

Scientific Enquiry Materials

KS2

SEASHORE



First published in 2007

© The Centre for Research in Primary Science and Technology (CRIPSAT), University of Liverpool

ISBN 978-0-9557200-1-7

Reproduction, storage, adaptation or translation, in any form or by any means, of this publication is prohibited without prior written permission of the publisher, unless within the terms of licences issued by the Copyright Licensing Agency. Excerpts may be reproduced for the purposes of research, private study or by educational institutions solely for educational purposes, without permission, providing full acknowledgement is given.

Further copies may be ordered from CRIPSAT, 126 Mt Pleasant, University of Liverpool, L69 3GR
Tel: 0151 794 3270

Printed by Zenith Media, Cardiff, CF15 7QR

Contents

Identifying shells	4
Investigating shells	6
Beach mysteries	8
Bird video	10
Two birds feeding	12
Coast to coast	14
Cetacean sightings	16
What's in the sea?	18
Tsunami	20
Tides	22

Levels 2–5

Resources

- ▶ Enquiry Sheet – Identifying shells
- ▶ selection of real shells
- ▶ books about shells
- ▶ Internet access
- ▶ shellisland.co.uk



pupils should wash hands after handling shells

Links to skills in the Science PoS

This activity invites pupils to develop their ideas by making careful observations and comparisons. Ideas are communicated by speech, drawing and writing. Pupils plan where and how to find information and are given the opportunity to search for this information using a range of sources.

Identifying shells

Overview

This activity encourages pupils to think about and discuss what they might find on a beach. They observe, draw and describe a selection of shells and list what else they would like to know about each shell. Pupils use secondary sources to find the names of the shells and to answer their questions.

Activity

Set the context by asking pupils to think about and discuss what they have seen / found on a beach. Encourage them to think of reasons why these things might be found on a beach.

Pupils should share their ideas in a class discussion.

Give the pupils a selection of shells and ask them to think about and discuss with a partner, different ways of describing the shells.

Encourage them to observe the shells carefully so that they can accurately draw and describe each shell and to think of other things they would like to know about each shell.

The pupils could use secondary sources to find the name of each shell and the answers to their questions.

Suggested questions

On what part of a beach do you think each shell might be found?

What do you think shells are for?

How will you describe the shape (and texture) of each shell?

Do you recognise some of the shells?

How could you find out the name of the animal that lived in each shell?

What else would you like to know about each shell?

Supplementary activities

Pupils could use the information they find to make keys to help others identify shells.

Pupils could research different shells found along the coast of Wales and create a booklet, poster or podcast to provide information about some of them.

The photographs show Shell Island, Llanbedr near Harlech and some shells found there.



Look very carefully at the shells you have been given.
With your partner, think about and discuss ways of describing each of the shells.
Draw and describe each of the shells.

What else would you like to know about each shell? Make a list of questions.
Use books and the Internet to find out the name of each of the shells and the answers to your questions.

Levels 3–5**Resources**

- ▶ Enquiry Sheet – Investigating shells

**Links to skills in the Science PoS**

This activity allows pupils the opportunity to compare ideas that have been suggested to them. They consider the variables in an investigation and make comparisons and form considered opinions. Pupils make informed decisions, reflect on and justify their decisions.

Investigating shells**Overview**

This activity requires pupils to think about and discuss the advantages and disadvantages of different plans for an investigation of how many different types of shell are on the beach at Shell Island. They should put the plans in rank order starting with the best and justify this order.

Activity

Discuss and agree with the pupils, the criteria for what makes a good plan for an investigation.

Explain to them that the Enquiry Sheet contains details of five plans to investigate how many different types of shell are on the beach at Shell Island.

Ask the pupils to read each of the five plans on the Enquiry Sheet. Working in small groups, they should consider and make notes of the advantages and disadvantages of each plan.

Ask the pupils to cut out the five plans and to put them in order starting with the best plan, using the criteria agreed earlier.

Encourage groups to agree the reasons for their chosen order. Each group should then present their order of plans to the rest of the class, giving reasons for their decisions.

The whole class could decide on their preferred plan by using a rating system, voting or electronic polling.

Suggested questions

What do you think makes a good plan?

What are the advantages and disadvantages of each plan?

Which plan do you think has the least number of problems?

Have you changed your mind about some of the plans after discussing them with other pupils?

Which plan do you prefer and why do you prefer it?

Supplementary activities

Pupils could write their own plan to investigate how many different types of shells can be found on Shell Island.

Pupils could find some information about Shell Island and why so many shells are to be found on it.

Imagine that you are going to investigate how many different types of shell are on the beach at Shell Island.

Here are five plans for your investigation.



Plan 1

Count the number of each different type of shell at 5 metres, 10 metres and 15 metres from the edge of the water.

Plan 2

Collect a bucket full of shells from two different parts of the beach and count the number of different types of shell in the bucket.

Plan 3

Estimate the area of the beach and then count how many of each type of shell is in a small area.

Plan 4

Count every shell on the beach and find out how many of each different type of shell is to be found.

Plan 5

Collect a bucket full of shells from five different parts of the beach and count the number of different types of shell.

In your group, think about, discuss and make notes of the advantages and disadvantages of each plan.

Cut out the five plans and put them in order, starting with the best.

Make sure you agree the reasons for putting the plans in the order you have decided as you will need to explain your reasons to the rest of the class.

Levels 3–5

Resources

- ▶ Enquiry Sheet – Beach mysteries
 - ▶ Picture Sheet – Beach mysteries (available on the CD-ROM)
- This activity links with unit 9 – Forensic Science



Links to skills in the Science PoS

The emphasis within this activity is on pupils asking questions. They develop ideas by identifying and describing patterns. Pupils form considered opinions and reflect on these through preparing a tailored presentation.

Beach mysteries

Overview

This activity encourages pupils to think about evidence and its interpretation and to raise relevant questions through a method of enquiry called 'Quescussion'*. Pupils are required to present their interpretations of beach scenarios and to justify their ideas.

Activity

Ask groups of pupils to look at each of the six photographs on the Picture Sheet. Small groups of pupils should ask each other questions aimed at finding out more information about the scenes. Inform the pupils that they should not attempt to answer any of the questions, but that they should think of relevant and useful questions to ask and listen to other pupils' questions as well. Encourage them to discuss what they have learnt and which questions were the most useful in helping them think about the evidence in the photographs.

Explain to the pupils that the second part of this activity requires them to imagine that they are a group of scientists that has found the scenes shown in the photographs on the Picture Sheet.

Ask them to think of possible explanations for each scene and to give reasons for their ideas.

Each group should then choose a scene and prepare a presentation of their ideas. Using an audience cube** would provide variety in the style of presentations.

Suggested questions

- What can you see in the photographs?
- What do you think has happened here?
- What questions would you ask about the photograph?
- Which questions were the most useful to ask?

Supplementary activities

Pupils could find photographs of the footprints of animals using the Internet. Pupils could make print pads, using modelling clay or another suitable material to create prints similar to those made by the feet of specific animals. Pupils could use a digital camera to take their own interesting photographs that can be used for a 'quescussion' exercise.

* *Quescussion* – a questioning technique that requires pupils to ask only questions about stimulus materials. Pupils should not attempt to answer questions but try to generate as many relevant questions as possible.

** *Audience cube* – a cube that names a different audience on each face. Pupils throw the cube and the outcome determines the audience they will target. Pupils then prepare a presentation for a particular audience.

Look at the six photographs on the Picture Sheet you have been given.

- ▶ If you discovered this scene on a beach, what questions would you want to ask?
- ▶ Working in a small group, take turns to ask each other questions to find out more about the print in the photograph.
- ▶ Do not try to answer any of the questions, but ask a further question.
- ▶ Once you have asked your question, listen to the questions other pupils ask.

Imagine you are a group of scientists that has found these scenes on the beach and has to explain what has happened.

- ▶ Use the questions raised in the first activity to help you discuss your ideas with the rest of your group. Remember to give reasons for your ideas.
- ▶ Think about and discuss all the explanations you have heard. Which of the explanations do you think is best supported by the evidence?
- ▶ Choose one of the scenes in readiness to make a presentation.
- ▶ Use the audience cube to find out who the presentation is for.
- ▶ Prepare your presentation, making sure it is suitable and relevant for the audience you will be presenting it to.

Levels 3–5

Resources

- ▶ Enquiry Sheet – Bird video
- ▶ video clip 1 – avocet feeding (available on the CD-ROM)
- ▶ video clip 2 – snipe feeding (available on the CD-ROM)
- ▶ Internet access
- ▶ rspb.org.uk



Links to skills in the Science PoS

This activity requires pupils to make careful observations. They are encouraged to search for relevant information and communicate ideas in speech, drawings and writing.

Bird video

Overview

This activity invites pupils to make inferences from observing video clips of different birds feeding. They are required to use secondary sources to find out the name of one of the birds.

Activity

Show the pupils video clip 1 of a bird on a sandy beach, as many times as required.

Working in pairs, ask them to study the video carefully and to describe to each other what they think the bird is doing. They could record their ideas in rank order from most likely to least likely, using either the scale on the Enquiry Sheet or a diamond ranking grid*.

Ask the pupils to list some of the bird's features that may help them to find out the name of this type of bird and then encourage them to try and find out the name.

Ask the pupils to watch video clip 2 of a bird feeding. When they can see the bird clearly on the screen, the pupils should stop the video. In pairs, ask them to think about how close they would need to be to see the bird.

Having done this, they should view the rest of the film. They should discuss their observations of the bird feeding.

Suggested questions

- What do you think this bird is doing?
- What kind of bird do you think it might be?
- How will you find out what kind of bird it is?
- What information do you need from the video clip to help you name this type of bird?
- How will you estimate the distance to the bird?
- How can you estimate how tall the bird is and how long its beak is?
- What special features does this bird have to help it feed?

Supplementary activities

Pupils could list the different kinds of birds to be found on the coast of Wales. Pupils could make a 'bird file' containing information about one of these birds, explaining why they choose to research this particular bird.

* *Diamond ranking is a strategy that promotes discussion or reflection about the relative importance of a range of factors.*

Watch video clip 1 of a bird.

With a partner, think about and discuss what you think the bird is doing.

Put your ideas in rank order from the most likely idea to the least likely idea.

What is the bird doing?															
most likely idea	>	>	>	>	>	>	>	>	>	>	>	>	>	>	least likely idea

How could you find out whether your 'most likely idea' is correct?

List some of this bird's features that will help you identify its name.

--

With a partner, decide how you would find out what type of bird is shown in the video clip. Share your ideas with other pupils.

Use your ideas to find the name of the bird.

Start to watch video clip 2, that slowly closes in on a bird feeding. Stop the video when you can see the bird properly.

In pairs, think about and discuss the following questions.

If you had been walking towards the bird, how close would you need to be before you could see it properly?

How tall is the bird? How long is its beak?

Watch the rest of the video clip. Think about and discuss the following questions.

How do some of the bird's features help it to feed?

How is the bird feeding?

What do you think this bird is eating?

Levels 2–5

Resources

- ▶ Enquiry Sheet – Two birds feeding
- ▶ video clip 3 – teal and black tailed godwit feeding (available on the CD-ROM)
- ▶ Internet access
- ▶ rspb.org.uk



Links to skills in the Science PoS

This activity gives pupils the chance to make careful observations and comparisons. They are required to search for relevant information and communicate ideas in speech, drawings and writing.

Two birds feeding

Overview

This activity encourages pupils to observe and discuss a video clip showing two different kinds (species) of bird feeding. They record comparisons of how the birds feed, how they use their beaks and the shape of their feet.

Activity

Ask the pupils to watch video clip 3 showing two different kinds of bird feeding. In pairs, ask the pupils to compare the ways in which the two kinds of bird feed. Encourage them to think about and discuss what is similar and what is different about the ways the two birds feed.

Pupils can record their ideas on the Enquiry Sheet.

Ask the pupils to make drawings to compare how the birds use their different shaped beaks to catch their food. They should then find out about the shape of the feet of each kind of bird and use the information they find to write a description of how each bird uses its feet when it feeds.

Pupils should be given the opportunity to watch the video clip as many times as they feel is necessary.

Suggested questions

What is similar about the ways both birds feed?

What is different about the ways both birds feed?

What special features do these birds have to help them feed?

Describe the shape of the beak of each kind of bird.

What have you found out about the shape of the feet of each kind of bird?

Supplementary activities

Pupils could make comparisons with other kinds of birds that feed in another environment, e.g. sparrow and thrush.

Watch video clip 3 of two kinds of birds feeding. One kind (species) of bird is called a Black Tailed Godwit. The other kind is called a Teal.

In pairs, compare the ways in which the two kinds of bird feed.

Discuss how they are the same and how they are different.

what is the same about how they feed?	what is different about how they feed?

Make drawings to compare how the birds use their differently shaped beaks to collect their food.

beak of a Teal	beak of a Black Tailed Godwit

Find out about the shape of the feet of each kind of bird.

Draw and write a description of how each bird uses its feet when it feeds.

feet of a Teal	feet of a Black Tailed Godwit

Levels 3–5

Resources

- ▶ Enquiry sheet – Coast to coast
 - ▶ Internet access
 - ▶ ccw.gov.uk
- This activity links with unit 7 – Climate Change



Links to skills in the Science PoS

Pupils are given the chance to use prior knowledge to develop their ideas. They plan where and how to find relevant information and ideas from a range of sources and reflect on these by presenting them in writing and drawings.

Coast to coast

Overview

This activity requires pupils to choose a stretch of the Welsh coastline they are familiar with. They find information about the stretch of coastline and plan a brochure describing features of scientific and environmental interest.

Activity

Inform the pupils that Wales has nearly 750 miles of varied coastline.

Ask them to choose a stretch of Welsh coastline they are familiar with and to plan a brochure that will describe what they know about this coastline, using drawings and writing. They might use secondary sources to gather information. They could record their work on the Enquiry Sheet.

They should plan a brochure or video that aims to encourage other pupils to visit that stretch of coastline with their family. Encourage the pupils to compare the different brochures produced to find out if all the coastline of Wales is similar or whether it is variable.

Suggested questions

What does the stretch of coastline you have chosen look like?

Is this coastline rocky or sandy?

What colour is the sand?

Do you think the sand is the same colour all over Wales?

Why do you think the sand is that colour?

What animals, plants, etc. are found on this stretch of coastline?

Why is it suited to those animals or plants?

Why do you think people live / do not live on that stretch of coastline?

Supplementary activities

Pupils could contact the nearest coast guard to see what checks on sea water are made every day and to find out information about their work.

Pupils could visit a stretch of coastline and observe some of the details they have recorded.

Pupils could find out about conservation work taking place along stretches of the Welsh coastline.

Pupils could find out about the signs used to designate bathing areas as safe for bathing.

Ordnance survey and GPS references for favoured bathing areas could be defined.

Choose a stretch of the coastline of Wales that you are familiar with.
Use drawings and writing to plan your brochure.

Levels 4–5

Resources

- ▶ Enquiry sheet – Cetacean sightings
- ▶ Internet access
- ▶ wdcs.org



Links to skills in the Science PoS

This activity invites pupils to find relevant information and ideas. They develop their ideas by identifying and describing trends and patterns in data and forming considered opinions. An emphasis is placed on reflecting on information and interpreting and communicating this information through discussion.

Cetacean sightings

Overview

This activity requires pupils to consider and interpret information about cetacean sightings off the coastline of Wales. The information is presented to the pupils on the Enquiry Sheet in the form of a table, a bar chart and a map.

Activity

Ask the pupils to study the table on the Enquiry Sheet and to think about and discuss the information shown. Encourage pupils to think about what the word 'cetacean' (pronounced 'setayshun') means and to find out the meaning of the word. They could also be asked to consider and find out why some cetaceans appear to be solitary while others belong to larger groups.

Refer the pupils to the bar chart on the Enquiry Sheet and ask them to think about and discuss any patterns they might see and what conclusions they can draw from the information in the bar chart. Encourage pupils to share their ideas especially about the apparent drop in sightings in more recent years.

Finally, ask the pupils to look at the map on the Enquiry sheet and to think about and discuss the information shown. Encourage them to consider where in Wales would be the best place to see cetaceans. Pupils could also research their ideas to try and validate them.

Suggested questions

- Have you ever seen a whale or a dolphin?
- What do you think the table is telling you?
- How would you describe the main features of a cetacean?
- Why do you think some cetaceans swim in large groups while others seem to swim alone?
- What information is shown on the bar chart?
- What patterns can you see on the map? How would you explain these patterns?
- Where in Wales would you go to see cetaceans? Why do you think there are so many cetaceans seen in this area?

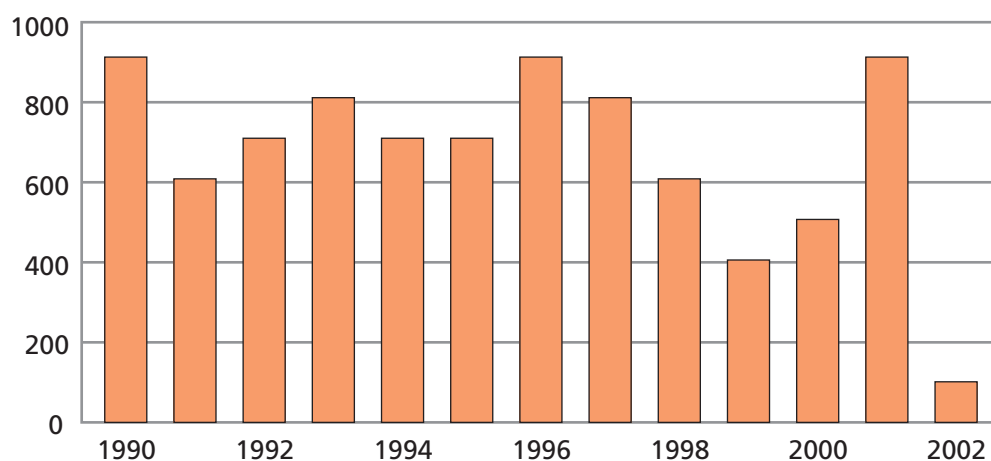
Supplementary activities

Pupils could research other records kept of animal sightings around Wales. Pupils could contact agencies involved in keeping records of cetacean / other living things to find out more about their work.

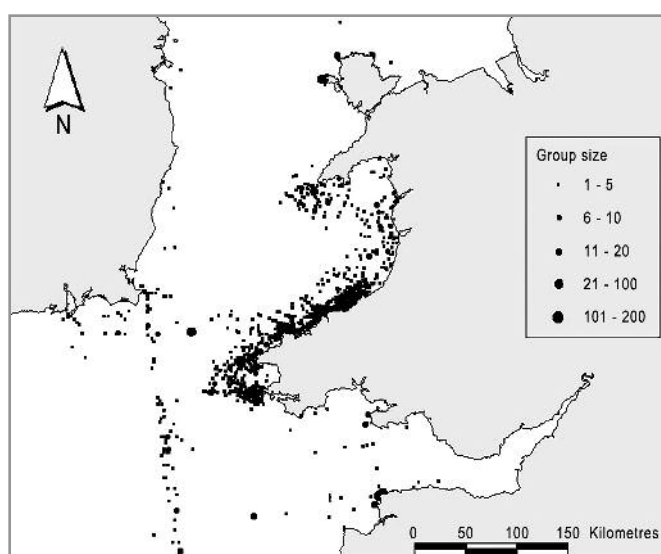
Table showing
Cetacean sightings,
reported from
Wales from
1990 – 2002

Species	Number of sightings	Total number of individuals	Mean group size
Harbour porpoise	5381	25975	5
Bottlenose dolphin	2830	15245	5
Common dolphin	418	6551	16
Risso's dolphin	142	756	5
Minke whale	25	29	1
Killer whale	6	10	2
Fin whale	6	9	2
Pilot whale	3	44	15
Striped dolphin	3	8	3
White sided dolphin	2	60	30
Northern bottlenose whale	2	3	2
Unidentified dolphin	208	939	5
Unidentified large whale	39	93	2
Unidentified cetacean	30	43	1

Bar chart
showing Cetacean
sightings, reported
from Wales from
1990 – 2002



Map showing
Cetacean sightings,
reported from
Wales from
1990 – 2002



Levels 3–5**Resources**

- ▶ Enquiry Sheet – What's in the sea?
- ▶ Internet access
- ▶ books about sea life

**Links to skills in the Science PoS**

This activity offers pupils the prospect of searching for, accessing and selecting relevant scientific information. They communicate their work clearly by speech, writing, drawings and diagrams.

What's in the sea?**Overview**

This activity encourages pupils to consider living things in the sea around the coastline of Wales and to record their ideas. They find more information about one of the things that lives in the sea and present the information as an animation or poster.

Activity

Tell the pupils that in 2005, people in Pembrokeshire were really surprised to see a pod of over 2000 common dolphins in the sea. Ask the pupils to draw and write about some of the living things that can be found in the sea off Wales. Encourage them to draw animals and plants on the Enquiry Sheet.

Ask the pupils to find out how some of the animals and plants they have thought of, live under the sea. Encourage them to find out where in the sea the animals live and whether they live there all year round or whether they move around the world. They should find out about the conditions at different depths of the sea. Ask the pupils to make an animation or poster story of the life of an animal or plant under the sea.

Ask them to explain why the living thing they have chosen is of interest to them.

Suggested questions

What living things have you drawn?

What do these animals and plants need in order to live in the sea?

How do they breathe?

Do these animals always live in the sea off Wales?

Where else in the world are these animals found?

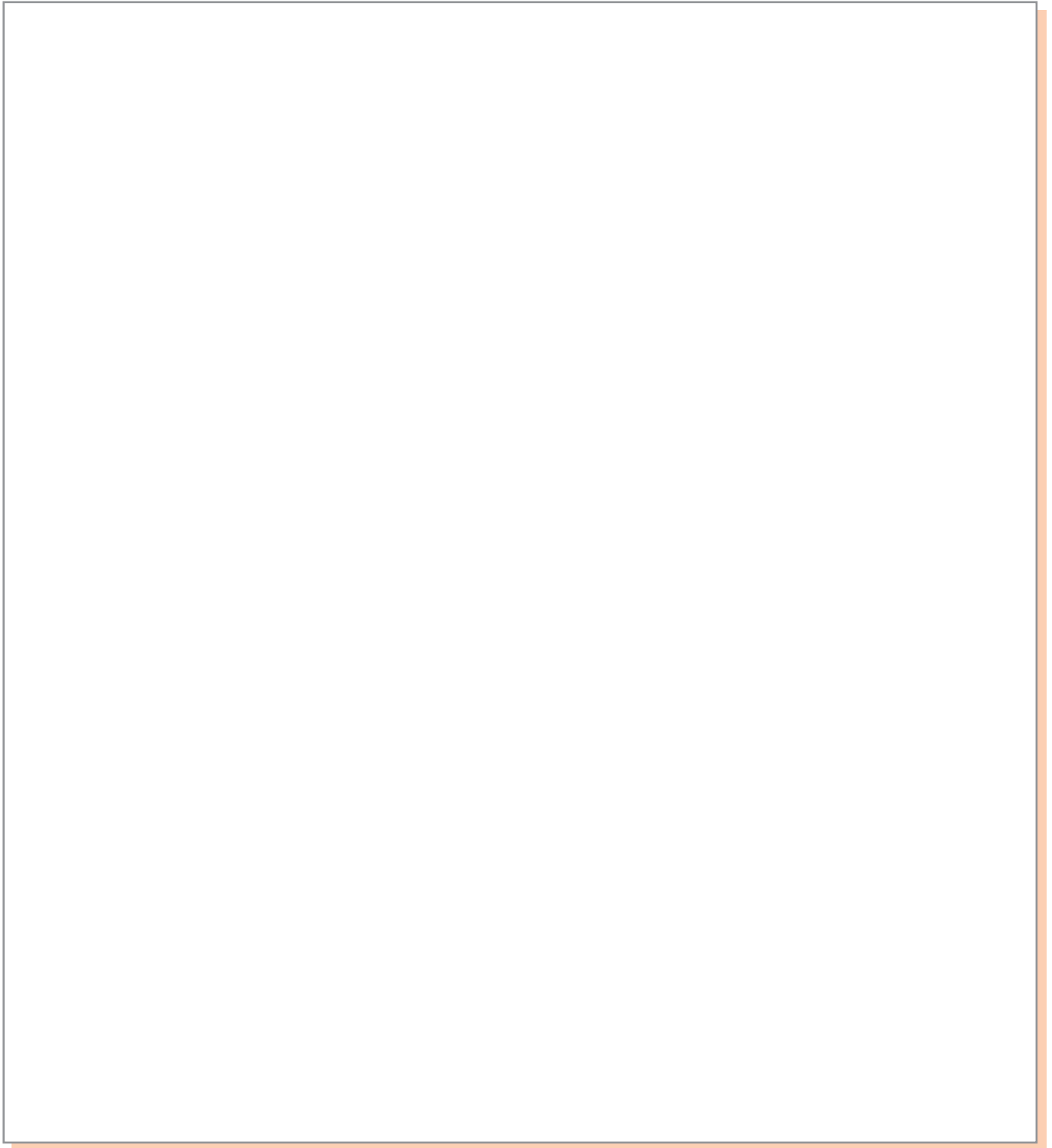
How does the temperature of the sea change with depth?

