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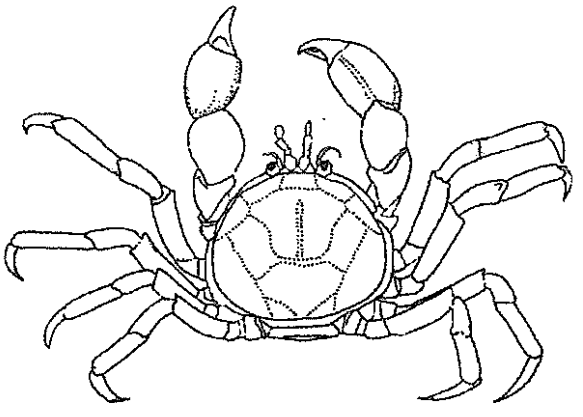
Subtidal ecological report on a proposed marine farm

Area South of Hapuku Rock, Admiralty Bay

Survey and monitoring report no. 129

A report prepared for:
TE KAWAU A TORU



11 JULY, 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 south of Hapuku Rock, Admiralty Bay (Figure 1).

Admiralty Bay is one of the largest bays in the outer Marlborough Sounds. Depths in Admiralty Bay are mostly between 40 m to 45 m but rise to considerably to shallower depths in the numerous small bays around its edges (see Navy Chart NZ 615). The shoreline of Admiralty Bay is subject to a variety of marine environmental conditions exhibited by the exposed bedrock shores towards Clay Point and along the north-eastern shores, through to sheltered cobble, pebble and gravel beaches in Elsie and Hamilton Bays. The terrestrial environment of most of Admiralty Bay is either pasture or clad in various stages of regenerating scrub. Water residence times in this area are probably very short compared to those recorded for the sheltered waters of Pelorus Sound (see Gibbs 1991).

The proposed marine farm site is located in a small bay located some 3 km south of Clay Point on the eastern shore of Admiralty Bay. The bay is itself some 600 m distance across and is bordered on both the north-east and south-western ends by small promontories (Figure 1).

Depths along the inshore boundary of the proposed marine farm were approximately 8 m (Point south-east) and 14 m (Point north-east), while depths along the offshore boundary were approximately 25 m (Point south-west) and 35 m (Point north-west). The proposed activity, details of farm structure and proposed species are outlined by a report by M. Gilbert on behalf of the applicant TE KAWAU A TORU.

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 Regional Coastal Plan.

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.

