U.G. (MJC-ZOOLOGY) Sem-I.

Date: 24/10/21

Water Vascular System in Asterias

The water vascular System is a modified part of coelom. It consists of a System of sea-water filled Canals having certain corpuscles. It plays most vital role in the locomotion of the animal and is also called ambulacral System. It comprises a no. of organs like madreporite, stone Canal, ring Canal, radial Canal, Tiedmann's bodies, lateral Canals and tube feet.

1. **Madreporite** → The madreporite is a rounded calcareous plate occuring on the aboral surface of the central disc in inter-radial position. Its surface bears a no. of radiating narrow, straight or wavy grooves or furrows. Each furrow contains many minute pores at its bottom. Each pore leads into a very short, fine tubular pore Canal which passes inward in the substance of the madreporite. The pore-canals unite to form the collecting Canals which open into an ampullae beneath the madreporite.

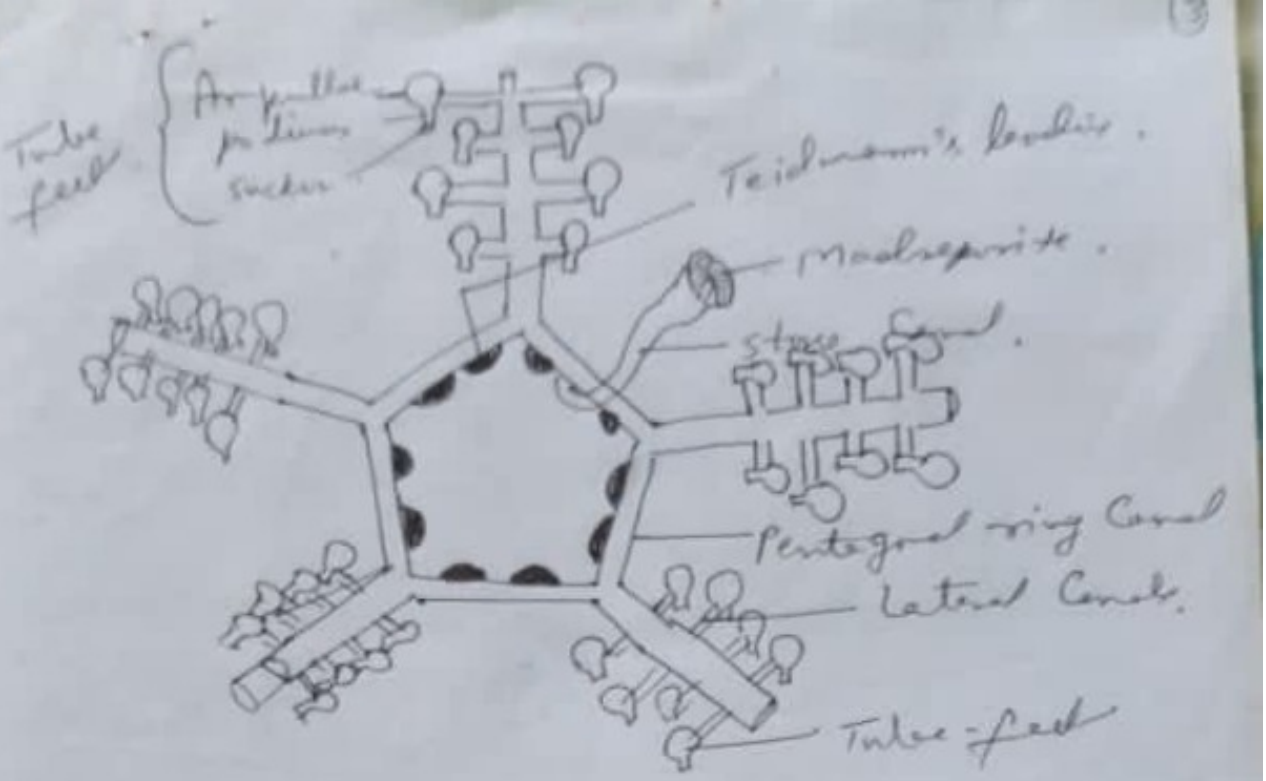
2. **Stone Canal** → The ampulla opens into a S-shaped Stone Canal. The Stone canal extends downwards ventrally and

open into a ring canal, around the mouth. The walls of stone canal are supported by a series of calcareous rings. The lumen of stone canal is lined by very tall flagellated cells. In embryonic stages and in young Asterias, the stone canal remains a simple tube but in adult Asterias, lumen of stone canal possesses a prominent ridge with two spirally rolled lamellae which by branching become more complicated in structure. During its course, the stone canal is enshrouded by a wide, thin walled tubular coelomic sac called axial sinus.

3. Ring Canal — The ring canal or water ring is located to the inner side of the peristomial ring of ossicles and directly aboral to the hyponeural ring sinus. It is wide and pentagonal or five sided.

4. Tiedmann's bodies — The ring canal gives out inter-radially nine small, yellowish, irregular or rounded glandular bodies called Tiedmann's bodies, from its inner margin. The Tiedmann's bodies rest upon the peristomial ring of ossicles. The actual function is still not certain, but they are supposed to be lymphatic glands to manufacture the amoebocytes of the water vascular system.

5. Polian Vesicles — The ring canal gives

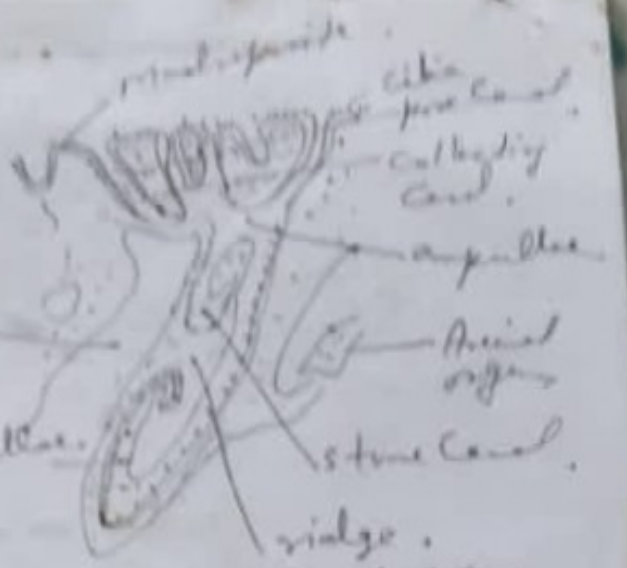


Asterias - Water Vascular System

off on its inner side in the interradial position, two or four, little pear shaped thin walled contractile bladders or reservoirs with long necks called polian Vesicles. They are supposed to regulate pressure inside ambulacral System and to manufacture amoeboid cells of ambulacral System.

6/ **Radial Canal** — From its outer surface, the ring canal gives off a radial water Canal into each arm and then runs throughout the length of the arm and terminates at the base of terminal tentacle. In the arm, the radial water Canal runs immediately to the oral side of the ambulacral muscles.

Madreporite in Asterias (Outer view).



Madreporite in Asterias (Vertical Section)

7. Lateral Canals — In each arm, the radial Canal gives out two series of short, narrow, transverse branches called lateral or podial Canals. Each lateral Canal is attached to the base of a tube-foot and is provided with a valve to prevent backward flow of fluid into the radial Canal.

8. Tube-feet — There are four rows of tube-feet in each ambulacral groove.

A tube-foot or podium is a hollow, elastic, thin-walled, closed cylinder or sac-like structure having an upper sac like ampullae, a middle tubular podium and a lower disc-like sucker. The ampullae lies within the arm, projecting into the coelom above the ambulacral pore which is a gap between the adjacent ambulacral ossicles for the passage of the podium. The tube feet are chief locomotory and respiratory organs of Asterias.