



Year 2 Science lessons pack

Where are the polar regions and how are they changing?



Year 2

Science lessons pack

ENQUIRY QUESTION

Where are the polar regions and how are they changing?

LINKED HARMONY PRINCIPLE

The principle of Oneness

The six lesson plans in this pack can be used to deliver the science content for the Year 2 enquiry of learning *Where are the polar regions and how are they changing?*, linked to the principle of Oneness. This science learning builds on the foundations of the National Curriculum statutory requirements relating to living things and their habitats.

‘Our actions can help our polar regions stay amazing.’

Each lesson plan includes opportunities to refer to the children’s prior learning, as well as questions to use to reflect on current learning and to assess the children’s developing knowledge and understanding. In addition, lessons feature key elements that are distinctive to the Harmony approach to teaching and learning, for example: opportunities to **learn about Nature**, to **learn in Nature** and to **learn from Nature**.

A summary of each of these elements in relation to the six lesson plans in this pack is set out on the next pages.



01 - Learning about Nature

The statutory requirements of the National Curriculum set out what children need to learn about Nature – although, of course, their wider learning about Nature will extend beyond this.

As children progress through their primary education, we can map the journey that their science learning about living things and their habitats takes. By understanding their prior learning about living things and their habitats in the EYFS and Year 1, and by looking ahead to the path that their learning about living things and their habitats will take in Years 3 to 6, we are better able to plan for progression.

The table below shows where the science learning about living things and their habitats, covered in the lesson plans in this pack, sits within this journey.

	EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
ENQUIRY	Understanding the world	What would it be like to live on an island elsewhere in the world?	Where are the polar regions and how are they changing?	How did life change from the Stone Age to the Iron Age?	Why should we protect the biodiversity of the rainforest?	How can we restore our UK habitats back to health?	Where do migratory animals travel to and from and why?
SUMMARY OF LEARNING	Children will be guided to increase their knowledge and sense of the ecologically diverse world around them, including the animals that live within it. They will explore and begin to recognise some environments that are different from the one in which they live and will start to identify some of the animals that live in different places around the world	Children identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals and those that are carnivores, herbivores and omnivores	Children explore and compare the differences between living, dead and never been alive. They identify that most living things live in habitats to which they are suited and that these habitats provide for their basic needs. They begin to explore simple food chains and how different animals care for their young	Children will identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. They will identify that humans and some other animals have skeletons and muscles for support, protection and movement	Children explore living things within different food chains, identifying producers, predators and prey. They learn how to use classification keys to help group, identify and name a variety of plants and animals within local and wider environments. They learn about the potential dangers to living things that can be caused by changes in environments	Children learn to describe the differences in life cycles of different living species within a variety of UK habitats. They will build on their knowledge of how plants reproduce, including seed dispersal and pollination, and learn about photosynthesis	Children explore how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, and give reasons for classifying animals based on specific characteristics *They identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution
KEY VOCABULARY	key animals and their young, fish, bird, pets, habitat, farm, zoo, fur, feathers, skin, paws, claws, hooves, wings, camouflage	birds, mammals, fish, reptiles, amphibians, (in)vertebrates, herbivore, carnivore, omnivore, structure, coral reef	polar, living, dead, never been alive, microhabitat, Arctic, Antarctica, offspring, adaptation, food chain, producer, consumer, source, sea ice, temperature	skull, ribs, spine, joints, protein, minerals, fibre, carbohydrates, skeleton, bones, muscles, support, protect	tropical, temperate, rainforest, food chain, producer, predator, prey, environment, habitat, microhabitat, classification key	moorland, heathland, wetland, reproduction, carpel, stamen, anther, filament, stigma, style, ovary, ovule, indicator species, endangered, photosynthesis	resident, migrate, (non-)migratory, classification, taxonomy, observable characteristics, Linnaean, kingdom, phylum, class, order, family, genus, species

The table below sets out what the children’s learning about living things and their habitats looks like over the course of the six lessons.

Week 1	Week 2	Week 3
Where are the polar regions and what would we find there?	Which animals live in the polar regions and how do they protect their offspring?	How are polar animals suited to their habitat and what are their basic needs?
Explore and compare the differences between things that are living, dead and things that have never been alive.	Identify and name a variety of animals in their habitats, including microhabitats. Notice that animals, including humans, have offspring that grow into adults.	Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other.
Week 4	Week 5	Week 6
What is an Arctic food chain and why do we need to know?	How is an Antarctic food chain different from an Arctic food chain?	Why is ice such an important part of polar habitats?
Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food.	Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food.	Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other.

02 – Learning in Nature

In addition to learning about Nature, a Harmony approach also provides suggestions for rich opportunities to learn in or alongside Nature, as the six science lessons in this pack demonstrate.

For example, the children will explore whether all living things need the same key things to survive; they will explore the sensation of cold and classification in outdoor spaces and, through observations in Nature, the connection between human and planetary health.

As they learn in Nature, the children will also experience opportunities to develop their skills in working scientifically. Although these skills will be developed incrementally over time (as shown in Appendix A), the coverage of these skills within the sequence of these six lessons is set out below.

Week 1	Week 2	Week 3
Where are the polar regions and what would we find there?	Which animals live in the polar regions and how do they protect their offspring?	How are polar animals suited to their habitat and what are their basic needs?
Identifying and classifying	Identifying and classifying	Using their observations and ideas to suggest answers to questions
Scientific enquiry type: Identifying, classifying and grouping	Scientific enquiry type: Research using secondary sources	Scientific enquiry type: Identifying, classifying and grouping
Week 4	Week 5	Week 6
What is an Arctic food chain and why do we need to know?	How is an Antarctic food chain different from an Arctic food chain?	Why is ice such an important part of polar habitats?
Identifying and classifying	Identifying and classifying	Observing closely, using simple equipment
Scientific enquiry type: Identifying, classifying and grouping	Scientific enquiry type: Identifying, classifying and grouping	Scientific enquiry type: Observing over time

Working scientifically vocabulary

- observe
- describe
- research
- measure
- record

03 – Learning from Nature

The third key element of a Harmony approach to learning is learning from Nature, which is linked to progression in understanding of Harmony principles. This aspect of learning supports the development of children’s understanding of what it means to live sustainably.

The six lessons in this pack, and the wider enquiry they are part of, are underpinned by the principle of Oneness; they build on the children’s prior learning in the EYFS and Year 1 and prepare them for further learning in Years 3 to 6.

The children’s progression in their understanding of the principle of Oneness, through enquiries of learning that help us to think and live more sustainably, is shown below.

	EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
ENQUIRY	Children are introduced to opportunities to explore and develop their initial knowledge and understanding about Oneness (finding times to be still, quiet, feeling connected with friends or family, being part of a team, experiencing community)	What would it be like to live on an island elsewhere in the world?	Where are the polar regions and how are they changing?	How did the Ancient Egyptians live in harmony with Nature?	What can we learn from the Indus Valley civilisation about the importance of place?	What can we learn about how the Ancient Greeks lived?	How can we learn to live in peace?
PROGRESSION: CONCEPT OF ONENESS		What would it be like to live on a small island?	Where are the polar regions and how are animals adapted to live there?	How did the Ancient Egyptians live in harmony with Nature?	How was a sense of place important to the people of the Indus Valley?	What was Ancient Greek life like?	What helps us to feel peaceful?
THINKING SUSTAINABLY		What does it mean to be part of one world?	What can we do to use less energy and cleaner energy?	How can the Ancient Egyptians help us to learn to live more sustainably?	Is having a sense of place important to me and why?	What is the legacy of the Ancient Greeks?	Why is peace important for a sustainable future?
THINKING SUSTAINABLY VOCABULARY		team quiet community belong	connected calm balance global community awe and wonder	transformative uplifting impact consequence reversible irreversible	awareness integrated complex tradition culture harmony	fulfilment patterns proportions geometry golden ratio design	peace inner peace spirituality contemplation religion social movement oneness unity

Living things and their habitats
Explore and compare the differences between things that are living, dead and things that have never been alive

Working scientifically:
Identifying and classifying

Scientific enquiry type:
Identifying, classifying and grouping

Vocabulary relating to living things and their habitats, working scientifically and thinking sustainably is highlighted within the unit introduction.

