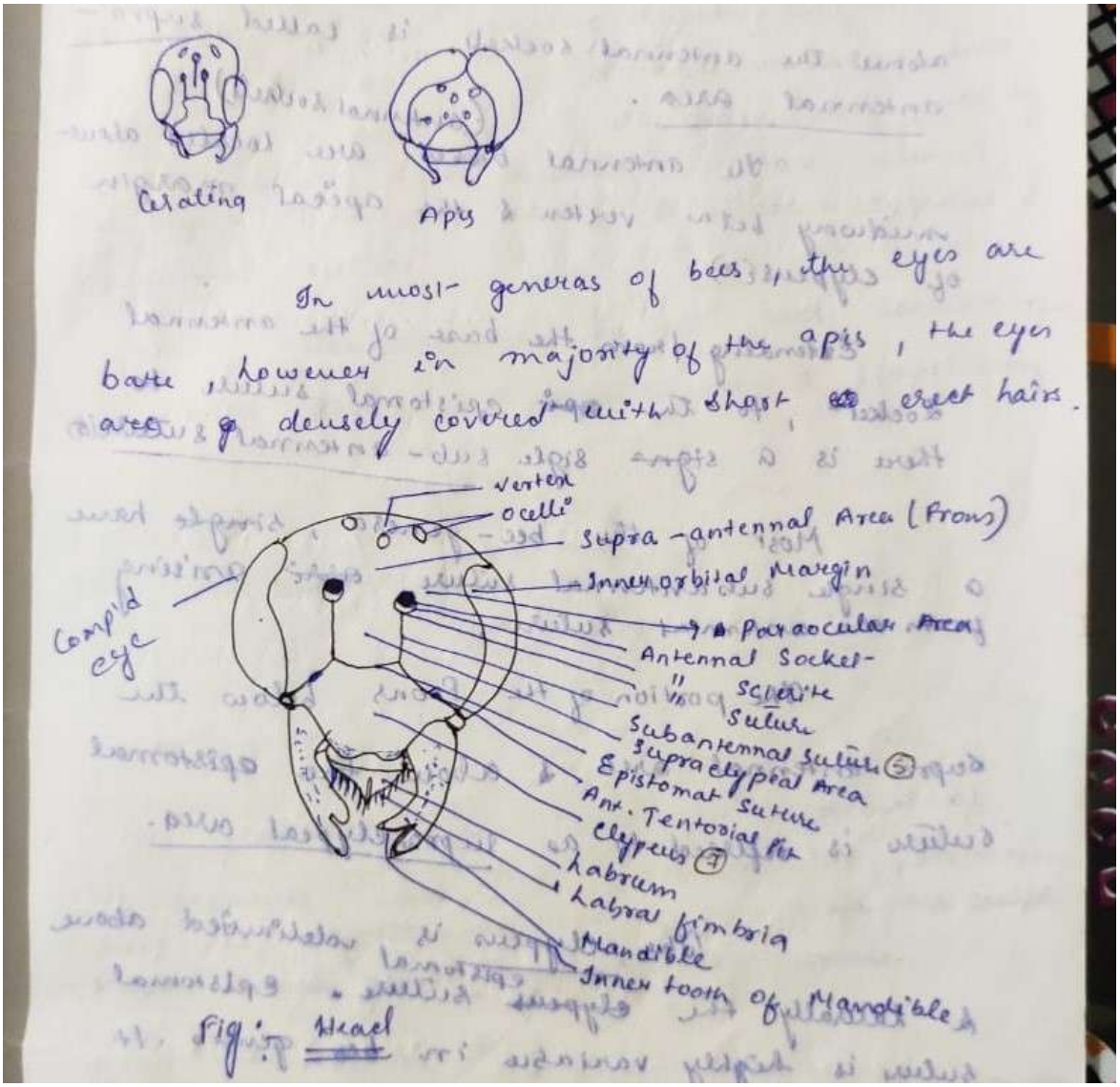
External morphology of honey bee

Classically, Three body regions are designated among insects- head, thorax and abdomen.

Head:

The head is hypognathous, with the face perpendicular to the longitudinal axis of the body. The large convex compound eyes occupy much of the lateral surface of the head. In some genera, such as ceratina, the compound eye do not nearly reach the upper margin of the sides of the head, whereas in the males of certain species of *Bombus* & apis as shown in the following fig(1) the compound eyes extend over the top of the head and meet in the midline.



