Digestive System of *Pila globosa*

TDC Part I
Paper I-Group C

Digestive System of *Pila globosa*

Pila is herbivorous, lives primarily on aquatic vegetation.

The digestive system comprises:

1. A tubular alimentary canal
2. A pair of salivary glands
3. A large digestive gland

The digestive canal

It is a coiled tube extending from the mouth and terminating at the anus.

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 foregut and the hindgut possibly develop from the ectodermal layer, while the midgut is endodermal in origin.

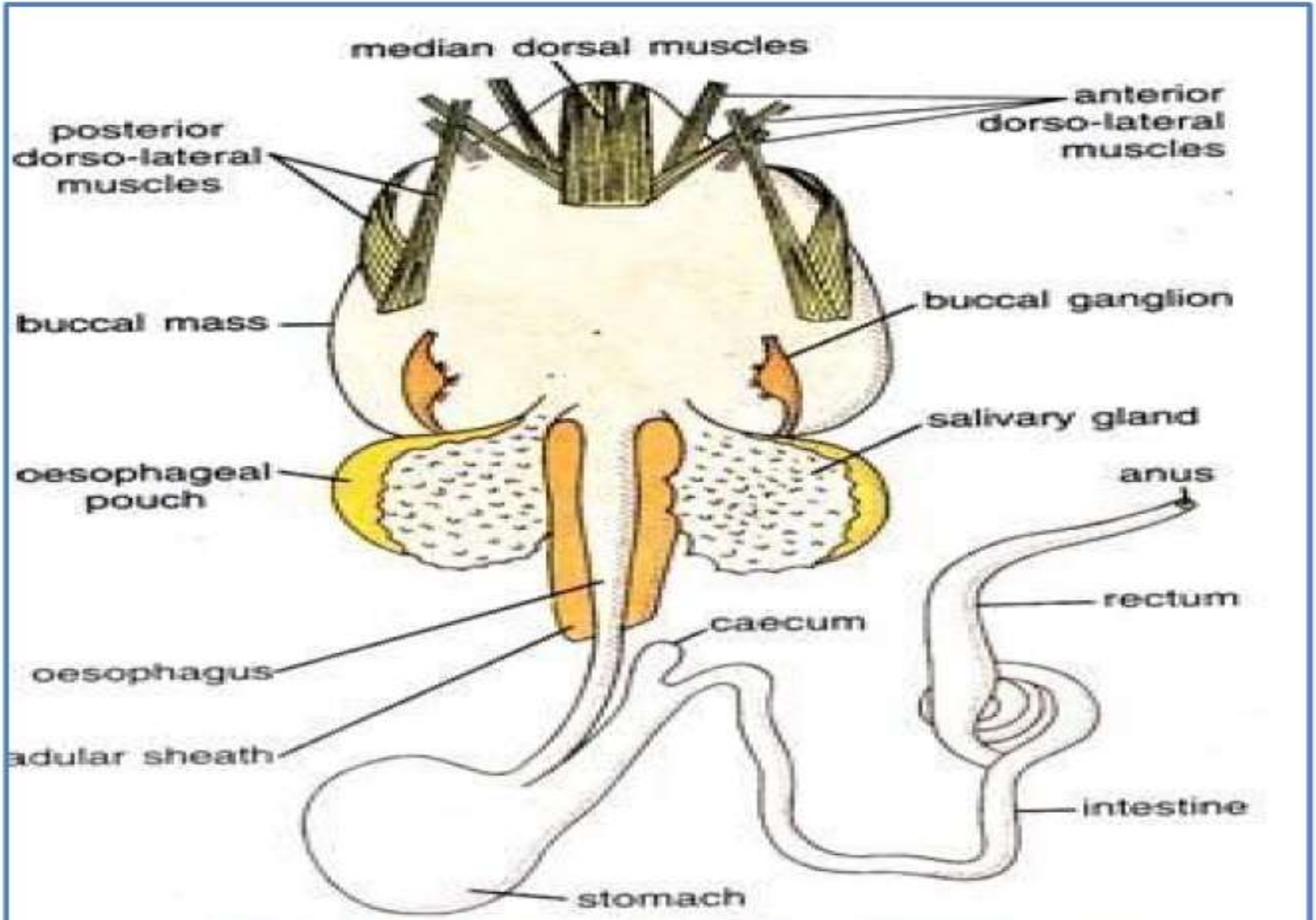

Fig. 60.7. *Pila globosa*. Alimentary canal.

(i) Foregut or Stomodaeum:

- The foregut includes the mouth, buccal mass and oesophagus.
- Mouth: The mouth is a vertical slit which leads into the anterior end of the digestive tract which becomes greatly swelled to form an oval buccal cavity.
- The buccal cavity is enclosed by a strong thick-walled muscular structure called buccal mass.
- The buccal mass is regarded as the pharynx by many workers.

Radula

- The entrance of the mouth is guarded by a pair of chitinous jaws projecting from the roof of the buccal cavity . Covering the floor of the buccal cavity, is present a chitinous ribbon like structure. This structure is known as radula or lingual ribbon and is produced from a radular sac. The radula is movably placed by muscles upon a large outgrowth of the floor of the buccal cavity, called tongue mass or odontophore. Odontophore is supported by two sets of cartilages

(i) A pair of more or less triangular superior cartilages at the top of the odontophore.

(ii) A pair of S-shaped lateral cartilages lying on the sides of odontophore.

- Radular sac is a bag-like diverticulum of the buccal cavity above and behind the odontophore • The radula is an elongated structure bearing transverse rows of serrations. The radular sac has transverse rows of cells called adontoblasts. Inside the radular sac is a radula which is characteristic of Mollusca.

- Each transverse row contains about seven horny teeth—two marginals, a lateral on either side of a median rachidian tooth, giving the formula as: 2, 1, 1, 1, 2 = 7. It is made up of muscles with cartilaginous support. It has an anteriorly placed subradular organ. The radula moves forward and backward on the odontophore for rasping food particles; these movements of radula are called chain saw movements.
- The subradular organ is a more or less rounded structure. It is divided into two by a median furrow. A small pouch like sublingual cavity is present beneath the subradular-organ. The radula at the posterior end enters into a radular sac which supplies new teeth to the radula.
- The radula is pushed forward by muscles from behind and it works as a file by rasping food materials.

- Pila is a vegetable feeder and takes leaves of aquatic weeds by cutting with the jaws. The buccal cavity receives two salivary glands on the posterior side.
- The buccal cavity leads into oesophagus. The oesophagus is a long tube and just after its origin from the buccal mass it gives out on each side, a small out-pushing called oesophageal pouch. The oesophagus ends in stomach.

- 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.

