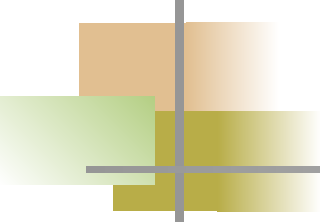




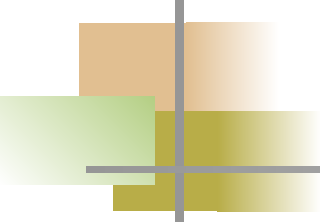
2026 Entomology (B&C)

KAREN LANCOUR
National Rules Committee
Chairman- Life Sciences



Entomology (B&C)

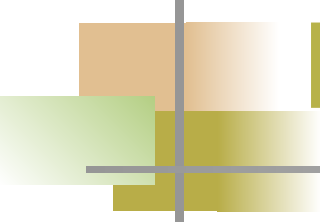
- **Content:**
 - Identify insects and selected immature forms
 - 26 orders, 1 subclass and 113 families
 - Taxonomic Scheme of the **2026 Official Science Olympiad Insect List**
- **Process Skills:** observation, inferences, data and diagram analysis, make and/or use a dichotomous key on insects
- **Event Parameters:** see 2026 Official Rules



Event Rules – 2026

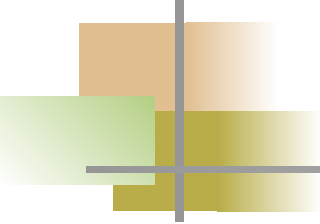
DISCLAIMER

This presentation was prepared using draft rules. There may be some changes in the final copy of the rules. The rules which will be in your Coaches Manual and Student Manuals will be the official rules.



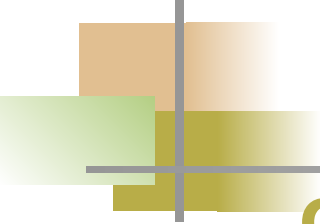
Event Rules – 2026

- **BE SURE TO CHECK THE 2026
EVENT RULES FOR EVENT
PARAMETERS AND TOPICS FOR
EACH COMPETITION LEVEL**
- **The National Insect List is at
www.soinc.org under Event
Information**



TRAINING MATERIALS

- **Training Power Point – content overview**
- **Training Handout - content information**
- **Sample Tournament – sample problems with key**
- **Event Supervisor Guide – event prep tips, setup needs and scoring tips**
- **Internet Resources & Training Materials – on the Science Olympiad website at www.soinc.org under Event Information**



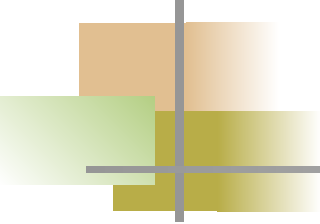
The Competition

Content:

- Taxonomic Scheme of the **2026** Official National Science Olympiad Insect List is used in competition
- 26 Orders, 1 Subclass and 113 Families of Insects
- Identification, internal and external anatomy, ecology, economic characteristics, and management

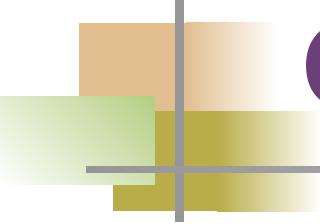
Process Skills: observation, inferences, data and diagram analysis

Event Parameters: check **2026** rules for what is allowed



Official National Insect List

- **the Official National Insect List is based upon the *Insects of North America Princeton Field Guide (2023)***
- **Since taxonomic schemes may vary greatly from source to source, the Science Olympiad Official Insect List will be used for all competitions and all arbitration questions will defer to the *Insects of North America Princeton Field Guide*.**



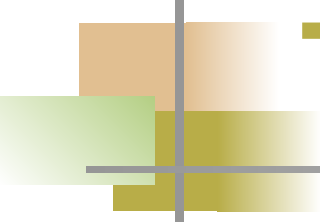
Good Websites for Insects

NC State General Entomology

<http://www.cals.ncsu.edu/course/ent425/course/modules/index.html>

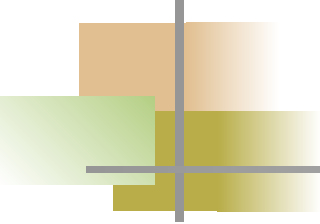
Texas A&M General Entomology

<https://insects.tamu.edu/students/undergrad/ento201/lecture.html>



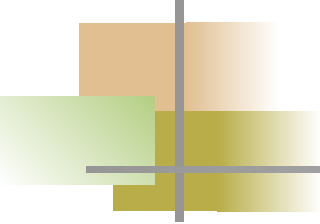
The Competition

- **Specimens or images (nymph or larva for selected orders and families) will be exhibited – usually as stations.**
- **For any *individual specimen* , questions may also concern economic or health impact of specimens on humans.**
- **Topics may include structure and function of internal and external anatomy, ecology, behavior & history.**
- **One of the parts of the exam may involve using or formulating a simple dichotomous key to identify insects.**



