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ZOOLOGY

PAPER No.: IX (NON-CHORDATES)

MODULE No. 1 (PHYLUM ARTHROPODA)

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1. Learning Outcomes:

In this module,

- You shall learn about the information regarding the concept of phylum Arthropoda.
- You shall learn about morphology, classification and behaviour of members of phylum Arthropoda.
- You shall learn about habit and habitat, types of mouth parts in insects.
- You shall learn about poisonous and non-poisonous and social insects' members of Arthropoda.

2. INTRODUCTION:

The phylum Arthropoda contains a wide diversity of animals with hard exoskeletons and jointed appendages. Many familiar species belong to the phylum Arthropoda—insects, spiders, scorpions, centipedes, and millipedes on land; crabs, crayfish, shrimp, lobsters, and barnacles in water.

- Phylum Arthropoda is the largest phylum of Animalia which includes insects.
- They have organ-system level of organization, they are bilaterally symmetrical, triploblastic, segmented and coelomate animals.
- The body is covered by chitinous exoskeleton.
- The body consists of head, thorax and abdomen and have jointed appendages.
- Respiratory organs are gills, book gills, book lungs or tracheal system.
- Circulatory system is of open type, sensory organs like antennae, eyes, statocysts are present, and excretion takes place through Malpighian tubules, coxal gland and moulting.
- They are mostly dioecious, fertilization is internal, mostly oviparous, and development may be direct or indirect.
- Examples:

Economically important insects – Apis (Honey bee), Bombyx (Silkworm), lac insect and parasitoids.

3. General Characteristics of Phylum Arthropoda:

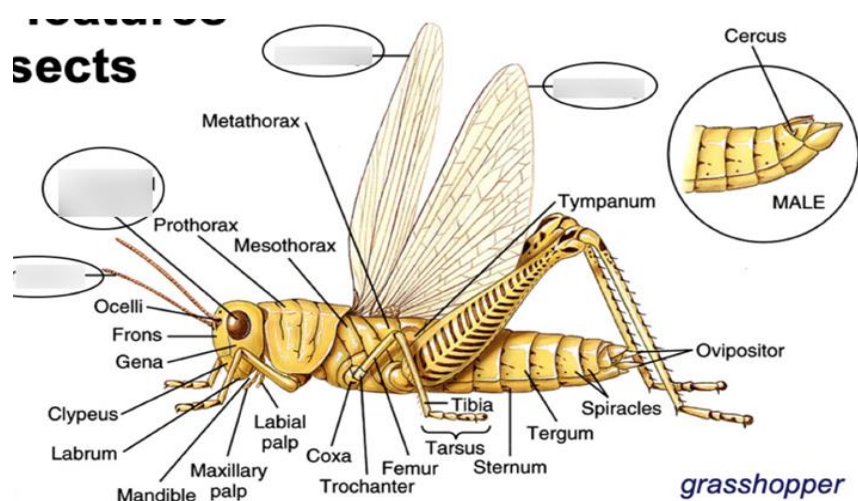
- Arthros; Jointed, podos; Foot)
- Kingdom: Animalia
- Habitat: mostly terrestrial, also aquatic
- Insects are the most successful life on the planet: they make up more than half of all living things on Earth.
- Body has Three-part: head, thorax, abdomen.
- Body is metamerically segmented.
- Three pairs of jointed legs (6 legs).
- Compound eyes which contain several thousand lenses leading to a larger field of vision.
- They possess two antennae.
- Symmetry: bilateral
- Germ layer: triploblastic
- Grade of organization: organ system grade
- Coelom: hoemocoel
- Chitinous (hard) exoskeleton, no bones or a skeleton
- Respiratory system: by general body surface, by gills, tracheae or book lungs
- Circulatory system: open type with dorsal heart, thirteen chambered in some insect.
- Excretion: Malpighian tubules or green gland
- Nervous system: dorsal brain with ventral nerve cord
- Sexes are separate. Sexually dimorphism is present
- Fertilization: internal.
- Development: direct or indirect with larval stages.

4. Classification of Phylum Arthropoda:

Arthropoda is classified into five classes on the basis of body divisions, body appendages, habitat, organs of respiration and modes of excretion.

