Davidson Environmental Limited

Ecological report for relicensing of farm 8293 located in Squally Cove, Croisilles Harbour

Research, survey and monitoring report number 851

A report prepared for:
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C/o Aquaculture Direct
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1.0 Introduction

The main aim of the present study was to describe the impact zone and biological features associated with a 5.25 ha marine farm consisting of the parent farm (3 ha) and an eastern (0.75 ha) and western extension (1.5 ha). The farm is located along the southern shore of Squally Cove (Figure 1, Plates 1 and 2).

This report was commissioned by Aquaculture Direct on behalf of the farm owner (Sanford Limited).

Figure 1. Location of marine farm site 8293 (red circle) in Squally Cove.

Plate 1. Marine farm site 8293. Taken from a location alongshore and west of the existing offshore backbones, looking eastwards into the consent.

Plate 2. Oblique view of existing consent 8293 (grey) in Squally Cove. Note: pine forest has been logged since the aerial photos was taken.

2.0 Background information

2.1 Study area

Squally Cove is the eastern arm of Croisilles Harbour. Croisilles Harbour is the western most harbour in the Marlborough Sounds, opening into Tasman Bay. Squally Cove is some 38.5 km by sea from the entrance to Port Nelson. Squally Cove (as measured from Red Clay Point on the northern side to the western headland of Symonds Bay on the southern side) has a coastline length of approximately 24 km, and covers an area of sea of approximately 1109 ha. Squally Cove is roughly 6.5 km long and up to 1.5 km wide.

The farm is in Samson Bay. Samson Bay has a coastline length of approximately 2 km, and covers an area of sea of approximately 32.3 ha (Figure 2).

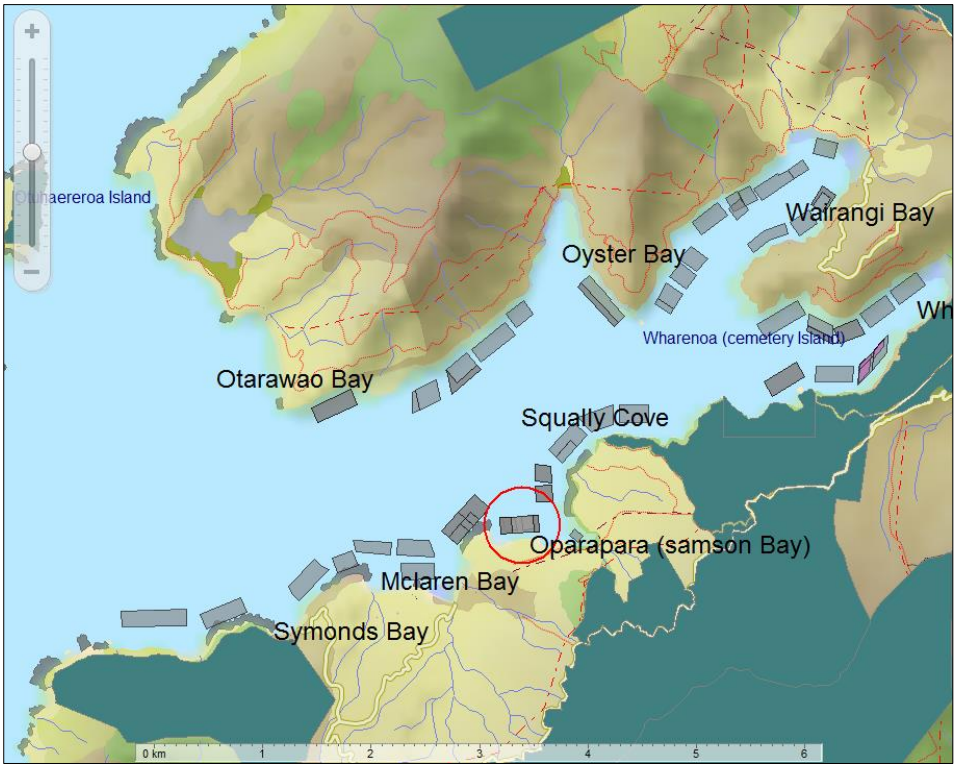

Figure 2. Location of farm (red circle) and other marine farm consents in the area.

2.2 Historical reports

One historic biological report was found in relation to an extension to the parent farm (Brown and Handley, 2001).

"This report presents the results of a seabed ecological survey undertaken as background for an application to extend the area of marine farm 419, Pe 152 and Pe 15, located at Samson Bay, on the southern side of Squally Cove in Croisilles Harbour. At the time of the survey, the actual position of farm structures belonging to Licence 419, Pe 152, and Pe 15 as determined using the GPS, differed from the mapped position.

Results from grain size analysis of the sediment samples confirmed diver observations that the sediment within the proposed extension was predominantly composed of silt.

Inshore of the proposed extension at a depth of 4 m, the substratum was sand/shell/silt. From a depth of 9 m, out to the seaward edge of the farm (depth of 15 m), the substratum was predominantly silt. Conspicuous organisms noted by divers were the turret shell (*Maoricolpus roseus*), the eleven-armed star (*Coscinasterias muricata*), and the cushion star (*Patiriella regularis*), scallops (*Pecten novaezelandiae*) and horse mussel (*Atrina zelandica*). The scallops and horse mussels occurred at densities below the trigger levels which would activate a quantitative survey according to the 'Guidelines for ecological investigations of proposed marine farm areas, Marlborough Sounds' (0.1 and 0.2 per m^{-2} respectively) (DoC, 1995). A small area containing a high density of small scallops was encountered approximately 5 m inshore of the proposed extension at a depth of 10 m.

