# Adaptation

Adaptations are physical and behavioural characteristics that improve a living organism's chances of survival. This could be sensitive hearing that allows an animal to avoid being eaten or long roots in a plant that help it to collect water.

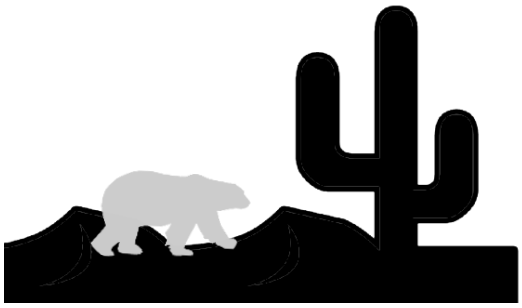
**Habitats**

The place that an organism lives is called a habitat. Almost everywhere in the world is a habitat, ranging from the species rich rainforests of South America to that space behind the fridge where all the spiders hang out.

In every habitat, there are challenges that an organism must adapt to in order to survive. These challenges can be categorised into **biotic** (living) or **abiotic** (non-living) factors. Here are some examples:

| Biotic Factors | Abiotic Factors |
|---|---|
| Food availability | Water availability |
| Competition | Temperature |
| Diseases | Wind intensity |

Have a look at the images below. Is anything wrong with them?



What challenges do organisms face in these habitats, and what characteristics do these animals have that would make it difficult for them to survive here?

| Challenges in polar habitat | Lizard characteristics | Challenges in desert habitat | Polar bear characteristics |
|---|---|---|---|
| | | | |

There are lots of different terms that can be used to describe where an organism lives and how it interacts with its surroundings. See if you can match up the words with the correct definitions. The paragraph underneath is there to help you.

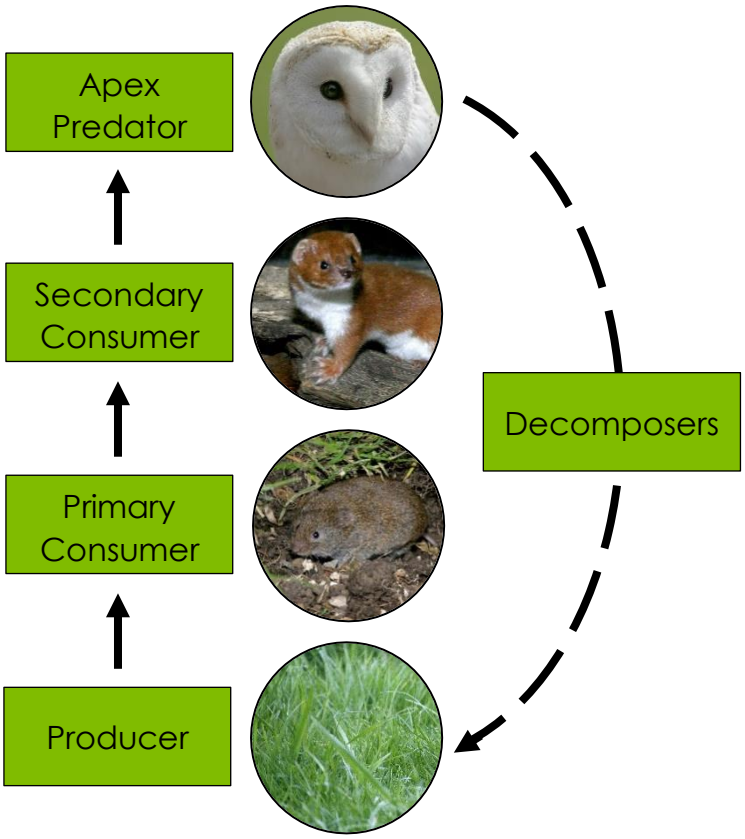
| | |
|---|---|
| **Biotic and abiotic factors** | The place where an organism lives |
| **Organism** | A community of organisms and the habitat in which they live |
| **Habitat** | Living and non-living parts of an ecosystem |
| **Population** | The variety of plants and animals in a habitat |
| **Community** | All the members of a single species that live in a habitat |
| **Biodiversity** | An individual animal, plant, or single-celled life form |
| **Ecosystem** | All the populations of different organisms that live together in a habitat |

Coombe Bissett Down nature reserve is a chalk grassland **habitat**. The **organisms** that live here are specially adapted to **biotic and abiotic factors**, such as poor quality soil, and high competition. Recently, the nature reserve was doubled in size, which means that it can now support much larger **populations** of plant and animal species, resulting in a bigger **community**. All of these pieces put together make a rich **ecosystem** that supports a wide variety of organisms. As a result, the nature reserve has a very high **biodiversity**, and that makes it an important site for conservation.

**Food Chains**

Where there are lots of plants, there are lots of animals that eat the plants. Where there are lots of animals that eat the plants, there are lots of animals that eat the animals that eat the plants, and there are lots of animals that eat the animals that eat the animals that eat the plants, which all sounds very confusing!

Thankfully, there is a better way of representing this:




A food chain shows the different organisms that live in a habitat, and what eats what.

