

## The Insect Orders II: Isoptera through Hemiptera

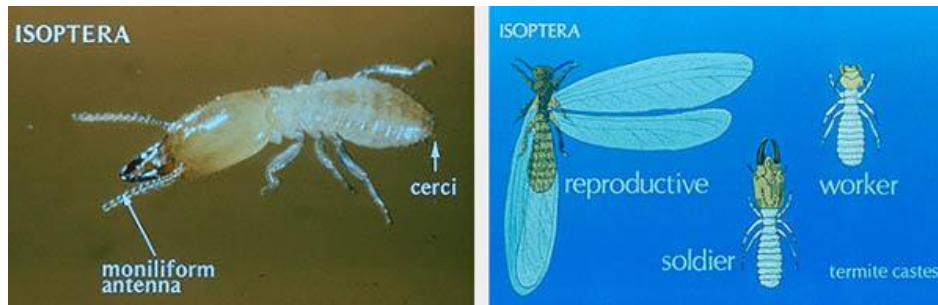
This lecture spans the following orders:

- 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
  - Suborder Heteroptera -- the true bugs
  - “Suborder” Homoptera -- cicadas, hoppers, psyllids, whiteflies, aphids, and scales

To cover this range of orders, lecture 6 devotes only a little time to each. In addition, the Embioptera and Zoraptera are not discussed at all in this course.

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### Isoptera: The termites



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

Web sites to check ...

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

[Isoptera on Wikipedia](#)

[Termite control, University of Kentucky](#)

Description and identification:

Adults:

- Mouthparts: Chewing
- Size: Workers and soldiers 6 - 13 mm (1/4- to 1/2-inch); queens much larger
- Wings: 4 in reproductives, lost after dispersal flight. Wings are equal in size. Other castes are wingless.
- Distinguishing characteristics: Head is heavily sclerotized; other body regions are soft. Castes include workers, soldiers, reproductives. Soldiers have enlarged or specially modified mandibles.

Immatures (called nymphs): Similar to adults (except for the reproductives).

Metamorphosis: Gradual; nymphs resemble adults and share the same habitat. In those with wings, external wing pads develop as nymphs mature.

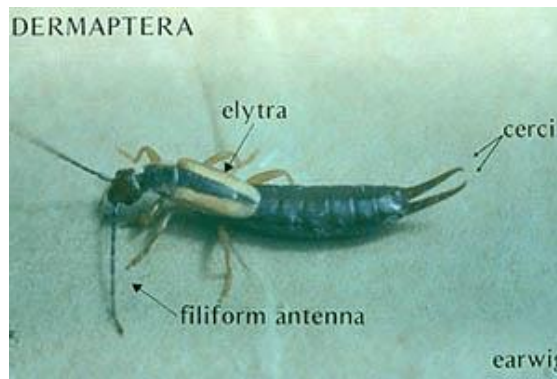
Habitat: Nests (colonies) in wood or soil; feed directly on wood, wood products, and similar high-cellulose materials.

Pest or Beneficial Status: Severe pests of wood and related products; key in breakdown of plant debris.

The 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 that they build. Dampwood and drywood termites are present in the southern and southwestern U.S.

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**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)
- [Dermaptera at Wikipedia](#)

Description and identification:

Adults:

- Mouthparts: chewing
- Size: 4 - 30 mm (1/6- to 1 1/4-inch)
- Wings: 4 or none; forewings shortened and thickened; hind wings membranous and folded.
- Distinguishing characteristics: Enlarged, pincer-like cerci

Immatures (called nymphs): Similar to adults.

Metamorphosis: Gradual; nymphs resemble adults and share the same habitat. In those with wings, external wing pads develop as nymphs mature.

Habitat: Moist debris and decaying materials. Earwigs are nocturnal and feed on plants or decaying plant material; some are predaceous (and beneficial).

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).

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**Plecoptera:** The stoneflies.

Pleco = pleated or 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 at Wikipedia](#)

Description and identification:

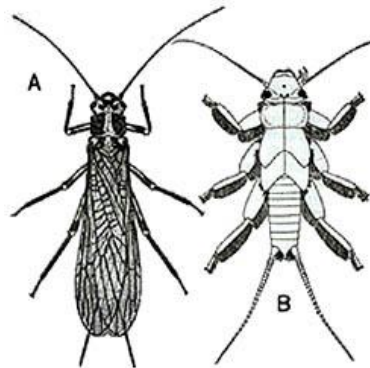
Adults:

- Mouthparts: Chewing
- Size: Most 10 - 30 mm (1/2- to 1 1/4- inch long); some up to 65 mm (2 1/2 inches) long
- Wings: 4; forewings narrower than hind wings; hind wings fold at the anal lobe
- Other distinguishing characteristics: Long antennae and long cerci (2)

Immatures (called naiads):

Aquatic naiads are elongate and flattened, with long antennae and cerci; they have hair-like gills at the bases of thoracic legs.

Metamorphosis: Incomplete. Naiads do not really look like adults and live in water; wing “pads” develop gradually and externally through successive stages.



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

Pest or Beneficial Status: No agricultural or human health roles; important as nutrient cyclers in water and as food for aquatic vertebrates (fish).

