

What's buggin' you?



COLLEGE OF AGRICULTURE
AND LIFE SCIENCES
COOPERATIVE EXTENSION



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Entomology?

- Study of insects
- Other related animals (known as arthropods), such as mites, spiders and scorpions.



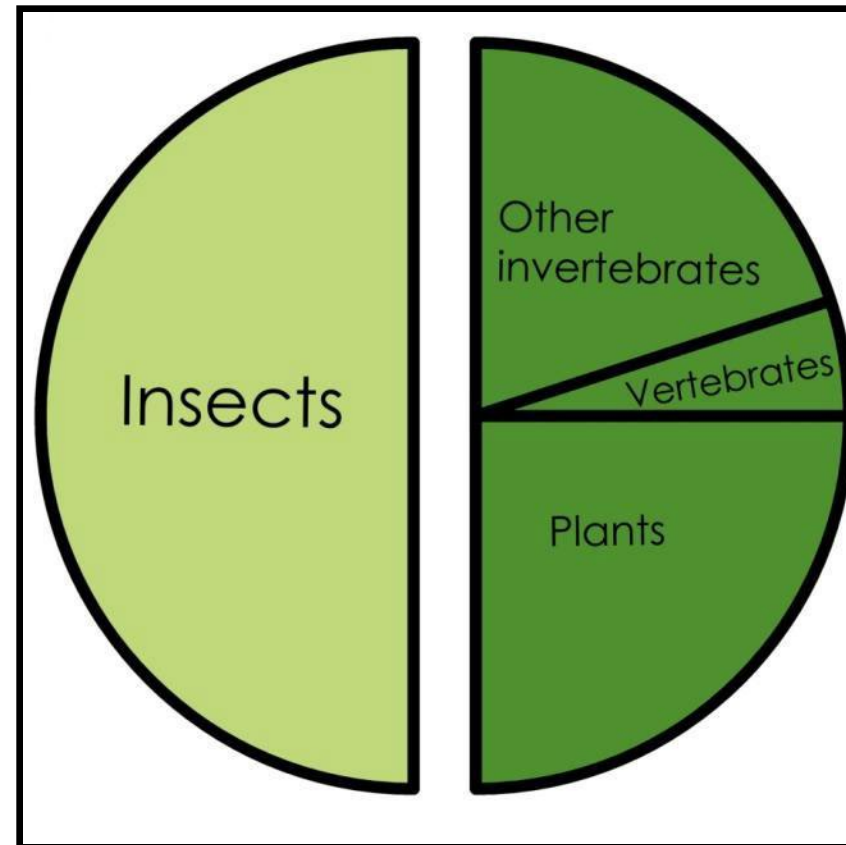
Why should we study insects?

- Most diverse group of organisms
- Approx. 80 percent of the world's species
- 30 million species and still counting



Insects rule the world!

- There are more insects than all other plants and animals combined
- 1 out of every 5 animals is a beetle!



Imagine a world without



- Chocolate
- Blueberries
- Peaches
- Melons
- Almonds
- Coffee
- Vanilla



Why should we study insects?

- Affect many aspects of human life, from food production to housing.
- Help by pollinating crops, eating other insects, and recycling nutrients in nature.
- Help to advance knowledge in many scientific fields, such as ecology, molecular biology, medical research, forensics, even robotics!

Some cause harm by spreading disease, destroying plants, or damaging homes.



Why should we study insects?

- Studying entomology teaches us which insects are harmful and which are helpful, and how we can deal with them to make our lives better.



When you see an insect, do you experience:



Why should we study insects?

- Misconceptions about insects
- Majority of insects are harmless or beneficial
- Only 3 % are pests!



Growing plants

- Plant-feeders
- Storage pests

- Bees and other pollinators
- Beneficials – natural enemies

AGRICULTURAL ENTOMOLOGY



Protecting animals

- Fleas, flies, ticks, lice affect domestic animals and livestock

VETERINARY ENTOMOLOGY



Protecting people

- Insects spread diseases
- MALARIA

MEDICAL ENTOMOLOGY



Fighting crime

- Insects provide clues to time/location of death

FORENSIC ENTOMOLOGY



Protecting environments

- Invasive insects cause severe damage to forests and native plants

**FOREST
ENTOMOLOGY**



Protecting homes

- Household pests cause annoyance
- Contaminate food and surfaces

URBAN & STRUCTURAL ENTOMOLOGY



Discovering species

- 30 million and still counting
- Only ~ 1 million have been described

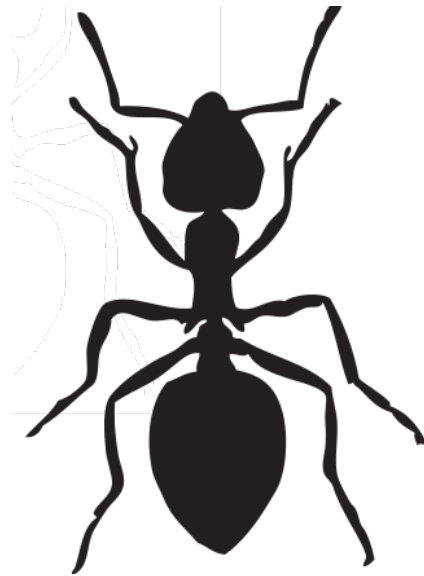
TAXONOMIC ENTOMOLOGY



Insects and their relatives

- Arthropods are numerous and diverse
 - Insects (beetles, flies, moths, earwigs, aphids)
 - Arachnids (spiders, ticks, mites, scorpions)
 - Crustaceans (crayfish, crabs, lobsters, sowbugs)
 - Centipedes, millipedes
- Exoskeleton is a hard outer shell
- Jointed appendages, segmented body
- *Not arthropods*: slugs, snails, earthworms

