

## Lecture 7

### The Insect Orders - II

Isoptera >>> Homoptera

Lecture 7 spans the following orders:

- Isoptera -- the termites
- Dermaptera -- the earwigs
- Embioptera\* -- the webspinners
- Plecoptera -- the stoneflies
- Zoraptera\* -- the zorapterans
- Psocoptera -- the psocids (booklice and barklice)
- Phthiraptera -- the lice
- Hemiptera -- the true bugs
- Homoptera -- cicadas, hoppers, psyllids, whiteflies, aphids, and scales

To cover this range of orders, lecture 7 devotes only a little time to each. In addition, the Embioptera and Zoraptera are not discussed at all in this course.

#### **Isoptera:** The termites



Iso = equal; ptera = wing; fore and hind wings are nearly identical

Web sites to check ...

[The Order Isoptera](#) (at The Wonderful World of Insects)

## Description and identification:

### Adult:

- Mouthparts: chewing
- Tarsal segments: 4
- Size: workers and soldiers 6 - 13 mm; queens much larger
- Wings: 4 in reproductives, lost after dispersal flight. Wings are equal in size. Other castes wingless.
- Distinguishing characteristics: Head is heavily sclerotized; other body regions are soft. Castes include workers, soldiers, reproductives. Soldiers have enlarged or specially modified mandibles.

Immature: Like adult

Metamorphosis: Gradual

Similar orders: Hymenoptera (narrow "waist" between thorax and abdomen) and Psocoptera (2- or 3-segmented tarsi; longer antennae)

Habitat: Nests (colonies) in wood or soil; feed directly on wood, wood products, and similar high-cellulose materials.

Pest or Beneficial Status: Severe pests of wood and related products; key in breakdown of plant debris. Eastern subterranean termite is most troublesome in the eastern United States. This species nests in the ground and workers must be protected from dry air by the tunnels or mud tubes. Drywood and dampwood termites also are present in the U.S.

Abundance in North America: 4 families, 42 species

### **Dermaptera:** The earwigs



Derma = skin; ptera = wing ... refers to the skin-like texture of the front wings

Web sites to check:

[The Dermaptera](#) (in the Tree of Life)

[Dermaptera](#) (at The Wonderful World of Insects)

[Labidura riparia](#)

Description and identification:

Adult:

- Mouthparts: chewing
- Tarsal segments: 3
- Size: 4 - 30 mm
- Wings: 4 or none; forewings shortened and thickened; hind wings membranous and folded
- Distinguishing characteristics: Enlarged, pincer-like cerci

Immature: Like adult, but wingless. Add antennal segments with each molt.

Metamorphosis: Gradual

Similar orders: Coleoptera: rove beetles resemble earwigs but lack pincer-like cerci.

Habitat: Moist debris and decaying materials. Nocturnal ... feed on plants or decaying plant material; some are predaceous.

Pest or Beneficial Status: Earwigs are usually pests only as nuisance creatures, but one species, the European earwig, *Forficula auricularia* L. (Dermaptera: Forficulidae), is a pest of vegetables, ornamental plants, and fruits. Its feeding leaves scars on the surface of apples and pears (not a key pest).

Abundance in North America: 6 families, 22 species

**Plecoptera:** The stoneflies

Pleco = folded; ptera = wing ... refers to the fact that the anal portion of the hind wing is folded when the wings are at rest.

Web sites to check:

[The Order Plecoptera](#)

[Plecoptera](#)

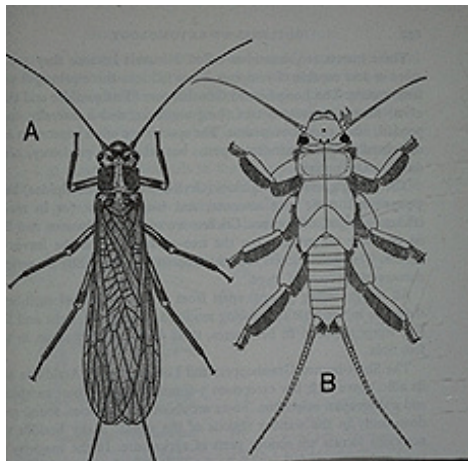
## Description and identification:

### Adult:

- Mouthparts: chewing
- Tarsal segments: 3
- Size: Most 10 - 30 mm; some up to 65 mm long
- Wings: 4; forewings narrower than hind wings; hind wings fold at the anal lobe
- Other distinguishing characteristics: long antennae and long cerci (2)

### Immature:

- Naiads are elongate and flattened; with long antennae and cerci; hairlike gills at the bases of thoracic legs



Metamorphosis: Incomplete

### Similar orders:

- Adults: Mayflies (but they have short antennae and small hind wings) and the Neuroptera and Trichoptera (they have 5-segmented tarsi and no anal lobe in the hind wing).
- Naiads: Mayflies (but they have 3 caudal filaments and leaf-like gills) and the Odonata (but they have a modified labium and lack the hair-like thoracic gills of the stonefly naiads).

Habitat: Immatures are aquatic; adults near water. Naiads feed on plants or are predators; adults feed on plants.

Pest or Beneficial Status: None (except fish food)

Abundance in North America: 9 families and approximately 540 species

**Psocoptera:** The psocids (booklice and barklice)



Psoco = rub small; ptera = wings; refers to the gnawing habits of these insects

Web sites to check:

[The Order Psocoptera](#) (in An Introduction to Insect Taxonomy)

[The Booklice](#) , a fact sheet from Ohio State University

Description and identification:

Adult:

- Mouthparts: chewing
- Tarsal segments: 2 or 3
- Size: less than 5 mm
- Wings: 4 or none; hind wings smaller than the forewings
- Distinguishing characteristics: soft-bodied; face swollen or bulging; long, slender antennae, no cerci.

Immature:                Like adult

Metamorphosis:        Gradual

Habitat: Debris, under bark, sometimes in buildings; feed on dry organic matter, molds, algae, lichens, cereal products

Pest or Beneficial Status: Nuisance; some contaminate stored grains and cereal products; may eat starchy glues used in book bindings; usually associated with damp conditions and molds

Abundance in North America: 13 families, 280 species

(An authority on the Psocoptera is Dr. Ed Mockford at Illinois State University in Normal.)

**Phthiraptera:** The lice

Phthir = lice; aptera = without wings

The Phthiraptera is divided into two suborders, considered by some to be separate orders ...

**Mallophaga** / Mallo = wool; phaga = eat, the chewing lice

**Anoplura** / Anopl = unarmed; ura = tail , the sucking lice (also termed the Siphunculata)

The Chewing lice:

Web sites to check:

[The Mallophaga](#) (at The Wonderful World of Insects)



A chewing louse

Description and identification:

Adult:

- Mouthparts: chewing
- Tarsal segments: 1 or 2
- Size: Less than 5 mm
- Wings: None
- Other distinguishing characteristics: Head as broad or broader than thorax; very small compound eyes; antennae short, often concealed.

Immature: Like adult

Metamorphosis: Gradual

Similar groups: The suborder Anoplura (sucking mouthparts, head narrower than thorax)

Habitat: Ectoparasites of birds and mammals

Pest or Beneficial Status: Some species are important pests of poultry and livestock.

Abundance in North America: 7 families; 320 species

## The Sucking Lice

Web sites to check:

[The Siphunculata](#) (at The Wonderful World of Insects)

Description and identification:

Adult:

- Mouthparts: sucking
- Tarsal segments: 1
- Size: Less than 5 mm
- Wings: None
- Other distinguishing characteristics: Head slender or pointed; many species lack eyes; legs adapted to clinging on hairs (scansorial).