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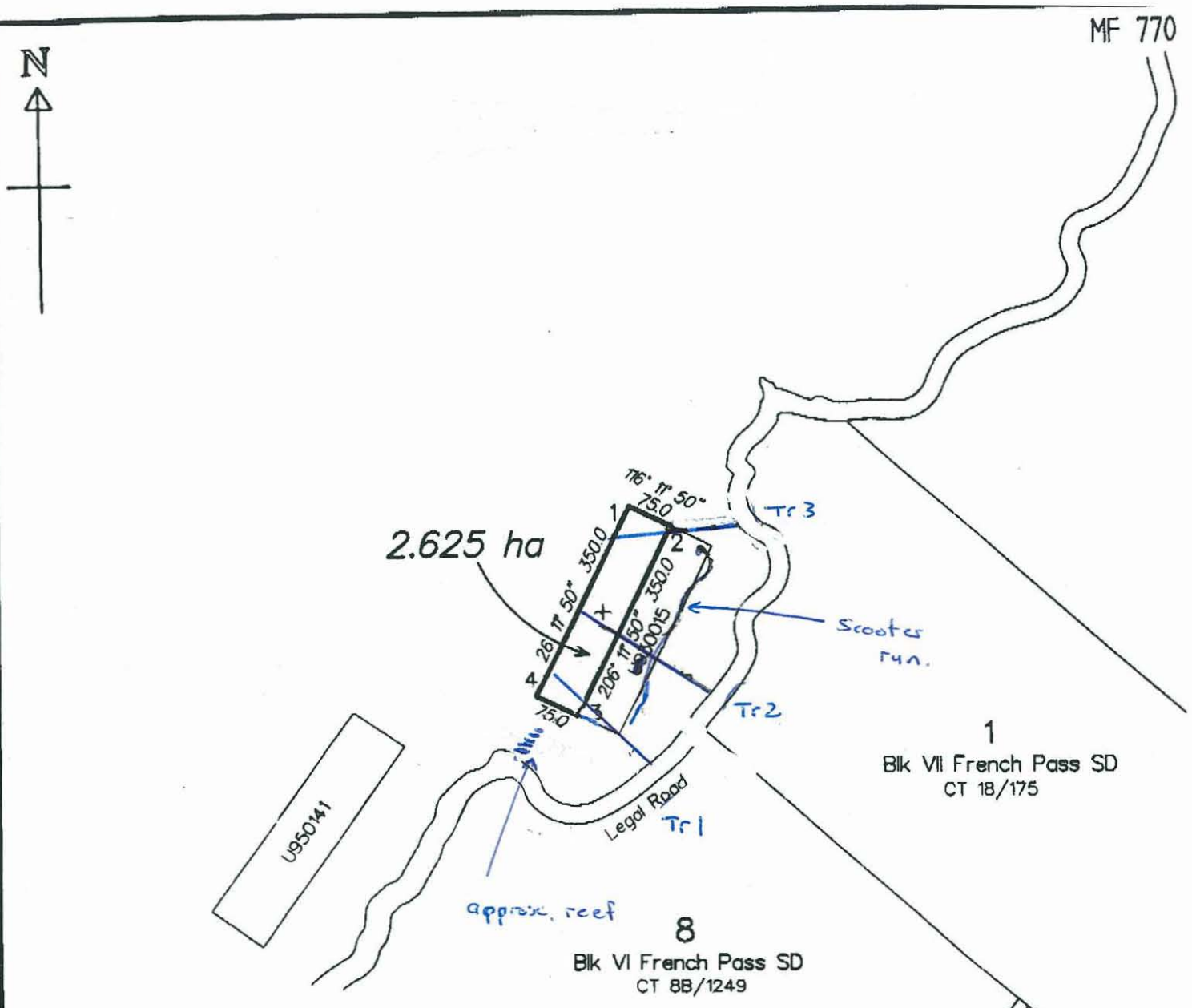

SCHEDULE OF COORDINATES

Datum: New Zealand Map Grid			Datum: Geographical		
Point	North	East	Point	Latitude	Longitude
1	6033061.6	2590190.2	1	40° 54' 24.4655"	173° 57' 6.5470"
2	6033028.5	2590257.5	2	40° 54' 25.5147"	173° 57' 9.4381"
3	6032714.5	2590103.0	3	40° 54' 35.7486"	173° 57' 2.9828"
4	6032747.6	2590035.7	4	40° 54' 34.6993"	173° 57' 0.0916"
Centroid	6032888.1	2590146.6	Centroid	40° 54' 30.1054"	173° 57' 4.7649"

Plan of Coastal Permit U941080

Coastline is MHWM from DOSLI DCDB

Bearing variation Geodetic Datum 1949 to NZMG +11' 5

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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Prepared by JB	Date 7/4/96	Job No 726863	File 6475/01/02	Reference P26/5.1

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Fig. 1. Transects and scooter run.

2.0 MATERIALS AND METHODS

The proposed site was investigated on the 10th July 1996, using three subtidal survey techniques. Firstly, the inshore and offshore boundaries of the proposed area were remotely sensed using digital depth sounder. Depths and any abnormalities along the sea bottom were noted for later diver inspection. The inshore boundary of the proposed marine farm was investigated by a diver assisted by an underwater motorised scooter. Based on depth soundings, three areas were selected and a lead-lined transect line marked at 5 m intervals was installed from the low water mark (Figure 1). These transect sites were located in representative parts of the proposed marine farm and also targeted the only offshore rock located during the depth soundings (Transect 2).

