

- **Insect Pest:** *Population increases to create economic losses*
 - Criteria to be a pest:
 - *Insect*
 - *Economic losses*
 - *Minimum population*
 - Economic threshold level (ETL / TL) : *Pest density at which control measure should be applied*
 - Economic injury level (EIL) : *Lowest population that cause economic damage*
-
- **Insect Pest:** *Population increases to create economic losses*
 - Criteria to be a pest:
 - *Insect*
 - *Economic losses*
 - *Minimum population*
 - Economic threshold level (ETL / TL) : *Pest density at which control measure should be applied*
 - Economic injury level (EIL) : *Lowest population that cause economic damage*

KIDS PREFER CANDY OVER FRIED GREEN SPINACH

- Entomology:
- Phylum – Arthropoda – Segmented leg
- Class : Hexapoda (*Head, Thorax, Abdoman, 6 legs, Bee*) & Arachnida (*head & thorax fused, 8 legs, spider*)
- Insects
 - Tracheate Arthropods
 - 3 Pairs of working legs
 - 1-2 pairs Wings, 1 antenna



Mites

Animal



Acari are a taxon of arachnids that contains mites and ticks. The diversity of the Acari is extraordinary and its fossil history goes back to at least the early Devonian period. [Wikipedia](#)

Scientific name: Acari

Rank: Subclass

Higher classification: Arachnid

Lower classifications

[View 5+ more](#)



Types of Mouth Parts

1. Piercing & sucking type: *Mosquitos, Bugs*
 2. Sponging type: *Housefly*
 3. Siphoning type: *Butterfly moth*
 4. Rasping & lapping type (chewing): *Honey bee*
- A/T Agricultural purpose only two types
 1. Chewing/ biting & cutting – **Stomach Poison:**
Grasshopper, Larvae
 2. Piercing & sucking type
 - Bug type: **Sys / Contact Poison**
 - Mosquito type: **Sys / Contact Poison**

Life Cycles: Metamorphosis

- **Complete Metamorphosis**
 - For butterflies, the caterpillar is very different from the adult.
- **Incomplete Metamorphosis**
 - In grasshoppers, the young resemble the adults. The younger stages are called nymphs.
- **No Metamorphosis**
 - The young are identical to adults, except for gonads.



Beetle

Insect



Beetles are a group of insects that form the order Coleoptera. The word "coleoptera" is from the Greek *κολεός*, *koleos*, meaning "sheath"; and *πτερόν*, *pteron*, meaning "wing", thus "sheathed wing", because most beetles have two pairs of wings, the front ... [Wikipedia](#)

Scientific name: Coleoptera

Higher classification: Insect

Rank: Order

Lifespan: *Callosobruchus maculatus*: 10 – 14 days, *Dynastes tityus*: 3 – 6 months

Length: Colorado potato beetle: 1 cm, *Dynastes tityus*: 4 – 6 cm

Plant damage caused by pests with piercing/sucking mouthparts



Phylum Arthropoda is Divided into Classes:

- Common Classes* include:
 - Insecta---insects
 - Arachnida---mites and ticks, spiders, others
 - Crustacea---sowbugs; crab, shrimp, lobster, krill, others have been included in this group, FYI
 - Diplopoda---millipedes
 - Chilopoda ---centipedes
-





Lady Beetle Species

Scale predators and parasites



UC Statewide IPM Project
© Regents, University of California



- **Khapra Beetle**
 - Larvae
 - Wheat



Khapra beetle

Insect

The Khapra beetle, also called cabinet beetle, which originated in South Asia, is one of the world's most destructive pests of grain products and seeds. It is considered one of the 100 worst invasive species in the world. [Wikipedia](#)

Scientific name: *Trogoderma granarium*

Higher classification: *Trogoderma*



More images

Growth and Development

Metamorphosis - The process of change from egg to adult.

Incomplete or gradual metamorphosis. Baby insects (nymphs) look similar to adults (grasshoppers, aphids, cockroaches). Growth occurs through molting.

