

# **Regional Estuary Monitoring Programme (REMP) Data Report: Benthic Macrofauna Communities and Sediments – July 2007 to April 2008**

**Southern Firth of Thames and Whaingaroa  
(Raglan) Harbour**

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# Executive summary

In April 2001 Environment Waikato initiated the Regional Estuary Monitoring Programme (REMP) at five permanent monitoring sites in both the southern Firth of Thames and Whaingaroa (Raglan) Harbour. It is a long-term programme with the objective of monitoring the temporal changes in intertidal sediment characteristics and benthic macrofauna communities which may occur as a direct or indirect consequence of catchment activity and/or estuary development. It is envisaged that the Regional Estuary Monitoring Programme will provide relevant information useful in setting policy and assisting with the sustainable management of estuaries in the Waikato region. This report presents the monitoring results of sediment characteristics, and a suite of 26 'indicator' taxa and abundant non-indicator taxa of the intertidal benthic communities for the period July 2007 to April 2008.

This report documents the data from the seventh year of the monitoring programme. In addition to annual reports, detailed discussion and analysis of trends or patterns of change over time in the benthic macrofaunal communities and sediment characteristics are reported every five years in a separate trend report series for the Regional Estuary Monitoring Programme.

In the southern Firth of Thames five permanent sites were sampled in October 2007 and April 2008. In Whaingaroa Harbour five sites were sampled in October 2007 and, due to extreme weather conditions, only four in April 2008. Two sites from each harbour were additionally sampled in July 2007 and January 2008. Sampling the benthic macrofauna communities involved collecting 12 randomly located core samples from a permanent monitoring plot at each site. On each sampling occasion replicate bulked sediment samples were collected for grain-size analysis, total organic carbon and total nitrogen content. Surface scrapes were collected and analysed for chlorophyll-a and phaeophytin content.

Results from the July 2007 to April 2008 monitoring period indicate that there were only slight changes in assemblage composition in both the Firth of Thames and Whaingaroa Harbour. Overall bivalves were found to be more abundant in Whaingaroa Harbour than in the Firth of Thames, whereas polychaetes were more abundant in the Firth of Thames. Gastropods and crustaceans were also more abundant in Whaingaroa Harbour. The most consistently common taxa found at sites in the Firth of Thames included the polychaetes *Aonides oxycephala*, capitellids, *Magelona dakini*, *Aquilaspio aucklandica* and *Scoloplos cylindrifera*; and the bivalves *Nucula hartvigiana*, *Austrovenus stutchburyi* and *Paphies australis*. The exotic 'Asian date mussel', *Musculista senhousia*, occurred at most sites in Firth of Thames, being most common at the Gun Club site. In Whaingaroa Harbour, consistently common taxa included the polychaetes *Aquilaspio aucklandica*, *Cossura* sp. and capitellids; and the bivalves *Austrovenus stutchburyi*, *Nucula hartvigiana* and *Arthritica bifurca*.

Between July 2007 and April 2008 the median grain size remained consistent at all but one site in the Firth of Thames and all sites in Whaingaroa Harbour. At most sites in the Firth of Thames and Whaingaroa Harbour, peaks in mud content occurred in October 2007. Sites in Whaingaroa Harbour were generally 2-3 times muddier than those in the Firth of Thames. In Whaingaroa Harbour the highest amount of mud occurred at Haroto Bay, which remained consistent over the one year of sampling. The shell-hash content was also consistent over the sampling period in both estuaries.

Continued monitoring will identify any patterns of temporal change in sediment characteristics and the associated benthic communities. From these time-series data we will be able to distinguish changes which may occur as a direct or indirect consequence of catchment activity and/or estuary development from natural variability.



# 1 Introduction

Environment Waikato initiated the Regional Estuary Monitoring Programme in April 2001. The programme samples permanent monitoring sites in the southern Firth of Thames and Whaingaroa (Raglan) Harbour. Within the programme, sediment characteristics and benthic macrofauna communities<sup>1</sup> are monitored as indicators of estuarine health at five fixed locations in each estuary. It is a long-term state of the environment programme with the objective of monitoring the temporal changes in intertidal sediments and benthic macrofauna communities which may occur as a direct or indirect consequence of catchment activity and/or estuary development. The programme provides information on the ecology of the intertidal benthic macrofauna communities in these estuaries and will ultimately provide information relevant for estuary management in the Waikato region. Details of the rationale and design of the programme are provided in Turner (2000 & 2001). The Regional Estuary Monitoring Programme is based on similar monitoring programmes designed by NIWA and undertaken by other regional councils (for example Auckland Regional Council).

A pilot study was carried out in April 2001, to establish a baseline for detecting changes over time in the benthic macrofauna communities and sediment characteristics (Turner et al., 2002). Since then permanent sites in both estuaries have been monitored at 3- or 6-monthly intervals to provide information on temporal (seasonal, annual and longer-term) and spatial patterns of variability in the intertidal benthic communities and sediment characteristics.

The results of the pilot study undertaken in April 2001 were presented in Turner et al. (2002), with subsequent results being published in three data reports to date (Turner & Carter, 2004; Felsing et al., 2006; Singleton & Pickett, 2006; Singleton, 2007). Results of the sediment sampling up to April 2003 were reported in Gibberd and Carter (2005). The first trend report (Felsing and Singleton, 2008) brought together data from the first five years of monitoring from April 2001 to April 2006. A laymans report (Nathan 2009) outlined the monitoring programme and summarised results from the trend report in a more public friendly manner. This report presents the results of the estuary monitoring from July 2007 to April 2008. A second time series analyses to determine any trends in the data will be carried out on 10 years of data in 2011.

The distribution and abundance of benthic macrofauna are related to physical and chemical sediment characteristics. For this reason sediment grain-size, organic matter content and photosynthetic pigment concentration were determined alongside macrofauna community data. The variables measured in the Regional Estuary Monitoring Programme are:

- 1 Twenty-six "indicator" taxa<sup>2</sup> characteristic of intertidal mud / sand-flat benthic macrofauna communities (Table 1), selected to represent a variety of taxonomic groups and a range of life-histories, ecological niches and feeding methods (see Hewitt et al., 2001). Non-indicator taxa are separated out to the lowest possible taxonomic level.
- 2 Sediment physical, chemical and biological characteristics:
  - Grain-size
  - Organic carbon and nitrogen
  - Chlorophyll-*a* and pheophytin concentration (to quantify benthic micro-algal biomass)
  - Rates of sediment deposition and erosion.

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<sup>1</sup> Benthic macrofauna communities include the variety of organisms (e.g. shellfish, crabs, polychaetes [marine worms], crustaceans) that live in or on the bottom sediments. The "macrofauna" comprises those animals which are retained by a 500 µm mesh sieve.

<sup>2</sup> 'Taxa' is used here to indicate that some benthic macrofauna can not reliably be identified to species level and that therefore some of the 'taxa' or monitored may include more than one species.

**Table 1: Macrofauna indicator taxa monitored in the Regional Estuary Monitoring Programme.**

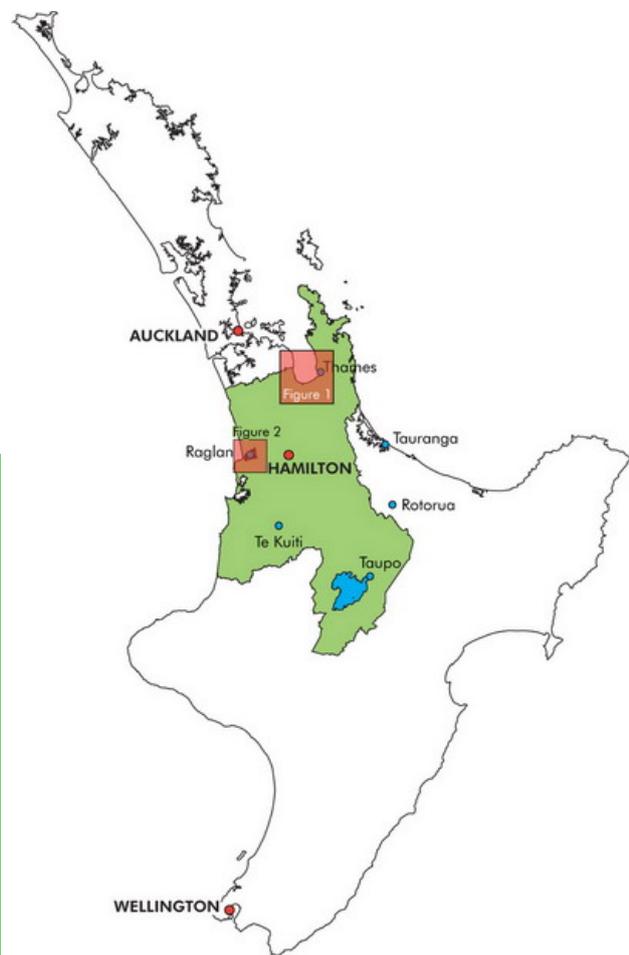
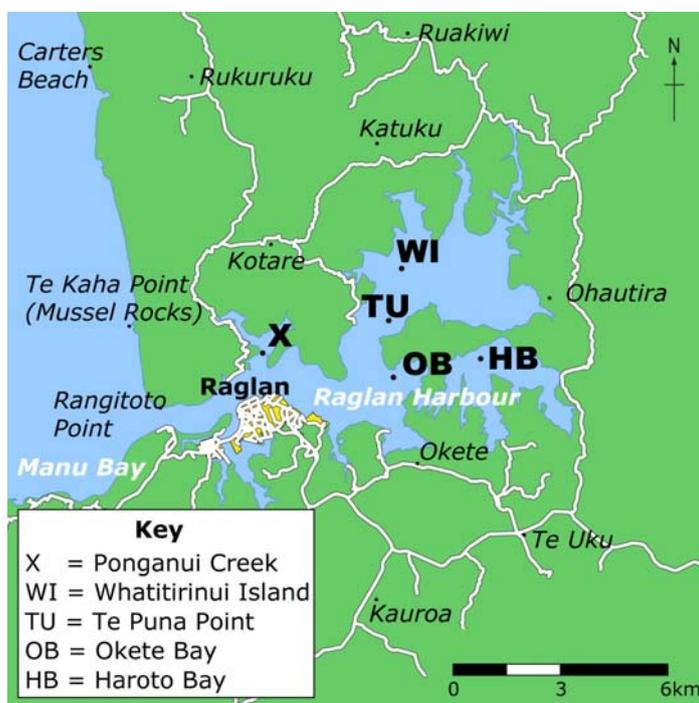
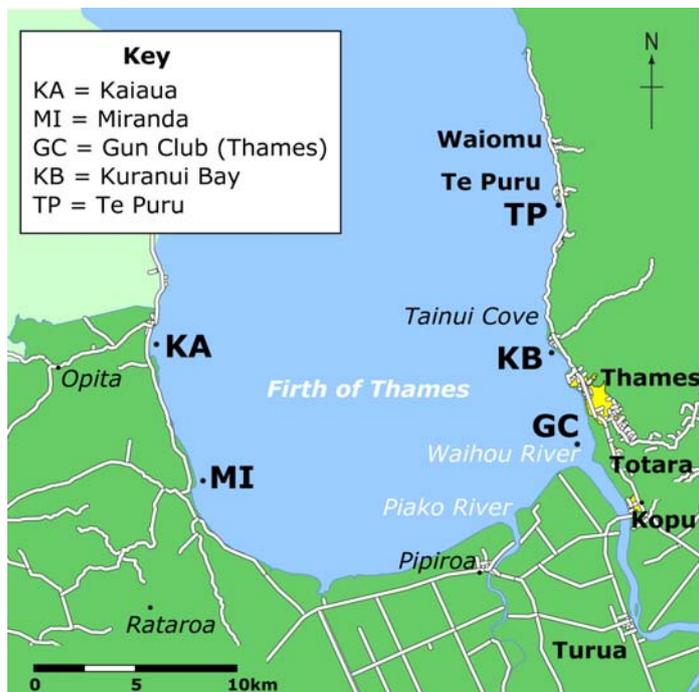
Phylum	Class	Order	Family	Genus	Species
<b>Amphipods</b>					
Arthropoda	Crustacea	Amphipoda	Corophiidae	<i>Paracorophium</i>	sp.
Arthropoda	Crustacea	Amphipoda	Phoxocephalidae		
<b>Bivalves</b>					
Mollusca	Bivalvia	Veneroida	Lasaeidae	<i>Arthritica</i>	<i>bifurca</i>
Mollusca	Bivalvia	Veneroida	Veneridae	<i>Austrovenus</i>	<i>stutchburyi</i>
Mollusca	Bivalvia	Veneroida	Tellinidae	<i>Macomona</i>	<i>liliana</i>
Mollusca	Bivalvia	Nuculoida	Nuculidae	<i>Nucula</i>	<i>hartvigiana</i>
Mollusca	Bivalvia	Veneroida	Mesodesmatidae	<i>Paphies</i>	<i>australis</i>
Mollusca	Bivalvia	Veneroida	Semelidae	<i>Theora</i>	<i>lubrica</i>
<b>Cumaceans</b>					
Arthropoda	Crustacea	Cumacea	Diastylidae	<i>Colurostylis</i>	<i>lemurum</i>
<b>Gastropods</b>					
Mollusca	Gastropoda	Neogastropoda	Buccinulidae	<i>Cominella</i>	<i>adspersa</i>
Mollusca	Gastropoda	Docoglossa	Lottiidae	<i>Notoacmea</i>	sp.
<b>Other</b>					
Cnidaria	Anthozoa	Actiniaria	Actiniidae	<i>Anthopleura</i>	<i>aureoradiata</i>
<b>Polychaetes</b>					
Annelida	Polychaeta	Spionida	Spionidae	<i>Aquilaspio</i>	<i>aucklandica</i>
Annelida	Polychaeta	Phyllodocida	Nephtyidae	<i>Aglaophamus</i>	sp.
Annelida	Polychaeta	Spionida	Spionidae	<i>Aonides</i>	<i>oxycephala</i>
Annelida	Polychaeta	Orbiniida	Paraonidae	<i>Aricidea</i>	sp.
Annelida	Polychaeta	Spionida	Spionidae	<i>Pseudopolydora</i>	<i>complex</i>
Annelida	Polychaeta	Orbiniida	Paraonidae	<i>Cossura</i>	sp.
Annelida	Polychaeta	Sabellida	Sabellidae	<i>Euchone</i>	sp.
Annelida	Polychaeta	Phyllodocida	Goniadidae	<i>Goniada</i>	sp.
Annelida	Polychaeta	Phyllodocida	Glyceridae	<i>Glycera</i>	sp.
Annelida	Polychaeta	Capitellida	"Capitellidae"		
Annelida	Polychaeta	Spionida	Magelonidae	<i>Magelona</i>	<i>dakini</i>
Annelida	Polychaeta	Phyllodocida	Nereidae		
Annelida	Polychaeta	Orbiniida	Orbiniidae	<i>Orbinia</i>	<i>papillosa</i>
Annelida	Polychaeta	Orbiniida	Paraonidae		

## 2 Methods

Detailed methods of the Regional Estuary Monitoring Programme are outlined in Turner (2001), Turner et al. (2002) and Turner and Carter (2004).

### 2.1 Field sites and sampling regime

Five permanent sites in the southern Firth of Thames (Figure 1) and five sites in Whaingaroa (Raglan) Harbour (Figure 2) were sampled between two and four times in the period between July 2007 and April 2008. These sites are considered representative of the intertidal mud / sand-flats and are distributed throughout the main area of each estuary. In each estuary two sites were sampled in 3-monthly intervals and three sites in 6-monthly intervals (Table 2).



**Figure 1.** Location of permanent monitoring sites in the southern Firth of Thames and Whaingaroa (Raglan) Harbour.

**Table 2:** Details of permanent monitoring sites and sampling regime in southern Firth of Thames and Whaingaroa Harbour.

		Site Code	Sampling months
Firth of Thames	Kaiaua	KA	October 07, April 08
	Miranda	MI	July 07, October 07, January 08, April 08
	Thames (Gun Club)	GC	October 07, April 08
	Kuranui Bay	KB	July 07, October 07, January 08, April 08
	Te Puru	TP	October 07, April 08
Whaingaroa Harbour	Whatitirinui Island	WI	July 07, October 07, January 08, April 08
	Te Puna Point	TU	October 07, April 08
	Okete Bay	OB	July 07, October 07, January 08, April 08
	Haroto Bay	HB	October 07, April 08
	Ponganui Creek	X	October 07, April 08

## 2.2 Sample collection and processing

### 2.2.1 Benthic macrofauna

Permanent monitoring plots (approximately 100 m x 100 m) were randomly located at the mid-intertidal level at each site. Wooden posts mark the corners of each monitoring plot. On each sampling occasion 12<sup>3</sup> core samples (13 cm diameter, 15 cm deep) were collected from within each monitoring plot. Each plot was divided into 12 equal-sized sectors and one core sample taken randomly (randomly derived Cartesian coordinates) from within each sector (see Thrush et al., 1988). To minimise sample interdependence (spatial autocorrelation) samples were not positioned within a 5 m radius of each other. To preclude any effects of localised modification of sampled populations from previous sampling occasions, samples were not taken within 5 m of previous sampling positions over any 6-month period.

Macrofauna were separated from the sediment by sieving (500 µm mesh), preserved in 70% isopropyl alcohol (in tap water) and stained with 0.1% Rose Bengal. In the laboratory, macrofauna were sorted and indicator species/taxa identified and counted. Indicator bivalve species were measured (shell width) and recorded into different size-classes: *Arthritica bifurca*: <2 mm, >2 mm; *Austrovenus stutchburyi* (cockle): <5 mm, >5 mm; *Macomona liliana* (wedge shell): <5 mm, 5–15 mm, >15 mm; *Nucula hartvigiana* (nut-shell): <2 mm, >2 mm; *Paphies australis* (pipi): <5 mm, 5–15 mm, >15 mm; *Theora lubrica*: <5 mm, >5 mm. The remaining species/taxa (i.e. non-indicator species/taxa) were identified to the lowest possible taxonomic level. Samples were stored in 50% isopropyl alcohol. Quality assurance and control procedures are outlined in Appendix 6.

From each site where sufficient numbers of shellfish were available, 20 to 30 adult-sized individuals of *Austrovenus stutchburyi*, *Macomona liliana*, and *Paphies australis* were selected, frozen and retained for condition analysis<sup>4</sup>. Condition analysis work has so far been done on samples from April 2003 to April 2006.

After sorting, the remaining non-living material (e.g. broken shells or 'shell-hash') was dried at 70°C for 48 hours and weighed to establish its dry weight.

### 2.2.2 Sediment characteristics

Five replicate (randomly placed) bulked surface (2 cm) sediment samples were collected from each monitoring plot on each sampling occasion for analysis of grain-size and total organic matter and stored frozen until analysis. In addition, five replicate surface sediment scrapes were collected from each monitoring plot on each sampling occasion for analysis of chlorophyll-*a* and phaeophytin content. These samples were stored in black containers and also frozen until analysis.

#### 2.2.2.1 Surficial sediment grain-size

A sub-sample from each bulked sediment sample was analysed for grain size. Prior to analysis, samples were pre-treated with 10% hydrogen peroxide to remove organic material and 1M HCl to remove carbonate material. Calgon was added as a dispersant and samples were placed in an ultrasonic bath for 10 minutes to aid disaggregation. Samples taken in July 2007 were then analysed using a Galai laser sediment analyser, and for samples taken from October 2007 to April 2008 a Malvern Mastersizer 2000 sediment analyser was used. It should be noted the Galai's lower detection limit is 10 µm, whereas the Malvern can analyse sediment samples down to 0.01 µm.

#### 2.2.2.2 Sediment organic carbon and nitrogen content

Another sub-sample from each bulked sediment sample was analysed for total organic carbon and total nitrogen content using an automated CHN analyser. Samples were

<sup>3</sup> See Hewitt *et al.* (2001) and Turner (2001) for justification.

<sup>4</sup> Bivalves for condition analysis were removed during sieving and prior to sample preservation in isopropyl alcohol.

dried and finely ground before analysis. Sediment for total organic carbon analysis was pre-treated with acid to remove carbonate material prior to analysis.

### 2.2.2.3 Sediment photosynthetic pigment concentration

Chlorophyll-*a* was extracted from the sediment by boiling in 95% ethanol and the extract analysed using a spectrophotometer. Acidification was used to separate plant degradation products (phaeophytin) from chlorophyll-*a*.

## 3 Results

### 3.1 Benthic macrofauna community structure

#### 3.1.1 Southern Firth of Thames

Figure 2 shows the mean total number of individuals and the major taxonomic group composition of the intertidal benthic macrofauna communities at each of the permanent monitoring sites in the Firth of Thames on each sampling date. At GC the mean total number of individuals was more than 2.5× higher compared to all other sites. At TP and KA bivalves were the most abundant taxonomic group, whereas polychaetes were the most abundant group on most sampling dates at GC, MI and KB.

Between July 2007 and April 2008, sites TP and KB showed the greatest changes in the total number of individuals and taxonomic composition. At TP the total abundance increased in from 50 individuals in October 2007 to 87 individuals in April 2008. Indicator bivalves were the most abundant taxonomic group on both sampling dates (48–81% of total abundance). The abundance of indicator polychaetes at TP in October 2007 was also relatively high (35% of individuals). The benthic community at KB was dominated by indicator polychaetes, which decreased from 72% of individuals in July 2007 to 49% and 47% in January 2008 and April 2008, respectively.

The community at MI was dominated by indicator polychaetes (40–60% of individuals) on all sampling dates but abundances fluctuated among the sampling events. The total number of individuals decreased from 95 individuals in July 2007 to 56 in January 2008 (followed by a small increase to 62 individuals in April 2008). Bivalves were also relatively abundant (32% of individuals) at MI in July 2007.

At sites GC and KA the total number of individuals and taxonomic composition was relatively consistent between sampling dates. At GC a small decrease in the total number of individuals occurred from October 2006 to April 2007. Indicator polychaetes (mainly *Aonides oxycephala*) were the most abundant group on both sampling dates (82–84% of individuals). Indicator bivalves dominated the benthic community composition at site KA (65–69%).

Abundances of gastropods (and crustaceans in general) in the Firth of Thames were very low. The full data set of Firth of Thames species and taxonomic group abundances is provided in Appendix 1.

#### 3.1.2 Whaingaroa (Raglan) Harbour

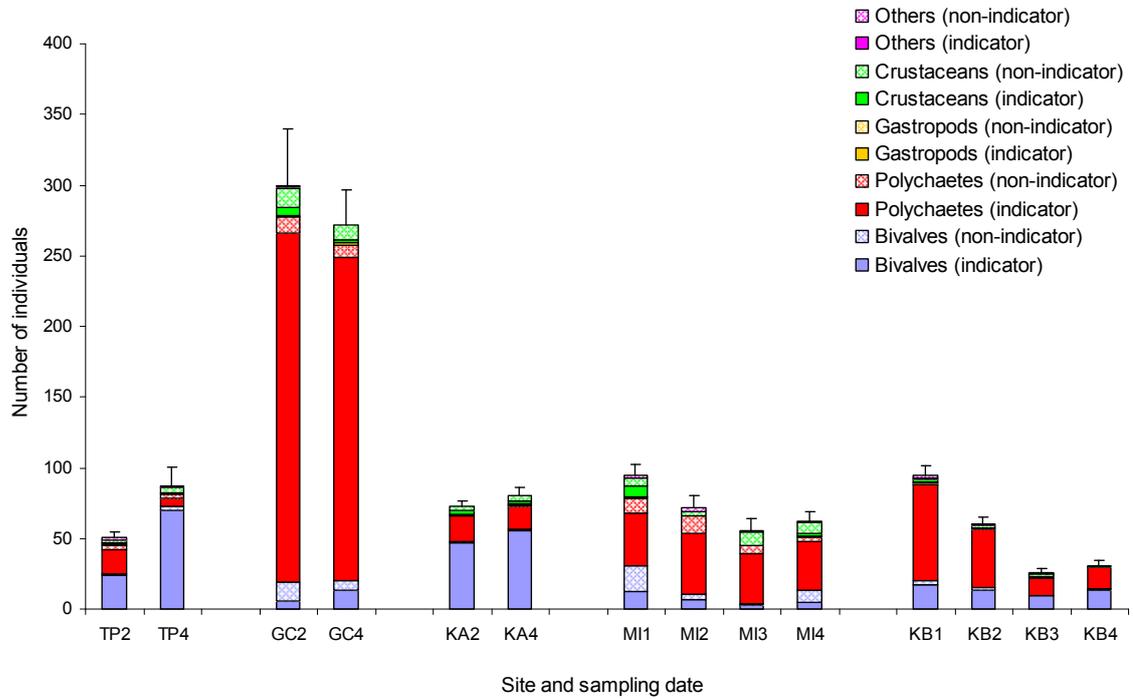
Figure 3 shows the mean total number of individuals and the major taxonomic group composition of the intertidal benthic macrofauna communities at each of the permanent monitoring sites in Whaingaroa (Raglan) Harbour on each sampling date between July 2007 and April 2008.

From July 2007 to April 2008 the total number of individuals varied at HB, X and OB, whereas TU and WI showed little variation. Taxonomic composition was relatively consistent at all sites.

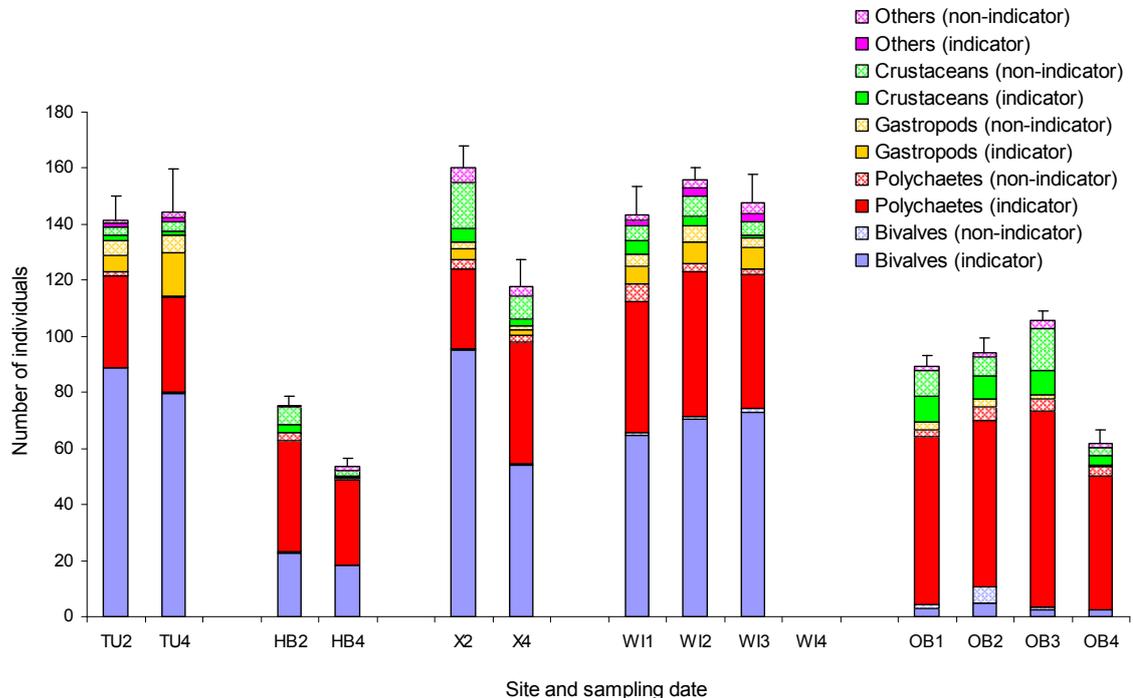
Indicator polychaetes clearly dominated numerically at sites OB (63–77% of individuals) and HB (53–57%), whereas indicator bivalves were more abundant at TU (55–63%), X (46–59%) and WI (45–49%). Indicator polychaetes were also relatively abundant at X in April 2008 (43%) and WI over all sampling dates (32–33%). There was a decrease in total abundance between October 2007 and April 2008 at sites HB (75 to 53 individuals) and X (160 to 118 individuals). This was mainly due to a decrease in abundance of indicator polychaetes and crustaceans at HB, and a decrease of indicator bivalves and crustaceans at site X.

The total abundance at OB slowly increased from 89 individuals in July 2007 to 94 and 106 in October 2007 and January 2008, respectively, followed by a large decrease in April 2008 to 62 individuals. This was mainly caused by a decrease in abundance of indicator polychaetes and crustaceans.

Gastropods were relatively abundant at sites TU (8–15%) and WI (7–9%) and crustaceans at sites X (9–13%), WI (4–7%) and OB (10–21%). The full data set of Whaingaroa (Raglan) Harbour species and taxonomic group abundances is provided in Appendix 2.



**Figure 2: Mean ( $\pm$  standard error) total number of individuals and major taxonomic group composition of intertidal benthic macrofauna communities at the permanent monitoring sites in the southern Firth of Thames between July 2007 and April 2008. Sampling dates: Jul 07 = 1, Oct 07 = 2, Jan 08 = 3, Apr 08 = 4.**



**Figure 3: Mean ( $\pm$  standard error) total number of individuals and major taxonomic group composition of intertidal benthic macrofauna communities at the permanent monitoring sites in Whaingaroa Harbour between July 2007 and April 2008. Sampling dates: Jul 07 = 1, Oct 07 = 2, Jan 08 = 3, Apr 08 = 4. WI was not sampled in Apr 08.**

## 3.2 Changes in the abundance of individual species and taxonomic groups

### 3.2.1 Southern Firth of Thames

The five most common species/taxonomic groups (indicator and non-indicator) at each of the permanent monitoring sites in the southern Firth of Thames on each sampling date between July 2007 and April 2008 are listed in Table 3.

From July 2007 to April 2008 only a few changes were observed in the mean abundance of the most common taxonomic groups at all sampling sites. At TP the bivalve species *Paphies australis* (0-21 individuals core<sup>-1</sup>) and *Nucula hartvigiana* (4-118 individuals core<sup>-1</sup>) were the two most abundant species in October 2007 and April 2008. There was a change in the third to fifth most common species found at TP between the sampling dates.

At GC, the polychaete *Aonides oxycephala* was the most abundant taxa on both sampling dates (80-489 individuals core<sup>-1</sup>). Other bivalves (including the Asian date mussel, *Musculista senhousia*), other amphipods and *Scoloplos cylindrifera* (a non-indicator polychaete) were consistently within the 5 most common taxa on both sampling dates.

*N. hartvigiana* (29-75 individuals core<sup>-1</sup>) and capitellid polychaetes (1-36 individuals core<sup>-1</sup>) were the two most common taxa at KA on both sampling dates. The polychaete *Magelona dakini* was also common in October 2007 and April 2008 (0-6 individuals core<sup>-1</sup>).

**Table 3: The five most common (highest mean abundance) species/taxonomic groups on each sampling date for each permanent monitoring site in the southern Firth of Thames. 'Other bivalves', 'Other crustaceans' and 'Other amphipods' denote non-indicator species of these taxonomic groups.**

	TP	GC	KA	MI	KB
Jul-07				Other bivalves	"Capitellidae"
				<i>Aonides</i>	<i>Austrovenus</i>
				<i>Scoloplos</i>	<i>Arthritica</i>
				<i>Aquilaspio</i>	<i>Magelona</i>
				<i>Colurostylis</i>	Other bivalves
Oct 07	<i>Paphies</i>	<i>Aonides</i>	<i>Nucula</i>	<i>Aonides</i>	"Capitellidae"
	<i>Nucula</i>	Other bivalves	"Capitellidae"	<i>Scoloplos</i>	<i>Austrovenus</i>
	"Capitellidae"	"Capitellidae"	<i>Phoxocephalidae</i>	<i>Orbinia</i>	<i>Arthritica</i>
	<i>Pseudopolydora</i>	<i>Scoloplos</i>	<i>Magelona</i>	<i>Aquilaspio</i>	<i>Magelona</i>
	<i>Aonides</i>	Other amphipods	<i>Nereidae</i>	"Capitellidae"	<i>Nereidae</i>
Jan-08				<i>Aonides</i>	"Capitellidae"
				Other crustaceans	<i>Austrovenus</i>
				<i>Aquilaspio</i>	<i>Arthritica</i>
				<i>Scoloplos</i>	Other crustaceans
				"Capitellidae"	<i>Glycera sp.</i>
Apr-08	<i>Nucula</i>	<i>Aonides</i>	<i>Nucula</i>	<i>Aonides</i>	"Capitellidae"
	<i>Paphies</i>	<i>Scoloplos</i>	"Capitellidae"	<i>Aquilaspio</i>	<i>Arthritica</i>
	<i>Austrovenus</i>	Other amphipods	<i>Arthritica</i>	Other bivalves	<i>Austrovenus</i>
	Other amphipods	Other bivalves	<i>Magelona</i>	Other crustaceans	Other bivalves
	Other bivalves	<i>Arthritica</i>	<i>Austrovenus</i>	<i>Scoloplos</i>	<i>Magelona</i>

At MI the polychaete *A. oxycephala* was the most abundant taxa (4-38 individuals core<sup>-1</sup>) on all sampling dates, except July 2007 where non-indicator bivalves were dominant (5-37 individuals core<sup>-1</sup>). Indicator polychaetes, capitellids and *Aquilaspio aucklandica* and two non-indicator taxa (*S. cylindrifera* and crustaceans) were also common.

At KB, the capitellid polychaete was the most abundant taxa on all sampling dates (0-83 individuals core<sup>-1</sup>). The bivalves *Austrovenus stutchburyi* (2-20 individuals core<sup>-1</sup>) and *Arthritica bifurca* (0-26 individuals core<sup>-1</sup>) were also consistently common on all sampling dates at KB.

Mean abundances of selected (most abundant) indicator and non-indicator species/taxa at each of the sites on each sampling date are shown in Figure 4.

The bivalve, *Arthritica bifurca* was most abundant at MI in July 2007, followed by a sharp decline in abundance over subsequent sampling dates (Figure 4a). The abundance of *A. bifurca* was relatively high at KB over the first two sampling dates, followed by a decrease in abundance in January 2008 and a subsequent strong increase in April 2008. A substantial increase in numbers was also seen in April 2008 at GC. The patterns in abundance of *A. bifurca* are mainly due to changes in abundance of individuals less than 2 mm long.

The abundance of *Austrovenus stutchburyi* showed a gradual decline from July 2007 to April 2008 at KB, was relatively consistent at MI, and showed an increase at GC, TP and KA (slight increase; Figure 4b). This was mainly a reflection of changes in abundance of individuals <5 mm.

*Macomona liliiana* abundance was highest in July 2007 at MI and KB, with numbers decreasing over subsequent sampling dates (Figure 4c). There was a slight increase in abundance of *M. liliiana* in April 2008 at sites GC and TP. The patterns in abundance of *M. liliiana* can be mainly attributed to changes in abundance of individuals <5 mm.

The abundance of *Nucula hartvigiana* was consistently high at KA with a slight increase in April 2008. At TP there was a very strong increase in numbers from a mean abundance of 11 individuals in October 2007 to 58 individuals in April 2008 (Figure 4d). This was mainly due to an increase in numbers in the <2 mm size class.

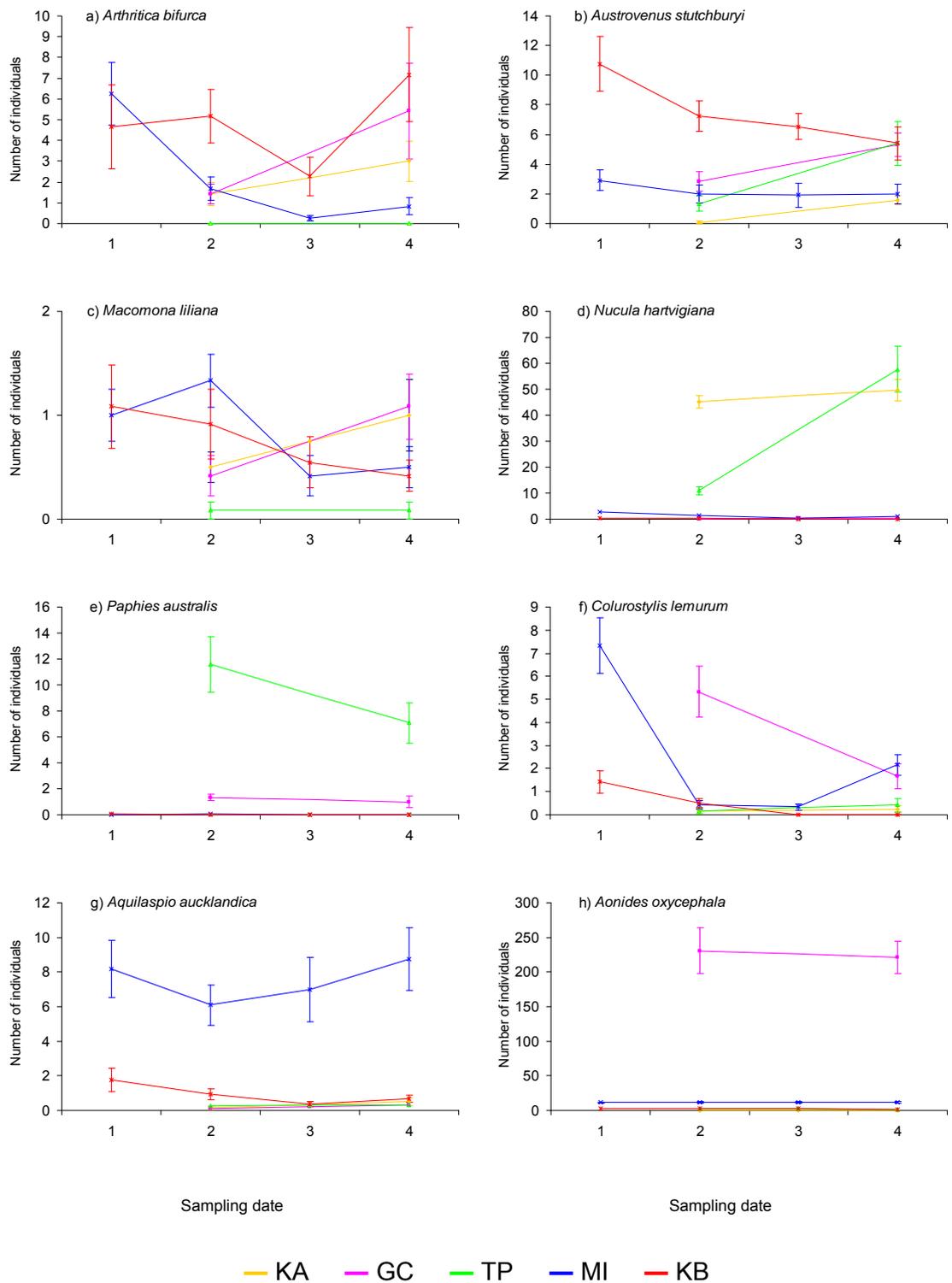
*Paphies australis* was only found in relatively high abundances at TP, with a strong decrease in numbers occurring between Jul 2007 and April 2008. Consistently low numbers were found at GC (Figure 4e). Individuals found at TP were mainly in the >20 mm size class, whereas a mix of <5 mm and 5–15 mm size classes were found at GC.

The highest abundance of the cumacean *Colurostylis lemurum* occurred at MI in July 2007; however, a sharp decline followed in October 2007, with numbers slightly increasing again in April 2008 (Figure 4f). At GC there was a strong decrease in numbers over the one year of monitoring. The abundance at KA, KB and TP was low.

The abundance of most polychaetes species varied over the year of monitoring reported here. The most abundant polychaete was *Aonides oxycephala* (Figure 4h). This species was clearly most abundant at GC, where numbers were consistent between October 2007 and April 2008. MI had consistently lower numbers. Capitellid polychaetes were also found in high numbers, with the highest abundance occurring at KB (Figure 4k). A steady decline in abundance occurred between July 2007 and January 2008, with numbers remaining consistently low in April 2008. Capitellid numbers also decreased slightly over the sampling period at GC, TP and MI, and remained relatively consistent at KA. Another spionid polychaete species, *Aquilaspio aucklandica*, was found in lower numbers (Figure 4g). *A. aucklandica* was most abundant at MI, where numbers initially decreased in October 2007, followed by a gradual increase over subsequent sampling periods. The abundance at all other sites was consistently low (with a slightly higher abundance at KB).

The polydorid polychaetes (“pseudopolydora complex”) were most abundant at TP, with a strong decrease in numbers occurring between October 2007 and April 2008 (Figure 4i). The polychaete *Glycera* sp. was most abundant at KB, with numbers peaking in October 2007, followed by a decline over the last two sampling periods (Figure 4j). *Magelona dakini* abundance declined in October 2007 and January 2008, with numbers remaining consistent in April 2008. The abundance increased at KA, TP and MI over the sampling year, with a decline in April 2008 occurring at MI (Figure 4l). The abundance of nereid polychaetes decreased overall at all sites over the one year of sampling (Figure 4m). *Orbinia papillosa* was most abundant at MI with numbers peaking in October 2007, followed by a strong decline over subsequent sampling periods (Figure 4n). The non-indicator polychaete *Scoloplos cylindrifera* was most abundant at MI and GC. Over the sampling periods numbers decreased slightly at GC, with a stronger decrease occurring at MI (Figure 4o).

Note that indicator amphipods were only found in extremely low abundances so are not presented graphically in this report.



**Figure 4:** The mean ( $\pm$  standard error) number of individuals per core at each monitoring site on each sampling date for selected taxa in the southern Firth of Thames. Sampling dates: Jul 07 = 1, Oct 07 = 2, Jan 08 = 3, Apr 08 = 4. Note the different scales on the vertical axes.

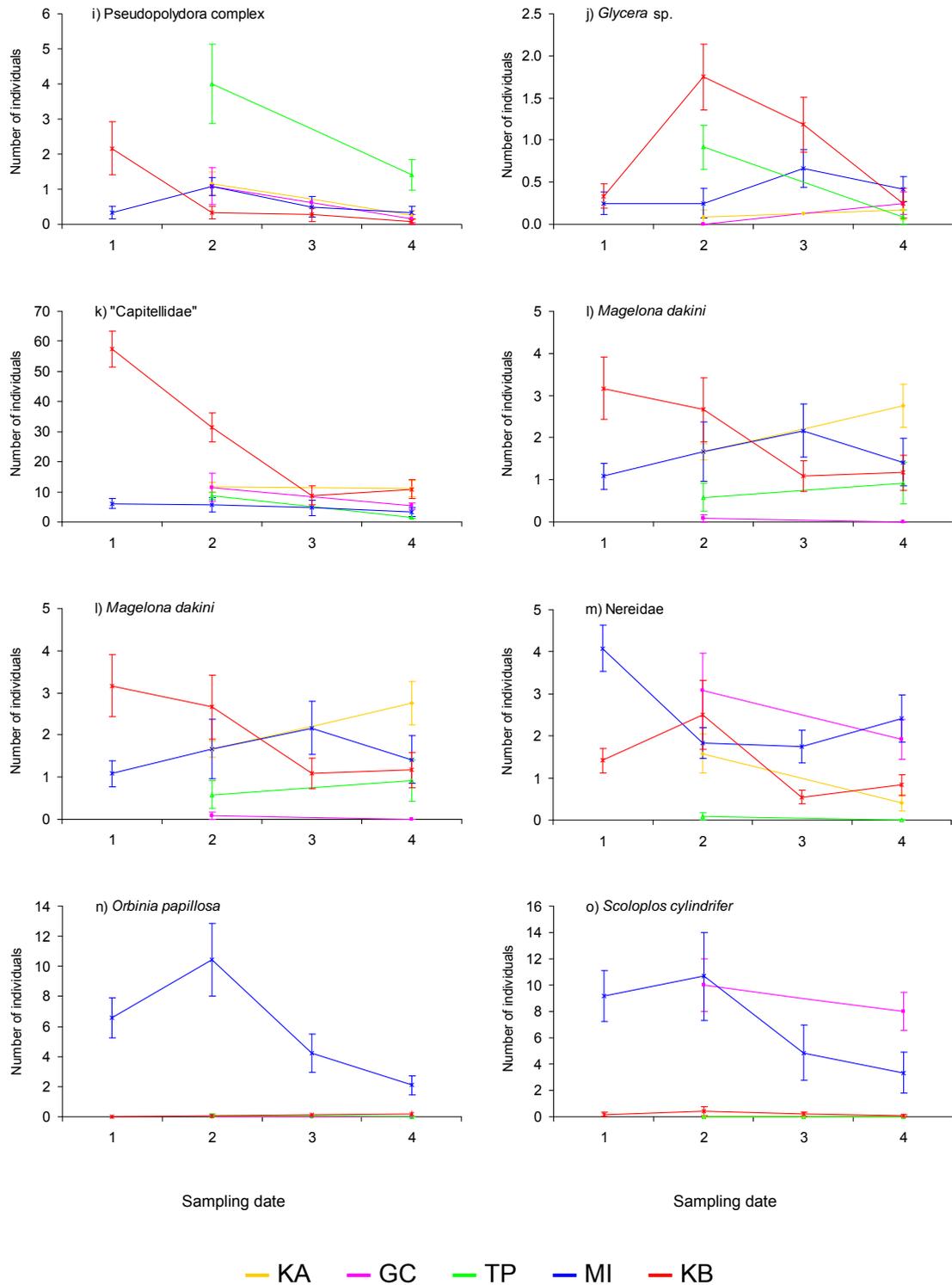


Figure 4. (cont.)

### 3.2.2 Whaingaroa (Raglan) Harbour

The five most common species/taxonomic groups (indicator and non-indicator) at each of the permanent monitoring sites in Whaingaroa (Raglan) Harbour on each sampling date between July 2007 and April 2008 are listed in Table 4.

At sites TU, X, HB and OB the most abundant taxa remained unchanged over all sampling dates. At TU the bivalve species *Austrovenus stutchburyi* (11–74 individuals core<sup>-1</sup>) and *Nucula hartvigiana* (8–69 individuals core<sup>-1</sup>) were the most common taxa on both sampling dates. The polychaetes, *Aquilaspio aucklandica* (1–36 individuals core<sup>-1</sup>) and capitellids (1–20 individuals core<sup>-1</sup>) were also among the most common species; however, in lower numbers. At HB, capitellid polychaetes were the most abundant taxa

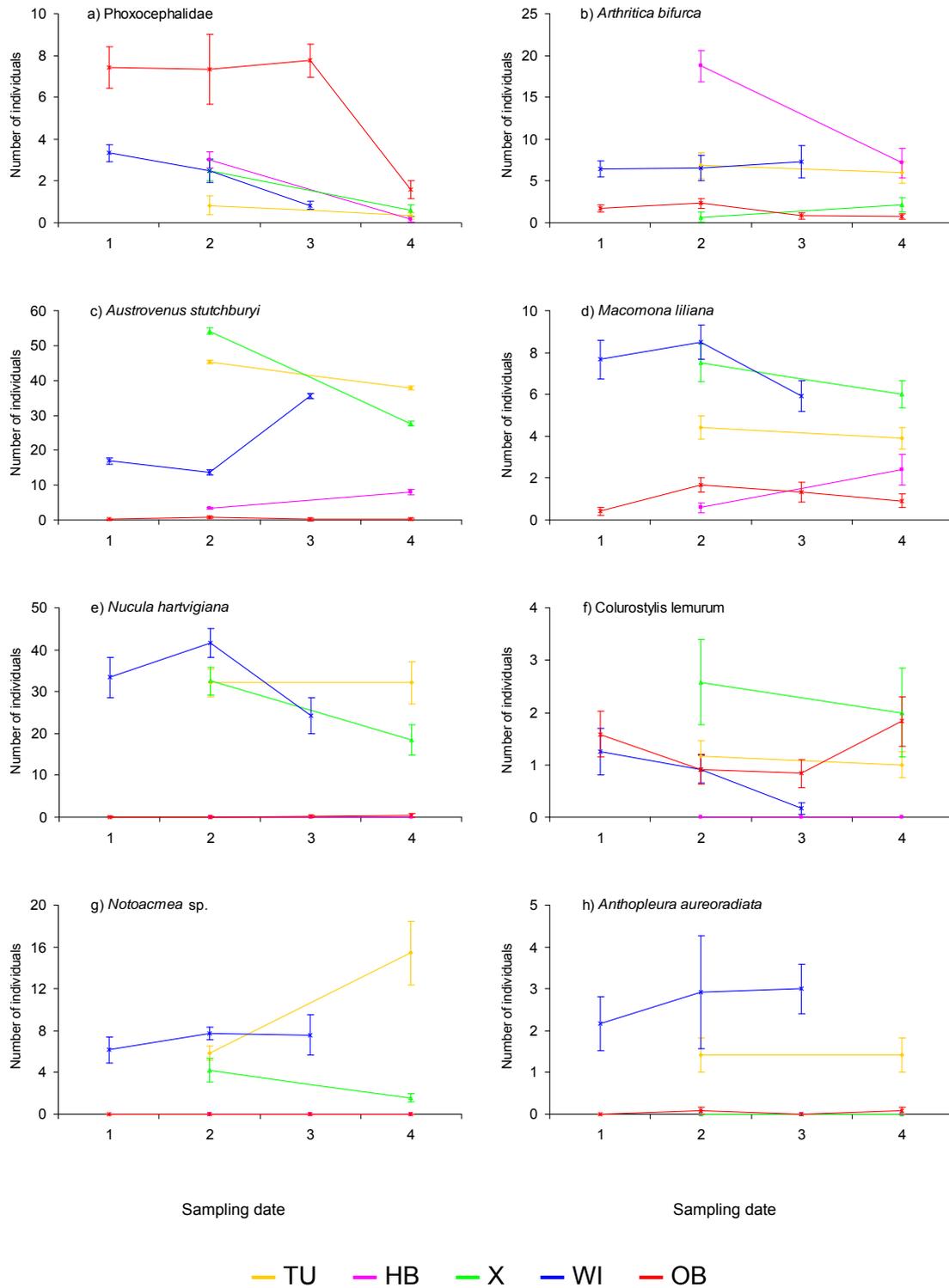
on both sampling dates (6–29 individuals core<sup>-1</sup>). The second most abundant taxa changed from the bivalve *Arthritica bifurca* in October 2007 (1–28 individuals core<sup>-1</sup>) to another bivalve, *A. stutchburyi*, in April 2008 (0–15 individuals core<sup>-1</sup>). Nereid polychaetes were also abundant on both sampling dates at HB. At X, *A. stutchburyi* (15–80 individuals core<sup>-1</sup>) was the most abundant taxa on both sampling dates. The bivalve *N. hartvigiana* and polychaetes *A. aucklandica* and capitellids were frequent on both sampling dates.

At OB the most abundant taxa on all four sampling dates was capitellids (12–48 individuals core<sup>-1</sup>). The second most abundant taxa on three of the four sampling dates were Cossura polychaetes (3–24 individuals core<sup>-1</sup>). *A. aucklandica* were second in January 2008, and common on two other sampling dates. Other abundant taxa found on three sampling dates included the amphipod taxa *phoxocephalidae* (1–20 individuals core<sup>-1</sup>), and nereid polychaetes (1–11 individuals core<sup>-1</sup>). At WI the most abundant taxa changed slightly over the sampling dates. *N. hartvigiana* was most abundant in July and October 2007 (5–59 individuals core<sup>-1</sup>) and *A. stutchburyi* in January 2008 (21–53 individuals core<sup>-1</sup>). Capitellid polychaetes were consistently the second most abundant taxa (12–46 individuals core<sup>-1</sup>) on all sampling dates. *A. aucklandica* (1–33 individuals core<sup>-1</sup>) and the bivalve *Macomona liliiana* (3–15 individuals core<sup>-1</sup>) were also common taxa at WI.

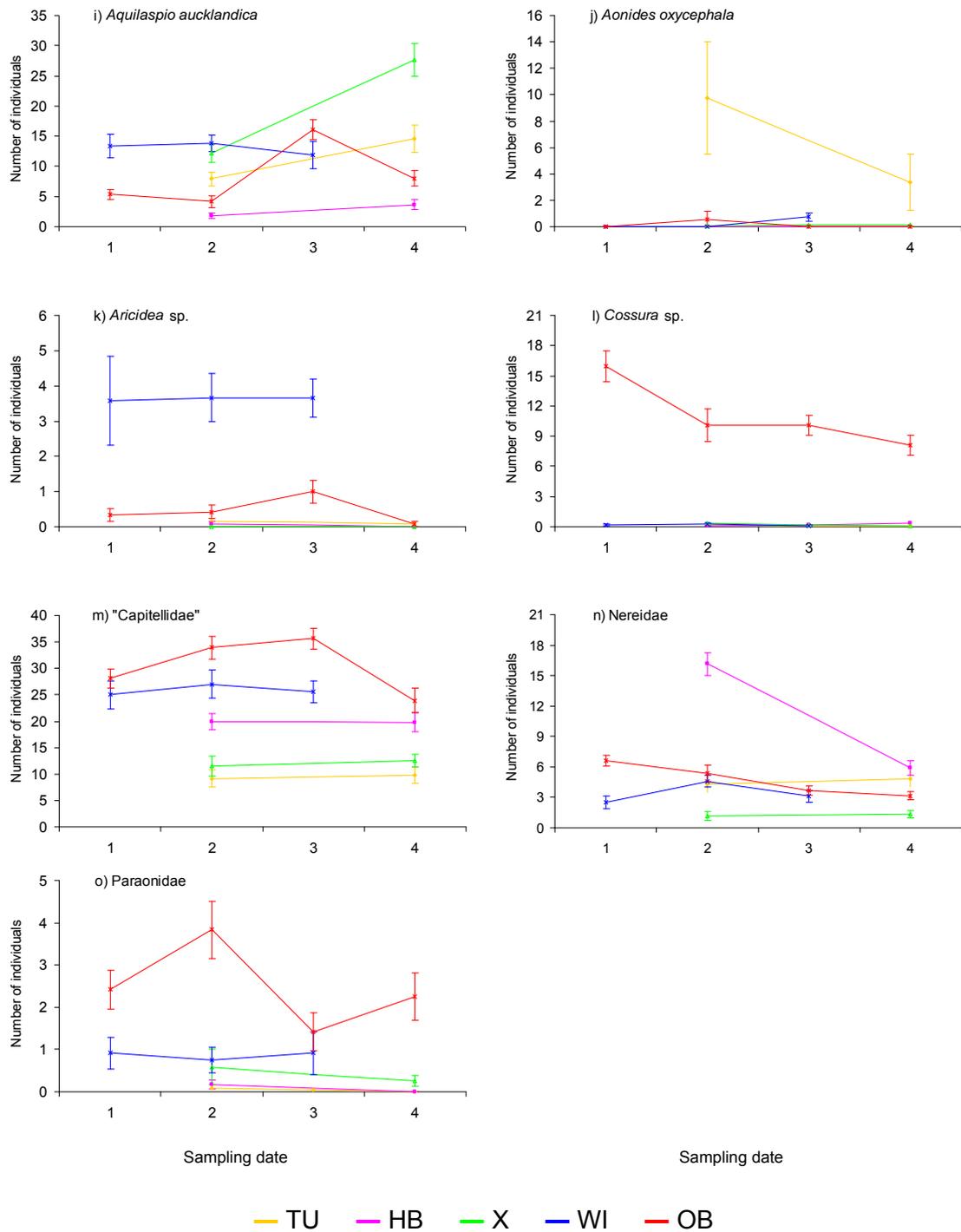
The mean abundances of selected taxa at each of the sites on each sampling date are shown in Figure 5.

**Table 4:** The five most common species/taxonomic groups on each sampling date for each permanent monitoring site in Whaingaroa Harbour. 'Other polychaetes', 'Other bivalves', 'Other crustaceans', 'Other gastropods' and 'Other amphipods' denote non-indicator species of these taxonomic groups. . WI was not sampled in Apr 08.

	TU	HB	X	WI	OB
Jul-07				<i>Nucula</i>	"Capitellidae"
				"Capitellidae"	<i>Cossura</i> sp.
				<i>Austrovenus</i>	<i>Phoxocephalidae</i>
				<i>Aquilaspio</i>	<i>Nereidae</i>
				<i>Macomona</i>	<i>Aquilaspio</i>
Oct-07	<i>Austrovenus</i>	"Capitellidae"	<i>Austrovenus</i>	<i>Nucula</i>	"Capitellidae"
	<i>Nucula</i>	<i>Arthritica</i>	<i>Nucula</i>	"Capitellidae"	<i>Cossura</i> sp.
	<i>Aonides</i>	<i>Nereidae</i>	<i>Aquilaspio</i>	<i>Aquilaspio</i>	<i>Phoxocephalidae</i>
	"Capitellidae"	<i>Austrovenus</i>	"Capitellidae"	<i>Austrovenus</i>	Other bivalves
	<i>Aquilaspio</i>	Other amphipods	Other crustaceans	<i>Macomona</i>	<i>Nereidae</i>
Jan-08				<i>Austrovenus</i>	"Capitellidae"
				"Capitellidae"	<i>Aquilaspio</i>
				<i>Nucula</i>	Other amphipods
				<i>Aquilaspio</i>	<i>Cossura</i> sp.
				<i>Notoacmea</i> sp.	<i>Phoxocephalidae</i>
Apr-08	<i>Austrovenus</i>	"Capitellidae"	<i>Austrovenus</i>		"Capitellidae"
	<i>Nucula</i>	<i>Austrovenus</i>	<i>Aquilaspio</i>		<i>Cossura</i> sp.
	<i>Notoacmea</i> sp.	<i>Arthritica</i>	<i>Nucula</i>		<i>Aquilaspio</i>
	<i>Aquilaspio</i>	<i>Nereidae</i>	"Capitellidae"		<i>Nereidae</i>
	"Capitellidae"	<i>Aquilaspio</i>	<i>Macomona</i>		Other polychaetes



**Figure 5:** The mean ( $\pm$  standard error) number of individuals per core at each monitoring site on each sampling date for selected taxa in Whaingaroa (Raglan) Harbour. Sampling dates: Jul 07 = 1, Oct 07 = 2, Jan 08 = 3, Apr 08 = 4. Note the different scales on the vertical axis. WI was not sampled in Apr 08 due to adverse weather conditions.



**Figure 5. (cont.)**

The highest abundance of phoxocephalid amphipods occurred at OB, where numbers were very consistent over the first three sampling periods, followed by a sharp decline in April 2008 (Figure 5a). A decline in numbers was also seen at the other four sampling sites.

