Research, Survey and Monitoring Report Number 66

Description of the subtidal macrobenthic community from a proposed marine farm in central Tawhitinui Bay, Pelorus Sound

by

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1.0 INTRODUCTION

This report presents a biological description of the habitats and associated conspicuous macrobenthic communities from an area proposed as a marine farm in central Tawhitinui Reach, Pelorus Sound (Figure 1).

Tawhitinui Reach is regarded as the central part of Pelorus Sound. It reaches depths of up to 29 m but most of the area is between 24 to 25 m depth (Navy Chart NZ 615). The shoreline of Tawhitinui Reach area is typical of much of the sheltered Marlborough Sounds being dominated by a narrow rubble or bedrock intertidal zone with a backdrop of steep hill sides often with relatively rounded tops. Water residence times in this area are probably shorter than those recorded for back-waters of the central Pelorus Sound such as Hallam Cove, and Crail and Beatrix Bays (Gibbs 1991).

Tawhitinui Bay is a relatively small bay some 1.4 km wide and 600 m in length and is located in the eastern parts of Tawhitinui Reach (Figure 1).

The inner and offshore boundaries of the proposed marine farm stretch some 400 metres in length in an approximately east/west orientation. The farm is 150 m wide along its entire length (Figure 2). Depths on the inshore boundary were approximately 26 m (Point 1) to 19 m (Point 2), while depths along the offshore boundary were approximately 26 m (Points 3, 4). The proposed activity, details of farm structure and species are outlined in a report by Resource Management Consulting on behalf of the applicant Marlborough Mussel Co.

The Marlborough Sounds lie at the northern end of the South Island, with Cook Strait to the north and east and Golden Bay and the West Coast to the west. The Marlborough Sounds area was formed by a combination of tectonic processes and sea level rise. The Sounds consist of approximately 1500 km of bays, passages, peninsulas, headlands, estuaries and beaches, often with an adjacent steep terrestrial topography. The Sounds are a resource of major environmental importance. In a nationwide report by the Department of Conservation, the Marlborough Sounds was identified as being of national conservation importance. The Sounds was also identified as having areas of international biological importance (Davidson et al ., 1990; Davidson et al., in press). These values will be important consideration in the soon to be produced Marlborough District and Coastal Plans.

Multiple use (marine farming, fishing, boating, housing, waste water disposal, port development, forestry, agriculture) have the potential to degrade the environment of the Sounds. Marine farming for example, can have considerable impact on the environment through habitat modification or lowering water quality (Kaspar et al., 1985; Gowan and Bradbury, 1987; Kaspar et al., 1988; Gowan et al., 1990; Silvert, 1992). It is therefore important that all new marine farm proposals adequately identify natural values within and adjacent to a proposed marine farm.

The aim of this study was therefore to provide environmental information on the proposed site and to identify features of biological value which could be threatened by the establishment and associated impacts from the proposed marine farming activity.

