

Protecting our Marine World

EDUCATION RESOURCE

YEARS 1-8



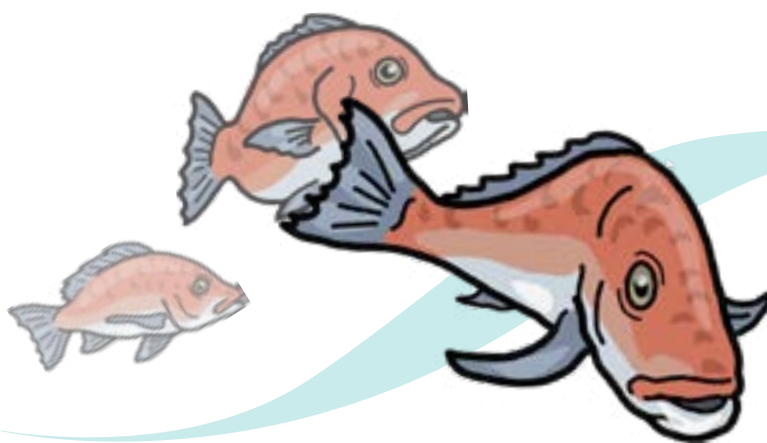
Department of
Conservation
Te Papa Atawhai

New Zealand Government

Protecting our Marine World

EDUCATION RESOURCE

YEARS 1–8



Illustrations: Lisa Paton

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INTRODUCTION

Protecting our Marine World is a teaching and learning resource for New Zealand teachers and students who want to learn what they can do to protect our unique marine environment.

ABOUT THIS RESOURCE

Protecting our Marine World is an integrated curriculum teaching resource with New Zealand's marine reserves as a real-life context for learning. The resource links to the New Zealand Curriculum at levels 1-4, but can be adapted for use at various levels. It has been developed for primary school students and teachers (years 1-8).

The resource contains teaching and learning material to support a unit of work grounded in Environmental Education for Sustainability (EEfS)/conservation education themes and incorporates aspects of Te Āo Māori (a Māori world view). The unit is based on an integrated, inquiry learning process.

The big picture context for this resource

Without healthy marine environments and fresh air, clean water, fertile soils, plants, animals and forests, we humans could not survive. You, your school and your neighbourhood are all part of a bigger ecosystem. Everything is connected, from the deepest ocean to outer space – and what we do, does make a difference.



Teaching and learning about marine reserves

Marine reserves are a fundamental part of protecting New Zealand's marine environment. They form the basis for marine protection measures. The Department of Conservation (DOC) is working to protect our natural treasures and preserve our marine ecosystems. This teaching and learning resource aims to equip students with the knowledge, values, skills, understandings and motivation to help contribute to healthy oceans for the next generation and beyond.



School group at Cape Rodney-Okakari Point Marine Reserve (Goat Island). Photo courtesy of Lorna Doogan/EMR

What is a marine reserve?

A marine reserve is a protected coastal area. In New Zealand, marine reserves are 'no-take', which means people are not allowed to fish, gather shellfish or take anything from the reserve. People can swim, dive, snorkel, walk, sail, boat and play in marine reserves – they are wonderful places to have fun and connect with nature.



OBJECTIVES OF THIS RESOURCE

Overall vision

To provide students, teachers and their communities with opportunities to grow their knowledge, skills and understandings about marine conservation, so they can help resolve environmental challenges for the marine environment in their local area and beyond.



Rocky reef in the subtidal zone, Poor Knights Islands. Photo: Vincent Zintzen, DOC

Pathways for learning

The exact pathways of learning and associated outcomes are up to students and teachers. Activities and suggestions in the resource enable the following learning opportunities.

Connecting to the marine environment (Te Taha Wairua)

Students can:

- Form significant personal connections to their local marine environment
- Have awareness and sensitivity about local species and environments and start to care for them.

Knowledge, skills and understandings (Te Taha Hinengaro, Te Taha Tinana)

Students can:

- Grow their understandings of no-take marine reserves in New Zealand
- Recognise the roles of tangata whenua in marine conservation
- Learn skills to help address marine conservation issues.

Taking collective action and working with community (Te Taha Whānau)

Students can:


- Act alongside the wider community to contribute to a healthy marine environment
- Participate in active sharing with the community to celebrate success and action.








STRUCTURE OF THIS RESOURCE

Each activity has two parts, first the background notes and then the suggested learning experience. The background notes describe key concepts for the activity to promote deep understanding. The suggested learning experiences include many teaching and learning ideas. Please note that these are suggestions only. Teachers and students are encouraged to adjust the activities and learning sequence to suit students' needs, interests and inquiries. Each activity also provides opportunities for reflection, extension and extra resources.

Format of each activity

<p>Background notes:</p> <ul style="list-style-type: none">▪ Curriculum links▪ Learning intentions and success criteria▪ Description of concepts in activity	
<p>Learning experience suggestions:</p> <ul style="list-style-type: none">▪ Resources▪ Vocabulary▪ Reflecting on learning▪ Extending learning▪ Other resources	

Symbols used in this resource



	<p>Curriculum links</p> <p>This symbol represents New Zealand Curriculum links included in the resource.</p>
	<p>Inquiry learning</p> <p>This symbol represents inquiry-based learning experiences and steps in the inquiry cycle.</p>
	<p>Māori world views</p> <p>This symbol represents learning experiences around Mātauranga Māori (Māori knowledge and perspectives).</p>
	<p>Outdoor experiential learning</p> <p>This symbol represents a hands-on, outdoor learning experience. These experiences encourage student connection to the natural world.</p>
	<p>Classroom activity ideas</p> <p>This symbol represents classroom-based student activities to learn about the marine environment, leading to environmental action.</p>



WHAT IS CONSERVATION EDUCATION?

Conservation education or Environmental Education for Sustainability (EEfS) provides authentic opportunities for learning and gives education providers opportunities to connect with their local communities in meaningful ways. Conservation is about our place now, while also encompassing the past and future of Aotearoa.

Teaching conservation education is not an extra, but is about providing students with a real-life context on which to base their learning, and an opportunity to apply their learning to authentic local community needs and projects.

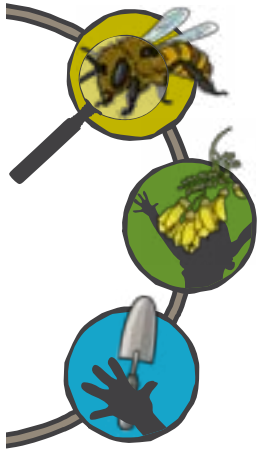
See:  www.doc.govt.nz/what-is-conservation-education and  www.doc.govt.nz/eefs for more information.

DOC's education strategy

DOC is working towards a target of 'one million conservation kids'.

A conservation kid is a young person who:

- is part of and connected to the natural world
- appreciates that Aotearoa is a special place with unique ecosystems
- understands that caring for our resources of the land and sea is important to our well-being and survival.



Conservation education integrates:


Education ABOUT the environment – developing knowledge and skills
Curriculum-based learning and inquiry, usually in the classroom. Education ABOUT the environment develops awareness and understanding of environmental issues.

Education IN the environment – connecting to nature and place
Learning that takes place outside – place-based learning. Education IN the environment fosters values and attitudes by encouraging personal growth and well-being through direct contact with nature.

Education FOR the environment – taking action to restore, grow and protect
Applying skills, knowledge and values to take environmental action and participate in local restoration. Education FOR the environment increases a sense of responsibility, confidence and empowerment through participating in active citizenship and taking collective action to resolve environmental issues.

MĀORI PERSPECTIVES

This resource incorporates cultural knowledge, kaupapa and te reo Māori. Concepts from Te Ao Māori are woven through the resource, such as: whakapapa, manaaki/manaakitanga, kaitiakitanga, mauri and tikanga. Activities include links and concepts aligned with Te Marautanga o Aotearoa.

For more information about Te Ao Māori and how to incorporate these important concepts into your teaching, see:  <http://maorihistory.tki.org.nz/en/programme-design/te-takanga-o-te-wa-maori-history-guidelines-year-1-8>.




The following Māori values will be explored in this resource:

- **Mauri** – the life force or life essence. All things are united through mauri. People are part of the natural world and connected through mauri. The mauri of the natural world has been weakened by pests and habitat destruction, but we can restore mauri by looking after our environment.
- **Mana** means respect, power and authority. Everything in the natural world has mana.
- **Tapu** means something is sacred. Every part of the natural world, including ourselves has tapu. Some places have a tapu placed on them if they are sacred or for spiritual reasons.
- **Manaaki** means to look after and take care of. It is our responsibility to manaaki (care for) our natural resources.


For more information see:  www.doc.govt.nz/get-involved/conservation-education/#big-picture.

INTEGRATED INQUIRY CYCLE

This resource is based on the integrated inquiry learning cycle (see  page 8). Inquiry learning is a constructivist approach, where the student is at the centre of learning.


Students form and develop a learning inquiry to investigate aspects of the topic and build a depth of understanding through questioning, thinking and research, which allows them to apply these and contribute to real-life authentic action. The teacher supports this process and guides the students on their journeys.

This teaching model incorporates a variety of thinking skills, information literacy skills and integrates well with digital technology.

For more information about DOC's inquiry cycle, see:  www.doc.govt.nz/integrated-inquiry-learning-cycle.

Using the inquiry cycle

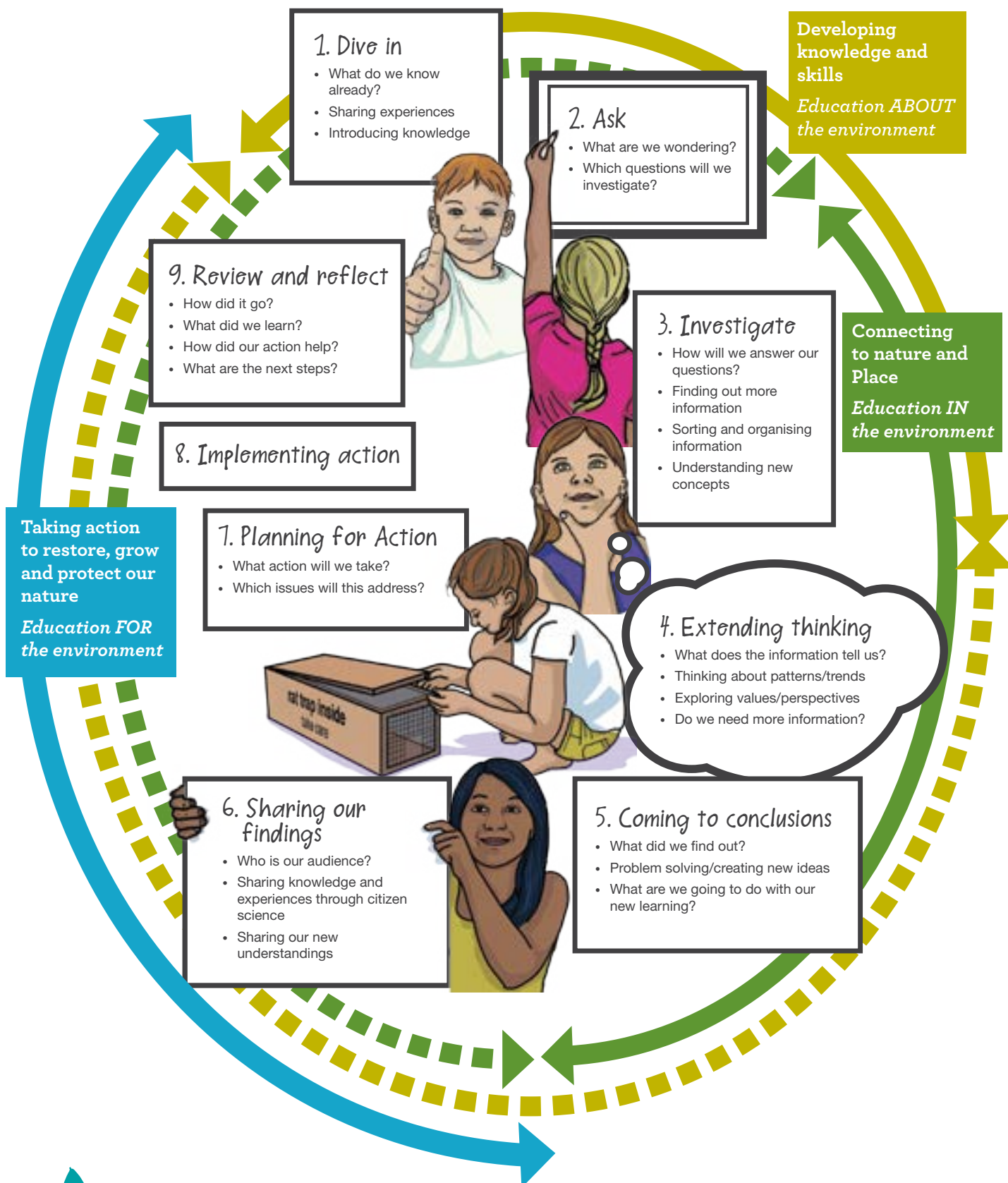
Teachers and students can select material and parts of activities from the resource to suit their learning inquiries. The resource is not meant to be taught from beginning to end, but can serve as a pool of ideas to draw from. Suggested inquiry steps can be found throughout the learning experiences.

