COMMUNITIES

Adaptation: the organism has structures and behaviours, which allow it to survive and reproduce successfully.

Community: populations of different species living and interacting with each other in a particular area.

Consumers: organisms that cannot make their own food. They obtain their food by feeding on other organisms.

Ecology: study of relationships between plants, animals and their surroundings.

Ecosystem: the community plus all the non-living aspects of the environment in which the community lives.

Environment: all the outside influences on an organism.

Food web: the interconnected food chains between organisms in a community

Habitat: place where organism lives and to which it is adapted.

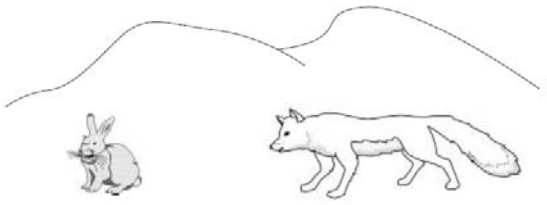
Predator: an animal that captures and eats another animal

Prey: an animal that is hunted and eaten by another animal

Producers: organisms that can make their own food e.g. green plants. All food chains start with them, because they can make food by photosynthesis.

Scavengers: feed on dead animals. They perform a useful cleaning-up function. Examples are crow, vulture, buzzard and hyena.

- Ecology is the study of organisms and their relationship with their surroundings. Ecologists study the interaction between an organism and its environment. Some ecologists study a specific species or habitat. They might study the behaviour of a single species to see how it interacts with other organisms and the environment. Or, an ecologist might study many different species that either depend on each other (a food web, for example), or compete with each other for food and space.
- An ecosystem includes all the abiotic (non-living) factors in addition to the community of species that exists in a certain area. Abiotic and biotic factors affect populations. Abiotic factors are the non-living factors in an environment such as temperature, light, water, and nutrients. Biotic factors are living organisms that are part of an environment. Together abiotic and biotic factors make up our surroundings. Some biotic factors are the animals we eat and the plants that give us oxygen. Some abiotic factors are the temperature, water, and soil.
- Animals and plants are normally well adapted to survive in their usual environment. Organisms have features (adaptations) which enable them to survive in the conditions in which they live. Successful organisms are adapted (suited) to their habitat. Eg. The brown feathers of the kiwi camouflage it to hide it from its predators. The yellow petals of the buttercups attract insects to pollinate them. The long pointed teeth of a tigers allow it to kill its prey. Animals may be adapted for survival in arctic and desert environments in terms of: body size and surface area; thickness of insulating coat; amount of body fat; and camouflage. Eg. The thick white fur of the Arctic fox both camouflages it, and insulates it.

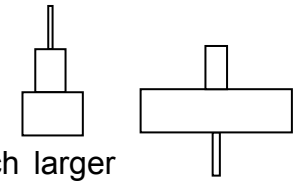


- Plants are adapted to survive in arid (dry) conditions by having thick waxy leaves, or rolled leaves (like the grasses that grow in sand dunes).

