REC 946
U991216

Subtidal Ecological Investigation
Fitzroy Bay.

By Michelle M^{c}Lean for Pamela Thompson.

Introduction.

This survey of the seabed and associated marine life covers an area within Fitzroy Bay, Pelorus Sound, to accompany a marine farm application.

Methods.

The area was surveyed on 28-8-99.

Sea bed survey.
Two transect lines were laid out across the site running approximately perpendicular to the coast over the sea bed from shore to deep water. The transect lines, weighted nylon cord, were up to 200metres in length and marked every 10 metres.
Each transect line was followed from deepwater to shore by scuba diver, recording depth and type of sea bed (substrate) every 10 metres, and marine life seen.
Data recorded is given in the Appendix .

Adjacent Inshore Coast Investigation.
A diver, recording species and substrate present, followed the inshore coast adjacent to the location of the proposed marine farm.
Data recorded is given in the Appendix .

Figure 1 shows the approximate location of the proposed marine farm and the approximate position of the transects and inshore coast survey.

Results.
General Description.

In deeper water the silty sea bed is scattered with dead unbroken shell. Saddle squirts are common here and present right into the shore, where cobbles provide a surface for attaching seaweeds, especially neptune's necklace, and attaching molluscs, tubeworms and ascidians; hermit crabs and triplefins are also present.
No species, communities nor habitats of scientific or ecological importance were recorded at sufficient levels to warrant more detailed study.

Conclusion.

The benthic biology of the area is assessed as suitable for the placement of a marine farm.

FIGURE 1

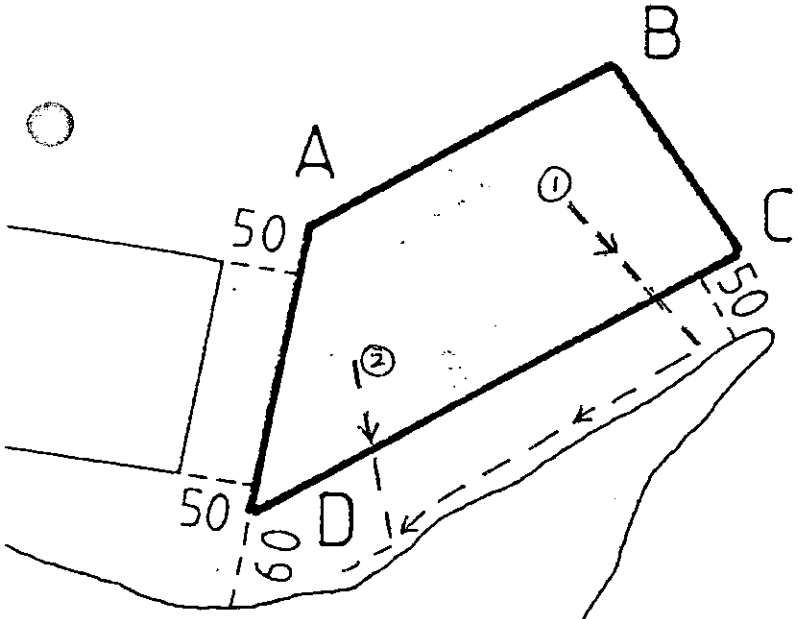
Fitzroy Bay

KEY

Transect ① ②

Diver route

Approximate location of dive transects and inshore survey in relation to proposed farm boundaries



AREA 4·35 ha

Long Reef Point

Pass S.D

ic Res.

