

# **Insect classification and biodiversity**

## **ENT-304**

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[makuaf@gmail.com](mailto:makuaf@gmail.com)

*Chrysoxylum* sp.  
Goldschlagensfliegen



*fasciolatum*  
Weib. des ♀, die ich V. albopileatum nenn.



*subulatum* von Lepelletier



*pro subulatum* von Lepelletier



*Paragus*  
Lach.

*libialis* Fall. u. *obscurus* sp. n.

*var. femoralis* sp. n.

*var. laevigulatus* Fall.

*var. haemorrhoidalis* sp. n.

*var. curvatus* sp. n.

*var. pallidus* sp. n.

*Libella* sp. n.

*var. areolaris* sp. n.

*var. testaceus* sp. n.

*var. testaceus* sp. n.

*var. testaceus* sp. n.

*var. testaceus* sp. n.

*Pyralisella* sp. n.  
Blattfliegenlarven

*var. testaceus* sp. n.

*var. testaceus* sp. n.

*var. testaceus* sp. n.

*var. testaceus* sp. n.

# DIPTERA (Two wings)

Members having only one pair of front wings,

Hind pair of wings are reduced and modified into **halteres**

They are commonly known as **flies, mosquitoes** etc.

## **Characters**

### **Head**

Mouthparts are sponging type, or piercing and sucking, rasping and lapping type etc.

### **Thorax**

Hind wings modified into halteres

# Classification

It is divided into three suborders

## **1. SUBORDER NEMATOCERA:**

- Antennae – many segmented – usually longer than the head and thorax.
- Pleural suture of the mesothorax – straight
- Discal cell – absent

## **2. SUBORDER BRACHYCERA:**

- Antennae – shorter than the head and thorax – variable – generally 3-segmented
- Pleural suture – twice bent
- Discal cell – present

## **3. SUBORDER CYCLORRHAPHA:**

- Antennae – 3 segmented with an arista usually present in dorsal position
- Pleural suture – twice bent
- Discal cell – present

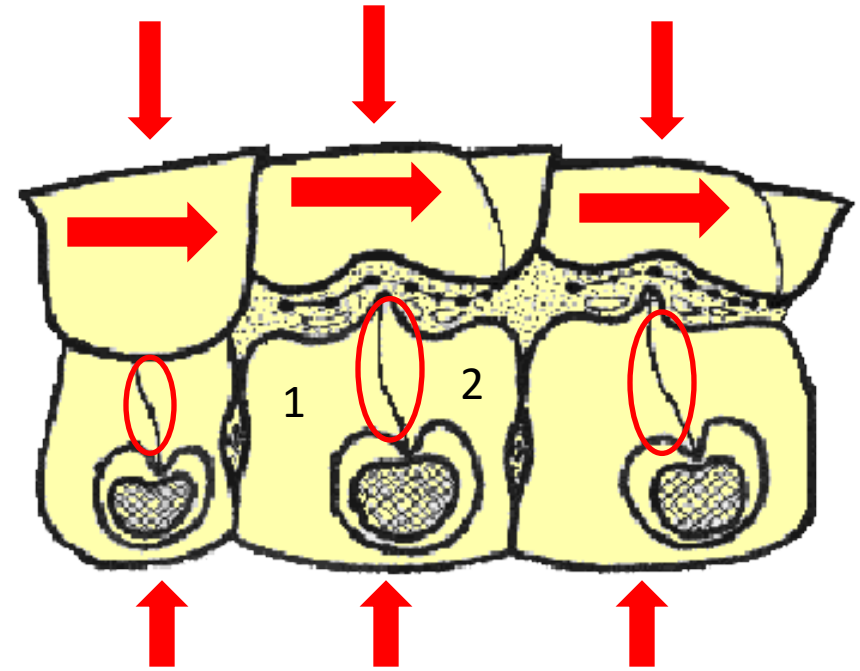


# Thorax

These segments are joined together rigidly to form a “box” that houses for the legs and wings.

The side of each segment is called the pleuron — it is usually divided by a pleural suture into at least two sclerites:; an anterior episternum<sup>1</sup> and a posterior epimeron<sup>2</sup>.

The ventral sclerite of each segment is the sternum (prosternum, mesosternum, and metasternum).

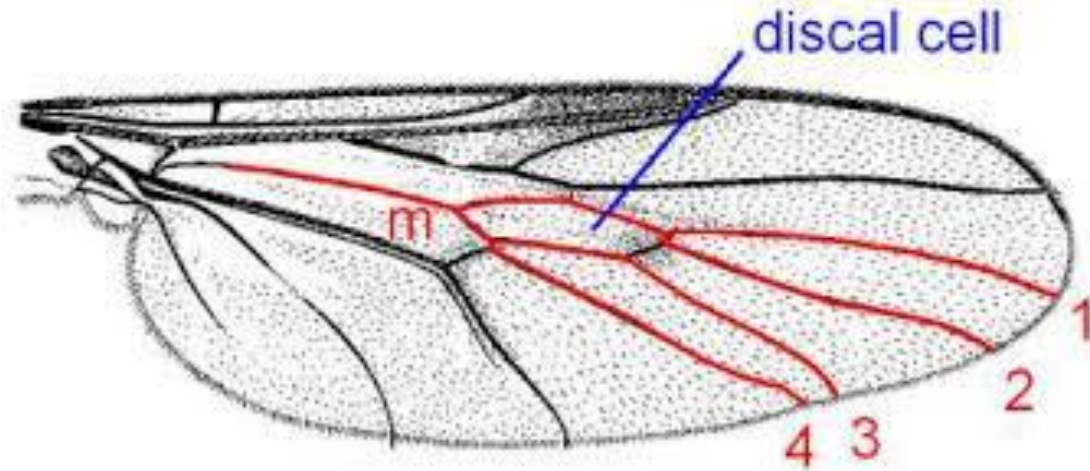


Thorax is composed of three body segments: prothorax, mesothorax, and metathorax.

Each segment has a dorsal sclerite, the notum (pronotum, mesonotum, and metanotum)

# Wing

**Discal cell:** A closed cell in the centre of the wing bordered by longitudinal veins and closed by cross-vein



Nematocera

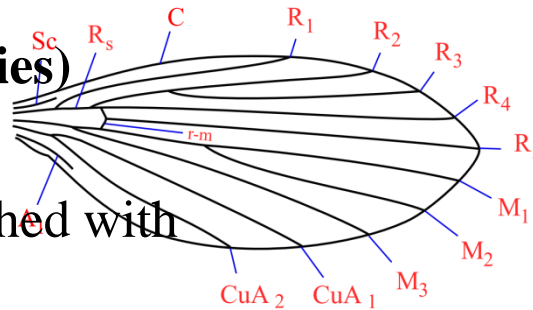


Brachycera

# Families of the suborder Nematocera

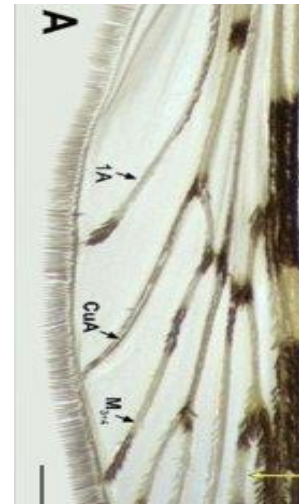
## **FAMILY PSYCHODIDAE: (Sand flies)**

1. These are minute moth like flies
2. The body, legs and wings are clothed with long hairs
3. Wings with Rs 4-branched and no obvious cross vein is present.



## **FAMILY CULCIDAE: (Mosquitoes)**

1. Antennae are densely hairy (plumose or pilose)
2. Wings are fringed with scales along the posterior margin



## **FAMILY SIMULIDAE: (Black flies)**

1. Antennae are 11-segmented and short
2. Wings are broad and interior veins are thickened
3. Legs are short



# Families of suborder Brachycera

## **FAMILY TABANIDAE: (Horse flies)**

1. 3<sup>rd</sup> antennal segment is annulated
2. Eyes are very large.
3. Pulvilli and arolium is pad-like.

