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Survey and Monitoring Report No. 51

Description of the subtidal macrobenthic community from a proposed marine farm west of The Reef, outer Richmond Bay Waitata Reach, Pelorus Sound

by
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A report prepared for

Marlborough Mussel Co.

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1.0 INTRODUCTION

This report presents a biological description of habitats, substrata and associated conspicuous macrobenthic communities from a proposed 5.25 ha marine farm area west of The Reef, outer Richmond Bay, Waitata Reach, Pelorus Sound (Figure 1, 2).

The proposed site is located on the coast immediately south-west of The Reef which itself forms the southern headland of Richmond Bay. The Reef is a narrow peninsula some 800 m long comprising a ridge which terminates in bare outcropping rock. This rock extends subtidally offshore some 300-500 m distance. The proposed marine farm site is situated on the western side of this peninsula (Figure 1, 2).

Richmond Bay and the coast immediately outside the bay (Waitata Reach) is dominated by steep hillsides clad in scrub and pasture. Waitata Reach is regarded as being part of central Pelorus Sound and reaches depths of up to 67 m, but most is between 40 to 55 m depth. The shoreline of Waitata Reach is typical of much of the sheltered Marlborough Sounds being dominated by a narrow rubble or bedrock intertidal zone often backed by short steep banks or small bays. Water residence times in this area are probably short compared to those recorded for the back-waters of the central Pelorus Sound such as Hallam Cove, and Crail and Beatrix Bays (Gibbs 1991) as this area is relatively close to the entrance to Pelorus Sound and the clean waters of Cook Strait.

The proposed marine farm area is north-east to south-west orientated with the closest distance between the shore and proposed marine farm being approximately 50 m distance (Fig. 2). The proposed farm stretches 350 metres in length is 150 m wide along its entire length. Depths on the eastern or inshore boundary were approximately 16 m (Point 4) to 22.5 m (Point 3), while depths on the outside or western boundary ranged between approximately 19 m (Point 2) to 30 m (Point 1). The proposed activity, details of farm structure and species are outlined by 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 submergence of river valleys, 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. 1995). These values will be important consideration in the soon to be produced Marlborough District Council Regional Coastal Plan and District Plan.

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 of the proposed marine farming activity.

2.0 MATERIALS AND METHODS

The proposed site was qualitatively investigated on the 21st July 1995. All of the inshore boundary and randomly selected parts of the adjacent subtidal shore between 1.5 to 17 metres depth were investigated by a free swimming diver assisted by an Apollo scooter. Observations were immediately recorded using waterproof paper, clipboard and a pencil. Based on observations made during the scooter run, two representative areas, one near each end of the

