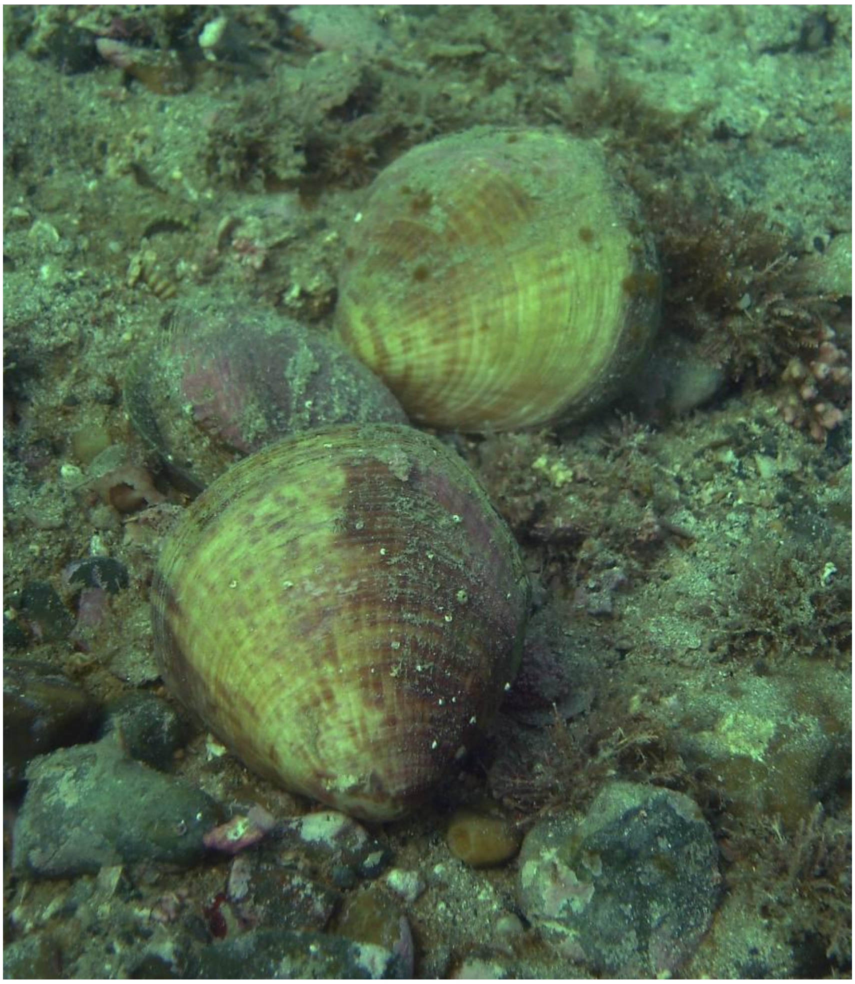
Benthic-invertebrate diversity of *Tucetona laticostata* (Mollusca: Bivalvia) biogenic substrata in Hauraki Gulf



Severine E. A. Dewas

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Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Signed:

Severine Dewas

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Preface

"Temperate marine ecosystems are some of the most productive and diverse of all ecosystems. Over the past century the resources contained within these communities have been subjected to gross mismanagement. They are continually subjected to threats from multiple stresses imposed mostly by human activities, predominantly as a result of increased population growth. Furthermore, because subtidal and offshore coastal marine communities are not easily observed, their deterioration often goes mostly unnoticed. Impacts from stresses on coastal marine communities are manifested at the individual species level, but magnify in effect throughout the entire ecosystem because of complex inter-connected relationships between species at different trophic levels, including interactions such as predation, competition and mutualism. Therefore, one missing species or group of species may have unpredictable direct or indirect consequences through secondary effects on the ecosystem, possibly leading to the loss of a few to many species. Rather than striving to maintain some specific level of diversity, we should endeavor to understand the basic ecological processes that control populations, communities and ecosystems so we can best predict what kinds of stresses will cause the most serious alterations to the system and avoid them. In addition, we should be conservative about protecting systems even before we understand the processes fully" (Suckanek 1994).

Abstract

Marine ecosystems are increasingly being subject to human impact from diverse recreational and commercial activities, not necessarily restricted to those of a marine nature. This has significant implications for biodiversity.

The large dog cockle, *Tucetona laticostata*, once occurred live in Rangitoto Channel, Hauraki Gulf, although this species no longer appears to occur there, most likely as a consequence of repeated dredging and channel excavation and continued siltation. *Tucetona laticostata* still occurs in a few isolated pockets of sea bed throughout Hauraki Gulf, particularly off Otata Island, part of the Noises complex of islands, where it resides partially buried in shell and rock gravels in shallow water (to 15 metres depth). The shells of *T. laticostata* collect in large post-mortem deposits in an area ramping from the sea bed off southwestern Otata Island. These mounds differ significantly in structural complexity from those of adjacent, extensively fragmented shell and rock gravels.

Using the mounds of *T. laticostata* shell as a proxy for structural complexity, in order to appraise the effect of complexity on benthic-invertebrate diversity, the sea bed off southwestern Otata Island was sampled quarterly at two depths and in both *T. laticostata* shell mounds and adjacent extensively fragmented shell and rock gravels. These data were complemented with those from additional surveys around Otata Island, and off eastern Motutapu Island to determine the distribution and composition of benthic-invertebrate community assemblages throughout the region, and from concurrent surveys throughout the Waitemata Harbour and inner Hauraki Gulf to determine the current distribution of *T. laticostata* in this region.

The number of benthic invertebrate species and individuals within *T. laticostata* habitat almost always was higher than that occurring within extensively fragmented shell- and rock gravel habitat, with densities to 142,385 individuals m^{-2} encountered. Temporal and spatial variations in benthic community structure also are reported for the two habitats, *T. laticostata*-based shells and extensively fragmented shell- and rock gravels.

The numbers of species were higher amongst samples collected off the southwestern and eastern sides of Otata Island than elsewhere around this island, or of eastern Motutapu Island. Of the 351 species reported from all Otata and Motutapu Island samples combined, 73% of them occurred off southwestern Otata Island, 30% of which were found exclusively within *T. laticostata* shell habitat, and 10.5% within extensively fragmented shell and rock gravel habitat.

The sea bed off southwestern Otata Island is regularly, seasonally dredged by recreational scallop fishers, in addition to being a popular small-vessel anchorage site. Both of these activities, dredging and anchorage, stand to reduce substratum complexity by fragmentation and dispersal of the valves of *T. laticostata*. Given the unique benthic invertebrates reported from *T. laticostata* shell deposits reported from southwestern Otata Island, any activity that damages the shells of this species, regardless of whether they are live or dead, is likely to result in loss of biodiversity. Admittedly, many of species identified as major contributors to differences in benthic invertebrate assemblages between *T. laticostata* shell-based habitats and those of extensively fragmented shell and rock gravels are not particularly charismatic or large, but each likely plays a role in local food webs and/or sediment and water column chemistry.

It was not the intention of this research to determine the effects of anthropogenic disturbances like dredging or vessel anchorage on benthic-invertebrate communities off southwestern Otata Island. However, given the reported differences in species diversity within the structurally complex substratum provided by *T. laticostata*, conservation of biogenic reef-forming species like it might be a prudent, precautionary measure to take.

Introduction

The marine environment around Auckland, throughout the Hauraki Gulf, has been extensively modified by development (residential and industrial), discharge, spoil and munitions disposal, pollution, fisheries, recreational activities, and waves of incursion of marine invasive species. However, without baseline data, the effect these disturbances have had on biodiversity cannot be quantified, and the biodiversity of the region is otherwise poorly known.

Otata Island, part of the Noises complex of islands situated in the outer Hauraki Gulf, New Zealand, lies approximately 22 km northeast of Auckland. The islands are surrounded by relatively clear water, reefs, and depths of approximately 20–30 m. The seabed between about 5 and 8 m depth is characterized by extensive shell and rock gravel, interspersed with substantial deposits of shells of the large dog cockle, *Tucetona laticostata* (Quoy and Gaimard, 1835) (Fig. 1), a species formely known as *Glycymeris laticostata*; these deposits are colonised by diverse epibiont communities. Adjacent to mounds of *T. laticostata* the sea bed comprises fragmented and less structurally complex shell gravel (Fig. 2).

Figure 1: *Tucetona laticostata* habitat, southwestern Otata Island, water depth 5 m.

Figure 2: *Tucetona laticostata* habitat, and adjacent fragmented shell gravel, southwestern Otata Island, 7 m water depth.

The large thick-shelled bivalve *T. laticostata*, has a recognised, extant distribution extending from Cape Reinga to Stewart Island, southern New Zealand, extending east to Chatham Islands; it is known from shallow water to about 73 m depth, occurring partly buried in coarse sand and gravel (Powell 1979). The species generally is restricted to clean-swept areas of high flow speed, particularly in channel environments and off headlands. Elsewhere it is recorded from southeastern Australia, although as empty worn shells only (Lamprell and Whitehead 1992). The species *T. laticostata* is one of two extant species in the family Glycymerididae in New Zealand waters. The second, *Glycymeris modesta* (Angas, 1879), is considerably smaller and more delicate. Both species have similar bathymetric and geographic distributions (Powell 1979).

Live *T. laticostata* have also reported from between North Cape and Cape Reinga (Keane 1986, Cryer *et al*. 2000); the southern part of the gravel habitat southwest of Seagull Island, Mimiwhangata, north Auckland, where it reaches densities of >80 individuals m^{-2} (Kerr and Grace 2005); off the northeastern and western coasts (10–15 m) of Great Barrier Island (Department of Conservation 2004, Auckland Regional Council 2004); and at Separation Point in Tasman Bay, at depths less than 30 m (Grange *et al*. 2003). Elsewhere it has been reported off the entrance to Manukau Harbour, Hawkes Bay, Wanganui, Cape Farewell; in Tasman Bay; off Cape Palliser, Timaru, Oamaru; near Bligh Sound; off the entrance to Doubtful Sound, Chalky Inlet, Te Waewae Bay; on Puysegur Bank; and from the Otago Peninsula to south of Stewart Island (McKnight 1969).

In the *Tawera*-*Tucetona* formation throughout Hauraki Gulf in the early 1930's, Powell (1937) identified *T. laticostata* as one of the dominant species (Powell 1937), although such a formation has not been subsequently reported (Roberts 1990, Hayward *et al*. 1997). (Postcript November 2008: five live juvenile *T. laticostata* were collected from 5 meters depth off Rangitoto Beacon during sampling conducted in October 2008. (personnal observation)) This species also has been described as characterising a *Tucetona–Purpurocardia* (as *Venericardia*) *purpurata* 'community' throughout the Tasman and Golden Bay region (Handley 2006).

Despite the size, local abundance and extensive distribution of *T. laticostata*, almost nothing is known of its biology or longevity, and it has not been the subject of any detailed ecological study. What research has been undertaken on *T. laticostata* in New Zealand generally has been of a paleontological nature (e.g., Marwick 1923; Neef 1992; Gammon 1995; Hayton *et al*. 1995; Gillespie and Nelson 1996; Abbott 1997; Gillespie *et al*. 1998; Brook 1999; Bland *et al*. 2004; Hendy and Kamp 2004, 2007; Beu 2004, 2006; Abbott *et al*. 2005), wherein the relative abundance and systematics of *T. laticostata* and associated species in various geological formations is reported. Recent and fossil species associated with *T. laticostata* consistently include those in the genera *Tawera* and *Purpurocardia* (Powell 1940, Gammon 1995, Gillespie and Nelson 1996); *Talochlamys*, *Purpurocardia, Celleporina*, and *Celleporaria* (Gillespie *et al*. 1998), and *Ostrea* (Hendy and Kamp 2004, Abbot *et al*. 2005). Abbott *et al*. (2005) also found the *Tiostrea*-*Tucetona* community to be high in species diversity, attributed to a stable environment, lack of terrigenous sedimentary input, and wide range of niches available on a shelly ground substrate.

Seabed communities throughout the outer Waitemata Harbour and Hauraki Gulf have been surveyed on several occasions (e.g., 1926 to 1936, 1993 to 1995, and 2006 to 2008): Powell (1937), Hayward *et al*. (1997), and Auckland University of Technology (2006–08, unpublished). Powell reported a *Tucetona* 'community' within Rangitoto Channel, in addition to locations off the Noises group of islands, western Waiheke, and north of Motuihe Island. Although Hayward *et al*. (1997) intimated that *Tucetona* in

Powell's *Tucetona* community may not have been live (Powell (*loc. cit.*) did not specifically state that they were live), one photograph depicted a live animal, at least two live individuals were collected in one of his stations (Hayward *et al*. 1997); Powell also referred to their dead shells as creating habitat for myriad smaller invertebrates (p. 380). It is known that Powell's *Tucetona* community did contain live individuals of *T. laticostata* (Hayward *et al*. 1997).

Roberts (1990) surveyed Rangitoto Channel to assess the effects of spoil disposal on seabed communities in this region. No live *T. laticostata* were encountered in any of his samples, although relictual deposits of *Tucetona* were common (Roberts 1990, O'Shea pers com.). Hayward *et al*. (1997) similarly did not locate live *T. laticostata* in Rangitoto Channel, surveying 78 locations. Even more recently, (AUT unpub), 96 additional samples taken from within and adjacent to Rangitoto Channel in areas earlier surveyed by Powell (1937), Roberts (1990) and Hayward *et al*. (1997), also failed to locate live individuals, and recorded only five bioeroded and one recent-looking fragments. Remarkably, two extensively bioeroded fragments of the extinct (in New Zealand) thick-shelled bivalve *Anadara trapezia* (Deshayes, 1840) also were taken in these shell residues, indicating the relictual nature of at least some sediment-surface shell deposits in this channel.

The primitive, palaeotaxodont hinge and robust shell of *Tucetona* renders it particularly resistant to damage, even in the high energy environments within which both the live animals exist and shells accumulate. Although *T. laticostata* likely lives for approximately 100 years (*sensu* Ramsay *et al*. 2000), their valves could well persist for many thousands of years, given the smaller, more fragile valves of *Tawera spissa* collected from the sea bed surface on the Wanganui shelf have been radiocarbon dated at 12,250 ± 230 yr BP (Gillespie *et al*. 1998). The valves of *T. laticostata* collected from the Wanganui shelf have been carbon-dated at 9,170 ± 210 yr BP (Gillespie 1998), and those from surface, relictual deposits off the Bay of Plenty have been dated at 35,800 ± 2,250 yr BP (Beu 2004). Post mortem the shells of *T. laticostata* likely persist in an articulated state for decades, if not hundreds of years once encrusting communities have established upon and within the valves, although no supporting radiocarbon data are available.

The effects of dredging and other types of bottom fishing are now widely accepted to reduce habitat complexity and species diversity by impacting the substratum and sessile epifaunal species and associated taxa (Reise and Schubert 1987; Dayton *et al*. 1995; Collie *et al*. 1997; Auster 1998; Jennings and Kaiser 1998; Walting and Norse 1998; Turner *et al*. 1999; Kaiser *et al*. 2000; Bradshaw *et al*. 2000, 2001, 2003; Thrush and Dayton 2002). Macroinvertebrate density and species richness generally are positively correlated with structural complexity (Crowder and Cooper 1982, Diehl 1992, Grabowski 2004). Therefore, any disturbance that affects structural complexity is likely to result in loss of invertebrate diversity and abundance, and change the composition of communities associated with this structures. Mechanisms for damage include direct contact, overturning of stones to which epifauna is attached, mixing of epifauna into the sediment, and secondarily, smothering of epifauna by suspended sediment.

Despite the rapid rates of shell destruction that can be documented in modern environments, dead-shell assemblages in nearshore and shelf settings are age-mixtures that have commonly formed over thousands to tens of thousands of years (Kidwell 1997). As such, any damage to relictual substrata is likely to result in a loss in biodiversity, given these shell deposits could be non-renewable or non-replenishing. Biogenic deposits, such as those formed of accumulated articulated valves of *Tucetona* (Fig. 3), provide a temporally stable, structurally complex substratum upon and within which encrusting or epifaunal organisms establish, and other small-bodied organisms take refuge from predation, and physical or physiological stress (Gutierrez *et al*. 2003).

The seabed off Otata Island, particularly off the southwestern corner, is subject to annual and seasonal dredging and diving by recreational fishers hunting scallop, *Pecten novaezelandiae* Reeve, 1853, with scallops being relatively common between and amongst extensive mounds of live and dead *T. laticostata* (Fig. 4). In this region, dredging and anchoring could degrade surface deposits of *T. laticostata* shells, and accordingly sea-bed structural complexity and species diversity. The role of physical sea-bed complexity plays on macrobenthic communities has not been researched in this region, and neither have the effects of *T. laticostata* shell deposits on structuring macrobenthic community.

Figure 3: Articulated *Tucetona laticostata* valves and associated epibionts, southwestern Otata Island, 5 m water depth.

Figure 4: *Pecten novaezelandiae*, *Atrina zelandica* in *Tucetona* shell habitat, southwestern Otata Island, 5 m water depth.

The role of shell debris in increasing and maintaining biodiversity has been reported from New Zealand only for the large, but comparatively fragile bivalve *Atrina zelandica* (Gray, 1835) (Cummings *et al*. 1998, Norkko *et al*. 2001, Grange *et al*. 2003, Hewitt *et al*. 2005). The horse mussel, *A. zelandica* prefers low energy soft-sediment environments, although it too occurs around Otata Island (Fig. 4). Dead shells of this species around Otata Island are fragmented, and not encrusted with epibionts (pers obsv.) and contribute little structure to the sea bed throughout this region. Clear differences have been reported for macrofaunal assemblages in and outside of *A. zelandica* beds at Te Kapa Inlet and Martins Bay (Cummings *et. al*. 1998), with this species also reported to influence oxygen and nutrient fluxes (Hewitt *et al*. 2006), adding complexity to soft-sediment habitat by projecting into the water column and altering boundary-flow conditions, and by providing refuges and substrata for epifaunal settlement (Cummings *et al*. 2001).

The role *T. laticostata* plays in enhancing species diversity has not been previously studied, although it has been inferred for benthic invertebrate communities off northernmost New Zealand, offshore of Spirits Bay (Cryer *et al*. 2000). Accordingly, the objectives of this thesis were to determine whether *T. laticostata* shell on the sea bed surface, as a proxy for physical structural complexity, hosts elevated species diversity; and to determine whether the macrobenthic invertebrate communities associated with *T. laticostata* surface shell deposits differ in structure from those in adjacent, less-structurally complex sea-bed habitat.

Methods

Study area

Hauraki Gulf lies between the Hauraki plains and Coromandel Peninsula, off the East Coast of North Island, New Zealand (Fig. 5). AUT has recently undertaken intensive intertidal and subtidal surveys throughout this region (Figs. 6–10).

Prior to commencing this research and selecting an appropriate site at which to undertake research, reconnaissance dives were undertaken throughout Hauraki Gulf to locate beds of *T. laticostata*. Few areas at which dense *Tucetona* shell accumulations occurred at depths and locations that could be readily and safely surveyed by SCUBA were identified. Thus, to address the objectives of this research, the site off the southwestern corner of Otata Island, initially selected on grounds of reconnaissance dives, proved to be the most appropriate site then recognised at which to conduct this study, as it is one of few locations in Hauraki Gulf at which *T. laticostata* shell accumulations had been identified.

Sampling

Reconnaissance dives off southwestern Otata Island had identified two major sea-bed habitat types to occur: mounds of articulated *Tucetona* valves, interspersed with live individuals of *T. laticostata*; and adjacent, less-structurally diverse, fragmented shell-gravel plains. Both habitat types extended from depths of about 5 m to at least 8 m. The differences in sea-bed structure between these two substratum types were described, and the presence of *T. laticostata* valves was used as a proxy for structural complexity, rather than undertaking extensive grain-size analysis of sediments.

To determine temporal variation in macrobenthic-community structure of southwestern Otata Island, two locations were selected within the recognised distribution of *T. laticostata* in this region; one at 5 m depth (36°41.878'S, and 174°58.301'E) and one at 7 m depth (36°41.300'S, and 174°58.227'E). Within each major habitat, articulated *Tucetona* shell and fragmented shell gravel, quarterly, and at two depths (5 and 7 m), 83 samples in total were collected and analysed to determine temporal and spatial variation in species composition and abundance. A minimum of 3 and a maximum of 6 SCUBA-collected core samples were collected within each habitat type at each site over the course of 9 calendar months, spanning the Austral summer, autumn, winter and spring in accordance wih Table 1.

Table 1: Number of SCUBA-operated core samples collected by date and habitat type, southwestern Otata Island.

	SITE 1		**SITE 2**	
Survey date	*T. laticostata*	Shell gravel	*T. laticostata*	Shell gravel
25/01/07	3	3	3	3
04/04/07	6	6	5	6
28/06/07	6	6	6	6
19/09/07	6	6	6	6

To characterise the distribution of *T. laticostata* and associated benthic-invertebrate communities around Otata Island, a further 43 Van Veen grab samples were collected on 04/04/07; a further 46 grab samples were collected off eastern Motutapu Island on 23/03/07. Complementing these surveys are additional grab samples collected off eastern Waiheke Island, both eastern and western Browns Island (29/10/07), eastern Rakino Island (March 2008), and throughout Rangitoto Channel (February–March 2008) in habitat formerly classified in Powell's *Tucetona*-based community, in accordance with Table 2.

Table 2: Number of Van-Veen Grab samples collected by date and location, Hauraki Gulf.

	Location						
Survey date	Otata	Motutapu	Rakino	Waiheke (Western)	Waiheke (Eastern)	Motuihe (Western)	Rangitoto
23/03/07		46					
04/04/07	43						
29/10/07				21		15	
Feb-March 2008					200		115
March 2008			24				

In total, 464 sea bed samples were collected to characterise the current distribution of *T. laticostata* throughout Hauraki Gulf, and 172 samples for the purposes of characterising sea-bed communities around Otata and the adjacent Motutapu Island. A detailed inventory of species diversity and abundance for Otata and Motutapu Island SCUBA–collected core and Van Veen Grab samples only are reported herein.

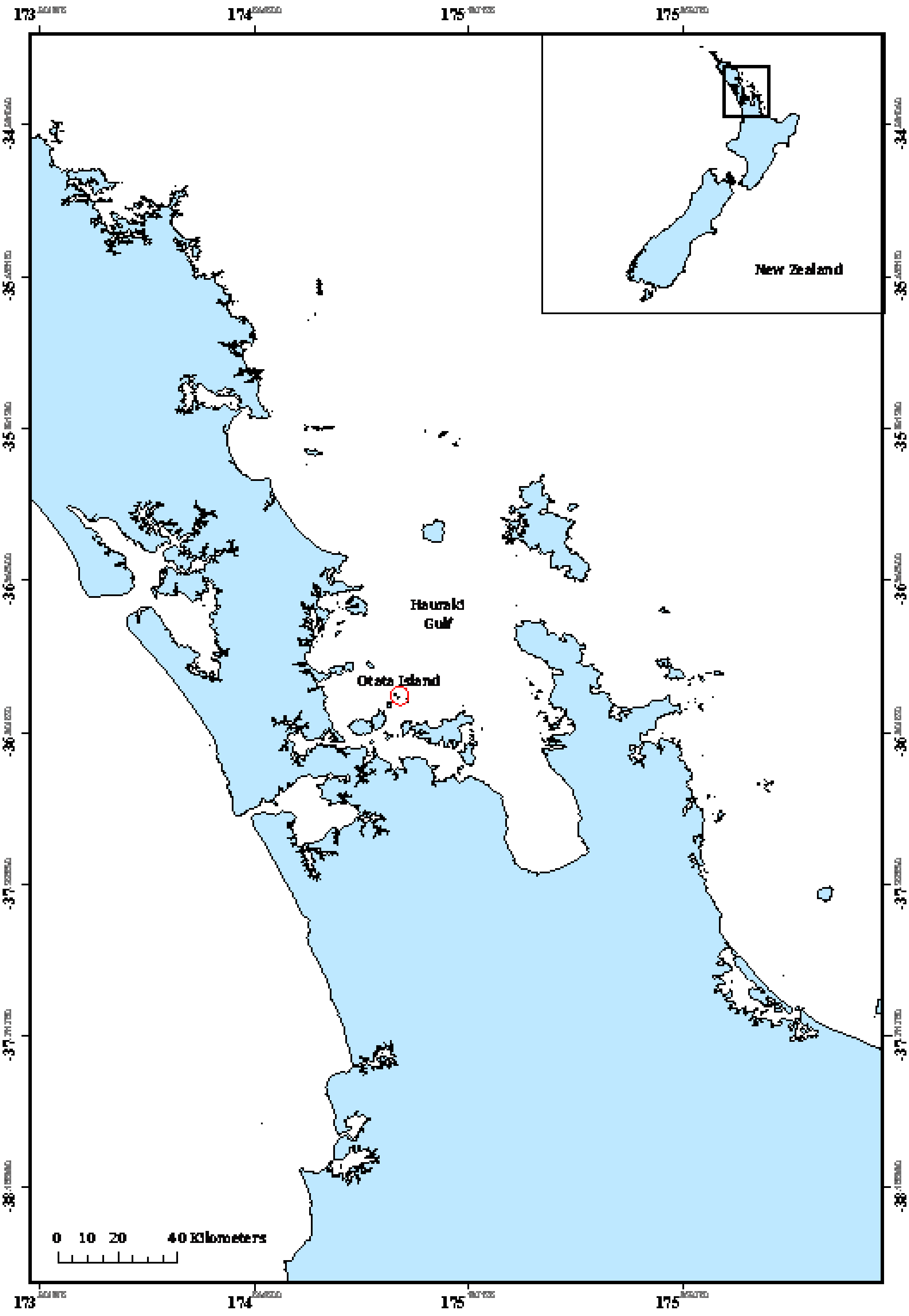

Figure 5: Survey area, Otata Island (red), Hauraki Gulf, New Zealand.

Concurrent with this exercise, additional sampling of intertidal and subtidal communities has been undertaken from Whangarei Heads in the north to Tauranga in the south, and off the west coast of Auckland. Full species inventories from these surveys populate a novel AUT Biodiversity database being developed, provisionally entitled ‘Monalisa’.

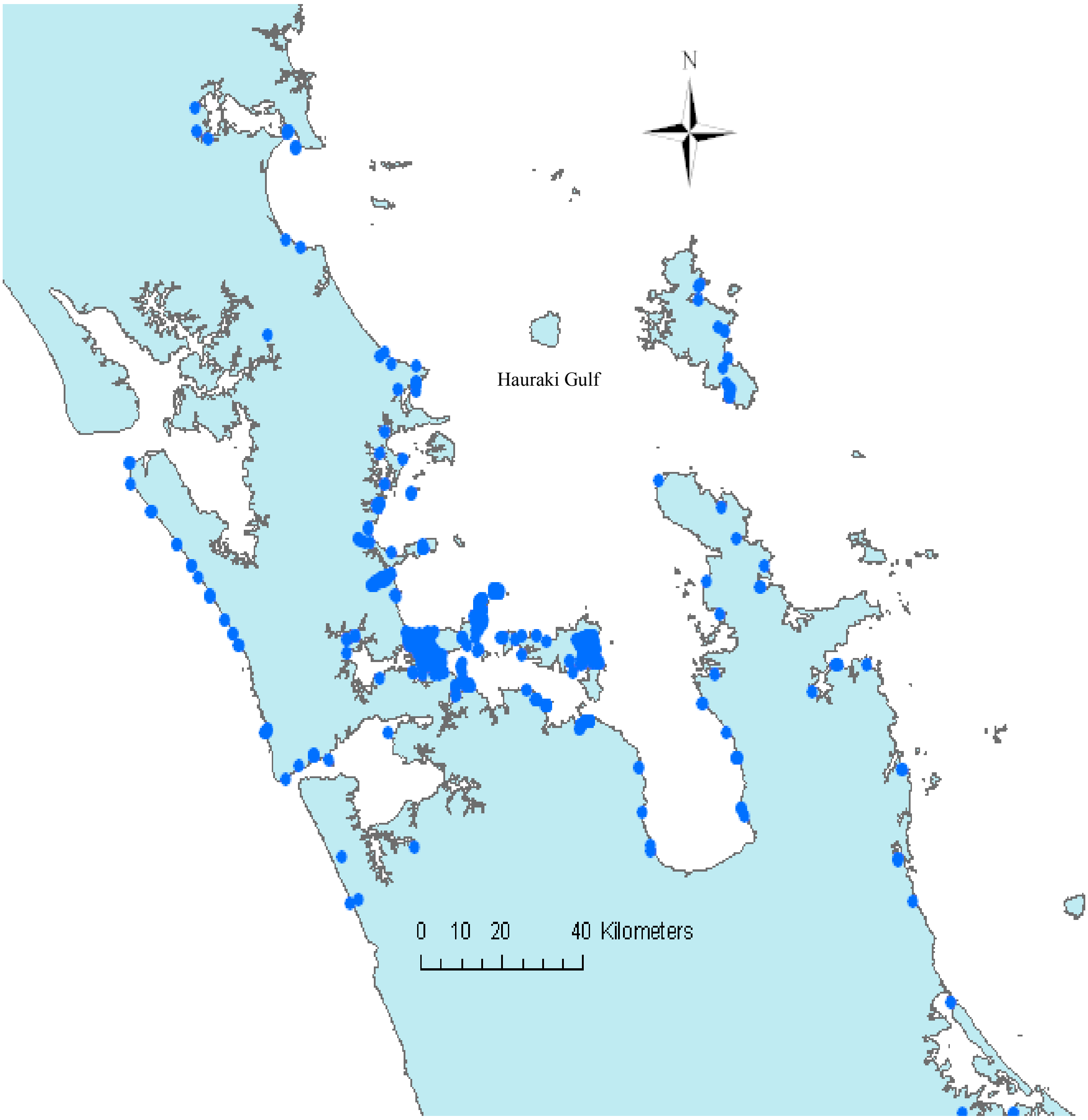

Figure 6: Map of 'Monalisa' survey sites (AUT unpub.). Circles depict stations at which intertidal and subtidal samples have been collected and analysed.

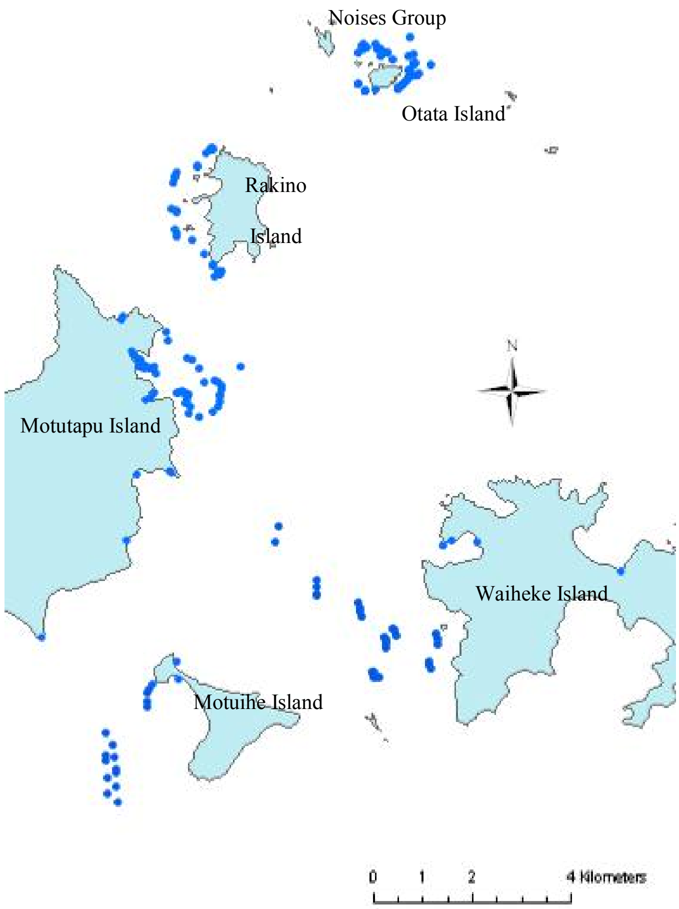

Figure 7: Distribution of Van Veen Grab sampling sites and intertidal sites sampled around Otata, Rakino, Motutapu and Motuihe Islands, 4 April 2007, March 2008, and 29 October 2007, New Zealand.

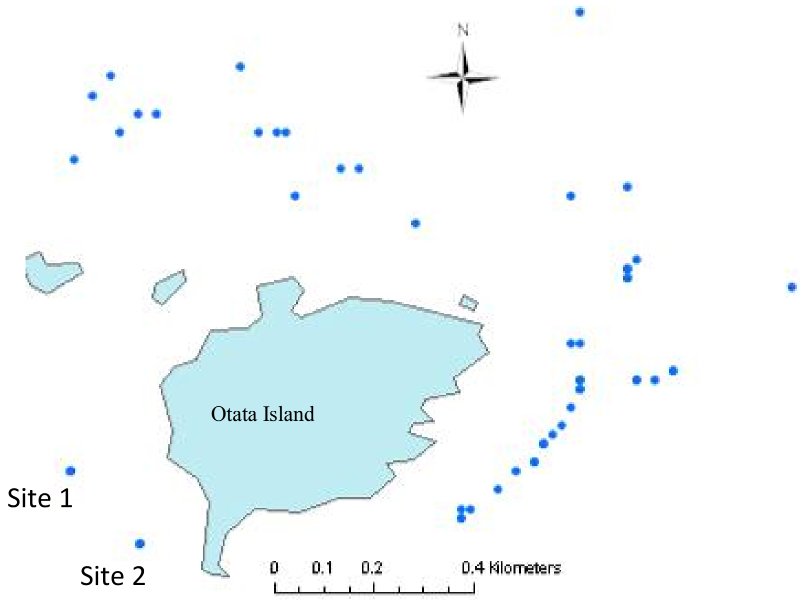

Figure 8: Distribution of Van Veen Grab sampling sites around Otata Island, 4 April 2007, New Zealand.

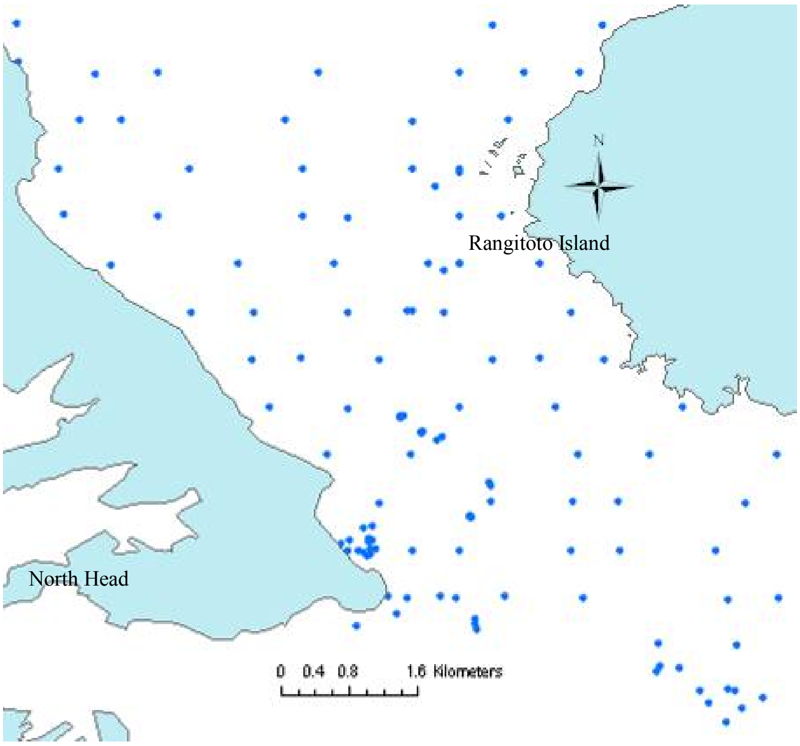

Figure 9: Distribution of Van Veen Grab sampling sites throughout Rangitoto Channel, February–March 2008, New Zealand.

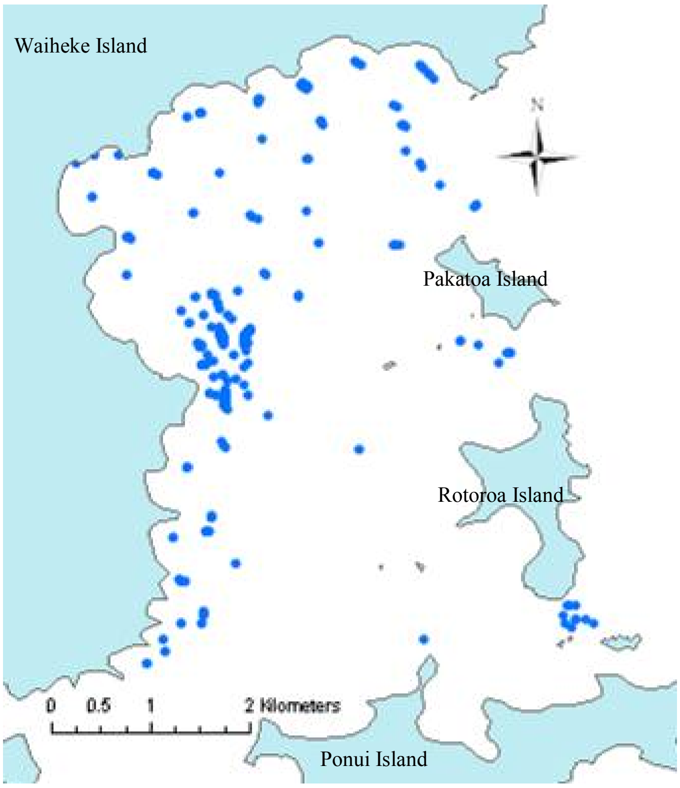

Figure 10: Van-Veen grab sampling sites, February–March 2008, of eastern Waiheke Island, Pakatoa, and Rotoroa Islands, New Zealand.

Sampling Equipment

Samples were collected with a VanVeen Grab or a SCUBA-operated core sampler. The Van Veen grab (Fig. 11) (KC Denmark, 12.110 with 4 lids) has a bite aperture of 0.24 × 0.14 m, and collects a sample of 0.0336 m^2 surface area. The depth to which this sampler bites depends upon grain size and degree of substratum compaction, and the volume of any sample therefore is subject to variation. The SCUBA-operated core sampler (Fig. 12) has a surface-sampling area of 0.013 m^2, and it too has limitations in the habitat in which it can be used, sampling anywhere from the upper 5−15 cm similarly depending upon substratum type and depth. Species abundances reported herein are presented in terms of sampled sea-bed surface area, 0.0336 m^2 (Van Veen Grab) or 0.013 m^2 (SCUBA-operated core).

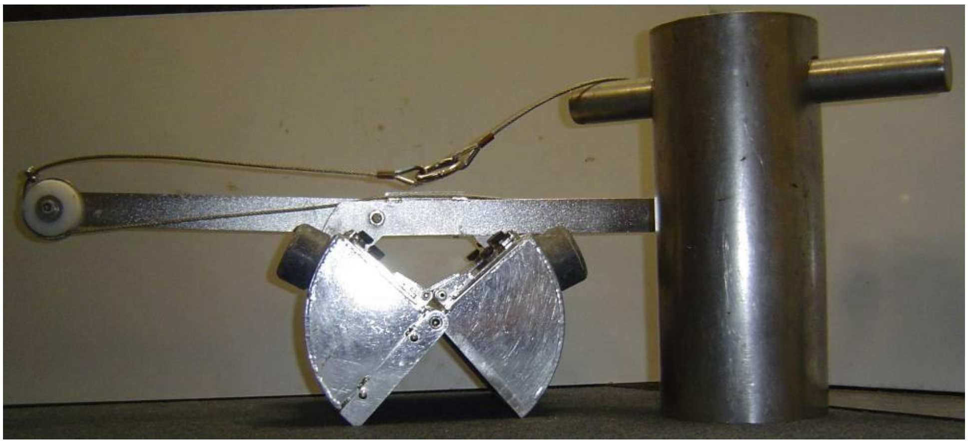

Figure 11: Van Veen Grab and SCUBA-operated core sampler.

Figure 12: Sampling of sea bed using SCUBA-operated core sampler, shell-gravel habitat, southwestern Otata Island, 7 m water depth.

Sampling collection and fixation

Upon collection each sample was labeled with a sample identifier relating it to GPS coordinate (Table 3), date, depth and habitat, then fixed in a 5% buffered (sodium bicarbonate) formalin-seawater solution, and double bagged. Samples were left for a minimum of 2 days to fix prior to sorting.

Table 3: Abbreviations used to identify samples referred to subsequently throughout text.

Abbreviation				
L1 and L2	**D1-D4**	**T1-T6**	**G1-G6**	**M and O**
Site 1 (7 m depth) and 2 (5 m depth)	Survey dates 1 - 4 (25/01/07, 04/04/07, 28/06/07, and 19/09/07, respectively)	*T. laticostata* habitat replicate number	Gravel habitat replicate number	Motutapu and Otata Islands

Sample sorting

Following fixation, all samples were sieved twice over 2 mm and 0.5 mm mesh (Endecott sieve). Coarse fractions retained in the 2 mm sieve were sorted by eye in a tray filled with freshwater — a process usually taking 0.5–2 h per sample. Fine fractions retained on the 0.5 mm sieve were sorted in a Petri dish filled with freshwater under a binocular dissecting microscope, usually taking 2–5 h per sample. Specimens were removed from all samples and placed into a plastic pottle and preserved in 40% isopropyl alcohol.

Following visual and microscopic sorting, 12 representative samples were elutriated to ensure that the sorting adequately removed at least 95% of fauna and flora contained within any sample. The elutriator is based on the design of Magdych (1981), manufactured out of PVC tube, with a sieve plate with 0.5 mm pores drilled through Perspex sheet.

Elutriation alone proved ineffective for separating encrusting and large-bodied macrofauna from structurally complex shell fractions, but was equally effective as visual and microscopic sorting at sorting small-bodied fauna from shell fragments. Accordingly, visual sorting, although more labour intensive, was the preferred, most accurate means of extracting >95% of species from samples, and was used for all samples herein reported.

Specimen identification

Where appropriate (with the obvious exception of large-bodied fauna), all invertebrate taxa have been identified using a combination of stereo and compound light microscopy.

In instances where fauna fragmented, only anterior or posterior/head or tail regions were counted, and the greatest number (but not both) determined to estimate density of any given taxon. This is particularly important for polychaete taxa that are subject to damage during sample collection, fixation and subsequent sorting. In instances where neither head nor tails of polychaete taxa were included within or sorted from any sample, details of parapodial and setal structure were determined by light (compound) microscopy, and compared against vouchers taken from anterior, central and posterior body regions of intact specimens to identify species; in instances where fragments only were included, unless it was obvious that more than one individual was represented in any given sample (based on relative size, sex, colour, or other obvious anatomical condition of any fragments), counts are arbitrarily assumed to be one. Only individual colonies of colonial species have been enumerated.

In instances where either male (e.g. Pycnogonida) or female (Polychaeta, Crustacea) invertebrates obviously had been brooding, the abundances of certain species sometimes are elevated given brood disassociation from parents during sample collection, fixation or subsequent sorting.

Given a general dearth of systematic monographs for Polychaeta and many Arthropoda, many taxa cannot be identified to species, and in many instances genera. In such instances, taxa have been identified to the lowest common denominator, of species or species-specific enumerated unknown, and enumerated. Exceptions to this are all Amphipoda, Oligochaeta, Nematoda and most Porifera, each being treated as a single taxonomic unit. The Bryozoan fauna of this region was collected and sorted but could not be wholly identified in the time available to conduct this research; the bryozoan fauna of this region, with the exception of one species, is accordingly not included in the appraisal of species diversity or abundance.

A voucher set of all identified taxa, and those attributed a species-specific enumerated unknown have been accessioned into the biological collections at AUT.

GIS analysis

The GIS work was done using the Arc View 9, version 9.2 (ESRI).

An Excel table including GPS coordinates and species diversity was used to create an attribute table and layers into Arc Map. Natural Breaks (Jenks) classification drew quantities using symbol size to show relative species diversity. The layer created was displayed over a scanned colored map (A05324).

Statistical analysis

The method of choice for multivariate representation of community structure is often non-metric multi-dimensional scaling (MDS). This has great flexibility in accommodating biologically relevant definitions of similarity in species composition of 2 samples, and in preserving the rank-order relations amongst those similarities in the placing of samples in an ordination (Clarke and Ainsworth 1993).

The majority of the analytical techniques used are described in Clarke and Warwick (1994) and are included in the PRIMER package, a computer program developed at the Plymouth Marine Laboratory.

Indices of total individuals (N), total species (S), Margalef's index of species richness (d), Shannon-Wiener diversity index (H' loge), and Pielou's evenness index (J'), were computed using the DIVERSE dialog in Primer. Diversity indices aim at reducing the multivariate complexity of assemblage data into a single index. The species richness or total number of species (S) was dependant on sample size. Alternatively, *d* a measure of the number of species present for a given number of individuals which also incorporates the total number of individuals (N) was used. The Shannon-Wiener diversity index was calculated using the natural logarithm log to base e. This diversity index accentuated the species richness or equitability components of diversity to varying degrees. Equitability expressed as Pielou's evenness index measured how evenly the individuals were distributed among the different species.

Hill's diversity number is a measure of diversity used to estimate the number of species in a sample of size *n* individuals. The number of individuals in the collected grab samples varied between 2 and 1291; a single value of n= 150 was then chosen for the rarefaction indice ES(*n*).

Multivariate analysis followed methods of Clarke and Warwick (1994). Species abundances were square root-transformed to down-weight the effect of very abundant species, and similarity matrices were calculated with the Bray-Curtis similarity index. Data were presented graphically using multi-dimensional scaling (MDS) ordinations, and clusters (group average mode) were created using group average linking with the Bray-Curtis similarity measure. Two-way crossed analysis of similarity (ANOSIM, Clarke and Green 1988) and multiple pairwise comparisons were used to test for differences in species assemblages among the two different habitats sampled (*T. laticostata* and gravel). The analysis of similarity (ANOSIM) used a multivariate test that calculated similarities between groups. The R value ranges between -1 and +1; the closer to 0, the higher the similarity between and within groups.

To identify which species were largely responsible for any observed differences in species assemblages, SIMPER (similarity percentage) routines were performed using a Bray-Curtis dissimilarity on square-root-transformed abundance data. Species were listed in decreasing order of their importance (Clarke and Gorley 2001). The indicator species analysis (Appendix 2) provides a list of species contribution to within and across group similarity or dissimilarity.

Results

The total number of species collected around Motutapu and Otata Island is 351. A systematic breakdown, in accordance with the 'Integrated Taxonomic Information System,' of these taxa is presented in Tables 4–7.

Table 4: Annelida class, family, and species found in sediments of Motutapu and Otata Islands.

<u>Polychaeta</u>	
Ampharetidae	*Ampharete* sp.
Aphroditidae	*Aphrodita talpa*
Capitellidae	Gen. sp. 1
	Gen. sp. 2
	Gen. sp. 3
	Gen. sp. 4
	Gen. sp. 5
Chaetopteridae	*Chaetopterus* sp.
Chrysopetalidae	*Chrysopetalum* sp.
Cirratulidae	Gen. sp. 1
	Gen. sp. 2
	Gen. sp. 3
	Gen. sp. 5
	Dodecaceria berkelyi
Dorvilleidae	*Dorvillea australiensis*
Eunicidae	*Eunice* sp. 1
	Eunice sp. 2
	Eunice sp. 3
	Eunice sp. 5
	Gen. sp. 1
	Gen. sp. 2
	Marphysa depressa
	Nematonereis sp.
Flabelligeridae	*Brada* sp.
	Diplocirrus sp.
	Flabelligera affinis
Glyceridae	*Glycera americana*
	Glycera lamellipoda
	Glycera tesselata
	Hemipodus sp. 1
	Hemipodus sp. 2
Goniadidae	*Glycinde* sp.
	Goniada sp.
Hesionidae	*Ophiodromus angustifrons*
Lumbrineridae	*Lumbrineris sphaerocephala*
	Lumbrineris sp.
Maldanidae	*Asychis* sp.
	Macroclymenella stewartensis
	Gen. sp. 1
	Gen. sp. 2
	Gen. sp. 3
	Gen. sp. 4
	Gen. sp. 5
Nephtyidae	*Nephtys macroura*
Nereididae	*Nereis cricognatha*
	Perinereis nuntia
	Platynereis australis
Oenonidae	*Arabella* sp.
Onuphidae	*Diopatra* sp.
Opheliidae	*Armandia maculata*
	Ophelia sp.
Orbiniidae	*Orbinia papillosa*
Oweniidae	*Owenia fusiformis*
Paraonidae	*Aricidea* sp. 1
	Aricidea sp. 2
	Gen. sp. 1
Pectinariidae	*Pectinaria australis*
Phyllodocidae	*Eulalia* sp.
	Eteone sp.
	Gen. sp. 1
	Gen. sp. 2
	Gen. sp. 3
	Gen. sp. 4
	Gen. sp. 5
	Gen. sp. 6
	Gen. sp. 7
	Gen. sp. 8
	Gen. sp. 9
Pisionidae	*Pisione* sp.
<u>Polychaeta</u>	
Polynoidae	*Lepidastheniella* sp.
	Lepidonotus purpureus
	Lepidonotus sp.
Sabellidae	Gen. sp. 1
	Gen. sp. 2
	Gen. sp. 3
	Gen. sp. 4
	Gen. sp. 5
	Gen. sp. 7
Scalibregmidae	Gen. sp. 1
Serpulidae	*Galeolaria hystrix*
	Pomatoceros cf. *terranovae*
	Gen. sp. 1
	Gen. sp. 2
	Gen. sp. 3
	Gen. sp. 4
	Gen. sp. 5
Sigalionidae	*Psammolyce antipoda*
	Sigalion sp.
Sphaerodoridae	*Sphaerodoridium* sp.
Spionidae	*Prionospio* sp. 1
	Gen. sp. 1
	Gen. sp. 2
	Gen. sp. 3
	Gen. sp. 4
	Gen. sp. 5
	Gen. sp. 6
	Gen. sp. 7
	Gen. sp. 8
	Gen. sp. 9
	Gen. sp. 10
Syllidae	*Geminosyllis* sp.
	Sphaerosyllis sp.
	Gen. sp. 1
	Gen. sp. 2
	Gen. sp. 3
	Gen. sp. 4
	Gen. sp. 5
	Gen. sp. 6
	Gen. sp. 7
	Gen. sp. 8
	Gen. sp. 9
	Gen. sp. 10
	Gen. sp. 11
	Gen. sp. 12
	Gen. sp. 14
	Gen. sp. 15
	Gen. sp. 16
	Gen. sp. 17
	Gen. sp. 18
	Gen. sp. 19
	Gen. sp. 20
	Gen. sp. 21
	Trypanosyllis zebra
Terebellidae	*Amphitrite* sp.
	Gen. sp. 1
	Gen. sp. 2
	Gen. sp. 3
	Gen. sp. 4
	Gen. sp. 5
	Terebellides stroemi
Trichobranchida	*Trichobranchus* sp.
Indeterminate	Gen. sp. 1
	Gen. sp. 2
	Gen. sp. 3
	Gen. sp. 4
	Gen. sp. 5
	Gen. sp. 6
	Gen. sp. 7
	Gen. sp. 9
<u>Polychaeta</u>	
Indeterminate	Gen. sp. 10
	Gen. sp. 11
	Gen. sp. 12
	Gen. sp. 13
	Gen. sp. 14
	Gen. sp. 15
	Gen. sp. 16
<u>Oligochaeta</u>	Gen. et spp. indet.

Table 5: Arthropoda class, family, and species found in sediments of Motutapu and Otata Islands.

Arachnida

Halacaridae	Gen. sp. 1

Pycnogonida

	Gen. sp. 1

Malacostraca

Alpheidae	*Alpheus* sp.
Ampeliscidae	Gen. sp. 1
Anthuridae	Gen. sp. 1
	Gen. sp. 2
	Gen. sp. 3
	Gen. sp. 4
Arcturidae	Gen. sp.
	Neastacilla levis
Bodotriidae	*Cyclapsis argus*
	Cyclaspis cf. *thomsoni*
	Cyclaspis similis
Caprellidae	Gen. sp. 1
	Gen. sp. 2
Carpiliidae	*Pilumnus novaezelandiae*
Cirolanidae	Gen. sp.
	Eurylana arcuata
Crangonidae	*Pontophilus* sp. 2
Diastylidae	*Diastylis insularum*
Epialtidae	*Pyromaia tuberculata*
Geryonidae	*Liocarcinus corrugatus*
Gnathiidae	Gen. sp. 1
Hymenosomatidae	*Elamena momona*
	Halicarcinus cookii
	Halicarcinus innominatus
	Halicarcinus varius
Idoteidae	*Euidotia stricta*
Majidae	*Notomithrax minor*
Mysidae	Gen. sp. 1
Indeterminate	Gen. sp. 1 (Amphipoda)
	Gen. sp. 2 (Anomura)
	Gen. sp. 3 (Anomura)
	Gen. sp. 4 (Anomura)
	Gen. sp. 5 (Anomura)
	Gen. sp. 6 (Anomura)
	Gen. sp. 7 (Anomura)
	Gen. sp. 8 (Anomura)
	Gen. sp. 9 (Asellota)
	Gen. sp. 10 (Isopoda)
	Gen. sp. 11 (Isopoda)
	Gen. sp. 12 (Isopoda)
	Gen. sp. 13 (Valvifera)
Nannastacidae	*Nannastacus* sp.
Nebaliidae	*Nebalia* sp.
Pagurapseudidae	*Pagurapseudes* sp.
Palaemonidae	*Periclimenes yaldwyni*
Paranthuridae	*Paranthura punctata*
Phliantidae	*Iphinotus typicus*
Phoxocephalidae	*Paraphoxus* sp. 1
Pinnotheridae	*Pinnotheres novaezelandiae*
Porcellanidae	*Petrolisthes novaezelandiae*
Sphaeromatidae	*Ciliacaea dolorosa*
	Cymodocella sp.
Tanaidae	Gen. sp. 1
	Gen. sp. 2
	Gen. sp. 3
	Gen. sp. 4
	Gen. sp. 5
	Gen. sp. 6
Upogebiidae	*Upogebia hirtifrons*

Maxillopoda

Archaeobalanidae	*Balanus trigonus*
Indeterminate	Gen. sp. 1

Ostracoda

Indeterminate	Gen. sp. 1
	Gen. sp. 2
	Gen. sp. 3
	Gen. sp. 4
	Gen. sp. 5
	Gen. sp. 6
	Gen. sp. 7
	Gen. sp. 8
	Gen. sp. 9
	Gen. sp. 10
	Gen. sp. 11
	Gen. sp. 12
	Gen. sp. 13
	Gen. sp. 14
	Gen. sp. 15
	Gen. sp. 16
	Gen. sp. 17
	Gen. sp. 18
	Gen. sp. 19
	Gen. sp. 20
	Gen. sp. 21
	Gen. sp. 22
	Gen. sp. 23
	Gen. sp. 24

Table 6: Mollusca class, family, and species found in sediments of Motutapu and Otata Islands.

Bivalvia

Anomiidae	*Monia zelandica*
Arcidae	*Barbatia novaezelandiae*
Carditidae	*Purpurocardia purpurata*
Corbulidae	*Corbula zelandica*
Galeommatidae	*Galeommatacea* sp.
	Scintillona zelandica
Glycymerididae	*Tucetona laticostata*
Limidae	*Limaria orientalis*
Mactridae	*Scalpomactra scalpellum*
Mytilidae	*Musculista senhousia*
	Perna canaliculus
Nuculidae	*Nucula nitidula*
Ostreidae	*Ostrea* sp.
Pectinidae	*Chlamys zelandiae*
	Chlamys zelandona
	Pecten novaezelandiae
Pinnidae	*Atrina zelandica*
Psammobiidae	*Gari stangeri*
	Soletellina nitida
Semelidae	*Leptomya retiaria*
Ungulinidae	*Diplodonta striatula*
	Felaniella zelandica
Veneridae	*Dosinia maoriana*
	Dosina zelandica

Polyplacophora

Acanthochitonidae	Gen. sp. 1
	Craspedochiton rubiginosus
	Notoplax violacea
Chitonidae	*Chiton glaucus*
	Onithochiton neglectus
	Rhyssoplax stangeri
Ischnochitonidae	*Ischnochiton maorianus*
Leptochitonidae	*Leptochiton inquinatus*
Indeterminate	Gen. sp. 1
	Gen. sp. 3
	Gen. sp. 4

Gastropoda

Acmaeidae	Gen. sp. 1
Aeolidiidae	*Aeolidia* sp.
Buccinidae	*Buccinulum lineum*
	Cominella adspersa
	Cominella maculosa
	Cominella quoyana quoyana
	Cominella virgata
	Penion sulcatus
Calyptraeidae	*Dentimarga cairoma*
	Maoricrypta costata
	Sigapatella novaezelandiae
	Zegalerus tenuis
Cerithiopsidae	*Seila terebelloides*
Cingulopsidae	*Eatonina* sp.
Cylichnidae	*Cylichna thetidis*
Diaphanidae	*Diaphana brazieri*
Discodorididae	*Alloiodoris lanuginata*
Dorididae	*Aphelodoris luctuosa*
Eatoniellidae	Gen. sp. 1
Epitoniidae	*Epitonium minora*
Eulimidae	*Eulima* sp.
Fasciolariidae	*Taron dubius*
Fissurellidae	*Emarginula striatula*
	Gen. sp.
Lamellariidae	*Lamellaria ophione*
Marginellidae	*Marginella cairoma*
	Mesoginella koma
Mitridae	*Austromitra rubiginosa*
Muricidae	*Haustrum haustorium*
	Muricopsis octogonus
	Xymene gouldi
Naticidae	*Proxiuber australe*
Olividae	*Amalda australis*
	Amalda northlandica
	Amalda novaezelandiae
Philinidae	*Philine angasi*
Pisinna	*Estea impressa*
	Estea zosterophila
Pleurobranchidae	*Pleurobranchaea maculata*
Pyramidellidae	*Turbonilla* sp.
Rissoidae	*Powellisetia* sp.
Turbinidae	*Astraea heliotropium*
	Homalopoma cf. *fluctuata*
	Turbo smaragdus
Triphoridae	*Monophorus fascelinus*
Trochidae	*Cantharidus purpureus*
	Trochus tiaratus
	Trochus viridis
Indeterminate	Gen. sp. 1
	Gen. sp. 2
	Gen. sp. 3

Table 7: Chaetognatha, Chordata, Cnidaria, Echinodermata, Ectoprocta, Hemichordata, Nematoda, Nemertea, Phoronida, Platyhelminthes, Porifera, Priapulida, and Sipuncula class, family, and species found in sediments of Motutapu and Otata Islands.

Ascidiacea	
Indeterminate	Gen. et spp. indet.
Styelidae	*Styela clava*
Osteichthyes	
Gobiesocidae	*Dellichthys morelandi*
	Trachelochismus melobesia
Hydrozoa	
Indeterminate	Gen. sp. 1
	Gen. sp. 2
	Gen. sp. 3
Asteroidea	
Asterinidae	*Patiriella regularis*
Echinoidea	
Arachnoididae	*Arachnoides zelandiae*
Echinometridae	*Evechinus chloroticus*
Loveniidae	*Echinocardium australe*
Holothuroidea	
Chiridotidae	*Kolostoneura novaezelandiae*
	Trochodota dendyi
Cucumariidae	*Ocnus brevidentis*
Stichopodidae	*Stichopus mollis*
Stelleroidea	
Ophiactidae	*Ophiactis resiliens*
Gymnolaemata	
Chaperiidae	Gen. et sp. indet.
Enteropneusta	
Harrimaniidae	*Saccoglosus australiensis*
Indeterminate	
Indeterminate	Gen. sp. 1 (Chaetognatha)
	Gen. sp. 2 (Actinaria)
	Gen. sp. 3 (Nomatoda)
	Gen. sp. 4 (Nemertea)
	Gen. sp. 5 (Phoronida)
	Gen. sp. 6 (Phoronida)
	Gen. sp. 7 (Platyhelminthes)
	Gen. sp. 8 (Priapulida)
Calcarea	
Sycettidae	*Sycon* sp.
Demospongiae	
Indeterminate	Gen. sp. 1
Sipunculida	
Sipunculidae	Gen. sp. 1

Distribution of *T. laticostata* throughout Hauraki Gulf

Live specimens of the bivalve *Tucetona laticostata* occured at 11 subtidal locations around Otata Island, four subtidal locations west of Rakino Island, one subtidal location south of Rotoroa Island, one subtidal location east of Motuihe Island, and two intertidal locations around Waiheke Island (Fig. 13). Shells of this species were recorded from western Waiheke Island, in Rangitoto Channel (Fig. 14), and around Rakino Island. The highest *T. laticostata* density recorded was 461 individuals per m^{-2}, off Otata Island.

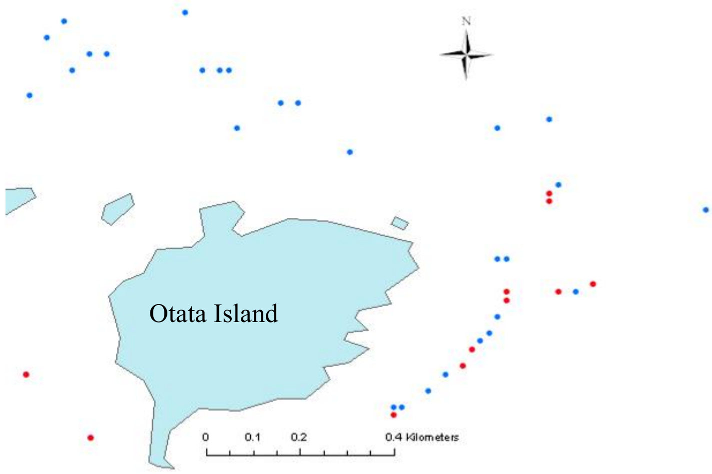

Figure 13: Locations sampled (blue) and locations where live *Tucetona laticostata* were found (red) around Otata Island, New Zealand.

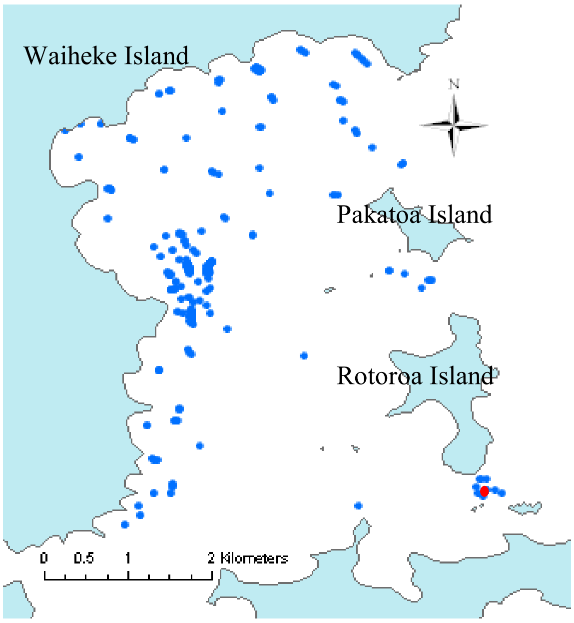

Figure 14: Locations sampled (blue) and locations where live *Tucetona laticostata* were found (red) around Rotoroa Island, New Zealand.

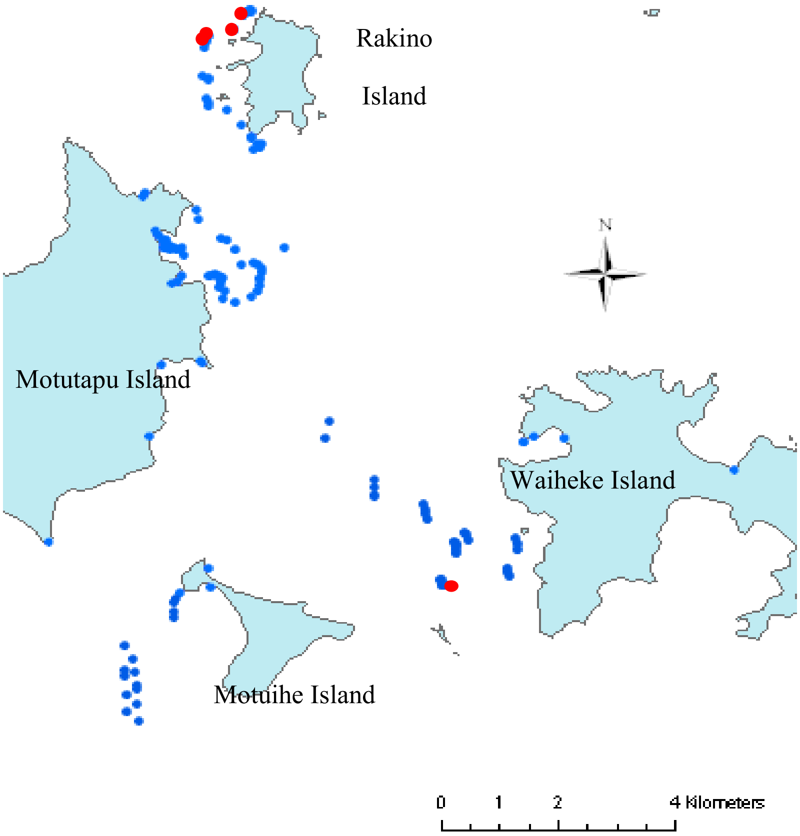

Figure 15: Locations sampled (blue) and locations where live *Tucetona laticostata* were found (red) off western Rakino Island and southwestern Waiheke Island, New Zealand.

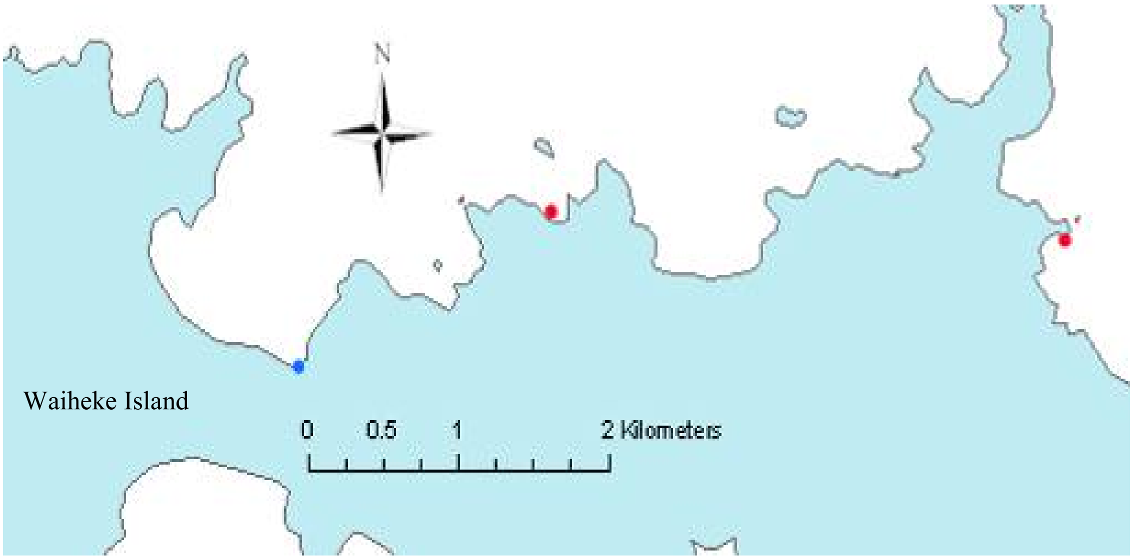

Figure 16: Locations sampled (blue) and locations where live *Tucetona laticostata* were found (red) around Waiheke Island, New Zealand.

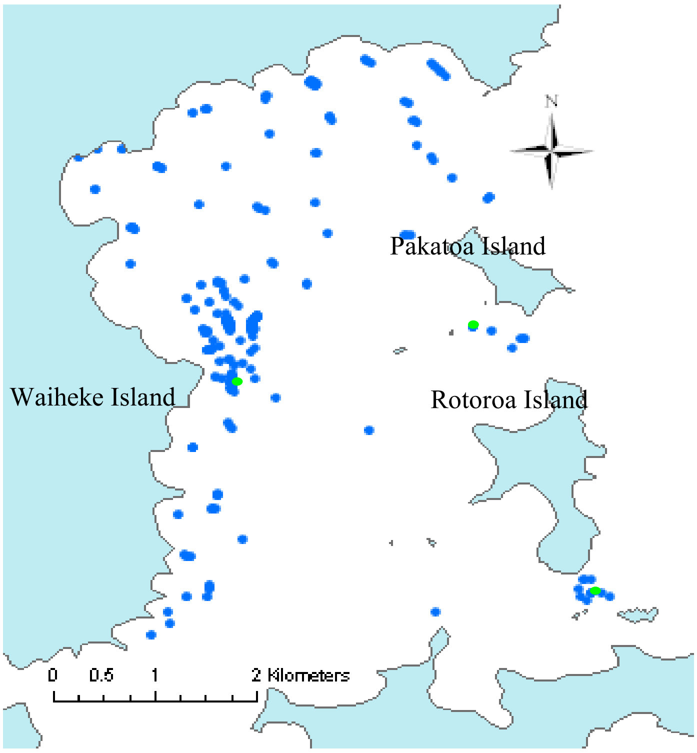

Figure 17: Locations sampled (blue) and *Tucetona laticostata* relictual shell locations (green) off Waiheke Island, New Zealand.

