The Diversity and Food Preferences of Foraging Ants

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Grade levels targeted: 5-8

National Science Education Standards: Populations and ecosystems, Diversity and adaptations of organisms, Understandings about scientific inquiry

Entomology Literacy Elements addressed in this activity:

Element I - Explain how insects provide environmental services to humans

> This activity shows how ants are a dominant organism in terrestrial and urban habitats.

Element II - Develop ability to use insects in inquiries and provide examples of insects' investigative value.

> This activity demonstrates the ability to assess biodiversity in a region using ant species diversity.

Element IV - Insects shouldn't be controlled without considering risks and benefits

> This activity demonstrates that even a relatively small habitat supports a large variety of ant species and consideration should be given whether to use insecticides in that area.

Element V: Appreciate that Insects have Aesthetic Value.

> This activity reveals the variety of shapes, colors and characteristics of the different ant species encountered by the students.

Observations:

Ants are one of the most abundant arthropod groups in both natural and urban environments. It is estimated that in North America alone there are 1,000 ant species which vary in size, behavior and life-history. These species range from minute, pale yellow slow-moving dwarves to large, shiny-black runners. Ants make use of different nesting places, utilize different food sources and display different levels of aggressiveness and the ability to recruit nest mates when food is found.

This abundance of ant species means that almost necessarily members of several ant nests will forage in the same territory. Since ant workers do not have wings, they look for food in the same habitat – on the ground, on walls and trees and under leaf-litter. Animals that are related and share the same habitat either compete with one another or utilize the available food in different ways.

Since ants are small and not easy to locate, scientists have two main ways to estimate ant diversity: (a) They can use pitfall traps and catch ants that unintentionally fall into them or (b) They can lure ants with tasty baits, and see how many ants arrive to feed on these food items.

Question(s):

How many different ant species or ant genera forage in the home or school's vicinity? What type of food will they be attracted to? Would some ant species be more efficient foragers than others?

Hints to form hypothesis:

Think about the different ants you encounter around your house and yard. Are they all the same color? The same size? Do they all move at the same speed? What other differences could there be between different ants? Think what characteristics of ants would make them better at finding food and moving it back to their nest. While accurately identifying ant species is very complicated, characteristics such as size, color and speed can help you classify ants into groups, which might represent species.

Hypothesis:

In the same environment there are usually several or many ant species that live side by side. These ants vary in size, speed, aggressiveness, the kind of food they prefer etc. and thus not all ants that live in the same area compete with one another for food.

Materials needed

- 3 hard-boiled eggs, shredded
- 3 spoons of sugar
- 3 small pieces of plastic
- A small vial of sugar water
- 3 spoons of peeled sunflower seeds (or other seeds)
- Magnifying glass (optional)
- Digital camera (optional)
- Small glass vials for holding ants (optional)

The Experiment:

- Start the experiment in the morning, because many ant species are not active when temperature is too high.
- Find an open space, perhaps in your yard or a nearby park. Place a small sign requesting people not to touch or disturb the experiment. Place three "feeding stations" in which you place a shredded boiled egg, a spoon of sugar, a plastic sheet with drops of sugar water and the sunflower seeds. In every station, it is important to randomize the relative places of the different ant-baits.

- The baits should be set apart by one meter (3 feet) and the 3 different stations should be placed at least 10 meters (30 feet) apart. Nevertheless, try to make the settings in which you place the feeding station as similar as possible.
  - The settings (shaded/light, amount of plants, number of stones) need to be as similar as possible to ensure that the diversity of ants we find is not caused by the settings, but exists within the same type of environment.
- Come back to the feeding stations every 15 minutes. Write down the types of ants you see (size, color, speed, special attributes) around the different baits. Note whether you see baits with several ant types around the same piece of food. How are they behaving? Are they fighting?
- If possible, take a sample from the different ant types and photograph them.
- Try to estimate the number of ants near every type of bait – not an exact number, but is it just several ants? 10? 50?
  - Example: Site #1, Time: 30 minutes, *Egg* – 5 small red ants, 3 small quick black ants; *Sugar* – 20 small red ants; *Sugar water* – 20 very small yellow ants
- Continue sampling every 15 minutes for 120 minutes (overall, you should visit your sampling sites 7 times).
- Every feeding station is a replicate of the experiment, that is, the experiment should be exactly the same in all three stations.

Results:

Present the results of the number of ants for the different baits in a series of line charts (Figure 1a) and of the number of ant groups (which may represent species) in a bar graph (Figure 1b). Present a table of the different ant types you have identified near the various baits (Figure 2). If you have results from all three feeding stations, try presenting your results on one chart as means of the results in the different replicates.

Discussion:

Discuss your results, both regarding the diversity of ants you found and the difference between different ant types and different baits. Do you think the ants you found compete for the same type of food? Which group of ants seems to be a better competitor and why?

Optional Extension of the Experiment:

Try conducting this experiment once in the morning and once at noon hours and compare the different diversity of ants active at these hours.

References

Photographs of North-American ants: http://myrmecos.net/north-american-ants/

Key to identifying common household ants:
http://www.ipm.ucdavis.edu/TOOLS/ANTKEY/

Key for advanced identification of ant species (requires the use of a binocular):
http://www.sbs.utexas.edu/muelleru/AntOutreach/AntIDKey/index.html

Estimated time required to conduct the experiment:

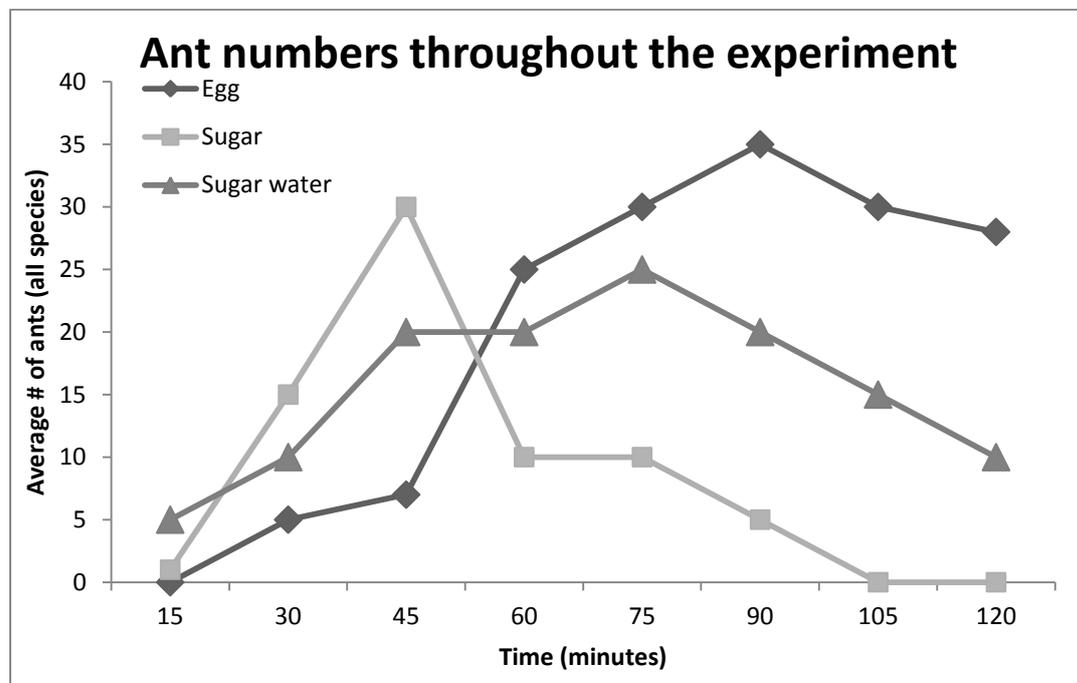15 minutes to set up and then 120 minutes of observation.

Estimated Cost: <10$

Contact:

For help or more information about this project, please contact the author – Matan Ben-Ari at matbenari@gmail.com.

Figures
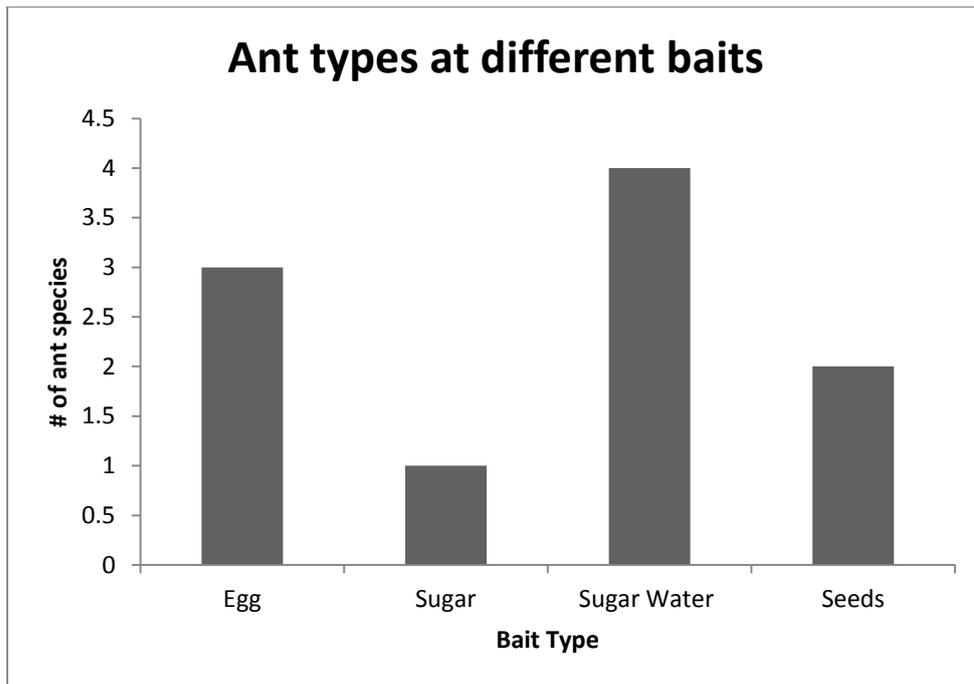
Figure 1 – Charts created in Microsoft Excel

A

B

Ant types at different baits

Figure 2 – Table created using Microsoft Word

Seeds					
Picture	Size	Color	Speed	Behavior	Comments
	Large – 5 - 10 mm	Black	Slow	Not aggressive	First to arrive, first to leave
	Large	Black and red	Very fast	Aggressive, always checking for enemies	Came late, after most seeds were gone

Pictures: http://www.flickr.com/photos/fourmis/6996390046/, http://antclub.org/node/195