

Onychophora status Introduction

Onychophora is a Greek term, onyx=Claw and pherein=to bear which means claw bearing animals. Onychophora was conventionally classified as one of the classes of the phylum Arthropoda. But modern system of classification gives it a status of independent phylum. As there are only 70 species included in this phylum it is considered as a minor phylum.

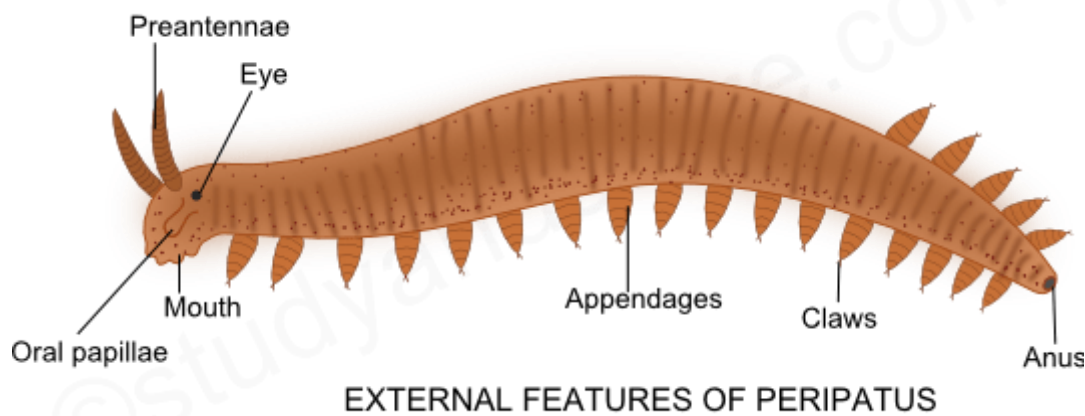
The most familiar genus of this phylum is Peripatus. These are very interesting caterpillar like forms which display both annelidans as well as arthropodan characters besides its own typical features. Owing to its resemblance with the two phyla, peripatus is often referred to as the connecting link between Annelida and Arthropoda.

Peculiar anatomical features of Peripatus

1. The body wall is dermo-muscular, consisting of cuticle, epidermis, dermis and striped circular and longitudinal muscles.
2. Coelom is in the form of small cavities around the gonads and metanephridia.
3. The body cavity is haemocoel, lined with epithelium.
4. A pair of slime glands is located one on either side of the body cavity
5. The mouth leads into alimentary canal which consists of tongue with rows of sensory spines, muscular pharynx, large salivary glands and short oesophagus, long mid gut or stomach-intestine and short hind gut or rectum.
6. The respiratory organs are unbranched trachea communicating outside through spiracles.
7. The excretory organs are coxal glands opening at the base of legs.
8. Dorsal tubular contractile heart lies within pericardial cavity.
9. The nervous system consists of brain with two circum-pharyngeal connectives and a pair of longitudinal nerve chord.
10. Sensory organs are a pair of eyes near the base of antennae, taste spines on the lips, pre oral cavity and tactile spines on surface tubercles.
11. Female reproductive system includes a pair of ovaries, a pair of oviducts and a pair of beaded uteri. Male reproductive system consists of a pair of testes, vas differentia, genital openings and seminal vesicles.
12. Female produces about 30 or more young ones in a year. The young resemble the adults.

Affinities of Peripatus

Peripatus has no economic importance but zoologically it is very interesting because it possess the characters of both Annelida and Arthropoda as well as the peculiarities of its own.



Annelidan characteristics

1. Vermiform body with truncated extremities
2. Absence of true head
3. Dermo-muscular body wall consisting of flexible cuticle with underlying circular and longitudinal muscles.
4. Locomotion is slow and by peristalsis as in case of earthworm.
5. Structure of eyes is simple as in case of polychaetes.
6. Unjointed, hollow, stumpy appendages like the parapodia of polychaetes.
7. Simple, straight alimentary canal with terminal mouth and anus.
8. Segmentally arranged paired nephridia.
9. Similar excretory glands
10. Presence of cilia in excretory and reproductive ducts

Arthropodan characteristics

1. Presence of antennae
2. Jaws are modified appendages provided with striped muscles.
3. Locomotion by definite legs with well-defined musculature and claws
4. Cuticle with thin deposit of chitin like arthropods
5. Body cavity is haemocoel
6. Coelom is reduced to small cavities arranged around gonads and metabephridia
7. Peculiar salivary glands
8. Dorsal tubular heart

9. Presence of tracheal respiratory system
10. Large and typically arthropod like brain
11. General structure of the reproductive organs resemble arthropods

Onychophoran characteristics

1. Body shows no or indistinct external segmentation
2. Texture of skin. Rough cuticle covered with numerous velvety processes not known in other phyla
3. Antennae not homologous to the antennae of Arthropoda
4. Three segmented head which is a condition midway between annelida and arthropoda
5. Restriction of jaws to single pair.
6. Irregular distribution of the spiracles of the tracheal openings
7. Two ventral widely separated nerve chords and no true ganglia
8. Structure of eyes is less complicated
9. Distribution of reproductive organs.

Molluscan characteristics

Peripatus was previously included in the phylum Mollusca due to its slug-like appearance of body and ladder like nervous system. But these characters are only superficial resemblances.

Systemic position of the Phylum onychophora

Onychophora has the characters of both Phylum Annelida and Phylum Arthropoda. Therefore, they are regarded as the intermediate stage or the connecting link between Annelida and Arthropoda. However, they appear to be more closely allied to arthropods than to annelids and have arisen as an offshoot from the base of arthropod line.

