

Vocabulary

abdomen
antennae
colonies
complete metamorphosis
crop
drones
exoskeleton
larva, larvae
nectar
nectaries
pollen
pollen baskets
pollination
proboscis
pupa, pupae
thorax

Suggested Internet Resources

Periodically, Internet Resources are updated on our Web site at www.LibraryVideo.com

www.nhb.org — The National Honey Board has a web site that includes recipes, honey facts, honey bee information and children's activities.

www.entsoc.org — This site includes links to just about any bug-related site on the Web.

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

Gould, J.L., & C.G. Gould. *The Honey Bee*. Scientific American Library, New York, NY; 1995.

Heinrichs, Ann. *Bees (Nature's Friends)*. Compass Point Books, New York, NY; 2002.

Llewellyn, Claire. *The Best Book of Bugs*. Larouse Kingfisher Chambers, New York; 2000.

Wilson, E.O. *The Insect Societies*. Harvard University Press, Cambridge, MA; 1971.

**BEES****Grades 1–6**

This guide is a supplement, designed for educators to use when presenting this program in an instructional setting.

Before Viewing: Research in learning suggests that it is important for the teacher to discover what the students know — or think they know — about a topic, at the start of a new unit, so that their accurate conceptions can be validated and reinforced, and their misconceptions identified and corrected. Therefore, create an "Everything We Know About..." list. Preview key vocabulary words and have students raise questions they hope will be answered by this program. Most importantly, students should be told to pay close attention to the show, so that after viewing the program, they will be able to tell whether or not the facts/beliefs they put on their list were scientifically accurate.

After Viewing: After a brief discussion about the program, challenge your students to prove or disprove the accuracy of the facts they put on their "Everything We Know About..." list. Discuss what else they learned and any additional questions they may have. Encourage students to research the topic further with the Internet and print resources provided.

TEACHER'S GUIDE

SARAH S. THOMPSON
Education Specialist — Insect Zoo
Natural History Museum of
Los Angeles County

ARTHUR V. EVANS, D.Sc.
Insect Zoo Director
Natural History Museum of
Los Angeles County

COMPLETE LIST OF TITLES

- ANTS
- AQUATIC INSECTS
- BEES
- BEETLES
- BUTTERFLIES & MOTHS

- CRICKETS, GRASSHOPPERS & FRIENDS
- FLIES & MOSQUITOES
- HOUSE & BACKYARD INSECTS
- LADYBUGS & FIREFLIES
- SPIDERS & SCORPIONS

Teacher's Guides Included
and Available Online at:

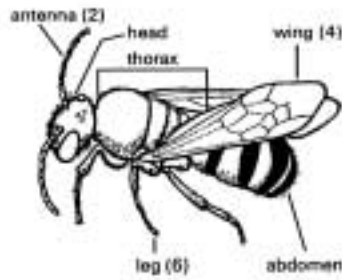
800-843-3620

Teacher's Guide and Program Copyright 1998 by Schlessinger Media,
a division of Library Video Company
P.O. Box 580, Wynnewood, PA 19096 • 800-843-3620
Produced and directed by David Yarnell Productions
Executive Producer, Andrew Schlessinger
All rights reserved

K6673



Imagine an animal community comprised primarily of females that are sisters. Each sister has a different job to do depending on her age, but they all work cooperatively to gather food, build their home and care for their younger siblings. These are honey bees, just one of the many types of bees found throughout the world. Most people think that all species of bees live in cooperative groups called colonies. Actually, of the 20,000 known species of bees, relatively few form colonies. Honey bees have been kept by humans for the past 4,000 years for the honey and beeswax they produce.



All species of bees are insects, complete with a protective external shell called an exoskeleton. All insects have six legs as adults, one pair of antennae and three body sections. The head contains the mouth parts and the sensory organs; the thorax contains muscles needed to move the legs and wings; and the abdomen is the location of the internal organs needed for respiration, digestion and circulation. In many bees the proboscis, or tongue, is adapted for probing into flowers. Bees undergo the drastic transformation of complete metamorphosis, with four distinct stages in their lives: egg, larva, pupa and adult.

Pollination

All bees, whether they are solitary or live in colonies, play a critical role in nature: they pollinate plants. Many flowering plants depend on bees and other insects to move their reproductive cells, pollen grains, from flower to flower. Only after it has been pollinated can a plant produce fruit, the vehicle for seed dispersal. Bees and other insects in turn depend on plants for protein-rich pollen and for nectar, a sweet liquid full of energizing carbohydrates.

