Waimea Inlet Sponge Gardens

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Prepared for
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1. INTRODUCTION

Broadscale mapping of Waimea Inlet (Clark *et al*. in prep) defined two regions containing biologically diverse sponge-associated communities (Figure 1), referred to here as 'sponge garden' communities. Previous survey work indicated that the sponge garden community observed at the Traverse location had only recently developed subsequent to removal of a causeway to improve tidal flushing (Gillespie & Asher 1997, 2003). This report describes the sponge garden communities at both sites and proposes an estuarine biodiversity restoration scenario to explain the habitat restructuring observed in the Traverse.

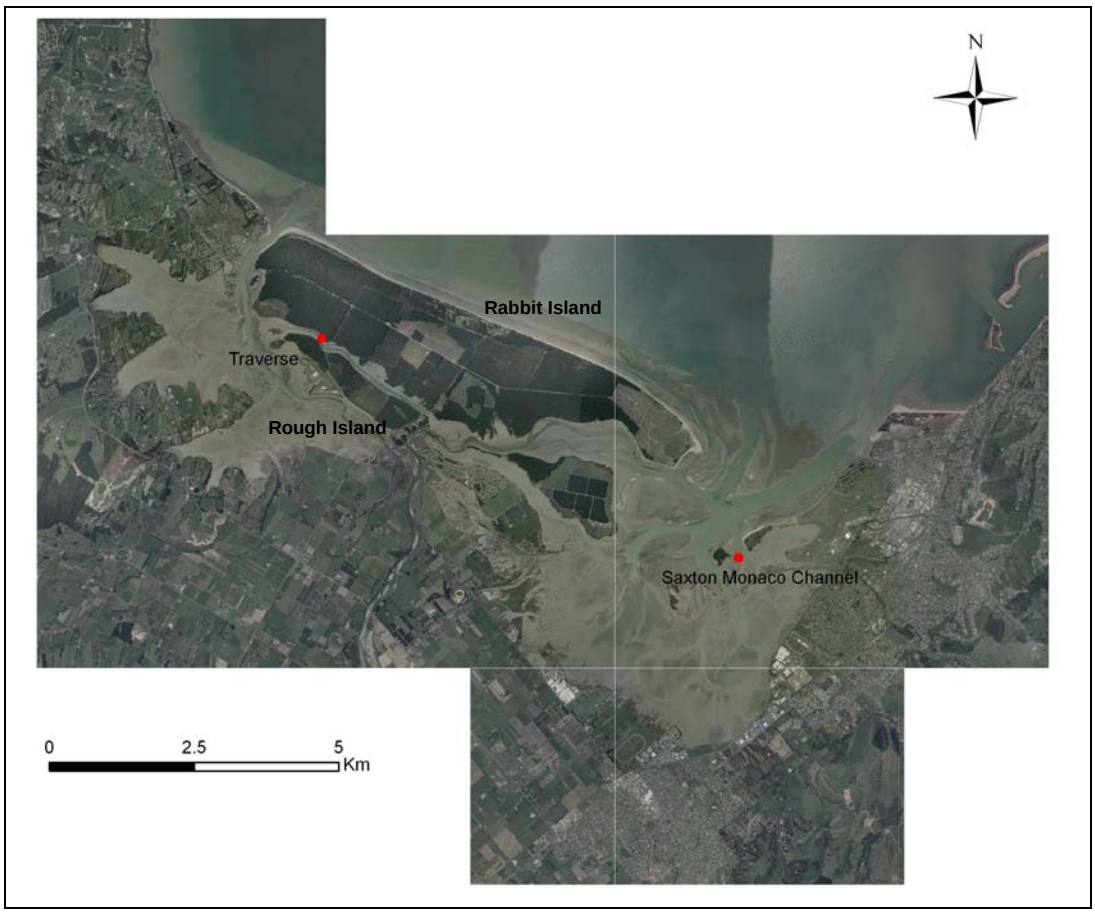

Figure 1. Waimea Inlet and the locations of the two sponge gardens discussed in this report.

2. TRAVERSE RESTORATION

Prior to 1998, causeways blocked each end of the Traverse between Rabbit and Rough Islands, with a pipe culvert at each end allowing only restricted tidal movement of water. A strong but restricted ebb flow fanned out over the mud and shingle flats. The resulting lagoon within the Traverse had limited water exchange resulting in growth of large mats of *Enteromorpha* sp. and shallow muddy ponds dominated by thick growth of *Gracilaria* sp. (Gillespie & Asher 1997). During the period 1996 through 2003, no sponge-associated habitats were observed during various estuary monitoring surveys in the Traverse (Gillespie & Asher 1997, 2003). In late 1998 the causeway across the western end of the Traverse was removed, allowing greater flushing at the western end. However it must be noted that there is a raised sill of shingle and firm mud at this end. Consequently the Traverse does not empty completely with each tide and there remains a degree of ponding with a strong ebb flow until the much gentler flood tide reverses the flow. Since the causeway removal, the stronger ebb flow has formed a distinct 5-10 m wide channel flowing towards Mapua. The surrounding substrate is predominantly mud, shingle and cobble, but is progressively graded from cobble and shingle within the fastest flow at the western outlet to shingle to sand and increasing mud 50-100 m downstream. Within the Traverse the water now generally appears to be less turbid and, although the substrate is still thick soft mud, the *Enteromorpha* sp. mat is much reduced.

Ten years after the removal of the western causeway the community structure of the western exit channel has changed from an anoxic soft sediment habitat with low species richness to a diverse sponge-associated biotic community. Figures 2-5 illustrate some of the changes that have occurred since removal of the causeway.

Figure 2. Rabbit Island margin of Traverse west of the causeway, October 1995.

Figure 3. Central Traverse Rabbit Island margin, 1996**.**

Figure 4. General view of the Traverse, September 1999. The causeway was previously located in the centre of the photo.

Figure 5. General view of Traverse, October 2008.

2.1. Vegetation changes

Since the western causeway was removed in 1998 there have been significant changes in the vegetation present in the Traverse area. Historical broadscale habitat mapping based on aerial photographs from 1985 shows the causeway and significant coverage of the invasive grass *Spartina anglica* to the east (Figure 6). *Spartina* was once a major pest species in the Waimea Estuary but was successfully eradicated in the late 1980s through an extensive herbicide spraying programme. The 1985 map also shows the presence of glasswort (*Sarcocornia quinqueflora*) along the estuary margin to the west of the causeway. In 2007, nine years after the causeway was removed, *Sarcocornia* had spread along the margins to the east (Figure 7). Areas of previously modified shore have been allowed to return to the estuary after the removal of a road along the northern boundary of the Traverse, opening up water flow into these areas. Visual surveys of the Traverse region carried out at approximately 6-monthly intervals 1997-2001 and less frequently through 2006 (Gillespie *et al*. in prep) document these changes as a gradual erosion of the previously infilled margin of the Rabbit Island shoreline. These changes resulted in the above-mentioned expansion of the glasswort (*Sarcocornia*) salt marsh and a general return to a more natural estuarine condition.

Figure 6. Vegetation present in the Traverse area in 1985 based on historical photographs (Tuckey & Robertson 2003).

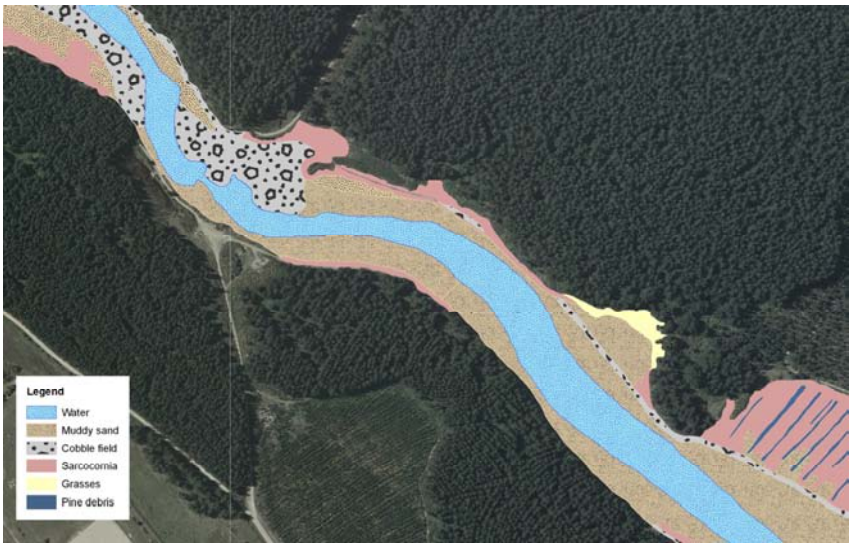

Figure 7. Vegetation present in the Traverse area in 2007 based on ground-truthed broadscale habitat mapping (Clark et al in prep).

3. SPONGE GARDEN CHARACTERISTICS

3.1. Traverse

The subtidal sponge garden in the Traverse covered an area of approximately 1.2 ha and consisted mainly of *Mycale (Carmia) tasmani* (Figure 8) and associated biota on a cobble/shingle substrate. This species is often present in harbour and port environments and is found throughout the South Island (Appendix 1). Varying forms of this sponge were collected from the two sites in Waimea Inlet. One is a thick encrusting form which is fibrous and loosely constructed with a smooth fleshy surface, commonly indicative of exposure to considerable current activity (Appendix 1). Other specimens collected had an erect foliose finger-like morphology, indicating exposure to a much quieter flow environment (Appendix 1). Both forms were present in the Traverse although the thick encrusting form was more common, likely due to the relatively high flows in the channel. The sponge aggregations were most dense in the centre of the western Traverse exit channel (see Appendix 2). Another sponge species, *Hymeniacidon perleve*, was also present in small amounts near the outlet (west) end of the channel. At the eastern entrance to the site, both sponges appeared to be at earlier stages of development and were interspersed with large amounts of macroalgae, including *Ulva* sp., *Ceramium apiculatum*, *Gigartina circumcincta*, *Gelidium caulacantheum* and *Gracilaria* sp.

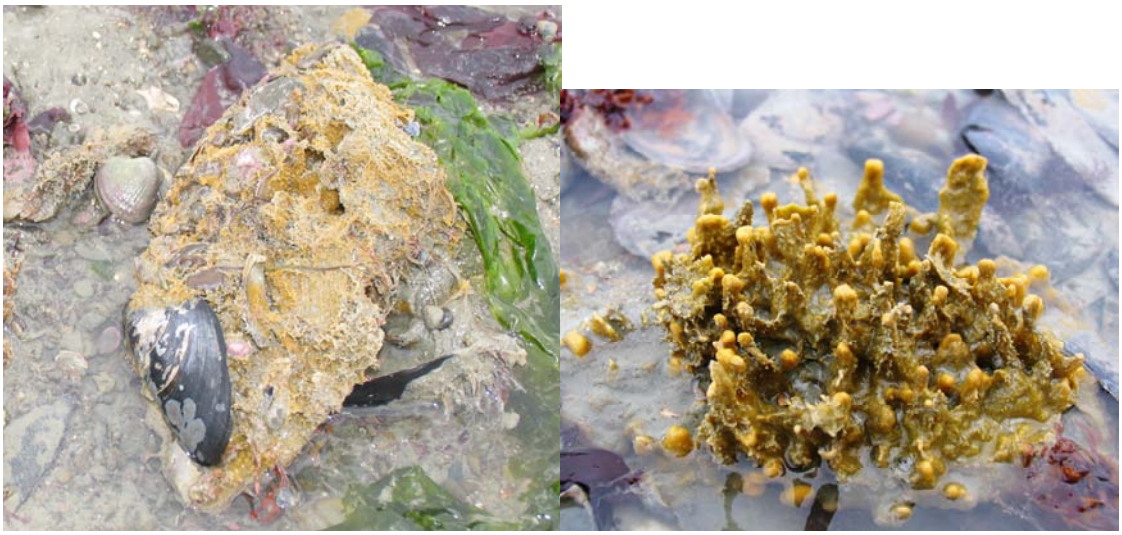

Figure 8. *Mycale (Carmia) tasmani* collected in Waimea Inlet. On the left is an example of the thick, flat form and on the right is a specimen of the erect foliose finger-like form.

The aerial extent of the Traverse sponge garden and the associated substrate characteristics (Figure 9) are controlled by tidal current velocities. The flow velocities are markedly different from one end of the Traverse to the other. The outgoing tide creates a strong current while on an incoming tide the flow is relatively gentle. As a result, the community at the eastern end experiences considerably higher flow velocities than that at the western end.

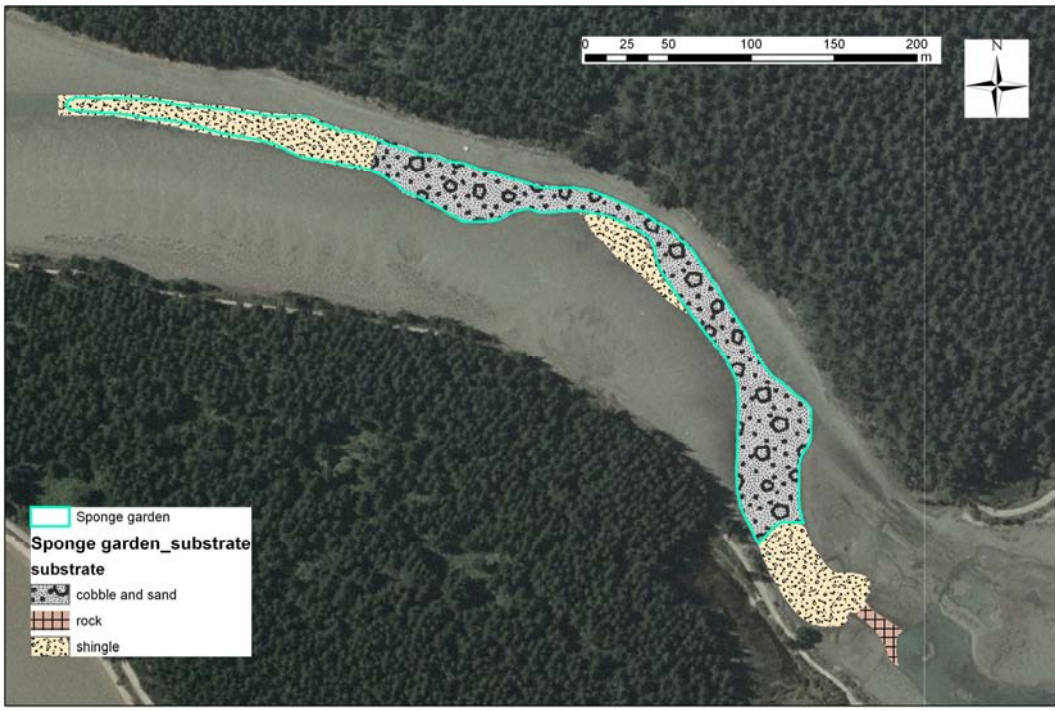

Figure 9. Sponge garden coverage and substrate characteristics in the Traverse.

A total of 114 taxa were found within the sponge-associated community of the Traverse, however the composition was variable. The central part of the Traverse sponge garden was more diverse than at either end, and there were large differences in the abundances of some individual species. For example, the cats eye *Turbo smaragdus* was classed as very abundant at the eastern entrance of the traverse but was not recorded at all on the western side. The 16 most common species found in the Traverse sponge garden community are listed in Table 1. The full species list and abundance data are presented in Appendix 1.

Table 1. The 16 most common species present in the Traverse sponge garden community.

General Group	Taxa	Common Name
Amphipoda	Amphipoda	Amphipods
Asteroidea	*Patiriella regularis*	Cushion Star
Porifera	*Mycale (Carmia) tasmani*	Sponge
Rhodophyta	*Coralline officinalis*	
Gastropoda	*Micrelenchus tenebrosus*	Grazing snail
Gastropoda	Gastropoda (micro snails)	Unidentified gastropod
Ostracoda	Ostracoda	Ostracods
Polychaeta: Spionidae	*Prionospio* sp.	
Polychaeta: Syllidae	*Sphaerosyllis* sp.	
Rhodophyta	*Ceramium apiculatum*	Red seaweed
Bivalvia	*Xenostrobus pulex*	Little Black Mussel
Chlorophyta	*Ulva* sp.	Sea lettuce
Decapoda	*Hemigrapsus crenulatus*	Hairy-handed Crab
Gastropoda	*Turbo smaragdus*	Cat's Eye (Ataata)
Isopoda	*Paravireia* sp.	
Polychaeta: Nereidae	Nereidae	Rag worms

3.2. Saxton Monaco channel

The spatial extent and substrate characteristics of the Saxton Monaco channel sponge garden are illustrated in Figure 10. It covered a considerably larger area (4.8 ha) than that of the sponge garden in the Traverse (1.2 ha). The Saxton Monaco channel sponge garden is usually subtidal but during a spring tide (<0.2 m chart datum) half of the garden area may be exposed for periods of up to half an hour. The dominant organism was once again the sponge *Mycale (Carmia) tasmani*. Both growth forms (Figure 8) were present and the distributions of these forms were correlated with current flow. In the centre of the channel where current velocities were highest the thick, flat form was most common whereas the erect foliose finger-like morphology dominated in areas of slower velocity current. *Hymeniacidon perleve* was not present in samples collected from the Saxton Monaco channel. There have been no major changes to flushing in this area that we are aware of and it is possible that the sponges have been present in the Saxton Monaco channel for some time. This area may even have acted as the "seed population" for the more recent colonisation of the Traverse.

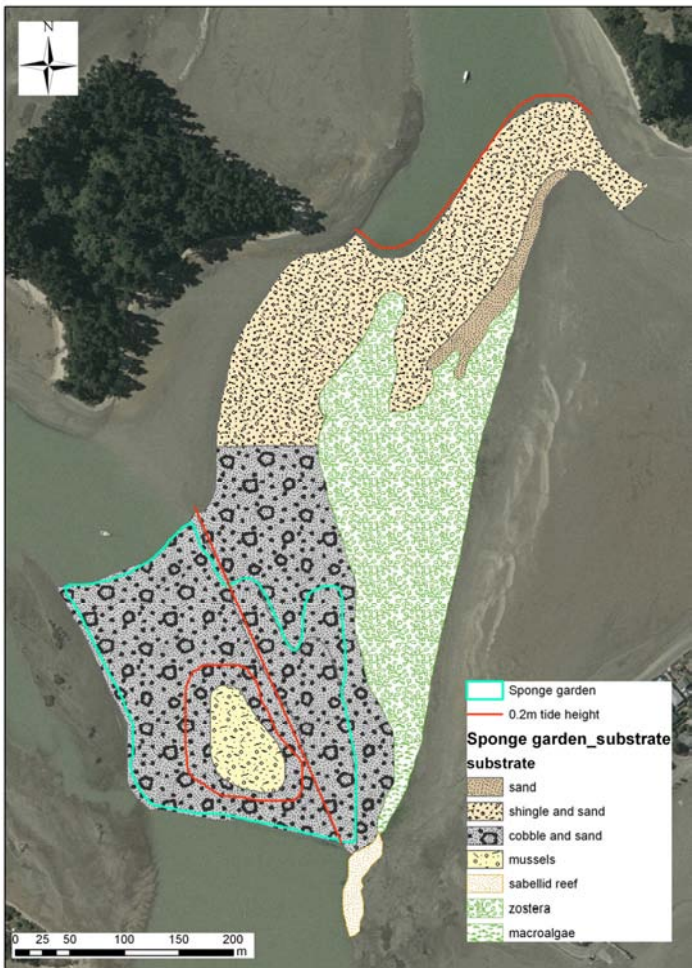

Figure 10. Sponge garden coverage and substrate characteristics in the Saxton Monaco channel.

There were 69 taxa identified within the sponge-associated community of the Saxton Monaco channel. Sixteen of these were absent from the Traverse sponge garden.

There were both similarities and differences among the sponge communities at the two sites. Amphipods were very abundant at both sites, as were gastropods, encrusting bryozoans and sea lettuce (*Ulva* sp). However, some taxa that were very common at Saxton Monaco channel were not recorded at all in the Traverse (*e.g.* the half crab, *Petrolisthes elongates*, and athecate hydroids) or were present only in low numbers (*e.g.* the mussel, *Perna canaliculus*, and the red alga, *Rhodymenia* sp.). The invasive seaweed *Undaria pinnatifida* was found at the Monaco site, but not in the Traverse.

Table 2. The 15 most common species present in the Saxton Monaco channel sponge garden community.

General Group	Taxa	Common Name
Porifera	*Mycale (Carmia) tasmani*	Sponge
Amphipoda	Amphipoda	Amphipods
Bivalvia	*Perna canaliculus*	Green Lipped Mussel
Bryozoa	Bryozoa (encrusting)	
Chlorophyta	*Ulva* sp.	Sea lettuce
Decapoda	*Petrolisthes elongatus*	Half crab
Gastropoda	Gastropoda (micro snails)	Unidentified gastropod
Gastropoda	*Eatoniella limbata*	
Hydrozoa	Hydroida (athecate.)	
Rhodophyta	*Rhodymenia* sp.	
Decapoda	*Palaemon affinis*	Estuarine Prawn
Gastropoda	*Lepsiella scobina*	Oyster borer
Gastropoda	*Micrelenchus tenebrosus*	Grazing snail
Phaeophyta	*Undaria pinnatifida*	
Rhodophyta	Coralline algae	Coralline Paint

4. SUMMARY

A major factor resulting in habitat change in many New Zealand estuaries has been the restriction of flushing due to changes in the estuary margins as a result of coastal developments such as roading and reclamation. Along with increased nutrient inputs (via mechanisms such as increased urban run-off), this can often have a major impact on the health of an estuarine system.

We describe the composition and areal coverage of a highly diverse, sponge-dominated biological community or 'sponge garden' between Rabbit and Rough islands (an area known as the Traverse) in Waimea Inlet. The habitat was predominantly subtidal but bordering on the spring low tide level and occupying cobble/shingle substrate in areas of relatively high current flows. To be able to survive in these environments the sponge communities must be able to tolerate fluctuating high turbidity and reduced salinity. The Traverse sponge garden is thought to have recently developed in response to removal of a causeway that had previously restricted tidal flushing. When first discovered in 2007, approximately nine years after removal of the causeway, the Traverse sponge community was already well developed, including an observed 114 species of plants and animals. Previous investigations within the region suggested that gradual flushing away of accumulated muddy, enriched sediments and algal debris exposed the underlying hard cobble substrate required for colonisation of this diverse array of species.

A second, more established, sponge garden was observed at a nearby location, the Saxton-Monaco channel, where similar strong current flows pass over a shallow subtidal

cobble/shingle substrate. This site, although slightly less diverse (69 species), may have provided a 'seeding' source for colonisation of the Traverse, however it is possible that small pockets of similar habitat exist in other parts of Waimea Inlet.

Although small in comparison to the surrounding areas of soft sediment and intertidal vegetation present, these habitats may be considered important in terms of the overall biodiversity of the estuary.

Some additional expansion of upper intertidal habitat, including vegetation coverage, was also noted within the Traverse. In particular, areas of glasswort (*Sarcocornia quinqueflora*) developed along the Rabbit Island upper intertidal fringe where pines had been harvested and roading was subjected to tidal erosion.

We suggest that the Traverse area in the Waimea Estuary is an example of how an unnatural flow restriction can be removed to enhance biodiversity, and previously 'reclaimed' land can be returned to a healthier, more "natural" estuarine state without the need for extensive restoration/revegetation work.

5. ACKNOWLEDGEMENTS

This study was funded through a Foundation for Research, Science and Technology Envirolink grant to Tasman District Council (TDC) with additional support from TDC, Nelson City Council and Nelson Regional Sewerage Business Unit. We would also like to thank Allan Smith, Robin Holmes, Anne Asher and Jude Longley for their assistance in the field. Allan Smith also provided photographs for use in this report.

6. REFERENCES

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Appendix 1. NIWA sponge identification report

NIWA
Taihoro Nukurangi

TAXONOMIC IDENTIFICATION

REQUESTED BY:

Rod Asher
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Private Bag 2
Nelson 7001
New Zealand

NIWA CONTRACT: SCJ081AM/MK5

CLIENT SAMPLE: **Cawthron Sponge 1**

NIWA reference specimen: NIWAKD 5767

Client description: Cawthron Sponge 1 is from Rabbit Island Traverse West, sponge garden in channel, Waimea Inlet, and was collected 20 September 2007.

Taxonomic identification: *Mycale (Carmia) tasmani* Bergquist & Fromont, 1988 (Demospongiae: Poecilosclerida: Mycalidae)

Comments: Although this species was first described from Maui A platform off the west coast of the North Island, it is far more typically present in harbour and port environments, and has been recorded from many of the major ports in the South Island. The sponge usually forms a thick encrusting and is always a loosely constructed, rather fibrous sponge, with a smooth fleshy surface. The sponge typically co-occurs with coralline algae attached to the surface and growing through the sponge body.

This particular specimen has a thick encrusting form that is vertically compressed compared to "Cawthron Sponge 3," which is the same species. This indicates that the sponge would have experienced considerable current activity in the location it was collected from.

CLIENT SAMPLE: **Cawthron Sponge 2**

NIWA reference specimen: NIWAKD 5768

Client description: Cawthron Sponge 2 is from Rabbit Island Traverse West, channel entrance, Waimea Inlet, and was collected 20 September 2007

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NIWA
Taihoro Nukurangi

Taxonomic identification: *Hymeniacidon perleve* (Montague, 1818) *sensu* Bergquist (1970) (Demospongiae: Halichondrida: Halichondriidae)

Comments: The sponge forms a thickly encrusting mat or tuberous mass. It has a smooth somewhat fleshy surface. The species is probably a New Zealand endemic, but it was given the name of a relatively common European species, that it was indistinguishable from. It is also a common harbour species throughout New Zealand.

CLIENT SAMPLE: **Cawthron Sponge 3**

NIWA reference specimen: NIWAKD 5769

Client description: Cawthron Sponge 3 is from the channel between Monaco, Saxton, and Oyster Islands, Waimea Inlet, Nelson, and was collected 30 October 2007

Taxonomic identification: *Mycale (Carmia) tasmani* Bergquist & Fromont, 1988 (Demospongiae: Poecilosclerida: Mycalidae)

Comments: Although this species was first described from Maui A platform off the west coast of the North Island, it is far more typically present in harbour and port environments, and has been recorded from many of the major ports in the South Island. The sponge usually forms a thick encrusting and is always a loosely constructed, rather fibrous sponge, with a smooth fleshy surface. The sponge typically co-occurs with coralline algae attached to the surface and growing through the sponge body.

This particular specimen has an erect foliose fingery morphology compared to "Cawthron Sponge 1," which is the same species. This indicates that the sponge would have experienced a relatively quiet environment in the location it was collected from, compared to that of Cawthron Sponge 1.

Michelle Kelly

Senior biologist, NIWA Auckland

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Appendix 2. Full taxa list by site. Scores from 1-5 indicate the abundance of each taxa. 1 = rare, 2 = occasional, 3 = common, 4 = abundant, 5 = very abundant.

GenGroup	Taxa	Common Name	Traverse lower	Traverse West central	Traverse Rock Entrance	Saxton Monaco channel
Porifera	*Mycale (Carmia) tasmani*	Sponge	4	5	3	5
Porifera	*Hymeniacidon perleve*	Sponge			2	
Amphipoda	Amphipoda	Amphipods	5	5	5	5
Amphipoda	Caprellidae					1
Anthozoa	*Edwardsia* sp.					
Asteroidea	*Patiriella regularis*	Cushion Star	3	5	5	3
Bivalvia	*Xenostrobus pulex*	Little Black Mussel	1	4	4	
Bivalvia	*Arthritica bifurca*		1	2	1	
Bivalvia	*Austrovenus stutchburyi*	Cockle (Huangi)	1	3		
Bivalvia	*Crassostrea gigas*	Pacific Oyster		4		
Bivalvia	*Macomona liliana*	Wedge shell (Hanikura)	1	1		
Bivalvia	*Hunkydora australica novozelandica*			1		
Bivalvia	*Bassina yatei*	Frilled venus shell			1	
Bivalvia	*Perna canaliculus*	Green Lipped Mussel		1	1	5
Bivalvia	*Nucula hartvigiana*	Nut Shell	3	3	2	1
Bivalvia	*Ruditapes largillierti*		1	1	1	1
Bivalvia	*Leptomya retiaria retiaria*			1		1
Bivalvia	*Nucula cf gallinacea*			1		1
Bivalvia	*Theora lubrica*		1			1
Bryozoa	*Watersipora* spp.			1	4	
Bryozoa	*Bugula* sp	Bryozoan				
Bryozoa	*Bryozoa (encrusting)*			3	5	5
Chlorophyta	*Enteromorpha* sp.			2		
Chlorophyta	*Rhizoclonium* sp		1			
Chlorophyta	*Ulva lactuca*	Sea lettuce				
Chlorophyta	*Ulva* sp.	Sea lettuce	1	4	4	5
Cirripedia	*Austrominius modestus*	Estuarine Barnacle			4	1
Copepoda	Copepoda	Copepods	1			
Crustacea	Notostraca	Tadpole shrimps		1		
Cumacea	Cumacea	Cumaceans				
Decapoda	*Hemigrapsus crenulatus*	Hairy-handed Crab - Mud Crab	2	3	4	
Decapoda	*Helice crassa*	Tunnelling - Mud Crab	1	2	1	
Decapoda	*Alpheus* sp.	Snapping shrimp		1		
Decapoda	*Petrocheles spinosus*	spiny Half crab		1		
Decapoda	*Halicarcinus whitei*	Pill-box Crab			1	
Decapoda	Decapoda (larvae unid.)	Unidentified Crab Larvae				
Decapoda	*Petrolisthes elongatus*	Half crab				5
Decapoda	*Palaemon affinis*	Estuarine Prawn			4	4
Decapoda	*Halicarcinus cookii*	Pill-box Crab	2	3	1	3
Decapoda	*Pinnotheres novaezelandiae*	Mussel Pea Crab			5	3
Decapoda	*Macrophthalmus hirtipes*	Stalk-eyed Mud Crab	1	3		3
Decapoda	*Pantophlus australis*	Shrimp				3
Decapoda	*Notomithrax peronii*					2
Decapoda	*Pagurus* sp.	Hermit Crab				2

Decapoda	*Halicarcinus varius*	Pill-box Crab	1	2	1	1
Diptera	Orthocladiinae	midges		1	1	
Gastropoda	*Turbo smaragdus*	Cat's Eye (Ataata)		4	5	
Gastropoda	*Caecum digitulum*		2	2	3	
Gastropoda	*Eatoniella* sp.			3	4	
Gastropoda	*Diloma subrostrata*		2	2	2	
Gastropoda	*Nodilittorina antipodum*	Banded periwinkle		2	2	
Gastropoda	*Zeacumantus subcarinatus*	Small Mud Snail		3	1	
Gastropoda	*Onchidella nigricans*			3		
Gastropoda	*Zeacumantus lutulentus*	Spireshell		3		
Gastropoda	*Risellopsis varia*	Crevice Snail		2		
Gastropoda	*Maoricolpus roseus roseus*			1		
Gastropoda	*Siphonaria cookiana*	Siphon limpet		1		
Gastropoda	Gastropoda Unid.	Unidentified gastropod	1			
Gastropoda	*Cominella glandiformis*	Mud Flat Whelk			1	
Gastropoda	*Cominella virgata*				1	
Gastropoda	*Diloma zelandica*		1			
Gastropoda	*Amphibola crenata*	Mud Snail				
Gastropoda	*Trochus tiaratus*					
Gastropoda	Gastropoda (micro snails)	Unidentified gastropod	1	4	5	5
Gastropoda	*Eatoniella limbata*			3		5
Gastropoda	*Micrelenchus tenebrosus*	Grazing snail	2	5	4	4
Gastropoda	*Lepsiella scobina*	Oyster borer				4
Gastropoda	*Notoacmea helmsi*	Limpet	3	2	3	1
Gastropoda	*Turbonilla* sp.		1	1		1
Gastropoda	*Alloiodoris lanuginata*					1
Gastropoda	*Sigapatella novaezelandiae*					1
Hydrozoa	Hydroida (thecate)					
Hydrozoa	Hydroida (athecate.)					5
Hydrozoa	Sertulariidae				1	1
Insecta	*Philanisus plebeius*	Caddisfly larvae	2	2	1	
Isopoda	*Paravireia* sp.		4	3	2	
Isopoda	*Sphaeroma quoyanum*			1		
Mysidacea	Mysidacea	Mysid shrimp				1
Nematoda	Nematoda	Roundworm	2	5		1
Nemertea	Nemertea	Proboscis worms	1	1		1
Nudibranchia	*Doriopsis flabellifera*			1		
Nudibranchia	*Dendrodoris citrina*			1		3
Oligochaeta	Oligochaeta	Oligochaete worms	1			
Ophiuroidea	Ophiuroidea	Brittle stars	1			2
Opisthobranchia	*Haminoea zelandiae*	Bubble shell		2		
Opisthobranchia	*Flabellina albomarginata*					2
Osteichthyes	*Grahamichthys radiata*	Grapham's gudgeon				
Osteichthyes	*Forsterygion* sp.	Triplefin				
Osteichthyes	*Forsterygion nigripenne*	Estuarine Triplefin	1		1	1
Osteichthyes	*Notolabrus celidotus*	Spotty				1
Ostracoda	Ostracoda	Ostracods	4	3	3	3
Phaeophyta	*Colpomenia peregrina*		1	2	1	
Phaeophyta	*Punctaria latifolia*	Brown seaweed		1		
Phaeophyta	*Scytosiphon lomentaria*			1		

Phaeophyta	*Halopteris congesta*		1			
Phaeophyta	*Undaria pinnatifida*					4
Platyhelminthes	Platyhelminthes	Flat Worm	1	1		2
Polychaeta: Ampharetidae	Ampharetidae					
Polychaeta: Capitellidae	*Heteromastus filiformis*		3	1		1
Polychaeta: Cirratulidae	Cirratulidae		2	1	3	
Polychaeta: Dorvilleidae	Dorvilleidae			1		1
Polychaeta: Glyceridae	Glyceridae		3	1	1	1
Polychaeta: Hesionidae	Hesionidae		1	1		1
Polychaeta: Lumbrineridae	Lumbrineridae			1		
Polychaeta: Maldanidae	Maldanidae	Bamboo Worms				
Polychaeta: Nephtyidae	*Aglaophamus macroura*					
Polychaeta: Nereidae	*Perinereis camiguinoides*			1	1	
Polychaeta: Nereidae	*Platynereis australis*		1			
Polychaeta: Nereidae	Nereidae	Rag worms	2	3	4	2
Polychaeta: Nereidae	*Perinereis vallata*			1	1	1
Polychaeta: Opheliidae	*Armandia maculata*		3	3	1	3
Polychaeta: Orbiniidae	*Scoloplos cylindrifer*		1	1		1
Polychaeta: Oweniidae	*Owenia petersenae*	Polychaete				1
Polychaeta: Paraonidae	Paraonidae		4	1	1	
Polychaeta: Pectinariidae	*Pectinaria australis*					1
Polychaeta: Phyllodocidae	*Eulalia microphylla*			1		1
Polychaeta: Polynoidae	Polynoidae	Scale worms	1	4	3	2
Polychaeta: Sabellidae	Sabellidae	Umbrella worms		1	1	
Polychaeta: Scalibregmidae	*Scalibregma inflatum*		1	1		
Polychaeta: Serpulidae	*Pomatoceros* sp.		1	4	1	1
Polychaeta: Spionidae	*Aonides* sp.		1	1		
Polychaeta: Spionidae	*Prionospio* sp.		4	3	3	1
Polychaeta: Syllidae	*Sphaerosyllis* sp.		5	4	1	1
Polychaeta: Syllidae	Syllidae			4	3	1
Polychaeta: Terebellidae	Terebellidae		2	1	1	
Polyplacophora	*Acanthochitona violacea*	Chiton	1	3	3	
Polyplacophora	*Chiton glaucus*	Green Chiton	2	2	1	2
Polyplacophora	*Leptochiton inquinatus*		1	1		2
Polyplacophora	*Ischnochiton maorianus*	Variable Chiton -	1			1

		Active Chiton				
Pycnogonida	Pycnogonidae					
Rhodophyta	*Gelidium caulacantheum*		1	3	3	
Rhodophyta	*Gracilaria chilensis*				5	
Rhodophyta	*Hildenbrandia kerguelensis*		2		3	
Rhodophyta	*Gigartina atropurpurea*				4	
Rhodophyta	*Gigartina* sp.		1	2		
Rhodophyta	*Callithamnion* sp.		3			
Rhodophyta	*Nemastoma laciniata*	Red seaweed			2	
Rhodophyta	*Rhodymenia* sp.			1		5
Rhodophyta	Coralline Paint	Coralline Paint	2	3	2	4
Rhodophyta	*Gracilaria* sp.		1	5		3
Rhodophyta	*Rhodymenia dichotoma*			1		3
Rhodophyta	*Coralline officinalis*		4	3	5	1
Rhodophyta	*Ceramium apiculatum*	Red seaweed	1	4	5	1
Rhodophyta	*Gigartina circumcincta*			2	4	1
Rhodophyta	*Caloglossa leprieurii*					1
Sipuncula	Sipuncula	Peanut Worm		2		