

## B.Sc. Zoology Part I

### GENERAL CHARACTERS AND ORGANISATION OF PHYLUM ECTOPROCTA (BRYOZOA): *Bugula*

#### SYSTEMATIC POSITION

Phylum: Ectoprocta  
Class: Gymnolaemata  
Order: Cheilostomata  
Family: Bugulidae  
Genus: *Bugula*  
Species: *avicularia*

#### INTRODUCTION

- ❖ Ectoprocta are microscopic, sessile, colonial, unsegmented, coelomate animals that are fastened permanently in exoskeletal cases or gelatinous material of their own secretion with a circumoral ring, crescentic lophophore and a U-shaped digestive tract bringing the anus near the mouth but without nephridia and circulatory system.
- ❖ The Ectoprocta form colonies known as “Sea meat” or “Corallines” which in many cases bear a general resemblance to hydroid coelenterates.
- ❖ The Ectoprocts exhibit slight structural diversities and a typical genus *Bugula* has been described as an example of Ectoprocta.

#### HABIT AND HABITAT

- ❖ *Bugula avicularia*, the common **Bird’s Head Coralline** occurs in brown or purple bushy tufts, 5.0 to 7.0 cm long found attached on rocks, piles of jetties and similar situations on the shore in all the parts of the world.
- ❖ The Ectoprocts are strictly benthonic and pelagic only in larval stages.
- ❖ *Bugula* is a ciliary feeder and lives on micro-organisms specially diatoms.

#### EXTERNAL STRUCTURES

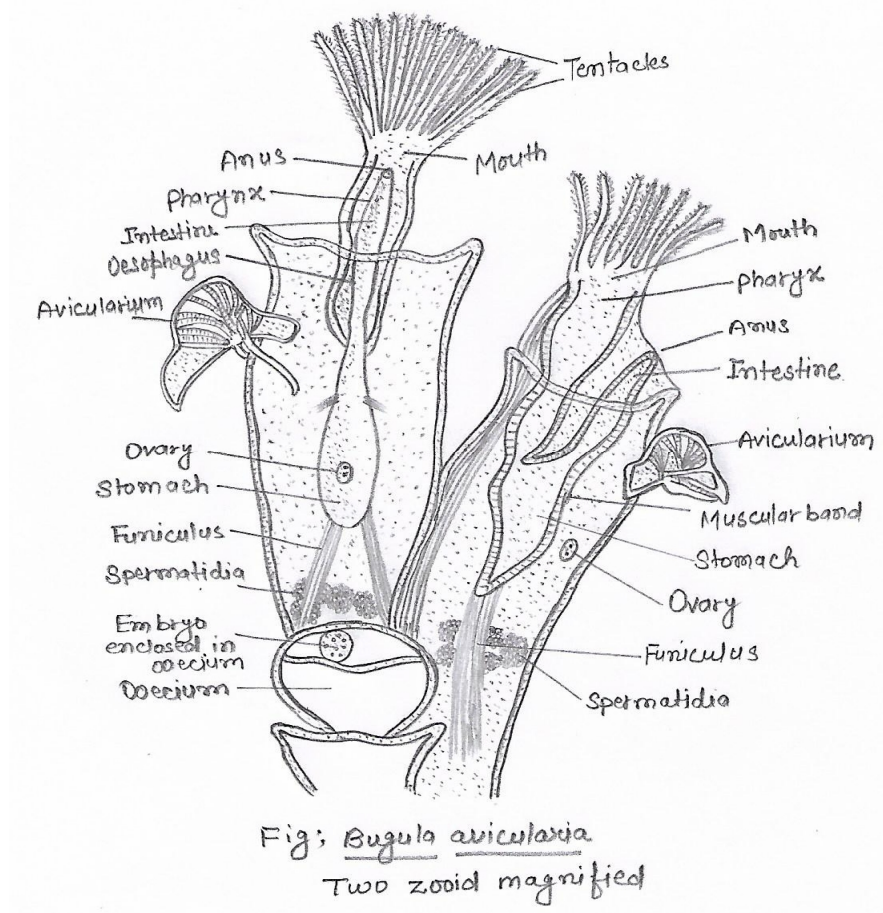
- ❖ An Ectoproct colony superficially resembles to a hydroid coelenterate but a closer examination reveals that it has a much higher type of organization.
- ❖ A complete ectoproct colony is called zoarium.
- ❖ It is composed of several individuals or units called zooids.
- ❖ The colony of *Bugula* consists of dichotomously branched narrow stem, which are rooted by a number of slender root filaments.

