Order Diptera: Life History

Order Diptera: Flies, gnats, mosquitos, and midges

The name Diptera, derived from the Greek words "*di*" meaning two and "*ptera*" meaning wings, refers to the fact that true flies have only a single pair of wings. Diptera means "two wings," and true flies bear only one pair of functional wings. The hind wings are reduced to small, club-shaped structures called halteres, only the membranous front wings are used in flight. The halteres help the insect maintain balance. All flies have piercing/sucking/sponging mouthparts. All larvae are legless

Flower fly adult (Charles Ray, Auburn Univ., bugwood.org).

Flower fly larva (Clemson Univ., bugwood.org).

Classification

In some newer classifications, Brachycera includes the Cyclorrhapha.

Nematocera - Larvae have well-developed head capsules with mandibulate mouthparts. Adults with long, multisegmented antennae.

Brachycera - larvae, known as maggots, have worm-like bodies and only a pair of mouth hooks for feeding. Adults with stylate antennae.

Cyclorrhapha - larvae, known as maggots, have worm-like bodies and only a pair of mouth hooks for feeding. Adults with aristate antennae.

Morphology:

1. **mouthparts:** piercing/sucking/sponging/sectorial (haustellate)
2. **antennae:** filiform, stylate, or aristate
3. **legs:** cursorial
4. **body segments:** three body segments, head, thorax, abdomen; mesothorax larger than pro- or metathorax
5. **tarsi:** 5 segmented
6. **wings:** front wings for flying; hind wings reduced (halteres)

Immatures:

1. Culiciform (mosquito larvae)
   Head capsule present with chewing mouthparts Legs absent

2. Vermiform (maggots)
   Without legs or a distinct head capsule Mouthparts reduced; only present as mouth hooks

Development: Complete metamorphosis (egg, larva, pupa, adult)

Life History

Habitats: Adapted to a broad range of habitats terrestrial, aquatic and semi aquatic.

Feeding:
Adult flies live in a wide range of habitats and display enormous variation in appearance and life style. Although most species have haustellate mouthparts and collect food in liquid form, their mouthparts are so diverse that some entomologists suspect the feeding adaptations may have arisen from more than a single evolutionary origin. In many families, the proboscis (rostrum) is adapted for sponging and/or lapping. These flies survive 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 of these flies 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.

Importance in landscapes: Mosquitoes transmit diseases to humans and domestic animals. Few dipteran species damage landscape plants. In greenhouses, fungus gnats damage roots and may vector root diseases. Many flies are beneficial since they pollinate flowers, are predators, and are parasitoids.

Families

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

> **Mosquitoes (Family Culicidae)** may spread malaria, encephalitis, yellow fever, filariasis, and other diseases.
>
> **Horse flies / deer flies (Family Tabanidae)** may spread tularemia, loiasis, trypanosomiasis, and other diseases.
>
> **Black flies (Family Simuliidae)** may spread human onchoceriasis and leucocytozoon infections of poultry.
>
> **Moth flies (Family Psychodidae)** may spread leishmaniasis, sand fly fever, and other diseases.
>
> **Punkies, no-see-ums (Family Ceratopogonidae)** small but vicious biters that have been linked to the spread of several roundworm, protozoan, and viral pathogens in humans and other animals.

House flies (Family Muscidae) these are among the most cosmopolitan of all insects. Some species have biting mouthparts, others are merely scavengers. Diseases such as dysentery, cholera, and yaws may be transmitted on their feet and mouthparts.

Herbivores: larvae feed on plant tissues.

Gall midges (Family Cecidomyiidae) some induce the formation of plant galls; others are scavengers, predators, or parasites

Fruit flies (Family Tephritidae) many species are agricultural pests; such as the apple maggot, *Rhagoletis pomonella*.

Leafminers (Family Agromyzidae) most larvae are leafminers, some are stem and seed borers. Several species are agricultural pests.

Seed maggots (Family Anthomyiidae) many species are root or seed maggots.**Scavengers:** larvae feed in dung, carrion, garbage, or other organic matter.

Pomace flies (Family Drosophilidae) feed on decaying fruit.

Crane flies (Family Tipulidae) larvae live in soil or mud.

Blow flies (Family Calliphoridae) larvae feed on garbage and carrion; includes the screwworm, *Cochliomyia hominivorax*.

Flesh flies (Family Sarcophagidae) larvae typically feed on carrion. Some species may cause human myiasis.

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

Robber flies (Family Asilidae) general predators of other insects.

Bee flies (Family Bombyliidae) predatory larvae; adult bee mimics.

Dance flies (Family Empididae) adults are predatory.

Flower flies (Family Syrphidae) some larvae are aphid predators; most adults mimic bees or wasps.

Parasites: larvae are parasites or parasitoids of other animals.
parasitoids of other insects **(Family Tachinidae)**. Several species are important biocontrol agents.

Marsh flies (Family Sciomyzidae) larvae parasitize slugs and snails.

Bot flies / warble flies (Family Oestridae) larvae are endoparasites of mammals, including humans.

Louse flies (Family Hippoboscidae) adults are blood-feeding ectoparasites of birds and mammals.

In the textbook, *IPM of Midwest Landscapes Pests of Trees and Shrubs*

Order Diptera, Flies, gnats, midges, Tachinids

Family Asilidae, Robber flies
robber fly, several species

Family Cecidomyiidae, Gall and predatory midges
predaceous midge, *Aphidoletes aphidimyza*

Family Syrphidae, Syrphid or hover flies
hover flies, several species

Family Tachinidae, Tachinid flies
Tachinid fly, several species

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