



# Agronomic Insect Pests

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# Classification

## Taxonomy:

- Kingdom Animalia
- Phylum Arthropoda - Arthropods
- **Class Insecta - Insects**
- **Order (29)**
- Suborder
- Superfamily
- **Family (950)**
- Subfamily
- **Genus**
- **Species (> 1 million)**

## Others Classes:

- Araneae – Spiders
- Chilopoda – Centipedes
- Diplopoda – Millipedes
- Isopoda – Sowbugs
- Opiliones - Harvestmen
- Scorpidida - Scorpions

## Orders covered on this practical:

- Coleoptera (beetles)
- Hemiptera (true bugs)
- Homoptera (cicadas, aphids, etc)
- Neuroptera (antlions, lacewings)
- Lepidoptera (butterflies & moths)
- Hymenoptera (wasps, bees)
- Orthoptera (Grasshoppers, Crickets, Katydid)

# Insects

## **Numbers:**

### Worldwide:

29 orders

949 families

> 1 million species

### U.S. & Canada:

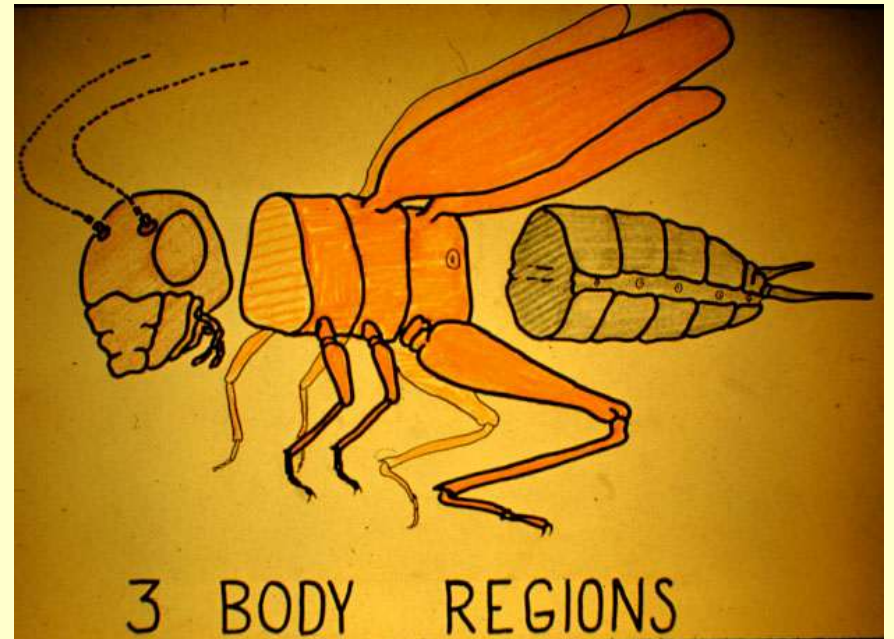
28 orders

612 recorded families

12,428 recorded genera

86,346 recorded species

# What is an Insect?



## **Class: Insecta**

- Three pairs of legs
- Three body parts: head, thorax, and abdomen
- None, one, or two pair of wings
- One pair of antennae
- Usually one pair of compound eyes

# Mouthparts

Mouth part types on practical:

- Chewing
- Chewing-laping
- Rasping-sucking
- Piercing-sucking
- Siphoning

## **MOUThPARTS OF SElECTED INSECT ORDERS**

**Coleoptera** (beetles): chewing

**Hemiptera** (true bugs): sucking

**Homoptera** (cicadas, aphids, etc): sucking

**Neuroptera** (antlions, lacewings): chewing

**Lepidoptera** (butterflies & moths): chewing and sucking

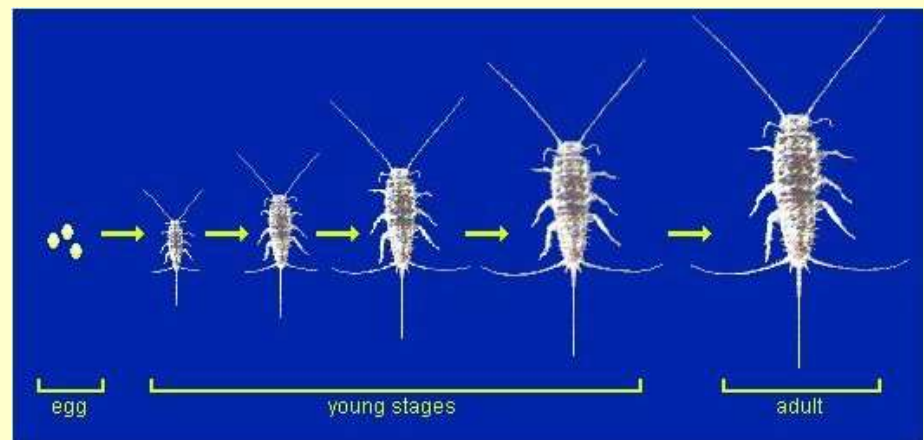
**Hymenoptera** (wasps, bees): chewing, chewing-sucking

**Odonata** (dragonflies): chewing

**Orthoptera** (grasshoppers, crickets, katydids): chewing

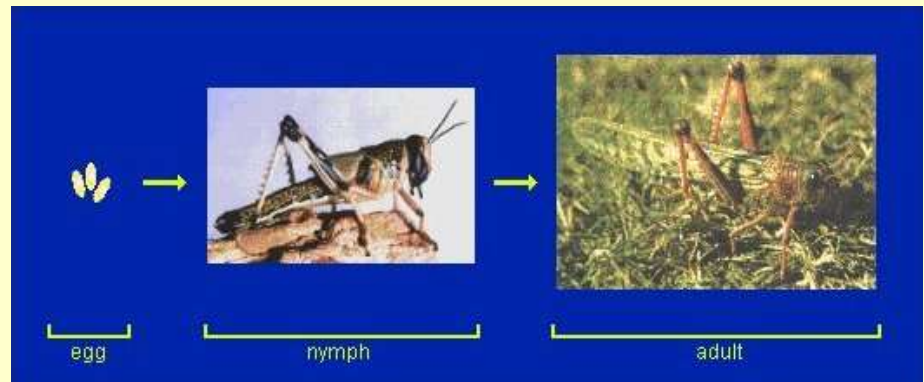
# Metamorphosis

Young are identical to adults at all stages. Examples: Silverfish



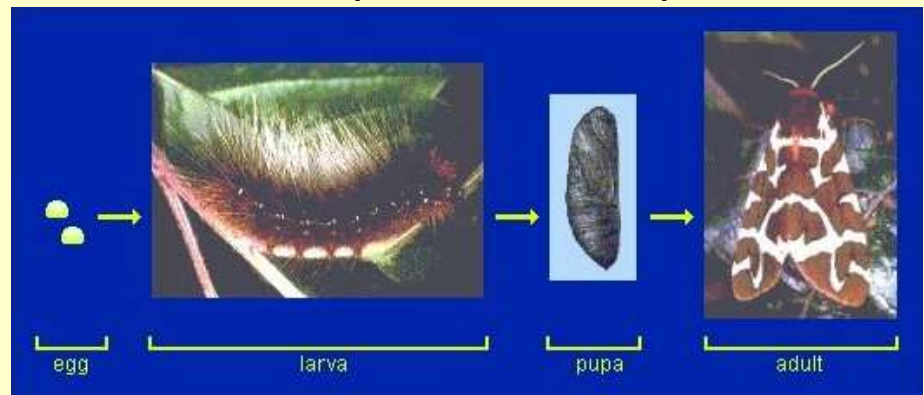
No Metamorphosis

The young called nymphs and are similar in form to adult except that the wings are not developed until the adult stage. Examples: Grasshoppers, True bugs, and white flies



Incomplete Metamorphosis

An egg hatches to produce a larva, which is generally worm-like in form and eventually becomes a pupa often sealed within a cocoon. In the pupal stage, the insect undergoes considerable change in form to emerge as an adult. Examples: Green lacewings, beetles, and moths

