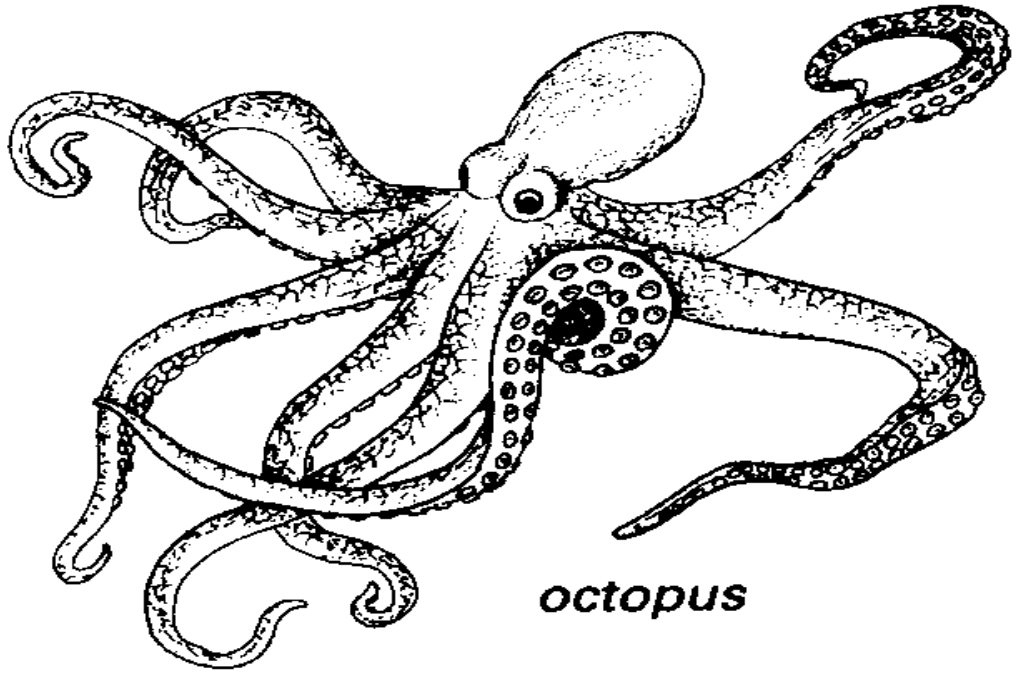
TROCHOPHORE LARVA



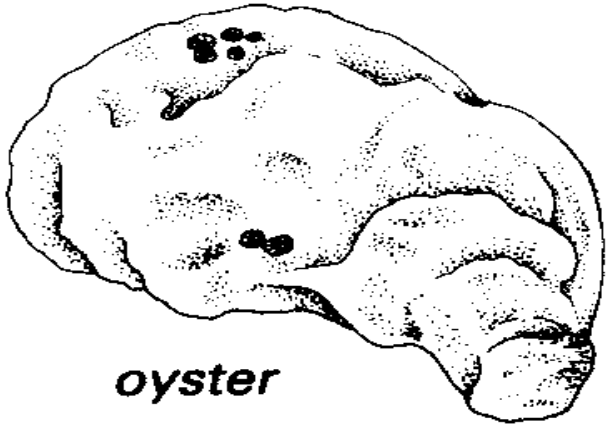




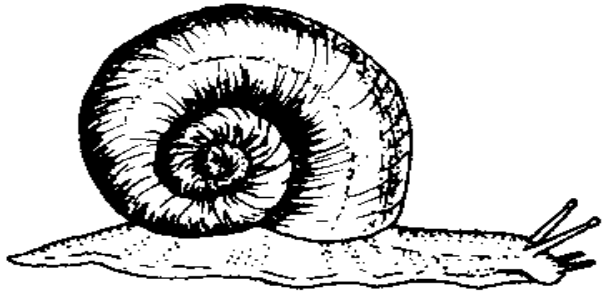
mussel



octopus



oyster



garden snail

limpet

A variety of molluscs.

INTERESTING FACTS

- Most of the molluscans are vegetarians.
- Octopuses are highly advanced invertebrates.
- Snails are molluscans with only one foot.
- Some oysters can change their gender alternately.

BIVALIA

MUQADDAS JABBAR

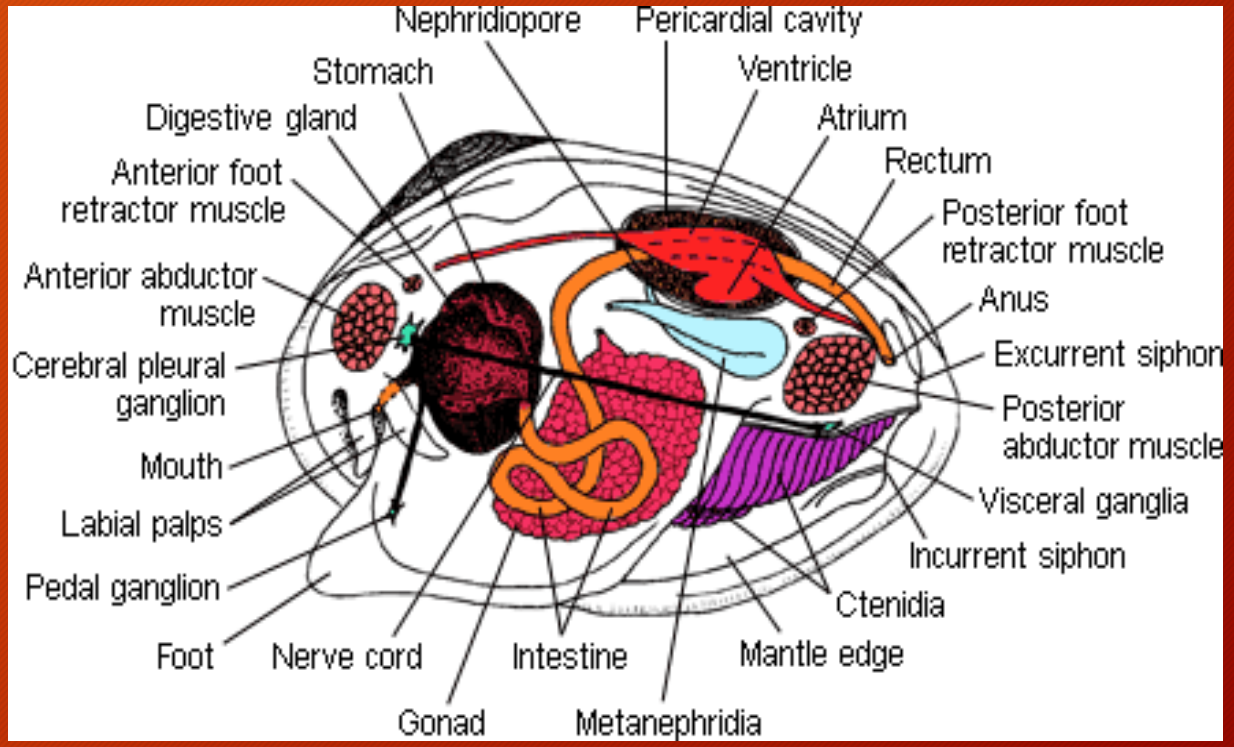
Class Bivalvia

CHARACTERISTICS

- Bivalves live in aquatic habitats
- They have **30,000** species
- Second largest class of molluscans
- Members include clams, oysters and scallops
- Outer covering is a shell having two valves
- Many are edibles, some form pearls
- Filter feeders and valuable in removing bacteria

