

BIG4 field workshop

June 5-11 2016, Havraníky, Czech Republic





Lepidoptera

Butterflies and moths

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Moths vs. Butterflies

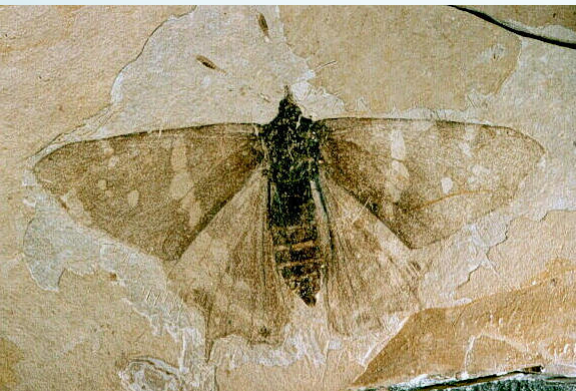
- Artificial separation based on:
- Time of flight
- Antennae
- Wing position at rest

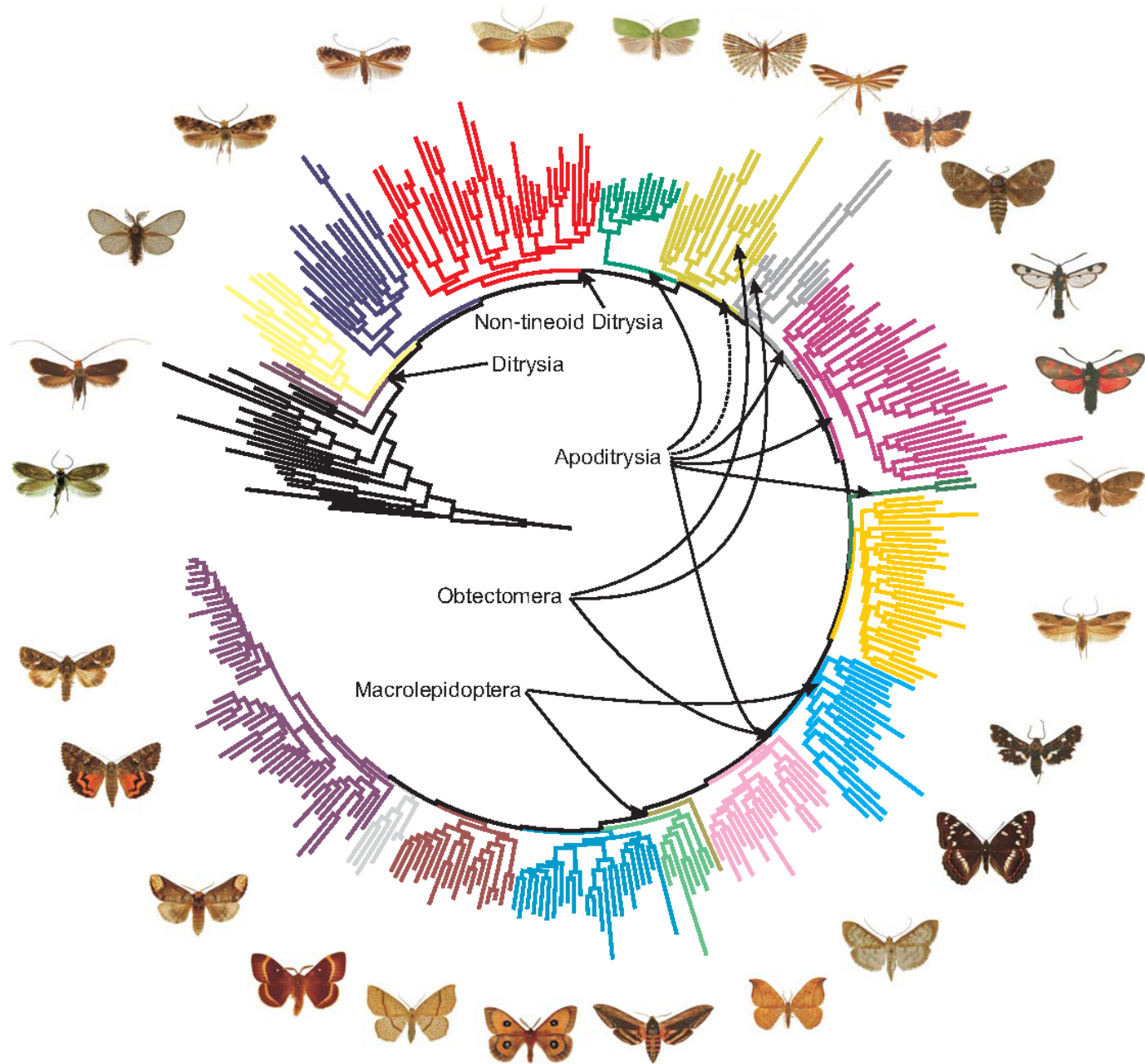
Lepidoptera

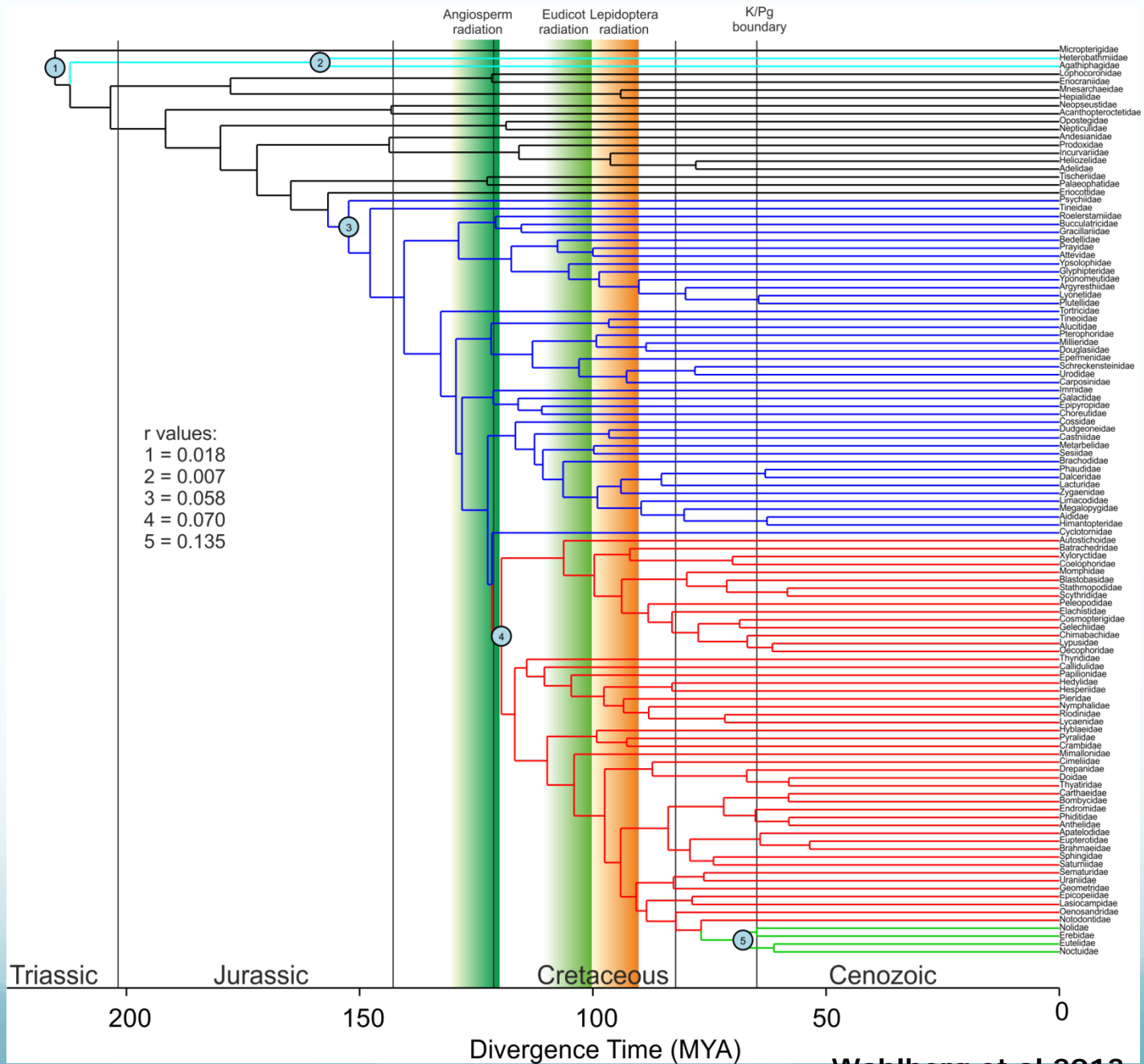
- Ancient Greek *lepis* – scale, *pteron* – wing
- 160,000 described species
- Estimates 500,000 spp.
- Around 120 families
- Wingspans from under 3 mm (Nepticulidae) to 275 mm (a neotropical noctuid)

