

# TOPIC 4.1: SPECIES → ECOSYSTEMS

## Ecological Organisation

### Species:

A group of organisms that can interbreed and produce fertile, viable offspring



### Population:

Group of organisms of the same species, living in the same area at the same time



### Community:

A group of different populations living together and interacting in a given area



### Habitat:

The environment in which a species lives or the normal location of an organism



### Ecosystem:

A community and also its environment (all biotic and abiotic factors)



## Modes of Nutrition

Living organisms can obtain chemical energy by one of two methods of nutrition (a few species can use both methods):

### Autotrophs

Autotrophs synthesise organic molecules from inorganic nutrients within the environment, using energy from either:

- Light (photoautotrophs)
- Oxidation reactions (chemoautotrophs)

### Heterotrophs

Heterotrophs obtain their organic molecules from other organisms via a variety of feeding methods and food sources

- Consumers ingest other living organisms
- Detritivores ingest detritus (decomposing matter and faeces)
- Saprotrophs externally digest dead organisms (*decomposers*)

Autotrophs are commonly referred to as **producers**, as they are responsible for the production of organic molecules

- Heterotrophs could not survive without autotrophs

## Nutrient Cycling

Nutrients are materials required by organisms for survival

The supply of inorganic nutrients within the environment is finite and therefore must be constantly recycled:

- Autotrophs convert inorganic nutrients into organic molecules (i.e. they are producers)
- Heterotrophs ingest organic molecules and may release inorganic byproducts (e.g. carbon dioxide)
- Saprotrophs break down the nutrients in dead organisms and return them to the soil (i.e. they are decomposers)

## Mesocosms

Ecosystems have the potential to be sustainable over long periods of time, however this requires three conditions:

- Energy availability (e.g. light source)
- Nutrient availability (e.g. decomposers)
- Waste recycling (e.g. detoxifying bacteria)

**Mesocosms** are enclosed environments with controlled conditions (e.g. terrariums)

- They can be used to study sustainability



## Species Associations

The presence of species in a habitat may be dependent on the interactions between them (either positive or negative)

If species are always found in the same habitat, this suggests a **positive association** (such as):

- Predator / prey relationships
- Symbiotic interaction (mutualism, commensalism, parasitism)

If species do not share the same habitat, this suggests there is a **negative association** (such as):

- Competition (niche partitioning or competitive exclusion)

## Quadrat Sampling

The presence of a species in a given area can be determined via quadrat sampling (to assess sessile/non-motile species)

- Rectangular frame placed in an area (+ repeat sampling)
- Species numbers within the frame are counted/estimated

