

Phylum Ctenophora: Features, Characters and Other Details (Section - I)

BSc. Part I Zoology (Hons) Paper I

Habit and Habitat of Phylum Ctenophora:

Ctenophores are very common marine animals found in diverse habitat. They are widely distributed being especially abundant in the warmer seas, though some occur in temperate or arctic regions.

They are of planktonic habit floating in the surface waters, mostly near shores but a few live to depth of even 3000 metres. Ctenophores feed on small marine animals including the eggs and larvae of molluscs, crustaceans and fish.



External Features of Phylum Ctenophora:

Pleurobrachia has a pear-shaped body about 5-20 mm in diameter, and of glass transparency. The mouth is situated at the centre of the oral pole and the opposite or aboral pole is occupied by a complicated and characteristic sense organ. This sense organ is a modified statocyst and acts as an organ of equilibrium.

From the opposite sides of the broad end hang two long tentacles provided with numerous little tag-like processes. Each tentacle springs from a deep cavity of sheath into which it can be retracted completely.

The surface bears eight equidistant meridional bands or swimming plates or costae starting from near the aboral pole and extending about two-thirds of the distance towards the oral pole.

Each band is constituted by a row of transversely arranged comb-like structures, consisting of narrow plates frayed at their outer ends. During life the frayed ends are in constant movement lashing to and fro, and so propelling the animal through the water.

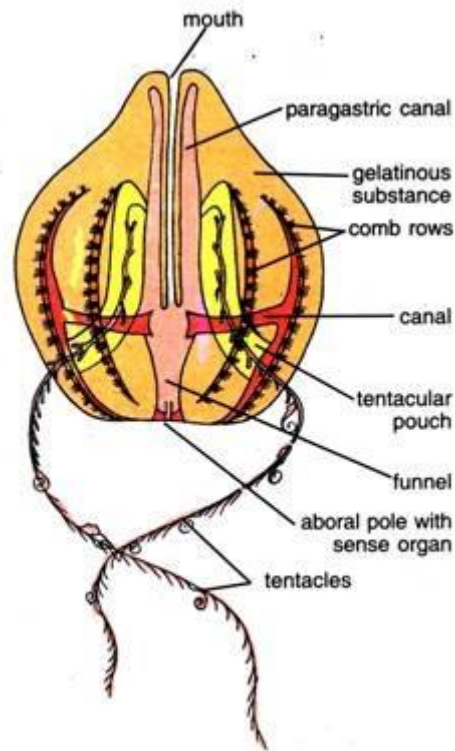


Fig. 37.1. *Pleurobrachia*. (From the side).

Histology of Phylum Ctenophora:

The body is covered externally by a delicate ectodermal epithelium.

The epithelium of stomodaeum is ectodermal, that of infundibulum and its canals endodermal. Both ectodermal and endodermal epithelia are ciliated. The space between the external epithelium and canal system is filled by a soft, jelly-like mesogloea. The tentacle sheath is an invagination of the ectoderm, and a layer of ectoderm covers the tentacle itself.

Delicate muscle fibres lie beneath the external epithelium and beneath the epithelium of the canal system, and also traverse the mesogloea in various directions. Ectodermal cells are cuboidal or columnar in shape and are ciliated in certain regions. These cells are interspersed with numerous gland cells and sometimes certain pigment granules or branched pigment cells.

The sensory cells are of two types:

- (i) One type is having several stiff bristles and
- (ii) The other type is with a single stout bristle.

Digestive System:

The mouth, lying in the centre of the lower end, is an elongated slit leading into a deep flattened tube called the stomodaeum. Towards its upper or aboral end the stomodaeum gradually narrows and opens into a cavity called the infundibulum, which is probably equivalent to the stomach of an anthozoan or a medusa, and is flattened in a direction at right angles to the stomodaeum, i.e., in the transverse plane.

From the infundibulum three tubes are given off one, the infundibular canal, passes directly upwards; and immediately beneath the aboral pole divided into four short branches, two of which open on the exterior by minute apertures, the excretory pores. The two other canals given off from the infundibulum are the pre-radial canals.

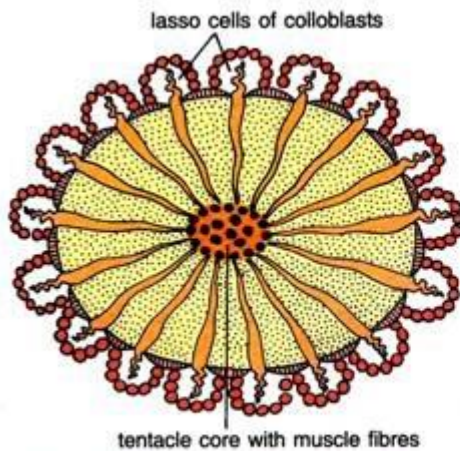


Fig. 37.2. Cross section of branch or pinna.

