

## Lecture (5)

### Phylum : Mollusca

#### Characteristic of Mollusca

1. Bilaterally symmetrical ,live in most environment.
2. Body has more than two cell layers , tissues and organs.
3. Open digestive system (have mouth and anus).
4. There is dorsal or lateral shells of protein or calcareous spicules.
5. Has a nervous system with a circum- esophageal ring , ganglia and paired nerve chords.
6. Has an open circulatory system with a heart and an aorta.
7. Has gaseous exchange organ called ctenidia gills.
8. Reproduction is sexual and asexual.
9. Feed a wide range of materials.

#### Classification of Mollusca

1. Class Gastropoda ( called stomach foot”) include well-known mollusks like *Helix*
2. Class Bivalvia (Lamellibranchiata or Pelecypoda) these Mollusca possess two shells
3. Class Aplacophora , these benthic (deep water) These animals lack shell but have small calcareous spicules embedded in their mantle like *Nomenia*
4. Class Monoplacophora (“bearing one plate”) possess a single shell like *Neopilina*
5. Class Polyplacophora (“bearing many plates”) with 8 plates like *Acanthochitem*
6. Class Scaphopoda (“boat feet”) like *Dentalium*
7. Class Cephalopoda (“head foot” animals), include *Octopus* have large head – eyes and tentacles.

#### Class Bivalvia

1. Members of this class are found in marine as well as freshwater habitats , bury themselves in sediment , other lie on the sea floor , attach themselves to rocks , bore into wood, clay or stone and live inside these substances , to save themselves from predation.

2. The body enclosed by shell consisting of two hinged parts , the shell contain of calcium carbonate , and two similar parts called valves.
3. They have no head, but they also lack radula .
4. Growth can be measured in bivalves by different methods including increments in shell length or height, increases in total or soft body weight, or a combination of all of these factors.

### **External anatomy**

1. There are two valves of the shell that may or may not be equal and may or may not completely enclose the inner soft parts, they variety of shapes and colors depending on species
2. The valves are composed mostly of calcium carbonate ( $\text{CaCO}_3$ ) and have three layers:
  - Inner or nacreous layer
  - Middle or prismatic layer (from most of the shell)
  - Outer or periostracum layer (brown leathery layer which is often missing through abrasion or weathering in older animals)
3. Bivalves do not have obvious head or tail regions.

### **Internal anatomy**

1. The soft parts are covered by the mantle, which is composed of two thin sheaths of tissue, thickened at the edges.
2. The two halves of the mantle are attached to the shell from the hinge ventral to the pallial line but are free at their edges.
3. The thickened edges may or may not be pigmented and have three folds. The mantle edge often has tentacles, in clams the tentacles are at the tips of the siphon. In species, such as scallops the mantle edge not only has tentacles but also numerous light sensitive organs – eyes.
4. The main function of the mantle
  - Secrete the shell.
  - It has a sensory function and can initiate closure of the valves in response to unfavorable environmental conditions.
  - It can control inflow of water into the body chamber and, in addition, it has a respiratory function.

## **Digestive system**

large gills..... labial palps (surround the mouth) ..... Mouth .....  
esophagus..... stomach (surround by liver)..... Intestine (contain  
crystalline style) .....rectum..... anus

**crystalline style:** The style is a clear, gelatinous rod that can be up to 8 cm in length in some species. It is round at one end and pointed at the other, it assists in mixing food in the stomach and releases enzymes that assist in digestion. The style is composed of layers of mucoproteins, which release digestive enzymes to convert starch into digestible sugars.

(Bivalves are filter feeders, feed primarily on phytoplankton – microscopic plant life).

## **Circulation and respiration**

1. Bivalves have an open circulatory system that bathes the organs in hemolymph.
2. Heart has three chambers: two auricles receiving blood from the gills, and a single ventricle. The ventricle is muscular and pumps hemolymph into the aorta, and then to the rest of the body.
3. The hemolymph usually lacks any respiratory pigment, In the carnivorous genus the hemolymph has red amoebocytes containing a haemoglobin pigment.
4. Oxygen is absorbed into the hemolymph in the gills which provide the primary respiratory surface. The gills hang down into the mantle cavity, the wall of which provides a secondary respiratory surface being well supplied with capillaries.

## **Nervous system**

1. The animals have no brain
2. the nervous system consists of a nerve network and a series of paired ganglia
  - cerebral ganglia,
  - pleural ganglia
  - pedal ganglia
  - visceral ganglia

cerebral ganglia (They are two are on either side of the oesophagus, all kinds of ganglia connected to the cerebropleural gangliaby nerve fibers), control the sensory organs. While the pleural ganglia supply nerves to the mantle

