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Description of the subtidal macrobenthic community from a proposed marine farm in Canoe Bay, Fitzroy Bay, Pelorus Sound

by

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A report prepared for
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1.0 INTRODUCTION

This report presents a biological description of the habitats and associated conspicuous macrobenthic communities from an area proposed as a marine farm in Canoe Bay, Fitzroy Bay, Pelorus Sound.

Canoe Bay is a small bay located on the southern shore of Fitzroy Bay. Fitzroy Bay is a complex of five bays characterised by their very sheltered shores and long water residence times (Gibbs 1991). Water depths in the Fitzroy Bay complex range between shallow subtidal bay heads to mud bottoms between 25 m to 27 m (Navy Chart NZ 615). Of particular note in these bays is the presence of elephant fish (*Callorhinchus millii*) spawning grounds, principally in Garne and Savill Bays, which have been identified as of international scientific value (Davidson et al., in press). The shoreline of the Fitzroy Bay complex of bays typical of much of the sheltered Marlborough Sounds being dominated by a narrow rubble or bedrock intertidal zone with a backdrop of steep hill sides often with relatively rounded tops.

Canoe Bay is a relatively small bay some 900 m wide at its entrance and 1.3 km in length and has an average depth of 25 m to 27 m.

The inner and offshore boundaries of the proposed marine farm stretch some 300 metres in length in an approximately east/west orientation. The proposed farm is 120 m wide along its entire length (Figure 1). Depths on the inshore boundary were approximately 27 m (Point 1) to 25 m (Point 4), while depths along the offshore boundary were approximately 27 m (Points 2, 3). The proposed activity, details of farm structure and species are outlined in a report by David Smyth Consulting on behalf of the applicants C.R, J.M., J.H. and Z.F. King-Turner.

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 a combination of tectonic processes and sea level rise. 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 and Coastal Plans.

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 and associated impacts from the proposed marine farming activity.

2.0 MATERIALS AND METHODS

The proposed site was qualitatively investigated on the 13 th October 1995, using two rapid subtidal survey techniques. The inshore boundary and randomly selected parts of the proposed marine farm area and adjacent coast between 4 to 24 metres depth were investigated by a free diver assisted by an Apollo scooter. Results from this preliminary investigation were recorded on waterproof paper. Based on these findings, two representative areas located within the proposed farm backbone structure were selected and a 100m lead-lined transect line marked at 5 m intervals was 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.

Using SCUBA, depth, distance, substrate, 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 100 m from the low tide mark and at depths of approximately 24 to 25 metres. The abundance of conspicuous macroinvertebrates, and macroalgae were estimated on a scale of 1 = uncommon (1 or 2 observed), 2 = occasional (observed sporadically), and 3 = common (regularly seen or forming a zone or patches).

At both transects, scallop (*Pecten novaezelandiae*), brachiopod (*Magasella sanguinea*) and horse mussel (*Atrina zelandica*) densities were collected from a 1 m wide strip at various intervals along the transect lines.

All depths presented in this report are adjusted to datum.

Data collected during the study followed the Department of Conservation guideline to the investigation of marine farm areas in the Marlborough Sounds (Department of Conservation, 1995).

3.0 RESULTS AND DISCUSSION

3.1 Scooter Run

Results from the scooter run across random parts of the proposed farm and along the inshore areas of the proposed marine farm and adjacent coast suggested that:

1) substrata present were bedrock, small sized boulders, pebbles, cobbles, fine sands, shelly mixes, (i.e. dead whole and broken shell) and silts and clays (mud);

2) no bedrock reef or rubble habitat was recorded within the boundaries of the proposed marine farm;

3) habitats and communities varied little between western and eastern parts of the proposed marine farm; and

