ANIMAL

KINGDOM 05

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MBC – Mridul Bhaiya Classes

B.Sc. 1st NOTES

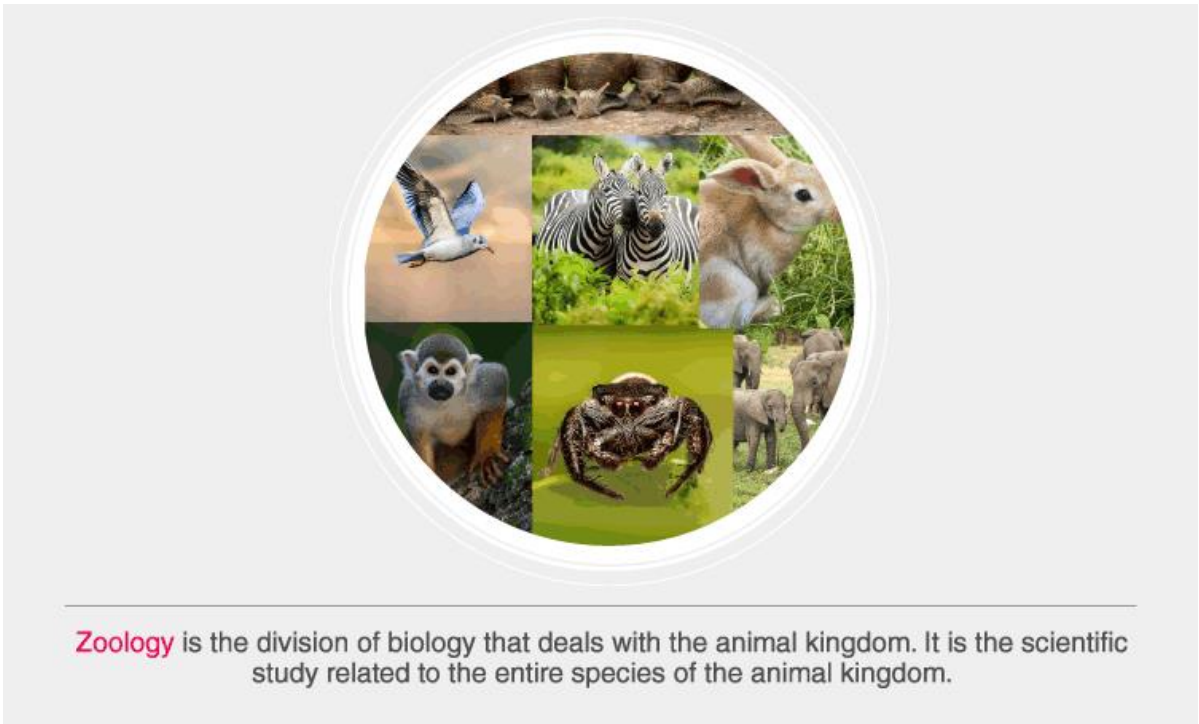
ZOOLOGY NOTES

PART - 05

GENERAL CHARACTERISTICS AND CLASSIFICATION OF ECHINODERMATA AND HEMICHORDATA

TYPE STUDY – ASTERIAS AND BALANOGLOSSUS

- ✓ Detailed notes
- ✓ PYQs with answers
- ✓ Graphics included



UNIT – 05 (SEMESTER 1ST)

TOPICS TO BE COVERED

A. General Characteristics and Classification of Phylum Echinodermata (Upto Class) Echinodermata – Type study : Asterias

B. General Characteristics and Classification of Phylum Hemichordata (Upto Class) Hemichordata – Type study : Balanoglossus

UNIT- 05

GENERAL CHARACTERISTIC AND CLASSIFICATION OF PHYLUM ECHINODERMATA

TYPE STUDY - ASTERIAS

[Greek Echinos = spine + dermata = cover]

General Characteristics

1. **Habitat** : Exclusively marine
2. **Level of organisation** : Organ System level organisation
3. **Symmetry** : Bilateral symmetry in Larvae and pentamerous radial symmetry in adults.
4. **Germ Layers** : Triploblastic organisation.
5. **Body** : Absense of head on the body, but dorsal surface and ventral surface are present. Oral surface is divisible into ambulacaral and inter-ambulacral Presence of endoskeleton of calcareous ossicles and spines in the body wall. Body wall is thick and laethery
6. **Coelom** : They are coelomates with enterocoel and contain a fluid with free amoeboid cells and coelomocytes.
7. **Digestion** : Digestive system is simple and complete.
   It consists ventrally located mouth, coiled gut and dorsally located anus.
   Tube feet helps in capture prey and transport of food.
8. **Circulation** : Circulatory system is present but is reduced. It is open and is known as Haemal system and does not consists of repiratory pigment. Heart is absent.
9. **Respiration** : Generally takes place through skin gills.

10. **Excretion :** There is no excretory system and waste are removed through gills
11. **Locomotion : water vascular or ambulacral system** and tube feet help in locomotion.

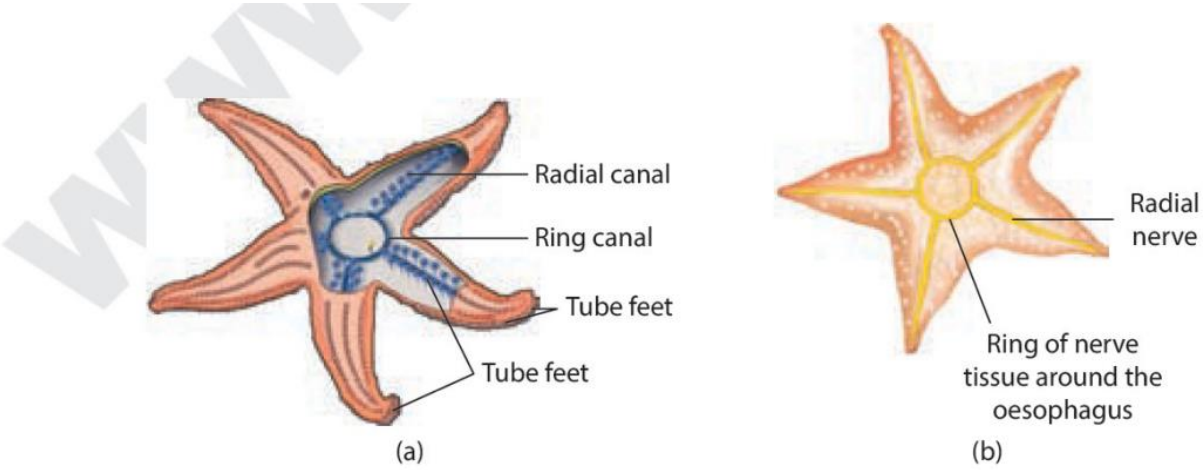


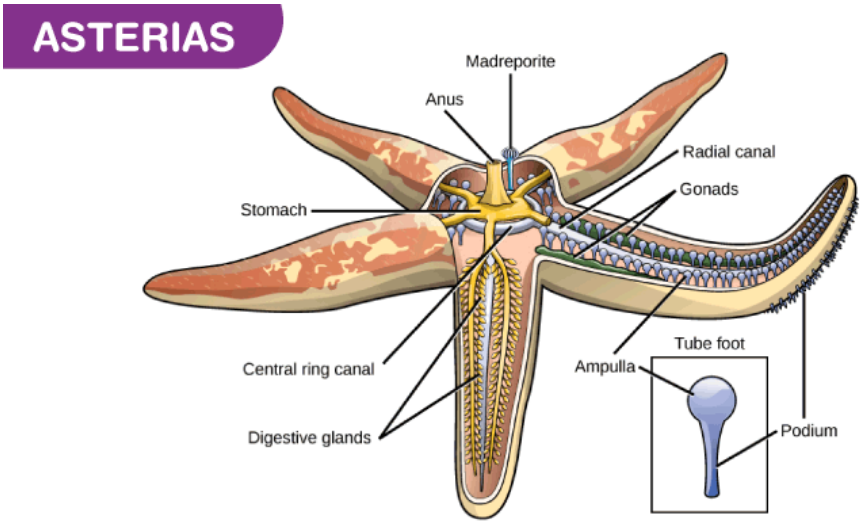
Figure 1.30 (a) The water vascular system and (b) neural system of a sea star.

12. **Nervous system and sensory organ :** Less developed and consists of central nerve ring around oesophagus.
13. **Reproduction :** Echinoderms are dioecious. Generally external fertilisation take place. Indirect development.

TYPE STUDY: ASTERIAS OR STAR FISH OR SEA STAR

CLASSIFICATION :

Phylum – Echinodermata
Sub-phylum - Asterozoa
Class – Stelleroida
Sub-class - Asteroidea
Order – Forcipulatida
Genus – *Asterias*

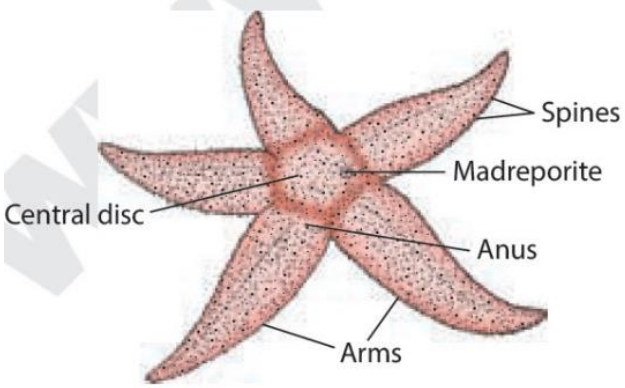


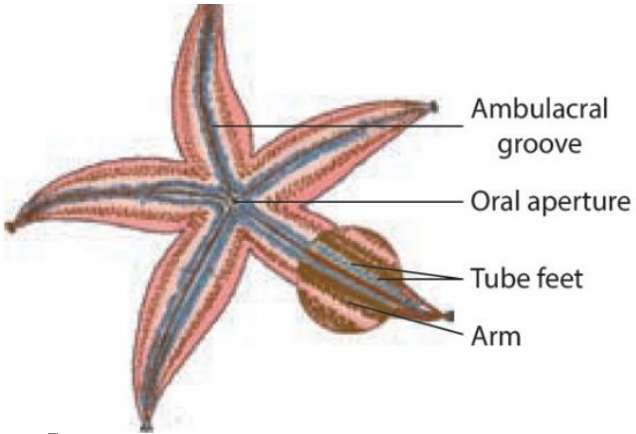
HABIT AND HABITAT :

- Exclusively deep sea animal.
- Free living carnivorous.
- It is completely benthonic animal, they crawl at bottom of the sea by their tube feet.
- Found attached on the marine bridge and submerged object of sea.
- Generally are solitary and are found in groups.
- Exhibits high regeneration power.

EXTERNAL MORPHOLOGY :

- Body is radially symmetrical, pentamerous and start shaped.
- Its colour is pinkish, yellow, organge and its upper convex, aboral surface is much darker.
- The body consists a central disc and five tapering rays or arms arising from the central disc.
- The space between the two adjacent arms on the disc is called as the inner-radii.
- There are two distinct surface in it :
  - Upper dorsal surface or aboral surface (convex)
  - Ventral lower surface or oral surface (flat)
- The skin is thick, stout and leathery in which plates or ossicles of $CaCO_3$ are embedded.





(a) **Aboral Surface** :

→ It is upper side of the body.

→ It is of red-brown colour.

→ On it there are many stout, blunt calcareous spines, arranged in the irregular rows.

→ There are large spines on margin

→ Around and between the spines occur tiny Pincer like structures the **Pedicellariae**.

→ Between the spines small, soft, membranous bag like projections **papullae** are present.

→ A minute circular aperture called the **anus**, situated close to the central disc of aboral surface.

→ Between the bases of two of the five arms, Madreporite is situated.

→ Madreporite is a sieve like plate, which lead into the water vasular system.

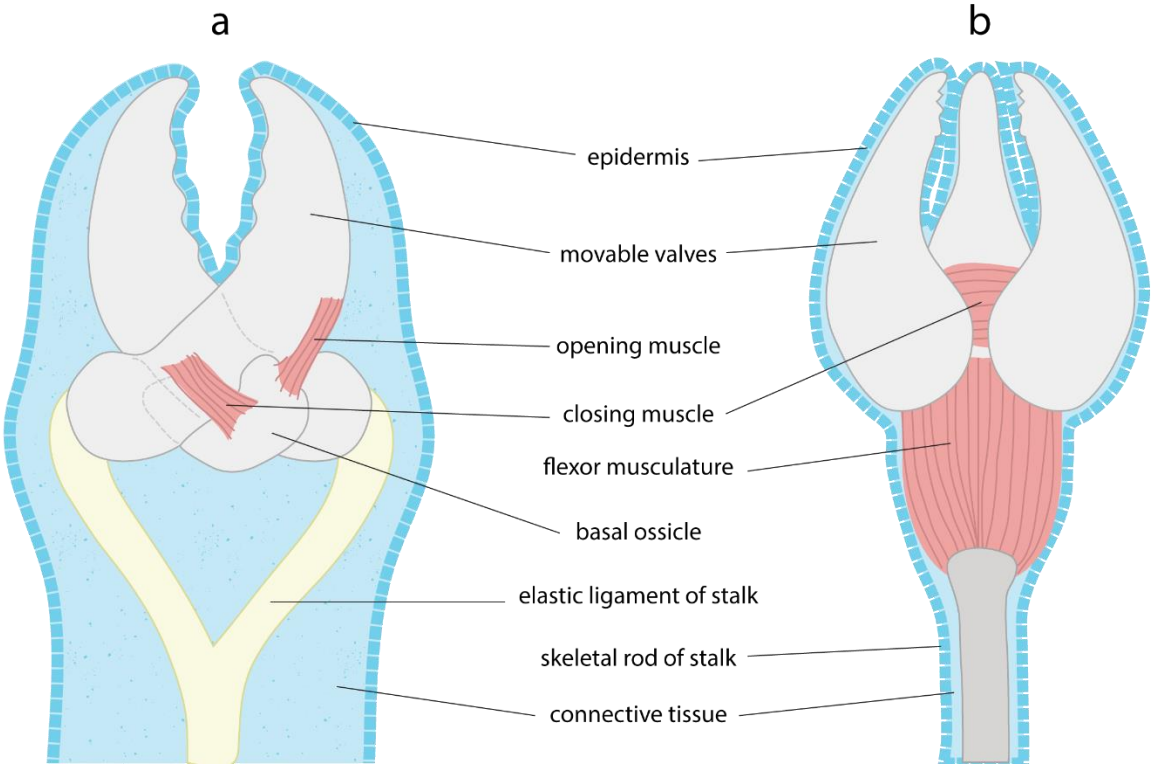
Pedicellaria

Pedicellaria are the organ of defence and offense. It also helps in keeping the body surface clean by removing debris or small organism.

It is of two types:

(i) Staight type

(ii) Crossed type



(b) **Oral Surface** :

→ It is a flat lower surface of the body directed towards the substratum.

→ In the centre of the central disc is a pentamerous **mouth**.

→ Mouth is a pentagonal aperture with five angles which are towards each arm.

→ On each side of the ambulacral groove, two double rows of short tubular retractile projections called the podia or tube feet.

→ Tube feet is used for locomotion, respiration and food capture etc.

→ At the tip of each arm **terminal tentacles** are present which are olfactory organs.

→ At base of ambulacrak groove occurs red photosensitive eye spot.

DIGESTIVE SYSTEM

- The digestive system comprises of alimentary canal and digestive glands.
- The alimentary canal is a very short straight tube. It extends from the oral to the aboral side of the body. The mouth is located near the centre of the oral surface.
- The mouth leads into a very short and wide oesophagus. The oesophagus passes into a spacious stomach
- The stomach is distinctly divided into two parts by a horizontal constriction.
  a. **Cardiac Stomach** : The voluminous anterior portion is called the cardiac stomach
  b. **Pyloric Stomach** : The smaller posterior chamber is called the pyloric stomach