U951077

Canoe Bay

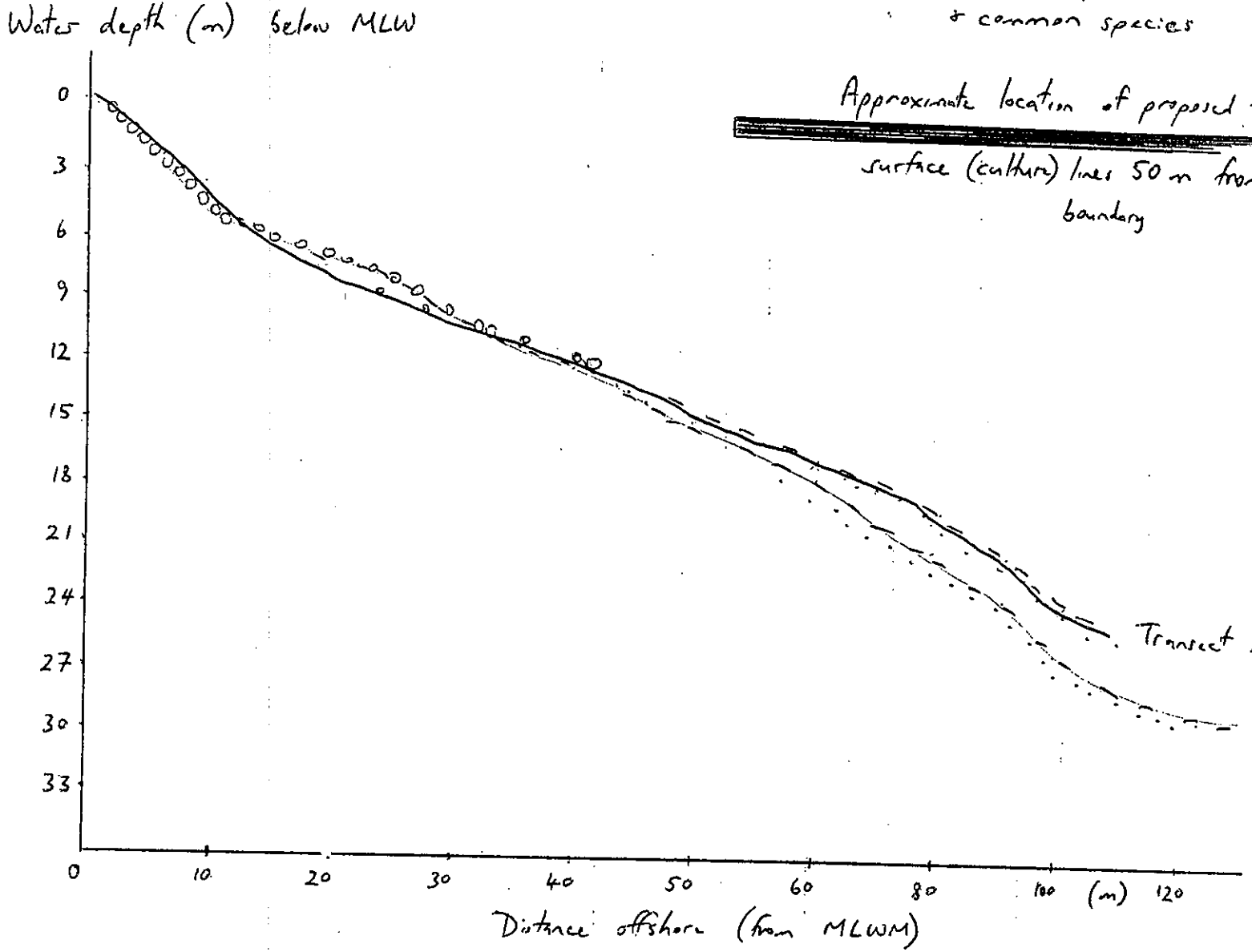
LI 206

LI 312

LI 274

FIGURE 2

Subtidal shore profiles
& common species



Summary

Seafloor substrate	Common Species
Cobble	Tube worms Pink paint Saddle squirt Hermit crab Kina
—	
Silts Broken shell	Hermit crab Occassional scallop Occassional lamp shell

Appendix.

Abundance scale used:

Rare: only one to five individuals or colonies observed.
Occasional: observed in low numbers.
Common: seen frequently.

Contents.

Table 1. Transect one species abundance and associated substrate.

