

## The Insect Orders VI: Siphonaptera and Diptera

### **Siphonaptera:** The fleas



Cat flea adult (left) and larva (right)

Siphon = tube; aptera = wingless

Web sites to check:

[Siphonaptera on the NCSU General Entomology page](#)

[Siphonaptera on Wikipedia](#)

Description and identification:

Adult:

- Mouthparts: sucking
- Size: minute
- Wings: none
- Distinguishing characteristics: Sucking mouthparts; body compressed laterally; bristles and setae on long legs modified for jumping. Genal and pronotal combs are important in identification.

Larvae:

- White, cylindrical, with visible head capsule; legless; long setae on thorax and abdomen; 2 small hooks at rear of abdomen; eat various forms of organic material (including dried host blood in adult flea feces).

Metamorphosis: Complete (Adults may remain dormant within the pupal covering until vibrations (signs of the possible presence of hosts) trigger emergence).

Habitat: Adults on host animals. Larvae are found in nests and similar materials (carpets and pet bedding).

Pest or beneficial status: Pests of humans and domestic animals; vectors of plague and other diseases.

***The odd nature of the transmission of bubonic plague:*** Rats and other rodents serve as the reservoir for the plague bacterium, *Pasteurella* (= *Yersinia*) *pestis*. The oriental rat flea, *Xenopsylla cheopsis*, feeds on infected rodents, and the bacterium multiplies in the flea's digestive tract, blocking the gut. The fleas continue to try to feed, but must regurgitate the contents of their foregut to do so. In so doing, they introduce the bacterium into the new feeding wound, infecting a new host (person or animal). This is the disease called the black death that periodically exploded in huge epidemics in Europe in the Middle Ages.

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**Diptera:** The flies

Di = 2; ptera = wings. The 2-winged insects.

"Fly" is written as a separate word for this order.

Web sites to check:

[Diptera on Wikipedia](#)

[Diptera on the NCSU General Entomology page](#)

[The Diptera at The Tree of Life](#)

Description and identification:

Adult:

- Mouthparts: sucking (including sponging)
- Size: minute to large
- Wings: 2 (or none in a few species); membranous; hind wings modified as knob-like halteres
- Distinguishing characteristics: Antennae in Nematocera are filiform (hairlike) or feathery; in the Brachycera, they are short and horn-like or hairlike.

Larvae:

- All are legless. In the Nematocera, there is a true head capsule; in the Brachycera, there is either a partial head capsule or no head capsule at all (in what was once recognized as the suborder Cyclorhapha). Larvae without a head capsule are accurately called maggots, and the only sclerotized (hardened) organs at the head are one or two mouth hooks. Maggots pupate within the last larval "skin" that is hardened to form a puparium.

Metamorphosis: complete

Habitat: Virtually every habitat -- aquatic, in vegetation, insect predators and parasites, vertebrate parasites (external and internal)

Pest or beneficial status: Important pests of humans and animals; mosquitoes carry several devastating human diseases; some plant pests (apple maggot, for example); also beneficial parasites and predators (syrphids or hover flies).

Recognize two suborders: Nematocera and Brachycera (Brachycera includes the prior-recognized suborder Cyclorhapha)

**Suborder Nematocera:**

In the **Nematocera** (the long-horned flies), the suborder that contains the mosquitoes, black flies, and many midges, the antennae are long, with 9 or more segments. In some groups the antennae are feathery. Common families include the Cecidomyiidae (gall midges), Culicidae (mosquitoes), Tipulidae (crane flies), Chironomidae (midges), Psychodidae (moth flies, sand flies, sewer flies), and Sciaridae (dark-winged fungus gnats). In the Tipulidae, the halteres are especially easy to see.

