

# Beneficial Insects and Other Arthropods



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# Beneficial Insects and Other Arthropods

**Class Arachnida:**

**Order Acari (Mites)**

**Order Araneae (Spiders)**



**Class Insecta (Insects)**

**Order Coleoptera (Beetles)**

**Order Diptera (Flies)**

**Order Hemiptera (Bugs)**

**Order Hymenoptera (Wasps)**

**Order Neuroptera (Lacewings, Mantidflies)**

**Order Thysanoptera (Thrips)**

**Class Chilopoda (Centipedes)**

# Predatory Mites

**Order Acari**

**Family Phytoseiidae**

**Life History:** Several families; phytoseiids are used in agriculture

and horticulture. Found in soil and leaf litter. Generations develop in one week.

**Prey:** Two-spotted spider mites and other small arthropods.



# Predatory Mites

**Predatory mite**



John Davidson



Whitney  
Cranshaw

**Predatory mite in  
spider mite colony**



# Spiders

**Order Araneae**  
**Many families**

**Life History:** Generalist predators. Most make webs and have poor eyesight.

**Prey:** Other small arthropods.

**Left:** Yellow garden spider (*Argiope aurantia*) (Araneidae)



## Spiders

The vast majority of spiders are harmless to humans.

**Above and right:  
Wolf Spiders  
(Lycosidae) actively  
hunt for prey rather  
that catch prey in  
webs.**



# Spiders

Tree of Life, <http://tolweb.org/tree/phylogeny.html>



**Left: Jumping Spiders (Salticidae), unlike most spiders, have good eyesight.**

Tree of Life  
<http://tolweb.org/tree/phylogeny.html>



**Left: Funnel Weaver (Agelenidae), Above: Crab Spider (Thomisidae)**



<http://www.biology.au.dk/~b951860/Agelenidae/Tegenaria/atrica.html>

# Soldier Beetles

**Order Coleoptera**  
**Family Cantharidae**

**Life History:** Adults on flowering shrubs and trees. Larvae in soil.



**Prey:** Aphids, locust eggs, snails, slugs, millipedes, earthworms, caterpillars, and maggots.



# Ground Beetles

Order Coleoptera  
Family Carabidae

## Life History:

Nocturnal, in or on soil, some live up to four years.

Prey: Caterpillars, soil and tree insects, earthworms.

Top: *Harpalus* sp.  
Bottom: *Calosoma* sp.



Vera Krischik

# Tiger Beetles

Order Coleoptera  
Family Cicindellidae

**Life History:**  
Stalking  
predators,  
fast runners.

**Prey:** Whatever  
they can catch.



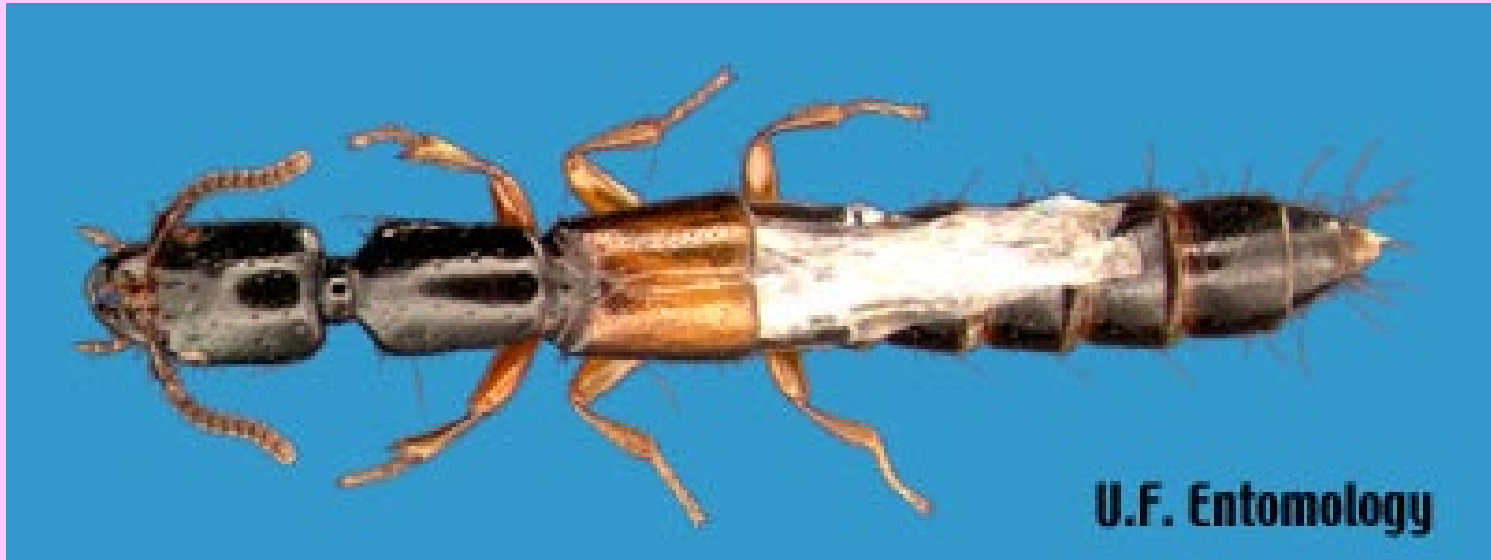
# Rove Beetles

Order Coleoptera

Family Staphylinidae

**Life History:** Nocturnal predators.

**Prey:** Soil-dwelling insects.



# Lady Beetles

Order Coleoptera  
Family Coccinellidae

**Life History:** Many species, both larvae and adults are predaceous.

**Prey:** Aphids, scale insects, mealybugs, whiteflies, spider mites, insect eggs.



Jeff Hahn

**Pink Lady Beetle (*Coleomegilla maculata*), a native lady beetle**

# Convergent Lady Beetle

Order Coleoptera  
Family Coccinellidae  
*Hippodamia*  
*convergens*

**Life History:** Native and common in the Midwest; larvae and adults are both predaceous.

**Prey:** Aphids.



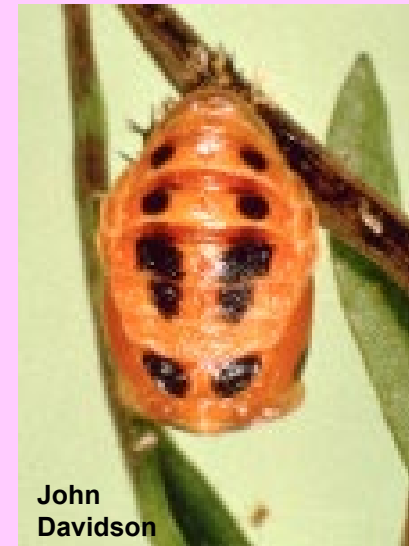
# Multicolored Asian Lady Beetle

Order Coleoptera  
Family Coccinellidae  
*Harmonia axyridis*



**Life History:** Introduced, invades homes in fall.

**Prey:**  
Aphids  
and  
scales.



# Spider Mite Destroyer Lady Beetle

Order Coleoptera  
Family Coccinellidae  
*Stethorus* spp.

**Life History:** Small lady beetle used for biological control.

**Prey:** Spider mites.

Left to right: spider mite and three life stages of *Stethorus*: larva, pupa, adult



# Twice-Stubbed Lady Beetle

<http://www.uoguelph.ca/~samarsha/lady-beetles.htm>

Order Coleoptera  
Family Coccinellidae  
*Chilocorus* spp.

