Tag and Recapture

OBJECTIVE

The student will conduct research and utilize basic mathematical concepts to solve an ecological question. The student will identify the tag and recapture equation and its importance to the study of ecology.

ACTION

Tag & Recapture Equation T= Mt / m

1. Fill small cups with beans. Distribute a cup of beans, a marker, and a small plastic bag to each student.

2. Explain that the beans in the cup represent a population of ducks in a lake. The student will be sampling from this lake to estimate the total population of ducks.

3. Next, have the student remove 20-30 beans from their cup (ducks from their lake). The student should tag these beans by making a mark on each side of the bean. Have the student write down the exact number of beans they tagged. This number will represent the "M" variable in the Tag & Recapture equation.

4. Instruct the students to place their tagged beans with the untagged beans into the plastic bag and mix them together.

5. Put all the beans back into the cup and randomly select another 20-30 beans. (It does not need to be the same number of beans as the first count). Have the student write down the total number of beans they pulled out for their second sampling. This number will represent the "t" variable in the Tag & Recapture equation.

6. Count the number of tagged beans (if there are any) in the second sampling. The number of tagged beans in the second sampling will represent the variable "m" in the Tag & Recapture equation.

7. Ask the students to plug all their variables into the Tag & Recapture equation to find an estimate of the total number of beans in the cup (ducks in the lake). The total amount of beans (ducks) is represented in the equation by the variable "T".

8. Repeat steps 5 and 6 three times and use the median as the final estimate for the number of beans in the cup.

9. Instruct the students to count all the beans in the cup to identify how close their estimations were.

10. The following questions can be used to prompt discussion after the activity. How close were some of the estimations? Why is the Tag & Recapture method important to ecologists?

EXTENSION

Instruct students to average the three trials and calculate the percent error. Next, the students should calculate the percent error for their median value and observe which value is closer to the actual number of beans in the cup. What would be a possible benefit of taking the median over the mean or the mean over the median?

Percent Error Equation

Actual Total - Calculated Total / Actual Total x 100%

BACKGROUND INFORMATION

When identifying animals as endangered or threatened or even when tracking bird migration movement and populations, it is necessary for wildlife biologists to count the number of species. It is often hard for scientists to count large quantities of animals (since they won't always sit perfectly still), so estimating the population through scientific and mathematical equation is crucial. For example, field biologists researching bird migrations and populations may "tag" as many birds as they can with ankle bracelets that have special tracking numbers. This same idea is used to track sharks, sea turtles, rhinos, elephants, and many more animals! By tagging only a few animals, scientists are able to estimate certain animal populations. And that's important in order to promote conservation, affect hunting laws, and help advance animal sciences.

MATERIALS

For each student:
• one pencil or marker
• one plastic sandwich bag
• one 3-oz paper cup
For class:
• 2-3 bags of beans (such as Great Northern beans, lima beans, etc.)

*Activity adapted from Dr. Prince at
the University of South Florida*