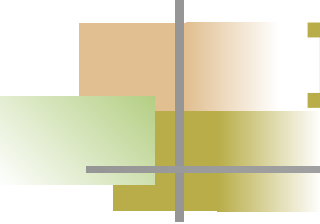
Insect Taxonomy

- **Kingdom – Animalia**
 - **Phylum – Arthropoda**
 - **Subphylum – Mandibulata**
 - **Superclass - Hexapoda**
 - **Class – Entognatha**
 - **Class – Insecta**
 - **Subclass - Acari**



26 Common Orders of Insects

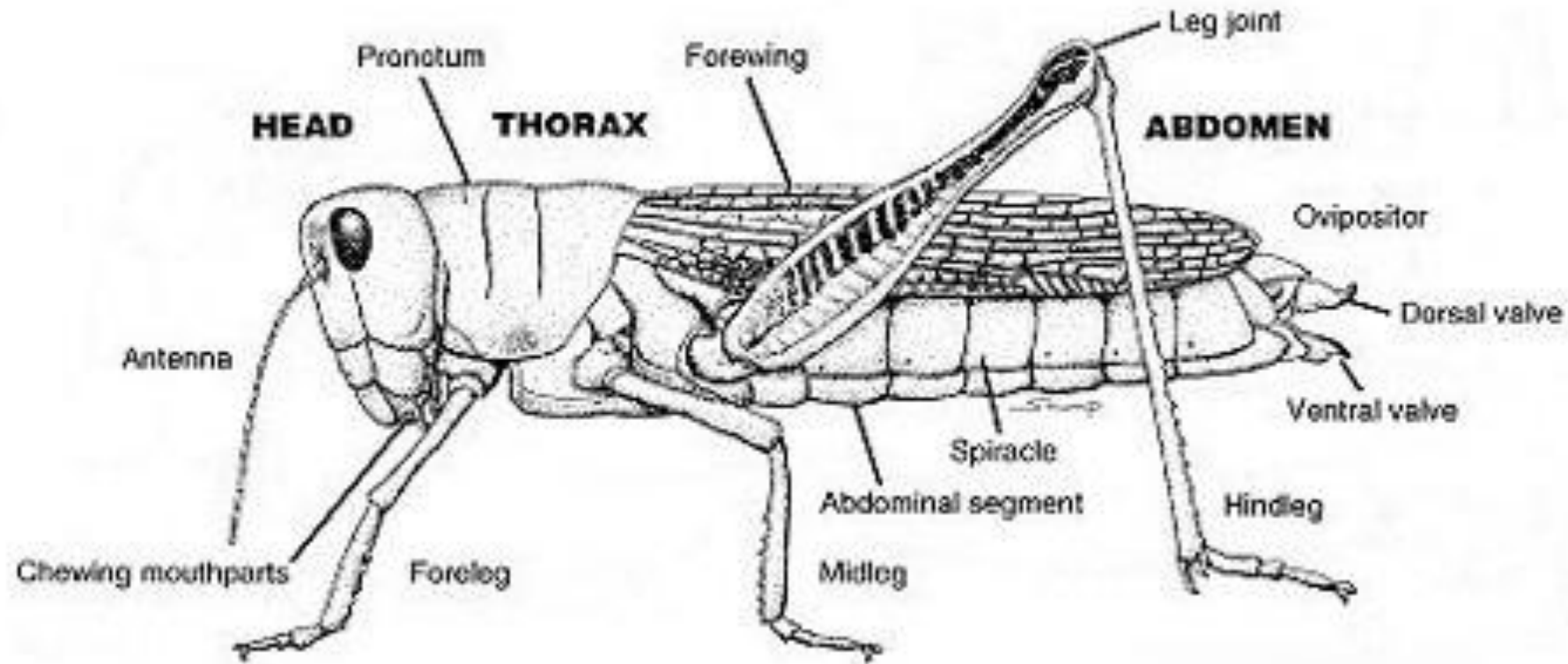
- | | |
|---|--|
| A. Protura (telsontails, proturans) | O. Hemiptera (true bugs) |
| B. Diplura (diplurans) | P. Thysanoptera (thrips) |
| C. Archeognatha (bristletails) | Q. Megaloptera (dobsonflies) |
| D. Zygentoma (silverfish, firebrats) | R. Neuroptera (lacewings, antlions) |
| E. Ephemeroptera (mayflies) | S. Coleoptera (beetles) |
| F. Odonata (dragonflies, damselflies) | T. Mecoptera (scorpionflies) |
| G. Blattodea (cockroaches, termites) | U. Raphidoptera (snakeflies) |
| H. Mantodea (mantids) | V. Siphonaptera (fleas) |
| I. Embiptera (webspinners) | W. Diptera (true flies) |
| J. Dermaptera (earwigs) | X. Trichoptera (caddisflies) |
| K. Plecoptera (stoneflies) | Y. Lepidoptera (butterflies, moths) |
| L. Orthoptera (crickets, grasshoppers) | Z. Hymenoptera (ants, bees, wasps) |
| M. Phasmatodea (walking sticks) | AA. Non-Insect Subclass Acari (ticks) |
| N. Psocoptera (booklice, barklice) | |



