

Basic Entomology for Master Gardeners Class 9/2/15

Dr. Elena M. Rhodes
Department of Entomology and Nematology
University of Florida
Gainesville, Florida

Outline

- Higher taxonomy
- Anatomy
- Ecology
- Common Orders and Families
- Discussion

Higher Taxonomy

- Phylum Arthropoda
 - Subphylum Trilobita
 - Subphylum Chelicerata
 - Class Merostomata
 - Horseshoe crabs
 - Class Arachnida
 - Spiders, mites, scorpions
 - Class Pycnogonida
 - Sea spiders



<http://www.bath.ac.uk/bio-sci/biodiversity-lab/research.html>



<http://beachchairscientist.wordpress.com/2008/07/13/hello-world/>



<http://tiger.gsfc.nasa.gov/wildlife.html>

Order Acari

- Mites and Ticks
- Plant pests and parasites
- Some predators

Two-spotted spider mite



Deer tick



Predatory mite



Higher Taxonomy

- Subphylum Crustacea
 - Ostracods
 - Copepods
 - Lobsters
 - Crabs
 - Shrimp
 - Crayfish
 - Pill bugs (rolly-pollies)



<http://mumbaifish.com/forms/CateListTwo.aspx>



http://www.activepestcontrol.com/learn_more/index.php

Higher Taxonomy

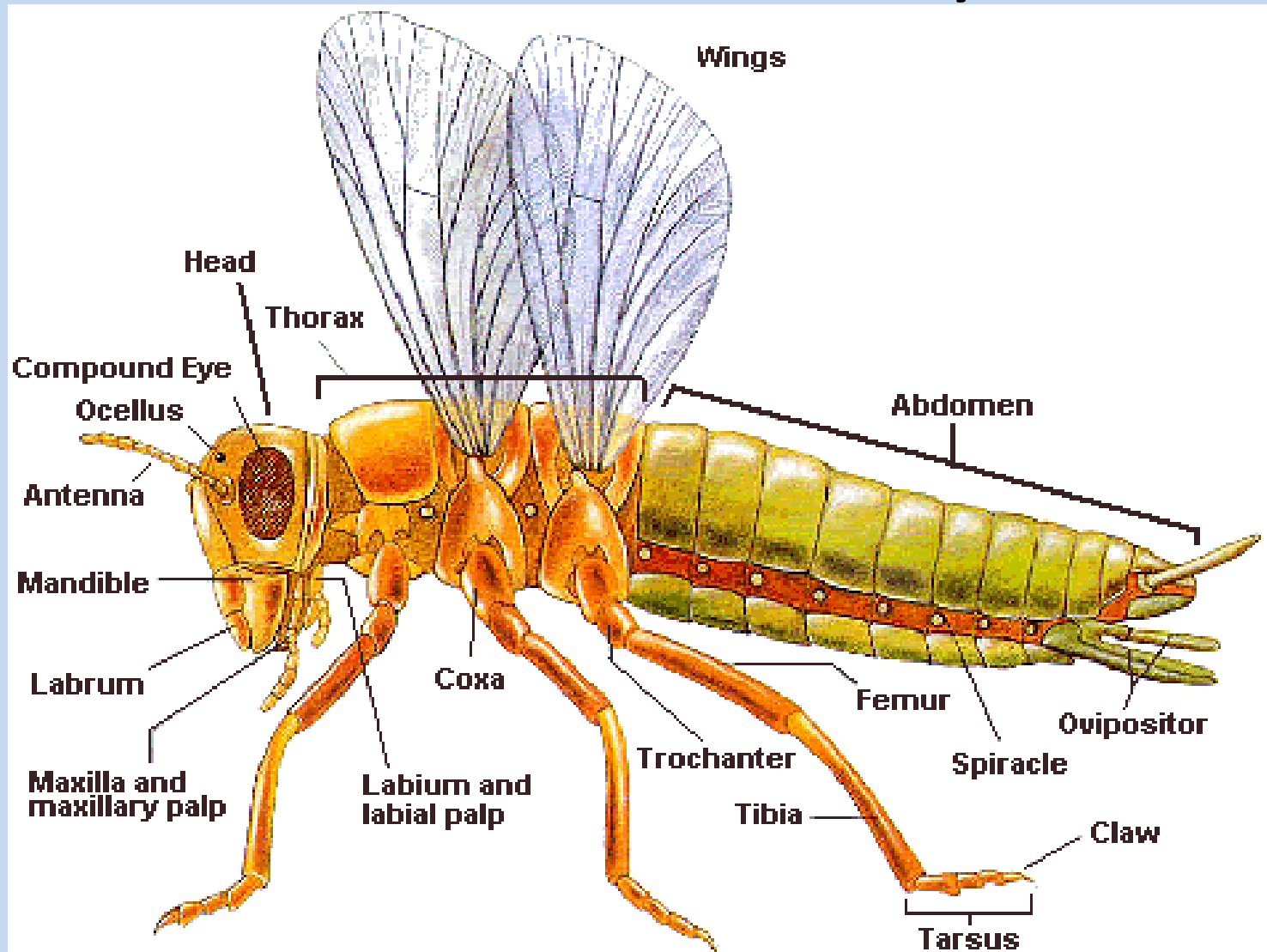
- Subphylum Aterlocerata
 - Class Diplopoda
 - Millipedes
 - Class Chilopoda
 - Centipedes
 - Class Pauropoda
 - Class Symphyla
 - Class Hexapoda (Insecta)
 - insects



