Digestive System & Feeding In Pila globosa

The digestive system of Pila globosa comprises:

1. A tubular alimentary canal

2. A pair of salivary glands

3. A large digestive gland

(i) Alimentary Canal:

The alimentary canal is distinguished into three regions, viz:

1. The foregut or stomodaeum including the buccal mass and oesophagus,

2. The midgut or mesenteron consisting of stomach and intestine, and

3. The hindgut or proctodaeum comprising the rectum. The midgut alone is lined by endoderm, while the other two are lined by ectoderm.

1. Foregut:

The foregut includes the mouth, buccal mass and oesophagus.

(i) Mouth:

The mouth is a narrow vertical slit situated at the end of snout. There are no true lips but the plicate edges alone serve as secondary lips.

(ii) Buccal Mass:

The mouth leads into a large cavity of buccal mass or pharynx having thick walls with several sets of muscles. The anterior part of the cavity of buccal mass is vestibule. Behind the vestibule are two jaws hanging from the roof of the buccal mass. The jaws bear muscles and their anterior edges have teeth-like projections for cutting up vegetable food.

Buccal Cavity:

Behind the jaws is a large buccal cavity. On the floor of the buccal cavity is a large elevation called odontophore. The front part of odontophore has a furrowed subradular organ which helps in cutting food. The odontophore has protractor and retractor muscles and two pairs of cartilages, a pair of triangular superior cartilages which project into the buccal cavity, and a pair of large S-shaped lateral cartilages.

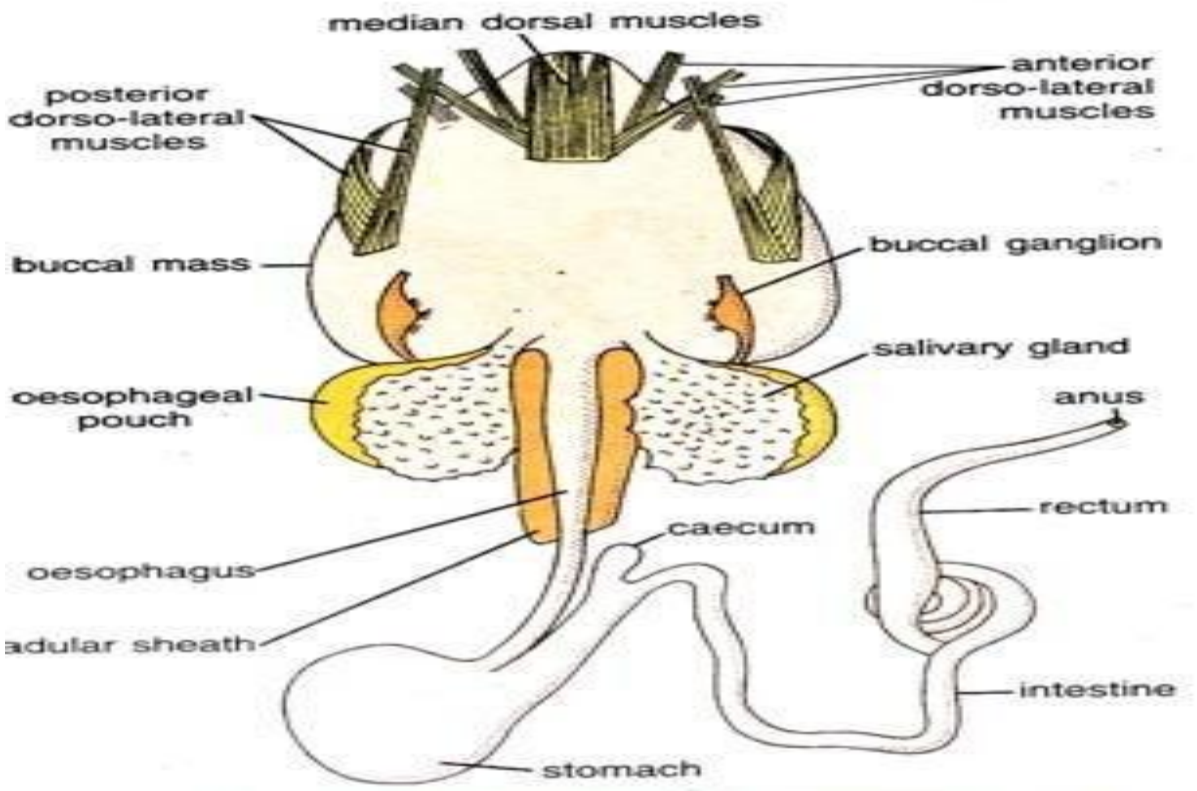

Fig. Digestive system of Pila

Radula:

Above and behind the odontophore is a bag-like radular sac which is a diverticulum of the buccal cavity. The radular sac has transverse rows of cells called adontoblasts. Inside the radular sac is a radula which is characteristic of Mollusca. The radula is made of many transverse rows of horny teeth.

Each row has seven teeth, two marginal and one lateral tooth on each side and a central or rachidian tooth in the middle, thus, giving a formula 2, 1, 1, 1, 2. The radula

moves forward and backward on the odontophore for rasping food particles; these movements of radula are called chain saw movements.

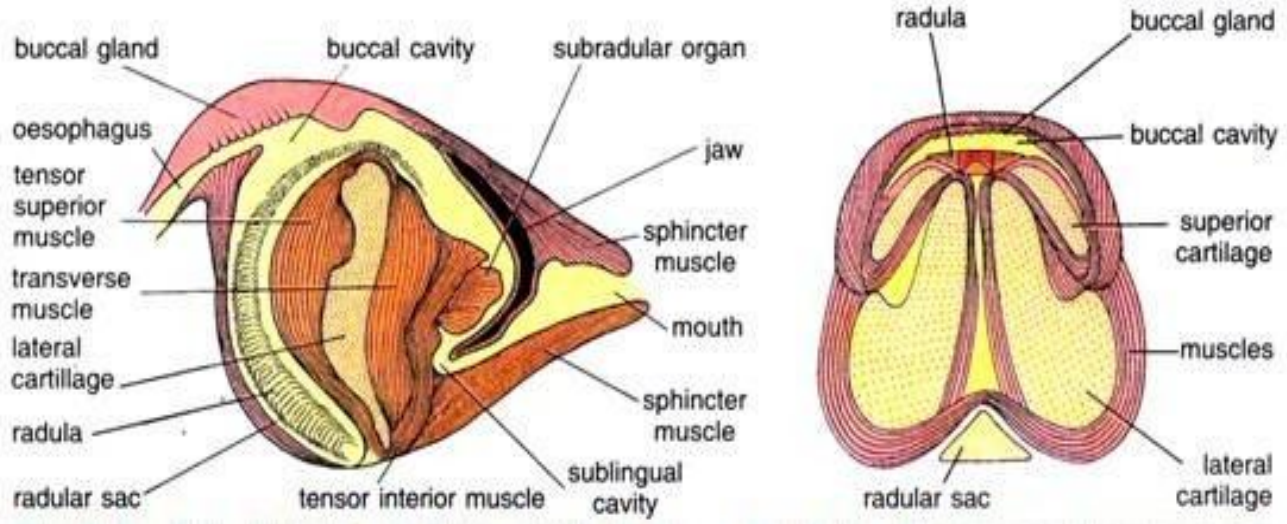

Fig a) L.S of Baccal mass b) T.S of Baccal mass of Pila

The teeth are made of chitin which is reinforced by hardened protein, they have sharp cutting projections which act like a file and rasp vegetable food. The teeth of the radula are worn off in front and new teeth are formed all the time by odontoblasts. On the roof of buccal cavity, above the radula, is a pair of grooved buccal glands which are digestive.

