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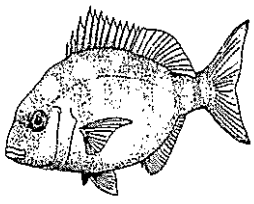

Specialists in:
Marine, and Freshwater Research, Survey and Monitoring

Biological report on a site proposed as a marine farm located in eastern Melville Cove, Port Gore

C18-475 (U951162)

Research, Survey and Monitoring Report Number 393

A report prepared for:

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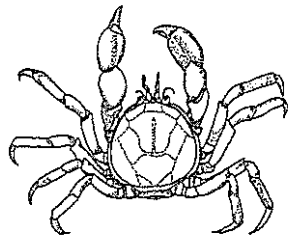

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SUMMARY

1. The aims of the study were to provide a biological description of the benthos within a proposed marine farm located in eastern Melville Cove, Port Gore. In particular, a request by the Ministry of Fisheries for more information were addressed as part of the present study.

2. Potential threats to any subtidal ecological values posed by the proposed activity have also been discussed.

3. The soft shore communities recorded from the present study were dominated by species that occur on subtidal shores swept by light tidal currents in the sheltered outer 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 and Davidson in press).

4. The initial plan approved at the Marlborough District Council hearing was based on an inshore boundary located approximately 50 m to 120 m distance from shore. This distance varied due to the orientation of the coastline relative to the farm boundary. The Ministry of Fisheries draft evaluation report recommended that the inshore 50 m of the marine farm be removed from consideration for a Fisheries Permit. The present report describes habitats in relation to the proposed marine farm boundary and makes recommendations based on the Ministry of Fisheries aim of avoiding fisheries habitats and also establishing a 20 m buffer between values and the mussel farm.

5. The proposed marine farm area and inshore areas were remotely investigated using a Furuno colour scrolling depth sounder. Positions of the proposed marine farm and the transects were established using a GPS chart plotter linked to a PC based chart plotting programme. The width of the shoreline from mean high water to mean low water was measured using a tape. The location of these tidal heights were established using biological key indicator species. There is some error associated with this biological estimation, but it is considered relatively small compared to using tidal tables.

6. Divers investigated three transects established within the proposed marine farm boundaries. A free diver swim was also established along the inshore boundary of much of the proposed marine farm area.

7. Due to the presence of existing marine farm structures, the offshore portions of each shore transect were investigated by a compass directed free swim. These free swims were conducted offshore of the shore slope. In these offshore areas species and habitats traditionally change little at depths > 30 m.

8. Hillsides around the bay were dominated by pasture with small fringe areas of early regeneration scrub.

9. The intertidal shore was dominated by small boulder, cobble and pebble substratum. On average, the shore was approximately 6 m to 8 m wide.

10. Depths along the initially proposed inshore boundary were approximately 17 m in the north, 28 m in center and 27 m in the south. Depths along the offshore boundaries were 31 m in the north and 35 m in the south. Depths along the Ministry of Fisheries recommendation line were 31 m in the north and 32 m in the south.

11. Areas within the original application area included cobbles, shell over a slit base and silt and clay. It is recommended that the inshore boundaries be adjusted to avoid cobble habitats. It is recommended that the inshore boundary be located at a minimum of 83 m from low water at transect 1, 120 m from low water at transect 2 and 125 m distance from low water at transect 3. These distances establish a minimum buffer zone between cobble and the farm boundary of 20 m.

12. The distance between cobble substrata and the modified inshore boundary would be 20 m at transect 1, 60 m at transect 2 and 20 m at transect 3.

13. Areas within the modified application area are now dominated by soft substrata (i.e. silt and clay substrata or further from shore silt and clay with mussel shell debris).

14. No red algae beds were recorded from within the application area.

15. No fish feeding holes in the substratum were observed during the present study.

16. Scallops were observed during the present investigation, but they were recorded in relatively low abundance.

17. A horse mussel bed was recorded from transect 2. The distance between the outer edge of the horse mussel bed and the inshore boundary of the farm was 30 m distance.

18. The common brachiopod *Magasella sanguinea* was recorded by divers during the present investigation, but not in high densities.

1.0 INTRODUCTION

The aims of the study were to provide a biological description of the benthos within a proposed marine farm located in eastern Melville Cove, Port Gore. In particular information requested by the Ministry of Fisheries were provided as part of the present study. Potential threats to any subtidal ecological values posed by the proposed activity have also been discussed.

2.0 STUDY AREA

Port Gore is a large blind bay located in the outer Marlborough Sounds. The entrance to Port Gore between Cape Jackson and Cape Lambert is some 6.5 km distance and the Port is some 9.5 km in length. Depths vary considerably depending on location within the Port. A large area in the outer reaches range between 15 m to 25 m depth, while the inner Port, including Melville Cove, is considerably deeper ranging between 31 m to 40 m depth (see Navy Chart NZ 615). The shoreline of Port Gore is exhibits a variety of intertidal and subtidal shore types subject to a variety of environmental conditions from very exposed bedrock through to sheltered cobble and gravel beaches. Water residence times in this area are probably considerably shorter shorted than those recorded for the sheltered waters of Pelorus Sound (see Gibbs 1991).

The proposed marine farm area was located along the eastern shoreline of Melville Cove (Figure 1 and 2). Hillsides around the bay were dominated by pasture with isolated fringes of early regeneration scrub. The intertidal shore was dominated by boulder and cobble substrata. On average, the shore was approximately 6 m to 8 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.

4.0 MATERIALS AND METHODS

The initial plan approved at the Marlborough District Council hearing was based on an inshore boundary located approximately 50 m to 120 m distance from shore. This distance varied due to the orientation of the coastline relative to the farm boundary. The Ministry of Fisheries draft evaluation report recommended that the inshore 50 m of the marine farm be removed from consideration for a Fisheries Permit. The present report describes habitats in relation to the proposed marine farm boundary and makes recommendations based on the Ministry of Fisheries aim of avoiding fisheries habitats and providing a 20 m buffer.

The area was investigated on the 14th August 2001. The proposed marine farm area and inshore areas were remotely investigated using a Furuno colour scrolling depth sounder. Positions of the proposed marine farm and the transects were established using a GPS chart plotter linked to a PC based chart plotting programme. The width of the shoreline from mean high water to mean low water was measured using a tape. The location of these tidal heights were established using biological key indicator species. There is some error associated with this biological estimation, but it is considered relatively small compared to using tidal tables.

Divers investigated three transects established within the proposed marine farm boundaries (Figure 2). A free diver swim was also established along the inshore boundary of much of the proposed marine farm area (Figure 1). Due to the presence of existing marine farm structures the offshore portions of each transect were investigated by a free swimming using a compass. The free swims were conducted offshore of the shore slope where species and habitats changes little. Each transect consisted of a lead-line marked at 5 m intervals and was deployed from the survey vessel perpendicular from the mean low water mark extending to the offshore extent of the proposed marine farm area (Figure 2).

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. Percentage cover estimates of any red algae beds and brachiopod (*Magasella sanguinea*) abundance estimates were collected from areas along the shore transects. The presence of any fish feeding holes in the substratum were recorded by divers.

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 12.00 midday to 3.00 p.m on the incoming tide.

5.0 RESULTS AND DISCUSSION

5.1 Water currents and diver observations

Observations from within the proposed farm area suggested that:

1 : 15,380 - MZ6151S2 : Port Gore

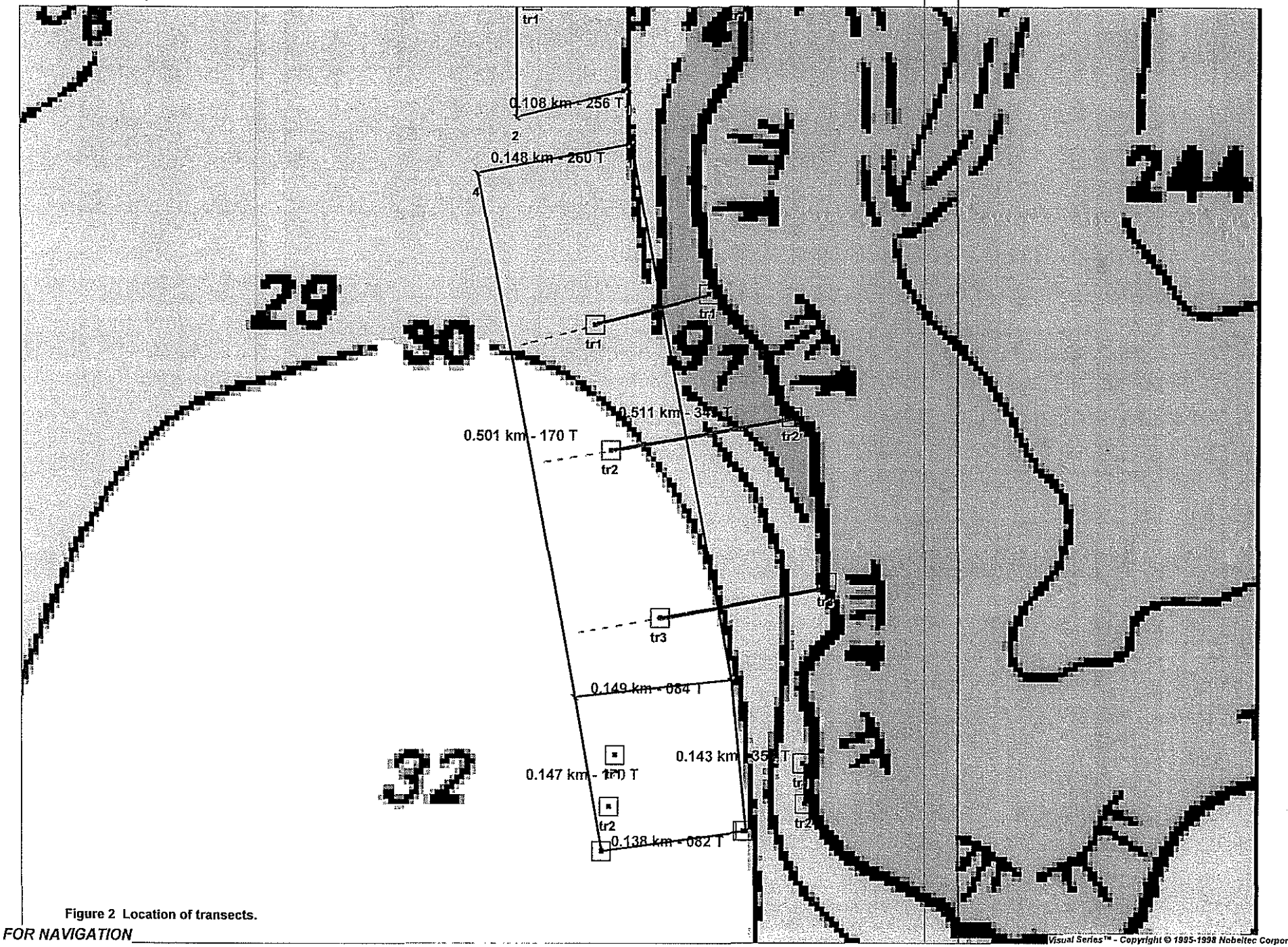

Figure 2 Location of transects.

DO NOT USE FOR NAVIGATION

1) Depths along the initially proposed inshore boundary were approximately 17 m in the north, 28 m in center and 27 m in the south.

2) Depths along the offshore boundaries were 31 m in the north and 35 m in the south.

3) Depths along the Ministry of Fisheries recommendation line were 31 m in the north and 32 m in the south.

4) All areas within the modified application area were dominated by soft substrata (i.e. a silt and clay benthos with a very small proportion of shell material).

5) No cobble or pebble substrata were recorded within the modified marine farm area;

6) No reef structures were observed within the modified proposed farm area;

7) Scallops were uncommon;

8) Brachiopods were recorded but were not common;

9) No fish feeding holes were observed;

10) A zone of horse mussels were observed inshore in the central area of the application; and

11) No red algae beds were recorded from transects.

A light northward along shore tidal current was observed on the benthos during the present study. Based on the species observed from the site, it is expected that light tidal currents regularly occur at the site.

5.2 Transects

The subtidal habitats recorded from transects were comparable, but the distance where habitats started and stopped varied (Figures 3, 4 and 5). The shallow subtidal was initially dominated of small boulder, cobble and pebble substrata. With increasing depth, the proportion of hard shore substrata declined and was replaced by dead whole shell and broken shell material over a base of fine sand and silt substrata. Cobbles ended at a variety of distances from mean low water. These were:

- Transect 1 = 63 m from MLW;
- Transect 2 = 60 m from MLW. and
- Transect 3 = 105 m from MLW.

The shell and fine sand-silt zone was only recorded from transect 2. Its location was:

- Transect 2 = 60 m to 80 m from MLW.

The location of the shell and silt base zone was recorded from transects 1 and 2. Its location was:

- Transect 1 = 63 m to 80 m from MLW; and
- Transect 2 = 80 m to 100 m from MLW.

Beyond the dead whole and broken shell over a base of silt zone the benthos was dominated by silt and clay. This habitat extended to the offshore extent of transects. A component of mussel shell debris over the silt and clay base was recorded from offshore areas of all transects (Figure 3, 4 and 5).

From the transect a total of 30 conspicuous surface dwelling species of invertebrate, one ascidean, three algae and nine species of bony fish were recorded during the present investigation. A list of species present within the boundaries of the proposed marine farm has been displayed in Table 1.

5.3 Fish

Nine species of bony fish were recorded during the investigation (Table 1). The number and composition of fish species were representative of sheltered cobble and soft bottom habitats of the Marlborough Sounds. No fish feeding holes in the substratum were observed during the present study.

5.4 Scallops (*Pecten novaezelandiae*)

The density of scallops was collected from a total of 29 10 x 1 m^2 quadrats installed on soft bottom substrata at transects (Table 2). No scallops were recorded from quadrats collected from inshore or within the proposed marine farm (Table 2). The Department of Conservation trigger level is >0.1 individuals per m^{-2}.

Table 2: Density of scallops collected from quadrats.

Number from 10m^2 quadrats	N	Mean density (per m^2)	Standard error
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	29	0.0	0.0

5.5 Horse mussels (*Atrina zelandica*)

The density of horse mussels was collected from a total of 29 10 x 1 m^2 quadrats installed on soft bottom substrata from transects (Table 3). The overall density of horse mussels recorded from quadrats was 0.038 individuals per m^2 (Table 3). This was below the Department of Conservation trigger level (i.e. > 0.2 individuals per m^{-2}). A zone of horse mussels was recorded from inshore areas at transect 2 from 60 m to 90 m distance from shore (Figure 4). The density of horse mussels from within the bed was 0.2 individuals per m^2 (Table 3).

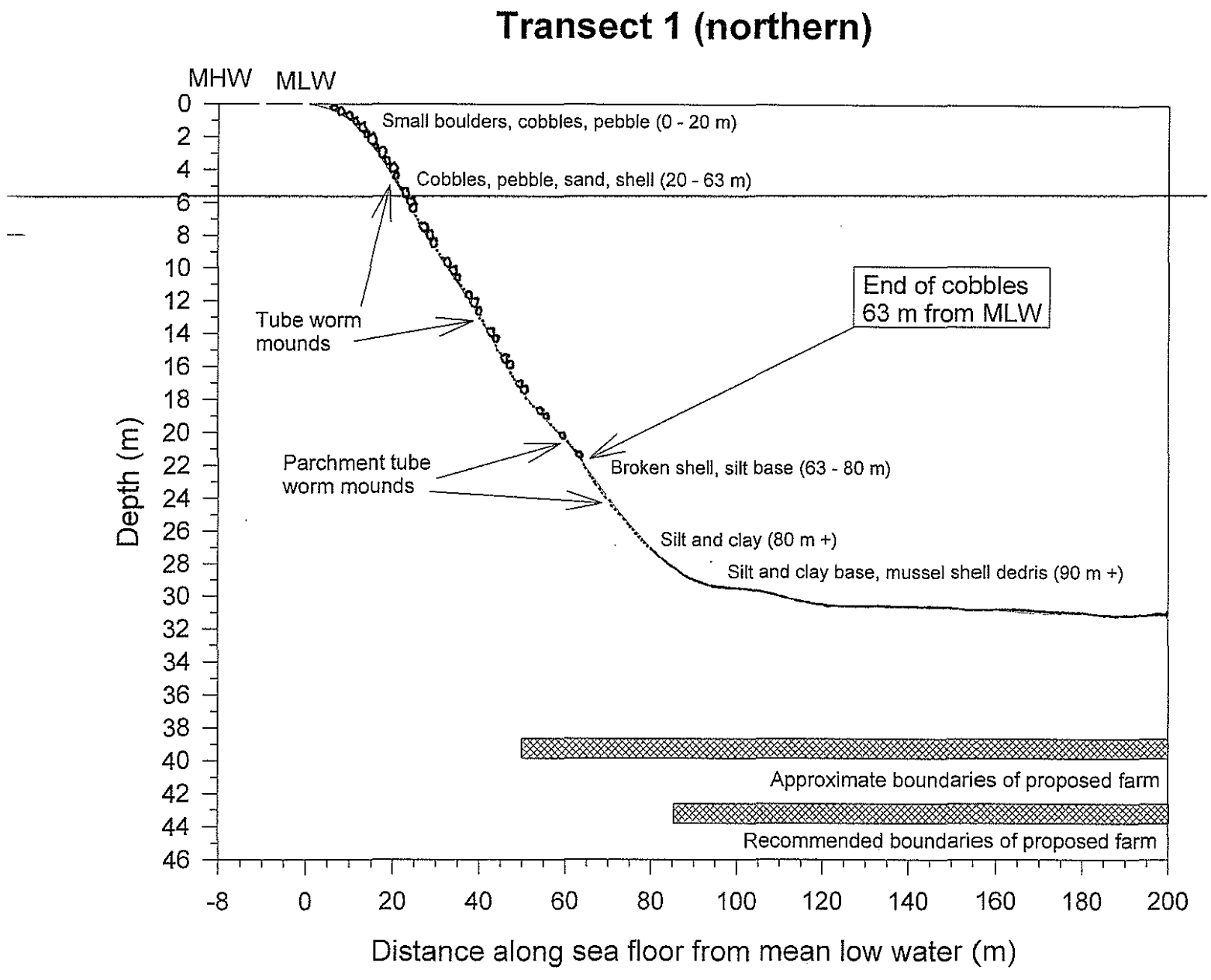

Figure 3 Subtidal shore profile and substratum from an area proposed as a marine farm in eastern Melville Cove, Port Gore.

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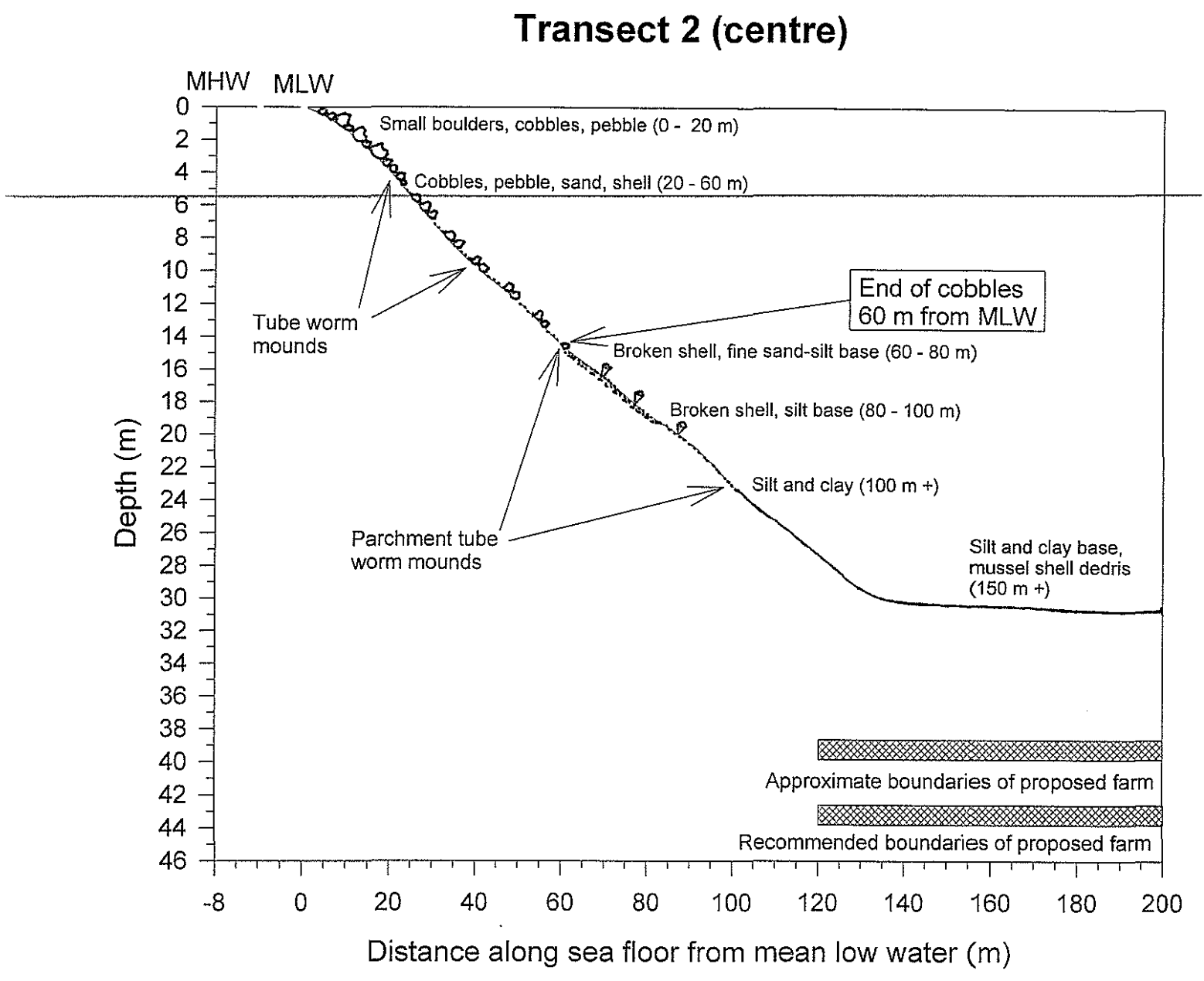

Figure 4 Subtidal shore profile and substratum from an area proposed as a marine farm in eastern Melville Cove, Port Gore.

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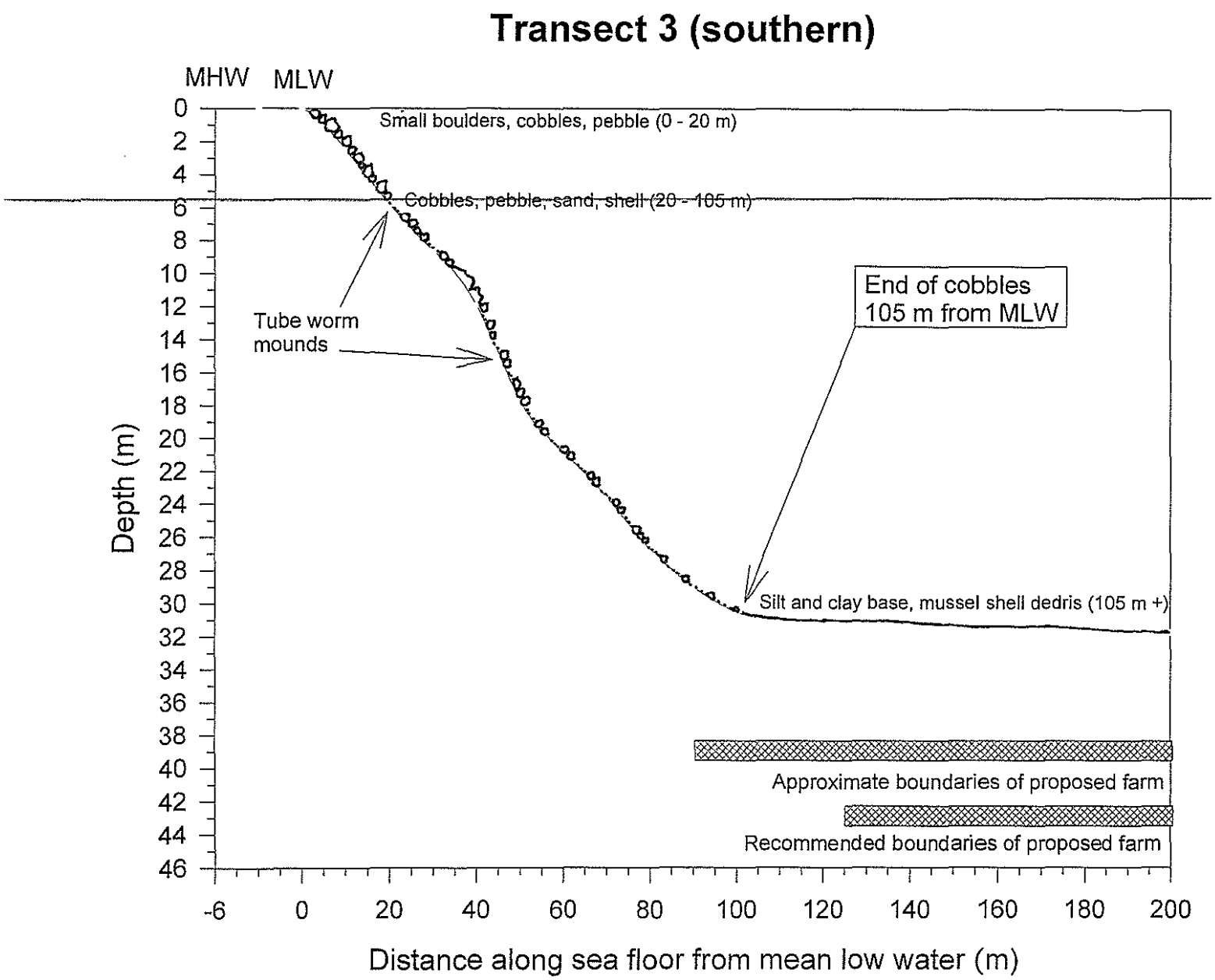

Figure 5 Subtidal shore profile and substratum from an area proposed as a marine farm in eastern Melville Cove, Port Gore.

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Table 1 Species observed from transects from an area in eastern Melville Cove, Port Gore.				
Algae	**Common name**	**Invertebrates**	**Habitat**	**Common name**
Corallina spp.(2)	paint	COELENTERATA		
Hormosira banksii (1)	Neptune's necklace	Actinothoe albocincta (1)	rubble	anemone
Lenormandia chauvinii (1)	red alga	Obelia sp. (2)	rubble/rock	hydroid fuzz
		GASTROPODA		
		Cellana spp. (2)	rubble	limpet
		Chiton pelliserpentis (1)	rubble	chiton
		Cryptoconcus porosus (2)	rubble	butterfly chiton
		Maoricolpus roseus (3)	sand/shell	spire shell
		Penion sp. (1)	soft	whelk
		Trochus viridus (2)	rubble	
		Turbo smaragdus (2)	rock/rubble	cats eye
		BIVALVIA		
		Atrina zelandica (1-2)	soft	horse mussel
		Dosina sp. (2)	soft	clam
		Modilarca impacta (1)	rubble	Nestling mussel
		Monia zelandica (2)	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
		Megalomma sp. (1)	soft	straw worms
		Spirorbis sp. (3)	rubble/rock	parchment worm
		Serpulid sp. (1)	soft	tube worm
		CRUSTACEA		
		Mysids sp. (3)	soft	shrimps
		Pagurus spp (2)	sand	hermit crab
		ECHINODERMATA		
		Allostichaster insignis (2)	rubble	starfish
BONY FISHES		Coscinasterias calamaris (2)	sand/shell	11 arm star
Notolabrus celidotus (2)	Spotty	Evechinus choroticus (2)	rock/rubble	kina
Hemercoetes monopterygius (2)	Opalfish	Patiriella regularis (2)	sand/rubble	cushion starfish
Forsterygion varium (2)	variable trip.	Echinocardium astrale (3)	soft	heart urchin
Peltorhamphus sp. (1)	sole	Pseudechinus albocinctus (2)	soft	pink urchin
Caesioperca lepidoptera (1)	butterfly perch	Stichopus mollis (2)	sand/silt	cucumber
Parapercis colias (2)	blue cod	BRACHIOPODA		
Pseudolabrus miles (1)	scarlet wrasse	Magasella sanguinea (1)	shell	lampshell
Notolabrus fucicola (1)	banded wrasse	ASCIDEACEA		
Grahamichthys radiata (2)	Grahams's gudgeon	Cnemidocarpa sp. (2)	rubble	saddle squirt

Table 3: Density of horse mussels collected from quadrats.

Number from $10m^2$ quadrats	N	Mean density (per m^2)	Standard error
1,1,0,0,1,0,0,0,0,0,1,3,2,1,0,1,0, 0,0,0,0,0,0,0,0,0,0,0	29	0.038	0.01

5.6 Lampshells

The lampshell (*Magasella sanguinea*) was recorded from within the application area, but it did not reach the Department of Conservation trigger level. This species is widespread throughout the Marlborough Sounds.

5.7 Hydroids and Bryozoans

No conspicuous bryozoans or hydroids were recorded by divers during the present investigation.

5.8 Tube worm mounds (*Galeolaria hystrix*)

Small tubeworm mounds were observed from all transects during the present study. They were recorded from:

- 10 m to 45 m distance from shore at transect 1;
- 10 m to 40 m distance from shore at transect 2; and
- 20 m to 40 m distance from shore at transect 3.

5.9 Red algae beds

No red algae beds 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.

Silt and clay soft bottom substrata and its associated community dominated the adjusted area under the proposed marine farm. This habitat supports 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). Cobble habitat and a horse mussel zone were observed were > 20 m distance from the adjusted inshore farm boundary. It is therefore unlikely that these ecological features would be impacted by the proposed activity.

7.0 ADJUSTMENTS TO PROPOSED BOUNDARIES

Areas within the original application area included cobbles, shell over a slit base and silt and clay. It is recommended that the inshore boundaries be adjusted to avoid cobble habitats. It is recommended that the inshore boundary be located at a minimum of 83 m from low water at transect 1, 120 m from low water at transect 2 and 125 m distance from low water at transect 3. These distances establish a minimum buffer zone between cobble habitat and the farm boundary of 20 m.

The distance between cobble substrata and the modified inshore boundary would be:

- 20 m at transect 1;
- 60 m at transect 2; and
- 20 m at transect 3.

Areas within the modified application area are now dominated by soft substrata (i.e. silt and clay or further from shore silt and clay with a shell debris). No other modifications are recommended.

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