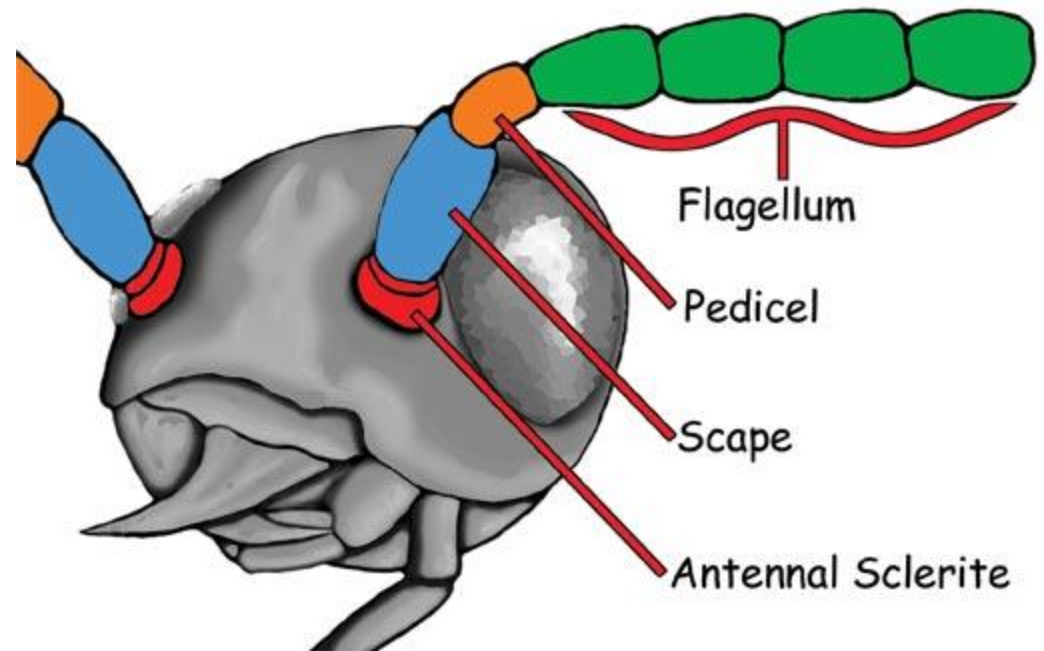


# Insect Antenna & its Modifications



- ❖ uniramous (unbranched), segmented and mobile structures
- ❖ basally fixed in to deep antennal socket (antennifer)
- ❖ Antennal socket is provided with an antennal suture
- ❖ The base of socket is connected to the edge of the socket by an articulatory membrane For free movement of antennae

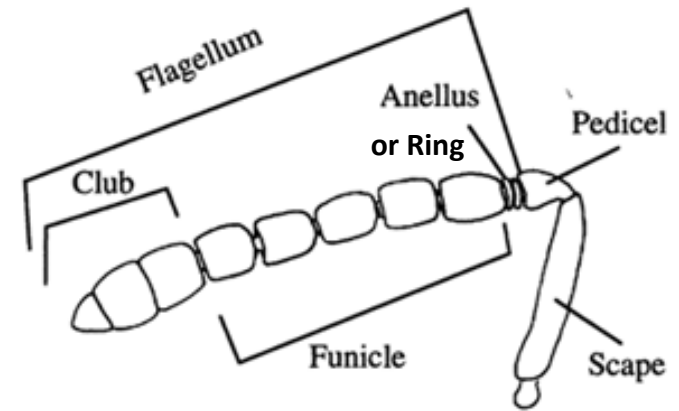


# Exceptions

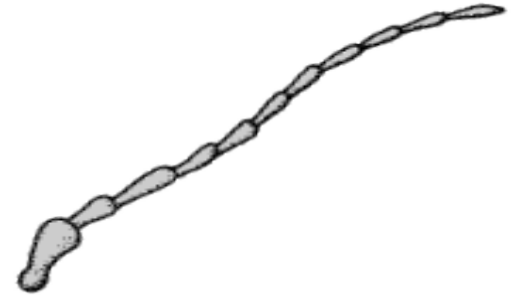
- ❖ Absent in Protura and Class Arachnida and 2 Pairs in Crustacea
- ❖ In Chalcidoids, Flagellum is divided into basal Ring, middle Funicle and upper Club
- ❖ In Collembola & Diplura, Antennae are muscular, Hence Segmented type
- ❖ Johnstons organs are absent in Collembola & Diplura

# Functions

- ❖ sense organ responding to touch, smell, odour, humidity, temperature & air currents or wind speed.
- ❖ Jhonston's organ on pedicel -auditory organ responding to sound and measuring the speed of air currents.
- ❖ Help the mandibles for holding prey and for mastication of food material
- ❖ Helps in sexual dimorphism
- ❖ Useful for clasping the female during copulation
- ❖ Aid in respiration by forming an air funnel in aquatic insects.