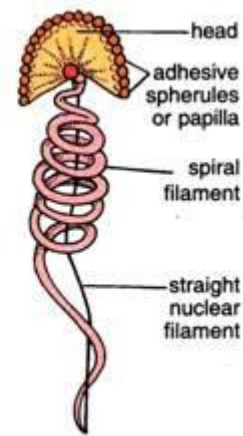


Fig. 37.3. A colloblast. (Highly magnified).

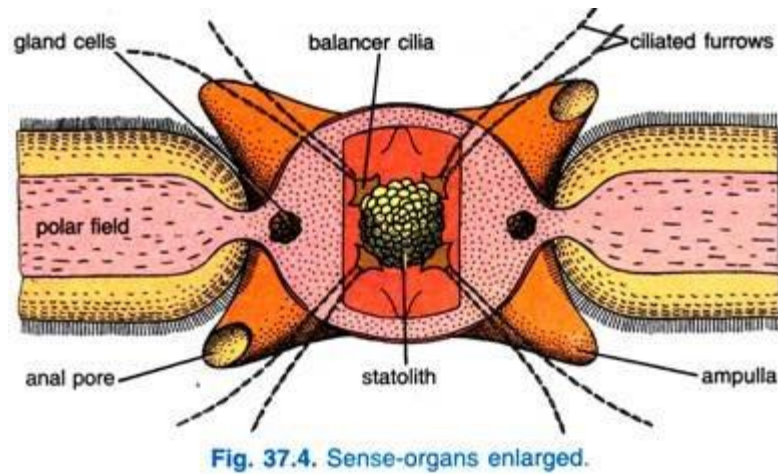
The per-radial canals pass directly outwards, in the transverse plane, and each divided into two inter-radial canals, which in their turn divide each into two ad-radial canals. Each per-radial canal gives off a stomodael canal that passes downwards parallel to and in close contact with the stomodaeum and a tentacular canal that extends outwards and downwards into the base of the corresponding tentacle.

Most of the digestion is completed extracellular in the stomodaeum. Undigested food passes out through either the mouth or anal pores.

Sense Organ:

The chief sense organ (Fig. 37. 4) is a peculiar apparatus situated at the aboral pole. In this region is a shallow depression lined by ciliated epithelium and produced in the transverse plane into two narrow ciliated areas, the polar plates.

From the depression, arise four equidistant groups of very large S-shaped cilia, united to form as many springs, which support a mass of calcareous particles. From each spring a pair of ciliated grooves proceeds outwards, and passes to the two swimming plates of the corresponding quadrant.



The calcareous mass, with its springs, is enclosed in a transparent case or bell, formed of coalesced cilia. It appears that the whole apparatus is a kind of steering gear or apparatus for the maintenance of equilibrium.

If the body is inclined, the statolith presses more heavily the ciliary tuft of the inclined side and the stimulus appears to be transmitted by the corresponding ciliated groove to a swimming plate and results in vigorous movement of the combs. A sub-epithelial plexus of nerve fibres with nerve cells extends all over the surface of the body, and nerve elements can be traced in the mesogloea.

Reproductive System:

The ctenophores are hermaphrodite, i.e., both the sexes are present in the same individual. The gonads are developed in the meridional canals. The ova are formed on one side and the spermatozoa on the other side of each meridional canal, from its endodermal lining. The matured ova and sperms are discharged into the canals and finally escape by the mouth. Fertilisation is external.

Development of Phylum Ctenophora:

Development of Pleurobrachia is not well-known but the following description of development in other forms of Ctenophora will give an idea of the development in Ctenophora. After fertilisation, the zygote undergoes cleavage and gives rise to four blastomeres by two meridional cleavages.

The third cleavage is nearly vertical resulting in a curved plate of eight cells arranged in two rows. The eight blastomeres divide twice along the horizontal plane and give rise in each time eight small cells, the micromeres and eight large cells, the macromeres. The micromeres are the source of ectoderm and the macromeres give rise to endoderm in due course.

Micromeres undergo rapid division and proliferate as a wreath of small cells over the macromeres that ultimately grow down as a one-layered sheet. Invagination starts and

gastrulation goes on by combined processes of emboly and epiboly. Micromeres cover the embryo to become the ectoderm.

Four inter-radial bands of small rapidly dividing cells become noticeable which differentiate extensively to form stomodaeum from which coelenteron arises by endodermal outgrowth. Biradial symmetry persists throughout the development.