

Unit 7C Environment and feeding relationships

About the unit

In this unit pupils learn:

- how habitats vary
- how plants and animals are adapted to live in a particular habitat
- how plants and animals interact with their environment and with each other, including feeding relationships
- about adaptations for feeding
- how to link food chains to make webs

In scientific enquiry pupils:

- consider the importance of sample size
- make measurements of environmental changes and interpret these
- survey the variety of living things within a habitat
- investigate the activity of a small invertebrate, taking into account variables they cannot control

This unit is expected to take approximately 8 hours.

Where the unit fits in

This unit draws on ideas developed in the key stage 2 programme of study. It builds on unit 4B 'Habitats' and unit 6A 'Interdependence and adaptation' in the key stage 2 scheme of work.

Together, this unit and unit 6A 'Interdependence and adaptation' in the key stage 2 scheme of work could be used as a bridging unit.

The unit provides a foundation for unit 8D 'Ecological relationships' and for unit 9A 'Inheritance and selection'.

The energy transfer ideas of unit 7I 'Energy resources' are used in considering feeding relationships between organisms. If this unit is covered before unit 7I 'Energy resources', then the treatment can be restricted to using the label 'energy' for what is transferred. If unit 7I 'Energy resources' is covered first, then links can be made to the burning of fuels and foods and the Sun as the energy resource for plants.

There are opportunities for pupils to make presentations about, and take measurements in, the environment. This links with unit 3 'Processing text and images' and unit 7 'Measuring physical data' in the ICT scheme of work.

Expectations

At the end of this unit

in terms of scientific enquiry

most pupils will: make a series of measurements of environmental variables appropriate to the task; identify a question to investigate about the activity of an invertebrate, suggesting a suitable approach and sample size; use their results to relate animal and plant activity to environmental changes

some pupils will not have made so much progress and will: make measurements of environmental variables appropriate to the task and make suggestions about investigating the activity of an invertebrate

some pupils will have progressed further and will: describe, in terms of approach and sample size, how strongly any patterns or associations identified are supported by the evidence

in terms of life processes and living things

most pupils will: identify differences between different habitats and relate these to the organisms found in them; describe ways in which organisms are adapted to daily or seasonal changes in their environment and to their mode of feeding; describe food chains within an environment and combine these into food webs

some pupils will not have made so much progress and will: identify differences between different habitats and describe how familiar organisms are suited to the habitat in which they are found; describe some simple food chains

some pupils will have progressed further and will: explain why a variety of habitats is needed in a community; describe how different organisms contribute to the community in which they are found and relate food chains to energy transfer

Prior learning

It is helpful if pupils:

- know that different habitats support different plants and animals and have identified ways in which plants and animals in a particular habitat depend on each other
- have explored local habitats to establish the variety of living organisms within them
- know that some animals feed on other animals and some feed on plants

Health and safety

Risk assessments are required for any hazardous activity. In this unit pupils:

- plan and carry out their own investigation
- collect and handle small invertebrates
- work in an outside environment

Many employers have specific guidance on fieldwork. Model risk assessments used by most employers for normal science activities can be found in the publications listed in the *Teacher's guide*. Teachers need to follow these as indicated in the guidance notes for the activities, and consider what modifications are needed for individual classroom situations.

Language for learning

Through the activities in this unit pupils will be able to understand, use and spell correctly:

- words and phrases relating to feeding, *eg predator, prey, food web*
- words and phrases relating to seasonal changes, *eg migration, hibernation, overwintering, dormant, insulation, climatic stress*
- words and phrases describing environmental conditions, *eg light intensity, availability of oxygen*
- words with different meanings in scientific and everyday contexts, *eg producer, consumer*
- words with similar but distinct meanings, *eg carnivore and predator*
- words relating to scientific enquiry, *eg temperature sensor, sample size, reliable data*

Through the activities pupils could:

- organise, sequence and link what they say so listeners can follow it
- find information from secondary sources using contents, index, glossary, key words or hotlinks
- join ideas within sentences using links of cause (so, because, since)

Resources

Resources include:

- sensor and software for temperature, oxygen, light, pH measurement
- secondary sources, *eg photographs, video clips, preserved and live specimens*, showing predators and prey
- pictures showing the range of organisms found in a variety of habitats
- secondary sources providing information about how animals deal with seasonal changes in their environment
- secondary sources showing how some plants, *eg holly, nettles, bracken*, have defence mechanisms
- simulation software illustrating changes in populations
- secondary sources, *eg CD-ROMs, videos*, illustrating diets of animals

Out-of-school learning

Pupils could:

- visit other habitats, *eg nature reserves, nocturnal houses in zoos and nature centres*
- find out about the feeding requirements of a variety of species of animal
- attend evening or early morning activities, *eg bat watching, snake spotting, moth spotting and listening to the dawn chorus run by country parks, waterways and other organisations*
- watch wildlife programmes on video and television, read accounts of life in a habitat supporting different plants and animals
- look for plants and animals in their immediate locality, *eg on the way to and from school*
- find out about wildlife conservation projects or ecology centres in their locality
- search the internet for information about habitats and feeding relationships using key words, *eg zoo, food chain, habitat*

Pupils should learn:

Pupils:

How does the environment influence the animals and plants living in a habitat?

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| <ul style="list-style-type: none"> • that different habitats have different features • that different habitats support different organisms • that the distribution of organisms in different habitats is affected by environmental factors, <i>eg light, nutrients or water availability</i> • to organise sequence and link what they say so listeners can follow it | <ul style="list-style-type: none"> • Ask pupils about environments or habitats they studied at key stage 2 and explain that in the first part of the work in this unit they are going to look at features of habitats. • Provide pupils with stimulus material, <i>eg video of the Arctic, poster of woodland life, picture of cacti in a desert, underwater scene, worms in a wormery</i>. Ask the pupils to describe the physical features of each habitat and identify major environmental factors, <i>eg light intensity, oxygen availability, temperature range</i>. • With pupils, decide on a limited list of animal and plant species for each habitat. Remind pupils of the importance of making sure listeners can follow their argument, and ask them, in groups, to use secondary sources to investigate how species are adapted to life in one habitat and to present their findings, <i>eg orally, using overhead transparencies (OHTs) or flip charts</i>. | <ul style="list-style-type: none"> • identify features, <i>eg light, temperature range</i>, which are different in different habitats • describe adaptations to life in a variety of habitats such as: <ul style="list-style-type: none"> – water, <i>eg streamlined shapes help animals move through the water, water plants float or have long stems to reach surface waters</i> – underground, <i>eg streamlined shapes, adaptations for tunnelling, poor sight but good senses of smell and vibration</i> – woodland, <i>eg colour vision, climbing plants and camouflage, early growth and flowering before the canopy develops</i> • pick out appropriate adaptations and explain clearly their significance • make an oral group presentation of their findings | <ul style="list-style-type: none"> • This activity is intended to help teachers find out what pupils know about habitats and how organisms are adapted to them. Teachers will need to take this into account in later work. • Pupils may need help to stay focused on the question of adaptations to the habitat and help in selecting appropriate material from a large quantity of general information on the lives of particular plants and animals. • This unit includes work on seasonal changes. It is useful to have a log of species sighted in the school and its surroundings. If possible, encourage pupils to note vegetation and other changes in the school environment over the academic year. • Extension: pupils could explore a wider variety of habitats through an interactive field trip, <i>eg www.field-guides.com</i> |
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Pupils should learn:

Pupils:

How do environments vary?

