

The Basics of Insect ID

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CCE Master Gardener Training



Jess Furlong

- **Instructional Support Technician**

Ecology background:

- *invasive insects (*Virginia; New Zealand*)
- *oyster reefs & nekton (*LSU; N. Gulf of Mexico*)
- *bird & bat wind turbine fatalities (*Upper Midwest*)
- *environmental education (*Iowa*)
- *botanical center & native plants (*Iowa; Maryland*)

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Plant & Food
RESEARCH

RANGAHAU AHUMĀRA KAI



WWW2.NZHERALD.CO.NZ

Wasp released to control Tomato Potato Psyllid - The Country - The Country News



Today's Online Lab

- Ecosystem Services Provided by Insects
- Insect Classification
- Key “Quick” Identification Features
- Sight ID to Order
- Recommended Resources
- Questions



Food, medicine, timber, fiber, fuel, fish, raw materials for agriculture and aquaculture

Nutrient cycling, soil formation, species habitat provision



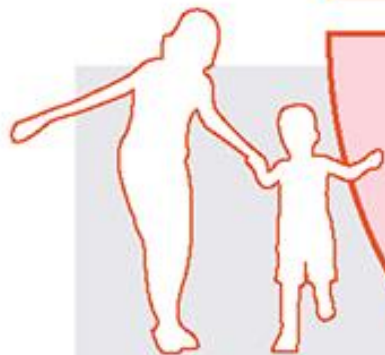
PROVISIONING SERVICES

Goods obtained directly from ecosystems



SUPPORTING SERVICES

regulation of basic ecological functions and processes necessary for all other ecosystem services



CULTURAL SERVICES

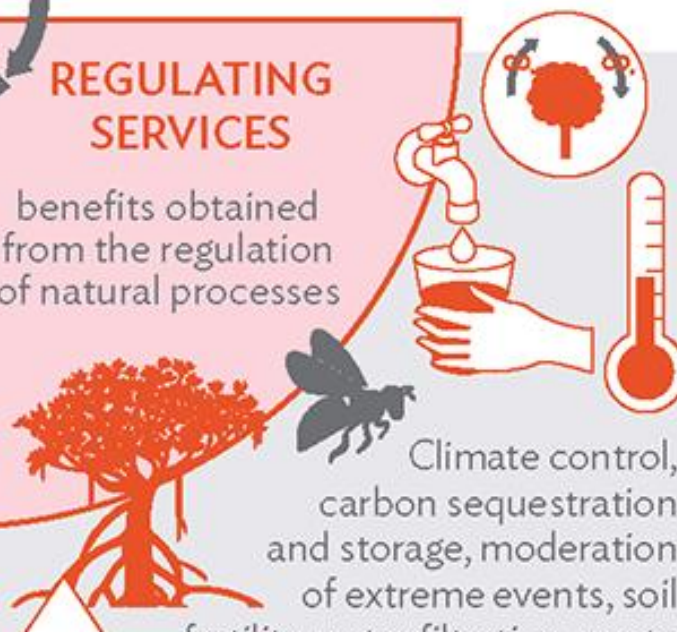
psychological and emotional benefits gained from human relations with ecosystems

Spiritual, aesthetic, tourism, educational, recreational



REGULATING SERVICES

benefits obtained from the regulation of natural processes



Climate control, carbon sequestration and storage, moderation of extreme events, soil

Interaction Disruption

Climate change is affecting ranges globally. Here ants are invading and consuming wildlife in cloud forest never before exposed to these marauders.

Nitrification

Fertilizer and products of fossil fuels combustion are nitrifying the planet, challenging the biotas adapted to low-nutrient conditions.

Fire

Global warming elevates fire risk. Fires in Australia, Amazonia, and California burned an unprecedented >5 million hectares of forest in 2019.

Storm Intensity

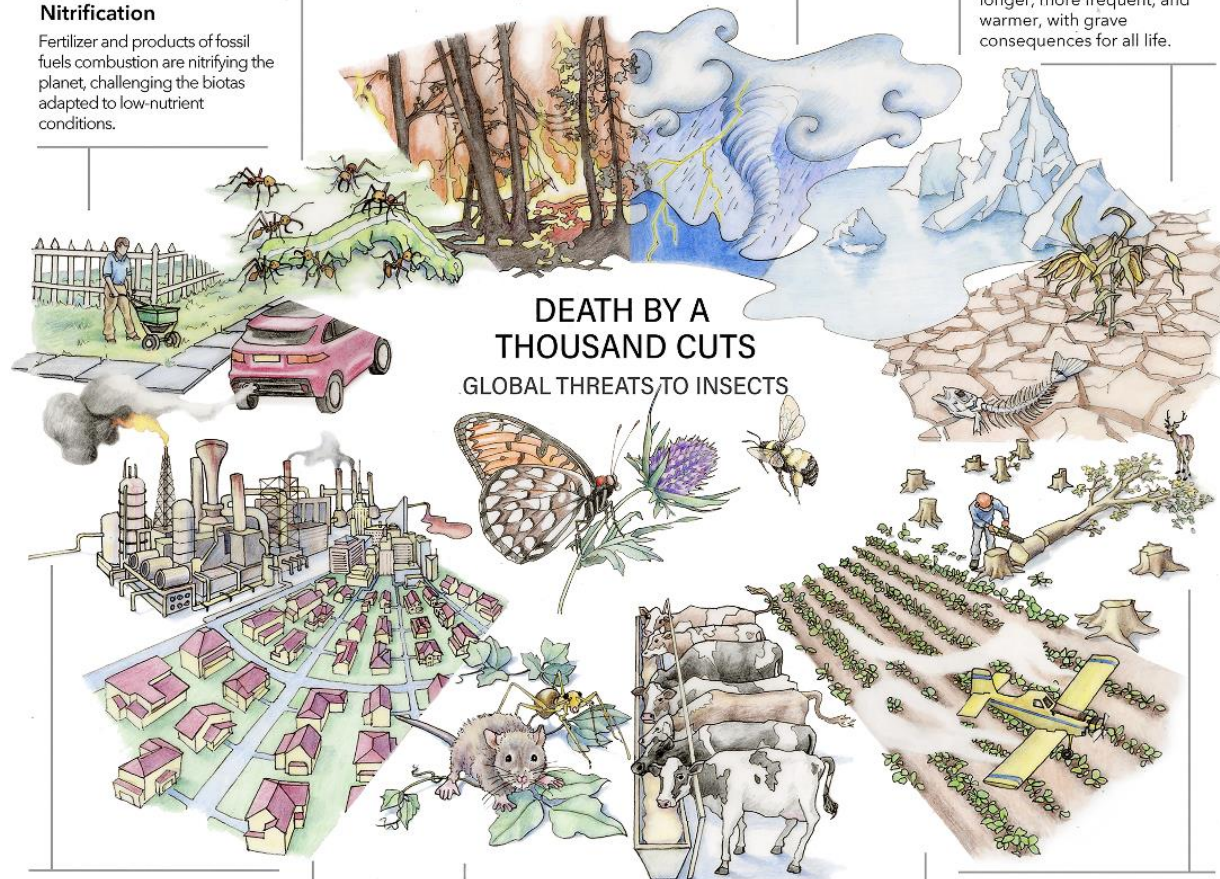
Climate changes bring stronger, more frequent storms and hurricanes; more fire-igniting lightening; and damaging flooding.

Global Warming

Arctic sea ice is declining precipitously, arctic-alpine and other cold-adapted communities are contracting, while sea-level rise threatens coastal ecosystems.

Droughts

Periods with diminished precipitation are becoming longer, more frequent, and warmer, with grave consequences for all life.



Pollution

Chemical, light, and sound pollution of water, air, and soil are impacting plant and animal life worldwide.

Introduced Species

Global trade is accelerating the movement of pernicious plants, animals, and pathogens to new regions—often with devastating consequences.

