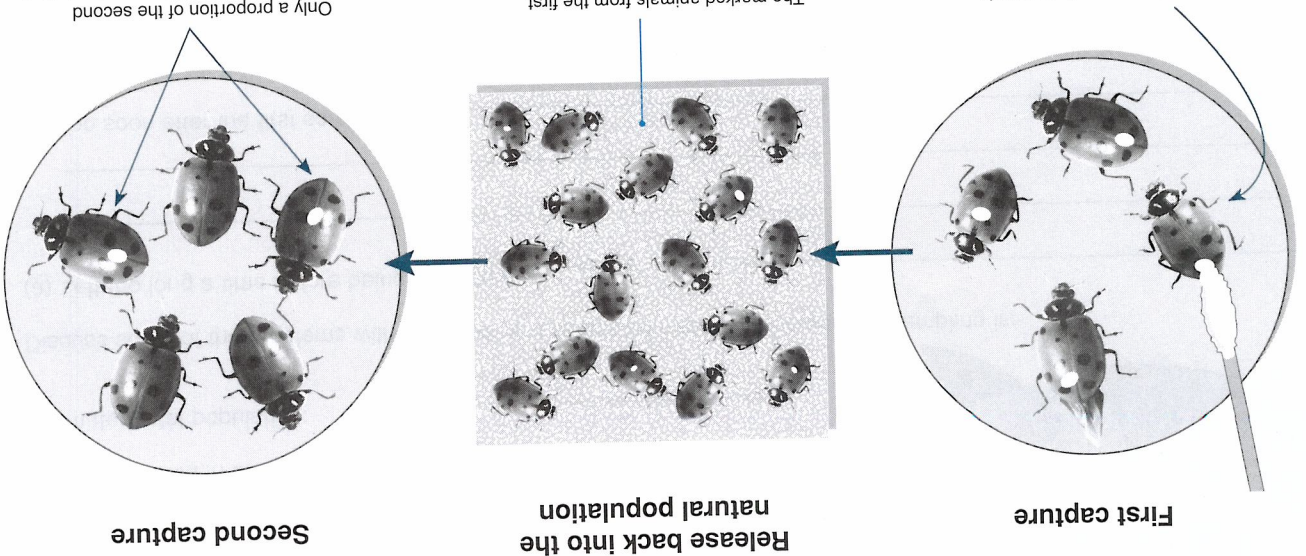


The mark and recapture method of estimating population size is used in the study of animal populations where individuals are highly mobile. It is of no value where animals do not move or



$$\text{Total population} = \frac{\text{No. of animals in 1st sample (all marked)} \times \text{Total no. of animals in 2nd sample}}{\text{Number of marked animals in the second sample (recaptured)}}$$

- The mark and recapture technique comprises a number of simple steps:
1. The population is sampled by capturing as many of the individuals as possible and practical.
 2. Each animal is marked in a way to distinguish it from unmarked animals (unique mark for each individual not required).
 3. Return the animals to their habitat and leave them for a long enough period for complete mixing with the rest of the population to take place.
4. Take another sample of the population (this does not need to be the same sample size as the first sample, but it does have to be large enough to be valid).
 5. Determine the numbers of marked to unmarked animals in this second sample. Use the equation above to estimate the size of the overall population.

1. For this exercise you will need several boxes of matches and a pen. Work in a group of 2-3 students to 'sample' the population of matches in the full box by using the mark and recapture method. Each match will represent one animal.
 - (a) Take out 10 matches from the box and mark them on 4 sides with a pen so that you will be able to recognize them from the other unmarked matches later.
 - (b) Return the marked matches to the box and shake the box to mix the matches.
 - (c) Take a sample of 20 matches from the same box and record the number of marked matches and unmarked matches.
 - (d) Determine the total population size by using the equation above.
 - (e) Repeat the sampling 4 more times (steps b-d above) and record your results:

Population	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Estimated					

- (f) Count the actual number of matches in the matchbox : _____
- (g) Compare the actual number to your estimates and state by how much it differs: _____

2. In 1919 a researcher by the name of Dahl wanted to estimate the number of trout in a Norwegian lake. The trout were subject to fishing so it was important to know how big the population was in order to manage the fish stock. He captured and marked 109 trout in his first sample. A few days later, he caught 177 trout in his second sample, of which 57 were marked. Use the Lincoln index (on the previous page) to estimate the total population size:



Size of first sample: _____

Size of second sample: _____

Number marked in second sample: _____

Estimated total population: _____

3. Discuss some of the problems with the mark and recapture method if the second sampling is:

(a) Left too long a time before being repeated: _____

(b) Too soon after the first sampling: _____

4. Describe two important assumptions being made in this method of sampling, which would cause the method to fail if they were not true:

(a) _____

(b) _____

5. Some types of animal would be unsuitable for this method of population estimation (i.e. would not work).

(a) Name an animal for which this method of sampling would not be effective: _____

(b) Explain your answer above: _____

6. Describe three methods for marking animals for mark and recapture sampling. Take into account the possibility of animals shedding their skin, or being difficult to get close to again:

(a) _____

(b) _____

(c) _____

7. At various times since the 1950s, scientists in the UK and Canada have been involved in computerized tagging programmes for Northern cod (a species once abundant in Northern Hemisphere waters but now severely depleted). Describe the type of information that could be obtained through such tagging programmes: