# Super Sites for Education at Waiotahi Spit Scenic and Historic Reserves

## OPOTIKI COASTLINE

### Resource Kit for Teachers

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# 1 Using the Resource

## 1.1 USING THE RESOURCE

**This Teacher Resource Kit is designed to give you a hand to plan exciting and educational conservation learning experiences outside the classroom. It focuses on a selection of parks and reserves administered by the Department of Conservation (DOC) in your region.**

There are thirteen accessible sites with East Coast Hawke's Bay that are ideal for learning about marine reserves, the coast line, mainland islands, forests, lakes, thermal pools, endangered species and historic reserves. By visiting these sites students can consolidate work already done and gain additional first-hand experiences and information to complete their studies.

## 1.2 CROSS-CURRICULAR OR SPECIALISED

In planning your programme we suggest using the *Guidelines for Environmental Education in New Zealand Schools.* The guidelines provide advice on environmental topics and how to plan these into curriculum studies and programmes with a bicultural focus.

Sites can be used to meet goals from specific curriculum areas, or different curriculum areas simultaneously. This is an approach that mirrors the interconnectedness of the environment.

## 1.3 ACTIVITIES

Activities in these kits can be adapted to the age/level of your students, allowing you to choose the achievement objectives at the appropriate level. Activities are designed to support the key dimensions of environmental education – in, about and for the environment.

The activities offer students the opportunity of working across a range of related subject areas – in much the same way as the project teams work together to manage a mainland island or marine reserve, for the benefit of all. Teachers are encouraged to undertake further extension activities such as:

- Use of media such as the internet, books, videos, maps and tapes.
- Taking part in a Ministry of Education LEOTC (Learning Experiences Outside the Classroom) programme.
- Visits to zoos, aquaria, botanic gardens, museums, marine education centres and other facilities offering environmental education programmes and resources.
- Guided trips and recreational activities led by accredited outdoor education providers.

### *1.3.1 Pre and Post Visit Activities*

To get the best value from a field trip teachers should plan good lead-in and follow-up activities. If students have some formative ideas about what they might find, they will observe in a more focused way and thereby develop their concepts more fully. The suggested activities given below are designed to encompass learning **'about'** and **'for'** the environment. You will find specific site-based activities for Waiotahi Spit Scenic and Historic Reserves, Opotiki, (learning **'in'** the environment) from page 12 onwards.

#### *1.3.1.1 Pre-Visit Activities*

- Brainstorm the ideas that students already have about Waiotahi Spit, for example, what is a spit? What is a scenic reserve, a historic reserve? Can you think of any sand spits or reserves you have visited? ***(about)***
- Design and carry out an opinion poll. What different attitudes do people have about reserves and their protection? Is there a range of views? What are the implications of your findings? ***(for)***
- Have a class debate on why the ecosystem at Waiotahi Spit should be protected and saved. Explore concepts such as attitudes and values. ***(for)***
- Examine the meanings of the words 'endangered', 'exotic', 'endemic', 'indigenous' and 'native'. Think about what plant and animal species might be found at Waiotahi Spit and where they fit into the above categories. ***(about)***
- Consider the impact of predators. What is the effect on the native ecosystem? ***(about and for)***
- Consider the impact of pollution and resource depletion. Why is their management necessary? Design a campaign to raise awareness about pollution and over-fishing and their impact on marine ecosystems. ***(for)***
- Find out what the students know about DOC. Why does DOC exist? Is there a DOC office in your area? What sort of things does a DOC ranger do? Check out the DOC website, www.doc.govt.nz ***(about and for)***
- Look at what your class can do to help the environment – while visiting Waiotahi Spit and back at school. Why is this important? How can your school's local community get involved in protecting natural areas? ***(for)***
- Explore New Zealand's responsibilities under global conventions such as the Convention on Biodiversity and the Kyoto Convention. Use the DOC website to find out about the New Zealand Biodiversity Strategy. Why is this strategy necessary? How do the goals and actions in the strategy relate to Waiotahi Spit? ***(about and for)***
- Find out who the local hapu are for Waiotahi. Where is their marae? Who are the kaumatua? What stories can they tell you about Waiotahi Spit and the Bay of Plenty? How can traditional knowledge of Waiotahi Spit and its use be more widely available to people who visit the area? Design ways of distributing information, such as interpretation panels, brochures, web pages and radio interviews. What will your message be? Why? ***(for)***

- Visiting outdoor areas usually requires special gear and there are safety issues to take into account. Have students list the clothing and other gear they think they will need on the trip and create new designs. ***(about)***
- Design an outdoor safety code. Appoint class members to help apply it on the day. Why is this important? ***(about)***

### *1.3.1.2 Post-Visit Activities*

- Make a coastal display along a wall of your classroom with teams working on seaweeds, molluscs, crustaceans, coastal vegetation – pingao, pohutukawa, mangroves etc. Add pictures or models of fish, birds and sea mammals (about) Why is it important to protect and save these species? What can you do to protect an ecosystem? ***(for)***
- Draw plants and animals that make a food chain and/or cut them out. Arrange them into a food chain, or, for more advanced students, build up a food web. What happens when you introduce an animal pest into the equation? ***(about)***
- Choose a picture of a fish/mollusc/marine mammal/bird and identify its special features. Add labels for these adaptations (features) and say how each helps the animal or plant survive. Why are many of our native species vulnerable to introduced predators? What can we do to help protect them? ***(about and for)***
- Make a "wanted" poster for an introduced pest. Describe the damage that the pest is doing or potentially may do and suggest an ecological reward for its elimination. ***(for)***
- Find out about the use of seaweed as food and rongoa or traditional medicines. Ask your local kaumatua or check books in the library. ***(about)***

**Get your school involved:**

- Adopt a local reserve.
- Join a community conservation group.
- Use plants that will encourage native birds to your school.
- Raise funds for a threatened species.
- Get involved with the Kiwi Conservation Corps (Forest & Bird) or Junior Naturalists.

*For more information on how your school can get involved in conservation contact your local DOC office.*

# 2 Organisation and Facilities

## 2.1 ORGANISATION OF OUTDOOR SAFETY

When planning a visit to Waiotahi Spit, follow school policy to make sure the correct procedures are being followed. For example you will need to do a risk analysis and management plan for your visit.

**Points to Remember:**

- Be sure to brief students on outdoor safety before the visit, and remind them again, on arrival, to take care. Students are to stay together at all times and under no circumstances are they to wander off by themselves or go into the water unsupervised..
- Have parents/helpers well briefed on their responsibilities – the main one is to know exactly where their charges are at all times.

**For further in-depth information on outdoor safety refer to:**

- ***Education Outside the Classroom Guidelines for Good Practice***. Ministry of Education, 1995.
- ***Managing Risks in Outdoor Activities***. Mountain Safety Manual 27, 1993.
- ***Outdoor Safety Management Systems***. EONZ, 1998.
- ***Outdoor Pursuits Guidelines for Educators***. Hillary Commission, 1996.
- ***Water Safety Across the Curriculum***. Water Safety New Zealand, 2000.

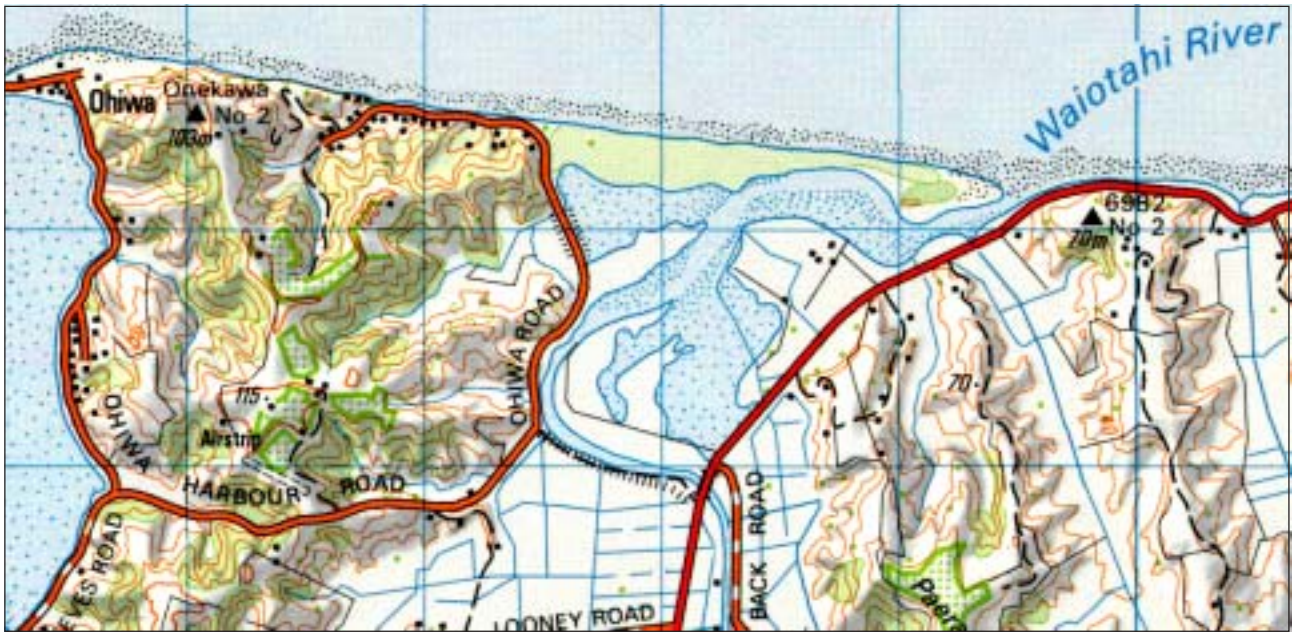
These publications are available in school or from your local EONZ branch.

## 2.2 WAIOTAHI SPIT FACILITIES

- Waiotahi Spit is located in the Bay of Plenty in the North Island, approximately 8 km west of Opotiki. If travelling from Whakatane the turn-off is at the point when the road meets the beach.
- There are toilet facilities.
- A pre-trip visit to the site by the trip leader is recommended to enable the best organisation for the class/es on the day.
- When exploring the estuary return any rocks you look under to their original position. This will help protect the plants and animals living on and under them.
- Keep the ocean and shore clean.
- Please do not visit the area of the Historic Reserve where the pa and urupa are: they are wahi tapu.

# 3 Waiotahi Spit Scenic and Historic Reserves

Waiotahi Spit and Estuary is one of the natural gems of the Opotiki coastline and has the highest conservation ranking. It retains a rare combination of features: a sand spit, an estuary, river mouth flats, adjacent low hills, a pa site, an urupa, pohutukawa forest, several rare birds (New Zealand dotterels, banded rails, bitterns and fernbirds), important shellfish beds, mangroves, culturally valuable plants (pingao) and a fish breeding zone (whitebait and others).




The spit is mainly vegetated in bracken-grassland following clearance of the original forest. There are however, clumps of pohutukawa trees at its base and at the pa and urupa at the outer, or eastern, end of the spit. Spinifex with some pingao occupies the foredune strip to seaward. The only weeds of note are small patches of gorse, a few pine trees and some boxthorn bushes. The dotterels, and oystercatchers and stilts, breed at the tip of the spit. Rabbits, stoats, cats, rats, weasels, hedgehogs and possums are resident, and trailbike riders make use of it. Nevertheless regeneration of pohuehue is vigorous and the revegetation potential is enormous.