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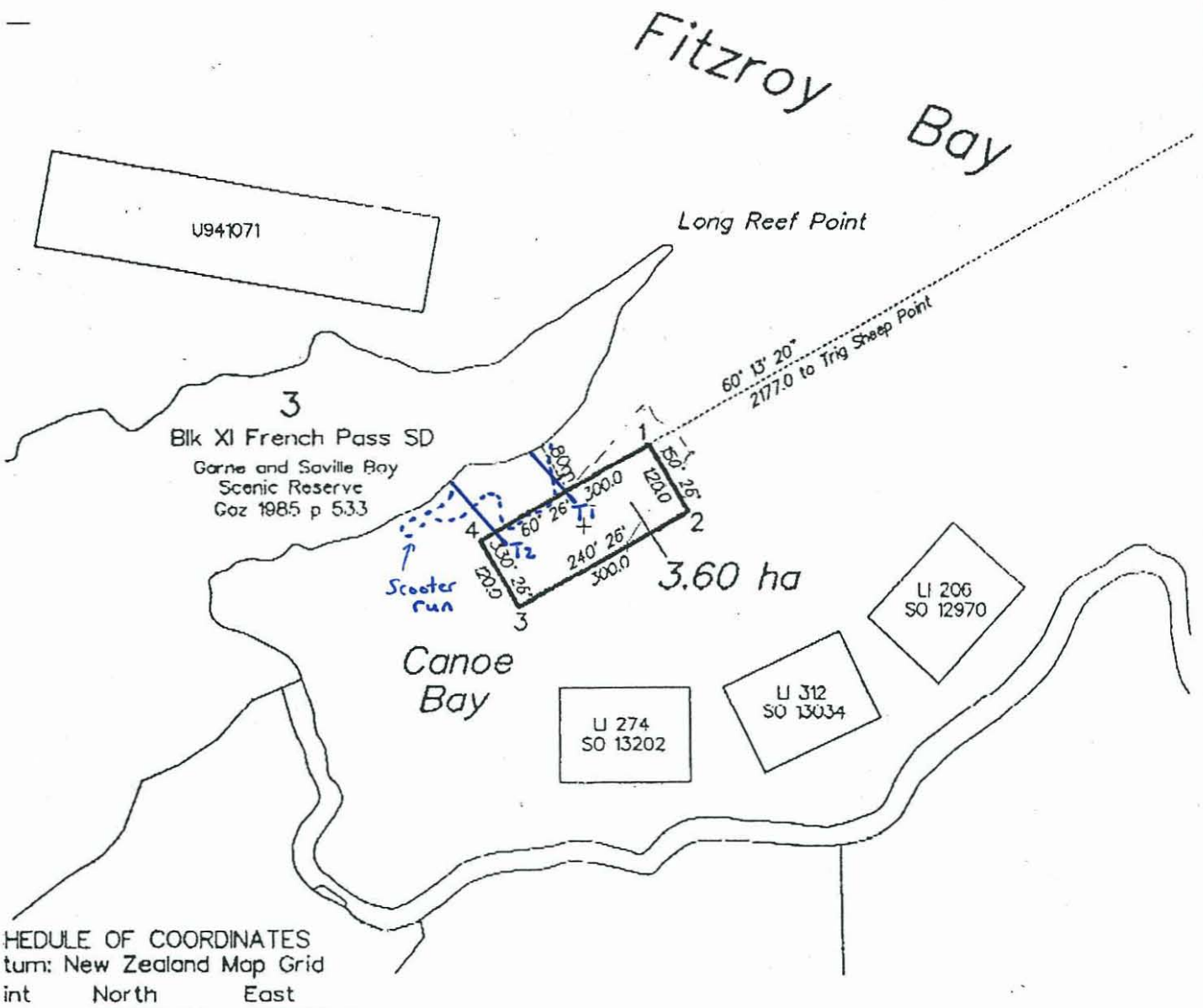

HEDULE OF COORDINATES
tum: New Zealand Map Grid

int	North	East
	6019822.2	2577110.7
2	6019717.8	2577169.9
3	6019569.8	2576909.0
T	6019674.1	2576849.8
ntroid	6019696.0	2577009.9

Plan of Proposed Coastal Permit

CR JM JH and ZF King–Turner

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

CAL AUTHORITY: MARLBOROUGH DISTRICT | NELSON LAND DISTRICT

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Figure 1. Transects and scooter run.