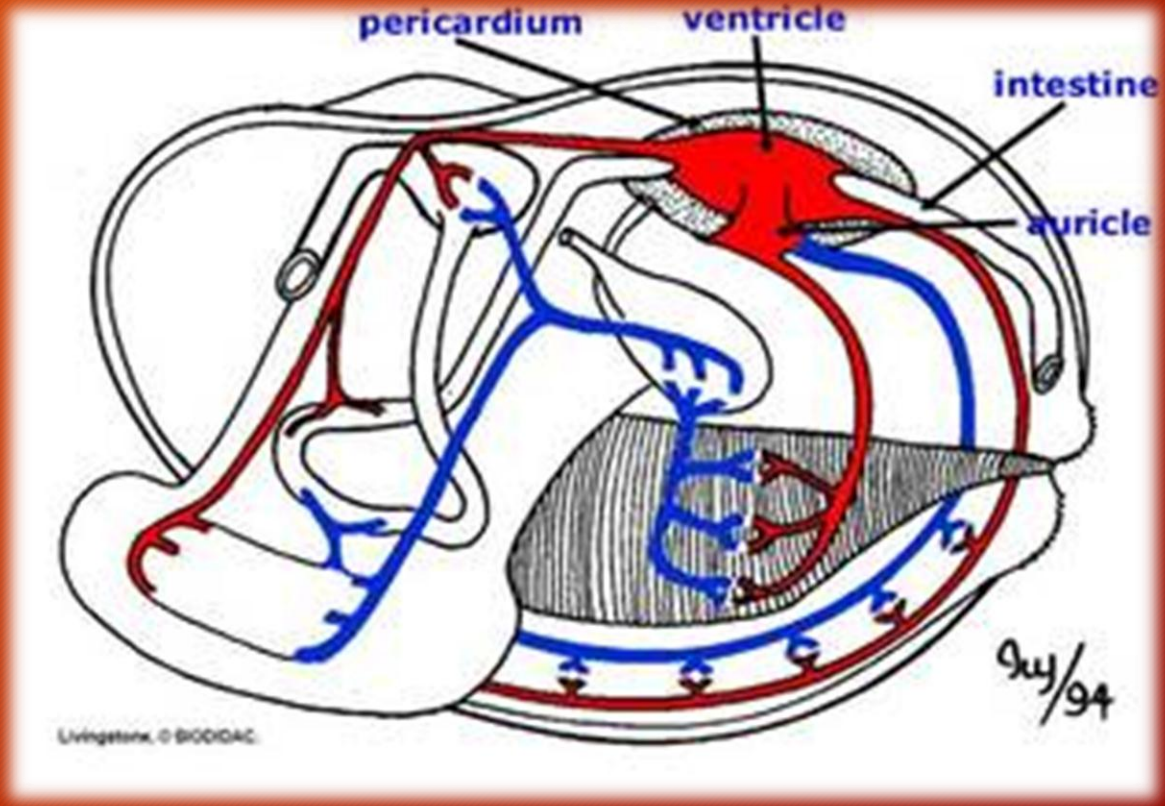
Associated Structures

- A series of tongue and groovemodification called **teeth**
- The oldest part is Umbo
- Secretion of protein and $CaCO_3$ from mantle
- Adductor muscled at dorsal half
- Nacre forms the pearl
- Pinctada margaritifera and Pinctada mertensi forms the highest quality pearl



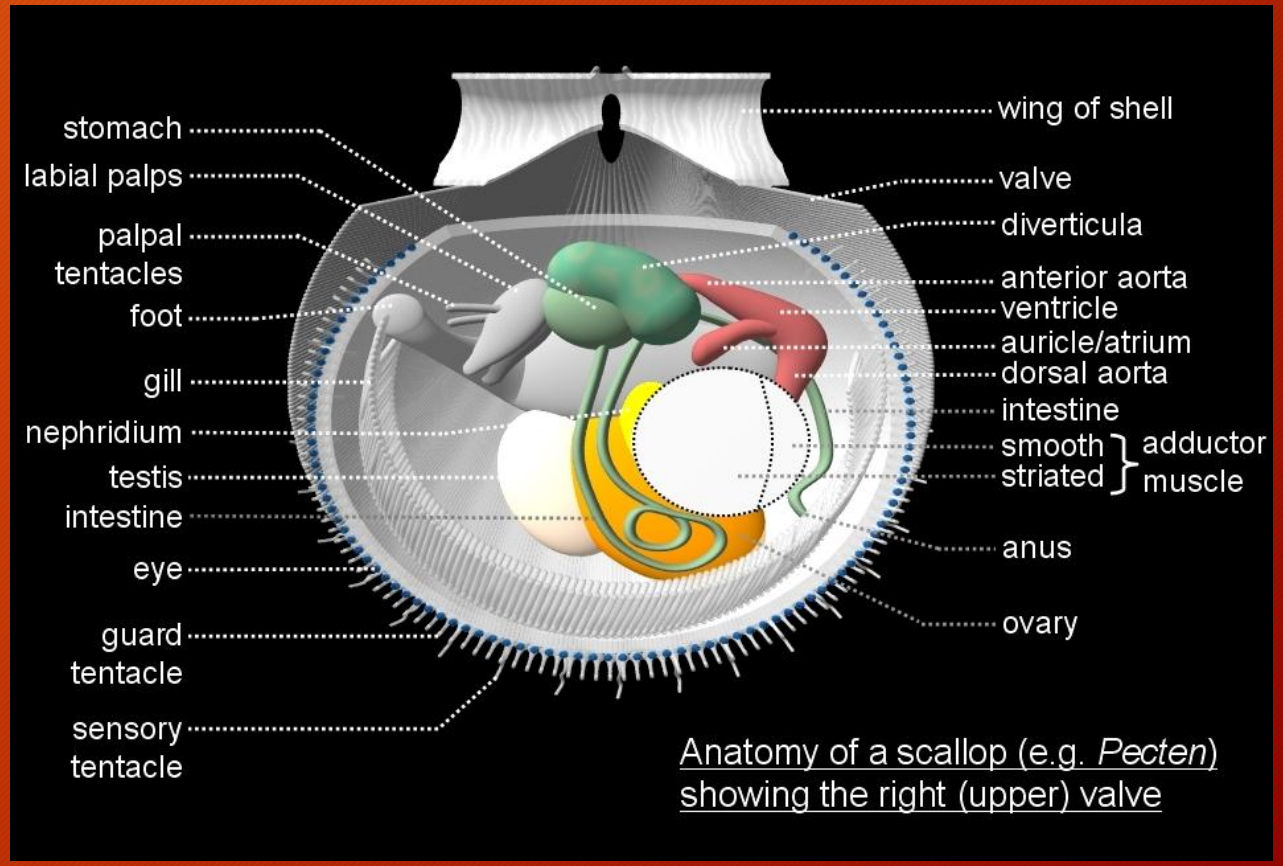
Gaseous Exchange

- No head and radula
- Cilia covered gills
- Mantle cavity present at two regions inhalant and exhalent
- Bivalves buried in substrate
- Extend its siphon to exchange gases
- Gaseous exchange occur through diffusion
- Water exit through super branchial chamber



Filter Feeding and Digestion

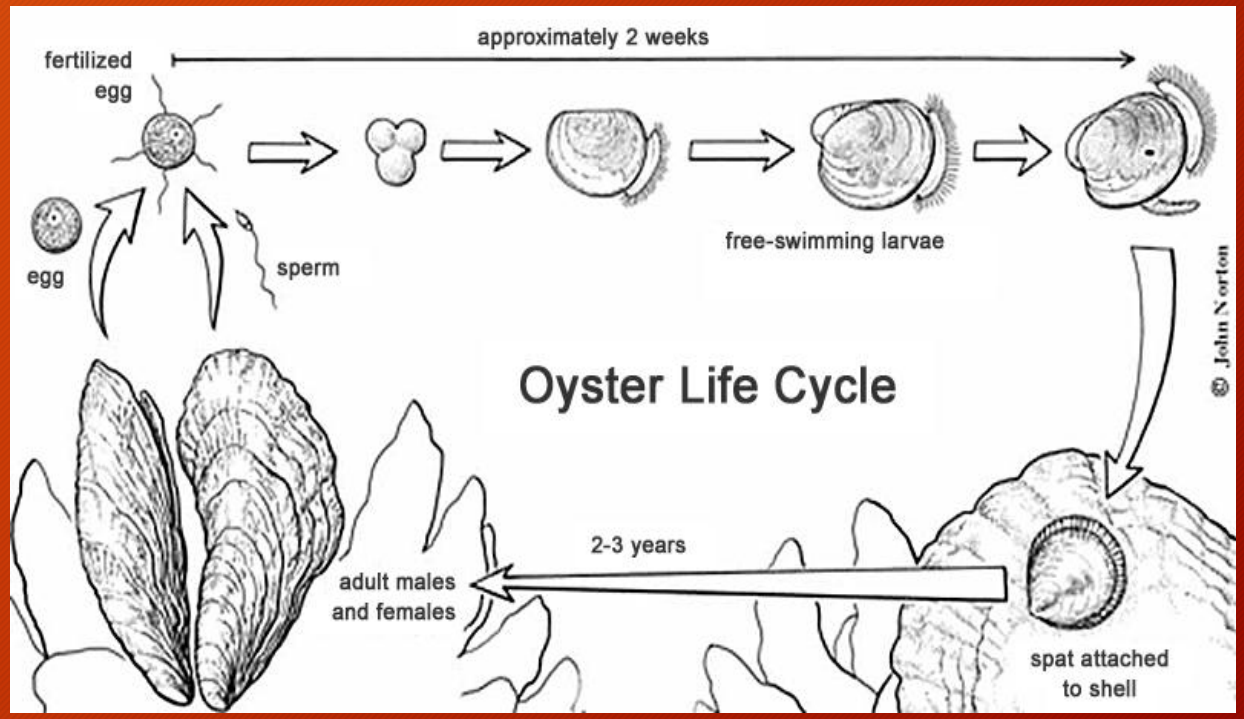
- Gills trap food particles through cilia
- Cilia covering is leaf like labial pulps
- Rejected materials pseudofeces is thrown on to the mantle
- Digestive tract is similar to that of other molluscs
- Food entangles in mucoid string
- Enzymes for digestion are in style sac



Anatomy of a scallop (e.g. *Pecten*) showing the right (upper) valve

Reproduction

- Most are Dioecious
- Few are Monoecious
- Some are Protandric
- Most exhibit External fertilization
- Marine bivalves freely spawn
- Larvae then mature as plankton



GASTROPODA

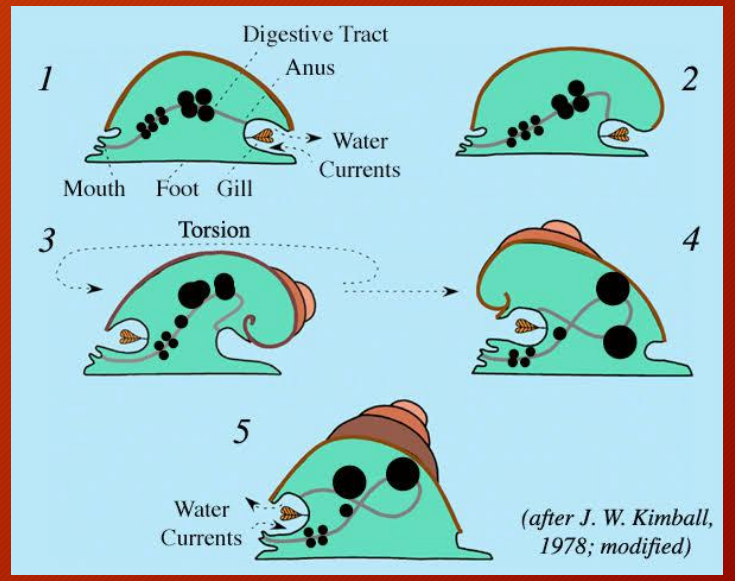
HIBBA SAEED

GASTROPODS

- The class gastropoda (gaster,gut+podos,foot) includes limpets,snail and slugs
- Gastropoda largest and most varied molluscan class
- **35000** living species
- Marine Fresh water, Terrestrial animals
- Most important impact is that they are intermediate host for trematode parasite of humans

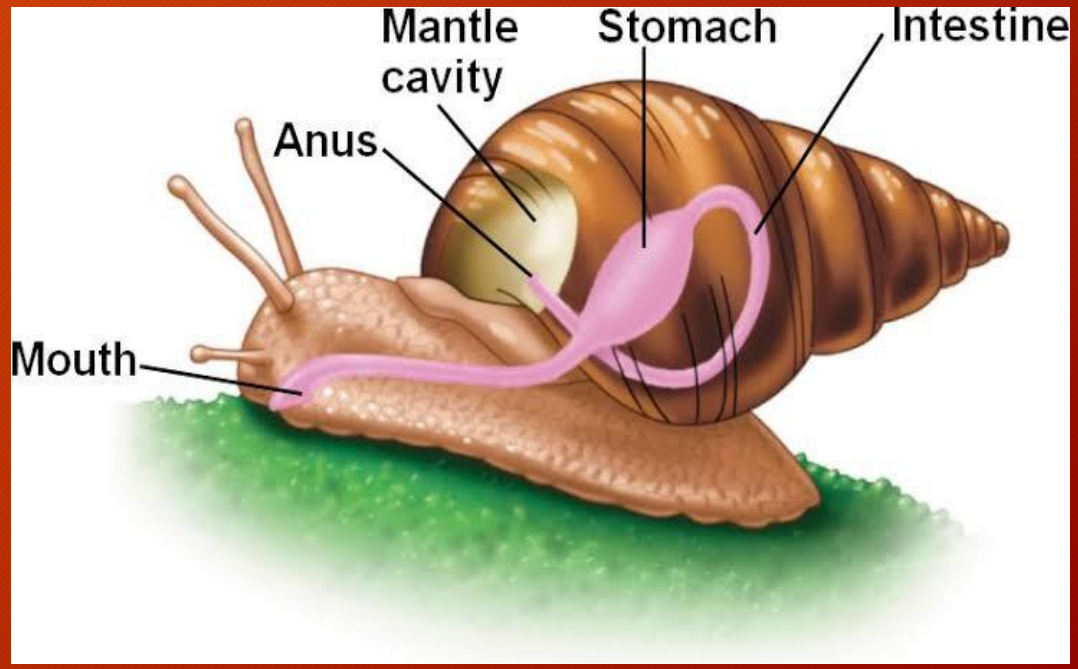
Torsion

- **180** counter clockwise twisting of mantle and mantle cavity.
- Its positions the gills, anus and opening from the excretory and reproductive system.
- Without torsion withdrawl into the shell would proceed with the foot entering first and the head entering last.
- In some snails proteinaceous covering called an operculum enhances protection.
- Some gastropods undergow detorsion in which embryo undergo a full 180 torsion and then untwist approximately **90**



Shell coiling

- Earliest fossil gastropods had a shell that was coiled in one plane.
- Most modern snails are asymmetrically coiled into a more compact form.
- This pattern leaves less room for organs which means the organs are now single.



