NIWA Taihoro Nukurangi

Seabed survey of mooring areas, Mapua Inlet

Prepared for Tasman District Council

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Executive summary

As part of a review of mooring areas within the coastal area of Tasman District Council, NIWA was commissioned to undertake a benthic (sea floor) survey of the existing and potential new mooring areas within the Mapua channel at the entrance to Waimea Inlet.

A variety of methods, including side-scan sonar, towed underwater video, and dredge tows were used to characterise the habitats and major species present, and to identify any obvious effects of the existing mooring structures.

The Mapua channel is characterised by strong tidal currents, as a result little fine sediment accumulates; rather the benthic habitat is dominated by gravel, cobbles, and small boulders. These cobbles and small boulders support populations of green lip mussels, along with a variety of common estuarine species that are resilient to tidal flow and sediment disturbance, including that caused by the movement of mooring chains. Small scour marks aligned parallel to the channel were evident around some existing moorings, probably as a result of the mooring chain dragging during ebb and flow currents. The only biological impact identified from this mooring-related disturbance was, however, the absence of small patches of mussels where the chain had dragged across the boulders.

The new proposed potential mooring areas are situated in the same depths, and support similar habitats and species communities as the existing ones. Therefore any potential effects will be the same as those recorded at the present moorings.

1 Introduction

Tasman District Council (TDC) is undertaking a review of the marine mooring areas within the district, which may result in the replacement of existing moorings, and/or the addition or contraction of areas. One area under consideration is the Mapua channel at the entrance to Waimea Inlet, where changes to the existing mooring areas are being considered (Figure 1-1).

Figure 1-1: Plan of existing mooring areas and potential changes within the Mapua Estuary.

To help inform decisions, TDC has requested a seabed survey of the existing and proposed mooring areas, along with an assessment of the affects the existing swing moorings have on the benthic habitats. NIWA was commissioned to undertake this survey in June 2015.

Little detailed information exists on the marine habitats of the Mapua channel. The habitat map available from the TDC website (http://www.tasman.govt.nz/environment/coastal-marine/coastal-marine-biodiversity/coastal-ecological-risk-assessment-monitoring-report/) identifies areas of firm sand at the entrance to the inlet, grading into soft sand/mud beyond the area of Grossi Point. It also identifies small areas of cobbles on the edges of the main entrance channel. Previous ecological reports on the Waimea Estuary, (e.g. Davidson & Moffat, 1990; Gillespie et al, 2007) also do not provide detailed descriptions of the Mapua channel area.

2 Methods

The sea floor habitats along the Mapua channel from seaward of the wharf to Grossi Point, and south and west of Grossi Point were surveyed using a variety of sampling methods on 16 June 2015. Additional underwater video sampling was completed on 24 July 2015. Benthic habitats were assessed using three methods. The first method used a high-resolution side-scan sonar to acoustically map sea floor features surrounding existing and potential moorings. The second method used dredge sampling to collect epibenthic species and sea floor material present around these mooring areas, and the third method used a towed underwater remote camera to record video transects, providing a visual assessment of the habitats adjacent to existing and potential new swing moorings.

2.1 Side-scan sonar

To identify sea floor features, five side-scan sonar transects, each 60 m in width (30 m either side of the vessel) and up to 800 m in length (Figure 2-1) were surveyed alongside existing and proposed mooring areas using a high-frequency (675 kHz) Tritech sonar towfish. The position of the side-scan sonar was automatically recorded every 2 seconds along each transect using a hand-held GPS and saved in real time to a laptop on board the vessel using SeaNet Pro™ software. The raw files were post-processed using Triton Perspective™ software to produce geo-referenced images from the acoustic data that could be viewed in ArcMap GIS or Google Earth and allow features of interest to be mapped in relation to the existing and newly-proposed mooring sites.

Figure 2-1: Side-scan sonar images from the Mapua mooring location.

2.2 Remote underwater video

To describe the benthic habitats and potential effects of existing swing moorings, six underwater video transects were taken using both a vertically facing remote drop camera (ROV attached to a frame) or a forward facing HD GoPro attached to a sled. Video footage was attained by either lowering the ROV to the sea floor using a live video feed to the surface vessel, or towing the video sled across the sea floor alongside or as close as possible to existing moorings and potential mooring sites at slack low water to mitigate the strong tidal currents and entanglement due to the close proximity of moored vessels (Figure 2-2). The start and end of each transect was recorded by the vessel GPS.

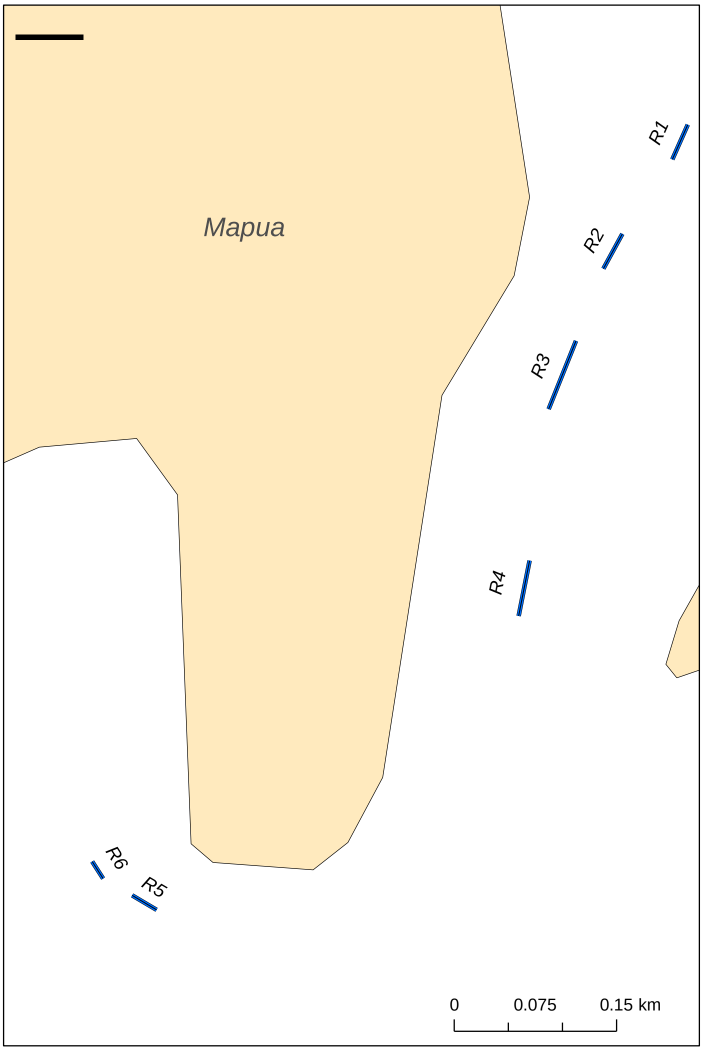

Figure 2-2: Six underwater video transect stations (R1-R6) located within the Mapua channel.

2.3 Dredge tows

The dominant epifauna was sampled using a benthic dredge (600 x 25 mm mouth dimensions; mesh size 2.0 mm). Ten dredge tows were collected up to half an hour either side of slack water. Dredge tows were run adjacent to and near existing and potential moorings and were predominantly parallel to the shoreline. The length of the first two tows was two minutes, but tow length was then reduced to 30 seconds because the longer tows collected large volumes of rocks and mussels. Because some tows were shorter than others and the dredge contents varied in quantity, all results can only be regarded as qualitative. Data on habitat type (cobble, gravel, sand) were visually assessed and also recorded for each dredge sample.

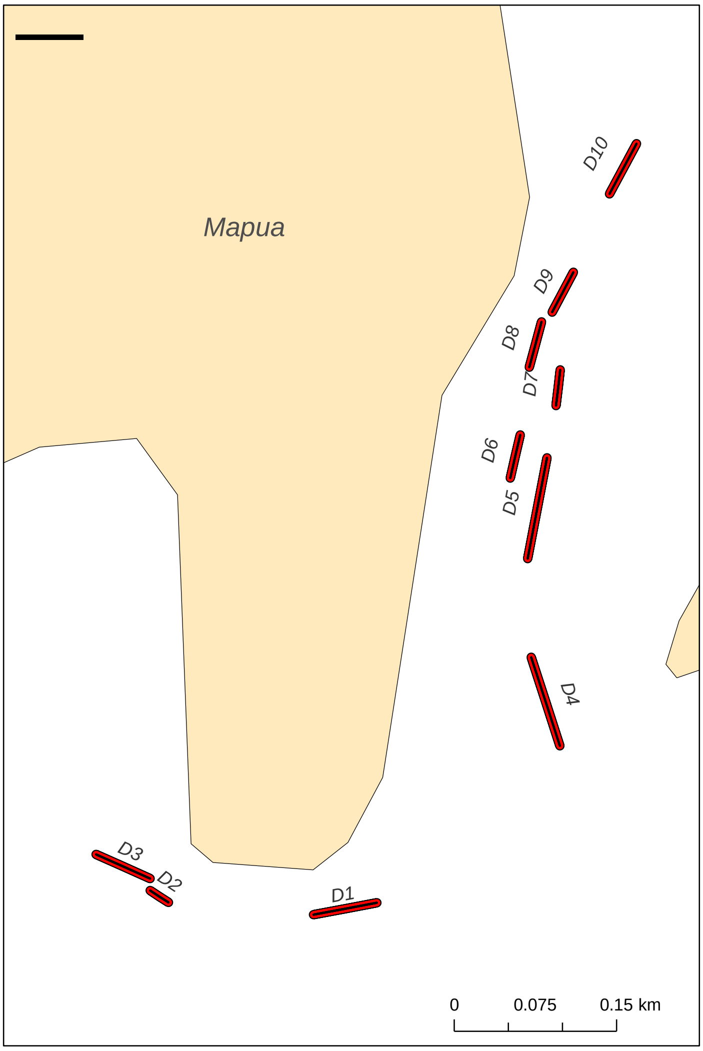

Figure 2-3: Dredge tows (D1-R10) situated near existing and potential mooring sites in Mapua channel.

3 Results

3.1 Side-scan sonar

A large proportion (approximately 10 ha) of the sea floor within the Mapua channel, covering both the existing moorings, and the proposed new mooring areas were covered by the side-scan sonar (see Fig 2-1). No reefs or rocky outcrops were identified, with most of the sea floor appearing on the side-scan images as rubble over sandy sediments. Offshore of Grossi Point, the sea floor appeared to be more homogeneous, possibly sandy, with smaller areas of rubble (Fig 3-1).

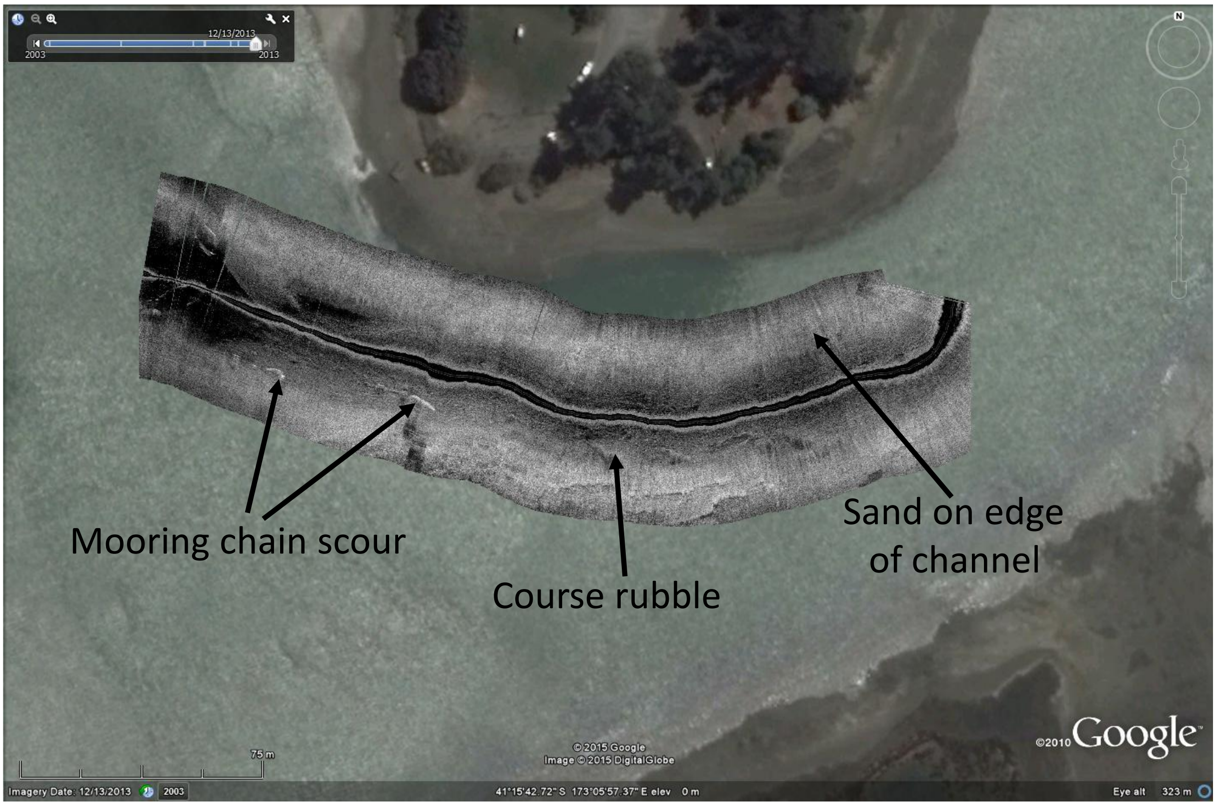

Figure 3-1: Side-scan sonar image off Grossi Point. Size of sonar image is 240 m x 60 m.

Smaller portions of some of the original side-scan sonar files were reanalysed to show more detail in the images. Examples are shown in Fig 3-2.

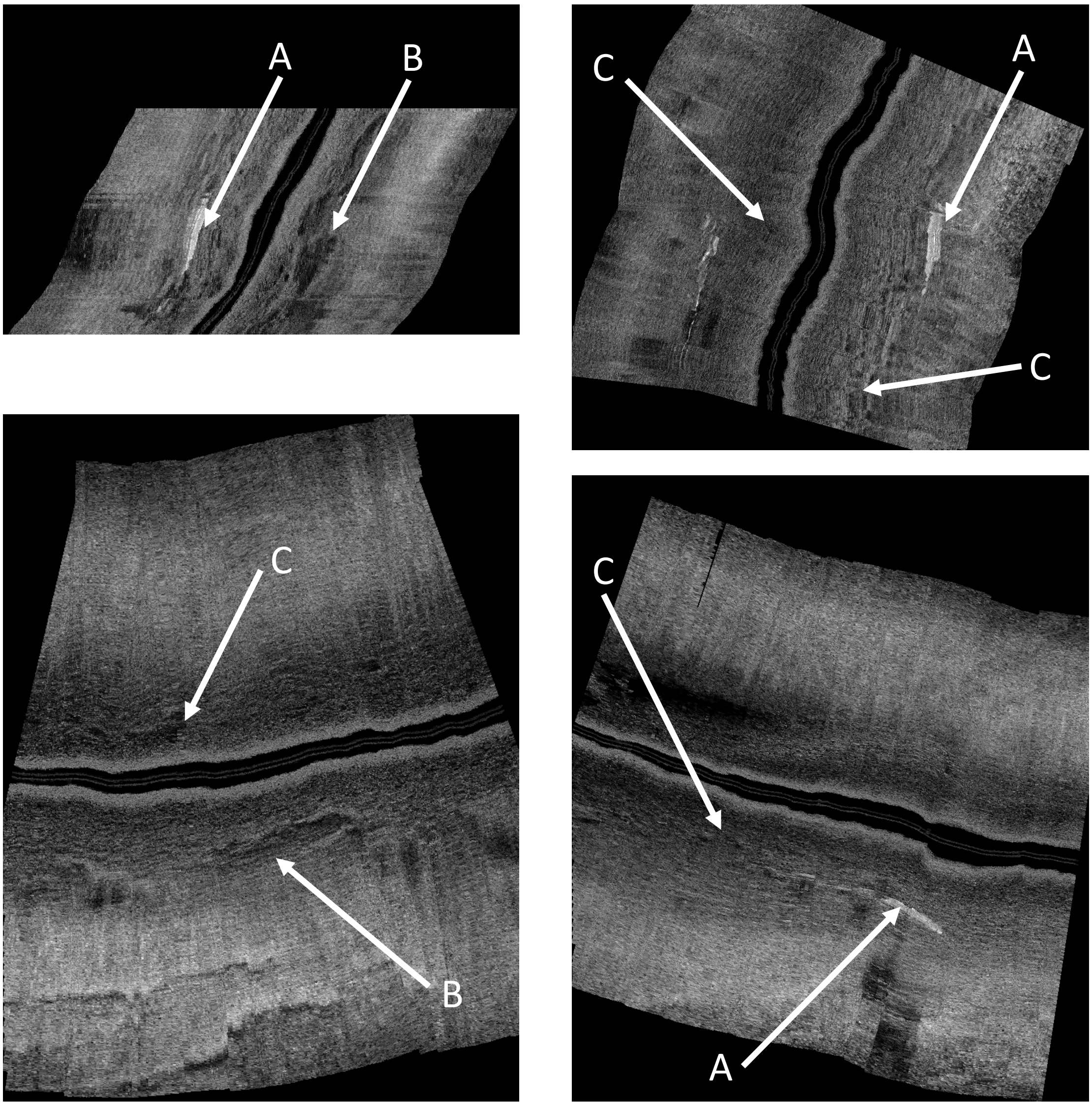

Figure 3-2: Side-scan sonar images depicting sea floor features. A= Mooring chain scour marks, lying parallel with tidal currents; B = tidal scour (hummocks and depressions) in sediment; C = Boulders and/or mussel beds. Width of each image = 60 m.

Scour marks were evident around some of the existing moorings, reflecting mooring chains dragging on the sediment with the changing tides. These scour marks were aligned parallel to the dominant tidal currents, i.e. along the axis of the channel, and were generally small, < 10 m in length. The textured appearance of the sediment throughout the area indicated the sea floor was comprised of cobbles and small boulders. This was confirmed by the video images and the dredge samples (see below). Video and dredge samples also contained dense populations of green lip mussels, *Perna canaliculus*, which also would have appeared as textured sediment in the side-scan sonar images. Parts of the soft sediment, particularly in the centre of the channel showed obvious hummocks and depressions, indicating the sediments is likely to be constantly shifting due to the strong tidal currents.

3.2 Underwater video

The video images confirmed features identified in the side-scan sonar files. The sea floor in the main portion of the channel comprised cobbles and small boulders up to approximately 20 cm in diameter, colonised by beds of green lip mussels. Other species recorded from this habitat were cushions stars (*Patiriella regularis*) (Fig 3-3) and small hydroid colonies. Small patches adjacent to some moorings in the main channel appeared to have had mussels removed by mooring chains as they dragged across the sea bed. This was apparent in the side-scan sonar images as acoustically reflective marks (see above).

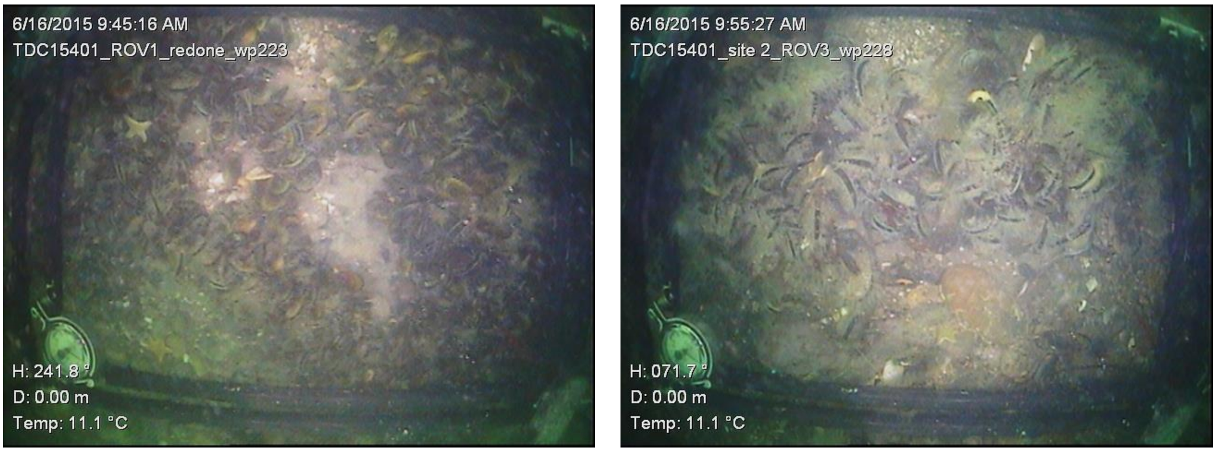

Figure 3-3: Benthic habitat in the Mapua Channel with dense beds of mussels and the occasional cushion star. The image on the left was taken immediately adjacent to a mooring and potentially shows some of the mussels scraped clear by the chain.

Fig 3-4 shows frame grabs from the Go Pro video footage. The main Mapua channel is dominated by small boulders, while the sediment in the channel adjacent to Grossi Point is comprised of a mixture of coarse sand and cobbles (Fig 3-4 C, D).

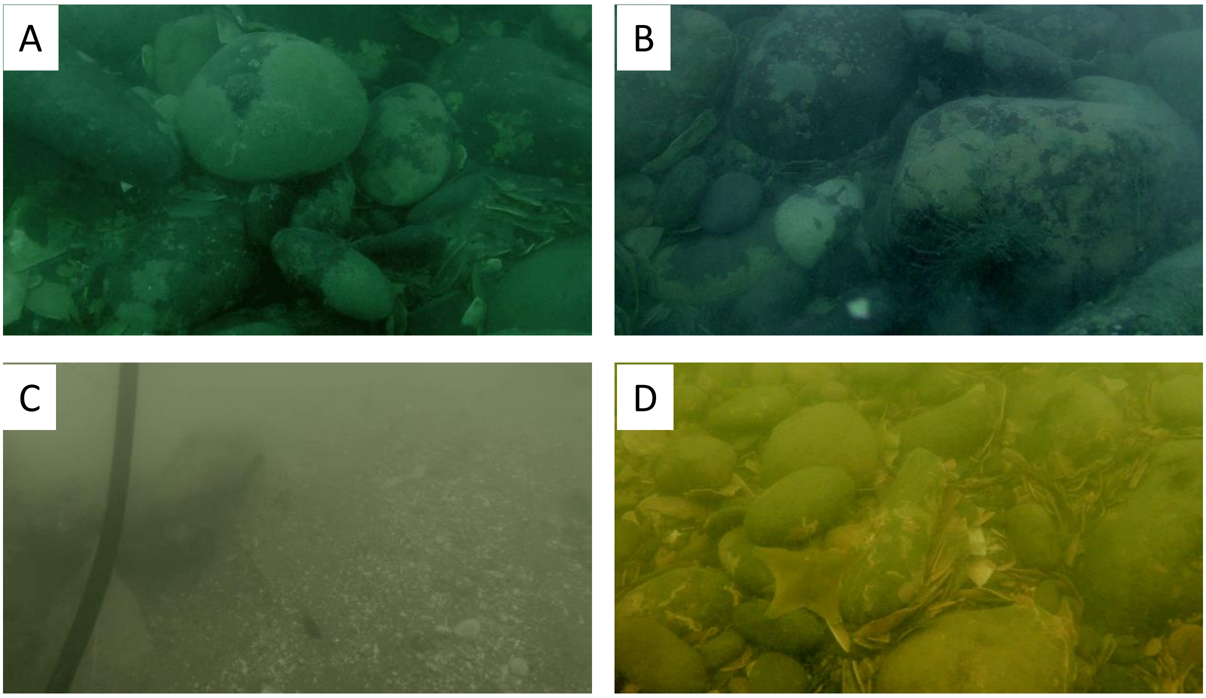

Figure 3-4: Frame grabs from remote underwater video. A, B: small boulders in main Mapua channel. C, D: sand and cobbles in channel off Grossi Point.

3.3 Dredge tows

Depths of each station ranged from 2.9 m below MSL off Grossi Point to 5.3 m below MSL in the main channel off Mapua wharf. Sediments, ascertained by visual inspection of the dredge contents, were similar at all stations, dominated by gravel and cobbles with small boulders in the main channel, but these were replaced by sand off Grossi Point. The dredge samples confirmed the sea floor habitats recorded in the video tows (Table 3-1).

The epifauna collected by the dredge tows were characterised by mussels (*Perna canaliculus*) and the small spider crab (*Halicarcinus* sp), both of which occurred at all 10 stations. The half-crab (*Petrolisthes novaezelandiae*) and the cushion star (*Patiriella regularis*) were also widespread, occurring at all but one station. A complete list of all 44 taxa recorded from the dredge tows is shown in Appendix A.

A summary of the numbers of taxa and the dominant species that occurred at each dredge station is listed in Table 3-1. In general all samples contained a very similar suite of species. Green lip mussels dominated all but 2 stations, and other common species included the cushion star, *Patiriella regularis*, the crab *Petrolithes novaezelandiae*, and the shrimps *Periclimenes yaldwyni* and *Pontophilus australis*.

Table 3-1: Characteristics of each dredge tow. (Depths are expressed as m below MSL).

Sample	Depth (m)	Habitat description	No taxa recorded	Dominant species
D1	3.5	Cobbles/gravel	16	*Perna canaliculus* *Patiriella regularis* *Petrolisthes novaezelandiae*
D2	4.2	sand/gravel	29	*Perna canaliculus* *Pontophilus australis* *Buccinulum linea*
D3	2.9	sand/gravel	14	*Periclimenes yaldwyni* *Buccinulum linea* *Perna canaliculus*
D4	4	Cobbles/gravel	12	*Perna canaliculus* *Patiriella regularis* *Petrolisthes novaezelandiae*
D5	4.7	Gravel/sand/shell	9	*Perna canaliculus* *Patiriella regularis* *Petrolisthes novaezelandiae*
D6	4.5	Cobble/gravel	16	*Perna canaliculus* *Patiriella regularis* *Petrolisthes novaezelandiae*
D7	4.8	Cobble/gravel	11	*Perna canaliculus* *Patiriella regularis* *Petrolisthes novaezelandiae*
D8	5	Cobble/gravel	10	*Perna canaliculus* *Patiriella regularis* *Petrolisthes novaezelandiae*
D9	5.3	Small boulders/cobbles	10	*Patiriella regularis* *Perna canaliculus* *Petrolisthes novaezelandiae*
D10	4.4	Small boulders/cobbles	10	*Perna canaliculus* *Patiriella regularis* *Petrolisthes novaezelandiae*

4 Discussion

The area of Mapua channel presently zoned for swing moorings and the adjacent proposed area are tidal channels characterised by strong current flows that remove fine material from the sediment and, as a result, the sea floor is comprised of gravel, cobbles, and small boulders, with quantities of sand only exposed in the lesser current area around Grossi Point. The strong currents and prevalence of these relatively stable cobbles and boulders have provided attachment for large quantities of green lip mussels that occur along the length of the channel. Other species present in this habitat include a variety of starfish, crustaceans, and molluscs, all of which are common and widespread within Tasman Bay and the adjacent estuaries. Other than the mussel beds, no other beds of shellfish were recorded.

The existing swing moorings along the channel have a less than minor impact on the sea floor habitats and associated species. Short (< 10 m in length) scour marks are visible in the side-scan sonar images, aligned parallel with the channel and tidal flows, caused by vessels swinging with the tide. The moorings appear to have little to no effect on the coarse cobble and boulder habitat, except that the swinging chains have, in places, prevented mussels from colonising the boulders in small patches.

The entire channel, including the areas proposed as potential new mooring sites, are very similar in habitat and species to those in the existing mooring zone. Consequently, it is highly unlikely that any habitat, other than small areas of mussels, would be affected by new moorings if established in the proposed sites.

5 Acknowledgements

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6 References

Davidson, R.J.; Moffat, C.R. 1990. A report on the ecology of Waimea Inlet, Nelson. Department of Conservation, Nelson/Marlborough Conservancy, Occasional Publication No 1. 160 p.

Gillespie, P., Clark, K.; Conwell, C. 2007. Waimea Estuary State of Environment Monitoring: Fine scale benthic assessment, April 2006. Prepared for Tasman District Council and Nelson City Council. Cawthron Report No. 1315. 27 p.

Appendix A Epifaunal species recorded from dredge tows, Mapua

Group	Taxa	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	Prevalence
Bivalvia	*Perna canaliculus*	277	12	2	279	107	176	12	125	19	172	10
Crustacea	*Halicarcinus* sp.	6	5	1	3	5	4	3	6	4	2	10
Asteroidea	*Patiriella* sp.	61	8		>20	15	92	13	90	65	22	9
Crustacea	*Petrolisthes novaezelandiae*	>60	8		>20	14	70	54	38	14	17	9
Crustacea	*Periclimenes yaldwyni*	7	8	7		3	6		22	6	6	8
Gastopoda	*Buccinulum linea*	13	9	5	5		5	3		1	4	8
Gastopoda	*Xymene plebeius*	3	1		5		8	1	6	2	2	8
Gastopoda	*Lunella smaragda*	7	4	1	1		3		1	1		7
Hydrozoa	*Amphisbetia* sp	p			p	p	p	p		p	p	7
Polchaeta	Polynoidae	1	1	1	1		1	3	1			7
Gastopoda	*Cantharidus tenebrosus*		3		1	1			3	1	8	6
Crustacea	Isopoda			1	1		1	1			3	5
Gastopoda	*Cominella adspersa*	1	6		1	1		1				5
Actinopteri	Tripterygiidae					1	1			1	2	4
Gastopoda	*Cominella glandiformis*		4	1		1	1					4
Polyplacophora	*Acanthochitona zelandica*	2	8	1								3
Polyplacophora	Polyplacophora	3	1		7							3
Crustacea	*Austrohelice crassa*	2	1									2
Crustacea	*Pontophilus australis*		10	1								2
Gastopoda	*Diloma aethiops*	2		2								2
Platyhelminthes	Platyhelminthes		1					1				2
Polychaeta	Oweniidae		3				1					2
Actinopteri	*Rhombosolea leporina*			1								1
Anthozoa	Actiniaria			1								1
Ascidiacea	Ascidiacea						1					1
Bivalvia	*Crassostrea gigas*	1										1
Bivalvia	*Hiatula nitida*		1									1
Bivalvia	*Leptomya retiaria*			1								1
Bivalvia	*Linucula hartvigiana*		4									1
Bivalvia	*Nuculana bellula*		1									1
Bivalvia	*Ostrea chilensis*								1			1
Crustacea	Cirripedia	>10										1
Crustacea	Mysida		1									1
Crustacea	Ostracoda		1									1
Crustacea	*Ovalipes catharus*		1									1
Echinoidea	*Fellaster zelandiae*		1									1
Gastopoda	*Amphibola crenata*								1			1
Gastopoda	*Epitonium tenellum (dead)*		0									1
Polychaeta	Glyceridae							1				1
Polychaeta	Nephtyidae		1									1
Polychaeta	Nereididae		6									1
Polychaeta	Serpulidae						1					1
Porifera	Porifera		1	p								1
Bryozoa	Bryozoa		p				p					0
	# taxa	16	29	14	12	9	16	11	10	10	10	