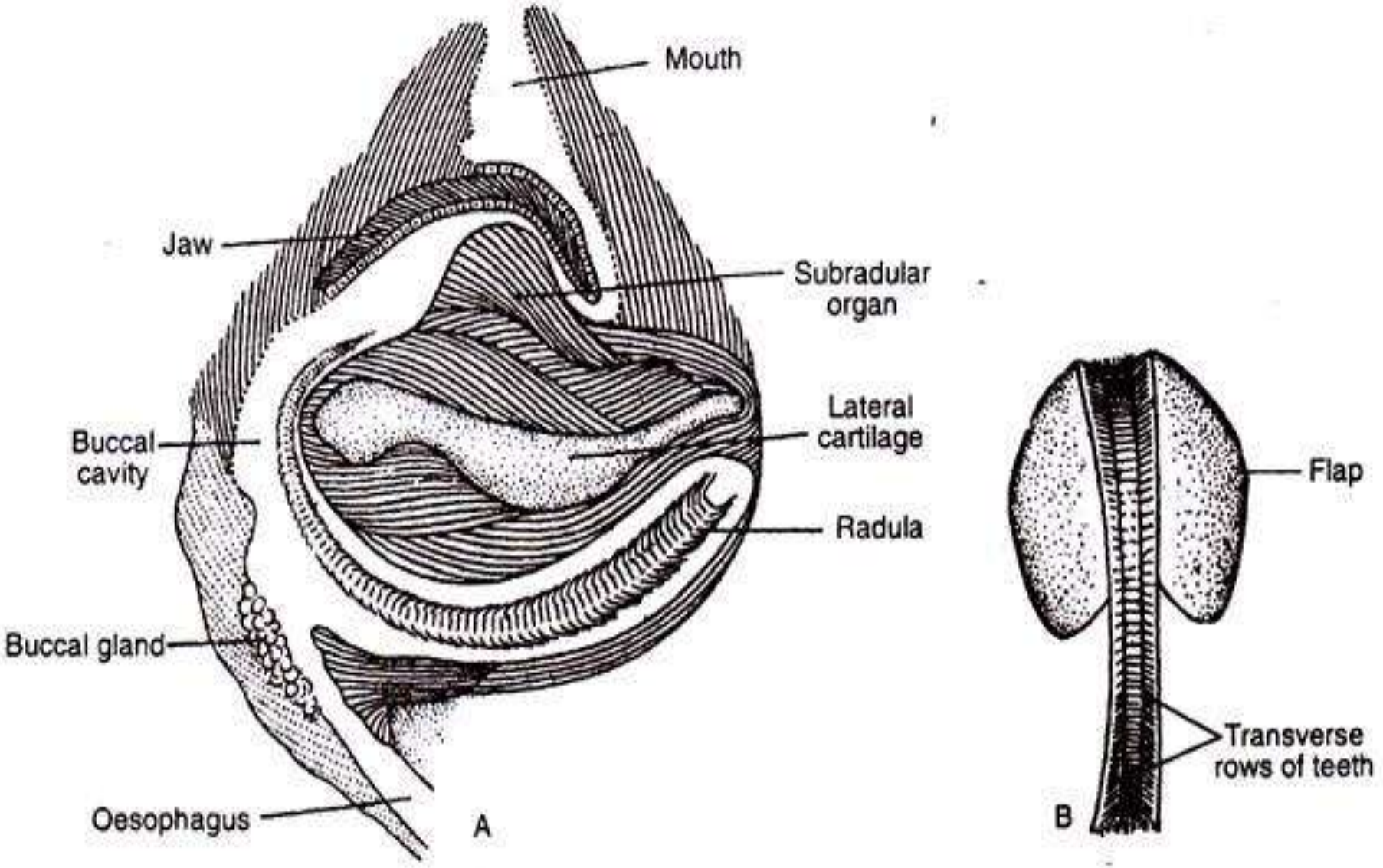

Fig. 16.12: A. Sectional view of buccal mass of *Pila*. B. Radula of *Pila*.

(ii) Midgut

- The stomach is red in colour and is situated on the lower part of the visceral mass just below the pericardium. It is a large sac and bent on itself to form a ‘U’- tube, one limb of which received the oesophagus and the other leads into the intestine. The end which receives the oesophagus is called the posterior or cardiac chamber, while the other end is called the pyloric chamber.
- The cardiac chamber actually constitutes the main part of the stomach. The pyloric chamber exhibits transverse folds at its inner wall, while that of cardiac chamber appears corrugated. A caecum or blind pouch opens at the junction of stomach and intestine. The caecum does not contain any crystalline style as observed in other gastropods. It is merely a blind diverticulum of the pyloric chamber of the stomach.

(iii) Hindgut:

- The intestine is long and forms 2-½-3 coils. The posterior part of the intestine is nearly straight and turns to the anterior direction and continues as the rectum.
- The rectum lies on the floor of the right side of the mantle cavity and terminates in anus which is situated near the mouth within the right mantle opening.

