Specialists in research, survey and monitoring

Davidson Environmental Limited

Ecological report for the proposed renewal of marine farm site 8289 located near Round Hill, Croisilles Harbour

Research, survey and monitoring report number 655

A report prepared for:
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1.0 Introduction

The aim of the present study was to describe the impact zone and habitats associated with a 4.5 ha marine farm (site 8289). The farm is located along the southern shoreline of Squally Cove in Croisilles Harbour (Plates 1 and 2).

The farm has been recently validated in an effort to position the consent to encompass the existing marine farm structures.

Present surface structures consist of two farm blocks. This report was commissioned by PALMS Ltd on behalf of the farm owner, BJS Marine Ltd.

Plate 1. Location of marine farm site 8289 located near Round Hill, Squally Cove.

Plate 2. Marine farm site 8289 looking westward along the backbone lines from the eastern-most block.

2.0 Background information

2.1 Study area

The marine farm area is located along the southern shoreline of Squally Cove west of Round Hill, Croisilles Harbour (Plate 1). Round Hill Bay is a small, north-facing bay, roughly 1.1 km south of Matakoi Point. Round Hill Bay has a coastline length of approximately 1300 m and covers an area of sea of approximately 13.3 ha. Round Hill Bay is approximately 50 km by sea from the entrance to Port Nelson.

2.2 Historical reports

Two biological reports were found in relation to the marine farm.

A benthic survey was conducted for the initial marine farm application hearing as evidence from Mike Bull for Aquaking Ltd in August 1994. The report is summarised below.

"At the shoreline, the area consists of large rocks which are mostly bare other than a covering of barnacles and some blue mussels. The seabed then follows a moderate slope to a depth of about 10 m at 30 m offshore. In this area, the substrate is stony. The substrate then becomes progressively more muddy, sloping gradually to reach a depth of 15 m at the 100 m mark offshore. Species seen during the dive were typical of this type of area. They include a single sea cucumber, a snakestar, several spotties, an opalfish and a juvenile tarakihi. Two dead horse mussels were seen and a finger sponge attached. I did not notice any other sponges in the area."

A second report was provided by Davidson Environmental Ltd for the proposed validation of the offsite marine farm (Davidson and Richards 2009).

The authors concluded:

"Existing marine farm structures are only partially located within the consent area. The farm structures are located east and further offshore than the consent area.

Benthos

The substratum located under the consent and from the area outside the consent currently occupied by farm structures was characterised by silt and clay substrata (mud). Turfing red algae was recorded in the inshore area of the consent and the structure area located outside of the consent. No cobble or hard substrata was recorded from any area investigated in the present study.

Impact

The existing marine farm has resulted in shell deposition under the existing structures. Areas of the consent located outside the structure zone have not been impacted by shell debris.

Validation of off-site structures

The area presently occupied by marine farm structures is located over habitat traditionally considered appropriate for consideration for marine farming activities. This area has been impacted by mussel debris. Movement of the farm to fit within the consent would result in a new impact zone located to the west and inshore of the present impact area. Although no habitats or species of particular importance or significance are located in this area, such a shift would result in a new impact zone over a relatively undisturbed habitat closer to shore."

3.0 Methods

The site was sampled on 13th 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 0.6 m at 7.45 am and high tide was 3.83 m at 1.57 pm. During the survey, the tide was incoming.

3.1 Drop camera stations and site depths

A total of 16 drop camera photographs were collected by Davidson and Richards 2009. A further 8 photos were collected in an effort to fill gaps and provide an improved coverage of the site for the proposed renewal. Photos were collected form 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 75 quadrats collected from 5 transects, with each transect comprising 15 contiguous 1 m^2 quadrats. Each transect of quadrats began under the inshore backbone of the eastern 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

The consent area (grey) and areas occupied by surface structure (pink) have been plotted onto Figures 1 and 2. Inshore depths for the validated consent area ranged from 9.7 m to 11.2 m, while offshore depths were 11.4 m to 11.9 m (Figure 1). The depth for surface structures ranged from 9.4 m inshore to 11.9 m at the offshore extent of backbones. 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.