**Life History:** Spiny  
larvae pupate in last  
larval skin.

**Prey:** Armored or soft  
scales (depending on  
species).

Top: adult  
Bottom: larva



Cliff Sadof





# Lady Beetles



David Laughlin

Mealybug destroyer (*Cryptolaemus montrouzieri*) adults feeding on mealybug egg mass (left)



Whitney Cranshaw

Twospotted lady beetle (*Adalia bipunctata*) adult and pupa with shed pupal skins (right)

# Robber Flies

Order Diptera  
Family Asilidae

**Life History:** Larvae live in soil and decaying wood; adults are fast fliers.



**Prey:** Butterflies, wasps, bees, dragonflies, grasshoppers, beetles, and other flies. Larvae feed on soft-bodied insects such as grasshopper eggs, white grubs, and other insect larvae.

# Robber Flies



**Adult female**



**Adult male**

# Gall Midges

Order Diptera  
Family Cecidomyiidae

**Life History:** Tiny adults feed on honeydew and nectar, larvae are predaceous.

**Prey:** Larvae feed on aphids, mites, scales, whiteflies, and thrips.



Whitney Cranshaw

Top and bottom: *Aphidoletes aphidimyza* feeding on aphids

# Syrphid or Hover Flies

Order Diptera  
Family Syrphidae

**Life History:** Adults feed on nectar and pollen. Larvae are predaceous. One generation every 2 to 4 weeks.



**Prey:** Larvae feed on aphids, scales, and other insects.

# Syrphid or Hover Flies

**Clockwise from right:  
Syrphid egg, larva, and  
larva on branch**



# Tachinid Flies

Order Diptera  
Family Tachinidae

**Life History:** Adults lay eggs on plants or hosts. Larvae develop inside hosts and pupate in 4 to 14 days. One or more generations per year.

**Prey:** Caterpillars, adult and larval beetles, sawfly larvae, true bugs, grasshoppers, and others.



# Minute Pirate Bugs

Order Hemiptera  
Family Anthocoridae

**Life History:** One generation takes 20 days to complete, multiple generations per year.



*Orius insidiosus* adult

**Prey:** Spider mites, insect eggs, aphids, thrips, scales, caterpillars.



# Minute Pirate Bugs



*Orius insidiosus*  
nymph

Minute pirate bug  
feeding on thrips



Whitney Cranshaw

# Seed and Big-Eyed Bugs

Order Hemiptera  
Family Lygaeidae

**Life History:** Many Lygaeids feed on plants, but some are predaceous.

**Prey:** Insect eggs, aphids, mealybugs, spider mites, leafhoppers, plant bugs, whiteflies, caterpillars, and beetle larvae.



Top and bottom: *Geocoris* species

# Pirate Bugs

Order Hemiptera  
Family Miridae

**Life History:** Most mirids feed on plants, but some are predaceous.

**Prey:** Mites and plant-feeding insects; lace bugs, cotton aphid, tobacco budworm.



Top: *Deraeocoris nebulosus* adult  
Bottom: Pirate bug adult (L) and nymph (R)

# Stink Bugs

Order Hemiptera  
Family Pentatomidae

**Life History:** Most feed on plants, but some are predaceous. Many discharge a distasteful smell when handled.



Whitney Cranshaw

**Predatory stink bug feeding on elm leaf beetle larva**

**Prey:** Caterpillars and beetles such as Colorado potato beetle and Mexican bean beetle.

# Stink Bugs



David Laughlin



Whitney Cranshaw

CW from top left: *Podisus maculiventris* adult attacking tussock moth caterpillar, *Perillus bioculatus* nymph feeding on beetle larva, *P. bioculatus* nymph feeding on hornworm



John Davidson

# Assassin Bugs

Order Hemiptera  
Family Reduviidae

**Life History:** Assassin bugs feed by piercing prey with their beaks to suck out juices.

**Prey:** Caterpillars, small flying insects, aphids, and leafhoppers.



Wheel bug (*Arilus cristatus*)

# Aphelinid Wasps

Order Hymenoptera  
Family Aphelinidae

**Life History:** Solitary, lay eggs in or outside hosts. Females usually reproduce parthenogenetically, males are rare.



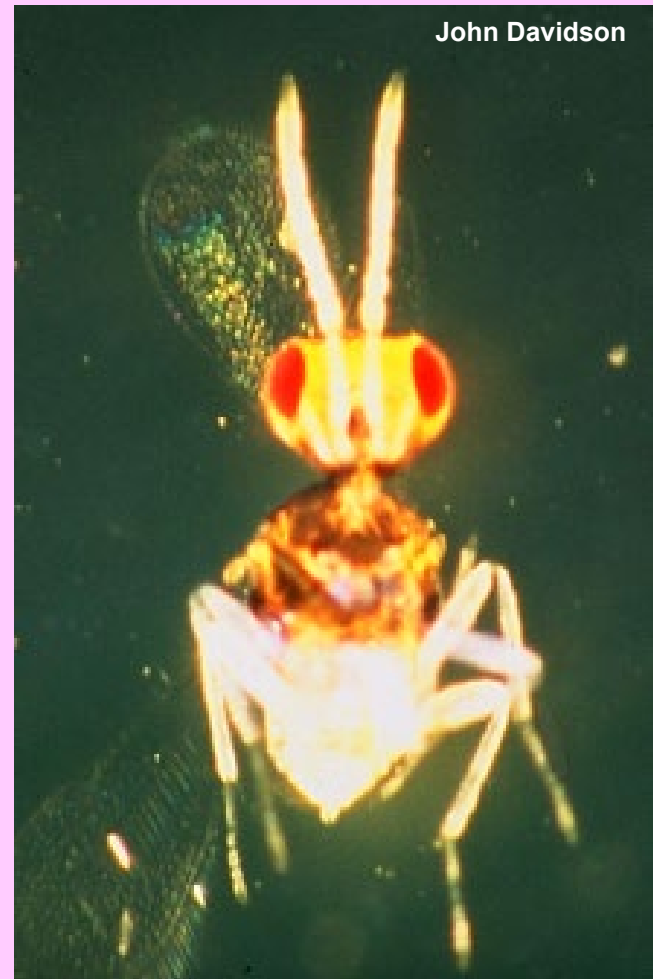
*Encarsia formosa* adult

**Prey:** Aphids, mealybugs, psyllids, scales, and whiteflies.

# Aphelinid Wasps



Empty pupal cases of greenhouse whiteflies and black parasitized pupae containing *Encarsia formosa*



*Encarsia formosa*



# Braconid Wasps

Order Hymenoptera  
Family Braconidae

**Life History:** Life cycle is 10–14 days.

Larvae are internal parasitoids; many pupate outside hosts.

More females than males.



John Davidson

**Prey:** Aphids, larvae of beetles, flies, sawflies, and caterpillars; tomato hornworm, imported cabbageworm, gypsy moth.

# Braconid Wasps



***Cotesia congregata* cocoons  
on tomato hornworm**

**Aphid mummies with braconid  
emergence holes**

# Chalcid Wasps

Order Hymenoptera  
Family Chalcidae

**Life History:** Larvae  
are internal parasitoids  
of other insects.

**Prey:** Moths,  
butterflies, beetles,  
flies, other wasps.

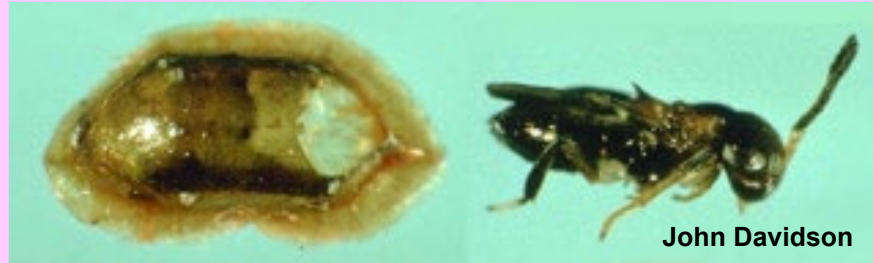


# Encyrtid Wasps

Order Hymenoptera  
Family Encyrtidae

**Life History:** Larvae are parasitoids; adults live 2–3 days.

**Prey:** Ticks, insect eggs, larvae, and pupae; beetles, bugs, moths, mealybugs, scales.



Top: *Encyrtus fuscus* reared from hemispherical scale

Bottom: Parasitized hemispherical scales turned black

# Ichneumonid Wasps

Order Hymenoptera  
Family Ichneumonidae

**Life History:** Larvae are internal or external parasitoids.



**Prey species:** Larvae and pupae of beetles, wasps, and caterpillars; armyworms, cabbage looper, fall webworm, oakworms, tent caterpillars, tussock moths, European corn borer.

