

**General characters and Classification of Phylum Platyhelminthes,
Nemathelminthes and Cnidaria upto classes.**

Polymorphism in Hydrozoa

ACADEMIC SCRIPT

Introduction:

Coelenterata includes around nine thousand living species. Coelenterata word is actually derived from the term coel means hollow while enteron means gut. Coelenterata includes the simplest form of the cellular animals or metazoa. Coelenterate body is double layered sac with the single opening to the exterior aperture called mouth.

Distinguishing character of the coelenterata is presence of Nematocyst or stinging cell in the body wall.

The colonial cnidarians are usually polymorphic in which poly means many while morphe means form. It means that same individual may bear different forms, some of which are tube-like feeding stage or polyps and others are saucer-shaped reproductive stage or medusae. Alternation of generations or metagenesis is frequently observed in coelenterates. The polyps, reproducing asexually, bring forth the medusae, and the medusa, reproducing sexually, brings forth the polyp.

Coelenterata are mostly marine except few freshwater species. Phylum coelenterate includes hydras, jelly-fishes, sea anemones, and corals. Phylum coelenterata can be divided into three major classes viz., Hydrozoa, Scyphozoa and Anthozoa.

General Characters of Coelenterata:

1. Coelenterates are Metazoan or multicellular animals in which tissue grade of organization has been observed for the first time.
2. They are aquatic animals, mostly marine except few freshwater forms like Hydra.

3. They are sedentary i.e., fixed with substratum or free-living and solitary or colonial.
4. Symmetry of coelenterates is radial or biradial with a gastro vascular cavity connected to the exterior by the mouth.
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6. They are diploblastic animals. Body wall consists of an outer layer of cells called ectoderm and inner layer of cells the endoderm linked with each other by an intermediate non-cellular gelatinous layer called mesogloea.
7. They are acoelomate animals due to the absence of secondary body cavity, the coelom.
8. Surrounding the mouth, short and slender tentacles are present in one or more whorls.
9. Tentacles of coelenterates contain nematocysts. Tentacles are also meant for food capturing, its ingestion and for defense.
10. Except few, polymorphism is widely observed in coelenterates. Polyps and medusa are the main types of zooids in polymorphic forms. Among these two polyp is asexual and sessile zooid, while medusa is sexual and free-swimming zooid.
11. Exoskeleton or endoskeleton is present in coelenterates.
12. These animals are mostly carnivorous; digestion is extracellular as well as intracellular. Anus is absent.
13. Nervous system first time observed in coelenterates which consists of nerve net or nerve-cells and neurites located in the ectoderm and endoderm.
14. Respiratory, circulatory and excretory systems are lacking.
15. Asexual as well as sexual mode of reproduction is present.
16. Asexual reproduction takes place by budding and sexual reproduction occurs by the formation of gametes.
17. Development is indirect with formation of a ciliated planula larva.
18. Alternation of generations or metagenesis is present in the life history in which the asexual polypoid and sessile generation alternates with sexual medusoid, free-swimming generations.

Classification of Phylum Cnidaria:

Total nine thousand species of Cnidaria can be further divided into three major classes.

Class I: Hydrozoa (Hydra means a sea-serpent):

- Simple forms such as Hydra and complex colonial form like Obelia, exhibit polymorphism as well as metagenesis.
- They are solitary and freshwater or mostly colonial and marine, sessile and free-swimming forms.
- Symmetry is tetramerous or polymerous radial.
- Body wall is composed of an outer ectoderm and an inner endoderm, separated by non-cellular mesogloea.
- Gastrovascular cavity is without stomodeum, septa or nematocysts bearing gastric filament.
- In some forms, skeleton or horny structure is horny perisarc, while coenosarc secretes a skeleton of calcium carbonate forming massive stony structure or coral in other forms.
- Medusa is provided with true muscular velum.
- Sex cells are usually ectodermal in origin and discharged externally.
- Cleavage is holoblastic. Embryo with ciliated planula larva.

Class II. Scyphozoa (Skyphos means cup):

- Generally medusoid forms are dominant in scyphozoa such as the jelly-fishes. Aurelia and Chrysaora are provides good examples.
- Medusoid forms exclusively marine.

- Medusae are large, bell or umbrella-shaped, without true velum, free swimming or attached by an aboral stalk.
- Tentaculocysts are marginal sense organs and contains endodermal statoliths.
- Polyps are mostly absent.
- Mesogloea is usually cellular.
- Gonads are endodermal and the sex cells are discharged.

Class III. Anthozoa (Anthos means flower):

- Solitary or colonial exclusively marine forms.
- They are exclusively polypoid and medusoid is completely absent.
- Cylindrical body with hexamerous, octomerous or polymerous biradial or radio bilateral symmetry.
- Oral end of the body is extended radially into an oral disc containing hollow tentacles surrounding the mouth in the centre.
- Gastro vascular cavity is divided into compartments by complete or incomplete septa or mesenteries. Mesenteries bear nematocysts at their inner free edges.
- Mesogloea contains fibrous connective tissue and amoeboid cells.
- External or internal skeletal system.
- Exoskeleton is made up of calcium carbonate which form massive corals.
- Gonads are endodermal which are mature in the mesenteries.
- The matured sex cells are discharged into coelenteron.
- Fertilisation is external. Fertilised egg develops into a planula larva, which after a short free life develops into an adult.

