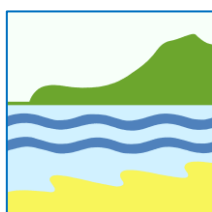


Seashore Education Pack

for primary schools



Ceredigion County Council
Coast and Countryside Section

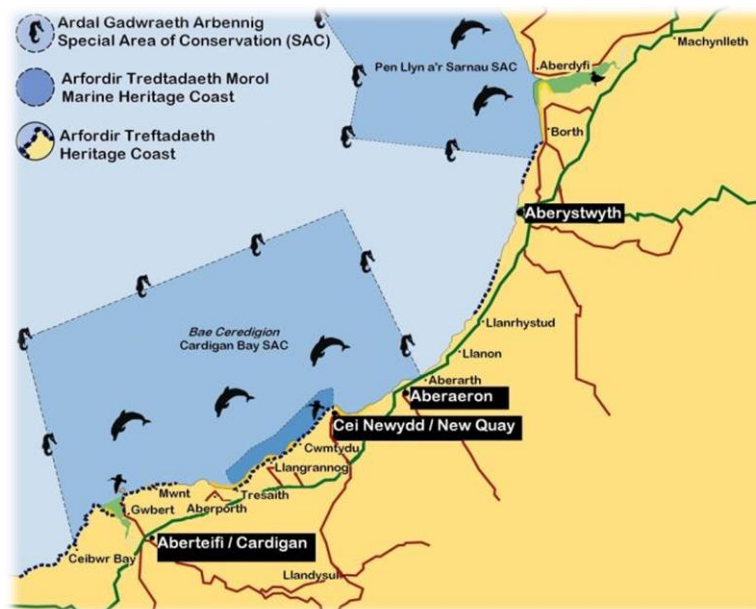
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About the pack

Field visits to the local sandy or rocky shore provide fantastic opportunities for cross-curricular topic work, offer the chance to do something different and inspiring and make available great opportunities for multi-sensory learning. A shore visit can also inspire the children with their learning by providing opportunities to participate in 'real science' projects where they can contribute their findings to national marine life data collection schemes and enhances their sense of place and pride in their local area.

Cardigan Bay is home to an amazingly rich variety of marine animals and plants, including one of Europe's largest populations of bottlenose dolphins. The Ceredigion Marine Heritage Coast was established in 1992 to help preserve the coastline and its wildlife, and in 2004 Cardigan Bay and Pen Llŷn a'r Sarnau Special Areas of Conservation (SAC) were formally designated under the EU Habitats Directive, forming part of a network of Europe's finest wildlife sites.



This pack has been funded by the relevant authorities of Cardigan Bay Special Area of Conservation, to share the activities provided by the Coast and Countryside Section's Education Ranger with a wider audience of schools within Ceredigion.

We hope that the ideas and activities offered by the pack will encourage educational trips to the coast, help you to get the most out of your visit, and enhance the children's understanding of why Cardigan Bay is such a special place.



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 = foundation phase  = key stage 2








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The Cardigan Bay Boat Place

In 2006 the Coast and Countryside Section of the County Council opened an exciting information centre on New Quay pier; the Cardigan Bay Boat Place.

Packed with interesting and innovative displays, schools can visit to discover more about the wildlife of Cardigan Bay. School groups can participate in a range of activities to raise their awareness of the special marine life that lives here; encouraging sustainable use of the marine environment and to help them to make the most of their experience at the coast and on the shore.



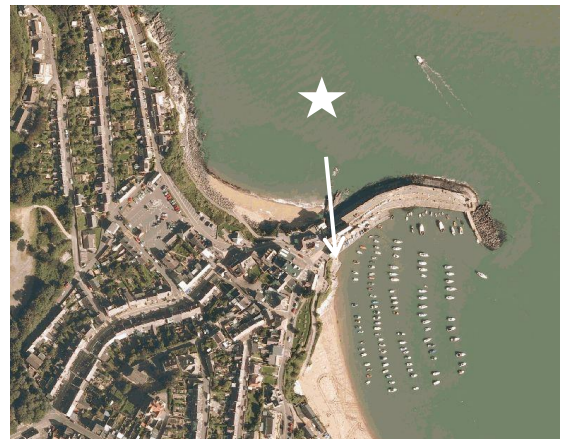
The Boat Place is located at the start of the harbour wall next to the yacht club in New Quay.

We are open at weekends between May and September and during the school holidays.

Our weekend and school holiday opening hours are 11am to 5pm.

We are happy to open on week days for school groups on request.

Please call 01545 561074 to arrange a visit.



Staying Safe

The following common sense precautions should be taken before visiting the beach:

- ❖ Get to know the shore that you will be working on with the children, carry out a site visit and risk assessment to identify any dangers.
- ❖ Check tide times and ensure that your visit coincides with low tide. It is better to run the session working towards low tide than to start at low tide and then have the tide coming in towards you. Tide times can be found on the Discover Ceredigion website: www.discoverceredigion.co.uk/english/where/coast/tidetables/pages/tidetables.aspx
- ❖ Check the weather forecast and know when to cancel. Be aware that wet weather can cause slippery conditions on a rocky shore.
- ❖ Ensure that the children have appropriate clothing and footwear.
- ❖ Be aware of the dangers of sun exposure. Apply plenty of high factor sun protection cream, sun hats, and limit exposure time, especially at mid-day; and ensure everyone in the group has plenty to drink.
- ❖ Avoid sitting directly under cliffs.
- ❖ Ensure that the children are aware of hazards; seaweeds can be very slippery and barnacles on the rocks are very sharp.
- ❖ Check the children's hands and make sure that all cuts are covered.
- ❖ Always wash hands thoroughly after contact with rockpools, animals, shore objects and sediment; and before eating and drinking.
- ❖ Walking the boundary area with the class at the start of the session provides a clearly defined area for the children to work in and can be used to point out things of interest on the way; to see how things have changed since the last visit, to set the theme for the day's activities or tell a story.



The Seashore Code

Any trip to the shore has the potential to impact on the wildlife found there. By following the Seashore Code you will minimise the effect on animals and plants and engender a responsible attitude from the children. The Seashore Code can be explained to the children alongside the safety talk and repeated and reinforced throughout the session.

- ❖ Fill trays with sea water first before you begin netting or searching.
- ❖ Hold creatures low and still.
- ❖ Always place animals in water as quickly as possible and then observe them.
- ❖ Some creatures such as limpets and anemones should not be removed from their rocky home; never kick or poke them or try and prise them off the rocks. If in doubt, don't touch.
- ❖ Tread carefully – to avoid trampling any animals or their homes.
- ❖ Always handle all shore life very carefully and with respect.
- ❖ Return shore animals to the place where you found them; that is their home and they may be guarding eggs.
- ❖ Do not leave any animal in a bucket for too long. Return it to where it was found before the water in the bucket becomes too warm and the oxygen level drops.
- ❖ Always carefully place rocks back the same way up that you found them.
- ❖ If you do want to take shells away, please make sure that they are empty first.
- ❖ Make sure that you have not left any litter behind on the shore – take it back with you.



Suggested kit

- ❖ White buckets, trays, or tubs such as large yoghurt pots
- ❖ Magnifying glasses
- ❖ Plastic spoons
- ❖ Identification keys
- ❖ Stethoscope - great for placing in rock pools to listen to the sound of limpets grazing
- ❖ Garden sieve and trowel (if investigating sandy shores)
- ❖ Nets (use carefully to avoid damaging fragile creatures)
- ❖ Camera
- ❖ Clipboards, paper or A6 card, pencils
- ❖ Spare warm clothing for the children
- ❖ First aid kit
- ❖ Mobile phone
- ❖ Sun protection lotion
- ❖ Water



Whole class activities / Warm up games

These activities focus on the children's love of play and movement. They are useful when first arriving on the shore as they get the group together and involved and provide a good way to get all the children engaged, enthusiastic, energised and alert ready for later more focused activities.

A clear, flat, open space is needed where the children can run around safely.

'In comes the tide . . .'

This activity is a useful way of assessing what the children already know about the seashore and marine life. It also gets the class settled and listening carefully.

How to play

Everyone sits in a large circle.

Explain that the sea is a dynamic environment that is never still; when waves wash up on the shore, pebbles and small creatures will be moved around and settle in different places.

It is useful to begin with something easy that you know applies to most of the group -

"In comes the tide and washes away everyone wearing a red sweatshirt."

After hearing this, all the children who this statement applies to need to get up and move clockwise around the circle, before sitting back down in a different place.

Other useful statements could be – *"In comes the tide, and washes away everyone who . . ."*

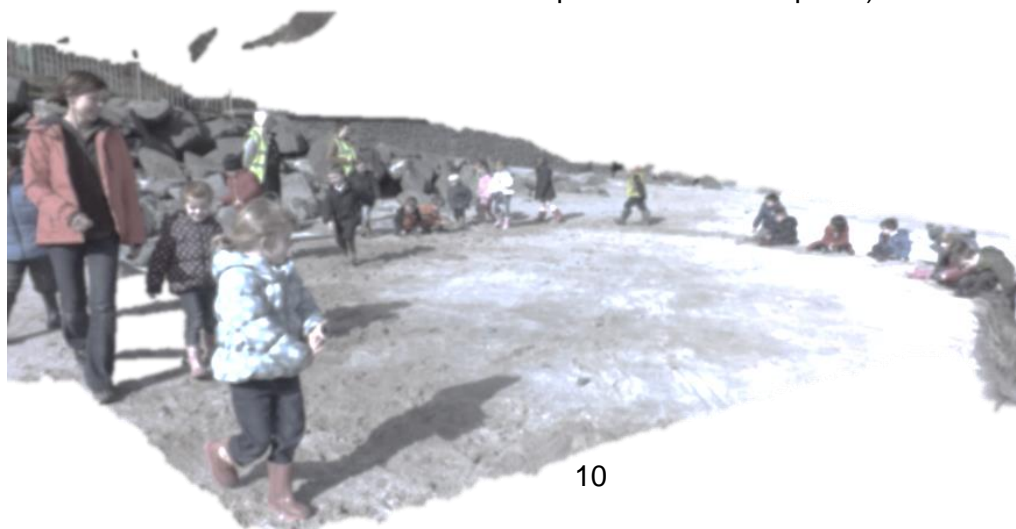
"has been to this beach before."

