

### Programme 1: Exploring the Rocky Shore

The majority of schools which have visited the Marine Education Centre in the past requested one of our *Exploring the Rocky Shore* programmes. Since 1997, this programme suite has provided many thousands of school children with their first encounter with marine life, and has proven to be especially popular and effective in providing valuable, science-based, learning experiences to students at all levels. In 2005 we expanded this basic experience into a four-stage programme which now provides increasing levels of complexity to match the age and achievement level of the students participating. Since many schools in the region book visits annually and some students have visited several times, this four-staged programme provided returning students with stimulating, new, focussed experiences which are linked to, and build on, the knowledge they gained during previous visits.

These programmes are also suited to first-time students of whatever age group since the information and activities can be adapted to any level of achievement. All four programmes focus on the key concepts of *Biodiversity, Adaptation, Interrelation, Change* and *Conservation*. Students are encouraged to explore each of these key concepts during their visit and during after-visit discussions using a series of questions keyed to each of the four stages described below.

This programme suite will continue to provide the core programmes for the coming school years. However, we expect that more school groups will be attracted to our other programmes over the coming years as public awareness of the Centre and its activities continues to increase through our website, monthly Open Days, our public Reading Cinema display and other promotional sources.

Programme 1. Exploring Rocky Shores		
Stage 1: "Fish Fingers" A full, hands-on, interactive plunge into discovering the variety of marine life which lives on a rocky shore. Level 1-2; 1.5 Hours*		
Achievement Objectives	Specific Learning Experiences	Links
Understanding the difference between living and non-living attributes of our local environment.	Discussing the characteristics of living and non-living components of the local environment using examples.	SNS- 1:1,2; 2:1,2 SLW- 1:1-3; 2: 1-3 SMW-1:1, 2:1 SPE: 1:1, 2:1,2
Understanding the difference between an animal and a plant.	Observing and touching live plants and animals that live on land; Looking at our "visible" plant and animal models to identify the major parts and their function.	A- drawing, drama, story telling
Investigating the kinds of plants and animals that live on the rocky shore.	Holding marine animals and plants close-up; Exploring and interacting with the live marine habitat displays; "Shaking Hands" with an octopus; Counting parts of some animals (i.e. octopus legs).	E- 1,2 M- counting
Understanding how marine animals are similar and differ from those on land.	Helping feed some of the live marine animals; Drawing pictures of favourite marine animals;	Tk, Lst, Ms, Po
Exploring how and what some marine animals eat, and how they breathe, grow, have babies, etc.	Dressing up and acting in our "Predator Parade"; Describing what was seen and done by story telling and drawing pictures.	
* Indicates the visit includes a hands-on experience.		
+ Indicates the visit includes a guided exploration of the adjacent rocky shore.		



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**Stage 2: "Rock & Roll" An exploration of how marine plants and animals have adapted to living on the rocky shore. Level 3-4; 1.5 Hours \*+.**

Achievement Objectives	Specific Learning Experiences	Links
Understanding how marine plants and animals are adapted to living in a dynamic environment, including the special characteristics of New Zealand species.	Discussing the type of plants and animals that live on rocky shores; Exploring adjacent rock pools and observing relationship between physical environment and habitat.	SNS- 3:1-4, 4:1-4
Ability to distinguish between different groups of marine animals.	Examining characteristics of major marine groups using local examples: starfish, mussels, crab, sponge, etc.	SLW- 3:1-3, 4:1-3
Understanding how marine animals and plants survive on the rocky shore.	Investigating marine animals and plants close-up and interacting with the live animals in our marine habitat displays.	SMW- 3:1, 4:1
Understanding how marine animals move, feed, breathe, and grow, and how sea plants grow.	Observing how common rocky shore animals move in the laboratory, discussing how they grow, testing different types of food, and examining different types of seaweeds.	SPE- 3:1,2 4:1.2
Ability to describe the relationship between form and function in different kinds of animals;	Observing the parts of crabs, snails, and starfish, and "shaking hands" with an octopus to find out which parts do what.	E- 3,4
Recognising the impact humans have had and have on the marine environment especially the rocky shore.	Collecting rubbish on the beach as part of the rocky shore visit; observing the most common materials found; discussing the kinds of rubbish found and their persistence and potential harm to marine life.	Lst, Tk, Ms, Ro, Po

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**Stage 3: "On the Rocks" A hands-on investigation of the inter-relationships of rocky shore plants and animals with each other and with their non-living environment. Level 5-6; 2 Hours \*+, plus group field study time.**

Achievement Objectives	Specific Learning Experiences	Links
Understanding the physical characteristics of rocky shores which influence the type of life found there.	Exploring rock pools and observing relationship between physical factors (tides, waves, type of rocks, exposure to surf and sunlight) and the types of available habitats.	SNS- 5:1-4, 6: 1-4
Understanding the diversity of marine organisms within a rockpools.	Observing and listing the major types of organisms and where they were seen (at low tide!!) <i>i.e.</i> in rockpools, on or under rocks, etc.	SLW- 5:1-4, 6:1-4
Ability to describe the interrelationships <b>among</b> apparently different kinds of animals.	Comparing a selection of marine animals of the same group (such as echinoderms, crustaceans, molluscs) and describing similar features.	SPE- 5:1-3, 6:1-3
Ability to distinguish between different species of the same kind of animal.	Examining different specimens of crab, starfish, and snail; discussing and drawing the distinguishing differences; Making a simple key to the different species examined based on visual features.	A- drawing B- 6.1a , 7.1a,b
Understanding relationships <b>between</b> different kinds of animals (friend, foe, or ho-hum).	Describing and drawing some of the different types of animals that live on rocky shores and deciding what they eat by experimentation and asking questions.	E- 6
Understanding the concept of food webs within an ecosystem. Ability to determine a simple food web within a rockpool.	Discussing food webs on land and in the sea, how they are similar, how they differ, and why they are important to all marine animals and humans. Observing and drawing a simple food web for a specific rockpool	Lst, Tk, Po
Recognising humans as part of the marine ecosystem and their impact on its health.	Discussing the concept of sustainability, and the impact humans have had, and continue to have, on marine resources.	



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**Stage 4: "Life on the Edge" A detailed, field-orientated study of zonation, the concept of dynamic equilibrium, and factors which influence continual change. Level 7-8; 2+ Hours\* + plus group field study time.**

Achievement Objectives	Specific Learning Experiences	Links
Ability to describe how seasonal cycles of weather, wind, waves affect the rocky shore environment and its biota.	Discussing how coastal weather changes from season to season, and what we do during each season and why. Making a list of the possible impacts seasonal changes have on rocky shore habitat and biota.	SNS-7:1-4, 8:1-4
Understanding how the sea and oceans were formed, how they differ now, basic physical properties of seawater, and impact of changing environmental factors on local marine life.	Watching a demonstration of how the seas were formed, those factors which caused changes over time, and those factors which are still influencing changes in our coastal waters. Discussing what changes in which environmental factors affect local marine life.	SLW- 7:1-3, 8:1-3
Understanding what causes tides.	Drawing a diagram of the earth, moon, and sun at different times of the year, month, and day to observe how each affects local tidal cycles. Study a local tide table for the day to determine tidal height.	A-drawing B- 7.1(a), 8.1(a,b), 8.3(a)
Understanding how tides affect where animals and plants live on the rocky shore.	Exploring rock pools at low tide and observing relationship between physical environment and where different habitats are located along the beach from the shore out to sea. Making a diagram of the profile of the beach along a transect between high tide and low tide marks.	E- 8
Understanding how and why marine organisms change as they age, how and why local marine life may change their appearance.	Discussing how marine animals and plants grow and reproduce, observing how marine life may change appearance with age and over generations. Observing how marine animals in the live habitat display area change in response to stimuli such as food or danger.	M- statistics
Ability to use a computer microscope correctly.	Observing plankton under the computer microscope and using the interactive <i>New Zealand Coastal Creatures</i> CD-ROM to learn about other rocky shore biota.	Tk, Lst, Ms, Ro, Po
Understanding changes caused by undersea landslides, impacts El Nino and global warming could have on local rocky shores, and how humans have changed the marine environment.	Describing a <i>tsunami</i> , their causes, and how they affect coastal habitats and humans. Discussing the connections between pollution and global changes in weather patterns, and the potential impact of these changes on global and local marine environments.	

**Programme 2: Introduction to Marine Ecology**

Over the past eight years, many schools have requested bookings for our **Ecology of Rocky Shores** programme. This was especially true of intermediate and secondary schools. Our new programme is field-oriented, a hands-on opportunity to discover the inter-connection of all life in the sea; from worms to whales and rock pools to the deepest ocean. Students will learn why marine plants and animals live where they do, how marine plants grow, how marine animals feed, move and protect themselves.

The programme concentrates not only on how marine life interacts with their environment but on how humans have, and continue to have a significant impact on marine ecosystems, especially in readily accessible coastal areas. Students will be

able to explore the rocky shore utilising our new “**Rocky Shore Life Identification Wheel**” and special presentations by local scientists and experts will continue to be available to schools requesting this programme.

<b>Programme 2. Introduction to Marine Ecology</b> <i>A hands-on opportunity to discover the inter-connection of all life on earth, and how our continued survival and that of all creatures in the sea, from worms to whales and in rock pools to the deepest ocean, depends on healthy oceans. Level: 4-8; 2 Hours * + plus field study time.</i>		
Achievement Objectives	Specific Learning Experiences	Links
Realising the size, composition, and nature of the world's oceans, and their interconnectedness to New Zealand's coastal waters.	Examining an “Ocean Globe” showing the world's major oceans, seas, depths, and bottom features; Comparing the size of New Zealand's land area with its Exclusive Economic Zone to illustrate the importance of the sea to our daily lives.	SNS- 6:1-4; 6.3,  SPE- 4:1, 6:1,2:
Understanding how marine plants and animals have adapted to living in all habitats in the sea.	Describing the physical, chemical, and biological characteristics of various types of habitats found in the sea.	SLW- 4-8:1-3
Ability to describe the inter-relationships of marine species.	Observing marine species in the Live Habitat Displays.	SPE- 4-8:1-3
Understanding factors which lead to zonation and how it is maintained.	Observing the order and pattern of a variety of diverse species on the adjacent rocky shores, and mapping their distribution using graphs, etc.	A- drawing, photography
Improving scientific investigative skills by collecting data to describe interrelationships among species and test basic ecological concepts.	Selecting a study site on the adjacent rocky shore; making maps of the site; identifying, measuring, and recording data on marine species using transects, quadrants, and digital photography.	B- 6.1(a,b), 7.1(a,b) 8.1(a,b)
Understanding order and pattern in the distribution of marine intertidal species populations.	Writing a report on the results of the transect studies including maps indicating the relative position and number of plants and animals along the transect.s	E- 5-8  M- statistics
Increased knowledge of local marine ecosystem impact humans may have on environment.	Discussing the results of the field study and preparing a photo collection and identification chart for common marine species. Discussing how human decisions and activities can change planet Earth's physical environment.	Tk, Ist, Ms, Ro, Po
Establishing baseline data for permanent transects within rock pools adjacent to proposed new Centre.	Participating in a research project to determine the impact of school group visits on the rocky shore within, and outside, the proposed boundaries of the South Coast Marine Reserve.	





### **Programme 3: Life in Sand and Mud**

This new programme is a field-oriented programme aimed primarily at intermediate and older age groups. It will explore and compare differences between marine life in and on the sandy/muddy sediments on nearby Island Bay beaches with that on rocky shores. Students will use field equipment to discover where and how hidden marine organisms live in these two different environments and to record observations and relevant environmental data.

<b>Programme 3. Life in Sand and Mud</b> <b>A hands-on laboratory and field study of marine life that lives on Island Bay Beach.</b> <b>Level: 4-8; 2 Hours * + plus field study time..</b>		
Achievement Objectives	Specific Learning Experiences	Links
Understanding the physical differences between soft sediments and rocky shores, and their influence on the type and variety of marine life found.	Discussing the physical, chemical, and biological differences between rock, sand, and mud substrates; Using an aquarium to observe the nature of sediment deposition.	SNS- 4-6:1,2; 7-8:1-4 SLW- 4-8:1-3 SPE- 4-8:1-3
Understanding the reasons for different patterns of diversity in different habitats.	Comparing the features of live marine animals and plants from all three environments using the Live Habitat Displays. Observing how flat fish change colour to match their environment.	A- drawing B- 6.1(a), 7.1(a,b), 8.1(b)
Ability to describe the types of organisms that live in soft sediments and their characteristics.	Sieving a sediment sample to sort out and count organisms that live in the soft substrates; Examining both macro and micro fauna found in soft sediments with emphasis on the almost never seen creatures that live between sand grains on most beaches in the region.	E- 5-8 M statistics Tk, Lst, Ms, Ro, Po
Understanding the behavioural and physical adaptations sand and mud animals use to live in their particular environment.	Comparing and describing the physical features of different species of crabs from sandy, muddy and rocky shores.	
Ability to design a field study to characterise an area of soft sediments by grab sampler collections.	Drawing a perfect sand-dweller; Watching live surf clams dig into different sediments to determine sediment preferences.	

### **Programme 4: Exploring Our Taputeranga Marine Reserve**

This new programme focuses on learning about the marine life of the Taputeranga Marine Reserve and offers two levels of hands-on activities; observation and environmental monitoring research.

The basic programme includes an explanation of the why, where and how marine reserves are created and why the TMR is special. It includes a comparison of marine reserves with other methods to protect marine resources and endangered species, such as taia pure and mataitai reserves. It will primarily focus on providing students with an opportunity to explore and compare the marine life found on the rocky shores, sandy beaches, and below the tides within the TMR.

Schools are able to select this basic programme or combine it with one of our two new, six hour "Marine Reserve Immersion" options: "Protecting our Marine Reserve" environmental monitoring project and an "Experiencing Marine Reserves" educational snorkelling experience.

#### **Option 1- "Protecting Our Marine Reserve"**

As part of our proposed TMR related "Marine Reserve Immersion" programmes, we are offering schools with Level 4-8 students an opportunity to participate in a long-term monitoring programme to determine the potential impact of school groups and other visitors on rocky shore marine life immediately surrounding the IBMEC's Bait House facility.

This monitoring programme is being designed in collaboration with NIWA scientists and Department of Conservation staff. The programme will be similar to the **Shorekeepers' Monitoring Programme** in Vancouver British Columbia involving local students and parents, and the University of California at Santa Cruz's **Seymour Marine Intertidal Monitoring Programme** in

California for secondary school students. Programmes like these contribute to a better understanding of local coastal and marine ecologies and have proven to be extremely effective in detecting both positive and adverse impacts over time while allowing successive student groups the opportunity to participate in actual research projects that benefit the overall community and to practise being scientists.

**Option 2- “Experiencing Marine Reserves”**

The second “immersion” option we are able to offer local schools is participation in the “Experiencing Marine Reserves” programme through our collaboration with and support of the Nga Maunga ki te Moana Conservation Trust which established the programme and which has been operational in Northland since 2002. Marine reserves can provide unique educational and inspirational opportunities for school children and the aim of the programme is to advocate for the establishment of marine conservation areas and raise awareness, understanding of and involvement in marine conservation, especially among young children.

The Nga Maunga ki te Moana Conservation Trust has made its programmes and resources available to other marine education organisations in New Zealand since 2004, with support from the Department of Conservation. The programmes enable schools, communities and individuals to learn about how marine reserves develop in comparison to unprotected environments, by direct hands-on experience of the environments that extends learning gained through more traditional means. The programme also encourages participants to put their knowledge into action in some way within their communities.

The EMR programme involves investigating marine biodiversity and the local marine environment before exploring a fully-protected marine reserve. After this experience, students are able to compare unprotected and protected areas and are encouraged to put their knowledge into action within the community.

We propose to offer this programme to local or regional schools as an additional option for up to 24 students per session. The Department of Conservation is very supportive of the Wellington Marine Conservation Trust operating this optional programme from the IBMEC. Full details of this programme are available on the EMR website [www.emr.org.nz](http://www.emr.org.nz).

<b>Programme 4. “Exploring and Protecting Our Taputeranga Marine Reserve”</b>		
<b>An introduction to the Marine Reserve concept and a hands-on, field exploration of some of the marine life within the TMR. Level: 4-8; 2 Hours *+ optional “immersion” time.</b>		
<b>Achievement Objectives</b>	<b>Specific Learning Experiences</b>	<b>Links</b>
Understanding the nature and need for marine reserves and other protected areas.	Watching presentation of the benefits of a marine reserve system and present status of New Zealand’s marine reserves.	SNS- 4-8:1-4 SLW- 4-8:1,2 E- 6-8 Tk, Lst, Ms, Ro, Po
Understanding how marine reserves are created.	Discussing the Taputeranga Marine Reserve proposal with Department of Conservation’s TMR Ranger.	
Understanding importance of human impact on natural environments.	Discussing other local conservation issues and public involvement in conservation decisions.	
Understanding the difference between marine reserves, taiapure areas, mataitai reserves, and marine mammal and bird sanctuaries.	Presenting a group oral and written report on the nature of marine protected areas in New Zealand and discussing the benefits and drawbacks of each.	
Understanding how people and marine environments depend on each other.	Exploring the marine life on the rocky shore and sandy beach within the TMR and comparing it with an adjacent area outside the reserve.	

**Programme 5: Te Mara Moana “The Living Sea”**

This programme was introduced during our current LEOTC contract period and has been very well received by local kura kaupapa groups in the Wellington region, especially the Hutt Valley and Porirua areas. We have now revised this programme to focus on an exploration of the rocky shore utilising resources we are developing in Maori and Pasifika languages. Students

will be able to immerse themselves in the rocky shore, explore where and how common marine life lives, identify different species using the guide and connect their local names with those familiar in their parent language.

The programme will be presented in two levels; 1-2 and 3-5. Te reo Maori and other Pasifika languages will be spoken by a fluent speaker where applicable and the programme will include an introduction to Maori names for common marine species, local landmarks and locations, and a selection of Maori oral traditions.

<b>Programme 5. Te Mara Moana “The Living Sea”</b> <b>A special, hands-on programme designed for kohanga reo, kura kaupapa, and Pasifika students wishing to know about Maori scientific knowledge and prospective on the sea and its uses. Level: 1-5. 2 Hours*.</b>		
Achievement Objectives	Specific Learning Experiences	Links
Understanding differences between living and non-living things, and living animals within broad groups based on external features.	Comparing a collection of shells and the live animals that lived in them; Holding and comparing a selection of common rocky shore crabs ( <i>papaka</i> ) and describing differences.	SNS- 1-5:1,2,3 SLW- 1-5:1-3 SMW- 1-5
Understanding the general parts of marine animals and plants.	Looking at our “visible” fish and plant models, and investigating how the parts fit together and what they do.	SPE- 1-5:1,2 A- drawing, drama
Understanding how special features help common marine animals protect themselves.	Holding and looking at a sea urchin ( <i>kina</i> ) and describing the various parts; Looking at a scorpion fish and watching it spread its poisonous spines for protection.	E- 1, 2, 3
Understanding how fish and some other common marine animals move.	Watching any of the live fish and other marine animals in the Live Habitat Displays move and feed; Dressing up in our “Fish Suits” and trying to “swim”; All try walking like crabs (which way?).	M- counting
Understanding how marine animals and plants grow and reproduce; and how they change during their life cycles.	Observing live rock lobster babies, juveniles, and adults in the laboratory; and measuring a group of abalone ( <i>paua</i> ) shells to show how long it takes to grow to adult size.	MA- 1-5
Understanding the fishing methods of ancestors, which methods are still used, and the differences between traditional and modern fishing systems.	Listening to a te reo fluent Maori guest speaker talk about traditional fishing methods and demonstrating how simple nets and traps were made.	Tk, Lst, Ms, Ro, Po
Gaining appreciation of the abundance, importance, and vulnerability of sea food ( <i>kaimoana</i> ) in New Zealand.	Sampling a variety of traditional <i>kaimoana</i> (mussels, clams, seaweeds) and seeing the live plants and animals in their natural habitats.	
Developing a sense of guardianship ( <i>kaitiaki</i> ) for the marine life and the sea.	Discussing the importance of conservation education for all New Zealanders, and participating in our seafood treasure hunt activity which illustrates the effect of overfishing.	

### 3.4 Partnership with Schools and Classroom Teachers

The