Brachiopod (*Magasella sanguinea*) were observed in low abundance from the study area. No density calculations were therefore attempted. Scallop (*Pecten novaezelandiae*) and horse mussel (*Atrina zelandica*) were also observed in very low abundance. Densities were collected from areas where their numbers were highest from each transect.

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).

Notes were collected on water current direction and relative speed were collected at a variety of depths between 10.30 am and 1 p.m. at transects 2 and 3. These observations were collected close to low water and the early stages of the incoming tide.

3.0 RESULTS AND DISCUSSION

3.1 Water Currents, Scooter Swim and Depth Soundings

Results from depth soundings and the scooter run across random parts of the proposed farm area suggested that:

1) substrata present were bedrock, cobbles, pebbles, boulders and various combinations of fine sand, medium sand, broken shell and dead whole shell, shell debris and silt;

2) one reef structure was observed within the boundaries of the proposed marine farm. No other outcropping rock, bedrock, or boulder substrata were recorded within the boundaries of the proposed marine farm;

3) tube worm mounds (*Galeolaria hystrix*) were not observed within the boundaries of the proposed marine farm;

4) apart from the isolated offshore rock, all areas offshore of 30 m to 60 m distance from shore were dominated by soft bottoms;

5) large brown algae was observed along immediate subtidal zone along the shore adjacent to the proposed marine farm;

6) hydroids were observed from the rock habitat towards the northern end of the small bay; and

7) a reef projecting from the southern side of the bay to within 20 m to 30 m distance from the proposed marine farm was identified (Figure 1).

Water currents were estimated from transects 2 and 3 at 10.30 am and 12 p.m. at 4m, 18 m and 25m depth. Tidal water currents were detected moving in a southward direction at all stations. All tidal current were very slight. Based on the species observed from this site, is expected that tidal water currents would be light in all parts of the bay apart from the headland areas where moderate strength currents may occur at particular stages of the tide.

3.2 Shore Profiles

The intertidal zone adjacent to the proposed marine farm area was dominated by bedrock and large/medium boulder shores.

Subtidal shore profiles were initially dominated by hard substrata, bedrock and boulders at transects 1 and 3 and cobbles at transect 2. Rubble, boulder and rock material with various proportions of shell and fine sand extended to approximately 10 m distance at transect 1, 30 m at transect 2 and 60 m at transect 3. The benthos beyond these hard shores was dominated by soft bottom substrata composed of sand, fine sand and shell. With increasing depth the soft shores graded from fine sands and shell through to shell and silt and clay at approximately 22 m to 24 m depth. An isolated rock approximately 15m in length and 5 m to 10 m wide was recorded between 100 m to 110 m distance from shore at transect 2. This rock supported reef species including blue cod, sponges and encrusting invertebrates.

From transects and scooter run from areas within and adjacent to the proposed marine farm, a total of 34 conspicuous species of invertebrate, 6 algae, 1 ascidian and 9 species of bony fish were observed. A list of species are presented in Table 1, while the profiles are plotted in Figures 2, 3 and 4.

Green-lipped mussel (*Perna canaliculus*) and blue mussel (*Mytilus edulis*) were both observed during the study.

3.3 Fish

Nine species of bony fish were recorded during the investigation of the proposed marine farm site and adjacent coast. The number and composition of species was representative of rubble bank areas in the sheltered outer Marlborough Sounds. Most common reef fish were spotty and blue cod with cod being common over the rock habitats, offshore rock at transect 2 and the reef on the southern side of the bay. Greatest abundance of fish and fish diversities were observed from the northern and southern parts of the bay and the deep offshore rock observed from transect 2. Blue moki and banded wrasse were recorded from the southern reef but nowhere else during the study. Three species of triplefin and opal fish were also observed during the study.