Which animals live close together?

Supplementary activities

Pupils could describe some predator and prey relationships between things that live in the sea. They could also draw marine food chains.

Draw and write about some of the living things that can be found in the sea off Wales.

A large, empty rectangular box with a thin black border, intended for a child to draw and write about living things found in the sea off Wales. The box is positioned centrally on the page and has a light orange shadow on its right and bottom edges.

Choose one of the living things you have drawn and make an animation or poster story about its life under the sea.

Why does this living thing interest you?

Levels 4–5**Resources**

- ▶ Enquiry Sheet – Tsunami
- ▶ Information Sheet – Tsunami
(available on the CD-ROM)

**Links to skills in the Science PoS**

This activity gives pupils the opportunity to decide where and how to find information and to consider how evidence might be interpreted differently. Emphasis is placed on reflection, with pupils considering their own learning and how it might link to their role as citizens outside school.

Tsunami**Overview**

This activity requires pupils to read and interpret a newspaper report about a tsunami. They find out more information about tsunamis and present their findings to the class.

Activity

Ask pupils, working in groups, to read the report on the Information Sheet. It provides a report of a child who saved people on a beach in Thailand at the time of the Tsunami in 2004. She used the information she had learnt in school to interpret the changes in the sea.

The Enquiry Sheet requires pupils to consider the different ways the evidence of changes in the sea was interpreted. They will need to consider the different factors that affect whether or not people are persuaded by an interpretation of the evidence.

The pupils are also asked to predict the effect of a tsunami on the environment.

Suggested questions

What change in the sea was evidence for a tsunami?

What effects do you think a tsunami might have on the seaside, plants, animals and people, close to where it struck?

Supplementary activities

Pupils could research any disasters that have affected the coastline of Wales.

Pupils could carry out their own research into an aspect of tsunamis that has caught their interest.

Pupils could think of interesting ways to present their findings to the class such as an ebook, a podcast or a poster presentation.

A tsunami is a giant wave of sea water.
What key sign was evidence of a tsunami?

Describe how the child and her mum interpreted this evidence.

Tilly thought:	Tilly's mum thought:

Discuss why you think it was difficult for the child to persuade other people that there was going to be a tsunami.

Predict what effect a tsunami might have on the people, animals, plants and seaside close to where it struck:

the seaside	different kinds of plant	all the animals and people

Levels 4–5

Resources

- ▶ Enquiry Sheet – Tides
- ▶ Internet access
- ▶ bbc.co.uk (provides tidal information – follow the weather and coast links)



Links to skills in the Science PoS

Pupils are given the chance to make comparisons and identify and describe patterns in data. They reflect on their ideas by drawing conclusions and communicate them by speech.

Tides

Overview

This activity requires pupils to think about, discuss and consider patterns in data presented in a table showing phases of the Moon and the height of tides. They are required to use a graph of tide height to draw conclusions and to justify their conclusions in a group discussion.

Activity

Firstly, ask the pupils to share all they know about tides. Where do they think they happen, how often do they think they happen and why do they think they happen? Tell the pupils that the table on the Enquiry Sheet shows the height of the tides at Aberystwyth on some dates in 2007. It also shows the phase of the moon on these dates.

Pupils should discuss in pairs, any relationships they observe between the phases of the moon and the differences in the height of the tides.