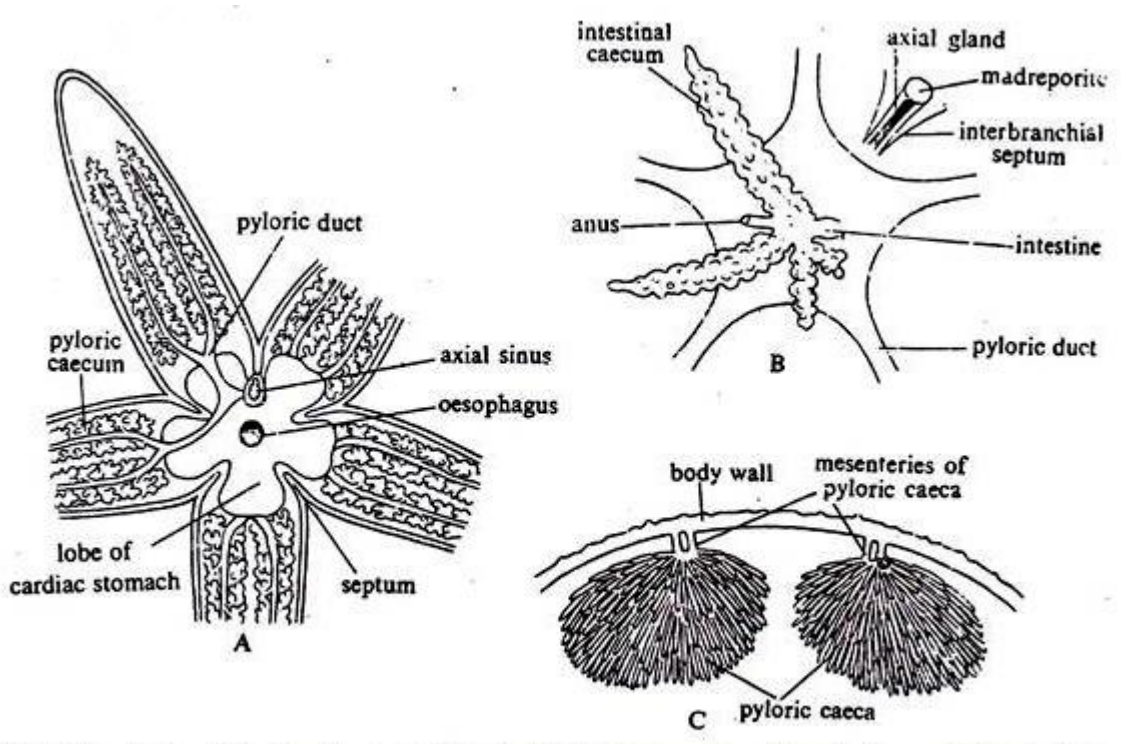


Fig. 2.49 : A. Aboral view of the digestive tract of *Asterias*. B. Pyloric stomach and intestinal caeca of *Asterias* (enlarged view). C. Attachment of pyloric caeca with the aboral wall of arm of *Asterias*.

FEDDING MECHANISM

- With the help of eye and tentacles they locate the prey.
- It bends all the arms on it and forms an arc in the centa part of body.
- It firmly attaches its tube feet to the body of prey and tries to pull apart the two shells by powerful adductor muscles.
- As soon as small opening is produced stomach of starfish is everted through the mouth and inserted into the mantle cavity.
- As soon as the calm or the prey is eaten by the cardiac stomach, then stomach and pyloric caeca pours its digestive enzymes.
- Digested food is absorbed mainly by pyloric caecum and is distributed to various parts of the body by coelomic fluid.
- As starfish Ingest partially digested food, the rest food is egested out through the anus.

RESPIRATORY SYSTEM

- Respiration is carried out by **gills, papulae** and **tube feet**.
- The external cilia by there vibration maintain a water current passing over the branchiae on the outside and interal cilia are responsible for flowing out of body fluid into the branchiae.
- So the coelomic fluid all round comes in contact with the water. During the flow of water current the exchange of gases takes place.

EXCRETORY SYSTEM

No definite Specialised Excretory Organ in starfish. The wandering amoebocytes in the body collects the excretory particles and takes them to branchiae/gills.

WATER VASCULAR SYSTEM

The presence of water vascular system is a unique feature of Echinoderms which mainly helps in locomotion.

It is the modified part of coelom.

The water vascular system of asterias comprises the following parts:

1. **Madreporite** :
2. **Stone Canal** :
3. **Ring Canal** :
4. **Radia Canal** :

5. **Tiedmann's bodies** :
6. **Polian vesicles** :
7. **Lateral canals** :
8. **Tube feet** :