Hands-On Activity

Modeling Natural Selection: Owls and Field Mice

We know from molecular, anatomical, and fossil evidence that species have changed over time. This change is called evolution. But how does evolution actually occur in nature? In this lab, you will model one mechanism of evolution called natural selection. You will represent the predator, an owl in search of field mice. Your group will "consume" all the field mice that you can easily see until only 25 percent of the population remains. These surviving field mice will then reproduce. As with the orchid mantises, the mice will pass on an important trait for survival to their offspring. You will continue the process for several generations of mice, with some being consumed and others surviving to pass on the traits that made them successful.

PREDICT

How does a population change as a result of natural selection?

PROCEDURE

1. Spread out the fabric habitat given to you on the tabletop.
2. Count out 20 pieces of paper of each of the five different colors for a total of 100 pieces. This will be your initial population of field mice.
3. One person should spread the pieces out randomly over the entire fabric habitat, making sure that none of the pieces cover the others. The remaining members of the group should not watch this process.
4. The other members of the group are now owls. They should pick up 75 pieces (field mice) as they see them, one by one, until a total of 25 of the field mice remain in the habitat. Be sure to count carefully.
5. Carefully shake off the habitat to remove the surviving mice (a total of 25).
6. Group the survivors by color and record the numbers in your data table. See Figure 3 for an example data table.
7. Next assume that each survivor has three offspring. Place three additional pieces of the same color with each survivor. Record the number of each color in the table. Note that there should again be 100 total pieces.
8. Mix up the new set of pieces and have a different person spread them over the habitat.
9. Repeat the entire process (Steps 3 to 8) two more times, making a total of three generations of field mice being preyed upon.

Analyze Explain how you will model predation in this activity.

FIGURE 2: Barn owls are predators. They feed mostly on small mammals, such as mice, voles, and shrews.

MATERIALS

- construction paper, five colors
- piece of fabric

DATA TABLE

FIGURE 3: Effect of Predation on Field Mice Populations Over Time

	Color 1	Color 2	Color 3	Color 4	Color 5
Number at start	20	20	20	20	20
Number after first predation					
Number after first reproduction					
(Add rows for two more generations.) ⬇					

ANALYSIS

1. Graph your data. What patterns can you identify in the data?
2. Which traits appear to be the most beneficial for survival in this environment? Explain your answer.
3. Explain why the number of some mouse varieties increased over time while others decreased.
4. How do you think the data would have changed if the experiment were continued until a total of five generations of field mice were preyed upon?

FIGURE 4: Mice can reproduce rapidly. The large number of offspring must compete with one another for resources.

Mice can reproduce rapidly. In fact, their population could increase exponentially if given enough resources and few predators. However, the greater the population, the more individuals must compete for resources such as food, water, and mates. In addition, mice must escape predators to survive long enough to pass on their traits. Any traits that help them survive and pass on their genes are considered beneficial in this environment. Natural selection is a mechanism by which individuals that have inherited beneficial adaptations show differential reproductive success.

If the environment were to change, the traits that are beneficial could also change. If the grass in a field were to change colors due to a change in weather, different traits would be "selected for." This does not mean that nature actually "chooses" traits. It simply means that some traits are passed down more often than others because organisms with those traits are better able to survive and reproduce more than others in their population.

Explain Answer these questions about the concepts explored in this activity.

1. Name an animal that uses camouflage to avoid predators. What habitat is it most likely to survive in? What are some other traits that could help an animal survive in the presence of predators?
2. What kinds of resources might field mice compete for? What types of traits would give a field mouse a competitive advantage over other members of its own species?