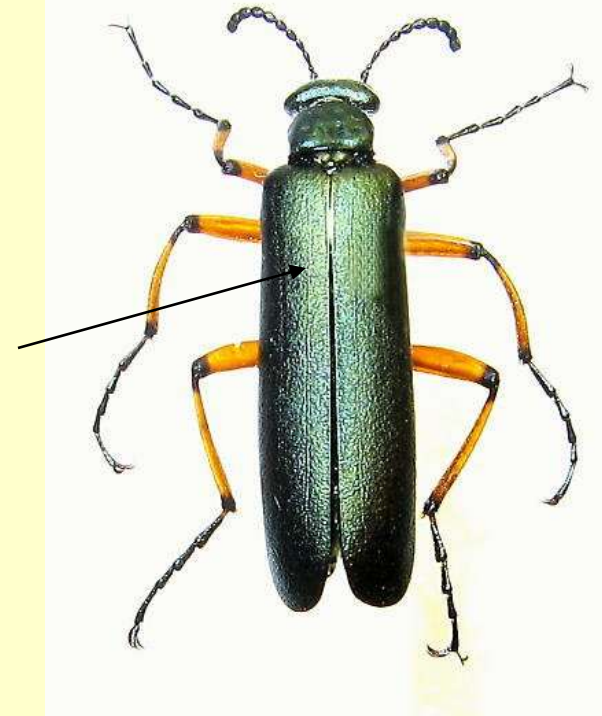


Complete Metamorphosis

# Beetles

## Order: Coleoptera

Elytra



- 1/5 of all animals are beetles
- Coleoptera usually have two pairs of wings
  - front wings called elytra meet in a straight line down middle of back
  - hind wings are membranous and are folded under the front wings
- Chewing mouthparts
- Complete metamorphosis

# Boll Weevil

## *Anthonomus grandis*

rostrum



- Larvae live in cotton bolls and adults feed on foliage and pollen of cotton plant
- Cause major damage to cotton crops
- Chewing mouth parts at end of snout (rostrum)
- Complete metamorphosis

Description: A brown to grayish brown, fuzzy beetle with prominent snout. Adults 1/8 to almost 1/2 inches long. Larvae are legless grubs with brown heads up to 1/2 inch long before pupating. Weevils drill holes in squares or bolls with chewing mouthparts at the tip of their rostrum.

Foods: feed and develop in cotton and closely related tropical malvaceous plants. females lay eggs in cotton squares (flower buds) or bolls (fruit) that are 1/4 inch or more in diameter. Larvae feed for 7 to 14 days and develop through several instars before pupating. Adults emerge in 4 to 6 days and chew their way out of the cotton square or boll in which they developed.

Similar: The pink bollworm, *Pectinophora gossypiella* also has larvae found in cotton bolls. These caterpillars can be distinguished by their color and the presence of legs.



# Alfalfa leaf weevil

*Hypera postica*



- Larvae and adults feed on alfalfa leaves
- Chewing mouth parts at end of snout (rostrum)
- Complete metamorphosis

Identification: The adult weevil is a brown snout beetle, about 5 mm long, with a dark brown stripe extending from the head down the centre of the back. Larvae are bright green with a black head, six legs and a distinctive white stripe down the centre of the back. At full size, they are about 8 mm long.

# Blister Beetles

Family: Meloidae



- Adults feed on leaves and flowers of crop plants
- Chewing mouthparts
- Complete metamorphosis

Description: Medium to large beetles (1/10"→1"; typically 2/5"–4/5"); head broad, generally rectangular when viewed from above; elytra not flat, typically rolled over abdomen; body elongate, soft and somewhat leathery; antennae filiform (thread-like) or moniliform (beaded); often found on flowers and foliage.

Food: larvae are parasitoids of bees of families Megachilidae and Andrenidae. *Epicauta* (and other genera) and prey on eggs of grasshoppers. Adults feed on leaves and flowers of several families of plants, particularly Asteraceae, Fabaceae, and Solanaceae.

Remarks: Pressing or rubbing adult blister beetles may cause them to exude some of their hemolymph ("blood"), which contains cantharidin. This compound causes blistering of the skin, thus the name blister beetle.

Similar families (head is usually not wider than pronotum): Soldier beetles - elytra usually flat, not rolled; false blister beetles - have no "neck"; fire-colored beetles - antennae saw-like or comb-like.

# Flea beetles

Tribe: Alticini



- Chewing mouthparts
- Complete metamorphosis
- Adults feed on leaves and flowers of ornamentals and leafy vegetable crops

Description: small, often shiny beetles with large rear legs that allow them to jump like a flea when disturbed.

Food: characteristic injury known as "shotholing" when adults chew many small holes or pits in the leaves, which look like damage by fine buckshot. Young plants and seedlings are most susceptible and growth may be seriously retarded, appearance damaged, and plants even killed. Most important among ornamentals and leafy vegetable crops.

# Colorado Potato Beetle

*Leptinotarsa decemlineata*



- Chewing mouthparts
- Complete metamorphosis
- Adults feed on potato plants and other members of Solanaceae family

Identification: 1/8"-7/8", ten black stripes and irregular punctures on the pale yellow elytra. Larva has two rows of black spots on each side.

Food: Potatoes and related plants.

# Wireworm

(Click beetles)  
Family: Elateridae



- Chewing mouthparts
- Complete Metamorphosis
- Larvae feed on potatoes and other root crops, lawn grasses, and vegetables.

Discription: adults are bullet shaped, brown to black; larvae are hard, smooth, slender, yellowish to white to coppery color, 3 pairs of small thin legs behind head, 1-2' long.

Food: Larvae move up and down in soil in response to temperature. Primarily feed on small grains, corn, potatoes, sugar beets and vegetables. Adults are found on flowers, under bark or on vegetation. Many of the larvae are found in rotten logs.

Remarks: They are peculiar in being able to "click" and jump made possible by the flexible union of the prothorax and mesothorax and the prosternal spine that fits into a groove on the mesosternum. If they are placed on their backs they use this mechanism to snap and jump usually falling right side up.

# Ladybird Beetles

Family: Coccinellidae



- Chewing mouthparts
- Complete metamorphosis
- Adults and larvae are predators of aphids and other insects

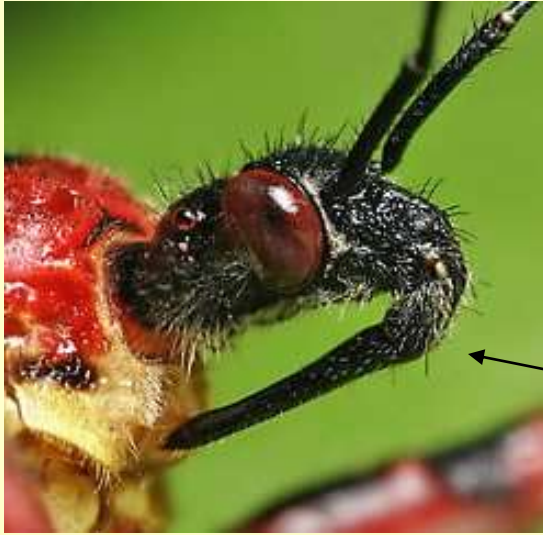
Identification: 1/25" -3/8" in length, characteristic oval to rounded shape, strongly convex on dorsal side, flat on ventral. Many species boldly marked in orange, yellow, black. Head often concealed from above. Antennae short with club end. Larvae are flattened and elongated (alligator like), without wings, with normal, fully-developed legs, so they don't resemble worms like typical beetle larvae.

Food: Most are predaceous as larvae and adults, a very few species feed on plants or fungi. Important beneficial insects.

Similar insects: Some similar groups (Leaf beetles, handsome fungus beetles, pleasing fungus beetles, etc.) but most have longer antennae.

