



## **CHAPTER 2 INTRODUCTION TO GROUP PROTOCHORDATA**

**Mahevi Reshma**

**Dept. of Zoology**

**Asst. Professor**

**Dr. D.Y.Patil ACS College,  
pimpri, Pune-18**

# Introduction to group-Protochordata

- The organisms belonging to the Protochordata are generally known as the lower chordates. They don't form a "proper" taxonomic group and are only classified as such for convenience purposes. However, they do form a major division of Chordata. They are also known as Acraniata because they lack a true skull. They are divided into three sub-phyla- Hemichordata, Urochordata, Cephalochordata.

## Characteristics of Protochordata:

- They are generally found in marine water, & with small forms.
- They lack head or cranium.
- Their body is bilaterally symmetrical, triploblastic, and coelomated.
- At a certain stage of their lives, their body develops a long, rod-like structure for support called the notochord, which is confined to tail region in larval stage & disappear in adult stage while in cephalochordata it is extends along the entire body.
- Buccal diverticulum either consider as notochord, present in the proboscis.
- The alimentary canal is complete ,in the form of straight or U shaped tube.
- Coelom is enterocoelous, divided into protocoelus, mesocoelus & metacoelus.
- Numerous pairs of gill slits are present on the dorsolateral , anterior part.
- Circulatory system is simple, well developed, closed type. Excretion by single glomerulus situated in the proboscis.
- Nervous system is primitive, only contains intra epidermal nerve plexus.
- They exhibit organ system level of organization.
- Vertebral jaws, paired appandages are absents.
- Mode of feeding is is ciliary.
- Sexes are seperated/united. Reprodction mostly sexual. fertilization is external. Development is indirect through free swimming tornaria larva. Some organisms shows direct development.
- E.g., Herdmania, Amphioxus.