## **FAMILY ASILIDAE: (Robber flies)**

1. Vein R1 is very long
2. Pulvilli large and empodium bristle-like.

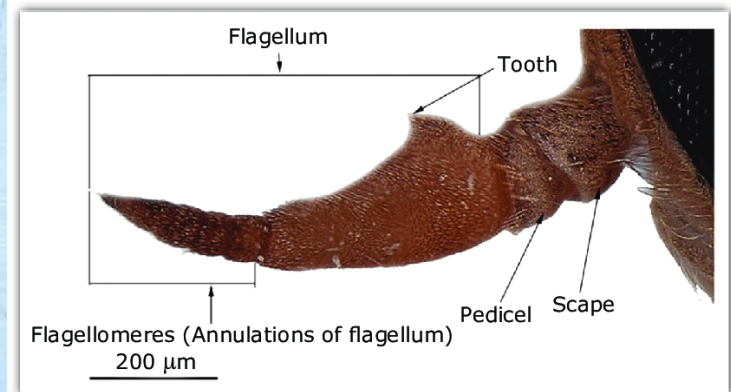
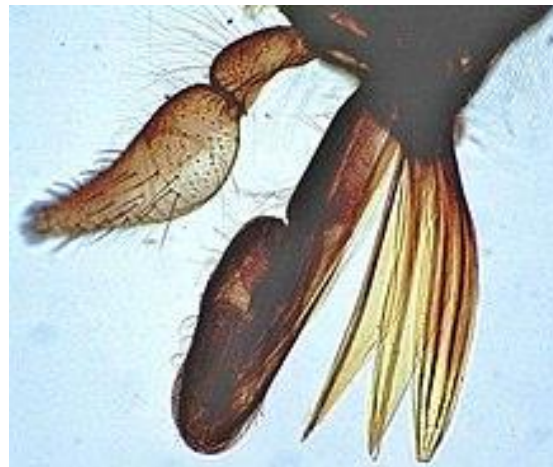
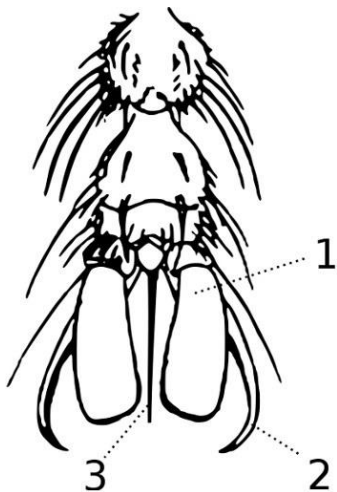


**ANNULATION** refers to the structural ‘subdivision’ of the flagellum into several flagellomeres that are often called annuli

Each annulus carries a number of sensilla, allowing the insect to determine the location, taste

**PULVILLI** are lobes or pads that are located between the tarsal claws of many insects. The pads have adhesive properties, including the use of an adhesive fluid, and this helps the insect stick to the surface on which it is standing

Many insects possess a lobe or spine between the two claws at the end of the tarsus. This lobe or spine is called an **EMPODIUM**.



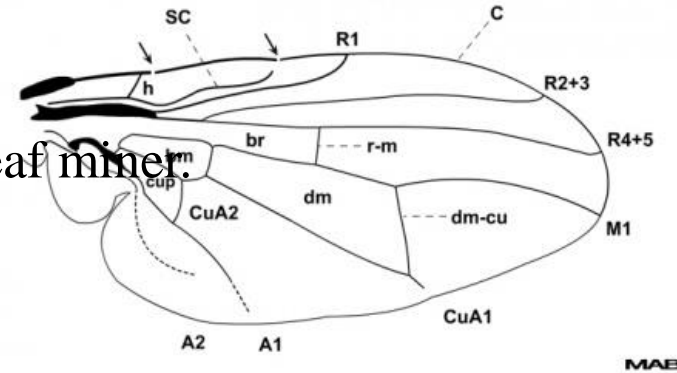
# Families of the suborder Cyclorrhapha

## **FAMILY SYRPHIDAE: (Hover flies)**

1. Moderate to large sized flies with brightly coloured markings.
2. Vena spuria is present between R and M.

## **FAMILY AGROMYZIDAE: (e.g. leaf miner)**

1. These are minute flies and larvae are usually leaf miner.
2. Vein Sc is reduced

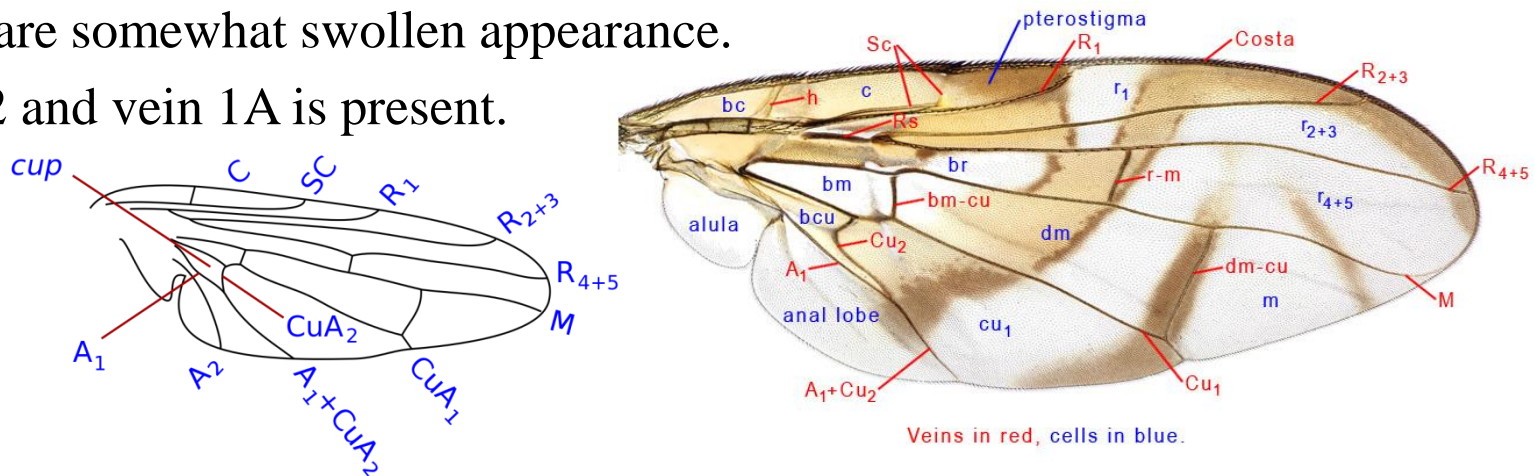


## **FAMILY TEPHRITIDAE: (e.g. Fruit flies)**

1. Many species frequently with pictured wings.
2. Costal cell is wide and the Sc ends shortly angled

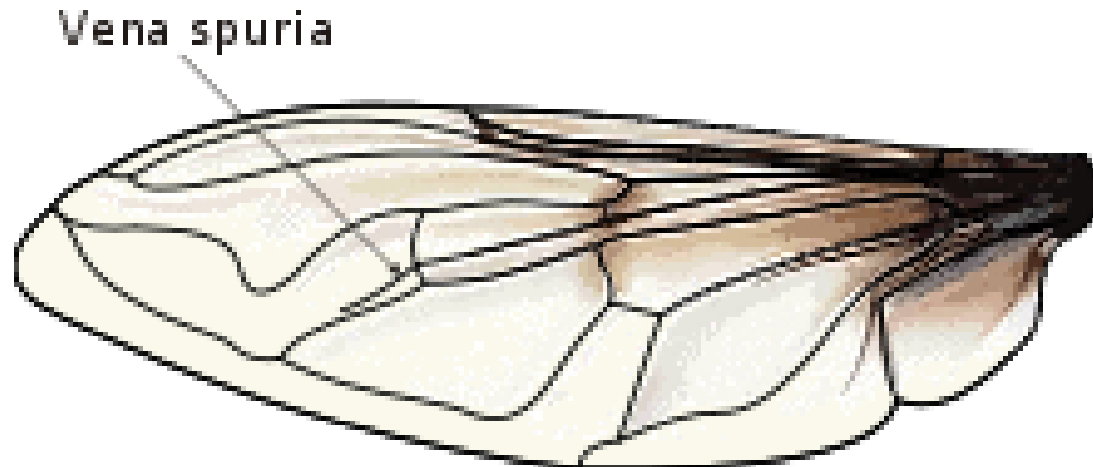
## **FAMILY DROSPHILIDAE: (vinegar fly, *Drosophila melanogaster*)**