4) soft bottom substrata especially, dead whole shell overlying silts and silts and clays (mud), dominated all of the proposed marine farm area investigated.

3.2 Profiles

The intertidal shore adjacent to the proposed marine farm area was dominated by a combination of short bluffs and a bedrock shore in the west and a relatively low gradient shore or cobble/pebble beach in the east. The coast was bordered by coastal forest.

Both subtidal shore profiles were initially extensions of the intertidal shore being dominated by either a narrow strip of bedrock or cobble/pebble substrata (Figures 2, 3). At both transects the hard shore zone terminated in soft shores at approximately 18 m to 19 m depth and 60 m to 70 m distance from shore (Figures 2, 3).

On the hard shores, no macroalgal fringe was observed. Instead, a hard shore habitat dominated by encrusting filter and grazing invertebrates was observed (Figures 2, 3). Further from shore the proportion of fine sands and broken shell increased until it replaced pebble and cobble material. Large numbers or individual tubeworm mounds (*Galeolaria hystrix*) were observed on the cobble/pebble bank. Few tubeworm mounds were recorded during the study. At transect 1, a localised area of bedrock substrata was recorded between 16 m to 18 m depth and 45 m to 60 m distance from shore.

Soft bottom areas were dominated by dead whole and broken shell overlying silts, while at greater depths, silts and clays dominated (Figure 2, 3). Within the proposed marine farm boundaries, the bottom communities and substrata remained relatively consistent. Brachiopods and scallops were recorded from these soft bottom shores.

From the transects and scooter run a total of 24 conspicuous species of invertebrate, 3 algae, 3 ascidians and 5 species of bony fish were recorded. A list of species are presented in Table 1, while the profiles are plotted in Figures 2, 3.

Green-lipped mussel (*Perna canaliculus*) were not recorded from during the present study. Blue mussel (*Mytilus edulis*) were recorded forming a zone at low tide.

3.3 Reef Fish

Five species of fish were recorded during the investigation. Most abundant reef fish observed were spotty (*Notolabrus celidotus*). Spotty were the most abundant reef fish, while blue cod (*Parapercis colias*) were relatively uncommon. During the investigation, no blue cod greater than 30 cm length were observed. Very few spotty or blue cod were observed from the benthos below the proposed marine farm