Phylum: Platyhelminthes

Introduction:

The phylum Platyhelminthes includes about thirteen thousand species. Platyhelminthes term has been derived from the Greek word, platys means flat and helminth means worms. Platyhelminthes includes flatworms whose bodies are dorsoventrally compressed and show bilateral symmetry. They are the first triploblastic acoelomate Metazoans. They possess organ level grade organization.

General Characters of Platyhelminthes:

1. Platyhelminthes are bilaterally symmetrical and dorsoventrally flattened, triploblastic worms.
2. Body is dorso-ventrally flattened and generally worm-like but moderately elongated flattened shape or long flat ribbons and leaf-like.
3. They are small to moderate in size varying from microscopic to extremely elongated forms generally measuring up to the 10-15 metres.
4. Flatworms are mostly white, colourless but some derive colour due to the food ingested, while the free-living forms are brown, grey, black or brilliantly coloured.
5. Anterior end of the body is differentiated into head.
6. Ventral surface contains mouth and genital pores is well exhibited in turbellarians but is less evident in trematodes and cestodes.
7. Platyhelminthes contains variety of adhesive secretions or organ of attachment like hooks and suckers.
8. Body wall includes cellular, syncytial, one layered and partly ciliated epidermis. Parasitic trematodes and cestodes, epidermis is absent and the body is covered by cuticle.

9. Exoskeleton and endoskeleton are completely absent. Therefore, the body is generally soft. Body possess hard parts made up of cuticle, spines, thorns, hooks, teeth, etc.
10. They are acoelomate, i.e., true coelom is absent.
11. Mesenchyme usually called parenchyma fills the body cavity between the various organs.
12. Digestive system is totally absent in Acoelomates and tapeworms but in other flatworms it is made up of mouth, pharynx and blind intestine, anus absent.
13. Respiratory and circulatory systems are absent.
14. Single or paired protonephridia with flame cells or bulbs are distinguished feature of excretory system.
15. Nervous system is primitive type which consists of a pair of cerebral ganglia or brain and one to three pairs of longitudinal nerve cords connected to each other by transverse commissures. This kind of nervous system is also known as ladder type of nervous system.
16. Sense organs are mostly present in Tubellaria but they are greatly reduced in parasitic forms. Chemo and tango receptors generally occur in the form of ciliated pits and grooves.
17. Sexes are not separated, i.e., hermaphrodite with very few exceptions.
18. Reproductive system is highly evolved or complex in most of the forms.
19. Asexual reproduction takes place by fission for example, freshwater Turbellarians.
20. Mostly, eggs are devoid of yolk but provided with special yolk cells and are covered by egg shell.

21. Fertilisation is internal. In trematodes, cross-fertilisation and in cestodes, self-fertilisation is very common.
22. Life cycle is complex which involves one or more hosts.
23. Parthenogenesis and polyembryony commonly occur in trematodes and tapeworms. Some tapeworms reproduce by endogenous or exogenous budding.
24. The flatworms are either free-living or ecto or endo commensals or parasites.

Classification of Platyhelminthes:

The classification adopted here is from Hyman, L.H., (1951) up to suborders only with certain modifications.

Class 1. Turbellaria (In Latin, turbella means a little string):

1. They are free-living flatworms but some are ectoparasitic and endoparasitic.
2. Body is not segmented.
3. Body covered with a cellular or syncytial epidermis usually with mucous cells and partly ciliated.
4. Adhesive organs abundantly present.
5. Digestive system usually consists of mouth, pharynx and intestine, anus not found.
6. Excretory system consists of protonephridia, the flame cells.
7. Sense organs composed of tango receptors and chemoreceptors.
8. Sexes are united.
9. Reproduction sexual, asexual and by regeneration.

Class 2. Trematoda (In Greek, trematodes means having pores):

1. Ectoparasitic or endoparasitic forms, commonly called flukes.
2. Body is dorsoventrally flattened and usually leaf-like.
3. Epidermis and cilia are absent in body wall.
4. Body is covered with a cuticle and is not divided.
5. Well-developed suckers are present.
6. Alimentary canal is incomplete which consists of mouth, pharynx and two forked or many branched intestine. Anus is absent.
7. Excretory system is protonephridial type which consists of flame cells.
8. Mostly hermaphrodite (monoecious).
9. Ovary is single, testes are two or more.
- 10.10 Simple or complicated kind of life history.

Class 3. Cestoda (In Greek, keston means girdle and eidos means form):

1. Lives as an endoparasite in the intestine of vertebrates.
2. Commonly called tapeworms.
3. Body without epidermis and cilia but covered with cuticle.
4. Body usually divided into segments called proglottids, rarely undivided.
5. Scolex, an anterior end is provided with adhesive structures like hooks and suckers except in Cestodaria.
6. Mouth and digestive tract completely absent.
7. Excretory system comprises of protonephridia with typical terminal flame bulbs.