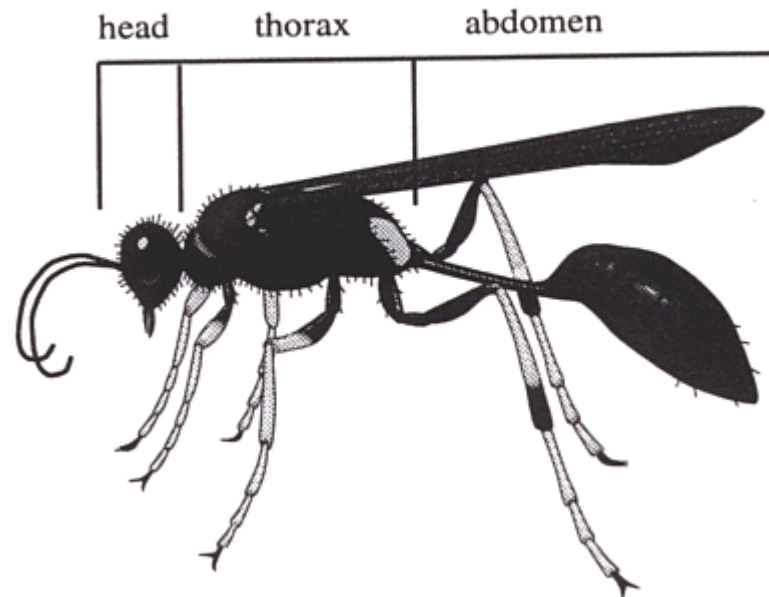
What makes an insect an insect?



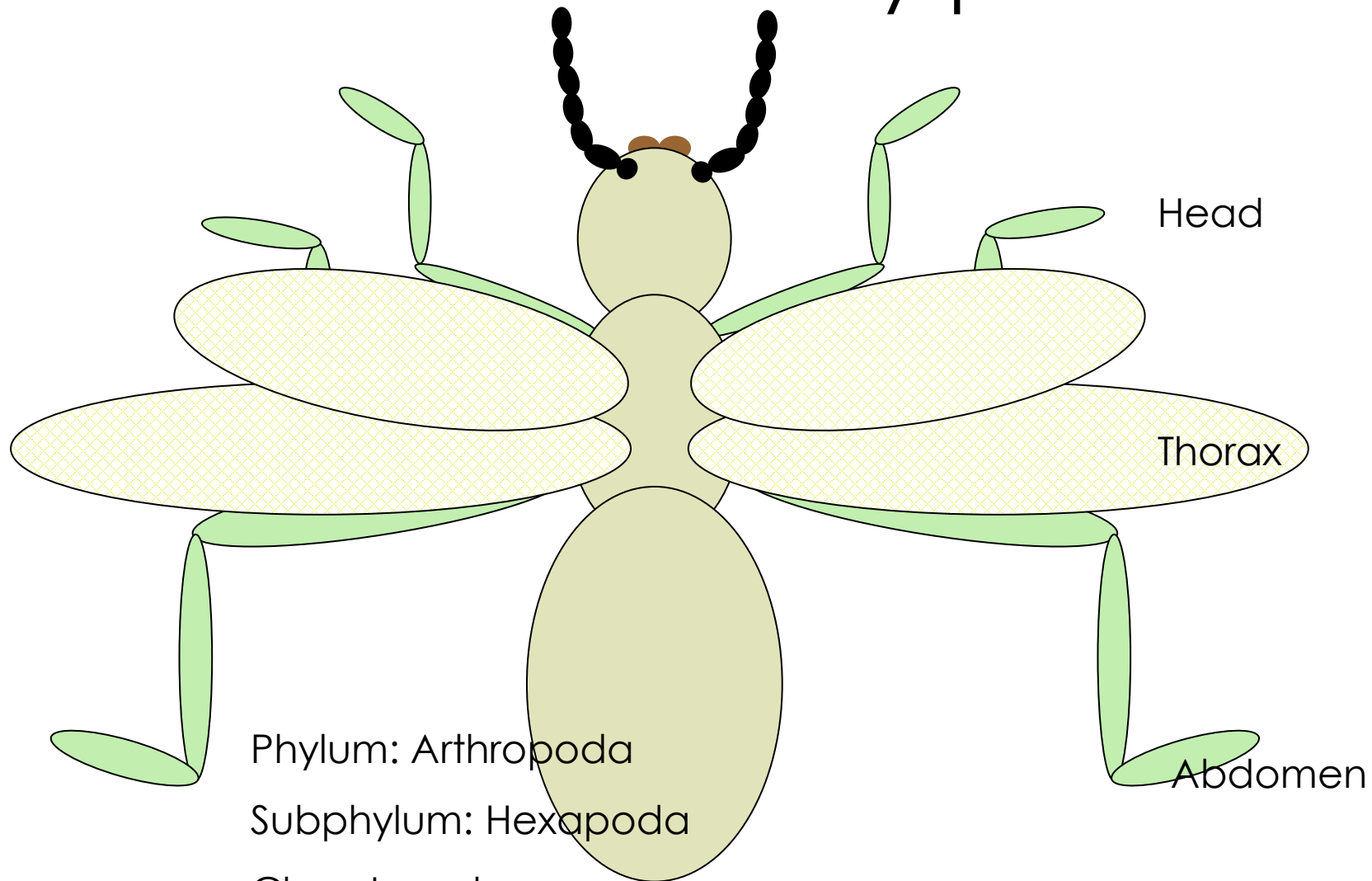
Can you count the ant's legs?

All insects have:

- Six legs
- Segmented bodies
- An exoskeleton



Basic insect body plan



Head

Thorax

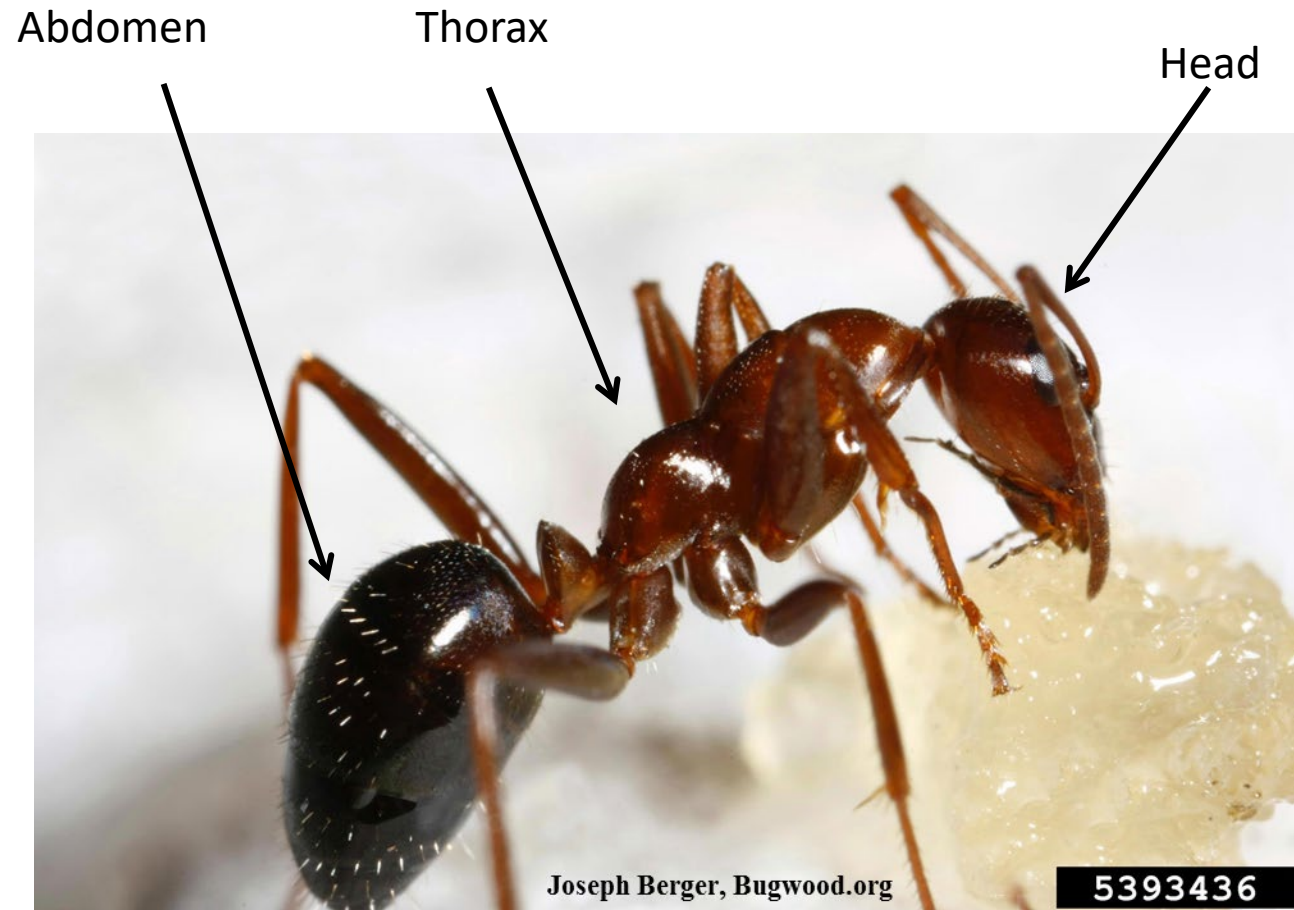
Abdomen

Phylum: Arthropoda

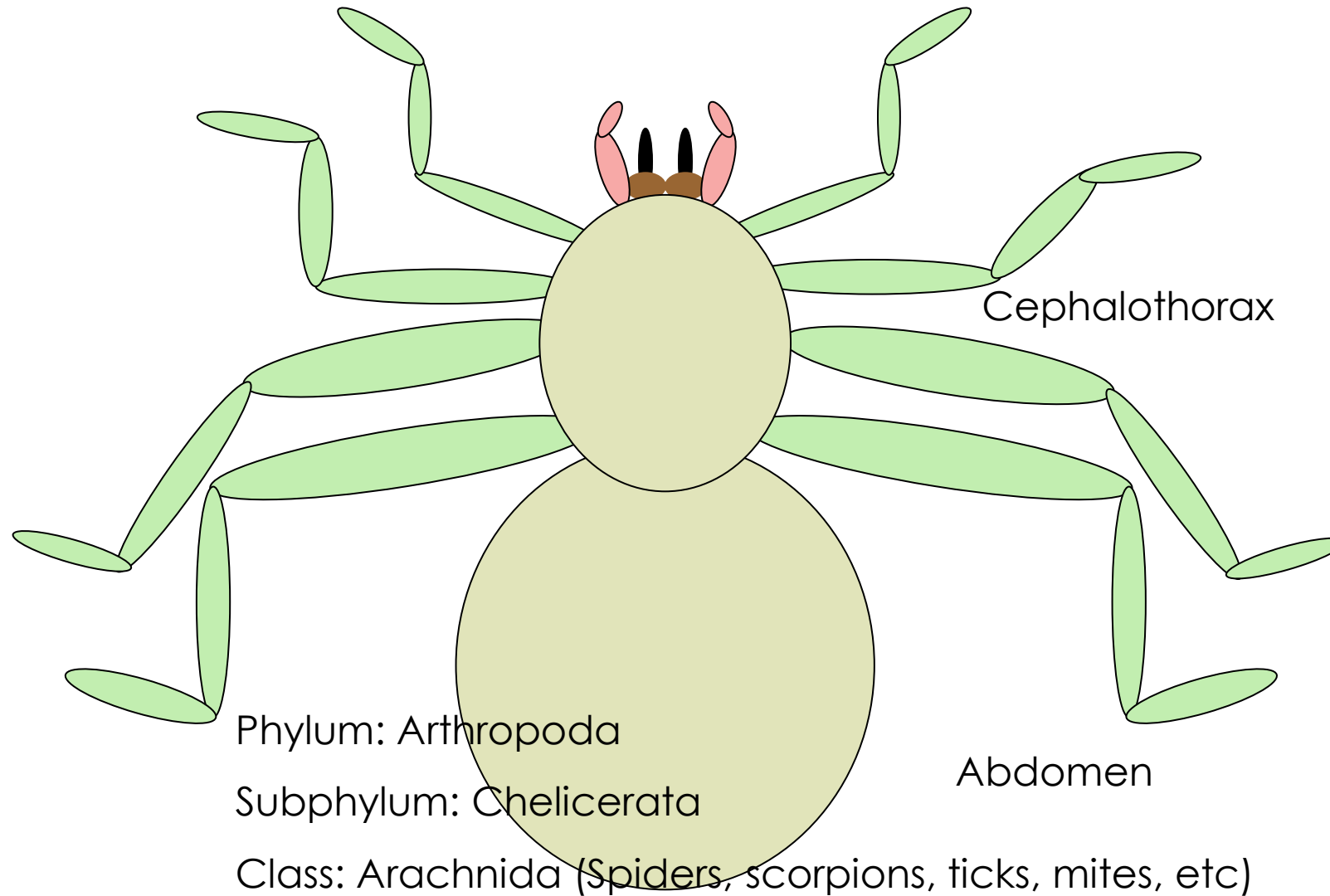
Subphylum: Hexapoda

Class: Insecta

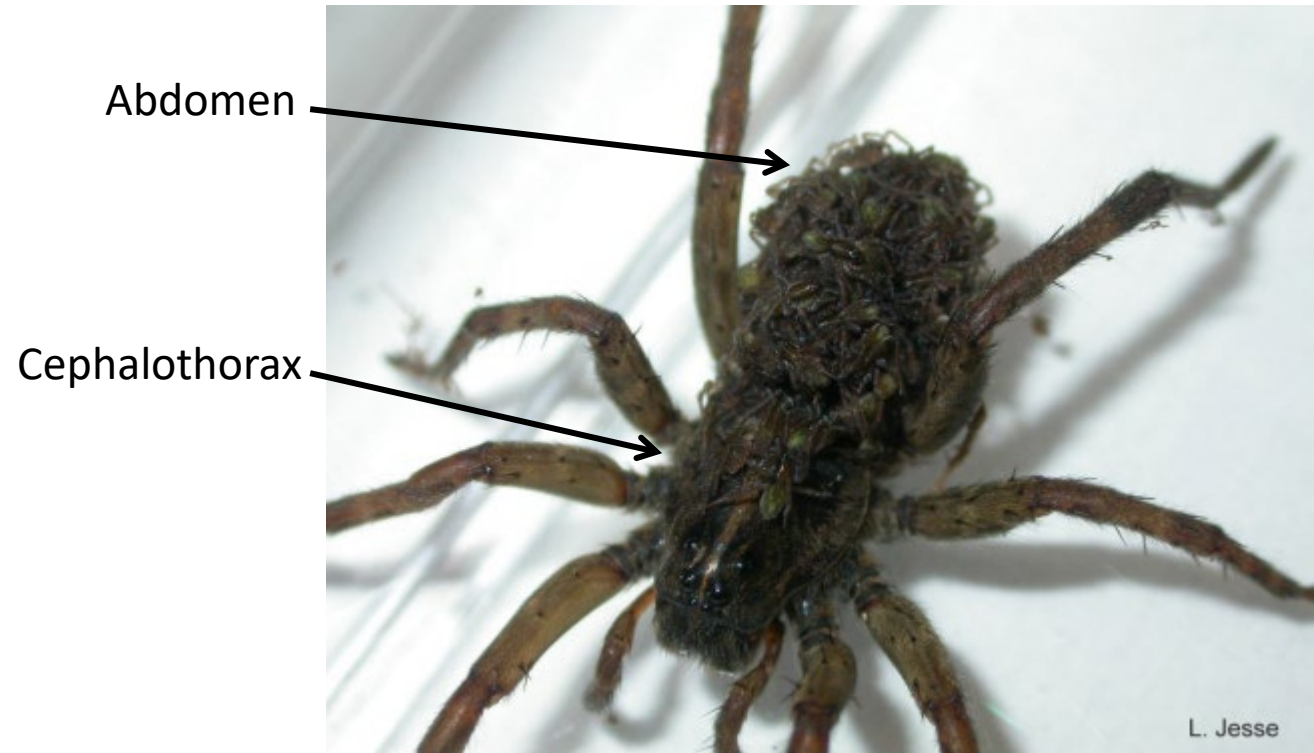
Basic insect body plan

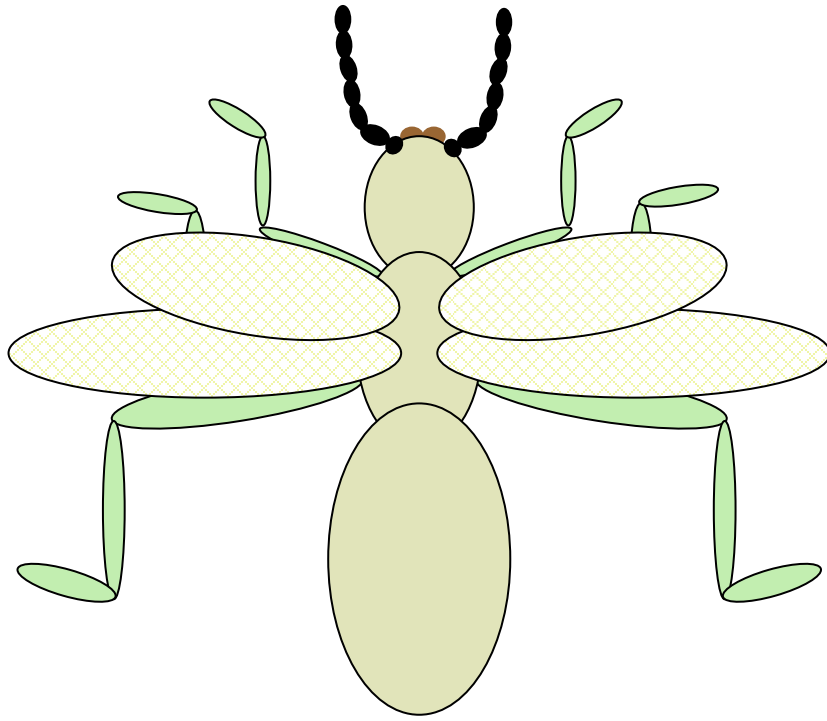


Basic arachnid body plan



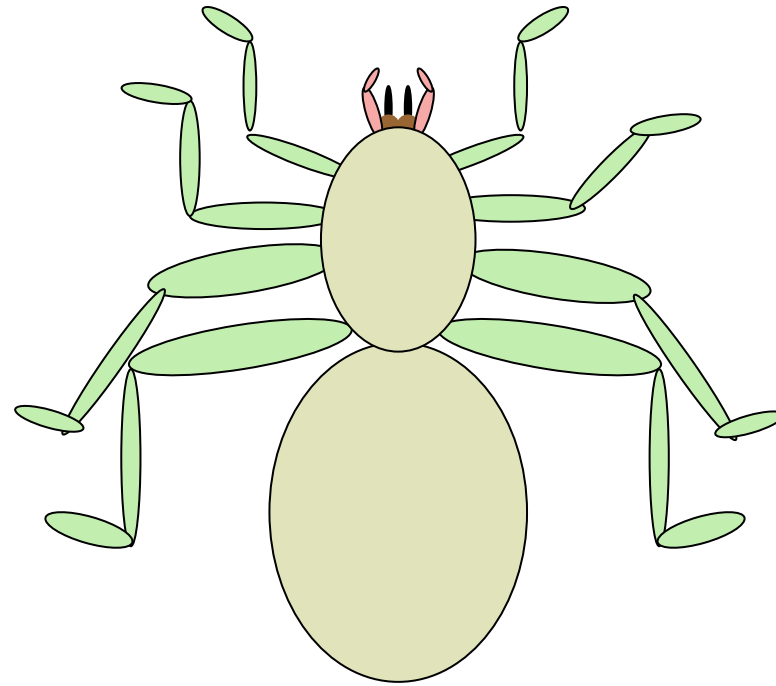
Basic arachnid body plan





Insects