The inquiry cycle follows a thread throughout the resource and each inquiry step is described within activities. For further information about inquiry steps, see  pages 10–11.



Student inquiry learning cycle

The Environmental Education inquiry cycle is a continuous learning process. The solid lines represent the opportunity for focussed teaching and learning ABOUT, IN or FOR the environment. The dotted lines reflect the potential for ongoing opportunities in these dimensions.



Stages in the inquiry cycle

Stage 1: Dive in



Introducing the topic and immersing students in the subject or context. Taking into account prior knowledge and experience, students and teachers can develop a learning sequence which will meet learning needs and interests. Key concepts are introduced to form a foundation of knowledge for a learning inquiry.

Key questions: *What do we know already?*

Sharing experiences of marine reserves, introducing knowledge

Stage 2: Ask



Students now ask questions and further explore their ideas and how they relate to their prior knowledge. Student questions can be grouped with one main 'big/essential' question and several minor questions for those needing more guidance. A big/essential question has multiple answers and is an open question, requiring extensive research to answer. This forms the foundation of the inquiry. Students needing extension can have their own essential/big question/s.

Key questions: *What are we wondering? What do we want to know?*

Which questions will we investigate?

Stage 3: Investigate



At this stage of the inquiry, students are investigating their questions and further exploring the topic. Their research should be driven by their interests and inquiry questions. Students can follow lines of further inquiry to find out more information from relevant sources. They begin to organise and filter information.

Key questions: *How will we answer our questions?*

Which information is relevant to our inquiry?

How can we sort and organise the information?

What new concepts have I understood?

Stage 4: Extending thinking



At this stage of the inquiry, students are encouraged to use specific thinking skills to further explore a topic and seek a deeper understanding. Students now take the information they have gathered and begin to compare, contrast and sort. The information connects to what they already know or supports them to form new concepts. At this stage, students also look into aspects of social inquiry: values and perspectives and consider people's responses and decisions.

Key questions: *What does the information tell us?*

Can we see any patterns/ trends?

Do we need more information?



Stage 5: Coming to conclusions



Look back at overall findings. Next, students take a holistic view of information they have gathered, compared and organised. They begin to draw conclusions. Students make decisions about the current situation for their marine environment and which issue is most engaging and relevant to them.

Key questions: *What did we find out?*
What new ideas have come from this information?
What are we going to do with our new learning?

Stage 6: Sharing our findings



Students can now share their ideas, information, conclusions and observations with a selected audience. This can be a powerful link to community and lead to collaboration and further information sharing. Sharing also helps students to consolidate their learning.

Key questions: *Who do we want to share this information with?*
How can we communicate our new knowledge and ideas?
What does our audience think?

Stage 7: Planning for action



Students now create a brief, outlining their action and how it will target the focus issue. Now there is a focus for action they can begin to plan how they will take action for their marine environment.

Key questions: *What can we do to help this situation? What action will we take?*
What issue will this address?

Stage 8: Implementing action



Now it's time to have fun and take action. Students work in a real marine context to apply their learning and understanding to take action. The action should target the focus issue and aim to create a positive future for their local marine environment.

Key questions: *Are we following our brief and criteria?*
Is our action making a difference?

Stage 9: Review and reflect



After carrying out an environmental action, students can now reflect on how it went. This may lead to further inquiry. Reviewing and reflecting is also helpful at each stage of the inquiry learning cycle.

Key questions: *How did it go?*
What did we learn?
How did our action help?
What are the next steps?



EXAMPLE UNIT PLAN

Key outcome:

To provide students, teachers and their communities with opportunities to grow their knowledge, skills and understandings about marine conservation, so that they can help resolve environmental challenges for the marine environment in their local community and beyond.

Curriculum areas:

Science, Social sciences, English, Mathematics, Technology, Health and Physical Education.

Te Marautanga o Aotearoa: Pūtaiao:
The natural world

Levels: 1–4

Years: 1–8

Overarching learning outcomes:

- Build knowledge and understanding of marine reserves
- Raise awareness of the current situation for their marine environment
- Understand how people are involved in the marine environment and reserves
- Contribute to a positive future for marine environments.

Values

Ecological sustainability, equity, respect, inquiry and curiosity, innovation, diversity, community and participation

Key competencies

Thinking; Using language, symbols and text; Managing self; Relating to others; Participating and contributing

Principles

Learning to learn, Cultural diversity, Treaty of Waitangi, High expectations, Inclusion, Coherence, Community engagement, Future focus





Lesson sequence	Inquiry stage/s	Curriculum links	Key concepts	Description
1. Introducing marine reserves	1. Dive in 2. Ask	Science: Living world: Ecology; Planet Earth and Beyond: Earth systems; Nature of Science: Participating and contributing Science capabilities: Engage with science Te Marautanga o Aotearoa: Pūtaiao: The natural world	Definitions of marine reserve. A marine reserve as a natural resource.	Introducing marine reserves. Appreciating that marine reserves are a resource. Introduction to why New Zealand has marine reserves and why they are important.
<i>Learning through inquiry</i> Stages 1–9 (throughout the learning)		<i>Integrated curriculum areas</i>	<i>Additional key concepts will depend on inquiry questions.</i>	<i>Students can work through an inquiry using these suggested lessons or alternative resources.</i>
2. Marine habitats of New Zealand	3. Investigate 4. Extending thinking	Science: Living world: Ecology; Nature of Science: Investigating in science Science capabilities: Gather and interpret data, Use evidence, Interpret representations Te Marautanga o Aotearoa: Pūtaiao: The natural world	A marine reserve as a habitat for living things.	This activity describes the different habitats in marine environments and reserves, including: estuaries, rocky shore and sandy shore beaches, deep sea and open ocean. Marine reserves as a habitat for living things.
3. Stars of a marine reserve	2. Ask 3. Investigate	Science: Living World: Life processes; Nature of Science: Investigating in science Science capabilities: Gather and interpret data, Use evidence, Interpret representations English: Listening, Reading, and Viewing: Processes and strategies Te Marautanga o Aotearoa: Pūtaiao: The natural world	Introducing key species in the resource and then giving opportunities to ask and inquire about them.	Inquiry-based activity about different species common in New Zealand. Students choose a species to investigate further and develop a learning inquiry plan around that species. Includes information on: kelp/rimurapa, sea urchins/kina, snapper/tāmure, blue cod/pākirikiri, crayfish/kōura, stingray/whai repo, orca/kākahī, eel/ tuna, seagrass/karepō, cockles/tuangi, oystercatcher/tōrea, sponges/kōpūpūtai.
4: Investigating marine ecosystems	3. Investigate, 4. Extending thinking	Science: Living World: Life Processes, Planet Earth and Beyond: Earth systems, Nature of Science: Investigating in science, Communicating in science Science capabilities: interpret representations, Engage with science English: Listening, Reading, and Viewing: Ideas Te Marautanga o Aotearoa: Pūtaiao: The natural world	Feeding adaptations and food webs.	A window into the rocky shore ecosystem through descriptions of feeding behaviours of different species. Integrated literacy activity with reading sheets. Feeding behaviours: student reading sheets: Producer: Neptune's necklace (seaweed), Producer: Phytoplankton, Consumer: Filter feeder: example: barnacle and oyster, Consumer: Grazers and browsers: example: butterfish, kina, limpet, Consumers: Predators: examples: crayfish, snapper, orca, Consumers: Scavengers and decomposers: cushion star, mud whelk.



Lesson sequence	Inquiry stage/s	Curriculum links	Key concepts	Description
5. Te Ao Māori and the marine environment	3. Investigate, 4. Extending thinking	Social Science: Social Studies English: Listening, Reading, and Viewing Science: Nature of Science: Participating and contributing Science capabilities: Interpret representations Te Marautanga o Aotearoa: Hauora, Tikanga ā iwi, Pūtaiao: The natural world	Tikanga and Māori conservation ideas and practices.	Early history of marine conservation in New Zealand and indigenous practices, e.g. rāhui, noa, tapu. Concepts of: Tikanga Kaitiakitanga Manaakitanga. Investigating stories and articles and finding out about Māori perspectives and tikanga. Students look at their local situation and see if they can work with iwi or support kaitiaki.
6: Marine reserves for everyone	4. Extending thinking	Social Sciences: Social studies Science capabilities: Interpret representations, Engage with science English: Listening, Reading, and Viewing Health and Physical Education: Healthy communities and environments Te Marautanga o Aotearoa: Tikanga ā iwi; Pūtaiao: The natural world	How people influence marine ecosystems and reserves.	Students explore their own values and perspectives about marine reserves. Integrated literacy activity: fictional newspaper articles from 1911, 1930s, 1960s and today exploring values, perspectives and decisions of different groups of people. These highlight how our communities' values and perspectives have changed over time. Students then investigate local people involved with marine reserves and conservation.
7: Issues for marine environments	4. Extending thinking	Science: Living world: Ecology, Planet Earth and Beyond: Interacting systems, Nature of Science: Participating and contributing Science capabilities: Gather and interpret data, Use evidence, Engage with science Social Sciences: Social studies, Mathematics: Statistics	Issues for marine reserves and oceans. What is the current situation for our oceans around New Zealand? Investigate what is happening in your local area.	Introducing issues for marine reserves and the wider marine environment. Human impacts on marine reserves. This activity centres on these main issues for marine reserves: Overfishing, both commercial and recreational Climate change, warming and ocean acidification Pollution: sedimentation and run-off, litter, rubbish and plastics. Students identify a focus issue for marine ecosystems in their local area.
8: Visiting marine reserves and environments	3. Investigate 4. Extending thinking 5. Coming to conclusions	Science: Nature of Science: Understanding about science, Investigating in science, Participating and contributing Living world: Ecology, Life processes, Evolution Science capabilities: Gather and interpret data, Use evidence, Critique evidence, Engage with science Health and Physical Education: Personal health and physical development: Safety management	Experiential learning. Safety in the outdoors and managing EOTC risks.	Safety (H&S/EOTC) considerations. IN the environment activities that can be done at marine reserves. Data collecting in a marine reserve to determine health (rocky shore, sandy shore) using Marine Metre Squared rocky shore and sandy shore surveys, Other options e.g. Experiencing Marine Reserves (EMR).