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
Validated consent corner	11.4m	2571258.02,6016494.56
Validated consent corner	11.9m	2570988.0,6016495.9
Validated consent corner	11.2m	2570987.19,6016329.2
Validated consent corner	9.7m	2571257.2,6016327.86
Structure corner	11.4m	2571248.8,6016491.1
Structure corner	11.7m	2571133.6,6016485.8
Structure corner	11.9m	2571117.1,6016486.5
Structure corner	11.8m	2571005.8,6016487.7
Structure corner	10.4m	2571002.8,6016368.5
Structure corner	9.4m	2571116.0,6016315.1
Structure corner	9.6m	2571127.1,6016303.5
Structure corner	9.8m	2571236.4,6016309.6
Original consent corner	8m	2571089.2,6016280.0
Original consent corner	12m	2570789.4,6016281.0
Original consent corner	12.1m	2570789.8,6016430.8
Original consent corner	11.2m	2571089.7,6016430.0

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 validated consent area was characterised by silt and clay and mussel shell substratum (e.g. photos 19, 20, 21). Areas located inshore of the validated consent were also characterised by silt and clay with some mussel shell debris (e.g. photos 7, 8, and 17).

Mussel shell debris was observed from areas close to backbones and from particular areas close to warps and inshore of the backbones. Mussel debris ranged from none to high percentage cover estimates (Table 2). Highest debris values were recorded from the validated consent area with lower values observed from inshore areas.

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 without farm structures. 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, 11.4m	2571231.9,6016480.7	In consent, under backbones	Silt and clay, mussel debris	Low-moderate
2, 11.5m	2571166.2,6016473.4	In consent, under backbones	Silt and clay, mussel debris	Low-moderate
3, 11.8m	2571100.6,6016464.2	In consent, under backbones	Silt and clay, mussel debris	Low-moderate
4, 12m	2571043.1,6016457.6	In consent, under backbones	Silt and clay, mussel debris	Low
5, 10.4m	2571216.4,6016419.0	In consent, under backbones	Silt and clay, mussel debris	Moderate-high
6, 10.6m	2571134.2,6016408.2	In consent, under backbones	Silt and clay, mussel debris	Low-moderate
7, 9.4m	2571249.1,6016322.8	Outside consent, under warps	Silt and clay, filamentous red algae	None
8, 9.4m	2571203.8,6016317.8	Outside consent, under backbones	Silt and clay, filamentous red algae, mussels	Low
9, 9.5m	2571138.8,6016309.5	Outside consent, under backbones	Silt and clay, filamentous red algae	None
10, 8.5m	2570988.9,6016296.2	Outside consent, no farm structures	Silt and clay, natural shell, turfing red algae	None
11, 8.6m	2570907.0,6016288.4	Outside consent, no farm structures	Silt and clay, natural shell, turfing red algae	None
12, 12m	2570806.8,6016286.7	Outside consent, no farm structures	Silt and clay	None
13, 13m	2570989.8,6016353.9	In consent, under warps	Silt and clay	None
14, 12.5m	2570878.6,6016343.4	Outside consent, no farm structures	Silt and clay, natural shell	None
15, 12.2m	2570806.7,6016389.3	Outside consent, no farm structures	Silt and clay, natural shell	None
16, 12.1m	2570917.7,6016421.1	Outside consent, no farm structures	Silt and clay, natural shell	None
17, 10m	2571062.7,6016300.3	Inshore of consent, no structures	Silt and clay, mussel shell	Low-moderate
18, 10.2m	2571246.1,6016365.3	In consent, under warps	Silt and clay, mussel shell	Moderate
19, 10.2m	2571178.8,6016358.8	In consent, under backbones	Silt and clay, mussel shell	Low-moderate
20, 10.2m	2571104.4,6016349.1	In consent, under backbones	Silt and clay, mussel shell	Low-moderate
21, 11.8m	2571037.2,6016338.8	In consent, under backbones	Silt and clay	None
22, 11.5m	2571098.3,6016406.9	In consent, under backbones	Silt and clay	None
23, 12.2m	2571023.1,6016398.6	In consent, under backbones	Silt and clay, mussel shell	Low-moderate
24, 12.4m	2570992.5,6016484.3	In consent, under warps	Silt and clay	None