Table 1 Species observed from an area south of Hapuku Rock, Admiralty Bay. * = recorded within adjusted farm boundaries.				
Algae	**Common name**	**Invertebrates**	**Habitat**	**Common name**
Corallina spp.(3)	paint	SPONGIA		
Cystophora torulosa (2)		Ancorina alata (2)	rock/rubble	grey sponge
Carpophyllum flexuosum (2)	wide flap-jack	Aplysilla sulphurea (1)	rock	sulphur sponge
Carpophyllum maschalocarpum (2)	narrow flap jack	Tethia sp. (1)	rock	golf ball sponge
*Microalgal mat (3)		COELENTERATA		
Hormosira banksii (1)	Neptune's necklace	Culicea rubeola (2)	rubble	box anemone
		Actinothoe albocincta (2)	rubble/soft	anemone
		Hydrodendron sp. (2)	rubble	hydroid tree
		GASTROPODA		
		Cryptoconchus porosus (1)	rock	butterfly limpet
		Cellana stellifera (2)	rubble	limpet
		Haustorum haustorium (1)	rock	whelk
		Octopus maorum (1)	rubble	octopus
		Cookia sulcata (1)	rubble	Cook's turban
		Maoricolpus roseus (2)	sand/shell	spire shell
		Trochus viridus (2)	rubble	
		Turbo smaragdus (3)	rock/rubble	cats eye
		Penion sp. (1)	soft	whelk
		BIVALVIA		
		*Atrina novaezelandiae (1)	soft	horse mussel
		Chlamys sp. (1)	rock	queen scallop
		Modilarca impacta (2)	rubble	Nestling mussel
		Monia zelandica (2)	rock/rubble	window oyster
		Mytilus edulis aoteanus (2)	rubble	blue mussel
		Pecten novaezelandiae (1)	soft	scallop
		Perna canaliculus (2)	rock	green mussel
		POLYCHAETA		
		*Brachiomma sp.(2)	sand/rubble	fan worm
		Galeolaria hystrix (2)	sand/rubble	tube worm
		Spirorbis sp. (2)	rubblerock	
		CRUSTACEA		
		*Pagurus spp (2)	sand	hermit crab
		Ballanus sp. (3)	rubble	barnacle
		ECHINODERMATA		
BONY FISHES		*Coscinasterias calamaris (2)	sand/shell	11 arm star
Notolabrus celidotus (3)	Spotty	Evechinus choroticus (2)	rock/rubble	kina
*Hemercoetes monopterygius (3)	Opalfish	*Patiriella regularis (2)	sand/rubble	cushion starfish
Forsterygion varium (3)	variable triplefin	Pectinura maculata (2)	rubble	snake star
Notoclinops segmentatus (1)	blue eye triplefin	*Pseudechinus albocinctus (1)	soft	pink urchin
Parapercis colias (2)	blue cod	Stichopus mollis (2)	sand/silt	cucumber
Latridopsis ciliaris (2)	blue moki	BRACHIOPODA		
Pseudolabrus fucicola (1)	banded wrasse	*Magasella sanguinea (1)	sand/shell	lamp shell
Nemadactylus macropterus (1)	tarakihi	ASCIDEACEA		
Forsterygion malcolmi (2)	mottled triplefin	Cnemidocarpa sp. (2)	rubble	saddle squirt

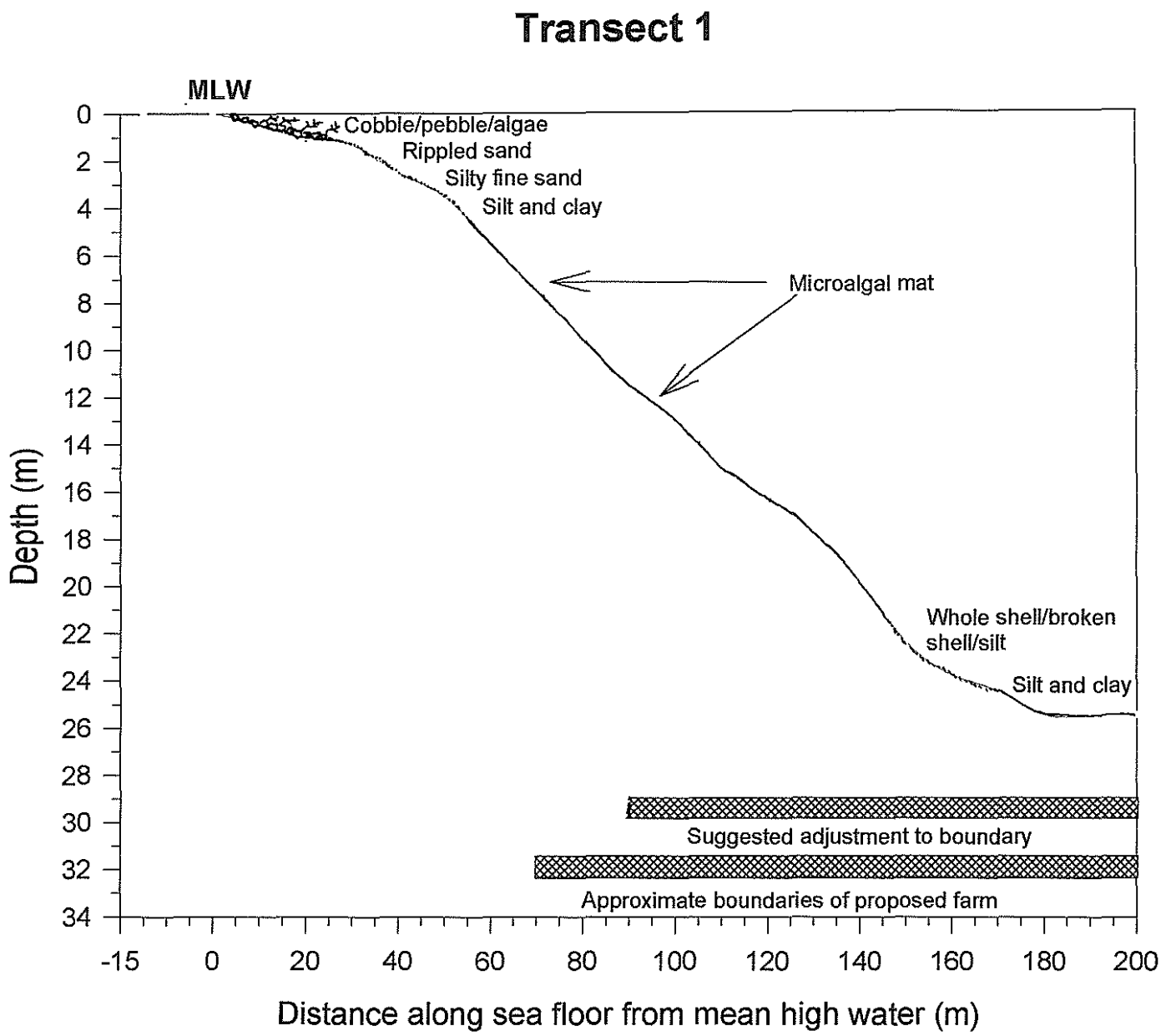

Figure 2 Subtidal shore profile and substratum from an area proposed as a marine farm south of Hapuku Rock, Admiralty Bay.