Class 1 Insecta: (Insectus: divided)

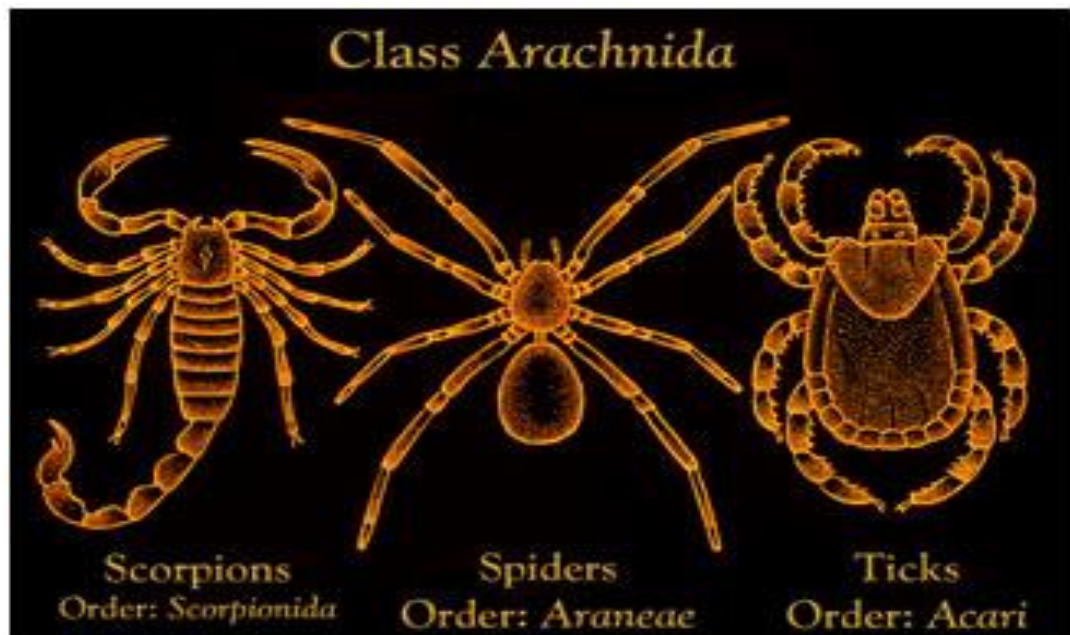
- Habitat: Mostly terrestrial and rarely aquatic
- Body divided into three regions: head, thorax and abdomen.
- Thorax has three segments, each bearing a pair of leg and a pair of wings found on second and third segments.
- Some insects are having only one pair of wings.
- Abdomen has 7-11 segments without appendages.
- Respiration: by tracheae, gills etc.
- Excretion: usually by malpighian tubules.
- Examples; Pieris (Butterfly), Periplaneta (Cockroach), Tabernus (Housefly), Mosquitoes, Ants, etc.



Class 2 Arachnida: (Arachne: spider)

- Habitat: mostly terrestrial and rarely aquatic

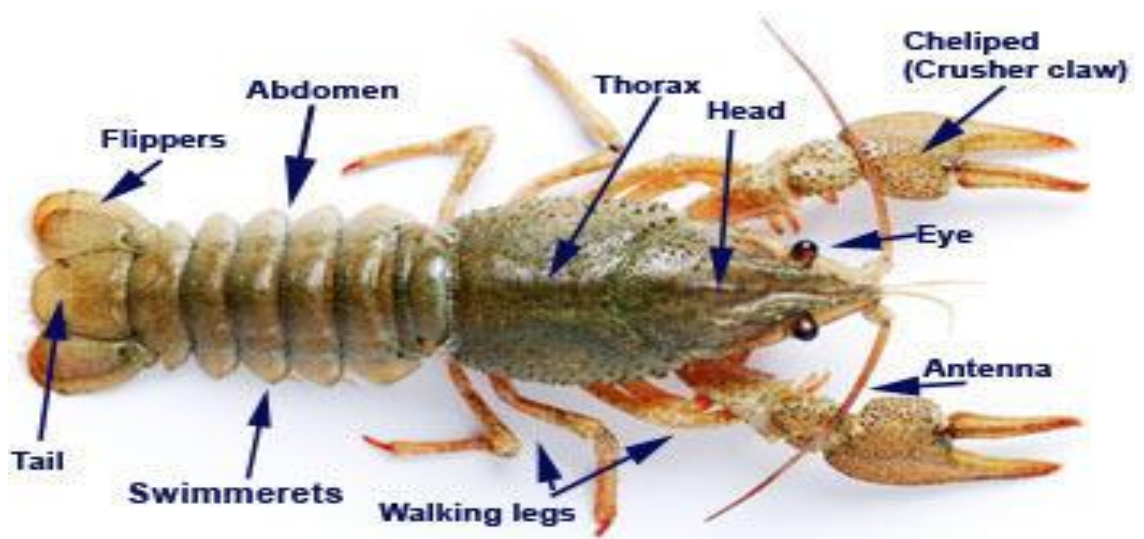
- Body is usually divided into cephalothorax and abdomen.
- There are four pairs of legs attached to the cephalothorax.
- Respiration: by tracheae or book lungs or gills.
- Excretion: by malpighian tubules or coxal gland or both.
- Generally, animals are poisonous.
- Examples: Aramea (Spider), Palamnaeus (Scorpion), Limulus (King Crab), etc



Class 3 Crustacea: (Crusta: shell)

- Habitat: They are mostly aquatic, few are terrestrial and very few are parasitic.
- Cephalothorex: Head is often fused with thoracic segments to form cephalothorax.
- Thorax and abdomen have a pair of biramous appendages in each segment.
- Respiration: through the gills or general body surface.

- Excretory organs are modified coelomoducts which may either maxillary glands or antennary glands.
- They have importance in food as it contains rich protein in it.
- It gives job opportunity .Prawn culcure .
- It is the best food of Fishes.
- Examples: Cancer (crab), Palaemon (Prawn), Daphnia (water flea) etc.



Class 4 Myriapoda: (Myrios: ten thousand; podos: foot)

- Habitat: Mostly terrestrial.
- Many appendages: Body is long with numerous segments each having one or two pairs of legs.
- Head is distinct with antennae, a pair of eyes and two to three pairs of jaws.
- Excretion: by malpighian tubules.
- Animals are generally nocturnal.
- Respiration: by trachea.

- Examples: Julus (Millipede), Scolopendra (Centipede), Spirobolus etc



Class 5 Onychophora: Onychos: claw; phoros: bearing

- These are small-sized, terrestrial arthropods.
- The body is divided into segments.
- Excretion occurs through nephridia.
- They respire through the trachea.
- This class shows connecting link between phylum Annelida and Arthropoda.



➤ **Annelidan affinities:**

- Vermiform body with truncated extremities.
- Locomotion very slow and by peristalsis as in an earthworm .

➤ **Arthropodan affinities:**

- Presence of antennae.
- Presence of tracheae as a respiratory organ.

➤ **Molluscan affinities:**

- Slug-like appearance of the body.
- Ladder like nervous system.

➤ **Onychophoran characters:**

- Body shows indistinct segments.
- Presence of two widely separated and without true ganglia.
- Appearance of skin is not like that of arthropodas.
- Structure of eye is less complicated.

- Antennae are not homologous to the antennae of other arthropods.
- Presence of slime and coxal glands.
- Tubercles are present all over the body.
- Hollow legs with terminal claws.
- Eg., Paripatus

5. Summary:

The phylum Arthropoda is the largest phylum in the world because most of animals are found in water, on tree, in soil, some are fresh water some are marine water.

Some animals are destructive while some animals are very important in agriculture as they are pollinators, some animals are beneficial giving silk, lac, honey, wax etc.

There are different insects having different types of mouth parts like chewing and lapping, biting, sucking, sponging, mandibulate, and siphoning types of mouth parts.

Some insects are pests while some are parasitoids commonly known as natural enemies of crop pests.

Specific insects are vectors as they are carriers of some diseases like malaria, dengue.

Insects like Cimex cimex is an ectoparasite of humans responsible for transmitting some diseases.

Video1:

<https://drive.google.com/file/d/1cNYjwAoPW1AiiQaHSQKbQfJj5ReMyaxN/view?usp=sharing>

Video2:

<https://drive.google.com/file/d/1cNYjwAoPW1AiiQaHSQKbQfJj5ReMyaxN/view?usp=sharing>

Assignment:

https://docs.google.com/forms/d/e/1FAIpQLScyI_5GDRLIjcxKxrbn2Xu7kNFyMKQ345ciiTRnq4MOubhiw/viewform?usp=sf_link

Know more:

Suggested readings, web links:

1. <https://en.wikipedia.org/wiki/Arthropod>
2. <https://www.britannica.com/animal/arthropod>
3. <https://www.vedantu.com/biology/phylum-arthropoda>
4. Text book of Invertebrates Dhama Dhama
5. Invertebrates by R.L.Kotpal
6. Text book of Non chordates by S.N.Prasad

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