5.1 Practical activities

1 What lives in your schoolyard?

Purpose

To investigate the small organisms that are living in various habitats of the school grounds.

Materials

- small paintbrush
- protective gloves
- magnifying glass
- sweep net
- 4 m of string
- 4 weights (stones will do)
- field guide
- large resealable plastic bags
- map of school grounds

SAFETY

Some stinging insects may be captured, so gloves should be worn by the person who has to hold the net and shake the animals into the plastic bag. If there are any animals still caught in the net, avoid contact. Use a paintbrush to remove them.

Procedure

1. Choose the location for your experiment. If possible, each group should choose a location with a different type of ground cover. Draw a sketch of your location, noting the types of plants and the ground conditions. Take photographs if you can.
2. At your location, measure a square area that has sides of one metre. Mark the area using the string and weights. This is the area that will be swept.
3. Practise making a 'figure 8' swing in such a way that the opening of the net is always first to sweep the area.
4. At your test site, go back and forward over the area using the 'figure 8' motion until you have swept the entire square metre area.
5. Hold the bag halfway up to make sure that the organisms do not escape.
6. While another student holds the resealable bag, place the net over it, loosen your hold and turn it inside out into the bag. Carefully shake and remove the net from the bag, being sure to seal it so that the organisms do not escape.
7. Observe the organisms through the resealable bag and try to identify them using your field guide. Count the numbers of each type of organism.
8. Release any organisms that you have found.

Results

1. Record the time and date of your experiment and describe the area in which you made your observations.
2. Construct a table showing the appearance and number of each type of organism at your site.
3. Record your results along with those of other members of your class on your map of the school grounds.
4. As a class, prepare a poster of what lives in the school grounds.

Discussion

1. **Compare** the numbers and different types of organisms caught at the various sites.
2. **Identify** the site that was the most successful in terms of the:
   - a number of organisms caught
   - b variety of organisms caught.
3. **Discuss** the differences between the sites that could cause these variations.
4. **Identify** any other factors that could have led to this result.
5. **Classify** the organisms into groups according to the environmental conditions each preferred. Examples include: dry or moist; long grass or short grass; sun or shade.
6. a **Discuss** whether or not you would expect the same organisms in your sweep if you conducted this experiment at:
   - i different times of day
   - ii other times during the year.
   - b **Propose** reasons for any variation.
   - c **Describe** a way of testing your predictions.

2 Looking at earthworms

Purpose

To investigate how worms behave in their habitat.

Materials

- trowel
- gloves
- containers
- stereomicroscope or magnifying glass
- sheet of white paper or a white tile

SAFETY

Make sure that you are wearing gloves and that you don't directly inhale any dust. It is important that the worms are treated with care and are not harmed during your investigation. Take care to look after them and then return them to where you collected them, once you have finished.

Procedure

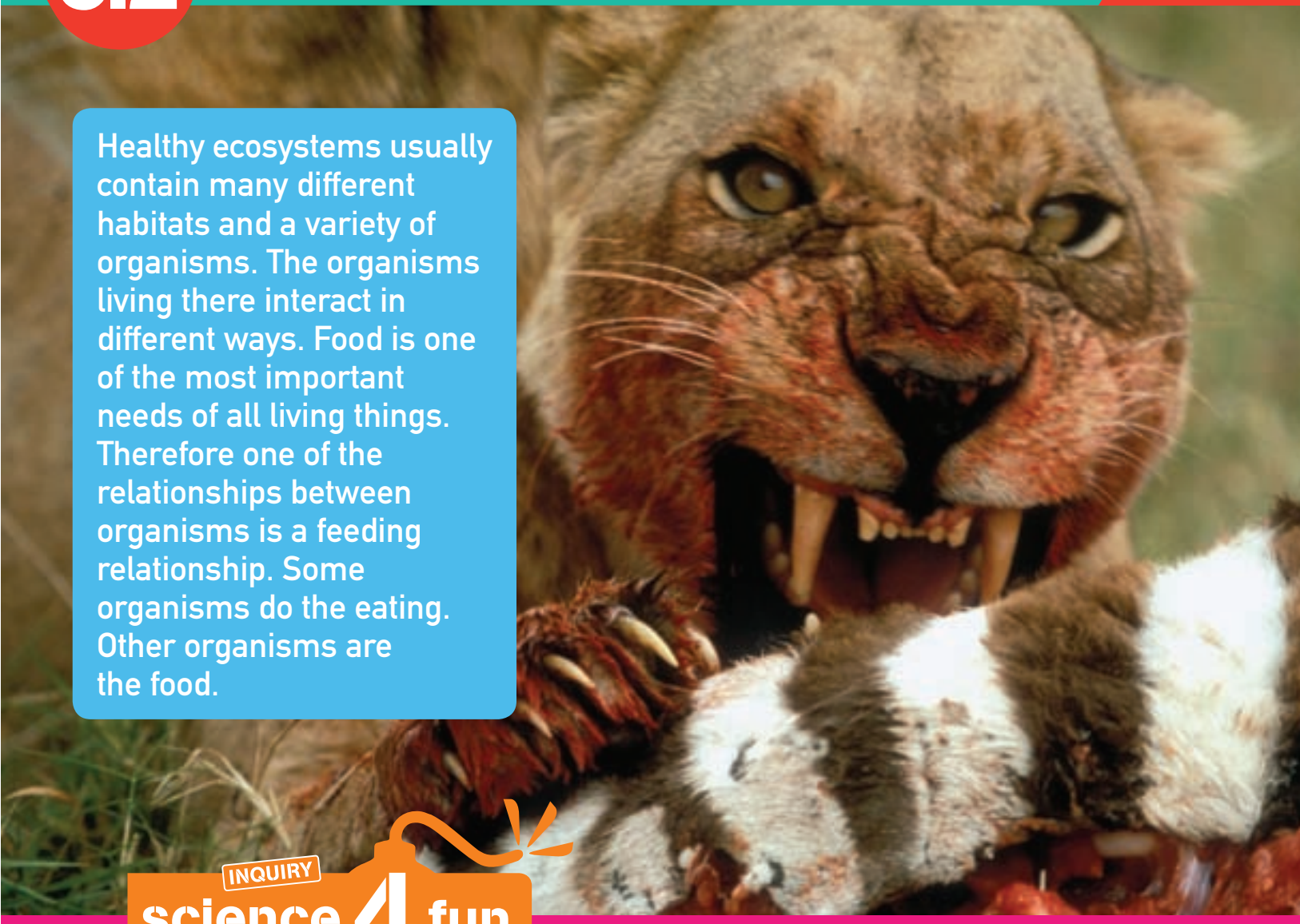
1. Dig for worms in the garden. Choose a place where the soil is moist.
2. Place the worms in a container with some loose soil. Keep the worms moist at all times and make sure they don't escape.
3. In the classroom, gently place one of the worms on the white paper.
4. Look at the earthworm through a stereomicroscope. Make notes about its appearance. Sketch what you see.

5. Observe the way the worm moves.
6. Use the stereomicroscope or magnifying glass to look carefully at the underside of the worm close to its head.
7. Run your finger very gently from the back to the front of the worm's underside.
8. When you have finished, return the earthworm to a natural habitat under some leaves in a moist, shady location.