# FILIFORM (thread-like)



The segments of flagellum are of same thickness and thread-like.

Example :

Grass hopper

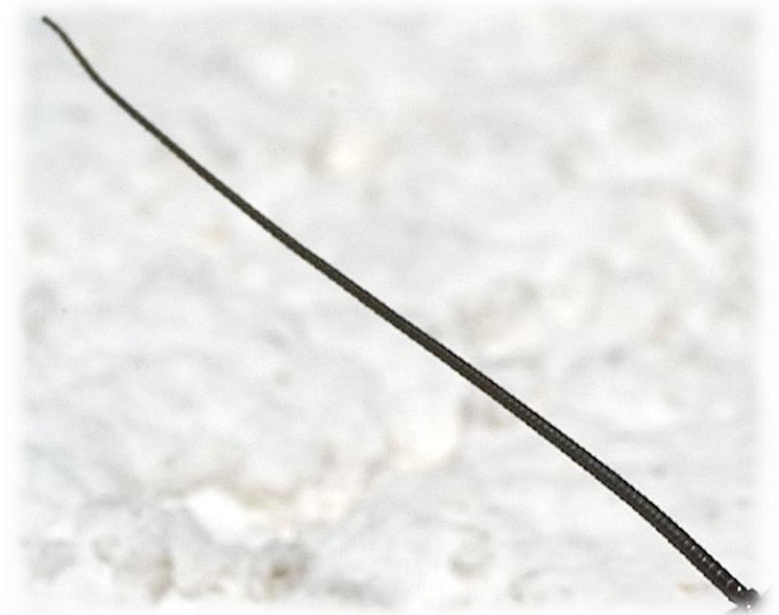


# SETACEOUS (whip-like)



The segments of flagellum are taper towards apex.

Example : Dragon fly, Cockroach



# MONILIFORM (bead-like)



The segments of flagellum are globular and bead-like with clear constrictions.

Example : Termites



# PECTINATE (comb)



The segments of flagellum have long stiff projections on one side.

Example :

Female Arctiid moths



# BIPECTINATE (Double comb)



The segments of flagellum have long stiff projections on both sides.

Example : Male Lymantrids, Mulberry silk moth



# SERRATE OR DENTATE (tooth-like)

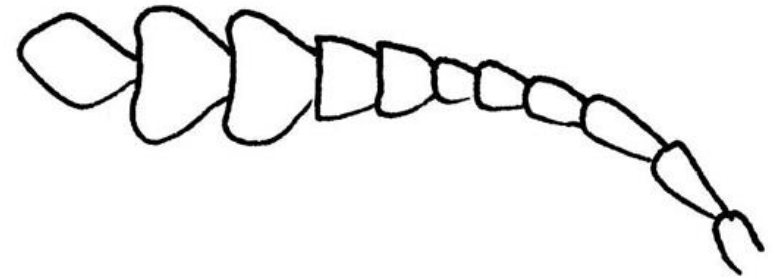


The segments of flagellum have tooth-like projections on one side.

Example : Pulse Beetles



# CLAVATE (club-like)

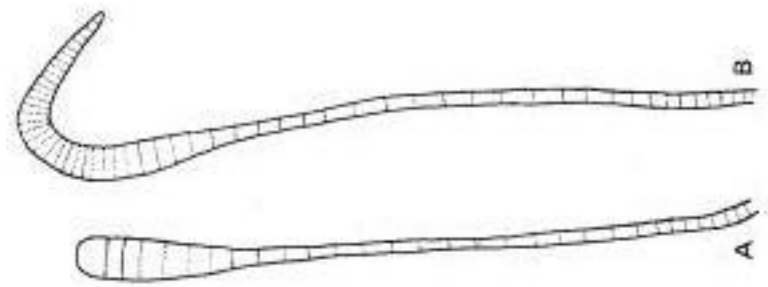


The segments of flagellum are gradually broaden towards apex.