Abundance of indicator bivalves varied both temporally and spatially. *Arthritica bifurca* was present in highest numbers at HB which showed a sharp decline in April 2008. The medium level of abundance at WI and TU, and low numbers at OB and X, remained relatively consistent over the sampling period (Figure 5b). Similar to the Firth of Thames, the majority of *A. bifurca* recorded from Raglan Harbour were <2 mm. High numbers of *Austrovenus stutchburyi* were found at TU and X in October 2007, with a decline in abundance at both sites in April 2008. In contrast a sharp increase in abundance occurred at WI in April 2008, with a smaller increase at HB (Figure 5c).

These patterns can be mainly attributed to a change in abundance of individuals <5 mm.

The abundance of *Macomona liliiana* at site X and TU decreased slightly between October 2007 and April 2008 (Figure 5d), compared to a greater decrease in numbers at WI over the one year of sampling (which was a reflection of a decrease in abundance of individuals <5 mm). There was a small increase in abundance at OB between October 2007 and January 2008. The changes in numbers of *M. liliiana* can mainly be attributed to changes in abundance of individuals <5 mm. High numbers of *Nucula hartvigiana* occurred at TU, WI and X (Figure 5e). The abundance at WI peaked in January 2007, with a subsequent decline in April 2008. A strong decline in numbers also occurred at X in April 2008, whereas the abundance at TU remained very consistent over the sampling dates. The pattern at X and WI (between July and October 2007) was mainly caused by changes in numbers of both size classes, <2 mm and >2 mm, whereas between October 2007 and January 2008 at WI it was mainly the >2 mm size class.

*Colurostylis lemorum* (cumacean) numbers were highest at X in October 2007, followed by a small decrease in numbers in April 2008. Numbers also decreased at WI, whereas a slight increase occurred at OB in April 2008 (Figure 5f). There was a sharp increase at TU and a more gradual increase at WI in the abundance of the limpet *Notoacmea* sp. over the sampling period. There was a decline in abundance at site X (Figure 5g). The abundance of the anemone *Anthopleura aureoradiata* over the one year of sampling increased slightly at WI and was very consistent at TU (Figure 5h).

The abundance of polychaetes also varied over time and between sites. The abundance of *Aquilaspio aucklandica* increased strongly at X and TU, with a small increase in numbers occurring at HB (Figure 5i). At OB there was sharp peak in abundance of *A. aucklandica* in January 2008, followed by a strong decline the following sampling period. Numbers at WI were relatively consistent. *Aonides oxycephala* had the highest number of individuals at TU, with a sharp drop in abundance occurring in April 2008 (Figure 5j). The polychaete *Aricidea* sp. was most abundant at WI, where numbers were very consistent between July 2007 and January 2008. This species was present at low levels at OB, where numbers were relatively consistent apart from a slight increase in January 2008 (Figure 5k).

*Cossura* sp. were either absent or found in very low abundance at all sites, except for OB where the average numbers of individuals were relatively high (16) in July 2007 followed by a gradual decrease to 8 individuals in April 2008 (Figure 5l).

Capitellid polychaetes occurred in relatively high numbers at all sites, in particular WI and OB (Figure 5m). At WI and OB numbers were overall consistent between sampling dates, with a slight peak occurring at OB in January 2008, followed by a decline in April 2008. The abundance at all other sites was very consistent over the one year of sampling. The abundance of nereid polychaetes decreased substantially at HB and steadily at OB between July 2007 and April 2008 (Figure 5n), while all other sites maintained relatively consistent abundances of nereids. Paraonid numbers at OB peaked in October 2007, followed by a decline in January 2008 and a subsequent smaller peak in abundance in April 2008. Consistently low levels were found at all other sites (Figure 5o).

## **3.3 Sediment characteristics**

### **3.3.1 Surficial sediment grain-size**

#### **3.3.1.1 Southern Firth of Thames**

Over the sampling period the median grain size was lowest (136–215  $\mu\text{m}$ ) and remained relatively consistent at sites MI and KA and KB (Figure 6a). At site TP the median grain size was slightly higher (262–274  $\mu\text{m}$ ) but unchanged. At GC there was a large increase from an average of 224  $\mu\text{m}$  in October 2007 to 325  $\mu\text{m}$  in April 2008.

The proportion of mud was variable at sites MI, KB and GC (Figure 6b). There was a marked increase in the average proportion of mud at KB in October 2007, followed by a strong decline in January 2008. In contrast a sharp decline occurred at GC, from an average of 26.8% in October 2007 (which is abnormally high for GC when compared to previous monitoring results) to 8.7% in April 2008. The proportion of mud in the sediment was relatively consistent at KA and TP.

#### **3.3.1.2 Whaingaroa (Raglan) Harbour**

The median grain size remained relatively consistent at WI, HB and OB except for a small decrease at OB in October 2007 (Figure 7a). At X and TU there was a small increase in grain size between October 2007 and April 2008. The median grain size at all sites ranged from 47 to 157  $\mu\text{m}$ .

The proportion of mud varied considerably among sites. The highest proportion of mud occurred at HB (56.3–59.1%) and OB (18.3–40.4%; Figure 7b). At both OB and WI there was an increase in mud content from 18% and 15% to 40% and 24%, respectively, between July 2007 and October 2007. At TU and X the proportion of mud decreased over the study period from 15% and 25% to 10% and 12%, respectively.

### **3.3.2 Shell hash**

#### **3.3.2.1 Southern Firth of Thames**

The greatest amount of mean dry weight of shell-hash per core was found at site GC, where shell-hash content decreased from 738  $\text{g core}^{-1}$  in October 2007 to 681  $\text{g core}^{-1}$  in April 2008 (Figure 6c). Samples from all other sites contained substantially lower and relatively constant amounts of shell hash (MI: 376–441  $\text{g core}^{-1}$ , TP: 95–130  $\text{g core}^{-1}$  and KA: 66–87  $\text{g core}^{-1}$ ). Detailed results are provided in Appendix 3.

#### **3.3.2.2 Whaingaroa (Raglan) Harbour**

In Whaingaroa Harbour the greatest amount of shell-hash was found at X and HB and the lowest at OB (Figure 7c). At X there was a decrease in shell-hash from 216  $\text{g core}^{-1}$  in October 2007 to 194  $\text{g core}^{-1}$  in April 2008. In contrast there was an increase in shell material at HB (from 158  $\text{g core}^{-1}$  in October 2007 to 193  $\text{g core}^{-1}$  in April 2008) and TU (from 93  $\text{g core}^{-1}$  in October 2007 to 123  $\text{g core}^{-1}$  in April 2008). The amount of shell-hash at WI and OB was relatively consistent over the study period. Detailed results are provided in Appendix 3.

### **3.3.3 Sediment organic carbon and nitrogen content**

#### **3.3.3.1 Southern Firth of Thames**

Mean total organic carbon at the southern Firth of Thames sites was consistent and relatively stable (0.2–0.5%) except for a peak of 0.93% at site KB in October 2007 (Figure 6d). At site KA, total organic carbon decreased from 0.47% in October 2007 to 0.26% in April 2008 but the October measurement was very variable.

Trends in the mean total nitrogen content generally followed those in total organic carbon and values ranged from below detection limit to 0.15% (Figure 6e). Detailed results are provided in Appendix 4.

### 3.3.3.2 Whaingaroa (Raglan) Harbour

The mean levels of total organic carbon declined over the study period at OB (1.12% in July 2007 to 0.60% in April 2008), WI (0.71% in July 2007 to 0.49% in January 2008) and HB (0.74% in October 2007 to 0.57% in April 2008; Figure 7d). Consistent levels were observed at TU and X.

Mean total nitrogen mirrored the trends of total organic carbon with values ranging from 0.06 to 0.15% (Figure 7e). Detailed results are provided in Appendix 4.

### 3.3.4 Sediment photosynthetic pigment concentration

#### 3.3.4.1 Southern Firth of Thames

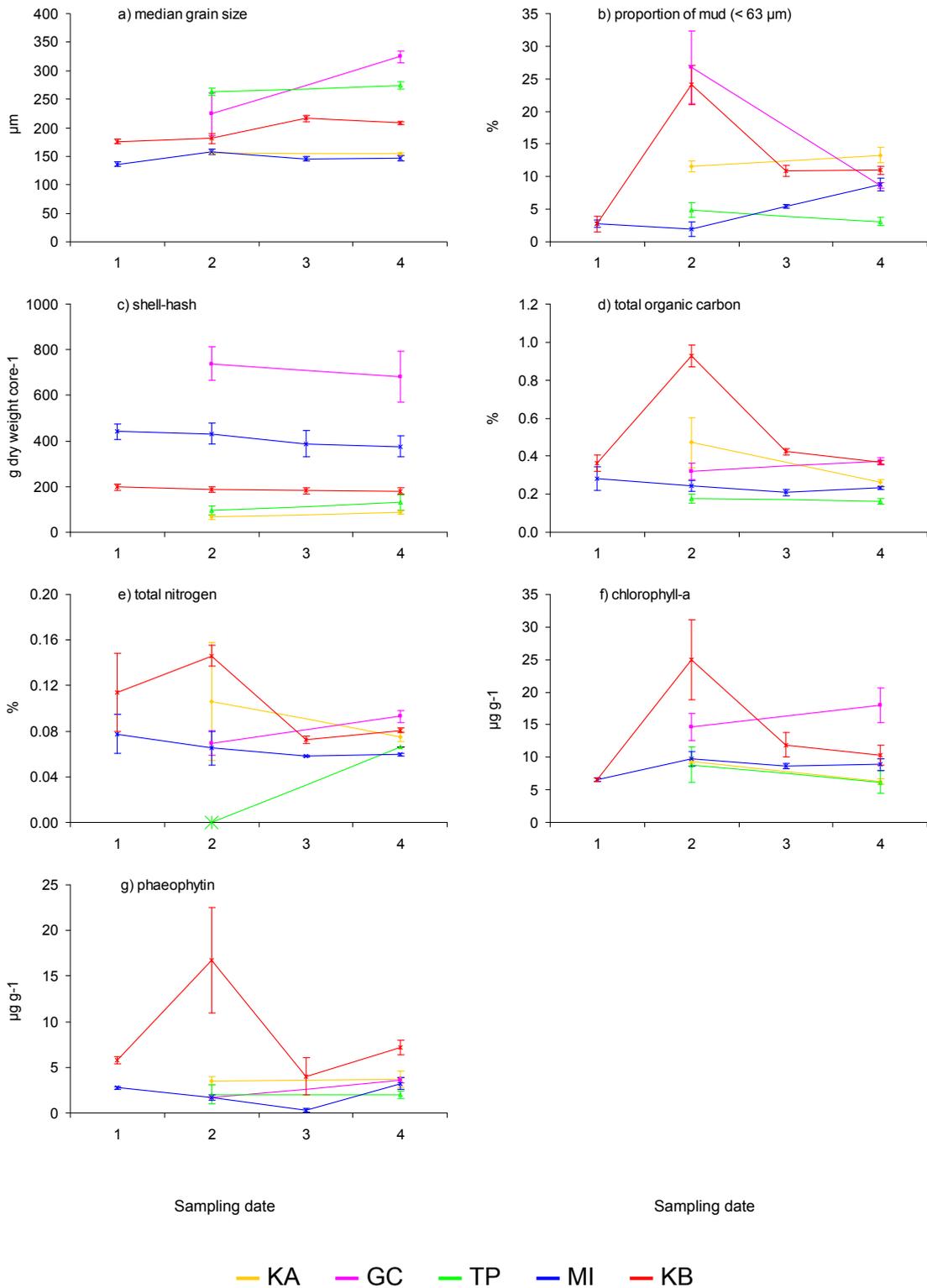
Mean chlorophyll-*a* levels followed a similar trend as total organic carbon (Figure 6f). Values peaked at KB in October 2007 (24.96  $\mu\text{g g}^{-1}$ ) and declined sharply in January 2008 (11.88  $\mu\text{g g}^{-1}$ ) followed by a smaller decline in April 2008 (10.28  $\mu\text{g g}^{-1}$ ). Levels also decreased in April 2008 at KA and TP, whereas they increased at GC and were relatively consistent over the study period at MI.

Similar to chlorophyll-*a* levels, phaeophytin levels peaked in October 2007 at KB (16.74  $\mu\text{g g}^{-1}$ ), declined sharply in January 2008 (4.03  $\mu\text{g g}^{-1}$ ) and increased again in April 2008 (7.20  $\mu\text{g g}^{-1}$ ; Figure 6g). Low phaeophytin levels were observed at MI (0.3–3.22  $\mu\text{g g}^{-1}$ ), GC (1.7–3.56  $\mu\text{g g}^{-1}$ ), KA (3.50–3.72  $\mu\text{g g}^{-1}$ ) and TP (2.02–2.03  $\mu\text{g g}^{-1}$ ). Detailed results are provided in Appendix 5.

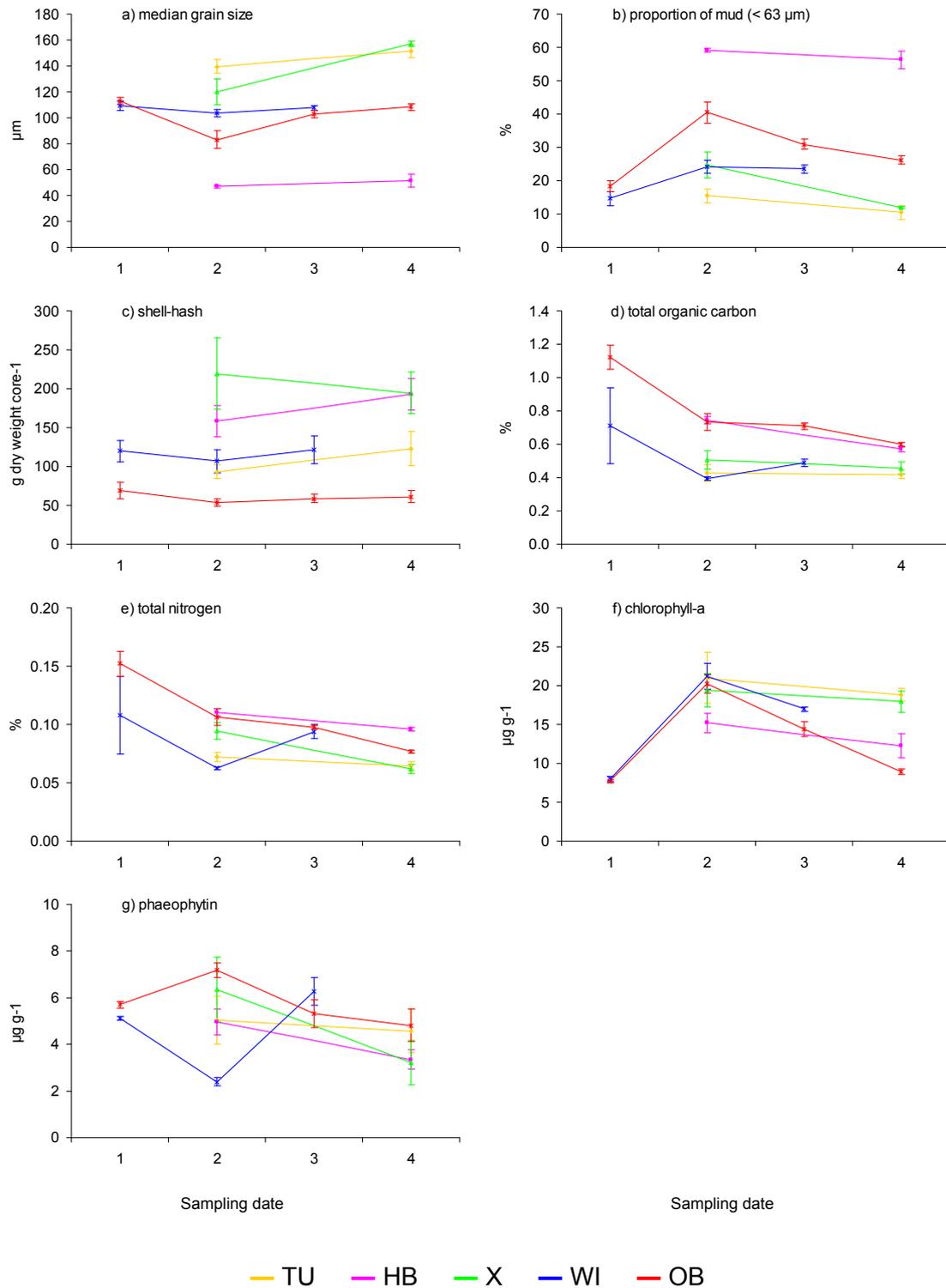
#### 3.3.4.2 Whaingaroa (Raglan) Harbour

Contrary to the southern Firth of Thames sites, trends in mean chlorophyll-*a* content at the Whaingaroa Harbour sites differed from those observed for total organic carbon (Figure 7f). The decrease in chlorophyll-*a* between October 2007 and April 2008 was in general consistent with total organic carbon trends. However, values at sites TU and X were generally higher (17.94–21.0  $\mu\text{g g}^{-1}$ ) than those at sites HB and OB (7.68–20.20  $\mu\text{g g}^{-1}$ ), the exact opposite trend to total organic carbon. Furthermore, chlorophyll-*a* increased sharply at WI (from 7.98  $\mu\text{g g}^{-1}$  in July 2007 to 21.20  $\mu\text{g g}^{-1}$  in October 2007) and OB (from 7.98  $\mu\text{g g}^{-1}$  in July 2007 to 21.20  $\mu\text{g g}^{-1}$  in October 2007) while, at the same time, organic carbon strongly decreased.

Phaeophytin levels in Raglan Harbour over the study period declined at all sites except WI (Figure 7g). At WI there was a decline from 5.12  $\mu\text{g g}^{-1}$  in July 2007 to 2.40  $\mu\text{g g}^{-1}$  in October 2007, followed by an increase to 6.28  $\mu\text{g g}^{-1}$  in January 2007. Detailed results are provided in Appendix 5.



**Figure 6:** Mean ( $\pm$  standard error) a) median grain-size, b) proportion of mud (< 63  $\mu\text{m}$ ), c) shell-hash dry weight, d) total organic carbon content, e) total nitrogen content  $\ast = < 0.05$ ) chlorophyll-a concentration and g) phaeophytin concentration of the sediment at the permanent monitoring sites in the southern Firth of Thames between July 2007 and April 2008. Sampling dates: Jul 07 = 1, Oct 07 = 2, Jan 08 = 3, Apr 08 = 4. Note the different scales on the vertical axis.



**Figure 7:** Mean ( $\pm$  standard error) a) median grain-size, b) proportion of mud (< 63  $\mu\text{m}$ ), c) shell-hash dry weight, d) total organic carbon content, e) total nitrogen content, f) chlorophyll-a concentration and g) phaeophytin concentration of the sediment at the permanent monitoring sites in Whaingaroa Harbour between July 2007 and April 2008. Sampling dates: Jul 07 = 1, Oct 07 = 2, Jan 08 = 3, Apr 08 = 4. Note the different scales on the vertical axis. WI was not sampled in Apr 08.

## 4 Discussion

This report documents the results of the Regional Estuary Monitoring Programme from July 2007 to April 2008. Detailed discussion and analysis of trends or patterns of change over time in the benthic macrofaunal communities and sediment characteristics are reported on every five years in a separate trend report series for the monitoring programme. The next trend report will be prepared after completion of the July 2010 to April 2011 monitoring period. At present we are building up a picture of short-term changes (their nature, size and frequency) that affect macrofaunal communities in the southern Firth of Thames and Whaingaroa Harbour. In the future, information on these changes will enable long-term trends to be identified. It is in such trends that any impacts of long-term changes in the estuaries or their catchments are likely to become apparent. The first trend report (Felsing and Singleton, 2008), which analysed data from April 2001 to April 2006, showed a trend of increasing fine sediment over just 5 years in both estuaries. Although the muddiest sites in Raglan Harbour had the lowest abundance and diversity of macrobenthic invertebrates there was no clear declining trends of mud sensitive taxa observed. If the current trend in fine sediment continues it may reach critical threshold levels where the benthic community could be adversely impacted.

After a review of the Regional Estuary Monitoring Programme was undertaken in 2008/2009 (to assess whether any changes should be implemented in terms of frequency of sampling or the number of sites sampled) it was decided that monitoring continues in both estuaries at 6-monthly intervals at all sites and that monitoring at one site in Raglan Harbour, Te Puna Point (TU), be discontinued. Outlines of the sampling schedule for past and future monitoring in both estuaries are presented in Tables 4 and 5.

**Table 5: Past and planned future 3- and 6-monthly sampling schedule at the five permanent monitoring sites in the southern Firth of Thames.**

	KA	MI	GC	KB	TP
2001	Apr/Oct	Apr/July/Oct	Apr/Oct	Apr/July/Oct	Apr/Oct
2002	Apr/Oct	Jan/Apr/July/Oct	Apr/Oct	Jan/Apr/July/Oct	Apr/Oct
2003	Apr/Oct	Jan/Apr/July/Oct	Apr/Oct	Jan/Apr/July/Oct	Apr/Oct
2004	Apr/Oct	Jan/Apr/July/Oct	Apr/Oct	Jan/Apr/July/Oct	Apr/Oct
2005	Apr/Oct	Jan/Apr/July/Oct	Apr/Oct	Jan/Apr/July/Oct	Apr/Oct
2006	Apr/Oct	Jan/Apr/July/Oct	Apr/Oct	Jan/Apr/July/Oct	Apr/Oct
2007	Apr/Oct	Jan/Apr/July/Oct	Apr/Oct	Jan/Apr/July/Oct	Apr/Oct
2008	Apr/Oct	Jan/Apr/July/Oct	Apr/Oct	Jan/Apr/July/Oct	Apr/Oct
2009	Apr/Oct	Apr/Oct	Apr/Oct	Apr/Oct	Apr/Oct

**Table 6: Past and planned future 3- and 6-monthly sampling schedule at the five permanent monitoring sites in Whaingaroa Harbour.**

	HB	WI	TU	OB	X
2001	Apr/Oct	Apr/July/Oct	Apr/Oct	Apr/July/Oct	Oct
2002	Apr/Oct	Jan/Apr/July/Oct	Apr/Oct	Jan/Apr/July/Oct	Apr/Oct
2003	Apr/Oct	Jan/Apr/July/Oct	Apr/Oct	Jan/Apr/July/Oct	Apr/Oct
2004	Apr/Oct	Jan/Apr/July/Oct	Apr/Oct	Jan/Apr/July/Oct	Apr/Oct
2005	Apr/Oct	Jan/Apr/July/Oct	Apr/Oct	Jan/Apr/July/Oct	Apr/Oct
2006	Apr/Oct	Jan/Apr/July/Oct	Apr/Oct	Jan/Apr/July/Oct	Apr/Oct
2007	Apr/Oct	Jan/Apr/July/Oct	Apr/Oct	Jan/Apr/July/Oct	Apr/Oct
2008	Apr/Oct	Jan/July/Oct	Apr/Oct	Jan/Apr/July/Oct	Apr/Oct
2009	Apr/Oct	Apr/Oct	Sampling discontinued	Apr/Oct	Apr/Oct

The Regional Estuary Monitoring Programme was designed to monitor a suite of 26 selected benthic macrofauna species and taxa as indicators of environmental change. However, over time some non-indicator species were found to occur in high numbers. For example, the non-indicator gastropod species *Cominella glandiformis* is more common in Firth of Thames samples than the indicator gastropod *Cominella adspersa*. A non-indicator polychaete *Scoloplos cylindrifera* is also abundant in the Firth of Thames (at MI and GC). Conversely, some indicator species are either absent at some of the monitoring sites, or found in very low numbers. Therefore it was recommended that all macroinvertebrate fauna be identified to the lowest taxonomic level possible (indicator and non-indicator) to provide a comprehensive description of the macrofaunal communities (which is also useful in identifying potential incursions of introduced species such as *Musculista senhousia*, the asian mussel). This approach has been in place since July 2007. The selection of indicator species may be reconsidered in the next trend report to include our experience over ten years of monitoring.

Continued monitoring will identify any patterns of temporal change in sediment characteristics and the associated benthic communities. From these time-series data we will be able to distinguish changes which may occur as a direct or indirect consequence of catchment activity and/or estuary development from natural variability.

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# Appendix 1 - Southern Firth of Thames species/taxonomic group abundances

KA October 2007

INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN			
		1	2	3	4	5	6	7	8	9	10	11	12					
<b>AMPHIPODS</b>																		
ACOR	<i>Corophiidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
APHOX	<i>Phoxocephalidae</i>	1	2	0	2	0	6	7	0	1	3	17	1				40	3.3
<b>BIVALVES</b>																		
		<b>SIZE</b>																
BAB<2	<i>Arthritica bifurca</i>	<2	3	0	1	0	0	1	1	1	0	1	7	1			16	1.3
BAB>2		>2	0	0	0	0	0	0	0	0	1	0	0	0			1	0.1
		Total	3	0	1	0	0	1	1	1	1	7	1				17	1.4
BAS<5	<i>Austrovenus stutchburyi</i>	<5	0	1	0	0	0	0	0	0	0	0	0	0			1	0.1
BAS>5		>5	0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
BAS-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
		Total	0	1	0	0	0	0	0	0	0	0	0	0			1	0.1
BML<5	<i>Macomona lilliana</i>	<5	0	0	0	1	0	1	0	0	0	0	0	0			2	0.2
BML5-15		5-15	0	0	0	0	0	0	0	0	0	0	1	0			1	0.1
BML>15		>15	0	0	0	0	0	0	1	0	1	1	0	0			3	0.3
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
		Total	0	0	0	1	0	1	1	0	1	1	0	0			6	0.5
BNH<2	<i>Nucula hartvigiana</i>	<2	1	0	0	2	0	0	0	1	0	0	0	0			4	0.3
BNH>2		>2	33	49	52	56	43	49	43	53	50	38	39	33			538	44.8
		Total	34	49	52	58	43	49	43	54	50	38	39	33			542	45.2
BPA<5	<i>Paphies australis</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
BPA5-15		5-15	0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
BPA>15		>15	0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
BPA-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
BTHL<5	<i>Theora lubrica</i>	<5	0	0	0	0	0	1	0	0	0	0	1	0			2	0.2
BTHL>5		>5	0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
		Total	0	0	0	0	0	1	0	0	0	0	1	0			2	0.2
<b>CUMACEANS</b>																		
CCL	<i>Colurostylis lemurum</i>		0	0	0	0	1	0	1	0	0	0	0	0			2	0.2
<b>GASTROPODS</b>																		
GCA	<i>Cominella adspersa</i>		0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
GNHE	<i>Notoacmea sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
<b>OTHER</b>																		
OAN	<i>Anthopleura aureoradiata</i>		0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
<b>POLYCHAETES</b>																		
PAA	<i>Aquilaspio aucklandica</i>		0	1	0	0	0	1	0	0	0	0	0	0			2	0.2
PAGL	<i>Aglaophamus sp.</i>		0	0	0	0	1	0	0	0	0	0	0	0			1	0.1
PAO	<i>Aonides oxycephala</i>		2	0	0	0	0	0	0	0	0	0	0	0			2	0.2
PAR	<i>Aricidea sp.</i>		1	1	0	0	0	0	0	0	0	0	0	0			2	0.2
PBOC	<i>Pseudopolydora complex</i>		3	1	3	2	0	0	0	0	2	1	1	1			14	1.2
PCOS	<i>Cossura sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
PEUC	<i>Euchone sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
PGE	<i>Goniada sp.</i>		4	0	0	0	0	2	0	0	1	3	0	1			11	0.9
PGLY	<i>Glycera sp.</i>		0	0	0	0	0	0	0	0	0	0	1	1			1	0.1
PHF	"Capitellidae"		20	13	14	2	7	13	6	8	14	17	20	5			139	11.6
PMD	<i>Magelona dakini</i>		2	2	1	2	2	1	1	1	3	1	2	2			20	1.7
PNIC	Nereidae		1	0	2	2	0	1	2	0	2	0	5	4			19	1.6
POP	<i>Orbinia papillosa</i>		0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
PPAR	Paraonidae		0	0	0	0	1	0	0	0	0	0	0	0			1	0.1
<b>NON INDICATOR SPECIES</b>																		
CAMPH	Amphipods		0	0	0	0	0	0	0	0	0	0	1	0			1	0.1
CCRAB	Crabs		1	2	0	0	0	1	1	0	0	1	1	1			8	0.7
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
CISO	Isopods		0	0	1	0	0	0	0	0	0	1	0				2	0.2
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
CSHR	Shrimps/Mysids		0	0	1	0	0	0	1	3	3	0	1	0			9	0.8
COTH	Other Crustaceans		0	1	0	1	0	1	0	0	0	3	1	4			11	0.9
BOTH	Bivalves		1	0	1	1	0	0	0	1	0	2	1	1			8	0.7
GOTH	Gastropods		0	0	0	0	1	0	1	0	0	1	2				5	0.4
EFEZ	<i>Fellaster zealandiae</i>		0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
EHOL	Holothurians		0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
ONEM	Nemerteans		0	0	0	0	0	0	0	0	0	0	1			1	0.1	
POTH	Polychaetes		1	1	2	0	0	1	2	0	0	1	1	0			9	0.8
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
OEDW	<i>Edwardsia</i>		0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
OTHER	Misc. Other		1	0	0	0	0	0	0	0	0	0	0	0			1	0.1
<b>TOTAL</b>			75	74	78	71	56	79	67	68	78	72	101	58			877	73.1

INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN		
		1	2	3	4	5	6	7	8	9	10	11	12				
<b>AMPHIPODS</b>																	
ACOR	<i>Corophiidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
APHOX	<i>Phoxocephalidae</i>	0	1	0	1	0	1	1	2	3	4	4	1				
<b>BIVALVES</b>																	
BAB<2	<i>Arthritica bifurca</i>	<2	0	0	4	0	4	1	6	3	11	3	1	2			
BAB>2		>2	0	0	0	0	0	0	0	0	1	0	0	0			
		Total	0	0	4	0	4	1	6	3	12	3	1	2			
BAS<5	<i>Austrovenus stutchburyi</i>	<5	0	1	0	0	2	1	1	1	3	3	2	2			
BAS>5		>5	0	0	0	1	0	0	0	0	0	0	0	0			
BAS-COND		Cond.analysis	0	0	1	0	0	0	0	0	0	1	0	0			
		Total	0	1	1	1	2	1	1	1	3	4	2	2			
BML<5	<i>Macomona liliiana</i>	<5	2	0	1	0	1	1	0	0	0	0	0	3			
BML5-15		5-15	0	0	1	0	0	0	0	0	1	0	0	0			
BML>15		>15	1	0	0	0	1	0	0	0	0	0	0	0			
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0			
		Total	3	0	2	0	2	1	0	0	1	0	0	3			
BNH<2	<i>Nucula hartvigiana</i>	<2	14	3	14	13	13	7	22	36	30	21	26	35			
BNH>2		>2	15	29	28	35	25	31	41	25	29	30	34	40			
		Total	29	32	42	48	38	38	63	61	59	51	60	75			
BPA<5	<i>Paphies australis</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0			
BPA5-15		5-15	0	0	0	0	0	0	0	0	0	0	0	0			
BPA>15		>15	0	0	0	0	0	0	0	0	0	0	0	0			
BPA-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0			
		Total	0	0	0	0	0	0	0	0	0	0	0	0			
BTHL<5	<i>Theora lubrica</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0			
BTHL>5		>5	0	0	0	0	0	0	0	0	0	0	0	0			
		Total	0	0	0	0	0	0	0	0	0	0	0	0			
<b>CUMACEANS</b>																	
CCL	<i>Colurostylis lemurum</i>		1	0	1	0	0	0	0	0	0	1	0	0			
<b>GASTROPODS</b>																	
GCA	<i>Cominella adspersa</i>		0	0	0	0	0	0	0	0	0	0	0	0			
GNHE	<i>Notoacmea</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0			
<b>OTHER</b>																	
OAN	<i>Anthopleura aureoradiata</i>		0	0	0	0	0	0	0	0	0	0	0	0			
<b>POLYCHAETES</b>																	
PAA	<i>Aquilaspio aucklandica</i>		0	0	2	0	0	0	0	0	0	2	1	1			
PAGL	<i>Aglaophamus</i> sp.		0	1	0	0	2	0	0	0	0	1	2	2			
PAO	<i>Aonides oxycephala</i>		0	0	0	1	0	0	0	0	0	0	0	0			
PAR	<i>Aricidea</i> sp.		0	0	0	1	0	2	0	0	0	0	0	0			
PBOC	<i>Pseudopolydora</i> complex		1	0	0	0	0	0	0	0	1	0	0	1			
PCOS	<i>Cossura</i> sp.		0	0	0	0	0	0	1	0	0	0	0	1			
PEUC	<i>Euchone</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0			
PGE	<i>Goniada</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0			
PGLY	<i>Glycera</i> sp.		0	0	1	0	0	0	0	0	1	0	0	0			
PHF	"Capitellidae"		6	8	12	3	14	12	1	36	18	4	14	5			
PMD	<i>Magelona dakini</i>		1	4	6	2	4	3	1	2	2	5	0	3			
PNIC	Nereidae		0	0	0	0	1	0	2	1	0	0	0	1			
POP	<i>Orbinia papillosa</i>		0	0	0	0	0	0	0	0	0	0	0	0			
PPAR	Paraonidae		0	0	0	0	0	0	0	0	0	0	0	0			
<b>NON INDICATOR SPECIES</b>																	
CAMPH	Amphipods		3	0	0	0	0	5	1	6	0	0	0	0			
CCRAB	Crabs		0	0	1	0	0	0	0	0	0	0	1	0			
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0			
CISO	Isopods		0	1	0	0	0	0	0	0	1	0	0	0			
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0			
CSHR	Shrimps/Mysids		0	0	0	1	7	0	0	0	1	3	1	1			
COTH	Other Crustaceans		0	2	6	1	1	0	1	0	2	0	0	0			
BOTH	Bivalves		1	0	1	2	2	2	2	0	1	4	3	1			
GOTH	Gastropods		0	1	1	0	0	0	1	3	0	0	2	0			
EFEZ	<i>Fellaster zealandiae</i>		0	0	0	0	0	0	0	0	0	0	0	0			
EHOL	Holothurians		0	0	0	0	0	0	0	0	0	0	0	0			
ONEM	Nemerteans		0	0	0	0	0	0	0	0	0	0	0	0			
POTH	Polychaetes		1	1	1	2	1	1	1	0	0	0	2	0			
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0			
OFLAT	Flatworms		0	1	0	0	0	0	0	0	0	3	0	0			
OEDW	<i>Edwardsia</i>		0	0	0	0	0	0	0	0	0	0	0	0			
OTHER	Misc. Other		0	0	0	0	0	0	0	0	0	0	0	0			
<b>TOTAL</b>			46	53	81	63	78	67	82	115	105	85	93	99			967
																	80.6

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INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN		
		1	2	3	4	5	6	7	8	9	10	11	12				
<b>AMPHIPODS</b>																	
ACOR	<i>Corophiidae</i>	0	1	0	0	1	0	0	0	0	0	0	0	0	0	2	0.2
APHOX	<i>Phoxocephalidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>BIVALVES</b>																	
<b>SIZE</b>																	
BAB<2	<i>Arthritica bifurca</i>	<2	1	3	0	0	0	4	1	1	1	5	1	0	17	1.4	
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	1	3	0	0	0	4	1	1	1	5	1	0	17	1.4	
BAS<5	<i>Austrovenus stutchburyi</i>	<5	1	1	1	2	1	5	6	2	2	1	0	8	30	2.5	
BAS>5		>5	0	1	1	0	1	0	0	0	1	0	0	0	4	0.3	
BAS-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	1	2	2	2	2	5	6	2	3	1	0	8	34	2.8	
BML<5	<i>Macomona lilliana</i>	<5	0	0	0	0	1	1	0	1	0	0	1	0	4	0.3	
BML5-15		5-15	0	0	0	0	0	0	0	1	0	0	0	0	1	0.1	
BML>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	0	0	0	0	1	1	0	2	0	0	1	0	5	0.4	
BNH<2	<i>Nucula hartvigiana</i>	<2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BNH>2		>2	0	0	0	0	0	1	0	0	0	0	0	0	1	0.1	
		Total	0	0	0	0	0	1	0	0	0	0	0	0	1	0.1	
BPA<5	<i>Paphies australis</i>	<5	0	2	0	0	0	2	1	0	1	1	1	3	11	0.9	
BPA5-15		5-15	1	0	2	0	1	0	0	0	1	0	0	0	5	0.4	
BPA>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BPA-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	1	2	2	0	1	2	1	0	2	1	1	3	16	1.3	
BTHL<5	<i>Theora lubrica</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BTHL>5		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<b>CUMACEANS</b>																	
CCL	<i>Colurostylis lemurum</i>		8	3	1	3	5	13	7	2	3	11	6	2	64	5.3	
<b>GASTROPODS</b>																	
GCA	<i>Cominella adspersa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
GNHE	<i>Notoacmea</i> sp.		2	1	1	3	1	0	0	0	0	0	0	1	9	0.8	
<b>OTHER</b>																	
OAN	<i>Anthopleura aureoradiata</i>		0	0	0	0	0	1	0	1	0	0	0	3	5	0.4	
<b>POLYCHAETES</b>																	
PAA	<i>Aquilaspio aucklandica</i>		0	0	0	0	0	0	0	0	0	1	0	0	1	0.1	
PAGL	<i>Aglaophamus</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PAO	<i>Aonides oxycephala</i>		120	135	273	202	189	131	212	489	303	340	80	295	2769	230.8	
PAR	<i>Aricidea</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PBOC	<i>Pseudopolydora</i> complex		1	0	0	0	1	0	0	3	0	2	0	6	13	1.1	
PCOS	<i>Cossura</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PEUC	<i>Euchone</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PGE	<i>Goniada</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PGLY	<i>Glycera</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PHF	"Capitellidae"		11	15	11	0	6	4	7	61	7	3	4	8	137	11.4	
PMD	<i>Magelona dakini</i>		0	0	0	0	0	0	1	0	0	0	0	0	1	0.1	
PNIC	Nereidae		1	3	2	1	1	2	7	11	2	2	1	4	37	3.1	
POP	<i>Orbinia papillosa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PPAR	Paraonidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<b>NON INDICATOR SPECIES</b>																	
CAMPH	Amphipods		6	5	7	10	12	1	3	3	2	3	0	2	54	4.5	
CCRAB	Crabs		0	0	0	0	0	1	1	1	2	1	0	0	6	0.5	
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
CISO	Isopods		1	0	0	0	0	0	1	0	0	1	0	3	6	0.5	
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
CSHR	Shrimps/Mysids		0	0	0	0	1	0	0	0	1	0	0	0	2	0.2	
COTH	Other Crustaceans		19	0	0	47	1	12	1	1	5	0	0	12	98	8.2	
BOTH	Bivalves		8	10	3	4	11	9	3	25	7	7	3	72	162	13.5	
GOTH	Gastropods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
EFEZ	<i>Fellaster zealandiae</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
EHOL	Holothurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
ONEM	Nemerteans		0	0	0	0	0	0	0	1	2	0	0	2	5	0.4	
POTH	Polychaetes		14	8	3	9	10	8	16	26	10	24	9	2	139	11.6	
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
OEDW	<i>Edwardsia</i>		0	1	1	1	0	0	1	0	0	0	0	1	5	0.4	
OTHER	Misc. Other		0	0	0	0	0	0	0	3	0	4	1	0	8	0.7	
<b>TOTAL</b>			194	189	306	282	243	195	268	632	350	406	107	424	3596	299.7	

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INDICATOR SPECIES	CORE NUMBER	CORE NUMBER												TOTAL	MEAN	
		1	2	3	4	5	6	7	8	9	10	11	12			
<b>AMPHIPODS</b>																
ACOR	<i>Corophiidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
APHOX	<i>Phoxocephalidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>BIVALVES</b>																
		<b>SIZE</b>														
BAB<2	<i>Arthritica bifurca</i>	<2	2	0	0	2	25	12	4	13	0	1	2	2	63	5.3
BAB>2		>2	0	0	0	0	1	1	0	0	0	0	0	0	2	0.2
		Total	2	0	0	2	26	13	4	13	0	1	2	2	65	5.4
BAS<5	<i>Austrovenus stutchburyi</i>	<5	10	3	3	4	8	7	4	2	4	2	4	2	53	4.4
BAS>5		>5	0	1	0	0	0	2	4	1	0	1	2	0	11	0.9
BAS-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	10	4	3	4	8	9	8	3	4	3	6	2	64	5.3
BML<5	<i>Macomona liliiana</i>	<5	2	0	0	1	0	3	2	1	1	1	1	0	12	1.0
BML5-15		5-15	1	0	0	0	0	0	0	0	0	0	0	0	1	0.1
BML>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	3	0	0	1	0	3	2	1	1	1	1	0	13	1.1
BNH<2	<i>Nucula hartvigiana</i>	<2	0	0	1	0	0	0	0	0	0	0	3	0	4	0.3
BNH>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	1	0	0	0	0	0	0	0	3	0	4	0.3
BPA<5	<i>Paphies australis</i>	<5	0	2	3	0	1	0	0	0	1	0	1	0	8	0.7
BPA5-15		5-15	0	2	1	0	0	0	0	0	0	1	0	0	4	0.3
BPA>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	4	4	0	1	0	0	0	1	1	1	0	12	1.0
BTHL<5	<i>Theora lubrica</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL>5		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>CUMACEANS</b>																
CCL	<i>Colurostylis lemurum</i>		1	1	6	3	4	3	1	0	1	0	0	0	20	1.7
<b>GASTROPODS</b>																
GCA	<i>Cominella adspersa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE	<i>Notoacmea</i> sp.		0	0	1	0	0	0	0	0	0	5	9	1	16	1.3
<b>OTHER</b>																
OAN	<i>Anthopleura aureoradiata</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>POLYCHAETES</b>																
PAA	<i>Aquilaspio aucklandica</i>		0	0	1	0	1	2	0	0	0	0	0	0	4	0.3
PAGL	<i>Aglaophamus</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	<i>Aonides oxycephala</i>		117	218	315	264	249	151	210	286	62	249	209	324	2654	221.2
PAR	<i>Aricidea</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PBOC	<i>Pseudopolydora</i> complex		0	0	0	1	0	1	0	0	0	0	0	0	2	0.2
PCOS	<i>Cossura</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PEUC	<i>Euchone</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGE	<i>Goniada</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGLY	<i>Glycera</i> sp.		0	1	0	0	0	0	0	1	0	0	1	0	3	0.3
PHF	"Capitellidae"		2	3	10	4	2	12	6	5	2	5	11	2	64	5.3
PMD	<i>Magelona dakini</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PNIC	Nereidae		2	1	1	2	2	4	1	4	0	1	5	0	23	1.9
POP	<i>Orbinia papillosa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PPAR	Paraonidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>NON INDICATOR SPECIES</b>																
CAMPH	Amphipods		0	0	0	0	0	0	0	0	1	2	0	1	4	0.3
CCRAB	Crabs		0	0	0	0	0	3	0	0	0	0	1	1	5	0.4
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		0	0	1	2	0	2	4	2	2	6	9	3	31	2.6
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CSHR	Shrimps/Mysids		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
COTH	Other Crustaceans		0	0	0	0	0	1	0	1	0	4	53	27	86	7.2
BOTH	Bivalves		17	12	3	3	6	6	13	9	4	4	4	1	82	6.8
GOTH	Gastropods		0	0	2	0	0	0	0	1	0	3	0	1	7	0.6
EFEZ	<i>Fellaster zealandiae</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
EHOL	Holothurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
ONEM	Nemerteans		1	0	0	1	0	0	0	0	0	0	0	0	2	0.2
POTH	Polychaetes		12	12	15	7	5	16	8	6	0	3	14	3	101	8.4
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OEDW	<i>Edwardsia</i>		0	0	1	0	0	0	0	0	0	0	1	0	2	0.2
OTHER	Misc. Other		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>TOTAL</b>			167	256	364	294	304	226	257	332	78	288	329	369	3264	272.0

INDICATOR SPECIES	CORE NUMBER	CORE NUMBER												TOTAL	MEAN	
		1	2	3	4	5	6	7	8	9	10	11	12			
<b>AMPHIPODS</b>																
ACOR	<i>Corophidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
APHOX	<i>Phoxocephalidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>BIVALVES</b>																
		<b>SIZE</b>														
BAB<2	<i>Arthritica bifurca</i>	<2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BAS<5	<i>Austrovenus stutchburyi</i>	<5	0	1	1	2	1	0	0	0	0	0	0	0	5	0.4
BAS>5		>5	0	2	4	0	2	1	0	0	1	0	0	0	10	0.8
BAS-COND		Cond.analysis	0	0	0	0	1	0	0	0	0	0	0	0	1	0.1
		Total	0	3	5	2	4	1	0	0	1	0	0	0	16	1.3
BML<5	<i>Macomona lilliana</i>	<5	0	0	0	0	1	0	0	0	0	0	0	0	1	0.1
BML5-15		5-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BML>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	1	0	0	0	0	0	0	0	1	0.1
BNH<2	<i>Nucula hartvigiana</i>	<2	1	0	0	0	0	0	0	0	0	0	0	0	1	0.1
BNH>2		>2	16	19	12	17	17	12	8	4	4	6	9	6	130	10.8
		Total	17	19	12	17	17	12	8	4	4	6	9	6	131	10.9
BPA<5	<i>Paphies australis</i>	<5	0	0	1	2	0	0	0	1	1	0	0	0	5	0.4
BPA5-15		5-15	0	0	0	1	1	0	0	0	0	0	0	0	2	0.2
BPA>15		>15	1	0	0	0	0	1	1	0	0	0	1	4	4	0.3
BPA-COND		Cond.analysis	17	9	10	7	17	20	18	0	1	2	9	18	128	10.7
		Total	18	9	11	10	18	21	19	1	2	2	9	19	139	11.6
BTHL<5	<i>Theora lubrica</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL>5		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>CUMACEANS</b>																
CCL	<i>Colurostylis lemurum</i>		0	0	0	0	0	0	0	0	1	0	1	0	2	0.2
<b>GASTROPODS</b>																
GCA	<i>Cominella adspersa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE	<i>Notoacmea sp.</i>		0	0	1	0	0	0	0	3	0	1	5	0	10	0.8
<b>OTHER</b>																
OAN	<i>Anthopleura aureoradiata</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>POLYCHAETES</b>																
PAA	<i>Aquilaspio aucklandica</i>		0	0	0	1	0	0	0	0	1	1	0	0	3	0.3
PAGL	<i>Aglaophamus sp.</i>		0	0	0	0	0	0	0	0	0	1	0	0	1	0.1
PAO	<i>Aonides oxycephala</i>		2	1	0	18	0	2	0	0	3	6	3	0	35	2.9
PAR	<i>Aricidea sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PBOC	<i>Pseudopolydora complex</i>		5	8	0	1	1	0	3	13	2	8	4	3	48	4.0
PCOS	<i>Cossura sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PEUC	<i>Euchone sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGE	<i>Goniada sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGLY	<i>Glycera sp.</i>		0	0	0	2	0	1	0	2	1	1	2	2	11	0.9
PHF	"Capitellidae"		14	16	6	10	7	6	7	5	4	15	7	8	105	8.8
PMD	<i>Magelona dakini</i>		0	0	0	4	1	0	0	0	1	1	0	0	7	0.6
PNIC	Nereidae		0	0	0	0	0	0	0	0	0	0	0	1	1	0.1
POP	<i>Orbinia papillosa</i>		0	0	0	1	0	0	0	0	0	0	0	0	1	0.1
PPAR	Paraonidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>NON INDICATOR SPECIES</b>																
CAMPH	Amphipods		0	1	0	0	0	0	0	0	0	0	2	1	4	0.3
CCRAB	Crabs		0	0	1	0	0	0	0	0	0	1	1	0	3	0.3
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		0	0	1	0	0	1	0	0	0	0	0	1	3	0.3
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CSHR	Shrimps/Mysids		2	0	0	1	0	2	0	0	0	2	1	3	11	0.9
COTH	Other Crustaceans		0	3	1	0	0	0	0	4	0	0	2	1	11	0.9
BOTH	Bivalves		0	0	2	0	0	0	1	0	0	1	2	0	6	0.5
GOTH	Gastropods		0	1	0	0	0	0	1	1	1	0	1	0	5	0.4
EFEZ	<i>Fellaster zealandiae</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
EHOL	Holothurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
ONEM	Nemerteans		0	0	0	0	0	0	0	2	1	0	0	0	3	0.3
POTH	Polychaetes		1	1	1	18	0	0	1	2	3	6	2	0	35	2.9
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OEDW	<i>Edwardsia</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OTHER	Misc. Other		0	0	0	0	0	0	7	0	1	0	0	4	12	1.0
<b>TOTAL</b>			<b>59</b>	<b>62</b>	<b>41</b>	<b>85</b>	<b>49</b>	<b>46</b>	<b>47</b>	<b>37</b>	<b>26</b>	<b>51</b>	<b>52</b>	<b>49</b>	<b>604</b>	<b>50.3</b>

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INDICATOR SPECIES	CORE NUMBER	CORE NUMBER												TOTAL	MEAN	
		1	2	3	4	5	6	7	8	9	10	11	12			
<b>AMPHIPODS</b>																
ACOR	<i>Corophiidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
APHOX	<i>Phoxocephalidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>BIVALVES</b>																
BAB<2	<i>Arthritica bifurca</i>	<2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BAS<5	<i>Austrovenus stutchburyi</i>	<5	4	3	10	10	2	3	0	9	10	2	1	1	55	4.6
BAS>5		>5	0	0	0	3	0	0	0	1	5	0	0	0	9	0.8
BAS-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	1	1	0.1
		Total	4	3	10	13	2	3	0	10	15	2	1	2	65	5.4
BML<5	<i>Macomona liliiana</i>	<5	0	0	0	0	0	0	0	0	1	0	0	0	1	0.1
BML5-15		5-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BML>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	1	0	0	0	1	0.1
BNH<2	<i>Nucula hartvigiana</i>	<2	26	20	62	52	42	28	25	87	83	19	19	21	484	40.3
BNH>2		>2	11	9	15	18	20	18	21	31	28	15	8	15	209	17.4
		Total	37	29	77	70	62	46	46	118	111	34	27	36	693	57.8
BPA<5	<i>Paphies australis</i>	<5	0	0	0	1	0	0	0	0	1	0	0	0	2	0.2
BPA5-15		5-15	0	0	1	0	0	0	0	0	0	0	0	0	1	0.1
BPA>15		>15	0	0	0	0	0	2	0	0	0	0	0	0	2	0.2
BPA-COND		Cond.analysis	7	4	3	2	8	10	3	17	1	0	13	12	80	6.7
		Total	7	4	4	3	8	12	3	17	2	0	13	12	85	7.1
BTHL<5	<i>Theora lubrica</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL>5		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>CUMACEANS</b>																
CCL	<i>Colurostylis lemurum</i>		0	0	2	3	0	0	0	0	0	0	0	0	5	0.4
<b>GASTROPODS</b>																
GCA	<i>Cominella adspersa</i>		0	0	0	3	0	0	0	0	0	0	0	0	3	0.3
GNHE	<i>Notoacmea</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>OTHER</b>																
OAN	<i>Anthopleura aureoradiata</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>POLYCHAETES</b>																
PAA	<i>Aquilaspio aucklandica</i>		0	0	0	0	0	0	0	0	3	1	0	0	4	0.3
PAGL	<i>Aglaophamus</i> sp.		1	0	0	0	0	0	0	0	0	0	0	0	1	0.1
PAO	<i>Aonides oxycephala</i>		1	1	1	4	0	0	0	0	8	2	0	0	17	1.4
PAR	<i>Aricidea</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PBOC	<i>Pseudopolydora</i> complex		0	0	0	1	3	2	3	1	3	0	0	4	17	1.4
PCOS	<i>Cossura</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PEUC	<i>Euchone</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGE	<i>Goniada</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGLY	<i>Glycera</i> sp.		0	0	0	0	0	0	0	0	1	0	0	0	1	0.1
PHF	"Capitellidae"		5	0	0	2	2	2	1	1	0	2	2	1	18	1.5
PMD	<i>Magelona dakini</i>		0	1	0	6	1	0	1	0	0	1	1	0	11	0.9
PNIC	Nereidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
POP	<i>Orbinia papillosa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PPAR	Paraonidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>NON INDICATOR SPECIES</b>																
CAMPH	Amphipods		0	0	0	0	2	1	0	3	26	1	1	0	34	2.8
CCRAB	Crabs		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		0	0	0	0	0	0	2	0	0	0	2	1	5	0.4
COST	Ostracods		0	0	0	0	0	0	0	1	0	0	0	0	1	0.1
CSHR	Shrimps/Mysids		0	0	0	0	0	0	0	0	2	0	0	0	2	0.2
COTH	Other Crustaceans		0	0	0	0	0	1	1	0	0	1	0	1	4	0.3
BOTH	Bivalves		0	1	11	11	0	0	0	1	4	5	0	1	34	2.8
GOTH	Gastropods		2	0	1	0	0	0	0	7	1	0	0	0	11	0.9
EFEZ	<i>Fellaster zealandiae</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
EHOL	Holothurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
ONEM	Nemertean		0	0	2	0	0	0	0	0	1	0	0	0	3	0.3
POTH	Polychaetes		1	1	4	16	0	0	1	0	0	3	0	0	26	2.2
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OEDW	<i>Edwardsia</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OTHER	Misc. Other		1	0	0	0	0	0	0	0	0	0	0	0	1	0.1
<b>TOTAL</b>			59	40	112	132	80	67	58	159	178	52	47	58	1042	86.8

INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN		
		1	2	3	4	5	6	7	8	9	10	11	12				
<b>AMPHIPODS</b>																	
ACOR	<i>Corophiidae</i>	1	0	0	0	0	0	1	0	0	0	0	0	0	0	2	0.2
APHOX	<i>Phoxocephalidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>BIVALVES</b>																	
<b>SIZE</b>																	
BAB<2	<i>Arthritica bifurca</i>	<2	1	18	3	9	10	2	11	4	6	0	8	2	74	6.2	
BAB>2		>2	0	0	1	0	0	0	0	0	0	0	0	0	1	0.1	
		Total	1	18	4	9	10	2	11	4	6	0	8	2	75	6.3	
BAS<5	<i>Austrovenus stutchburyi</i>	<5	0	2	0	0	0	0	0	0	1	0	0	1	4	0.3	
BAS>5		>5	2	4	9	2	2	2	2	0	3	1	2	2	31	2.6	
BAS-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	2	6	9	2	2	2	2	0	4	1	2	3	35	2.9	
BML<5	<i>Macomona lilliana</i>	<5	0	0	2	0	0	1	0	0	1	1	1	1	7	0.6	
BML5-15		5-15	0	0	0	1	1	1	0	0	0	1	0	4	4	0.3	
BML>15		>15	0	0	0	1	0	0	0	0	0	0	0	1	1	0.1	
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	0	0	2	2	1	2	0	0	1	1	2	1	12	1.0	
BNH<2	<i>Nucula hartvigiana</i>	<2	0	1	1	1	3	2	4	3	2	4	1	2	24	2.0	
BNH>2		>2	0	0	0	0	0	2	2	0	1	0	2	1	8	0.7	
		Total	0	1	1	1	3	4	6	3	3	4	3	3	32	2.7	
BPA<5	<i>Paphies australis</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BPA5-15		5-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BPA>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BPA-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BTHL<5	<i>Theora lubrica</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BTHL>5		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<b>CUMACEANS</b>																	
CCL	<i>Colurostylis lemurum</i>		2	16	6	5	4	9	4	9	8	7	4	14	88	7.3	
<b>GASTROPODS</b>																	
GCA	<i>Cominella adspersa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
GNHE	<i>Notoacmea sp.</i>		0	2	0	0	0	0	0	1	0	1	0	0	4	0.3	
<b>OTHER</b>																	
OAN	<i>Anthopleura aureoradiata</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<b>POLYCHAETES</b>																	
PAA	<i>Aquilaspio aucklandica</i>		3	2	9	5	14	10	13	11	1	4	6	20	98	8.2	
PAGL	<i>Aglaophamus sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PAO	<i>Aonides oxycephala</i>		5	1	2	4	9	17	16	16	2	11	20	27	130	10.8	
PAR	<i>Aricidea sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PBOC	<i>Pseudopolydora complex</i>		0	0	1	0	2	1	0	0	0	0	0	0	4	0.3	
PCOS	<i>Cossura sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PEUC	<i>Euchone sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PGE	<i>Goniada sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PGLY	<i>Glycera sp.</i>		0	0	0	1	0	0	0	1	0	0	1	3	3	0.3	
PHF	"Capitellidae"		1	7	14	9	6	3	7	3	19	0	3	1	73	6.1	
PMD	<i>Magelona dakini</i>		2	0	3	2	2	1	2	0	0	0	1	0	13	1.1	
PNIC	Nereidae		3	4	7	7	3	1	4	2	5	3	6	4	49	4.1	
POP	<i>Orbinia papillosa</i>		1	5	6	10	3	11	2	1	11	10	15	4	79	6.6	
PPAR	Paraonidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<b>NON INDICATOR SPECIES</b>																	
CAMPH	Amphipods		3	2	0	1	0	0	1	1	4	1	0	0	13	1.1	
CCRAB	Crabs		0	1	0	0	0	0	0	0	0	0	0	0	1	0.1	
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
CISO	Isopods		0	1	0	0	2	4	1	5	2	0	0	2	17	1.4	
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
CSHR	Shrimps/Mysids		0	1	0	0	0	0	0	0	0	0	0	0	1	0.1	
COTH	Other Crustaceans		0	3	1	0	0	0	0	0	20	16	1	0	41	3.4	
BOTH	Bivalves		10	37	19	18	17	5	15	14	25	14	30	11	215	17.9	
GOTH	Gastropods		0	0	0	2	0	0	1	1	0	0	0	0	4	0.3	
EFEZ	<i>Fellaster zealandiae</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
EHOL	Holothurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
ONEM	Nemertean		1	1	4	0	1	2	0	1	1	1	2	3	17	1.4	
POTH	Polychaetes		4	21	19	10	7	12	4	4	23	6	9	7	126	10.5	
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
OEDW	<i>Edwardsia</i>		0	0	0	0	0	2	0	1	0	1	1	1	6	0.5	
OTHER	Misc. Other		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<b>TOTAL</b>			39	129	107	88	86	89	89	78	135	81	113	104	1138	94.8	