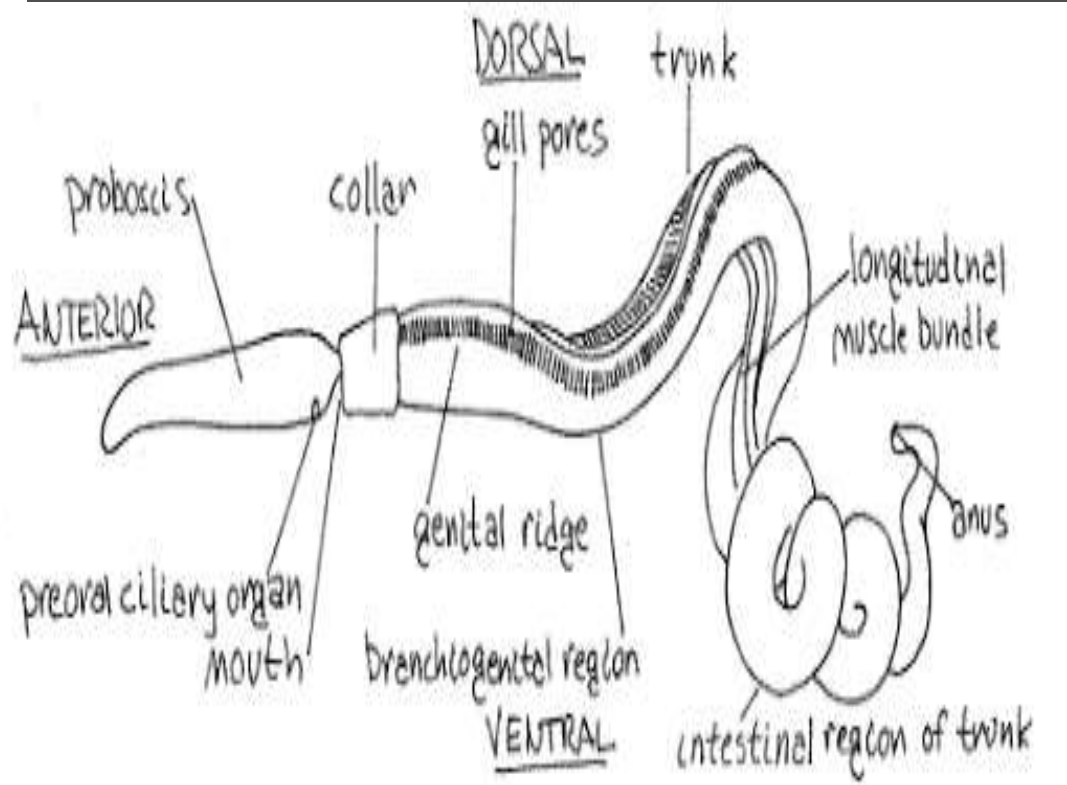
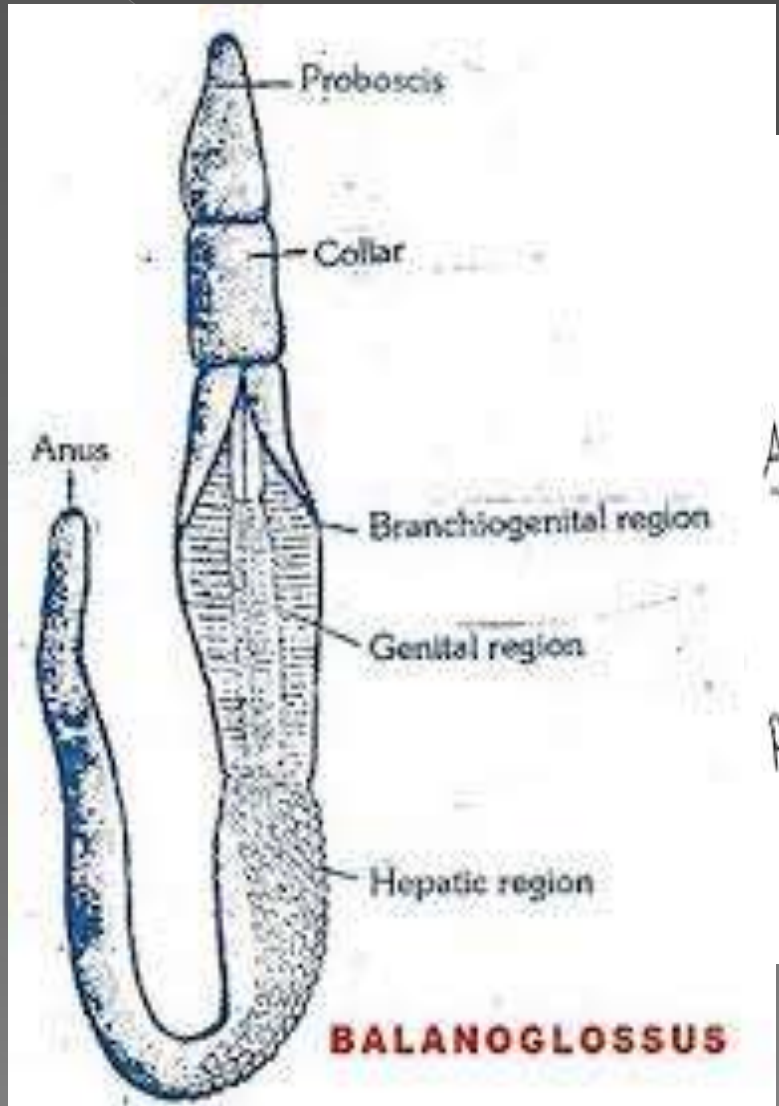
# Salient features of subphylum-Hemichordata, Urochordata & Cephalochordata

## Hemichordata

- They are found in marine water.
- Some live solitarily, and some stay in colonies.
- The body is soft, fragile, vermiform, cylindrical, unsegmented, and stout.
- The body is divided into proboscis, collar, and trunk.
- The collar bears arms and tentacles.
- Body wall consists of a single layer of epidermis with mucus glands. Dermis is absent.
- Coelom is enterocoelous, divided into protocoel, mesocoel & metacoel
- Buccal divertulum is present in proboscis considered as notochord.
- They have a complete digestive system with U shaped tube.
- They respire through gills or general body surface.
- They are ciliary feeders.
- The circulatory system comprises a heart with two longitudinal vessels.
- The blood has no colour and corpuscles.
- The proboscis gland or glomerulus make up the excretory system.
- Nervous system is primitive comprising mainly intra epidermal nerve plexuses.
- Reproduction is sexual.
- Sexes may be separate or united and fertilization is either internal or external.
- E.g., Cephalodiscus, Rhabdopleura.

