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# General Entomology



Susan Ellis, www.insectology.org

UGA1366089

Prepared from information written by Dr. Kris Braman,  
Dr. Beverly Sparks, Dr. David Adams

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## Learning objectives

- Basic classification
- Existence of insects
- Basic form and structure
- Metamorphosis
- Injury from insects feeding
- Benefits and value of insects
- Proper pest identification & pest management plan

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## Insect Facts

- Most numerous animals on earth
- About 100,000+ species in North America
- Likely 1,000+ insects in a typical back yard at any given time
- Less than 3% of those insects will be damaging
- Most are either beneficial or harmless

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## Benefit and Value of Insects

- Insects are important because they:
  - **pollinate** most fruits and vegetables
  - **serve as food** for birds, fish, and animals
  - **destroy injurious insects** (beneficial insects and spiders)
  - **provide** honey, wax, shellac, silk and other products
  - **decompose and recycle** dead plant and animal matter

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## Harmful Aspects of Insects

- Insects are considered pests when they:
  - **transmit diseases** of humans, domestic animals, and plants
  - are **nuisance pests** in and around the home
  - **feed on crop and amenity** (turf and ornamental) plants

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## Classification of Insects and their Relatives

- Identification of insects is aided by understanding how they are organized around a standard classification system
- Insects belong to a group of animals called the Arthropods (“jointed legs”)
  - Insects, crabs, lobsters, spiders, ticks, etc.

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## Classification of Insects and their Relatives- cont

- Insect characteristics (based on the adult form)
  - Three distinct body regions
  - Jointed legs (3 pairs)
  - Antennae (1 pair)
  - Wings (0-2 pair)

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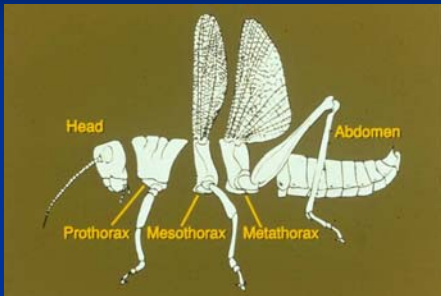
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## Insect Form and Structure (Morphology)



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## Insect legs



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### Insect Wings



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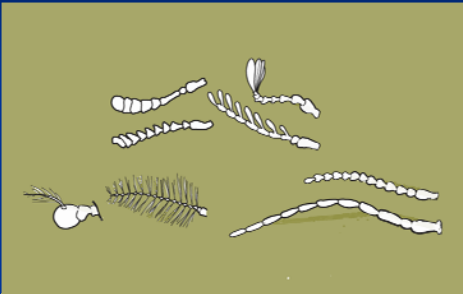
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### Antennae



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### Insect Mouthparts



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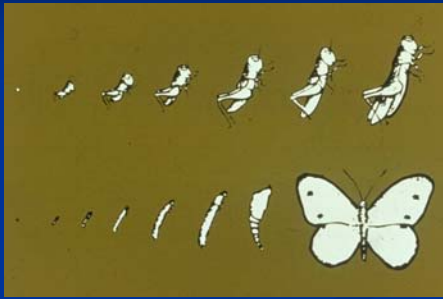
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### Growth and Development of Insects



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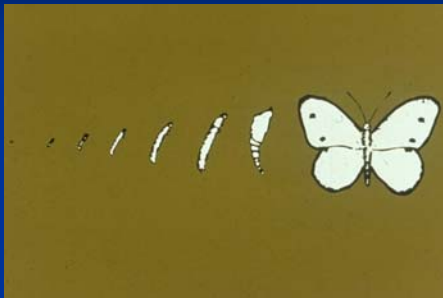
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### Complete Metamorphosis



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### Gradual Metamorphosis



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## Complete classification system of insects.

- Phylum: Arthropoda
- Class: Insect
- Order: Diptera
- Family: Muscidae
- Genus: Musca
- Species: domestica
- Common name: housefly

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## Insect Identification

Knowledge gained from classification to order level.

- Life cycle
- Damage caused
- Habitat

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## Coleoptera: Beetles and weevils



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## Coleoptera: Beetles and weevils

Chewing mouthparts

Complete metamorphosis

Adults

- Hardened outer skeleton
- 2 pairs of wings, outer pair hardened - inner pair membranous.
- Noticeable antennae

Larvae

- Head capsule, 3 pairs of legs on the thorax no legs on the abdomen (Weevil larvae lack legs on the thorax)

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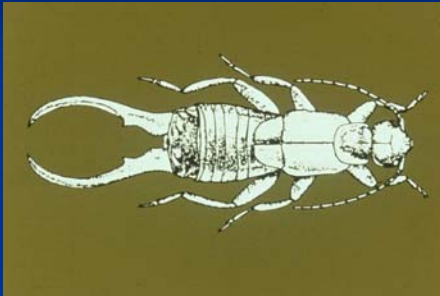
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## Dermaptera: Earwigs



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## Dermaptera - Earwigs.

- Chewing mouthparts
- Gradual metamorphosis
- Elongate, flattened insects with strong, movable forceps on the abdomen
- Outer wings- short, hardened ; inner wings folded, membranous, "ear-shaped"
- Adults and nymphs similar in appearance
- Adults moderately sized insects

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**Diptera:** Flies, mosquitoes, gnats and midges



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**Diptera:** Flies, mosquitoes, gnats and midges

Complete metamorphosis

Adults

- 1 pair of wings, are soft-bodied and often hairy
- Sponging (housefly) or piercing (mosquito) mouthparts

Larvae

- Mouth hooks or chewing mouthparts
- Most larvae are legless
- Larvae of advanced forms, housefly and relatives, have no head capsule, possess mouth hooks, and are called maggots; lower forms such as mosquito larvae and relatives have a head capsule

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**Hemiptera – Heteroptera**

Stink Bug, Plant Bug, Squash Bug, Box elder Bug



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## Hemiptera – Heteroptera

Stink Bug, Plant Bug, Squash Bug, Box elder Bug

- Gradual metamorphosis (egg, nymph, adult)
- 2 pairs of wings; 2nd pair is membranous, 1<sup>st</sup> pair are "half-wings"-membranous thickening on basal half
- Adults and nymphs usually resemble one another
- Piercing-sucking mouthparts
- Adults and nymphs- both damaging stages

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## Hemiptera – Homoptera

Scale Insects, Mealybugs, Whiteflies, Aphids, Cicadas and Leafhoppers



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## Hemiptera –

Scale Insects, Mealybugs, Whiteflies, Aphids, Cicadas and Leafhoppers

- Most are small, soft bodied insects; cicadas may be large and hard bodied
- Winged and unwinged forms
- All stages- sucking mouthparts
- Gradual metamorphosis
- Many are carriers of plant pathogens

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## Hymenoptera –

Bees, Ants, Wasps, Sawflies, Horntails.



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## Hymenoptera –

Bees, Ants, Wasps, Sawflies, Horntails

Complete metamorphosis

Most have chewing mouthparts

Adults

- Membranous wings- 2 pairs
- Soft or slightly hardened body
- Larvae
  - 0 legs (wasps, bees, ants), or 3 pair of legs on thorax and more than 4 pair of legs on abdomen (some sawflies)

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## Lepidoptera –

Butterflies, Moths



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## Lepidoptera – Butterflies, Moths

### Complete metamorphosis

#### Adults

- soft bodied
- 4 wings covered with small scales
- Mouthparts coiled, sucking tube. Adults feed on nectar

#### Larvae

- Chewing mouthparts
- Caterpillar, worm-like, variable in color and voracious feeders
- Legs on the abdomen, as well as the thorax

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## Neuroptera –

Lacewings, Antlions, Snakeflies, Mantispids, Dustywing



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## Neuroptera –

Lacewings, Antlions, Snakeflies, Mantispids, Dustywing

- Insect predators, many are aquatic
- 2 pair of membranous wings
- Chewing mouthparts
- Complete metamorphosis

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**Orthoptera –**  
Grasshopper, Cricket, Praying Mantis



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**Orthoptera –**  
Grasshopper, Cricket, Praying Mantis

- Simple metamorphosis
- Chewing mouthparts. Both adults and nymphs are damaging
- Immature stages – nymphs-- resemble adults but are wingless

**Adults**

- Moderate to large, often rather hard bodied
- 2 pairs of wings. Forewings- elongate, narrow and hardened; hindwings- membranous with extensive folded area
- Hind legs of forms enlarged for jumping (except cockroaches and walking sticks)

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**Thysanoptera-**  
Thrips



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## Thysanoptera-

Thrips

- Adults - small, soft bodied insects
- Rasping-sucking mouthparts
- Varied metamorphosis (complete or gradual)
- Found on flowers or leaves of plants
- 2 pairs wings- slender, feather-like with fringed hairs

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## Insect Relatives

- Arachnida
- Diplopoda
- Chilopoda
- Crustacea

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## ARACHNIDA

- Spiders
- Spider Mites
- Ticks
- Scorpions
- Daddy-longlegs

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## Spiders



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## Acari- Ticks, Spider mites



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## Millipedes -DIPLODA and Centipedes- CHILOPODA



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Sowbugs and Pillbugs - CRUSTACEA



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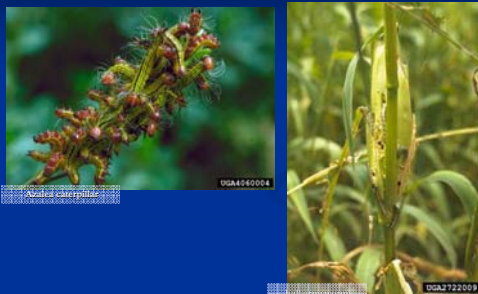
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Injury by Chewing Insects



University of Georgia Archives, The University of Georgia, [www.insectimages.org](http://www.insectimages.org)

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Injury by Piercing Sucking Insects



Alton N. Sparks, Jr., The University of Georgia, [www.insectimages.org](http://www.insectimages.org)

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## Injury by Subterranean Insects



www.insectimages.org

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## Injury by Internal Feeders

Emerald ash borer



David R. McKay, USDA APHIS PPQ, www.insectimages.org

UGA143900



David Cappaert, www.insectimages.org/UGA1460073

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## Injury by Laying Eggs

Dog-day cicada



Jim Occi, BugPics, www.insectimages.org

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## Insects as Disseminators of Plant Diseases



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## Diagnosing Problems Caused by Insects

Poor plant performance may be caused by:

- Insects and their relatives
- Plant disease
- Improper cultural practices and conditions
- Several factors may work together

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## Major Control Methods for Insects

- Legislative (quarantine)
- Physical or Mechanical Control
- Cultural Control
- Biological Control
- Chemical Control

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## Integrated Pest Management Concepts

- Monitoring and assessment
- Understanding pest and beneficial biology and life cycles
- Develop a control strategy
- Implement a control strategy
- Evaluate the level of control
- Diagnosis and detection; pest (and beneficial!) identification

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## Summary



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# Questions?

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