# Practice Tips:
# Don't Bug Me

## CLARIFICATIONS:

Although the title refers to bugs, this event is about ***arthropods***, a group that includes spiders, lobsters, and butterflies – but ***none*** of these is a true bug!

We also found several misspellings in the event description in the official manual. Please see the *Errata* section at the end of this Tip Sheet.

## USEFUL WORDS TO KNOW:

**Here are some representative words you should know.**

| | | | | | |
|---|---|---|---|---|---|
| Exoskeleton | Abdomen | Metamorphosis | Mandible | Larva | Caterpillar |
| Antenna | Thorax | Compound Eye | Pedipalp | Pupa | Egg Sack |
| Scales | Segmented | Chrysalis | Proboscis | Chitin | Jointed |

## USEFUL THINGS TO TRY:

**Practice with your teacher or at home with a parent.**

1. Have an Arthropod Adventure! This group of animals is all around us, both inside and outside. They are crafty creatures who find a way inside even well-cleaned houses or schools. Spend 15 minutes looking around carefully to see how many examples you can find. Check out this website to see how many household invaders you found in the Guide to Arthropods of our Homes from Dr. Rob Dunn's lab in the Department of Applied Ecology at NC State University. Can you identify all yours?
2. What's Your Order? This event includes knowing the ***orders*** of the Insects, six-legged creatures that often have wings and antennae. The names of each order are taken from the Latin language, and they identify some easily observed feature of all of the creatures in the order. Investigate each order using the online sites listed below or a reference book about insects. Can you name the distinguishing feature behind the name for ***all*** of the ***insect orders*** listed in our table at the end of this Practice Tip sheet?
3. "Tell the Waiter that I'll Have the Arthropod." Investigate the use of arthropods in cooking and foods from around the world. How many examples can you find the next time you go to the grocery store with your parents? (Be sure to look in the Seafood section.) One edible arthropod product is the food coloring called cochineal. Can you find it in anything?
4. The official Rules Manual says that you can bring a key to help answer the questions. ***We require a student-made key – nothing merely printed out.*** Look at the table in this Tip for some ideas of things to include, like pictures, ecology notes and names of parts!

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Where Science Becomes an Adventure

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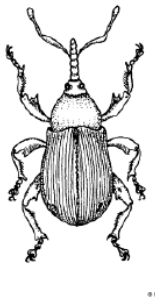
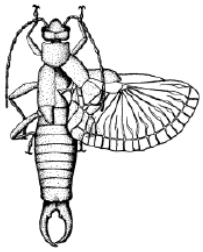
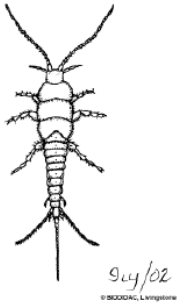
5. Make a ***dichotomous key*** that allows you to figure out members of the different insect orders. (This is difficult if you include all of them, so you might start with just the orders tagged as *Olympiad Focus* in the attached table.)

   Here are some examples to get you started – see any differences? (Scale varies.)

| Diptera | Coloptera | Dermaptera | Thysanura |
|---|---|---|---|
|  |  |  |  |
| Adult Housefly | Adult Weevil | Adult Earwig | Adult Silverfish |
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## USEFUL WEBSITES TO SEE: **We verified these in January of 2020.**

| | |
|---|---|
| http://robdunnlab.com/science-portfolio/guide-to-arthropods-of-our-homes/ | (Downloadable guide) |
| http://bugguide.net/ | (No crustaceans) |
| https://entomology.k-state.edu/extension/4-h-and-youth/Guide-to-Insect-Orders/ | (Insect orders) |
| http://www.ento.csiro.au/education/index.html | (Info for non-insects) |
| http://www.cals.ncsu.edu/course/ent425/library/index.html | (Only hexapods) |

## RULE CLARIFICATIONS: These apply only to DeKalb's Olympiad.

1. The attached table describing the Insect orders has a column marked "Olympiad Focus." We will definitely have questions related to these!
2. We ***will*** use the Latin names for the classes and orders that are listed in the Event Description (and in the attached tables), but students ***will not*** need to know full Latin names for any individual species. Furthermore, we will not ask students to identify creatures at the species level using terms other than common names such as those provided in the attached tables. (This may not be true for State.)
3. A creature's "ecological significance" can include its economic effect on agriculture and cash crops, particularly crops important for Georgia's economy.

## ERRATA for the Event Description in manual:

Diploda should be ***Diplopoda***.
Ephemrida should be ***Ephemerida***.
Hynmenoptera should be ***Hymenoptera***.

In the *Sample Questions:*
A. In the question, "class" should be "order."
B. In answer choice 3, "plumes" should be "plumose."