Within the estuary there are large areas of oioi (jointed wire rush) rushlands interspersed with some sea rush, *Baumea juncea*, three-square, and shrubs of *Olearia solandri* (apparently the only place this occurs on the Opotiki coast) and saltmarsh ribbon wood. There are also small areas in which raupo and jointed twig-rush are dominant at the base of the spit. Banded rails and Australasian bitterns, both nationally threatened birds, have been recorded here recently. Fernbirds, which are regionally threatened, are also present.

The estuarine mudflats are habitat for wading birds, several fish species and numerous invertebrates, including shellfish. Whitebait spawn in the seawater/freshwater wedge where the river and streams enter the estuary. Where the Waiotahi River enters are two small mangroves, the only remnants of the former mangrove forests of the estuary. These, and the population at the Waiaua Estuary are at the southeastern extreme of the range of mangroves in New Zealand. [1]

*1* CAS Notes: 189 pp. 3-4.

## 3.1 HISTORY

Waiotahi Spit was historically very highly valued as a food source for both fish and shellfish. This abundance of food led to the area often being contested for ownership and control by hapu of the Whakatohea, the Upokorehe and the Ngatiparu people against Tuhoe. Whakatohea were the inhabitants of the adjacent pa, but there were times when they were dislocated by Tuhoe and then Tuhoe would have control and occupation. The area is a meeting point on the Whakatohea and Tuhoe traditional boundaries. The area is protected by the Atua kaitiaki and contains the urupa of both Tuhoe and Whakatohea. Tangata whenua never cross the estuary to the spit which is very tapu (sacred) and do not want people to visit the spit and put pressure on the delicate and tapu place.

## 3.2 USES OF WAIOTAHI SPIT

- Swimming/snorkelling/diving/boating
- Beach recreation/picnicking
- Education
- Fishing
- Scientific research.

## 3.3 CONSERVATION AND CURRENT ISSUES

The New Zealand Dotterel is found only in New Zealand. It is a threatened species – there are only about 1300 left in the world which makes it rarer than the kokako and the yellow-eyed penguin. New Zealand dotterel are in trouble because of introduced predators and the disturbance of the breeding habitat by people. In 1992 a recovery plan was prepared and staff are employed at three key sites to help protect the birds. Predators are trapped early in the season and disturbance is reduced by raising public awareness.

## 3.4 THREATS

Threats to the native flora and fauna include:

- Introduced pests: rabbits, stoats, weasels, hedgehogs, ferrets, dogs, cats and possums.
- Black-backed gulls
- The introduction of exotic seaweeds
- Oil or toxic substance spills from damaged or wrecked ships/boats.
- Visitors: - use of vehicles on the beach, particularly trail bikes; and thoughtless actions such as not returning rocks to their original position after they have been looked under.
- Over fishing –and excessive collection of shellfish

## 3.5 MANAGEMENT

Short-term management: Statutory protection of the estuary; continued rabbit and possum control; mustelid control; eradication of gorse, boxthorn and exotic pines; prevention as much as possible of access by trailbikes, horses and cattle; protection of New Zealand dotterel site from human disturbance; planting of pohutukawa on spit.

Long-term management: Restoration of dune forest on spit by fostering regeneration of native trees and planting native trees (pohutukawa, ngaio, karaka, karo, taupata, etc) retention of rushlands and mangroves in estuary.

## 3.6 MANAGEMENT OBJECTIVES OF THE DEPARTMENT OF CONSERVATION

- To protect the natural and historic resources of Waiotahi spit, particularly the New Zealand dotterel and the pa and urupa.
- To encourage and facilitate recreational use and appreciation of the natural resources of the area.

NEW ZEALAND ENVIRONMENTAL CARE CODE

Protect plants and animals

Remove rubbish

Bury toilet waste

Keep streams and lakes clean

Take care with fire

Camp carefully

Keep to the track

Consider others

Respect our cultural heritage

Enjoy your visit

*Toitu te whenua (Leave the land undisturbed)*

# 4 Teachers' Background Reading

## 4.1 WAIOTAHI SPIT

### *4.1.1 The Coast line*

The **intertidal zone** of inlets and estuaries is a little-known world. This is where the sea meets the land; its extent changes throughout the day with the changing tides. The ever-changing picture is also complicated by the influence of the waves which affect the tides. In rough weather the tidal levels are even higher because the water is forced further up the shore. The lowest tides are the spring tides in very calm conditions when the water is able to recede unopposed by wind or surge.

**Splash zone**

Above high tide – may extend as much as 10m above high tide mark. The creatures are very tolerant of salt and desiccation and can survive long periods without being wetted. Sometimes called periwinkle zone because periwinkles are often abundant there.

**High tide mark**

The band to which spring tides reach – often marked by a band of dried seaweed and debris.

**Upper shore**

This is between mid-tide level and high tide and is a zone frequented by organisms which can withstand prolonged exposure to air such as barnacles, chitons, grazing snails and small seaweeds.

All wetted at each tidal cycle but some for only an hour or so.

**Mid-tide level**

Arbitrary level half way between high and low tides

**Lower shore**

This is between mid-tide level and low tide mark. Organisms are exposed to air for short periods and on exposed shores they are often kept wet all the time by splash and spray. This is a less harsh environment as far as desiccation is concerned. Many species are present in this zone and the interactions between them are correspondingly complex.

**Low-tide mark**

The lowest level to which the ocean recedes at low spring tide.

**Zonation**

Creatures of the tidal shore often live in bands at various levels of the shore which is called Zonation. It is the result of biological and physical forces working together. The **biological force** is competition, by which some species completely oust others from

a particular level or share the space with certain others. The **physical forces** are heat, desiccation and weather which become more severe the higher up the shore you go. Generally the upper limit is regulated by physical factors and the lower by biological factors. [2]

### *4.1.2 The Visit to Waiotahi Spit*

**Animals and Plants**

The best way to learn about the sea is to get into the water with a mask and snorkel and explore the sheltered estuary.

Pre- and post-visit viewings of *Marine Things* (TVNZ/Wildtrack) and *Exploring the Sea* (Kingdom of the Sea, UK – 52 mins.) will enhance understanding of marine ecosystems.

## 4.2 PLANT IDENTIFICATION

### *4.2.1 Seaweeds*

Green, brown and red seaweeds and diatoms are the most common marine plants. Collectively they are called algae. As with land plants, seaweeds contain chlorophyll and use sunlight as a fuel to convert water and carbon dioxide into sugars. However unlike land plants seaweeds need little woody tissue because the plant is supported by water. They do not have roots, instead they absorb minerals and water through all their surfaces and cling to rocks with a holdfast – a clinging pad or cluster of tendrils which acts as an anchor.

Seaweeds reproduce by spores, both sexually and asexually. Sexual reproduction occurs when the egg is fertilised by sperm. In asexual reproduction, the spores are produced from one parent plant.

### *4.2.2 Mangroves*

There are only two mangroves left at Waiotahi estuary. Mangroves play a crucial role in northern estuaries: they provide shelter and nursery grounds for small fish and they protect, consolidate and build up foreshores. They also act as nutrient traps to enrich the productivity of inshore waters. Adaptation to living half in and half out of the sea has produced some remarkable specialisations. They grow in airless soil (black, sulphur smelling mud just below the surface). They have roots for anchorage and feeding and special roots sticking up for breathing. Mangroves only grow from seed. Birds shelter in the branches but they are not a good place for feeding because few insects live there, but close to the ground on the trunk roots and even on the leaves there are many animals which use the food moving in suspension in the tide.

2 Bradstock 1989: pp. 13-14.

## 4.3 BIRD IDENTIFICATION

Almost a third of New Zealand's bird species depend on the ocean for food, in the form of plankton, crustaceans, squid and fish. The availability of these food sources is largely controlled by the mixing of ocean currents and tide cycles.

During low tide wading birds and gulls forage across the mudflats for shellfish, chitons, crabs and fish. Birds include: Pied stilt, Pied shag, Black shag, Caspian Terns, Variable oyster catcher, Bitterns, New Zealand Dotterel, Black-backed Gull, White faced heron, Reef heron, Spur-winged plover, Banded Rail, Cattle egret and the occasional White heron. Eastern Bar-tailed Godwits are visitors from Siberia who arrive for the summer in September/October and leave in March for their breeding ground in Siberia.

## 4.4 FISH IDENTIFICATION

A great many fish visit the tidal shore when it is covered. The most common visitor is the yellow-eyed mullet. Kahawai often venture into shallow water to prey on yellow-eyed mullet. Other common estuary fish are trevally and jack mackerel. Flounder and flatfish are frequently encountered as puffs of fine sediment scudding away from shore. Young flatfish swim upright and have an eye on both sides of the head. They then **metamorphose** so that both eyes are on the right-hand side and take up life on the bottom lying on the left side. They make this transition in summer when there is plenty of food about so that they can grow faster. Parore are our biggest estuary fish often reaching 400mm in length and over 3 kg in weight. There are major differences in colour and shape between the young of some fish and the adults they grow into. Butterfish start life a golden-yellow with a white line along the side, but become blue-green and a slightly different shape as an adult. The male and female of the small fish called the spotty (*Notolabrus celidotus*) look quite different from each other. The female is yellowish-brown with a large dark spot in the middle. When the female reaches about 200mm it turns into a male and changes colour to advertise this change. The dark spot changes into smaller spots closer to the dorsal fin and the background colour becomes grey-brown.

**Whitebait** are the young of five different species called galaxiids. The adults live in fresh water and the life history consists of three migrations. First the adults migrate down to the estuaries and marshes to spawn. Then the newly-hatched young migrate out to the open sea, to return eventually as the partly grown juveniles. As these little fish migrate into the rivers and streams they are eagerly netted by fishermen. Waiotahi Spit is an important spawning area for whitebait.

## 4.5 MOLLUSCS IDENTIFICATION

A great many different species of mollusc may share the same ground on a tidal shore which makes their ecology quite complex. They are able to co-exist because they are specialised for many different ways of life and so do not compete seriously for food and living space. Molluscs are the easiest shore dwellers to find and recognise. All snails, limpets, and chitons are molluscs, so are oysters, mussels, sea slugs, whelks and octopuses. The name means soft body and refers to a quality they all share – the body is made up of a mass of soft parts. Molluscs also have a foot which is a muscular organ

which they use variously for crawling, grasping or digging. Most molluscs have a shell although some octopuses and sea slugs do not. Generally the shell protects the animal although in some it is hidden inside the animal and serves as a skeleton or protective shield.

Sea snails such as cats eye, limpets, paua and sea slugs are **gastropods** and are adapted to living in the open or in sediment.

Pipis, tuatua, cockles, toheroa and tellina are **bivalves** and are mainly filter feeders. The hinged shells enable them to control the amount of contact between the animal and its habitat.

## 4.6 CRABS AND OTHER CRUSTACEAN IDENTIFICATION

All crustaceans have three distinguishing characteristics: they are joint-legged; they have two pairs of antennae and they moult their shells as they grow. Barnacles are crustaceans although they outwardly only resemble crustaceans during their larval stages.

## 4.7 MARINE MAMMAL IDENTIFICATION

Whales and dolphins New Zealand fur seals, and several dolphin and whale species are all regularly observed in the area. coastal waters. Species include the Bottlenose dolphin, the Common dolphin, Dusky dolphin and the Orca.

