

# Unit 2: GCSE Applied Science

## 2.1.2 World of life

### Biodiversity

Biodiversity is a measure of:

- the variety of different species
- the numbers of each of those species in a particular area.

It is important as it provides:

- food and potential foods
- industrial materials
- new medicines
- enhances human well-being.

Biodiversity and endangered species can be conserved and protected by:

- convention on International Trade in Endangered Species
- sites of Special Scientific Interest
- captive breeding programmes
- national parks
- seed/ sperm banks
- local biodiversity action plans.

### Measuring biodiversity

Plants

To measure the biodiversity of plants in an area or to investigate the different distribution of plants we can use a **quadrat**.

It is important to take a **random sample** of an area to avoid collecting **biased data**.

A **larger sample** will give a valid estimate of the number of plants in the area.



Quadrat, usually a 1 m square grid.

#### Quadrat

- Randomly throw a quadrat.
- Count the different species and the number of each in each quadrat.
- Take a mean number of each species of plants from all the quadrats collected.
- Multiply up to estimate how many in the whole area.

Measuring the distribution of plants can be carried out using quadrats set in a row 1m apart. This will give you an idea of how plant life changes along a route e.g. along a seashore. This is called a **transect**.

### Measuring biodiversity

Animals

Measuring the biodiversity of animals cannot be achieved using quadrats, as animals may move quickly out of the area.

Instead, scientists use the **capture/recapture technique**.

#### Method

1. Carefully collect organisms found in 1 area without trampling habitat or leaving litter.
2. Mark the organisms and return them to the same area they were collected from.
3. Leave time for organisms to reintegrate into their community.
4. Return and again collect as many organisms as found. Collect as those already marked and unmarked samples.
5. Use an equation to calculate the estimated population size.

When using capture-recapture data, assumptions made include:

- no death
- immigration or emigration
- marking technique does not affect chances of survival.

### Adaptations

Living things become adapted to their habitat.

These adaptations may be **morphological**.

Fennec foxes who live in hot climates have large ears to radiate heat away from their bodies.



Arctic foxes have small furry ears to reduce heat loss.



Adaptations may also be behavioural; the Fennec fox is mostly nocturnal (awake at night) and burrows under the sand to avoid the heat of the day in the desert. Some living things avoid adverse environmental conditions such as hibernation or migration.

**Classifying and naming organisms** - Traditionally based on morphological features but more recently DNA analysis has been used to more accurately group organisms to show how related they are.

DOMAIN	The largest groups. There are 3 domains: eukarya (which contains 4 of the 5 kingdoms), bacteria and archaea.
KINGDOM	There are 5 kingdoms: animals, plants, fungi, single celled organisms and bacteria.
PHYLUM	Groups get smaller and organisms
CLASS	more similar as they have more
FAMILY	<b>morphological features</b> (body structures) in common.
GENUS	The first part of an organism's scientific name. Starts with a capital letter e.g. Panthera.
SPECIES	The second part of an organism's scientific name e.g. tigris.

*Panthera tigris*

Lower case



**Scientific names** are used as they are universal. Language barriers or the use of common names for organisms could be confusing. The use of these names from the binomial system by all scientists **avoids any confusion**.

**Evolution** - Variations in species that can be inherited (are heritable) are the basis of evolution.

**Charles Darwin** and **Alfred Russel Wallace** worked on the theory of evolution by **natural selection**.

1. **Mutation** - random changes in genes cause variations in species.
2. **Variation** - Small differences within a species make some individuals better adapted to the environment.
3. **Competition** - Organisms compete for survival and resources, or some may have a gene allowing resistance to a toxin.
4. **Survival of the fittest** - Those with advantageous genes have a selective advantage over others. They can compete better for resources or survive an antibiotic, pesticide or other toxin that kills others of the species.
5. **Breeding** - The organisms that survive can breed, **passing on their advantageous genes** to the next generation.

If environmental change is too quick for species to adapt by natural selection, **extinction** may occur.