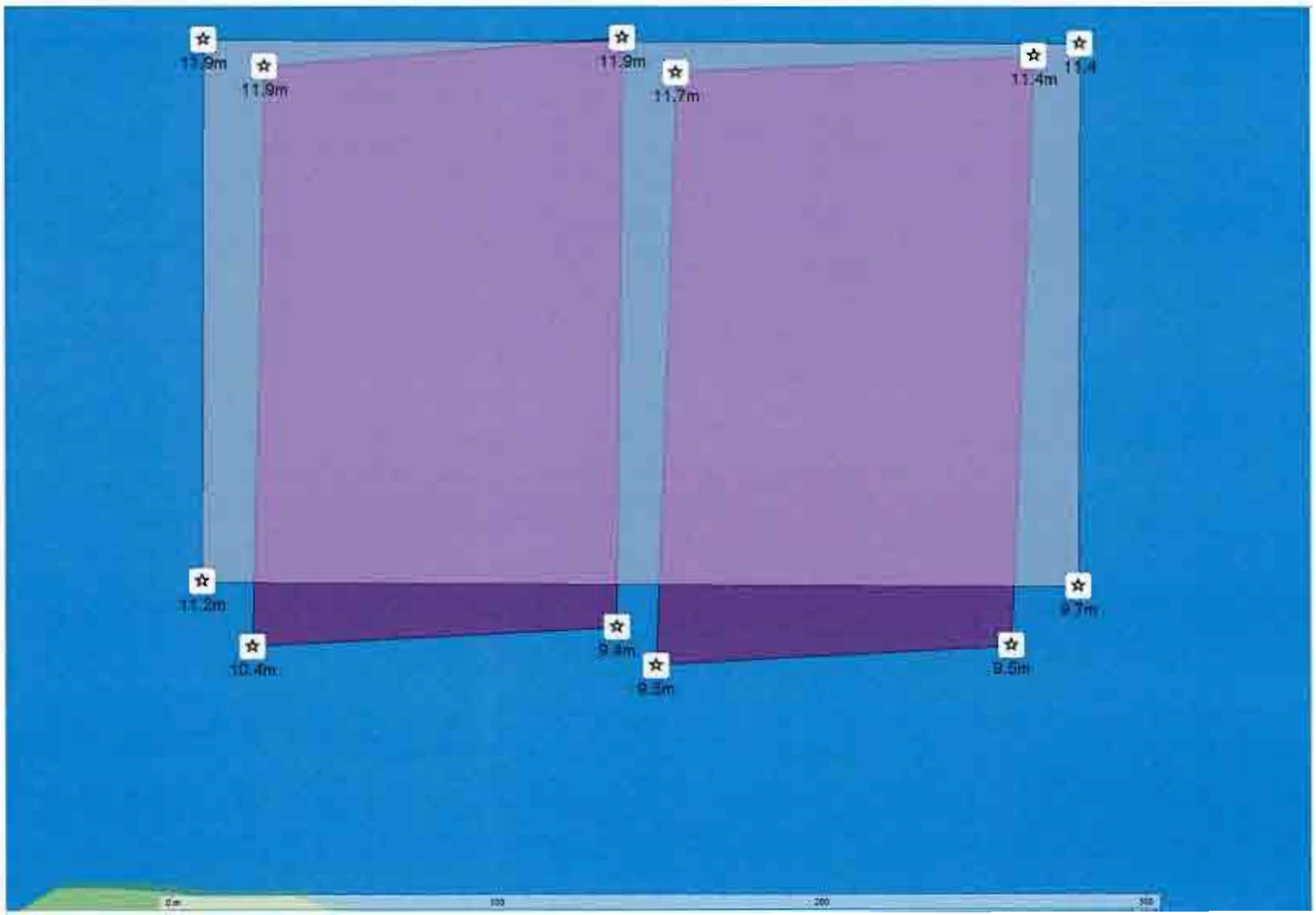


Figure 1. Depths of the marine farm (grey block) and surface structures (pink) for site 8289.