Example :Butterfly



# Clavate with Hook



The segments of flagellum are gradually broaden towards apex structure with a terminal hook like curve

Example : Skipper Butterfly



# CAPITATE (knob-like)

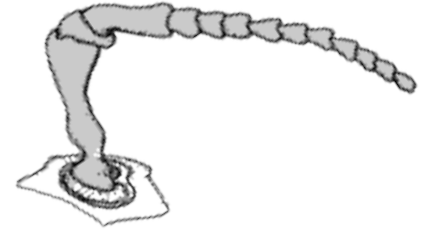


The segments of flagellum Suddenly thickened to form a knob-like structure.

Example : Red Flour Beetle



# GENICULATE (elbow-like)

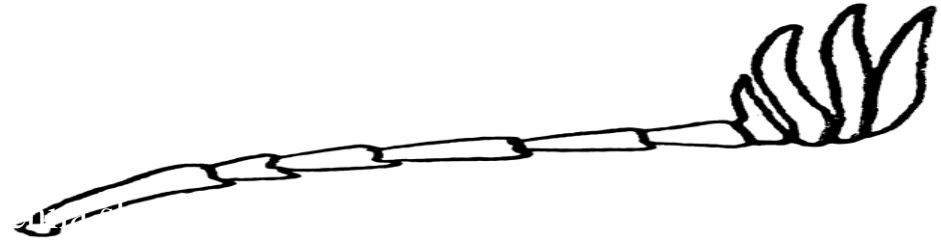


In these the scape is very long and flagellum forms a sharp bend like a flexed arm.

Example : Ant, Honey bee



# LAMMELLATE (Plate-like)



The terminal segment of flagellum are extended into leaf-like plates on one side.

Example : Rhinoceros beetle

Dung roller



# FLABELLATE (tongue-like)



The segments of flagellum are produced into long and thick tongue-like projections.

Example : Male stylopid



# PLUMOSE (feather-like)



The segments of flagellum have thick whorls of long hairs.

Example : Male mosquito



Male (Plumose)



# PILOSE (hairy)



The segments of flagellum have very thin whorls of hairs .

Example :Female mosquito



Female (Pilose)



# ARISTATE (arista-like)

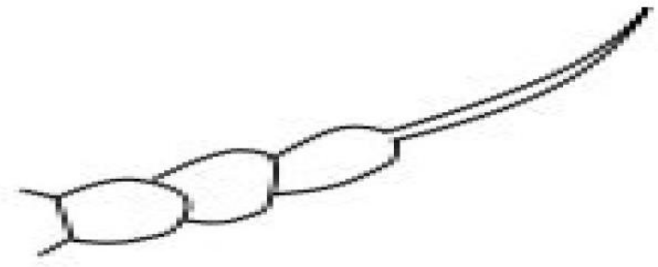


The segments of flagellum form an arista or bristle like structure on dorsal surface