Substrate type⇒		Soft silt & shell	Cobble & shell.
Species ⇩			
Scientific name	Common name		
Algae			
Lithothamnion sp.	Pink paint	common	common
Foliose red			rare
Ascidacea			
Cnemidocarpa bicornuata	Saddle squirt	common	common
Aplidium sp.	Colonial ascidian		rare
Didemnum candidum	Colonial ascidian	rare	rare
Brachiopoda			
Magasella sanguinea	Lamp shell	rare	
Crustacea			
Pagurus sp.	Hermit crab	common	common
Notomitrax sp.	Decorator crab		rare
Echinoidea			
Evechinus chloriticus	Kina	occasional	common
Stichopus mollis	Sea cucumber	rare	occasional
Echinodermata			
Patiriella regularis	Cushion star	occasional	occasional
Coscinasterias calamaris	Eleven armed star	occasional	occasional
Mollucsa			
Atrina zelandica	Horse mussel	rare	
Ruditapes		rare	
Pecten novaezelandiae	Scallop	rare	
Modiolarca impacta	Nestling mussel	occasional	occasional
Turbo smaragdus	Cat`s eye		occasional
Trochus sp.	Topshell		occasional
Monia	Window oyster		occasional
Cellana	Limpet		rare
Lepsiella	Whelk		occasional
Maoricolpus	Turret shell		occasional
Porifera			
Anchorina	Massive grey sponge	rare	
Unidentified	sponge	rare	
Osteichthyes			
Tryptverygiidae	triplefins		occasional
Tube worms			
Serpullids	Tube worms		rare
Galeolaria hystrix	Tube worms	occasional	occasional
Spirobus	Christmas tree worm		rare
Unidentified tube worms		occasional	occasional

Table 2. Transect two species abundance and associated substrate.

Substrate type⇒		Soft silt & shell	Cobble & shell.
Species ⇓			
Scientific name	Common name		
Algae			
Lithothamnion sp.	Pink paint	common	common
Ascidacea			
Cnemidocarpa bicornuata	Saddle squirt	common	common
Aplidium sp.	Colonial ascidian		
Didemnum candidum	Colonial ascidian		
Brachiopoda			
Magasella sanguinea	Lamp shell	rare	
Crustacea			
Pagurus sp.	Hermit crab	rare	common
Echinoidea			
Psuedochinus albocincta	Little pink kina	rare	
Evechinus chloriticus	Kina	occasional	occasional
Stichopus mollis	Sea cucumber		occasional
Echinodermata			
Patiriella regularis	Cushion star	occasional	
Coscinasterias calamaris	Eleven armed star	occasional	
Pentagonaster pulchellus	Biscuit star		rare
Mollucsa			
Atrina zelandica	Horse mussel	rare	
Pecten novaezelandiae	Scallop	rare	
Modiolarca impacta	Nestling mussel	rare	occasional
Turbo smaragdus	Cat's eye	occasional	common
Trochus sp.	Topshell		
Monia	Window oyster	rare	occasional
Lepsiella	Whelk		occasional
Cryptoconchus	Butterfly chiton		rare
Porifera			
Anchorina	Massive grey sponge		rare
Osteichthyes			
Tryptyerygiidae	triplefins		occasional
Tube worms			
Serpullids	Tube worms	rare	
Galeolaria hystrix	Tube worms	rare	common
Unidentified tubeworms			common

Table 3. Inshore coast survey- species abundance.

Species		abundance
Scientific name	Common name	
Algae		
Hormosira banksia	Neptune's necklace	common
Cystophora sp.	Brown seaweed	occasional
Colpomenia sinuosa	Bubble seaweed	occasional
Lithothamnion sp.	Pink paint	occasional
Unidentified	Corralline algae	rare
Ascidacea		
Cnemidocarpa bicornuata	Saddle squirt	occasional
Crustacea		
Pagurus sp.	Hermit crab	common
Echinoidea		
Evechinus chloriticus	Kina	occasional
Echinodermata		
Patiriella regularis	Cushion star	occasional
Mollucsa		
Mytilus edulis	Blue mussel	occasional
Modiolarca impacta	Nestling mussel	occasional
Turbo smaragdus	Cat's eye	common
Trochus sp.	Topshell	occasional
Lepsiella	Whelk	rare
Cellana	Limpet	occasional
Comminella	Whelk	occasional
Sypharochiton	Snakeskin chiton	rare
Hydroidea		
?Plumularia	Branching hydroid	rare
Porifera		
Unidentified	Encrusting dark sponge	rare
Osteichthyes		
Tryptverygiidae	triplefins	occasional
Notolabrus ceilodotus	Spotty	occasional

Cawthron Report No. 640

CAWTHRON

Marine Farm Site Assessment: Fitzroy Bay, Pelorus Sound

Prepared for

Pamela Thomson

May 2001

1. INTRODUCTION

Pamela Thomson has contracted Cawthron to describe the characteristics of the seabed beneath a proposed 4.35 ha marine farm site at Fitzroy Bay in the Pelorus Sound (Figure 1). A resource consent application (U991216) for this site has previously been declined by Marlborough District Council, partly because insufficient information was provided on the ecology of the seabed beneath the proposed farm and its immediate environs. Of particular concern was the lack of information on the proximity of a significant reef at Long Reef Point to the south-east of the site (see Figure 1).