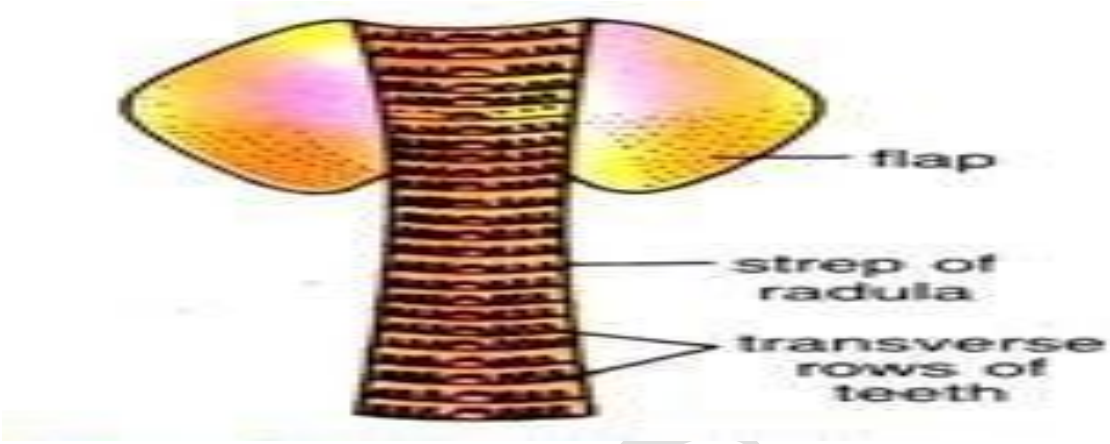

Fig. Radula of Pila

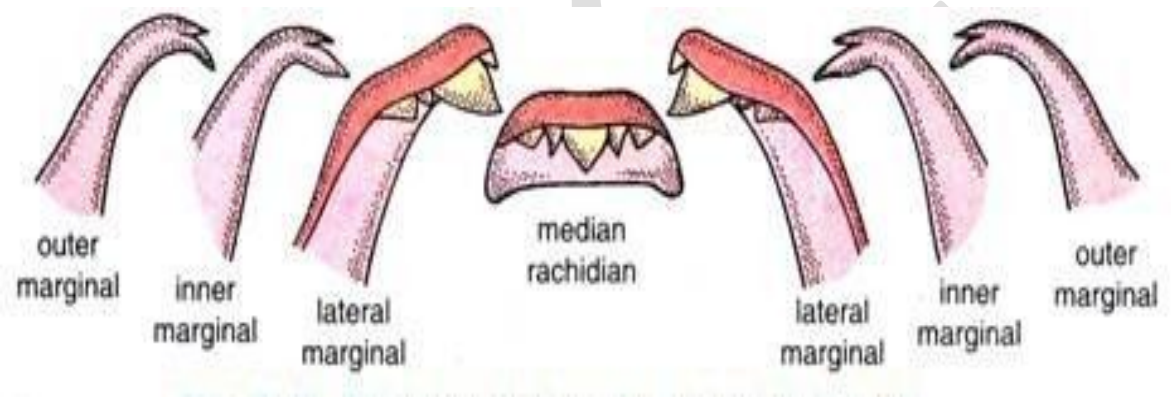

Fig. Single row of radular teeth in Pila

(iii) Oesophagus:

The buccal mass leads into a long narrow oesophagus. From near the origin of the oesophagus arise a pair of round, whitish oesophageal pouches. They arise by short ducts and lie below the salivary glands. They are prolongations of the oesophagus, they probably secrete digestive enzymes.

Oesophageal pouches serve for a temporary storage of food and digestion begins in them. Some extracellular digestion is brought about in the stomach by the enzymes produced by the salivary glands and oesophageal pouches.

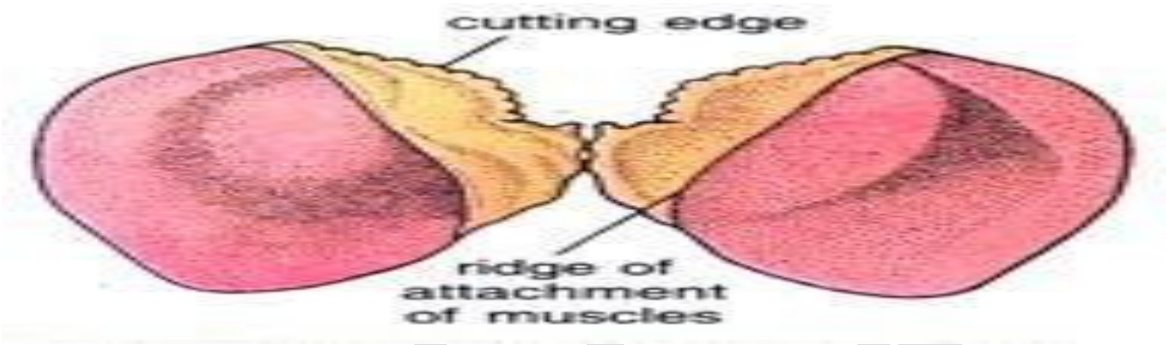

Fig. Jaw of Pila

2. Midgut:

The midgut includes the stomach and intestine.

(i) Stomach:

The stomach begins on the left side just below the pericardium and runs backwards as a blind pouch on the postero-lateral sides of the main whorl of the visceral mass. It is a rectangular sac of dark red colour having a broad U-shaped internal cavity of rose-red colour. The stomach is differentiated into two chambers—cardiac chamber and pyloric chamber.

The cardiac chamber is rounded in appearance and possesses longitudinal folds on its inner surface. The

oesophagus opens into it. The pyloric chamber is tubular and has transverse folds on its inner surface. From the pyloric chamber arises a short bag-like caecum but it has no crystalline style as found in many gastropods. The duct of digestive gland opens into the stomach at the junction of its two chambers.

(ii) Intestine:

From the pyloric chamber arises an intestine which runs along its anterior edge and further along the digestive gland beneath the posterior renal chamber. It then turns upwards and backwards in the visceral mass where it forms 2½ or 3 coils between the gonad in front and the digestive gland behind, before joining the rectum.