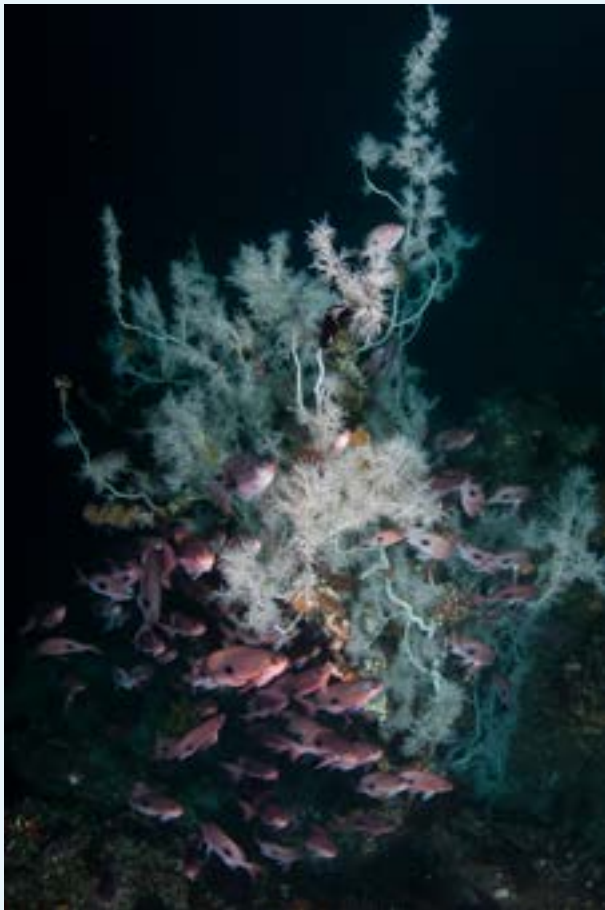
Lesson sequence	 Inquiry stage/s	 Curriculum links	Key concepts	Description
9: The health of marine environments	<ul style="list-style-type: none"> 4. Extending thinking 5. Coming to conclusions 	<p>Science: Nature of Science: Investigating in Science, Participating and contributing.</p> <p>Science: Material World: Properties and changes of matter</p> <p>Science capabilities: Use evidence, Interpret representations</p> <p>Mathematics: statistics</p>	Students learn about how scientists can measure the health of marine reserves.	<p>Students explore water samples and scientific data. They learn about what a healthy marine environment means and how scientists measure the health of marine reserves.</p> <p>Through graphs and text, students learn about the current health of some New Zealand marine reserves.</p>
10: The future of marine reserves	<ul style="list-style-type: none"> 4. Extending thinking 5. Coming to conclusions 6. Sharing our findings 	<p>Science: Nature of Science: Participating and Contributing</p> <p>Science capabilities: Use evidence, Critique evidence, interpret representations, Engage with science</p> <p>Social Science: Social studies</p>	<p>The big picture of ocean conservation.</p> <p>The situation in New Zealand.</p>	<p>Looking to the future for a local marine issue.</p> <p>Students examine possible futures and think about the best future for their issue and how that could eventuate.</p> <p>Future-focussed thinking and problem-solving.</p>
11: Action for marine environments	<ul style="list-style-type: none"> 7. Planning for action 8. Implementing action, 9. Review and reflect 	<p>Science: Nature of Science: Participating and Contributing</p> <p>Science capabilities: Engage with science</p> <p>Technology: Technological practice: Brief development</p>	Action for marine ecosystems.	<p>Students plan an action to target their issue. They carry out their action (ideally with a collaborative approach) to make a real difference to the marine environment.</p> <p>This activity includes example brief, action plan and previous actions. Students then reflect on the success of their project and identify their next steps.</p>
Appendix 1: Our marine reserves – visit notes	<ul style="list-style-type: none"> 3. Investigate 	<p>Science, Nature of Science: Investigating in Science, Living world, science capabilities. Health and Physical Education: Personal health and safety management</p>	Guidelines for experiential learning and education in DOC's marine reserves.	<p>DOC marine reserves visitor guidelines:</p> <ol style="list-style-type: none"> 1. Whangarei Harbour Marine Reserve 2. Cape Rodney-Okakari Point Marine Reserve (Goat Island) 3. Long Bay-Okura Marine Reserve 4. Whanganui A Hei (Cathedral Cove) Marine Reserve 5. Te Angiangi Marine Reserve 6. Te Tapuwae o Rongokako Marine Reserve 7. Tapuae Marine Reserve 8. Kapiti Island Marine Reserve 9. Piopiotahi (Milford Sound) Marine Reserve 10. Punakaiki Marine Reserve



BACKGROUND NOTES ABOUT NEW ZEALAND'S MARINE ENVIRONMENT AND RESERVES

Our marine environment

New Zealand has an amazing and unique marine environment that is home to a wide range of living things. Most New Zealanders live near the coast and the ocean is an important part of our lives. We have relatively clean, healthy seas, that provide us with food (e.g. fish and shellfish), recreation opportunities and other resources. These resources need protecting to ensure the future health of our oceans. See:  www.doc.govt.nz/marine.



Right: Black coral in Fiord habitat, Fiordland.
Photo: Vincent Zintzen, DOC

Rich and complex habitats

New Zealand is responsible for just over four million square kilometres of ocean, as part of its Exclusive Economic Zone. This is the fourth-largest marine area in the world. Of this total area, only 0.4% is protected as marine reserves. Our marine habitats are very diverse, from the subtropical coral in the north of New Zealand to the fiords, black coral and subantarctic islands in the south.

New Zealand's unique marine species

New Zealand's unique marine habitats host a range of species from turtles, migratory seabirds and sponges to sea lions and penguins. Many of our marine species are endemic, which means they are only found in New Zealand. New species are still being regularly discovered – a new species is identified about every 2 days and only 1% of our total marine environment has been surveyed so far! There are thought to be around 65,000 different marine species living in New Zealand waters, far more than on our land and islands.

Marine reserves and marine protection in New Zealand

We currently have 44 marine reserves and others are proposed. However, areas outside of marine reserves are under increasing pressure from population growth, habitat destruction, mining, energy generation, development and many other threats. The effects of these threats are becoming more serious and alarming. Marine reserves alone will not protect our oceans from the effects of human impacts. There will need to be a variety of measures in the future to protect ocean health. All marine conservation and protection relies on community support and education. Students, their schools and their communities, can make a significant contribution to marine conservation.