This report aims to provide sufficient information to address these information gaps, recognising that a limited survey of the area has already been undertaken (described in a report by Michelle McLean to Pamela Thomson). The present report provides the methods and results of a dive investigation and depth sounding survey conducted at the proposed site on 24 April 2001, and makes a recommendation as to the suitability of the site for a marine farm. Particular attention was given to assessing the values of potentially vulnerable areas not adequately covered in the previous site investigation. These included the south east corner and reef, the inshore boundary, and the deeper seaward half of the site.

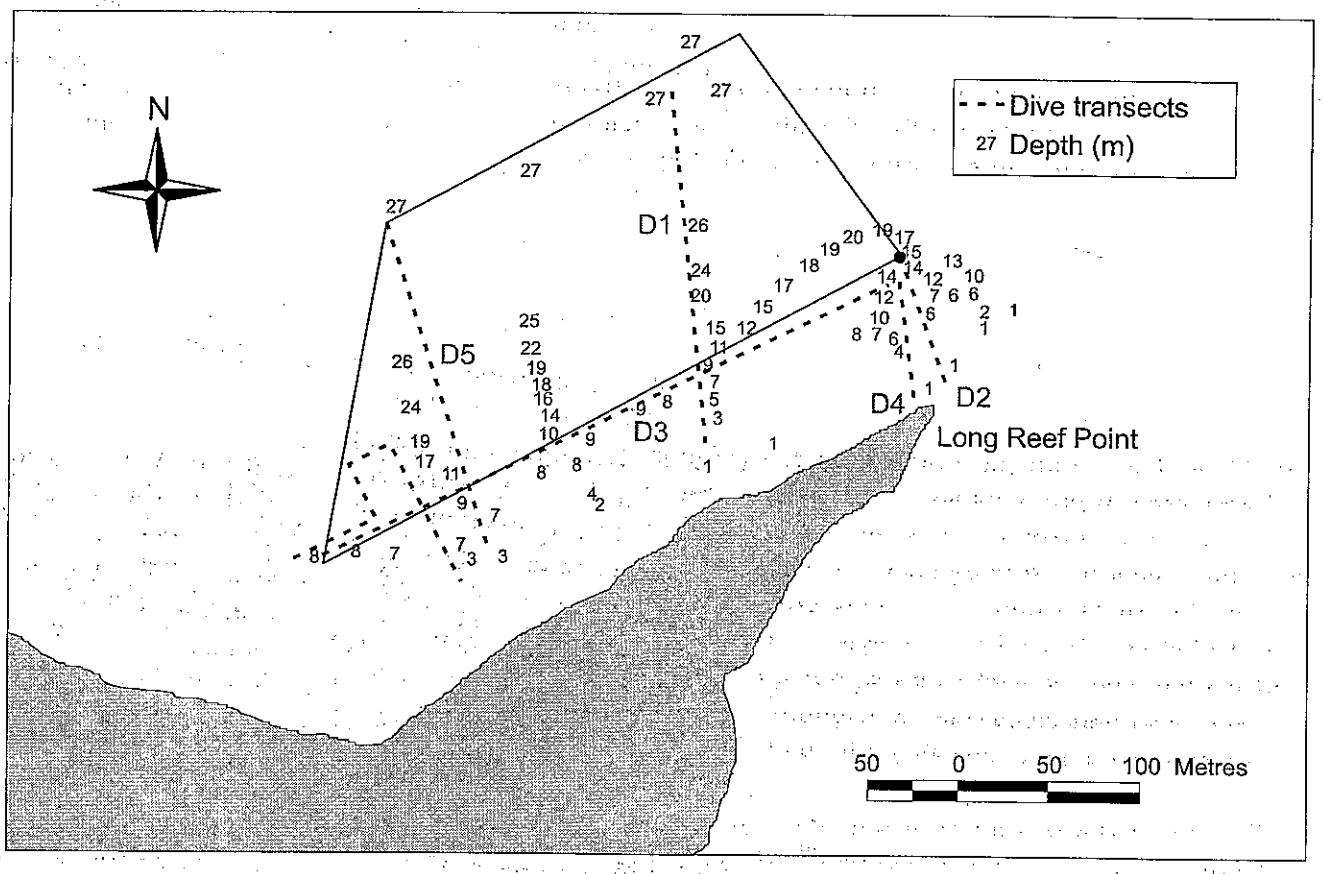


Figure 1 Site plan for a proposed marine farm at Fitzroy Bay showing survey work conducted on 24 April 2001, and site depths (adjusted to chart datum).

2. METHODS

The corners of the site were located using GPS and marked with buoys to allow easy on-site orientation for subsequent positioning of sampling transects. Survey work undertaken at the site is depicted in Figure 1. This included three depth sound profiles, and also a sounding of the inshore boundary and reef area. To ensure accurate spatial information on depths, GPS positions were recorded concurrently for each point where depths were recorded. Depths were later adjusted to chart datum (± 1m) and plotted for each GPS position as shown in Figure 1.