# Classification of Hemichordata

- Phylum Hemichordata has been divided into following four classes:
- **Class 1. Enteropneusta:**
- 1. Commonly known as “**acorn**” or “**tongue worms.**”
- 2. Solitary and burrowing worm-like marine animals.
- 3. Body consists of proboscis, collar and trunk; collar without tentaculated arms.
- 4. Alimentary canal straight; mouth and anus at opposite ends.
- 5. Numerous pairs of U-shaped gill-slits.
- 6. Two pairs of hepatic caeca present in the middle of the trunk.
- 7. Sexes separate; gonads numerous, sac-like.
- 8. Development with or without tornaria larva.
- **Examples:**
- Balanoglossus, Saccoglossus (= Dolichoglossus), Ptychodera.



**SACCOGLOSSUS**

# Class 2. Pterobranchia

- 1. Sedentary, solitary or colonial, tubicolous marine animals.
- 2. Proboscis with ciliated tentacles to produce ciliary feeding currents of water.
- 3. Collar with two or more tentaculated arms bearing tentacles.
- 4. One pair of gill-slits or none, never U- shaped.
- 5. Alimentary canal U-shaped with dorsal anus situated near the mouth at the same end.
- 6. Sexes separate or united; single or one pair of gonads.
- 7. Development direct, may or may not include a free swimming larval stage.
- 8. Asexual reproduction by budding in some.
- examples: *Rhabdopleura*, *Cephalodiscus*

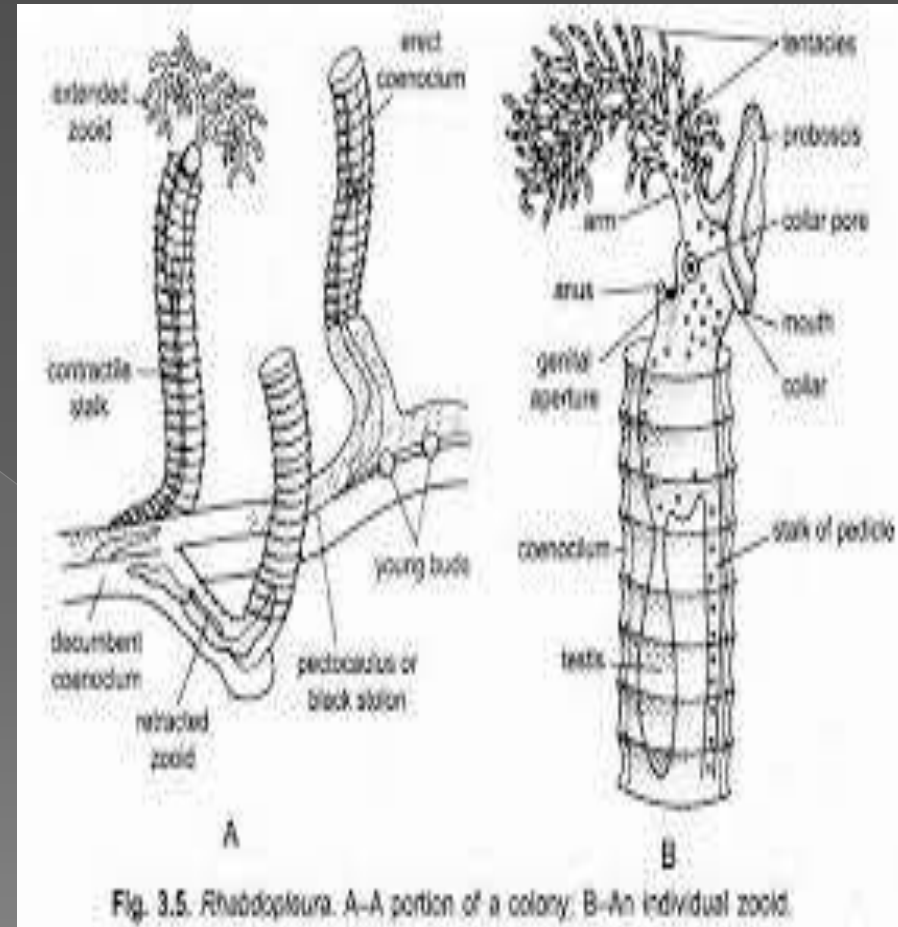


Fig. 3.5. *Rhabdopleura*. A-A portion of a colony. B-An individual zooid.