# Ichneumonid Wasps



**Adult Ichneumonid wasps: note the long ovipositor of the female *Megarhyssa* sp. (below)**



# Scelionid Wasps

**Order Hymenoptera**  
**Family Scelionidae**

## **Life History:**

**Larvae are internal parasitoids of other insects and spiders.**



**Prey:** Insect and spider eggs, especially those of true bugs and moths.

# Trichogramma Wasps

Order Hymenoptera

Family

Trichogrammatidae

**Life History:** Larvae are internal parasitoids of other insects.



**Prey:** Sawfly and moth eggs; cabbageworm, tomato hornworm, corn earworm, codling moth, cutworm, armyworm, cabbage looper, European corn borer, tomato fruitworm.



# Vespid Wasps

Order Hymenoptera  
Family Vespidae

**Life History:** Many have annual colonies with queens, workers, and males.



Yellowjacket with caterpillar



**Prey:** Caterpillars and other insects. May bother people at picnics.

Paper wasp (*Polistes* species)

# Ants

Order Hymenoptera  
Family Formicidae

**Life History:** Annual colonies with queens, workers, and drones (males).

**Prey:** Other arthropods, as well as pollen, nectar, and human food.

**Workers with eggs**



# Ants

Clemson University, USDA Cooperative Extension Slide Series, [www.forestryimages.org](http://www.forestryimages.org)



**Above: Carpenter ant  
(*Camponotus* sp.)**

**Right: Red imported fire  
ants (*Solenopsis invicta*)  
with cerambycid larvae**



Herbert A. "Joe" Pase III, Texas Forest Service, [www.insectimages.org](http://www.insectimages.org)

# Green Lacewings

Order Neuroptera  
Family Chrysopidae



**Life History:** Oval, white eggs laid singly on stalks 8 mm long. Small gray larvae spin cocoons and pupate on undersides of leaves when they are 10 mm long. One to ten generations per year.

**Prey:** Larvae feed on aphids and other small insects. Adults feed on honeydew and pollen.

# Green Lacewings



**Clockwise from top left: eggs, larva, cocoons, adult**

# Brown Lacewings

**Order Neuroptera**  
**Family Hemerobiidae**

**Life History:** Oval, white eggs laid singly. Small gray larvae spin cocoons and pupate on undersides of leaves when they are 10 mm long. One to ten generations per year.

**Prey:** Mites, aphids, mealybugs, scales, whiteflies, and other soft-bodied arthropods.



# Mantidflies

**Order Neuroptera**  
**Family Mantispidae**

**Life History:** Nocturnal insects that resemble mantids. Both larvae and adults are predaceous.

**Prey:** Spider egg sacs, bee and wasp larvae.



# Predatory Thrips

**Order Thysanoptera**  
**Families Aleoarthripidae**  
**and Phlaeothripidae**

**Life History:** Sexual or asexual reproduction.

**Nymphs resemble adults in size and color.**  
**Several generations per year.**

**Prey:** Pest thrips, aphids, mites, whiteflies, and other soft-bodied insects.





# Centipedes

## Class Chilopoda

**Life History:** Nocturnal; in gardens and houses.

**Prey:** Small arthropods.

Tree of Life  
<http://tolweb.org/tree/phylogeny.html>



Tree of Life  
<http://tolweb.org/tree/phylogeny.html>

**Left:** *Lithobius forficatus*  
**Above:** House centipede  
(*Scutigera coleoptrata*)