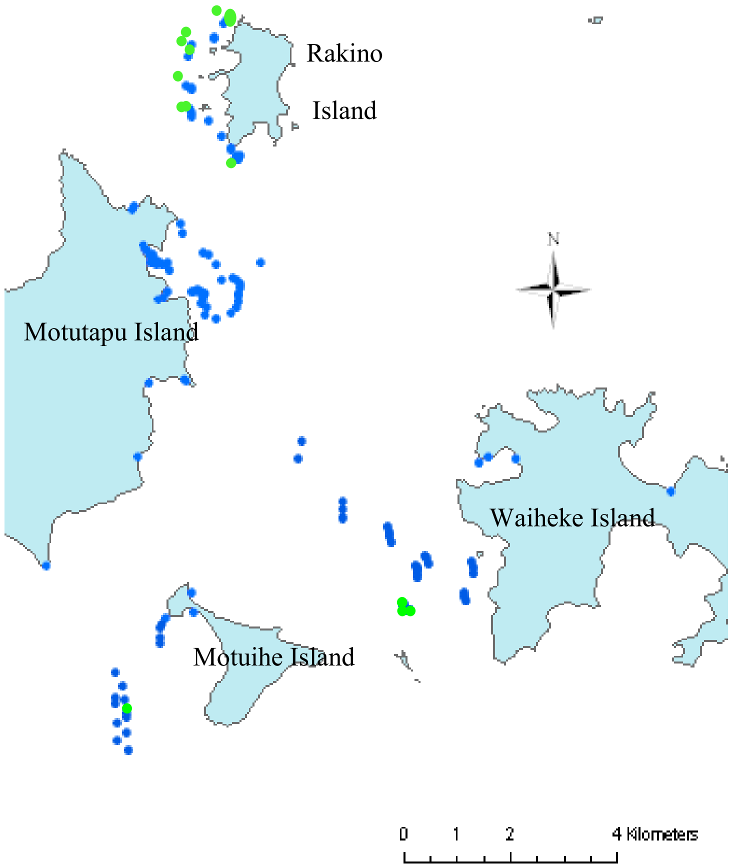

Figure 18: Locations sampled (blue) and *T. laticostata* relictual shell locations (green) off Motuihe and Rakino Islands, New Zealand.

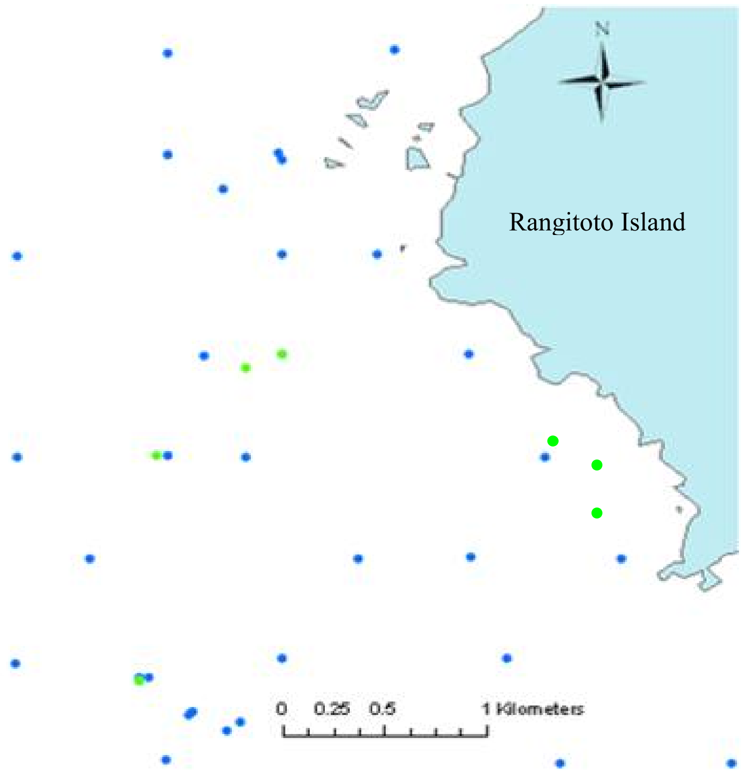

Figure 19: Locations sampled (blue) and *T. laticostata* relictual shell locations (green) in Rangitoto Channel, New Zealand.

Univariate analysis

Mean numbers of species and individuals were higher within *T. laticostata* habitat than gravel habitat. In total, 351 species were reported from all samples combined. Of these, 256 (73%) species occured off southwestern Otata Island, of which 30% of species occured exclusively within *T. laticostata* habitat, 10.5% of species exclusively within gravel substrate, and 59.5% of species were common to the two habitats.

The mean total species number, mean index of species richness, and mean diversity index of each habitat were all higher within site 1 than site 2. Shell-gravel habitat at sites 1 and 2 had maximum numbers of individuals of 104,538m^{-2} and 142,385m^{-2} respectively; figures for *T. laticostata* habitat at these same sites are 103,769m^{-2} and 136,692m^{-2} respectively. Gravel substrata contained more individuals at site 1 (47,846m^{-2}, compared to 43,007 m^{-2} in *T. laticostata* habitat); however at site 2, *T. laticostata* habitat contained more individuals (75,154m^{-2}, compared to 67,077m^{-2} in gravel habitat). The maximum numbers of species in samples collected at site 1 was 74 within *Tucetona laticostata* habitat and 65 within gravel habitat. At site 2, *Tucetona laticostata* habitat held a maximum number of 82 species, and gravel habitat held a maximum of 56 species per sample.

The mean total species number and mean index of species richness were higher at site 2 within *T. laticostata* on 19/09/07 than any other sampling date (Fig. 20). The mean total individual number was higher on the 28/06/07 in *T. laticostata* habitat at site 2. The mean diversity index was higher in January than the rest of the year. The mean evenness index was higher in April than other months. The highest total species number, 82, was recorded on 19/09/07 within *T. laticostata* habitat, the lowest of 24 on 25/01/07 within gravel habitat. The highest total individual number of 1,851(= 142,385 m^{-2}) was recorded in April and the lowest of 101 individuals per sample (=7,769 individuals m^{-2}) in January both within gravel habitat.

There are significant differences at site 1 between the mean values of Shannon-Wiener diversity index and Pielou's evenness index within gravel and *T. laticostata* habitats in January and June (Fig. 20).

At site 2 there was a significant difference between the mean numbers of species in gravel and *T. laticostata* habitats in both January and September. The mean values of Shannon-Wiener diversity index for gravel and *T. laticostata* habitats were significantly different in both June and September. Mean Margalef's index of species richness were significantly different between gravel and *T. laticostata* habitats in September.

The month of April alone showed no significant difference of various mean values calculate for the two habitats at each site.

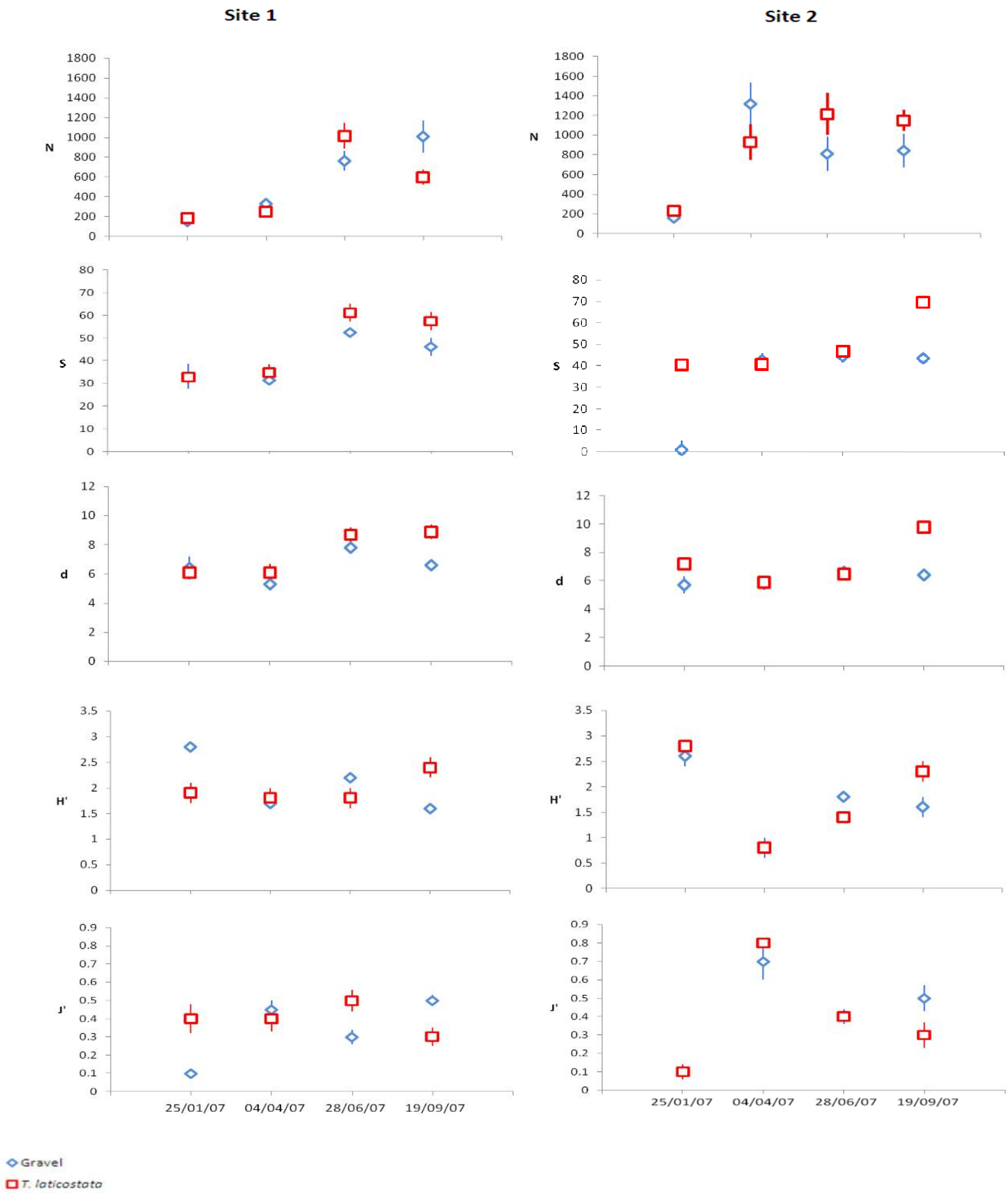

Figure 20: Means of total individual (N), total species (S), Margalef's index of species richness (d), Shannon-Wiener diversity index (H' loge), and Pielou's evenness index (J') for each site, season and habitat, with 95% standard error bars.

Seasonal variation in the strucutre of the macrobenthic community

A) *Tucetona laticostata* habitat

The mean number of species and index of species richness values increased throughout the year. The mean number of individuals' value increased from 206.5per core (=15,884 m^{-2}) in January to 1,117.5 per core (=85,962m^{-2}) in June, but decreased in September. The mean diversity index value was the highest on 25/01/07 and 19/09/07; mean J' value was highest in April.

With site 1 and 2 combined, the mean number of species and index of species richness increased throughout the year to reach maximum averages of 63.6 and 9.35 respectively.

B) Gravel habitat

The mean values of S and d increased to 48.5 and 7.2 respectively until 28/06/07, then declined towards September. The maximum mean number of individuals, 927, was recorded on 19/09/07.

With site 1 and 2 grouped together, S and d mean values peaked at 48.5 and 7.2 respectively on 28/06/07.

The total number of species increased throughout the year, and with one exception (Site 2 on 04/04/2007) was higher in *T. laticostata* habitat than in extensively fragmented shell- and rock gravel. N, the number of individuals, was higher in April for 4 replicates in gravel and 2 replicates in *T. laticostata* habitats, in June for 2 replicates in gravel and 4 replicates in *T. laticostata* habitats, and in September for 6 replicates in gravel and 7 replicates in *T. laticostata* habitats. The H' diversity measure was higher in 36 samples, 20 of which were within *T. laticostata* habitat. The Pielou's evenness was also higher within *T. laticostata* habitat.

Species richness per sample around Motutapu Island varied between 3 and 41, usually lower than around Otata Island where it varied between 2 and 59. The number of individuals per sample was higher around Otata Island, reaching 1,291 (=38,730 individuals m^{-2}), compared to Motutapu Island where it reached only 327 (=9,810 individuals m^{-2}).

Differences in univariate analysis results for Otata and Motutapu Islands

The mean total species, total number of individuals, index of species richness, and diversity estimating 150 individuals per sample, were higher around Otata than Motutapu Island.

Table 8: Univariate analysis values for Motutapu and Otata Islands, means of total species (S), total individual (N), Margalef's index of species richness (d), Pielou's evenness index (J'), measure of diversity estimating the number of species in a sample of size 150 individuals (ES), and Shannon-Wiener diversity index (H' loge), with 95% standard error bars, around Motutapu and Otata Islands.

		N	S	d	J'	ES(150)	H'
Otata	Mean	219	26.4	5	0.7	22	2
	95% standard error	47	2.3	0.4	0	1.5	0.1
Motutapu	Mean	60.4	18	4.2	0.8	18	2.2
	95% standard error	9.3	1.7	0.3	0	1.6	0.1

The number of species collected by each Van-Veen grab sample around Otata Island was higher than around Motutapu Island. Moreover, for Otata Island only, the number of species was higher amongst samples collected on the southwestern and the eastern sides of the island than from the northern side. Samples taken from eastern Motutapu Island are relatively low in species diversity, particularly those from within Station Bay.

The DIVERSE dialog results for each sample collected at the two southwestern sites of Otata Island and grabs collected off Motutapu and Otata are given in Appendix 1.

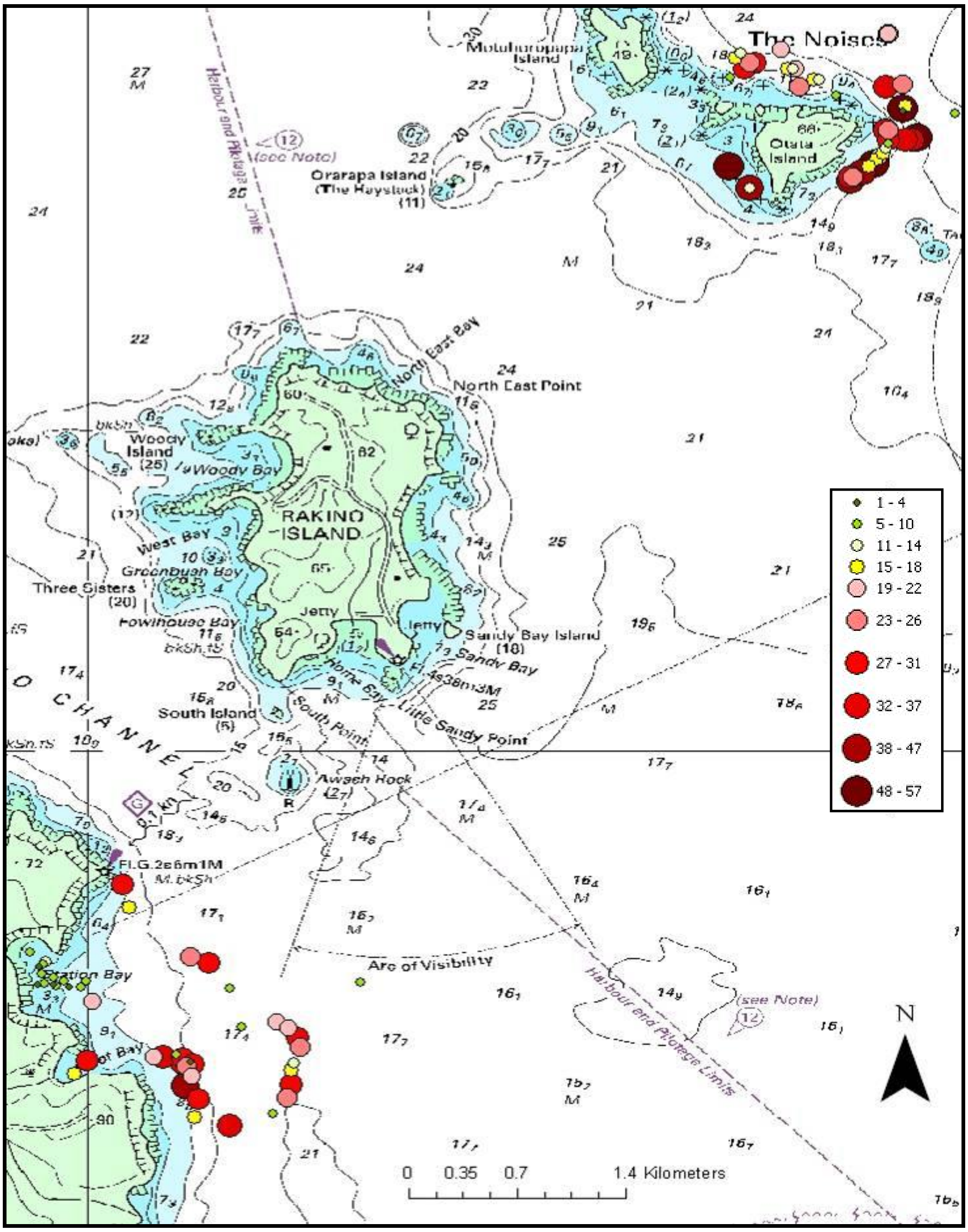

Figure 21: Depiction of number of benthic invertebrate species per grab sample collected of Motutapu and Otata Islands, New Zealand.

Multivariate analysis

Temporal and spatial variations in community structure within two habitats at site 1 and site 2

The null hypothesis (H_o) chosen was that there was no difference in benthic-invertebrate community structure between gravel and *T. laticostata* habitat within site 1.

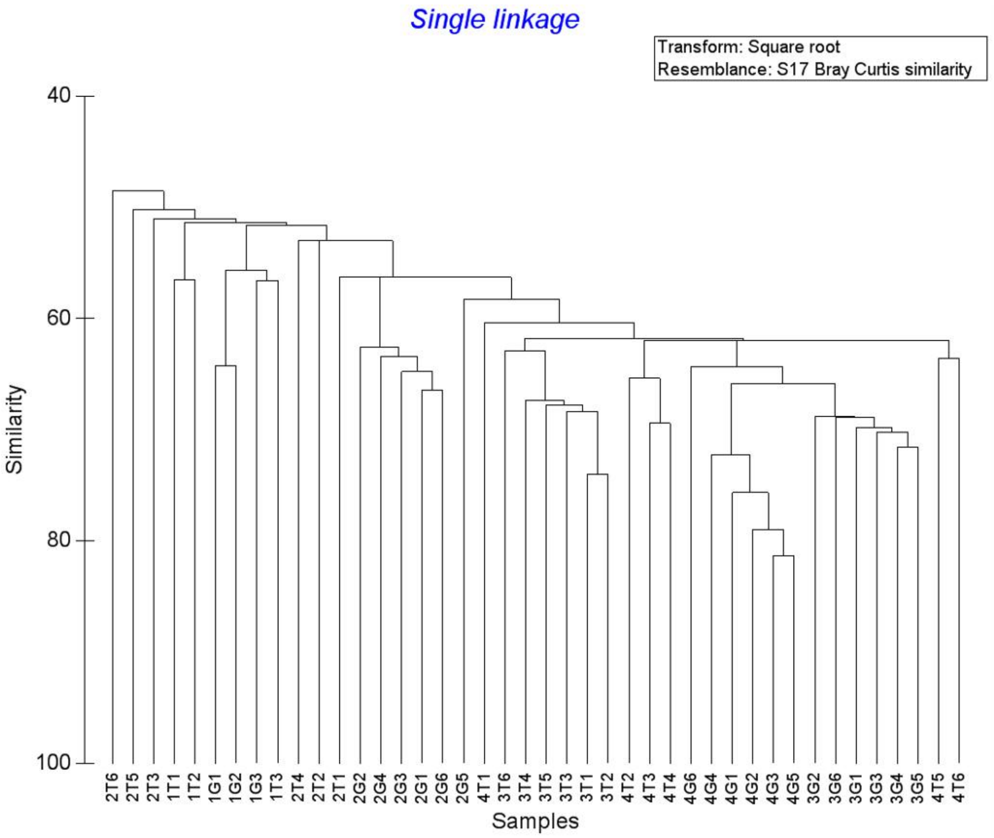

Figure 22: Dendrogram, for all samples collected at site 1, from Bray-Curtis similarities computed for square-root transformed species abundance.

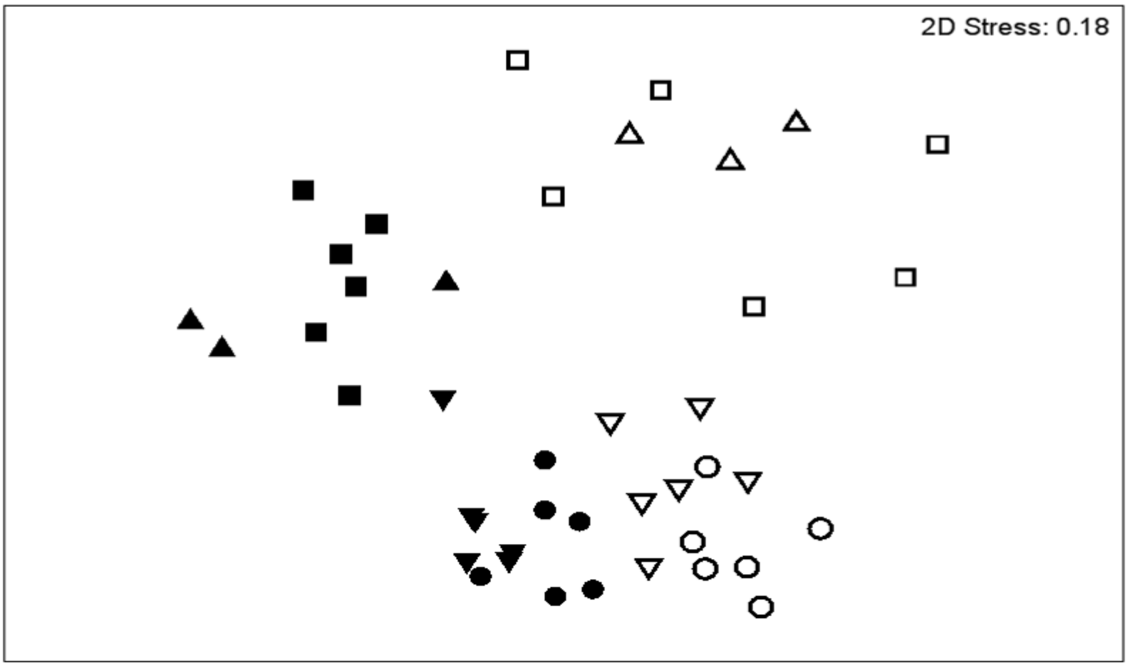

Figure 23: Non-metric mutli-dimensional scaling (MDS) ordination in two dimensions; computed for all samples collected at site 1 (▲ January, gravel; △ January, *T. laticostata*; ■ April, gravel; □ April, *T. laticostata*; ● June, gravel; ○ June, *T. laticostata*; ▼ September, gravel; ▽ September, *T. laticostata*).

The analysis of similarity (ANOSIM), using habitat type as factors gave a sample statistic *R* value of 0.853 at a significance level of $p<0.1\%$. The *R* value of 0.853 falls outside the range of computed values (-0.2 and 0.5), so the null hypothesis that gravel and *T. laticostata* habitat hold communities of similar structure is rejected. Two significantly different benthic-invertebrate communities occured at site 1, one within gravel, and the other within *T. laticostata* shell habitat. When using date as factor, the *R* value of 0.817 at a significance level of $p<0.1\%$ falls outside the range of computed values (-0.2 and 0.3). The null hypothesis that there is no seasonal variation in community structure at site 1 is rejected.

A similarity matrix comparing 41 samples collected at site 2 was built to test the null hypothesis (H_o) that there no difference in benthic-invertebrate community structure between gravel and *T. laticostata* habitat within site 2.

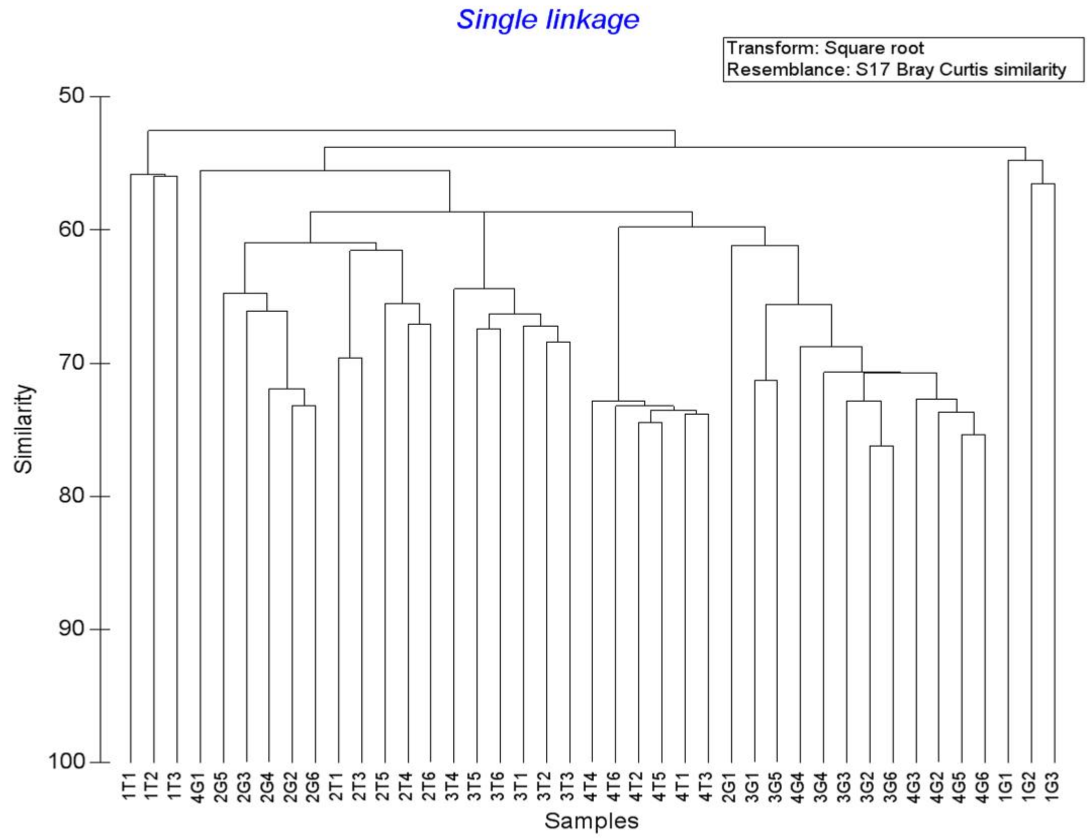

Figure 24: Dendrogram, for all samples collected at site 2, from Bray-Curtis similarities computed for square-root transformed species abundance.

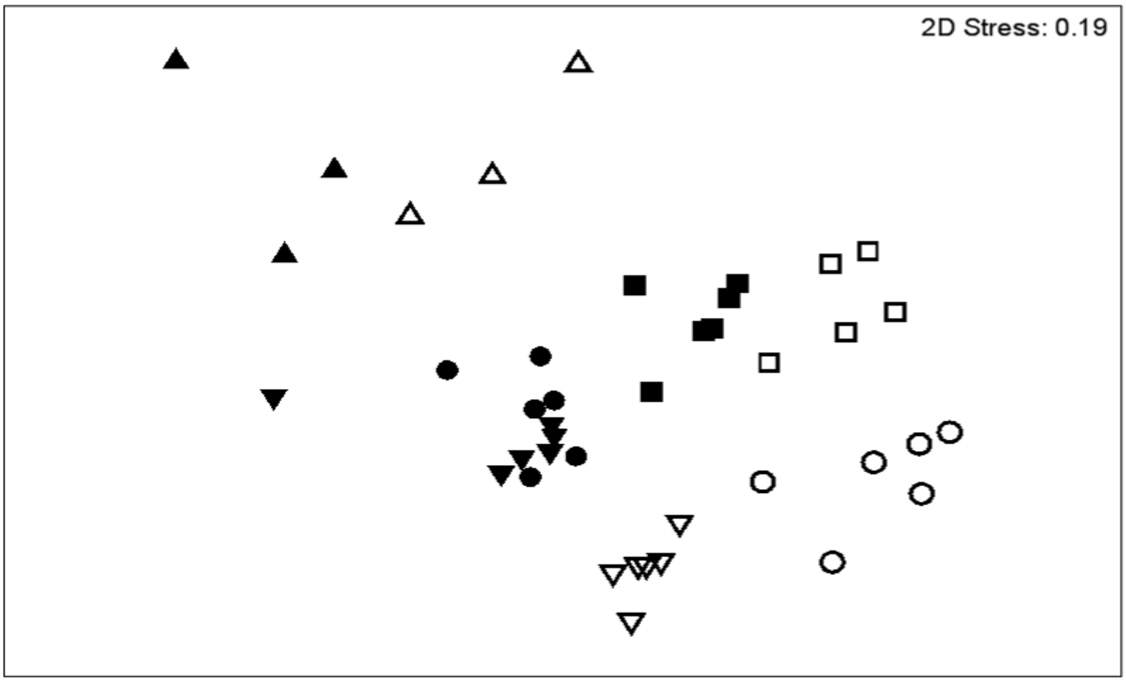

Figure 25: Non-metric multi-dimensional scaling (MDS) ordination in two dimensions; computed for all samples collected at site 2(▲January, gravel; △ January, *T. laticostata*; ■ April, gravel; □ April, *T. laticostata*;● June, gravel; ○ June, *T. laticostata*;▼ September, gravel; ▽September, *T. laticostata*).

The analysis of similarity (ANOSIM), using habitat type as a factor, gave a sample statistic *R* value of 0.889 (significance level: p<0.1%). The *R* value of 0.889 falls outside the range of permuted values (-0.2 and 0.4); as a result, the null hypothesis that gravel and *T. laticostata* habitat host similar benthic-invertebrate community structures is rejected. The benthic-invertebrate community structures found within gravel habitat and *T. laticostata* shell at site 2 are significantly different. If using date as factor, the *R* value of 0.841 at a significance level of p<0.1% falls outside the range of permuted values (-0.2 and 0.3). The null hypothesis of no temporal changes in community structure at site 2 is rejected.

The average dissimilarities between gravel and *T. laticostata* habitat within site 1 and 2 were 51.99 and 51.72 respectively, with Amphipoda spp. and *Balanus trigonus* making the highest similarity percentage of species contribution (Appendix 2).

Variations in community structure between Motutapu and Otata Islands

All grab samples were used to build a similarity matrix allowing comparison between samples from around Motutapu and Otata Islands. The null hypothesis (H_o) chosen was that there is no difference in benthic-invertebrate community structure between samples taken from around Motutapu and Otata Islands.

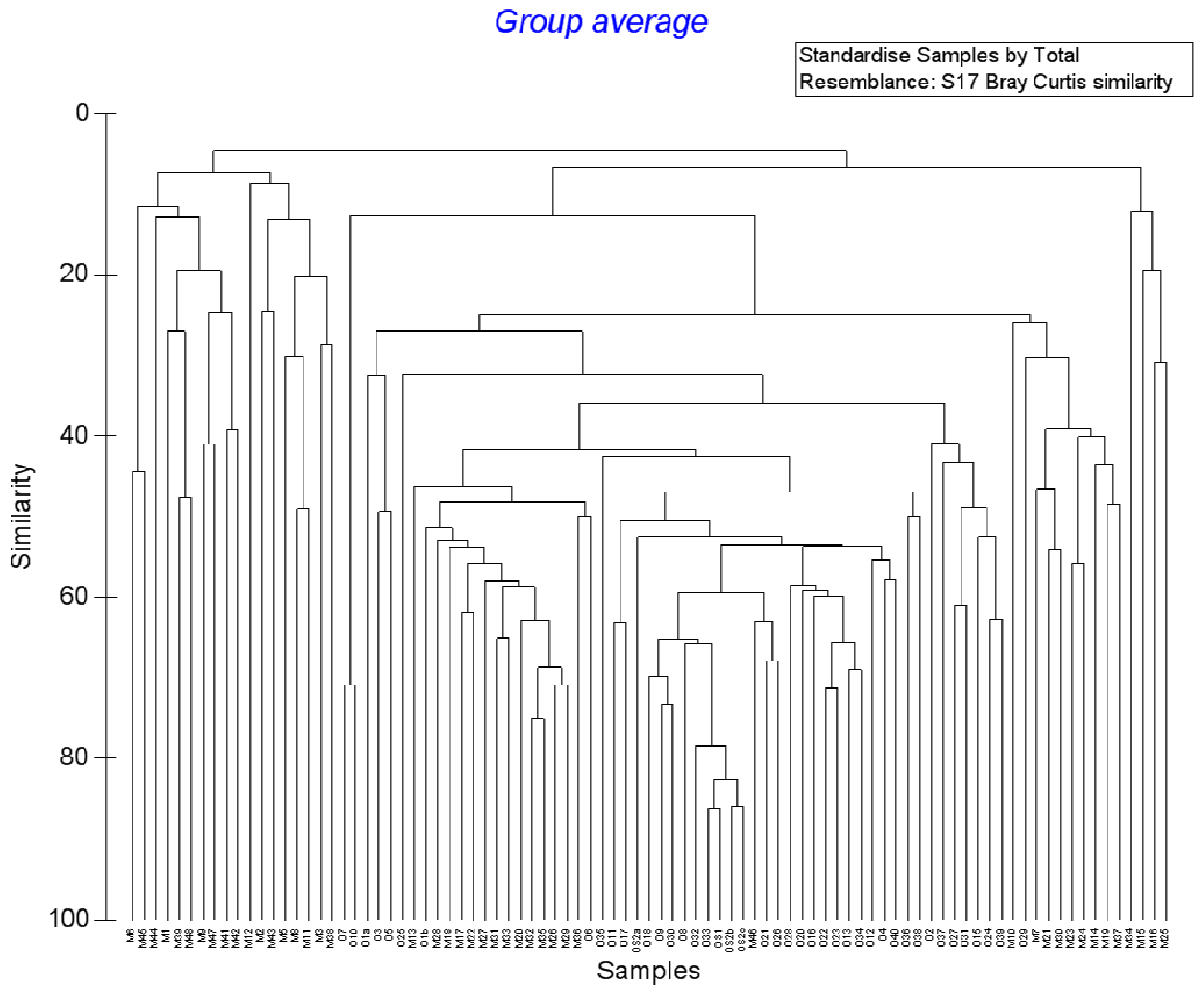

Figure 26: Dendrogram, for all samples collected around Motutapu and Otata Islands, from Bray-Curtis similarities computed for square-root transformed species abundance.

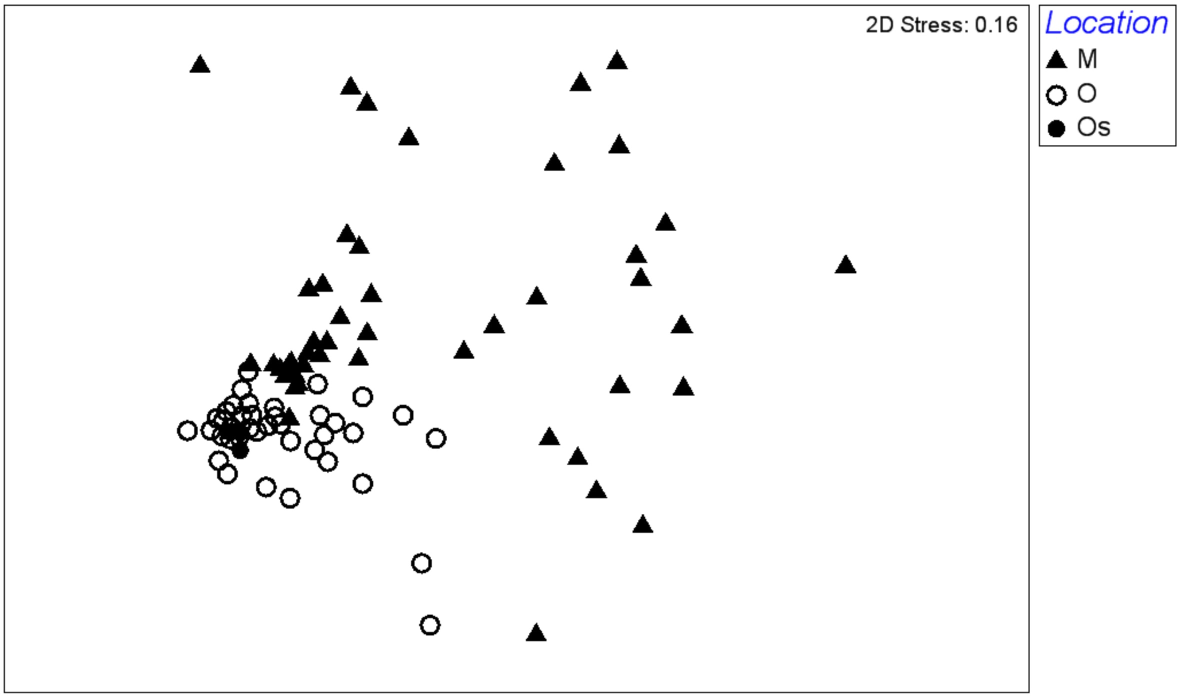

Figure 27: Non-metric multi-dimensional scaling (MDS) ordination in two dimensions; computed for all samples collected around Motutapu (M), Otata (O), and southwestern Otata (Os) Islands.

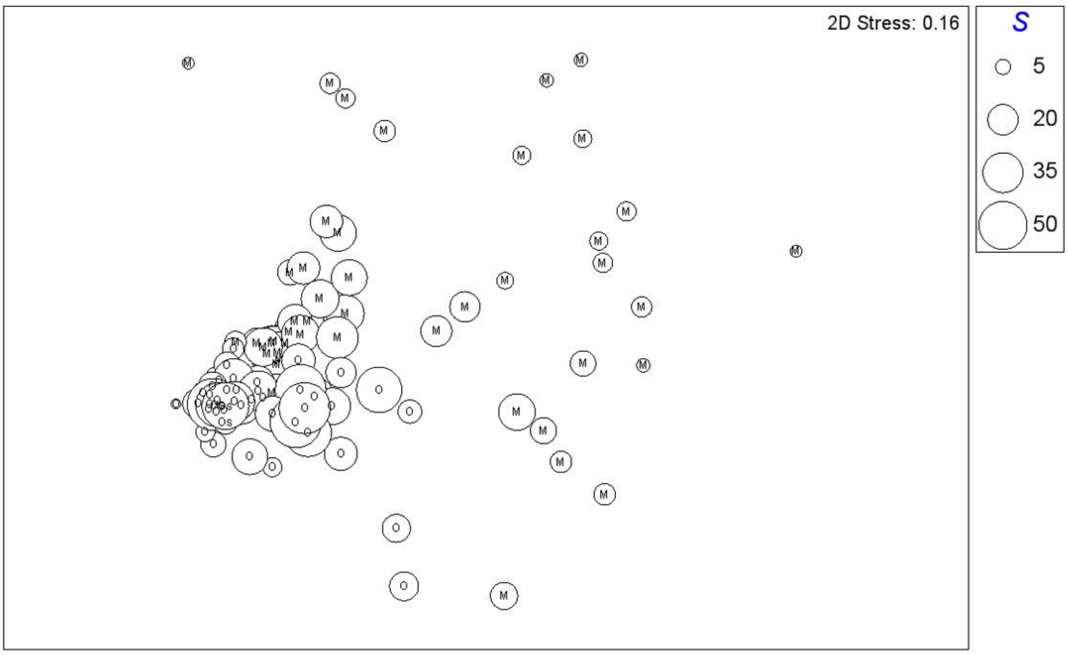

Figure 28: Non-metric multi-dimensional scaling (MDS) ordination in two dimensions; computed for total number of species (S) in each sample collected off Motutapu (M) and Otata (O) Islands.

The analysis of similarity (ANOSIM) with sampled sites as a factor, gave a sample statistic *R* value of 0.187 at a significance level of $p<0.1\%$. This *R* value falls outside the range of calculated values (-0.08 and 0.16), so the null hypothesis is rejected at a significance level of $p<0.1\%$. Motutapu and Otata Islands have significantly different subtidal benthic invertebrate community structures.

The differences in benthic invertebrate community structure between Motutapu and Otata Islands was also clearly indicated by the average dissimilarity of 81.34 (with southwestern Otata Island samples excluded) and 82.84 (with southwestern Otata Island samples only). Dividing Otata Island samples into two groups, Otata and Otata southwestern, gave a lower dissimilarity of 55.8 between the two groups (Appendix 2).

The group Amphipoda provided the highest contribution to the similarity between groups of samples (Motutapu and Otata Islands). The Asian bivalve *Limaria orientalis* (Adams and Reeve, 1850) was more abundant around Motutapu Island. Southwestern Otata Island benthic community structure differed from the community found around the rest of the island. The crustaceans of the genus *Caprella* and order Amphipoda were more abundant in the southwestern area of Otata Island while the Polychaeta *Asychis* sp. and *Sphaerosyllis* sp. were more abundant in other areas around Otata Island.

Postscript November 2008:

At the time of thesis submission sediment grain-size analyses could not be undertaken in time for incorporation in the thesis. These data and the methodology followed are presented for completeness of this thesis.

Method for sediment grain-size analysis:

Two core samples were collected on the 08/04/2008, preserved in a 5% buffered (sodium bicarbonate) formalin-seawater solution, and double bagged. Sediments were oven-dried (Wilton utility oven) at 90 ºC for 2 days. Once dry, sediments were placed on a stack of 10 Endecott sieves of meshes ranging from 4.75mm to 63µm (see following table) and shaken on a sieve shaker for 30 minutes. Sediments retained in each sieve were weighed to one decimal place.

Sediment grain-size analysis results:

Dry weight percentage contribution of sediments within 10 grain-size fractions (x>4.75mm, x<63µm, and 8 subfractions between 4.75mm and 63 µm) from *T. laticostata* and shell gravel sea-bed habitat.

	Sea-bed habitat	
Mesh size	*T. laticostata*	Shell gravel
	Grain-size contribution (%)	
x≥4.75mm	28.9	8.0
4.75mm>x≥3.35mm	5.6	6.5
3.35mm>x≥2mm	9.0	16.6
2mm>x≥1mm	15.9	22.6
1mm>x≥600µm	16.9	21.0
600µm>x≥500µm	5.5	7.1
500µm>x≥300µm	14.9	15.6
300µm>x≥150µm	2.9	2.5
150µm>x≥63µm	0.4	0.2
x<63µm	0.1	0.0
Total	100	100

Discussion

The primary objectives of this research programme were to determine whether surface deposits of *T. laticostata* shell host elevated species diversity, and whether the macrobenthic invertebrate communities associated with these deposits differ from those within adjacent substrata comprising fragmented, less-structurally complex shell gravels.

Sea-bed structural complexity has been long-recognised and reported to affect the communities associated with it, resulting in elevated species diversity (Powell 1937, Grange 1977, Bostrom and Bonsdorff 1997, Warwick *et al.* 1997, Norkko *et al*. 2001, Abbott *et al.* 2005). However, such a relationship has not been earlier quantified for Recent fauna, using the valves of *T. laticostata* as a proxy for structural complexity. Data are reported in this thesis document the relationship between structural complexity and macrobenthic-invertebrate species composition and abundance off the Noises group of islands, outer Hauraki Gulf.

The following discussion places the research findings in context with that reported elsewhere for the Auckland region, and where relevant, New Zealand; and what is known of coastal soft-sediment and shell-gravel communities around Auckland, and New Zealand. Possible conservation strategies to ensure the longer-term viability of these substrata and associated communities are given.

<u>Species composition</u>

The combined diversity of invertebrates in Otata and Motutapu Island samples comprises 351 species or species-groups (e.g., Nemertea, Nematoda, Amphipoda and Oligochaeta). Of these 351 'species', only 37% could be reliably identified to species, and for some identification could not proceed past phylum (Table 9). The level to which species could be reliably identified reflects a number of factors: the general lack of monographic revisions of the New Zealand shallow-water invertebrate fauna (e.g., Annelida: Polychaeta and Oligochaeta; Nematoda; Arthropoda (excluding Brachyura)), and otherwise poor knowledge of these species taxonomy; lack of systematic expertise to identify some of the lesser-known phyla amongst samples (e.g., Chordata, Sipunculida); and for one, limitations on the time available to conduct this study (e.g., Ectoprocta (= Bryozoa)), as the ectoproct fauna off the Noises complex of islands is diverse.

Table 9: Proportion of taxa that can be identified to taxonomic level (n = 351 species).

Phylum	**Phylum**	**Class**	**Family**	**Genus**	**Species**
Annelida		11%	50%	22%	17%
Arthropoda		44%	22%	8%	26%
Mollusca		7%	5%	8%	80%
Chordata			25%		75%
Cnidaria		100%			
Echinodermata				11%	89%
Ectoprocta	100%				
Hemichordata					100%
Porifera		99%		1%	
Sipunculida			100%		
Chaetognatha Nematoda Nemertea Phoronida Platyhelminthes Priapulida	100%				
Total	3%	19%	27%	14%	37%

As some phyla could not be identified within the time available to conduct this study, or could not be identified given the lack of systematic reviews, a voucher set of all species identified in the course of this research programme has been accessioned into the biological collections of AUT. This will enable continuity in identification of species-specific enumerated unknown taxa between surveys, off the Noises, and within soft-sediments throughout Hauraki Gulf, given personnel with varying degrees of systematic experience are likely to be involved.

The most recent appraisal of marine species diversity in New Zealand, including both described and known undescribed taxa, estimates 16,220 species occur in these waters (Gordon 2000). Excluding Protista and fungi, seaweeds and plants, comb jellies, bryozoans, entoprocts, lamp shells, arrow worms, and fish and marine mammals, as none was sampled for or identified in this research programme, we are left with an estimate of 11,006 species that could potentially occur in the research area. The combined diversity of invertebrates in Otata and Motutapu Island grab and core samples, 351 species or species-groups of collective unknowns (the latter including the likes of Nemertea, Nematoda, Amphipoda and Oligochaeta, treated as single operational taxonomic units), represents 3.19% of the recognised diversity of species in New Zealand waters (an underestimate, given the diverse amphipod fauna of Otata sites has yet to be identified, yet their diversity is included in the total diversity in NZ waters, *sensu* Gordon 2000).

A partially anonymised dataset is provided in Appendix 3, where the entire species diversity and abundance data sets reported herein have been reduced to one of presence or absence. Full biodiversity data of this research will be available on the AUT Biodiversity database, '*Monalisa*', upon internet release in late 2008 (for which access restrictions will apply).

<u>Coastal soft-sediment and shell gravel communities around Auckland</u>

Few comprehensive accounts of coastal soft-sediment and shell-gravel communities are available for the greater Auckland region. Most notable amongst these are the pioneering studies of Powell (1937), and subsequent studies of Grange (1977, 1979) for Manukau Harbour; and Powell (1937), and the subsequent study of Hayward *et al*. (1997) for the Waitemata Harbour and inner Hauraki Gulf.

The Manukau Harbour, west of Auckland, is an extensive shallow inlet that extends about 9km due east before dividing into four major tributaries, the Wairopa, Purakau, Papakura and Waiuku channels (Hume and Herendof 1998). Approximately 40% of the ~340 km^2 of harbour environment comprises intertidal mud- and sand-flats that are exposed at spring low tide (Pridmore *et al*. 1990).

The marine flora and fauna of Manukau Harbour seldom has been reported, with the most comprehensive assessments of seabed and intertidal communities being those of Powell (1937) and Grange (1977, 1979), although more localised accounts of species are provided by, and for example, Chapman and Ronaldson (1958), Henriques (1980), and Thrush *et al*. (1990). Most recent research on the flora and fauna of this harbour has reported relationships between intertidal-infaunal species, heavy metals, species recruitment and sediment grain size at very local scales (e.g. Pridmore *et al*. 1990, 1991; Roper *et al*. 1991), rather than the composition and distribution of subtidal species assemblages.

Grange (1977) recognised four biotic associations in Manukau Harbour, and although he referred to these as communities, he recognised that they were not particularly discrete and overlapped in their species composition. Dominant taxa in these 'communities' were: *Microcosmus* + *Notomithrax* (equivalent to the *Maoricolpus* + *Nucula* community of Powell (1937)), also the highest-diversity of all recognised by Grange (*loc. cit*.), and associated with a coarse sediment of dead bivalve shells and small rocks in shallow water; also high in diversity was a *Halicarcinus* + *Bugula*-characterised community (also referable to Powell's *Maoricolpus* + *Nucula* community), associated with a relatively coarse sediment comprising shells, grit, and little sand in deep water in the main channels; a diverse *Amalda* + *Myadora*-characterised community (similar to Powell's *Amalda* + *Pervicacia* community), associated with fine sand, mud and shell grit in shallow parts of the channels; and the least-diverse community characterised by *Fellaster* and *Pagurus* (comparable to Powell's *Fellaster* [= *Arachnoides*] community), associated with ironsand and occuring in shallow water in the outer harbour. *Tucetona laticostata* was not reported from Manukau Harbour, although it has been reported from near the harbour entrance (McKnight 1969) (although it is not known whether this report was based on live animals or dead shells). Of particular note is that the highest diversities of macrobenthic invertebrates in Manukau Harbour were associated with shallow-water coarse-grained sediments comprising dead bivalve shells and small rocks (Grange 1977).

Powell (1937) recognised the benthic invertebrate communities in Manukau and Auckland Harbours to be dissimilar. None of the species reported from the Manukau Harbour dominates sea-bed communities off or around the Noises, although *Fellaster* is not uncommon in shallow waters off eastern Motutapu Island.

Sea-bed communities throughout outer Waitemata Harbour and Hauraki Gulf have been reported on two occasions only (Powell 1937) and Hayward *et al*. (1997). Powell recognised three basic communities (referring to them as *formations*) throughout this region, from highest to lowest diversity: *Tawera* + *Tucetona* [= *Glycymeris*], *Maoricolpus*, and *Echinocardium* formations. Powell (1937) also recognised several subdominant taxa, and subformations within these basic community types. Hayward *et al*. (1997) resurveyed many sites close to where Powell had earlier surveyed, and within Rangitoto Channel reported significant changes in Powell's 'formations'; three exotic bivalves (*Limaria orientalis*, *Theora lubrica*, and *Musculista senhousia*) had become codominant and characteristic species of six associations recognised throughout this region; the *Tawera* + *Tucetona* community in Rangitoto Channel was no longer recognised (Hayward *et al*. 1997).

Powell's (1937) *Tawera* + *Tucetona* 'community' occurred within Rangitoto Channel, between Motuihe and Waiheke Islands, Motutapu and Motuihe Islands, and around the Noises group of islands. Recent sampling (AUT, 2007 to present) in these same areas has resulted in live *T. laticostata* being found at three subidal sites only, off the Noises group of islands, between Waiheke and Motuihe Islands, and south of Rotoroa Island. Hayward *et al*. (1997) intimate that Powell's *Tawera* + *Tucetona* community may not have been based upon the occurrence of live individuals, although in at least at one of Powell's station in Rangitoto Channel (E3) two live and a number of dead *T. laticostata* were recorded (Hayward *et al*. (1997: 6). Regardless of whether the entire community (*formation*) as reported by Powell (1937) was based on live or dead *T. laticostata*, no live and only rare and bioeroded or otherwise fragmented valves of *T. laticostata* occur throughout this region today.

Anthropogenic disturbances (sediment dumping, dredging, anchorage and introduction of exotic species) have contributed to changes of species distribution through Hauraki Gulf (Hayward *et al*. 1997). Densities and diversities of species in Rangitoto Channel (Roberts 1990), where *T. laticostata* occurred, collected by Van Veen grab, are lower (30m^{-2} to 4,440m^{-2}) than those values determined from around Otata Island (60m^{-2} to 38,730m^{-2}), with a maximum value of 136,692 invertebrate m^{-2} (using the core sampler) within *T. laticostata* habitat in this region. As *Tucetona* valves contribute significant matrix to the substratum, enhancing both structural complexity and macrobenthic-invertebrate density and diversity, it is reasonable to suggest that changes to the sea bed throughout Rangitoto Channel since the 1930s have resulted in loss of species diversity and abundance in this region, concurrent with the loss of *T. laticostata*-based shell gravels.

Sampling equipment used by Powell (1937), a scientific or cone dredge, differs from the Van-Veen grab used during all AUT recent sampling. However, fauna retained with these varied sampling gear are comparable; the real difference between them is that the former collects quantitative and the latter qualitative data. Grab sampling has collected numerous *T. laticostata* off the Noises group of islands, and west of Rakino Island, so this equipment is effective in sampling this sea-bed type, associated species, and *T. laticostata* itself.

Of the 142 species Powell (1937) recognised within his *Tawera* + *Tucetona* community (with sampling undertaken in the early 1930s), the maximum number of species identified from any one station was 61, and the average number of species for all stations within this community was 39. These maximum and average values are similar to those determined from recent sampling in comparable 'formations' off the Noises group of islands (Figs 8, 13), for which the average number of species (all sampling events combined) was 46, and maximum number of species (again, all sampling events combined) was 82.

Appraisals of species diversity presented herein cannot be compared with those of Powell (1937), given Powell did not identify many smaller taxa to species or to species-specific enumerated unknown in groups such as Polychaeta and Arthropoda (most of Powell's taxa were Mollusca, Echinodermata and large-bodied Polychaeta and Brachyura). Additionally, of those samples reported (Figs 7, 9, and 10), only those collected from around the Noises and Motutapu islands have been processed to determine their full complement of species and abundances (a more limited number of Rakino and eastern Waiheke Island samples have been processed). As such, both the maximum number and average numbers of species in recent samples collected throughout Powell's formerly recognised *Tawera* + *Tucetona* community have not been determined, and the total numbers of species within unprocessed samples could skew maximum and average values for the entire community.

Diversity and abundance of macrobenthic-invertebrate taxa

The benthic-invertebrate communities surrounding Otata Island and those off eastern Motutapu Island in comparable depth horizons differ significantly. Significant differences are apparent in the community structures occurring within and upon fragmented shell gravels, and *T. laticostata*-shell habitat off southwestern Otata Island. Otata Island communities also differed on each of the sampling dates they were surveyed. As such, macrobenthic-invertebrate communities off Otata Island can be reported to vary according to the substratum upon and within which they occur, and seasonally.

Both the mean number of species and individuals proved to be higher within *T. laticostata* habitat in site 2. Of the 351 species reported from all samples combined, 73% of these occurred off southwestern Otata Island, 30% of which were found exclusively within *T. laticostata* habitat, and 10.5% within gravel habitat. Gravel-habitat community structure had higher abundances of Amphipoda, Oligochaeta, *Caprella*, Nematoda, *Pisione*, Anthuridae, Nemertea, and Ostracoda. The benthic community structure within *T. laticostata* was characterised by greater abundance of the following species, *Balanus trigonus*, *Perinereis nuntia*, *Petrolisthes novaezelandiae*, *Rhyssoplax stangeri*, Tanaidae sp. 3, and Syllidae sp. 4. The species that most contributed to the community structure around Motutapu Island are the bivalves *Limaria orientalis* and *Corbula zelandica*, holothurian *Trochodota dendyi*, heart urchin *Echinocardium australe*, and polychaetes Sabellidae sp. 1, *Eunice* sp. 1, Maldanidae sp. 3, Capitellidae sp. 1, and Cirratulidae sp. 1. Groups contributing most to the dissimilarity between southwestern Otata Island and other areas around Otata Island were the crustaceans Amphipoda and *Caprella*, and polychaetes *Asychis* and *Sphaerosyllis*. Malacostraca were more abundant off southwestern Otata Island, and Polychaeta were more abundant around the rest of Otata Island.

Benthic-invertebrate community structure within *T. laticostata*-based habitat and fragmented adjacent gravel substrata at both 5 and 7 metres depth off southwestern Otata Island varies temporally. The most abundant taxa present in both habitats are small-bodied and not particularly charismatic, and also are those that could be identified only to the level of phylum or class, such as Amphipoda, Nemertea and Oligochaeta.

Amphipoda had the highest percentage contribution at each sampled date and location. Oligochaeta prove abundant at site 1 in January, June, and September, whereas Nemertea were abundant in the months of January at site 2. The barnacle *Balanus trigonus* was very abundant within *T. laticostata* at site 2 in June, giving the highest average abundance after Amphipoda. A chiton, *Ischnochiton maorianus*, had one of the largest contributions at sites 1 and 2 in January only.

Within any particular depth horizon, benthic-invertebrate community structure varied during any single sampling event. At 7 metres (site 1), two large-bodied species, the polychaete *Perinereis nuntia* and crab *Petrolisthes novaezelandiae* were both more abundant in *T. laticostata*-based habitat, whereas the small-bodied *Caprella* sp. 1, Oligochaeta, Nematoda, and Amphipoda were all more abundant in fragmented shell-gravel habitat. At site 2 (5 metres), *T. laticostata*-shell-based habitat hosted different invertebrate community structure to that of fragmented gravel habitat, with each of the barnacle *Balanus trigonus*, small-bodied syllid polychaetes Syllidae sp. 4 and *Sphaerosyllis* sp., and the polychaete and crab *Perinereis nuntia* and *Petrolisthes novaezelandiae* respectively, more abundant within or on *T. laticostata*-shell-based substrata; whereas the small-bodied Amphipoda (collective unknowns), interstitial Oligochaeta (collective unknowns), and *Caprella* sp. 1 were more abundant within fragmented gravel-based substrata.

Benthic invertebrate faunas of sites 1 and 2, 7 and 5 metres respectively, also differed in that the deeper site had greater numbers of Oligochaeta, whereas the more shallow site had greater numbers of Amphipoda (collective unknowns), *Balanus trigonus*, and Syllidae sp. 4.

Benthic invertebrate communities around Motutapu Island differed from those of Otata Island in having higher densities of the invasive bivalve *Limaria orientalis*, the echinoderms *Trochodota dendyi* and *Echinocardium australe*, the bivalve *Corbula zelandica*, and the polychaetes Sabellidae sp. 1, *Eunice* sp. 1 and Maldanidae sp. 3.

Macrobenthic organisms are crucial to many ecosystem processes. They play an important role in organic matter mineralisation and increase anaerobic degradation within sediments enhancing bioturbation, biochemical processes, and exchanges between sediments and the water column, releasing nutrients and resuspending sediments. Burrowing activities modify surface-sediment topography, in addition to increasing fluxes of fine particulate matter and oxygen into deeper sediment layers. Deposit and filter feeders act as bioturbators, increasing bentho-pelagic coupling and enhancing productivity and diversity of marine systems (Wilson 1991). The density and feeding rate of deposit-feeders impacts the growth of bacteria which have the key role of organic matter breakdown and decomposition, allowing the carbon and nutrients contained in dead organisms to be released back into the environment (Wilson 1991). Infaunal communities also influence ammonia release, which increase primary production in the water column (Biles *et al*. 2002).

Amphipoda were the most abundant of all benthic invertebrates identified in the two habitats, *Tucetona* shells and extensively fragmented shell gravel. Large amounts of sediments are released into the water column by the burrowing activites of the amphipod *Corophium volutator* (Spooner and Moore 1940). Benthic amphipods are a major component of some juvenile fish diet (Stoner 1982, Franz and Tanacredi 1992), also are present in the diet of nemerteans (McDermott 1993), and are the second to fourth highest most important prey items in the diet of five deep-sea fish species for which data are available (Clark 1985). Amphipoda also are an important part of the diet of the commercially fished paddle crab (*Ovalipes catharus*) in New Zealand waters (Wear and Haddon 1987).

Other macrobenthic invertebrates play important roles in the ecosystem. Larvae and juvenile nematodes and polychaetes are major prey species of amphipods (Oliver *et al*. 1982). Oligochaetes are an important link in benthic-pelagic coupling, transferring energy from primary producers and decomposers to higher trophic levels (Diaz and Schaffner 1990, Posey *et al*. 2002). Nemerteans have been recorded in fish diet (McDermott 2001). Polychaetes burrowing into sediments redistribute organic matter and impact sediment chemistry and aeration (Lopez and Levinton 1987). The invasive *Balanus trigonus* common at site 2 in *T. laticostata* habitat was present in the diet of *Lepsiella scobina* (Luckens 1975), *Pseudophycis breviusculus* (Northern bastard red cod), *Pseudolabrus celidotus* (Spotty), *Pseudolabrus miles* (Scarlet wrasse), *Gilloblennius tripennis* (Spectacled triplefin), *Tripterygion bucknilli* (Blue-eyed triplefin), *Tripterygion* sp. (Yellow and black triplefin), and *Parika scaber* (Leatherjacket) (Russell 1983). The crab *Petrolisthes novaezelandiae* occurred in the diet of *Scorpaena cardinalis* (Scorpion fish), *Ellerkeldia huntii* (Red banded perch), *Cheilodactylus spectabilis* (Red moki), *Latridopsis ciliaris* (Blue moki), *Pseudolabrus celidotus* (Spotty), and *Pseudolabrus fucicola* (Banded wrasse) (Russell 1983).

Anthropogenic threats to structurally complex substrata

Despite the extensive recognised distribution of *T. laticostata* throughout New Zealand (Powell 1979), it is not widespread throughout Hauraki Gulf amongst those sites recently surveyed (Figs 13, 14, 15, and 16). This species rarely occurs intertidally, and when it does it has been found only at extreme low water. High-energy subtidal habitat off the northwestern-, northern and northeastern side of Waiheke Island have yet to be surveyed, and neither has that extending along the western side of the Firth of Thames towards Colville Channel, and around Great Barrier and Little Barrier Islands. It is likely that *T. laticostata* occurs off some of these offshore islands, channels and around headlands.

On the basis of subtidal sampling effort throughout the Waitemata Harbour and inner Hauraki Gulf, *T. laticostata* is seldom found live, and at those locations where it has been it is seldom abundant; more often than not this species is represented by extensive deposits of its shells. This species is known to live off the Noises group of Islands and Rakino Island, where it is common; and off eastern Waiheke Island, and between Pakatoa and Rotoroa Islands, where it is rare (in both instances known from a single juvenile only, and occasional dead valves).

Benthic invertebrate communities in the outer Waitemata Harbour have changed from those first reported in the 1930s (Powell 1937) to those recognised in the 1990s (Hayward *et al*. 1997). One of these changes appears to have been the demise of live *T. laticostata* in Rangitoto Channel, and the effective loss altogether of its structurally complex dead shells, while a second is the current predominance of exotic marine species throughout this region. Dredging and channel deepening, as have occured throughout Rangitoto Channel, have already physically removed much of the sea-bed structural complexity, particularly live and dead *T. laticostata*. Removal of this species, its shells, and consequently the removal of structural complexity, is likely to cause further, persistant and cascading losses of associated species.

Disposal of spoil, in the event this occurs near where live *T. laticostata* communities are recognised, is likely to smother *T. laticostata* and associated species in an otherwise clean-swept environment. This is the case with spoil-disposal sites as established off the Noises in the outer Hauraki Gulf and Browns Islands (west of Motuihe Island) in the Waitemata Harbour — both sites at or near which live *T. laticostata* occurs.

The seabed off Otata Island, off the southwestern corner, is subject to annual and seasonal dredging and diving by recreational fishers hunting scallop, *Pecten novaezelandiae*, with scallops being common between and amongst extensive mounds of live and dead *T. laticostata* (Fig. 4). In this region, dredging activities, and those of recreational vessel anchorage, could degrade deposits of *T. laticotata* shells, and sea-bed structural complexity and species diversity (Figs. 29 and 30). Macrofaunal density has been shown to be negatively affected by scallop dredging off Coromandel Peninsula, New Zealand (Thrush *et al*. 1995), with 15–20% of variability in macrofaunal community composition being attributed to fishing effects (Thrush *et al*. 1998).

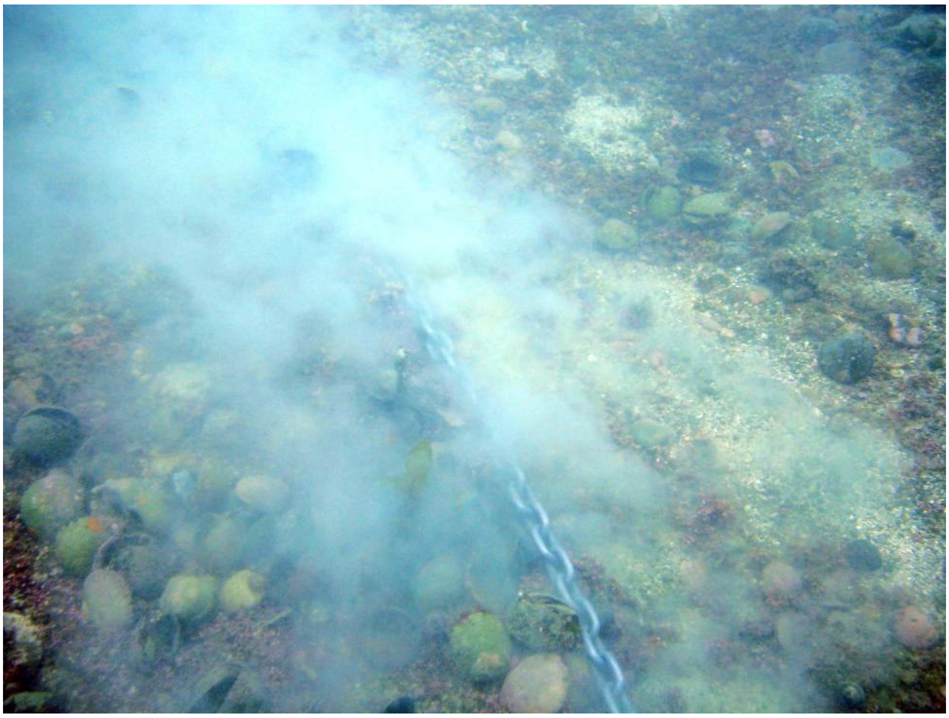

Figure 29: Anchor chain mixing benthic sediments at 5m depth, Otata Island, New Zealand.

Figure 30: Anchor crushing *T. laticostata* valves at 5m depth, Otata Island, New Zealand.

Mobile fishing gear, such as the scallop dredges used by recreational fisherfolk around Otata Island stand to reduce habitat complexity by removing and damaging epifauna; destroying the structurally complex, articulated valves of *T. laticostata*; redistributing mounds of *T. laticostata* valves; and removing taxa which produce structure, such as sponges, ascidians and other epibionts. No current regulations on recreational scallop dredging activities have been established; the only limitation is that recreational fishers can take no more than 20 scallops over 100mm per person per day (Ministry of Fisheries)

Recovery of the benthic community depends on the timing, severity, and frequency of disturbance. Natural disturbances such as large scale storms are known to impact benthos (Ebeling 1985, Posey *et al*. 1996), and provide an unpredictable source of mortality for benthic organisms that can strongly influence community composition. However a storm can impact the benthos only up to a certain depth and time scale. Invertebrate communities might not recover at the same speed, or at all, in the event the sea bed is periodically disturbed by both storm events and recreational dredge activities. Disturbance is a significant cause of mortality in many assemblages that depend upon habitat structure as a refuge (Woodin 1978). Structurally complex habitats (e.g., biogenic reefs) and those that are relatively undisturbed by natural perturbations (e.g., deep-water mud substrata) are more adversely affected by fishing than unconsolidated sediment habitats that occur in shallow coastal waters; these former habitats also have the longest recovery trajectories in terms of the recolonization by the associated fauna (Kaiser *et al*. 2002).

Conservation strategies for sea-bed communities

The lack of data on the intensity of effort and extent of the area affected by recreational scallop fishers around the Noises group of islands precludes evaluation of any actual or potential impact of fishing on the sea-bed and associated species.

Biogenic reefs can be defined as solid structures which are formed by accumulation of organisms rising from the sea bed, creating a habitat different from the surrounding seabed (Holt *et al*. 1998). Herein valves of *T. laticostata* are recognised to create habitat that defines the species associated with them, and as such could be considered a biogenic reef. The most recent DOC/MFish Marine Protected Area (MPA) draft classification (May 2007) recognises only bryozoan and rodolith beds, sponge gardens, and tube worm mounds as biogenic substrata in New Zealand (Department of Conservation, Ministry of Fisheries 2007). Results and interpretation presented necessitate re-evaluation of current proposed biogenic substrata, and incorporation of *T. laticostata*-based in the recently proposed DOC/MFish biogenic substratum classification scheme (DOC/MFish 2007).

With 3.19% of the potential diversity of named and unnamed species occurring off Otata Island, it would appear that these shallow subtidal waters host unrecognised, nationally significant, diverse, abundant, and potentially sensitive biogenic communities that have yet to be afforded any protection.

Commercial fisheries for *Tucetona* are now established in New Zealand, off Kaitaia (west coast Northland), although no data are available for this fishery in terms of collecting equipment and tonnage removed. As *T. laticostata* does not share with pectinid bivalves (scallops) the ability to swim, dredging or trawling for this species could lead to their eventual disappearance, disruption of habitat, loss of structural complexity, and consequently decrease in biodiversity.

