

## How sandy is your beach?



Sand is formed when rocks, coral or shells are smashed into tiny pieces by the waves, worn away by rain, or ground up by the action of animals. It tends to get trapped in sheltered bays to form the beaches we all love to visit.

Different beaches have different sorts of sand. Sometimes the sand is very fine or rather coarse. Sometimes the sand is clean, or it may have a lot of organic material in it. It may be made from limestone (broken down coral and shells) or it could be from weathered rocks. It may contain impurities

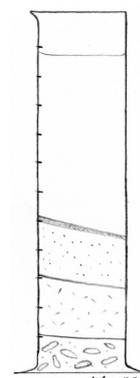
like iron oxide. All these differences will lead to differences in colour. Pure, white sands are usually **calcareous** – they are made from calcium carbonate (limestone) from the skeletons of corals or from sea shells. Volcanic rocks often produce black sand. In this investigation you will try to find out about sand from your local beaches.

### What you need

- Tall plastic measuring cylinder
- Sand samples
- Water
- Small spade
- Plastic bags to collect samples in

### What to do

- Collect your sand samples from different places. Try different beaches that you know, perhaps ones that face in different directions, ones near to rivers or mangroves. You could even collect samples from different areas of the same beach...
- Weigh a standard amount of sand (say 500g) and pour it into a good big measuring cylinder. It shouldn't be more than about half full.
- Fill the cylinder up with water.
- Put your hand over the top and shake it – be careful !!
- Let the contents settle – it might take a while.
- Observe the different layers of sediment. What do you notice?



### Things to think about

- Where does the organic material come from?
- How might you expect it to affect who lives in the sand?
- Is the sand from limestone, or is it from igneous rocks? Drip some acid on it: if it bubbles then it's limestone and was probably made by a coral or was part of a shell.
- Find out where sand comes from and why parrotfish are important.

## How many worms?



Animals that live buried in the sand or mud are called **infauna**. Most organisms need oxygen to live but this can be a problem, especially in fine sand or mud, because not enough oxygen gets through. Worms can dig deep burrows in the sand which allow oxygen-rich water to circulate. This allows the worm to breathe and also helps many other organisms to survive. The worm also swallows large amounts of sand and

digests any organic material or bacteria that it finds. The worm excretes waste sand, which forms a small pile on the surface of the beach. You can often see these near the low tide mark. The stirring and oxygenation of sand or mud by infauna is called **bioturbation**.

### What you need

- Tape measure
- 1m<sup>2</sup> quadrat
- Notepad / clipboard and pencil

### What to do

Select an area of beach near the low tide mark which you wish to study. You could look at just one area, or a number of different ones, to see which has most worms.

- Lay out a tape measure parallel to the water's edge.
- Pick a small random number, perhaps by throwing a die.
- Walk that many metres along the tape and put the quadrat down.
- Count the number of worm casts in the quadrat and record it carefully
- Repeat at least 10 times. Go back to the start of the tape if you need to.
- Work out the average number of worms per m<sup>2</sup>.

Once you know the average number of worms per m<sup>2</sup>, estimate how large this area of beach is. Remember much of the beach isn't really suitable for worms, so just think about the overall size of the area where you have worked.

### Things to think about

- Try out the "how sandy is your beach" experiment and the "how many worms" experiment on some different areas of beach.
- Can you figure out if there is any link between the results?

## Bird Diary



*Curlew by Alan Wilson*

Sandy and muddy shores are often a good place to see birds searching for food. At low tide the birds will use their beaks to probe in the sand, looking for worms, small clams and other tasty treats. You might notice different kinds of birds with beaks that are exactly the right shape for catching particular kinds of prey. Some birds stay in the same place year round, others migrate long distances and so we only see them some of the time.

### What you need

- Notepad and pencil
- Bird guide, book or checklist.
- Binoculars (optional!)

### What to do

- Choose a good beach to use for your project. It's probably best to find a quiet, sheltered bay without too many people or big waves. Remember, the best places are where it is easy for birds to find food without being disturbed.
- Find a place from where you can observe the birds without disturbing them. You won't see much if you're noisy or impatient!
- Tick the birds from the checklist that you see. Don't forget to write the date on the top of the sheet!
- Make a large wall chart and record which birds you have seen month by month.

### Bird Checklist

Common name	Latin name	Dates seen							
Pink-backed pelican	<i>Pelecanus rufescens</i>								
Western reef heron	<i>Egretta gularis</i>								
Great egret	<i>Casmerodius albus</i>								
Long tailed cormorant	<i>Phalacrocorax africanus</i>								
Grey heron	<i>Ardea cinerea</i>								
Green backed heron	<i>Butorides striatus</i>								
Black heron	<i>Egretta ardesiaca</i>								
Black crowned night heron	<i>Nycticorax nycticorax</i>								
African fish eagle	<i>Haliaeetus vocifer</i>								
Palm nut vulture	<i>Gypohierax angolensis</i>								
Cape gannet	<i>Sula capensis</i>								
Greater frigatebird	<i>Fregata minor</i>								
Masked booby	<i>Sula dactylatra</i>								
Herring gull	<i>Larus argentatus</i>								
Black headed gull	<i>Larus ridibundus</i>								
Lesser black backed gull	<i>Larus fuscus fuscus</i>								
Sooty gull	<i>Larus hemprichii</i>								
White tailed tropic bird	<i>Phaeton lepturus</i>								
Brown noddy	<i>Anous stolidus</i>								
Gull-billed tern	<i>Gelochelidon nilotica</i>								
Roseate tern	<i>Sterna dougalii</i>								
Common tern	<i>Sterna hirundo</i>								
Little tern	<i>Sterna albifrons</i>								
Sooty tern	<i>Sterna fuscata</i>								
Lesser crested tern	<i>Sterna bengalensis</i>								
Greater crested tern	<i>Sterna bergii</i>								
Caspian tern	<i>Sterna caspia</i>								
Ringed plover	<i>Charadrius hiaticula</i>								
Lesser sandplover	<i>Charadrius mongolus</i>								
Greater sandplover	<i>Charadrius leschenaultii</i>								
White fronted plover	<i>Charadrius marginatus</i>								
Grey plover	<i>Pluvialis squatarola</i>								
Sanderling	<i>Calidris alba</i>								
Curlew sandpiper	<i>Calidris ferruginea</i>								
Little stint	<i>Calidris minuta</i>								
Whimbrel	<i>Numenius phaeopus</i>								
Bar-tailed godwit	<i>Limosa lapponica</i>								
Common sandpiper	<i>Actitis hypoleucos</i>								
Greenshank	<i>Tringa nebularia</i>								
Marsh sandpiper	<i>Tringa stagnatilis</i>								
Terek sandpiper	<i>Xenus cinereus</i>								
Crab plover	<i>Dromas ardeola</i>								
Ruddy turnstone	<i>Arenaria interpres</i>								