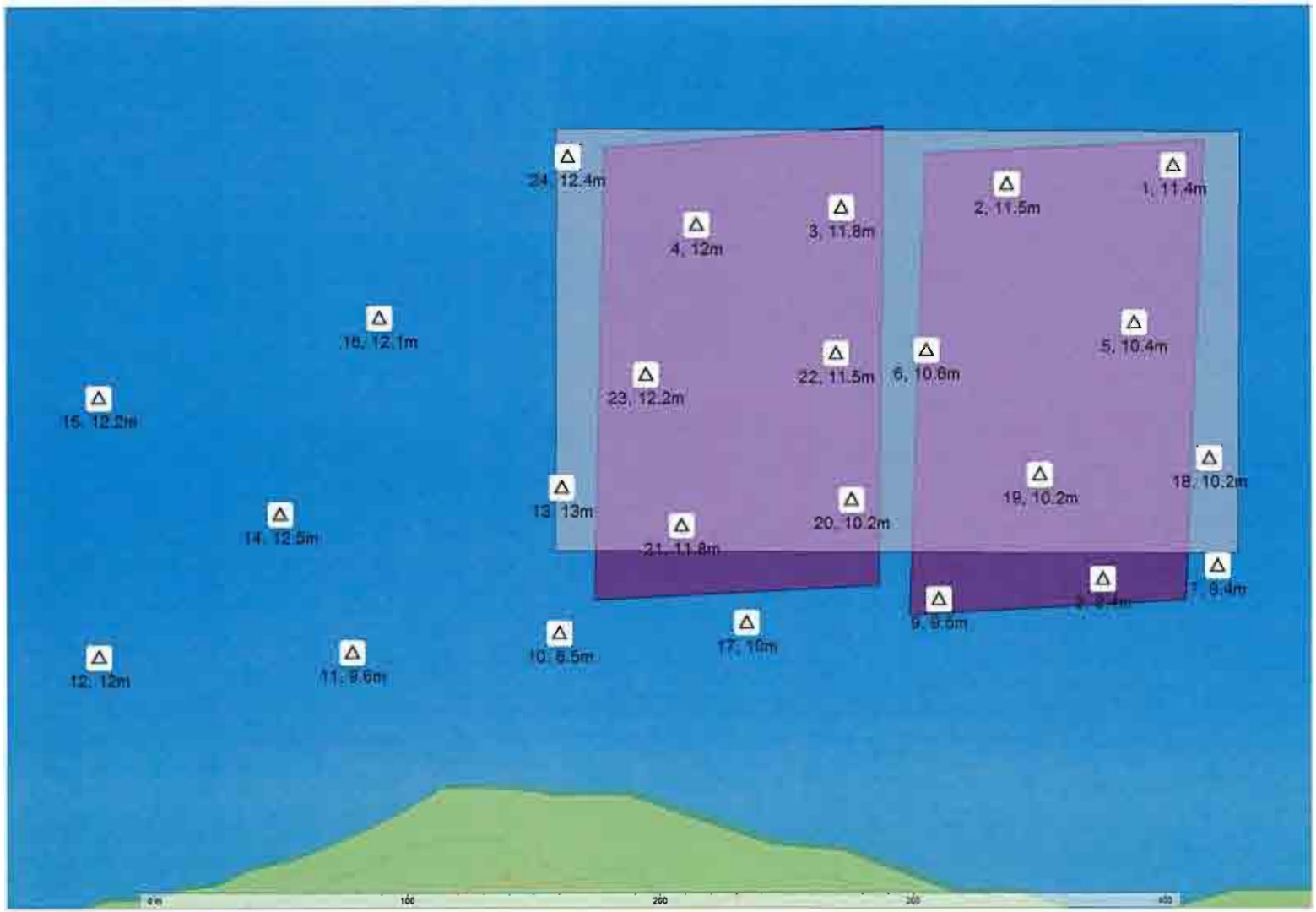
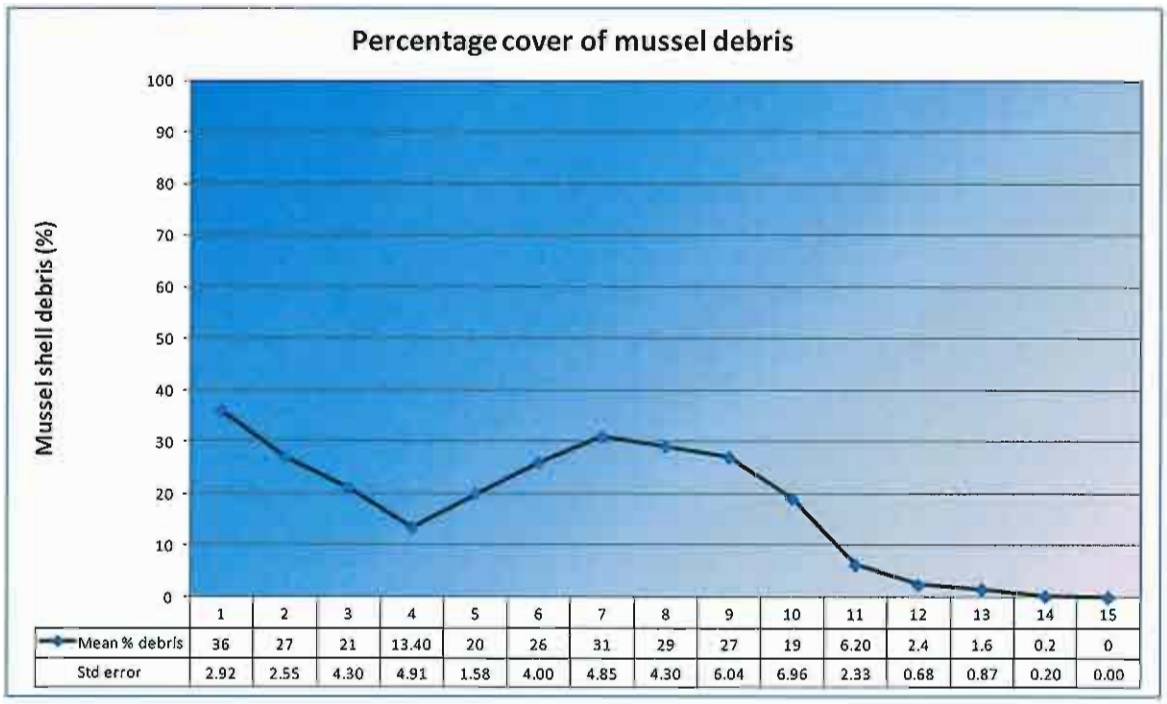


