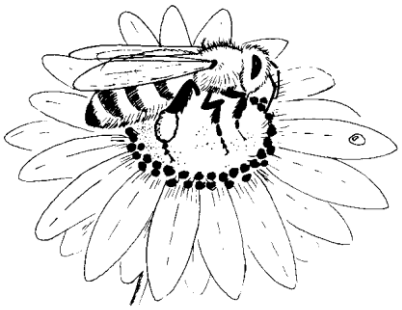
Activity: **Honey Bee Adaptation**



Grade Level: Grade 5

Major Emphasis: Invertebrates and Their Environments

Major Curriculum Area: Science

Related Curriculum Areas:

Refer to Outdoor Education Curriculum Matrix 3-5:
- Science
- Mathematics
- Language Arts
- Human Relations
- Social Studies

Program Indicator:

The students will compare various types of invertebrates in terms of their adaptations to the environment.

Student Outcomes: The student will:

1. demonstrate safe and proper use of stereo and zoom microscopes.
2. observe the behavior of honey bees by completing a behavior checklist. (Refer to Supplement A)
3. define "adaptation" and will give examples of adaptations using the honey bee.
4. observe various bee body parts and their functions using microscopes.

Readiness: (DL2,3,4)

1. Introduce vocabulary:

physical adaptation	drone	pollen basket	poison sac
behavioral adaptation	queen	mandible	cell
head	fanning	cleaning	nectar
thorax	building	supersedure	pollen
abdomen	wax gland	proboscis	clustering
worker	antennae	stinger	swarming
nurse bee	foraging	guarding	

2. Discuss the unique nature of the honey bee colony using the SVE Honey Bee Study Prints. How is it different from other insect communities, i.e., paper wasps, ant colonies, yellow jackets?
3. Complete the Fifth Grade Unified Science Unit on invertebrates.
4. Review the concept of adaptation (physical or behavioral) in the natural world. Use invertebrates as examples.

Materials:

demonstration hive	magnifying boxes (large)	bee study prints
bee plastomounts	stereo microscopes	bee posters
bee microscope slides	preserved queen, worker and drone	bee tree

Procedures:

Note: This activity can be divided into two sections:

- *Observation of bee behavior in the observation hive and bee tree.*
- *Identification of physical characteristics using bee slide and whole, preserved bees.*

These can be done as one big group or 2 smaller groups.

Activity A: Bee Behavior (DL2)

1. Have students share what they know about bees.
2. Review various honey bee behaviors using the **Study Print Cards** and demonstration hive with photos of bee behaviors. Use the learning station, "Daily Life in the Hive," to illustrate honey bee roles and behaviors.
3. Have the students work in pairs for observation of bee behavior at the 3 indoor hives.
4. Have students observe and record their observations at the hives. Because one of the hives is man-made (frames) and the other is a natural hallowed out tree, observation time can be divided, between the two types of hives.
5. Have students use the behavior checklist in this packet to observe different behavior (Refer to Supplement A).

Activity B: Bee Anatomy (DL2) *(there are laminated copies of Supplement B to reuse)*

1. Each student should use a stereo microscope to observe a whole, preserved bee. Students should try to locate and identify the head, thorax, abdomen, proboscis (if visible) and other body parts. The student should identify the specimen as queen, worker or drone.
2. The student should complete the attached physical adaptation sheet (Refer to Supplement B). Have students label the head, thorax, abdomen, wings, proboscis, stinger, legs (one with pollen basket), antennae and eyes of the bee sketch in Part A of the sheet.
3. Each student should use a stereo microscope to observe the following honey bee slides: whole body (including chewing mouth parts), three legs (one with pollen basket), stinger and poison sac, and wing.
4. In Part B (lower portion) of Supplement B, the student should draw a leg (with pollen basket), a wing, a stinger, proboscis, and mandibles of the bee and briefly describe how they are used.

Summary:

1. Discuss the role and importance of honeybees in the environment.
2. Discuss the Chesapeake Stewards question and how students can help honeybees.
3. Identify the most frequently observed behavior.
4. How do you predict the behavior will change as the seasons change? **(DL3)**
5. How would you describe the most interesting body part you observed?