*Whales Dolphins and Porpoises Resource Kit*

This resource produced by Project Tohora may be obtained from:

- T. Jenkins
  PO Box 12056
  CHRISTCHURCH

**A visit to Waiotahi Spit will be more interesting if you are able to recognise some of the seaweeds, birds, fish, shellfish and marine animals.**

**Worksheets include birds, seaweeds, fish, molluscs and other marine animals.**

Birds:

- Oyster catchers
- New Zealand dotterels
- Gulls
- Terns
- Banded rails
- Bitterns
- Fernbirds

Plants:

- Mangroves
- Pohutukawa
- Ngaio
- Pohuehue
- Raupo
- Jointed wire rush
- Pingao
- spinifex
- seaweeds
- Flapjack
- Bull kelp
- Neptunes necklace
- Glass wort
- Zostera

Intertidal fish:

- Yellow-eyed mullet
- Kahawai
- Trevally
- Jack mackerel
- Flounder and flatfish
- Parore
- Butterfish
- Spotty
- Snapper
- Red mullet
- Whitebait
- Eels
- Cockabullies - triplefin
- Anchovies
- Rays
- Spotted dogfish

Molluscs:

- Limpets
- Chitons
- Mud snails

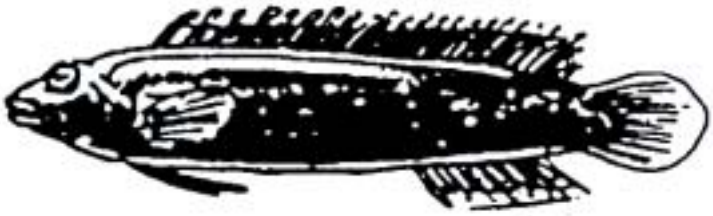
- Cats eye
- Periwinkles
- Tuatua
- Pipi
- Whelks
- Cockles
- Tellina
- Octopus

Marine mammals:

- New Zealand fur seals
- Elephant seal
- Leopard seal
- Dolphins
- Orcas

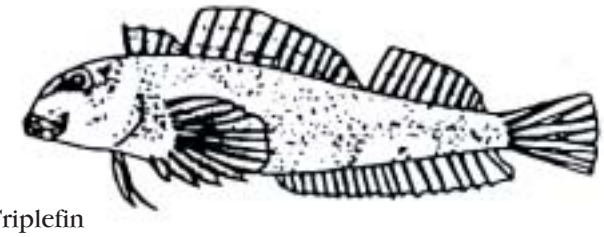
Other Marine Animals :

- Sea anemones
- Rock lobster (crayfish)
- Crabs
- Shrimps
- Barnacles
- Starfish
- Sea egg (kina)
- Sponges