Flowers have evolved their beautiful colors not for humans, but for their pollinators. When viewed under ultraviolet light, some flowers have "runways," or markings that insects can follow to reach the flower's nectaries and pollen. Bees have bodies that are adapted to efficiently exploit a flower's resources: their long tongues can reach deep into the flower's nectaries, and the hair on their bodies traps pollen. On their third pair of legs some bees have a group of longer, thicker hairs, called pollen baskets, where the bee packs clumps of pollen for the return trip to the nest.

2

Honey is actually concentrated flower nectar. A honey bee sips nectar from a flower and stores it in her crop, a food storage organ similar to a stomach. She returns to the hive and regurgitates the nectar into another bee's mouth, who partially digests the nectar then regurgitates it into cells of the hive. Flower nectar is 80% water, so the house bees must flap their wings until 61% of the water in the nectar is evaporated and the nectar becomes concentrated. The resulting honey is used to feed the entire hive, especially during the winter months, when the flowering season is over.

Social Bees

Honey bees have the most advanced social behavior of all bees. A queen is the founder of a hive and the only female capable of reproducing. Most of the thousands of eggs she lays in her lifetime will develop into sterile females, or workers. Female bees follow a progression of different jobs as they age. The youngest bees are house cleaners, keeping the hive neat and disposing of any deceased sisters. After three weeks, they serve as nurse bees, feeding the developing larvae pollen collected by their sisters. Later, they will perform the duties of guarding the nest, making honey from nectar and producing beeswax for building cells in the hive. At the end of their lives they will serve as field bees, collecting nectar and pollen for the hive. To rear another queen, workers first build special larger cells hanging below the rest of the comb. The current queen lays an egg in a queen cell, and the workers feed the developing larva only protein-rich royal jelly. Male bees, called drones, develop from unfertilized eggs and do not participate in the hive's activities; their only role is to mate with new queens outside the hive. Most honey bees live for less than a year, though queens may live as many as five years.

Solitary Bees

The majority of bee species are solitary. They build smaller nests and, other than providing a food source, do not care for their young. The carpenter bee gets her name from the tunnel-shaped nests she excavates in rotting wood. She places a ball of pollen at the end of the tunnel, lays an egg on it, then seals up the chamber with a mixture of saliva and wood. She repeats this process three or four more times, creating a separate chamber for each egg. Her larvae will hatch out of the eggs and feed on the protein-rich pollen, then pupate in their cells. The bee at the far end of the tunnel must wait until her other siblings hatch out before she can chew herself out of the nest. Other solitary bees, such as alkali bees, dig their nests in clay soil, building multiple chambers for their offspring. These bees also provide their brood with a food source but do not actively care for them.

3

Build Your Own Bee House

Solitary bees are constantly searching for suitable nesting sites. You can attract solitary bees to your school yard without worrying about the danger that a honey bee colony might pose. Because of their pollination activities, bees are welcomed by local gardeners.

Materials

- A 4" x 5" block of wood
- An electric drill with a 5/8" bit

What to Do:

1. Teacher only! Drill several holes in a horizontal line several inches into the block. Do not drill all of the way through the block.
2. Attach the block firmly to a fence post or a low tree branch. If bees move in, you will see the females going in and out of the block, provisioning their nests, until they seal up each hole with wood pulp. After six or eight weeks the young bees will chew exit holes in the pulp to escape.
3. Later, when the bees have vacated the nesting block, you can use a hand or a table saw to cut the block in half along the horizontal line and see a cross-section of the chambers. Look for the walls of each cell, pupal cases, shed exoskeletons, and the bodies of any bees that didn't survive.

Alternative: Box of Straws

A simple box of plastic drinking straws will be an attractive home for not only bees but other insects and spiders. Simply take off the entire top of the box and tape it to a low tree branch or near the ground on the side of your school building. Check the box of straws periodically to see if any insects or spiders have moved in.

Suggested Extensions

Explore different products that have been made from honey and beeswax. Supermarkets often stock different flavors of honey such as clover or orange blossom. You can do a classroom taste test and chart which honey is the most popular. Health food stores often stock other bee products such as royal jelly, honeycombs and beeswax candles.

Often local bee keeping organizations will conduct education programs in schools. Find out if any beekeepers have exhibition hives (a hive with glass walls) or would be willing to visit the classroom to talk about bee keeping.

4