Agricultural Intensification

Industrialized agriculture, with its attendant increases in scale, monoculturalization, nutrient input, and pesticide use, is becoming increasingly nature unfriendly.

Deforestation

The tropics lost 11.9 million hectares of forest in 2019, mostly to agriculture.

Insecticides

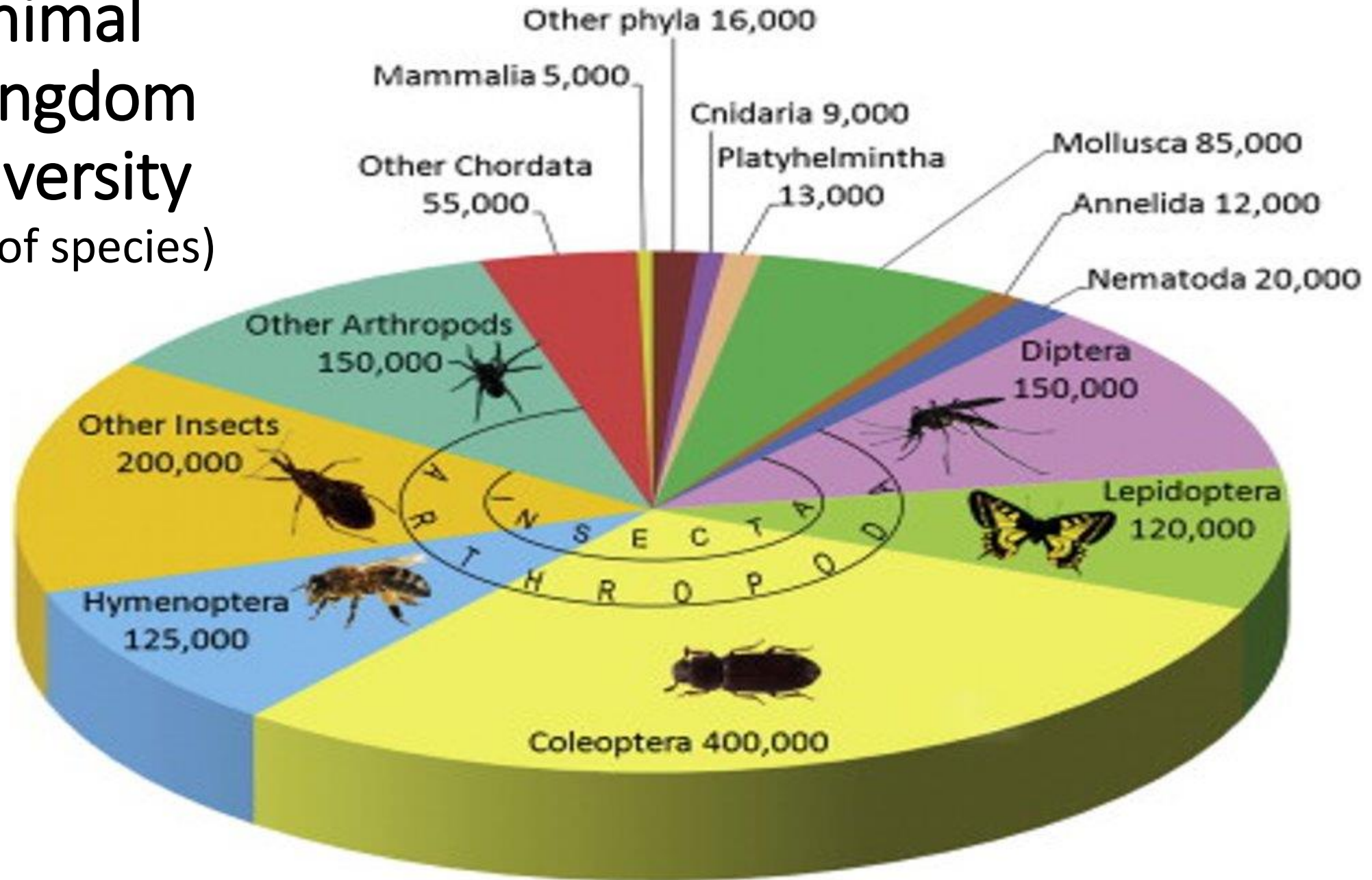
Modern, industrialized agriculture, with its increasing reliance on chemical insecticides, has led to chronic contamination of wildlands - and impacts to non-target insects.

Urbanization

Our global population of 7.8 billion, spread planet-wide, comes at great cost to biodiversity and wildlands. Already, over 500 vertebrates have been driven to extinction.

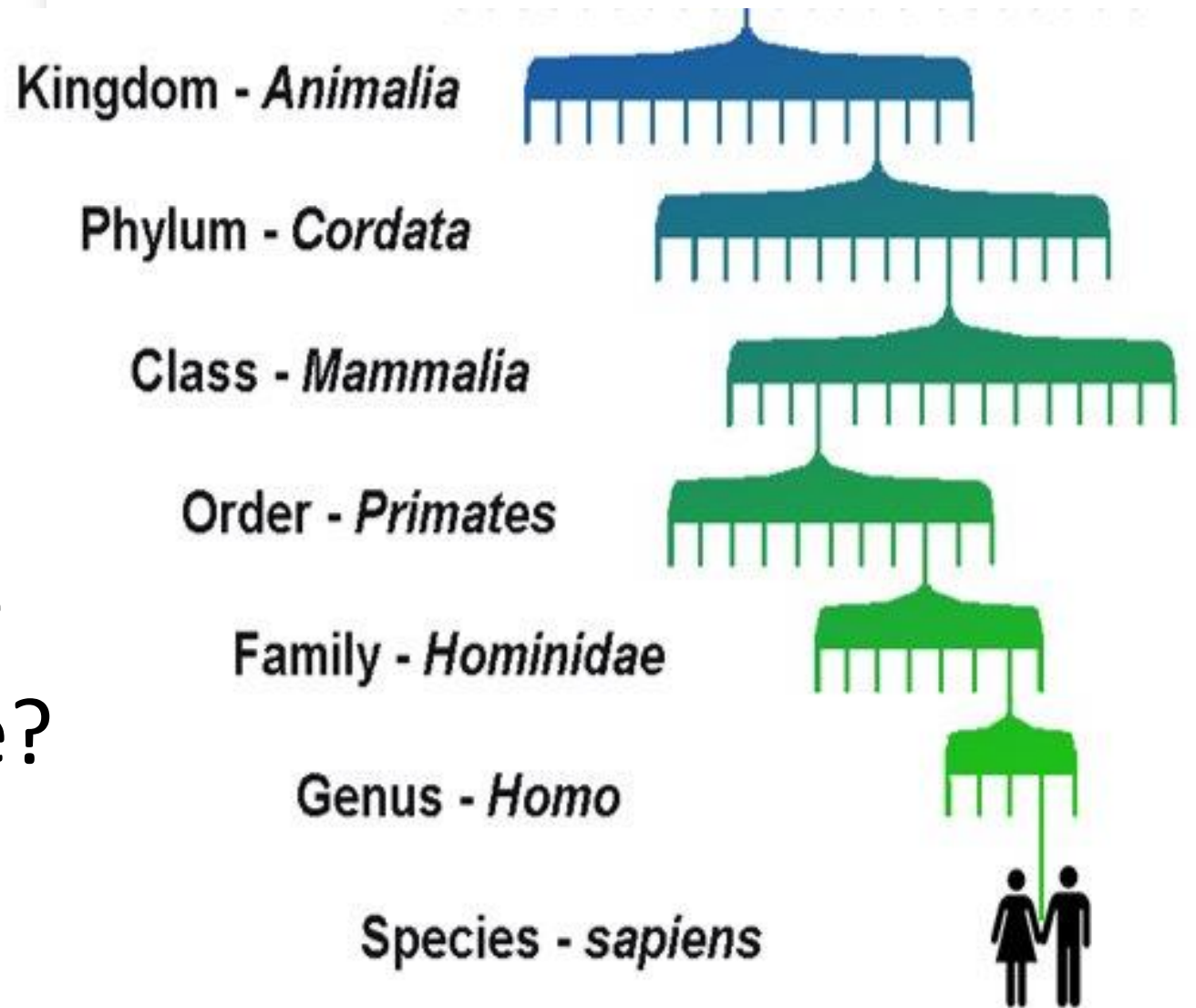


Animal Kingdom Diversity (# of species)



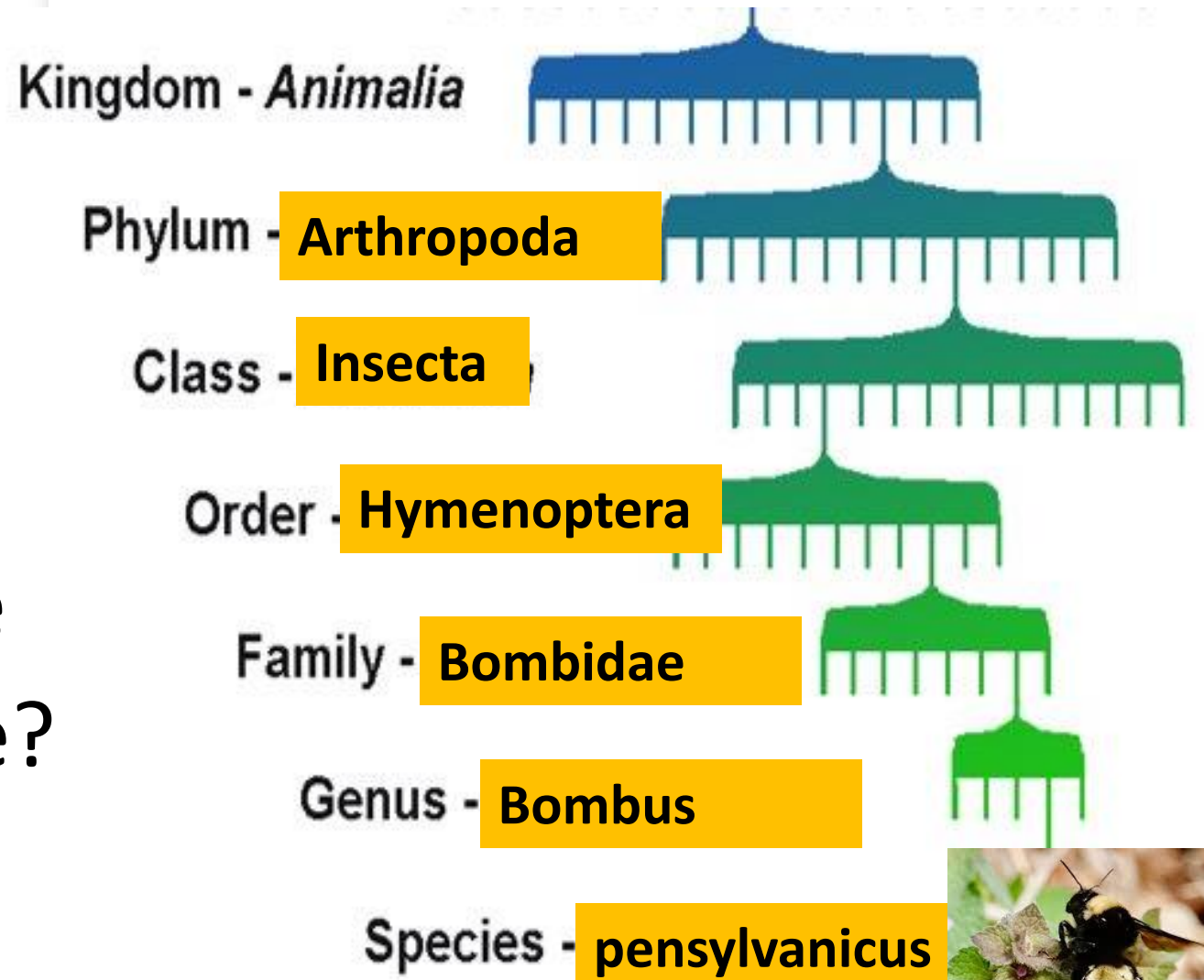
Classification

Can you taxonomically categorize the American bumble bee?



Classification

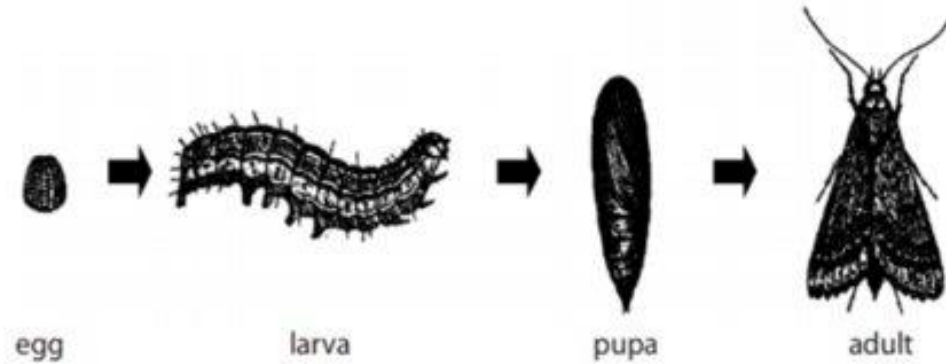
Can you taxonomically categorize the American bumble bee?



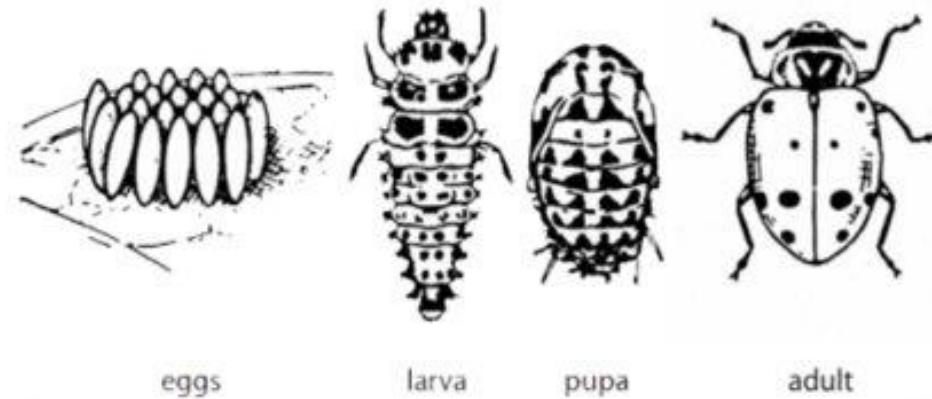
Different Life Cycles for Different Orders

HOLOMETABOLOUS COMMON ORDERS

- Beetles: Coleoptera
- Butterflies: Lepidoptera
- Bees, Wasps, and Ants: Hymenoptera



The stages of complete metamorphosis, shown for a typical moth. There is typically an egg stage, multiple larva stages, a single pupa stage, and a single adult stage.

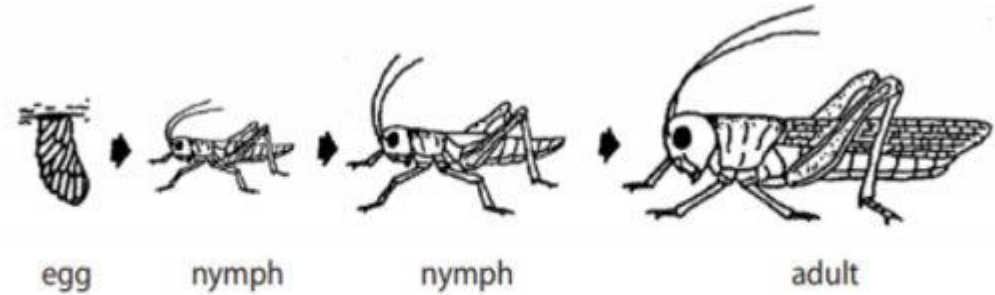


All beetle species also undergo complete metamorphosis, including lady beetles.