8. Nervous system includes a pair of ganglia and two lateral longitudinal nerve cords.
9. Each segment, proglottis contains one or two sets of complete hermaphroditic reproductive system.
10. Life cycle complicated usually involving two or more hosts.
11. Embryos possess hooks.

Phylum Nematoda

Introduction:

Nematodes are unsegmented, cylindrical and vermiform animals bearing anterior lateral chemosensory organs or amphids and with a persistent blastocoel or pseudocoelom; dorsal and ventral nerve cords in epidermis and excretory system of renette cells or tubules.

General Characteristic Features of Phylum Nematoda:

1. The body of phylum Nematoda is bilaterally symmetrical, unsegmented, elongated and tapering at both ends.
2. They are triploblastic animals with perivisceral cavity which is more extensive as compared to Platyhelminthes.
3. Body is generally covered with thick, flexible multi-layered collagenous cuticle and mostly bears cuticular setae, spines or annulations.
4. Moulting of cuticle occurs periodically.
5. Epidermis or hypodermis syncytial; i.e., the nuclei are not separated from each other by cell membranes.
6. Only longitudinal body-wall muscles; absence of circular muscles.

7. Phylum Nematoda contains pseudocoel which is filled with parenchyma in most cases.
8. Digestive tract is provided with distinct mouth and anus i.e., complete digestive tract is present. Pharynx is muscular and the inner surface of the gut usually not lined by cilia. Digestion is extracellular.
9. Mouth is encircled by six lips.
10. Blood vascular system and respiratory system are entirely absent in Phylum Nematoda.
11. Sometimes pseudocoelomic fluid contains haemoglobin.
12. Excretory system without nephridia and flame cells. In the class Adenophorea glandular renette cells with a duct or in the class Secernentea excretory canal system without flame cells act as excretory system.
13. Dorsal and ventral nerve cords are present in the epidermis.
14. Small cuticular projections called amphids works as a chemosensory organs which are situated on the lips, derived from cilia. They are opening to the exterior through a small pore, and lined with modified non-motile cilia called sensillae.
15. Sexes are separate.
16. Gonads are present and tubular in structure in Phylum Nematoda.
17. Sperm cells amoeboid.
18. Fertilization is internal.
19. Life history of Nematoda is generally complex.
20. They are free-living or phytoparasitic or zooparasitic.

Classification of Phylum Nematoda:

Based on the scheme of Chitwood (1933), the phylum Nematoda can be divided into two classes:

1. Adenophorea or Aphasmdida and
2. Secernentea or phasmidea.

Class 1. Adenophorea or Aphasmdida (In Greek, Adenophorea means gland-bearing while Aphasmdida means without phasmids):

1. Caudal adhesive glands and epidermal glands are noticed in most of the species.
2. Phasmids means caudal papillae bearing pores connecting with glandular pouch called phasmids which are thought to be chemosensory in function are absent.
3. Amphids are post labial and are with different shapes such as pouch-like or tube-like and rarely pore-like.
4. Coelomocytes are well developed.
5. Renette cells only acts as excretory organs but they are without collecting tubules.
6. Males are generally without caudal alae.
7. Males contains generally two testes.
8. Mostly marine, and include both free-living and parasitic species. The free-living species include both terrestrial, freshwater, and major marine forms.

Class 2. Secernentea or

Phasmida: Characters:

1. Caudal phasmids are present.
2. Labial amphids are pore-like.

3. Excretory system is comparatively more complex and canal-like.
4. Epidermal and caudal adhesive glands are absent.
5. Males with only single testis.
6. Mostly parasitic.
7. Free-living species are mostly terrestrial.

SUMMARY

Animals belonging to phylum **Platyhelminthes** are with dorsoventrally flattened leaf like body. Due to flattened body, body cavity is absent between body wall and gut and hence called acoelomate. Some platyhelminthic forms are free living while some are parasitic, living inside the body of another host animal. Due to parasitic mode of life, animals are devoid of sense organs. Alimentary canal of these organisms is incomplete and open through the single opening known as mouth.

Nemathelminthes word is derived from the term 'nema' means thread and 'helminth' means worm. Nemathelminthes were formerly known as Aschelminthes. These animals are worm like with cylindrical body. Male and female animals are separate in this phylum and sexual dimorphism is well marked between two sexes. The animals have false body cavity and hence known as pseudocoelomate animals. Generally parasitic animals, dependent on host body to complete their life cycle. Frequent moulting i.e. removal of cuticle periodically takes place in these organisms.

Coelenterata animals are also known as cnidarians hence they possess sting apparatus known as cnidoblast. Sting apparatus is used for defense as well as prey capturing in these organisms. Animals contains cavity inside the body and therefore known as coelenterate. Nervous system was observed for the first time in this phylum in the form of nerve net. Coelenterate is known for their polymorphism i.e., different forms

during the life viz., polyp and medusa. Polyp is fixed form and responsible for asexual reproduction while medusa is free form responsible for sexual reproduction.

