

TOPIC: GENERAL CHARATERISTICS AND CLASSIFICATION OF HEMICHORDATA

LECTURE NO:02

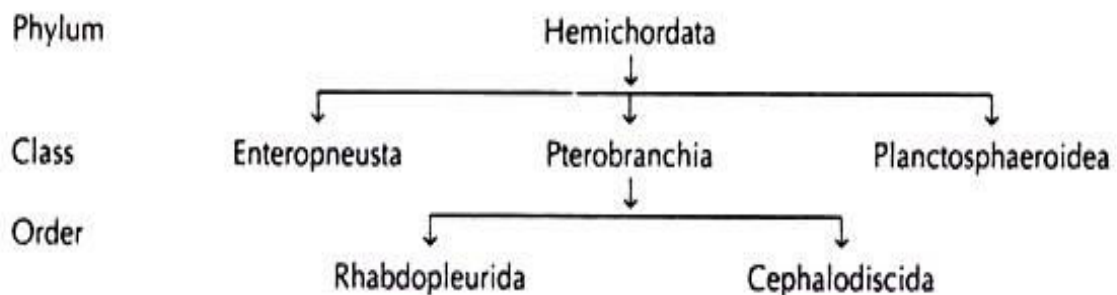
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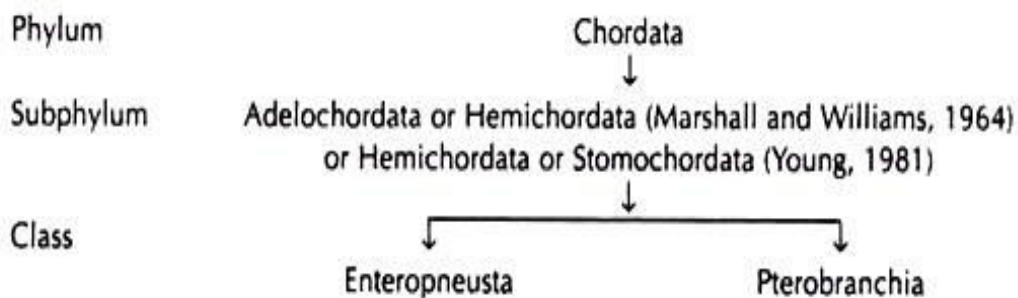
Systematic Resume of the Hemichordata

Scheme of Classification

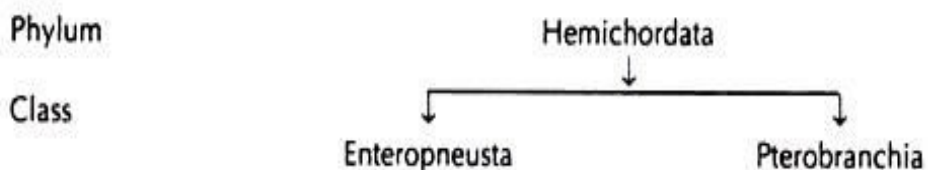
According to Hyman (1959)



According to Marshall and Williams (1964), Young (1981)



According to Ruppert and Barnes (1994), Anderson (1998), Pechenik (2000), Kardong (2002)



Class 1. Enteropneusta [Gr. enteron = intestine ; pneustikos = for breathing ; or Intestine breather] Approx. 70 species.

1. This class includes the acorn worms having vermiform body.

2. They lead a solitary life.

3. There are numerous pharyngeal slits.

4. The intestine is a straight tube and anus is a terminal.

5. The arms are absent.

6. Sexes are separate (gonochoristic). Gonads are numerous and sac-like. Fertilization takes place in sea water.

Occurrence:

They are inhabitants of mucus-lined burrows of intertidal zone of sandy or muddy shores. They are found in the seas of temperate and warm zones. The class includes four families.

Family 1. Protobalanidae (Protoglossidae):

Branchial skeletal pieces free; glomerulus ill-developed; metacoelomic diverticula absent.

Geographical distribution:

British and French coasts.

Examples:

Protoglossus (= Protobalanus, Fig. 2.15A).

Remark:

The family Protoglossidae was created by its discoverers, Caullery and Mesnil (1904), but Burdon-Jones (1956) included the members under the family Harrimaniidae due to lacking of perihaemal diverticula and branchial synapticules.

Family 2. Harrimaniidae:

Branchial synapticula and perihaemal diverticula absent; liver sacs not seen from outside ; simple gonads.

Geographical distribution:

Tropical and cold water of both hemispheres.

Examples:

Harrimania, Saccoglossus (= Dolichoglossus Fig 2.15B).