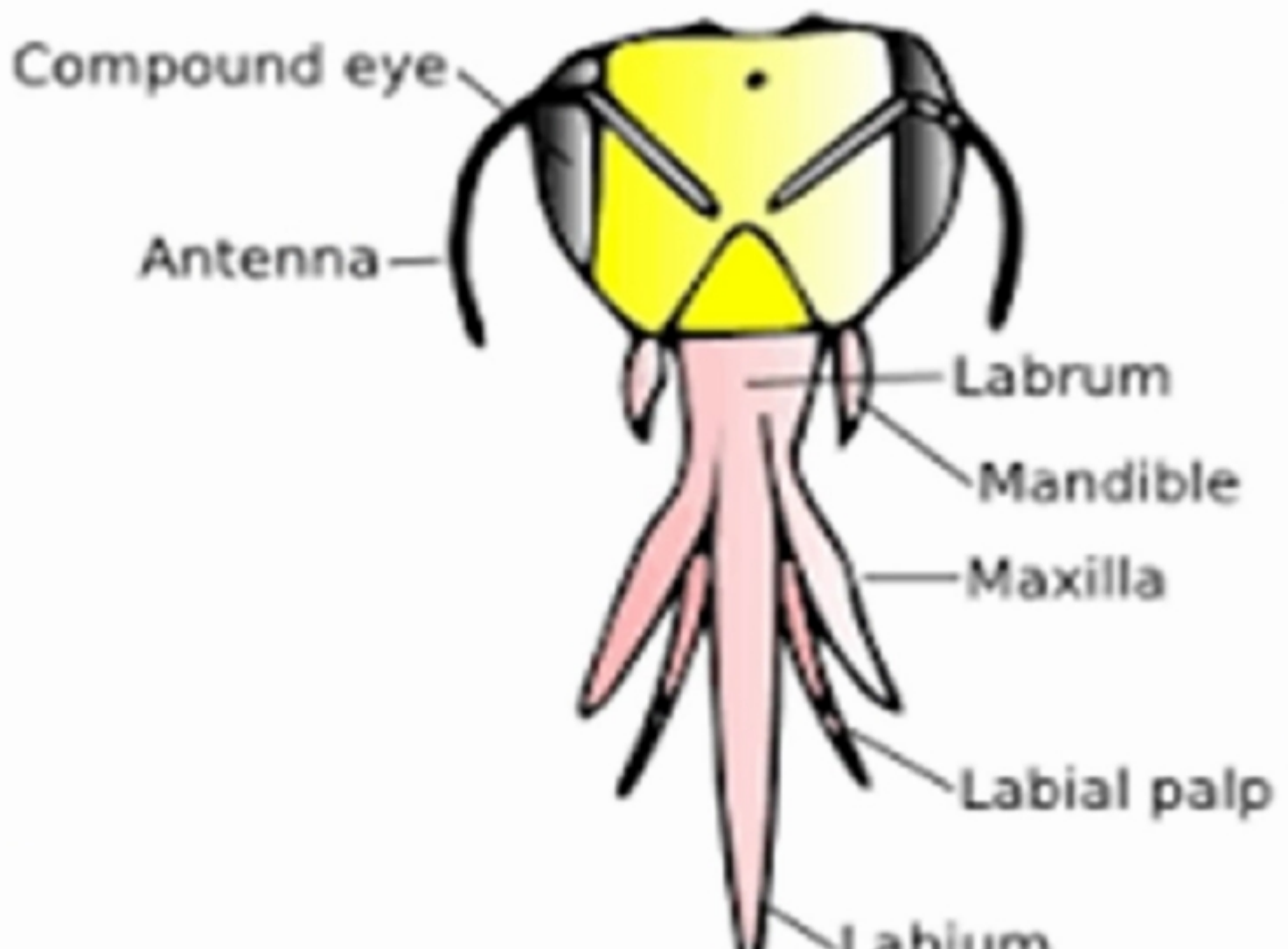


Japanese Beetle Life Stages

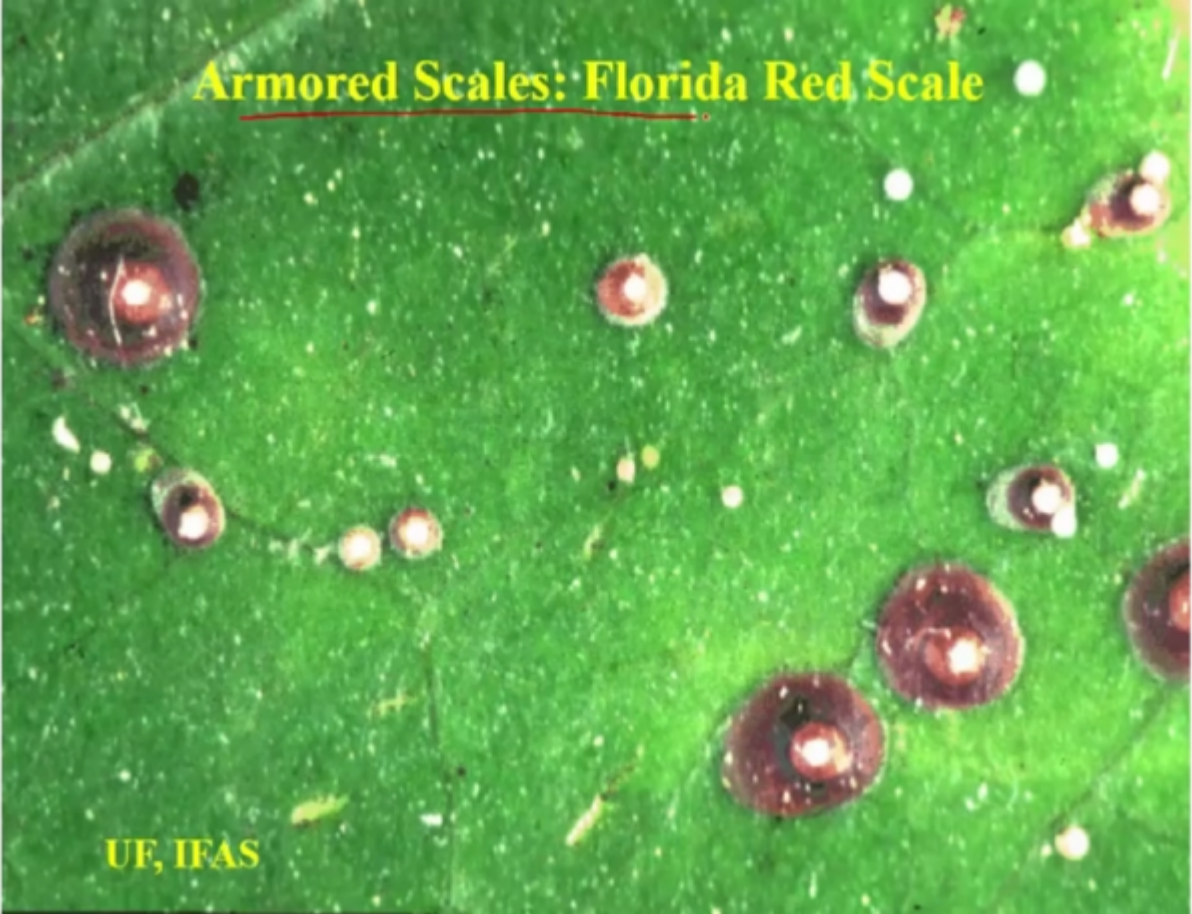


How Insects Feed

Insects can be separated by the type of mouthparts they possess which dictates the type of job they have.



