Field Techniques: Health & Safety

Field Work

Aspects of fieldwork can present a hazard.

Field work poses a Wider range of hazards than when working in a laboratory.

Hazards

1. **Difficult terrain**

   how much the land goes up and down and what it is like underfoot.

   easy terrain =e.g a cultivated field.

2. **Adverse weather conditions**

   This could be caused by prevailing weather conditions expected in the area they are sampling or possible extremes of weather and how likely they are to occur.

3. **Problems associated with isolation**

   As soon as you move off the beaten track do you know exactly where you are and do you have mobile signal in case of emergency.

4. **Contact with harmful organisms**

Risk

Risk is the likelihood of harm arising from exposure to a hazard.

Risk assessments involve identifying control measures to minimise risk.

Control Measures

Appropriate equipment, clothing, footwear and means of communication are needed to control any hazards.

Field Techniques: Sampling of Wild Organisms

Sampling should be carried out in a manner that **minimises impact** on wild species and habitats.

Consideration must be given to **rare and vulnerable species** and **habitats that are protected by legislation.**

Rare / Vulnerable Species

Habitats protected by legislation

Sampling Techniques

1. Point Count
2. Remote Detection
3. Transect

Field Techniques: Sampling of Wild Organisms

Which technique?

1. Point Count

The observer records all individuals seen from a fixed point count location. This can be compared with other point count locations or with data from the same location gathered at other times.

e.g. Sampling birds in one area at one time.

2. Remote Detection

2.1 Capture Techniques

*Capture techniques are used for **mobile species** these techniques include **traps and nets**.*

2.2 Remote techniques

*Remote detection is used for **elusive species** that cannot easily be found.*

Direct - camera traps

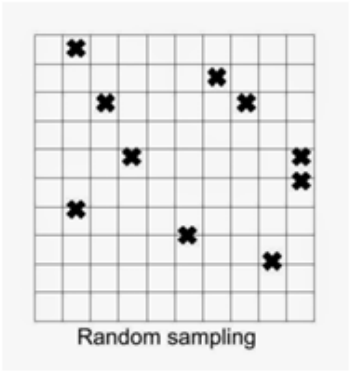
Indirect - scat sampling

Field Techniques: Sampling of Wild Organisms

3. **Transect**

1. Random Used to sample large areas using a random number generator.

Organisms have an equal chance of being selected.

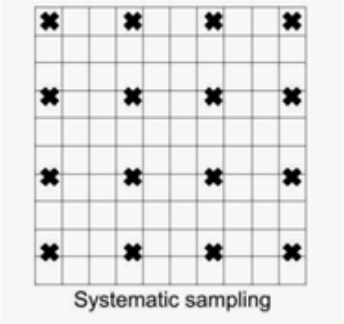


Problem— Random sampling could under represent the population.

2. Systematic Members of a population are selected at regular intervals

e.g. A quadrat every meter.

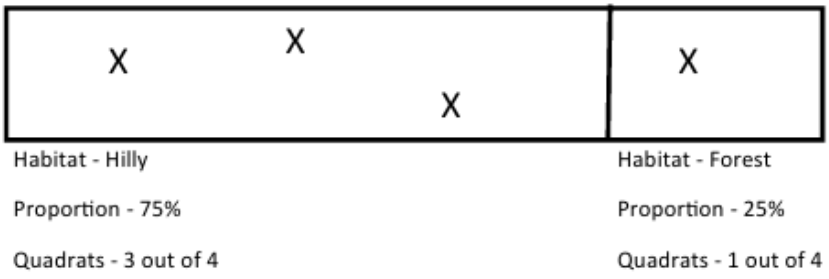
Line or Belt transects are used in systematic sampling.



Problem— Systematic sampling is more biased than random sampling.

3. Stratified When samples are divided into categories and then sampled proportionally.

Used to sample habitats that are not uniform. A standard formula is used to calculate the number of samples from each area.



Field Techniques: Sampling of Wild Organisms

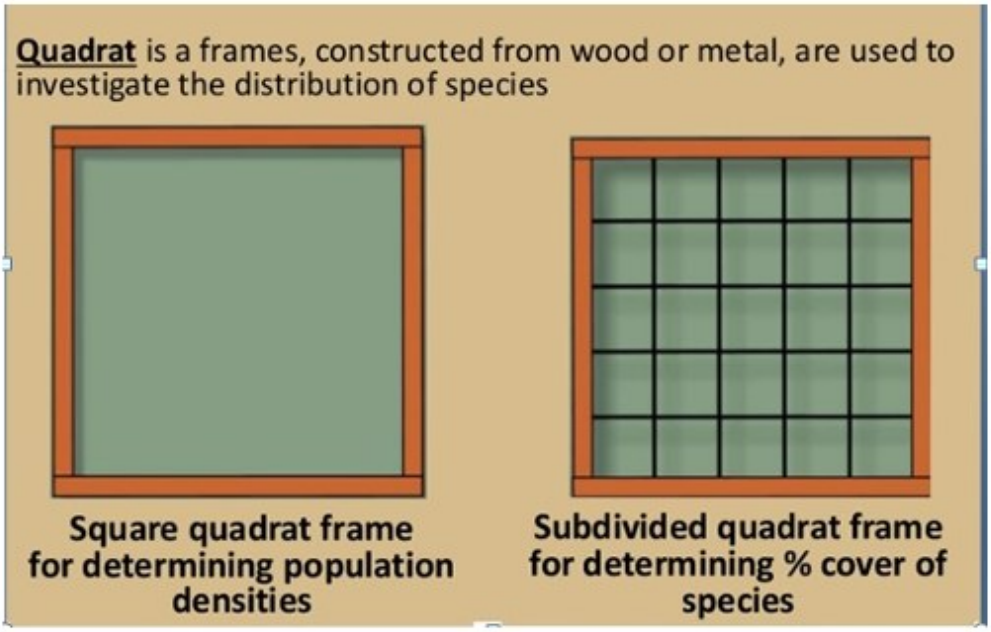
Quadrats are used as an appropriate technique to sample slow moving animals and sessile organism (organisms that are not able to move).

1. Size of Quadrat

Quadrats should be of suitable size and shape

2. Types of Quadrat measurement

1. Population densities - divide number of plants per square metre.
2. Percentage cover— count number of squares with plants not every plant.



3. Number of quadrats attempts

The more quadrats thrown the more reliable the results (representative sampling)

Two few quadrats fail to show the number of species present

Two many quadrats are a waste if the maximum is already being shown

In percentage cover quadrats the more squares per quadrat the more reliable the results

Identification & Taxonomy: Identification

Identification

Identification of a sample can be made using

1. Classification guides
2. Biological keys
3. Analysis of DNA or protein

Organisms can be classified by both taxonomy and phylogenetics.

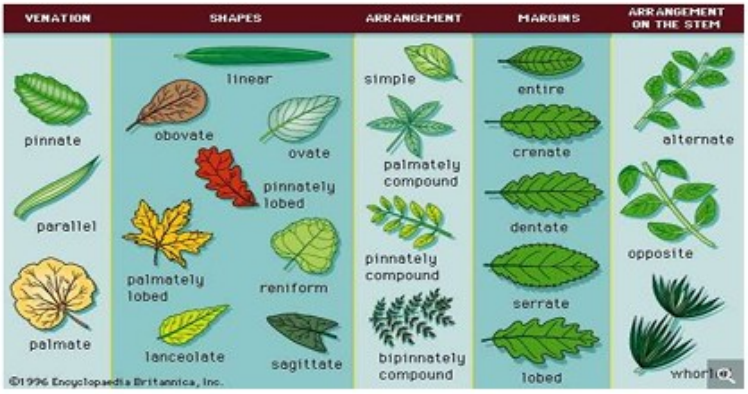
Taxonomy

Taxonomy involves the identification and naming of organisms and their classification into groups based on shared characteristics.

Classic taxonomy classification is based on morphology.

Morphology

A branch of biology that deals with the study of the structure of organisms.



Phylogenetics

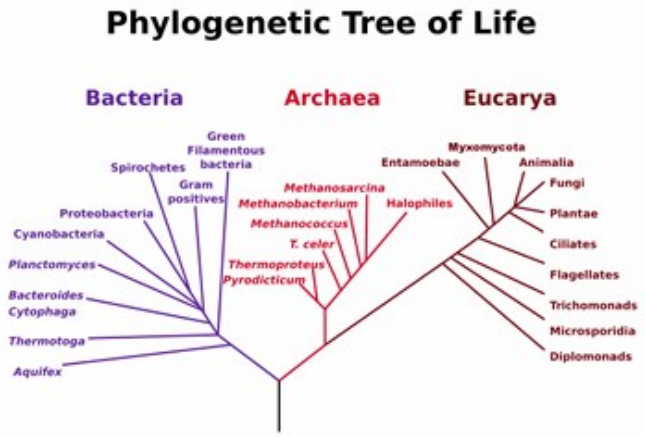
Phylogenetics is the study of the evolutionary history and relationships among individuals or groups of organisms .

Phylogenetics uses heritable traits such as morphology, DNA sequences, and protein structure to make inferences about an organism's evolutionary history and create a phylogenetic tree.

Identification & Taxonomy: Identification

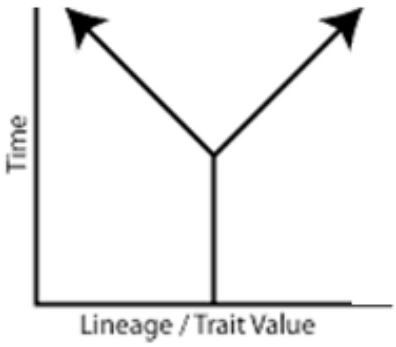
Phylogenetic Tree

Diagrammatic hypothesis of an organisms relationships to other organisms.