1. Species are somewhat swollen appearance.
3. Cell Cu2 and vein 1A is present.



# How to see if it is a Syrphidae?

- In the field you can quickly see if its a Syrphidae due to its flying behavior
- In general "Hovering" in one spot in the air this is most probably just an hoverfly. Wasps, bees and bumblebees are not so athletic in the air.
- Also interesting to know: Hoverflies do NOT STING you!
- The real prove is in the wing where there is an unused vein called "**VENA SPURIA**":



**FAMILY MUSCIDAE: (House fly, Stable fly, Tsetse fly etc.)**

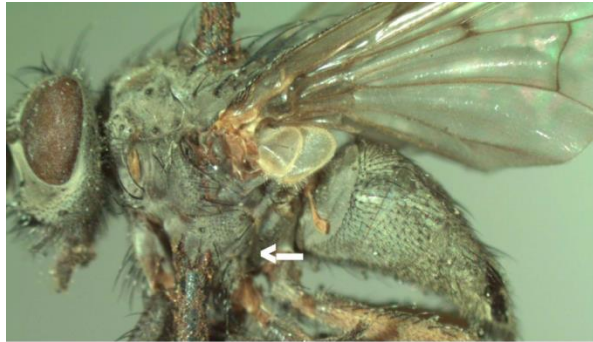
Hypopleuron bristle is present.

Pteropleural bristle is absent.

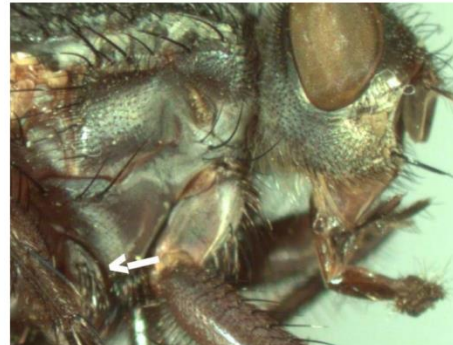
**FAMILY CALLIPHORIDAE: (Blow fly)**

1. Pteropleural and hypopleural bristle are present.

2. 2<sup>nd</sup> abdominal sternite with its sides is overlapped by the tergite



) Hypopleura with bristles.....7



In some Diptera, two rows of bristles, one on side of the thorax, from below and in front of the halteres to above the base of the hind legs.

## **Collection**

These flies can be collected from different sources of their habitat like rotten fruits, vegetables and plant materials. Their maggots can be brought from their hosts and reared in the lab



**Lepidoptera (scale wings)**

# General characters

## Head

- Antenna clavate (butterfly) or varies (moth)
- Mouthparts siphoning type – coiled proboscis
- Proboscis formed from galea of the maxilla

## Thorax

- Wings – membranous
- Few cross-veins

# Classification

## **TWO SUBORDERS**

### **Rhopalocera or Jugate (butterflies)**

- Antenna clavate forming club at the end
- Wings are covered with sclae

### **Heterocera of Frenate (moths)**

- Antenna not clavate
- Body, antenna, wings and legs covered with scale

## **FAMILIES OF SUBORDER RHOPALOCERA OR JUGATE**

## ❑ FAMILY PIERIDAE

- Small to medium sized butterflies, which are Usually white or yellowish in colour with the wings margins black in colour.
- The fore legs are well developed with claws bifid (two branched).
- **E.G: \_ Cabbage butterflies, *pieris brassicae***





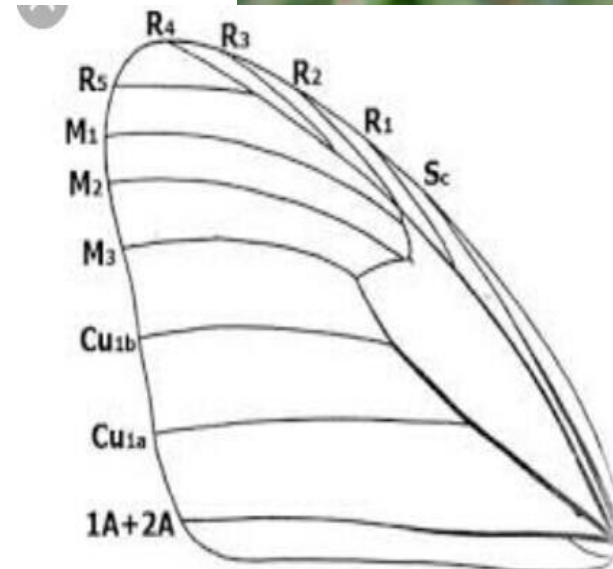
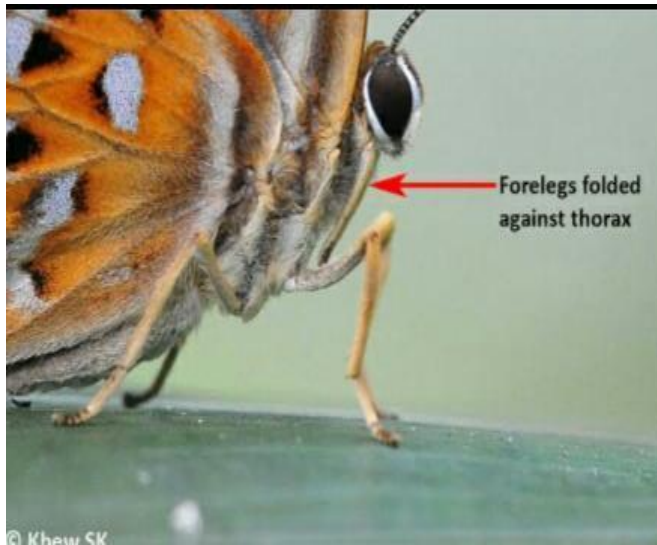
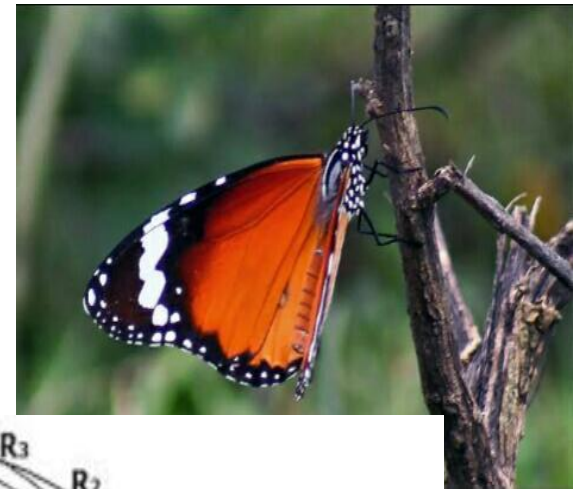
## □ FAMILY PAPILIONIDAE

- Medium to large in size, - a tail like prolongation is present on the hind wings
- 2-3 anal veins in the front wings and only 1 anal veins in the hind wings present
- Greenish colour with black and red markings
- Cubitus in the front wings is 4 branched.



# Family Danaidae e.g. Ak butterfly

- Large butterflies which are usually reddish or brown in colour with black and white markings
- Front legs are very small and without claws
- Radius in front wings is 5 branched.



# Family Hesperiidae (e.g. Skipper)

- Small butterfly
- Differ from other butterflies in having radius (R) without 5 branches in the front wings
- Antennae are widely separated at base and usually re-curved at tips.
- Wings are dark brown with very minute white dots.



