WJEC England Biology A Level

SP C1 05: Investigation into the abundance and distribution of plants in a habitat

Practical notes

Introduction

Abundance refers to the **number** of **different species** present in a habitat.
Distribution refers to the **spread** of organisms in a habitat.

The abundance and distribution of organisms in a habitat are affected by both **biotic** and **abiotic** factors. Biotic factors are the **living** aspects of an ecosystem such as **predation**, **competition** and **disease**. Abiotic factors are the **non-living** aspects of an ecosystem and include **water availability**, **light intensity** and **temperature**.

The abundance and distribution of a plant species can be investigated using a variety of methods as outlined in this practical.

Equipment

- 0.25 × 0.25 quadrat
- 2× 10 m tape measure
- 20 m tape measure
- Dichotomous key

Risk assessment

Hazard	Risk	Precaution	Emergency
Plants (thorns, sting, poisonous)	Adverse skin reaction	Keep skin covered at all times	Carry out appropriate procedure e.g. take an antihistamine for stings; seek medical assistance
Insect bites and stings	Adverse skin reaction	Keep skin covered at all times; wear insect repellent	Take an antihistamine; seek further medical assistance
Weather	Hypothermia; hyperthermia; sunburn	Wear appropriate clothing; bring suitable kit e.g. suncream, sunglasses, gloves	Seek medical assistance
Terrain	Slipping, tripping	Wear appropriate footwear; take care when walking; don't run	Seek medical assistance

Method 1

In a habitat where abiotic variables are **even**, **random** sampling is carried out using a **quadrat**:

1. Position two 10 m **tape measures** at **right angles** along the border of the sample area
2. Use a **random number generator** to randomly select **two** numbers which serve as the **x-coordinate** and **y-coordinate** with the tape measures as the **axis**
3. At each location, place the **left** hand corner of the quadrat at the **coordinate point**
4. Identify the species present in each quadrat using a **dichotomous key**
5. Take readings at **10 pairs** of randomly-generated coordinates and calculate a **mean**. Record the abundance of plant species by:
    a. Directly **counting** individuals and calculating a **plant density** (mean per m^2)

    e.g. if a mean of 4.6 plantains per 0.25 m^2 is calculated, plant density is equal to 4.6 × 4 = 18.4 plantain plants per m^2

    b. Estimating the **percentage cover**

    A quadrat is divided into 100 squares so that each square represents 1%. Estimate the % cover of each plant species.

    c. Using the **ACFOR** system and converting into a numerical value

ACFOR scale	Abundance scale
Species absent	0
Rare	1
Occasional	2
Frequent	3
Common	4
Abundant	5

6. Compare readings from areas of **different abiotic factors**

Method 2

A **transect** can be used in a habitat where a **correlation** between an **abiotic variable** and the **distribution** of organisms exists.

Two types of transect line exist:

- **Line** transect - organisms that **touch** the transect line at regular intervals are recorded
- **Belt** transect - **quadrats** are placed at regular intervals along the transect line allowing the density, % frequency or % area cover to be estimated

A method involving the use of a **belt transect** is outlined below:

1. Place a **20 m** tape measure across a sample area to make a transect line
2. Place a quadrat at regular intervals (e.g. every 5 m) along the transect line. *Ensure that the bottom **left-hand** corner of the quadrat touches the interval mark.*
3. Use a **dichotomous key** to identify the species present in the quadrat. Record the abundance of plant species by estimating the density, % frequency or % area cover.
4. Produce a **kite diagram** of species distribution against distance along the transect

Example results

Species	% area cover at distance along transect (m)				
	0	5	10	15	20
Grass	75	60	30	5	0
Moss	5	10	60	60	60
Bracken	20	15	10	10	10

Example kite diagram