Example : House fly

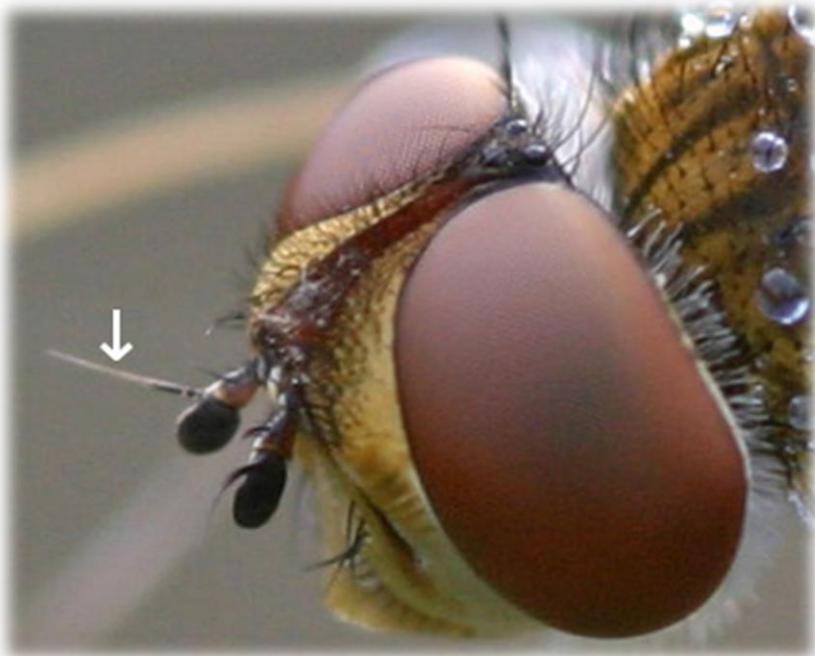


# STYLATE (styliform)



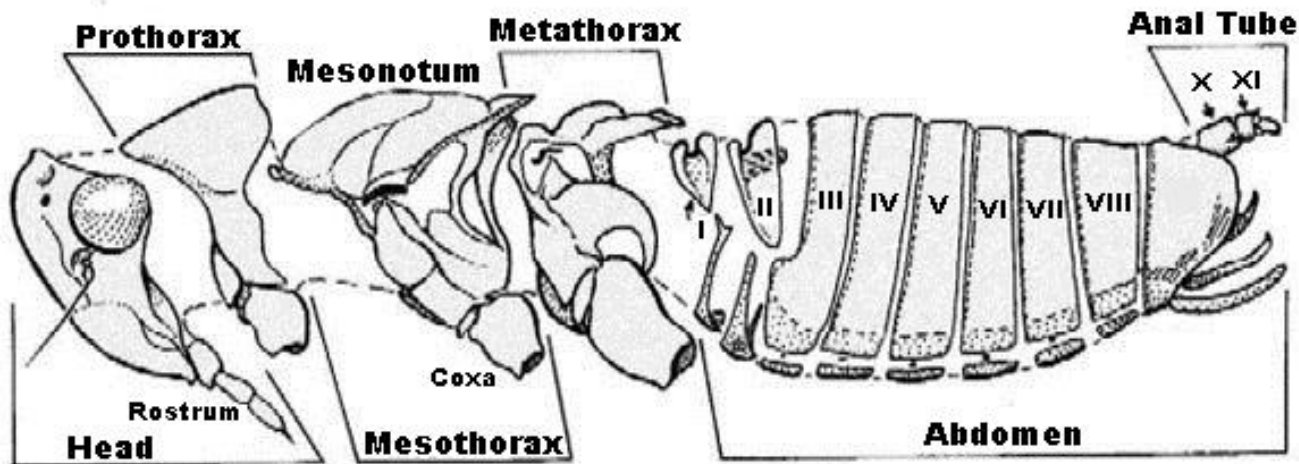
The flagellum forms a long unsegmented , terminal hair.