Based on such phylogenetic considerations, Manton and many other Zoologists have included Onychophorans as a class in Arthropoda. But, lack of exoskeleton, joined limbs and presence of annelidan characters in onychophora created a serious problem.

Many others claim that peripatus is definitely an annelid. In fact onychophorans are neither worms nor arthropods but have distinct characters of their own. Hence, Onychophora is now-a-days treated as a separate phylum.

It is undoubtedly a very ancient group because a mid-cambrian fossil, Aysheaia, closely resembles modern onychophora. Its extreme isolation and discontinuous distribution at present suggest that this group has lived through many geological

ages and that it has been more wide spread and diversified in past. Aysheaia and Peripatus suggest that arthropoda may have evolved from annelid like ancestors.

Some of the questions

- What is the most familiar genus of the phylum Onychophora?
- Give out the meaning of the term Onychophora.?
- Mention Annelidan and Arthropodan characteristics of Peripatus.?
- Discuss systematic position of Onychophora.?

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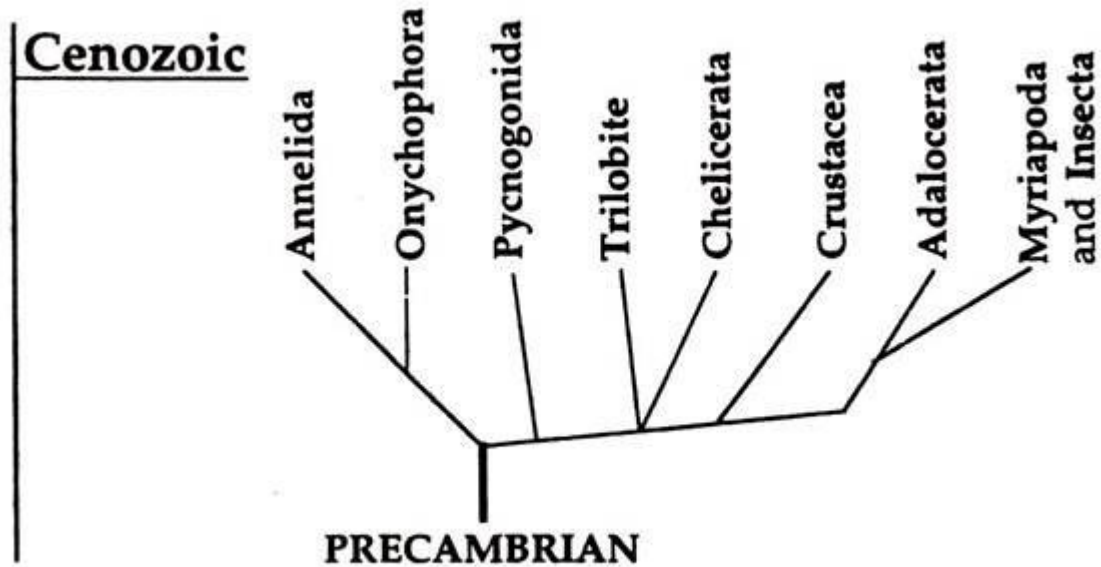
In this article we will discuss about the evolutionary status of peripatus.

It is presumed that Onychophora represents a phylogenetically intermediate stage between Annelida and Arthropoda. However, some of their special adaptations do not confirm the “missing link” status of Onychophora, as suggested by some authors.

Kestner (1968) lists the following features in this regard:

1. Transformation of the claws of the 2nd and 3rd appendages into mandible.
2. The number of tracheal spiracles and their disposition on the body.
3. Fine structures of the eye.

The importance of onychophores in tracing the phylogeny of arthropods has been discussed by Sharov (1966) and Manton (1973), who consider that arthropods are monophyletic and the onychophores represent an isolated line of evolution.



Phylogenetic tree of the major groups of arthropods (Sharov)

Peripatus was assigned different systematic position by zoologists. It was placed in Annelida by some while others thought it was Myriapoda, Mosely (1874).

Marshall and William (1972) and Storer (1983) considered Peripatus as an aberrant form and placed it in a separate subphylum Onychophora under phylum Arthropoda.

Tiegs and Manton (1958) and Manton (1970) believe the Arthropoda is polyphyletic and that the modern Onychophora, Myriapoda, Symphyla and Insecta have evolved from onychophore like ancestral stock.

Kaestner (1968) and Meglitsch (1972), Barnes (1980) considered Onychophora as an independent phylum.

However, the Onychophora differs from other tracheae's in the simplicity and diffuseness of tracheae; in having only one pair of jaws; in the absence of external segmentation; in the nature of body wall and the number of short rings bearing minute spines.

The ladder-like ventral nervous system is considered primitive for its resemblance to that of primitive molluscs, phyllopod crustaceans and nemertean's. It is not certain that the antennae, jaws and oral papillae of Peripatus precisely correspond to the antennae, mandibles and first maxillae of insects.

It may be concluded that Peripatus is a survivor of archaic type, related to the Middle Cambrian marine fossil Aysheaia, ancestral to tracheate and closely related to annelids, might have been derived from the type of lobopod annelids by the loss of eversible proboscis and

subsequent development of jaws. However, the Peripatus and its relatives may be placed in a separate phylum Onychophora.

Sources:

<http://www.notesonzoology.com/phylum-arthropoda/evolutionary-status-of-peripatus-zoology/6067>

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