

# EXOPTERYGOTAN ORDERS-1

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DR. NIHAL R

# 1. NEUROPTERA



**Etymology:** Neuro-nerve; ptera - wings.

**Common names:** Lace wings, Ant lions, Mantispidflies, Owlflies.

# Characters

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- **They are soft bodied insects.**
- **Antenna is filiform, with or without a terminal club.**
- **Mouthparts are chewing type in adults.**
- **Wings are equal, membranous with many cross veins.**
- **They are held in a roof-like manner over the abdomen.**
- **They are weak fliers**
- **Larva is campodeiform with mandibulosuctorial mouthparts.**
- **Pupa is exarate.**
- **Pupation takes place in a silken cocoon.**
- **Six out of eight Malpighian tubules are modified as silk glands.**
- **They spin the cocoons through anal spinnerets.**



# Classification

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- This order is subdivided into two suborders viz., **Megaloptera** and **Planipennia** and all the following four families come under **planipennia**.

# Chrysopidae

(Green lacewings, Goldeneyes, Stinkflies, Aphid lions)

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- **Body is pale green in colour.**
- **Eyes are golden yellow in colour.**
- **Eggs are mounted on stalks to avoid predation and cannibalism.**
- **Larvae prey on soft bodied insects, especially on aphids.**
- **It often carries a layer of debris on its body which provides camouflage.**
- **They emit a stinking fluid when alarmed, from prothoracic stink gland.**
- **They are mass multiplied and released in fields for controlling aphids.**









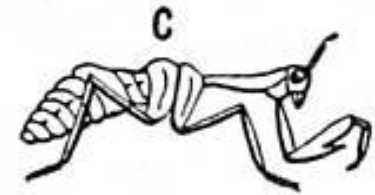
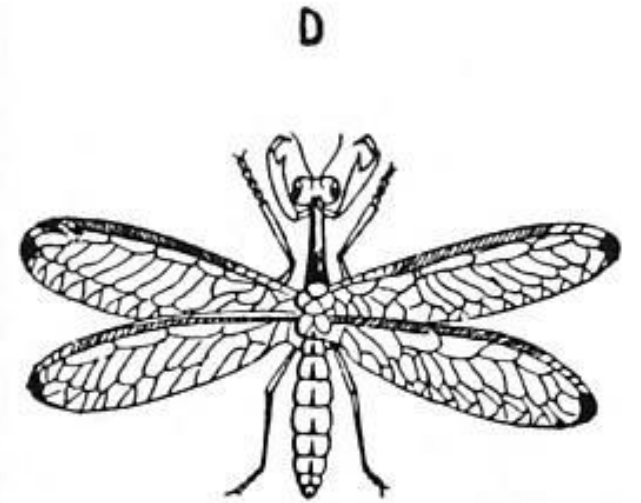
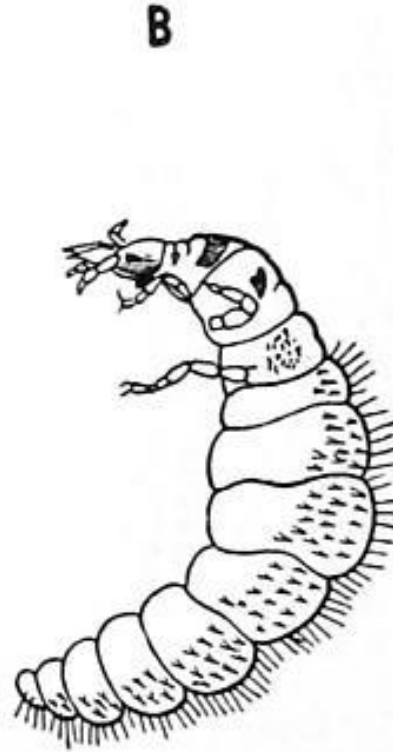
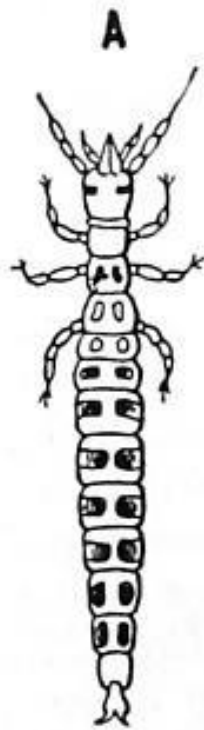