Rock Fish

Clingfish



Triplefin

Dog Fish

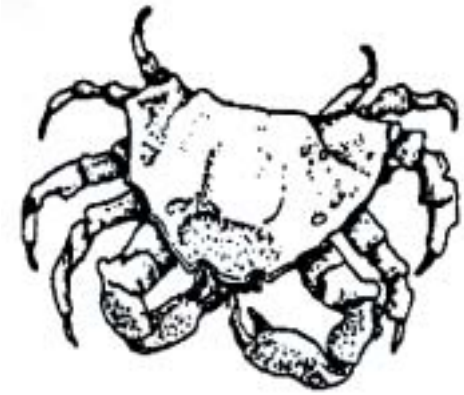
Sponge

Cat's Eye

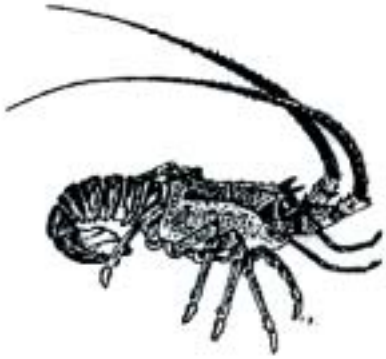
Turret shell

Hermit crab

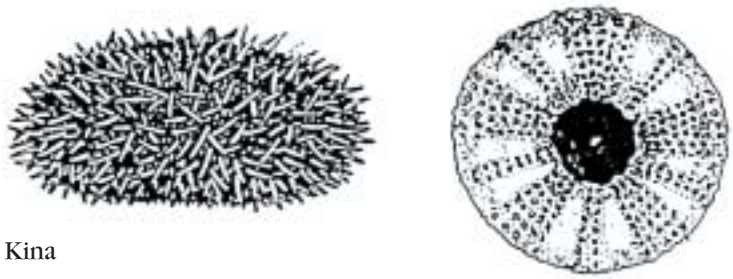
Anemone



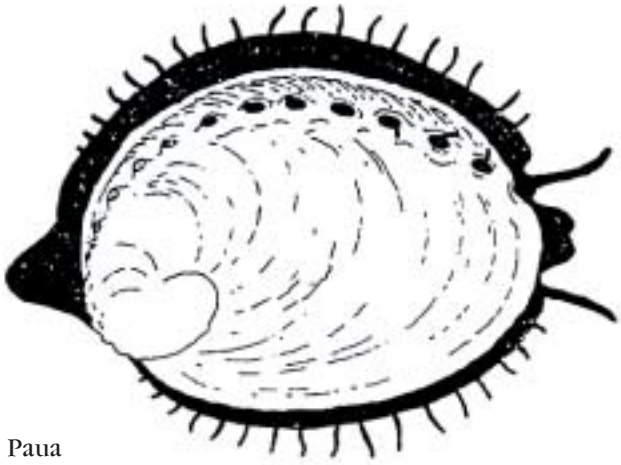
Crab



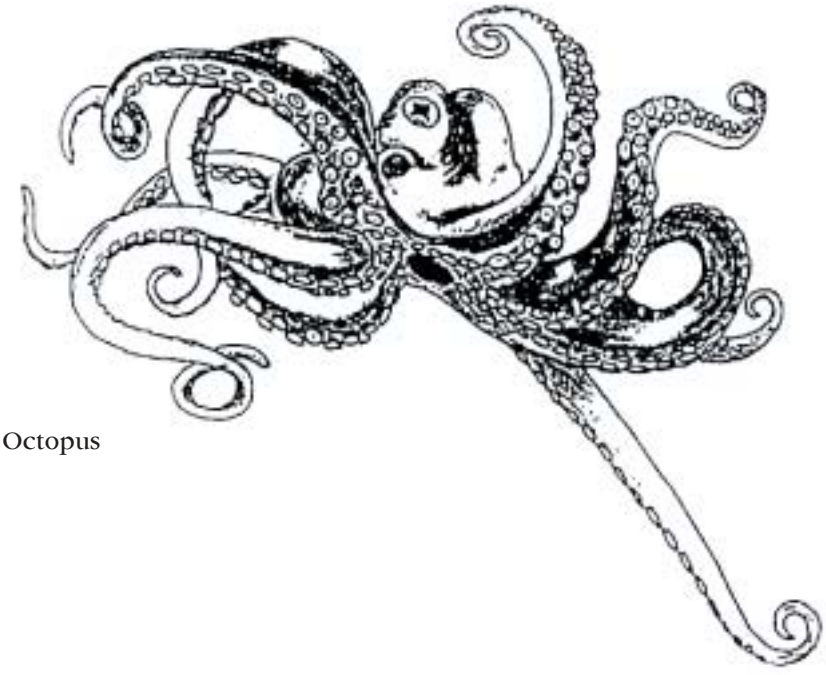
Crayfish



Kina



Paua



Octopus

# 5 Statements about Curriculum Links and the Kits

Because this kit is site-based and most kit users will visit the site, the main curriculum objectives will be based around an **environmental theme**.

The strongest links will probably be with the **science**, **social studies** and **health and physical education** documents, although aspects of the **technology** and the **art** curriculums are important in getting the best value from a visit.

Of course the **English** document is always the basis of any study as the other documents continually feed in material that develops students' learning in oral, written and visual language. Similarly, good opportunities exist at all sites to explore many ideas in all of the mathematics strands.

The best summary of links for the seven curriculum areas can be found in: **Ministry of Education, 1999. *Guidelines for Environmental Education in New Zealand Schools*. Ministry of Education, Wellington, New Zealand.**

## 5.1 SOCIAL STUDIES

**Social Studies Education aims to enable students to participate in a changing society as informed, confident and responsible students.**

Waiotahi Spit visits and projects offer opportunities for students, at appropriate levels, to develop concepts in each of the five strands. Examples for each of the five strands are listed below:

### *5.1.1 Social Organisation*

- how people organise themselves to visit the beach
- what type of groups of people visit the beach
- how groups organise themselves to respond to coastal management issues
- how DoC /Environment Bay of Plenty organise staff to manage the coast.

### *5.1.2 Culture and Heritage*

- aspects of Maori tradition associated with Waiotahi Spit,
- the use of the beach by family, community and educational groups,
- Waiotahi Spit as a significant landmark and coastal feature for people of the Bay of Plenty

### *5.1.3 Place and Environment*

- why Waiotahi Spit is a significant environment for people
- how peoples' activities influence the coastal environment

- how and why peoples' perceptions of the coastal environment are reinforced or changed by information or experience
- how and why people seek to resolve differences over how places and environments should be used
- how people express a sense of belonging to the Waiotahi Spit
- the importance of the place and environment for recreation.

### *5.1.4 Time, Continuity and Change*

- how beliefs and ideas in society change and how this has impact on the coast
- how the process of change over time is used as a tool for coastal management
- how Maori use of Waiotahi Spit has changed over the centuries.

### *5.1.5 Resources and Economic Activities*

- how Maori used the area as a resource in the past
- the European use of Waiotahi Spit in the past.

## 5.2 SCIENCE

Learning in science is fundamental to understanding the world in which we live and work. It helps people clarify ideas, to ask questions, to test explanations through measurement and observation and to use their findings to establish the worth of an idea. (*Science in the New Zealand Curriculum*, p. 7.)

Of the four contextual strands: the living world, the physical world, the material world and planet earth and beyond, Waiotahi Spit studies will particularly enhance development of knowledge, understanding, skills and attitudes in the **living world** and **planet earth** strands.

### *5.2.1 Living World*

Development of concepts in all of the four achievement aims (*Science Curriculum*, p. 52) could be attained during a Waiotahi Spit project with the first three aims culminating in an enhanced understanding of the all important Aim Four. This can be achieved through appropriate activities at any level from one to eight.

- What are the living and non-living things that make up an intertidal mudflat?
- Design nutrient and water cycles.
- Identify molluscs, crabs and crustaceans, fish, echinoderms.
- Introduce intertidal ecosystems. Why are particular species found in specific zones or habitats?

### *5.2.2 Birds*

- Identify bird species.

### *5.2.3 Planet Earth*

Achievements in Aims One and Two (*Science Curriculum*, p. 106) lead to achievement of Aim Four: investigate how people's decisions and activities change the physical environment and develop a responsibility for the guardianship of the planet and its resources. Any achievement in this aim through studies at Waiotahi Spit is probably the most important of the entire New Zealand Curriculum Framework.

Research **Biodiversity** to develop children's understanding of why New Zealand's native plants and animals are unique.

### *5.2.4 Videos*

- *Paua Growing*
- *Marine Things* (TVNZ/Wildtrack)
- *Exploring the Sea* 52 mins. (Kingdom of the Sea, UK)

Interpretation of the extensive views of the surrounding landscape, however elementary, from the vantage points can help to cement important '**our land, our place, our guardianship**' values and attitudes in students of all ages.

## 5.3 TECHNOLOGY

**Learning in technology implies becoming confident in using a variety of means to address needs and opportunities and solve practical problems within society.**

Technology education explores choice and the factors which influence choice, including culture and society, costs and benefits, aesthetics and fitness for purpose.

It seeks to empower students to make informed choices in the use of technology and in their response to technological change. (*Technology in the New Zealand Curriculum,* p. 8.)

**A wide range of opportunities exist through a visit to Waiotahi Spit within the context of three strands:**

1. Technological Knowledge and Understanding.
2. Technological Capability.
3. Technology and Society.

**Examples would include the technologies involved in:**

- Animal, plant monitoring at Waiotahi Spit
- The development of facilities for visitors such as signage
- Aspects of the school trip to Waiotahi Spit such as choices of:
  - clothing,
  - food,
  - drink,
  - personal accessories,
  - protection – hat, sunblock.
- Design an underwater viewing device.

## 5.4 HEALTH AND PHYSICAL EDUCATION

Waiotahi Spit visits and projects offer opportunities for students, at appropriate levels, to develop concepts in each of the four strands. For example:

### 5.4.1 Personal Health and Physical Development

- Identify and use safe practices and risk management in the coastal environment.
- Share ideas and beliefs about how the use of the coastal environment enhances a person's health.

### *5.4.2 Movement Concepts and Motor Skills*

- All achievement objectives in this strand could be met through the development of concepts relating to safe and efficient water skills in a group situation.

### *5.4.3 Relationships with other People*

- Development of skills relating to planning safe and enjoyable experiences at Waiotahi Spit with class or family groups.
- Develop skills in relating to other group members while at Waiotahi Spit – to maximise enjoyment and positive learning experience outcomes.

### *5.4.4 Healthy Communities and Environments*

- Share ideas to identify factors that relate to coastal use and community mental and physical health.
- Identify concepts that are used in the management of the coastal environment that enhance the wellbeing of the plants and animals (ecosystem).

# 6 Teacher Study Sheets

## 6.1 SOCIAL STUDIES

### Debating

During discussions about the place that the Department of Conservation has in preserving our natural and historic heritage students will realise that people hold different opinions on that role.

Encourage them to talk to their families, parents, friends etc. to find out what they consider should be done.

Use the media – for example TV, the newspaper (the free local edition, or the Education page in newspapers) magazines (if your school subscribes).

Use Web pages for information or write to organisations that are involved in environmental issues, such as Forest and Bird.

Find out about Resource Consents.

These findings can then be used to form debates on issues such as :

**Role playing** could cover the same issues.

### Surveys

The issues raised in the debating topics could be used to develop surveys to find out other peoples' views.

Surveys could be developed using criteria such as:

- Age,
- Gender,
- Culture.

Collate information as graphs, percentages, etc.

Results could be presented :

- in the school newspaper,
- at assembly,
- on the local newspaper, or
- shared with other schools.

## 6.2 AUDIO AND VISUAL ARTS

This worksheet is designed to give you ideas you can develop with students of any age group. The suggestions may be developed individually or could become a major, integrated unit of work, linking many curriculum areas.

## Music

The sea/beach provides a wonderful symphony of sound. This could be taken back to the classroom, either by using a tape recorder, and /or having sound on of the objectives students focus on during the visit. For example:

- Identify and note down the different sounds heard (in what form students record this is to be discussed before the visit.)
- Record these sounds in written form.
- Take a tape recorder and record as many different sounds as possible.
- Elect groups to study specific areas, e.g.
  - Natural – air, water, land.
  - 'Man-made' – air, water, land.

### Back at school

- Discuss the different sounds heard and recorded.
- Record as many sounds as possible in written form to produce a score of music.
- Using voices and music produce a piece of music that represents the "Voices of Waiotahi Spit"

## Plays

The beach also portrays never-ending activities by the creatures in their habitat. These provide wonderful opportunities for students to develop their imagination. If you choose this concept, before your visit, you will need to prepare students to observe closely all the activities on site. These could then be the objectives on which to base your unit.

- Observe and record the movements and areas creatures are seen and how they move.
- Record the creatures' responses to their environment. What would their response be if you could understand their language?
- Discuss the effect people have on their environment.

### Back at school

- Collate this information into a play for presentation e.g. at school assembly.
- portray the characters using costumes, masks etc.

## Art

To develop an understanding of Waiotahi Spit students' attention needs to be directed towards the colour, texture and form of the environment.

- Feeling the different textures and recording (using crayon and newspaper)
  - Sand
  - Shells
  - Feathers
  - Seaweed
  - Animals

- Observe the colours – above, around and below – a camera will help record.
- Look at the form of plants, birds, fish, animals, water and the landscape.

**Back at school**

- Develop the above points individually using a variety of media and discuss the need to look at and record them individually.
- When developing form use pencil/charcoal sketching as a starting point.
- Combine the three elements of colour, form and texture to produce a picture. This can be developed with multi-media and as a group activity.

## 6.3 EARTH SCIENCE

In conjunction with visits to Waiotahi Spit the children will be able to discover the natural processes and forces involved in forming the landscape. A variety of projects can be developed depending on the site visited, but much can be done pre and post-visit e.g.

- Discover the meanings of these geological terms, giving a brief description of each one:

| | | |
|---|---|---|
| earthquake | fault line | sedimentary |
| igneous | metamorphic | thrust |
| fold | anticline | syncline |
| sandstone | mudstone | limestone |
| tephra | pumice | conglomerate |

- Discuss and record the processes involved in forming the Bay of Plenty landscape.
- Estimate the geological age of the Bay of Plenty.
- Predict the forces that are at work forming the coastline.
- Refer to the topographical maps W15 & 16; X15 & 16. Find Waiotahi Spit, Ohiwa Harbour, Opotiki Harbour, White Island, Motuhora Island, the Huiarau Range. Identify cliffs, gorges and fault lines in the area. In what direction is the land uplifting and sloping?

## 6.4 FIELD TRIP

### Equipment needed:

**Buckets, whiteboards, 3-D viewers, (and/or) masks, snorkels and flippers, rulers/tape measures**

### Adaptations

Animals and plants found in the intertidal zone and in the sea have specific adaptations to live in this environment. Many of these organisms live in distinct zones. Encourage the children to look at and compare the animals and plants so they can discover the adaptations.

- Look at the estuary
- Select a zone
- Study the animals and plants within it
- List the adaptations of the inhabitants
- Do observational drawings of the inhabitants. (Remember to be careful and return everything to its original position.)
- Map where the specific animals and plants are found. Measure the distances.
- Compare the adaptations of creatures in another part of the estuary.
- How does the substrate influence where organisms are found?

## Life Cycle and growth

- Observe and measure a particular species of animal e.g. shellfish
- Record the sizes

Remember that time spent on preparation at school will ensure better results in the field.

## Back at school

- Decide how the data can be presented and analysed.
- Draw a graph
- Identify the area of the reserve you surveyed
- Show numbers and sizes of organisms
- Add drawings and written work to the class mural
- How do the animals react to:
  - light
  - predation
  - evaporation/heat
  - salinity
  - wave exposure

# 7 Monitoring

This section covers the measurement of ecosystem recovery and the monitoring of species outcome, which indicate the success of pest control.

The intertidal ecosystem involves interactions between many different components. Different parts of the ecosystem and interactions between them, can be used as indicators of ecosystem health.

### Procedures

**Baseline studies** refer to data that are collected to provide information on the present state of the area under study.

When marine scientists and managers check on marine health over a period of time they find out if the coast is improving, is stable or is declining in overall health. This is called monitoring.

**Monitoring** involves repeated sampling over time and at more than one location. Monitoring over a prolonged period is designed to detect variations in populations. It may include evaluations of impact, distribution and abundance.

Drawing comparisons between sites is an important aspect of marine studies and involves **sampling** organisms to gain information on distributions.

This information can be gathered by:

- Mapping the position of the organisms:
  - draw the estuary and show where the animals and plants are found.
- Sampling the area repeatedly either using transect lines or quadrates.

This information can be compared with existing data from other habitats or locations.

Studies of **Variation** are ideally suited for along a shore or between **micro-habitats**. Variation across the shore is an exercise which can be developed because well-defined zones containing predictable sites of species are rarely, if ever found. An investigation can be carried out using transects and/or quadrates to determine the distribution of species**.**

## 7.1 SAMPLING METHODS

### Transects and Quadrates

***Equipment:***

- 25 metre tape measure or a measured length of rope marked at regular intervals e.g. every 5 m.
- 0.25m² quadrates constructed from lengths of wood or metal
- Recording slate/board
- Identification charts.

### *Transects*

**Cross shore profiles** can be obtained by using a transect line for studying habits, mapping widths and positions of **habitats** or **species assemblages** and for quantifying abundance patterns. Profiles can be used in association with quadrates.

### *Quadrats*

Quadrats may be deployed randomly over the whole shore, **(simple random sampling,)** or placed in allocated areas. Within the test area quadrats can be placed in pre-selected strata, such as habitat.

A quadrat size of 0.25m x 0.25m enables a wide variety of organisms and habitat types to be assessed.

Variables measured by quadrates include:

- Density of organisms
- Size of organisms
- Cover (proportion of area occupied)
- Frequency (percentage by which species occur in quadrates).

Sampling can cause a dilemma, but the alternatives are:

- Sample whatever falls within the randomly chosen quadrat.
- Arbitrarily move the chosen quadrate to avoid obstacles, if necessary.

## 7.2 MONITORING STUDY SHEETS

### Checklist

- Field recording sheet
- Clip board
- Pencil
- Binoculars (optional)
- ruler/tape measure
- bucket
- 3-D viewer
- Worksheet 1 - birds
- Worksheet 2 - plants
- Worksheet 3 - fish
- Worksheet 4 - molluscs
- Worksheet 5 - other marine animals.
- Hat
- Sunblock

# 8 Other References and Resources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# 9 Super Sites for Education Resource Kit Evaluation Form

**This "Super Sites" education resource is designed to help you plan exciting learning experiences using parks and reserves administered by DOC in your area. Is it useful? How can we improve it? Please let us know!**

| |
|---|
| How did you find out about this Super Sites resource?<br>Comment: |
| |
| Was there enough information for you to get an overall understanding of the site? YES/NO<br>If NO, what else would you like included? |
| |
| |
| |
| What was the level of the class that used the resources? (Circle the answer)<br>Year 1 2 3 4 5 6 7 8 9 10 |
| Did the resources help you to meet your curriculum objectives? YES/NO<br>If NO, how could we improve them? |
| |
| |
| |
| Were the activities enjoyable? YES/NO |
| Did they meet the learning needs and interests of your students? YES/NO |
| Do you have any suggestions for improving them? |
| |
| |
| |
| Were the suggested activities manageable at this site? YES/NO |
| |
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| Were there any safety concerns arising from these activities, or the site? YES/NO<br>Comment: |
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|---|
| Has using this resource helped raise your awareness of an environmental issue in your region? If so, what? |
| |
| |
| |
| Is your class or group taking on an environmental project as a result of the visit? YES/NO<br>Comment: |
| |
| |
| |
| Are you aware of any change in your students' attitudes or behaviour towards the environment/environmental issues since using this resource?<br>Comment: |
| |
| |
| |
| Was this your first visit with a class to a Department of Conservation Super Site? YES/NO |
| Are you planning any more visits to this or other conservation sites this year? YES/NO<br>Comment: |
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| |
| How would you like future Super Sites resources and programmes to be developed? (Circle the answer):<br>New themes Web access More sites Other<br>Comments: |
| |
| |
| |
| On a scale of 1-10, how would you rate this resource? (1 = excellent, 10 = poor)<br>1 2 3 4 5 6 7 8 9 10 |
| Would you use a 'Super Sites' education resource again? YES/NO |
| Have you any other comments about how we could improve this resource? |
| |
| |
| |

***Please post the completed form to:*** Community Relations Officer (Education), Department of Conservation, PO Box 668, GISBORNE.

Thank you!