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# Proposed Marine Farm Extension, Cutters Bay, Port Underwood: Benthic Survey, July 1999

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Bernard Brosnan



*prepared for*

Mr. B. Dick
Blenheim

Bernard Brosnan
11 Gillet Lane, Hamilton
New Zealand
Tel: 07 855 8594
Cel: 021 621 439
Email: bcb4@mngt.waikato.ac.nz

## Introduction

This report presents the results of a dive and profile survey undertaken as background for an application to extend an existing marine farm in Cutters Bay, Port Underwood (Figure 1).

The aim of this study was to provide ecological information on the proposed extension and to identify features of significant biological value that could potentially be threatened by the extension of the marine farm.

The "Guideline for Ecological Investigations of Proposed Marine Farm Areas" (DEPARTMENT OF CONSERVATION 1995) was used as a basis for survey design and ecological assessment.

## Study area

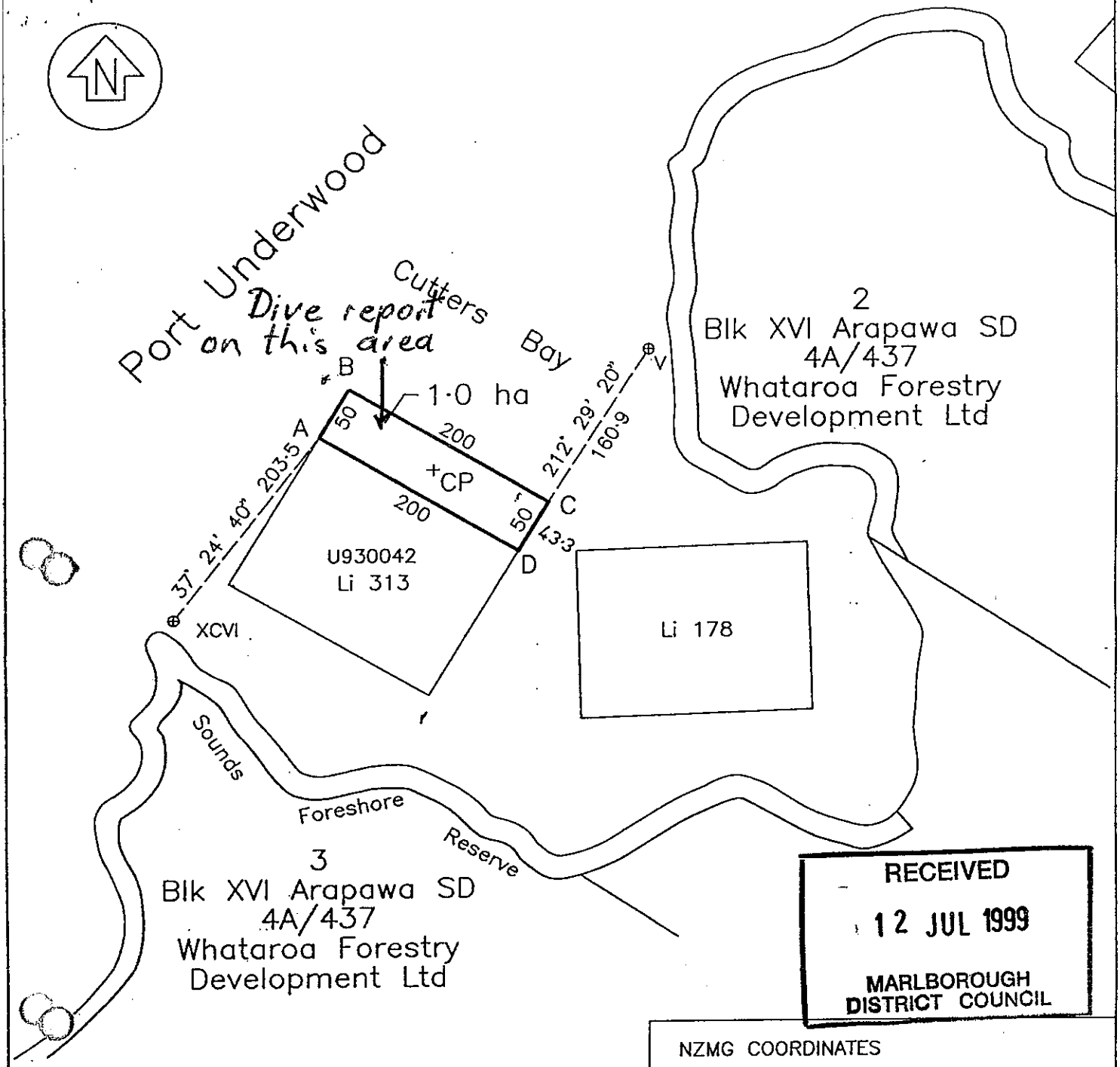
The location of the proposed extension site is just inside Cutters Bay, located close to the mouth of Port Underwood. The current owner wishes to extend the current marine farms northern boundary another 50 m (Figure 1). The area of this proposed extension is 1.0 ha (Figure 1). Position fixes were gained using the ships DGPS. The bay itself is sheltered and experiences little in the way of wave action and tidal currents. The terrestrial landscape above the shoreline is composed of reasonably steep hills which are covered in a mixture of pine trees (*Pinus radiata*) and gorse.

## Qualifications

I realise that my name is new to most people in the Marlborough Sounds region, so I hope to allay any suspicions of my competency in carrying out the described assessment by listing my qualifications and experience below. I would be more than happy to furnish anyone with a list of referees if they felt the information supplied below was insufficient.

My name is Bernard Brosnan and I am the biological coordinator for the ecological assessment of the present site. I have a number of marine related qualifications and which qualify me to carry out this type of assessment. My tertiary qualifications include;

- an M.Sc. in Marine Science with credit from the university of Otago
- a postgraduate diploma in Marine Science with credit from the university of Otago
- a B.Sc. in Zoology and Psychology from Massey University.

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| C | 5984305·1 mN | 2604506·9 mE |
| D | 5984262·0 mN | 2604481·5 mE |
| CP | 5984334·3 mN | 2604408·1 mE |
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| XCVI | 5984201·9 mN | 2604185. |

Survey marks adopted from SO 321

Coastal Permit Application


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# PLAN OF PROPOSED EXTENSION TO MARINE FARM Li 313
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I have spent three years carrying out epibenthic surveys in Fiordland and have a great deal of experience in survey design and analysis. I am familiar with many types of survey techniques and community analysis, indeed my Masters thesis was solely based on epibenthic surveys.

I have worked at the National Institute of Environmental and Scientific Research (ESR) as a laboratory analyst in the Marine Biotoxin group. As a result I have become more familiar with the shellfish industry, particularly in the Marlborough Sounds.

I have been a qualified PADI diver for over eleven years, I currently hold a PADI rescue diver qualification. I have also been involved in research diving for over five years both in a leading and assisting role.

I have worked as an assistant or researcher on a number of marine projects such as;

- The national survey for the level of contaminants in the common cockle
- Contamination of stormwater entering the coastal environment
- Temporal, spatial and seasonal variation in productivity and larvae in the port of Tauranga.

I would be more than happy to furnish you with a copy of my cirriculum vitae or a list of referees if you require further information on my work history.

Currently, I am enrolled in a Postgraduate diploma in Environmental Management at the University of Waikato. I hope to continue on next year and complete a Masters in management.

**Methods**

Field work was completed on the 6th of July 1999. The areas of the proposed extension to the marine farm and location of shore profiles were identified using the vessels radar and DGPS.

The guidelines for ecological investigations (Department of Conservation 1995) sets out the basic procedures to be followed when doing an ecological assessment. These are explained below.

*Investigative survey*

The aim of the investigative study was to provide a description of substratum and the distribution and/or abundance of conspicuous species or features of particular ecological interest in, and immediately adjacent to, a proposed marine farm area (Department of Conservation 1995). The 'Marine farm guidelines' (Department of Conservation 1995) suggest that a number of shore profiles being carried out. The guidelines define a 'shore profile' as a profile showing bottom type, depth, and conspicuous species along a transect that originates at a point on the shoreline and that runs at 90° to the shore and ends at a point on the seaward side of the proposed

boundary. This was not possible in the present study. This was because the proposed extension was to move the seaward boundary line another 50 m outwards.

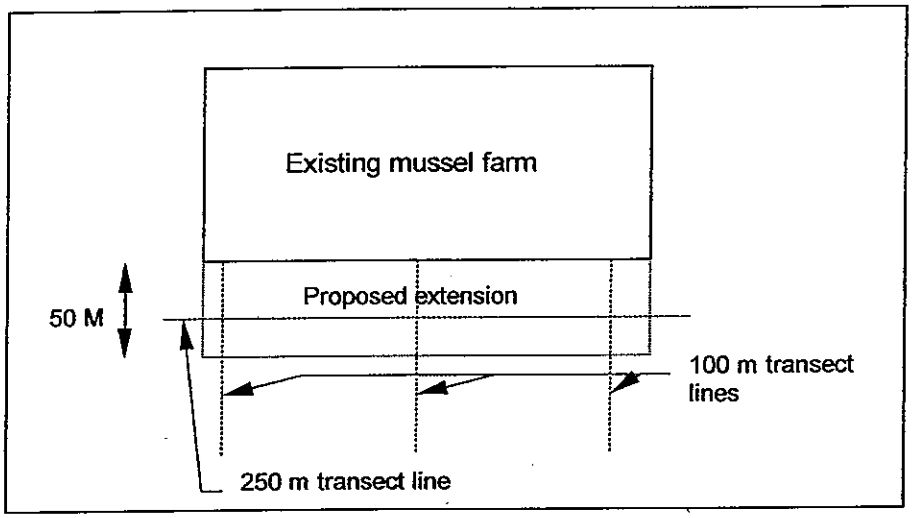


Figure 2. Diagram of transects carried out in present study.

To describe the substratum and conspicuous species present in the area of the proposed extension, the present study undertook three 100 m transects which originated from points within the existing mussel farm and headed at 90° to the shoreline to finish at a point 100 m from the existing farm boundary (Figure 2). A 250 m transect was laid out parallel to the existing seaward boundary of the existing mussel farm to further investigate the substratum and conspicuous species present.

Along each transect, marine biologist recorded all conspicuous species present and the habitat (including bottom sediment and depth). All depths in this report are adjusted to chart datum.

The three 100 m transects of the extension area were analysed as a three dimensional mesh plot to provide a visual representation of the sea floor beneath the extension.

The 250 m transect was analysed as a two dimensional line plot to provide a depth profile across the area that is under application (Figure 2).

If any conspicuous species were observed above the 'trigger levels' indicated in "the guidelines for ecological investigations of proposed marine farm areas" (Department of Conservation 1995), a more rigorous, quantitative survey was undertaken.

The abundance scale used in the present study for the distribution of species along the shore profiles, are defined as follows;

- **rare** = only one or two individuals, colonies or plants observed during shore profile investigations

- **occasional** = seen in low abundances, often only in a particular depth zone or from a particular habitat type
- **common** = seen often or in large numbers or over the entire study area, and may form a zone, bed or school.

## Results

*Shore profiles*
The shore profiles show the general distribution sediment type and species across the sea bottom.

The three dimensional mesh plot shows a constant depth along the transects (Figure 3). The substrate was dominated by fine silt and mud at all depths. The proposed extensions to the farm lie over a mud/ silt bottom and in a depth of around 10 m.

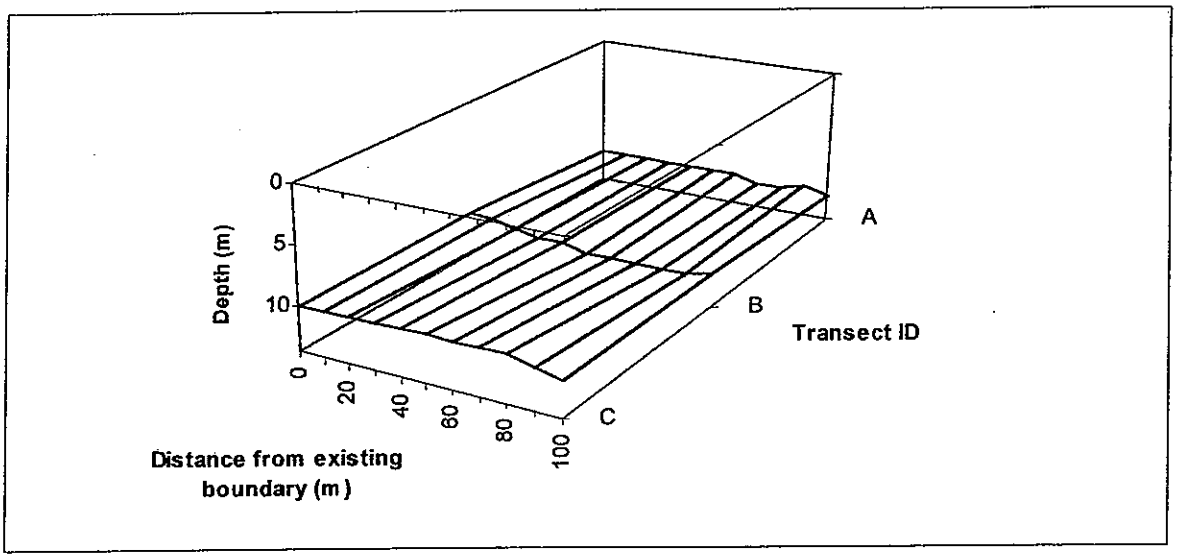


Figure 3. 3-D mesh plot of marine farm extension area.

Figure 4 shows the same information as Figure 3. The substrate is dominated by mud and silt and has a constant depth of around 10 m.

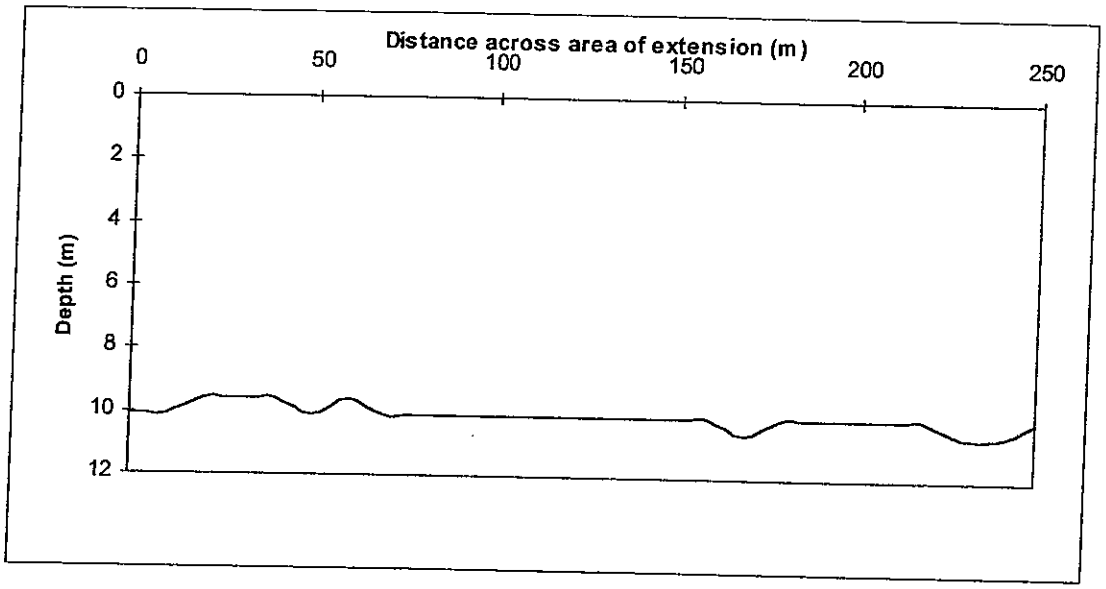


Figure 4. Depth profile across the area of the proposed extension.

*Conspicuous species*
The distribution of species over the study area was relatively even with no transects or areas of the surveys having a species that was found in only in one area.

A total of 16 species were recorded, covering a wide range of animal and plant groups (Table 1). The species that were common along the transects were two species of red algae, *Rhodymenia foliifera* and an unknown specimen of red algae. These two species were observed in all depths and habitats over the study area.

Another organism that was common throughout the entire study area was a small tube worm that lived in the fine sediments. A number of predators such as the white nudibranch, the black sea slug, the 11 arm starfish (*Coscinasterias muricata*) and the common octopus (*Octopus maorum*) were observed within the study area but were rare.

The algae that was observed along the transects were no larger than 20 cm high and were partially covered in sediment.

*Horse Mussels (Atrina zelandica)*
The horse mussel (*Atrina zelandica*) was observed along the extension profiles. Specimens were also observed living under the drop lines within the existing farm. The distribution of these individuals did not appear to be clumped in one area or region of the survey area. They appeared to have a random distribution throughout the survey area and were as likely to be located under drop lines as located 100 m from the existing farm boundary.

*Lampshells*
No lampshells (Brachiopoda) were observed on any of the transects.

*Hydroids and Bryozoans*
No large hydroid species were observed during the present study. No bryozoan mounds were observed within the study area.

| | | |
|---|---|---|
| **Algae** | | |
| | Unknown red algae | Rhodymenia foliifera |
| | | Ecklonia radiata |
| | | Tinocladia novae-zelandiae |
| **Chordata** | | |
| | Saddle squirt | Cnemidocarpa bicornuata |
| **Echinodermata** | | |
| | Cushion star | Patiriella regularis |
| | Snake star | Pectinura maculata |
| | Sea cucumber | Stichopus mollis |
| | 11 arm starfish | Coscinasterias muricata |
| **Mollusca** | | |
| | Green mussel | Perna canaliculus |
| | Horse mussel | Atrina zelandica |
| | White nudibranch | Fam. Opisthobranchia |
| | Octopus | Octopus maorum |
| | Black sea slug | Fam. Opisthobranchia |
| **Polychaeta** | | |
| | White tube worm | Fam. Terebellidae |
| | Fan worm | Branchiomma serratibranchis |

Table 1. List of conspicuous species identified along transects

*Tube worm mounds (Galeolaria hystrix)*
No tube worm mounds were observed during the present study.

## Discussion

The present study identified that the substratum and distribution of species did not differ over the entire survey area. Interesting findings included horse mussels being located beneath the existing mussel farm drop lines.

The species observed in the survey area did not appear to be adversely affected by the existing marine farm being located close by. Indeed, the shore profiles showed similar species being present at either end of the transect line.

Horse mussels were detected in with the proposed extension area but these were at densities lower than the 'trigger levels' given in the guidelines (Department of conservation 1995).

*Potential Impact of a bivalve farm*

Impacts of mussel culture on soft bottom substratum have been reported as (Gillespie 1989, Watson 1995, Davidson 1998);

- increased levels of shell and fine sediment particles deposited onto the benthos (due to shell drop off, mussel harvesting, and float and warp cleaning)
- on a mud bottom, the diversity of species living on the surface most often increases (due to shell substratum providing additional habitat), while the diversity of species lining within the sediment most often decreases (due to deposition of finer sediment and chemical changes)
- the anoxic layer moves closer to the surface (due to the deposition of finer sediment and organic material originating from the mussel farm)
- an increase in sulphide and organic material, especially nitrogen which results in a increase in ammonium levels

Since a farm is already located next to the extension area, the above processes are already occurring. As stated before, there appears to be no adverse affects on the biological community of the survey area. Hence granting permission for the extension is unlikely to affect this community. The species present are structured to cope with the conditions produced by a mussel farm.

The study site is located well within Port Underwood and experiences low tidal currents and little wave action. As a result, any possible effects will be localised to areas beneath the farm or a few meters adjacent to it (Gillespie 1989).

Visibility was very low during the present study (<1 m) which may indicate a high suspended sediment load. I am unaware of any research carried out on the sedimentation rates in Port Underwood which would confirm this statement. However, local divers who regularly use this area have stated that Port Underwood commonly has very low visibility.

The species observed during the present study did not appear to be adversely affected by this sediment. It is likely then that the communities present are able to cope with high sediment loads and low sediment oxygen concentrations which are said to be produced by mussel farms. Indeed, the fine silt sediment of the area beneath the proposed extension is dominated by polychaetes which are resistant to low sediment oxygen concentrations (Gillespie 1989) and therefore unlikely to be adversely affected by the granting of the application.

Marine farms have also been noted to increase abundances of animals in and on the seabed around mussel farms (Watson 1995). The mussel farm can provide hard substrata, and an enhanced source of food for natural predators such as starfish, crabs and fish (Watson 1995).

*Conclusion*

From these results, there appears to have been no significant impact from the existing farm, and no sessile species were regarded as being rare or in densities above trigger levels stated in the marine farm application guidelines (Department of Conservation 1995). It is therefore concluded that the area is suitable for the proposed extension from a benthic ecological stand.

**References**

Davidson, R.J. (1998). Preliminary report on ecological issues related to mussel harvesting activities. *Research, Survey and Monitoring report number 158, Wellington.*

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Gillespie, P.A. (1989). The impact of long-line mussel culture on benthic habitat. *Report prepared for the Coastal and Marine Resources Directorate, Department of Conservation, Wellington.*

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