Recommendations

- Despite the size, local abundance and extensive recognised distribution of *T. laticostata*, almost nothing is known of its biology or longevity, and it has not been the subject of any detailed ecological study. Such research needs to be undertaken.

- The current distribution and abundance of live *T. laticostata* should be determined throughout Hauraki Gulf.

- The current distribution of *T. laticostata* shell throughout Hauraki Gulf should be determined, and shell deposits Carbon dated to provide fundamental data on sea-bed age and regenerative capacity.

- *Tucetona laticostata* should be placed in the Ministry of Fisheries Quota Management System.

- The effects of dredge fisheries for *T. laticostata* on the receiving environment, sea-bed structural complexity, shell replenishment, and associated biodiversity should be determined.

- In the absence of data on age of seabed shell deposits, a precautionary approach should be adopted, and MPAs established that take into consideration Molluscs as biogenic reefs — especially the large, robust shells of *T. laticostata*.

- Installation of permanent moorings off southwestern Otata Island would enable recreational use of this area without causing extensive damage to sea-bed communities during anchorage.

- The research concentrated on benthic-invertebrate community only, looking at two habitats. Sediment grain size analysis was not done and water parameters (temperature, visibility) could not be recorded for the area, given limitation on time available to undertake this study. These data would contribute to an improved understanding of the relationship between *T. laticostata* and its environment.

- Research to date has focussed on reporting the benthic-invertebrate communities around Otata and Motutapu Islands. The fish fauna of this region remains poorly known. It is unsure whether elevated diversities of benthic-invertebrate fauna are correlated or coupled with elevated diversities of fish in this region.

- Monographic, systematic reviews of Polychaeta and small-bodied Crustacea (eg. Amphipoda) are urgently required to facilitate identification of benthic invertebrates in this region. Few polychaete, amphipod, tanaid or ostracod taxa could be reliably identified for the sake of this diversity appraisal.

- The diverse bryozoan fauna of this region requires more detailed study than proved possible in the one year temporal constraint of this research programme.

References

Integrated Taxonomic Information System, 2008, retrieved from http://www.itis.gov/index.html, January to March 2008.

Zipcodezoo, 2008, retrieved from http://zipcodezoo.com/, January to March 2008.

Abbott S 1997. Mid-cycle condensed shellbeds from mid-Pleistocene cyclothems, New Zealand: implications for sequence architecture. *Sedimentology 44(5)*: 805−824.

Abbott ST, Naish TR, Carter RM, Pillans BJ 2005. Sequence stratigraphy of the Nukumaruan Stratotype (Pliocene-Pleistocene, *c*. 2.08−1.63 Ma), Wanganui Baisn, New Zealand. *Journal of the Royal Society of New Zealand 35(1/2)*: 123−150.

Auckland Regional Council 2004. State of the Auckland Region Report 2004: 203.

Auster PJ 1998. A conceptual model of the impacts of fishing gear on the integrity of fish habitats. *Conservation Biology 12(6)*: 1198−1203.

Bakus GJ 2007. Quantitative Analysis of Marine Biological Communities Field Biology and Environment. John Wiley and Sons, Inc., Hoboken, New Jersey, AUT Library, 578.77BAK.

Beu AG 2004. Marine Mollusca of oxygen isotope stages of the last 2 million years in New Zealand. Part 1: Revised generic positions and recognition of warm-water and cool-water migrants. *Journal of the Royal Society of New Zealand 34(2)*: 111–265.

Beu AG 2006. Marine Mollusca of oxygen isotope stages of the last 2 million years in New Zealand. Part 2. Biostratigraphically useful and new Pliocene to Recent bivalves. *Journal of the Royal Society of New Zealand 36(4)*: 151–338.

Biles CL, Paterson DM, Ford RB, Solan M, Raffaelli DG 2002. Bioturbation, ecosystem functioning and community structure. *Hydrology and Earth System Sciences 6(6)*: 999–1005.

Bland KJ, Kamp PJJ, Pallentin A, Graafhuis R, Nelson CS, Caron V 2004. The early Pliocene Titiokura Formation: stratigraphy of a thick, mixed carbonate-siliciclastic shelf succession in Hawke's Bay Basin, New Zealand. *New Zealand Journal of Geology and Geophysics 47*: 675–695.

Bostrom C, Bonsdorff E 1997. Community structure and spatial variation of benthic invertebrates associated with *Zostera marina* (L.) beds in the northern Baltic Sea. *Journal of Sea Research 37(1–2)*: 153–166.

Bradshaw C, Veale LO, Hill AS, Brand AR 2000. The effects of scallop dredging on gravelly seabed communities, *in*: Kaiser MJ, de Groot SJ (2000). The effects of fishing on non-target species and habitats: biological, conservation and socio-economic issues. *Fishing News Books*: 83−104.

Bradshaw C, Veale LO, Hill AS, Brand AR 2001. The effects of scallop dredging on Irish Sea benthos: experiments using a closed area. *Hydrobiologia 465*: 129−138.

Bradshaw C, Collins P, Brand AR 2003. To what extent does upright sessile epifauna affect benthic biodiversity and community composition. *Marine Biology 143*: 783−791.

Brook FJ 1999. Stratigraphy and landsnail faunas of the Late Holocene coastal dunes, Tokerau Beach, northern New Zealand. *Journal of the Royal Society of New Zealand 29(4)*: 337−359.

Chapman VJ and Ronaldson JW 1958. The mangrove and salt marsh flats of the Auckland isthmus. *New Zealand Department of Scientific and Industrial Research Bulletin 25*: 1−79.

Clarke KR, Ainsworth M 1993. A method of linking multivariate community structure to environmental variables. *Marine Ecology Progress Series 92*: 205−219.

Clarke KR, Gorley RN 2001. Primer v5: user manual/tutorial. Primer-E, Plymouth.

Clarke KR, Green RH 1988. Statistical design and analysis for a "biological effects" study. *Biological effects of pollutants. Results of a practical workshop. 46(1−3)*: 213−226.

Clarke KR, Warwick RM 1994. Change in marine communities: an approach to statistical analysis and interpretation. Plymouth Marine Laboratory, Natural Environment Reseach Council, UK.

Clark MR 1985. The food and feeding of seven fish species from the Campbell Plateau, New Zealand. *New Zealand Journal of Marine and Freshwater Research 19*: 339−363.

Collie JS, Escanero GA, Valentine PC 1997. Effects of bottom fishing on the benthic megafauna of Georges Bank. *Marine Ecology Progress Series 155*: 159–172.

Crowder LB, Cooper WE 1982. Habitat structural complexity and the interaction between bluegills and their prey. *Ecology* 63: 1802−1813.

Cryer M, O'Shea S, Gordon D, Kelly M, Drury J, Morrison M, Hill A, Saunders H, Shankar U, Wilkinson M, Foster G 2000. Distribution and structure of benthic invertebrate communities between North Cape and Cape Reinga. Final Research Report for Ministry of Fisheries Research Project ENV9805 Objectives 1–4: 1–154.

Cummings VJ, Thrush SF, Hewitt JE, Turner SJ 1998. The influence of the pinnid bivalve *Atrina zealandica* [*sic*] (Gray) on benthic macroinvertebrate communities in soft-sediment habitats. *Journal of Experimental Marine Biology and Ecology 228(2)*: 227−240.

Cummings VJ, Thrush SF, Hewitt JE, Funnell GA 2001. Variable effect of a large suspension-feeding bivalve on infauna: experimenting in a complex system. *Marine Ecology Progress Series 209*: 159−175.

Dayton PK, Thrush SF, Agardy TM, Hofman RJ 1995. Environmental effects of marine fishing. *Aquatic Conservation: Marine and Freshwater Ecosystems 5(3)*: 205−232.

Department of Conservation 2004. Aoteroa (Great Barrier) Marine Reserve Application. An application by the Director-General of Conservation. Auckland Conservancy: 50p.

Department of Conservation and Ministry of Fisheries 2007. Marine protected areas policy statement and implementation plan draft for consultation: 24p.

Deshayes GP 1840. Nouvelles especes de mollusques, provenant des cotes de la Californie, du Mexique, du Kamtschatka, et de la Nouelle Zelande. *Revue Zoologique 2*: 356−361.

Diaz RJ, Schaffner LC 1990. The functional role of estuarine benthos, p. 25−56. *In* M. Haire and EC Krome (eds.), Perspectives on the Chesapeake Bay, 1990. Advances in Estuarine Sciences. U.S. Environmental Protection Agency, Gloucester Point, Virginia.

Diehl S 1992. Fish predation and benthic community structure: the role of omnivory and habitat complexity. *Ecology 73 (5)*: 1646−1661.

Franz DR, Tanacredi JT 1992. Secondary production of the amphipoda *Ampelisca abdita* Mills and its importance in the diet of juvenile winter flounder (*Pleuronectes americanus*) in Jamaica Bay, New York. *Estuaries 15(2)*: 193−203.

Gammon P 1995. Hautotara Formation, Mangaopari Basin, New Zealand: record of a cyclothemic Pliocene-Pleistocene marine to nonmarine transition. *New Zealand Journal of Geology and Geophysics 38*: 471−481.

Gillespie JL, Nelson CS 1996. Distribution and control of mixed terrigenous-carbonate surficial sediment facies, Wanganui shelf, New Zealand. *New Zealand Journal of Geology and Geophysics 39*: 533−549.

Gillespie JL, Nelson CS, Nodder SD 1998. Post-glacial sea-level control and sequence stratigraphy of carbonate-terrigenous sediments, Wanganui shelf, New Zealand. *Sedimentary Geology 122(1−4)*: 245−266.

Gordon DP 2000. The Pacific Ocean and Global OBIS: a New Zealand perspective. *Oceanography 13(3)*: 41−47.

Grabowski JH, Powers SP 2004. Habitat complexity mitigates trophic transfer on oyster reefs. *Marine Ecology Progress Series 277*: 291−295.

Grange KR 1977. Littoral benthos-sediment relationships in Manukau Harbour, New Zealand. *New Zealand Journal of Marine and Freshwater Research 11(1)*: 111–123.

Grange KR 1979. Soft-bottom macrobenthic communities of Manukau Harbour, New Zealand. *New Zealand Journal of Marine and Freshwater Research 13(3)*: 261–271.

Grange KR, Tovey A, Hill AF 2003. The spatial extent and nature of the bryozoan communities at Separation Point, Tasman Bay. *Marine Biodiversity Biosecurity Report 4*: 7−9.

Gutierrez JL, Jones CG, Strayer DL, Iribarne OO 2003. Mollusks as ecosystem engineers: the role of shell production in aquatic habitats. *OIKOS 101(1)*: 79−90.

Handley S 2006. An analysis of historical impacts and composition of the benthic environment of Tasman and Golden Bays: NIWA Client Report: NEL2006-002: 1–28.

Hayton S, Nelson CS, Hood SD 1995. A skeletal assemblage classification system for non-tropical carbonate deposits based on New Zealand Cenozoic limestones. *Sedimentary Geology 100(1−4)*: 123−141.

Hayward BW, Stephenson AB, Morley M, Riley JL, Grenfell HG 1997. Faunal changes in Waitemata Harbour sediments, 1930s–1990s. *Journal of the Royal Society of New Zealand 27(1)*: 1−20.

Hendy AJW, Kamp PJJ 2004. Late Miocene to early Pliocene biofacies of Wanganui and Taranaki Basins, New Zealand: applications to paleoenvironmental and sequence stratigraphic analysis. *New Zealand Journal of Geology and Geophysics 47*: 769−785.

Hendy AJW, Kamp PJJ 2007. Paleoecology of late Miocene-early Pliocene sixth-order glacioeustatic sequences in the Manutahi-1 core, Wanganui-Taranaki Basin, New Zealand. *PALAIOS 22(3)*: 325−337.

Henriques PR 1980. Faunal community structure of eight soft shore, intertidal habitats in the Manukau Harbour. *New Zealand Journal of Ecology 3*: 97−103.

Hewitt JE, Thrush SF, Gibbs M, Lohrer D, Norkko A 2006. Indirect effects of *Atrina zelandica* on water column nitrogen and oxygen fluxes: the role of benthic macrofauna and microphytes. *Journal of Experimental Marine Biology and Ecology 330(1)*: 261−273.

Hewitt JE, Thrush SF, Halliday J, Duffy C 2005. The importance of small-scale habitat structure for maintaining beta diversity. *Ecology 86(6)*: 1619−1626.

Holt TJ, Rees EI, Hawkins SJ, Seed R 1998. An overview of dynamic and sensitivity characteristics for conservation management of marine SACs. *Biogenic Reefs IX*: 7

Hume TM, Herendof CE 1998. A geomorphic classification of estuaries and its application to coastal resource management — a New Zealand example. *Ocean and Shoreline Management 11*: 249–274.

Jennings S, Kaiser MJ 1998. The effects of fishing on marine ecosystems. *Advances in Marine Biology 34*: 201−351.

Kaiser, MJ, Collie JS, Hall SJ, Jennings S, Poiner IR 2002. Modification of marine habitats by trawling activities: prognosis and solutions. *Fish and Fisheries 2(2)*: 114−136.

Kaiser MJ, Spence FE, Hart PJB 2000. Fishing-gear restrictions and conservation of benthic habitat complexity. *Conservation Biology 14(5)*: 1512−1525.

Keane SL 1986 Temperate skeletal carbonate deposits on the New Zealand continental margin with particular reference to the Three Kings region. Unpublished MSc thesis, University of Waikato, New Zealand. 324p.

Kerr V, Grace R 2005. Intertidal and subtidal habitats of Mimiwhangata Marine Park and adjacent shelf. DOC Research and Development series 201: 21.

Kidwell SM 1997. Time-averaging in the marine fossil record: overview of strategies and uncertainties. *Geobios 30(7)*: 977–995.

Lamprell K, Whitehead T 1992. Bivalves of Australia 1: 182pp.

Lopez GR, Levinton JS 1987. Ecology of deposit-feeding animals in marine sediments. *The Quarterly Review of Biology 62(3)*: 235−260.

Luckens PA 1975. Predation and intertidal zonation of barnacles at Leigh, New Zealand. *New Zealand Journal of Marine and Freshwater Research 9(3)*: 355–378.

Magdych WP 1981. An efficient, inexpensive elutriator design for separating benthos from sediment samples. *Hydrobiologia 85(2)*: 157−159.

Marwick J 1923. The genus *Glycymeris* in the Tertiary of New Zealand. *Transactions and Proceedings of the Royal Society of New Zealand 54*: 63−80.

McDermott JJ 1993. Nemertea inhabiting the *Haploops* (Amphipoda) community of the northern Øresund with special reference to the biology of *Nipponnemertes pulcher* (Hoplonemertea). *Hydrobiologia 266(1−3)*: 15−28.

McDermott JJ 2001. Status of the Nemertea as prey in marine ecosystems. *Hydrobiologia 456(1−3)*: 7−20.

McKnight DG 1969. Infaunal benthic communities of the New Zealand continental shelf. *New Zealand Journal of Marine and Freshwater Research 3*: 409−444.

Neef G 1992. The Cenozoic geology of the Gisborne area (1:50 000 metric sheet Y18AB), North Island, New Zealand. *New Zealand Journal of Geology and Geophysics 35*: 515−531.

Norkko A, Hewitt JE, Thrush SF, Funnell GA 2001. Benthic-pelagic coupling and suspension-feeding bivalves: linking site-specific sediment flux and biodeposition to benthic community structure. *Limnology and Oceanography 46(8)*: 2067−2072.

Oliver JS, Oakden JM, Slattery PN 1982. Phoxocephalid amphipod crustaceans as predators on larvae and juveniles in marine soft-bottom communities. *Marine Ecology Progress Series 7*: 179−184.

Posey M, Lindberg W, Alphin T, Vose F 1996. Influence of storm disturbance on an offshore community. *Bulletin of Marine Science 59(3)*: 523−529.

Posey MH, Alphin TD, Cahoon LB, Lindquist DG, Mallin MA, Nevers MB 2002. Top-down versus bottom-up limitation in benthic infaunal communities: direct and indirect effects. *Estuaries 25*: 999−1014.

Powell AWB 1937. Animal communities of the sea-bottom in Auckland and Manukau Harbours. *Transactions and Proceedings of the Royal Society of New Zealand 66*: 354−401.

Powell AWB 1940. Note on the importance of Recent animal ecology as a basis of paleoecology. In: Proceedings of the Sixth Pacific Science Congress of the Pacific Science Association held at the University of California, Berkeley, Stanford University and San Francisco, July 24th to August 12th, 1939. Berkeley, University of California Press. Vol. 2. Pp. 607–617.

Powell AWB 1979. New Zealand Mollusca: Marine, Land, and Freshwater Shells: 500pp.

Pridmore RD, Thrush SF, Hewitt JE, Roper DS 1990. Macrobenthic community composition of six intertidal sandflats in Manukau Harbour, New Zealand. *New Zealand Journal of Marine and Freshwater Research 24*: 81–96.

Pridmore RD, Thrush SF, Wilcock RJ, Smith TJ, Hewitt JE, Cummings VJ 1991. Effect of the organochlorine pesticide technical chlordane on the population structure of suspension and deposit feeding bivalves. *Marine Ecology Progress Series 7*: 261–271.

Ramsay K, Kaiser MJ, Richardson CA, Veale LO, Brand AR 2000. Can shell scars on dog cockles (*Glycymeris glycymeris* L.) be used as an indicator of fishing disturbance? *Journal of Sea Research 43*: 167−176.

Reise K, Schubert A 1987. Macrobenthic turnover in the subtidal Wadden Sea: the Norderaue revisited after 60 years. *Helgoland Marine Research 41(1)*: 69−82.

Roberts RD 1990. Impact of dredge spoil disposal at sea. Unpublished MSc Thesis. *University of Auckland*: 174pp.

Roper DS, Pridmore RD, Cummings VJ, Hewitt JE 1991. Pollution related differences in the condition cycles of Pacific oysters *Crassostrea gigas* from Manukau Harbour, New Zealand. *Marine Environmental Research 31(3)*: 197−214.

Russell BC 1983. The food and feeding habits of rocky reef fish of north-eastern New Zealand. *New Zealand Journal of Marine and Freshwater Research 17*: 121−145.

Spooner GM, Moore HB 1940. The ecology of the Tamar estuary. II. An account of the macrofauna of the intertidal muds. *Journal of the Marine Biology Association of the United Kingdom 24*: 283−330.

Stoner AW 1982. The influence of benthic macrophytes on the foraging behavior of pinfish, *Lagodon rhomboides* (Linnaeus). *Journal of Experimental Marine Biology and Ecology 58(2−3)*: 271−284.

Thrush SF, Pridmore RD, Hewitt JE, Cummings VJ, Latimer GJ 1990. Ecological monitoring programme for the Manukau Harbour: presentation of data collected up to February 1990. Water Quality Centre, DSIR, Hamilton.

Thrush SF, Hewitt JE, Cummings VJ, Dayton PK, Cryer M, Turner SJ, Funnell GA, Budd RG, Milburn CJ, Wilkinson MR 1998. Disturbance of the marine benthic habitat by commercial fishing: impacts at the scale of the fishery. *Ecological Applications 8(3)*: 866−879.

Thrush SF, Hewitt JE, Cummings VJ, Dayton PK 1995. The impact of habitat disturbance by scallop dredging on marine benthic communities: what can be predicted from the results of experiments? *Marine Ecology Progress Series 129*: 141−150.

Thrush SF, Dayton PK 2002. Disturbance to marine benthic habitats by trawling and dredging: implications for marine biodiversity. *Annual Review of Ecology and Systematics 33*: 449−473.

Townend J 2002. Practical Statistics for Environmental and biological Scientists. John Wiley and Sons Ltd, Baffins Lane, Chichester, West Sussex PO19 1UD, England, AUT Library, 519.5TOW.

Turner SJ, Thrush SF, Hewitt JE, Cummings VJ, Funnell G 1999. Fishing impacts and the degradation or loss of habitat structure. *Fisheries Management and Ecology 6(5)*: 401−420.

Warwick RM, McEvoy AJ, Thrush SF 1997. The influence of *Atrina zelandica* Gray on meiobenthic nematode diversity and community structure. *Journal of Experimental Marine Biology and Ecology 214(1−2)*: 231−247.

Wear RG, Haddon M 1987. Natural diet of the crab *Ovalipes catharus* (Crustacea, Portunidae) around central and northern New Zealand. *Marine Ecology Progress Series 35*: 39−49.

Wilson WH 1991. Competition and predation in marine soft-sediment communities. *Annual Reviews of Ecological Systems 21*: 221−241.

Woodin SA 1978. Refuges, disturbance, and community structure: a marine soft-bottom example. *Ecology 59(2)*: 274−284.

Appendices

Appendix 1

Indices of diversity and evenness of each core sample of southwestern Otata Island.

Location	Date	Habitat	S	N	d	H'(loge)	J'
1	1	Gravel	30	138	5.9	2.8	0.09
1	1	Gravel	28	113	5.7	2.8	0.1
1	1	Gravel	42	205	7.7	2.7	0.1
2	1	Gravel	30	190	5.5	2.40	0.2
2	1	Gravel	24	101	5.0	2.5	0.1
2	1	Gravel	36	186	6.7	2.8	0.1
1	1	*T. laticostata*	28	179	5.2	1.6	0.5
1	1	*T. laticostata*	34	173	6.4	2.1	0.3
1	1	*T. laticostata*	36	199	6.6	2.0	0.3
2	1	*T. laticostata*	40	178	7.5	2.8	0.2
2	1	*T. laticostata*	42	252	7.4	2.7	0.1
2	1	*T. laticostata*	39	258	6.8	3.0	0.08
1	2	Gravel	29	323	4.8	1.5	0.5
1	2	Gravel	34	504	5.3	1.6	0.5
1	2	Gravel	32	284	5.5	1.7	0.4
1	2	Gravel	38	276	6.6	2.0	0.4
1	2	Gravel	33	337	5.5	2.1	0.3
1	2	Gravel	23	245	4.0	1.3	0.6
2	2	Gravel	41	566	6.3	1.5	0.4
2	2	Gravel	34	1673	4.5	0.5	0.9
2	2	Gravel	39	949	5.5	0.6	0.8
2	2	Gravel	42	1473	5.6	0.7	0.8
2	2	Gravel	56	1851	7.3	1.0	0.7
2	2	Gravel	43	1394	5.8	0.7	0.8
1	2	*T. laticostata*	30	306	5.1	1.2	0.6
1	2	*T. laticostata*	46	302	7.9	2.3	0.3
1	2	*T. laticostata*	45	325	7.6	2.1	0.3
1	2	*T. laticostata*	33	221	5.9	1.7	0.4
1	2	*T. laticostata*	27	140	5.3	2.3	0.2
1	2	*T. laticostata*	27	213	4.9	1.4	0.5
2	2	*T. laticostata*	37	1405	5.0	0.6	0.8
2	2	*T. laticostata*	48	1225	6.6	0.7	0.8
2	2	*T. laticostata*	41	578	6.3	0.9	0.7
2	2	*T. laticostata*	43	790	6.3	0.9	0.8
2	2	*T. laticostata*	34	649	5.1	0.7	0.8
1	3	Gravel	65	989	9.3	2.1	0.4
1	3	Gravel	41	448	6.6	2.3	0.2
1	3	Gravel	51	936	7.3	2.3	0.2
1	3	Gravel	53	748	7.9	2.0	0.4
1	3	Gravel	58	911	8.4	2.1	0.3
1	3	Gravel	47	544	7.3	2.3	0.3
2	3	Gravel	38	311	6.5	2.1	0.3
2	3	Gravel	43	767	6.3	1.6	0.5
2	3	Gravel	46	1246	6.3	1.5	0.5
2	3	Gravel	52	1186	7.2	1.9	0.4
2	3	Gravel	48	436	7.7	2.1	0.4
2	3	Gravel	40	918	5.7	1.6	0.5
1	3	*T. laticostata*	60	1074	8.5	1.8	0.4
1	3	*T. laticostata*	63	1204	8.7	1.4	0.6
1	3	*T. laticostata*	72	1349	9.9	1.9	0.4
1	3	*T. laticostata*	52	1063	7.3	1.2	0.6

Location	Date	Habitat	S	N	d	H'(loge)	J'
1	3	*T. laticostata*	69	922	10.0	2.1	0.4
1	3	*T. laticostata*	51	502	8.0	2.2	0.3
2	3	*T. laticostata*	45	736	6.7	1.5	0.4
2	3	*T. laticostata*	42	674	6.3	1.5	0.4
2	3	*T. laticostata*	38	969	5.4	1.3	0.4
2	3	*T. laticostata*	49	1777	6.4	1.2	0.5
2	3	*T. laticostata*	59	1522	7.9	1.6	0.4
2	3	*T. laticostata*	47	1615	6.2	1.3	0.4
1	4	Gravel	59	1144	8.2	1.9	0.4
1	4	Gravel	53	1359	7.2	1.4	0.6
1	4	Gravel	43	1228	5.9	1.3	0.6
1	4	Gravel	43	1086	6.0	1.5	0.5
1	4	Gravel	45	900	6.5	1.7	0.5
1	4	Gravel	34	348	5.6	1.6	0.5
2	4	Gravel	31	201	5.7	2.4	0.2
2	4	Gravel	48	1119	6.7	1.6	0.5
2	4	Gravel	48	1289	6.6	1.4	0.6
2	4	Gravel	41	670	6.2	1.6	0.5
2	4	Gravel	48	991	6.8	1.3	0.6
2	4	Gravel	45	786	6.6	1.5	0.5
1	4	*T. laticostata*	53	637	8.1	2.0	0.4
1	4	*T. laticostata*	58	454	9.3	3.0	0.1
1	4	*T. laticostata*	74	850	10.8	2.4	0.3
1	4	*T. laticostata*	58	728	8.7	2.3	0.3
1	4	*T. laticostata*	48	493	7.6	2.2	0.3
1	4	*T. laticostata*	54	433	8.7	2.5	0.2
2	4	*T. laticostata*	68	1212	9.4	2.1	0.3
2	4	*T. laticostata*	66	899	9.6	2.3	0.3
2	4	*T. laticostata*	66	919	9.5	2.5	0.2
2	4	*T. laticostata*	63	1520	8.5	1.3	0.6
2	4	*T. laticostata*	73	1070	10.3	2.4	0.3
2	4	*T. laticostata*	82	1286	11.3	2.9	0.2

Indices of diversity and evenness of each grab sample taken off Motutapu and Otata Islands.

Location	S	N	d	J'	ES(150)	H'(loge)
Motutapu	8	8	3.4	1	8	2.1
Motutapu	10	22	2.9	0.8	10	1.9
Motutapu	10	33	2.6	0.6	10	1.4
Motutapu	14	27	4.0	0.9	14	2.5
Motutapu	3	3	1.8	1	3	1.1
Motutapu	29	95	6.2	0.7	29	2.9
Motutapu	15	63	3.4	0.8	15	2.1
Motutapu	4	9	1.4	0.7	4	1.0
Motutapu	21	31	5.8	1.0	21	2.9
Motutapu	29	327	4.8	0.6	19.4	2. 2
Motutapu	16	125	3.1	0.4	16	1.1
Motutapu	24	60	5.6	0.8	24	2.5
Motutapu	31	77	6.9	0. 9	31	2.9
Motutapu	10	18	3.1	0.9	10	2.0
Motutapu	8	12	2.8	1.0	8	2.0
Motutapu	23	53	5.5	0.9	23	2.7
Motutapu	22	58	5.2	0.8	22	2.5

Location	S	N	d	J'	ES(150)	H'(loge)
Motutapu	31	94	6.6	0.9	31	2.9
Motutapu	27	146	5.2	0.7	27	2. 4
Motutapu	14	41	3.5	0.9	14	2.4
Motutapu	19	69	4.3	0.8	19	2.2
Motutapu	28	66	6. 5	0.9	28	3.0
Motutapu	23	52	5.6	0.9	23	2.9
Motutapu	9	17	2.8	0.9	9	2.0
Motutapu	34	141	6. 7	0.8	34	2.7
Motutapu	19	52	4.6	0.8	19	2.3
Motutapu	29	74	6.5	0.8	29	2.6
Motutapu	41	196	7.6	0.7	36.1	2.7
Motutapu	23	64	5.3	0.9	23	2.8
Motutapu	26	83	5.7	0.8	26	2.7
Motutapu	39	155	7.5	0.7	38.4	2.7
Motutapu	31	99	6.5	0.8	31	2.9
Motutapu	3	5	1.2	0.9	3	1.0
Motutapu	32	106	6.7	0.7	32	2.6
Motutapu	10	22	2.9	0.8	10	1.8
Motutapu	38	125	7.7	0.9	38	3.2
Motutapu	20	46	5.0	0.9	20	2.7
Motutapu	7	14	2.3	0.9	7	1.8
Motutapu	4	4	2.2	1	4	1.4
Motutapu	7	14	2.3	0.9	7	1.8
Motutapu	4	5	1.9	1.0	4	1.3
Motutapu	9	11	3.3	1.0	9	2.1
Motutapu	6	9	2.3	0.9	6	1.7
Motutapu	8	24	2.2	0.7	8	1.4
Motutapu	7	10	2.6	0.9	7	1.8
Motutapu	8	12	2.8	0.9	8	1.9
Otata	20	56	4.7	0.9	20	2.5
Otata	24	50	5.9	0.8	24	2.6
Otata	33	83	7.2	0.8	33	2.9
Otata	24	113	4.9	0.8	24	2.6
Otata	18	102	3. 7	0.6	18	1.7
Otata	12	26	3. 4	0.9	12	2.3
Otata	10	33	2.6	0.8	10	1.8
Otata	17	62	3.9	0.7	17	2.0
Otata	14	39	3.6	0.6	14	1.6
Otata	20	155	3.8	0.6	19.7	1.6
Otata	18	162	3.3	0.5	17.3	1.4
Otata	23	56	5.5	0.8	23	2.4
Otata	15	56	3.5	0.7	15	1.8
Otata	25	146	4.8	0.6	25	2.0
Otata	30	175	5.6	0.8	28.3	2.7
Otata	25	76	5.5	0.7	25	2.3
Otata	31	135	6.1	0.7	31	2.3
Otata	10	34	2.6	0.6	10	1.5

Location	S	N	d	J'	ES(150)	H'(loge)
Otata	35	230	6.3	0.7	28.9	2.4
Otata	26	263	4. 5	0.6	21.6	1.9
Otata	33	230	5.9	0.6	27.3	2.1
Otata	35	121	7. 1	0.7	35	2.3
Otata	56	351	9.4	0.8	39.1	3.1
Otata	8	17	2.5	0.9	8	1.9
Otata	36	199	6.6	0.6	30.7	2.1
Otata	48	245	8.5	0.8	40.1	3.1
Otata	27	108	5.6	0.7	27	2.4
Otata	45	158	8.7	0.9	43.8	3.3
Otata	16	108	3.2	0.5	16	1.4
Otata	57	499	9.0	0.8	35.7	3.0
Otata	19	141	3.6	0.4	19	1.2
Otata	22	1113	3.0	0.2	9.5	0.7
Otata	16	106	3.2	0.6	16	1.6
Otata	14	34	3.7	0.8	14	2.2
Otata	8	16	2.5	0.8	8	1.8
Otata	28	86	6.1	0.8	28	2.6
Otata	2	2	1.4	1	2	0.7
Otata	57	335	9.6	0.7	37.2	3.0
Otata	17	120	3.3	0.6	17	1.7
Otata	59	1011	8. 4	0.3	19.8	1.2
Otata	12	64	2.7	0.7	12	1.7
Otata	42	1003	5.9	0.3	17.6	1.2
Otata	48	1291	6.6	0.3	19.1	1.3
Otata	35	230	6.3	0.7	28.9	2.4

Appendix 2

Variations in community structure within two habitats at site 1 and site 2

Site 1

Group gravel similarity percentage of species contribution to 40%.

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Amphipoda spp.	18.11	16.65	4.21	26.00	26.00
Oligochaeta spp.	5.13	4.02	3.09	6.27	32.27
Caprella sp. 1	3.23	2.97	1.20	4.64	36.91
Nematoda spp.	3.80	2.58	1.83	4.02	40.93

Average similarity: 64.04

Group *T. laticostata* similarity percentage of species contribution to 40%.

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Amphipoda spp.	17.25	15.26	4.08	27.12	27.12
Oligochaeta spp.	3.76	2.77	1.63	4.92	32.04
Perinereis nuntia	3.33	2.67	3.74	4.74	36.78
Rhyssoplax stangeri	2.55	2.11	1.87	3.74	40.53

Average similarity: 56.27

Groups gravel and *T. laticostata* similarity percentage of species contribution to 40%.

	Group gravel	Group *T. laticostata*				
Species	Av.Abund	Av.Abund	Av.Diss	Diss/SD	Contrib%	Cum.%
Amphipoda spp.	18.11	17.25	2.98	1.47	5.73	5.73
Caprella sp. 1	3.23	0.05	1.96	1.22	3.76	9.49
Perinereis nuntia	0.40	3.33	1.51	2.48	2.91	12.40
Petrolisthes novaezelandiae	0.00	2.54	1.36	1.24	2.62	15.02
Oligochaeta spp.	5.13	3.76	1.12	1.35	2.15	17.17
Nematoda spp.	3.80	2.31	1.10	1.21	2.12	19.29
Rhyssoplax stangeri	0.59	2.55	1.07	1.78	2.06	21.35
Macroclymenella stewartensis	2.07	0.81	0.93	0.97	1.79	23.14
Ostracoda sp. 9	1.70	0.05	0.85	1.17	1.63	24.77
Capitellidae sp. 1	1.83	1.90	0.77	1.09	1.49	26.26
Pisione sp.	1.56	0.55	0.76	1.16	1.45	27.71
Tanaidae sp. 3	0.51	1.82	0.74	1.29	1.42	29.14
Cumacea spp.	2.05	0.54	0.73	1.14	1.40	30.54
Anthuridae sp. 1	2.69	1.68	0.71	1.30	1.37	31.90
Ostracoda sp. 2	3.01	2.64	0.71	1.21	1.36	33.27
Nemertea spp.	2.77	2.02	0.71	0.89	1.36	34.62
Syllidae sp. 4	2.21	2.75	0.70	1.35	1.34	35.97
Ciliacea dolorosa	1.00	0.98	0.70	0.80	1.34	37.30
Asellota spp.	2.03	2.59	0.69	1.20	1.32	38.63
Ostracoda sp. 10	1.43	0.53	0.62	1.12	1.19	39.82
Balanus trigonus	0.05	1.33	0.60	0.91	1.16	40.98

Average dissimilarity = 51.99

Site 2

Group gravel similarity percentage of species contribution to 40%.

