

Exercise 15 Estimating Population Size

Objectives

1. Use a technique for estimating populations.
2. Understand the factors that can influence the accuracy of a population estimate.

Safety considerations: Your instructor will give specific instructions regarding hazards.

Introduction

Scientists often estimate the size of a population of animals by sampling the population. If a specific number of individuals are captured, marked, and released into the wild population, it is possible to estimate the total population by using the following ratio:

$$\frac{\text{total population}}{\text{number marked initially}} = \frac{\text{total in 2nd sample}}{\text{number of marked individuals in 2nd sample}}$$

This ratio can be rearranged as follows:

$$\text{total population} = \frac{\text{total in 2nd sample}}{\text{number marked in 2nd sample}} \times \text{number marked initially}$$

For example, if

1. 100 animals were captured, marked, and released;
2. mixed with the total population;
3. 50 animals are recaptured, of which 10 are marked.

$$\text{total population} = \frac{\text{total in 2nd sample (50)}}{\text{number marked in 2nd sample (10)}} \times \text{number marked initially (100)}$$

$$\text{total population} = \frac{50}{10} \times 100 = 500$$

Several assumptions must be met if this method is to be reasonably accurate:

1. Marked individuals must not behave differently from unmarked individuals.
2. Marked individuals must have time to mix freely.
3. The sampling of the population must capture animals randomly.

Procedures

1. Capture and mark organisms as instructed.
2. Return the organisms to their normal habitat and allow them to mix freely.
3. Resample the population.
4. Record total number in second sample and the number in the second sample that were marked.
5. Calculate population size.

Laboratory Exercise

Since it is possible to use this method with a variety of animals, your instructor will give specific instructions on how to proceed. Several possibilities exist.

1. "Tag" some of the students in the class as they enter. After the class has assembled, "sample" the class by counting every fifth student. Ask if they are "tagged" and calculate the size of the class. Since you know how many people are in the class you can check your accuracy.
2. Laboratory insect populations of meal worms, fruitflies, or flour beetles could be used. Sample the population and mark a known number of individuals with a colored pen. Return the marked individuals to the container, allow them to mix thoroughly, sample the population, and count the total number of individuals and the number of marked individuals. Calculate the size of the population.
3. Sampling wild populations of birds, mammals, or amphibians is also possible but usually requires special circumstances, equipment, and techniques. In many cases special permits are required from state or federal regulatory agencies. Your instructor will give specific instructions. Possibilities are
 - (spring) breeding amphibians at a pond
 - (summer/fall) live trapping of small mammals
 - (winter) mistnetting birds at bird feeder

Name _____

Section _____

Estimating Population Size Data Sheet

Number of marked individuals released _____

Total captured

Number captured that were marked

Recapture sample

The total number of animals in the population is _____.

List three factors that would make this method inaccurate.