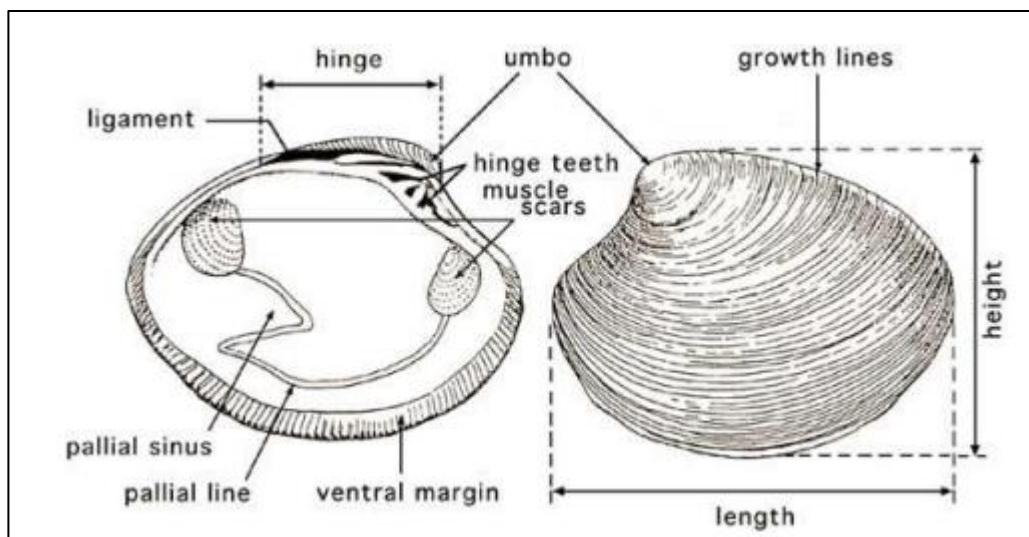
cavity. The pedal ganglia, which control the foot, are at its base, and the visceral ganglia, which can be quite large in swimming bivalves.

### Senses

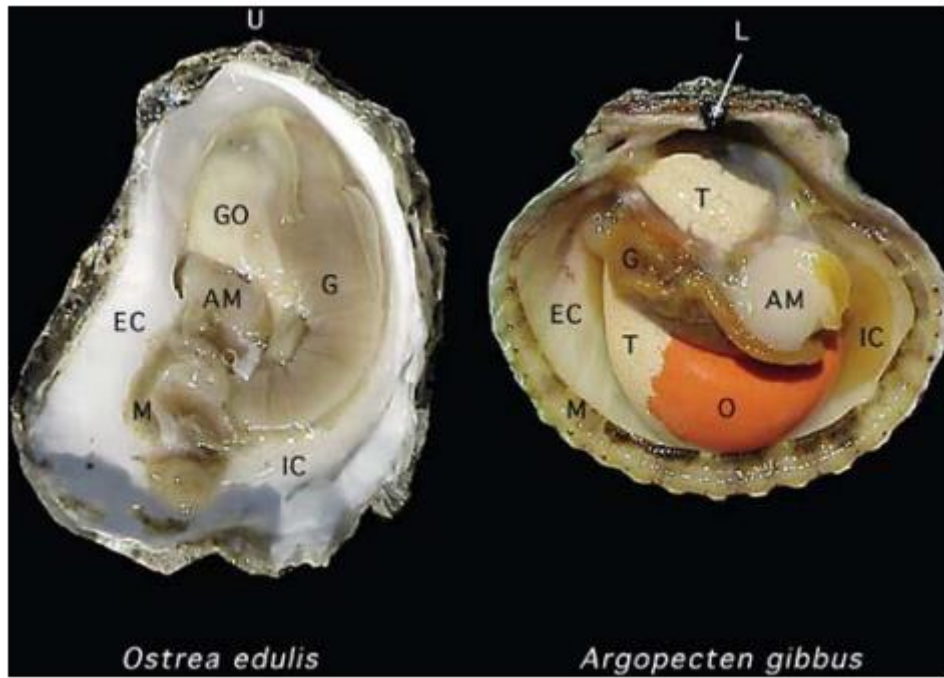
1. The organs are usually mechanoreceptors or chemoreceptors
2. Many bivalves have no eyes, but a few members of the Arcoidea have simple eyes, some consist of a pit of photosensory cells and a lens. have more complex eyes with a lens.

### Urogenital system

1. Sexes of bivalves can be separate (dioecious) or hermaphroditic (monoecious).
2. The gonad is generally only evident during the breeding season.
3. The male gonad is white in color and the female is red, even in hermaphroditic species.
4. The animal may spawn originally as a male in a season, refill the gonad with eggs and spawn a second time during the season as a female.
5. The two kidneys are small, brown, sac-like bodies that lie flattened against the anterior part of the adductor muscle, The kidneys empty through large slits into the mantle chamber



**Figure :** External and internal features of the shell valves of the hard shell clam, *Mercenaria mercenaria*. Modified from Cesari and Pellizzato, 1990



**Figure :** The soft tissue anatomy of the European flat oyster, *Ostrea edulis*, and the calico scallop, *Argopecten gibbus*, visible following removal of one of the shell valves. **Key:** **AM** - adductor muscle; **G** - gills; **GO** - gonad (differentiated as **O** - ovary and **T** - testis in the calico scallop); **L** - ligament; **M** - mantle and **U** - umbo. The inhalant and exhalant chambers of the mantle cavity are identified as **IC** and **EC** respectively