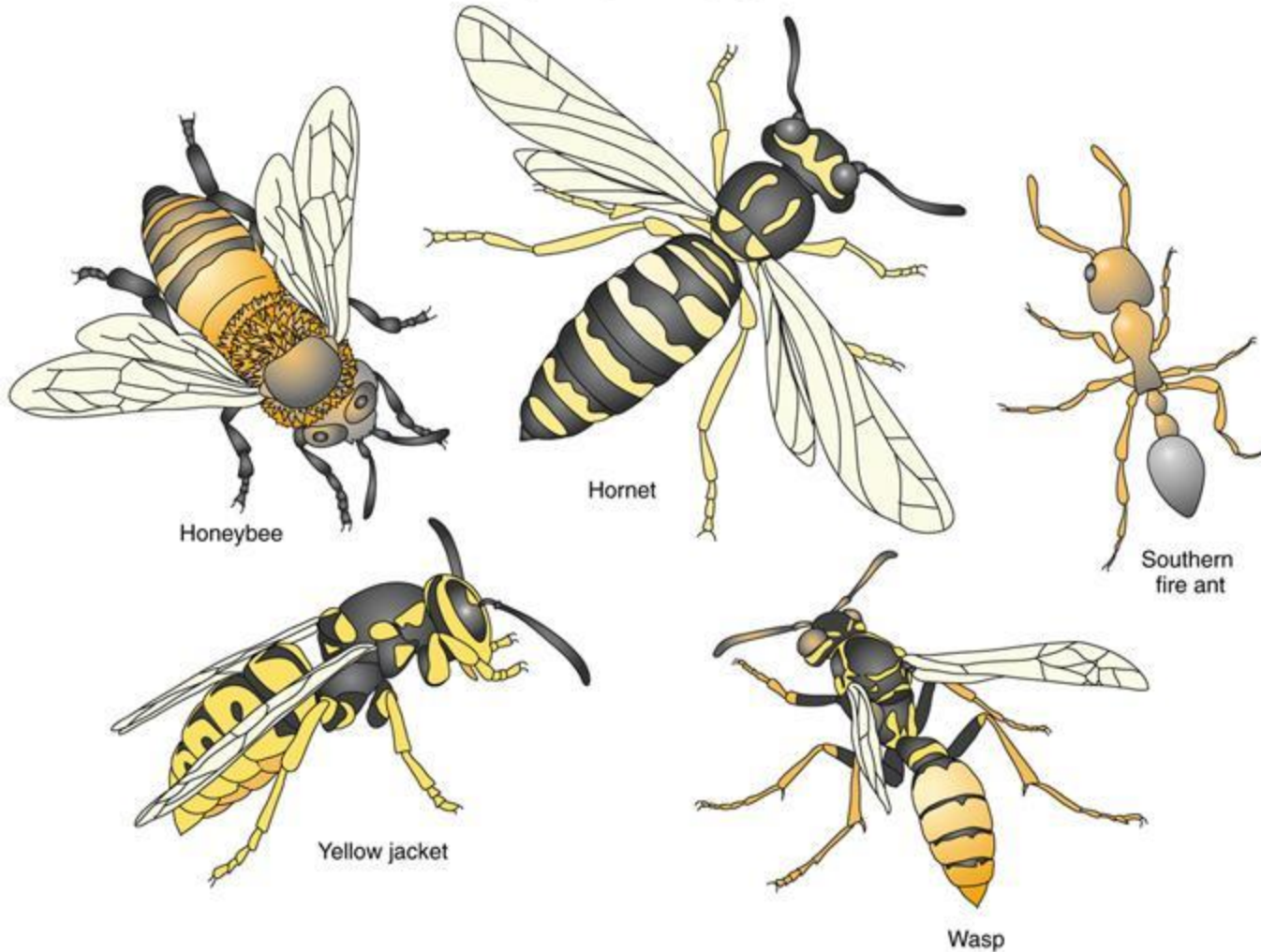


ORDER: HYMENOPTERA

Hymen = Membranous; pteron = wing

Wasps, bees, ants, sawflies

Hymenoptera stinging insects



- Beneficial order with **parasites, predators and bees involved in pollination, honey production**
- **Most of them are social living**
- Head prominent remarkably free with small neck
- Antennae variable usually exhibit **sexual dimorphism** being **longer in males**
- Mouth parts primarily adopted for biting and often for lapping and sucking also
- Usually two pairs of naked **membranous wings** are present with reduced venation
- Hind wings have a row of tiny hooks on anterior margin by which they attach to the fore wings
- Usually **stigma** is present in the **forewings** along the costal margin near the apex
- **Trochanter 1 or 2 segmented**
- Abdomen usually basally constricted to form pedicel or petiole
- 1st abdominal segment fused with metathorax- **propodeum**
- Second segment forms **pedicel**
- The remaining region of the abdomen is bulged one known as **gaster**
- Ovipositor very well developed and modified for sawing, boring, piercing, stinging etc
- Larvae are known as **grubs** with well developed head and usually apodous



Family : Tenthredinidae Sawflies

- Stout wasp like insects **without abdominal pedicel**
 - **Trochanter 2 –segmented**, front tibia posses **2 apical spurs**
 - ovipositor well developed with **2 pairs of flattened plates**
 - In many species, the **two sexes are different colored**
 - body segments are usually subdivided by transverse folds in to annulets
 - Provided with **6 to 8 pairs of abdominal legs** which are **devoid of crochets**
 - Larvae have glands resembling osmoteria, open on sternum the **first 7 abdominal segments**
- Eg: Mustard sawfly - *Athalia lugens proxima*



Family: Ichneumonidae

- Legs are provided with **conspicuous tibial spurs and strong claws**
- In forewings, the costal cell is wanting and have **two recurrent veins**
- **Petiole usually curved and expanded apically**
- Ovipositor very long often **longer than the body** arising anterior to the tip of abdomen
- Most of the members are **endoparasites** and undergo **hypermetamorphosis**
- **Caudal prolongation** of tail is present in **1st instar larvae**
- pupate in **inside the body of the host**

Eg: Larval parasite on jowar stem borer - *Xanthopimpla stemmator*

Larval parasite on stem borers of paddy and sugarcane top borer - *Isotima javensis*



Family: Braconidae Braconids

- Closely related to Ichneumonids
- Abdomen **sessile or sub sessile or petiolate**
- Costal cell is wanting in forewings with **one recurrent vein**
- Unlike Ichneumonids, many of these pupate in silken cocoons **on the outside of the body** of the host
- **Polyembryony** occurs in a few species of this family

Eg: Larval parasite on jower stem borer - *Apanteles flavipes*

Larval parasite on coconut, black headed caterpillar - *Bracon hebetor*



Family: Trichogrammatidae

- Minute insects with three tarsal segments
 - **Microscopic hairs on wings arranged in rows**
 - Egg parasitoids on lepidopterans
- Eg: *Trichogramma minutum*, *T. Chilonis*, *T. Japonicum*

Chalcididae: Chalcid wasps

- Hind femur with rows of short teeth
 - Wings not folded longitudinally at rest
- Eg. *Brachymeria* sp



Eulophidae:

- A protibial spur is present
 - Antennae has 2-4 funicle segments and 10 antennomeres
- Eg. *Trichospilus pupivora*



Elasmidae:

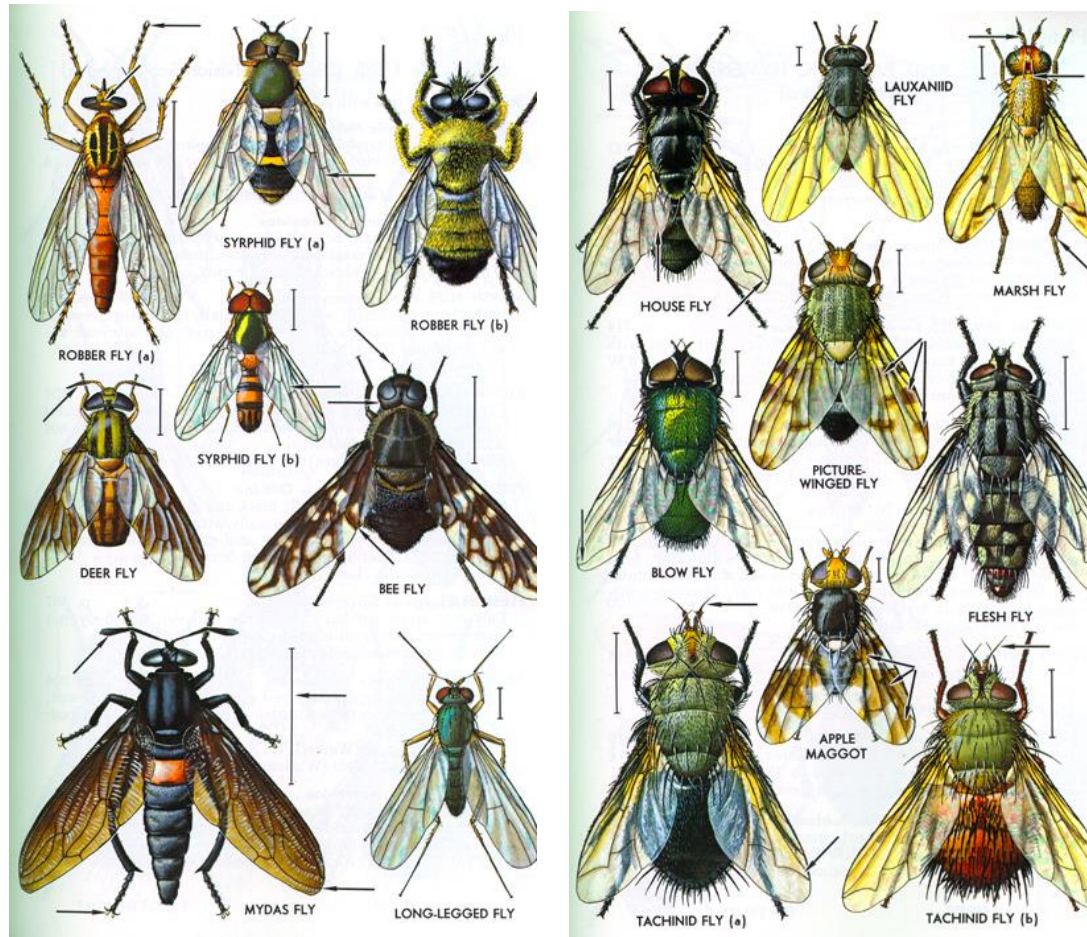
- wavy or diamond shaped pattern of setae on hind tibiae
- Eg. *Elasmus brevicornis*