- 3 body regions
- 1 pair of antennae
- 3 pair of legs
- 2 pair of wings



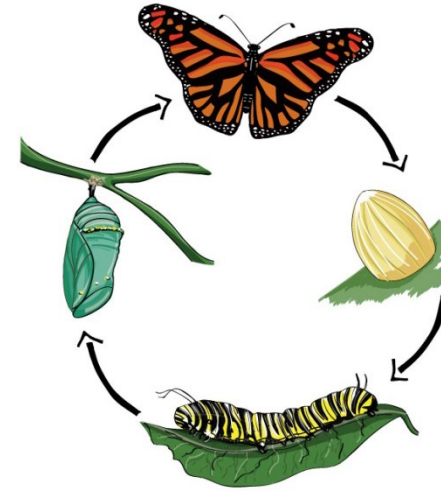
Arachnids

- 2 body regions
- No antennae
- 4 pair of legs
- No wings

Metamorphosis

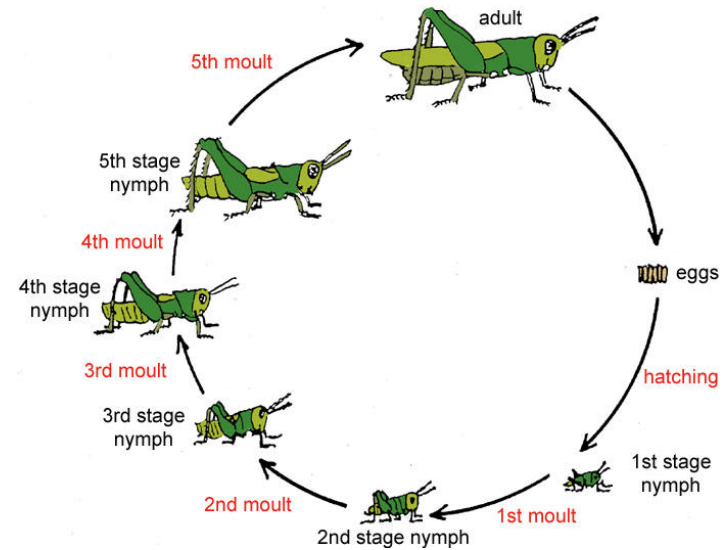
Complete

- E.g. butterflies, beetles, flies



Incomplete

- E.g. Bugs, grasshoppers





Why are insects so successful?



© Marlin E. Rice

- Small size
- Multigenerational
- Flight
- Metamorphosis
- Wide variety in food choices