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Amphipoda spp.	23.49	19.39	2.62	30.87	30.87
Anthuridae sp. 1	3.20	2.51	1.75	4.00	34.86
Nemertea spp.	3.02	2.34	1.88	3.72	38.59
Ostracoda sp. 2	2.60	2.22	2.46	3.53	42.12

Average similarity: 62.83

Group *T. laticostata* similarity percentage of species contribution to 40%.

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Amphipoda spp.	22.82	17.88	2.63	27.76	27.76
Balanus trigonus	6.97	5.29	0.75	8.21	35.98
Perinereis nuntia	3.17	2.31	3.95	3.58	39.56
Ostracoda sp. 2	3.17	2.00	2.49	3.10	42.66

Average similarity: 64.41

Groups gravel and *T. laticostata* similarity percentage of species contribution to 40%.

	Group gravel	Group *T. laticostata*				
Species	Av.Abund	Av.Abund	Av.Diss	Diss/SD	Contrib%	Cum.%
Balanus Trigonus	0.21	6.97	3.14	0.74	6.08	6.08
Amphipoda spp.	23.49	22.82	3.04	1.18	5.87	11.95
Syllidae sp. 4	2.89	3.12	1.30	1.60	2.51	14.46
Oligochaeta spp.	3.12	1.61	1.25	1.35	2.42	16.88
Caprella sp. 1	2.98	1.45	1.23	1.04	2.38	19.27
Perinereis nuntia	0.68	3.17	1.12	2.18	2.16	21.43
Petrolisthes novaezelandiae	0.00	2.52	1.11	1.93	2.15	23.58
Pisione sp.	2.71	0.66	1.08	1.45	2.10	25.67
Sphaerosyllis sp.	2.49	2.71	0.99	1.55	1.92	27.59
Rhyssoplax stangeri	0.86	2.78	0.92	2.10	1.77	29.37
Anthuridae sp. 1	3.20	2.26	0.82	1.33	1.59	30.95
Tanaidae sp. 3	0.28	2.10	0.79	1.22	1.53	32.48
Nematoda spp.	3.00	2.39	0.75	0.90	1.44	33.92
Caprella sp. 2	1.64	0.28	0.72	0.98	1.39	35.32
Eunice sp. 1	2.11	1.82	0.64	1.34	1.25	36.57
Nemertea spp.	3.02	2.32	0.64	1.13	1.25	37.81
Ophiodromus angistifrons	0.26	1.62	0.64	1.21	1.24	39.05
Capitellidae sp. 1	1.81	1.63	0.63	1.26	1.22	40.27

Average dissimilarity = 51.72

Variations in community structure between Motutapu and Otata Islands

Grab samples

Group Motutapu Island similarity percentage of species contribution to 40%.

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Amphipoda spp.	15.13	5.81	0.55	33.17	33.17
Corbula (*Anisocorbula*) *zelandica*	3.90	1.26	0.50	7.19	40.36

Average similarity: 17.51

Group Otata Island (excluding southwestern Otata Island) similarity percentage of species contribution to 40%.

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Amphipoda spp.	41.19	30.53	2.10	79.39	79.39

Average similarity: 38.45

Group Otata Island (couthwestern) similarity percentage of species contribution to 40%.

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Amphipoda spp.	70.82	63.09	4.40	88.84	88.84

Average similarity: 71.01

Group Motutapu and Otata Islands (excluding southwestern Otata samples) similarity percentage of species contribution to 40%.

	Group M	Group O				
Species	Av.Abund	Av.Abund	Av.Diss	Diss/SD	Contrib%	Cum.%
Amphipoda spp.	15.13	41.19	15.21	1.56	18.70	18.70
Limaria orientalis	4.30	2.35	2.58	0.55	3.17	21.87
Trochodota dendyi	3.97	0.98	2.15	0.61	2.65	24.52
Echinocardium australe	4.15	0.00	2.07	0.50	2.55	27.07
Corbula (*Anisocorbula*) *zelandica*	3.90	0.13	1.95	0.76	2.39	29.46
Sabellidae sp. 1	3.10	1.17	1.82	0.39	2.24	31.70
Asychis sp.	0.46	3.13	1.77	0.28	2.17	33.87
Eunice sp. 1	3.06	0.69	1.63	0.52	2.01	35.88
Maldanidae sp. 3	3.21	0.00	1.60	0.29	1.97	37.85
Capitellidae sp. 1	1.94	1.76	1.55	0.59	1.90	39.75
Cirratulidae sp. 1	2.38	1.24	1.51	0.61	1.86	41.61

Average dissimilarity = 81.34

Group Motutapu and Otata (southwestern) Islands similarity percentage of species contribution to 40%.

	Group M	Group Os				
Species	Av.Abund	Av.Abund	Av.Diss	Diss/SD	Contrib%	Cum.%
Amphipoda spp.	15.13	70.82	27.89	2.70	33.66	33.66
Caprella sp. 1	0.00	6.44	3.22	1.13	3.89	37.55
Limaria orientalis	4.30	0.14	2.15	0.45	2.59	40.14

Average dissimilarity = 82.84

Group Otata and Otata southwestern similarity percentage of species contribution to 40%.

	Group O	Group Os				
Species	Av.Abund	Av.Abund	Av.Diss	Diss/SD	Contrib%	Cum.%
Amphipoda spp.	41.19	70.82	15.88	1.69	28.47	28.47
Caprella sp. 1	0.64	6.44	3.10	1.12	5.55	34.01
Asychis sp.	3.13	0.00	1.57	0.25	2.81	36.82
Sphaerosyllis sp.	2.52	0.63	1.28	0.71	2.29	39.11
Caprella sp. 2	0.04	2.41	1.19	0.76	2.14	41.25

Average dissimilarity = 55.80

Appendix 3

List (presence/absence) of specimens collected on the 25/01/07 at the two sampling sites of Otata Island, New Zealand.

Polychaeta		L1G1	L1G2	L1G3	L2G1	L2G2	L2G3	L1T1	L1T2	L1T3	L2T1	L2T2	L2T3
Opheliidae	*Armandia maculata*	0	0	0	0	0	*	0	*	0	0	0	0
Capitellidae	Gen. sp.1	*	*	0	*	*	*	*	*	0	*	*	0
Chaetopteridae	*Chaetopterus* sp.	0	0	*	0	0	0	0	0	*	0	0	0
Chrysopetalidae	*Chrysopetalum* sp.	0	0	*	0	0	*	0	0	*	0	0	*
Cirratulidae	Gen. sp. 1	0	*	0	*	0	*	0	*	0	0	0	0
Cirratulidae	Gen. sp. 2	0	*	0	*	*	0	0	0	0	0	0	0
Onuphidae	*Diopatra* sp.	*	*	*	0	0	0	0	0	0	0	0	0
Flabelligeridae	*Diplocirrus* sp.	0	0	0	0	*	0	0	0	0	*	0	0
Dorvilleidae	*Dorvillea australiensis*	0	*	*	0	0	0	0	0	*	0	0	0
Phyllodocidae	*Eulalia* sp.1	0	*	0	0	0	0	0	0	0	0	0	0
Eunicidae	*Eunice* sp. 1	0	*	*	0	0	0	0	*	0	*	*	*
Eunicidae	*Eunice* sp. 2	0	0	0	0	0	0	0	0	*	*	0	0
Flabelligeridae	*Flabelligera affinis*	0	0	*	0	*	*	0	0	*	*	*	0
Glyceridae	*Glycera americana*	0	0	0	0	0	*	0	0	0	0	0	0
Goniadidae	*Glycinde* sp.	*	*	*	0	0	0	0	*	*	0	*	0
Glyceridae	*Hemipodus* sp. 1	*	*	0	*	0	0	0	0	0	0	0	0
Glyceridae	*Hemipodus* sp. 2	0	0	0	0	0	*	0	0	0	0	0	0
Polynoidae	*Lepidonotus purpureus*	0	0	0	0	0	0	0	0	0	*	0	0
Lumbrineridae	*Lumbrineris sphaerocephala*	0	0	0	0	0	0	0	0	0	*	0	*
Maldanidae	*Macroclymenella stewartensis*	*	*	*	0	0	0	0	0	*	0	0	0
Eunicidae	*Marphysa depressa*	0	0	0	0	0	0	0	0	0	0	*	0
Nereididae	*Nereis cricognatha*	0	0	0	*	0	0	0	0	0	*	0	*
Hesionidae	*Ophiodromus angustifrons*	0	0	*	0	0	0	0	0	0	*	0	*
Oweniidae	*Owenia fusiformis*	0	0	0	0	0	*	0	0	0	0	0	0
Nereididae	*Perinereis nuntia*	0	0	*	0	*	0	*	*	*	*	*	*
Pisionidae	*Pisione* sp.	*	*	0	0	0	0	0	0	0	0	*	*
Spionidae	*Prionospio* sp. 1	*	0	*	*	*	*	*	*	*	0	0	*
Sabellidae	Gen. sp. 1	*	0	0	*	*	*	*	0	0	*	*	0
Syllidae	*Sphaerosyllis* sp.	0	*	0	*	*	*	0	0	0	*	*	*
Sphaerodoridae	*Sphaerodoridium* sp.	0	0	0	0	0	0	0	0	0	0	*	0
Spionidae	Gen. sp. 1	0	0	0	0	0	*	0	0	0	0	0	0
Syllidae	Gen. sp. 2	0	0	*	0	0	0	0	0	*	0	0	0
Syllidae	Gen. sp. 3	*	*	*	*	0	*	*	*	*	*	*	*
Syllidae	Gen. sp. 4	*	*	*	*	*	*	0	0	*	*	*	*
Syllidae	Gen. sp. 5	0	0	0	0	0	*	0	0	0	0	0	*
Syllidae	Gen. sp. 6	0	0	*	0	0	0	0	0	*	0	0	*
Terebellidae	Gen. sp. 1	0	0	*	0	0	0	0	0	*	0	0	0
Trichobranchidae	*Trichobranchus* sp.	0	0	*	0	*	0	0	0	*	0	0	*
Indeterminate	Gen. et sp. indet. 11	0	0	0	0	0	0	0	0	0	0	*	0
Indeterminate	Gen. et sp. indet. 16	*	0	0	0	0	0	0	0	0	0	0	0
Polyplacophora													
Acanthochitonidae	Gen. sp. 1	0	0	0	0	0	0	0	*	0	*	0	0
Acanthochitonidae	*Craspedochiton rubiginosus*	0	0	0	0	0	0	0	*	0	0	0	0
Indeterminate	Gen. et sp. indet. 1	0	0	*	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. et sp. indet. 4	0	0	0	0	0	0	*	0	0	0	0	0
Ischochitonidae	*Ischnochiton maorianus*	*	*	*	*	*	*	*	*	*	*	*	*
Leptochitonidae	*Leptochiton inquinatus*	*	0	0	*	0	*	*	0	*	*	*	*
Chitonidae	*Onithochiton neglectus*	0	0	0	0	0	0	0	0	0	*	0	0
Chitonidae	*Rhyssoplax stangeri*	*	0	*	0	0	*	*	*	*	*	*	*
Gastropoda													
Buccinidae	*Buccinulum lineum*	0	0	0	0	0	0	0	*	0	0	0	0
Eatoniellidae	Gen. sp. 1	0	0	*	0	0	0	0	0	0	0	0	0
Rissoidae	*Estea zosterophila*	*	0	*	0	0	0	0	0	0	0	*	0
Marginellidae	*Marginella pygmea*	0	0	*	0	0	0	0	0	0	0	0	0
Calyptraeidae	*Maoricrypta costata*	0	0	0	0	0	0	0	0	0	*	0	0
Naticidae	*Proxiuber australe*	0	0	0	0	0	0	*	0	0	0	0	0
Fasciolariidae	*Taron dubius*	0	0	*	0	0	0	0	0	0	0	0	0
Trochidae	*Trochus viridis*	0	0	0	0	0	0	0	0	0	0	0	*
Turbinidae	*Turbo smaragdus*	0	0	0	0	0	0	0	0	0	*	0	0
Muricidae	*Xymene gouldi*	0	0	0	0	0	0	0	*	0	0	0	0
Calyptraeidae	*Zegalerus tenuis*	0	0	0	0	0	0	0	0	0	0	*	0

Bivalvia													
Arcidae	*Barbatia novaezelandiae*	0	0	0	0	*	0	*	0	0	0	0	0
Pectinidae	*Chlamys zelandiae*	0	0	0	0	0	0	0	*	0	0	*	*
Ungulinidae	*Felaniella zelandica*	*	*	0	0	0	*	0	0	*	0	*	0
Psammobiidae	*Gari stangeri*	0	0	0	0	*	0	0	*	0	0	0	0
Semelidae	*Leptomya retaria*	*	0	0	0	0	0	*	0	0	0	0	0
Limidae	*Limaria orientalis*	0	0	0	0	0	0	0	0	0	*	0	0
Nuculidae	*Nucula nitidula*	0	0	0	0	0	0	*	0	0	*	0	0
Glycymerididae	*Tucetona laticostata*	*	*	0	0	*	*	*	*	*	*	*	*
Ostracoda													
Indeterminate	Gen. sp. 1	*	0	0	0	0	0	0	0	0	*	0	0
Indeterminate	Gen. sp. 2	0	0	*	*	*	*	*	*	0	*	*	*
Indeterminate	Gen. sp. 3	0	0	0	*	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 5	0	0	0	*	0	0	*	0	0	0	*	*
Indeterminate	Gen. sp. 6	0	0	0	0	0	0	0	*	0	0	*	0
Indeterminate	Gen. sp. 7	0	0	0	0	0	*	0	0	0	0	0	0
Indeterminate	Gen. sp. 9	0	0	0	0	0	*	0	0	0	0	0	0
Indeterminate	Gen. sp. 12	0	0	0	0	*	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 14	0	0	0	*	0	0	0	*	0	0	0	0
Indeterminate	Gen. sp. 17	0	0	0	*	*	*	*	0	0	0	*	0
Indeterminate	Gen. sp. 18	0	0	0	0	0	0	0	0	0	0	*	0
Indeterminate	Gen. sp. 19	0	0	0	*	0	0	*	*	*	0	*	0
Malacostraca													
Anthuridae	Gen. sp. 1	*	*	*	*	0	*	*	0	0	*	*	*
Anthuridae	Gen. sp. 2	0	*	0	0	0	*	0	0	0	0	0	0
Nebaliidae	*Nebalia* sp.	0	0	0	0	0	*	0	0	*	0	0	0
Diastylidae	*Diastylis insularum*	*	0	*	0	0	0	0	0	0	0	0	0
Nannastacidae	*Nannastacus* sp.	*	0	*	0	0	0	0	0	0	0	0	0
Sphaeromatidae	*Ciliacaea dolorosa*	0	0	*	0	0	*	0	0	0	*	*	*
Sphaeromatidae	*Cymodocella* sp.	0	0	0	0	0	0	0	0	*	0	0	0
Caprellidae	Gen. sp. 1	*	*	*	*	0	*	0	*	0	*	0	*
Caprellidae	Gen. sp. 2	0	0	*	0	0	0	0	*	0	0	0	0
Pagurapseudidae	*Pagurapseudes* sp.	0	0	*	0	*	*	*	0	*	0	*	0
Phliantidae	*Iphinotus typicus*	0	0	*	0	*	0	0	0	0	0	*	0
Tanaidae	Gen. sp. 1	0	0	0	0	0	0	0	0	0	*	0	0
Tanaidae	Gen. sp. 2	0	0	0	0	0	0	0	0	0	*	0	0
Tanaidae	Gen. sp. 3	0	0	0	0	0	0	0	0	0	0	*	*
Tanaidae	Gen. sp. 4	*	*	*	*	*	*	0	0	0	0	0	*
Tanaidae	Gen. sp. 6	0	0	0	0	0	0	0	0	0	0	*	0
Indeterminate	Gen. sp. 1	*	*	*	*	*	*	*	*	*	*	*	*
Indeterminate	Gen. sp. 2	0	0	0	0	0	0	0	0	*	*	*	0
Indeterminate	Gen. sp. 3	0	*	0	*	0	0	0	0	0	0	*	0
Indeterminate	Gen. sp. 4	0	0	0	*	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 5	0	0	0	*	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 6	0	0	0	0	0	0	0	0	*	0	0	0
Hymenosomatidae	*Elamena momona*	0	0	0	0	0	0	0	*	0	0	0	0
Hymenosomatidae	*Halicarcinus cookii*	0	0	0	0	0	0	0	0	*	0	0	*
Geryonidae	*Liocarcinus corrugatus*	0	0	0	0	0	0	0	0	0	*	0	0
Mysidae	Gen. sp. 1	0	0	0	0	0	0	0	*	*	0	0	*
Majidae	*Notomithrax minor*	0	0	0	0	0	0	0	*	*	0	0	*
Palemonidae	*Periclimenes yaldwyni*	0	0	0	0	0	0	0	*	0	0	*	*
Porcellanidae	*Petrolisthes novaezelandiae*	0	0	0	0	0	0	*	*	*	*	0	*
Holothuroidae													
Chiridotidae	*Trochodota dendyi*	*	*	*	0	*	*	*	*	*	*	*	*
Stelleroidea													
Ophiactidae	*Ophiactis resiliens*	*	*	*	*	0	*	*	*	*	*	*	*
Hydrozoa													
Indeterminate	Gen. sp. 1	0	0	0	0	0	0	0	*	0	0	0	0
Maxillopoda													
Archaeobalanidae	*Balanus trigonus*	0	0	0	0	0	0	*	0	0	0	0	0
Indeterminate	Gen. sp. 3	*	*	*	*	*	*	*	*	0	*	*	*
Indeterminate	Gen. sp. 4	*	*	*	*	*	*	*	0	*	*	*	*
Indeterminate	Gen. sp. 5	0	0	*	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 7	0	0	*	*	0	0	0	0	*	0	0	*
Oligochaeta													
	Gen. spp.	*	*	*	*	0	0	*	*	*	*	*	*

List (presence/absence) of species found at two locations around Otata Island, New Zealand, on the 04/04/07.

Polychaeta		L1G1	L1G2	L1G3	L1G4	L1G5	L1G6	L2G1	L2G2	L2G3	L2G4	L2G5	L2G6	L1T1	L1T2	L1T3	L1T4	L1T5	L1T6	L2T1	L2T3	L2T4	L2T5	L2T6
Capitellidae	Gen. sp. 1	*	0	*	0	*	*	*	0	0	*	*	0	*	*	0	0	0	0	0	*	0	0	*
Capitellidae	Gen. sp. 2	*	0	*	*	0	0	0	0	0	*	*	0	0	0	*	0	0	0	0	0	0	0	0
Capitellidae	Gen. sp. 3	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0
Capitellidae	Gen. sp. 4	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capitellidae	Gen. sp. 5	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chaetopteridae	*Chaetopterus* sp.	0	*	0	0	0	0	0	*	0	0	*	0	*	*	*	*	0	0	0	0	0	0	0
Chrysopetalidae	*Chrysopetalum* sp.	0	0	0	0	0	0	*	0	*	*	0	*	0	0	0	0	0	0	0	0	*	*	*
Cirratulidae	Gen. sp. 1	0	*	0	0	0	*	*	0	*	*	*	0	0	*	*	0	0	0	0	*	0	0	0
Cirratulidae	Gen. sp. 2	*	0	*	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0
Onuphidae	*Diopatra* sp.	*	*	*	*	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0
Flabelligeridae	*Diplocirrus* sp.	*	0	0	*	0	*	*	0	0	0	*	0	*	0	*	0	0	0	0	0	0	0	0
Dorvilleidae	*Dorvillea australiensis*	0	0	0	0	*	0	0	0	0	0	0	0	*	0	*	*	0	0	*	*	0	0	0
Phyllodocidae	*Eulalia* sp.	0	0	0	0	0	0	*	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunicidae	*Eunice* sp. 1	*	*	0	0	*	*	*	*	*	*	*	*	*	0	0	0	0	0	*	*	0	0	0
Eunicidae	*Eunice* sp. 2	0	0	0	0	0	*	0	0	0	*	0	0	0	0	0	*	0	0	0	0	0	0	0
Eunicidae	*Eunice* sp. 3	0	0	0	0	*	0	0	0	*	0	0	*	0	0	0	0	0	*	0	0	0	0	0
Flabelligeridae	*Flabelligera affinis*	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	*	0	0	0	*	0	0	*
Serpulidae	*Galeolaria hystrix*	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0
Glyceridae	*Glycera americana*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0
Goniadidae	*Glycinde* sp.	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	*	0	0	0	0	0
Glyceridae	*Hemipodus* sp. 1	0	0	0	0	*	0	*	*	*	*	0	*	0	0	*	0	0	0	0	0	0	0	*
Glyceridae	*Hemipodus* sp. 2	0	0	*	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0
Polynoidae	*Lepidonotus purpureus*	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	*	0	0	0	0	0	0	0
Maldanidae	*Macroclymenella stewartensis*	*	*	0	0	*	*	*	*	0	*	0	*	*	*	0	0	0	0	0	*	0	0	0
Maldanidae	Gen. sp. 3	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0
Maldanidae	Gen. sp. 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
Maldanidae	Gen. sp. 5	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0
Eunicidae	*Marphysa depressa*	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunicidae	*Nematonereis* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	0
Nereididae	*Nereis cricognatha*	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0
Hesionidae	*Ophiodromus angustifrons*	0	0	0	0	0	0	*	0	0	0	*	*	0	*	0	*	0	0	*	*	0	*	0
Oweniidae	*Owenia fusiformis*	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nereididae	*Perinereis nuntia*	0	0	0	0	0	0	*	0	0	*	0	0	*	*	*	*	*	*	*	*	*	*	*
Phyllodocidae	Gen. sp. 1	0	0	0	*	0	0	*	*	*	*	*	*	*	0	0	0	0	0	*	*	*	0	0
Phyllodocidae	Gen. sp. 2	0	0	0	0	0	*	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0
Pisionidae	*Pisione* sp.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0	*	0	0	*	0	0	0
Nereididae	*Platynereis australis*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0
Spionidae	*Prionospio* sp. 1	0	0	0	0	0	0	*	0	0	*	*	*	0	*	0	*	*	*	*	0	*	*	0
Sabellidae	Gen. sp. 1	*	*	0	*	*	*	*	*	*	*	*	*	*	*	0	*	*	0	0	*	0	*	0
Sabellidae	Gen. sp. 3	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0
Syllidae	*Sphaerosyllis* sp.	0	0	*	*	*	0	*	*	*	*	*	*	0	*	*	*	*	0	0	*	0	*	*
Sphaerodoridae	*Spherodoridium* sp.	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spionidae	Gen. sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	0	0	0	0	0	0	0	0

Spionidae	Gen. sp. 3	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spionidae	Gen. sp. 6	0	0	0	0	*	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0
Syllidae	Gen. sp. 1	0	0	0	0	*	0	0	0	0	0	0	0	0	0	*	*	0	0	*	*	*	0	*
Syllidae	Gen. sp. 2	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0
Syllidae	Gen. sp. 3	*	*	*	*	*	*	*	0	*	*	*	*	0	0	0	0	*	0	0	0	*	*	0
Syllidae	Gen. sp. 4	0	0	*	0	*	0	*	*	*	*	*	*	0	*	*	0	0	0	0	*	*	0	0
Syllidae	Gen. sp. 5	0	0	0	0	0	*	0	0	0	0	0	0	0	0	*	*	*	0	0	0	0	0	0
Syllidae	Gen. sp. 6	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	*	0	0	0	0	0	0	0
Syllidae	Gen. sp. 8	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	0	0	0	0	0	*	0
Syllidae	Gen. sp. 9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	*	0
Syllidae	Gen. sp. 10	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0
Syllidae	*Trypanosyllis zebra*	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	*	0	0	0	0	0	0	0
Terebellidae	Gen. sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	0	0	0	0	*	0
Terebellidae	*Terebellides stroemi*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0
Terebellidae	Gen. sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 7	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0
Indeterminate	Gen. sp. 16	0	0	0	*	*	*	0	0	0	0	0	0	*	0	*	0	*	0	0	0	0	0	0
Paraonidae	Gen. sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0
Polyplacophora																								
Acanthochitonidae	Gen. sp. 1	0	0	0	0	0	0	0	0	0	0	*	0	*	*	0	0	*	0	0	0	*	0	*
Indeterminate	Gen. sp. 1	*	*	*	0	0	0	0	*	0	*	*	*	*	0	0	0	*	*	0	0	*	*	*
Indeterminate	Gen. sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	*	0	0	0	0	0	0	0
Ischnochitonidae	*Ischnochiton maorianus*	0	0	0	0	0	0	*	0	0	0	*	*	0	0	0	0	0	0	*	0	*	0	*
Leptochitonidae	*Leptochiton inquinatus*	0	*	0	*	0	0	0	0	0	0	*	*	0	0	*	0	*	0	*	0	*	*	0
Chitonidae	*Rhyssoplax stangeri*	0	0	0	0	0	0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Gastropoda																								
Dorididae	*Alloiodoris lanuginata*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0
Olividae	*Amalda australis*	0	0	0	0	0	0	0	0	*	*	0	0	0	0	0	0	0	0	0	0	0	0	0
Trochidae	*Cantharidus purpureus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	*	0
Buccinidae	*Cominella adspersa*	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	*	0	0	0
Buccinidae	*Cominella virgata*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0
Eatoniellidae	Gen. sp. 1	0	0	0	*	0	0	0	0	0	0	0	*	0	0	0	*	0	0	0	0	0	0	0
Rissoidae	*Estea zosterophila*	0	0	0	0	0	0	0	0	0	0	*	*	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. et sp. indet. 2	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Muricidae	*Haustrum haustorium*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0
Turbinidae	*Homalopoma* cf. *fluctuata*	0	0	0	0	*	0	*	0	0	0	*	*	0	0	0	0	0	0	0	0	*	0	0
Marginellidae	*Marginella cairoma*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0
Marginellidae	*Marginella pygmea*	0	0	0	*	0	*	0	*	0	*	*	*	0	*	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. et sp. indet. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	*	0	0	0	0	0	*	0
Philinidae	*Philine angasi*	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerithiopsidae	*Seila terebelloides*	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0
Calyptraeidae	*Sigapatella novaezelandiae*	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	*	0
Muricidae	*Xymene gouldi*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0
Calyptraeidae	*Zegalerus tenuis*	*	0	*	0	0	0	0	0	*	0	0	0	0	*	*	*	0	0	0	0	*	0	0

Bivalvia																								
Pectinidae	*Chlamys zelandiae*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	*	*	*	*	0	0
Pectinidae	*Chlamys zelandona*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0
Ungulinidae	*Felaniella zelandica*	*	0	*	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0
Psammobiidae	*Gari stangeri*	0	0	0	0	0	0	*	*	0	*	0	0	0	0	0	0	0	0	0	*	0	0	0
Limidae	*Limaria orientalis*	3	0	0	*	0	0	*	0	*	*	*	0	0	*	0	*	*	*	0	*	*	0	0
Anomiidae	*Monia zelandica*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0
Nuculidae	*Nucula nitidula*	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	*	*
Psammobiidae	*Soletellina nitida*	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glycymeridae	*Tucetona laticostata*	*	*	*	0	0	0	0	0	0	*	0	0	0	0	0	0	0	*	*	*	0	0	0
Carditidae	*Purpurocardia purpurata*	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0
Ostracoda																								
Indeterminate	Gen. sp. 1	0	*	*	*	0	0	*	*	*	0	*	*	0	*	*	0	0	*	0	*	*	*	*
Indeterminate	Gen. sp. 2	*	*	*	*	*	0	*	*	*	*	*	*	0	*	*	0	*	*	*	*	*	*	*
Indeterminate	Gen. sp. 3	0	0	0	*	0	0	*	*	0	*	*	*	0	0	0	0	0	0	0	0	*	*	0
Indeterminate	Gen. sp. 4	0	0	0	0	0	0	0	0	0	0	0	*	0	0	*	0	0	0	*	*	0	0	0
Indeterminate	Gen. sp. 5	0	0	*	*	*	0	*	0	*	*	*	0	0	0	0	0	*	0	0	*	*	*	*
Indeterminate	Gen. sp. 6	0	0	0	*	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	*	0
Indeterminate	Gen. sp. 7	0	*	0	*	0	0	*	0	*	*	*	0	0	0	0	0	0	0	0	0	0	*	*
Indeterminate	Gen. sp. 8	0	0	0	0	0	0	0	0	*	0	*	0	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 9	0	*	*	*	*	0	0	0	*	*	*	0	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 10	*	*	0	0	0	0	0	*	*	0	0	*	0	0	0	0	0	0	0	0	0	*	0
Indeterminate	Gen. sp. 11	0	0	0	*	0	0	0	0	*	*	*	*	0	0	0	0	*	0	0	0	0	0	0
Indeterminate	Gen. sp. 12	*	*	*	*	0	0	0	0	0	0	*	0	0	0	0	0	0	*	0	0	0	0	0
Indeterminate	Gen. sp. 13	0	0	0	0	0	0	0	0	0	0	*	*	*	0	0	0	0	0	0	0	0	0	0
Malacostraca																								
Anthuridae	Gen. sp. 1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0	*	*	*	*	*	*	*
Anthuridae	Gen. sp. 2	0	*	0	*	0	*	0	*	0	*	0	*	*	0	0	0	0	0	*	*	0	0	*
Anthuridae	Gen. sp. 4	0	0	0	0	0	0	0	0	*	0	0	0	0	0	*	0	0	*	*	0	0	0	*
Nebaliidae	*Nebalia* sp.	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	*	0	0	0
Nannastacidae	*Nannastacus* sp.	0	0	0	0	0	0	0	0	0	0	*	0	0	0	*	0	0	0	0	*	0	0	0
Indeterminate	Gen. sp. 1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Indeterminate	Gen. sp. 9	0	0	0	0	*	0	0	*	*	0	*	*	0	*	*	0	*	*	*	*	0	*	0
Sphaeromatidae	*Ciliacaea dolorosa*	0	*	0	*	0	0	*	*	*	*	*	*	0	*	*	*	0	*	0	*	*	*	*
Sphaeromatidae	*Cymodocella* sp.	0	0	0	0	0	0	0	0	0	*	*	0	0	0	0	0	0	0	0	0	0	*	0
Caprellidae	Gen. sp. 1	*	*	*	*	*	*	*	*	0	0	*	0	0	0	0	0	0	0	*	*	*	*	0
Caprellidae	Gen. sp. 2	0	*	0	*	0	0	*	*	0	0	*	0	0	0	0	0	0	0	*	0	0	0	0
Pagurapseudidae	*Pagurapseudes* sp.	0	*	*	*	0	0	*	*	*	0	*	*	0	0	0	0	0	*	*	0	*	0	0
Phliantidae	*Iphinotus typicus*	0	*	*	0	0	0	0	0	*	0	*	*	0	0	0	0	0	0	0	0	*	0	*
Tanaidae	Gen. sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	*	0	*	0	*
Tanaidae	Gen. sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	*	*
Tanaidae	Gen. sp. 3	*	0	*	*	0	*	*	0	0	0	*	0	*	*	0	*	*	*	*	*	*	*	*
Tanaidae	Gen. sp. 4	0	*	0	0	*	0	0	0	0	0	*	0	*	*	0	0	0	0	0	0	0	0	0
Tanaidae	Gen. sp. 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0

Tanaidae	Gen. sp. 6	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	*	0	0	0
Indeterminate	Gen. sp. 5	*	*	0	0	0	*	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 6	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hymenosomatidae	*Halicarcinus cookii*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	*	*
Geryonidae	*Liocarcinus corrugatus*	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	*	0	0	*	*	0
Majidae	*Notomithrax minor*	0	0	0	0	0	0	*	0	0	0	0	0	*	*	0	0	0	0	*	*	0	*	*
Palaemonidae	*Periclimenes yaldwyni*	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	*	*	0	0	*	*	*
Porcellanidae	*Petrolisthes novaezelandiae*	0	0	0	0	0	0	0	0	0	0	0	0	*	*	*	*	0	*	*	*	*	*	*
Carpiliidae	*Pilumnus novaezelandiae*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0
Mysidae	Gen. sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	*	0	0	*	*	*	*	*
Pycnogonida																								
	Gen. sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	*	*	0	*	*	0
Maxillopoda																								
Archaeobalanidae	*Balanus trigonus*	0	0	0	0	0	0	0	*	0	0	0	0	0	*	*	*	0	0	*	0	0	*	0
Echinoidea																								
Echinometridae	Evechinus chloroticus	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Holothuroidea																								
Chiridotidae	*Kolostoneura* sp.	0	*	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0
Chiridotidae	*Trochodota dendyi*	*	*	*	*	*	*	0	0	0	*	0	*	0	0	0	*	0	*	0	*	0	0	0
Stichopodidae	*Stichopus mollis*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0
Stelleroidea																								
Ophiactidae	*Ophiactis resiliens*	0	0	*	0	0	0	*	*	*	*	*	*	0	0	0	0	0	0	*	*	*	*	0
Asteroidea																								
Asterinidae	*Patiriella regularis*	0	0	0	0	0	0	*	0	*	0	0	0	0	0	0	0	0	0	0	*	0	0	0
Osteichthyes																								
Gobiesocidae	*Trachelochismus melobesia*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0
Hydrozoa																								
Indeterminate	Gen. sp. 1	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arachnida																								
Halacaridae	Gen. sp. 1	0	0	0	0	0	0	0	*	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indeterminate																								
Indeterminate	Gen. sp. 3	0	*	*	*	*	0	*	*	0	*	*	*	*	*	*	*	*	0	0	0	*	0	*
Indeterminate	Gen. sp. 4	*	*	*	*	*	*	*	*	*	*	*	*	*	0	*	*	0	0	*	*	*	*	*
Indeterminate	Gen. sp. 5	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 7	0	0	0	0	0	0	0	0	*	*	*	0	*	*	0	0	*	0	*	*	*	0	*
Enteropneusta																								
Harrimaniidae	*Saccoglosus australiensis*	*	0	*	0	*	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oligochaeta																								
	Gen. spp.	*	*	*	*	*	*	*	*	*	*	0	*	*	*	*	0	*	*	0	*	0	0	0

List (presence/absence) of species found at the two dived locations around Otata Island, New Zealand, on the 28/06/07.

Polychaeta		L1G1	L1G2	L1G3	L1G4	L1G5	L1G6	L2G1	L2G2	L2G3	L2G4	L2G5	L2G6	L1T1	L1T2	L1T3	L1T4	L1T5	L1T6	L2T1	L2T2	L2T3	L2T4	L2T5	L2T6
Flabelligeridae	*Brada* sp.	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capitellidae	Gen. sp. 1	0	*	*	*	*	*	0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0
Capitellidae	Gen. sp. 2	0	0	*	*	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chaetopteridae	*Chaetopterus* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0
Chrysopetalidae	*Chrysopetalum* sp.	*	*	0	*	*	0	0	0	0	*	0	0	*	*	*	*	0	*	*	*	*	0	*	*
Cirratulidae	Gen. sp.1	*	*	*	0	*	*	*	*	*	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0
Cirratulidae	Gen. sp. 2	*	0	*	*	*	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	*	*	0	0
Cirratulidae	Gen. sp. 3	0	0	*	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onuphidae	*Diopatra* sp.	0	0	0	0	0	0	*	*	*	*	*	*	0	0	0	0	0	0	*	0	0	*	*	*
Flabelligeridae	*Diplocirrus* sp.	*	0	0	*	0	*	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	*	0	0
Cirratulidae	*Dodecaceria berkelyi*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0
Dorvilleidae	*Dorvillea australiensis*	0	0	0	*	*	0	0	0	0	0	0	0	0	0	0	*	0	*	0	0	0	*	0	0
Eunicidae	*Eunice* sp. 1	*	*	0	*	*	*	*	*	*	*	*	*	0	*	*	*	*	*	0	*	*	*	*	*
Eunicidae	*Eunice* sp. 2	0	*	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	*	0	*	*
Flabelligeridae	*Flabelligera affinis*	*	0	0	*	*	0	0	0	0	0	*	0	0	*	*	0	*	0	0	*	0	0	0	0
Glyceridae	*Glycera americana*	0	0	0	0	0	0	0	*	0	0	0	0	0	*	0	0	0	0	0	*	0	0	0	0
Goniadidae	*Glycinde* sp.	*	*	*	*	0	*	*	*	*	*	*	*	*	*	*	0	*	*	*	*	*	*	*	*
Glyceridae	*Hemipodus* sp. 1	*	0	0	0	0	0	0	0	0	*	0	0	0	0	*	0	0	0	0	0	0	0	0	0
Glyceridae	*Hemipodus* sp. 2	*	*	*	0	0	0	0	0	0	*	0	*	0	0	0	0	0	0	0	0	0	0	0	0
Polynoidae	*Lepidonotus purpureus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	*	0	0	0	0	0	0	0
Polynoidae	*Lepidonotus* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0
Maldanidae	*Macroclymenella stewartensis*	0	*	0	0	0	0	*	*	*	*	*	*	0	0	*	0	0	*	*	*	*	*	*	*
Eunicidae	*Marphysa depressa*	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunicidae	*Nematonereis* sp.	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	*	0	0	*	0	0	0	0	0
Nereididae	*Nereis cricognatha*	0	0	0	0	0	0	0	0	0	0	*	0	0	0	*	*	0	*	0	0	0	*	0	*
Hesionidae	*Ophiodromus angistifrons*	*	0	0	*	*	0	0	0	*	0	0	0	*	*	*	*	*	*	*	*	0	0	*	*
Orbiniidae	*Orbinia papillosa*	0	*	*	*	*	*	0	0	0	0	0	0	0	0	*	0	*	0	0	0	0	0	0	0
Oweniidae	*Owenia fusiformis*	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	*	0	0	0	0	0
Nereididae	*Perinereis nuntia*	0	0	*	*	*	*	0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Phyllodocidae	Gen. sp. 1	0	0	0	0	0	*	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phyllodocidae	Gen. sp. 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0
Phyllodocidae	Gen. sp. 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0
Phyllodocidae	Gen. sp. 8	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pisionidae	*Pisione* sp.	*	*	*	0	0	0	*	*	*	*	*	*	*	*	0	0	0	0	*	0	*	*	*	*
Serpulidae	*Pomatoceros* cf. *terranovae*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0
Spionidae	*Prionospio* sp. 1	*	*	*	*	*	*	0	*	0	*	*	0	0	*	0	*	0	*	0	0	0	*	0	0
Sabellidae	Gen. sp. 1	*	0	*	*	*	0	*	*	*	*	*	*	*	0	*	*	*	*	*	*	0	*	*	*
Sabellidae	Gen. sp. 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0
Sabellidae	Gen. sp. 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0
Serpulidae	Gen. sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0
Syllidae	*Sphaerosyllis* sp.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0	0	0	0	0	0
Spionidae	Gen. sp. 1	*	0	*	*	0	*	0	0	*	0	0	*	0	*	*	*	*	*	0	0	0	0	0	0

Spionidae	Gen. sp. 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0
Spionidae	Gen. sp. 6	*	0	*	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spionidae	Gen. sp. 8	0	0	0	0	0	0	*	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Syllidae	Gen. sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	0	0	0	0	0	0	0
Syllidae	Gen. sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	*	0
Syllidae	Gen. sp. 3	*	*	*	*	*	0	*	*	*	*	*	*	0	0	*	0	0	0	*	*	*	*	*	*
Syllidae	Gen. sp. 4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0	*	0	*	0
Syllidae	Gen. sp. 5	*	0	0	0	0	*	0	0	0	0	0	0	*	*	*	*	0	0	0	0	0	0	*	0
Syllidae	Gen. sp. 6	0	0	0	0	0	0	0	0	*	0	0	0	0	*	*	*	*	0	0	0	*	0	0	0
Syllidae	Gen. sp. 8	*	0	0	0	0	0	0	0	*	0	0	0	0	*	*	*	*	*	0	0	0	0	0	0
Syllidae	Gen. sp. 10	0	0	*	*	*	0	0	0	*	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0
Syllidae	*Trypanosyllis zebra*	0	0	0	0	0	0	0	0	0	*	0	0	0	0	*	0	*	0	0	0	0	0	0	0
Syllidae	Gen. sp. 15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0
Terebellidae	Gen. sp. 1	0	0	0	0	0	0	0	0	0	*	0	*	0	0	*	*	0	0	0	0	0	0	*	0
Paraonidae	Gen. sp. 1	*	0	0	0	0	0	0	0	0	0	0	0	0	*	0	*	*	0	0	0	0	0	0	0
Indeterminate	Gen. et sp. indet. 16	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0
Polyplacophora																									
Acanthochitonidae	Gen. sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	*	*	*	*	*	*	0	*	*	0	*	*
Indeterminate	Gen. sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	*	0	0
Ischnochitonidae	*Ischnochiton maorianus*	*	*	*	*	*	*	0	*	*	*	*	*	*	*	*	0	*	*	0	0	0	0	*	*
Leptochitonidae	*Leptochiton inquinatus*	*	0	0	*	*	*	*	*	0	0	0	0	*	*	*	*	*	*	*	0	0	0	0	0
Acanthochitonidae	*Notoplax violacea*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0
Chitonidae	*Rhyssoplax stangeri*	*	*	0	*	*	*	*	0	0	*	*	0	*	*	*	*	*	*	*	*	*	0	*	*
Gastropoda																									
Asteronotidae	*Aphelodoris luctuosa*	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	*	0	0
Olividae	*Amalda australis*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	*	0	0	0	0	0	0	0
Olividae	*Amalda northelandica*	0	0	0	0	0	0	0	*	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0
Turbinidae	*Astraea heliotropium*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
Buccinidae	*Cominella maculosa*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	*	0
Buccinidae	*Cominelle quoyana quoyana*	*	0	*	0	0	*	0	0	0	0	0	0	0	0	0	*	0	*	*	0	0	0	0	0
Buccinidae	*Cominella virgata*	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	*
Cylichnidae	*Cylichna thetidis*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0
Cingulopsidae	*Eatonina* sp.	*	0	0	*	*	*	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0
Fissurellidae	*Emarginula striatula*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0
Rissoidae	*Estea zosterophila*	*	*	0	*	*	*	0	*	0	*	*	*	0	0	0	0	*	0	*	0	0	*	*	0
Turbinidae	*Homalopoma* cf. *fluctuata*	0	0	0	*	*	*	*	*	0	0	*	*	0	*	*	0	*	*	*	0	0	*	*	*
Lamellariidae	*Lamellaria ophione*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	*	*
Marginellidae	*Marginella pygmea*	*	0	0	0	0	0	0	0	0	0	*	*	0	0	0	0	0	0	0	0	0	*	0	0
Calyptraeidae	*Maoricrypta costata*	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	0	0	0	0	0	0	0	*	0
Muricidae	*Muricopsis octogonus*	0	0	0	0	*	0	0	0	0	0	0	0	0	0	*	0	0	0	0	*	0	0	0	0
Cerithiopsidae	*Seila terebelloides*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
Clyptraeidae	*Sigapatella novaezelandiae*	0	0	0	0	0	0	0	0	0	0	0	*	*	*	0	0	0	0	0	0	0	0	0	0
Fasciolariidae	*Taron dubius*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	*	*	*	0	0	0	0	*
Triphoridae	*Triphora fascelina fascelina*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0

Trochidae	*Trochus tiaratus*	*	0	0	0	*	0	0	0	0	0	*	0	0	0	*	*	*	*	0	0	0	0	0	0
Trochidae	*Trochus viridis*	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	*	0	0	0	0	0	0
Muricidae	*Xymene gouldi*	0	*	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0
Calyptraeidae	*Zegalerus tenuis*	0	0	0	*	0	0	0	0	0	0	0	*	0	0	0	0	0	0	*	0	0	0	0	0
Bivalvia																									
Arcidae	*Barbatia novaezelandiae*	*	0	0	*	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	*
Pectinidae	*Chlamys zelandiae*	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	0	*	0	*	0	0	0	0	*
Corbulidae	*Corbula zelandica*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0
Veneridae	*Dosina zelandica*	*	0	0	0	0	0	0	0	*	0	0	*	*	0	0	0	*	0	0	0	0	0	0	0
Ungulinidae	*Felaniella zelandica*	*	0	*	0	0	*	0	*	0	0	*	0	*	*	0	*	*	*	0	0	0	*	0	0
Psammobiidae	*Gari stangeri*	0	0	*	*	*	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	*	0	0	*
Semelidae	*Leptomya retaria*	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	*	0	0	0	0	0	0	0
Limidae	*Limaria orientalis*	*	0	*	0	0	0	*	0	0	0	*	0	*	*	*	0	0	0	*	*	0	*	0	*
Nuculidae	*Nucula nitidula*	*	*	*	*	*	*	*	0	0	0	*	0	0	*	*	*	*	*	0	0	0	0	0	*
Pectinidae	*Pecten novaezelandiae*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0
Psammobiidae	*Soletellina nitida*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0
Glycymeridae	*Tucetona laticostata*	*	0	*	*	*	*	*	*	*	0	*	*	*	*	*	0	*	*	0	*	0	*	*	0
Carditidae	*Purpurocardia purpurata*	*	0	0	0	0	*	0	0	0	0	0	0	*	*	0	0	0	0	0	0	0	0	0	0
Ostracoda																									
Indeterminate	Gen. sp. 1	*	0	0	*	*	0	0	0	0	*	0	0	*	*	*	*	*	*	*	0	0	0	*	*
Indeterminate	Gen. sp. 2	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Indeterminate	Gen. sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	*	0	0	0	*	0	*	0	0
Indeterminate	Gen. sp. 4	*	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	*	0	0	0	*	0	0	0
Indeterminate	Gen. sp. 5	*	*	*	*	*	*	*	0	*	0	*	0	*	0	*	*	*	*	*	0	*	0	*	1
Indeterminate	Gen. sp. 6	0	0	0	*	*	*	0	*	0	*	0	0	*	*	*	*	*	*	*	0	*	0	*	0
Indeterminate	Gen. sp. 7	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 8	0	0	0	*	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 9	*	*	*	*	*	*	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 10	*	*	*	*	*	*	*	0	*	0	*	0	0	0	0	0	0	0	0	0	0	0	*	0
Indeterminate	Gen. sp. 11	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	0	*	*	*	*	0
Indeterminate	Gen. sp. 12	0	0	0	0	0	0	0	0	0	0	0	0	*	*	*	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 14	*	*	*	0	*	*	*	0	0	0	*	0	*	*	*	0	0	*	0	0	0	0	0	0
Indeterminate	Gen. sp. 16	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 17	*	*	*	0	*	*	0	0	0	0	0	0	0	*	*	*	*	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 19	0	*	*	*	0	*	*	*	*	*	*	*	*	0	0	0	*	0	0	0	0	0	*	0
Indeterminate	Gen. sp. 20	0	0	0	0	0	*	0	0	0	0	0	0	*	0	*	0	*	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 21	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malacostraca																									
Anthuridae	Gen. sp. 1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0	*	*	*	*	*	*
Anthuridae	Gen. sp. 2	*	*	0	0	*	0	*	0	*	0	*	0	*	0	0	0	0	0	0	*	0	*	*	0
Anthuridae	Gen. sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	*	0	0	0
Anthuridae	Gen. sp. 4	0	0	0	0	0	0	0	0	0	0	0	0	*	*	*	0	0	0	0	0	*	*	0	0
Paranthuridae	*Paranthura punctata*	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0
Nebaliidae	*Nebalia* sp.	0	0	0	0	0	0	0	*	*	0	*	*	*	0	*	0	0	0	0	0	0	*	0	*

Nannastacidae	*Nannastacus* sp.	*	*	*	*	*	*	0	*	0	*	0	0	0	*	0	0	*	*	0	0	0	0	0	0
Arcturidae	Gen. sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Indeterminate	Gen. sp. 2	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	*	*	*
Indeterminate	Gen. sp. 3	0	0	0	0	0	0	*	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 4	0	0	*	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 6	*	0	*	0	0	0	0	0	0	*	*	0	0	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0
Indeterminate	Gen. sp. 9	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0	*	0	0	*	*
Indeterminate	Gen. sp. 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0
Spaeromatidae	*Ciliacaea dolorosa*	*	0	*	*	*	*	*	*	*	*	*	0	*	*	*	0	*	0	*	0	0	0	0	*
Spaeromatidae	*Cymodocella* sp.	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	*	*	*
Gnathiidae	Gen. sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	*	*	0	0	0	0	0	0
Capreliidae	Gen. sp. 1	0	0	*	*	*	0	*	*	*	*	*	*	0	0	0	0	0	0	0	0	0	*	*	0
Capreliidae	Gen. sp. 2	*	0	*	*	0	0	*	*	*	*	*	*	0	0	*	*	0	0	0	0	0	0	0	0
Pagurapseudidae	*Pagurapseudes* sp.	*	*	*	*	*	*	*	*	*	*	*	0	0	*	*	*	*	*	0	*	*	*	*	0
Phliantidae	*Iphinotus typicus*	*	*	0	*	0	0	0	0	*	*	0	0	0	*	0	*	0	0	*	0	*	0	*	0
Tanaidae	Gen. sp. 1	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	*	0
Tanaidae	Gen. sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0
Tanaidae	Gen. sp. 3	*	*	0	0	*	0	0	*	0	*	0	*	*	*	*	*	*	*	*	*	*	*	*	*
Tanaidae	Gen. sp. 4	*	*	*	*	*	0	0	*	*	*	*	*	*	*	*	0	0	0	0	0	0	*	*	0
Tanaidae	Gen. sp. 5	0	0	0	0	0	0	0	0	*	*	0	0	0	0	*	0	*	0	0	0	0	0	0	0
Hymenosomatidae	*Halicarcinus cookii*	0	0	0	0	*	0	0	0	0	0	0	0	0	*	0	0	0	0	0	*	0	*	0	*
Geryonidae	*Liocarcinus corrugatus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	*	0
Majidae	*Notomithrax minor*	0	*	0	0	*	*	0	0	0	0	0	0	0	*	0	*	*	0	0	*	0	0	*	*
Mysidae	Gen. sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	*	*	*	*	*	0	*	*	*	0	0	*
Palaemonidae	*Periclimenes yaldwyni*	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	*	*	*	0	*	*	0	*	*
Porcellanidae	*Petrolisthes novaezelandiae*	0	0	0	0	0	0	0	0	0	0	0	0	*	*	*	*	*	0	*	*	*	0	*	*
Crangonidae	*Pontophilus* sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0
Upogebiidae	*Upogebia hirtifrons*	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pycnogonida																									
	Gen. sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0
Maxillopoda																									
Archaeobalanidae	*Balanus trigonus*	0	0	0	0	0	0	0	0	*	0	0	0	*	0	*	*	*	*	*	*	*	*	*	*
Echinoidea																									
Echinometridae	*Evechinus chloroticus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0
Holothuroidea																									
Chiridotidae	*Trochodota dendyi*	*	0	*	0	0	*	0	0	*	*	*	*	0	0	0	0	0	0	0	0	0	*	0	0
Cucumariidae	*Ocnus brevidentis*	0	0	0	0	*	*	0	0	0	0	0	0	*	*	*	*	*	*	0	0	0	0	0	0
Stelleroidea																									
Ophiactidae	*Ophiactis resiliens*	*	*	*	*	*	*	0	*	*	*	*	*	*	*	*	*	*	*	0	*	*	*	*	*
Asteroidea																									
Asterinidae	*Patiriella regularis*	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0

Osteichthyes																									
Gobiesocidae	*Trachelochismus melobesia*	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	0	0	0	0	0	0	*	0	*
Hydrozoa																									
Indeterminate	Gen. sp. 1	*	*	*	*	*	0	*	0	0	0	*	0	*	0	*	0	*	0	0	0	0	*	0	0
Indeterminate																									
Indeterminate	Gen. sp. 3	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0	*	*	0	*	*	*	*	0
Indeterminate	Gen. sp. 4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0
Indeterminate	Gen. sp. 5	0	0	*	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 7	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	0	*	*	*	*	0	0	*	*
Indeterminate	Gen. sp. 8	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Enteropneusta																									
Harrimaniidae	*Saccoglosus australiensis*	*	0	0	0	0	0	*	*	*	*	0	0	*	*	*	0	0	0	*	*	*	*	*	*
Sipunculida																									
Sipunculidae	Gen. sp.	0	0	0	0	0	0	0	0	0	*	0	0	0	0	*	0	*	0	*	0	0	0	*	0
Oligochaeta																									
	Gen. spp.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0	0	*	0	*	0

List (presence/absence) of species found at two locations sampled around Otata Island, New Zealand, on the 19/09/07

Polychaeta		L1G1	L1G2	L1G3	L1G4	L1G5	L1G6	L2G1	L2G2	L2G3	L2G4	L2G5	L2G6	L1T1	L1T2	L1T3	L1T4	L1T5	L1T6	L2T1	L2T2	L2T3	L2T4	L2T5	L2T6
Opheliidae	*Armandia maculata*	0	0	0	0	0	0	0	0	0	0	0	0	*	*	*	*	0	0	*	*	*	*	*	*
Capitellidae	Gen. sp. 1	*	*	0	*	*	*	*	*	*	0	0	*	*	*	*	*	*	*	*	*	*	*	*	*
Capitellidae	Gen. sp. 2	0	0	0	*	0	0	0	0	0	0	0	0	0	0	*	*	0	0	0	0	0	0	0	0
Chaetopteridae	*Chaetopterus* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	*	*	0	0	0
Chrysopetalidae	*Chrysopetalum* sp.	0	0	0	0	0	0	0	0	0	0	*	0	*	0	*	*	0	*	*	*	*	0	*	*
Cirratulidae	Gen. sp. 1	*	*	*	*	*	0	0	*	*	0	*	0	0	*	*	*	*	0	0	0	0	0	*	*
Cirratulidae	Gen. sp. 2	*	0	0	0	0	0	0	0	*	0	0	0	0	0	*	0	0	*	0	*	0	0	0	0
Cirratulidae	Gen. sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0
Onuphidae	*Diopatra* sp.	*	*	*	*	*	*	*	0	*	*	*	*	*	*	*	*	*	*	0	0	0	0	*	*
Flabelligeridae	*Diplocirrus* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	*	0	0	0	0	0	0	0
Dorvilleidae	*Dorvillea australiensis*	*	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	*	0	*	0	0	0
Eunicidae	*Eunice* sp. 1	*	*	*	*	*	*	0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Flabelligeridae	*Flabelligera affinis*	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	0	0	0	*	*	*	*	*	*
Glyceridae	*Glycera americana*	0	*	0	0	*	0	0	*	0	0	0	0	0	0	0	0	0	0	*	*	0	0	*	0
Glyceridae	*Glycera tesselata*	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goniadidae	*Glycinde* sp.	*	*	*	*	*	*	0	*	*	*	*	*	0	*	*	*	*	*	0	0	*	0	0	*
Glyceridae	*Hemipodus* sp. 2	0	0	*	0	0	0	0	0	0	0	*	*	0	0	*	*	0	0	0	0	0	0	0	*
Polynoidae	*Lepidonotus purpureus*	0	0	0	0	0	0	0	0	*	0	0	0	0	*	*	*	0	*	0	0	0	0	*	*
Polynoidae	*Lepidonotus* sp	0	0	0	0	0	0	0	0	0	0	0	0	*	0	*	0	0	0	0	0	0	0	*	*
Lumbrineridae	*Lumbrineris sphaerocephala*	*	0	0	0	0	0	0	*	0	0	*	*	0	0	0	0	0	*	0	0	0	0	0	0
Maldanidae	*Macroclymenella stewartensis*	*	*	*	*	*	*	*	*	*	*	*	*	0	*	*	*	*	*	*	*	*	*	0	*
Eunicidae	*Marphysa depressa*	0	0	0	0	0	*	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	*
Eunicidae	*Nematonereis* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0
Nereididae	*Nereis cricognatha*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	*	*	0	0	0	*
Hesionidae	*Ophiodromus angistifrons*	*	*	*	*	*	*	0	0	*	0	0	0	*	*	*	*	*	*	*	*	*	*	*	*
Orbiniidae	*Orbinia papillosa*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0
Oweniidae	*Owenia fusiformis*	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	0	0	0	0	0	0	0	0
Nereididae	*Perinereis nuntia*	*	*	0	0	0	0	0	0	*	*	0	0	*	*	*	*	*	*	*	*	*	*	*	*
Phyllodocidae	Gen. sp. 1	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0
Phyllodocidae	Gen. sp. 7	0	0	0	0	0	0	0	0	0	0	*	*	0	0	*	0	0	*	*	0	*	0	*	*
Phyllodocidae	Gen. sp. 8	0	0	0	0	0	0	0	0	0	0	0	0	*	*	*	*	0	0	0	0	*	0	*	0
Pisionidae	*Pisione* sp.	*	*	*	*	*	*	*	*	*	*	*	*	0	0	0	0	0	0	0	0	0	0	0	0
Spionidae	*Prionospio* sp. 1	*	*	*	*	*	*	*	*	*	0	0	*	*	*	*	*	*	*	*	*	*	*	*	*
Sabellidae	Gen. sp. 1	*	*	*	*	*	0	*	*	*	*	*	*	*	*	*	*	*	*	*	0	*	0	*	*
Serpulidae	Gen. sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0
Syllidae	*Sphaerosyllis* sp.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Sphaerodoridae	*Spherodoridium* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0

Spionidae	Gen. sp. 1	0	*	*	*	0	0	0	*	0	0	0	0	0	*	*	0	0	0	0	0	0	0	*	0
Spionidae	Gen. sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	*	0	0	0	0	0	0
Spionidae	Gen. sp. 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0
Spionidae	Gen. sp. 6	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0
Spionidae	Gen. sp. 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0
Syllidae	Gen. sp. 2	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Syllidae	Gen. sp. 3	*	*	*	*	*	*	0	*	*	*	0	0	0	*	*	0	*	*	0	*	0	*	*	0
Syllidae	Gen. sp. 4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Syllidae	Gen. sp. 5	0	*	0	0	0	0	0	0	0	0	0	0	0	*	*	0	*	*	*	*	0	0	*	*
Syllidae	Gen. sp. 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	*	0	0	0	0	*
Syllidae	Gen. sp. 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0
Syllidae	Gen. sp. 8	*	0	0	0	0	0	0	0	0	0	0	0	0	*	*	*	*	*	*	*	*	*	*	0
Syllidae	Gen. sp. 9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0
Syllidae	Gen. sp. 10	*	*	*	0	0	0	0	0	0	0	*	*	*	*	0	0	*	0	*	*	*	*	*	*
Syllidae	*Trypanosyllis zebra*	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	0	0	0	0	0	0	0	*
Syllidae	Gen. sp. 15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0
Syllidae	Gen. sp. 19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0
Syllidae	Gen. sp. 20	0	0	0	0	0	0	0	*	*	0	*	*	0	0	0	0	0	0	0	0	0	0	0	0
Syllidae	Gen. sp. 21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	0	0	0	0	0	0	0
Terebellidae	Gen. sp. 1	0	0	0	0	0	0	0	0	*	0	*	*	0	0	*	0	0	0	0	0	0	*	*	0
Trichobranchidae	*Trichobranchus* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
Indeterminate	Gen. sp. 4	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0
Indeterminate	Gen. sp. 16	*	0	0	*	0	*	0	0	*	0	*	0	*	0	0	*	0	0	0	0	0	0	0	0
Paraonidae	Gen. sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	0	0	*	*	*	*	*	*
Polyplacophora																									
Aconthochitonidae	Gen. sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	*	*	*	0	*	*	*
Indeterminate	Gen. sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	0	0	0	0	0
Ischnochitonidae	*Ischnochiton maorianus*	*	*	*	0	0	0	*	*	*	0	*	*	*	*	*	0	*	*	*	*	*	*	*	*
Leptochitonidae	*Leptochiton inquinatus*	*	*	0	0	0	0	0	0	*	0	*	0	0	0	*	0	*	0	*	*	0	*	*	0
Chitonidae	*Rhyssoplax stangeri*	0	0	0	0	0	0	*	*	*	*	0	0	*	0	*	*	*	*	*	*	*	*	*	*
Gastropoda																									
Aeolidiidae	*Aeolidia* sp.	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0
Olividae	*Amalda australis*	0	0	0	0	0	0	0	0	*	0	0	0	*	0	0	0	0	0	*	*	0	0	*	0
Olividae	*Amalda northelandica*	0	0	*	0	*	0	*	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0
Turbinidae	*Astraea heliotropium*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0
Diaphanidae	*Austrodiaphana maunganuica*	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mitridae	*Austromitra rubiginosa*	0	0	*	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Buccinidae	*Cominella adspersa*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0
Buccinidae	*Cominelle quoyana quoyana*	*	0	0	0	*	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Buccinidae	*Cominella virgata*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	0	0	0	0	0
Eatoniellidae	Gen. sp. 1	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0
Cingulopsidae	*Eatonina* sp.	0	0	0	0	0	0	0	*	*	0	*	*	0	0	0	0	0	0	0	*	0	*	*	*
Fissurellidae	*Emarginula striatula*	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0
Epitoniidae	*Epitonium minora*	0	0	*	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0
Rissoidae	*Estea zosterophila*	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	*	0	0	0	0	0
Muricidae	*Haustrum haustorium*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0
Turbinidae	*Homalopoma* cf. *fluctuata*	0	0	0	*	0	0	0	*	0	*	0	*	*	0	0	0	0	0	*	*	*	*	0	*
Lemellariidae	*Lamellaria ophione*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	*
Marginellidae	*Marginella cairoma*	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	*	*	0
Marginellidae	*Marginella pygmea*	*	*	0	0	*	0	0	*	*	0	*	*	0	0	0	0	0	0	0	0	0	0	0	0
Clyptraeidae	*Maoricrypta monoxyla*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0
Muricidae	*Muricopsis octogonus*	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	*	0	0	*	0	*	0	0	0
Buccinidae	*Penion sulcatus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0
Naticidae	*Proxiuber australe*	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calyptraeidae	*Sigapatella novaezelandiae*	0	0	*	*	0	0	0	0	0	0	0	0	0	0	*	*	0	*	*	0	0	0	0	*
Trochidae	*Trochus tiaratus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0
Trochidae	*Trochus viridis*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0
Turbinidae	*Turbo smaragdus*	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0
Pyramidellidae	*Turbonilla* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0
Muricidae	*Xymene gouldi*	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	*	0	*	0	0	*	*	*	*
Calyptraeidae	*Zegalerus tenuis*	0	0	0	0	0	0	0	0	0	0	0	*	*	0	0	0	0	0	0	0	0	0	0	*
Bivalvia																									
Arcidae	*Barbatia novaezelandiae*	*	0	*	0	0	0	0	0	0	0	0	0	0	0	*	*	0	0	*	*	0	*	*	*
Pectinidae	*Chlamys zelandiae*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	0	0	*	*	*	*
Ungulinidae	*Diplodonta striatula*	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0
Veneridae	*Dosina zelandica*	0	0	0	*	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
Veneridae	*Dosinia anus*	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0
Ungulinidae	*Felaniella zelandica*	0	*	0	0	0	0	0	0	*	0	0	0	0	*	*	*	0	0	0	*	0	*	0	0
Galeommatidae	*Galeommatacea* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0
Psammobiidae	*Gari stangeri*	0	0	0	*	0	0	0	*	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0
Limidae	*Limaria orientalis*	0	*	0	*	*	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	*	*	*	*
Mytilidae	*Musculista senhousia*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0
Nuculidae	*Nucula nitidula*	*	0	0	0	0	0	0	0	0	*	0	0	*	*	*	*	0	0	*	*	0	*	0	*
Pectinidae	*Pecten novaezelandiae*	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mytilidae	*Perna canaliculus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0
Carditidae	*Pyrpurocardia purpurata*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0
Mactridae	*Scalpomactra scalpellum*	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glycymerididae	*Tucetona laticostata*	0	*	0	0	0	0	0	*	*	*	*	0	0	0	0	0	0	*	0	0	0	*	*	*
Carditidae	*Purpurocardia purpurata*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0

Ostracoda																									
Indeterminate	Gen. sp. 1	*	0	0	0	*	0	*	*	0	*	0	*	*	0	0	0	*	*	*	*	*	*	*	*
Indeterminate	Gen. sp. 2	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Indeterminate	Gen. sp. 3	0	0	0	*	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	*
Indeterminate	Gen. sp. 4	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	*	0	0	0
Indeterminate	Gen. sp. 5	*	0	0	0	*	*	0	0	*	*	*	0	*	*	0	0	0	0	0	*	*	0	*	*
Indeterminate	Gen. sp. 6	*	*	0	0	*	*	0	0	0	0	0	0	*	0	0	0	*	0	0	0	*	*	*	*
Indeterminate	Gen. sp. 8	*	*	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 9	*	0	*	*	*	*	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	*	*
Indeterminate	Gen. sp. 10	*	*	*	0	*	0	0	0	0	0	0	0	*	*	*	*	0	0	0	*	*	*	*	*
Indeterminate	Gen. sp. 11	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	*	*	*
Indeterminate	Gen. sp. 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0
Indeterminate	Gen. sp. 14	0	0	0	0	0	0	*	0	*	*	*	0	0	0	0	0	0	0	0	0	*	*	0	*
Indeterminate	Gen. sp. 16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0
Indeterminate	Gen. sp. 17	0	0	0	0	0	0	0	0	0	0	0	*	*	0	*	*	0	0	*	0	0	0	0	0
Indeterminate	Gen. sp. 18	*	*	0	*	0	0	0	0	0	0	0	0	0	0	*	*	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 19	*	*	*	0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Indeterminate	Gen. sp. 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0
Indeterminate	Gen. sp. 21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	*	0	0
Indeterminate	Gen. sp. 22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0
Indeterminate	Gen. sp. 23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0
Indeterminate	Gen. sp. 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	*
Malacostraca																									
Anthuridae	Gen. sp. 1	*	*	*	*	*	*	*	*	*	0	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Anthuridae	Gen. sp. 2	*	*	*	*	*	*	0	*	0	*	*	*	*	*	*	*	*	0	*	*	0	0	*	*
Anthuridae	Gen. sp. 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0
Anthuridae	Gen. sp. 4	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	*	0	*	0	0	*	*	0	*
Paranthuridae	*Paranthura punctata*	0	0	0	*	0	0	0	0	0	0	0	*	0	0	0	0	0	*	0	0	0	0	0	0
Nebaliidae	*Nebalia* sp.	*	*	0	0	0	*	0	*	*	*	*	0	0	0	0	0	0	0	0	*	*	0	0	*
Nannastacidae	*Nannastacus* sp.	*	*	*	*	*	*	0	0	*	*	*	0	0	*	*	0	*	*	*	*	*	0	0	0
Sphaeromatidae	*Ciliacaea dolorosa*	*	*	*	0	*	0	0	*	0	*	0	0	0	0	0	0	*	0	*	*	0	*	*	0
Sphaeromatidae	*Cymodocella* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	*	*	*	*	*	*
Gnathiidae	Gen. sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	0	0	0	0
Caprellidae	Gen. sp. 1	*	*	*	*	*	*	*	*	*	*	*	*	0	0	0	0	0	0	*	*	*	*	*	*
Caprellidae	Gen. sp. 2	*	*	*	*	*	*	0	*	*	*	*	*	0	0	0	0	0	0	0	*	*	0	0	*
Pagurapseudidae	*Pagurapseudes* sp.	*	*	0	*	*	0	*	*	*	*	*	*	0	*	*	0	*	0	*	*	*	*	*	*
Phliantidae	*Iphinotus typicus*	0	0	0	0	0	0	0	*	0	0	*	0	0	0	0	0	0	*	0	0	*	0	0	*
Tanaidae	Gen. sp. 1	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	*	0	*	0	0	0
Tanaidae	Gen. sp. 2	*	*	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0
Tanaidae	Gen. sp. 3	*	0	0	*	0	0	0	0	0	0	0	0	*	0	*	*	0	*	*	*	*	0	*	*

Tanaidae	Gen. sp. 4	*	*	*	0	*	0	*	*	*	*	*	*	0	0	0	*	*	0	*	*	*	*	*	*
Tanaidae	Gen. sp. 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0
Tanaidae	Gen. sp. 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0
Indeterminate	Gen. sp. 1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Indeterminate	Gen. sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	0	0	*	0	*	0	0
Indeterminate	Gen. sp. 6	*	*	*	0	*	0	*	*	0	*	0	*	0	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 7	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 8	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 9	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0	*	*	*	*
Hymenosomatidae	*Elamena momona*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
Hymenosomatidae	*Halicarcinus cookii*	*	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	*	*	*	*	*	*
Geryonidae	*Liocarcinus corrugatus*	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mysidae	Gen. sp. 1	0	0	*	0	0	0	0	0	0	0	0	0	*	*	*	*	*	0	*	0	*	0	0	*
Majidae	*Notomithrax minor*	0	0	*	0	0	0	0	0	0	0	0	0	0	*	*	*	*	0	*	*	*	*	*	*
Palaemonidae	*Periclimenes yaldwyni*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	*	0	0	*	0	*
Porcellanidae	*Petrolisthes novaezelandiae*	0	0	0	0	0	0	0	0	0	0	0	0	*	*	*	*	*	*	*	*	*	*	*	*
Crangonidae	*Pontophilus* sp. 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0
Arachnida																									
Halacaridae	Gen. sp. 1	0	0	0	0	0	0	0	0	0	*	0	*	0	0	0	0	0	0	0	0	*	0	0	*
Pycnogonida																									
	Gen. sp. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	*	*	*	*
Maxillopoda																									
Archaeobalanidae	*Balanus trigonus*	0	0	*	0	0	0	0	0	0	0	0	0	*	*	*	*	0	*	0	*	0	*	*	*
Echinoidea																									
Echinometridae	*Evechinus chloroticus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	0	0	*
Holothuroidea																									
Chiridotidae	*Kolostoneura* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0
Chiridotidae	*Trochodota dendyi*	*	0	0	*	0	0	*	*	*	0	*	0	0	0	*	*	0	0	*	0	0	0	0	0
Stelleroidea																									
Ophiactidae	*Ophiactis resiliens*	0	0	0	*	*	0	*	*	0	*	*	*	*	0	*	0	*	0	*	*	*	*	*	*
Osteichthyes																									
Gobiesocidae	*Trachelochismus melobesia*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	*	0	0	*	0
Hydrozoa																									
Indeterminate	Gen. sp. 1	*	0	*	*	*	*	*	*	*	*	0	0	0	*	*	0	*	0	*	*	*	*	0	*
Demospongiae																									
Indeterminate	Gen. sp. 1	0	0	0	0	0	0	0	0	0	0	0	*	0	0	*	0	0	0	0	0	0	0	0	0
Gymnolaemata																									
Chaperiidae	*Chaperiopsis cervicornis*	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indeterminate																									
Indeterminate	Gen. sp. 1	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Indeterminate	Gen. sp. 2	*	0	0	0	0	0	0	0	0	0	*	0	0	0	0	*	0	0	0	0	*	0	0	0
Indeterminate	Gen. sp. 3	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Indeterminate	Gen. sp. 4	*	*	*	*	*	*	0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Indeterminate	Gen. sp. 5	0	0	0	0	0	0	0	0	0	0	0	0	*	*	0	*	*	*	0	0	0	0	0	0
Indeterminate	Gen. sp. 6	*	*	*	*	*	*	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 7	0	*	*	0	*	0	0	*	0	*	0	0	*	0	*	0	*	*	*	*	*	*	*	*
Oligochaeta																									
	Gen. spp.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0	*	*
Enteropneusta																									
Harrimaniidae	*Saccoglosus australiensis*	0	*	0	*	*	0	*	*	*	*	*	*	*	*	0	0	0	0	0	0	0	0	0	0
Sipunculida																									
Sipunculidae	Gen. sp. 1.	0	0	0	0	0	0	0	*	0	0	*	0	0	0	0	0	0	*	0	0	0	0	0	0

List (presence/absence) of species found in Van-Veen grab samples collected around Motutapu Island.

Polychaeta		1	2	3	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	41	42	43	44	45	46	47	48
Ampharetidae	*Ampharete* sp.	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
Terebellidae	*Amphitrite* sp.	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	0	0	0	0	0	0	0	0	0	0	0	0	0
Aphroditidae	*Aphrodita talpa*	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	*	0	0	0	0	0	0	0	0	0	0	0	0
Oenonidae	*Arabella* sp.	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	0	0	0	0	0	0	0	0	0	0	0
Paraonidae	*Aricidea* sp. 1	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	0	0	0	0	0	0	0	0	0	0	0	0
Paraonidae	*Aricidea* sp. 2	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Opheliidae	*Armandia maculata*	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
Maldanidae	*Asychis* sp.	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	0	0	0	0	0	0	0	0	0	0	0	0
Flabelligeridae	*Brada* sp.	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	0	0	0	0	0	0	0	0	0	0
Capitellidae	Gen. sp. 1	0	0	*	*	0	*	0	0	*	*	*	*	*	0	0	*	*	*	*	0	0	*	*	*	*	0	0	*	0	*	*	*	0	*	0	*	0	0	0	*	0	0	0	0	0	0
Capitellidae	Gen. sp. 2	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	0	0	0
Capitellidae	Gen. sp. 3	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	0	0	0	0	0	0	0	0	0	0	0	0
Capitellidae	Gen. sp. 4	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chaetopteridae	*Chaetopterus* sp.	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	0	0	0	0	0	0	0	0	0	0	0	0
Cirratulidae	Gen. sp. 1	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
Cirratulidae	Gen. sp. 2	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	0	0	0	0	0	0	0	0	0	0	0	0
Onuphidae	*Diopatra* sp.	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	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0
Flabelligeridae	*Diplocirrus* sp.	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	0	0
Dorvilleidae	*Dorvillea australiensis*	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	0	0	0	0	0
Phyllodocidae	*Eulalia* sp.	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	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunicidae	*Eunice* sp. 1	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	*
Eunicidae	*Eunice* sp. 2	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunicidae	*Eunice* sp. 3	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	0	0	0	0	0	0	0	0	0	0	0	0	0
Flabelligeridae	*Flabelligera affinis*	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	0	0	0
Glyceridae	*Glycera americana*	*	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	0	*	0	0	0	0	0	0	0	0	0
Glyceridae	*Glycera tesselota*	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goniadidae	*Goniada* sp.	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	0	0	0	0	0	0	0	0	0	0	0	0
Glyceridae	*Hemipodus* sp. 1	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	0	0	0	0	0	0	0	0	0	0	0
Glyceridae	*Hemipodus* sp. 2	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polynoidae	*Lepidastheniella* sp.	*	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	0	0	0	0	0	0	0	*	0	0	0	*	0	0
Polynoidae	*Lepidonotus purpureus*	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	0	0	0	0	0	0	0
Polynoidae	*Lepidonotus* sp.	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	0	0	0	0	0	0	*	*	0	0	0	0	0	0	0
Lumbrimeridae	*Lumbrineris sphaerocephala*	*	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	0	0	0	0	0	0	0	0	0	0	0	0	0
Maldanidae	*Macroclymenella stewartensis*	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	0	0	0	0
Maldanidae	Gen. sp. 1	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	0	0	0	0	0	0	0	0	0	0	0	0
Maldanidae	Gen. sp. 2	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	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0
Maldanidae	Gen. sp. 3	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	0	0	0	0	*	*	*	0	0	0	0	*	0
Nephtyidae	*Nephtys macroura*	*	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	0	0	0	0	0	0	0	*	0	0	*
Nereididae	*Nereis cricognatha*	*	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	0	0	0	0	0	0	0	0	0
Hesionidae	*Ophiodromus angistifrons*	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	0	0	0	0	0	0	0	0	0	0	0
Orbiniidae	*Orbinia papillosa*	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	*	0	0	0	0	0	0	0	0	0	0	0	0
Pectinariidae	*Pectinaria australis*	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nereididae	*Perinereis nuntia*	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

Phyllodocidae	Gen. sp. 1	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	0	*	0	0	0	0	0	*	0	0	0	0
Phyllodocidae	Gen. sp. 2	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	0	0	0	0	0	0	0	0	0	0	0	0	0
Phyllodocidae	Gen. sp. 3	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	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0
Phyllodocidae	Gen. sp. 5	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	0	*	0	0	0	0	0	0	0	0	0	0
Phyllodocidae	Gen. sp. 6	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phyllodocidae	Gen. sp. 7	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	0	0	*	0	0	0	0	0	0	0	*	0
Spionidae	*Prionospio* sp. 1	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
Sigalionidae	*Psammolyce antipoda*	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	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0
Sabellidae	Gen. sp. 1	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
Sabellidae	Gen. sp. 3	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	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0
Sabellidae	Gen. sp. 4	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	0	0	0	*	0	0	0	0	0	0	0	0	0	0
Sabellidae	Gen. sp. 5	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	0	0	0	0	0	0	0	0	*	*	0	0	0	0
Scalibregmidae	Gen. sp. 1	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
Sigalionidae	*Sigalion* sp.	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	0	0	0	0	0	0	0	0	0	0	0	0	*	*
Syllidae	*Sphaerosyllis* sp.	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	0	0	0	0	0	0	0	0	0
Spionidae	Gen. sp. 1	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	*	0	0	0	0	0	0	0	0	0
Spionidae	Gen. sp. 2	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	0	0	0	0	0	0	0	0	0	0	0	0	0
Spionidae	Gen. sp. 3	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	0	*	0	0	0	0	0	0
Spionidae	Gen. sp. 4	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	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0
Spionidae	Gen. sp. 5	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	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0
Spionidae	Gen. sp. 10	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Syllidae	Gen. sp. 1	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	0	0
Syllidae	Gen. sp. 2	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	*	0	0	0	0	0	0	0	0	0	0
Syllidae	Gen. sp. 4	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	0	0	0	0	0	0	0	*	0	0
Syllidae	Gen. sp. 5	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	0	0	0	0	0
Syllidae	Gen. sp. 6	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	0	0	0
Syllidae	Gen. sp. 8	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	0	0	0	0	0	0	0	0	0	0	0	0
Terebellidae	Gen. sp. 1	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	0	0	0	0	0	0	0	0	0	0	0	0
Terebellidae	Gen. sp. 5	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	0	0	0	0	0	0	0	0	0	0	0	0	0
Terebellidae	*Terebellides stroemi*	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
Trichobranchidae	*Trichobranchus* sp.	0	0	0	0	0	*	0	0	0	*	0	*	*	*	0	*	*	*	*	*	*	*	*	0	*	*	*	*	*	*	*	*	0	*	*	*	0	0	0	*	0	0	0	0	*	0
Indeterminate	Gen. sp. 1	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	0	0	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 7	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen..sp. 15	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 16	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	*	0	0	0	0	0	0	0	0	0	0	0	0
Polyplacophora																																															
Leptochitonidae	*Leptochiton inquinatus*	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	0	0	0	0	0
Acanthochitonidae	*Notoplax violacea*	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gastropoda																																															
Asteronotidae	*Aphelodoris luctuosa*	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olividae	*Amalda novaezelandiae*	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	0	0	0	0	0	0	0	0	*	0	0	0	0	*	0
Olividae	*Amalda australis*	*	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Buccinidae	*Cominella adspersa*	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Buccinidae	*Cominella quoyana*	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	0	0	*	0	0	0	0	0	0	0	0	0	0
Rissoidae	*Estea impressa*	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 3	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	0	0	0	0	0	0	0	0	0	0	0	0	0

Philinidae	*Philine angasi*	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pleurobranchidae	*Pleurobranchaea maculata*	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rissoidae	*Powellisetia* sp.	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Muricidae	*Xymene gouldi*	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calyptraeidae	*Zegalerus tenuis*	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	0	*	0	0	0	0	0	0	0	0	0
Bivalvia																																															
Pinnidae	*Atrina zelandica*	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arcidae	*Barbatia novaezelandiae*	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corbulidae	*Corbula zelandica*	0	0	0	0	0	*	*	0	*	*	0	0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0	*	*	*	*	*	0	*	0	*	*	0	0	0	0	0	0	0	0	0
Veneridae	*Dosinia lambata*	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*
Ungulinidae	*Felaniella zelandica*	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	0	0	0	0	0	0	0	0	0	0	0	0
Semelidae	*Leptomya retaria*	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	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0
Limidae	*Limaria orientalis*	0	0	0	0	0	*	*	0	0	0	0	*	*	0	*	0	*	*	*	*	*	*	0	*	*	*	*	*	*	*	*	*	*	*	0	*	*	0	0	0	0	0	0	0	0	0
Nuculidae	*Nucula nitidula*	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	0	0
Mactridae	*Scalpomactra scalpellum*	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galeommatidae	*Scintillona zelandica*	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	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0
Carditidae	*Purpurocardia purpurata*	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	0	0	0	0	0	0	0
Ostracoda																																															
Indeterminate	Gen. sp. 1	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	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 2	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	0	0	0	0	0	0	0	0	0	0	0	0	0
Malacostraca																																															
Anthuridae	Gen. sp. 1	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	0	0	0	0	0	0	*	0	*	0	0
Anthuridae	Gen. sp. 2	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	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0
Nebaliidae	*Nebalia* sp.	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	0	0	0	0	0	0	0
Bodotriidae	*Cyclapsis argus*	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	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0
Bodotriidae	*Cyclaspis* cf. *thomsoni*	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bodotriidae	*Cyclaspis similis*	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nannastacidae	*Nannastacus* sp.	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	0	0	0	0	0	0	0	0	*	0	0	0	0
Sphaeromatidae	*Ciliacaea dolorosa*	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	0	0	0	0	0	0
Cirolanidae	*Eurylana arcuata*	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	0	0	0	0	0	0	0	0	0	0	0	0	0
Gnathiidae	Gen. sp. 1	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pagurapseudidae	*Pagurapseudes* sp.	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ampeliscidae	Gen. sp. 1	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phoxocephalidae	*Paraphoxus* sp. 1	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	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 1	0	0	0	0	0	*	0	0	*	*	0	*	*	0	0	*	*	*	*	*	*	*	*	0	*	*	*	*	*	*	*	*	0	*	*	*	*	0	0	0	0	0	*	*	0	0
Indeterminate	Gen. sp. 5	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	0	0	0	0	0	0	0	0	*	*	0	0
Indeterminate	Gen. sp. 6	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 10	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 12	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	0	0	0	0
Indeterminate	Alpheus sp.	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	0	0	0	0	0	0	0
Hymenosomatidae	*Halicarcinus cookii*	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	0	0	0	*	0	0	0
Hymenosomatidae	*Halicarcinus innominatus*	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hymenosomatidae	*Halicarcinus varius*	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Geryonidae	*Liocarcinus corrugatus*	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Majidae	*Notomithrax minor*	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	*	0	0	0	0	0	0	0	0	0	0	0	0
Palaemonidae	*Periclimenes yaldwyni*	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	0	0	0	0	0

Porcellanidae	*Petrolisthes novaezelandiae*	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	0	0
Crangonidae	*Pontophilus* sp. 2	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	0	0	0	0	0	0	0	0	0	0	0	0	0
Epialtidae	*Pyromaia tuberculata*	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	0	0	0	0	0	0	0	0	0	0	0	0
Maxillopoda																																															
Archaeobalanidae	*Balanus trigonus*	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	0	0	0	0	0	0	0	0	0	0	0	0	*	0	*
Echinoidea																																															
Arachnoididae	*Arachnoides zelandiae*	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	0	0	0	0	0	0	0	0	0	0	0	0	0
Loveniidae	*Echinocardium australe*	*	*	*	*	*	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	0	*	*	*	*	*	*
Holothuroidea																																															
Chiridotidae	*Trochodota dendyi*	*	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	*
Cucumariidae	*Ocnus brevidentis*	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	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0
Stelleroidea																																															
Ophiactidae	*Ophiactis resiliens*	0	0	*	0	0	*	0	0	*	*	0	*	*	0	0	*	*	*	*	0	*	*	0	0	*	*	*	*	*	*	*	*	0	*	*	*	*	*	0	0	0	0	0	0	0	*
Hydrozoa																																															
Indeterminate	Gen. sp. 1	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	0	0	0	0	0	0	0	0	0	0	0	0	0
Demospongiae																																															
Indeterminate	Gen. sp. 1	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	0	0	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. et sp. 2	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcarea																																															
Sycettidae	*Sycon* sp.	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	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0
Ascidiacea																																															
Indeterminate	Gen. spp..	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Styelidae	*Styela clava*	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	0	0	0	0	0	0	0	0	0	0	0	0	0
Enteropneusta																																															
Harrimaniidae	*Saccoglosus australiensis*	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	0	0	0	*	0	0	0	0	0	0	0	0	0	0
Indeterminate																																															
Indeterminate	Gen. sp. 2	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	0	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 3	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	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 4	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
Indeterminate	Gen. sp. 5	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	0	0	0	0	0	0	0	0	0	*	0	0	0	0
Indeterminate	Gen. sp. 7	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sipunculida																																															
Sipunculidae	Gen. sp. 1	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	0	0	0	0	0	0	0	0	0	0

List (presence/absence) of species collected in Van-Veen grab samples around Otata Island.

Polychaeta		1a	1b	2	3	4	5	6	7	8	9	10	11	12	13	15	16	17	18	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	S1	L2a	L2b	L2c
Ampharetidae	*Ampharete* sp.	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	0	0	0	0	0	0	0	0
Aphroditidae	*Aphrodita talpa*	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	0	0	0	0	0	0	0	0	0	0
Opheliidae	*Armandia maculata*	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	0	0
Maldanidae	*Asychis* sp.	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	0	0	0	0	0	0	0	0
Flabelligeridae	*Brada* sp.	*	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	0	0	0	0	0	0	0	0	0	0	0
Capitellidae	Gen. sp. 1	*	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	*
Capitellidae	Gen. sp. 2	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	0	0	0	0	*	0	*	0	*	*
Caetopteridae	*Chaetopterus* sp.	*	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	0	0	0
Chrysopetalidae	*Chrysopetalum* sp.	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	0	0	0	0	0	0	*	0	0	0
Cirratulidae	Gen. sp. 1	*	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	*
Cirratulidae	Gen. sp. 2	*	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	0	0	0	0
Cirratulidae	Gen. sp. 5	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	0	0	0	0	0	0	0	0	0	0	0
Onuphidae	*Diopatra* sp.	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	0	0	0	0	0	0	0	0	*	0	0	0
Flabelligeridae	*Diplocirrus* sp.	*	*	*	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	0	0
Dorvilleidae	*Dorvillea australiensis*	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	0	0	0	0	0
Phyllodocidae	*Eulalia* sp.	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	0	0	0	0	0	0	0	0	0	0	0
Eunicidae	*Eunice* sp. 1	0	*	*	*	*	0	0	0	0	0	*	*	*	*	*	0	*	0	0	0	0	*	*	0	0	*	*	*	0	0	0	0	0	0	0	0	0	*	0	*	*	*	*
Eunicidae	*Eunice* sp. 3	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	0	0	0	0	0	0	0	0	0	0	0	*
Eunicidae	*Eunice* sp. 5	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	0	0	0	0	0	0	0	0
Flabelligeridae	*Flabelligera affinis*	0	0	0	0	0	0	0	0	0	0	0	*	0	*	*	*	*	0	*	0	*	*	*	0	0	*	*	*	0	*	*	*	*	0	0	*	0	*	*	0	0	*	0
Syllidae	*Geminosyllis* sp.	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	0	0	0	0	0	0	0	0	0	0	0
Glyceridae	*Glycera americana*	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	0	0	*	0	0	0	0	0
Glyceridae	*Glycera lamellipoda*	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	0	0	0	0	0	0	0	0	0	0	0
Glyceridae	*Glycera tesselota*	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	0	0	0	0	0	0	0	0	0	0	0
Goniadidae	*Glycinde* sp.	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	0	0	0	0	0	0	*	0	0	0
Glyceridae	*Hemipodus* sp. 1	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	0	0	0	*	0	0	0	*	*
Glyceridae	*Hemipodus* sp. 2	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	0	0	0	0	0	0	0	0	0	0	0
Polynoidae	*Lepidonotus purpureus*	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	0	0	0	0
Lumbrineridae	*Lumbrineris sphaerocephala*	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	0	0	0	0	0	0	0	0	0	0
Lumbrineridae	*Lumbrineris* sp	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	0	0	0	0	0	0	*	0	0	0	0	0
Maldanidae	*Macroclymenella stewartensis*	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	*	*
Maldanidae	Gen. sp. 1	*	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	0	0	0	0	0	0	0	0	0	0
Maldanidae	Gen. sp. 5	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	0	0	0	0	0	0	0	0	0	0	0	*
Nereididae	*Nereis cricognatha*	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	0	0	0	0	0	0	0	*	0	0	0
Hesionidae	*Ophiodromus angistifrons*	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
Orbiniidae	*Orbinia papillosa*	*	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	0	0	0	0	0	0	0	0	0	0
Oweniidae	*Owenia fusiformis*	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	0	0	0	0	0	0
Pectinariidae	*Pectinaria australis*	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	0	0	0	0	0	0	0	0	0	0	0
Nereididae	*Perinereis nuntia*	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
Phyllodocidae	Gen. sp. 1	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	*
Phyllodocidae	Gen. sp. 4	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	0	*	0	0	0	0	0	0	0	0
Phyllodocidae	Gen. sp. 7	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	0	0	0	0
Phyllodocidae	Gen. sp. 8	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	0	0	0	0	0	0	0	0	0	0	0

Pisionidae	*Pisione* sp.	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	0	0	0	0	0	0	0	0	*	0	*	*
Spionidae	*Prionospio* sp. 1	*	*	*	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	*	*
Sigalionidae	*Psammolyce antipoda*	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	0	0	0	0	0	0	0	0	0	0	0
Sabellidae	Gen. sp. 1	0	0	0	0	0	*	0	0	0	0	0	0	0	*	*	*	0	0	*	*	0	*	*	*	*	*	*	*	0	*	0	*	0	0	*	0	0	*	0	*	0	*	*
Sabellidae	Gen. sp. 2	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	0	0	0	0	0	0	0	0	0	0	0
Sabellidae	Gen. sp. 3	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	0	0	0	0	0	0	0	0	0	0	0
Scalibregmidae	Gen. sp. 1	*	*	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	0	0	0	0	0	0	0	0	0
Serpulidae	Gen. sp. 1	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	0	0	0	0	0	0	0	0	0	0	0
Serpulidae	Gen. sp. 4	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	0	0	0	0	0	0	0	0	0	0	0
Serpulidae	Gen. sp. 5	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	0	0	0	0	0	0	0	0	*	0	0	0
Syllidae	*Sphaerosyllis* sp.	0	0	*	*	0	*	0	*	*	0	*	0	0	*	*	0	0	0	*	*	*	*	*	0	0	*	*	*	0	*	0	0	*	0	0	*	0	*	0	*	0	*	*
Spionidae	Gen. sp. 1	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	0	0	*
Spionidae	Gen. sp. 2	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	0	0	0	0	0	0	0	0	0	0	0
Spionidae	Gen. sp. 3	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	0	0	*	0	0	0
Spionidae	Gen. sp. 5	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	0	0	0	0	0	0	0	0	0	0	0
Spionidae	Gen. sp. 6	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	0	0	0	0	0	0	0	0	0	0	0
Spionidae	Gen. sp. 7	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	0	0	0	0	0	0	*	0	0	0	0	0
Spionidae	Gen. sp. 9	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	0	0	0	0	0	0
Spionidae	Gen. sp. 10	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	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Syllidae	Gen sp. 1	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
Syllidae	Gen. sp. 2	*	*	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	0	0	0	0	0	0
Syllidae	Gen. sp. 3	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	0	0	0	*	0	*	*
Syllidae	Gen. sp. 4	0	0	*	0	*	0	0	0	0	0	0	*	*	*	*	0	*	0	*	*	*	*	*	*	*	*	0	*	0	*	0	0	0	*	0	0	0	*	0	*	0	0	*
Syllidae	Gen. sp. 5	*	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
Syllidae	Gen. sp. 6	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	*	0	0	0	0	0
Syllidae	Gen. sp. 7	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	0	0	*	0	0	0	0	0	0	0	0	0
Syllidae	Gen. sp. 8	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	*	0	*	0	*	0	0	0
Syllidae	Gen. sp. 9	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	0	0	0	0	0	0	0	0	0	0
Syllidae	Gen. sp. 10	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	0	0	0	0	0	*	0	0	0
Syllidae	Gen. sp. 11	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	0	0	0	0	0	0	0	0	0	0	0
Syllidae	Gen. sp. 14	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	0	0	0	0	0	0	*	0	0	0	0	0
Syllidae	Gen. sp. 15	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	0	0	0	0	0	0	0	0
Syllidae	Gen. sp. 16	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	0	0	0	0	0	0	0	0	0	0	0
Syllidae	Gen. sp. 17	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	0	0	0	0	0	0	0	0	0	0	0
Syllidae	Gen. sp. 18	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	0	0	0	0	0	0	0	0	0	0
Terebellidae	Gen. sp. 1	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	0	0	0	*	0	0	0	0	0	0	0
Terebellidae	Gen. sp. 5	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	0	0	0	0	0	0	*	0	0	0	0	0
Terebellidae	*Terebellides stroemi*	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	0	0	0	0	0	0	0
Trichobranchidae	*Trichobranchus* sp.	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	0	0	0	0	0	0	*
Syllidae	*Trypanosyllis zebra*	*	*	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	0	0	*	0	0	0	0	0
Indeterminate	Gen. sp. 1	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	0	*	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 2	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	0	0	0	0	0	0	0	0	0	0	*
Indeterminate	Gen. sp. 3	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	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 4	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	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 5	*	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	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 12	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	0	0	0	0	0	0	0	0	0	0	0

Indeterminate	Gen. sp. 13	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	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 14	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	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 15	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	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 16	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	0	*	0	0	0	0	0
Polyplacophora																																												
Acanthochitonidae	Gen. sp. 1	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	0	*	0	0	0	0	0	0	0	0	0
Chitonidae	*Chiton glaucus*	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	0	0	0	0	0	0	0	0	0	0	*	0
Indeterminate	Gen. sp. 1	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	0	0	0	0	0	0	0	0	*	0
Ischnochitonidae	*Ischnochiton maorianus*	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	*	*
Leptochitonidae	*Leptochiton inquinatus*	0	0	*	*	*	0	0	0	0	*	0	*	0	*	*	0	*	*	0	0	0	*	*	0	*	*	*	*	0	0	*	0	*	0	0	0	0	*	*	0	0	*	*
Acanthochitonidae	*Notoplax violacea*	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	0	0	0	0	0	0	0	0	0	0
Chitonidae	*Rhyssoplax stangeri*	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
Gastropoda																																												
Acmaeidae	Gen. sp. 1	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	0	0	0	0	0	0	0	0	*	0	0	0
Buccinidae	*Cominella adspersa*	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	0	0	0	0	0	0	0	0	0	*	0
Buccinidae	*Cominella maculosa*	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	0	0	0	0	0	0	0	0	0	0	*	*
Buccinidae	*Cominelle quoyana*	*	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	0
Epitoniidae	*Epitonium minora*	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	0	0	0	0	0	0	0	0	*	0	0	0
Eulimidae	*Eulima* sp.	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	0	*	0	*	0	0	0	0	*
Fissurellidae	Gen. sp. 1	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	0	0	0	0	0	0	0	0	0	0	0
Lamellariidae	*Lamellaria ophione*	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	0	0	0	0	0	0	0	0	*	0	0	0
Marginellidae	*Marginella pygmea*	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	*	0	0	0	0	0	0	0	0	0	0	0
Calyptraeidae	*Maoricrypta costata*	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	0	0	0	0	0	0	0	0	0	0	0
Calyptraeidae	*Maoricrypta monoxyla*	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	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 3	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	*	0	0	0	0	0
Rissoidae	*Powellisetia* sp.	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	0	0	0	0	0	0	0	0	0	0
Naticidae	*Proxiuber australe*	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	0	0	0	0	0	0	0	0	0	0	0	*
Calyptraeidae	*Sigapatella novaezelandiae*	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	0	0	0	0	0	0	0	*	0	0	0
Trochidae	*Trochus tiaratus*	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	0	0	0	0	0	0	0	0	0	0
Muricidae	*Xymene gouldi*	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	0	0	0	0	0	0	0	0	0	0	0
Calyptraeidae	*Zegalerus tenuis*	0	0	0	0	*	0	0	0	0	*	*	*	0	*	0	*	*	0	0	0	*	*	0	0	*	*	*	*	0	*	*	0	*	0	0	*	0	0	0	*	0	*	0
Bivalvia																																												
Pectinidae	*Chlamys zelandiae*	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	*	0	*	0	0	0
Corbulidae	*Corbula zelandica*	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	0	0	0	0	0	0	0	0
Veneridae	*Dosina zelandica*	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	0	0	0	0	0	0	0	0	0
Ungulinidae	*Felaniella zelandica*	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	0	0	*	0	0	0	0	0
Psammobiidae	*Gari stangeri*	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	0	0	0	0	0	0	0	0	0	0	0
Limidae	*Limaria orientalis*	0	*	*	0	*	0	0	0	0	0	0	0	*	*	*	*	*	0	*	0	0	*	*	0	*	*	0	*	0	*	*	*	0	0	0	0	0	*	*	*	0	*	*
Mytilidae	*Musculista senhousia*	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	0	0	0	0	0	0	0	0	0	0
Nuculidae	*Nucula nitidula*	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	0	0	0	0	0	0	0	0
Ostreidae	*Ostrea* sp.	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	0	0	0	0	0	0	0	0	0
Glycymerididae	*Tucetona laticostata*	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	0	0	0
Carditidae	*Purpurocardia purpurata*	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	0	0	0	0	0	0	0	0	0	0
Ostracoda																																												
Indeterminate	Gen. sp. 1	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	*	*	*	*	*
Indeterminate	Gen. sp. 2	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	*	*	*	*

Indeterminate	Gen. sp. 3	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	*	0	*	*
Indeterminate	Gen. sp. 5	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	0	0	0	0	0	0	*	0	0	*
Indeterminate	Gen. sp. 6	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	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 7	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	0	*	0	0	0	0	0	*	0
Indeterminate	Gen. sp. 8	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	0	0	0	0
Indeterminate	Gen. sp. 9	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	0	0	*	0	*	*
Indeterminate	Gen. sp. 10	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	0	0	0	0	0	0	0	0	0	0	*
Indeterminate	Gen. sp. 11	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	0	0	0	0	0	0	*	0	*	*
Indeterminate	Gen. sp. 12	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	0	0	0	0	0	0	0	0	0	*	*	0
Indeterminate	Gen. sp. 13	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	0	0	0	0	0	0	0	0	0	0	0
Malacostraca																																												
Anthuridae	Gen. sp. 1	0	0	0	*	0	*	0	0	0	*	*	0	0	*	*	0	*	*	*	0	*	*	*	0	0	*	*	*	*	*	0	*	0	*	0	0	0	*	*	*	*	*	*
Anthuridae	Gen. sp. 2	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
Anthuridae	Gen. sp. 3	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	0	0	0	0	0	0	0	0	0	0	0
Anthuridae	Gen. sp. 4	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	0	0	*	0	*	0	0	0
Nebaliidae	*Nebalia* sp.	*	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
Idoteidae	*Euidotia stricta*	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	0	0	*	0	0	0	0	0	0	0	0	0
Nannastacidae	*Nannastacus* sp.	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	0	*	0	0	0	0	0	*	0	0	0
Sphaeromatidae	*Ciliacaea dolorosa*	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	0	0	0
Sphaeromatidae	*Cymodocella* sp.	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	0	0	0	0	0	0	0	0	0	0	0	*
Gnathiidae	Gen. sp. 1	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
Caprellidae	Gen. sp. 1	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	*	*	*	*	*	*
Caprellidae	Gen. sp. 2	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	*	*	0	0	0	0	0	0	*	*	*	*
Pagurapseudidae	*Pagurapseudes* sp.	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	0	0	0	0	0	*	0	*	*
Phliantidae	*Iphinotus typicus*	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	0	0	0	0	0	0	0	*	0	*	*
Tanaidae	Gen. sp. 1	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	0	0	0	*	*	0	0	0	0
Tanaidae	Gen. sp. 2	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	0	0	0	0	0	0	*	0
Tanaidae	Gen. sp. 3	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	*	0	0	0
Tanaidae	Gen. sp. 4	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	0	0	*	*	0	0	0
Tanaidae	Gen. sp. 5	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	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Indeterminate	Gen. sp. 2	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	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 3	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	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 5	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	0	0	0	0	0	0	*	0	0	0	0
Indeterminate	Gen. sp. 6	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	0	0	0	0	0	*	0	0	0
Indeterminate	Gen. sp. 7	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	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 9	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	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 10	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	0	0	0	0	0	0	0	0	*	*	*	0
Indeterminate	Gen. sp. 11	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	0	0	0	0	0	0	0	0	*	*	0	*
Indeterminate	Gen. sp. 13	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	*	*	0	0	0	0
Hymenosomatidae	*Halicarcinus cookii*	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	0	0	0	0	0	0	0	0
Geryonidae	*Liocarcinus corrugatus*	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	0	0	0	0	0	0	*	*	0	0	0	0
Majidae	*Notomithrax minor*	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	0	0
Palaemonidae	*Periclimenes yaldwyni*	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	0	0	0	0	0	0	0	0	0	*	0	0
Porcellanidae	*Petrolisthes novaezelandiae*	*	0	0	0	*	0	*	0	0	*	0	0	*	0	0	*	*	*	0	*	*	0	*	0	*	*	0	*	*	*	0	0	0	0	0	*	0	0	*	*	0	0	0

Pycnogonida																																												
	Gen. sp. 1	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
Maxillopoda																																												
Archaeobalanidae	*Balanus trigonus*	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	0	0	0	0	0	0	*	0	0	0
Echinoidea																																												
Echinometridae	*Evechinus chloroticus*	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	0	0	0	0	0	0	*	0	0	0	0
Stelleroidae																																												
Ophiactidae	*Ophiactis resiliens*	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	0	0	0	0	0	0	0	*	0	*	*
Asteroidea																																												
Asterinidae	*Patiriella regularis*	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	0	0	0	0	0	0	*	0	0	0
Osteeichthyes																																												
Gobiesocidae	*Dellichthys morelandi*	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	*	0	0	*	0	0	0	0	0	0	0
Gobiesocidae	*Trachelochismus melobesia*	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	0	0	0	0	0	0	0	0	*	0	0	0
Hydrozoa																																												
Indeterminate	Gen. sp. 1	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	0	0	0	0	0	0	0	0	0	0	0
Indeterminate	Gen. sp. 2	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	0	0	0	0	0	0	0	0	0	0	0	*
Indeterminate	Gen. sp. 3	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	0	0	0	0	0	0	0	0	0	0	0
Demospongiae																																												
Indeterminate	Gen. sp. 1	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	0	0	0	0	0	0	0	0	0
Calcarea																																												
Sycettidae	*Sycon* sp.	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	0	0	0	0	0	0	0	0	0	0	0
Ascidiacea																																												
Indeterminate	Gen. sp. 1	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	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata																																												
Chaperiidae	*Chaperiopsis cervicornis*	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	0	0	0	0	0	0	0	0	0	0	0
Enteropneusta																																												
Harrimaniidae	*Saccoglosus australiensis*	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	*	0	0	0	0	*
Holothuroidea																																												
Chiridotidae	*Kolostoneura* sp.	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	0	0	0	0	0	0	0	0	0	0	0
Chiridotidae	*Trochodota dendyi*	*	*	*	*	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	*	*
Indeterminate																																												
Indeterminate	Gen. sp. 3	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	*	*
Indeterminate	Gen. sp.. 4	*	*	*	*	*	0	0	*	0	0	*	*	*	*	*	*	*	0	0	0	*	*	*	0	*	*	*	*	0	*	*	*	*	0	0	*	0	*	0	*	*	*	*
Indeterminate	Gen. sp. 6	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	0	0	0	0	0	0	0	0	0	0	0	*
Indeterminate	Gen. sp. 7	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	0	*	*
Oligochaeta																																												
	Gen. spp.	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	*
Sipunculida																																												
Sipunculidae	Gen. sp. 1.	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	0	0	0	0	0	0	0	0	0	0