Example : Robber fly



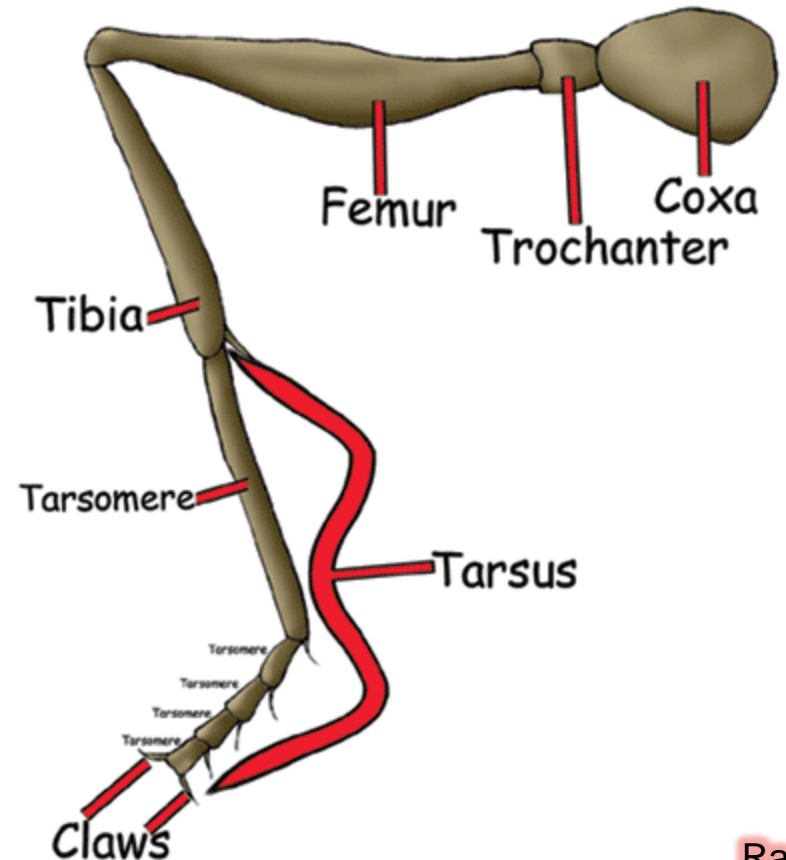
# Thorax

- consisting of three segments, Prothorax, Mesothorax and Metathorax
- Each possess a pair of legs and a pair of wings on meso and meta thoracic segment
- Meso and meta thoracic segments together known as **pterothorax**
- Sclerite of dorsal region of thorax is **tergum or notum**
- ventral region is called sternum and lateral region is called **pleuron**

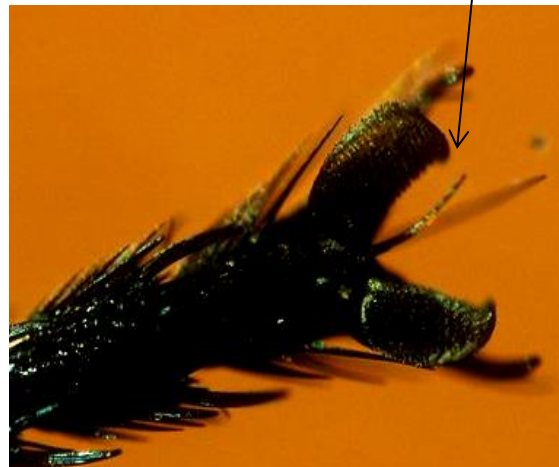


# Insect Leg and its Modifications

- All the three thoracic segments of an insect possess a pair of legs - **hexapods** and class insecta as **hexapoda**
- Insect leg consists of 5 parts viz. **Coxa, Trochanter, Femur, Tibia and Tarsus**.
- In primitive insects, a small sclerite known as **subcoxa** occur before the coxa which form the true basal segment



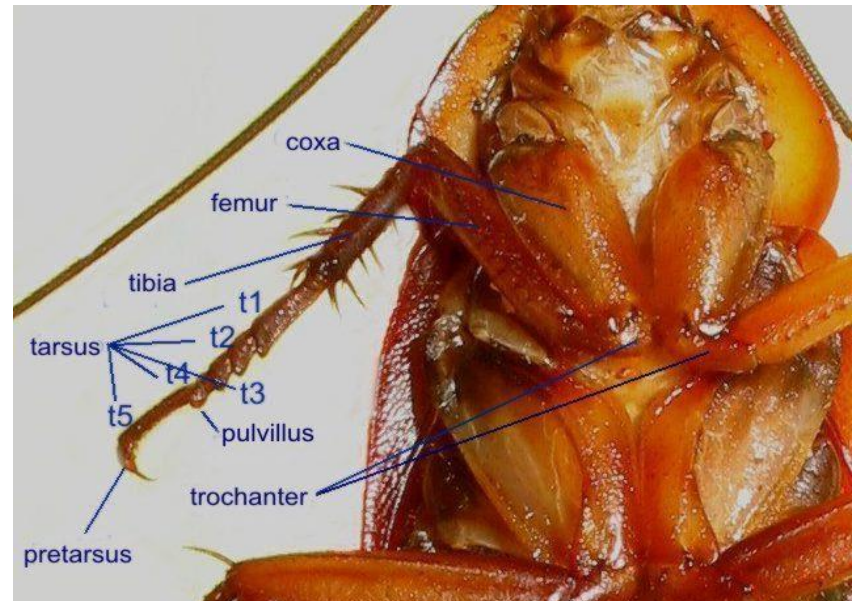
1. Coxa: It is the functional basal segment rigidly fixed to thorax or weakly articulated
  2. Trochanter : It is very small is articulated with coxa and more or less fixed to femur
  3. Femur : It is the largest, strongest segment and is articulated with the tibia
  4. Tibia : It is equal or more than the length of the femur, articulated with tarsus
  5. Tarsus : largest segment of the leg divided into **tarsomeres**, no. vary from 1-5 and are movable one on the other
- 1st segment is large, big or broad in size known as **basitarsus**
  - Tarsus at it's end consists of **pretarsus** with a pair of claws and cushion like **pulvilli**
  - In between the claws, if there is lobe like structure, it is known as “**aroleum**” as in **Orthoptera** and if it is bristle like, it is called “**embodium**” as in **Diptera**



