DEPARTMENT OF ZOOLOGY

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B.Sc. Zoology Part I

GENERAL ORGANISATION OF BALANOGLOSSUS

SYSTEMATIC POSITION

Phylum:	Chordata
Group:	Acraniata
Subphylum:	Hemichordata
Class:	Enteropneusta
Type:	*Balanoglossus*

HABIT AND HABITAT

- *Balanoglossus* (Gr; *balano*= acorn + *glossa*= tongue) belong to class Enteropneusta which have a straight digestive tube with mouth and anus at opposite ends.
- *Balanoglossus* is popularly called 'acorn' or 'tongue worm'.
- It is marine and cosmopolitan.
- It is tubicolous living in U-shaped burrows excavated in the sandy bottom.
- In its burrow *Balanoglossus* lies in a twisted condition but its anterior and posterior extremities are straight.

EXTERNAL MORPHOLOGY

- 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 offensive odor.
- The body is bilaterally symmetrical and divided into three regions, viz.,
    1. Proboscis or Protostome

2. Collar or Mesosome
3. Trunk or Metastome

1. 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.
- The proboscis sits in the collar somewhat like an acorn in the 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.

2. Collar:-

- The collar is the shortest part of the body.
- It lies behind the proboscis and anterior to the trunk.
- It is cylindrical and has thick muscular wall.
- It is about as wide as long.
- It is capable of expansion and assists the proboscis in burrowing.
- It also lodges many vital organs.
- The collar houses the mouth on its antero-ventral face.
- Its ventral edges form the lips.

3. 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 branchogenital region, a middle hepatic region and a posterior abdominal or post-hepatic region.

(i) Anterior-branchiogenital region:-

- It has a pair of longitudinal genital ridges.
- These contain gonads.
- In some cases these are so prominent that they form a pair of wing like lateral folds called genital wings.
- Dorsal surface of this region is provided with double rows of small furrow. These serve as openings of gill chambers and are called branchial apertures or gill-slits.

(ii) Middle hepatic region:-

- ❖ It is marked by the presence of a paired series of sacculations of the intestine.
- ❖ These lateral pouches projecting from the intestine are called hepatic caeca.

(iii) Posterior abdominal region:-

- ❖ It is the longest and cylindrical part of the body. It is more or less uniform in diameter.
- ❖ It bears a terminal anus.

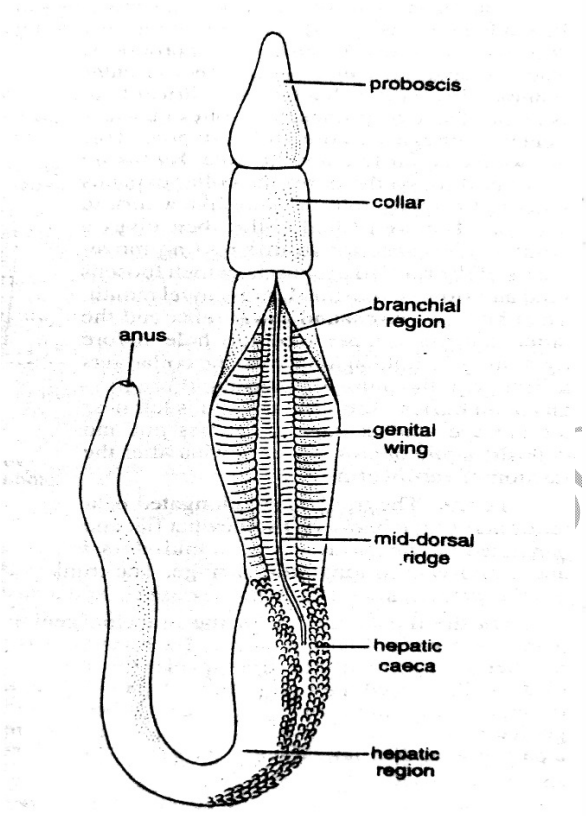

Fig. 88.2. *Balanoglossus*. External features in dorsal view.