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| <ul style="list-style-type: none"> • that some animals are adapted to daily changes in their habitat • how to measure and record changes in environmental factors • how to interpret patterns in data | <ul style="list-style-type: none"> • Ask pupils to predict how physical environmental factors around the school, <i>eg light intensity, temperature, humidity, noise levels</i>, would change over a 24-hour period and how they could measure the changes. With pupils, set up instruments, <i>eg datalogging equipment with a light probe, automatic weather station, temperature and sound sensors</i>, to monitor changes. Provide pupils with data about environmental changes around the school over a 24-hour period and help them to describe what these show and to identify links between the different changes. • Ask pupils to suggest how the population of plants and animals in the school habitat would change over the same time, <i>eg crows and starlings visiting dustbins in daylight, squirrels visiting after school finishes, foxes after dark; slugs, cats, mice, bats active at night</i>. Using their ideas, secondary sources and first-hand observation where possible, help pupils to generate comparative lists of animals active during the day, at dawn and dusk and those which are nocturnal. | <ul style="list-style-type: none"> • describe changes in physical environmental factors, <i>eg temperature, light intensity</i>, over a 24-hour period • interpret data about daily changes and explain in simple terms, <i>eg beginning to get dark</i> • relate changes in variables, <i>eg light and temperature</i>, to each other • relate plant and animal activity to environmental changes | <ul style="list-style-type: none"> • There is an opportunity to use datalogging equipment. Secondary sources, <i>eg newspapers, Ceefax and geography weather stations</i>, could be used to confirm readings. • Schools near the coast and by tidal rivers have an opportunity to focus on adaptations to changes in these habitats. • Schools with CCTV may be able to monitor animal activity at night. |
| <ul style="list-style-type: none"> • how to frame a question to be investigated • how to decide what factors are relevant to a question • about the importance of sample size • to consider results in relation to the sample used | <ul style="list-style-type: none"> • Using observations of small invertebrates in the school grounds or elsewhere, ask pupils to generate a suitable question about how the activity of an invertebrate, <i>eg woodlice, snails, brine shrimps, daphnia</i>, varies with environmental changes, <i>eg dampness, light/dark</i>, and to plan and carry out an investigation. • Help pupils to produce an account of what they did, focusing on the size of sample they used, the factors they could and could not control and how confident they were in their results. | <ul style="list-style-type: none"> • identify a suitable question for investigation • identify and control relevant variables • choose an appropriate way of obtaining an adequate sample • explain why they are, or are not, confident in their results, <i>eg 18 out of 20 times the snails went to the damp, I think this is sufficient; we only used 6 woodlice and 4 of them chose the dark, I think we need to use more than 6 woodlice to be sure</i> | <ul style="list-style-type: none"> • Extension: pupils could find out about adaptations to daily changes in two or three plant or animal species. • If any animals are brought into the classroom, ensure that they are treated carefully and that they are returned to the habitat from which they came as soon as possible. <p> Safety</p> <ul style="list-style-type: none"> – teachers will need to check pupils' plans for health and safety before practical work begins – wash hands after handling animals. Particular pupils may have allergies and these should be appropriately taken into account. Wipe benches with disinfectant |

Learning objectives

Pupils should learn:

- how some animals are adapted to seasonal changes in their habitats
- that adaptations may be to avoid climatic stress

Possible teaching activities

- Provide pupils with overwintering structures or photographs or video clips of these as stimulus material, *eg onion bulb, pupa, twig with buds, carrot, plastic bag of hair from a moulting pet*. Ask pupils to suggest when they would normally be found and their function. Show videos of habitats at different times of the year and ask pupils to identify differences and describe the consequences of these for the organisms in the habitat. Ask pupils to describe from their own knowledge how plants in the school habitat change over the year and predict the likely effects of the changes on the animals in the locality.
- Provide pupils with key words and phrases, *eg migration, hibernation, overwintering of pupae, dormant structures, making food stores, thicker insulation*, and ask pupils to use secondary sources to find out about these and how they help animals avoid climatic stress. Ask pupils to describe what they found out and help them to contribute to a summary sheet about seasonal changes.

Learning outcomes

Pupils:

- identify ways in which habitats vary through the year
- describe some strategies which plants and animals adopt to avoid climatic stress

Points to note

- It may be useful to have data about temperature ranges and daylight hours in the locality of the school to support this work.
- Some dormant twigs can be frozen successfully for use at other times of year. Ash trees are usually among the last to come into leaf.

Checking progress

- to summarise and make connections between key ideas about adaptation to a habitat
- Provide pupils with a list of adaptive animal and plant characteristics and ask them to decide on the six most important for a particular habitat. Ask them to explain their choices and ask others to evaluate these critically, identifying the advantages the adaptation gives the organism. Help pupils to use the results of the work to make generalisations about adaptation.
- identify adaptations for particular habitats
- explain the advantages adaptations give an organism

What is a feeding relationship?

