

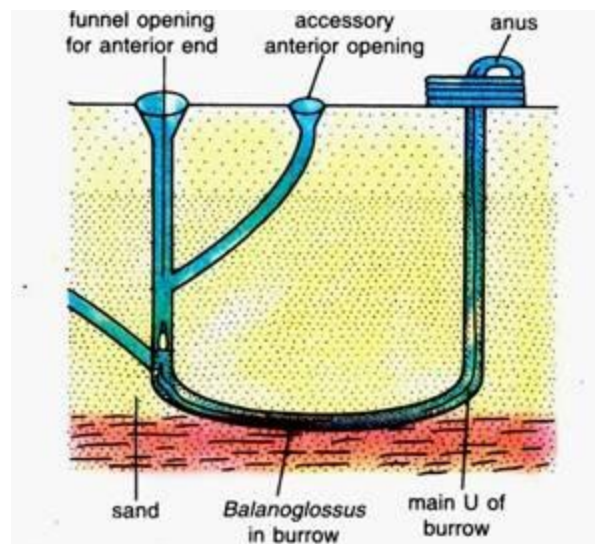
# Habit and Habitat of Balanoglossus

## BSc. Part I Zoology (Subsidiary)

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Balanoglossus is a burrowing and exclusively marine animal. It is found in shallow waters between tide marks along the coast of warm and temperate oceans. Balanoglossus is world-wide in distribution. Balanoglossus is tubicolous living in U-shaped burrows excavated in the sandy bottom. The walls of the tube are lined with mucus secreted by the mucous gland of the animal.

The burrows are open at both ends, and spiral coils of faeces like the castings of earthworms may be seen at the posterior opening. In its burrow Balanoglossus lies in a twisted condition but its anterior and posterior extremities are straight. Knight Jones (1952) reported that the animal moves in its burrow with the help of cilia present all over the body.



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### External Morphology of Balanoglossus:

The body of Balanoglossus is soft, elongated, cylindrical, being richly ciliated all over and covered with mucus.

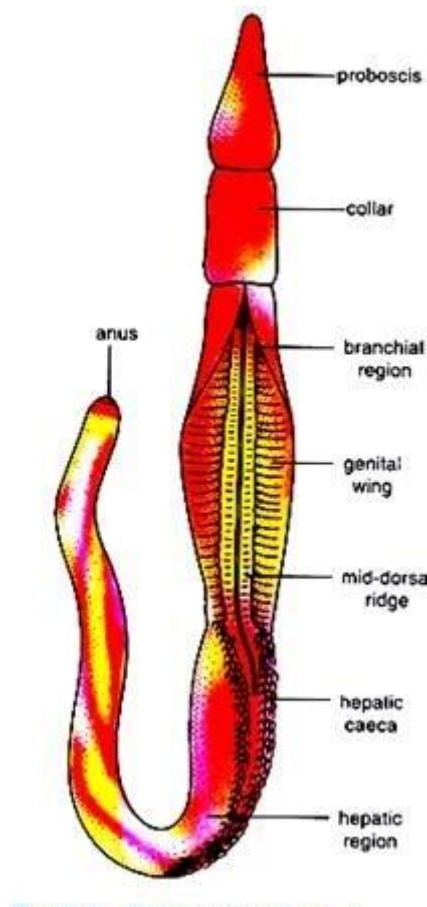
The length of animal varies from 2 cm to 2.5 meters. Most forms are drab coloured, though reddish tints are present, several species are luminescent due to mucus. They have an offensive odour. The body is bilaterally symmetrical and divided into three regions, viz., proboscis or protosome, collar or mesosome, and trunk or metasome.

## Proboscis:

The proboscis forms the anterior part of the body and is either rounded or conical in shape. It is continued posteriorly into a short, narrow neck or proboscis stalk.

The proboscis is hollow and has thick muscular walls. Its cavity opens to the outside by means of a small opening called the proboscis-pore. In certain cases there are two proboscis-pores. In some species the proboscis-pore does not communicate with the proboscis-coelom, but terminate blindly, and may send off a narrow tubular diverticulum which opens into the neurocoel.

The proboscis sits in the collar somewhat like an acorn in its cup, a character that has given the name “**acorn worms**” to the group. The mouth, which is always wide open and incapable of closing completely, lies on the ventral side and its lips are the ventral edges of the collar region.