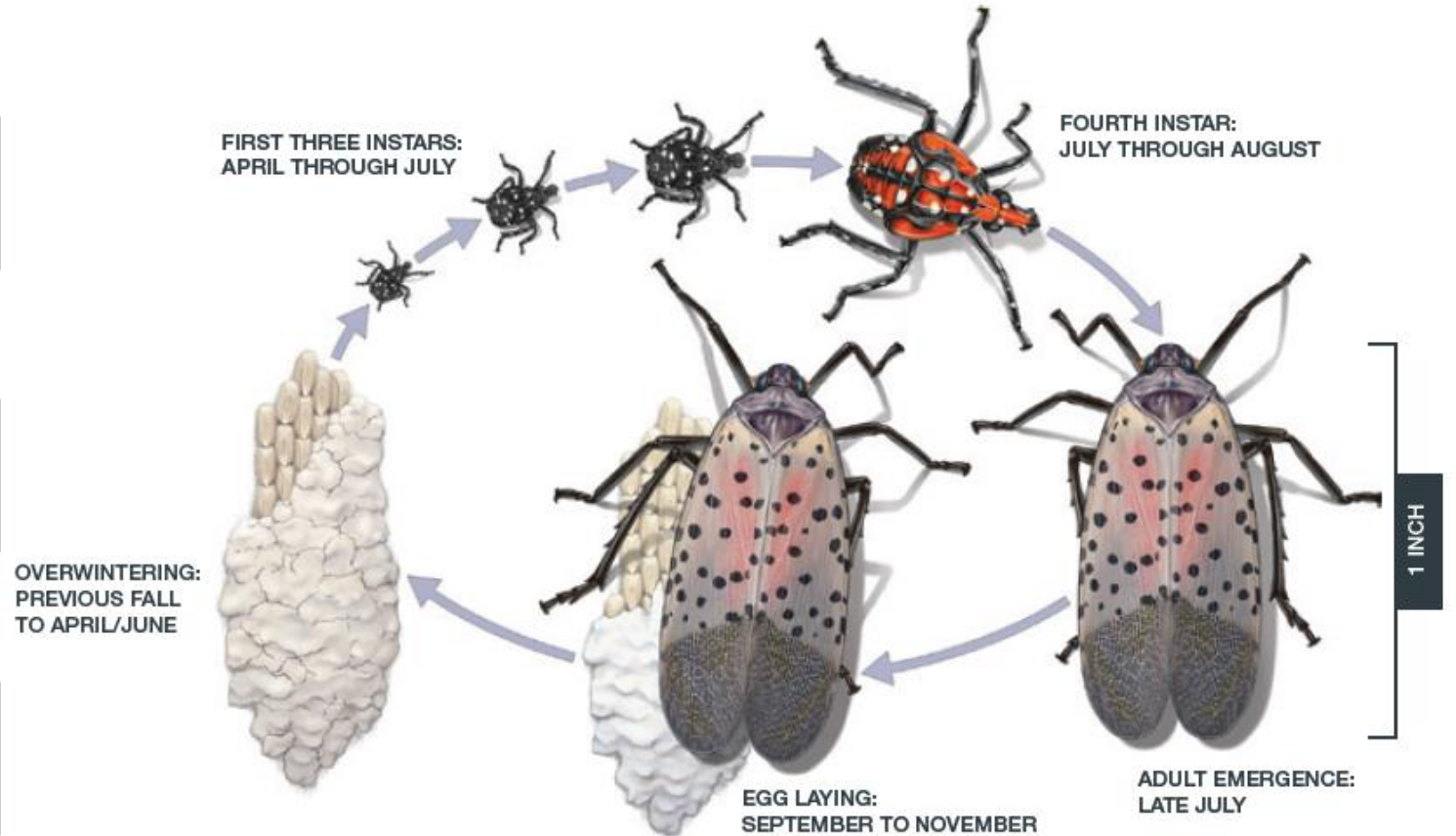
Different Life Cycles for Different Orders

HEMIMETABOLOUS COMMON ORDERS

- Hemiptera: True Bugs
- Orthoptera: Grasshoppers, Crickets

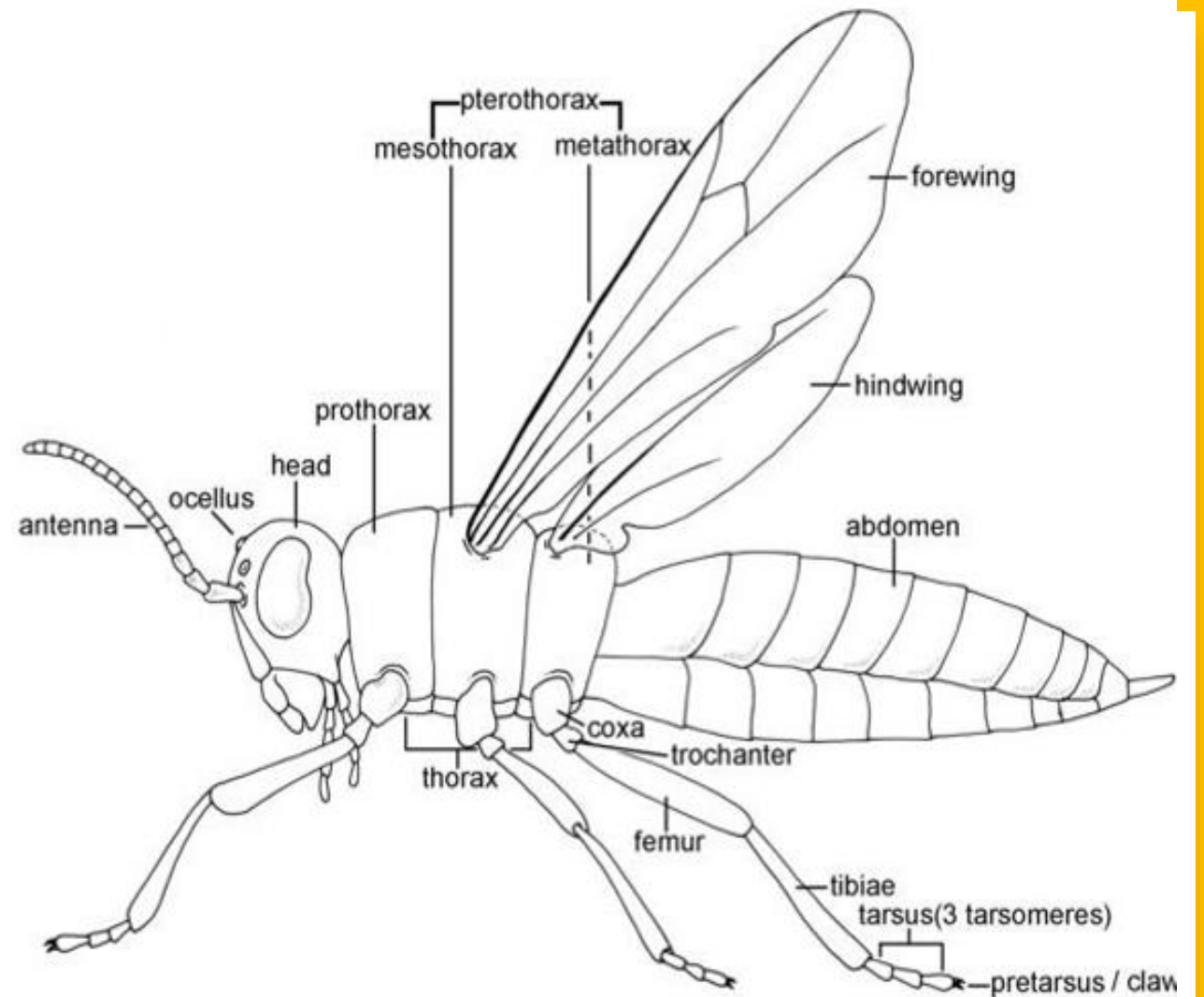


The stages of gradual metamorphosis. There is typically an egg stage, multiple nymph stages, and a single adult stage.