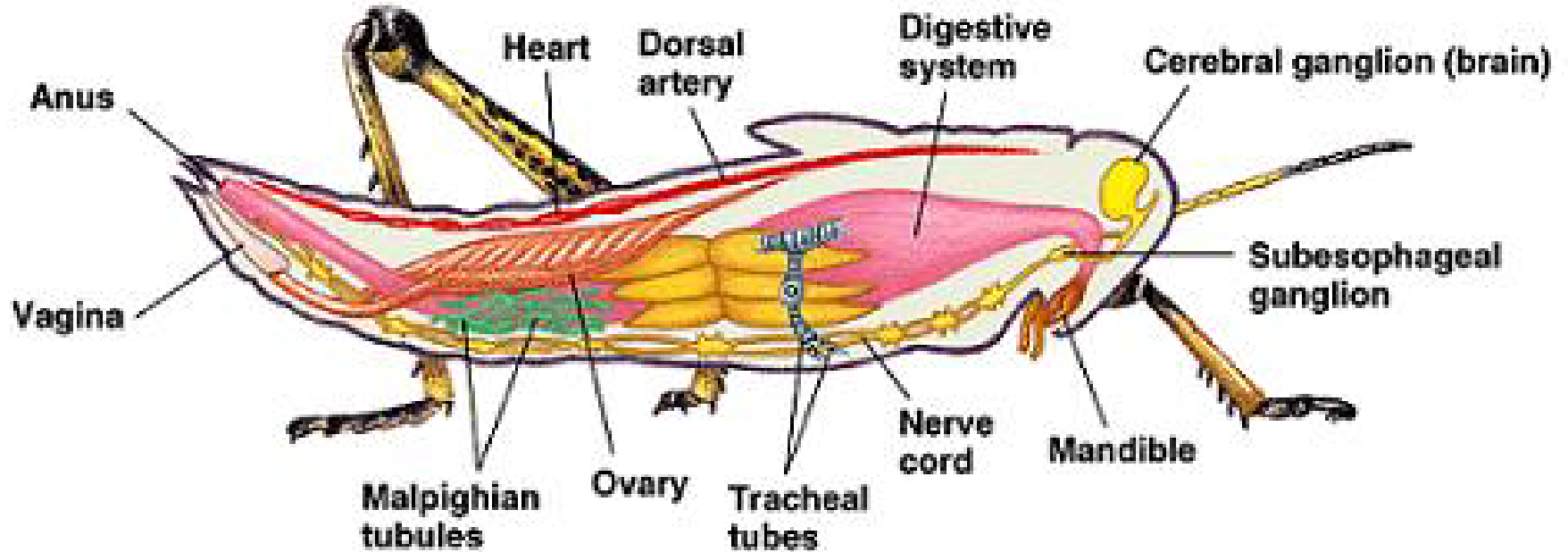
Insecta

- One pair of antennae
- Two pairs of wings or none
- Three body regions
 - Head, thorax, abdomen
- Three pairs of legs
- Tracheal respiratory system

External Anatomy



Internal Anatomy



Ecology

- Live everywhere except the oceans
- Herbivores
- Predators
- Parasitoids
- Parasites
- Decomposers
- Prey
- Pollinators
- Soil improvers
- And more!

