Natural Selection Lab
Evolution
Honors Biology
Lindemulder

Introduction

The basis of Darwinian evolution is the theory that the organisms with the most favorable features for a particular environment will survive. In other words, the fittest will survive. Naturally, only those who survive will reproduce young. These young will have features similar to their parents. Thus, over a period of many generations, the predominant features in a population can change, reflecting the features possessed by the members of the population that survive.

The data for this phenomena can be found by examining the results of a rare and classic exception to this rule, the peppered moth, studied by an English scientist, Dr. Kettlewell. In this study, Dr. Kettlewell showed that the coloration of the moths in the forest outside Manchester had changed from being predominantly dark to predominantly light in about 100 years.

Before the Industrial Revolution in England began to blacken the bark of trees with smoke and soot, the predominant variety of peppered moth had a light-colored, speckled wings that blended perfectly with lichen covered tree bark and camouflaged the insects against predatory birds: A mutant moth with black wings was easily spotted against the light-colored tree bark. In fact the first black moths were so rare that the first one was not captured until 1848. As tree trunks become progressively darker, it became easier for birds to see and prey upon the light speckled variety of the peppered moth. By 1900, the black peppered moths outnumbered the light speckled variety by 99 to 1. In a survey conducted near one industrial town between 1952 and 1964, not one light speckled moth was found. However, humans have once again impacted the course of this evolution. With the passage of pollution control laws in England in the 1950s, the landscape is becoming cleaner. The cleaner trees now provide a lighter and safer resting place for any surviving light speckled moths. From 1966 to 1969, a survey in the same town showed that of the 972 specimens collected, 25 were of the light speckled variety which is a clear indication that the peppered moth is again in the process of changing its color.

This experiment will show that nature selects out the fittest to survive. In one experiment you will be given a tray with a dark background and a collection of moths in nine varying intensities. In the second experiment, you will be given a tray with a light background and a collection of squares in seven different sizes.

Materials

Light and dark environmental trays, sets of moths, sets of squares

Procedure

1. If your tray has a dark background, one group member should place the moths into the tray and spread them out. Another group member must then quickly select five moths, one at a time and set those moths aside.
2. If your tray has a light background, one group member should place the squares into the tray and spread them out. Another group member must then quickly select five squares, one at a time and set those squares aside.
3. Record which moths or squares were collected by making tally marks in the table provided.
4. Replace the moths or squares back in the tray and mix up the contents of the tray.
5. Repeat steps 1-4 four more times.
6. Obtain the type of tray you did not have in your first trial and complete steps 1-5.
7. Record class data on the board.

Data Chart

Table 1: The Selection of Varying Intensities of Moths

Color	White				Grey				Black
Number of Each Moth Selected									
Total Class Count									

Table 2: The Selection of Different Sized Squares

Size	1/2”	3/4”	1”	1 1/4”	1 1/2”	1 3/4”	2”
Number of Each Square Selected							
Total Class Count							

Questions

1. Explain how the color of the moths increases or decreases their chances of survival.
2. If uneaten moths were mated, what color offspring would they tend to be in greater numbers?
3. Using what you know about the theory of evolution, how would you explain the long neck of a giraffe?
4. What would happen if there were no predators in the forest. Would the colors of the moths change over time? Defend your answer.
5. Are the light and dark colored moths different species? How would you be able to tell?