The proposed extension is situated over a relatively flat seabed composed of silt and very fine sand. This type of habitat and the accompanying species assemblage are widespread and common within the Marlborough Sounds, and the conspicuous epifaunal species noted in the survey are common throughout soft sediments in Croisilles Harbour (Davidson and Duffy, 1992).

No other species, communities or habitats of scientific or ecological importance according to those guidelines were identified in the survey."

3.0 Methods for present study

The area was investigated on 27th March 2017. Prior to fieldwork, the consent corners were plotted onto mapping software (TUMONZ Professional). The laptop running the mapping software was linked to a Lowrance HDS-12 Gen2 with an external Lowrance Point 1 high sensitivity GPS 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.

3.1 Sonar imaging

Sonar investigations of the area were conducted using a Lowrance HDS-12 Gen 2 and HDS-8 Gen2 linked with a Lowrance StructureScan™ Sonar Imaging LSS-1 Module. These units provide right and left side imaging as well as DownScan Imaging™. The unit also allows real time plotting of StructureMap™ overlays onto the installed Platinum underwater chart. A Lowrance HDS 10 Gen 1 unit fitted with a high definition 1kw Airmar transducer was used to collect traditional sonar data from the site.

Prior to the collection of underwater photographs, the boundaries of both the consent area and the marine farm surface structure area were investigated using the sonar. Any bottom abnormalities such as reefs, hard substrata or abrupt changes in depth were noted for inspection using the drop camera (see section 3.2).

3.2 Drop camera stations, depths and low tide

A total of 30 drop camera photographs were collected from the existing parent farm and approved extension areas, including under droppers and warps. At each drop camera station,

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 benthic mussel shell from drop camera photographs were ranked as: None = no benthic mussel shell, 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 to obtain a representative range of habitats and depths within the consent. Additional photographs were taken when any features of interest (e.g. mussel shell, 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.

Low tide was determined at three locations inshore of the consent. The survey vessel was positioned over the low water mark and the position recorded using the mapping software. Low tide was determined by using the transition between intertidal and subtidal species.

4.0 Results

On the day of the survey, low tide was 0.8 m at 3.59 am and high tide was 3.5 m at 9.56 am. During the present biological survey, the tide was incoming.

4.1 Consent corners and surface structures

Corner depths of the existing marine farm consent ranged from 1.7 m to 4.2 m inshore and 7.5 m to 9.5 m offshore (Figure 3). The bottom topography under the existing consent comprised a gently sloping shore that increased from inshore to offshore and from west to east.

Existing surface structures consisted of two blocks of backbones covering at total of 2.72 ha of the 5.25 ha consent.

The distance between low tide and the consent boundary was measured from positions established by positioning the survey vessel over low water. Separation distances between the existing consent boundary and the low tide mark were: low tide eastern = 10 m, low tide middle = 20 m and low tide western = 36 m (Figure 3 and 4).

Figure 4. Consent (yellow), structures (red) and adjacent coastline.

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

Type	No. & Depth (m)	Coordinates
Consent corner	1, 4.2 m	1660243.6,5453614.6
Consent corner	2, 9.5 m	1660233.5,5453764.3
Consent corner	3, 7.5 m	1659884.4,5453741.1
Consent corner	4, 1.7 m	1659894.4,5453591.4
Low tide		1659979.3,5453560.9
Low tide		1660040.7,5453580.3
Low tide		1660106.3,5453594.5
Structure corner	A, 2.5 m	1659931.8,5453620.2
Structure corner	B, 6.5 m	1660043.6,5453626.9
Structure corner	C, 5.5 m	1660090.4,5453630.8
Structure corner	D, 6.4 m	1660211.8,5453642.3
Structure corner	E, 8.7 m	1660196.2,5453758.6
Structure corner	F, 8.5 m	1660084.0,5453752.2
Structure corner	G, 8.5 m	1660019.1,5453747.9
Structure corner	H, 8.5 m	1659914.5,5453740.8

Figure 3. Depths of the consent area (teal), and existing surface structures (pink). Low tide positions are also plotted.

4.2 Drop camera stations

Substratum and habitat distribution relative to the consent area were based on drop camera images (Table 2, Figure 5, Appendix 1) and sonar.

Substratum was dominated by a base of silt and clay with a weak component of dead whole and broken natural shell (Plate 4, Table 2). The inshore edges of the consent were very shallow and had a component of fine sand and a higher quantity of natural shell compared to offshore areas. Occasional cobbles were observed along the inshore edge of the consent (Plate 5).

Mussel shell was observed under backbones and appeared to be localised to areas close to droppers. In shallow parts of the consent, little shell was recorded from most photos. Mussel shell, where present, ranged in cover from none to high (Table 2, Plate 6). Drop camera data and sonar images suggest mussel shell is mostly located close to droppers.

Bedrock, boulders and cobbles were observed at a variety of locations inshore and alongshore of the consent (Plate 7, Table 2). This substratum seldom reached the consent, but did penetrate the consent at two locations.

Surface dwelling biota under the backbones was dominated by 11 arm seastars, saddle squirts, cushion seastars, sea cucumbers and in places a low percentage cover of filamentous algae. A greater variety of encrusting species were observed from the bedrock and boulder substratum compared to soft bottom areas. No tubeworm mounds were observed suggesting tidal currents are weak in this area. Spotty were present under the farm and were also associated with reef areas.

