Edexcel IAL Biology A Level

Core Practical 11

Carry out a study of the ecology of a habitat, such as using quadrats and transects to determine the distribution and abundance of organisms, and measuring abiotic factors appropriate to the habitat.

Various abiotic factors that affect the abundance of the distribution of a certain species can be investigated in this ecological study. Some examples include:

- Light intensity (e.g. area in shade or in sunlight)
- Distance from a large tree / river / lake / path
- River depth
- Area - woodland, heath or grassland

Equipment list

- 0.25 m² quadrat with grid
- 20 m belt transect
- Clipboard and pen
- Identification book
- Measuring equipment depending on the factor being investigated - for instance a light sensor

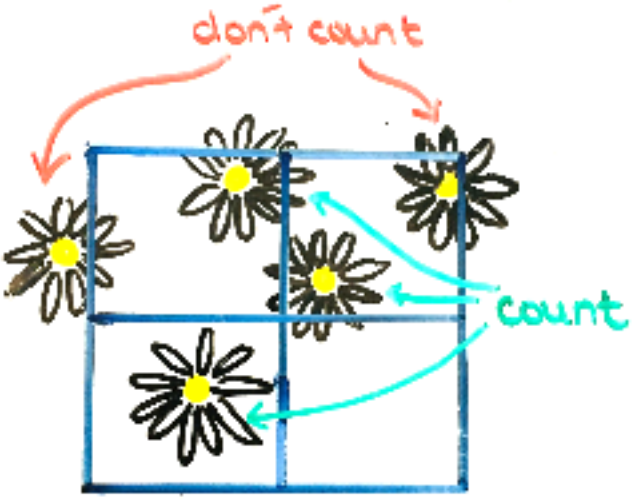
Method

When carrying out an ecological study of a habitat there are 2 main methods of sampling:

1. Transects - this samples across an area and measures an environmental gradient
2. Quadrats - this samples at 2 environmentally different areas

<u>Method 1 - Quadrats</u>

1. Draw a large grid over the images or maps of the 2/3 areas being sampled at. Assign a **numerical scale** to the grid, creating a **coordinate grid.**
2. Use a **random number generator** to generate 20 coordinates for the first area, these will be where the quadrats are placed.
3. Place a quadrat at the generated coordinates and count the number of the species being investigated in the quadrat, or the percentage cover. If a box of the quadrat is **more than half-filled** by the species being investigated, count that as a full box and then **calculate the percentage of full boxes counted.** If investigating small species, or species that are hard to distinguish from each other then percentage cover is the most practical way to measure abundance; whereas if investigating a species like daisies where they are easy to count then record species frequency. Record the abundance in a suitable table.
4. Repeat step 3 with the remaining 19 quadrat sampling locations.
5. Repeat steps 2-5 in the other sampling areas.



Method 2 - transect

1. Choose an area with a **clear environmental gradient** in the abiotic factor being investigated - for instance under a tree where it is shaded, out into the open where there is no shade.
2. Lay the belt transect across the gradient, starting in the **shaded area.** Place the quadrat at the 0m mark and count the number of the species being investigated in the quadrat, or the percentage cover, recording the results in a suitable table. Also take a measurement of the independent variable being investigated, in this case use the light sensor and record a reading of the light intensity.
3. Repeat step 2, placing the quadrat every 2 metres down the transect to take samples so you have taken 10 across the 20m line.
4. Repeat steps 1-3 in different areas at the site with the same environmental gradient being investigated. This means you end up with multiple results for each distance.

Risk assessment

Hazard	Risk	Precaution
Thorns, thistles	Cuts, infection	Clean all cuts with and cover with a plaster
Plant material	Potential allergy	Inform teachers of any known allergies
Dirt and bacteria	Infection	Don't eat or drink throughout the experiment Wash hands thoroughly afterwards
Water or wet grass	Slipping Leeches	Wear footwear with good grip Check your body after working in the area for leeches
Sun	Sunburn	Wear a sunhat and apply sun cream if working in direct sunlight for long periods of time

Results table

Method 1 - quadrats

Area one - grassland

Sample	Percentage cover (%) or frequency
1	
2	
3	
4	
5	
...	
20	

Area one - woodland

Sample	Percentage cover (%) or frequency
1	
2	
3	
4	
5	
...	
20	

Method 2 - transects

	Area 1		Area 2		Area 3	
Distance along transect (m)	Light intensity (or other abiotic factor)	% cover or frequency	Light intensity (or other abiotic factor)	% cover or frequency	Light intensity (or other abiotic factor)	% cover or frequency
0						
2						
4						
6						
...						
20						

Analysis

After the experiment and data collection you can carry out a **statistical test** to examine whether the results you obtained are significant. It can also be used to reject or accept a null hypothesis.

Transect experiment

Use a **spearman's rank correlation coefficient test** to determine whether there is a correlation between the independent and dependent variable and whether the correlation is significant or not.

Quadrat experiment

After the experiment, exclude anomalous results and calculate a **mean percentage cover or frequency** for each area, these can be statistically compared using the **student's t-test** which determines whether or not there is a significant difference between the means of 2 or more areas.