Follow Up: (if time allows)

1. Use a graphic organizer to list and explain the physical adaptations of the honey bee to its environment, then write a summary (Refer to Supplement C).
2. Explore an outdoor beehive using the beekeeper's equipment and observe the special structural and behavioral adaptations of the honey bee.
3. Research the stinging behavior (and treatment) for the honey bee, wasp, yellow jacket and hornet. Present an oral or written report to the class. **(DL4)**

Extension Activities: (classroom)

1. Art: Construct a puzzle using bee body parts and have the students label the part.
2. Language Arts: Have the students write a story about a day in the life of a worker bee or a queen bee. Specify the age of the bee since the roles of the bees change during their lifespan. Use a story map.
3. Social Studies: Have students investigate how beekeeping methods have changed over the years.
4. Use honey bee products in a cooking activity.
5. Have students investigate the defense behavior of African honeybees and how they differ from honeybees in America. Possible resources: Ranger Rick magazine, newspaper articles. **(MC)**

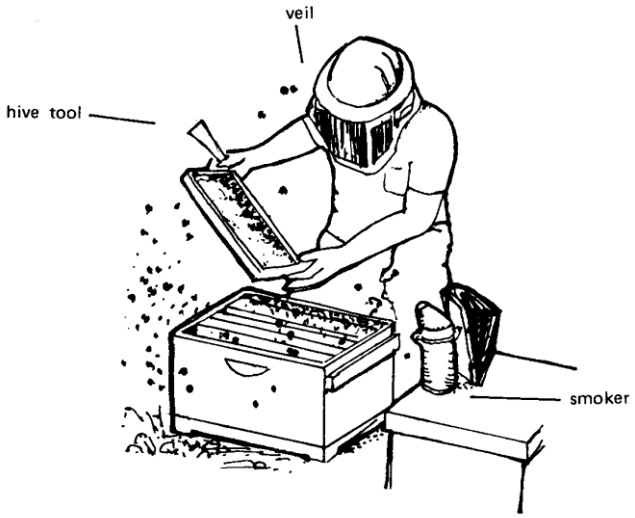
Teacher Resources:

Books:
< *Mastering the Art of Beekeeping, Aebi.
< *Bees and Wasps, Cloudsley.

Filmstrip Kits:
< *Beekeeping.
< *Honey Bee Anatomy and Life Cycle.

Slides:
< *Beekeeping at Arlington Echo.

Supplementary Materials:
< *Honey Bee Guidebook.
< Honey Bee Study Prints, SVE.



