

Activity 2: Marine habitats of New Zealand



Let's explore the
habitats found within
New Zealand marine
reserves



CURRICULUM LINKS

Learning areas

Science: Levels 1–4:

- Living world: Ecology
- Nature of Science: Investigating in science

Science capabilities: Gather and interpret data, Use evidence, Interpret representations

Te Marautanga o Aotearoa:

Pūtaiao: Pūtaiao: The natural world

Learning intentions

Students are learning to:

- Identify living things in marine habitats and explore how they are suited to their environment.
- Understand the importance of protecting a range of different habitats as part of marine reserves.

Success criteria

Students can:

- Describe living things and their features in marine habitat posters.
- Explain why it is important to protect a range of marine habitats in marine reserves.

CONTENTS

BACKGROUND NOTES

The importance of protecting a range of New Zealand marine habitats	3
Which habitats are found in New Zealand marine reserves?	3
How do we decide which habitats to protect?	4
Examples of marine habitats in New Zealand	4
Rocky shore/reef habitat	4
Sandy shore beaches	5
Zones of the rocky and sandy shore	5
Open ocean or oceanic zone	6
Deep sea.....	6
Other important marine habitats in New Zealand	7
Fiords	7
Antarctica	7

LEARNING EXPERIENCE 2: MARINE HABITATS OF NEW ZEALAND

Introducing students to habitats in New Zealand's marine environment	9
Not all marine environments are the same.....	9
Looking at different marine habitats and what lives there	9
Which habitats should we protect?.....	9
Labelling habitats of the marine environment	10
Reflecting on learning	10
Visiting local habitats.....	10
Extending learning	10
How living things are suited to their habitat	10
Other resources about marine habitats	11

