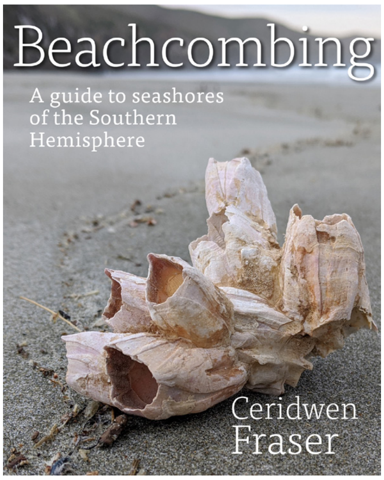

TEACHER NOTES

BEACHCOMBING

A guide to seashores of the Southern Hemisphere

CRID FRASER

THEMES

- Ocean processes and dynamics
- Coastal biodiversity
- Habitats and ecosystems
- Litter
- Conservation and sustainability

KEY LEARNING OUTCOMES

- Learn about key physical processes, such as waves and tides, that affect beaches
- Learn about some of the plants, algae and animals that live on, in and near beaches
- Learn about how human-made objects end up adrift at sea
- Learn about the life cycles and causes of death of near-shore coastal species
- Consider the environmental impacts of ocean litter and human use of beaches

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If you've ever walked along a beach or rocky shore and peered, poked or wondered at the things cast upon it by the waves, this book is for you. Beaches are our windows to the ocean, and the objects we find on them tell stories about life, death and dynamic processes in the sea. Learn about how waves, currents, tides and storms affect beaches. Find out about the many different sorts of plants, animals and algae we find living on dying on beaches, and where human-made flotsam and jetsam might come from. Discover the processes that connect coastal ecosystems around the Southern Hemisphere, and why there are so many similarities between far-distant shores. Rather than identifying living things to species level, this book will help you to understand what sorts of organisms and other objects you find on beaches, and the intriguing reasons they have come to be there.

About the Author

Ceridwen ('Crid') Fraser is a marine biologist and biogeographer living in Dunedin, New Zealand. She grew up in Canberra, Australia, but has worked or studied at six universities across three countries. For as long as she can remember, she has been obsessed with the ocean, and the amazing life within and around it. Crid is at her happiest when neck-deep in cold southern waters, surrounded by kelp and penguins. *Author Photo by Alan Dove*

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PRE-READING ACTIVITIES

If your school is near the coast, plan a field trip to a nearby beach. Spend at least an hour at the beach, letting students walk in small groups along the sand, looking for interesting things that have washed up. So long as the things are not still alive, ask the students to pick them up and bring them back, if it is safe to do so.

As a class, look at the objects that have been collected, and see if the class as a whole can identify what sorts of things they are – for example, crabs, snails, bivalves, seaweed, bones. Talk about the weather, and the surf, and how these might have affected what was found on the beach that day.

If your school is not near a beach, you could either ask students to take photos of, or draw, things that they see on beach visits over school holidays, ask them to remember interesting things they remember seeing on beaches in the past, or ask them to ask their parents if they ever found interesting things on beaches. Discuss the objects and ask the students to speculate on how they might have come to be found on a beach.

DISCUSSION QUESTIONS

SCIENCE

1. Ask students to identify some of the reasons that floating objects thrown into the ocean at the same place but at different times might end up on different beaches. How do wind, waves, tides and ocean currents affect where drift material goes?
2. Animals, plants and other living things are usually grouped (classified) by scientists based on who their closest relatives are – rather than how they live or what they look like. Ask students to come up with some examples of marine animals, such as jellyfish and squid, that might look a little similar but are not closely related. See if the students can think of reasons why similar body shapes or lifestyles might evolve in different groups.

ENGLISH

1. The table on page 9 shows a few of the many indigenous names for some words and concepts associated with beaches. Do any of these sound anything like what they mean? Many words in all languages, including English, have evolved through onomatopoeia (words sounding like what they mean, such as 'bang' or 'slam').

GEOGRAPHY

1. The book talks about similarities between coastal ecosystems around the Southern Hemisphere. What is it about the Southern Hemisphere that helps coastal ecosystems on different continents to resemble each other (see the section on Southern Connections)?
2. Walking on beaches reveals that many things, from plant seeds to living animals, can travel long distances at sea. What might be some of the benefits and risks of dispersing far from 'home', for plants and animals?

ACTIVITIES

SCIENCE

Ocean circulation

Ocean circulation influences where drifting objects go. Ocean circulation / currents can help explain why 'plastic islands' form (page 24), or why we get mass strandings of some small animals on beaches (page 13).

Ask students to fill a large tub (for example, a plastic storage tub that holds 30–50 litres) with water. Float small objects on the surface of the water – for example, collect many small seeds, or bark. The students can use kitchen tools to create different movements in the water – replicating waves, eddies, or even the circular counter-currents of Langmuir cells (using a mechanical double whisk) (see page 22). Ask students to describe what happens to the floating particles when different sorts of currents are created, and what this means for movement of living things and rubbish at sea.

ENGLISH

Essay

Ask students to imagine themselves as an animal washed up on a beach, and to write an essay reminiscing on how they came to be there – the other animals they met on their journey, the things they ate on the way, and the processes that shaped where they went (think Nemo's dad's journey in *Finding Nemo*). Students should be able to demonstrate an understanding of biological interactions, life cycles, and physical processes in the ocean.