"likes touching slimy things."

"likes exploring outside and on the seashore."

"has seen a dolphin or a seal in the wild." (Both bottlenose dolphins and Atlantic grey seals can be seen in Cardigan Bay)

"has eaten seaweed." (Explain that everyone probably has; as seaweed is found in some foods like ice-cream and other edible products like toothpaste).



‘Creature features’

This warm up activity is a good way of introducing creature’s names, and information about the way they might live or move.

How to play

Discuss the following animals with the children, what they look like and how they might move. Then explain to the children that when they hear the following instructions they will -

Starfish – make a star shape

Jellyfish – wobble like a jelly

Crab – walk sideways and make pincer actions with their hands

Limpet – crouch down (like a limpet clamped to the rock)

Sandhopper – jump up and down





‘Bird’s breakfast’ – A simple and fun introduction to camouflage

This fun, whole class activity, encourages the children to look closely and works well at the start of a session. It helps the children to understand that many of the animals they will see on the sand and on the rocky shore are very small, and that they have adapted to be the same colour as the place where they live.

You will need

About 100 pieces of wool or cut up pipe cleaners (each approx. 5 cm long) – these need to be in a range of colours so that some are muted browns and beiges and are camouflaged on the sandy shore and are more difficult to see; while others should be very bright colours so that they will be spotted easily by the children.

A large (A2) display card showing a picture of baby birds.

How to play

Scatter the coloured wool in an area on the beach.

Explain that they are helping the parent bird to find food for her babies who are very hungry. This game works really well if at this point a soft toy singing bird can be introduced and shown and passed around for the children to see, touch and listen to (the RSPB sells a selection for about £7.00 each).

Point out the boundaries for the search area and then take them over to look for a worm each to bring back and place on the display card. The worms need to be placed on the card in the order that they are found.

Encourage the children to keep collecting the worms until they have all been found.



Show the children the collected worms and discuss whether it was hard or easy looking for the worms and which colour worms were easier to find and why. (The children should have found all the brightly coloured worms first so they will all be together on the display card).

Discuss how this happens in the natural world; that many animals are very small and that they are the same colour as the place where they live to avoid being seen easily and eaten by other animals.

To finish, explain that when they are looking for animals on the sand or in the rockpools that they will need to look very closely and carefully because many of the animals will be camouflaged.



‘Limpet game’

As well as being a great warm-up, this game also teaches children about the adaptations and behaviour of limpets and provides the opportunity to reinforce important messages in the seashore code. This game demonstrates how important the limpet ‘home spot’ is and that they should never be pulled or kicked off the rocks.

How to play

Explain to the children that a limpet is a sea snail and that they behave in a special way:

- ❖ After feeding at high tide limpets always return to the exact same spot on the rocks.
- ❖ Then they clamp their shell down tightly with their muscular foot so that they don’t dry out and wait for the tide to come back in again.
- ❖ This place is called the ‘home scar’ and the limpets grind their shell into the rock to make it a perfect, tight fit.
- ❖ When the tide comes in the limpets move about, grazing on young seaweeds.
- ❖ They can live for 15-20 years if they avoid being eaten by starfish, whelks or wading birds.

Mark an area in the sand where all the ‘home scars’ will be, this is where everyone will start the game. Explain the instructions below, when you shout out the following commands the children will need to:

‘Tide in’ – leave the home scar area and move around looking for food

‘Feed’ – stand still and make a rasping noise that you imagine a limpet would make when scraping seaweed off the rocks with its tongue.

‘Oystercatcher’ – crouch down on the ground to mimic a limpet clamping down on the rocks to try and protect themselves from being eaten.

‘Starfish’ – jump up and down – this mimics the limpet’s behaviour of stamping its shell down hard on the starfishes’ feet to try and defend themselves from being eaten.

‘Tide out’ – return to the home scar area and clamp down to prevent drying out.

After a couple of practice goes the game can have a competitive element by adding that the last child to complete a particular action, or if a child does the wrong action, they are out and then help to judge the rest of the game.



‘Creeping crabs’

This game can be used to discuss camouflage and predator - prey relationships with the children. It is based on ‘British Bulldog’.

How to play

Mark a line along the sand and choose one child to be ‘on’ and be the herring gull, they stand on this line.

Next, make another line about ten metres away for the rest of the children to stand behind.

Then explain that they are shore crabs and that when the tide is out, herring gulls and other birds will try and eat them.

Explain that one way that a crab will try and protect itself from being predated is by ‘freezing’ if it thinks it is in danger; relying on its camouflage to prevent it from being seen and eaten.

Next, the child who is the gull faces away from the crabs and the crabs walk towards the gull as quietly as possible. The aim is for the crabs to cross the line without being spotted by the gull.

At intervals the gull will turn around then all the crabs must freeze. Any crabs that are seen by the gull are ‘eaten’ and have to go back to the start line.

The crab that successfully reaches the finish line first becomes the gull in the next game.



‘Echo-location game’

This game helps the children to understand how dolphins and other cetaceans use echo-location to communicate, navigate and hunt, and how other underwater noise can disturb them and prevent them from hunting or communicating.

The aim is to demonstrate how dolphins hunt by relying on echo-location; as visibility in the sea is often very poor due to sediment and wave action.

You will need

Two blindfolds

How to play

8 children volunteer to be mackerel, 2 children are dolphins.

The rest of the class make a large circle and are divided into two groups - the reef and the sandbank.

Next the dolphins are blind-folded. They stand in the centre of the circle with the mackerel.

The ‘dolphins’ need to repeatedly call out “*dolphin, dolphin*” and the ‘mackerel’ call out “*mackerel, mackerel*”.

Then the dolphins use these calls to try and locate and tag the mackerel.

At the same time, the rest of the class who form the reef and the sandbank need to call out “*rocky reef*” and “*sandbank*” to prevent the dolphins from bumping into them. This mimics the way that dolphins use echo-location to alert them to geological features on the seabed when they are hunting for prey.

The children then swap roles to give the children on the outside of the circle the chance to be a dolphin or a mackerel.



‘Food chain game’

The marine food chain game encourages the children to think about the way that energy is transferred up the food chain and that all the creatures that live in Cardigan Bay are interdependent; that every animal found in the ocean or on the shore is part of a food chain.

This simple food chain could be extended back in the class room. The children could create several different food chains and link them together to make a giant marine food web.

You will need

4 sets of different coloured bands (the ones used for team games in PE are ideal).

A yellow bag (to represent the sun) containing ‘energy’ units, for example dried peas.

How to play

Question the children about how every food chain starts, until they respond that all food chains start with the sun, and then discuss a food chain with them; it does not have to be a marine food chain.

For example:

The sun – green plant- caterpillar – blackbird – sparrow hawk

Explain that in the ocean the sun’s energy is used by tiny planktonic plants to grow. Ask the children to suggest something that might eat phytoplankton, such as sand eels, then something that might eat the sand eels – mackerel; and finally the animal at the top of the food chain – the bottlenose dolphin.

Then explain that they are going to play a game to show how energy passes up a marine food chain.

Next, split the class into groups, each group wears a different coloured band, for example -

Green – phytoplankton (teacher and adult helpers)

Yellow – sand eels (approx. 14 children)

Red – mackerel (approx. 8 children)

Blue – dolphins (2-4 children)

To begin, the phytoplankton hold some of the dried peas in their hands, this represents their energy from the sun.

The phytoplankton then spread out around the game area.

Next, the sand eels are sent out to feed on the phytoplankton.

They collect energy as they feed, one unit (dried pea) at a time, and they must visit a different phytoplankton bloom each time they collect a unit.

After a few minutes the mackerel are sent out to hunt and catch the sand eels.

‘Food chain game’ continued...

When the mackerel carefully tag a sand eel, the sand eel must give the mackerel all of their energy. They can then continue to play, but they have to start collecting energy again.

A few minutes later, the dolphins join in. They catch the mackerel, and again the energy is passed up the food chain; this time from mackerel to dolphin.

So each time they are caught, they hand over their energy supply to the predator that caught them.

After a few minutes stop the game to see who has energy to live and who has failed to survive.

Question the children about what we, and other animals, need energy for – to move, to breathe, to look for food and shelter, to grow, to reproduce.

The game can be continued, but with different scenarios included to extend the children’s learning. For example –

- ❖ A large trawler catches most of the mackerel

Now play the game again with 5 or 6 of the mackerel removed, question the children about what the dolphins might need to eat now, and how this will affect the sand eels, the mackerel and the dolphins.



‘Gravel bed gamble’

This activity is a kind of musical chairs but with a message about marine habitat loss.

Explain to the children that the sea lamprey is a rare, pre-historic kind of fish with a sucker mouth that it uses to feed on the blood of other fish.

It lives in Cardigan Bay, but uses gravel beds in rivers, such as the River Teifi to spawn.

You will need

PE hoops

How to play

Place a hoop on the floor for every two players. Each hoop represents a gravel bed.

The children then walk or run in a clockwise direction around the outside of the gravel bed area until you shout “*gravel bed*”.

Then the players need to find a gravel bed to breed, but only two fish can use each gravel bed.

A practice session is often helpful, after this remove a gravel bed after each round.

Any fish without a gravel bed have failed to breed and do not survive to play the next round.

As each gravel bed is removed, a different scenario for the habitat loss can be introduced:

- ❖ the river is dredged
- ❖ pollution covers the gravel bed in oil or chemicals
- ❖ a large pile of rubbish is tipped into the river smothering the breeding area
- ❖ a dam or weir is built, blocking their migration route

To make the game more difficult, the group can be allocated as males or females, so one of each gender is needed for successful spawning.