Figure 2. Location of marine farm consent area (light grey) and surface structures (pink). Triangles are locations of drop camera stations; numbers are the photo number and water depth (m).



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mean % debris	36	27	21	13.40	20	26	31	29	27	19	6.20	2.4	1.6	0.2	0
Std error	2.92	2.55	4.30	4.91	1.58	4.00	4.85	4.30	6.04	6.96	2.33	0.68	0.87	0.20	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 at its eastern end was relatively low with a mean cover directly under the backbone of 36% cover, ranging from 30 to 45% cover for individual quadrats (Appendix 2). By 12 m distance from the dropper, mean mussel shell debris declined below 5% cover (Figure 3). No mussel shell debris was observed by 15 m distance from the backbone (Figure 3).

5.0 Conclusions

5.1 Impact

Mussel shell under and adjacent to backbones ranged from low to high values, however, most photographs showed low to moderate levels of mussel debris. This level of shell debris is representative of a low to moderate impact mussel farms in the Marlborough Sounds.

5.2 Benthos

The benthos under the farm area was characterised by silt and clay substratum. This substratum is traditionally regarded suitable for consideration for marine farming activities in Marlborough.

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

5.2 Boundary adjustments and validation

The farm has recently been validated to a position encompassing marine farming structures located eastward of the original consent. No further adjustments are suggested on ecological criteria.

References

Bull, M. 1994. Evidence presented by M Bull for a hearing of a marine farm at Round Hill, Squally Cove.

Davidson, R.J.; Richards, L.A. 2009: Biological report for a revalidation of marine farm site 8289 located near Round Hill, Squally Cove, Croisilles Harbour. Prepared by Davidson Environmental Ltd for BJS Marine Ltd. Survey and Monitoring Report No. 597.