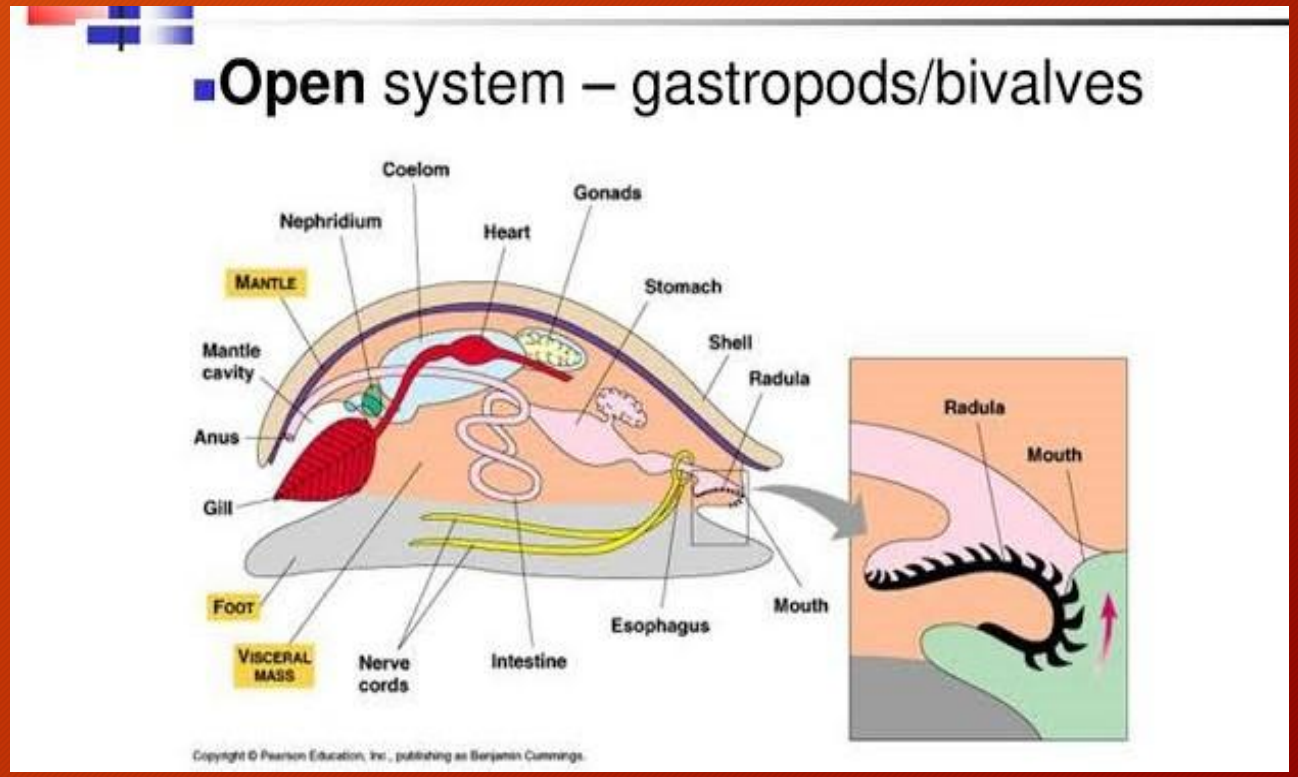
Locomotion

- Nearly all gastropods have a flattened foot that is often ciliated.
- The smallest gastropods use cilia to propel them.
- Largest gastropods use wave of muscular contraction for moment.
- E.g:

  Sea Butterflies and Sea Hares

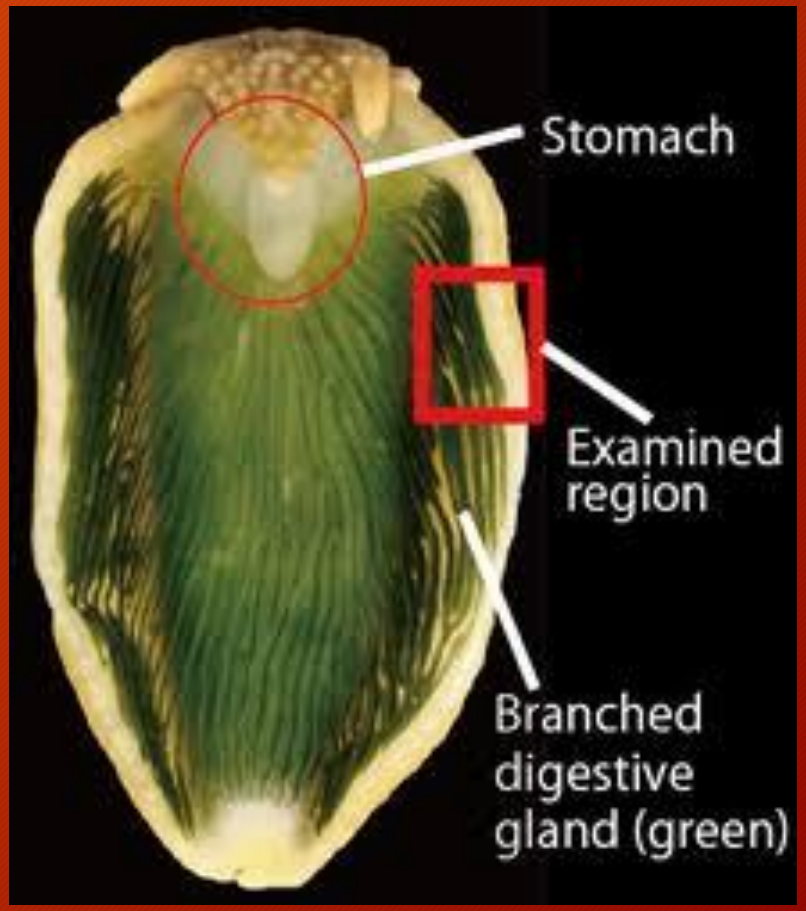
Gas exchange and Circulatory system

- Primitive gastropods had two gills; modern gastropods have lost one gill because of coiling.
- Some have a rolled extension of the mantle called siphon.
- Gills lost in land snails
- Open circulatory system.
- Heart consisting of a single ventricle and two auricles.



Feeding and Digestion

- Most gastropods feed on algae or other small organisms.
- Some are herbivores, scavengers, parasites or predators.
- Anterior portion of the digestive tract is an extensible proboscis.
- Structure important for some predatory snails.
- Food trapped in mucous strings and incorporated in protostyle.



Nervous and Excretory system

- Nervous system of primitive gastropods is characterized by six ganglia.
- Smalls pits of photoreceptor cells are present.
- Statocysts are in the foot.
- Primitive gastropods possess two nephridia.
- In modern species only one nephridia is present.
- Aquatic gastropod excrete ammonia while terrestrial excrete uric acid.