Apidae: Honey bees

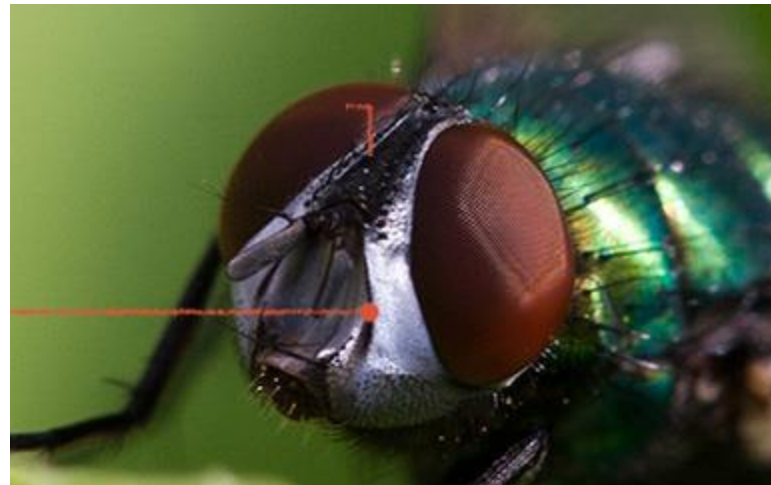
- Social living
 - 3 pairs of legs are modified into antennal cleaning, wax pick and pollen basket resp.
- Eg. *Apis Indica*

ORDER: DIPTERA



Dip = Twice, pteron = wings
Flies and mosquitoes
(two winged insects or true flies)

- **Ptilinum or frontal sac** is characteristic feature of cyclorrhapha indicated by the ptilinal suture
- It is a retractile bladder like organ employed to **break open the puparium**
- Antennae mostly 3 segmented (except in Nematocera) and **aristate**
- In many they are piercing and sucking and in others they are **sponging (lapping) with labium distally expanded in to a pair of fleshy lobes**
- **Mesothorax large supporting the functional wings**, pro and meta fused with mesothorax
- Only front pair of wings present. Hind pair modified into **halters which act as balancers**
- Legs well developed, **pulvilli and an empodium** Usually present
- Larvae eruciform and apodous known as **maggots** mostly **amphipneustic**
- Pupa either free or enclosed in the larval cuticle known as **puparium (coarctate pupa)**



Family: Cecidomyiidae Gall midges; gall flies

- Antennae long, **moniliform with whorls of hairs**
- Larvae live in plants **forming galls**
- The **head is greatly reduced without mandibles**
- In the last larval instar, **sternal spatula/breast bone** on ventral side of prothorax
- **Paedogenesis** is seen in some members of this family

Eg: Rice gall midge -*Orseolia oryzae*

Hessian fly on wheat -*Phytophaga destructor*



Family: Tephritidae (Trypetidae) Fruit flies

- Wings large **mostly pictured**
- Middle legs tarsi with spurs**
- Ovipositor is **horny and flattened** and usually 3 segmented
- Adults are visitors of flowers, fruits and foliage
- Larvae **phytophagous, Amphipneustic**

Eg: Fruit fly on cucurbit- *Dacus cucurbitae*

Fruit fly on guava- *Chaetodacus incisus*

Family: Agromyzidae Leaf miner flies

- **Femora of the legs bristled**
- Wings by hyaline or pictured
- **Vibriosae** are generally present
(a pair of stout bristles on each side of the face just above the oral margin longer than other bristles on the vibrissal ridge)
- **mine in the leaves producing characteristic blotches**
Eg: Redgram podfly- *Melanagromyza obtusa*
Pea leaf miner -*Phytomyza atricornis*



Family: Tachinidae Tachinid flies (Parasitic flies)

- **Pteropleural bristles** are present
- Abdominal **sternite overlapped by tergites** on the sides
- Abdomen with long, **marginal, dorsal and apical bristles**
- Larvae mostly parasitoids. Few are saprophagous
- **Metapneustic in first instar and amphipneustic subsequently**
Eg. *Sturmiabimaculata* – parasitoid on Spodoptera and other
Stomatomiabezziana- parasitoid on black headed caterpillar

Family: Muscidae Flower flies, root maggots, shoot flies, house flies

- Fine erect hairs on the under surface of scutellum and **more than one stereo pleural bristles**
- Abdomen bristly with somewhat constricted base usually 4-5 segmented
- Vein Cu2 + 2A is short and do not reach the wing margin
- Larvae **cylindrical and truncate posteriorly**
- Eg: Jowar shootfly-Atherigona soccata