Armored Scales: Florida Red Scale

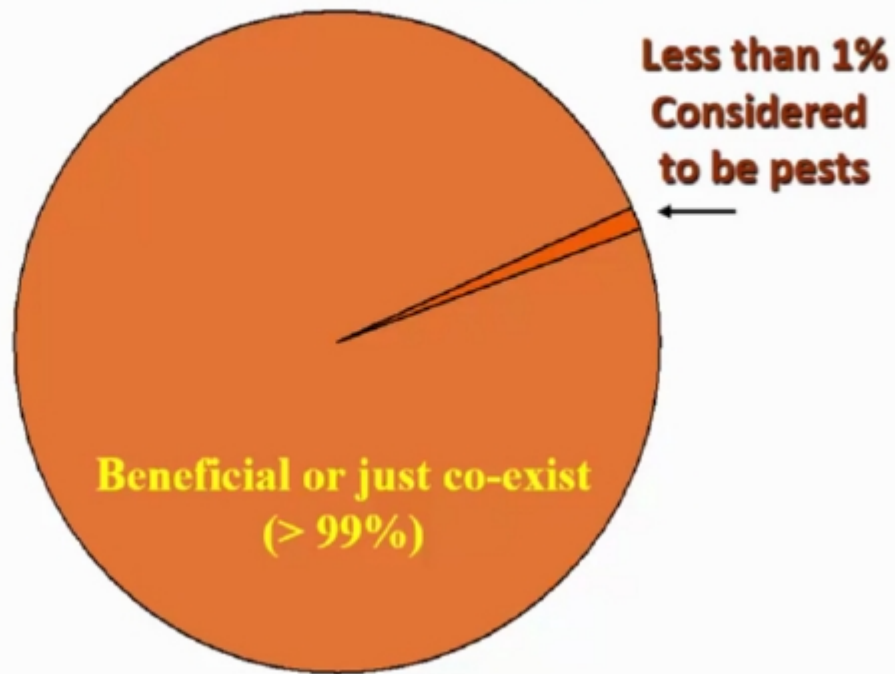


UF, IFAS

The Head. Functions mainly for feeding and sensory perception.



Of all insect species in the world



- Lesser Grain Borer

- Adult + Grubs
- Grains



Rhyzopertha dominica

Insect

Scientific name: *Rhyzopertha dominica*

Higher classification: *Rhyzopertha*

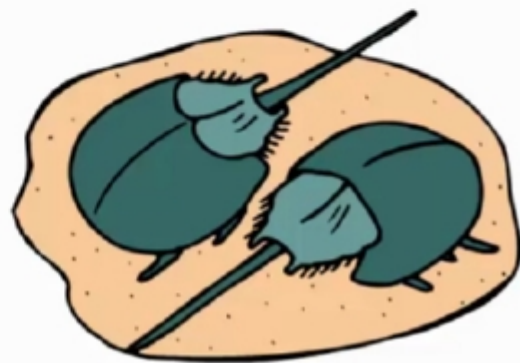
Rank: Species

Whiteflies – Bad insects



Insects are from an ancient lineage that included trilobites and other arthropods which were abundant in the oceans over 500 million years ago.

Trilobites are extinct... but we are surrounded by other arthropods.





True bugs

Insect



The Hemiptera /hɛˈmɪptərə/ or true bugs are an order of insects comprising some 50,000 to 80,000 species of groups such as the cicadas, aphids, planthoppers, leafhoppers, and shield bugs. [Wikipedia](#)

Scientific name: Hemiptera

Higher classification: [Paraneoptera](#)

Some Things That Eat Aphids (Good Insects)



Lady Beetles- eggs, adult, pupae, and larvae



The class **Arachnida** have 8 legs and no antennae.
They are in a group of Arthropods that diverged from
the insects in the mid-paleozoic.



Predatory Mite (eats bad mites)



Damaging Stages

1. **Coleoptera** (beetles)
2. **Lepidoptera** (butterflies)
3. **Hemiptera** (bugs)
4. **Diptera** (fly type)
5. **Hymenoptera** (ant)
 - Except mustard saw fly all are beneficial



[More images](#)

Fly

Insect



True flies are insects of the order Diptera, the name being derived from the Greek di = two, and ptera = wings. [Wikipedia](#)

Scientific name: Diptera

Lifespan: Housefly: 28 days

Higher classification: [Panopida](#)