In Human Terms

- Pestiferous

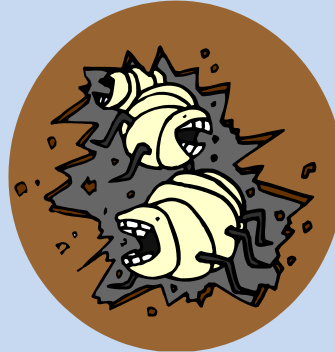


- Crop pests

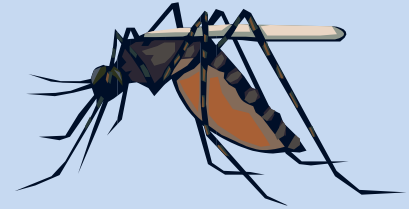
- Direct (part we eat)
- indirect

- Urban pests

- Decomposers
- Landscape pests



- Pestiferous



- Med / Vet pests

- Livestock, poultry, pig, etc.
- Transmit human diseases

- Aesthetic pests

- It's an insect, its gross, I don't want to see it

In Human Terms

- Beneficial

- Predators / parasitoids of pests
- Herbivores eat pest plants
- Pollinators
- Makers of useful things
 - honey, silk, etc.

- Beneficial

- Decomposers
 - Forensic entomology
- Soil improvers
- Medicinal
- Food
- Art



How Many?!

- Nearly 60% of all described plant and animal species are insects
- About 1 million described species
 - Only 1% serious pests & about 10,000 occasional pests
- Estimates from 3 – 50 million insect species total

Insect Orders

- Primitive, tiny, soil dwelling orders
 - Protura (proturans)
 - Collembola (springtails)
 - Diplura (Diplurans)
 - Microryphia (bristletails)
 - Thysanura (silverfish)



Ephemeroptera (mayflies)

- 21 families
- Immatures called naiads
- Subimago
 - Immature stage with wings
- Adults emerge en mass and are very short lived
- Simple metamorphosis



Odonata beneficial



- Naiads
- Simple metamorphosis
- Predatory



- Anisoptera (dragonflies)

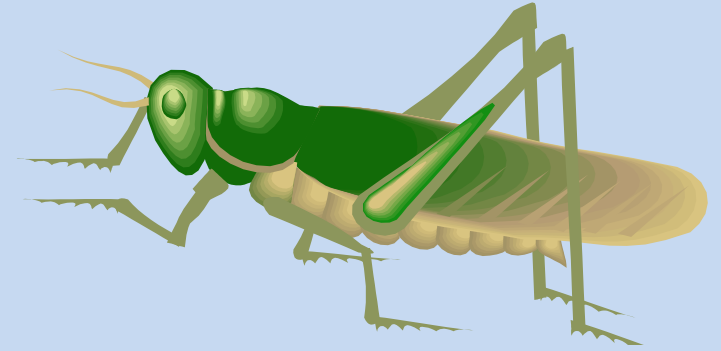
- 6 families
- Hold wings out

- Zygoptera (damselflies)

- 5 families
- Hold wings over body

Orthoptera

- 16 families
- Leathery forewings
- Jumping legs
- “sing”
- Tympanum (ear)
- Herbivores
- Simple metamorphosis



Orthoptera



Acrididae (Locustidae)
(grasshoppers)



<http://nathistoc.bio.uci.edu/Arthropods.htm>

Gryllidae (crickets)



<http://nathistoc.bio.uci.edu/Arthropods.htm>

Tettigoniidae (katydids)



Drees,
<http://insects.tamu.edu/images/insects/color/molecricket.html>

Gryllotalpidae (mole crickets)

Phasmatodea (walking sticks)



<http://geeksinaction.org/?p=312>

- 4 families
- Reduced or absent wings
- Resemble sticks
- Herbivores
- Simple metamorphosis
- Secrete stinky substance when disturbed

Dermaptera (earwigs)

- 6 families
- Forcepslike cerci
- Mostly decomposers
- Nocturnal
- Simple metamorphosis



Mantodea (Mantids) beneficial

- 5 families
- Raptorial forelegs
- Predatory
- Females eats male during or after copulation
- Simple metamorphosis



Isoptera (termites) pests



- 4 families
- 4 membranous, equally sized wings
- Abdomen broadly joined to thorax
- Decompose dead wood with the help of gut symbionts
- Simple metamorphosis
- Social (reproductives (king & queen), workers, soldiers)

Blattodea (cockroaches)

Blattidae



pests

- 4 families
- Winged and wingless species
- Very fast
- Decomposers
- Simple metamorphosis

Blattellidae



Hemiptera (bugs)

- Heteroptera (true bugs)
 - 54 families
 - Hemelytra
- Auchenorrhyncha
 - 15 families
- Sternorrhyncha
 - 21 families
- Piercing-sucking mouthparts
- Simple metamorphosis
- Herbivorous
- Some predatory

Heteroptera (aquatic)



<http://www.worsleyschool.net/science/files/waterstrider/page.html>

Gerridae (water striders)



Belastomatidae
(giant water bugs)



T. Donovan, Tampa, Florida, 2003

Nepidae (water scorpions)



<http://www.giffbeaton.com/True%20Bugs.htm>

Gelastocoridae (toad bugs)



http://www.cals.ncsu.edu/course/ent525/water/aquatic/pages/09_jpg.htm

Corixidae (water boatmen)



<http://nathistoc.bio.uci.edu/hemipt/Notonectid.htm>

Notonectidae
(backswimmers)

Heteroptera (**pests**)



Extension Entomology, Texas A&M,
<http://insects.tamu.edu/extension/youth/bug/bug034.html>

Pentatomidae (stink bugs)



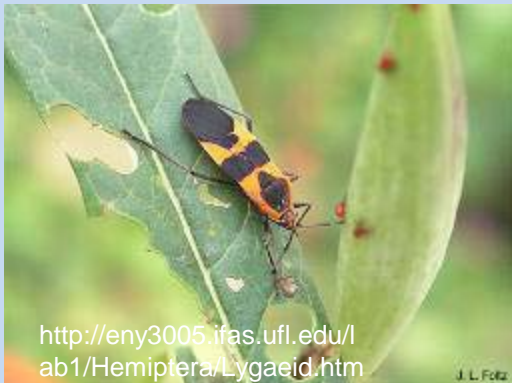
<http://eny3005.ifas.ufl.edu/lab1/Hemiptera/Mirid.htm>

Miridae (leaf or plant bugs)



http://www.winnipeg.ca/cms/bu/gline/insect_information/bedbugs.stm

Cimicidae (bed bugs)



<http://eny3005.ifas.ufl.edu/lab1/Hemiptera/Lygaeid.htm>

Lygaeidae (seed bugs)



<http://eny3005.ifas.ufl.edu/lab1/Hemiptera/Coreid.htm>

Coreidae (leaf-footed and squash bugs)

Heteroptera (beneficial)



Reduviidae (assassin bugs)



Anthocoridae (minute pirate bugs)



Pentatomidae (stink bugs)



Geocoridae (big-eyed bugs)

Auchenorrhyncha



Cicadidae (cicadas)



Cercopidae
(froghoppers,
spittlebugs)



Membracidae
(treehoppers)



Cicadellidae
(leafhoppers)



Superfamily Fulgoroidea (planthoppers)



Sternorrhyncha



Psyllidae (psyllids, jumping lice)



Aleyrodidae (whiteflies)

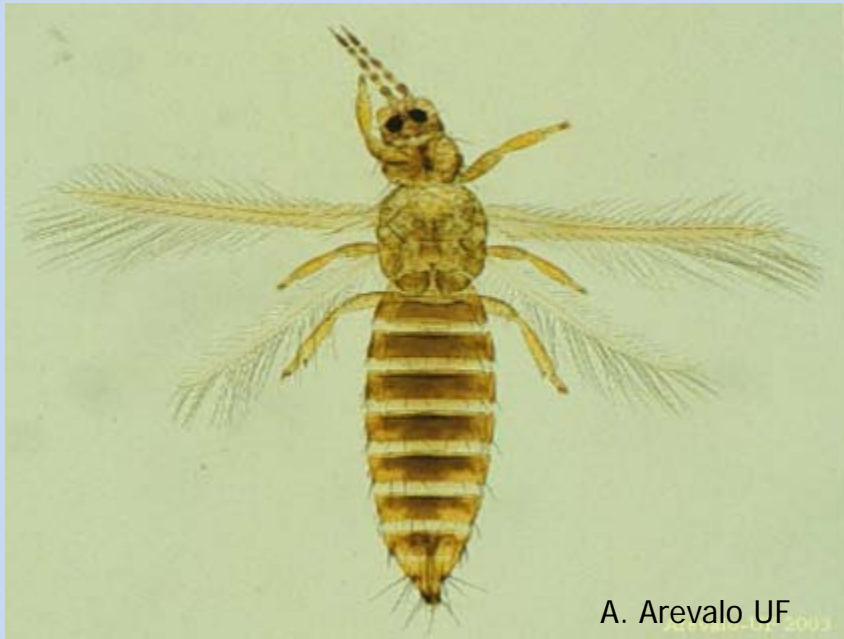


Aphididae (aphids)



Superfamily Coccoidea (scales and mealybugs)

Thysanoptera (thrips)



- 7 families
- Tiny (~1 mm)
- Bristle-like wings
- Punch and suck mouthparts
- **pests** **beneficial**
- Herbivores, predators, and decomposers
- In between simple and complete metamorphosis

Psocoptera (book and barklice)

- 28 families
- Small (~6 mm)
- Booklice live in books and papers in houses
- Barklice live in bark
- Winged and wingless species
- Simple metamorphosis



Phthiraptera (lice) pests



Pediculidae (head and body lice)



Pthiridae (crab lice)

- 18 families
- Small
- Wingless
- Ectoparasites
- Simple metamorphosis

Coleoptera (beetles)

- 128 families
- Elytra (hardened forewings)
- Chewing mouthparts
- Herbivores, predators, and decomposers
- Complete metamorphosis
 - Larvae of some species are called grubs

Coleoptera



Dytiscidae (predacious diving beetles)



Elateridae (click beetles)



Gyrinidae (whirligig beetles)



Lampyridae (fireflies, lightning bugs)

Coleoptera (pests)



Scarabaeidae (scarab, June, and dung beetles)



Chrysomelidae (leaf and flea beetles and rootworms)



Cuculionidae (weevils)

Coleoptera (beneficial)



Coccinellidae (ladybird beetles)



Carabidae (ground beetles)

Neuroptera

- 15 families
- Alderflies, dobsonflies, fishflies, snakeflies, lacewings, antlions, and owlflies
- Lacey wings
- Complete metamorphosis
- Some larvae are predators
- Adults feed on nectar if at all



beneficial

Hymenoptera

- 74 families
- Sawflies, wasps, ants, bees
- Hind wing smaller than forewing
- Predators, parasitoids, pollinators
- Complete metamorphosis
- Stinger is modified ovipositor
 - Not all sting!
- Many are social
 - Female queens and workers
 - Male drones for reproduction only



Diprionidae (conifer sawflies)



Sawfly larvae
(Diprionidae)

Wasps

beneficial



Scoliidae (scoliid wasps)

beneficial



Chalcidoidea (tiny parasitic wasps)

beneficial

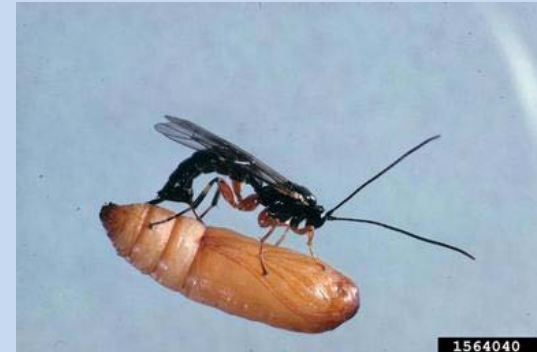
beneficial



Sphecidae (mud-daubers)