### **Class 3. Planctosphaeroidea:**

This class is represented by a few small rounded, transparent and pelagic larvae, supposed to be specialised tornaria of some unknown hemichordate

*Planctosphaera pelagica*. The larva has branching arborescent ciliated bands on the surface.

The alimentary canal of larva is U-shaped.

The adult form is yet unknown.

### **Class 4. Graptolita:**

These are extinct colonial hemichordates, mainly known from the fossil structures of their tubes. Each animal is housed in a zooid. These were abundant in the Ordovician and Silurian periods & placed under extinct class in hemichordata.

**Example:** *Dendrograptus*.



# Subphylum Urochordata

- The word 'Urochordata' is adapted from Greek term Uros-tail, Chorda-cord. The Urochordata are a medium sized group of around 2,000 species of marine animals, commonly referred to as Sea Squirts, Tunicates, Salps and Larvaceans.
- They are all filter feeders, using a basically similar mechanism of pumping water through a perforated (having holes in it) pharynx which collects small particles in a layer of mucus.
- **Characteristics of Urochordata:**
- They are marine, solitary or colonial, fixed or pelagic.
- Mostly sedentary, simple, aggregated in groups.
- Possesses a Notochord, a hollow nerve cord and a post anal tail.
- Notochord is present only in larval tail hence the name Urochordata.
- Adult Body degenerate, sac like, unsegmented without paired appendages.
- Body has more than two cell layers and includes tissues and organs.
- Has a U shaped gut, which bears terminal branchial aperture & dorsal atrial aperture.
- Body has no coelomic body cavity.
- Body wholly enclosed in a 'tunic' of secreted protein and cellulose-like material.
- Are hermaphroditic, normally with only one ovary and testis.
- Has a nervous system composed of an anterior ganglion from which individual nerves issue.
- Circulatory system is open. Heart is simple, tubular & ventral.
- Excretion by neural glands, pyloric glands & nephrocytes.
- Has a distinct larval stage showing retrogressive type of metamorphosis. Few tunicates larvae attain sexual maturity without metamorphosis-is called as **paedogenesis**.
- All are ciliary filter feeders.
- Live in marine environments.
- About 2,000 species currently known.
- Examples: *Hardmania*, *Doliolum*, *Salpa*



