Intertidal and subtidal habitats of Doubtless Bay, Northland, N.Z.

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for

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Keywords

Doubtless Bay, habitat mapping, aerial photography, habitat change, habitat map, biotypes

Client's Brief

- Collate and review information sources relating to historic research on marine natural features and ecology of the study site.
- Source and review available bathymetric data and historic aerial photos for the study site.
- Acquire and produce a current set of aerial photos for the shallow areas of the study area required for mapping in digital format suitable for geo-referencing in ArcGis.
- Carry out on-water survey where required using geographically referenced sonar, drop video, and diving methods to augment sub-tidal habitat information not obtainable from aerial photography. Data must be sufficient to map rocky reef edge at a scale of 1:50,000.
- Carry out more detailed investigation of a series of reference sites (a minimum of 5) which will provide information on biological communities and zonation by depth and more detailed ground-truthing of the overall survey. Information must have sufficient detail to allow mapping at 1:5,000 scale.
- Provide representative photos and/or video clips in digital format for each of the reference sites depicting the habitats therein. All digital photographs and video clips must be geographically referenced.
- Produce GIS habitat and biotype maps in collaboration with Information Services, Northland Conservancy.
- Provide a report for the project which includes an executive summary, introduction, methodology, habitat classification, map sets, discussion and conclusions. The report must: discuss accuracy and validity issues associated with the investigation and output of habitat maps; comment on biological communities and assemblies in the study area; and discuss the suitability of the study area as a marine protected area (MPA).
- Provide a review of identified information gaps relating to habitats and species assemblages of the study site.
- Provide recommendations for future research in the study area that would inform planning of MPAs in Northland.

Cover photo: Shallow algal-covered patch reefs are numerous across the gap between the mainland and a small island off Parekerake near Whatuwhiwhi. Dark (gravel) and pale (sand) alternating streaks out to the right of the island probably move in storms. They are aligned with the force of the waves.

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Executive Summary

A habitat investigation of the Doubtless Bay area was completed in April - June 2005. The survey was done using a combination of drop video, side-scan and single beam sonar techniques. Aerial photographs were used to map shallow (< 12 m depth) habitats. A map of physical and biological habitats was produced at 1:50,000 scale covering an area of approximately 18,700 ha, excluding the major estuaries of Mangonui and Taipa. Seven smaller areas were mapped in more detail at 1:5,000 scale.

Major habitats recognised were:

- Intertidal habitats, including sandy beaches, gravel and boulder beaches, and solid rock shores. Limited areas of mangroves occurred in a few sheltered pockets.

- Subtidal habitats, including large areas of sand, gravel and muddy sand, as well as hard rock bottom. The rock substrates were occupied by biological assemblages forming a mainly depth-related sequence from shallow to deeper water, including shallow mixed weed, kina barrens, *Ecklonia* kelp forest, and deep reefs. A few sheltered shallow rock areas were occupied by tangle-kelp forest. Large areas of mixed rock and sediment substrates occurred at various depths.

It is concluded that marine habitats of Doubtless Bay are typical of those generally on the Northland east coast, but the large area of low reef in the central part of the Bay is a special feature which may have value as a nursery area for fish. The extensive occurrence of kina barrens suggests that snapper and crayfish have been seriously depleted.

It is recommended that the report and maps should be used widely to promote awareness within the community of the marine values of Doubtless Bay, and to foster moves toward improved management including establishment of marine protected areas (MPAs) and Marine Reserves as the central core of any restoration programme. Monitoring at a few key sites could involve the local community.

The complexity and diversity of habitats represented in Doubtless Bay suggest that the area is an ideal candidate site for some form of marine protection.

Introduction

Doubtless Bay is a semi-circular embayment on the northeast coast of Northland in the North Island of New Zealand (Figs. 1 and 1a), centred approximately at 34 degrees 55 minutes south, 173 degrees 28 minutes east. Prevailing winds are west to southwest, though northeast winds are frequent, particularly in summer. The main ocean current affecting the area is the East Auckland Current, a warm current of subtropical origin arising from eastern Australia. The East Australian Current originates in the Coral Sea and passes southward down the east Australian coast before turning east to cross the Tasman Sea as the Tasman Current. The Tasman current is rather diffuse but as it approaches northern New Zealand it becomes more defined and runs into the East Auckland Current which then passes southward down the Northland east coast and into the Bay of Plenty.

The East Auckland Current carries with it eggs and larvae of subtropical species picked up from eastern Australia, Lord Howe Island and Norfolk Island, some of which survive and settle on the Northland east coast and offshore islands. This gives the marine life of northeastern New Zealand, and the Doubtless Bay area, its distinct subtropical affinity, with numerous marine species in families which have their centre of distribution in the subtropical waters to the north of New Zealand. The main impact of the East Auckland Current is apparent in summer with the arrival in Northland of many large game fish species such as marlin, tuna, some sharks, and occasionally manta rays.

Water temperatures in the East Auckland Current and Doubtless Bay area range from approximately 22 degrees C in summer, peaking around February, to around 14 degrees C in winter with the minimum usually in July or August. These peaks and troughs vary a few degrees, and in their timing, from year to year, often associated with the El Nino/La Nina phases of the Southern Oscillation.

Underwater visibility in Doubtless Bay also varies throughout the year. Plankton blooms usually occur in spring, when visibility may drop to around three or four metres due to plankton in the water. Sometimes a secondary plankton bloom occurs in autumn. Water clarity in winter and in summer frequently reaches 15 to 20 m, particularly in the outer bay and around Knuckle Point, Berghan Point, and the reefs at Albert Rocks and Bastard Rock. Onshore winds or heavy swells can disturb bottom sediments and cloud the water, especially close to the shores and in the southwestern part of the Bay.

The southern coast between Aurere and Mangonui is more sheltered than the outer coasts near Knuckle and Berghan Points. Visibility along the southern shore is frequently reduced, particularly after heavy rain, by silt-laden water emanating from Mangonui Harbour, which can stretch westward along the coast clouding the water near Coopers Beach, Cable Bay and Taipa. West of Taipa visibility is usually better than further east.

Exposure to wave action generally increases from the inner bay to the outer bay along the Knuckle Point and Berghan Point coasts. These coasts are rocky, with many projecting points and reefs which afford shelter on their southern or western sides. Small rocky or sandy coves are common along both coasts.

Bathymetry of Doubtless Bay (see map section at end of report) shows mainly a gently shelving seafloor, increasing in depth to around 70 m midway between Knuckle and Berghan Points. Outside the confines of Doubtless Bay itself, the predominantly rocky and wave-exposed shores to the southeast and northwest drop steeply to over 50 m within a short distance of the coast. Within Doubtless Bay the seafloor is by no means a regular slope, with numerous rocky reef areas with variable relief over a large proportion of the central Bay. The nature of the seafloor and the marine habitats present in Doubtless Bay form the basis of the investigations and results described in this report.

For any planning of spatial use of land or sea a basic knowledge of 'what is there' is fundamental to progress. This report provides a basic understanding of the seabed habitats, a description of their nature, and maps their distribution within Doubtless Bay. It is our hope that this report will help facilitate the planning process, and in particular MPA planning, for marine areas of the Bay. It may also encourage or assist further ecological research and management of the Bay's natural marine resources.

Review of previous work

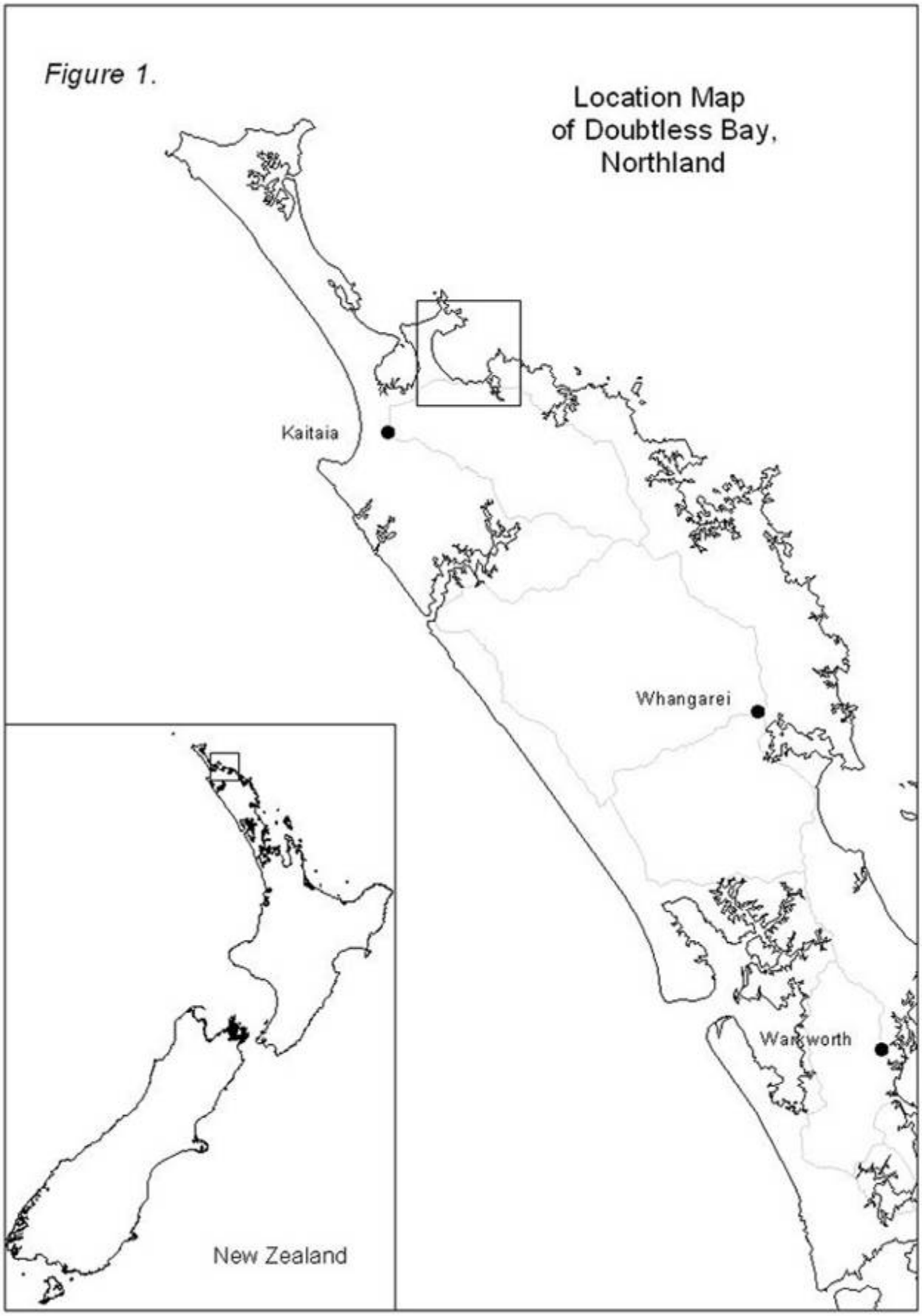
The marine area of Doubtless Bay has received little attention from marine researchers in the past. A few studies have investigated various aspects of marine life around Cape Karikari, such as fish population studies (Willan et al. 1979), and intertidal and sublittoral zonation patterns (Grace and Puch 1977). Shaw and Maingay (1990) included consideration of Doubtless Bay and Mangonui Harbour in their Coastal Resource Inventory for the Department of Conservation.

More recent studies looking at broad issues have included a few sites within Doubtless Bay. For example, Brook (2002) included four sites between Whatuwhiwhi and Knuckle Point in his study of the biogeography of reef fishes in northern New Zealand, and noted an increase in species richness from the shallow sheltered western site to the deeper more exposed Knuckle Point site. Shears and Babcock (2000) included two sites east of Brodie's Creek in their work on the rocky coastal community types of northeastern New Zealand. Strangely, Shears and Babcock specifically noted an absence of the shallow exposed brown seaweed *Carpophyllum angustifolium* from these sites and other sites on Cape Karikari, but Grace and Puch (1977) found it zone-forming on the Moturoa Islands, and in this study we found it abundant in the surge zone immediately south of Knuckle Point.

As part of a review of the natural marine features and ecology of Northland, Morrison (2005) included some discussion of the shorelines and marine life inside and outside Doubtless Bay. Other recent work relates to proposed Aquaculture Management Areas (AMAs) in northern New Zealand. Haggitt and Mead (2004; 2005) investigated an area inside Mangonui Harbour as a potential site for intertidal aquaculture, and found the species abundance and diversity markedly lower than in more northern estuaries sampled such as Houhora.

The only recent study specifically of Doubtless Bay is that by Makey (2005), which looked at fisheries and the social and cultural implications of various reform options for management of the marine areas of Doubtless Bay.

Figure 1.


Location Map
of Doubtless Bay,
Northland
Kaitaia
Whangarei
Warkworth
New Zealand

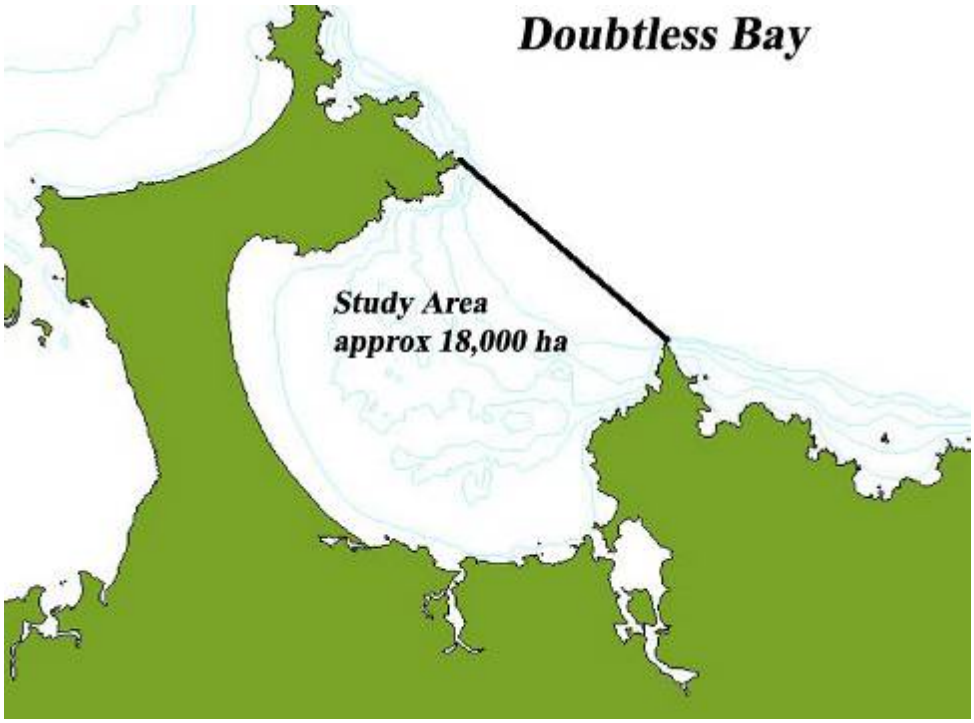


Figure 1a. Doubtless Bay, Northland, showing the study area.

Methods

Habitat Classification and Descriptions

The habitat classification used in this study is based on work by Ballantine et al. (1973), Ayling (1978), Ayling et al. (1981) and Grace (1981; 1983). The method adopted in this study closely follows the classification and methodology adopted in the Kerr and Grace (2005) Mimiwhangata habitat mapping report. The habitat descriptions generally use a combination of physical substrate characteristics and groupings of habitat-forming macro-algae. Qualitative habitat descriptors were used to enable rapid mapping of the study area using a combination of sonar and video methods, rapid sediment sampler, diving, and aerial photography.

Table 1 compares historic habitat classifications, ranging from the earliest work of Ballantine et al. 1973 at Mimiwhangata to a very recent classification (Shears et al. 2004), and including the classification adopted for this study.

The Shears et al. (2004) study examined the degree of concordance between qualitative habitat descriptors and quantitative species data from various locations along the northeast coast. They concluded that qualitative habitat descriptors for rocky reefs do accurately define biologically distinct species assemblages and are therefore an efficient means of mapping subtidal rocky reef habitats. It is worth noting that Shears et al. (2004) describe five additional habitats on the shallow reef not used in this study: mixed algae, red foliose algae, turfing algae, *Caulerpa* mats and encrusting invertebrates. While all these habitat assemblies occur at Doubtless Bay, all but turfing algae occur in patches or mixed areas at spatial scales too small to map with the methods chosen for this study. Turfing algae would make up some of the habitat classified as ‘kina barrens’ in this study. The two algal types can not be distinguished from each other in aerial photos, which were used as the basis for mapping shallow areas.

Some of the historic classifications did not deal with intertidal or sediment-bottom habitats.

TABLE 1. HABITAT CLASSIFICATIONS

Doubtless Bay (this report)	**Mimiwhangata** Kerr and Grace 2005	**Northeast NZ** Shears et al. 2004	**Hauraki Gulf** Grace 1983	**Paparahi** Grace 1981	**Leigh** Ayling 1978	**Mimiwhangata** Ballantine et al. 1973
Intertidal Habitats						
Sandy beaches	Sandy beach	Not considered	Not considered	Sandy beaches	No equivalent	Light-coloured sand beaches
Gravel beaches	Gravel beach	Not considered	Not considered	Gravel beaches	No equivalent	Dark-coloured sand beaches
Rocky shores	Rocky shore	Not considered	Not considered	Rocky shores	No equivalent	Solid rock shores
Mangroves	Not present	Not considered	Not considered	Not present	Not present	Not present
Subtidal Habitats						
Sand or mud	Sand/mud	Not considered	Not considered	Sand (sand/mud)	Sand & gravel (in part)	Clean sand
Gravel or cobbles	Gravel/cobble	Not considered	Not considered	Gravel (gravel/cobbles)	Sand & gravel (in part)	Coarse gravelly sand, gravel
Gravel or cobbles	Gravel/cobble	Cobbles	Not considered	Cobbles	Cobbles (in part)	Coarse gravelly sand, gravel, cobbles
Shallow mixed weed	Shallow mixed weed	Shallow *Carpophyllum*	Shallow mixed weed	Shallow mixed weed	Shallow broken rock	Shallow exposed zone
Urchin (kina) barrens	Kina barrens	Urchin barrens	Rock flats	Rock flats	Rock flats	Medium-depth without kelp
Tangle-weed forest	Tangle-weed (kelp) forest	*Carpophyllum flexuosum* forest	Kelp forest (in part)	*Carpophyllum flexuosum* forest	Not present	Shallow sheltered zone
Ecklonia forest	*Ecklonia* forest	*Ecklonia* forest	Kelp forest (in part)	*Ecklonia* forest	*Ecklonia* forest	Medium-depth kelp bed
Deep reef	Deep reef	Not considered	Very deep reef	Not present	Sponge garden (in part)	Very deep reef
Mixed sand and rock	Deep reef mixed sand and rock (part)	Not considered	No equivalent	No equivalent	No equivalent	No equivalent

The area investigated in the present survey (Fig. 1a) includes the entire marine area of about 18,700 ha southwest of a line between Knuckle Point in the north to the small islands off Berghan Point to the south, but does not include the estuaries at Aurere, Taipa or Mangonui. The work was completed in

stages between April and June 2005. Aerial photography was used to map habitats in shallow waters (< 12 m depth). In deeper waters sonar methods were used. In both cases video techniques and diving were used to ground-truth the resulting habitat classification. Information from previous habitat maps and dive records from other investigations (Kerr and Grace 2005) were also referred to. In association with the sonar surveys the soft bottom areas were investigated at spot sites with a simple rapid sediment sampler. The description of the various methods and equipment used follows.

Survey vessel

All work in this investigation was carried out from a 4.2 m Mac boat powered with a 50 hp outboard. The sonar equipment described below is mounted in the boat and transducers for both machines are mounted on the bottom edge of the transom either side of the motor.

Side-scan sonar

The side-scan unit used was a Humminbird 987-C SI. The unit has side-scan GIS capability as described in the following specification:

- Side Image Coverage area (max 200 m swath 0-30 m depth) of the bottom, 160 degrees @-10 dB in 455 kHz.
- 2D conventional sonar depth capability 780 m,74 degrees @ -10 dB in 50 kHz & 20 degrees @ -10 dB in 200 kHz.
- 7" sunlight viewable colour display with 480V x 854H resolution TFT LCD screen technology (allows easy screen capture w/ digital camera, i.e. no flicker).
- Dual frequency 50/200 kHz sonar conventional 2D sonar, side image sonar 262 kHz / 455kHz.
- 750 Watts RMS, 6,000 Watts PtP (200 kHz) and 1,000 Watts RMS, 8,000 Watts PtP (50 kHz) Power Output, 63 m target separation.
- Dual microprocessors and triple channel sonar transmitter/receiver.
- Full screen track-plotter, 3D track and split screen sonar/track with adjustable split.
- Programmable view presets access important screens with one touch.
- Plug & Play Compatibility and PC Connection.
- Accelerated Real Time Sonar™ operates at up to 40 times per second to instantly capture the action under the boat. Signal displayed in window as actual sonar return intensity plotted against a vertical depth scale.
- Freeze Frame pauses the sonar scroll for detailed inspection of the screen.
- Totally automatic operation or totally manual operation with upper and lower range control.
- One-touch Zoom with 2 x, 4 x, 6 x, and 8 x zoom levels.
- Adjustable chart speed.

Multibeam 3D sonar

A second sonar unit utilised for the project was a Humminbird 947c 3D unit. This machine had a multi-beam arrangement and produces a 3D swath image on its screen. It also has conventional 2D sonar images and the Humminbird ‘real time sonar’ window display. This second system was used as a check on the interpretation of the side-scan unit and was especially helpful in the interpretation of soft sediments. It was a further advantage to have the track-plotter capability on this second machine so that the side-scan unit was totally free for side-scan imaging.

- Same GPS, track-plotter and general features as the Humminbird 987c SI unit described above.

- Dual frequency 83/455 kHz arranged in a 6 beam configuration.
- Depth capability 3D 75 m, 2D 330 m.
- Area of coverage 74 degrees @ -10 dB in 83 kHz & 53 degrees @ -10 dB in 455 kHz.
- 750 Watts RMS, 6,000 Watts PtP (200 kHz) and 1,000 Watts RMS, 8,000 Watts PtP (50 kHz) Power Output, 63 mm Target Separation.
- Accelerated Real Time Sonar™ operates at up to 40 times per second to instantly capture the action under the boat. Signal displayed in window as actual sonar return intensity plotted against a vertical depth scale.
- Freeze Frame pauses the sonar scroll for detailed inspection and selection of georeferenced target points via cursor control.

GPS and Georeferencing data collection

For all point and track information in the study a Garmin 12 GPS unit was used. The position accuracy of this unit given by the manufacturer is 15 m. Our own checks of accuracy of the unit by returning to known points indicated an accuracy of 5-7 m. At the end of each day data was downloaded into a PC laptop into Fugawi 3.4 software for processing to Excel spreadsheets. The track-plotter function in the Humminbird 947c unit was used for basic navigation and the setting up of target points for sonar and video drop positions.

