Sea

This education pack was produced by two long standing partnerships, the Pen Llŷn a'r Sarnau SAC and the Llŷn Partnership, with contributions from a wide range of additional partners.

FOR MORE INFORMATION AND EXTRA RESOURCES

VISIT OUR WEBSITE: **www.tiramor.cymru**

OR EMAIL US AT: **info@penllynarsarnau.co.uk**

@PenLlyna'rSarnau @ ACA_PLAS_SAC @acapenllynarsarnausac7493 @aca_pen_llyn_ar_sarnau_sac

Welcome

Wales could definitely be considered a maritime country. Its huge coastline stretches for 1,680 miles, enveloping the country in its influence, even if in nothing more than the milder wetter weather its proximity brings.

The coastline alone offers a wealth of different habitats and along with them species specifically adapted to thrive there. Muddy river estuaries, long sandy beaches, exposed and violent rocky shores, and cliffs, share as many differences as similarities and all can be found along Wales' shores. As you move offshore you may come across the country's largest inhabitants. Cardigan Bay is home to one of only two resident bottlenose dolphin pods in the UK, and every summer our waters are visited by the world's second largest fish, the basking shark, and the fifth largest, the ocean sunfish, drawn here by the plankton blooms that flourish in spring's lengthening days. Welsh seas provide a home for thousands of species, from the tiniest barnacle to some of the world's largest living creatures.

No matter how far you live from the sea you are dependent on it for every breath you take as over half the world's oxygen is generated by marine organisms. The sea improves people's health and well-being, providing recreation, food and, employment. It also contributes a lot of the Welsh economy, especially through tourism. However, for a long time this has been a one-sided relationship and protection of the sea has been slower to come and harder to enforce. Our seas are under constant pressure and the more people who understand and appreciate the wonder of our seas, the more likely any protection measures are to succeed and the safer the future of our seas will become.

How to use this pack

Each topic begins with a basic introduction and ideas for further study. Every activity within that topic starts with the teachers' guidance sheet and then the learners' worksheets. (These can also be found as separate sheets to be printed directly from the electronic resources).

The symbols below are found in the top right-hand corner of every activity and provide a quick reference guide for preparing and planning:

Booklet type, in this case Sea

Activity takes place outside or inside

Individual, partner or group activity

Time this activity takes to complete

Time of year this activity is suitable for - spring, summer, autumn, winter, or all year

Where to get more information

This printed pack is intended to act as a starting point for a much bigger collection of activities that will regularly be updated. These resources will be made available on **www.tiramor.cymru** as they are created and further physical additions will be issued as and when funding becomes available. All activities are available as separate downloads on the website.

All URLs correct at time of publishing.

Activities Overview

This provides an overview of all the activities provided in this printed edition of the Sea booklet. The progression steps are to be used as a guide, all the activities can be expanded by the teacher to cater for varying levels of abilities and interests. Most activities can be done year round but if there are any that require a specific season they are shown on the activity sheet.

ACTIVITY NAME	TOPIC	PROGRESSION STEP	OUTDOOR INDOOR
Strandline Hunt	Strandline	PS 1/2/3	OUTDOOR
Sea Search	Strandline	PS 2/3	INDOOR
Hidden Haiku	Strandline	PS 2/3	INDOOR
Find the Food Chain	Food Chains	PS 2/3	EITHER
Predator vs Prey	Food Chains	PS 1/2	OUTDOOR
Make a Food Chain	Food Chains	PS 3	INDOOR
Beach Detectives	Plastic Pollution	PS 1/2/3	OUTDOOR
Coconut Crusoe	Plastic Pollution	PS 2/3	INDOOR
Seagrass or Seaweed?	Seagrass	PS 3	INDOOR
Seagrass vs Seaweed Sort	Seagrass	PS 3	OUTDOOR
Seagrass Scars	Seagrass	PS 3	INDOOR
Seagrass Scar Solutions	Seagrass	PS 3/4	INDOOR
Bubble Munchers	Pink Sea Fan	PS 2	OUTDOOR
Build your own Edible Pink Sea Fan	Pink Sea Fan	PS 2/3	INDOOR
Acidification vs Pink Sea Fan	Pink Sea Fan	PS 3	INDOOR
Pink Sea Fan Meditation Music	Pink Sea Fan	PS 3	BOTH
Oyster Battleships	Native Oysters	PS 2/3	OUTDOOR
How Oysters Filter Dirty Water	Native Oysters	PS 2/3	INDOOR
Human Impact on Oysters	Native Oysters	PS 3	INDOOR
Oyster Challenges	Native Oysters	PS 3	INDOOR
Sensory Nature Scavenger Hunt	Wildlife Recording	PS 1/2	OUTDOOR
Wildlife Surveys	Wildlife Recording	PS 2/3	OUTDOOR
Coastal Wildlife Sound Map	Wildlife Recording	PS 2/3	BOTH
Identifying Wildlife	Wildlife Recording	PS 2/3	BOTH
Manx Shearwater	Wildlife Recording	PS 2/3	INDOOR
The Bird Observatory	Wildlife Recording	PS 2/3	OUTDOOR

Other booklets in this series:

Check online for new activities: **www.tiramor.cymru**

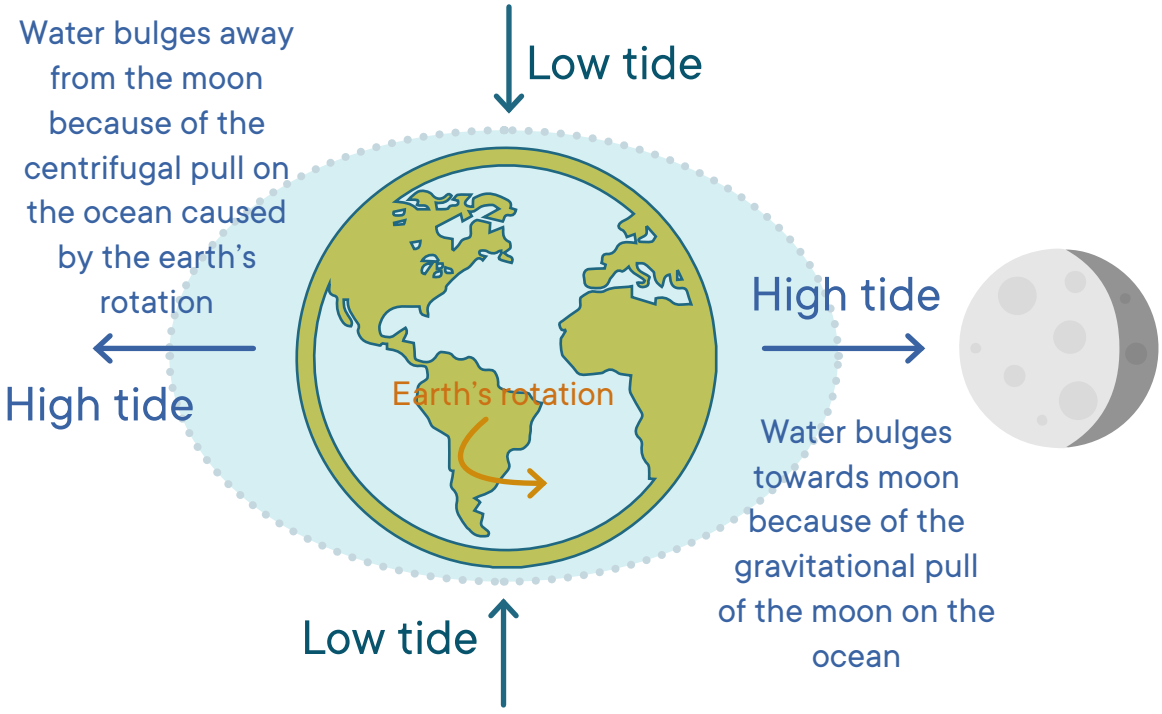
Strandline

Introduction

Strandline

Everything on the shore is influenced by the tides. This daily rise and fall of water is mostly driven by the moon and its gravitational pull on the earth.

The earth's rotation means that we experience two high tides and two low tides in every 24 hours, one high tide because your place on earth is closest to the moon and its gravitational pull, and one because it is furthest away from the moon and the spinning force of the earth's rotation is pushing the water outwards.



The daily changing of the tides means that life on the shore is distributed by its ability to withstand being submerged or drying out. This creates zones which can roughly be divided into upper, mid and lower shore. Species in the upper shore, where they are only submerged by the high tides for a couple of hours at most, can either tolerate desiccation, hide or create their own micro-climate. At the other end of the scale the species of the lower shore can only tolerate being exposed for short periods.

The tide deposits all types of treasures along the shoreline at the highest point of the last tide. This is where you'll find evidence of the species living in our seas. Unfortunately this is also where we see most of the plastic pollution aggregating. The strandline differs from beach to beach depending on the habitats offshore and the prevailing currents and winds. Generally recognisable as a line of seaweed, the strandline can include shells, crab carapaces and mermaid's purses. Unfortunately it also contains plastics, such as nurdles (tiny pellets of plastics that are used by manufacturers in the production of plastic products).

Further research keywords
Tidal ranges, spring and neap tides, rocky shore zonation, intertidal zone, rockpools, crab moult, ocean gyres, nurdles, egg case hunt, marine litter.

45 - 60 mins

Strandline Hunt

Equipment required

- Clipboards
- Collection trays or buckets
- Equipment to explain how tides work
- Something to group objects (e.g. hula hoops)

Before arriving at the beach

1. Introduce the moon as the factor with the greatest influence that causes the tide. As a result of the gravitational pull, the moon causes a swell in the sea on both sides of the earth, namely the two high tides. This can be explained with pictures, or you can use balls to represent the earth and the moon in order to show how the tide moves around the earth. Using a large elastic band is a good way of showing how the sea swells on opposite sides of the earth.

At the beach

1. Explain the variety of things that can be found in the strandline, both natural and man-made.

2. Spilt the class into pairs. Give them a 30min time limit.

3. Encourage learners to find as many items on the list as possible. Challenge learners to add three other objects they found interesting and draw them into the worksheet.

4. Invite the learners to lay their finds out on the beach in groups with similar objects. Analyse the learners' finds. Go through the items on the list and discuss what they are, e.g. mermaid's purse, whelk eggs, mussels.

5. If you still have time you can ask the learners to rearrange the finds into groups based on which zone of the shoreline you would find them and go through their adaptations to that zone.

45 - 60 mins

Strandline Hunt

Below are some facts about the things on the seashore hunt to help get your discussions started.

Mussel shell - mussels live grouped together in beds. They attach to the sea floor using threads. Starfish eat mussels by prizing apart their shells slightly and then inserting their stomachs to dissolve the flesh.

Whelk egg case - also known as sea wash balls, they are the empty egg sacks of a sea snail called the common whelk. As soon as they hatch they start eating each other.

Razor shells - called razor shells because of their resemblance to old fashioned razors, they live vertically in the sand.

Cockle shells - there are different types of cockle. They are food for lots of seashore birds.

Limpets - are adapted to living on the exposed shore by having a hard shell to protect them from heat and waves. They attach so strongly to the rocks that they form a little micro climate around themselves so they don't dry out. Their tongue has been found to contain the hardest biological material known to man.

Shore crab - crabs can only walk sideways. To grow, crabs must get rid of their hard shell and grow another bigger one. This is why we find so many empty crab shells on the beach.

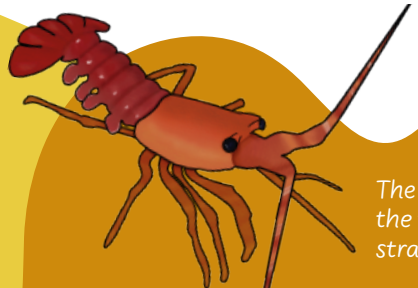
Hornwrack - although it looks like a plant, it is actually a colony of animals called polyps which together are called a sea mat. Some polyps protect it, some feed the colony and others reproduce.

Eggcases are also know as Mermaid's purses, they are often found on the strandline. If they have curly tendrils they are from the cat shark, if they have horns they are from a skate or a ray.
Take empty eggcases back to the classroom, soak them in water and they will rehydrate and you can use the guides on the Shark Trust website to identify the species.

Strandline Hunt

How many items on the list can you find? Collect one of each if you can!

		
☐ Mussel shell	☐ Whelk egg case	☐ Razor shell
		
☐ Cockle shell	☐ Limpet shell	☐ Shore crab
		
☐ Hornwrack	☐ Lesser spotted catshark eggcase	☐ Spotted ray eggcase



The line of dead seaweed along the top of the beach is called the strandline.

** Use the bottom line to add three natural items you have found on the beach. Draw each item and then add their names*

ADDITIONAL **TASK**

30 mins




Sea Search

Equipment required

- Print out of the ‘Sea Search’ worksheet for all learners
- Pencils or pens
- Internet enabled devices and internet access

To complete the activity

1. Hand out a copy of the ‘Sea Search’ worksheet to each learner. Ask learners to find all the words in the wordsearch grid and mark them off as they find them.

2. Once learners have found the words, ask them to research and write a fun fact or definition for each one. Encourage learner to use books, the internet, or prior knowledge to complete this, e.g., Starfish can regenerate lost arms!

3. Support learners to create "Who Am I?" riddles based on the words from the wordsearch. Each riddle should include at least two clues about the word, e.g. I have a hard shell, but I am not a crab. I cling to rocks and never move. Who am I? (Answer: Barnacle).

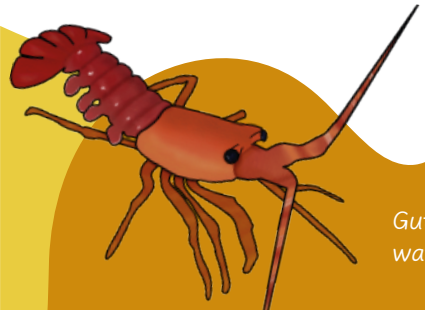
Once everyone has written their riddles, support them to take turns reading them aloud while the rest of the learners guess the answer.

Sea Search

Can you find the seashore plants and animals listed in the word search grid below?

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

Shore crab
Whelk
Barnacle
Mussel
Cockle
Limpet
Eggcase
Hermit crab
Gutweed
Wrack
Starfish
Prawn
Beadlet anemone
Kelp
Butterfish



Gutweed is often found where fresh water runs down the beach.

30 mins

Hidden Haiku

Equipment required

- Print out of the 'Hidden Haiku' worksheet for all learners
- Scrap paper or workbooks
- Pencils or pens

Introduction to haiku

Haiku is a form of short poem originally from Japan. Traditionally they consist of three phases that follow a strict pattern of syllables, five, seven, five. They do not need to rhyme. They have often been used to depict moments from nature.

Example: the lines have been broken into their syllables using bold and non bold.

5 syllables **White**caps on the **bay**
7 syllables **A** bro**ken** sign**board** bang**ing**
5 syllables **In** the **A**pril **wind.**

— Richard Wright, collected in Haiku: This Other World, 1998

Before starting the activity

1. Introduce the idea of haiku to the class and share some examples.

To complete the activity

1. Encourage learners to spend time creating their haikus. They could use rough paper to plan the final version before entering it on to the worksheet.

2. Support learners to read out their finished verses, and provide an opportunity for the rest of the class to guess which species they are describing.

Hidden Haiku

Use the lines below to write two haikus describing the seashore plants and animals we have been learning about. Remember not to use the creatures' name, so that other people can work out which animal your poem is describing.

Haiku rules: *There are three lines to each poem. Five syllables in the first line, seven syllables in the second and five in the third.*

Big sharp claws clicking
Wide orange shell protects me
Walk sideways quickly

**It's describing an edible crab, did you guess it right?*

1

.....

.....

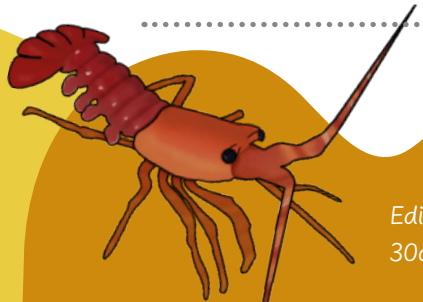
.....

2

.....

.....

.....



Edible crabs can grow up to 30cm across!

Food Chains

Introduction

Food Chains

All living things depend on each other to survive. Food chains are a way of showing how the energy from food moves from organism to organism.

Food chains always start with a **producer** - they create their own food from sunlight. Producers are eaten by **consumers** and consumers are eaten by other consumers.

Examples:

Phytoplankton → Shrimp → Mackerel → Grey seal

Seaweed → Sand eels → Whiting → Bottlenose dolphin

Seaweed → Sea urchins → Crabs → Cuttlefish

Phytoplankton → Mussels → Starfish → Herring gull

Food chains are made up of organisms that get their food in different ways. As previously described, producers make their own food usually from sunlight. These are then eaten by consumers. Consumers can be broken into different categories separated by <u>what</u> they eat.

Herbivores only eat plants.
Omnivores eat both plants and animals.
Carnivores only eat other animals.

These can be divided again by <u>how</u> they get their food.
Prey are animals that are eaten by another animal.
Predators are animals that get their food by killing other animals.
Scavengers eat what they can find, including dead animals.

Within food chains animals can be both predator and prey.

Producer	Consumer Prey	Consumer Predator Prey	Consumer Predator
Phytoplankton →	**Shrimp** →	**Mackerel** →	**Grey seal**

Food chains interlink and overlap with each other. This is called a **food web**. Understanding these food webs can help us to understand the effects of many things on the environment including pollution, habitat loss and species extinction.

Further research keywords
Ecosystem, pyramid of numbers, photosynthesis, biomagnification, bioaccumulation, mercury in fish, trophic level, apex predator, autotroph, keystone species.

30 - 45 mins

Find the Food Chain

Equipment required

- Copies of cards S_FC_1 (1 to 6), one per group
- Arrows (3 arrows per group - could print or create arrows with chalk)

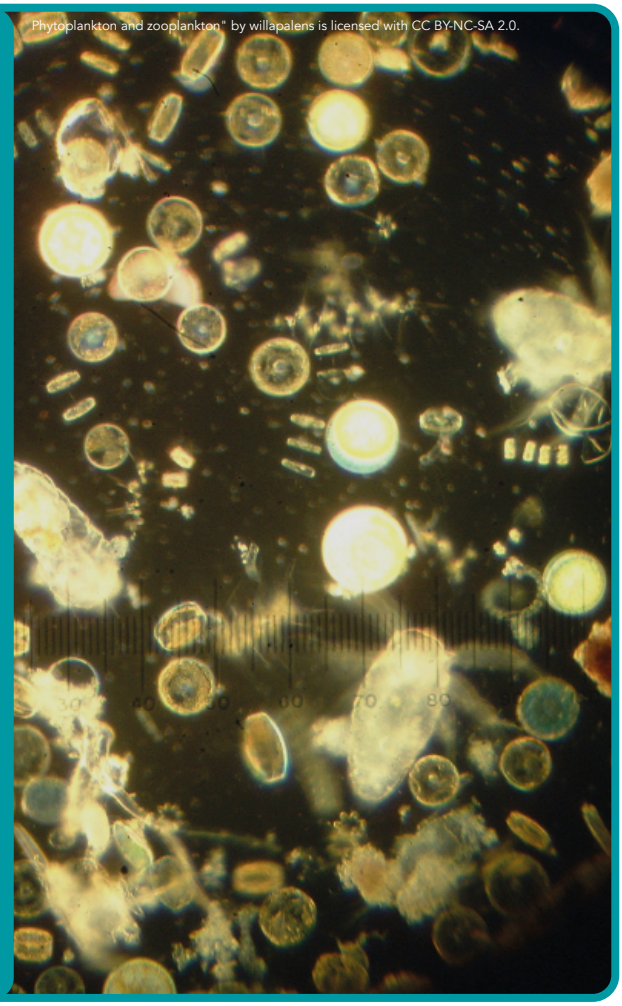
To complete the activity

1. Either split the class into groups of four, or complete the activity as a whole class, with four learners holding the photos and the whole class deciding where they should stand.