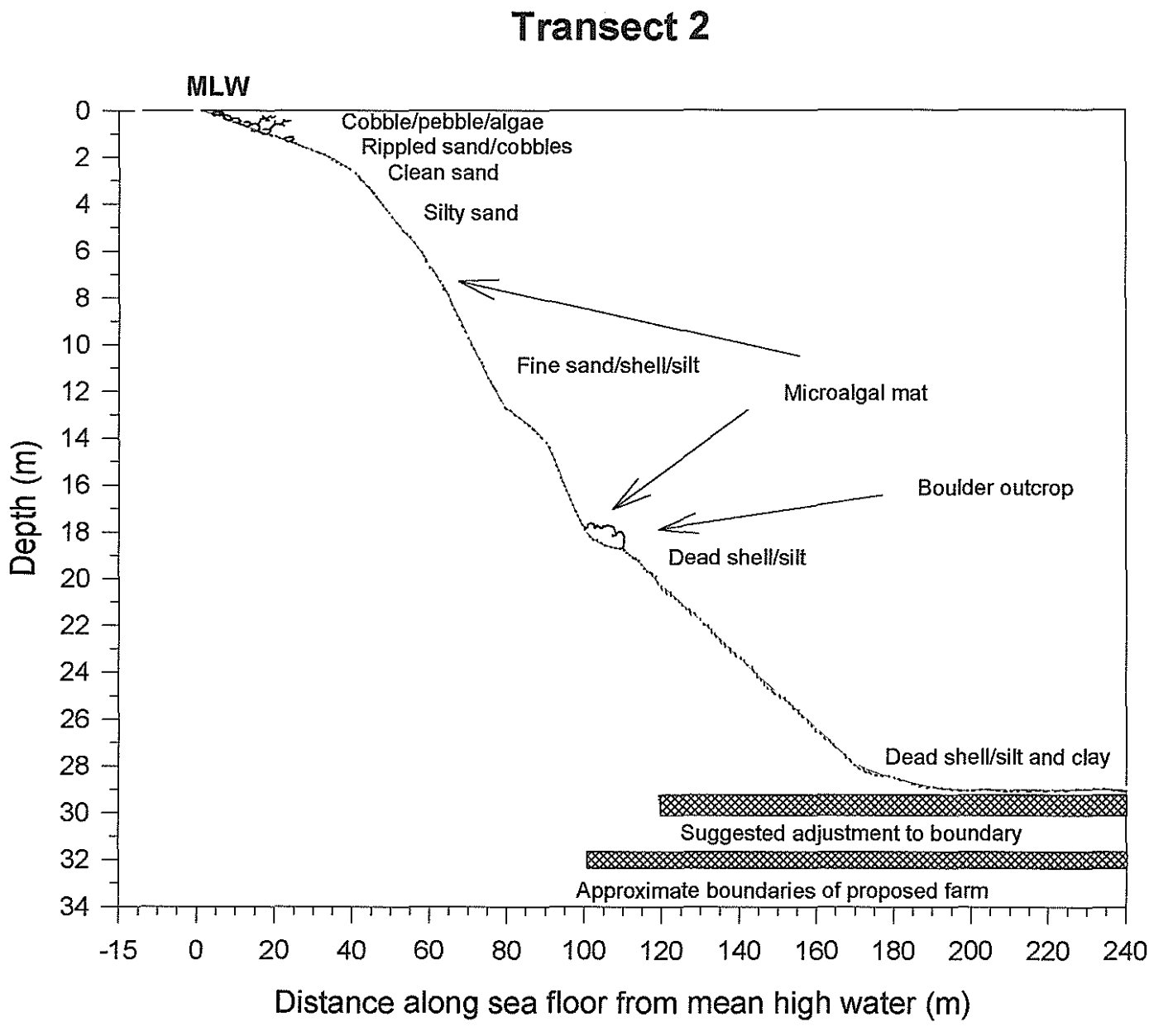

Figure 3 Subtidal shore profile and substratum from an area proposed as a marine farm south of Hapuku Rock, Admiralty Bay.