Copies of Resource 1B, on clipboards (enough for one per pair)

Globe

Copies of Resource 1C (enough for one per pair)

Large sheets of paper

Scissors

Glue sticks

Optional: Poles Apart by Jeanne Willis and Jarvis

Children requiring additional support may benefit from an adult modelling how some of the things they see on their walk could be recorded in a table, in preparation for the main learning

Challenge the children to carry out further research using fiction and non-fiction books about the polar regions. Can they find any further examples of 'living, dead or never alive' to add to their lists?

CLIMATE ACTION PLAN:
Biodiversity and Nature;
Climate education and green skills

Where are the polar regions and what would we find there?

What do we already know?

Begin the lesson by recalling the children's prior **learning about Nature** and animal habitats in Year 1. Display the image of the woodland habitat on Resource 1A and ask the children to share three things about it with a partner before sharing their observations as a class.

Repeat for the two remaining habitats. Ask the children: *What is a habitat? What is the same and what is different about these habitats? What kind of animals might we see in each one?*

Play a game of true or false by presenting some statements such as:

We would see a shark in a meadow.
We would see a rabbit in a rock pool.
We would see a fish nesting in a tree.

The children could write T or F on either side of their individual whiteboards and use this to vote. In pairs, the children devise their own true or false statements; ask some of them to present these to the rest of the class.

What are we learning today?

Move the children's **learning about Nature** on by asking: *What does 'living' or 'alive' mean?* Explain that in the lesson, they will be identifying things that are living, things that were living but are no longer living and things that have never been alive.

Display the checklist on Resource 1B and explain that the things on the list are things that all living things do. Read through them as a class and discuss any new vocabulary. Encourage the children to share something they know about each of the things on the checklist with a partner e.g. we breathe air but fish can breathe underwater; my cat eats cat food; frogs lay eggs but foxes have live babies.

TEACHER TIP:
Some children may question the inclusion of waste on this list because they have learned that Nature produces no waste linked to the **principle of the Cycle**. If this is the case, you may need to clarify that even the waste from living things is used by other living things.

Take the children outdoors to **learn in Nature**. Visit different areas and ask the children to find examples of things that are living, dead and which have never been alive in each. Encourage them to use the checklist on Resource 1B to help them identify things that are alive or have been alive, or to give reasons for their thinking. Address any misconceptions and clarify that things that are dead once performed all the life processes on the checklist and things that have never been alive didn't ever perform these things.

Some of the things the children find could be photographed and added to the learning wall. Take the opportunity to highlight connections between living things and their habitats.

TEACHER TIP:
You could use the BBC film clip [Is it alive, dead or non-living?](#) to consolidate this learning.

How are we learning today?

Back in the classroom, use a globe to locate the Earth's polar regions and explain that the polar region at the top of the world is called the Arctic and the polar region at the bottom of the world is the Antarctic.

Move the children's learning about Nature on by asking: What do you think lives in the polar regions? What else might you see there? Discuss and record their ideas before watching the BBC Bitesize film clip [Andy's Animal Raps: Polar Party](#). Revisit the list of ideas about what might live in the polar regions and what we might see there, ensuring that a range of both living things (e.g. polar bear, leopard seal, emperor penguin) and things that have never been alive (e.g. snow, ice, rocks) are represented.

Draw out in the discussion the fact that polar bears only live in the Arctic and penguins only live in the Antarctic. It is a common misconception that they live in the same place.

Explain to the children that they are going to sort images from the Arctic and Antarctica into three categories: living, dead and never alive.

TIME TO EXPLAIN:
The children create a table with three columns labelled: living, dead and never alive. In pairs, they discuss, sort and stick the images from Resource 1C into the categories.

STEM SENTENCES:

A _____ is living. I know this because _____ .

A _____ is dead. I know this because _____ .

A _____ has never been alive.
I know this because _____ .

TEACHER TIP:

Either in this lesson, or at another point in the school day, you could share with the children the book *Poles Apart* by Jeanne Willis and Jarvis, which works well to support this learning.

What have we learned today?

Encourage the children to reflect on their **learning about Nature** and assess their understanding by asking: What do we find at the polar regions? *Can you name things that you would see in the polar regions that are living and dead, and things that have never been alive?*

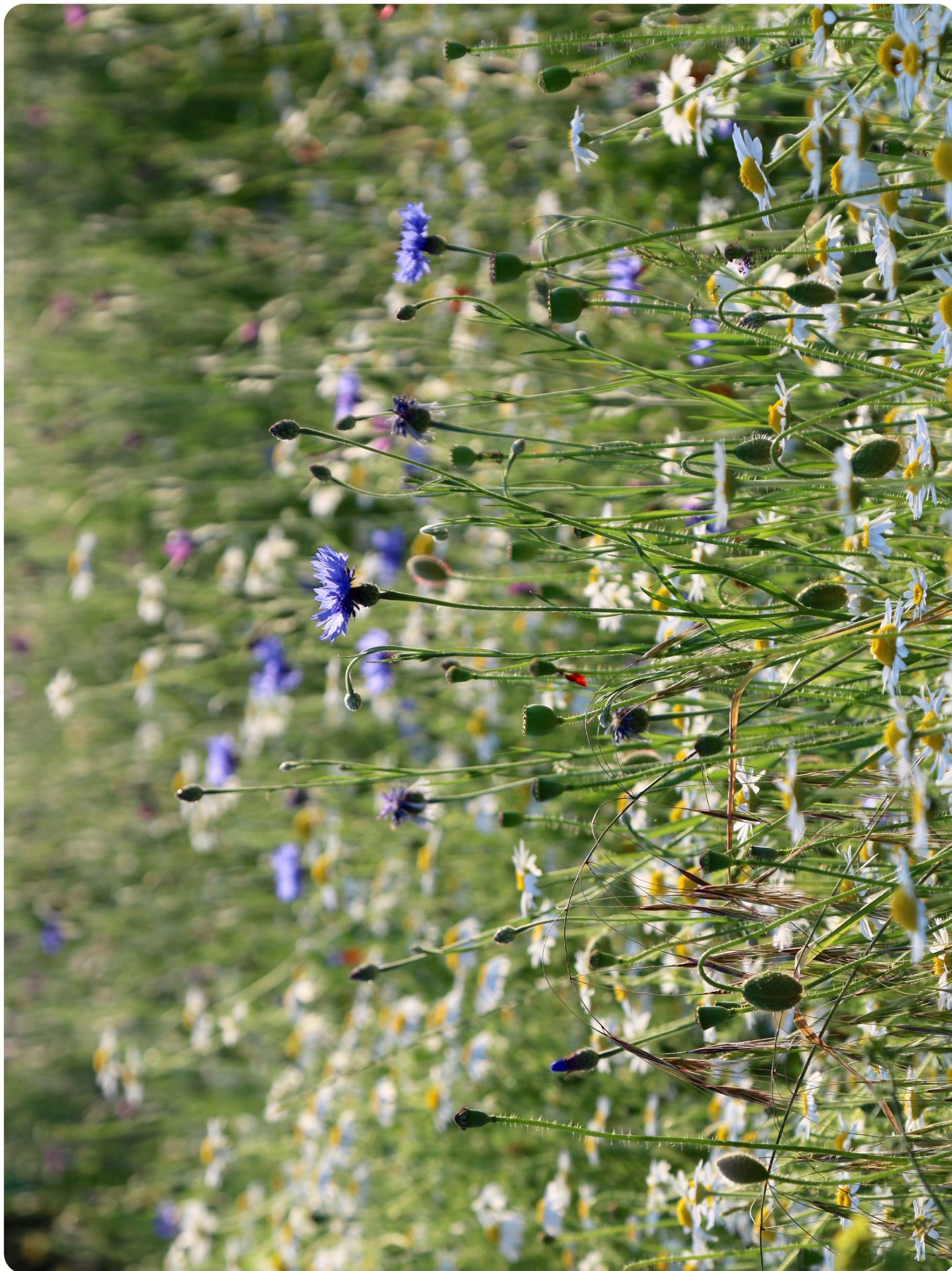
Begin to nurture the children's engagement with the **principle of Oneness** in their **learning from Nature** by sharing this

[YouTube video montage](#) to allow them to immerse themselves in the sights of the Arctic. Alternatively, you could revisit some of the images on Resource 1B. Remind the children that although the Arctic and Antarctic might look very different to where they live, these places are part of the one world that we are part of, too.

