Insect Basics

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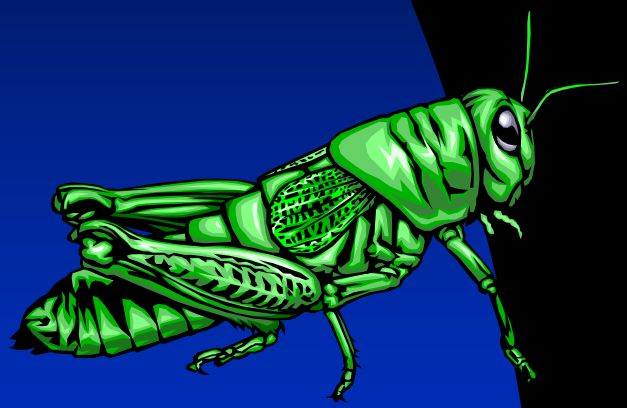
Crop Protection Specialist

Introduction



- What is an insect?
- Close Relatives of Insects
- Life Development
- Field Crops Pest
- Beneficial Insects

What is an Insect?

- **Dominant group of animals – over**

  8-35 million species?
- **Lived on earth for 350 million years**
- **Live in all types of habitat**

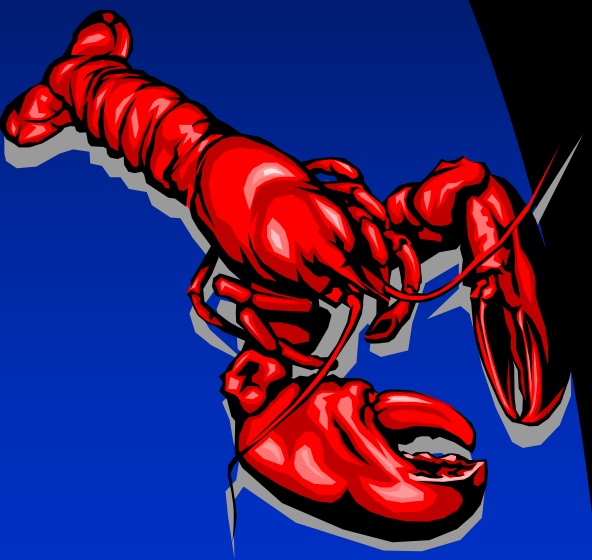
What is an Insect?

- **Beneficial**
  - **pollinate our crops**
  - **food for other animals**
  - **make honey or silk**
  - **medical uses**
  - **food source**
  - **scavengers**
  - **biocontrol agent of weeds**

What is an Insect?

- Pests
  - attack food crops
  - humans
  - animals
  - transmit serious diseases
- Destroy 10-15% of world's food supply

Phylum ARTHROPODA

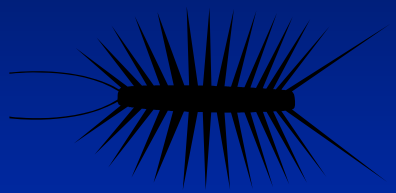


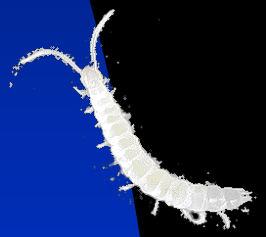
- Invertebrate (no back bone)
- Segmented bodies
- Jointed appendages
- Exoskeleton
- Bilateral symmetry
- Ventral nerve cord
- Dorsal heart

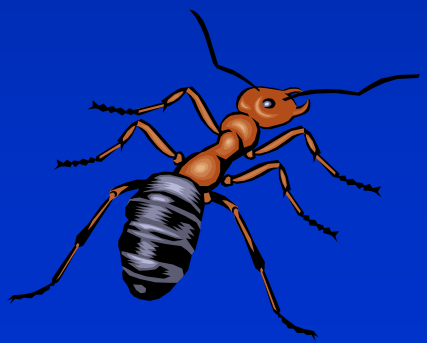
Close Relatives of Insects

- **Phylum ARTHROPODA**
  - **Class Arachnida**
    - **Spiders, scorpions, daddy longlegs, tick, mites)**
  - **Class Crustacea**
    - **Sowbugs**
    - **Aquatic forms – crabs**
  - **Class Diplopoda**
    - **Millipedes**