Divers swam five shore profiles, two of which extended from the seaward boundary of the site to the shore. An additional survey of the entire inshore boundary was conducted by divers on a towed manta board. This complemented two partial shore profiles and a shoreline survey conducted by Michelle McLean. Rather than produce exhaustive lists of the species considered typical of subtidal habitats in the Sounds (*e.g.* Forrest 1995) the aim of the dive surveys was to determine the occurrence and distribution of any species or habitats having special value for ecological, conservation, fishery or scientific reasons, including those listed in the Department of Conservation (DOC) guidelines for marine farm site assessments (DOC 1995).

3. RESULTS AND DISCUSSION

3.1 General description of the site

A list of the conspicuous species found in the environs of the proposed site is given in Table 1. The habitats along the two longest dive profiles are indicated in Figure 2. The seaward half of the site was 25-27 m deep and is positioned above a relatively flat seabed consisting of soft brown mud (Figures 1 & 2). In terms of surface dwelling species, this area was relatively barren except for the occasional saddle squirt and horse mussel (*Atrina zelandica*). Based on sampling of such habitats conducted elsewhere in the Sounds (*e.g.* McKnight & Grange 1991, Forrest & Barter 1999) we would expect these soft sediment habitats to contain a diverse array of infaunal species (*i.e.* those living within the sediment matrix). Common species would likely include heart urchins (*Echinocardium cordatum*), brittle stars (*e.g. Amphiura rosea*), and a range of smaller-bodied suspension or deposit feeding invertebrates primarily represented by polychaete worms and amphipods.