4.3 Sonar

The sonar run along the inshore and western boundary of the consent revealed the area was relatively flat, with a featureless seafloor under the consent. Rocky habitats were common inshore and alongshore of the consent (Figures 6 and 7). Rocky substrata extended a small distance into the consent at two locations along the inshore boundary.

Table 2. Coordinates of drop camera stations showing depths, substratum, biological features and level of benthic mussel shell. Depths adjusted to datum. None = no benthic mussel shell, Low = 1-30%, Moderate = 31-50%, Moderate to High = 51-75%, and High = 76-100% cover.

No. & Depth (m)	Coordinates	Location	Position	Substratum	Shell debris
1, 1.2 m	1659939.8,5453585.7	Inshore of consent	No farm structures	Silt, fine sand, natural shell	None
2, 2.5 m	1660001.6,5453599.4	In consent	No farm structures	Silt, fine sand, natural shell	None
3, 2 m	1660079.4,5453607.3	In consent	No farm structures	Silt, fine sand, natural shell	None
4, 4.5 m	1660170.6,5453618.2	In consent	No farm structures	Silt, fine sand, natural shell	None
5, 4.5 m	1660236.7,5453616.3	In consent	No farm structures	Silt, fine sand, natural shell, occasional cobbles	None
6, 0.3 m	1660202.5,5453593.6	Inshore of consent	No farm structures	Silt, fine sand, natural shell	None
7, 0.6 m	1660100.0,5453598.6	Inshore of consent	No farm structures	Silt, fine sand, natural shell	None
8, 0.6 m	1660033.9,5453584.7	Inshore of consent	No farm structures	Silt, fine sand, natural shell, occasional cobbles	None
9, 0m	1659979.0,5453561.5	Inshore of consent	No farm structures	Boulders, cobbles	None
10, 0.5 m	1659914.8,5453568.3	Inshore of consent	No farm structures	Fine sand, natural shell	None
11, 2.5 m	1659924.7,5453625.4	In consent	Under warps	Silt, fine sand, natural shell	None
12, 6.5 m	1660012.1,5453630.6	In consent	Under backbones	Silt, fine sand	None
13, 3.5 m	1660100.8,5453636.6	In consent	Under backbones	Silt	None
14, 7 m	1660177.5,5453643.4	In consent	Under backbones	Silt	None
15, 7.5 m	1660214.6,5453643.0	In consent	Under warps	Silt	None
16, 7.2 m	1660214.9,5453697.9	In consent	Under warps	Silt	None
17, 8 m	1660148.5,5453695.9	In consent	Under backbones	Silt, mussel shell	High
18, 8 m	1660073.2,5453686.4	In consent	Under warps	Silt, mussel shell	Low
19, 8.3 m	1659975.4,5453678.7	In consent	Under backbones	Silt, mussel shell	Low
20, 2.4 m	1659918.0,5453673.5	In consent	Under warps	Silt, mussel shell	Low
21, 5.5 m	1659914.2,5453710.4	In consent	Under warps	Silt, mussel shell	Low
22, 8.1 m	1659981.9,5453708.5	In consent	Under backbones	Silt, mussel shell	Low
23, 8 m	1660063.3,5453720.5	In consent	Under warps	Silt, mussel shell	Low
24, 8.5 m	1660143.7,5453723.8	In consent	Under backbones	Silt, mussel shell	Moderate
25, 9.5 m	1660206.5,5453727.4	In consent	Under warps	Silt	None
26, 9.4 m	1660195.1,5453776.5	Offshore of consent	Close to farm structures	Silt, natural shell	None
27, 9.6 m	1660128.4,5453762.9	Offshore of consent	Close to farm structures	Silt, mussel shell	High
28, 8.5 m	1660046.5,5453763.1	Offshore of consent	Close to farm structures	Silt, mussel shell	Moderate
29, 8.5 m	1659954.2,5453754.1	Offshore of consent	Close to farm structures	Silt, mussel shell	Low
30, 7.5 m	1659897.1,5453748.1	Offshore of consent	Close to farm structures	Silt, mussel shell	Low

Figure 5. Existing consent (teal), surface structures (pink) and drop camera stations with depths (triangles).