# True Bugs

Order: Hemiptera



beak

scutellum



- Four wings folded flat over the body
- Often a visible triangle at center of back that wings do not cover called the scutellum
- Front wings are thickened and leathery at base with membranous tips
- Mouthparts are piercing and sucking and the beak arises from front part of head
- Some true bugs cause considerable plant damage by their feeding
- Some are beneficial because they prey on other insects
- A few bite humans on occasion.
- Metamorphosis is incomplete (juveniles usually like the adults but wingless)

# Assassin Bugs

Family: Reduviidae



- Piercing and sucking mouthparts
- Incomplete metamorphosis
- Adults and larvae are predators



Identification: brown, black or brightly colored with short three-segmented beaks used for stabbing prey. Head typically constricted behind the eyes, giving a neck-like appearance; antennae long, thin, not clubbed; forelegs sometimes swollen or expanded for catching prey.

Food: Predatory on other insects.

Remarks: Many species can inflict a painful bite on humans if handled, so it's wise to avoid touching them. If one lands or is seen on your body, brush it or flick it off with a sideways motion. Do not slap or swat it because it will almost certainly bite if you try to crush it.

Similar insects: Ambush Bugs (Phymatidae) are small stout bugs with short clubbed antennae and usually swollen forelegs, modified for capturing prey.



# Chinch Bug

*Blissus leucopterus*



- Piercing and sucking mouthparts
- Incomplete metamorphosis
- Adults and larvae feed on plant juices

Identification: small and slender, 1 /6” to 1 /5” long with black bodies and white wings. Each wing bears a distinctive, triangular black mark. Some adults at a site will have full-sized, functional wings, while other individuals will be short-winged and incapable of flight. Recently hatched nymphs are wingless, yellow or pinkish-red, with a light-colored band across their abdomen.

Food: Pest of St. Augustine grass lawns but also found on zoysia, Bermuda, and centipede. Damage is due not just to the direct effects of feeding, but also to phytotoxic effects of the saliva.

Similar to: Big-eyed bugs are beneficial predators that kill chinch bugs and many other pests. Although similar in size to chinch bugs, big-eyed bugs have large, protruding eyes and a head at least as wide as the thorax (the leg-bearing part of the body). Chinch bugs have small heads (narrower than the thorax); eyes are small in proportion to the head; and their bodies are more slender. Big-eyed bugs do not have the distinctive white wings with black triangular marks that chinch bugs have.

# Lygus bugs

(Tarnished plant bug)  
*Lygus* sp.



- Piercing and sucking mouthparts
- Incomplete metamorphosis
- Adults and larvae feed on plant juices

Identification: Adult - body either mottled or solid color varying from pale green to reddish-brown or black with pale Y or V shape on scutellum; antennae and legs relatively long. Nymph - young nymphs are pale green and wingless or have tiny wing buds that grow with age; older nymphs take on more adult coloration and develop 5 black dorsal spots (2 pairs straddling the midline of the thorax, and 1 spot on the midline of the abdomen)

Food: Host plants include alfalfa, canola, lentils, potato, strawberries, vegetable crops, flax, hemp, fababean, tree fruits and weeds such as redroot pigweed, stinkweed, wild mustard, lambsquarters.

# Stink bugs

Family: Pentatomidae



- Piercing and sucking mouthparts
- Incomplete metamorphosis
- Adults and larvae feed on plant juices

Identification: segmented antennae; large, triangular scutellum; head relatively small and often "tucked into" a concavity in anterior margin of pronotum; ocelli present body (as viewed from above) apparently divided into 5 sections.

Food: Both adults and nymphs of plant-feeding species are capable of injuring plants. Feeding damage is caused when they insert their piercing-sucking mouthparts into the plant, inject digestive enzymes, extract plant juices and allow entry of pathogenic microorganisms. The majority of stink bugs found in North America are plant-feeding species.

Remarks: Stink bugs are sometimes serious agricultural pests, in particular when they attack developing fruits and nuts, which can quickly be ruined for commercial purposes by an infestation.

