

Vocabulary _____

abdomen
arthropod
cephalothorax
exoskeleton
insectivore
thorax
vermicompost

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 _____

Gordon, David George, 1996. *The Compleat Cockroach*. Ten Speed Press, Berkeley, CA. The author of this book looks at cockroaches from a cultural perspective, tracing our repulsion and fascination with roaches as seen in art, comic books, movies and much more.

Appelhof, Fenton, Harris, 1993. *Worms Eat Our Garbage*. Flower Press, Kalamazoo, MI.

Kneidel, S. 1993, *Pet Bugs*. John Wiley & Sons, New York, NY.

Burnett, R. 1992, *The Pillbug Project*. National Science Teachers Association, Washington, DC.

TEACHER'S GUIDE BY: _____

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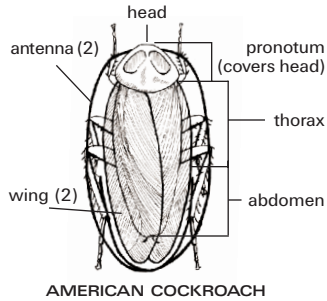
To collect and identify insects, you don't have to go on a collecting trip to some exotic locale. There are many arthropods (insects and their relatives) that are easily found in and around your own school or home!

The five major classes of arthropods include: insects; arachnids (spiders, scorpions and ticks); centipedes; millipedes; and crustaceans (lobsters, shrimp, pillbugs and crayfish). All arthropods are characterized by a hard outer shell, called an exoskeleton, and many jointed legs. Most arthropods are smaller than one inch and quietly live their lives under our noses but out of our sight!

The following is a simple chart illustrating the differences between the five major classes of arthropods:

Class	Number of Body Parts	Number of Legs	Identifying Characteristics and Behaviors
Insects	Three: the head, thorax and abdomen.	Six legs as adults.	Insects always have antennae, and some species have wings. Insects can be found during the day, though many species are nocturnal.
Arachnids	One or two: the cephalothorax and the abdomen.	Eight legs as adults.	All arachnids are predatory, usually feeding on other small invertebrates. Arachnids do not have antennae.
Millipedes	13-75 segments in their bodies. They are often rounded on the dorsal surface.	Two pairs of legs on each segment; the legs are short.	Millipedes are herbivores, feeding on decaying plants. They move rather slowly.
Centipedes	10-25 body segments. They are often flattened on the dorsal surface.	One pair of legs per segment. Their legs are longer than millipedes.	Centipedes are carnivorous, feeding on small invertebrates. They are venomous and should never be picked up.
Crustaceans	Two or more body parts.	Have five or more pairs of legs.	Many crustaceans live in salt water, such as lobsters, crabs and shrimp. Only pillbugs and sowbugs live on land.

Two of the most common residents in our yards, the pillbugs and sowbugs, are actually closely related to crabs, shrimp and lobsters. They are one of the few terrestrial crustaceans and because they have no way to seal moisture in their bodies, they live in damp, moist soil. A close examination of their bodies reveals that they have 14 legs and only one main body region. Pillbugs are known as "rolly pollies" because they have tightly fitting plates on their bodies and roll up into a tiny "pill" when disturbed. Their close relatives, the sowbugs, are slightly larger and are unable to roll up into a ball.



AMERICAN COCKROACH

There are some other "creepy crawlers" that may be familiar such as earthworms, slugs and snails. Like the arthropods, these animals are invertebrates (animals that lack an internal skeleton), but they are soft-bodied and do not have legs.

Cockroaches

Perhaps the most familiar and yet reviled insect in our homes is the cockroach. Cockroaches are related to grasshoppers and crickets. Like other insects, cockroaches have an external skeleton called an exoskeleton; they have 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; the abdomen contains the digestive, circulatory and respiration systems.

Cockroaches are ancient insects, existing almost unchanged on the earth for about 300 million years. There are actually 4,000 different species, most of whom live nowhere near humans. Though we dislike them because they like to eat all the foods that we leave behind, they play an important role in the ecosystem. Perhaps the most important function of the cockroach is that of the recycler. Dead plant and animal matter is broken down by the FBI: Fungus, Bacteria and Insects. These animals consume decaying plants and animal carcasses and return the nutrients to the soil where they can be used by plants. If the FBI weren't here to perform this necessary task, we would be up to our ears in dead plants and animals!

Cockroaches are a source of food for many insectivores, animals that consume insects. Some species of cockroaches, such as the German cockroach, are capable of completing their life cycle in as little as six weeks, and they have up to 48 young at a time. Thanks to all of the animals that eat cockroaches, only a few young cockroaches survive to reproduce.

Set Up a Pitfall Trap

Making a pitfall trap is an easy way to collect species of arthropods in your backyard. Since many of these animals are nocturnal, we may never know just who we share our gardens with until we catch them during their night-time wanderings.

Materials

- A trowel or small shovel
- Ten 12 oz. plastic deli cups
- Bait, such as slices of apple, carrots and moist pet food
- Large forceps

Select five different sites in moist or sandy soil on the school grounds or in your yard in order to set up your pitfall traps. Insects and other small animals tend to travel along walls and fences, so putting the traps in a shady spot at the edges of a yard is a good idea. Dig a hole just large enough to accommodate the whole deli cup, and place one of the cups in the soil, right up to the rim. Nest a second cup inside the first. This will enable you to empty the traps without destroying the holes. Place a bit of bait in each of the five cups. Try placing a slightly raised board or flat rock over each cup; invertebrates will attempt to hide under the rock and fall into the cup. Placing a few leaves in each cup will give the trapped arthropods something to hide under. Be sure to check the traps every day; your captives can die without water within 24 hours.

Bring some of the animals you find back to the classroom for examination. Empty the animals into covered petri dishes or a plastic container with a clear lid. Encourage students to look at the animals but not handle them if they are not sure if they bite or sting. Use magnifying glasses to look closely at each animal.

1. Determine which class of arthropod your animal is in. Is it an arachnid? A millipede?
2. What location in the yard yielded the most animals? Was it near a building or near the trees?
3. Which bait food was the most popular? Were more animals attracted to the pet food?

Have students use magnifying glasses to draw the animals. Try to identify the different body parts.

Release the animals within two days near where you found them.

Suggested Extension: Vermicomposting

Some of the animals that you find in leaf litter or the soil of your yard are recyclers, eating decaying plants and animals and returning them to the soil in the form of feces. Vermicompost is like a regular compost, but uses any combination of pillbugs, earthworms, cockroaches, ground beetles, and earwigs to make healthy soil. Find books in the library and set up a classroom vermicompost bin. Learn about the role that earthworms play in aerating the soil and enriching it with organic material. You can add the student's lunch scraps, and in 3 or 4 months time, have soil to plant in a garden.