# Family Lycaenidae (e.g. Anar butterfly)

- Small to moderate butterflies
- Upper side of wings is metallic blue or coppery
- Lower side of wings has dark centred eye-spot.



# **Families of suborder Heterocera and Frenate**

**Moths**



# Family Sphingidae (Hawk moth)

- Heavy bodied moth having long narrow front wings
- Antennae - thickened in middle
- Proboscis is very Long



# Family Saturniidae (Giant silkworm moth)

- Largest Moths
- Wings have transparent eye spot
- Antennae are Bipectinate.



# Family Epipyropidae (Epipyrops)

- Parasites of plant hoppers
- Minute moth,
- Larvae ectoparasite on hoppers
- Larvae feed on dorsal side of abdomen under the wings



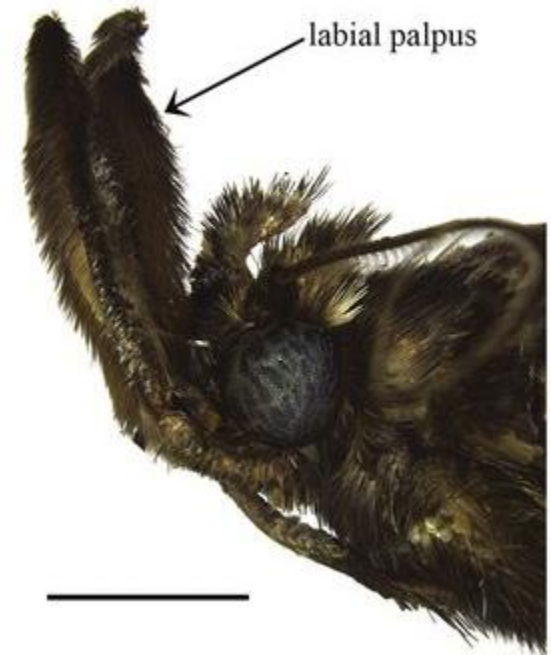
# Family Bombycidae (silkworm moth)

- Heavy and hairy body
- No proboscis in adults
- Creamy white in colour with several brownish lines across front wings
- Antennae are bipectinate.



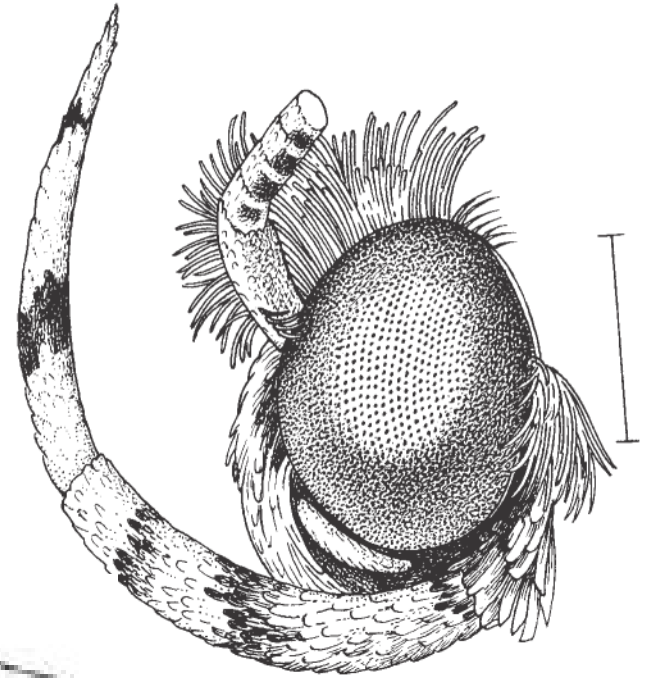
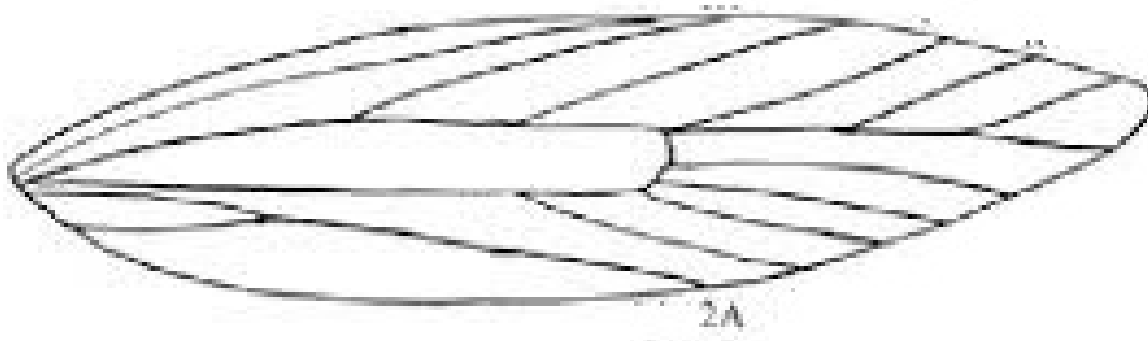
# Family pyralidae (pyralid moth or borers)

- Mostly small
- Fore wings elongate or triangular
- Cubitus – 4 branched
- Labial palpi project out to form snout (also called snout moth)



# Family Gelechiidae eg. PBW

- Labial palpi long and up curved
- 2A forked at the base in fore wings





# Family Gracilariidae (leafminer)

- Small moth
- Makes tunnels in the leaves
- long hairs on the forewing and hindwing



# Olethreutidae (codling moth)

- Medium sized brownish moth



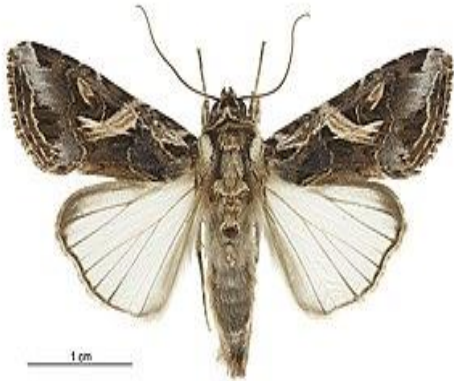
# Olethreutidae(cont....)

**Tip of wing is square in Shape  
just like a square bracket.**



# Noctuidae

- Largest family having medium sized moths of dull color (e.g. army worms, tobacco caterpillar, cutworms etc).



Spodoptera  
litura  
(tobacco  
caterpillar)



Agrotis ipsilon  
(black  
cutworm)



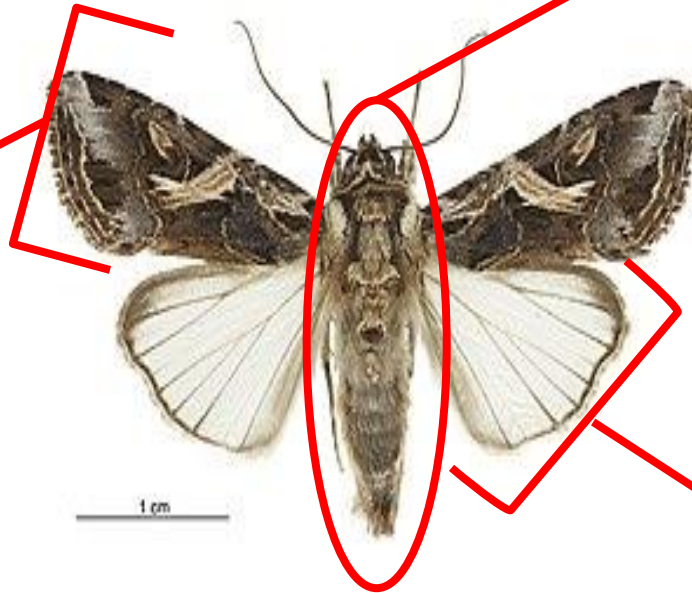
Spodoptera  
frugiperda  
(fall armyworm)

