

Vocabulary

- abdomen
- carnivore
- cerci
- exoskeleton
- herbivore
- larva, larvae
- mandible
- Mantodea
- omnivore
- ootheca
- Orthoptera
- Orthopteroid
- ovipositor
- Phasmida
- raptorial
- stridulation
- thorax

Resources on the Internet

- www.entsoc.org** — This site includes links to just about any bug-related site on the Web.
- members.aol.com/YESedu/welcome.html** — The Minibeast World of Insects and Spiders site is a treasure trove of information on insects, with ideas for both teachers and students.
- www.sasionline.org** — The Sonoran Arthropod Studies Institute is a non-profit organization dedicated to arthropod research and education projects.
- www.nhm.org** — The Natural History Museum of Los Angeles County's web site includes pages devoted to the Insect Zoo

Suggested Reading for Educators

- Preston-Mafham, K., 1990. *Grasshoppers and Mantids of the World*. Facts on File, New York, NY.
- Ryan, L., 1996. *Insect Musicians and Cricket Champions*. China Books and Periodicals, San Francisco, CA.

TEACHER'S GUIDE BY:

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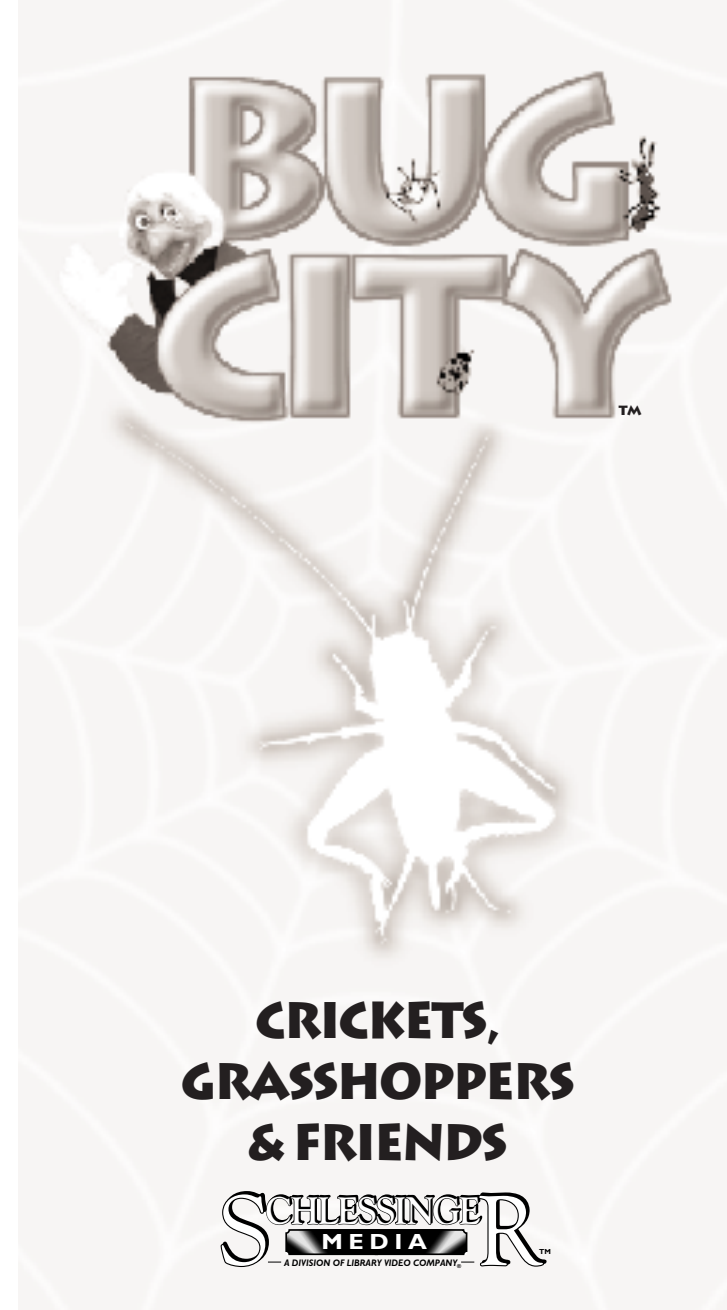
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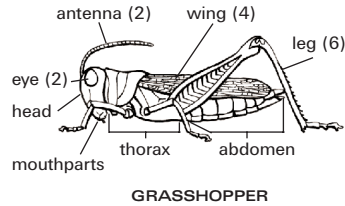
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**CRICKETS,
 GRASSHOPPERS
 & FRIENDS**



Imagine a group of animals that can jump 100 times their body length and scrape a “file” on one of their wings to sing at night. Some of these animals are masters of disguise, masquerading as leaves or twigs. Others can swivel their heads 270 degrees to search for prey. All of these animals are members of the order Orthopteroids, a group so big that it includes several suborders: Orthoptera, the crickets and grasshoppers; Mantodea, the praying mantids; and Phasmida, the stick insects.