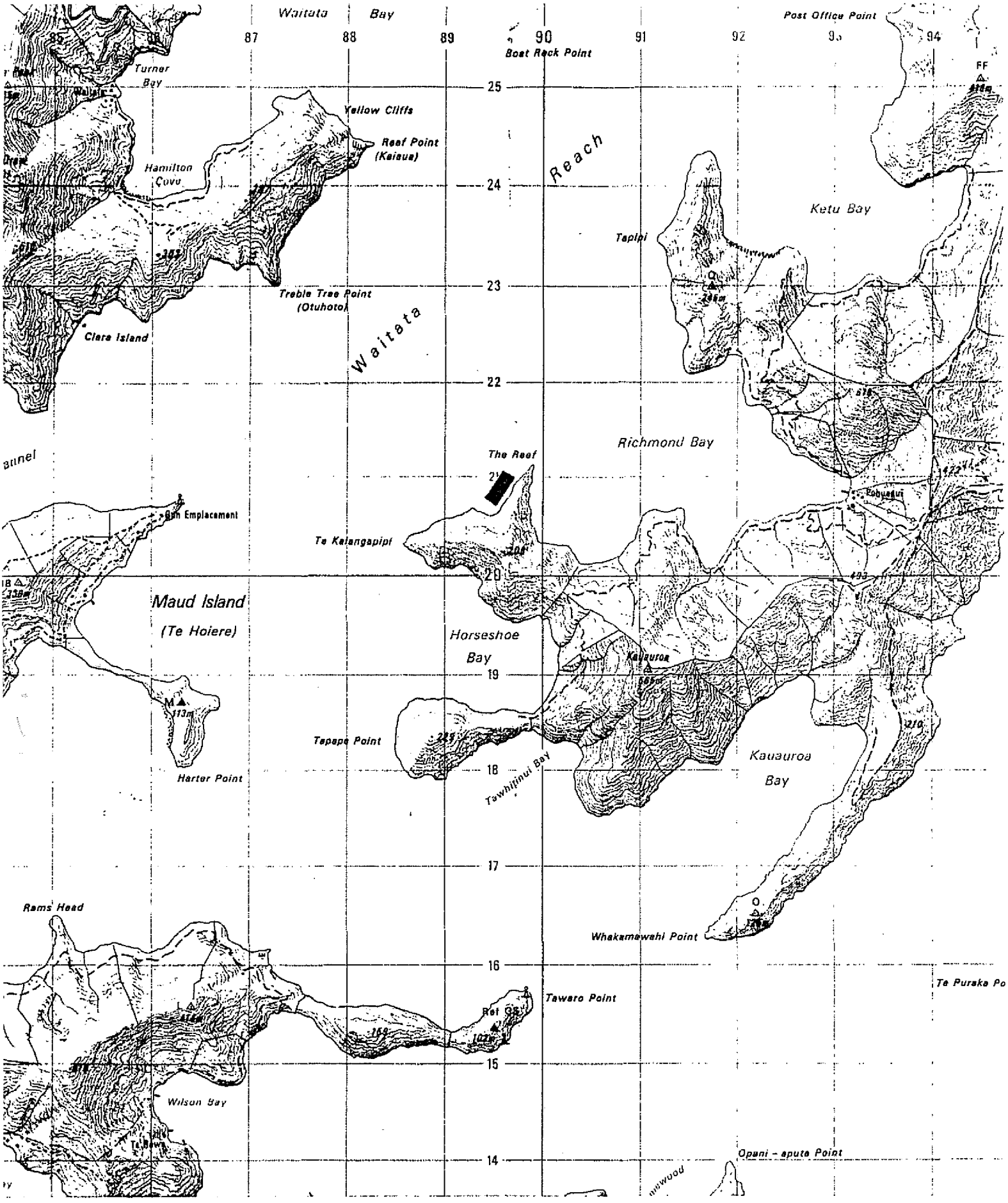

Fig. 1.

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Locality Map of Proposed Coastal Permit

Applicant: Marlborough Mussel Co. Ltd.