Resource 1A



Resource 1A



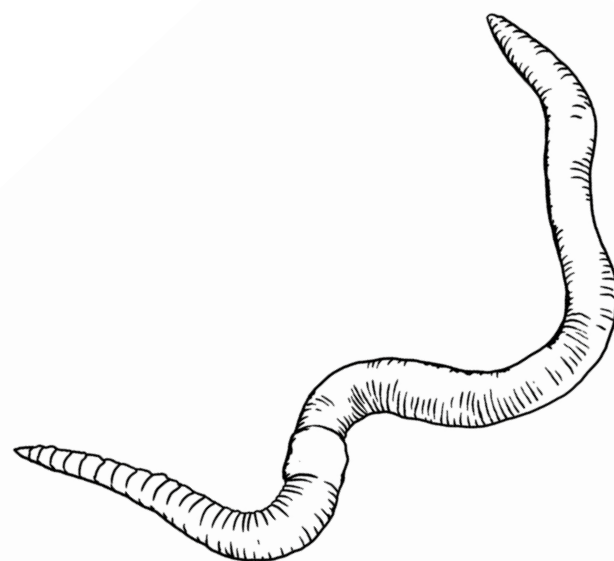
Resource 1A



Resource 1B

Living things checklist

- ☐ All living things move.
- ☐ All living things breathe.
- ☐ All living things eat and drink.
- ☐ All living things grow.
- ☐ All living things can sense their surroundings.
- ☐ All living things reproduce.
- ☐ All living things produce waste.



Resource 1C



Antarctic hair grass



Antarctic pearlwort



Arctic cotton grass



Arctic fox

Resource 1C



Arctic hare



reindeer



dead fish

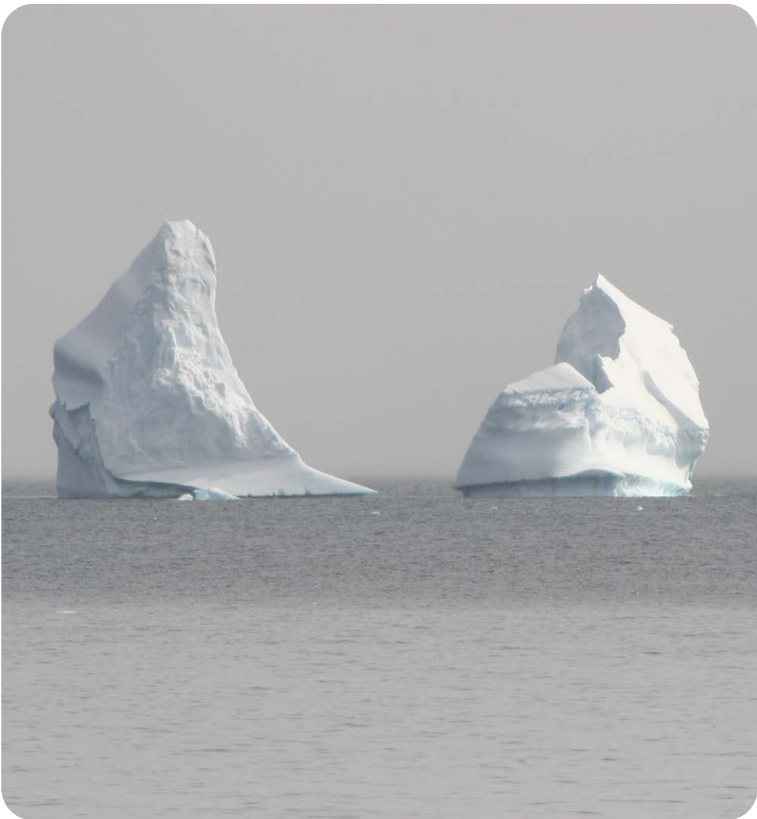


emperor penguin

Resource 1C



harp seal



iceberg



leopard seal



mammal bone

Resource 1C



polar bear



rock



snow bunting



wooden boat

Living things and their habitats

Identify and name a variety of animals in their habitats, including microhabitats

Animals including humans
Notice that animals, including humans, have offspring that grow into adults.

Working scientifically:
Identifying and classifying

Scientific enquiry type:
Research using secondary sources

Vocabulary relating to living things and their habitats, working scientifically and thinking sustainably is highlighted within the unit introduction.

Whiteboards and pens

A3 paper

Laptops or tablets and non-fiction books about polar animals for research

Children requiring additional support may benefit from a word or picture bank that links key animals and their offspring

Challenge children to add further information to their factsheet using appropriate online sources or non-fiction books for support

CLIMATE ACTION PLAN:
Adaptation and resilience;
Biodiversity and Nature;
Climate education and green skills

Which animals live in the polar regions and how do they protect their offspring?

What do we already know?

Begin the lesson by revisiting the children's **learning about Nature** from the previous lesson.

Share with them the images on Resource 1C and ask them to work with a partner to identify all the things in the images that are alive (e.g. reindeer, polar bear, Antarctic hair grass, Arctic cottongrass, emperor penguin).

Make a class list of these living things or conceal the images of things that are dead or have never been alive, then ask: *How do we know these things are alive? What do they do that proves they are alive?*

Challenge the children to think of three of the characteristics of all living things explored in the previous lesson before sharing their ideas as a class to create a complete list (e.g. they move, they eat and drink, they breathe).

What are we learning today?

Move the children's **learning about Nature** on by focusing the children's attention on the one characteristic of all living things: they reproduce. Explain to the children that for animals, this means they either have babies (offspring) or lay eggs that their babies hatch from. For plants, this means they create new plants.

Share with the class the images of the polar animals on Resource 2A. Ask the children to match the animal with its offspring (e.g. the polar bear has cubs), using the correct name for the offspring of the animal. Do the same with the images of the Antarctic animals and their offspring.

Explain to the children that animals look after their young in different ways and challenge them to think of any examples closer to home, drawing on animals they will be familiar with from their learning in Year 1. For example, a robin builds a nest to protect and shelter its offspring and sits on its eggs until they hatch. Once the eggs have hatched, the parents collect food for the chicks. A fox digs a den (or several dens) to shelter and protect its offspring and the mother fox feeds the young cubs milk.

How are we learning today?

Explain to the class that they will be **learning about Nature** by finding out how one Antarctic animal (the emperor penguin) looks after its young and how one Arctic animal (the polar bear) looks after its young.

Watch the BBC film clip [Wonders of Nature: Emperor Penguin - Caring](#), pausing to discuss the different ways that the parent penguins look after their egg and then their chick (e.g. they balance the egg on their feet to keep it off the freezing ice). The children work in pairs to make notes about key information on one of their whiteboards.

Repeat this process for polar bears by watching the BBC film clip [Polar bears in their habitat](#). Draw out in discussion why the cubs' exploration and play is so important (to teach them to hunt) and compare this with other examples the children may be more familiar with, such as a kitten or a puppy. The children work in pairs to make notes about key information on their other whiteboard.

TIME TO EXPLAIN:

Focusing on either the emperor penguin or the polar bear, the children start a factsheet by drawing their animal and writing simple sentences about it, referring to the stem sentences for support. They will continue adding to this factsheet in the next lesson.

STEM SENTENCES:

A baby _____ is called a _____.
They are found in the _____
(Arctic/Antarctic). Adults protect their young by _____.

TEACHER TIP:

If time allows, the children could add to their factsheet using their own research online or using non-fiction books. Modelling effective search prompts may be beneficial – for example: 'How do _____ protect their offspring?' 'How do _____ keep their young warm?' 'What do _____ feed their young?'

What have we learned today?

Allow time for the children to share with a partner the information they added to their factsheet. If they work with a child who has focused on the other animal, they can swap facts to extend their knowledge and understanding of the way different animals care for their offspring.

Reflect on the children's **learning about Nature** and assess their understanding by asking: *Which animals live in the polar regions? Which animals only live in the Arctic?* (e.g. polar bear) *Which only live in the Antarctic?* (e.g. emperor penguin) *How do they protect their offspring?*

Draw out the children's **learning from Nature** by asking: *What can we learn from the way emperor penguins and polar bears look after their young?* For example, we might learn from them about: **patience** – Polar bears hunt seals for blubber to feed their young when they are around three to four months old. This

involves waiting patiently for the right moment when a seal comes up for air. **commitment** – Emperor penguins commit to incubating an egg on their feet for two to three months.

responsibility – Emperor penguins take turns and share the responsibility of caring for their chick, and they do so equally.

community – Emperor penguins live in large groups where they keep each other warm in winter. They work as a team to protect and care for chicks.

Ask the children to reflect on when they or people around them have exhibited these behaviours. Ask them: *How do our parents or carers look after us?* Draw out the link to the **principle of Oneness** by asking: *How can we look after each other? How can we look after the one world we are part of?*

Resource 2A



Arctic tern adult



pup



Weddell seal adult



cubs



emperor penguin adults



chick



polar bear adult



chicks

Living things and their habitats
Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals

Working scientifically:
Using their observations and ideas to suggest answers to questions

Scientific enquiry type:
Identifying, classifying and grouping

Vocabulary relating to living things and their habitats, working scientifically and thinking sustainably is highlighted within the unit introduction.

Stopwatch or timer

Copies of Resource 3D and 3E (enough for one per pair)

A3 factsheets the children started in Lesson 2

Laptops or tablets and non-fiction books for research

Optional: The Search For The Giant Arctic Jellyfish by Chloe Savage

Children requiring additional support could benefit from familiarisation with the language required prior to the lesson using aids and visual prompts e.g. ‘temperature’, ‘shivering’

Challenge children to think about any future adaptations that polar bears or emperor penguins may need to make to survive

CLIMATE ACTION PLAN:
Adaptation and resilience;
Biodiversity and Nature;
Climate education and green skills

How are polar animals suited to their habitat and what are their basic needs?

What do we already know?

Begin the lesson by retrieving the children’s existing **learning about Nature** using the multiple-choice quiz on Resource 3A. Ask: *Which other animals will we find in the Arctic? Which do we find in the Antarctic?* Draw the children’s attention to the growing list of polar animals on the learning wall.

TEACHER TIP:
You may wish to use the BBC Bitesize film clip [What is a polar habitat?](#) to help consolidate their previous learning.

What are we learning today?

Ask the children to recall what they know about the temperature in the Arctic and Antarctic. Share the image of the Antarctic jellyfish on Resource 3B and explain that it is able to survive in the freezing cold water because it is cold-blooded. This means it is able to match its body temperature to the temperature of the cold water.

Explain that the process of an animal becoming better suited to its environment over time is called **adaptation**.

This is an ideal opportunity to remind the children of their learning about animal groups in Year 1 and to recall those that

are warm-blooded (mammals and birds) and cold-blooded (reptiles, amphibians and fish).

Explain that in this lesson they will be finding out about how polar animals have adapted to survive in the coldest regions of our planet.

TEACHER TIP:
Either in this lesson, or at another point in the school day, you could share with the children the book *The Search For The Giant Arctic Jellyfish* by Chloe Savage, which works well to support this learning.

How are we learning today?

Gather the children together in an outdoor space and invite them to take part in an experiment to see how cold air affects their body. Ask: *How warm or cold do you feel now?* Ask the children to remove their coats and pull up their sleeves so that they have bare arms.

Ask the children to close their eyes or look at their arms and start a timer for a minute or two depending on the outdoor temperature. When the timer ends, ask the children: *Have you noticed any changes?* (e.g. hairs standing on end, goose bumps, shivering, feeling cold) *Why did these changes happen? What would happen to us if we went into the polar regions dressed like this?* Establish that because we are warm-blooded, we are not able to survive in very cold conditions without having lots of layers on to keep us warm.

TEACHER TIP:
Ensure the children know they can put their cardigans, jumpers and coats back on when they need to!

Back in the classroom, display the images of the polar bear and the emperor penguin on Resource 3C and ask the children: *Which animal groups do these animals belong to?* (e.g. mammals and birds). Establish that both are warm-blooded just like us and need to stay warm in the freezing temperatures of the Arctic. Over time, their bodies have changed (adapted) so they can

withstand this cold. They have changed in other ways, too, to help them survive in the Arctic.

TIME TO EXPLAIN:
Using either the information on Resource 3D about polar bears or the information on Resource 3E about emperor penguins, the children add labels and sentences to the factsheets they started in the previous lesson about the adaptations of one of these animals.

STEM SENTENCES:
Polar bears need _____ to stay alive.
Polar bears can survive in the Arctic because they have _____. This helps them to _____.

Emperor penguins need _____ to stay alive.
Emperor penguins can survive in Antarctica because they have _____. This helps them to _____.

TEACHER TIP:
If time allows, the BBC Earth film clip [How Does Huddling Help Penguins Stay Warm?](#) explores this remarkable behavioural adaptation in more detail. The CBeebies film clip [Adaptations of animals living in the Arctic](#) would work well to consolidate the children’s understanding of the concept of animal adaptations.

What have we learned today?

Allow time for the children to share with a partner the information they added to their factsheet. If they work with a child who has focused on the other animal, they can swap facts to extend their knowledge and understanding about the adaptations of these animals.

Watch the BBC film clip [Wonders of Nature: Animals in polar habitats](#) and encourage the children to reflect on their **learning about Nature** by asking: *Which animals did you see in the film? How do these animals keep warm in such cold conditions?*

Assess their understanding by asking and discussing the learning question: *How are polar animals suited to their habitat and what are their basic needs?*

Continue to nurture the children's engagement with the **principle of Oneness** by making links with their learning in PSHE about the role we can play in caring for nature and the animals we share our world with.

Resource 3A

Polar regions quiz

1. What are the most important things that all animals need to survive?

- a. Air
- b. Water
- c. Food
- d. Shelter
- e. All of the above

2. What is a habitat?

- a. The environment where different plants and animals live
- b. Another word for 'offspring'
- c. A type of penguin

