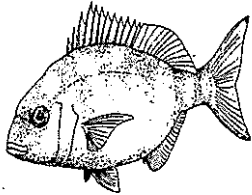


Davidson Environmental

98a Quebec Road, Nelson,

Ph: (03) 546 8413, Fax: (03) 545 9399, Email: davidson@xtra.co.nz



*Specialists in:
Marine, and Freshwater Research, Survey and Monitoring*

Biological report on a proposed marine farm extension located in Hallam Cove, Pelorus Sound

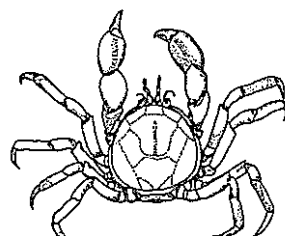
Li 237

Research, Survey and Monitoring Report Number 292

A report prepared for:

Peter Archer
C/o PALMS
P.O. Box 751
Blenheim

By:
Robert J. Davidson



SEPTEMBER, 1999

Bibliographic reference:

Davidson, R. J. 1999: Biological report on a proposed marine farm extension located in Hallam Cove, Pelorus Sound.
Prepared by Davidson Environmental Limited for Peter Archer. Survey and Monitoring Report No. 292.

©Copyright:

The contents of this report are copyright and may not be reproduced in any form without the permission of the client.

Prepared by:

Davidson Environmental Limited
98a Quebec Road
Nelson
September, 1999

SUMMARY

1. The aims of the study were to provide a biological description of the benthos within and adjacent to a proposed marine farm extension to Li 237 located north of Sheep Point, Hallam Cove, Pelorus Sound. Potential threats to any subtidal ecological values posed by the proposed activity were also discussed.
2. The soft shore communities recorded from the present study were dominated by species that occur on subtidal shores swept by light tidal currents in central Pelorus Sound, 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).
3. One transect and a free diver swim were conducted within the proposed marine farm.
4. The hillsides adjacent to the proposed site were dominated by pasture. The intertidal shore was dominated by small boulders and cobble substrata. The intertidal shore was approximately 10 m wide.
5. All areas offshore of 45 m distance from low water were dominated by soft substrata (ie. pebbles and fine sand/shell, a silt base with dead whole shell material or further from shore silt and clay).
6. Cobble material extended offshore to 45 m distance from low water. No other hard shore substrata were recorded from within the application area.
7. Based on the initial draft plan (presented in the present investigation) it is recommended that the inshore boundary be located no closer than 60 m distance from low water. This adjustment would avoid hard shore substrata. No other adjustments to the proposed boundaries are recommended on ecological grounds.

1.0 INTRODUCTION

The aims of the study were to provide a biological description of the benthos within and adjacent to a proposed marine farm extension to Li 237 located north of Sheep Point, Hallam Cove, Pelorus Sound. Potential threats to any subtidal ecological values posed by the proposed activity were also discussed.