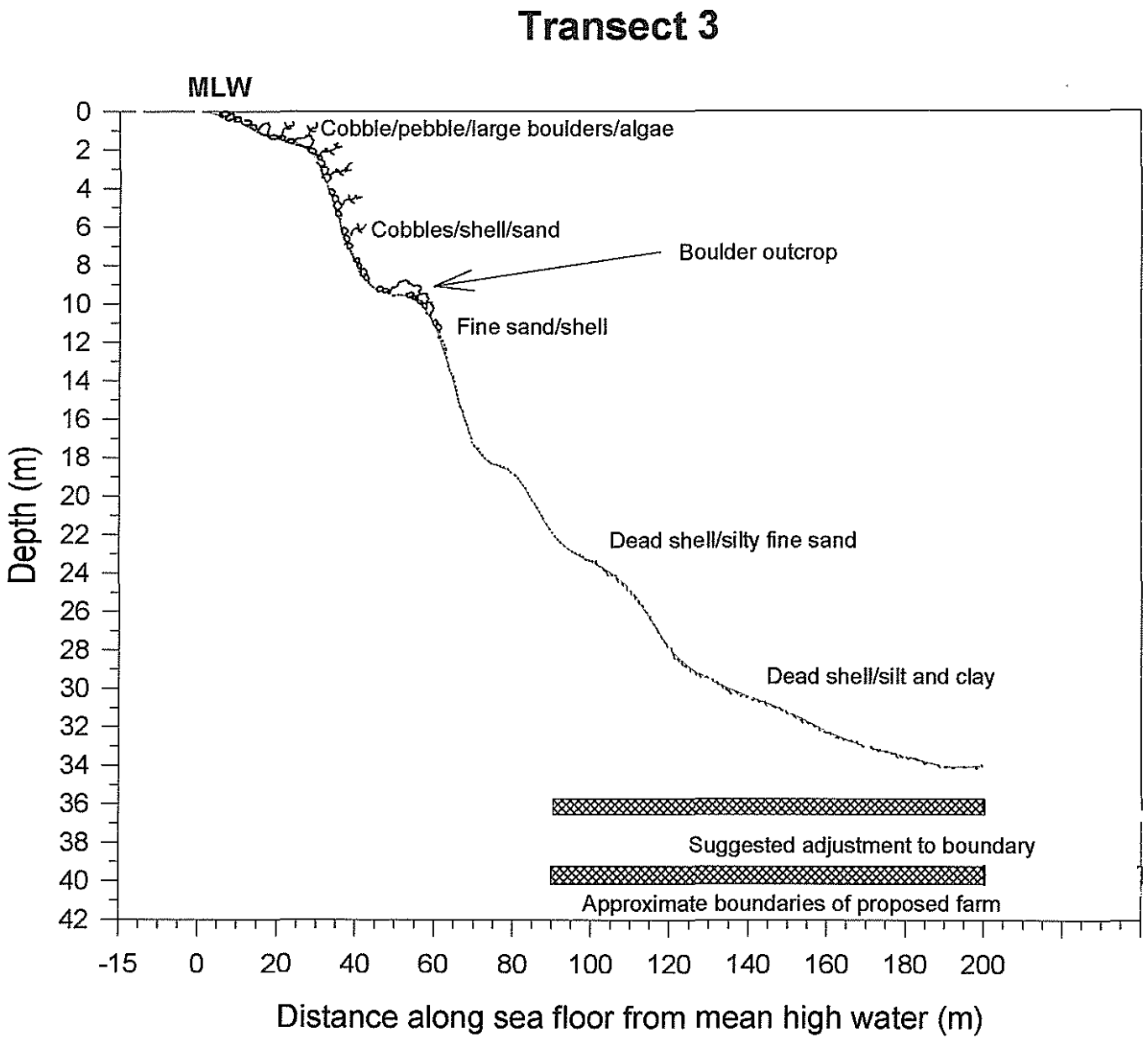

Figure 4 Subtidal shore profile and substratum from an area proposed as a marine farm south of Hapuku Rock, Admiralty Bay.

3.4 Scallops (*Pecten novaezelandiae*)

Scallops were observed from transects but in very low abundance. The highest number of scallop recorded from along a transect was 3 individuals. This abundance of scallop is well below that considered as recreationally acceptable.

3.5 Horse mussels (*Atrina zelandica*)

Horse mussel were recorded from the study area during the present study but in very low abundance. A total of five horse mussels were observed from along transect 1. This represents a very low density over the study area. These densities are well below those considered as constituting a horse mussel bed (Department of Conservation guidelines).

