Exploring Rock Pools – Lesson Plan

Module 4
This lesson plan is based on using the Dr Forsey Outdoor Education Pond Dipping Kit – but you can use your own materials if this is not available.

The equipment found in the Pond Dipping kit can also be used to explore Rock Pools and discover the plants and animals living along a rocky shore. This lesson plan will show you how. The Rock Pool activity can be carried out by a class of school children led by a teacher. It is suitable for use by primary pupils.

### Exploring Rock Pools Equipment

<table>
<thead>
<tr>
<th>Item</th>
<th>Item name</th>
<th>Number</th>
<th>For class of 30</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pond Net</td>
<td>1 between 3</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Observation Tray</td>
<td>1 between 3</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Plastic Spoon</td>
<td>1 each</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Observation Dish</td>
<td>1 each</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Magnifying Glass</td>
<td>2 between 3</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>ID Guide</td>
<td>1 between 3 plus 1 for teacher</td>
<td>11</td>
<td>Can be downloaded free at <a href="http://www.drforsey.com">www.drforsey.com</a>. Print and laminate before use or download on to all class tablets/iPads.</td>
</tr>
<tr>
<td>7</td>
<td>Universal Tube with lid</td>
<td>1 between 2</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>SmartCase</td>
<td>1 between 6</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>A rocky shore with plenty of safe, accessible rock pools</td>
<td>-</td>
<td>1</td>
<td>Can be downloaded free at <a href="http://www.drforsey.com">www.drforsey.com</a>. Review with students prior to undertaking a beach trip.</td>
</tr>
<tr>
<td>10</td>
<td>Seashore Code</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Exploring Rock Pools Primary National Curriculum Links

- KS1 Working scientifically
- Year 1 Animals, including humans
- Year 2 Living things and their habitats
- Year 2 Animals, including humans
- Lower KS2 Working scientifically
- Year 3 Animals, including humans
- Year 4 Living things and their habitats
- Year 4 Animals, including humans
- Upper KS2 Working scientifically
- Year 5 Living things and their habitats
- Year 6 Living things and their habitats
- Year 6 Evolution and inheritance.

Seashore Safety

Always note the tide times, check the weather conditions, carry out a preliminary site visit and conduct a site specific risk assessment prior to any coastal field trip. Always go rock pooling on a falling tide, 1-2 hours before low tide is best.

A copy of the Wildlife Trust’s Coastline Code can be found at the end of this lesson plan and is a nice colouring activity prior to any beach visit. RNLI has a selection of free to download activity sheets and lesson plans on beach signs and dangers. [http://rnli.org/safetyandeducation/teachersandyouthleaders/resources/downloadresources/Pages/respect-the-water.aspx]
Can be carried out within a 1 hour lesson (excluding preparation)

**Preparation**

- Well in advance of your trip, print and laminate the free to download Wildlife Watch Rockpool Detective, Shoreline Detective and Seabird spotter sheets from www.drforsey.com or select or design a recording sheet (examples shown at the end of this guide) suitable for the age and ability of your pupils.
- Depending on how often you are able to visit the beach, you could expand the activity to investigate the effect of time of year/seasonal change, depth of sample or temperature of the water on the species found, or do a comparison of the species found in two different rock pools.
- Ideally, the students should be familiar with the kit and techniques and have carried out pond dipping activities previously. Many of the techniques used are similar to those needed for exploring rock pools.
- Students should be introduced to the Seashore Code.
- Split the students into groups of three, two groups of three (totalling six students) share one SmartCase and should work on adjacent rock pools.

- Choose a rock pool that is easy to access/observe by all students for your demonstration. On the edge of the rocky area is good if the site allows as the students can stand on the beach while you stand on the rocks to demonstrate.
- When the students arrive at their rock pool, carrying their SmartCases and nets, they should place the nets next to the observation trays along with the observation dishes, plastic spoons and ID guide. If it is windy then keep the lids closed to prevent the ID guides from blowing away.
- Stand between the students and the rock pool.

**Introduction and Demonstration (10 minutes)**

Recall the Coastline Code. Set your working boundaries with football cones or other markers, agree a muster point and ensure all students know what to do if they get into any difficulty.

Explain that they are going to explore the rock pools and identify the plants and animals living in them. Ask them these questions while on the beach or as part of your classroom work ahead of your outdoor session.
What is a habitat?
The place where an animal lives is known as a habitat, and different sorts of animals live in different habitats. Habitats can be very big, like the arctic habitats where polar bears live, or very small such as between two blades of grass where a money spider might make its web. Remember, a habitat is just the place where the animal lives. Your house is your habitat! The rock pool is a habitat.

The rock pools will be a habitat for many creatures. Can you think what we might find?
Allow time for answers and then introduce the students to the identification guides/spotter sheets.

Older/higher ability students might consider how are these creatures are adapted to life in the rock pool? How do the conditions in the rock pool change over a day?
Gills, being happy living in salt water, the ability to move between rock pools or survive if the pool dries up completely, the ability to defend your space in the rock pool and compete for food are all examples of adaptations to life in the rock pool. A great set of BBC video clips on the secret life of rock pools looks at adaptations for rock pool survival [www.bbc.co.uk/programmes/b01rtdr4/clips]

Teacher Demonstration
- Approach the edge of a rock pool and run through the method;
- Scoop some water up into your observation tray, a few centimetres is sufficient, and place it well away from the rock pool edge. There should be plenty of room to work and move around the edge without knocking into the tray or other equipment.
- It is best to kneel, sit or crouch down safely and use your hands to collect creatures from the rock pool. If you do need to use the nets you must be careful not to damage to rock pool environment.
- Demonstrate how to dip with the nets and describe how they must stand sideways on to the rock pool with their knees bent or kneel down next to the rock pool. Without moving closer to the rock pool, ask all the children to stand sideways on and bend their knees to practice the position. Don’t stand straight on to the rock pool, it is easier to lose balance and slip in this position
- Dip the net just below the surface and avoid the rocks and sand at the bottom. Explain that if they get lots of sand by accident they should put it straight back in the rock pool and not put it in their observation trays as they wouldn’t be able to see any creatures and neither will the other students in their group. It is important not to put the net in too deep.
- Move the net in sweeps around the rock pool ‘jiggling’ it gently past seaweed (many creatures like to hide here), while describing to the students what you are doing. Explain to the students that the creatures are not usually swimming out in the open water in the middle of the pool so there is no need to lean out over the water.
- Explain to the students not to remove the net from the water and spend time looking into it as any creatures in there may suffer from being out of the water. They should move the net away from the pool and promptly to an observation tray.
- Empty your net out carefully by turning it inside out into the observation tray and put your net down. Tell the students they must now allow the water to go still, so moving creatures will be easy to spot.
- If you find anything, scoop some water into one of the observation dishes and transfer the creature to the dish using the plastic spoon. Do this gently, don’t tip the creatures in from height in a ‘kamikaze dive’ as it may harm them.
- Demonstrate the use of the ID guides or spotter sheets.
- Tell them that any creatures they find should be identified and then recorded. Show them a data sheet or tick card and if necessary describe what they should write on it.
- Optional - once identified, the creatures in the observation dishes could be emptied into a class/communal observation tray for reference by the teacher later.
- Tell the students that they should not put their hands in their mouths during this activity.
- If it is windy, they should leave the ID guides under the corner of the observation trays or in a closed SmartCase so they don’t blow away.

Activity (~30 minutes)
- Select rock pools for the students that are shallow and have a clearly visible bottom. The students should not stand in the rock pools but they must be able to do so safely if they slip.
- Working in groups of three to an observation tray, the students should show you the ‘sideways on knees bent’ position once more. They can take it in turns to approach the pond and do a sweep/jiggle with the net, once they have emptied the net into the tray the next student can take the net and repeat the process. The first student can start looking in the tray and separating and identifying the creatures while the other dips. Repeat again for the third student. They can also use their hands to collect creatures.
- While the students are exploring, always stand facing them and the sea, i.e. never crouch down with your back to the water while looking into an observation tray. Move between the groups, checking on them as necessary. They should not be dipping for a second time until all the creatures in their trays have been separated and identified. Approximately 80% of their time will be spent at the observation tray and only 20% by the rock pool.
- Help to identify any creatures they find by encouraging them to find it on the ID guide themselves. They should complete their recording sheet (select recording method appropriate to the age and ability of the students) as they go along. If you are using a class observation tray, once the creatures are identified and recorded, they can transfer their creatures to the class observation tray.
After 20-30 minutes of work, ask the students to ensure their nets are clean and not full of sand or seaweed. They should complete their final separation, ID and recording before carefully emptying their separation dishes back into their observation trays and placing their equipment back into their SmartCase.

The observation trays should be lowered into the rock pools and the contents allowed to ‘swim’ gently back into the rock pool with as little disturbance as possible.

Students should collect a small sample of rock pool water in the lidded tubes to take back to the classroom if you wish to carry out the follow up activity looking for microscopic sea life. Supervise them carefully while they do this. To increase your chances of collecting some plankton and other microorganisms, squeeze the water from seaweed into the tube or gently scrape the green or brown growth from the seaweed.

