A Preliminary Investigation of the Marine Habitats of Taiharuru Reef

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Aerial photo #237159 1993, coutesy of Department of Conservation

Keywords
Taiharuru, habitat mapping, aerial photography, deep reefs, sponge communities

Introduction

This habitat mapping investigation was carried out by the authors utilising the methodology developed and described in (Kerr & Grace 2005). Taiharuru Point is commonly known by local people as an area with extensive "foul ground". The peninsula itself extends a considerable distance out into the coastal waters relative to the coastline. A raised subtidal ridge can be seen on bathymetry extending out from the Point several kms. The Taiharuru reef system was selected to be a suitable site to compare to Mimiwhangata where the authors have completed extensive habitat survey work.

The aim of the survey was to utilise the rapid survey approach developed by the authors at Mimiwhangata, (Kerr & Grace 2005) to gain a better understanding of the habitats of this location and in addition provide some basis through which the Mimiwhangata habitats could be compared to other similar habitats.

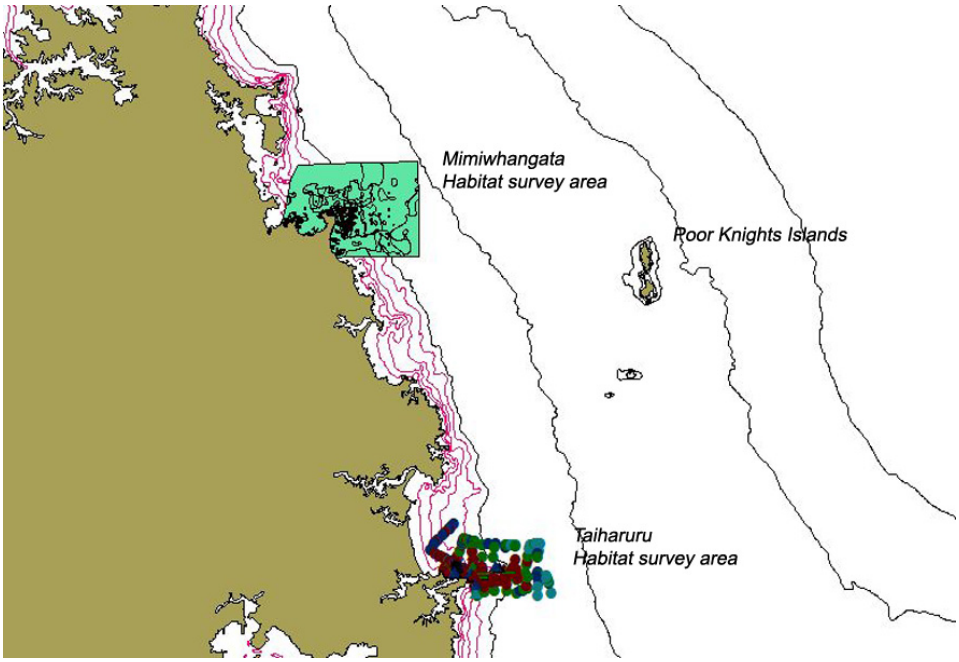

Figure 1 Location map showing relationship of the Taiharuru survey area to Mimiwhangata and the Poor Knights islands

Methods

The survey work was completed over the months of February to June.2004. Three days were spent with on the water survey. Single beam sonar was used to classify the physical habitats and video drops were employed to ground truth the sonar analysis and provide descriptive information on species and biological communities. The sonar work was carried out on board the local charter vessel, "Norseman" and the equipment is described below.

The system GPS interface records boat position and track plot. The ship used, the survey vessel 'Norseman' operating out of Tutukaka, has a Furuno GP31, 12 channel receiver linked to a Furuno Chart Plotter navigation and single beam sonar system. The system uses a Furuno FCV Color Video Sounder bronze thru-hull transducer 1KW (transducer inserted in keel). Position accuracy is estimated at 15 metres.

The sonar method involved having the survey ship travel a predetermined grid course, while one person constantly watched and evaluated the sonar image for any change in bottom substrate. Each time a change was observed a GPS fix was taken and recorded along with the habitat change and depth. GPS location of survey points was done with a hand held Garmin 12 GPS unit. When all this information was mapped the result was a single line track. Each line segment was labelled with it's habitat classification. Interpretation of the single beam sonar takes some practice. In this method the authors spent considerable time practicing this technique. Practice runs in known areas and in areas of clear waters where the bottom substrate could be observed were helpful. In interpreting the habitat classifications, picking the differences between sand and mud substrates was not reliable, therefore these soft bottoms were grouped together. In some cases picking changes between gravels and sand was challenging. Notes on these concerns were taken to assist the design of the video ground truthing.

Following the mapping of the single beam sonar survey, ground truthing target points for the drop video was established. Points were selected to test:

1) all the major physical habitat types: high relief rock avg. height > 3m, low relief rock, mixed rock and soft sediment areas, sand & mud, gravels
2) areas where there was inconsistency between sonar interpretations
3) gap areas where there was likelihood of habitat boundaries still not covered by sonar survey,
4) areas where predicted major depth dependent biological boundaries occurred on the reef,

Most of the video drop work was carried out from the authors 4.2m runabout. The video drop apparatus was a Sony TR7 mini DV camera mounted in a simple, but robust housing built by the authors from a recycled scuba cylinder and Plexiglas sheet material. The housing was arranged with a bottom weight attached on a 1m 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 1m above the housing. 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 3-5m of slack in the line. The unit then hung vertically approximately 1m above the bottom held by the float arrangement. We also found that the arrangement would naturally rotate the housing in a circle or semi-circle, effectively panning the area, which greatly increased the viewing area. We also devised a method of bouncing the unit along the bottom for short distances which 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 between drops on the surface. Using this system drops could be made with a minimum of time and effort, allowing more drops to be made. Most of this work was done from a small runabout which allowed for fast movement around the relatively large distances of the survey area.

The sonar survey lines, habitat change points and video ground truthing sites are shown on the map below, (figure 2).

Depths referred to in this report and listed in the data in Appendix 1 were generated by the on board sounder and calibrated against a series of actual measurements done with weighted tapes sent to the bottom. These figures however are not tide adjusted. They are also not adjusted for the affect of swell and sea condition at the time of measurement. The swell and/or chop was less than 1m during the survey period. The possible tide correction error for these depth measurements is in the range of 0-1.4m.

Available aerial photographs were examined to assist the mapping of the subtidal habitats. Unfortunately no photos were suitable for detailed subtidal mapping.

Results

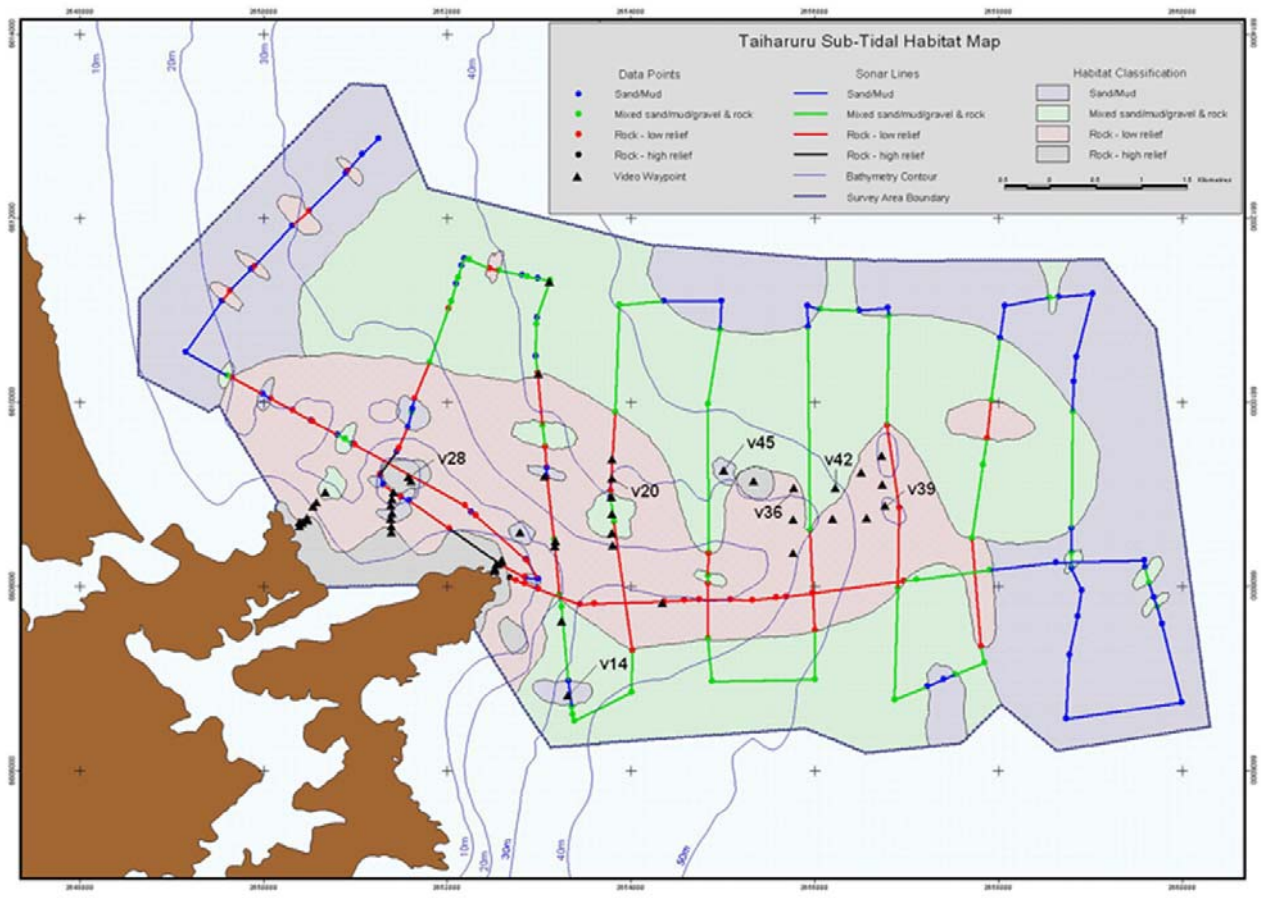

Figure 2 Preliminary habitat map for Taiharuru

As the map indicates we were able to draw preliminary outlines of the basic physical habitats of the survey area. Generally we had very good correlation between our sonar interpretation and the ground truthing classification from the video drops. In all 44 video drops were completed. 150 habitat change points were recorded in the sonar survey. This data is included in Appendix 1 of this report. The video drops indicated on the map, (figure 2) have representative photos displayed in figures 3-8, along with some descriptive notes.

From our limited number of video drops it appears the in the deeper waters the division between kelp communities and sponge and encrusting communities occurred between 34 m and 39m depth. This is similar to what the authors found at Mimiwhangata, (Kerr & Grace 2005). More video drops would be required to be confident that this boundary is consistent across the survey area, subsequently this biological transition zone has not been indicated on our map. One observation of the deeper video drops was that significant areas of Gorgonian corals were largely absent from the deep reef at Taiharuru. We observed Gorgonian corals on only one site out of 25 sites surveyed in waters over 30m depth. Another observation was that the reef off Taiharuru lacks large areas of complex terrain and high relief areas. (as defined by having avg. vertical variation greater than 3m). This difference however does not explain the lack of Gorgonian coral habitat as Mimiwhangata has large areas of low relief reef which have dense populations of Gorgonian corals on them.

In the shallow zones 0-15m we did not have the benefit of a good set of aerial photography which adequately displays underwater features. Also with the time available to us we were only able to complete three video drop transects in the shallow zone. From our observations the biological zonation is typical of the exposed Northland east coast with a distinct shallow mixed weed zone extending to approximately 3m depth, a variable sized kina barren zone occurring at 3-8m and Ecklonia radiata forest extending from 3-8m to 34-39 m depths. Representative video still images are included below in figures 3-8.

Figure 3 video drop 28, 3m, shallow mixed weed showing top edge of kina grazed zone

Figure 4 video drop 14, 40m, sand with some cobble supporting sponge and other encrusting invertebrates, note two wandering anemones, *Epiactis thomsoni*

Figure 5 video drop 20, 42m, low rock reef with encrusting invertebrate life some sand patches visible

Figure 6 video drop 45, 44m, gravel with wave ridges, female pigfish

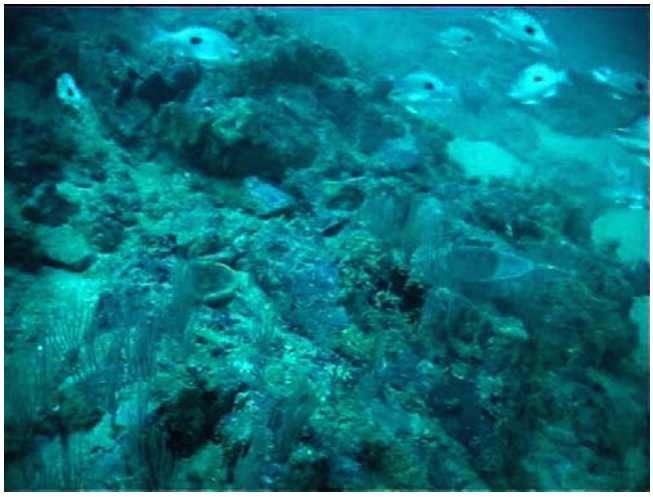

Figure 7 video drop 42, 48m, high relief rock with encrusting invertebrates, sponge species and gorgonian corals present, note: this is the only survey site where gorgonian corals were identified

