

Ecosystem and The environment

12.1 Food chains

An **ecosystem** is formed from living things, the environment they live in, and the interactions between the two. In any ecosystem the Sun is the prime source of energy. Solar energy is trapped and converted into chemical energy by green plants through the process of photosynthesis. In an ecosystem these green plants are known as producers. Producers are always at the beginning of a **food chain**. A food chain shows the feeding relationship between organisms. Here is an example:

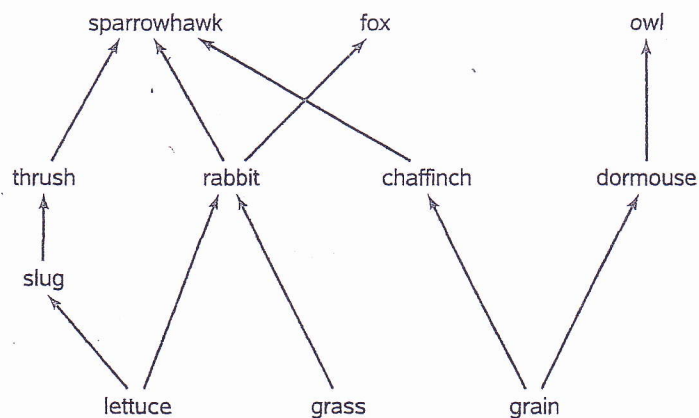
Lettuce → Slug → Thrush → Sparrowhawk
(producer) (primary consumer) (secondary consumer) (tertiary consumer)

The arrows used in food chains show the direction in which energy is transferred. The arrows always points towards the eater. Each level in the food chain is known as a **trophic level**.

- Producers are plants
- Primary consumers are **herbivores**
- Secondary and tertiary consumers are **carnivores**.

12.2 Food webs

A food chain only shows one feeding relationship. There are many other feeding relationships and one organism may eat more than one organism. To show how different food chains are linked together we show the feeding relationships as a **food web**. A food web shows the interdependence of organisms on each other and their trophic level. Some organisms can be placed in more than one trophic level.



12.1 Foodweb representing various food chains linked together

KEY WORDS

Ecosystem one or more communities of living things that live in the same environment and interact with each other

Food chain a sequence that shows the feeding relationships between organisms

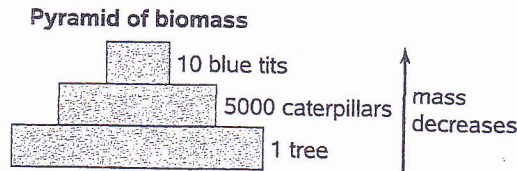
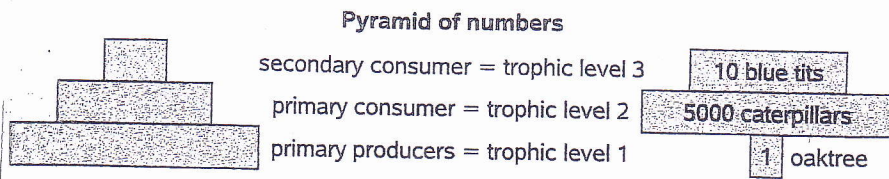
Trophic level the place of an organism in a food chain, each organism will eat and be eaten by organisms at higher or lower trophic levels

KEY WORD

Food web a sequence that shows how different food chains are linked together

12.3 The pyramids of numbers and biomass

The total number of organisms involved at each trophic level can be shown as a pyramid of numbers.



KEY WORDS

Pyramid of numbers a diagram that shows the number of organisms at each trophic level in the food chain

Pyramid of biomass a diagram that shows the mass of living material at each trophic level in a food chain

12.2 Pyramid of numbers and pyramid of biomass

The size of each box is proportional to the total number of organisms present at each trophic level. It is important to note that a pyramid shape is not always produced. For this reason we can use a **pyramid of biomass** instead which takes into consideration the number of organisms and the amount of **biomass** involved.

12.4 Pyramid of energy

A **pyramid of energy** can be formed by measuring the amount of energy available at each level in the food chain. As you move further up the pyramid the amount of energy decreases. This is because:

- Some energy is being used for respiration
- Waste products are being released
- Energy is being used to keep organisms warm
- Some energy is lost as plants and animals die and **decompose**. Decomposers such as fungi and bacteria feed on the **remains** of these organisms.

KEY WORD

Pyramid of energy a diagram that shows the energy available at each trophic level in the food chain

12.5 Populations

The size of populations within a community is influenced by a number of factors:

- Food supply – if there is more food available more offspring will be produced and survive
- Adaptations – animals and plants that are adapted to their habitat are more likely to survive
- Competition – if there is more competition for food only those that have an advantageous adaptation will survive in that environment
- **Predation** – if there are more predators they will catch and eat their **prey**, the population of predators will increase and the population of prey will decrease
- Disease – a disease will decrease the size of a population.

KEY WORDS

Population all members of the same species living in a particular area

Community all the different populations of organisms which live together

Habitat the place where organisms live

Environment the conditions that surround an organism

12.6 Human impact on the environment

The ozone layer and the greenhouse effect

The increase in human population has had a huge impact on the environment. As the population increases there is an increased demand for energy. Energy is needed for transport, industry, and heating. To meet these demands more **fossil fuels** are burnt. This has resulted in severe air **pollution** and the production of harmful substances:

- Sulfur dioxide – released from power stations burning fossil fuels, it contributes to acid rain
- Nitrogen oxide – released from vehicle **exhaust fumes** and contributes to acid rain
- Carbon monoxide – produced from the incomplete **combustion** of petrol, and it is a poisonous gas
- CFCs (chlorofluorocarbons) – released from **aerosols** and refrigerators, destroys the **ozone layer** allowing more dangerous **ultraviolet** light from the sun to reach the Earth's surface
- Carbon dioxide – released from power stations burning fossil fuels and contributes to the **greenhouse effect**.