2. Place or draw three arrows on the floor with gaps in-between. Give out the four photos from that food chain, and support learners to put them into the right order.

3. Support learners to complete the six different food chains included based on UK marine species.

Phytoplankton



Shrimp

Mackerel

Grey seal

Sand eel

Bottlenose dolphin

Seaweed

Whiting

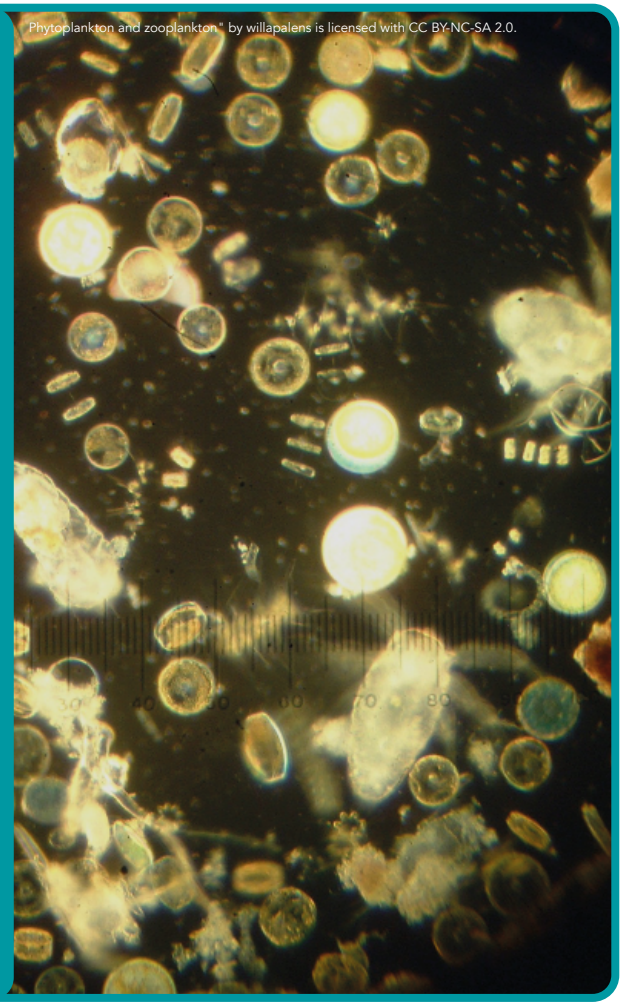
Seaweed

Sea urchin

Crab

Cuttlefish

Phytoplankton



Mussel

Starfish

Herring gull

Seaweed

Sand eel

Puffin

Great skua

Algae

Limpet

Wrasse

Bull huss

15 - 30 mins

12

Predator vs Prey

Equipment required

- Print out of tokens in S_FC_2, one per group
- Something to mark out the game area and the safe zone

To play the game

1. Set out the whole game area and the designated 'safe' area - this is the prey's habitat and they cannot be caught there because they are adapted to it and can find safe niches to hide in.

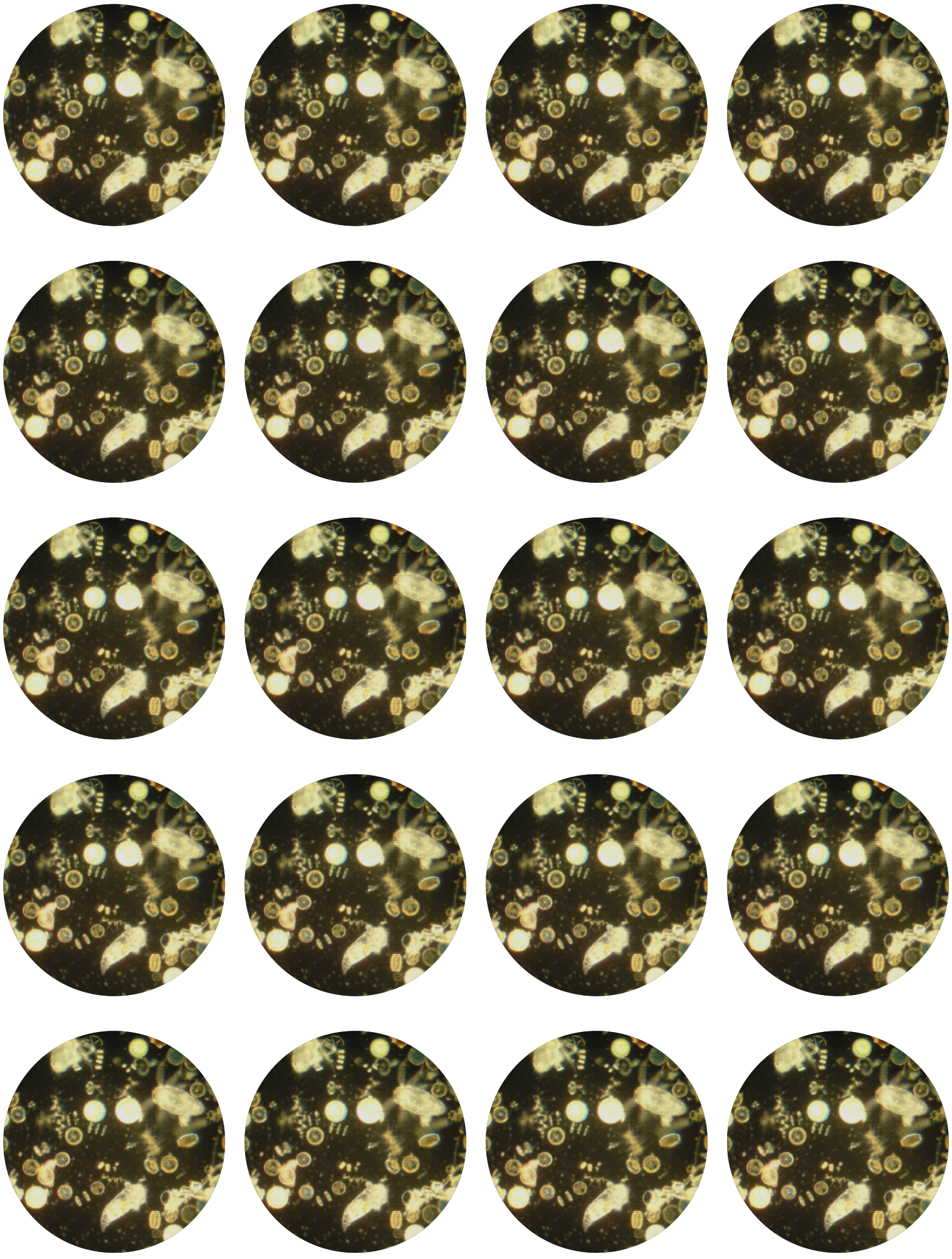
2. Distribute the plankton food tokens throughout the game area.

3. Select 2 - 4 learners to act as predators. The rest of the learners are the prey.

4. The aim is for the learners to collect as many plankton tokens as possible. They have to avoid being 'eaten' (tagged by the predators).

5. Set a timer for the game play and then start the game. The predators run around trying to tag the other learners. If caught by a predator, the learners move to the side and sit until the end of the timer.

6. Once the timer is up, ask all the 'prey' that survive to come together and count their plankton food tokens. The one with the most tokens wins. Encourage learners to collect at least 3 tokens, to demonstrate that the animals must leave their safe hiding places to feed otherwise they would starve.



60 mins




Make a Food Chain

Equipment required

- Print out of the 'Make a Food Chain' worksheet, one per learner
- Pencils or pens
- Books / resources
- Internet enabled devices and internet access for independent research

To complete the activity

1. Introduce the idea of food chains to the class and share some examples. This could be done using the other two activities within the topic.

2. Introduce the idea of independent research and explain all the sources available.

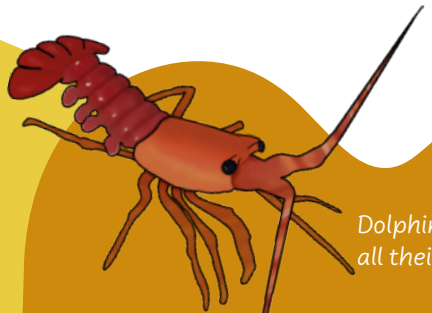
3. Encourage learners to research potential food chains in the marine environment.

4. Ask learners to share their examples with the rest of the class. The lesson could be expanded by creating class food webs from any species in the learners' food chain examples that overlap.

Make a Food Chain

Find out about food chains in the sea.

Use the boxes below to draw in the plants and animals you have found out about to create two food chains. Write the organism's name and whether they are a herbivore, carnivore or omnivore.



Dolphins don't need to drink. They get all their water from their food.

Plastic Pollution

Introduction

Plastic Pollution

Pollution is the introduction of something into the natural environment that causes adverse changes.

Some pollution is visible whilst other types are not. There are many kinds of pollution that threaten the marine environment. This lesson will focus on just one - plastic pollution. This type of pollution provides a good example because the effects are so considerable and actions to combat it can be taken at an individual level.

Plastic enters the oceans in many different ways. Some gets into the sea from towns and industries far inland, getting washed into rivers and storm drains. Some comes from people leaving rubbish on beaches, whilst other plastic is dropped at sea.

Plastic pollution is a problem for many reasons. It can injure or kill animals through physical entanglement, it may be ingested, and chemical pollutants in the sea build up on the plastic making it toxic. Below are just a few examples of ways plastic is damaging marine life:

- Animals mistake plastic items for food. It fills up their stomachs so they can't eat anymore and end up starving to death.
- When a fishing net or pot is lost at sea it carries on catching animals - this is known as ghost fishing.
- Marine mammals and turtles need to be able to surface to breathe. If they get trapped in floating plastic they may drown.

Plastic pollution is a global problem. Ocean currents are continuously moving around the world, carrying litter from one country's shores to another. Here in Wales we often find plastic from North America and Canada, brought here by the Gulf Stream. Ocean currents can cause huge amounts of plastic pollution to build up in dense patches, in the middle of the ocean. These regions are called 'garbage patches'.

Everybody can help to reduce plastic pollution. Below are a few easy things to do:

- Avoid single use plastic when you can, for example always carry a refillable water bottle with you rather than buying bottled water. Bring your own shopping bags and use reusable straws.
- Never leave rubbish on the beach or river banks. Always dispose of it properly.
- Recycle everything you can.
- Take part in local beach cleans.
- Do not flush anything down the toilet other than toilet paper.

Further research keywords

Great Pacific garbage patch, nurdles, Lego on beaches, friendly floatees, microplastic, anthropocene, oceancleanup.com, the Great British beach clean, microfibres, microbeads.

45 - 60 mins

Beach Detectives

Equipment required

- Something to group objects (e.g. hula hoops)
- Gloves
- Bin bags
- Litter pickers (optional)

At the beach

1. Divide the class into groups. Go through safety briefing - see below for some points to cover:
    - Keep in sight of the adults at all times
    - Be aware of the tide changing
    - Wear gloves and do not pick up broken glass, needles or anything unfamiliar

2. Support the learners to create a sorting area on the beach. Ask learners to collect as much litter as they can, then bring it back to the sorting area and organise into different groups, by type e.g. bottles, bags and fishing equipment.

3. Discuss what everything is, how it got into the sea and solutions to improve the situation. **See below examples of what you might find to help with the discussion.**

Nurdles are small pellets of plastic. It is the raw material that companies use to manufacture plastic goods. They end up on beaches when containers are lost overboard whilst being shipped across the globe and washed downstream from industrial sites into the sea.

Wet wipes and sanitary products are are flushed down the toilet, but the majority are made of plastic and do not biodegrade.

Most fishing litter are made of plastic. They can end up discarded where they could continue to capture marine life (ghost fishing). Look out for lobster tags from the USA and Canada, record the tag numbers and send them to the Marine Conservation Society.

Balloons released accidentally or for charity events and memorials eventually burst and usually end up in the sea where they do not break down and are often mistaken for food.

Disposable BBQ / food packaging are often left on the beach.

Plastic packaging - sometimes you can find plastic packaging with old designs because the litter has been floating around the ocean for years and years.

60 - 90 mins

Coconut Crusoe

Equipment required

- Print out of the 'Coconut Crusoe' worksheet, one per learner
- Pencils or pens
- Paper or workbooks

This activity works best if it is done after the beach detectives worksheet, but can also be done independently if some examples of beach litter are brought into the classroom and discussed beforehand.

To complete the activity

1. Encourage each learner chooses an item of beach litter - either that they found on the beach or that was discussed in the introduction.

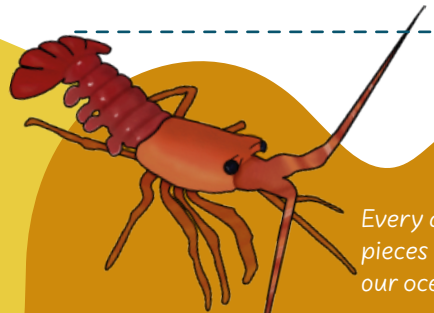
2. Support learners to write a story about how the item reached Wales and think about all the different environments and species it would have seen on the journey.

Coconut Crusoe

Choose one of the items you found whilst doing your beach clean and write a story that describes how it got there.

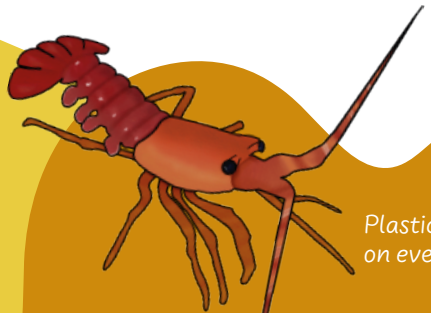
Some things to think about...

Where did it come from? Who did it belong to? How did it get into the sea? Where did it go whilst at sea? What creatures did it meet? How did it end up on the beach in Wales?



Every day approximately 8 million pieces of plastic find their way into our oceans.

Coconut Crusoe



Plastic pollution can now be found on every beach in the world.

The end.

Seagrass

Introduction

Seagrass

Seagrass is the only flowering plant that grows in the marine environment and is one of the most important plants on Earth.

Seagrass forms underwater meadows which provide food and shelter for a wide range of marine animals, from tiny invertebrates to large fish, crabs, starfish, marine slugs, seahorses, turtles, marine mammals, and birds. Hermit crabs are also common in seagrass meadows, making these habitats lively, diverse ecosystems. Seagrass also benefits people in many ways, but sadly, much of it has been lost due to human activities.

Seagrass plants are similar to land plants—they have roots, stems, and leaves, and they produce flowers and seeds. However, they differ from seaweed or algae, which rely on holdfasts and absorb nutrients through diffusion. Seagrass ranges in size from tiny plants as small as your fingernail to species with leaves that can grow up to 7 meters long. Their leaves come in different shapes, resembling ribbons, ferns, clovers, or even spaghetti. Regardless of their size or shape, seagrass leaves rely on sunlight to perform photosynthesis, a process that converts carbon dioxide and water into oxygen and sugar. This makes seagrass a vital part of the food chain, providing oxygen and energy for many living organisms.

In the UK, two species of seagrass form meadows: eelgrass (Zostera marina) and dwarf eelgrass (Zostera noltii). These meadows are found in sheltered coastal areas, including along the Welsh coastline, where they play an important role in supporting marine life and contributing to healthy oceans.

Seagrass meadows are fragile ecosystems and are being lost due to pollution, such as sewage, oil spills, and coastal runoff, as well as physical damage caused by dredging, boat propellers and anchors. Overfishing can also upset the balance of these habitats by disrupting the food chain. Moorings can also pose a threat; traditional moorings with heavy chains and anchors can drag along the seabed, uprooting seagrass and leaving scars in the meadows. Monitoring seagrass is critical because it allows scientists, conservationists, and local communities to track the health of these ecosystems over time. By observing changes in seagrass meadows, these groups can identify threats, measure the impact of human activities, and encourage the adoption of seagrass-friendly moorings, such as Advanced Mooring Systems that minimize damage to the seabed. Monitoring also helps us better understand how well seagrass is performing its essential functions, such as absorbing carbon dioxide, protecting coastlines from storms and erosion, and improving water quality by filtering nutrients and bacteria.

Despite their importance, many people are unaware of seagrass and its vital role in marine ecosystems and the global environment. Seagrasses act as ecological engineers, shaping their environment in ways that benefit both marine life and humans. By monitoring and conserving these remarkable ecosystems, we can ensure they continue to thrive and provide benefits to future generations.

Further research keywords
Photosynthesis, primary producers, food chain, seagrass meadows, chloroplasts, monocotyledon, angiosperms, ecological engineers, ecosystem services.

30 mins

Seagrass or Seaweed?

Equipment required

- Print out or share the photos on sheet (S_S_1), one per class/group
- Print out of the 'Seagrass or Seaweed?' worksheet, one per pair
- Pencils or pens
- Internet enabled devices and internet access

To complete the activity

1. Share the photos on sheet (S_S_1) with the class by printing copies or displaying on a digital device. Ask learners to examine the images closely, noting details like texture, shape, colour, and habitat.

2. Provide time for learners to consider and research what they can see. Can they distinguish between seagrass and seaweed? Support learners to understand the difference between plants like seagrass (with roots, stems and leaves) and algae like seaweed (with holdfasts, stipes and blades).

3. Discuss the different parts of each organism and their functions.

4. Split the class into pairs. Provide each pair of learners with the 'Seagrass or Seaweed?' worksheet, and guide them to match each part of seagrass and seaweed to its correct function (A-I). Encourage learners to discuss how these roles contribute to the survival of seaweed and seagrass, and to identify any similarities and differences between them.

5. Support learners to label the parts of seagrass and seaweed on the diagram, ensuring each feature is correctly identified.

ANSWER KEY

Seaweed

- Holdfast → F
- Stipe → D
- Blade → A

Seagrass

- Leaves → B
- Stem→H
- Rhizome → G
- Roots → C
- Flowers → I
- Seeds → E

Seagrass or Seaweed?

Seagrass or Seaweed?