- ❖ Each stem is composed of a number of elements, the zooecia of the colony, which are closely united together and arranged in four longitudinal rows.
- ❖ The zooecia are cylindrical in shape, but broader distally than proximally, five times as long as broad and have, near the distal end, a wide crescentic aperture, the mouth of the zooecium, on either of which is a short blunt spine.
- ❖ A rounded structure- the ooeecium, in many parts of the colony lies in front of each zooecium.
- ❖ On each zooecium except a few, is a remarkable appendage, the avicularium.
- ❖ The avicularium has appearance of bird's head supported on a very short stalk.
- ❖ The chitinous wall of the zooecia is the hardened and thickened cuticle of zooids, having beneath it the soft body wall.
- ❖ The anterior region of the body of the zooid forms an introvert.
- ❖ When the introvert is everted it is seen to bear at its anterior end a circlet of usually fourteen long, slender, filiform tentacles on a circular ridge or lophophore surrounding the mouth of the zooid.
- ❖ The tentacles are densely ciliated except along their outer surface.
- ❖ The cilia of the tentacles vibrate in such a way as to drive currents of water and with them food particles towards the mouth.
- ❖ The tentacles are capable of being bent in various directions.
- ❖ Besides bringing minute food particles to the mouth of the zooid by the action of their cilia, the tentacles are tactile and also act as organs of respiration.
- ❖ When retracted they become enclosed by the walls of the introvert or by a sheath, the tentacles sheath.
- ❖ A pair of bands of muscle fibers, the parieto-vaginal muscles passing to the introvert from the body wall serve to retract the introvert from the body wall serve to retract the introvert from the body wall serve to retract the introvert tentacles.
- ❖ The main body of the zooid is the trunk which is immovably attached inside the zooecium. It contains the coelom and other internal organs.

### **BODY WALL**

- ❖ Body wall consists of cuticle, epidermis, two muscular layers and parenchyma.
- ❖ The cuticle forms the covering of the zooecium.
- ❖ Beneath the cuticle lies the epidermis composed of a single layer of large flattened cells.

- ❖ Muscle layers are also present in some genera in the form of outer circular and inner longitudinal



## COELOM

- ❖ The coelom is quite extensive and is incompletely divided into two parts by an incomplete septum.
- ❖ The anterior coelom is small and called ring coelom.
- ❖ The ring coelom is situated at the base of the lophophore and extends into the tentacle.
- ❖ The trunk coelom is quite large and occupies the space between the body wall and alimentary canal.
- ❖ The coelom is lined externally either by the parietal layer of parenchyma or ciliated peritoneum and internally by visceral layer of the same tissue, ensheathing the alimentary canal.
- ❖ Coelom is crossed by numerous radiating strands of spindle-shaped cells.
- ❖ The coelom is filled with a colourless fluid containing several kinds of suspended coelomocytes.

## DIGESTIVE SYSTEM

- ❖ The alimentary canal is a U-shaped tube.
- ❖ The mouth is situated at the centre of the lophophore.
- ❖ The mouth leads into the wide chamber the pharynx which passes into the oesophagus.
- ❖ The oesophagus leads into stomach.
- ❖ The stomach gives off a long conical prolongation or caecum passing towards the aboral end of the zoecium to which it is attached by the funiculus.
- ❖ The intestine comes off from the oral aspect of the stomach.
- ❖ The intestine terminates in a rounded anus situated near the mouth but outside the lophophore.
- ❖ The entire alimentary canal is lined by an epithelium which is ciliated throughout except in a portion of the stomach.
- ❖ A pair of slender muscles passing from the body wall to the stomach act as retractors of the alimentary canal when the introvert is drawn back.