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INDICATOR SPECIES	CORE NUMBER	CORE NUMBER												TOTAL	MEAN	
		1	2	3	4	5	6	7	8	9	10	11	12			
<b>AMPHIPODS</b>																
ACOR	<i>Corophiidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
APHOX	<i>Phoxocephalidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>BIVALVES</b>																
	<b>SIZE</b>															
BAB<2	<i>Arthritica bifurca</i>	<2	0	4	2	5	0	0	2	0	1	1	0	3	18	1.5
BAB>2		>2	0	1	0	0	0	0	1	0	0	0	0	0	2	0.2
		Total	0	5	2	5	0	0	3	0	1	1	0	3	20	1.7
BAS<5	<i>Austrovenus stutchburyi</i>	<5	0	0	0	0	0	0	0	0	0	1	2	0	3	0.3
BAS>5		>5	0	1	2	6	0	6	1	1	1	0	1	2	21	1.8
BAS-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	1	2	6	0	6	1	1	1	1	3	2	24	2.0
BML<5	<i>Macomona liliiana</i>	<5	1	1	0	1	1	1	1	0	2	1	0	1	10	0.8
BML5-15		5-15	0	1	0	0	0	1	1	0	0	0	1	0	4	0.3
BML>15		>15	0	0	0	0	0	0	1	0	0	0	0	1	2	0.2
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	1	2	0	1	1	2	3	0	2	1	1	2	16	1.3
BNH<2	<i>Nucula hartvigiana</i>	<2	0	0	1	2	0	0	1	0	0	1	0	2	7	0.6
BNH>2		>2	1	0	1	0	1	0	0	1	0	1	2	1	8	0.7
		Total	1	0	2	2	1	0	1	1	0	2	2	3	15	1.3
BPA<5	<i>Paphies australis</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA5-15		5-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL<5	<i>Theora lubrica</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL>5		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>CUMACEANS</b>																
CCL	<i>Colurostylis lemurum</i>		0	1	0	2	1	0	1	0	0	0	0	0	5	0.4
<b>GASTROPODS</b>																
GCA	<i>Cominella adspersa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE	<i>Notoacmea</i> sp.		0	0	0	1	0	0	0	0	0	0	0	0	1	0.1
<b>OTHER</b>																
OAN	<i>Anthopleura aureoradiata</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>POLYCHAETES</b>																
PAA	<i>Aquilaspio aucklandica</i>		2	7	8	6	1	7	10	3	11	0	5	13	73	6.1
PAGL	<i>Aglaophamus</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	<i>Aonides oxycephala</i>		12	20	4	4	14	10	22	15	29	17	12	41	200	16.7
PAR	<i>Aricidea</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PBOC	<i>Pseudopolydora</i> complex		0	2	1	1	0	3	1	1	1	0	1	2	13	1.1
PCOS	<i>Cossura</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PEUC	<i>Euchone</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGE	<i>Goniada</i> sp.		0	0	0	0	0	0	0	0	1	0	0	0	1	0.1
PGLY	<i>Glycera</i> sp.		0	0	1	0	0	0	0	0	0	0	0	2	3	0.3
PHF	"Capitellidae"		1	2	8	26	2	3	2	0	2	0	18	4	68	5.7
PMD	<i>Magelona dakini</i>		0	1	6	3	1	0	0	0	0	1	7	1	20	1.7
PNIC	Nereidae		0	3	0	3	2	1	2	2	1	1	3	4	22	1.8
POP	<i>Orbinia papillosa</i>		4	20	18	12	23	1	1	7	17	5	17	0	125	10.4
PPAR	Paraonidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>NON INDICATOR SPECIES</b>																
CAMPH	Amphipods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CCRAB	Crabs		0	0	0	0	0	0	0	0	0	0	0	2	2	0.2
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		0	0	0	2	1	0	0	0	0	0	0	0	3	0.3
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CSHR	Shrimps/Mysids		1	0	0	0	0	0	1	0	0	0	0	0	2	0.2
COTH	Other Crustaceans		10	0	0	9	0	0	2	4	0	0	1	0	26	2.2
BOTH	Bivalves		2	1	7	4	10	2	3	2	7	3	4	2	47	3.9
GOTH	Gastropods		1	0	0	0	0	0	0	0	0	0	0	0	1	0.1
EFEZ	<i>Fellaster zealandiae</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
EHOL	Holothurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
ONEM	Nemertean		6	4	4	3	4	3	2	0	1	2	3	3	35	2.9
POTH	Polychaetes		4	13	23	20	3	2	2	2	9	0	36	26	140	11.7
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OEDW	<i>Edwardsia</i>		0	1	1	0	0	0	0	1	0	0	1	0	4	0.3
OTHER	Misc. Other		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>TOTAL</b>			45	83	87	110	64	40	57	39	83	34	114	110	866	72.2

INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN	
		1	2	3	4	5	6	7	8	9	10	11	12			
<b>AMPHIPODS</b>																
ACOR	<i>Corophiidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
APHOX	<i>Phoxocephalidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>BIVALVES</b>																
BAB<2	<i>Arthritica bifurca</i>	<2	0	0	1	0	0	0	1	0	0	0	1	0	3	0.3
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	1	0	0	0	1	0	0	0	1	0	3	0.3
BAS<5	<i>Austrovenus stutchburyi</i>	<5	2	0	3	0	0	0	0	0	0	0	0	0	5	0.4
BAS>5		>5	1	0	7	2	1	1	2	0	1	0	0	3	18	1.5
BAS-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	3	0	10	2	1	1	2	0	1	0	0	3	23	1.9
BML<5	<i>Macomona lilliana</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BML5-15		5-15	1	0	0	1	0	0	0	0	0	0	0	0	2	0.2
BML>15		>15	0	1	0	0	2	0	0	0	0	0	0	0	3	0.3
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	1	1	0	1	2	0	0	0	0	0	0	0	5	0.4
BNH<2	<i>Nucula hartvigiana</i>	<2	0	0	0	0	1	0	0	0	0	0	0	0	1	0.1
BNH>2		>2	0	0	0	0	1	0	0	0	0	1	0	0	2	0.2
		Total	0	0	0	0	2	0	0	0	0	1	0	0	3	0.3
BPA<5	<i>Paphies australis</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA5-15		5-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL<5	<i>Theora lubrica</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL>5		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>CUMACEANS</b>																
CCL	<i>Colurostylis lemurum</i>		1	0	1	0	0	0	1	1	0	0	0	0	4	0.3
<b>GASTROPODS</b>																
GCA	<i>Cominella adspersa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE	<i>Notoacmea sp.</i>		0	0	0	0	0	0	1	0	0	0	0	0	1	0.1
<b>OTHER</b>																
OAN	<i>Anthopleura aureoradiata</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>POLYCHAETES</b>																
PAA	<i>Aquilaspio aucklandica</i>		4	3	4	7	2	8	24	15	4	1	6	6	84	7.0
PAGL	<i>Aglaophamus sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	<i>Aonides oxycephala</i>		16	7	4	16	13	6	13	16	25	23	25	12	176	14.7
PAR	<i>Aricidea sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PBOC	<i>Pseudopolydora complex</i>		0	2	3	0	0	0	1	0	0	0	0	0	6	0.5
PCOS	<i>Cossura sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PEUC	<i>Euchone sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGE	<i>Goniada sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGLY	<i>Glycera sp.</i>		2	0	1	0	1	2	0	0	0	1	0	1	8	0.7
PHF	"Capitellidae"		1	1	31	0	0	2	9	3	0	2	0	8	57	4.8
PMD	<i>Magelona dakini</i>		3	0	5	0	0	4	4	6	0	2	0	2	26	2.2
PNIC	Nereidae		2	2	0	0	1	4	1	2	3	3	0	3	21	1.8
POP	<i>Orbinia papillosa</i>		3	7	14	4	4	0	3	0	11	2	0	3	51	4.3
PPAR	Paraonidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>NON INDICATOR SPECIES</b>																
CAMPH	Amphipods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CCRAB	Crabs		0	1	0	0	0	0	1	0	0	1	0	0	3	0.3
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		0	0	1	0	0	0	0	1	0	1	4	0	7	0.6
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CSHR	Shrimps/Mysids		0	0	0	0	0	0	0	0	0	1	0	0	1	0.1
COTH	Other Crustaceans		0	18	6	40	0	0	42	0	0	1	0	0	107	8.9
BOTH	Bivalves		1	0	3	2	0	2	0	0	0	1	0	1	10	0.8
GOTH	Gastropods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
EFEZ	<i>Fellaster zealandiae</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
EHOL	Holothurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
ONEM	Nemertean		0	1	3	0	1	1	2	1	0	0	3	0	12	1.0
POTH	Polychaetes		20	2	11	20	1	1	2	0	0	4	0	0	61	5.1
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OEDW	<i>Edwardsia</i>		0	1	0	0	0	0	0	1	0	0	0	0	2	0.2
OTHER	Misc. Other		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>TOTAL</b>			57	46	98	92	28	31	107	46	44	44	39	39	671	55.9

INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN		
		1	2	3	4	5	6	7	8	9	10	11	12				
<b>AMPHIPODS</b>																	
ACOR	<i>Corophiidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
APHOX	<i>Phoxocephalidae</i>	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
<b>BIVALVES</b>																	
BAB<2	<i>Arthritica bifurca</i>	<2	0	0	0	0	0	0	5	1	1	0	1	2	10	0.8	
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	0	0	0	0	0	0	5	1	1	0	1	2	10	0.8	
BAS<5	<i>Austrovenus stutchburyi</i>	<5	1	0	4	0	0	2	1	4	2	0	2	0	16	1.3	
BAS>5		>5	0	0	4	1	0	1	0	0	0	1	1	0	8	0.7	
BAS-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	1	0	8	1	0	3	1	4	2	1	3	0	24	2.0	
BML<5	<i>Macomona liliana</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BML5-15		5-15	0	0	0	0	0	0	2	0	0	1	1	1	5	0.4	
BML>15		>15	0	0	0	0	0	0	0	0	1	0	0	0	1	0.1	
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	0	0	0	0	0	0	2	0	1	1	1	1	6	0.5	
BNH<2	<i>Nucula hartvigiana</i>	<2	0	1	0	1	0	0	0	0	0	0	0	1	3	0.3	
BNH>2		>2	2	0	0	0	3	0	0	0	3	0	1	0	9	0.8	
		Total	2	1	0	1	3	0	0	0	3	0	1	1	12	1.0	
BPA<5	<i>Paphies australis</i>	<5	0	0	0	1	0	0	0	0	0	0	0	0	1	0.1	
BPA5-15		5-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BPA>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BPA-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	0	0	0	1	0	0	0	0	0	0	0	0	1	0.1	
BTHL<5	<i>Theora lubrica</i>	<5	0	0	0	0	0	0	0	0	0	0	0	2	2	0.2	
BTHL>5		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	0	0	0	0	0	0	0	0	0	0	0	2	2	0.2	
<b>CUMACEANS</b>																	
CCL	<i>Colurostylis lemurum</i>		0	4	3	5	1	3	2	2	2	3	1	0	26	2.2	
<b>GASTROPODS</b>																	
GCA	<i>Cominella adspersa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
GNHE	<i>Notoacmea</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<b>OTHER</b>																	
OAN	<i>Anthopleura aureoradiata</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<b>POLYCHAETES</b>																	
PAA	<i>Aquilaspio aucklandica</i>		9	2	12	4	2	7	3	12	24	7	10	13	105	8.8	
PAGL	<i>Aglaophamus</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PAO	<i>Aonides oxycephala</i>		6	13	5	13	19	25	14	38	14	22	9	9	187	15.6	
PAR	<i>Aricidea</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PBOC	<i>Pseudopolydora</i> complex		0	0	2	0	0	0	0	0	0	1	0	1	4	0.3	
PCOS	<i>Cossura</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PEUC	<i>Euchone</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PGE	<i>Goniada</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PGLY	<i>Glycera</i> sp.		1	0	1	1	0	0	1	1	0	0	0	0	5	0.4	
PHF	"Capitellidae"		0	1	19	1	1	1	1	2	3	1	5	3	38	3.2	
PMD	<i>Magelona dakini</i>		0	0	3	0	0	0	1	2	1	0	4	6	17	1.4	
PNIC	Nereidae		3	1	1	2	0	1	6	3	3	0	4	5	29	2.4	
POP	<i>Orbinia papillosa</i>		1	0	5	3	4	1	1	2	7	1	0	0	25	2.1	
PPAR	Paraonidae		0	0	1	0	0	0	0	0	0	0	0	0	1	0.1	
<b>NON INDICATOR SPECIES</b>																	
CAMPH	Amphipods		0	0	1	0	0	0	0	0	0	0	1	0	2	0.2	
CCRAB	Crabs		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
CISO	Isopods		1	0	0	1	1	0	6	1	1	2	1	0	14	1.2	
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
CSHR	Shrimps/Mysids		0	0	0	0	0	0	1	0	0	0	0	0	1	0.1	
COTH	Other Crustaceans		1	1	9	15	0	0	0	0	18	30	0	0	74	6.2	
BOTH	Bivalves		3	19	13	14	13	3	4	5	6	15	2	7	104	8.7	
GOTH	Gastropods		0	0	0	2	0	0	0	0	0	0	0	0	2	0.2	
EFEZ	<i>Fellaster zealandiae</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
EHOL	Holothurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
ONEM	Nemertean		0	0	4	0	0	0	0	0	1	4	1	0	10	0.8	
POTH	Polychaetes		1	0	15	0	1	4	2	0	14	0	4	2	43	3.6	
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
OEDW	<i>Edwardsia</i>		0	0	0	0	0	0	0	0	0	1	0	0	1	0.1	
OTHER	Misc. Other		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<b>TOTAL</b>			29	42	102	64	45	48	50	73	101	89	49	52	744	62.0	

INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN	
		1	2	3	4	5	6	7	8	9	10	11	12			
<b>AMPHIPODS</b>																
ACOR	<i>Corophidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
APHOX	<i>Phoxocephalidae</i>	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
<b>BIVALVES</b>																
<b>SIZE</b>																
BAB<2	<i>Arthritica bifurca</i>	<2	8	5	26	3	0	2	2	3	2	0	2	3	56	4.7
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	8	5	26	3	0	2	2	3	2	0	2	3	56	4.7
BAS<5	<i>Austrovenus stutchburyi</i>	<5	5	7	5	10	11	7	14	1	3	11	13	3	90	7.5
BAS>5		>5	1	1	3	3	6	2	3	2	1	9	7	1	39	3.3
BAS-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	6	8	8	13	17	9	17	3	4	20	20	4	129	10.8
BML<5	<i>Macamona lilliana</i>	<5	0	0	4	1	0	3	0	0	0	0	0	0	8	0.7
BML5-15		5-15	0	0	0	1	0	0	1	0	0	1	1	0	4	0.3
BML>15		>15	0	0	0	0	0	0	0	0	0	0	1	0	1	0.1
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	4	2	0	3	1	0	0	1	2	0	13	1.1
BNH<2	<i>Nucula hartvigiana</i>	<2	1	0	1	0	0	0	0	0	0	0	0	0	2	0.2
BNH>2		>2	1	1	1	1	0	0	0	0	0	0	0	0	4	0.3
		Total	2	1	2	1	0	0	0	0	0	0	0	0	6	0.5
BPA<5	<i>Paphies australis</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA5-15		5-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL<5	<i>Theora lubrica</i>	<5	0	0	0	0	0	0	0	0	0	0	1	0	1	0.1
BTHL>5		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	1	0	1	0.1
<b>CUMACEANS</b>																
CCL	<i>Colurostylis lemurum</i>		2	0	0	2	0	3	2	0	0	3	5	0	17	1.4
<b>GASTROPODS</b>																
GCA	<i>Cominella adspersa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE	<i>Notoacmea sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>OTHER</b>																
OAN	<i>Anthopleura aureoradiata</i>		0	0	0	0	2	0	0	0	1	0	0	0	3	0.3
<b>POLYCHAETES</b>																
PAA	<i>Aquilaspio aucklandica</i>		4	8	0	3	2	2	0	1	0	0	1	0	21	1.8
PAGL	<i>Aglaophamus sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	<i>Aonides oxycephala</i>		0	14	2	2	1	0	0	0	0	0	1	20	1.7	
PAR	<i>Aricidea sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PBOC	<i>Pseudopolydora complex</i>		3	0	0	9	3	0	4	0	1	1	4	1	26	2.2
PCOS	<i>Cossura sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PEUC	<i>Euchone sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGE	<i>Goniada sp.</i>		0	0	1	0	0	1	0	0	0	0	0	0	2	0.2
PGLY	<i>Glycera sp.</i>		0	0	0	1	1	1	0	0	0	1	0	0	4	0.3
PHF	"Capitellidae"		83	82	31	59	77	29	62	47	71	74	25	50	690	57.5
PMD	<i>Magelona dakini</i>		0	1	3	0	1	3	5	7	7	2	3	6	38	3.2
PNIC	Nereidae		3	1	1	2	1	1	0	3	2	0	2	1	17	1.4
POP	<i>Orbinia papillosa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PPAR	Paraonidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>NON INDICATOR SPECIES</b>																
CAMPH	Amphipods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CCRAB	Crabs		1	1	0	0	1	1	3	1	0	1	1	0	10	0.8
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CSHR	Shrimps/Mysids		0	0	0	0	0	0	0	1	0	0	0	0	1	0.1
COTH	Other Crustaceans		1	0	0	0	0	1	0	1	1	0	1	0	5	0.4
BOTH	Bivalves		0	2	0	5	3	2	2	4	3	5	1	7	34	2.8
GOTH	Gastropods		5	3	0	0	2	0	1	1	2	1	1	2	18	1.5
EFEZ	<i>Fellaster zealandiae</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
EHOL	Holothurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
ONEM	Nemertean		4	2	0	3	1	2	1	0	1	0	0	2	16	1.3
POTH	Polychaetes		0	2	0	0	0	1	0	0	1	1	1	0	6	0.5
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OFLAT	Flatworms		0	0	0	0	0	0	0	2	0	0	0	0	2	0.2
OEDW	<i>Edwardsia</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OTHER	Misc. Other		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>TOTAL</b>			122	130	78	105	112	61	100	75	96	110	69	78	1136	94.7

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INDICATOR SPECIES	CORE NUMBER	CORE NUMBER												TOTAL	MEAN	
		1	2	3	4	5	6	7	8	9	10	11	12			
<b>AMPHIPODS</b>																
ACOR	<i>Corophiidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
APHOX	<i>Phoxocephalidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>BIVALVES</b>																
		<b>SIZE</b>														
BAB<2	<i>Arthritica bifurca</i>	<2	0	4	0	7	6	7	10	5	0	13	9	0	61	5.1
BAB>2		>2	0	0	0	0	1	0	0	0	0	0	0	1	0.1	
		Total	0	4	0	7	6	8	10	5	0	13	9	0	62	5.2
BAS<5	<i>Austrovenus stutchburyi</i>	<5	4	4	1	2	3	3	7	4	0	3	4	6	41	3.4
BAS>5		>5	2	3	2	3	5	3	8	4	2	4	4	6	46	3.8
BAS-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	6	7	3	5	8	6	15	8	2	7	8	12	87	7.3
BML<5	<i>Macarona liliiana</i>	<5	1	1	0	2	1	2	0	0	0	0	0	0	7	0.6
BML5-15		5-15	0	0	0	0	2	0	0	0	0	0	0	0	2	0.2
BML>15		>15	0	0	0	1	0	0	0	0	1	0	0	0	2	0.2
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	1	1	0	3	3	2	0	0	1	0	0	0	11	0.9
BNH<2	<i>Nucula hartvigiana</i>	<2	1	0	0	0	1	0	0	1	0	0	0	0	3	0.3
BNH>2		>2	0	0	0	0	1	0	0	0	0	0	1	0	2	0.2
		Total	1	0	0	0	2	0	0	1	0	0	1	0	5	0.4
BPA<5	<i>Paphies australis</i>	<5	0	0	1	0	0	0	0	0	0	0	0	0	1	0.1
BPA5-15		5-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	1	0	0	0	0	0	0	0	0	0	1	0.1
BTHL<5	<i>Theora lubrica</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL>5		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>CUMACEANS</b>																
CCL	<i>Colurostylis lemurum</i>		0	1	0	0	1	0	1	1	2	0	0	0	6	0.5
<b>GASTROPODS</b>																
GCA	<i>Cominella adspersa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE	<i>Notoacmea</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>OTHER</b>																
OAN	<i>Anthopleura aureoradiata</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>POLYCHAETES</b>																
PAA	<i>Aquiaspio aucklandica</i>		0	1	0	0	3	3	1	1	0	1	0	1	11	0.9
PAGL	<i>Aglaophamus</i> sp.		1	2	0	0	0	0	0	0	0	0	0	0	3	0.3
PAO	<i>Aonides oxycephala</i>		0	0	1	12	1	1	1	0	0	0	0	0	16	1.3
PAR	<i>Aricidea</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PBOC	<i>Pseudopolydora</i> complex		0	0	1	1	0	0	0	0	0	2	0	0	4	0.3
PCOS	<i>Cossura</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PEUC	<i>Euchone</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGE	<i>Goniada</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGLY	<i>Glycera</i> sp.		2	4	2	0	2	1	3	4	0	1	1	1	21	1.8
PHF	"Capitellidae"		26	17	49	6	38	28	45	63	28	43	18	15	376	31.3
PMD	<i>Magelona dakini</i>		2	1	0	1	1	4	5	0	7	7	0	4	32	2.7
PNIC	Nereidae		2	0	1	2	2	2	4	2	1	1	2	11	30	2.5
POP	<i>Orbinia papillosa</i>		0	0	0	0	0	0	0	0	0	0	1	1	1	0.1
PPAR	Paraonidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>NON INDICATOR SPECIES</b>																
CAMPH	Amphipods		0	0	0	0	0	0	0	1	0	0	0	0	1	0.1
CCRAB	Crabs		2	0	0	0	0	1	1	0	1	1	4	1	11	0.9
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		0	0	0	1	0	0	0	1	1	0	0	0	3	0.3
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CSHR	Shrimps/Mysids		0	0	1	2	0	1	1	0	0	1	0	0	6	0.5
COTH	Other Crustaceans		0	0	0	0	0	0	0	0	1	0	0	0	1	0.1
BOTH	Bivalves		3	1	0	0	1	1	1	2	5	0	1	1	16	1.3
GOTH	Gastropods		1	0	0	0	0	2	0	1	0	0	0	0	4	0.3
EFEZ	<i>Fellaster zealandiae</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
EHOL	Holothurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
ONEM	Nemertean		0	1	0	0	0	0	1	0	0	1	0	3	6	0.5
POTH	Polychaetes		0	0	0	4	1	1	0	0	0	0	2	0	8	0.7
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OEDW	<i>Edwardsia</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OTHER	Misc. Other		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>TOTAL</b>			47	40	59	44	69	61	89	90	49	75	49	50	722	60.2

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INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN	
		1	2	3	4	5	6	7	9	10	11	12				
ACOR	<i>Corophiidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
APHOX	<i>Phoxocephalidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>BIVALVES</b>		<b>SIZE</b>														
BAB<2	<i>Arthritica bifurca</i>	<2	1	1	1	2	0	2	2	0	1	4	11	25	2.3	
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	1	1	1	2	0	2	2	0	1	4	11	25	2.3	
BAS<5	<i>Austrovenus stutchburyi</i>	<5	0	1	3	0	0	0	1	0	0	0	0	5	0.5	
BAS>5		>5	5	6	2	2	6	11	11	5	4	7	8	67	6.1	
BAS-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	5	7	5	2	6	11	12	5	4	7	8	72	6.5	
BML<5	<i>Macamona liliana</i>	<5	0	0	0	0	1	0	0	0	0	0	0	1	0.1	
BML5-15		5-15	0	0	0	0	0	1	2	0	2	0	0	5	0.5	
BML>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	0	0	0	0	1	1	2	0	2	0	0	6	0.5	
BNH<2	<i>Nucula hartvigiana</i>	<2	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BNH>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BPA<5	<i>Paphies australis</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BPA5-15		5-15	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BPA>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BPA-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BTHL<5	<i>Theora lubrica</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BTHL>5		>5	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<b>CUMACEANS</b>																
CCL	<i>Colurostylis lemorum</i>		0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<b>GASTROPODS</b>																
GCA	<i>Cominella adspersa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0.0	
GNHE	<i>Notoacmea</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<b>OTHER</b>																
OAN	<i>Anthopleura aureoradiata</i>		0	1	0	0	2	0	1	0	0	1	0	5	0.5	
<b>POLYCHAETES</b>																
PAA	<i>Aquiaspio aucklandica</i>		0	1	1	0	1	1	0	0	0	0	0	4	0.4	
PAGL	<i>Aglaophamus</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PAO	<i>Aonides oxycephala</i>		0	0	0	2	0	0	1	0	0	0	0	3	0.3	
PAR	<i>Aricidea</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PBOC	<i>Pseudopolydora</i> complex		0	0	0	0	1	2	0	0	0	0	0	3	0.3	
PCOS	<i>Cossura</i> sp.		0	0	0	0	0	1	0	0	0	0	0	1	0.1	
PEUC	<i>Euchone</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PGE	<i>Goniada</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PGLY	<i>Glycera</i> sp.		3	1	0	0	2	1	3	0	1	1	1	13	1.2	
PHF	"Capitellidae"		6	0	34	6	3	2	4	15	21	3	3	97	8.8	
PMD	<i>Magelona dakini</i>		1	0	0	0	2	0	1	3	2	3	0	12	1.1	
PNIC	Nereidae		0	1	0	0	1	1	1	0	0	1	1	6	0.5	
POP	<i>Orbinia papillosa</i>		0	0	0	0	0	0	0	0	0	1	0	1	0.1	
PPAR	Paraonidae		0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<b>NON INDICATOR SPECIES</b>																
CAMPH	Amphipods		0	0	0	0	0	0	2	0	0	0	0	2	0.2	
CCRAB	Crabs		0	0	0	1	0	0	1	0	0	1	0	3	0.3	
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0.0	
CISO	Isopods		0	0	0	0	0	1	0	0	0	1	0	2	0.2	
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0.0	
CSHR	Shrimps/Mysids		0	1	0	0	0	0	0	0	0	0	0	1	0.1	
COTH	Other Crustaceans		0	7	1	0	0	2	2	0	1	2	0	15	1.4	
BOTH	Bivalves		0	0	0	0	0	0	0	0	0	0	0	0	0.0	
GOTH	Gastropods		0	0	0	0	0	0	2	0	1	1	2	6	0.5	
EFEZ	<i>Fellaster zealandiae</i>		0	0	0	0	0	0	0	0	0	0	0	0	0.0	
EHOL	Holothurians		0	0	0	0	0	0	0	0	0	0	0	0	0.0	
ONEM	Nemertean		1	0	0	1	0	0	0	0	0	0	0	2	0.2	
POTH	Polychaetes		1	0	0	2	0	0	1	0	1	0	0	5	0.5	
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0.0	
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0.0	
OEDW	<i>Edwardsia</i>		0	0	0	0	0	0	0	0	0	0	0	0	0.0	
OTHER	Misc. Other		0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<b>TOTAL</b>			18	20	42	16	19	25	35	23	34	25	27	284	23.7	