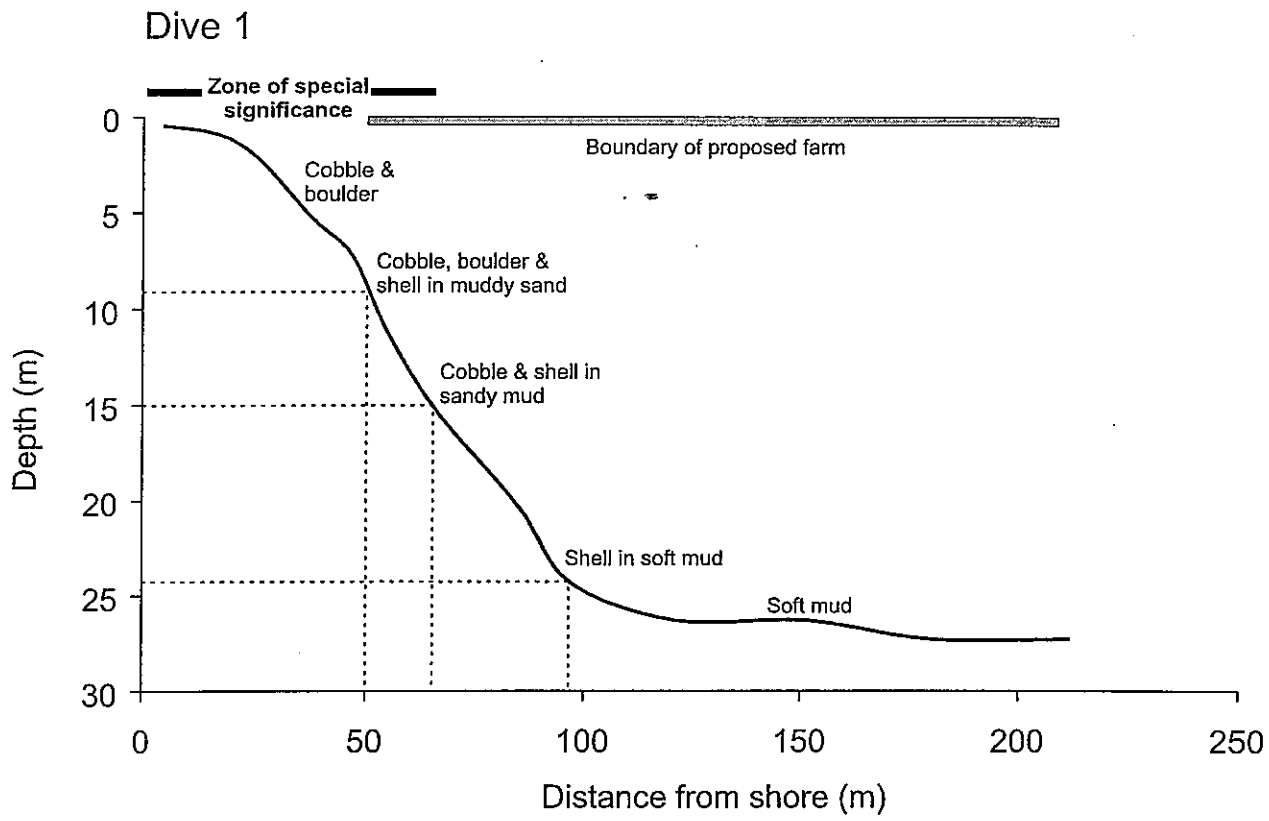
At 23-24 m depth the gradient of the seafloor steepened, and whole-shell and empty calcareous worm tubes were conspicuous. From approximately 15-20 m depth, corresponding to the inshore quarter of the proposed site, these shell/tubeworm debris covered 30-50% of the seabed. A variety of conspicuous surface-dwelling species in this area reflected the increased habitat complexity provided by the debris. Species present were those typical of such habitats in the Sounds and included saddle squirts, eleven arm starfish, cushion stars, kina, and sea cucumbers. Potentially important species such as horse mussels, sponges (*e.g. Ancorina alata*), brachiopods (*Terebratella sanguinea*) and calcareous reef-building tubeworms (*Galeolaria hystrix*) were present, but not at densities considered significant in the DOC guidelines (DOC 1995).

The most notable feature of the site was the increased extent of cobble and boulder habitat as the depth shallowed. An estimated area of 20-50% cobble extended to 15 m depth on dive transect D1. Much of the remaining habitat consisted of considerable shell/tubeworm debris that, together with the cobble, provided extensive areas of hard substrata. These substrata were primarily covered in crustose coralline algae, and high densities of grazing snails such as cats-eyes (*Turbo smaragdus*) were present. Other profiles, and the survey of the inshore boundary, revealed a similar habitat

Table 1 Relative abundance of conspicuous seabed species beneath a proposed mussel farm site (and immediate vicinity) in Fitzroy Bay.

