A BIOLOGICAL REPORT ON A PROPOSED MARINE FARM EXTENSION LOCATED AT MAORI BAY, PELORUS SOUND, MARLBOROUGH SOUNDS (Lic. 175)

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A report prepared for:

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1. SUMMARY

1. The aim of this study was to provide a biological description of the benthos and associated species within and adjacent to a proposed mussel farm extension in Māori Bay (Licence 175), Pelorus Sound, Marlborough Sounds.

2. Two 90 metre transects were conducted from the shore into the proposed farm area. In addition, two 20m transects were conducted; one within the proposed farm extension and one inshore.

3. The habitat beneath the proposed farm extension consisted of soft sediments (mud base).

4. The depth beneath the proposed farm extension remained at 6 metres.

5. There were 7 species of invertebrates, 2 algal species, and 2 species of bony fish recorded in the transects.

6. Based on data collected during the present study, no modifications to the proposed extension appears necessary as nothing ecologically important was present beneath or adjacent to the proposed farm extension.

2. INTRODUCTION

Marine farming has the potential to have a detrimental effect on the environment through lowering water quality and habitat modification. It is, therefore, important that the substratum and associated organisms below and adjacent to the proposed marine farm are properly identified.

To determine whether the species, communities, or habitats present at the proposed site have any special ecological, conservation, scientific, or resource value the Department of Conservation has produced a "Guideline for ecological investigations of proposed marine farm areas" (DOC 1995). This guide outlines criteria for assessing values of proposed mussel farms and identifies a preliminary list of significant species, communities and habitats.

The present survey provides a biological description of the substratum and the distribution and/or abundance of conspicuous species or features of particular ecological interest within and adjacent to a proposed farm extension located at Maori Bay (Licence 175), Pelorus Sound, Marlborough Sounds (Figure 1).

In this report we provide the following:

i) A brief background on the potential effects of mussel farms.
ii) The potential farm extension location.
iii) A description of the survey design and sampling methods used for the site.
iv) A description of the seabed habitats and depth profiles.
v) The species present and their abundance within and adjacent to the proposed extension.
vi) Suitability of the area for a proposed mussel farm.

3. BACKGROUND

The environmental effects of mussel farms in the Sounds have been described in previous reports and publications (Kaspar *et al.* 1985; Cole & Grange, 1996; Davidson, 1998). These studies indicate that the mussel farms impacts on the seabed are localised and do not generally extend more than a few tens of metres horizontally from the boundary of the long lines.

The main effects are:

1) The sedimentation of organic-rich fine-grained particles
2) Deposition and accumulation of faeces, pseudofaeces, and shell litter that can cause the benthic substrate to become anaerobic.
3) Formation of artificial reefs beneath the farm on mussel shell depositions.
4) Reduced levels of phytoplankton available in the water column.

The rationale for surveying the seabed beneath proposed farms is because the consequences of increased sedimentation from mussel farms will depend on the nature of the benthic substratum. For example, rocky reef communities, which are sensitive to increased sedimentation, are likely to be severely affected by increased sedimentation beneath a mussel farm. Conversely, the ecological impact on organisms living in mud and silt substrates is likely to be less significant (Davidson & Brown, 1999).

Organic enrichment beneath a marine farm can produce anaerobic (oxygen-depleted) sediments that is most likely to effect the infaunal communities which live in the sediment matrix, more than the epibenthic communities which live on the surface of the seabed. However, the effect of anaerobic sedimentation has not been described beneath shellfish culture areas in New Zealand.

There is some evidence that mussel shell depositions beneath farms can often act as a substrate for the formation of reef-type communities (Davidson & Brown, 1999). Conversely, there is also evidence that mussel clumps and shell litter can be relatively barren, with little apparent value as a reef community (Watson 1996).

Generally, deep marine farm sites, or sites exposed to strong currents are generally less susceptible to adverse inputs than shallow sites in areas of weak currents. However, within these conditions, the seabed impacts at any particular site are difficult to predict in advance. It is generally accepted that a flat or a gently sloping mud/silt seafloor, in the absence of important species, is the most appropriate habitat over which to place marine farms.

4. STUDY AREA

Maori Bay is located within the Pelorus Sound, Marlborough Sounds. The proposed extension of Licence 175 would increase the cover of the farm to 3.04 hectares (157.45m X 366m) (Figure 1).

5. MATERIALS AND METHODS

Data collected during the study followed the guidelines for ecological investigations of proposed farm areas in the Marlborough Sounds (DOC 1995). The proposed marine farm extension in Maori Bay (Licence 175) was investigated on June 15, 1999.

5.1 SITE POSITIONING

The corner boundaries for the proposed farm were located by visual identification of landmarks on the shore and measurement of distances using a vessel mounted radar and marked with buoys.

5.2 SURVEY DESIGN

To attain an accurate representation of the benthos under the proposed farm area, two 90 metre transects were conducted. Each transect consisted of a 90m lead rope marked at 5m intervals with cattle ear tags. Transects extended approximately 5m from MLWM at a 90° to the shore into the proposed farm. Where possible transects extended across the entire farm width. In addition, two 20m transects were conducted; one in a south-west direction within the proposed extension, the other along the inshore boundary (see Figure 1 for transect locations).

Two divers (using SCUBA) swam above the substrate along either side of the lead rope recording data on perspex plates. Habitat change and depth was noted along transect lines and species abundance and location were recorded. Species abundance was allocated a category: 1 = rare, 2 = occasional, and 3 = common. Densities (per $1m^2$) of important species (scallops, brachiopods, sponges, and horse mussels) were also reported.

6. RESULTS

6.1 PHYSICAL FEATURES

Transect 1 (south-east direction: north side of farm)

HABITAT: The first 0-10m of the transect was broken rock/silt with shells. Mud with clumps of shells occurred from 10-25m. The remaining 25-90m and the 20m south-west transect consisted of a mud base (Figure 2).

DEPTH: This is a gently sloping shallow site with no abnormalities, leveling out at 6m depth 25m offshore (Figure 2). The depth remained at 6m under the proposed extension and in the 20m south-west transect.

Transect 2 (south-east direction: south side of farm)

HABITAT: The first 0-10m of the transect was dominated by broken rock, silt and shells. The remaining 10-90m consisted of a mud base (Figure 3).

DEPTH: This is a gently sloping shallow site with no abnormalities, leveling out at 6m depth 25m offshore (Figure 2). The depth remained at 6m under the proposed extension (Figure 3).

Inshore transect (20m) (north-east direction)

The habitat was broken rock and shells with silt and was 3m deep (Table 1).

6.2 SPECIES PRESENT

Two transects revealed 7 species of invertebrates, 2 algal species, and 2 species of bony fish (Tables 1 + 2). The trigger abundance of important species was not significant in accordance to the DOC guidelines.

On the broken rock substrate (0-10m) the tube worm (*Galeolaria hystrix*), cats eye (*Turbo smaragdus*), and saddle squirts (*Cnemidocarpa* sp.) were the main invertebrate species. The red algae, *Rhodymenia*, and encrusting coralline species (*Corallina* sp.) were also common in this habitat.

The cushion starfish (*Paterillea regularis*), saddle squirts (*Cnemidocarpa* sp.), 11 arm starfish (*Coscinasterias calamaris*), a spider crab (*Notomithrax minor*) and green mussels (*Perna canaliculus*) were found in the mud substrata (10-90m).

Only two horse mussels (*Atrina zelandica*) were recorded within the proposed farm boundaries, therefore well below the trigger densities.

Spotties (*Notolabrus celidotus*) and triplefins (*Fosterygion lapillum*) were observed in low numbers throughout the transects.

7. DISCUSSION

The seabed impacts of mussel farms can vary from site to site, and depend on a variety of factors relating to farm management and environmental conditions. As conditions vary from site to site a reasonable scenario of impact would be a moderate enrichment of sediments and infaunal communities beneath the farms, along with an accumulation of shell litter with a variable value as reef habitat. Because of these effects the most suitable habitat is a soft-bottomed substrate (mud/silt) with a relatively low range of species in relatively low abundance.

A marine farm extension in Maori Bay appears suitable as the habitat beneath the proposed extension consisted of a shallow mud base. Also, there was low species diversity with most occurring in low abundance.

8. SITE SUITABILITY

The proposed farm extension at Maori Bay (Licence 175) is positioned over a flat area (6m) of mud seabed. Ecologically important species do not occur, therefore, no modifications to the proposed extension appear necessary on ecological grounds.

9. BIBLIOGRAPHY

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Table 1. Species and substrata observed along transect one (90m) at Maori Bay

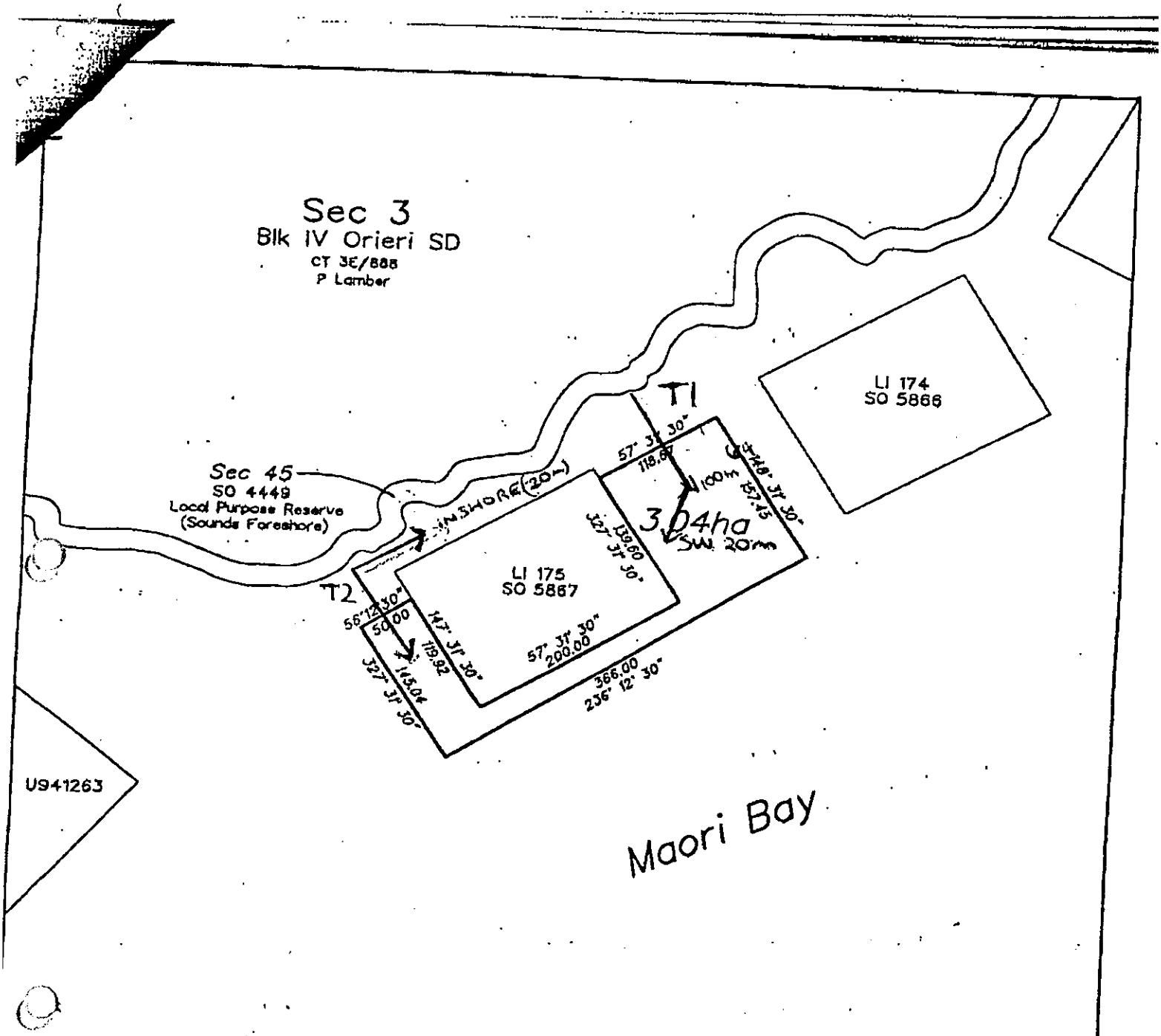
Distance	Depth	Habitat	Species	Common name	Abundance
0-10	0-3	Broken rock, silt and shells	*Galeolaria hystrix*	tube worm	3
			Forsterygion lapilum	triplefin	3
			Corallina spp.	paint	3
			Paterillea regularis	cushion star	2
			Turbo smaragdus	catseye	2
			Cnemidocarpa sp.	saddle squirts	2
			Rhodymenia sp.	red algae	2
10-25	4-6	Mud, shell clumps	*Rhodymenia sp.*	red algae	2
			Cnemidocarpa sp.	saddle squirts	2
			Coscinasterias calamaris	11 arm star	1
25-90	6	Mud	*Paterillea regularis*	cushion star	2
			Rhodymenia sp.	red algae	2
			Notolabrus celidotus	spotties	1

Distance	Depth	Habitat	Species	Common name	Abundance
20m Transect	6	Mud	*Paterillea regularis*	cushion star	2
			Rhodymenia	red algae	2
			Notolabrus celidotus	spotties	1
			Perna canaliculus	green mussel	1

Table 2. Species and substrata observed along transect one (90m) at Maori Bay

Distance	Depth	Habitat	Species	Common name	Abundance
0-10	0-3	Broken rock, silt and shells	*Rhodymenia*	red algae	3
			Corallina spp.	paint	3
			Forsterygion lapilum	triplefins	2
			Cnemidocarpa sp.	saddle squirts	1
10-90	3-6	Mud	*Paterillea regularis*	cushion star	3
			Rhodymenia sp.	red algae	2
			Atrina zelandica	horse mussel	1 (2 seen)
			Notolabrus celidotus	spotties	1
			Notomithrax minor	spider crab	1

Distance	Depth	Habitat	Species	Common name	Abundance
20m inshore	3	Broken rock/silt + shells	*Notolabrus celidotus*	spotties	3
			Rhodymenia	red algae	3
			Corallina spp.	paint	2
			Forsterygion lapilum	triplefins	2
			Cnemidocarpa sp.	saddle squirts	1



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Plan of Proposed Coastal Permit Being Extension to Licence 175

Marlborough Mussel Co

NOTE: The position of this application has not been surveyed.

MARLBOROUGH DISTRICT COUNCIL

SCALE 1:5000

50 0 50 100 150 200 250 300 350 400 450metres

Datum: New Zealand Map Grid	
Prepared by; DRAUGHTING *Plus*	Date 5/6/99
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FIGURE ONE