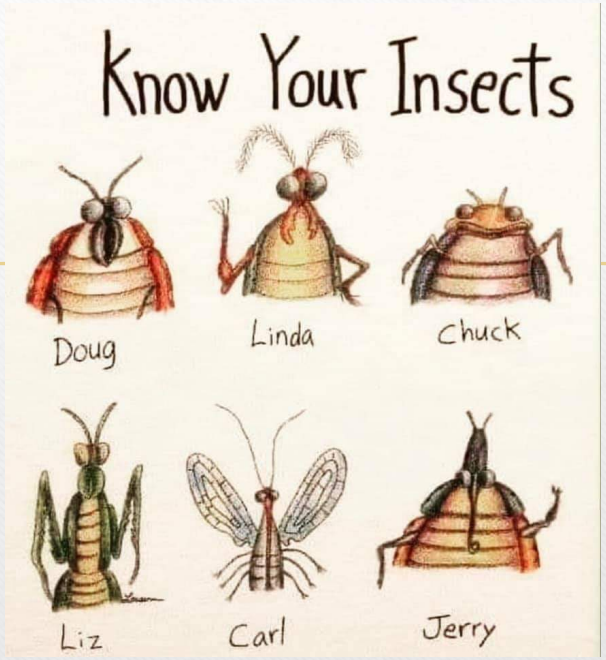
ARTHROPODS

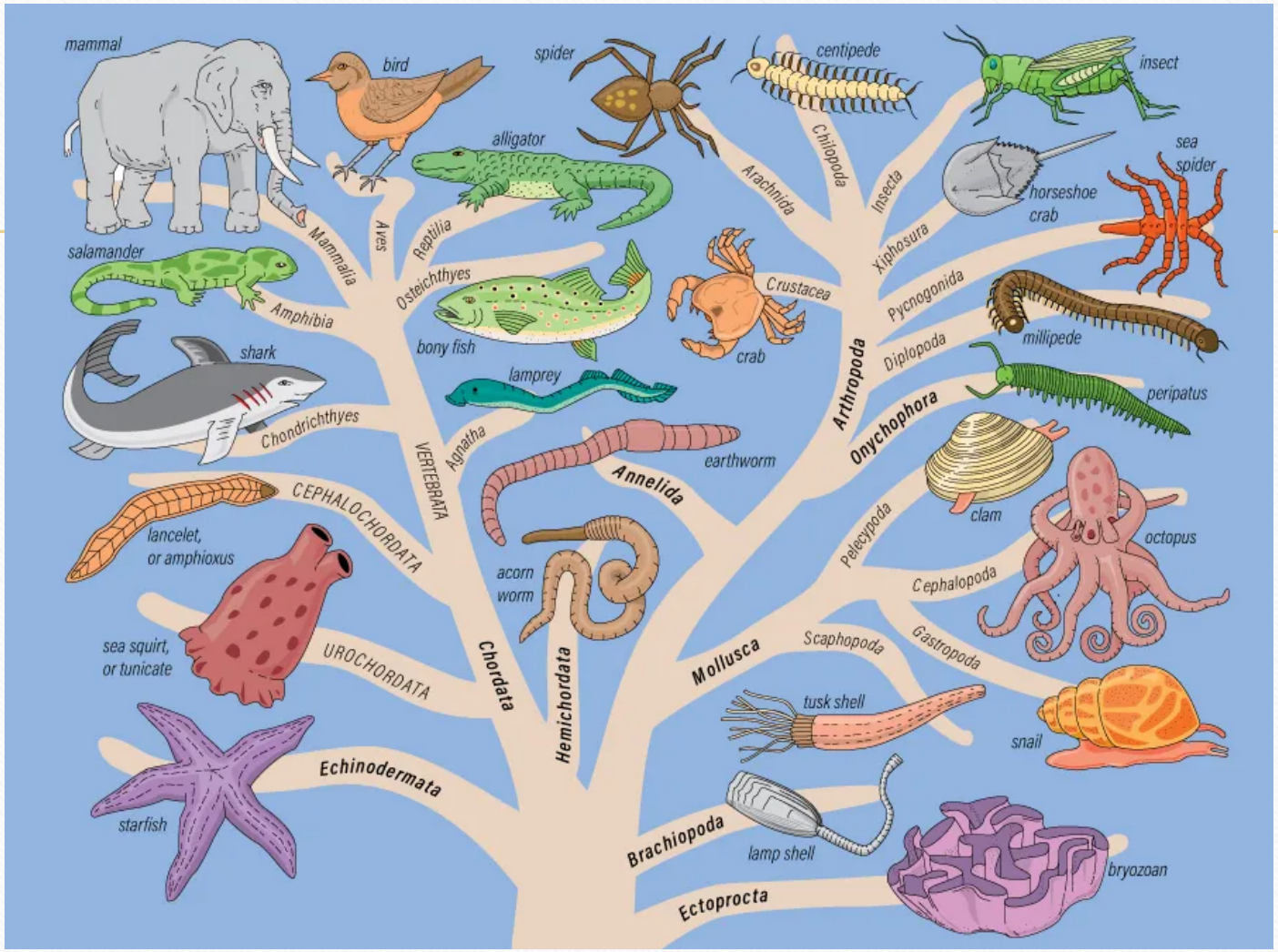


Olivia Miseroy

Regional Park Superintendent of the

Wildlife and Wildflower Sanctuaries

Phylogeny Tree



What is an arthropod?

- Means “Jointed foot” in Latin
- Has an exoskeleton
- Jointed appendages
- Segmented Body
- Bilaterally symmetrical
- Open circulatory system

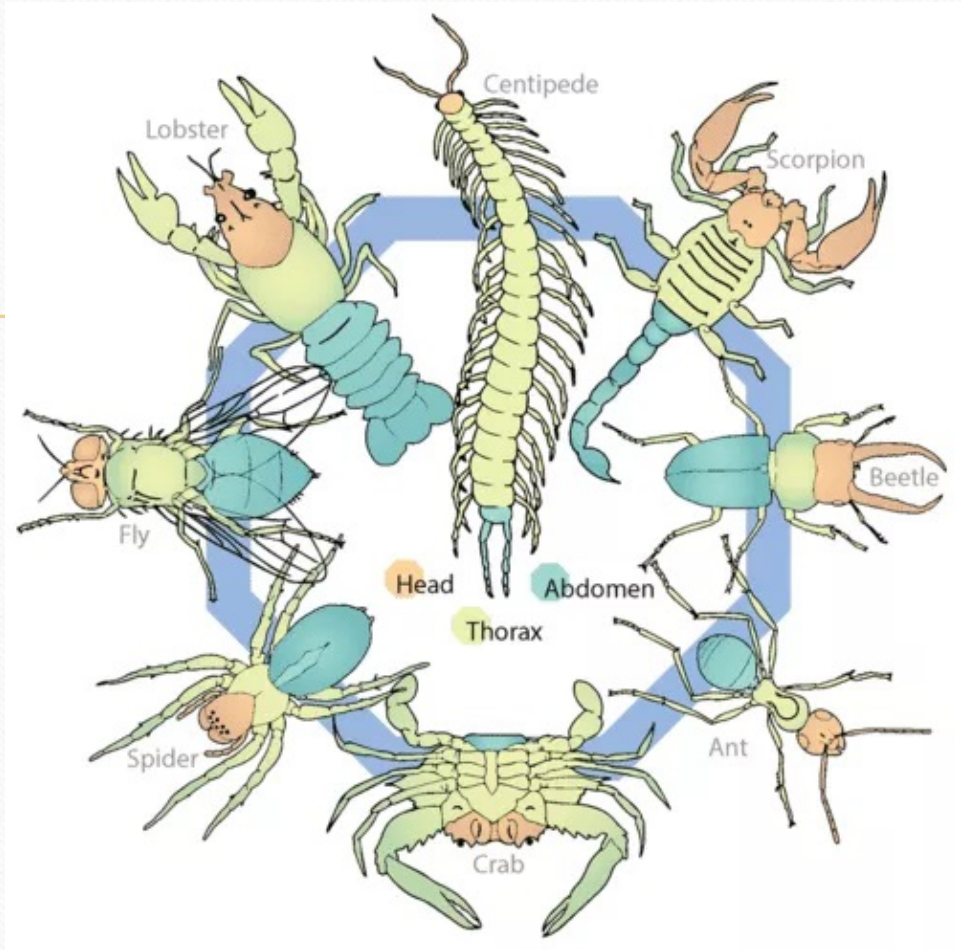
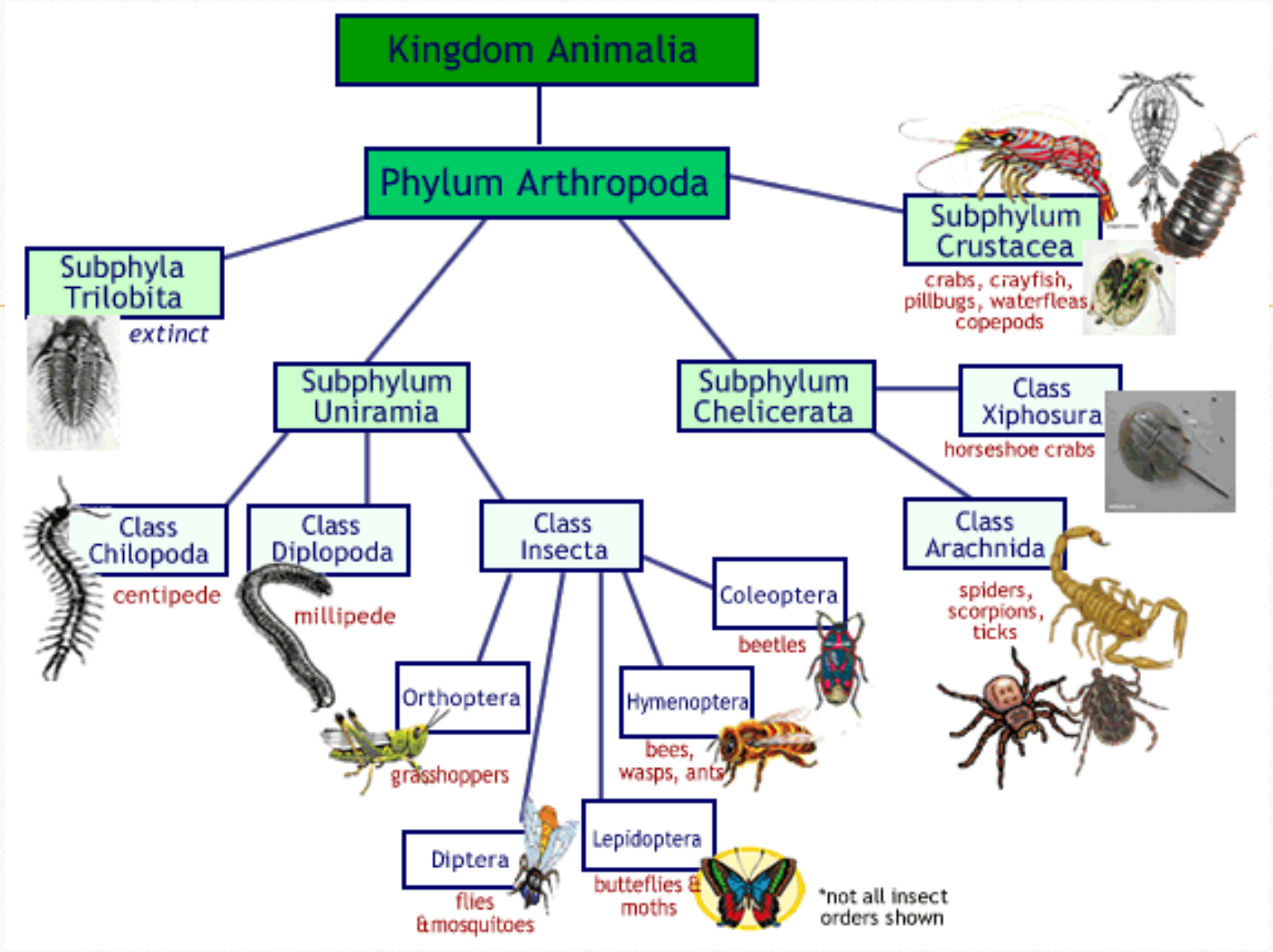