Appendix 1. Drop camera photographs

Photo site 1

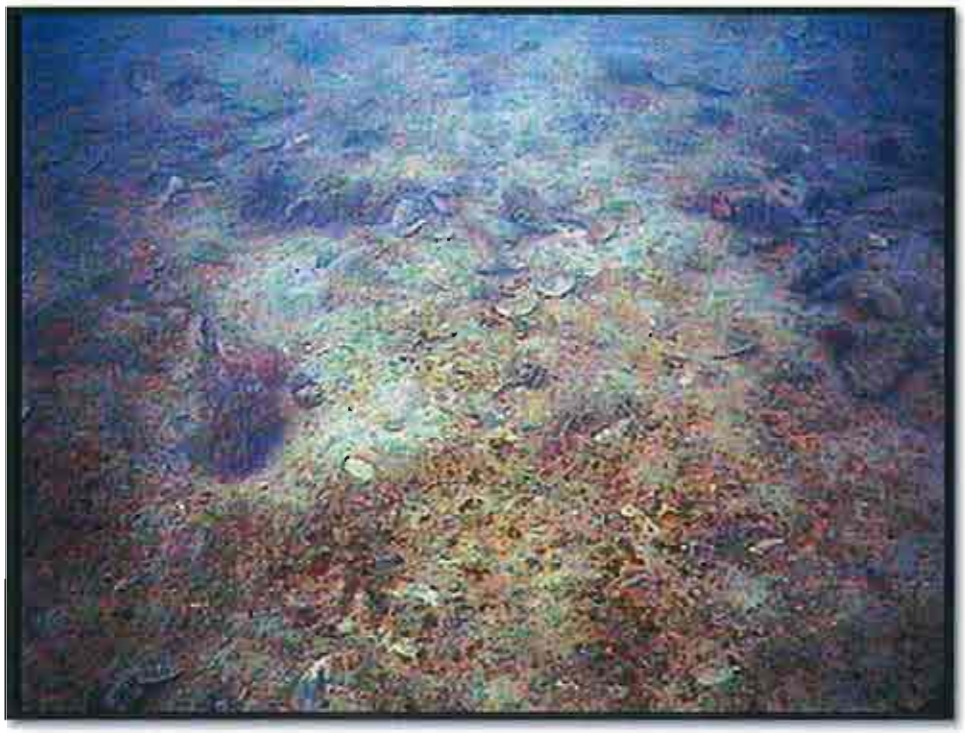


Photo site 2

Photo site 3

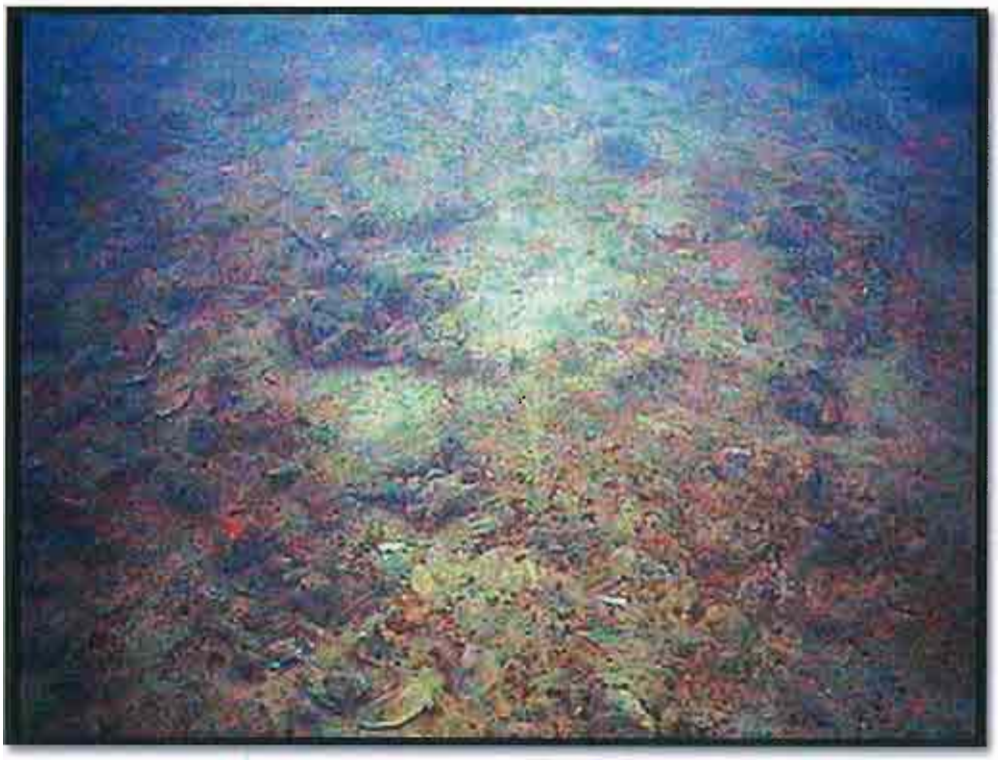


Photo site 4

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

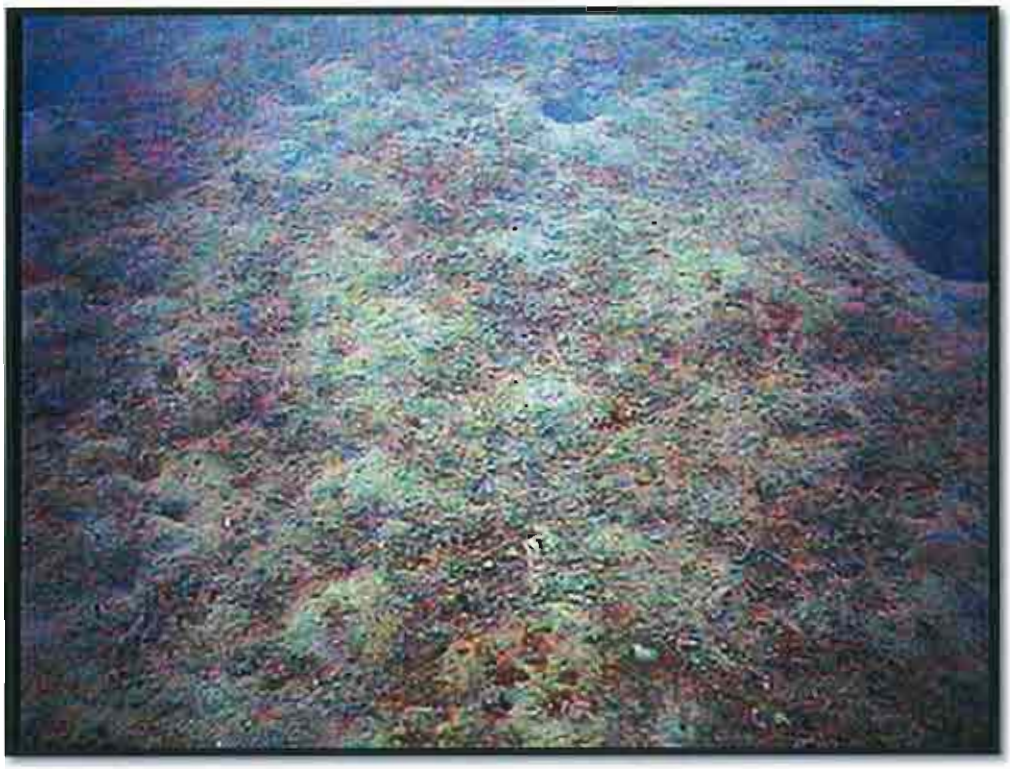


Photo 14

Photo 15

Photo 16

Photo 17

Photo 18

Photo 19

Photo 20

Photo 21

Photo 22

Photo 23

Photo 24

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	Depth range	Substratum deep	Substratum shallow
1																		
% shell debris	30	25	10	2	20	25	15	45	50	45	5	2	0	0	0	13.3-13.3m	Silt and clay, mussel shell	Silt and clay
2																		
% shell debris	30	20	15	10	25	40	45	30	15	5	1	1	1	0	0	13.3-13.3m	Silt and clay, mussel shell	Silt and clay
3																		
% shell debris	35	30	20	5	15	15	30	25	20	15	5	2	5	1	0	13.3-13.3m	Silt and clay, mussel shell	Silt and clay
4																		
% shell debris	40	35	25	25	20	25	30	25	25	10	5	2	1	0	0	13.3-13.3m	Silt and clay, mussel shell	Silt and clay
5																		
% shell debris	45	25	35	25	20	25	35	20	25	20	15	5	1	0	0	13.3-13.3m	Silt and clay, mussel shell	Silt and clay
N	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5			
Mean %	36	27	21	13.40	20	26	31	29	27	19	6.20	2.4	1.6	0.2	0			
SD	6.52	5.70	9.62	10.97	3.54	8.94	10.84	9.62	13.51	15.57	5.22	1.52	1.95	0.45	0.00			
SE	2.92	2.55	4.30	4.91	1.58	4.00	4.85	4.30	6.04	6.96	2.33	0.68	0.87	0.20	0.00			