# Aphids, Leafhoppers and Whiteflies

Order: Hemiptera



- Piercing and sucking mouthparts
- Beak arises from the hind part of the head
- Incomplete metamorphosis
- Adults and larvae feed on plant juices
- Wings (when present) are membranous, four in number, held roof-like over the body

# Aphids

Family: Aphididae

- Piercing and sucking mouthparts
- Adults and larvae feed on plant juices
- Incomplete metamorphosis

cornicles



Identification: may be identified by two tube-like projections on the posterior, called cornicles. These appear to function as a means of chemical defense, emitting pheromones to alert other aphids about a predator nearby. They also offer mechanical protection, as the fluid emitted can gum up the mouthparts of the predators. Often identified by the host plant upon which they are found.

Food: suck juices from plants and may be quite damaging. Some are restricted to a single plant species or group of related plants. Others may alternate between two unrelated host plants.

Remarks: when feeding, aphids excrete a sweet liquid known as honeydew. This provides food for ants, which are known to tend aphid colonies and protect them from predators in exchange for the sweet liquid. Ants have been observed herding aphids, and stroking them to "milk" them. Some species of ants have also been known to move aphids from one plant to another when the food supply is insufficient, and some even take aphid eggs into their underground nests to help them overwinter.

# Leaf Hoppers

Family: Cicadellidae



- Piercing and sucking mouthparts
- Adults and larvae feed on plant juices
- Incomplete metamorphosis



Identification: small jumping insects with one or more rows of small spines on the hind tibiae; many are brightly colored with patterns of lines, patches, and/or spots of various shades, wings fold over body like tent.

Food: nymphs and adults feed on sap of above-ground stems or leaves of plants; some species are limited to one host plant, whereas others feed on many species of plants. Several species are serious agricultural pests because of the damage they do to commercial crops. Some species also transmit plant pathogens such as viruses, mycoplasma-like organisms, or other microorganisms.

# Whiteflies

Family: Aleyrodidae



- Piercing and sucking mouthparts
- Adults and larvae feed on plant juices
- Incomplete metamorphosis

Identification: Minute soft-bodied insects that resemble tiny moths, The adult body is covered with a pair of wings, held more or less roof-like over the body and covered with a white waxy powder that lacks any distinguishing marks or pigmentation. The abdomen is yellow. Larvae or “crawler” is often transparent to opaque sometimes with white wax on surface.

Food: Feed on leaves by sucking plant juices of hundreds of host plants. The whitefly feeds by sucking sap from the plant and excretes a sticky exudate called honeydew. When populations are high, honeydew production is copious. Sooty mold often grows on the honeydew, blackening leaf or fruit surfaces. Often transmit crop diseases.

# Lacewings

Order: Neuroptera



- Chewing mouthparts
- Adults prey on other insects (beneficial)
- Complete metamorphosis
- Larva known as aphid lions

Identification: Fragile insects with 2 wings the same size with many veins held roof like over body. Antennae are long and threadlike (some are clubbed). Adults are pale green, about ½"-3/4" long, with long antennae and bright, golden eyes. They have large, transparent, pale green wings and a delicate body. Adults are active fliers, particularly during the evening and night and have a characteristic, fluttering flight. The larvae, known as aphid lions, are very active, are gray or brownish and alligator-like with well-developed legs and large pincers with which they suck the body fluids from prey.

Food: aphids, spider mites, thrips, whiteflies, eggs of leafhoppers, moths, and leafminers, small caterpillars, beetle larvae, and the tobacco budworm



# Butterflies, Moths and Skippers

Order: Lepidoptera

- Thin antennae with knobs
- Active during day
- Usually brightly colored
- Thin bodies
- Rest with wings closed above bodies
- Naked pupa (chrysalis)



- Feathery antennae
- Active at night
- Usually dull colored
- Thick bodies
- Rest with wings open, either flat or tented
- Protective cocoon around pupa made of silk
- Some species burrow in ground to pupate



# Butterflies, Moths and Skippers

Order: Lepidoptera



- Adults have siphoning; larvae have chewing mouthparts
- Complete metamorphosis
- Food – adults eat nectar; larvae eat vegetative, flowering and fruiting parts.
- Economic impact – adults are beneficial (pollinators); larvae are destructive pests.