SCIENTIFIC NAME	Description	ABUNDANCE*
SEAWEEDS		
Carpophyllum flexuosum	Brown seaweed	R
Carpophyllum maschalocarpum	Brown seaweed	R
Corallinales	Crustose coralline algae	A
Cystophora torulosa	Brown seaweed	O
ANIMALS		
Amaurochiton glaucus	Green chiton	O
Ancorina alata	Black sponge	O
Aplysilla sulfurea	Yellow sponge	R
Atrina zelandica	Horse Mussel	R
Botryllus schlosseri	Orange colonial ascidian	R
Cellana spp.	Limpets	O
Chiton pelliserpentis	Snake skin chiton	O
Cnemidocarpa bicornuata	Saddle squirt	A
Coscinasterias calamaria	Eleven arm seastar	C
Cryptoconchus porosus	Chiton	R
Elminius modestus	Barnacle	A
Epopella plicata	Barnacle	O
Evechinus chloroticus	Kina	O
Forsterygion sp.	Common triplefin	O
Forsterygion varium	Variable triplefin	O
Galeolaria hystrix	Large tube worm	C
Haliotis australis	Abalone	R
Maoricolpus roseus	Spire shell	O
Mauve encrusting sponge	Sponge	O
Monia zelandica	Window oyster	C
Mytilus galloprovincialis	Blue mussel	C
Notolabrus celidotus	Spotty	A
Orange encrusting sponge	Sponge	R
Paguridae	Hermit crab	O
Parapercis colias	Blue cod	R
Patiriella regularis	Cushion star	C
Pecten novaezelandiae	Scallop	R
Ruditapes largillierti	Clam	R
Spirorbis sp.	Small spiral tube worm	A
Stichopus mollis	Sea cucumber	C
Terebratella sanguinea	Brachiopod (lamp shell)	R
Tethya aurantium	Orange golf ball sponge	R
Turbo smaragdus	Cat's eye	A

* R=rare, O=occasional, C=common, A=abundant



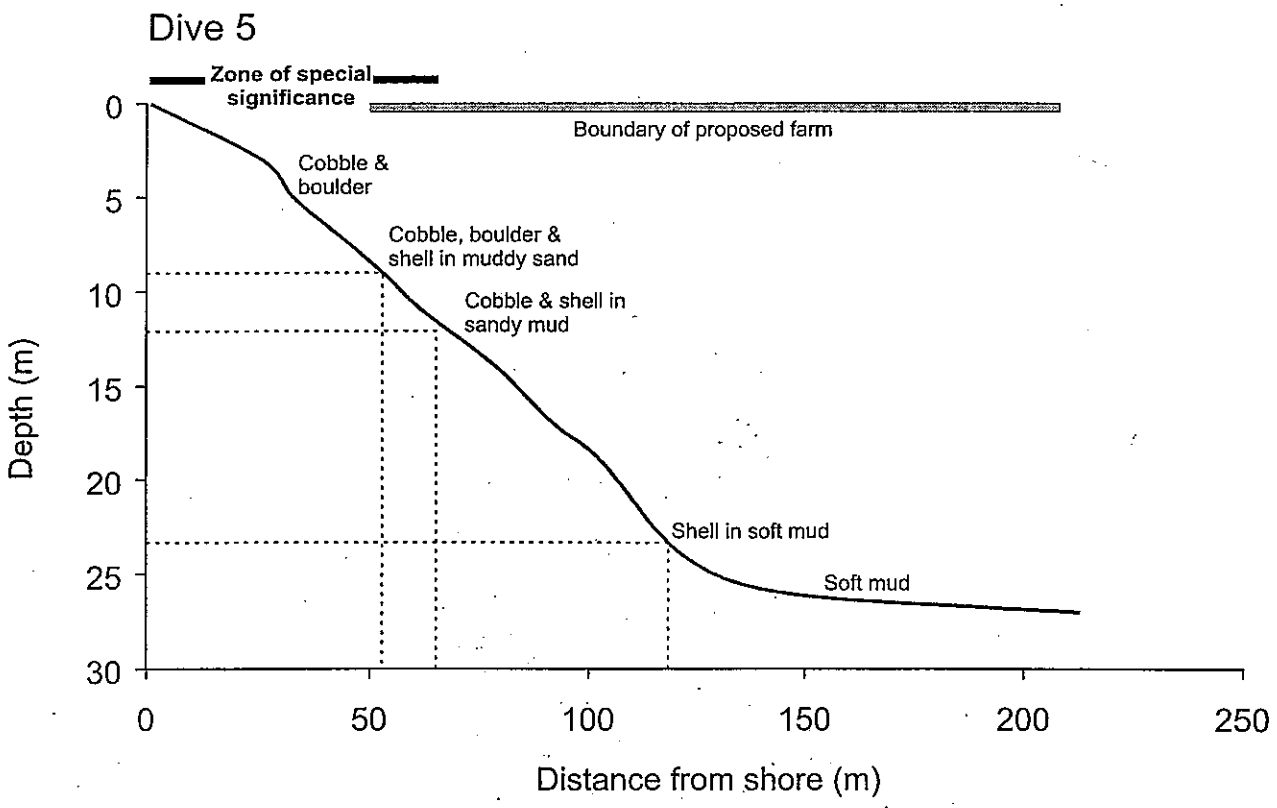


Figure 2 Shore profiles and habitat descriptions from dive transects 1 and 5. Along both profiles, habitats of special significance (cobble and shell/tubeworm debris) occurred approximately 65 m from the shore, or 15 m into the site. See text for description of main ecological features.

