Mimiwhangata Deep Reef Survey
Draft Report 2002

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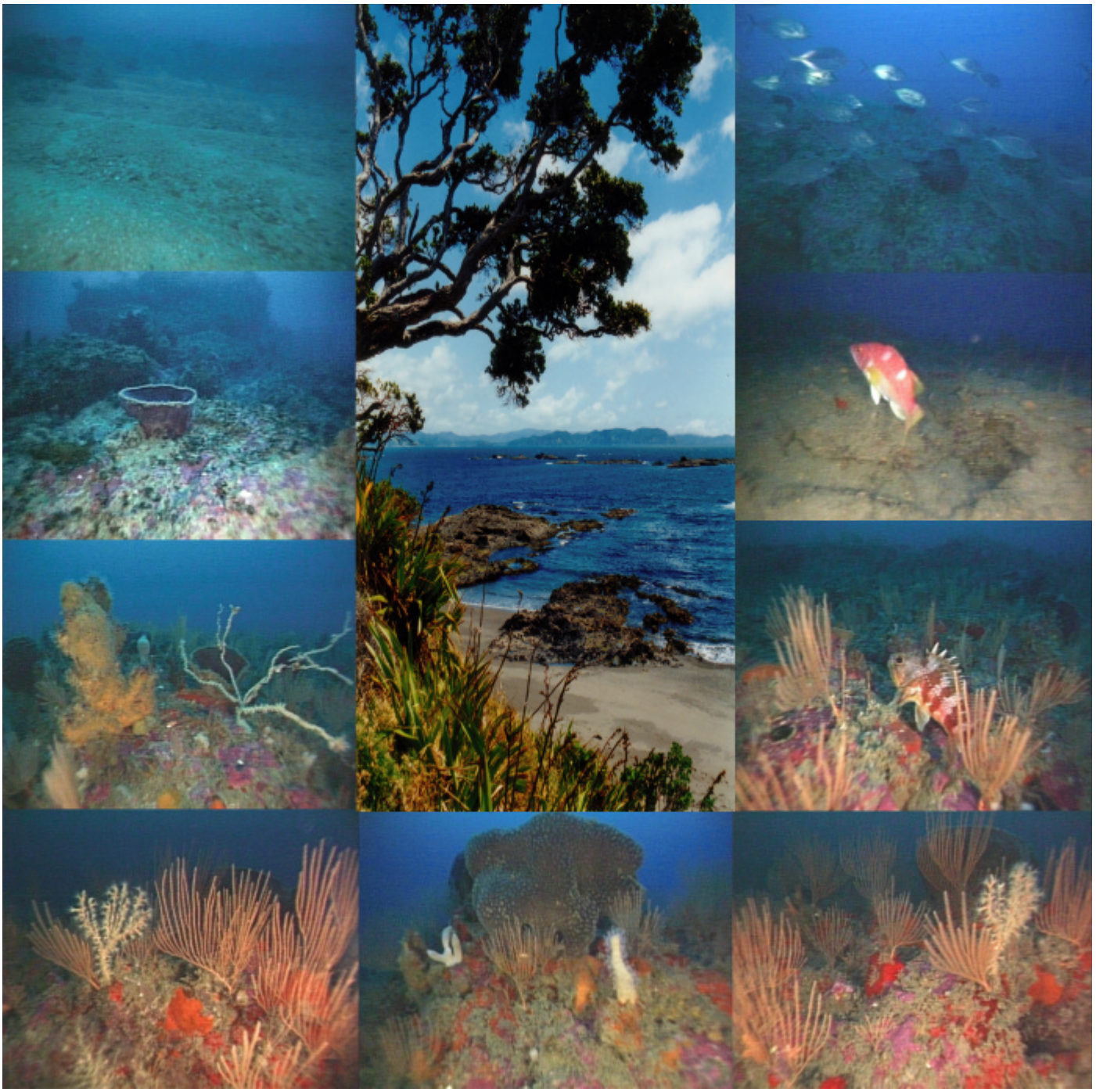
A Report to Northland Conservancy,
Department of Conservation, September 2002



