Mark and Recapture Lab

Purpose

This activity demonstrates the mark-recapture method as a means of estimating the size of a population in a given area.

Background

An important aspect of a population is its density, the number of individuals per unit area or volume. It is often difficult or impractical to count an entire population, especially one in which individuals move about in the area to be sampled. The mark-recapture method is used to estimate the size of populations. It consists of capturing and marking a portion of the existing population, releasing these marked individuals back into the environment, then capturing a portion of the existing population a second time, and recording the number of individuals that are recaptured (marked) in the second capture. The proportion of recaptures to new captures in this second round can be used to estimate the actual size of the population.

In this activity, you will simulate this method using a bag of M & Ms™. Let the candies represent small amphibians, the spring peeper. The spring peeper is a type of frog that emerges during early spring and begins calling for mates. You may have heard these small amphibians in early evening, especially near moist areas.

Procedures:

1. Remove 10 of the M & Ms™ from the bag. These represent your initial "capture."
2. Mark all of these individuals by putting a small piece of tape on them and place them back into the bag.
3. Hold the bag at the bottom and the top and shake it several times. Remove 10 individuals. This is your total catch second time. Record this number in an appropriate data table.
4. Count the number of marked recaptured individuals, record the number in an appropriate data table, and return them to the bag.
5. The equation used to calculate the estimated actual population from observations is,

$$N = \frac{\text{Number marked } x \text{ Total catch second time}}{\text{Number of marked recaptures}}$$

Calculate N for this trial.

6. Repeat steps 3, 4, and 5 for four more times, resulting in a total of five trials. Record all data and calculations.
7. Calculate a mean (average) for N in the five trials.
8. Assume that your bag represents an area of one square kilometer (1 Km^2). Calculate you population density and record it.
9. Remove all of the M & Ms from the bag and count the population to see how close you came to the actual number. Record this number.

10. Change the number of initially captured individuals, the total catches second time, or both. Repeat the experiment. Record your data in an appropriate table.
11. Remove all of the tape or marks from the M & Ms and return them to the bag.

Analysis Questions:

1. What assumptions does the mark-recapture method make?

2. What problems can you see with the mark-recapture method in nature?

3. How did your results compare with the actual population? Were you able to improve on the accuracy of the mark-recapture simulation when you manipulated the number of captured individuals? Explain.

4. Did other lab groups who used different number changes come to similar conclusions? Explain.

5. Why were you asked to repeat the procedure several times?

6. Why is it important to know the number of individuals in a population?