

Survey and Monitoring Report No. 8

*Description of the macrobenthic
community from a proposed mussel spat
catching area in Wet Inlet,
Marlborough Sounds*

by
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1.0 INTRODUCTION

This report presents a biological description of the macrobenthic communities from a proposed 4.5 ha mussel spat catching area in the head of Wet Inlet (Fig. 1). Wet Inlet is a small bay located in south-western Crail Bay, Pelorus Sound, Marlborough Sounds.

Wet Inlet is orientated in a more or less north-south direction and is approximately 1.8 km in length from the head of the bay to the point where it becomes Crail Bay proper. The inlet is approximately 900 m wide at the mouth and narrows to approximately 400 m at the head. Wet Inlet is relatively shallow, reaching depths not much greater than 11 m near the mouth and grading into intertidal flats at the head of the bay where a small stream drains the Bobs Knob catchment. Water residence times in the Crail Bay complex are relatively long and have been reported to be almost stagnant in deeper waters (Gibbs et al., 1991). Water residence in Wet Inlet by nature of its location is probably longer than those reported for Crail Bay.

The study site is located along the south-western shore at the head of Wet Inlet (Fig. 1). The inner boundary of the proposed mussel spat catching farm is located between 50 to 80 metres from the shore. The proposed spat catching farm stretches approximately 300 m in length on both the inside and outside boundaries. The proposed spat catching farm is 150 m wide along its entire length (Fig. 1). Depths on the inside boundary range between 3.3 to 4.8 m, while depths on the outside boundary range between 8.3 to 11 m. The proposed activity is green-lipped mussel (*Perna canaliculus*) spat catching. 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 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.

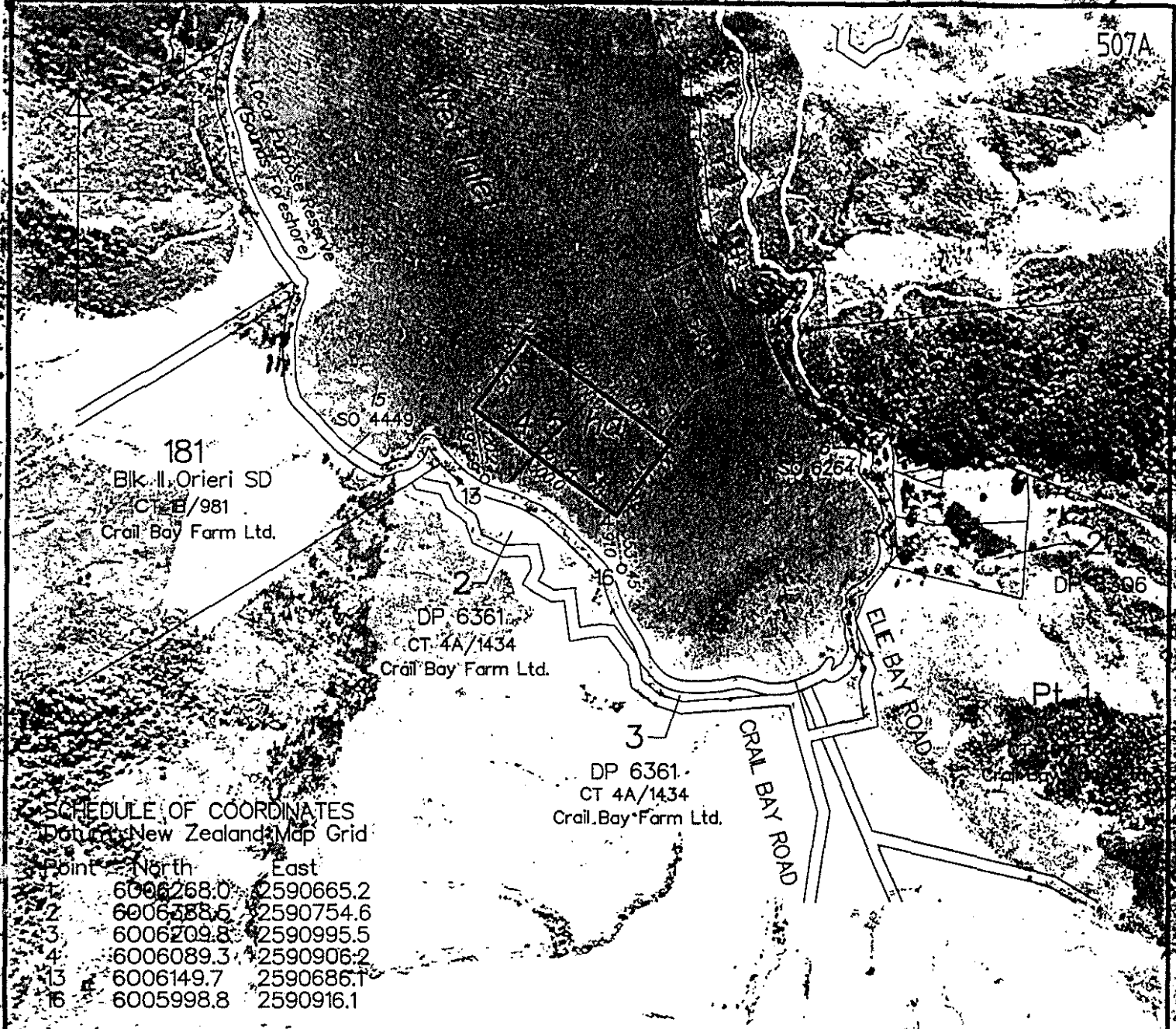
Multiple use (marine farming, fishing, boating, housing, waste water disposal, port development, forestry, agriculture) have the potential to degrade the environment of the Sounds. Marine farming for example, can have considerable impact on the environment through habitat modification or lowering water 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 be threatened by the establishment of the proposed spat catching activity.

2.0 MATERIALS AND METHODS

The proposed site was qualitatively investigated on the 22nd July 1994, using two rapid subtidal survey techniques. An area of the inshore boundary and randomly selected parts of the proposed spat catching area and adjacent coast between 1.5 to 9 metres depth were investigated using a wide-ranging survey technique utilizing an Apollo scooter. Results from this preliminary investigation were recorded on waterproof paper. Based on these findings a representative area was selected and a 150 m 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 during the scooter run.

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 200 m from the low tide mark and at a depth of 11 metres. The abundance of macroinvertebrates, macroalgae and fish were estimated on a scale of 1 = uncommon, 2 = occasional, and 3 = common.



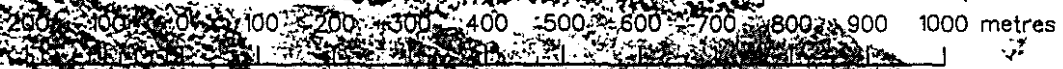
SCHEDULE OF COORDINATES
 Dot Grid - New Zealand Map Grid

Point	North	East
1	6006268.0	2590665.2
2	6006388.5	2590754.6
3	6006209.8	2590995.5
4	6006089.3	2590906.2
13	6006149.7	2590686.1
16	6005998.8	2590916.1

Plan of Proposed Marine Farming Licence N.Z. Marine Farming Assoc.

Survey marks adopted from SO 28. Bearing variation, Geodetic Datum, 1949 to NZMG, +31'30"

SCALE 1:10,000



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Prep. By: N.Z. Marine Farming Assoc.	Date: 22.8.94	Job No: 726569	File: 6475/01/02	Reference: P27/5.1
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3.0 RESULTS AND DISCUSSION

3.1 Scooter Run

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

- 1) no bedrock or rubble habitat extended more than approximately 15-20 m distance from the low water mark and in most areas rock habitat extended approximately < 15 m from the low tide mark;
- 2) the changes in substrata and associated communities in the proposed farm and adjacent shores showed similar trends in depth/distribution down the shore for the entire length of the inshore farm boundary;
- 3) a horse mussel bed was located in depths greater than 9 metres depth; and
- 4) few fish species were recorded and most were present in relatively low densities.

3.2 Profile

The intertidal shore adjacent to the proposed spat catching area was dominated by a low gradient rubble/cobble bank bordered by a steep bank/small clay cliffs and on a higher level, a road. The subtidal shore was initially an extension of the intertidal shore but finished abruptly approximately 15 m distance from shore at a depth of 1.5 m. Further from shore the benthos was dominated by soft sediments which graded from fine sands through to silts and clays further from shore (Fig. 2). At a distance of 160 m from shore and at a depth of 9 to 11 metres a horse mussel bed was recorded.

From the transect and scooter run a total of 14 species of invertebrate, 4 algae, 2 ascidians and 4 species of bony fish were recorded. A species list is presented in Table 1 and the shore profile is plotted in Figure 2.

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

Relatively few species of fish were recorded from the transect, with spotty (*Notolabrus celidotus*) being numerically the most abundant. No blue cod (*Parapercis colias*) were recorded, however, a number of adult leatherjacket (*Parika scaber*) were recorded from the horse mussel bed where they were observed resting amongst mussel shells.

Magasella sanguinea, the most widespread brachiopod recorded from shallow subtidal areas in the Marlborough Sounds (McKnight and Grange, 1991; Duffy et al., in prep; Chadderton and Davidson, in prep) was not recorded from the study area. No other species of brachiopod were recorded from the study site.

3.3 Horse Mussels

Horse mussel (*Atrina zelandica*) distribution and density has declined in New Zealand and in the Marlborough Sounds due to human activities such as dredging (Poiner and Kennedy 1984, Hay 1990, Jones 1992). Despite this, large areas in the Sounds where relatively dense beds of horse mussels occur can still be found (Hay, 1990). Relatively few horse mussels were recorded from 0 to 160 metres along the transect line. From 160 m from shore to approximately 200 m from shore and for an unknown distance further, a dense bed of horse mussels were recorded. The density of horse mussels observed in this area constituted a horse mussel bed as densities were estimated at up to 16 per m². It was not established what proportion of these mussels were alive and what proportion were old shells which were dead but still intact.

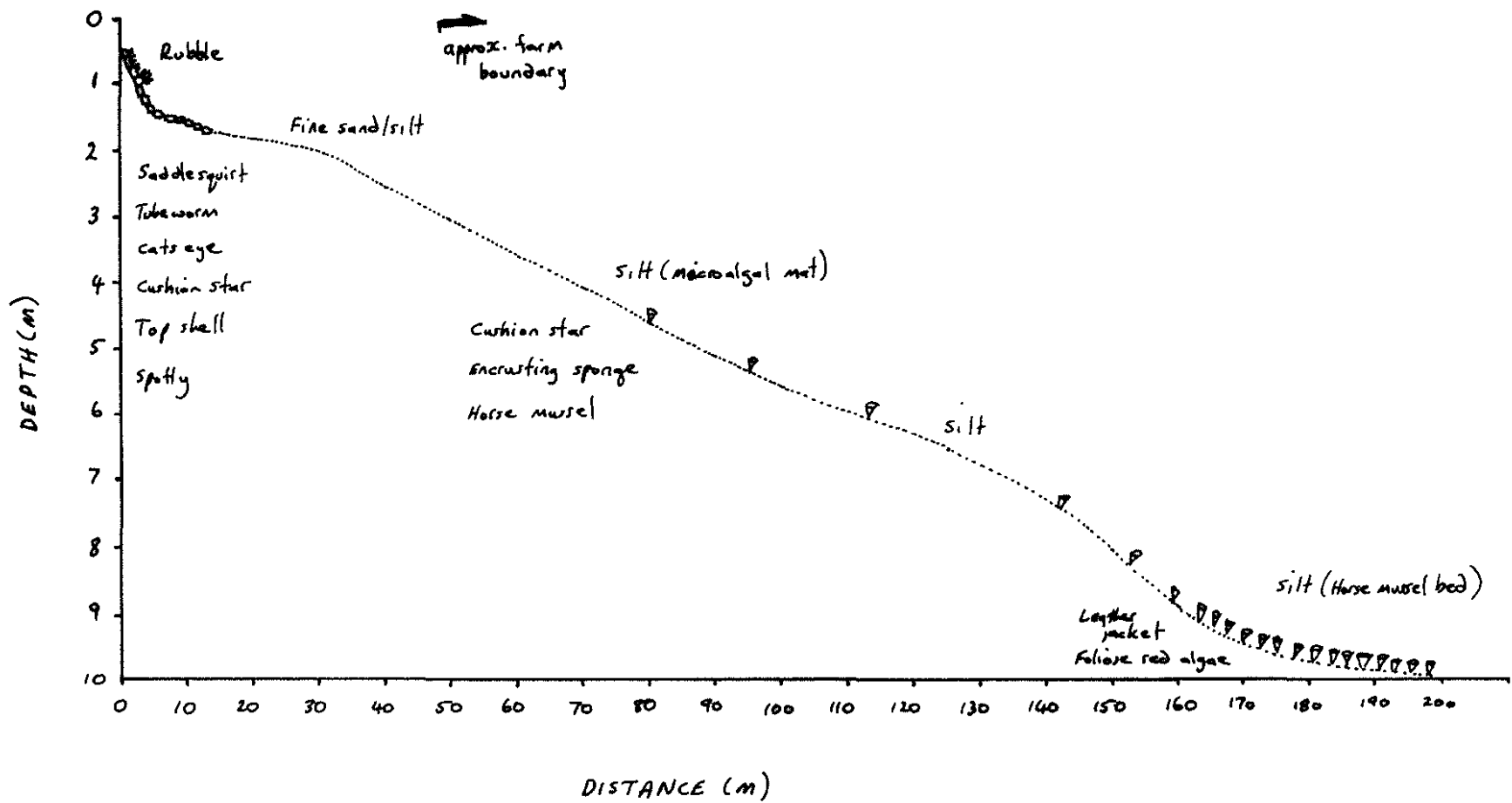


Figure 2. Shore profile and conspicuous species from transect in Wet Inlet.

4.0 DISCUSSION OF POTENTIAL IMPACTS OF MUSSEL SPAT CATCHING

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). Little is known, however, about the impact of mussel spat catching on benthic rocky or soft bottom communities in New Zealand. It is probable, however, that mussel spat collection would not result in an appreciable level of shell debris deposited on the benthos.

Over most of the proposed marine farm site there was little opportunity for mussels to naturally establish (ie. soft sediments), however, small clumps of adult green-lipped mussels were observed growing in occasional clumps on soft sediments. These mussels may have originated from mussel buoys or backbone lines which were located over this site. The substrata around the edges and immediately adjacent to the proposed site were dominated by substrata which may provide suitable attachment to mussels, but it is unlikely that a spat catching activity would result in an increased level of settlement unless spat were allowed to grow to sexual maturity prior to their relocation.

Studies on the impacts of dredging on marine environments has suggested that benthic communities can be either destroyed or modified into a different state of community structure (de Groot 1984; Poiner and Kennedy, 1984; Jones, 1992). The establishment of marine farms effectively precludes this activity from the area directly beneath the farm. This advantage to the benthic community is outweighed under many types of marine farms as the benthos is modified by material falling from the farm (Kaspar et al., 1985). In the case of a spat catching marine farm, the impact on the benthos may be minimal (depending on management practices) and therefore the advantage of dredge cessation could potentially be realized. This could be an advantage to communities which are sensitive to dredging as the farm may provide some level of protection.

5.0 MONITORING

Virtually no information on the impact of mussel spat catching farms on the environment of New Zealand has been documented. It is therefore important that approval for this activity in the marine environment be seen as an opportunity to document potential impacts. It is strongly suggested that a monitoring programme be part of any approval granted and that the appropriate regulatory authority also encourage research from appropriate educational or science institutions on some of the more complex issues raised by this type of activity.

It is suggested that a quantitative monitoring programme be centred on the horse mussel bed located in the proposed spat catching area. It is suggested that a baseline study be established and be repeated at an appropriate interval to assess that impact of mussel spat catching on a horse mussel bed. The collection of a thorough quantitative baseline including species associated with the horse mussel bed be collected.

6.0 CONCLUSION

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

All of the hard shore and most of the soft shore benthic 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; Davidson and Davidson, 1994a; 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, however, the horse mussel bed recorded from within the proposed spat catching area, represents a community which has been considerably reduced due to human activities. Overall, a relatively low diversity of species were recorded from this site. This was primarily due to the narrow depth range of rock substratum and the shallow nature of the site.

Potentially, a mussel spat catching farm may protect benthic communities directly below and immediately adjacent to the farm from impacts such as dredging, provided, however, the impact of such a farm did not itself threaten the benthic communities themselves. The practice of cutting free the plastic mesh bags which weigh down spat catching lines results in two environmental impacts. Firstly it introduces long-lasting plastic pollution into the environment and secondly, the bags and small cobbles act to smother benthic communities such as horse mussels directly below back-bone lines (author, pers. obs.). The impacts of green-lipped spat catching should therefore be the focus of a rigorous study on the impacts on the environment. Until this is forthcoming it is suggested that the horse mussel bed be the focus of a monitoring study to ensure the bed is not adversely affected by the establishment of a spat catching activity. Depending on farm management practices, it may be possible, however, that spat catching sites have relatively little impact on benthic communities in New Zealand.

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.
- Chadderton, W. L.; Davidson, R. J. in prep:** Patterns of shallow subtidal communities from Pelorus Sound, Marlborough Sounds.
- Dell, R. K. 1951:** Some animal communities of the sea bottom from Queen Charlotte Sound. *New Zealand Journal of Marine and Freshwater Research* B33(1), pp 19-29.
- Davidson, R. J. 1992:** A report on the intertidal and shallow subtidal ecology of Abel Tasman National Park coast. Department of Conservation, *Nelson/Marlborough Conservancy Occasional Publication*.
- Davidson, R. J. 1994:** A report on the ecology of Long Island-Kokomohua Marine Reserve: a biological baseline. Department of Conservation.
- 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. 416p.
- Davidson, R. J.; Millar, I. R.; Brown, D. A.; Courtney, S. P.; Deans, N. A.; Clerke, P. R.; Dix, J. C. in prep:** 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.; Davidson, J. M. 1994:** Description of the macrobenthic community from a proposed mussel spat catching area in the bay south of Te Puraka Point, Marlborough Sounds. A report prepared for the New Zealand Marine Farms Association, 9p.
- Davidson, R. J.; Davidson, J. M. 1994a:** Description of the macrobenthic community from a proposed mussel spat catching area in northern Fitzroy Bay, Marlborough Sounds. A report prepared for New Zealand Marine Farms Association. 10p.
- Duffy, C. A. J.; Davidson, R. J.; Cook, deC. 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, 10p.
- Gibbs, M. 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.
- Grange, K. R.; Singleton, R. J. 1993: An analysis of marine benthic data from Long Island-Kokomohua Marine Reserve and control areas. New Zealand Oceanographic Institute, prepared for Department of Conservation, No. 43, 15 p.
- Gowan, R. J.; Bradbury, N. B. 1987: The ecological impact of salmonid farming in coastal waters: a review. *Oceanography and Marine Biology Annual Review*. 25, 563-575.
- Gowan, R. J.; Rosenthal, H.; Makin, T.; Ezzi, I. 1990: Environmental impact of aquaculture activities. Aquaculture Europe '89 - Business Joins Science, Special Publication No. 12, 258-283.
- Hay, C. H. 1990: The ecological importance of the horse mussel *Atrina zelandica* with special reference to the Marlborough Sounds. Department of Conservation Report.
- Kasper, H. F.; Gillespie, P. A.; Boyer, I. C.; MacKenzie, A. L. 1985: Effects on the nitrogen cycle and benthic communities in Kenepuru Sound, Marlborough Sounds, New Zealand. *Marine Biology* 85, 127-136
- Kasper, 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.
- Jones, J. B. 1992: Environmental impact of trawling on the seabed: a review. *New Zealand Journal of Marine and Freshwater Research* 26, 59-67.
- 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. P629, 36 p.
- Roberts, R.; Asher, R. 1993: Environmental site characterisation for a proposed salmon farm in Port Ligar, Marlborough Sounds. Cawthron Report No. 224.
- Poiner, I. R.; Kennedy, R. 1984: Complex patterns of change in the macrobenthos of a large sandbank following dredging. *Marine biology* 78, 335-352.
- Silvert, W. 1992: Assessing environmental impacts of finfish aquaculture in marine waters. *Aquaculture* 107, 67-79.