Specialists in research, survey and monitoring

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Ecological report for the proposed renewal of marine farm site 8170 located Melville Cove, Port Gore

Research, survey and monitoring report number 653

A report prepared for:
Ngati Apa
C/O PALMS LTD
P.O. Box 751
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1.0 Introduction

The aim of the present study was to describe the impact zone and habitats associated with a 4.916 ha marine farm (site 8170). The farm is located along the western shoreline of Melville Cove, Port Gore (Plate 1).

Present surface structures consist of two farm blocks. This report was commissioned by PALMS LTD on behalf of the farm owner Ngati Apa.

Plate 1. Location of marine farm site 8170 located along the western shoreline of Melville Cove, Port Gore.

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Plate 2. Marine farm site 8170 looking south-westward along the backbone lines from the northern-most block.

2.0 Background information

2.1 Study area

Melville Cove is located in the western part of inner Port Gore. Port Gore is an enclosed body of water bounded by Capes Lambert on the west, and Jackson on the east, and opening directly into Cook Strait. Melville Cove has a coastline length of approximately 7230 m and covers an area of sea of approximately 316.2 ha. The mouth of Melville Cove is approximately 1650 m wide.

2.2 Historical reports

One biological study for the parent farm application was conducted by R. Davidson in September 1995 for Ngati Apa.

The author stated:

1) substrata present were bedrock, pebbles, cobbles, shelly mixes (i.e. dead whole and broken shell) and silts and clays (mud);

2) no bedrock reef or rubble habitat was recorded within the boundaries of the proposed marine farm;

3) at both transects, beds of relatively dense straw worms (Maldanidae sp.?) were recorded within the boundaries of the proposed marine farm;

4) similar habitats and communities were recorded from the length of the proposed marine farm; and

5) soft bottom substrata especially, dead whole and broken shell and silts (mud) dominated the majority of the proposed marine farm area.

Both shore profiles were initially extensions of the intertidal shore being dominated by a cobble/pebble substrata with an almost complete absence of brown macroalgae. An inshore shallow zone abruptly terminated in soft substrata dominated by shelly sand with a

component of dead whole and broken shell at approximately 20 to 40 m distance from shore. This relatively coarse bottom terminated in mud sediments at approximately 22 m depth and 70 m to 90 m distance from low water. From the transects and scooter run, a total of 25 conspicuous species of invertebrate, 4 algae, 1 ascidian and 5 species of bony fish were recorded. Spotty (*Notolabrus celidotus*) were numerically the most abundant reef fish. Only one small blue cod (< 30 cm length) was observed during the investigation.

Scallops were recorded from the soft bottom shore within the proposed marine farm mostly < 100 m distance from shore. Densities from one 5 x 1 m quadrat collected from an area where scallops appeared most common were 1 scallop per 5 m^2 or 0.2 per m^2. This density is above that considered as commercially viable, but is probably below the density which would be considered acceptable to recreational divers due to the abundance of scallops elsewhere in Port Gore (author, pers. obs.).

Horse mussels were recorded from the soft bottom shore within the proposed marine farm. Densities were very low, < 0.2 per m^2. These densities are very low when compared to particular areas in the Marlborough Sounds and do not constitute a horse mussel bed.

A small area of red algae (unidentified species) was observed from a narrow strip on transect 2. This was outside the proposed marine farm boundaries.

Soft bottom tubeworms were recorded from relatively widespread beds within the proposed marine farm within 100 m from shore. These beds were colonised by soft tubeworms in relatively high densities. No tubeworm beds were recorded more than 90 m distance from shore.

All of the benthos investigated below the proposed marine farm was dominated by soft bottoms (dead whole and broken shell, silty sands and silts). Muds were restricted to 80 m to 90 m distance from shore and beyond. Mud substrata was colonised by relatively low range of conspicuous epibenthic species which were all recorded or observed in relatively low numbers in the present investigation. Communities recorded from the inshore 40 m of the proposed farm were colonised by a range of epibenthic species including dense tubeworm beds and relatively low densities of scallops and horse mussels.

The soft and hard shore communities recorded from the present study were dominated by species that are widespread and common throughout the subtidal shores of sheltered

Pelorus Sound (Dell, 1951; Estcourt, 1967; Roberts and Asher, 1993; McKnight and Grange, 1991). This is not unexpected as Melville Cove is probably one of the most sheltered parts of Port Gore. Within the inshore 40 m of the proposed marine farm, beds of soft bottom dwelling tubeworms were observed in relatively high numbers. Relatively low densities of scallops and horse mussels were also observed within the proposed marine farm. No other species of special scientific or ecological importance were observed during the study.

The proposed areas beyond 90 m from shore were composed of silts and clays (mud). The associated flora and fauna was represented by a relatively low diversity of marine biota. This soft bottom habitat and all associated species are widespread in sheltered parts of the Marlborough Sounds. Between 50 m and 90 m distance from shore, dense soft bottom tubeworm beds which would be adversely effected by mussel shell debris were observed along the entire length of the proposed marine farm.

A second report was conducted for the southern extension (Davidson 2001).

The subtidal habitats recorded from transects 1, 2, 4, and 5 were comparable. At these transects, the shallow subtidal was initially dominated of boulder, cobble and pebble substrata. With increasing depth, the proportion of hard shore substrata declined and was replaced by dead whole shell and broken shell material over a base of silt substrata.

Beyond the dead whole and broken shell over a base of silt zone the benthos was dominated by silt and clay. Where present, this habitat extended to the offshore extent of transects.

The subtidal shore profile at transect 3 was different to those recorded from the other transects. At transect 3, a relatively extensive reef and cobble bank was recorded offshore to 160 m from mean low water. Beyond the reef and cobble zone, the benthos was dominated by dead whole and broken shell over a base of silt substrata.

Species or habitats recorded by divers that are included in the Department of Conservation guideline (DoC, 1995) included hard shore substrata, brachiopods, horse mussels, tube worms and scallops.

Brachiopods

The lampshell (*Terebratella sanguinea*) was recorded from all transects. The estimated density of this lampshell was 1 to 4 individuals per m^2. Based on observations from around the margins of the Marlborough Sounds and Port Gore, this species is relatively widespread and can reach considerably higher densities than those observed at this site. This density is well below the Department of Conservation trigger level of 20 individuals per m^2.