3. A habitat provides everything an animal or plant needs to survive.

- a. True
- b. False

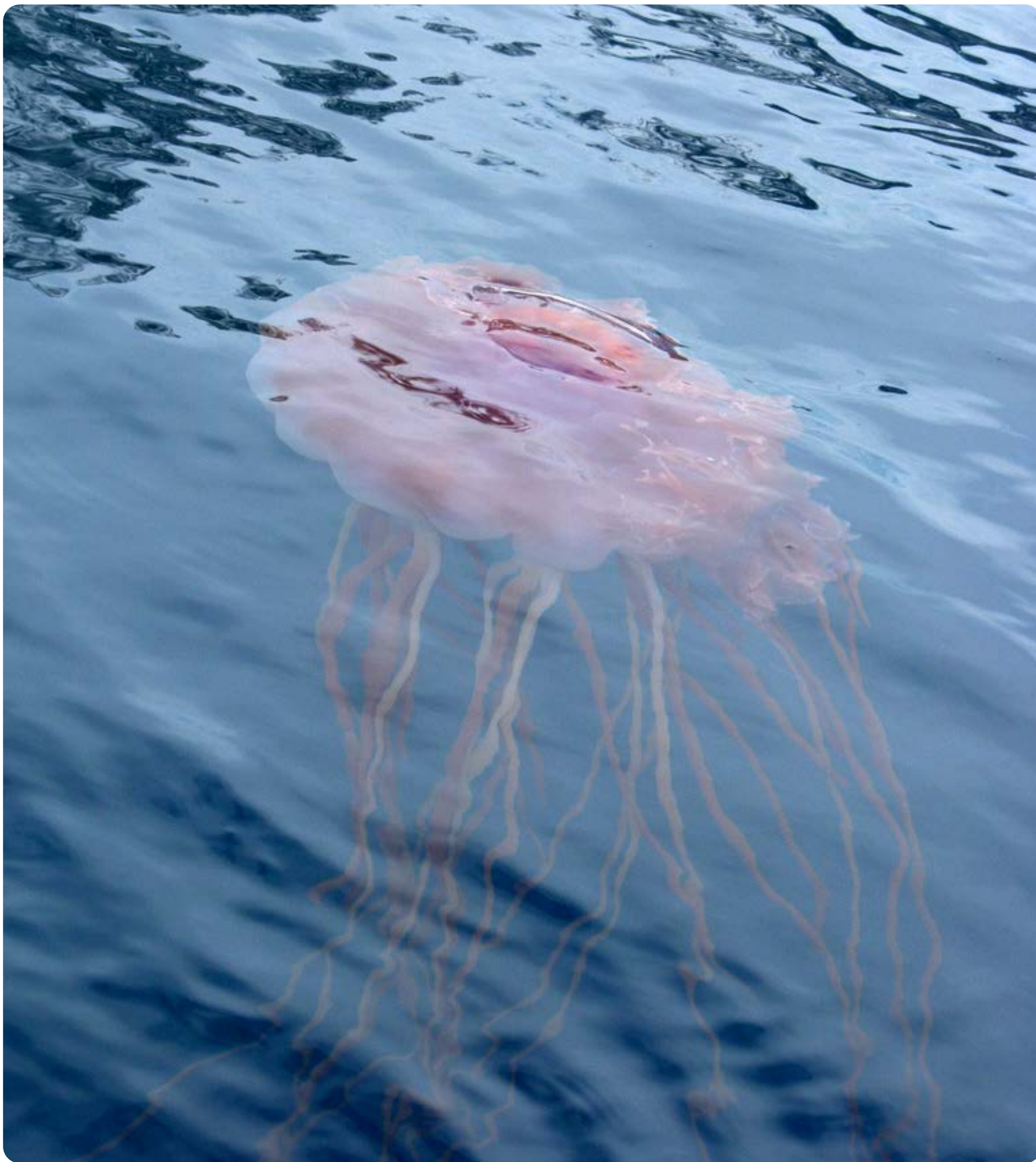
4. Where do penguins live?

- a. In the Arctic
- b. In Antarctica
- c. In Australia

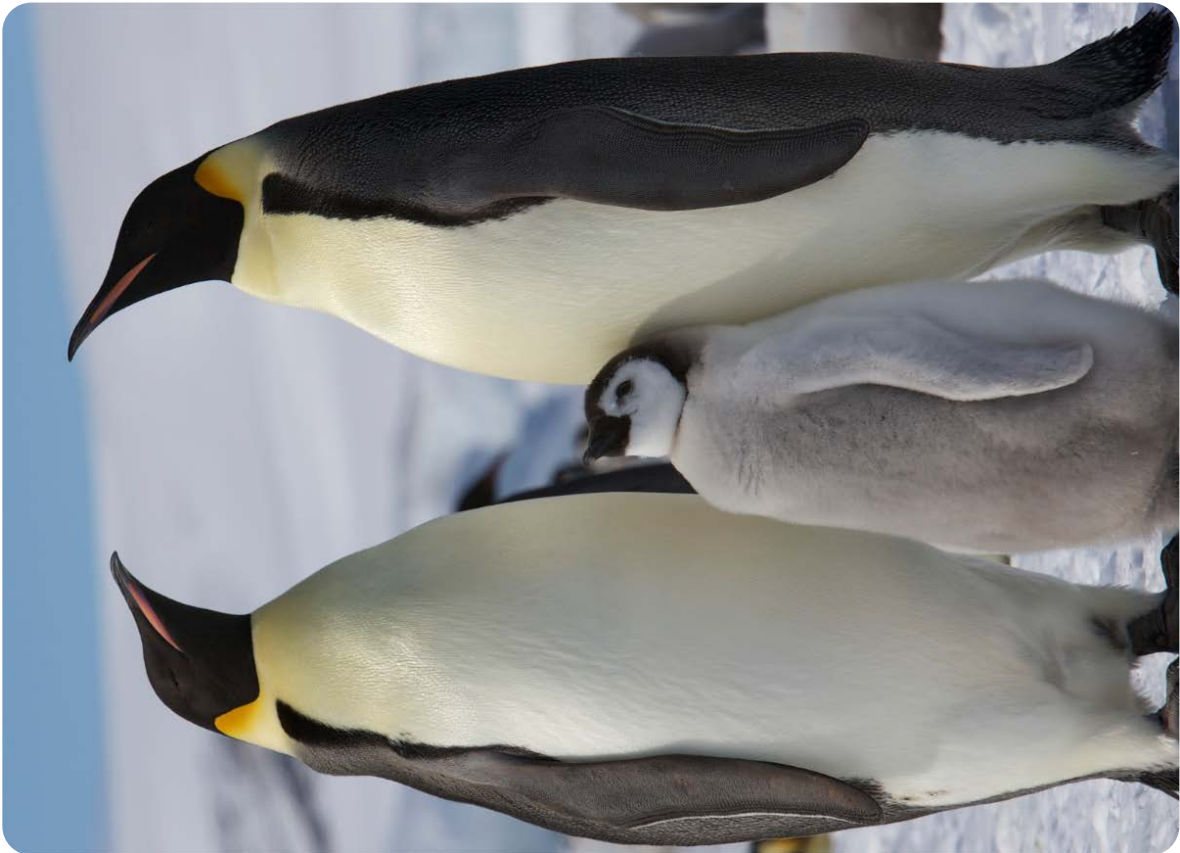
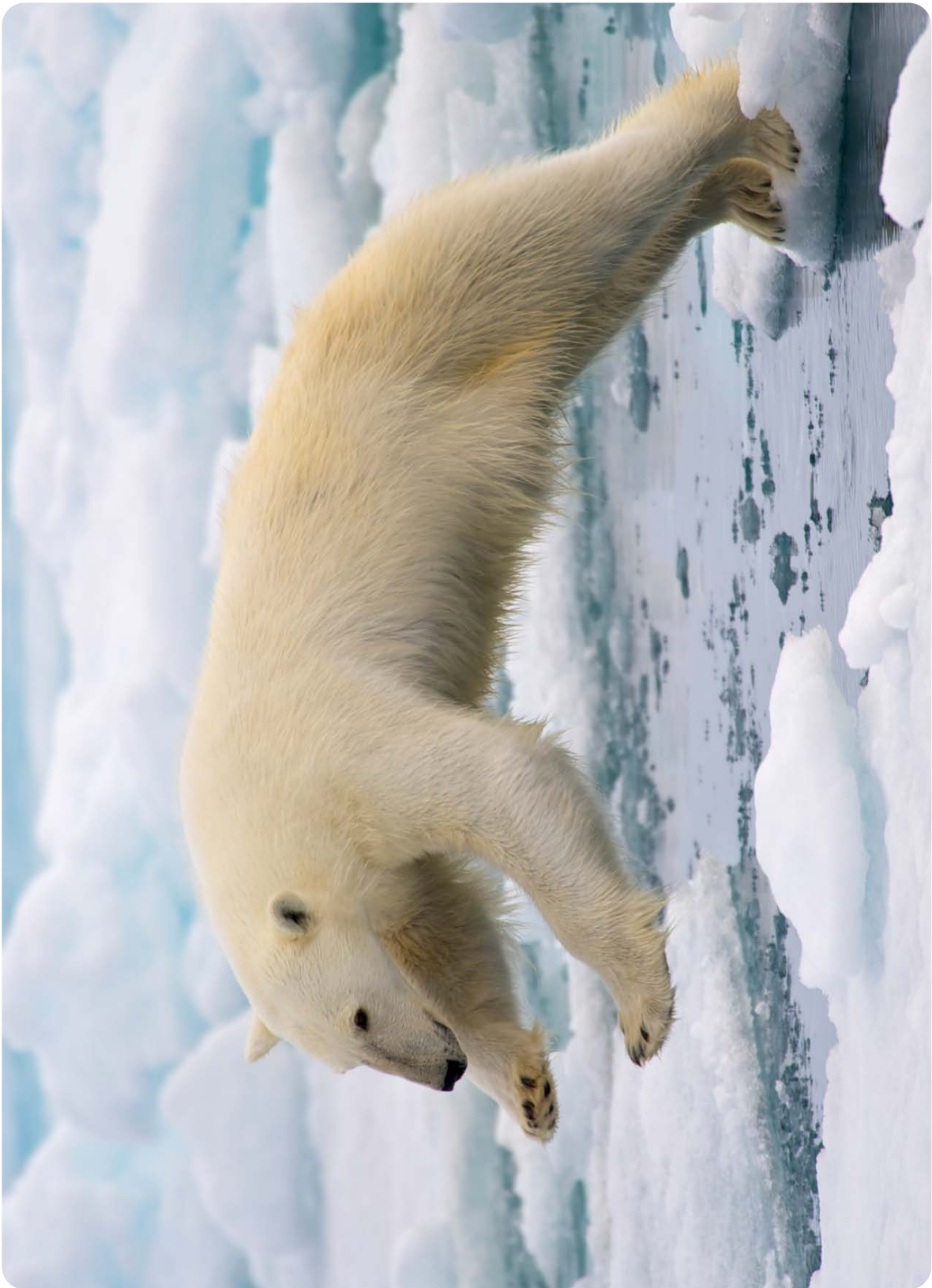
5. Where do polar bears live?