Image Credit: Mariana Ruiz Villarreal


Kingdom Animalia
Phylum Arthropoda
Subphyla Trilobita
extinct
Subphylum Crustacea
crabs, crayfish, pillbugs, waterfleas, copepods
Subphylum Uniramia
Subphylum Chelicerata
Class Xiphosura
horseshoe crabs
Class Chilopoda
centipede
Class Diplopoda
millipede
Class Insecta
Class Arachnida
spiders, scorpions, ticks
Coleoptera
beetles
Orthoptera
grasshoppers
Hymenoptera
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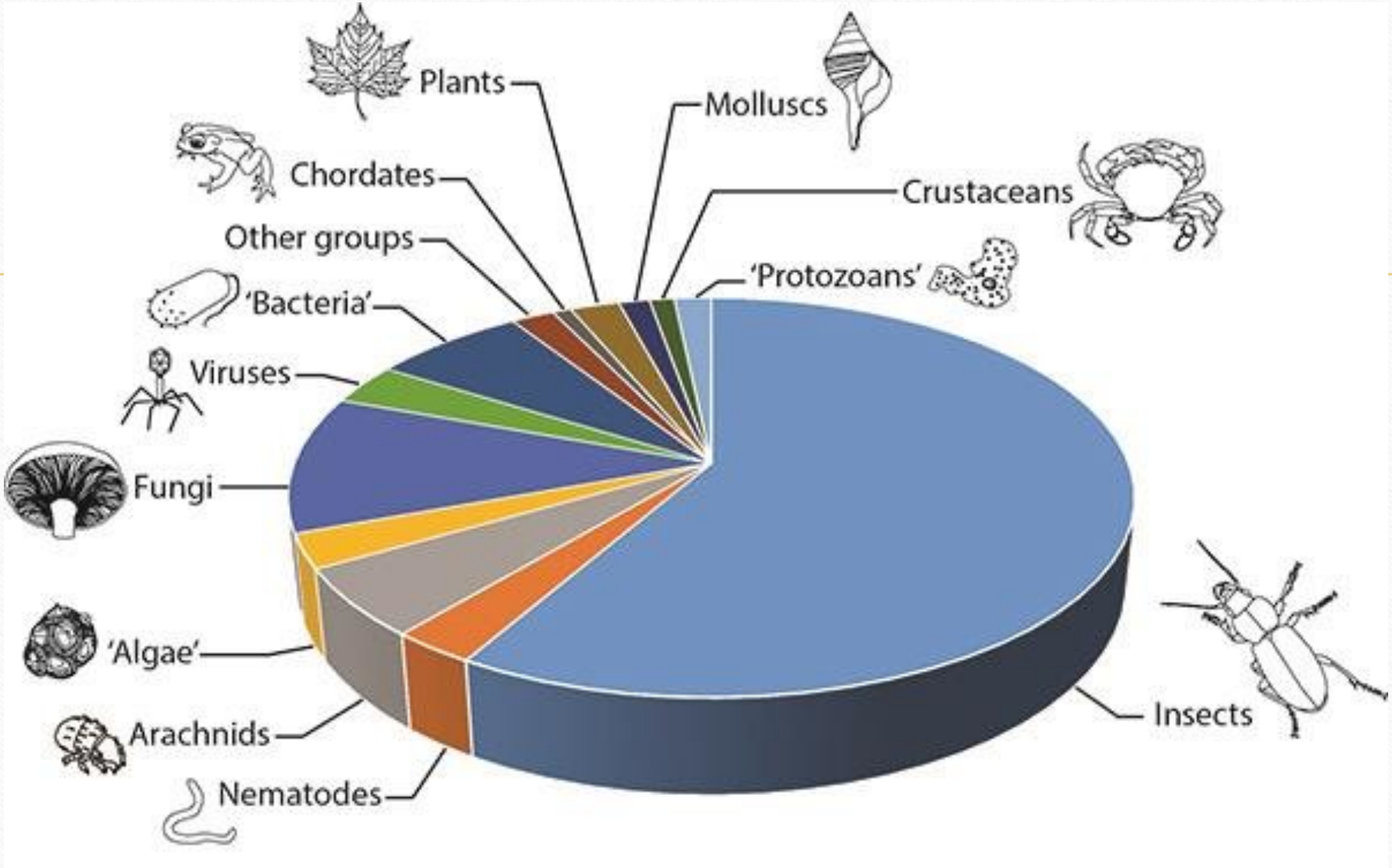
Diptera
flies & mosquitoes
Lepidoptera
butterflies & moths
*not all insect orders shown


Plants
Molluscs
Chordates
Crustaceans
Other groups
'Protozoans'
'Bacteria'
Viruses
Fungi
'Algae'
Arachnids
Nematodes
Insects

Why are arthropods important?

Pollinators

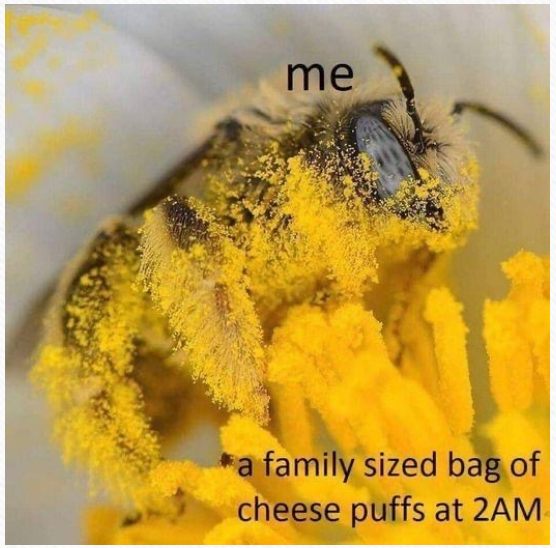
Decomposers

Food for other animals

Pest control

Pollination

- Pollination is how many plants reproduce. Moving pollen grains from plant to plant spreads genetic material to form seeds and propagate new plants.
- Pollinators include bees, wasps, birds, butterflies, moths, flies and even some small mammals, including bats.
- Pollinators help about 80% of the world's flowering plants to reproduce.
- Best pollinators have fuzzy “hairs” for pollen to stick to.



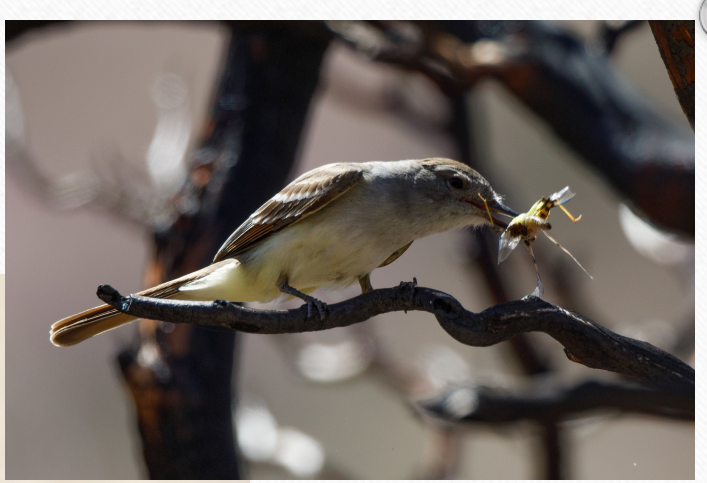
Decomposers

- Decomposers play a critical role in the flow of energy through an ecosystem. They break apart dead organisms into simpler inorganic materials, making nutrients available to primary producers.
- Without insects to help break down and dispose of wastes, dead animals and plants would accumulate in our environment and it would be messy indeed.

- **F**ungus, **B**acteria, **I**nvertebrates

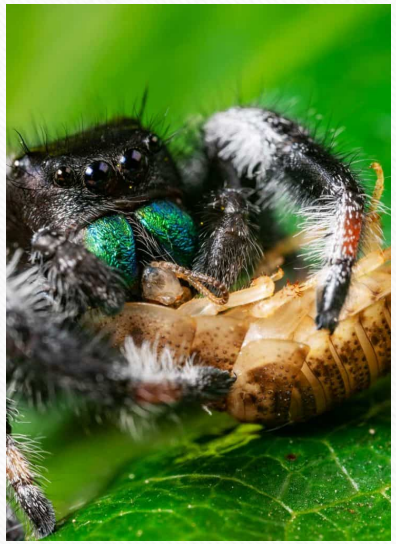
Food for other animals

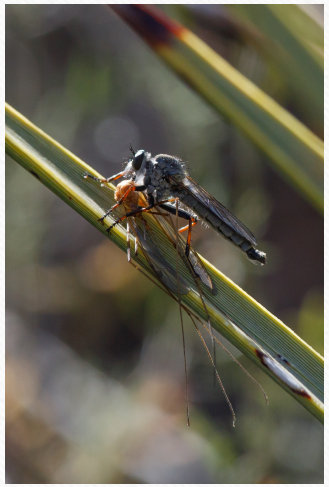
- Many animals rely on arthropods as a primary food source. This includes birds, fish, reptiles, amphibians, mammals.
- Humans all over the world eat arthropods, they are high in nutrients and protein and take less space and resources than other livestock raised for meat.



Natural Pest Control

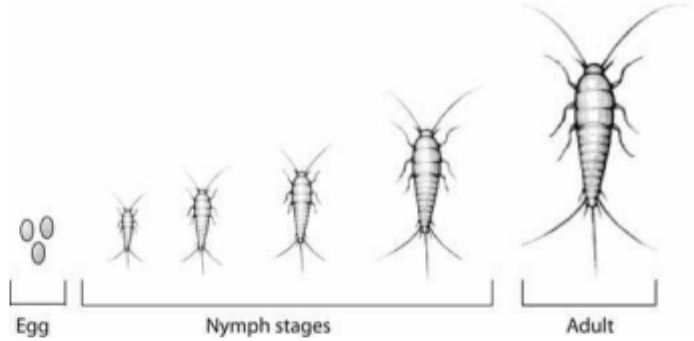
- Many arthropods feed on other arthropods that are pests.





Metamorphosis Types

Without



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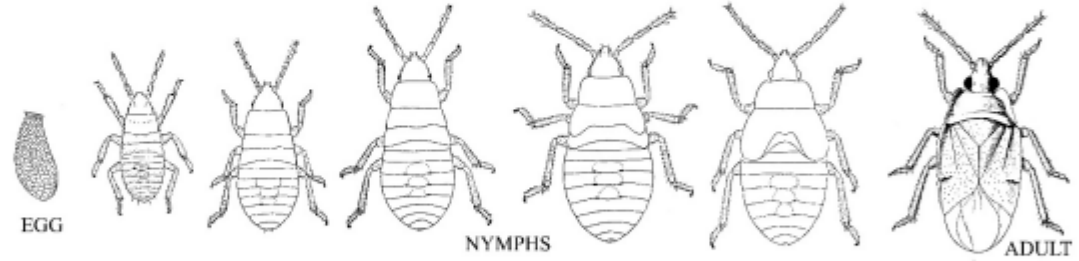

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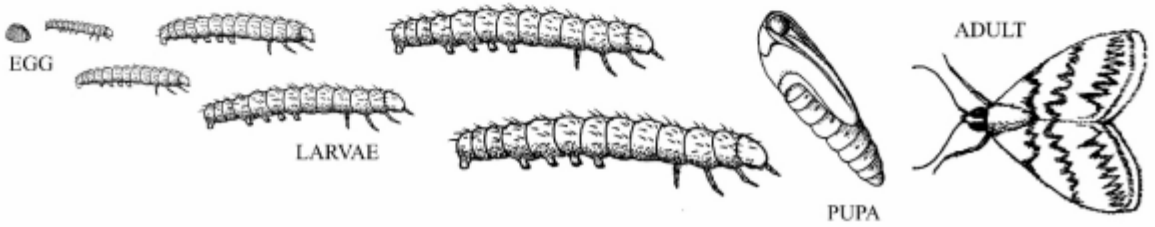