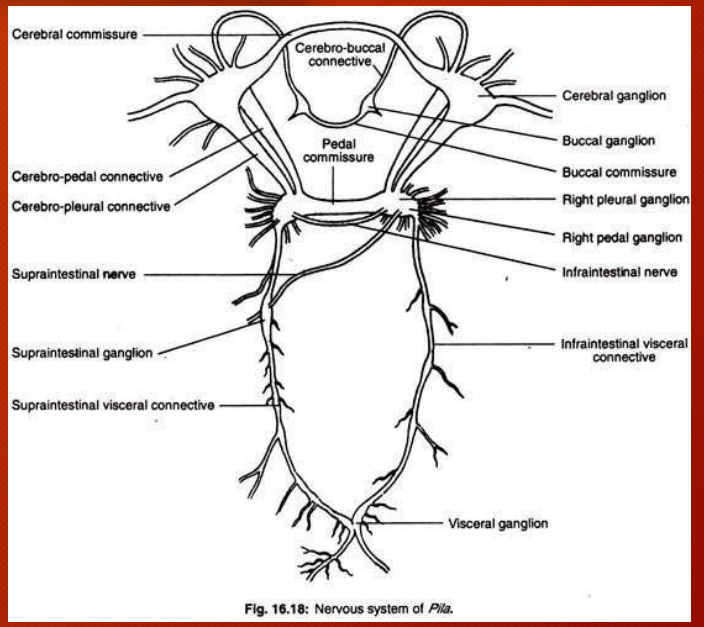
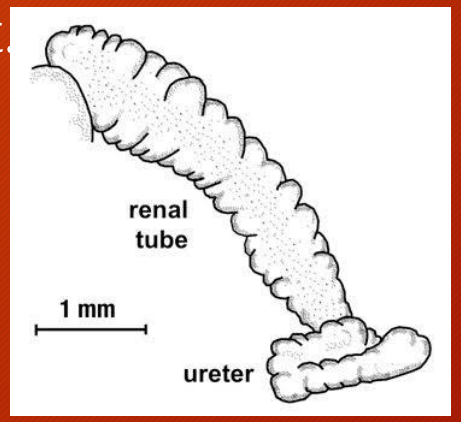
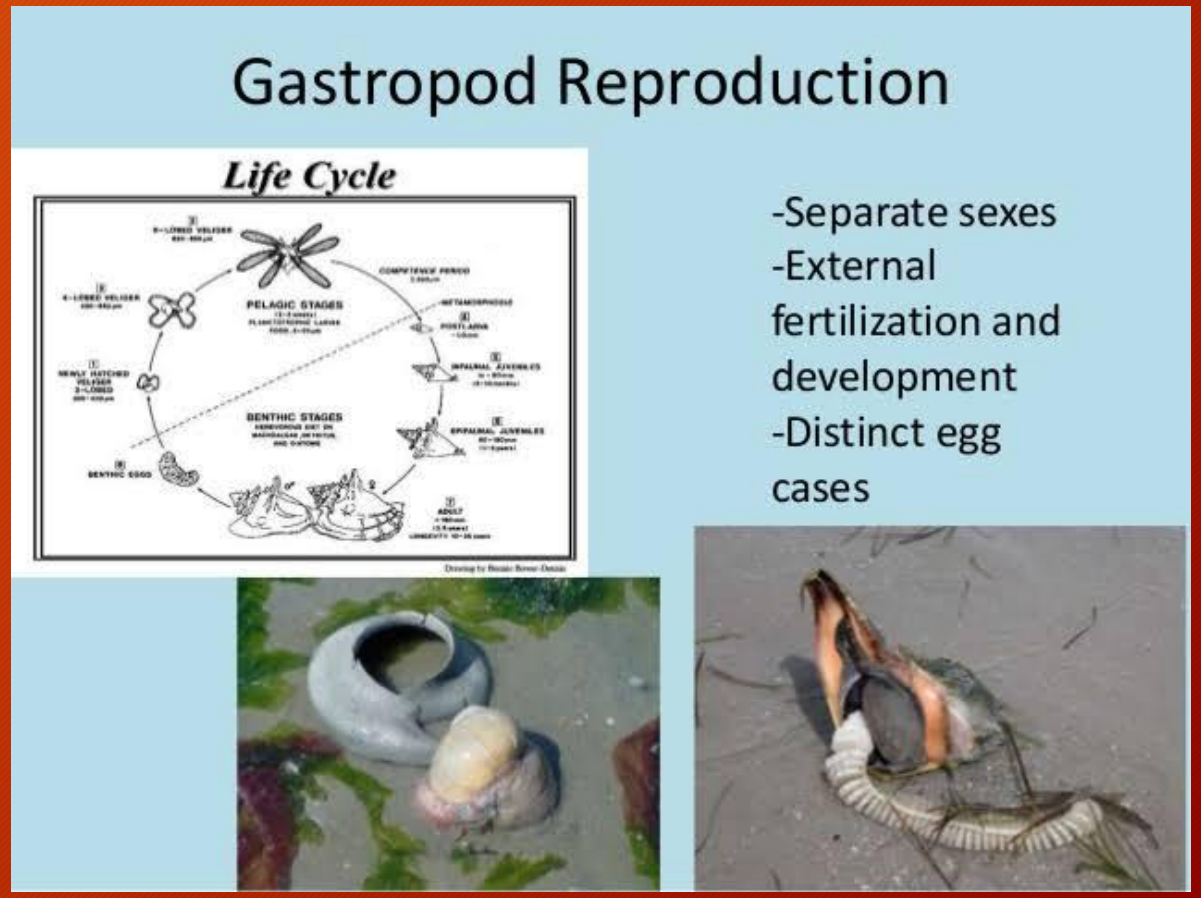


Fig. 16.18: Nervous system of *Pila*.



REPRODUCTION AND DEVELOPMENT

- Many marine snails Dioecious
- External Fertilization
- Many Monoecious
- Cross fertilization is the rule
- Larvae metamorphose into adult



Gastropod Diversity

- The largest group of gastropod is the subclass prosobranchia consisting of **20 thousand** species.
- They are mostly marine.
- The subclass pulmonata contain about **17 thousand** fresh water or terrestrial species.

CEPHALOPODA

SULEEHA KABIR

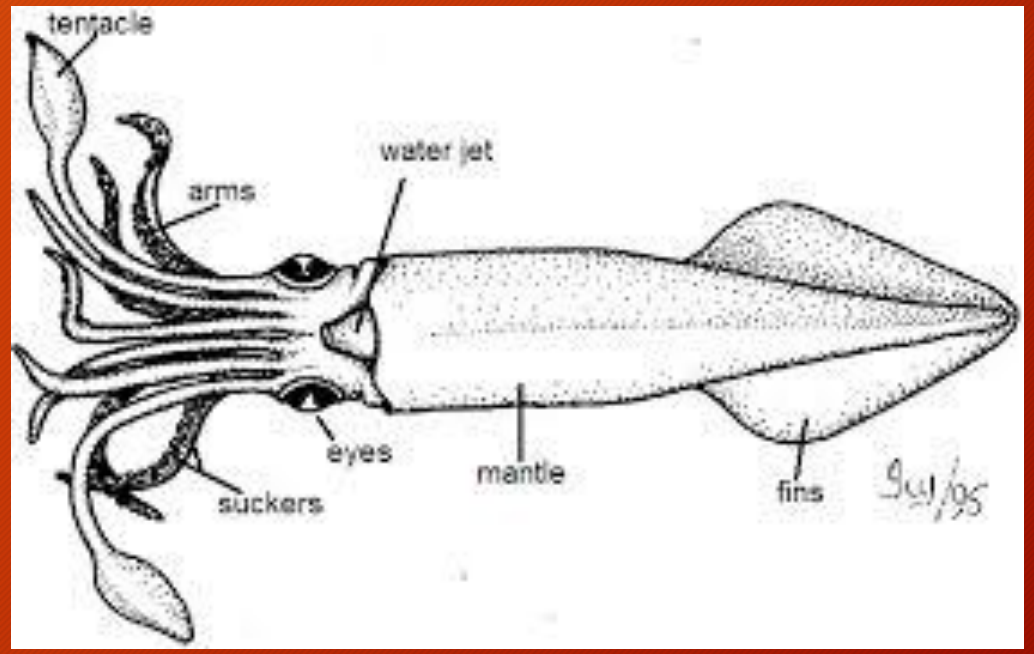
CEPHALOPOD ANCESTORS

- Cephalopds emerge during explosion of animal diversity in ocean during Cambrian period **500 million** years ago.
- Armed and soft bodies.
- Shells well preserved as fossils having :
- 1.)Septa

  2.)siphuncle
- Early cephalopods probably diverge from monoplacophorans.
- The first confirmed cephalopod ancestor is Tanulla.

