

Cicada Studies

By: Catherine E. Matthews and David Hildreth

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*****Note: Figures may be missing from this format of the document**

The cicadas are coming. The cicadas are coming. Now is the time to prepare students for the annual emergence of a fascinating insect. The annual emergence of periodical cicadas begins in late spring followed by the yearly emergence of annual cicadas in early to mid summer. Time of emergence varies by climate. But wherever you live, if you are in cicada country, the emergence of cicadas offers easy hands-on science lessons.

Known by a variety of names locally, cicadas are most commonly called "locusts." Like many local terms, *locusts* is inaccurate when used to refer to cicadas— locusts are grasshoppers. Cicadas probably came to be called locusts because of the plaguelike numbers of periodical cicadas (cicadas that emerge in broods every 13 or 17 years) during prime emergences.

Because of their abundance and accessibility, cicadas are excellent organisms to study in the science classroom. They leave lots of evidence of their ever- changing lifestyles in easily accessible places. Cicadas are unique insects that spend most of their lives in nymph form underground. The nymphs finally emerge to shed their skins, called exoskeletons, and to take on adult life forms. Cicadas are widely distributed, and when they emerge as adults, they emit high-pitched calls. Thus, many people are at least somewhat familiar with their existence.

In the investigations that follow, students are provided with a series of four mystery items that are all related to cicadas. They are asked to respond to questions about and make observations regarding these mystery items. A class discussion follows each observation of the four items. This approach provides for discovery-learning opportunities and gives students practice using basic science process skills.

Mystery Item #1 (Cicada nymph exoskeletons) Exoskeletons are abundant, are easy to collect, and can be stored in resealable plastic bags for years. Exoskeletons are especially easy to gather in a year in which a large 13-year or 17-year cicada brood is emerging. These periodical cicada nymphs emerge in May when school is still in session. Annual cicada nymphs emerge later in the summer, and their molts can be collected in midsummer and used in the fall in the classroom. Exoskeletons can be found on tree trunks and even on the sides of houses.

Students can use their senses of sight, touch, smell, and hearing to generate a list of observations about and a description of these mystery items. (Students should not taste cicadas because pesticides may be present.) These observations can be listed on the board or the overhead to encourage class discussion. The exoskeletons elicit many observations from students including the following:

- Six legs all attached to the midsection of the body (thorax).
- Segmented body.
- A split or slit like a zipper on the dorsal side that runs from the front of the thorax to the back of the thorax.
- Hairy structures on the forelimbs, legs, abdomen, and head; in short, the entire structure is hairy.
- Forelimbs have black tips and end with a pair of claws.
- Pair of short antennae.

- Forelegs are modified pinchers.
- Translucent and hollow.
- Big, bulging eyes.
- Pointed abdomen.
- Wing patterns on the body.
- No smell.
- Dry, brittle body.
- Lightweight (not much mass).
- Crunchy.
- Beelike appearance.

Mystery Item #2 (Cicada adults) Once the identity of the first mystery item is confirmed (the exoskeleton), students examine dried or frozen adult cicada specimens and compare them to the exoskeletons. Many students have never seen either the exoskeletons or the adults. Dead or dying adult cicadas can occasionally be collected from the ground, and live specimens can be collected just as they are drying their wings following emergence. Active specimens can be gathered with an insect net but are difficult to catch. However, cicadas can often be found on screen doors and screen porches. Dead cicadas can be stored in resealable plastic bags in the freezer. Student observations about the adult specimens include the following:

- Huge eyes.
- Membranous wings.
- Six legs.
- Long "tongue."
- Transparent wings.
- The ventral side of the abdomen on some of these organisms has a double platelike, or armorlike, appendage shaped like the letter W

Mystery Item #3 (Cicada nymph mud tunnels) Once students have examined the nymph molts and the adult cicadas, they are given mud tunnels to examine. When the periodic cicadas emerge, they are so abundant that the tunnels, which lie just beneath ground surface, are often exposed following spring rains. These tunnels are easy to collect then—they can simply be picked up off the ground. These, too, can be stored in resealable plastic bags.

Mystery Item #4 (Twigs damaged by the egg laying of adult female cicadas) Finally, as a fourth mystery item, students are given twigs to examine. Upon careful observation, students note that the joints of these twigs have a longitudinal slit. Students can also practice tree identification as the withered leaves are usually still attached. A cicada may issue a distress call. Students should be able to feel the vibrations of the tymbal as it vigorously moves back and forth within the cicada's abdomen.

when the twigs fall to the ground. Twigs are easily gathered from the ground.

After students examine the mystery items, we share information about cicadas with our students. Numerous biological concepts can be introduced or reviewed at this point, including the concepts of predator-prey interactions, complete and incomplete metamorphosis, life cycles of insects, characteristics of arthropods, characteristics of insects, taxonomic terms and classification schemes, and adaptations. See page 37 for a more complete discussion of selected concepts.

EXPERIMENTS WITH LIVE CICADAS

The best times to catch these insects are at dusk and at dawn when cicadas tend to call. Students can find cicadas on trees, shrubs, and screen porches by following the cicadas' calls. Students then can use butterfly nets to capture the cicadas. If the cicada adults are just emerging from their nymph stage, students can simply pick

up the cicadas carefully with their fingers. Likewise, if the cicadas have been injured, usually in encounters with birds or cats, students can easily obtain dead cicadas for their investigations.

Once a cicada is caught, students can gently grasp the cicada through the net or they can reach into the net to grasp the cicada if they feel comfortable doing so. When the students have the cicadas in their hands, the This sensation is similar to a hand buzzer that causes a vibration in one's hand when it is clasped. Before students grasp the cicada, the teacher should warn the students that when the cicada does call, it may startle them. This is also a good time to reinforce to the students that the cicada cannot harm them! In turn, the teacher should enforce the idea that students should not harm the cicada in any way. Students should release the cicadas as soon as possible.

ASSESSMENT

The following suggestions can be used to assess student learning after students have studied the buzzing world of the cicada:

- Write a short story about a male or female cicada: (Be sure students discuss the sexual dimorphism in cicadas.)
- Search the Internet for information on cicadas and write up a fact sheet on cicadas of a particular region of the United States. Compare and contrast cicadas in your region to cicadas of other regions of the United States and the world. This is a great time to focus on cicada adaptations. Have students become "entomologists" and present their "findings" to the class.
- Have students write an insect play that has students role-playing different insects and how they interact with one another. Predator-prey relationships and supportive (symbiotic) relationships can be explored.

These activities are an excellent way to engage students in gaining a deeper understanding of the natural world and some insights into entomology. They also provide many opportunities for students to enhance their observational skills.

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