3.6 Lampshells

Lampshells (*Magasella sanguinea*) were observed in low abundance with no distinct lampshell zones being recorded. Estimated densities from areas where lampshells were most common were < 1 per m^{-2}. These densities are low compared to lampshell beds in central Pelorus Sound (Chadderton and Davidson in prep.) and well below the Department of Conservation guideline threshold.

3.7 Hydroids

One large hydroid species observed during the present study of the marine farm site and adjacent coast (*Hydrodendron = Solandaria).* Individuals of these species were observed from transect 3 and the southern reef. Hydroids were recorded between 30 m to 60 m distance from shore at transect 3.

3.8 Dog cockles

No live dog cockles were recorded during the present study.

4.0 ADJUSTMENTS TO PROPOSED BOUNDARIES

Considering ecological data collected during the present study area south of Hapuku Rock, it is suggested that the inshore boundary be shifted to a minimum 20 m distance further from shore in order that the offshore rock recorded from transect 1 between 100 m and 110 m distance from shore would be avoided. This shift would also establish a 10 m buffer zone between the farm and the rock. No further adjustments to the proposed farm boundaries are suggested as the farm is distance to the majority of rock substrata, 20 m to 30 m distance (plus warp lengths) from the southern reef.

5.0 POTENTIAL IMPACT OF A BIVALVE MARINE FARM

The impact of shell and sediment deposition on the benthos under a mussel marine farm results is a shift from the initial state to a new state. The degree of change depends on the habitat type and communities present prior to mussel material deposition. In general, a build up of mussel shell on a mud bottom will result in an increased diversity of species living on the surface and a decrease of infaunal species due to increased sedimentation (Kaspar et al. 1985). On a rocky bottom, a decrease in species diversity as a result of shell and sediment deposition would be expected.

Post suggested adjustment, soft bottom substrata would dominate all of the proposed marine farm area investigated during the present study. These substrata and associated species and communities located within the proposed marine farm area were sands, dead and broken shell overlying fine sand and silts. A relatively low variety of species in low abundances were observed from these offshore soft bottom habitats compared to inshore hard shores. Horse mussels, scallops and brachiopods were recorded from these areas in very low densities. These animals would probably be smothered by the deposition of shell and sediment from an overlying marine mussel farm. In general, silt and clay areas represent the habitat least impacted by mussel shell deposition and is the most common subtidal substratum in the Marlborough Sounds.

Mild tidal currents in this area appear to flow into the bay and along the shore and although not observed during the study, it is expected that they would be more pronounced nearer the northern and southern promontories at each end of the bay. A reef located to the south of the proposed marine farm is some 20 m to 30 m distant to the farm boundary and another approximately 30 m to 40 m further removed from mussel droppers. Based on water currents observed at the site, it appears unlikely that shell or sediment derived from a mussel farm would adversely impact the southern reef area.

6.0 CONCLUSION

The aims of the study were to provide a biological description of the benthos under and adjacent to a proposed marine farm area south of Hapuku Rock, Admiralty Bay 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 outer 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, horse mussels and brachiopods were uncommon from the study area.

Substrata and communities observed from under the adjusted proposed area were characterised by sands, dead whole shell and silt sediments with a low variety of species in low abundance.

Substrata from inshore areas were characterised by coarser soft sediments and hard substrata habitats with a higher number of species in higher abundances than were observed from offshore soft bottom areas.

Hydroids and a variety of reef fish were recorded from these inshore areas. These inshore areas and values would be impacted by a mussel marine farm if were placed overhead or immediately adjacent.

Relocation of the inshore boundary by a distance of 20 m would ensure that the offshore rock recorded from between 100 m and 110 m distance from shore at transect 2 would be avoided and a 10 m buffer zone would be established between droppers and reef. A reef to the south of the proposed marine farm site was also observed. The distance between the reef and the proposed farm is some 20 m to 30 m distance and considerably greater between the reef and mussel droppers. Based on the observed light tidal currents within this bay it would be unlikely that shell and sediment originating from a mussel farm would adversely impact this southern reef. No further adjustments to the proposed farm boundaries are suggested.

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