In most genera of bees, the eyes are bare, however in the majority of the apis, the eyes are densely covered with short, erect hairs.

Vertex:
Vertex is the top of the head, bounded anteriorly by an imaginary horizontal line. Beneath the anterior ocellus and posteriorly by the pre-occipital ridge, and laterally by the inner margin of the compound eyes. This region of the head contains pre-ocelli of varying size.
In apis, they are closely arranged well down on the face, between the imaginary eyes under the median ocellus, the upper margin of the clypeus lies in the frontal area or frons. The portion of the frons lying above the antennal sockets is called **supra-antennal area**.
The antennal bases(antennal sockets) are located about midway between vertex and the apical margin of clypeus(7). Extending from the base of the antennal socket, to the epistomal suture there is a single **sub-antennal suture**(5).
Most of the bee- genera, have a single subantennal suture arising from the antennal above the suture.The portion of the frons below the supra-antennal area and above the epistomal suture is referred to as **supra clypeal area.** The clypeus is delimited above and literally epistomal suture. Epistomal suture is highly variable in the bee genera.It is convex in bees although the extent of its convection among the genera. In all bees, it is produced apically above the labrum.
The high degree of variability In the shape of the clypeus makes it a valuable structure for characterising bee groups. The apex of the clypeus is defined by the clypio labral suture, which is hidden in most bees by the overhanging clypeus as with the clypeus, the labrum is variable among bees. The areas on each side of the face delimited by the compound eyes laterally, the vertex above the supra-antennal area, supra-clypeus and epistomal suture. The antenna in all bees consists of a basal scalpel, a pedicel and a flagellum.(Fig 3).

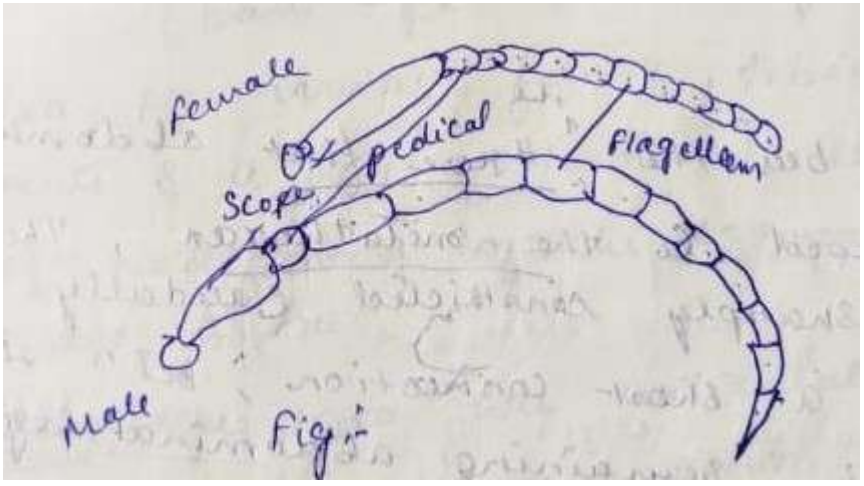


Fig: Antenna

The flagellum of the male is composed of 11 segments and that of the female has 10 segments. In most bees, the flagellar segments of the male are considerables longer than those of the female.

MOUTH PARTS: The mandibles of honey bee are broadened in the base and generally tapers to much more slender apex.Both the sexes of the aphids possess inner teeth.The proboscis of honey Bee is composed of highly complex and modified labium and maxilla,

which when extended from the tube through which fluids are taken into the pharynx. The base of the proboscis is largely membranous to permit folding and unfolding. Labium is the innermost structure of the proboscis and like the maxilla has undergone remarkable changes.

