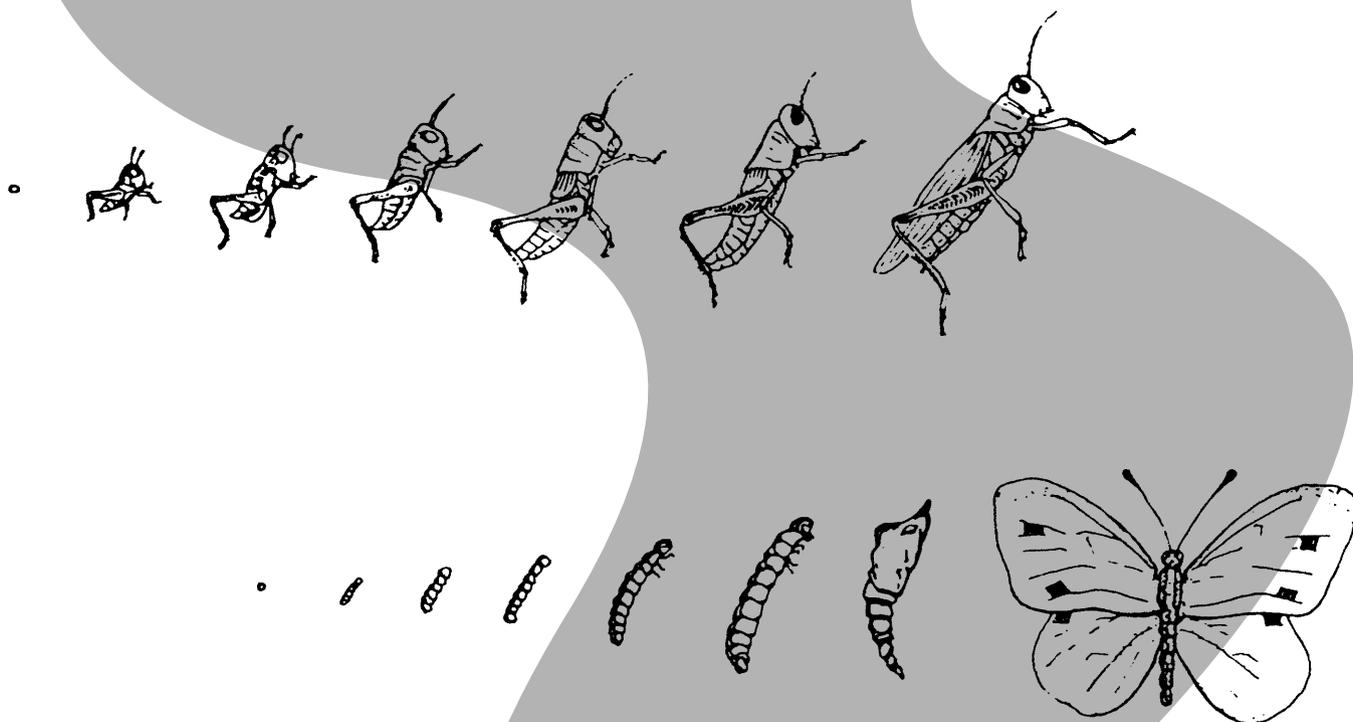


PEST MANAGEMENT

F

Insects



Insects



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Insects and Their Relatives

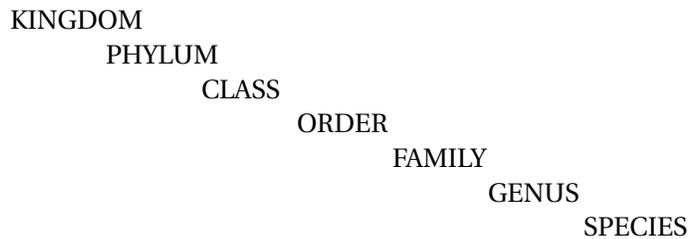
Insects and their relatives have been coexisting with man for thousands of years. Although many people may consider insects as undesirable pests, of the approximately 850,000 identified species (with an estimated one million different species in existence) it is generally agreed that “only” a small number (approximately 10,000) of these species are actually destructive. The remaining species may be broadly grouped as either beneficial or harmless insects.

Before developing strategies for insect pest management, it is important to study the insect world and the often delicate and fragile relationship that exists between insect species, other animals, plants and people.

Throughout history, serious problems have occurred due to insect pests. They have been known to cause devastating crop losses and transmit disease to crops, animals and humans.

The Classification of Insects and their Relatives

Insects are members of the vast and diverse animal kingdom. The animal kingdom is organized into groups based on similar structural features. The first classification is called the **Phylum**. There are ten common phyla in the animal kingdom and members of each of these phyla exhibit similar features.



Phylum

Each phylum is further divided into the sub-groups: CLASS, ORDER, FAMILY, GENUS, AND SPECIES based upon similarities. Insects and “insect relatives” belong to the phylum ARTHROPODA—literally meaning “jointed foot.” All arthropod members have the following characteristics:

- A segmented body
- Paired segmented appendages
- An exoskeleton that is periodically shed (“molted”) and renewed (humans have an endoskeleton)
- An open circulatory system (blood is not in vessels but sloshes through the tissue)
- A ventral nervous system (humans have a dorsal nervous system)
- Respiration by gills or a system of tubes (tracheae) (blood usually does not carry oxygen)
- Separate sexes

Class

Arthropods are further divided into five major CLASSES: Arachnida, Chilopoda, Crustacea, Diplopoda, and Hexapoda (Insecta). The Hexapoda class is the larg-

est of these classes and includes 7/8ths of all arthropod members. True insects are members of the Hexapoda (Insecta) class.