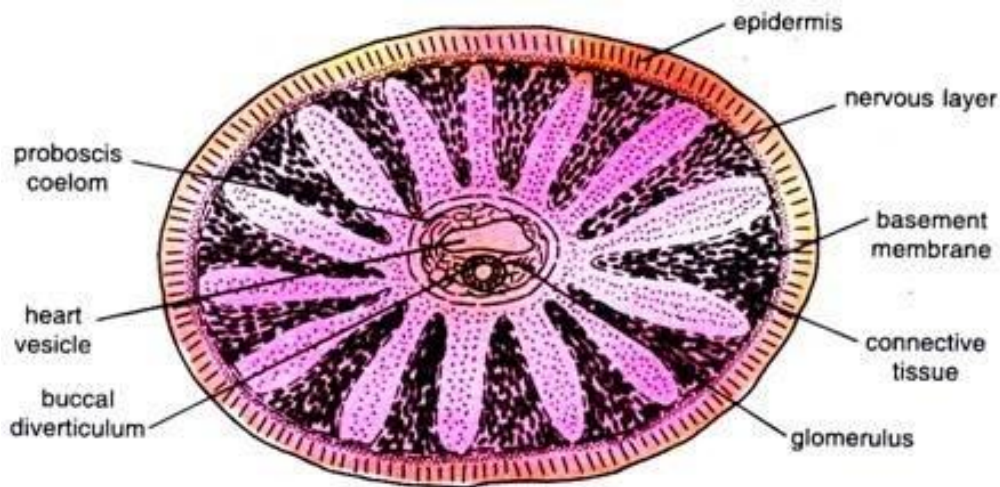


## Collar:

The collar lies posterior to the proboscis and anterior to the trunk. It is a short cylinder usually about as wide as long and mostly shorter than the proboscis although sometimes longer. The funnel-like anterior part of the collar, the collarete, embraces the proboscis stalk and usually also the posterior part of the proboscis. Posteriorly the collar is sharply demarcated from the trunk by a circular indentation.

The surface of the collar is often marked with elevations, depressions, and specially circular grooves. The collar is also muscular and possesses two coelomic cavities. The right and left coelomic cavities are separated from one another by dorsal and ventral mesenteries. The coelomic cavities of collar are completely cut off from the proboscis cavity.

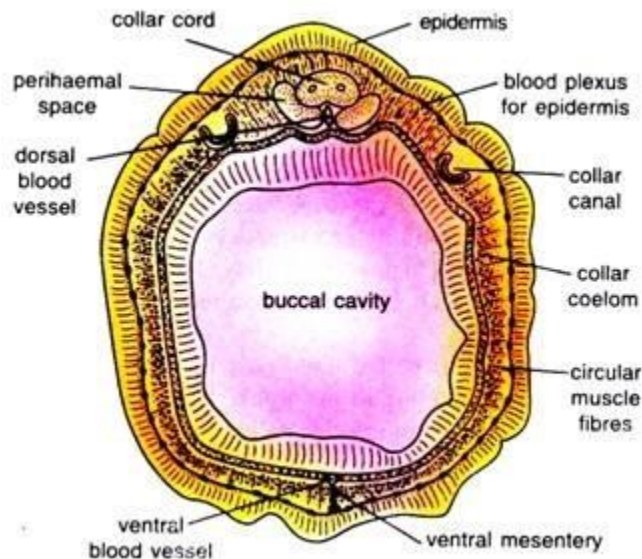
The collar cavity as well as the proboscis cavity are crossed by numerous strands of connective tissue which give the region a spongy appearance. The collar cavity communicated with the exterior by a pair of collar-pores, and short ciliated tubes (canals) leading into the first gill pouches.



The functional significance of the cavities and water pores in the proboscis and collar may best be explained through a description of the burrowing habits. When on the surface of the sandy bottom *Balanoglossus* pushes the tip of the proboscis into the sand, moving it around by muscular contractions until a shallow, cylindrical hole is made.

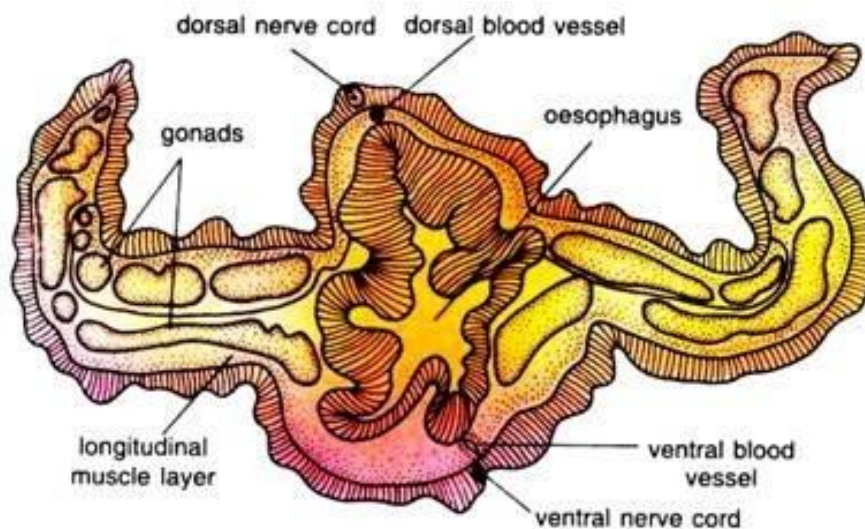
Then the proboscis empties its water content through its pore and collapses. This allows the collar to enter the hole. By taking in water through the pores the collar expands so as to fit lightly into the hole like a cork in a bottle. The well-filled collar then gives a point of resistance for further rooting movements of the refilled proboscis, which loosens sand and stows it into the scoop-shovel mouth.