extending to approximately 12 m depth. Such findings are consistent with the two shore profiles described by Michelle McLean. In relation to the site, these depths place significant areas of hard substrata in a zone extending from the shoreline to approximately 15 m seaward of the proposed inshore boundary (see Figure 2).

Along most of the inshore boundary (9-10 m depth) and further shoreward, rocky habitat was dominant, and shell/tubeworm debris considerably less. These shallower rocky areas consisted of relatively sediment-free angular cobbles and small boulders covering up to 90% of the substratum. Surprisingly, significant areas of rocky habitat and other hard substrata were most distant from the site at the south east corner next to Long Reef Point. The subtidal reef associated with this point continued in the same direction as the point itself, essentially parallel to the inshore boundary of the proposed site.

3.2 Site suitability, boundary adjustments and monitoring

DOC guidelines suggest that special significance be attributed to areas of hard substrata when they are > 25 m^2 in extent (DOC 1995). At the proposed Fitzroy Bay site, this would apply to the shallow areas of cobble, boulder, and shell/tubeworm debris that extend approximately 15 m inside the site along most of its inshore boundary. If a marine farm was located as proposed, it is highly likely that these significant habitats would be adversely affected. A key consideration, therefore, is the distance seaward that the inshore boundary of the proposed marine farm needs to be moved in order to reduce the risk of adverse impacts.

The answer to this depends on the spatial extent of depositional effects, and we have little reliable data on which to make this assessment. Results from modelling the dispersion of faecal and pseudofaecal deposits suggests that the spatial extent of deposition could be in the order of tens to hundreds of metres from a farm boundary, the distance depending of site-specific factors such as water depth, current speed, farm stocking densities *etc.* This contrasts with casual observations made beneath Pelorus Sound mussel farms (by the author and other marine scientists), which suggest that clearly discernible seabed impacts may be localised to within a few metres or tens of metres horizontally from the boundary of dropper lines. Such observations have not, however, covered the broad spectrum of conditions under which impacts may vary. Clearly, therefore, there is some uncertainty about the spatial extent of effects.

Bearing this uncertainty in mind, it is suggested for the proposed Fitzroy Bay site that the most inshore longline be relocated at least 40 m seaward of its present position. This would place the inshore edge of a marine farm approximately 25 m seaward of significant habitats, and would reduce the risk of adverse depositional effects. This measure is contradictory to Michelle McLean's recommendation that the site is suitable for marine farming in its present position, but is justified by the collective findings of the two site surveys. Such an adjustment would also make it unlikely that subtidal reef habitat extending off Long Reef Point would be adversely affected, especially given the additional buffer zone provided by the anchor warp distance.

However, recognising the uncertainty as to the spatial extent of effects, it is suggested that monitoring is carried out before and after site development. This should include consideration of effects in the direction of prevailing tidal currents, and significant habitats inshore of the site. Such monitoring studies have traditionally not been carried out as a part of the development of small marine farm sites. However, with the rapid expansion of the marine farming industry, both Cawthron and NIWA have identified the need for better information on the magnitude and spatial extent of impacts from both the small nearshore farms and larger offshore blocks.

4. SUMMARY AND RECOMMENDATION

The most significant seabed feature at the proposed Fitzroy Bay marine farm site is a shallow habitat of cobble, boulder, and shell/tubeworm debris that extends approximately 15 m inside the site along most of its shoreward boundary. This habitat is dominated by an extensive cover of crustose coralline algae and associated biota.

The potential for adverse impacts on this area would be reduced if the inshore boundary of the site was moved at least 40 m seaward. This would place significant habitats 25 m horizontally from the nearest inshore longline, and considerably further from the subtidal reef extending from Long Reef Point. With this modification, significant adverse impacts from the proposed marine farm are probably unlikely, but monitoring of the magnitude and spatial extent of effects will be needed in order to confirm this.

5. REFERENCES

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