STUDENT WORKSHEETS

Habitats of the marine environment	12
Marine reserve habitats.....	14



BACKGROUND NOTES

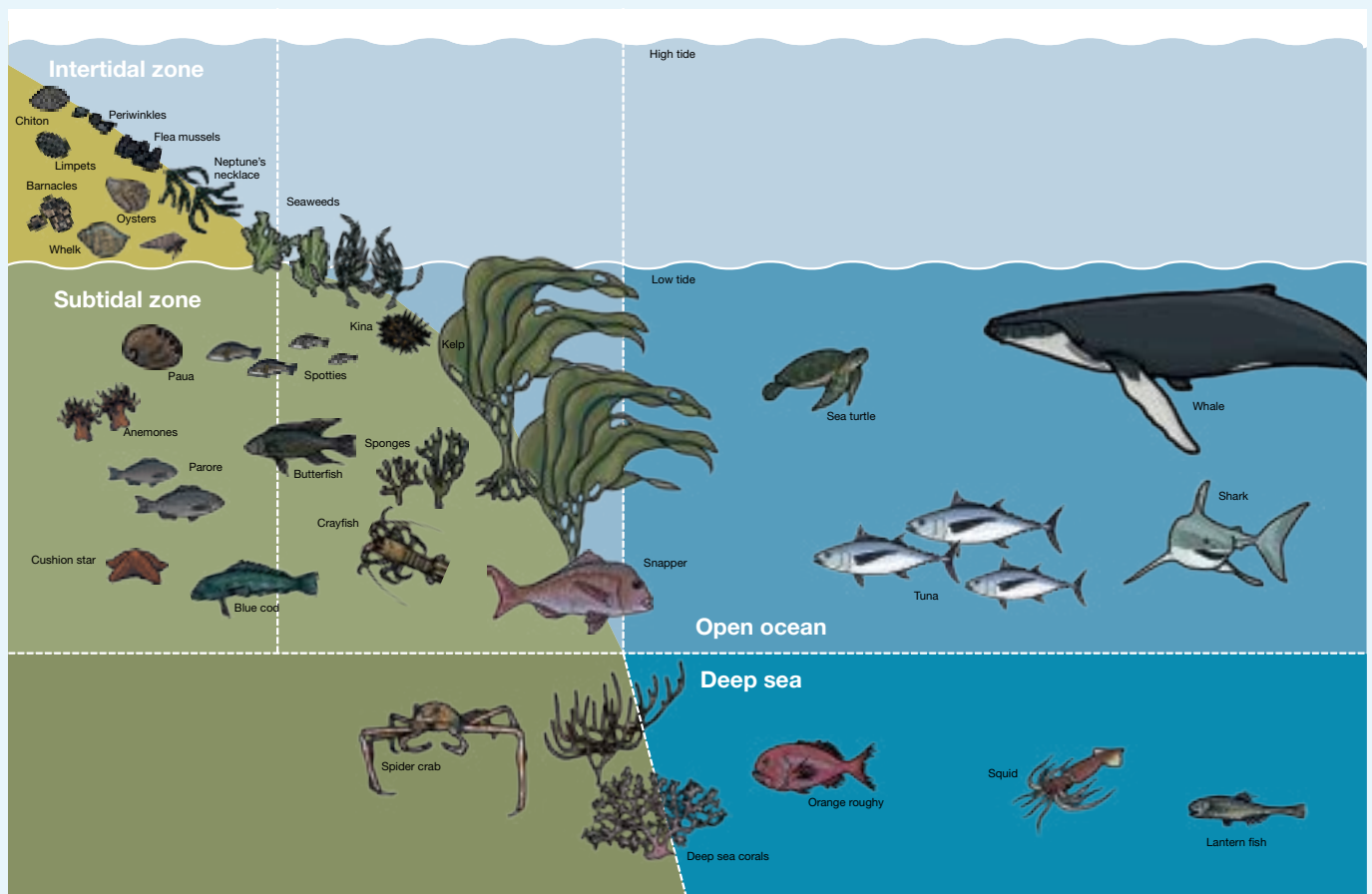
THE IMPORTANCE OF PROTECTING A RANGE OF NEW ZEALAND MARINE HABITATS

Marine reserves protect marine habitats. We have a wide variety of marine habitats in New Zealand that are home to a multitude of different species. It is important to include examples of most existing marine habitats in marine reserves around New Zealand, making a network of protected areas that reflect our natural diversity. The Department of Conservation (DOC) aims to protect a range of varied marine habitats in New Zealand, to safeguard the future of all living things in our waters.

Marine reserves play a key part in the network of marine protected areas. There are also other marine protected areas outside marine reserves, such as marine mammal sanctuaries, benthic protection areas and mātaītai reserves. For more information, see www.doc.govt.nz/nature/habitats/marine.

WHICH HABITATS ARE FOUND IN NEW ZEALAND MARINE RESERVES?

Habitats found within our marine reserves include sandy shores and beaches, rocky reefs, rocky shores, open ocean, deep ocean, fiords, estuaries and more! The habitats found in a marine environment depend on its location, the climate, weather conditions, geology and history.



Under current New Zealand laws, 'no-take' marine reserves can only include waters from the high-tide mark to the edge of New Zealand's territorial sea (12 nautical miles from the low-water mark). This is why most of our marine reserves are located on the coast.

How do we decide which habitats to protect?

Scientists and decision-makers weigh up many factors, including environmental, social and cultural factors, when deciding where to locate a marine reserve. They look at how representative it is (how many different varieties), how unique the habitat is, its biodiversity and what is already protected. They also consider factors such as existing cultural and recreational activities that occur in an area. It is a lengthy process to create a marine reserve and not all areas can be protected.

EXAMPLES OF MARINE HABITATS IN NEW ZEALAND

Rocky shore/reef habitat



Poor Knights Islands Marine Reserve. Photo: V. Zintzen, DOC

The rocky shore is a popular place for both people and animals. Here we find rock pools and reefs. At high tide, this habitat is covered in water and as the tide goes out the reefs are uncovered. Living things of the rocky shore must be able to cope with changing conditions because of the different waves, tides and weather patterns. Many New Zealand marine reserves include rocky reef habitats. What lives on a reef varies depending on its location and factors such as temperature and light intensity.

See the New Zealand Marine Studies Centre's *Northern NZ rocky shore guide* www.otago.ac.nz/marine-studies/resources/download/otago062828.pdf and *Southern NZ rocky shore guide* link www.otago.ac.nz/marine-studies/resources/download/otago062830.pdf.



4

Sandy shore beaches

Sandy shores and beaches are areas of sand that cover an area of coast – other beaches may be composed of mostly gravel or shells. Animals living here are adapted to live in or on the sand and are often small and complex. Some animals of the sandy shore can burrow into the sand to avoid threats like waves and predators (e.g. crabs, shellfish, shrimps and urchins). Sandy shores and beaches are particularly important for birds, which are often seen feeding here. Many shorebirds also nest in the sand and dunes on beaches.



Sandy beach (intertidal zone). Sydney Cove, Ulva Island.
Photo: V. Zintzen DOC

For specific examples of species found on the sandy shore, see New Zealand Marine Studies Centre's *Northern NZ sandy and muddy shore guide* www.otago.ac.nz/marine-studies/resources/otago110042.pdf and *Southern NZ sandy and muddy shore guide* www.otago.ac.nz/marine-studies/resources/otago110044.pdf.

Zones of the rocky and sandy shore

The intertidal zone is the area of rocky shore or sandy shore between the high-tide mark and the low-tide mark. At high tide, this zone is covered by water. At low tide, this zone is exposed, allowing us to walk around the shore. Living things in this habitat must be able to cope with ever-changing water conditions. This zone is light-filled: it can host plants and algae that photosynthesise (make their own food). Animals have plenty of hiding places in this zone.



New Zealand sea lion on the beach at Paterson Inlet/Whaka a Te Wera. Photo: V. Zintzen, DOC

The subtidal zone is where the habitat is always covered by water. It includes the area from the low-tide mark to the open ocean. This can be a high energy zone, with lots of waves and movement in the water, including currents. Animals living here need to be excellent swimmers and/or well adapted to hold on. The best way to see this habitat is to go under the water. Put on your snorkelling gear to explore this zone – it is always underwater!



Rocky reef (in the subtidal zone), Poor Knights Islands.
Photo: V. Zintzen, DOC



Open ocean or oceanic zone



Open ocean. Photo: Haley Neal | CC BY 2.0

The open ocean extends out from the edge of the subtidal zone. Open ocean only includes water to a depth where light can still reach: the 'photic zone'. The deep sea is the dark deep area where light no longer reaches. Open oceans are often not protected. Most existing New Zealand marine reserves are coastal, where the majority of impacts from people occur.

Some marine reserves include areas of open ocean, such as: Kermadec Islands Marine Reserve, Hikurangi Marine Reserve, Moutere Mahue/Antipodes Island Marine Reserve and Moutere Ihupuku/Campbell Island Marine Reserve (part of the subantarctic islands marine reserves). Kermadec and subantarctic marine reserves are large reserves covering open ocean. They make up about 93% of the total area of New Zealand's marine reserves.

The open ocean habitat is home to really big predatory fish (such as tuna, marlin, whale shark, great white shark) and large migratory species like humpback whales and sea turtles. Also, zooplankton are a very important part of the food chain in the open ocean.

Deep sea

Deep-sea habitat is below the open ocean. In the deep sea there is very little light. Living things found in the deep water have adapted to these very dark conditions. Deep-sea fish can look very strange - some have big eyes to capture as much of the limited light as possible, their skin is generally red or black, and some have enormous mouths. Areas of the Kaikoura Canyon, Kermadec and Hikurangi ridges, and the Fiordland marine reserves have deep-sea areas that are not well studied. The deep sea is the 'new frontier' of the marine world, like exploring space! New species are discovered there all the time.