A sensory journey along the shore 'Pirate hats and mermaid crowns'

Create a record of your journey along the sea shore with a marine themed hat or crown!

You will need

A card band for each child that will fit around their head with a strip of double sided sticky tape attached.

The sticky tape works best if it forms a narrow band in the centre of the card so that it is much smaller than the width of the cardboard. This provides a thin band around the centre for the children to use to stick on their special finds.

This way the sticky tape is less likely to become stuck to the children's hair.



Walk along the strandline with the children and encourage them to look closely at the natural objects washed in by the tide and to use these to decorate their Pirate or Mermaid hats.

(Please make sure that the children do not use any shells with live animals in them).



A sensory journey along the shore 'All the colours of the rainbow'

You will need

A colourful bag

A selection of large colourful beads or similar sized objects (or make pebble sized shapes with modelling clay and paint them – alternatively cut up a selection of Dulux colour mix paint cards)



Ask the children to look around them on the shore, and then to describe the colours that they can see.

Encourage the children to really look closely at the colours around them by giving each child, pair or group, two or three of the different colour tokens and ask them to find natural objects that are the same colours.

Challenge the children to see if as a class they can find all the colours of the rainbow on the seashore.



A sensory journey along the shore

‘Seashore smelly cocktail’

This activity encourages the children to discover and think about the different smells that will be experienced when exploring the seashore.

You will need

A selection of pots (small yoghurt pot sized)

Pots with lids are even better, and then the children can swish and shake them to make them extra smelly!

Ask the children to carefully choose a selection of natural objects to put into their pot to capture the smells of the seashore.

Encourage the children to think carefully which objects they select and not to use the first objects that they see.

When everyone has made their seashore smelly cocktail they can share them with the rest of the class.





A sensory journey along the shore

‘Sensory scavenger hunt’

This activity focuses the children's attention on what can be found along the shore's strandline. The children can choose to work either individually, in pairs or small groups depending on their preferred style of learning.

(Found items can then be used to introduce other topics such as a discussion on beach litter or they can be collected and used to make beach sculptures. They can also be used back in the classroom for still life sketching or to inspire creative writing).

Establish the boundaries for the activity. A useful way is to walk the boundary of the collection area with the children, to ensure the perimeters for the activity are clearly understood; this also provides the chance to point out things of interest to the children that they may wish to collect later.

It is a good idea if this activity focuses on the strandline area close to the top of the shore, this way there is less chance of the children collecting live animals or seaweeds. This area should also be flat and avoids the children looking around any rocks or pools.

Give each child, pair or group a Scavenger Hunt card listing the items to be collected. Remind the children not to collect live creatures and to avoid sharp or unsanitary man-made items.





Scavenger Hunt

Please only collect things that are not alive. Please check shells to make sure they do not have animals in them. Thank you.

Can you find

Something blown by the wind

Something round

Something smooth

Something that makes a noise

Something tickly

Something soft

Something with two colours

Something that you would like to keep



A sensory journey along the shore

‘Sensory box’

The sensory scavenger hunt activity listed previously can be given a more specific focus for Year One and Two by introducing the ‘Sensory Box’. This provides the opportunity to direct the children’s finds in a more focused way, and is a great activity for generating discussion and the use of descriptive language.

You will need

A selection of egg boxes, each with two descriptive words with opposite meanings written underneath:

- ❖ *hard and soft*
- ❖ *flat and lumpy*
- ❖ *wet and dry*
- ❖ *rough and smooth*

It is useful to laminate these label cards before gluing them onto the box to prevent them from getting wet on the beach.

Walk the boundary area with the children, then give each group or pair one of the egg boxes.

It is important that each pair or group keeps their words hidden as they will be swapping with another group later.

Then the children fill each half of the box with items that can be described using the words on their box, so for example if their words are rough and smooth, one side of the box may contain some rough shells and some dry seaweeds while the other may have sand, a pebble and a smooth shell.

When each group has filled their box, swap with another group and see if the children can guess by looking and touching the items in the box what the words might be.





‘Real life scale measuring, drawing and ordering by size’

You will need

A 5 metre measuring tape

Key Stage Two: Ask the children what large mammals they think live in the sea in Cardigan Bay. Encourage them to share any information they know about the animals and to decide which is the largest and which is the smallest.

Then split the class into groups to draw each of the animals in the sand in order of size (harbour porpoises are typically 1.5m long, grey seals are 1.8m (cow) to 3m (bull) and bottlenose dolphins up to 4m in length).

Ask the children to use non-standard measure to estimate or guess the size to complete their drawings. Question the children how they might do this; for example, by using an arm's length, a stride or lying on the sand and using their bodies.

When the drawings are complete Key Stage Two children can use the measuring tape to see which group estimated the most accurately.

For Foundation Phase you may wish to just give the children one animal to estimate and draw, for example a bottlenose dolphin, using their bodies as a non-standard measure.

The class may then wish to decorate the animals with pebbles or empty shells to add key features.





Habitats investigation, living things

‘Seashore safari’

Seashore safaris offer children the chance to explore and discover the creatures found in rocky shore pools and gullies and on the sandy shore. This activity demonstrates that the intertidal zone provides a range of valuable habitats and is a dynamic place to live supporting a wide diversity of wildlife, how animals adapt to the habitat where they live, and the differences and similarities between creatures found on the shore.

This exploration of the shore is best undertaken with the children working in small groups. Walking the boundaries before beginning a rockpooling session establishes a safe and defined area for the children to work in and provides the opportunity to point out interesting finds and to see what they already know.

There are some creatures that are almost certainly going to be found on a visit to the shore, such as limpets, mussels, periwinkles, top shells, whelks, barnacles, crabs, anemones, fish and seaweeds. If you know a few interesting facts about these common species, or have a few favourite stories about the creature’s special adaptations or behaviours; this can help to further enthusiasm, wonder and understanding. (The Seashore Species section at the back of the pack contains interesting facts and key features for common species found on the shore).

Remind the children of the Seashore Code before beginning habitat investigation work and always lead by example.

Have questions ready to ask the children –

“Where on the shore does the creature live and why?”

“How is it adapted to live here?”

“What key features does it have and why?” (Tentacles, claws, lots of legs, a shell, scales)

“How does it move?”

“How does it eat?”

“What does it eat?”

“What might eat it?”

Seashore safari worksheet 1 provides space to draw a favourite creature and record its key features.



‘Seashore safari’ continued...

You will need

White buckets, trays, or tubs such as large yoghurt pots

Magnifying glasses

Plastic spoons

Identification keys

Camera

Stethoscope – great for placing in rock pools to listen to the sound of limpets grazing

Garden sieve and trowel (for sandy shores)

Nets (use carefully to avoid damaging fragile creatures)

Clipboards, paper and pencils





My shore creature

A good name for it would be _____

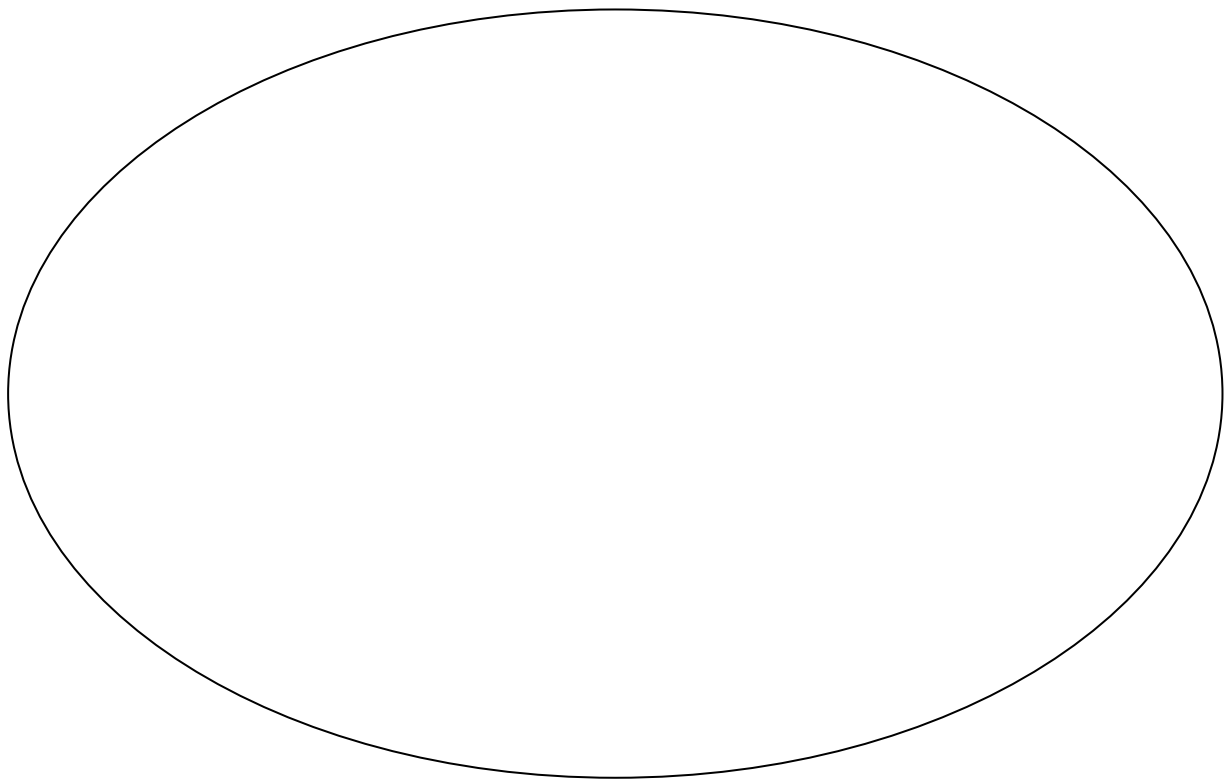
Its real name is

It has _____ body parts

Does it have eyes? _____

It has _____ legs

Does it have antennae? _____



Is its body hard or soft? _____

Does it move? _____

How? _____

It lives _____

What does it eat? _____

What might eat it? _____



Seashore safari extension activities for Key Stage Two - Habitats investigation Interdependence of organisms

- ❖ ***Opportunities for the children to engage in fieldwork – identification, nutrition, life cycles and place in the environment of rocky shore organisms***
- ❖ ***Environmental factors – sunlight, water availability/salinity, temperature***
- ❖ ***Opportunities for the children to design a fair test***

The seashore safari can be extended for Key Stage Two science work, with more detailed examination and questioning encouraging the children to think about how the creatures have adapted to the micro-habitats in which they live.

A Key Stage Two shore survey can also include opportunities to incorporate 'real science'. Shore investigations can be used to answer a hypothesis or question and to discuss what makes a fair test. They can also have a real –life practical application; providing the opportunity to input the data collected into a national marine biological recording scheme back in the classroom. Activities may include -

A timed species search – how many creatures can they find and identify in a given period of time – a 'Bio-blitz'.

A transect survey – to compare the creatures found in different parts of the shore – lower, middle and upper. This can be achieved by –

- ***A line transect survey*** – a long measuring tape is laid down from the upper shore, crossing through the middle shore to the lower shore. Animals found each side of the line are recorded.
- ***A quadrat survey*** – three equal sized random areas on the upper, middle and lower shore are marked out (hoops or quadrats can be used) and all the animals inside the hoops are counted and recorded.

You will need

A long measuring tape (line transect) or hoops (quadrat)

Recording sheet and pencil

Identification keys

Ask the children to make a prediction where they think most of the animals will be found and why.

Work out a fair system for selecting the survey site to test their hypothesis by using a line transect or quadrat sampling.



Count the number of species found along the line transect or in the hoops and try and identify them by using the identification keys. It is important to record all the animals in the sample area so ask the children to use a made up name or code for any species that they are unable to identify.

Line transect – half the group start their readings on the lower shore at the bottom of the tape, while the others start on the upper shore, crossing over in the middle. This will give you two sets of results to work with for more accuracy.

Quadrat survey – for accuracy and to make the test fair place the hoops or quadrat squares randomly (with eyes closed, for example) in each of the areas – upper, middle and lower shore. You can look at natural variability by comparing results of different groups.

(Note: small animals such as barnacles can be recorded by percentage cover. This is a measure of the amount of cover of a particular kind of animal in a quadrat where it is not possible to count each individual animal).

Follow up work in the classroom –

The children can prepare a report of their findings showing their results by:

- ❖ Producing a percentage pie chart of each survey site
- ❖ A Venn diagram to show which species were found in some or all of the survey sites.

The opportunity to input the data collected into a national marine biological recording scheme back in the classroom.

Data that the children collect on the shore can be fed into a national recording scheme such as:

The Marine Life Information Network (MarLIN) 'Sea-life Survey' or

The Shark Trust's 'Great Egg-case Hunt'

The children can record what they have seen and where they found it, it is also useful to take photographs to send in with recording data to help to identify what you have seen.

Important information to record includes – the location, the date, time, weather conditions, sea state and the height of the tide, the micro-habitat the animals were seen in, and how many individuals or colonies were seen.

It is also really useful if you can include a grid reference.

This gives the children the opportunity to participate and engage in 'real science'.



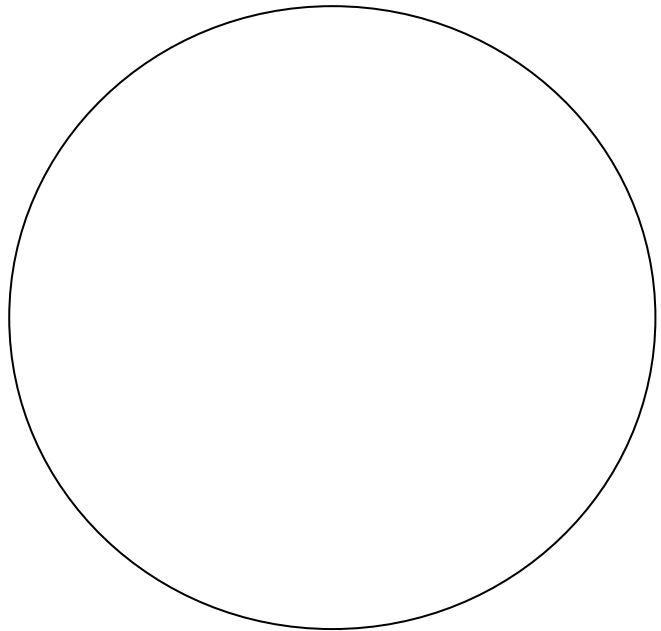
Quadrat Survey of Species Abundance

Record the different animal species found in each hoop or quadrat.

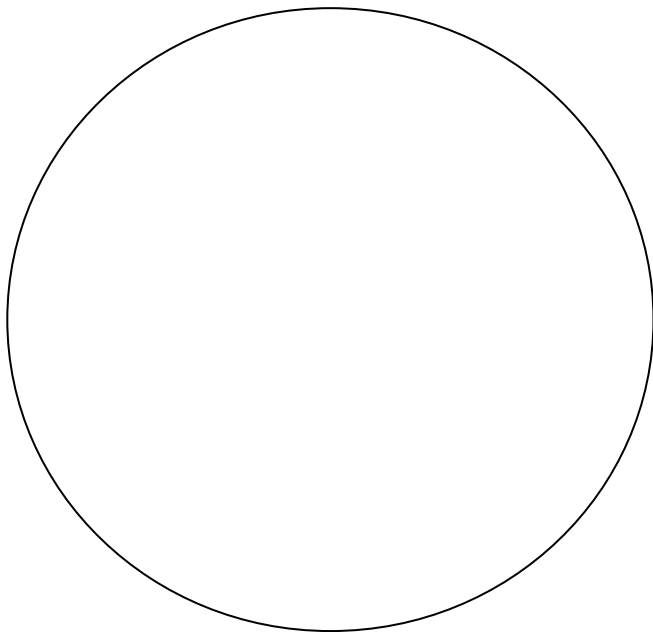
Estimate and sketch the approximate percentage cover for small species where it is not possible to count each animal.

Give animals you can't identify a made up name or code.

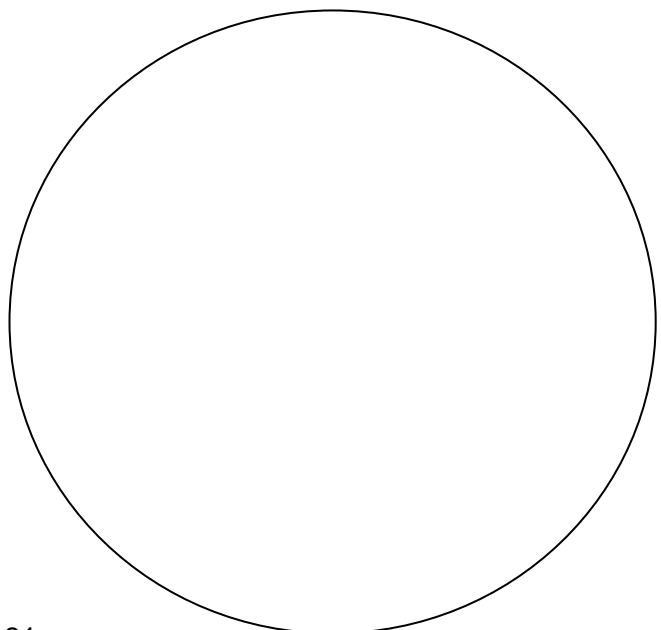
Upper shore



Middle shore



Lower shore





Science Investigation Plan

Which area of the shore do you predict has the greatest number of animals living there?

How will you test your prediction?

What do you predict will happen?

How will you make your test fair?

List the equipment you will need

Conclusions

How will you record your results?

‘Food chain investigation’

The children’s understanding of food chains can be extended after playing the ‘food chain game’ by an independent activity where the children are required to find evidence to create their own simple intertidal zone food chain.

This activity uses personal discovery and focuses attention to test the children’s understanding.

Show the children a simple 3 or 4 part food chain from items that you have already collected - for example:

seaweed > periwinkle shell > crab shell > feather

Discuss other possible simple chains such as:

phytoplankton > mussel > dog whelk > crab

Explain to the children that their challenge is to find evidence to create their own chain.

This is a good time to reinforce that they should only be collecting empty shells and not any creatures that are alive or seaweeds that are attached to a rock.

This activity works equally well whether the children choose to work individually, in pairs or groups depending on their preferred learning style. Discuss with the children the boundaries for the collection area.

When everyone has collected their food chain they can be shared with the rest of the group.

This exercise helps to clarify and strengthen experiences, enhances learning and provides an opportunity to assess the children’s understanding.



Reflective/plenary activities for the end of the session

‘Beach sculptures and sand art’

This activity encourages collaborative working and if it is used to follow up shore investigation work the children can base their sculpture on a creature they have discovered during the seashore safari.

Establish boundaries for the collection area, and explain to the children to be careful not to touch or collect sharp or unsanitary items; or anything that is alive including seaweeds attached to a rock.

It is a good idea to make sculptures quite high on the beach so that the children are less likely to be disturbed by an incoming tide and also to ensure that live seaweeds or shells with live animals in them are not used.

The children may wish to base their sculpture on either a real or imaginary sea creature.

On completion each group can present their work to the rest of the class as though walking around an art gallery, it is useful to make a photographic record of their work before it is washed away by the next incoming tide.

This activity provides a good opportunity to discuss beach litter with the children, removing any that has been used in the sculptures to dispose of appropriately.



‘Magic spots and sound maps’

This activity works well at the end of the day to give the children the opportunity to spend time reflecting on what they have learned during their visit and how this may have changed their thoughts and feelings towards their local shore and the creatures that live there.

Alternatively it can be used after playing one or two of the warm up games, to focus the children’s attention and develop their observation and listening skills and receptivity for more focused investigation work to come.

Give each child some paper or a piece of card and a pencil.

Explain to the children that they have to find their own magic spot – a quiet and comfortable place to sit and listen to the sounds of the shore around them.