Insect Morphology

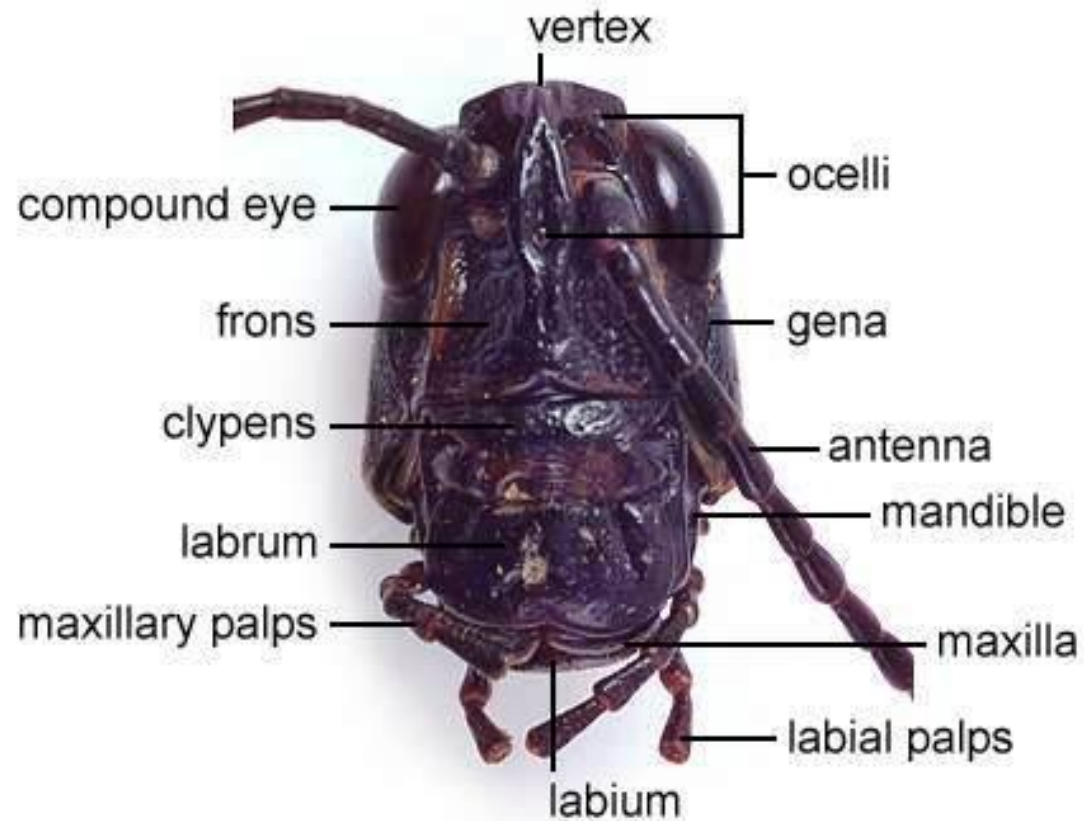
- **Segmented body** divided into three sections: head, thorax, abdomen
- **Mouth** including mandibles (most, not all)
- **Three pairs of legs** attached to the thorax
- **One pair of antennae.**
- **External skeleton (exoskeleton)**
- **Usually, one or two pairs of wings** attached to the thorax

External Anatomy

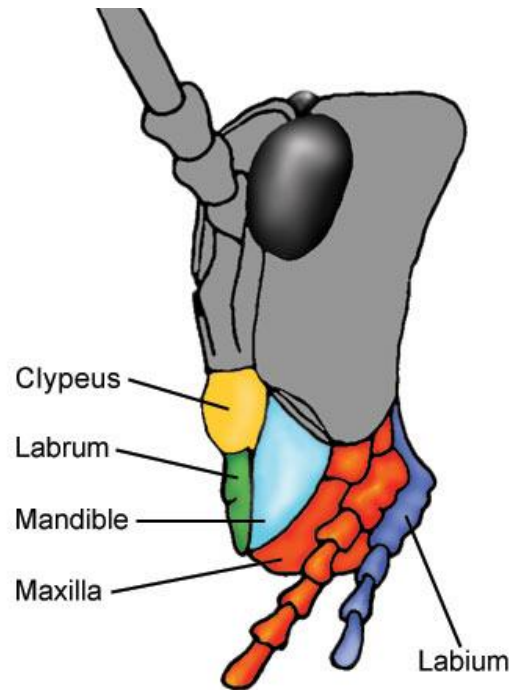


Insect Eyes

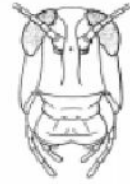
Grasshopper - Frontal View of Head



Mouth Parts



Insect Mouthparts



Chewing

Grasshopper



Sucking/Mouth Hooks

Maggot



Chewing/Lapping

Bee



Piercing/Sponging

Biting Fly



Rasping/Sucking

Thrips



Siphoning

Moth



Piercing/Sucking

Mosquito



Chewing

Beetle



Piercing/Sucking

Cicada



Sponging

House Fly



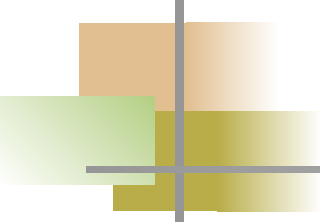
Piercing/Sucking

Flea



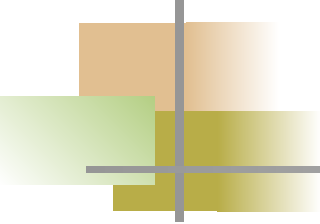
Chewing/Raptorial

Dragonfly



Insect Wings

- **Apterygota** – adults like immature without wings
- **Pterygota** – adults have wings
 - Exopterygota** -the wings develop externally on the *nymph body*
 - Endopterygote** – wings develop inside of body in immature insects and not visible until *adult immerses from pupa*

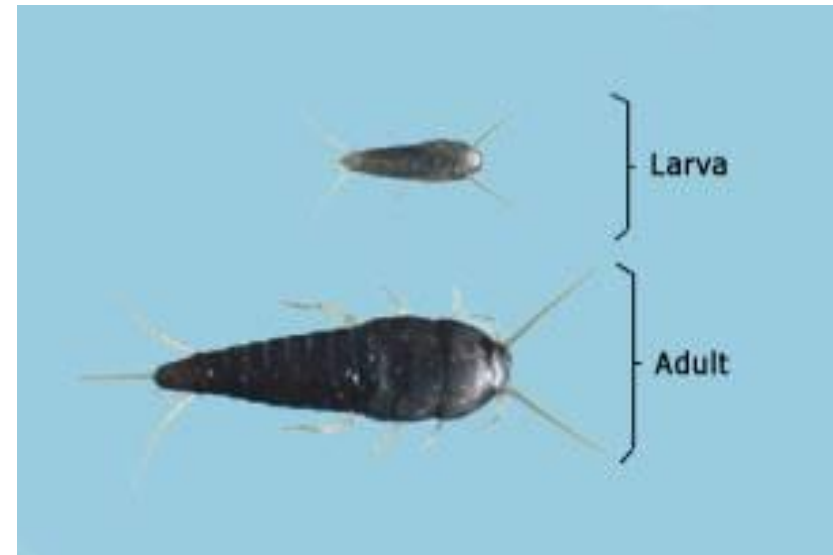


Metamorphosis

- **Ametabolous** – Without Metamorphosis
 - Young resembles the adult, except smaller
- **Hemimetabolous** – Incomplete Metamorphosis
 - Egg, nymph, adult
- **Holometabolous** – Complete Metamorphosis
 - Egg, larva, pupa, adult

Ametabolous

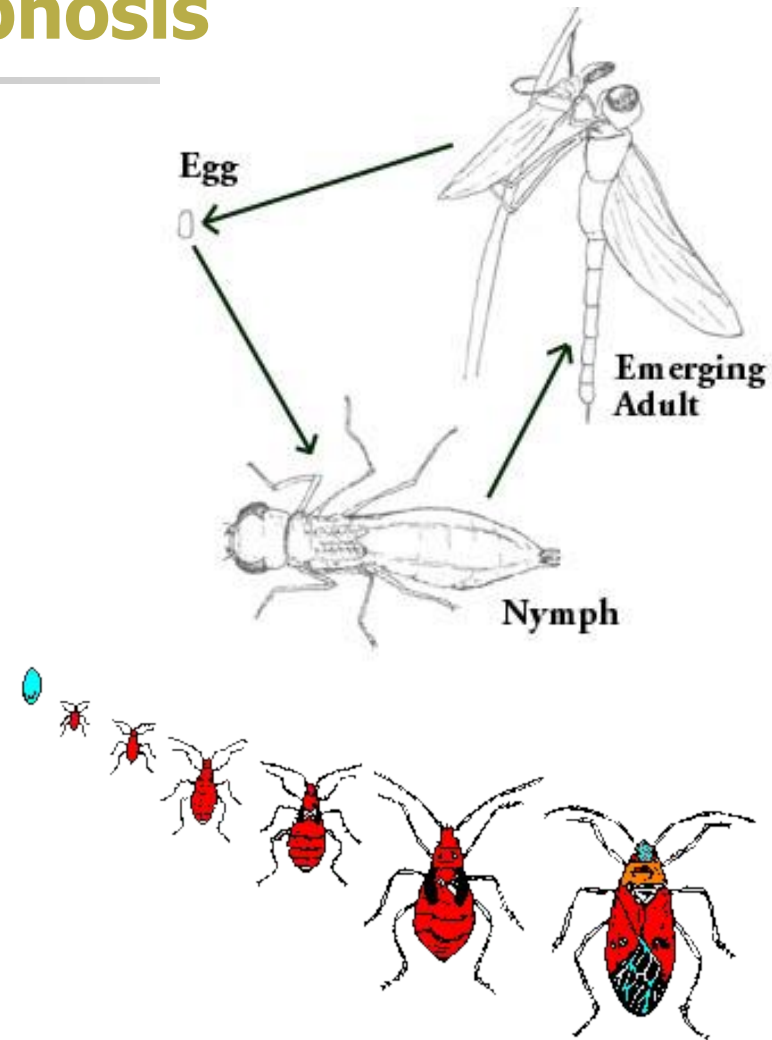
- Insects without metamorphosis
- The insect resembles the adult, except that it is smaller.
- Development involves increasing the insect's size by going through successive molts.
- Also **Apterygota** –adult like immature without wings



Hemimetabolous

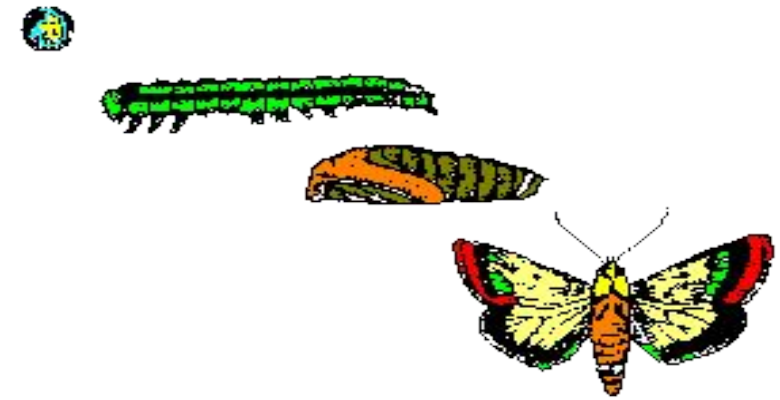
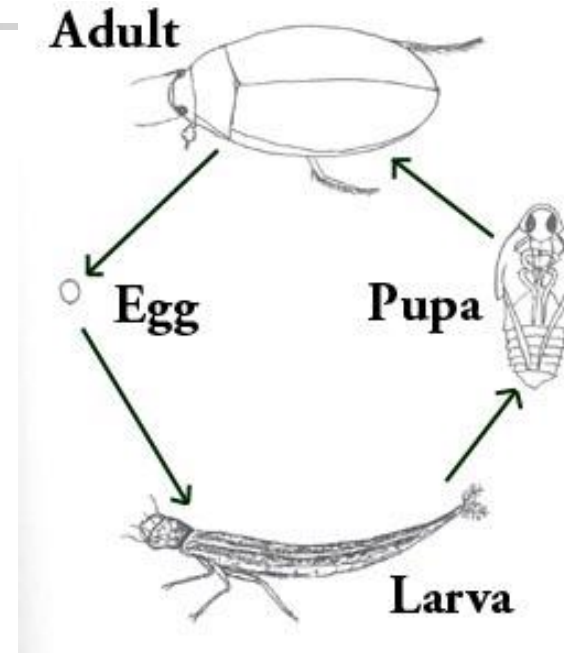
Incomplete Metamorphosis

