

PRACTICAL 3

MORPHOLOGY AND ANATOMY OF HONEY BEE

Aim: To become familiar with different body parts of honey bees and their modifications as per their food habit and social life.

In honey bees, body parts are modified as per their food habits and social life. Like any insect, body of honey bee can be distinguished in to three parts (Fig. 3.1):

- a. Head
- b. Thorax
- c. Abdomen

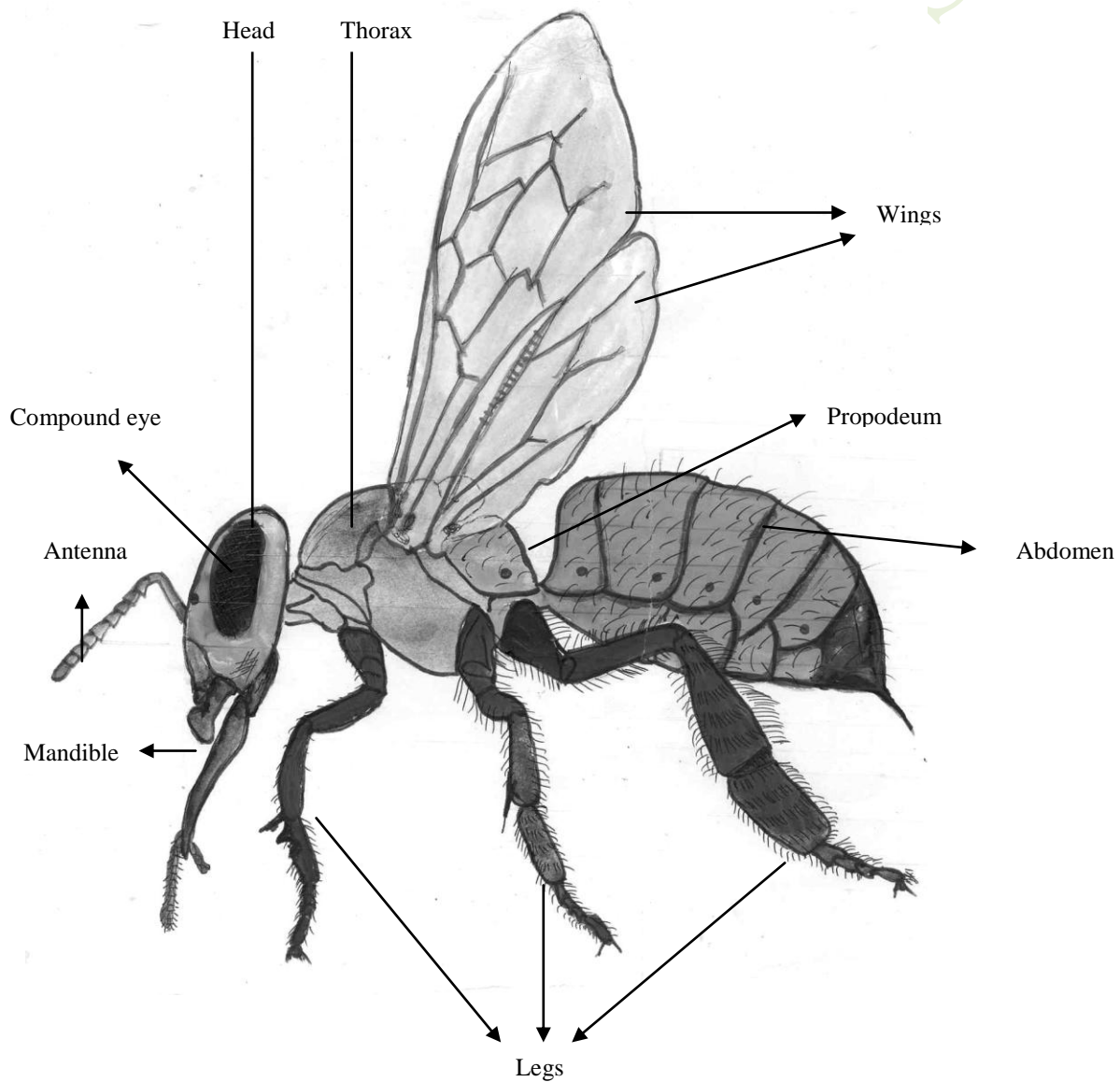


Figure 3.1 General morphology of a worker honey bee

a. **Head**

- Bears a pair of geniculate antennae
- Two compound eyes on lateral side of head. Bees can distinguish different colours but are red blind and can perceive ultraviolet rays
- Head bears 3 ocelli (simple eyes) on top portion which perceive degree of light
- Two mandibles are attached to ventro-lateral part of head capsule. Mandibles differ in shape in three castes. Workers use mandibles for grasping and scrapping pollen from anthers, feeding of pollen and in manipulation of wax scales during comb building
- Mouth parts of worker bees are modified for sucking and lapping. Tongue or proboscis (formed by medium labium and two lateral maxillae) is used for ingesting liquids. Labium has long median glossa and spoon shaped lobe (flabellum) at the end
- Inside the head there are long coiled strings of small lobes known as hypopharyngeal glands which secrete glandular food known as royal jelly that is fed to queen and young larvae.

b. **Thorax**

- Consists of three segments: prothorax , mesothorax and metathorax, each bears a pair of legs. Meso and metathorax, each bears a pair of wings. Legs and wings are locomotory organs. In addition to locomotion legs in honey bees are also modified to perform following functions:
- Prothoracic legs serve as antenna cleaner. Basal part of basitarsus has a notch and a small lobe projects from distal end of tibia (tibial spur). It is found in all the three castes.
- On mesothoracic legs, bushy tarsi serve as brushes for cleaning of thorax. Long spine at end of middle tibia is used for loosening pellets of pollen from pollen basket of hind leg and also for cleaning wings and spiracles. Wax scales are also removed from wax pockets of abdomen by these legs.
- Hind or metathoracic legs differ from other legs in being larger in size and with broad flattened form of tibia and basitarsus. In worker bees, smooth somewhat concave outer surface of hind tibia is fringed with long curved hairs and forms pollen basket or corbicula.