Key “Quick” ID Features

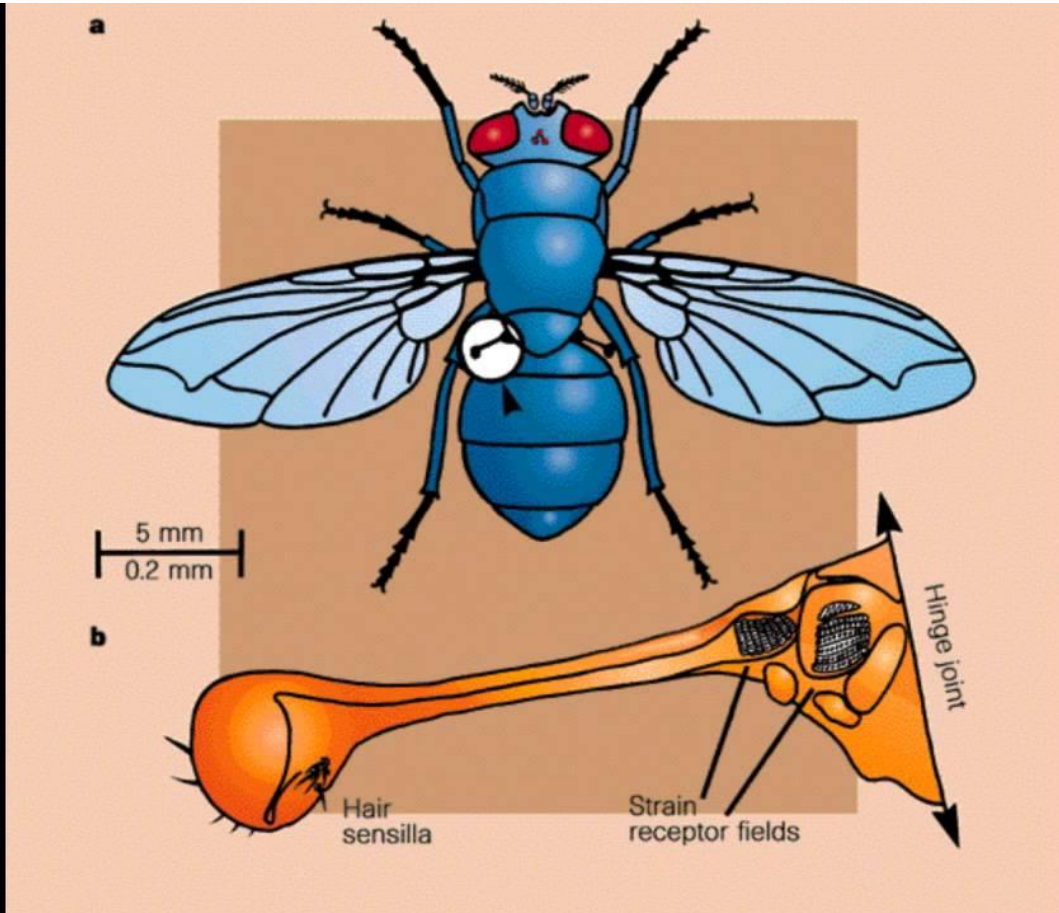
- Life Stage – Is it an adult?
- One or two sets of wings
- Mouth parts/function
- Habitat
- Coloration
- Length of antennae
- Wing Vein Patterns



True Flies: Diptera

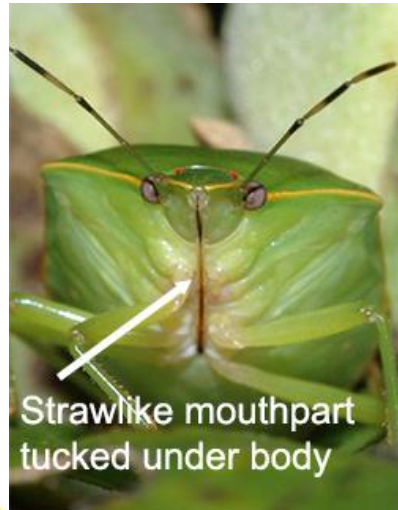
2 Wings (1 set) and Halteres (ball and stick)

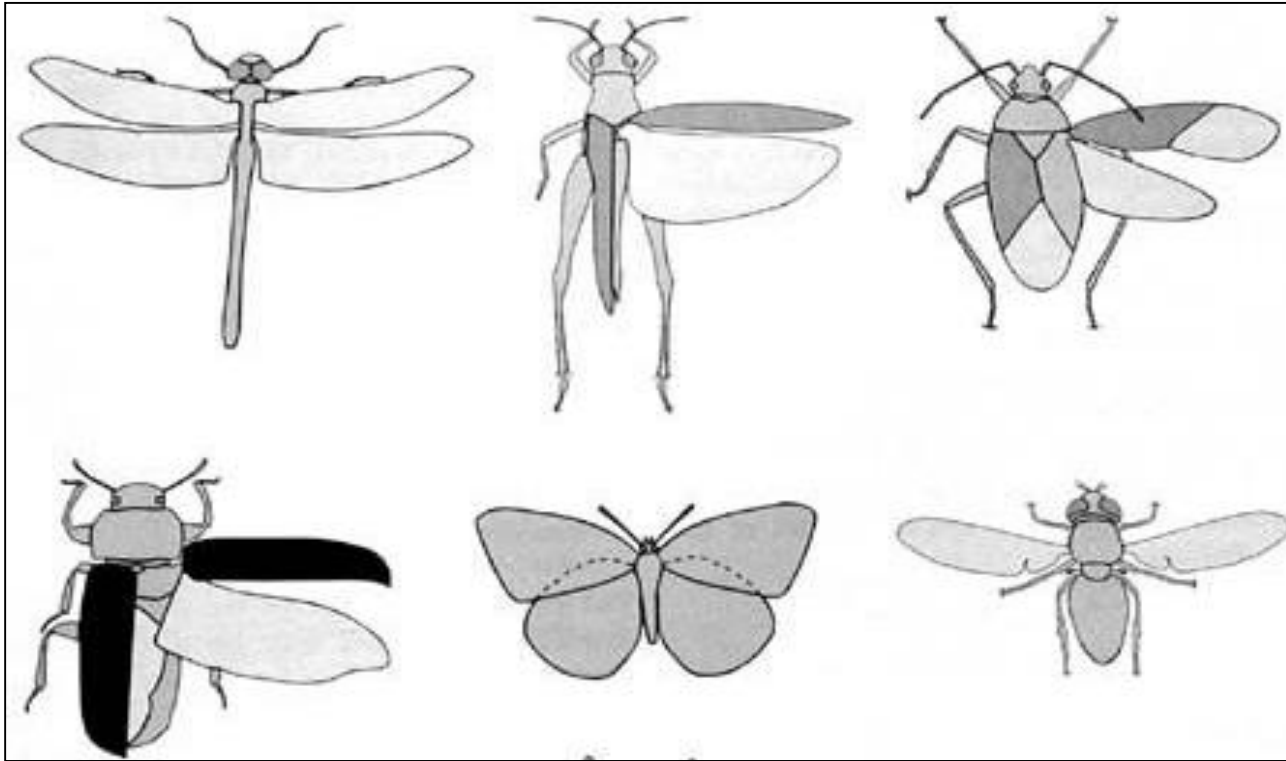
Sponging or Sucking Mouthparts



True Bugs: Order Hemiptera
Wing type: Hemelytra
TRIANGLE on Back!
Piercing Sucking Mouthparts