Hard Shore Substrata

Hard shore substrata (i.e. boulder and cobble material) have been known as habitat for reef fish such as blue cod (Cole et al., 2000). At the present site, bedrock, cobble and boulder habitat extended into the proposed north-eastern extension area. Modifications to the proposed extension areas have been suggested in order that the mussel growing structures will not be placed over this hard shore habitat. No zone of fish feeding holes were observed from any transect or during free swims during the present study.

Horse mussels

The density of horse mussels recorded from quadrats was 0.039 individuals per m^2. This was below the Department of Conservation trigger level (> 0.2 individuals per m^2).

Scallops

No scallops were recorded from quadrats collected along the five transects. The Department of Conservation trigger level is > 0.1 individuals per m^2. Scallops were, however, observed from the application areas outside the quadrats as isolated individuals.

Parchment worms

Parchment worms were recorded from transects 1, 2, 4 and 5. They were recorded in a relatively narrow band on dead whole and broken shell over a base of silt substrata. In these areas, they reached up to 60% cover. The Department of Conservation (1995) guideline trigger level is > 10% cover. This level was exceeded at transects 1, 2, 4, and 5 within distinct depth strata. They are:

- Transect 1 = 50 m to 60 m distance from MLW;

- Transect 2 = 40 m to 55 m distance from MLW;

- Transect 4 = 90 m to 100 m distance from MLW; and

- Transect 5 = 90 m to 110 m distance from MLW;

Parchment worms were often recorded adjacent to these zones, but at abundances less than the Department of Conservation trigger level.

Silt and clay soft bottom substrata and its associated community dominated the adjusted area under the proposed marine farm. This habitat supports a low variety of species often in low abundance.

3.0 Methods

The site was sampled on 3rd October 2010. Prior to fieldwork, the consent corners 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 marine farm surface structures and to pinpoint drop camera stations in the field. This GPS system has a maximum error of +/- 5 m.

The corners of the existing marine farm surface structures were surveyed by positioning the survey vessel immediately adjacent to the corner floats and the 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 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.

On the day of the survey, low tide was 0.37 m at 9.54 am and high tide was 0.96 m at 4.54 pm. During the survey, the tide was incoming.

3.1 Drop camera stations and site depths

A total of 25 drop camera photographs were collected from within existing farm backbones, areas alongshore of backbones, and areas inshore and offshore of the backbones during the present investigation. At each site, a Sea Viewer underwater splash camera fixed to an aluminium frame was lowered to the benthos and an oblique still photograph was collected where the frame landed.

The cover of mussel shell debris from drop camera photographs were ranked as: None = no mussel shell debris, Low = 1-30%, Moderate = 31-50%, Moderate to High = 51-75%, and High = 76-100% cover. This assessment is displayed in Table 2 of the present report.

The location of photograph stations was selected in an effort to obtain a representative range of habitats within consented farm structures (backbones and warps) and from areas adjacent to structures. Additional photographs were taken when any features of particular interest (e.g. shell debris, reef structures, cobbles) were observed on the remote monitor on-board the survey vessel. All photographs collected during the survey have been included in Appendix 1.

3.2 Diver-collected shell debris quadrats and habitat descriptions

Divers estimated the percentage cover of mussel shell debris from a total of 125 quadrats collected from 5 transects, with each transect comprising 25 contiguous 1 m^2 quadrats. Each transect of quadrats began under the inshore backbone of the southern farm block and progressed perpendicular to the backbone in a shoreward direction. To ensure quadrats were initiated under the inshore dropper, a 100 m lead-lined rope was deployed from the boat directly adjacent to the dropper. Divers also recorded depth at the start and end of transect, habitat, and 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, top-shell, and horse mussel shell were not included in percentage cover estimates. Mussel shell debris data has been presented in Appendix 2.

4.0 Results

4.1 Consent corners and existing surface structures

Inshore corner depths of the marine farm consent ranged from 15 to 25.7 m, while offshore corner depths were 27.6 to 28.6 m (Table 1, Figure 1).

The consent area and areas occupied by surface structures (pink) have been plotted in Figure 1. Depths and locations of all drop camera stations have been listed in Table 2 and plotted in Figure 2.

During the survey, backbones were located within or very close to the consent boundaries (Figure 1).

Table 1. Depths recorded from the corners of mussel farming surface structures and consent corners. Depths adjusted to datum. Coordinates = NZTM (Northing/Easting).

Type	No. & Depth (m)	Coordinates
Consent corner	1, 27.6m	1698833.7,5455747.6
Consent corner	2, 21.4m	1698825.8,5455842.2
Consent corner	3, 21.1m	1698928.7,5456029.0
Consent corner	4, 15m	1698912.7,5456040.9
Consent corner	5, 25.7m	1699078.2,5456266.5
Consent corner	6,28.6m	1699166.9,5456201.5
Consent corner	7, 27.8m	1699001.3,5455975.9
Structure corner	27.8m	1698874.2,5455808.6
Structure corner	21.4m	1698862.2,5455902.9
Structure corner	19.6m	1698908.5,5455979.8
Structure corner	28.2m	1698968.7,5455936.0
Structure corner	28m	1699036.3,5456017.8
Structure corner	21.7m	1698949.6,5456093.8
Structure corner	25.4m	1699048.3,5456221.9
Structure corner	28.6m	1699140.5,5456156.1

4.2 Substratum and mussel debris

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

The benthos under the consent area was dominated by silt and clay substratum (e.g. photos 6, 7, 11, 21). Combinations of natural shell and fine sand were observed from areas immediately inshore of the consent (e.g. photos 12, 13, 14).

Mussel shell debris was observed from areas under backbones (e.g. photos 5, 19). No mussel shell was observed under warps, however mussel shell was observed immediately inshore of the consent (e.g. photos 13, 15).

Mussel debris ranged from none to high percentage cover estimates (Table 2). For most drop camera photos, mussel debris was absent or relatively low.

Table 2. Coordinates of drop camera stations showing depths, substratum and level of mussel shell debris. Depths adjusted to datum. Pink = under backbone growing structures, Grey = in consent, not under backbone growing structures but can be around warps, Blue = outside consent area. Mussel shell debris in photos ranked as: None = no mussel shell debris, Low = 1-30%, Moderate = 31-50%, Moderate to High = 51-75%, and High = 76-100% cover.

No. & Depth (m)	Coordinates	Location	Substratum	Shell debris
1, 28.5m	1699125.3,5456129.6	Offshore of consent, no structures	Silt and clay	None
2, 28.6m	1699084.8,5456062.7	Offshore of consent, no structures	Silt and clay	None
3, 28.2m	1699013.1,5455966.6	Offshore of consent, no structures	Silt and clay	None
4, 27.6m	1699040.4,5456058.6	In consent, under backbones	Silt and clay, mussel shell	Low
5, 27.7m	1699084.0,5456126.6	In consent, under backbones	Silt and clay	None
6, 28m	1699136.5,5456222.5	In consent, no structures	Silt and clay	None
7, 27m	1699075.6,5456231.6	In consent, under warps	Silt and clay	None
8, 27.3m	1699052.1,5456178.5	In consent, under backbones	Silt and clay	None
9, 23.3m	1699002.6,5456156.5	In consent, under backbones	Silt and clay, mussel shell	Low
10, 27 m	1699000.5,5456106.7	In consent, under backbones	Silt and clay	None
11, 25.4m	1698957.5,5456071.8	In consent, under warps	Silt and clay	None
12, 26m	1699046.3,5456233.4	Inshore of consent, no structures	Silt and clay, natural shell	None
13, 20.8m	1699013.0,5456188.4	Inshore of consent, no structures	Silt and clay, natural & mussel shell	High
14, 15.4m	1698979.7,5456170.3	Inshore of consent, no structures	Silt, fine sand, natural shell	None
15, 21m	1698961.8,5456121.7	Inshore of consent, no structures	Silt and clay, mussel shell	Low
16, 19.2m	1698921.6,5456035.6	Alongshore of consent, no structures	Silt, fine sand, natural shell	None
17, 19m	1698901.8,5455976.6	In consent, no structures	Silt and clay, mussel shell	Low-moderate
18, 20m	1698871.1,5455930.0	In consent, no structures	Silt and clay, mussel shell	Low
19, 23.4m	1698885.0,5455909.1	In consent, under backbones	Silt and clay, mussel shell	Low-moderate
20, 24m	1698917.5,5455961.4	In consent, under backbones	Silt and clay, mussel shell	Low
21, 28.5m	1698959.7,5455969.8	In consent, under warps	Silt and clay	None
22, 28.4m	1698923.8,5455909.8	In consent, under backbones	Silt and clay, mussel shell	Low
23, 27m	1698880.1,5455850.4	In consent, under backbones	Silt and clay, mussel shell	Low-moderate
24, 30m	1698824.3,5455798.8	Alongshore of consent, no structures	Silt and clay	None
25, 23.8m	1698846.6,5455864.8	In consent, under warps	Silt and clay, natural shell	None

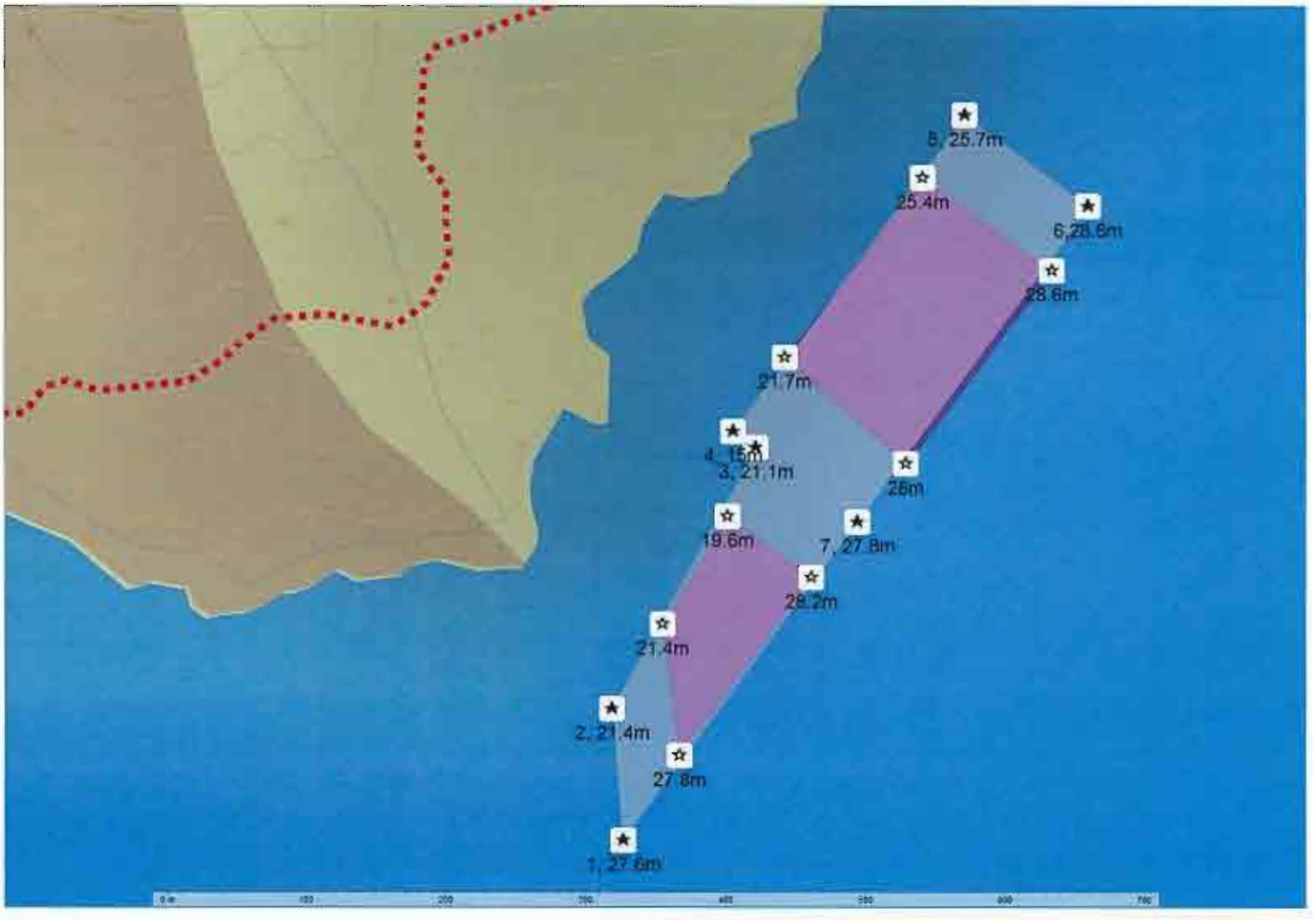


Figure 1. Depths of the marine farm (grey block) and surface structures (pink) for site 8170.

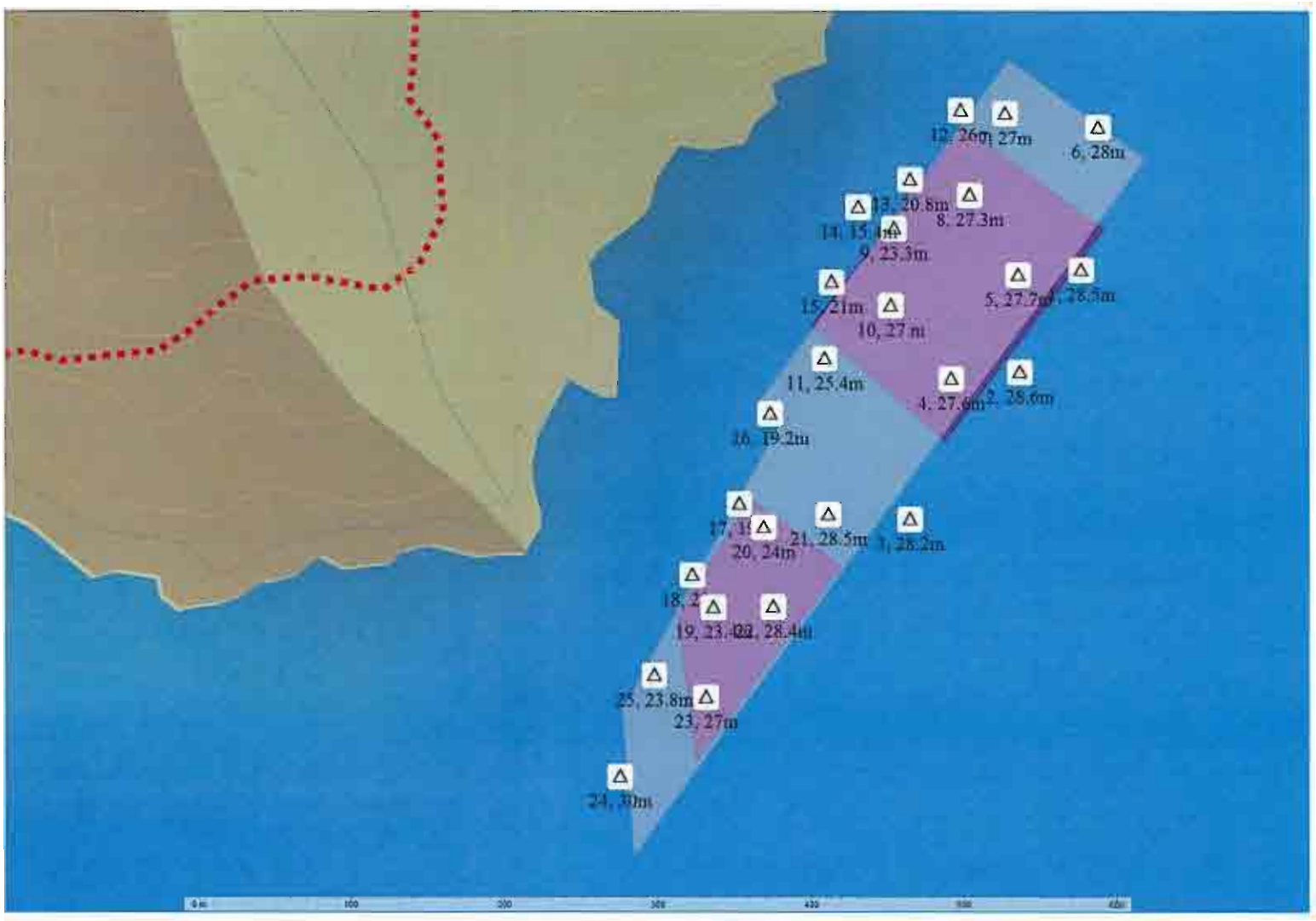
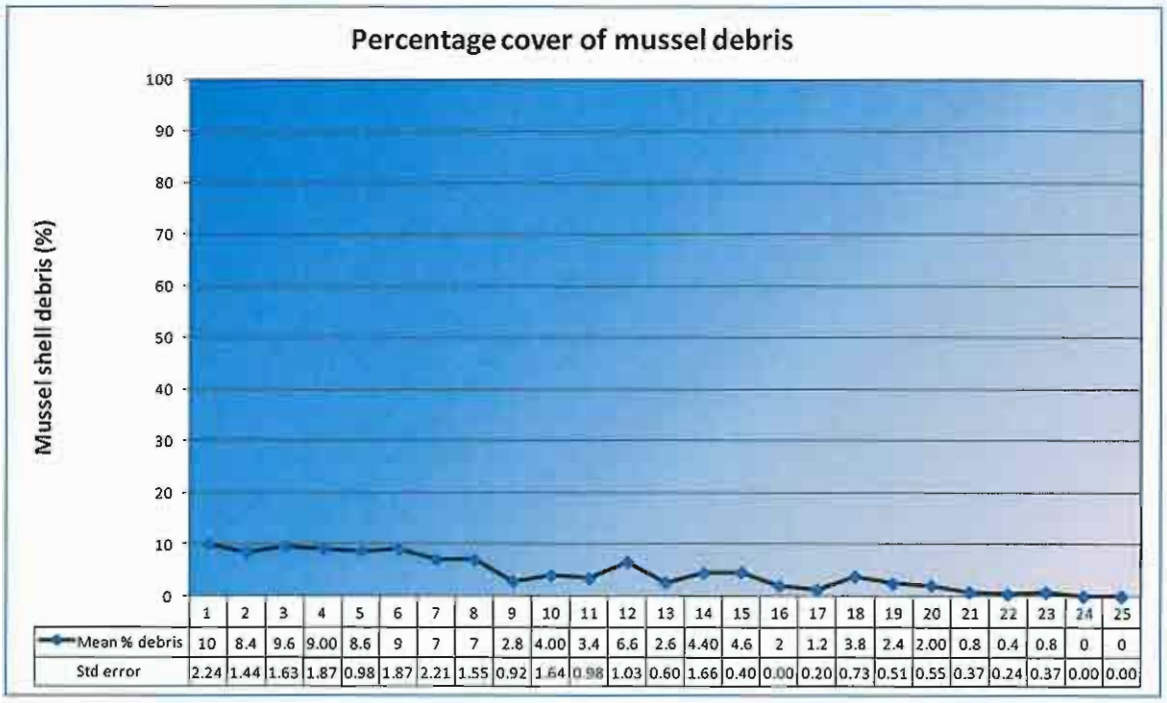


Figure 2. Location of marine farm consent area (light grey) and surface structures (pink). Triangles are locations of drop camera stations; numbers are the photo number and water depth (m).



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Mean % debris	10	8.4	9.6	9.00	8.6	9	7	7	2.8	4.00	3.4	6.6	2.6	4.40	4.6	2	1.2	3.8	2.4	2.00	0.8	0.4	0.8	0	0
Std error	2.24	1.44	1.63	1.87	0.98	1.87	2.21	1.55	0.92	1.64	0.98	1.03	0.60	1.66	0.40	0.00	0.20	0.73	0.51	0.55	0.37	0.24	0.37	0.00	0.00

Figure 3. Mean percentage cover of mussel shell debris versus increasing distance from the backbone. Mean values were collected from contiguous quadrats installed along transects extending perpendicular to the inshore backbone. Standard error values are listed (1 s.e).

4.3 Diver observations of shell debris

Mussel shell debris immediately below the inshore backbone of the southern farm block at its southern end was very low with a mean shell cover directly under the backbone of 10% (Appendix 2). Mussel shell was relatively widespread but at low levels. By 13m distance from the dropper, mean mussel shell debris declined and remained below 5% cover (Figure 3). No mussel shell debris was observed beyond 24 m distance from the backbone (Figure 3).

5.0 Conclusions

5.1 Impact

Mussel shell under and adjacent to backbones ranged from none to high values, however, most photographs showed none to low levels of mussel debris. This level of shell debris is representative of relatively low impact mussel farms in the Marlborough Sounds. No mussel shell debris was recorded in association with warps, however, mussel shell was relatively widespread inshore of the consent but at low levels. Reasons for the widespread distribution of mussel shell at low levels may be due to deck cleaning activities and or an inshore wind during harvest that has pushed the vessel and line the line further inshore than the normal location.

5.2 Benthos

The benthos under the farm area was dominated by silt and clay. Silt substratum is traditionally regarded suitable for consideration for marine farming activities in Marlborough. Areas of natural shell and fine sand were observed from areas immediately inshore of the consent. There was no indication that the farm has had an adverse impact on these inshore habitats.

No hard substratum in the form of cobbles, boulders and bedrock was observed during the present study.

5.2 Boundary adjustments and validation

No adjustments to the present farm boundaries due to ecological issues are recommended.

References

Davidson, R.J. 2001. Report Biological report on a proposed marine farm extension located in west Melville Cove, Port Gore. Survey and Monitoring Report No. 391. Prepared by Davidson Environmental Limited for Ngati Apa Ki Te Waipounamu Trust.

Davidson, R.J. 1995. Description of the subtidal macrobenthic community from a proposed marine farm in Melville Cove, Port Gore. Survey and Monitoring Report No. 58. Prepared by Davidson Environmental Limited for Ngati Apa Ki Te Waipounamu Trust.

Appendix 1. Drop camera photographs

Photo site 1

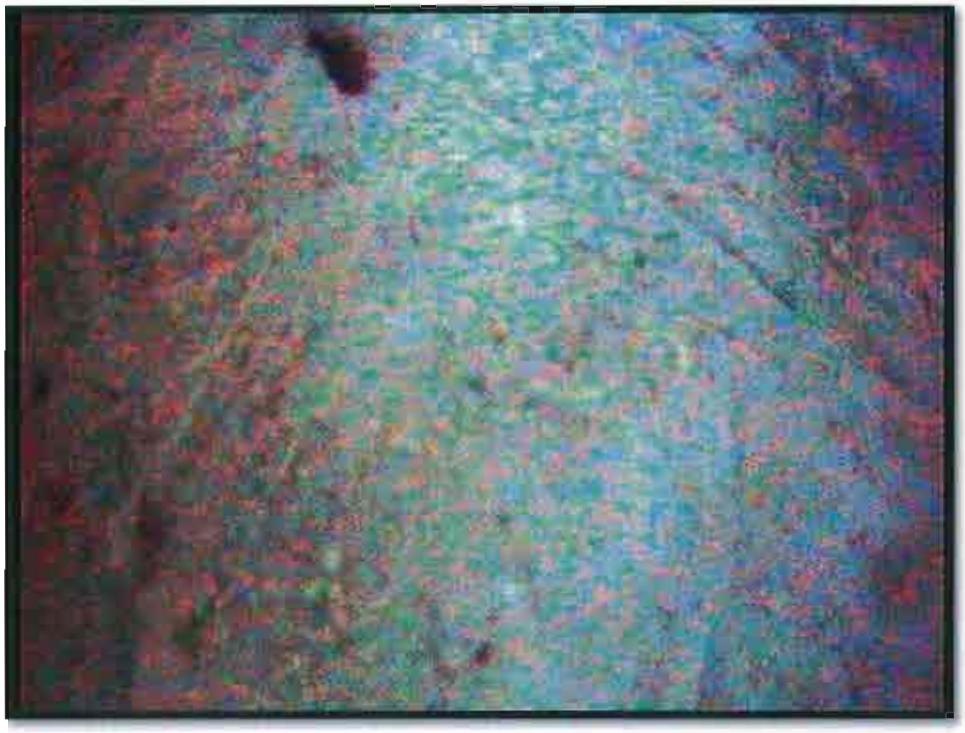


Photo site 2

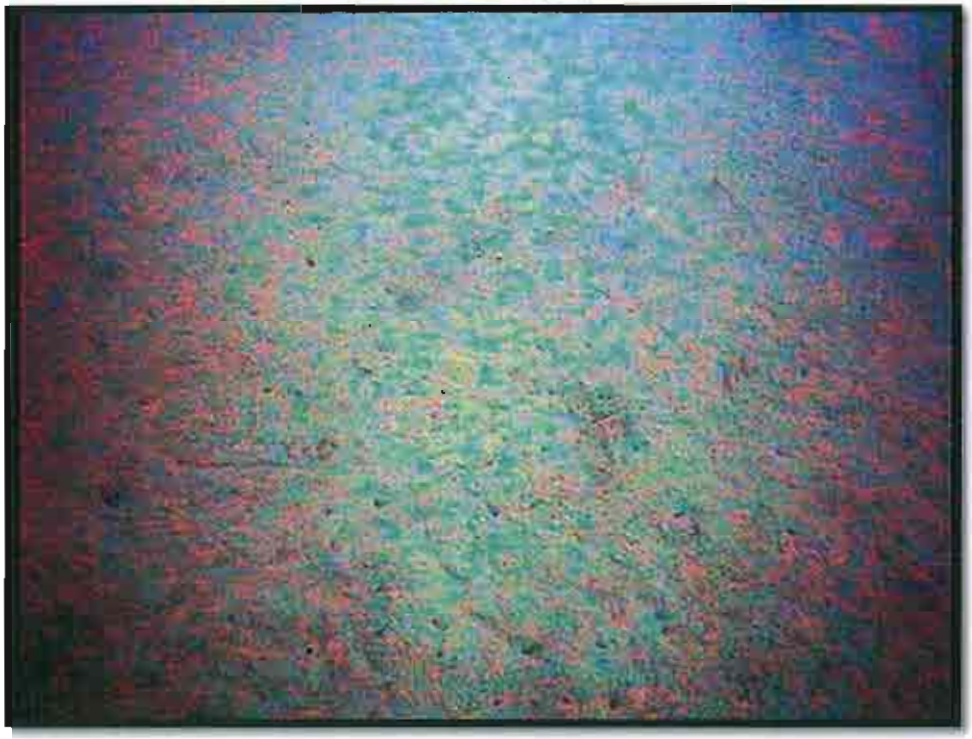


Photo site 3

Photo site 4

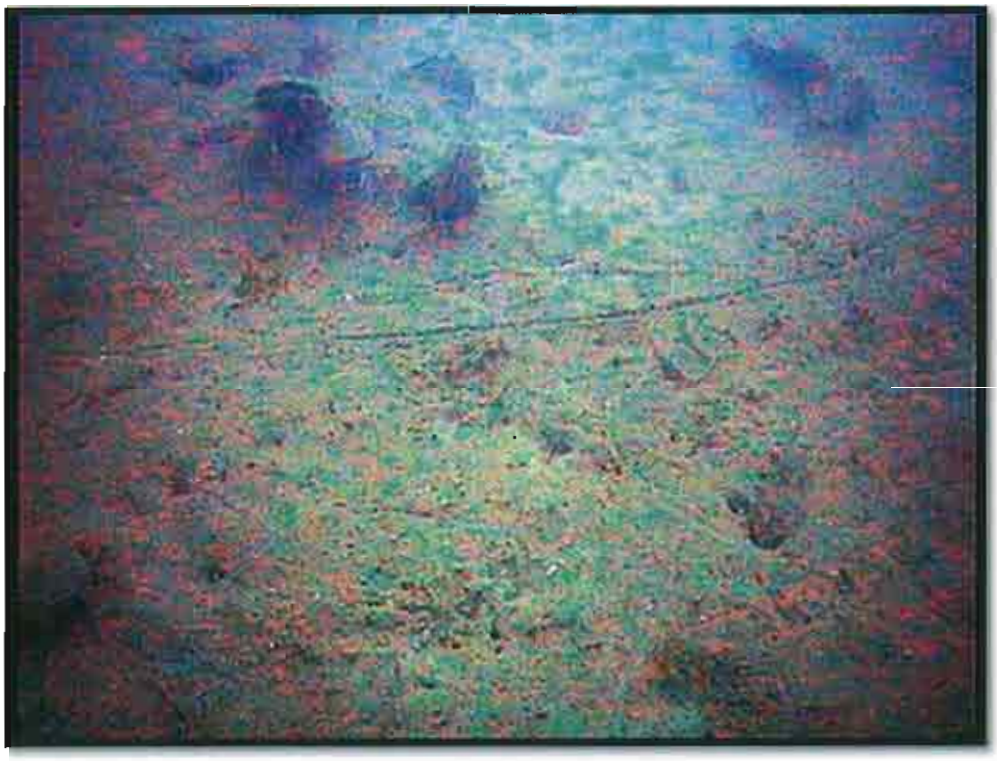


Photo site 5

Photo site 6

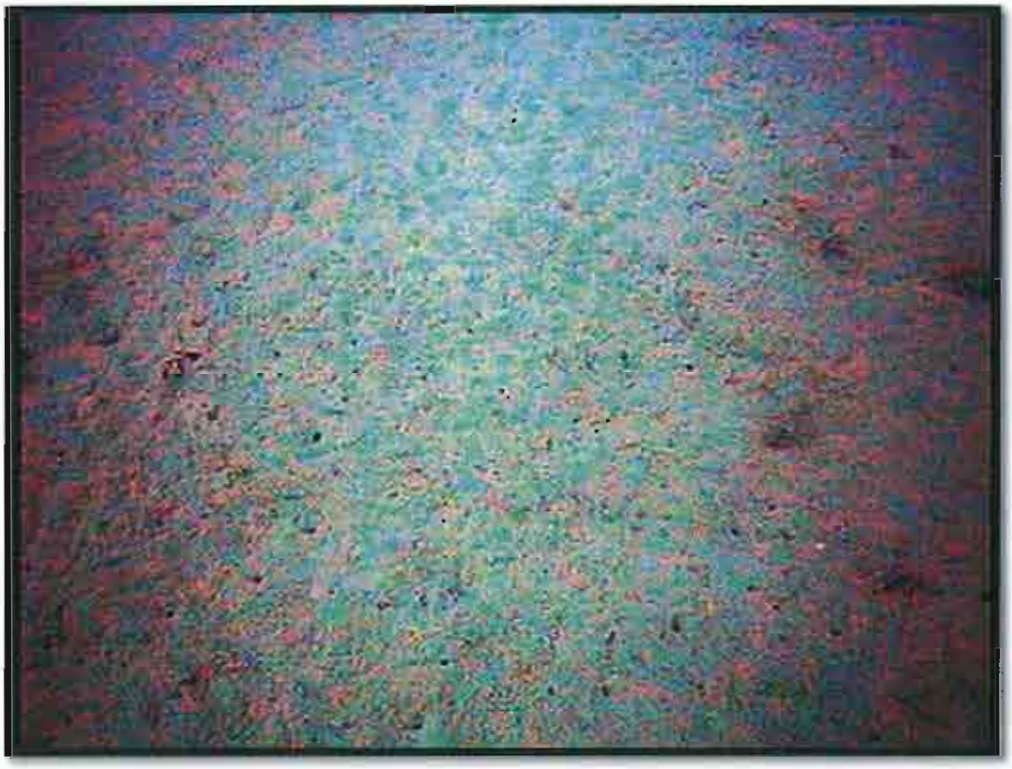


Photo site 7

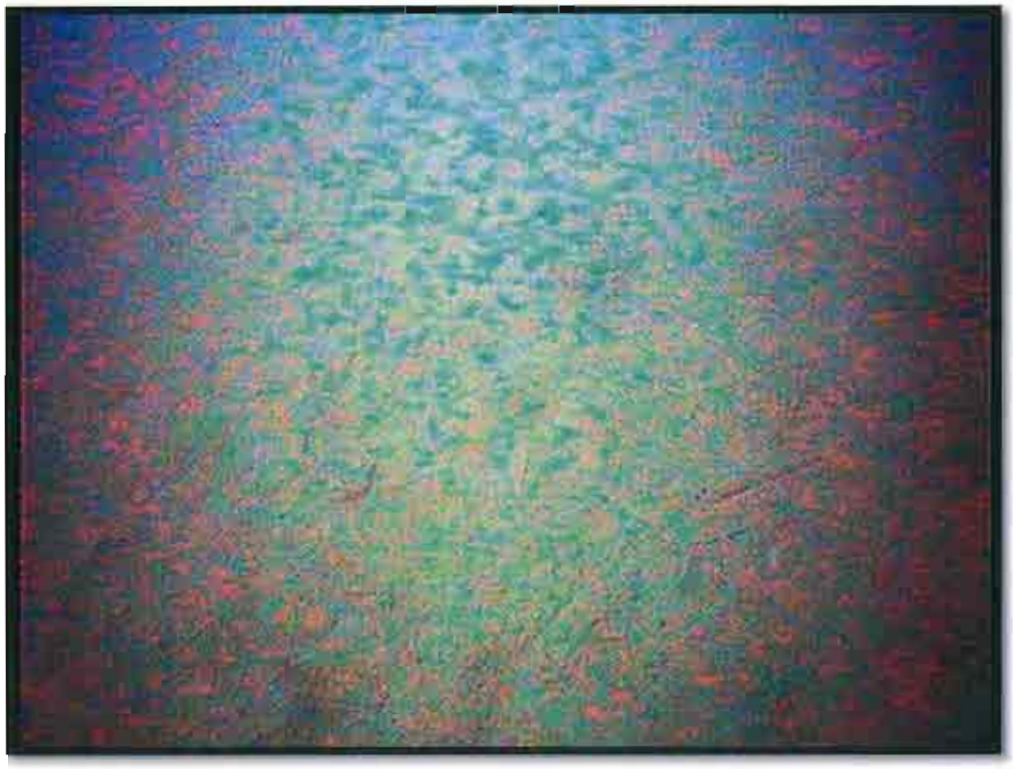


Photo site 8

Photo site 9

Photo site 10

Photo site 11

Photo site 12

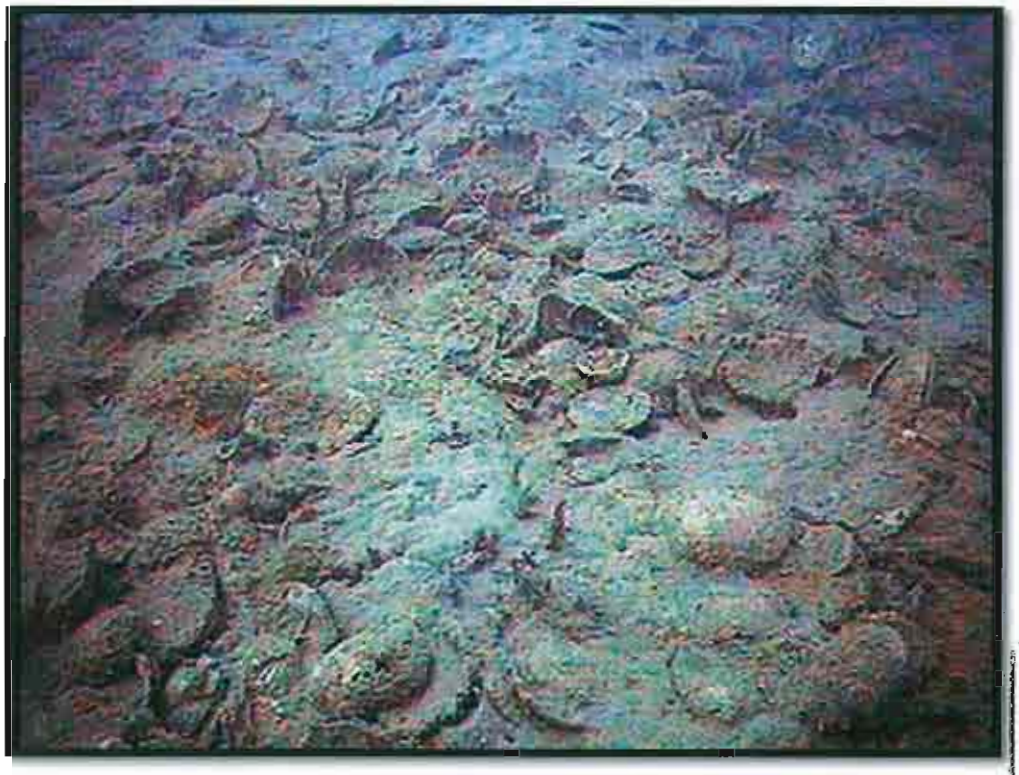


Photo 13

Photo 14

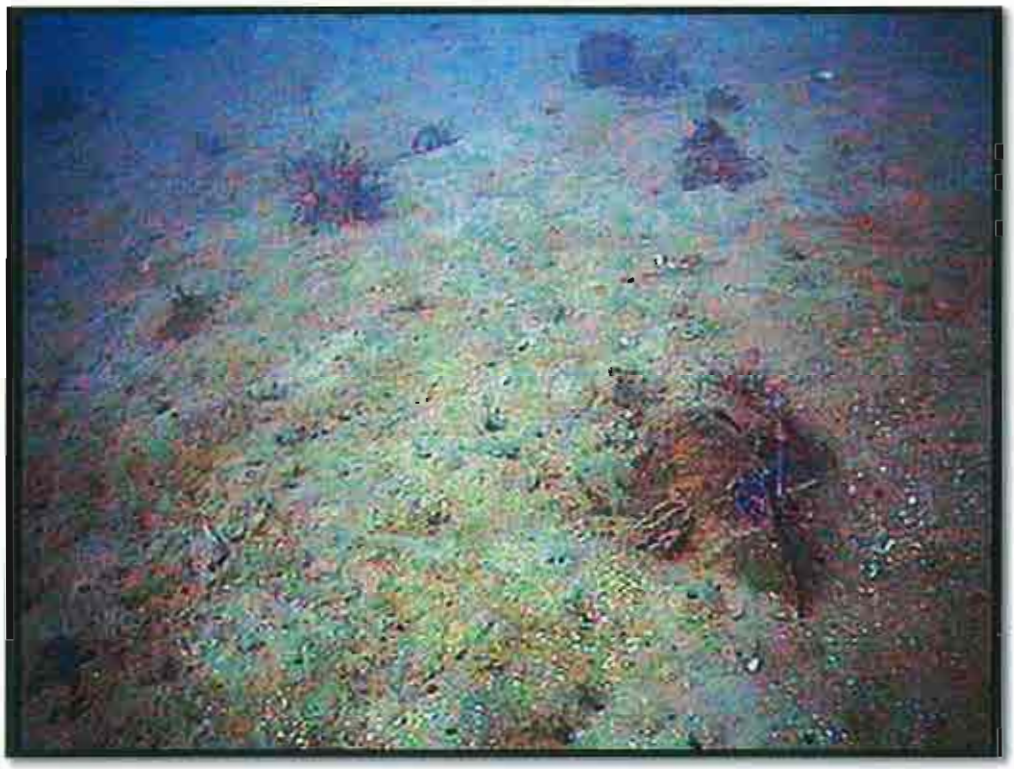


Photo 15

Photo 16

Photo 17

Photo 18

Photo 19

Photo 20

Photo 21

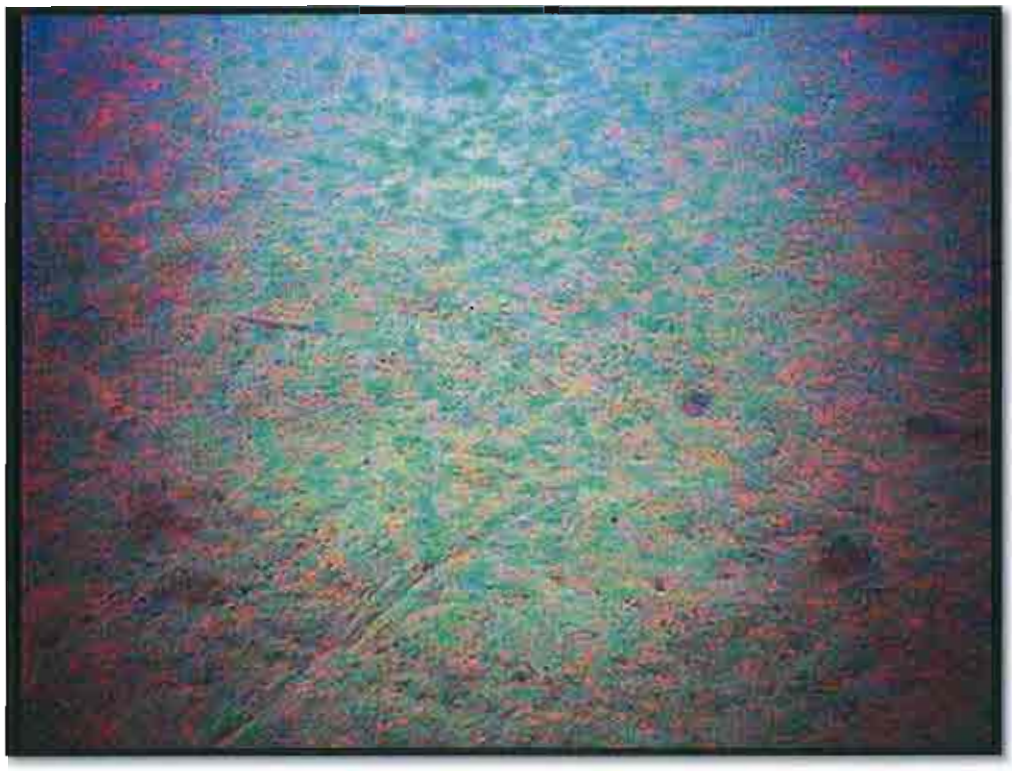


Photo 22

Photo 23

Photo 24

Photo 25

Appendix 2. Raw mussel shell debris data collected from diver quadrats.

Transect	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Depth range	Substratum deep	Substratum shallow
1																												
% shell debris	15	10	8	5	5	10	15	10	5	10	5	5	2	1	5	2	1	2	2	1	2	1	2	0	0	23-22.5	Silt, natural shell, mussel shell	Silt, fine sand, natural shell
2																												
% shell debris	5	12	10	10	8	5	8	10	5	5	5	5	2	5	5	2	1	5	4	2	0	0	0	0	0	23-22.5	Silt, natural shell, mussel shell	Silt, fine sand, natural shell
3																												
% shell debris	10	5	5	15	10	5	5	2	1	2	1	5	5	10	5	2	1	2	1	2	1	0	1	0	0	23-22.5	Silt, natural shell, mussel shell	Silt, fine sand, natural shell
4																												
% shell debris	15	10	10	10	10	10	2	5	1	2	5	10	2	1	5	2	1	5	3	4	1	0	1	0	0	23-22.5	Silt, natural shell, mussel shell	Silt, fine sand, natural shell
5																												
% shell debris	5	5	15	5	10	15	5	8	2	1	1	8	2	5	3	2	2	5	2	1	0	1	0	0	0	23-22.5	Silt, natural shell, mussel shell	Silt, fine sand, natural shell
N	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5			
Mean %	10	8.4	9.6	9.00	8.6	9	7	7	2.8	4.00	3.4	6.6	2.6	4.40	4.6	2	1.2	3.8	2.4	2.00	0.8	0.4	0.8	0	0			
SD	5.00	3.21	3.65	4.18	2.19	4.18	4.95	3.46	2.05	3.67	2.19	2.30	1.34	3.71	0.89	0.00	0.45	1.64	1.14	1.22	0.84	0.55	0.84	0.00	0.00			
SE	2.24	1.44	1.63	1.87	0.98	1.87	2.21	1.55	0.92	1.64	0.98	1.03	0.60	1.66	0.40	0.00	0.20	0.73	0.51	0.55	0.37	0.24	0.37	0.00	0.00			