KB April 2008

INDICATOR SPECIES	CORE NUMBER	CORE NUMBER												TOTAL	MEAN	
		1	2	3	4	5	6	7	8	9	10	11	12			
<b>AMPHIPODS</b>																
ACOR	<i>Corophiidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
APHOX	<i>Phoxocephalidae</i>	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0.1
<b>BIVALVES</b>																
	<b>SIZE</b>															
BAB<2	<i>Arthritica bifurca</i>	<2	4	2	0	15	1	10	23	2	0	1	14	13	85	7.1
BAB>2		>2	0	0	0	0	0	0	1	0	0	0	0	0	1	0.1
		Total	4	2	0	15	1	10	24	2	0	1	14	13	86	7.2
BAS<5	<i>Austrovenus stutchburyi</i>	<5	0	0	2	0	0	1	0	0	2	0	0	0	5	0.4
BAS>5		>5	3	2	2	3	2	4	9	3	7	6	15	3	59	4.9
BAS-COND		Cond.analysis	0	0	0	0	0	1	0	0	0	0	0	0	1	0.1
		Total	3	2	4	3	2	6	9	3	9	6	15	3	65	5.4
BML<5	<i>Macarona liliiana</i>	<5	1	0	0	0	1	0	0	0	0	0	0	0	2	0.2
BML5-15		5-15	0	1	0	0	0	0	0	0	0	0	1	1	3	0.3
BML>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	1	1	0	0	1	0	0	0	0	0	1	1	5	0.4
BNH<2	<i>Nucula hartvigiana</i>	<2	1	0	1	0	0	0	0	0	0	0	0	0	2	0.2
BNH>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	1	0	1	0	0	0	0	0	0	0	0	0	2	0.2
BPA<5	<i>Paphies australis</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA5-15		5-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL<5	<i>Theora lubrica</i>	<5	0	0	1	1	0	0	0	0	0	0	0	0	2	0.2
BTHL>5		>5	0	0	1	0	0	0	0	0	0	0	0	0	1	0.1
		Total	0	0	2	1	0	0	0	0	0	0	0	0	3	0.3
<b>CUMACEANS</b>																
CCL	<i>Colurostylis lemorum</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>GASTROPODS</b>																
GCA	<i>Cominella adspersa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE	<i>Notoacmea</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>OTHER</b>																
OAN	<i>Anthopleura aureoradiata</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>POLYCHAETES</b>																
PAA	<i>Aquaspio aucklandica</i>		0	2	0	2	1	0	1	0	1	0	1	0	8	0.7
PAGL	<i>Aglaophamus</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	<i>Aonides oxycephala</i>		0	4	0	0	0	0	1	0	0	1	0	1	7	0.6
PAR	<i>Aricidea</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PBOC	<i>Pseudopolydora</i> complex		0	0	0	0	0	1	0	0	0	0	0	0	1	0.1
PCOS	<i>Cossura</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PEUC	<i>Euchone</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGE	<i>Goniada</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGLY	<i>Glycera</i> sp.		0	0	0	0	0	1	0	0	2	0	0	0	3	0.3
PHF	"Capitellidae"		11	2	35	16	28	12	2	3	6	9	4	2	130	10.8
PMD	<i>Magelona dakini</i>		5	0	2	0	1	1	1	0	2	2	0	0	14	1.2
PNIC	Nereidae		1	2	0	2	0	1	2	0	0	1	0	1	10	0.8
POP	<i>Orbinia papillosa</i>		0	2	0	0	0	0	0	0	0	0	0	0	2	0.2
PPAR	Paraonidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>NON INDICATOR SPECIES</b>																
CAMPH	Amphipods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CCRAB	Crabs		0	0	0	1	0	1	0	0	0	0	0	0	2	0.2
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		0	0	0	1	0	0	0	0	1	0	1	0	3	0.3
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CSHR	Shrimps/Mysids		0	0	0	0	0	0	0	0	1	0	0	0	1	0.1
COTH	Other Crustaceans		0	1	0	0	0	0	0	0	0	0	2	0	3	0.3
BOTH	Bivalves		1	1	3	0	0	4	1	0	1	1	3	0	15	1.3
GOTH	Gastropods		0	1	1	1	0	0	0	0	2	0	0	0	5	0.4
EFEZ	<i>Fellaster zealandiae</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
EHOL	Holothurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
ONEM	Nemertean		0	0	0	0	0	0	0	0	0	1	0	0	1	0.1
POTH	Polychaetes		1	1	0	1	0	0	0	0	0	0	0	0	3	0.3
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OEDW	<i>Edwardsia</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OTHER	Misc. Other		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>TOTAL</b>			28	21	49	43	34	37	41	8	25	22	41	21	370	30.8

# Appendix 2 - Whaingaroa Harbour species/taxonomic group abundances

TU October 2007

INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN		
		1	2	3	4	5	6	7	8	9	10	11	12				
<b>AMPHIPODS</b>																	
ACOR	<i>Corophiidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
APHOX	<i>Phoxocephalidae</i>	0	0	3	0	0	1	0	0	0	0	1	5	0	0	0	0
<b>BIVALVES</b>																	
BAB<2	<i>Arthritica bifurca</i>	<2	10	6	3	4	13	14	1	1	1	14	12	3	82	6.8	
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Total	10	6	3	4	13	14	1	1	1	14	12	3	82	6.8	
BAS<5	<i>Austrovenus stutchburyi</i>	<5	37	14	26	14	17	25	26	15	13	6	11	11	215	17.9	
BAS>5		>5	17	25	18	31	37	25	34	31	32	29	24	25	328	27.3	
BAS-COND		Cond.analysis	0	1	0	0	0	0	0	0	0	0	0	0	1	0.1	
		Total	54	40	44	45	54	50	60	46	45	35	35	36	544	45.3	
BML<5	<i>Macamona lilliana</i>	<5	1	3	2	0	1	2	0	0	2	1	3	1	16	1.3	
BML5-15		5-15	1	0	0	1	2	0	2	0	0	1	1	2	10	0.8	
BML>15		>15	5	1	2	1	0	2	5	2	0	5	2	2	27	2.3	
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	7	4	4	2	3	4	7	2	2	7	6	5	53	4.4	
BNH<2	<i>Nucula hartvigiana</i>	<2	4	2	1	0	4	5	7	2	0	1	7	5	38	3.2	
BNH>2		>2	22	37	13	34	35	28	51	36	17	31	15	28	347	28.9	
		Total	26	39	14	34	39	33	58	38	17	32	22	33	385	32.1	
BPA<5	<i>Paphies australis</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BPA5-15		5-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BPA>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BPA-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BTHL<5	<i>Theora lubrica</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BTHL>5		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<b>CUMACEANS</b>																	
CCL	<i>Colurostylis lemurum</i>		0	2	1	3	2	2	1	0	0	2	1	0	14	1.2	
<b>GASTROPODS</b>																	
GCA	<i>Cominella adspersa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
GNHE	<i>Notoacmea</i> sp.		5	6	2	6	5	8	6	10	5	9	4	4	70	5.8	
<b>OTHER</b>																	
OAN	<i>Anthopleura aureoradiata</i>		2	5	1	1	1	0	1	2	0	1	3	0	17	1.4	
<b>POLYCHAETES</b>																	
PAA	<i>Aquilaspio aucklandica</i>		6	11	1	7	13	11	10	8	2	13	6	7	95	7.9	
PAGL	<i>Aglaophamus</i> sp.		0	0	0	0	0	0	0	0	0	1	0	0	1	0.1	
PAO	<i>Aonides oxycephala</i>		0	7	0	32	1	0	1	0	32	38	5	1	117	9.8	
PAR	<i>Aricidea</i> sp.		1	0	1	0	0	0	0	0	0	0	0	0	2	0.2	
PBOC	<i>Pseudopolydora</i> complex		0	0	0	1	1	1	0	0	0	0	0	0	3	0.3	
PCOS	<i>Cossura</i> sp.		0	1	0	0	0	0	0	0	1	0	0	0	2	0.2	
PEUC	<i>Euchone</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PGE	<i>Goniada</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PGLY	<i>Glycera</i> sp.		0	1	2	0	0	1	1	1	0	1	0	1	8	0.7	
PHF	"Capitellidae"		12	11	6	7	7	20	19	1	4	7	8	8	110	9.2	
PMD	<i>Magelona dakini</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PNIC	Nereidae		7	7	1	6	5	9	5	0	1	4	5	2	52	4.3	
POP	<i>Orbinia papillosa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PPAR	Paraonidae		0	0	0	0	0	1	0	0	0	0	0	0	1	0.1	
<b>NON INDICATOR SPECIES</b>																	
CAMPH	Amphipods		0	1	0	4	1	1	1	0	0	1	0	0	9	0.8	
CCRAB	Crabs		2	1	0	2	2	4	1	1	1	1	1	0	16	1.3	
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
CISO	Isopods		0	2	0	0	0	0	0	0	0	1	0	0	3	0.3	
COST	Ostracods		0	0	1	0	0	0	0	0	0	0	0	0	1	0.1	
CSHR	Shrimps/Mysids		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
COTH	Other Crustaceans		0	0	0	0	0	0	0	0	1	1	1	0	3	0.3	
BOTH	Bivalves		1	1	0	1	0	0	0	1	0	0	0	0	4	0.3	
GOTH	Gastropods		3	9	5	10	3	5	5	6	8	2	5	3	64	5.3	
EFEZ	<i>Fellaster zealandiae</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
EHOL	Holothurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
ONEM	Nemerteans		0	0	2	0	0	0	1	0	3	2	1	0	9	0.8	
POTH	Polychaetes		0	0	2	2	1	3	2	0	2	2	1	2	17	1.4	
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
OEDW	<i>Edwardsia</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
OTHER	Misc. Other		0	1	0	0	1	1	2	1	0	0	1	0	7	0.6	
<b>TOTAL</b>			136	155	93	167	152	169	181	119	122	174	124	107	1699	141.6	

INDICATOR SPECIES	CORE NUMBER	CORE NUMBER												TOTAL	MEAN	
		1	2	3	4	5	6	7	8	9	10	11	12			
<b>AMPHIPODS</b>																
ACOR	<i>Corophiidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
APHOX	<i>Phoxocephalidae</i>	0	0	1	1	0	0	0	0	0	0	0	1	1	4	0.3
<b>BIVALVES</b>																
<b>SIZE</b>																
BAB<2	<i>Arthritica bifurca</i>	<2	17	9	3	0	4	5	5	4	2	6	6	11	72	6.0
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	17	9	3	0	4	5	5	4	2	6	6	11	72	6.0
BAS<5	<i>Austrovenus stutchburyi</i>	<5	23	18	8	2	3	8	15	13	12	7	18	17	144	12.0
BAS>5		>5	51	25	22	24	8	38	37	13	17	33	25	15	308	25.7
BAS-COND		Cond.analysis	0	1	0	0	0	1	0	0	0	0	0	0	2	0.2
		Total	74	44	30	26	11	47	52	26	29	40	43	32	454	37.8
BML<5	<i>Macarmona liliiana</i>	<5	2	2	1	6	3	0	1	0	3	2	1	0	21	1.8
BML5-15		5-15	0	0	1	0	0	0	0	0	0	0	1	1	3	0.3
BML>15		>15	1	1	2	1	1	2	5	2	4	1	1	2	23	1.9
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	3	3	4	7	4	2	6	2	7	3	3	3	47	3.9
BNH<2	<i>Nucula hartvigiana</i>	<2	4	3	1	1	2	1	6	5	2	1	0	6	32	2.7
BNH>2		>2	38	38	7	19	27	33	63	21	6	17	43	41	353	29.4
		Total	42	41	8	20	29	34	69	26	8	18	43	47	385	32.1
BPA<5	<i>Paphies australis</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA5-15		5-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL<5	<i>Theora lubrica</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL>5		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>CUMACEANS</b>																
CCL	<i>Colurostylis lemorum</i>		0	1	1	3	0	2	1	1	1	0	1	1	12	1.0
<b>GASTROPODS</b>																
GCA	<i>Cominella adspersa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE	<i>Notoacmea</i> sp.		45	8	6	12	11	23	13	8	14	20	10	15	185	15.4
<b>OTHER</b>																
OAN	<i>Anthopleura aureoradiata</i>		2	1	3	1	0	1	5	1	0	1	2	0	17	1.4
<b>POLYCHAETES</b>																
PAA	<i>Aquilaspio aucklandica</i>		36	12	10	9	5	14	14	14	15	16	9	21	175	14.6
PAGL	<i>Aglaophamus</i> sp.		0	0	0	1	0	0	0	0	0	0	0	0	1	0.1
PAO	<i>Aonides oxycephala</i>		1	0	2	5	0	0	0	0	26	5	0	1	40	3.3
PAR	<i>Aricidea</i> sp.		0	0	0	0	0	0	1	0	0	0	0	0	1	0.1
PBOC	<i>Pseudopolydora</i> complex		1	2	0	0	0	1	1	0	0	1	0	1	7	0.6
PCOS	<i>Cossura</i> sp.		0	0	0	0	1	0	0	0	0	0	0	0	1	0.1
PEUC	<i>Euchone</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGE	<i>Goniada</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGLY	<i>Glycera</i> sp.		0	1	0	0	0	3	0	0	0	1	0	1	6	0.5
PHF	"Capitellidae"		18	18	2	5	10	12	8	8	2	12	13	10	118	9.8
PMD	<i>Magelona dakini</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PNIC	Nereidae		8	7	3	1	3	11	2	6	5	5	5	2	58	4.8
POP	<i>Orbinia papillosa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PPAR	Paraonidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>NON INDICATOR SPECIES</b>																
CAMPH	Amphipods		0	6	1	0	0	2	0	0	3	2	3	5	22	1.8
CCRAB	Crabs		2	1	1	2	0	0	1	1	2	3	1	0	14	1.2
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		0	0	0	1	1	0	1	0	0	0	0	0	3	0.3
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CSHR	Shrimps/Mysids		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
COTH	Other Crustaceans		0	0	2	0	0	0	0	0	2	0	0	0	4	0.3
BOTH	Bivalves		1	0	0	0	0	0	0	0	0	0	0	0	2	0.2
GOTH	Gastropods		21	9	1	7	4	13	1	3	4	6	4	4	77	6.4
EFEZ	<i>Fellaster zealandiae</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
EHOL	Holothurians		0	0	1	0	0	0	0	0	0	0	1	0	2	0.2
ONEM	Nemerteans		1	1	1	0	0	0	0	0	1	0	2	1	7	0.6
POTH	Polychaetes		0	2	0	0	0	0	1	1	0	0	0	1	5	0.4
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OEDW	<i>Edwardsia</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OTHER	Misc. Other		3	2	0	0	2	0	0	0	0	1	1	2	11	0.9
<b>TOTAL</b>			275	168	80	101	85	170	181	101	121	140	148	159	1730	144.2

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INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN	
		1	2	3	4	5	6	7	8	9	10	11	12			
<b>AMPHIPODS</b>																
ACOR	<i>Corophiidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
APHOX	<i>Phoxocephalidae</i>	3	3	1	2	2	3	4	1	5	5	3	4			
<b>BIVALVES</b>																
<b>SIZE</b>																
BAB<2	<i>Arthritica bifurca</i>	<2	17	28	21	12	17	31	14	20	25	9	15	16	225	18.8
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	17	28	21	12	17	31	14	20	25	9	15	16	225	18.8
BAS<5	<i>Austrovenus stutchburyi</i>	<5	1	2	1	2	0	4	3	1	0	0	5	3	22	1.8
BAS>5		>5	1	2	0	1	1	0	1	2	4	0	2	2	16	1.3
BAS-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	2	2	0.2
		Total	2	4	1	3	1	4	4	3	4	0	7	7	40	3.3
BML<5	<i>Macamona lilliana</i>	<5	0	0	0	0	0	0	0	1	2	2	0	1	6	0.5
BML5-15		5-15	0	0	0	0	0	0	0	0	0	0	1	0	1	0.1
BML>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	1	2	2	1	1	7	0.6
BNH<2	<i>Nucula hartvigiana</i>	<2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BNH>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA<5	<i>Paphies australis</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA5-15		5-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL<5	<i>Theora lubrica</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL>5		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>CUMACEANS</b>																
CCL	<i>Colurostylis lemurum</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>GASTROPODS</b>																
GCA	<i>Cominella adspersa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE	<i>Notoacmea sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>OTHER</b>																
OAN	<i>Anthopleura aureoradiata</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>POLYCHAETES</b>																
PAA	<i>Aquilaspio aucklandica</i>		2	1	2	1	3	5	0	0	2	1	0	4	21	1.8
PAGL	<i>Aglaophamus sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	<i>Aonides oxycephala</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAR	<i>Aricidea sp.</i>		0	0	0	0	0	0	0	0	0	0	0	1	1	0.1
PBOC	<i>Pseudopolydora complex</i>		0	1	2	1	1	0	2	1	2	1	0	0	11	0.9
PCOS	<i>Cossura sp.</i>		0	0	0	0	0	0	1	0	0	0	0	0	1	0.1
PEUC	<i>Euchone sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGE	<i>Goniada sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGLY	<i>Glycera sp.</i>		1	0	0	0	1	1	1	2	1	1	0	1	9	0.8
PHF	"Capitellidae"		16	18	27	15	28	21	11	16	25	25	20	17	239	19.9
PMD	<i>Magelona dakini</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PNIC	Nereidae		16	12	13	17	17	20	26	16	15	16	14	12	194	16.2
POP	<i>Orbinia papillosa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PPAR	Paraonidae		0	0	0	0	0	0	0	0	0	1	0	1	2	0.2
<b>NON INDICATOR SPECIES</b>																
CAMPH	Amphipods		2	11	1	3	1	6	3	3	3	0	4	2	39	3.3
CCRAB	Crabs		2	0	3	4	4	4	0	0	3	1	3	3	27	2.3
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CSHR	Shrimps/Mysids		0	0	0	0	0	4	0	0	0	0	0	0	4	0.3
COTH	Other Crustaceans		0	0	0	2	0	0	0	0	0	0	0	0	2	0.2
BOTH	Bivalves		1	0	0	0	0	1	2	0	0	0	0	0	4	0.3
GOTH	Gastropods		0	0	0	0	0	0	0	0	0	0	0	1	1	0.1
EFEZ	<i>Fellaster zealandiae</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
EHOL	Holothurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
ONEM	Nemertean		1	0	0	0	0	0	0	0	1	1	0	1	4	0.3
POTH	Polychaetes		1	3	3	1	4	3	2	1	4	2	4	5	33	2.8
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OFLAT	Flatworms		0	0	0	0	1	0	0	0	0	0	0	0	1	0.1
OEDW	<i>Edwardsia</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OTHER	Misc. Other		1	0	0	0	0	0	0	0	0	0	0	0	1	0.1
<b>TOTAL</b>			65	81	74	61	80	103	70	64	92	65	71	76	902	75.2

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INDICATOR SPECIES	CORE NUMBER	CORE NUMBER												TOTAL	MEAN	
		1	2	3	4	5	6	7	8	9	10	11	12			
<b>AMPHIPODS</b>																
ACOR	<i>Corophiidae</i>	0	0	0	0	0	0	3	0	0	0	0	0	3	0.3	
APHOX	<i>Phoxocephalidae</i>	0	0	1	0	1	0	0	0	0	0	0	0	2	0.2	
<b>BIVALVES</b>																
BAB<2	<i>Arthritica bifurca</i>	<2	7	6	1	10	13	21	2	12	2	2	8	2	86	7.2
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	7	6	1	10	13	21	2	12	2	2	8	2	86	7.2
BAS<5	<i>Austrovenus stutchburyi</i>	<5	4	14	5	6	7	8	4	7	12	3	15	10	95	7.9
BAS>5		>5	0	0	1	0	0	0	0	0	0	0	0	0	1	0.1
BAS-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	4	14	6	6	7	8	4	7	12	3	15	10	96	8.0
BML<5	<i>Macamona liliiana</i>	<5	4	2	0	2	0	1	8	0	4	0	5	3	29	2.4
BML5-15		5-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BML>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	4	2	0	2	0	1	8	0	4	0	5	3	29	2.4
BNH<2	<i>Nucula hartvigiana</i>	<2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BNH>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA<5	<i>Paphies australis</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA5-15		5-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL<5	<i>Theora lubrica</i>	<5	0	0	0	0	0	0	1	0	0	0	1	0	2	0.2
BTHL>5		>5	0	1	0	0	0	0	2	0	0	1	1	0	5	0.4
		Total	0	1	0	0	0	0	3	0	0	1	2	0	7	0.6
<b>CUMACEANS</b>																
CCL	<i>Colurostylis lemurum</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>GASTROPODS</b>																
GCA	<i>Cominella adspersa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE	<i>Notoacmea</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>OTHER</b>																
OAN	<i>Anthopleura aureoradiata</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>POLYCHAETES</b>																
PAA	<i>Aquilaspio aucklandica</i>		1	2	3	8	2	1	6	4	3	2	2	10	44	3.7
PAGL	<i>Aglaophamus</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	<i>Aonides oxycephala</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAR	<i>Aricidea</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PBOC	<i>Pseudopolydora</i> complex		0	0	0	1	1	1	0	0	0	2	0	0	5	0.4
PCOS	<i>Cossura</i> sp.		0	0	0	1	0	0	0	1	1	0	0	1	4	0.3
PEUC	<i>Euchone</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGE	<i>Goniada</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGLY	<i>Glycera</i> sp.		1	0	1	0	0	0	2	0	0	0	0	0	4	0.3
PHF	"Capitellidae"		15	6	16	21	20	23	28	16	24	29	18	21	237	19.8
PMD	<i>Magelona dakini</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PNIC	Nereidae		6	4	4	6	9	5	4	11	3	4	8	7	71	5.9
POP	<i>Orbinia papillosa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PPAR	Paraonidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>NON INDICATOR SPECIES</b>																
CAMPH	Amphipods		1	0	1	1	1	4	1	0	0	1	0	0	10	0.8
CCRAB	Crabs		0	0	0	0	2	0	1	2	1	1	2	0	9	0.8
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CSHR	Shrimps/Mysids		0	0	1	0	1	0	1	0	0	0	0	1	4	0.3
COTH	Other Crustaceans		0	0	0	0	0	0	4	0	0	0	0	0	4	0.3
BOTH	Bivalves		0	1	0	0	0	0	0	0	0	0	0	0	1	0.1
GOTH	Gastropods		0	1	0	0	1	1	0	0	1	1	0	0	5	0.4
EFEZ	<i>Fellaster zealandiae</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
EHOL	Holothurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
ONEM	Nemertean		0	1	0	1	2	0	0	0	1	2	1	1	9	0.8
POTH	Polychaetes		0	0	0	1	1	0	0	2	0	0	0	3	7	0.6
OOLIG	Oligochaetes		0	0	0	0	0	0	1	0	0	0	0	0	1	0.1
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OEDW	<i>Edwardsia</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OTHER	Misc. Other		0	1	0	0	0	0	1	0	0	1	0	0	3	0.3
<b>TOTAL</b>			39	39	34	58	61	65	67	57	52	49	61	59	641	53.4

INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN		
		1	2	3	4	5	6	7	8	9	10	11	12				
<b>AMPHIPODS</b>																	
ACOR	<i>Corophiidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
APHOX	<i>Phoxocephalidae</i>	5	3	2	2	6	2	3	3	1	1	2	0	30	2.5		
<b>BIVALVES</b>		<b>SIZE</b>															
BAB<2	<i>Arthritica bifurca</i>	<2	0	0	0	5	0	0	1	0	0	0	0	0	6	0.5	
BAB>2		>2	0	0	0	2	0	0	0	0	0	0	0	0	2	0.2	
		Total	0	0	0	7	0	0	1	0	0	0	0	0	8	0.7	
BAS<5	<i>Austrovenus stutchburyi</i>	<5	20	47	31	36	41	43	38	27	63	31	26	23	426	35.5	
BAS>5		>5	7	21	14	22	20	5	7	19	17	30	17	25	204	17.0	
BAS-COND		Cond.analysis	6	0	0	4	0	2	1	2	0	0	4	0	19	1.6	
		Total	33	68	45	62	61	50	46	48	80	61	47	48	649	54.1	
BML<5	<i>Macamona lilliana</i>	<5	0	8	3	2	3	3	4	10	6	9	7	3	58	4.8	
BML5-15		5-15	1	2	1	1	0	1	1	0	1	1	1	0	10	0.8	
BML>15		>15	2	2	1	2	3	1	1	2	2	1	2	3	22	1.8	
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	3	12	5	5	6	5	6	12	9	11	10	6	90	7.5	
BNH<2	<i>Nucula hartvigiana</i>	<2	11	10	7	5	9	7	9	12	0	15	3	9	97	8.1	
BNH>2		>2	2	24	15	14	32	14	23	30	34	27	38	41	294	24.5	
		Total	13	34	22	19	41	21	32	42	34	42	41	50	391	32.6	
BPA<5	<i>Paphies australis</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BPA5-15		5-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BPA>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BPA-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BTHL<5	<i>Theora lubrica</i>	<5	0	0	0	0	0	0	0	0	0	0	1	0	1	0.1	
BTHL>5		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	0	0	0	0	0	0	0	0	0	0	1	0	1	0.1	
<b>CUMACEANS</b>																	
CCL	<i>Colurostylis lemurum</i>		2	3	1	1	1	2	0	7	9	4	1	0	31	2.6	
<b>GASTROPODS</b>																	
GCA	<i>Cominella adspersa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
GNHE	<i>Notoacmea sp.</i>		2	1	0	14	2	5	5	2	6	3	2	8	50	4.2	
<b>OTHER</b>																	
OAN	<i>Anthopleura aureoradiata</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<b>POLYCHAETES</b>																	
PAA	<i>Aquilaspio aucklandica</i>		7	16	10	18	11	13	10	15	2	21	9	14	146	12.2	
PAGL	<i>Aglaophamus sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PAO	<i>Aonides oxycephala</i>		0	0	0	0	0	0	0	1	0	0	0	0	1	0.1	
PAR	<i>Aricidea sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PBOC	<i>Pseudopolydora complex</i>		0	2	1	0	0	0	1	1	0	0	1	3	9	0.8	
PCOS	<i>Cossura sp.</i>		0	0	0	1	1	0	0	0	0	2	0	0	4	0.3	
PEUC	<i>Euchone sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PGE	<i>Goniada sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PGLY	<i>Glycera sp.</i>		0	1	1	1	1	3	1	3	1	1	3	3	19	1.6	
PHF	"Capitellidae"		9	7	20	9	13	10	14	7	5	10	28	6	138	11.5	
PMD	<i>Magelona dakini</i>		0	0	0	0	1	1	0	0	0	0	0	0	2	0.2	
PNIC	Nereidae		2	0	0	1	1	2	5	1	0	0	2	0	14	1.2	
POP	<i>Orbinia papillosa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PPAR	Paraonidae		0	1	0	0	0	5	1	0	0	0	0	0	7	0.6	
<b>NON INDICATOR SPECIES</b>																	
CAMPH	Amphipods		5	4	2	4	3	18	1	0	9	19	2	0	67	5.6	
CCRAB	Crabs		3	2	3	2	0	1	1	1	0	1	3	2	19	1.6	
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
CISO	Isopods		0	0	0	0	1	2	0	0	0	1	0	0	4	0.3	
COST	Ostracods		0	2	0	4	0	2	0	1	0	0	0	2	11	0.9	
CSHR	Shrimps/Mysids		0	0	0	0	0	0	1	0	0	0	0	0	1	0.1	
COTH	Other Crustaceans		1	6	1	5	8	4	19	6	9	3	26	3	91	7.6	
BOTH	Bivalves		3	0	0	1	0	0	2	2	0	2	0	0	10	0.8	
GOTH	Gastropods		1	1	2	11	4	1	0	0	0	3	0	3	26	2.2	
EFEZ	<i>Fellaster zealandiae</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
EHOL	Holothurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
ONEM	Nemertean		2	3	3	2	3	6	3	3	2	3	1	5	36	3.0	
POTH	Polychaetes		4	0	2	4	0	2	5	3	0	3	6	8	37	3.1	
OOLIG	Oligochaetes		0	2	1	2	6	3	1	3	0	2	2	0	22	1.8	
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
OEDW	<i>Edwardsia</i>		1	0	0	0	0	0	0	0	0	0	1	0	2	0.2	
OTHER	Misc. Other		0	0	0	3	0	0	1	0	2	0	1	0	7	0.6	
<b>TOTAL</b>			96	168	121	178	170	158	159	161	169	190	192	161	1923	160.3	

INDICATOR SPECIES	CORE NUMBER												TOTAL	MEAN		
	1	2	3	4	5	6	7	8	9	10	11	12				
<b>AMPHIPODS</b>																
<i>Corophiidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<i>Phoxocephalidae</i>	1	1	0	0	0	0	3	0	0	0	0	2	0	0	7	0.6
<b>BIVALVES</b>																
	SIZE															
<i>Arthritica bifurca</i>	<2	1	0	1	2	0	1	0	5	1	0	6	9	26	2.2	
	>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	Total	1	0	1	2	0	1	0	5	1	0	6	9	26	2.2	
<i>Austrovenus stutchburyi</i>	<5	6	1	8	6	3	17	13	8	3	8	20	0	93	7.8	
	>5	11	23	22	23	13	6	19	8	8	26	23	16	198	16.5	
	Cond.analysis	7	1	1	3	4	2	6	2	4	0	2	9	41	3.4	
	Total	24	25	31	32	20	25	38	18	15	34	45	25	332	27.7	
<i>Macamona liliana</i>	<5	4	6	5	3	5	2	4	3	5	0	1	2	40	3.3	
	5-15	0	0	0	0	1	1	0	1	0	0	0	1	4	0.3	
	>15	2	1	2	3	4	2	3	2	0	1	4	2	26	2.2	
	Cond.analysis	0	2	0	0	0	0	0	0	0	0	0	0	2	0.2	
	Total	6	9	7	6	10	5	7	6	5	1	5	5	72	6.0	
<i>Nucula hartvigiana</i>	<2	3	3	0	3	2	3	1	3	1	3	3	4	29	2.4	
	>2	24	14	3	23	10	24	18	28	0	1	39	8	192	16.0	
	Total	27	17	3	26	12	27	19	31	1	4	42	12	221	18.4	
<i>Paphies australis</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
	5-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
	>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
	Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
	Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<i>Theora lubrica</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
	>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
	Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<b>CUMACEANS</b>																
<i>Colurostylis lemurum</i>		2	1	4	10	1	0	0	4	0	2	0	0	24	2.0	
<b>GASTROPODS</b>																
<i>Cominella adspersa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<i>Notoacmea</i> sp.		2	3	1	1	1	1	1	1	1	5	0	3	19	1.6	
<b>OTHER</b>																
<i>Anthopleura aureoradiata</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<b>POLYCHAETES</b>																
<i>Aquaspio aucklandica</i>		28	22	15	33	34	15	30	38	25	15	34	43	332	27.7	
<i>Aglaophamus</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<i>Aonides oxycephala</i>		0	0	0	0	0	0	1	0	0	1	0	0	2	0.2	
<i>Aricidea</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<i>Pseudopolydora</i> complex		0	0	1	0	0	1	1	2	1	0	0	0	6	0.5	
<i>Cossura</i> sp.		0	0	0	0	0	0	0	1	0	0	0	0	1	0.1	
<i>Euchone</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<i>Goniada</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<i>Glycera</i> sp.		0	1	0	3	0	0	0	1	1	1	1	0	8	0.7	
"Capitellidae"		14	9	12	6	15	12	13	16	10	7	17	20	151	12.6	
<i>Magelona dakini</i>		0	0	0	0	1	0	0	0	0	1	0	0	2	0.2	
Nereidae		1	2	0	0	1	1	1	2	4	0	3	1	16	1.3	
<i>Orbinia papillosa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
Paraonidae		0	1	1	0	0	0	0	0	1	0	0	0	3	0.3	
<b>NON INDICATOR SPECIES</b>																
Amphipods		2	2	0	1	5	0	1	3	1	0	0	1	16	1.3	
Crabs		0	0	1	0	0	1	1	0	0	1	0	2	6	0.5	
Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
Isopods		0	1	1	0	0	1	1	0	0	0	0	0	4	0.3	
Ostracods		0	0	0	1	2	0	0	1	1	0	0	1	6	0.5	
Shrimps/Mysids		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
Other Crustaceans		5	4	5	5	1	3	5	8	2	2	18	7	65	5.4	
Bivalves		0	0	0	0	0	1	0	1	0	0	0	0	2	0.2	
Gastropods		0	3	1	3	1	5	0	2	0	1	0	4	20	1.7	
<i>Fellaster zealandiae</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
Holothurians		0	0	0	0	0	0	3	1	0	0	0	0	4	0.3	
Nemerteans		1	4	1	5	1	2	1	6	3	0	2	1	27	2.3	
Polychaetes		2	3	2	1	2	4	1	2	0	0	9	6	32	2.7	
Oligochaetes		0	0	0	0	0	0	1	3	0	0	1	2	7	0.6	
Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<i>Edwardsia</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
Misc. Other		0	0	0	0	0	0	0	1	0	0	0	0	1	0.1	
<b>TOTAL</b>		<b>116</b>	<b>108</b>	<b>87</b>	<b>135</b>	<b>107</b>	<b>108</b>	<b>125</b>	<b>153</b>	<b>71</b>	<b>75</b>	<b>185</b>	<b>142</b>	<b>1412</b>	<b>117.7</b>	