Close Relatives of Insects

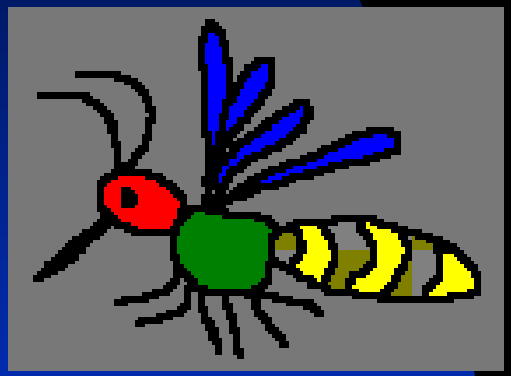






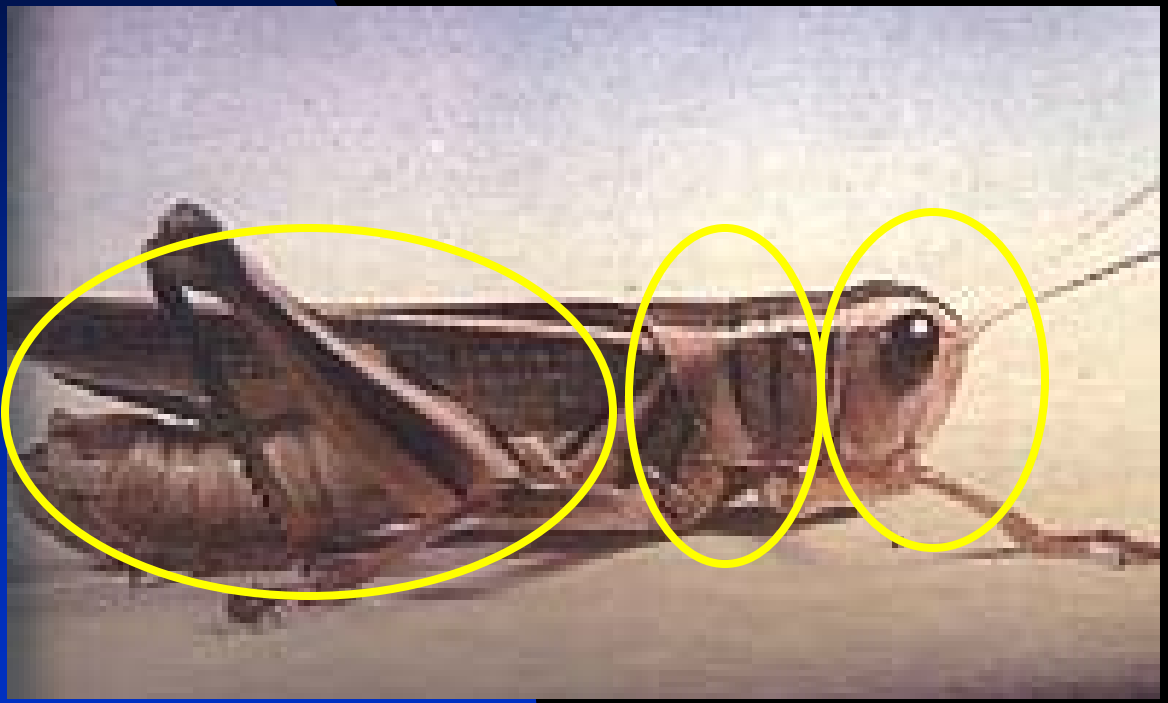
- **Phylum ARTHROPODA**
  - **Class Chilopoda**
    - **Centipedes**
  - **Class Symphyla**
    - **Symphylans**
  - **Class Insecta**
    - **Insects**

About Insects



- Cold blooded
- Three main body parts:
  - Head
  - Thorax
  - Abdomen
- One pair of antennae
- One pair of legs per thoracic segments = three pairs total
- Two pairs of wings