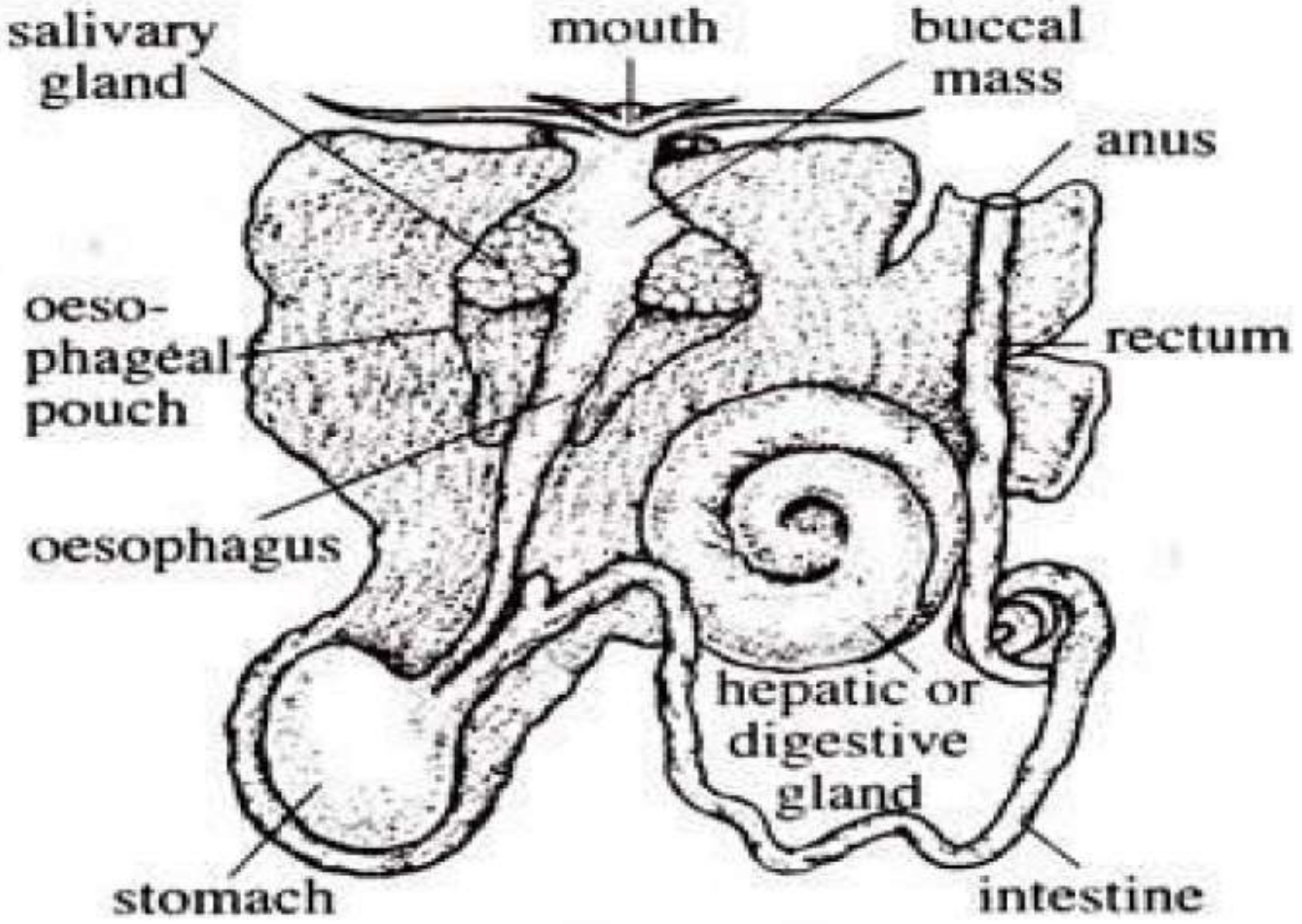

Fig. 1.83 : Digestive system of *Pila*.

Buccal and Salivary Glands of *Pila globosa*

Buccal glands :

- In the buccal cavity wall these glands are present.
- They secrete a juice whose function is not clearly known.

Salivary Glands

- There are two salivary glands situated one on each side of the posterior limit of the buccal mass and partially cover the oesophagus.
- 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.

Hepatopancreas

- 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 liver or digestive gland is black in colour and constitutes the main bulk of the visceral hump.
- It gives out two ducts which unite to form a common duct and opens into the stomach.
- In this gland three types of cells are present. They are

a) Secretory Cells : They secrete digestive juices.

b) Intracellular digesting Cells These cells will perform intracellular digestion.

c) Calcium Cells : These cells will store calcium phosphate.