Saccoglossus (Dolichoglossus) is constructed on the basic enteropneustan plan (Fig. 2.15A) and bears some peculiar individual features. It excavates spiral burrow for living.

Saccoglossus pygmaeus is the smallest enteropneust measuring about 2-3 cm. The proboscis is exceptionally elongated and slender in this genus. The posterior fold of the collar hangs like operculum over the anterior end of the trunk.

The glandular collar epidermis exhibits three distinct histological regions. The oesophagus opens to the exterior through four to six pairs of dorsal canals. The dorsal proboscis nerve cord expands into a fan-shaped area in the posterior part of the proboscis.

Family 3. Spengelidae:

Stomochord long and divided into 3 segments; liver sacs absent; pericardial diverticula short; perihaemal diverticula present.

Geographical distribution:

Subtropical, mainly Indo-Pacific and Mediterranean.

Examples:

Spengelia, Schizocardium (Fig. 2.15C), Clandiceps, (Fig. 2.15D)
Willeyia.

Family 4. Ptychoderidae:

Perihaemal diverticula and liver sacs present; metacoels segmented; lateral genital wings.

Geographical distribution:

Indo-Pacific, Red Sea, Mozambique to Galapagos Islands, Coast of Japan, subtropical Atlantic.

Examples:

Balanoglossus (Fig. 2.1 5E, Ptychodera (Fig. 2.15F),
Glossobalanus.

Ptychodera lava is common on sandy shores of Krusadi Island in the Gulf of Mannar.

Class 2. Pterobranchia [Gr. pteron = fin, branchia = the gills of the fishes or feather gills]. Approx. 15 species.

1. The pterobranchs are colonial, tube dwelling and live in deep sea water.

2. The arms are tentaculated.

3. The body is enclosed in an encasement, secreted by the animals.

4. The alimentary canal is U-shaped and a dorsal anus situated near the mouth.

5. The gill-slits are absent. If present, they are one pair.

6. Sexes are separate or united. Gonads are few in number.

Geographical distribution:

Members were collected in deep water from the seas around Antarctica and off the coast of Japan, but now are collected in shallow waters around Bermuda and in the coasts of Florida.

Habitat:

Normally they are bottom dwellers. They are often found to be attached to other animals such as sponges and bryozoans.

The class includes two families:

Family 1. Cephalodiscidae:

Coenocium present or absent; 4-9 pairs of arms in the lophophore; single pair of gill-slits.

Geographical distribution:

Majority are found in deep waters in Southern hemisphere of which *Cephalodiscus indicus* has been recorded from Sri Lanka and India, but *Atubaria* is found in northern waters, specially off the coast of Japan (Sagami Bay).

Examples:

Cephalodiscus (Fig. 2.16A, B) and *Atubaria*.

Cephalodiscus (Fig. 2.16A & B) live in association and inhabit branched upright tubes secreted by them. The tubes are called coenecium of unknown composition. Foreign particles like sand grains, broken molluscan shells and spicules of sponges adhere to the coenecium. Each tube is occupied by an individual or zooid. All the tubes are fixed permanently on the substratum.

The body is divided into three regions. The proboscis is represented by a flexible disc-like structure which is tilted as the upper lip to conceal the mouth. There are two proboscis pores in *Cephalodiscus*. The collar bears four to nine pairs of arms. Each arm contains two rows of tentacles which are tipped by glandular knobs.

The trunk is subdivided into two portions; an anterior sacciform part containing the alimentary canal and gonads and a posterior slender part for attachment with the tube. The alimentary canal is U-shaped with the mouth and anus located on the same side of the body. A single pair of gill-slits is present. Tongue-bars and skeletal supports are absent.

The gonads are two in each zooid and are symmetrically placed in the anterodorsal part of the trunk. Asexual reproduction by budding is common. Buds are produced in a localised budding zone near the stalk. Each zooid may possess one to fourteen buds at a time. All the zooids in an aggregation have arisen from a single sexual progenitor by the process of budding.

Atubaria is a solitary pterobranch closely related to *Cephalodiscus*. This genus, *Atubaria*, was first described by Sato

in the year 1936. The coenecium is absent. The body is about 1-5 mm long. The collar bears four pairs of tentaculated arms.

The distal ends of the second pair of arms are devoid of tentacles and rod-like in appearance. The stalk lacks the adhesive tips and *Atubaria* clings on the hydroid colonies by its stalk. The pharynx is perforated by a pair of gill-slits.

Family 2. Rhabdopleuridae:

Coenocium formed of ring-like tubes; only one pair of arms; gill-slits absent.

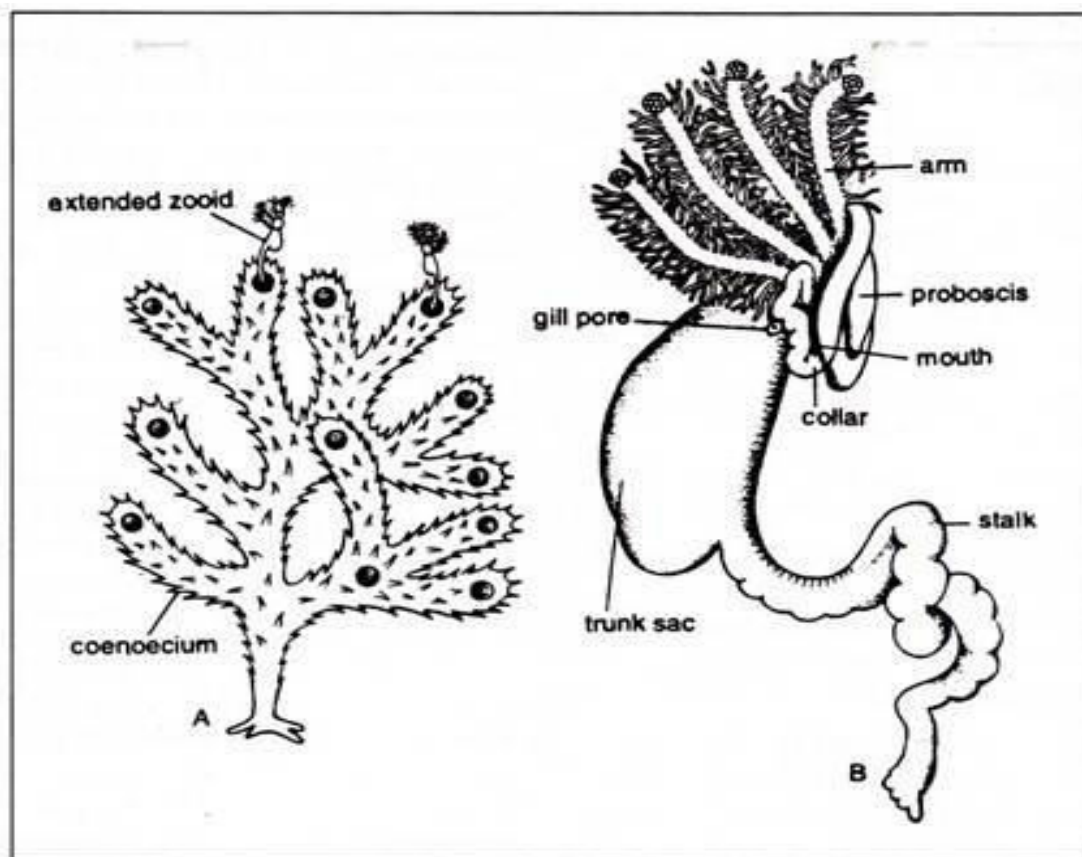


Fig. 2.16 : A. *Cephalodiscus* (a part of a colony); B. An individual zooid.

Geographical distribution:

Found in the colder regions of the world, mainly Shetlands (North Atlantic) and South Australia.

Examples:

Rhabdopleura (Fig. 2.17).

Rhabdopleura is a colonial pterobranch (Fig. 2.17A-B).

The zooids secrete small, erect and ring-like tubes of 6-7 mm in height. All the tubes are joined basally by a black stolon. This stolon also connects all the zooids of the colony.

The zooids resemble closely those of *Cephalodiscus* except that the zooids are very small and measure below one millimeter in length. Only one pair of arms is present in the collar. The gill-slits are totally absent. Single gonad is present and is situated on the right side of the trunk.

Some authors tried to create a third class Planctosphaeroidea for *Planctosphaera pelagica*, a large-size, transparent spherical larva with extensively branched ciliary bands.

The features resemble with tornaria larva. It seems to be larval form of some unknown abyssal hemichordate and still a debatable issue for the creation of a new class.

Another group, the graptolites (e.g., *Dendrograptus*) were colonial fossil organisms, known from the Palaeozoic era and classically associated to Cnidaria or Ectoprocta, represent a third extinct class, Graptolithina or Graptolita, placed under Hemichordata, and believed to be related to Pterobranchia. The relationship was disproved by Hyman (1959).