Rapid Sediment Sampler

As a quick field check on interpretation of soft sediment characteristics from the sonar image, a sediment sampling system was devised based on a method used on old sailing ships. In the old days depths were sounded using a lead weight and measured line. A sample of the bottom material was collected during soundings by smearing tallow on the bottom of the lead sounding weight, a small sample of the sediment sticking to the tallow when the weight hit the bottom. We copied the technique by using a lead weight smeared with margarine, dropping the weight to the bottom and retrieving it quickly using a casting rod and reel. This minimised sampling time but enabled retrieval of sufficient sedimentary material to characterise the substrate type. In some cases photographs of the samples were taken (Fig. 5).

Drop video equipment

The video drop apparatus was a Sony TRV6e mini DV camera mounted in a simple, robust housing built by us from a recycled scuba cylinder and Plexiglas sheet material. The housing was arranged with a bottom weight attached to a one metre line attached to the bottom edge of the housing. Another line was attached to the top edge of the housing extending upwards to a series of floats starting at one metre above the housing (Fig. 6). By adjusting these attachment points, weights and floats, we were able to arrive at an arrangement that allowed us to 'feel' when the unit hit the bottom. We would then let out 3-5 m of slack in the line. The unit then hung vertically held by the floats with the camera approximately one metre above the bottom. We found that the arrangement would naturally rotate the housing in a circle or semi-circle, effectively panning the camera and greatly increasing the viewing area. We also devised a method of bouncing the unit along the bottom for short distances which also increased the area photographed. The housing unit had no external camera controls. The camera was simply turned on, set on automatic focus and exposure, placed in the housing and deployed. A remote on/off device was used to place the camera on standby while on the surface between drops. Using this system drops could be made with a minimum of time and effort, allowing many drops during a field work session.

Manta board video

In some circumstances we used a georeferenced manta board survey technique which gives more coverage than the drop video method. This technique is adapted from a similar technique used successfully by Grace (1981) at Paparahi, and by Francis and Grace (1986) at Great Barrier Island. The manta board is a simple flat piece of marine plywood attached by a bridle to a thin tow line which is attached to the stern of the boat. A diver holds on to the front of the board and is towed at about two knots about 20 to 50 m behind the boat. By tilting the front of the board upward or downwards the diver can use the board like a paravane, and cruise above the bottom following the bottom contour observing marine habitats. Grace (1981) used a small rotor-driven distance log attached to the board, and made habitat notes on a writing pad attached to the board. The simple design of the board enabled it to be controlled with one hand, leaving the other hand free for writing notes while travelling over the seabed. Navigation was predetermined by having the boatman travel in a straight line between points on a map.

The new adaptation of this technique used the hand-held GPS on the boat for navigation and recording the route travelled, and a small underwater video unit pointing forwards attached to the top of the manta board for recording an image of the seabed covered. The camera used was the same one as in the video drop apparatus described above, but in a smaller purpose-built housing bolted to the manta board. By careful time-keeping and setting a constant tow line length (generally 50 m) it was possible to plot the tow route and relate it to the video image to within a few metres. Using this technique it is possible to make a continuous video record of habitats along a line several kilometres long.

Side-scan sonar, drop video survey method

Following initial analysis of bathymetry and aerial photos, areas of potential reef were marked on a work map. A system of parallel survey lines was then planned, the lines extending beyond the potential reef areas to try to ensure reef edges were detected and to pick up any outlying patch reefs nearby. The lines were at approximately 200 m spacings in the initial survey. The survey by necessity was at times adjusted in the field to suit the underwater topography, with most effort being focused in complex areas.

At each point along the survey track, where the substrate/habitat classification was judged to have changed, the coordinates of the point were recorded. The track was also recorded for all survey lines. The lines and ‘change points’ are illustrated in the ‘Tracklines and Waypoints Map’, (see map section). The data for all survey points is included in Appendix 1. This subjective classification interpretation was informed by diving experience in some of the areas, and by previous experience and testing with the sonar equipment. Where rock structures were visible, representative areas were studied by measuring the sonar ‘shadows’ cast by the vertical structure. This gives a relatively accurate calibration of vertical features (Fish and Carr 1990). Classification of the side-scan image and sonar imagery was ground-truthed with drop video, scuba and snorkel dives, manta video and rapid sediment sampling technique during the course of the investigation to further ensure the interpretation of the sonar images remained accurate. As a further check in the system, side-scan screen images of areas of particular interest were captured on digital video and archived on DVD backup disks as MPEG2 video files. The screen image has a latitude and longitude coordinates window and the video has a lineal timecode so that any location on the survey run can be located and checked or further analysed. The classification used for the initial sonar survey was as follows:

1. high relief rocky reef with vertical structures > 3 m (hr)
2. low relief rock reef (lr)
3. mixed reef and soft sediments (m)
4. gravel/cobble (g)
5. sand/mud (s)

Examples of the side-scan screen image for a high relief rocky reef area and a sand area changing to low relief rock are shown in Figs. 7 and 8.

Following the initial survey work, results were brought into an ArcView GIS system and mapped. The initial survey yields an approximate reef edge. Analyses of the initial survey maps allowed further sonar survey lines to be run with the objective of mapping reef edges and habitat changes to less than 200 m accuracy. In the areas determined as reference areas (see description below) the survey effort (line spacing) was typically closer to ensure that precision in deeper areas came down to approximately 100 m with the sonar. In shallow areas where fine resolution was possible from the aerial photos, precision came down to about 10-15 m.

From the mapped sonar survey information a drop video survey was designed. The video survey target points were selected to identify:

1. all the major physical habitat types
2. inconsistent interpretations between the side-scan and single beam sonar surveys
3. areas where it was likely habitat boundaries were still not covered
4. reef areas where major biological boundaries were likely to occur
5. areas to ground-truth the analysis of aerial photography

This survey served the function of checking the sonar interpretation in replicate areas.

Secondly, video drops were arranged across depth profiles in each reference area for the purpose of identifying depth dependent zonation patterns of biological communities as defined in the Mimiwhangata study (Kerr and Grace 2005). At some locations, in order to gather more detailed information than the video drop produces, we used a towed manta board with a mounted video camera, snorkel swim and scuba dive techniques. The data for the video drops and manta tows are included in Appendix 1.

Aerial Photography

Available aerial photographs were assembled and reviewed. Photo series taken for Doubtless Bay in 1993 and 2003 held by the Northland Regional Council (NRC) were found to contain some useful images of subtidal structures and habitats. However these photos were only of high quality for habitat mapping in a small proportion of the Doubtless Bay area. On June 7 2005 conditions were adequate for aerial photography and a new set of photographs were taken according to the specifications described below. The photos were georeferenced with the use of the NRC 2003 aerial photos and Image Analyst ArcView GIS software.

Aerial Photography Planning Details

Hardware, camera settings, and other technical details were as follows:

Camera:	Nikon D70 digital SLR
Lens:	35-70 mm zoom lens, generally set on 50 mm
Focus:	Fixed on infinity
Sensitivity:	Digital ISO equivalent 200
Shutter priority:	1/250 second

File type(s):	Fine resolution jpeg at 6MB file size
Download time:	3 seconds per image
CF card size:	1 GB
Images per card:	About 150
Plane:	Piper with camera port in floor
Height:	6,000 ft (though some were flown at 3,000 ft)
Speed:	120 mph
Picture width:	900 m on ground, across flight path (at 6,000 ft)
Picture length:	600 m on ground, parallel to flight path (at 6,000 ft)
Picture centres:	500 m intervals on the ground
Picture overlap:	About 100 m each end of picture
Time interval:	9.3 sec. between shots at 120 mph gives 500 m centres
Flight plan:	Flight north from Onerahi, then start at Berghan Point, follow coast southwards flying about 300 m seaward of the shoreline. Osprey Head, Mangonui Harbour, Coopers Beach, Cable Bay, Taipa and estuary, Tokerau Beach, Whatuwhiwhi, Knuckle Point. If conditions allow continue around Cape Karikari to Karikari Bay, then cut across peninsula to Whatuwhiwhi, then track along shallow edge of the two large reefs in the middle of Doubtless Bay. If the reef edge is visible cover as much of the edge as possible. Also target other small potential reefs, as suggested by the fair chart, in water shallow enough to get visual information on the seafloor. Return flight to Onerahi.

On the day several changes were made to the planned flight because of the presence of clouds rolling in and obscuring some areas. Some areas we had hoped to photograph became impossible because of low cloud. In the areas we did manage to cover, however, excellent underwater detail was visible in the photographs.

Sourcing and Analyses of Original Navy Fair Charts for Study Area

Navy fair charts for Doubtless Bay, from surveys by the NZ Navy Hydrographic Branch from 1972 to 1974 (mostly from the vessel HMNZS Lachlan) were obtained from Land Information NZ. Initial scanning and georeferencing of the fair charts was completed with a digital camera and Fugawi software system. It is fortunate that the quality and resolution (i.e. spatial frequency of soundings) for the Doubtless Bay area is particularly good. For the final bathymetry layers the fair charts were digitised and georeferenced in an ArcView GIS system.

Bathymetry Data Correction to Chart Data

During our side-scan surveys, depth was recorded for all data points along with time of day. There are two sources of error that affect the precision of the data. These are variations in relation to chart datum relating to the stage of the tide and error in the sounder reader as a result of boat movement up and down due to swell. We have recently put in place an operational procedure to correct or quantify these errors. For the tide correction to chart datum factor we have written an Excel spreadsheet program that transforms the field depth data to chart datum levels. This program uses published tide times and levels for the nearest secondary tide station and a set of formulas based on a translation of a Cosine curve. We have checked the accuracy of this program against US based tide prediction program and the calculation error is within 100 mm for any time in the tide cycle. We cannot eliminate the boat movement error, but we can record the movement routinely over the course of the survey work. This figure will then become one aspect of the error that goes along with the data in a metafile. In practice at the back of the boat, where the sonar transducers are mounted, there is minimal movement in the vertical plane in the conditions we normally work in. Typically swell heights were less than half a

metre while sonar surveys were done. The swell heights we encountered are listed in Appendix 2 and bathymetry data is included in Appendix 1.

Habitat Mapping

Sonar, video and all ground-truthing information were brought together in a series of GIS layers. The georeferenced June 2005 aerial photographs were adjusted for light/dark balance and contrast in a graphics programme to provide maximum visibility of underwater structures. The photos were then added as a further layer in the GIS system. A series of work maps were created from all the line and point data, which was overlaid on the aerial photo layer where this was helpful. In the shallow areas, aerial photographs allowed very close resolution of detail in the order of 3-15 m. A line indicated on the map in Fig. 4, (see map section) shows the seaward depth extent of the usefulness of the aerial photos for the mapping exercise. Beyond this line the distance between the sonar images combined with the video points determined the accuracy of the sonar-derived habitat polygons. In the final mapping exercise all the information was assessed collectively to make the best possible approximations of the habitat polygons which were drawn free-hand on hard copy work maps (1:5,000 scale). The hand-drawn habitat polygons on the work map were then digitised through a combination of scanning and computer drawing methods and transferred to the GIS system to produce the final habitat map.

Depth boundaries of the various habitats defined were determined by a combination of drop video, scuba diving, snorkelling, manta tows, and knowledge of similar habitats at Mimiwhangata (Kerr and Grace 2005). Care was taken to determine these boundaries at various locations throughout Doubtless Bay, paying particular attention to changes in depth boundaries related to changes in wave exposure from the outer to the inner parts of the Bay. Beyond the depth at which detail was visible on aerial photographs, the actual line on the map was set by interpolation along depth contours derived from the digitised bathymetry based on the original navy fair charts, and also bearing in mind changes in bottom substrate type derived from the side-scan survey lines. In shallow water where good detail was available from aerial photographs, habitat boundaries were drawn directly on aerial photo prints as described above.

For final presentation, habitat maps initially drawn at 1:5,000 for most areas were combined and scaled to 1:50,000 to cover the whole of Doubtless Bay on a convenient paper size (approximately A2). A reduced A3 size map of the entire study area is included in the back of the report.

Reference Site 1:5,000 scale mapping

Seven areas were selected for presentation as more detailed habitat maps at 1:5,000 scale. The areas are indicated on the map in Fig. 4, (see map section):

1. Brodie's Creek
2. Whatuwhiwhi
3. Parakerake
4. Aurere
5. Chuck's Cove
6. Onete

7. Fairway Reef

Selection of these sites was based on consideration of the following criteria:

1. Areas where good detail was visible in shallow water in aerial photographs;
2. Feature sites of interest to local communities;
3. Range covering the full variety of shore types and aspects (except the major estuaries), including one offshore reef system (Fairway Reef) and some deeper water features;
4. Spread widely in Doubtless Bay.

Techniques used included aerial photography, side-scan sonar, single beam sonar, 3D sonar display, drop-video, diver transects, diver manta board tows, spot dives, and direct observations from the boat while cruising slowly in shallow water. The final selection and balance of survey tools and spatial layout of the work was completed following consideration of the information from the initial survey.

Results

Habitat map

The habitat maps included in this report represent the summation of all the information assembled in this investigation. The total area mapped is approximately 18,700 ha. The mapped area includes all shorelines and seabed features landwards of a line from Knuckle Point to the small island off Berghan Point at the entrance to Doubtless Bay, but does not include the two major estuaries of Mangonui and Taipa, or the small estuary at Aurere.

Marine habitats of Doubtless Bay are mapped at a scale of 1:50,000 on the A2-size fold-out map inserted at the back of this report. The habitat classification used is shown in Table 2, which includes the area of each habitat occupied within the mapped area, as well as the percentage of the mapped area covered by each habitat.

TABLE 2. DOUBTLESS BAY MARINE HABITATS.

INTERTIDAL HABITATS		AREA OCCUPIED (Hectares)	PERCENTAGE OF MAPPED AREA
	Sandy beaches	162.4	0.87
	Gravel beaches	10.9	0.06
	Rocky shores	79.4	0.42
	Mangroves	2.2	0.01
SUBTIDAL HABITATS			
	Shallow mixed weed	138.0	0.74
	Urchin (kina) barrens	111.6	0.59
	Tangle-weed forest	6.0	0.03
	Ecklonia forest	570.0	3.04
	Deep reef	109.1	0.58
	Mixed sand and rock (kina barrens)	37.2	0.20
	Mixed sand and rock (*Ecklonia* forest)	1917.0	10.21
	Mixed sand and rock (deep reef)	1390.9	7.41
	Sand or mud	12208.0	65.01
	Gravel or cobbles	2030.7	10.82
TOTAL		18773.4	99.99

By far the greatest part of the mapped area is occupied by subtidal sand or mud (65.01%), with coarser gravels or cobble areas comprising a further 10.82%. Rock or rock-sediment mixes comprise 22.8% of the mapped area, only 4.98% being solid rock habitats. The rock and rock-sediment mixes thus make up only a small proportion of the Doubtless Bay seabed, but have a disproportionately large ecological importance because of their high topographical complexity and consequently high biological diversity.

Intertidal habitats occupy only 1.36% of the mapped area, but are interestingly the only habitats seen by the vast majority of people, with about two-thirds being sandy beaches.

Habitat descriptions

Intertidal habitats.

Sandy beaches

There are many sandy beaches in the Doubtless Bay area, the largest being Tokerau Beach at approximately 15 km long. Other smaller sandy beaches occur in the south of the Bay - Taipa, Coopers Beach, Cable Bay, and Hihi Beach - and Whatuwhiwhi in the north. There are also a few small sandy beaches in embayments on the predominantly rocky Berghan Point coast, and between Whatuwhiwhi and Knuckle Point. Biologically the sandy beaches generally support little life with species abundance and diversity low compared to the other habitats except gravel beaches. Apart from sand hoppers on the drift line, marine life consists of several species of worms and tiny crustaceans on the middle or lower parts of the beaches. Tuatuas have been reported from the northern end of Tokerau Beach, but were not noted during this survey, and wash-ups frequently occur of various surf clams and other molluscs from shallow water. The small estuary at Brodie's Creek on the Whatuwhiwhi coast contains some very sheltered muddy sand shores with cockles and mangroves in appropriate places.

Gravel beaches

Many of the smaller beaches in the area consist of gravel and pebbles, or gravel with sandy areas at certain tidal levels. There are many small gravel beaches in coves on the rocky shores on the northern and eastern sides of Doubtless Bay. This habitat is hostile to macro-invertebrates since movement of gravel and pebbles even in very light wave action causes mechanical damage to organisms living there. There are a few boulder beaches, particularly on the outer more wave-exposed shores of Berghan Point and Knuckle Point.

Rocky shores

A high proportion of the northern, eastern and southern shorelines of Doubtless Bay consist of hard rock of volcanic origin, criss-crossed with numerous joints. These joints are zones of weakness along which preferential erosion occurs. Consequently many rocky shoreline features, on both a large and small scale, are aligned parallel to the jointing system within the rocks, and some can be seen in the aerial photographs. Marine life on the rocky shores is rich and varied. The details of distribution and types of animals and plants present are controlled mainly by tidal level and the degree of exposure to wave action (Morton and Miller 1973). There is a wide range of exposure to wave action along the Knuckle Point and Berghan Point coasts, exposure generally decreasing westward and southward, but complicated by the presence of numerous embayments separated by projecting headlands. There is a correspondingly wide range of patterns of marine life. Some of the more familiar forms of marine life are rock oysters on the most sheltered shores, and surf barnacles on the more exposed rocky points and headlands. There are also examples of rocky shores where the major patterns of life are further modified by shade, sand scour, standing water in rock pools, and freshwater runoff. Small colonies of green lipped mussels *Perna canaliculus* occur on rocky shores in the Bay, notably in the Aurere area, some reefs and headlands between Taipa and the entrance to Mangonui Harbour, on Albert Reef, and sporadically elsewhere.

Mangroves

Mangroves are extensive in Mangonui Harbour and Taipa estuary, and in the Aurere estuary, but these areas are not included in this study. The small estuary at Brodie's Creek on the Whatuwhiwhi coast contains areas of mangroves in its upper reaches. In Chuck's Cove, a small area of large mangroves occurs in a small creek, and scattered individual mangrove trees occur in sediment pockets on the rocky and gravelly shores.

Subtidal habitats.

Sand or mud (depth range 0-70 m+)

Sand extends well offshore from most of the sandy beaches, and most of the sheltered rocky shores drop quickly on to sand below low water. In deep water beyond about 50 m, where the influence of storm waves is rarely felt, the sediment is muddy fine sand, and occupied by characteristic deeper water species. In shallow water, generally less than 10 m, the sandy bottom is characterised by ripple patterns - a series of small wave-induced parallel wave forms on the surface of the sand, except in the most sheltered areas. There is generally far more animal life in the permanently submerged sandy area than on the sandy shores, partly as a result of the greater stability and lack of violent wave action in sub-tidal areas. Coarser sand frequently supports dense beds of the morning star shell (*Tawera spissa*), a bivalve shellfish 20 to 25mm in length which in places reaches densities exceeding 5,000 per square metre. They are particularly common near reefs along the coast east of Whatuwhiwhi.

Off Tokerau Beach a variety of surf clams occurs, common species including the coarse-ringed *Dosinia anus* and the frilled venus shell *Bassina yatei*, while the burrowing gastropod *Struthiolaria papulosa* may also be common. The paddle crab *Ovalipes catharus* frequently occurs in shallow water off the sandy beach. Historically scallops and horse mussels have been found along Tokerau Beach, particularly toward the southern end, in depths from about 10 to 20 m.

Sand offshore from Tokerau Beach, and southeast of Whatuwhiwhi, is often streaked with elongated patches of gravel on a scale too small to map at the working scale. The aerial photo (Parakerake), and the cover photo, clearly show dark and light areas toward the south, the dark being gravel and the pale being sand. The distribution of sand and gravel areas probably changes in storms, with individual gravel areas being temporary in nature. The sand/gravel streaks are clearly aligned with the direction of wave movement.

Gravel or cobbles (depth range 0-60 m)

Sediments dominated by gravel and cobbles are less widespread than those characterised by sand or muddy sand. The major gravel areas are found west of the exposed outer Berghan Point coast where steep rocky reefs drop down to flatter gravel areas, and seawards of the extensive reef and mixed rock and sediment zones near the middle of the Bay. Another large area of gravel stretches west of the Berghan Point coast and across to the south of Fairway Reef. Smaller areas of gravel occur south of Knuckle Point, and sporadically amongst reef areas in the northern half of the Bay, and inshore east of Whatuwhiwhi.

Small areas of larger cobbles were noted in very shallow water immediately off two sandy beaches near Whatuwhiwhi, and in deeper water (around 30 metres) during a dive just south of Knuckle Point.

Gravel sediments often have large ripples, some being up to 300-400 mm tall and one metre from crest to crest. Often gravel ripples are clearly seen in the side-scan sonar images. An example of a gravel area with large ripples is shown in Fig. 9, which is a still grab from drop video. The more mobile gravel bottom areas are usually poor in macro-invertebrate life, but where the bottom material tends to be more stable dense populations of some sturdy bivalve shellfish are found. The morning star shell (*Tawera spissa*) is equally at home in these areas as it is in coarse sand, but in gravel may also be accompanied by the purple sunset shell (*Gari stangeri*), the small dog cockle (*Glycymeris modestus*), and sometimes *Dosinia maoriana.*

Under normal conditions a cobble bottom is fairly stable, but during storms some of the cobbles and pebbles may move. This semi-stability enables some types of faster-growing seaweeds (often red

algae) to survive on the more stable rocks, but theirs is a precarious existence as, sooner or later, the rocks will move in a storm and the algae will be destroyed.

Shallow mixed weed (depth range 0-3 m in shelter; 0-7 m in exposure)

This habitat occurs on rocky reefs between low water and about 7 m depth, and in increasing shelter is often restricted to the shallower part of this range. The rocky substrate is often very broken and dissected, with tumbled boulders, ridges and crevices. Several species of large brown algae are visually dominant. The most abundant of these is flapjack kelp (*Carpophyllum maschalocarpum*). Small plants of kelp (*Ecklonia radiata*) occur in the deeper areas or more sheltered parts of the zone. Where wave action is moderate or heavy, the upper part of the zone is characterised by a fringe of *Carpophyllum angustifolium*, which forms a dense swirling carpet, the vertical extent of which is determined largely by the degree of wave turbulence. There is usually a belt of *Carpophyllum maschalocarpum* just below the *Carpophyllum angustifolium* fringe. *Lessonia variegata*, which is superficially similar to *Ecklonia radiata* but differs in having a divaricating stipe or stalk, occurs in the deeper part of the zone in areas with maximum wave-exposure. The oak-leaved kelp (*Landsburgia quercifolia*) also frequently occurs in areas of heavy wave exposure. Tolerant of a wide range of wave exposure is the smaller finely-branched *Carpophyllum plumosum*. There are several species of red algae including the agar weed *Pterocladia lucida*, and *Melanthalia abscissa*. The sea-urchin or kina (*Evechinus chloroticus*) is common in this habitat, usually nestled in holes, crevices and depressions. Here it often feeds on seaweed which has been torn off the rocks by heavy wave action. A wide variety of grazing molluscs also occurs in this habitat.

The photograph in Fig. 10, taken from a video drop clip, shows an example of shallow mixed weed habitat.

Urchin (kina) barrens (depth range 3-13 m)

This rocky habitat is characterised by a lack of large brown algae, the rock surface appearing bare and relatively barren. Upon close inspection nearly the whole rock surface is covered in a thin film of mauve to pink-coloured encrusting coralline seaweed (coralline 'paint'), in some areas with coralline turfing algae as well. In a few areas small plants of the brown seaweeds *Carpophyllum angustifolium* or *Carpophyllum flexuosum* form patches within the predominantly coralline paint-covered rocks. The most conspicuous animal in this habitat is the sea urchin or kina which is often present at a density of 5-10 m^2 but may be much denser in places. It is the grazing by urchins that maintains the habitat in its relatively barren state. Sea urchins scrape the rock surface, removing recently settled algae and encrusting animals before they have a chance to grow. Sea urchins may also graze directly on large attached algae. This is relatively uncommon but when it does occur can lead to an extension of the kina grazed zone into formerly algal-covered areas. This zone is also the home of a number of small grazing molluscs, such as limpets and chitons. The most spectacular grazing mollusc here is the large Cook's turban shell (*Cookia sulcata*), a rough surfaced gastropod 10 cm or more in diameter. The white anemone *Actinothoe albocincta* is often common here, particularly on steeper slopes in wave-exposed sites.

Kina barrens are more extensive and occur over a wider depth range in the exposed outer parts of Doubtless Bay. With increasing shelter the depth of occurrence and the depth range covered decreases, until in maximum shelter kina barrens are absent from the inner parts of Doubtless Bay. A similar pattern was observed in the Bay of Islands by Brook and Carlin (1992), and in the Hauraki Gulf by Grace (1983); it is further discussed by Choat and Schiel (1982), Walker (1999), and Shears and Babcock (2000).

An example of an urchin (kina) barren is shown in Fig. 11, taken from a video clip, which unfortunately does not show the kina very well.

Tangle-weed forest (depth range 1-5 m)

In the most sheltered areas of rock substrate, a thick, almost impenetrable tangled forest of the brown seaweed *Carpophyllum flexuosum* occurs. Individual plants may reach a height of over 3 m. With increasing wave exposure it intergrades with *Ecklonia* forest. This habitat usually gives way to *Carpophyllum maschalocarpum* and a narrow strip of the shallow mixed weed zone towards low tide. In a few sheltered areas in Doubtless Bay, *Carpophyllum flexuosum* is joined or in some cases replaced by the similar-looking *Sargassum sinclairii.* The seaweed and the rock substrate of this sheltered zone is nearly always covered with a thin layer of fine silt, settled out from the water, which may be relatively turbid. This detritus provides food for a range of specialized detritus and deposit feeders, such as the sea cucumber (*Stichopus mollis*) found on the rocks and in crevices beneath the weed canopy.

Fig. 12, taken from a video clip, shows the tangle-weed *Carpophyllum flexuosum* forest.

Ecklonia forest (depth range 4-29 m)

Ecklonia forest is characterised by dominance of the large brown laminarian kelp *Ecklonia radiata*. This seaweed attaches to the rock surface by a branched holdfast, and has a single cylindrical stalk or stipe, on top of which is a bushy top or lamina. The density of the plants varies considerably, with perhaps 5 m^2 plants in 'thin' beds, often in deeper water, and about 50 plants m^2 in dense, usually shallower, beds. The length of the stipe also varies, apparently with depth, from about 20 cm in adult plants in shallow slightly turbulent water, to about 80-100 cm in some deeper sites.

The canopy of the *Ecklonia* forest greatly reduces the light intensity on the rock surface beneath, which provides more favourable conditions for small encrusting animals such as bryozoans, hydroids, sponges and ascidians. The holdfasts of *Ecklonia* provide a crevice-like habitat for a rich diversity of life. In many areas the rocky bottom occupied by *Ecklonia* forest is of low relief, but where a high relief rocky substrate occurs within this zone, *Ecklonia* plants are usually found on the tops of the rocks, but not on their more shaded vertical sides, which typically are covered in a rich variety of encrusting animal life. As light levels diminish with increasing depth, sponges of numerous types become increasingly common within the thinning *Ecklonia* forest. Along reef edges where the *Ecklonia* forest drops on to a sandy substrate, there is often a fringe of the green seaweed *Caulerpa flexilis* on the rock immediately adjacent to the sand. It appears that *Caulerpa* is more capable of surviving periodic burial by sand and of colonising the more frequently disturbed sand/reef edge than *Ecklonia.*

The *Ecklonia* forest zone usually occupies the rocky reefs between the urchin barren zone and the sandy seafloor, generally in a depth range of 4-29 m. Targeted video drops allowed us to identify the transition zone where the lower boundary of the kina barren changed to the upper boundary of the *Ecklonia radiata* forest. This boundary was at 7-13 m depth, tending toward the deeper figure in increasing exposure, and was usually quite abrupt. Sometimes, particularly in relatively sheltered areas, the *Ecklonia* forest occurs adjacent to the shallow mixed weed zone, and may imperceptibly intergrade with it. A second habitat transition zone at about 29 m also was identified with video drop survey and diving. At this depth *Ecklonia radiata* forest weakened and thinned out while sponge and other encrusting invertebrate life became more diverse and abundant.

Fig. 13 shows an example of a fairly tall, sparse *Ecklonia* forest habitat, with some of the plants suffering dieback generally associated with old age. There are a few small plants growing beneath the old canopy.

Deep reef (depth greater than 29 m)

On the rocky bottom deeper than 29 m there is insufficient light to support the large brown seaweeds found in shallower water. Sponge species become the dominant life form on the deep reef. A massive grey sponge *Ancorina alata* is common, as well as the orange branching *Raspailia* sp. and purplish thin branching fingers of *Callyspongia ramosa*. Red cup sponges (*Stelleta hauraki*) and a wide variety of other large and small sponges are present. Soft corals (*Alcyonium* sp.) and pencil bryozoans (*Steganoporella neozelanica*) are also common. Small cup corals (*Monomyces rubrum*) also occur in this habitat. The deep reef habitat is most extensive on low-relief rock reef. In a few places, in particular around Albert Reef, Bastard Rock, and steep rock near Berghan Point and Knuckle Point, the rock bottom is more dissected and irregular, with frequent gullies and high rocks with elevations of over 3 m. These high-relief areas provide opportunities for an even greater variety of life than on the low-relief deep reef.

With the limited opportunities for exploring this habitat, we were unable to find any of the pink *Primnoides* gorgonian so common on deep reefs at Mimiwhangata (Kerr and Grace 2005).

Fig. 14 shows the deep reef habitat close to Knuckle Point, with sponges and encrusting invertebrates common on a steep rock wall.

Mixed sand and rock (depth range 0-29 m algal communities on patch reefs, and 29-40 m sponge encrusting invertebrate communities on patch reefs)

This habitat type occurs in transition zones between reef and sediment as well as in areas comprised of a patchy mixture of rock and sediment habitats. It is very extensive through the middle areas of Doubtless Bay, and also common around the fringes of reefs to the north and east of the Bay. This ecologically important habitat is the preferred habitat of some species and is part of the habitat of the juvenile life stage of some reef species (for example, goatfish, juvenile snapper and blue cod). It is usually the place where foraging by species that shelter on reefs but feed in the sediments (like rock lobsters) is most intense. The habitat covers those areas where there is a mixture of small patches of rock scattered amongst sandy areas, but each is of such small extent that it is not possible to map them on the scale used or with the degree of precision of this survey. Areas of mixed sand and rock occur most commonly where a gently shelving rocky substrate meets a flat sandy bottom. If the rock surface is dissected by crevices and gullies sand fills these gullies as the rock dips beneath the sand surface. At depths less than 29 m there may be sand and or gravels combined with a shallow mixed weed zone, a kina grazed zone, or *Ecklonia* forest. Several species of red algae can be common in this mixed habitat, sometimes including large plants of *Gigartina circumcincta.*

The green sea rimu (*Caulerpa flexilis*) forms extensive beds where low relief rock is covered with a thin layer of sediment, or where sediment frequently comes and goes over the rock surface. It also often forms a fringe around patch reefs occupied by *Ecklonia* forest. '*Caulerpa* mats' have been elevated to a separate habitat type by Shears et al. (2004), but at the scales we are working with for this study it is not possible to map them separately.

At depths greater than 29 m sponges and other encrusting invertebrates dominate the rock habitat adjacent to soft sediments.

An example of mixed sand and rock, at the depth of the shallow mixed weed zone, is shown in Fig. 15.

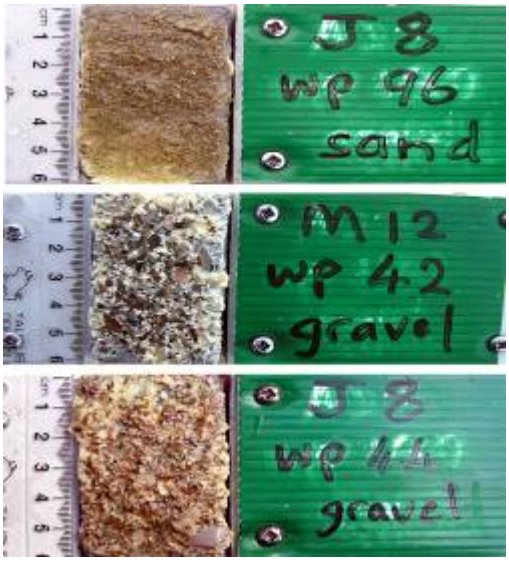


Fig. 5. One sample of sand and two of gravel collected with the rapid sediment sampler.

Fig. 7. Single-sided sidescan image of shallow high-relief rock.

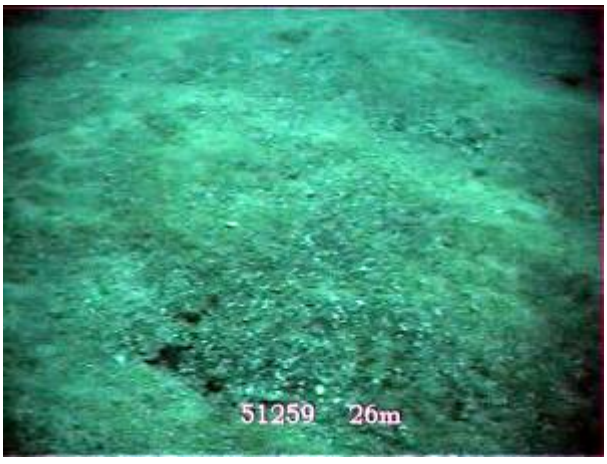


Fig. 9. Gravel bottom with ripples

Fig. 6. The drop-video apparatus being lowered over the side of the 4.2m Mac boat.

Fig. 8. Double-sided sidescan image running from sand at the bottom to low relief rock toward the top.

Fig. 10. Shallow mixed weed zone

Fig. 11. Urchin (kina) barrens zone

Fig. 12. Tangle-weed forest

Fig. 13. *Ecklonia* forest at moderate depth, showing some die-back and young plants under the canopy.

Fig. 14. The Deep reef zone near Knuckle Point, showing a yellow finger sponge, grey rambling *Ancorina* sponge, pencil bryozoans, encrusting sponges, and a feather star emerging from the grey sponge.

Fig. 15. Mixed shallow mixed weed zone and sediment.

Fig. 16. Large quantities of dry (left) and fresh (right) red weed rotting on Tokerau Beach.

Reference sites at scale of 1:5,000

The following discussions refer to the detailed habitat maps on A3 sheets folded and bound into the report toward the back. Each map and its accompanying aerial photo montage can be folded out for reference while reading the written discussions. The location of each map is indicated on Fig. 4 map.

1. Brodie's Creek

This site covers an embayment on the northwest coast of Doubtless Bay, about half way from Whatuwhiwhi to Knuckle Point. The shoreline is relatively sheltered compared with other parts of this coastline. The site includes the only estuary in the mapped area of Doubtless Bay. This very small estuary is a microcosm of larger estuaries, and includes the upper estuary with stream, salt marsh, mangrove forest, sand flats with cockles, sheltered rocky shores with oysters, a cobbly area with extensive necklace weed, a gravelly entrance channel, and a sand bank beside the entrance with a small bed of pipis.

Outside the estuary the coastline to the east is fairly sheltered, the rocky shore dropping fairly quickly through shallow mixed weed and mixed *Ecklonia* and sediment to a sandy bottom. The *Ecklonia* forest here has moderate numbers of tall tangle-weed plants scattered through it. Further east again, *Ecklonia* forest with tangle-weed drops to mixed *Ecklonia* forest and sediment extending farther offshore, eventually reaching sufficient depth for a fringe of deep reef and sediment before dropping to a gravel bottom.

To the west of the estuary is a small sandy beach. The rocky shore further west is relatively wave-exposed and quite complex with many reefs and rocks separated from the mainland. A couple of gravelly beaches back the exposed rocky shore in small embayments. Sub-tidally, shallow mixed weed passes to well-developed kina barrens, then mixed *Ecklonia* forest and sediment, before reaching fine sand out in the middle of the bay.

2. Whatuwhiwhi

Further west the rocky shore continues to be fairly wave-exposed due to its southeasterly aspect. A rugged rocky shore is backed by a couple of narrow sand beaches. The rock platform contains numerous rock pools, some of them quite large. Isolated rocks immediately offshore are common, and an extensive reef system extends to the south. Large areas of shallow mixed weed are broken up by narrow gutters and gullies amongst the complex rock outcrops of the reef.

Well-developed kina barrens lie seawards of the shallow mixed weed fringing the exposed rocks. In much of the area especially to the west the kina barrens are mixed with sediment patches. Further south large areas of *Ecklonia* forest occur, some as solid forest, but even bigger areas with a complex mixture of sediment and rock supporting *Ecklonia* on the outcrops. Fringing much of the rock/sediment interface, small areas of *Caulerpa* sea rimu are widespread. Adjacent to the rocks are two large areas of gravel, with a high density of the morning star shell (*Tawera spissa*) and a few associated shellfish species. To the southwest are extensive sand flats.

3. Parakerake

Further west the shores are moderately sheltered and in most places drop quickly from intertidal rocks to shallow sand. Several sheltered sandy beaches are present. Immediately adjacent to two of the beaches are areas of small rocks or cobbles just below low tide. The shallow mixed weed zone is mostly fairly narrow and drops straight on to sand. In the lee of a headland small areas of tangle-weed

forest occur in the most sheltered spots. A small island a few hundred metres offshore has a small area of kina barren on its north side, but mostly this area is too sheltered for kina barrens to be well developed. A series of small subtidal reefs form a chain from the island to the mainland, each with its own oasis of shallow mixed weed.

South of the island and rocky shores, the sandy seabed is relatively flat. Visible in the aerial photo is a series of elongated dark patches of gravel (more clearly visible in the cover photo), apparently streaked out in rows by the prevailing wave attack from the east. The gravel patches probably move during storm events.

4. Aurere

At the southern end of Tokerau Beach is Aurere, a small estuary with a sandy entrance and mangroves further upstream. The estuary itself was not investigated. The area mapped is all quite shallow and features an island and reefs sheltering a small lagoon almost enclosed at low tide. The lagoon is mostly sandy, but contains numerous rocks with tangle-weed forest in the sheltered waters.

The island is connected to the mainland by a gravelly tombolo covered at high tide but partly exposed at low tide. An area of gravel also fringes the sandy beach south of the lagoon.

Off the mouth of the estuary and towards the gravelly tombolo are numerous small isolated rocks, some of which are exposed at low tide. Many of these support numbers of the green-lipped mussel *Perna canaliculus.*

To the north of the island and moderately exposed rocky shore, a fringe of shallow mixed weed drops quickly on to the sandy seafloor. A short distance offshore is an isolated reef, with shallow mixed weed surrounding it in the shallows, but this drops straight into *Ecklonia* forest then on to the sand.

Toward the eastern end of the mapped area is a small sheltered rocky cove with a gravelly beach at its head. Rocks scattered throughout this cove are covered in the plumose seaweed *Carpophyllum plumosum.*

5. Chuck's Cove

Between Cable Bay and Coopers Beach is a complex rocky shore backed by low cliffs and a few gravelly beaches. A small cove, Chuck's Cove, is almost enclosed at low tide. Sand in the cove is fringed by gravelly areas. Off the eastern end of the Cove is a tiny estuary with some very large mangrove trees. Mangroves are also scattered over the gravelly shore east of the Cove, as well as a few plants to the west in pockets of sediment on what is essentially a rocky shore. This is a very unusual occurrence of mangroves.

The moderately exposed rock shores continue into an extensive area of shallow mixed weed, which drops abruptly on to the shallow sandy seabed. Offshore is a series of reefs and an island, with fringes of shallow mixed weed changing straight into *Ecklonia* forest. Some areas of gravel are associated with the reefs and island.

The water in this area was rather turbid at the time of our survey, and the aerial photos we obtained showed very little detail below the water.

6. Onete

On the eastern side of Doubtless Bay, a double embayment at Onete marks the change from exposure to shelter along the Berghan Point coast. North of Onete the rocky shore is exposed to northerly storms, whereas Onete itself and further south is in moderate shelter.

North of Onete the complex rocky shore is backed by cliffs, with a couple of sea caves on the point north of the bay. A narrow fringe of shallow mixed weed drops quickly into extensive kina barrens, then *Ecklonia* forest merging into gravelly sand.

The double embayment features two gravelly beaches giving way to sand just below low tide. Further south the moderately sheltered rocky shore is fringed by a narrow band of shallow mixed weed, and a narrow kina barren only present in small areas decreasing further south with increasing shelter. The mixed *Ecklonia* forest and sediment to seaward has scattered plants of the tangle-weed *Carpophyllum flexuosum* standing tall from the *Ecklonia* canopy, further indicating increasing shelter southwards. The rocky reef soon gives way to a sandy bottom. Towards the southern end of this reference site is another gravelly beach, also dropping quickly on to sand at low tide.

7. Fairway Reef

Fairway Reef is one of two reef systems which have rocks exposed at the surface in Doubtless Bay. The other is Albert Rocks, further offshore.

Fairway Reef is a large area of shallow rock with two high spots exposed at low tide and dangerously awash at high tide. An area of shallow mixed weed surrounds the exposed rocks, but additional areas of the same habitat occur on other shallow rock areas nearby. These are all surrounded by a huge expanse of kina barren on an extensive shallow rock platform. An irregular area of sand occurs in a shallow depression near the centre of the reef.

Particularly around the western end of the reef, the kina barrens drop steeply and abruptly into *Ecklonia* forest. The rocky bottom is extensive in all directions except toward the southwest, where gravel is encountered only a few hundred meters from the emergent rocks. Otherwise the low relief reef is mixed with areas of sand, with *Ecklonia* growing on the rocks where possible. The sea rimu *Caulerpa flexilis* seems to thrive where low rock is frequently covered by a thin layer of sand. In some areas of mixed rock and sand, several species of red seaweeds are seasonally prominent.

Discussion

The habitat maps of Doubtless Bay produced in this study are intended as tools for managers, iwi and community groups discussing options about marine protection, and as a baseline for studies of change over time. The surveys, aerial photographs and habitat maps provide a unique opportunity to assess changes occurring over a long period into the future.

In the current survey we had the opportunity to adapt a range of modern habitat mapping methods which enabled us to work efficiently over the depth range studied throughout Doubtless Bay. We were also able to explore the practicalities of how the various techniques could be used in combination to gather the most information for the least effort. In pragmatic terms this is a significant factor when attempting to map habitats at this scale. The combined use of GIS and GPS has created many advantages and opportunities for the future. Having the ability to georeference all data and photos and then arrange them in various 'layers' greatly enhanced our ability to interpret the data. The GIS layers can be spatially analysed and used for future research, greatly increasing the value of the habitat maps.

Limitations of this study

There were some limitations to our methods which should be noted. The precision changed with depth, reflecting the methods used, being greatest in shallow areas and decreasing as the depth increased. We suggest this is appropriate in that significant biological boundaries occur across much smaller scales in shallow waters and tend to become further apart as depth increases

Areas not on the sonar swathes or tracks, deeper than 15 m and/or not observed in video drops or dives or by snorkelling are interpretations or approximations between known points or areas. In offshore areas habitat variation between the observations is unknown and can only be determined by 100 % survey cover (e.g. side-scan or multibeam sonar). However, given the broad scale of the main habitat features documented here, we expect these variations will not be major. Our methodology also involved subjective judgments regarding which habitat descriptor (or class) 'best described' the sonar or video image of the area we were observing. This necessarily reduces the level of habitat patchiness that can be represented in the habitat map.

In depths less than 15 m the accuracy of the mapping was determined by the interpretation of aerial photography which in most areas afforded resolution of detail down to 3-5 m, however overall accuracy was limited by georeferencing error (i.e. approx 10-15 m).

Mixed reef and sediment areas

A special feature of Doubtless Bay is the extensive area of seabed characterised by mixed sediment and rock at a range of depths. Mostly these areas are of fairly low relief, and often a mix of exposed bedrock and loose rocks in a matrix of sand or gravel sediment. The firm rock substrate is occupied by either kina barrens, patchy *Ecklonia* forest often with sea rimu *Caulerpa flexilis*, or sponges and encrusting life of the deep reef. Together these mixed reef and sediment areas constitute 17.82% of the mapped area.

Low relief mixed rock and sediment areas such as this are likely to be important habitats for juvenile fishes of a number of species. The prevalence of this habitat in such abundance in Doubtless Bay appears to be an unusual and special feature.

Deep reefs

Deep reef areas characterised by sponges and encrusting life are far less prevalent at Doubtless Bay (only 0.58%) than at Mimiwhangata (over 30%). There is not much rocky substrate at the required depth in Doubtless Bay - simply an accident of geology and geography. At Doubtless Bay there is also a lack of the extensive beds of pink *Primnoides* gorgonians which are a feature of the Mimiwhangata deep reefs.

Soft sediments

Our limited observations of the sediment areas of Doubtless Bay indicate that there is a high degree of variation in types of sediment present. The sediments are likely to be occupied by a similar variation in benthic associations of species characteristic of the different sediment types and depths.

Sediments out off Tokerau Beach appear to be characterised by sands with streaky patches of gravel of limited extent, which probably shift around in stormy conditions. Extensive areas of gravel occur in deeper water, and in the deepest parts of the bay firm muddy sands predominate.

Mapping of these soft sediment benthic communities would no doubt add significantly to knowledge of the biodiversity of the Bay.

Information gaps

Currently the largest information gap relates to sediment-dwelling life in Doubtless Bay. As mentioned above, mapping of the soft sediment benthic communities would add greatly to our knowledge.

Due to limited field time we were unable to carry out as much ground-truthing by diving, snorkelling or video drops as would be desirable. Further exploration would be valuable to better refine habitat interpretations. This would be particularly useful in some of the mixed reef and sediment areas extensive throughout the Bay, as well as on the limited areas of deep reef habitat in the outer Bay.

We were told of some low reef structures off Tokerau Beach (Ramp Road area) but were unable to explore to ascertain their existence or nature.

Historically there have apparently been beds of scallops and horse mussels off Tokerau Beach, but we have been unable to explore for these also. Some targeted manta board runs would be useful for this purpose.

Due to patchy cloud cover during aerial photography, there were gaps in our coverage. The main gaps were parts of the Berghan Point coast, coast between Coopers Beach and Taipa, and Fairway Reef. Desirable additions would be the area off Ramp Road to determine the existence of shallow rock reefs, Coopers Beach and offshore reefs and islands, and from Coopers Beach to Hihi Beach during conditions with clearer water. In clear water conditions it may be possible to photograph some reef detail on the shallower reef areas near the middle of the Bay.

During our visit in autumn there was a huge wash-up of red seaweed on the northern end of Tokerau Beach (Fig. 16), which produced offensive smells as it rotted on the upper beach. It also caused anaerobic conditions in shallow water offshore as it drifted in deep swathes in a couple of metres of water prior to coming ashore, leading to deaths and wash-ups of considerable numbers of shallow water shellfish off the beach. (See dark drifts of weed close to the beaches in the northwestern corner

of the aerial photo montage for Parakerake. The weed was much more extensive than this off Tokerau Beach when it was causing a problem.) We were not able to determine the species or where the seaweed lives offshore. Serious wash-ups of this weed have apparently become a regular occurrence in late summer over several recent years. Identification of this weed and determination of where it lives (possibly on shallow reefs offshore) would be a prerequisite to assessing the likely cause of the problem and seeking a solution.

Conclusions

1. Marine habitats of Doubtless Bay are typical of those occurring generally on the Northland east coast.

2. The large area of low-relief reef, and mixed reef and sediment, throughout the central area of the Bay is unusual and appears to be a special feature of Doubtless Bay. These habitats have a high degree of small-scale surface irregularity which may impart special value as a nursery area for several fish species.

3. The great variety of coastlines, with different shore structures, depths nearby, and degrees of wave exposure, makes Doubtless Bay an excellent area for learning about the effects of shore type and exposure on marine ecology.

4. The extensive development of urchin (kina) barrens, particularly on Fairway Reef and close to the moderately exposed shorelines on the northwest and southeast sides of the Bay, suggest that kina predators, particularly snapper and crayfish, have been seriously depleted.

5. There are many opportunities, and several prime target areas, for establishment of Marine Protected Areas (MPAs) in the Bay, which would go a long way toward promoting the recovery of depleted snapper and crayfish stocks and restoration of habitats impacted by heavy fishing pressure. They would also have an educational role not only for schools but also for the wider community.

6. The habitat maps produced in this report will help promote understanding of marine aspects of the Bay, and discussion within the community of options for better management of marine resources in Doubtless Bay.

Recommendations

1. The information and maps in this report should be used widely in the Doubtless Bay area, to promote an awareness within the community of the values and attributes of the marine aspects of the Bay.

2. The report and maps should be used to promote discussion within the community of future directions and options for marine management of the Bay, including establishment of MPAs and Marine Reserves as the central core of any restoration and ongoing maintenance programme.

3. Refinement of an understanding of some of the habitats in the Bay would be desirable, including acquisition of much better images of the various habitats to help with presentations and other work within the community.

4. Moves should be made to fill the key information gaps identified, particularly soft sediment faunas, better habitat interpretations, underwater photos, aerial photos, and an understanding of the red algal washup problem at northern Tokerau.

5. The opportunity exists to establish a few key sites where formal monitoring could commence, perhaps involving members of the local community in an on-going programme.

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Appendix 1 Survey Data Points

Day/Wpt	Lat	Long	Eastings	Northings	Habitat	Notes	Record	Day
4181			2558847	6691429	g		sonar	A18
4182			2558822	6691755	s		sonar	A18
4183			2558855	6692379	s		sonar	A18
4184			2559011	6692930	s		sonar	A18
4185			2558774	6693904	g		sonar	A18
4186			2558751	6694571	g		sonar	A18
4187			2558795	6694679	hr		sonar	A18
4188			2558851	6695056	hr		sonar	A18
4189			2558871	6695127	hr		sonar	A18
41810			2558863	6695282	lr		sonar	A18
41811			2558848	6695396	m		sonar	A18
41812			2558850	6695513	hr		sonar	A18
41813			2558847	6695617	s		sonar	A18
41814			2558836	6695898	m		sonar	A18
41815			2558686	6697226	s		sonar	A18
41816			2558607	6697256	lr		sonar	A18
41817			2558478	6697268	m		sonar	A18
41818			2558370	6697293	m		sonar	A18
41819			2557915	6697343	m		sonar	A18
41820			2557828	6697366	m		sonar	A18
41821			2557362	6697325	g		sonar	A18
41822			2557254	6697300	m		sonar	A18
41823			2557212	6697497	m		sonar	A18
41824			2557304	6697484	g		sonar	A18
41825			2557392	6697476	m		sonar	A18
41826			2557626	6697461	lr		sonar	A18
41827			2558151	6697438	hr		sonar	A18
41828			2558237	6697445	g		sonar	A18
41829			2558655	6697461	m		sonar	A18
41830			2558809	6697492	g		sonar	A18
41831			2558770	6697496	g		sonar	A18
41832			2558750	6697579	g		sonar	A18
41833			2558740	6697616	m		sonar	A18
41834			2558705	6697740	m		sonar	A18
41835			2558568	6697755	m		sonar	A18
41836			2558459	6697754	lr		sonar	A18
41837			2558367	6697751	hr		sonar	A18
41838			2558281	6697753	hr		sonar	A18
41839			2558160	6697741	m		sonar	A18
41840			2557873	6697753	lr		sonar	A18
41841			2557143	6697794	g		sonar	A18
41842			2557095	6697830	g		sonar	A18
41843			2557123	6698018	g		sonar	A18
41844			2557329	6697986	lr		sonar	A18
41845			2557450	6697981	g		sonar	A18
41846			2557492	6697978	lr		sonar	A18
41847			2557843	6697947	hr		sonar	A18
41848			2558067	6697936	hr		sonar	A18
41849			2558154	6697928	lr		sonar	A18
41850			2558291	6697915	g		sonar	A18

41851			2558446	6697932	m		sonar	A18
41852			2558667	6697987	g		sonar	A18
41853			2558428	6698180	m		sonar	A18
41854			2558330	6698214	m		sonar	A18
41855			2557971	6698177	m		sonar	A18
41856			2557927	6698175	lr		sonar	A18
41857			2557842	6698182	hr		sonar	A18
41858			2557770	6698187	lr		sonar	A18
41859			2557496	6698225	lr		sonar	A18
41860			2557122	6698498	g		sonar	A18
41861			2556970	6698602	g		sonar	A18
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41863			2557238	6698684	m		sonar	A18
41864			2557353	6698610	lr		sonar	A18
41865			2557527	6698463	lr		sonar	A18
41866			2558105	6698328	g		sonar	A18
41867			2558238	6698366	m		sonar	A18
41868			2558325	6698447	g		sonar	A18
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41870			2558925	6697929	s		sonar	A18
41871			2560198	6698418	s		sonar	A18
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41873			2560642	6698623	g		sonar	A18
41874			2560877	6698719	s		sonar	A18
41875			2560996	6698760	s		sonar	A18
41876			2561145	6698817	g		sonar	A18
41877			2561545	6698937	g		sonar	A18
41878			2561613	6698964	s		sonar	A18
41879			2561814	6699052	g		sonar	A18
41880			2561892	6699092	m		sonar	A18
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41882			2561979	6699217	lr		sonar	A18
41883			2561908	6699298	g		sonar	A18
41884			2561485	6699651	g		sonar	A18
41885			2561301	6699560	s		sonar	A18
41886			2561416	6699162	s		sonar	A18
41887			2561552	6699013	g		sonar	A18
41888			2561693	6698903	g		sonar	A18
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41890			2561886	6698721	g		sonar	A18
41891			2561921	6698689	lr		sonar	A18
41892			2561890	6698670	g		sonar	A18
41893			2561857	6698591	m		sonar	A18
41894			2561812	6698525	hr		sonar	A18
41895			2561777	6698326	g		sonar	A18
41896			2561777	6698137	m		sonar	A18
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418110			2560807	6697477	m		sonar	A18
418111			2560729	6697478	m		sonar	A18
418112			2560596	6697444	m		sonar	A18
418113			2560954	6697040	lr		sonar	A18
418114			2561115	6696896	m		sonar	A18
418115			2561068	6696872	g		sonar	A18
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418150			2559085	6694265	g		sonar	A18
418151			2559084	6694233	g		sonar	A18
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418160			2557828	6696331	m		sonar	A18
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418194			2557951	6695026	g		sonar	A18
418195			2557948	6694925	g		sonar	A18
418196			2558199	6693892	s		sonar	A18
418197			2558903	6691578	g		sonar	A18
418198			2559014	6691364	m		sonar	A18
418199			2559183	6691186	g		sonar	A18
418200			2559243	6690623	g		sonar	A18
4191			2557835	6694513	g		sonar	A19
4192			2557132	6694628	g		sonar	A19
4193			2556983	6694647	g		sonar	A19
4194			2556732	6694690	g		sonar	A19
4195			2554926	6694480	g		sonar	A19
4196			2554536	6693957	g		sonar	A19

4197			2554270	6694033	g		sonar	A19
4198			2551290	6694026	g		sonar	A19
4199			2551154	6693989	g		sonar	A19
41910			2551165	6694542	g		sonar	A19
41911			2553513	6694546	g		sonar	A19
41912			2553691	6694490	g		sonar	A19
41913			2554448	6694996	g		sonar	A19
41914			2555853	6694904	m		sonar	A19
41915			2555979	6694940	m		sonar	A19
41916			2559178	6695207	lr		sonar	A19
41917			2558958	6695635	q		sonar	A19
41918			2558854	6695727	g		sonar	A19
41919			2559004	6695604	q		sonar	A19
41920			2559139	6695623	hr		sonar	A19
41921			2559103	6695756	hr		sonar	A19
41922			2559157	6695766	lr		sonar	A19
41923			2559212	6695808	g		sonar	A19
41924			2559321	6695770	lr		sonar	A19
41925			2559373	6695816	lr		sonar	A19
41926			2559374	6695850	g		sonar	A19
41927			2559626	6695678	g		sonar	A19
41928			2559715	6695802	m		sonar	A19
41929			2559670	6695892	g		sonar	A19
41930			2559777	6695934	lr		sonar	A19
41931			2559974	6696115	g		sonar	A19
41932			2560068	6696076	hr		sonar	A19
41933			2560202	6696077	g		sonar	A19
41934			2560257	6696066	m		sonar	A19
41935			2560355	6696106	m		sonar	A19
41936			2560482	6696251	g		sonar	A19
41937			2560539	6696188	g		sonar	A19
41938			2560611	6696325	g		sonar	A19
41939			2560601	6696378	g		sonar	A19
41940			2560685	6696399	hr		sonar	A19
41941			2560720	6696451	g		sonar	A19
41942			2560752	6696500	g		sonar	A19
41943			2560776	6696538	g		sonar	A19
41944			2560851	6696544	g		sonar	A19
41945			2560879	6696583	g		sonar	A19
41946			2560996	6696666	m		sonar	A19
41947			2561010	6696679	g		sonar	A19
41948			2561140	6696667	s		sonar	A19
41949			2561173	6696763	lr		sonar	A19
41950			2561147	6696910	hr		sonar	A19
41951			2561134	6696944	q		sonar	A19
41952			2561142	6696964	hr		sonar	A19
41953			2561051	6697023	lr		sonar	A19
41954			2561086	6697071	hr		sonar	A19
41955			2561053	6697123	m		sonar	A19
41956			2560981	6697164	m		sonar	A19
41957			2561060	6697289	g		sonar	A19
41958			2561240	6697218	g		sonar	A19

41959			2561325	6697047	m		sonar	A19
41960			2561366	6697162	g		sonar	A19
41961			2561407	6697269	m		sonar	A19
41962			2561523	6697351	hr		sonar	A19
41963			2561493	6697472	lr		sonar	A19
41964			2561381	6697580	hr		sonar	A19
41965			2561336	6697626	lr		sonar	A19
41966			2561279	6697679	m		sonar	A19
41967			2561118	6697783	g		sonar	A19
41968			2561130	6697851	m		sonar	A19
41969			2561147	6697910	m		sonar	A19
41970			2561435	6697882	g		sonar	A19
41971			2561520	6697868	hr		sonar	A19
41972			2561537	6697940	m		sonar	A19
41973			2561538	6697928	hr		sonar	A19
41974			2561637	6697886	m		sonar	A19
41975			2561682	6697868	hr		sonar	A19
41976			2561740	6698024	hr		sonar	A19
41977			2561699	6698084	m		sonar	A19
41978			2561546	6698202	g		sonar	A19
41979			2561512	6698364	g		sonar	A19
41980			2561513	6698370	g		sonar	A19
41981			2561684	6698359	m		sonar	A19
41982			2561756	6698351	lr		sonar	A19
41983			2561789	6698348	hr		sonar	A19
41984			2561852	6698460	hr		sonar	A19
41985			2561794	6698515	lr		sonar	A19
41986			2561780	6698529	m		sonar	A19
41987			2561737	6698574	m		sonar	A19
41988			2561682	6698615	g		sonar	A19
41989			2561597	6698684	g		sonar	A19
41990			2561750	6698869	g		sonar	A19
41991			2561944	6698768	g		sonar	A19
41992			2561967	6698746	lr		sonar	A19
41993			2561985	6698726	hr		sonar	A19
4291	34.9656	173.502	2556715	6692695	s		sonar	A29
4292	34.9529	173.485	2555154	6694121	s		sonar	A29
4293	34.9507	173.481	2554826	6694366	s		sonar	A29
4294	34.9459	173.475	2554262	6694900	s		sonar	A29
4295	34.9453	173.475	2554256	6694962	s		sonar	A29
4296	34.9454	173.473	2554136	6694962	m		sonar	A29
4297	34.946	173.471	2553961	6694888	m		sonar	A29
4298	34.946	173.471	2553957	6694888	s		sonar	A29
4299	34.946	173.47	2553854	6694891	lr		sonar	A29
42910	34.9462	173.468	2553609	6694877	m		sonar	A29
42911	34.9462	173.467	2553513	6694868	s		sonar	A29
42912	34.9459	173.464	2553260	6694906	s		sonar	A29
42913	34.947	173.458	2552685	6694791	lr		sonar	A29
42914	34.9447	173.462	2553071	6695043	g		sonar	A29
42915	34.9448	173.463	2553179	6695031	s		sonar	A29
42916	34.946	173.464	2553268	6694900	s		sonar	A29
42917	34.9456	173.461	2552958	6694947	m		sonar	A29

42918	34.9461	173.455	2552420	6694894	m		sonar	A29
42919	34.9459	173.45	2551969	6694918	s		sonar	A29
42920	34.9463	173.439	2551030	6694883	s		sonar	A29
42921	34.9423	173.44	2551084	6695319	s		sonar	A29
42922	34.9418	173.442	2551232	6695378	m		sonar	A29
42923	34.942	173.447	2551694	6695355	lr		sonar	A29
42924	34.9418	173.449	2551923	6695370	hr		sonar	A29
42925	34.9415	173.452	2552207	6695406	m		sonar	A29
42926	34.9413	173.454	2552360	6695422	lr		sonar	A29
42927	34.9415	173.464	2553298	6695393	m		sonar	A29
42928	34.942	173.469	2553749	6695340	lr		sonar	A29
42929	34.9425	173.475	2554316	6695272	m		sonar	A29
42930	34.9424	173.479	2554687	6695290	s		sonar	A29
42931	34.9387	173.477	2554508	6695696	s		sonar	A29
42932	34.9388	173.475	2554289	6695693	m		sonar	A29
42933	34.9382	173.466	2553464	6695756	m		sonar	A29
42934	34.9383	173.461	2553048	6695748	s		sonar	A29
42935	34.9384	173.46	2552954	6695745	m		sonar	A29
42936	34.9384	173.459	2552852	6695742	lr		sonar	A29
42937	34.9385	173.457	2552630	6695735	m		sonar	A29
42938	34.9386	173.455	2552470	6695726	s		sonar	A29
42939	34.9387	173.449	2551895	6695712	m		sonar	A29
42940	34.9387	173.444	2551431	6695716	s		sonar	A29
42941	34.939	173.442	2551313	6695686	s		sonar	A29
42942	34.9376	173.443	2551349	6695840	m		sonar	A29
42943	34.936	173.444	2551438	6696019	m		sonar	A29
42944	34.9353	173.445	2551511	6696093	m		sonar	A29
42945	34.9352	173.448	2551864	6696107	lr		sonar	A29
42946	34.935	173.453	2552250	6696129	m		sonar	A29
42947	34.935	173.458	2552704	6696122	s		sonar	A29
42948	34.9352	173.46	2552909	6696100			sonar	A29
42949	34.9351	173.463	2553183	6696106	m		sonar	A29
42950	34.9353	173.474	2554156	6696082	m		sonar	A29
42951	34.9347	173.479	2554612	6696136	m		sonar	A29
42952	34.9329	173.479	2554645	6696335	s		sonar	A29
42953	34.9328	173.478	2554542	6696351	m		sonar	A29
42954	34.9327	173.476	2554423	6696362	m		sonar	A29
42955	34.9327	173.475	2554292	6696360	m		sonar	A29
42956	34.9326	173.467	2553592	6696386	s		sonar	A29
42957	34.9324	173.466	2553465	6696405	lr		sonar	A29
42958	34.9322	173.465	2553393	6696428	m		sonar	A29
42959	34.9321	173.464	2553261	6696444	s		sonar	A29
42960	34.932	173.463	2553179	6696455	s		sonar	A29
42961	34.9317	173.461	2552982	6696490	m		sonar	A29
42962	34.9317	173.454	2552413	6696488	s		sonar	A29
42963	34.9318	173.445	2551553	6696482	s		sonar	A29
42964	34.9289	173.449	2551914	6696800	s		sonar	A29
42965	34.9286	173.45	2551982	6696839	m		sonar	A29
42966	34.9283	173.45	2552030	6696869	s		sonar	A29
42967	34.9272	173.453	2552246	6696988	s		sonar	A29
42968	34.9289	173.455	2552513	6696803	s		sonar	A29
42969	34.9264	173.458	2552703	6697077	m		sonar	A29

42970	34.9253	173.459	2552849	6697200	s		sonar	A29
42971	34.9255	173.452	2552188	6697179	s		sonar	A29
42972	34.9257	173.449	2551923	6697160	m		sonar	A29
42973	34.9259	173.446	2551639	6697135	s		sonar	A29
42974	34.9259	173.445	2551545	6697140	g		sonar	A29
42975	34.9258	173.443	2551405	6697151	m		sonar	A29
42976	34.9258	173.441	2551172	6697149	m		sonar	A29
42977	34.9257	173.438	2550951	6697168	s		sonar	A29
42978	34.9234	173.436	2550697	6697424	g		sonar	A29
42979	34.923	173.435	2550630	6697465	s		sonar	A29
42980	34.9218	173.433	2550468	6697601	s		sonar	A29
42981	34.9212	173.44	2551112	6697662	m		sonar	A29
42982	34.9213	173.445	2551517	6697656	s		sonar	A29
42983	34.9213	173.446	2551669	6697645	m		sonar	A29
42984	34.9213	173.448	2551795	6697652	s		sonar	A29
42985	34.9213	173.451	2552073	6697652	m		sonar	A29
42986	34.9211	173.454	2552383	6697670	lr		sonar	A29
42987	34.921	173.455	2552515	6697680	m		sonar	A29
42988	34.9215	173.461	2552984	6697620	s		sonar	A29
42989	34.92	173.461	2553052	6697788	m		sonar	A29
42990	34.9192	173.461	2553050	6697872	lr		sonar	A29
42991	34.9181	173.463	2553237	6697990	m		sonar	A29
42992	34.9173	173.462	2553104	6698080	m		sonar	A29
42993	34.9182	173.455	2552511	6697992	lr		sonar	A29
42994	34.9182	173.454	2552395	6697987	m		sonar	A29
42995	34.9181	173.452	2552228	6697998	m		sonar	A29
42996	34.918	173.452	2552162	6698010	s		sonar	A29
42997	34.9182	173.447	2551792	6697994	m		sonar	A29
42998	34.9186	173.445	2551597	6697952	m		sonar	A29
42999	34.9189	173.444	2551451	6697917	s		sonar	A29
429100	34.9188	173.443	2551379	6697926	m		sonar	A29
429101	34.9187	173.442	2551287	6697936	s		sonar	A29
429102	34.9185	173.44	2551142	6697960	m		sonar	A29
429103	34.9184	173.439	2550994	6697977	lr		sonar	A29
429104	34.9183	173.438	2550912	6697987	m		sonar	A29
429105	34.9183	173.436	2550785	6697991	s		sonar	A29
429106	34.9182	173.434	2550581	6698006	s		sonar	A29
429107	34.9146	173.437	2550818	6698398	s		sonar	A29
429108	34.914	173.442	2551327	6698459	lr		sonar	A29
429109	34.9141	173.445	2551585	6698443	m		sonar	A29
429110	34.9142	173.446	2551679	6698433	lr		sonar	A29
429111	34.9141	173.448	2551842	6698442	s		sonar	A29
429112	34.9141	173.449	2551932	6698449	m		sonar	A29
429113	34.9141	173.451	2552071	6698449	s		sonar	A29
429114	34.914	173.452	2552219	6698459	m		sonar	A29
429115	34.9138	173.454	2552344	6698473	lr		sonar	A29
429116	34.9138	173.461	2553021	6698474	m		sonar	A29
429117	34.9146	173.466	2553454	6698383	s		sonar	A29
429118	34.9146	173.467	2553576	6698375	m		sonar	A29
429119	34.915	173.469	2553783	6698333	s		sonar	A29
429120	34.9116	173.463	2553185	6698713	m		sonar	A29
429121	34.9106	173.463	2553210	6698825	m		sonar	A29

429122	34.9103	173.461	2553039	6698855	s		sonar	A29
429123	34.9103	173.46	2552960	6698861	m		sonar	A29
429124	34.9102	173.456	2552615	6698877	lr		sonar	A29
429125	34.9102	173.455	2552471	6698878	lr		sonar	A29
429126	34.9105	173.45	2551983	6698845	m		sonar	A29
429127	34.9106	173.444	2551493	6698835	s		sonar	A29
429128	34.9107	173.444	2551447	6698822	m		sonar	A29
429129	34.9109	173.442	2551296	6698807	s		sonar	A29
429130	34.9111	173.44	2551156	6698786	g		sonar	A29
429131	34.9112	173.44	2551157	6698772	s		sonar	A29
429132	34.9124	173.436	2550773	6698638	s		sonar	A29
429133	34.9142	173.43	2550235	6698450	s		sonar	A29
429134	34.9148	173.428	2550028	6698377	s		sonar	A29
429135	34.9158	173.426	2549797	6698278	g		sonar	A29
429136	34.916	173.425	2549744	6698252	g		sonar	A29
429137	34.9158	173.426	2549846	6698275	s		sonar	A29
429138	34.9156	173.426	2549868	6698294	s		sonar	A29
429139	34.9157	173.426	2549795	6698285	g		sonar	A29
429140	34.9171	173.423	2549579	6698126	s		sonar	A29
429141	34.9173	173.423	2549534	6698112	g		sonar	A29
429142	34.9179	173.421	2549388	6698046	s		sonar	A29
429143	34.9182	173.42	2549250	6698016	g		sonar	A29
429144	34.9185	173.418	2549125	6697979	s		sonar	A29
429145	34.9191	173.416	2548917	6697910	g		sonar	A29
429146	34.9196	173.414	2548748	6697859	g		sonar	A29
429147	34.9209	173.411	2548481	6697721	s		sonar	A29
429148	34.9222	173.405	2547942	6697579	s		sonar	A29
429149	34.9225	173.404	2547810	6697541	s		sonar	A29
429150	34.9229	173.404	2547768	6697498	s		sonar	A29
429151	34.9249	173.402	2547588	6697276	s		sonar	A29
429152	34.9265	173.396	2547085	6697105	s		sonar	A29
429153	34.9275	173.386	2546177	6696996	s		sonar	A29
429154	34.9276	173.383	2545923	6696990	s		sonar	A29
429155	34.9287	173.379	2545546	6696875	s		sonar	A29
429156	34.9307	173.38	2545609	6696652	s		sonar	A29
429157	34.9304	173.382	2545834	6696678	s		sonar	A29
429158	34.93	173.386	2546172	6696719	s		sonar	A29
429159	34.93	173.387	2546231	6696725	s		sonar	A29
429160	34.9297	173.388	2546388	6696756	s		sonar	A29
429161	34.9285	173.395	2546962	6696888	s		sonar	A29
429162	34.9261	173.406	2548029	6697140	s		sonar	A29
429163	34.9309	173.405	2547932	6696613	s		sonar	A29
429164	34.9326	173.404	2547797	6696428	s		sonar	A29
429165	34.9348	173.407	2548083	6696172	s		sonar	A29
429166	34.9355	173.408	2548190	6696104	g		sonar	A29
429167	34.9364	173.409	2548292	6696000	g		sonar	A29
429168	34.9395	173.413	2548651	6695651	s		sonar	A29
429169	34.9707	173.51	2557439	6692126	s		sonar	A29
429170	34.9804	173.527	2559014	6691034	s		sonar	A29
4301	34.8762	173.39	2546535	6702688			sonar	A30
4302	34.8762	173.39	2546551	6702686	c		sonar	A30
4303	34.8766	173.389	2546487	6702642	s		sonar	A30

4304	34.8776	173.389	2546494	6702536	s		sonar	A30
4305	34.883	173.394	2546896	6701936	lr		sonar	A30
4306	34.8838	173.395	2546997	6701840	s		sonar	A30
4307	34.8983	173.419	2549170	6700219	s		sonar	A30
4308	34.9066	173.433	2550450	6699289	s		sonar	A30
4309	34.9096	173.438	2550942	6698952	s		sonar	A30
43010	34.911	173.44	2551146	6698801	g		sonar	A30
43011	34.9108	173.439	2550999	6698816	g		sonar	A30
43012	34.9105	173.438	2550907	6698854	s		sonar	A30
43013	34.9097	173.434	2550590	6698944	g		sonar	A30
43014	34.9087	173.43	2550237	6699057	s		sonar	A30
43015	34.9084	173.43	2550162	6699089	g		sonar	A30
43016	34.9076	173.427	2549910	6699185	s		sonar	A30
43017	34.9073	173.43	2550242	6699211	s		sonar	A30
43018	34.9075	173.433	2550447	6699194	g		sonar	A30
43019	34.9075	173.434	2550559	6699185	s		sonar	A30
43020	34.9078	173.437	2550853	6699155	m		sonar	A30
43021	34.9078	173.44	2551072	6699152	m		sonar	A30
43022	34.9077	173.442	2551281	6699166	s		sonar	A30
43023	34.9075	173.443	2551422	6699187	lr		sonar	A30
43024	34.9074	173.445	2551540	6699198	s		sonar	A30
43025	34.9071	173.449	2551895	6699218	m		sonar	A30
43026	34.9072	173.45	2552067	6699206	lr		sonar	A30
43027	34.9072	173.458	2552783	6699208	g		sonar	A30
43028	34.9072	173.459	2552878	6699206	lr		sonar	A30
43029	34.9072	173.46	2552961	6699203	lr		sonar	A30
43030	34.9074	173.462	2553107	6699176	lr		sonar	A30
43031	34.9077	173.465	2553391	6699141	m		sonar	A30
43032	34.9079	173.468	2553676	6699127	s		sonar	A30
43033	34.9075	173.468	2553701	6699168	m		sonar	A30
43034	34.9063	173.465	2553364	6699298	m		sonar	A30
43035	34.9057	173.463	2553192	6699370	m		sonar	A30
43036	34.9051	173.461	2553053	6699441	m		sonar	A30
43037	34.9037	173.458	2552780	6699591	m		sonar	A30
43038	34.9036	173.452	2552212	6699606	m		sonar	A30
43039	34.9038	173.448	2551881	6699586	lr		sonar	A30
43040	34.9037	173.437	2550830	6699612	m		sonar	A30
43041	34.9037	173.433	2550481	6699612	m		sonar	A30
43042	34.9038	173.431	2550328	6699600	s		sonar	A30
43043	34.9039	173.427	2549892	6699590	s		sonar	A30
43044	34.9026	173.427	2549887	6699739	g		sonar	A30
43045	34.9005	173.427	2549893	6699971	g		sonar	A30
43046	34.9001	173.426	2549852	6700013	g		sonar	A30
43047	34.9001	173.427	2549935	6700009	g		sonar	A30
43048	34.9004	173.429	2550080	6699975	g		sonar	A30
43049	34.9003	173.431	2550336	6699990	m		sonar	A30
43050	34.9002	173.433	2550501	6700002	g		sonar	A30
43051	34.9001	173.436	2550731	6700006	m		sonar	A30
43052	34.9	173.438	2550924	6700020	lr		sonar	A30
43053	34.9	173.442	2551346	6700011	hr		sonar	A30
43054	34.8999	173.445	2551607	6700020	lr		sonar	A30
43055	34.8999	173.446	2551714	6700024	hr		sonar	A30

43056	34.9	173.447	2551807	6700013	lr		sonar	A30
43057	34.9003	173.453	2552267	6699971	m		sonar	A30
43058	34.9003	173.459	2552881	6699968	m		sonar	A30
43059	34.9003	173.461	2553044	6699968	m		sonar	A30
43060	34.9004	173.463	2553208	6699954	s		sonar	A30
43061	34.9005	173.464	2553273	6699941	s		sonar	A30
43062	34.8966	173.459	2552863	6700375	s		sonar	A30
43063	34.8966	173.459	2552840	6700376	lr		sonar	A30
43064	34.8964	173.457	2552703	6700405	m		sonar	A30
43065	34.8964	173.451	2552166	6700405	lr		sonar	A30
43066	34.8971	173.443	2551388	6700334	m		sonar	A30
43067	34.8966	173.433	2550443	6700401	s		sonar	A30
43068	34.8967	173.427	2549902	6700390	s		sonar	A30
43069	34.8928	173.428	2550061	6700818	s		sonar	A30
43070	34.8929	173.432	2550378	6700808	s		sonar	A30
43071	34.8927	173.435	2550661	6700829	lr		sonar	A30
43072	34.8922	173.441	2551185	6700879	m		sonar	A30
43073	34.8922	173.444	2551481	6700879	lr		sonar	A30
43074	34.8922	173.446	2551651	6700879	s		sonar	A30
43075	34.8922	173.447	2551783	6700882	m		sonar	A30
43076	34.8927	173.46	2552912	6700815	m		sonar	A30
43077	34.8929	173.461	2553074	6700786	s		sonar	A30
43078	34.893	173.462	2553132	6700780	m		sonar	A30
43079	34.893	173.463	2553242	6700778	m		sonar	A30
43080	34.8929	173.468	2553667	6700790	m		sonar	A30
43081	34.8933	173.468	2553669	6700743	s		sonar	A30
43082	34.8937	173.468	2553678	6700698	ss		sonar	A30
43083	34.8921	173.468	2553671	6700879	m		sonar	A30
43084	34.8893	173.468	2553658	6701187	s		sonar	A30
43085	34.8896	173.464	2553281	6701157	m		sonar	A30
43086	34.8898	173.459	2552861	6701138	m		sonar	A30
43087	34.8901	173.446	2551710	6701109	s		sonar	A30
43088	34.8901	173.442	2551342	6701109	m		sonar	A30
43089	34.8899	173.435	2550690	6701141	s		sonar	A30
43090	34.8899	173.434	2550614	6701143	g		sonar	A30
43091	34.8898	173.433	2550458	6701158	s		sonar	A30
43092	34.8895	173.431	2550276	6701187	g		sonar	A30
43093	34.8895	173.427	2549957	6701187	g		sonar	A30
43094	34.8902	173.427	2549971	6701110	s		sonar	A30
43095	34.8906	173.427	2549933	6701065	s		sonar	A30
43096	34.8894	173.421	2549422	6701209	m		sonar	A30
43097	34.8888	173.419	2549178	6701273	m		sonar	A30
43098	34.8879	173.415	2548809	6701370	s		sonar	A30
43099	34.8828	173.396	2547147	6701958	s		sonar	A30
430100	34.8821	173.395	2547032	6702033	s		sonar	A30
430101	34.8781	173.39	2546600	6702476	s		sonar	A30
430102	34.8764	173.39	2546542	6702666	c		sonar	A30
430103	34.8772	173.39	2546535	6702580			sonar	A30
430104	34.8772	173.39	2546538	6702573	s		sonar	A30
430105	34.878	173.39	2546607	6702486	lr		sonar	A30
430106	34.8783	173.391	2546642	6702455	s		sonar	A30
430107	34.8822	173.396	2547157	6702014	s		sonar	A30

430108	34.8829	173.398	2547279	6701945	s		sonar	A30
430109	34.8828	173.401	2547606	6701950	lr		sonar	A30
430110	34.8826	173.403	2547782	6701972	m		sonar	A30
430111	34.8821	173.404	2547887	6702027	s		sonar	A30
430112	34.882	173.405	2547928	6702041	m		sonar	A30
430113	34.8817	173.406	2547991	6702063	s		sonar	A30
430114	34.8816	173.408	2548180	6702078	m		sonar	A30
430115	34.8807	173.408	2548207	6702176	s		sonar	A30
430116	34.881	173.408	2548206	6702148	lr		sonar	A30
430117	34.8814	173.407	2548129	6702104	lr		sonar	A30
430118	34.8801	173.406	2548045	6702242	s		sonar	A30
430119	34.8806	173.406	2548072	6702192	lr		sonar	A30
430120	34.8815	173.407	2548114	6702086	s		sonar	A30
430121	34.8834	173.407	2548106	6701882	s		sonar	A30
430122	34.8841	173.41	2548382	6701797	m		sonar	A30
430123	34.8837	173.411	2548476	6701845	s		sonar	A30
430124	34.8828	173.411	2548501	6701940	m		sonar	A30
430125	34.8814	173.411	2548497	6702102	m		sonar	A30
430126	34.8822	173.412	2548601	6702008	m		sonar	A30
430127	34.8836	173.414	2548727	6701848	lr		sonar	A30
430128	34.8846	173.415	2548849	6701737	m		sonar	A30
430129	34.8882	173.418	2549153	6701342	s		sonar	A30
430130	34.8885	173.418	2549163	6701307	m		sonar	A30
430131	34.8897	173.419	2549229	6701169	lr		sonar	A30
430132	34.89	173.419	2549251	6701138	m		sonar	A30
430133	34.8917	173.422	2549454	6700944	m		sonar	A30
430134	34.8925	173.423	2549605	6700860	s		sonar	A30
430135	34.8891	173.429	2550109	6701236	s		sonar	A30
430136	34.884	173.421	2549424	6701802	m		sonar	A30
430137	34.8832	173.42	2549312	6701894	m		sonar	A30
430138	34.8826	173.419	2549218	6701962	m		sonar	A30
430139	34.882	173.418	2549138	6702023	lr		sonar	A30
430140	34.8815	173.417	2549060	6702080	hr		sonar	A30
430141	34.8808	173.416	2548961	6702161	hr		sonar	A30
430142	34.8806	173.416	2548939	6702181	m		sonar	A30
430143	34.88	173.418	2549132	6702253	m		sonar	A30
430144	34.8791	173.42	2549287	6702343	m		sonar	A30
430145	34.8796	173.421	2549391	6702289	m		sonar	A30
430146	34.8805	173.423	2549559	6702192	m		sonar	A30
430147	34.8817	173.425	2549781	6702053	m		sonar	A30
430148	34.8826	173.427	2549933	6701952	s		sonar	A30
430149	34.8808	173.431	2550306	6702149	s		sonar	A30
430150	34.88	173.429	2550158	6702242	s		sonar	A30
430151	34.8793	173.428	2550019	6702318	m		sonar	A30
430152	34.8786	173.427	2549922	6702398	lr		sonar	A30
430153	34.8776	173.425	2549810	6702510	m		sonar	A30
430154	34.877	173.425	2549723	6702583	m		sonar	A30
430155	34.8773	173.427	2549934	6702543	m		sonar	A30
430156	34.8765	173.428	2550045	6702629	m		sonar	A30
430157	34.876	173.428	2550078	6702689	m		sonar	A30
430158	34.8752	173.429	2550142	6702778	m		sonar	A30
430159	34.8754	173.429	2550172	6702749	m		sonar	A30

430160	34.8764	173.431	2550275	6702644	m		sonar	A30
430161	34.878	173.433	2550526	6702459	m		sonar	A30
430162	34.8784	173.434	2550587	6702419	s		sonar	A30
430163	34.8788	173.435	2550646	6702373	s		sonar	A30
430164	34.8763	173.438	2550933	6702647	s		sonar	A30
430165	34.8758	173.437	2550886	6702698	m		sonar	A30
430166	34.8741	173.433	2550474	6702894	m		sonar	A30
430167	34.8733	173.431	2550328	6702985	m		sonar	A30
430168	34.8726	173.43	2550218	6703065	hr		sonar	A30
430169	34.8709	173.432	2550404	6703248	m		sonar	A30
430170	34.8706	173.433	2550503	6703287	m		sonar	A30
430171	34.8716	173.434	2550590	6703171	m		sonar	A30
430172	34.874	173.436	2550790	6702906	m		sonar	A30
430173	34.8758	173.438	2550954	6702706	s		sonar	A30
430174	34.8765	173.439	2551032	6702619	s		sonar	A30
430175	34.875	173.44	2551151	6702791	m		sonar	A30
430176	34.8737	173.441	2551257	6702929	s		sonar	A30
430177	34.8728	173.442	2551321	6703027	s		sonar	A30
430178	34.8717	173.441	2551213	6703155	m		sonar	A30
430179	34.8699	173.439	2551018	6703353	s		sonar	A30
430180	34.8694	173.438	2550928	6703418	m		sonar	A30
430181	34.8688	173.436	2550815	6703485	m		sonar	A30
430182	34.8662	173.439	2551064	6703771	hr		sonar	A30
430183	34.865	173.439	2551029	6703900	m		sonar	A30
430184	34.8637	173.437	2550913	6704047	s		sonar	A30
430185	34.8633	173.437	2550883	6704094	m		sonar	A30
430186	34.8628	173.437	2550855	6704144	m		sonar	A30
430187	34.862	173.438	2550961	6704238	s		sonar	A30
430188	34.8612	173.438	2550972	6704319	s		sonar	A30
430189	34.8608	173.441	2551215	6704370	g		sonar	A30
430190	34.8588	173.441	2551211	6704592	g		sonar	A30
430191	34.8611	173.441	2551214	6704329	s		sonar	A30
430192	34.8637	173.442	2551332	6704044	m		sonar	A30
430193	34.8661	173.444	2551470	6703773	s		sonar	A30
430194	34.8687	173.445	2551634	6703485	s		sonar	A30
430195	34.8685	173.449	2551958	6703508	s		sonar	A30
430196	34.8633	173.446	2551724	6704081	hr		sonar	A30
430197	34.863	173.446	2551709	6704117	hr		sonar	A30
430198	34.8629	173.447	2551827	6704131	g		sonar	A30
430199	34.8629	173.448	2551855	6704129	hr		sonar	A30
430200	34.8626	173.449	2551945	6704158	m		sonar	A30
430201	34.8627	173.449	2551982	6704146	m		sonar	A30
430202	34.8636	173.45	2552031	6704051	m		sonar	A30
430203	34.864	173.45	2552061	6704000	s		sonar	A30
430204	34.8656	173.451	2552169	6703820	s		sonar	A30
430205	34.8641	173.457	2552676	6703983	s		sonar	A30
430206	34.8624	173.456	2552650	6704176	m		sonar	A30
430207	34.8617	173.456	2552623	6704255	lr		sonar	A30
430208	34.8611	173.456	2552599	6704317	hr		sonar	A30
430209	34.8604	173.455	2552564	6704395	m		sonar	A30
430210	34.8602	173.456	2552655	6704426	m		sonar	A30
430211	34.8601	173.458	2552798	6704435	m		sonar	A30

430212	34.8605	173.458	2552820	6704385	s		sonar	A30
430213	34.8613	173.459	2552860	6704302	m		sonar	A30
430214	34.8625	173.459	2552924	6704163	s		sonar	A30
430215	34.8634	173.46	2552992	6704061	s		sonar	A30
430216	34.8632	173.462	2553151	6704087	s		sonar	A30
430217	34.8617	173.461	2553104	6704248	m		sonar	A30
430218	34.8613	173.461	2553085	6704301	lr		sonar	A30
430219	34.8608	173.461	2553070	6704348	hr		sonar	A30
430220	34.86	173.462	2553204	6704443	hr		sonar	A30
430221	34.8606	173.464	2553315	6704369	m		sonar	A30
430222	34.8611	173.464	2553380	6704315	s		sonar	A30
430223	34.8636	173.469	2553771	6704040	s		sonar	A30
430224	34.8627	173.467	2553616	6704138	s		sonar	A30
430225	34.8636	173.467	2553622	6704037			sonar	A30
430226	34.8584	173.47	2553854	6704607	s		sonar	A30
430227	34.8559	173.466	2553578	6704894	hr		sonar	A30
430228	34.8537	173.464	2553398	6705134	m		sonar	A30
430229	34.8533	173.464	2553369	6705187			sonar	A30
430230	34.9076	173.427	2549913	6699187			sonar	A30
430231	34.8531	173.464	2553358	6705207	lr		sonar	A30
430232	34.8523	173.464	2553312	6705289	hr		sonar	A30
430233	34.8517	173.464	2553317	6705357	m		sonar	A30
430234	34.8517	173.465	2553473	6705357	hr		sonar	A30
430235	34.8511	173.466	2553568	6705424	hr		sonar	A30
430236	34.8512	173.467	2553625	6705413	m		sonar	A30
430237	34.8514	173.468	2553679	6705391	hr		sonar	A30
430238	34.8515	173.468	2553709	6705379	m		sonar	A30
430239	34.8519	173.469	2553808	6705339	g		sonar	A30
430240	34.8524	173.47	2553915	6705275	s		sonar	A30
430241	34.8546	173.474	2554226	6705032	s		sonar	A30
430242	34.852	173.476	2554471	6705322	s		sonar	A30
430243	34.8525	173.476	2554409	6705264	lr		sonar	A30
430244	34.8532	173.474	2554308	6705190	s		sonar	A30
430245	34.8526	173.474	2554267	6705257	s		sonar	A30
430246	34.8523	173.475	2554372	6705289	lr		sonar	A30
430247	34.852	173.476	2554424	6705314	s		sonar	A30
430248	34.8516	173.475	2554364	6705357	lr		sonar	A30
430249	34.8514	173.474	2554308	6705385	s		sonar	A30
430250	34.8511	173.474	2554232	6705416	m		sonar	A30
430251	34.8495	173.47	2553921	6705602	hr		sonar	A30
681	34.9812	173.528	2559082	6690947	g		sonar	J8
682	34.9301	173.509	2557422	6696629	m		sonar	J8
683	34.9253	173.51	2557505	6697165	g		sonar	J8
684	34.9231	173.51	2557523	6697404	m		sonar	J8
685	34.922	173.511	2557548	6697523	lr		sonar	J8
686	34.92	173.511	2557611	6697749	m		sonar	J8
687	34.9194	173.511	2557622	6697811	lr		sonar	J8
688	34.918	173.512	2557670	6697974	m		sonar	J8
689	34.917	173.513	2557738	6698084	m		sonar	J8
6810	34.9161	173.514	2557850	6698177	hr		sonar	J8
6811	34.9152	173.513	2557819	6698274	lr		sonar	J8
6812	34.9147	173.513	2557801	6698338	m		sonar	J8

6813	34.9135	173.512	2557683	6698468	g		sonar	J8
6814	34.9129	173.51	2557522	6698535	g		sonar	J8
6815	34.9111	173.511	2557645	6698730	lr		sonar	J8
6816	34.9102	173.513	2557740	6698840	m		sonar	J8
6817	34.9098	173.513	2557770	6698877	m		sonar	J8
6818	34.909	173.514	2557839	6698964	g		sonar	J8
6819	34.9054	173.517	2558150	6699369	s		sonar	J8
6820	34.9046	173.518	2558259	6699449	s		sonar	J8
6821	34.9044	173.521	2558528	6699472	s		sonar	J8
6822	34.9038	173.512	2557721	6699541	g		sonar	J8
6823	34.904	173.509	2557454	6699528	m		sonar	J8
6824	34.9033	173.503	2556861	6699606	m		sonar	J8
6825	34.9035	173.499	2556530	6699583	g		sonar	J8
6826	34.9033	173.496	2556246	6699609	m		sonar	J8
6827	34.9033	173.494	2556022	6699609	g		sonar	J8
6828	34.9035	173.489	2555571	6699598	m		sonar	J8
6829	34.9038	173.486	2555313	6699558	g		sonar	J8
6830	34.9038	173.484	2555184	6699560	m		sonar	J8
6831	34.9039	173.482	2554955	6699553	lr		sonar	J8
6832	34.9042	173.477	2554524	6699523	m		sonar	J8
6833	34.9044	173.475	2554277	6699500	lr		sonar	J8
6834	34.9042	173.47	2553858	6699525	lr		sonar	J8
6835	34.9052	173.47	2553832	6699415	m		sonar	J8
6836	34.9062	173.47	2553823	6699305	lr		sonar	J8
6837	34.907	173.47	2553830	6699223	m		sonar	J8
6838	34.9102	173.47	2553834	6698868	lr		sonar	J8
6839	34.9107	173.47	2553849	6698807	m		sonar	J8
6840	34.9116	173.47	2553845	6698709	m		sonar	J8
6841	34.9116	173.475	2554321	6698702	g		sonar	J8
6842	34.9117	173.475	2554355	6698696	m		sonar	J8
6843	34.9125	173.484	2555155	6698602	r		sonar	J8
6844	34.9125	173.49	2555688	6698599	g		sonar	J8
6845	34.9125	173.492	2555870	6698597	g		sonar	J8
6846	34.9124	173.496	2556200	6698601	m		sonar	J8
6847	34.9123	173.497	2556304	6698618	lr		sonar	J8
6848	34.9121	173.498	2556407	6698631	m		sonar	J8
6849	34.9118	173.502	2556739	6698669	g		sonar	J8
6850	34.9116	173.503	2556871	6698689	g		sonar	J8
6851	34.911	173.507	2557202	6698750	g		sonar	J8
6852	34.9115	173.502	2556820	6698697	g		sonar	J8
6853	34.9164	173.503	2556834	6698155	m		sonar	J8
6854	34.9197	173.503	2556865	6697785	m		sonar	J8
6855	34.9195	173.493	2555968	6697815	g		sonar	J8
6856	34.9193	173.489	2555560	6697841	m		sonar	J8
6857	34.9193	173.487	2555418	6697845	lr		sonar	J8
6858	34.9192	173.485	2555181	6697855	m		sonar	J8
6859	34.9193	173.481	2554870	6697850	lr		sonar	J8
6860	34.9194	173.48	2554756	6697836	m		sonar	J8
6861	34.9195	173.477	2554496	6697830	g		sonar	J8
6862	34.9195	173.476	2554374	6697827	lr		sonar	J8
6863	34.9194	173.473	2554122	6697836	m		sonar	J8
6864	34.9194	173.472	2553989	6697843	lr		sonar	J8

6865	34.9195	173.469	2553768	6697834	m		sonar	J8
6866	34.9193	173.464	2553264	6697858	lr		sonar	J8
6867	34.9225	173.462	2553144	6697502	g		sonar	J8
6868	34.9267	173.46	2552963	6697035	g		sonar	J8
6869	34.9273	173.463	2553187	6696967	m		sonar	J8
6870	34.9272	173.468	2553697	6696976	lr		sonar	J8
6871	34.9267	173.475	2554271	6697034	m		sonar	J8
6872	34.9266	173.478	2554540	6697040	lr		sonar	J8
6873	34.9265	173.483	2555051	6697046	m		sonar	J8
6874	34.9263	173.501	2556649	6697053	g		sonar	J8
6875	34.9264	173.504	2556953	6697043	m		sonar	J8
6876	34.9263	173.507	2557225	6697051	m		sonar	J8
6877	34.9286	173.507	2557198	6696797	lr		sonar	J8
6878	34.9287	173.506	2557099	6696783	m		sonar	J8
6879	34.928	173.502	2556761	6696869	g		sonar	J8
6880	34.927	173.497	2556275	6696980	m		sonar	J8
6881	34.9272	173.479	2554646	6696971	lr		sonar	J8
6882	34.9274	173.474	2554235	6696959	m		sonar	J8
6883	34.9277	173.47	2553817	6696927	lr		sonar	J8
6884	34.9282	173.465	2553404	6696876	m		sonar	J8
6885	34.9289	173.461	2553059	6696792	g		sonar	J8
6886	34.9298	173.46	2552900	6696696	g		sonar	J8
6887	34.9306	173.459	2552866	6696607	m		sonar	J8
6888	34.9307	173.458	2552749	6696596	g		sonar	J8
6889	34.9307	173.457	2552629	6696598	m		sonar	J8
6890	34.9307	173.454	2552333	6696599	g		sonar	J8
6891	34.9303	173.449	2551894	6696648	g		sonar	J8
6892	34.9312	173.447	2551752	6696554	g		sonar	J8
6893	34.936	173.442	2551254	6696020	m		sonar	J8
6894	34.9368	173.441	2551154	6695937	g		sonar	J8
6895	34.9474	173.428	2550007	6694766	s		sonar	J8
6896	34.9436	173.424	2549668	6695186	s		sonar	J8
6897	34.9417	173.422	2549467	6695402	s		sonar	J8
6898	34.9345	173.434	2550524	6696197	m		sonar	J8
6899	34.9337	173.435	2550656	6696279	s		sonar	J8
68100	34.9332	173.436	2550733	6696338	m		sonar	J8
68101	34.932	173.438	2550914	6696473	s		sonar	J8
68102	34.9308	173.44	2551059	6696596	m		sonar	J8
68103	34.9295	173.441	2551202	6696743	s		sonar	J8
68104	34.9276	173.444	2551429	6696955	s		sonar	J8
68105	34.9251	173.443	2551346	6697230	m		sonar	J8
68106	34.923	173.442	2551247	6697468	m		sonar	J8
68107	34.9228	173.44	2551065	6697484	lr		sonar	J8
68108	34.9237	173.438	2550954	6697387	m		sonar	J8
68109	34.9252	173.437	2550824	6697220	s		sonar	J8
68110	34.9287	173.433	2550497	6696835	m		sonar	J8
68111	34.9311	173.431	2550303	6696577	s		sonar	J8
68112	34.9323	173.43	2550190	6696437	m		sonar	J8
68113	34.9361	173.426	2549827	6696015	s		sonar	J8
68114	34.9385	173.423	2549541	6695753	s		sonar	J8
68115	34.9411	173.419	2549194	6695466	s		sonar	J8
68116	34.9377	173.416	2548894	6695853	s		sonar	J8

68117	34.9288	173.427	2549927	6696825	m		sonar	J8
68118	34.9248	173.433	2550459	6697273	s		sonar	J8
68119	34.9238	173.435	2550691	6697376	s		sonar	J8
68120	34.9238	173.433	2550454	6697382	s		sonar	J8
68121	34.9218	173.43	2550163	6697607	s		sonar	J8
68122	34.928	173.421	2549379	6696919	m		sonar	J8
68123	34.93	173.419	2549160	6696705	s		sonar	J8
68124	34.9313	173.417	2549007	6696560	m		sonar	J8
68125	34.9337	173.415	2548808	6696296	s		sonar	J8
68126	34.9359	173.413	2548615	6696051	s		sonar	J8
68127	34.9304	173.415	2548792	6696664	m		sonar	J8
68128	34.9292	173.415	2548840	6696794	s		sonar	J8
68129	34.9269	173.415	2548861	6697045	m		sonar	J8
68130	34.9253	173.416	2548878	6697220	s		sonar	J8
68131	34.9212	173.417	2548957	6697677	m		sonar	J8
68132	34.9193	173.417	2548963	6697894	s		sonar	J8
68133	34.9174	173.416	2548953	6698098	m		sonar	J8
68134	34.9157	173.416	2548951	6698286	s		sonar	J8
68135	34.9136	173.416	2548953	6698523	m		sonar	J8
68136	34.9111	173.415	2548844	6698806	s		sonar	J8
68137	34.9093	173.417	2549055	6699002	m		sonar	J8
68138	34.9102	173.42	2549259	6698896	s		sonar	J8
68139	34.9159	173.425	2549771	6698264	m		sonar	J8
68140	34.9171	173.427	2549886	6698130	s		sonar	J8
68141	34.9277	173.437	2550865	6696946	m		sonar	J8
68142	34.9302	173.44	2551076	6696671	s		sonar	J8
68143	34.9389	173.449	2551907	6695695	m		sonar	J8
68144	34.94	173.45	2552000	6695569	m		sonar	J8
68145	34.9396	173.454	2552411	6695612	g		sonar	J8
68146	34.9397	173.455	2552488	6695606	m		sonar	J8
68147	34.9395	173.457	2552668	6695621	lr		sonar	J8
68148	34.9398	173.46	2552894	6695587	m		sonar	J8
68149	34.9397	173.461	2552988	6695594	g		sonar	J8
68150	34.9397	173.464	2553245	6695598	r		sonar	J8
68151	34.9403	173.464	2553276	6695525	m		sonar	J8
68152	34.9423	173.464	2553277	6695305	m		sonar	J8
68153	34.9425	173.462	2553068	6695288	lr		sonar	J8
68154	34.943	173.457	2552609	6695234	hr		sonar	J8
68155	34.943	173.454	2552354	6695239	hr		sonar	J8
68156	34.943	173.452	2552183	6695233	m		sonar	J8
68157	34.9431	173.45	2551999	6695231	m		sonar	J8
68158	34.9428	173.448	2551785	6695267	m		sonar	J8
68159	34.9434	173.448	2551780	6695193	g		sonar	J8
68160	34.9447	173.448	2551791	6695056	m		sonar	J8
68161	34.9447	173.449	2551878	6695046	m		sonar	J8
68162	34.9447	173.449	2551930	6695049	m		sonar	J8
68163	34.9444	173.452	2552163	6695080	lr		sonar	J8
68164	34.9449	173.455	2552418	6695027	m		sonar	J8
68165	34.9447	173.457	2552678	6695048	hr		sonar	J8
68166	34.9447	173.458	2552767	6695047	m		sonar	J8
68167	34.9446	173.459	2552863	6695058	lr		sonar	J8
68168	34.9444	173.464	2553272	6695072	m		sonar	J8

68169	34.946	173.464	2553318	6694894	g		sonar	J8
68170	34.9483	173.465	2553402	6694643	s		sonar	J8
68171	34.98	173.496	2556176	6691102	s		sonar	J8
68172	34.9828	173.498	2556323	6690786	hr		sonar	J8
68173	34.9845	173.499	2556426	6690603	s		sonar	J8
68174	34.9869	173.5	2556497	6690330	m		sonar	J8
68175	34.9872	173.5	2556504	6690300	hr		sonar	J8
68176	34.9856	173.501	2556633	6690477	s		sonar	J8
68177	34.9852	173.499	2556422	6690529	g		sonar	J8
68178	34.985	173.498	2556356	6690545	hr		sonar	J8
68179	34.9848	173.497	2556218	6690572	m		sonar	J8
68180	34.9848	173.496	2556161	6690565	g		sonar	J8
68181	34.9849	173.495	2556053	6690564	m		sonar	J8
68182	34.9844	173.493	2555850	6690612	g		sonar	J8
68183	34.9841	173.491	2555716	6690656	g		sonar	J8
68184	34.9839	173.49	2555661	6690674	s		sonar	J8
68185	34.9833	173.488	2555423	6690739	s		sonar	J8
68186	34.9847	173.488	2555459	6690586	s		sonar	J8
68187	34.9848	173.492	2555834	6690568	s		sonar	J8
68188	34.9849	173.494	2555945	6690565	m		sonar	J8
68189	34.9847	173.495	2556120	6690578	g		sonar	J8
68190	34.9849	173.497	2556244	6690554	lr		sonar	J8
68191	34.9847	173.499	2556441	6690576	s		sonar	J8
68192	34.9848	173.504	2556924	6690559	m		sonar	J8
68193	34.985	173.509	2557342	6690538	hr		sonar	J8
68194	34.9849	173.51	2557438	6690545	g		sonar	J8
68195	34.9849	173.51	2557481	6690550	s		sonar	J8
68196	34.9845	173.518	2558151	6690587	hr		sonar	J8
68197	34.9837	173.518	2558152	6690678	s		sonar	J8
68198	34.9827	173.517	2558045	6690788	s		sonar	J8
68199	34.9825	173.515	2557867	6690817	lr		sonar	J8
68200	34.9824	173.514	2557801	6690821	s		sonar	J8
68201	34.9822	173.509	2557395	6690845	hr		sonar	J8
68202	34.9823	173.508	2557309	6690842	s		sonar	J8
68203	34.9822	173.507	2557144	6690855	s		sonar	J8
68204	34.9823	173.504	2556900	6690837	g		sonar	J8
68205	34.9825	173.502	2556729	6690818	s		sonar	J8
68206	34.9823	173.494	2555941	6690848	hr		sonar	J8
68207	34.9821	173.492	2555773	6690870	s		sonar	J8
68208	34.9818	173.49	2555591	6690911	s		sonar	J8
68209	34.9817	173.487	2555392	6690918	lr		sonar	J8
68210	34.9818	173.486	2555295	6690911	s		sonar	J8
68211	34.9818	173.485	2555142	6690909	s		sonar	J8
68212	34.9809	173.488	2555406	6691005	s		sonar	J8
68213	34.9812	173.49	2555627	6690976	s		sonar	J8
68214	34.9808	173.522	2558571	6690991	s		sonar	J8
68215	34.9809	173.523	2558669	6690986	hr		sonar	J8
68216	34.9805	173.524	2558705	6691031	s		sonar	J8
68217	34.9787	173.522	2558553	6691229	s		sonar	J8
68218	34.9782	173.5	2556552	6691298	s		sonar	J8
68219	34.9784	173.488	2555416	6691283	s		sonar	J8
68220	34.9815	173.49	2555588	6690945	s		sonar	J8

68221	34.9811	173.49	2555635	6690986	s		sonar	J8
68222	34.9798	173.491	2555727	6691131	s		sonar	J8
68223	34.9799	173.491	2555683	6691120	s		sonar	J8
68224	34.9814	173.491	2555672	6690949	s		sonar	J8
68225	34.9825	173.49	2555642	6690830	s		sonar	J8
68226	34.9833	173.492	2555784	6690739	hr		sonar	J8
68227	34.9835	173.492	2555828	6690716	s		sonar	J8
68228	34.9836	173.493	2555861	6690705	lr		sonar	J8
68229	34.9836	173.493	2555906	6690701	m		sonar	J8
68230	34.9837	173.494	2556010	6690692	hr		sonar	J8
68231	34.9843	173.499	2556422	6690627	s		sonar	J8
68232	34.9835	173.504	2556858	6690713	lr		sonar	J8
68233	34.9837	173.504	2556908	6690691	hr		sonar	J8
68234	34.9838	173.505	2556950	6690680	hr		sonar	J8
68235	34.9842	173.505	2556976	6690631	g		sonar	J8
68236	34.9841	173.506	2557053	6690644	g		sonar	J8
68237	34.984	173.507	2557128	6690655	lr		sonar	J8
68238	34.9839	173.507	2557208	6690662	m		sonar	J8
68239	34.9838	173.508	2557294	6690674	hr		sonar	J8
68240	34.9838	173.51	2557455	6690671	s		sonar	J8
68241	34.9831	173.517	2558124	6690744	g		sonar	J8
68242	34.9832	173.52	2558364	6690729	s		sonar	J8
68243	34.9799	173.525	2558829	6691095	g		sonar	J8
68244	34.9837	173.528	2559113	6690664	g		sonar	J8
68245	34.9838	173.528	2559119	6690653	g		sonar	J8
691	34.9177	173.514	2557872	6698004		video failed	video	J9
692	34.9186	173.516	2558063	6697901	hr	butterfly perch Demoiselles,	video	J9
693	34.9188	173.517	2558116	6697873	hr	Ancorina, hydroids, encrusting sponges, calcareous sponges	video	J9
694	34.9182	173.515	2557928	6697948	hr	Ancorina, hydroids, encrusting sponges, calcareous sponges	video	J9
695	34.9181	173.515	2557948	6697956	s	double drop finish 21:57 sand	video	J9
696	34.92	173.52	2558374	6697741	lr	demoiselles, butterfly perch, red pigfish, Steganoporella, Polymastia, leatherjacket	video	J9

697	34.9201	173.519	2558318	6697731	hr	calcareous sponges, Steganoporella, hydroids, encrusting sponges, Ancorina, scarlet wrasse, Raspailia, Zonaria, red encrusting algae, coralline paint, cup coral, bryozoans	video	J9
698	34.9201	173.518	2558233	6697733	hr	Yellow moray, sweep, bigeye, Ancorina, Stelleta hauraki, leatherjacket, slender roughy, Zonaria Steganoporella, encrusting sponges, red pigfish, calcareous sponge, trevally, left camera on in boat	video	J9
699	34.9214	173.518	2558275	6697583	hr	dive computer depth 26m start 42:41 Ancorina, Steganoporella, porae, red pigfish, red moki, Stelleta, calcareous sponges, hydroids, sparse Ecklonia	video	J9

6910	34.9251	173.548	2560964	6697153	lr	dive computer depth 28m calcareous sponges, demoiselles, sweep, Raspailia, scarlet wrasse, Steganoporella	video	J9
6911	34.9253	173.548	2560993	6697138	lr	drift bounce to 97m at finish. Callyspongia, demoiselle, red moki, Zonaria, Stelleta, Steganoporella, sparse Ecklonia, Raspailia	video	J9
6912	34.9253	173.549	2561037	6697134	lr	Polymastia granulosa, Raspailia, demoiselle, Zonaria, Ancorina, Steganoporella, Stelleta	video	J9
6913	34.926	173.549	2561062	6697056	lr	sparse Ecklonia, male red pigfish, Ancorina, Stelleta, demoiselle, koheru, goatfish	video	J9
6914	34.9259	173.549	2561083	6697064	lr	scattered Ecklonia, red moki, Ancorina, goatfish, leatherjacket, Callyspongia, red pigfish, male orange wrasse banded wrasse	video	J9
6915	34.926	173.55	2561110	6697053	lr	scattered Ecklonia, Ancorina	video	J9

6916	34.9263	173.55	2561128	6697021	lr	Ecklonia forest, Ancorina, red moki, demoiselles	video	J9
6917	34.9264	173.55	2561145	6697005	lr	scruffy Ecklonia forest, Callyspongia, spotty	video	J9
6918	34.9264	173.55	2561137	6697010	lr	scruffy Ecklonia forest	video	J9
6919	34.9267	173.55	2561180	6696974	hr	depth ? Double drop start, banded wrasse, red moki, spotty, Ecklonia forest	video	J9
6920	34.9269	173.55	2561158	6696955	hr	depth ? Double drop finish, Ecklonia forest, demoiselle	video	J9
6921	34.9269	173.552	2561326	6696948	hr	smw - edge of kina barren, barren & Ecklonia	video	J9
6922	34.927	173.552	2561332	6696940	hr	spotty, dense Ecklonia in part	video	J9
6923	34.9255	173.556	2561727	6697107	lr	smw, surface video looking at edge of reef primarily Ecklonia with some Carpophyllum flexuosum and C. plumosum, spotty	video	J9
6924	34.9377	173.491	2555791	6695796	m	double drop start. start fairway reef start J9-2 to 13:08 kina barren, Actinothoe	video	J9

6925	34.9389	173.49	2555648	6695662		double drop finish, changed to gravel with trevally school, some scattered Ecklonia and scattered C. angustifolium	video	J9
6926	34.9383	173.488	2555453	6695732	lr	C. maschalocarpum	video	J9
6927	34.9385	173.487	2555427	6695714	lr	C. maschalocarpum	video	J9
6928	34.9386	173.487	2555412	6695704	lr	double drop, start, edge kina barrens and smw	video	J9
6929	34.9387	173.487	2555399	6695694	lr	double drop, finish, kina barrens, Actinothoe coralline paint, yellow sponge scattered C.mashalocarpum	video	J9
6930	34.939	173.487	2555356	6695654	lr	double drop, start, red moki, bigeye, kina barren with sparse C. mashalocarpum	video	J9
6931	34.9391	173.487	2555346	6695646	lr	double drop, finish, kina barrens, Actinothoe, coralline paint, yellow sponge, scattered C.mashalocarpum end 21:22	video	J9
6932	34.9393	173.486	2555309	6695623	lr	double drop, start, kina barren, Actinothoe, coralline paint	video	J9

6933	34.9394	173.486	2555300	6695615	lr	double drop, finish, Ecklonia, Caulerpa forest end 23:22	video	J9
6934	34.9395	173.486	2555286	6695608	lr	double drop, start, Ecklonia forest, Ancorina	video	J9
6935	34.9395	173.486	2555276	6695601	m	double drop, finish, Ecklonia forest, red algae? End 26:43	video	J9
6936	34.9397	173.486	2555249	6695578	lr	Ecklonia, Gigartina, Caulerpa small reds pebbles	video	J9
6937	34.9502	173.525	2558833	6694391	lr	Ecklonia forest, spotty, coralline paint, red moki, Ancorina followed by sunset clip, end 33:57	video	J9
6101	34.9892	173.46	2552849	6690105			notes	J10
6102	34.9888	173.459	2552759	6690148			notes	J10
6103	34.9879	173.458	2552726	6690255			notes	J10
6104	34.9845	173.452	2552110	6690631			notes	J10
6105	34.9861	173.449	2551842	6690461			notes	J10
6106	34.9847	173.452	2552116	6690606	lr	habitat notes C.flex	video	J10
6107	34.9846	173.448	2551829	6690620			notes	J10
6108	34.9842	173.446	2551633	6690672	lr	drift over smw	video	J10
6109	34.9815	173.443	2551347	6690978	lr	smw C. masch	video	J10
61010	34.9813	173.443	2551335	6690994	lr	blury see field notes	video	J10
61011	34.9806	173.444	2551381	6691070	lr	blury see field notes	video	J10
61012	34.9805	173.444	2551382	6691081	lr	blury see field notes	video	J10
61013	34.9803	173.444	2551394	6691103	lr	blury see field notes	video	J10
61014	34.9804	173.444	2551397	6691098	lr	blury see field notes	video	J10
61015	34.9797	173.444	2551422	6691171	lr	blury see field notes	video	J10
61016	34.9797	173.444	2551420	6691175	lr	blury see field notes	video	J10
61017	34.9796	173.444	2551433	6691186	lr	blury see field notes	video	J10

61018	34.9791	173.444	2551459	6691237	s	blury see field notes	video	J10
61019	34.9793	173.444	2551444	6691217	lr	blury see field notes	video	J10
61020	34.9828	173.44	2551093	6690829	lr	blury see field notes	video	J10
61021	34.9835	173.44	2551080	6690752	m	blury see field notes	notes	J10
61022	34.9827	173.439	2551007	6690838	lr	blury see field notes	video	J10
61023	34.9832	173.438	2550882	6690787	lr	blury see field notes	video	J10
61024	34.9821	173.438	2550848	6690913	lr		notes	J10
61025	34.9813	173.438	2550831	6691002	lr		notes	J10
61026	34.9841	173.437	2550747	6690687	m		notes	J10
61027	34.9839	173.433	2550382	6690717	m		video	J10
61028	34.9891	173.496	2556173	6690090		video of cows blurry 39:54	notes	J10
61029	34.9835	173.498	2556311	6690711	m	photo of mussel rock	notes	J10
61030	34.9836	173.498	2556306	6690697	hr	blury see field notes	video	J10
61031	34.9836	173.497	2556305	6690707	hr	blury see field notes	video	J10
61032	34.9835	173.498	2556309	6690716	hr	blury see field notes	video	J10
61033	34.9834	173.497	2556302	6690729	hr	blury see field notes	video	J10
61034	34.9834	173.498	2556308	6690729		blury see field notes	video	J10
61035	34.9834	173.498	2556319	6690726	lr	blury see field notes	video	J10
61036	34.9832	173.498	2556310	6690745	lr	blury see field notes	video	J10
61037	34.9372	173.489	2555532	6695857	lr	start Fairway reef blury	video	J10
61038	34.9372	173.489	2555534	6695861	lr	failed	video	J10
61039	34.9367	173.489	2555568	6695913	lr	kina barren failed blury	video	J10
61040	34.9366	173.489	2555572	6695924	lr	blury see field notes	video	J10
61041	34.9362	173.489	2555612	6695966	lr	blury see field notes	video	J10
61042	34.9351	173.49	2555644	6696086	lr	blury see field notes	video	J10
61043	34.935	173.49	2555656	6696094	lr	blury see field notes	video	J10
61044	34.9348	173.49	2555666	6696118	lr	blury see field notes	video	J10
61045	34.9346	173.49	2555690	6696140	lr	blury see field notes	video	J10
61046	34.9347	173.491	2555712	6696136	lr	blury see field notes	video	J10
61047	34.9336	173.491	2555791	6696251	lr	blury see field notes	video	J10
61048	34.9323	173.492	2555872	6696396	lr	blury see field notes	video	J10
61049	34.9497	173.525	2558869	6694441		caves	notes	J10