# Mantispidae

(Mantispidflies)

- **They resemble preying mantids.**
- **Prothorax is elongated.**
- **Forelegs are raptorial.**
- **Femur is armed with powerful spines.**
- Larva preys on spiderlings in the nests of ground spiders.
- Development involves **hypermetamorphosis.**









# Myrmeleontidae

(Ant lions)

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- **Adult resembles a damselfly.**
- **The antenna is long and clubbed.**
- **They are weak fliers. Grubs construct conical pits for capturing prey.**
- **Larval mandibles are sickle-like with one or more internal teeth.**
- **They have dolichasters (Lateral segmental processes fringed with setae).**







# Ascalaphidae

(Owlfly)

- **Adult resembles a dragonfly.**
- **Antenna is long, conspicuous and clubbed.**
- **Hypostigmal cell is present in the wings.**
- **Larvae do not construct pits to capture the prey.**
- **Adults are aerial predators like dragonflies.**





## 2. MECOPTERA

**Common name:** Scorpionflies



# Characters

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- **Slender, moderate or small-sized, usually carnivorous insects with elongate, filiform antennae.**
- **Head usually produced into a vertically deflected rostrum with biting mouthparts.**
- **Ligula wanting. Legs long and slender.**
- **Wings similar and membranous, carried longitudinally and horizontally in repose.**
- **Venation primitive.**
- **Abdomen elongate with short cerci, male genitalia prominent.**
- **Larvae eruciform with biting mouthparts and three pairs of thoracic legs.**
- **Abdominal feet present or absent.**
- **Pupae exarate.**
- **Wings with reduced tracheation.**