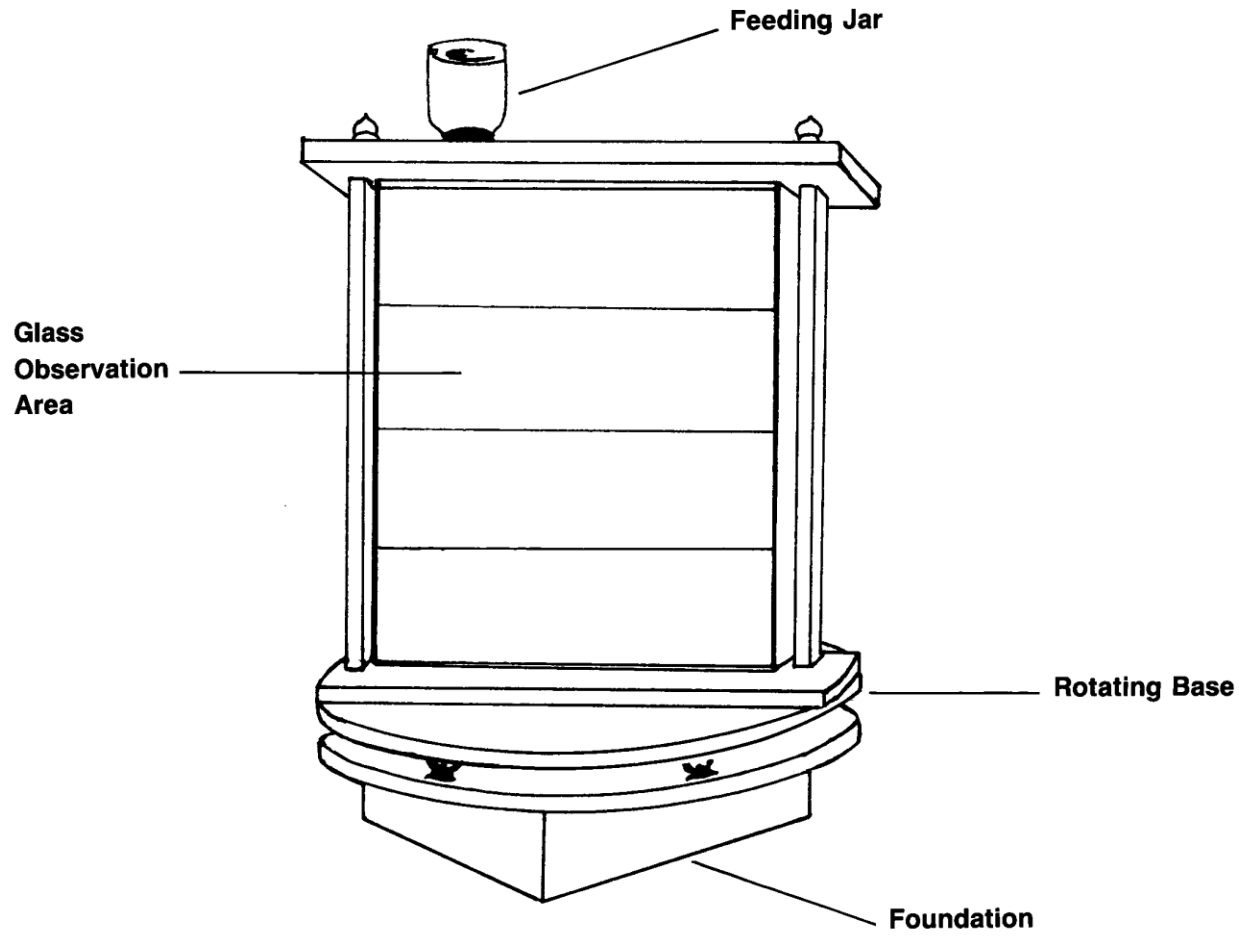


Fig. 1: Honey Bee Observation Hive

Helpful Hints:

1. Remove the wooden panels to observe the hive only when you are ready to have students observe the bees. *Note: Bees prefer the dark so only leave the covers off when actively viewing. Keeping them closed in the beginning of the activity will also help keep the students focus.*
2. Feeding jar on top of the hive is glass, be careful not to knock it off.

Bee Behavior Checklist

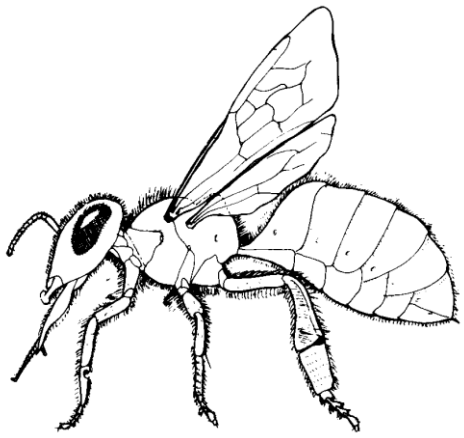
Observation Time of day: _____ Air Temperature: _____ Date: _____

Weather Description: _____

Behavior	✓ Observed	Notes
Worker feeding larvae		
Cells with pollen stored		
Cells with nectar		
Worker fanning hive		
Bee dance		
Worker bringing pollen to hive (pollen baskets on legs)		
Food storage (pollen from bee legs to cells)		
Hatching bees		
Clustering (winter)		
Worker bees carrying dead bees (cleaning)		
Queen laying eggs		
Workers sharing food (nectar)		
Drone bee		

Physical Adaptation Data Sheet

Look at the bee in your stereo microscope and identify (worker, queen or drone). Label the head, thorax, abdomen, wings, proboscis, stinger, legs (one with pollen basket), antennae and eyes in the sketch below.



Look at the honey bee slides under the zoom microscope. Fill in the chart for each body part.

Body Part	Sketch	How is it used?
3 legs (one with pollen basket)		
Wing		
Stinger and poison sac		
Mouth parts: ! Proboscis ! Mandibles		

Honeybee Fact Sheet

Honeybees have a very important job of pollinating flowers and plants so that we can have the fruits and vegetables that we eat.

3 types of bees in the hive:

Queen: Her job is to lay eggs to make more bees. The hive senses her and if she was not present the hive would not survive. She can live 2-3 years

Worker: All the females. They do all the work of collecting nectar and pollen, making honey, cleaning the hive, feeding and caring for baby bees. Once they sting, they die. They can live up to 45 days.

Drone: All the male bees in the hive. They have no stingers. They fly out and mate with a queen of another hive. They can live up to 45 days but are not around during the winter months.

Food sharing and gathering: honeybees collect nectar from flowers using their long straw like tongue called a **Proboscis**. As they fly around some pollen gets collected in their "pollen baskets" and is delivered to other flowers which is how they pollinate them.

Honeybees use non-verbal communication. They use a "Bee Dance" to communicate the location of the nectar and pollen to the other bees. A circle means that it is **near** and a figure 8 means that it is **far**.

Nectar and Pollen are brought back to the hive and stored in the cells (this can be seen in the observations hives. Nectar is shiny and pollen is yellowish)

Baby bees are called **brood.** They go through metamorphosis. They start as an egg, then go to the larva stage (looks like a worm, then pupa then it emerges as a baby bee.

Division of Labor:

Workers go through jobs as they get older which can be compared to people's jobs in the family:

1. Young bees might first have to help clean up around the hive
   Young children might have to help clean up around the house or put away their dishes
2. Slightly older bees help take care of the baby bees, feeding them
   Slightly older children might have to help watch their younger siblings
3. More mature bees have to go out and collect nectar and pollen to bring back to the hive
   Teenagers that can drive might have to help get groceries at the store for the family
4. Mature bees guard the hive and protect it from predators or bees trying to rob their honey
   Mature adults protect their family and guard the house