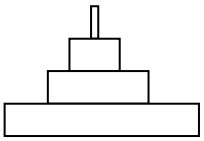
- Adaptations can be classified as:
  - Structural Eg. The webbed feet of ducks are ideal for swimming, bat sonar receptors in ears, rabbits large eyes are placed on the sides of their heads.
  - Functional Eg. The venom in snakes, ink projection by squid, rhino ears pivot like a sonar dish to hear all environmental sounds.
  - Behavioural Eg. Mating dances, reptiles moving to different areas to regulate their body temperature, rabbits use hind feet to drum alarm signals to other rabbits if attacked.
- In a community the number of animals of a species (its population) is usually limited by the food available; if the prey population increases, more food is available for its predators and their population may also increase; if the predator population increases, more food is needed and the population of prey will decrease. The population size may be affected by: the total amount of food or nutrients available; competition for food or nutrients; competition for light (plants); water; predation or grazing; and disease.
- Plants often compete with each other for space, and for water and nutrients from the soil. Animals often compete with each other for space, food and water. Animals which kill and eat other animals are called predators; the animals they eat are called prey.
- A food chain is a list of species, where each species becomes food for the next one in the list. The arrows indicate the direction of energy flow. The food chain moves food from one organism to another, giving energy to the organism digesting the food. Eg.
  - Grass → Rabbit → Fox.
  - Buttercup → Bee → Thrush → Hawk.
  - Rosebush → Greenfly → Ladybird → Sparrow → Hawk
  - Plankton → Herrings → Salmon → Seals → Killer whales
- All food chains start with the sun which provides energy for plants. Photosynthesis by plants converts light energy to food. Plants are considered <u>producers</u> because they make their own food. The producers above are grass, buttercup, rosebush and plankton.
- Animals, including humans, cannot make their own food. As a result, they must get their energy from other sources, usually plants and other animals. Thus, animals are considered <u>consumers</u>.
- Many trees shed their leaves each year. Animals produce droppings. All plants and animals eventually die. <u>Decomposers</u> are the very small micro-organisms and fungi that break down the bodies of dead animals and plants. Micro-organisms digest materials faster in warm, moist conditions. The nutrients from this decomposition become part of the soil that is re-used by new plants, back at the start of the food chain.
- Consumer types include: Herbivore - feeds only on plant. Eg. rabbit, greenfly (aphid); Carnivore - feeds only on flesh (meat). Eg. cat, hawk, ladybird; Omnivore - feeds on plants and flesh. Eg. humans, thrush, kiwi.
- The trophic level is the position of an organism in a food chain. Eg. Rosebush → Greenfly → Ladybird → Sparrow. The rosebush is the producer, the greenfly is the primary consumer, the ladybird is a secondary consumer and the sparrow is the tertiary consumer.
- Food chains are short because the transfer of energy from one trophic level to the next is very inefficient. About 10% of the energy is passed to the next trophic level, about 90% of the energy being used for respiration to supply energy to stay alive. All food chains are pretty short. There are never usually more than four steps, because a lot of energy is lost at each step, and after three steps most of the available energy has been expended. This also explains why the organisms at the top of food chains (eg hawks) are very small in number compared with those lower down (eg buttercup plants). After 2 steps there is simply not enough available energy to support more than a few top predators.

- Food chains and webs show the flow of materials and energy in habitats, but they do not give you any idea of <u>how many</u> organisms there are in the habitat.
- Pyramids of number show the number of organisms at each level

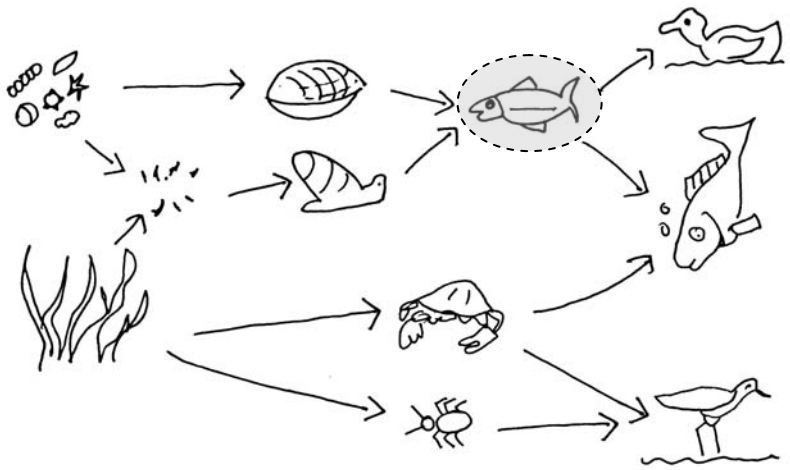
  eg 50 lettuces → 20 slugs → 1 thrush

  However it is possible to have many organisms feeding off one much larger one - giving an inverted pyramid Eg tree → caterpillars → blue tits (birds).
- The mass of living material (biomass) at each stage in a food chain is less than it was at the previous stage. The biomass at each stage can be drawn to scale and shown as a pyramid of biomass. Pyramids of biomass are *always* pyramid-shaped.



- Almost all animals must eat other organisms to obtain energy. Animals do not generally eat just one thing, nor are they eaten by only one thing. This means that each organism, through feeding, is interconnected to many different organisms. A food web shows how all species in a community are connected.



- If any one species is disturbed, then all species will undergo changes in its population. Eg. If small fish numbers go down then snail and cockle numbers will go up. Big fish and seabird numbers will go down.
- An animal can be both a predator and a prey. For example, a small fish may eat certain types of snails, but he may also be eaten by a duck. So the small fish is both predator and prey in this food web.
- Humans often upset the balance of different populations in natural ecosystems, or change the environment so that some species find it difficult to survive.
  - Humans reduce the amount of land available for animals and plants by: building; quarrying; farming; dumping waste.
  - Human activities may pollute: water - with sewage, fertiliser or toxic chemicals; air - with smoke and gases such as sulfur dioxide; land - with toxic chemicals, such as pesticides and herbicides, which may be washed from land into water.
- When fossil fuels are burned carbon dioxide is released into the atmosphere. Sulfur dioxide and nitrogen oxides may also be released. These gases dissolve in rain and make it more acidic. Acid rain may damage trees directly. Water plants and animals cannot survive if the water in rivers and lakes becomes too acidic. Large scale deforestation in tropical areas has increased the release of carbon dioxide into the atmosphere (because of burning and reduced the rate at which carbon dioxide is removed from the atmosphere (by photosynthesis). Increases in the number of cattle have increased the amount of methane released into the atmosphere.
- Increasing levels of carbon dioxide and methane in the atmosphere may be increasing the 'greenhouse effect' leading to global warming. An increase in the Earth's temperature of only a few degrees Celsius may cause a rise in sea level was well as quite big changes in the Earth's climate and weather patterns.

- Farmers add fertilisers to soil to replace the nutrients used by crops. If excess fertilisers get washed into lakes and rivers they may cause a pollution called eutrophication. This is:
  - the rapid growth of water plants
  - death of some water plants due to competition for light
  - increased numbers of micro-organisms which decompose them
  - increased use of oxygen from the water by these micro-organisms for their respiration
  - death of fish and other aquatic animals due to oxygen shortage.

  Untreated sewage provides food for micro-organisms. This has the same effect (eutrophication) in water as dead plant material.

SAMPLING

- Ecologists cannot possible count all the animals or plants in an area so “sampling” has to be done to estimate the distribution, population and frequency of a species/species.
- A line transect might be used to investigate the distribution of a plant species. Eg. daisy. A line transect is a measuring tape placed in a straight line across the area. Walk beside the line and mark the position of each ‘daisy’ touched by the line. Another way is to stop every metre along the tape measure and record the species touched by the line. Several transects should be taken in an area.
- A quadrat can be used to calculate the population of a plant species. Eg. Buttercup. A quadrat is a square frame of a definite size such as 1 m^2. Quadrats are randomly placed in the field and the number of plants in each quadrat is counted and recorded. The average number of plants per metre squared is calculated. This can then multiplied by the total area to estimate the population. Putting your quadrat in ten different places will give you a better estimate. However, you do not choose what you think are the "best" places to put your quadrat because this will bias the sample. To make the sample random, one way is to throw the quadrat over your shoulder. The more random samples that are taken, the more accurate the overall result will be.
- CLASSIFYING. Scientists have a special system to keep track of plants and animals. Every kind of plant or animal belongs to its own group, or "species." Similar species belong to a larger group, called a "genus." For example, dogs and wolves are two species. They are cousins belonging to the same "genus" (Canis) and the same "family:" canines, or Canidae.
- KEYS are used to identify unknown plants or animals.