They always start with a **producer**, which are organisms that make food from sunlight.

Organisms at the top of the food chain eat lots of prey and do not have any animals that eat it, making them **apex predators**.

Meanwhile, animals that are both predators and prey are known as **secondary** or **tertiary consumers**, depending on their position in the food chain. Vegetarian animals are called **primary consumers**.

**Decomposers** recycle the nutrients, which the producers then use to grow.

See if you can join up the organisms in this food web. Unlike a food chain, this diagram shows how some prey may have multiple predators and some predators may have multiple prey.

Fox Buzzard

Frog Vole Thrush

Rabbit Insect Slug

Grass

Understandably, animals do not want to be eaten, but they do want to get better at finding food. To improve their chances of survival, they adapt.

Below are some animals that you may see at Coombe Bissett Down nature reserve. Cut out the "domino cards" along the dotted lines and match up the animals with their adaptations, which are on another card. The cards will form a complete loop if they have all been matched up correctly.

There are two adaptations on here that are not related to the food chain. What might they be adaptations for instead?

| | | | |
|---|---|---|---|
|  | Able to shed its still-moving tail to distract predators, allowing it to escape |  | Digs a network of tunnels under the grass so that it can move around undetected |
|  | Eyes set high on its head and a flexible neck gives it a greater field of vision |  | Thick tail provides balance and helps keep its face warm when sleeping |
|  | Facial disk that focusses sound towards its ears, allowing it to catch prey in complete darkness |  | Slender body allows it to pursue prey through tunnels |
|  | 'Plays dead' and releases a foul smelling substance when threatened by predators in order to appear less appetising |  | Strong limbs and sharp claws that help it to dig burrows |
|  | Huge and extremely sensitive ears that help it to detect prey |  | Can see 8 -10 times further than we can, enabling it to spot prey three kilometres away |

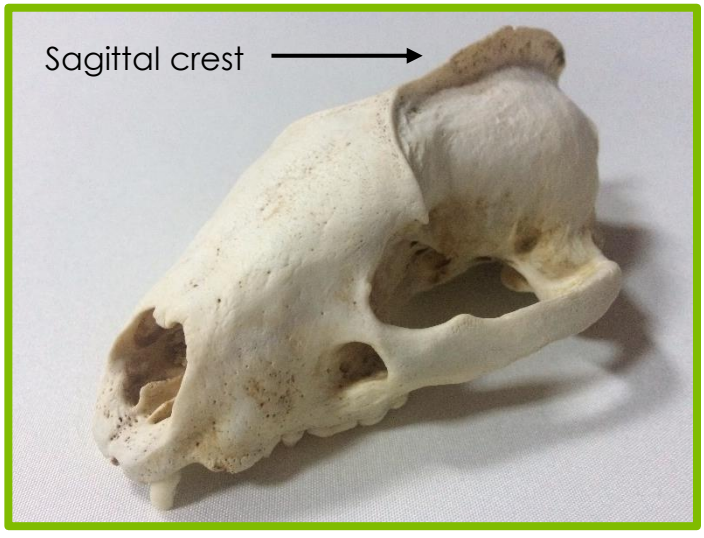
When food is difficult to come by, an organism may adapt to exploit different food sources. **Carnivores** (e.g. buzzards, weasels, and common lizards) eat other animals, **herbivores** (e.g. rabbits and voles) eat plants, and **omnivores** (e.g. foxes and badgers) eat both animals and plants.

Here is the upper jaw of a badger's skull. Eighty percent of a badger's diet is earthworms, but they also eat insects, fruit, and small mammals.

What adaptations can you see that allow badgers to eat such a wide variety of food? (Hint: humans are also omnivores but we do not eat as much meat as a badger. Are there any specific structures that are similar to our own in some areas but different in others?)

One other adaptation that helps badgers to feed is a ridge along the back of its **skull** called a sagittal crest. This is where the jaw **muscles** are attached to the skull by strong **tendons**. The bigger the crest, the bigger the muscles and the stronger the muscle **contractions,** which result in a stronger bite.

This process where muscles and bones work together to exert forces is called **biomechanics**.




**Did you know?**

The Bite Force Quotient (bite force of an animal divided by its body mass) of a badger is 109, which is greater than a leopard's!

However, the British mammal with the highest bite force relative to its body mass - scoring 164 - is actually the weasel.

Images: badger; buzzard; grass snake; rabbit; weasel; barn owl; fox; common lizard; field vole, Darin Smith; brown long-eared bat, Tom Marshall; badgers skulls, Oliver Davies

# Design an Animal

My animal is called: _____

**Things to think about:**

What habitat does it live in? Is the habitat hot or cold, wet or dry? Is there much vegetation?

What does it eat/get eaten by?

Circle its position in the food chain:

- Primary Consumer
- Secondary Consumer
- Apex Predator

How does it move?

How does it communicate?

Is it active during the day or at night?

**Trickier things to think about:**

How does it interact with other animals in its habitat?

Does it change the habitat it lives in? For example, beavers cut down trees and flood forests.

What are its conservation threats?

Drawing of animal:

Drawing of habitat: