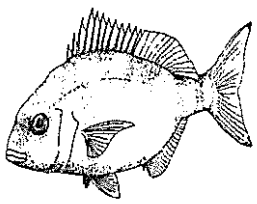
Record: 1107

Davidson Environmental

P. O. Box 958, Nelson,

Ph: (03) 547 1090, Fax: (03) 547 1096, e mail: davidson@xtra.co.nz



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

Biological report on a proposed marine farm extension located in Otatara Bay, Clova Bay, Pelorus Sound

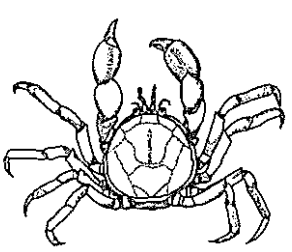
U930693

Research, Survey and Monitoring Report Number 333

A report prepared for:

Marine Farming Association
P.O Box 86
Blenheim

By:
Robert J. Davidson



MARCH, 2000

Bibliographic reference:
Davidson, R. J. 2000. Biological report on a proposed marine farm extension located in Otatara Bay, Clova Bay, Pelorus Sound. Prepared by Davidson Environmental Limited for Marine Farming Association. Survey and Monitoring Report No. 333.

Prepared by:
Davidson Environmental Limited
P. O. Box 958
Nelson
Phone 03 5471090
Fax 03 5471096
e-mail davidson@xtra.co.nz
March, 2000

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 located on the southern shoreline of Otatara Bay, Clova Bay, 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. Six diver sampled transects were investigated from within the proposed marine farm extension area.

4. The land adjacent to the proposed site was dominated by combinations of pasture, early regeneration scrub, pine plantation and higher on the hillside native forest.

5. The intertidal shore was dominated by boulder, cobble and pebble substrata

6. All areas within the offshore application were dominated by soft substrata (ie. silt and clay with a small component of shell material).

7. No cobble material or other hard shore substrata were recorded from within the application area.

8. Scallops and horse mussels were recorded from within the proposed marine farm extension area. These biological features were most common from inshore portions of the proposed extension area.

9. Based on the initial draft plan (presented in the present investigation) it is recommended that 80 m be removed from the eastern side of the proposed extension area. This modification would place the proposed marine farm offshore of the depth zone where scallops were most common. No other modifications 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 U 930693 (12.78 ha) located on the southern shoreline of Otatara Bay, Clova Bay, Pelorus Sound. Potential threats to any subtidal ecological values posed by the proposed activity were also discussed.

2.0 STUDY AREA

Clova Bay is a relatively narrow and small bay located east of the main Pelorus Channel (Figure 1). Clova Bay is some 2.5 km in length and approximately 1 km wide. Depths of up to 27 m exist in the entrance area, but most of the bay is between 14 to 24 m deep (Navy Chart NZ 615). The shoreline of Clova Bay is typical of much of the sheltered Marlborough Sounds being dominated by a narrow rubble or bedrock intertidal zone with a backdrop of steep hillsides often with relatively rounded tops. Water residence times in this area are relatively long and comparable to Hallam Cove, Crail and Beatrix Bays (Gibbs 1991).

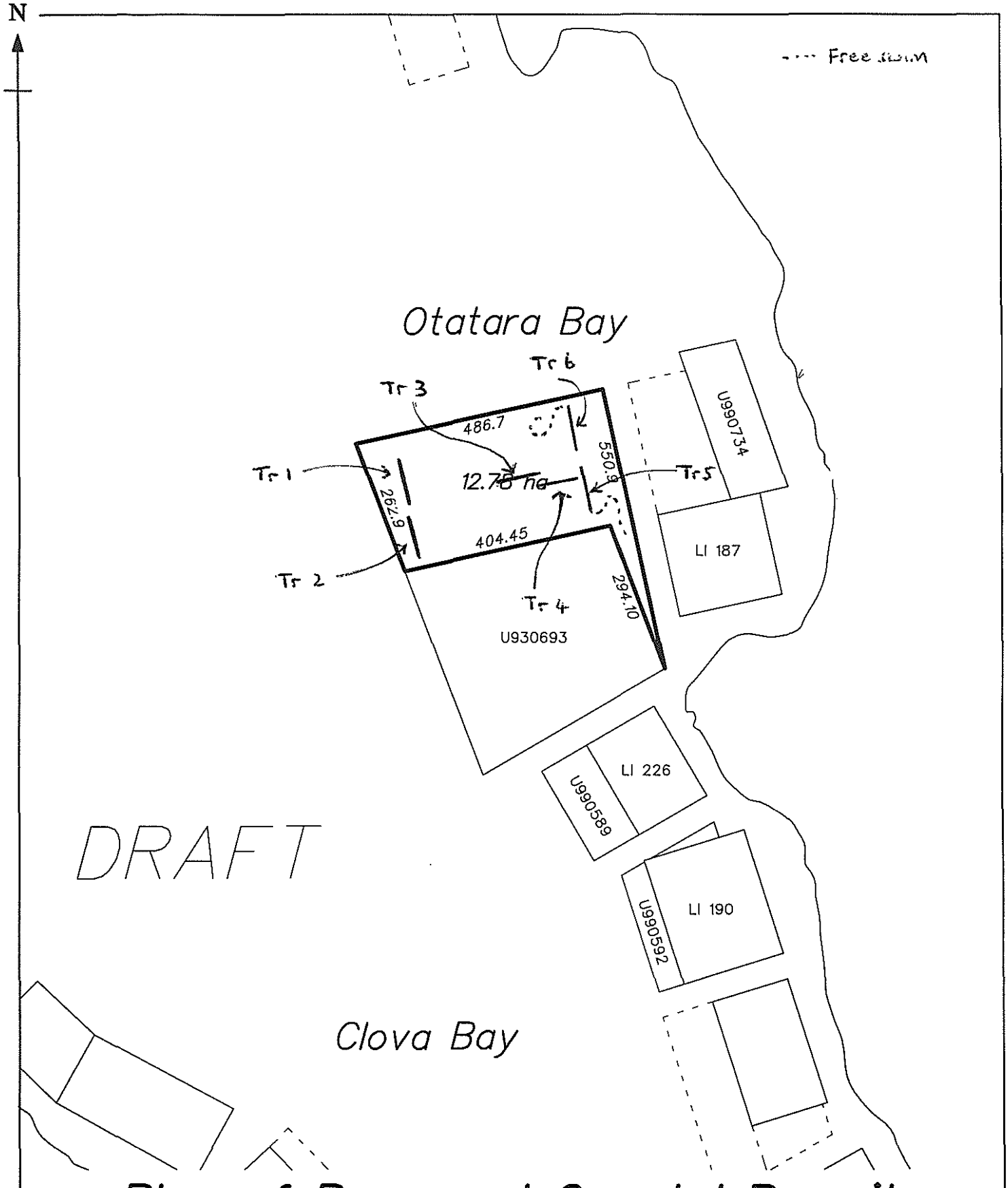
The proposed marine farm area was located in Otatata Bay, which is itself located along the eastern shores of Clova Bay (Figure 1).

The land adjacent to the proposed site was dominated by combinations of pasture, early regeneration scrub, pine plantation and higher on the hillside native forest.

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.



Plan of Proposed Coastal Permit Being Extension to U930693

Marine Farming Association

NOTE: The position of this application has not been surveyed.

MARLBOROUGH DISTRICT COUNCIL

SCALE 1:10,000

200 100 0 100 200 300 400 500 600 700 800 m

Datum: New Zealand Map Grid

Prepared by; DRAUGHTING *Plus*

Date 07/03/00

MF_1155.gcd

4.0 MATERIALS AND METHODS

The area was investigated on 10th March 2000. Six transects were established within the offshore application area perpendicular and parallel to the existing backbone structures (Figure 1). Transects have not been plotted in the present report as the substratum and species present remained relatively consistent over their length. Transects consisted of a lead-line marked at 5 m intervals. Depth soundings were conducted using a Furuno scrolling colour sounder, while distances from shore were determined using a Furuno radar.

Densities of horse mussel (*Atrina zelandica*) and scallop (*Pecten novaezelandiae)* were collected from 10 x 1 m^2 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 10.00 a.m. to 1.00 p.m. These observations were collected during the incoming tide.

5.0 RESULTS AND DISCUSSION

5.1 Water currents, free swim and diver observations

Observations from within the proposed farm area suggested that:

1) depths increased gradually in an offshore direction (ie. 21 m to 32 m);
2) substrata was dominated by silt and clay with a component of shell that increased towards the onshore boundary of the proposed marine farm area;
3) cobble and pebble sized substrata were not recorded within the proposed marine farm area;
4) no reef structures were recorded within the proposed farm area;
5) horse mussels and scallops were recorded from within the proposed marine farm area;
6) brachiopods were also recorded from the proposed marine farm area.

A very light southward 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 Transects

The offshore application area was characterised by silt and clay substratum with occasional clumps of mussel debris close to the existing backbone structures. In areas located within the inshore 80 m of the extension area the substratum was characterised by an increasing component of shell compared to offshore areas where shell material was relatively rare.

From the transect and free swims a total of 20 conspicuous surface dwelling species of invertebrate, 1 ascidian and 5 species of fish were observed. A list of species present are displayed in Table 1. The shore profiles have not been plotted as depths and substrata remained relatively consistent over their length.

5.3 Fish

Five species of bony fish were recorded during the investigation. The number and composition of fish species were representative of offshore mud habitats and areas where occasional horse mussel shells exist in the sheltered Marlborough Sounds. No fish feeding holes in the substratum were observed during the present study.

5.4 Scallops (*Pecten novaezelandiae*)

Scallop counts were conducted from along the length of all transects (Table 2). Scallops were relatively uncommon from offshore areas, but were common from the inshore 80 m of the proposed extension area, particularly in the south-east areas close to the existing marine farm structures.

Table 2 Scallop data collected from 10 m2 quadrats collected from along transects located within the proposed marine farm area.

Transect	1	2	3	4	5	6	7	Mean density per m^{-2}
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	0	0	0	2	0	0	0	0.03
4	0	0	1	0	1	1	0	0.04
5	1	0	1	2	3	0	0	0.1
6	2	1	3	3	3	4	4	0.29

Table 1 Species observed from an area in Clova Bay, Pelorus Sound.				
Algae	**Common name**	**Invertebrates**	**Habitat**	**Common name**
Corallina spp.(1)	paint	SPONGIA		
Rhodomenia sp (1)	red algae	*Crella incrustans (1)*	rubble	encrusting sponge
		GASTROPODA		
		Maoricolpus roseus (1)	sand/shell	spire shell
		Alcithoe fucus (1)	soft	volute
		Amalda novaezelandiae (1)	soft	olive shell
		Struthiolaria vernis (1)	soft	ostrich foot
		Trochus viridus (1)	rubble	
		BIVALVIA		
		Atrina zelandica (1)	soft	horse mussel
		Modilarca impacta (1)	rubble	nestling mussel
		Mytilus edulis (1)	rock	blue mussel
		Pecten novaezelandiae (2)	soft	scallop
		Perna canaliculus (1)	rock	green mussel
		POLYCHAETA		
		Brachiomma sp.(2)	sand/rubble	fan worm
		Maldanidae (1)	soft	tube worm
		Spirorbis sp. (2)	rubble/rock	
		CRUSTACEA		
		Pagurus spp (2)	sand	hermit crab
		ECHINODERMATA		
		Coscinasterias calamaris (2)	sand/shell	11 arm star
		Evechinus choroticus (2)	rock/rubble	kina
BONY FISHES		*Patiriella regularis (2)*	sand/rubble	cushion starfish
Notolabrus celidotus (3)	spotty	*Stichopus mollis (2)*	sand/silt	cucumber
Hemercoetes monopterygius (2)	opalfish	BRACHIOPODA		
Forsterygion lapillum (3)	common trip.	*Magasella sanguinea (1)*	shell	lamp shell
Forsterygion varium (2)	variable trip.	ASCIDEACEA		
Parapercis colias (1)	blue cod	*Cnemidocarpa* sp. (2)	rubble	saddle squirt
1 = occasional, 2 = common, 3 = abundant				

Densities from the inshore 80 m were: mean = 0.195 individuals per m^{-2}, SE = 0.04. This density is above the Department of Conservation trigger level (i.e. trigger level = 0.1 individuals per m^{-2}). Densities from the offshore part of the proposed extension area were: mean = 0.017 individuals per m^{-2}, SE = 0.02. . This density is below the Department of Conservation trigger level (i.e. trigger level = 0.1 individuals per m^{-2}).

5.5 Horse mussels (*Atrina zelandica*)

An occasional horse mussel was observed within the application area. At no stage were horse mussels observed in densities that could be considered a bed (i.e > 0.2 individuals per m^{-2}).

5.6 Lampshells

An occasional lampshell (*Magasella sanguinea*) was observed within the inshore 80 m of the proposed extension area.

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 almost all of the area under the proposed marine farm. This relatively uniform silt and clay substratum recorded from the offshore application area 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 inshore or eastern 80 m of the application are supported a bed of scallops that may be adversely impacted by the establishment of mussel farming activities overhead.

7.0 SUGGESTED ADJUSTMENTS TO THE PROPOSED BOUNDARIES

Based on the initial draft plan (presented in the present investigation) it is recommended that 80 m be removed from the eastern side of the proposed extension area. This modification would place the proposed marine farm offshore of the depth zone where scallops were most common. No other modifications are recommended on ecological grounds as:

- the proposed offshore area was dominated soft substrata supporting a relatively low variety of species in relatively low abundance;
- the offshore habitat and community present is 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.