2.0 STUDY AREA

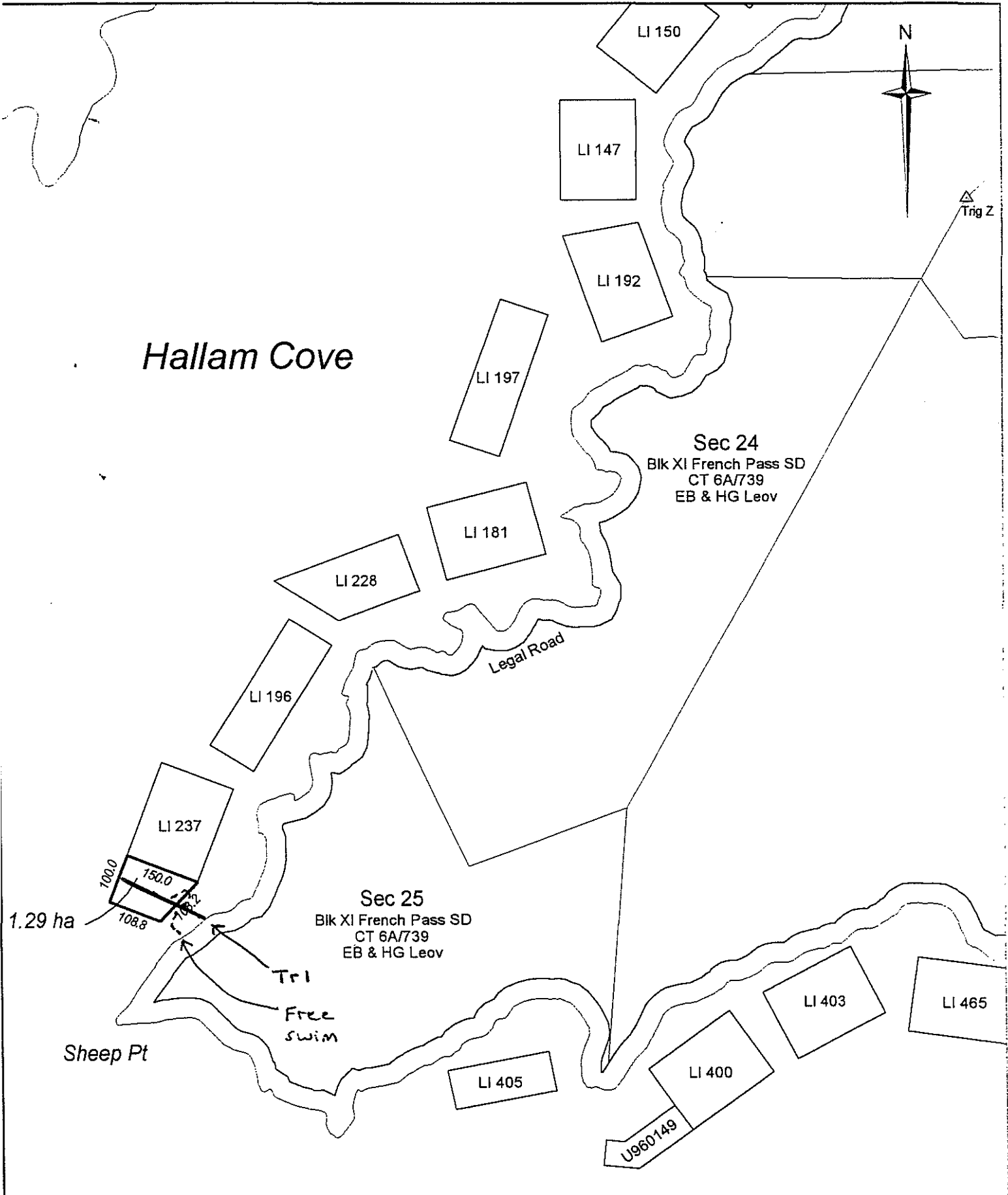
Hallam Cove is the largest bay in the Fitzroy Bay complex comprising a total of five bays. Hallam Cove is located on the northern side of Fitzroy Bay and is some 3.5 km in length and is approximately 1 km wide at its entrance (Garne Point to Sheep Point). Depths in Hallam Cove are relatively consistent between 25 m to 27 m but rise to considerably shallower depths around the edges of small bays such as Cissy Bay and Te Towaka (see Navy Chart NZ 615). The shoreline of Hallam Cove is pasture, pine plantations or coastal forest. Water residence times in this area have been recorded as some of the longest in the Marlborough Sounds (see Gibbs 1991).

The proposed marine farm area was located on the eastern shoreline of Hallam Cove immediately north of Sheep Point (Figure 1). The hillsides adjacent to the proposed site were dominated by pasture. The intertidal shore was dominated by small boulders and cobble substrata. The intertidal shore was approximately 10 m wide.

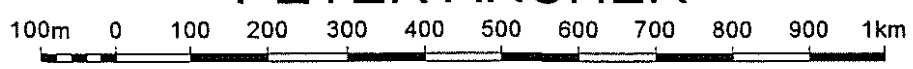
3.0 BACKGROUND

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 as one ecological unit was identified as having national conservation importance. Within the Sounds, areas have been ranked ranging from areas of international to regional biological importance (Davidson *et al.*, 1990; Davidson *et al.*, 1995). These values have been included in the Marlborough District Council's draft Marlborough Sounds Regional Plan.

Multiple use (marine farming, fishing, boating, housing, waste water disposal, port development, forestry, agriculture) all have the potential to degrade the marine 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; deJong 1994). It is therefore important that all new marine farm and farm extension proposals adequately identify natural values within and adjacent to a proposed marine farm.



Proposed Extension to Coastal Permit LI 237
PETER ARCHER



SCALE 1:10,000

4.0 MATERIALS AND METHODS

The area was investigated on 18th September 1999. One transect was extended from the shoreline into the proposed marine farm area (Figure 1). The transect consisting of a lead-line marked at 5 m intervals. One diver free swim was conducted during the present study along the inshore portion of the proposed marine farm extension.

Densities of horse mussel (*Atrina zelandica*) and scallop (*Pecten novaezelandiae*) were collected from 10 x 1 m² quadrats installed at various intervals along transects lines. Brachiopod (*Magasella sanguinea*) abundance estimates were collected from areas where brachiopods were most common.

All depths presented in this report are adjusted to datum. Data collected during the study follow the Department of Conservation guideline outlining procedures for the investigation of marine farm areas in the Marlborough Sounds (Department of Conservation, 1995). Observations on water current direction and relative speed were collected at a variety of depths between 1.00 p.m. to 2.30 p.m. These observations were collected during the incoming tide.

5.0 RESULTS AND DISCUSSION

5.1 Water currents, free swims and observations

Observations from within the proposed farm area suggested that:

- 1) depths were relatively consistent in offshore areas (ie. 27 m to 28 m), while the proposed inshore boundary was approximately 11 m depth;
- 2) offshore substrata was silt and clay with pebble and shell/sand, fine sand and dead whole shell material present on the shore slope;
- 3) cobble sized substrata were not recorded offshore within the proposed marine farm area;
- 4) no reef structures were recorded within the proposed farm area;
- 5) horse mussels and scallops were relatively uncommon from the proposed marine farm area;
- 6) lampshells were recorded between 80 m to 120 m distance from shore.

A light northward along shore tidal current was observed during the present study. Based on the species observed from the site, it is expected that tidal currents remain predominantly light for much of the time.

5.2 Profile

The shore was characterised by bedrock reef, cobble, small boulder and pebble substrata that extended offshore to approximately 45 m distance (Figure 2). Beyond the hard shore zone, a zone of pebble, shell and fine sand was recorded 45 m to 80 m distance from shore. Further from shore a silt base with dead whole and broken shell material was observed between 80 m and 140 m distance from low water. Beyond 140 m distance, the shell/silt zone graded into silt and clay substrata with a small component of shell material. Silt and clay substratum extended to the offshore boundary of the proposed marine farm.

From the transect and free swims a total of 26 conspicuous surface dwelling species of invertebrate, 3 ascidians, 6 species of algae and 6 species of bony fish were observed. A list of species present are displayed in Table 1. The shore profile has been plotted in Figure 2.

5.3 Fish

Six species of bony fish were recorded during the investigation. The number and composition of fish species were representative of cobble and reef areas in the sheltered shores of central Pelorus Sound. Reef fish were restricted to the rubble bank and reef habitats. An occasional blue cod were observed from the reef and rubble bank, while other reef species were absent during the inspection (eg. blue moki, tarakihi). A variety of triplefins were common from the rubble bank. Offshore mud habitats were dominated by opal fish (Table 1). No fish feeding holes in the substratum were observed during the present study.

5.4 Scallops (*Pecten novaezelandiae*)

Scallop density recorded from the site was: mean = 0.043 individuals per m², SE = 0.03. This density is below the Department of Conservation trigger level (i.e. 0.1 individuals per m²). All scallops were observed within 120 m distance from shore.

5.5 Horse mussels (*Atrina zelandica*)

Horse mussel density recorded from the site was: mean = 0.03 individuals per m², SE = 0.016. This density is below the Department of Conservation trigger level (i.e. 0.2 individuals per m²). All horse mussels were observed within 130 m distance from shore.

5.6 Lampshells

Lampshells (*Magasella sanguinea*) were observed between 80 m to 120 m distance from shore. Lampshells did not form a dense bed or zone in this area.

Transect

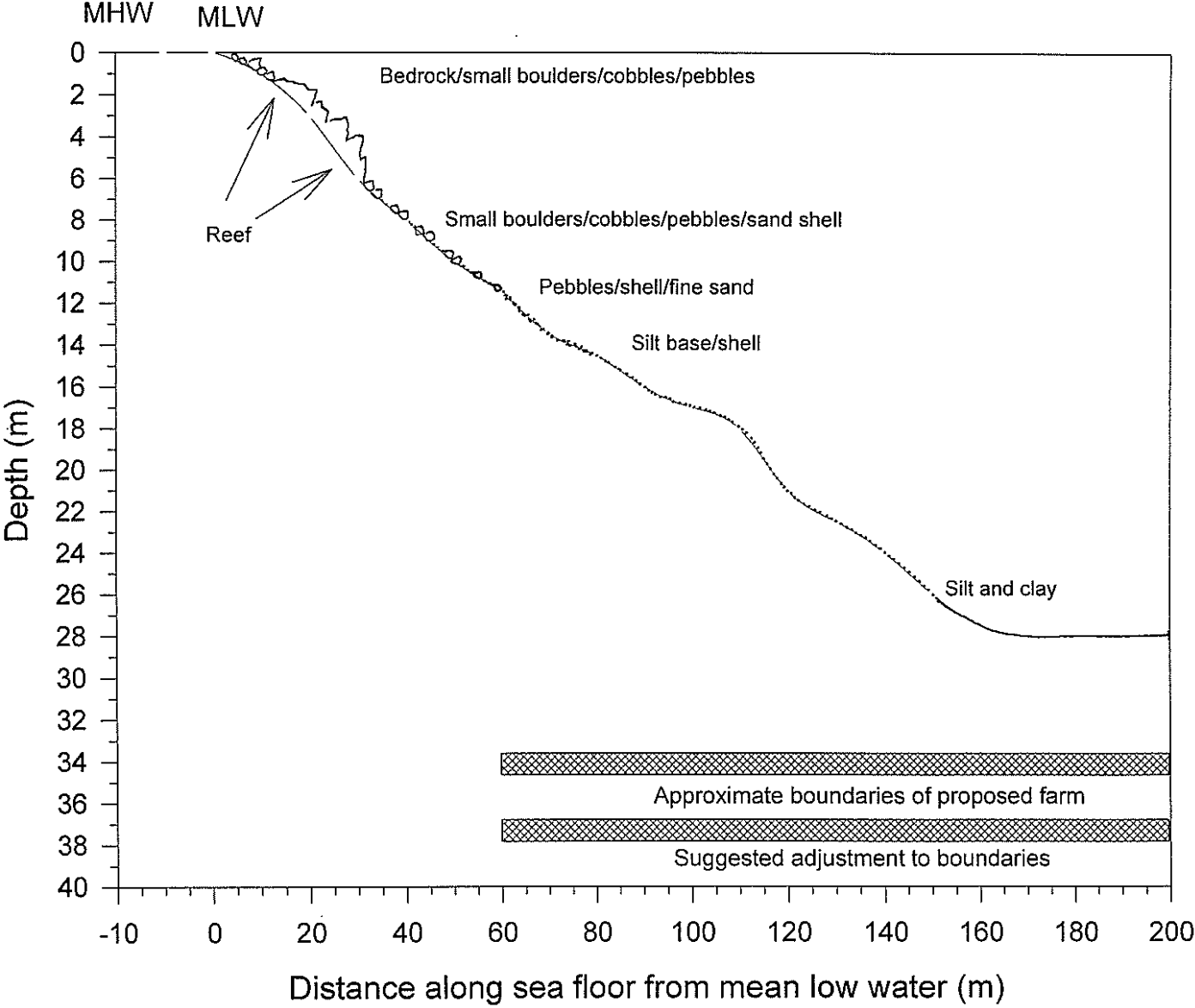


Figure 2 Subtidal shore profile and substratum from an area proposed as a marine farm in Hallam Cove.

Table 1 Species observed from transects from an area in Hallam Cove, Pelorus Sound.				
Algae	Common name	Invertebrates	Habitat	Common name
Corallina spp.(3)	paint	SPONGIA		
Colpomenia sp. (2)	bubble weed	Crella incrustans (1)	rubble	encrusting sponge
Hormosira banksii (1)	Neptune's necklace	COELENTERATA		
Ulva sp. (2)	Green alga	Actinothoe albocincta (1)	rubble/bedrock	anemone
Rhodomenia sp. (1)	red alga	Culicea rubeola (1)	rubble	box anemone
Caulerpa sediodes (2)	grape weed	Obelia sp. (2)	rubble/rock	hydroid fuzz
		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		
		Atrina zelandica (1)	soft	horse mussel
		Chlamys sp. (1)	rock	queen scallop
		Modiolarca impacta (3)	rubble	Nestling mussel
		Monia zelandica (3)	rock/rubble	window oyster
		Mytilus edulis (1)	rock	blue mussel
		Pecten novaezelandiae (1)	soft	scallop
		POLYCHAETA		
		Brachiomma sp.(2)	sand/rubble	fan worm
		Galeolaria hystrix (2)	sand/rubble	tube worm
		Spirorbis sp. (3)	rubble/rock	
		Serpulid sp. (1)	soft	tube worm
		CRUSTACEA		
		Pagurus spp (2)	sand	hermit crab
		ECHINODERMATA		
		Allostichaster insignis (2)	rubble	starfish
		Coscinasterias calamaris (2)	sand/shell	11 arm star
		Evechinus choroticus (2)	rock/rubble	kina
		Patiriella regularis (2)	sand/rubble	cushion starfish
		Pentagonaster pulchellus (1)	rubble	broach star
BONY FISHES		Stichopus mollis (2)	sand/silt	cucumber
Notolabrus celidotus (3)	Spotty	BRACHIOPODA		
Hemercoetes monopterygius	Opalfish	Magasella sanguinea (1)	shell	lamp shell
Forsterygion flavonigrum (2)	yellow-black trip.	ASCIDEACEA		
Forsterygion lapillum (3)	common trip.	Cnemidocarpa sp. (2)	rubble	saddle squirt
Forsterygion varium (2)	variable trip.	Leptoclinides sp. (2)	rubble	purple ascidian
Parapercis colias (1)	blue cod	Didemnum sp. (2)	rubble	cream ascidian

5.7 Hydroids and Bryozoans

No conspicuous hydroids were observed during the present study. No bryozoans mounds were observed within the study area.

5.8 Tube worm mounds (*Galeolaria hystrix*)

No tubeworm mounds were observed during the present study.

6.0 POTENTIAL IMPACT OF A BIVALVE MARINE FARM

The impact of shell and sediment deposition on the benthos under a mussel marine farm results in a shift from the initial ecological 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; deJong 1994). On a rocky bottom, a decrease in species diversity as a result of shell and sediment deposition would be expected.

Soft bottom substrata and associated communities dominated the area under the proposed marine farm. This relatively uniform silt and clay substratum recorded offshore of 140 m distance from shore supported a low variety of species often in low abundance. Of the range of substratum types in the Marlborough Sounds, mud represents the habitat that would be least altered by a mussel marine farm (Kaspar *et al.* 1985; deJong 1994). The placement of mussel growing structures offshore of 60 m distance should provide sufficient buffer between growing structures and the inshore reef habitats to avoid any adverse impacts from the activity.

7.0 SUGGESTED ADJUSTMENTS TO THE PROPOSED BOUNDARIES

Based on the initial draft plan (presented in the present investigation) it is recommended that the inshore boundary be located no closer than 60 m distance from low water. This adjustment would avoid hard shore substrata. No other adjustments to the proposed boundaries are recommended on ecological grounds.as:

- the offshore proposed area was dominated soft substrata supporting a relatively low variety of species in relatively low abundance;
- the offshore habitats and associated community was representative of the most widespread and common habitat in the Marlborough Sounds and
- no ecological values identified in the Department of Conservation report (DOC 1995) were recorded in offshore areas above trigger levels during the present study.

