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Experiment worksheet

2.3 Population size depends on biotic and abiotic factors

Pages 22–23 and 182

Challenge 2.3: Delicious counting

What you need

- Smarties®
- M&M's®
- Paper bag
- A4 graph paper
- Pencil
- Ruler

What to do

PART A: CAPTURE–RECAPTURE

CAUTION: DO NOT EAT IN THE LABORATORY. THIS EXPERIMENT SHOULD BE DONE IN A CLASSROOM OR CANTEEN/CAFÉ IF THE LOLLIES WILL BE CONSUMED.

1 Place a random number of Smarties in a paper bag.

2 Draw 10 Smarties out of the bag and replace them with 10 M&M's. This is equivalent to tagging the Smarties and releasing them.

3 Mix the lollies in the bag and draw another 10 out of the bag. Count the number of M&M's you collected in the 'recapture'.

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4 Use the formula to determine how many lollies are in the bag.

$$\text{Total number of animals} = \frac{N_1 \times N_2}{M_2}$$

Where N_1 is the number of Smarties drawn out the first time (10), N_2 is the number of lollies caught the second time (10) and M_2 is the number of M&M's that were drawn out during the second draw.

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5 Count the number of lollies that were actually in the paper bag.

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FIGURE 1 Counting the number of Smartie insects

PART B: QUADRATS

1 Divide the graph paper into 20 equal-sized squares.

2 Spread a large handful of Smarties over the graph paper. These represent insects in an ecosystem.

3 Count the number of 'Smartie insects' found in 4 of the squares. Include the Smarties that are on the top lines and left lines of the squares. Do not include the smarties that are resting on the bottom lines and right lines of the squares. Divide the number counted by 4 to determine the average number of Smartie insects in each square.

4 Multiply the number of 'Smartie insects' found in each square by 20 to determine the size of the population in the ecosystem.

5 Count the number of Smarties that were actually spread over the graph paper.

Discussion

1 What populations would you use the following methods to determine their size?
a capture–recapture

b quadrats

2 How accurate was the capture–recapture method in determine population size? Provide evidence to support your answer.

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3 Would animals that had already been caught be more or less like to be recaptured? Provide a reason for your answer.

4 How accurate was the quadrat method for determining the population size? Provide evidence to support your answer.

5 How large would a quadrat have to be to measure a population of full-grown trees?

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