# 3. DIPTERA



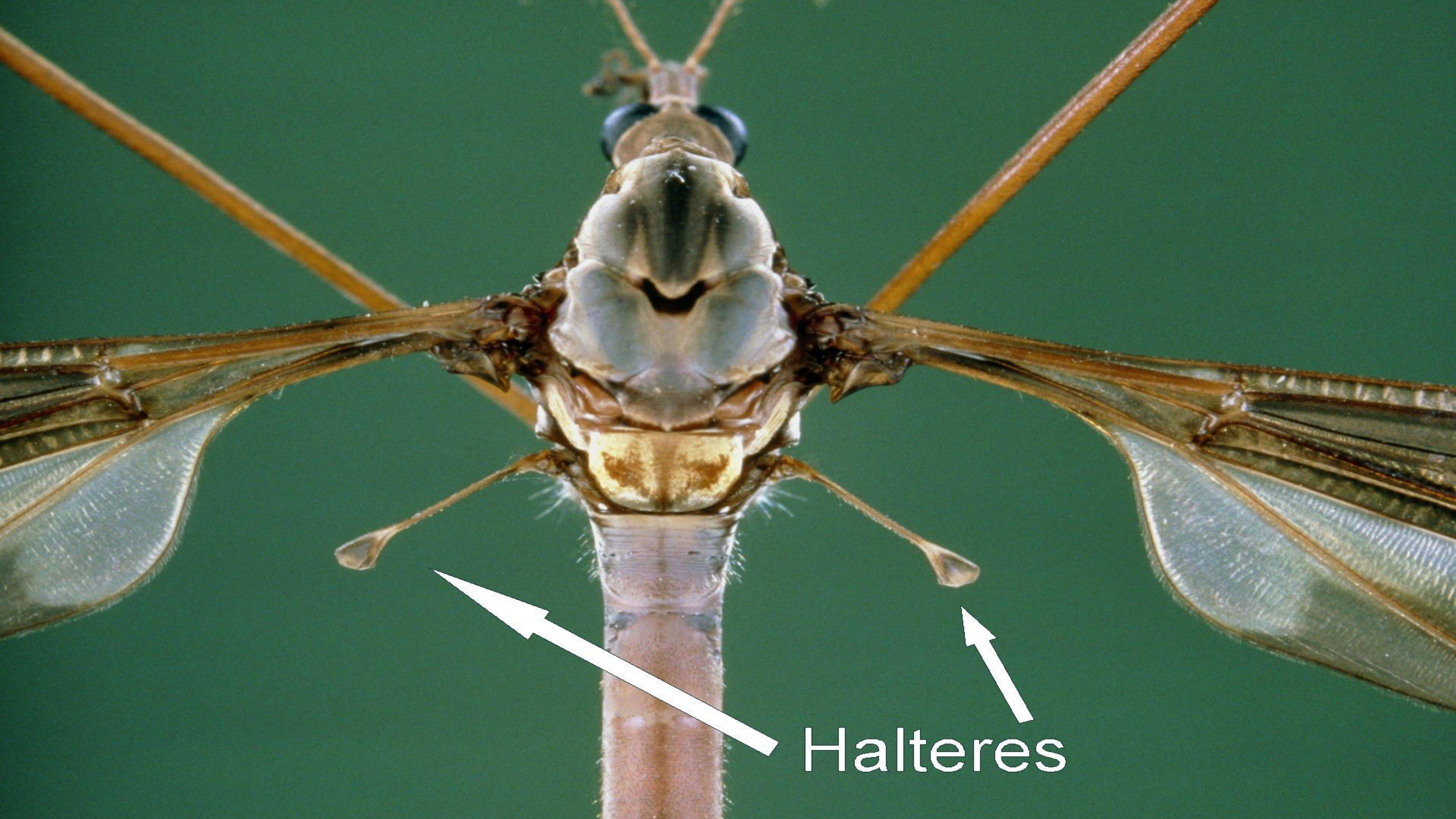
**Etymology:** Di-two; ptera-wing

**Common names:** True flies, Mosquitoes, Gnats, Midges.

# Characters

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- They are small to medium sized, soft bodied insects.
- The body regions are distinct.
- Head is often hemispherical and attached to the thorax by a slender neck.
- Mouthparts are of sucking type, but may be modified.
- All thoracic segments are fused together.
- The thoracic mass is largely made up of mesothorax.
- A small lobe of the mesonotum (scutellum) overhangs the base of the abdomen.
- They have a single pair of wings. Forewings are larger, membranous and used for flight.
- Hind wings are highly reduced, knobbed at the end and are called haltere.
- They are rapidly vibrated during flight.
- They function as organs of equilibrium. Flies are the swiftest among all insects.



Halteres



# Characters

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- **Metamorphosis is complete.**
- **Larvae of more common forms are known as **maggots**.**
- **They are **apodous and acephalous**.**
- **Mouthparts are represented as mouth hooks which are attached to internal sclerites.**
- **Pupa is generally with free appendages, often enclosed in the hardened last larval skin called **puparium**.**
- **Pupa belongs to the **coarctate type**.**



# Classification

This order is sub divided in to three suborders.

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- **Nematocera (Thread-horn):** Antenna is long and many segmented in adult. Larval head is well developed. Larval mandibles act horizontally. Pupa is weakly obtect. Adult emergence is through a straight split in the thoracic region.
- **Brachycera (Short-horn):** Antenna is short and few segmented in adult. Larval head is retractile into the thorax. Larval mandibles act vertically. Pupa is exarate. Adult emergence is through a straight split in the thoracic region.
- **Cyclorrhapha (Circular-crack):** Antenna is aristate in adult. Larval head is vestigial with mouth hooks. Larval mouth hooks act vertically. Pupa is coarctate. The coarctate pupa has a circular line of weakness along which the pupal case splits during the emergence of adult. The split results due to the pressure applied by an eversible bladder ptilinum in the head.





# NEMATOCERA FAMILY

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# Culicidae

(Mosquitoes)

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- Females have piercing and sucking type of mouthparts with six stylets.
- Antenna is plumose (bushy) in male and pilose (less hairy) in female. Legs are slender, delicate and long.
- Wings are fringed with hairs and scales on hind margin and on some veins.
- Males are short lived and feed on nectar or decaying fruits. Females live long and are blood feeders.
- Larvae are called wrigglers. Larval head is large with chewing mouthparts and mouth brush aiding in filter feeding. Thorax is large without legs.
- Respiratory siphon is located in the penultimate abdominal segment. Anal gills are present at the terminal end of the abdomen.
- Pupa is known as tumbler. It is very active. It has a pair of prothoracic horns which houses the anterior pair of spiracles. A pair of anal paddles is present at the terminal end aids in swimming.
- Malarial mosquito *Anopheles* sp. transmits malaria and Filarial mosquito, *Culex* sp. transmits filariasis.