Discussion

1. **Describe** the shape of the worm and how this helps it move through the soil.
2. a **Describe** how the shape of the worm changed as it moved.
   b **Explain** how the change in shape helps the worm move forward.
   c **Propose** what was happening inside the worm to cause these changes in shape.
3. a **Describe** what you felt and/or saw on the underside of the worm.
   b **Propose** how this feature could help the worm move.
   c **Deduce** why it is difficult to pull a worm from its burrow.
4. Worms are well adapted to living underground. **Identify** the adaptations you observed.

5.2 Food chains and food webs



Healthy ecosystems usually contain many different habitats and a variety of organisms. The organisms living there interact in different ways. Food is one of the most important needs of all living things. Therefore one of the relationships between organisms is a feeding relationship. Some organisms do the eating. Other organisms are the food.

INQUIRY science 4 fun

Predators in the garden

Can I see predators at work in the garden?

Collect this…

A magnifying glass could be useful but is not essential.

Do this…

1 Sit quietly in the garden or in an area of parkland where there are flowers, bushes and trees.

2 Observe the insects, birds and other animals such as lizards that are moving around.

3 Use your magnifying glass to observe insects moving around on the plants.

Record this…

Describe any situations where an animal was feeding.

Explain which organism was the predator and which was being eaten.

Predators and prey

For an organism to live in a particular habitat, that habitat must provide adequate food or nutrients. Plants make their own food. Animals must consume other animals or plants to get their food. Animals that eat other animals are called **predators**. For example, a dingo will hunt a hopping mouse. The dingo is a predator of the hopping mouse. The animal that is eaten is the **prey**. The hopping mouse in Figure 5.2.1 is the prey of the dingo.

Figure 5.2.1 The dingo is the predator. It preys upon the hopping mouse as a food source.

If two animals eat the same sort of food and they live in the same habitat, they must compete for their food; they are **competitors**. Rabbits (Figure 5.2.2) were introduced into Australia during the 1830s and they compete with many Australian animals for food, living space, water and shelter.

Figure 5.2.2 Wombats and rabbits compete for food, shelter, living space and water.

Food chains

Plants and animals use energy in growing and in day-to-day activity. This energy must come from somewhere. Plants get their energy from sunlight, and animals get their energy from the food they eat. For example, grass uses the energy from sunlight to make the food it needs to be able to grow. A grasshopper may eat the grass to get the energy it needs and a kookaburra might eat several grasshoppers to get the energy it needs. When the kookaburra dies, bacteria will help to decompose its body. The bacteria get the energy they need. The nutrients stored in the body of the kookaburra are returned to the soil and help more grass to grow.

Figure 5.2.3 All food chains start with the Sun, and usually end with bacteria or fungi.

This flow of energy from organism to organism is called a **food chain**. An example of a food chain is shown in Figure 5.2.3.

A food chain is usually drawn as a simple flow chart like this:

Sun → grass → grasshopper → kookaburra → bacteria

The direction of the flow of energy is shown by the arrows.

Producers, consumers and decomposers

Food chains start with the Sun. The Sun gives out light energy. Plants trap the Sun's energy in their leaves using a chemical called **chlorophyll**. Chlorophyll gives plants their green colour. Plants then use the energy they have trapped, with water and carbon dioxide, to make the carbohydrate called glucose. Glucose is a simple sugar. Oxygen is also produced. This process is called photosynthesis. **Photosynthesis** is often written as a chemical equation:

$$\text{carbon dioxide} + \text{water} \xrightarrow[\text{chlorophyll}]{\text{sunlight}} \text{glucose} + \text{oxygen}$$

Plants can produce their own food and so they are called producer organisms or **producers**.

Animals cannot make their own food and must consume (eat) plants or other animals to get the energy and nutrients they need. Animals are therefore called **consumers**. Consumers such as grasshoppers, kangaroos or koalas that eat only plants are known as **herbivores** (Figure 5.2.4). Consumers such as lions, dingoes or kookaburras that eat only other animals are called **carnivores**. **Omnivores** are consumers that eat plants and animals. Humans and some bears are examples of omnivores.

Figure 5.2.4 Koalas are herbivores. They only eat leaves from eucalyptus trees.

If a plant or animal dies without being eaten, its body is broken down by decomposers. **Decomposers** are organisms such as bacteria and fungi that are able to get the energy they need as they break down dead matter and waste products. You can see a type of fungus in Figure 5.2.5.

Figure 5.2.5 The fungi on the tree stump are decomposer organisms. Fungi break down the materials that the tree is made from, returning these materials to the soil. Through this process fungi get the nutrients they need to live and grow.

In this food chain:

Sun → grass → grasshopper → kookaburra → bacteria

the grass is the producer, the grasshopper is a **first-order consumer** and the kookaburra is a **second-order consumer**.

In another food chain, a lizard could eat the grasshopper. The lizard could then be eaten by the kookaburra. The new food chain would look like this:

Sun → grass → grasshopper → lizard → kookaburra → bacteria

The lizard is the second-order consumer and the kookaburra is a **third-order consumer**.

5.6

Food webs

In the pond ecosystem shown in Figure 5.2.6, small fish live in constant danger of being eaten. If they go too close to the surface, birds might catch them. If they move away from the protection of the pond weeds, large fish will catch and eat them. The edge of the pond is also dangerous, because frogs and birds are always alert for an easy meal.

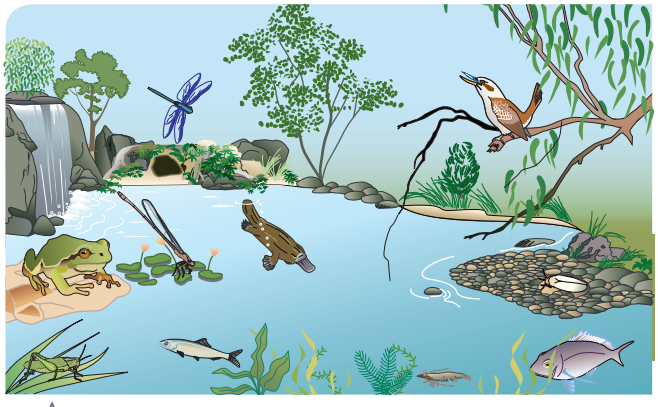


Figure 5.2.6 A pond ecosystem is home to a variety of organisms.

If you drew food chains for every predator in and around the pond, the small fish would be included in most of them. This situation is common in many ecosystems. Each animal consumes a variety of foods but is also the prey of a number of different predators.

Following are four possible food chains for the pond ecosystem.

Sun → pond weed → small fish → kookaburra → decomposer

Sun → pond weed → insect larvae → platypus → decomposer

Sun → pond weed → insect larvae → small fish → kookaburra → decomposer

Sun → pond weed → small fish → large fish → kookaburra → decomposer

Joining a number of food chains together produces a **food web**, such as the one shown in Figure 5.2.7.

Changes often occur in food webs as the populations of different organisms increase, decrease or disappear altogether. Some animals or plants might be in the pond for only a short time each year; for example, tadpoles might be an abundant food source for fish one week, but if they become frogs the next week they will no longer be available to the fish but instead could be a food source for the kookaburra.