THE INSECTS

- Fossil records indicate insects on land more than 300 million years ago



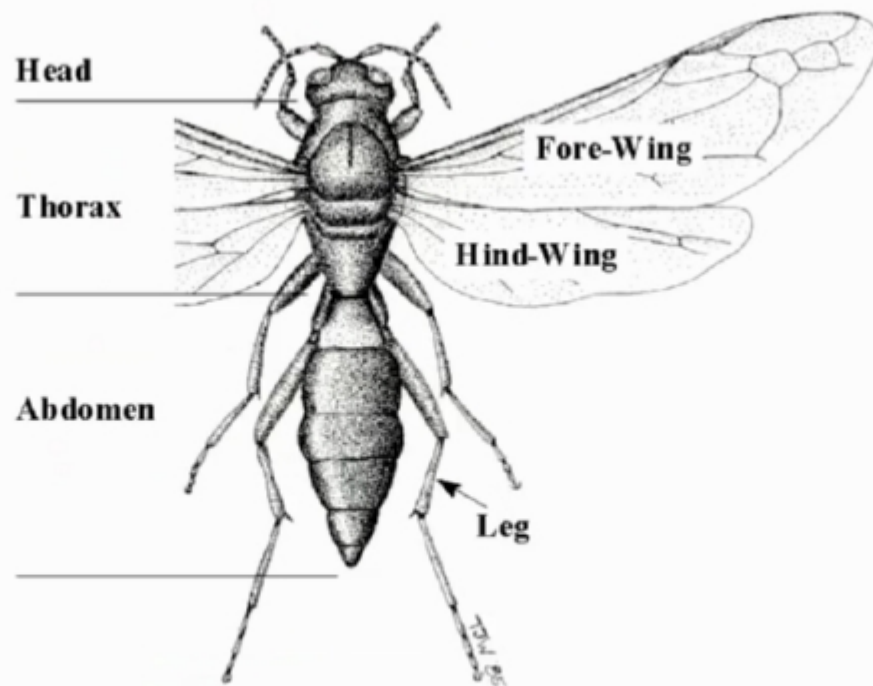
The Class Crustacea (lobster, shrimp, crab, pillbugs, etc.) have two pairs of antennae and at least five pairs of legs.



Lacebugs

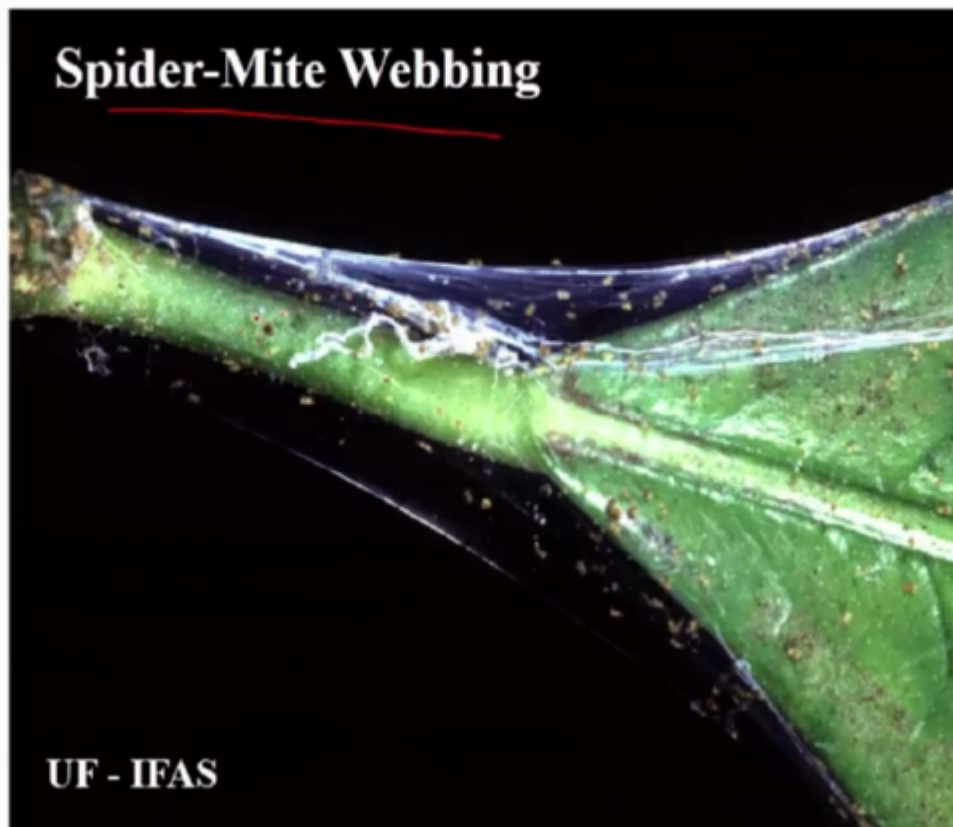


(Note: Black dots of excrement on leaf undersides)