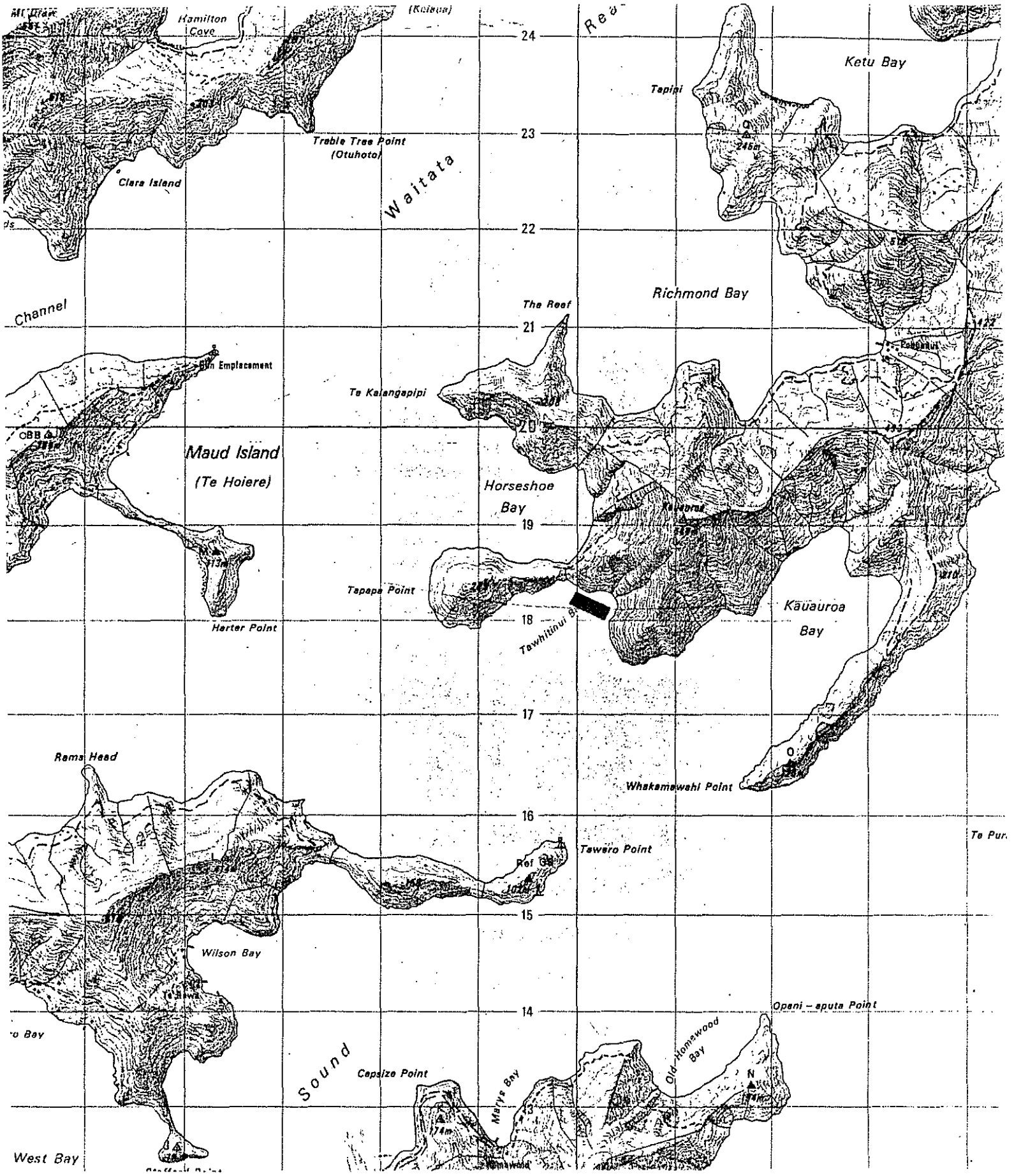

Fig. 1. Locality

MF 538

Locality Map of Proposed Marine Farming Licence

Applicant: Marlborough Mussel Co. Ltd.

LOCAL AUTHORITY: MARLBOROUGH DISTRICT	MARLBOROUGH LAND DISTRICT
CROWN COPYRIGHT RESERVED LIC. No. MB 1994/21	SCALE 1:50,000
Prep. by GJR | Date NOV.1994 | Job 726605 | File 6475/01/02 | Infoman 260 P26	

Department of Survey & Land Information
Te Puna Korero Whenua

2.0 MATERIALS AND METHODS

The proposed site was qualitatively investigated on the 12 th October 1995, using two rapid subtidal survey techniques. The inshore boundary and randomly selected parts of the proposed marine farm area and adjacent coast between 2 to 24 metres depth were investigated by a free diver assisted by an Apollo scooter. Results from this preliminary investigation were recorded on waterproof paper. Based on these findings, two representative areas located within the proposed farm backbone structure were selected and a 100m to 150 m lead-lined transect line marked at 5 m intervals was installed perpendicular to the shore (Figure 2). These transect sites were considered representative of the substrata, habitats and flora and fauna observed during the free swim.

Using SCUBA, depth, distance, substrate, habitat and associated conspicuous surface dwelling flora and fauna were recorded using waterproof paper, clipboard and a pencil. This process was terminated at a distance of 150 m (transect 1) and 100 m (transect 2) from the low tide mark and at depths of approximately 22 to 27 metres. The abundance of conspicuous macroinvertebrates, and macroalgae were estimated on a scale of 1 = uncommon (1 or 2 observed), 2 = occasional (observed sporadically), and 3 = common (regularly seen or forming a zone or patches).

At both transects, scallop (*Pecten novaezelandiae*), brachiopod (*Magasella sanguinea*) and horse mussel (*Atrina zelandica*) densities were collected from a 1 m wide strip at various intervals along the transect line.

All depths presented in this report are adjusted to datum.

Data collected during the study followed the Department of Conservation guideline to the investigation of marine farm areas in the Marlborough Sounds (Department of Conservation, 1995).

