Survey and Monitoring Report No. 6

Description of the macrobenthic community from a proposed marine farm site in Anakoha Bay, Marlborough Sounds

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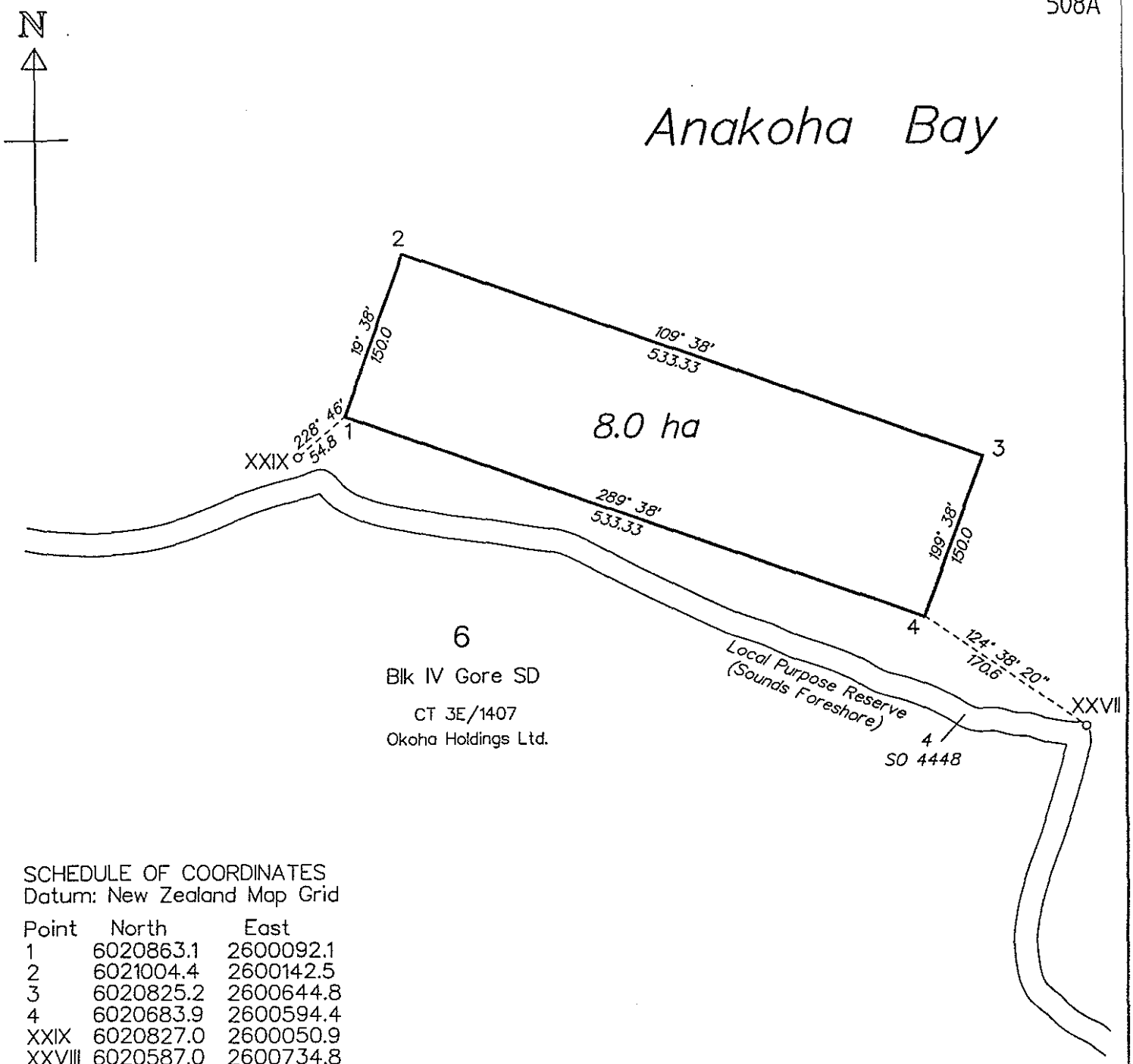
1.0 INTRODUCTION

This report presents a biological description of the macrobenthic communities from a proposed 8.0 ha marine farm on the western side of Anakoha Bay, approximately 2.4 km south-east of Allen Strait (Forsyth Island)(Fig. 1). Anakoha Bay is an approximately 7 km long, north-west orientated dead-end bay, in the outer Marlborough Sounds. The mouth of the bay is approximately 2.5 km wide (measured between Allen Strait in the west and Tawaroa Point in the east.

The study site is located on a north facing shore in Anakoha Bay and is exposed to winds from the northerly quarter. Anakoha Bay itself probably receives oceanic water directly from Cook Strait and it is expected that the bay would have relatively short water residence times compared to those calculated for bays within Pelorus Sound (Gibbs et al., 1991). Water clarity in the outer Marlborough Sounds including Anakoha Bay is not subject to the influx of a surface freshwater layer of turbid water prevalent in Pelorus Sound following heavy rain (Gibbs 1991, Gibbs et al. 1991).

The inner boundary of the proposed marine farm is located between 35 and 55 meters from the shore (Fig. 1). The proposed marine farm stretches 533.33 meters in length along the inside and outside boundaries and is 150 m wide along its entire length (Fig. 1). Depths on the inside boundary range between 4.5 to 10 m, while depths on the outside boundary range between 24 to 26 metres depth. The proposed activity is green-lipped mussel (*Perna canaliculus*) farming. According to the applicant, mussel spat will be moved to the site for a growing period and then be moved again to other sites for final fattening. This means that no harvesting of mussels will occur at this site. Details of farm structure and management practices are outlined in a report by the applicant.

The Marlborough Sounds lie at the northern end of the South Island, adjacent to Cook Strait in the north and east and Tasman Bay in the west. Formed by the submergence of river valleys, the Sounds consist of approximately 1500 km of bays, passages, peninsulas, headlands, cliffs, 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



SCHEDULE OF COORDINATES
Datum: New Zealand Map Grid

Point	North	East
1	6020863.1	2600092.1
2	6021004.4	2600142.5
3	6020825.2	2600644.8
4	6020683.9	2600594.4
XXIX	6020827.0	2600050.9
XXVIII	6020587.0	2600734.8

Plan of Proposed Marine Farming Licence

AJ King

Survey marks adopted from SO 386

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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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 potentially be threatened by the establishment of the proposed activity.

2.0 MATERIALS AND METHODS

The proposed site was qualitatively investigated on the 23rd July 1994. Based on preliminary depth soundings a representative area was selected and a lead-lined transect line marked at 5 m intervals was installed perpendicular to the shore (Fig. 1). This site was considered representative of the substrata, habitats and flora and fauna found over the proposed farm.

Using SCUBA, depth, distance, substrata, 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 140 m from the low tide mark and at 19.5 m depth. The abundance of macroinvertebrates, macroalgae and fish were estimated on a scale of 1 = uncommon, 2 = occasional, and 3 = common.

3.0 RESULTS AND DISCUSSION

3.1 Profiles

The shore at the proposed site in Anakoha Bay was characterised by a shallow rubble/bedrock zone (<2.5 m depth) followed immediately offshore by rippled clean sand substratum (Fig. 2). The rippled sand zone was obviously worked on by wave action which had sorted this material resulting in a very uniform particle size. Between 45-58 m distance offshore was a second rubble zone which was colonised by a high percentage cover of macroalgae dominated by *Carpophyllum flexuosum* and a smaller proportion of *Ecklonia radiata*. This macroalgal habitat was located between 5-6 m depth. Further seaward the shore increased in depth relatively slowly and graded from fine sand through to silts and clays at a depth of 13.5 m. Virtually no dead or broken shell material was recorded in the soft substrata habitat. A zone of very fine sand with a microalgal mat was also recorded (Fig. 2).

From the transect a total of 24 species of invertebrate, 8 algae, 1 ascidian and 4 species of bony fish were recorded (Table 1, Fig. 2).

Although tubeworms *Galeolaria hystrix* were recorded on rubble habitat in the present study, no mounds were observed.

Relatively few species of fish were recorded, with spotty (*Notolabrus celidotus*) being numerically the most abundant. Few blue cod (*Parapercis colias*) were recorded, with all fish below legal size (330 mm length). No leatherjackets (*Parika scaber*) were recorded.

3.2 Brachiopods

Magasella sanguinea were not recorded from the transect but have been recorded from Anakoha Bay (Duffy et al. in prep). Duffy et al. (in prep) recorded *M. sanguinea* in relatively low densities from deeper reef habitat in the outer parts of Anakoha Bay. This record is not unexpected as *M. sanguinea* is the most widespread brachiopod in the Marlborough Sounds being recorded from hard and shell/silt substrata in subtidal areas in the inner and outer Sounds

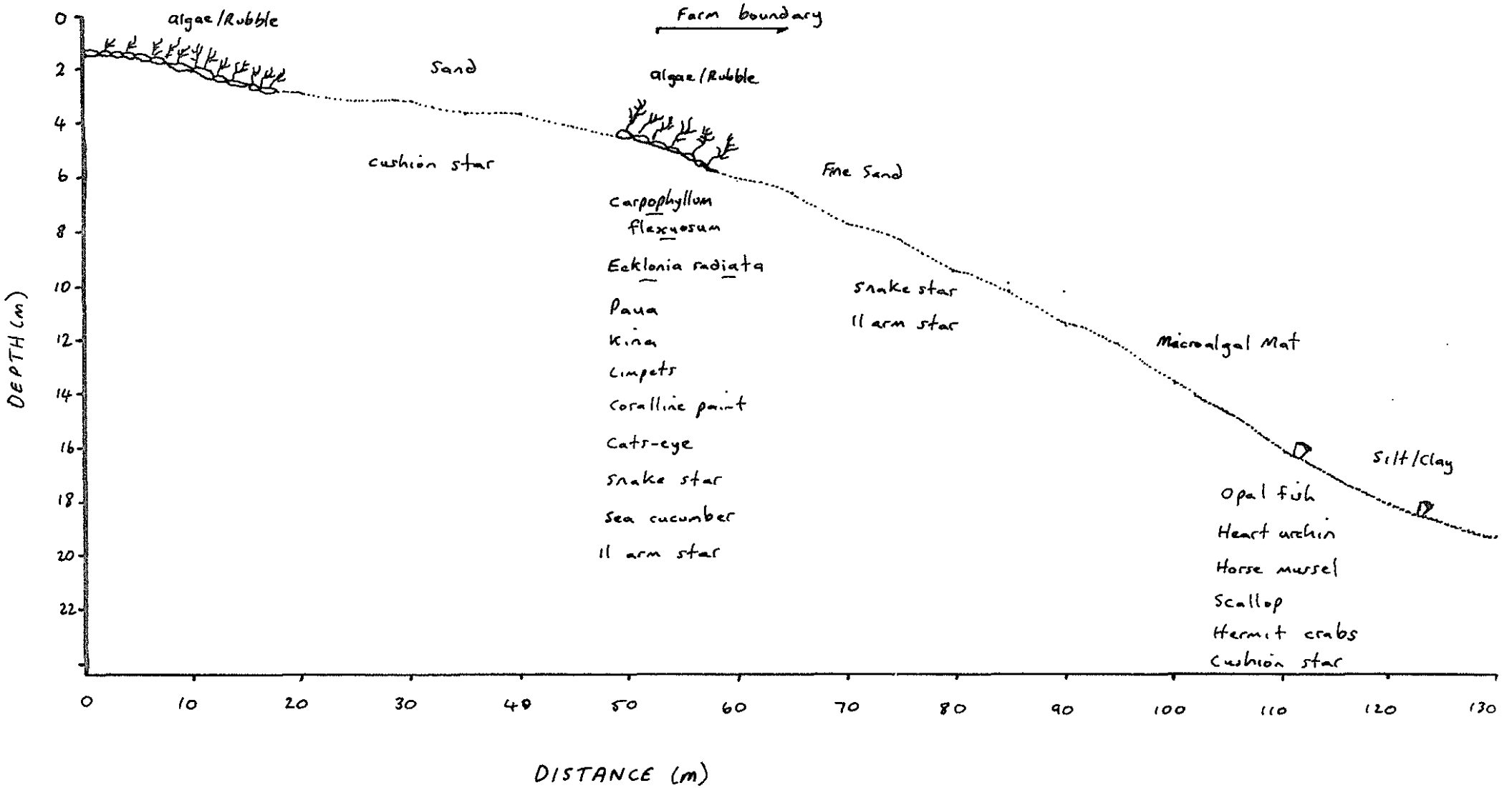

Figure. 2 Shore profile and conspicuous species recorded from transect in Anakoha Bay.

Table 1 Species recorded from transect in Anakoha Bay.				
Algae	Common name	Invertebrates	Habitat	Common name
		SPONGIA		
Corallina spp.(2)	paint	Ancorina alata (2)	rock/rubble	grey sponge
Cystophora spp. (2)		MOLLUSCA		
Carpophyllum flexuosum (1)	wide flap-jack	GASTROPODA		
Carpophyllum maschalocarpum	narrow flap-jack	Anomia trigonopeis (2)	rock/rubble	window oyster
Colpomenia sp. (1)		Cellana spp. (2)	rubble	limpet
Hormosira banksii (2)	Neptune's necklace	Cookia sulcata (1)	rubble	Cook's turban
Ecklonia radiata (1)		Haliotis iris (2)	rubble	paua
Splachnidium sp.		Trochus tiaratus (2)	sand	topshell
		Maoricolpus roseus (2)	sand/shell	spire shell
		Trochus viridus (1)	rubble	topshell
		Turbo smaragdus (2)	rock/rubble	cats eye
		Cominella adspersa (2)	sand	whelk
		BIVALVIA		
		Atrina zelandica	silt	horse mussel
		Mytilus edulis (2)	rubble	blue mussel
		Perna canaliculus (2)	rubble	green mussel
		Modiarca impacta (2)	rubble	Nestling mussel
		Pecten novaezelandiae (1)	sand/shell	scallop
		POLYCHAETA		
		Brachiomma sp.(2)	sand/rubble	fan worm
		Galeolaria hystrix (2)	sand/rubble	tube worm
		CRUSTACEA		
		Pagurus spp (1)	sand	hermit crab
		ECHINODERMATA		
		Coscinasterias calamaria (2)	sand/shell	11 arm star
		Evechinus chloroticus (2)	rock/rubble	kina
		Patiriella regularis (1)	sand/rubble	cushion starfish
		Pectinura maculata (2)	sand	snake star
		Stichopus mollis (2)	sand/silt	cucumber
		Echinocardium (3)	silt	heart urchin
		ASCIDEACEA		
		Cnemidocarpa sp. (2)	rubble	saddle squirt
		BONY FISHES		
		Notolabrus celidotus (2)	rubble	Spotty
		Hemercoetes monopterygius (3)	silt	Opalfish
		Tripterygion sp. (3)	rubble	yellow/black trip
		Parapercis colias (1)	rubble	blue cod

(McKnight and Grange, 1991; Duffy et al., in prep; Chadderton and Davidson, in prep). The absence of *M. sanguinea* from the proposed marine farm site was primarily due to the lack of deep rock or substratum with a dead and broken shell component onto which the brachiopod can attach.

3.3 Horse Mussels

Horse mussel (*Atrina zelandica*) distribution and density has declined in the Marlborough Sounds due to human activities such as dredging (Poiner and Kennedy 1984, Hay 1990, Jones 1992). Despite this, large beds of relatively dense beds of horse mussels are still found within the Sounds (Hay, 1990). The density of horse mussels recorded at the present site was very low (approximately 1 per 100 m^{-2}). This does not constitute a horse mussel bed when compared to the dense beds which have been recorded from the top of the South Island (Hay 1990, Davidson 1992).

3.4 Allen Strait Bryozoan Community

Within Allen Strait a dense bryozoan bed has been recorded and is regarded as nationally important (Davidson et al. in prep). These bryozoans are located on hard substrata in a high current regime. At the present study site located some 2.5 km south-east of Allen Strait, strong currents were not apparent and no bryozoans were recorded.

4.0 DISCUSSION OF POTENTIAL IMPACTS OF 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). Gibbs et al. (1991) recorded depressed oxygen levels below mussel farms and up to 70% reduction in water flow within farms. It is therefore important that mussel farms are not located directly over areas with important ecological value or over communities recognised as uncommon or rare.

The proposed marine farm in Anakoha Bay has an inner boundary which is located over rubble habitat colonised by a high percentage cover of macroalgae dominated by *Carpophyllum flexuosum* and *Ecklonia radiata* in depths < six meters. Shell debris build-up on the algal habitat would probably result in the decline and ultimate death of macroalgae.

Sparse individual horse mussels (*Atrina zelandica*) were recorded from beneath the proposed marine farm. Horse mussels would probably be adversely effected by shell debris.

As no harvesting of mussels is proposed for this site it would be expected that shell debris may be lower than a site where harvesting occurred.

5.0 CONCLUSION

The aims of the study were to provide a biological description of the benthos under and adjacent to a proposed mussel marine farm in the Anakoha Bay and to identify potential threats to any conservation values posed by the proposed activity.

The benthic soft and hard shore 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, 1994; Duffy et al. in prep; Chadderton et al., in prep, Chadderton and Davidson in prep). No rare or threatened species or communities were recorded in the present study. Overall, a relatively low diversity of species was recorded. This was primarily related to large areas of sand/silt substrata with very little dead and broken shell component and a lack of deeper water hard substratum.

Horse mussels recorded beneath the proposed marine farm would probably be adversely effected by the establishment of a mussel farm due to accumulation of mussel shell debris, however, the density of horse mussels was very low compared with those recorded from the outer Marlborough Sounds (Hay, 1990) and Tasman Bay (Davidson 1992).

Although relatively close to the important bryozoan community of Allen Strait (Davidson et al. (in prep) no bryozoans were recorded from the proposed site. It is unlikely that reduced water flows due to the establishment of a marine farm would influence water circulation through Allen Strait some 2.5 km to the north-west.

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