Survey and Monitoring Report No. 19

Description of the macrobenthic community from a proposed spat holding area in Whangatoetoe Bay, Port Underwood, Marlborough Sounds

by
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1.0 INTRODUCTION

This report presents a biological description of the conspicuous macrobenthic communities from a proposed 4.05 ha marine farm on the south-western shore of Whangatoetoe Bay, Port Underwood (Figure 1). Whangatoetoe Bay is located on the eastern side of Port Underwood some 2 km distance from the entrance to the Port (Robertson Point) and 7 km distance from the head of the Port at Ngakuta Bay. Whangatoetoe Bay is relatively sheltered from southerly storms but is subject to winds from the north-west which generate a considerable sea in an onshore direction at the proposed marine farm site. The adjacent terrestrial area is characteristic of many areas in the Marlborough Sounds being steep hill sides with rounded summits.

The shoreward boundaries of the proposed spat holding area are located between 47 to 80 metres distance from the shore (Figure 1). The proposed area stretches a total of 270 metres in length and is 150 metres wide along its entire length (Figure 1). This represents a total offshore distance from the south-western shore of between 200 to 225 m distance. Depths on the south-western boundary were approximately 7.7 m (Point 1) to 8.7 m (Point 4), while depths on the outside boundary were approximately 11.5 m (Point 3) to 11.5 m (Point 2). The proposed activity (mussel spat holding), farm structure and management practices are outlined in a report by R. Sutherland on behalf of the applicant (New Zealand Marine Farming Association).

The Marlborough Sounds lie at the northern end of the South Island, with Cook Strait to the north and east and Tasman Bay in the west. 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., in press). These values will be important consideration in the soon to be produced Marlborough District Council 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 PORT UNDERWOOD

Port Underwood is a Y-shaped drowned river valley extending approximately 8.5 km in length in a north-east direction from Cloudy Bay (Lat. 41° 16′ S., Long 174° 11′ E.)(Figure 1). The Port is the southern-most component of the Marlborough Sounds ecological area. Catchments of the Port have been heavily modified by farming, forestry, and land clearance. Much of the land is now farmland (mostly on alluvial flats), pine plantation or regenerating scrub. Water depths in the Port range from low gradient alluvial flats through to depths of 12 to 18 m in the central and outer Port areas.

A Department of Conservation report on the ecological values of the Nelson/Marlborough region (Davidson et al., 1990) outlined important conservation values in the Port. The intertidal heads of many of the bays of were recognised as the most important areas to wildlife. The report recognised the 'rare' variable oystercatcher *Haemotopus unicolor* and a variety of other waders, waterfowl, shags, gulls and terns as being present. Further, pied shags *Phalacrocorax varius* nest at Hakana Bay.

The First Order Inventory also noted that marine mammals occasionally enter the Port, including bottle-nose dolphin *Tursiops truncatus* (C. Duffy, pers. comm., Author pers. obs.) and orca *Orcinus orca* (R. Thomas, pers. comm.). The Port was once a calving ground for right whale *Eubalaena australis* (Grady, 1982). Further, Davidson et al. (1990) recognised the Port as a settling and juvenile area for crayfish *Jasus edwardsii* with large numbers occurring on reef

habitat (C. Duffy, pers. comm.).

The First Order Inventory ranked Port Underwood as nationally important due to the large numbers juvenile crayfish and the presence of variable oystercatcher. Potentially, the Port may once again used by right whales to calve their young as whale numbers in the southern ocean slowly building up.

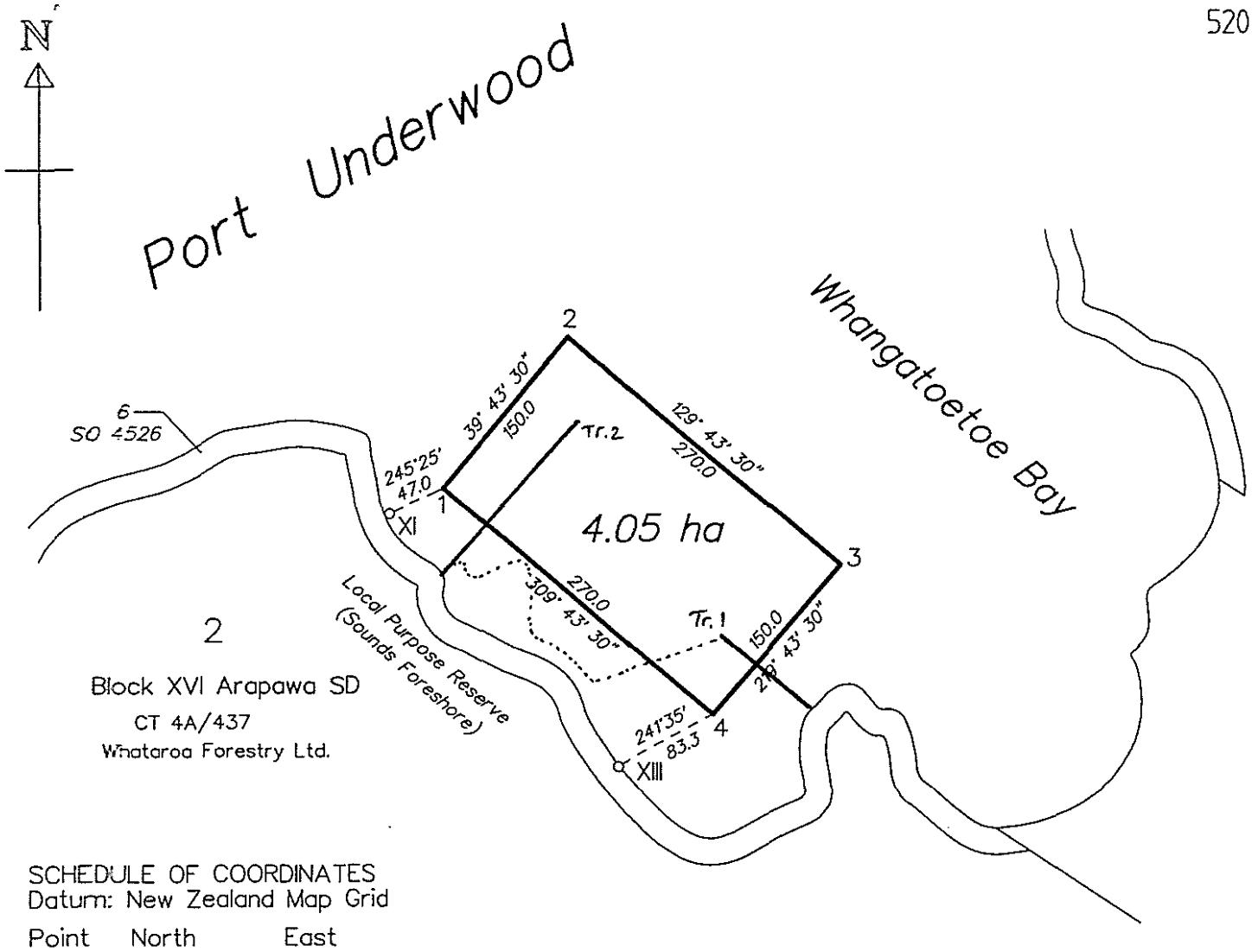
The Port is one of the three location in the Marlborough Sounds with a cuspate foreland feature. These features are geologically important in New Zealand and are usually regarded as nationally important features (Kenny & Hayward, 1993).

In an intertidal study, Marsden and Fenwick (1986) recorded 122 species of macroinvertebrate and 27 species of algae from Port Underwood. The authors stated that this result compared favourably with other intertidal areas, including Kaikoura Peninsula (Marsden, 1981). Further, the authors stated that the intertidal areas of the Port were relatively homogeneous and were similar to those found by Knox & Bolton (1979) in Queen Charlotte Sound. Marsden & Fenwick (1986) concluded that the Port was an area of high biological interest.

3.0 MATERIALS AND METHODS

The proposed site was qualitatively investigated on the 6 th October 1994, using two rapid subtidal survey techniques. The south-western boundary, headland area and randomly selected parts of the proposed spat catching area and adjacent coast between 1.0 to 10 metres depth were investigated using an Apollo scooter. Results from this preliminary investigation were recorded on waterproof paper. Based on these findings a two representative areas were selected and a lead-lined transect line marked at 5 m intervals was installed perpendicular to the shore (Fig. 1). The transect sites were considered representative of the substrata, habitats and flora and fauna found over the proposed farm and the majority of the adjacent coast during the scooter run.

Using SCUBA, depth, distance, substrate, habitat and associated conspicuous surface dwelling



SCHEDULE OF COORDINATES
Datum: New Zealand Map Grid

Point	North	East
1	5984695.0	2604958.8
2	5984810.4	2605054.6
3	5984637.8	2605262.3
4	5984522.5	2605166.4
XI	5984675.4	2604916.1
XIII	5984482.8	2605093.2

Plan of Proposed Marine Farming Licence (Spat Holding Area)

New Zealand Marine Farming Assoc.

Survey marks adopted from SO 321

Bearing variation Geodetic Datum 1949 to NZMG +31'30"

SCALE 1:5000

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

LOCAL AUTHORITY: MARLBOROUGH DISTRICT	MARLBOROUGH LAND DISTRICT
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Department of Survey & Land Information
Te Puna Korero Whenua

Figure 1. Proposed farm and location of profiles (solid line) and scooter run (dot line).

flora and fauna were recorded using waterproof paper, clipboard and a pencil. This process was terminated at a distance of 180 m for the eastern transect and 170 m distance from the low tide mark at the western site. The abundance of conspicuous macroinvertebrates, macroalgae and fish were estimated on a scale of 1 = uncommon, 2 = occasional, and 3 = common.

4.0 RESULTS AND DISCUSSION

4.1 Scooter Run

Results from the scooter run across random parts of the proposed farm, around the eastern headland and along most of the adjacent coast suggested that:

1) no bedrock or rubble areas were recorded within the proposed marine farm boundaries. In most areas rubble habitat extended approximately < 40 m from the low tide mark;

2) changes in substrata and associated communities in the proposed farm and adjacent shores showed similar trends in depth/distribution down the shore for the area investigated; and

3) few species of fish in relatively low numbers were recorded from the study area.

4.2 Profiles

The intertidal shore adjacent to the proposed spat catching area was dominated by a bedrock/rubble/cobble areas. All of the coast was bordered by short bluffs and steeply rising hill side clad in gorse and pine trees. Above the immediate shoreline was a large pine plantation. Similar shore profiles were recorded from both transects with the major distinction being a bedrock zone between 0 to 2.8 m for the eastern headland (Figure 2). Generally, the subtidal shore was initially an extension of the intertidal shore. The bedrock/rubble substrata was dominated by a high percentage cover of foliose macroalgae (*Carpophyllum maschalocarpum, C. flexuosum*) with isolated plants of the giant kelp (*Macrocystis pyrifera*).

Below the shallow bedrock areas, the substrata graded into rubble shell/sand sediments (Figure 2, 3). Further from shore the benthos was dominated by soft sediments. At the eastern site, a low percentage cover of red alga (*Lenormandia chauvini*) at 35 to 45 metres distance from the low tide mark and in depths of 9 to 10 m was recorded. No *Lenormandia* was recorded at the western site was observed.

From the combined transects and scooter run a total of 23 species of conspicuous invertebrate, 11 algae, 4 ascidians, and 8 species of bony fish were recorded. A list of species is presented in Table 1, while the shore profiles are plotted in Figure 2, 3. The relatively high species diversity and presence of particular species absent from inner parts of Port Underwood (eg. *Scytosiphon lomentaria, Triostrea lutaria*) is most likely a factor of a relatively short distance from the outer coast.

No species of brachiopod were recorded from the study site.

Horse mussels (*Atrina zelandica*) were recorded from the silt/mud habitat but in low densities (<1 per 10 m^{-2}).

Green-lipped mussels (*Perna canaliculus*) were not observed, while a band of blue mussel (*Mytilus edulis*) was recorded from the intertidal rubble/bedrock bank.

Tube worms (*Galeolaria hystrix*) were recorded on rubble habitat but no mounds were recorded.

Relatively few species of fish in low abundances were observed in the present study (Table 1). Spotty, opal fish, and an unidentified triplefin were the most abundant species.

4.3 Red Alga Beds

A zone of red algae dominated by *L. chauvini* have regularly recorded from Port Underwood (Duffy in prep, Author pers. obs.). A zone with relatively low percentage cover ($<$ 5 % cover) was recorded at the eastern profile station in depths of 9 to 10 metres depth. No *Lenormandia* was recorded on the scooter run or the western profile (Figure 3).