- a. All over the world
- b. In the Arctic
- c. In Antarctica

Resource 3B



Resource 3C



Resource 3D

How are polar bears adapted to live in the Arctic?

Polar bears' bodies have changed over time to help them survive in their Arctic habitat. These changes have happened very slowly over a very long time.

When animals bodies' change like this to suit their habitat, we say that they have adapted.

Polar bear fur

Polar bears have very thick fur to help keep them warm. In fact, they have two layers of fur to keep them extra warm in the Arctic.

Like all animals, polar bears need food to stay alive. They hunt for seals on the sea ice and in the sea. They have waterproof fur, which is handy when they are hunting.

Polar bears have a thick layer of fat under their skin to help them stay warm in the water.

Polar bear fur is hollow. This helps to trap air, which also helps to keep them warm.

Polar bear paws

Polar bears have huge paws. They are about 30cm wide. Their big paws help the polar bear to walk on the sea ice where it is thinner. They also help them to swim.

The pads under a polar bear's paws are bumpy. The bumps help to stop the polar bear slipping on the ice.

Polar bears have long, sharp claws to grip the ice and to catch their food.

Resource 3E

How are emperor penguins adapted to live in the Antarctic?

Emperor penguins' bodies have changed over time to help them survive in their Antarctic habitat. These changes have happened very slowly over a very long time.

When animals bodies' change like this to suit their habitat, we say that they have adapted.

Emperor penguin feathers and wings

Emperor penguins have very thick feathers to help keep them warm. In fact, they have many layers of feathers to keep them extra warm in the Antarctic.

Like all animals, emperor penguins need food to stay alive. They are strong swimmers and they hunt for fish in the sea. Their feathers are waterproof, which is handy when they are hunting.

They also have a thick layer of fat under their skin to help them stay warm in the water.

They use their wings like flippers when they are swimming.

Emperor penguin feet

Emperor penguins have webbed feet to help them swim in the water. Their feet also have special fats in them that stop them freezing on the ice!

They have long, sharp claws to grip the ice so that they don't slip.

Living things and their habitats
Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food

Working scientifically:
Identifying and classifying

Scientific enquiry type:
Identifying, classifying and grouping

Vocabulary relating to living things and their habitats, working scientifically and thinking sustainably is highlighted within the unit introduction.

A copy of Resource 4A, cut into cards (enough for one set per group)

A2 paper to make posters

Optional: The Lights That Dance In The Night by Yuval Zommer, or An Arctic Story: The Animals Of The Frozen North by Jane Burnard and Kendra Binney

Children requiring additional support may benefit from having fewer of the living things on Resource 4A to order in their food chain.

Challenge the children to add simple sentences showing their understanding of what their food chain represents, using the stem sentences for support

CLIMATE ACTION PLAN:
Adaptation and resilience;
Biodiversity and Nature;
Climate education and green skills

What is an Arctic food chain and why do we need to know?

What do we already know?

Play ‘Spot the mistake’ to help the children recall their learning from Year 1 about herbivores, omnivores and carnivores.

Herbivores eat meat.
Carnivores eat plants.
Omnivores eat both.

Display the following sentences and ask the children to spot, explain and correct the mistakes to a partner.

What are we learning today?

The next part of the lesson could take place outdoors or in a large, indoor space. Move the children’s **learning about Nature** on by asking them: *What do all living things need to stay alive?* Draw their attention to the fact that food is one of the basic needs of all living things.

Explain to the children that plants can make their own food from sunlight. Ask them: *Where do animals get their food from?* Establish that animals can’t make their own food so they need to eat plants or other animals. Explain that we can create a model to show what eats what in a habitat and this is called a food chain.

Tell the children that a food chain always starts with a plant. Introduce the term **producer** and explain that this is the word we use to describe living things that can create their own food from sunlight (almost always plants). Ask for a volunteer to play the part of a plant. Take suggestions from the class about plants or parts of plants that animals eat e.g. grass or leaves. Choose one suggestion (e.g. a leaf) and ask the volunteer to mime being a leaf.

Next in the food chain comes an animal that eats plants. Elicit from the children that this could be a herbivore or an omnivore. Focus their attention on herbivores and ask them to suggest some herbivores that eat leaves. Choose one suggestion (e.g. a caterpillar) and ask a volunteer to stand a little way away from the child miming the leaf. Introduce the

term **consumer** and explain that this is the word we use to describe living things that have to eat other living things for food.

Continue by introducing two more organisms to the food chain model you are creating. These could be a bird such as a great tit (omnivore) that feeds on caterpillars and an owl (carnivore) that predates small birds such as great tits. Consolidate the children’s understanding of the terms producer and consumer in the context of the living things in the class model.

Ask for three more volunteers to stand between the living things in the food chain model and to represent the arrows that show the transfer of energy ‘up’ the food chain and discuss this concept with the children.

On the way back to the classroom, encourage the children to see if they can spot a food chain – or part of it – in action. For example, can they see a bird searching for worms or insects, or feeding on seed heads? This activity could help to highlight any misconceptions that need to be addressed.

TEACHER TIP:
You could use the BBC Bitesize film clip [Explain this: The food chain](#) to consolidate this learning.

How are we learning today?

Back in the classroom, the children work in pairs or small groups to use the set of picture cards and clues on Resource 4A to create an Arctic food chain. They share and compare their food chain with those of others before sharing as a class. Address any misconceptions.

TIME TO EXPLAIN:
The children create a poster showing an Arctic food chain by sticking their picture cards to a large piece of paper and adding

arrows. They add text to explain their understanding of what their food chains show, using the terms producer, consumer, herbivore, omnivore and carnivore.

STEM SENTENCES:
In this food chain, the producer is _____ the consumers are _____ and _____.
_____ is a herbivore.
_____ is an omnivore.
_____ is a carnivore.

Either display a group's work or use the images on Resource 4A to create a food chain with a polar bear as the consumer at the top of it. Explain that the main threat to polar bears is melting sea ice caused by global warming. With less sea ice to walk over, polar bears aren't able to hunt effectively. They also need the ice to rest on and to raise their cubs.

Ask the children to discuss the following questions in pairs before sharing their ideas as a class: *What would happen if polar bears couldn't find enough food? What would happen if they disappeared from the food chain?*

For example, without polar bears hunting them, seal numbers would grow. With more seals hunting fish, fish populations would decrease. We call this interdependence as one species relies on another for survival.