GRASSHOPPER

Orthopteroids

Orthoptera means “having straight wings.” Many of the insects in this order have four long wings, though not all of them. Like other insects, Orthopteroids have a hard outer shell called an exoskeleton, six legs and three body parts. The head contains the sensory organs such as eyes, mouth parts and antennae; the thorax is the location of the wings (if any) and legs; and the abdomen contains the digestive, circulatory and respiration systems. All Orthopteroids have mouth parts designed for chewing. Stick insects are herbivores, consuming plants; praying mantids are carnivores, eating live prey; and some crickets are omnivores, eating both plant and animal materials.

Orthopteroid Life Cycles

All Orthopteroids have a similar life cycle. Like all insects, they develop from eggs. The larvae that emerge from the eggs resemble the adults, but they lack wings. As they grow, their wings slowly develop until they become adults, and at this point they are ready to reproduce. Grasshoppers lay their eggs in a pod called an ootheca in a tunnel in the soil, while stick insects drop their eggs to the ground from the branches of a bush or tree. Praying mantids form a protective foamy mass, also called an ootheca, around a clump of eggs and glue it onto a branch.

Crickets and Grasshoppers – Orthoptera

Crickets and grasshoppers are usually characterized by their huge back legs, designed for jumping away from danger. Most of these insects can also fly, although some species, like the Jerusalem cricket, are wingless and burrow in the soil. Grasshoppers have mandibles for chewing plants and in large numbers they can be crop pests. Crickets are nocturnal scavengers, searching for plant and animal matter while we are asleep.

Grasshoppers and crickets are more often heard than seen. On hot summer nights, male crickets chirp to attract females. On one wing crickets have a series of tiny pegs, like teeth on a comb, that rub against the ridge on the other wing, producing an audible chirp; this is called stridulation. You can imitate this action by running your fingernail down the teeth of a comb. Different species of cricket have differing frequencies of chirps. Female crickets, the silent partners, locate the best “chirpers” as mates. Because crickets have the habit of falling silent when we approach, it is very difficult to locate a cricket by its song. Female katydids answer the males’ songs with a click to signal their readiness to mate.

Stick Insects – Order Phasmida

The longest insect in the world is a stick insect, aptly named the giant stick insect. This branch-like creature measures a whopping 14 inches long, though most stick insects are one to three inches long. Stick insects are the masters of disguise of the insect world. They may resemble leaves, sticks or even spiny branches. These herbivores rely on their camouflage and statue-like pose to survive in the forest, though when disturbed they have a variety of ways to defend themselves. Some, like the jungle nymph, are covered with sharp spines that they will use to scratch their attacker. Others will flap their brightly colored wings to seem larger, while others can emit a skunk-like odor.

Stick insects of North America are thin and delicate. They are so well camouflaged that people may have them in their yard and may be unaware of their presence. These insects are not considered serious plant pests because of their slow-moving nature and small size. However, permits are required from state and federal agriculture authorities to keep exotic stick insects.

Praying Mantids – Order Mantodea

These solitary carnivores wait patiently for any insect to happen by, then strike with lightning speed. Their raptorial front legs, which seem to be held in a prayerful position, are lined with spines that seize and hold an insect as it is eaten alive. Mantids are predators with huge multi-faceted eyes and heads that can swivel about 270°, enabling them to spot an unsuspecting insect from a foot away and slowly move towards it. Mantids are cannibalistic and occasionally a hungry female may begin consuming the smaller male while mating. Mantids ordered from a nursery are easy to keep in a terrarium in the classroom, but need to be fed live insects every day. They will reject an insect if it is not moving, though they may sometimes be fooled by jiggling a freshly dead insect or bits of raw meat in front of them with tweezers.

Set Up a Classroom Cricket Colony

Crickets can be collected outside at night, though it is much easier to buy them at a pet store or a bait shop. “Pinhead” crickets are the youngest available and will survive several months in a classroom terrarium. Crickets are very active and will probably escape if picked up by the students, so they should only be handled by an adult. Their behavior in a colony is interesting to watch, but teachers might want to transfer them to smaller glass jars with lids to enable students to make and record observations about their body structures.

Materials

- Medium pet container or ten gallon glass tank
- Moist sand or potting soil
 - Note:** Moist potting soil can attract fungus flies, so cover the top of a cage with an open-weave cloth such as cheesecloth
- A plastic or metal jar lid to use as a water dish
- Toilet paper tubes for hiding places and a stick for climbing
- A variety of foods such as pieces of lettuce, apples, carrots, oatmeal and flaked fish food

Cover the bottom of the container with sand or potting soil about an inch deep. Fill the jar lid with water and place it in the center of the container. Add toilet paper tubes, the stick and the crickets. Add fresh food every day, varying the crickets’ diet from day to day. Remove dead crickets and uneaten food. The terrarium should be cleaned out every other week.

Extension

- Have students draw crickets and label the body parts. Mature males and females have two cerci, hair-like sensory structures at the tip of their abdomen. However, only females have an ovipositor, or an egg-laying tube. Are the crickets males or females?
- One or several crickets can be marked with white-out or a small dab of acrylic paint; follow their movements around the cage. Watch crickets interacting. How do they seem to communicate (they will touch antennae). Are any of them fighting?
- Crickets usually chirp at night, but you may hear them during the day. Watch crickets stridulating. Are they males or females? Why do they chirp? Do students notice any response from other crickets?