# Cecidomyiidae

(Gall midges)

- They are minute delicate, mosquito like flies.
- Antennae and legs are long.
- Wing venation is reduced.
- Wings are covered with long hairs.
- A dark sclerotised area is present midventrally on the prothorax in the larva called 'chest bone'.
- Rice gall midge: *Orseolia oryzae*.
- Larval feeding produces galls.









# BRACHYCERA FAMILY

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# Asilidae

(Robber flies)

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- **They are elongate bristly flies.**
- **Head is broad and hollowed out in between the compound eyes.**
- **Compound eyes are protuberant.**
- **A prominent tuft of hairs is found on the head forming the mouth-beard.**
- **The proboscis is thick and stout.**
- **Legs are stout, hairy and suited for catching the prey.**
- **Abdomen is tapering and has a pair of large claspers at the tip of the male and a horny ovipositor in female.**
- **They are most active, non selective predators.**









# Tabanidae

(Horse flies)

- **Body is stout. Head is large.**
- **Eyes are large and often brilliantly coloured.**
- **In male eyes are holoptic (contiguous) and in female dichoptic (seperate).**
- **The third antennal segment is annulated.**
- **The proboscis is strong and pointing downwards.**
- **They are swift fliers. Male feeds on nectar.**
- **Female sucks blood from cattle and horses.**
- **They spread anthrax.**







# CYCLORRHAPHA FAMILY

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# Syrphidae

(Hover flies, Flower flies)

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- They are brightly colored and brilliantly striped.
- A vein like thickening (spurious vein) is present in between the radius and median in the forewing.
- Abdomen has distinct black and yellow markings.
- Maggots prey on soft bodied insects especially aphids.
- Adults are excellent fliers.
- They hover over flowers. They feed on pollen and nectar. They aid in pollination.

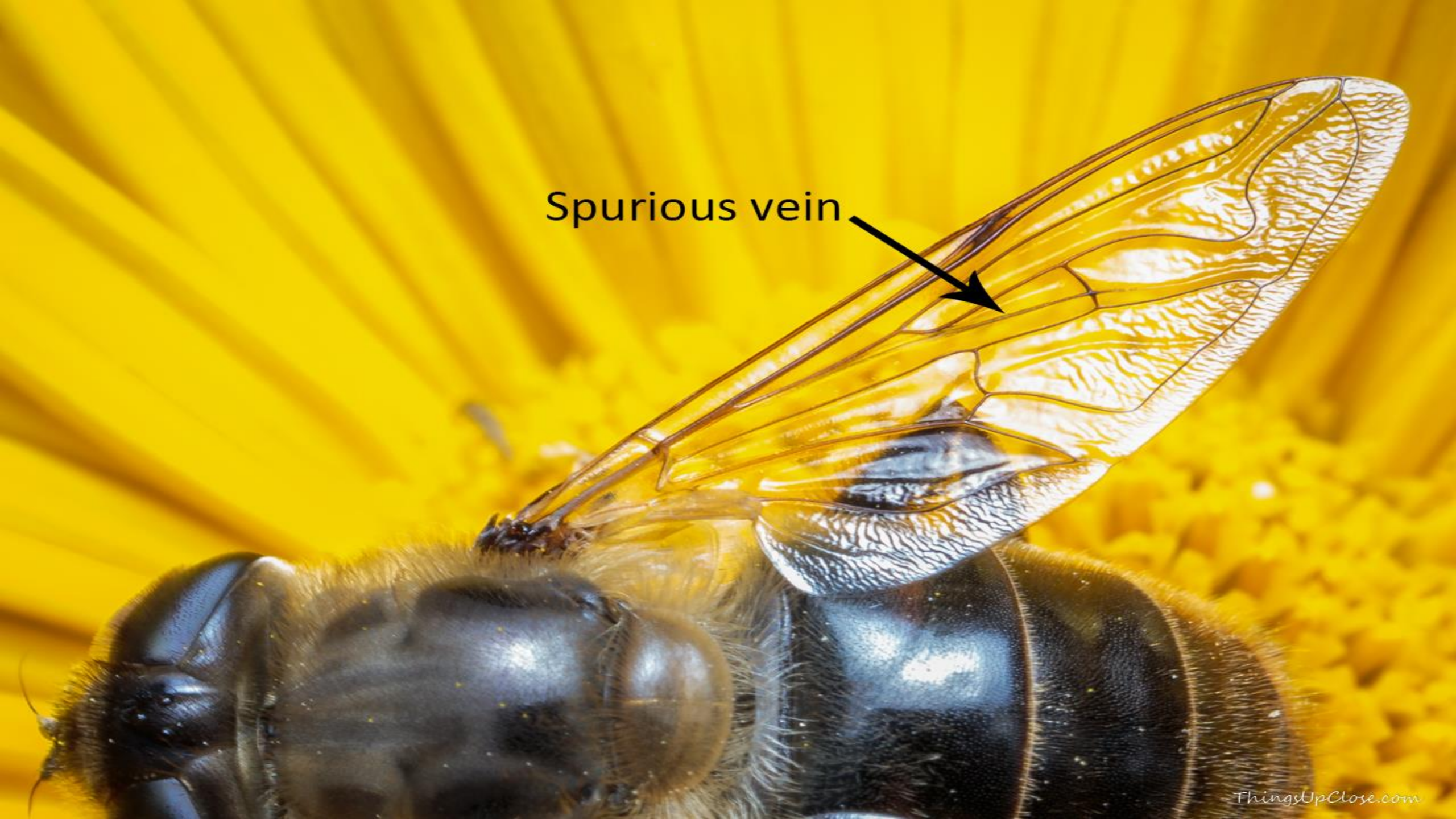




Spurious vein

Stubby

Spurious vein













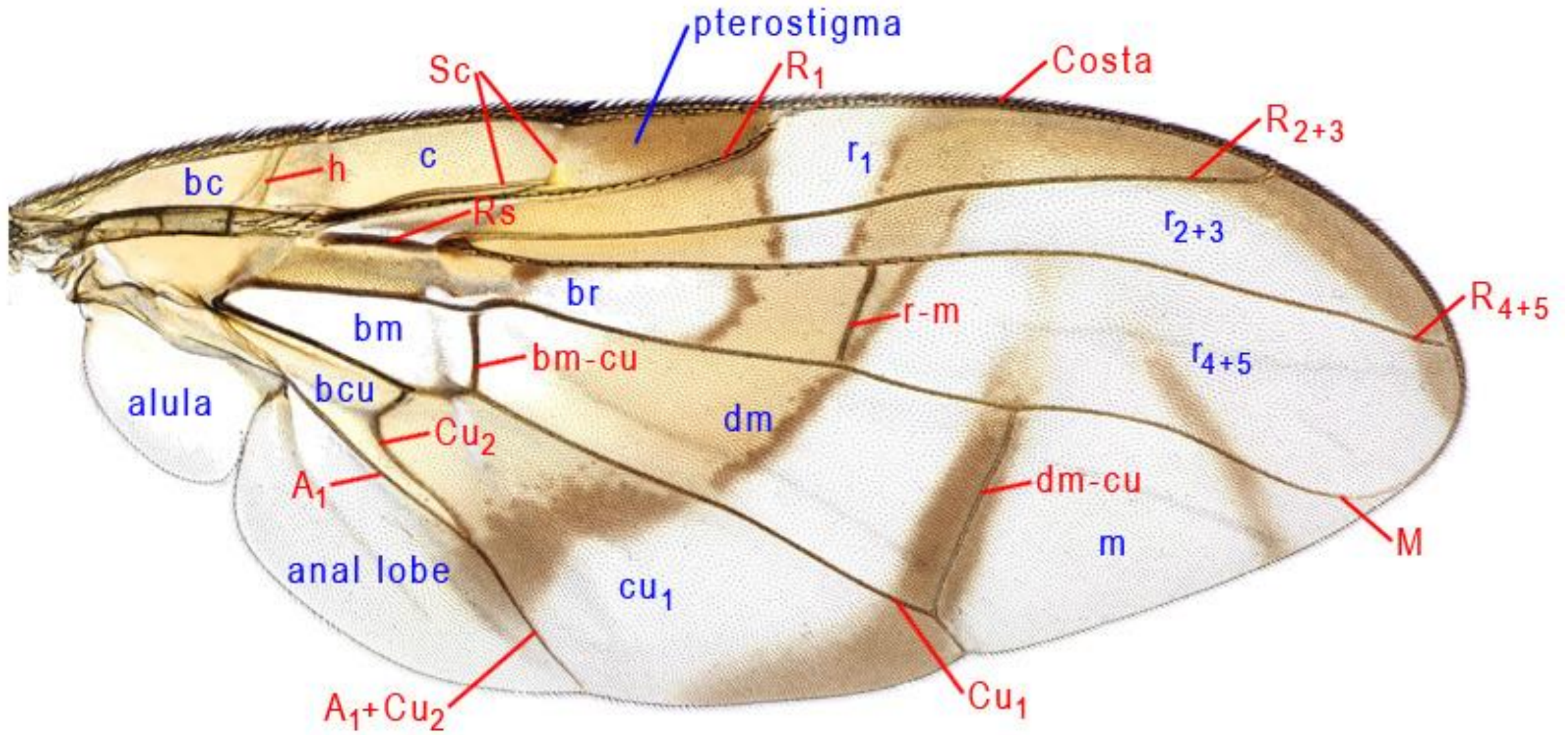
# Tephritidae

(Fruit flies)

- **Sub costa bends apically and fades out.**
- **Wings are spotted or banded.**