A deep-sea chimaera. Photo: NOAA Ocean Exploration & Research | CC BY-SA 2.0

See NOAA (National Oceanic and Atmospheric Administration, USA) expedition with their ship: *Okeanos Explorer*, including live video feed: <http://oceanexplorer.noaa.gov/okeanos/welcome.html>.



OTHER IMPORTANT MARINE HABITATS IN NEW ZEALAND

Fiords

Fiords are inlets of sea carved out by glaciers over a very, very long time. Fiordland is home to many fiords, and has a network of marine reserves. These unique and important habitats are some of the more pristine and isolated areas in New Zealand.

Huge volumes of freshwater run-off from the steep land in the fiords washes all the tannins from the forest into the sea. The dark freshwater layer doesn't all mix with the marine layer and instead sits on top, blocking out light further below. This means species adapted to low light conditions, such as those typically found in the deep ocean, are present near the surface, e.g. black corals.

Black corals are actually bright white but turn black when they die. There are also isolated populations of species, like the Fiordland bottlenose dolphin.



Fresh water run-off in the fiords, Fiordland.
Photo: V. Zintzen



Black coral, Fiordland. Photo: V. Zintzen

Antarctica

New Zealand is also responsible for some of Antarctica, such as the Ross Dependency. The area is pristine and relatively untouched, with thriving ecosystems. It includes marine protected areas such as the Ross Sea. For more information, see the *Ross Sea Region Marine Protected Area* at:

www.mfat.govt.nz/en/environment/antarctica/ross-sea-region-marine-protected-area and

the poster *We're protecting the Ross Sea region* by the Ministry of Foreign Affairs and Trade:

<https://www.mfat.govt.nz/assets/Environment-images/Ross-Sea-MPA-Poster.PDF>.

See also the film *The Last Ocean: Exploring New Zealand's connection to the Ross Sea, Antarctica*:

www.thelastoceanfilm.com.



MARINE HABITATS OF NEW ZEALAND


Resources for this activity

- *Habitats we can find in marine reserves* poster  (page 13).
- *Marine reserve habitats* worksheet  page 12 or
 <https://docs.google.com/document/d/1RyH3Wqp8wF1BgIKY8jVamg1WuYhaAH2UMNp5AbMBLhQ/edit?usp=sharing>.
- NZ Marine Studies Centre's *Rocky and sandy shore guides*
 www.otago.ac.nz/marine-studies/resources/download/otago062828.pdf (Northern New Zealand) and  www.otago.ac.nz/marine-studies/resources/download/otago062830.pdf (Southern New Zealand).



Focus question:
What habitats are part of New Zealand's marine environment?
What can live in these habitats?

Posters

The following posters can be viewed online, printed, or ordered from the providers. The three *Gulf Journal* posters featured can be viewed online at:  http://gulffjournal.org.nz/?post_type=poster. Hard copies can be ordered by emailing: GulfPosters@aucklandcouncil.govt.nz.

Reef habitat

- *Our changing gulf: The reefs*  <http://gulffjournal.org.nz/poster/the-reefs>.


The open ocean

- *Explore the gulf: Across the ocean/Whiti noa i te Moana*
 <http://gulffjournal.org.nz/poster/across-the-ocean>.

Estuary habitat






- *Our changing gulf: The estuaries*  gulffjournal.org.nz/poster/the-estuaries.

Sandy shore/estuary habitat

- *Te Awanui Tauranga Harbour* poster by Bay of Plenty Regional Council:
 <https://www.boprc.govt.nz/media/424749/4443-tauranga-harbour-wildlife-poster-paths.pdf>.