# Noctuidae (cont....)

1. Heavy body

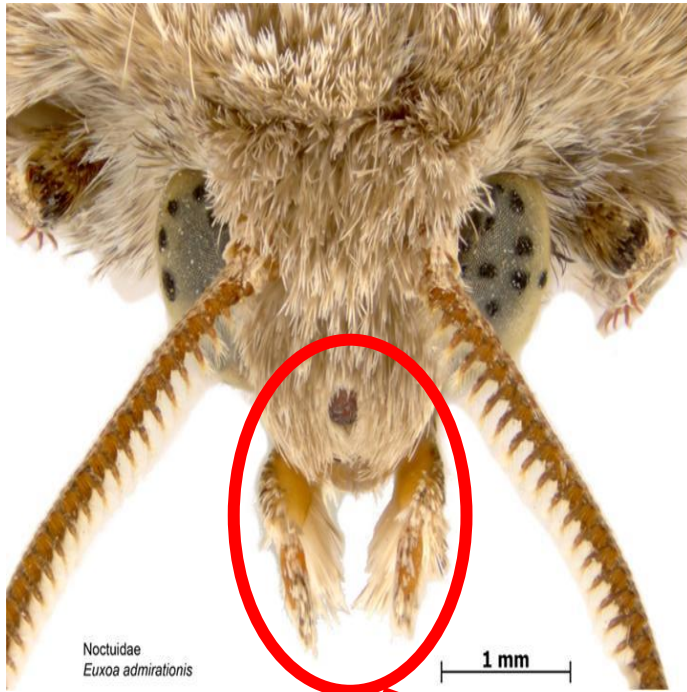
2. Front wing narrower than hind wing

3. Broadened hind wing





# Noctuidae (cont....)



Long labial palpia



# Trichoptera (Hair wings)

- Small to medium sized insects
- Somewhat similar to moths in general appearance bear hairy wings
- Commonly called Caddisfly



# Characters

## Head

- Antenna are long – setaceous
- Mouthparts are chewing type



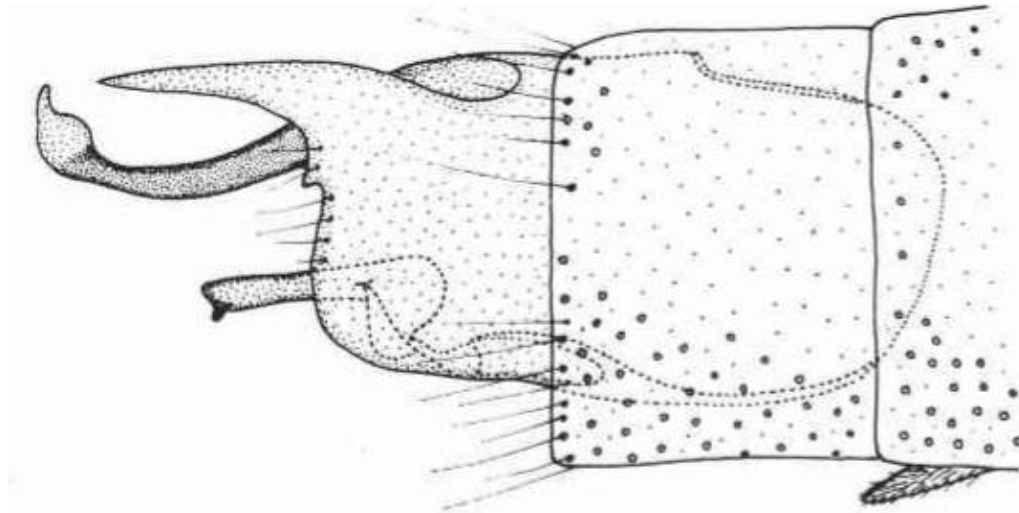
## Thorax

- Wings are membranous – hairy
- Wings held roof like over abdomen at rest



## Abdomen

- Claspers are well developed at the end of abdomen



- Larvae are aquatic and live near ponds, lake, stream etc

**Family:** Hydroptillidae

**Collection:** Insects can be found sitting on grass, ground

# Hymenoptera

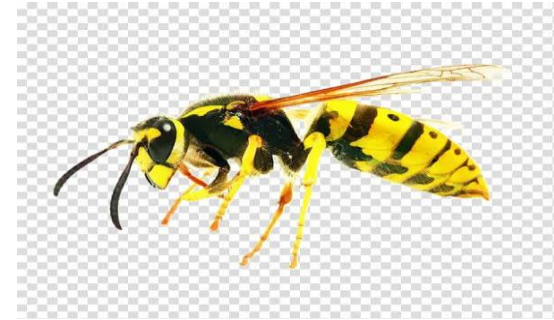
## (Hymen—membrane ; ptera—wing)

Members having a pair of membranous wings and they are commonly called **Bees, Wasp, Ants**

**Characters:**

**Head:**

- Antenna are mostly geniculate but extremely variable – may be filiform, clavate, pectinate, branched, verticillate and longer in male than female.
- Mouthparts are biting and chewing, lapping or sucking type.

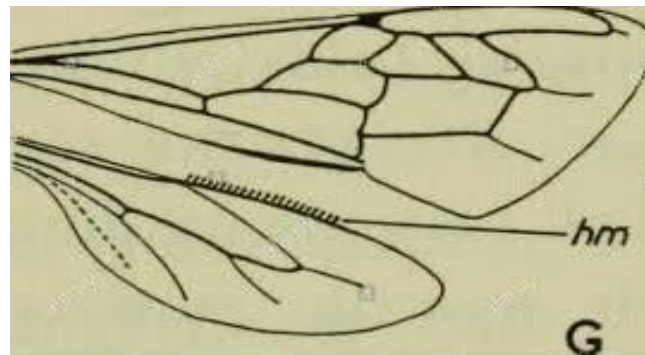


## **Thorax:**

- Wings are membranous
- Venation greatly reduce
- Hindwings are smaller than forewings and interload with Hamuli

## **Abdomen:**

- Usually at the base constricted its 1st segment fused with the metathorax
- Ovipositor is modified for sawing, piercing or stinging





# Classification:

It has two suborders

## 1. Suborder Symphyta:

- Abdomen broadly attached to the thorax
- No marked constriction between the 1st and 2nd abdominal segment

## 2. suborder Apocrita:

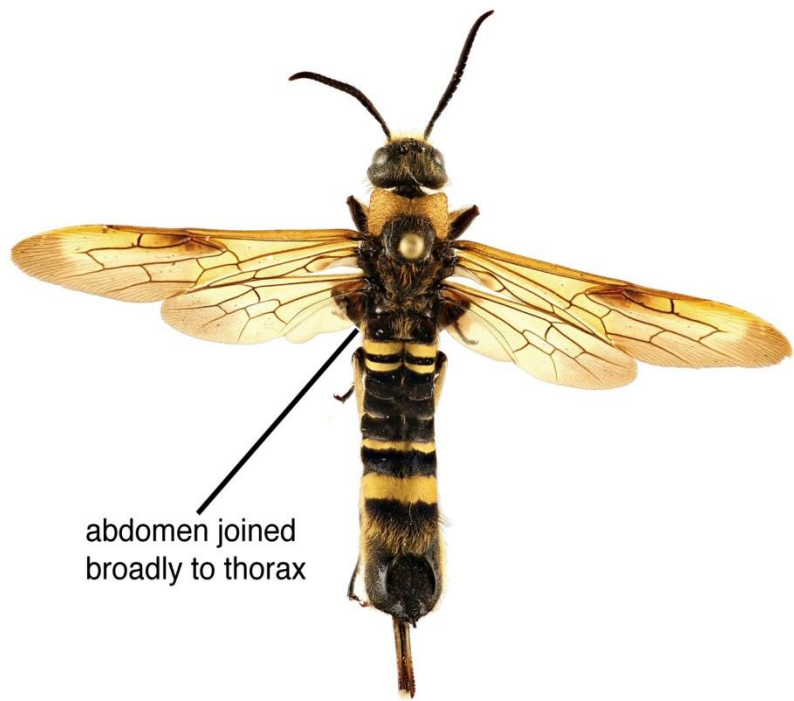
- Abdomen deeply constricted between 1st abdominal segment (propodeum) and 2nd abdominal segment.