Review (~10 minutes)

If you have used one, gather the children around the class observation tray in a large circle on a flat area of the beach (use the end of one net to draw a circle in the sand to stop the children crowding in). Look at any interesting finds or good examples and test their identification skills/recollection, ask then if they can say how each creature is adapted to life in the rock pool.

Finally, empty the class observation try back into the pond carefully (you might want to take a picture of it first).

Microscopic rock pool life

To observe rock pool creatures often found at the bottom of the food chain and too small to see with the naked eye, take the samples of sea water collected at the end of the activity and allow them to settle. Using your own microscopy equipment (not provided in kit) use a plastic dropper to collect a small amount from the bottom of the tube and place it into the centre of a welled slide, add a cover slip and place under a microscope. Look out for algae, zooplankton (microscopic animal life) and phytoplankton (microscopic plant life). [www.lifeadrift.info/media/1821/zooplankton_holoplankton_sheet.pdf], [www.lifeadrift.info/media/4303/phytoplankton_sheet.pdf]

Hypothosis

For older students, this is a great opportunity to carry out an investigation and work scientifically. One potential hypothesis is: A shallow pool on the upper shore will have less life than a deeper pool on the middle or lower shore. Can your students think of any other hypotheses to test?

Suggested Follow Up Activities

Food chains/web

Initiate further discussions about rock pool food chains/webs now or as a follow up in a later lesson [ypte.org.uk/factsheets/seashore/rocky-shore-food-web]. Students could research what the residents eat, and what they are eaten by, identifying which creatures are carnivores, herbivores and omnivores. There is a Beachy Food Chains game by Scottish Natural Heritage you could play on the beach or back in your school grounds available to download [www.snh.gov.uk/docs/B902615.pdf] from [www.drforsley.com]

Life cycles

Hermit crab, limpet and herring gull lifecycles could be further explored depending on which of these animals you find in and around your rock pool. [sites.google.com/site/projecthermies/project-hermies/the-anatomy-and-lifecycle-of-the-hermit-crab/thelifecycleofthehermitcrab]

Make your own hermit crab shell

Hermit crabs usually live in the empty shells of dead snails. Sometimes they even fight another hermit crab and take their shell and swap between shells as they grow [www.youtube.com/watch?v=cVQGSM1cABI]. Hermit crabs have been found living in other, rather strange, homes if they can’t find a nice shell. Could you make or find something that could be a good home for a hermit crab? [www.bing.com/images/search?q=hermit+crab+funny+pictures&qpvt=hermit+crab+funny+pictures&FORM=IGRE]
Example ID recording sheet – you could create your own to obtain the data you need for post-activity analysis and development of specific numeracy skills or for follow up work on adaptation Students.

### Rock Pool Tick Card Younger Students

<table>
<thead>
<tr>
<th>Your Name(s): ___________________________</th>
<th>Date: ______________________</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Seaweed</td>
<td>□ Shrimp</td>
</tr>
<tr>
<td>□ Limpets</td>
<td>□ Crab</td>
</tr>
<tr>
<td>□ Mussels</td>
<td>□ Sea Anemone</td>
</tr>
<tr>
<td>□ Starfish</td>
<td>□ Others…</td>
</tr>
</tbody>
</table>

### Rock Pool Tick Card Older Students

<table>
<thead>
<tr>
<th>Your Name(s): ___________________________</th>
<th>Date: ______________________</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Species</th>
<th>Tally</th>
<th>Interesting Features</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seaweed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shrimp</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limpet</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Crab</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mussel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sea Anemone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Starfish</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hermit Crab</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sea Urchin</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Jellyfish</td>
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<td></td>
<td></td>
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<tr>
<td>Barnacles</td>
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<td></td>
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<tr>
<td>Shell</td>
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<td></td>
</tr>
<tr>
<td>Starfish</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Coastline Code

## Additional information

**Shoreline detective**

<table>
<thead>
<tr>
<th>Starfish</th>
<th>Mermaid's purse</th>
<th>Cockle shell</th>
<th>By the-wind sailor</th>
<th>Razor shell</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cuttlefish bone</td>
<td>Jellyfish</td>
<td>Whelk eggs</td>
<td>Whelk shell</td>
<td>Gull feather</td>
</tr>
</tbody>
</table>

Starfish and whelk shell by Amy Lewis / Mermaid's purse and Jellyfish by Paul Naylor / Cockle shell, By-the-wind-sailor and Razor shell by Sion Roberts / Cuttlefish bone by aSIMULAtor - flickr / Whelk eggs by guzzar - flickr / Gull feather by Nico1edeB - flickr
Seabird spotter