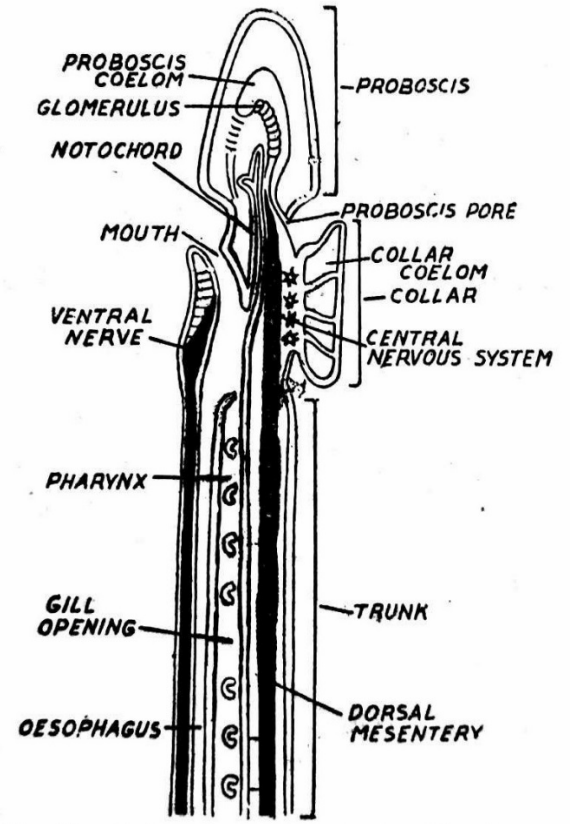

Fig. 14. Balanoglossus. Longitudinal Section.

BODY WALL

- ❖ Body wall consists of-

Epidermis: single layer of tall ciliated epithelial cell containing reticulate, goblet and neuro sensory cells.

Nervous layer: a network of nerve cells and fibres;

Basement membrane: beneath which lies musculature comprised to circular and longitudinal muscles in proboscis and collar but only longitudinal muscles in trunk.

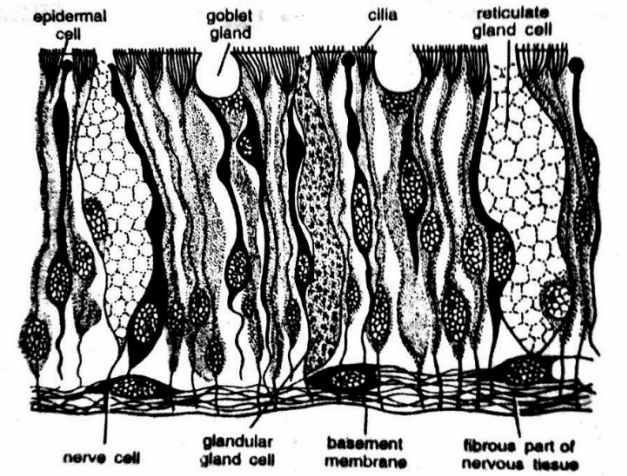

Fig. 88.6, *Balanoglossus*. V.S. of body wall.

BODY CAVITY

- Enterocoelous coelom is divided into 5 compartments:-
  i.) One Proboscis coelom
  ii.) Two Collar coelom
  iii.) Two Trunk coelom
- These are separated from each other by septa.
- Proboscis coelom opens to the exterior by a mid-dorsal proboscis pore.
- Each collar coelom communicates to the exterior by a collar pore and with the first gill pouch by a pore canal.
- These remained filled with sea water while trunk coeloms do not communicate to the exterior and are filled with coelomic fluid containing amoeboid coelomocytes.

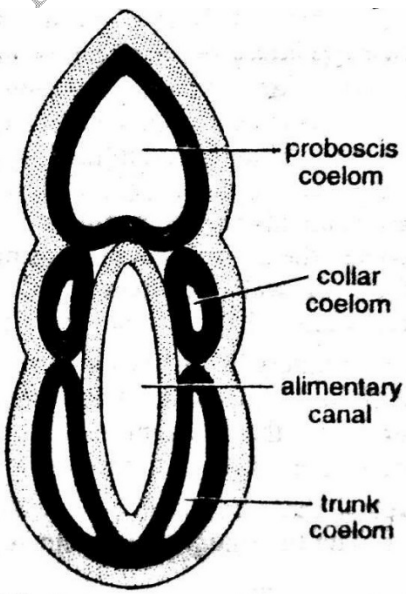

Fig. 88.7. *Balanoglossus*. Diagram of tripartite embryo showing coelomic cavities.

ENDOSKELETON

Endoskeleton is represented by-

(i) Buccal diverticulum or stomochord:-

- It is hollow pre-oral extension from the anterior wall of the oral cavity projecting into the proboscis.
- It is neither homologous nor analogous to the notochord.

(ii) Proboscis skeleton or nuchal skeleton:-

- It lies beneath stomochord, formed by the thickening of basement membrane in the form of a 'A' shaped structure, its median part called basal plate with a mid-ventral keel lies in the proboscis stalk while its two horns called cornea extend on the roof of the buccal cavity on each side of the same.

