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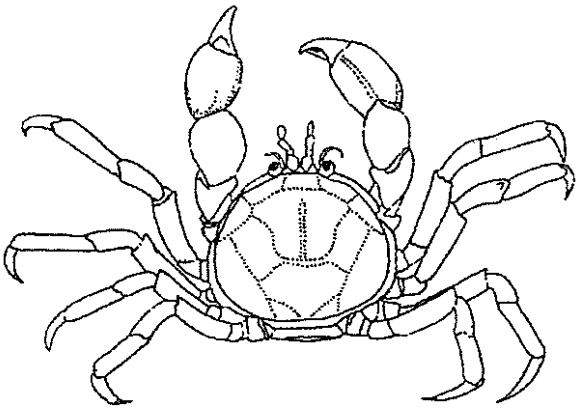
Research, survey and monitoring report number 111

Description of the subtidal macrobenthic substratum and associated communities from a proposed marine farm in Waihinau Bay, Pelorus Sound

A report prepared for:
Simpson & McConnachie



April, 1996

1.0 INTRODUCTION

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

Waihinau Bay is a moderate sized bay in the outer reaches of Pelorus Sound. The bay is some 1.2 km wide at its entrance and approximately 1.7 km in length. Depths in Waihinau Bay are relatively consistent between 25 m to 29 m (see Navy Chart NZ 615). The shoreline of Waihinau Bay is either regenerating pasture, or scrub in various stages of regeneration.

The application area is located along the north-western shore of Waihinau Bay (Figure 1). The boundaries of the proposed 3.34 ha area are shown in Figure 1. Depths along the inshore boundary were approximately 21.6 m (Point 3) and 18 (Point 4), while depths along the offshore boundary were approximately 27 m (Points 1 and 2). The proposed activity, details of farm structure and proposed species are outlined by a report by Resource Management Consulting on behalf of the applicant Simpson and McConnachie.

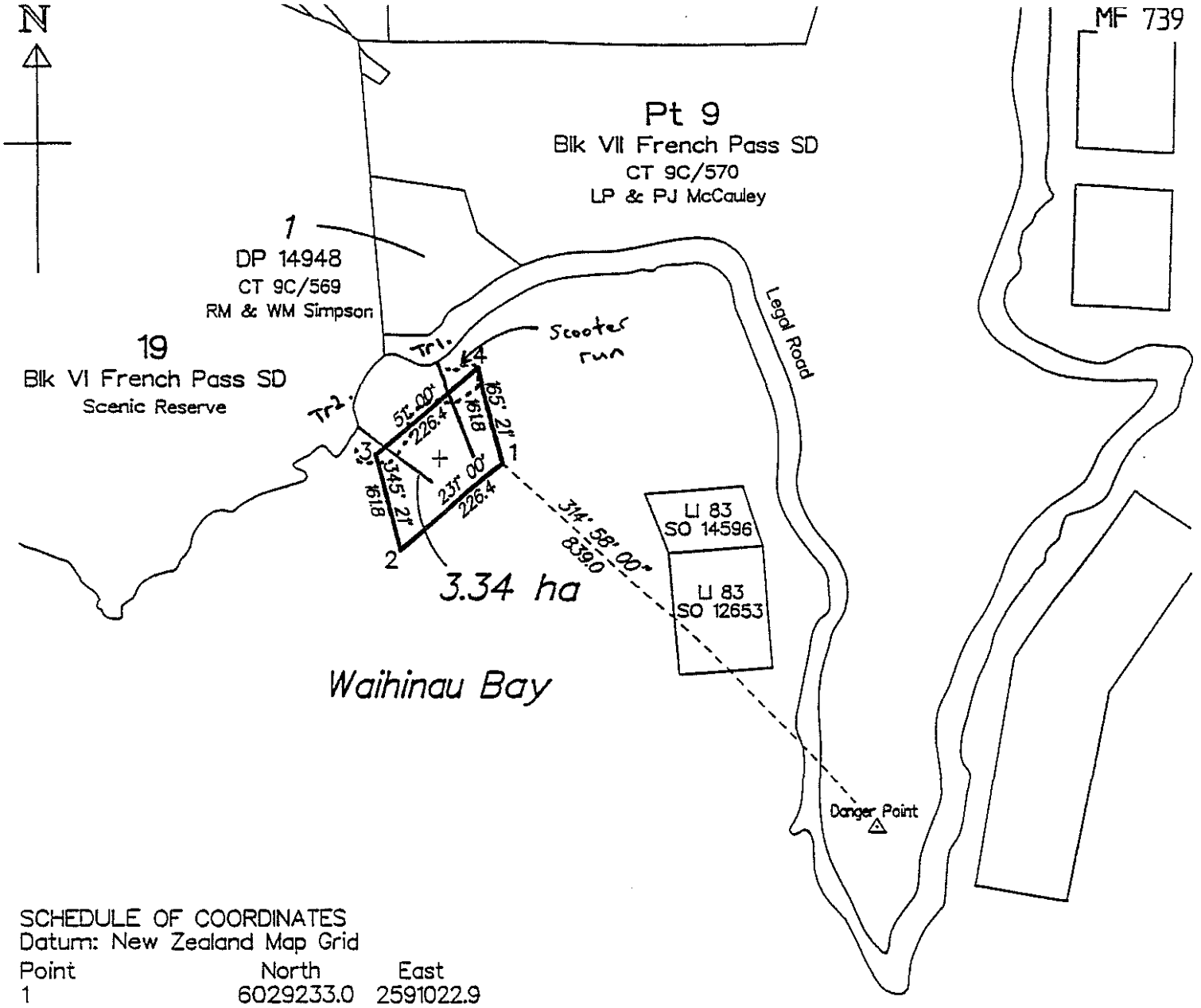
The Marlborough Sounds lie at the northern end of the South Island, with Cook Strait to the north and east and Golden Bay and the West Coast to the west. The Marlborough Sounds were formed by a submergence of river valleys. The Sounds consist of approximately 1500 km of bays, passages, peninsulas, headlands, 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 having national conservation importance. The Sounds has areas of international biological importance (Davidson et al., 1990; Davidson et al., in press). These values will be important consideration in the Marlborough District and Coastal Plans.