Then when they have found a place to sit, they will draw representations of all the sounds they hear on their map; they can also use a symbol to represent their own location.

Before the children start, set boundaries for the activity and explain that each child needs to quietly sit in their own magic spot – a few metres away from anyone else. Explain that once the allocated time is up you will make a specific noise, a hand clap for example, when they hear this they will come back quietly.

After completing the activity, question the children about the sounds they could hear:

“Were they surprised by the number of different sounds?”

“How far did the sounds travel?”

“Did they hear any unusual or unexpected sounds?”

Discussing sounds that do not occur in the natural environment can provide the opportunity to talk about noise pollution.

The sound maps can be used to generate a piece of descriptive writing back in the classroom.



‘True or false . . . ?’

This game is useful at the end of the session, to revisit learning during the session and to assess the children’s understanding.

How to play

Place a ‘true’ and ‘false’ marker each side of the group, with a large enough distance that they can all move safely and easily from the middle to each marker.

A competitive element can be introduced by splitting the class into two teams, for example, girls and boys, and seeing which team gets the majority correct answer each time.

Statements could be –

Cardigan Bay has one of the biggest resident population of bottlenose dolphins in Europe – true – over 200 live here in the summer

Bottlenose dolphins are up to 4 metres long – true

Dolphins, porpoises and seals can breathe underwater – false (they are mammals like us and need to go to the surface to breathe)

Underwater nose is a problem for dolphins and porpoises because it interferes with their echolocation that they use to communicate, navigate and hunt – true

60% of the world’s grey seal population are found around the UK coast – true

It is ok to chase dolphins, porpoises and seals if you are in a boat or canoe – false – (this disturbs the animals and stops them from feeding or other natural behaviours)

Seals use their whiskers to help them to find fish – true

Dolphins, porpoises and seals suckle their young - true

Leatherback turtles swim over from the Caribbean every summer to feed on dustbin lid jelly fish in Cardigan Bay – true

A chough is a red footed crow that can be seen if you walk along the coast path – true

Humpback whales and killer whales have been seen in Welsh waters - true

Plastic is the most common kind of litter found in the sea - true

A starfish eats by pushing their stomach come out of their body and covering their prey – true

The male goby, a fish found in rock-pools, guards its eggs until they hatch - true

Seaweed is used to make ice-cream and toothpaste – true

We need to take our litter home with us - true

A sea anemone’s mouth is also its bottom – true



‘True or false’ continued...

Crabs have 8 legs – false (they are decapods and have 10 limbs – the claws are modified legs)

Adult barnacles cement their heads to the rocks and catch food with their feet – true

A sea lamprey is a prehistoric kind of fish with a sucker mouth that lives in Cardigan Bay – true

Atlantic grey seals can hold their breath underwater for 15 minutes – true

Guillemots build nests on the cliffs to rear their young – false (they lay their eggs directly onto the bare rock)

Limpets can live for 15 – 20 years – true

A great white shark is the biggest fish in the world – false (the whale shark is the biggest, the next biggest is the basking shark that can be seen in Welsh waters)

A mermaid’s purse is where mermaids keep their hairbrush – false (they are the egg cases of skates and rays)

Crabs can only walk sideways – false (some species such as spider crabs can walk forwards)

The bootlace worm is the longest animal in the world – true (they can grow over 30 metres long and are sometimes found in rockpools).

A baked bean sea squirt is only found on toast – false (it lives on rocks or seaweeds and feeds by sieving tiny particles out of the water. If disturbed it shoots out jets of water)

A dog whelk feeds by drilling through the shell of barnacles and mussels, then turns them into soup and then sucks it out – true

We love the beach!

‘Designing and creating marine creatures using recycled materials’

A shore visit can be used as inspiration to design and create marine creature sculptures during art or design and technology lessons.

These sessions are especially valuable if they can also be used to communicate the Reduce, Re-use, Recycle message by using recycled materials to create the designs.

The use of plastic materials to create the creatures further reinforces the message that plastics in the marine environment can easily be mistaken for jellyfish by turtles and whales.

(For information on the problems caused by the persistence of plastics and the threats it poses for marine life, see the SAC information section at the back of the pack).



'Identification game'

This game is a useful and fun follow up activity after a shore visit.

It encourages listening and questioning skills.

How to play

Organise the children into a circle.

The children take turns to volunteer to have a marine or rocky shore animal's name stuck to their forehead on a post-it note.

They then ask the rest of the class questions about the animal until they guess what creature they are.

It may be helpful to discuss with the children at the start of the session the different creatures that they discovered on their shore visit, and to have pictures of the animals for each volunteer to hold up to help the rest of the class to answer the questions accurately.



Cardigan Bay – A Special Area of Conservation

Stretching from Ceibwr Bay in Pembrokeshire to Aberarth in Ceredigion and extending almost 20km from the coast, Cardigan Bay Special Area of Conservation (SAC) protects the wildlife found in and around 1000 square kilometres of sea.

The area is home to an amazingly rich variety of animals and plants, including one of Europe's largest populations of Bottlenose dolphins. Its Atlantic grey seals, sea and river lampreys, reefs, sand banks and sea-caves are also of international importance.

How did Cardigan Bay become a protected site and how is it managed?

The 1992 Rio Earth Summit placed biodiversity firmly on the global political agenda. Europe responded by ratifying the EU Habitats Directive in 1992, instructing all member states to designate Special Areas of Conservation to protect Europe's most important wildlife sites. These protected sites form a Europe wide conservation network of which the Cardigan Bay SAC is a small part.

The Directive includes a list of animals, plants and habitats considered to be most in need of protection at a European level. Bottlenose dolphins, Atlantic grey seals, river and sea lampreys, reefs, sandbanks and sea caves are all on this list. This doesn't mean that we can't continue to use and enjoy the natural resources of the area, but that any activities have to be carried out sustainably.

The public bodies who have responsibility in the marine environment have worked together to produce a management scheme for Cardigan Bay. This explains how potentially damaging activities such as fishing, development, commercial shipping and recreation will be managed so that the wildlife can continue to flourish.

Managers need to know whether the measures that they are taking are effective, and the Government has to report to Europe every six years on whether the SAC is meeting its objectives, so monitoring is also important.

Education is an essential part of the scheme because public support, especially from local communities, is crucial to the site's success.

Where to find out more . . .

The website www.cardiganbaysac.org.uk has information on the wildlife of the area, what is being done to protect it, and how you can help.

There are discussion boards to allow you to raise any concerns and keep up with all the latest news from the site. You can check the latest weather forecast to see if it's a good day for a visit to the shore. You can also download a copy of the management scheme and find links to other useful sites.

There is also lots of information in the **Boat Place**, Ceredigion County Council's marine information centre on New Quay's harbour wall. The centre is open at weekends from May to September and throughout the school holidays. We are also happy to open for school visits on request.

Habitats

The underwater seascape and its habitats are just as varied as those found on land, each feature or habitat can provide a home for different marine life; specifically adapted to the underwater world where they live.

Reefs

Reefs in Cardigan Bay consist largely of boulders, cobbles or pebbles. They are known as '**Sarnau**' which means 'pavements' or 'causeways'. There are three 'Sarnau' in Cardigan Bay.

Biogenic reefs are formed by marine plants and animals whose hard skeletons and tubes form 'reefs' that provide a home for other plants and animals. Honeycomb worms form extensive biogenic reefs on the lower shore.



Sub-tidal sandbanks

Specialised, burrowing animals live on and in the sand banks, including the rare mantis shrimp. Sandbanks are important, not just for the range of species found there; but for the important role they play in the food web.

Sea caves

Sea caves are composed of uplifted sedimentary rock that has softer, strata layers of sediment sandwiched between them.

They provide important pupping sites for seals on dry beaches and rock ledges, and a home for a variety of animals and plants - barnacles, tube worms, sponges, anemones, giant cave spiders and sea squirts.



Bottlenose dolphins

The quiet southern waters of Cardigan Bay provide an ideal place for dolphins to live and raise their young, and this area is an important feeding and breeding site for these animals. There is a resident population of around 200 dolphins that live in Cardigan Bay.

Headlands such as Mwnt, Aberporth, Ynys Lochdyn and New Quay are especially important feeding areas. Dolphins can be seen all year round, but the summer months are the best time for sightings. Many of Cardigan Bay's dolphins head north, to the waters off Anglesey for the winter.

From the shore or headlands it is possible to see the dolphins hunting, displaying high-speed chases on the surface; with fish being thrown up in the air as they feed and play.



- ❖ Bottlenose dolphins are light to dark grey in colour with a pale coloured underside. They have a prominent nose or beak that gives them their name.
- ❖ They can be up to four metres long.
- ❖ Female bottlenose dolphins can live to over 40 years old, and males nearly as long. Scientists can age dolphins by counting the growth rings in their teeth.
- ❖ Female bottlenose dolphins give birth every three to six years. There is a very strong mother/calf bond; and they suckle their young for the first eighteen to twenty-four months. Even after weaning, young dolphins stay with their mother until they are five or six years old.
- ❖ Dolphins live together in groups or 'pods' and communicate with each other through high-pitched clicks or whistles. Mums and calves are able to recognise each other through unique 'signature whistles'.
- ❖ The sounds that dolphins produce are called 'echolocation'. As well as being used for communication this helps them to navigate and to detect their prey (see the echolocation game).

Dolphin or porpoise?

Bottlenose dolphins can be up to four metres long, harbour porpoises only reach up to 1.7 metres long.

Dolphins have a taller, half-moon dorsal fin; a porpoise's dorsal fin is much smaller and more triangular.

Bottlenose dolphins have a distinct nose or beak; porpoises have a rounded head.

Bottlenose dolphins are known for their playful and acrobatic behaviour. Harbour porpoises are very shy and timid animals, they are not frequently seen.

Atlantic grey seals

Like the dolphins, seals use Cardigan Bay to hunt for food, socialise and give birth to their young.

- ❖ Males or 'bulls' are darker than females or 'cows' and can grow up to three metres long.
- ❖ Seals can be seen hunting along the shoreline or hauled out on rocks; but they can also go out to sea to hunt up to 50km offshore.
- ❖ Seals use both their eyes and their coarse whiskers to search for their prey. They will feed on fish, crustaceans and molluscs.
- ❖ When they are sleeping, seals can stay submerged for up to fifteen minutes. They are sometimes seen 'bottling' when they sleep under the surface with just their nose sticking out to breathe.
- ❖ Females produce one pup a year, and give birth during the autumn months. The pups are born in sea caves and on beaches and are white when they are born, but turn grey after a few weeks. They rely on their mother's milk for the first three weeks, and then they are left to look after themselves.



It is vital not to disturb pups during this important time. Although young seal pups can appear to be abandoned this is usually not the case; they are left on the beach while their mothers are offshore hunting for food. It is important that they are not disturbed.

Sea lampreys (see gravel bed gamble game)

- ❖ Sea lampreys are an ancient type of jawless fish. They have no scales. They have a skeleton made of cartilage instead of bone.
- ❖ They have a distinctive suckered mouth that they use to feed parasitically on other fish.
- ❖ Adult lampreys grow to around 90cm long.
- ❖ Sea lampreys need to spawn in fresh water, but the habitats they depend on have suffered from a range of impacts including pollution, silt from surrounding land smothering important breeding areas, land use change and river engineering that can remove important nursery sites.



Anthropogenic threats to marine life

Cardigan Bay, although relatively quiet, is still well used for a wide range of activities. Commercial fishing, angling, boating, military testing, tourism, wildlife watching, scientific research and treated sewage disposal all take place within the SAC.

Dolphins and porpoises are vulnerable to **disturbance by boats**, as any underwater noise interferes with the echolocation that they use to communicate, navigate and hunt for prey.

Seals also need undisturbed shores for resting and breeding.

Very loud underwater noise such as **seismic testing** can injure dolphins and other cetaceans.

These top predators also require a healthy and productive ecosystem if they are to sustain their populations.

Fishing (especially with heavy mobile gear) and **trampling** on the shore can damage reef features.

Marine litter

Pollution is often difficult to see, but **marine litter** is an easily visible indicator showing how polluted our seas really are. Litter can entangle animals or be mistaken for food and eaten; Over 50% of litter in the oceans is made of plastic. Plastics are of particular concern because they are so persistent in the marine environment and can have a devastating effect on marine life.

Fishing debris is the second most frequently found source of litter on UK beaches, fishing debris can impact on marine wildlife through entanglement in lost or discarded fishing nets.

Plastic bags are a potentially deadly form of litter, because they are lightweight they are readily carried by the wind and they persist indefinitely in the environment. Even after proper disposal they often blow out of litter bins and landfill sites.

Balloons and sky lanterns are also very damaging to the marine environment and balloon litter is increasingly becoming a common item found on beaches. Balloon releases are used to celebrate happy events such as birthdays, fetes and fund-raising events, but releasing balloons into the environment can lead to marine animals dying from eating or becoming entangled in balloons and their string.

When plastic bags and balloons land on the sea the surface tension of the water prevents them from being blown any further, and they can be mistaken for food by marine creatures such as whales, dolphins, sharks, birds and turtles, who confuse floating debris and brightly coloured litter such as balloons for jellyfish, a source of food. They ingest the bags and balloons that then block their stomachs, leading to death from starvation.

Seabirds also mistake floating plastic bags for food; a recent study found that over 90% of fulmars found dead in British waters have plastic in their stomachs (Marine Conservation Society).

Estimates for plastic degradation at sea range from 450 to 1000 years. Plastics never fully degrade and disappear however, they break down into smaller and smaller pieces and ultimately into microscopic 'plastic dust'. This plastic dust can be ingested by filter feeders, and this type of plastic along with any toxins present is then passed up the food chain.

This plastic litter comes from many sources – the public, fishing activities, sewerage pipes and shipping – but it is all preventable.

Cotton bud sticks are almost exclusively made up of plastic so they will persist in the marine environment. Cotton buds make up half of the sewage related debris found on our beaches and they can number in their thousands along a single stretch of beach. They should never be disposed of down the toilet as they are difficult to screen through sewerage systems as they are notorious for orientating themselves horizontally in sewers; making it possible for them to pass through even very small mesh screens.

There are many things that you can do to help, as a whole school and at home; even small things can make a big difference.

Organise a beach clean on your local beach.

Take action in school and at home by trying to avoid using plastic bags.

Try alternatives to mass balloon releases to celebrate or commemorate a special event. For more information and alternative activities to balloon releases, please see the Marine Conservation Society website and their 'Don't Let Go!' campaign.

Be aware of what you flush down the toilet and always dispose of cotton buds in the bin instead.



Useful Contacts

The organisations below all have useful websites offering information on marine wildlife around our coasts; or they can help you to plan a trip to the coast by providing information on current weather conditions and tide timetables.

Ceredigion County Council	http://www.ceredigion.gov.uk
Gwynedd Council	http://www.gwynedd.gov.uk
Cardigan Bay Special Area of Conservation	http://www.cardiganbaysac.org.uk
Pen Llŷn a'r Sarnau Special Area of Conservation	http://www.penllynarsarnau.co.uk
Keep Wales Tidy	http://www.keepwalestidy.org
Marine Conservation Society	http://www.mcsuk.org
MarLIN – the Marine Life Information Network	http://www.marlin.ac.uk
Whale and Dolphin Conservation	http://www.wdcs.org
Cardigan Bay Marine Wildlife Centre	http://www.cbmwc.org
Sea Watch Foundation	http://www.seawatchfoundation.org.uk
Shark Trust	http://www.sharktrust.org
Weather	http://www.bbc.co.uk/weather
Tides	http://www.discoverceredigion.co.uk

Activity risk Assessments

Risk Assessment form			
Assessor:		Date:	
Activity: Seashore safari and rockpooling (Exploring habitats, life-cycles and food chains)			
Persons at Risk Adults (including employees and volunteers) and children			
Hazards Involved In The Activity Risk from incoming tide. Children wandering away from the group and getting lost. Uneven rock surface with some sharp edges, slippery conditions. Exposure to water borne diseases. Risk of infection in exposed cuts/grazes. Risk from litter, faeces and sharp objects. Slipping or falling into the sea. Eye damage by looking at the sun through a magnifying glass. Weather: heavy rain/wind/cold – exposure. Mist/fog – poor visibility, loss of contact with others in the group. High temperatures, sun - sunburn, sunstroke and dehydration. High winds – wind-blown debris, detritus and sand, children blown over on uneven rocky surface, difficulty in verbal communication.			
Risk and Risk Rating	Likelihood X	Severity	Rating =
Incoming tide	3	1/5	3/15
Children wandering away from the group and getting lost.	2	4	8
Uneven rocks with sharp edges, slippery conditions.	4	2/3	8/12
Exposure to water borne diseases.	3	3/4	9/12
Risk of infection in exposed cuts/grazes.	3	3	9
Risk from litter, faeces and sharp objects.	3	2/3	6-9
Eye damage by looking at the sun through a magnifying glass.	1/2	4	4/8
Slipping or falling into the sea.	1/2	4	4/8
Weather: heavy rain/wind/cold – exposure. Mist/fog – poor visibility, loss of contact with others in the group. High temperatures, sun - sunburn, sunstroke and dehydration. High winds – wind-blown debris, detritus and sand, children blown over on uneven rocky surface, difficulty in verbal communication.	3	2/3	6/9

Likelihood	Severity	Risk Rating	
1 rare	1 insignificant	1 - 5	Minimal Risk - maintain measures
2 unlikely	2 minor	6 – 10	Low Risk - review risks
3 possible	3 moderate	11 – 15	Moderate Risk - Additional controls In 12 months
4 likely	4 major	16 - 25	High Risk - additional controls implemented immediately
5 almost certain	5 catastrophic		

Implementation of controls and monitoring

Additional controls required to reduce risk(s) below risk rating of 5

Risk from incoming tide – check tide times and ensure that all activities will take place working towards low tide.

Children wandering away from the group and getting lost - high level of supervision by accompanying adults. Definite boundaries will be established for the collecting area.

Uneven rock surface, with some sharp edges, slippery conditions – Group will be warned of dangers during Health and Safety talk prior to activity. Ensure group have adequate clothing especially footwear.

Exposure to water borne diseases. Risk of infection in exposed cuts/grazes - Ensure exposed cuts and grazes are covered. Alert the group to the potential risks during Health and Safety talk prior to activity and advised to wash hands before eating or drinking.

Risk from litter, faeces and sharp objects – A site inspection will be carried out before the activity to remove any potentially dangerous items. Group will be warned of dangers during Health and Safety talk prior to activity and advised to wash hands before eating or drinking. Do not use any site where sewage is present.

Eye damage by looking at the sun through a magnifying glass – Group will be warned of dangers during Health and Safety talk prior to activity, children will be given magnifying glasses to use under close adult supervision.

Slipping or falling into the sea - Group will be warned of dangers during Health and Safety talk prior to activity, high level of supervision by accompanying adults. Definite boundaries will be established.

Weather - Schools and pupils advised suitable grippy footwear and rain/windproof clothing is required. In hot weather advised to ensure that all pupils have sun hat and protective cream.

Level of Risk after Additional Control Measures

Below level of 5 - Yes

Date Implemented _____ Signature _____

Date to Review Again: _____

Risk Assessment Form																					
Assessor:		Date:																			
Activity: Strandline scavenger hunt A sensory journey along the shore Beach art																					
Persons at Risk Adults (including employees and volunteers) and children																					
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Implementation of controls and monitoring

Additional controls required to reduce risk(s) below risk rating of 5

Risk from incoming tide – all activities will take place working towards low tide.

Exposure to water borne diseases. Risk of infection in exposed cuts/grazes - Ensure exposed cuts and grazes are covered. Alert the group to the potential risks during Health and Safety talk prior to activity and advised to wash hands before eating or drinking.

Risk from litter, faeces and sharp objects – A site inspection will be carried out before the activity to remove any potentially dangerous items. Group will be warned of dangers during Health and Safety talk prior to activity and advised to wash hands before eating or drinking.

Children wandering away from the group and getting lost - high level of supervision by accompanying adults. Definite boundaries will be established for the collecting area.

Weather - Schools and pupils advised suitable grippy footwear and rain/windproof clothing is required. In hot weather advised to ensure that all pupils have sun hat and protective cream.

Level of Risk after Additional Control Measures
Yes

Below level of 5

Date Implemented

Signature

Seashore habitats and creature guide

Tides

Tides are governed by the gravitational pull of the moon (and to a lesser extent the sun), with the tide rising and falling twice each day, with approximately 6 hours from high to low tide. Because the moon takes around 24hrs and 50 minutes to orbit the earth, the time of high (and low) tide is approximately 50 minutes later each day. The largest tides, with the sea rising higher and falling lower, occur around new and full moons (when the sun, earth and moon are lined up) and are called **spring tides**. **Neap tides**, with a much smaller range, occur during the first and third quarter of the moon, when the sun and moon are at right angles when viewed from Earth.

Low spring tides give the best conditions for investigating the shore because more of the shore is exposed.

Rocky shores

The rocky shore is a dynamic place to live, governed by the tides and providing many different micro-habitats that offer shelter to the creatures that live there: on rocks and under boulders, in gullies, in rockpools or on and under seaweeds.

Different animals and seaweeds can be found on specific areas of the shore; **upper, middle or lower**, depending on how they can cope with varying environmental conditions. The way that marine life occupies different areas is termed **zonation**.



Life on the **upper shore** is tough, with long periods exposed to sun and wind, and therefore the risk of drying out is the greatest. The temperature is also far more variable, with the rocks baked by the summer sun or exposed to winter frosts for much longer than the lower shore. There is also less opportunity to feed during high tide. Not many species can survive on the upper shore, but those that have evolved to live here may be very abundant because there is little competition for space.

As you travel down the shore, the time spent exposed by the tide becomes progressively less. At the extreme **lower shore** creatures might only spend a few minutes every month exposed to the air. This causes its own problems however, as here competition for food and space is fierce and the risk of predation is increased.

Some animals choose to live in gullies or under boulders and seaweeds where it is damp and cool, to hide from predators and prevent their bodies from drying out.

In general, the lower down the shore you look, the greater the variety of creatures you will see.



Rockpools are one of the best places for observing the creatures that live on the rocky shore. They form a natural oasis amongst the parched rocks. The best way to discover more about the marine life that lives here is simply to sit still and observe the animals in their natural environment. Although less extreme than the exposed rocks nearby, environmental conditions in rockpools are still far more variable than in the open sea. Salinity can increase significantly as water evaporates in sunny weather, or plummet on wet days, as the

rain dilutes the seawater. The further down the shore and deeper the rockpool, the more stable its temperature and salinity and the greater its variety of animals and plants.

Although they may seem empty at first, the longer you spend looking in a rockpool, the more you will see.

Wave exposure is another significant factor influencing which creatures can be found on the shore. Animals living on **exposed shores** are continually vulnerable to wave action, so the risk of being pulled off the rocks by the waves and washed away is much greater. These shores are usually dominated by barnacles and limpets; released from predation pressure they can form very dense populations. **Sheltered shores** are often covered in seaweeds and provide much more protection for marine life.

Sandy shores

Unlike the animals living on rocky shores, animals found on sandy shores do not have the variety of micro-habitats to live in; they can be found burrowed into the sand, in sandy pools or under debris on the strand-line. These habitats provide protection from wind and sun, from predation and from wave action.

Most animals living on the sandy shore bury themselves in the sand, and if you look carefully you will see evidence such as small burrow holes and worm casts lying on the surface.

If you wait by a sandy pool, you may see brown shrimp moving around, before they bury themselves back in the sand again.

The strandline, the line on the upper shore where the tide deposits dead seaweed, drift wood and man-made debris, is a great place to look for mermaid's purses (the egg-cases of skates and rays), whelk egg-cases and horn-wrack. Sand-hoppers can also be seen here.



The Ceredigion beaches used by the Coast and Countryside Education Ranger and shown in the photographs in this pack are:

Aberaeron (South Beach) - a pebbly beach with sandy areas exposed at low tide; also rockpooling on the lower shore at low tide at the southern end of the shore (please take care not to trample the honeycomb worm colonies that can be found here).



New Quay (Dolau Beach) - a sandy and a rocky shore; good rockpools exposed at low tide (please take care not to trample the honeycomb worm colonies that are exposed at low tide).

Llangrannog - a sandy shore, with rockpooling areas exposed on the lower shore at low tide.



Aberporth - a sandy shore, with rockpooling areas on the lower shore exposed at low tide.

Shore life

Many of these species are almost guaranteed finds, knowing where to find them and knowing a few interesting facts about them will go a long way. Many of the more mobile creatures such as prawns, crabs and fish move offshore during the winter months to avoid the hazards of crashing waves and the worst of the cold weather, while many of the more delicate seaweeds are summer annuals for similar reasons. Summer seashore safaris tend to find a greater variety of creatures, especially the more charismatic species, but if you have the opportunity, visiting the same shore through the year will highlight these seasonal changes, mirroring those on dry land.

Molluscs

Sea snails (gastropods)

Sea snails have a head with eyes and two antennae.

They have gills to breathe.

They have a hard, waterproof shell that can help to protect them from wave action and helps them to retain water so that they don't dry out.

At low tide they retreat into their shell and they close a special trapdoor (operculum) that also helps to protect them from drying out.

They have a large powerful muscular foot that they use to move around, this helps them to clamp down on the rocks and prevents them from being washed away.

They scrape their food off the rocks with rows of teeth on a tongue-like organ called a radula. These teeth are continually being replaced as they wear away.

Predatory snails such as dog whelks use their radula to drill holes in the shell of their prey.

Bivalves

Bivalves have a symmetrical pair of shells – clams, cockles and mussels are bivalves.

They are filter-feeders – sucking water into their shell through a *siphon* and filtering tiny particles of food such as plankton with their gills.

Many species of bivalve burrow into sand and mud, but mussels can be found attached to rocks on the shore.

Periwinkles

- ❖ Several related species, but you are most likely to encounter edible (large, dull grey / brown) and flat periwinkles (pretty, often bright colours including yellow, orange, green and brown).
- ❖ The operculum or trapdoor (that protects them from drying out) is elongated or tear shaped.
- ❖ Their shell spire curls to the side.
- ❖ They are herbivores, feeding on fine seaweeds such as sea lettuce.
- ❖ Flat periwinkles are almost always found on or near large brown seaweeds.

*Flat periwinkle**Edible periwinkles***Top shells**

- ❖ There are several species but all have stripy or zigzag patterns on their shell.
- ❖ They have mother of pearl inside the shell opening.
- ❖ The operculum or trapdoor is circular.
- ❖ Their shell spire goes straight up.
- ❖ They are herbivores, scraping microscopic algae off the rocks.
- ❖ They can spin like a top to avoid predators!

*Purple top shells***Dog whelks**

- ❖ *Dog whelks have a white or brownish shell, sometimes stripy.*
- ❖ *They are found on the middle or lower shore on rocks and in crevices, where they won't dry out while feeding.*
- ❖ *The female dog whelk lays clusters of yellow egg cases in crevices in the rocks, each holds hundreds of eggs.*
- ❖ *Dog whelks are predatory (carnivores) – they use their radula to drill a hole through the shell of their prey (barnacles and mussels, but they will also eat snails and limpets) then they use their digestive juices to dissolve their prey before sucking out their insides!*



Limpets

- ❖ They have a grey cone-shaped shell.
- ❖ They crawl over the rock at high tide, grazing on seaweeds, returning to the same spot before the tide drops.
- ❖ They make a home spot or scar by grinding their shell down into the rock until it is a perfect watertight fit.
- ❖ They follow their slime trail to find the way back home.
- ❖ Limpets pull their shell down tight onto the rock and trap water under their shell to prevent their delicate gills from drying out.
- ❖ If you place a stethoscope next to a limpet in a rock pool you can hear the sound of its radula scraping the algae off the rock surface as it grazes.
- ❖ If threatened by a starfish they can lift up their shell and stamp on the starfish's feet!
- ❖ Limpets can live for up to 20 years.



It is important not to remove limpets from the rocks as this can kill them, altering the balance of life on the shore – without grazing by limpets, the rocks can become swamped with seaweed growth.

Mussels

- ❖ Mussels have a waterproof shell in two halves that trap water inside to protect them from drying out at low tide. Powerful muscles open and close the two shells.
- ❖ They anchor themselves to the rocks with strong threads. They also have a streamlined shape and hard shell to protect them from wave action.
- ❖ They do not have to make a final choice where to settle, they can detach themselves from the rocks and move to another place on the shore.
- ❖ They are filter feeders: they create water currents through the opening in their shells and filter particles of food with their gills.
- ❖ Their gills are enormously enlarged – and extend for the entire length of their body!



Crustaceans

Crabs, prawns, shrimps and barnacles

Crustaceans have a hard carapace that cannot stretch with their growing body. To grow they have to moult their old shell, forming a new soft shell beneath which expands before hardening. They are very vulnerable when moulting so hide away in crevices and under boulders.

Many of the “dead” crabs you find on the shore are actually empty moulted shells. Try opening one from the back – if the top of the shell lifts off, it is a moulted shell – all that is left inside are the old gills.

If a crustacean loses a leg or claw they can grow a new one when they moult. Crabs breathe using gills hidden under their shell. Male crabs have a thin ‘V’ shaped tail curled under their body, and larger claws. Females have a wider ‘U’ shaped tail for carrying their eggs. Females will carry their eggs for several months before the larvae hatch and swim freely as plankton.

Juvenile crabs live in the inter-tidal zone under rocks or seaweeds, while larger adult crabs will often migrate up and down the shore to feed with the tides. They have a special internal rhythm so that they know when to move, so they are always in the right place at the right time!

Each front claw does a different job – one is for cutting and the other is for crushing. **Take care when handling!**

Prawns and shrimps have two pairs of feeding legs with tiny claws on.

They have three different ways of moving: walking with their legs, swimming using specialised swimming legs (pleopods) and, in emergencies, swimming very quickly backwards with strong flicks of their paddle shaped tail to escape predators.

They also have two pairs of long antennae and eyes on stalks.

They feed on tiny particles of food (detritus).

Shore crab

- ❖ Can be found all over the shore – this is the most common crab that you will find.
- ❖ They can survive out of water as long as they stay cool and damp – try looking under rocks.
- ❖ They are dark green or brownish-red.

**Edible crab**

- ❖ They have a brown shell with a pie crust like edge!
- ❖ The young crabs are white.
- ❖ This is the largest and slowest moving crab that you will see on the shore.
- ❖ They rely on their strong shell for defence and are more likely to curl up into a ball than pinch you!
- ❖ They can live for up to 100 years!

**Velvet swimming crab**

- ❖ They have unmistakable red eyes and blue lines on the legs and claws.
- ❖ They have flat paddle-like back legs.



These crabs are fast and aggressive so please take extra care.

Hermit crabs

- ❖ Hermit crabs have a soft body and so use the shells of sea-snails as protection – they move into successively larger shells as they grow.
- ❖ The easiest way to find hermit crabs is to quietly watch a rockpool and wait for a winkle to sprout legs and start to walk about!
- ❖ They are shy – if they detect a threat they will quickly withdraw into their shell.
- ❖ Finding a hermit crab provides a good opportunity to discuss with the children the implications of removing shells from the beach.



Prawns

- ❖ Are transparent with brown lines on their body and stripy blue and yellow legs.
- ❖ They live in rockpools. If you find a shrimp in a rockpool it is probably a prawn!
- ❖ They are not fussy eaters – they will eat seaweed, carrion or find tiny particles of food in the sediment.
- ❖ You can sometimes see their last meal inside their transparent body!

**Shrimps**

- ❖ Are transparent with brown speckles and are well camouflaged on the sandy shores where they live.
- ❖ They often bury themselves in the sand with just their eyes and antennae visible.
- ❖ You can often find them in pools on sandy or muddy beaches.

**Barnacles**

- ❖ Juvenile barnacles swim freely as plankton.
- ❖ The young barnacles carefully choose a location to settle on the rocky shore and cement their head to the rocks! Then they change into their adult form – they will spend all of their adult lives in this spot and cannot move again.
- ❖ They have volcano shaped calcified plates and a trapdoor that can be tightly closed to prevent them from drying out.
- ❖ The adults feed when the tide is in by catching small particles of food with their feathery legs!



Starfish and Brittlestars

These animals have no left or right side and no front or back – they have radial symmetry.

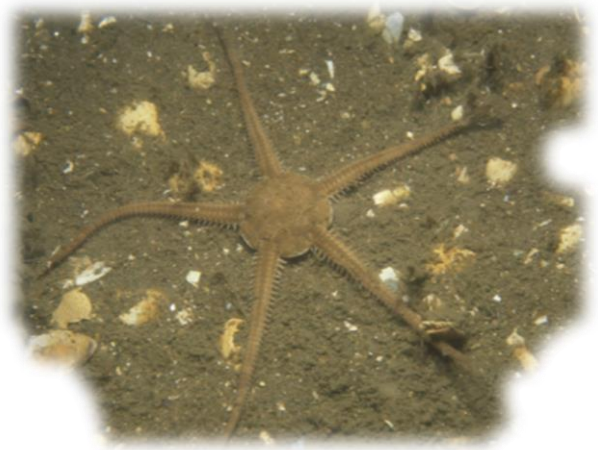
Starfish

- ❖ They have a star-shaped, spiny body and their legs have 1000's of tube feet so they are able to move surprisingly fast.
- ❖ They are only found on the very low shore and sublittorally and they are most active at night.
- ❖ They feed on bivalves by prising their shells apart before pushing their stomach out through their mouth and into the shell of their prey to digest it!



Brittlestars

- ❖ Brittlestars have long, slender, delicate, very fragile arms that can easily break - so please handle with care.
- ❖ They walk over the seabed and feed on detritus.
- ❖ They can also filter-feed, holding their hairy legs up into the water and trapping food passing by in the current.
- ❖ When conditions are just right, you can get countless millions of brittlestars forming huge beds, all filter-feeding together.



Worms

Most species have soft, segmented bodies and they have bristles along the sides.

Some species live in tubes that are able to retain some water that helps to protect against predators and prevent them from drying out. Tube worms have feathery tentacles to filter feed.

Keelworm

- ❖ They secrete calcium carbonate (limestone) to form hard, white tubes.
- ❖ They are often found on the underside of boulders.
- ❖ When the tide is in they extend feathery tentacles out of the entrance to trap passing plankton and other tiny food particles.



Honeycomb worm

- ❖ They build their tube homes by binding sand and shell fragments together with mucus.
- ❖ They are filter feeders.
- ❖ They usually build their tube on top of other honeycomb worm tubes, sometimes forming extensive reefs.
- ❖ Large honeycomb worm reefs bind together boulders and rocks on the shore, preventing them from crashing around in winter storms and providing shelter for lots of other animals and plants.
- ❖ Cardigan Bay is a good place to see honeycomb worms – look on lower shore rocks and boulders near sandy beaches.



When walking on the lower shore, it is important to keep a careful look out for honeycomb worm populations to avoid trampling on the delicate tubes and the worms inside.

Lugworm

- ❖ Lugworms live in 'U' shaped burrows in the sand.
- ❖ They suck sand in through their mouth, digest tiny food particles in it, and then pass the 'cleaned' sand out of the other end.
- ❖ About every forty-five minutes the lugworm backs up the tube to deposit this 'worm cast' on the surface.



Sea anemones

Anemones are related to jellyfish. They have stinging tentacles and soft bodies so please don't touch or poke them.

They attach themselves to rocks with their sucker-like base, but can crawl around very, very slowly!

They are carnivorous – anemones are 'sit and wait' predators, catching unwary prey such as small fish and prawns in their tentacles.

The tentacles are covered in microscopic stinging cells, called nematocysts. When touched, they fire thousands of tiny poisoned harpoons into their prey, trapping and immobilising it.

They use the same hole for both eating and excreting waste - so their mouth is also their bottom!

When two anemones meet they will fight, inflating their tentacles and firing nematocysts at each other until one retreats!

Many sea anemones are capable of reproducing by splitting off a part of their body which will grow into a new individual.

Beadlet anemone

- ❖ Can be red, brown, orange or green.
- ❖ These anemones retract their tentacles when the tide is out, reducing their surface area to conserve water; then they look like a small blob of jelly.
- ❖ They have bright blue spots just below their tentacles these are covered in stinging cells and used to fight other anemones in territorial disputes.



Snakelocks anemone

- ❖ They have long green or brown tentacles with purple or pink tips.
- ❖ They prefer to live in brightly lit places because their tentacles contain microscopic algae that provide them with food. In return the anemone provides protection for the algae, so they have a symbiotic relationship.
- ❖ They cannot retract their tentacles so they are always found in damp places.



Fish

Unlike the other animals we have looked at in this guide, fish are vertebrates and have a bony skeleton.

Fish catch and eat their prey with strong jaws. They can eat most small shore animals and they will also eat green seaweed.

Most are well camouflaged to hide from predators and sneak up on their prey.

A few fish species can survive on the shore, sheltering in rockpools, crevices and under boulders to protect themselves from the sun and from wave action; others live offshore and visit the shore at high tide to feed.

During the winter months they may move offshore.

Shanny or common blenny

- ❖ Look happy ☺
- ❖ They have no scales and can survive in the air as long as they stay damp, breathing through their skin.
- ❖ They have sharp teeth.
- ❖ They have one long dorsal fin.
- ❖ The shanny is a true rocky shore resident, they stay in the inter-tidal zone and they are active during the day.



Rock goby

- ❖ Are grumpy looking ☹
- ❖ They have two dorsal fins.
- ❖ They may be found in lower shore rockpools.
- ❖ The female lays up to 10,000 eggs in a crevice in the rocks; the male then guards them and fans them with his tail to give them a constant supply of oxygenated water!



Other fish species that may be found - Clingfish, sea scorpion, pipefish, rockling, butterfish; fry and young of various offshore species such as bass, mullet, wrasse, pollack and sandeels; sand gobies in sandy pools.

Seaweeds

There are three main groups of seaweed – reds, green and browns.

Seaweeds do not have roots. They attach themselves to the rocks by a 'holdfast' and get all the nutrition they require directly from the water.

Many are edible and are used to make toothpaste, jelly, ice-cream and other products.

Each species of seaweed has a particular tolerance to drying out, so can be found in a particular zone of the shore.

There are hundreds of different seaweed species found around our coasts.

Green seaweeds

- ❖ These are found mainly on the upper shore and in shallow pools.
- ❖ Green seaweeds can also be found where freshwater runs onto the shore.



Sea lettuce

Brown seaweeds

- ❖ These are found in all zones of the shore depending on their tolerance to drying out.
- ❖ Some species have floats or bladders to keep them in the sunlight when they are submerged.
- ❖ This group includes the largest seaweeds on the shore, the wracks and kelps.
- ❖ The holdfasts of brown seaweeds provide an important micro-habitat for many shore species.



Bladder wrack

Red seaweeds

- ❖ These are found mainly on the lower shore and in rockpools.
- ❖ They are very variable in colour and growth form, from encrusting pale pink weeds, looking like spilled paint, to fine delicate feathery forms.
- ❖ Some species contain calcium carbonate in their fronds to prevent them from being eaten, and look similar to corals.
- ❖ Many of the edible seaweeds such as dulse, laver and carragheen are reds.



Dulse