Figure 8 video drop 39, 51m, low relief rock, sponge and encrusting invertebrates, female pigfish

A list of identified species seen in the drop video survey follows:

Fish

Cheilodactylus spectabilis (red moki)
Parika scaber (leatherjacket)
Chromis dispilus (demoiselle)
Pseudocaranx dentex (trevally)
Bodianus unimaculatus (red pigfish)
Pseudolabrus miles (scarlet wrasse)
Scorpis violaceus (blue maomao)
Upeneichthys lineatus (goatfish)
Pempheris adspersus (bigeye / bullseye)
Caesioperca lepidoperca (butterfly perch)
Nemadactylus douglasii (porae)
Ellerkeldia huntii (red-banded perch)
Trachurus novaezelandiae (jack mackerel)
Callanthias australis (northern splendid perch)
Caprodon longimanus (pink Maomao)
Kyphosus sydeyanus (silver drummer)
Notolabrus celidotus (spotty)
Notolabrus fucicola (banded wrasse)

Species n = 21

Sponges Porifera

Scientific name	Common name or description
Tedania sp	Red encrusting sponges
Stellata crater	with encrusting sponge
Desmacella dendyi	Orange cup sponge
Geodina regina	Large grey sponge
Axenillid	Tall red finger sponge
Raspaillia sp.	Orange finger sponge branching
Leucetusa lancifer	Calcareous flask sponge
Iophon proximum	Yellow finger sponge
Callyspongia ramose	Thin finger sponge
Polymastia granulosa	Yellow round sponge
Tethya fastigata	Round yellow ball shaped sponge
Ancorina alata	Large grey rambling cup sponge

Cnidaria

Primnoides sp. (gorgonian coral)
Alcyonium aurantiacum (soft coral)
Steginoporella neozelanica (pencil bryozoan)
Epiactis thomsoni (wandering anemone)

Discussion

One of the aims of this survey was to allow for the comparison of similar reef systems on the Northland east coast to Mimiwhangata. While Taiharuru is a large reef area extending seaward several kms out to similar depth zones to Mimiwhangata, there were some surprising differences between the two systems. In comparison the Mimiwhangata reef is bigger in area possibly several times bigger and much more complex in terms of its physical structure. It is noticeable that the invertebrate life appears to be richer and more diverse at Mimiwhangata in comparison to Taiharuru. The lack of gorgonian corals at Taiharuru is an example of this general difference. As stated in the results this can not be explained by physical make-up of the reef alone as Mimiwhangata has large areas of flat terrain reef that are very lush sponge dominated habitats which commonly include gorgonian corals as well. We suggest that these differences could be understood if we had more understanding of the current and nutrient flows that affect these two sites.

The Taiharuru reef system is extensive and certainly warrants further study. There could be real value in the future to look at this system as a control for marine protected area like Mimiwhangata. Taiharuru is a very popular recreational fishing area so offers an opportunity to compare some sort of intensive fishing management system with a protected area. Another value of this work and any further work is that Taiharuru by comparison suggests that Mimiwhangata has special biodiversity because of the quality of environments and biodiversity that exist there compared to the other similar areas of the coast.

The authors would like to make the following recommendations for the future study of the site based on the information gathered to date:

- Taiharuru is recognised as a valuable reference site to compare to other prominent Northland east coast sites
- Habitat mapping work could be extended at Taiharuru based on this current study to include more detail and precision, collection of suitable aerial photography for shallow subtidal mapping and determination of biological zonation or ‘biotypes’ to overlay the existing map
- Taiharuru could be considered as a reference site for long term investigation of algal forest change to enable comparison with other Northland sites under different local management regimes
- Taiharuru has potential as a control site for fish and crayfish monitoring based on its current status as a ‘heavily fished’ site.

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Appendix 1 Survey data points and GPS information

Taiharuru Sonar Survey and Video Drops April 1, 2004 - June 11, 2004

Substrate code = 5 high relief rock >3m height, 4 low relief rock, 3 mixed rock & soft sediments, 2&1 soft sediments

Wpt	Latitude	Longitude	NZ Grid Eastings	NZ Grid Northings	Date of Work	Depth	Substrate Code	Notes
1	-35.6739701	174.55265	2651248	6612862	1/04/2004	35	2	
2	-35.6755258	174.55071	2651069	6612692	1/04/2004	35	2	
3	-35.6771565	174.54903	2650914	6612514	1/04/2004		4	
4	-35.6773979	174.54879	2650891	6612488	1/04/2004		2	
5	-35.6811155	174.54442	2650488	6612082	1/04/2004		4	
6	-35.6826229	174.54243	2650305	6611918	1/04/2004		2	
7	-35.6866301	174.53804	2649899	6611481	1/04/2004		4	
8	-35.6869198	174.53759	2649858	6611450	1/04/2004		2	
9	-35.6891031	174.53512	2649630	6611212	1/04/2004		4	
10	-35.6901009	174.53419	2649544	6611102	1/04/2004		2	mixed odd patches
11	-35.6951863	174.52999	2649153	6610545	1/04/2004		2	
12	-35.6973536	174.53498	2649601	6610296	1/04/2004		3	
13	-35.697595	174.53558	2649654	6610269	1/04/2004		4	steady rise
14	-35.6991346	174.53925	2649984	6610092	1/04/2004		2	
15	-35.6995476	174.5403	2650078	6610044	1/04/2004		4	close to high relief
16	-35.700701	174.54291	2650311	6609912	1/04/2004		4	close to high relief
17	-35.7016344	174.54514	2650511	6609805	1/04/2004		2	some patches
18	-35.7017202	174.54533	2650529	6609795	1/04/2004		4	undulating
19	-35.7030291	174.54837	2650801	6609645	1/04/2004		2	
20	-35.7033993	174.54927	2650882	6609602	1/04/2004		3	
21	-35.703807	174.55018	2650963	6609555	1/04/2004		2	
22	-35.7039357	174.55047	2650989	6609541	1/04/2004		4	approx. 2m relief , one peak
23	-35.709622	174.56385	2652189	6608887	1/04/2004		4	
24	-35.7102818	174.56463	2652258	6608813	1/04/2004		2	
25	-35.710652	174.56517	2652306	6608771	1/04/2004		4	
26	-35.7148147	174.57127	2652849	6608299	1/04/2004		2	
27	-	174.57145	2652865	6608284	1/04/2004		4	

	35.7149489							
28	-35.716703	174.57289	2652992	6608087	1/04/2004		2	
29	-35.7166547	174.57134	2652852	6608095	1/04/2004		4	
30	-35.7165635	174.57111	2652831	6608105	1/04/2004		4	
31	-35.7154531	174.56851	2652598	6608233	1/04/2004		5	
32	-35.711977	174.56201	2652018	6608629	1/04/2004		4	
33	-35.7092572	174.55712	2651580	6608939	1/04/2004		2	
34	-35.7089783	174.55614	2651492	6608972	1/04/2004		4	some rises up to 6m
35	-35.7078035	174.55397	2651298	6609106	1/04/2004		2	
36	-35.7068164	174.55356	2651263	6609216	1/04/2004		4	
37	-35.7045312	174.55557	2651450	6609466	1/04/2004		2	
38	-35.704161	174.55582	2651473	6609507	1/04/2004		4	
39	-35.7021225	174.55679	2651565	6609731	1/04/2004		2	
40	-35.7006312	174.55729	2651614	6609896	1/04/2004		3	
41	-35.7003147	174.55734	2651619	6609931	1/04/2004		2	
42	-35.6993277	174.55759	2651643	6610040	1/04/2004		4	
43	-35.6957442	174.55927	2651802	6610435	1/04/2004		3	gravel and patchy rock
44	-35.6904657	174.56147	2652013	6611017	1/04/2004		4	
45	-35.6897522	174.56174	2652038	6611096	1/04/2004		3	
46	-35.6880302	174.56233	2652095	6611286	1/04/2004		2	
47	-35.687424	174.56255	2652116	6611352	1/04/2004		3	
48	-35.6861848	174.56294	2652154	6611489	1/04/2004		2	
49	-35.6855572	174.56321	2652180	6611558	1/04/2004		2	
50	-35.685584	174.56377	2652231	6611555	1/04/2004		3	low rock and gravel
51	-35.6863994	174.56628	2652456	6611460	1/04/2004		4	
52	-35.6865872	174.56743	2652559	6611437	1/04/2004		3	
53	-35.6870646	174.57022	2652811	6611380	1/04/2004		2	
54	-35.6871451	174.57077	2652861	6611370	1/04/2004		3	
55	-35.6873221	174.57216	2652986	6611348	1/04/2004		2	
56	-35.6875528	174.57363	2653119	6611320	1/04/2004		3	
57	-35.691163	174.57216	2652978	6610922	1/04/2004		2	
58	-	174.57205	2652967	6610847	1/04/2004		3	

	35.6918336							
59	-35.694961	174.57202	2652958	6610500	1/04/2004		2	
60	-35.6965757	174.57234	2652983	6610321	1/04/2004		4	
61	-35.7017202	174.57305	2653037	6609749	1/04/2004		3	
62	-35.7037962	174.57336	2653061	6609518	1/04/2004		4	
63	-35.705824	174.57364	2653082	6609292	1/04/2004		2	
64	-35.7068003	174.57374	2653089	6609184	1/04/2004		4	
65	-35.7128192	174.57465	2653159	6608515	1/04/2004		3	
66	-35.7132644	174.57473	2653166	6608465	1/04/2004		4	think top up to 20-25m in places
67	-35.7182587	174.57547	2653222	6607910	1/04/2004		3	
68	-35.719455	174.57569	2653240	6607777	1/04/2004		3	
69	-35.7266218	174.57673	2653319	6606980	1/04/2004		2	
70	-35.7291914	174.57717	2653354	6606694	1/04/2004		3	
71	-35.7299478	174.57725	2653359	6606610	1/04/2004		3	low rock and gravel
72	-35.7305915	174.57753	2653383	6606538	1/04/2004		3	
73	-35.7276196	174.58432	2654004	6606856	1/04/2004		3	
74	-35.7236017	174.58436	2654016	6607302	1/04/2004		4	
75	-35.7109738	174.58184	2653814	6608707	1/04/2004		3	
76	-35.7086081	174.58137	2653776	6608971	1/04/2004		2	
77	-35.7079751	174.58138	2653778	6609041	1/04/2004		4	
78	-35.7002772	174.58174	2653827	6609894	1/04/2004		3	
79	-35.6897897	174.58198	2653870	6611057	1/04/2004		3	mostly gravel
80	-35.6893284	174.58731	2654353	6611100	1/04/2004		2	substrate reflection deeper
81	-35.6892372	174.59424	2654981	6611098	1/04/2004		2	
82	-35.6919891	174.59421	2654972	6610793	1/04/2004		3	
83	-35.6993491	174.59285	2654834	6609978	1/04/2004		3	
84	-35.7138867	174.59328	2654843	6608365	1/04/2004		4	probably changed before this filming fish
85	-35.7160647	174.59329	2654839	6608123	1/04/2004		3	
86	-	174.59327	2654835	6608032	1/04/2004		4	

	35.7168908							
87	-35.7222498	174.59337	2654834	6607437	1/04/2004		3	
88	-35.7264287	174.594	2654882	6606972	1/04/2004		3	
89	-35.7260747	174.60635	2656000	6606990	1/04/2004		3	
90	-35.7212252	174.60622	2655998	6607529	1/04/2004		4	
91	-35.7114674	174.60548	2655952	6608612	1/04/2004		3	possibly moving to gravel
92	-35.6915815	174.60472	2655925	6610820	1/04/2004		2	
93	-35.6895376	174.60461	2655919	6611047	1/04/2004		2	
94	-35.6898166	174.60619	2656061	6611013	1/04/2004		3	
95	-35.689897	174.61086	2656484	6610996	1/04/2004		1	not sure on definition between 1 & 2
96	-35.6895483	174.61431	2656797	6611029	1/04/2004		1	not sure on definition between 1 & 2
97	-35.6903208	174.61448	2656810	6610943	1/04/2004		3	mostly gravel
98	-35.7010711	174.61443	2656783	6609751	1/04/2004		4	
99	-35.7091553	174.61608	2656916	6608851	1/04/2004		4	
100	-35.7170142	174.61613	2656903	6607979	1/04/2004		3	
101	-35.7279147	174.61596	2656865	6606770	1/04/2004		3	w/ patches of reef
102	-35.7265896	174.6199	2657225	6606910	1/04/2004		2	
103	-35.7258225	174.62183	2657401	6606992	1/04/2004		2	scatter got deeper
104	-35.7253022	174.62325	2657530	6607047	1/04/2004		3	
105	-35.7241435	174.62675	2657849	6607170	1/04/2004		3	
106	-35.7224966	174.62629	2657811	6607353	1/04/2004		4	
107	-35.7120038	174.62493	2657711	6608520	1/04/2004		3	?
108	-35.7047833	174.62608	2657830	6609319	1/04/2004		3	
109	-35.7021172	174.62652	2657875	6609614	1/04/2004		4	
110	-35.6984908	174.62696	2657923	6610015	1/04/2004		3	
111	-35.6922681	174.62785	2658017	6610704	1/04/2004		1	looking convincing think mud sand

112	-35.6891353	174.62832	2658066	6611051	1/04/2004		1	think mud orange substrate scatter pattern almost gone
113	-35.6882555	174.63365	2658550	6611139	1/04/2004		3	
114	-35.6881482	174.63479	2658653	6611149	1/04/2004		1	
115	-35.6877674	174.63889	2659025	6611184	1/04/2004		1	
116	-35.6940223	174.63712	2658851	6610494	1/04/2004		1	
117	-35.6964094	174.63682	2658819	6610229	1/04/2004		2	
118	-35.6993813	174.63678	2658809	6609900	1/04/2004		3	
119	-35.7108075	174.63693	2658799	6608632	1/04/2004		2	
120	-35.7131089	174.63694	2658795	6608376	1/04/2004		3	
121	-35.714686	174.63702	2658799	6608201	1/04/2004		1	
122	-35.7168479	174.63823	2658903	6607959	1/04/2004		1	
123	-35.7193799	174.63785	2658864	6607679	1/04/2004		2	
124	-35.7231886	174.63694	2658773	6607258	1/04/2004		1	
125	-35.7294435	174.63669	2658738	6606564	1/04/2004		1	
126	-35.7276464	174.65055	2659995	6606740	1/04/2004		1	
127	-35.719986	174.64799	2659780	6607594	1/04/2004		2	
128	-35.7183499	174.64743	2659732	6607776	1/04/2004		3	
129	-35.7173682	174.647	2659696	6607886	1/04/2004		1	
130	-35.7159735	174.64639	2659643	6608042	1/04/2004		3	
131	-35.7144929	174.64584	2659598	6608207	1/04/2004		1	
132	-35.7137955	174.64575	2659591	6608285	1/04/2004		1	
133	-35.7141603	174.63505	2658622	6608263	1/04/2004		2	
134	-35.7150508	174.62713	2657903	6608178	1/04/2004		3	
135	-35.7161022	174.61831	2657103	6608076	1/04/2004		3	
136	-35.7162792	174.61677	2656963	6608059	1/04/2004		4	
137	-35.7176579	174.60581	2655969	6607925	1/04/2004		4	
138	-35.7179851	174.60275	2655691	6607894	1/04/2004		4	
139	-35.71813	174.60146	2655574	6607880	1/04/2004		4	good bump

140	-35.7184357	174.59861	2655316	6607851	1/04/2004		4	
141	-35.718366	174.59604	2655083	6607863	1/04/2004		4	
142	-35.7184572	174.59224	2654739	6607860	1/04/2004		4	
143	-35.7185216	174.59048	2654580	6607855	1/04/2004		4	
144	-35.7186879	174.58805	2654360	6607841	1/04/2004		4	undulating relief up to 2m
145	-35.719058	174.57965	2653599	6607814	1/04/2004		4	
146	-35.7191438	174.57795	2653444	6607807	1/04/2004		4	
147	-35.717733	174.57287	2652988	6607972	1/04/2004		4	
148	-35.7172341	174.57123	2652841	6608031	1/04/2004		4	
149	-35.7169015	174.5702	2652748	6608069	1/04/2004		4	
150	-35.7166708	174.56942	2652678	6608096	1/04/2004		5	
d1	-35.7017524	174.58174	2653824	6609731	3/04/2004	44		
d2	-35.715496	174.56772	2652527	6608229	3/04/2004	11		
d3	-35.7084901	174.54501	2650486	6609044	3/04/2004	23	4	gravel change to reef traveling to d4
d4	-35.7102389	174.54457	2650443	6608851	3/04/2004	16	4	reef edge changing to gravel traveling towards d5
d5	-35.7111938	174.54423	2650410	6608746	3/04/2004	12	4	gravel change to reef rising up
Reef	-35.7074668	174.55584	2651468	6609140	3/04/2004	0	5	
v1	-35.7187951	174.58792	2654347	6607829	1/04/2004	34	4	check video
v10	-35.7105018	174.55517	2651401	6608804	3/04/2004	18	1	
v11	-35.7097829	174.55501	2651388	6608884	3/04/2004	14	4	
v12	-35.7091231	174.55514	2651402	6608957	3/04/2004	13	4	
v13	-35.7084418	174.55529	2651417	6609033	3/04/2004	7	5	
v14	-35.7280112	174.57675	2653317	6606826	3/04/2004	40	1	
v15	-35.7207424	174.57584	2653251	6607634	3/04/2004	33	2	
v16	-35.7132537	174.58176	2653802	6608455	3/04/2004	33	5	
v17	-35.7120306	174.58167	2653796	6608590	3/04/2004	36	3	
v18	-35.7101745	174.58163	2653796	6608796	3/04/2004	39	4	