- In some insects, the ventral surface of pretarsus consist of a median circular plate between the claws known as **unguitractor** where as the claws are known as **ungues**

# Modifications of Leg

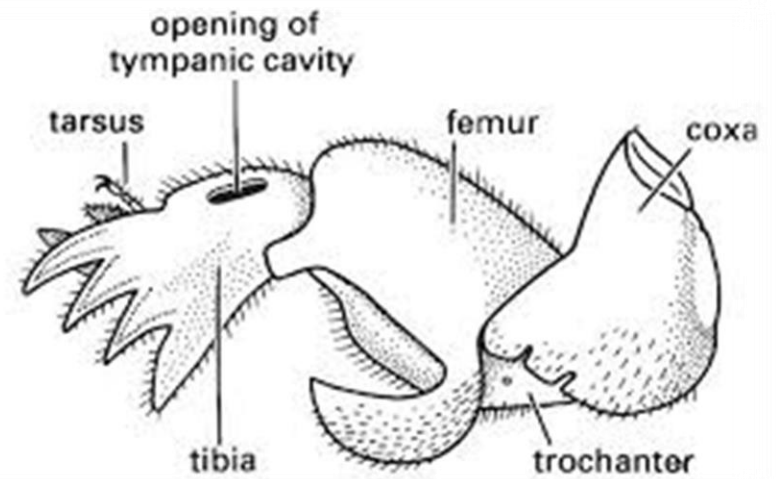
Type	Leg modified	Example	purpose	Modification
Cursorial	All legs	Blister beetle, wasp	Walking	All the legs uniformly well developed without any special modification
Ambulatory	All legs	Cockroach	Running	All legs are normal. coxa widely separated
Saltatorial	Hind legs	Grasshopper , gryllids	Leaping & jumping	Femur and tibia elongated
Fossorial	Front legs	Mole crickets, dung rollers	Digging	Tibia and tarsus short and broad with teeth like projections