Braconidae



Ichneumonidae

Wasps



Vespidae (paper wasps, yellow jackets, hornets, mason wasps, potter wasps)



Mutillidae (velvet ants)

Bees beneficial



<http://en.wikipedia.org/wiki/Halictidae>

Halictidae
(sweat bees)

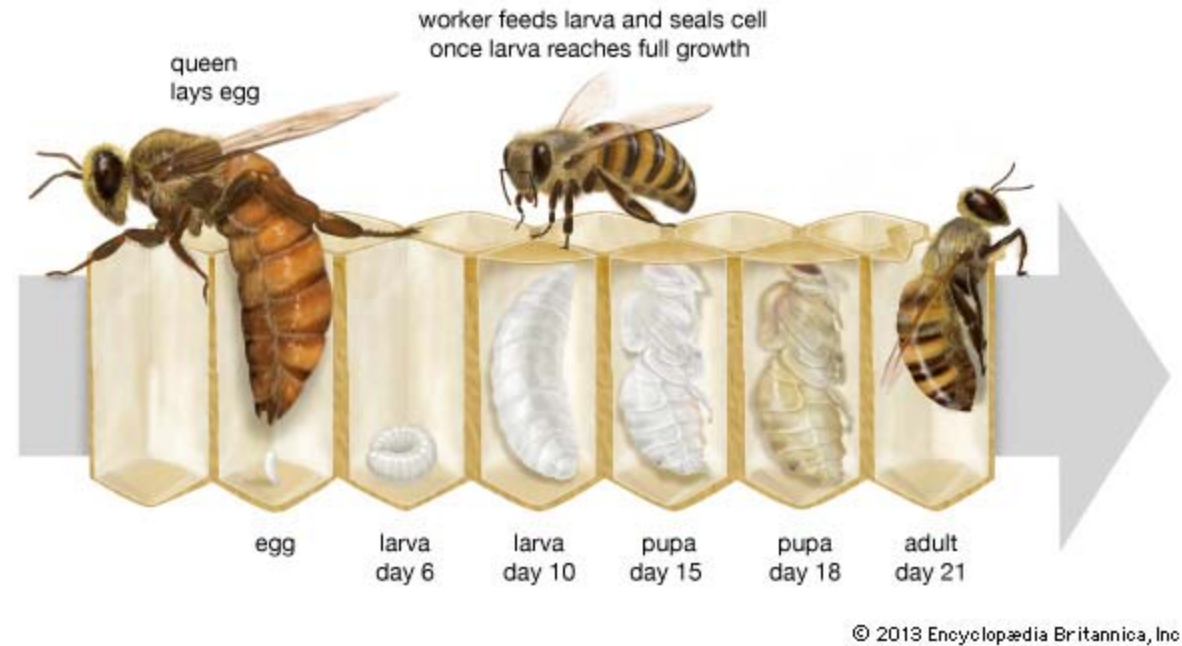


<http://eny3005.ifas.ufl.edu/lab1/Hymenoptera/Apid.htm>

U F Ent. Dep., James L. Castner

Apidae (honey, bumble, orchid, cuckoo, digger, and carpenter bees)

Life cycle of honeybees



Ants (Formicidae)



Sanford D. Porter, USDA, Gainesville, FL

Red imported fire ant (pest)



Lepidoptera

- 80 families
- Butterflies, skippers, moths
- Siphoning mouthparts (adults)
 - Feed on nectar while pollinating
- Wings covered with scales
- Complete metamorphosis
 - Larvae called caterpillars
 - herbivores



Danaidae (milkweed butterflies)

Lepidopteran pests



Spingidae (sphinx moths
/ hornworms)



Plutellidae (diamondback
moth)

Lepidopteran pests



Cabbage looper

Armyworms

Corn earworm

Noctuidae

Siphonaptera (fleas) pests

- 7 families
- Small
- Wingless
- Complete metamorphosis
- Ectoparasites

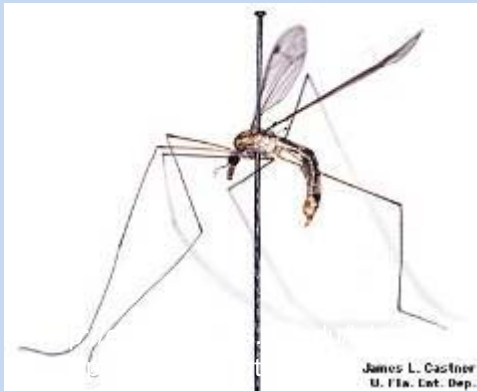


Pulicidae (common fleas)

Diptera (flies)

- 106 families
- Hind wings reduced to halteres
- Predators, parasitoids, parasites, herbivores, decomposers, pollinators
- Complete metamorphosis
 - Some larvae are called maggots

Suborder Nematocera (long-horned flies)

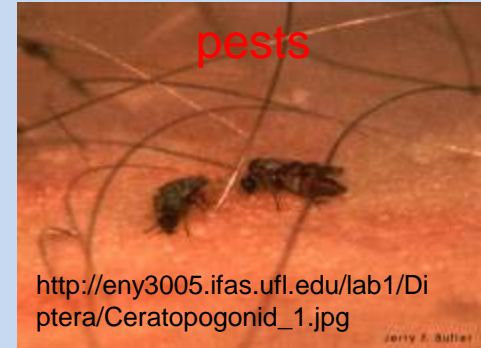


Tipulidae (crane flies)

pests



Culicidae (mosquitoes)



Ceratopogonidae
(punkies, biting midges)



Chironomidae (midges)



Simuliidae
(black flies)



Bibionidae
(march flies aka
love bugs)



Cecidomyiidae
(gall midges)

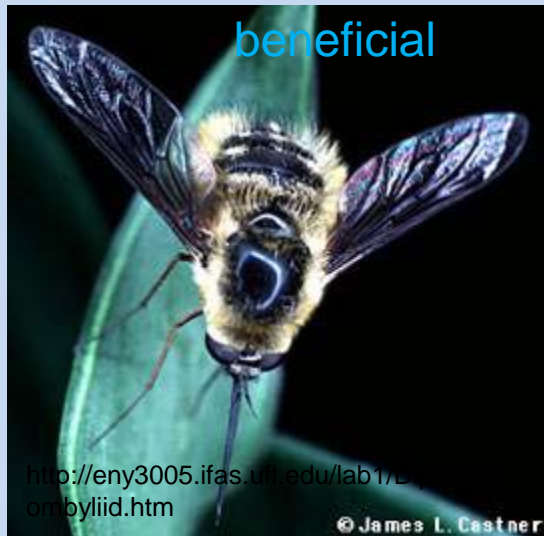
Suborder Brachycera (short-horned flies)



Syrphidae (flower and hover flies)



Asilidae (robber flies)



Bombyliidae (bee flies)



Tachinidae (tachinid flies)

Suborder Brachycera (short-horned flies)

pests



<http://eny3005.ifas.ufl.edu/lab1/Diptera/Tabanid.htm>

James L. Castner, U. Fla. Ent. Dep.

Tabanidae (horse and deer flies)



Tephritidae (fruit flies)

pests



Agromyzidae
(leafminer flies)

pests



Drosophilidae (pomace and vinegar flies)

Suborder Brachycera (short-horned flies)



Oestridae (bot flies)



Muscidae (house, horn, and stable flies)



Calliphoridae (blow flies)



Sarcophagidae (flesh flies)

Fly larvae



Mosquito
larvae

<http://www.mosquitobarrier.com/larvae.html>

Seed corn
maggot



<http://plantandsoil.unl.edu/croptechology2005/cpnrn/?what=topicsD&informationModuleId=1029338910&topicOrder=9&max=11&min=0&>