Fossil record

- Fossil record suggests that Lepidoptera has been around for at least 190 million years
- Oldest known Trichoptera fossil is 185 million years old
- A possible stem Amphiesmenopteran from earliest Jurassic ca. 200 million years ago
- Most fossils from Cenozoic between 50-5 million years ago







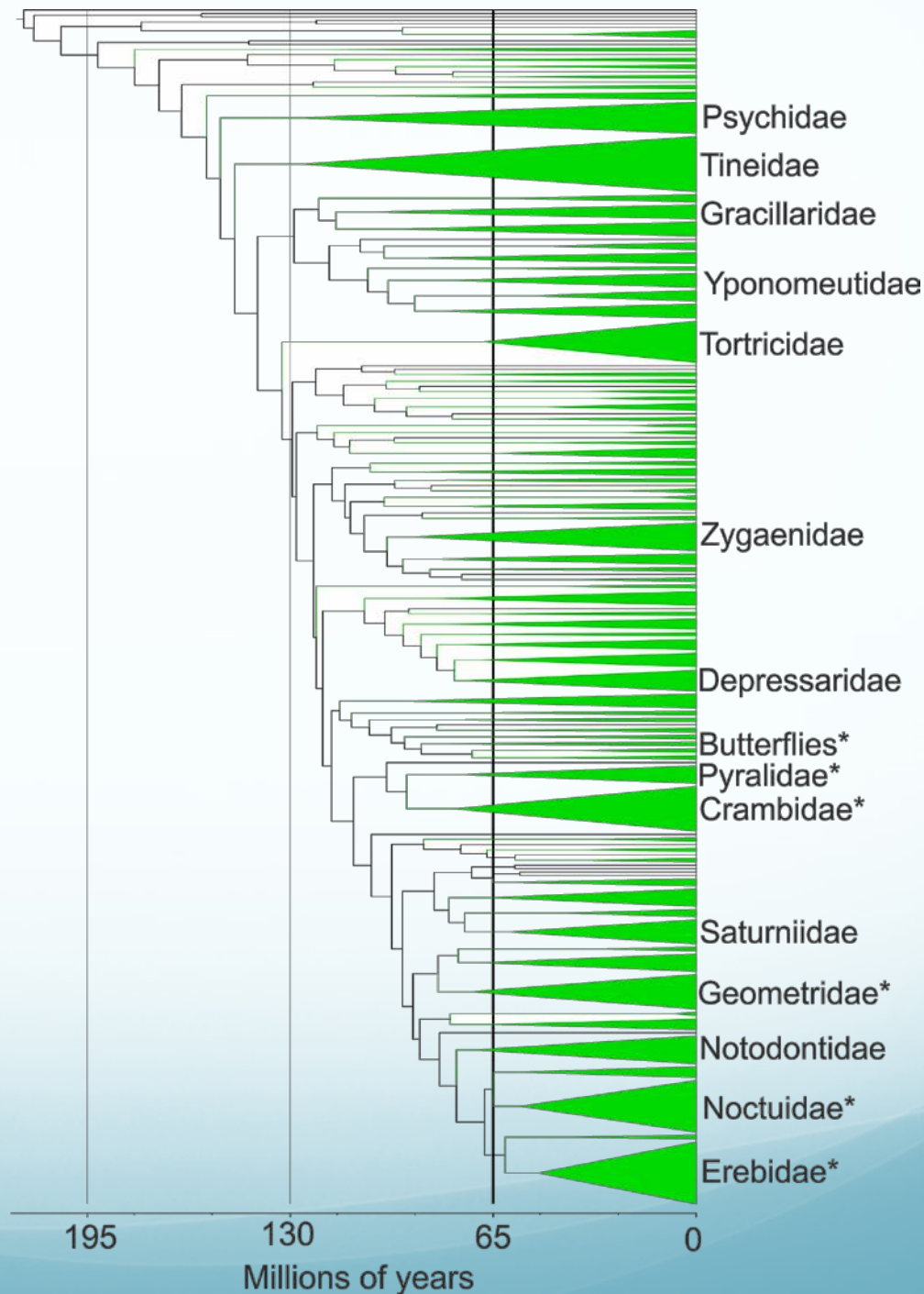
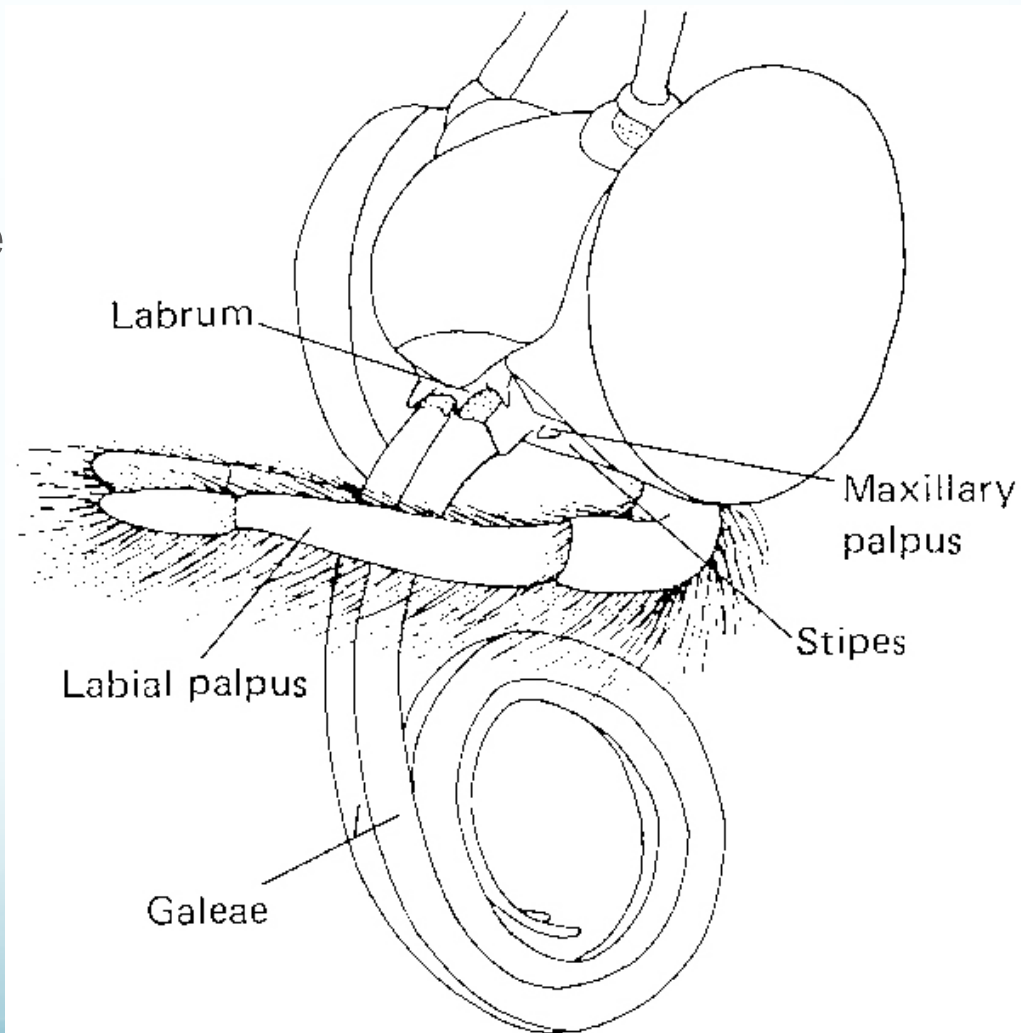


Figure 1. Phylogenetic tree of butterflies showing divergence times in millions of years. The x-axis represents time in millions of years, ranging from 195 million years ago to the present (0). Major families are labeled on the right side of the tree.

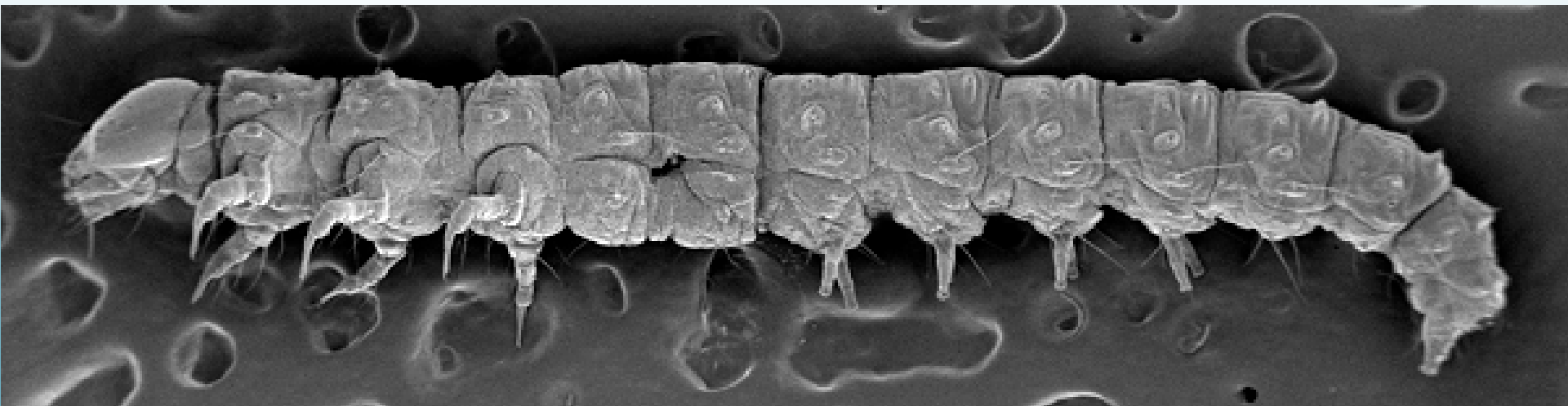
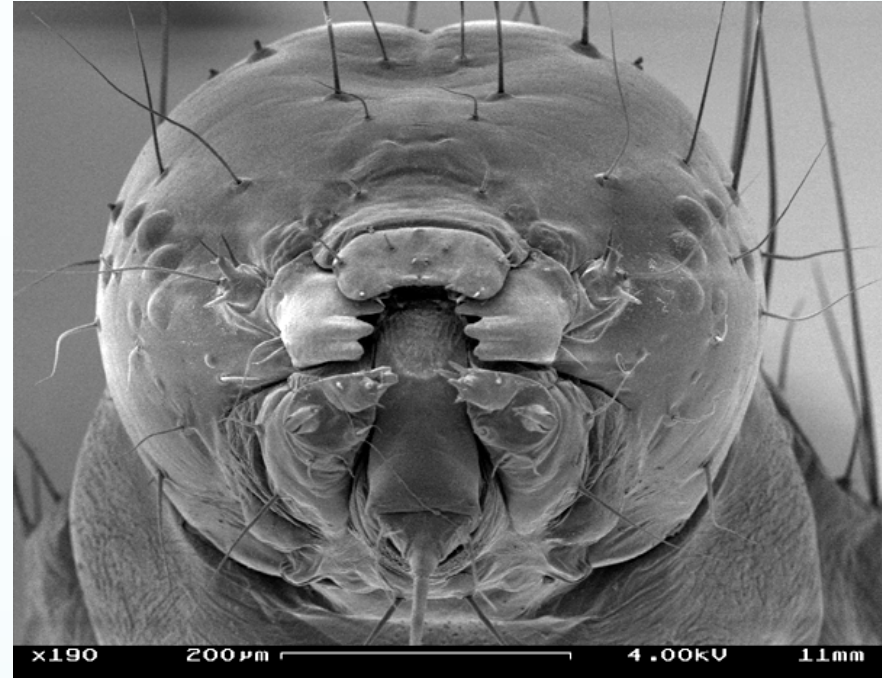
Morphology

- Adults:
 - body and wings covered with scales
 - sucking mouth parts (galeae of maxilla)
 - hearing organs evolved independently at least three times



Morphology

- Caterpillars:
 - chewing mouth parts
 - usually 5 pairs of prolegs



Natural Enemies

- Pathogens (viruses, bacteria and fungi)
- Parasitoids (ichneumonid wasps and tachinid flies)
- Predators (birds, mammals, reptiles, amphibians, various invertebrates)

Defense

- Unpalatable species, e.g. Monarch
 - sequestering toxins from host plants
- Stinging setae on caterpillars
- Giving away unpleasant odors
 - Papilionidae

