ANT BEHAVIOR – Teacher's Guide

DESCRIPTION:

Students observe the behavior of ants at the entrance of an ant colony and relate this activity to temperature. This study can be done for one to several days or it can be continued throughout the school year.

GRADE LEVEL:

7th

OBJECTIVES:

Students will:

- Observe and record the behavior of ants around an ant colony during the school year.
- Draw conclusions about the behavior patterns of a species of ant during the year and how the behavior relates to temperature.

NEXT GENERATION SCIENCE STANDARDS:

This activity supports the following Performance Expectation:

MS-LS1-4. Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.

This activity is aligned with the three-dimensional learning model of NGSS.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations Analyzing and Interpreting Data	LS1.B Growth and development of organisms	Patterns Cause and Effect

COMMON CORE STATE STANDARDS:

English Language Arts

RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Mathematics

7.RP.A.2. Recognize and represent proportional relationships between quantities.

7.SP.A.1. Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

MATERIALS:

- Ant Behavior Data Sheet [1 per student]
- Stopwatch [1 per group]
- Thermometer [1 per group]

BACKGROUND:

All insects (including ants) are ectothermic (cold-blooded), so their activity is dramatically affected by ambient temperature. However, they still have the ability to regulate their body temperature behaviorally. For example, some insects orient themselves perpendicular to the sun's rays in the morning to absorb heat, and parallel to the sun's rays later in the day once temperatures become too warm.

In several desert environments, there are ant species that seem to tolerate hot temperatures better than other species. These species, called "thermophilic" species, tend to have one or several behavioral and physiological characteristics. Many have long legs, which are thought to raise the ant's body off the hot surface of the ground. Many thermophilic species are also fast; this is thought to minimize their exposure to the sun. Finally, some species rest in thermal refuges, areas such as on the stalks of vegetation where it is slightly cooler. The ants can remain in these refuges until their body temperatures decrease.

Most ants live in-ground colonies with a queen and workers (sterile females); the males (drones) are only present for a short time. In spring or summer, winged female and male ants fly from the colony to mate. After mating, the males die and the females lose their wings, and they become egg-laying queens.

TIPS FOR ENTIRE CLASS PARTICIPATION:

- This study is designed to be done on just one ant colony, with different students collecting data during each observation period.
- Alternatively, you can locate multiple ant colonies and have students work in groups, with each group doing simultaneous observations of their colony. Data can then be averaged, or each group can graph data for only their colony throughout the year.

PROCEDURES:

1. Introduce the question students will be investigating: Does temperature affect ant behavior? Have students make a hypothesis and write it page one of their handout. Explain that we can't observe every single ant, so we will be looking at a smaller *sample*. This can give us information about the *population* of ants.

2. Locate an ant colony in your schoolyard. Be very careful to not disturb the colony.

3. Have students identify the ant species (or describe the characteristics of the species) and record this information on the Ant Behavior Data Sheet.

4. Have students make observations on the ant colony at times of varying outside temperatures. This could be done over the course of one day, several days, or the entire school year. Students will be observing the ant colony for three minutes during each observation period.

5. During each three-minute observation, students will complete the following tasks:
    a. Have one person in the group start the stopwatch.
    b. Record the number of ants <u>leaving</u> the colony.
    c. At the end of each observation, use the thermometer to determine the temperature.
    d. Record these values on the Ant Behavior Data Sheet. See Figure 1 for an example of what students may record.
    e. Stop observations when timer has reached three minutes.

6. Graph the data (number of ants leaving the colony and temperature) on the Ant Behavior Graph. See Figure 2 for an example graph.

<u>Ant Behavior Data Sheet</u>

Location of ant colony: North of café fire exit

Ant species: Rough harvester ant

Description of species: Brownish-black ant with small hairs over whole body

Date	Time	Number of Ants Leaving Colony	Temperature (°C)	Humidity (%)
Feb. 10, 2022	10:00 AM	0	6.8 °C	15%
Feb. 24, 2022	10:00 AM	0	6.5 °C	14%
Mar. 10, 2022	10:00 AM	2	19.8 °C	20%
Mar. 24, 2022	10:00 AM	2	18.9 °C	36%
Apr. 7, 2022	10:00 AM	15	25.1 °C	31%
Apr. 21, 2022	10:00 AM	7	34.8 °C	26%

Figure 1. Example Ant Behavior Data Sheet

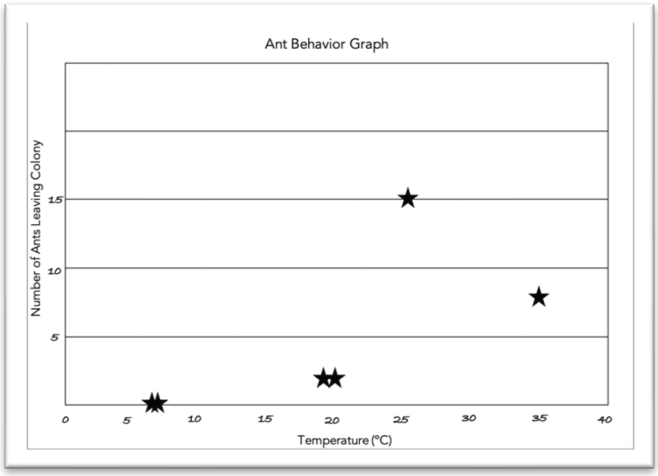


Figure 2. Example Ant Behavior Graph

<u>CONCLUSIONS:</u>

Allow students to draw conclusions from the data sheets and graph. Students should answer the following question:

- Does the temperature have any effect on the number of ants leaving the colony?

<u>EXTENSION:</u>

Use a thermohygrometer to examine ant activity in relation to humidity.