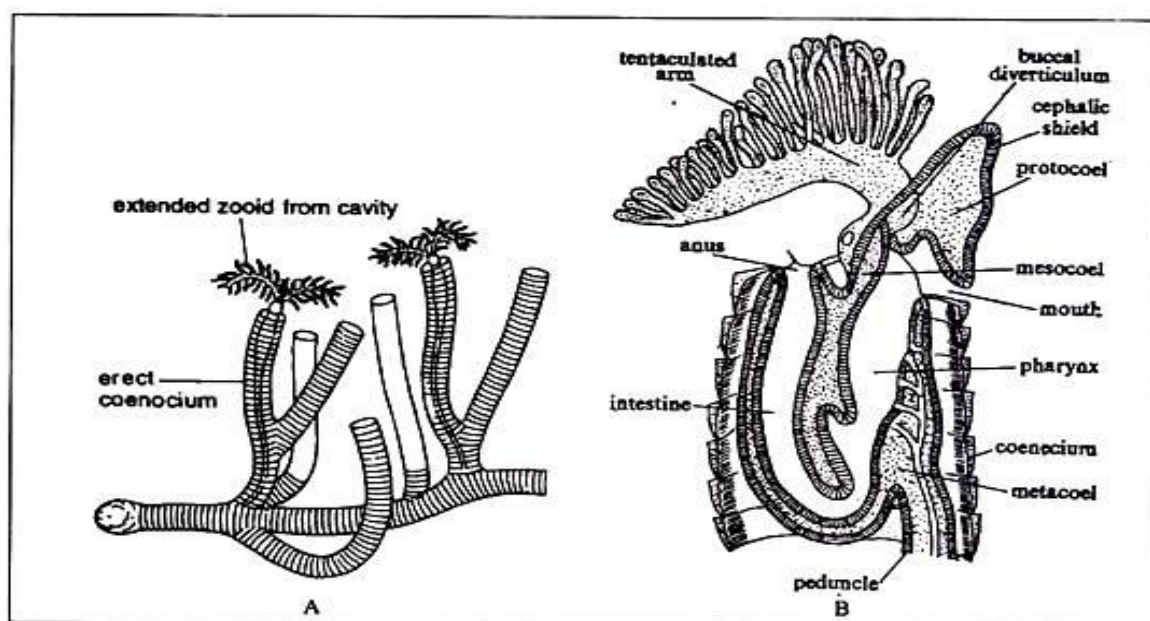


Fig. 2.17 : A. *Rhabdopleura* (A part of a colony), B. Longitudinal section of *Rhabdopleura*.

Indian hemichordates:

Collection and Research:

First Punnet (1903) described enteropneust worms from Laccadive and Maldives Islands. Menon (1904) worked on dredged collections off Madras coast. Rao (1955) described some species which are collected from the same area.

Pillay (1950) described the only enteropneust worm, collected from Okha (Gujarat) coast. Dhandapani identified *Glandiceps malayanus* and *Glossobalanus minutus*, collected from Andaman and Nicobar Islands and Maldives Islands.

Ptychodera flava occurs in the Krusadai Island, located in the gulf of Manner. The author (Badal Chandra Bharati Goswami) visited Krusadai Island several times with students and has observed the specimen in shallow water of sandy shore. *Ptychodera flava* lives in U-shaped burrows, lined by a mucous layer.

Rao (1955) recorded *Glandiceps bengalensis*, *Glossobalanus elongatus* and *Ptychodera flava* from the Madras (presently Tamil Nadu) coast. Balasubramanyan (1978) described two species of *Tornaria* from Porto Novo waters in Tamil Nadu.

Saccoglossus has been recorded from Prentice Island, Sundarbans, West Bengal by Singh, B. and A. Choudhury in 1984. It has been collected from mangrove mudflat of Sundarbans, ecosystem.

About 8 species have been recorded from the Madras (at present Tamil Nadu) coast. These are *Saccoglossus bournei* Menon, 1904; *S. madrasensis* Rao, 1955; *Glandiceps coromandelicus* Menon, 1904; *G. stiasnyi* Rai, 1953; *Glossobalanus elongatus* spengel; *G. minutus* and *Ptychodera flava* Eschscholtz and *Glandiceps bengalensis*.

Table 12 : Families and Genera known from India

<i>Taxa</i>	<i>World</i>	<i>India</i>
1. Class Enteropneusta		
Families	4	3
Genera	12	4
2. Class Pterobranchia		
Families	2	—
Genera	2	—

‘—’ means not hitherto known.

Table 13 :Total number of species known in the World and India

<i>Taxa</i>	<i>World</i>	<i>India</i>
1. Class Enteropneusta	70 (approx.)	12
2. Class Pterobranchia	15	—

‘—’ means not hitherto known.