Life Cycle

- Egg
- Larva – caterpillar
 - feeding stage; very vulnerable (cryptic or aposematic)
- Pupa
 - immobile; almost always cryptic; sometimes in a cocoon
- Adult
 - reproduction and dispersal

Cryptic Caterpillars



Aposematic Caterpillars



=



Mimicry complexes

- similar “butterflies” but from different families

1 – *Dismorphia orise* (Pieridae)

2 – *Methona confusa*
(Nymphalidae)

DISTASTEFUL

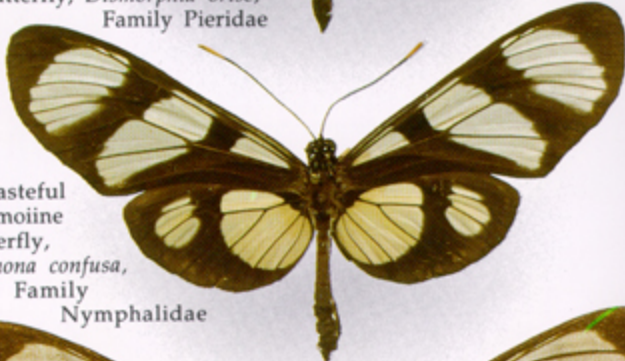
3 – *Lycorea phenarete*
(Nymphalidae)

4 – *Gazera linus* (Castniidae)

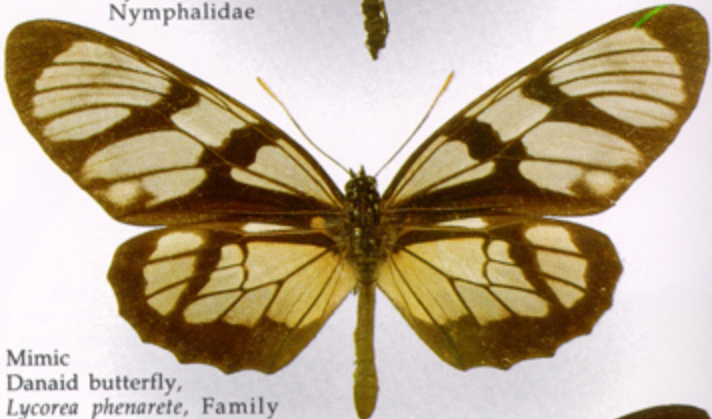
MOTH!



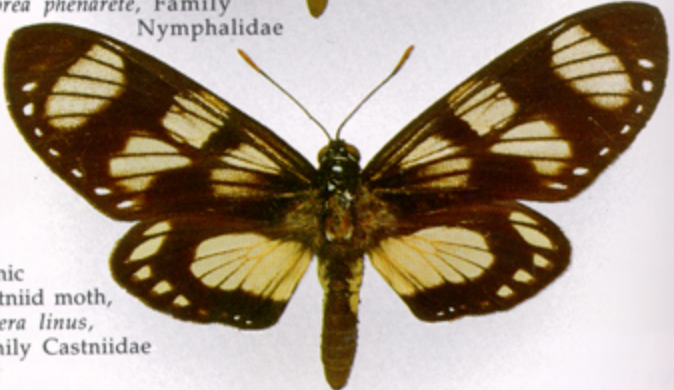
Mimic
Dismorphiine
butterfly, *Dismorphia orise*,
Family Pieridae



Distasteful
Ithomiine
butterfly,
Methona confusa,
Family
Nymphalidae



Mimic
Danaid butterfly,
Lycorea phenarete, Family
Nymphalidae



Mimic
Castniid moth,
Gazera linus,
Family Castniidae

Camouflage

- avoiding predation by “disappearing” into the surroundings
- Peppered Moth resting on tree bark
- Indian Leaf Butterfly at rest looks like a decaying leaf



Species Richness

- 80% of Lepidopteran species in five families:
 - Noctuidae
 - Geometridae
 - Pyralidae
 - Tortricidae
 - Gelechiidae

Collecting Techniques

- Entomological net
- Blacklight or mercury vapor light at night
- Baits (sugar solutions, pheromones)
- Caterpillar collecting (beating, visual searching)
- Collecting of mines, cases, etc.

Collecting Techniques

- Immatures
 - preservation: boiling and transferring to 75% ethanol
- Adults
 - killing jars with cyanide, ethyl acetate, ammonium
 - freezing
 - injecting with ethanol
 - glassine envelopes