Then both proboscis and collar relax and the latter squirms deeper into the hole before tightening its hold again. Once the collar gets a firm grip, the animal makes rapid progress and soon buries itself. The tail end is left near the surface, and at intervals comes out and deposits a pile of castings somewhat after the fashion of earthworms.



## Trunk:

The trunk is the elongated posterior part of the body. It is somewhat flat and annulated on the surface. It has a mid-dorsal and a mid-ventral longitudinal ridge. The trunk is divisible into three parts, an anterior branchio-genital region, a middle hepatic region, and a posterior abdominal or post-hepatic region.



On the dorsal of the branchio-genital region of the trunk is a double row of small pores the branchial apertures. Each row is situated in a long furrow. These pores increase in number during growth. In some species the most anterior are overlapped by a posterior prolongation of the collar called the operculum.

A pair of longitudinal genital ridges or genital wings extends throughout a considerable part of the body behind and in the region of the branchial apertures. In these genital ridges, gonads are situated. In some genera, the genital ridges are so prominent that they form a pair of wing-like lateral folds, the genital wings, but in other genera folds are absent.

The hepatic region is marked externally with irregular elevations due to sacculations produced by projecting hepatic caeca of the intestine. The abdominal region is longest and cylindrical. It tapers gradually and has a terminal anus. The coelom of the trunk is divided into two lateral closed cavities by vertical partition.

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### **Body Wall of Balanoglossus:**

The body wall of Balanoglossus is made up of an outer epidermis and an inner musculature.

#### **1. Epidermis:**

It consists of a single layer of epithelial cells. The epithelial cells are of tall columnar type and have their nuclei near their broader bases.

#### **These cells are mainly of two types:**

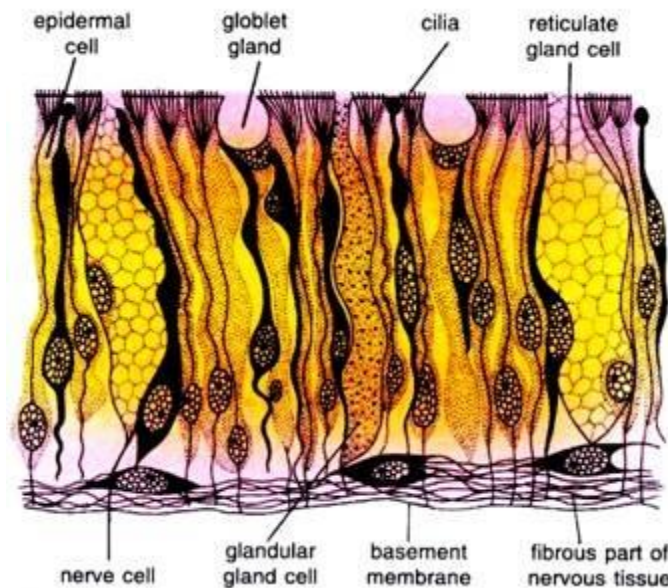
- (i) Ciliated epidermal cells are more numerous and each bears cilia at its free end;
- (ii) Gland cells are lying interspersed between the ciliated epidermal cells and are further of three kinds
  - (a) Goblet cells are flask-shaped and secrete mucus;
  - (b) Reticulate cells are long cells with vacuolated cytoplasm which also secrete mucus;
  - (c) Mulberry cells are long cells containing coarse cytoplasmic granules and, hence, are also called granular gland cells.

They secrete amylase. The mucus, secreted by gland cells, covers the animal and lines its burrow. The mucus has an obnoxious smell. In addition to these cells, the body wall of proboscis and anterior part of the collar also contain neurosensory cells which take darker stain than the rest. There is no dermis.

Immediately below the epidermis is a thick nervous layer consisting of bipolar and quadripolar nerve cells and fibres which form a network lying in close contact with the epidermal cells. This layer is traversed by the filamentous bases of the epidermal cells that are connected with the basement membrane.

The fibres of sensory epidermal cells synapse with the fibres of nerve cells. Below the nervous layer is a thick basement membrane made up of two lamellae pressed together. The basement membrane supports the epidermis and serves for attachment of underlying muscles.





## 2. Musculature:

The musculature of typical body-wall and gut-wall is greatly reduced and more or less replaced by muscles arising from the coelomic epithelium. The muscle fibres are smooth and of circular, longitudinal and diagonal types. The muscle layer lies below the basement membrane.

The proboscis musculature comprises a thin layer of circular muscle fibres and a thick layer of longitudinal muscle fibres. The longitudinal muscles fibres obliterate the proboscis coelom and some of the fibres cross one another diagonally. The collar musculature is confined to the collarette and consists of an inconspicuous layer of circular fibres and prominent bands of longitudinal and diagonal fibres.

The longitudinal and diagonal fibres, along with connective tissue, also traverse the collar coelom in a criss-cross pattern. The trunk musculature consists mainly of moderately developed longitudinal muscle fibres which are better developed on the ventral side. The muscle layer is interrupted by the dorsal and ventral mesenteries and the lateral septa.

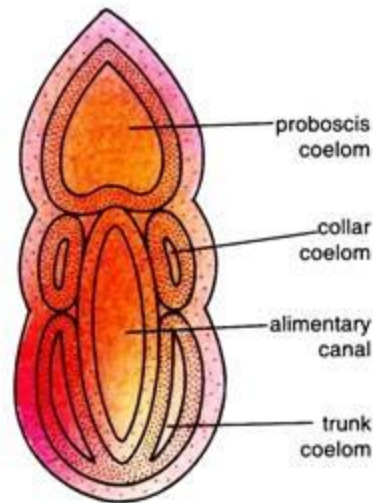
Several radial muscle fibres are also found in the trunk region. The radial muscle fibres extend between the digestive tract and the body wall and traverse the trunk coelom.

## Coelom in Balanoglossus:

The coelom is enterocoelous having been formed as outgrowths of the enteron. Corresponding with the three body regions the coelom is divided into three portions which are completely separated from each other by septa. The coelom is lined with coelomic epithelium or peritoneum.

But enteropneusts are peculiar in that their coelomic epithelium has connective tissue and muscle fibres which fill much of the original coelomic cavities, and a distinct peritoneal lining

has disappeared, moreover the coelomic musculature largely replaces the body wall muscles. The three parts of the coelom are an unpaired proboscis coelom, a pair of collar coeloms, and a pair of trunk coeloms.



### **1. Proboscis Coelom:**

The proboscis coelom or protoel is a single space in the proboscis which is largely occupied by muscles and connective tissue and a few structures like buccal diverticulum, glomerulus and central sinus or heart.

Dorsally, towards the posterior side, the proboscis coelom is divided by a dorsal mesentery into right and left dorsolateral compartments which extend into the proboscis stalk; the left compartment is larger than the right and communicates with the exterior through the proboscis pore situated mid-dorsally at the base of the posterior stalk.

Ventrally the proboscis coelom is divided by a ventral mesentery into right and left ventrolateral compartments which are continuous behind the mesentery.

### **2. Collar Coelom:**

The collar coelom or mesocoel has two cavities lying side by side in the collar, one on each side between the collar wall and buccal cavity. The two cavities are partitioned by incomplete mid-dorsal and mid-ventral mesenteries. The collar coelom does not communicate with the proboscis coelom, but posteriorly, its each cavity opens into the first gill sac of its side by a canal called collar canal.

Each collar coelom opens to the exterior by a collar pore. The collar coelom is greatly obliterated by the collar musculature and connective tissue.

### **3. Trunk Coelom:**

The trunk coelom or metacoel has two closed cavities lying between the body wall and alimentary canal. The two cavities are separated by an incomplete dorsal and a complete ventral mesentery.

In the branchiogenital region each cavity is further divided by a lateral septum into a dorsolateral and ventrolateral compartment. The trunk coelom is separated from the collar coelom by a collar-trunk septum. The trunk coelom is obliterated by the trunk musculature.

### **Coelomic Fluid:**

The proboscis and collar coeloms communicate with the exterior and get filled with sea water through their pores, which keeps them turgid. The trunk coelom is filled with a watery coelomic fluid having amoeboid coelomocytes. The coelomocytes originate from the coelomic epithelium.

Each coelomocyte possesses a single large vacuole. According to Spengel, they behave like leucocytes by secreting a membrane around any foreign body that may invade the animal.