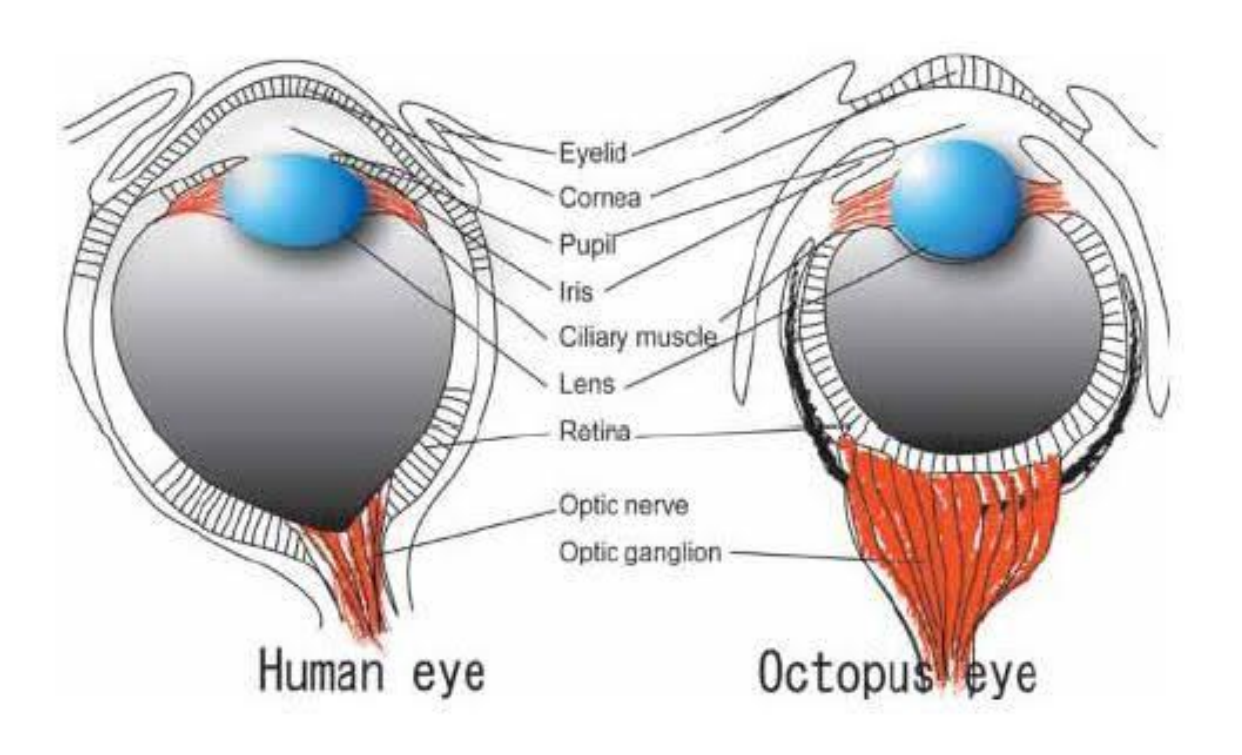
Anatomy

- Cephalopods have two eyes, a mantle, a funnel(siphon)and at least eight arms.
- Some hard internal structures like cuttle bone in cuttle fish and pen in a squid.
- In many octopuses hard structure is completely lost.
- Octopus has 8 arms.
- Squid and cuttle fish have 8 arms and 2 specialized arms called tentacles.
- Tentacles are adapted to catch prey.



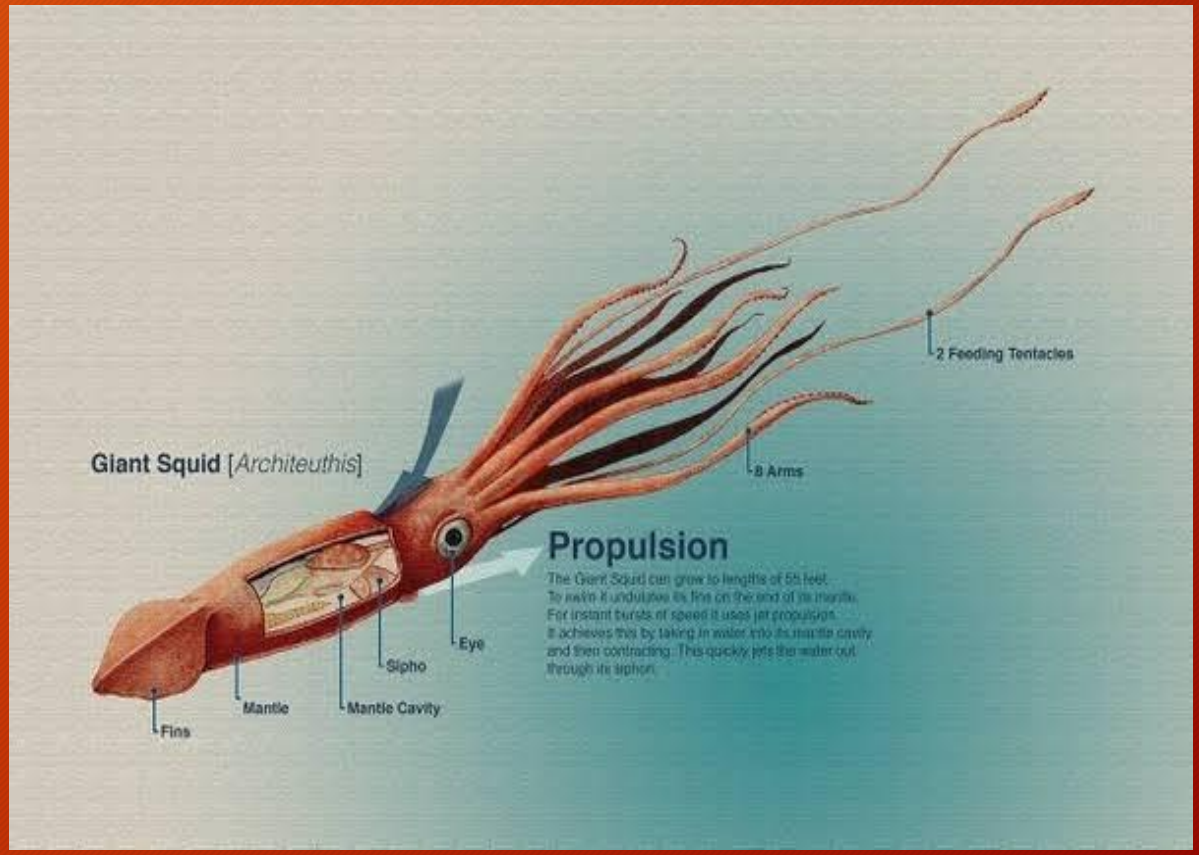
Sight

- Eyes are complex as human eyes.
- They contain iris, lens and cornea.
- Different shapes of pupil like octopus have rectangular, cuttle fish have w-shaped,and squida have circular.
- Nautilus have pin hole pupil without lens.