Molting


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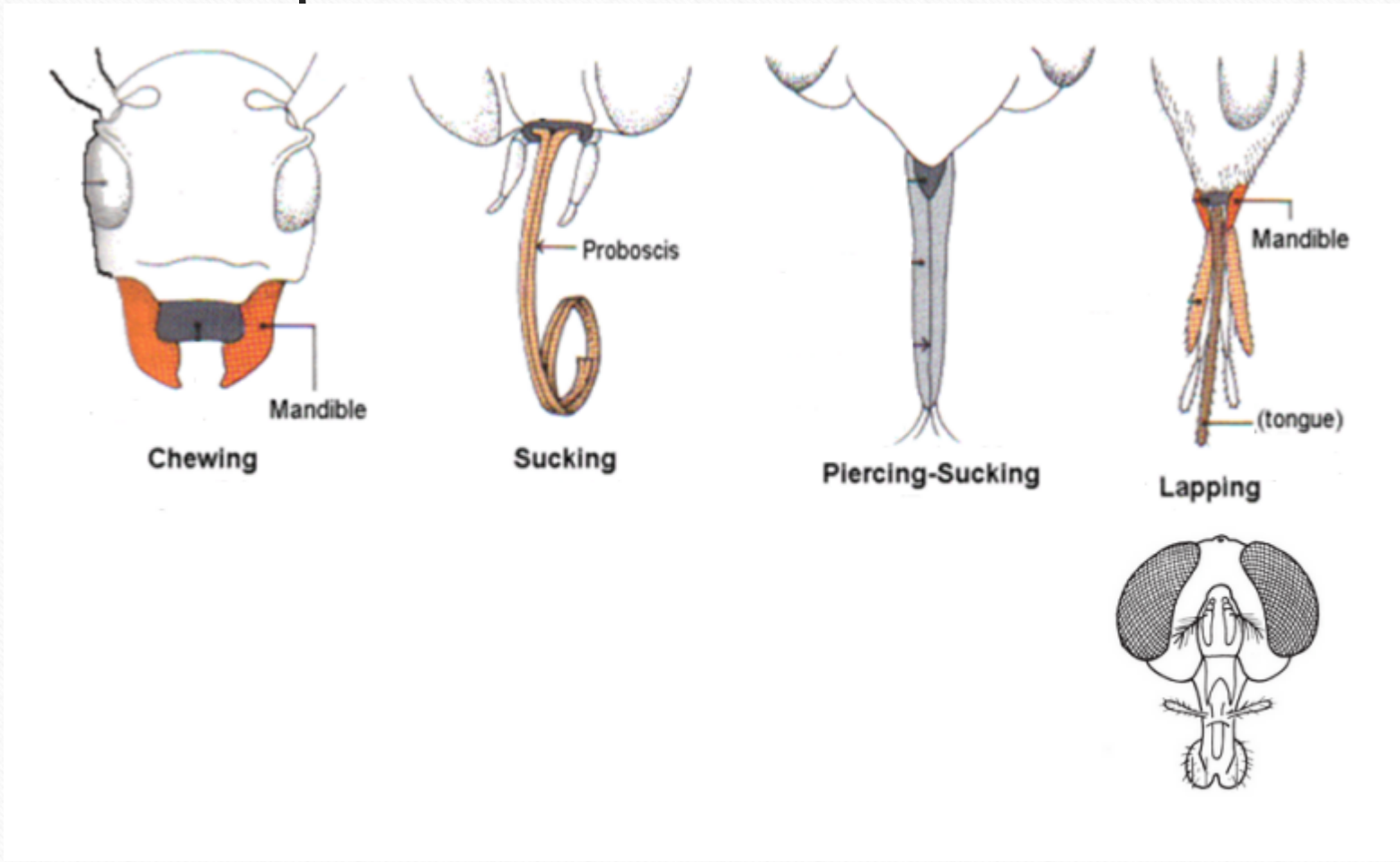
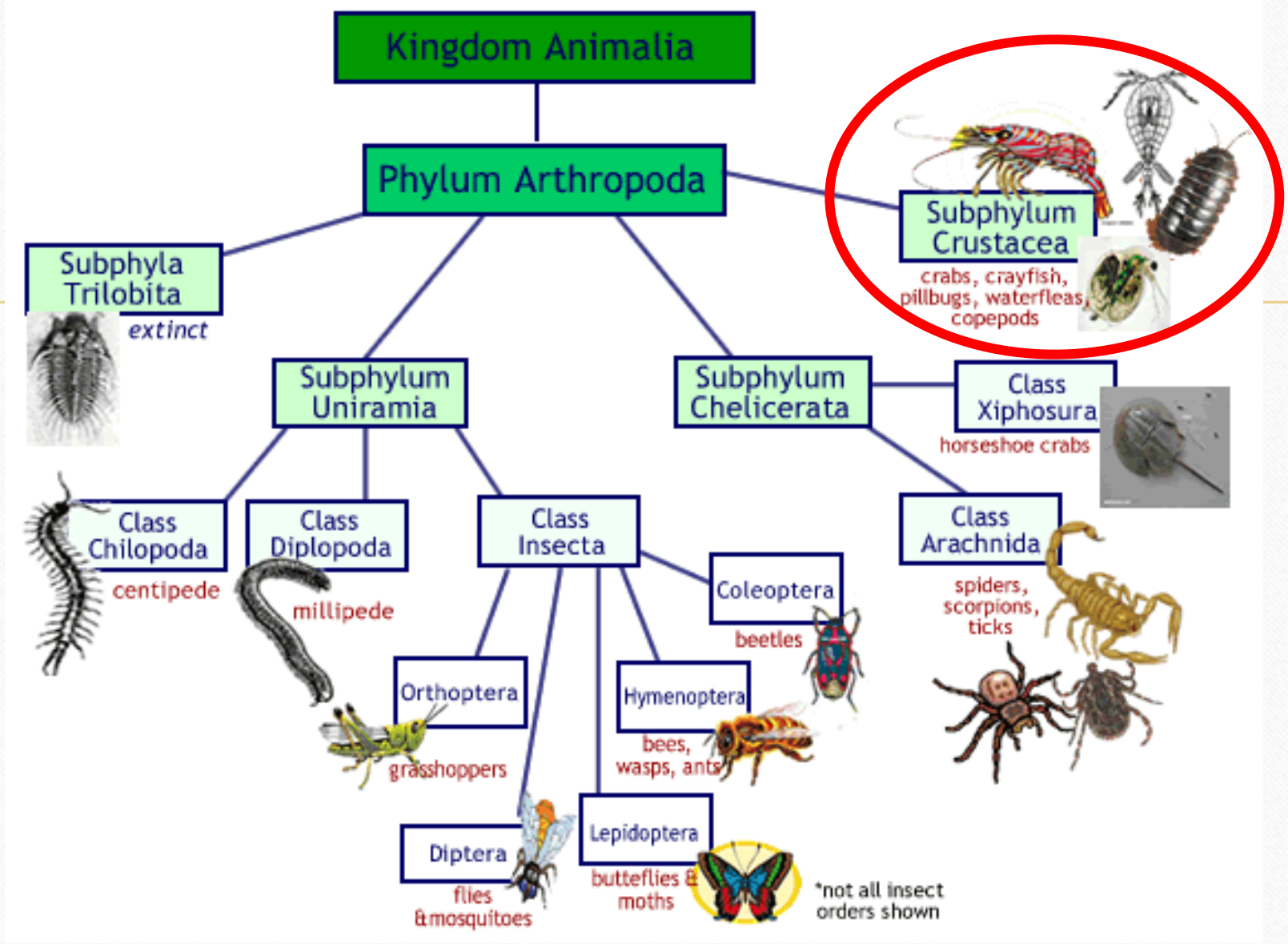
Mouthparts


Mandible
Chewing
Proboscis
Sucking
Piercing-Sucking
Mandible
(tongue)
Lapping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beetles
Orthoptera
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Hymenoptera
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Diptera
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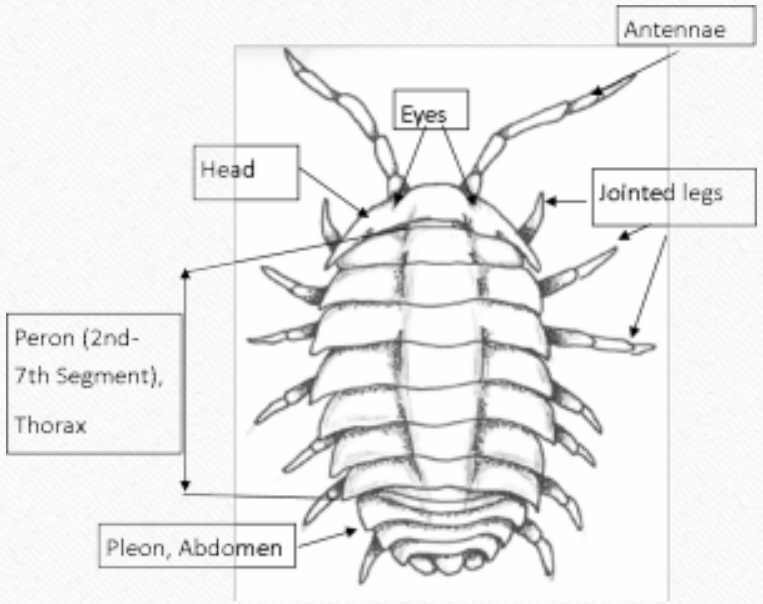
Lepidoptera
butterflies & moths
*not all insect orders shown

Crusteaceans

Isopods (Pillbugs, sow bugs, roly-polys)

- Found under rocks, logs in damp areas
- Eat decomposing plant and sometimes animal matter
- Very few native species in LA County, most are invasive species from Europe.



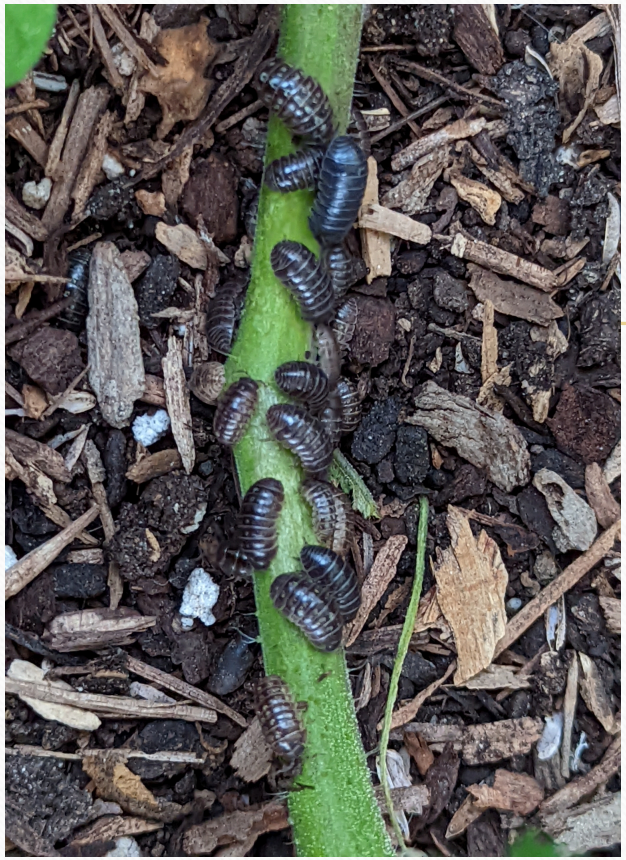
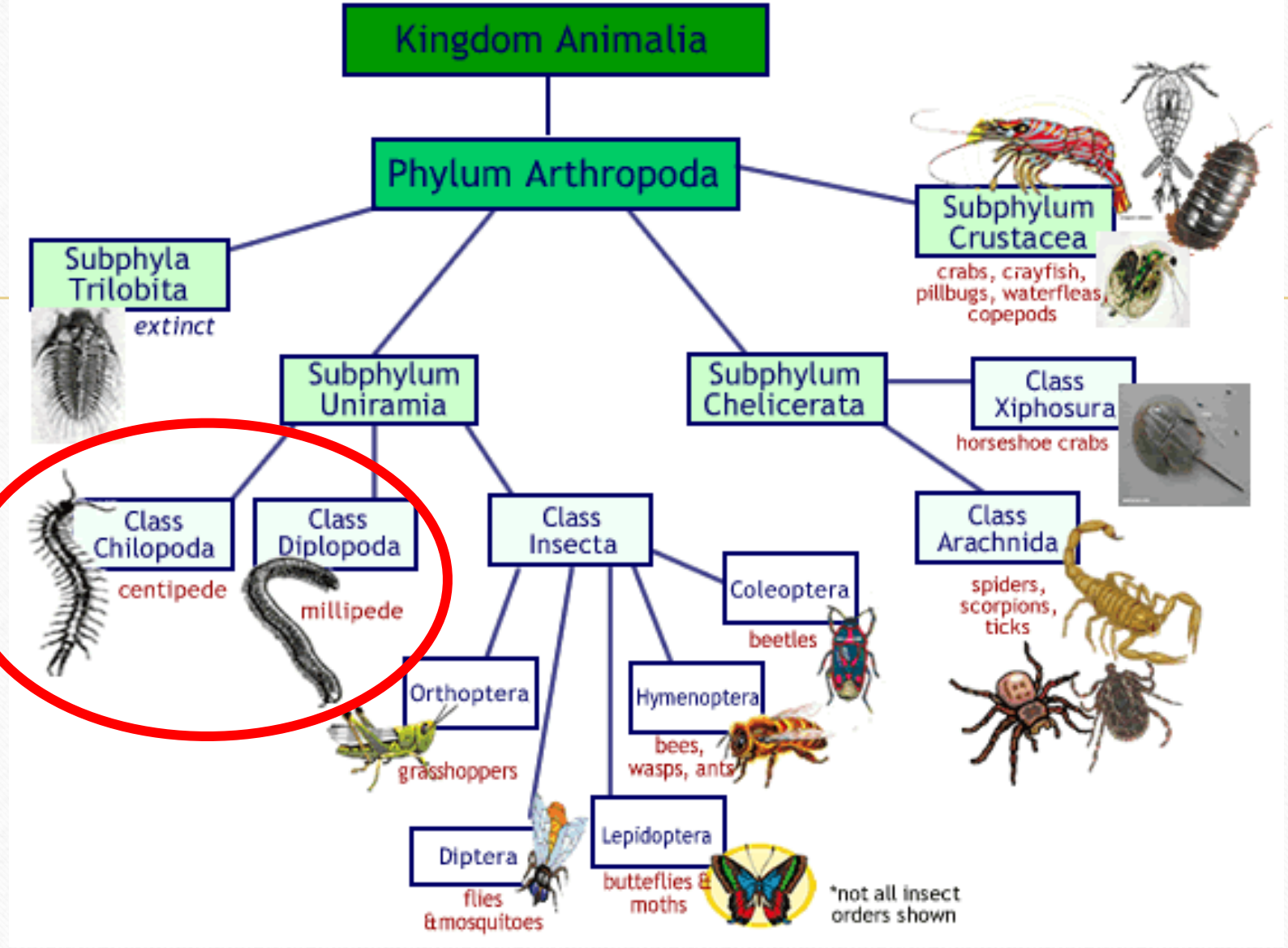