# Cabbage Looper

*Trichoplusia ni*



Identification: Adult: forewing a blend of light and dark brown, showing very little overall contrast; Larva: green with thin white stripes down the back, and a single thicker white stripe along the side

Food: larvae feed on cabbage, broccoli, Brussels sprouts, kale, cauliflower, asparagus, beets, lettuce, and many other garden crops

# Leaf Skeletonizer

Family: Zygaenidae



Oak leaf Skeletonizer



Grape leaf skeletonizer

Description: Adult: small moths, usually black; larvae - yellowish green, 6mm fully grown

Food: generally host specific; oak skeletonizer attacks black, red, white oak. Skeletonizes leaves by eating material between veins.

# Corn Earworm Moth

*Helicoverpa zea*



Identification: Adult - forewing dull yellowish, usually with diffuse grayish shading, with green eyes; Larva - variable in color. Overall, the head tends to be orange or light brown with a white net-like pattern, the thoracic plates black, and the body brown, green, pink, or sometimes yellow or mostly black. The larva usually bears a broad dark band laterally above the spiracles, and a light yellow to white band below the spiracles. A pair of narrow dark stripes often occurs along the center of the back. Close examination reveals that the body bears numerous black thorn-like microspines. These spines give the body a rough feel when touched.“

Food: As its common names suggest, larvae feed primarily on corn but can also attack a wide range of hosts, including many field crops, hence this species has been much studied. Adult moth feeds on nectar, especially of trees and shrubs.

# Armyworms



**Southern Armyworm**  
*Pseudaletia unipuncta*



**Yellow striped armyworm**  
*Spodoptera ornithogalli*

Food: Though they feed primarily on grasses (oats, wheat, fall rye, corn, barley, and forage grasses), they can be a pest of some vegetables (bean, cabbage, carrot, onion, pea, pepper, radish and sweet potato).

# European corn borer

## *Ostrinia nubilalis*



Identification: larva: body pale brown or pinkish-gray with dark gray middorsal line on abdominal segments; last abdominal segment sometimes darker; head black to reddish-brown

Food: larvae bore in stalks of corn but have been reported on 200 species of plants, including aster, barley, bean, dahlia, millet, oats, potato, sorghum, and other herbaceous species. Serious pest of corn in several areas of United States and Canada larvae feed on all above ground tissues of the corn plant.

# Tomato Hornworm (Five-Spotted Hawkmoth)

*Manduca quinque maculata*



# Tobacco hornworm (Carolina Sphinx Moth)

*Manduca sexta*



Larva: The tomato hornworms have eight V-shaped markings; tobacco hornworm can be distinguished by its seven diagonal lines on its sides. An easy way to remember the markings is tobacco hornworms have straight white lines like cigarettes, while tomato hornworms have V-shaped markings as in V8 juice.

Food plants: Tomato hornworms are known to eat various plants from the family Solanaceae, commonly attacking tomato, eggplant, pepper, tobacco and potato. Accordingly, tomato hornworms are often found on defoliated tomato plants, the caterpillar clinging to the underside of a branch near the trunk. They are difficult to spot due to their coloration.



# Grasshoppers, Crickets, Katydid

## Order *Orthoptera*



- Generally have two pairs of wings with many veins
- The front pair is usually slender and the hind pair is broad and fan-like
- Chewing mouthparts
- Legs are generally long and robust, fitted for jumping
- Incomplete metamorphosis

Identification: hind legs long, modified for jumping, forewings (tegmina) hardened, leathery, spread in flight, covering membranous hindwings at rest,

Food: many species are general herbivores eating vegetative parts of a variety of plants while some only eat grasses. They are important as pests of cereal crops and forage plants.

# Honey Bee

(*Apis mellifera*)



- Chewing and sucking mouthparts
- Suck nectar; chew pollen
- Complete metamorphosis

Description: 2 sets of wings, pollen baskets on legs, worker honey bees are about 5/8" long and are brown or black with yellow-striped abdomens.