Species names

Ask students to invent a new marine species, describe what it looks like and how it lives, and decide what they would call it. All living things are given two names that are used by scientists to identify them: the first is the 'genus' name, which has a capital letter at the front, and the second is the 'species' name, which doesn't have a capital letter. Two species can be from the same genus if they are very closely related, but each has only one 'species' name. The combination of these two names is always unique. The names are written in italics. For example, southern bull kelp includes several species in the genus *Durvillaea*, including *Durvillaea antarctica* and *Durvillaea willana*. These are different, but closely related, species (see page 54–55). The names are sometimes based on characteristics of the organism, such as how it looks, or might be based on history, or explorer or scientist names. For example, for the bluebottle-munching sea slug *Glaucus antlanticus* (page 27), the genus is named after a god of the sea from a Greek myth (Glaucus), and the species name refers to where it was first found (Atlantic Ocean).

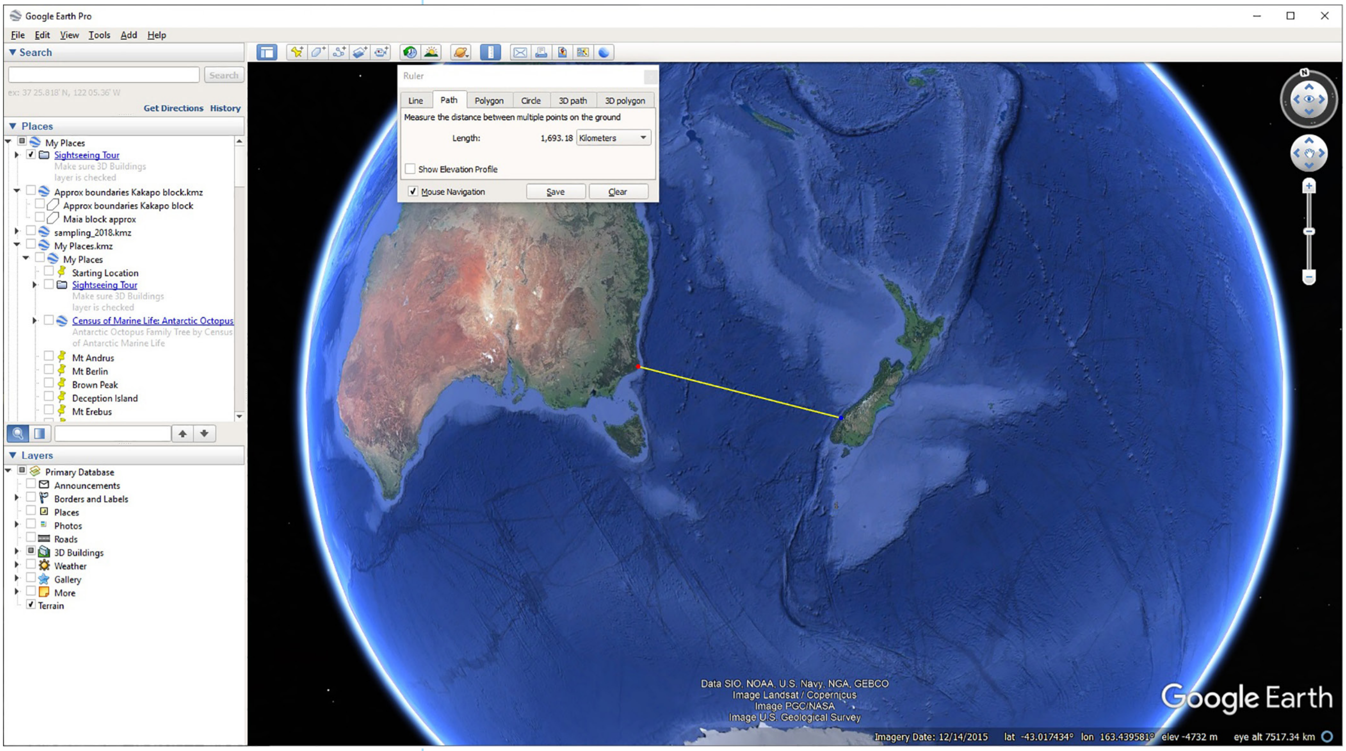

Image credit: Google Earth

GEOGRAPHY

Southern vs Northern Hemisphere

The Southern Hemisphere has more ocean relative to land than the Northern Hemisphere (see rough schematic on page 93). Ask students to use the 'path' or 'line' tools in Google Earth (see above) to measure the minimum oceanic distances between areas of interest in the Southern Hemisphere – for example, for students in Australia or New Zealand, you could ask them to measure the distance across the Tasman Sea, or for students in Chile, they might want to measure the distance from New Zealand to Chile. For more advanced students, the path could follow the predominant surface currents based on animated data from earth.nullschool.net (to see surface currents, click on 'earth' in the bottom left corner, then select mode: ocean and animate: currents). Ask students to calculate how long an organism would take to drift that distance, if the currents it was being pushed by were moving at an average of 0.3 metres per second. Students can be asked to consider what sorts of animals, plants, algae and life history characteristics (such as spawners versus those that brood their young) might make species better suited to survive long journeys at sea.

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