- **Female has a sharp and projecting ovipositor.**
- **Maggots can hop.**
- **They are highly destructive to fruits and vegetables.**
- **Curcubit fruit fly, *Dacus curcurbitae***







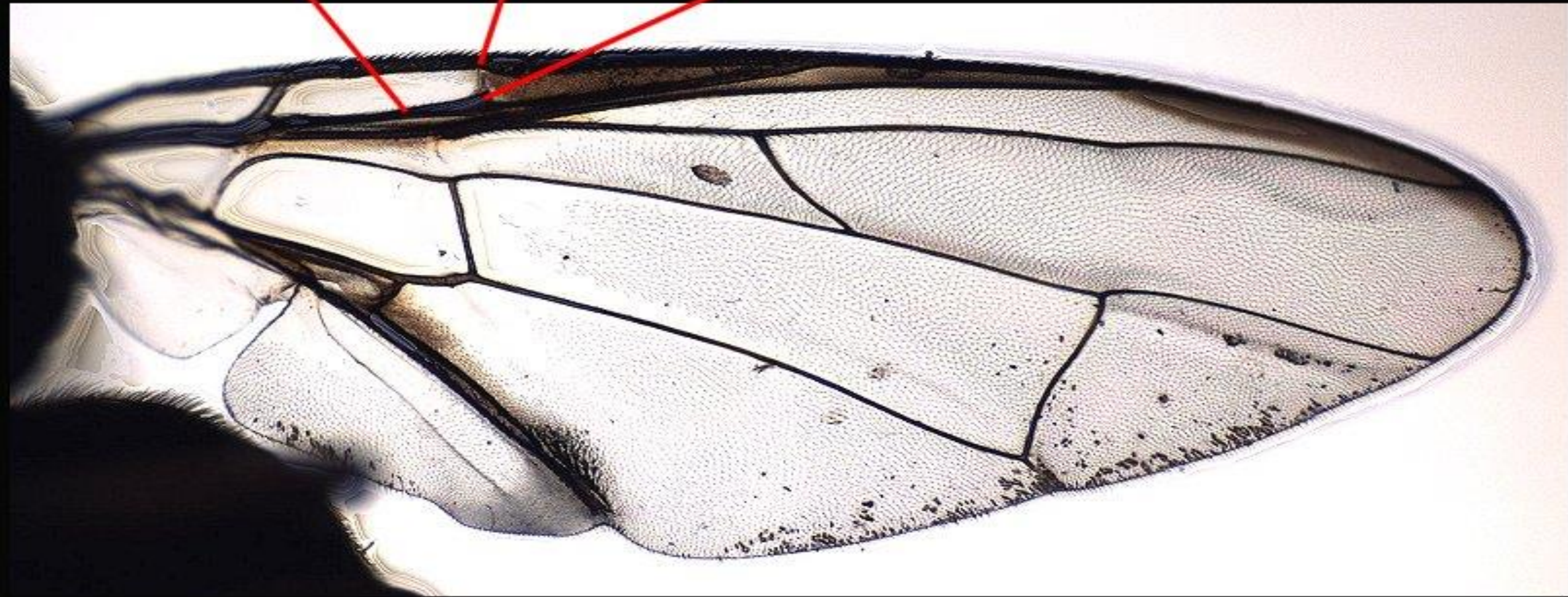
Veins in red, cells in blue.