The natural greenhouse effect is a good thing because it keeps our planet warm for life. Some gases such as carbon dioxide in the atmosphere trap heat from our sun and do not let all of it escape. The addition of more of these gases leads to a steady increase in the global atmospheric temperature. As a result polar ice starts melting which causes flooding.

More energy in the atmosphere also leads to more violent and extreme weather. Because of the increased greenhouse effect the climate in some countries, like Bangladesh, has changed rapidly. Some species which cannot quickly adapt to these changes are dying.

Deforestation

As the world population increases food production must also increase. This has resulted in intensive farming which has caused **deforestation**. Large areas of forest have been cleared to open up land to grow crops and provide **timber** for fuel and building furniture.

This has a number of effects on the ecosystem:

- Destruction of habitats – this has reduced the number of organisms in an area
- Soil **erosion** – there are no longer trees to hold the soil in place so it washes away
- Flooding – there are no roots to absorb water
- Less oxygen is produced – there is a decreased amount of oxygen in the atmosphere leading to an imbalance of oxygen and carbon dioxide levels
- Less carbon dioxide is absorbed from the atmosphere – this increases the greenhouse effect
- Lost nutrients – nutrients are washed into lakes and rivers and may destroy water life.

KEY WORDS

Fossil fuels fuels made from ancient organic remains, these include coal, oil, and natural gas

Acid rain rain made acidic by gases that come from volcanoes or pollution

Ozone layer the layer of ozone (O_3) gas high up in the atmosphere that stops dangerous rays from the sun reaching the ground

Greenhouse effect the increase in surface temperature of the Earth because of the warming effect of the atmosphere

KEY WORD

Deforestation the cutting down or burning of trees

2 Read these sentences ~~with a partner~~ and then decide if they are true (T) or false (F).

- F a A food chain shows more than one feeding relationship.
- T b One organism may eat two or three other organisms.
- T c Feeding relationships are shown in a food web.
- F d Organisms can only be placed in one trophic level.
- T e Slugs eat lettuce.
- F f Foxes eat lettuce.
- F g Dormice eat grass.
- T h Sparrowhawks eat rabbits.
- T i Grass is a producer.
- T j Thrushes are secondary consumers.
- F k Foxes are tertiary consumers.
- T l Chaffinches are primary consumers.

3 Complete these sentences based on diagram 12.2 and section 12.3.

- a The total number of organisms at each trophic level can be shown as a pyramid of NUMBERS.
- b PRIMARY consumers are placed on trophic level 1.
- c The pyramid of numbers in diagram 12.2 shows that the CATERPILLARS form the largest group of organisms at trophic level 2.
- d The pyramid of BIOMASS is arranged so that the mass DECREASES as you go up the pyramid.
- e The pyramid of biomass shown in diagram 12.2 shows a TREE as the primary producer.
- f This primary producer is supporting 5000 caterpillars.
- g The 5000 caterpillars are supporting just 10 bluetits.

a numbers

b Primary,

c caterpillars, 2

d biomass, decreases

e Tree

f 5000

g 5000, 10

4 Match the words below to their meanings.

- | | |
|-----------------|---|
| c 1 population | 5 a how much food is available at any one time |
| e 2 community | 4 b the conditions surrounding an organism |
| f 3 habitat | 1 c members of the same species living in the same area |
| b 4 environment | 8 d illness |
| a 5 food supply | 7 e the process of hunting, killing, and eating animals |
| h 6 competition | 3 f where organisms live |
| e 7 predation | 2 g different populations of species living together |
| d 8 disease | 6 h having to win something by working hard for it |

5 Find the key words below in the wordsearch.

pollution

ozone

timber

fossil

ultraviolet

forest

exhaust

greenhouse

erosion

combustion

acid

flood

aerosols

planet

habitats

V	S	F	L	O	O	D	I	N	G	W	F	G	K	I	O	Y	D	X	A	X
F	F	G	J	O	Q	A	C	D	P	G	J	A	S	L	O	S	O	R	E	A
N	O	I	S	O	R	E	S	D	L	K	G	D	A	S	D	K	L	Q	A	F
D	S	F	W	B	L	F	S	S	A	Z	R	G	N	F	A	S	R	A	A	W
H	S	U	L	N	O	O	T	D	N	T	E	L	O	I	V	A	R	T	L	U
D	I	C	A	R	A	A	E	A	E	D	E	F	I	S	Y	C	H	S	L	O
J	L	I	E	O	T	J	U	Q	T	V	N	S	T	A	U	S	F	F	H	O
K	W	S	J	I	K	Y	O	O	H	J	H	F	U	E	X	H	A	U	S	T
L	T	Q	B	F	H	G	E	N	O	Z	O	I	L	O	R	S	A	G	H	S
A	S	A	A	R	R	D	H	J	G	S	U	O	L	H	W	O	D	H	A	S
L	H	P	S	S	F	S	Y	F	S	A	S	W	O	V	T	I	M	B	E	R
N	O	I	T	S	U	B	M	O	C	L	E	S	P	S	A	P	W	S	W	A