

7) PHYLUM ARTHROPODA

INTRODUCTION

The word Arthropoda is derived from two Greek words; Arthros meaning jointed and Podos means limbs or legs, hence arthropoda includes all those animals having jointed legs.

This is the most successful group and the largest phylum of the animals.

HABITAT Koracademy.com

They are free living or parasites and are found in all types of habitat.

SYMMETRY

They are triploblastic and bilaterally symmetrical.

SEGMENTATION

The body is metamerically segmented. Segments are modified, specialized and fused. They have jointed limbs and generally every segment of the body has a pair of legs.

EXOSKELETON

The body is covered with a hard exoskeleton in the form of thick cuticle

chemically made of chitin. This exoskeleton endows arthropods with several adaptive features to the terrestrial environment. Its physical durability protects the animals from physical injury. It also provides structural support to the muscles that move their appendages. Lastly, the cuticle is waterproof and helps prevent desiccation in a dry terrestrial environment.

The only negative feature of the exoskeleton is that it inhibits growth, but arthropods deal with this problem by periodically shedding their exoskeleton in a process known as moulting.

BODY PLAN

Body can be differentiated into three regions; head, thorax and abdomen.

COELOM

Body cavity is haemocoel.

CIRCULATORY SYSTEM

Circulatory System is of open type. The heart is typically a muscular tube that runs just under the back and for most of the length of hemocoel. Blood does not contain any respiratory pigment. Blood is called hemolymph bcz (it does not carry oxygen) it only carries food to different tissues of the body.

RESPIRATION

Respiration takes place in aquatic forms through gills and in terrestrial form (especially insects) through trachea. Trachea are air tubes which divide repeatedly to form numerous branches distributed to all the tissues in the body. ^{They communicate with exterior through openings on each side of body known as spiracles.}

Arachnids, a group of arthropoda including scorpion, spider etc respire through special structures, arranged side by side like books in a book shelf, hence called book lungs.

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EXCRETORY SYSTEM

There are two different type of arthropod excretory system. In aquatic arthropods, the end-product of biochemical reactions that metabolize nitrogen is ammonia, which is so toxic that it needs to be diluted as much as possible with water. The ammonia is then eliminated via any permeable membrane, mainly through the gills. All crustaceans use this system, and its high consumption of water may be responsible for the relative lack of success of crustaceans as land animals. ^(Crabs, shrimps, lobster, zooplankton) In crustacean the excretion may occur in green gland or coxal gland.

Various groups of terrestrial arthropods ^(e.g. insects) have independently developed a different system. The end product of nitrogen metabolism is uric acid, which can be excreted as dry material; the Malpighian tubule system filters the uric acid and other nitrogenous

waste out of the blood in hemocoel, and dumps these materials into the hindgut, from which they are expelled as feces.

Most aquatic arthropods and some terrestrial ones have organs called nephridia (little kidneys) which extract other wastes for excretion as urine.

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REPRODUCTION

Fertilization is internal. Sexes are generally separate. Sexual dimorphism is generally present i.e. male and female can be differentiated from each other on the basis of their morphology.

COLONIES

Some insects like honey bees, ants, termites etc show social behaviour. They live in colonies and divide their work among different groups.

NERVOUS SYSTEM

Nervous system in arthropods is well developed. It consists of a pair of cerebral ganglia (simple brain) connected to a double nerve cord. A ganglion is present in each segment and nerves arising from these ganglia connect the whole body. The responses are well coordinated. Sensory organs are eyes and antenna.

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DIGESTIVE SYSTEM

Digestive system is complete, mouthparts modified from appendages and adapted for different methods of feeding.

METAMORPHOSIS

During development they exhibit either complete metamorphosis or incomplete metamorphosis.

METAMORPHOSIS IN ARTHROPODS

All the changes occurring from the fertilization of an egg to the formation of an adult are collectively called metamorphosis.

During metamorphosis a larva undergoes a series of changes called **ecdysis** or **moulting** in which it casts off (removes) its skin many times to attain its maximum size. The stages between ecdysis are called **stadia** (singular stadium) and the form attained by an insect larva in any stadium between two ecdyses is termed as **instar**. The final instar is the adult or **Imago**.

On the basis of metamorphosis arthropods are classified into following three groups:

1. Ametabola
2. Hemimetabola
3. Holometabola

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1. AMETABOLA

Ametabola are the insects in which no metamorphosis occurs. Collembolan and other primitive wingless insects are example. e.g. ants

2. HEMIMETABOLA

These are the insects in which incomplete metamorphosis takes place e.g. this type of metamorphosis is found in insects like cockroaches, wasps etc.

3. HOLOMETABOLA

Holometabola are those insects in which complete metamorphosis takes place. Most insects are holometabolites like flies, butterflies, moths, beetles etc.

CLASSES OF PHYLUM ARTHROPODA

Phylum Arthropoda is divided into four classes:

1. Chelicerates

2. Crustaceans

3. Uniramians

4. Trilobites (all are extinct, but fossil record indicates that they were once the dominant class)

1. CLASS CHELICERATES

Chelicerates is made up of

arachnids (which include scorpions and spiders), ticks, mites and horseshoe crabs. Members of this phylum can be predators, parasitic, or decomposers. They generally have six pairs of legs, one or two body segments, and no wings or antennae. Members of this class generally live on land, although some are aquatic.

2. CLASS CRUSTACEANS

Crustaceans include crabs, shrimps, lobsters, and zooplankton. Crustaceans have two pair of antenna, ten limbs, two eyestalks with compound eyes, and three body segments. Two of the limbs are mandibles on the head, for example the familiar claws of crab.

3. CLASS UNIRAMA

Unirama is the largest class of arthropods, which includes insects, centipedes, and millipedes. Insects have three body segments, three pairs of legs, a single pair of antenna, and generally one or two pair of wings. Most insects live on land, although some have been evolved to live on aquatic environment as well. Centipedes have more body segments, and are wingless, and have one pair of legs per segment; millipedes have two rather than one pair of legs per segment.

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+ IMPORTANCE OF ARTHROPODS

1. AS FOOD

Lobsters, crayfish and prawns are used as food.

2. COMMERCIAL IMPORTANCE

Insects give us many substances of commercial importance e.g honey and bee's wax are produced by honeybee, (^{This is not an arthropod} silk by silk worms) etc.

3. FOR RESEARCH

Fruit fly (*Drosophila*), cockroach, grasshopper are abundantly used as laboratory animals for scientific learning and research.

4. POLLINATION

Insects are very useful for pollination.

5. MEDICINAL PURPOSES

The blood of horseshoe crab contains a clotting agent which is now used to test that antibiotics and kidney machines are free of dangerous bacteria, and to detect spinal meningitis and some cancers.

6. FORENSIC ENTOMOLOGY

Forensic Entomology uses evidence

provided by arthropods to establish the time and sometimes the place of death of a human, and in some cases the cause.

*DISADVANTAGES OF ARTHROPODS

Insects destroy field crops, fruit trees and timber plants. They spread diseases among human beings. Bees and wasps sting. Mosquitoes, lice and fleas bite and suck blood. The arachnids are mainly harmful to man. Scorpions and a few spiders are poisonous and sting.

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