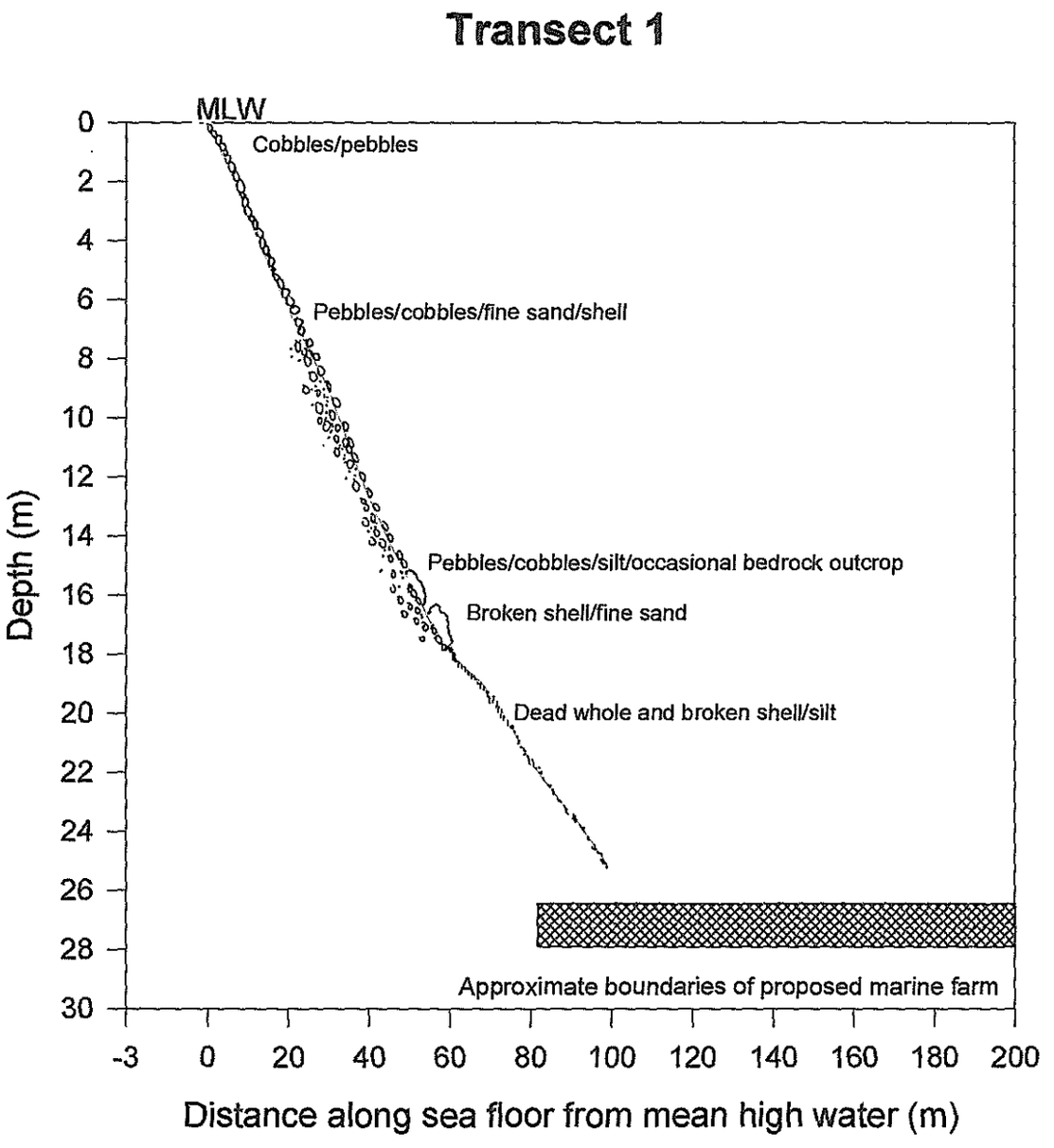

Figure 2 Subtidal shore profile, and substrata from a proposed marine farm in Canoe Bay, Pelorus Sound.