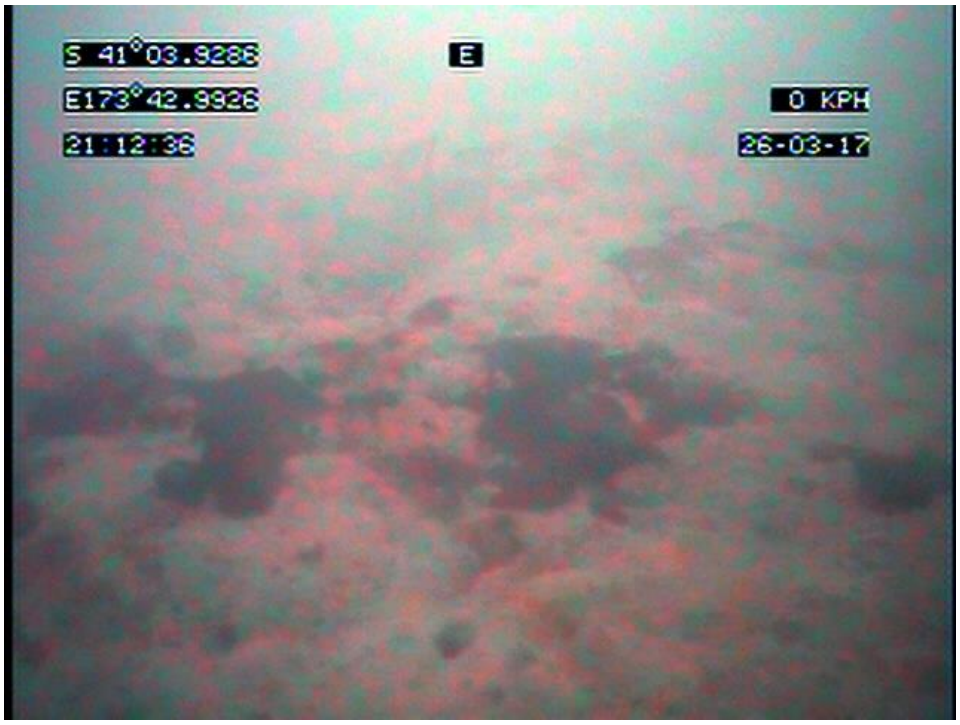

Plate 4. Silt and clay with a small component of whole and broken natural shell located in the consent away from backbones (photo 25, 9.5 m depth).

Plate 5. Silt, fine sand, natural shell inside consent (photo 5, 4.5 m depth).

Plate 6. Silt and natural shell with occasional cobbles located in the consent, close to backbones (photo 24, 8.5 m depth).

Plate 7. Boulders and cobbles inshore of consent (photo 9, 0 m depth).

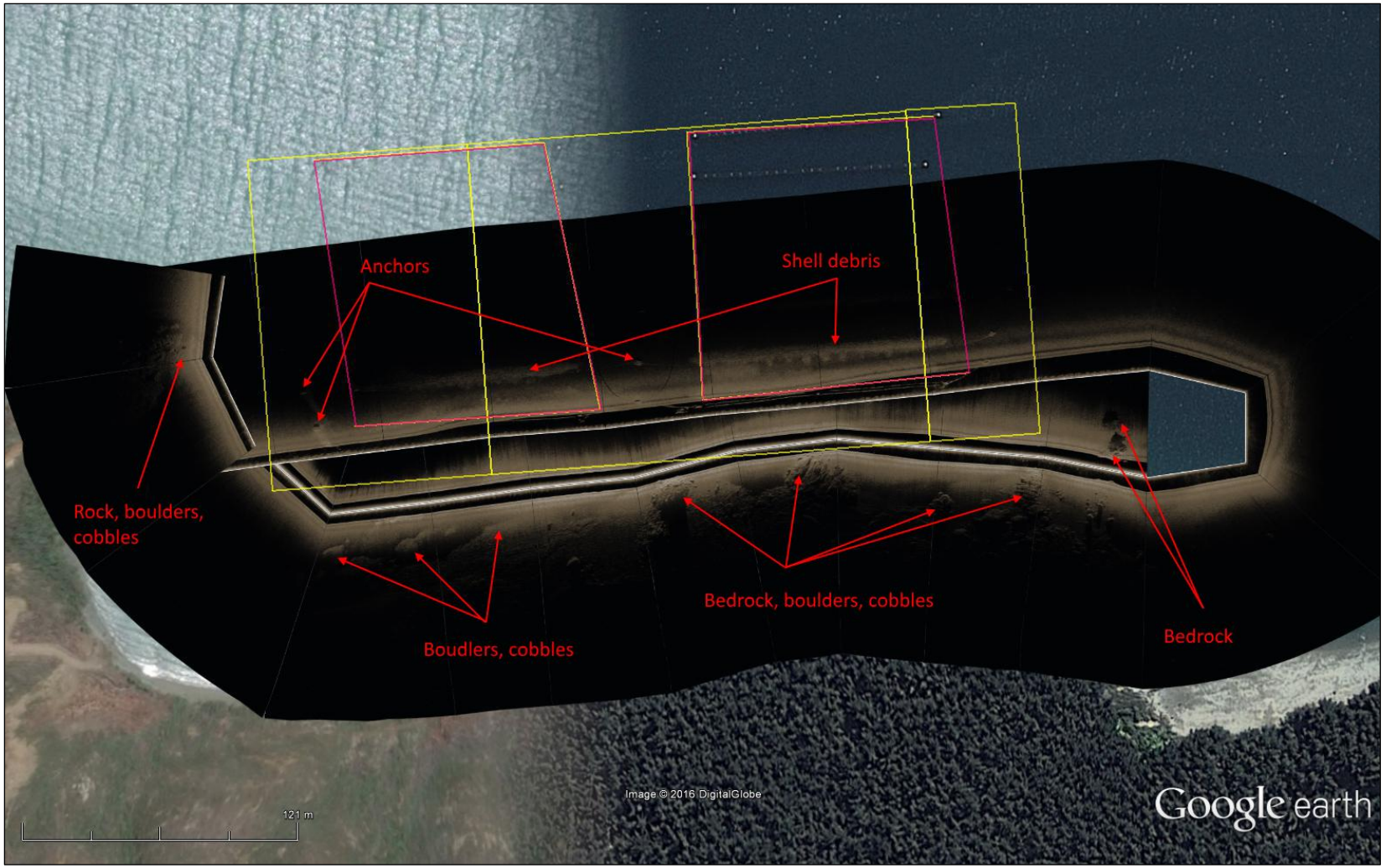

Figure 6. Sonar run at farm 8293. Yellow polygon = consent boundary, white line = sonar track, red polygons = surface structures.

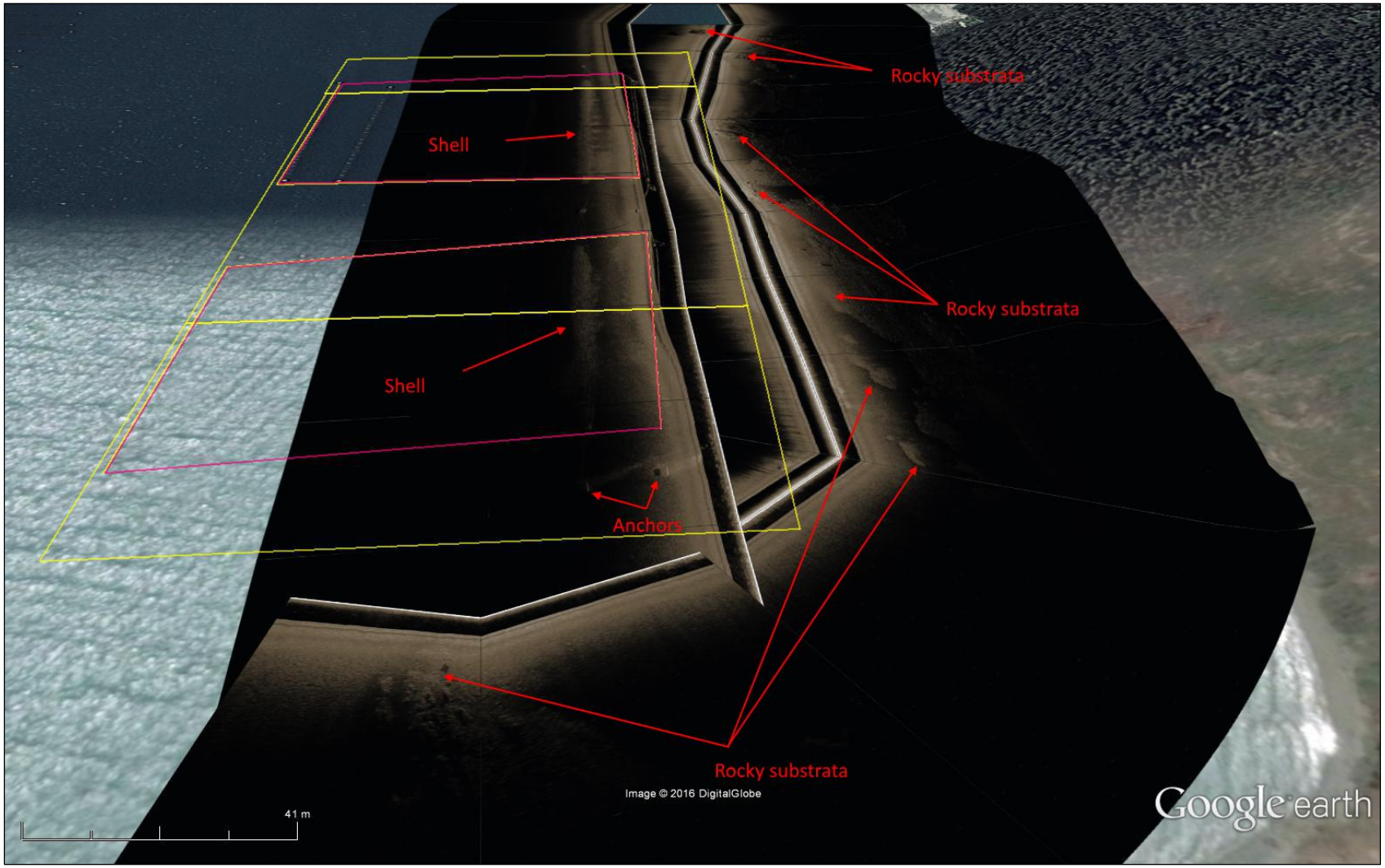

Figure 7. Oblique aspect of sonar runs at farm 8293. Yellow polygon = consent boundary, white line = sonar track, pink polygons = surface structures.

5.0 Summary and conclusions

5.1 Benthos

The marine farm consent is in a shallow, sheltered Bay. The benthos under the consent was dominated by soft substratum (i.e. combinations of silt, fine sand, and broken and dead whole natural shell).

Rocky substratum (bedrock, boulder and cobbles) was recorded at a variety of locations inshore and alongshore of the consent. At two locations, some rocky substrata (i.e. occasional cobble) were recorded just inside the consent along the inshore boundary. Mussel farm structures have been positioned offshore of the hard substrata and are presently positioned over substratum considered suitable for marine farming activities.

Mussel shell debris was observed under and close to backbones. When present, it was recorded at low to high levels. High levels were found near droppers.

5.2 Species and communities

Species abundance and diversity was highest from inshore rocky areas compared to offshore soft substratum under and around the growing structures. Encrusting species observed from rocky areas appeared representative of a relatively sheltered shore.

No species or communities of scientific, conservation or ecological importance were observed during the present study (see Davidson *et al*., 2011 for criteria and biological features). No scallops were seen under the Consent or proposed extension.

5.3 Mussel farming impacts

5.3.1 Benthic impacts

Low to high levels of benthic mussel shell were recorded from drop camera photos collected under and near backbones. Shell debris impact levels were within the range known for mussel farms in the Marlborough Sounds and towards the lower end of the impact spectrum.

It is probable that the impact of continued shellfish farming at this site will result in the deposition of more shell and fine sediment under and near droppers. Based on the literature and assuming the present level of activity remains relatively consistent, it is very unlikely that the surface sediments would become anoxic, despite the site being in a low current area (Hartstein and Rowden, 2004; Keeley *et al*., 2009; Davidson and Richards, 2014). Tidal flows are expected to be low; however, winds are likely to be a important driver of water movement in this area, especially in shallow parts of the farm.

It is noted that benthic impacts of mussel farms are not permanent. If structures are removed, the benthos recovers over a period of approximately 10 years (Davidson and Richards, 2014).

5.3.2 Productivity

Mussel farms can influence adjacent farms by slowing water flow to farms located in downstream positions. This is particularly pronounced in quiescent areas of the Sounds. However, published work by Zeldis *et al*. (2008, 2013) suggests that the major factors influencing productivity in the Marlborough Sounds relate to cyclical weather patterns in the summer (El Nino and La Nina) and river-derived nutrient inputs in winter. Slow crop cycles in some years are therefore a reflection of a weather cycle and much less about the number of farms.

There has been no data presented to show that the ecological carrying capacity of the Sounds has been reached. There is considerable evidence that shows the major drivers of the Pelorus system, for example, naturally leads to large within and between year variability. Relative to this, the impact of mussel farms appears to be material but relatively small compared to major environmental drivers (Broekhuizen *et al*., 2015).

Croisilles Harbour opens directly to Tasman Bay waters. Unlike Pelorus Sound, it receives little riverine input. It is therefore likely that Tasman Bay delivers most nutrients to the area and algae primary production occurs during the period water resides in the Harbour. Croisilles Harbour is not known as a highly productive area because of these factors, however, its proximity to Tasman Bay means that depletion of seston by farms is likely a minor effect.

5.5 Boundary adjustments, recommendations and monitoring

Rocky substrata are located at two locations along the inshore boundary of the consent. No farm structures are presently located in this area.

The farm has been historically positioned too close to shore (i.e. as little as 10 m distance from low tide). It is suggested that the farm relocated further form shore to avoid rocky substrata and establish an appropriate inshore separation. Offshore habitats are dominated by silt substrata. This type of substratum is considered more suitable for marine farming activities compared to inshore shallow areas.

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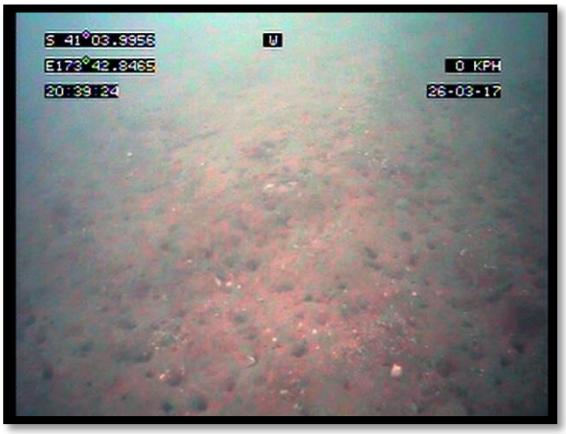
Appendix 1. Drop camera photographs

Photo site 1

Photo site 2



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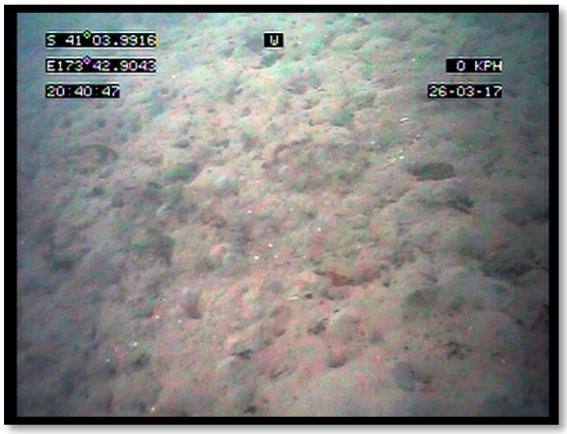

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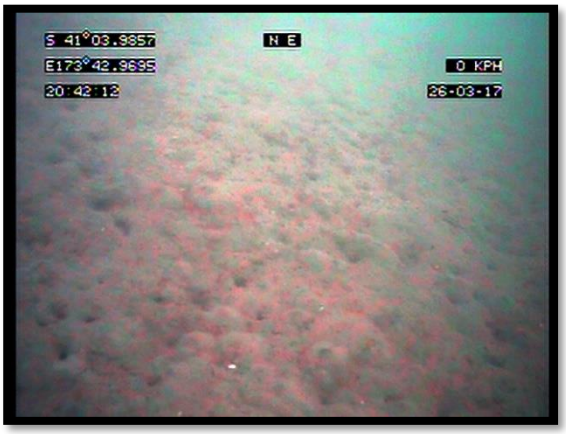

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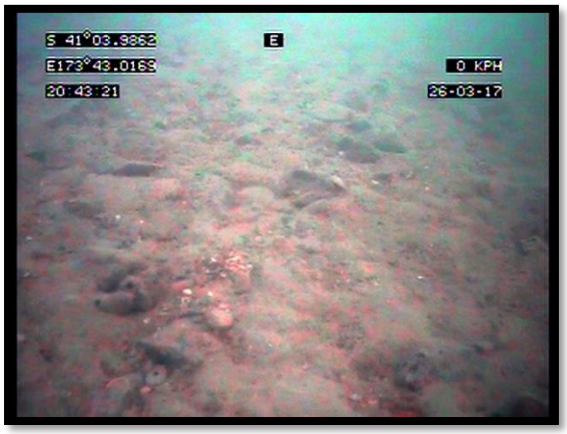

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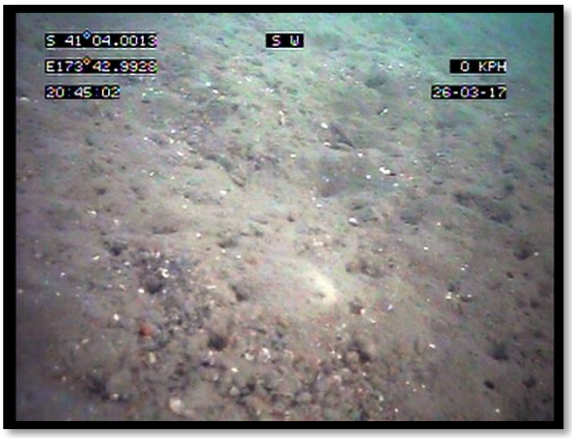


Photo site 7

Photo site 8

Photo site 9

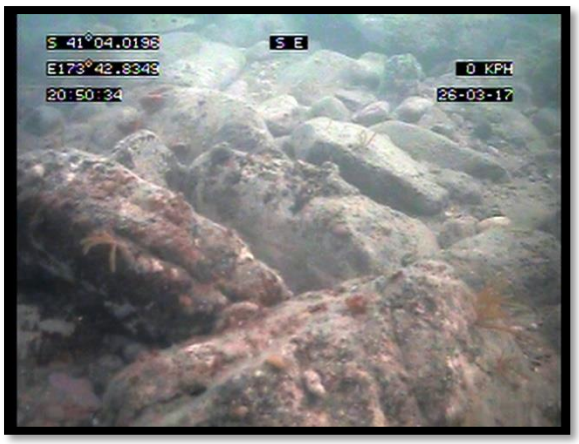
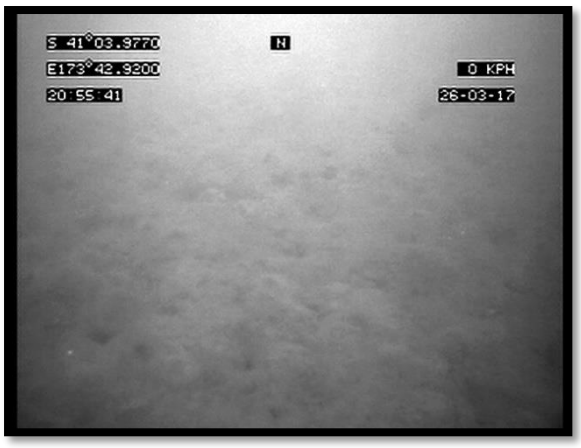


Photo site 10

Photo site 11

Photo site 12

Photo site 13



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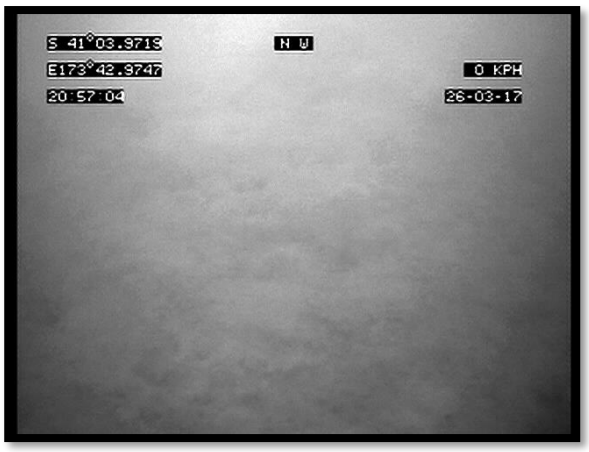

Photo site 15

Photo site 16

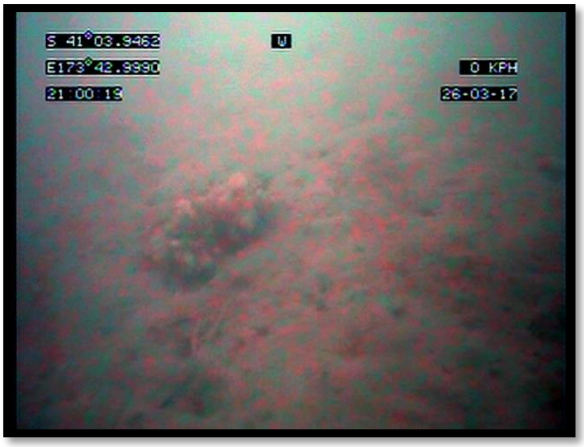

Photo site 17

Photo site 18

Photo site 19

Photo 20

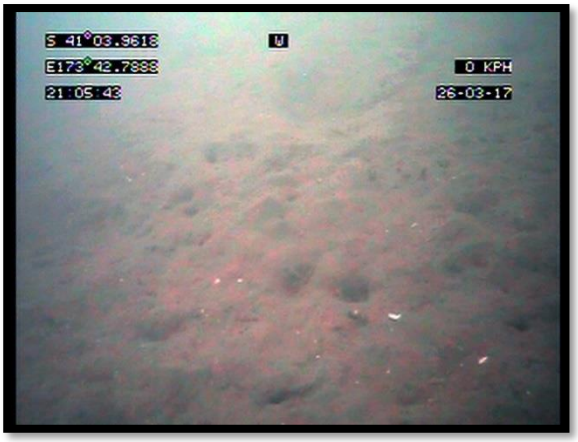

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Photo 22

Photo site 23

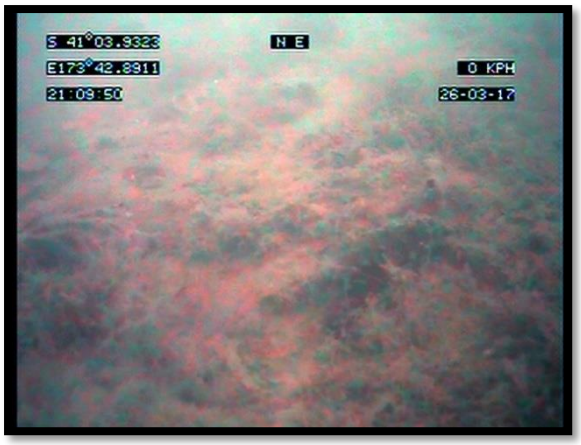


Photo 24

Photo site 25

Photo 26

Photo site 27

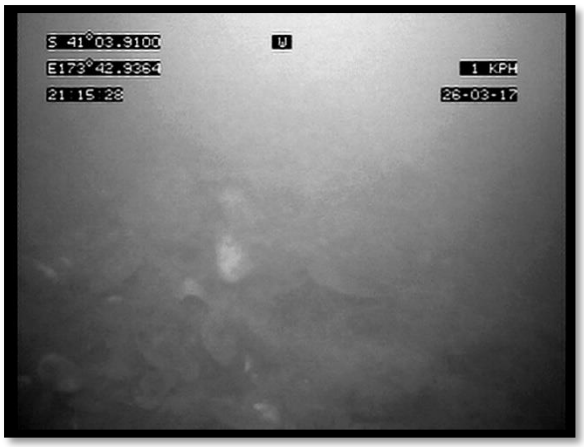


Photo 28

Photo site 29

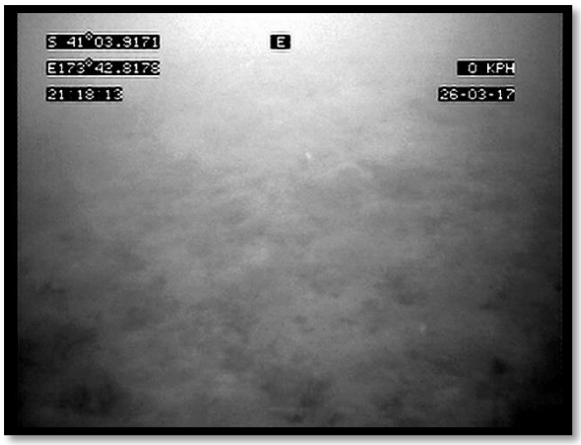
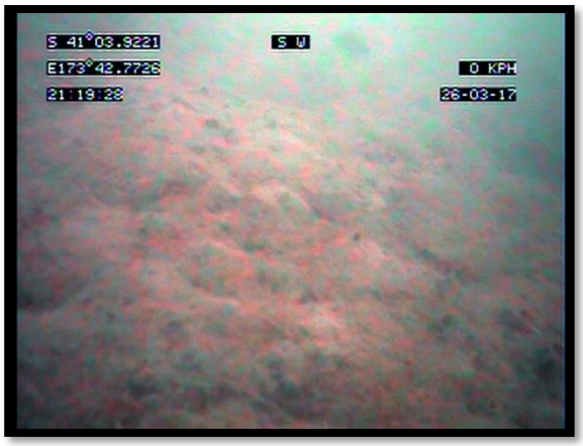


Photo 30



To: Marlborough District Council
PO Box 443
Blenheim 7240

MARLBOROUGH DISTRICT COUNCIL

ISO 9001:2008
Document Number:
RAF0010-CI1220

SUBMISSION ON APPLICATION FOR A RESOURCE CONSENT

1. Submitter Details

Name of Submitter(s) in full .....

Address for Service *(include post code)* .....

.....

.....

Email .....

Telephone *(day)* Mobile Facsimile

Contact Person *(name and designation, if applicable)* .....

.....

2. Application Details

Application Number U.....

Name of Applicant *(state full name)* .....

Application Site Address .....

Description of Proposal .....

.....

.....

3. Submission Details *(please tick one)*

I/we support all or part of the application ☐

I/we oppose all or part of the application ☐

I/we are neutral to all or part of the application ☐

The specific parts of the application that my/our submission relates to are *(give details, using additional pages if required)*

.....

.....

.....

.....

The reasons for my/our submission are *(use additional pages if required)*

The decision I/we would like the Council to make is *(give details including, if relevant, the parts of the application you wish to have amended and the general nature of any conditions sought. Use additional pages if required)*

---

4. Submission at the Hearing

I/we wish to speak in support of my/our submission ☐

I/we do not wish to speak in support of my/our submission ☐

OPTIONAL: Pursuant to section 100A of the Resource Management Act 1991 I/we request that the Council delegate its functions, powers, and duties required to hear and decide the application to one or more hearings commissioners who are not members of the Council. *(Please note that if you make such a request you may be liable to meet or contribute to the costs of commissioner(s). Requests can also be made separately in writing no later than 5 working days after the close of submissions.)* ☐

5. Signature

Signature ---------- Date ----------

Signature ---------- Date ----------

6. Important Information

- Council must receive this completed submission before the closing date and time for submission for this application. The completed submission may be emailed to mdc@marlborough.govt.nz
- You must also send a copy of this submission to the applicant as soon as reasonably practicable, at the applicant's address for service.
- Only those submitters who indicate that they wish to speak at the hearing will be sent a copy of the hearing report.

7. Privacy Information

The information you have provided on this form is required so that your submission can be processed under the Resource Management Act 1991. The information will be stored on a public file held by Council. The details may also be available to the public on Council's website. If you wish to request access to, or correction of, your details, please contact Council.