Then, ask pupils to look at the graph of tides at Aberystwyth in January 2007. Invite pupils to draw as many conclusions as they can from the graph. It is important that pupils reflect on their conclusions and decide whether they are really supported by the data in the graph or not. They can change their mind about a conclusion as they reflect on the data available. Groups could present their conclusions to the class. They should be prepared to defend their conclusions by referring to the data.

Suggested questions

- Can you describe how the range in the height of tides changes?
- Can you link the change in height of tides to the changes in the moon?
- Can you tell the story of the graph to your partner?
- What do you notice about the pattern in the graph?
- Do you think this pattern would go on and on for ever?
- What do you look at to make sense of the graph?
- What conclusions can you draw from the data in the graph?

Supplementary activities

Pupils could describe how they think the height of the tide is measured and find out which of their ideas is correct.

Pupils could use the Internet to find out why the tides change during the day and over a month.

Pupils could decide what other type of data would produce a graph with a pattern similar to this?

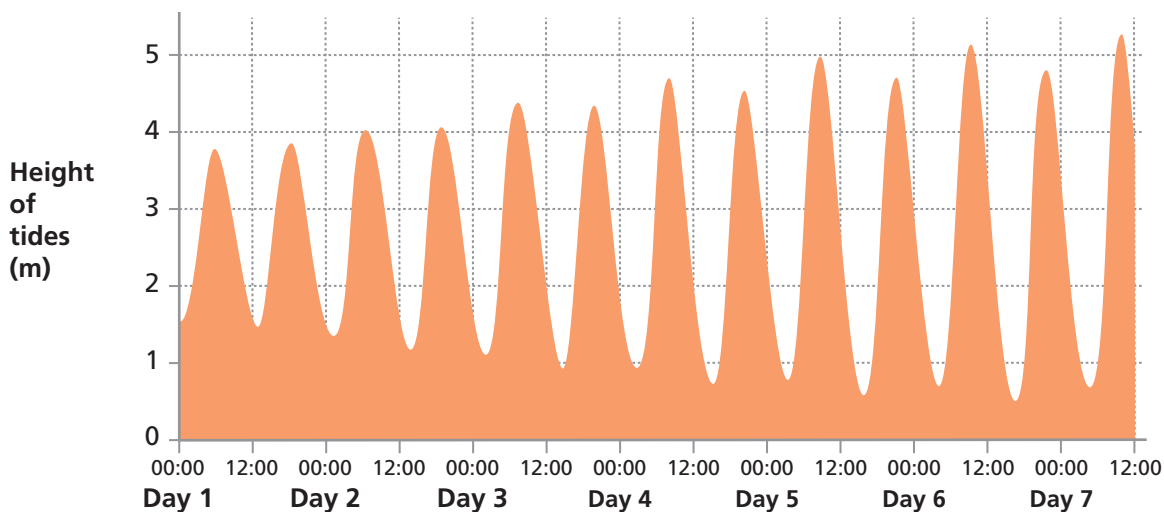
The table shows the morning tides at Aberystwyth on some dates in 2007. It also shows the phase of the Moon on those dates.

Discuss in pairs, any patterns you can find between the phases of the Moon and the difference in the height of the tides.

Timetable for tides at Aberystwyth Wales 2007.

2007	phase of the Moon		high water, in m	low water, in m	difference in height, in m
Jan 19	new Moon		4.8	0.9	3.9
Jan 26	first quarter Moon		4.2	1.3	2.9
Feb 2	full Moon		5.0	1.1	3.9
Feb 10	last quarter Moon		3.7	1.8	1.9
Feb 17	new Moon		5.7	0.8	4.3
Feb 24	first quarter Moon		4.2	1.4	2.8
Mar 3	full Moon		5.0	1.0	4.0
Mar 12	last quarter Moon		3.6	1.9	1.7

The graph shows the height of the tides at Aberystwyth for one week.



Draw as many conclusions as you can from the graph. Share your ideas with the rest of your group. Be prepared to defend your group's conclusions in a class discussion.

Produced by
The Centre for Research in Primary
Science & Technology (CRIPSAT),
The University of Liverpool

Sponsored by the Welsh Assembly
Government

Authors:
Terry Russell
Linda McGuigan
Dewi Roberts
Mark Thomas