Video

Deep sea

- *Sea floor discoveries – Tales from Te Papa*, episode 98, Museum of New Zealand Te Papa Tongarewa (05:05 min):  [youtube.com/watch?v=eQPCzQ-Q1IU](https://www.youtube.com/watch?v=eQPCzQ-Q1IU).
- *Living on the ocean floor*, Museum of New Zealand Te Papa Tongarewa (03:05 min):
 <https://www.youtube.com/watch?v=x2X6H1lIkB0>.
- NOAA (National Oceanic and Atmospheric Administration, USA) expedition with their ship: *Okeanos Explorer*, including live video feed:  oceanexplorer.noaa.gov/okeanos/welcome.html.
- *Biodiversity in the Kermadecs*, NIWA video of deep sea life in the Kermadec Islands Marine Reserve (10.50 min):  <https://www.niwa.co.nz/videos/biodiversity-in-the-kermadecs>.
- *Exploring the deepsea*, NIWA video: Scientist Di Tracey describes what it's like to find new species in the deep sea (02.29 min):  <https://www.niwa.co.nz/videos/exploring-the-deepsea>.

Vocabulary

Habitat, sandy shore beach, mangrove forest, open ocean, estuary, reef, deep ocean, adaptations, fiord.



INTRODUCING STUDENTS TO HABITATS IN NEW ZEALAND'S MARINE ENVIRONMENT



Note: These are suggestions only. Teachers are encouraged to adapt and change material to suit their students.

Inquiry stage 3: Investigate



Not all marine environments are the same

- Show students the *Habitats of the New Zealand marine environment* poster (📎 page 12). Discuss and brainstorm with students the marine environments they know about already (e.g. the sandy shore/beach, rocky shore, estuary, open ocean, deep sea). Explain that these are all examples of marine habitats. These habitats are featured in the poster. These habitats are all connected and living things can move between them freely.
- This poster shows an example of a (fictional) marine reserve. Marine reserves can include a range of habitats, as in the poster. No two reserves are the same. DOC tries to protect the full range of marine ecosystems and habitats as part of its marine reserve network.

Looking at different marine habitats and what lives there

- Divide the class into even groups and issue copies of the habitat posters/online versions (from the *Resources* link on 📎 page 8) or printed versions of the image to each group to explore the reefs, open ocean, beach/sandy shore and estuary. Another group can explore the video clips about the deep sea (see 📎 page 8).
- Ask each group to explore their habitat poster/image/video.
- They could observe:
 - a. the water: is it shallow or deep? Could it be salty or fresh water? Would it be clear, dark, light or murky in these areas?
 - b. the substrate (a substrate is what is on the ground e.g. rocks, mud or sand). Can they tell if the ground seen in the poster or video is muddy or sandy or rocky?
 - c. What are the living things found here and featured in the poster (e.g. plants, algae, animals, sponges)? How are these living things similar or different? How are they suited to their habitat?

Students can record their observations from posters or from the marine environment. If desired, use a template like the *Student worksheet: Marine reserve habitats* 📎 page 14.

Inquiry stage 4: Extending thinking






Which habitats should we protect?

- Groups could then present their information to other students in the class. Which are the most important habitats? Ask students which of these habitats would be the highest priority to protect?



- After discussion, refer to background notes and explain why it is important to protect a range of different habitats so that we have a variety of biodiversity in New Zealand in the future. All of these habitats are equally important and need protecting. Our New Zealand marine reserves contain examples of all of the habitats students have investigated in this activity and more!


Labelling habitats of the marine environment

- Label the following habitats on the Student Worksheet on  page 12: *open ocean, deep ocean, estuary, mangroves, seagrass.*
- Then label the key (underneath): *sandy intertidal, sandy subtidal, rocky intertidal, rocky subtidal, open ocean, deep ocean.*
- For more information, see the PDF/poster  <https://www.niwa.co.nz/te-k%C5%ABwaha/research-projects/ng%C4%81-waihotanga-iho-iwi-estuarine-monitoring-toolkit>. For a diagram showing completed labels, see  page 13.