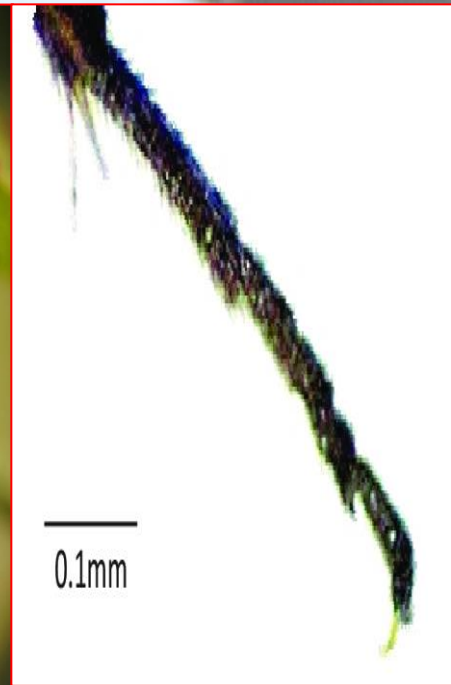
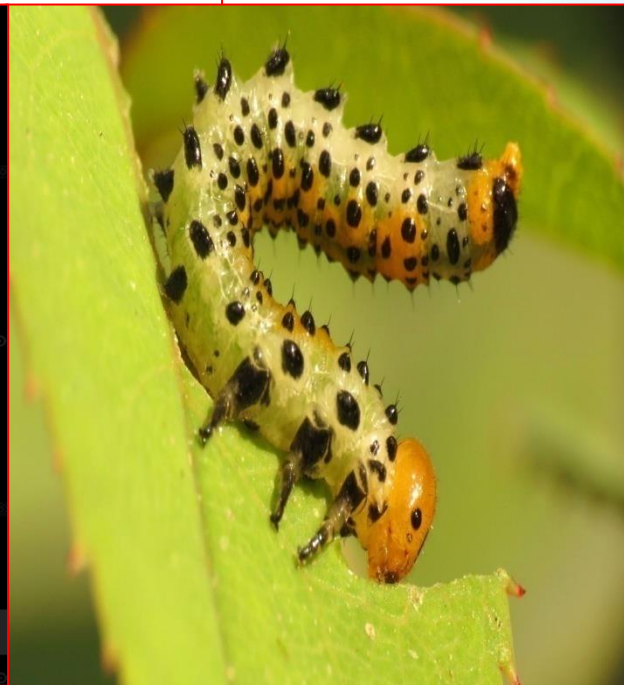
# Suborder Symphyta

## Family Tenthredinidae (true Sawflies)

- Subcalvate antenna.
- Broad connection between thorax and abdomen.
- Caterpillar like Eruciform larvae.
- Saw-like appearance of ovipositor.
- Fore tibia with 2 apical spurs.



abdomen joined broadly to thorax



0.1mm

## **Family Xiphydriidae (Wood wasps)**

- Subclavate antennae.
- Fore tibia with 2<sup>nd</sup> spur small or absent



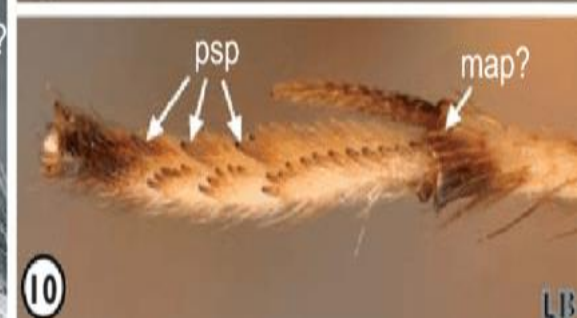
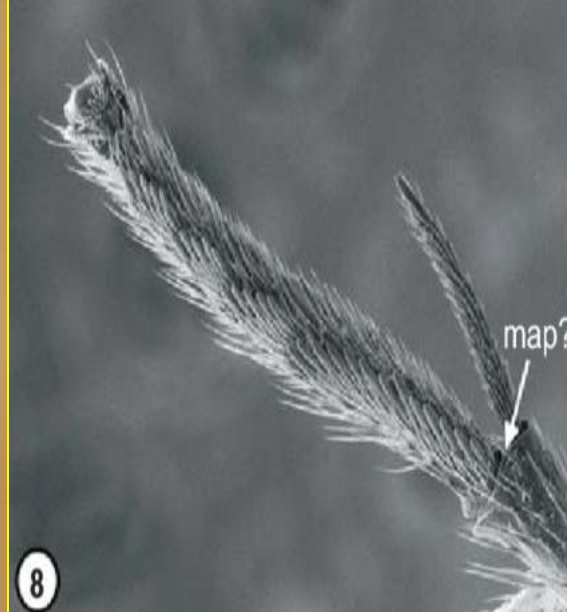
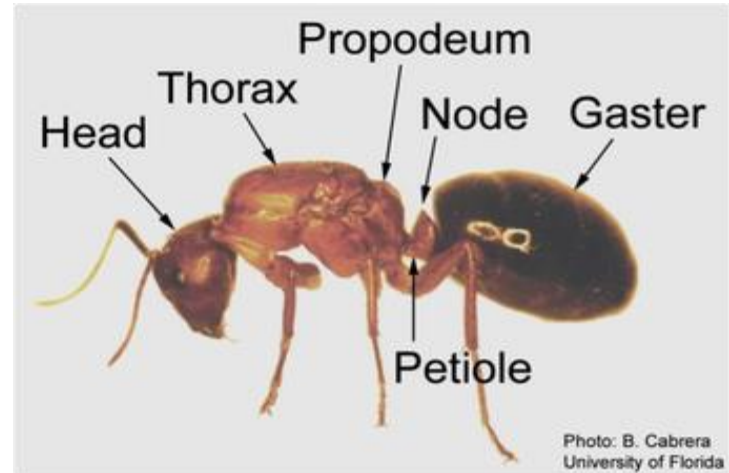
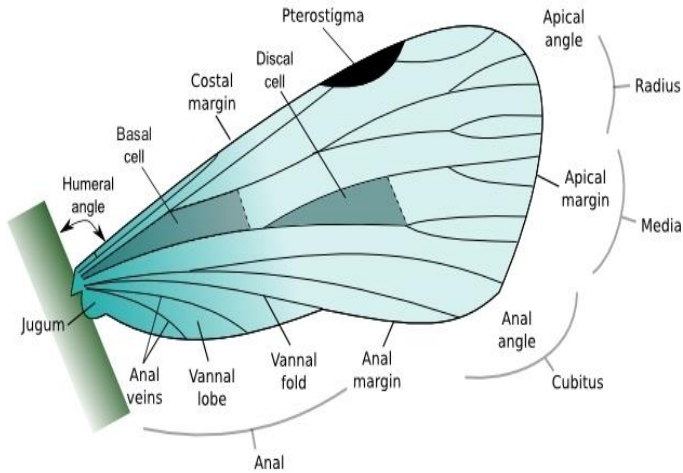


Photo: Wood Wasp laying eggs (by Alistair Constable)

# Suborder Apocrita

- **SuperFamily:- ichneumonidae**
- Forewings nearly always with a distinct pterostigma
- Gaster attached at the bottom of propodeum.



The **pterostigma** is a dark pigmented spot on the front edge of the wings of some species of insect.

The first segment of the abdomen is the median segment or **propodeum**, and has often been considered to be part of the metathorax.