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5.7

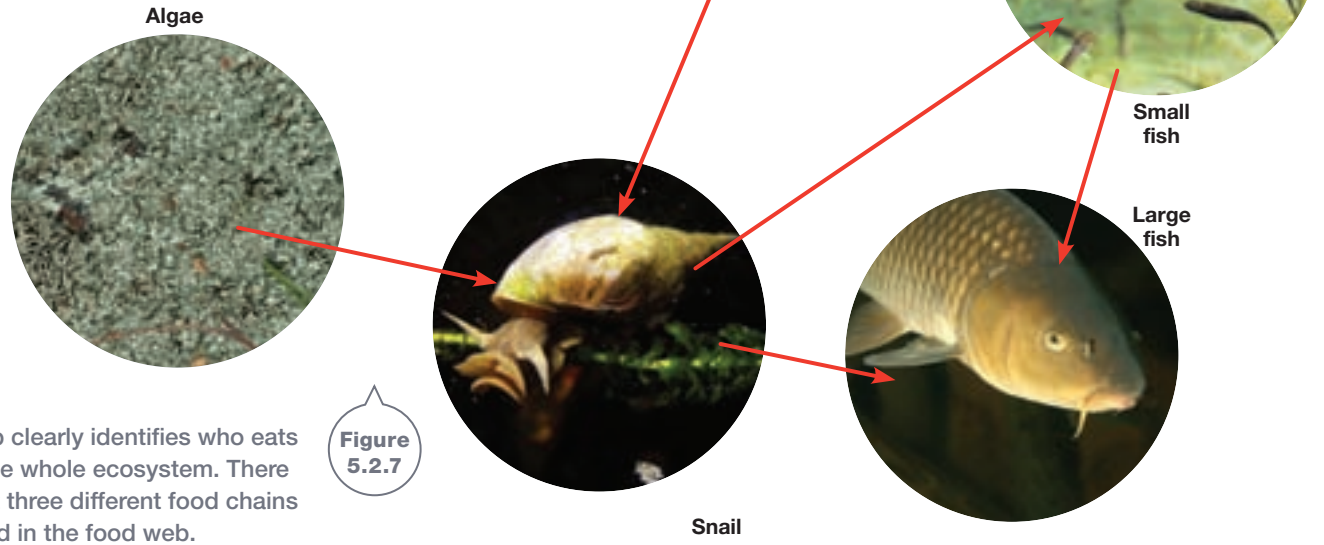

Figure 5.2.7 A food web clearly identifies who eats whom in the whole ecosystem. There are at least three different food chains represented in the food web.

5.2 Unit review

Remembering

1 **State** what the arrows in a food chain indicate.

2 **Name** the process that plants use to make their food.

3 **State** where the energy in a plant's food comes from.

Understanding

4 **Define** the following terms:
- a producer
- c consumer
- d decomposer.

5 **Explain** why all food chains begin with the Sun.

6 **Explain** why a producer is the first living thing in a food chain.

7 **Describe** an example of each of the following:
- a competition between two carnivores
- b competition between two herbivores
- c a predator and its prey.

Applying

8 a Using the food web shown in Figure 5.2.8, **identify** the:
- i producers
- ii consumers.

b **Identify** and record three food chains that are contained within the web.

Analysing

9 **Compare** a food chain and a food web.

10 **Compare** carnivores, herbivores and omnivores.

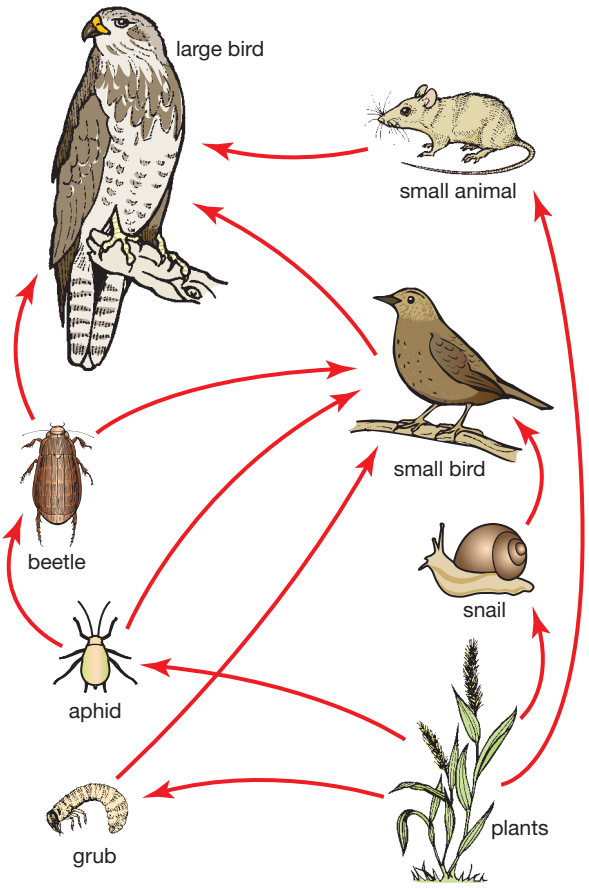

Figure 5.2.8 A large food web

Evaluating

11 a Figure 5.2.9 shows a venus flytrap. This plant catches insects and uses them as a source of nutrients. **Propose** whether a carnivorous plant like a venus flytrap should be known as a producer or a consumer.

b **Justify** your response.

Figure 5.2.9 Venus fly trap

12 **Propose** what could happen in the food web shown in Figure 5.2.8 if the number of:

a small birds decreased

b large birds increased

c plants decreased.

Creating

13 **Use** the following information to **construct** a food web:

- algae (a producer)
- snail (eats algae)
- small fish (eats algae and snails)
- water beetle (eats small fish)
- frog (eats beetles)
- snake (eats beetles and frogs)
- decomposers.

14 Using a set of six cards, write your own name on one card. On the other cards write the names of five plants and animals that you could eat.

a Use these cards to **construct** a food chain in which you are:

i a first-order consumer

ii a second-order consumer

iii the consumer at the end of the food chain.

b **Discuss** how easy was it to make the food chains, and whether you had to make other cards.

15 Ecosystems rely on producers, consumers and decomposers. **Create** a role-play for each of the following situations.

a All the consumers in an ecosystem are removed.

b All the producers in an ecosystem are removed.

c All the decomposers in an ecosystem are removed.

Inquiring

1 Select a habitat in which you are interested or that is relevant to your local area.

a Create a list of plants and animals that live there.

b Construct a food web for the habitat.

2 Research the food eaten by a koala, a great white shark, an emu and a Tasmanian devil. Deduce which of these animals would be most affected if one of their food sources disappeared.

5.2 Practical activities

1 Woolly web

Note: This is a whole-class activity.

Purpose

To create a food web using students connected by pieces of wool.

Materials

- information about feeding relationships in a particular habitat
- small balls of wool or string (start with five for each student)
- card to make labels
- marker pen
- paper clips (one per student)

Procedure

1. Each student selects an organism from the list of organisms found in the habitat.
2. Using the card and marker pen, create a name label so that you can be identified. Attach it using a paper clip.
3. Using the information about feeding relationships, identify the organisms that you will use as a source of food.
4. Start with the producer organisms. Connect the producers to the herbivores that eat them, extending the wool from the producer's right hand to the herbivore's left hand. The producer organisms and the herbivore hold opposite ends of a piece of wool. The wool represents an arrow in the food web.
5. The carnivores then connect to the herbivores they eat, by holding opposite ends of a piece of wool (wool from the right hand of the herbivore should extend to the left hand of the carnivore).
6. Any carnivores that eat other carnivores are then connected until all the feeding relationships are created by pieces of wool. The wool always goes from the right hand of the organism being eaten to the left hand of the predator.
7. Identify one organism that will be eaten—the prey. The student representing that organism gently pulls on one piece of wool so that the energy moves along the food chain from the prey to the predator. The predator then pulls on all of his/her strings so that the energy moves to the next level. Continue in this way until the energy reaches the consumers at the ends of all the food chains.
8. Repeat the exercise, starting with organisms at different levels in the food web.

Results

Observe the effect on other parts of the food web, of the changes you have made.

Discussion

1. **Describe** the effect of a change on the levels of a food web above it.
2. **Describe** the effect of a change on the levels of a food web below it.
3. **Propose** what could happen at higher levels in the food web if an organism disappeared from the habitat.
4. **Identify** any effect the organism's disappearance had on lower levels of the food web.
5. **Explain** why it is an advantage for organisms to have a variety of food sources.
6. **Identify** any of the higher-order consumers that would be left with no food source if one of the first-order consumers in your food web was to disappear from the area.
7. **Deduce** what will happen to your food web if a producer organism is removed from the area.

5.3 Impacts on ecosystems

Environmental conditions in ecosystems change constantly. These changes can be short term such as waves crashing on a rocky shore, or long term such as the seasons. Not all changes are natural changes. Human activity can change ecosystems.

Sustainable ecosystems

Ecosystems that are diverse and are able to provide the needs of the organisms living there over a long period of time are **sustainable ecosystems**.

In sustainable ecosystems (like the one in Figure 5.3.1) there are a wide variety of species. The term **species** is used to describe different types of organisms. There are many different habitats for these species. Each species has a variety of food sources, so if one food source is in short supply they can use another.

Natural ecosystems are sustainable ecosystems. Human activities can change ecosystems. This can result in sustainable or unsustainable environments. Humans can influence ecosystems so that species leave the ecosystem because their needs are no longer met. If the species cannot find a suitable place to live then it is in danger of becoming extinct.

Figure 5.3.1 Sustainable ecosystems provide habitats for a variety of species. The needs of those species are met by the resources of the ecosystem.

Traditional use of fire

Fire causes rapid changes in ecosystems. Fire has been an important part of Australian ecosystems since before humans lived on the continent. In large areas of Australia the plants are adapted to fire. For example, some plants need fire to release seeds from woody seed pods. Others plants recover quickly after fire has destroyed their leaves.

When Aboriginal people came to Australia they used fire as a tool for hunting. Kangaroos and wallabies escaping from the fire would be captured by hunters. Traditional burning patterns used frequent cool fires, such as the fire in Figure 5.3.2. Forests were replaced by open woodlands and grasslands. There was an increase in grazing animals, such as the kangaroos the Aboriginal people used for food. Plants used as food also flourished.

Figure 5.3.2 Traditional Aboriginal burning practices used cool fires that burned the grass and low shrubs without destroying the leaves at the tops of the tallest trees.

Different areas were burned at different times, leaving a mosaic pattern which provided a variety of habitats for different plants and animals. In turn this provided a variety of foods for the Aboriginal people.

When Europeans arrived in Australia, traditional Aboriginal burning practices gradually stopped. Many of the ecosystems they had created disappeared.

Floods

Floods change ecosystems. The usual image of Lake Eyre is a dry bed of salt surrounded by desert, as shown in Figure 5.3.3. When water reaches the lake, a completely different ecosystem is established. After remaining in the sand for years, the seeds of wildflowers germinate, producing large areas of colour.

Fish and other aquatic animals flow into the lake with the flood waters. Thousands of water birds such as pelicans, cormorants and ducks fly in and start nesting and breeding. The young birds are an abundant food source for predators such as dingoes and kites. A desert ecosystem returns when the flood waters dry up.

Figure 5.3.3 When water reaches Lake Eyre, the ecosystem is changed from dry desert to an area with many different organisms.

Floods can destroy ecosystems. As Figure 5.3.4 shows, flood waters can carry large amounts of soil from the land, down rivers and into lakes and the ocean. The soil settles out of the water, covering coral reefs, sea grasses and other aquatic habitats. This covering, known as sediment, prevents light from reaching the plants and smothers small animals such as corals. Many of the organisms living in these ecosystems die and the system is permanently changed.

Figure 5.3.4 Dark brown sediments moving from the river into the ocean. The sediments cover plants and animals on the ocean floor.

INQUIRY

science 4 fun

No food!

How would things change if all the supermarkets closed down?

Collect this…

No equipment is needed.

Do this…

Imagine how life in your area would change if all the supermarkets were closed down.

Record this…

1. **Describe** what you think would happen in the short term of two weeks and in six months.
2. **Explain** how this relates to the destruction of a natural environment and the effect on the organisms that lived there.

Human activities

Agriculture

In Australia, a large proportion of the total land area has been cleared of native vegetation (the plants that usually grow there). The land is now used to graze animals or to grow crops such as the wheat seen in Figure 5.3.5. These agricultural areas provide very different habitats from the native vegetation. Fertilisers and pesticides used on the crops may wash into rivers from the farmland, causing changes in river and wetland ecosystems.

Figure 5.3.5 Vast fields of wheat cannot provide the same habitats as those provided by native vegetation.

Logging

Trees growing in Australia's forests are a valuable source of timber. Timber is used in construction, furniture making and as wood pulp for the production of paper. Figure 5.3.6 shows how the forests, and the habitats the forests contained, are destroyed when the trees are removed.

Figure 5.3.6 Large trees provide food and shelter for a variety of organisms. These organisms all lose their homes when old trees are cut down.

Mining

In some forms of mining, the surface of the Earth is scraped away to access the resource underneath (Figure 5.3.7). All the habitats that were there are destroyed. There have also been situations where poisonous chemicals from the mines pollute waterways, causing damage to these habitats and the organisms that live in them. Loose soil also washes into rivers and creeks and destroys the habitat of water plants, which cannot grow in muddy water.

Figure 5.3.7 Open-cut mines remove all the vegetation from the surface. The soil and vegetation have to be replaced when mining is finished, but that is too late for the animals that have lost their habitat.

Urbanisation

Towns and cities are built on land that was once a natural ecosystem. The native vegetation is replaced with houses, shops, offices, industries, roads, and new parks and gardens. The animals that once lived there no longer have their habitat and have to move away. However, there are some animals that live quite happily in urban areas and appear to thrive there. Possums such as the brushtail possum in Figure 5.3.8 are a common sight in cities.

Figure 5.3.8 Possums thrive in cities. They live in the space between the ceiling and roof of houses and use vegetable gardens and fruit trees as a source of food. They are often seen travelling from place to place along electricity and telephone wires.

Introduced species

Many species of plants and animals have been introduced into Australia. Most of the animals and plants we use as food are introduced. Pet animals, such as cats, dogs and rabbits, are also introduced.

The wool, cotton and leather used to make clothes and furnishings come from introduced species. The majority of the introduced species have benefited humans. The same is not true for other introduced species such as the fox (Figure 5.3.9), the rabbit and the cane toad.

Figure 5.3.9 The fox was introduced into Australia from Europe in the 1860s to provide sport for hunters.

SciFile

Garbage dump

Mount Everest, the world's highest mountain, could be called the 'World's Highest Garbage Dump'. There are nearly 110 tonnes of litter on Mt Everest. The waste includes high-tech climbing equipment, plastic, tins, oxygen tanks, aluminium cans, clothes, glass and tents.

Loss of species diversity

Human actions have caused many native species to become **extinct**. A species is said to be extinct when nobody has seen it in the wild for over 50 years and the last known individual has died. In the past 200 years more than 125 species of Australian native plants and animals have become extinct. Hunting, changes to the environment, and habitat loss have caused many more species to become threatened.

Threatened organisms can be classified into one of three groups, depending on how great the threat to their survival appears to be.

- **Endangered species** are close to extinction and very small numbers remain. Examples are the helmeted honeyeater, the blue whale, the beaked gecko and the Leadbeater's possum (Figure 5.3.10).
- **Vulnerable species** are experiencing a rapid population decline and are in danger of becoming extinct if the drop in numbers continues. Examples of vulnerable animals are the mountain pygmy possum, the Gippsland giant earthworm, the Mallee fowl, the bilby and the diamond python (Figure 5.3.10).
- **Rare species** have low numbers and are often spread out over a large area. Although the populations may be small, they are not decreasing. Rare organisms include the eastern wallaroo, the leafy sea dragon (Figure 5.3.10), the powerful owl and the alpine tree frog.

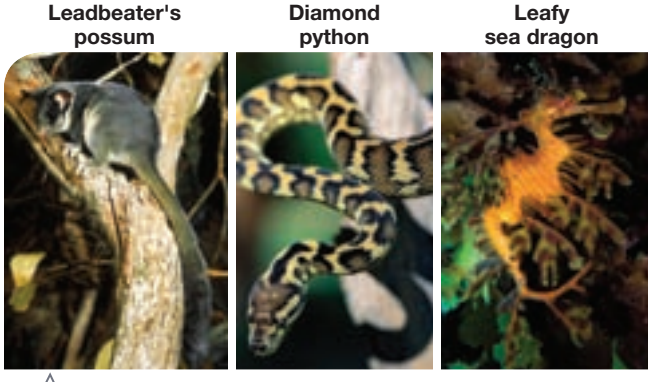

Figure 5.3.10 Threatened species of Australia

Effect of an industry

Sumatra is one of the islands of Indonesia. Its position is shown in Figure 5.3.11. It has a huge range of plant and animal species, some of which are found only on this island.

Figure 5.3.11 Sumatra is one of many islands that make up the country of Indonesia.

The Sumatran elephant, Sumatran tiger (Figure 5.3.12), Sumatran rhino and Sumatran orang-utan are four species that are critically endangered because their habitat is disappearing. These species live in the rainforests of Sumatra. However, Sumatra has lost almost 50% of its tropical rainforests in the past 35 years.

Figure 5.3.12 Sumatra is the only place where this tiger is found. It is the smallest of the tigers and there are fewer than 400 individuals left in the wild.

The rainforests of Sumatra are logged and burned, and then oil palm plantations (such as the one shown in Figure 5.3.13) are established. Indonesia is the world's largest producer of palm oil and the industry brings money into the country and provides employment for many people.

Figure 5.3.13 Oil palm plantations such as this one are replacing rainforest on the island of Sumatra. This is not a suitable habitat for the Sumatran tigers, orang-utan, rhinos and elephants.

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SCIENCE AS A HUMAN ENDEAVOUR

Use and influence of science

Biological control

Figure 5.3.14 *Cactoblastis* moth caterpillars

ENDEAVOUR

One method of controlling unwanted pests is to introduce a predator of the pest or a type of organism that will compete with the pest for food or shelter. Using one type of organism to control the numbers of another type of organism is called **biological control**. This includes introducing a disease-causing organism that will kill the pest but not other species.

The following are three examples of biological controls that have been tried in Australia.

The *Cactoblastis* moth (Figure 5.3.15) was introduced into Australia in 1925 in an attempt to control the spread of the prickly pear cactus (Figure 5.3.16). The moths feed only on the cactus, and so they died out when they had eaten all the food. This was a big success and the problem of the cactus was solved within a few years.

Figure 5.3.15 The *Cactoblastis* moth. The caterpillars (larvae) of this moth eat the prickly pear cactus.

Figure 5.3.16 The prickly pear cactus was brought to Australia by Captain Phillip on the First Fleet because it was a food source for a beetle that provided the red dye used for soldiers' uniforms. Later it was grown as cattle feed and as a pot plant in gardens. The cactus spread very rapidly and at one stage covered an area the size of the state of Victoria.

Figure 5.3.17 Plagues of rabbits can quickly destroy the land. Scientists tried to control the spread of rabbits in Australia with poisons and viruses.

Sometimes biological controls do not work as planned. An example of this is the biological control introduced to control rabbits in Australia (Figure 5.3.17). Rabbits eat out crops and grazing lands, as well as burrowing through the soil until it can't be used for anything. In 1995 a virus, the calicivirus, was being researched as a possible method of control. It was accidentally released into the wild ahead of schedule. In the first few weeks, millions of rabbits died. Grazing land regenerated quickly. The results looked promising until it was realised that the foxes that relied on the rabbits for food were now eating small native mammals instead.

The most famous Australian biological control story is the cane toad (seen in Figure 5.3.18). Cane toads are native to South America and were first introduced in Australia in 1935 to control cane beetles. Cane beetles were accidentally introduced with imported sugar cane. As a control agent cane toads were a failure. They did not eat the cane beetle; instead the cane toads found many other things they preferred to eat. A cane toad eats anything it can swallow, including insects, mice, small snakes, lizards and even young cane toads. Poison from glands on its back kills many potential predators such as snakes and even crocodiles.

Figure 5.3.18 Cane toads can weigh up to 1.25 kg, live for up to 15 years and produce 40 000 eggs per year. Cane toad numbers are increasing rapidly and they are spreading across northern Australia. This cane toad is eating a frog.

5.3 Unit review

Remembering

1 **List** three ways in which humans can affect ecosystems.

2 **Name** the method of controlling pests that uses natural predators.

3 **Name** two species that are:
- a endangered
- b vulnerable.

Understanding

4 **Describe** changes in ecosystems caused by the traditional burning practices used by Indigenous Australians.

5 a **Explain** how a mosaic pattern was created in the vegetation.
- b **Explain** the benefits of having the mosaic pattern.

6 **Explain** why the cane toad:
- a was introduced into Australia
- b is now considered a pest that needs to be controlled.

Applying

7 In an area of the Flinders Ranges in South Australia, foxes were preying on the yellow-footed rock wallaby. Foxes were excluded from an area and for the next ten years the number of wallabies in the area was counted. The results are show in Figure 5.1.19. **Use** the information in the graph to **describe** the effect on the wallaby population of removing the foxes.

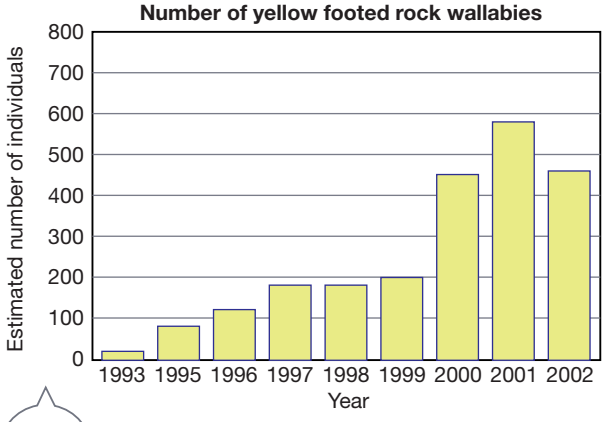


Figure 5.3.19

Analysing

8 **Compare** a sustainable and an unsustainable ecosystem.

9 **Compare** two effects of floods on natural ecosystems.

10 **Compare** the three groups of threatened species.

Evaluating

11 A wheat field is not a natural habitat. However, the wheat field provides a habitat for organisms. **Deduce** the types of organisms that would thrive in this habitat.

12 In some forests only the largest trees are taken out by loggers. **Propose** changes that removing only the largest trees would have on the other organisms living in the forest.

13 Are all introduced species pests? **Justify** your answer.

14 a **Propose** ways in which construction of the buildings shown in Figure 5.3.20 has already affected natural ecosystems.
- b **Predict** what could happen to organisms living in a creek downhill from the building site after a heavy rainstorm.

Figure 5.3.20

Creating

15 A wildlife corridor is a strip of native vegetation that links patches of bushland. In many cases the patches of bushland are no longer big enough to provide for all the needs of organisms living in this habitat. Linking the patches of bushland allows animals to reach their food sources, shelter and breeding grounds.

In Figure 5.3.21, there are several isolated patches of bushland. Your task is to modify this area to include wildlife corridors. **Design** this area to include wildlife corridors so that the animals can move between the various areas. You may need to consider how to form links across roads. Present your design in a format of your choice.

farm boundaries

present bushland

swampy areas – unproductive farmland

Conditions

- Farmers don't own land along the river. It is public land 15 m either side of the river's edge
- Farmers have the right to use water for stock
- Farms A, C and G unlikely to cooperate in the wildlife corridor project

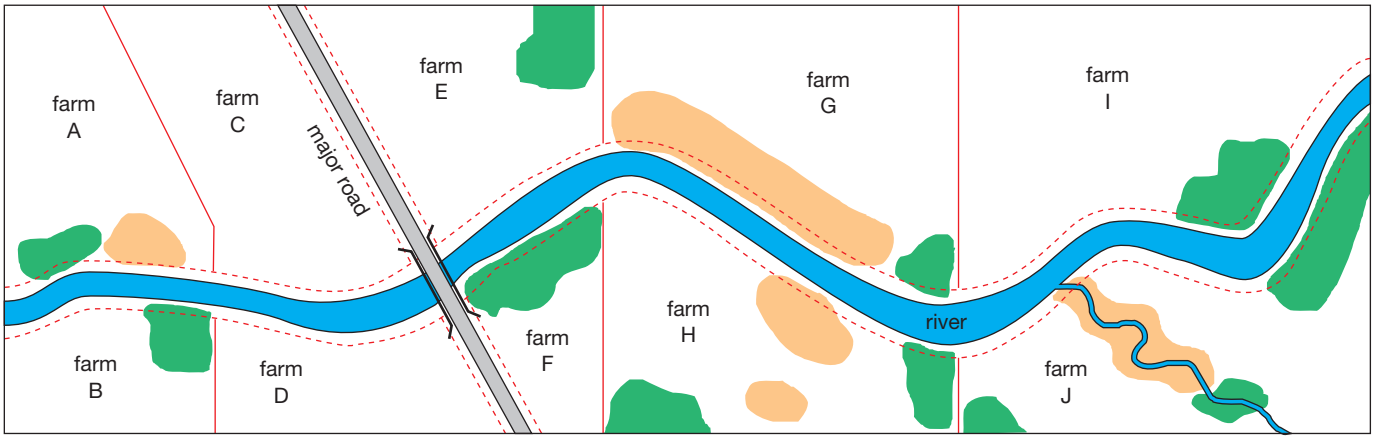


Figure 5.3.21

Inquiring

1 Research the different scientific responses to the rabbit plagues in Australian agricultural areas.

2 The cane toad has become established in many areas of northern Australia.

- **a** Research the effect that the cane toad has had on other living things in these areas.
- **b** Investigate strategies that have been used to control the spread of the cane toad.

3 Identify Australian scientists who are studying the impacts of humans on environments.

- **a** Outline the research these scientists are involved in.
- **b** Describe the human impacts they have identified.
- **c** Describe the changes in human behaviour that the scientists suggest have to be made.

4 Research a local environmental management project.

- **a** Outline the project.
- **b** Describe the reasons the project was set up and the expected benefits to the community.
- **c** Identify the types of scientists involved in the project and the role that each scientist has.

5.3 Practical activities

1 Taking control of plants

Purpose

To design an experiment to investigate the effect of changes in light on the growth of plants.

Materials

- a cardboard box
- black paper
- digital camera
- a range of plants, such as grass, alfalfa, cress
- different-coloured cellophane (blue, green, red, clear)
- measuring tools (rulers, balances, measuring cylinders)
- a light source

Procedure

1. Decide whether you want to study the effect of the direction from which the light is coming, or the effect of the quality of light that is reaching the plant. This will be the controlled variable.
2. Use the above materials to design a way of controlling the amount or quality of light that is reaching the plants.
3. Think about ways in which all the other variables can be kept the same.
4. Decide how you are going to measure or record the response of the plant. The digital camera could be useful for this purpose.
5. Check that the experiment you have designed is a fair test.
6. Record the procedure for your experiment.

Results

Present your results in a way that identifies patterns.

Discussion

1. **Compare** the reaction of different plant species to the variable you studied.
2. **Identify** situations where plants in a natural environment could be exposed to changes in the direction or quality of light.
3. **Discuss** your results in relation to how changes in the environment can affect plants.
4. **Deduce** whether your procedure could be used by ecologists to investigate plant behaviour.
5. **Discuss** the things that worked well and those that didn't in this experiment.
6. **Decide** how the experiment could be improved.

2 Threatened organisms

Purpose

To research the causes of organisms becoming threatened.

Materials

Research tools: access to the internet, encyclopaedias and textbooks

Procedure

1. Research the names of species living in your state or territory that are classified as threatened. The humpback whale (shown in Figure 5.3.22) is an example.
2. Select one of the organisms from the list.
3. Find out:
   - **a** its normal habitat
   - **b** the changes occurring that are causing the numbers of this organism to decrease
   - **c** the influence of human activity on these changes.
4. Propose actions that could be taken to conserve this organism.

Results

Present your research in the form of an electronic presentation or poster.

Figure 5.3.22 The humpback whale is considered to be an endangered species in most countries. A typical humpback whale is about the size of a bus and can live to 95 years.

5 Chapter review

Remembering

1 **State** why a producer organism is normally part of every food chain.

2 **Recall** the original source of energy for food chains.

3 **List** these in order from largest to smallest: habitat, biosphere, ecosystem.

4 **List** these groups of organisms from the ones that are most threatened to the ones that are least threatened:
rare, vulnerable, endangered.

Understanding

5 **Explain** why the habitat of an organism is sometimes referred to as its address.

6 **Modify** these scrambled sentences and rewrite with the words in the correct order.
- a ecosystem are All things an living in interdependent.
- b may feeds A is off organism parasite that kill its an host and it.
- c and sensitive Plants to environment animals changes are their in.

7 Figure 5.4.1 shows a food web where an eagle is the consumer at the top of the food chains.
- a **Predict** what would happen to the number of eagles in the area if foxes were introduced. (Note: foxes would eat koalas, birds and kangaroos.)
- b Redraw the food web and **modify** it to include the foxes.

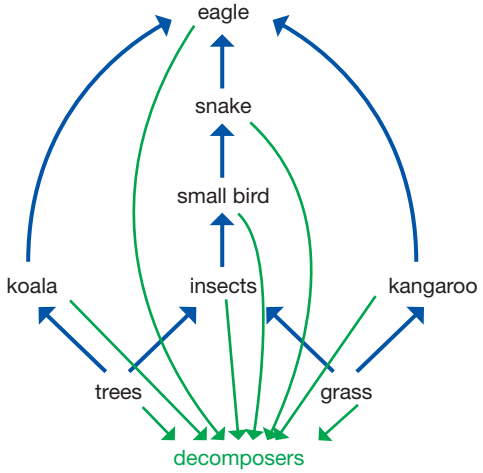


Figure 5.4.1

Analysing

8 **Compare** the role of prey and predator in a habitat.

9 **Classify** the organisms in the following list as either producers or consumers:
cat, magpie, rose, eucalypt, sparrow, worm, ant, grass, daisy.

10 Construct two lists by **classifying** the following items as biotic or abiotic environmental factors in a wetland ecosystem:
water birds, water temperature, crocodile, rate of water flow, amount of salt in the water, water plants, frogs, fish.

Evaluating

11 *Lantana* is a large flowering shrub that is native to Central and South America. It was introduced to Australia in 1841 as an ornamental garden plant that could be cut into a hedge. In the wild it grows rapidly along creek banks. It forms very dense bushes that prevent light from reaching the ground. *Lantana* grows in areas that are difficult to access and is not easy to remove. *Lantana* has a prickly stem and the leaves are poisonous to livestock if eaten. Its seeds are contained in a cluster of fleshy black berries that birds love to eat.

Use the information about *Lantana* to:
- a **propose** ways in which *Lantana* could affect the growth of native plants
- b **propose** ways in which *Lantana* could affect the number and species of native animals living in an area
- c **propose** actions that could be taken to prevent the spread of this plant.

12 Figure 5.4.2 shows the changes in the numbers of different animals found in an area for a period of 40 years. You are asked to interpret the information in this graph.
- a **Identify** the general trend in the population of the native animals (red-necked wallaby and eastern grey kangaroo).
- b **Identify** the general trend in the population of the rabbit—an introduced species.
- c **Compare** the changes in the rabbit population and the changes in the population of the eastern grey kangaroo.

d **Deduce** what may have caused the drop in grey kangaroo numbers in 1885.

e **Identify** the animals that are competing with the eastern grey kangaroo for food.

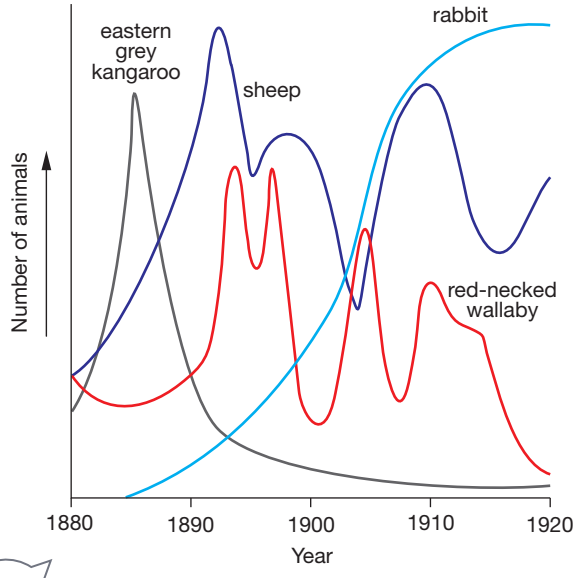


Figure 5.4.2

13 Use the information in Figure 5.4.3 to answer the following questions.

a **Identify** the organisms that compete with each other for food.

b **Deduce** which organism would be affected most by the use of insecticides (chemicals that kill insects).

c **Propose** the consequences for the remaining organisms in the food web if bandicoots became extinct in the area.

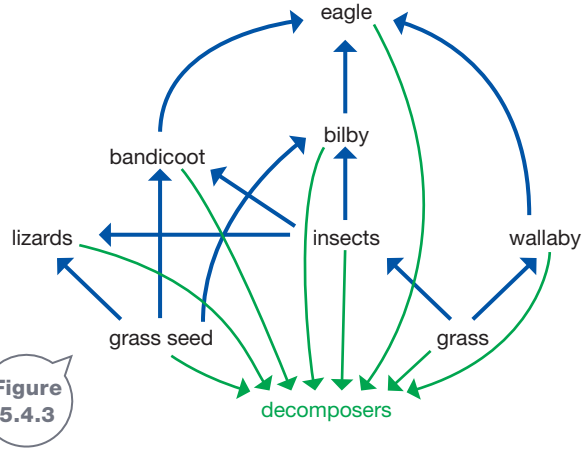


Figure 5.4.3

14 **Propose** reasons why humans are able to live in so many environments.

15 a Use information from the chapter to **identify** ways that human activity affects ecosystems.

b **Classify** the effects as positive or negative.

c **Propose** how the negative influences would make the ecosystem unsustainable.

d **Propose** how the positive influences increase the sustainability of the ecosystem.

16 In northern Australia there is a distinct wet season and dry season. The wet season may last for three months and during this time there may be floods. In the dry season there may not be any rain at all.

a **Propose** the effect on farmers managing a cattle property in this area.

b **Recommend** strategies these farmers could use to overcome any difficulties you identified.

Creating

17 a **Use** the following lists of organisms to **construct** food chains. Under the name of each organism, label it as a producer or a consumer.

b **State** whether it is a first-order, second-order or third-order consumer.

i grass, snake, frog, grasshopper

ii eucalypt, kookaburra, caterpillar

iii shark, large fish, small fish, snail, water plants

18 **Use** the following ten key terms to **construct** a visual summary of the information presented in this chapter:

environment, biotic factors, abiotic factors, habitat, food chain, producer, consumer, photosynthesis, endangered species, adaptation.

Thinking scientifically

Q1 Environmental factors may be biotic (living) or abiotic (non-living). **Identify** the list that has these sorted correctly.

A *biotic:* soil, predators, living space, bacteria, parasites
abiotic: water, prey, light, wind, rock

B *biotic:* prey, living space, parasites, predators, wind
abiotic: soil, water, bacteria, light, rock

C *biotic:* soil, predators, rock, bacteria, light
abiotic: water, parasites prey, wind, living space

D *biotic:* predators, prey, bacteria, parasites
abiotic: water, living space, light, wind, rock, soil

Q2 The fish shown in Figure 5.5.1 is adapted to its habitat; it has characteristics that assist it to survive in its environment. Which characteristic will help it swim through the water?

A the dark colour of its tail and fins
B the long spines in its back fin
C its streamlined shape
D its gaping mouth and small teeth

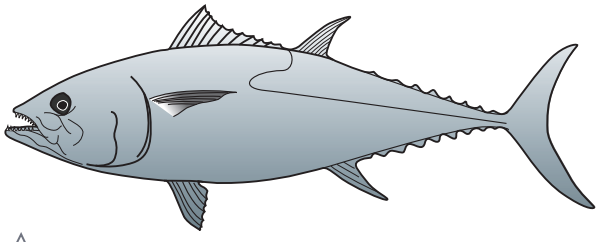


Figure 5.5.1

Q3 First-order consumers feed directly on producers. A producer can manufacture its own food from energy in sunlight. From the food web in Figure 5.5.2, **identify** the group of organisms that are all first-order consumers.

A tadpole, water beetle, snail
B water beetle, frog, small fish
C kingfisher, snail and algae
D snail, tadpole, algae

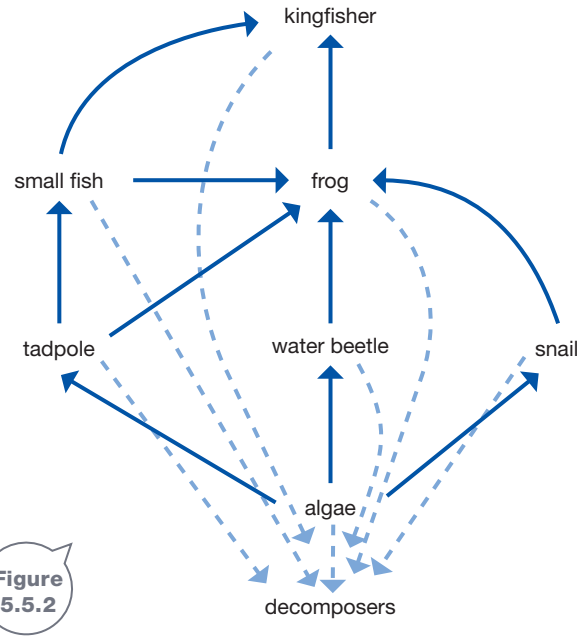


Figure 5.5.2

Q4 From the food web in Figure 5.5.2, **identify** the organism that is both a second-order and a third-order consumer.

A small fish
B kingfisher
C frog
D snail

Q5 **Identify** the plant in Figure 5.5.3 that would be adapted to get the most water from its environment.

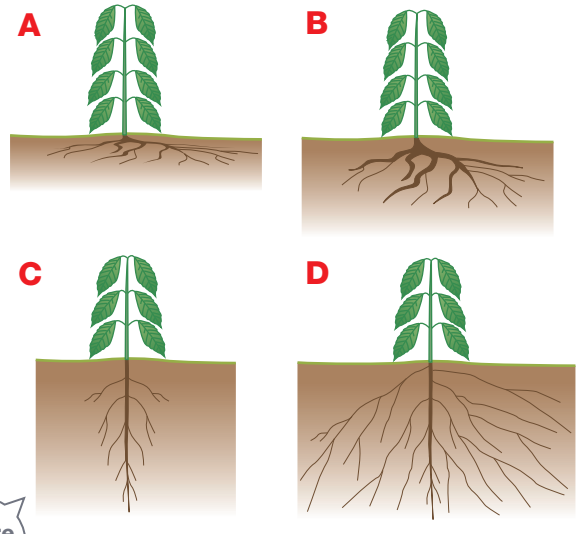


Figure 5.5.3

Glossary

Unit 5.1

Abiotic factors: non-living factors in the environment

Adaptations: characteristics that help an organism to survive in its environment

Biosphere: the place where all life exists; consists of Earth and its atmosphere

Biotic factors: living factors in the environment

Commensalism: an interaction between two organisms where one of them benefits but the other one is not affected

Ecologists: scientists who study the interactions between living things and their environment

Ecosystem: a system formed by organisms interacting with each other and their non-living surroundings in a balanced way

Environment: the term used to describe all the conditions that affect a plant or animal in its habitat

Habitat: the place where an organism lives

Host: an organism in or on which a parasite lives

Interdependent: depending on each other for survival

Mutualism: an interaction between organisms where both the organisms benefit from the relationship and neither is harmed

Mutualism

Nocturnal: active or hunting at night

Parasite: an organism that lives on or in a host, taking food or shelter from the host. The host gets nothing in return and may be harmed

Parasitism: an interaction where one type of organism (the parasite) lives on or in another type of organism (the host); the host is usually harmed or even killed

Parasitism

Symbiosis: another name for interdependence

Unit 5.2

Carnivore: a consumer that eats only other animals

Chlorophyll: the chemical in plants that traps energy from the Sun and gives plants their green colour

Carnivore

Competitors: organisms that have the same food source and live in the same habitat

Consumers: organisms that must eat other organisms to get the energy and nutrients they need; animals are consumer organisms

Decomposers: organisms that get the energy they need by breaking down dead matter and waste products

First-order consumer: a consumer that eats a producer

Food chain: the flow of energy from organism to organism in a series of feeding relationships

Food web: a number of food chains combined

Herbivore: an animal that eats only plants

Omnivore: an animal that eats both plants and animals

Omnivore

Photosynthesis: the process used by plants to make their own food

Predator: an animal that eats other animals

Prey: an animal that is eaten by a predator

Producer: an organism able to manufacture its own food; plants are producer organisms

Second-order consumer: a consumer that eats a first-order consumer

Third-order consumer: a consumer that eats a second-order consumer

Unit 5.3

Biological control: a method of controlling unwanted pests by using a natural predator or disease

Endangered species: species that are close to extinction and very small numbers remain

Extinct: term used to describe a species that has not been seen in the wild for over 50 years, and of which the last known individual has died

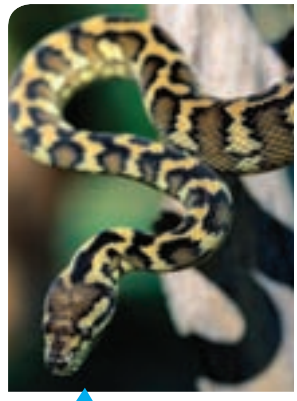
Rare species: species that has low numbers, often spread out over a large area; the population is not decreasing

Endangered species

Species: the term used to describe different types of living things

Sustainable ecosystem: an ecosystem that is diverse and able to provide for the needs of the organisms living there over a long period of time

Vulnerable species: species that is experiencing a rapid population decline and is in danger of becoming extinct if the drop in numbers continues



Vulnerable species