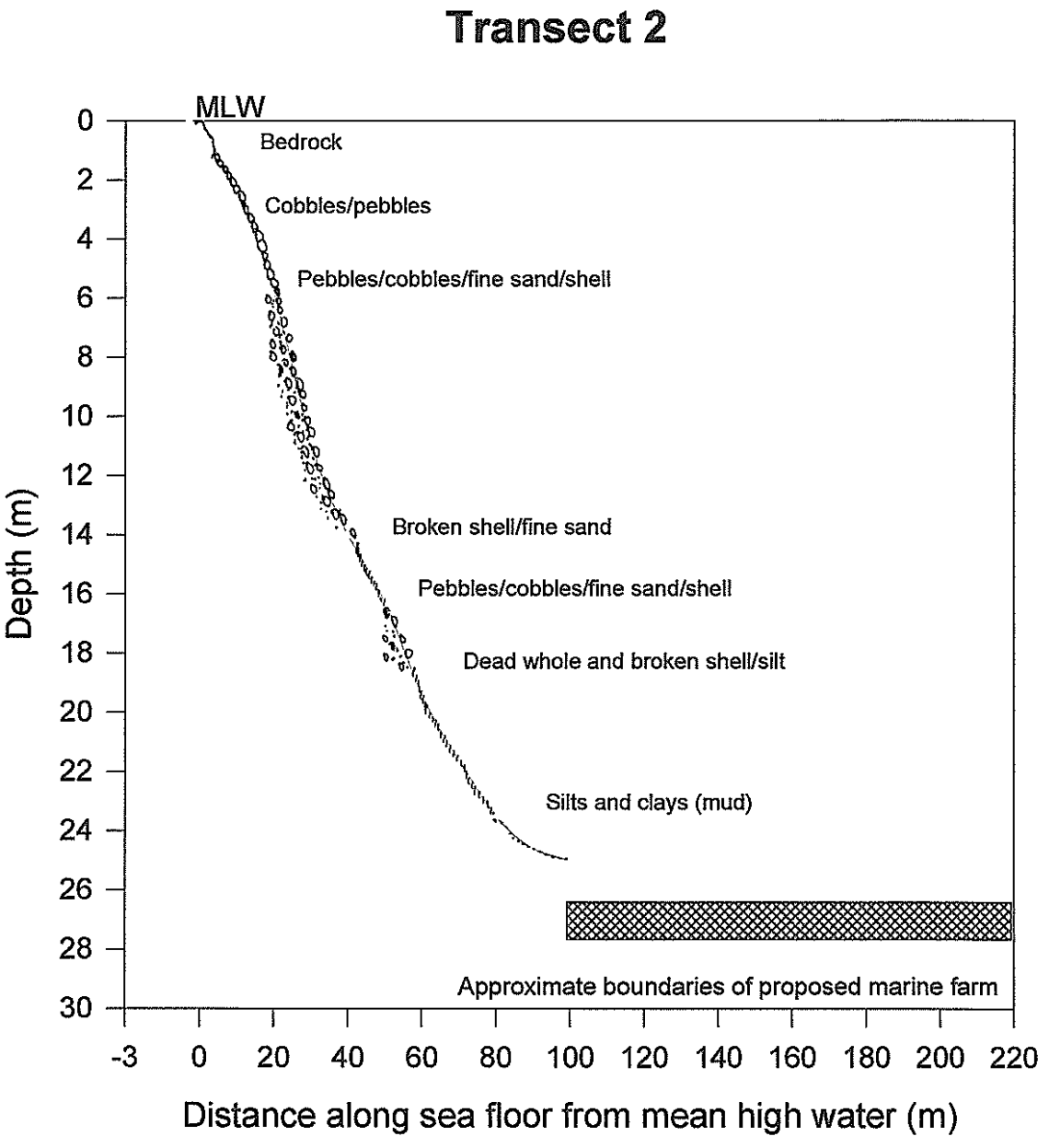

Figure 3 Subtidal shore profile, and substrata from a proposed marine farm in Canoe Bay, Pelorus Sound.

Table 1 Species observed from an area in Canoe Bay, Pelorus Sound.				
Algae	**Common name**	**Invertebrates**	**Habitat**	**Common name**
Corallina spp.(3)	paint	SPONGIA		
Colpomenia sp. (2)	bubble weed	Ancorina alata (2)	rubble	grey sponge
Hormosira banksii (1)	Neptune's necklace	Aplysilla sulphurea (2)	rock	sulphur sponge
		Crella incrustans (1)	rubble	encrusting sponge
		COELENTERATA		
		Culicea rubeola (1)	rubble	box anemone
		GASTROPODA		
		Cellana spp. (2)	rubble	limpet
		Maoricolpus roseus (2)	sand/shell	spire shell
		Trochus viridus (1)	rubble	
		Turbo smaragdus (3)	rock/rubble	cats eye
		BIVALVIA		
		Modilarca impacta (3)	rubble	Nestling mussel
		Monia zelandica (3)	rock/rubble	window oyster
		Mytilus edulis (3)	rock	blue mussel
		Pecten novaezelandiae (1)	soft	scallop
		POLYCHAETA		
		Brachiomma sp.(2)	sand/rubble	fan worm
		Galeolaria hystrix (3)	sand/rubble	tube worm
		Spirorbis sp. (3)	rubble/rock	
		Serpulid sp. (1)	soft	tube worm
		CRUSTACEA		
		Pagurus spp (2)	sand	hermit crab
		ECHINODERMATA		
		Coscinasterias calamaris (2)	sand/shell	11 arm star
		Echinocardium astrale (3)	soft	heart urchin
		Evechinus choroticus (2)	rock/rubble	kina
		Patiriella regularis (2)	sand/rubble	cushion starfish
		Stichopus mollis (2)	sand/silt	cucumber
		BRACHIOPODA		
		Waltonia inconspicua (2)	shell	lamp shell
		Magasella sanguinea (3)	shell	lamp shell
		ASCIDEACEA		
		Cnemidocarpa sp. (2)	rubble	saddle squirt
		Didemnium sp. (2)	rubble	white ascidian
		Leptoclinides sp. (2)	rubble	purple ascidian
		BONY FISHES		
		Notolabrus celidotus (3)	rubble	Spotty
		Hemercoetes monopterygius (2)	silt	Opalfish
		Forsterygion varium (2)	rock/rubble	variable trip.
		Parapercis colias (2)	rubble	blue cod
		Forsterygion nigripenne (3)	rubble	triplefin

3.4 Scallops

Scallops were recorded from the soft bottom shore within the proposed marine farm. Densities averaged from ten 10 m^2 quadrats between 50 m to 100 m from shore were mean = 0.07 per m^{-2}, SE = 0.002. This density is below that considered as commercially viable, and recreationally acceptable to divers. Highest numbers of scallops were recorded from the inshore soft bottom areas most of which are outside the area proposed as a marine farm

3.5 Horse mussels

Horse mussels were not observed from the soft bottom shore within or outside the proposed marine farm.

3.6 Brachiopods

Brachiopods or lampshells (*Magasella sanguinea, Waltonia inconspicua*) were recorded from the soft bottom shore within the proposed marine farm between 19m and 24 m depth, but were most common between 20m to 24 m depth or 60 to 80 m distance from shore (Figure 2, 3). Densities of lampshell in this zone were relatively low 2-3 individuals per m^2. Compared to densities of this species recorded from other parts of Tawhitinui Reach, most densities recorded from the present site are relatively low. Most brachiopods were observed outside the proposed marine farm boundaries.

3.6 Elephant fish embryos

Elephant fish (*Callorhinchus millii*) embryos were not observed during the present study. All habitat suitable as spawning substrata were located outside the proposed marine farm between 60 m to 80 m from shore (Figures 2, 3).

4.0 DISCUSSION OF POTENTIAL IMPACTS 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.).

All of the benthos investigated below the proposed marine farm was dominated by a soft bottom (dead whole shell overlying silt or silts and clays). These substrata were colonised by a relatively

low range of conspicuous epibenthic fauna. Sessile species would probably be smothered by any shell debris originating from a farm, while some species such as the mobile opal fish would probably relocate.

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 Canoe Bay, Fitzroy Bay, Pelorus Sound and to identify potential threats to any subtidal ecological values posed by the proposed marine farming activity.

The soft and hard shore communities recorded from the present study were dominated by species that are widespread and common throughout the subtidal shores of the sheltered central Pelorus Sound (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). Individuals of the tube worm (*Galeolaria hystrix*) were recorded in relatively high abundances on the cobble banks but were well outside the proposed marine farm boundaries. Brachiopods were recorded in relatively low densities and abundances on the inshore soft bottom areas mostly outside the proposed marine farm. Scallops were recorded from within the proposed marine farm but relatively low densities. Horse mussels were not observed in the present study. No elephant fish embryos were recorded during the present study and all appropriate spawning substrata were observed from immediately outside the proposed marine farm. No other species of special scientific or ecological importance were observed during the study.

It appeared that the substrata under the proposed marine farm was dominated by dead whole shell overlying silts in the inshore areas and silts and clays (mud) in deeper areas. The associated flora and fauna from these areas was represented by a relatively low diversity of marine biota. This soft bottom habitat and all species are widespread in Pelorus Sound, and also in many of the sheltered parts of the Marlborough Sounds. Based on subtidal ecological data, no modifications to the proposed marine farm are suggested.

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