Beetles: Order Coleoptera
Wing Type: Elytra
STRAIGHT LINE down back
Chewing mouthparts





Insect mouthparts

sucking



butterfly
(side view)

lapping



bee
(front view)

chewing



beetle
(front view)



cicada
(front view)



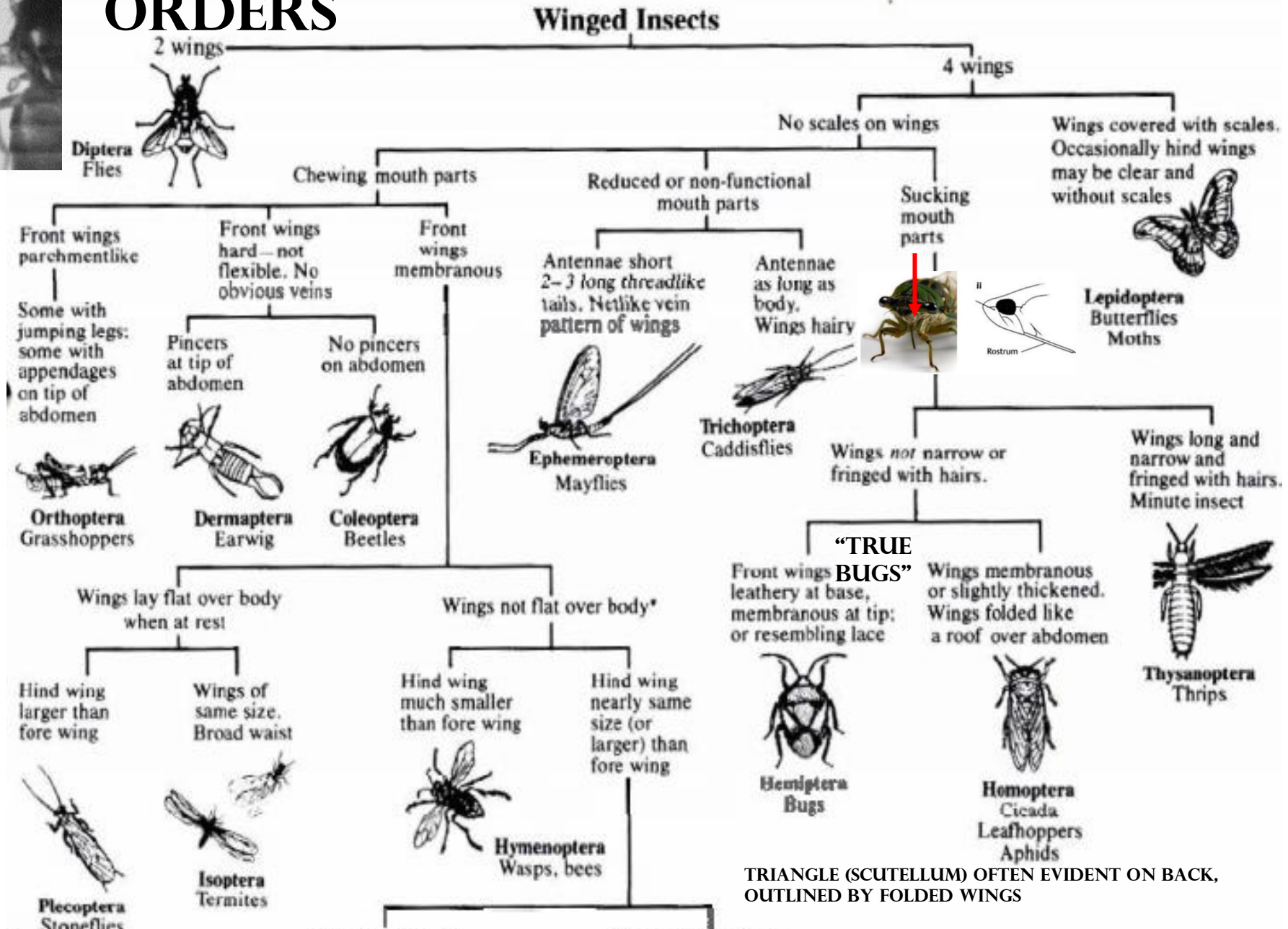
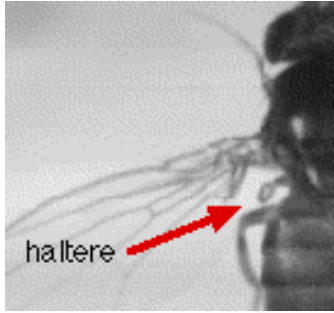
housefly
(front view)











grasshopper
(side view)

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SIMPLIFIED VISUAL KEY TO INSECT ORDERS



TRIANGLE (SCUTELLUM) OFTEN EVIDENT ON BACK, OUTLINED BY FOLDED WINGS

| | Order | Example Insects | Common Characteristics | Illustration |
|---|-----------------------------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1 | The Membrane Wings (Hymenoptera) | Ants, Bees, and Wasps | <ul style="list-style-type: none"> --2 pairs of clear, membranous wings --Compound eyes --Sponge-like, sucking or biting mouthparts --long legs --stingers |  |
| 2 | The Two Wings (Diptera) | Flies, Mosquitoes, Gnats | <ul style="list-style-type: none"> --1 pair of regular wings & 1 pair of very small wings -- Compound Eyes --Sponge-like or sucking mouthparts |  |
| 3 | The Scaly Wings (Lepidoptera) | Moths, Butterflies | <ul style="list-style-type: none"> --2 pairs of scaly wings --Antennae feathery, needle- or pin-like --Compound Eyes --Sucking mouthparts |  |
| 4 | The Sheath Wings (Coleoptera) | Beetles | <ul style="list-style-type: none"> --1 pair of hard wings --Wings cover top of body & meet in straight line down center of back --Biting mouthparts |  |
| 5 | The Straight Wings (Orthoptera) | Crickets, Grasshoppers, Locusts | <ul style="list-style-type: none"> --1 pair leathery wings in front (fold over body when not in use) --1 pair fan-like wings in back --Long legs/ high hopper --Make rhythmic sounds --Chewing mouthparts |  |
| 6 | The Toothed Wings "Born with Teeth" (Odonata) | Dragonfly, Damselfly | <ul style="list-style-type: none"> --2 pairs of wings -- Most have thin legs & short antennae -- Large compound eyes nearly cover small heads --Biting mouthparts |  |
| 7 | The Same Wings (Homoptera) | Aphids, Cicadas, Treehoppers, Leafhoppers | <ul style="list-style-type: none"> --Both (2) pairs of wings are same from base to tip --Wings held in tent-like position over body when resting --Piercing or sucking mouthparts |  |
| 8 | The Half Wings (Hemiptera) | True Bugs, Back Swimmers, Water Striders | <ul style="list-style-type: none"> --2 pairs of wings: thick and leathery near the body & thin at tip --Wings fold on back forming a triangle behind the head --Snout on head is used for piercing and sucking |  |