**Family Cecidomyiidae:** The gall midges, includes the Hessian fly

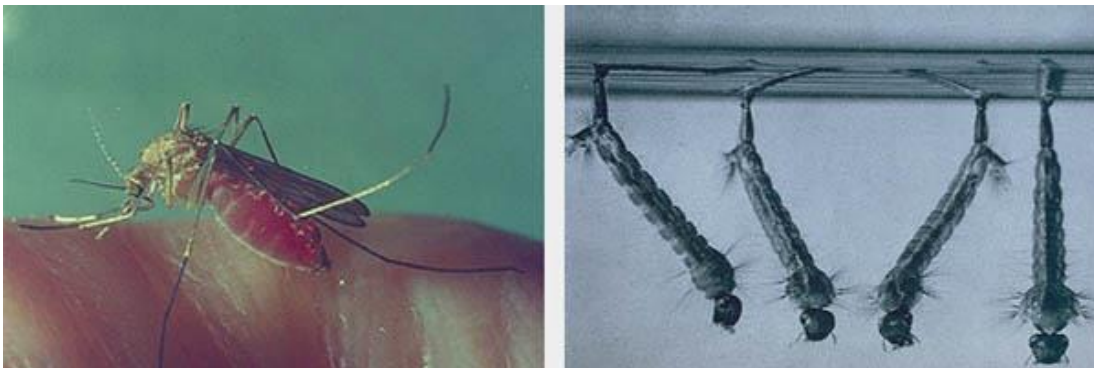
- Delicate, long legs, long antennae, reduced wing venation



Hessian fly adult (left) and pupae ("flax seeds") (right)

**Family Culicidae:** The mosquitoes

- Long proboscis
- Hairs/scales along wing veins
- Females feed on blood; males feed on nectar, etc. *Anopheles* spp. transmit malaria. *Aedes* spp. transmit dengue, yellow fever, others. *Culex* and other genera transmit the viruses that cause encephalitis, including West Nile virus.



Mosquito adult (left) and larvae (right)

**Family Tipulidae:** The crane flies

Crane flies look like giant mosquitoes but lack a biting proboscis. They have extremely long legs.



A crane fly (University of Idaho)

**Family Chironomidae:** The midges

Chironomids are one family referred to as midges ... you may think of them as gnats. They resemble mosquitoes but lack scales on the wings and a long proboscis; they do not bite. The front legs usually are the longest.



A chironomid midge

**Family Psychodidae:** The moth flies, sand flies, and sewer flies

Very small, hairy-bodied, moth-like flies that hold their wings roof-like over the body. Species here are often associated with decaying material in seldom-used drains. In other parts of the world, sand flies in the subfamily Phlebotominae are blood-feeders that transmit several diseases to humans.



A moth fly (Oklahoma Biological Survey).

**Family Sciaridae:** The dark-winged fungus gnats

Sciarids are usually dark colored and have long antennae. Distinguishing them from related families requires use of characteristics that we do not cover in this introductory course. Larvae feed on decaying plant matter, excrement, or fungus; some are pests in commercial mushroom facilities and in greenhouses.



A dark-winged fungus gnat (University of Minnesota).

### **Suborder Brachycera:**

In the **Brachycera**, (the short-horned flies), the antennae are short, with five or fewer segments. Common families include the Asilidae (robber flies), Tabanidae (horse flies and deer flies), Syrphidae (hover flies), Tephritidae (fruit flies), Drosophilidae (pomace or vinegar flies), Tachinidae (tachinid flies), Calliphoridae (blow flies), Sarcophagidae (flesh flies), and Muscidae (house flies and related muscid flies). Check your text for the families not discussed below; a few other families are presented below to illustrate the diversity of the suborder.

**Family Tabanidae:** The horse flies and deer flies -- blood feeders on humans and other animals.



A deer fly

**Family Syrphidae:** The [hover flies or flower flies](#) (larvae of many species are predaceous).

- Adults resemble wasps.
- Larvae of *Eristalis* (rattailed maggots) live in manure pits, etc.

**Family Tephritidae:** The fruit flies, including apple maggot and Mediterranean fruit fly

- Spotted or banded wings



Apple maggot adults (left) and larvae (right)

**Family Agromyzidae:** [leafminers](#)

**Family Anthomyiidae:** [seedcorn maggot](#) and similar species in the genus *Delia*, also some leafmining species (spinach leafminer)

**Family Muscidae:** Includes the house fly, stable fly, face fly, etc.



Stages of house fly development



House fly (left) and stable fly (right)

**Family Tachinidae:** [Tachinid flies](#); larvae are parasitic on other insects, including several important Lepidopteran pests .. [see photos](#).