Biological report on a proposed marine farm renewal (U950139A, Pe378) located east of Fish Bay, Kenepuru Sound

Research, Survey and Monitoring Report Number 498

A report prepared for:

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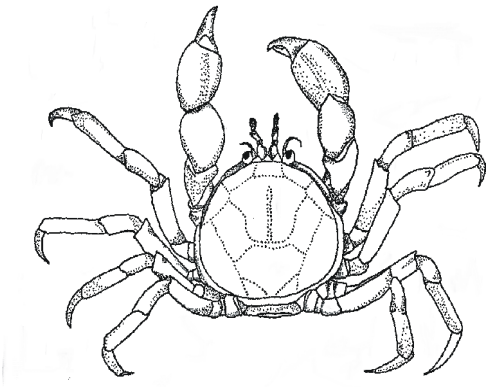

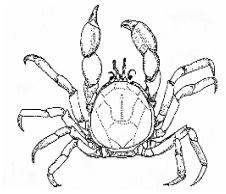

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Introduction

The aim of the present study was to report on the habitats and the impact zone associated with an existing 1.4 ha mussel farm (U950139A, Pe378) located east of Fish Bay, Kenepuru Sound.

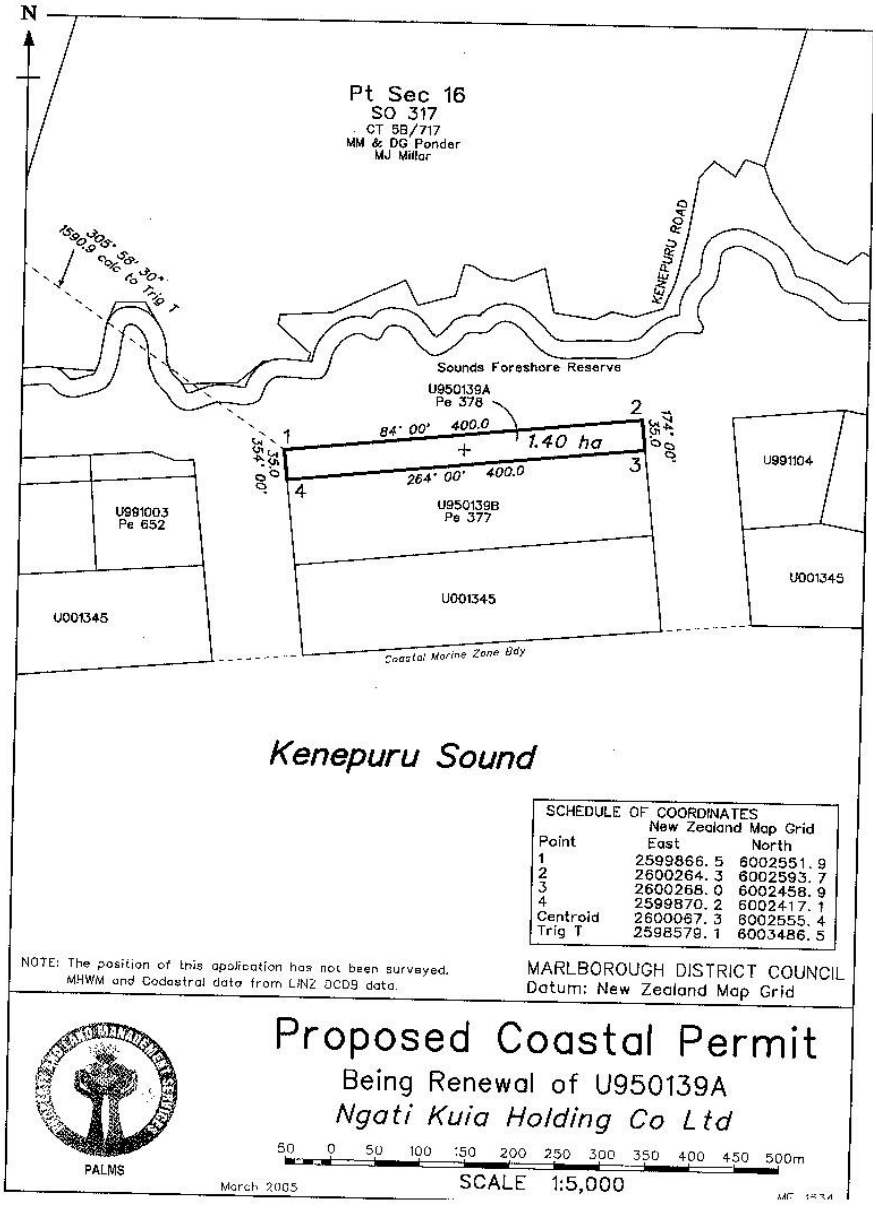

Figure 1. Location and RMA boundary of U950139A in Kenepuru Sound.

Background

Historic biological reports

In 1995, a biological survey was undertaken for the original 6 ha U950139 consent by First Wave Ltd. The following benthic observations were recorded:

> *"Inshore substrate was cobble/gravel to about 2 m depth, where there was a band of dead shell followed by silt to 3 m (about 20 m offshore) and soft silt from 3 – 4 m (from about 35 m offshore onwards). Worm holes were commonly observed in the soft silt substrate. Dog cockles were observed in the silt substrate around 2.5 m depth."*

Davidson and Brown (2000) surveyed three adjacent marine farm areas, including U950139, in September 2000. The authors observed the following benthic substrate characteristics:

> *"Combinations of hard and soft substrata extended from the low tide mark to 15 m at transect 4. Dead whole and broken shell over a base of silt substratum extended for up to 5 m distance beyond the cobble habitat. Beyond the fine sand, silt shell zone, the substratum was dominated by silt and clay material with very little shell material."*

Observations were also made of the biological community found under existing growing structures (Davidson and Brown, 2000).

> *"Within the existing marine farm area, dead shell debris and living mussels were observed under mussel droppers. Mussel shell and associated fine substrata had formed mounds under the droppers with little or no debris associated with mussel farming observed away from droppers. The diversity of surface dwelling species was higher from mussel debris than from the surrounding silt and clay habitat. Dominant species on the shell debris were the 11 arm seastar, sea lettuce, cushion seastar, and triplefin."*

Farming history of the site

According to present farm management, U950139 was approved in August 1995 and this consent was spilt into U950139A and U950139A in April 1999. The Fisheries Permit was granted in January 1997. Currently, 2 farm blocks consisting of 156 m (western block) 165 m (eastern block) backbone lengths are in place at U950139A. The present owners use this consent for production mussel crop.

Study area

The study area is located east of Fish Bay along the northern shoreline of Kenepuru Sound, some 18 km from its entrance into Hikapu Reach. Kenepuru Sound has a coastline of approximately 73 km and encompasses an area of sea of approximately 4450 ha. At the location of the proposed renewal area, Kenepuru Sound is approximately 1.2 km wide.

Methods

The site was sampled on August 3rd and 9th 2005. Prior to fieldwork, the proposed renewal area consent boundaries were plotted onto mapping software (TUMONZ). The laptop running the mapping software was linked to a Lowrance LC X-15$_{MT}$ GPS receiver allowing real-time plotting of the corners of surface marine farm structures and to pinpoint drop camera stations in the field. This GPS system has a maximum error of 10 m distance.

The corners of the existing marine farm surface structures were surveyed by positioning the survey vessel immediately adjacent to the corner floats and their position plotted. It should be noted that surface structures can move due to environmental variables such as tidal current and wind. The plot of surface structures is therefore variable from day to day and over the duration of tidal cycles. These data should not therefore be regarded as a precise measurement of the position of surface structures, but rather an approximate position.

Drop camera stations

A total of 24 drop camera photographs were collected from the consent renewal area and adjacent areas (Figure 2). At each site, an IKELITE underwater splash camera fixed to a tripod was lowered to the benthos and an oblique still photograph was collected where the tripod landed on the benthos. The location of photograph stations were selected in an effort to obtain a representative range of habitats inshore, alongshore and offshore of the growing structures, and to detect the extent of spread of mussel shell debris on the benthos. Additional photographs were taken when features of particular interest (e.g. shell debris, reef structures, horse mussels) were observed on the remote monitor on-board the survey vessel. In particular instances, the boat was left to drift so that observations of the benthos could be made via the camera monitor. All photographs collected during the survey have been included in Appendix 1.

Shell debris quadrats

Divers estimated the percentage cover of mussel shell debris from a total of 6 transects each comprising 12 contiguous $1m^2$ quadrats. Shallow depths meant the droppers were visible by divers underwater. Each transect of quadrats began directly under the inshore backbone and progressed perpendicular to the backbone orientation in a shoreward direction. Divers also recorded depth at the start and end of transect, habitat, and noted any important ecological, scientific or conservation features.

Mussel shell debris was defined as "*mussel shell originating from the activity of growing mussels*". Mussel debris therefore included live and dead green and blue mussels. Natural shell debris such as scallop, dog cockle, topshell, and horse mussel shell were not included in percentage cover estimates. Mussel shell debris data has been presented in Appendix 2.

Plate 1. Looking east along the lines of U950139A and B, Kenepuru Sound.

Figure 2. U950139A located east of Fish Bay in Kenepuru Sound, showing the marine farm consent area (light grey) and location of surface structures (pink). Triangles are locations of drop camera stations; numbers are the photo number and approximate water depth (m).

Results

Drop camera stations – depth, habitat, shell debris

Most of Kenepuru Sound is relatively shallow, with offshore depths ranging from 5 to 24 m depth (see Navy Chart NZ615). In the vicinity of the proposed consent renewal, offshore depths were between 3 to 5 m (Figure 1, Table 1).

Table 1. Depths recorded from the outer structure corners of U950139A/B (low tide).

Corner	Location	Depth
1	South-east	3.8 m
2	South west	4.7 m
3	North-west	3.8 m
4	North-east	3.6 m

Substratum

Substratum and habitat distribution relative to the proposed consent renewal area were based on drop camera images (Table 2, Appendix 1) and diver observations made during the collection of quadrat data (Appendix 2).

Hard substratum (i.e. cobbles, bedrock) was not recorded from the existing consent or adjacent areas (Table 2, Appendix 1). The entire substratum was characterised by soft silt and clay.

Shell debris under growing structures

Photos taken within the growing structures had estimated shell debris cover values ranging from none to moderate (photos 2 – 4, 7 – 9) (Table 2, Appendix 1). Observed mussel debris was dead and live green mussel shell of varying sizes. Most debris was in the process of being covered by soft silt. Most shell debris was observed from under the droppers, where a small mound had accumulated over time.

Table 2. Drop camera station location, substratum, and relative cover of mussel shell debris.

No. & Depth (m)	Coordinates	Location	Substratum	Shell debris
1, 4.2m	41 10.73964,174 04.24765	outside consent	silt and clay	none
2, 4.1m	41 10.73963,174 04.27819	under structures	silt and clay	none
3, 4m	41 10.73635,174 04.30481	under structures	silt and clay	none
4, 3.8m	41 10.73310,174 04.34123	under structures	silt and clay	none
5, 3.6m	41 10.72671,174 04.37725	in consent	silt and clay	none
6, 3.6m	41 10.72141,174 04.41893	in consent	silt and clay	none
7, 3.9m	41 10.71921,174 04.44564	under structures	silt and clay	none
8, 3.4m	41 10.71741,174 04.47636	under structures	silt and clay	low
9, 3.5m	41 10.71486,174 04.51265	under structures	silt and clay	moderate
10, 3.6m	41 10.71170,174 04.54407	in consent	silt and clay	none
11, 3.4m	41 10.71504,174 04.57431	outside consent	silt and clay	none
12, 3.5m	41 10.71975,174 04.56208	in consent	silt and clay	none
13, 3.4m	41 10.70051,174 04.56241	outside consent	silt and clay	none
14, 3.7m	41 10.70242,174 04.53155	outside consent	silt and clay	none
15, 3.6m	41 10.70492,174 04.48889	outside consent	silt and clay	none
16, 3.5m	41 10.71003,174 04.42790	outside consent	silt and clay	none
17, 3.5m	41 10.71611,174 04.39560	outside consent	silt and clay	none
18, 2.5m	41 10.68924,174 04.52518	outside consent	silt and clay	none
19, 3.3m	41 10.70367,174 04.35620	outside consent	silt and clay	none
20, 3.5m	41 10.71927,174 04.35216	outside consent	silt and clay	none
21, 3.6m	41 10.72614,174 04.31644	in consent	silt and clay	none
22, 3.6m	41 10.72657,174 04.28184	outside consent	silt and clay	none
23, 3.4m	41 10.71206,174 04.30227	outside consent	silt and clay	none
24, 3.3m	41 10.70574,174 04.33106	outside consent	silt and clay	none

Shell debris from areas adjacent to growing structures

Photographs taken from areas alongshore and inshore of the existing farm structures showed no mussel shell debris adjacent to farming structures or outside of the consent area (e.g. photos 1, 10, 14, 16, 21) (Table 2, Appendix 1).

Mussel shell debris from diver transects

Mussel shell debris data collected from 72 quadrats along 6 transects have been presented in Appendix 2.

The percentage cover estimates for mussel shell debris ranged from 10 to 65 % cover directly adjacent to the inshore backbone (Appendix 2). Mean mussel shell debris declined to < 5 % cover

by 5 m distance from the backbone and debris ended between 5 to 10 m distance (Figure 3). Due to relatively high sedimentation in Kenepuru Sound, much of the shell debris appeared to be in a process of smothering by silt and clay sediments.

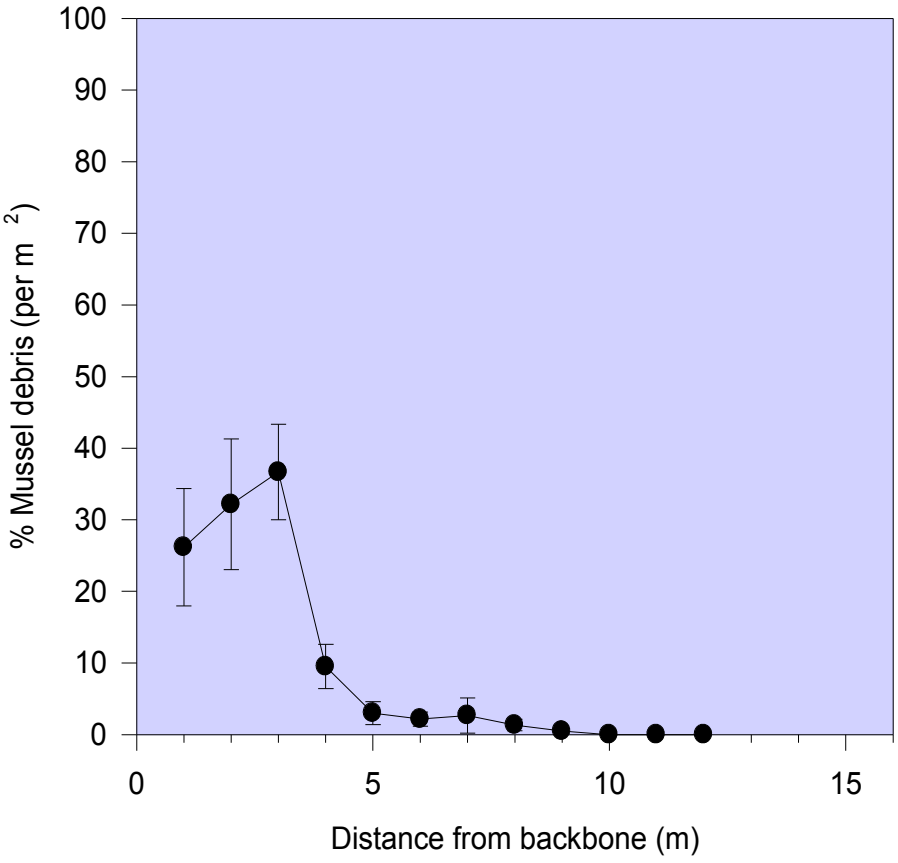

Figure 3. Mean percentage cover of mussel shell debris collected from contiguous quadrats installed along transects at the inshore backbone. Error bars are +/- 1 s.e.

Conclusions

All of the benthos under existing mussel farming structures and the adjacent area was dominated by soft substratum (i.e. silt and clay). No natural shell or hard substratum was observed by divers or from drop camera photographs.

The maximum spread of shell debris associated with mussel farming activities was 10 m at this site, however most shell was recorded < 5 m distance form the dropper. No mussel debris was observed outside of the consent area in drop camera photographs

We note that some surface structures were positioned outside of consent area (i.e. western end).

References

Davidson, R.J. and Brown, D.A. 2000. Biological report on three proposed marine farm areas located in inner Kenepuru Sound. Prepared by Davidson Environmental Limited for United Fisheries Ltd. Survey and Monitoring Report No. 362.

Appendix 1. Drop camera photos from U950139A/Pe378, Kenepuru Sound.

Photo site 1

Photo site 2

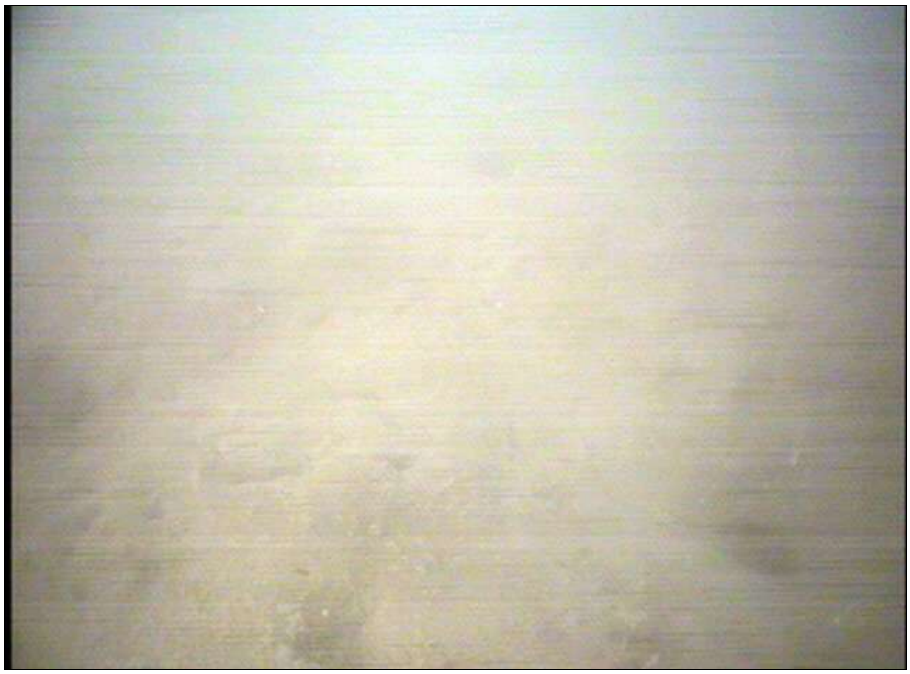

Photo site 3

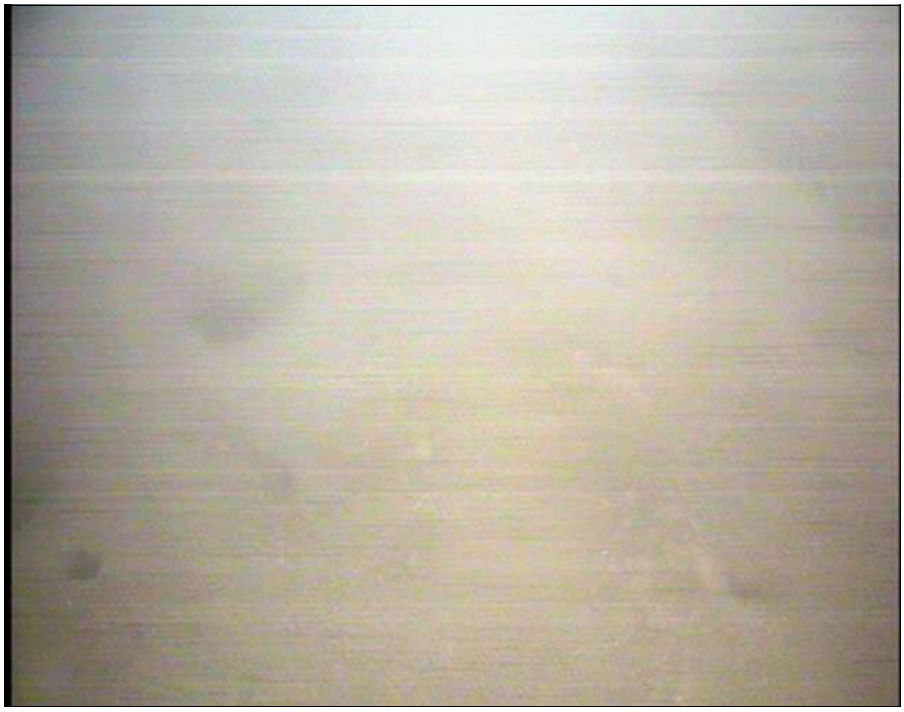

Photo site 4

Photo site 5

Photo site 6

Photo site 7

Photo site 8

Photo site 9

Photo site 10

Photo site 11

Photo site 12

Photo site 13

Photo site 14

Photo site 15

Photo site 16

Photo site 17

Photo site 18

Photo site 19

Photo site 20

Photo site 21

Photo site 22

Photo site 23

Photo site 24

Appendix 2. Raw data and averages for percent mussel shell debris quadrats.

Transect	1	2	3	4	5	6	7	8	9	10	11	12	Depth range (m)	Substratum deep	Substratum shallow
1															
% shell debris	25	20	30	10	0	0	0	0	0	0	0	0	3.3 - 4	silt and clay	silt and clay
2															
% shell debris	10	15	25	10	2	0	0	0	0	0	0	0	3.3 - 4	silt and clay	silt and clay
3															
% shell debris	25	35	15	2	0	1	0	0	0	0	0	0	3.3 - 4	silt and clay	silt and clay
4															
% shell debris	65	30	45	0	10	6	1	1	1	0	0	0	3.3 - 4	silt and clay	silt and clay
5															
% shell debris	12	18	45	20	5	4	15	5	2	0	0	0	3.3 - 4	silt and clay	silt and clay
6															
% shell debris	20	75	60	15	1	2	0	2	0	0	0	0	3.4 - 4	silt and clay	silt and clay
N	6	6	6	6	6	6	6	6	6	6	6	6			
Mean %	26.17	32.17	36.67	9.5	3	2.167	2.667	1.333	0.5	0	0	0			
SD	20.05	22.32	16.33	7.583	3.899	2.401	6.055	1.966	0.837	0	0	0			
SE	8.187	9.112	6.667	3.096	1.592	0.98	2.472	0.803	0.342	0	0	0			