Hexapoda or Insecta • This class includes true bugs, butterflies, bees, beetles, flies, fleas, scales, termites, ants, etc.

Insect Orders

Thousands of insects exist and they are further organized into groups with similar characteristics such as mouthparts, wing structure, and metamorphosis. Depending upon classification, 26 to 30 different orders are recognized.

Characteristics of Insects (Figure F-1)

- Three body regions (head, thorax, abdomen)
- One pair of antennae
- Chewing or piercing-sucking mouth parts
- Thorax usually with two pair of wings (sometimes only one or none)
- Thorax usually with 3 pair of legs (sometimes none)

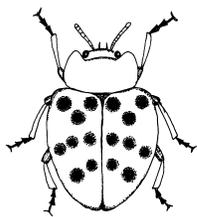
Characteristics of Insect Relatives (Figure F-2)

Spiders, Mites and Ticks (Arachnida)

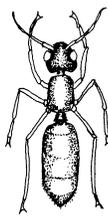
- Have two body regions(cephalothorax, abdomen)
- Have four pairs of legs
- No antennae
- Spiders have eight simple eyes
- Ticks are large mites

Millipedes (Diplopoda)

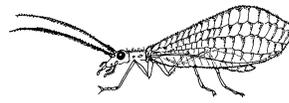
- Two body regions
- Elongate or “wormlike”
- Rounded in cross section
- Two pairs of legs per body segment



Beetles



Ants



Lacewings



Flies



Butterflies



Fleas

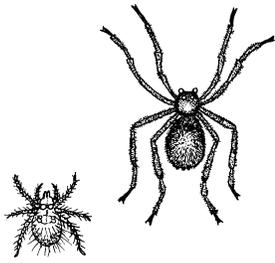


Scales



Blister beetle

Figure F-1. Various insects demonstrating characteristic body parts.

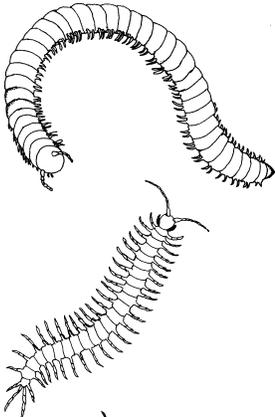


Centipedes (Chilopoda)

- Resemble millipedes
- Flattened in cross section
- One pair of legs per body segment

Crustaceans—Lobsters, Crayfish, Barnacles, Sowbugs (Crustacea)

- Two body regions
- Mostly aquatic species, except for the sowbugs
- One pair of compound eyes
- Two pairs of antennae
- Five–seven pairs of legs



Insect Anatomy

All insects have three body regions: head, thorax, and abdomen (see Figure F-3). The head contains the mouth parts, antennae, and eyes. The thorax is where the legs and wings are attached, and the abdomen contains reproductive and sensory structures.

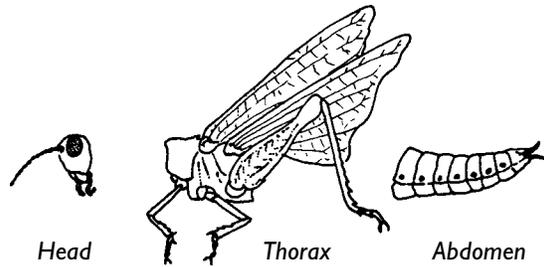


Figure F-3. Body Regions

External Anatomy

The Exoskeleton • The exoskeleton has three major functions. The first is for protection and support; it protects the insect's internal muscles and organs from many outside influences such as disease organisms, natural predators and parasites, dessication, pesticide penetration, etc. Secondly, the exoskeleton acts as a receptor of various stimuli and aids in communication between the outside world and inside the insect. For example, some epidermal cells may be modified to recognize heat and humidity changes, or changes in wind direction. Also, the exoskeleton is directly involved with insect movement. The muscles are attached to this outer body wall.

The insect body is segmented which allows for flexibility. These segments are fused together to form three body parts: head, thorax and abdomen.

The Head • The major parts associated with the head are the antennae, eyes, and mouthparts. The head position is dependent upon its mouthparts and the type of food that it eats.

The mouthparts may project forward, downward or backward.

The antennae are located between or just below the eyes and act as sensory structures. Using their antennae, insects can detect a wide range of environmental conditions, such as chemical cues, changes in humidity, the surface they are walking upon, and vibrations.

Antennae may be very conspicuous and their structure can differ greatly between insect species. Antennae can be helpful for taxonomic (identification) purposes. See Figure F-5.

Compound eyes are the major sight organs. Most adult and many young insects have compound eyes. Each compound eye is made up of individual receptor units. Each individual receptor unit can perceive shape, movement

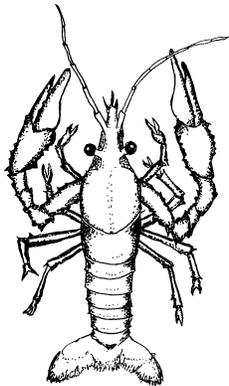


Figure F-2. Insect Relatives

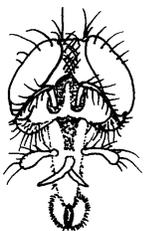


Figure F-4. The Head