3. Hindgut:

The rectum or terminal part of the alimentary canal is a thick-walled tube. It enters the mantle cavity and passes downwards to open by an anus on the right of the head.

Salivary Glands:

The two salivary glands lying one on each side of the posterior limit of the buccal mass and partially cover the oesophagus. The surface and margins of each gland are

greatly cut up, giving it the appearance of a somewhat branched type of gland.

The duct of each gland begins near its internal anterior corner and immediately enters the muscles of the buccal mass and opens into the buccal cavity. The secretion of salivary glands contains mucus and an enzyme which digests starch. The mucus lubricates the radula and helps in the transport of food.

Digestive Glands:

The digestive gland, often referred to as liver or hepatopancreas, of Pila globosa is a somewhat triangular plate or cone with a very convex outer and more or less flattened inner surface. The cone is spirally coiled from the tip inwards and downwards following the whorls of the shell.

The gland is of a brownish to dirty green colour and is quite soft when fresh. Two main ducts arise from the two main lobes of the digestive gland; these ducts unite just before reaching stomach to open into it by a common aperture.

The digestive gland is made up of a number of fine tubules bound together by connective tissue. These

tubules unite with one another to form larger tubules which terminate in two main ducts corresponding to two main lobes of the gland. The terminal part of each tubule is glandular, called the alveolus and the rest of the tubule is ciliated.

The alveoli have three kinds of cells, they are secretory, resorptive and calcareous cells or lime cells. The secretory cells produce a brown liquid containing an enzyme which dissolves cellulose of plants in the stomach converting in into pulp. The resorptive cells produce a proteolytic enzyme. This enzyme brings about intracellular digestion of cellulose pulp. The calcareous cells store phosphate of lime.

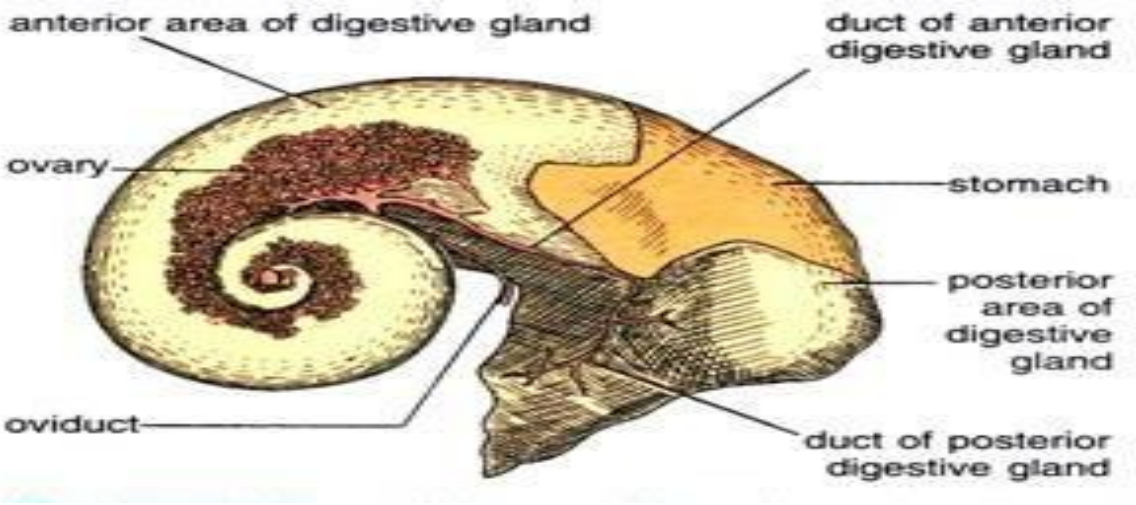

Fig. Digestive gland of Pila

(ii) Food and Feeding:

The food consists of aquatic plants of succulent nature like Vallisneria and Plstia which are cut by jaws and the odontophore, then the radula moves forwards and backwards filing the food into small particles exactly like the chain-saw mechanism. Thus, the food is cut up and masticated inside the buccal cavity.

(iii) Digestion:

The salivary glands pour their secretion by means of their ducts into the buccal cavity where it mixes with the food. It helps in digesting the starch by converting it into sugar. In the stomach the food is digested by the secretion of digestive gland. Secretion of digestive gland digests various kinds of food but cellulose is digested inside the resorptive cells only.

Thus, both extracellular and intercellular digestion occur. The stomach is the site of extracellular digestion and the digestive gland is the site of intracellular digestion and absorption, this is characteristic of Mollusca. Absorption of digested food takes place mainly in the digestive gland and some in the intestine.