

## EVOLUTIONARY SIGNIFICANCE OF TROCHOPHORE LARVA

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Unit :05 - Mollusca

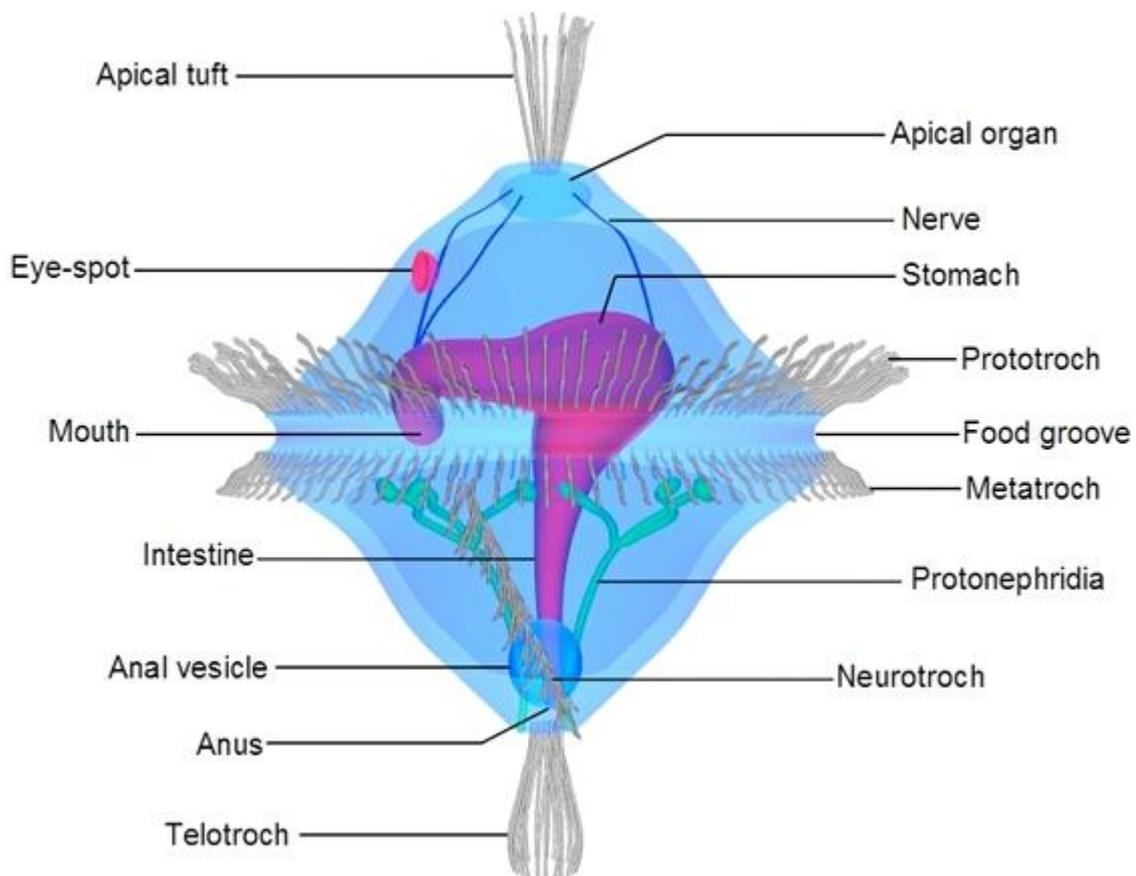
When development is indirect, there is a larval stage which differs from the adulthood through metamorphosis. Advancement from free living to sessile or sedimentary requires many stages. If the food habit scenario limits the larval form and adults are coexisting member of a habitat, more taxa shows a significant larva. As in case phylogeny points out their origin to be a monophylatic one. Such as larva is **Trochophore** arising theories in bilateral over radial symmetry.

**Etymology :** **Trochophore** derives from the ancient greek where trokhos meaning "wheel", and phero means 'to bear, to carry', because the larva is bearing a wheel-shaped band of cilia.

**Occurrence:** 1. A characteristics larval stage of **annelids**, egg hatch to form **Trochophore larva- the first larval stage.**

2. Also found in **Mollusca** and some other phyla also.

### A typical Trochophore Larva



**Salient features of Trochophore larva:** It is a minute pelagic bilaterally symmetrical oval or ovoid shaped larval creature or zooplankton but can also be found at epipelagic zone. The structural features are as follow:

**1. BODY :** Unsegmented body form with distinct oral and aboral end, divided into three regions: **petrochal region** consisting apical plate, prototroch, area about the mouth; **pygidium** consisting of Telotroch and anal area behind it; and the **growth zone** which includes all of the larva between the mouth and telotroch.

**2. APICAL PLATE :** Fully grown larva develops a plate like structure at apical portion bearing a tuft of cilia named apical tuft of cilia.

**3. CILIATED BAND :** Very unique and important identifying character of the larva is the presence of a few encirclet ciliated bands – **Prototroch or preoral ciliated band**, which is present anterior to mouth above the equator region; **Post-Oral ciliated band or Metatroch**, which is present posterior to the mouth after the equator; **Telotroch**, occur in front of anus or pygidium; **Neurotroch**, a longitudinal band of cilia traverses the body. These ciliated ring like structures perform different functions such as locomotion( chiefly the Prototroch) and feeding.

**4. GUT :** Complete, have four distinct region- **A mid-ventral Mouth, A sac like stomach, long Intestine, Anus.**

**5. GANGLION :** Single ganglion found at apical region considered as rudimentary to brain or primordial to cerebral ganglia and ventral nerve cord is present.

**6. MESODERM :** Appearance as undifferentiated mass at lower pole and present in pairs.

**7. ECTODERM :** Containing ectodermal derivatives and scattered ectodermal elements.

**8. Absence of COELOM** at this early larval stages but very prominent blastocoel present between endoderm and ectoderm, appears as gelatinous matrix layer.

**9. OCELLI :** A pair present at apical end in some groups.

**10. Presence of PROTONEPHRIDIA** at blastocoel at each side of alimentary canal or gut.

**AFFINITIES WITH OTHER LARVAL FORM:** Trochophore shows striking similarities among larval forms. It is significant in all archiannelids and now class polychaeta or phylum mollusca.

- 1. Mollusca- Veliger :** SIMILARITIES: Presence of ciliated bands., well distinct alimentary canal. Presence of rudimentary eye.
- 2. Arthropoda- Nauplius :** Presence of eye and oval or ovoid body.  
DISSIMILARITIES: Presence of appendages, antenna and complex naupliar eye.
- 3. Echinodermata- Bipinaria :** SIMILARITIES: 5 pairs of ciliated bands, preoral and postoral ciliated bands, presence of gut and mouth. DISSIMILARITIES : Presence of arms and undulating flaps.

4. **Auricularia** : SIMILARITIES : ciliated bands, mouth anus well developed.  
DISSIMILARITIES : Presence of one longitudinal ciliated band and well developed pre oral lobe, presence of star shaped or wheel like bodies.
5. **Hemichordata- Tornaria** : SIMILARITIES : translucent oval ciliated body, complete alimentary canal. DISSIMILARITIES: convoluted bands of cilia covers the body.  
Remark:

**Phylogenetic Significance:** The 'Recapitulation Theory' of Biogenetic law of Ernst Haeckel states that successive stages of individual development into successive adult ancestors and the line of evolutionary descendants. In Haeckel own words '**Ontogeny recapitulates phylogeny**'. Trochophore also exhibits the primitive form of metamerism. Nowadays old idea of recapitulation have been greatly modified.

It is claimed that the trochophore represents a transitional stage in the line of emergence of the bilateral groups (e.g., Rotifers) from the radial groups (Ctenophores). Similarities between the trochophore and the echinoderm larva (Bipinnaria and Pluteus) and Tornaria larva of Balanoglossus added more weight to this contention.

A peculiar but characteristic arrangement of blastomeres which may be of evolutionary significance appears at the animal pole of many embryos undergoing spiral cleavage at the 64-cell stage and the pattern consisting of four pairs of cells from the animal pole like **a spoke on a bicycle wheel** with each pair radiating outward like an '**X**'. The four "hub" cells are also arranged tetrahedrally directly above the animal pole called "**rosette**", in phylum annelida its named as **Annelidan Cross** and in mollusca as **Molluscan Cross** ; and also in Sipuncula and Echiura, suggesting their close relation. In both annelida and mollusca the rosette cells become apical plate and the cross cells join other cells to form the pretrochal epidermis of the trochophore larva.

Many workers are of the opinion that the Trochophore larva serves as a bridge between radial and bilateral symmetry. They have opined that the bilateral symmetry has evolved from the radial one.