Multiple use (marine farming, fishing, boating, housing, waste water disposal, port development, forestry, agriculture) has 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 of 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 that could be threatened by the establishment of the proposed marine farming activity.

2.0 MATERIALS AND METHODS

The proposed 3.34 ha site was qualitatively investigated on the 28 th March 1996, using three subtidal survey techniques. Firstly, the inshore and offshore boundaries of the proposed area were remotely sensed using a colour scrolling Furuno depth sounder. Depths and any abnormalities along the sea bottom were noted for later diver inspection. In addition, the inshore boundary and randomly selected parts of the proposed marine farm area and adjacent coast between 4 to 19 metres depth were investigated by a diver assisted by a motorised subtidal Apollo scooter. Results from sounding and scooter investigations were recorded on waterproof paper.



SCHEDULE OF COORDINATES
Datum: New Zealand Map Grid

Point	North	East
1	6029233.0	2591022.9
2	6029090.5	2590846.9
3	6029247.0	2590806.0
4	6029389.5	2590982.0
Trig Danger Point	6028640.0	2591616.5
Centroid	6029240.0	2590914.5

Plan of Proposed Coastal Permit

Simpson & McConnachie

Coastline is MHWM from DOSLI DCDB

Bearing variation Geodetic Datum 1949 to NZMG +11' 50"

SCALE 1:10,000

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

LOCAL AUTHORITY: MARLBOROUGH DISTRICT	NELSON LAND DISTRICT
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Prep. By JB	Date 17/1/96	Job No 726817	File 6475/01/02	Reference P26/5.2

Department of Survey & Land Information
Te Puna Korero Whenua

Figure 1. Transects and scooter run.

Based on findings from these techniques, two areas were selected and a lead-lined transect line marked at 5 m intervals installed perpendicular to the shore (Figure 1). These transect sites were considered representative of the substrata, habitats and flora and fauna observed during the free swim.

Scallop (*Pecten novaezelandiae*), horse mussel (*Atrina zelandica*) and brachiopod (*Magasella sanguinea*) densities were not collected due to either their absence or very low abundances from the study area.

Notes were collected on water current direction and relative speed at 2 pm. These observations were approximately 2.5 hours after low tide.

All depths presented in this report are adjusted to datum.

Data collected during the study follow the Department of Conservation guideline on procedures for the investigation of marine farm areas in the Marlborough Sounds (Department of Conservation, 1995).

3.0 RESULTS AND DISCUSSION

3.1 Scooter Run, Depth Soundings and Water Currents

Results from depth soundings and the scooter swim across random parts of the proposed farm and along the inshore area of the proposed marine farm suggested that:

1) substrata present were bedrock and outcropping rock, small boulders, pebbles, cobbles, fine sand, broken and dead whole shell and silt;

2) outcropping bedrock, cobble and pebble substrata were recorded within the boundaries of the proposed marine farm;

3) tube worm mounds, opaque ascidian colonies and soft tube tubeworm colonies were observed within the boundaries of the proposed marine farm;

4) areas beyond 75 m distance from shore were dominated by dead whole shell overlying silt or simply a silt substrata;

5) large brown macroalgae were present but restricted to a sparse bed between low tide to 10 m offshore; and

6) horse mussels and scallops were relatively uncommon, while brachiopods were not observed during the study.

Water currents were estimated at approximately 12m and 26 m depth. At 12 m depth water current were estimated at 1 m per 12 seconds in an north-east direction along the shore. At 26 m depth, no current was detected.

3.2 Shore Profiles

Transects were terminated at 150 m to 160 m distance from shore some 40 m short of the offshore farm boundary. No bottom abnormalities were recorded from depth soundings of this offshore strip. From transects, the bottom was dominated by a relatively flat silt and clay benthos which extended from 100 m distance offshore to 150 m to 160 m distance. It was therefore considered unlikely that any changes in sediment and community composition would occur in the offshore unsurveyed area.

The intertidal zone adjacent to the proposed marine farm area was dominated by bedrock material on each side of the small bay, while within the bay cobble and pebble substrata dominated the intertidal zone. The coast was bordered by a terrestrial environment dominated early regeneration scrub and broardleaf scrubs.

Subtidal shore profiles were initially dominated by bedrock substrata (Figures 2 and 3). On these hard shores, brown macroalgae (*Carpophyllum flexuosum*) were relatively uncommon in a relatively narrow sublittoral fringe. Beyond the fringe of macroalgae, most rock substrata was dominated by coralline paint and numerous invertebrate grazers including kina, cats eye and limpets. Outcropping bedrock areas were observed from both transects between 0 m and 50 m distance from shore. Hard shores (cobbles and pebbles), extended 75 m to 80 m distance from shore and to depths of 19 m to 20 m depth.

Soft bottom shores dominated the benthos beyond the hard shore zone at all transects. At both transects the benthos was dominated by dead whole shell overlying silt substrata. Beyond this zone the benthos was dominated by silts and clays with very few species. These offshore areas were colonised by relatively few species in relatively low abundances (e.g. horse mussel, scallop, opal fish, saddle squirt and sponge).

From transects and scooter run, a total of 35 conspicuous species of invertebrate, 6 algae, 7 ascidians and 6 species of bony fish were observed. A list of species are presented in Table 1, while the profiles are plotted in Figures 2 and 3.

Green-lipped mussel (*Perna canaliculus*) were not observed during study, while blue mussel (*Mytilus edulis*) formed a zone near low water.

3.3 Fish

Six species of bony fish were recorded during the investigation. Spotty (*Notolabrus celidotus*) were the most abundant reef fish observed during the investigation. Blue cod (*Parapercis colias*) were relatively common with most observed from the cobble and outcropping rock areas and soft bottoms

Table 1 Species observed from transects from an area in Waihinau Bay, Pelorus Sound.				
Algae	**Common name**	**Invertebrates**	**Habitat**	**Common name**
Corallina spp.(3)	paint	SPONGIA		
Hormosira banksii (2)	Neptune's necklace	Aplysilla sulphurea (2)	rock	sulphur sponge
Rhodomenia sp. (1)	red alga	Ancorina alata (3)	rubble	grey sponge
Codium convolutum (1)	green alga	Crella incrustans (2)	rock/rubble	encrusting sponge
Caulerpa sediodes (3)	grape weed	Callyspongia sp. (1)	rubble	purple glass
Carpophyllum fleuosum (1)	wide flap-jack	Tethia sp. (2)	rock	golf ball sponge
		COELENTERATA		
		Actinothoe albocincta (1)	rubble/rock	striped anemone
		Culicea rubeola (1)	rubble	box anemone
		Obelia sp. (3)	rubble/rock	hydroid fuzz
		GASTROPODA		
		Cryptoconchus porosus (1)	rock	butterfly chiton
		Eudoxochiton nobilis (1)	rock	noble chiton
		Cellana spp. (2)	rubble	limpet
		Maoricolpus roseus (2)	sand/shell	spire shell
		Penion sp. (1)	soft	whelk
		Trochus viridus (2)	rubble	
		Turbo smaragdus (3)	rock/rubble	cats eye
		BIVALVIA		
		Atrina zelandica (1)	soft	horse mussel
		Modilarca impacta (3)	rubble	Nestling mussel
		Monia zelandica (3)	rock/rubble	window oyster
		Mytilus edulis (3)	rock	blue mussel
		Ostrea lutaria (2)	rock	dredge oyster
		Chlamys sp. (3)	rock	queen scallop
		Pecten novaezelandiae (1)	soft	scallop
		POLYCHAETA		
		Brachiomma sp.(3)	sand/rubble	fan worm
		Galeolaria hystrix (3)	sand/rubble	tube worm
		Maldanidae sp. (2)	soft	tube worm
		Spirorbis sp. (3)	rubble/rock	
		CRUSTACEA		
		Pagurus spp (2)	sand	hermit crab
		ECHINODERMATA		
		Allostichaster insignis (2)	rubble	starfish
		Coscinasterias calamaris (2)	sand/shell	11 arm star
		Evechinus choroticus (3)	rock/rubble	kina
		Patiriella regularis (3)	sand/rubble	cushion starfish
		Pectinura maculata (2)	rubble	snake star
		Pentagonaster pulchellus (1)	rubble	broach star
		Stichopus mollis (2)	sand/silt	cucumber
		ASCIDEACEA		
BONY FISHES		Aplidium phortax (3)	rock/rubble	opaque ascidian
Notolabrus celidotus (3)	Spotty	Cnemidocarpa bicornuata (3)	rubble	saddle squirt
Hemercoetes monopterygius (2)	Opalfish	Didemnium sp. (2)	rubble	cream ascidian
Forsterygion varium (2)	variable trip.	Leptoclinides sp. (2)	rubble	purple ascidian
Forsterygion lapillum (3)	common trip.	Unidentified species (1)	rubble/soft	warty squirt
Forsterygion malcolmi (2)	mottled trip.	Aplidium adamsi (1)	rubble	colonial ascidian
Parapercis colias (3)	blue cod	Aplidium phortax (3)	rock	opaque ascidian
1 = uncommon, 2 =occasional, 3 = abundant				

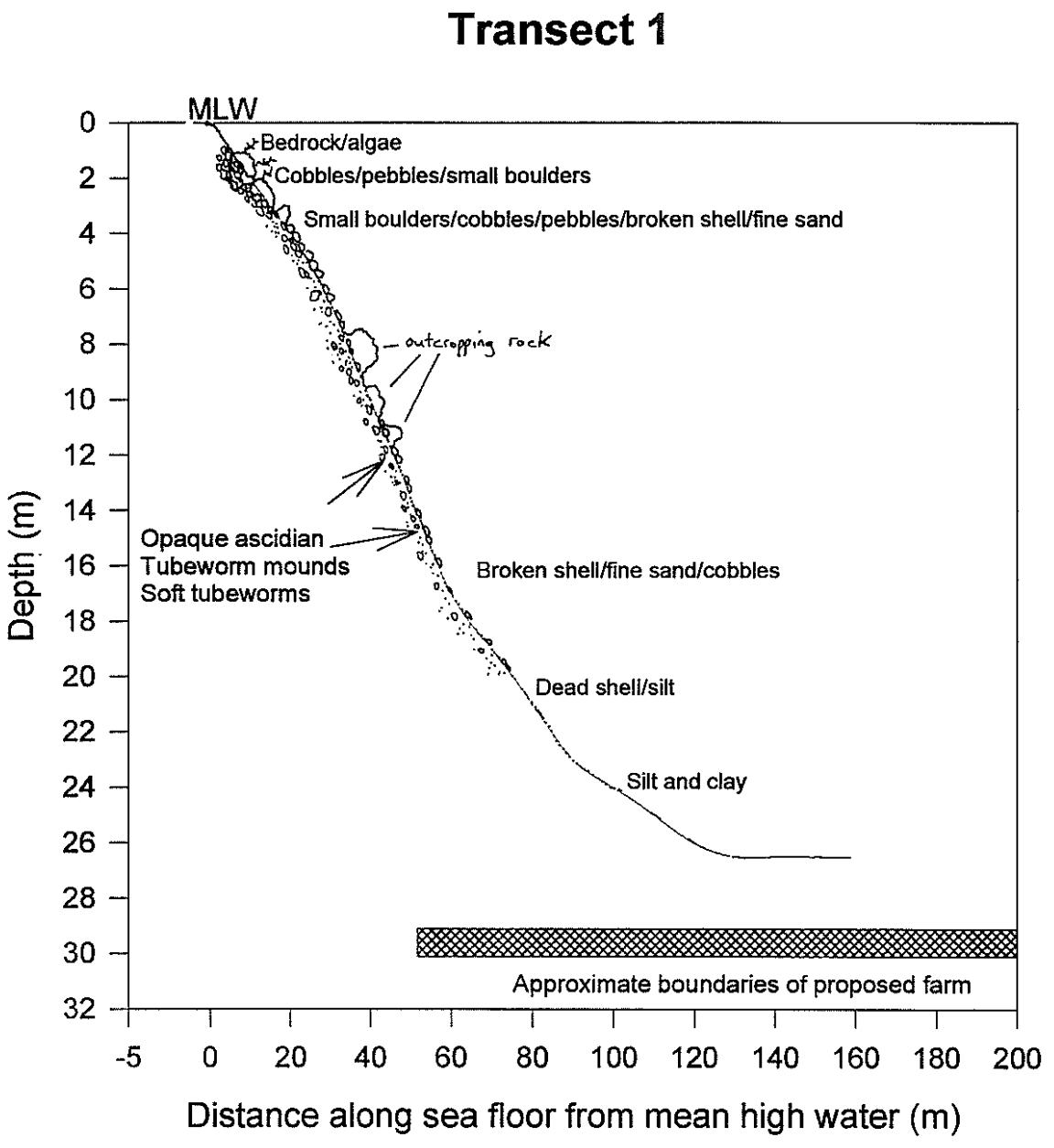

Figure 2 Subtidal shore profile and substratum from an area proposed as a marine farm in Waihinau Bay, Pelorus Sound.

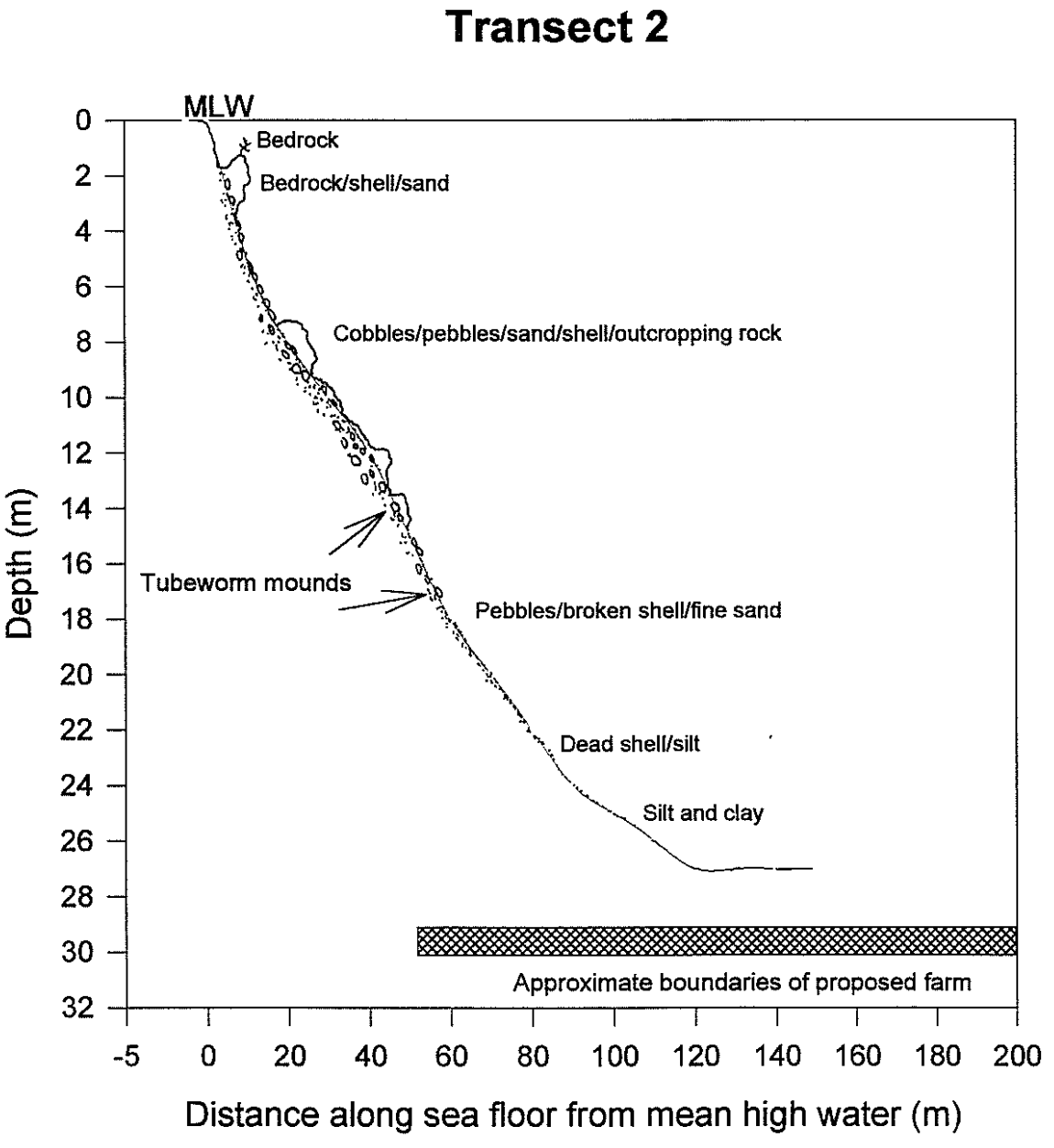

Figure 3 Subtidal shore profile and substratum from an area proposed as a marine farm in Waihinau Bay, Pelorus Sound.

immediately offshore of these hard shores. No cod were observed from the mud bottoms further from shore. Opal fish were common from these mud areas, while three species of triplefin were relatively common on the rock habitat.

3.4 Scallops (Pecten novaezelandiae)

Scallops were observed from the study area in very low abundances. Most scallops were observed from 50 m to 100 m distance from shore.

3.5 Horse mussels

Horse mussels were also very uncommon with most being seen from greater than 80 m distance from shore.

3.6 Lampshells

Lampshells (*M. sanguinea*) were not recorded during the present study.

3.7 Hydroids

No large hydroid species or hydroid zones were recorded during the present study.

4.0 POTENTIAL IMPACT OF A BIVALVE MARINE FARM

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.).

Beyond 80 m distance from shore, the benthos was dominated by soft shores characterised initially by an area of dead whole shell overlying a silt base and further from shore a silt and clay substratum. A low variety of species in low abundances were observed from these offshore soft bottom areas. No species or communities of particular ecological importance were observed from these offshore soft sediment areas.

The inshore area between 50 m to 80 m distance from shore was dominated by areas of outcropping rock, cobble, pebbles, fine sand and broken shell. Most outcropping rock were recorded between 50 m to 60 m distance from shore, while the proportion of cobble material declined with increasing distance from shore. This zone, however, supported a considerably more diverse community than

offshore mud shores in the present study. These hard shore and sand habitats and their associated species would probably be smothered by shell debris originating from an overlying mussel marine farm.

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 Waihinau Bay, Pelorus Sound and to identify potential threats to any subtidal ecological values posed by the proposed activity.

The soft and hard shore communities recorded from the present study were dominated by species that occur on subtidal shores in the sheltered Marlborough Sounds (Dell 1951; Estcourt 1967; McKnight 1969, 1974; Roberts and Asher 1993; McKnight and Grange 1991; Davidson and Duffy, 1992; Davidson, 1995; Davidson and Brown 1994; Duffy et al. in prep; Chadderton et al., in prep, Chadderton and Davidson in prep).

Scallops and horse mussels were uncommon from this site, while brachiopods were not observed during the present investigation.

Results showed that the offshore areas beyond 80 m were dominated by whole shell and silts and clays with a relatively low diversity community. Apart from opal fish, all species in this offshore area were observed in relatively low abundances. No species or communities of particular ecological importance were observed in these offshore mud areas under the proposed marine farm during the present study.

Between 50 m to 80 m, a zone of outcropping rock, cobbles, pebbles, sand and shell was observed and was colonised by a relatively high range of species in often high abundances compared to offshore areas. This zone would probably be altered through the deposition of shell from a mussel marine farm.

Considering ecological data collected during the present study in Waihinau Bay, Pelorus Sound, it is suggested that the inshore boundary between Points 3 and 4 be relocated to a minimum of 80 m distance from the low tide mark. This modification would mean that no outcropping rock, or cobble substrata and associated species would be located under the farm backbones.

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