

# Phylum Ctenophora: Features, Characters and Other Details (Section - II)

## BSc. Part I Zoology (Hons) Paper I

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### Characters and Classification of Ctenophora:

Ctenophores are free-swimming, transparent, jelly-like, soft-bodied, marine animals having biradial symmetry, comb-like ciliary plates for locomotion, the lasso cells but nematocysts are wanting.

### General Characters:

1. Free-swimming, marine, pelagic and solitary animals.
2. Body gelatinous, transparent, pear-shaped, cylindrical or flat or ribbon-shaped.
3. Biradially symmetrical body along an oral-aboral axis.
4. Comb-like eight ciliary plates on the body for locomotion.
5. Nematocysts absent; mesogloea cellular with muscular elements.
6. Digestive system with mouth, pharynx and stomach; the stomach is highly branched to form a complex system of gastro vascular canals.
7. The digestive system terminates out at anal pore.
8. Colloblasts, also referred to as lasso cells, are special adhesive cells present on the tentacles which help in food capture.
9. Skeletal, circulatory, respiratory and excretory systems are absent.
10. Nervous system is diffused type and the aboral end bears a sense organ, called statocyst.
11. Monoecious (hermaphrodite); gonads endodermal situated on the walls of gastric canals.
12. Development direct with a characteristic- larva called cydippid.
13. Regeneration and paedogenesis are of common occurrence. Alternation of generations not found.
14. Body organization cell-tissue grade.

## **Classification:**

### **Class 1. Tentaculata:**

1. Adults nearly always with two long aboral tentacles.
2. In some only the larva has tentacles, while adults possess oral lobes.
3. Mouth narrow and pharynx small.

### **Order 1. Cydippida:**

1. Simple, rounded or oval body.
2. Digestive canals terminate blindly; no anal pore.
3. Tentacles two long and branched.
4. Tentacles are retractile into sheath.

### **Examples:**

Mertensia, Pleurobrachia.

### **Order 2. Lobata:**

1. Laterally compressed oval body.
2. Adults with two large oral lobes.
3. Tentacles reduced and without sheath.
4. The gastrovascular canals are connected by a ring canal at the oral end.

### **Examples:**

Mnemiopsis, Bolinopsis.

### **Order 3. Cestida:**

1. Body elongated and compressed, ribbon like.
2. Comb plates in four rows but rudimentary.
3. Tentacles and tentacular sheaths along the oral margin reduced.

**Examples:**

Cestum, Velamen.

**Order 4.****Platyctenea:**

1. Greatly compressed body in oral-aboral
2. Two well developed tentacles with sheaths.
3. Adults often without comb plates.
4. Flattened creeping forms.

**Examples:**

Ctenoplana, Coeloplana.

**Class 2. Nuda:**

1. Body large, conical and compressed
2. Tentacles and oral lobes absent.
3. Wide mouth and large pharynx.
4. Voracious feeders.

**Order 1. Beroida:**

1. Since class Nuda has only one order Beroida, hence, class characters are the characters of the order.

**Example:**

Beroe.

**Affinities and Systematic Position of Ctenophora:**

The ctenophores possess many characters of Coelenterata, but they differ considerably from the other members of the phylum Coelenterata. This group has also some similar features with different animals of diverse phyla, which will be discussed here to judge its systematic position.

## **1. Resemblance with Coelenterata:**

- (1) Possession of radial symmetry and tentacles.
- (2) Arrangement of parts along an oral-aboral axis.
- (3) Lack of coelom.
- (4) Two cell-layers with a gelatinous mesogloea in between.
- (5) Branching gastro vascular canals.
- (6) Presence of mesogloea.
- (7) Presence of diffused nerve network.
- (8) Presence of statocyst as sense organ.
- (9) General lack of organ system.
- (10) Endodermal origin of gonads.
- (11) Absence of nephridia. Due to the above similarities, the ctenophores are considered by many zoologists to be a class of Coelenterata.

## **2. Resemblance with Hydrozoa:**

**An anthomedusan form Ctenaria shows remarkable similarities with a cydippid such as Hormiphora in the following characters:**

- (1) Presence of two tentacles, situated at opposite per-radii, in sheath.
- (2) Presence of eight radial canals formed by the bifurcation of four inter-radial pouches of the stomach.
- (3) The subumbrellar cavity of the Ctenaria can be homologised with the stomodaeum of Hormiphora.

**But these similarities are superficial and the claim that Ctenaria represents a form directly intermediate between the Hydrozoa and Ctenophora seems to be untenable due to the following objections:**

- (1) The tentacles of Ctenaria have no muscular base.
- (2) Eight rows of nematocysts of Ctenaria are not homologous to rows of comb-plates of a ctenophore.

- (3) Ctenaria is radially symmetrical, while a ctenophore is biradially symmetrical.
- (4) The development of gonad is different. In Ctenaria, the gonads develop from manubrium but in Ctenophora gonads develop from meridional canals.
- (5) Absence of characteristic aboral sense organs in Ctenaria.

Hydractinia, a narcomedusan, shows some closer resemblances with Ctenophora.

**These resemblances are:**

- (1) Possession of two tentacles with sheath situated between the margin and the apex of the bell.
- (2) Possession of aboral sense organ. However, the presence of swimming-plates in Ctenophora and the presence of velum in Hydractinia remain as important differences to visualize a close relation among them.

**3. Resemblance with Anthozoa:**

**The ctenophores also possess certain anthozoan features that are as follows:**

- (1) Ciliated ectoderm of Anthozoa is probably a forerunner of the ciliated band of Ctenophora.
- (2) Presence of well-developed stomodaeum.
- (3) The gut in embryos of both is four-lobed, thus, presenting a biradial symmetry.
- (4) Mesogloea is cellular.
- (5) The gonads develop in connection with the endoderm and the sexual elements passed out through the mouth.

Both the aboral sense organs and rows of comb-plates of a ctenophore have no parallel parts in an anthozoan. Lasso cells differ structurally from the nematocysts and tentacles are hollow in Anthozoa, while solid in Ctenophora.

**4. Differences from Coelenterata:**

**The ctenophores differ greatly from coelenterates in the following points:**

- (1) Possession of oppositely placed tentacles suggesting a biradial symmetry.
- (2) Presence of an aboral sensory region.
- (3) Absence of nematocysts except in one or two cases.
- (4) Presence of eight locomotory meridional ciliated bands of comb-plates over the body.

- (5) Presence of colloblasts (special adhesive cells) over the tentacles.
- (6) Presence of mesenchymal muscles.
- (7) Presence of definite organisation of digestive system with anal pores.
- (8) Presence of determinate type of development.

### **5. Affinities with Platyhelminthes:**

The Platyctenea has been considered to be a connecting link between Ctenophora and the Bilateria. Besides, Ctenophora, in general, exhibits many structural similarities with the Platyhelminthes and particularly with the turbellarians.

#### **The similarities are as follows:**

- (1) Ciliation of the body.
- (2) Dorso-ventrally flattened body.
- (3) Crawling mode of life.
- (4) Origin of the so-called mesoderm is more or less similar.
- (5) The dorsal polar nerve of Turbellaria can be compared with the statocyst of Ctenophora.
- (6) Ctenophora exhibits both radial as well as biradial symmetries.
- (7) Similar earlier stages of segmentation and gastrulation.
- (8) Gelatinous mesenchyme with muscle fibres and cells. The view that the primitive Bilateria have evolved through Platyctenea has not been accepted. A careful thorough examination of the Platyctenea reveals that it is a ctenophore that has become extensively modified for sessile habits.

It can further be suggested that Platyctenea is a tissue- grade diploplastic animal whereas Polyclad is an organ-grade triploblastic form. Further it can be stated that amongst the Platyhelminthes, the Acoela is the most primitive group and not the polyclads. The Ctenophora, on the other hand, exhibits no close similarity with the Acoela.

Ctenophora exhibit many striking characteristics of their own so that it appears more justified to treat them a separate phylum rather than a class of the phylum Coelenterata.

**They present certain advanced structural features that appear to look forward to the Bilateria:**

- (1) Prominence of an apical organ.
- (2) Mode of origin of musculature from mesoderm.
- (3) Presence of gonoducts.
- (4) Determinate type of cleavage.

It appears that Ctenophora are intermediate between Radiata and Bilateria. They appear to have diverged very early from trachyline stem that also gave off the other three branches of Coelenterata. The Ctenophora themselves represent a blind offshoot. Not in the direct line of ancestry, the Ctenophora appear to indicate the structural advances along which the Bilateria have evolved from the ancestral stock.