Photo: trinaroberts iNaturalist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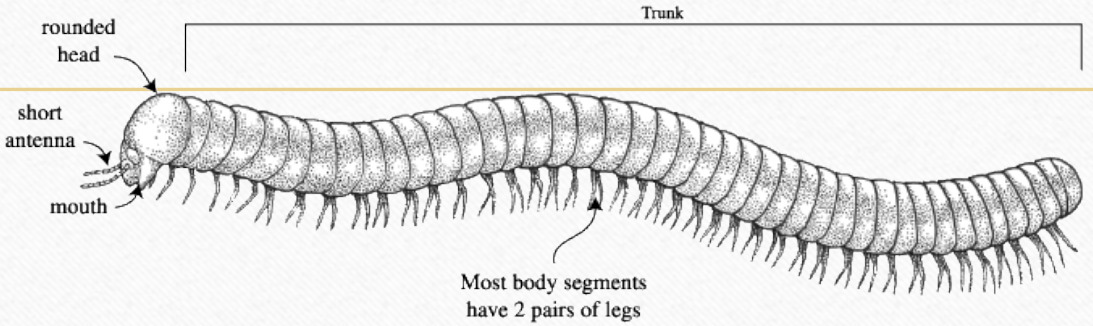
*not all insect orders shown

Myriapods "Many Legged"

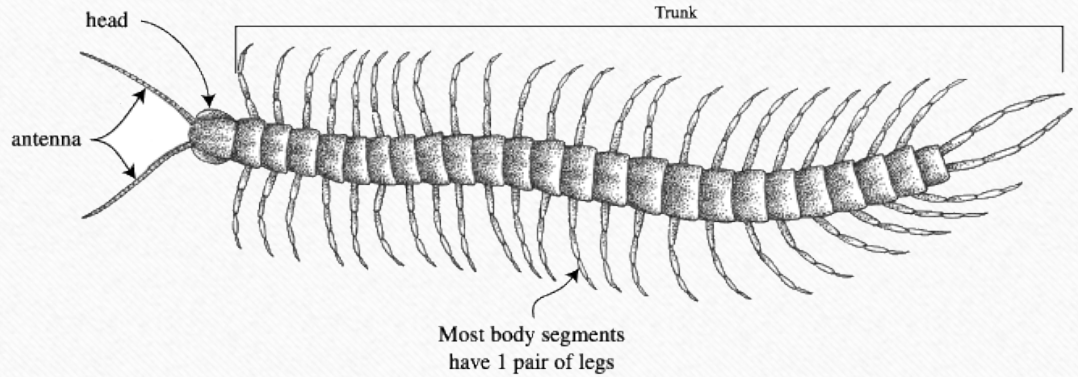
Millipedes and Centipedes

- Elongated body with one or two pairs of legs per segment.
- Pair of antenna
- Chewing mouthparts

Millipede- External Anatomy



Centipede- External Anatomy



Myriapods

Millipedes

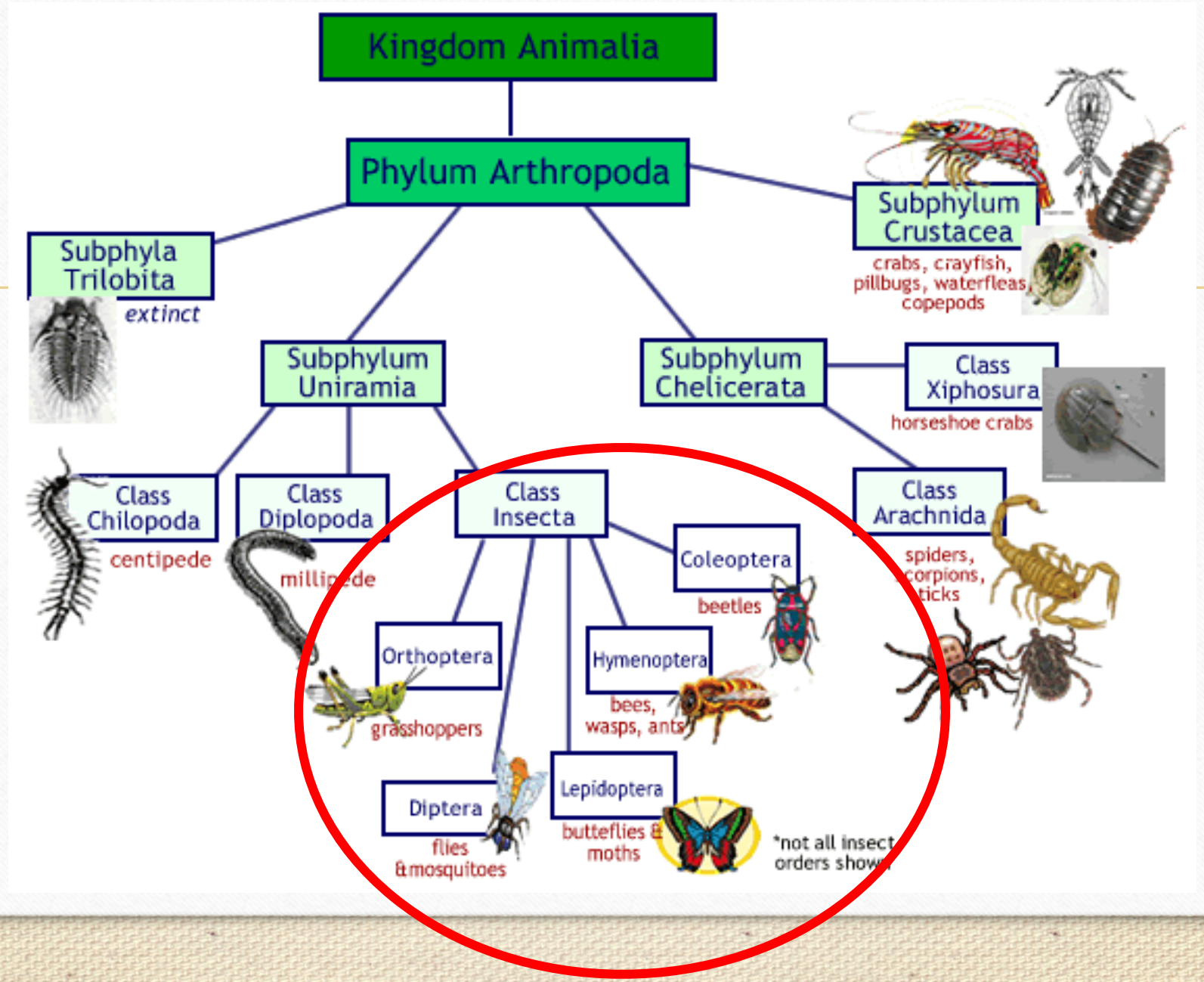
- Herbivorous and feed mostly on decaying plant matter
- Rounded body
- Two pairs of legs on most body segments
- Slow moving
- Can secrete a mild acid when threatened
- Found at night in moist areas, under rocks and in leaf litter. Often seen after rain

Myriapods

Centipedes

Common Desert Centipede

- Usually carnivorous and prey on live invertebrates and sometimes vertebrates
- Flat body
- One pair of legs per segment
- First pair of legs are venomous claws
- Actively hunts and is very fast
- Nocturnal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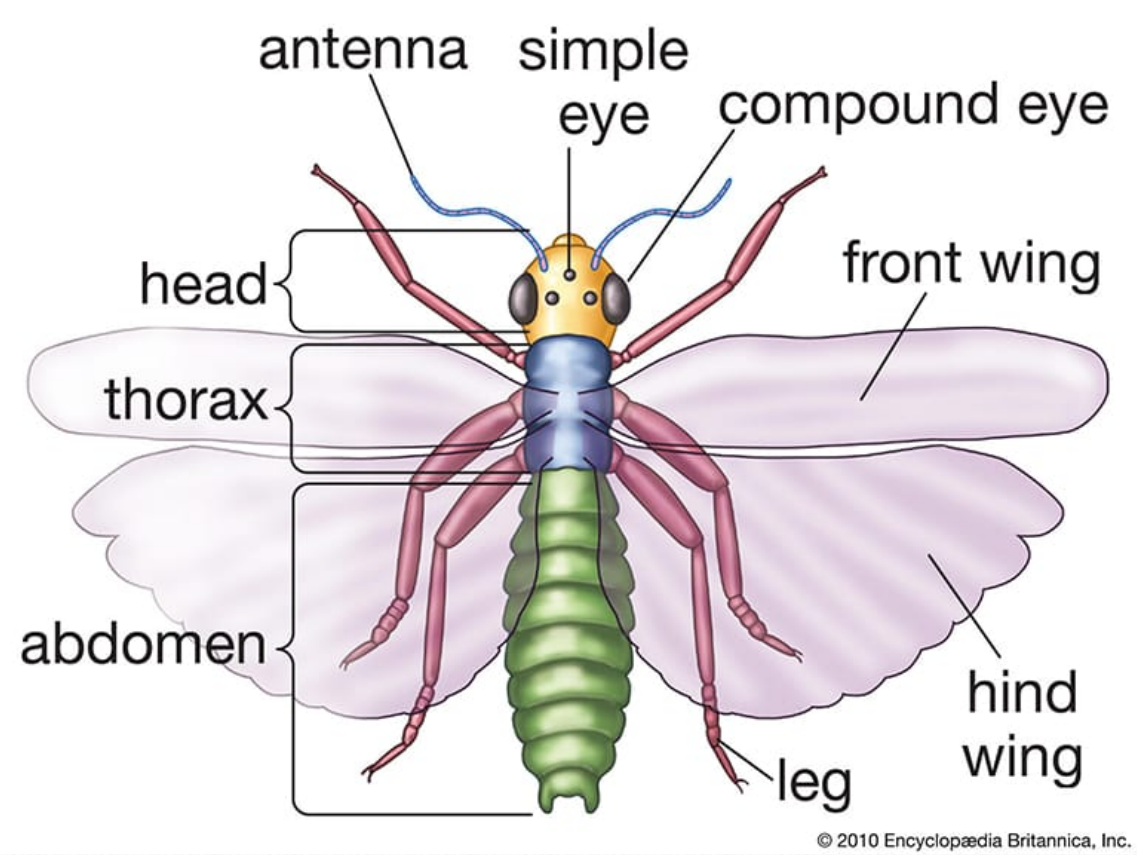
Insects



- 6 Legs
- Pair of antenna
- Wings (most adult species)
- 3 body parts
  - Head
  - Thorax
  - Abdomen

Orders of Insects

- **Microcoryphia** - Bristletails
- **Zygentoma** - Silverfish
- **Ephemeroptera** - Mayflies
- **Odonata** - Dragonflies and Damselflies
- **Zoraptera** - Zorapterans
- **Dermaptera** - Earwigs
- **Plecoptera** - Stoneflies
- **Orthoptera** - Grasshoppers, Crickets, Katydids
- **Notoptera** - Rock Crawlers
- **Embiidina** - Webspinners
- **Phasmida** - Walkingsticks
- **Mantodea** - Mantids
- **Blattodea** - Cockroaches and Termites
- **Thysanoptera** - Thrips
- **Hemiptera** - True Bugs, Cicadas, Hoppers, Aphids and Allies
- **Psocodea** - Barklice, Booklice, and Parasitic Lice
- **Megaloptera** - Alderflies, Dobsonflies, and Fishflies
- **Raphidioptera** - Snakeflies
- **Neuroptera** - Antlions, Lacewings and Allies
- **Strepsiptera** - Twisted-winged Insects
- **Coleoptera** - Beetles
- **Hymenoptera** - Ants, Bees, Wasps and Sawflies
- **Trichoptera** - Caddisflies
- **Lepidoptera** - Butterflies and Moths
- **Mecoptera** - Scorpionflies, Hangingflies and Allies
- **Diptera** - Flies
- **Siphonaptera** - Fleas
- **Protorthoptera**

Orders of Insects

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- **Protorthoptera**

Order: Odonata "Dragon's Tooth"

Dragonflies

- Bigger eyes, take up most of the head
- Big bodies, typically over 2in long
- Broad wings that are thicker at the base
- When at rest, the wings are held straight out, like an airplane

Damselflies

- Large but smaller than the dragonfly
- Small, twig-like body
- Smaller wings that taper closer to the body
- When at rest the wings are held back along the body

Dragonfly and Damselfly Facts

- They are predators and help keep mosquito populations down.
- They have been around over 300 million years, before dinosaurs!
- Ancient dragonflies had wingspans of around 2 feet
- They have complete metamorphosis, larvae are aquatic predators.
- Some species like the North American Green Darner migrate.
- Threatened by loss of wetland habitat.