## CIRCULATORY SYSTEM:-

- ❖ There are no blood vessels in the ectoprocts and the circulatory system is entirely absent.

## EXCRETORY SYSTEM:-

- ❖ Definite excretory organs do not occur in ectoprocts.
- ❖ The function of excretion (i.e., the collection of nitrogenous waste matters) being apparently carried on by the leucocytes and the cells of the funicular tissue.

## NERVOUS SYSTEM

- ❖ The nervous system consists of a small round ganglion situated in the ring coelom between the mouth and anus.
- ❖ This ganglion gives off nerves to various parts of the body.
- ❖ The ganglion is continuous with the nerve ring surrounding the pharynx.
- ❖ The nerve ring gives two ganglionated motor and sensory nerve fibres to each tentacle.
- ❖ Special organs of sense are absent.

## REPRODUCTIVE SYSTEM

- ❖ *Bugula* is hermaphrodite.
- ❖ Ovary and testis are found to occur together in the same zooid.

- ❖ Both ovary and testis are formed from specially modified cells of the parenchyma, either of the funiculus or of the body wall.
- ❖ The testis develops from the cells of the funicular tissue and gives origin to the spherical masses of cells, the spermatidia which develop into sperms with very long motile tails.
- ❖ These become free from one another and move about the body cavity. There is no sperm duct and it is doubtful if the sperms pass to the exterior.
- ❖ The ovary is a small rounded body formed from the parietal layer of the parenchyma about the middle of the zoeoecium.
- ❖ It consists of only a small number of cells of which only one at a time becomes a mature ovum, certain smaller cells forming an enclosing follicle.
- ❖ The mature ovum is perhaps fertilized in the coelom.
- ❖ Development of ovum takes place in brood pouch lined with parenchyma.

## DEVELOPMENT

- ❖ Self-fertilization has been observed in *Bugula*.
- ❖ The fertilized egg undergoes cleavage which is holoblastic (complete) and nearly regular.
- ❖ The plane of cleavage is of radial type.
- ❖ A coeloblastula is formed which eventually transforms into a gastrula by the process of delamination.
- ❖ During the process of production of 64-128 blastomeres, four elongated cells become cut off into the blastocoel.
- ❖ The larva is called **cyphonautes**.
- ❖ The cyphonautes larva in *Bugula* shows few specialized features, viz., oval shape, absence of alimentary canal and delimitation of the apical organ by a circular groove.

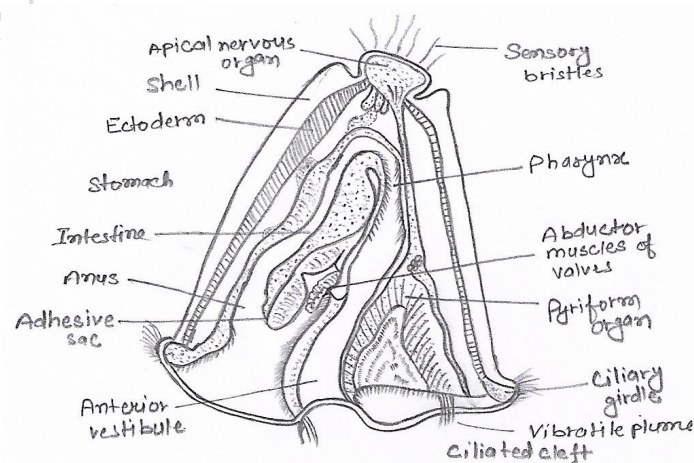


Fig: V.S. of a Cyphonautes larva

## ASEXUAL REPRODUCTION

- ❖ Ectoprocta reproduce asexually by building **statoblasts**, **hibernacula**, **brown bodies** and **regeneration**.

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