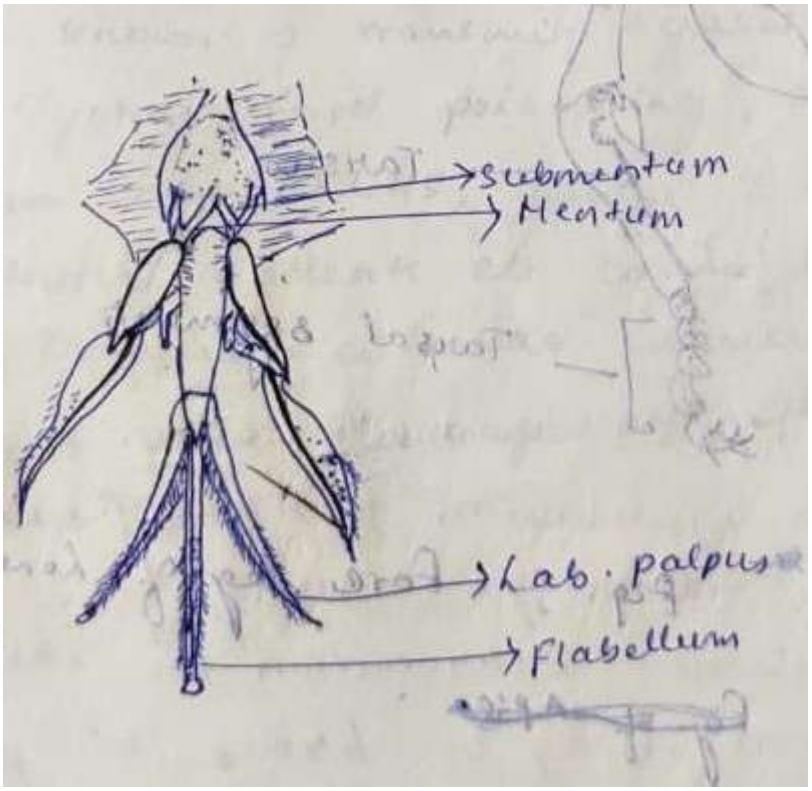


Fig: Mouth parts

Thorax:

In honey bees the first three abdominal segments are fused to the metathorax . The segment is sharply constricted caudally resulting in a short connection between the thorax and the remaining abdominal segment.

Prothorax:

The first segment of the thorax is reduced in the honey bee that encircles the upper anterior head of the mesothorax and is produced on its postero lateral margin into the lateral lobes of the pronotum.

Meso-thorax: This is by far the largest of the thorax and in most species of honey bee it makes up over half of this body region.

Metathorax:The metathoracic segment like the prothorax is reduced. It lies between a large mesothorax and the propodeum.

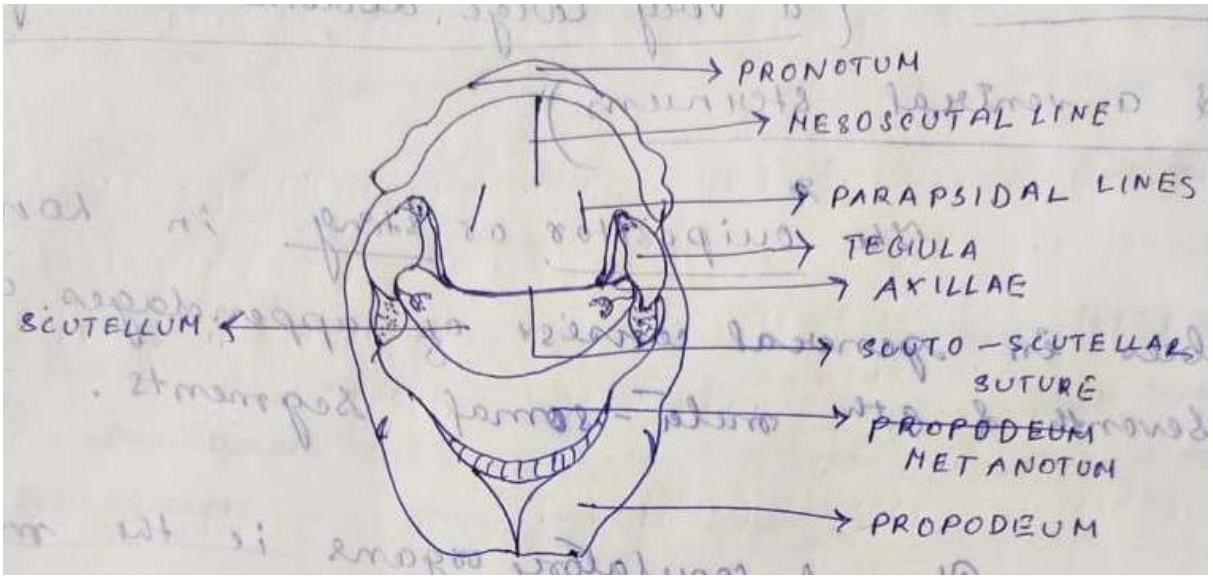


Fig: Dorsal view of thorax.

Legs: Each leg in all honey bees consists of a coxa, prochantar, femur,tibia,5 tarsal segments and a pair of terminal claws.A number of modifications of the segment of the legs occur in bees.

Coxae:The coxa articulates to the lower portion of the thoracic pleura and they vary considerably in size among different bees. The trochanters are small segments, protein baselly and tapering sharply at their apixes.

The Femur are approximately as long as the tibia. The anterior and the mid tibia of the female and all three tibia of the male are approximately as long as the femura and constricted sharply at their bases. There is a short spine on the anterior apical margin of the front and mid tibia . The spur on the fore tibia forms antenna cleaner in apis. The tarsi of most bees are 5 segmented and their combined length usually exceeds that of tibia. Raising from the are membranous a between the pair claws there is a large well developed membranous exclusion termed is arolium. **The pollen collecting apparatus scopa (Pollen basket) is usually located in the posterior legs in female workers.**

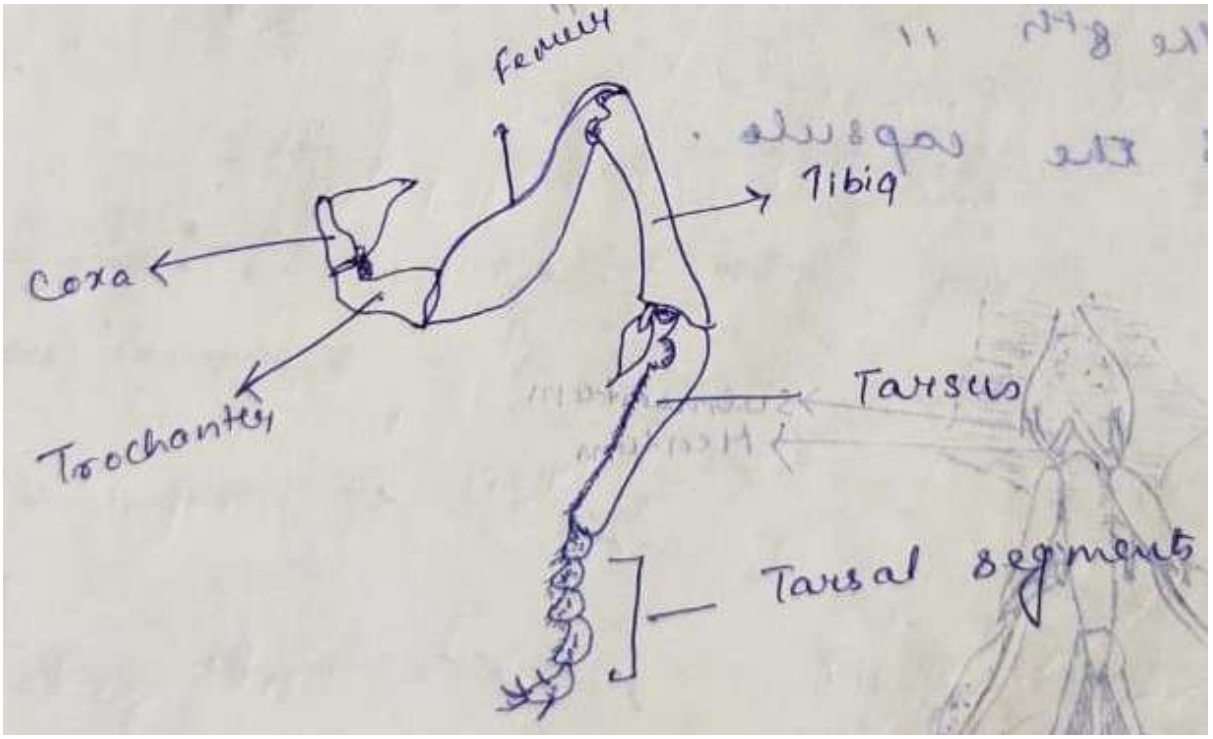


Fig: Fore leg of honey bee.

Wings:

Two Pairs of wings present which are composed of wings veins and different lobes. The comparative sizes of the jugal lobe and the venel lobe are very important in identifying the honey bees.

Abdominal segments:

Meta Soma: The first two abdominal segments are functionally a part of the thorax and the obvious body division between the thorax and the abdomen occurs between the first and 2nd abdominal segment. Each abdominal segment consists of two large sclerites-(a very large abdominal targum and a ventral sternum)

The ovipositor or sting in honey bees in general consists of appendages of 7th and 8th metasomal segments. The male copulatory organs i.e. the male genitalia consists of 3 distinct structures- The 7th metasomal sternum, the 8th metasomal sternum and the capsule.