Common Odonata in LA County

Flame Skimmer

Blue Dancer

Variegated Meadowhawk

Order: Orthoptera "Straight winged"

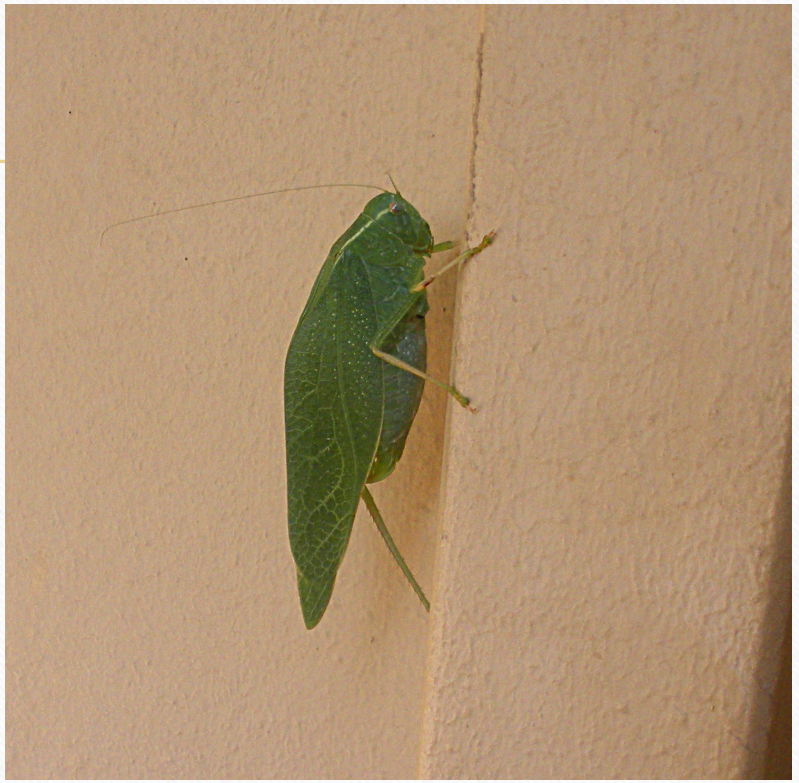
Grasshoppers, Crickets and Katydids

- Enlarged hind legs for jumping
- If humans could jump like orthoptera we would jump nearly 500 ft.
- Produce sound called "stridulation" by rubbing their wings or legs together.
- Only male crickets chirp, primarily to attract females.
- Excellent camouflage, some can even change colors.
- Incomplete metamorphosis, nymphs develop wings only when they become adults.
- Most crickets have wings but cannot fly.

Common Orthoptera of LA County

Pallid-winged Grasshopper

Jerusalem Cricket
"Potato Bug"
"La Niña de Tierra"



Katydid

Order: Phasmatodea "Greek for Phantom"

Walking sticks

- Herbiverous
- Can be between ½ inch to 13 inches
- They are a food source for a lot of animals and rely on their camouflage to escape predation.
- Their most effective predators are bats because of their echolocation.
- Some will drop their limbs to escape predators and can regrow them next time they molt.

Order: Mantodea "Mantis means soothsayer in Greek"

Praying Mantis

- Ambush predators that can turn their heads 180 degrees
- Have 5 eyes on their triangle shaped head. Two large compound eyes and three small eyes between them.
- Forelegs in the "praying" position are used to grab prey and then eat it alive with chewing mouthparts.
- Sometimes will eat small vertebrates like lizards and small birds.
- During mating the females will sometimes eat the male. This will give her nutrients and energy to produce an eggsack called an ooethca.
- Most mantids found in the United States are non-native species brought in for pest control.

Mantodea of LA County

European Mantis male

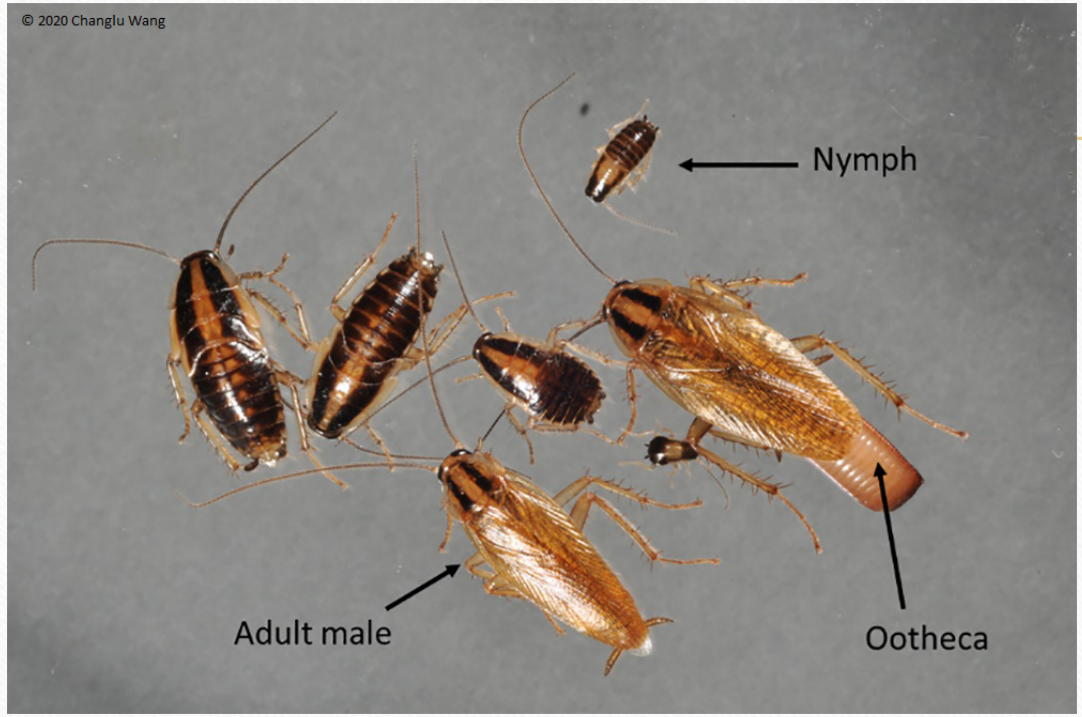
Arizona Mantis female

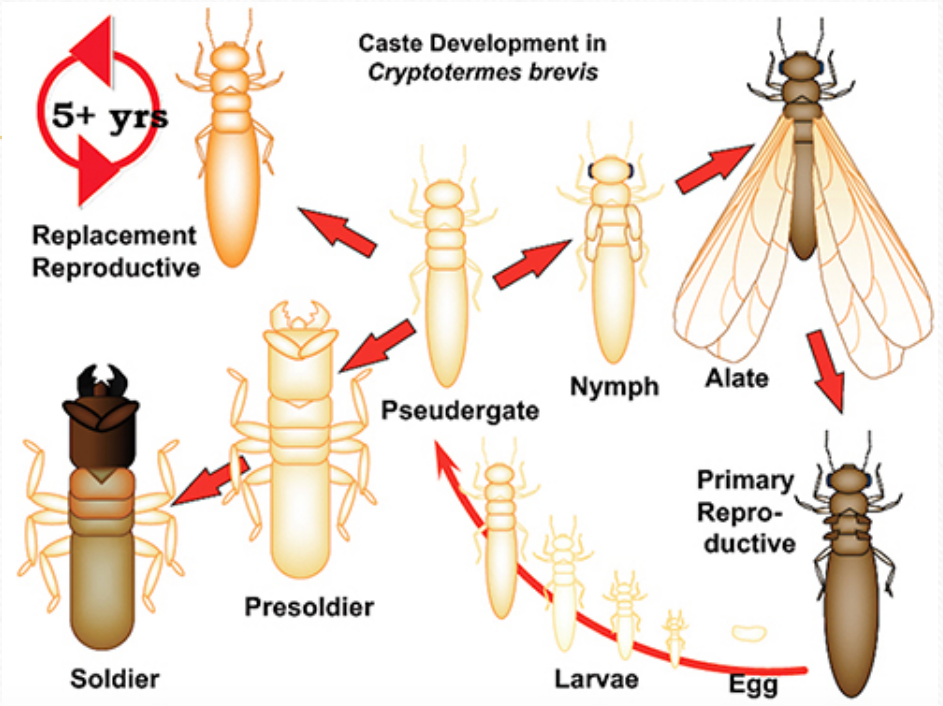
Agile Ground Mantis

Mantis ootheca eggsac

Order: Blattodea "Greek for Cockroach"

Cockroaches and Termites

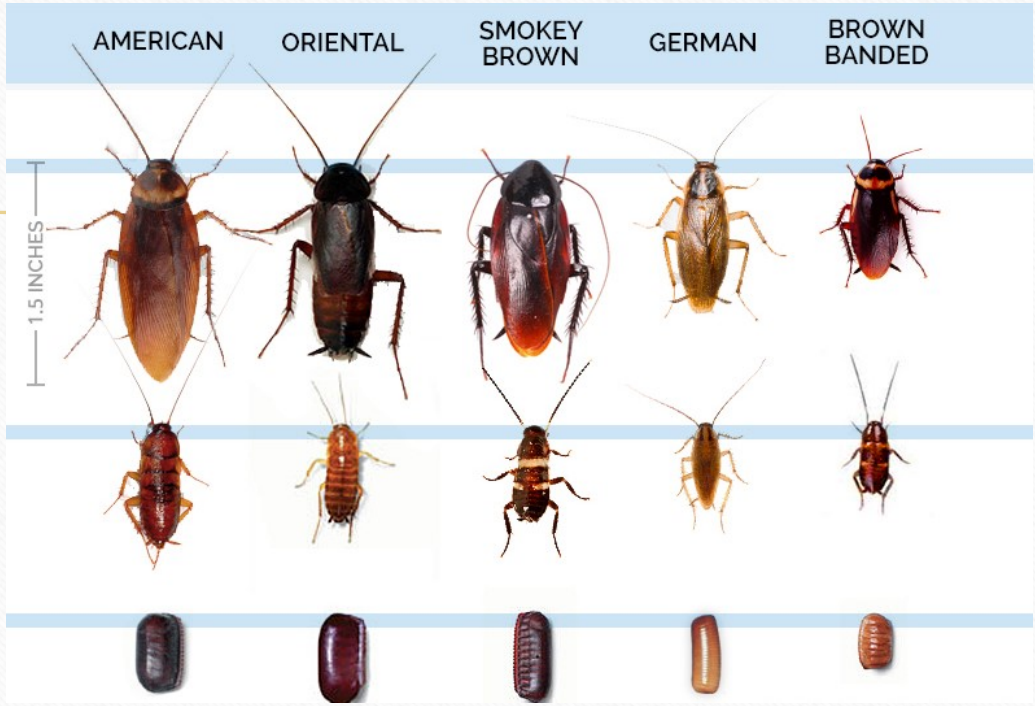




Order: Blattodea "Greek for Cockroach"

Cockroaches

- Cockroaches eat just about anything and are vital decomposers.
- The Blattodea family has been around since the time of the dinosaurs.
- Most of the species found in LA County are invasive and common pests.
- Some people can become allergic to the fecal matter and exoskeletons left behind.
- Roaches can live a week without their head.