3.0 RESULTS AND DISCUSSION

3.1 Scooter Run

Results from the scooter run across random parts of the proposed farm and along the inshore areas of the proposed marine farm and adjacent coast suggested that:

1) substrata present were bedrock, small to medium sized boulders, pebbles, cobbles, fine sands, 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) a zone where three species of hydroids and tube worm mounds were regularly observed occurred between approximately 6 to 16 m depth;

4) habitats and communities varied between western and eastern halves of the proposed marine farm; and

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

3.2 Profiles

The intertidal shore adjacent to the proposed marine farm area was dominated by a combination of short bluffs and a bedrock shore in the west and a relatively low gradient shore or cobble/pebble beach in the east. The coast was bordered by coastal forest.

Both subtidal shore profiles were initially extensions of the intertidal shore being dominated by cobble/pebble/boulder substrata (Figures 3, 4). At both transects the hard shore zone terminated in soft shores at approximately 12 m to 14 m depth and 40 m to 50 m distance from shore (Figures 3, 4).

On the hard shores, a shallow subtidal zone of relatively dense brown macroalgae occurred and was dominated by *Carpophyllum flexuosum*. With increasing depth the macroalgal bed was replaced by encrusting invertebrate communities including tubeworm mounds (*Galeolaria hystrix*) and hydroid colonies.

Soft bottom areas were dominated by dead whole and broken shell overlying silts in the shallower fringe, while at greater depths, silts and clays were common (Figure 3). Within the proposed marine farm boundaries, the bottom communities and substrata remained relatively consistent. Brachiopods and scallops were recorded from these soft bottom shores.

From the transects and scooter run a total of 35 conspicuous species of invertebrate, 8 algae, 2 ascidians and 5 species of bony fish were recorded. A list of species are presented in Table 1, while the profiles are plotted in Figures 3, 4.

Green-lipped mussel (*Perna canaliculus*) were recorded from during the present study. Blue mussel (*Mytilus edulis*) were recorded forming a zone at low tide.

3.3 Reef Fish

Five species of fish were recorded during the investigation. Most abundant reef fish observed were spotty (*Notolabrus celidotus*) and blue cod (*Parapercis colias*). Spotty were by far

Table 1 Species observed from transects from an area in Tawhitinui Bay.				
Algae	**Common name**	**Invertebrates**	**Habitat**	**Common name**
Corallina spp.(3)	paint	SPONGIA		
Colpomenia sp. (2)	bubble weed	Ancorina alata (2)	rubble	grey sponge
Hormosira banksii (1)	Neptune's necklace	Aplysilla sulphurea (2)	rock	sulphur sponge
Halopteris sp. (1)		Crella incrustans (1)	rubble	encrusting sponge
Carpophyllum maschalocarpum (2)	narrow flap-jack	COELENTERATA		
Carpophyllum flexuosum (3)	wide flapjack	Actinothoe albocincta (1)	rubble/bedrock	anemone
Codium convolutum (2)	green alga	Culicea rubeola (1)	rubble	box anemone
Cystophora torulosa (2)		Obelia sp. (2)	rubble/rock	hydroid fuzz
		Pennaria sp. (2)	rubble/shell	golden hydroid
		Pennaria sp. (2)	rubble/shell	hydroid
		Solanderia racemosa (1)	rubble/shell	hydroid tree
		BRYOZOA		
		Celleporaria agglutinans (2)	shell	coral
		GASTROPODA		
		Cellana spp. (2)	rubble	limpet
		Maoricolpus roseus (2)	sand/shell	spire shell
		Trochus viridus (1)	rubble	
		Turbo smaragdus (3)	rock/rubble	cats eye
		BIVALVIA		
		Atrina zelandica (1)	soft	horse mussel
		Chlamys sp. (1)	rock	queen scallop
		Modilarca impacta (3)	rubble	Nestling mussel
		Monia zelandica (3)	rock/rubble	window oyster
		Mytilus edulis (3)	rock	blue mussel
		Pecten novaezelandiae (1)	soft	scallop
		Perna canaliculus (1)	rock	green mussel
		POLYCHAETA		
		Brachiomma sp.(2)	sand/rubble	fan worm
		Galeolaria hystrix (3)	sand/rubble	tube worm
		Spirorbis sp. (3)	rubble/rock	
		Serpulid sp. (1)	soft	tube worm
		CRUSTACEA		
		Pagurus spp (2)	sand	hermit crab
		ECHINODERMATA		
		Allostichaster insignis (2)	rubble	starfish
		Coscinasterias calamaris (2)	sand/shell	11 arm star
		Evechinus choroticus (2)	rock/rubble	kina
		Patiriella regularis (2)	sand/rubble	cushion starfish
		Pectinura maculata (2)	rubble	snake star
		Pseudechinus albocinctus (2)	soft	pink urchin
		Stichopus mollis (2)	sand/silt	cucumber
		BRACHIOPODA		
		Waltonia inconspicua (2)	shell	lamp shell
		Magasella sanguinea (3)	shell	lamp shell
		ASCIDEACEA		
		Cnemidocarpa sp. (2)	rubble	saddle squirt
		Didemnium sp. (2)	rubble	cream ascidian
		BONY FISHES		
		Notolabrus celidotus (3)	rubble	Spotty
		Hemercoetes monopterygius (2)	silt	Opalfish
		Forsterygion varium (2)	rock/rubble	variable trip.
		Parapercis colias (2)	rubble	blue cod
		Parika scaber (1)	rubble	leatherjacket

numerically the most abundant reef fish, while blue cod < 30 cm length were relatively common. During the investigation, few blue cod greater than 30 cm length were observed. Very few spotty or blue cod were observed from the benthos below the proposed marine farm. This was particularly apparent in the mud area from transect 1 (Figure 3).

3.4 Scallops

Scallops were recorded from the soft bottom shore within the proposed marine farm. Densities averaged from fifteen 10 m^2 quadrats between 50 m to 150 m from shore were mean = 0.073 per m^{-2}, SE = 0.021. This density is below that considered as commercially viable, and recreationally acceptable to divers. Highest numbers of scallops were recorded from the inshore soft bottom areas most of which are outside the area proposed as a marine farm. Almost all scallops recorded from the mud habitat from transect 1 were 30 mm to 50 mm width.

3.5 Horse mussels

Horse mussels were observed from the soft bottom shore within the proposed marine farm but were not recorded from quadrats.

3.6 Brachiopods

Brachiopods or lampshells (*Magasella sanguinea, Waltonia inconspicua*) were recorded from the soft bottom shore within the proposed marine farm between 11m to 23 m depth, but were most common between 20m to 23 m depth or 60 to 80 m distance from shore (Figure 4). Densities of lampshell were relatively low 2-5 individuals per m^2 from transect 2. Compared to densities of this species recorded from other parts of Tawhitinui Reach, most densities recorded from the present site are relatively low.

3.6 Hydroids

Three species of hydroids were observed along the western half of the study area between approximately 40 m to 50 m from shore at depths of 14 m to 17 m. In this zone these species were relatively common. These species appear to prefer areas of Pelorus Sound where relatively strong tidal currents occur. These species have been recorded in higher densities in other parts of

the main channel of central Pelorus Sound (author, pers. obs.), but this particular area has a healthy zone of this community type.

4.0 DISCUSSION OF POTENTIAL IMPACTS OF BIVALVE MARINE FARMS

In a study on the effects of mussel aquaculture, it was recognised that build-up of shell debris and increased sedimentation rates directly below mussel farms strongly influenced benthic communities (Kaspar et al., 1985). Deposition of shell debris can ultimately smother natural benthic communities (Author, pers. obs.).

All of the benthos investigated below the proposed marine farm was dominated by a soft bottom (dead whole and broken shell, silts and clays). In most areas under the proposed marine farm, these substrata were colonised by relatively low range of conspicuous epibenthic. Sessile species would probably be smothered by any shell debris originating from a farm, while some species such as the mobile opal fish would probably relocate.

5.0 CONCLUSION

The aims of the study were to provide a biological description of the benthos under and adjacent to a proposed marine farm in central Tawhitinui Bay, Pelorus Sound and to identify potential threats to any subtidal ecological values posed by the proposed marine farming activity.

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 the sheltered central Pelorus Sound (Dell 1951; Estcourt 1967; McKnight 1969, 1974; Roberts and Asher 1993; McKnight and Grange 1991; Davidson and Duffy, 1992; Davidson, 1994; Davidson and Brown 1994; Duffy et al. in prep; Chadderton et al., in prep, Chadderton and Davidson in prep). A zone of hydroids and tube worms were recorded in relatively high abundances but were outside the proposed marine farm boundaries. Brachiopods were recorded in relatively low densities and abundances on the inshore soft bottom areas inside and outside the proposed marine farm. Scallops and horse mussels were recorded from within the proposed marine farm but relatively low densities. No other species of special scientific or ecological importance were observed during the study.

It appeared that the substrata under the proposed marine farm was dominated by dead whole shell overlying silts in the inshore areas and silts and clays (mud) in deeper areas. The associated flora and fauna from these areas was represented by a relatively low diversity of marine biota. This soft bottom habitat and all species are widespread in Pelorus Sound, and also in many of the sheltered parts of the Marlborough Sounds.

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