Beneficials and a few not-such-a-nuisance

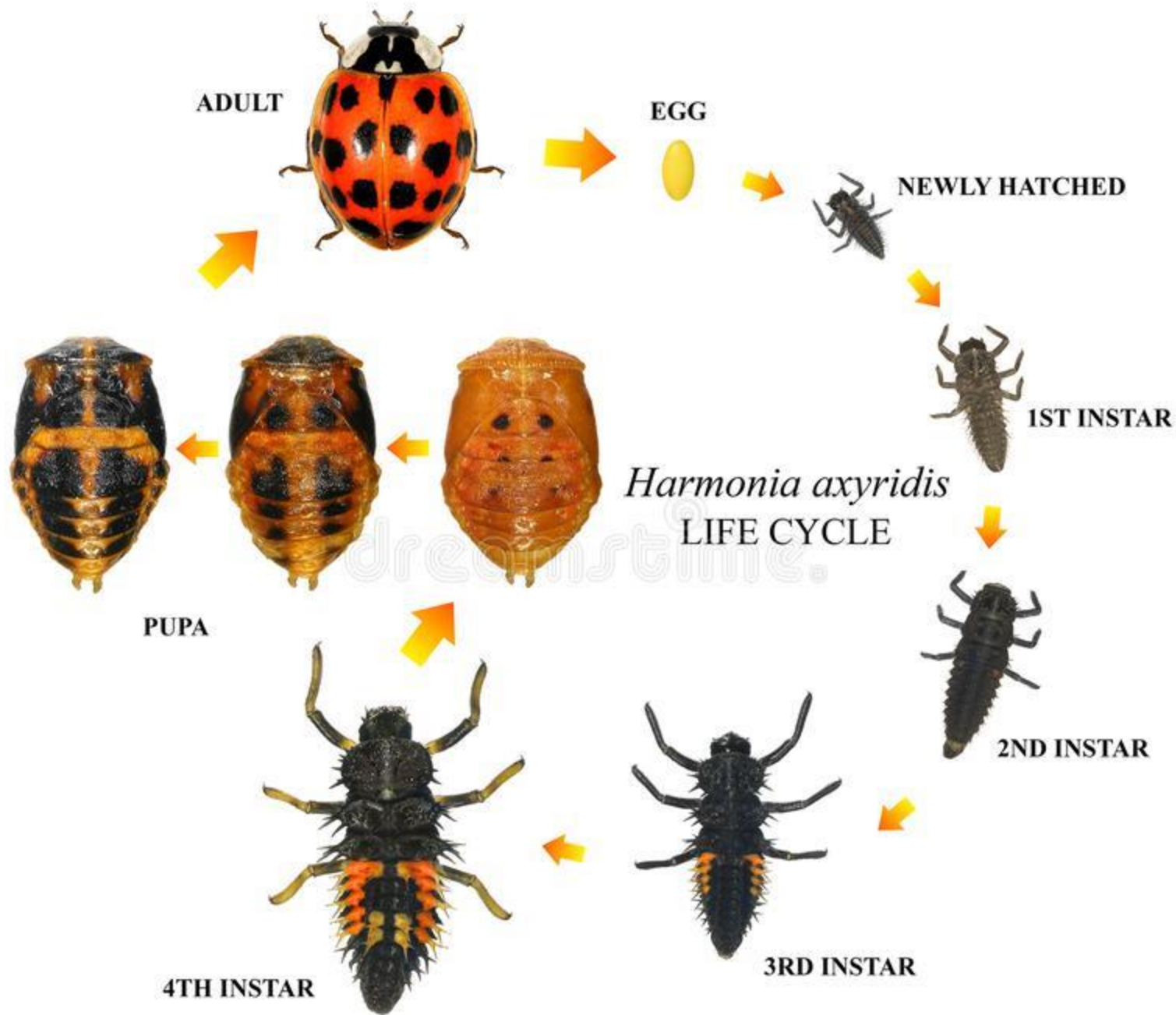
- Attempt to Sight ID to Order
- Check the PowerPoint NOTES to see links/ID answers



