A pubic louse

Immature: Like adult

Metamorphosis: Gradual

Similar orders: Mallophaga (wide head; chewing mouthparts; some with 2-segmented tarsi)

Habitat: Ectoparasites of mammals

Pest or Beneficial Status: Some species are important pests of livestock (cattle louse, hog louse); human body louse is a vector of epidemic typhus

Abundance in North America: 9 families; 70 species

**Hemiptera:** The true bugs

Hemi = half; ptera = wing; refers to the half-sclerotized, half membranous forewing

We are treating as separate orders the Hemiptera and the Homoptera. Some current references lump these orders into one, still called the Hemiptera, but more broadly defined. This order is

then split into three suborders, the Heteroptera (same as Hemiptera in its narrow sense) and two suborders that comprise the Homoptera.



Damsel bugs

Web sites to check:

[The Order Hemiptera](#) (at The Wonderful World of insects) ... this site covers the Hemiptera and the Homoptera according to the order names we use in this course.

Description and identification:

Adult:

- Mouthparts: sucking
- Tarsal segments: 2 or 3
- Size: 1 mm to 11 cm
- Wings: 4 or none. Forewings thickened at base, membranous at tip (hemelytra). Some groups wingless (bed bugs).
- Other distinguishing characteristics: Mouthparts form a beak that arises from the tip of the head

Immatures:            Like adults

Metamorphosis:      Gradual

Similar orders: Coleoptera (front wings are modified as full elytra without veins; Homoptera: forewing completely membranous; beak arises from the base of the head.

Habitat: Some groups are aquatic; most feed on plants; several families are predaceous on other insects; a few species are ectoparasites of animals.

Pest or Beneficial Status: Several important crop pests (including *Lygus* bugs, stink bugs, chinch bug, squash bug); several beneficial predators (damsel bugs; big-eyed bugs, minute pirate bugs), and a few pests of humans (bed bugs and *Triatoma*, the vector of Chagas disease).

Abundance in North America: 44 families, 4,600 species

### Selected Groups of Hemiptera:

**Miridae:** The plant bugs and leaf bugs:

Recognize mirids by their having a cuneus on the hemelytra (a cell set off by a crease) and 2 closed cells in the membrane of the forewing.



A lygus bug

One genus that contains important pests of many plants is *Lygus*. Lygus bugs are serious pests in cotton, alfalfa seed, and fruit production.

**Lygaeidae:** The seed bugs:

The Lygaeidae contains many plant-feeding species, among them the [chinch bug](#), a serious pest of corn and wheat in the Southern Plains and an occasional pest of turf as well.

A predaceous lygaeid, the **big-eyed bug**, is a natural enemy of many plant-feeding insects.

**Coreidae:** The leaf-footed bugs:

Several species of the coreids have the hind tibia flattened to resemble a leaf; all have scent glands on the thorax between the mid and hind coxae. A key pest in this group is the [squash bug](#), *Anasa tristis*. (Its hind tibiae are NOT flattened or leaflike.)

**Pentatomidae:** The stink bugs:

The Pentatomidae contains several important pests of crops, including the [green stink bug](#), the brown stink bug, and the harlequin bug

In addition to the pest species of the Pentatominae, the subfamily Asopinae contains several predaceous species, notably the spined soldier bug. Unlike the brown stink bug, it has a forward-projecting spine between the hind coxae, a heavy basal segment in the beak, and darkened lines at the tips of the membranous portion of the forewing. Although the spined soldier bug is sold for use in biological control, its feeding rate and reproductive rate limit its value in "augmentation" efforts.

**Nabidae:** The damsel bugs; **Anthocoridae:** the minute pirate bugs:

The nabids (damsel bugs) and the minute pirate bugs are generalist predators of soft-bodied insects. Where their prey is NOT comprised of specialist predators, they can be important in the natural control of plant pests.



Damsel bugs

**Homoptera:** The cicadas, hoppers, psyllids, whiteflies, aphids, and scales



Periodical cicada

Homo = same; ptera = wing ... refers to the fact that the forewing is of a single quality ... completely membranous

Web sites to check:

[The Order Hemiptera](#) (at The Wonderful World of insects) ... this site covers the Hemiptera and the Homoptera according to the order names we use in this course.