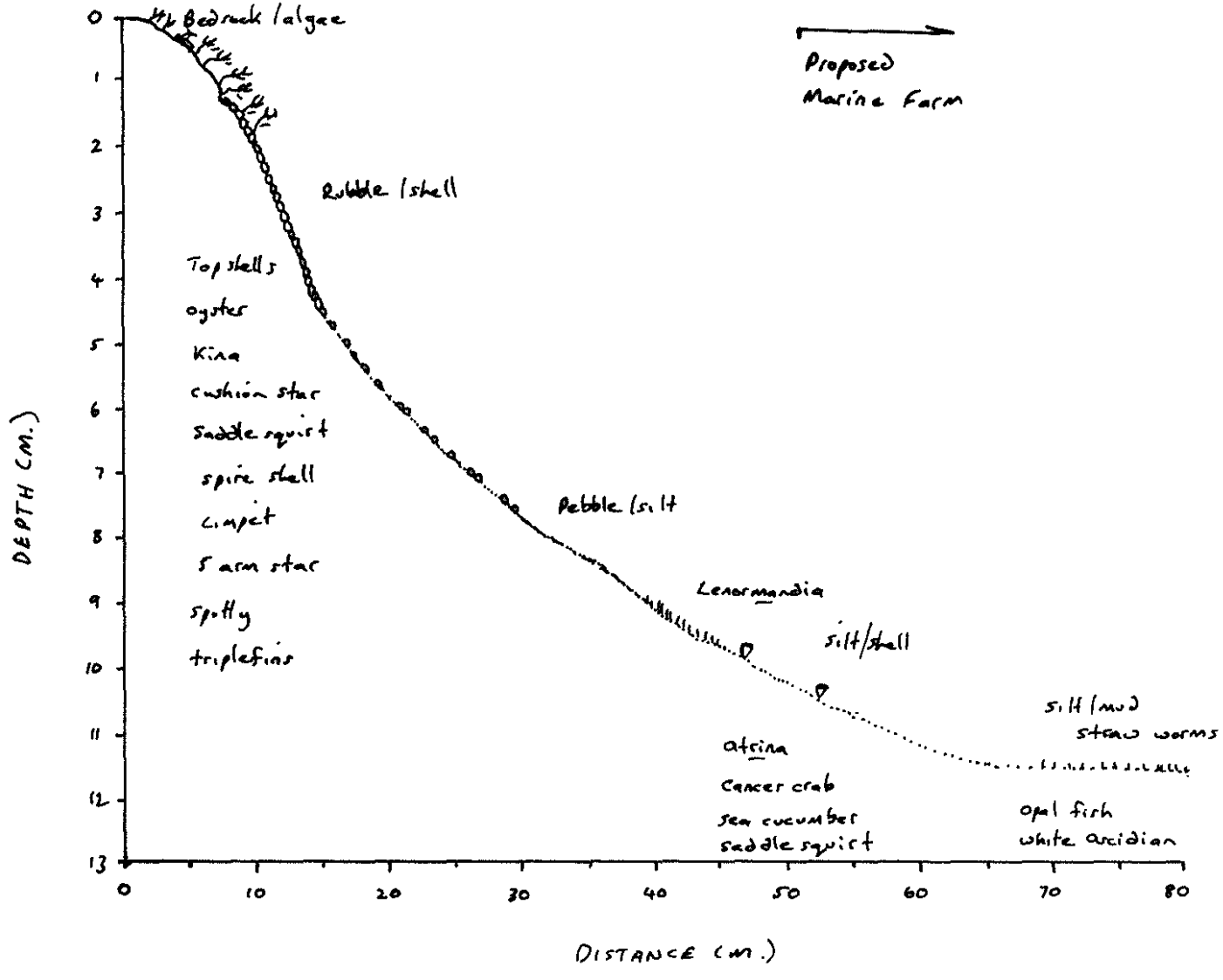

Figure 2. Transect 1 from propored marine farm site in Whangateetee Bay, Port Underwood.