photos by R. Grace, K. Gordon and V. Kerr

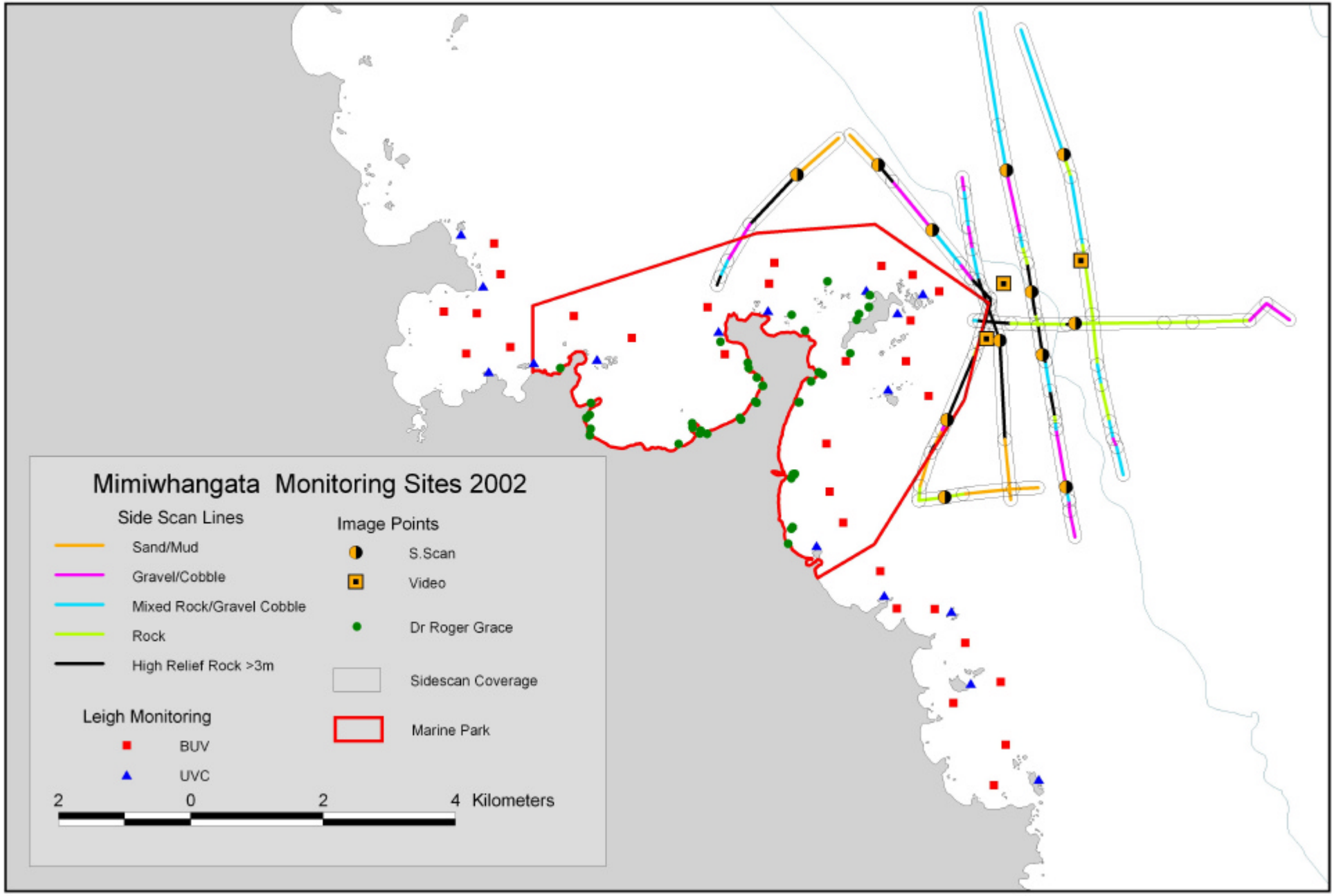
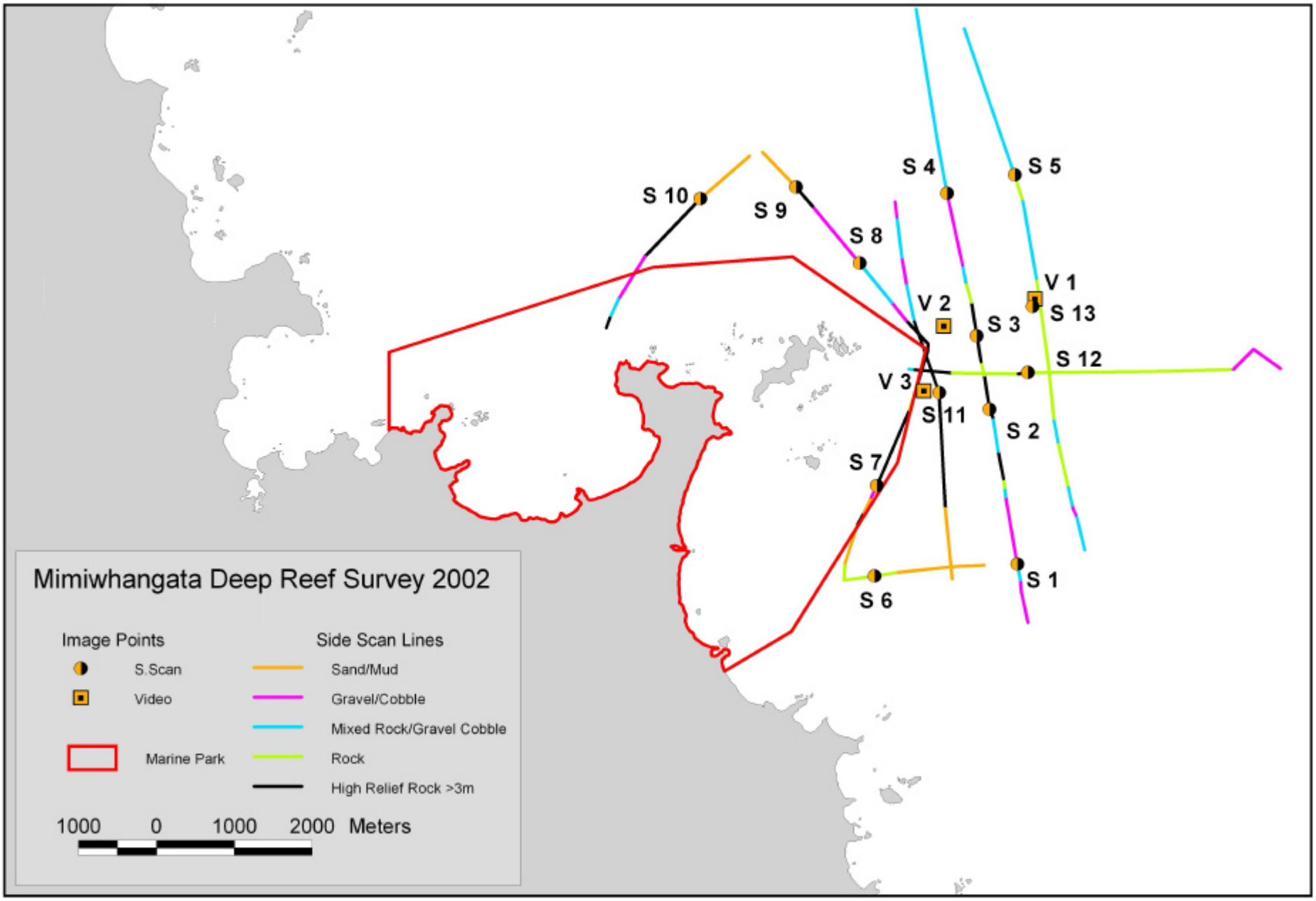

Mimiwhangata Monitoring Sites 2002
Side Scan Lines
Sand/Mud
Gravel/Cobble
Mixed Rock/Gravel Cobble
Rock
High Relief Rock >3m
Image Points
S.Scan
Video
Dr Roger Grace
Sidescan Coverage
Marine Park
Leigh Monitoring
BUV
UVC
2 0 2 4 Kilometers

Figure 1


S 10
S 9
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S 11
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Mimiwhangata Deep Reef Survey 2002
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High Relief Rock >3m
1000 0 1000 2000 Meters

Figure 2

Abstract

This report describes marine survey work commissioned by the Department of Conservation at Mimiwhangata. Work done in the 70s at Mimiwhangata, (Ballantine et.al. 1973), can now be compared with the current more extensive survey. Similar studies at Spirits Bay, Northland, (Cryer et.al 2000) and by the authors at Great Barrier Island, (unpublished, 2002) are discussed. In the current Mimiwhangata survey, sidescan sonar was employed along with remote video 'ground truthing' to allow the mapping of reef habitats in the study area. A preliminary description of species and habitat classification was made possible by the video images produced. Depths studied ranged between 33 and 72 metres and showed considerable differences in species composition. The survey extends habitat information from the previously studied inshore reefs of Mimiwhangata to 4 kilometres offshore. These offshore deep reefs form a significant area of biodiversity-rich and ecologically important habitat.

Introduction and History of Investigation

The marine area of Mimiwhangata has been the subject of considerable scientific interest since the early 70s. In the fourteen years prior to 1986 extensive habitat and species survey and monitoring programmes were set up and developed. This work is well documented, (see references).

The survey work of the 70s concentrated on the intertidal and subtidal habitats of the near shore environment. However at this time questions were raised about the deeper areas off Mimiwhangata. The following excerpt is from the 1973 Mimiwhangata Marine Report:

"Deep water areas

Initially our survey took us to depths no greater than 60 feet where light penetration is still adequate to sustain healthy forests of Ecklonia kelp on every available rock surface which is not too steep or shaded for these plants to adhere or find light. In this region, we found certain deep-water conditions in every narrow canyon or steep cliff face, where conditions for seaweeds are unfavourable and encrusting organisms, freed from competition for standing room, became profuse.

However, during heavy storms water movement in this zone can become too harsh for some more delicate organisms, which only flourish in deep quiet waters offshore.

Our first attempt at finding deeper water was well rewarded. From the southeastern tip of Rimariki, we descended and swam seawards following the bottom contours. For some distance, we were swimming over a rather barren rock plateau at 40 feet depth. Then suddenly it became intersected by a series of very deep winding canyons which dropped to 75 feet and extended seawards. The sides of these canyons were from 10 - 15 feet apart, twin cliff faces clad in an amazing array of filter feeding life forms which the very topography itself must have sustained with an increased directional flow from tidal currents and wave surges. There were tall, candelabra-like sponges, Solandaria trees, bright red branches of Aplysilla rosea sponge and myriad gem-like polyzoans and coral forms, compound ascidians, jewel anemones and delicately sculptured little calcareous sponges. These canyons opened out into white sand at 75 feet and we thought that the seabed might continue in this way seawards, a featureless, gently sloping sandy plain, as suggested by the soundings on the Navy charts. However, time permitting; we were determined at the latter stages of our survey, to establish if this were so.

Accordingly, the charter launch "Matira", with graph echo sounder, skippered by Mr. F. Cotterill, was engaged for one day to explore the deeper water in the survey area. The long experience of this skipper, in this sort of work was a great help in making a series of echo sounding traverses off-shore. Whenever large irregularities were found they were checked out carefully, and once we were satisfied they were extensive rock formations, rising at least 4 feet above the sand, we dropped a grapnel on them and descended the line. In this way we began a series of deep descents which continued using the 19 foot runabout, once we had carefully plotted the area of foul ground on our chart using sextant.

Our descents varied from 105 to 150 feet. We found three distinct zones: at 100 feet approximately, the light levels became so diminished that Ecklonia and other algae ceased to grow within about ten feet of depth increase. This transitional area has a variety of deepwater and shallow water life forms and a greater variety of fish species than found deeper down. It is particularly favoured by plankton feeding butterfly perch. Large encrusting sponges in the area are still rather irregular in form, showing that quite vigorous water movement can occur there in rough weather.

At 125 feet the transition was dramatically complete. No large algae remained just small red seaweeds. The rocks were up to 10 feet in height above the gravely sand and there were similarly elevated rocky plateaux dissected with trenches and overhangs. Over the entire region, the delicate, beaded gorgonian Primnoides sp. was the dominant growth, up to 54 per square metre. These were interspersed with exquisite assemblages of erect sponges, very regular and symmetrical in form (even more so than at the Poor Knights Islands because they grow on a flat bottom rather than a rocky slope): bright red deer antlers; yellow candelabra, golden lattice work trellises, or vast grey goblets and lilac bases. There were delicate orange soft corals, gorgonian fans infested with parasitic zoanthids like tiny yellow daisies. Here and there lay saffron yellow starfish, Knightaster bakeri, formerly only known from the Poor Knights Islands and other offshore locations. To describe the profusion of deep-water marine organisms would require many pages.

A third zone was found at 150 feet depth. Here we landed on a reef of low profile where the variety of organisms was considerably reduced, probably from sand particle abrasion in rough weather. (On a subsequent dive there during a very strong swell we found a 3 feet to 8 feet oscillation on the seabed, unexpected at such a depth).

However, on a more elevated rock nearby a mass of branching ivory corals was found: Oculina virgosa. There were clumps up to 8 inches high and at least eight on the rock. This is a true stony coral such as those found in the tropics. Its larval form appears to prefer areas with low light levels to settle, possibly because of reduced competition with other light seeking organisms. This find completed our deep diving survey nicely. Such corals have been discovered at the Three Kings Islands and off Cape Karikari Peninsula. That we should find dense beds of them on the open bottom within our survey area (just over half a mile from the southeastern tip of Rimariki Island) was beyond our wildest dreams.

Fish life in deep water was sparse but a new range of species was introduced to the survey: butterfly perch, sea perch and pink maomao etc.

The marine life in deep water in the survey area completes the picture of a rare coastal area which, within a few miles compresses almost the full range of marine life conditions found on our northern continental shelf: from the quiet detrital zone at Porae Point to the depths off Rimariki where we found a world equal in beauty to the famous Poor Knights Islands themselves. "

Note: The early survey effort reported on above extended seawards to areas of 47 metres depth off Rimariki Island. This overlaps with the current survey where depths ranged from 33 to 72 metres in the study area.

Based on the earlier work described above, the Department of Conservation commissioned a study of the habitat of the offshore areas of Mimiwhangata. The field work was done on the 23rd and 24th of January 2002. The aim of the study was to attempt to survey the bottom substrates and habitats of the deeper areas off Mimiwhangata and explore the biodiversity of this offshore reef system.

Methods

The area investigated in January 2002 at Mimiwhangata was approximately 4km square, offshore and to the east of Rimariki Island. The methods employed were side scan sonar habitat mapping, remote video and single beam sonar. The side scan sonar is essentially a 'sideways looking' sonar that produces a sonograph or image that resembles an aerial photograph of the sea bottom. The sonograph images from the side scan sonar were analysed and coded into five basic habitat/substrate types. (mud and sand, gravels and cobble, mixed rock and gravels, low relief rock and high relief rock). At each point along the image track, where the substrate/habitat classification was judged to have changed, the coordinates of that point were recorded. The subjective method used to make the classification was informed by diving experience in some of the shallower areas, (Wade Doak and Roger Grace) and by experience with the equipment and remote video ground truthing of the images in other work, (Keith Gordon). In addition where rock structures were visible, representative areas were studied by measuring the 'shadows' created by the vertical dimension of the rock structure. This gives a relatively accurate calibration of vertical features of the reef. Information was entered into a GIS system at the Department of Conservation to produce the maps in Figure 1 & 2. Images from the video 'ground truthing' at three sites in the survey area are being analyzed for species composition and habitat descriptions. A preliminary species list appears in the results section.

The side scan equipment used was based on an Imagenex 858 Sonar Processor. The transducer frequency was 330 Khz, beam width was 0.9 deg horizontal, 60 deg vertical. Max range: 240 meters. The transducer was mounted on a towfish which was towed behind the vessel at 10-30m off the bottom. The sonar images were displayed in real time on a RGB monitor and recorded onto a SyQuest disc drive. The side scan sonar is a colour imaging sonar system based on a high performance digital signal processing chip and a graphic processor chip. The processor outputs standard VGA video and so can be used with standard computer monitors. The range is selectable from 10 to 200 meters. A number of different colour tables can be selected to represent sonar echo levels, thus assisting interpretation of the images. The system GPS interface records boat position and track plot. The ship's navigation and single beam sonar system is a Furuno GP31, 12 channel receiver linked to a Furuno Chart Plotter. The system uses a Furuno FCV Color Video Sounder bronze thru-hull transducer 1KW (transducer inserted in keel). Position accuracy is estimated at 15 metres on both units. Win858 viewing software for Windows was used on an IBM compatible computer to analyse images and produce the snapshot still images in this report.

The remote operating video (ROV) system used was a modified Benthos MiniRover MkII. The system has a maximum depth rating of 330 meters and includes: 2 x 150 watt quartz halogen lights, a pan & tilt colour video camera, a single function claw device. The Video records on DV format.

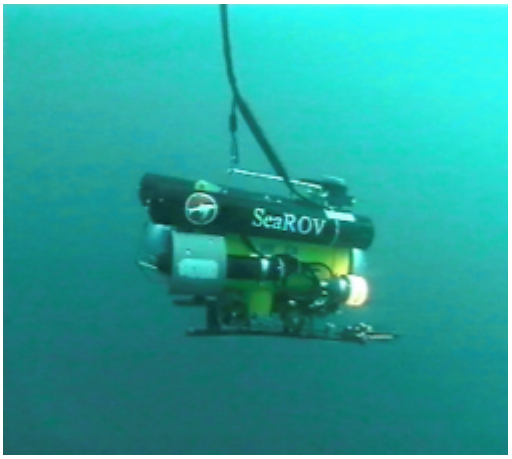


Photo 1 remote video apparatus

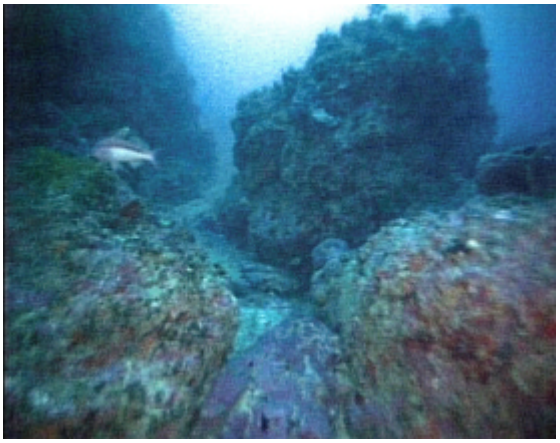


Photo 2 video drop site 3


Photo 3 video drop site 3


Photo 4 video drop site 2

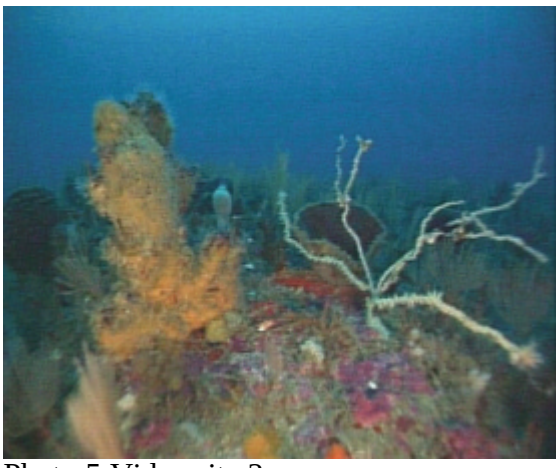


Photo 5 Video site 2

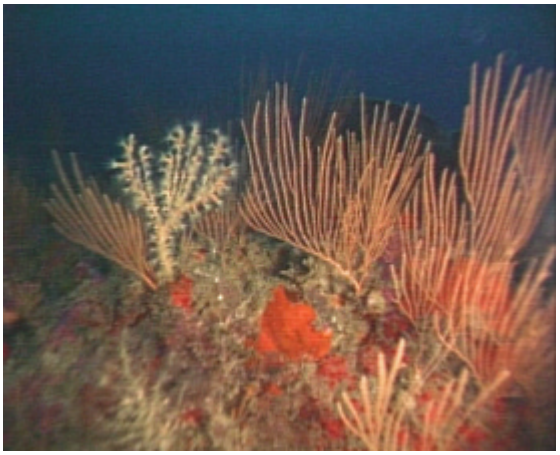


Photo 6 video drop site 2


Photo 7 video site 1

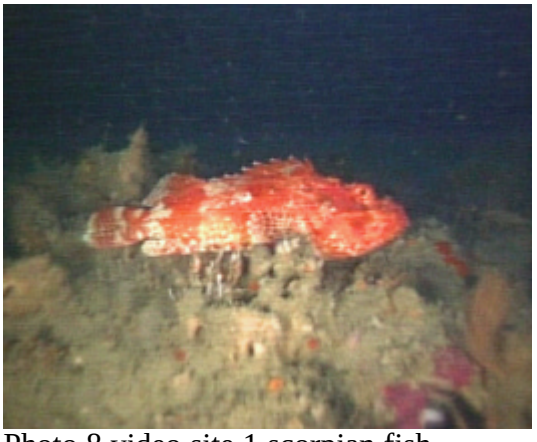
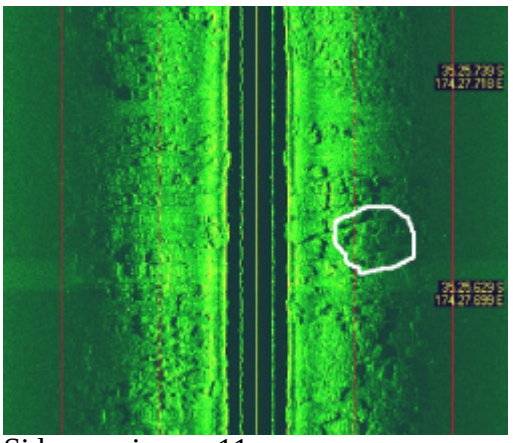


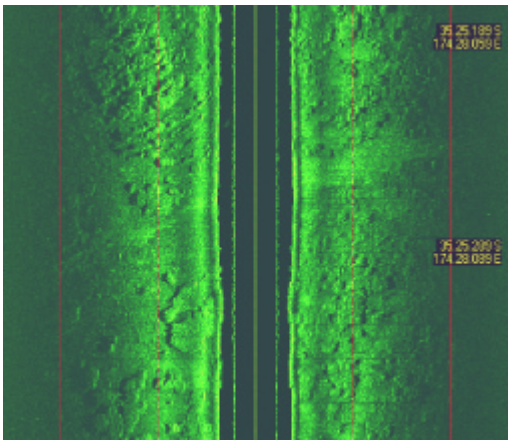
Photo 8 video site 1 scorpian fish

Photo 9 video site 1 firebrick star



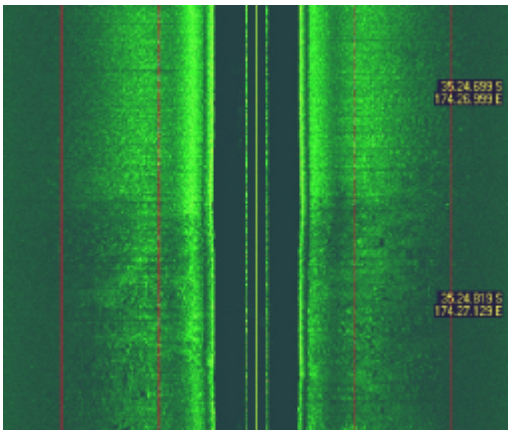
Side scan image 11

Photo 10 video site 1

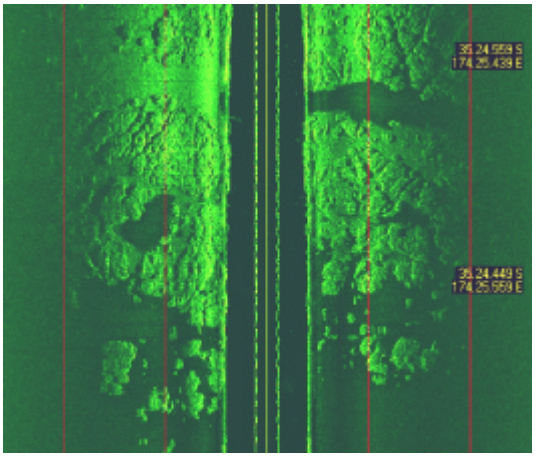


Side scan image 3

Photo 11 video site 1



Side scan image 8



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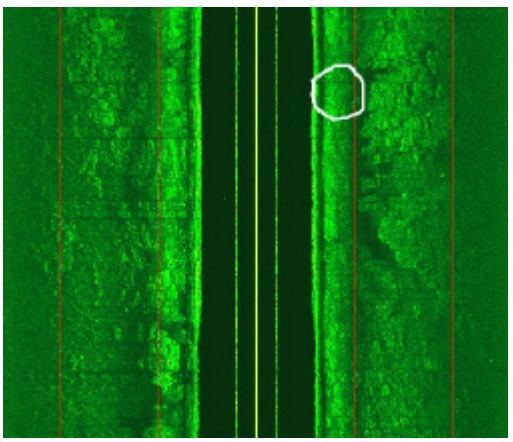

Side scan image 13

Results

The current survey effort as indicated in the figure 1 map shows that the reef structure extends 4km offshore to the east of Rimariki Island and covers an area in a north to south direction of several kilometres. Depths at the eastern edge of the survey area were 72m (4 km offshore). The three video drops made on the reef supported the habitat classification interpretation of the side scan sonar system. In addition the video images quite clearly show the considerable differences between the three sites, assumed to be depth related. These filter feeding communities appear to be diverse and complex. Analysis of the side scan images of the survey show significant areas in the center part of the survey area are characterized by high relief rocky reef, defined as having vertical dimensions in excess of 3 meters. Side scan images showed that these reefs are highly featured with cracks, protruding rock structures.

Sidescan Sonar

The side scan sonar survey design was based on the need to achieve a broad understanding of the reef and substrate characteristics over a large area. Each swath of the side scan sonar creates a 200m wide three dimensional sonograph image of the bottom. The actual width of the side scan image is represented in figure 1. The survey approach was limited by the time available with the 'gaps' between the image swaths being up to 1km in some places. Within this limitation our work indicates that there is a significant area in the centre of the survey area characterised as continuous rocky reef with rocky features protruding in places 3-5 metres vertically and criss-crossed with gully features. Associated with the high relief reef are large areas of patch reef, low relief reef and additional areas of rough stone and cobble meeting areas of fine sediments.

Representative still images of the side scan image tracks are shown in this report. Their image numbers correspond to the side scan points labelled on figure 2. The scale of the features of the seabed can be determined by comparison to the distance between the red vertical lines which are 80 metres apart. The dark green centre part of the images is a representation of the depth of water under the boat. The centre line is the boat's horizontal track. The first line to right and to the left is the position of the sonar fish device, the edge of the solid area to the right and to the left is the bottom directly under the boat. The distances from the boat track to the sonar fish device and to the bottom are to scale with the red vertical lines 80m distance apart. It is thus possible to measure the depth of the bottom directly from the image. The solid area that extends to the right and to the left represents an image of the bottom surface. Shadows showing on this image of the bottom are made by vertical rock structures blocking the side scan sonar. The width of the shadow can be measured to give a measure of the vertical protruding reef structures. An interpretation of the images follows:

Side scan image 10 This image marks an edge of high relief rocky reef Northwest of Rimariki Island. The lower part of the image shows a dark smooth area that is interpreted as a smooth sand/mud surface. The rough structure of the reef in the center part of the image is easily recognised. The small smooth areas in the top left quarter of the image are interpreted as coarse gravel or cobble amongst patch rocky reef areas. The depth of this area ranged from 35 to 40 metres.

Side scan image 11 This image is interpreted as high relief rocky reef. Within this reef area there are patches of gravel and cobble. This image is typical of the large area of reef lying east of Rimariki Island in the centre of the current survey area. The white circle indicates the approximate area that was surveyed by the video drop #3. Photos 2 & 3 in this report are representative of this reef habitat and terrain. The depth of this area ranged from 35 to 40 metres.

Side scan image 3 This image is interpreted as predominately high relief rocky reef and is located 1.5 km east/southeast of the outer tip of Rimariki Island and is typical of the large reef area central in the survey area. The area surveyed by video drop #2 lies approximately 300 metres to the west/northwest from where this sidescan image was taken. It is expected that this side scan image is typical of the area of video drop #2. Photos 4, 5 and 6 are representative of the terrain and habitat of this area. The depth of this area ranged from 45 to 48 metres.

Side scan image 8 This image represents an example of where the substrate changed from a gravel/cobble habitat to mixed rock and gravels. The mixed rock habitat could also be described as patch reefs. The site is located 1 km to the northeast of Rimariki Island. The depth of this area ranged from 40 to 43 metres.

Side scan image 13 This image is taken from an area approximately 2.4km east of Rimariki Island. The habitat is interpreted as predominately rocky reef with a small proportion of high relief rock also present. (Note the high relief rock in lower left portion of the image). The white circle indicates the approximate area that was surveyed by video drop #1. Photos 7–11 in this report are representative of this reef habitat and terrain. The depth of this area ranged from 63 to 65 metres.

Remote Video

The three video drop locations are indicated in figure 2. Their depths are: video site 1, 63-65 metres, video site 2, 45-48 metres, video site 3, 35-40 metres. Video sites 2 and 3 were predominately reef areas where vertical faces and protruding large rock formations were 3 metres in height, making for a rather complex habitat and providing sheltered sites for delicate encrusting communities to establish. Video site 1 was predominately low relief rocky reef with some gravel areas, where there were very few rock structures seen approaching 3 metres in height.

The representative photo images included in this report and accompanying notes show very clear differences between the three sites. These differences are discussed further in the results section. At this stage it is only possible to identify a small fraction of the larger and more obvious of the species present. These preliminary results are included below.

Photo 1 The remotely operated video unit being lowered from the survey boat. The unit has an integrated light source and is connected to a live video monitor on the boat. The operator can control movement of the unit via a series of directional motors mounted on the unit. The camera can also be tilted up and down, and sideways.

Photo 2, video site 3 Shows high relief (c. 3m) broken reef area with rich encrusting life on the rocks.

Photo 3, video site 3 On top of rocks sparse *Ecklonia* kelp forest. The *Ecklonia* plants are typically small in size. The *Ecklonia* forest here is approaching its depth limit due to diminishing light. Kelp plants can be seen leaning, indicating moderate current through the area (probably about 0.3 to 0.5m/sec.) Encrusting life on rocks is rich and diverse. Pinkish purple species is coralline "paint" (encrusting calcareous alga). Calcareous flask sponge at left is *Leucetusa lancifer*.

Photo 4, video site 2 Rich bed of *Primnoides* gorgonian fans. Specimen at right has been taken over by a species of Zoanthid (killed the host and has taken over the skeleton). Encrusting coralline algal "paint" is common (pinkish purple). Bright red/orange areas are encrusting sponges - several species possible but a common one is *Tedania sp.*

Photo 5, video site 2 Large orange/yellow upright sponge mass at left is *Stelleta sp*. and dead black coral is to right with zoanthids and other encrusting organisms attached. There is a great diversity of encrusting life on rocks, including the large cup-shaped sponge *Stelleta hauraki,* and the calcareous flask sponge *Leucetusa lancifer* in the background.

Photo 6, video site 2 Abundant pink *Primnoides* gorgonians are present with zoanthid-encrusted specimen on left. Red encrusting sponges evident in lower foreground.

Photo 7, video site 1 Rock surfaces noticeably siltier than at video site 2. Unknown cream-coloured sponge in foreground, with *Alcyonium aurantiacum* (soft coral) at left of sponge.

Photo 8, video site 1 A commonly seen fish of this reef area, *Scorpaena cardinalis* (scorpionfish). Diverse encrusting life with evidence of significant silt present.

Photo 9, video site 1 *Asterodiscus truncatus,* firebrick star. Silt again evident.

Photo 10, video site 1 Finger sponge *Raspaillia sp*. is on left hand side and in background. Sponge in foreground is *Stelleta sp*.

Photo 11, video site 1 Unidentified sponge or possibly two sponges grown together.

Species seen in the video:

Fish

Bodianus sp. (foxfish)
Parapercis colias (blue cod)
Scorpaena cardinalis (scorpionfish)
Cheilodactylus spectabilis (red moki)
Parika scaber (leatherjacket)
Chromis dispilus (demoiselle)
Pseudocaranx dentex (trevally)
Centroberyx affinis (golden snapper)
Bodianus unimaculatus (red pigfish)
Forsterygion flavonigrum (yellow-black triplefin)
Heliocolenus papillosus (Jock Stewart, sea perch)
Pseudolabrus miles (scarlet wrasse)
Optivus elongatus (slender roughy)
Scorpis violaceus (blue maomao)
Canthigaster callisternus (sharp nosed puffer)
Upeneichthys lineatus (goatfish)
Pempheris adspersus (bigeye / bullseye)
Caesioperca lepidoperca (butterfly perch)
Nemadactylus douglasii (porae)
Coris sandageri (sandaggers' wrasse)
Ellerkeldia huntii (red-banded perch)

Species n = 21

Sponges Porifera

Scientific name	Common name or description
Tedania sp	Red encrusting sponges
Stellata crater	with encrusting sponge *Desmacella dendyi*
	Orange cup sponge
Geodina regina	Large grey sponge
Axenillid	Tall red finger sponge
Stellata hauraki	Red crimson sponge
Raspaillia sp.	Orange finger sponge branching
Leucetusa lancifer	Calcareous flask sponge
Hormaxinella erecta	Tall thin yellow sponge
Aaptos aaptos	Round brown small sponge
Iophon proximum	Yellow finger sponge
Callyspongia ramose	Thin finger sponge
Polymastia granulosa	Yellow round sponge
Vagocia imperialis	Giant tube sponge
Tethya fastigata	Round yellow ball shaped sponge
Apllysilla rosea	Pink branching 'prickly' sponge
Ancorina alata	Large grey rambling cup sponge

Cnidaria

Primnoides sp. (Gorgonian coral)
Alcyonium aurantiacum (soft coral)
Apanipathes sp. (black coral)
Steginoporella neozelanica (pencil bryozoan)

Echinodermata

Knightaster bakeri (yellow seastar)
Asterodiscus truncatus (firebrick star)

Algae

Ecklonia radiata (common kelp)
Caulerpa hypnoides (sea rimu)
Encrusting species numerous unidentified

Discussion

In the 70s Dr Roger Grace and Wade Doak, (Ballantine et.al.,1973), explored with scuba dives out to the edge of what we now refer to as the deep reef at Mimiwhangata. Their dives went to approximately 47m depth and 1 km offshore which is approximately the existing boundary of the Marine Park. They were impressed by the richness of this sponge and gorgonian dominated habitat and commented that it could well extend further to the east into deeper waters. They also noted that these deeper reef habitats could play a very important role in the ecology of the Mimiwhangata marine area and that they were biologically very rich.

In recent times considerable attention has been drawn to the ecological importance of offshore benthic communities, their biological diversity and to understanding the role they play in underpinning fisheries productivity. A recent NIWA study, (Cryer et.al., 2000), describes detailed survey work off Spirits Bay, Northland. Although there are obvious differences in oceanography and biogeography between Mimiwhangata and Spirits Bay, there are also similarities. It is likely that reef communities off Mimiwhangata are not as diverse and complex as those off Spirits Bay; however a more detailed study would be required to quantify those differences. The following excerpt from the NIWA study is included here to show just how unique and biologically diverse these sponge garden, deep reef areas of the Northland Coast can be:

"Sponges (over 200 species) and bryozoans (over 300 species) are present in great diversity in the area between North Cape and Cape Reinga. The richness of bryozoans is not matched anywhere in the world. Two gorgonian and two coral species were collected from four stations in deep water (65-100 m), and black coral was observed on video at one station (live material has been collected since).

The epifaunal assemblage has very high rates of local endemism (i.e., many of the species are found nowhere else in the world). There are some ubiquitous New Zealand species, some species with subtropical affinities, and some species with affinities with areas of high current or carbonate-rich substratum in New Zealand or overseas.

The richness of sponges, bryozoans, and hydroids were all correlated, and richness was highest between about 30 m and 80 m depth. Rates of endemism peaked at similar depths. There was a strong correlation between bryozoan and crustacean species richness, suggesting that colonial filter feeding fauna provide a diverse habitat suitable for a diverse macrofauna.

Colonial, filter-feeding animals comprised 85% of all taxa collected. Such taxa are efficient components of pelagic-benthic energy coupling systems, and provide three-dimensional structure which may be important to other components of the fauna. Reduction in the variety and abundance of colonial filter feeders by fishing may therefore have adverse consequences for ecosystem functioning and productivity as well as for the conservation of local, regional and national biodiversity. These consequences may persist for decades."

Note: The fishing referred to in the NIWA reference above is scallop dredging and trawling.

Returning to the current study of the reef areas off Mimiwhangata, analysis of the diverse encrusting life on these reefs is still in progress and a need for further field work is indicated. It is clear however that these deep reefs are very rich in biodiversity with a significant array of sponge species dominating the encrusting community. Other notable species of gorgonian fans, soft corals and black coral were identified. The quantities and species composition of fish identified in the video footage are consistent generally with the descriptions of the Leigh lab work done further inshore, (Denny & Babcock, 2002). The overall impression of fish abundance was that it was less than what would be expected for a habitat of this type and significantly less than at similar sites at the Poor Knights Island, (W.Doak, pers. com.).

Two specific observations were notable. A foxfish, *Bodianus sp*., a subtropical species occasionally seen at the Poor Knights Islands was identified. This species has not being recorded at Mimiwhangata previously. Also snapper, *Pagrus auratus* were not seen in the video footage. Total recorded video time on the three reef sites was approximately 1.5 hours. The design of the video survey was targeted at habitat description and is not suitable for quantitative analysis of fish abundance.

A general discussion of the three reef sites studied follows:

Video Site 3 (35-40metres depth) This area is sufficiently shallow to allow large seaweeds to grow, such as *Ecklonia radiata.* The sea rimu, *Caulerpa hypnoides* was also present. Sponges are common, but there is too much competition/light for *Primnoides* gorgonians to be predominant as they are in deeper waters. There was very little silt deposited at this site. Moderate current and occasional storm wave action most likely keeps the rock surface relatively free of silt.

Video Site 2 (45 – 48 metres depth) This site is deep enough for light levels to be too low to support large seaweeds. Some encrusting coralline paint and small red seaweeds are present, but the bottom is covered in encrusting animal life including *Primnoides* gorgonians. The weak current alone would not be sufficient to keep this area sufficiently clean for the rich encrusting life, but occasional storm waves reach these depths to sweep the rocks clean from time to time. The height of the rocks is important as gravel beds close by move in the heavy storm swells (evidence of 2-metre wavelength ripples in the gravel beds was observed). Moving gravel will seriously damage all delicate encrusting life. Hence the best-developed gorgonian fields, sponges, corals etc were observed on the higher rock areas remote from the influence of moving gravel.

Video Site 1 (63-65 metres depth) This site is below the depth at which wave action commonly moves the sediments. Currents are not sufficiently strong by themselves to keep the rocks clear of silt. Hence the rock surface tends to be more silty than that in shallower water, reducing the diversity of delicate filter-feeding organisms such as bryozoans. A range of sponges tends to dominate in these slightly siltier areas, as many of them are capable of moving silty sediment off their surfaces. The cleanest parts in this deepest area were on any upstanding rocks, sticking up several metres above the surrounding seabed, as well as on the steep sides of rocks and overhangs.

A similar pattern of wave/current/topography affecting deep reef habitats was recently observed by the authors, (unpublished, 2002), in a study of deep reefs off Great Barrier Island. In about 70 metres of water SE of Rakitu, rocky areas support lots of sponges but the rock surface is covered in silt. Here it appears that the area is in a back-eddy with little current. This site is believed to be too deep for wave action to reach. As a result silt has accumulated on the reef. In contrast, the reefs north of Rakitu despite being deeper (80 or 90 metres) have a constant and moderate current passing over them, and the reefs are some 20 metres above the surrounding seabed. Here the upper parts of the reefs are relatively silt free and very rich in delicate hydroids, bryozoans, black corals and sponges.

Further work is in progress to update the habitat maps of the entire Mimiwhangata marine area. Habitat maps that were done for the inshore areas of Mimiwhangata in the 70s and 80s were state-of-the-art work in marine survey. These maps are being converted to current GIS systems and combined with the maps being generated from the deep reef study to make one continuous map connecting these areas. This work will assist greater understanding of Mimiwhangata as a system comprised of a complex of habitats ranging from rugged rocky reef to soft bottom substrates. The importance of the deeper reef areas in supporting the marine life of the shallow areas, is a crucial area of investigation and consideration for future planning of Mimiwhangata and potential marine reserve design. This survey has established that Mimiwhangata has a significant deep offshore biodiversity rich reef complex associated with its valuable and diverse shallow reef areas.

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Appendix 1

Locations of Video drop sites and side scan images

East	North	Depth	Photos
2644823	6641532	63	Video1
2643651	6641183	44	Video2
2643395	6640355	35	Video3
2640529	6642823		S.Scan 10
2644596	6638135		S.Scan 1
2644239	6640122		S.Scan 2
2644076	6641063		S.Scan 3
2643695	6642891		S.Scan 4
2644561	6643128		S.Scan 5
2642763	6637982		S.Scan 6
2642796	6639143		S.Scan 7
2642575	6641995		S.Scan 8
2641759	6642973		S.Scan 9
2643593	6640335		S.Scan 11
2644730	6640592		S.Scan 12
2644823	6641532		S.Scan 13