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**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)
- [Psocoptera on the NCSU General Entomology page](#)
- [Booklice fact sheet](#)

Description and identification:

Adults:

- Mouthparts: Chewing
- Size: Less than 5 mm (¼ inch).
- Wings: 4 or none; hind wings smaller than the forewings
- Distinguishing characteristics: Soft-bodied; face swollen or bulging; long, slender antennae, no cerci.

Immatures (nymphs): Similar to adults.

Metamorphosis: Gradual; nymphs resemble adults and share the same habitat. In those with wings, external wing pads develop as nymphs mature.

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.

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## **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)

Web sites to check:

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

[Phthiraptera at the Tree of Life](#)

### **Chewing Lice, Mallophaga:**



A chewing louse

Description and identification:

Adults:

- Mouthparts: Chewing
- Size: Less than 5 mm (1/4- inch)
- Wings: None
- Other distinguishing characteristics: Head is as broad as or broader than thorax; very small compound eyes; antennae short, often concealed.

Immatures (nymphs): Similar to adults.

Metamorphosis: Gradual; nymphs resemble adults and share the same habitat.

Habitat: Ectoparasites of birds and mammals; may live in nests or dens.

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

### **Sucking Lice, Anoplura:**

Description and identification:

Adults:

- Mouthparts: Sucking
- Size: Less than 5 mm (1/4- inch)
- Wings: None
- Other distinguishing characteristics: Head is slender or pointed; many species lack eyes; legs adapted to clinging on hairs (scansorial).



A pubic louse

Immatures (nymphs): Similar to adults.

Metamorphosis: Gradual; nymphs resemble adults and share the same habitat.

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.

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**Hemiptera:** Suborders are Heteroptera, the true bugs, and Homoptera, the cicadas, hoppers, psyllids, whiteflies, aphids, and scales. (This usage of Homoptera as a suborder includes Auchenorrhyncha and Sternorrhyncha.)

Web sites to check:

[The Order Hemiptera](#) (at The Wonderful World of insects)  
[Hemiptera at Wikipedia](#)

Description and identification:

Adult:

- Mouthparts: Sucking
- Size: 1 mm to greater than 25 mm (minute to greater than 1 inch long)
- Wings: 4 or none in the Heteroptera; 2, 4, or none in the Homoptera.

In the Heteroptera, the mouthparts form a beak that arises from the front of the head, and the front wings are half hardened and half membranous. In the Homoptera, the mouthparts form a beak that arises from the base of the head, and the wings are of uniform structure.

Immatures (most are called nymphs): Similar to adults (though there are exceptions)

Metamorphosis: Gradual ... but in some cases a transition toward complete metamorphosis is evident. Nymphs and adults share the same habitat.

Habitat: Some families of Heteroptera are aquatic; most other heteropterans are terrestrial, where some feed on plants, some are predaceous on other insects, and a few are ectoparasites of animals. All groups of Homoptera are terrestrial and feed on plants.

**Pest or Beneficial Status:** Many species within Heteroptera and Homoptera are important crop pests. Within the Heteroptera, some species are beneficial predators, and a few are pests of humans (bed bugs and *Triatoma*, the vector of Chagas disease).

**Suborder Heteroptera:**

Hetero = different; ptera = wing; refers to the half-sclerotized, half membranous forewing.



A lygus bug

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

**Family Lygaeidae:** The seed bugs:

The family 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.

**Family 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.)

**Family 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. A new invasive species moving westward toward Illinois is the [brown marmorated stink 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 forewings. Although the spined soldier bug is sold for use in biological control, its feeding rate and reproductive rate limit its value in "augmentation" efforts.

**Family Nabidae:** The damsel bugs

**Family 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 bug (family Nabidae) feeding on an aphid. (Photo from Oregon State University)

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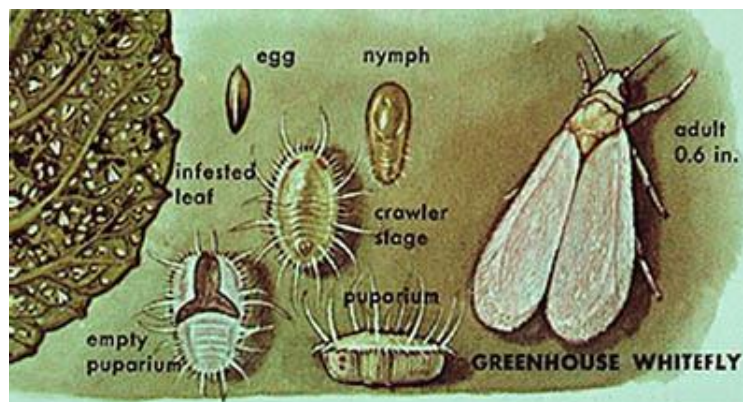
**Suborder Homoptera:** The cicadas, hoppers, psyllids, whiteflies, aphids, and scales



Aphids on goldenrod



**Family 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 Web Page](#).)

**Family 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

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).



Potato leafhopper nymph (left) and adult (right)

**Family 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

This superfamily 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:

[San Jose scale](#)

[Cottony cushion scale](#)

[Longtailed mealybug](#)

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

[Grape phylloxera](#), [rosy apple aphid](#), [cicadas](#)