VEIN Sc

basal section of Sc

end of Sc

right-angled bend in Sc



*Bactrocera invadens* wing (dorsal view)



# Agromyzidae

(Leaf-miner flies, pod flies and stem flies)

- **These flies are small, blackish or yellowish in colour.**
- **The larvae are leaf miners or stem borers or pod eaters.**
- **Most agromyzids make serpentine mines, that is narrow winding mines which increase in width as the larva grows.**
- **E.g. Tomato leaf miner, *Lyriamyza trifoli*.**













# Drosophilidae

(Vinegar gnats, Pomace flies)

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- **Eyes are usually red.**
- **They are attracted to rotting vegetables and fruits.**
- **Larvae feed on yeast and products of fermentation.**
- **Life cycle is very short (7 days).**
- **Pomace fly, *Drosophila melanogaster*.**
- **They are extensively used in the study of animal genetics.**









# Tachinidae

(Tachinid flies)

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- **Arista is completely bare.**
- **Abdomen is stout with several noticeable bristles.**
- **They are non specific endoparasites on the larvae and pupae of Orthoptera, Hemiptera, Lepidoptera and Coleoptera.**





# Muscidae

(House fly)

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- **Antennal arista is plumose.**
- **Mouthparts are sponging type.**
- **Labium is distally muddled into a pair of oval shaped fleshy lobes called **labella**.**
- **Pretarsus consist of two claws and two adhesive pads.**
- **First abdominal segment is yellow in colour.**
- **Terminal abdominal segments are telescopic forming a **pseudo ovipositor**.**
- **Abdomen is not bristly on basal part.**
- **Maggots are scavengers.**
- **Adults carry certain disease causing microbes on its legs, body hairs and mouthparts.**
- **Common house fly, *Musca domestica***





# Hippoboscidae

(Dog fly)

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- **Body is flat and leathery.**
- **Legs are short, strong and useful for clinging to the host.**
- **Wings are present or absent.**
- **They are viviparous. They give birth to mature larvae which are glued to the hairs of the host.**
- **The young larva is retained in a special uterine pouch and nourished by special nutritive glands.**
- **Larva once laid never feeds. It pupates immediately.**
- **They are blood sucking ectoparasites on cattle and dogs.**
- ***Hippobosca maculata*, is associated with cattle and *H. capensis*. is parasitic on dogs.**









# 4. TRICHOPTERA

**Common name:** Caddisflies



# Characters

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- **Small to moderate-size moth-like insects with setaceous antennae.**
- **Mandibles vestigial or absent. Maxillae single-lobed with elongate palpi.**
- **Labium with a median glossa and well-developed palpi.**
- **Wings membranous, more or less densely hairy, and held roof-like over the back in repose.**
- **Fore wings elongate, hind wings broader with a folding anal area.**
- **Venation generalized, cross-veins few.**
- **Tarsi five segmented.**
- **Larvae aquatic, more or less eruciform and usually living in cases and body terminated by hooked caudal appendages.**
- **Pupae exarate with strong mandibles. Wing tracheation reduced.**





