TEACHER TIP:

Either in this lesson, or at another point in the school day, you could share with the children the book *An Arctic Story: The Animals Of The Frozen North* by Jane Burnard and Kendra Binney, which works well to support this learning. To consolidate the children's learning about food chains, you could play the BBC Bitesize game [Food chain challenge - Tundra](#) at another time.

What have we learned today?

Reflect on the children's **learning about Nature** and assess their understanding by asking: *Can you describe an Arctic food chain? What is a producer and what is a consumer?*

Reflect on the second part of the learning question for the lesson by asking: *How are food chains in our polar regions threatened?*

Remind the children that global warming poses a major threat to polar food chains, citing the polar bear example from earlier in the lesson. Explain that one of the ways that we can all help to limit global warming is to use less energy. Ask: *What actions can we take to reduce the amount of energy we use?*

Draw out the link to the **principle of Oneness** and the role we can play in protecting the incredible world we are part of.

End the session by immersing the children in the awe and wonder of Nature in our polar regions by darkening the room and sharing the BBC Bitesize film clip [Hunting the northern lights in Lapland](#) or the story *The Lights That Dance In The Night* by Yuval Zommer.

Resource 4A



Arctic willow

I make my own food from sunlight.



Arctic fox

I eat Arctic hares.
I am an omnivore.



Arctic hare

I eat Arctic willow.
I am a herbivore.



harp seal

I eat Arctic cod.
I am a carnivore.

Resource 4A



Arctic cod

I eat zooplankton.
I am an omnivore.



polar bear

I eat Arctic foxes, reindeer and seals.
I am a carnivore.



algae

I make my own food from sunlight.



zooplankton

I eat algae.
I am an omnivore.

Resource 4A



reindeer

I eat arctic willow.
I am herbivore.



Arctic wolf

I eat reindeer and Arctic hares.
I am a carnivore.

Living things and their habitats
Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food.

Working scientifically:
Identifying and classifying

Scientific enquiry type:
Identifying, classifying and grouping

Vocabulary relating to animals, including humans, working scientifically and thinking sustainably is highlighted within the unit introduction.

Food chain posters from Lesson 4

Copies of Resource 5A, cut into cards (enough for one per group)

Whiteboards and pens

Cards about half the size of a postcard (enough for four per pair)

Hole punches

Treasury tags or short lengths of string

Spare card

Scissors

Glue

Optional: Let's Save Antarctica: Why We Must Protect Our Planet by Catherine Barr and Jean Claude

Children requiring additional support may benefit from exploring the key vocabulary involved in this lesson within a pre-teach activity such as a matching game

Challenge the children to consider and model what would happen if there were any changes within their food chain (e.g. if there wasn't enough algae)

CLIMATE ACTION PLAN:
Adaptation and resilience;
Biodiversity and Nature;
Climate education and green skills

How is an Antarctic food chain different from an Arctic food chain?

What do we already know?

Begin the lesson by recapping the children's prior **learning about Nature** by revisiting the animals that have adapted to living in Antarctica using a resource such as the [British Antarctic Survey's](#) wildlife webpage. Share one of the food chain posters the children created in Lesson 4. In pairs, the children take it in turns to 'Speak like an

expert' about what they know about food chains and about what this food chain shows. They take turns speaking for 15 seconds at a time so that each child adds to the information their partner has already shared.

What are we learning today?

Explain that in this lesson, the children will be creating Antarctic food chains.

Take the class into a large space outdoors or indoors. Organise them into groups of four and explain that they are going to create an Antarctic 'food chain theatre.'

Share with the children the food chain cards on Resource 5A and ask them to decide in their groups who will represent each of the categories on the cards (plant – producer; herbivore – consumer; omnivore – consumer; carnivore – consumer) on the cards. The children act out their food chain

using mime. Review some of the mimes in the 'food chain theatre' as a class and guess which part of the food chain each child is representing. Add other children to the 'food chain theatre' models the children have presented to represent the arrows showing the direction in which energy travels.

TEACHER TIP:
Either in this lesson, or at another point in the school day, you could share with the children the book *Let's Save Antarctica: Why We Must Protect Our Planet* by Catherine Barr and Jean Claude, which works well to support this learning.

How are we learning today?

Back in the classroom, the children work in pairs to use the food chain facts on Resource 5B to create their own Antarctic food chain. Encourage them to plan their food chain out on a whiteboard first. They present this to another pair who use the facts on Resource 5B to assess whether they agree the food chain is in the correct order. Share some of the children's ideas as a class and address any misconceptions.

TEACHER TIP:
You may need to explain to the children that the algae at the bottom of the Antarctic food chains they are creating are tiny living things that create their own food from sunlight, just like other producers do. In this sense, they behave like the plants on land that children will be more familiar with, although they don't have roots, stems or leaves. You may need to show them in the image of Resource 5B that the green areas on the sea ice are actually patches of algae.

The children draw each of the living things in their food chain on a separate card and write its name.

They punch a hole in the top and bottom of their cards and use treasury tags or short lengths of string to attach them in the right order to create a food chain mobile, with the producer at the bottom and consumer at the top of the food chain at the top. They could cut out arrows from spare card and stick these to the bottom or top edges of

some of the cards to show the transfer of energy 'up' the food chain.

TIME TO EXPLAIN:
Display the words **producer**, **consumer**, **herbivore**, **omnivore** and **carnivore** and encourage the children to discuss the food chain they have created using these terms and add these words to the appropriate cards.

STEM SENTENCES:
In this food chain, the producer is _____, the consumers are _____ and _____ and the predator is _____.

Once the children have completed their food chains, share some examples with the class.

Explain that, just like in the Arctic, melting sea ice in Antarctica means penguins are losing areas to hunt and have their young. Algae grows under the sea ice, so if there is less sea ice, less algae can grow. Ask the children to discuss the following questions in pairs before sharing as a class: **What would happen if penguins couldn't find enough food? What would happen if algae disappeared from the food chain?** (e.g. if there wasn't enough food for the penguins, there would be fewer penguins; without algae, herbivores would have less food, which means animals further up the food chain would have less food, too)

What have we learned today?

Reflect on the children's **learning about Nature** by returning to the lesson's learning question: *How is an Antarctic food similar to an Arctic food chain?* Draw out the similarities (e.g. structure, transfer of energy and the position of consumers/producers and herbivores/omnivore/carnivores in the food chain) and differences (e.g. species) between an Arctic and Antarctic food chain. Ask them: *Are the similarities and differences the same for a food chain where we live?*

Ask the children: *Why is it important for us to know how these food chains are threatened? What part can we play in protecting these food chains?* Discuss with the children the three actions they could take, linked to the sustainability action for the wider enquiry, to reduce their energy use. Draw out in this discussion the link to

the **principle of Oneness** and the idea that we are all responsible for caring for the world we are part of.

Remind the children of the footage of the northern lights they watched at the end Lesson 4. Explain that a similar phenomenon occurs on the opposite side of the world in Antarctica: it is known as the southern lights. End the session by immersing the children in the awe and wonder of Nature in our polar regions by darkening the room and sharing [video](#) footage of the southern lights over the Halley Research Station in Antarctica.

Resource 5A

I am a producer.

I am almost always a plant.

I make my own food from
sunlight.



I am a consumer.

I am a herbivore.



I am a consumer.

I am an omnivore.



I am a consumer.

I am an carnivore.