Order: Blattodea "Greek for Cockroach"

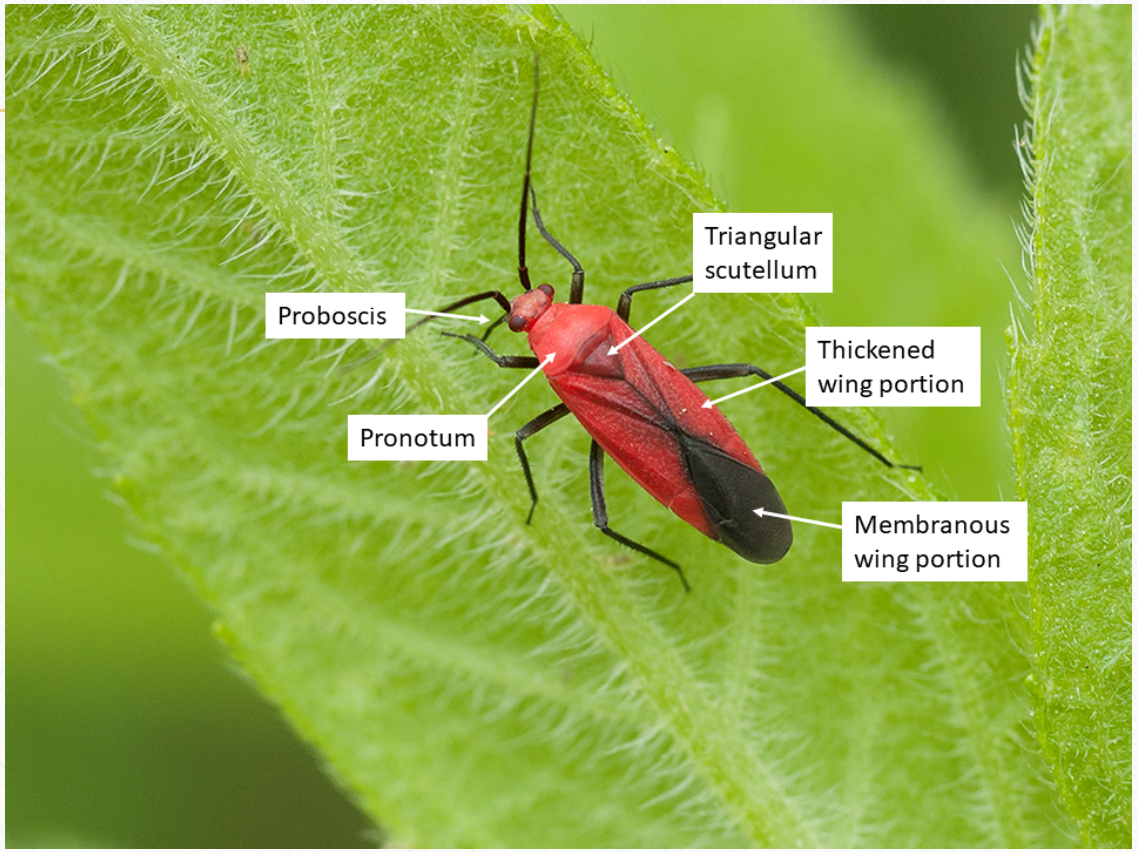
Termites

- Termites break down decaying wood and recycle it back into the environment.
- There are three types of termites, damp wood, dry wood and subterranean.
- Many species live in social groups with a reproductive pair that produces different types of offspring like workers or soldiers.
- Termites can consume wood 24/7 and won't even sleep for days.

Order: Hemiptera "Half wing"

True Bugs, Cicadas, Aphids, Leaf Hoppers, Plant Hoppers, Scale Bugs

- The one true "bug"
- Wings crossing over forms an "X"
- Half of the wing is thick and tough, the other is thin and membranous
- Hemiptera have gradual or incomplete metamorphosis (no pupa stage); juveniles (nymphs) resemble adults except they usually have reduced wings and are incapable of flight.



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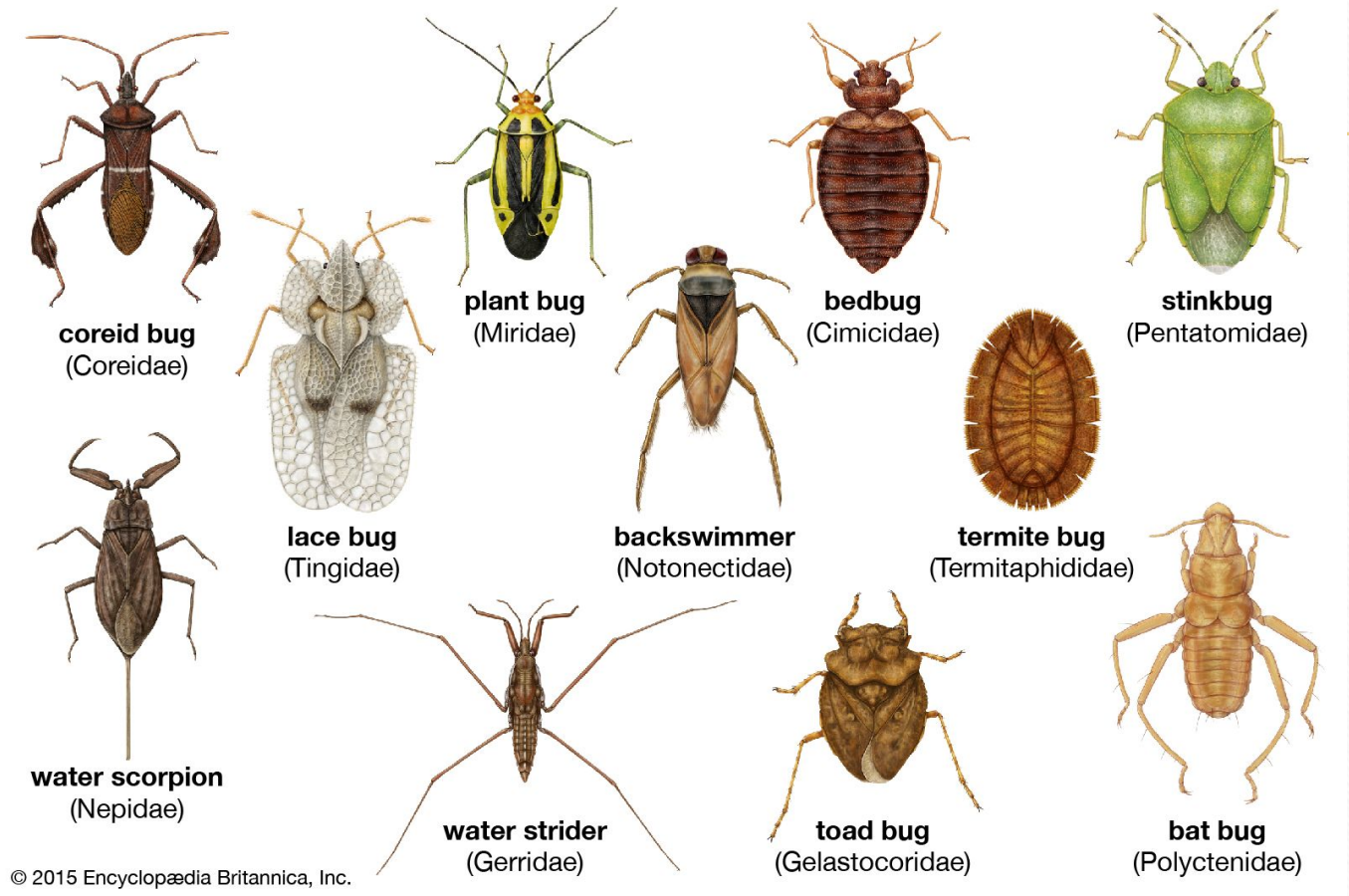
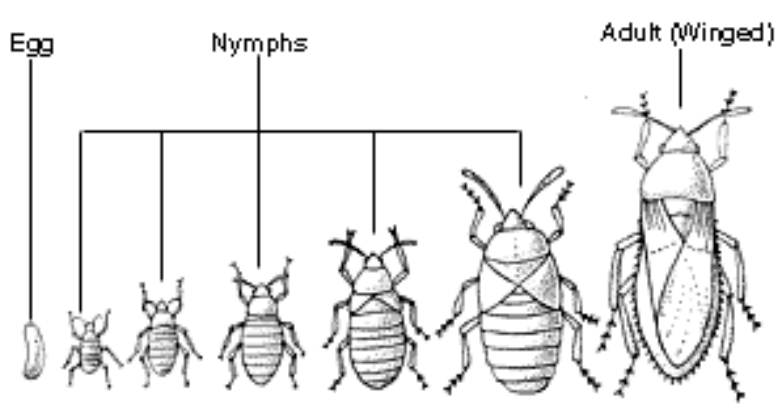




Order: Hemiptera "Half wing"

True Bugs, Cicadas, Aphids, Leaf Hoppers, Plant Hoppers, Scale Bugs

California Bee Assassin

Say's Stink Bug

Western Blood-sucking conenose

Milkweed Bug

Ambush Bugs

Order: Hemiptera "Half wing"

True Bugs, Cicadas, Aphids, Leaf Hoppers, Plant Hoppers, Scale Bugs

Cicadas

Water Boatmen

Water Strider

Oak Wax Scale Bug

Order: Neuroptera "Nerve Wing"

Lacewings, Mantispids, Owlflies, Antlions

- Two similar sized membranous wings with venation that looks like "nerves".
- Complete metamorphosis, larvae spin a silk cocoon to pupate in.
- Many are carnivorous, lacewings are sometimes used for pest control.
- Winged adults active at night.

Antlion sand pit…. Inspiration for the Sarlacc pit?

Green lacewing

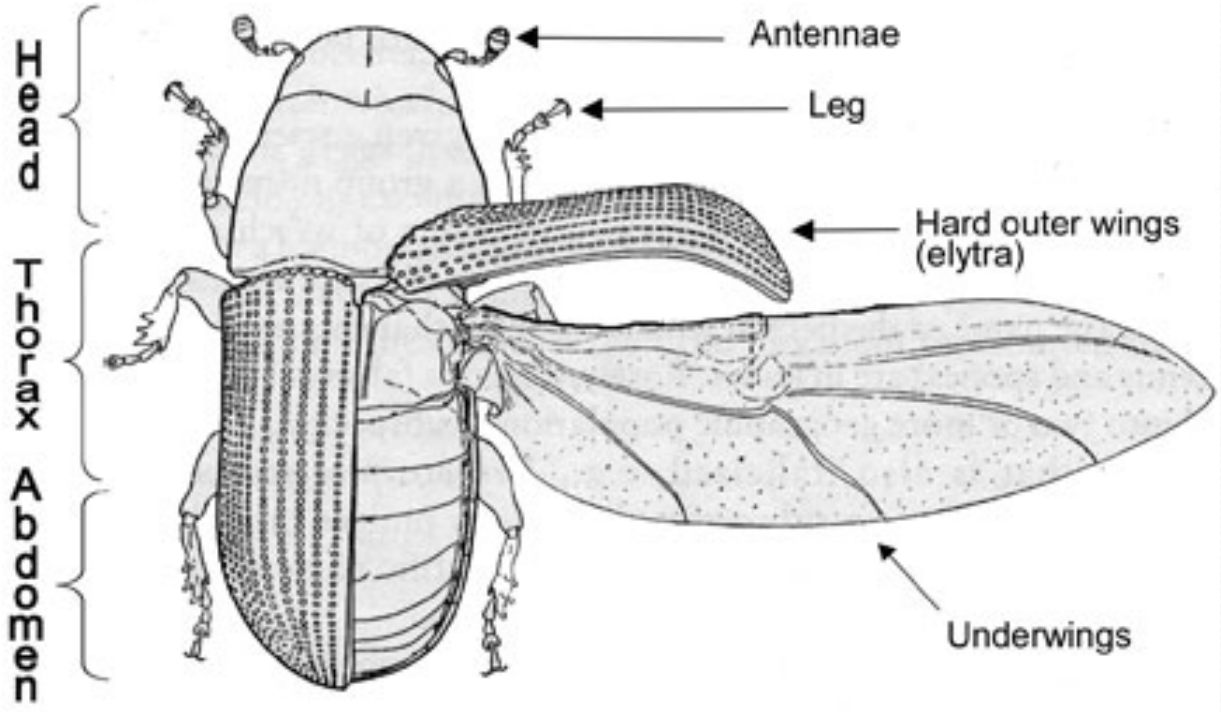
Antlion larvae

Antlion adult

Order: Coleoptera "Sheath wing"

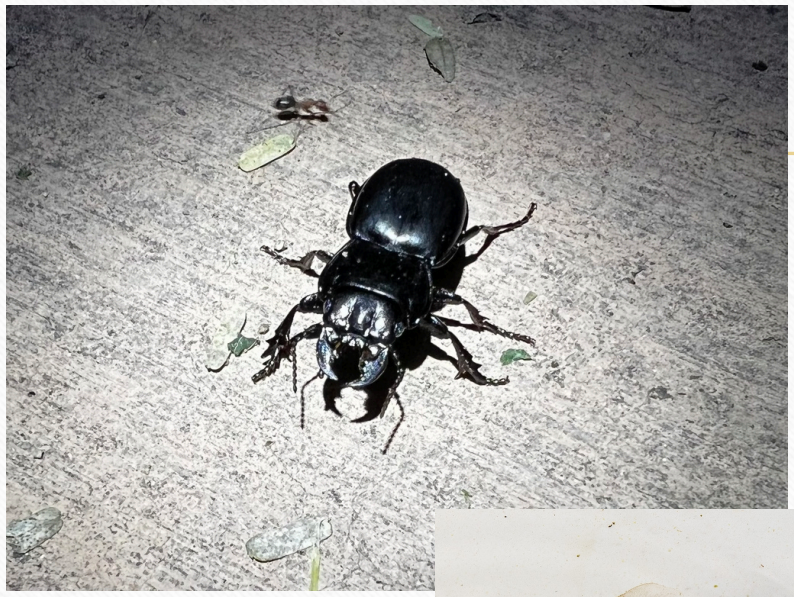
Beetles

- Largest order of species on earth with 350,000 named species and more being discovered.
- Named for having a hard cover over the wings called elytra. This protects their delicate wings.
- Complete metamorphosis, larvae are worm-like with six small legs.
- Diverse in every way.



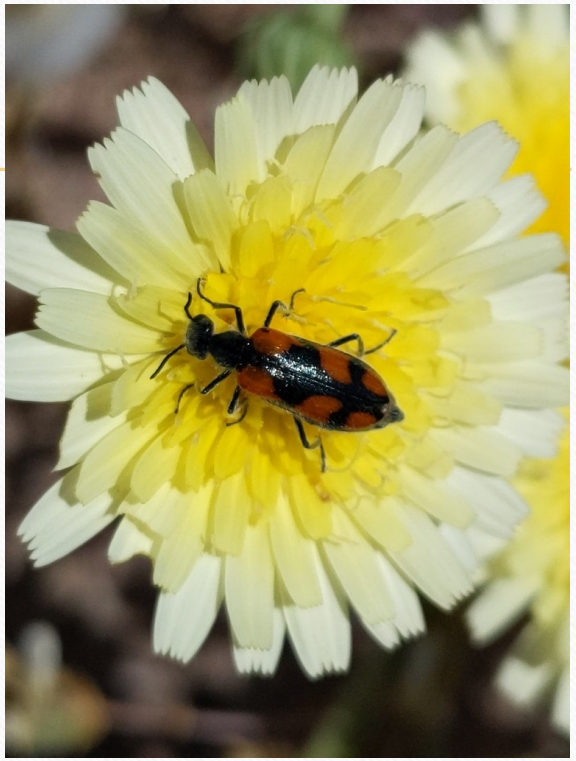
Order: Coleoptera "Sheath wing"

Beetles - Carnivorous



Order: Coleoptera "Sheath wing"

Beetles - Herbivorous



Order: Coleoptera "Sheath wing"

Beetles - Herbivorous

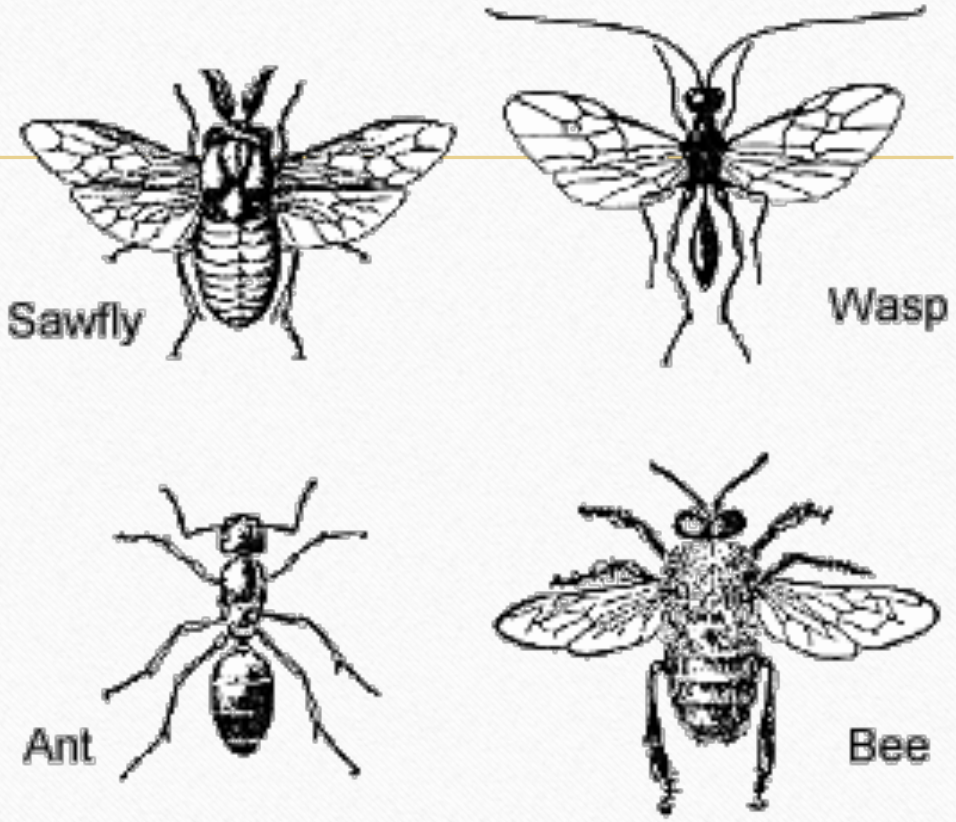
Order: Coleoptera "Sheath wing"

Beetles - Detritivores

Order: Hymenoptera "Membrane wing"

Ants, Bees, Wasps and Sawflies

- Have a narrow waist between the thorax and abdomen, except with sawflies
- All species of ant, some species of bee and wasps are social insects. Apart from the termites all the social insects are in the Hymenoptera order.
- One third of all crops are pollinated by bees.
- Stingers are modified ovipositors for egg laying and are often found only in females.
- Honeybees are native to Europe and are naturalized in the United States. They are essentially livestock and not endangered.



Order: Hymenoptera "Membrane wing"

Bees

Western Carpenter Bee

Digger Bee

Sweat bee

Male Cellophane Bee Roost

Crotch's Bumblebee

Western Honeybee Swarm

Order: Hymenoptera "Membrane wing"

Wasps

Oak Gall formed by wasp eggs

Mason Wasp nest

Tarantula Hawk dragging a paralyzed tarantula to its burrow

Male wasps roosting

Thread-waisted Wasp

Female and Male Velvet Ant

Order: Hymenoptera "Membrane wing"

Ants

Southern Fire Ant
Reproductive Swarm

Honey Ant

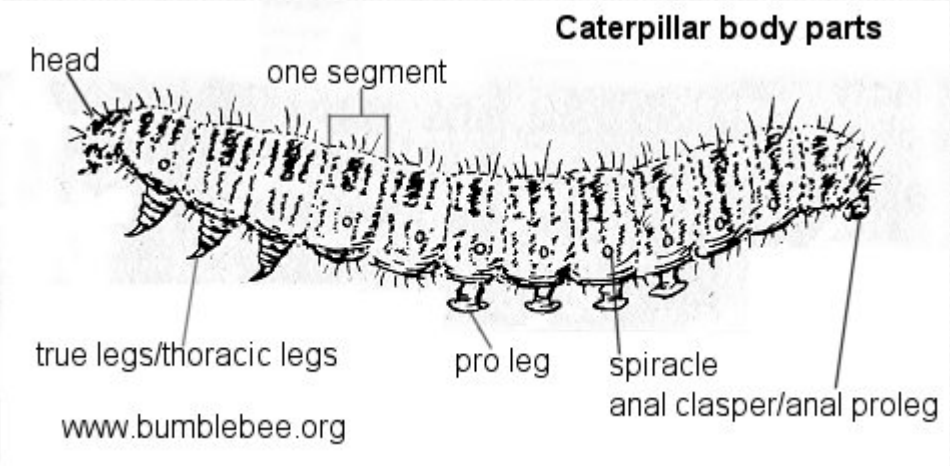
California Harvester Ant

Black Harvester Ant

Order: Lepidoptera "Scale wing"

Butterflies and Moths

- Their wings are covered in tiny scales.
- Complete metamorphosis, larvae is called a caterpillar.
- Moths outnumber butterflies 9 to 10



Order: Lepidoptera "Scale Wing"

Butterflies

- Usually colorful
- Day active
- Thin body
- Long, straight antenna
- Hard chrysalis
- Wings rest upright
- Wings rest closed

Moths

- Usually dull coloration
- Night active
- Thick body
- Short, feathery antenna
- Silky pupa
- Wings rest along body
- Wings rest open

Order: Lepidoptera "Scale Wing"

Butterflies

Behr's Metalmark

Lorquin's Admiral

Cabbage Whites

Tiger Swallowtail

Painted Lady

Skippers

Order: Lepidoptera "Scale Wing"

Moths

Tussock Moth

Tiger Moth

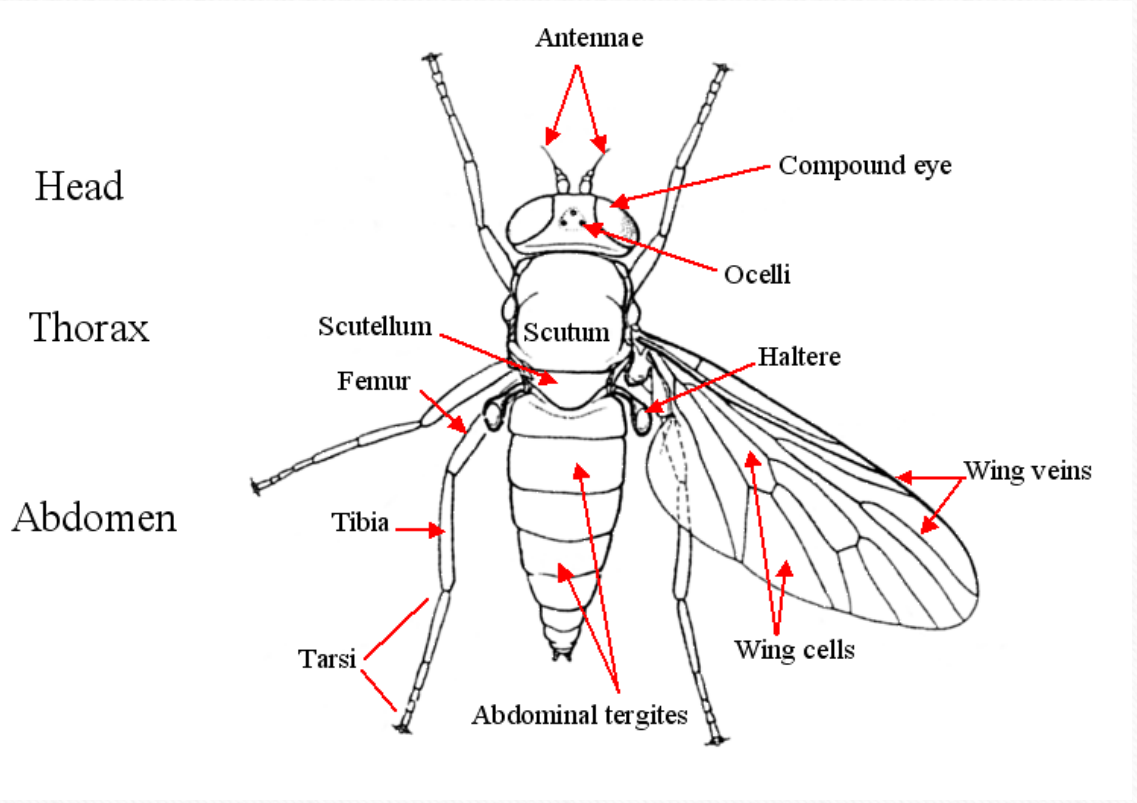
Ceanothus Silk Moth

White-lined Sphinx Moth

Order: Diptera "Two wings"

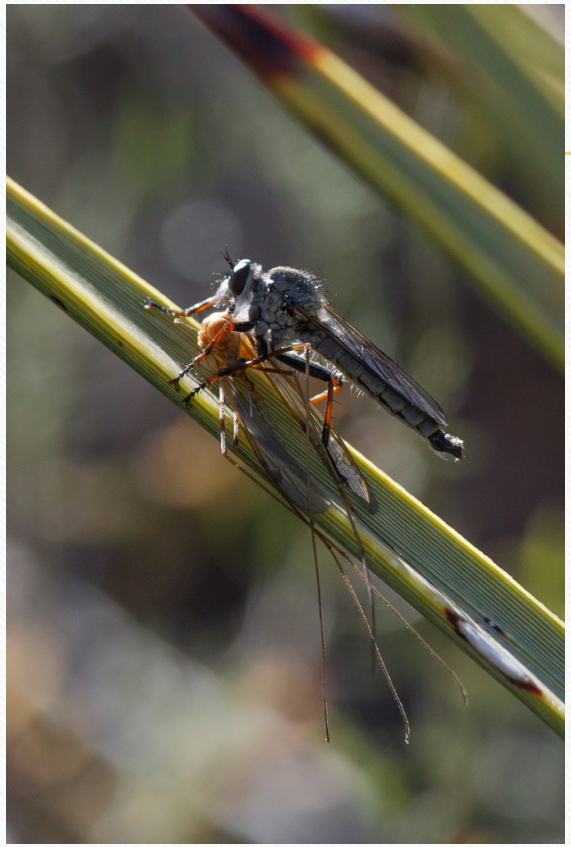
Flies, Mosquitos, Gnats and Midges

- Two pairs of membranous wings and two rear gyroscopic balancers.
- All are liquid feeders with various sized sucking mouthparts.
- Can taste with both their mouthparts and legs
- Legless larvae are called maggots.