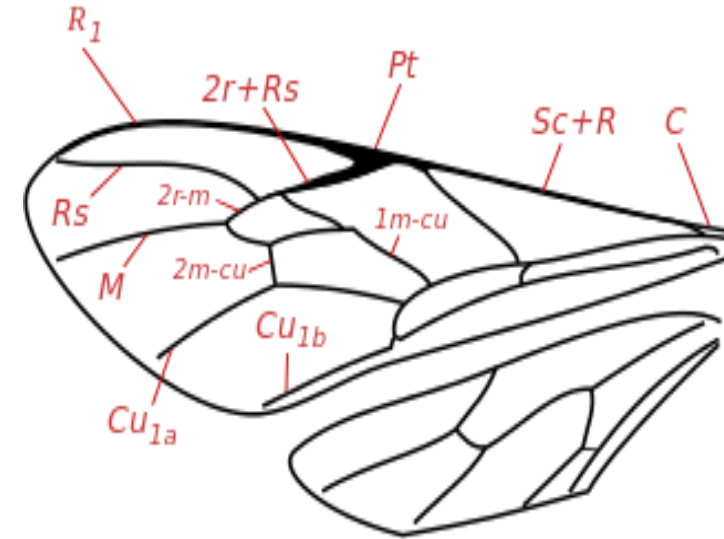
## **SUPERFAMILY HAVE TWO FAMILIES**

1. Family ichneumonidae ( ichneumonid wasp)
2. Family Braconidae ( Braconid wasp)

# Different veins venation pattern in ichneumonidae and braconidae:

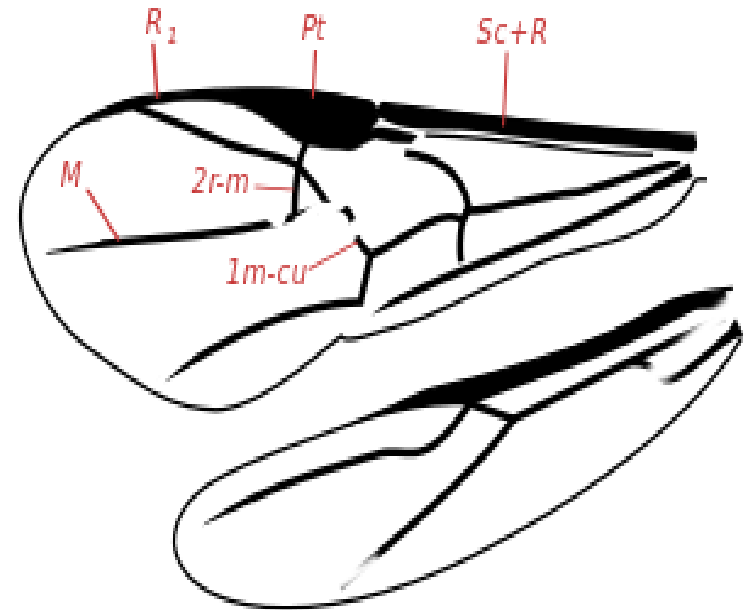
## Ichneumonidae

- Forewings with cross vein (2m-Cu) is present



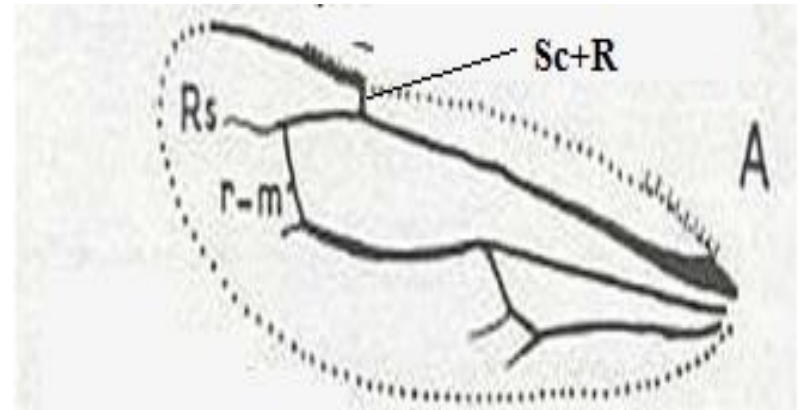
## Braconidae

- Forewings with cross vein (2m-Cu) is absent



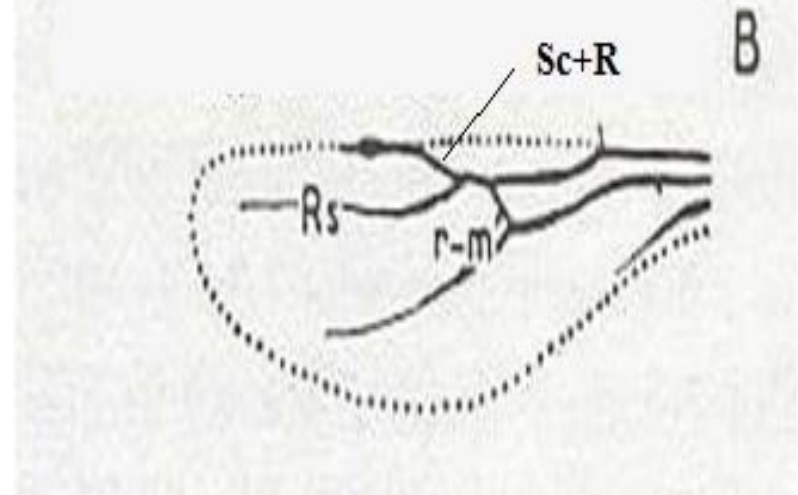
## Ichneumonidae

- Hind wing with cross vein r-m meets Rs after Sc+R



## Braconidae

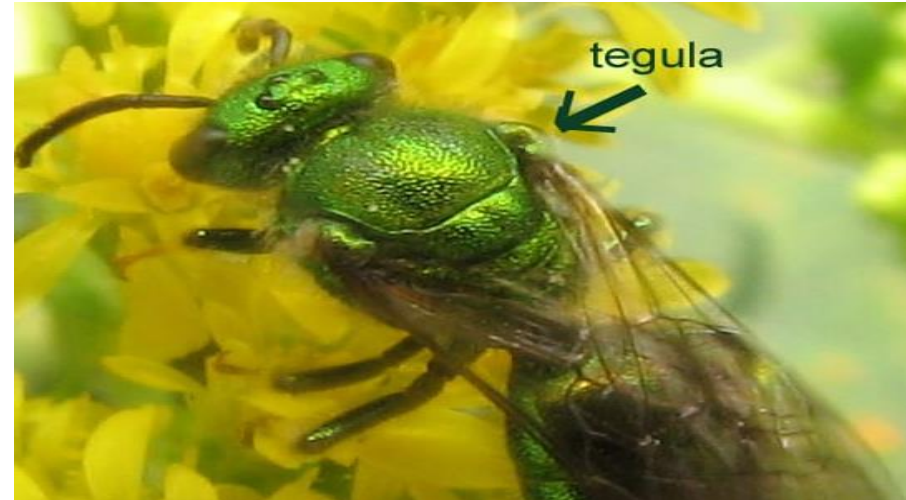
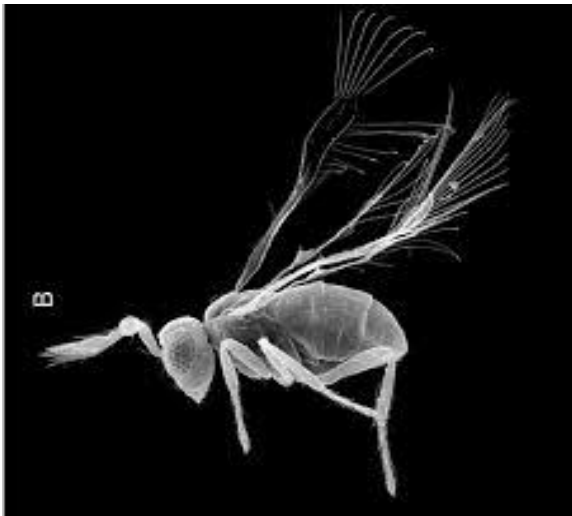
- Hind wing with cross vein r-m meets Sc+R before Rs