## Between the grains - Meiofauna



Image by M. Lee

It can be hard to see with the unaided eye, but the space between wet sand grains is full of interesting animals. They are grouped into categories according to size. Large animals more than about 0.5mm in size are called **macrofauna**. They include things like large worms, crustaceans like amphipods (sand hoppers) and burrowing crabs, and some burrowing echinoderms like heart urchins and sand dollars. Animals less than 0.05 mm are much too small to see with the unaided eye and are referred to as **microfauna**. Between these two sizes are

the **meiofauna**. You can just about see them without a microscope but you won't be able to tell much about them. The picture shows a tiny crustacean from between sand grains but you could also find various kinds of worms and other organisms.

### What you need

- Spoon
- Small airtight container (plastic pot with a lid, sandwich bag etc.)
- Coolbox
- Low power binocular microscope
- Slides or petri dishes

### What to do

- Collect some wet sand near the low tide mark on a sandy beach. You don't need very much, just a few spoonfuls.
- Seal the sand sample in an airtight container so it can't dry out. Make sure there's some air in there too. Keep the sample cool or the animals will quickly die!
- In the classroom, put a small quantity of sand on a microscope slide or in a petri dish and examine under low power. Spread the sand out and look for animals moving around!

## Beachcomber collage

Sandy beaches are great places for beachcombing. Near the top of the beach you will nearly always find material washed up by the tide. Although a lot of this is usually plastic rubbish you will also find shells, seaweed, the skeletons of crabs and heart urchins, and all sorts of other things. Why not collect some and use them for art projects? Remember, take only dead shells, never live ones.



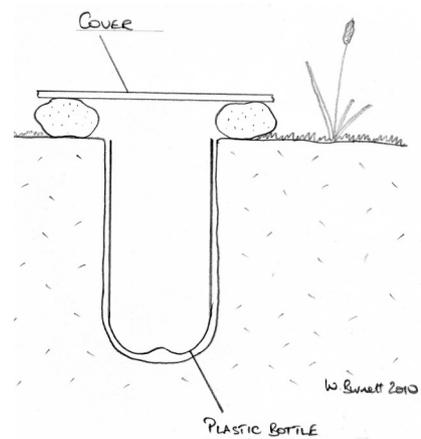
### Ideas

- Create a reef scene on your classroom wall showing your favourite organisms
- Use small shells and colourful stones like pieces of a mosaic
- Make a mobile or a wind chime by suspending small shells from fishing line

## Catching crabs

A **pitfall trap** is a good way to catch small mobile invertebrate animals that walk around on the beach, such as fiddler and ghost crabs. You can make pitfall traps out of all kinds of things. Plastic buckets make good big traps, but you can also make smaller traps with plastic drinks bottles cut in half or polystyrene cups. What a good way to use plastic waste from the beach!

Bury your trap so that the top is level with the sand, somewhere above the high tide mark. It's probably a good idea to poke a stick into the ground next to it to help you find it again! A cover over the top propped up with small stones will stop birds from eating anything you catch!



Leave your traps overnight and come back the next morning to see what you have caught. Remember, anything caught in your trap will eventually die if you don't release it! Always make sure you check all your traps and never leave them for a long time!

Use a field guide to identify any crabs or other animals that you catch. Be careful they don't pinch you!

**Caution: some animals may bite, pinch or sting. Be careful!**

### Lower shore traps

If you have access to a sheltered sandy bay then you could try some traps on the lower shore. Don't do this anywhere with a lot of wave action as your traps will just fill up with sand. Large bucket traps are probably best – polystyrene cups will float away! Wait for low tide before setting your traps and make sure you mark the position of each one with a pole or stake. Compare the species you catch in this trap with the ones from the top of the beach. Are they the same? If not, why not?

## Sandy shores quiz

1. Are sandy shores **accreting** or **eroding** shores? .....
2. Animals that live buried in the sand are called .....
3. Name the process by which animals stir up the sand and mix in oxygen. ....
4. The smallest animals that are visible to the naked eye are called .....
5. The patch at the top of the beach where debris washes up is the ..... line.
6. Large worms are most common at the ..... of the beach (top, middle or bottom?)
7. Name three different seabirds ....., ..... and .....
8. Name the minerals that make up
  - a) coral sand .....
  - b) quartz sand.....
9. The smallest sand grains sink the .....
10. True or false: Parrotfish make sand from coral .....