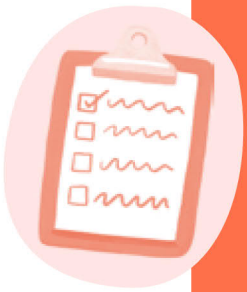
1. Sand Detective
2. Sand Under the Magnifying Glass
3. Find the High Tide Line
4. Tide Fort Champion
5. Make Your Own Salt
6. Explore Life in the Briny Sea
7. Love Your Limpets
8. Press Seaweed
9. Spot Signs of a Changing Beach
10. Hunt for Fossils
11. How Do Worms Change the Beach?
12. Find Evidence of Sponges and Piddocks
13. Make Your Own Plankton Net
14. Be Kind to a Crab
15. Shell Collecting
16. Secret Trapdoors, a Snail Investigation
17. How Do Starfish Scrub Their Backs?
18. What Makes Starfish Arms Special?
19. Tentacles Experiment
20. Anemones in Action
21. Find a Fish, Design a Fish
22. How Fish See Without Being Seen
23. Twenty-Minute Bird Count Challenge
24. Operation Save Your Sandwich!
25. Create a Miniature Rock Pool
26. Best-Dressed Animal Competition
27. Egg Hunt
28. The Protective Fish Father Challenge
29. A Rock Pool Weapon Inventory
30. Spy on a Hermit Crab Battle
31. Be a Super-Sleuth Part One: Murder Holes
32. Be a Super-Sleuth Part Two: Line Up the Suspects
33. Set Up a Fish Table
34. Find a Sea Creature's Bottom
35. Hunt for Mermaids' Purses
36. Identify Your Egg Case
37. Balloon in a Bottle
38. Junk Jigsaw
39. Sourcing the Source.
40. Litter Investigation
41. Investigate Why Sea Levels Are Rising
42. Plan a Climate-Friendly Beach Trip
43. Make a Splash!
44. Seashells in Vinegar Experiment
45. Prawn-Catching Challenge
46. Use a Good Fish Guide
47. Leave a Message in the Sand
48. Make a Pledge
49. Join a Group
50. Adopt a Beach



CHAPTER 1

BEACH DISCOVERY

Your first challenge is to unlock the mysteries of how your beach was made and how it is changing over time.

These explorations will take you on a journey through millions of years of history. Along the way, you will encounter the incredible forces that move rocks and oceans and meet animals and plants that endure some of the most extreme conditions on Earth. You'll also uncover evidence of how your beach is still changing today.

Like all great explorers, you will need to open all your senses and be prepared for some surprises!

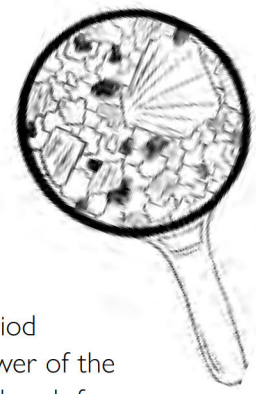
ACTIVITY 1

Sand Detective

Where does sand come from and why does it feel comfortable to walk on? Your first activity is to become a Sand Detective!

Study the **cliffs** from a distance and explore the **rocks, shells** and **pebbles** on your beach.

- Look at the colours of the rocks and shells. Are they similar to the colour of the sand?
- Does the sand contain mud or very tiny grains? If so, can you spot a river or stream nearby?
- Is the sand the same size and colour in every part of your beach?
- Can you figure out what the sand is made of?



What's Happening?

The sand on your beach starts out as larger rocks and shells which often come from the cliffs and seas close to the beach. Over a long period of time, these have been broken down by the power of the waves. Rocks and mud can also be carried to the beach from far inland by rivers.

Head to Activity 2 to investigate further

ACTIVITY 2

Sand Under the Magnifying Glass

You may have noticed that the grains of sand on your beach are different **colours**. What else can you find out? It's time to get up-close.

- Put some sand onto black paper. This will help the colours stand out.
- Use a magnifying glass, hand lens or a microscope to look at your sand.
- What do you notice about the size of the sand grains? Can you see tiny shells in your mix?
- Are they smooth and rounded or jagged and rough?

What's Happening?

You will probably find lots of transparent crystals of a mineral called quartz in the sand. Quartz is very hard and does not dissolve in water. While softer rocks erode or wash away, quartz is left behind. Marine biologists can examine sand to identify what species of seashells are living near the beach.