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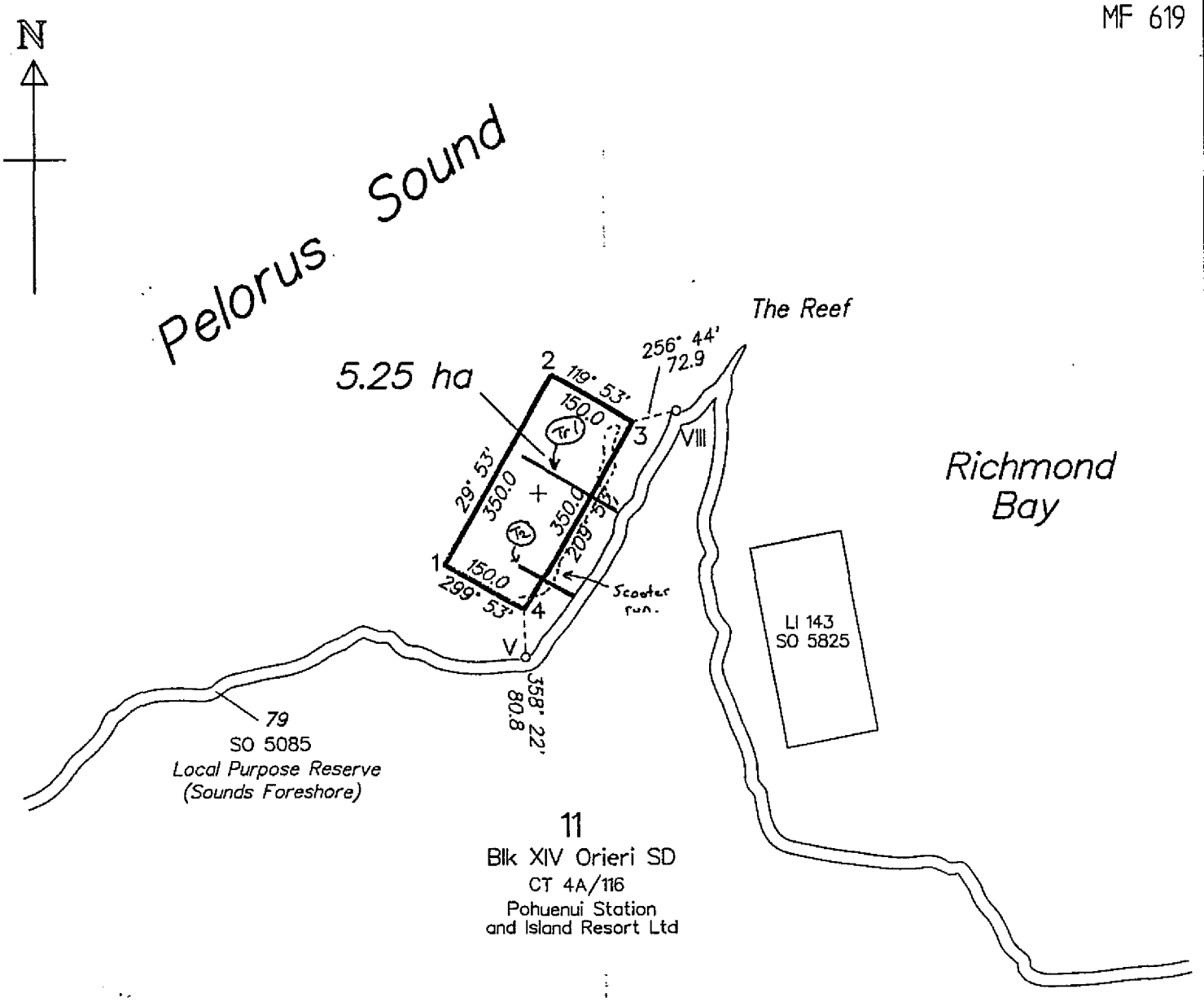

SCHEDULE OF COORDINATES
Datum: New Zealand Map Grid

Point	North	East
1	6020772.7	2589405.5
2	6021076.2	2589579.9
3	6021001.4	2589709.9
4	6020698.0	2589535.6
V	6020617.1	2589537.9
VIII	6021018.2	2589780.9
Centroid	6020887.1	2589557.7

Plan of Proposed Coastal Permit

Marlborough Mussel Co

Coastal Survey marks adopted from SO 394

Bearing variation Geodetic Datum 1949 to NZMG +3°30"

SCALE 1:10,000

200 100 0 100 200 300 400 500 600 700 800 900 1000 metres

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Figure 2. Proposed marine farm and transect (scooter) sites.

proposed marine farm were selected and a lead-line marked at five metre intervals was installed perpendicular to the shore. For each transect, depth, substrata and the abundance of conspicuous macroinvertebrates, macroalgae and fish were recorded. Biota abundance were estimated on a scale of 1 = uncommon (1 or 2 individuals observed), 2 = occasional (observed sporadically), and 3 = common (regularly seen or forming a zone or patch).

All depths presented in this report were adjusted to chart datum.

3.0 RESULTS AND DISCUSSION

3.1 Scooter Run

Results from the scooter run across random parts 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, sandy broken shell, shelly silt, dead whole shell and silts;

2) cobble and pebble material were recorded in the inshore parts of the proposed marine farm, particularly in the north;

3) no dramatic differences in habitats or communities between northern and southern parts of the proposed area were observed, however, the offshore extent of the cobble, pebble, shell substrata were greater from the northern transect;

4) a current community dominated by three species of hydroid was observed between 14 to 24 m depth along the length of the proposed marine farm; and

4) silts and clays (mud) dominated the majority of the proposed marine farm area beyond 100 m from shore.

3.2 Shore Transects

The intertidal shore adjacent to the proposed marine farm area was dominated by a combination of short bluffs, and a rubble/small boulder/bedrock intertidal shore. The adjacent coast was bordered by land clad in a very early stages of regeneration.

Both subtidal shore profiles were initially an extension of the intertidal shore being dominated by a bedrock, boulder and cobble/pebble substrata. The bedrock was restricted to the sublittoral zone and was replaced at greater depth by cobble and pebble material. This rubble zone formed a steep bank which graded into a cobble/broken shell sand bottom at the northern transect or into a dead and broken shell substratum at the southern transect. Further offshore a dead whole shell/broken shell/silt substrata extended out until the silt/clay (mud) habitat dominated the benthos (Figure 3).

From the scooter run and two shore transects a total of 43 conspicuous species of invertebrate, 13 algae, 3 ascidians and 5 species of bony fish were recorded. A list of species observed from the scooter run and transects are presented in Table 1.

The cobble/dead whole shell/broken shell/sandy silt bottom between 14 and 24 m depth was most notable for a community dominated by three hydroid species. Two of which were common and found growing on cobble and dead shell material. All three species prey on food which is carried in the water column by the strong tidal currents which appear to sweep this coast. The hydroids recorded in the present study represent a community of benthic species which may have a restricted distribution in the Marlborough Sounds.

Tube worms *Galeolaria hystrix* were observed on rubble substrata, but no mounds were seen in the present study.

Five species of fish were recorded from the transect and scooter run. Spotty (*Notolabrus celidotus*), blue cod (*Parapercis colias*), (common triplefin (*F. lapillum*), and opal fish

(*Hemercoetes monopterygius*) were all abundant. Blue cod were dominated by small (< 250 mm length) individuals observed mostly in the rubble substrata. Three juvenile < 10cm individuals were observed diving for cover as the divers approached.

Brachiopods(*Magasella sanguinea, Waltonia inconspicua*) were recorded in low numbers from the study area, mostly in depths of 18 to 24 m. *M. sanguinea* and *W. inconspicua* are the most widespread brachiopods recorded from shallow subtidal areas in the Marlborough Sounds (McKnight and Grange, 1991; Duffy et al. in prep; Chadderton et al., in prep). They are most often recorded from broken/ dead shell/sand substrata in depths greater than 8 m. Chadderton et al., (in prep) recorded it in highest densities in Pelorus Sound from their sample site in Hallam Cove and recognised *M. sanguinea* as a species which characterised their matrix habitat (sand/ shell substrata) in central Pelorus Sound. The author recorded this species of brachiopod in an average density of 4.1 per m^{-2} and in densities as high as 23.2 per m^{-2}. No quantitative data were collected in the present study but it is estimated that the brachiopods located in the proposed marine farm area were low in comparison to those recorded by Chadderton et al (in prep). Preliminary results suggest that parts of central Pelorus Sound, particularly in the Hallam\Garne Bay area may be characterised by dense beds of the brachiopod *M. sanguinea.*

Green-lipped mussel (*Perna canaliculus*) were recorded from shallow rubble substrata during the present study. Blue mussels (*Mytilus edulis aoteanus*) were also recorded at and around the low tide mark on the shore adjacent to the proposed marine farm.

Scallops (*P. novaezelandiae*) were recorded from soft substrata in the present study. No density calculations were attempted as part of the present study as scallops were extremely rare. The only scallops observed were seen in the 10 to 24 m depth range. The density of scallops observed in the study area would be well below the 0.1 individuals per m^{-2} density.

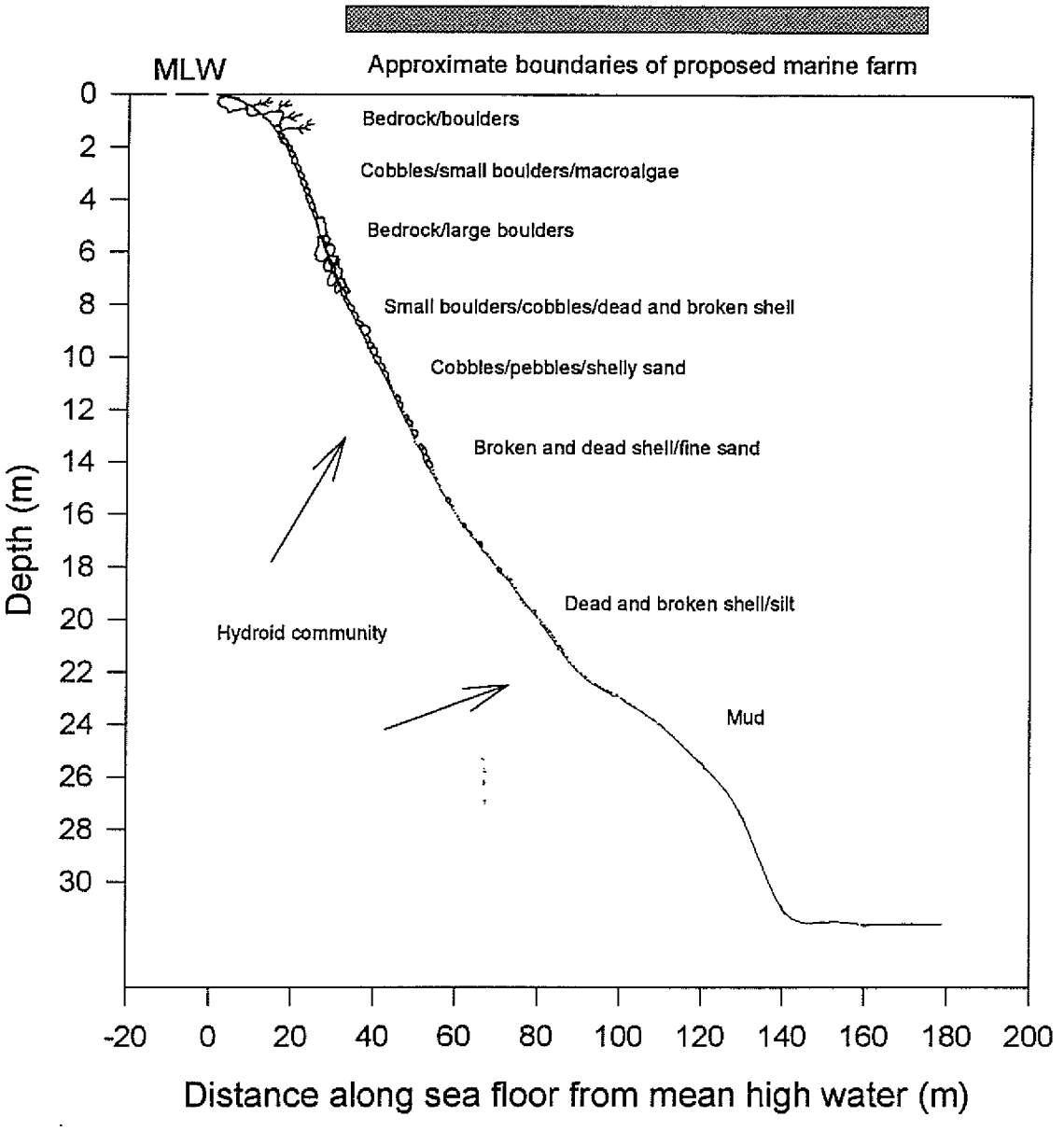

Figure 3 Subtidal shore profile, and substrata from a proposed marine farm site west of The Reef (Transect 1).