Digestion

- Pila takes smaller plants and their leaves as food. With the help of walls of Buccal cavity it will catch the leaves. Radula will cut the leaves into bits.
- 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.
- The undigested food will be sent out of the anus.

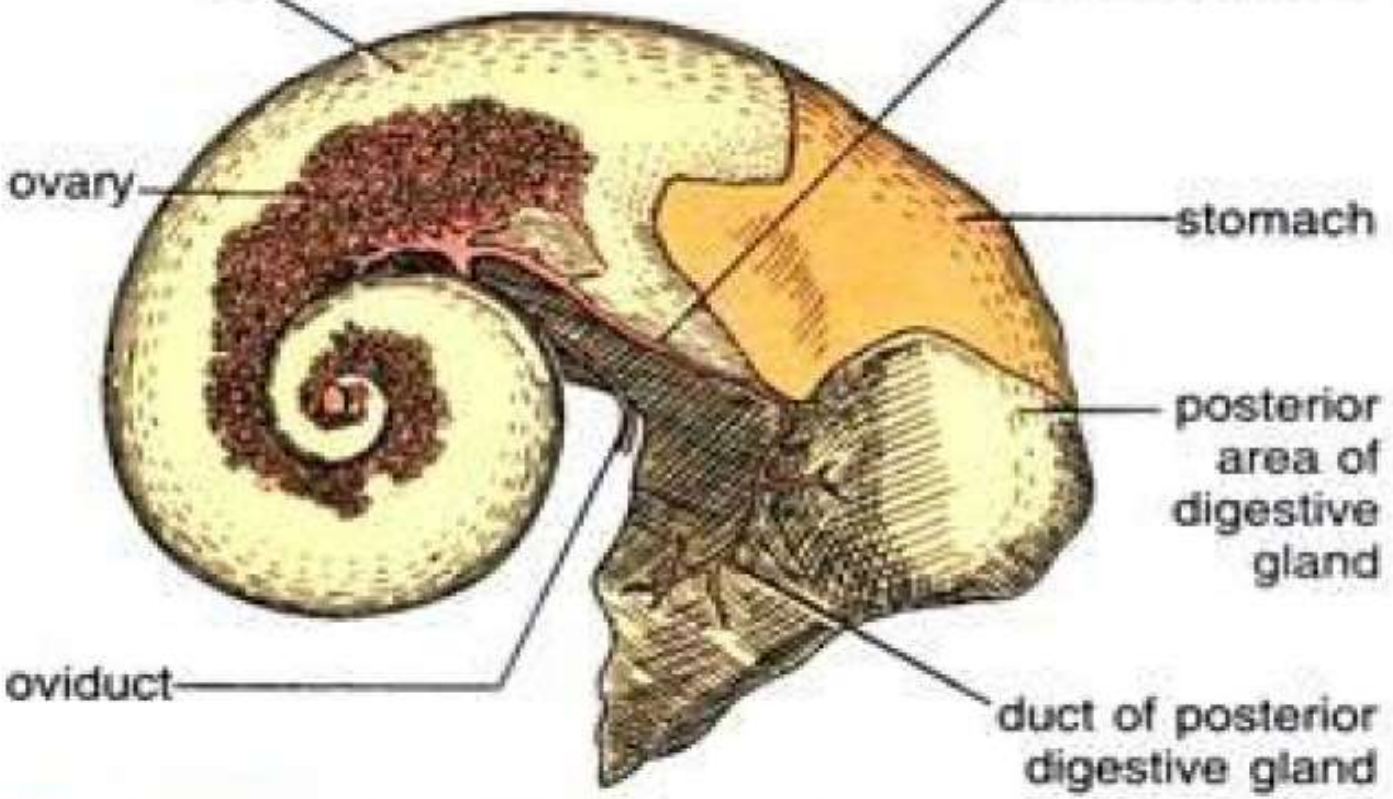

Fig. 60.13. *Pila globosa*. Digestive gland and associated structures seen from inner side.