(iii) Branchial skeleton:-

- It supports gill clefts in the form of primary and secondary gill bars which are formed by the thickening of basement membrane.

(iv) Pygochord:-

- It is strong rod like structure in the caudal region formed by a median derivative of the ventral face of the gut.

DIGESTIVE SYSTEM

- It consists of a round mouth located in a ventral groove between collar and proboscis.
- Oral cavity lying in the collar in the form of a broad canal.
- Pharynx beginning at the junction of collar and trunk and extending in the anterior part of the trunk, its lumen is divided into dorsal branchial and ventral digestive regions, the former bears gill-clefts while the latter conducts food and is called oesophagus.
- Intestine lies behind oesophagus and is divisible into anterior hepatic caeca and posterior intestine parts, the latter leads to the exterior through sphincter muscles bearing terminal anus.
- *Balanoglossus* is ciliary feeder.
- Cilia of proboscis and gill clefts create water current.
- Food particles (microscopic organisms) along with sand particles coming with water current are entangled to the mucous secreted by proboscis.
- Bulk of food containing mucus is moved backwards by the strong ciliary current and is carried to collar. Here it enters into the buccal cavity through mouth.

- Undigestible food is discarded by closing the mouth by muscular projection of collar.
- Digestion begins when the food particles get attached with the proboscis slime which contains amylase.
- The glandular oesophagus also helps in digestion.
- Most of the digestive enzymes are secreted by hepatic caeca.
- Digestion and absorption occur in intestine.

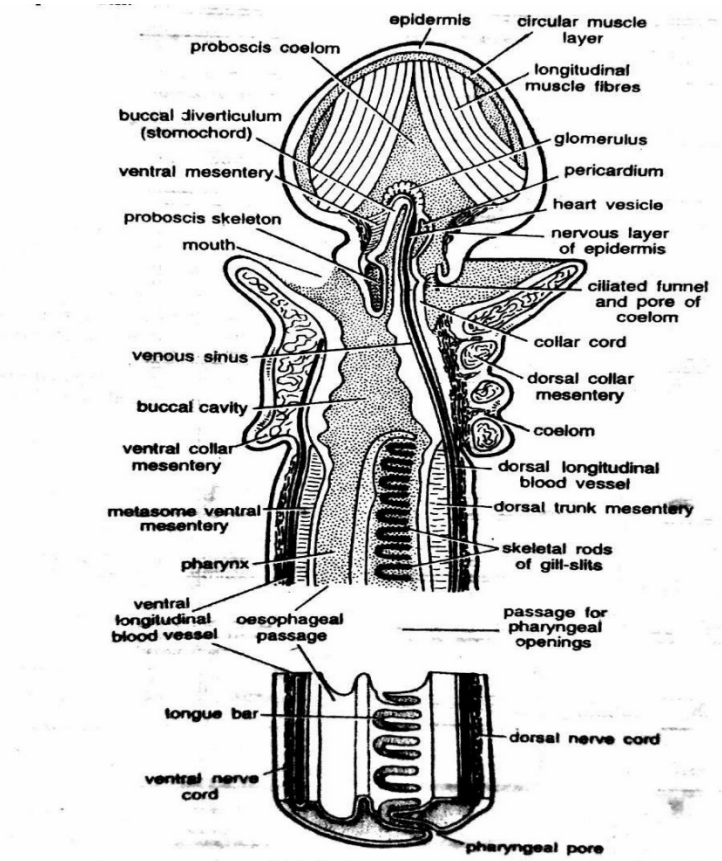

Fig. 88.10. *Balanoglossus.* M.L.S. of anterior region to show the alimentary canal.

RESPIRATORY SYSTEM

- It consists of series of numerous gill clefts (up to 700 pairs) on each side of dorsal pharyngeal wall.
- Each gill cleft is U-shaped.
- Downward projection of the dorsal end of the gill-cleft is termed tongue bar while the part of pharynx between two gill cleft is called septum.
- Both tongue bars and septa are supported with skeletal rods called primary gill rods (forked ventrally and secondary gill bars respectively).
- Each gill-cleft communicates pharynx to a bag like structure called branchial pouch or gill sac located between the wall of the pharynx and body wall.
- Exchange of Oxygen and Carbon dioxide occurs in vascular gill-clefts.