Dig Deeper

Dark-coloured sand sometimes contains magnetite, a mineral that can be used to make iron. Try dragging a magnet through the sand. Any magnetite will stick to it.

ACTIVITY 1

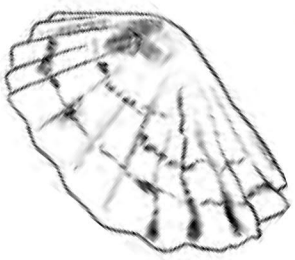
Love Your Limpets

Limpets are sea snails. They can be found on rocks and man-made structures like sea walls and quays. Their yellow-brown shells are cone shaped, like a paper hat.

As the tide goes out, locate some limpets.

- Sometimes you can see one twist as though it's dancing on the spot. What might it be doing?
- Look around the rocks for circular grooves. Can you see how they're made?
- Put an ear close to the limpets. Can you hear a grating, crackling sound?
- Gently push against a limpet's shell. Do you feel it shift? If you touch it lightly again, does it feel easier or harder to move?

What's Happening?

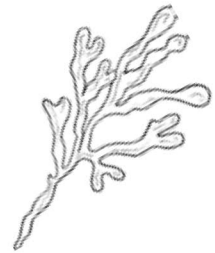


Limpets live on rocks that are exposed to all the elements. To survive, they grind their shells against the rock to create a groove. By pushing their shells into this groove and gripping the rock with their powerful sucker foot, limpets protect themselves from the dry air. Limpets feed on seaweed by scraping with a saw-like organ. This chips off pieces of rock, which makes a crackling noise.

ACTIVITY 8

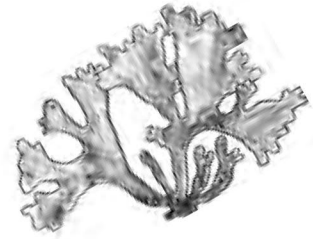
Press Seaweed

Plants on the beach are full of surprises. Below the tide line, you enter the realm of seaweed. These plants have no roots or flowers, but are as beautiful as any garden plants.



Pressing seaweed is a lovely way to appreciate the different colours and shapes of the weeds. You need a deep tray, a sheet of heavy paper (watercolour paper is ideal), greaseproof baking paper, paper towels, newspaper and heavy books.

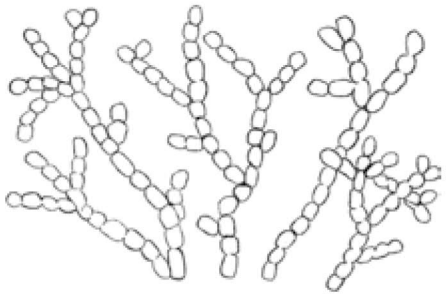
- Rinse your seaweed in fresh water.
- Part fill your tray with water and place your sheet of watercolour paper at the bottom.
- Float your seaweed over the paper until you are happy with the position. Slowly lift the paper out.
- Gently dry with paper towels and lay on some newspaper. Cover with a paper towel and some more newspaper.
- Place between heavy books. Check each day and change the newspaper and paper towel until your pressed seaweed is completely dry.
- Admire your dried seaweed!



Fact File: Life at the Extreme

Life on the beach is tough. It can be baking hot or freezing cold. Wildlife that lives near the top of the beach has to endure being plunged underwater and dried out by the wind over and over again. Few flowering plants and grasses can survive these conditions. They only grow above the tide line and tend to have tough, thick leaves to keep the water in. They may also have red leaves when they are struggling with too much salt.

Below the tide line, only seaweed and seagrass can grow. Seagrasses are flowering grasses that can make meadows underwater. Seaweeds are **algae**, which grow in water and don't mind the salt.



pink coral weed

Fact File: Life at the Extreme

Seaweed Ice Cream?

Most seaweeds are edible. Laver seaweed is used to make laverbread in Wales. Carrageenan, which comes from seaweed, is sometimes used as a thickener in ice cream! In Japan some red seaweeds are called nori and are used for wrapping sushi.

Boy or Girl?

All limpets are male when they are young. As they grow older and bigger, they become female.



Grass Glue

Marram grass has long tangled roots, around a metre long, that help hold sand dunes in place. It is being used in parts of China to try to hold back the Gobi Desert.