REFERENCES

- Chadderton, W. L.; Davidson, R. J.; Brown, D. A. in prep: Report on a quantitative investigation of subtidal sites in Pelorus Sound, Marlborough Sounds. Department of Conservation, Nelson/Marlborough Conservancy.
- Dell, R. K. 1951: Some animal communities of the sea bottom from Queen Charlotte Sound. *New Zealand Journal of Marine and Freshwater Research* B 33(1), pp. 19-29.
- Davidson, R. J. 1995: Long Island-Kokomohua Marine Reserve: subtidal biological baseline. Department of Conservation, Occasional publication.
- Davidson, R. J.; Preece, J.; Rich, L.; Brown, D.; Stark, K.; Cash, W.; Waghorn, E.; Rennison, G. 1990: Coastal resource inventory, Nelson/Marlborough Conservancy. Published by Department of Conservation. 416 p.
- Davidson, R. J.; Millar, I. R.; Brown, D. A.; Courtney, S. P.; Deans, N. A.; Clerke, P. R.; Dix, J. C. 1995: Ecologically important marine, freshwater, Island and mainland areas from Cape Soucis to Ure River, Marlborough, New Zealand: recommendations for protection. Department of Conservation report, Nelson/Marlborough Conservancy.
- Davidson, R. J.; Brown, D. A. 1994: Ecological report on the marine reserve options in the D'Urville Island area. Nelson Marlborough Department of Conservation Occasional Publication.
- DeJong, R. J. 1994: The effect of mussel farming on the benthic environment. Master of Science Thesis, University of Auckland. 150 p.
- Department of Conservation 1995: Guideline for ecological investigations of proposed marine farm areas in the Marlborough Sounds. Nelson/Marlborough Conservancy, Occasional publication No. 25, 21 p.
- Duffy, C. A. J.; Davidson, R. J.; Cook, de C. S. in prep: Shallow subtidal habitats of the Marlborough Sounds, New Zealand. Department of Conservation, Nelson/Marlborough Conservancy.
- Estcourt, I. N. 1967: Distribution and associations of benthic invertebrates in a sheltered water soft-bottomed environment (Marlborough Sounds, New Zealand). *New Zealand Journal of Marine and Freshwater Research* 1(5), pp. 352-370.
- Gibbs, M. M. 1991: Nutrient availability and cycling in the water column associated with green-lipped mussel farming in the Marlborough Sounds on a spatial, tidal and seasonal basis. DSIR Report prepared for Department of Conservation, 10 p.
- Gibbs, M.; James, M. R.; Pickmere, S. E.; Woods, P. H.; Shakespeare, B. S.; Hickman, R. W.; Illingworth, J. 1991: Hydrodynamic and water column properties at six stations associated with mussel farming in Pelorus Sound, 1984-85. *New Zealand Journal of Marine and Freshwater Research* 25: 239-254.
- Gowan, A. L. 1985: Effects on the nitrogen cycle and benthic communities in Kenepuru Sound, Marlborough Sounds, New Zealand. *Marine Biology* 85, 127-136
- Kaspar, H. F.; Gillespie, P. A.; Boyer, I. C.; MacKenzie, A. L. 1985: Effects of mussel aquaculture on the nitrogen cycle and benthic communities in Kenepuru Sound, Marlborough Sounds, New Zealand. *Marine Biology*, Vol. 85, 127-136.
- Kaspar, H. F.; Hall, G. H.; Holland, A. J. 1988: Effects of sea cage salmon farming on sediment nitrification and dissimilatory nitrate reductions. *Aquaculture* 70, 333-344.
- McKnight, D. G. 1969: Infaunal benthic communities of the New Zealand continental shelf. *New Zealand Journal of Marine and Freshwater Research* 3(3), pp 409-444.
- McKnight, D. G.; Grange, K. R. 1991: Macrobenthos-sediment-depth relationships in Marlborough Sounds. NZ Oceanographic Institute, prepared for Department of Conservation, No. P 629, 36 p.
- Roberts, R.; Asher, R. 1993: Environmental site characterisation for a proposed salmon farm in Port Ligar, Marlborough Sounds. Cawthron Report No. 224.
- Silvert, W. 1992: Assessing environmental impacts of finfish aquaculture in marine waters. *Aquaculture* 107, 67-79.