- that animals have features which are adaptations against predators
 - that animals are adapted to their particular food source
 - to collect sufficient data to reduce error and obtain reliable evidence
 - Review pupils' knowledge of predators and prey by providing stimulus material, *eg posters, photos, pictures, video clips, preserved and live specimens*, of predatory animals and prey species, *eg eagle, dog, pike, bat, spider, rabbit, antelope, snail*, and asking pupils to describe how the predators are adapted for finding, catching and killing their prey and how prey species are adapted for detecting and avoiding predators. Help pupils construct tables of general features of predators and prey, *eg predators may have eyes forward, acute vision and sense of smell, sharp claws/talons/beaks for piercing and tearing, may ambush or hunt by stealth, whereas prey may have eyes at the side, acute hearing and sense of smell, be easily startled, be nocturnal, camouflaged*.
 - Ask pupils to investigate the effect of beak shape in seed-eating birds, *eg by using blunt and fine-pointed forceps to pick up and transfer seeds of varying sizes from a dish in one minute*. Discuss with pupils how much data they need to gather for reliable conclusions.
 - identify predators and prey from information about commonly encountered animals
 - identify features of predators, *eg a hooked beak, sharp claws, acute vision, ability to trap prey*
 - identify features of prey animals, *eg camouflage, acute senses, armour, speed*
 - state how many observations they made and explain why this was appropriate
 - Nature centres, botanical gardens and zoological collections may have outreach teachers who can bring a selection of plants and animals into schools to illustrate adaptations to habitat and food source. In addition, they often have education programmes to support visits to their establishments.
 - Alternatively, pupils could use dough coloured with food dyes, or red and green wool, distributed on a marked-off stretch of grass to investigate the effectiveness of camouflage.
-  **Safety** – wash hands after handling animals. Particular pupils may have allergies and these should be taken into account. Wipe benches with disinfectant

Learning objectives

Pupils should learn:

- about characteristics of predator and prey species
- to join ideas within sentences using links of cause, *eg so, because, since*
- that all the organisms in a habitat can be linked together in food webs
- that food webs are made up of a number of food chains which start with plants
- that arrows in a food chain represent energy transfer

Possible teaching activities

- Establish by quick questions pupils' understanding from work in key stage 2 of terms related to food chains, *eg producer, consumer*.
- Present pupils with stimulus material, *eg a habitat poster such as meadowland or woodland*, and challenge them to make as many food chains as they can. Ask them to identify producers, consumers, herbivores and carnivores. Explain the direction of the arrows in the food chain and relate to energy transfer, with the Sun as the ultimate source of energy. Ask pupils to write a sentence about each food chain, using links of cause, *eg so, because, since*.
- Ask pupils to find examples of animals that occur in more than one food chain and to explain what this shows about their food sources. Show pupils a food web and explain that it is a more accurate representation of feeding relationships.
- Help pupils use the food chains they have generated to construct a food web for display. Provide pupils with secondary data so they can practise identifying food chains within a food web and constructing food webs from food chains.
- Establish with pupils that food webs, food chains and terms, *eg predator and prey* are ways of describing feeding relationships.

Learning outcomes

Pupils:

- sort organisms into a food chain
- explain what is meant by, and identify, carnivore, herbivore, consumer, producer
- identify food chains within food webs and describe what a food web shows
- explain the direction of arrows in a food chain, *eg energy from the leaves passes to the caterpillar*

Points to note

- In unit 71 'Energy resources', the idea that food chains show energy transfer is introduced.
- Food chains may also start with bacteria or fungi. However, at this stage it is acceptable for pupils to be taught that food chains begin with plants.
- Pupils do not need to be familiar with the term 'trophic level' at this stage.
- Extension: pupils could be asked to find out about different predators and prey and produce an account of how one of each is adapted.

Pupils should learn:

Pupils:

What do food webs tell us?

- to make careful observations of plants and animals and sources of evidence about animals' food
 - to link organisms together in food webs
 - that some plants have adaptations to deter animals from feeding on them
 - to interpret evidence about food sources and draw conclusions from it
 - Ask pupils to suggest likely places to find plants and animals in the locality of the school, what species they think they might find and how the plants and animals might be linked in food webs. Encourage pupils to consider what evidence we use to find out what animals eat, *eg owl pellets, remains near lairs and nests, thrush anvils, observations, teeth marks, bird droppings showing coloured berries have been eaten.*
 - Show pupils how to use simple equipment and techniques, *eg direct observation, pooters, tree beating*, and ask them to find, identify and record as many species of plants and animals as possible within the school locality.
 - Ask pupils to record any observations which help to identify a food source, *eg a greenfly found on a rose bush, woodlice found under decaying wood, fly entangled in a spider's web*, and to note plant features which may deter animals from feeding on them, *eg prickles on holly, thistles, sting on nettles*. If appropriate, extend this work using secondary sources.
 - Help the pupils to use the information gathered to construct a database using a data-handling programme.
 - identify plants and animals found in the immediate locality
 - state that a wide variety of organisms is found in quite small habitats
 - describe and explain what might provide evidence about animals' food
 - identify features of plants which may deter animals from feeding on them
 - interpret evidence about food sources, *eg the bird droppings are purple, so they could have eaten blackberries*
 - This exercise can be done in very small-scale habitats, *eg flower bed, grass verge*. It needs to be clear that the focus of the activities is identification of food webs, because pupils may have visited an area local to their school in key stage 2 to identify organisms, using keys, and to identify food chains.
 - Pupils are likely to be familiar with using keys to identify living things from their work at key stage 2. Some may need more practice.
 - It is not necessary to quantify species at this stage, but it may be useful to count the number of species identified and the number of individuals of different feeding types for possible use in year 8.
 - If any animals are brought into the classroom, ensure that they are treated with respect, their needs are met and that they are returned to their habitat as soon as possible.
-  **Safety**
 – all off-site visits must be carried out in accordance with school/LEA guidelines
 – pupils should wash their hands after handling animals and soil.
 Particular pupils may have allergies and these should be taken into account. Disinfect pooter mouthpieces

Learning objectives

Pupils should learn:

- that all the organisms in a habitat can be linked together in food webs
- to find information using contents, index, glossary, key words or hotlinks

Possible teaching activities

- Provide pupils with secondary sources, *eg reference books, CD-ROMs, databases*, to find information about the diet of animals identified in the previous activity, and remind them how to use the index, contents section, key words and hotlinks. Ask them to add the information to the database. Ask them to use the information to construct food chains using the species identified, and to describe what the food chains show. Help the pupils to link their food chains together into a food web. Challenge the pupils to explain any missing links, *eg absence of carnivores, such as owls or hawks*. Help pupils to produce a display of their food web(s).

Learning outcomes

Pupils:

- use organisational features of text to identify relevant information about the diet of animals
- place food chains within a food web
- describe how all the organisms in a habitat can be linked together in food webs
- sequence a food chain
- recognise that arrows in a food web or food chain show the direction of energy flow

Points to note

- Pupils may need reminding that food webs are the focus of the activity, as they may have found out about the food source of a local animal in key stage 2.
- Pupils often have difficulty with the idea that arrows in a food chain represent energy flow. This could be reinforced here.

- that factors influencing the number of organisms in one part of a food web have an effect on other parts of the web

- Challenge pupils to suggest where there is competition between species in the food web. Reinforce their ideas by removing a plant species or adding two or more consumers and ask the pupils to predict the consequences.
- Extend the work by asking pupils to use food webs, *eg those generated in previous activities*, to practise predicting the effects of altering the numbers of various organisms in a web. Use ICT simulations to test out the predictions made.

- predict the effects of altering the numbers of an organism in one part of a food web
- recognise that organisms living in a habitat compete with each other for food resources
- recognise the importance of plants as the food source at the start of all food chains

- This activity provides opportunities to use ICT simulations.

Reviewing work

- that organisms in a habitat compete for resources from the environment

- Construct a paper and wool model of a food web identified in the previous activity. Remove one animal species from the web, *eg by cutting the strands of wool holding it in place*. Ask the pupils what will happen to the animals that feed on that species. Challenge pupils to identify any other effects on the food web.
- Extend by providing pupils with a food web in which at least one animal is a seasonal visitor and asking them to identify differences in the food web in other seasons.

- predict and explain the consequences of changes in the organisms making up a food web

- If the food webs generated earlier are very complex, it may be better to simplify them for this activity.
- As an alternative, pupils could be given copies of a food web generated earlier, with an animal blanked out.