- Wide variety in habitat resources

Size wise

- **Largest**

Giant Weta - cricket-like creature with a wingspan ~ 7 inches.



- **Longest**

Chan's Mega Stick
~ 14 inches.



- **Heaviest**

Hercules Beetle ~ 0.25 lbs.

Size wise

- **Smallest**

Fairy wasps - tiny wasps ~ 0.139 mm
(0.0055 in).



Ant sizes



Pharaoh ant



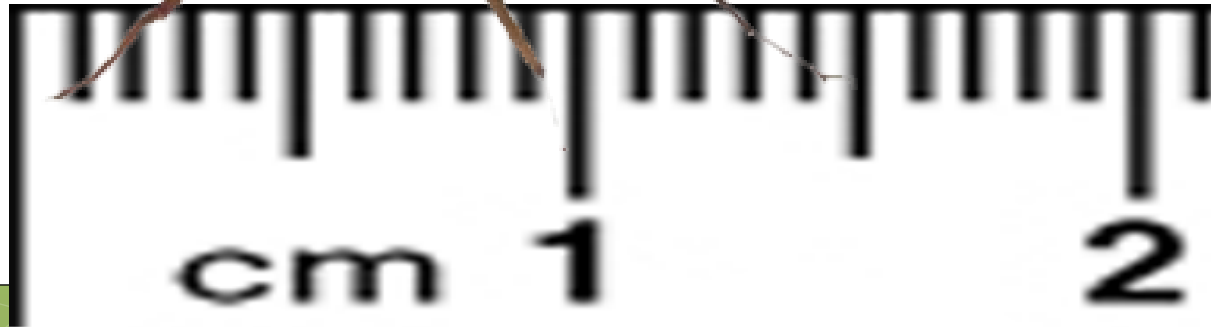
Argentine ant



Southern fire ant



Carpenter ant



How do insects feed?