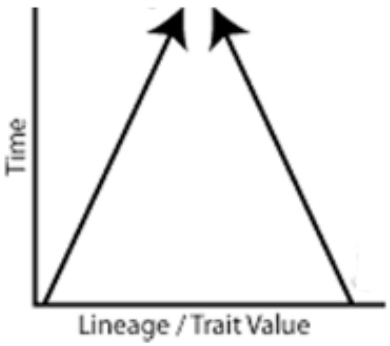
Genetic evidence can reveal relatedness obscured by divergent or convergent evolution.

Divergent Evolution



accumulation of mutations within a species that leads to speciation.

Convergent Evolution



independent evolution of two species to become more similar. E.g. birds and bats.

Identification & Taxonomy: Taxonomic Group

Taxonomy

The study of classifying species according to an organism's physical appearance and genome.

Familiarity with taxonomic groupings allows predictions and inferences to be made about the biology of an organism from better-known (model) organisms.

Taxonomic Groups (Phyla) - Examples

1. Nematodes - *Round worms*
2. Arthropods - *Joint-legged invertebrates, with paired appendages & exoskeletons.*
3. Chordates - *Live bearing mammals, sea squirts.*

Model Organisms

Organisms that are either **easily studied** or have **been well studied.**

Studying these model organisms have been very important in the advancement of modern biology.

Information obtained from them can be applied to other species that are more difficult to study directly.

Model Organism - Examples

1. Bacterium - *E.coli*
2. Flowering plant - *Arabidopsis thaliana*
3. Nematode - *C.elegans*
4. Arthropod - *Drosophila melanogaster (fruit fly)*
5. Chordates - *Mice, rats and zebrafish*

- ***Very important*** *in the advancement of modern biology.*

Field Techniques: Indicator Species

Indicator Species

The presence, absence or abundance of an indicator species gives information of environmental qualities such as presence of a pollutant.

Susceptible and favoured species can be used to monitor an ecosystem.

Susceptible species

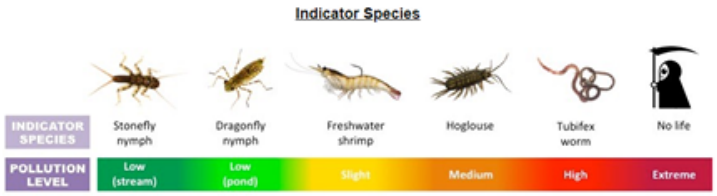
Absence or reduced population indicates a species is susceptible to a negative factor in the environment such as a pollution.

E.g. Stonefly nymph will not be present in polluted areas.

Favoured species

Abundance or increased population indicated it is favoured by the conditions in the environment such as a high concentration of oxygen.

E.g. Stonefly nymph will be present in areas that have a high concentration of oxygen.



Field Techniques: Monitoring Populations

Marking Population

The method of marking and subsequent observation must be effective but minimise impact on the study species.

Care must be given to **protected/endangered species.**

Types of Marking

1. Banding
2. Tagging
3. Painting
4. Surgical implantation
5. Hair clipping

Bands

Tags

Painting

Surgical Implantation

Field Techniques: Monitoring Populations

Two Techniques

1. **Direct Count**

   Count every organism in a given area.

   Suitable for small populations.

2. **Mark & Recapture**

   Sampling organisms by counting organisms on two occasions to estimate numbers of total population

   Used in large populations where it is not possible to count every organism.

Mark and Recapture Technique

Stage one

A sample of the population is captured and marked (M) and then released

Stage two

After an interval of time, a second sample is captured (C).

Some of the individuals in this second sample are recaptures (R).

Formula

$$N = \frac{M \times C}{R}$$

N = total population M = marked population C = captured population R = recaptured population

Mark & Recapture Assumptions

1. All individuals have an **equal chance** of capture.

2. No **immigration** or **emigration.**

3. Individuals that are marked and released can mix fully and randomly with the total population.

Measuring & Recording Animal Behaviour & Ethograms

Animal Behaviour

What the animal is doing or how they are reacting to a stimulus.

Ethogram

the study of animal behaviour shown by a species in a wild context. Ethograms allow the construction of time budgets.

An ethogram lists species-specific behaviours to be observed and recorded in the study.

Recording the duration of each of the behaviours in the ethogram, together with the total time of observation, allows the proportion of time spent on each behavior to be calculated in the time budget.

Ethogram Measurements

1. **Latency**

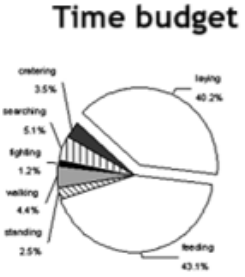
   The time between the stimulus occurring and the response behaviour.

2. **Frequency**

   The number of times a behaviour occurs within the observation period.

3. **Duration**

   The length of time each behaviour occurs during the observation period.



Measuring & Recording Animal Behaviour & Ethograms

Anthropomorphism

Attributing human characteristics, emotions, personalities & behaviours to animals.

Example—animal smiling OR animal begging for food.

Why is anthropomorphism bad in animal behaviour studies?

Very similar behaviour, completely different meaning in different species.

Examples :

Showing teeth in humans is a smile to indicate happiness.

However, primates showing teeth is a subordinate behaviour.

Anthropomorphism can lead to invalid conclusions.