Biology in Focus 210-211

Key Concepts

- Biotic and abiotic factors exert selection pressures that influence the survival and reproduction of an individual, population or species.
- Biotic and abiotic selection pressures affect the distribution and abundance of organisms in an ecosystem.
- Rainfall, temperature and landform patterns significantly affect the abundance and distribution of organisms in ecosystems in Australia.
- Ecologists study the distribution and abundance of organisms and how these properties are affected by interactions between the organisms and their environment.

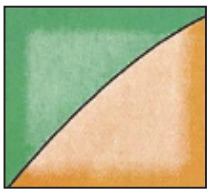
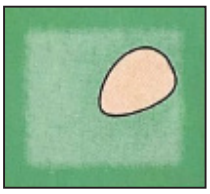
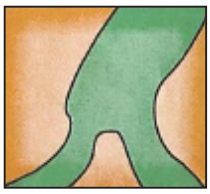
Measuring plant abundance

It is easy to calculate the abundance of plant species because plants stay in the one place. However, calculating the number of an entire plant species in many cases would be an endless task, so ecologists commonly use sampling techniques to estimate plant species abundance. Usually one or more samples are taken randomly from a population and assumed to be representative of the total population.

There are a few different techniques used to estimate abundance in plants. The one that is simple and easy to use in the field is the percentage cover method. This method uses quadrats (1m X 1m squares) to cover randomly selected representative areas for estimating the percentage cover of an area. This method is beneficial when numbers of a plant species are too high to count individually.

Percentage cover calculations require randomly plotting a number of quadrats (for example, 10), estimating the percentage cover for each one and then finding an average percentage cover. If the area of the ecosystem is known or estimated, then the percentage cover can be converted to area (see the example below).

Estimating the abundance of grass

Quadrat 1:

Estimate of 50% grass cover, 50% bare soil

Quadrat 2:

Estimate of 90% grass cover, 10% bare soil

Quadrat 3:

Estimate of 40% grass cover, 60% bare soil

If the school gardener, Mr G, needs to purchase new turf for the football ground, he needs to know how much grass cover the football oval has. To find this out he uses the percentage cover method to estimate the grass cover. Ten 1 m X I m quadrats were randomly placed on the oval and the grass cover was drawn to scale and plotted for each one.

A sample of three of the quadrats is shown in Figure 7.5.Back in the office, estimates of percentage cover were made for each of the 10 quadrat drawings (see the results in Table 7.3), then the percentages were added up and averaged.

Total of the 10 quadrats = 540

An average of the percentage of grass cover for the entire oval is calculated.

Average % = total % ÷ no. of quadrats
= 540 ÷ 10
= 54%

Therefore the oval is estimated as having 54 per cent grass cover. If the area of the oval is measured at 250m^2, then the estimated area of grass cover is 54% x 250m^2 = 135m^2. Mr G can now safely assume he needs to purchase 115m^2 (250m^2 — 135m^2) of turf to fill the bare areas. He can then repeat the same process the following year to determine if the turf replacement has successfully changed the percentage grass cover of the football oval. (See Table)

Table Results of quadrat percentage cover

Quadrat	1	2	3	4	5	6	7	8	9	10	
Estimated % cover	50	90	40	60	20	70	90	80	10	30	Total % cover

Worked Example:

If 42 individuals have been counted in ten 1 m X 1 m quadrats, what is the estimated abundance of the species in an area of 200m^2?

Estimated abundance of a species in an area =

$$\frac{\text{total number of individuals counted}}{\text{area of each quadrat X number of quadrats}} \text{ X total area}$$

Answer	Logic
$\frac{42}{1\text{m}^2 \text{ x } 10}$ x200 = 840 individuals per m^2	• Apply the formula above. • Calculate the answer.

Try These Yourself

1. 120 daisies have been counted in ten 1m X 1m quadrats. What is the estimated abundance of the weeds in an area of 800m^2?
2. 341 dandelions have been counted in ten 1m X 1m quadrats. What is the estimated abundance of the dandelions in an area of 650m^2?