Herring gull  Puffin  Fulmar  Gannet  Cormorant
Common tern  Black-backed gull  Common guillemot  Razorbill  Kittiwake

Credits: Herring gull and Razorbill (c) Gillian Day  Puffin (c) Neil Aldridge  Fulmar and Common tern (c) Amy Lewis  Gannet (c) Tam Marshall  Cormorant (c) Zuzanna Bird  Black-backed gull and Common guillemot (c) Lynne Newton  Kittiwake (c) northeastwildlife.co.uk
This activity shows how beach animals and algae (plankton and seaweed) depend on each other. Children can also imagine the exciting ways that life changes when the beach is underwater.

Background for group leaders

1. Beach food chains begin with seaweed, phytoplankton (tiny plant-like organisms in the sea and sand), and particles of decaying matter.

2. Small animals filter plankton or these organic particles out of the sea or sand. For example lugworms sieve edible scraps out of the sand and when the tide comes in barnacles wave feathery legs to catch passing plankton. Other creatures, including limpets, sea urchins and winkles, have strong rasping teeth or tongues which they use to scrape up small seaweed.

3. Crabs, whelks, lobsters, and most fish are carnivores or scavengers. They use drills, strong teeth or crushing claws to break the shells of mussels and limpets. Starfish also eat prey with shells but they have a different eating style. They grip shellfish, such as cockles, until the cockle tires and opens its shell a fraction. Then the starfish slips its stomach into the cockle’s shell and dissolve the poor creature alive!

4. Larger carnivores such as otters, seals, birds, salmon and halibut do not live on the beach but visit it for a feast. They are well adapted for this, for instance the long beaks of oyster catchers are perfect for picking buried cockles.

Beaches are many worlds in one. Most animals are active at high tide and many feed only at night by smelling out their prey. (We can get a glimpse of what life is like underwater by looking into a fresh rock pool.) When the tide is out most animals hide - but shorebirds and humans flock to the beach.

Another whacky world exists beneath the sand. Here lugworms, bivalves, (animals with two shells such as razor shells and cockles), crabs and sometimes weaver fish are buried.

The two games described here should get children running around and thinking about how wildlife interacts. Simple food chains (e.g. seaweed-limpet-crab-seagull) are introduced using games and then the more advanced idea of food webs is discussed. Game 1 should suit children of all ages; Game 2 is aimed at upper primary children.

Preparation

The labels (page 4) should be printed, cut out and possibly laminated. Children could do some research into food webs but this is not essential. Prior to the trip you could identify a safe rock pool for children to examine.

You will need

Four cones or other markers to mark out a pitch for Game 1; a set of labels (page 4). Copies of instructions and the labels sheet to show the correct order for food chains (pages 2-4).

Fun follow-up and Links

Children could draw pictures of the seaweed and animals they saw at the beach and link them to create a food web display. Alternatively, they could make pictures of different worlds at the beach, tide in, tide out, or life above and below the sand.
Let’s start, instructions for the beach

Instructions for group leaders

If a safe rock pool is at hand show children differences between creatures that are in and out of the water. Anemones might be open in the water where they use their sticky tentacles to trap fish and shrimps. Winkles should be moving about and feeding on algae; sometimes you can see their trails. If you gently disturb a rock or seaweed you might also see small shrimps or fish moving around, they are very shy because big fish love to eat them. Tell children this is what all rocky areas are like when the tide is in and to imagine how much food there is for visiting fish.

Food web facts for children

Like us many these creatures visit the beach but do not live there. See if they can think of some? Cod, otters, herons and salmon. In this way beaches are very important for sea and land animals, a bit like cafes or restaurants where they can go to fill up with food.

Cool biologists wanted to find out what was eating limpets. So they made pretend limpets from soft wax (a bit like play dough), painted them to look exactly like limpets and stuck them to rocks. They left them overnight and then examined the marks they found in the wax. They got a surprise; can you guess what had left tooth marks in their limpets? Rats! There were also sharp claw marks from crabs.

Game 1 - Tide in ~ Tide out!

Maximum activity duration: 30 minutes

Mark out a large pitch (say 20m square) using cones or flags. Children should stay in this area. Split children into three teams: Seaweed, Winkles, Butterfish (these are long slippery fish that live in rock pools). Each team should draw a home circle.

- Start the game by shouting “Tide In”, children should run around constantly whispering the name of their team. They aim to tag as many opponents as possible and take them back to their home base. Seaweed can tangle butterfish, winkles can eat seaweed and butterfish can eat winkles. (No one can be caught when they are transporting their prey back to base.)