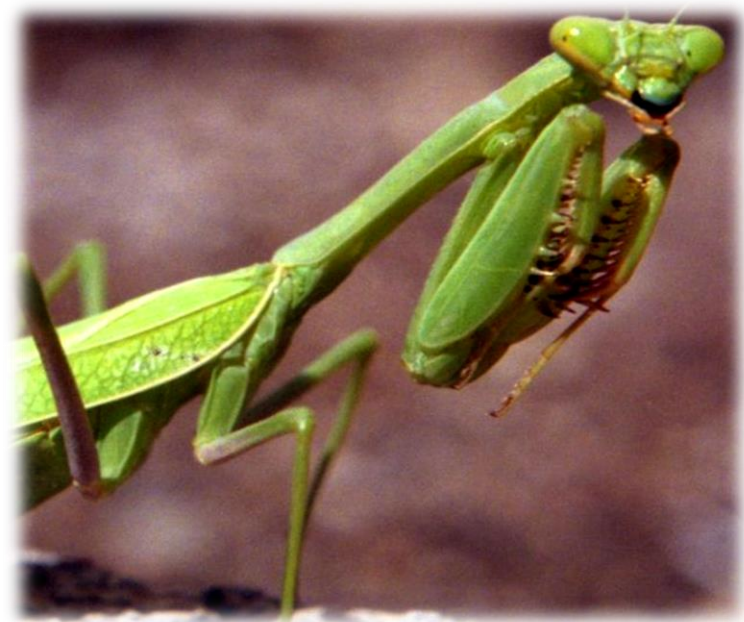
## Saltatorial



## Fossorial

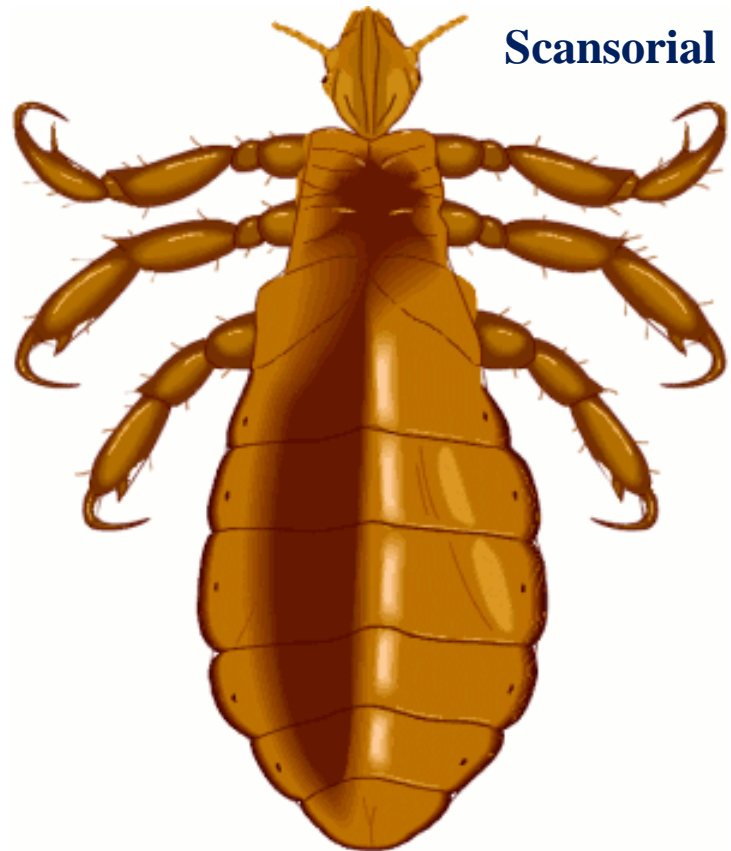


Type	Leg modified	Example	purpose	Modification
Raptorial (grasping )	Front legs	Preying mantids	Preying	femur spinose and possess a central longitudinal groove. Tibia narrow, blade like spinose and fits into the groove of femur
Natatorial	Hind legs	Water beetle, water bugs	Swimming	Hind legs pad like. Tibia and tarsus short and broad having dense long marginal hairs.
Scansorial	All legs	Head louse	clinging	Tibia possess tibial thumb. Tarsus single segmented and pretarsus with a single long curved claw