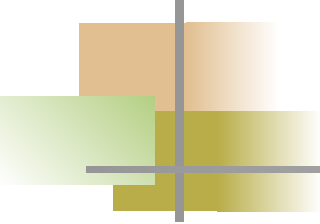
- Egg, nymph, adult
- Also **Exopterygota** -winged insects, the wings develop externally on the nymph body



Holometabolous Complete metamorphosis

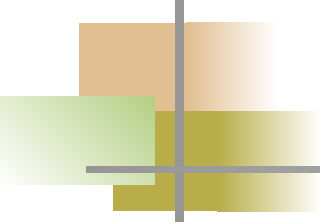
- Egg, larva, pupa, adult
- Also **Endopterygote** – wings develop inside of body in immature insects and not visible until adult immatures from pupa





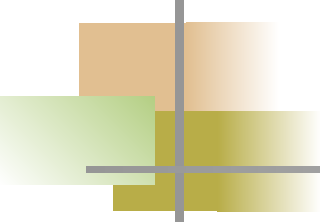
Orders - Ametabola & Apterygote

- **Protura** (telsontails, proturans)
- **Dipula** (diplurans)
- **Collembola** (springtails, snow fleas)
- **Zygentoma** (silverfish, firebrats)



Orders- Hemimetabola & Exopterygota

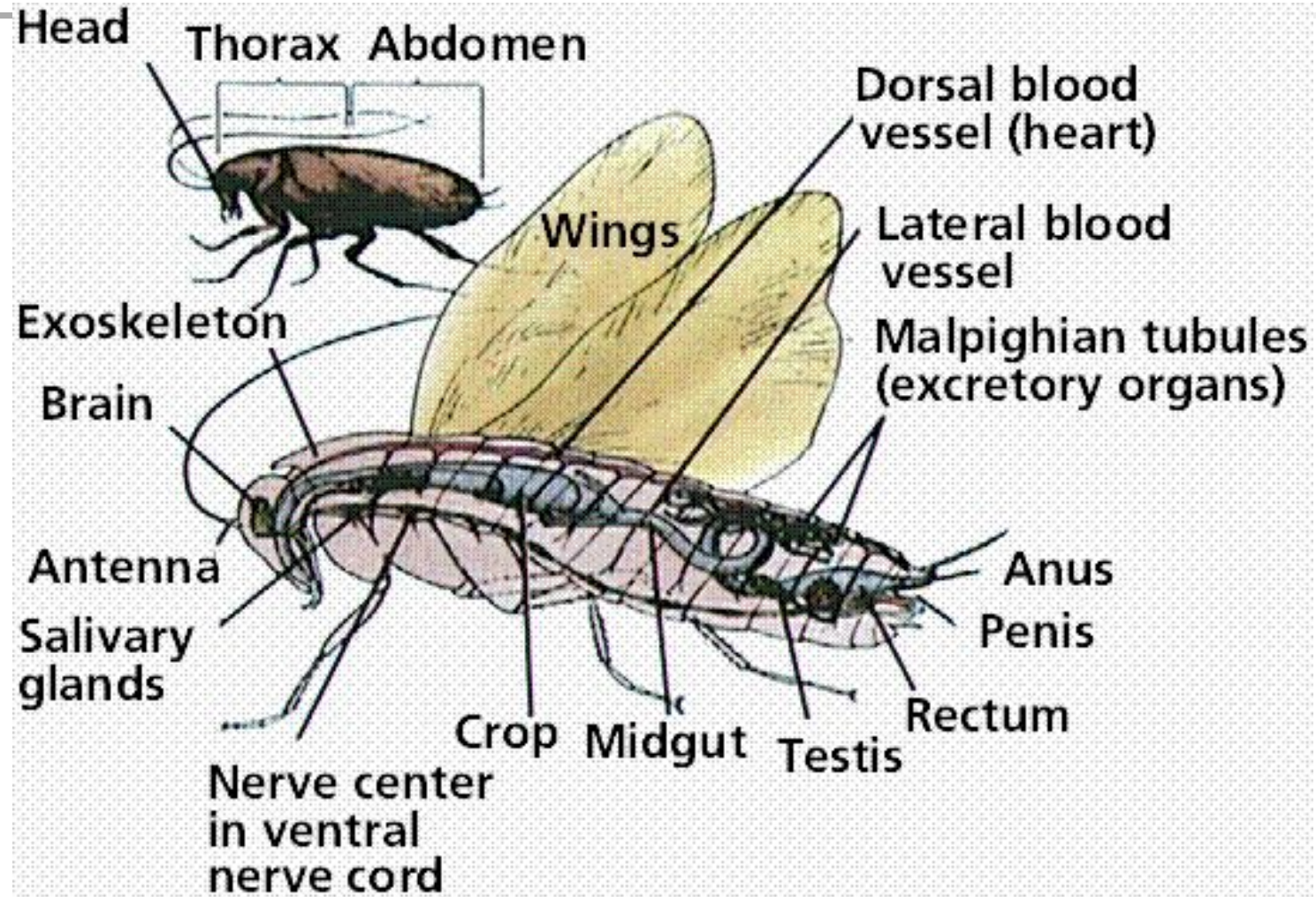
- **Ephemeroptera** (mayflies)
- **Odonata** (dragonflies, damselflies)
- **Blattodea** (cockroaches, termites)
- **Mantodea** (mantids)
- **Embioptera** (webspinners)
- **Dermaptera** (earwigs)
- **Plecoptera** (stoneflies)
- **Orthoptera** (crickets, grasshoppers)
- **Phasmatodea** (walking sticks)
- **Psocoptera** (book and bark louse)
- **Thysanoptera** (thrips)
- **Hemiptera** (true bugs)

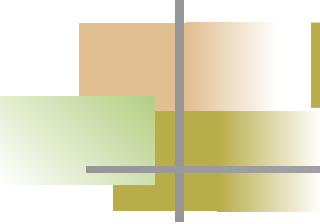


Orders-Holometabola & Endopterygota

- **Megaloptera** (dobsonflies)
- **Neuroptera** (lacewings, antlions)
- **Coleoptera** (beetles)
- **Strepsiptera** (twisted-wing parasite)
- **Mecoptera** (scorpionflies)
- **Raphidioptera** (snakeflies)
- **Siphonaptera** (fleas)
- **Diptera** (true flies)
- **Trichoptera** (caddisflies)
- **Lepidoptera** (butterflies, moths)
- **Hymenoptera** (ants, bees, wasps)

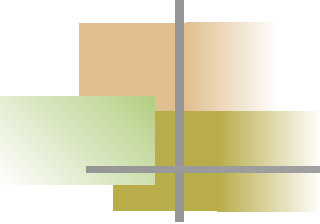
Internal Anatomy





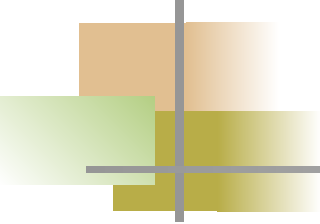
Beneficial Insects

- **Pollination of many flowering plants**
- **Decomposition of organic materials**
- **Recycling of carbon, nitrogen, and other essential nutrients**
- **Control of populations of harmful invertebrates including other insects**
- **Direct production of foods as honey**
- **Manufacture of products as silk**



Insect Pests – 10,000 species

- **Damage Crops**
- **Household Pests**
- **Parasites**
- **Biting and Stinging Insects**
- **Prey on domestic animals**
- **Eat human food, clothing & possessions**
- **Destroy trees, wood, paper**



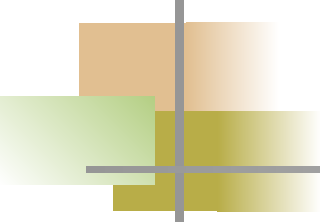
Disease Vectors

- **Mosquitoes** – malaria, arboviral encephalitis, dengue fever, Rift Valley fever, West Nile encephalitis viral infection
- **Fleas** - plague
- **Lice** – lice infestation

Insect Characteristics

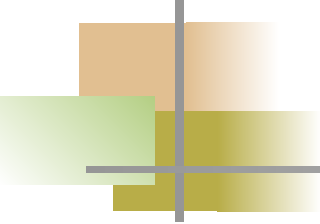
Make a list of characteristics for each insect





A Sample Dichotomous Key

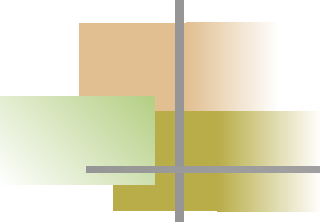
- 1. wings covered by an exoskeleton go to step 2
1. wings not covered by an exoskeleton. . . . go to step 3
- 2 body has a round shape. **ladybug**
2 body has an elongated shape. **grasshopper**
- 3.wings point out from the side of the body . . **dragonfly**
3 wings point to the posterior of the body. . . . **Housefly**
- **Note:** There should be one less step than the total number of organisms to be identified in your dichotomous key.

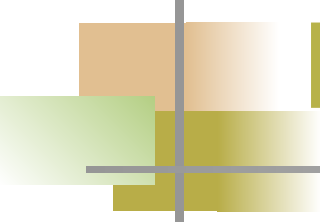


GENERAL TIPS FIELD GUIDES

- **Study the information in the front of the field guide**
- **Become familiar with the organization of the color plates in the field guide**
- **Notice how the field guide organization is similar to the organization of the Official Insect List**
- **Put the page numbers of Orders and Families Information from the Insects of North America Princeton Field Guide on the Official Insect List – it will save you a lot of time**
- **Tab the field guide with very small useful tabs so it is not cluttered and can be easily used**
- **Practice using the Field Guide to identify specimens or photos**
- **Practice under timed conditions to prepare for competition**

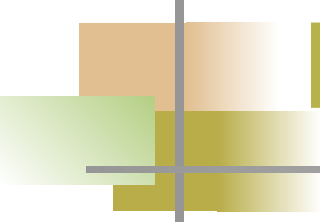
Study Binder - Use It to Learn the Insects

- 
- The most effective resources are the ones produced by the students.
 - The process of producing the resources is a major learning tool.
 - Have a copy of the rules in your binder
 - Have a copy of the lists (insects, birds, fossils if applicable) in your binder
 - Prepare and organize materials by major topic divisions.
 - Place materials from many different sources into your topic divisions
 - Reduce the size of pictures where possible to get more information on a page.
 - Color code information to help you locate or emphasize key items.
 - Put pages in sheet protectors – two per protector to save space.
 - Use tabs to separate sections.
 - Label tabs so items can be located with ease.



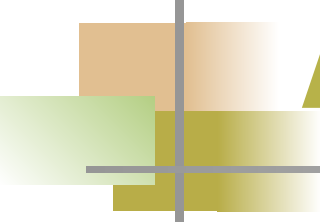
Power Point Slides

- **Make power point slides for each species**
- **Prepare them so they can be reorganized to make practice competitions for study**



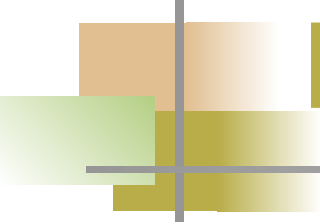
Flash Cards

- **Make flash cards with pictures on one side and information on the back**
- **Use the flash cards to make up sample competitions**
- **Use the flash cards to learn the insects**



Actual Specimens

- **Collect and preserve insects**
- **Note that preserved specimens may not look exactly like live specimens – texture and color changes may occur**
- **Use specimens to learn the insects**
- **Timer – prepare practice stations and use the timer to improve efficiency of your teamwork skills**



Doing the Competition

- **Place information in appropriate place on answer sheet**
- **Print legibly so information is understandable**
- **Work as a team – use time effectively**
- **Use Notes and Field Guide effectively**
- **Identify to Order and then to Family if needed**
- **Be sure to spell names correctly**
- **Carefully read all questions and use common sense in answering**

Relax, Do your best, and Have Fun!!