## 5. SIPHONAPTERA

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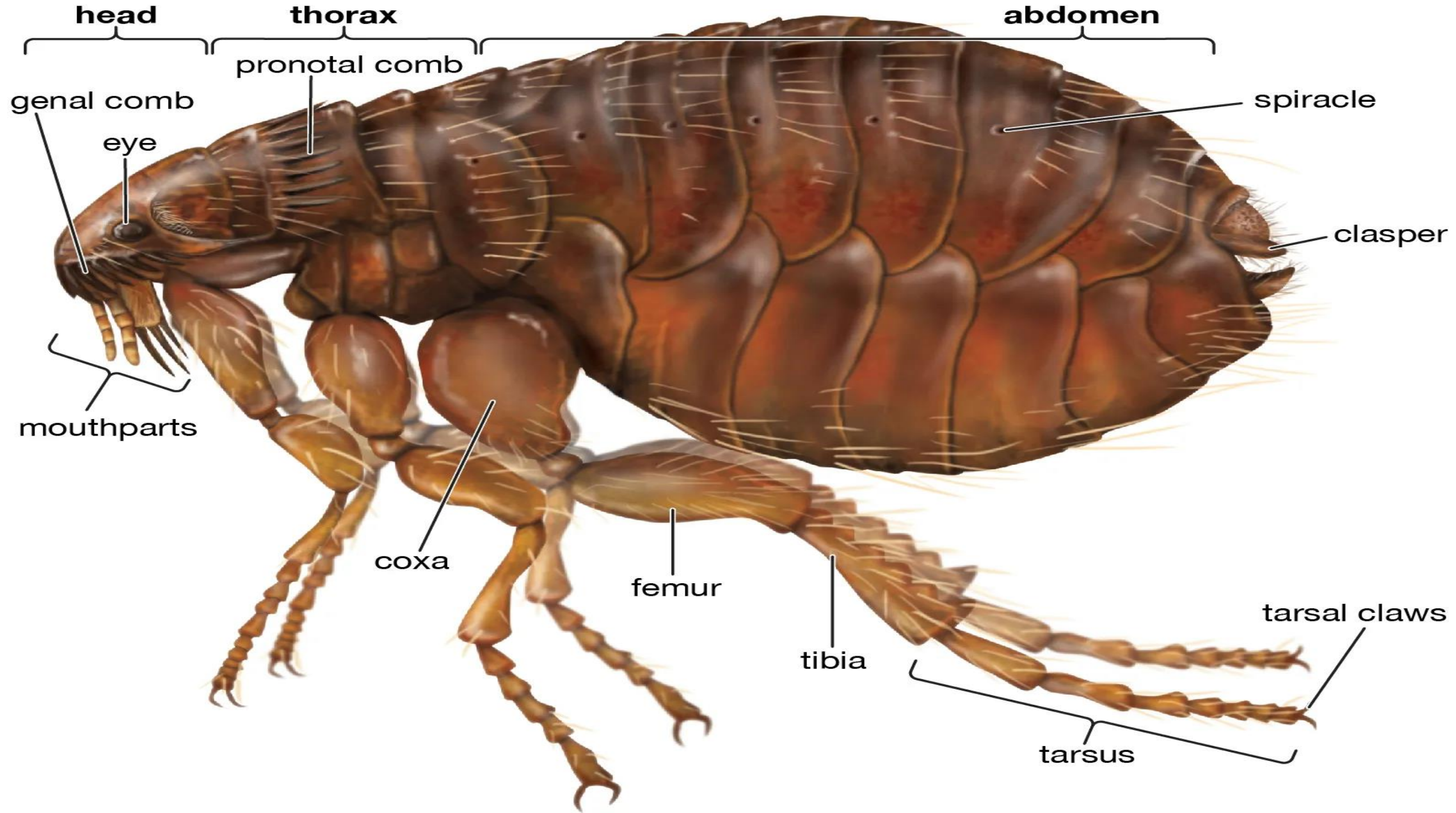
**Synonyms:** Aphaniptera

**Common name:** Fleas

# characters

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- **Small, apterous, laterally compressed insects whose adults are ectoparasites of warm-blooded animals.**
- **Eyes absent, two ocelli usually present.**
- **Antennae short and stout, reposing in grooves.**
- **Mouthparts modified for piercing and sucking.**
- **Thoracic segments free.**
- **Coxae very large, tarsi five segmented.**
- **Larvae elongate, eruciform and apodous.**
- **Pupae exarate, enclosed in cocoons**







## 6. STREPSIPTERA



**Common name:** Stylopids, Twisted wing parasites

# Characters

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- **Small, endoparasitic insects.**
- **Males free-living.**
- **Mouthparts of a degenerate biting type.**
- **Antennae conspicuous and flabellate.**
- **Fore wings reduced to small club-like structures in male.**
- **Metathorax greatly developed, hind wings large and fan-shaped in male.**
- **Trochanters absent.**
- **Female normally remaining in host, enclosed in a puparium. A gonopore.**
- **Larval development hypermetamorphic.**