INDICATOR SPECIES	CORE NUMBER	CORE NUMBER												TOTAL	MEAN	
		1	2	3	4	5	6	7	8	9	10	11	12			
<b>AMPHIPODS</b>																
ACOR	<i>Corophiidae</i>	0	0	0	0	0	0	0	2	0	0	0	0	0	2	0.2
APHOX	<i>Phoxocephalidae</i>	1	2	5	2	4	2	4	5	4	5	3	3	40	3.3	
<b>BIVALVES</b>																
	<b>SIZE</b>															
BAB<2	<i>Arthritica bifurca</i>	<2	5	2	0	8	5	6	8	10	11	7	4	11	77	6.4
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	Total		5	2	0	8	5	6	8	10	11	7	4	11	77	6.4
BAS<5	<i>Austrovenus stutchburyi</i>	<5	4	8	2	6	7	8	5	10	13	5	7	8	83	6.9
BAS>5		>5	8	4	2	4	9	5	17	7	20	14	44	111	9.8	
BAS-COND	Cond.analysis		0	0	0	0	0	0	0	0	0	2	0	2	0.2	
	Total		12	12	4	10	16	13	22	17	33	19	26	19	203	16.9
BML<5	<i>Macomona liliana</i>	<5	6	4	7	5	8	9	2	2	1	3	5	4	56	4.7
BML5-15		5-15	1	2	2	0	2	1	0	0	1	0	0	1	10	0.8
BML>15		>15	1	1	6	2	1	0	3	1	5	2	1	3	26	2.2
BML-COND	Cond.analysis		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	Total		8	7	15	7	11	10	5	3	7	5	6	8	92	7.7
BNH<2	<i>Nucula hartvigiana</i>	<2	2	6	0	3	4	6	9	11	7	9	15	2	74	6.2
BNH>2		>2	22	27	5	10	38	10	48	30	34	24	44	35	327	27.3
	Total		24	33	5	13	42	16	57	41	41	33	59	37	401	33.4
BPA<5	<i>Paphies australis</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA5-15		5-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA-COND	Cond.analysis		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	Total		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL<5	<i>Theora lubrica</i>	<5	0	1	0	0	0	0	0	0	0	0	0	1	2	0.2
BTHL>5		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	Total		0	1	0	0	0	0	0	0	0	0	0	1	2	0.2
<b>CUMACEANS</b>																
CCL	<i>Colurostylis lemorum</i>		0	1	0	1	0	0	5	1	2	3	2	0	15	1.3
<b>GASTROPODS</b>																
GCA	<i>Cominella adspersa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE	<i>Notoacmea</i> sp.		1	2	5	0	6	6	7	6	9	6	16	10	74	6.2
<b>OTHER</b>																
OAN	<i>Anthopleura aureoradiata</i>		0	1	6	1	0	1	1	4	4	1	6	1	26	2.2
<b>POLYCHAETES</b>																
PAA	<i>Aquilaspio aucklandica</i>		1	18	20	25	10	7	19	18	9	11	11	11	160	13.3
PAGL	<i>Aglaophamus</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	<i>Aonides oxycephala</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAR	<i>Aricidea</i> sp.		0	8	15	5	0	3	1	5	1	2	0	3	43	3.6
PBOC	<i>Pseudopolydora</i> complex		0	0	0	2	1	0	0	2	1	1	0	0	7	0.6
PCOS	<i>Cossura</i> sp.		0	0	0	1	0	0	1	0	0	0	0	0	2	0.2
PEUC	<i>Euchone</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGE	<i>Goniada</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGLY	<i>Glycera</i> sp.		1	1	0	2	1	1	1	0	1	1	0	0	9	0.8
PHF	"Capitellidae"		17	20	39	43	24	29	15	31	28	14	20	20	300	25.0
PMD	<i>Magelona dakini</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PNIC	Nereidae		0	1	0	2	2	2	1	8	3	4	2	5	30	2.5
POP	<i>Orbinia papillosa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PPAR	Paraonidae		1	0	4	3	0	0	1	0	0	1	1	0	11	0.9
<b>NON INDICATOR SPECIES</b>																
CAMPH	Amphipods		3	0	2	0	3	7	3	3	5	9	7	0	42	3.5
CCRAB	Crabs		2	3	0	0	0	0	2	1	1	0	1	0	10	0.8
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		0	1	0	0	0	0	0	0	0	1	1	0	3	0.3
COST	Ostracods		0	0	1	1	0	0	0	1	0	1	1	0	5	0.4
CSHR	Shrimps/Mysids		0	0	2	1	1	0	0	0	0	0	0	0	4	0.3
COTH	Other Crustaceans		0	0	0	0	0	0	0	0	0	0	1	0	1	0.1
BOTH	Bivalves		0	2	4	0	1	0	0	0	0	2	1	2	12	1.0
GOTH	Gastropods		1	0	2	2	2	4	3	3	12	6	10	8	53	4.4
EFEZ	<i>Fellaster zealandiae</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
EHOL	Holothurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
ONEM	Nemertean		0	1	1	0	2	1	1	0	0	1	0	0	7	0.6
POTH	Polychaetes		1	5	7	1	1	1	5	13	6	7	21	7	75	6.3
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OFLAT	Flatworms		0	0	0	0	0	0	1	0	0	0	0	0	1	0.1
OEDW	<i>Edwardsia</i>		0	0	0	0	0	0	1	0	0	0	0	0	1	0.1
OTHER	Misc. Other		0	0	0	0	0	0	1	2	4	0	4	1	12	1.0
<b>TOTAL</b>			<b>78</b>	<b>121</b>	<b>137</b>	<b>130</b>	<b>132</b>	<b>109</b>	<b>165</b>	<b>176</b>	<b>182</b>	<b>140</b>	<b>203</b>	<b>147</b>	<b>1720</b>	<b>143.3</b>

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INDICATOR SPECIES	CORE NUMBER	CORE NUMBER												TOTAL	MEAN	
		1	2	3	4	5	6	7	8	9	10	11	12			
<b>AMPHIPODS</b>																
ACOR	<i>Corophiidae</i>	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1
APHOX	<i>Phoxocephalidae</i>	1	4	4	2	3	6	1	0	0	0	2	5	2	30	2.5
<b>BIVALVES</b>																
		<b>SIZE</b>														
BAB<2	<i>Arthritica bifurca</i>	<2	16	6	3	5	3	13	2	15	2	5	7	2	79	6.6
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	16	6	3	5	3	13	2	15	2	5	7	2	79	6.6
BAS<5	<i>Austrovenus stutchburyi</i>	<5	0	2	2	3	8	5	7	5	11	12	5	7	67	5.6
BAS>5		>5	3	13	0	3	10	10	5	10	9	9	12	9	94	7.8
BAS-COND		Cond.analysis	0	0	0	0	0	0	2	0	0	0	0	0	2	0.2
		Total	3	15	2	6	18	15	19	10	21	21	14	19	163	13.6
BML<5	<i>Macarona liliana</i>	<5	8	6	4	6	8	5	0	10	5	3	3	6	64	5.3
BML5-15		5-15	1	3	1	1	1	1	2	1	0	3	0	3	17	1.4
BML>15		>15	1	3	4	0	2	3	2	1	1	2	1	1	21	1.8
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	10	12	9	7	11	9	4	12	6	8	4	10	102	8.5
BNH<2	<i>Nucula hartvigiana</i>	<2	10	4	19	10	8	17	3	10	12	11	14	4	122	10.2
BNH>2		>2	17	10	29	40	25	31	42	44	32	29	42	36	377	31.4
		Total	27	14	48	50	33	48	45	54	44	40	56	40	499	41.6
BPA<5	<i>Paphies australis</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA5-15		5-15	1	0	0	0	0	0	0	0	0	0	0	0	1	0.1
BPA>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	1	0	0	0	0	0	0	0	0	0	0	0	1	0.1
BTHL<5	<i>Theora lubrica</i>	<5	0	0	0	0	1	0	0	0	0	0	0	0	1	0.1
BTHL>5		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	1	0	0	0	0	0	0	0	1	0.1
<b>CUMACEANS</b>																
CCL	<i>Colurostylis lemurum</i>		2	1	0	1	0	0	0	2	2	0	2	1	11	0.9
<b>GASTROPODS</b>																
GCA	<i>Cominella adspersa</i>		0	1	0	0	0	0	0	0	0	0	0	0	1	0.1
GNHE	<i>Notoacmea</i> sp.		6	4	6	7	7	7	11	9	11	9	9	7	93	7.8
<b>OTHER</b>																
OAN	<i>Anthopleura aureoradiata</i>		0	3	5	0	2	1	3	0	1	17	1	2	35	2.9
<b>POLYCHAETES</b>																
PAA	<i>Aquilaspio aucklandica</i>		11	12	8	11	11	21	11	7	20	20	17	17	166	13.8
PAGL	<i>Aglaophamus</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	<i>Aonides oxycephala</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAR	<i>Aricidea</i> sp.		4	5	8	7	5	0	4	3	2	2	3	1	44	3.7
PBOC	<i>Pseudopolydora</i> complex		0	2	0	0	0	0	1	0	0	0	0	1	4	0.3
PCOS	<i>Cossura</i> sp.		0	0	0	0	1	1	1	0	0	0	0	0	3	0.3
PEUC	<i>Euchone</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGE	<i>Goniada</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGLY	<i>Glycera</i> sp.		2	1	0	1	1	1	0	2	0	2	0	0	10	0.8
PHF	"Capitellidae"		46	41	21	24	28	23	20	25	36	21	16	324	27.0	
PMD	<i>Magelona dakini</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PNIC	Nereidae		2	5	3	6	5	4	8	1	5	7	3	6	55	4.6
POP	<i>Orbinia papillosa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PPAR	Paraonidae		2	0	0	0	1	2	0	1	0	0	3	0	9	0.8
<b>NON INDICATOR SPECIES</b>																
CAMPH	Amphipods		6	7	7	3	6	4	4	7	0	3	2	2	51	4.3
CCRAB	Crabs		3	1	4	3	3	1	2	1	4	2	0	0	24	2.0
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		2	1	0	0	0	1	0	0	0	2	1	0	7	0.6
COST	Ostracods		1	0	1	0	0	1	0	3	0	0	0	0	6	0.5
CSHR	Shrimps/Mysids		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
COTH	Other Crustaceans		0	1	0	0	0	0	0	0	0	0	0	0	1	0.1
BOTH	Bivalves		1	1	5	0	1	1	1	0	0	1	2	1	14	1.2
GOTH	Gastropods		8	4	5	6	2	2	4	7	8	5	7	7	65	5.4
EFEZ	<i>Fellaster zealandiae</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
EHOL	Holothurians		0	0	0	0	0	0	0	1	0	0	0	0	1	0.1
ONEM	Nemerteans		0	1	1	2	2	0	0	3	0	1	2	0	12	1.0
POTH	Polychaetes		9	1	4	2	2	4	4	1	0	5	5	1	38	3.2
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OEDW	<i>Edwardsia</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OTHER	Misc. Other		1	0	4	0	3	1	1	0	0	6	0	4	20	1.7
<b>TOTAL</b>			165	143	148	143	149	166	149	158	152	194	164	139	1870	155.8

INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN	
		1	2	3	4	5	6	7	8	9	10	11	12			
<b>AMPHIPODS</b>																
ACOR	<i>Corophiidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
APHOX	<i>Phoxocephalidae</i>	0	1	1	2	0	1	1	2	1	1	0	0	0	10	0.8
<b>BIVALVES</b>																
		<b>SIZE</b>														
BAB<2	<i>Arthritica bifurca</i>	<2	6	1	10	12	2	6	6	8	0	24	12	1	88	7.3
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	6	1	10	12	2	6	6	8	0	24	12	1	88	7.3
BAS<5	<i>Austrovenus stutchburyi</i>	<5	27	26	19	22	22	25	21	24	21	39	23	11	280	23.3
BAS>5		>5	9	9	2	7	10	19	10	19	7	14	8	25	139	11.6
BAS-COND		Cond.analysis	3	1	0	0	0	0	2	0	1	0	0	0	7	0.6
		Total	39	36	21	29	32	44	33	43	29	53	31	36	426	35.5
BML<5	<i>Macamona lilliana</i>	<5	3	6	0	8	2	7	3	5	4	3	1	1	43	3.6
BML5-15		5-15	1	1	1	1	0	1	1	1	2	0	1	0	10	0.8
BML>15		>15	0	1	2	2	3	1	1	1	1	1	3	2	18	1.5
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	4	8	3	11	5	9	5	7	7	4	5	3	71	5.9
BNH<2	<i>Nucula hartvigiana</i>	<2	7	30	12	10	9	12	3	13	2	11	2	2	113	9.4
BNH>2		>2	3	33	7	23	17	15	14	19	14	16	9	7	177	14.8
		Total	10	63	19	33	26	27	17	32	16	27	11	9	290	24.2
BPA<5	<i>Paphies australis</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA5-15		5-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL<5	<i>Theora lubrica</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL>5		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>CUMACEANS</b>																
CCL	<i>Colurostylis lemurum</i>		0	1	0	0	1	0	0	0	0	0	0	0	2	0.2
<b>GASTROPODS</b>																
GCA	<i>Cominella adspersa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE	<i>Notoacmea</i> sp.		3	11	3	1	4	2	23	7	5	16	12	4	91	7.6
<b>OTHER</b>																
OAN	<i>Anthopleura aureoradiata</i>		7	3	6	1	3	3	2	1	3	1	1	5	36	3.0
<b>POLYCHAETES</b>																
PAA	<i>Aquillaspio aucklandica</i>		13	33	16	8	8	11	16	6	13	11	4	4	143	11.9
PAGL	<i>Aglaophamus</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	<i>Aonides oxycephala</i>		1	2	3	0	0	0	1	0	0	0	2	9	0.8	3.7
PAR	<i>Aricidea</i> sp.		1	4	7	2	4	2	6	5	2	2	4	5	44	3.8
PBOC	<i>Pseudopolydora</i> complex		1	1	1	2	0	0	0	0	0	1	0	1	7	0.6
PCOS	<i>Cossura</i> sp.		0	1	0	0	0	0	0	0	0	0	0	0	1	0.1
PEUC	<i>Euchone</i> sp.		0	0	0	0	1	0	0	0	0	0	0	0	1	0.1
PGE	<i>Goniada</i> sp.		0	0	0	0	0	0	1	0	0	0	0	0	1	0.1
PGLY	<i>Glycera</i> sp.		0	1	1	1	2	0	1	2	1	1	2	0	12	1.0
PHF	"Capitellidae"		35	32	35	26	21	21	12	24	24	32	26	19	307	25.6
PMD	<i>Magelona dakini</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PNIC	Nereidae		2	0	6	4	1	4	2	3	1	5	7	2	37	3.1
POP	<i>Orbinia papillosa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PPAR	Paraonidae		6	1	0	0	1	0	0	0	2	0	1	0	11	0.9
<b>NON INDICATOR SPECIES</b>																
CAMPH	Amphipods		1	1	0	2	2	0	2	1	0	1	8	0	18	1.5
CCRAB	Crabs		2	3	4	0	0	2	9	1	2	4	4	1	32	2.7
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
COST	Ostracods		0	0	0	0	1	0	0	0	0	0	1	0	2	0.2
CSHR	Shrimps/Mysids		1	0	0	0	1	0	2	1	1	1	0	0	7	0.6
COTH	Other Crustaceans		0	0	0	0	0	1	0	0	0	0	0	0	1	0.1
BOTH	Bivalves		1	5	5	2	2	1	2	0	0	0	1	0	19	1.6
GOTH	Gastropods		1	6	1	4	4	1	6	2	2	5	4	2	38	3.2
EFEZ	<i>Fellaster zealandiae</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
EHOL	Holothurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
ONEM	Nemerteans		6	4	2	0	0	0	1	1	0	2	2	2	20	1.7
POTH	Polychaetes		1	7	3	1	3	3	1	1	1	0	1	1	23	1.9
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OEDW	<i>Edwardsia</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OTHER	Misc. Other		2	7	1	0	3	1	1	0	2	3	3	0	23	1.9
<b>TOTAL</b>			143	232	148	141	127	139	149	148	112	194	140	97	1770	147.5

INDICATOR SPECIES	CORE NUMBER	CORE NUMBER												TOTAL	MEAN		
		1	2	3	4	5	6	7	8	9	10	11	12				
<b>AMPHIPODS</b>																	
ACOR	<i>Corophiidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
APHOX	<i>Phoxocephalidae</i>	3	3	6	6	7	13	8	5	10	12	5	11				
<b>BIVALVES</b>																	
BAB<2	<i>Arthritica bifurca</i>	<2	2	1	3	0	3	5	3	1	1	0	1	1			
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0			
		Total	2	1	3	0	3	5	3	1	1	0	1	1			
BAS<5	<i>Austrovenus stutchburyi</i>	<5	1	0	0	0	0	0	0	0	1	0	0	0			
BAS>5		>5	0	0	0	0	0	0	0	0	0	0	0	0			
BAS-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0			
		Total	1	0	0	0	0	0	0	0	1	0	0	0			
BML<5	<i>Macarona liliiana</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0			
BML5-15		5-15	0	0	0	0	0	0	0	0	0	0	1	0			
BML>15		>15	0	1	0	0	0	2	0	0	1	0	0	0			
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0			
		Total	0	1	0	0	0	2	0	0	1	0	1	0			
BNH<2	<i>Nucula hartvigiana</i>	<2	0	0	0	0	0	0	0	1	0	0	0	0			
BNH>2		>2	0	0	0	0	0	0	0	0	0	0	0	0			
		Total	0	0	0	0	0	0	0	1	0	0	0	0			
BPA<5	<i>Paphies australis</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0			
BPA5-15		5-15	0	0	0	0	0	0	0	0	0	0	0	0			
BPA>15		>15	0	0	0	0	0	0	0	0	0	0	0	0			
BPA-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0			
		Total	0	0	0	0	0	0	0	0	0	0	0	0			
BTHL<5	<i>Theora lubrica</i>	<5	1	0	0	0	0	0	0	1	0	1	0	1			
BTHL>5		>5	0	0	0	0	0	0	0	0	0	0	0	0			
		Total	1	0	0	0	0	0	0	1	0	1	0	1			
<b>CUMACEANS</b>																	
CCL	<i>Colurostylis lemorum</i>		4	0	0	1	3	3	1	1	1	4	0	1			
<b>GASTROPODS</b>																	
GCA	<i>Cominella adspersa</i>		0	0	0	0	0	0	0	0	0	0	0	0			
GNHE	<i>Notoacmea</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0			
<b>OTHER</b>																	
OAN	<i>Anthopleura aureoradiata</i>		0	0	0	0	0	0	0	0	0	0	0	0			
<b>POLYCHAETES</b>																	
PAA	<i>Aquilaspio aucklandica</i>		6	1	5	9	6	4	1	7	6	3	10	6			
PAGL	<i>Aglaophamus</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0			
PAO	<i>Aonides oxycephala</i>		0	0	0	0	0	0	0	0	0	0	0	0			
PAR	<i>Aricidea</i> sp.		0	1	0	2	0	0	0	0	0	1	0	0			
PBOC	<i>Pseudopolydora</i> complex		0	0	0	0	0	0	0	0	1	2	0	0			
PCOS	<i>Cossura</i> sp.		10	13	8	11	19	12	22	17	14	19	22	24			
PEUC	<i>Euchone</i> sp.		1	1	0	0	0	1	0	0	0	0	0	0			
PGE	<i>Goniada</i> sp.		0	0	0	0	0	0	0	0	0	0	0	0			
PGLY	<i>Glycera</i> sp.		0	0	0	0	0	0	0	1	0	0	0	0			
PHF	"Capitellidae"		32	24	23	25	32	29	40	35	24	31	20	22			
PMD	<i>Magelona dakini</i>		1	0	0	0	0	0	0	1	0	1	0	0			
PNIC	Nereidae		4	6	4	7	11	7	8	6	7	6	7	6			
POP	<i>Orbinia papillosa</i>		0	0	1	0	0	0	0	0	0	0	0	0			
PPAR	Paraonidae		0	1	3	3	3	2	1	2	6	3	1	4			
<b>NON INDICATOR SPECIES</b>																	
CAMPH	Amphipods		4	2	1	1	3	1	6	4	2	2	4	4			
CCRAB	Crabs		0	2	0	1	2	2	0	2	0	1	6	3			
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0			
CISO	Isopods		6	3	4	3	5	1	6	2	2	1	1	3			
COST	Ostracods		0	2	0	2	0	0	0	0	1	2	0	0			
CSHR	Shrimps/Mysids		0	1	0	0	0	4	1	0	0	1	1	1			
COTH	Other Crustaceans		0	0	1	0	0	4	0	0	0	0	1	0			
BOTH	Bivalves		0	0	1	7	1	2	3	0	1	3	3	0			
GOTH	Gastropods		0	0	0	3	2	3	3	3	7	5	5	3			
EFEZ	<i>Fellaster zealandiae</i>		0	0	0	0	0	0	0	0	0	0	0	0			
EHOL	Holothurians		0	0	0	0	0	0	0	0	0	0	0	0			
ONEM	Nemertean		1	0	1	0	0	0	1	0	0	1	2	0			
POTH	Polychaetes		3	3	3	3	4	1	3	2	2	3	4	0			
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0			
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0			
OEDW	<i>Edwardsia</i>		0	0	0	0	0	0	0	0	0	0	0	0			
OTHER	Misc. Other		0	1	0	0	0	0	1	4	2	1	0	1			
<b>TOTAL</b>														<b>79</b>	<b>89.2</b>		

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INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN		
		1	2	3	4	5	6	7	8	9	10	11	12				
<b>AMPHIPODS</b>																	
ACOR	<i>Corophidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
APHOX	<i>Phoxocephalidae</i>	5	4	8	5	1	1	13	20	5	15	4	7			88	7.3
<b>BIVALVES</b>		<b>SIZE</b>															
BAB<2	<i>Arthritica bifurca</i>	<2	1	0	5	7	1	3	2	2	3	2	2	0	0	28	2.3
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	1	0	5	7	1	3	2	2	3	2	2	0	0	28	2.3
BAS<5	<i>Austrovenus stutchburyi</i>	<5	1	2	2	0	0	2	0	1	1	0	0	0	0	9	0.8
BAS>5		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BAS-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	1	2	2	0	0	2	0	1	1	0	0	0	0	9	0.8
BML<5	<i>Macamona lilliana</i>	<5	1	2	1	3	1	1	0	2	1	4	1	0	17	1.4	
BML5-15		5-15	0	0	0	0	0	1	0	0	0	0	0	0	1	0.1	
BML>15		>15	0	0	0	0	1	0	0	0	0	0	1	0	2	0.2	
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	1	2	1	3	2	2	0	2	1	4	2	0	20	1.7	
BNH<2	<i>Nucula hartvigiana</i>	<2	0	0	0	0	0	0	0	0	0	0	1	0	1	0.1	
BNH>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	0	0	0	0	0	0	0	0	0	0	1	0	1	0.1	
BPA<5	<i>Paphies australis</i>	<5	0	0	0	0	0	0	0	0	1	0	0	0	1	0.1	
BPA5-15		5-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BPA>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BPA-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	1	0	0	0	1	0.1	
BTHL<5	<i>Theora lubrica</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL>5		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>CUMACEANS</b>																	
CCL	<i>Colurostylis lemurum</i>		0	2	1	2	0	0	1	0	1	3	1	0	11	0.9	
<b>GASTROPODS</b>																	
GCA	<i>Cominella adspersa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE	<i>Notoacmea sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>OTHER</b>																	
OAN	<i>Anthopleura aureoradiata</i>		0	0	0	0	0	1	0	0	0	0	0	0	1	0.1	
<b>POLYCHAETES</b>																	
PAA	<i>Aquilaspio aucklandica</i>		5	3	2	3	0	1	2	6	13	4	6	5	50	4.2	
PAGL	<i>Aglaophamus sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PAO	<i>Aonides oxycephala</i>		0	7	0	0	0	0	0	0	0	0	0	0	7	0.6	
PAR	<i>Aricidea sp.</i>		0	0	0	2	0	0	0	1	0	0	1	1	5	0.4	
PBOC	<i>Pseudopolydora complex</i>		0	0	1	0	1	0	1	0	0	0	0	1	4	0.3	
PCOS	<i>Cossura sp.</i>		8	8	3	15	6	12	14	24	11	7	6	7	121	10.1	
PEUC	<i>Euchone sp.</i>		0	0	0	0	0	0	0	1	0	0	0	0	1	0.1	
PGE	<i>Goniada sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PGLY	<i>Glycera sp.</i>		1	1	1	0	0	0	1	1	0	0	0	1	6	0.5	
PHF	"Capitellidae"		20	45	32	42	35	32	39	28	40	40	30	24	407	33.9	
PMD	<i>Magelona dakini</i>		0	0	0	0	0	1	0	0	0	0	0	0	1	0.1	
PNIC	Nereidae		7	8	1	7	3	7	11	4	3	4	3	6	64	5.3	
POP	<i>Orbinia papillosa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PPAR	Paraonidae		3	9	5	1	0	6	4	3	5	3	3	4	46	3.8	
<b>NON INDICATOR SPECIES</b>																	
CAMPH	Amphipods		1	3	0	0	3	1	5	0	2	4	7	6	32	2.7	
CCRAB	Crabs		0	1	1	0	1	1	3	1	3	1	4	2	18	1.5	
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
CISO	Isopods		2	2	0	0	1	1	1	0	0	0	0	1	8	0.7	
COST	Ostracods		1	1	1	1	1	0	0	0	0	0	0	1	6	0.5	
CSHR	Shrimps/Mysids		1	0	0	0	1	1	0	8	2	0	0	0	13	1.1	
COTH	Other Crustaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BOTH	Bivalves		0	5	1	10	3	5	5	11	4	4	12	10	70	5.8	
GOTH	Gastropods		8	2	4	1	0	1	2	2	5	2	3	6	36	3.0	
EFEZ	<i>Fellaster zealandiae</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
EHOL	Holothurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
ONEM	Nemertean		0	0	1	0	0	1	1	3	2	0	0	1	9	0.8	
POTH	Polychaetes		3	3	12	4	3	3	9	6	3	5	3	3	57	4.8	
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
OFLAT	Flatworms		0	0	0	0	0	0	1	0	0	0	0	1	2	0.2	
OEDW	<i>Edwardsia</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
OTHER	Misc. Other		1	1	2	0	0	1	0	0	0	0	0	0	5	0.4	
<b>TOTAL</b>			69	109	84	103	62	83	115	124	105	98	88	87	1127	93.9	

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INDICATOR SPECIES	CORE NUMBER	CORE NUMBER												TOTAL	MEAN	
		1	2	3	4	5	6	7	8	9	10	11	12			
<b>AMPHIPODS</b>																
ACOR	<i>Corophiidae</i>	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1
APHOX	<i>Phoxocephalidae</i>	12	6	5	7	4	9	11	10	5	5	8	11	93	7.8	
<b>BIVALVES</b>																
		<b>SIZE</b>														
BAB<2	<i>Arthritica bifurca</i>	<2	0	0	0	2	0	1	0	2	4	0	0	0	9	0.8
BAB>2		>2	0	0	0	0	0	0	0	0	0	1	0	1	0.1	
		Total	0	0	0	2	0	1	0	2	4	0	1	10	0.8	
BAS<5	<i>Austrovenus stutchburyi</i>	<5	0	0	0	1	1	0	0	0	0	0	0	2	0.2	
BAS>5		>5	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BAS-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	0	0	0	1	1	0	0	0	0	0	0	2	0.2	
BML<5	<i>Macarona liliiana</i>	<5	0	1	1	1	1	0	0	1	0	4	1	12	1.0	
BML5-15		5-15	0	1	0	0	0	0	0	0	0	0	0	1	0.1	
BML>15		>15	0	0	0	0	0	0	0	0	0	0	2	0.2		
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	1	0	0	1	0.1	
		Total	0	2	1	1	1	0	0	1	0	5	1	16	1.3	
BNH<2	<i>Nucula hartvigiana</i>	<2	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BNH>2		>2	0	0	0	0	0	2	0	0	0	0	0	2	0.2	
		Total	0	0	0	0	0	2	0	0	0	0	0	2	0.2	
BPA<5	<i>Paphies australis</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BPA5-15		5-15	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BPA>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BPA-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BTHL<5	<i>Theora lubrica</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
BTHL>5		>5	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<b>CUMACEANS</b>																
CCL	<i>Colurostylis lemurum</i>	1	1	0	1	0	1	0	2	0	0	3	1	10	0.8	
<b>GASTROPODS</b>																
GCA	<i>Cominella glandiformis</i>	1	1	0	0	0	0	0	0	0	0	0	1	3	0.3	
GNHE	<i>Notoacmea</i> sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<b>OTHER</b>																
OAN	<i>Anthopleura aureoradiata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
<b>POLYCHAETES</b>																
PAA	<i>Aquilaspio aucklandica</i>	15	23	8	5	21	15	17	17	9	20	22	21	193	16.1	
PAGL	<i>Aglaophamus</i> sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PAO	<i>Aonides oxycephala</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PAR	<i>Aricidea</i> sp.	3	1	0	1	0	1	2	3	0	0	1	0	12	1.0	
PBOC	<i>Pseudopolydora</i> complex	0	1	0	0	1	0	0	0	0	0	0	0	2	0.2	
PCOS	<i>Cossura</i> sp.	6	12	9	9	9	6	16	13	9	8	8	16	121	10.1	
PEUC	<i>Euchone</i> sp.	0	6	3	1	1	0	0	1	1	0	0	0	13	1.1	
PGE	<i>Goniada</i> sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PGLY	<i>Glycera</i> sp.	0	0	2	1	2	1	0	1	1	2	2	0	12	1.0	
PHF	"Capitellidae"	38	38	40	39	48	31	28	28	39	42	31	26	428	35.7	
PMD	<i>Magelona dakini</i>	0	1	0	0	0	0	0	0	0	0	0	1	2	0.2	
PNIC	Nereidae	3	2	2	8	3	4	4	2	5	4	3	4	44	3.7	
POP	<i>Orbinia papillosa</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
PPAR	Paraonidae	1	1	0	4	4	0	0	3	0	0	2	2	17	1.4	
<b>NON INDICATOR SPECIES</b>																
CAMPH	Amphipods	5	21	0	6	8	17	12	9	6	7	17	17	125	10.4	
CCRAB	Crabs	3	0	0	2	0	1	4	1	1	0	3	2	17	1.4	
CCUM	Cumaceans	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
CISO	Isopods	1	3	1	1	0	0	2	3	1	2	0	1	15	1.3	
COST	Ostracods	1	2	0	0	0	1	1	1	2	1	0	0	9	0.8	
CSHR	Shrimps/Mysids	0	1	0	0	1	0	1	0	0	0	6	0	9	0.8	
COTH	Other Crustaceans	0	0	4	0	0	0	0	0	0	0	0	0	4	0.3	
BOTH	Bivalves	2	0	1	0	0	1	3	0	1	1	0	0	9	0.8	
GOTH	Gastropods	1	1	2	0	3	1	3	0	1	1	2	2	17	1.4	
EFEZ	<i>Fellaster zealandiae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
EHOL	Holothurians	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
ONEM	Nemertean	0	2	2	2	1	0	2	1	1	2	0	0	13	1.1	
POTH	Polychaetes	5	5	9	3	4	4	2	6	2	1	2	6	49	4.1	
OOLIG	Oligochaetes	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
OFLAT	Flatworms	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
OEDW	<i>Edwardsia</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
OTHER	Misc. Other	2	0	0	1	0	1	1	1	0	2	1	9	18	1.5	
<b>TOTAL</b>		<b>101</b>	<b>130</b>	<b>89</b>	<b>95</b>	<b>112</b>	<b>97</b>	<b>109</b>	<b>105</b>	<b>88</b>	<b>103</b>	<b>113</b>	<b>124</b>	<b>1266</b>	<b>105.5</b>	

INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN			
		1	2	3	4	5	6	7	8	9	10	11	12					
<b>AMPHIPODS</b>																		
ACOR	<i>Corophidae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
APHOX	<i>Phoxocephalidae</i>	3	4	2	0	3	1	0	0	3	0	2	0	1			19	1.6
<b>BIVALVES</b>		<b>SIZE</b>																
BAB<2	<i>Arthritica bifurca</i>	<2	1	1	0	2	3	0	0	1	0	1	0	0	0	0	9	0.8
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	1	1	0	2	3	0	0	1	0	1	0	0	0	0	9	0.8
BAS<5	<i>Austrovenus stutchburyi</i>	<5	1	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0.2
BAS>5		>5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1
BAS-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	1	1	0	0	1	0	0	0	0	0	0	0	0	0	3	0.3
BML<5	<i>Macomona lilliana</i>	<5	0	0	0	0	3	1	0	0	1	0	0	0	0	0	5	0.4
BML5-15		5-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BML>15		>15	1	0	1	1	1	0	1	0	0	0	0	0	0	0	5	0.4
BML-COND		Cond.analysis	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0.1
		Total	1	0	1	1	4	1	1	1	1	0	0	0	0	0	11	0.9
BNH<2	<i>Nucula hartvigiana</i>	<2	0	3	0	0	1	0	0	0	0	0	0	0	0	0	4	0.3
BNH>2		>2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1
		Total	0	4	0	0	1	0	0	0	0	0	0	0	0	0	5	0.4
BPA<5	<i>Paphies australis</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA5-15		5-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA>15		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL<5	<i>Theora lubrica</i>	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL>5		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>CUMACEANS</b>																		
CCL	<i>Colurostylis lemurum</i>		5	2	5	2	1	2	0	1	2	0	1	1	1		22	1.8
<b>GASTROPODS</b>																		
GCA	<i>Cominella adspersa</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE	<i>Notoacmea sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>OTHER</b>																		
OAN	<i>Anthopleura aureoradiata</i>		0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0.1
<b>POLYCHAETES</b>																		
PAA	<i>Aquilaspio aucklandica</i>		11	14	16	7	5	4	8	11	9	6	4	1			96	8.0
PAGL	<i>Aglaophamus sp.</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	<i>Aonides oxycephala</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAR	<i>Aricidea sp.</i>		0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0.1
PBOC	<i>Pseudopolydora complex</i>		1	0	2	1	0	2	0	1	1	0	0	1			9	0.8
PCOS	<i>Cossura sp.</i>		13	5	8	4	9	9	5	8	10	15	7	4			97	8.1
PEUC	<i>Euchone sp.</i>		0	0	0	1	1	1	1	1	0	1	0	1			7	0.6
PGE	<i>Goniada sp.</i>		1	1	0	0	0	1	0	0	1	0	0	0			4	0.3
PGLY	<i>Glycera sp.</i>		0	0	1	0	0	1	0	0	0	0	0	1			3	0.3
PHF	"Capitellidae"		20	22	39	17	32	27	21	19	35	27	16	12			287	23.9
PMD	<i>Magelona dakini</i>		1	0	0	0	0	0	1	0	0	1	0	0			3	0.3
PNIC	Nereidae		3	2	1	1	3	4	2	3	5	5	4	5			38	3.2
POP	<i>Orbinia papillosa</i>		0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
PPAR	Paraonidae		2	1	2	2	6	1	2	1	6	1	3	0			27	2.3
<b>NON INDICATOR SPECIES</b>																		
CAMPH	Amphipods		2	1	0	0	0	1	0	0	0	1	0	1			6	0.5
CCRAB	Crabs		1	0	0	0	0	0	1	0	0	2	2	1			7	0.6
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
CISO	Isopods		0	0	1	0	3	1	0	0	0	1	0	0			6	0.5
COST	Ostracods		3	1	1	0	0	1	0	0	1	3	1	2			13	1.1
CSHR	Shrimps/Mysids		0	1	0	0	0	0	0	0	0	0	0	0			1	0.1
COTH	Other Crustaceans		0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
BOTH	Bivalves		0	0	0	0	0	1	0	0	0	0	1	1			3	0.3
GOTH	Gastropods		1	1	3	0	0	1	0	0	2	0	1	0			9	0.8
EFEZ	<i>Fellaster zealandiae</i>		0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
EHOL	Holothurians		0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
ONEM	Nemerteans		1	2	0	0	0	0	0	2	0	2	0	0			7	0.6
POTH	Polychaetes		3	3	6	4	4	3	3	2	5	2	2	1			38	3.2
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
OEDW	<i>Edwardsia</i>		0	0	0	0	0	0	0	0	0	0	0	0			0	0.0
OTHER	Misc. Other		1	1	2	1	1	0	0	0	0	0	1	1			8	0.7
<b>TOTAL</b>			75	67	90	43	77	62	45	55	78	71	43	34			740	61.7

# Appendix 3 – Dry weight shell-hash

Southern Firth of Thames

Whaingaroa Harbour

July 2007

Site	Sample No.	Shell hash weight (g)
<b>MI</b>	1	201.3
	2	455.7
	3	354.1
	4	395.8
	5	532.1
	6	522.2
	7	339.9
	8	532.0
	9	408.1
	10	453.8
	11	648.5
	12	451.8
<b>KB</b>	1	211.1
	2	273.4
	3	193.9
	4	234.7
	5	230.7
	6	225.4
	7	124.9
	8	150.8
	9	112.6
	10	176.2
	11	254.8
	12	183.5

Site	Sample No.	Shell hash weight (g)
<b>WI</b>	1	50.1
	2	131.3
	3	190.6
	4	197.3
	5	86.6
	6	56.8
	7	133.0
	8	152.8
	9	111.5
	10	147.8
	11	98.4
	12	85.7
<b>OB</b>	1	164.0
	2	63.9
	3	42.8
	4	67.4
	5	63.1
	6	54.8
	7	47.3
	8	35.1
	9	50.5
	10	127.9
	11	63.4
	12	46.0

**Southern Firth of Thames**

**Whaingaroa Harbour**

**October 2007**

Site	Sample No.	Shell hash weight (g)
<b>KA</b>	1	86.0
	2	52.4
	3	85.8
	4	70.3
	5	51.1
	6	72.5
	7	0.3
	8	64.4
	9	116.7
	10	57.9
	11	48.6
	12	83.0
<b>GC</b>	1	661.3
	2	662.8
	3	737.6
	4	1336.4
	5	585.2
	6	672.9
	7	590.7
	8	611.3
	9	1139.5
	10	861.4
	11	534.6
	12	465.3
<b>TP</b>	1	52.1
	2	95.7
	3	47.2
	4	86.5
	5	35.5
	6	35.9
	7	28.7
	8	142.6
	9	161.2
	10	222.9
	11	196.1
	12	36.5
<b>MI</b>	1	361.6
	2	602.3
	3	527.9
	4	295.1
	5	602.8
	6	319.2
	7	167.5
	8	505.5
	9	631.4
	10	449.6
	11	520.5
	12	195.4
<b>KB</b>	1	203.0
	2	180.4
	3	140.5
	4	266.7
	5	146.5
	6	173.8
	7	199.1
	8	178.6
	9	176.2
	10	158.2
	11	257.8
	12	169.6

Site	Sample No.	Shell hash weight (g)
<b>TU</b>	1	87.5
	2	99.9
	3	99.5
	4	102.2
	5	79.9
	6	109.2
	7	63.5
	8	41.5
	9	66.9
	10	166.5
	11	112.6
	12	87.5
<b>HB</b>	1	100.2
	2	78.1
	3	86.2
	4	79.1
	5	171.5
	6	235.3
	7	214.7
	8	187.7
	9	135.8
	10	136.6
	11	171.6
	12	301.7
<b>X</b>	1	160.6
	2	134.7
	3	158.9
	4	695.2
	5	196.3
	6	226.6
	7	200.8
	8	103.6
	9	113.8
	10	265.2
	11	220.3
	12	159.1
<b>WI</b>	1	228.5
	2	86.9
	3	165.8
	4	68.9
	5	69.2
	6	96.8
	7	60.0
	8	109.8
	9	78.8
	10	150.6
	11	67.9
	12	97.5
<b>OB</b>	1	82.7
	2	64.0
	3	67.3
	4	59.4
	5	60.9
	6	60.7
	7	26.8
	8	48.0
	9	47.4
	10	50.7
	11	32.4
	12	37.9

## Southern Firth of Thames

January 2008

Site	Sample No.	Shell hash weight (g)
<b>MI</b>	1	209.3
	2	679.2
	3	236.0
	4	662.4
	5	435.3
	6	187.9
	7	584.4
	8	237.1
	9	455.5
	10	549.5
	11	280.0
	12	133.2
<b>KB</b>	1	191.8
	2	285.7
	3	118.9
	4	255.0
	5	171.4
	6	174.8
	7	141.2
	8	191.4
	9	206.4
	10	181.1
	11	137.9
	12	125.0

## Whaingaroa Harbour

Site	Sample No.	Shell hash weight (g)
<b>WI</b>	1	231.3
	2	154.3
	3	223.9
	4	76.1
	5	107.9
	6	57.6
	7	70.8
	8	159.3
	9	111.3
	10	114.6
	11	109.8
	12	37.9
<b>OB</b>	1	83.7
	2	87.8
	3	72.7
	4	50.3
	5	69.1
	6	53.4
	7	35.8
	8	45.7
	9	50.3
	10	50.6
	11	70.0
	12	37.0

**Southern Firth of Thames**

**Whaingaroa Harbour**

**April 2008**

Site	Sample No.	Shell hash weight (g)
<b>KA</b>	1	95.7
	2	82.4
	3	49.6
	4	102.4
	5	110.5
	6	108.0
	7	81.9
	8	63.1
	9	46.8
	10	135.5
	11	66.8
	12	98.7
<b>GC</b>	1	354.2
	2	376.3
	3	777.2
	4	554.1
	5	488.6
	6	533.8
	7	578.0
	8	717.0
	9	1387.8
	10	1544.3
	11	439.4
	12	419.2
<b>TP</b>	1	44.4
	2	61.3
	3	165.7
	4	75.3
	5	56.2
	6	35.5
	7	137.5
	8	43.6
	9	434.1
	10	306.3
	11	126.7
	12	71.5
<b>MI</b>	1	242.8
	2	480.2
	3	544.3
	4	541.8
	5	447.6
	6	254.6
	7	247.8
	8	248.0
	9	538.4
	10	600.8
	11	164.6
	12	201.9
<b>KB</b>	1	147.3
	2	253.2
	3	151.8
	4	180.4
	5	153.0
	6	209.5
	7	109.9
	8	230.1
	9	233.2
	10	188.6
	11	155.1
	12	161.8

Site	Sample No.	Shell hash weight (g)
<b>TU</b>	1	286.4
	2	108.1
	3	85.8
	4	87.8
	5	67.8
	6	132.9
	7	68.5
	8	76.7
	9	58.8
	10	256.5
	11	152.9
	12	96.1
<b>HB</b>	1	216.0
	2	118.0
	3	162.7
	4	132.3
	5	134.7
	6	192.3
	7	145.5
	8	294.5
	9	166.0
	10	161.4
	11	331.7
	12	259.0
<b>X</b>	1	148.6
	2	213.9
	3	318
	4	130.3
	5	140.8
	6	121.2
	7	86.6
	8	164.1
	9	406.1
	10	173.4
	11	158.8
	12	268.7
<b>WI</b>	1	0.0
	2	0.0
	3	0.0
	4	0.0
	5	0.0
	6	0.0
	7	0.0
	8	0.0
	9	0.0
	10	0.0
	11	0.0
	12	0.0
<b>OB</b>	1	95.7
	2	64.4
	3	122.7
	4	60.0
	5	50.7
	6	49.1
	7	47.4
	8	46.9
	9	80.5
	10	30.5
	11	46.5
	12	40.4

# Appendix 4 – Sediment organic carbon and nitrogen content

## Southern Firth of Thames

## Whaingaroa Harbour

### July 2007

	Total Organic Carbon g/100g dry wt	Dry Matter g/100g as rcvd	Total Nitrogen g/100g dry wt
MI	0.24	72.8	0.05
	0.2	75.1	0.12
	0.26	68.6	0.05
	0.52	59.5	0.09
	0.19	66.6	< 0.05
KB	0.31	62.3	0.1
	0.36	58.4	0.06
	0.36	59.6	0.08
	0.27	66.1	0.25
	0.52	55.5	0.08

	Total Organic Carbon g/100g dry wt	Dry Matter g/100g as rcvd	Total Nitrogen g/100g dry wt
WI	0.45	61.8	0.07
	0.45	61.8	0.07
	0.55	62	0.24
	0.49	58.1	0.07
	1.62	67.5	0.09
OB	0.95	48.2	0.12
	1.36	33.5	0.18
	1.03	47.8	0.17
	1.07	43.8	0.14
	1.21	42.4	0.15

### October 2007

	Total Organic Carbon g/100g dry wt	Dry Matter g/100g as rcvd	Total Nitrogen g/100g dry wt
KA	0.4	63	< 0.068
	0.35	63	< 0.063
	0.99	59	0.21
	0.33	63	0.057
	0.29	69	0.051
GC	0.47	64	0.095
	0.27	66	0.061
	0.25	65	0.057
	0.25	62	0.063
	0.37	61	0.072
TP	0.16	71	< 0.050
	0.27	71	< 0.050
	0.15	69	< 0.050
	0.14	71	< 0.050
	0.17	71	< 0.050
MI	0.2	68	< 0.050
	0.35	58	0.08
	0.27	65	< 0.050
	0.2	72	0.05
	0.2	71	< 0.050
KB	1.1	35	0.16
	0.77	47	0.11
	0.88	43	0.15
	0.89	43	0.15
	1	39	0.16

	Total Organic Carbon g/100g dry wt	Dry Matter g/100g as rcvd	Total Nitrogen g/100g dry wt
TU	0.46	73	0.086
	0.6	71	0.069
	0.38	73	0.065
	0.33	77	0.065
	0.37	73	0.075
HB	0.77	59	0.11
	0.71	62	0.11
	0.82	61	0.12
	0.74	60	0.11
	0.68	64	0.1
X	0.44	70	0.077
	0.45	69	0.093
	0.41	72	0.092
	0.71	70	0.12
	0.52	71	0.089
WI	0.42	67	0.065
	0.39	69	0.061
	0.39	67	0.06
	0.42	68	0.064
	0.35	70	< 0.050
OB	0.59	65	0.092
	0.73	62	0.11
	0.89	61	0.13
	0.79	60	0.11
	0.67	63	0.091

### January 2008

	Total Organic Carbon g/100g dry wt	Dry Matter g/100g as rcvd	Total Nitrogen g/100g dry wt
MI	0.26	69	0.057
	0.23	67	0.059
	0.18	74	< 0.050
	0.17	72	< 0.050
	0.21	63	< 0.050
KB	0.43	57	0.075
	0.46	55	0.077
	0.42	56	0.071
	0.36	62	0.062
	0.45	58	0.078

	Total Organic Carbon g/100g dry wt	Dry Matter g/100g as rcvd	Total Nitrogen g/100g dry wt
WI	0.53	70	0.11
	0.4	70	0.073
	0.52	70	0.095
	0.49	69	0.097
	0.5	70	0.094
OB	0.76	61	0.096
	0.68	61	0.093
	0.68	62	0.1
	0.67	59	0.1
	0.76	61	0.1

## Southern Firth of Thames

April 2008

	Total Organic Carbon g/100g dry wt	Dry Matter g/100g as rcvd	Total Nitrogen g/100g dry wt
KA	0.32	63	0.084
	0.27	65	0.086
	0.23	64	0.067
	0.24	67	0.075
	0.25	65	0.064
GC	0.39	58	0.098
	0.33	58	0.088
	0.41	62	0.097
	0.41	63	0.1
	0.33	61	0.083
TP	0.22	75	0.066
	0.16	67	< 0.050
	0.14	64	< 0.050
	0.13	69	< 0.050
	0.16	65	< 0.050
MI	0.22	66	0.058
	0.25	64	0.057
	0.22	69	0.058
	0.24	64	0.062
	0.23	66	0.063
KB	0.38	60	0.083
	0.39	57	0.083
	0.38	64	0.086
	0.35	62	0.075
	0.34	58	0.077

## Whaingaroa Harbour

	Total Organic Carbon g/100g dry wt	Dry Matter g/100g as rcvd	Total Nitrogen g/100g dry wt
TU	0.45	73	0.074
	0.45	70	0.067
	0.41	73	0.059
	0.46	69	0.07
	0.32	74	0.052
	0.58	60	0.1
HB	0.54	59	0.093
	0.56	57	0.094
	0.63	62	0.099
	0.54	57	0.093
	0.55	69	0.072
X	0.37	73	0.058
	0.41	73	0.059
	0.41	75	0.051
	0.55	72	0.07
	Not Sampled	Not Sampled	Not Sampled
WI	Not Sampled	Not Sampled	Not Sampled
	Not Sampled	Not Sampled	Not Sampled
	Not Sampled	Not Sampled	Not Sampled
	Not Sampled	Not Sampled	Not Sampled
	Not Sampled	Not Sampled	Not Sampled
OB	0.58	64	0.077
	0.56	64	0.072
	0.63	64	0.08
	0.63	64	0.076
	0.59	64	0.078

# Appendix 5 – Sediment photosynthetic pigment concentration

## Southern Firth of Thames

## Whaingaroa Harbour

### July 2007

	Chlorophyll-a mg.kg <sup>-1</sup>	Pheophytin mg.kg <sup>-1</sup>
MI	5.80	2.60
	7.20	2.90
	7.10	2.50
	6.80	2.60
	5.80	3.10
KB	7.50	6.60
	6.50	5.30
	6.30	4.80
	5.90	5.30
	6.60	6.90

	Chlorophyll-a mg.g <sup>-1</sup>	Pheophytin mg.g <sup>-1</sup>
WI	8.50	5.00
	7.40	4.80
	7.50	5.30
	9.00	5.30
	7.50	5.20
OB	7.90	5.50
	7.60	6.20
	8.40	5.40
	7.40	5.60
	7.10	5.80

### October 2007

	Chlorophyll-a mg.kg <sup>-1</sup>	Pheophytin mg.kg <sup>-1</sup>
KA	10.00	3.40
	9.20	3.60
	8.30	4.30
	9.50	4.30
	10.00	1.90
GC	12.00	< 0.1
	13.00	< 0.1
	9.10	< 0.1
	20.00	< 0.1
	19.00	1.70
TP	4.00	0.30
	2.70	< 0.1
	13.00	3.80
	7.30	< 0.1
	17.00	2.00
MI	7.40	0.90
	10.00	2.20
	11.00	2.10
	13.00	1.20
	7.10	2.10
KB	14.00	5.40
	41.00	24.00
	32.00	25.00
	7.80	0.30
	30.00	29.00

	Chlorophyll-a mg.kg <sup>-1</sup>	Pheophytin mg.kg <sup>-1</sup>
TU	13.00	3.10
	33.00	8.90
	21.00	5.10
	19.00	3.60
	19.00	4.50
HB	14.00	5.20
	12.00	4.80
	19.00	5.40
	17.00	6.40
	14.00	3.00
X	27.00	10.0
	18.00	8.2
	21.00	6.9
	15.00	4.6
	16.00	2.1
WI	26.00	2.30
	17.00	2.00
	23.00	2.80
	18.00	2.10
	22.00	2.80
OB	22.00	8.30
	22.00	6.90
	22.00	7.00
	16.00	7.20
	19.00	6.50

## January 2008

	Chlorophyll-a mg.kg <sup>-1</sup>	Pheophytin mg.kg <sup>-1</sup>
MI	8.20	0.20
	9.90	< 0.1
	9.00	0.60
	8.10	< 0.1
	8.00	0.10
KB	7.50	2.60
	11.00	< 0.1
	8.90	0.50
	18.00	9.90
	14.00	3.10

	Chlorophyll-a mg.kg <sup>-1</sup>	Pheophytin mg.kg <sup>-1</sup>
WI	17.00	7.30
	17.00	7.50
	17.00	6.60
	16.00	5.80
	18.00	4.20
OB	14.00	6.80
	14.00	4.00
	18.00	< 0.1
	14.00	4.80
	12.00	5.70

## Southern Firth of Thames

### April 2008

	Chlorophyll-a mg.kg <sup>-1</sup>	Pheophytin mg.kg <sup>-1</sup>
KA	6.70	3.20
	6.30	2.50
	7.40	1.40
	4.60	5.30
	6.40	6.20
GC	19.50	2.60
	12.40	3.40
	17.30	3.60
	27.30	4.20
	13.40	4.00
TP	1.10	2.00
	9.40	2.20
	9.70	1.30
	8.00	3.40
	2.80	1.20
MI	5.90	2.40
	7.60	5.80
	10.50	2.40
	10.20	2.70
	10.30	2.80
KB	11.40	8.50
	4.30	5.50
	10.90	5.00
	12.40	9.00
	12.40	8.00

## Whaingaroa Harbour

	Chlorophyll-a mg.kg <sup>-1</sup>	Pheophytin mg.kg <sup>-1</sup>
TU	20.40	8.20
	15.70	4.30
	19.70	4.20
	18.20	3.30
	20.10	2.90
HB	8.70	2.90
	14.40	2.90
	10.60	4.90
	17.20	2.50
	10.20	3.50
X	16.70	2.80
	22.70	0.80
	19.10	6.70
	14.70	3.10
	16.50	2.70
WI	Not sampled	Not sampled
	Not sampled	Not sampled
OB	7.80	4.90
	9.30	2.10
	9.50	5.60
	9.50	5.60
	8.60	5.90

## Appendix 6 – QA/QC procedures

Each sample is sieved and preserved in the field, returned to the laboratory, and analysed for indicator species. All non-indicator species are classified into major taxonomic groups (amphipods, bivalves, crabs, cumaceans, gastropods, isopods, ostracods, polychaetes, shrimps and “other”) and enumerated. The laboratory analysis of samples for benthic communities involves two processes:

- Sample sorting.
- Species identification and enumeration.

A subsequent step is the input and storage of data into corporate databases. There are also quality control procedures in place for this step.

Quality control of sample sorting<sup>5</sup> is essential to ensure the value of all subsequent steps in the sample analysis process. Re-sorting of samples is employed for quality control of sorting. As a minimum re-sorting effort, a random selection of 16% (2 out of 12 samples) of the samples from each site is completely re-sorted. Re-sorting is conducted by an experienced sorter other than the original sorter.

Percent sorting efficiency is:

$$\frac{\text{\# organisms originally sorted}}{\text{\# organisms originally sorted} + \text{\# organisms found in re-sort}} \times 100$$

Minimum acceptable sorting efficiency is 95%. If sorting efficiency is greater than 95%, no action is required. Sorting efficiencies below 95% require re-sorting of all samples from the site concerned. Note that samples that are completely re-sorted after falling below 95% are assumed to have achieved 95% efficiency. Any organisms found in the re-sort should be added to the original sorted sample for later identification and enumeration. Once all quality control criteria for sample sorting have been met, the sample debris (shell-hash) can be dried and weighed.

The goal of species identification and enumeration is species or species group level identification and an accurate count of each indicator species, and identification and an accurate count of remaining taxonomic groups. Quality control is provided by complete re-identification and re-enumeration of a random selection of 16% of the samples from each site. This includes examination of any material left-over from each sorted sample. Re-identification and re-enumeration is conducted by an experienced identifier other than the original identifier.

Percent identification and enumeration efficiency is:

$$\frac{\text{\# organisms in re count} - \text{number of errors}}{\text{\# organisms in re count}} \times 100$$

Note that the number of errors is based upon the difference between the original (correctly identified) count and the re-count.

Minimum acceptable identification and enumeration efficiency is 90%. If identification and enumeration efficiency is greater than 90%, no action is required. Identification and enumeration efficiencies below 90% require that the type of error (see below) is identified and samples re-analysed for this error. Laboratory data sheets should be amended accordingly.

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<sup>5</sup> Sorting is the separation of biological material from sediment, shell-hash, and other non-living biological material retained by a 500 µm sieve.

The following are examples of potential errors in species identification and enumeration:

- Counting errors (e.g., counting 11 individuals of a species/species group as 10 or 12; including dead bivalves in a count; including headless polychaete parts in a count).
- Identification errors (e.g., identifying species X as species Y).
- Unrecorded species errors (e.g., not identifying species X when it is present).
- Recording errors (e.g., recording species X as species Y on a data sheet).
- Specimens overlooked in the original analysis (e.g., missed organisms in the left-over sample).

A standard processing form is used for tracking each sample. It includes the details of each sample, the name of the sorter and identifier responsible, time required for sorting and species identification and enumeration, and any additional comments. These need to be completed at each stage of the laboratory analysis of all the samples.