# Families of the super family chalcidoidea:

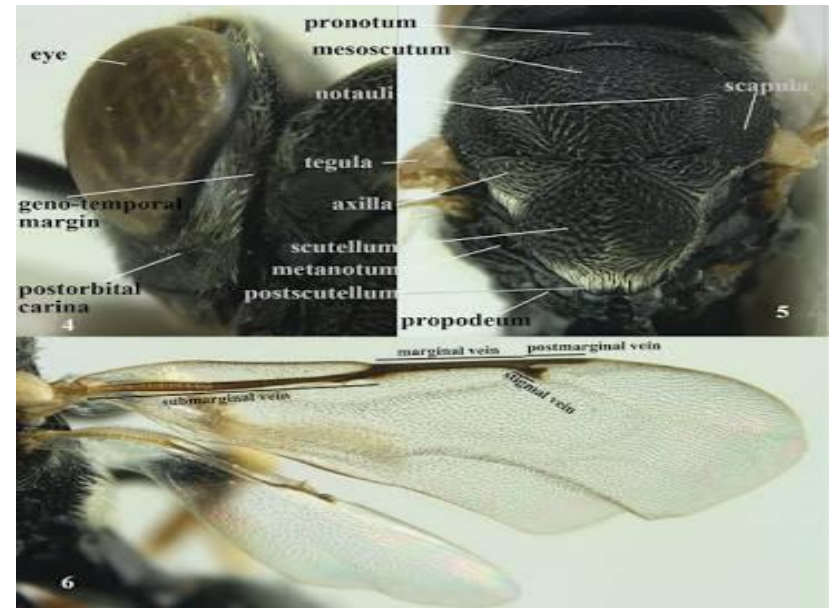
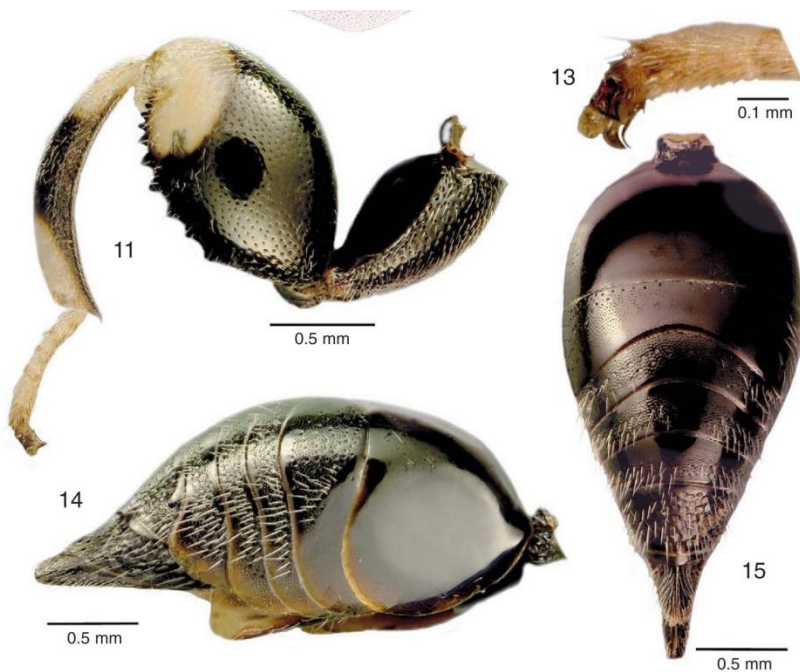
## 1. Family trichogrammatidae:

- Axillae are advanced and strongly in front of interior margin of scutellum and usually in front of tegulae
- Tarsi are usually with three segmented.



## 2. Family chalcididae

- Axillae are not a little advanced in front of interior margin of scutellum
- Tarsi are five segmented



# Superfamily Proctotrupodiea;

- Fore wings without pterostigma
- Antenna are 14 or more segment.
- Hind wings without cell enclosed by veins and without anal lobes.

**There are two superfamily;**

1. Family Platygasteridea
2. Family Scelionidea





## 1. Family Platygasteridea;

- Antenna are with 10 or fewer segment.
- Forewing are without marginal or stigmal veins.



## 2. Family Scelionidea

- Antenna are with 11 or 12 segment.
- Forewings are with stigmal veins.



# SUPER FAMILY FORMICOIDEA

- Male **abdomen** of formicoidea is not ending in an upturned sternal spine
- Female **winged** but wing shed soon
- Antennae are **elbow** like shaped
- Spur of **fore tibiae** are less carved and externally pectinate



# SUPER FAMILY VESPOIDAE

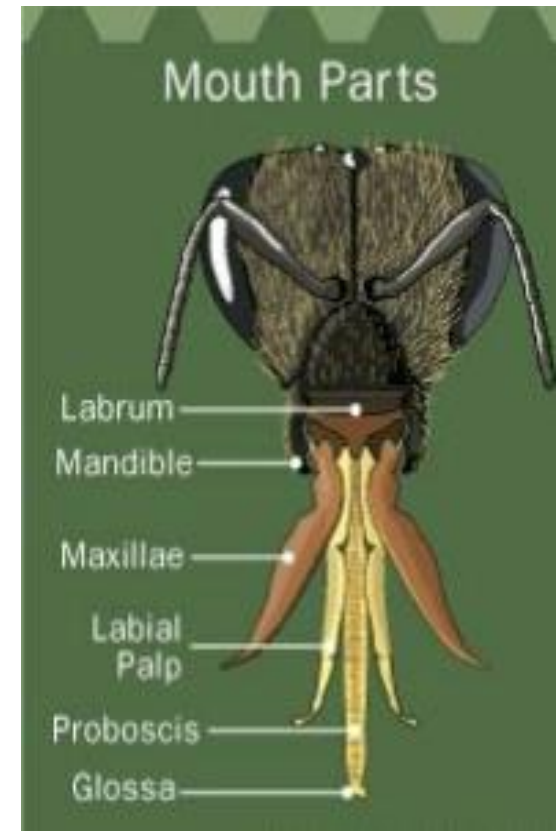
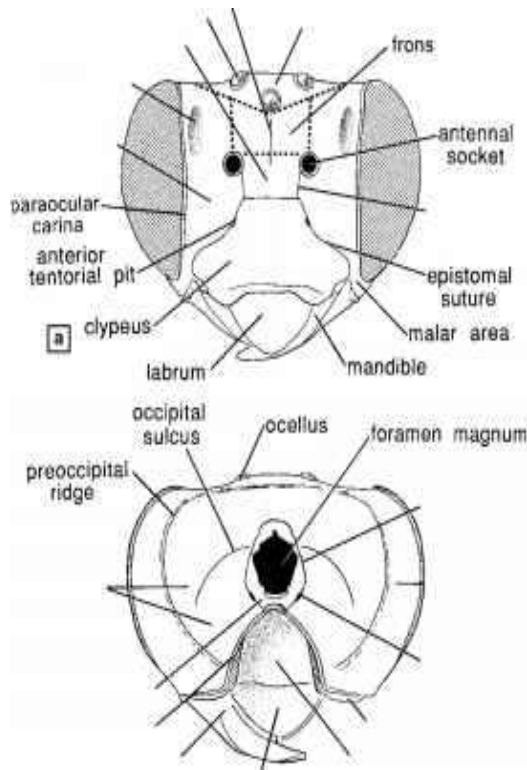
- The edge of the **pronotum** reaches or passes the **tegula**
- Most species have fully developed **wings**, but some have reduced or absent wings in one or both sexes.
- Forewings fold in half **longitudinally**



# Super Family Apoidea

- Glossa and paraglossa are not ending in pigmented pods
- Hind tarsi are usually more or less widened and densely pubescent

- **Family Apidae (honey bees, bumble bees)**
- Labrum is usually broader than long
- Antennal socket is connected with fronto- clypeal suture by single suture through inner margin.





## **Collection**

The flying Hymenopterous insect can be collected from different source like wild plant, cultivated flowering plants, orchards, parasitized lepidopterous larvae)