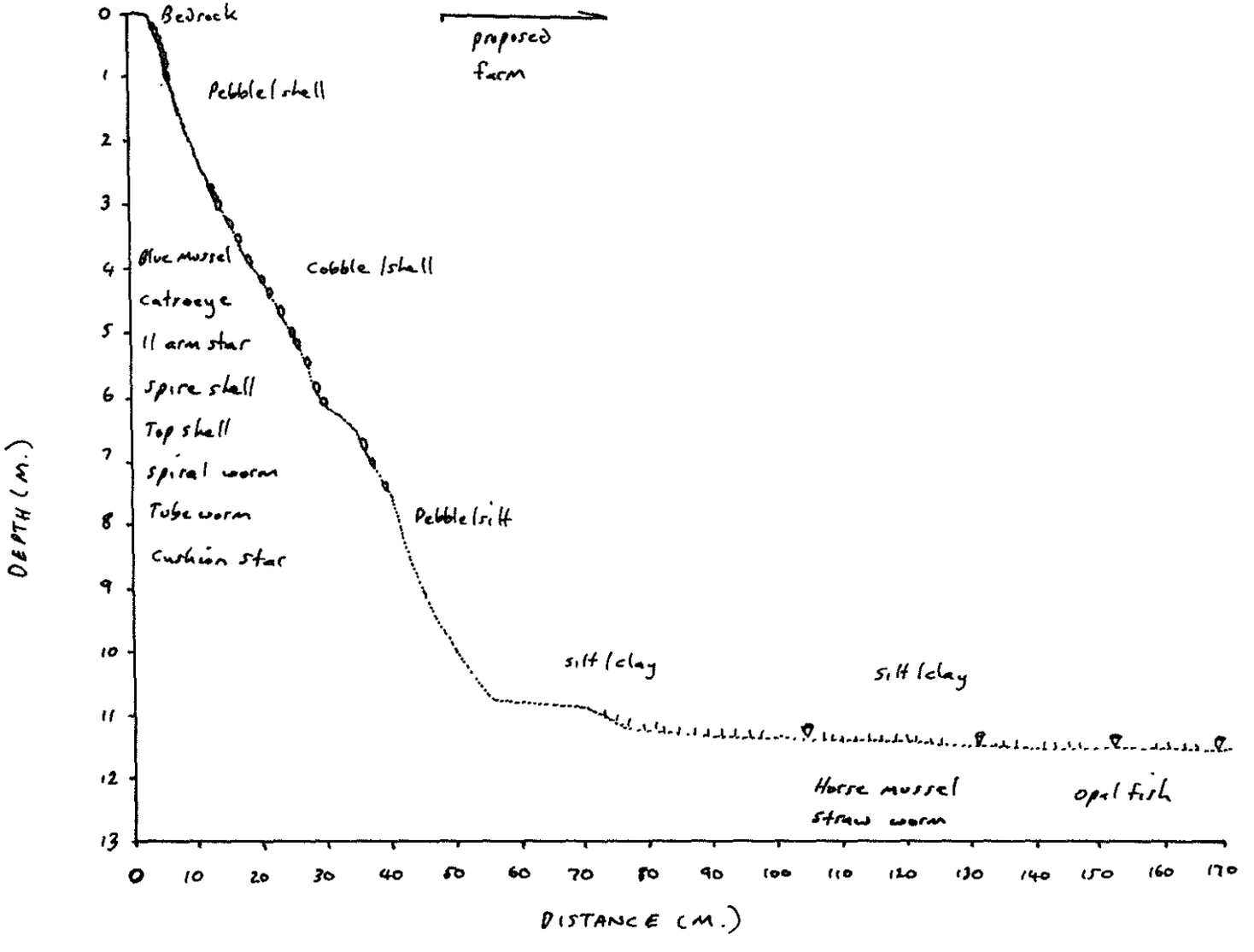

Figure 3. Transect 2 from proposed marine farm site in Whangatoetoe Bay, Port Underwood.