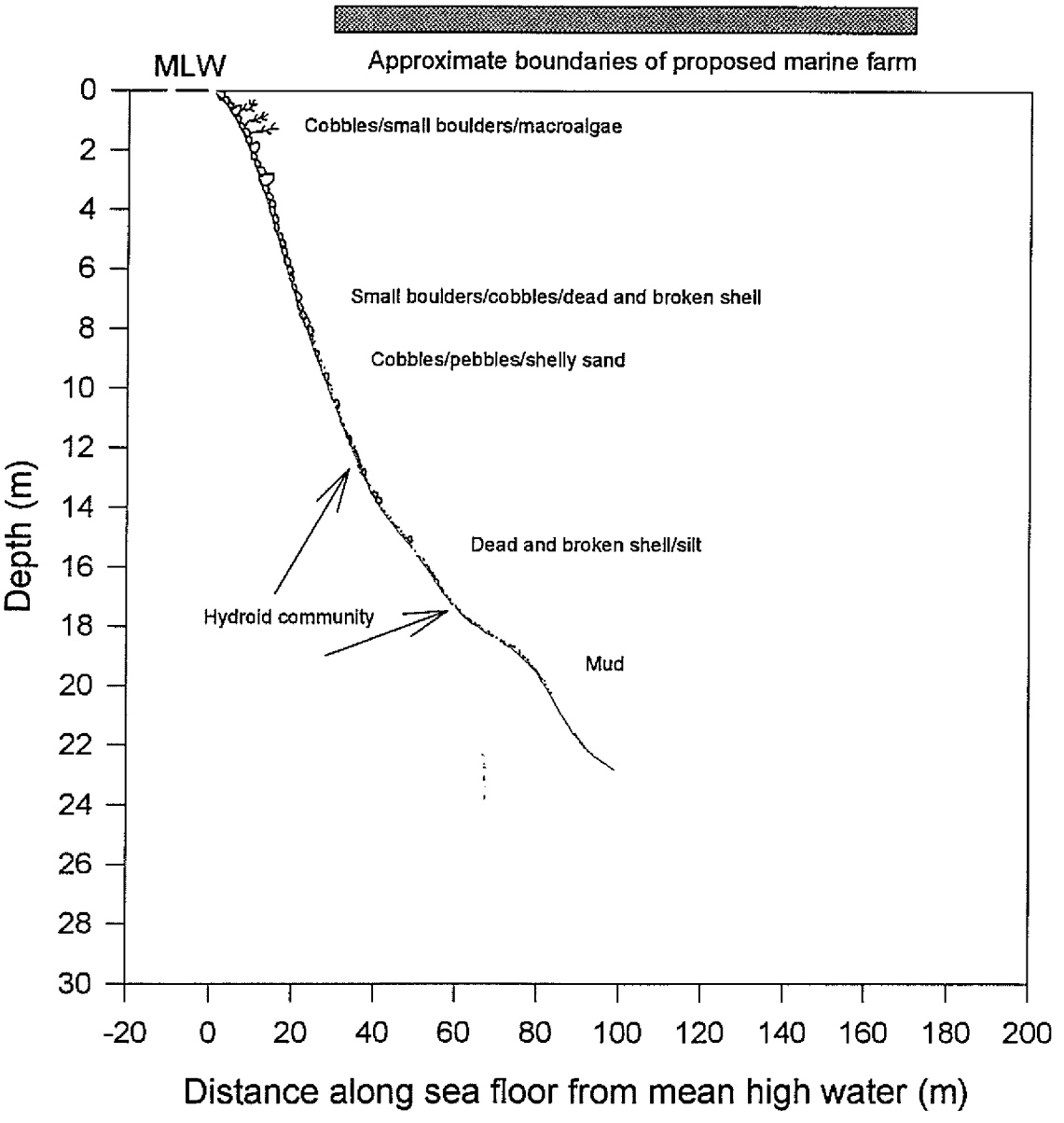

Figure 3b Subtidal shore profile, and substrata from a proposed marine farm site west of The Reef (Transect 2).