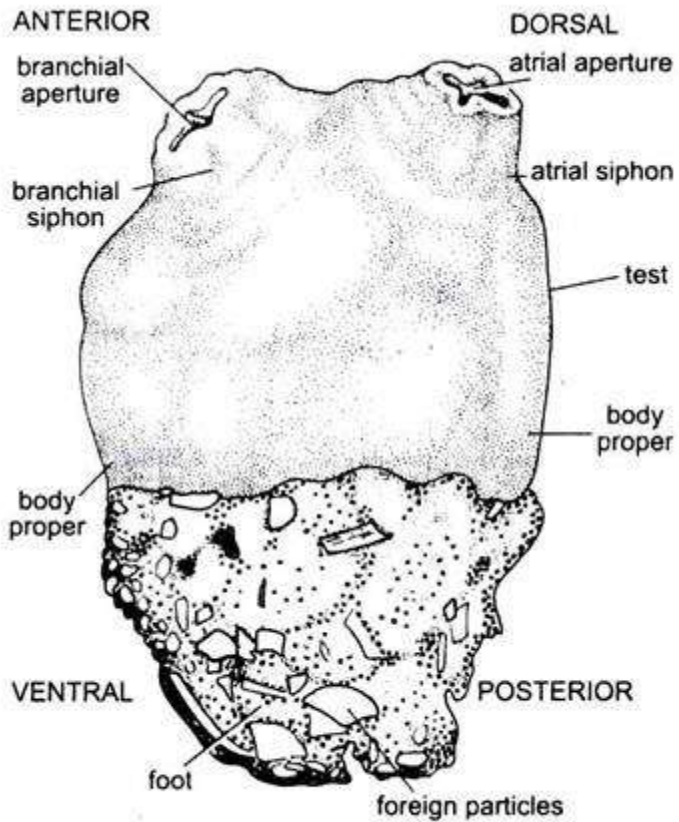


Fig. 4.1. *Herdmania pallida*. External features.

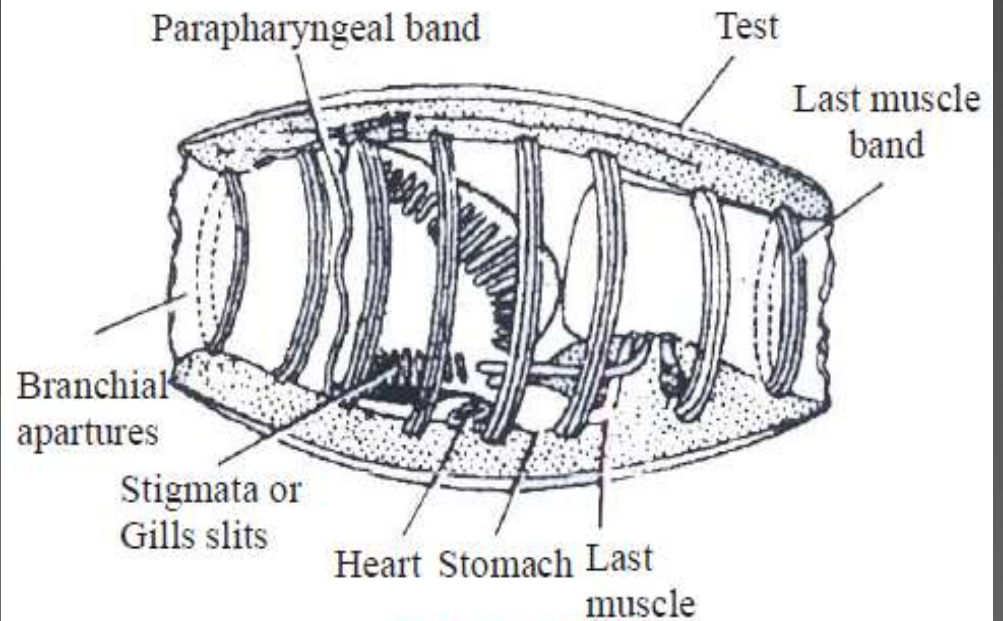


Fig. : *Doliolum*

# Cephalochordata

- Cephalochordates are small fish like animals which show Chordate characters. The notochord extends the entire length of the body. They show a dorsal, tubular neural tube without a definite brain.

## GENERAL CHARACTERS:

- Body is fish-like and is useful for burrowing and swimming.
- It has a body with head, trunk & tail.
- Appendages are absent.
- Dorsal, caudal and ventral fins are present.
- Body-wall shows one- cell thick, non-ciliated epidermis, dermis, [connective tissue](#), striated muscle and [parietal peritoneum](#).
- It has no exoskeleton.
- Notochord extends from the [anterior](#) end to [posterior](#) end.
- Enterocoelic coelom is present. However, reduced in the pharyngeal region by atrium.
- Alimentary canal is long. It includes a large pharynx with many gill-slits ciliary mode of feeding is developed.
- Gills will perform respiration.
- Circulatory system is closed.
- Heart and respiratory pigments are absent.
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- Hepatic portal system is present.
- Excretory system shows paired protonephridia with solenocytes.
- Brain is not present. Two pairs of cerebral and several pairs of spinal nerves are present.
- Sexes are separate. Gonads are metamerically arranged and without gonoducts.

Asexual reproduction will not take place.

- Fertilization is external.
- Development is indirect including free swimming larva.
- Limbs or paired fins are absent.

Examples: Amphioxus, Asymmetron