## Description and identification:

### Adult:

- Mouthparts: sucking
- Tarsal segments: 1-3
- Size: minute to large
- Wings: 4, 2, or none; when present, the wings are membranous and of uniform texture.
- Distinguishing characteristics: Mouthparts are modified to form a beak that arises from the base of the head. Antennae may be long and filiform or short and setaceous.

Immature: Like adult, but wingless

Metamorphosis: Gradual, but some groups show more complicated development

Similar orders: Coleoptera (chewing mouthparts and elytra); Hemiptera (beak arises from tip of head; forewings are hemelytra)

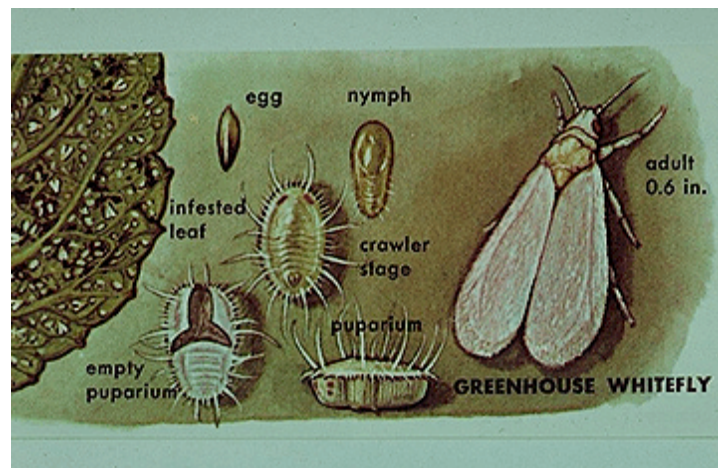
Habitat: On plants (foliage, stems, or roots); all species are plant-feeders

Pest or Beneficial Status: Many important pests

Abundance in North America: 38 families, 33,000 species

### Selected Groups of Homoptera:

**Aleyrodidae:** The whiteflies



After the first instar, nymphs are inactive and scale-like; wings develop internally. A "pseudopupa" stage precedes adult emergence. Adults are covered with a white dust or waxy powder. Examples include the greenhouse whitefly and the poinsettia/sweet potato/silverleaf whitefly. (See the USDA's [Whitefly Knowledge Base](#).)

**Aphididae:** The aphids



Corn leaf aphid (left) and an "alate" (winged) aphid (right)

Pear-like shape, posterior **cornicles**, and long antennae. Life cycles are often complex, with winged and wingless forms and winter and summer hosts. **Parthenogenesis** is common.

**Cicadellidae:** The leafhoppers



Potato leafhopper nymph (left) and adult (right)

Some leafhoppers "just" remove sap and chlorophyll (white apple leafhopper); others inject toxins or saliva that block xylem or phloem channels (potato leafhopper); others damage stems by egg-laying; still others carry pathogens (beet leafhopper; aster leafhopper).

**Cicadidae:** The cicadas

Annual or "dog-day" cicadas' life cycles take several years, but broods overlap, and some adults emerge every year. Periodical cicadas are synchronized in given regions. Damage to twigs of woody plants is caused by egg-laying females; nymphs drop to the ground and feed on tree roots.

Superfamily **Coccoidea** -- The scales



Scale insects

Includes armored scales, soft scales and mealybugs. Newly hatched scales are mobile "crawlers" that soon insert their mouthparts into a plant, become sedentary, and secrete a waxy, cottony, or hardened covering. See the index of the text for examples of many pest species. See also:

[San Jose scale crawler](#)

[San Jose scale male](#)

[San Jose scale fruit injury to apple](#)

Other Homopterans to check out (via the text and links):

[Pear psylla nymphs](#)

[Pear psylla female / eggs](#)

[Grape phylloxera](#)

[Rosy apple aphid](#)

[Aster leafhopper](#)

[White apple leafhopper nymphs](#)

[Periodical cicada adult](#)