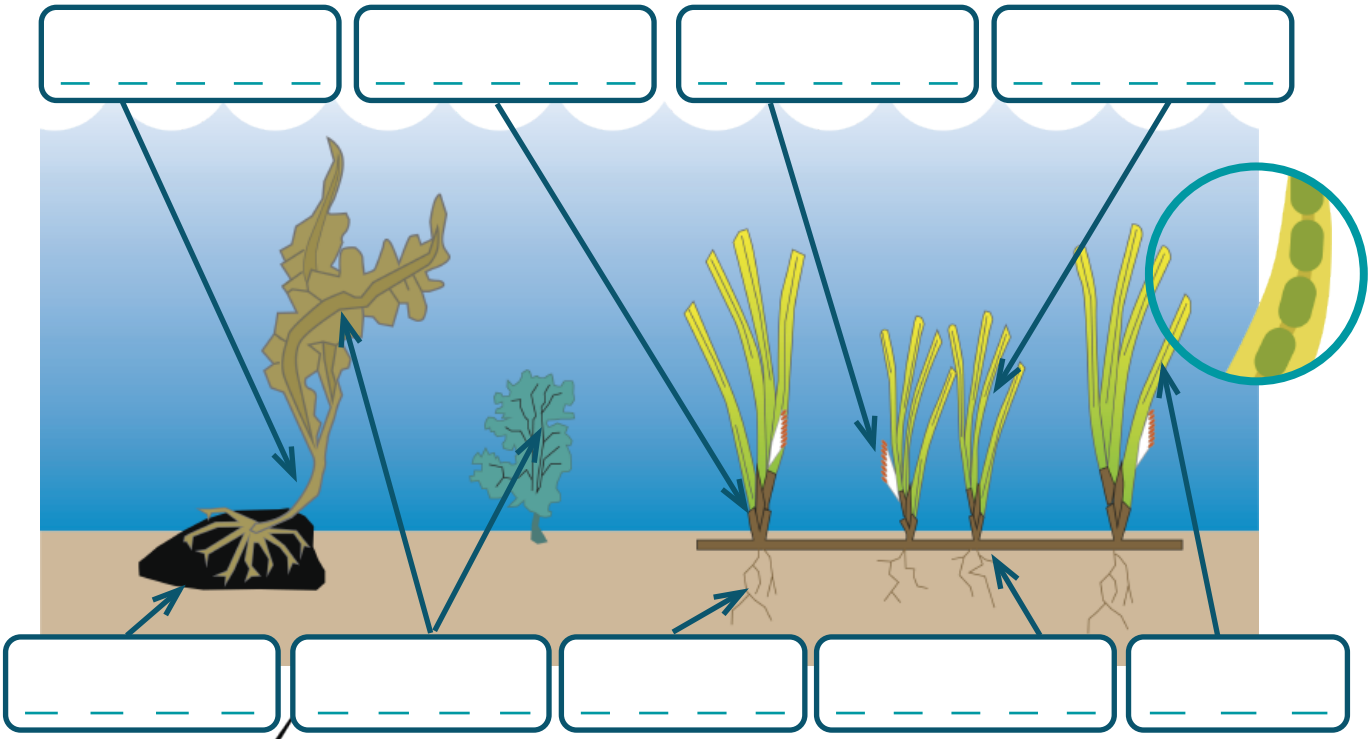
Match each part of the seaweed and seagrass to its correct function by writing the corresponding letter (A-I) next to the name of the part.

Functions

A. *Absorbs sunlight and produces food for the seaweed through photosynthesis.*
B. *Absorbs sunlight to produce food for the seagrass through photosynthesis.*
C. *Anchors the seagrass to the seabed and absorbs nutrients and water.*
D. *Supports the blades of seaweed, acting like a stem.*
E. *Floats through the water to grow new seagrass plants elsewhere.*
F. *Attaches the seaweed to rocks or other surfaces.*
G. *Spreads out under the sand to store food and nutrients for the seagrass.*
H. *Supports the leaves and transports water, nutrients, and energy between roots and leaves in seagrass.*
I. *Produces pollen and seeds for seagrass reproduction.*

- ◯ Holdfast
- ◯ Leaves
- ◯ Stem
- ◯ Rhizome
- ◯ Roots
- ◯ Flowers
- ◯ Seeds
- ◯ Blade
- ◯ Stipe

Label the diagram below using the correct parts and functions from the list:



Seagrasses are the only flowering plants that have adapted to live in the ocean.

Activity Guide

Seagrass vs Seaweed Sort

Equipment required

- Print out of the 'Seaweed vs Seagrass Sort' cards, one per group (2 pages)
- Scissors
- 2 Hula hoops or chalk per group
- Internet enabled devices and internet access

To complete the activity

1. To setup, ask learners to use chalk to draw two large overlapping circles on the school yard, or place two overlapping hula hoops on the ground.

2. Provide each group with the 'Seaweed vs Seagrass' cards. Ask learners to cut the cards, labelling one circle with the "Seaweed" card and the other with the "Seagrass" card. The overlapping section represents characteristics shared by both.

3. Ask each group to share and read their cards aloud. Encourage learners to discuss each characteristic and place the card in the correct part of the Venn diagram: either in the Seaweed circle, the Seagrass circle, or the overlapping Both section.

4. Prompt groups to explain their reasoning:
   - Why do you think this belongs in Seaweed?
   - Can you think of examples from nature that support your decision?

5. Encourage groups to add their own ideas or observations if inspired, writing them on the blank cards.

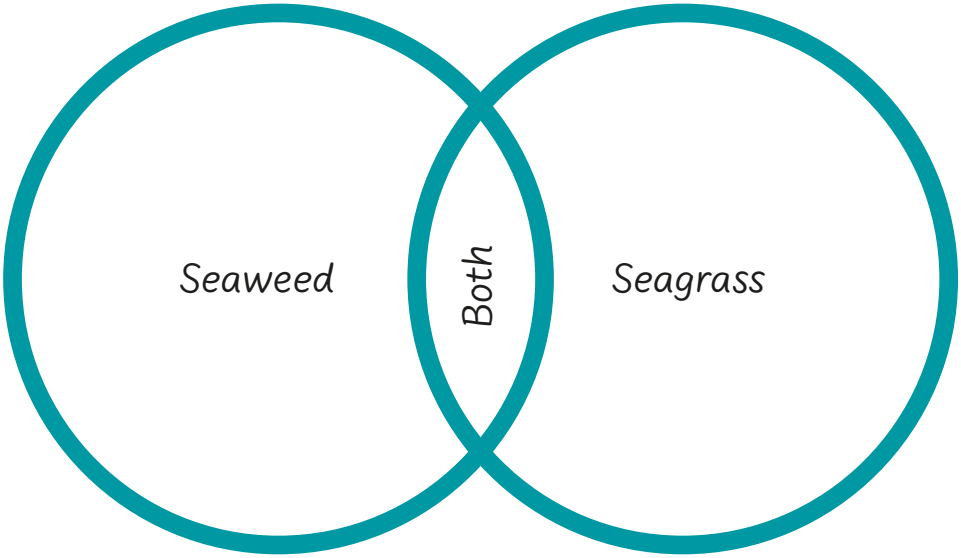
6. Review the diagrams with the class, discussing any misconceptions and highlighting key similarities between seaweed and seagrass.

ANSWER KEY

Statement	Seaweed	Seagrass
Lives mainly on a rocky seabed	✓	
Produces flowers		✓
Is a true plant, like terrestrial (land) plants		✓
Is a good home for sea life	✓	✓
Lives near the shore	✓	✓
Feels rubbery to touch	✓	
Is eaten by humans	✓	
Is an algae	✓	
Attaches to rocks with holdfasts	✓	
Has roots that anchor it into the seabed		✓
Provides oxygen to the water through photosynthesis	✓	✓
Is a food source for marine animals, such as turtles	✓	✓
Can be affected by pollution and climate change	✓	✓

Seagrass vs Seaweed Sort

Use chalk or hula hoops to create two large overlapping circles

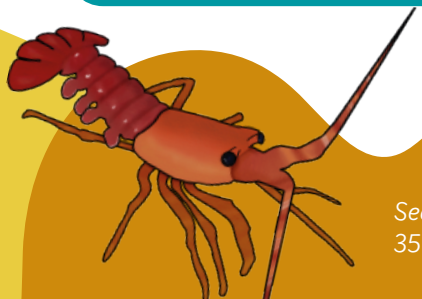


Cut out the cards below and label one circle 'Seaweed' and the other 'Seagrass'. The overlapping section represents 'Both'.

Lives mainly on a rocky seabed	Produces flowers	Is a true plant, like terrestrial (land) plants
Is a good home for sea life	Lives near the shore	Feels rubbery to touch

Seagrass vs Seaweed Sort

Is eaten by humans	Is an algae	Attaches to rocks with holdfasts
Has roots that anchor it into the seabed	Provides oxygen to the water through photosynthesis	Is a food source for marine animals, such as turtles
Can be affected by pollution and climate change		



Seagrasses store carbon up to 35 times faster than rainforest.

ADDITIONAL **TASK**

Use the blank cards to create additional statements to add to the diagram.

60 mins

12

Seagrass Scars

Equipment required

- Print out of the 'Seagrass Scars' worksheet, one per pair
- Print out or share the photos on sheet (S_S_2), one per class/group
- Paper
- Art materials
- Internet enabled devices and internet access

To complete the activity

1. Share the 'Seagrass Ocean Rescue' video with the learners – www.tiramor.cymru/seagrass (Resource 1). Discuss with learners the main threats to seagrass ecosystems mentioned in the video and their impact on marine life.

2. Share the 'Seagrass Scars' worksheet (S_S_2). Provide an opportunity for learners to discuss what they can see in the image and describe any features they notice. What impact do learners think the moorings might have on seagrass meadows?

3. Challenge learners to find out further causes of seagrass decline, researching and recording any findings on the 'Seagrass Scar' worksheet.

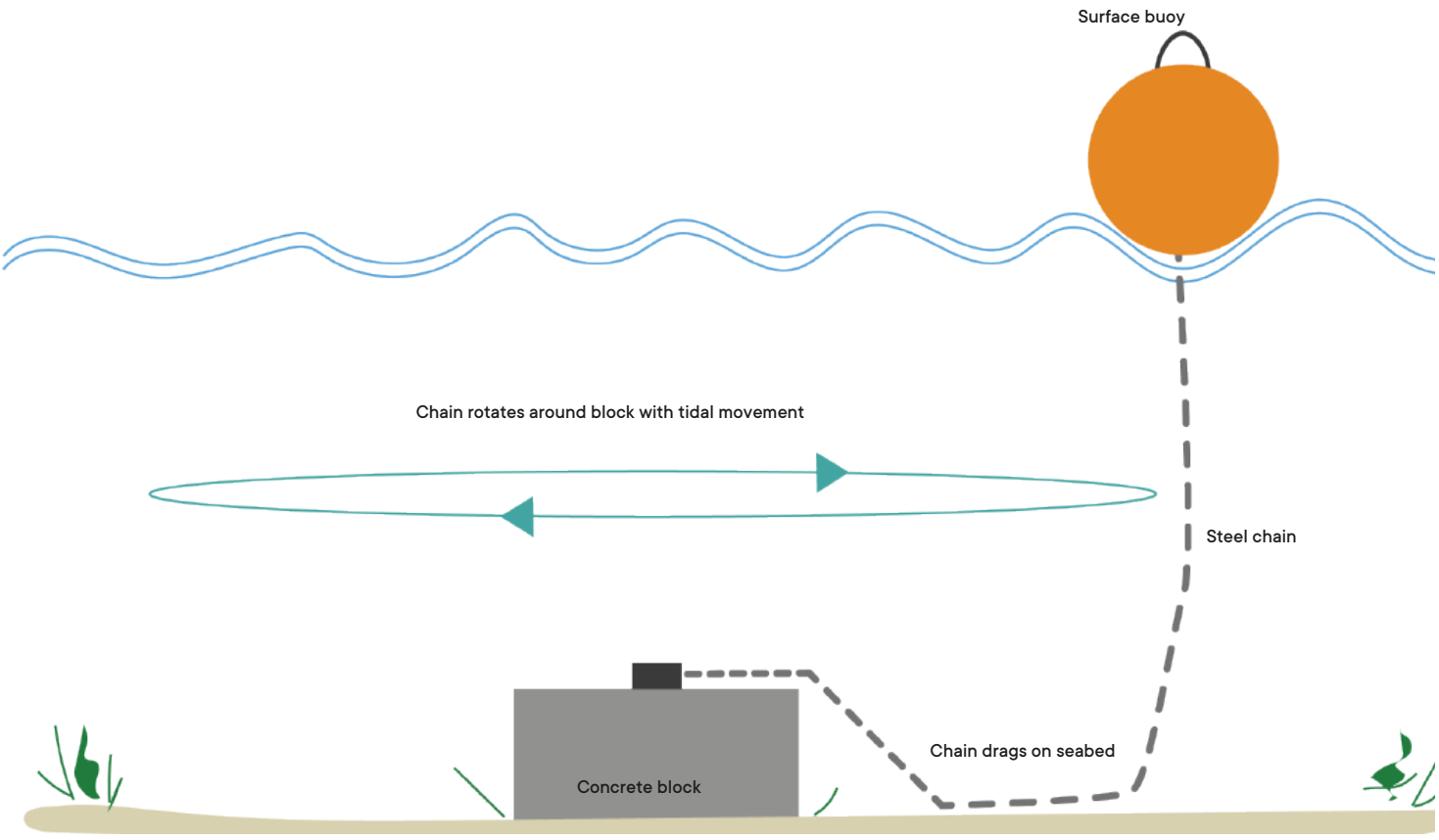
4. Encourage learners to consider the scar caused by each stressor, creating a pattern or symbol to represent the scar.

5. Using the patterns or scars created, provide each pair of learners with art materials such as paints, markers, or paper to design a visual representation of seagrass and the stressors affecting it.

6. Ask learners to share their artwork with the class, explaining the stressors they illustrated and their potential impact on seagrass.

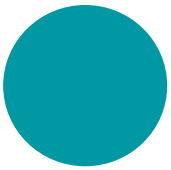
ANSWER KEY

Stressor	Potential impact on Seagrass
Boat moorings (chains)	Scouring of the seagrass, resulting in the removal of shoots.
Boat keels	Creation of short ditches through the meadow and damage to seagrass shoots.
Boat scouring	Scouring of the seagrass as boats land on seagrass at low tide, resulting in damage or removal of shoots.
Anchors	Dropping anchors in seagrass beds damages shoots, especially as anchors are recovered.
Tractors	Compression of sediments, creation of tracks through meadows, and damage to seagrass shoots.
Dumping of fishery waste	Lobster and brown crab shell waste suffocates seagrass.
Digging seagrass by shellfish gatherers	Loss and disturbance of seagrass.
Coastal development	Loss and disturbance of seagrass through habitat destruction.
Pollution (oil spills and chemicals)	Contamination of water reduces seagrass health and affects associated ecosystems.
Climate change (rising water temperatures)	Increased temperatures stress seagrass, potentially leading to die-offs.
Sea level rise	Alteration of light availability and changes in suitable seagrass habitat due to deeper waters.
Algae overgrowth	Excess nutrients from pollution causing thick algae to block sunlight.
Marine litter	Plastic waste and debris can entangle and suffocate seagrass.


Surface buoy
Chain rotates around block with tidal movement
Steel chain
Chain drags on seabed
Concrete block

Seagrass Scars

Research and record the causes of seaweed decline:

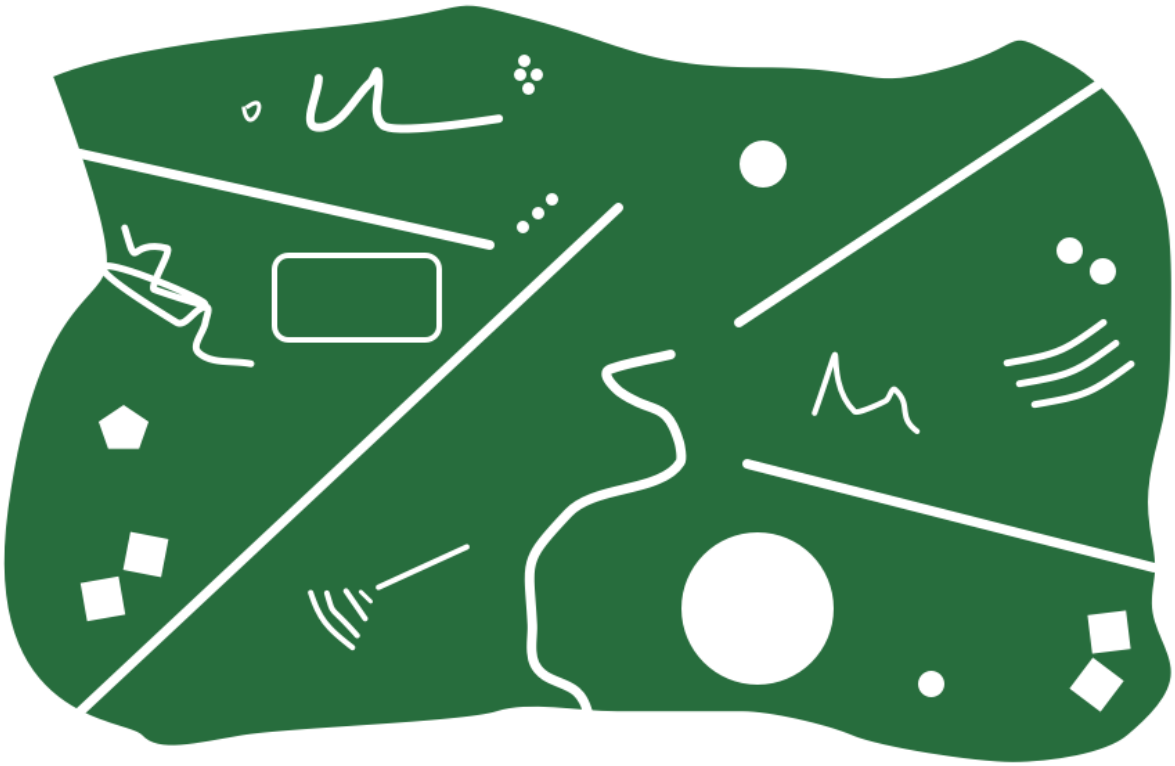
Stressor	Cause	Pattern or Scar Created
Boat mooring	*Chains dragging across the seabed.*	

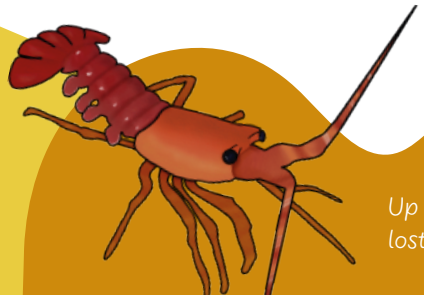
Seagrass Scars

Create an abstract artwork inspired by the scars and patterns caused by human impacts on seagrass meadows, such as tracks or boat propellors. Use lines, shapes, and colours to visually represent these effects.

Reflect on your design and explain how it illustrates the challenges seagrass faces due to human impacts.

Discuss what actions can be taken to protect and restore these vital ecosystems.





Up to 92% of seagrass has been lost in the UK in the last century.

60 mins

Seagrass Scar Solutions

Equipment required

- Print out of the 'Seagrass Scars Solution' worksheet, one per group (3 pages)
- Internet enabled devices and internet access

To complete the activity

1. Share the 'Project Seagrass' video with the learners – www.tiramor.cymru/seagrass (Resource 2).

2. Distribute the 'Seagrass Scars Solution' worksheet - one per group, and provide learners with internet-enabled devices with internet access.

3. Ask learners to imagine they are marine conservation engineers designing solutions to protect seagrass meadows, just like the replanting efforts shown in the video. Explain their goal is to design a creative solution to protect or restore these vital habitats and to prevent scars caused by stressors like boats, vehicles, pollution, or algae overgrowth. Can they help prevent damage to seagrass meadows and ensure they thrive for the marine life that depends on them?

4. Have each group choose a stressor to focus on, such as boat moorings, vehicles in intertidal zones, algae overgrowth from pollution, or sediment disturbance caused by construction or turbulence.

5. Provide an opportunity for learners to research real-life strategies, such as Advanced Mooring Systems, seagrass restoration, education campaigns, or pollution reduction.

6. Ask groups to design a solution for their chosen stressor. They can create a labelled diagram, a 3D model using recycled materials, or a poster/infographic showcasing the stressor, its impact, and their solution.

7. Provide an opportunity for the groups to present their projects to the class, role-playing as conservation scientists. They should explain their chosen stressor, their solution, and the benefits of their idea for seagrass ecosystems.

8. Ask learners to reflect on their work by considering what inspired their solution, how it helps seagrass and marine life, and what else people can do to protect seagrass ecosystems. Learners may wish to complete the checklist provided to evaluate their work. Discuss how learners could improve or what you would do differently next time.

Seagrass Scar Solutions Challenge Card

Mission: *You are marine conservation engineers!*

Seagrass meadows are being damaged by human activities, leaving scars caused by boats, vehicles, pollution, and algae overgrowth.

Your challenge is to work together to design a creative solution to protect seagrass meadows, prevent these scars, and help them recover.

1. Choose your stressor

As a group, pick one stressor to focus on:

Boat moorings

Chains and anchors dragging across the seabed.

Vehicles

Cars or quad bikes driving through intertidal seagrass beds.

Algae overgrowth

Pollution causing thick algae to block sunlight.

Sediment disturbance

Construction or turbulence burying seagrass or blocking light.

2. Research solutions

Work together to explore real-life strategies to inspire your solution. Ideas might include:

Advanced Mooring Systems

Special moorings that don't drag on the seabed.

Seagrass restoration

Replanting seagrass in damaged areas.

Education campaigns

Teaching people to protect seagrass.

Pollution reduction

Stopping nutrient runoff to improve water quality.

Divide research tasks between your group members to gather information quickly.

3. Design your group solution

Combine your ideas to create one group solution.
Choose how to present it:

Create a diagram
Show how your solution works and label its parts.

Build a model
Use recycled materials to create a 3D version of your solution.

Create a poster or infographic
Explain the stressor, its impact, and your solution visually.

Ensure every team member contributes to the final design!

4. Present your solution

Work together to prepare a short group presentation.
Explain:

1. What stressor you focused on.

2. Your group's solution and how it works.

3. Why your solution will help protect seagrass meadows.

Role-play as conservation scientists to make your presentation fun and engaging!

5. Reflect

After your presentation, discuss as a group:

What inspired your solution?

How does it help protect seagrass ecosystems?

What other ideas could people use to protect seagrass?

Seagrass Solution Presentation Self-assessment Checklist

Content

- ◯ We clearly explained the stressor we focused on.
- ◯ We described our solution and how it works.
- ◯ We explained why our solution will help protect seagrass meadows.

Visuals

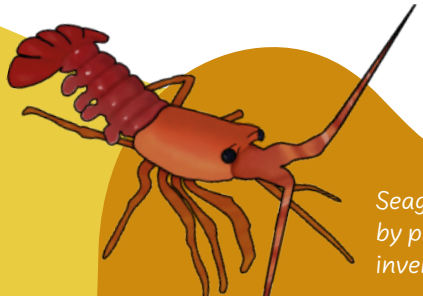
- ◯ We used a diagram, model, or poster to support our explanation.
- ◯ Our visuals were clear and easy for the audience to understand.
- ◯ We labelled important parts of our visuals.

Delivery

- ◯ Everyone in the group participated in the presentation.
- ◯ We spoke clearly and at a good pace so everyone could hear and follow.
- ◯ We stayed on topic and kept the audience engaged.

Engagement

- ◯ We answered questions from the audience confidently.
- ◯ We encouraged the audience to think about ways to protect seagrass.



Seagrass meadows support biodiversity by providing habitats for fish, invertebrates and marine mammals.

Pink Sea Fan

Pink Sea Fan

Pink sea fans are a type of soft coral and one of the most beautiful creatures found in Welsh waters. These corals are not a single organism but rather a colony of tiny animals called polyps, which resemble small anemones.

Found at depths of 10–50 metres, pink sea fans can be pink, orange, or even white, despite their name! They grow on rocks and hard surfaces in mostly flat, two-dimensional structures. Many align at right angles to the sea current to maximise the flow of nutrients passing by.

Like humans, pink sea fans grow faster when young, slowing down as they mature, but unlike us, they continue growing throughout their lives. They grow at a rate of just 1cm per year, with the largest recorded individual standing an impressive 50cm tall and 100cm wide, estimated to be over 100 years old. However, most pink sea fans in the UK are typically around 20cm in size. These corals are fragile and rare, making them a protected species due to their vulnerability to human impacts. They also support other rare species, such as the sea fan anemone and the sea fan sea slug. Remarkably, one species of sea slug not only feeds on pink sea fans but also camouflages itself to look like them.

Although we still know little about how pink sea fans reproduce, genetic studies reveal that Welsh pink sea fans are connected to populations as far away as France, suggesting their young can drift hundreds of miles across the ocean. Pink sea fans even serve as anchors for the eggs of small sharks like catsharks, though this can sometimes backfire. The added weight from the eggs and attached sea life can tangle branches and damage the sea fan.

Overall, pink sea fan populations are declining. In the Skomer Marine Conservation Zone, records show a loss of 50 pink sea fans since 1994, with 40 lost since 2015, and only 12 new recruits have been recorded. The main causes of their decline are believed to include:

- Entanglement of catshark eggs, which can damage branches.
- Changes in sea temperatures as a result of climate change.
- Physical damage from boat anchors and fishing.
- Entanglement in discarded fishing nets or lost fishing and angling gear, and marine litter.
- Accidental damage by scuba divers.
- Increased storm activity.

Pink sea fans thrive in warm waters and are more abundant in the Mediterranean.

Further research keywords
Eunicella verrucosa, soft coral, coral reefs, gorgonian, benthic ecosystems, epifauna, polyp-bearing, habitat-forming octocoral, three-dimensionality, ecological substrate, scallop dredging.

15–20 mins

Bubble Munchers

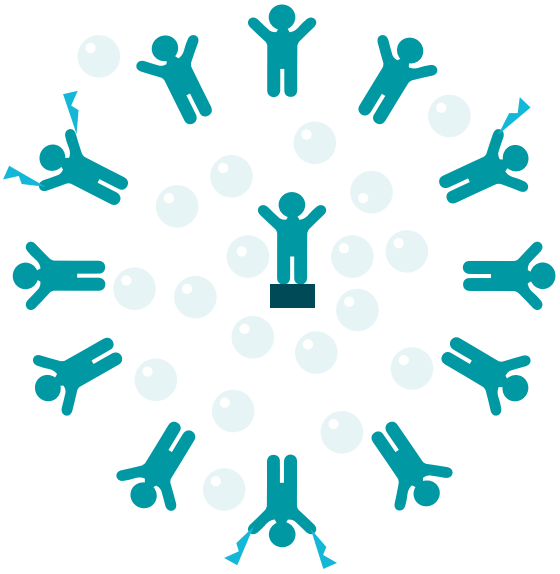
Equipment required

- Bubbles (machine/bubble wands)
- Newspaper (optional)

To complete the activity

1. Ask learners to consider how and where they find their food. In pairs, ask learners to discuss how they would catch food if they were stranded on a desert island? Discuss how different animals in the wild find and catch their food. Encourage them to consider the different adaptations they have to help them. Explain that in the sea, many animals pursue their prey (e.g. sharks and dolphins). How about animals that don't move, e.g. sea anemones and barnacles? Explain that these animals attach to hard rocks and need to capture food which is swimming or drifting past them in the water.

2. In an open play area, ask learners to sit on the floor in a circle with the bubble machine or volunteer/s blowing bubbles in the centre. The learners are sea anemones, and the bubbles are prey (tiny particles of food in the water). With the bubble machine/volunteer blowing bubbles around the circle, encourage learners to catch as many as possible, while remaining seated in one place.



After a few minutes, ask the learners how they found the activity and what they needed to do to catch the bubbles. They may realise that to catch food, they need to stretch out their arms and wave them about, just as sea anemones do with their tentacles, to take in plankton and minerals.

3. As an addition to this activity, if space allows, offer learners rolled up or fanned out newspaper to 'extend their limbs'. Ask them to work out which is most effective and consider how these compare to the feeding adaptations of real animals.

4. Next, ask the learners to become dolphins and explain that the bubbles are fish. This time, the learners can 'swim' around chasing their prey. After a few minutes ask the learners if this was an easier way to feed. Did they catch more? Did they get tired? This may prompt a discussion about energy gained and lost, and the balance needed between energy used and energy consumed. Is actively chasing food always worth the energy spent?

Bubble Munchers is adapted from Life around the Turbines, an outreach project developed by the Marine Biological Association of the UK (MBA) funded by charity COWRIE (Collaborative Offshore Wind Research into the Environment). COWRIE was set up by the Crown Estate but the collaboration has ended.

60 mins

12

Build your Own Edible Pink Sea Fan

Equipment required (per learner)

- 'Build your Own Edible Pink Sea Fan' worksheet, one per learner, or shared digitally
- 1 paper plate
- 1 large marshmallow
- 2 strawberry laces – cut into 8 pieces
- 1 straw
- 1 toothpick
- 1 spoonful of jam (any flavour)
- 1 teaspoon
- 2 round biscuits (e.g. rich tea)
- Green, pink, or red sugar sprinkles

To complete the activity

1. Share the 'Wales Best of the West' video with the learners – www.tiramor.cymru/pinkseafan (Resource 1).

2. Ask learners to share some examples of marine life they noticed in the video. How might these organisms be connected to each other within their environment? At 0:42 in the video, ask learners to identify what the scuba diver is looking at. Do they think it is a plant or an animal?

3. Correct any misconceptions. It's easy to think that coral is a plant, but they're in fact small animals. Each coral colony contains many individual coral animals, each known as a coral polyp. They share a hard skeleton made of protein and calcium carbonate.

4. Share the 'Build your own edible pink sea fan' worksheet and support learners to create their own coral polyp.

5. After completing their model, ask learners to reflect on what they learned about coral polyps. Discuss how the model represents real-life features and why these features, like tentacles, are important for survival.

ADDITIONAL TASK

Encourage learners to use The Marine Life Information Network website to view where pink sea fans are found: www.tiramor.cymru/pinkseafan (Resource 2). Ask them to identify the areas around the UK where pink sea fans are located and describe the types of habitats they prefer.

Important Note: Always check for allergies beforehand and follow your school's guidelines for handling food during activities.

Build your Own Edible Pink Sea Fan

What you will need

- 1 paper plate
- 1 large marshmallow
- 2 strawberry laces
- 1 straw
- 1 toothpick
- 1 spoonful of jam
- 1 teaspoon
- 2 round biscuits
- Green, pink or red sugar sprinkles

STEP 1: Prepare for the experiment

A. Wash your hands before starting.

B. Ensure all your equipment is clean and ready to use.

STEP 2: Create the polyp body

A. Place your marshmallow in the centre of your paper plate.

B. This represents the body of your coral polyp.

STEP 3: Make the mouth and stomach

A. Take a straw and carefully poke a hole in the centre of the marshmallow.

B. Remove the straw, leaving the hole behind. This represents the mouth and stomach of your coral polyp.

Coral polyps use this hole to eat and digest food, with their tentacles helping to catch tiny food pieces and guide them inside. Pink sea fans have just one hole that they use for both.

STEP 4: Add tentacles

A. Use a toothpick to create 8 small holes around the marshmallow.

B. Cut your strawberry laces into 8 small pieces (about 3cm each).

C. Insert the strawberry lace pieces into the holes. These represent the tentacles of your coral polyp.

STEP 5: Attach your polyp to its base

A. Use a spoon to spread a small amount of jam onto one of your round biscuits.

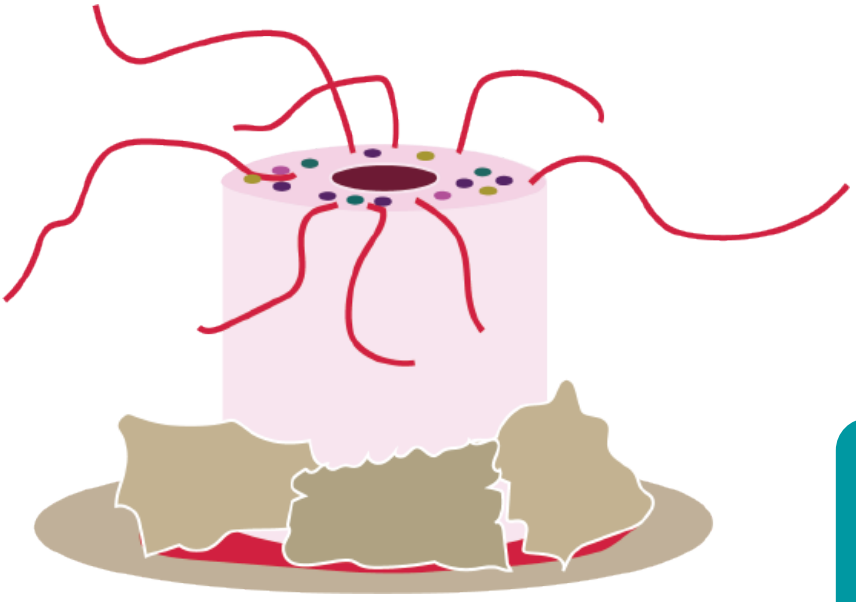
B. Stick the marshmallow onto the jam. This represents the coral polyp gluing itself to a rock.

STEP 6: Add skeleton protection

A. Break the second biscuit into 4 pieces.

B. Arrange these pieces around the marshmallow. These represent the coral skeleton, which provides protection and structure to the polyp.

Build your Own Edible Pink Sea Fan



STEP 7: Add algae
A. Sprinkle some sugar (green, pink, or red) on the marshmallow. This represents the algae that live inside the coral.

Some corals produce food by teaming up with tiny algae that live inside their bodies. These algae use sunlight to create energy through photosynthesis, similar to how plants make food. The algae shares this energy with the coral, while the coral provides nutrients and a safe home for the algae.

STEP 8: Form a coral colony
A. Work with 2 other learners.
B. Place your marshmallows (coral polyps) close together on one plate to represent a coral colony.
C. If you have permission, you can eat your coral polyp creation!

Pink sea fan coral is made of colonies of tiny animals called polyps. These polyps live together, working as a team to form the coral!

ADDITIONAL **TASK**

Encourage learners to use the Marine Life Information Network website to view where pink sea fans are found: www.tiramor.cymru/pinkseafan (Resource 2).
Where along the the Welsh coast are pink sea fans located? What types of habitats do pink sea fans prefer?

A coral polyp with 8 tentacles is called an octocoral, as "octo" means eight.

60 mins

Acidification vs Pink Sea Fan

Equipment required

- Measuring jug
- Funnel
- Water
- Salt (2 tablespoons)
- Tablespoon
- 1 litre container
- Sour sweet (optional)

Equipment required (per group)

- 'Acidification vs Pink Sea Fan' worksheet
- 75cm^3 brown vinegar (avoid white vinegar lest learners think it is water)
- 2 Beakers/Containers (minimum capacity of 75cm^3)
- Measuring cylinder
- 2 raw eggs

To complete the activity

1. Start by sharing a sour sweet with learners or asking if they've ever tasted something sour. Use this to introduce the idea of acidity and ask, "What makes sour things taste this way?" Briefly explain acids and how they interact with certain materials.

2. Show or pass around a piece of chalk and ask learners what they think it's made of. Explain that coral skeletons, like those of the pink sea fan, are made of the same material: calcium carbonate.

3. Engage learners by asking them to predict what might happen to chalk if it were placed in an acidic liquid (e.g., vinegar).

4. Connect this to the ocean: Ask,"If sea water becomes more acidic, how might that affect the calcium carbonate skeleton of the pink sea fan?" Encourage discussion and hypotheses before explaining the potential impacts of ocean acidification.

5. Explain that you need to create a simple sea water solution. Invite learners to join in as you prepare the solution.

6. Use a measuring jug to measure 1 litre of tap water and pour it into a large container.

7. Add 2 level tablespoons of salt to the water, approximately 36 grams, which is close to the 35 grams per litre concentration found in seawater.

8. Stir the water until the salt is fully dissolved. Explain to the learners that this solution represents seawater. The 1–litre solution is sufficient for the whole class.

9. Provide each group with the 'Acidification vs Pink Sea Fan' worksheet, and support groups as required to conduct the experiment.

10. Encourage learners to carefully observe the experiment, noting bubbles or changes in the shells over time. Prompt them to think about the bubbles forming around the shells, by asking "What do you think these bubbles are?"

11. Support learners to remove the raw eggs from the containers and encourage them to gently bounce the eggs. The egg in pure vinegar will bounce better due to the reaction.

12. Provide an opportunity for learners to research other organisms with calcium carbonate shells and explore how ocean acidity affects them.

Acidification vs Pink Sea Fan

What you will need

- 25cm^3 Seawater solution
- 75cm^3 Brown vinegar
- 2 Beakers/Containers (minimum capacity of 75cm^3)
- Measuring cylinder
- 2 Raw eggs

STEP 1
Label your containers as 'Vinegar Solution' and 'Pure Vinegar'.

STEP 2
Use your measuring cylinder to measure 25cm^3 of the seawater solution and pour it into the container labelled 'Vinegar Solution'.

STEP 3
Add 25cm^3 of vinegar to the same container to create a 1:1 ratio of seawater and vinegar.

This represents water with low acidity.

STEP 4
Carefully place one egg into the 'Vinegar Solution' container.

STEP 5
In the container labelled 'Pure Vinegar', measure 50cm^3 of brown vinegar and carefully place the second egg into this container.

STEP 6
After 1 hour, observe both containers and record your findings in the table.

STEP 7
Check the containers again after 24 hours and write down your observations.

STEP 8
Finally, observe the eggs after 48 hours and note the changes in the table.

You may gently touch the eggshells during your observations but handle them carefully as they are raw eggs and can easily break.

Remember!
Wash your hands thoroughly after handling the eggs to maintain cleanliness and avoid contamination.

Acidification vs Pink Sea Fan

Egg 1 - Vinegar Solution

TIME (hours)	OBSERVATIONS
1 hour	
24 hours	
48 hours	

Egg 2 - Pure Vinegar

TIME (hours)	OBSERVATIONS
1 hour	
24 hours	
48 hours	

Conclusion

- *After 48 hours, what differences did you notice between the two eggshells?*
- *What have you learned from this experiment about how water acidity impacts the pink sea fan?*
- *Did you notice bubbles forming around the shells? What do you think these bubbles are?*

STEP 9

Before removing the raw eggs from their containers, make a prediction: Which egg do you think will bounce better? Then, carefully take the eggs out and gently try bouncing them. Compare your results to your prediction!

ADDITIONAL **TASK** Optional

Research other organisms that have a shell containing Calcium Carbonate? How might increased acidity in their environment affect these organisms?

The largest pink sea fan on record is 50cm tall and 100cm wide and is believed to be over 100 years old!

60 mins

12

Pink Sea Fan Meditation Music

Equipment required

- Print out the 'Pink Sea Fan Meditation Music' worksheet, one per group (2 pages)
- Recording devices (e.g. tablets), one per group
- Internet enabled devices and internet access

To complete the activity

1. Share examples of relaxing ocean music and/or guided meditation with learners, e.g.
   - 'Wales 4k Benar Beach' - www.tiramor.cymru/pinkseafan (Resource 3)
   - 'Beautiful 4K Scenery' - www.tiramor.cymru/pinkseafan (Resource 4)
   - '10-minute guided meditation' - www.tiramor.cymru/pinkseafan (Resource 5)
   - 'Eco Anxiety: Guided Meditation' - www.tiramor.cymru/pinkseafan (Resource 6).

2. Explain the goal: Each group will create a 1-minute relaxing sound piece inspired by the peaceful, rhythmic flow of pink sea fans.

3. Provide each group with the 'Pink Sea Fan Meditation Music' worksheet and recording device (e.g. tablet), before moving to an outdoor space. Let learners pause and listen to the sounds around them. Discuss how pink sea fans gently sway underwater, move slowly, depend on ocean currents, and live in calm, undisturbed environments. How does the environment make them feel when they listen?

4. Challenge learners to use the outdoor environment to inspire calm, ocean-like sounds. Options may include rustling leaves to mimic ocean currents, tapping sticks softly on tree trunks for more rhythmic sounds, splashing or tapping gently in water puddles to reflect the movement and sound of waves, or using their own voices, humming or breathing.

5. Support learners to record sounds separately (e.g. one recording for ocean currents, another for bubbles or swaying sounds). Remind learners to keep recordings short (e.g. 10–15 seconds).