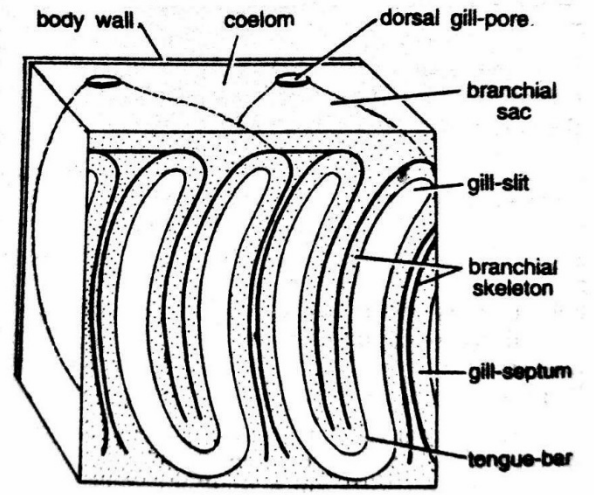

Fig. 88.14. *Balanoglossus.* Diagrammatic three-dimensional view of two gill-slits and two branchial sacs.

CIRCULATORY SYSTEM

- It is of closed type and consists of contractile longitudinal dorsal and ventral blood vessels running above and beneath the gut with forward and backward flow respectively; a small non-contractile central sinus or heart in the posterior part of proboscis, a pericardium with contractile ventral wall above the heart and glomerulus in the proboscis coelom.

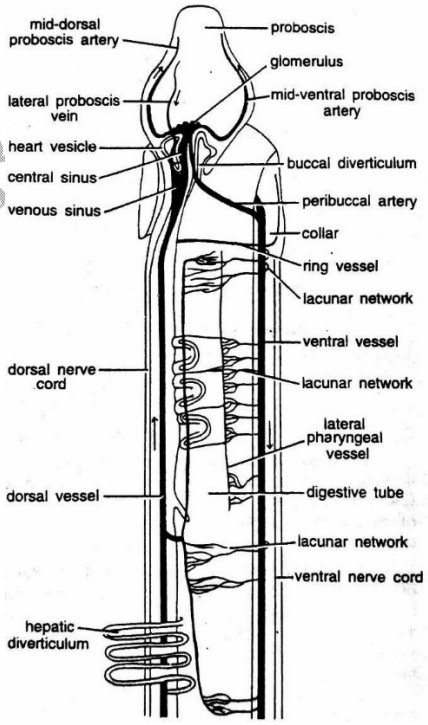

Fig. 88.16. *Balanoglossus.* Blood vascular system in anterior end in lateral view.

EXCRETORY SYSTEM

- A glomerulus of proboscis gland located in closed vicinity to buccal diverticulum separates urea and uric acid from blood and eliminates them into proboscis coelom.

NERVOUS SYSTEM

- The nervous system of *Balanoglossus* is of a very primitive type resembling that of coelenterates and echinoderms.
- Nervous layer is thickened on mid-dorsal and ventral positions to form dorsal and ventral nervous cords.
- These are mere thickenings of a layer of nerve fibres which are found all over the body in the deeper part of the epidermis.
- At the posterior end of the collar the dorsal and ventral cords are connected by a ring-like thickening.
- There is also a thickening all-round the neck of the proboscis.
- There are no organs of special sense.

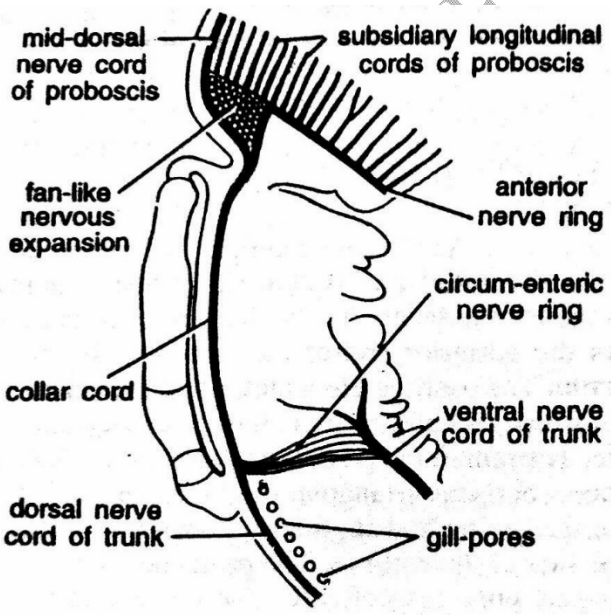

Fig. 88.18. *Balanoglossus.* Nerve cords in the anterior region of the body.

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