

Taxonomy of Insects

Lecture (7)

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Lecture Topics

- **Order: Diptera**
- **Order: Neuroptera**

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Endopterygota (Order: Diptera)

Life history and Ecology

- Includes all true flies, They are distinctive because their hind wings are reduced to small, club-shaped structures called halteres. The halteres vibrate during flight to help the insect maintain balance.
- All Dipteran larvae are legless. They live in aquatic (fresh water), semi-aquatic, or moist terrestrial environments (e.g., soil, plant or animal tissues, and carrion or dung. Some species are herbivores, but most feed on dead organic matter or parasitize other animals, especially vertebrates, molluscs, and other arthropods.

Endopterygota (Order: Diptera)

Life history and Ecology

- In the more primitive families (suborder Nematocera), fly larvae have well-developed head capsules with mandibulate mouthparts. These structures are reduced or absent in the more advanced suborders (Brachycera and Cyclorrhapha) where the larvae, known as maggots, have worm-like bodies and only a pair of mouth hooks for feeding.
- Adult flies live in a wide range of habitats and display enormous variation in appearance and life style.

Endopterygota (Order: Diptera)

Life history and Ecology

- Adults mouthparts are so diverse. In many families, the proboscis is adapted for sponging and/or lapping, they feed on honeydew, nectar, or the exudates of various plants and animals (dead or alive).
- In other families, the proboscis is adapted for cutting or piercing the tissues of a host. Some are predators of other arthropods (e.g., robber flies), but most of them are external parasites (e.g., mosquitoes and deer flies) that feed on the blood of their vertebrate hosts, including humans and most wild and domestic animals.

Endopterygota (Order: Diptera)

Appearance of Immatures

- Most fly larvae do not have legs, when they do have legs, they are always simple and fleshy (called “prolegs”).
- Most fly larvae in Cyclorrhapha are referred to as **maggots**. They are usually legless, with a pointy end (head) and a blunt end.

Maggot (Mediterranean fruit fly)



A comparison of larvae from (A) Diptera (true fly), (B) Coleoptera (beetle) and (C) Hymenoptera (wasp: sawfly) showing the lack of true, jointed, thoracic legs in Diptera.

Endopterygota (Order: Diptera)

Appearance of Adults

1. Antennae filiform, stylate, or aristate.
2. Mouthparts suctorial (haustellate).
3. Mesothorax larger than pro- or metathorax.
4. One pair of wings (front); hind wings reduced (halteres).
5. Tarsi 5-segmented.



Endopterygota (Order: Diptera)

Classification

The Diptera have traditionally been divided into three suborders:

1. **Nematocera** (flies with multisegmented antennae)
2. **Brachycera** (flies with stylate antennae)
3. **Cyclorrhapha** (flies with aristate antennae)

In some newer classifications, Brachycera includes the Cyclorrhapha.

Endopterygota (Order: Diptera)

(Grouped by life history):

Herbivores: larvae feed on plant tissues.

Scavengers: larvae feed in dung, carrion, garbage, or other organic matter.

Parasites: larvae are parasites or parasitoids of other animals.

Predators: adults and/or larvae attack other insects as prey.

Biting flies: In most cases, only the adult females take blood meals.

Endopterygota (Order: Diptera)

The main families.

Culicidae (mosquitoes) — may spread malaria, yellow fever, etc.

Tabanidae (horse flies / deer flies) — spread trypanosomiasis etc.

Simulidae (black flies) — may spread human onchocerciasis etc.

Muscidae (House flies) — Diseases are transmitted on their feet and mouthparts.

Psychodidae (moth flies) — may spread leishmaniasis, sand fly fever.

Ceratopogonidae (punkies, no-see-ums) — small but vicious biters.



horse flies



moth flies

Endopterygota (Order: Diptera)

Distribution

- Abundant worldwide. Larvae are found in all fresh water, semi-aquatic, and moist terrestrial environments.
- Approximately 108 families and 16,914 species in North America and 130 families and ~98,500 species worldwide.

Economic Importance

- They have the a great economic impact on humans. Some flies are pests of agricultural plants, others transmit diseases to humans and domestic animals. On the other hand, many flies are beneficial — particularly those that pollinate flowering plants, assist in the decomposition of organic matter, or serve as biocontrol agents.

Endopterygota (Order: Neuroptera)

Life history and Ecology

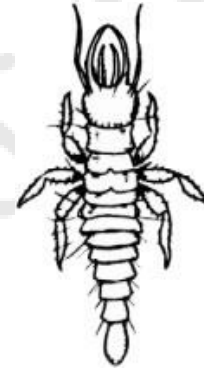
- Except for larval spongillaflies (family Sisyridae) which feed on fresh-water sponges, all members are terrestrial.
- Antlion larvae live in the soil and construct pitfall traps to snare prey.
- Lacewing larvae are usually found in vegetation where they typically feed on aphids, mites, and scale insects.
- In most cases, the adults of these insects are also predators — the non-predatory species usually feed on nectar, pollen, or honeydew.
- As adults, all neuropterans have two pairs of membranous wings . At rest, the wings are folded flat over the abdomen or held tent-like over the body. Most species are rather weak fliers.

Endopterygota (Order: Neuroptera)

Appearance of Immatures and Adults

Immatures

- Three pairs of thoracic legs.
- Head well-developed with ocelli, antennae, and chewing or pinching mouthparts.
- Aquatic forms have thread-like gills on most abdominal segments.



Adults:

- Antennae filiform, multisegmented.
- Chewing mouthparts.
- Front and hind wing membranous, similar in size with extensive veins .



Endopterygota (Order: Neuroptera)

Classification

Suborder: Hemerobiiformia— terrestrial predatory and parasitic larvae

Chrysopidae (Green lacewings) — aphid predators

Hemerobiidae (Brown lacewings) — aphid and mite predators

Mantispidae (mantidflies) — parasitoids and predators.



Green lacewings



Brown lacewings



Mantidflies

Endopterygota (Order: Neuroptera)

Suborder: Myrmeleontiformia— terrestrial predatory larvae

Myrmeleontidae (Antlions) — doodlebugs, ant predators

Ascalaphidae (Owlfly) — similar habits to antlions



Distribution: Common worldwide, with multiple families.

Economic Importance

Lacewing larvae are beneficial as predators of agricultural pests (aphids, whiteflies and scale insects). Some species are reared and sold commercially as biocontrol agents.

Usfel websites

<https://genent.cals.ncsu.edu/insect-identification/order-diptera/>

<https://genent.cals.ncsu.edu/insect-identification/order-neuroptera/>

<https://wiki.bugwood.org/Diptera>

Thanks for listening