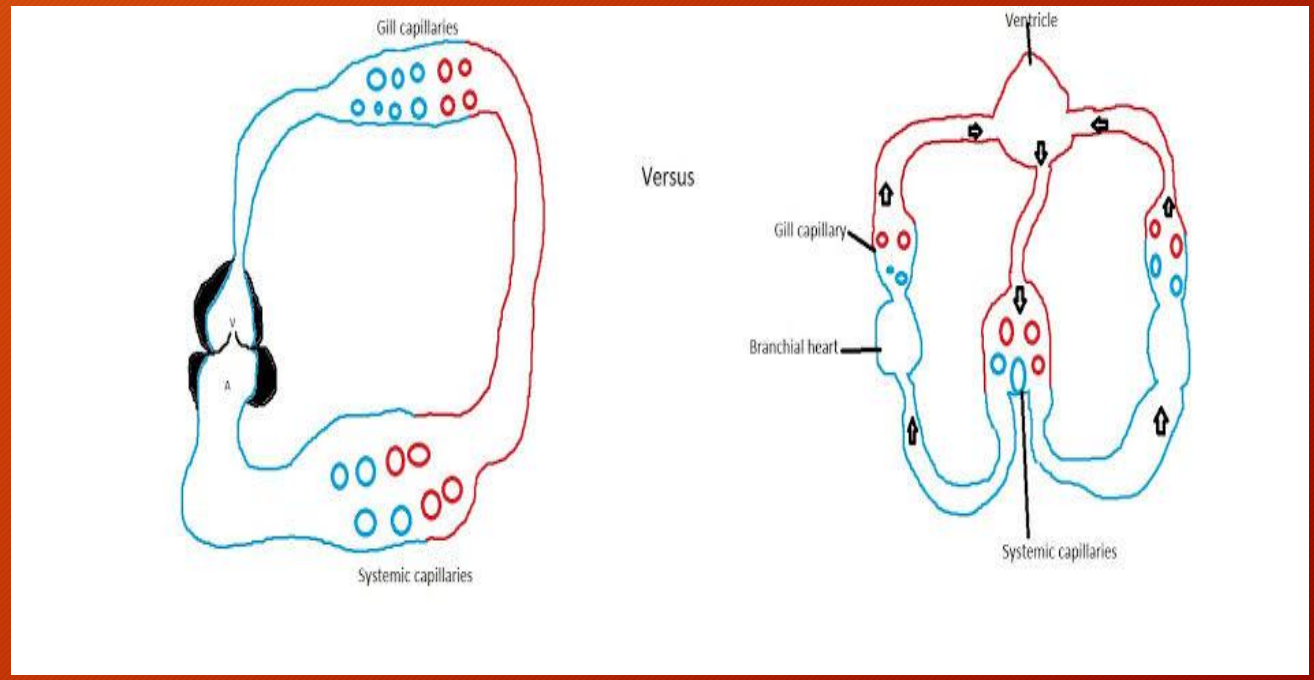
Propulsion and movement

- Cephalopod generally use jet propulsion.
- Bottom dewelling octopuses use their arms to walk across sea floor.
- Cuttle fish and squids undulate their fins to hover.
- Others produce and store ammonium based chemical that makes neutrally buoyant.



Circulatory system

- Cephalopods have three hearts.
- 2 branchial hearts push oxygen depleted blood through gills.
- Systemic heart pumps oxygenated blood throughout body.
- Blood is actually blue due to copper based system.
- Haemocyanin binds to oxygen and carry throughout the body.
- Haemocyanin is efficient in cold water but loses in acid water(warm water).
- Nautilus lower its metabolic rate in order to survive.



The Nautiloids

- Oldest group.
- **10,000** different species.
- Earliest nautiloids had straight shells.
- Shells began to diversity becoming gently curved and others coiling.
- Siphuncle is found directly down the middle of the chambers.

The Ammonoids

- Extinct group.
- Derived from Greek word with reference to Egyptian god Amun.
- Some are small as thumbnail and largest measured over **8 feet (2.5 m).**
- Siphuncle hugs the outer shell wall.
- Septa shell edge is called suture.
- Early lived in deep water and over time moved into shallow waters.

The Belemnites

- Straight shelled cephalopods.
- They are fossil group.
- Their fossils show that they were squid-like ,with straight internal shell
- Solid tip beyond chambered shell called rostrum.
- These are tasty meal for sharks.

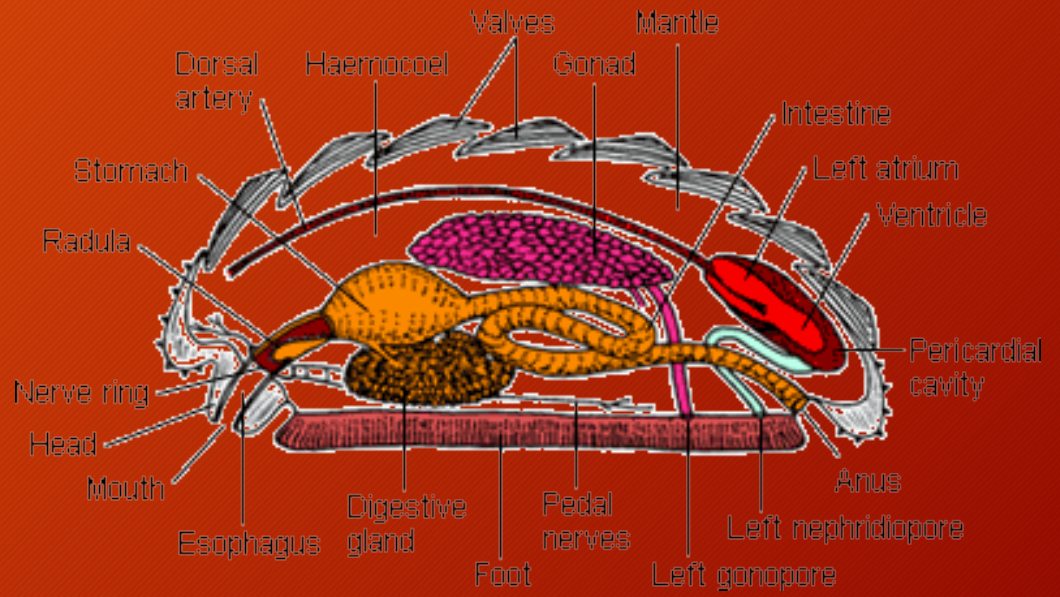
POLYPLACOPHORA

GHOZEEL FATIMA

POLYPLACOPHORA

CHARACTERISTICS

- Chitons
- Fishy flavor,Tough to chew
- Reduced head,Flattened footshell divides into eight ariculating dorsal valves
- Muscular mantel and Foot
- Crawl over their substrate
- Articulation allows to roll into a ball when dislodged from substrate



GILLS

- Linear series
- Water currents cilia produce enter Anteriorly and exit Posteriorly

