

LECTURE 3. insect external morphology:

Head,

Antenna

HEAD

The head of an insect is composed of a series of segments, which are specialized for food

gathering and manipulation, sensory perception, and neural integration.

The head bears

the eyes (compound eyes and ocelli), antennae, and mouthparts. The anterior part of the

head is the **frons**. The anterior area below the dorsum of the head, between and behind

the eyes is the **vertex**. The area below the compound eye, on the side of the head, is the

gena. The liplike sclerite is the **clypeus**.

Based on the inclination of long axis of the head and orientation of mouth parts

there are three types of insects heads.

1. Hypognathous: (Hypo-below ; gnathous-jaw)

This type is called orthopteroid type. The long axis of the head is vertical, it is at

right angles to the long axis of the body. Mouth parts are ventrally placed and project

downwards. E.g. grasshopper, cockroach.

2. Prognathous: (Pro-infront ; gnathous-jaw)

This type is also called coleopteroid type. The long axis of the head is horizontal.

It is in line with the long axis of the body. Mouth parts are directed forward. e.g. ground

beetle.

3. Opisthognathous: (Opistho-behind; gnathous-jaw)

This is also called hemipteroid type or opisthorhynchous type. Head is deflexed.

Mouthparts are directed backwards and held in between the forelegs. e.g. stink bug.

Structure of insect antenna: Antennae are also called feelers. They are paired, highly

mobile and segmented. Antennae are located between or behind the compound eyes. All insects except protura have a pair of antennae. Antennae are well developed in adults and poorly developed in immature stages. The antenna is set in a socket of the cranium called antennal socket. The base of the antenna is connected to the edge of the socket by an articular membrane. This permits free movement of antennae. The basal segment is called **scape**. It is conspicuously larger than succeeding segments. The second antennal segment is called **pedicel** which immediately follow the scape. A mass of sense cells called **Johnston's organ** is present in the pedicel, which is used as a chordatoneal organ in some of the insects like mosquitoes. Both scape and pedicel are provided with intrinsic muscles. The remaining annuli or flagellomeres are known as **flagellum** or **clavola** which lack individual muscle. Surface of the flagellum is supplied with many sensory receptors that are innervated by the deutocerebrum of brain. Flagellum may vary in size and form.

Function: Antenna is useful to detect chemicals including food and pheromones (chemicals secreted into air by opposite sex). It perceives smell, humidity changes, variation in temperature, vibration, wind velocity and direction.

Antenna is useful to perceive the forward environment and detect danger. It is useful for hearing in mosquitoes and communication in ants. Rarely it is also useful to clasp the mate (e.g. Flea) and grasp the prey.

Antennae vary greatly among insects, but all follow a basic plan: segments 1 and 2 are termed the scape and pedicel, respectively. The remaining antennal

segments

(flagellomeres) are jointly called the flagellum.

Antennae function almost exclusively in sensory perception. Some of the information that

can be detected by insect antennae includes: **motion and orientation, odor, sound,**

humidity, and a variety of chemical cues. Some of the most common types of insect

antennae with which you should be familiar are illustrated below:

(e.g., Odonata) (e.g., Coleoptera)

(e.g., Lepidoptera) (e.g., Diptera)

Types of antennae:

1. Setaceous: (Bristle like) Size of the segments decreases from base to apex. e.g.

Leafhopper, Dragonfly, Damselfly.

2. Filiform: (Thread like) Segments are usually cylindrical. Thickness of segments

remains same throughout. e.g. Grasshopper.

3. Moniliform: (Beaded) Segments are either globular or spherical with prominent

constriction in between e.g. Termite.

4. Serrate: (Saw like) Segments have short triangular projections on one side. e.g.

Longicorn beetle

5. Unipectinate: (Comb like) Segments with long slender processes on one side e.g.

Sawfly

6. Bipectinate: (Double comb like) Segments with long slender lateral processes on both

the sides e.g. Silkworm moth

7. Clavate: (Clubbed) Antenna enlarges gradually towards the tip. e.g. Blister beetle

8. Capitate: (Knobbed) Terminal segments become enlarged suddenly e.g. butterfly

9. Lamellate: (Plate like) Antennal tip is expanded laterally on one side to form flat

plates e.g. lamellicorn beetle

10. Aristate: The terminal segment is enlarged. It bears a conspicuous dorsal bristle

called arista e.g. House fly

11. Stylate: Terminal segment bear a style like process eg. Horse fly, Robber fly.

12. Plumose: (Feathery) Segments with long whorls of hairs e.g. male mosquito **13.**

Pilose: (Hairy) Antenna is less feathery with few hairs at the junction of flagellomeres.

e.g. Female mosquito.

14. Genuate: (Elbowed) Scape is long remaining segments are small and are arranged

at an angle to the first resembling an elbow joint. e.g. Ant, weevil and honey bee.

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