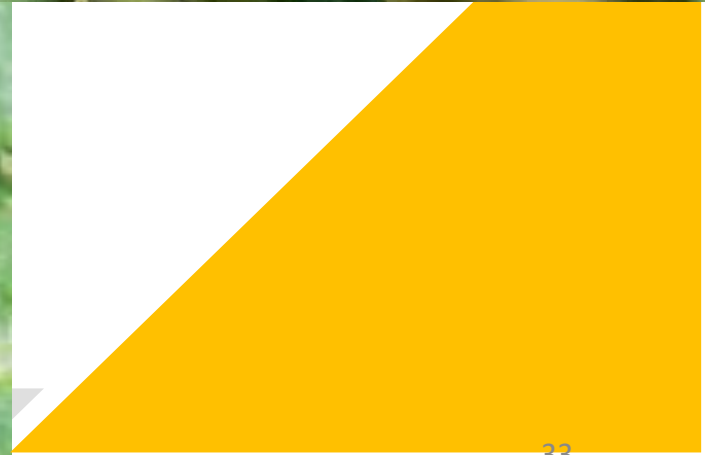










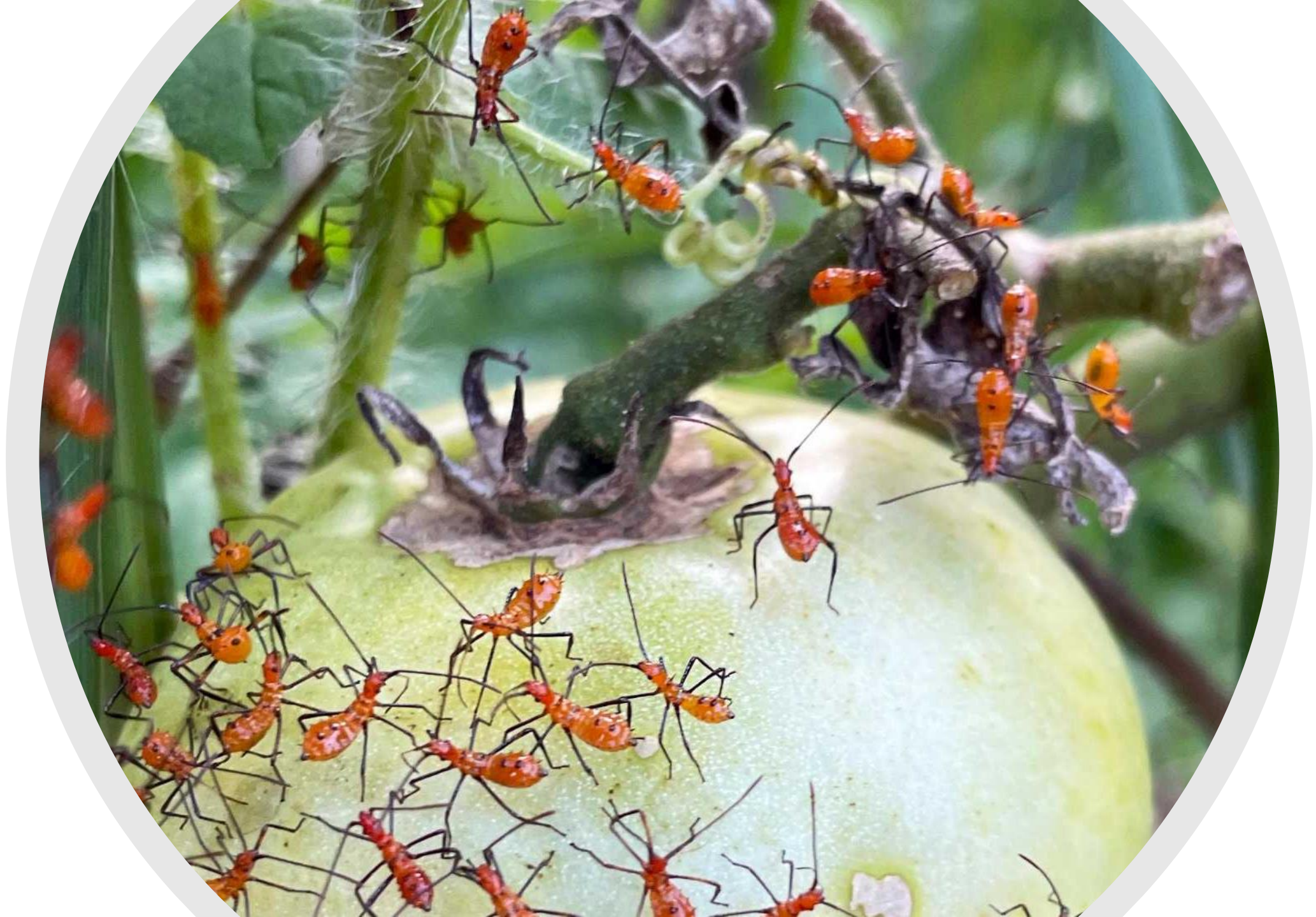


Pests

- Attempt to Sight ID to Order



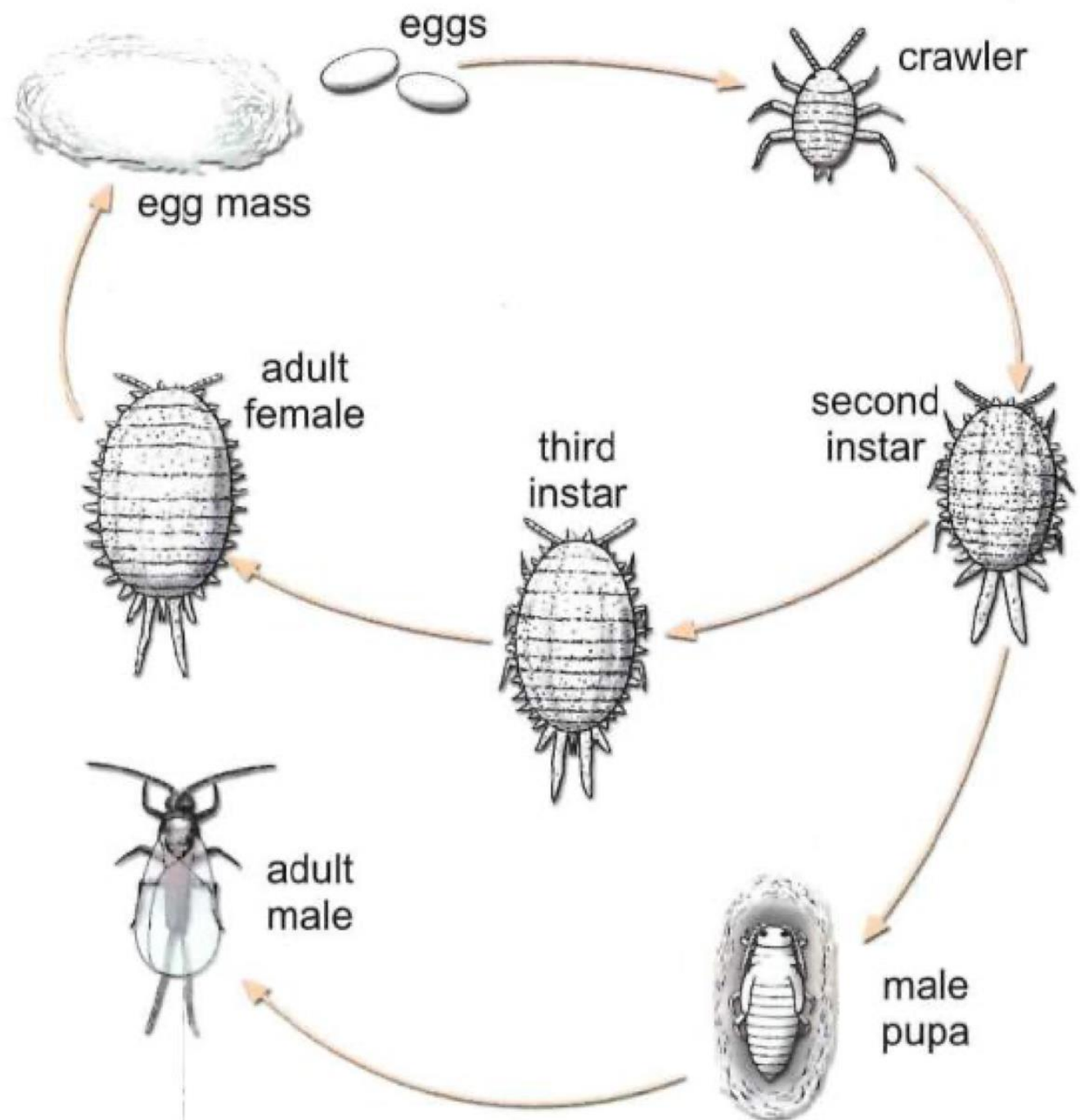
















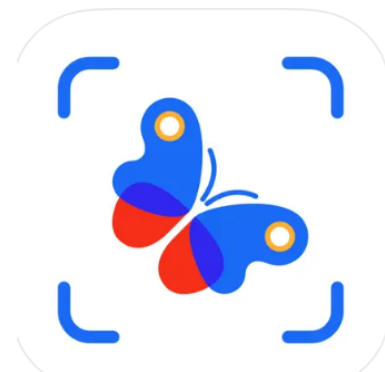




Recommended Resources

- Printed Book:
Kaufmann Field Guide ~\$7 Used on Amazon
- Website “Bugfinder”:
<https://www.insectidentification.org/bugfinder-start.php>

- Phone App:
Picture Insect



Picture Insect: Bug Identifier 4+

Pest, Butterfly Identification

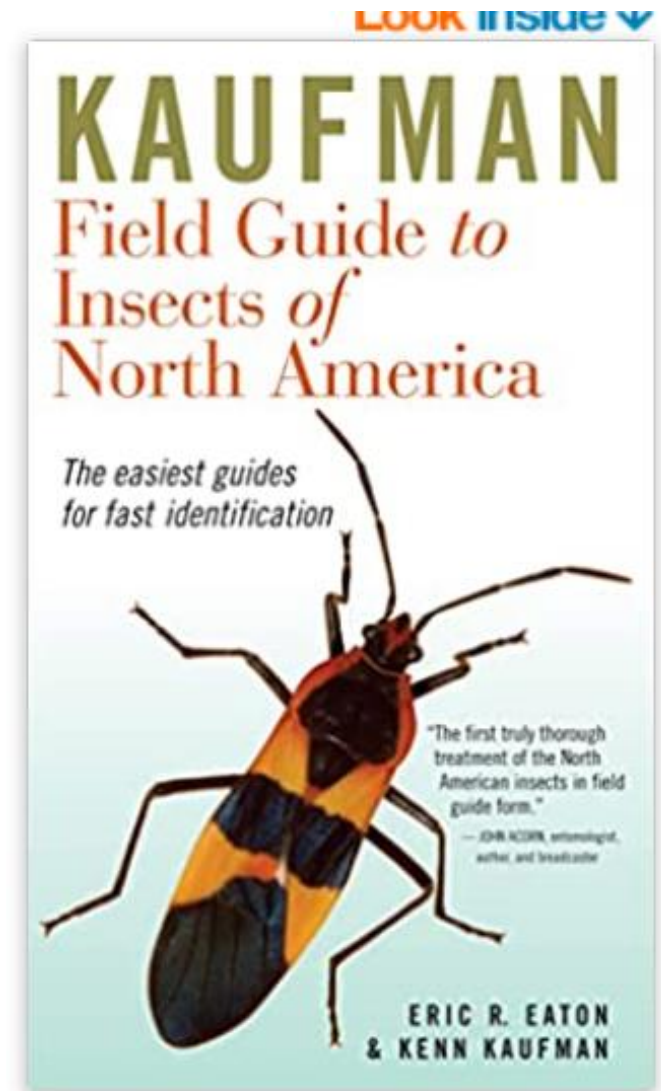
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- <https://www.facebook.com/fishwildlife>

- <https://www.facebook.com/ABBReintroductionNY>

- <https://web.cobleskill.edu/media/2022/08/05/suny-cobleskill-students-and-faculty-contribute-research-to-empire-state-native-pollinator-survey/>

Environmental Management Major:
Invertebrate, Soil, Water, Ecology, Restoration, CONSERVATION Focus

- <https://www.cobleskill.edu/academics/schools/agriculture-and-natural-resource-management.aspx>