Table 1 Species observed from transects from an area west of The Reef, Richmond Bay.				
Algae	**Common name**	**Invertebrates**	**Habitat**	**Common name**
Carpophyllum maschalocarpum (2)	narrow flap jack	SPONGIA		
Carpophyllum flexuosum (3)	wide flap jack	Ancorina alata (1)	rubble	grey sponge
Corallina spp.(3)	paint	Crella incrustans (1)	rubble	encrusting sponge
Cystophora torulosa (1)		Stellatid sp. (2)	rubble	
Cystophora sp. (2)		COELENTERATA		
Colpomenia sp. (2)	bubble weed	Actinothoe albocincta (3)	rubble/soft	anemone
Hormosira banksii (1)	Neptune's necklace	Epiactis sp. (1)	soft	anemone
Ulva sp. (1)	sea lettuce	Obelia sp. (3)	rubble/rock	hydroid fuzz
Lenormandia chauvini (1)	red alga	Pennaria sp. (3)	rubble/shell	golden hydroid
Unidentified red alga (1)		Pennaria sp. (3)	rubble/shell	hydroid
Rhodymenia sp. (1)	red alga	Solanderia racemosa (2)	rubble/shell	hydroid tree
Codium convolutum (3)	green alga	BRYOZOA		
Halopteris sp. (1)		Celleporaria agglutinans (1)	shell	"coral"
		GASTROPODA		
		Haliotis iris (1)	rock	paua
		Monia zelandica (2)	rock/rubble	window oyster
		Cellana stelifera (2)	rubble	limpet
		Cellana radians (1)	rubble	limpet
		Chlamys diffenbachii (2)	shell/rubble	queen scallop
		Cookia sulcata (1)	rock	Cook's turban
		Cryptoconchus porosus (1)	rubble	butterfly chiton
		Jason mirabilis (1)	soft	purple nudibranch
		Maoricolpus roseus (2)	sand/shell	spire shell
		Pecten novaezealndiae (1)	soft	scallop
		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 (2)	rubble	Nestling mussel
		Mytilus edulis aoteanus (2)	rubble	blue mussel
		Pecten novaezelandiae (2)	soft	scallop
		Perna canaliculus (1)	rock	green mussel
		POLYCHAETA		
		Brachiomma sp.(2)	sand/rubble	fan worm
		Galeolaria hystrix (2)	sand/rubble	tube worm
		Spirorbis sp. (3)	rubble/rock	
		Serpulid sp. (1)	soft	tube worm
		CRUSTACEA		
		Balanus sp. (1)	rock	barnacle
		Pagurus spp (2)	sand	hermit crab
		ECHINODERMATA		
		Coscinasterias calamaris (2)	sand/shell	11 arm star
		Evechinus choroticus (2)	rock/rubble	kina
		Patiriella regularis (2)	sand/rubble	cushion starfish
		Pectinura maculata (3)	rubble	snake star
		Pentagonaster pulchellus (1)	shell	broach star
		Pseudechinus albocinctus (2)	soft	pink urchin
		Stichopus mollis (2)	sand/silt	cucumber
		BRACHIOPODA		
		Magasella sanguinea (2)	sand/shell	lamp shell
		Waltonia inconspicua (2)	soft	lamp shell
		ASCIDEACEA		
		Aplidium phortax (1)	rubble/soft	opaque squirt
		Cnemidocarpa sp. (2)	rubble	saddle squirt
		Didemnium sp. (2)	rubble	cream ascidian
		BONY FISHES		
		Notolabrus celidotus (3)	rubble	Spotty
		Hemercoetes monopterygius (3	silt	Opalfish
		Forsterygion lapillum (2)	rubble	common trip
		Forsterygion varium (2)	rock/rubble	variable trip.
		Parapercis colias (3)	rubble	blue cod

4.0 DISCUSSION OF POTENTIAL IMPACTS ON THE BENTHOS 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.).

The areas of benthos investigated below the proposed marine farm were dominated by soft bottoms, mostly silts and clays, however, a zone of cobble/pebble/shell substrata were recorded extending to 60 to 105 m from high water. This substrata appeared to extend greatest distances from shore in the northern parts of the proposed area. This inshore zone was dominated by a high diversity of species and a high density of hydroids which formed a very conspicuous community. This community would probably be adversely affected by a marine mussel farm. A mussel farm would probably result in the ultimate smothering of these sessile organisms due to deposition by shell debris and possibly particulate matter. Substrata and communities further than 100 m from the high tide mark were dominated by silts and clays with a very low diversity of species (opal fish, cushion star). These species would probably be either smothered by any shell debris originating from a farm (cushion star) or would relocate to areas dominated by their preferred habitat (opal fish).

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 west of The Reef, outer Richmond Bay, Waitata Reach and to identify potential threats to any subtidal ecological values posed by the proposed activity.

The soft and hard shore species recorded from the present study contained biota that are widespread throughout the subtidal shores of central Pelorus Sound and sheltered Marlborough Sounds (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). No rare or threatened species were recorded from the study area.

A hydroid community dominated by three species was observed between approximately 14 to 24 m depth and 60 to 105 m from the high tide mark. This community may be of particular ecological importance as they are most often recorded in lower densities in the outer Sounds. These animals rely on strong tidal currents to bring them food and are vulnerable to smothering of both the feeding apparatus or smothering of the whole animal. This community was recorded within the boundaries of the proposed marine farm and would probably be adversely affected by such a farm. It is therefore suggested that the inshore boundary of the proposed marine farm be relocated a minimum of 50 m further offshore.

The substrata under the remaining outside 100 m of the proposed marine farm was dominated by silts and clays (mud). The associated flora and fauna was represented by a relatively low diversity of marine biota. This soft bottom habitat and its associated species are widespread in the Marlborough Sounds. The establishment of a marine farm over this benthos (the outside 100 m of the proposed marine farm) would probably mean the ultimate modification of this soft bottom benthos and its associated community. This impact would, however, represent a small fraction of this habitat type in the sheltered parts of the Marlborough Sounds.

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