- Two pairs of wings arise from sides of meso and metathorax. Fore wings are stronger than hind wings. Series of upturned hooks (hamuli) are present on front margin of each hind wing. Decurved fold on rear margin of fore wing works as coupling apparatus for holding hamuli and this result in unity of action of the wings in flight.

c. **Abdomen**

First abdominal segment is united with the metathorax and forms anatomically a part of thorax known as propodeum

- Bee larva has 10 abdominal segments but in adult workers abdomen appears 6 segmented; segments 8-10 are reduced in size and first segment (propodeum) is transferred to thorax during pupal stage
- Abdomen bears sting, wax glands (on sternites 4 to 7) and scent glands (on last two terga) and genitalia in addition to other viscera
- In workers egg laying apparatus (ovipositor) is modified into sting
- Queen uses ovipositor for egg laying and for stinging rival queen.

Important anatomical features:

- Digestive system is unique in having oesophagus with expanded honey stomach which stores the collected nectar.
- From honey stomach food goes to ventriculus through X shaped opening known as proventriculus, regulating passage of food to ventriculus. It removes pollen from nectar and nectar is retained in honey sac and pollen passes to ventriculus. Nectar is regurgitated in the comb cells for conversion into honey
- Reproductive organs are fully developed in queen and drone but greatly reduced in worker.
- Sperms are stored in the queen in a sac like structure known as spermatheca. The stored sperms are utilized by queen throughout her life time as she does not go for mating once starts egg laying.

Practical things to do:

- i. Take a worker bee. Note its structural adaptations (tongue, wings, legs and abdomen)
- ii. Draw a well labelled diagram by observing a worker bee to depict general morphology
- iii. Note special features of fore leg, middle leg and hind leg of the worker bee and draw well labelled diagrams
- iv. Observe wing coupling apparatus at junction of fore and hind wing. Count number of wing hooks on the hind wing and observe marginal fold in the fore wing. Also observe wing venation. Draw well labelled diagrams
- v. Draw a diagram by observing mouth parts of a worker bee under microscope.