v19	-35.7085008	174.58156	2653793	6608982	3/04/2004	40	3	
v2	-35.7066555	174.57342	2653061	6609201	1/04/2004	36	3	
v20	-35.7066877	174.58158	2653799	6609183	3/04/2004	42	4	
v21	-35.7048261	174.58152	2653797	6609390	3/04/2004	40	4	
v22	-35.7159305	174.56767	2652521	6608181	3/04/2004	9	5	
v23	-35.7157589	174.5677	2652524	6608200	3/04/2004	11	4	
v24	-35.7153351	174.56781	2652535	6608247	3/04/2004	12	5	
v25	-35.7149435	174.56851	2652599	6608289	3/04/2004	17	5	
v26	-35.7121433	174.57064	2652797	6608596	3/04/2004	29	2	
v27	-35.7073421	174.5574	2651609	6609151	3/04/2004	13	5	
v28	-35.7069505	174.55708	2651582	6609195	3/04/2004	3	5	
v29	-35.7119233	174.54407	2650394	6608665	3/04/2004	6	5	
v29a	-35.7115264	174.54407	2650395	6608709	3/04/2004	7	5	
v3	-35.7129318	174.57491	2653182	6608502	1/04/2004	32	4	
v30	-35.7116122	174.5444	2650425	6608699	3/04/2004	9	5	
v31	-35.7111133	174.545	2650480	6608753	3/04/2004	12	5	
v31a	-35.7113225	174.54507	2650486	6608730	3/04/2004	10	5	
v32	-35.7085867	174.54709	2650674	6609030	3/04/2004	25	3	
v33	-35.7099707	174.5457	2650546	6608879	3/04/2004	15	4	
v33a	-35.7095844	174.54604	2650577	6608921	3/04/2004	19	4	
v34	-35.7136507	174.6035	2655768	6608374	11/06/2004	41	4	
v35	-35.7103998	174.60344	2655770	6608734	11/06/2004	39	4	
v36	-35.7073314	174.60348	2655779	6609075	11/06/2004	43	4	
v37	-35.7102443	174.60819	2656199	6608744	11/06/2004	51	4	w/sand patches
v38	-35.7101102	174.61228	2656570	6608751	11/06/2004	53	4	w/sand patches
v39	-35.7088495	174.61451	2656774	6608887	11/06/2004	51	4	
v4	-35.7134468	174.57483	2653174	6608445	1/04/2004	29	4	
v40	-35.7067949	174.61411	2656743	6609116	11/06/2004	54	4	
v41	-35.7040323	174.61393	2656732	6609423	11/06/2004	52	4	
v42	-	174.60846	2656230	6609078	11/06/2004	48	3	

	35.7072295							
v43	-35.7056845	174.61156	2656514	6609244	11/06/2004	54	4	
v44	-35.7067413	174.59865	2655344	6609148	11/06/2004	41	5	w/ sand gutters
v45	-35.7056738	174.59496	2655012	6609273	11/06/2004	44	2	some patch reef visible
v5	-35.6966508	174.57246	2652995	6610312	1/04/2004	42	4	
v6	-35.6876011	174.57363	2653119	6611314	1/04/2004	46	3	
v7	-35.7124115	174.55515	2651396	6608592	3/04/2004	5	5	
v8	-35.7117839	174.55517	2651399	6608662	3/04/2004	7	5	
v9	-35.7110275	174.55504	2651389	6608746	3/04/2004	10	2	