FUMIGANTS

- Aluminium Phosphide (Celphos)
 - 2 Tablets (3g) for 10 Quintal Grains
- Methyl Bromide
 - 3.5 Kg / 100 m³ for 10 - 12 Hrs
- Ethylene Dibromide (EDB)
 - @ 3 ml Ampule for 1 Quintal Grain
 - @ 18 ml - 5 Q
 - @ 30 ml -10 Q



- **Rust Red Flour Beetle**
– **Secondary Feeder**



Termite



Insect

Termites are eusocial insects that are classified at the taxonomic rank of infraorder Isoptera, or as epifamily Termitoidae within the cockroach order Blattodea. [Wikipedia](#)

Scientific name: Isoptera

Higher classification: [Blattodea](#)



Hymenoptera



Insect

Hymenoptera is the third-largest order of insects, comprising the sawflies, wasps, bees, and ants. Over 150,000 species are recognized, with many more remaining to be described. [Wikipedia](#)

Scientific name: Hymenoptera

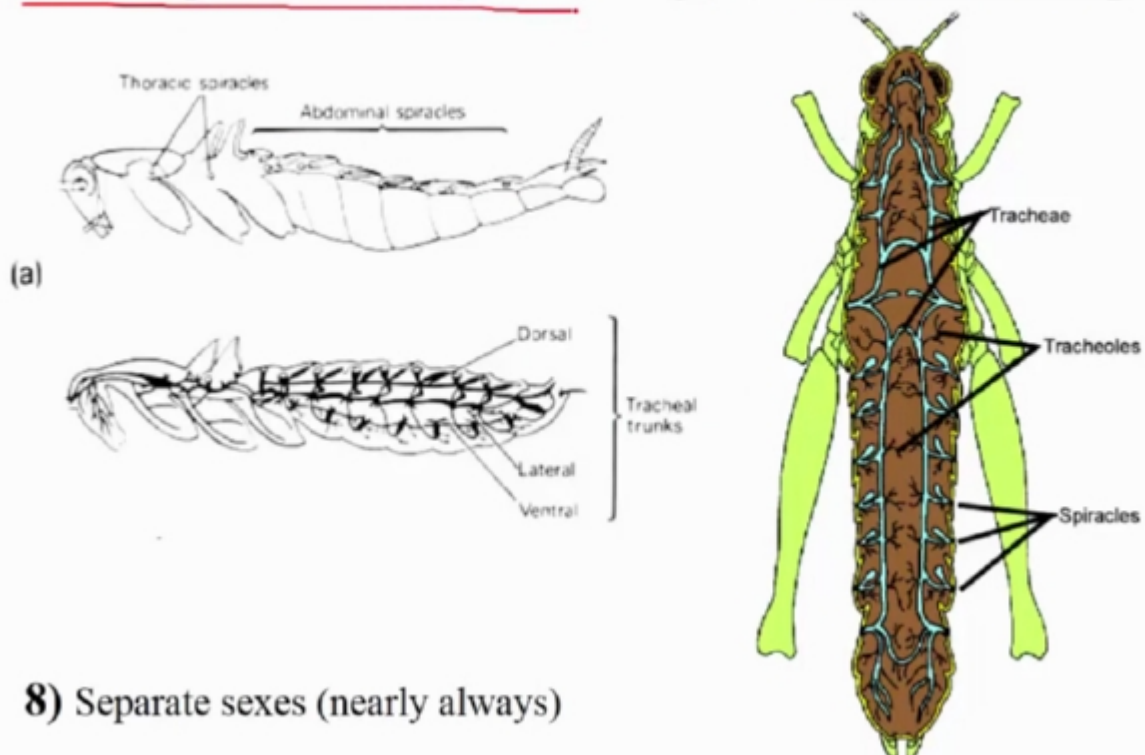
Higher classification: Endopterygota

Rank: Order

Speed: Asian giant hornet: 40 km/h

Lifespan: Western honey bee: 1 – 10 months, Pharaoh ant: 4 – 12 years, Black garden ant: 15 years, Early bumblebee: 28 days

7) All arthropods breathe by means of gills, or **tracheae and spiracles**.



8) Separate sexes (nearly always)

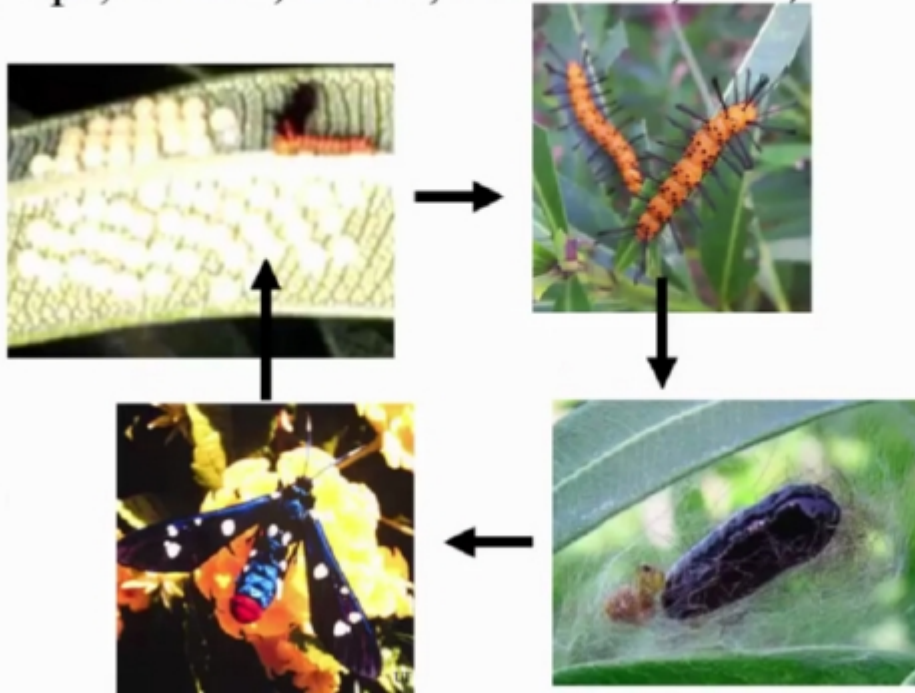
Enemies of Lawn Pests



Thrips
Rasping-sucking
mouthpart



Complete metamorphosis. Larvae look nothing like adults. The larvae pass through a pupal stage to change into the adult form (wasps, beetles, moths, butterflies, flies).



- Rice Moth

- Rice
- Larvae



Rice moth

The rice moth is a moth of the family Pyralidae. It is – as far as is known – the only living species of the genus *Corcyra*. This small moth can become a significant pest. Its caterpillars feed on dry plantstuffs such as seeds, including cereals. [Wikipedia](#)

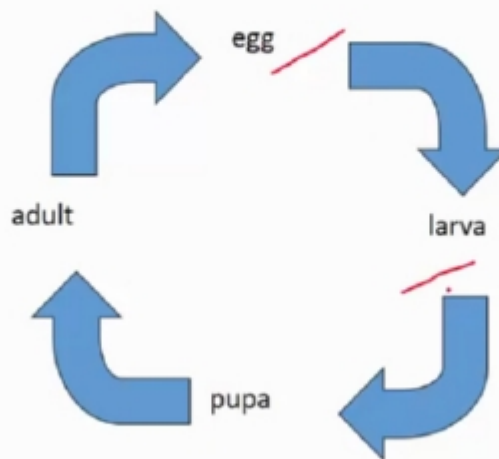
Scientific name: *Corcyra cephalonica*

Rank: Species

The Abdomen is responsible for excretion and reproduction.

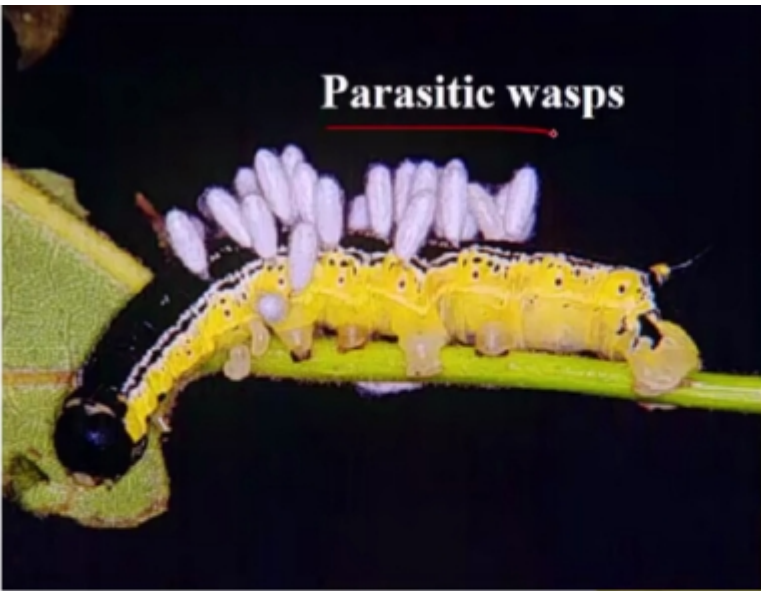


Complete Metamorphosis





Mole Cricket Damage

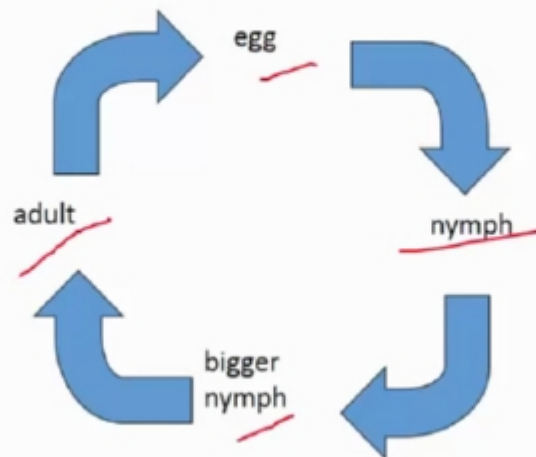


Parasitic wasps

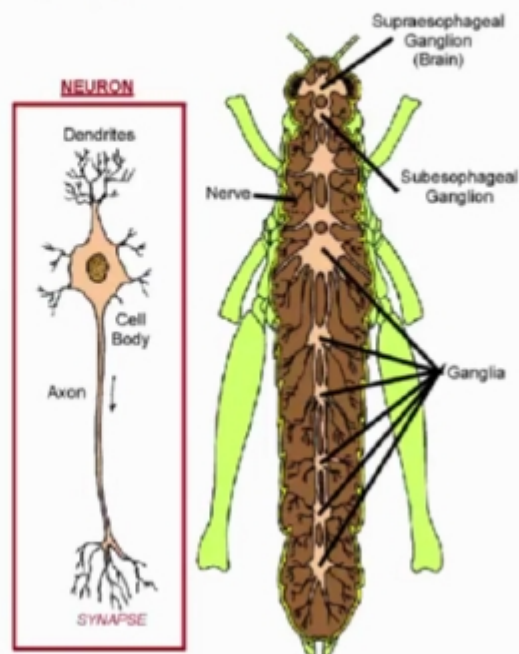


**Predaceous
Stinkbug**

Incomplete Metamorphosis



6) All arthropods have a ventral nervous system which consists of a tiny brain, paired nerve cords which extend from the brain backward, and nerve centers called ganglia.



Insects are in the phylum Arthropoda ("jointed leg")

The phylum is divided into 6 smaller groups called classes:

- ▶ **Crustacea** (crabs, lobsters, shrimps)
- ▶ **Chilopoda** (centipedes)
- ▶ **Diplopoda** (millipedes)
- ▶ **Symphyla** (symphylans)
- ▶ **Arachnida** (spiders, mites)
- ▶ **Insecta** (insects)

- **Ticks / Mites**

- Killing substance – acaricide
- 4 pairs of legs

- **Metamorphosis :**

- Radial changes in morphology

1. **Incomplete/ Direct/ Gradual/ Hemi –**

Metamorphosis: 3 Stages, Egg - Nymph - Adult

2. **Complete/ Complex/ Indirect/ Holo -**

Metamorphosis: 4 Stages, Egg- Larva- Pupa- Adult