Table 1 Conspicuous species recorded from transects in Whangatoatoa Bay, Port Underwood.				
Algae	**Common name**	**Invertebrates**	**Habitat**	**Common name**
Corallina spp.(3)	paint	SPONGIA		
Cystophora spp. (2)		Ancorina alata (2)	rock	grey sponge
Carpophyllum flexuosum (3)	wide flap-jack	Crella encrustans (1)	rock	sponge
Carpophyllum maschalocarpum	narrow flap-jack	MOLLUSCA		
Colpomenia sinosa (1)	air cushion	Cryptoconcus porosus (1)	rock	chiton
Hormosira banksii (2)	Neptune's necklace	GASTROPODA		
Lenormandia chauvini (2)	red alga	Cellana spp. (2)	rubble	limpet
Red filamentous (1)	red alga	Trochus viridus (2)	rubble	topshell
Macrocystis pyrifera (1)	giant kelp	Maoricolpus roseus (2)	sand/shell	spire shell
Ulva sp. (2)	sea lettice	Scutus breviceps (1)	rock	
Scytosiphon lomentaria (2)	sausage alga	Turbo smaragdus (2)	rock/rubble	cats eye
		BIVALVIA		
		Atrina zelandica (1)	silt	horse mussel
		Mytilus edulis (3)	rubble	blue mussel
		Triostrea lutaria (2)	rock	dredge oyster
		POLYCHAETA		
		Brachiomma sp.(1)	sand/rubble	fan worm
		Galeolaria hystrix (2)	sand/rubble	tube worm
		Maldanidae sp. (2)	silt	straw worm
		Serpula sp. (1)	rock	tube-worm
		Spirorbis sp. (3)	rubble	spiral worm
		CRUSTACEA		
		Cancer novaezelandiae (2)	soft	cancer crab
		Pagurus spp (1)	sand	hermit crab
		ECHINODERMATA		
		Sclerasterias mollis (1)	rock	star
		Coscinasterias calamaris (1)	sand/shell	11 arm star
		Evechinus choroticus (2)	rock/rubble	kina
		Patiriella regularis (2)	sand/rubble	cushion starfish
		Stichopus mollis (3)	sand/silt	sea cucumber
		ASCIDEACEA		
		Aplidium sp. (1)	rubble	
		Cnemidocarpa sp. (3)	rubble	saddle squirt
		Didenium sp. (2)	rubble	white ascidian
		Warty ascidian sp. (2)	rubble	
		BONY FISHES		
		Aldrichetta forsteri (1)	pelagic	yellow mullet
		Notolabrus celidotus (2)	rubble	Spotty
		Hemercoetes monopterygius (3)	silt	Opalfish
		Forsterygion sp. (2)	rubble	unident.
		Forsterygion malcomi (2)	rock	common triplefin
		Forsterygion varium (2)	rubble	variable triplefin
		Pseudolabrus fucicola (3)	rock	banded wrasse
		Parapercis colias (1)	rubble	blue cod

5.0 DISCUSSION OF POTENTIAL IMPACTS OF MUSSEL FARMING

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). Build up of shell debris can ultimately change the natural community and replace it with 100 % cover of dead and live mussel shell (author pers. obs.). The impact of a spat holding area on the marine benthos below has not been published in the literature. Drop-off of mussel debris (shell, sediment) could potentially be less than a mussel farm, but this may depend on the period mussels spend in this area and their sizes.

The marine farm was dominated by mud habitat with dominant species being straw worm, horse mussel, red alga and opal fish. These sessile species would be smothered by any mussel debris originating from a spat holding area, while the opal fish would probably be displaced.

6.0 CONCLUSION

The aims of the study were to provide a biological description of the benthos under and adjacent to a proposed mussel spat holding area in Whangatoetoe Bay, Port Underwood and to identify potential threats to any conservation values posed by the proposed activity.

Most of the hard shore and all of the soft shore benthic communities recorded from the present study contained species that are widespread and common throughout the subtidal shores of the 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 Davidson, 1994a; Duffy et al. in prep; Chadderton et al., in prep, Chadderton and Davidson in prep). The sea star *Sclerasterias mollis* recorded from the eastern profile is relatively uncommon in the Marlborough Sounds (Duffy et al. in prep.). This species appears close to its northern limit in New Zealand here as it is relatively common in more southern waters, particularly on the Otago coast.

The substrata and associated flora and fauna under the proposed spat holding area was dominated

by mud (silts and clays) with a relatively low diversity of marine biota. Red alga, horse mussel, straw worm beds and opal fish were the most common species on the benthos directly beneath the proposed farm. This habitat and these associated species are widespread in either Port Underwood and the Marlborough Sounds and have a relatively low diversity of species compared to many rich and diverse habitats and communities recorded from parts of the Sounds. The establishment of a mussel farm extension at this site could mean the ultimate modification of this mud benthos and its associated community. This impact would, however, represent a small fraction of this habitat type in the Marlborough Sounds.

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