**Natatorial**



**Scansorial**

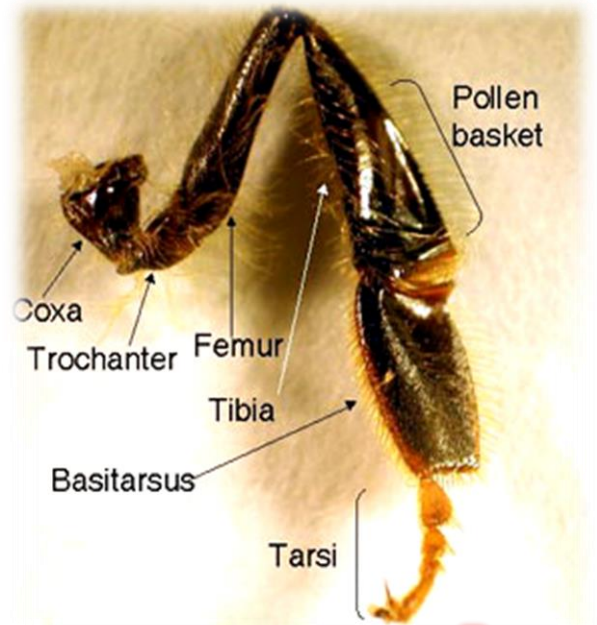
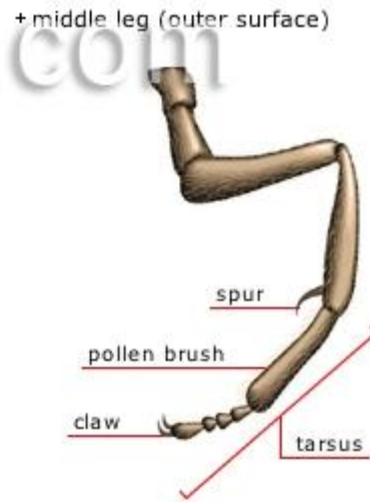
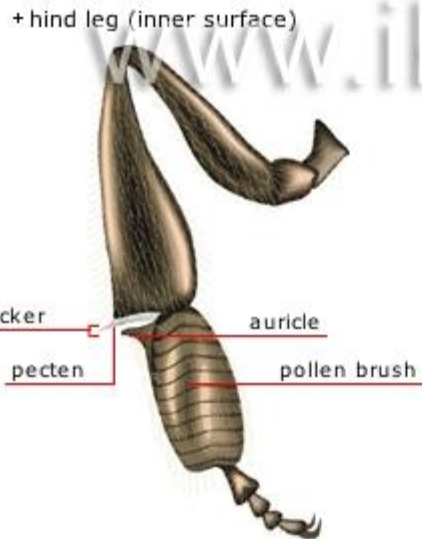
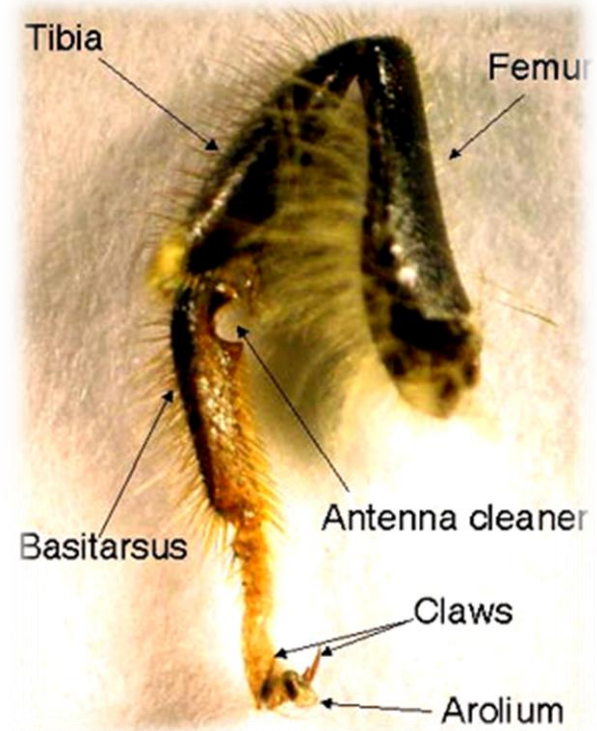
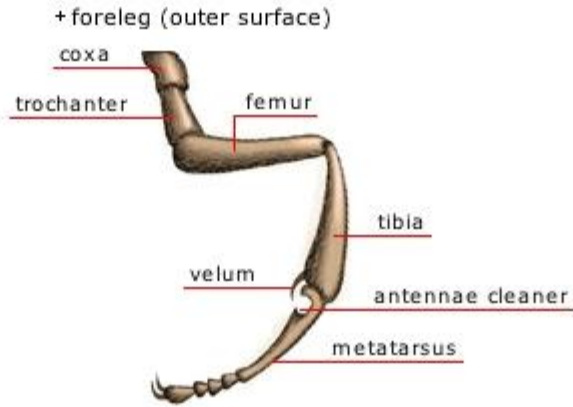


Type	Leg modified	Example	purpose	Modification
Prehensile	All legs together	Dragon flies	Catching prey, basket forming type	Thoracic segments obliquely arranged . Tergal plates are pulled backwards and Sternal plates pushed forward, resulting that all the legs pushed forward and seen below the head, together from a basket like structure useful for catching the prey even in flight



Type	Leg	Example	purpose	Modification
Antennal cleaning legs	Front legs	Honey bee	For cleaning antennae	Tibia possess a movable spine, and the first tarsal segment with a semicircular notch
Wax pick type	Middle legs	Honey bee	For picking wax plates	Tibia possess a spine called wax pick for removing the wax plates from the ventral side of the abdomen
Pollen basket and brush type	Hind legs	Honey bee	For collecting pollen and cleaning the body	Inner surface of large tibia has a groove and is used as pollen basket or 'Corbicula' for temporary storage of pollen grains. First tarsal segment enlarged and possess short stiff hairs 'Pecten' all over the surface called pollen brush.





# Legs of immature stages

The immature stage of exopterygotes i.e. nymph consist of only thoracic legs similar to its adult  
The endopterygote i.e. larva possess two types of legs. 1.Thoracic legs or true legs: Jointed, on 3 thoracic segments

2.Abdominal/prolegs: Unjointed sucker like legs, having flat, fleshy surfaced tip known as **Planta**.

Planta consists of hook like structures known as **Crochets** ,used for clinging to the substrate

The number of prolegs vary from 1-5 pairs distributed on 3rd, 4th, 5th, 6th and 10th abdominal segments

For example, sawfly larva has 6-8 pairs of abdominal prolegs. In some insects leg are degenerated e.g.: Coccidae; Endoparasitic hymenopterans.