- To end the game shout “Tide Out” everyone should stop still and the team that has captured the most opponents wins a point.

- Now repeat the game with the tide out. First ask children what might be different? Of course fish will not be hunting when the tide is in. So for the next round butterfish should change into Seagulls.

For younger children you could now ask the three teams to act out a video clip of when the tide is in. Most things will be moving and eating and the seaweed will be swaying. On your shout they should change to a tide-out video. The animals will be hiding under seaweed and only birds will be moving around. The team with the best scene wins.
**Game 2 - Making chains**

The labels on page three are arranged in food chains and coloured differently for five teams. The object of this game is to encourage children to make food chains and see what happens if links in the chain are removed.

1. Mix up the labels and give one to each child. If there are less than 20 children a chain can be left out and top levels of one chain can also be removed as necessary. Children should look at their label and listen to the following information carefully as the first team to make their food chain correctly will win points.

- All the food chains start with seaweed, small seaweed or dead seaweed. Seaweed doesn’t eat anything. It makes food by catching sunlight.
- Winkles and limpets live in shells. They have sharp tongues with razor blades for eating seaweed.
- Crabs and lobsters have massive claws for crushing shells and eating what’s inside.
- Sand hoppers are the jumpy creatures you find under rocks and seaweed! They feast on smelly rotting seaweed. Fish love to eat them.

When you signal children should find the other people in their team colour and hold hands to make their food chain in the right order.

2. When children are in the right order ask them to remain in their chains but stand close together. Consider the following:

   **What do humans like to eat?** Ask children with appropriate cards to sit down (answer: there is one in each group, winkles, crabs, salmon, cod, lobsters). What would happen if we were very greedy and ate all of these things? Which other animals would disappear? You could think of other impacts such as an oil spill killing the seaweed or a disease killing seals.

   In real life food chains link to form food webs. To show how this happens tell children they can move but must keep holding hands in their chains. They should touch feet to represent links between chains and people touching feet must stay still. Call: “dead seaweed and seaweed feet together, humans and salmon feet together, seals and lobsters feet together, winkles and cod feet together”. They should end up with a big tangle to show how complicated webs can get!

**To discuss**

Can you think of other ways that creatures depend on each other?

Hermit crabs live in the shells of big whelks or even bottle tops. Tiny crabs called pea crabs live inside mussel shells and steal bits of food from mussels. Humans use seaweed to help their vegetables grow.

Tall seaweed called kelp is like an oak tree of the sea. Hundreds of little creatures make their homes in the bottom of kelp. If you have time you could look for some kelp on the beach and examine it.

<table>
<thead>
<tr>
<th>Seaweed (TEAM RED)</th>
<th>Winkle (TEAM RED)</th>
<th>Butterfish (TEAM RED)</th>
<th>Otter (TEAM RED)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Seaweed (TEAM GREEN)</td>
<td>Limpet (TEAM GREEN)</td>
<td>Crab (TEAM GREEN)</td>
<td>Seagull (TEAM GREEN)</td>
</tr>
<tr>
<td>Dead Seaweed (TEAM BLUE)</td>
<td>Sand-hopper (TEAM BLUE)</td>
<td>Salmon (TEAM BLUE)</td>
<td>Heron (TEAM BLUE)</td>
</tr>
<tr>
<td>Dead Seaweed (TEAM YELLOW)</td>
<td>Sand-hopper (TEAM YELLOW)</td>
<td>Cod (TEAM YELLOW)</td>
<td>Seal (TEAM YELLOW)</td>
</tr>
<tr>
<td>Seaweed (TEAM PURPLE)</td>
<td>Winkle (TEAM PURPLE)</td>
<td>Lobster (TEAM PURPLE)</td>
<td>Human (TEAM PURPLE)</td>
</tr>
</tbody>
</table>
Useful websites

Life in a rock pool
yte.org.uk/factsheets/seashore/life-in-a-rock-pool

Rocky shore food web
yte.org.uk/factsheets/seashore/rocky-shore-food-web

The rock pool ecosystem
slc4u.org/moodle20/mod/page/view.php?id=663

The Sea Life Centre teacher pack

Rock Pool Explorers Pack - younger years
www.mcsuk.org/downloads/coolseas/teachit/Beside_the_Sea/Rockpool_Explorers_1_Younger_years.pdf

Rock Pool Explorers Pack - older years
www.mcsuk.org/downloads/coolseas/teachit/Beside_the_Sea/Rockpool_Explorers_2_older_years.pdf

Plankton information - see the resources tab
www.lifeadrift.info

Explore The Shore
www.snh.gov.uk/docs/B902594.pdf