Investigation into factors affecting the abundance and distribution of a species

Introduction

Daisies are a common plant species that can be found on a school field. Using quadrats for random sampling allows you to estimate the numbers of daisy plants growing in this habitat. This technique also reduces sampling bias. A simple calculation can then be used to estimate the total number of daisy species in the entire school field habitat.

Apparatus

2 × 20 m tape measures
2 × 20 sided dice
1 m^2 quadrat

Diagram of Apparatus
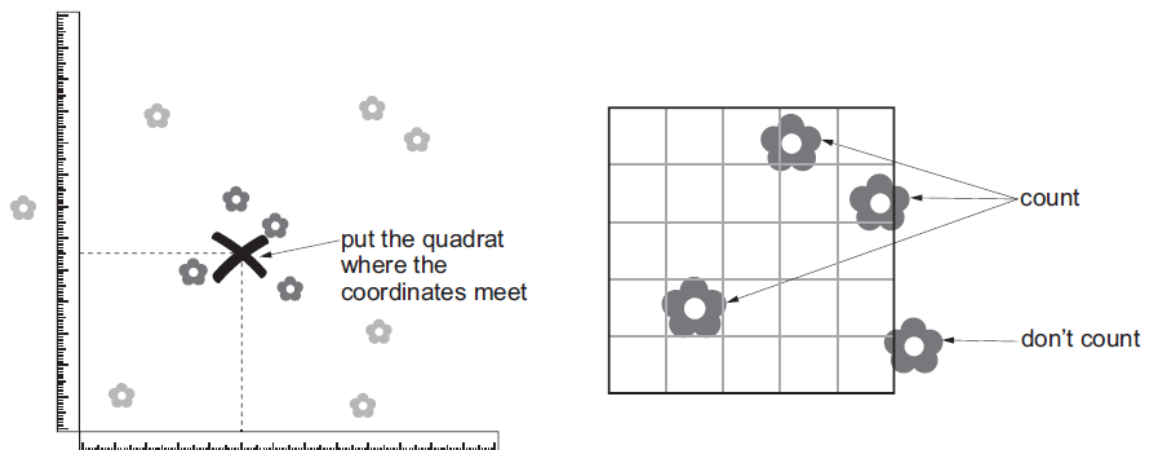
Method

1. Lay two 20 m tape measures at right angles along two edges of the area to survey.
2. Roll two 20 sided dice to determine the coordinates.
3. Place the 1 m^2 quadrat at the place where the coordinates meet.
4. Count the number of daisy plants within the quadrat. Record this result.
5. Repeat steps 2-4 for at least 25 quadrats.

Analysis

1. Use the following equation to estimate the total number of daisy plants in the field habitat:

$$\text{Total number of daisy plants in the habitat} = \text{total number in sample} \times \frac{\text{total area (m}^2)}{\text{total sample area (m}^2)}$$

Where:
total area = 400 m^2
total sample area = number of 1 m^2 quadrats used

Risk Assessment

Hazard	Risk	Control measure
Some plants have thorns, sting or are poisonous	Adverse skin response	Cover skin at all times
Biting and stinging insects	Adverse skin response	Cover skin at all times. Use insect repellent.
Tripping	Strains and sprains	Care where walking

Teacher/Technician notes

Students could compare data for mown and unmown areas.

This practical activity is effective at developing practical fieldwork skills. Students can discuss the need for a large sample of data in ensuring that there is confidence in a valid conclusion. Also, students can describe the importance of random sampling techniques in reducing/eliminating bias.

Alternative methods of generating coordinates can be used, such as using a random number generator or random number tables.

Practical techniques covered

B1   Use of appropriate apparatus to make and record a range of measurements accurately, including length, area, mass, time, temperature, volume of liquids and gases, and pH.

B3   Use of appropriate apparatus and techniques for the observation and measurement of biological changes and or processes.

B4   Safe and ethical use of living organisms (plants or animals) to measure physiological functions and responses to the environment.

B6   Application of appropriate sampling techniques to investigate the distribution and abundance of organisms in an ecosystem vis direct use in the field.