Mouthparts

- Chewing
- Piercing and sucking
- Lapping
- Siphoning



Chewing

- Roaches, beetles, grasshoppers



Piercing and sucking

- Bugs (Hemiptera)
- Diptera (Mosquitoes)



Lapping

- Honey bees



Siphoning

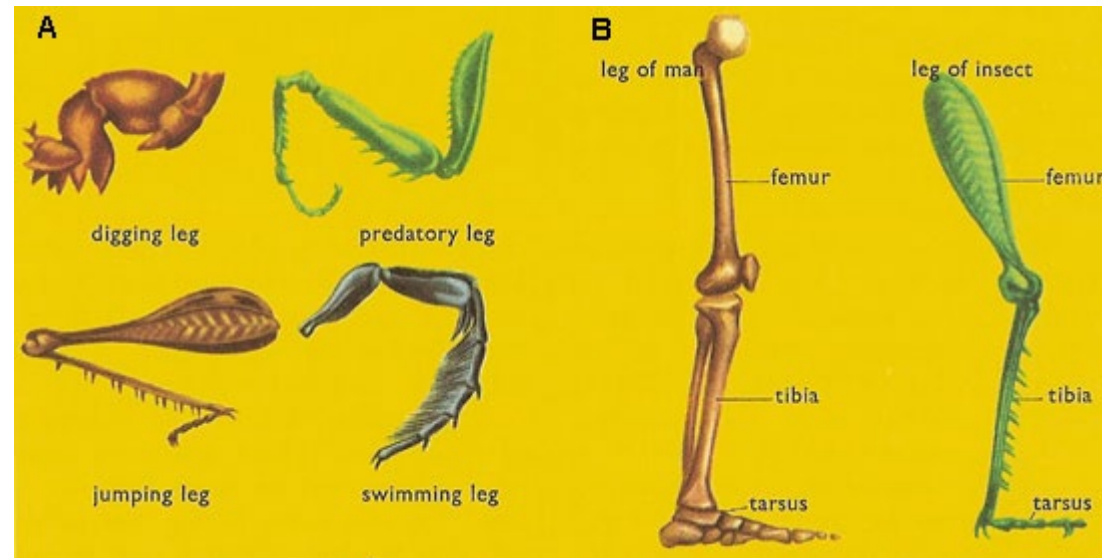
- Butterflies and moths



Diagnostic tools

- An insect's mouth parts and its method of feeding determines the type of injury it causes.
- Biting/ chewing mouth parts → physical removal of plant tissue.
- Piercing-sucking mouth parts → leave plant intact but remove fluids.
- These differences have important implications for diagnosis and management.

Other ways to ID insects: legs



Other ways to ID insects: antennae



What do insects eat?



Lots of different foods!

Where do insects live?





Mimicry

Monarch
Danaus plexippus



Viceroy
Limenitis archippus





Photo taken by John Flannery



Types of insects

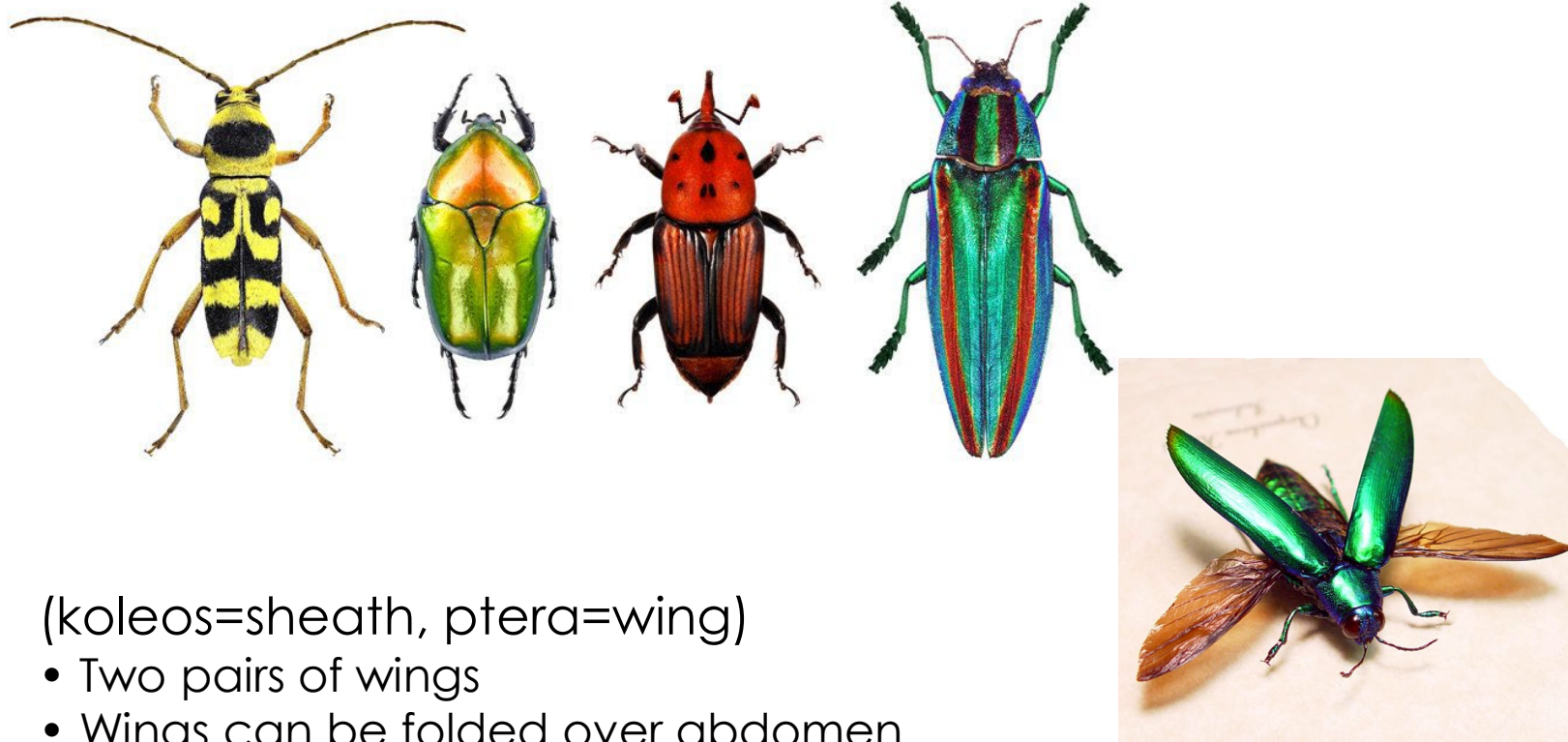
Common insect orders

- Coleoptera (Beetles)
- Lepidoptera (Butterflies and moths)
- Diptera (Flies, mosquitoes)
- Hemiptera (True bugs)
- Hymenoptera (Wasps, ants, bees)
- Blattodea (Roaches, termites)

Not all insects are bugs!!!



Coleoptera: The beetles



(koleos=sheath, ptera=wing)

- Two pairs of wings
- Wings can be folded over abdomen
- “Elytra” forewings heavily sclerotized - protective covering
- Membranous hindwings folded underneath forewing
- Chewing mouthparts
- Adults and larvae feed on plant or organic material

Lepidoptera: Butterflies and Moths



(Lepido=scale, ptera=wing)

- Two pairs of membranous wings with scales
- Unable to completely fold wings over abdomen
- Larvae (caterpillars) - chewing mouthparts
- Adults - piercing/siphoning mouthparts
- Larvae feed on plant material
- Adults feed on nectar or not at all

Butterflies - wings held vertically at rest, diurnal

Moths - wings held horizontally at rest, nocturnal

Lepidoptera: Butterflies and Moths

Butterflies - wings held vertically at rest, diurnal

Moths - wings held horizontally at rest, nocturnal



Diptera: The Flies



(di=two, ptera=wing)

- Only one pair of membranous wing visible
- Second pair of wings functions as a balance organ - the haltere
- Wings cannot completely fold over abdomen
- Piercing/sucking and chewing mouthparts
- Larvae (maggots) feed on plant and animal tissue
- Adults feed on dead/decaying material

Hymenoptera: Wasps, Ants, Bees



(hymeno=god of marriage, ptera=wing)

- Social insects
- Two pairs of membranous wings that couple during flight
- Wings cannot completely fold over abdomen
- Some groups apterous (wingless)
- Stinging organ - ovipositor can be used in defensive capacity
- Chewing or lapping mouthparts
- Adults feed on plant material, nectar, or other insects

Hemiptera: The True Bugs



(hemi=half, ptera=wing)

- Two pairs of wings
- Wings can be folded over abdomen
- Half of the forewing is sclerotized – “hemelytra”
- Hindwing folded under forewing
- Piercing/sucking mouthparts
- Adults and immatures can feed on plant material or other insects



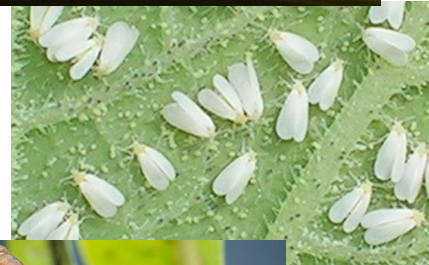
Nature Production/Nature Production/naturepl.com

Hemiptera: Three sub orders

Auchenorrhynca



Sternorrhynca



Heteroptera



Orthoptera: Crickets, grasshoppers, locusts, katydids



(Ortho=straight, ptera=wing)

- Two pairs of wings, can be folded over abdomen
- Forewing straight (does not curve over abdomen), leathery and narrow (usually)
- Hindwing folded fan-like beneath forewing - large surface area
- Legs modified for jumping or fast running
- Chewing mouthparts
- Adults and immatures can be plant feeders

Blattodea: Termites, roaches



- Adults and immatures feed on dead/decaying plant material
- Chewing mouthparts
- Decomposers

Termites



(Formerly, Isoptera, iso=equal, ptera=wing)

- Adult sexual forms have two equal pair of wings
- Most are apterous
- Social insects
- Chewing mouthparts
- Adults and immatures feed on dead/decaying plant material

Dermaptera: Earwigs



(derma=skin, ptera=wing)

- Two pairs of wings: short and leathery forewings with very thin hindwings
- Both sexes have prominent “cerci” at the end of the abdomen
- Chewing mouthparts
- Adults and immatures feed on any kind of organic material

Thysanoptera: Thrips



(thysano=fringe, ptera=wing)

- Winged species have two pairs of thin strap-like wings fringed with fine hairs
- Elongated tubular body, ~ 1 mm in length
- Asymmetrical, rasping mouthparts
- Adults and immatures feed on plant material
- Singular and plural is 'thrips'

Insect names



Entomologists say:

Bug

Beetle

Most people say:

Bug

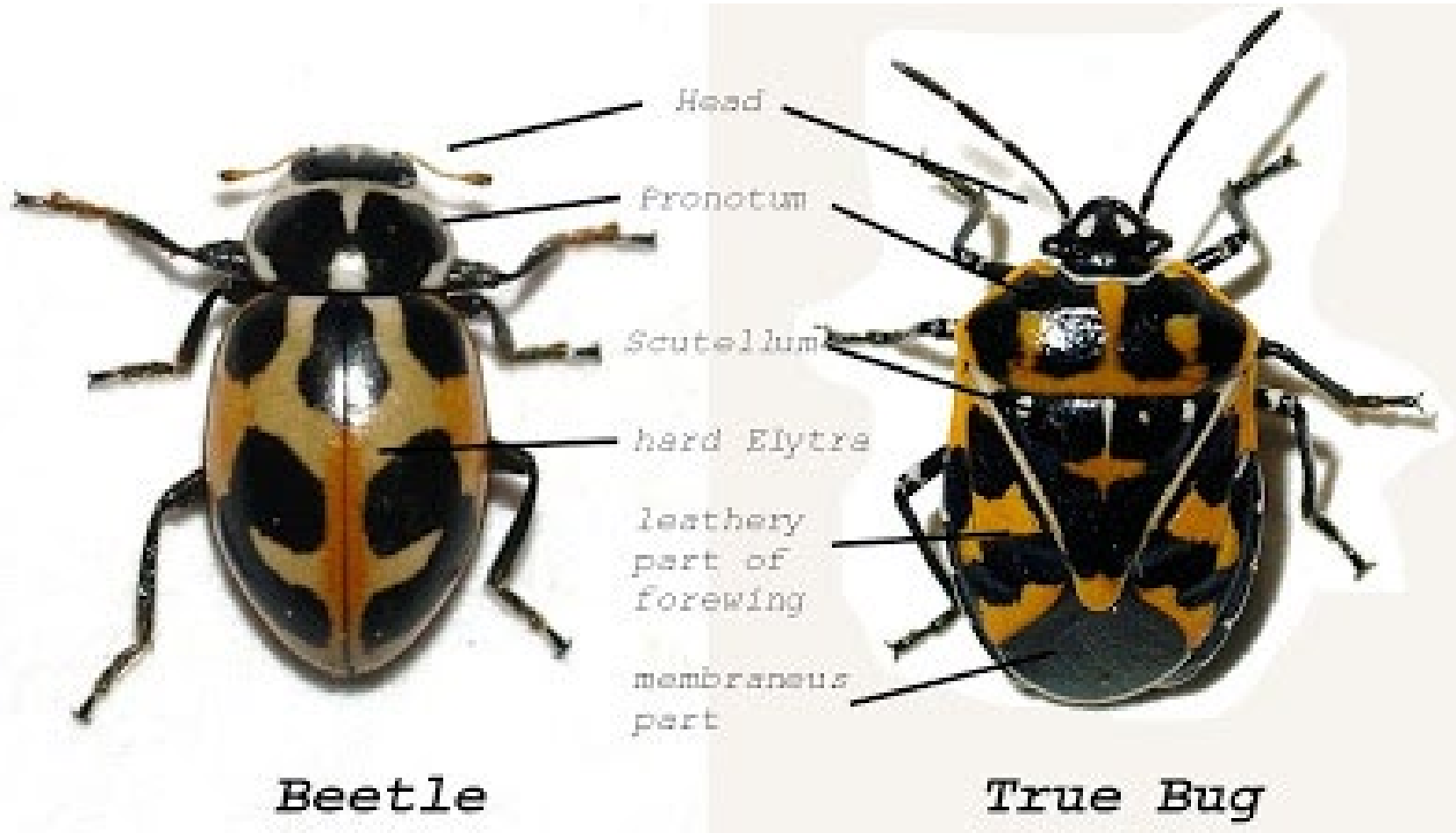
Bug

Scientific name:

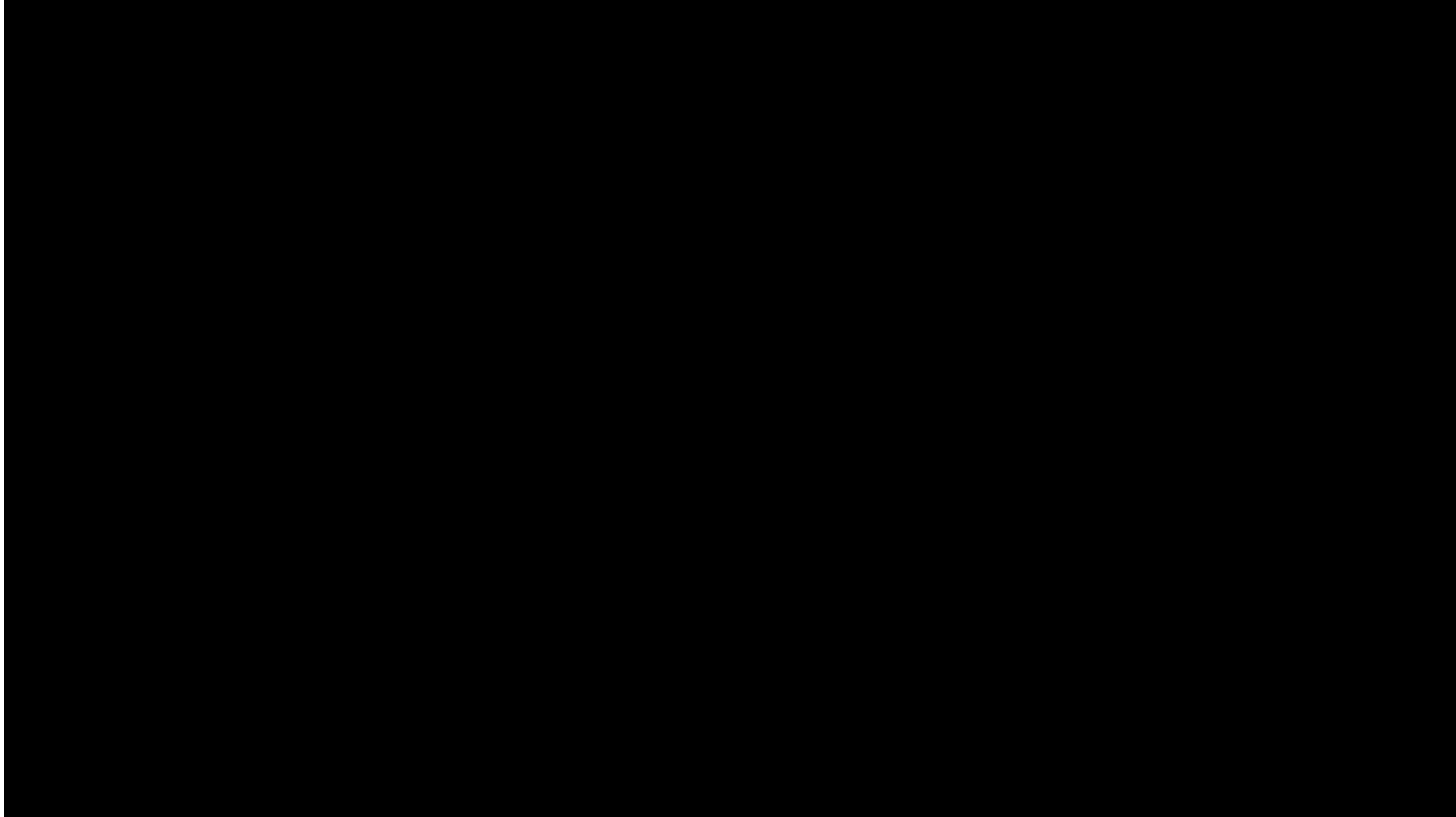
Hemiptera

Coleoptera

Insect names



Arthropod Adaptations



<https://www.youtube.com/watch?v=bz4ODmqbnQA>

Contact



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