Insect Body Parts



- **Head**
- **Thorax**
- **Abdomen**

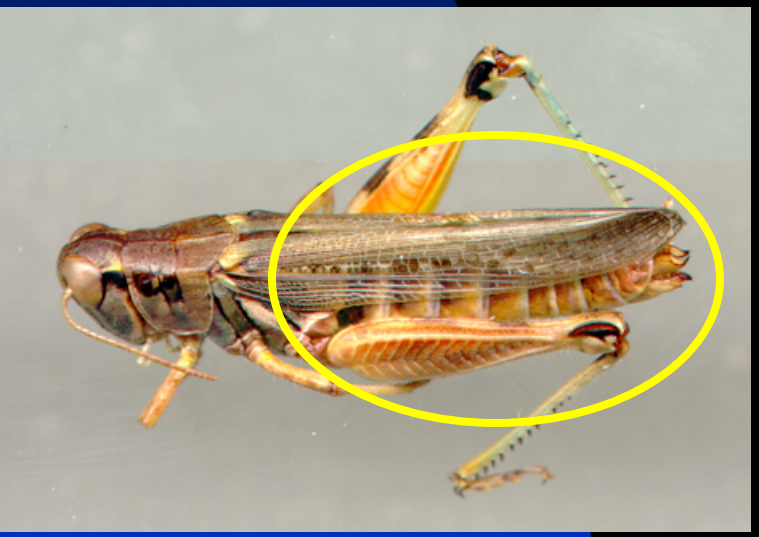
Insect Body Parts

- Head
  - Mouthparts
    - Chewing – grasshoppers, beetles
    - Sucking – aphids, butterflies, moths
  - Antennae
    - Detect odors
    - Tactile (touch)
  - Eyes – compound, simple

Insect Body Parts: Thorax

- 3 segments (prothorax, mesothorax, metathorax)
- 3 pairs of legs
  - Segmented
- 2 pairs of wings (some insects have only one pair)
  - Membranous (wasp, aphids)
  - Hard called elytra (beetles)
  - Scales (moths, butterflies)

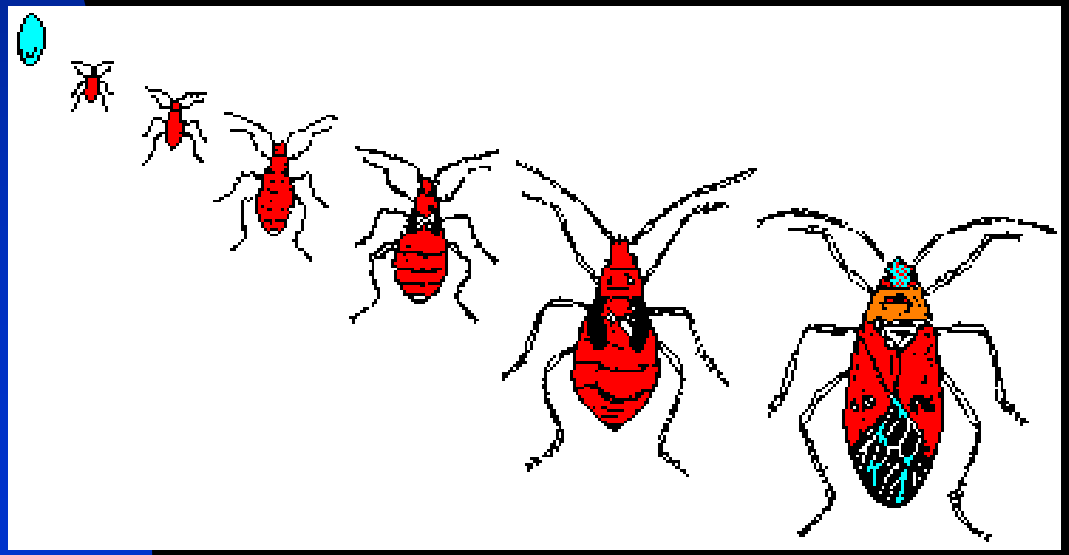
Insect Body Parts: Abdomen



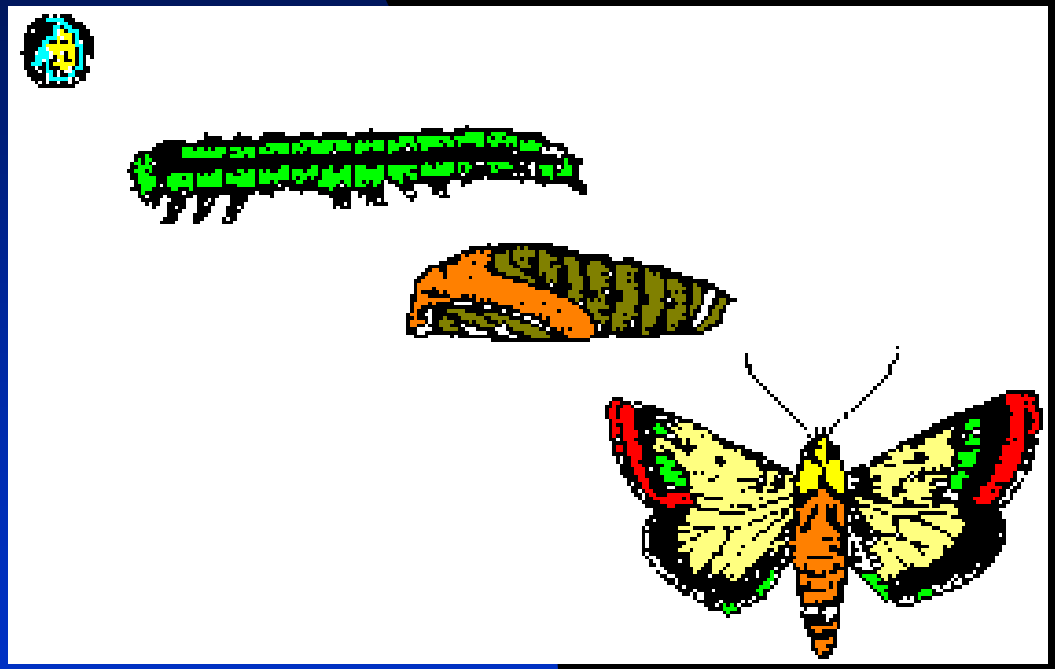
- **11 segments**
- **External genitalia (ovipositor in females)**

Life Development Simple Metamorphosis

- **Egg to larval stages (nymphs) to adult**
- **Larvae look similar to adult**
- **No pupal stage**



Complete Metamorphosis



- Egg to larval stages to pupae to adult
- Larvae look different from adult
- Pupal stage (inactive)

Mouth Parts and Feeding Behavior

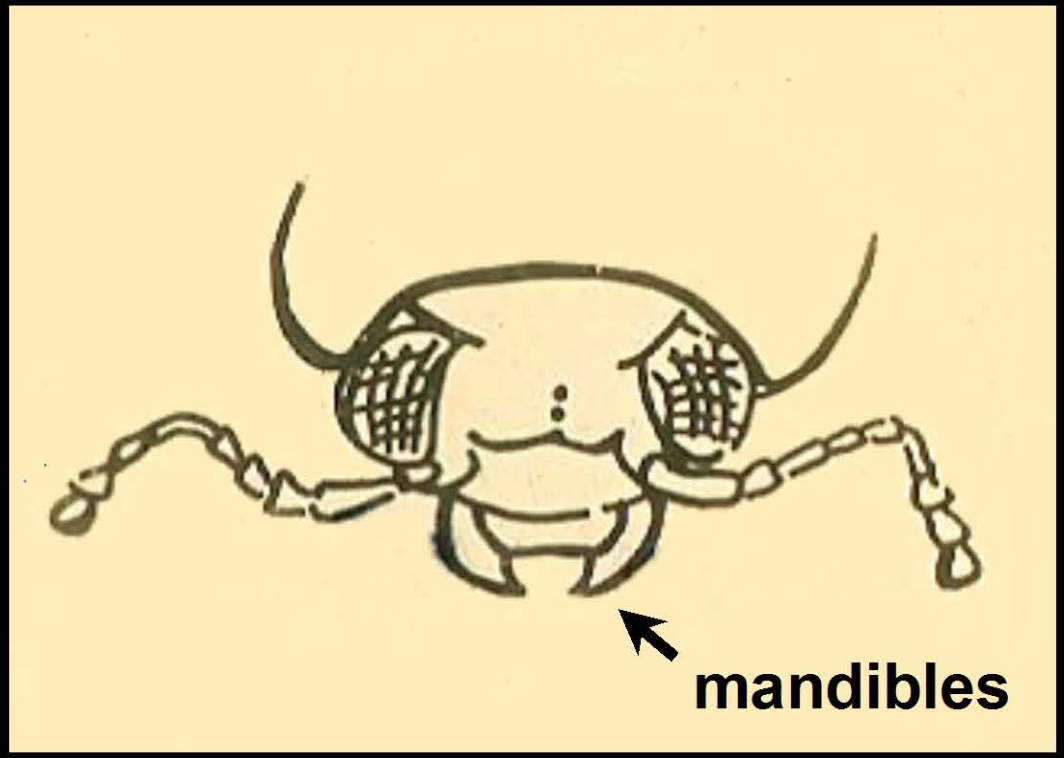
- **May determine economic importance**
- **Food Preferences**
  - **Phytophagous – Plant feeder**
  - **Zoophagous – predator**
  - **Saprophagous – carrion feeder**
- **Two main types**
  - **Chewing**
  - **Sucking**

the Insects

Feeding Damage

Mouthparts

Chewing



Typical injury :

- **missing plant material**
- **holes in plant parts**

the Insects

Feeding Damage

Mouthparts

Sucking

Typical injury :

- wilting plants
- “dead”spots in tissue
- honeydew

Insect Senses

- Sight
  - Eyes (see color, detect movements, short distances, blurred image, UV light)
- Smell
  - Antennae, feet, ovipositor
- Hearing
  - Abdomen, legs, antennae

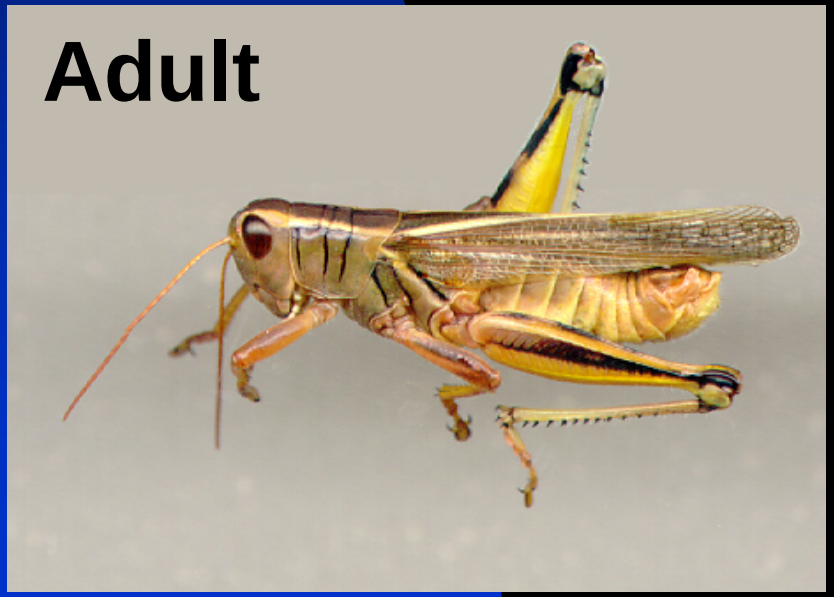
Insect Senses

- Touch
  - Trichomes (hairs), antennae – very sensitive
- Sound
  - Antennae, legs, wings, …

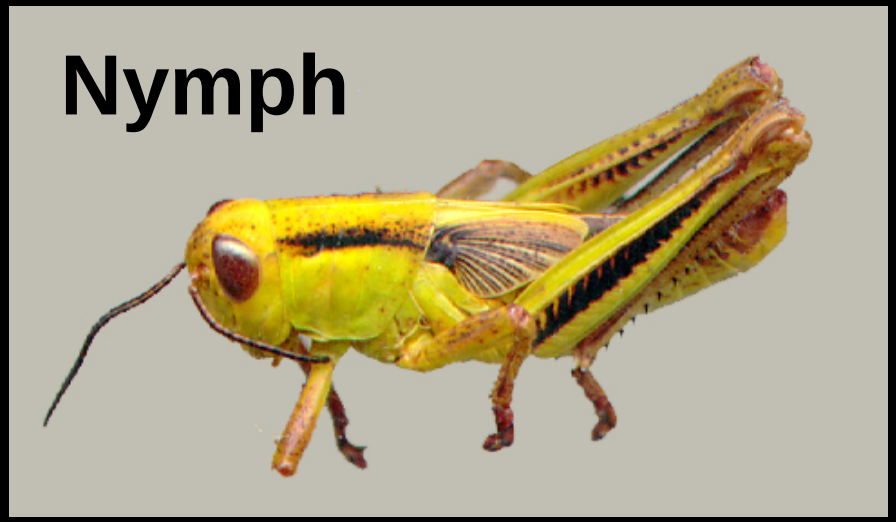
Insect Pests of Field Crops

- **Telling immatures from adults**
  - **Wings present = Adults**
  - **Wings absent = Immature**

Adult



Nymph



Order Orthoptera

"Straight-Wing"

- Elongated bodies
- Chewing mouthparts
- Simple Metamorphosis

- **Crickets**
  - **Black with antennae longer than body**
- **Grasshoppers**
  - **Antennae one-half length of body or shorter**

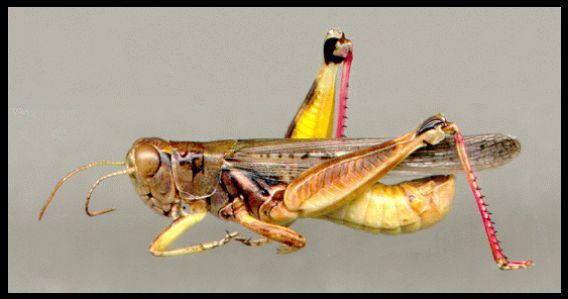
Order Orthoptera

- Simple metamorphosis
- Wings - tegmina and membranous wings
- Chewing mouthparts

Migratory grasshopper

Melanoplus sanguinipes

- Male with ventral hump
- Male subanal plate bilobed
- Female ovipositor without dorsal point
- Tibiae red, blue, or gray
- Hind femur banded
- Black side patch with green spots



Two-striped grasshopper

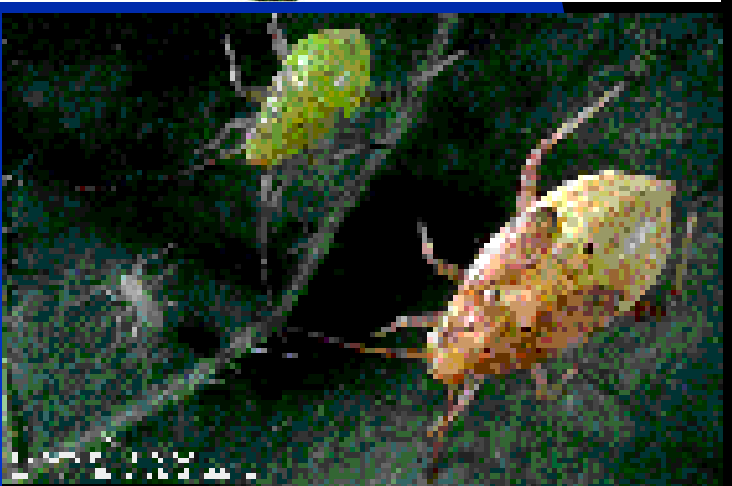
Melanoplus bivittatus

- Two pale stripes from behind eyes extend on to tegmina
- Hind femur black above, yellow below
- Nymph green or brown, hind femur bicolored as in adult

Order Thysanoptera

- **Thrips**
- **Simple metamorphosis**
- **Wings – 2 pr. Slender, fringed with hair**
- **Rasping-sucking mouthparts**

Order Hemiptera



- True Bugs
- Simple metamorphosis
- Wings – Hemelytra and membranous hind wings or none
- Piercing-sucking mouthparts

Order Homoptera

- Aphids, scales, leafhopper
- Simple metamorphosis
- Wings – 2 pr. Membranous or none
- Piercing-sucking mouthparts

Order Coleoptera

- **Beetles, Weevils**
- **Complex metamorphosis**
- **Wings - Elytra and membranous**
- **Chewing mouthparts**

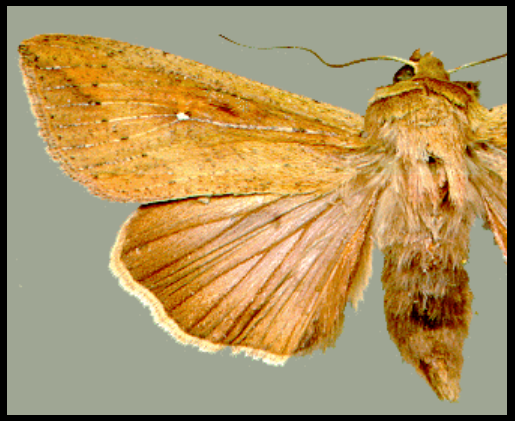
Order Lepidoptera

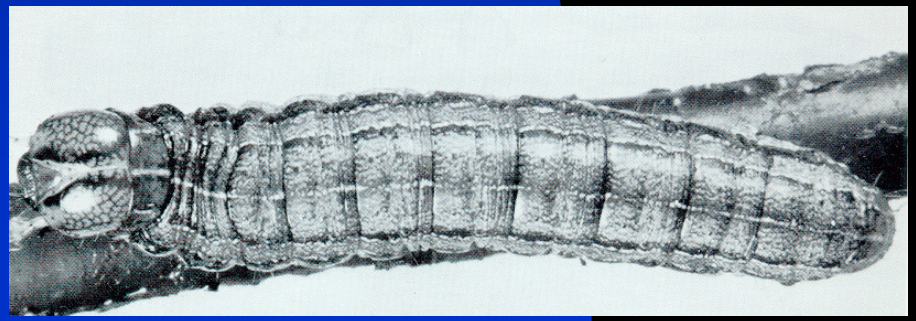
- Butterflies, moths, skippers
- Complex metamorphosis
- 2 pr. wings with scales
- Mouthparts
  - Siphoning in adults
  - Chewing in larvae

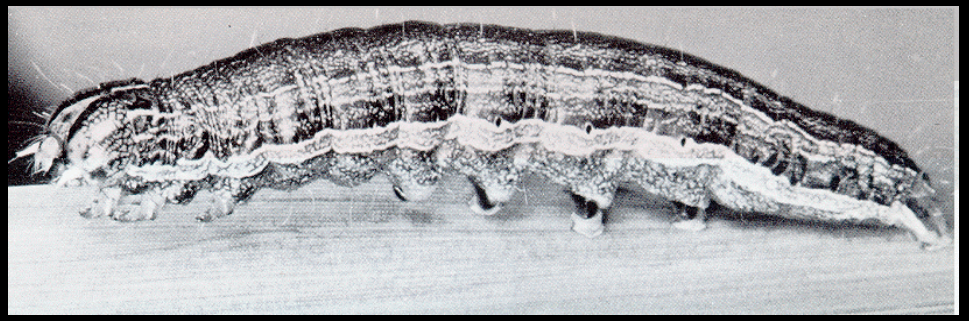
Armyworm

Pseudaletia unipuncta

- Moth with pointed fws and white discal spot
- Larva has two tan bands
- Head capsule with long coronal suture



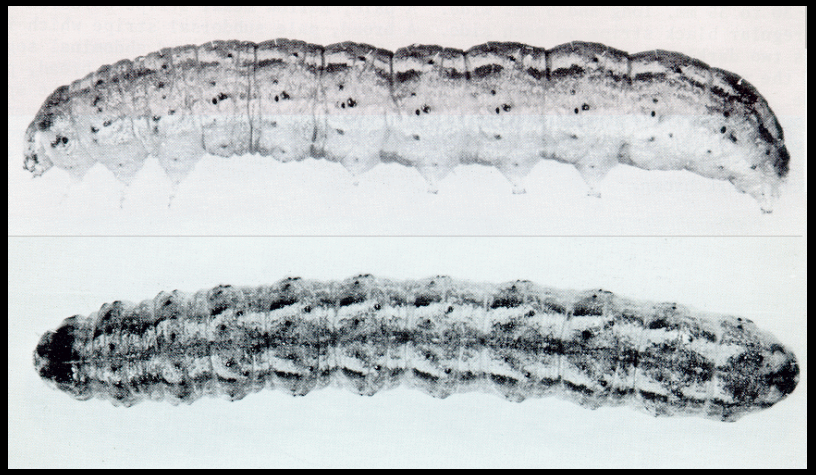




Dingy cutworm

Feltia jaculifera

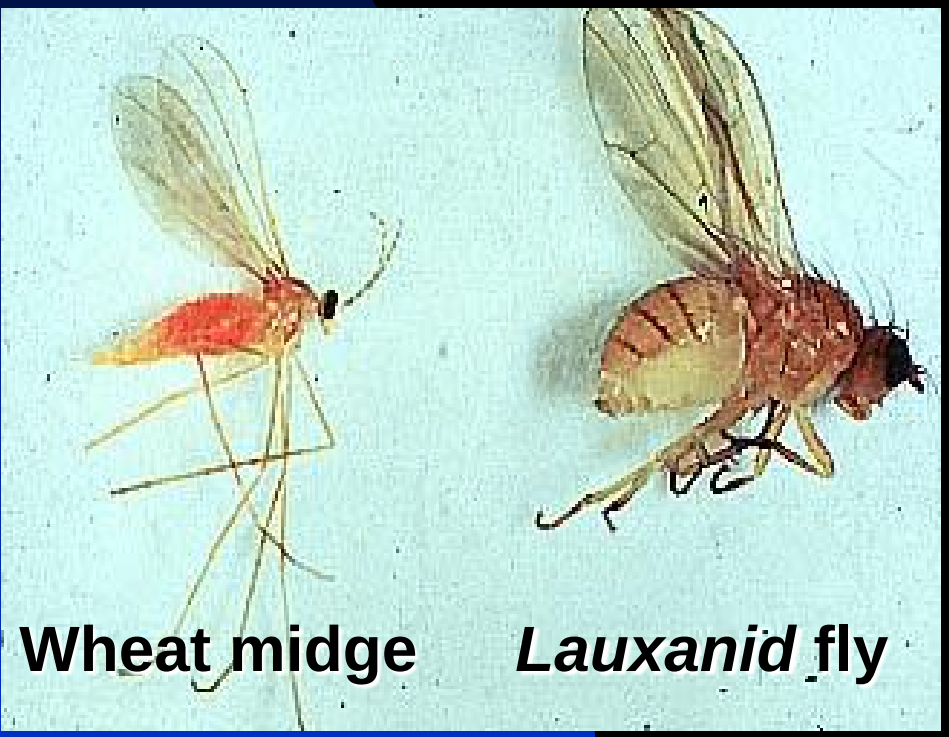
- Moth with contrasting wing pattern, >V'-shaped orbicular spot
- Larva with roughened cuticle and black dorsal wedges



Order Hymenoptera

- Ants, bees, wasps
- Complex metamorphosis
- 2 pr. wings membranous
- Mouthparts
  - Chewing
  - Chewing-lapping

Order Diptera



Wheat midge

Lauxanid fly

- Flies
- Complex metamorphosis
- Wings - Membranous and halters or none
- Mouthparts
  - Piercing sucking in Adults
  - Chewing in larvae

Beneficial Insects

- **Parasitoids (parasite)**
  - **Develop on inside or on its host, killing it as it matures**
- **Predators**
  - **Consume prey during its lifetime**

Beneficial Insects

- Pathogens
  - Bacteria
  - Viruses
  - Fungi
  - Protozoa
- Weed feeders
  - Insect fed only on a specific weed

Parasitoids

- Host specific
- Smaller than host
- Only female searches for food
- Different species can attack different life stages of host
- Immature stages remain on or in host
- Adults are free living, mobile
- Immatures almost always kill host – slow acting

Parasitoids Relative Effectiveness

- **Slow acting**
- **Shorter life cycles therefore increase in numbers faster than predators**
- **Presence is not obvious (dissect or rear out)**
- **HYPERPARASITISM**
  - **A parasite attacked by another parasite**

Parasitoids Pesticide Susceptibility

- **More susceptible than predators**
- **Immature parasitoids can tolerate pesticides better than adult if inside the egg of their host or their own cocoon.**
- **Immatures dies if their host is killed**


Wheat
Macroglenes penetrans
Egg-larval parasitoid of Orange Wheat Blossom Midge

Sunflower
Nealiolus curculionis

Atttacks larvae of Sunflower stem weevil

Corn
Trichogramma ostriniae

T. ostriniae parasitizing egg mass of European Corn Borer
>80% parasitism

Bacteria

Virus

Predators

- Adults and immatures are often generalists rather than specialists
- Generally larger than prey
- Kill or consume many prey
- Male, females, immatures and adults may be predatory
- Attack both immature and adult prey

Predators Relative Effectiveness

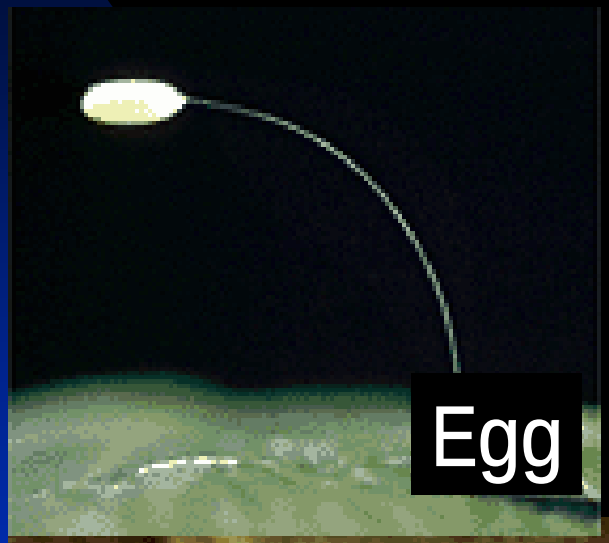
- **Variable**
- **Good late season control**
- **Not studied adequately**
- **Contribute to overall pest mortality as a group**

Sunflower
Lebia grandis – Carabidae
Attacks sunflower beetle eggs and larvae

Many crops
Ladybird Beetles - Coccinellidae

Adults eat 200 aphids a day!

Many crops
Lacewings - Chrysopidae



Sunflower Two-spotted stink bug *Perillus bioculatus* Pentatomidae

- **Attacks sunflower beetle egg and larvae**

Proper Identification of Insect Pests

Identify the insect pests on this trap?

Pixera Microscope System

Digital Imaging

Unidentified bug in canola seed

THREAT?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