DIGESTIVE SYSTEM

- Opens near exhalant water carries products of system away
- Extracellular in stomach

FEED

- Attach to algae
- Chomorecetors+subradular organ extends from mouth to detect food
- Mucous traps food enter esophagus by Cilia action

NERVOUS SYSTEM

- Ladder like with four Anteroposterior nerve cord and neumrous transverse nerves
- Nerve ring encircle esophagus
- Sensory structures Osphradia + Tactile receptors on mantel margin

REPRODUTIVE SYSTEM

- Sexes are separate
- External fertilization
- Tpochophore larva

SCAPHOPODA

CHARACTERISTICS

- Tooth shells / Tusk shells
- **300** species
- Conical shell Major character
- Head + Foot project from wider end of shell
- Mantle is greatly elongated

GILLS

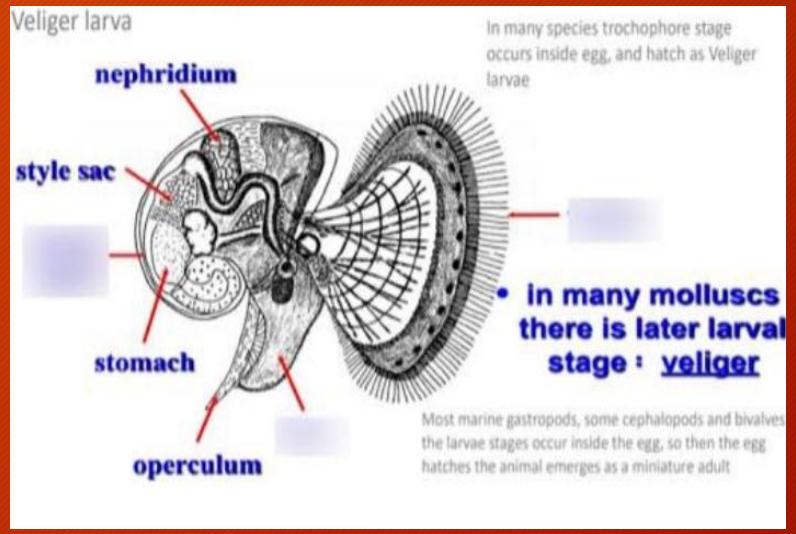
- Functional absent
- Gases exchange across Mantle folds

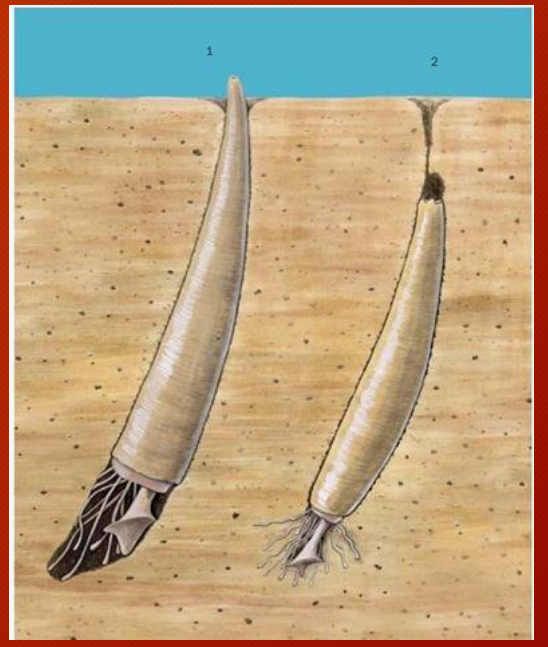
FEED

- Radula + Tantacles on foraminiferans

REPRODUCTIVE SYSTEM

Sexes separate ,Trochophore and Veliger larva





MONOPLACOPHORA

CHARACTERISTICS

- Undivided , Arched shell ; Abroad flat foot

GILLS

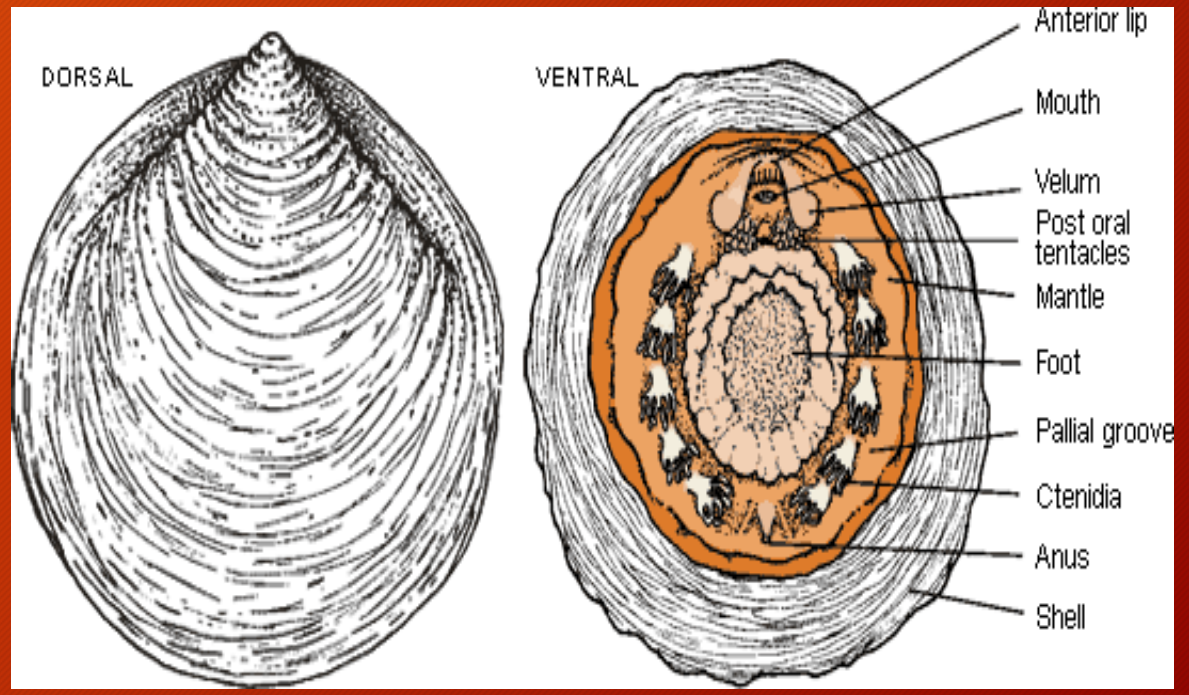
- Serially repeated pair and foot refractor muscles

FOSSILS

- Until **1952** Limper like Monoplaophorans *Neopilina* dredged depth of **3520m** Pacific Coast of Costa Rica

REPRODUCTIVE SYSTEM

- Dioecious
- Nothing is known for their Embroyology



CAUDOFOVEATA

CHARACTERISTICS

- Worm like , Size **2mm-14cm**
- **70** species
- Live in vertical burrows on deep sea floor
- Scale like scales , Lack shell , Crystalline style Statocysts , Foot and Nephridia

APLACOPHORA

CHARACTERISTICS

- Solenogasturs
- **250** species
- Cylindrical Molluscans , Lack shell and Crawl on their ventral surface

FEED

- Microorganisms and Detritus
- Radula + Nephridia
- Most lack Nephridia + Radula
- Surface dwellers on Corals , Carnivores
- Frequently feedig on Cnidrians polyps

NERVOUS SYSTEM

- Ladder like reminiscent of flatworms body form
- Burring species present

THANK YOU