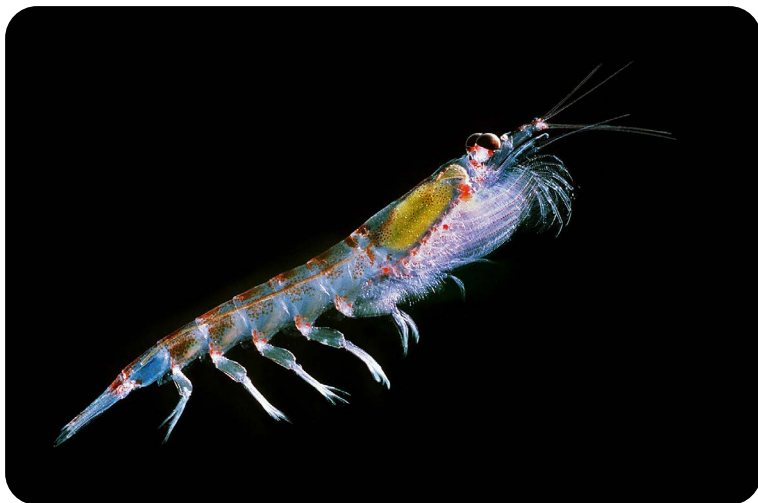
Resource 5B



emperor penguin
I eat silverfish and krill.



orca
I eat penguins and leopard seals.



krill
I eat algae.



algae
I make my own food from sunlight.



chinstrap penguin
I eat krill.



leopard seal
I eat krill and penguins.

Living things and their habitats
Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other.

Working scientifically:
Observing closely, using simple equipment

Scientific enquiry type:
Observing over time

Vocabulary relating to living things and their habitats, working scientifically and thinking sustainably is highlighted within the unit introduction.

A tray of individual ice cubes

Whiteboards and pens

Optional: Protecting The Planet: Emperor Of The Ice by Nicola Davies and Catherine Rayner

Timer

4 blocks of ice (created freezing water in an ice cream tub)

4 plastic trays (deep enough to hold the water as the ice blocks melt)

Thermometers
Tape measures or rulers

Optional: small measuring beakers

A non-fiction book about ice in the polar regions or a fiction book such as *Iceberg* by Claire Saxby and Jess Racklyeft

Children requiring additional support may benefit from working in mixed-ability groupings or alongside an adult when recording their observations over time

Challenge children to calculate the difference between the temperatures in the different locations and the difference between the last measurements taken of the height, width or depth of the ice blocks

CLIMATE ACTION PLAN:
Adaptation and resilience;
Biodiversity and Nature;
Climate education and green skills;
Decarbonisation and net zero

Why is ice such an important part of polar habitats?

What do we already know?

Begin the lesson by recapping the children’s prior **learning about Nature** in relation to water and ice. Display the word ‘ice’ and allow the children time to consider and record as many facts about ice as they can think of on their individual whiteboards.

Model how to play ‘Fact Tennis’ with a partner. Show the children one cube of ice from the ice cube tray. As you hold the ice, share one fact (such as ‘ice is cold’) before passing the ice to a partner. Encourage your partner to share another fact about ice before passing the ice cube back to you and repeat. You or your partner may wish to ask the class for help and the rest of the class

should be encouraged to support the game with further facts from their whiteboards. Alternatively, the children could be encouraged to play the game in pairs, with each pair being given their own ice cube to pass between facts. At the end of the game ask: *What do we know about ice? What has happened to our ice cube during our game of Fact Tennis?*

Encourage children to share their observations and address any misconceptions.

What are we learning today?

Explain to the children that in this lesson they will be learning why sea ice is such an important part of the habitat in the polar regions, then learning more about what is happening to it.

Display the image of Arctic sea ice on Resource 6A to give the children a sense of what it looks like.

Move their **learning about Nature** on by introducing Resource 6B – this has the names and pictures of living things in the polar regions on it, along with statements about why these animals need sea ice.

In pairs, the children read the statements and use the clues to match them to the correct animal.

Reveal the correct pairings and discuss as a class what they have learned.

Remind the children that the sea ice in the polar regions is melting due to global warming. Ask them to discuss in pairs: *If there is less sea ice, what problems will this cause for living things in the polar regions?* Discuss their thinking as a class and address any misconceptions.

How are we learning today?

Share with the children the question they will be investigating in the next part of the lesson: *How does temperature affect how quickly ice melts?* Display the image on Resource 6A again and show the children the blocks of ice that they will be using in the investigation. Ask them to imagine these are slabs of polar sea ice.

Explain that they will be setting up the investigation by placing each block in a plastic tray and putting them in different places. Some of these places will be warmer and some will be cooler (e.g. on a sunny windowsill or near a radiator, in a cool cupboard, outdoors, in the fridge in the staff room, in the classroom). They will use thermometers to measure the temperature of the air near to each ice block when they set up the investigation, so they can see which locations are warmer and which are colder. Then they’ll measure the ice block (height, width and depth) every hour or at agreed points throughout the school day. Resource 6C can be used to record their measurements.

Encourage the children to suggest other methods that they could use to record how

the ice is melting. For example, they could photograph and compare the ice blocks or measure the volume of water that has melted from each block each time they check it.

In pairs, ask them to make a prediction about which ice block they think will melt the fastest. Discuss their ideas as a class and record a class prediction.

Set up an ice block in each location and measure and record the temperature there. Discuss and order these temperature measurements from coldest to warmest.

Once the experiment is complete, bring the class back together and use questioning to discuss and reflect on the results. Ask: *Which ice block melted the quickest? Which melted the slowest? Why?*

Support the children in making the connection between the ice blocks melting when the surroundings are warmer and sea ice melting due to global warming. Ask them: *What does this tell us about what is happening to the sea ice in our polar regions?*

STEM SENTENCES:

The ice block in the coldest place _____.

The ice block in the warmest place _____.

This tells us that ice melts fastest when _____.

Sea ice in the polar regions is melting because _____.

Polar animals such as _____ need on the sea ice in their habitats for _____.

TEACHER TIP:

Either at this point in the lesson, or at another time in the school day, you could share with the children the book *Protecting The Planet: Emperor Of The Ice* by Nicola Davies and Catherine Rayner, which works well to support this learning.

What have we learned today?

Reflect on the children's **learning about Nature** and assess their understanding, by asking: *What did we learn about the role temperature plays in how quickly ice melts?*

Why is sea ice such an important part of polar habitats? What will happen to the sea ice if our world carries on getting warmer? Display the statements from the different animals on Resource 6B. Challenge the children to discuss in pairs what the animals would say if the sea ice continues to melt. Discuss their ideas as a class.

Draw out the link to the principle of Oneness by asking the children: *Why are the polar regions in our world so special?* Share a non-fiction book about polar regions, a fiction book such as *Iceberg* by Claire Saxby and Jess Racklyeft or look at some of the images on the resources that support this pack. Take time to pause and ponder over the images of the living things that are adapted to living in extremely cold conditions, both on the ice and in ice-cold waters. Draw the children's attention to how much biodiversity there is in our polar regions and how all life there depends on many factors including healthy food chains and sea ice.

Remind the children that we and these living things are all part of the same world and that we have a responsibility to protect them and their habitat.

End this learning sequence by reminding the children of the sustainability action for this learning enquiry and the three personal energy-saving challenges they will set themselves.

These challenges could be displayed as prompt posters around the classroom or school building. For example, prompts by light switches to turn lights off when the room is not in use.

TEACHER TIP:

The book *Protecting The Planet: Emperor Of The Ice* by Nicola Davies and Catherine Rayner could be used to support the discussion about the three personal energy-saving challenges – particularly the section 'What Can People Do to Help?'

Resource 6A



Resource 6B

	polar bear	I feed on the algae that grows under the sea ice.
	ringed seal	I look after my chicks on the sea ice. I use the sea ice as a platform to dive off when I hunt.
	algae	I build my den on the sea ice and cover it with snow. My den protects my pups.
	emperor penguin	My pups are born on the sea ice. I rest on the sea ice when I'm tired.
	krill	I hunt seals on the sea ice. I teach my pups to hunt on the sea ice, too.
	walrus	I grow on the sea ice underwater.

Does ice melt faster in warmer temperatures?

Location _____

Temperature _____

	At the start	After _____ mins	After _____ mins	After _____ mins
length of ice block				
width of ice block				
height of ice block				

Additional image credits

Resource 1C

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Resource 2A

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Resource 3C

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Resource 4A

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Resource 5B

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Resource 6A

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Resource 6B

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