61050	34.9494	173.525	2558883	6694475		caves	notes	J10
61051	34.9453	173.524	2558765	6694927		manta tow end start close to wpt 52	manta	J10
61052	34.9516	173.528	2559083	6694235	s	start 2nd manta to (Roger)	manta	J10
61053	34.954	173.528	2559073	6693969		edge of rocky reef	manta	J10
61054	34.958	173.528	2559092	6693521		stop at crayfish pot	manta	J10
61055	34.9606	173.53	2559314	6693234		end manta tow	manta	J10
51251	34.8504	173.469	2553780	6705501	hr		sonar	M1
51252	34.8631	173.444	2551554	6704103	hr		sonar	M1
51253	34.8616	173.438	2550990	6704280	s	rippled sand	video	M1
51254	34.8605	173.441	2551215	6704398	g	Brodie's Creek	video	M1
51255	34.863	173.446	2551687	6704122	lr	smw, small Ecklonia, C. masholocarpum, few kina, coralline turf	video	M1
51256	34.8632	173.446	2551686	6704100	lr	good Ecklonia forest	video	M1
51257	34.8633	173.446	2551688	6704084	lr	rock,coralline paint, Zonaria, Actinothoe, Ecklonia	video	M1
51258	34.8636	173.446	2551703	6704055	m	low rock and sand, Caulerpa poor condition, Raspailia	video	M1
51259	34.8648	173.447	2551763	6703921	m	coarse sand ripples	video	M1
51260	34.8677	173.447	2551815	6703597	s	sand with ripples	video	M1
51261	34.8709	173.452	2552267	6703231	m	Raspailia,encrusting reds, Ancorina, tall red Axinella	video	M1
51262	34.87	173.436	2550753	6703346	r	smw, coralline paint, coralline turf?	video	M1
51263	34.8705	173.436	2550793	6703291	m	Ecklonia forest, close up, lr &s	video	M1
51264	34.8725	173.437	2550900	6703071	s		sonar	M1

51265	34.8726	173.438	2550928	6703054	r	Ecklonia forest, close up, Ancorina sponge	video	M1
51266	34.8735	173.438	2550975	6702958	m		sonar	M1
51267	34.8748	173.44	2551100	6702817	m	High rock and sand	video	M1
51268	34.875	173.44	2551150	6702787	lr	Ancorina, Demoiselle, Ecklonia forest, goatfish	video	M1
51269	34.875	173.44	2551147	6702788			notes	M1
51270	34.878	173.442	2551366	6702457	m	butterfly perch, sparse Ecklonia, encrusting sponges, demoiselles, coraline paint,	video	M1
521	34.8772	173.389	2546448	6702580	s		sonar	M2
522	34.8836	173.379	2545599	6701878	s		sonar	M2
523	34.8852	173.378	2545444	6701698	s		sonar	M2
524	34.8897	173.373	2544962	6701201	s		sonar	M2
525	34.8957	173.386	2546169	6700524	s		sonar	M2
526	34.8977	173.401	2547591	6700291	g		sonar	M2
527	34.8979	173.402	2547675	6700274	s		sonar	M2
528	34.8973	173.398	2547265	6700348	s		sonar	M2
529	34.8977	173.401	2547576	6700291	g		sonar	M2
5210	34.8981	173.401	2547549	6700255			notes	M2
5211	34.8983	173.403	2547723	6700224	s		sonar	M2
5212	34.8994	173.407	2548124	6700106	g		sonar	M2
5213	34.9	173.41	2548351	6700031	s		sonar	M2
5214	34.9023	173.423	2549568	6699775	s		sonar	M2
5215	34.9015	173.426	2549874	6699862	s		sonar	M2
5216	34.8996	173.426	2549884	6700070	g		sonar	M2
5217	34.8984	173.427	2549973	6700208	s		sonar	M2
5218	34.8986	173.435	2550689	6700180	m		sonar	M2
5219	34.8986	173.436	2550796	6700174	l		sonar	M2
5220	34.8976	173.44	2551095	6700278	m		sonar	M2
5221	34.8969	173.44	2551131	6700365	m		sonar	M2
5222	34.897	173.439	2551033	6700354	m		sonar	M2
5223	34.9	173.438	2550906	6700021	m		sonar	M2
5224	34.8997	173.439	2550989	6700056	m		sonar	M2
5225	34.8991	173.439	2550990	6700113	lr		sonar	M2
5226	34.8985	173.439	2550986	6700184	m		sonar	M2
5227	34.8985	173.439	2551031	6700182	m		sonar	M2
5228	34.8994	173.439	2551038	6700087	lr		sonar	M2
5229	34.9001	173.44	2551077	6700007	m		sonar	M2
5230	34.8994	173.44	2551116	6700079	m		sonar	M2
5231	34.8983	173.44	2551168	6700204	m		sonar	M2
5232	34.8978	173.44	2551163	6700263	m		sonar	M2
5233	34.899	173.44	2551089	6700124	lr		sonar	M2

5234	34.8995	173.439	2551045	6700072	lr		sonar	M2
5235	34.8995	173.439	2551046	6700076	lr	Ecklonia, goatfish, demoiselle, sweep, leatherjacket, coralline turf, sandy patches not quite mixed, female red pigfish	video	M2
5236	34.8994	173.439	2551052	6700086	lr	Anemonies, banded wrasse, kina barren, parore, oblique swimming blenny, sweep, few kina, coralline paint, kelpfish, demoiselle, leatherjacket	video	M2
5237	34.8984	173.439	2551037	6700193	m	lr, s, Ecklownia, few kina, maybe good boundary clip, spotty goatfish, Caulerpa,Aaptos	video	M2
5238	34.8966	173.44	2551114	6700390	m	s lr Ecklonia, diatom film on sand, leatherjacket, red algae, Caulerpa	video	M2
5239	34.8932	173.442	2551299	6700772	m		video	M2
5240	34.8925	173.442	2551343	6700842	m	sparse Ecklonia, cobbles, sand, grey cup sponge	video	M2
5241	34.8904	173.446	2551646	6701074			video	M2
5242	34.8909	173.446	2551641	6701025	s		video	M2
5243	34.8901	173.446	2551716	6701109	s	Tawera bed ? Dog cockle shells	video	M2
5244	34.8874	173.452	2552221	6701409	m	lr cobbles s Caulerpa small sponges Raspailia, Calyspongia	video	M2

5245	34.8818	173.463	2553218	6702018	s		sonar	M2
5246	34.8824	173.462	2553159	6701959	g	medium ripple little bits of gravel, and coarse sand, maybe close to rock	video	M2
5247	34.8806	173.463	2553265	6702148	m		sonar	M2
5248	34.8794	173.464	2553317	6702283	hr		sonar	M2
5249	34.8785	173.464	2553353	6702389	m		sonar	M2
5250	34.8781	173.465	2553388	6702435	m		sonar	M2
5251	34.8778	173.464	2553326	6702463	m		sonar	M2
5252	34.8782	173.464	2553302	6702419	lr		sonar	M2
5253	34.8787	173.463	2553267	6702363	hr		sonar	M2
5254	34.8797	173.462	2553190	6702259	m		sonar	M2
5255	34.8804	173.462	2553140	6702180	m		sonar	M2
5256	34.8802	173.461	2553055	6702202	m		sonar	M2
5257	34.8786	173.462	2553195	6702377	m		sonar	M2
5258	34.8781	173.463	2553264	6702432	m		sonar	M2
5259	34.8776	173.464	2553296	6702487	m		sonar	M2
5260	34.8781	173.465	2553383	6702427	s		sonar	M2
5261	34.8786	173.465	2553462	6702372	s		sonar	M2
5262	34.8795	173.465	2553395	6702271	m		sonar	M2
5263	34.8813	173.464	2553327	6702078	m		sonar	M2
5264	34.8816	173.464	2553316	6702044	m		sonar	M2
5265	34.882	173.465	2553381	6701998	s		sonar	M2
5266	34.882	173.465	2553397	6701994	s		sonar	M2
5267	34.88	173.466	2553480	6702218	m		sonar	M2
5268	34.8791	173.466	2553541	6702322	s		sonar	M2
5269	34.8788	173.467	2553562	6702354	m		sonar	M2
5270	34.8781	173.467	2553622	6702429	m		sonar	M2
5271	34.8794	173.464	2553332	6702285	hr		sonar	M2
5272	34.8792	173.463	2553262	6702304	hr		sonar	M2
5273	34.8792	173.463	2553226	6702308	lr		sonar	M2
5274	34.8792	173.462	2553188	6702312	m		sonar	M2
5275	34.8794	173.463	2553215	6702284	lr		sonar	M2
5276	34.8796	173.463	2553267	6702269	lr		sonar	M2
5277	34.8794	173.463	2553267	6702288	hr		sonar	M2
5278	34.8793	173.464	2553287	6702302	hr		sonar	M2
5279	34.8791	173.463	2553274	6702324	hr		sonar	M2
5280	34.8788	173.463	2553253	6702358	m		sonar	M2

5281	34.8792	173.463	2553278	6702305	hr	Butterfly perch, Ecklonia, Callyspongia, orange wrasse, demoiselle, Corynactis, goatfish, scarlet wrasse male, orange wrasse, Anchorina alata, leatherjacket, kelpfish, butterfly perch, koheru	video	M2
5282	34.8793	173.463	2553278	6702295	hr	koheru, butterfly perch, slender roughy, hydroid, encrusting sponge, coralline turf, red moki, male red pigfish, Leucetusa sponge, Ancorina, john dory, bigeyes, Stelletta hauraki, cup coral, Calypongia, leatherjacket, golden snapper, demoiselle, Zonaria	video	M2
5283	34.8795	173.463	2553272	6702276	hr	Leatherjacket, bigeye, encrusting sponges, hydroids, cup coral, slender roughy, coralline paint, grey cup sponge, hydroids, butterfly perch	video	M2

5284	34.8797	173.463	2553264	6702254	g	Angular cobbles, golf ball sponge, Aaptos, female red pigfish, yellow sponge, Leucetusa, pencil bryozoan	video	M2
5285	34.8775	173.464	2553296	6702500	s		sonar	M2
5286	34.8765	173.464	2553320	6702603	m		sonar	M2
5287	34.8747	173.464	2553355	6702807	s		sonar	M2
5288	34.8677	173.466	2553483	6703585	s		sonar	M2
5289	34.86	173.468	2553742	6704437	s		sonar	M2
5290	34.8565	173.472	2554088	6704824	s		sonar	M2
5291	34.8525	173.47	2553870	6705265	m		sonar	M2
5292	34.8514	173.469	2553817	6705389	lr		sonar	M2
5293	34.8509	173.469	2553798	6705446	hr		sonar	M2
5294	34.8503	173.469	2553776	6705508	hr		sonar	M2
5295	34.8504	173.469	2553787	6705497	hr		sonar	M2
5296	34.8508	173.469	2553814	6705451	hr		sonar	M2
5297	34.8516	173.47	2553871	6705365	m		sonar	M2
5298	34.8523	173.47	2553927	6705288	m		sonar	M2
5299	34.8527	173.471	2553967	6705240	g		sonar	M2
52100	34.8533	173.471	2553999	6705181	g		sonar	M2
52101	34.855	173.469	2553772	6704995	g		sonar	M2
52102	34.8525	173.471	2553984	6705268	g		sonar	M2
52103	34.852	173.471	2553966	6705317	m		sonar	M2
52104	34.8534	173.469	2553808	6705171	g		sonar	M2
52105	34.8552	173.468	2553688	6704971	hr		sonar	M2
52106	34.8558	173.466	2553564	6704903	hr		sonar	M2

52107	34.8556	173.467	2553665	6704923	hr	female red pigfish, pencil bryozoan, sweep, cup coral, Leucetusa, goatfish, red moki, Ancorina, bryozoans encrusting sponges, butterfly perch, nudibranch eggs, Stellata crater, oblique-swimming blenny, Callyspongia, coarse sand, goatfish	video	M2
52108	34.8599	173.463	2553272	6704449	hr		sonar	M2
5111	34.885	173.393	2546831	6701712	s		sonar	M11
5112	34.889	173.404	2547817	6701262	s		sonar	M11
5113	34.8932	173.404	2547792	6700790	s		sonar	M11
5114	34.9167	173.403	2547721	6698189	s		sonar	M11
5115	34.9168	173.403	2547713	6698174	s		sonar	M11
5116	34.9267	173.401	2547559	6697080	s		sonar	M11
5117	34.9298	173.404	2547794	6696735	s		sonar	M11
5118	34.9309	173.402	2547647	6696612	g		sonar	M11
5119	34.9305	173.402	2547606	6696658	g	mixture of coarse sand, ripples	video	M11
51110	34.9297	173.402	2547629	6696744	s		sonar	M11
51111	34.9301	173.402	2547615	6696706	s	fine sand, fine ripples	video	M11
51112	34.9294	173.403	2547750	6696774	s	fine sand, fine ripples	video	M11
51113	34.9293	173.404	2547777	6696784	g	edge of fine sand turning to gravel with medium ripples	video	M11
51114	34.9285	173.407	2548083	6696875	s		sonar	M11
51115	34.9287	173.404	2547813	6696853	g		sonar	M11
51116	34.929	173.402	2547636	6696824	s		sonar	M11
51117	34.9296	173.396	2547081	6696764	s		sonar	M11
51118	34.9312	173.388	2546322	6696593	s		sonar	M11
51119	34.9312	173.388	2546312	6696591	s		sonar	M11
51120	34.9323	173.382	2545762	6696471	s		sonar	M11
51121	34.9325	173.38	2545638	6696448	s		sonar	M11
51122	34.9315	173.382	2545798	6696562	s		sonar	M11
51123	34.9551	173.402	2547571	6693927	s		sonar	M11

51124	34.9559	173.398	2547260	6693847	s	fine sand irregular ripples, possibly bio-turbated with blobs	video	M11
51125	34.9552	173.398	2547215	6693916	s		sonar	M11
51126	34.9601	173.4	2547454	6693374	s		sonar	M11
51127	34.959	173.403	2547718	6693496	s		sonar	M11
51128	34.9527	173.415	2548820	6694185	s		sonar	M11
51129	34.9505	173.42	2549239	6694426	g		sonar	M11
51130	34.9485	173.423	2549527	6694645	s		sonar	M11
51131	34.9479	173.423	2549527	6694718	s		sonar	M11
5121	34.8856	173.412	2548553	6701632	s		sonar	M12
5122	34.8855	173.412	2548573	6701639	lr		sonar	M12
5123	34.8854	173.413	2548688	6701658	m		sonar	M12
5124	34.8854	173.414	2548727	6701658	lr		sonar	M12
5125	34.8845	173.417	2549006	6701748	m		sonar	M12
5126	34.8845	173.417	2549010	6701749	hr		sonar	M12
5127	34.8845	173.418	2549113	6701755	m		sonar	M12
5128	34.8844	173.418	2549134	6701762	hr		sonar	M12
5129	34.8841	173.419	2549217	6701794	g		sonar	M12
51210	34.884	173.419	2549244	6701801	m		sonar	M12
51211	34.884	173.42	2549285	6701806	lr		sonar	M12
51212	34.8838	173.421	2549362	6701825	m		sonar	M12
51213	34.8837	173.421	2549410	6701842	lr		sonar	M12
51214	34.8833	173.422	2549523	6701876	m		sonar	M12
51215	34.8833	173.423	2549578	6701880	s		sonar	M12
51216	34.883	173.426	2549828	6701913	s		sonar	M12
51217	34.8823	173.432	2550392	6701985	s		sonar	M12
51218	34.8833	173.435	2550701	6701869	s		sonar	M12
51219	34.8842	173.436	2550773	6701767	m		sonar	M12
51220	34.884	173.437	2550902	6701790	lr		sonar	M12
51221	34.8836	173.438	2550961	6701838	m		sonar	M12
51222	34.8828	173.44	2551105	6701928	s		sonar	M12
51223	34.881	173.444	2551501	6702127	s		sonar	M12
51224	34.88	173.445	2551638	6702234	m		sonar	M12
51225	34.8792	173.447	2551770	6702318	lr		sonar	M12
51226	34.8785	173.448	2551877	6702400	m		sonar	M12
51227	34.8781	173.449	2551968	6702442	hr		sonar	M12
51228	34.8778	173.45	2552029	6702473	m		sonar	M12
51229	34.8775	173.45	2552075	6702508	s		sonar	M12
51230	34.8772	173.451	2552145	6702535	m		sonar	M12
51231	34.8772	173.452	2552218	6702544	s		sonar	M12
51232	34.8719	173.459	2552917	6703120	s		sonar	M12
51233	34.8698	173.464	2553320	6703349	s		sonar	M12
51234	34.8666	173.472	2554086	6703705	s		sonar	M12
51235	34.8632	173.493	2555996	6704066	s		sonar	M12
51236	34.866	173.497	2556352	6703752	s		sonar	M12
51237	34.8724	173.507	2557262	6703034	s		sonar	M12
51238	34.8753	173.509	2557479	6702711	s		sonar	M12
51239	34.8762	173.497	2556343	6702620	s		sonar	M12
51240	34.8763	173.489	2555628	6702608	s		sonar	M12

51241	34.8761	173.481	2554894	6702646	g		sonar	M12
51242	34.8756	173.478	2554655	6702703	g		sonar	M12
51243	34.875	173.467	2553578	6702776	lr		sonar	M12
51244	34.8747	173.466	2553506	6702806	m		sonar	M12
51245	34.8743	173.464	2553377	6702854	g		sonar	M12
51246	34.874	173.463	2553218	6702883	g		sonar	M12
51247	34.8746	173.466	2553563	6702817	g		sonar	M12
51248	34.8779	173.467	2553653	6702454	m		sonar	M12
51249	34.8801	173.467	2553571	6702201	lr		sonar	M12
51250	34.8816	173.466	2553546	6702038	lr		sonar	M12
51251	34.8824	173.466	2553507	6701956	m		sonar	M12
51252	34.8829	173.466	2553472	6701891	g		sonar	M12
51253	34.8832	173.465	2553441	6701862	m		sonar	M12
51254	34.8835	173.465	2553404	6701834	m		sonar	M12
51255	34.8836	173.473	2554153	6701817	m		sonar	M12
51256	34.8839	173.475	2554357	6701777	lr		sonar	M12
51257	34.884	173.476	2554404	6701767	m		sonar	M12
51258	34.884	173.476	2554471	6701761	g		sonar	M12
51259	34.8837	173.487	2555449	6701787	s		sonar	M12
51260	34.8837	173.495	2556155	6701785	s		sonar	M12
51261	34.8831	173.504	2557017	6701845	s		sonar	M12
51262	34.8834	173.517	2558153	6701808	s		sonar	M12
51263	34.8835	173.523	2558748	6701788	s		sonar	M12
51264	34.8829	173.525	2558891	6701856	s		sonar	M12
51265	34.8858	173.528	2559197	6701529	s		sonar	M12
51266	34.892	173.535	2559769	6700836	s		sonar	M12
51267	34.8931	173.525	2558926	6700728	s		sonar	M12
51268	34.894	173.508	2557343	6700632	s		sonar	M12
51269	34.8946	173.498	2556418	6700575	g		sonar	M12
51270	34.8929	173.479	2554684	6700780	g		sonar	M12
51271	34.8928	173.478	2554570	6700793	g		sonar	M12
51272	34.8927	173.476	2554392	6700798	m		sonar	M12
51273	34.8928	173.474	2554280	6700789	g		sonar	M12
51274	34.893	173.473	2554111	6700773	m		sonar	M12
51275	34.8931	173.47	2553864	6700758	m		sonar	M12
51276	34.8923	173.47	2553898	6700852	m		sonar	M12
51277	34.8961	173.47	2553878	6700426	m		sonar	M12
51278	34.9012	173.47	2553824	6699867	m		sonar	M12
51279	34.9015	173.478	2554636	6699828	g		sonar	M12
51280	34.9011	173.483	2555086	6699863	m		sonar	M12
51281	34.9009	173.487	2555438	6699881	g		sonar	M12
51282	34.9011	173.489	2555598	6699865	g		sonar	M12
51283	34.9015	173.502	2556813	6699810	g		sonar	M12
51284	34.9014	173.506	2557144	6699815	m		sonar	M12
51285	34.9014	173.511	2557629	6699815	s		sonar	M12
51286	34.9013	173.513	2557780	6699820	s		sonar	M12
51287	34.9011	173.516	2558033	6699838	s		sonar	M12
51288	34.8974	173.511	2557626	6700261	s		sonar	M12
51289	34.8947	173.507	2557255	6700559	g		sonar	M12
51290	34.8924	173.504	2556951	6700817	s		sonar	M12
51291	34.8907	173.501	2556739	6701005	s		sonar	M12
51292	34.8833	173.484	2555170	6701841	g		sonar	M12

51293	34.8782	173.472	2554077	6702410	g		sonar	M12
51294	34.8778	173.471	2553980	6702462	m		sonar	M12
51295	34.877	173.469	2553820	6702545	g		sonar	M12
51296	34.8729	173.461	2553082	6703007	s		sonar	M12
51297	34.8666	173.448	2551855	6703715	g		sonar	M12
51298	34.864	173.443	2551390	6704007	m		sonar	M12
51299	34.8636	173.441	2551229	6704057	s		sonar	M12
512100	34.8634	173.438	2550931	6704075	g		sonar	M12
512101	34.8632	173.437	2550877	6704100	m		sonar	M12
512102	34.863	173.436	2550810	6704127	m		sonar	M12
512103	34.8629	173.436	2550771	6704133	lr		sonar	M12
512104	34.8631	173.437	2550859	6704118	lr		sonar	M12
512105	34.8632	173.438	2550960	6704096	s		sonar	M12
512106	34.8627	173.443	2551401	6704154	s		sonar	M12
512107	34.8628	173.443	2551446	6704138	s		sonar	M12
512108	34.8633	173.445	2551615	6704086	m		sonar	M12
512109	34.863	173.448	2551869	6704113	m		sonar	M12
512110	34.863	173.449	2551999	6704110	hr		sonar	M12
512111	34.863	173.45	2552024	6704116	g		sonar	M12
512112	34.8629	173.451	2552144	6704127	m		sonar	M12
512113	34.8627	173.452	2552270	6704145	hr		sonar	M12
512114	34.8629	173.453	2552336	6704126	hr		sonar	M12
512115	34.8628	173.453	2552375	6704138	m		sonar	M12
512116	34.8625	173.454	2552395	6704171	hr		sonar	M12
512117	34.8622	173.454	2552424	6704203	m		sonar	M12
512118	34.862	173.454	2552473	6704218	g		sonar	M12
512119	34.8619	173.455	2552530	6704233	m		sonar	M12
512120	34.8616	173.456	2552655	6704270	lr		sonar	M12
512121	34.8615	173.457	2552662	6704272	g		sonar	M12
512122	34.8613	173.458	2552802	6704294	m		sonar	M12
512123	34.8611	173.459	2552873	6704319	g		sonar	M12
512124	34.861	173.46	2552942	6704325	hr		sonar	M12
512125	34.8611	173.46	2553018	6704317	m		sonar	M12
512126	34.8611	173.461	2553046	6704319	hr		sonar	M12
512127	34.8609	173.461	2553097	6704340	m		sonar	M12
512128	34.8604	173.462	2553163	6704400	hr		sonar	M12
512129	34.8602	173.463	2553263	6704420	hr		sonar	M12
512130	34.8592	173.463	2553281	6704522	m		sonar	M12
512131	34.8584	173.463	2553249	6704621	hr		sonar	M12
512132	34.8578	173.463	2553231	6704688	hr		sonar	M12
512133	34.8575	173.462	2553149	6704719	hr	SMW, Ecklonia, coralline paint, coralline turf, Actinothoe, C. angustifolium, Vidalia	video	M12

512134	34.8574	173.462	2553169	6704728	hrr	Lessonia, spotty, Carpophyllum angustifolium, kina barrens, leather jacket, Carpophyllum flexuosum, snapper (12) 20cm	video	M12
512135	34.8572	173.462	2553181	6704752	hr	Ecklonia, banded wrasse, red moki, kelpfish, demoiselle spotty	video	M12
512136	34.8569	173.462	2553195	6704778	lr	Rocky, cobbly, good Ecklonia forest, jack mackerel	video	M12
512137	34.8566	173.463	2553223	6704815	lr	Good Ecklonia forest, cobbly, rocky, spotty	video	M12
512138	34.8525	173.46	2553005	6705276	lr	SMW, coralline paint, coraline turf, Actinothoe, C. angustifolium, Vidalia, C. plumosum, C. mashalocarpum, Ecklonia	video	M12
512139	34.8528	173.461	2553037	6705239	m	sand gutter, SMW	video	M12
512140	34.853	173.461	2553060	6705222	lr	SMW, cobbles with rock and sand patches	video	M12
512141	34.8532	173.461	2553088	6705195	m	sand gutter, SMW, C. angustifolium	video	M12

512142	34.8535	173.462	2553139	6705166	m	Ecklonia forest and kina barrens, goatfish, rock and sand patches, female red pigfish, Ancorina sponge	video	M12
512143	34.8539	173.463	2553242	6705118	lr	Ancorina sponge, Ecklonia forest, pencil bryozoan	video	M12
512144	34.8565	173.461	2553071	6704829	m	sweep, SMW, mostly Ecklonia, cobbly, Actinothoe, spotty, C. angustifolium, C. maschalocarpum	video	M12
512145	34.8627	173.443	2551408	6704149	m	Ecklonia forest, gravel with rock interspersed	video	M12
512146	34.8627	173.443	2551429	6704157	m	sand gutter with gravel, rock patches covered with Ecklonia, probable Tawera bed, goatfish	video	M12
512147	34.8626	173.443	2551444	6704164	m	Ecklonia forest on rock and gravel patches, calcareous sponges, leather jacket	video	M12
512148	34.8626	173.443	2551468	6704167	m	Ecklonia forest on rock and gravel patches, porae	video	M12

512149	34.8626	173.444	2551481	6704165	m	leather jacket, Ecklonia forest on rock and gravel patches	video	M12
512150	34.8625	173.444	2551483	6704175	lr	video failed tape ran out	video	M12
51301	34.8874	173.422	2549508	6701423	s		sonar	M13
51302	34.8872	173.423	2549596	6701449	s		sonar	M13
51303	34.8871	173.425	2549793	6701461	m		sonar	M13
51304	34.8869	173.427	2549945	6701477	s		sonar	M13
51305	34.8859	173.434	2550583	6701588	s		sonar	M13
51306	34.8859	173.434	2550593	6701588	m		sonar	M13
51307	34.8859	173.435	2550672	6701589	m		sonar	M13
51308	34.8859	173.437	2550885	6701583	s		sonar	M13
51309	34.8862	173.439	2551082	6701550	s		sonar	M13
51310	34.8852	173.439	2551033	6701655	m		sonar	M13
51311	34.885	173.437	2550821	6701686	s		sonar	M13
51312	34.885	173.434	2550579	6701685	s		sonar	M13
51313	34.8849	173.433	2550451	6701697	s		sonar	M13
51314	34.8846	173.432	2550421	6701729	s		sonar	M13
51315	34.884	173.432	2550434	6701800	s		sonar	M13
51316	34.8837	173.434	2550581	6701830	m		sonar	M13
51317	34.8835	173.436	2550738	6701844	m		sonar	M13
51318	34.8836	173.438	2550961	6701838	m		sonar	M13
51319	34.8836	173.439	2551022	6701831	lr		sonar	M13
51320	34.8838	173.439	2551072	6701813	s		sonar	M13
51321	34.8839	173.44	2551127	6701806	s		sonar	M13
51322	34.8832	173.44	2551139	6701878	s		sonar	M13
51323	34.8831	173.439	2551053	6701892	m		sonar	M13
51324	34.8832	173.438	2550995	6701880	m		sonar	M13
51325	34.8832	173.438	2550944	6701881	m		sonar	M13
51326	34.8831	173.436	2550761	6701889	m		sonar	M13
51327	34.8831	173.434	2550572	6701894	s		sonar	M13
51328	34.883	173.432	2550433	6701909	s		sonar	M13
51329	34.8827	173.432	2550419	6701939	m		sonar	M13
51330	34.8822	173.432	2550428	6701993	s		sonar	M13
51331	34.882	173.434	2550564	6702016	m		sonar	M13
51332	34.882	173.435	2550656	6702020	s		sonar	M13
51333	34.8821	173.439	2551087	6702007	s		sonar	M13
51334	34.8825	173.439	2551064	6701956	s		sonar	M13
51335	34.8828	173.439	2551011	6701925	m		sonar	M13
51336	34.8843	173.435	2550716	6701763	m		sonar	M13
51337	34.8843	173.434	2550620	6701761	m		sonar	M13
51338	34.8843	173.433	2550492	6701759	s		sonar	M13
51339	34.8845	173.432	2550439	6701745	s		sonar	M13
51340	34.8841	173.432	2550434	6701787	s		sonar	M13
51341	34.8839	173.434	2550580	6701806	m		sonar	M13
51342	34.8839	173.437	2550849	6701809	m		sonar	M13
51343	34.8839	173.439	2551068	6701805	s		sonar	M13
51344	34.8829	173.446	2551726	6701909	m		sonar	M13
51345	34.8826	173.448	2551836	6701945	m		sonar	M13

51346	34.8821	173.449	2551978	6702000	s		sonar	M13
51347	34.8819	173.452	2552229	6702014	s		sonar	M13
51348	34.8811	173.452	2552253	6702109	s		sonar	M13
51349	34.8809	173.45	2552020	6702131	s		sonar	M13
51350	34.8809	173.447	2551778	6702130	m		sonar	M13
51351	34.8809	173.446	2551645	6702129	s		sonar	M13
51352	34.8809	173.442	2551355	6702131	s		sonar	M13
51353	34.8801	173.442	2551351	6702217	s		sonar	M13
51354	34.8802	173.447	2551785	6702209	m		sonar	M13
51355	34.8802	173.449	2551917	6702210	lr		sonar	M13
51356	34.8801	173.45	2552038	6702215	m		sonar	M13
51357	34.8801	173.451	2552166	6702213	s		sonar	M13
51358	34.8801	173.452	2552221	6702214	s		sonar	M13
51359	34.8792	173.452	2552218	6702315	s		sonar	M13
51360	34.8792	173.451	2552106	6702319	m		sonar	M13
51361	34.8792	173.45	2552009	6702321	lr		sonar	M13
51362	34.8792	173.448	2551884	6702323	lr		sonar	M13
51363	34.8791	173.446	2551682	6702328	s		sonar	M13
51364	34.8791	173.442	2551319	6702329	s		sonar	M13
51365	34.8783	173.442	2551308	6702426	s		sonar	M13
51366	34.8785	173.444	2551485	6702402	m		sonar	M13
51367	34.8786	173.446	2551686	6702391	s		sonar	M13
51368	34.8785	173.447	2551762	6702392	lr		sonar	M13
51369	34.8785	173.448	2551886	6702401	m		sonar	M13
51370	34.8784	173.449	2551967	6702402	lr		sonar	M13
51371	34.8785	173.451	2552104	6702394	s		sonar	M13
51372	34.8784	173.451	2552169	6702406	s		sonar	M13
51373	34.878	173.451	2552183	6702452	m		sonar	M13
51374	34.8776	173.451	2552158	6702498	s		sonar	M13
51375	34.8775	173.449	2551998	6702508	m		sonar	M13
51376	34.8775	173.448	2551910	6702509	lr		sonar	M13
51377	34.8775	173.447	2551822	6702505	m		sonar	M13
51378	34.8775	173.446	2551725	6702510	s		sonar	M13
51379	34.8775	173.446	2551688	6702507	lr		sonar	M13
51380	34.8776	173.445	2551599	6702503	s		sonar	M13
51381	34.8776	173.444	2551535	6702500	m		sonar	M13
51382	34.8775	173.444	2551460	6702506	s		sonar	M13
51383	34.8776	173.443	2551420	6702499	m		sonar	M13
51384	34.8776	173.442	2551357	6702496	m		sonar	M13
51385	34.8769	173.443	2551373	6702578	m		sonar	M13
51386	34.8768	173.445	2551553	6702589	lr		sonar	M13
51387	34.8768	173.445	2551619	6702588	m		sonar	M13
51388	34.8767	173.446	2551672	6702593	m		sonar	M13
51389	34.8769	173.448	2551878	6702573	s		sonar	M13
51390	34.8769	173.448	2551908	6702575	lr		sonar	M13
51391	34.8768	173.45	2552038	6702587	s		sonar	M13
51392	34.8767	173.451	2552102	6702593	m		sonar	M13
51393	34.8768	173.451	2552147	6702588	s		sonar	M13

51394	34.8816	173.466	2553541	6702045	lr	SE of Bastard Rock (video light), maomao, butterfly perch, Stelleta sp.	video	M13
51395	34.8813	173.467	2553601	6702076	lr	SE of Bastard Rock (video light.) Female red pigfish, leatherjacket, goatfish, sweep, Raspailia ?sponge 40:11, coralline paint, sediment on rocks, calcareous sponges, male red pigfish, finger sponges	video	M13
51396	34.8757	173.464	2553298	6702700	s		video	M13
51397	34.8785	173.464	2553322	6702388	m	North of Bastard Rock, Ancorina, pink maomao, 47:14, calcareous Leucetusa pencil sponges, butterfly perch, goatfish, kingfish, coarse sand, female red pigfish	video	M13
51398	34.8781	173.464	2553366	6702429	s	North of Bastard Rock, coarse sand	video	M13

51399	34.8793	173.463	2553200	6702301	hr	just west of Bastard Rock peak, demoiselle, bigeye, Ancorina, crimson cleaner, female red pigfish, 1:00:31, Stelleta sp., hydroids, Calyspongia, sweep, beyond Ecklonia, Ancorina, male red pigfish, male orange wrasse, Leucetusa, leather jacket, butterfly perch	video	M13
513100	34.8793	173.463	2553274	6702300	hr	just west of Bastard Rock peak, 1:11:02, Ancorina, Ecklonia forest, butterfly perch, leather jacket, red moki, sweep	video	M13
513101	34.888	173.43	2550226	6701352	s		sonar	M13
513102	34.8885	173.428	2550076	6701297	s		sonar	M13
513103	34.889	173.427	2549951	6701246	g		sonar	M13
513104	34.8893	173.426	2549845	6701211	g		sonar	M13
513105	34.8897	173.424	2549679	6701168	m		sonar	M13
513106	34.8918	173.421	2549369	6700934	lr		sonar	M13
513107	34.8929	173.419	2549231	6700819	g		sonar	M13
513108	34.8931	173.419	2549193	6700795	g		sonar	M13
513109	34.8935	173.418	2549130	6700750	m		sonar	M13
513110	34.8929	173.417	2549064	6700816	m		sonar	M13
513111	34.892	173.417	2548991	6700922	m		sonar	M13
513112	34.8908	173.419	2549221	6701048	lr		sonar	M13
513113	34.8903	173.42	2549330	6701104	lr		sonar	M13
513114	34.8895	173.422	2549513	6701193	m		sonar	M13
513115	34.8892	173.423	2549570	6701222	g		sonar	M13
513116	34.8889	173.424	2549628	6701254	m		sonar	M13
513117	34.8887	173.424	2549683	6701284	g		sonar	M13
513118	34.8879	173.426	2549836	6701364	s		sonar	M13
513119	34.8867	173.428	2550064	6701502	s		sonar	M13
513120	34.8852	173.426	2549853	6701667	s		sonar	M13

513121	34.8868	173.421	2549389	6701497	m		sonar	M13
513122	34.887	173.42	2549315	6701476	lr		sonar	M13
513123	34.8878	173.417	2549037	6701382	m		sonar	M13
513124	34.8881	173.415	2548850	6701356	s		sonar	M13
513125	34.8874	173.415	2548820	6701429	m		sonar	M13
513126	34.8868	173.415	2548836	6701495	m		sonar	M13
513127	34.8862	173.417	2549059	6701557	lr		sonar	M13
513128	34.8861	173.418	2549115	6701575	m		sonar	M13
513129	34.8859	173.419	2549236	6701596	lr		sonar	M13
513130	34.8858	173.42	2549316	6701601	g		sonar	M13
513131	34.8844	173.426	2549813	6701758	s		sonar	M13
513132	34.8827	173.426	2549872	6701949	m		sonar	M13
513133	34.8838	173.424	2549657	6701823	g		sonar	M13
513134	34.8841	173.423	2549595	6701787	m		sonar	M13
513135	34.8845	173.422	2549456	6701750	lr		sonar	M13
513136	34.8846	173.42	2549331	6701735	hr		sonar	M13
513137	34.8847	173.42	2549291	6701725	lr		sonar	M13
513138	34.8849	173.419	2549239	6701710	hr		sonar	M13
513139	34.8854	173.417	2549054	6701648	m		sonar	M13
513140	34.8856	173.417	2549014	6701628	hr		sonar	M13
513141	34.8858	173.416	2548963	6701608	m		sonar	M13
513142	34.8859	173.416	2548917	6701593	lr		sonar	M13
513143	34.8861	173.415	2548806	6701572	m		sonar	M13
513144	34.8862	173.412	2548605	6701562	m		sonar	M13
513145	34.8865	173.412	2548556	6701528	g		sonar	M13
513146	34.8871	173.411	2548497	6701470	g		sonar	M13
513147	34.8834	173.394	2546934	6701891	hr	46:35 campground rock, paddle cam, C. maschalocarpum	video	M13
513148	34.8836	173.395	2546978	6701869	hr	SMW, C. maschalocarpum	video	M13
513149	34.881	173.398	2547311	6702153	m	SMW, C. flexuosum	video	M13
513150	34.8813	173.398	2547279	6702123	m	SMW, C. maschalocarpum, Ecklonia	video	M13
513151	34.8821	173.397	2547246	6702026	m	SMW, Ecklonia	video	M13
513152	34.8824	173.398	2547300	6701992	hr	SMW, Ecklonia, C. maschalocarpum	video	M13
513153	34.8825	173.399	2547407	6701989	hr	SMW, C. maschalocarpum, Ecklonia	video	M13
513154	34.8811	173.408	2548206	6702133	hr	SMW, C. plumosum, Ecklonia, C.maschalocarpum	video	M13

513155	34.8811	173.41	2548376	6702127	hr	SMW, C.maschalocarpum 1:02:30	video	M13
5141	34.8817	173.419	2549254	6702059	lr		sonar	M14
5142	34.8822	173.419	2549259	6702008	m		sonar	M14
5143	34.8826	173.42	2549270	6701963	lr		sonar	M14
5144	34.8837	173.42	2549291	6701834	hr		sonar	M14
5145	34.884	173.42	2549302	6701803	lr		sonar	M14
5146	34.8845	173.42	2549320	6701744	lr		sonar	M14
5147	34.8845	173.42	2549348	6701746	m		sonar	M14
5148	34.8844	173.421	2549367	6701759	lr		sonar	M14
5149	34.884	173.422	2549443	6701809	m		sonar	M14
51410	34.8838	173.422	2549464	6701828	m	start of manta tow bottom 08:33 lr start Ecklonia	manta	M14
51411	34.8839	173.42	2549329	6701812	m	forest, sand patches, medium ripples, red moki	manta	M14
51412	34.8843	173.42	2549309	6701773	lr		manta	M14
51413	34.8847	173.42	2549273	6701727	m		manta	M14
51414	34.8853	173.419	2549180	6701664	lr		manta	M14
51415	34.8854	173.418	2549146	6701645	m		manta	M14
51416	34.8859	173.418	2549083	6701600			manta	M14
51417	34.8859	173.418	2549081	6701598	lr	manta tow line broke, string broke 13:08	manta	M14

51418	34.8864	173.418	2549100	6701535	m	restart manta tow bottom 21:30, Ecklonia, mixed low rock and sand patches, little snapper, Ancorina, Stelleta, goatfish, cool Ancorina clip 24:19, sea bed change to gravel larger ripples, banded wrasse, Polymastia granulosa, Dosinia maoriana, Tethya sponge 37:	manta	M14
51419	34.8867	173.418	2549091	6701508	m		manta	M14
51420	34.8877	173.417	2549048	6701399	m		manta	M14
51421	34.8873	173.416	2548944	6701437	lr		manta	M14
51422	34.887	173.416	2548924	6701474	m		manta	M14
51423	34.8865	173.414	2548777	6701525	g		manta	M14
51424	34.8869	173.414	2548746	6701490	m		manta	M14
51425	34.8874	173.413	2548701	6701435	g		manta	M14
51426	34.8909	173.411	2548465	6701049	g		manta	M14
51427	34.8914	173.409	2548294	6700995	g	end of manta tow 38:53	manta	M14
51428	34.8591	173.441	2551229	6704552	g	Brodie's Creek 45:57 start end 59:54 end of M14-1 tape2	manta	M14

51429	34.8621	173.449	2551981	6704214	lr	start of manta tow tape M14-2 time 00:44, boulder beach, Xiphophora, C.maschalocarpum, C. plumosum, C. flexuosum, parore, Ecklonia, sand patches, oblique swimming blenny, Ancorina, Ecklonia phasing out at 22m, butterfly perch, sweep, demoiselle school 7:48, going up 7:57	manta	M14
51430	34.8625	173.449	2551985	6704165	hr		manta	M14
51431	34.8635	173.449	2551950	6704062	lr		manta	M14
51432	34.8636	173.449	2551942	6704048	m		manta	M14
51433	34.8651	173.449	2551936	6703878	g		manta	M14
51434	34.8657	173.447	2551786	6703816		end of manta tow	manta	M14
51435	34.8655	173.447	2551767	6703840	g		sonar	M14
51436	34.8648	173.447	2551761	6703912	m		sonar	M14
51437	34.8639	173.447	2551752	6704019	m		sonar	M14
51438	34.8632	173.447	2551753	6704092	lr		sonar	M14
51439	34.8631	173.447	2551754	6704102	hr		sonar	M14
51440	34.8628	173.447	2551758	6704137	hr		sonar	M14
51441	34.8631	173.444	2551539	6704104	g		sonar	M14
51442	34.863	173.444	2551537	6704119	lr		sonar	M14
51443	34.8624	173.444	2551539	6704189	lr		sonar	M14

51444	34.8626	173.444	2551542	6704159	lr	start of manta tow 14:58 Ecklonia forest, C.flexuosum, C.mashalocarpum, C. flexuosum,kelp much denser than further out, parore, changes to Ecklonia forest, scattered rock on sand changing to gravel mixed with sand, goatfish, nice rock & Ancorina clip 18m 19:2	manta	M14
51445	34.8632	173.444	2551522	6704097	g		manta	M14
51446	34.8639	173.444	2551500	6704022	m		manta	M14
51447	34.8641	173.444	2551497	6704000	lr		manta	M14
51448	34.8643	173.444	2551498	6703977	m		manta	M14
51449	34.8648	173.444	2551503	6703924	g		manta	M14
51450	34.865	173.444	2551502	6703900	m		manta	M14
51451	34.8654	173.444	2551504	6703851	g		manta	M14
51452	34.8679	173.443	2551430	6703573	g	end of manta tow	manta	M14

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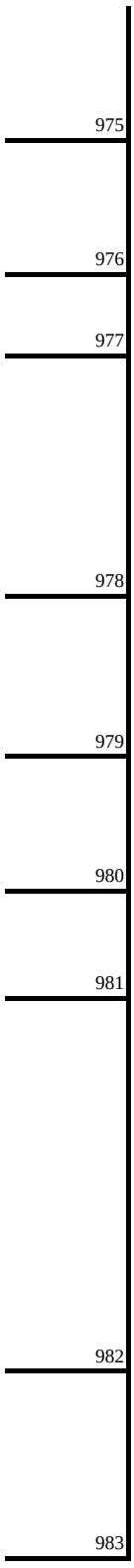
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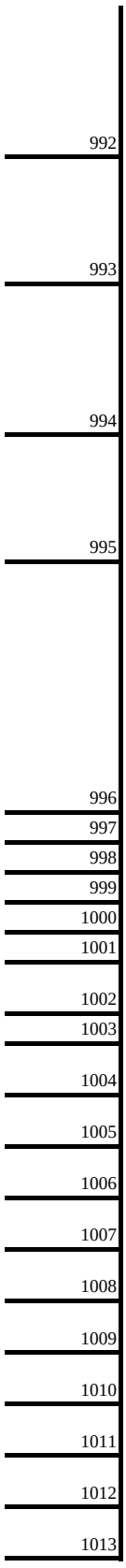
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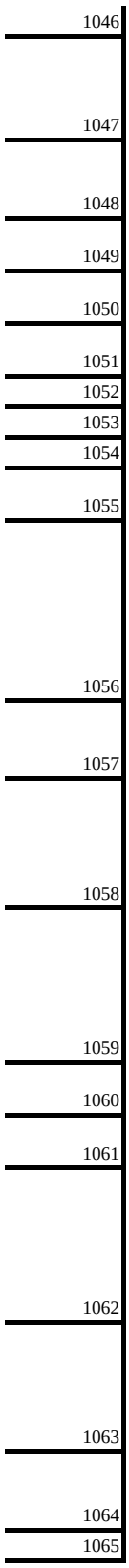
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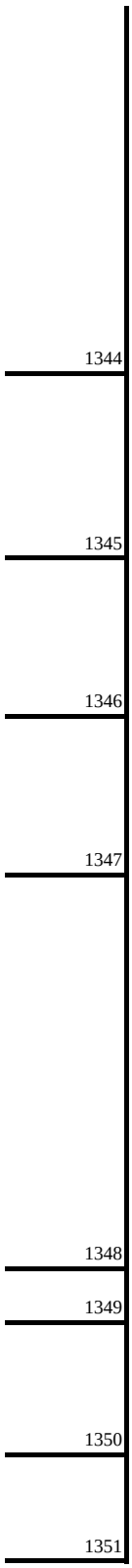
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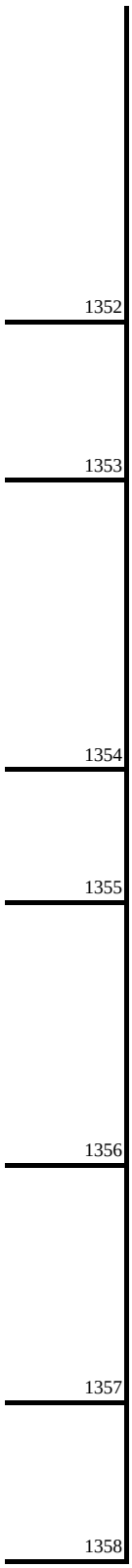
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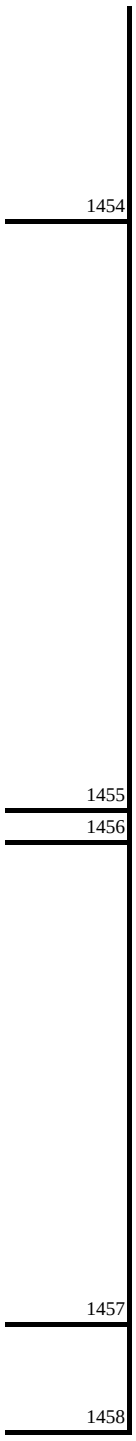
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