6. When learners have completed their ocean sound recordings, return indoors, and using audio editing tools (e.g. GarageBand, Audacity or BandLab), provide time for learners to put their piece together. Ensure learners can import each recorded sound file into the editing app, and support to arrange the tracks, considering carefully how they layer sounds, add fades or pauses for a meditative feel, and adjust volume to ensure a gentle, flowing balance.

7. When learners have completed their 1-minute piece, encourage each group to export their final recordings as MP3 or WAV files.

8. Finally, play each group's soundscape in a calm, quiet space. Guide learners to sit comfortably, close their eyes, and focus on the sounds, as they would in a meditation session. Encourage slow, deep breathing as they listen, imagining the gentle movement of pink sea fans swaying with ocean currents. Afterward, reflect together on how the music makes them feel - does it help them feel calm, relaxed or focused?

Pink Sea Fan Meditation Music

Welcome to my world!

I need your help to create a beautiful, relaxing soundscape that captures the gentle, flowing rhythm of my underwater home. Picture the soft swaying of pink sea fans, the quiet currents of the ocean, and bubbles drifting peacefully by.

- Gill Bell

Use the outdoor environment - like rustling leaves, splashing in puddles, or your own soft humming - to bring this serene world to life. Work together to create a 1-minute piece of music that's as calming and tranquil as the ocean itself. Let your creativity flow!

Sounds to include

What underwater sounds do you want to include in your piece? (e.g. ocean currents, bubbles, swaying movements)

What will you use to create the sounds above? (e.g. rustling leaves)

Decide on your sounds, and plan how you will record them.
Remember to keep each sound recording short (10-15 seconds).

Sound to record	Length	Who will record?

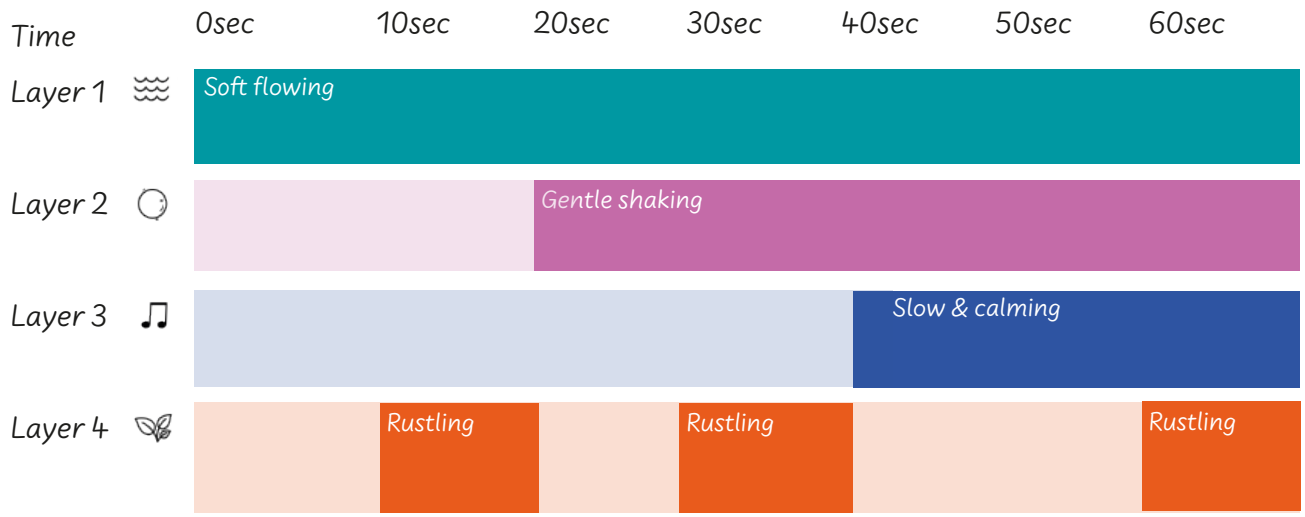
Pink Sea Fan Meditation Music

Think carefully about how you will arrange your sounds to create a relaxing, flowing piece of music.

Create a simple timeline to note the order of your sounds, for example:

Waves *Bubbles* *Humming* *Leaves*

If you would like sounds playing together, create a 'layered' timeline.



Once you've completed your piece, reflect on the following:

1. How does your music reflect the gentle, flowing movements of the pink sea fan?

2. How did listening to your finished piece make you feel?

In Ireland, all pink sea fans are white, and scientists don't yet know why!

Share your 1-minute soundscape with the class!

Native Oysters

Introduction

Native Oysters

Oysters are amazing animals and true superheroes of the sea. Only one oyster is native to the UK, the European oyster (also known as the edible flat oyster). They are molluscs, related to sea snails, and are bivalves, meaning they have two shells connected by a strong muscle.

They have no brain or eyes but do have a nervous system and light receptors. Oysters can live for up to 15 years and generally grow to 10cm long, although some 20cm specimens have been found! They are all born male, then change between male and female throughout their lives. Each adult female can produce 1 million babies each year.

Oysters live at the coast in water up to 80 meters deep, often in muddy areas where they always need a hard surface to settle on, such as bedrock, stones, or shell fragments. If you are lucky, you can see oysters on the low shore (e.g. in rockpools). They can't really move and so are stuck, sometimes literally, to the seabed, filtering seawater that flows over and around them to remove essential food and nutrients needed to grow. They are very efficient filterers, and this is useful for humans and other wildlife, as they can filter water, making it cleaner and clearer. A single native oyster can filter up to 200 litres of water a day. Oysters eat tiny particles, including plankton, which are vital in marine food chains and even play a role in climate regulation. Unfortunately, oysters may also ingest microplastics, highlighting links between pollution and their health.

Oysters start life as tiny larvae floating in the water column. These larvae are washed about before settling onto a hard surface and developing into 'spat,' which are effectively baby oysters. They then grow bigger, forming growth rings like trees, which can help determine their age.

Oysters are very friendly, preferring to live in large groups that form reefs. They make glue that they use to stick themselves to or near to other oysters. Oyster reefs can help to stabilise sandy and muddy seafloors, allowing for more oysters to settle in the area. Oyster reefs create homes, safe hiding places and are food for other animals, all of which helps to increase the number of fish in the sea. Oysters also help to clean the sea, improving water quality by filtering large volumes of water and removing some pollutants. Oysters also provide jobs and food for people.

Oysters need our help. Wild native oyster beds are one of the most endangered marine habitats in Europe. It is believed that oyster populations in the UK have declined by around 95% in the last 200 years, due to overfishing, pollution and habitat loss. The restoration of oyster habitats could help to boost some fish populations and improve catches for both recreational and commercial fishermen over the long-term. Projects around Wales are returning oysters back to the sea to help bring back these amazing animals from near extinction, but they will need help over a long time because oyster reefs take about 20 years to become established. There's so much to learn and lots you can do to help oysters. Oysters are vital to marine ecosystems, and with your help, they can continue to play their superhero role in the sea!

Further research keywords

Ostrea edulis. bivalve, molluscs, brackish water, adductor muscle, shucked, filter-feeding, algae, phytoplankton, gills, cilia, reef-building, substrate, aquaculture.

30 mins

Oyster Battleships

Equipment required (per group)

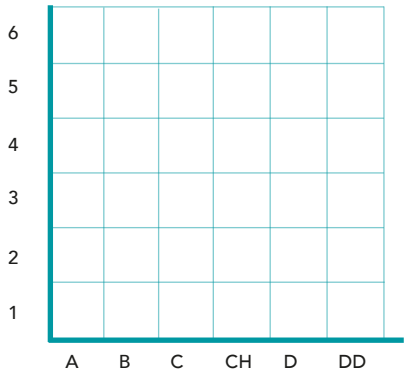
- Chalk

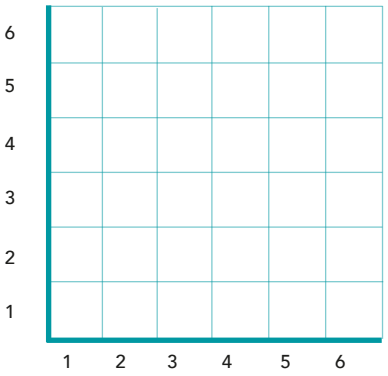
To set up

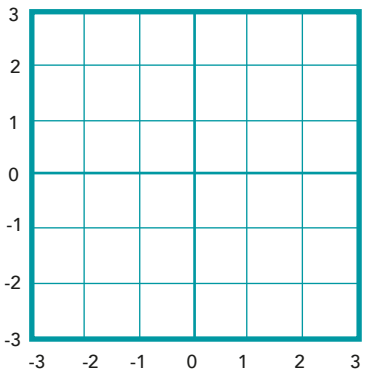
1. Organise learners into groups of 10–12.

2. Support learners to create a large 6x6 grid using chalk on the ground. Each square must be big enough for a learner to sit in comfortably - this represents the ocean floor where oysters live.

3. Encourage learners to label the axes. They could use:
   - Letters for one axis and numbers for the other, like the traditional Battleship game *e.g. A–F ,along one axis, 1–6 along the other.*
   - A simple Cartesian grid using positive coordinates e.g. (3,2).
   - Negative numbers on one axis e.g. (–2 to 2) to explore basic coordinate concepts.



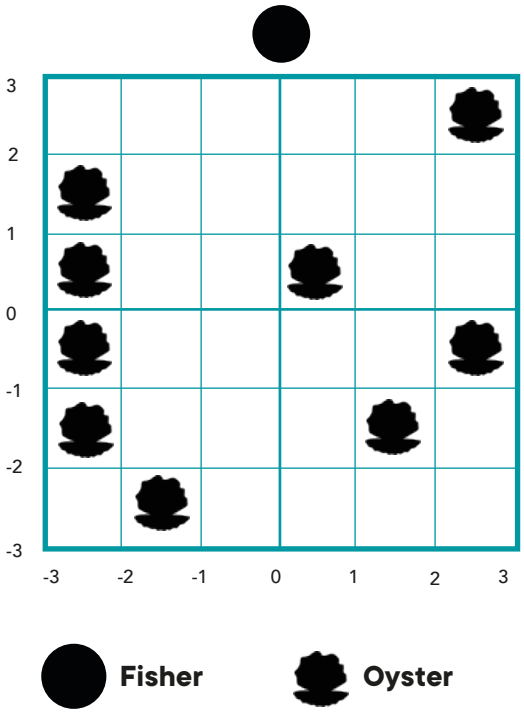




4. Ask each group to choose one learner to be the 'fisher'. The fisher must turn away from the grid or close their eyes while the rest of the group (acting as oysters) silently choose their grid positions.

30 mins

Oyster Battleships



To complete the activity

1. The designated fisher has two attempts per round to catch oysters by calling out coordinates e.g. D4 or (3,2) depending on the grid type. If they pick a square where an oyster is sitting, that oyster is caught and must leave the grid.

2. Repeat the game, increasing the number of fishers to 2–3, making it harder for oysters to survive. Calculate how many oysters were caught after each round.

3. Next, give one fisher a 'better boat', allowing extra turns per round (e.g. four turns instead of two).

4. After a few rounds, swap roles so oysters become fishers and vice versa.

5. Compare how many oysters were left at the end of each round. Link this to overfishing, discussing the impact of having too many fishers or advanced fishing equipment.

6. Consider the following questions:
   - How did the number of fishers in each round affect the oyster population over time?
   - What impact did advanced fishing techniques have on the sustainability of oyster populations during the game?
   - What strategies could be introduced to maintain a balance between fishing and preserving oyster populations?

ADDITIONAL TASK Optional

After each round, ask learners to calculate the percentage of oysters caught using this formula:
Percentage of oysters caught = (Number of oysters caught / Total oysters at the start of the round) x 100

60 mins

Activity Guide

How Oysters Filter Dirty Water

Equipment required (per group)

- Print out of the 'How Oysters Filter Dirty Water' worksheet, one per group
- Empty container (no more than 300ml)
- Oregano (to represent algae)
- Dried onion (to represent debris and other loose material)
- Peppercorn (to represent sediment)
- Teaspoon
- Funnel
- Empty container (over 300ml)
- Coffee filter

To complete the activity

1. Share the time-lapse video 'Oysters Clean the Bay!' with the learners – www.tiramor.cymru/nativeoysters (Resource 1). This demonstrates how oysters can clear cloudy water over 5 hours. This sets the context for understanding their role in ecosystems. Oysters eat the algae (which go into the gut) and expel both real waste faeces and pseudofaeces, which are particles of non-food things (silt, microplastics...). They are very efficient and good at this where other animals suffocate with fouled up gills.

2. Ask learners to discuss the following:
   - Why is clean, clear water important for marine animals?
   - How might dirty water affect the ability of animals to breathe?
   - What impact might dirty water have on sunlight reaching marine plants?
   - How do oysters help clean the water?
   - What do you think happens if there is too much debris or pollution in the water?

3. Provide each group with a 'How Oysters Filter Dirty Water' worksheet and necessary equipment.

4. After completing steps 1–5, encourage learners to observe and discuss how the dirty water looks after mixing the ingredients?

5. Ask each group to predict how oysters might clean the 'dirty' water.

6. Support learners to follow next steps to create their own oyster out of a coffee filter.

7. Support learners to set their coffee filter in the funnel. Before they pour the 'dirty water' through the filter, remind learners not to use a spoon to push liquid through the filter, as this may cause the filter to tear.

8. After filtering, encourage learners to discuss how clean the water is after going through the filter. What was removed easily? Why is it cleaner? Encourage learners to consider whether everything has been removed? What about organisms that are too small to see and those that have been dissolved.

9. Ask each group to consider how the experiment demonstrates how oysters filter water in nature. Reflect on the limitations of the filter and the challenges oysters might face in heavily polluted water.

How Oysters Filter Dirty Water

What you will need

- Empty container (no more than 300ml)
- Oregano (to represent algae)
- Dried onion (to represent debris and other loose material)
- Peppercorn (to represent sediment)
- Teaspoon
- Funnel
- Empty container (over 300ml)
- Coffee filter

1. Add 1 teaspoon of oregano to the container.

   This represents algae, small plants that live in the water.

2. Add 1 teaspoon of dried onion to the container.

   This represents debris, (small fragments of broken-down plants and animal waste).

3. Add 1 teaspoon of peppercorn to the container.

   This represents sediment, which is made up of small pieces of broken-down rocks.

4. Fill the container halfway with tap water.

   This represents the water in a bay or river.

5. Mix everything together with your teaspoon.

   You've now created your 'dirty water'!

6. Set aside the 'dirty water'.

7. Create your own 'oyster' by folding the coffee filter in half; then fold in half again.

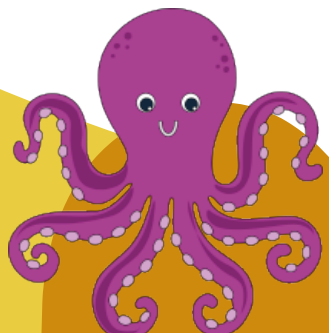
8. Set the coffee filter in a funnel over the remaining empty container.

9. Pour the 'dirty water' mixture slowly through the filter.

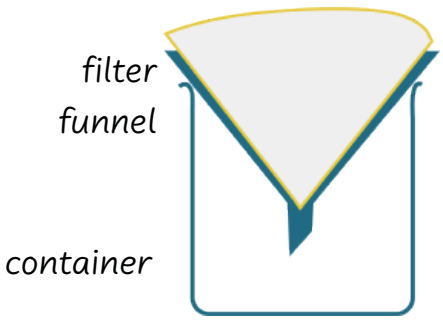
10. Discuss how clean the water is after going through the filter.

DISCUSS

Why is the water cleaner?
How does this relate to how oysters filter water in nature?



Even though oysters are known to create pearls, the European native oyster rarely creates pearls.



60 mins

Human Impact on Oysters

Equipment required (per group)

- Print out of the 'Microfibre Experiment' worksheet, one per group
- Fabric samples (synthetic and natural fibres)
- Scissors
- 5 jars (with lids)
- Magnifying glass or microscope (optional)
- Tap water
- 5 coffee filters
- Funnel and empty container
- Internet enabled devices and internet access

To complete the activity

1. Share the video 'Stop Ocean Threads!' with the learners – www.tiramor.cymru/nativeoysters (Resource 2).

2. Explain that oysters are natural filters that help keep waterways clean by removing particles and debris from the water. Note that human activities can introduce pollutants, including microfibres from clothing, into aquatic ecosystems.

3. Ask learners to consider the following questions:
   - What are microfibres, and where do they come from?
   - How do microfibres enter rivers, bays, and oceans?
   - What impact could microfibres have on oysters and other marine life?
   - How might microfibres affect oysters' ability to filter water?

4. Share the 'Microfibre Experiment' worksheet with each group. Encourage learners to explore how microfibres from synthetic and natural fabrics behave in water and discuss their impact on oysters and water quality.

5. Support learners to record their findings.

6. Discuss findings. What differences did learners notice between synthetic and natural fibres? How might microfibres impact oysters' ability to filter water? What solutions could help reduce microfibre pollution in aquatic environments?

7. Provide an opportunity for learners to research and consider practical solutions to reduce microfibre pollution in their daily lives. This may include using a Guppyfriend washing bag or Cora Ball to capture microfibres during washing; installing a washing machine filter to washing machines to trap fibres; washing clothes less frequently; choosing natural fabrics (which decompose faster that synthetic fibres); using cooler water and gentle washing cycles to minimize shedding and raising awareness about microfibre pollution.

8. Support learners to create a short presentation or poster to present ways to reduce microfibre pollution.

Microfibre Experiment

What you will need

- *Fabric samples (synthetic and natural fibres)*
- *Scissors*
- *5 jars (with lids)*
- *Magnifying glass or microscope (optional)*
- *Tap water*
- *5 coffee filters*
- *Funnel and empty container*

STEP 1
Cut 5 fabric samples (synthetic and natural fibres) into small pieces, 1-2 cm^2.

STEP 2
Place each fabric sample into separate jars, filling each jar three-quarters full of water.

Screw the lid on tightly.

STEP 3
Fill the table below with details about each fabric sample and initial observations before agitation.

STEP 4
Shake each jar for 1-2 minutes to stimulate agitation.

Record any visible changes in the table below.

STEP 5
Pour each jar's content through a coffee filter placed in a funnel into an empty container below.

Record observations about what is captured by the filter in the table below.

FABRIC NAME	NATURAL/ SYNTHETIC	INITIAL OBSERVATION	AFTER AGITATION OBSERVATIONS	FILTRATION OBSERVATIONS

DISCUSS

How might microfibres impact oysters' ability to filter water?

ADDITIONAL TASK Optional

Research and create a presentation or poster proposing practical solutions to reduce microfibre pollution.

Focus on actions individuals and communities can take, including tools, technologies, and lifestyle changes to minimise microfibre release into the environment. Be prepared to share your presentation or poster with the class and discuss your proposed solutions!

Native oysters filter seawater to consume phytoplankton and organic matter – this results in cleaner and clearer water.

30 mins




Oyster Challenges

Equipment required

- Print out of the 'Oyster Challenges' worksheet, one per learner (2 pages)
- Pens or pencils
- Internet enabled devices and internet access

To complete the activity

1. Share the 'A history of the native oyster in Wales' presentation with learners - www.tiramor.cymru/nativeoysters (Resource 3).

2. Share the following link with learners and ask them to identify where native oysters can be found in Wales - www.tiramor.cymru/nativeoysters (Resource 4). Discuss the habitat conditions needed for native oysters to survive. Learners may wish to use The Wild Oyster Project fact sheet to support their research - www.tiramor.cymru/nativeoysters (Resource 5).

3. Provide each learner with the 'Oyster Challenges' worksheet.

4. Encourage learners to solve the challenges and to discuss their strategies and approaches with a partner.

5. Allow time for learners to reflect on the following and to create their own oyster-related question:
   - Which question did they find the most challenging? Why?
   - What new skills did they use or learn in this activity?

ANSWERS:

1. 8 x 12 = 96 oysters
2. 2.5 x 4 = 10 cm
3. 200 x 6 x 7 = 8400 litres
4. 250 x 15 = 3750 grams (or 3.75 kg)
5. 120 / 6 = 20 oysters
6. 2(8 + 5) = 2(13) = 26 metres
7. 14 x 6 = 84 m^2 (square metres)
8. 72 / 8 = 9 oysters
9. 0.40 x 250 = 100 oysters
10. 100 / 20 = 5; 5 x 15 = 75 minutes (1 hour 15 mins)
11. 12 x 4 = 48
12. 25, 36 (squares of numbers)

Oyster Challenges

1. Counting Oysters
A reef has 8 rows of oyster beds, and each row contains 12 oysters. How many oysters are there in total?

Answer: _____

2. Growth Rate
An oyster grows 2.5cm each year. How many centimetres will it grow in 4 years?

Answer: _____

3. Filtration Power
An oyster can filter 200 litres of water per day. How much water can 6 oysters filter in a week?

Answer: _____

4. Weight Calculation
If one oyster weighs 250 grams, what is the total weight of 15 oysters?

Answer: _____

5. Volume Problem
A tank holds 120 litres of water. If each oyster needs 6 litres of water to survive, how many oysters can live in the tank?

Answer: _____

6. Perimeter of Oyster Beds
An oyster bed is 8 meters long and 5 meters wide. What is its perimeter?

Answer: _____

7. Area of an Oyster Bed
An oyster bed is 14 meters long and 6 meters wide. Calculate the area of the oyster bed.

Answer: _____

8. Sharing Oysters
A fisherman collects 72 oysters and shares them equally among 8 friends. How many oysters does each friend receive?

Answer: _____

9. Percentage Problem
40% of an oyster reef has been damaged by pollution. If the reef originally had 250 oysters, how many oysters have been affected?

Answer: _____

Oyster Challenges

10. Time Challenge

It takes 15 minutes to clean 20 oysters. How long will it take to clean 100 oysters?

Answer: _____

11. Money Problem

In 1835, oysters were very popular food, and you could buy 4 for 1 penny. How many oysters would you have been able to buy for a shilling (12 pence)?

Answer: _____

12. Pattern and Sequences Problem

Oysters are planted in rows forming a pattern: 1, 4, 9, 16... What are the next two numbers in the sequence?

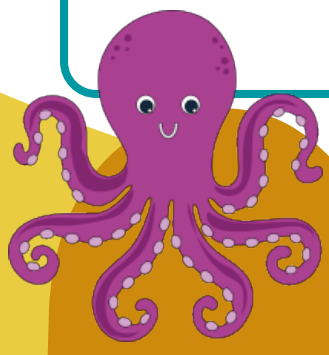
Answer: _____

Which question did you find the most challenging? Why?

What new skills did you use or learn in this activity?

Can you create your own oyster-related question?

Be prepared to share it with the class.



Oysters start their lives as males and change sex multiple times, usually ending as females.

Wildlife Recording

Introduction

Wildlife Recording

Wildlife is all around us, from the birds in our gardens to the seals on our shores and the whales swimming in our seas.

Every sighting, no matter how small, helps us understand the natural world and how it is changing. Wildlife recording is an essential tool in conservation, allowing scientists, conservationists, and budding nature lovers to track species, monitor populations, and detect changes that might signal wider environmental issues. Encouraging learners to engage with their environment through sight, touch, hearing, and smell helps build essential observation skills needed for effective wildlife recording.

Wildlife recording helps us protect and restore nature. By tracking species over time, we can identify declines, take action to support struggling populations, and make informed decisions to help biodiversity thrive. Using wildlife spotting tools like binoculars, nets, and tracking apps can support learners in identifying a wide range of species, including birds, mammals, invertebrates and plants while developing essential field skills. Bird observatories, such as the Bardsey Bird and Field Observatory, play a crucial role in gathering and analysing this data. Projects such as the Bardsey Marine Mammal Project and Sea Watch monitor Risso's dolphins, harbour porpoises, and Atlantic grey seals using timed watches, drones, and citizen science contributions, providing insights into their behaviour, movement, and conservation needs.

Marine wildlife recording is particularly important. Our seas host cetaceans, seals, and seabirds, and tracking them helps us understand population trends and threats. Learning to recognise species through unique markings is a technique used in marine research to track individuals and understand their movements. Such projects contribute essential data to conservation efforts, ensuring the protection of these species.

Citizen science allows people of all ages to contribute valuable data to conservation efforts. Whether it's recording birds in gardens for the Big Garden Birdwatch, searching for shark egg cases along the coast as part of the Great Eggcase Hunt, or tracking butterfly numbers for the Big Butterfly Count, every record helps build a clearer picture of wildlife populations. Learners can also observe and document species in school grounds using ID guides, field notebooks, and magnifying glasses. Listening to and identifying natural sounds in the environment helps develop auditory observation skills useful for monitoring bird and marine life. By contributing to citizen science projects and monitoring wildlife over seasons, everyone can play a part in conservation.

Further research keywords
Species identification, biodiversity, citizen science, migration tracking, marine mammals, bird ringing, cetaceans, wildlife surveys, nature conservation, habitat monitoring, Manx shearwater, Risso's dolphin, grey seal, Bardsey Island, bird observatories, sensory scavenger hunt, coastal safari, sound mapping, marine mammal ID, Bardsey Marine Mammal Project, hydrophones, citizen science contributions, elasmobranchii.

30–60 mins

12

Sensory Nature Scavenger Hunt

Equipment required (per group)

- Print out or share a digital copy of 'S_WR_1'
- Print out of the 'Sensory Nature Scavenger Hunt' worksheet, one per pair (2 pages)
- Clipboards or sturdy surfaces
- Pencils or crayons
- Magnifying glasses

To set up

Choose a safe outdoor location (e.g. school grounds, park, garden or beach).

To complete the activity

1. Introduce the activity by discussing the five senses: sight, touch, hearing, smell, and taste.

2. Share the photo of the boulder cobble reef in S_WR_1 with learners. Discuss:
   - What can you see in the photograph?
   - Can you find any shapes or patterns in nature?
   - How do you think the environment might feel if you touched it?
   - What sounds do you imagine you would hear if you were there?
   - What do you think might live or grow in this environment?

3. Hand out the 'Sensory Nature Scavenger Hunt' worksheets, explaining that the goal is to find natural items that match the descriptions.

4. Encourage learners to explore, observe closely, and use their senses (except taste unless specifically allowed). Remind learners not to touch unknown plants, insects or fungi. Encourage learners to observe and appreciate living things (e.g. minibeasts, plants and flowers) in their natural environment without picking or disturbing them, so others can enjoy them too.

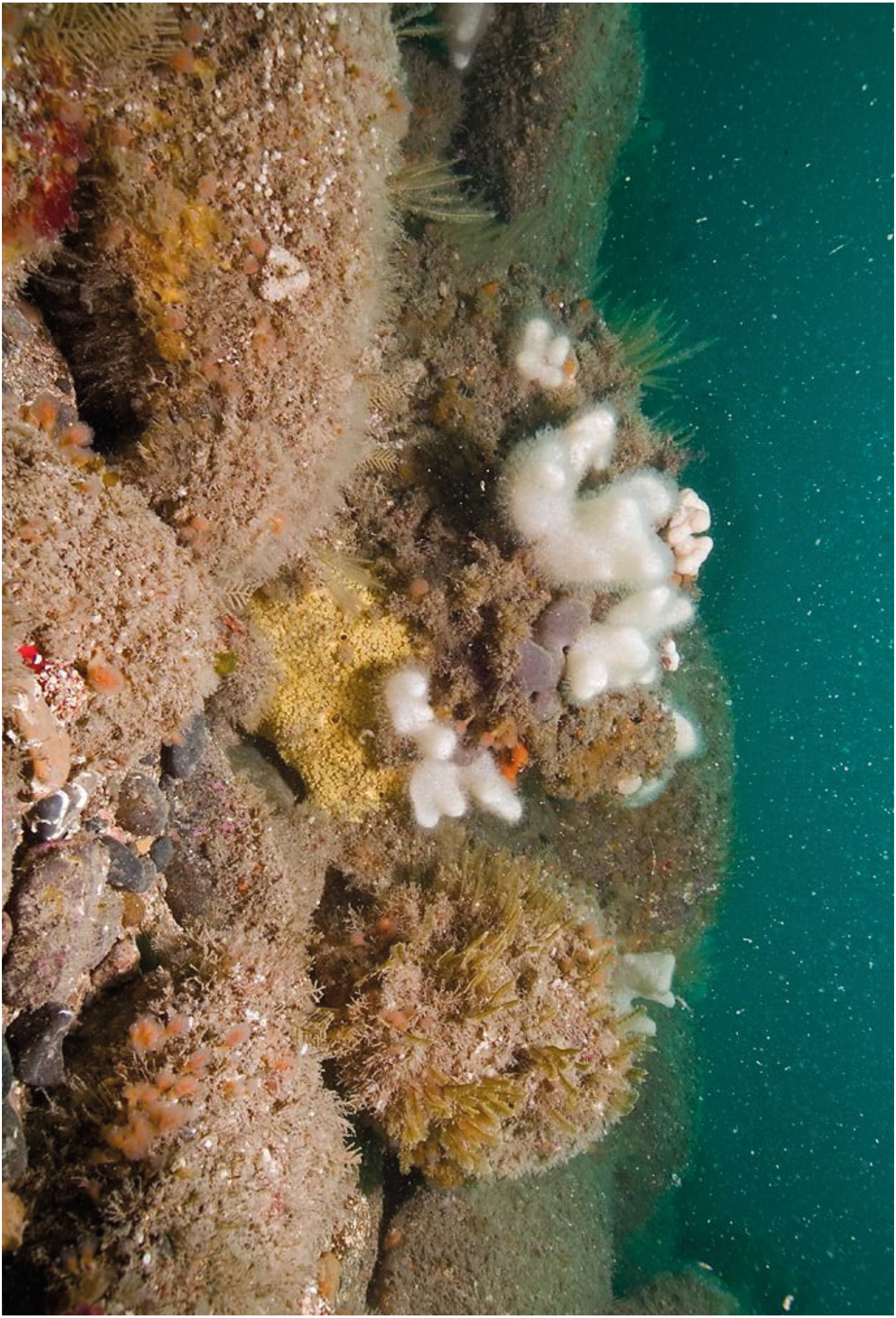
5. Support learners to draw or describe what they find in the corresponding boxes.

6. Regroup to share discoveries, promoting descriptive language and discussion.

ADDITIONAL TASK Optional

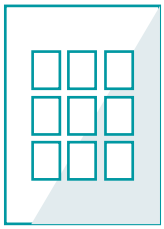
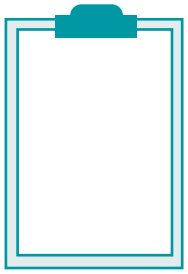
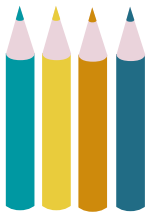
Encourage learners to create their own 'Scavenger Hunt' cards, with unique sensory prompts for their classmates to complete.

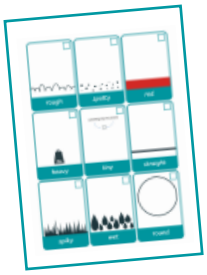
Safety
Supervise learners closely to ensure safe exploration



Sensory Nature Scavenger Hunt

What you will need

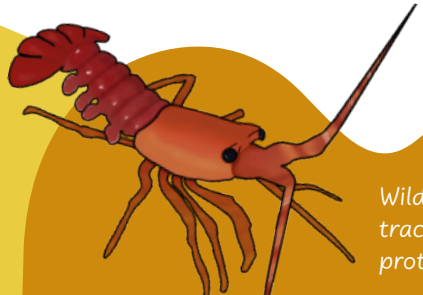



Use your senses to find natural items that match the descriptions.

Draw or write what you find!

ADDITIONAL **TASK** Optional

Create your own 'Scavenger Hunt' cards



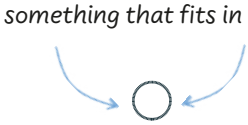
Wildlife recordings help scientists track species, populations and protect habitats.

rough

spotty

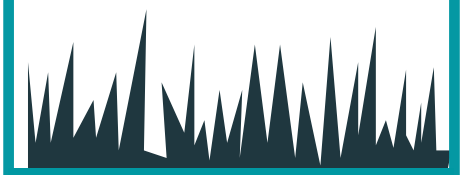
red

heavy



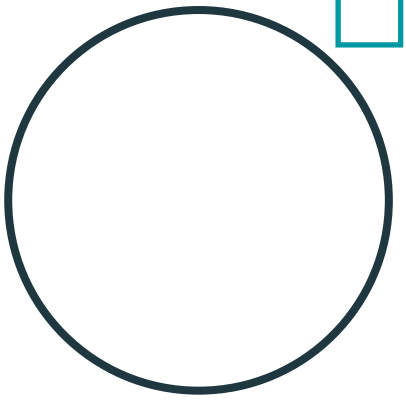
tiny

straight



spiky

wet



round

60 mins

Wildlife Surveys

Equipment required

- Print out of the 'Wildlife Survey Equipment' worksheet, one per group
- Print out of the 'Invertebrate Traps' worksheet, one per group (2 pages)
- Print out of the 'Invertebrate Investigation' worksheet, one per group
- Observational tools, e.g. aquatic dipping net, binoculars, sweep net, trail camera, magnifying loupe
- Pencils, clipboards
- Basic materials for traps (cardboard, string, flour, plastic cups, paper, trays, sand, soil, sugar etc)
- Magnifying glasses
- Nets
- Internet enabled devices and internet access (if using Seek/iNaturalist)

To complete the activity

1. Ask learners to suggest examples of equipment that could be used to find and record wildlife.

2. If available, show a variety of wildlife recording tools to the class to spark curiosity and interest.

3. Share the 'Wildlife Survey Equipment' worksheet, one per group. Ask learners to match each piece of equipment with the type of wildlife it helps to spot/find.

4. Discuss answers and explain how each tool works, using real equipment if available.

5. Challenge the learners to consider other ways of surveying wildlife (e.g. insect traps, footprint traps, listening devices). Share ideas with the whole class.

6. Provide each group with the 'Invertebrate Investigation' worksheet, which will support them to:
   - Choose **how** they will survey invertebrates.
   - Create a simple **investigation plan:** What do we need? Where will we look? What will we record?

7. Support learners to carry out their plans, creating their own traps to actively search for their chosen invertebrate.

8. Learners may wish to use an app such as Seek/iNaturalist to record their findings.

9. Provide an opportunity for groups to present and reflect on their investigation results.

ANSWERS:

1. Seal - BINOCULARS
2. Bat - BAT DETECTOR
3. Moth - MOTH TRAP
4. Gannet - TELESCOPE
5. Wheatear - CAMERA
6. Butterfly - SWEEP NET
7. Shrimp - AQUATIC DIPPING NET
8. Dolphin - DRONE
9. Otter - TRAIL CAMERA
10. Limpet - MAGNIFYING LOUPE

Wildlife Survey Equipment

To complete the activity

Match the animal to what you might use to find it.

Equipment required (per group)


Seals


Sweep Net


Binoculars


Butterfly


Bat


Telescope


Camera


Shrimp


Magnifying Loupe


Aquatic Dipping Net


Moth


Dolphin


Gannet


Drone


Moth Trap

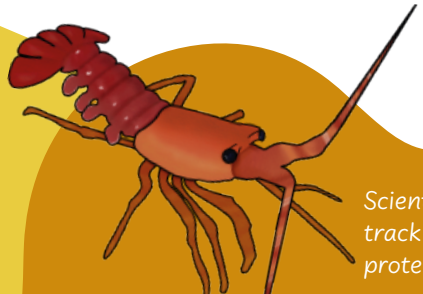

Otter


Wheatear


Bat Detector


Trail Camera


Limpet



Scientists use satellite and GPS tags to track animals, learn where they go, and help protect them.

Images by Steven Stansfield and Ed Betteridge

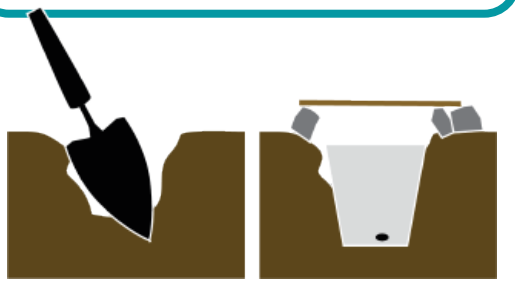
Invertebrate Traps

You don't always need a trap to spot invertebrates.
Simply sitting quietly and observing carefully can reveal a variety of fascinating creatures. However, if you'd like to investigate further, here are some simple traps that can help you ...

1. Pitfall Trap

You will need

A trowel
A plastic cup or jar
Stones
A piece of wood or an old leaf



Instructions

1. Dig a small hole in the ground and place the cup inside. Make sure the top of the cup is level with the soil.

2. Place a few small stones around the edges of the hole and lay the piece of wood or leaf over the top, resting it on the stones. Leave the trap for a few hours, then check to see what has been caught.

3. Once finished, release any creatures back into their habitat, clearing trap and filling the hole to leave the area as you found it.

2. Sugared Leaf Trap

You will need

A paintbrush
Sugar or honey
Warm water
A small bowl
A large leaf or piece of bark

Instructions

1. Mix a small amount of warm water with sugar or honey in a bowl to create a sticky solution.

2. Allow the mixture to cool slightly, then use a paint brush to spread it on to a large leaf or piece of bark.

3. Place the sugared leaf in an area where invertebrates are likely to visit, such as near bushes, trees, or flowers.

4. Leave the trap for a while and observe which invertebrates are attracted to the sweet surface.

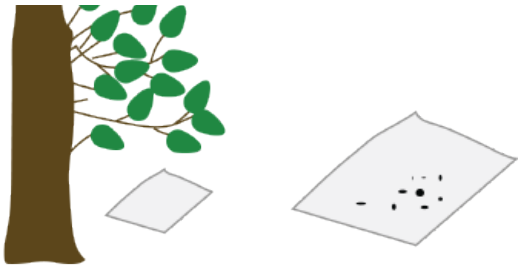
5. Once finished, remove the leaf/bark to avoid disturbing the natural environment.

Invertebrate Traps

3. Beating Tray Trap

You will need

A white sheet
or large piece of white paper
A stick or small branch



Instructions

1. Find a tree or bush with plenty of leaves and branches.

2. Hold the white sheet or paper underneath a branch.

3. Gently tap or shake the branch using a stick to dislodge any invertebrates.

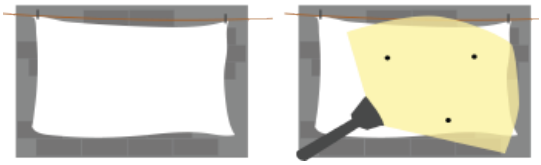
4. Watch as small invertebrates fall onto the sheet.

5. Carefully observe and identify the creatures before letting them go back into their habitat.

4. Light Trap

You will need

A bright torch or lamp
A white sheet
or large piece of white paper
String or pegs
(optional, for securing the sheet)



Instructions

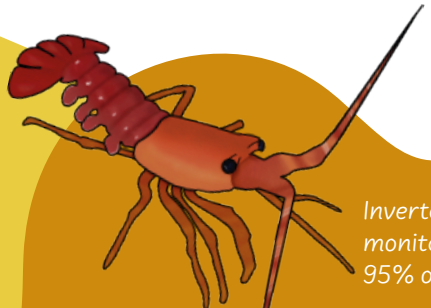
1. Find a quiet outdoor space away from other bright lights.

2. Hang or spread out a white sheet against a wall, fence, or between trees. You can secure it with string or pegs if needed.

3. Return after dark and place a torch or lamp in front of the sheet so it shines brightly onto the surface.

4. Wait as nocturnal invertebrates are attracted to the light and land on the sheet.

5. Observe the different species that appear, then let them fly away undisturbed.



Invertebrate recordings help scientists monitor biodiversity as they make up over 95% of animal species.

Invertebrate Investigation

Plan your own Invertebrates Investigation below:

1. Which invertebrates would you like to spot?

2. Where will you look?
Tick one or more.

○ Trees ○ Bushes ○ Grass ○ Rocks ○ Sand ○ Water ○ Other

3. When do you think is the best time to look?
Tick the best time.

○ Morning ○ Afternoon ○ Evening ○ Night

4. How will you spot this animal?
Draw or describe your method.

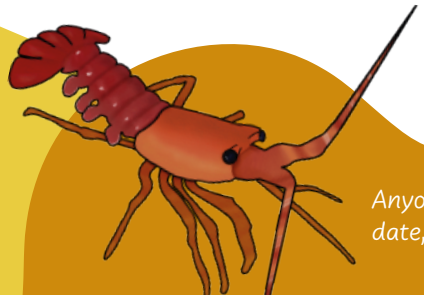
5. List the tools or materials you will need for your investigation.

6. Record Your Observations.
What did you see?
Describe or draw your findings.

7. Did you find the animal you were looking for?
If yes, describe what it was doing. If no, what do you think happened?

DISCUSS

What did you enjoy most about your investigation? What would you do differently next time?



Anyone can record wildlife - just note the date, location, species and habitat.

1–2 hours

12

Coastal Wildlife Sound Map

Equipment required

- Print out of 'Sound Quest' worksheet, one per pair
- Outdoor space for observation
- Sound recording devices, one per pair (optional)
- Internet enabled device and internet access

To complete the activity

1. Take the learners outdoors. Ask them to close their eyes and listen carefully for 1–2 minutes to the different natural and human-made sounds around them.

2. Gather as a group and share the different sounds heard, noting any common patterns, unique noises, or unexpected sounds.

3. Discuss how different environments influence the variety and intensity of sounds. Why are certain sounds present? How do they contribute to the ecosystem?

4. Play the 'Coastal Wildlife Sounds' video – www.tiramor.cymru/wildliferecording (Resource 1). Ask learners to guess.

5. Share the 'Sound Quest' worksheet with learners. Explain that the sounds they heard were of: chough, dolphin, Manx shearwater and seal. Play the sound clip again. Support the learners to arrange the cards in chronological order, as heard in the clip.

6. Reveal the correct answer and discuss with learners how each animal uses sounds (e.g. communication, navigation, hunting). Reinforce the importance of identifying species correctly when recording.

7. Challenge learners to place the sounds in the corresponding habitat on the 'Sound Quest' worksheet.

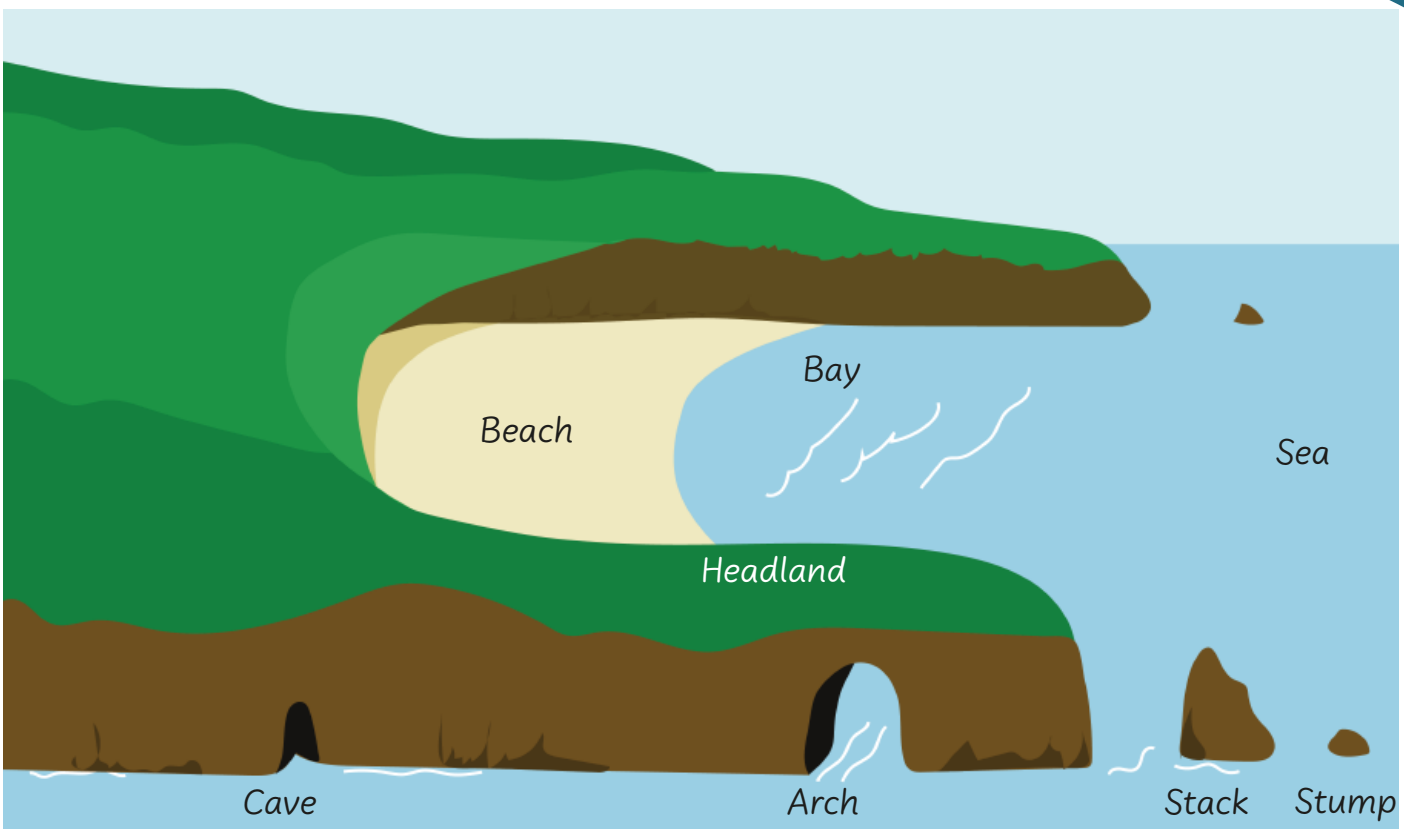
8. After the activity, discuss with learners:
   - What other sounds would be present? Why might that be?
   - How might the sounds change at different times of the day or during different seasons?
   - How do different coastal animals use sound for survival?

9. Provide an opportunity for learners to explore a local area, record sounds and photos, and create their own sound map.

ANSWERS:

1. Manx shearwater
2. Seal
3. Chough
4. Dolphin

Sound Quest



Listen to the clip: www.tiramor.cymru/wildliferecording (Resource 1) .

Can you identify the marine mammals and birds?
Use the cards below, and arrange in chronological order.


Chough


Dolphin


Manx shearwater


Seal

Place the sounds in the corresponding habitat on the image above.

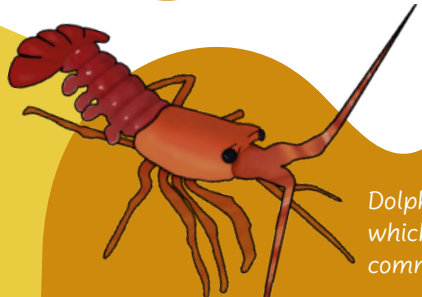
DISCUSS

Why do you think the sounds belong in those specific habitats? Explain your choices.

ADDITIONAL TASK Optional

Explore a local area, record sounds and photos, and create your own sound map.

You may wish to use field guides (e.g. Collins) or online guides (e.g. Seek by iNaturalist or Merlin) to identify different species.



Dolphins use clicks and whistles which researchers record to study communication and behaviour.

1–2 hours

12

Identifying Wildlife

Equipment required (per pair)

- Print out of the 'Guess the Marine Mammal' worksheet, one per pair
- Print out of the 'Dolphin Detectives' worksheet, one per pair
- Print out of the 'Risso's Dolphins Challenge' worksheet, one per pair
- Chalk
- Measuring tape
- Pencils
- Research books and internet enabled devices and internet access

To complete the activity

1. Share the 'Bardsey Marine Mammal Project' video – www.tiramor.cymru/wildliferecording (Resource 2). Why do you think projects like the Bardsey Marine Mammal Project are important? How do scientists use photos and technology, like drones, to study marine mammals?

2. Discuss with learners:
   - Why is it important to correctly identify a species before recording it?
   - What could happen if species are misidentified in a wildlife record?

3. Share a copy of 'Guess the Marine Mammal'. Challenge learners to research online and name the different species of dolphins that have been observed along the Welsh coast. What are the differences between species?

4. Share the 'Bardsey Dolphins' video – www.tiramor.cymru/wildliferecording (Resource 3). Can learners identify individual Risso's Dolphins from their markings? What do learners notice about the size, shape, colour, behaviour and markings? How can these be used to identify individuals?

5. Share the 'Dolphin Detectives' worksheet. Challenge learners to group the 9 Risso's dolphin photos into 3 images of 3 individuals. Guide learners to observe, compare, and group the photos based on markings.
   - What do you notice about the shape of the dorsal fin?
   - Are there any distinctive scars on the dolphin's body?

6. Share the 'Risso's Dolphin Challenge' worksheet. Challenge learners in pairs to identify scientific name, average length and anatomy of a Risso's dolphin. Support learners to access books or online resources.

7. Take the class outside, and support learners to work together to draw a pod of Risso's dolphins to scale, based on real measurements. Once the outline is complete, encourage learners to label the major anatomical features, such as flippers, fluke and dorsal fins.

8. After completing the activities, support learners to reflect on what they have learnt.

ANSWERS: Guess the Marine Mammal

1. Bottlenose dolphin
2. Common dolphin
3. Risso's dolphin
4. Harbour porpoise

ANSWERS: Dolphin Detectives

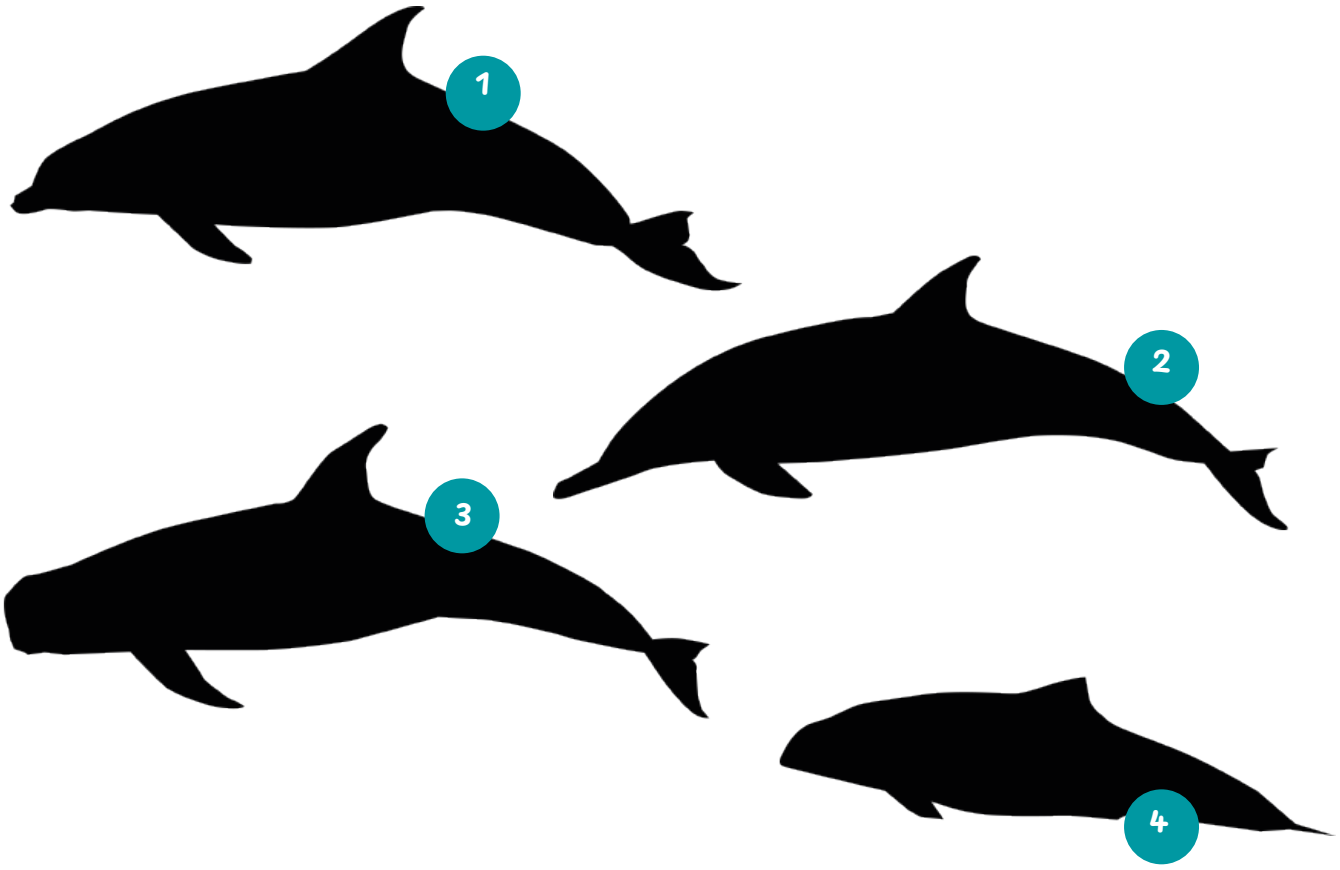
1. NIKE	4. DOT	7. McQUEEN
2. McQUEEN	5. NIKE	8. DOT
3. DOT	6. McQUEEN	9. NIKE

Guess the Marine Mammal

Which species can you see? Try to identify these different marine mammals found around the coast of Wales.

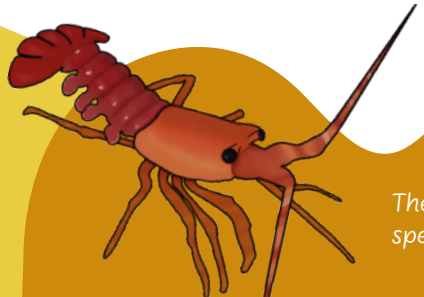
Look at the silhouettes provided and try to identify the different marine mammals. Pay attention to their shape, size, and features!

Think about the shape of their dorsal fin, beak or body size.



ADDITIONAL **TASK** Optional

What clues helped you identify each species?
How are porpoises different from dolphins? Research and explain two key differences.

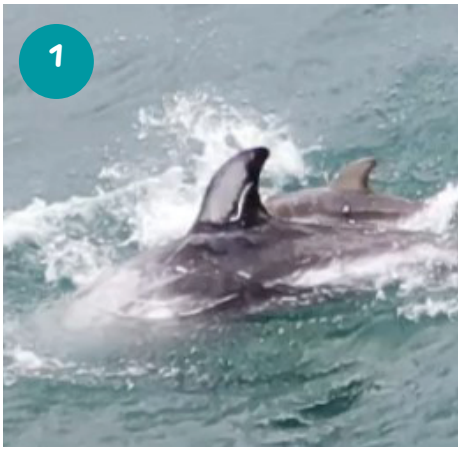


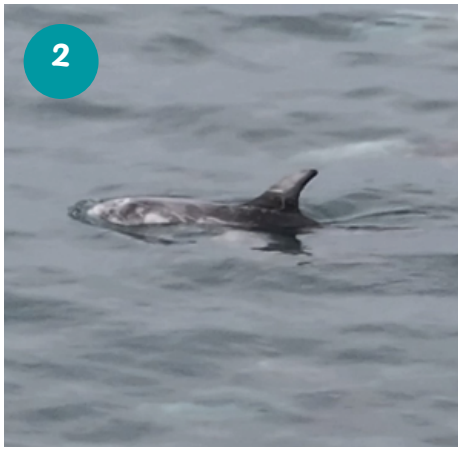
There are over 40 different species of dolphins worldwide!

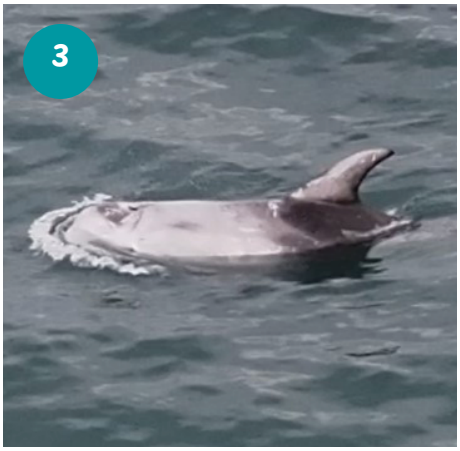
Dolphin Detectives

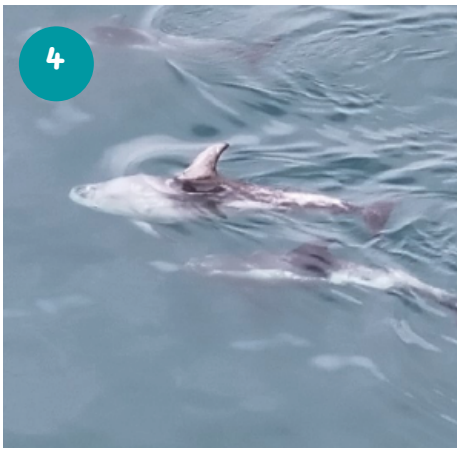
Here are 9 photos of Risso's dolphins from Enlli.

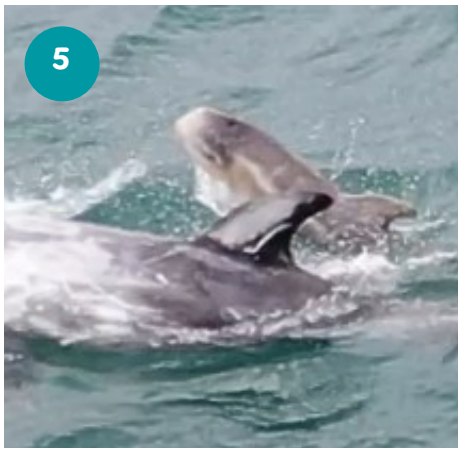
There are 3 different dolphins, and each dolphin appears in 3 photos. Your job is to find all the photos of each dolphin by looking at their unique markings. Dolphins have different scratches, scars, and patterns on their bodies, just like fingerprints for humans!

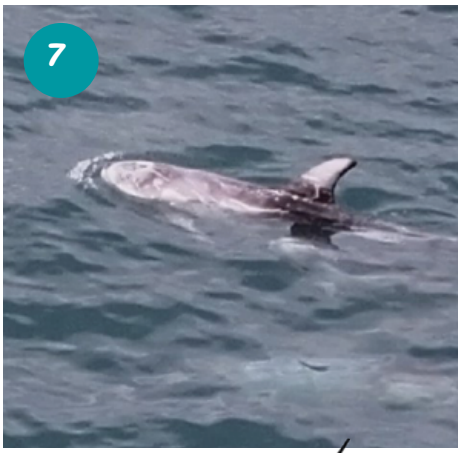


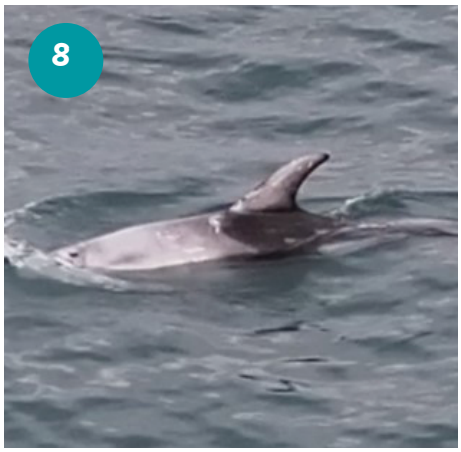












Some dolphins can reach speeds of up to 30 miles per hour.

Risso's Dolphins Challenge

You will need

- Chalk

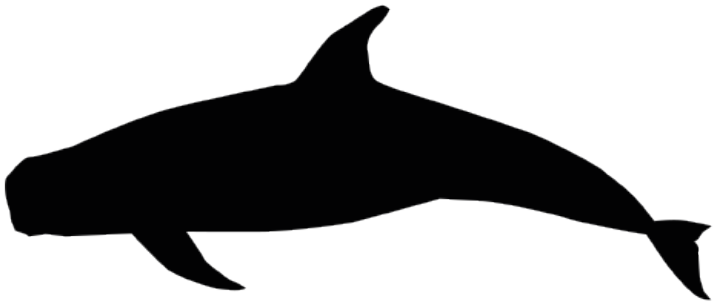
Work in pairs to research and identify the following:

Scientific Name: _____

Average Length: _____

Other Facts: _____

Label the key anatomical features of the Risso's Dolphin:



As a class, go outside to the yard and in pairs, create life size drawings of a Risso's dolphin to scale, using chalk.
Work together as a class to create a pod of unique dolphins.

Follow these steps:

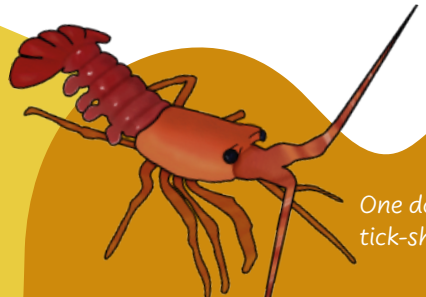
STEP 1
Measure and mark the average length of a Risso's dolphin on the ground and draw the outline.

STEP 2
Add key body parts such as fluke, fins, blowhole, eyes and mouth.

STEP 3
Include unique markings, like scars or spots, just like those scientists use to identify individual dolphins.

DISCUSS

Are Risso's dolphins endangered, vulnerable, or thriving? What conservation efforts are in place to protect the species?



One dolphin, Nike, was named for the tick-shaped scar on its dorsal fin.

1–2 hours

12

Manx Shearwater

Equipment required

- Print out of the 'Manx Shearwater Population Trend Graph' (S_WR_2) 1 per group or displayed digitally
- 'Manx Shearwater' information sheet, 1 per group or displayed digitally
- Internet enabled devices and internet access for research

To complete the activity

1. Ask learners in the class to share names of birds they have seen in the school grounds or local area. Create a class bird list from their responses. Ask each group to choose a different bird from the list and discuss its appearance, habitat and diet.

2. Encourage learners to consider why accurate identification matters, how scientists record birds in their conservation work and what clues can help distinguish species.

3. Explain to the learners that they will examine diverse information sources about the Manx shearwater - from text-based sheets and graphs to comics and quizzes - to understand how different mediums present data and communicate scientific findings.

4. Share the lifecycle comic with learners – www.tiramor.cymru/wildliferecording (Resource 4) and discuss:
   - How does the Manx shearwater differ from the birds in the school grounds?
   - Where does it live? How does it behave?
   - Why is it important to learn more about birds like the Manx shearwater?

5. Then, share the Bardsey Manx shearwater population trend graph (S_WR_2) and ask:
   - Has the population increased or decreased? What factors might explain this?
   - How does this compare to other bird populations?
   - How can data guide conservation strategies?

Encourage learners to use the British Trust for Ornithology (BTO) website to consider trends for other birds - www.tiramor.cymru/wildliferecording (Resource 5).

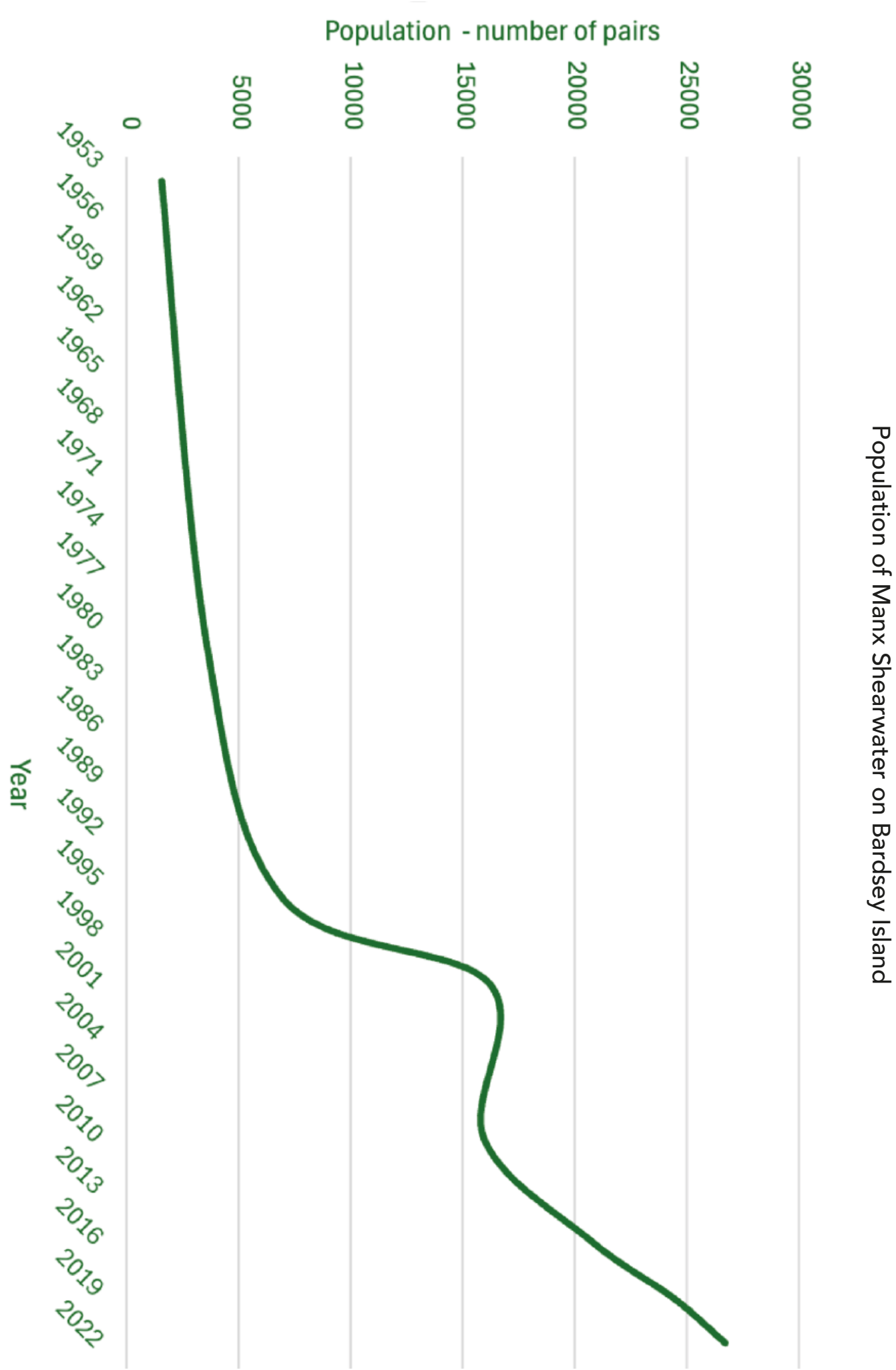
6. Provide an opportunity for learners to complete the 'Manx Shearwater Quiz' – www.tiramor.cymru/wildliferecording (Resource 6)

7. Share the 'Manx Shearwater' information sheet and ask learners to annotate, highlighting key details and discuss the structure.

8. Encourage a brief class discussion on preferred ways of sharing information and why preferences vary. Which medium— text, comic, graphs, quiz, or other— would learners choose and why? Discuss why different people might prefer varying methods to share information.

9. Support learners to choose a medium (e.g. PowerPoint, Sway, Word document, poster, comic, quiz, or graph) to present information about a bird from the class list. Encourage them to gather key facts and present their findings in a clear and engaging way.

10. Encourage learners to share their work with the class, explaining key facts about their bird and their medium choice. What did they learn? Facilitate a brief Q&A after each presentation so peers can offer constructive feedback and discuss different approaches.



Population of Manx Shearwater on Bardsey Island

Manx Shearwater
(Puffinus puffinus)

Quick facts
Scientific Name: Puffinus puffinus
Size: Around 30-38cm long
Wingspan: 76-89cm
Weight: Approx. 400-600g
Lifespan: Can live over 50 years! (Average is 30 years)

Appearance
Black upperparts and white underparts
Looks like a flying 'M' from below!
Thin, slightly hooked beak, for catching fish. Long, narrow wings for gliding over the sea.

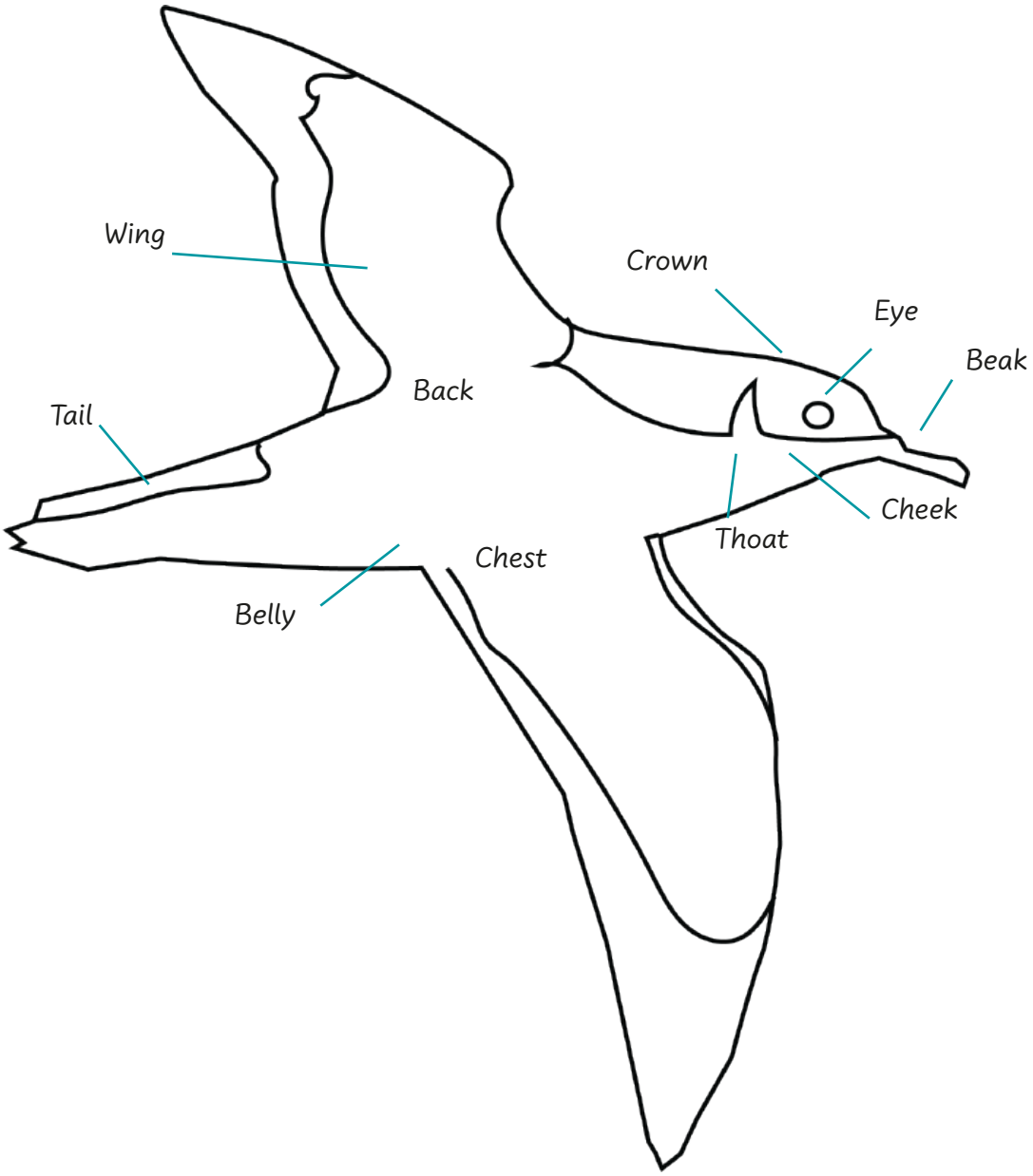
Habitat & migration
Spends most of its life at sea, only coming to land to breed. Nests on Welsh islands like Bardsey, Skomer and Skokholm.
Every year, they migrate over 10,000km to South America for the winter!

Diet
Eats small fish, squid, and crustaceans.
Catches food by diving underwater and grabbing prey with its beak - can dive up to 50 meters deep.
Can drink saltwater and filter out the salt!

Behaviour & adaptations
Flies low over the ocean, barely flapping its wings. Only comes to land at night to avoid predators. Nests in burrows or hidden crevices to stay safe. Uses its amazing sense of smell to find its nest at night.

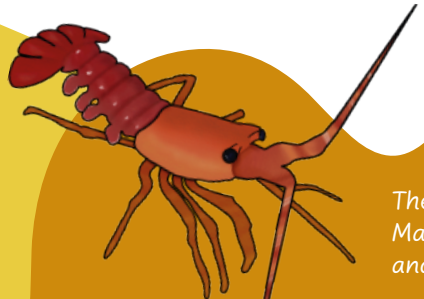
Conservation & threats
Main threats: rats and other predators eating eggs & chicks. Plastic pollution & climate change are affecting food sources. Conservation efforts on Welsh islands have helped protect nesting sites.

Manx Shearwater
(Puffinus puffinus)



Call & song

Very noisy at night in colonies! Sounds like a weird, eerie cackling laugh: Listen on the RSPB website – www.tiramor.cymru/wildliferecording (Resource 7).



There are only 5 major colonies of Manx shearwaters in the world and Bardsey is one of them.

1–2 hours

The Bird Observatory

Equipment required (per group)

- Outdoor space for observation
- Natural materials for the observatory/bird hides
- 'Role Cards – Bird Observatory Team' worksheet (2 pages), one per group
- Internet enabled devices and internet access for research

To complete the activity

1. Begin by asking learners "What do you think a bird observatory does?" to gauge their understanding.

2. Explain that there is a bird observatory on Bardsey Island. You may wish to use the 'Bardsey Bird Observatory Education Pack' - www.tiramor.cymru/wildliferecording (Resource 8) to find out more.

3. Divide learners into groups of 4–6 and share the 'Role Cards – Bird Observatory Team' worksheet. Explain that learners are now wildlife conservationists working for a nature organisation tasked with building a bird observatory.

"Your conservation team has been hired to set up a bird observatory. Your task is to correctly identify and record different bird species. Scientists depend on your accuracy to track bird populations – mistakes could mean the wrong data being used to protect species!"

4. Ask learners to take on a different role within their Conservation Team. Encourage them to act as experts in their field and communicate their findings effectively. Encourage learners to describe bird features rather than guess if unsure. Remind them that correct recording helps scientists protect birds and their habitats! Learners may wish to use field guides (e.g. Collins Bird Guide), or online Merlin Bird Guide to identify species.

5. Support learners to build the bird observatory/hide, observe and collect data as required.

6. Ask learners to reflect on their mission and discuss findings.
   - What challenges did they face?
   - How could they improve the accuracy of their data?
   - Invite each group to share one key challenge and one proposed improvement with the class.

Encourage learners to think about their role as conservationists and the importance of their contributions.

Additional TASK Optional

Encourage learners to take part in the 'Big Garden Birwatch' citizen science initiative or input their findings onto the BTO's bird track recording system.

www.tiramor.cymru/wildliferecording (Resource 9).
www.tiramor.cymru/wildliferecording (Resource 10).

Role Cards
Bird Observatory Team

What you will need

- Natural materials for the observatory/bird hides
- Copies of 'Role Cards – Bird Observatory Team' worksheet, one per group
- Internet enabled devices and internet access for research

Welcome to the Bird Observatory Team!

Your conservation team has been chosen for an important mission – setting up a bird observatory to study and protect birds!

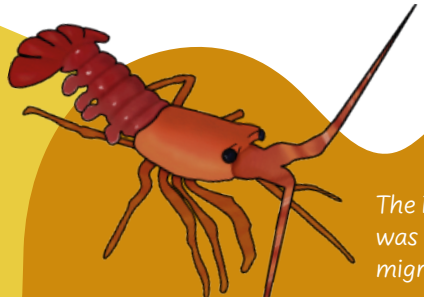
Your task is to identify and record different bird species and their behaviours. Scientists depend on your accurate observations to track bird populations. Mistakes could lead to the wrong data being used, putting some birds at risk.

Each of you will take on a special role in your team, based on your skills and interests. Would you enjoy observing birds, designing hides, or tracking data?

Choose a role that suits you!
Every role plays a vital part in making your observatory a success.

Work together, share your findings clearly, and if you're unsure about a bird, describe its features instead of guessing—good records help protect birds and their habitats!

Stay curious, work as a team, and enjoy discovering the amazing world of birds.



The Bardsey Bird Observatory was founded in 1953 to record bird migration.

Role Cards
Bird Observatory Team

Ornithologist

Your role

Study birds, observe size, flight, food and behaviour.

Help identify species.

Create a bird ID sheet to log bird species seen/heard, e.g.

Time	Bird Seen	Amount?	Behaviour	Location	Habitat Notes
10:15am	Robin	2	Pecking ground for worms	Near a tree	Lots of bushes nearby

Habitat Engineer

Your role

Design & build the observatory using natural materials.

Choose the best location for bird hides to observe discreetly.

Record features that might attract birds to the area.

Wildlife Tracker

Your role

Record all bird sightings. This may include bird species, behaviour, habitat, and time of sighting.

Keep a record of when and where you see each bird using tally charts for numbers.

Work with the Ornithologist.

Conservation Officer

Your role

Explain why birds need protection and suggest improvements to the birdwatching area.

Consider population trend data for birds sighted. www.tiramor.cymru/wildliferecording (Resource 11).

Media Specialist

Your role

Sketch or take notes on birds and their surroundings.

Help present findings using drawings, reports or videos.

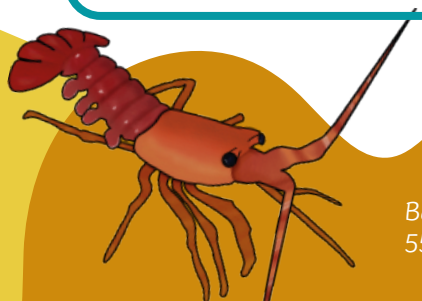
Ecologist

Your role

Investigate the habitat - record nearby food sources (e.g. insects, berries, water, etc).

Log any environmental factors that might affect bird presence (e.g. weather, trees or other animals).

Suggest ways to improve the birdwatching hide.



Bardsey was once home to a 55-year-old Manx shearwater.

For more information and extra resources please visit:
www.tiramor.cymru
or email:
info@penllynarsarnau.co.uk