Order: Diptera "Two wings"

Flies, Mosquitos, Gnats and Midges



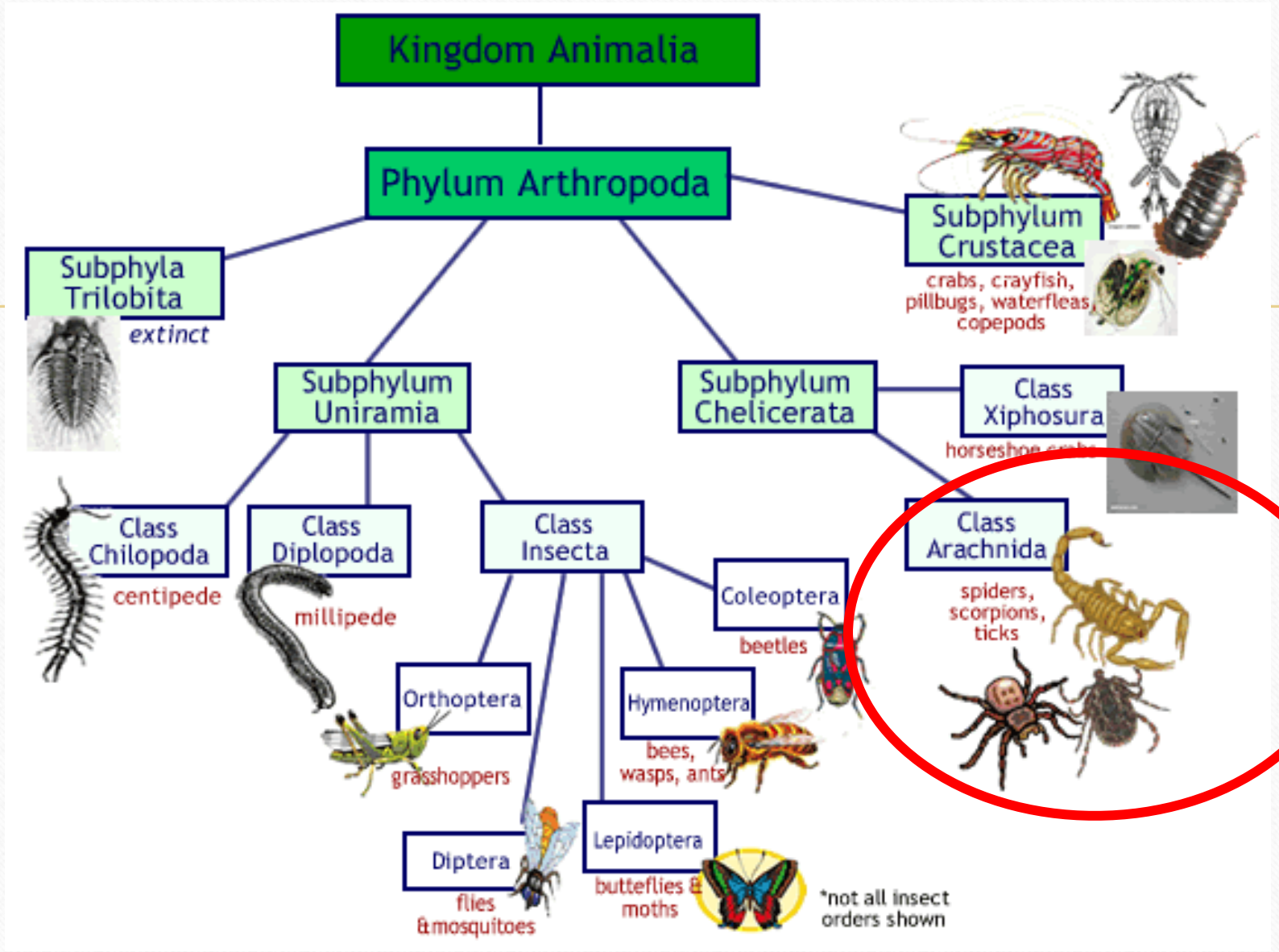
Robber Fly

Flesh Fly

Mosquito

Bee Fly

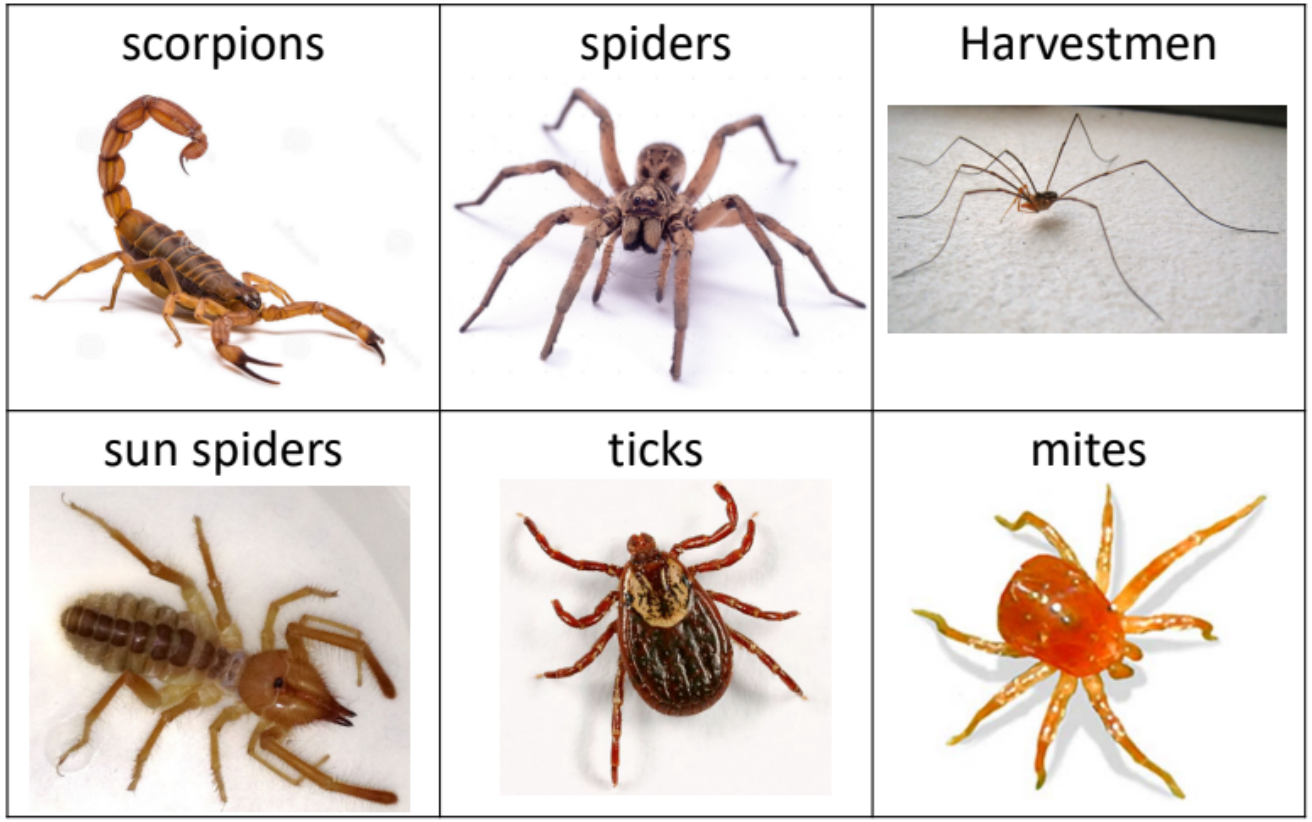
Crane Fly


Kingdom Animalia
Phylum Arthropoda
Subphyla Trilobita
extinct
Subphylum Crustacea
crabs, crayfish, pillbugs, waterfleas, copepods
Subphylum Uniramia
Subphylum Chelicerata
Class Xiphosura
horseshoe crabs
Class Chilopoda
centipede
Class Diplopoda
millipede
Class Insecta
Class Arachnida
spiders, scorpions, ticks
Coleoptera
beetles
Orthoptera
grasshoppers
Hymenoptera
bees, wasps, ants
Diptera
flies & mosquitoes
Lepidoptera
butterflies & moths
*not all insect orders shown

Arachnids

Spiders, Scorpions, Ticks, Mites, Solpugids

- 8 legs
- Typically 8 eyes (can vary)
- Have "arm-like" pedipalps
- Fangs also known as chelicerae
- No antenna or wings
- Two body parts cephalothorax and abdomen
- Mostly carnivorous



Scorpions

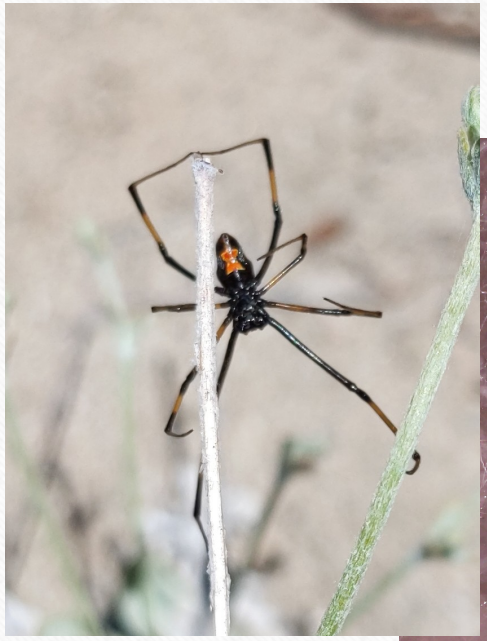
- Seen at night in the summer
- Can fluoresce under blacklight, best way to find them.
- Do not handle

California Common Scorpion/
Silvestri Scorpion

Swollen Stinger Scorpion

Desert Hairy Scorpion at Alpine Butte Wildlife Sanctuary

“Potentially Dangerous” Spiders



Western Black Widow

Brown Widow

Desert Recluse

Note the placement of the 6 eyes

Large Spiders

California Ebony Tarantula

Dwarf Tarantula

Trapdoor Spider

Golden Huntsman

Green Lynx Spider

Common Spiders

Goldenrod Crab Spider

Woodlouse Spider

Silver Garden Orbweaver

Jumping Spider

Wolf Spiders

Why arthropods?

- **Arthropods are often marginalized members of the ecosystem:** Insects are often overlooked in regards to how important they are to the environment. More often they are seen as pests so there are lots of learning opportunities for visitors.
- **Invertebrates are accessible to everyone:** Everyone has seen a "bug". Park visitors can easily be inspired to learn more about ones that they see nearly every day. Unlike a lot of wildlife that people might only see in wild spaces, invertebrates are everywhere.
- **Invertebrates are great for ambassador animals:** Nothing captivates park visitors more than the opportunity to see wildlife up close with our animal ambassador program. It is one of the best ways to educate people, help them care and have a personal connection to an animal. Invertebrates are great for animal ambassadors because of their small size and ease of care.
- **Programming opportunities:** There are so many different methods to do programs. From crafts, bug walks to blacklight nights

Want to know what kind of arthropod you found?
Post it to iNaturalist!

@fowlivia

iNaturalist