Students may want to extend these tables to include columns for the other aspects that the event addresses: habitats, ecological significance, life cycle, and body parts. Remember that some body parts can ***change*** as the creatures develop!

## Major Classes of the Arthropods

| Name of Class | Common Names and Examples | Features / What to Look For |
|---|---|---|
| Arachnida | Spiders, scorpions, mites and ticks, daddy longlegs (also called the granddaddy longlegs) | Eight walking legs and no antennae. Eyes are not compound. The class includes more than spiders. |
| Crustacea | Lobsters, crayfish, crabs, barnacles, roly-polies (isopods), water fleas, sea monkeys | Two pairs of antennae. Most species are aquatic in both marine and freshwaters. |
| Chilopoda | Centipedes | One pair of walking legs on most trunk segments, and there are many segments. They are carnivores. |
| Diplopoda | Millipedes | Two pairs of walking legs on most trunk segments, and there are many segments. Most are herbivores. |
| Hexapoda | Insects | Six legs. Adult forms frequently have wings and antennae but not always! Their classes are described more completely in the following table. |

## Orders of the Insects (the Hexapoda)

| Name of Order | Common Names and Examples | Typical Features / What to Look For | Olympiad Feature |
|---|---|---|---|
| Orthoptera | Grasshoppers and crickets | Long antennae, big jumping legs, large wings that lie flat along body when not flying. | * |
| Blattodea<br>Note: Termites were reclassified and added to this order in 2018. | Cockroaches and Termites | Cockroaches have a head that is rather small compared to its body, relative to other insects. Their bodies are flat and broad.<br>Termites have white or colorless bodies and resemble ants. Colony lifestyle with homes frequently found in the soil or in rotting wood. | * |
| Coleoptera | Beetles: dung beetles, long-horned beetles, June beetles (also called June bugs), Ladybugs, boll weevils | Hard, shell-like front wings that cover their flying wings. The larvae are often called grubs. | * |
| Hymenoptera | Bees, wasps, ants | Almost all have three distinct body parts with a pinched in, very narrow waist. | * |
| Lepidoptera | Butterflies, moth, skippers | Adults have straw-like siphon tubes for their mouth. The larvae are caterpillars with chewing mouths. | * |
| Hemiptera | Stink bugs, leaf-footed bugs | All true bugs have a piercing-sucking mouthpart, looking something like a beak. Most adults have four wings. Most possess stink glands. | * |
| Diptera | True flies: house flies, blow flies, flesh flies, horse flies | Only two true wings, with a narrow neck between head and thorax. Many have compound eyes. | * |
| Homoptera | Aphids, cicadas, leafhoppers, scale insects | All have piercing-sucking mouthparts, and all are herbivores, so they are common plant pests. They may or may not have wings. | |
| Mallophaga | Chewing lice, biting lice, bird lice | Wingless and flat-bodied, usually with large chewing mouthparts. They have wide heads, in general. They are parasitic on birds and (to some extent) on mammals. | |
| Anoplura | Sucking lice: head lice, body lice, pubic lice on humans and other mammals | All are wingless, blood-sucking parasites on mammals. Head is narrower than the thorax. | |

| | | | |
|---|---|---|---|
| Neuroptera | Lacewings, hellgrammites, mantis flies | Large wings with prominent, net-like veins that give wings an appearance like lace | |
| Ephemerida | Mayflies | Larvae are aquatic and spend several months or years in water before they emerge to live very briefly as adults with big, buggy eyes and three graceful tail whips. | |
| Odonata | Dragonflies, damselflies | Large horizontal wings, big, buggy eyes, and straight, rigid bodies. | |
| Siphonaptera | Fleas | Small, wingless parasites. Adults have sucking mouthparts. | |
| Dermaptera | Earwigs | They have chewing mouthparts, and they have two sharp pincers at the other end of their body, like a pair of pliers. | |
| Trichoptera | Caddisflies | The adults look like moths, but caddisflies have thin, slender antennae. Their larvae always live in water, unlike moths. | |
| Thysanura | Silverfish | Flat body, tapered end, three whip-like "tails" | |

## ADDITIONAL RESOURCES:

Arthropods frequently live in fresh water streams, and they are important markers of a stream's biological health. Consequently, another excellent way to find information about them is to search for the following terms: macroinvertebrates, benthic zone, or stream ecology.

Here is a link to a very nice dichotomous key of stream macroinvertebrates from Utah State University's Water Quality Extension program:

https://extension.usu.edu/waterquality/files-ou/whats-in-your-water/aquatic_macroinvertebrates/macrokeyforUtah.pdf

Here is a very small portion of the key so that you know what you should find at the link above: