

**BECOMING AN ECOLOGIST:
Investigation Into The Life Cycle Of The 17-Year Cicada**

Information for teachers

by Kathleen Moran (Cornell University)

Overview

This lab is meant to help students gain experience and develop an understanding of elements of scientific inquiry through the study of an ecological phenomenon. It can be a good way to introduce or conclude an ecology unit.

Subject and Audience

This lab is written specifically for ninth and tenth grade living environment classes. However, it can be used in any biology class that include a unit on ecology and/or require an understanding of the scientific process and the nature of that process.

Time required

Two consecutive days

- Students should read the first two pages of the lab and answer the questions before day 1.
- Introduction, in which teacher should talk about cicadas and go over students responses to the questions, can take from 10-15 minutes.

Background

Magicalicadas are a genus of cicadas that emerge from the ground every seventeen years. They emerge only to find a mate and reproduce. They die shortly after this objective is accomplished. When cicadas finally do emerge, they emerge by the millions in many areas. In observing this ecological phenomenon, scientists developed a hypothesis to explain this life cycle strategy. This hypothesis is called the predator satiation hypothesis. It states that a large population decreases the per capita chance of predation for individuals. Since cicadas have no anatomical defense mechanisms, strength in numbers is an important survival strategy for the species.

Testing this hypothesis can easily be done in a classroom environment. Using popcorn kernels or anything similar, students can test how many kernels get preyed upon as different amounts become available. The relationship that will be observed is that the number of kernels preyed upon will increase as the number available increases and eventually level off. The percentage of kernels preyed upon will decrease as the population increases.

This lab is written to familiarize students with many of the elements of scientific inquiry, as well. It also requires students to begin thinking about ecological concepts such as competition, predation and defense.

Learning and Behavioral Objectives

Students will:

- Become familiar with elements of scientific inquiry
 - Observation, prediction, interpretation
- Develop a more advanced understanding of the term “Hypothesis”
- Analyze observations of *Magicicada septendecim*
- Use the Predator Satiation Hypothesis to predict the results of a classroom procedure
- Gather data
- Interpret the results of a classroom activity (using graphs)

National Science Education Standards Addressed

- Science as Inquiry
 - Abilities necessary to do inquiry:
 - Identify questions and concepts that guide scientific investigations
 - Use mathematics to improve investigations
 - Formulate and revise scientific explanations and models using logic and evidence.
 - Understandings about inquiry
 - Scientists conduct investigations for a wide variety of reasons. For example, they may wish to discover new aspects of the natural world, explain recently observed phenomena,
- Life Science
 - The behavior of organisms
 - Like other aspects of an organism's biology, behaviors have evolved through natural selection. Behaviors often have an adaptive logic when viewed in terms of evolutionary principles.
 - The interdependence of organisms
 - Organisms both cooperate and compete in ecosystems. The interrelationships and interdependencies of these organisms may generate ecosystems that are stable for hundreds or thousands of years.

Assessment Strategy

- Students’ answers to the lab should be looked at.
- Their ability to complete part 2 of the lab will be based on their understanding of part one.
- A discussion of the discussion questions and results could help the teacher get all the objectives across

Teaching Tips/Potential Problems

- A great way to start the lab is to talk about Magicicadas. It will help to grab students’ attention. Background information and pictures are available at <http://members.fortunecity.com/cicadaman1999/id38.htm>

- For part two, adaptations can include
 - Reduced size—using rice or lentils instead of popcorn kernels
 - Spreading out—Using four sheets of paper instead of one
 - Camouflage or hiding—using gravel and popcorn kernels together
 - Increased digestion time—students have to count to three before putting the kernel down

Work Cited

Great Lakes Cicada Page:

<http://members.fortunecity.com/cicadaman1999/id38.htm>