REFLECTING ON LEARNING




Visiting local habitats

- Which of the marine habitats you have learned about are part of the students' local environment?
- If possible, visit the coast or a specific marine reserve in your area to explore real-life marine habitats. Otherwise, use a map, website or mapping app such as Google Maps/Google Earth to identify which habitats are near your school.
- See  www.doc.govt.nz/marine-reserves-map for a map of New Zealand's marine reserves.
- Students can then further investigate a habitat in their local environment that interests them. They can research which living things are present and how they are suited to their habitat.



EXTENDING LEARNING

How living things are suited to their habitat

- Discuss how other animals might be suited/adapted to their habitat. Spot living things in the different habitats in the posters.
- View this clip from the NZ Marine Studies Centre about how crabs are adapted to sandy/muddy shore environments: *Hide and seek*:  https://www.youtube.com/watch?v=w-Z_xSfjeME&t=35s.
- Learn more about rocky shore/rock pool habitats and adaptations in this video by the NZ Marine Studies Centre: *Life in rock pools*:  [youtube.com/watch?v=P3YC_7d3rDg&index=13&list=PLJk6IGWI7lLoDgotSv113yFRuCW4c364b](https://www.youtube.com/watch?v=P3YC_7d3rDg&index=13&list=PLJk6IGWI7lLoDgotSv113yFRuCW4c364b).
- After viewing, discuss the adaptations (both physical/structural and behavioural) that allow these animals to survive in a rock pool where space is limited and there are many predators around. For more information about physical, behavioural and physiological adaptations in marine animals, see the Science Learning Hub's *Adaptations of marine organisms*:  <https://www.sciencelearn.org.nz/resources/142-adaptations-of-marine-organisms>.



OTHER RESOURCES ABOUT MARINE HABITATS

- Learn more about marine habitats at the Science Learning Hub:
🔗 <https://www.sciencelearn.org.nz/resources/145-marine-habitats>.
- Bay of Plenty Regional Council's education resources:
 - *Dunes and sandspits* poster: 🔗 https://www.boprc.govt.nz/media/570973/4548-coast-care-bop-dunes-poster_a3_web.pdf.
 - *'Life's a beach'* teaching resource:
🔗 <https://www.boprc.govt.nz/residents-and-communities/teachers/teacher-resources/lifes-a-beach-education-resource/>.
- Game about the deep ocean habitat:
 - *Deep Ocean dive* game by NZ Marine Studies Centre:
🔗 www.otago.ac.nz/marine-studies/resources/download/otago062816.pdf.
- *Ross Sea* poster by MFAT:
🔗 <https://www.mfat.govt.nz/assets/Environment-images/Ross-Sea-MPA-Poster.PDF>.





Habitats of the marine environment

Label the following habitats on the diagram:
open ocean, deep ocean, estuary, mangroves, seagrass

Then label the key (at the bottom):
sandy intertidal, sandy subtidal, rocky intertidal, rocky subtidal, open ocean, deep ocean



Key:



Diagram showing habitats in a marine environment and some of the species within them. Credit: NIWA, developed by Max Oulton, <https://www.niwa.co.nz/te-k%C5%ABwaha/research-projects/ng%C4%81-waihotanga-iho-iwi-estuarine-monitoring-toolkit>.



Possible answers for 'Labelling habitats of the marine environment' worksheet



Key:







 Sandy intertidal	 Sandy subtidal	 Rocky intertidal	 Rocky subtidal	 Open ocean	 Deep ocean
--	--	--	--	--	--

Diagram showing habitats in a marine environment and some of the species within them. Credit: NIWA, developed by Max Oulton, <https://www.niwa.co.nz/te-k%C5%ABwaha/research-projects/ng%C4%81-waihotanga-iho-iwi-estuarine-monitoring-toolkit>





Marine reserve habitats

Our habitat is:

Observations

What do we notice about this habitat?

The water is:
(think about colour, clarity, depth)

The substrate looks like:

Which living things are found in this habitat?

How are they suited to this habitat?

Other notes:

