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Regional Estuary Monitoring Programme (REMP) Data Report: Benthic Macrofauna Communities and Sediments – July 2008 to April 2009

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 2008 to April 2009.

This report documents the data from the eighth 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 2008 and April 2009. In Whaingaroa Harbour five sites were sampled in October 2008 and, due to sampling at Te Puna Point being discontinued, only four in April 2009. Two sites from each harbour were additionally sampled in July 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 2008 to April 2009 monitoring period indicate that changes in assemblage composition in both the Firth of Thames and Whaingaroa Harbour were mainly small. 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 were more abundant in Whaingaroa Harbour and crustaceans in the Firth of Thames. The most consistently common taxa found at sites in the Firth of Thames included the polychaetes *Aonides oxycephala,* capitellids, polydorids and Scoloplos cylindrifer; and the bivalves *Nucula hartvigiana, Austrovenus stutchburyi* and *Paphies australis.* The exotic 'Asian date mussel', *Musculista senhousia*, occurred at the sites Kaiaua and the Gun Club. In Whaingaroa Harbour, consistently common taxa included the polychaetes *Aquilaspio aucklandica, Cossura* sp. and capitellids; and the bivalves *Austrovenus stutchburyi*, *Nucula hartvigiana, Macomona liliana* and *Arthritica bifurca.*

Between July 2008 and April 2009 the median grain size remained consistent at all but one site in the Firth of Thames and all sites in Whaingaroa Harbour. 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 decreased slightly over the one year of sampling. The mud content was relatively consistent over the study period in Whaingaroa Harbour and more variable in the Firth of Thames. The shell-hash content was also consistent at most sites 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[1] 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; Singleton, 2010). 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 (Singleton 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 2008 to April 2009. 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[2] 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 phaeophytin concentration (to quantify benthic micro-algal biomass)
   - Rates of sediment deposition and erosion.

[1] 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.

[2] '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
Amphipods					
Arthropoda	Crustacea	Amphipoda	Corophiidae	*Paracorophium*	sp.
Arthropoda	Crustacea	Amphipoda	Phoxocephalidae		
Bivalves					
Mollusca	Bivalvia	Veneroida	Lasaeidae	*Arthritica*	*bifurca*
Mollusca	Bivalvia	Veneroida	Veneridae	*Austrovenus*	*stutchburyi*
Mollusca	Bivalvia	Veneroida	Tellinidae	*Macomona*	*liliana*
Mollusca	Bivalvia	Nuculoida	Nuculidae	*Nucula*	*hartvigiana*
Mollusca	Bivalvia	Veneroida	Mesodesmatidae	*Paphies*	*australis*
Mollusca	Bivalvia	Veneroida	Semelidae	*Theora*	*lubrica*
Cumaceans					
Arthropoda	Crustacea	Cumacea	Diastylidae	Colurostylis	*lemurum*
Gastropods					
Mollusca	Gastropoda	Neogastropoda	Buccinulidae	*Cominella*	*adspersa*
Mollusca	Gastropoda	Docoglossa	Lottiidae	*Notoacmea*	sp.
Other					
Cnidaria	Anthozoa	Actiniaria	Actiniidae	*Anthopleura*	*aureoradiata*
Polychaetes					
Annelida	Polychaeta	Spionida	Spionidae	*Aquilaspio*	*aucklandica*
Annelida	Polychaeta	Phyllodocida	Nephtyidae	*Aglaophamus*	sp.
Annelida	Polychaeta	Spionida	Spionidae	*Aonides*	*oxycephala*
Annelida	Polychaeta	Orbiniida	Paraonidae	*Aricidea*	sp.
Annelida	Polychaeta	Spionida	Spionidae	*Pseudopolydora*	*complex*
Annelida	Polychaeta	Orbiniida	Paraonidae	*Cossura*	sp.
Annelida	Polychaeta	Sabellida	Sabellidae	*Euchone*	sp.
Annelida	Polychaeta	Phyllodocida	Goniadidae	*Goniada*	sp.
Annelida	Polychaeta	Phyllodocida	Glyceridae	*Glycera*	sp.
Annelida	Polychaeta	Capitellida	"Capitellidae"		
Annelida	Polychaeta	Spionida	Magelonidae	*Magelona*	*dakini*
Annelida	Polychaeta	Phyllodocida	Nereidae		
Annelida	Polychaeta	Orbiniida	Orbiniidae	*Orbinia*	*papillosa*
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 one and three times in the period between July 2008 and April 2009. 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 between 2001 and 2008. Sampling was reduced in 2009 to six monthly intervals at all sites, with sampling at Te Puna Point in Whaingaroa (Raglan) Harbour being discontinued (Table 2).

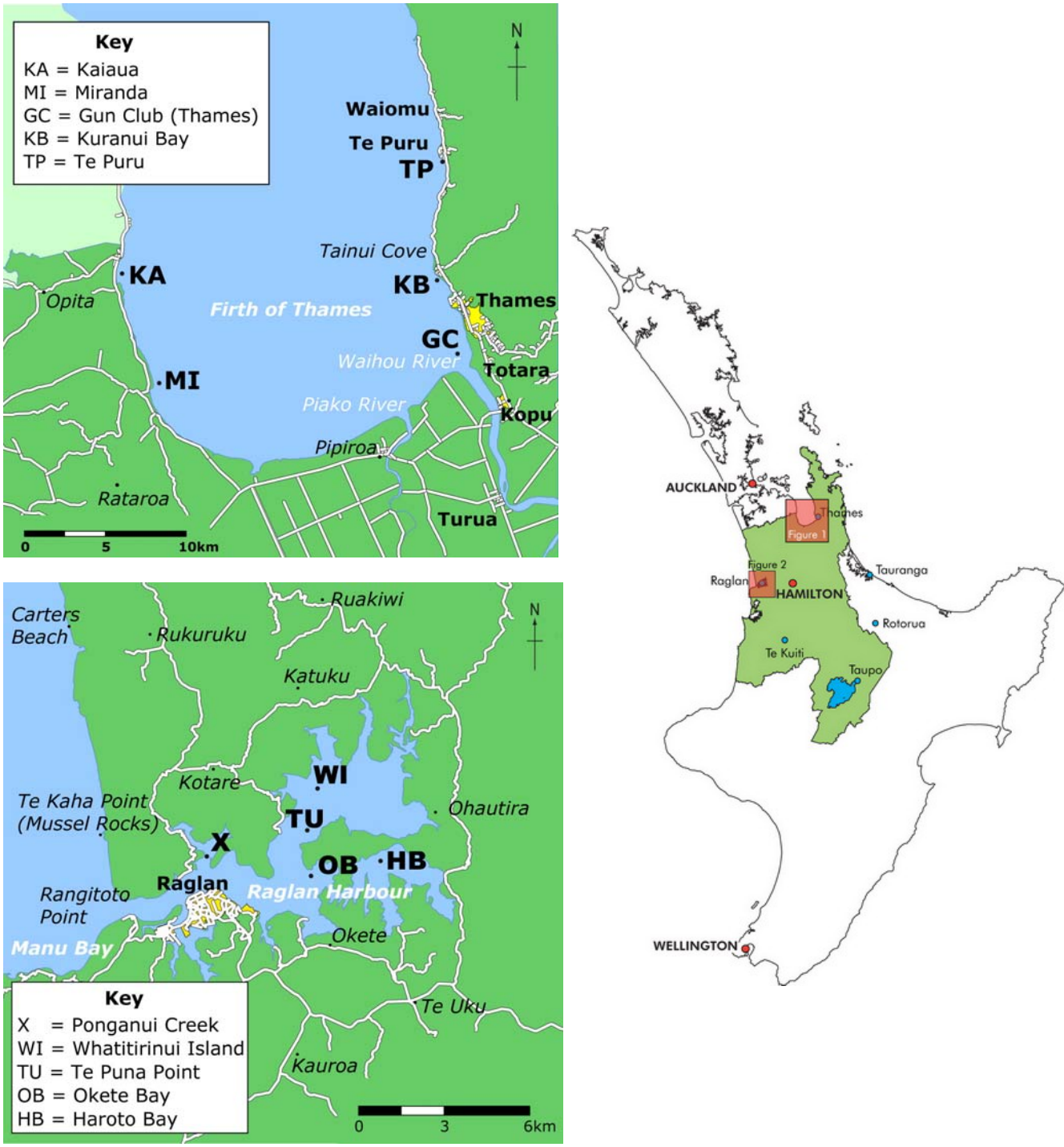

Figure 1. Location of permanent monitoring sites in the southern Firth of Thames and Whaingaroa (Raglan) Harbour.

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 08, April 09
	Miranda	MI	July 08, October 08, April 09
	Thames (Gun Club)	GC	October 08, April 09
	Kuranui Bay	KB	July 08, October 08, April 09
	Te Puru	TP	October 08, April 09
Whaingaroa Harbour	Whatitirinui Island	WI	July 08, October 08, April 09
	Te Puna Point	TU	October 08
	Okete Bay	OB	July 08, October 08, April 09
	Haroto Bay	HB	October 08, April 09
	Ponganui Creek	X	October 08, April 09

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[3] 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 co-ordinates) 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[4]. 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 were analysed with a Malvern Mastersizer 2000 sediment analyser, which has a lower detection limit of 0.05 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 dried and finely ground before analysis. Sediment for total organic carbon analysis was pre-treated with acid to remove carbonate material prior to analysis.

[3] See Hewitt *et al.* (2001) and Turner (2001) for justification.
[4] Bivalves for condition analysis were removed during sieving and prior to sample preservation in isopropyl alcohol.

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 and KA the mean total number of individuals was higher compared to all other sites. At TP and KA (in April 2009) bivalves were the most abundant taxonomic group, whereas polychaetes were the most abundant group on most sampling dates at GC, MI (except July 2008) and KB.

Between July 2008 and April 2009, sites MI and KA showed the greatest changes in the total number of individuals and taxonomic composition. At MI the total abundance decreased from 188 individuals in July 2008 to 102 individuals and 64 individuals in October 2008 and April 2009, respectively. Non-indicator crustaceans (barnacles) were the most abundant taxonomic group in July 2008 (50% of total abundance), with indicator polychaetes being more abundant in October 2008 (78% of individuals) and April 2009 (56% of individuals). Both indicator polychaetes (51% of individuals) and indicator bivalves (42% of individuals) were abundant at KA in October 2008. A strong increase in the abundance of indicator bivalves (79% of individuals) followed in April 2009.

At GC there was a small increase in the total abundance from 218 individuals in October 2008 to 272 individuals in April 2009. The benthic community was clearly dominated by indicator polychaetes on both dates (78 – 87% of individuals).

At sites TP and KB the total number of individuals and taxonomic composition was relatively consistent between sampling dates. At TP a small increase in the abundance of indicator bivalves occurred from October 2008 (57% of individuals) to April 2009 (65% of individuals). Indicator polychaetes clearly dominated the benthic community composition at KB in July and October 2008 (70-74% of individuals). In April 2009 there was a decrease of indicator polychaetes (50% of individuals) and an increase in indicator bivalves (from 18% to 43% of individuals).

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 2008 and April 2009.

From July 2008 to April 2009 the total number of individuals varied at HB, X and WI, whereas OB showed little variation. Taxonomic composition was relatively consistent at all sites.

Indicator polychaetes clearly dominated numerically at sites OB (64–78% of individuals) and HB (48–56%), whereas indicator bivalves were more abundant at TU (58%), X (50–54%) and WI in April 2009 (60%). Indicator polychaetes were also relatively abundant at X in October 2008 (23%) and April 2009 (34%). At WI the abundance of indicator polychates (42%) and indicator bivalves (38-42%) was relatively similar in July and October 2008. This was followed by a large increase in total abundance in April 2009, which was mainly due to an increase in abundance of indicator bivalves (60% of individuals). The total abundance at HB increased slightly between October 2008 and April 2009 (44 to 53 individuals).

There was a decrease in total abundance between October 2008 and April 2009 at X (137 to 122 individuals). This was mainly due to a decrease in abundance of indicator bivalves and crustaceans (indicator and non-indicator). The abundance of indicator polychaetes at OB slowly increased from 50 individuals in July 2008 to 59 and 62 individuals in October 2008 and April 2009, respectively.

Gastropods were relatively abundant at sites TU (12.1%) and OB (3–8%) and crustaceans at sites X (8–13%), OB (7-11%), WI (2–8%) and HB (5–20%). The full data set of Whaingaroa (Raglan) Harbour species and taxonomic group abundances is provided in Appendix 2.

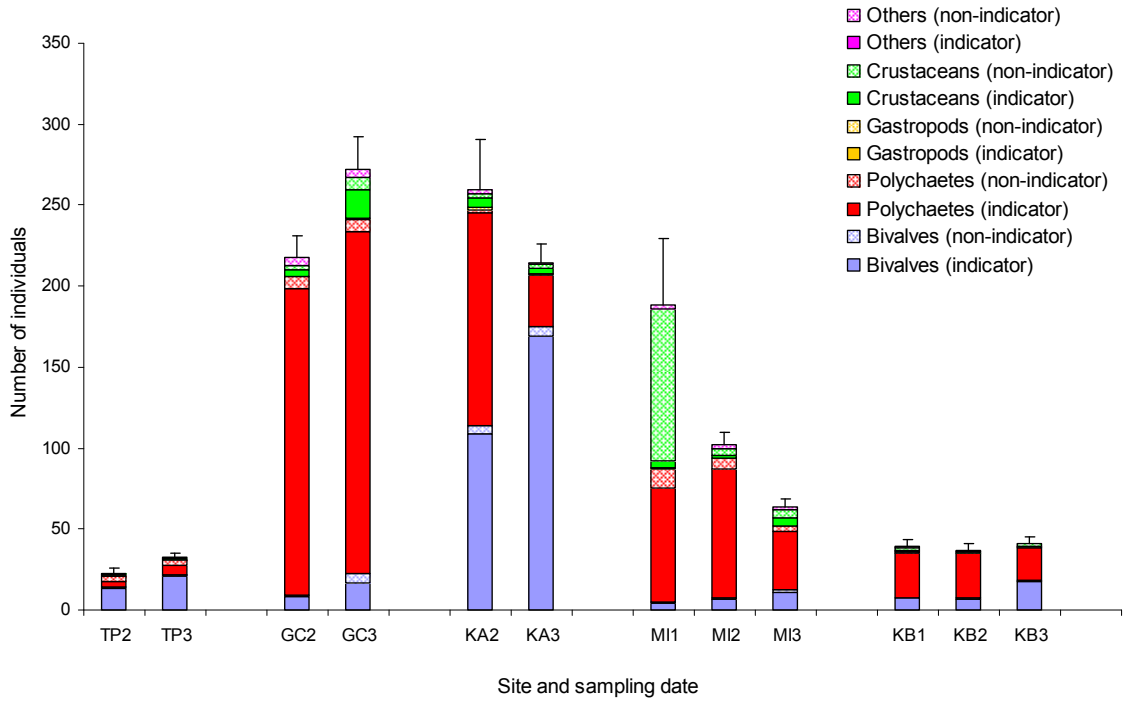

Figure 2: **Mean (± standard error) total number of individuals and major taxonomic group composition of intertidal benthic macrofauna communities at the permanent monitoring sites in the southern Firth of Thames between July 2008 and April 2009. X axis label represents site (TP = Te Puru, GC = Thames (Gun Club), KA = Kaiaua, MI = Miranda, KB = Kuranui Bay) and sampling dates (1 = Jul 08, 2 = Oct 08, 3 = Apr 09).**

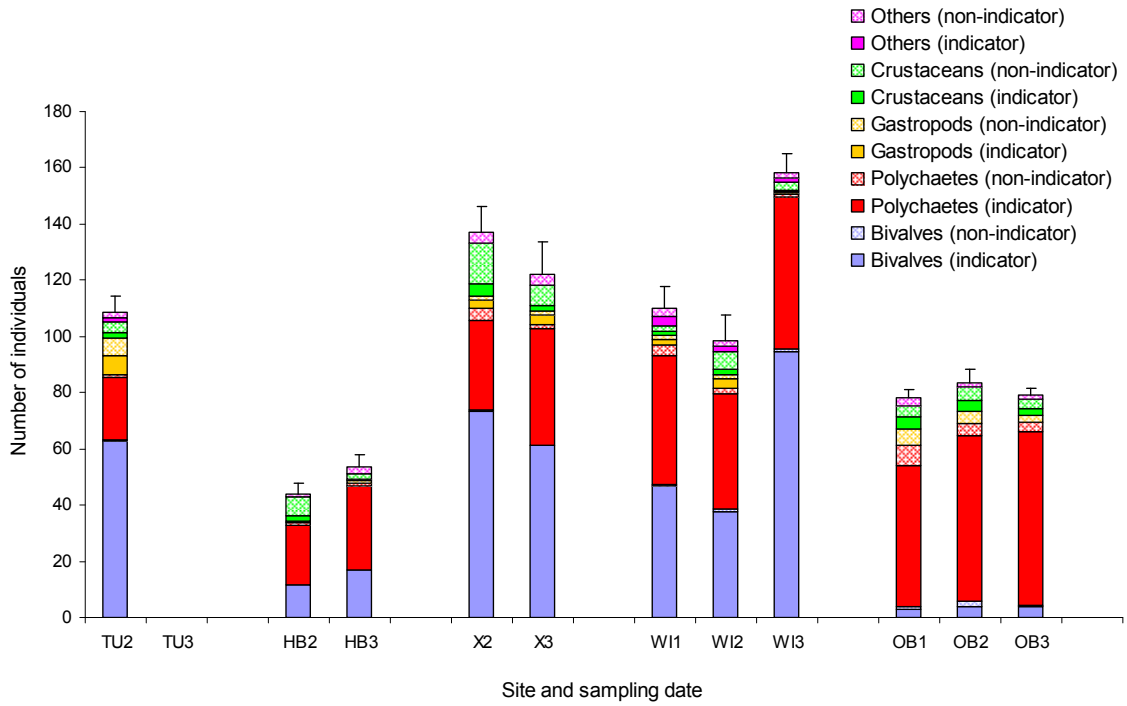

Figure 3: **Mean (± standard error) total number of individuals and major taxonomic group composition of intertidal benthic macrofauna communities at the permanent monitoring sites in Whaingaroa Harbour between July 2008 and April 2009. X axis label represents site (TU = Te Puna Point, HB = Haroto Bay, X = Ponganui Creek, WI = Whatitirinui Island, OB = Okete Bay) and sampling dates (1 = Jul 08, 2 = Oct 08, 3 = Apr 09). TU was not sampled in Apr 09 due to sampling being discontinued at this site.**

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 2008 and April 2009 are listed in Table 3.

From July 2008 to April 2009 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 *Nucula hartvigiana* (0-22 individuals core^{-1}) and *Paphies australis* (0-16 individuals core^{-1}) were the two most abundant species in October 2008 and April 2009. Non-indicator and capitellid polychaetes were also common on both sampling dates.

At GC, the polychaete *Aonides oxycephala* was the most abundant taxa on both sampling dates (85-325 individuals core^{-1}). The second most abundant taxa changed from non-indicator polychaetes in October 2008 (2-18 individuals core^{-1}) to a cumacean, *Colurostylis lemurum*, in April 2009 (3-37individuals core^{-1}). *Paphies australis* were also consistently within the five most common taxa on both sampling dates.

At KA, capitellid polychaetes were the most abundant taxa in October 2008 (42-304 individuals core^{-1}) and second in April 2009 due to a large decrease in abundance (4-42 individuals core^{-1}). *N. hartvigiana* (39-244 individuals core^{-1}) were among the two most common taxa at KA on both sampling dates. Non-indicator bivalves and polydorid polychaetes (pseudopolydora) were also common in October 2008 and April 2009.

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. "Polychaetes", "Bivalves", "Crustaceans" and "Other" denote non-indicator species of these taxonomic groups. The mean abundance is provided beside each taxa.

	TP	GC	KA	MI	KB
Jul-08				"Crustaceans" (88.3)	"Capitellidae" (20.7)
				Aonides (25.3)	*Austrovenus* (4.5)
				"Capitellidae" (16.5)	Pseudopolydora (2.3)
				"Polychaetes" (11.7)	*Magelona* (2.3)
				Aquilaspio (8.4)	*Arthritica* (2.1)
Oct 08	*Nucula* (7.7)	*Aonides* (180.4)	"Capitellidae" (121.8)	"Capitellidae" (30.1)	"Capitellidae" (20.2)
	Paphies (4.9)	"Polychaetes" (7.8)	*Nucula* (104.3)	*Aonides* (23.2)	*Austrovenus* (4.4)
	"Polychaetes" (3.6)	*Paphies* (6.2)	*Phoxocephalidae* (5.3)	*Aquilaspio* (15.2)	*Arthritica* (1.7)
	"Capitellidae" (5.4)	"Capitellidae" (5.4)	"Bivalves" (4.3)	"Polychaetes" (6.6)	Pseudopolydora (1.7)
	Other bivalves (0.8)	"Other" (4.2)	Pseudopolydora (4.1)	*Orbinia* (4.9)	*Magelona* (1.7)
Apr-09	*Nucula* (14.2)	*Aonides* (203.8)	*Nucula* (161.4)	"Capitellidae" (16.3)	"Capitellidae" (16.3)
	Paphies (4.2)	*Colurostylis* (18.2)	"Capitellidae" (22.5)	*Aonides* (9.9)	*Austrovenus* (11.1)
	"Polychaetes" (3.0)	*Paphies* (11.9)	"Bivalves" (5.9)	*Nereidae* (7.5)	*Arthritica* (4.9)
	Austrovenus (2.6)	"Polychaetes" (7.7)	Pseudopolydora (4.6)	*Austrovenus* (6.8)	*Nereidae* (1.3)
	"Capitellidae" (2.2)	Isopods (6.8)	*Theora* (4.0)	*Colurostylis* (5.3)	Pseudopolydora (1.2)

Capitellid polychaetes were the most abundant taxa (6-89 individuals core^{-1}) on all sampling dates at MI, except July 2008 where non-indicator crustaceans (0-424 individuals core^{-1}) and *Aonides oxycephala* (3-54 individuals core^{-1}) were dominant.

The indicator polychaete, *Aquilaspio aucklandica* and non-indicator polychaetes were also common.

At KB, capitellid polychaetes were the most abundant taxa on all sampling dates (2-60 individuals core^{-1}). The bivalves *Austrovenus stutchburyi* (0-18 individuals core^{-1}) and *Arthritica bifurca* (0-19 individuals core^{-1}) 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 abundance of phoxocephalid amphipods was highest at KA, with a strong decline in numbers in April 2009 (Figure 4a). All other sites had very low numbers. No individuals of the other indicator amphipod (*Paracorophium* sp.) were found in the Firth of Thames over the study period.

The bivalve*, Arthritica bifurca* peaked in abundance in April 2009 at KB and GC. In contrast the abundance at KA and MI declined in April 2009 after a peak in October 2008 (Figure 4b). 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 strong increase from October 2008 to April 2009 at KB and MI, was relatively consistent at GC, and showed a slight increase at TP and KA (Figure 4c). This was mainly a reflection of changes in abundance of individuals <5 mm.

Macomona liliana abundance increased in October 2008 at MI, with numbers decreasing in April 2009 (Figure 4d). The abundance at KB, KA and GC also showed a slight decline between October 2008 and April 2009. The patterns in abundance of *M. liliana* can be mainly attributed to changes in abundance of individuals <5 mm.

The abundance of *Nucula hartvigiana* was highest at KA, with a very strong increase in April 2009. At TP there was a slight increase in numbers from a mean abundance of 8 individuals in October 2008 to 14 individuals in April 2009 (Figure 4d). This was mainly due to an increase in numbers in the >2mm size class at KA and <2 mm size class at TP.

Paphies australis was most abundant at GC, with a strong increase in numbers occurring between October 2008 and April 2009. Consistently lower numbers were found at TP (Figure 4f). This is in contrast to previous years where *P. australis* is normally more abundant at TP. Individuals found at TP were mainly in the >20 mm size class, whereas individuals found at GC in October 2008 were mainly <5 mm and in April 2009 5–15 mm.

There was a very strong increase in abundance of the cumacean *Colurostylis lemurum,* between October 2008 and April 2009 at GC (Figure 4g). At MI the abundance decreased in October 2008, followed by an increase in April 2009 to numbers similar to July 2008. 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 4i). This species was clearly most abundant at GC, where numbers increased between October 2008 and April 2009. MI had consistently lower numbers, which declined in April 2009. Capitellid polychaetes were also found in high numbers, with the highest abundance occurring at KA (Figure 4k). A very sharp decline in abundance occurred between October 2008 (122 individuals) and April 2009 (23 individuals). Capitellid numbers remained relatively consistent at all other sites (with higher abundance at MI and KB) over the sampling period. Another spionid polychaete species, *Aquilaspio aucklandica*, was found in lower numbers (Figure 4h). *A. aucklandica* was most

abundant at MI, where numbers initially increased in October 2008, followed by a strong decrease in April 2009. The abundance at KB was consistently low.

The polydorid polychaetes ("pseudopolydora complex") were most abundant at MI in July 2008, with a strong decrease in numbers over subsequent sampling periods (Figure 4j). The average abundance at KA remained consistent over the study period, with a slight decline occurring at KB. *Magelona dakini* abundance declined over the study period at all sites (in particular at KB and KA) (Figure 4l). The abundance of nereid polychaetes peaked at MI in April 2009, with numbers remaining consistent at all other sites (Figure 4m). *Orbinia papillosa* was most abundant at MI with numbers declining sharply between July 2008 and April 2009 (Figure 4n). The non-indicator polychaete *Scoloplos cylindrifer* was most abundant at MI and GC. Over the sampling periods numbers decreased at MI, and stayed consistent at GC (Figure 4o). The non-indicator polychaete *Syllidae* sp. was only found at TP, where the abundance remained consistent between October 2008 and April 2009 (Figure 4p).

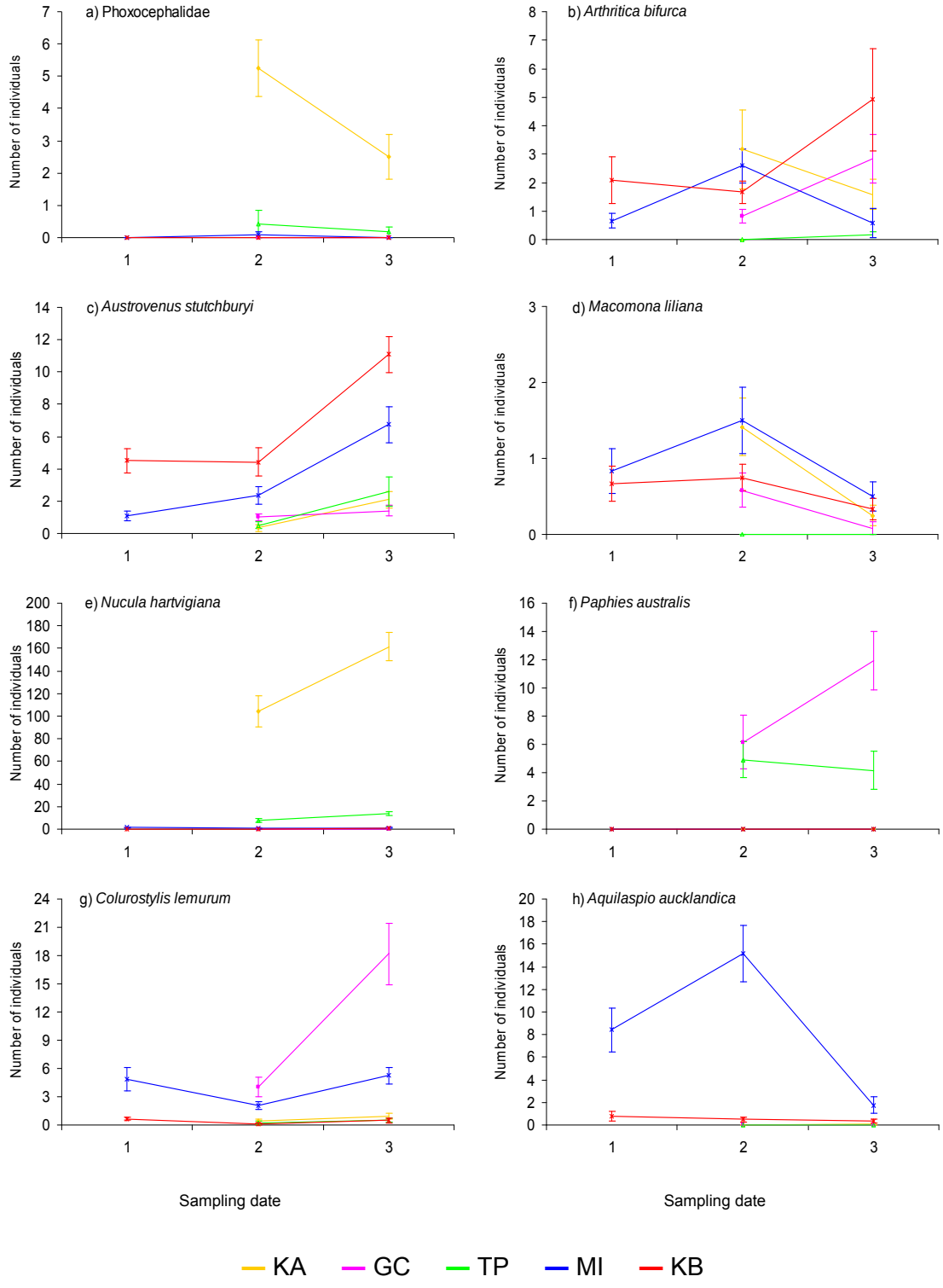

Figure 4: **The mean (± standard error) number of individuals per core at each monitoring site on each sampling date for selected taxa in the southern Firth of Thames. Sampling dates: Jul 08 = 1, Oct 08 = 2, Apr 09 = 3. Note the different scales on the vertical axes.**

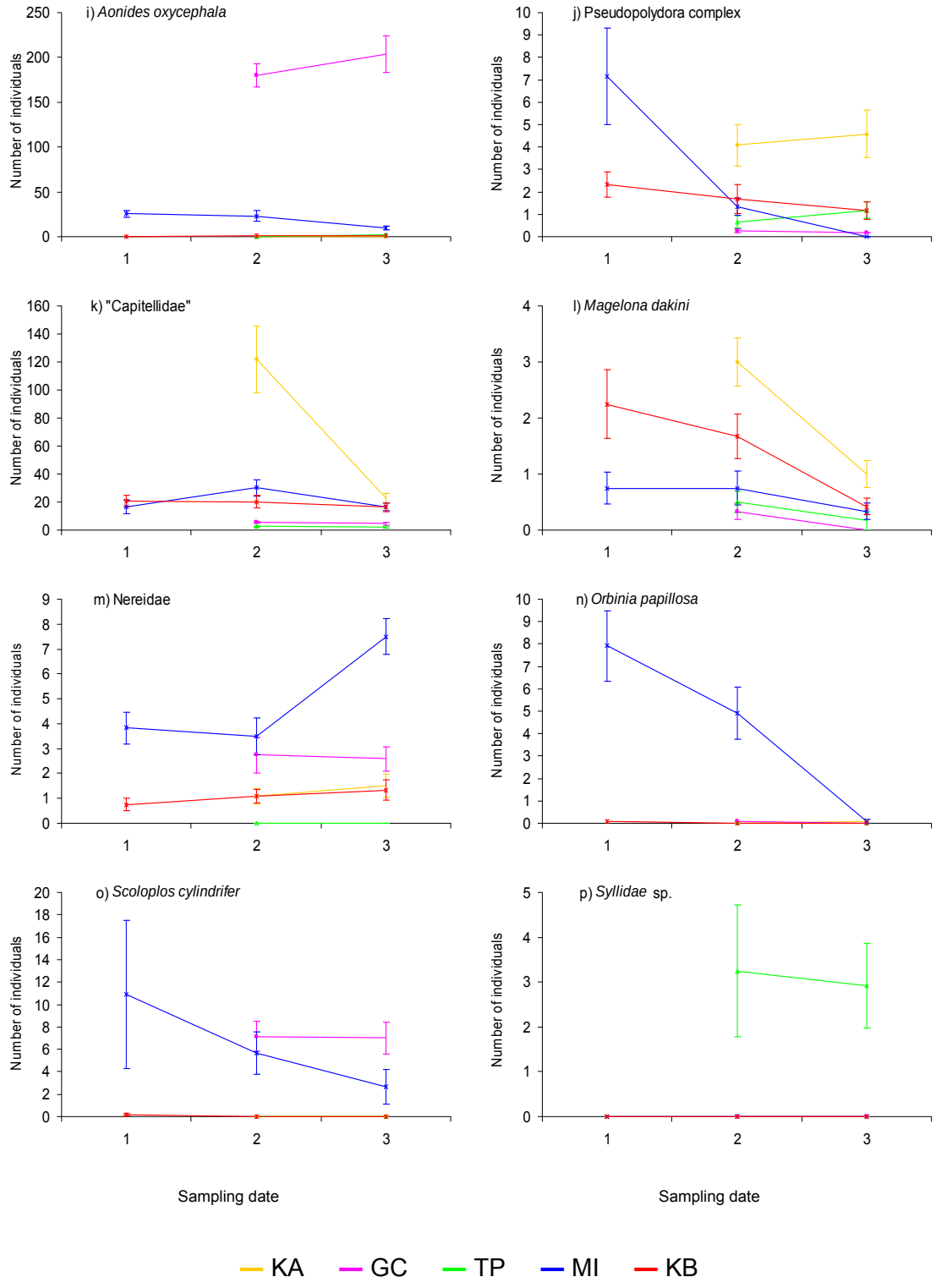

Figure 4. (cont.)

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 2008 and April 2009 are listed in Table 4.

From July 2008 to April 2009 only a few changes were observed in the mean abundance of the most common taxonomic groups at all sampling sites. At TU the bivalve species *Austrovenus stutchburyi* (12-52 individuals core^{-1}) and *Nucula hartvigiana* (7-37 individuals core^{-1}) were the most common taxa in October 2008. The polychaetes, *Aquilaspio aucklandica* (1-19 individuals core^{-1}) and capitellids (1-17

individuals core^{-1}) were also among the most common species; however, in lower numbers. At HB, capitellid polychaetes (4-36 individuals core^{-1}) and the bivalve *Arthritica bifurca* (0-41 individuals core^{-1}) were the most abundant taxa on both sampling dates. Nereid polychaetes were also abundant on both sampling dates at HB. At X, *A. stutchburyi* (9-51 individuals core^{-1}) was the most abundant taxa on both sampling dates. The bivalves *N. hartvigiana* and *Macomona liliana,* and polychaetes capitellids and *A. aucklandica,* were frequent on both sampling dates.

A. stutchburyi was the most abundant taxa at WI in July 2008 and April 2009 (14-77 individuals core^{-1}), with capitellid polychaetes being the most abundant in October 2008 (13-44 individuals core^{-1}). The bivalves *M. liliana* and *N. hartvigiana*, and the polychaete *A. aucklandica*, were amongst the five most common species on all sampling dates.

At OB three species of polychaetes were consistently the most abundant taxa over the sampling dates. Capitellids (15-40 individuals core^{-1}) were the most abundant, *Cossura* sp. (2-24 individuals core^{-1}) the second and *A. aucklandica* (3-18 individuals core^{-1}) the third most abundant. Non-indicator polychaetes were also common taxa at OB.

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. "Polychaetes", "Bivalves", "Crustaceans", "Amphipods" and "Gastropods" denote non-indicator species of these taxonomic groups. The mean abundance is provided beside each taxa. TU was not sampled in Apr 09 due to sampling being discontinued at this site.

	TU	HB	X	WI	OB
Jul-08				*Austrovenus* (25.4)	"Capitellidae" (24.9)
				"Capitellidae" (23.4)	*Cossura* sp. (8.8)
				Macomona (11.6)	*Aquilaspio* (8.6)
				Aquilaspio (10.7)	"Polychaetes" (7.5)
				Nucula (6.5)	"Gastropods" (5.8)
Oct-08	*Nucula* (28.1)	"Capitellidae" (13.5)	*Austrovenus* (34.0)	"Capitellidae" (23.4)	"Capitellidae" (31.3)
	Austrovenus (27.6)	*Arthritica* (9.0)	*Nucula* (25.0)	*Austrovenus* (16.8)	*Cossura* sp. (9.2)
	"Capitellidae" (8.7)	*Nereidae* (3.9)	*Aquilaspio* (17.8)	*Macomona* (11.0)	*Aquilaspio* (8.8)
	Aquilaspio (8.4)	"Amphipods" (2.8)	"Capitellidae" (11.3)	*Aquilaspio* (9.9)	*Paraonidae* (4.4)
	Notoacmea sp. (6.5)	*Aquilaspio* (2.8)	*Macomona* (10.8)	*Nucula* (6.2)	"Polychaetes" (4.3)
Apr-09		"Capitellidae" (24.9)	*Austrovenus* (33.3)	*Austrovenus* (56.8)	"Capitellidae" (27.5)
		Arthritica (10.3)	"Capitellidae" (19.5)	"Capitellidae" (30.0)	*Cossura* sp. (11.6)
		Nereidae (3.8)	*Aquilaspio* (18.0)	*Macomona* (22.5)	*Aquilaspio* (10.1)
		Austrovenus (3.3)	*Nucula* (17.5)	*Aquilaspio* (10.8)	*Nereidae* (5.3)
		Macomona (3.0)	*Macomona* (8.1)	*Nucula* (7.5)	"Polychaetes" (3.3)

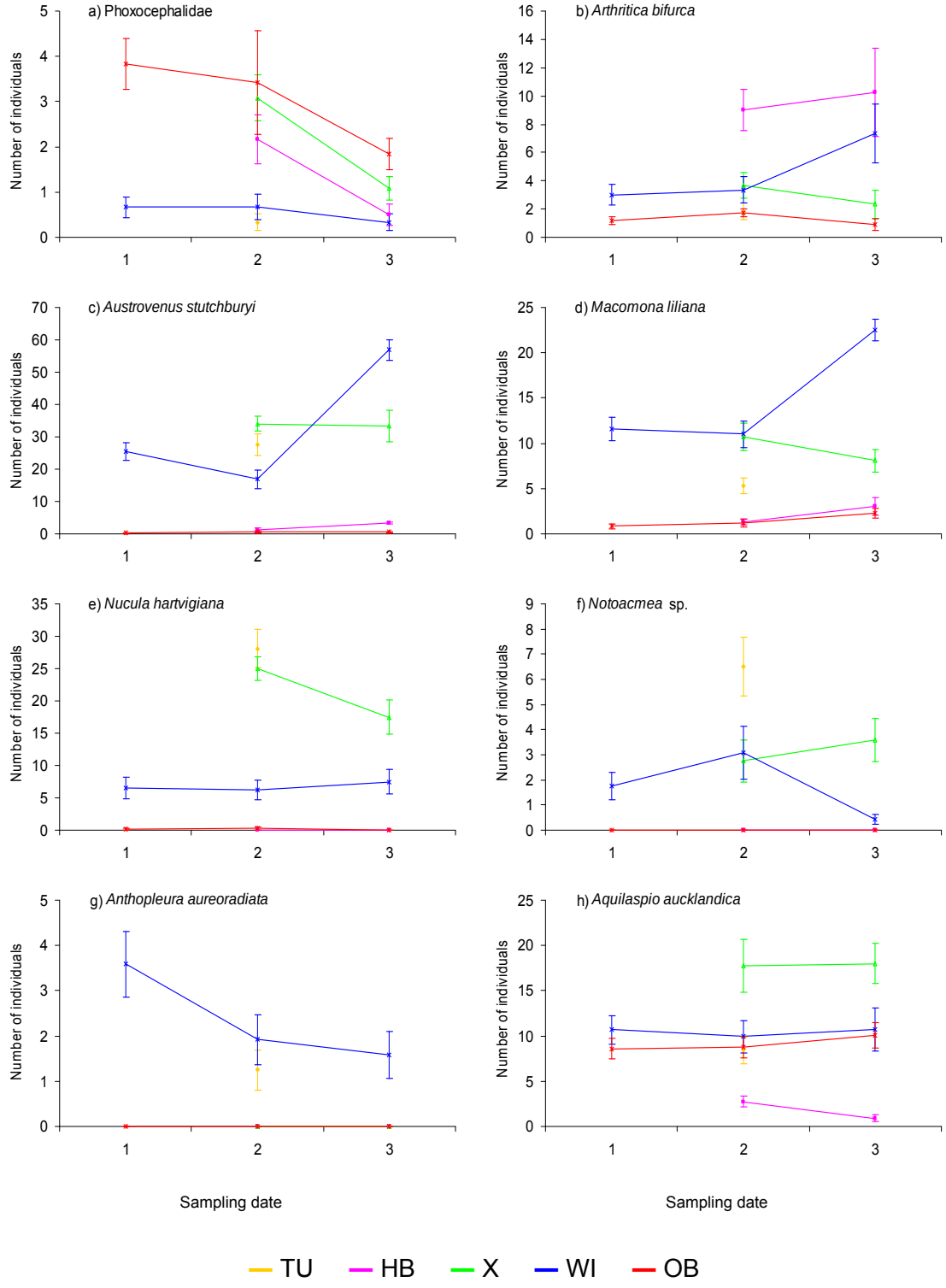

Figure 5: **The mean (± standard error) number of individuals per core at each monitoring site on each sampling date for selected taxa in Whaingaroa (Raglan) Harbour. Sampling dates: Jul 08 = 1, Oct 08 = 2, Apr 09 = 3. Note the different scales on the vertical axis. TU was not sampled in Apr 09 due to sampling being discontinued at this site.**

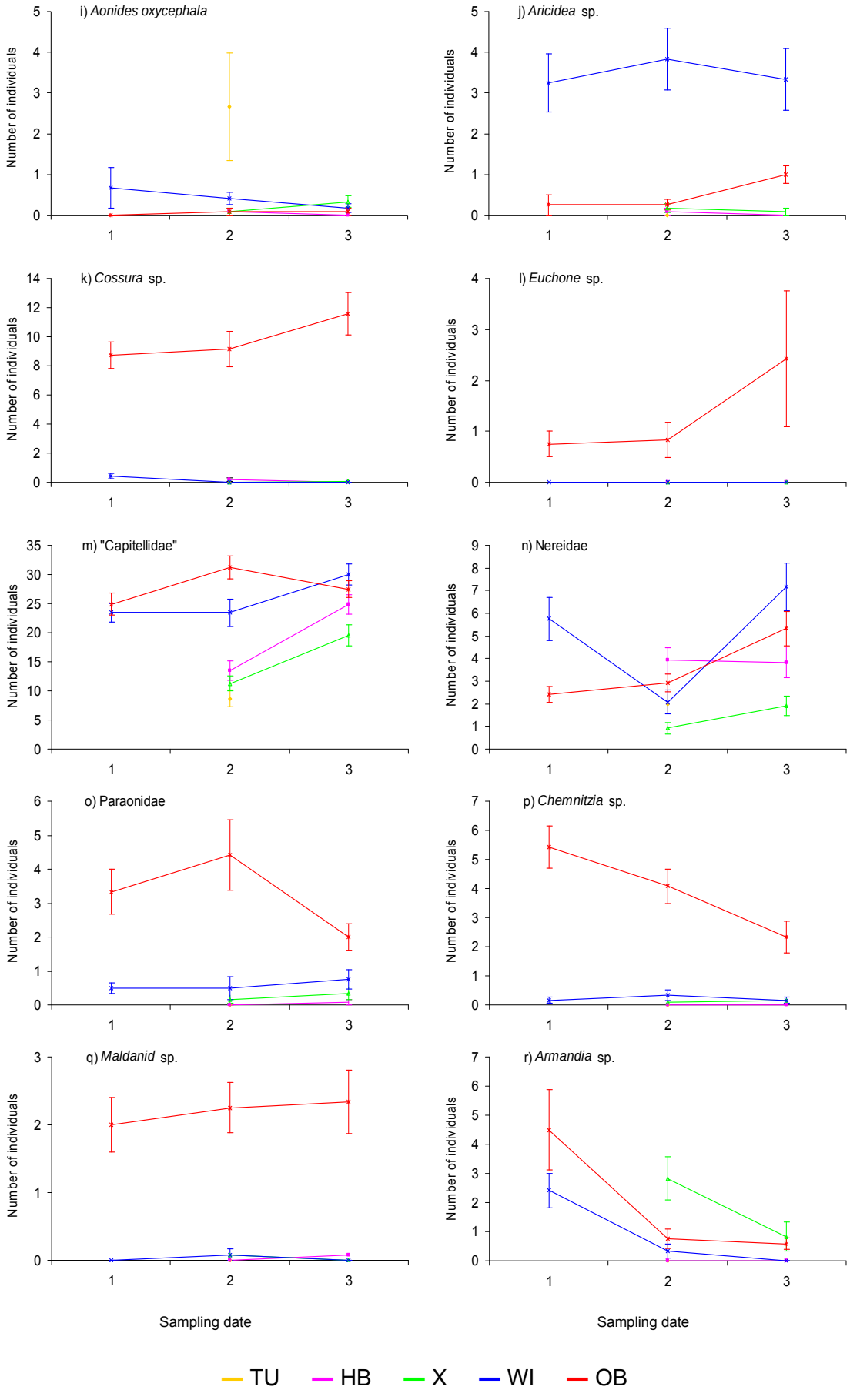

Figure 5. (cont.)

The highest abundance of phoxocephalid amphipods occurred at OB, where numbers showed a decline over the sampling periods. A decline in numbers was also found at HB and X (Figure 5a).

Abundance of indicator bivalves varied both temporally and spatially. *Arthritica bifurca* was present in highest numbers at HB which showed a slight increase in April 2009. A stronger increase in abundance occurred at WI in April 2009. The lower level of abundance at X and OB, remained relatively consistent over the study period (Figure 5b). Similar to the Firth of Thames, the majority of *A. bifurca* recorded from Raglan Harbour were <2 mm. The abundance of *Austrovenus stutchburyi* was high at WI, TU and X. At WI, numbers decreased in October 2008, followed by a strong increase in April 2009 (Figure 5c). At TU the abundance was very consistent. These patterns can be mainly attributed to a change in abundance of individuals <5 mm.

The abundance of *Macomona liliana* at site WI increased strongly between October 2008 and April 2009, compared to a decrease in numbers at X. A medium level of abundance was found at TU, with low numbers occurring at HB and OB (Figure 5d). The changes in numbers of *M. liliana* can mainly be attributed to changes in abundance of individuals <5 mm. High numbers of *Nucula hartvigiana* occurred at TU and X (Figure 5e). The abundance at X declined between October 2008 and April 2009 (this pattern was mainly caused by changes in numbers of the <2 mm size class). The lower numbers at WI remained very consistent over the sampling dates.

Notoacmea sp. (limpet) numbers were highest at TU in October 2008, with a lower abundance peaking in October 2008 at WI and in April 2009 at X (Figure 5f). The abundance of the anemone *Anthopleura aureoradiata* over the one year of sampling decreased at WI. Low numbers were found at TU in October 2008 (Figure 5g).

The abundance of polychaetes also varied over time and between sites. The abundance of *Aquilaspio aucklandica* was relatively consistent at most sites (apart from a small decline in numbers at HB). The numbers at X were high, WI, OB and TU medium, and at HB the abundance was low (Figure 5h). *Aonides oxycephala* had the highest number of individuals at TU in October 2008, however there was a large standard error associated with the mean. Very low numbers occurred at the other sites (Figure 5i). The polychaete *Aricidea* sp. was most abundant at WI, where numbers peaked slightly in October 2008. This species was present at low levels at OB, where numbers increased slightly in April 2009 (Figure 5j).

Cossura sp. were either absent or found in very low abundance at all sites, except for OB where the average numbers of individuals increased over the study period (Figure 5k). The abundance of the polychaete *Aricidea* sp. also increased at OB over the sampling dates (Figure 5l).

Capitellid polychaetes occurred in relatively high numbers at all sites, in particular WI and OB (Figure 5m). A peak in abundance occurred at OB in October 2008 and at WI in April 2009. Numbers also increased between October 2008 and April 2009 at HB and X. The lowest abundance was found at TU. The abundance of nereid polychaetes increased at WI, OB and X between October 2008 and April 2009 (Figure 5n), while numbers at HB were very consistent. Paraonid numbers at OB peaked in October 2008, followed by a decline in April 2009. Consistently low levels were found at all other sites (Figure 5o).

The abundance of three non-indicator taxa varied over the sampling dates. The gastropod, *Chemnitzia* sp. was most abundant at OB, where a steady decline in numbers occurred over the sampling dates (Figure 5p). The polychaete *Maldinid* sp. was also most abundant at OB, with numbers increasing slightly between July 2008 and April 2009 (Figure 5q). The abundance of another polychaete, *Armandia* sp., declined over the sampling dates at X, OB and WI (Figure 5r).

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 relatively consistent at sites KA and TP, and decreased at MI and KB over the study period (Figure 6a). The largest change occurred at GC with a large increase from an average of 265 µm in October 2008 to 410 µm in April 2009. The median grain size at all sites ranged from 109 to 265 µm.

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 MI between October 2008 (6%), and April 2009 (20%). An increase in mud content also occurred at KB over the study period, whereas a decrease occurred at GC. The proportion of mud in the sediment was relatively consistent at KA and TP (was lowest at this site).

3.3.1.2 Whaingaroa (Raglan) Harbour

The median grain size was highest at TU (141 µm) and X (124-132 µm), and lowest at HB (40-56 µm) (Figure 7a). At X and HB the grain size increased between October 2008 and April 2009, and remained relatively consistent at WI and OB, except for a small decrease at OB in October 2008. The median grain size at all sites ranged from 40 to 141 µm.

The proportion of mud varied considerably among sites. The highest proportion of mud occurred at HB (54–63%) and OB (36–44%) (Figure 7b). At WI there was a decrease in mud content in April 2009, and at OB there was a peak in October 2008. At X the proportion of mud was consistent over the study period.

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 increased slightly from 598 g $core^{-1}$ in October 2008 to 631 g $core^{-1}$ in April 2009 (Figure 6c). A decrease in shell-hash occurred at MI over the study period. Samples from all other sites contained substantially lower and relatively constant amounts of shell-hash (KB: 163-180 g $core^{-1}$, TP: 89-102 g $core^{-1}$ and KA: 80g $core^{-1}$). 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 (189-197 g $core^{-1}$) and HB (168-182 g $core^{-1}$), where a small increase occurred at both sites between October 2008 and April 2009 (Figure 7c). At WI the shell-hash increased from 115 g $core^{-1}$ in July 2008 to 171 g $core^{-1}$ in October 2008, followed by a decrease to 112 g $core^{-1}$ in April 2009. The least amount of shell-hash was found at OB, and 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 varied between sites (Figure 6d). At site MI, total organic carbon increased from 0.22% in October 2008 to 0.73% in April 2009. A slight increase also occurred at KB and GC over the study period, with a decrease occurring at KA. Consistently low levels were observed at TP.

The mean total nitrogen content over the study period decreased at KA and GC, and was generally consistent at KB, MI (apart from a decrease in October 2008) and TP.

Values ranged from to 0.03% to 0.09% (Figure 6e). Detailed results are provided in Appendix 4.

3.3.3.2 Whaingaroa (Raglan) Harbour

The mean levels of total organic carbon were highest at HB, where a decline occurred over the study period (0.86% in October 2008 to 0.69% in April 2009). A small decline also occurred at site X. At WI and OB levels peaked in October 2008 and stayed consistent in April 2009 (Figure 7d).

The mean total nitrogen content declined at HB, X, WI and OB over the study period, which the greatest decline occurring at HB. Values ranged from 0.03% to 0.17% (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 were clearly highest at GC, with values increasing from 36.34 µg g^{-1} in October 2008 to 44.52 µg g^{-1} in April 2009 (Figure 6f). Levels also increased over the study period at KB, MI and KA. In contrast to all other sites chlorophyll-*a* levels declined at TP.

Similar to chlorophyll-*a* levels, phaeophytin levels increased over the study period at GC, KB, MI and KA (Figure 6g). The greatest increase occurred at KB (from 4.70 µg g^{-1} in July 2008 to 20.15 µg g^{-1} in April 2009) and KA (from 8.87 µg g^{-1} in October 2008 to 16.94 µg g^{-1} in April 2009). Levels at TP were consistently low. Detailed results are provided in Appendix 5.

3.3.4.2 Whaingaroa (Raglan) Harbour

Mean chlorophyll-*a* levels were highest at sites TU (37.14 µg g^{-1}), HB (37.47 µg g^{-1}) and X (36.77 µg g^{-1}) in October 2008, with levels declining in April 2009 at HB and X (Figure 7f). The levels more than doubled between July 2008 and October 2008 at WI (from 11.42 µg g^{-1} to 24.89 µg g^{-1}) and OB (from 10.36 µg g^{-1} to 21.51 µg g^{-1}), and stayed consistent in April 2009.

Phaeophytin levels in Raglan Harbour declined sharply at site X from 11.05 µg g^{-1} in October 2008 to 5.09 µg g^{-1} in April 2009. In contrast levels at HB increased from 6.59 µg g^{-1} in October 2008 to 10.98 µg g^{-1} in April 2009 (Figure 7g). A similar pattern occurred at WI and OB, where levels declined between July 2008 and October 2008, followed by an increase again in April 2009. Detailed results are provided in Appendix 5.

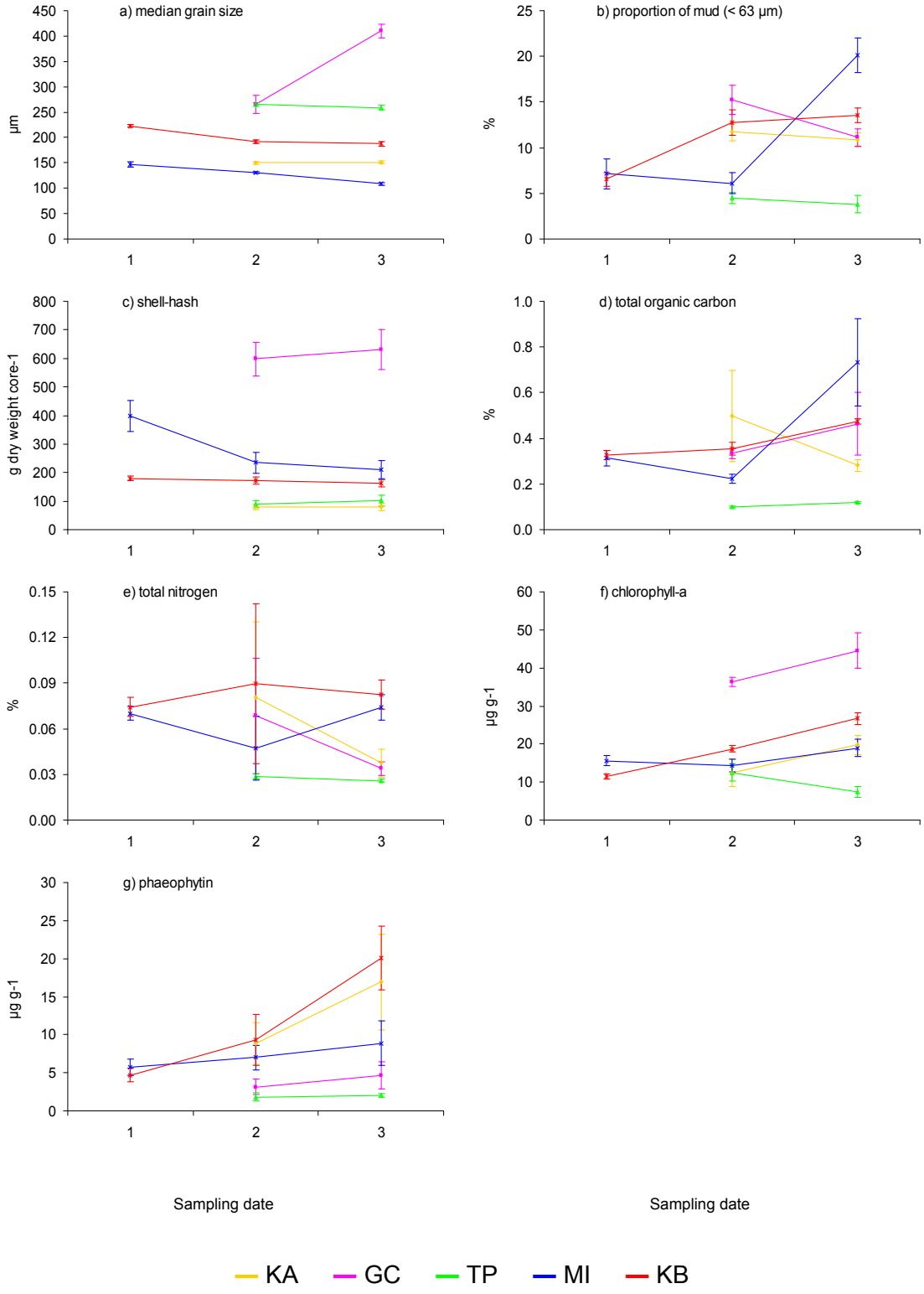

Figure 6: **Mean (± standard error) a) median grain-size, b) proportion of mud (< 63 µm), c) shell-hash dry weight, d) total organic carbon content, e) total nitrogen content, f) chlorophyll-*a* concentration and g) phaeophytin concentration of the sediment at the permanent monitoring sites in the southern Firth of Thames between July 2008 and April 2009. Sampling dates: Jul 08 = 1, Oct 08 = 2, Apr 09 = 3. Note the different scales on the vertical axis.**

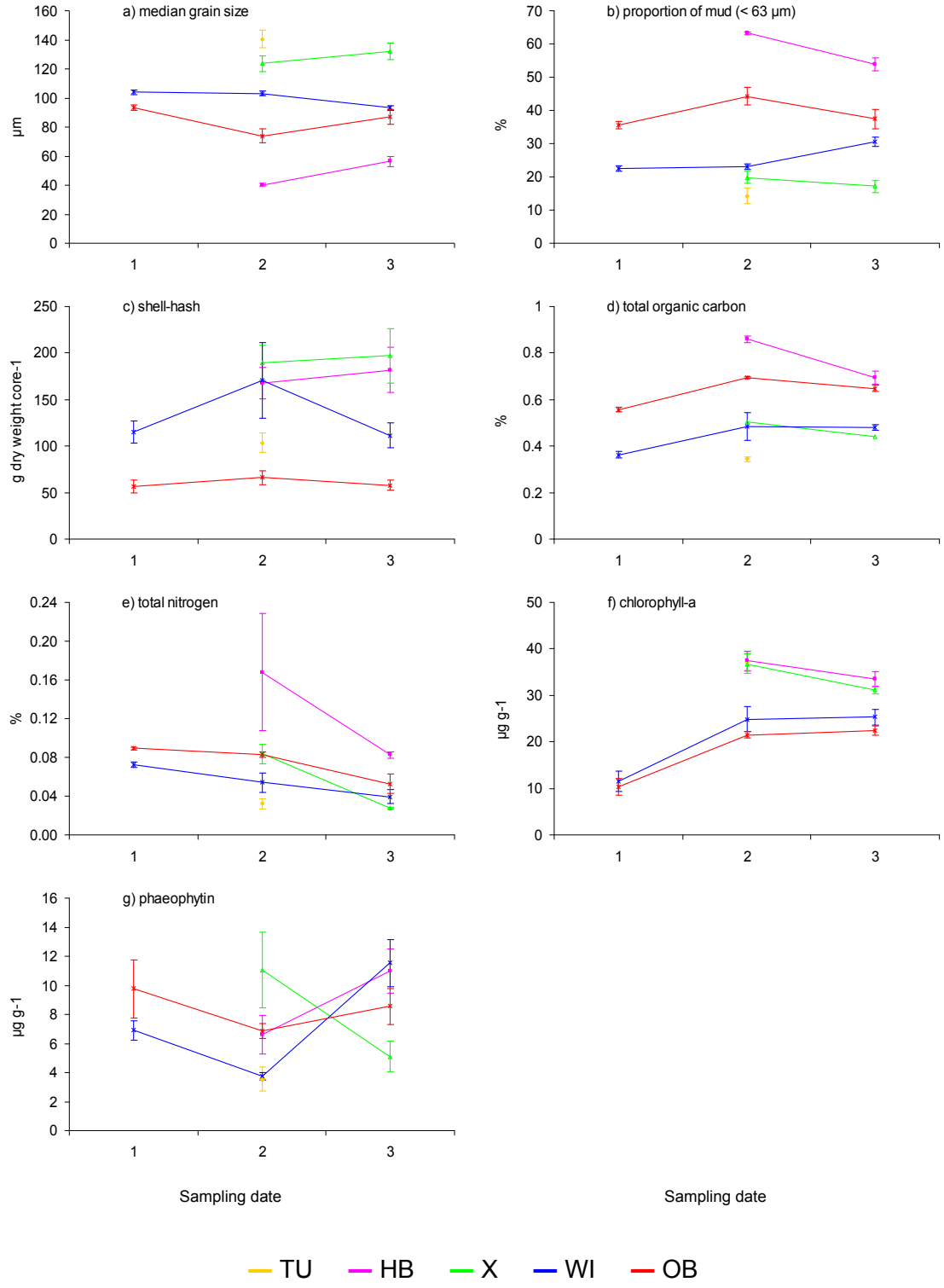

Figure 7: **Mean (± standard error) a) median grain-size, b) proportion of mud (< 63 µm), c) shell-hash dry weight, d) total organic carbon content, e) total nitrogen content, f) chlorophyll-*a* concentration and g) phaeophytin concentration of the sediment at the permanent monitoring sites in Whaingaroa Harbour between July 2008 and April 2009. Sampling dates: Jul 08 = 1, Oct 08 = 2, Apr 09 = 3. Note the different scales on the vertical axis. TU was not sampled in Apr 09 due to sampling being discontinued at this site.**

4 Discussion

This report documents the results of the Regional Estuary Monitoring Programme from July 2008 to April 2009. 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.

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
2010	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
2010	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 cylindrifer* 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 2008

	INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN
			1	2	3	4	5	6	7	8	9	10	11	12		
	AMPHIPODS															
ACOR	*Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
APHOX	*Phoxocephalidae*		2	6	4	4	8	3	2	9	7	2	11	5	63	5.3
	BIVALVES	**SIZE**														
BAB<2	*Arthritica bifurca*	<2	2	0	3	0	0	1	0	3	2	15	1	10	37	3.1
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	1	1	0.1
		Total	2	0	3	0	0	1	0	3	2	15	1	11	38	3.2
BAS<5	*Austrovenus stutchburyi*	<5	0	0	0	2	0	0	0	1	0	0	0	0	3	0.3
BAS>5		>5	0	1	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
		Total	0	1	0	2	0	0	0	1	0	0	0	0	4	0.3
BML<5	*Macamona liliana*	<5	0	0	1	0	2	1	2	0	0	2	4	0	12	1.0
BML5-15		5-15	0	0	0	0	0	0	0	0	1	0	0	0	1	0.1
BML>15		>15	0	1	1	0	1	1	0	0	0	0	0	0	4	0.3
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	1	2	0	3	2	2	0	1	2	4	0	17	1.4
BNH<2	*Nucula hartvigiana*	<2	78	30	22	46	55	126	101	136	112	37	105	44	892	74.3
BNH>2		>2	49	13	17	24	26	30	50	31	21	29	47	22	359	29.9
		Total	127	43	39	70	81	156	151	167	133	66	152	66	1251	104.3
BPA<5	*Paphies australis*	<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	*Theora lubrica*	<5	0	0	0	0	0	0	1	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	0	0	1	0	0	0	0	0	1	0.1
	CUMACEANS															
CCL	*Colurostylis lemurum*		0	2	0	0	0	0	0	1	1	0	1	0	5	0.4
	GASTROPODS															
GCA	*Cominella adspera*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE	*Notoacmea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	OTHER															
OAN	*Anthopleura aureoradiata*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	POLYCHAETES															
PAA	*Aquilaspio aucklandica*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAGL	*Aglaophamus* sp.		2	1	0	0	0	1	0	0	0	0	0	0	4	0.3
PAO	*Aonides oxycephala*		0	0	0	1	0	0	0	0	0	0	0	0	1	0.1
PAR	*Aricidea* sp.		0	1	1	0	0	0	1	0	0	0	0	2	5	0.4
PBOC	Pseudopolydora complex		7	12	3	2	5	2	3	5	4	1	5	0	49	4.1
PCOS	*Cossura* sp.		0	0	0	0	0	0	1	0	0	0	0	0	1	0.1
PEUC	*Euchone* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGE	*Goniada* sp.		1	0	0	1	1	2	0	2	0	0	0	5	12	1.0
PGLY	*Glycera* sp.		1	0	1	0	0	0	0	0	0	0	0	0	2	0.2
PHF	"Capitellidae"		42	113	119	176	51	79	47	179	221	71	304	60	1462	121.8
PMD	*Magelona dakini*		4	5	1	2	2	2	2	2	6	4	3	3	36	3.0
PNIC	Nereidae		2	1	2	0	0	0	0	1	2	3	0	2	13	1.1
POP	*Orbinia papillosa*		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
	NON INDICATOR SPECIES															
CAMPH	Amphipods		1	1	0	1	0	0	2	0	1	3	0	1	10	0.8
CCRAB	Crabs		0	1	0	0	1	1	1	0	1	0	1	0	6	0.5
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	1	0	0	0	0	0	1	0.1
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CSHR	Shrimps/Mysids		1	3	0	0	0	0	0	1	0	0	0	0	5	0.4
COTH	Other Crustaceans		1	0	1	0	2	1	2	0	0	0	0	1	8	0.7
BOTH	Bivalves		1	4	1	7	4	8	2	4	4	6	6	4	51	4.3
GOTH	Gastropods		0	2	3	2	1	0	1	1	5	2	4	2	23	1.9
EFEZ	*Fellaster zealandiae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
EHOL	Holuthurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
ONEM	Nemerteans		0	1	2	1	0	1	1	3	3	1	2	1	16	1.3
POTH	Polychaetes		0	2	1	0	2	3	1	1	0	0	1	1	12	1.0
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	*Edwardsia*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OTHER	Misc. Other		0	0	1	3	0	3	0	1	0	5	1	1	15	1.3
	TOTAL		**194**	**200**	**184**	**272**	**162**	**265**	**221**	**381**	**391**	**181**	**496**	**165**	**3112**	**259.3**

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	INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN
			1	2	3	4	5	6	7	8	9	10	11	12		
	AMPHIPODS															
ACOR	*Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
APHOX	*Phoxocephalidae*		2	7	1	0	2	1	6	6	0	2	1	2	**30**	**2.5**
	BIVALVES	**SIZE**														
BAB<2	*Arthritica bifurca*	<2	0	4	1	2	0	1	2	0	1	5	0	1	**17**	**1.4**
BAB>2		>2	0	0	1	0	0	0	0	0	0	1	0	0	**2**	**0.2**
		Total	0	4	2	2	0	1	2	0	1	6	0	1	**19**	**1.6**
BAS<5	*Austrovenus stutchburyi*	<5	0	2	3	2	1	0	0	4	2	5	2	3	**24**	**2.0**
BAS>5		>5	0	0	0	0	0	0	0	0	0	1	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	0	2	3	2	1	0	0	4	2	6	2	3	**25**	**2.1**
BML<5	*Macamona liliana*	<5	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
BML5-15		5-15	1	0	1	0	0	0	0	0	0	0	0	0	**2**	**0.2**
BML>15		>15	0	0	0	0	1	0	0	0	0	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	1	0	1	0	1	0	0	0	0	0	0	0	**3**	**0.3**
BNH<2	*Nucula hartvigiana*	<2	40	20	16	17	18	32	29	46	18	24	17	30	**307**	**25.6**
BNH>2		>2	176	116	110	91	167	154	94	198	151	85	128	160	**1630**	**135.8**
		Total	216	136	126	108	185	186	123	244	169	109	145	190	**1937**	**161.4**
BPA<5	*Paphies australis*	<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	*Theora lubrica*	<5	3	5	1	4	3	5	7	8	2	2	4	0	**44**	**3.7**
BTHL>5		>5	0	0	0	0	0	0	4	0	0	0	0	0	**4**	**0.3**
		Total	3	5	1	4	3	5	11	8	2	2	4	0	**48**	**4.0**
	CUMACEANS															
CCL	*Colurostylis lemurum*		0	0	3	2	0	1	0	1	0	1	0	3	**11**	**0.9**
	GASTROPODS															
GCA	*Cominella adspera*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
GNHE	*Notoacmea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
	OTHER															
OAN	*Anthopleura aureoradiata*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
	POLYCHAETES															
PAA	*Aquilaspio aucklandica*		0	0	0	0	0	0	0	0	0	1	0	0	**1**	**0.1**
PAGL	*Aglaophamus* sp.		1	2	0	0	1	0	1	0	0	1	0	0	**6**	**0.5**
PAO	*Aonides oxycephala*		0	0	1	0	0	0	0	0	0	0	0	0	**1**	**0.1**
PAR	*Aricidea* sp.		0	0	1	0	0	2	1	1	1	0	0	0	**6**	**0.5**
PBOC	Pseudopolydora complex		9	4	3	9	10	4	2	0	1	9	1	3	**55**	**4.6**
PCOS	*Cossura* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PEUC	*Euchone* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PGE	*Goniada* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PGLY	*Glycera* sp.		0	0	0	0	0	0	0	0	1	1	0	1	**3**	**0.3**
PHF	"Capitellidae"		16	37	4	21	16	29	42	30	12	33	20	10	**270**	**22.5**
PMD	*Magelona dakini*		0	0	0	2	0	1	1	1	2	2	2	1	**12**	**1.0**
PNIC	Nereidae		1	6	1	2	1	0	2	2	0	2	1	0	**18**	**1.5**
POP	*Orbinia papillosa*		1	0	0	0	0	0	0	0	0	0	0	0	**1**	**0.1**
PPAR	Paraonidae		1	0	0	0	1	0	0	0	0	1	0	0	**3**	**0.3**
	NON INDICATOR SPECIES															
CAMPH	Amphipods		0	0	1	0	0	0	0	0	1	0	1	1	**4**	**0.3**
CCRAB	Crabs		1	0	0	0	0	0	0	0	0	2	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	8	0	1	0	1	0	0	0	0	**11**	**0.9**
COST	Ostracods		0	0	0	0	0	1	0	0	0	0	0	0	**1**	**0.1**
CSHR	Shrimps/Mysids		1	1	1	0	0	0	0	0	1	0	1	0	**5**	**0.4**
COTH	Other Crustaceans		1	0	0	0	0	0	0	0	0	0	0	0	**1**	**0.1**
BOTH	Bivalves		3	9	5	6	7	8	12	1	5	7	3	5	**71**	**5.9**
GOTH	Gastropods		2	0	0	0	0	0	0	1	2	1	3	0	**9**	**0.8**
EFEZ	*Fellaster zealandiae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
EHOL	Holuthurians		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
ONEM	Nemerteans		0	0	1	0	1	0	2	1	0	2	1	0	**8**	**0.7**
POTH	Polychaetes		1	1	1	1	0	0	0	0	0	0	0	0	**4**	**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	*Edwardsia*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
OTHER	Misc. Other		0	0	0	3	0	3	1	0	0	1	0	0	**8**	**0.7**
	TOTAL		**260**	**214**	**157**	**170**	**229**	**243**	**206**	**301**	**200**	**189**	**185**	**220**	**2574**	**214.5**

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	INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN
			1	2	3	4	5	6	7	8	9	10	11	12		
	AMPHIPODS															
ACOR	*Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
APHOX	*Phoxocephalidae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
	BIVALVES	**SIZE**														
BAB<2	*Arthritica bifurca*	<2	1	1	0	0	2	2	1	2	1	0	0	0	**10**	**0.8**
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		Total	1	1	0	0	2	2	1	2	1	0	0	0	**10**	**0.8**
BAS<5	*Austrovenus stutchburyi*	<5	0	2	1	0	0	0	1	1	0	1	2	1	**9**	**0.8**
BAS>5		>5	0	0	0	1	0	0	0	0	0	1	0	0	**2**	**0.2**
BAS-COND		Cond.analysis	0	0	0	0	0	1	0	0	0	0	0	0	**1**	**0.1**
		Total	0	2	1	1	0	1	1	1	0	2	2	1	**12**	**1.0**
BML<5	*Macamona liliana*	<5	0	0	0	0	0	0	0	1	2	2	0	0	**5**	**0.4**
BML5-15		5-15	0	0	0	1	0	0	0	0	0	0	0	0	**1**	**0.1**
BML>15		>15	0	0	0	0	0	1	0	0	0	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	1	0	1	0	1	2	2	0	0	**7**	**0.6**
BNH<2	*Nucula hartvigiana*	<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	*Paphies australis*	<5	1	18	15	7	4	3	1	0	5	6	4	2	**66**	**5.5**
BPA5-15		5-15	0	2	4	0	0	0	0	0	0	0	0	0	**6**	**0.5**
BPA>15		>15	0	0	0	0	0	0	1	1	0	0	0	0	**2**	**0.2**
BPA-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		Total	1	20	19	7	4	3	2	1	5	6	4	2	**74**	**6.2**
BTHL<5	*Theora lubrica*	<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**
	CUMACEANS															
CCL	*Colurostylis lemurum*		0	0	10	7	0	8	7	1	5	2	6	2	**48**	**4.0**
	GASTROPODS															
GCA	*Cominella adspera*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
GNHE	*Notoacmea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
	OTHER															
OAN	*Anthopleura aureoradiata*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
	POLYCHAETES															
PAA	*Aquilaspio aucklandica*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PAGL	*Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PAO	*Aonides oxycephala*		145	218	156	216	165	110	101	206	190	250	199	205	**2161**	**180.1**
PAR	*Aricidea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PBOC	Pseudopolydora complex		0	0	0	1	1	0	0	0	0	0	1	0	**3**	**0.3**
PCOS	*Cossura* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PEUC	*Euchone* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PGE	*Goniada* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PGLY	*Glycera* sp.		0	0	0	1	0	0	0	0	0	0	0	0	**1**	**0.1**
PHF	"Capitellidae"		3	5	1	7	6	3	5	8	7	5	11	4	**65**	**5.4**
PMD	*Magelona dakini*		1	0	0	0	0	1	1	0	0	0	1	0	**4**	**0.3**
PNIC	Nereidae		2	1	0	1	9	2	5	3	3	3	4	0	**33**	**2.8**
POP	*Orbinia papillosa*		0	0	0	0	0	0	0	0	0	0	0	1	**1**	**0.1**
PPAR	Paraonidae		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
	NON INDICATOR SPECIES															
CAMPH	Amphipods		0	0	4	0	1	2	0	0	0	0	0	0	**7**	**0.6**
CCRAB	Crabs		3	0	0	0	3	4	3	2	1	1	0	0	**17**	**1.4**
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
CISO	Isopods		0	0	2	0	0	1	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		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
COTH	Other Crustaceans		0	0	0	0	0	2	0	0	0	0	0	4	**6**	**0.5**
BOTH	Bivalves		0	2	0	0	1	2	1	1	0	1	1	1	**10**	**0.8**
GOTH	Gastropods		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
EFEZ	*Fellaster zealandiae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
EHOL	Holuthurians		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
ONEM	Nemerteans		0	3	1	0	1	1	1	1	0	1	0	1	**10**	**0.8**
POTH	Polychaetes		7	2	7	8	8	11	7	18	5	2	10	8	**93**	**7.8**
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	*Edwardsia*		0	0	0	0	1	0	0	0	0	0	0	0	**1**	**0.1**
OTHER	Misc. Other		0	10	7	0	6	3	0	0	7	16	1	0	**50**	**4.2**
	TOTAL		**163**	**264**	**208**	**250**	**208**	**157**	**135**	**245**	**226**	**291**	**240**	**229**	**2616**	**218.0**

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INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN
		1	2	3	4	5	6	7	8	9	10	11	12		
AMPHIPODS															
Corophiidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Phoxocephalidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BIVALVES	**SIZE**														
Arthritica bifurca	<2	0	3	7	0	3	8	0	0	3	0	6	4	34	2.8
	>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	Total	0	3	7	0	3	8	0	0	3	0	6	4	34	2.8
Austrovenus stutchburyi	<5	2	0	3	1	3	2	3	1	1	0	0	0	16	1.3
	>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	Cond.analysis	0	0	0	1	0	0	0	0	0	0	0	0	1	0.1
	Total	2	0	3	2	3	2	3	1	1	0	0	0	17	1.4
Macamona liliana	<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	1	0	0	0	0	0	0	0	0	0	0	1	0.1
	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
Nucula hartvigiana	<2	0	0	0	0	0	0	0	0	0	0	0	2	2	0.2
	>2	0	0	0	0	0	0	1	0	0	0	0	2	3	0.3
	Total	0	0	0	0	0	0	1	0	0	0	0	4	5	0.4
Paphies australis	<5	5	1	1	0	4	3	1	1	2	4	0	2	24	2.0
	5-15	15	3	7	3	16	12	13	11	2	16	3	18	119	9.9
	>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	20	4	8	3	20	15	14	12	4	20	3	20	143	11.9
Theora lubrica	<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
CUMACEANS															
Colurostylis lemurum		37	24	6	6	13	18	35	18	16	3	13	29	218	18.2
GASTROPODS															
Cominella adspera		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Notoacmea sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OTHER															
Anthopleura aureoradiata		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
POLYCHAETES															
Aquilaspio aucklandica		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Aglaophamus sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Aonides oxycephala		175	129	156	237	262	186	130	85	325	272	262	227	2446	203.8
Aricidea sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Pseudopolydora complex		0	0	0	0	0	0	0	1	1	0	0	0	2	0.2
Cossura sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Euchone sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Goniada sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Glycera sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
"Capitellidae"		5	2	2	4	6	5	8	8	2	2	10	1	55	4.6
Magelona dakini		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Nereidae		1	3	2	2	1	2	6	6	1	2	3	2	31	2.6
Orbinia papillosa		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Paraonidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
NON INDICATOR SPECIES															
Amphipods		0	0	0	0	0	0	0	0	1	0	0	0	1	0.1
Crabs		0	0	2	1	0	0	0	0	0	0	0	1	4	0.3
Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Isopods		6	9	13	4	5	4	0	8	5	7	6	14	81	6.8
Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Shrimps/Mysids		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Other Crustaceans		0	0	0	0	0	0	0	0	0	2	0	0	2	0.2
Bivalves		1	0	4	3	1	1	3	25	4	16	5	9	72	6.0
Gastropods		0	0	0	0	0	0	0	0	1	0	1	0	2	0.2
Fellaster zealandiae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Holuthurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Nemerteans		0	0	0	0	1	0	2	0	0	1	1	0	5	0.4
Polychaetes		1	7	7	5	9	11	7	4	0	17	8	16	92	7.7
Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Edwardsia		0	0	0	0	0	0	0	2	0	0	0	0	2	0.2
Misc. Other		0	0	0	0	0	0	0	0	10	35	0	3	48	4.0
TOTAL		248	182	210	267	324	252	209	170	374	377	318	330	3261	271.8

TP October 2008

INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN
		1	2	3	4	5	6	7	8	9	10	11	12		
AMPHIPODS															
Corophiidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Phoxocephalidae		0	0	0	0	0	0	0	0	0	0	0	5	5	0.4
BIVALVES	**SIZE**														
Arthritica bifurca	<2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	>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
Austrovenus stutchburyi	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	>5	0	0	0	1	0	2	0	1	0	0	0	1	5	0.4
	Cond.analysis	0	1	0	0	0	0	0	0	0	0	0	0	1	0.1
	Total	0	1	0	1	0	2	0	1	0	0	0	1	6	0.5
Macamona liliana	<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
Nucula hartvigiana	<2	0	1	0	2	0	0	2	0	0	0	0	0	5	0.4
	>2	3	7	0	3	8	7	8	18	6	11	2	14	87	7.3
	Total	3	8	0	5	8	7	10	18	6	11	2	14	92	7.7
Paphies australis	<5	0	0	0	0	0	1	0	0	0	0	0	0	1	0.1
	5-15	0	0	0	0	0	0	0	0	2	0	0	0	2	0.2
	>15	0	0	0	0	0	1	0	0	0	0	0	0	1	0.1
	Cond.analysis	5	2	0	0	7	3	11	9	3	2	0	13	55	4.6
	Total	5	2	0	0	7	5	11	9	5	2	0	13	59	4.9
Theora lubrica	<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
CUMACEANS															
Colurostylis lemurum		0	1	0	0	0	0	0	0	2	0	0	0	3	0.3
GASTROPODS															
Cominella adspera		1	0	0	0	0	0	0	0	0	0	1	0	2	0.2
Notoacmea sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OTHER															
Anthopleura aureoradiata		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
POLYCHAETES															
Aquilaspio aucklandica		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Aglaophamus sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Aonides oxycephala		0	0	0	0	0	0	0	0	1	1	0	0	2	0.2
Aricidea sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Pseudopolydora complex		1	1	1	0	0	3	0	0	0	0	0	2	8	0.7
Cossura sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Euchone sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Goniada sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Glycera sp.		0	1	0	0	0	0	0	0	0	0	0	0	1	0.1
"Capitellidae"		1	3	6	2	3	0	0	3	2	2	4	3	29	2.4
Magelona dakini		0	0	1	1	2	0	1	0	1	0	0	0	6	0.5
Nereidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Orbinia papillosa		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Paraonidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
NON INDICATOR SPECIES															
Amphipods		0	2	1	0	0	0	0	0	0	0	0	0	3	0.3
Crabs		0	0	0	0	0	0	0	0	0	1	0	1	2	0.2
Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Isopods		0	0	0	0	0	0	0	0	0	1	0	0	1	0.1
Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Shrimps/Mysids		0	0	0	0	1	0	0	0	0	0	1	2	4	0.3
Other Crustaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Bivalves		0	2	0	1	1	0	1	0	1	1	2	0	9	0.8
Gastropods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Fellaster zealandiae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Holuthurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Nemerteans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Polychaetes		1	18	7	5	2	2	0	3	2	1	0	2	43	3.6
Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Edwardsia		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Misc. Other		0	0	0	0	0	0	1	0	0	0	0	0	1	0.1
TOTAL		12	39	16	15	24	19	24	34	20	20	10	43	276	23.0

TP April 2009

	INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN
			1	2	3	4	5	6	7	8	9	10	11	12		
	AMPHIPODS															
ACOR	*Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
APHOX	*Phoxocephalidae*		0	0	0	0	0	0	0	0	0	0	0	2	2	0.2
	BIVALVES	**SIZE**														
BAB<2	*Arthritica bifurca*	<2	0	0	0	0	0	1	0	0	1	0	0	0	2	0.2
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	1	0	0	1	0	0	0	2	0.2
BAS<5	*Austrovenus stutchburyi*	<5	1	0	6	4	2	0	0	0	1	5	0	1	20	1.7
BAS>5		>5	0	1	2	0	0	0	0	0	4	3	0	0	10	0.8
BAS-COND		Cond.analysis	0	0	0	0	0	0	0	0	1	0	0	0	1	0.1
		Total	1	1	8	4	2	0	0	0	6	8	0	1	31	2.6
BML<5	*Macamona liliana*	<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	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	0	0	0	0	0	0.0
BNH<2	*Nucula hartvigiana*	<2	2	2	13	12	7	4	2	5	5	6	0	1	59	4.9
BNH>2		>2	9	8	9	10	6	5	11	14	10	10	2	17	111	9.3
		Total	11	10	22	22	13	9	13	19	15	16	2	18	170	14.2
BPA<5	*Paphies australis*	<5	0	0	0	4	0	0	0	0	0	0	0	0	4	0.3
BPA5-15		5-15	0	0	0	0	0	0	0	0	0	1	0	0	1	0.1
BPA>15		>15	1	0	0	0	1	0	1	0	0	0	0	0	3	0.3
BPA-COND		Cond.analysis	8	3	1	0	4	0	15	6	2	0	0	3	42	3.5
		Total	9	3	1	4	5	0	16	6	2	1	0	3	50	4.2
BTHL<5	*Theora lubrica*	<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
	CUMACEANS															
CCL	*Colurostylis lemurum*		1	0	0	0	0	0	1	0	0	2	2	0	6	0.5
	GASTROPODS															
GCA	*Cominella adspera*		0	0	0	0	0	1	0	0	0	0	1	0	2	0.2
GNHE	*Notoacmea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	OTHER															
OAN	*Anthopleura aureoradiata*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	POLYCHAETES															
PAA	*Aquilaspio aucklandica*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAGL	*Aglaophamus* sp.		3	0	0	1	0	0	0	1	0	0	1	0	6	0.5
PAO	*Aonides oxycephala*		0	3	2	2	0	0	0	0	0	9	1	3	20	1.7
PAR	*Aricidea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PBOC	Pseudopolydora complex		0	4	1	0	1	1	2	3	1	0	0	1	14	1.2
PCOS	*Cossura* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PEUC	*Euchone* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGE	*Goniada* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGLY	*Glycera* sp.		0	0	0	0	0	0	0	0	1	0	0	0	1	0.1
PHF	"Capitellidae"		0	3	0	2	0	6	4	1	1	2	2	5	26	2.2
PMD	*Magelona dakini*		0	0	0	0	0	0	0	0	0	0	2	0	2	0.2
PNIC	Nereidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
POP	*Orbinia papillosa*		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
	NON INDICATOR SPECIES															
CAMPH	Amphipods		0	0	0	0	0	0	0	0	1	0	1	0	2	0.2
CCRAB	Crabs		0	0	0	0	0	0	1	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	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	1	0	0	0	0	1	0	1	0	3	0.3
COTH	Other Crustaceans		0	0	0	0	1	0	0	0	0	0	0	0	1	0.1
BOTH	Bivalves		0	1	2	2	4	0	2	0	0	2	0	0	13	1.1
GOTH	Gastropods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
EFEZ	*Fellaster zealandiae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
EHOL	Holuthurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
ONEM	Nemerteans		0	0	0	0	0	1	0	0	0	0	0	0	1	0.1
POTH	Polychaetes		0	12	1	3	5	5	2	2	2	1	1	2	36	3.0
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	*Edwardsia*		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
	TOTAL		25	37	37	41	31	24	41	32	31	41	14	35	389	32.4

MI July 2008

	INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN
			1	2	3	4	5	6	7	8	9	10	11	12		
	AMPHIPODS															
ACOR	*Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
APHOX	*Phoxocephalidae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	BIVALVES	**SIZE**														
BAB<2	*Arthritica bifurca*	<2	2	0	0	0	1	2	0	0	2	0	0	1	8	0.7
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	2	0	0	0	1	2	0	0	2	0	0	1	8	0.7
BAS<5	*Austrovenus stutchburyi*	<5	1	2	1	0	0	0	0	0	1	0	3	1	9	0.8
BAS>5		>5	0	0	0	0	0	2	1	0	0	0	0	1	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	1	0	0	2	1	0	1	0	3	2	13	1.1
BML<5	*Macamona liliana*	<5	0	0	0	0	1	1	0	3	0	0	0	1	6	0.5
BML5-15		5-15	0	1	0	0	0	1	0	0	0	0	0	1	3	0.3
BML>15		>15	0	0	0	0	0	0	0	0	0	1	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	1	0	0	1	2	0	3	0	1	0	2	10	0.8
BNH<2	*Nucula hartvigiana*	<2	0	0	0	1	0	0	1	2	0	2	0	2	8	0.7
BNH>2		>2	2	2	0	1	1	0	0	0	2	1	0	0	9	0.8
		Total	2	2	0	2	1	0	1	2	2	3	0	2	17	1.4
BPA<5	*Paphies australis*	<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	*Theora lubrica*	<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
	CUMACEANS															
CCL	*Colurostylis lemurum*		12	11	9	3	4	0	2	2	4	2	0	9	58	4.8
	GASTROPODS															
GCA	*Cominella adspera*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE	*Notoacmea* sp.		0	1	1	0	0	0	0	0	0	0	0	0	2	0.2
	OTHER															
OAN	*Anthopleura aureoradiata*		0	0	0	0	0	0	0	1	0	0	0	0	1	0.1
	POLYCHAETES															
PAA	*Aquilaspio aucklandica*		1	4	5	7	9	14	7	9	27	8	4	6	101	8.4
PAGL	*Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	*Aonides oxycephala*		17	31	21	28	36	7	26	54	23	34	24	3	304	25.3
PAR	*Aricidea* sp.		0	0	0	0	0	0	0	0	1	0	0	0	1	0.1
PBOC	Pseudopolydora complex		2	5	5	6	28	5	5	14	10	3	1	2	86	7.2
PCOS	*Cossura* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PEUC	*Euchone* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGE	*Goniada* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGLY	*Glycera* sp.		0	1	0	0	0	0	1	0	0	1	0	0	3	0.3
PHF	"Capitellidae"		4	6	2	10	14	47	40	10	6	10	2	47	198	16.5
PMD	*Magelona dakini*		0	0	0	1	1	1	3	0	0	0	1	2	9	0.8
PNIC	Nereidae		4	2	2	6	1	8	5	1	2	5	5	5	46	3.8
POP	*Orbinia papillosa*		7	8	20	12	4	4	4	12	11	10	2	1	95	7.9
PPAR	Paraonidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	NON INDICATOR SPECIES															
CAMPH	Amphipods		3	5	3	0	2	0	5	2	2	2	0	10	34	2.8
CCRAB	Crabs		1	0	0	0	0	2	3	0	0	0	0	0	6	0.5
CCUM	Cumaceans		0	0	0	0	0	0	0	0	1	0	0	0	1	0.1
CISO	Isopods		3	1	0	0	2	1	1	5	1	0	4	0	18	1.5
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CSHR	Shrimps/Mysids		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
COTH	Other Crustaceans		0	45	154	100	0	0	0	92	424	243	2	0	1060	88.3
BOTH	Bivalves		1	0	1	0	2	1	5	0	1	1	0	3	15	1.3
GOTH	Gastropods		0	0	1	1	1	0	0	0	0	0	0	0	3	0.3
EFEZ	*Fellaster zealandiae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
EHOL	Holuthurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
ONEM	Nemerteans		0	0	0	5	4	2	2	3	3	0	1	2	22	1.8
POTH	Polychaetes		2	4	85	3	7	7	1	14	9	5	0	3	140	11.7
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OFLAT	Flatworms		0	0	1	0	0	0	0	0	1	0	0	0	2	0.2
OEDW	*Edwardsia*		0	0	0	0	0	0	0	0	1	0	0	0	1	0.1
OTHER	Misc. Other		0	0	0	3	0	0	0	0	0	1	0	3	7	0.6
	TOTAL		62	129	311	187	118	105	112	224	532	329	49	103	2261	188.4

MI October 2008

	INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN
			1	2	3	4	5	6	7	8	9	10	11	12		
	AMPHIPODS															
ACOR	*Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
APHOX	*Phoxocephalidae*		0	0	0	0	0	0	0	1	0	0	0	0	**1**	**0.1**
	BIVALVES	**SIZE**														
BAB<2	*Arthritica bifurca*	<2	1	2	2	0	2	2	2	6	3	0	4	6	**30**	**2.5**
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	1	0	**1**	**0.1**
		Total	1	2	2	0	2	2	2	6	3	0	5	6	**31**	**2.6**
BAS<5	*Austrovenus stutchburyi*	<5	0	1	3	2	1	4	3	2	0	0	0	1	**17**	**1.4**
BAS>5		>5	0	0	1	1	0	1	1	1	1	0	3	0	**9**	**0.8**
BAS-COND		Cond.analysis	0	0	0	0	0	0	0	2	0	0	0	0	**2**	**0.2**
		Total	0	1	4	3	1	5	4	5	1	0	3	1	**28**	**2.3**
BML<5	*Macamona liliana*	<5	1	0	0	0	2	0	3	1	0	0	2	0	**9**	**0.8**
BML5-15		5-15	1	0	0	0	1	0	0	0	0	0	0	1	**3**	**0.3**
BML>15		>15	2	1	1	0	1	0	0	0	0	0	0	0	**5**	**0.4**
BML-COND		Cond.analysis	0	0	1	0	0	0	0	0	0	0	0	0	**1**	**0.1**
		Total	4	1	2	0	4	0	3	1	0	0	2	1	**18**	**1.5**
BNH<2	*Nucula hartvigiana*	<2	0	0	0	0	1	0	0	0	0	0	1	0	**2**	**0.2**
BNH>2		>2	1	0	1	2	0	0	0	0	0	0	0	0	**4**	**0.3**
		Total	1	0	1	2	1	0	0	0	0	0	1	0	**6**	**0.5**
BPA<5	*Paphies australis*	<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	*Theora lubrica*	<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**
	CUMACEANS															
CCL	*Colurostylis lemurum*		3	0	1	1	3	2	2	0	3	3	3	4	**25**	**2.1**
	GASTROPODS															
GCA	*Cominella adspera*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
GNHE	*Notoacmea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
	OTHER															
OAN	*Anthopleura aureoradiata*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
	POLYCHAETES															
PAA	*Aquilaspio aucklandica*		14	11	16	24	24	9	5	2	22	13	31	11	**182**	**15.2**
PAGL	*Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PAO	*Aonides oxycephala*		12	37	3	24	71	15	2	9	23	42	35	5	**278**	**23.2**
PAR	*Aricidea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PBOC	Pseudopolydora complex		2	3	0	4	0	1	0	1	0	2	1	2	**16**	**1.3**
PCOS	*Cossura* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PEUC	*Euchone* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PGE	*Goniada* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PGLY	*Glycera* sp.		0	0	0	0	2	0	0	0	0	0	0	0	**2**	**0.2**
PHF	"Capitellidae"		19	13	33	17	17	35	89	29	28	12	37	32	**361**	**30.1**
PMD	*Magelona dakini*		0	0	2	0	0	0	3	0	1	0	1	2	**9**	**0.8**
PNIC	Nereidae		1	3	3	1	5	6	3	2	3	1	10	4	**42**	**3.5**
POP	*Orbinia papillosa*		3	1	2	1	7	14	7	9	2	3	2	8	**59**	**4.9**
PPAR	Paraonidae		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
	NON INDICATOR SPECIES															
CAMPH	Amphipods		0	0	0	1	1	0	0	1	4	3	1	0	**11**	**0.9**
CCRAB	Crabs		1	2	2	0	1	1	0	0	3	1	1	1	**13**	**1.1**
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
CISO	Isopods		0	1	0	1	1	0	0	0	0	0	2	2	**7**	**0.6**
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	0	0	0	0	0	2	**3**	**0.3**
COTH	Other Crustaceans		0	1	1	0	6	0	0	1	0	0	0	0	**9**	**0.8**
BOTH	Bivalves		2	1	1	0	1	1	2	0	0	1	0	2	**11**	**0.9**
GOTH	Gastropods		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
EFEZ	*Fellaster zealandiae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
EHOL	Holuthurians		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
ONEM	Nemerteans		2	2	1	3	5	0	5	4	0	1	1	3	**27**	**2.3**
POTH	Polychaetes		20	0	2	19	5	2	5	10	0	2	10	4	**79**	**6.6**
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	*Edwardsia*		0	1	0	0	1	0	0	0	0	0	0	0	**2**	**0.2**
OTHER	Misc. Other		0	1	0	0	0	0	0	0	0	0	0	1	**2**	**0.2**
	TOTAL		**86**	**81**	**76**	**101**	**158**	**93**	**132**	**81**	**93**	**84**	**146**	**91**	**1222**	**101.8**

MI April 2009

	INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN
			1	2	3	4	5	6	7	8	9	10	11	12		
	AMPHIPODS															
ACOR	*Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
APHOX	*Phoxocephalidae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
	BIVALVES	**SIZE**														
BAB<2	*Arthritica bifurca*	<2	0	0	0	0	0	0	0	0	6	0	1	0	**7**	**0.6**
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	6	0	1	0	**7**	**0.6**
BAS<5	*Austrovenus stutchburyi*	<5	5	7	1	0	4	5	7	6	10	4	9	6	**64**	**5.3**
BAS>5		>5	2	1	1	0	0	0	3	1	3	1	3	2	**17**	**1.4**
BAS-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		Total	7	8	2	0	4	5	10	7	13	5	12	8	**81**	**6.8**
BML<5	*Macamona liliana*	<5	1	0	0	0	0	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	1	**1**	**0.1**
BML>15		>15	0	0	1	0	0	1	0	0	0	0	2	0	**4**	**0.3**
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		Total	1	0	1	0	0	1	0	0	0	0	2	1	**6**	**0.5**
BNH<2	*Nucula hartvigiana*	<2	0	0	0	0	0	0	0	0	0	1	0	0	**1**	**0.1**
BNH>2		>2	0	0	0	5	0	0	4	0	1	1	0	1	**12**	**1.0**
		Total	0	0	0	5	0	0	4	0	1	2	0	1	**13**	**1.1**
BPA<5	*Paphies australis*	<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	*Theora lubrica*	<5	2	0	0	0	2	0	0	6	1	0	7	2	**20**	**1.7**
BTHL>5		>5	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		Total	2	0	0	0	2	0	0	6	1	0	7	2	**20**	**1.7**
	CUMACEANS															
CCL	*Colurostylis lemurum*		8	3	5	8	7	3	1	3	8	3	3	11	**63**	**5.3**
	GASTROPODS															
GCA	*Cominella adspera*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
GNHE	*Notoacmea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
	OTHER															
OAN	*Anthopleura aureoradiata*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
	POLYCHAETES															
PAA	*Aquilaspio aucklandica*		0	1	6	6	0	0	0	0	6	1	0	1	**21**	**1.8**
PAGL	*Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PAO	*Aonides oxycephala*		8	5	20	27	7	2	0	6	20	12	6	6	**119**	**9.9**
PAR	*Aricidea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PBOC	Pseudopolydora complex		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PCOS	*Cossura* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PEUC	*Euchone* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PGE	*Goniada* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PGLY	*Glycera* sp.		0	0	0	0	0	0	0	0	0	1	0	0	**1**	**0.1**
PHF	"Capitellidae"		6	23	11	7	17	41	13	13	12	10	22	20	**195**	**16.3**
PMD	*Magelona dakini*		1	0	0	0	0	0	0	1	0	0	1	1	**4**	**0.3**
PNIC	Nereidae		9	4	9	7	8	11	5	11	9	5	8	4	**90**	**7.5**
POP	*Orbinia papillosa*		0	0	0	0	0	0	1	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**
	NON INDICATOR SPECIES						.									
CAMPH	Amphipods		1	0	0	0	1	0	0	0	0	0	0	1	**3**	**0.3**
CCRAB	Crabs		4	1	1	1	3	2	0	2	0	2	0	0	**16**	**1.3**
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
CISO	Isopods		0	0	10	2	2	0	1	0	4	3	0	0	**22**	**1.8**
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
CSHR	Shrimps/Mysids		0	0	0	0	2	0	0	0	0	0	0	0	**2**	**0.2**
COTH	Other Crustaceans		1	0	4	5	0	0	0	0	0	0	1	0	**11**	**0.9**
BOTH	Bivalves		3	3	1	1	1	1	2	2	1	0	4	3	**22**	**1.8**
GOTH	Gastropods		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
EFEZ	*Fellaster zealandiae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
EHOL	Holuthurians		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
ONEM	Nemerteans		2	3	3	1	1	4	2	1	1	0	2	1	**21**	**1.8**
POTH	Polychaetes		2	0	19	8	0	0	3	1	3	1	3	2	**42**	**3.5**
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	*Edwardsia*		0	1	0	0	0	1	2	0	0	0	0	0	**4**	**0.3**
OTHER	Misc. Other		0	0	0	1	0	0	0	0	0	0	0	0	**1**	**0.1**
	TOTAL		**55**	**52**	**92**	**79**	**55**	**71**	**44**	**53**	**85**	**45**	**72**	**62**	**765**	**63.8**

KB July 2008

INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN
		1	2	3	4	5	6	7	8	9	10	11	12		
AMPHIPODS															
Corophiidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Phoxocephalidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BIVALVES	**SIZE**														
Arthritica bifurca	<2	0	2	0	7	1	1	1	1	1	0	9	2	25	2.1
	>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	Total	0	2	0	7	1	1	1	1	1	0	9	2	25	2.1
Austrovenus stutchburyi	<5	0	0	0	0	0	1	0	0	0	0	0	0	1	0.1
	>5	2	4	2	4	2	8	8	0	6	2	5	7	50	4.2
	Cond.analysis	0	0	1	0	0	0	0	0	0	2	0	0	3	0.3
	Total	2	4	3	4	2	9	8	0	6	4	5	7	54	4.5
Macamona liliana	<5	0	0	0	0	0	0	0	0	1	0	0	0	1	0.1
	5-15	0	1	0	0	2	0	0	0	1	1	0	0	5	0.4
	>15	0	0	0	0	0	0	1	0	0	0	1	0	2	0.2
	Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	Total	0	1	0	0	2	0	1	0	2	1	1	0	8	0.7
Nucula hartvigiana	<2	0	0	0	0	1	0	0	0	0	0	0	0	1	0.1
	>2	0	0	0	0	0	0	0	0	0	1	0	1	2	0.2
	Total	0	0	0	0	1	0	0	0	0	1	0	1	3	0.3
Paphies australis	<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
Theora lubrica	<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
CUMACEANS															
Colurostylis lemurum		0	0	1	1	0	1	2	0	1	0	1	1	8	0.7
GASTROPODS															
Cominella adspera		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Notoacmea sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OTHER															
Anthopleura aureoradiata		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
POLYCHAETES															
Aquilaspio aucklandica		0	0	0	2	5	0	0	1	1	0	0	0	9	0.8
Aglaophamus sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Aonides oxycephala		3	0	0	0	1	0	1	1	0	0	0	0	6	0.5
Aricidea sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Pseudopolydora complex		0	2	2	5	1	2	1	7	1	1	3	3	28	2.3
Cossura sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Euchone sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Goniada sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Glycera sp.		0	0	0	0	0	0	0	0	1	1	0	0	2	0.2
"Capitellidae"		25	27	60	30	16	26	15	9	14	10	10	6	248	20.7
Magelona dakini		1	6	5	3	2	1	0	0	2	5	2	0	27	2.3
Nereidae		1	0	0	0	0	2	0	1	2	0	2	1	9	0.8
Orbinia papillosa		1	0	0	0	0	0	0	0	0	0	0	0	1	0.1
Paraonidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
NON INDICATOR SPECIES															
Amphipods		0	0	0	0	1	0	0	1	0	0	0	0	2	0.2
Crabs		1	1	0	0	0	0	0	0	1	0	0	0	3	0.3
Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Isopods		0	1	0	2	2	2	0	1	0	1	1	1	11	0.9
Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Shrimps/Mysids		0	0	0	0	0	0	0	0	1	0	0	0	1	0.1
Other Crustaceans		0	2	0	1	1	0	0	0	0	0	0	0	4	0.3
Bivalves		0	0	1	0	0	2	2	0	0	0	0	0	5	0.4
Gastropods		0	0	1	1	0	0	2	1	0	0	1	0	6	0.5
Fellaster zealandiae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Holuthurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Nemerteans		1	1	0	0	2	0	0	0	0	0	2	0	6	0.5
Polychaetes		0	0	0	0	1	0	0	0	1	1	0	0	3	0.3
Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Edwardsia		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Misc. Other		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
TOTAL		**35**	**47**	**73**	**56**	**38**	**46**	**33**	**23**	**34**	**25**	**37**	**22**	**469**	**39.1**

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INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN
		1	2	3	4	5	6	7	8	9	10	11	12		
AMPHIPODS															
Corophiidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Phoxocephalidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BIVALVES	**SIZE**														
Arthritica bifurca	<2	3	4	2	1	0	3	1	1	2	0	2	0	19	1.6
	>2	0	0	1	0	0	0	0	0	0	0	0	0	1	0.1
	Total	3	4	3	1	0	3	1	1	2	0	2	0	20	1.7
Austrovenus stutchburyi	<5	0	0	0	1	0	1	0	0	0	0	0	0	2	0.2
	>5	2	6	2	2	5	3	7	2	2	2	4	9	46	3.8
	Cond.analysis	0	0	0	0	0	0	0	0	0	0	2	3	5	0.4
	Total	2	6	2	3	5	4	7	2	2	2	6	12	53	4.4
Macamona liliana	<5	0	0	0	0	0	0	0	0	1	0	0	0	1	0.1
	5-15	1	1	0	0	1	0	0	1	0	0	0	0	4	0.3
	>15	0	0	0	1	0	0	0	0	1	1	0	1	4	0.3
	Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	Total	1	1	0	1	1	0	0	1	2	1	0	1	9	0.8
Nucula hartvigiana	<2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	>2	0	0	0	1	0	0	1	0	0	0	0	0	2	0.2
	Total	0	0	0	1	0	0	1	0	0	0	0	0	2	0.2
Paphies australis	<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
Theora lubrica	<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
CUMACEANS															
Colurostylis lemurum		0	0	0	0	0	0	1	0	0	0	0	0	1	0.1
GASTROPODS															
Cominella adspera		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Notoacmea sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OTHER															
Anthopleura aureoradiata		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
POLYCHAETES															
Aquilaspio aucklandica		0	1	0	0	0	0	2	0	2	0	0	1	6	0.5
Aglaophamus sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Aonides oxycephala		0	1	1	2	3	0	0	0	0	2	2	0	11	0.9
Aricidea sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Pseudopolydora complex		0	4	0	0	0	0	0	1	1	6	5	3	20	1.7
Cossura sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Euchone sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Goniada sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Glycera sp.		2	3	1	1	2	1	0	0	2	0	4	1	17	1.4
"Capitellidae"		36	7	56	39	9	19	17	15	20	7	6	11	242	20.2
Magelona dakini		3	1	2	4	2	0	1	1	1	1	4	0	20	1.7
Nereidae		1	0	2	3	0	2	1	2	0	1	0	1	13	1.1
Orbinia papillosa		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Paraonidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
NON INDICATOR SPECIES															
Amphipods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Crabs		1	0	0	1	0	0	1	1	1	2	2	1	10	0.8
Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Isopods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Shrimps/Mysids		1	0	0	0	0	0	0	0	0	0	0	0	1	0.1
Other Crustaceans		0	0	0	0	0	0	0	1	0	0	1	0	2	0.2
Bivalves		1	0	0	1	0	1	0	0	0	2	1	0	6	0.5
Gastropods		0	0	0	1	0	0	0	0	0	0	1	0	2	0.2
Fellaster zealandiae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Holuthurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Nemerteans		0	0	1	0	1	1	0	2	0	0	2	0	7	0.6
Polychaetes		1	0	0	0	0	0	0	0	0	0	0	0	1	0.1
Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Edwardsia		0	0	0	0	0	0	0	0	0	1	0	0	1	0.1
Misc. Other		0	0	0	1	0	0	0	0	0	0	0	0	1	0.1
TOTAL		52	28	68	59	23	31	32	27	33	25	36	31	445	37.1

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	INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN
			1	2	3	4	5	6	7	8	9	10	11	12		
	AMPHIPODS															
ACOR	*Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
APHOX	*Phoxocephalidae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
	BIVALVES	**SIZE**														
BAB<2	*Arthritica bifurca*	<2	18	7	0	2	11	9	0	0	5	1	2	0	**55**	**4.6**
BAB>2		>2	1	0	0	0	2	1	0	0	0	0	0	0	**4**	**0.3**
		Total	19	7	0	2	13	10	0	0	5	1	2	0	**59**	**4.9**
BAS<5	*Austrovenus stutchburyi*	<5	6	4	13	10	7	6	10	6	4	3	2	4	**75**	**6.3**
BAS>5		>5	6	4	5	3	2	3	5	10	6	2	5	3	**54**	**4.5**
BAS-COND		Cond.analysis	0	0	0	0	0	0	0	0	1	0	3	0	**4**	**0.3**
		Total	12	8	18	13	9	9	15	16	11	5	10	7	**133**	**11.1**
BML<5	*Macamona liliana*	<5	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
BML5-15		5-15	0	1	0	0	0	0	0	1	0	0	0	0	**2**	**0.2**
BML>15		>15	0	0	0	0	0	1	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**
		Total	0	1	0	0	0	1	0	1	0	0	1	0	**4**	**0.3**
BNH<2	*Nucula hartvigiana*	<2	0	0	0	0	0	0	0	0	0	1	0	0	**1**	**0.1**
BNH>2		>2	0	0	0	1	1	1	0	1	2	2	0	1	**9**	**0.8**
		Total	0	0	0	1	1	1	0	1	2	3	0	1	**10**	**0.8**
BPA<5	*Paphies australis*	<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	*Theora lubrica*	<5	1	0	2	0	2	0	0	0	0	2	0	0	**7**	**0.6**
BTHL>5		>5	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		Total	1	0	2	0	2	0	0	0	0	2	0	0	**7**	**0.6**
	CUMACEANS															
CCL	*Colurostylis lemurum*		0	0	1	0	0	1	0	0	0	3	0	1	**6**	**0.5**
	GASTROPODS															
GCA	*Cominella adspera*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
GNHE	*Notoacmea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
	OTHER															
OAN	*Anthopleura aureoradiata*		0	2	0	0	0	0	0	0	0	0	0	0	**2**	**0.2**
	POLYCHAETES															
PAA	*Aquilaspio aucklandica*		0	0	0	0	0	1	0	1	1	0	1	0	**4**	**0.3**
PAGL	*Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PAO	*Aonides oxycephala*		0	3	1	0	1	2	0	1	2	1	0	0	**11**	**0.9**
PAR	*Aricidea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PBOC	Pseudopolydora complex		1	1	0	0	2	1	1	0	2	5	0	1	**14**	**1.2**
PCOS	*Cossura* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PEUC	*Euchone* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PGE	*Goniada* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PGLY	*Glycera* sp.		0	1	0	0	1	1	0	0	1	0	0	0	**4**	**0.3**
PHF	"Capitellidae"		34	11	37	26	11	17	13	6	21	2	9	8	**195**	**16.3**
PMD	*Magelona dakini*		1	1	0	0	0	0	0	1	1	1	0	0	**5**	**0.4**
PNIC	Nereidae		0	0	2	4	1	2	0	0	2	3	0	2	**16**	**1.3**
POP	*Orbinia papillosa*		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**
	NON INDICATOR SPECIES															
CAMPH	Amphipods		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
CCRAB	Crabs		1	0	0	0	0	1	0	0	1	1	0	0	**4**	**0.3**
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
CISO	Isopods		0	0	0	0	0	1	0	2	0	3	1	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	0	1	0	**1**	**0.1**
COTH	Other Crustaceans		0	0	0	0	1	0	0	1	0	0	0	0	**2**	**0.2**
BOTH	Bivalves		0	0	2	0	1	0	0	0	1	0	0	0	**4**	**0.3**
GOTH	Gastropods		1	0	0	0	0	0	0	0	0	1	0	0	**2**	**0.2**
EFEZ	*Fellaster zealandiae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
EHOL	Holuthurians		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
ONEM	Nemerteans		0	0	0	1	1	0	0	0	0	0	0	1	**3**	**0.3**
POTH	Polychaetes		0	0	0	0	0	0	0	0	0	0	1	0	**1**	**0.1**
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	*Edwardsia*		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**
	TOTAL		**70**	**35**	**63**	**47**	**44**	**48**	**29**	**30**	**50**	**31**	**26**	**21**	**494**	**41.2**

Appendix 2 - Whaingaroa Harbour species/taxonomic group abundances

TU October 2008

	INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN
			1	2	3	4	5	6	7	8	9	10	11	12		
	AMPHIPODS															
ACOR	*Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
APHOX	*Phoxocephalidae*		0	1	0	1	0	0	0	0	0	0	0	2	4	0.3
	BIVALVES	**SIZE**														
BAB<2	*Arthritica bifurca*	<2	3	1	1	0	2	0	6	5	1	0	1	2	22	1.8
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	3	1	1	0	2	0	6	5	1	0	1	2	22	1.8
BAS<5	*Austrovenus stutchburyi*	<5	5	4	2	2	7	9	4	1	2	2	6	4	48	4.0
BAS>5		>5	27	12	50	24	30	32	14	24	10	19	19	21	282	23.5
BAS-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	1	0	1	0.1
		Total	32	16	52	26	37	41	18	25	12	21	26	25	331	27.6
BML<5	*Macamona liliana*	<5	1	0	4	2	1	4	1	6	6	4	1	0	30	2.5
BML5-15		5-15	0	0	1	1	0	1	0	0	2	0	0	1	6	0.5
BML>15		>15	1	3	3	0	1	2	2	2	2	6	3	3	28	2.3
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	2	3	8	3	2	7	3	8	10	10	4	4	64	5.3
BNH<2	*Nucula hartvigiana*	<2	3	5	3	2	4	2	4	0	2	0	1	2	28	2.3
BNH>2		>2	29	26	22	35	29	32	29	18	5	13	36	35	309	25.8
		Total	32	31	25	37	33	34	33	18	7	13	37	37	337	28.1
BPA<5	*Paphies australis*	<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	*Theora lubrica*	<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
	CUMACEANS															
CCL	*Colurostylis lemurum*		0	3	2	2	1	0	1	1	3	2	0	4	19	1.6
	GASTROPODS															
GCA	*Cominella adspera*		0	0	1	0	0	0	0	0	0	0	2	1	4	0.3
GNHE	*Notoacmea* sp.		10	6	15	6	9	3	7	6	1	10	2	3	78	6.5
	OTHER															
OAN	*Anthopleura aureoradiata*		3	1	0	2	0	0	0	1	0	1	5	2	15	1.3
	POLYCHAETES															
PAA	*Aquilaspio aucklandica*		15	3	11	1	9	5	9	8	3	19	8	10	101	8.4
PAGL	*Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	*Aonides oxycephala*		0	0	1	4	0	0	0	2	15	8	2	0	32	2.7
PAR	*Aricidea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PBOC	Pseudopolydora complex		1	0	0	0	0	1	0	0	0	1	0	0	3	0.3
PCOS	*Cossura* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PEUC	*Euchone* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGE	*Goniada* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGLY	*Glycera* sp.		0	0	0	0	2	0	0	1	0	0	1	1	5	0.4
PHF	"Capitellidae"		17	5	7	1	8	12	11	8	1	8	11	15	104	8.7
PMD	*Magelona dakini*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PNIC	Nereidae		3	2	3	2	1	3	5	2	0	2	0	1	24	2.0
POP	*Orbinia papillosa*		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
	NON INDICATOR SPECIES															
CAMPH	Amphipods		0	1	2	1	4	1	1	3	0	5	3	1	22	1.8
CCRAB	Crabs		4	0	1	2	1	0	2	2	0	1	1	3	17	1.4
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	1	1	0.1
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	1	0	1	0	0	1	1	1	0	1	6	0.5
BOTH	Bivalves		2	0	0	0	0	0	0	0	0	0	0	0	2	0.2
GOTH	Gastropods		3	8	6	12	8	6	6	5	8	8	7	3	80	6.7
EFEZ	*Fellaster zealandiae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
EHOL	Holuthurians		0	1	0	0	0	0	0	0	0	0	0	0	1	0.1
ONEM	Nemerteans		1	0	0	2	1	1	2	1	1	1	0	2	12	1.0
POTH	Polychaetes		2	0	0	2	1	0	1	0	2	1	0	1	10	0.8
OOLIG	Oligochaetes		1	0	0	0	0	0	0	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	*Edwardsia*		0	0	0	0	0	0	1	0	1	0	0	0	2	0.2
OTHER	Misc. Other		0	0	1	3	1	2	0	1	1	0	0	1	10	0.8
	TOTAL		**131**	**82**	**137**	**107**	**121**	**116**	**106**	**98**	**67**	**112**	**110**	**120**	**1307**	**108.9**

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	INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN
			1	2	3	4	5	6	7	8	9	10	11	12		
	AMPHIPODS															
ACOR	*Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
APHOX	*Phoxocephalidae*		0	2	5	2	4	1	4	2	5	1	0	0	**26**	**2.2**
	BIVALVES	**SIZE**														
BAB<2	*Arthritica bifurca*	<2	4	0	11	9	7	8	13	20	13	6	9	8	**108**	**9.0**
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		Total	4	0	11	9	7	8	13	20	13	6	9	8	**108**	**9.0**
BAS<5	*Austrovenus stutchburyi*	<5	1	0	0	0	1	1	1	1	2	1	2	3	**13**	**1.1**
BAS>5		>5	0	0	0	0	1	0	0	0	0	0	0	0	**1**	**0.1**
BAS-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	2	0	**2**	**0.2**
		Total	1	0	0	0	2	1	1	1	2	1	4	3	**16**	**1.3**
BML<5	*Macomona liliana*	<5	2	0	1	0	1	0	1	1	2	1	2	4	**15**	**1.3**
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	1	0	0	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	2	0	1	0	1	0	2	1	2	1	2	4	**16**	**1.3**
BNH<2	*Nucula hartvigiana*	<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	*Paphies australis*	<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	*Theora lubrica*	<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**
	CUMACEANS															
CCL	*Colurostylis lemurum*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
	GASTROPODS															
GCA	*Cominella adspera*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
GNHE	*Notoacmea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
	OTHER															
OAN	*Anthopleura aureoradiata*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
	POLYCHAETES															
PAA	*Aquilaspio aucklandica*		1	2	6	3	7	1	0	2	3	3	4	1	**33**	**2.8**
PAGL	*Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PAO	*Aonides oxycephala*		0	0	0	0	1	0	0	0	0	0	0	0	**1**	**0.1**
PAR	*Aricidea* sp.		0	0	0	0	0	0	0	0	0	1	0	0	**1**	**0.1**
PBOC	Pseudopolydora complex		0	1	0	1	0	0	0	2	1	1	2	1	**9**	**0.8**
PCOS	*Cossura* sp.		0	0	0	0	1	0	0	0	0	0	0	1	**2**	**0.2**
PEUC	*Euchone* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PGE	*Goniada* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PGLY	*Glycera* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PHF	"Capitellidae"		4	5	18	12	17	16	10	14	15	25	11	15	**162**	**13.5**
PMD	*Magelona dakini*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PNIC	Nereidae		6	2	2	4	5	2	8	3	5	2	5	3	**47**	**3.9**
POP	*Orbinia papillosa*		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**
	NON INDICATOR SPECIES															
CAMPH	Amphipods		1	0	2	1	4	7	6	5	2	0	4	2	**34**	**2.8**
CCRAB	Crabs		0	4	3	3	1	4	5	2	7	1	1	2	**33**	**2.8**
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	1	0	0	0	0	0	0	0	0	**1**	**0.1**
CSHR	Shrimps/Mysids		0	0	0	0	1	0	0	0	1	0	0	0	**2**	**0.2**
COTH	Other Crustaceans		0	0	0	1	2	0	7	0	0	0	0	0	**10**	**0.8**
BOTH	Bivalves		0	0	0	0	0	1	0	0	0	0	0	0	**1**	**0.1**
GOTH	Gastropods		0	0	0	0	2	0	0	0	0	0	0	0	**2**	**0.2**
EFEZ	*Fellaster zealandiae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
EHOL	Holuthurians		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
ONEM	Nemerteans		0	0	0	1	1	1	0	2	0	1	0	1	**7**	**0.6**
POTH	Polychaetes		0	1	0	0	2	0	1	0	2	1	1	3	**11**	**0.9**
OOLIG	Oligochaetes		0	0	0	0	1	0	0	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	*Edwardsia*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
OTHER	Misc. Other		0	1	0	1	0	0	0	0	0	0	1	0	**3**	**0.3**
	TOTAL		**19**	**18**	**48**	**39**	**59**	**42**	**57**	**54**	**58**	**44**	**44**	**44**	**526**	**43.8**

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	INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN
			1	2	3	4	5	6	7	8	9	10	11	12		
	AMPHIPODS															
ACOR	*Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
APHOX	*Phoxocephalidae*		2	0	0	1	0	0	0	0	2	0	1	0	6	0.5
	BIVALVES	**SIZE**														
BAB<2	*Arthritica bifurca*	<2	2	1	18	5	40	5	7	15	10	5	7	7	122	10.2
BAB>2		>2	0	0	0	0	1	0	0	0	0	0	0	0	1	0.1
		Total	2	1	18	5	41	5	7	15	10	5	7	7	123	10.3
BAS<5	*Austrovenus stutchburyi*	<5	1	2	2	2	4	2	5	3	3	2	4	5	35	2.9
BAS>5		>5	0	0	1	0	1	0	1	1	0	1	0	0	5	0.4
BAS-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	1	2	3	2	5	2	6	4	3	3	4	5	40	3.3
BML<5	*Macomona liliana*	<5	6	0	3	3	1	1	2	1	5	0	0	12	34	2.8
BML5-15		5-15	0	0	0	0	0	0	0	0	0	1	1	0	2	0.2
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	6	0	3	3	1	1	2	1	5	1	1	12	36	3.0
BNH<2	*Nucula hartvigiana*	<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	*Paphies australis*	<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	*Theora lubrica*	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL>5		>5	0	0	0	1	0	0	0	0	0	0	0	0	1	0.1
		Total	0	0	0	1	0	0	0	0	0	0	0	0	1	0.1
	CUMACEANS															
CCL	*Colurostylis lemurum*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	GASTROPODS															
GCA	*Cominella adspera*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE	*Notoacmea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	OTHER															
OAN	*Anthopleura aureoradiata*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	POLYCHAETES															
PAA	*Aquilaspio aucklandica*		0	2	1	0	0	1	0	1	1	0	1	4	11	0.9
PAGL	*Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	*Aonides oxycephala*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAR	*Aricidea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PBOC	Pseudopolydora complex		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PCOS	*Cossura* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PEUC	*Euchone* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGE	*Goniada* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGLY	*Glycera* sp.		1	0	0	0	0	0	0	0	1	0	0	0	2	0.2
PHF	"Capitellidae"		23	16	22	21	27	24	36	23	20	35	25	27	299	24.9
PMD	*Magelona dakini*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PNIC	Nereidae		3	3	2	6	4	5	0	4	5	1	4	9	46	3.8
POP	*Orbinia papillosa*		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	1	0	0	0	1	0.1
	NON INDICATOR SPECIES															
CAMPH	Amphipods		0	0	1	0	1	0	0	2	1	0	1	4	10	0.8
CCRAB	Crabs		0	0	0	3	4	3	1	0	0	1	0	0	12	1.0
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	1	0	0	0	0	0	1	0.1
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		0	0	0	0	0	0	0	1	0	0	0	0	1	0.1
BOTH	Bivalves		1	0	0	2	1	0	0	0	0	0	1	0	5	0.4
GOTH	Gastropods		0	0	0	1	0	0	5	1	0	0	1	3	11	0.9
EFEZ	*Fellaster zealandiae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
EHOL	Holuthurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
ONEM	Nemerteans		0	3	3	2	1	0	2	1	0	2	1	3	18	1.5
POTH	Polychaetes		1	0	0	0	1	1	4	1	0	0	0	0	8	0.7
OOLIG	Oligochaetes		1	0	1	0	1	2	0	2	0	2	0	0	9	0.8
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OEDW	*Edwardsia*		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
	TOTAL		41	27	54	47	87	44	64	57	49	50	47	74	641	53.4

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	INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN
			1	2	3	4	5	6	7	8	9	10	11	12		
	AMPHIPODS															
ACOR	*Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
APHOX	*Phoxocephalidae*		2	4	0	5	3	5	2	3	1	5	2	5	**37**	**3.1**
	BIVALVES	**SIZE**														
BAB<2	*Arthritica bifurca*	<2	1	7	8	3	2	4	7	1	1	0	2	8	**44**	**3.7**
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		Total	1	7	8	3	2	4	7	1	1	0	2	8	**44**	**3.7**
BAS<5	*Austrovenus stutchburyi*	<5	14	15	13	15	10	8	16	11	13	11	24	12	**162**	**13.5**
BAS>5		>5	10	30	12	21	16	15	24	18	19	13	13	11	**202**	**16.8**
BAS-COND		Cond.analysis	0	2	4	2	4	5	5	9	3	0	5	5	**44**	**3.7**
		Total	24	47	29	38	30	28	45	38	35	24	42	28	**408**	**34.0**
BML<5	*Macamona liliana*	<5	8	5	10	7	4	4	7	16	15	7	12	0	**95**	**7.9**
BML5-15		5-15	1	0	1	0	0	2	1	0	1	0	0	1	**7**	**0.6**
BML>15		>15	1	3	2	2	0	1	1	3	3	3	3	3	**25**	**2.1**
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	1	0	1	0	**2**	**0.2**
		Total	10	8	13	9	4	7	9	19	20	10	16	4	**129**	**10.8**
BNH<2	*Nucula hartvigiana*	<2	9	9	7	8	7	12	9	15	10	10	10	4	**110**	**9.2**
BNH>2		>2	13	9	9	17	19	15	19	24	13	13	22	17	**190**	**15.8**
		Total	22	18	16	25	26	27	28	39	23	23	32	21	**300**	**25.0**
BPA<5	*Paphies australis*	<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	1	0	0	0	**1**	**0.1**
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	1	0	0	0	**1**	**0.1**
BTHL<5	*Theora lubrica*	<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**
	CUMACEANS															
CCL	*Colurostylis lemurum*		2	0	1	0	2	3	0	2	0	2	0	1	**13**	**1.1**
	GASTROPODS															
GCA	*Cominella adspera*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
GNHE	*Notoacmea* sp.		10	1	3	3	2	2	2	7	2	0	1	0	**33**	**2.8**
	OTHER															
OAN	*Anthopleura aureoradiata*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
	POLYCHAETES															
PAA	*Aquilaspio aucklandica*		17	9	20	20	8	22	42	12	15	22	23	3	**213**	**17.8**
PAGL	*Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PAO	*Aonides oxycephala*		0	0	0	0	0	0	0	1	0	0	0	0	**1**	**0.1**
PAR	*Aricidea* sp.		0	0	0	0	0	0	1	0	0	1	0	0	**2**	**0.2**
PBOC	Pseudopolydora complex		1	0	0	0	1	1	0	0	0	0	0	1	**4**	**0.3**
PCOS	*Cossura* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PEUC	*Euchone* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PGE	*Goniada* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PGLY	*Glycera* sp.		0	1	1	2	2	2	2	1	0	2	1	0	**14**	**1.2**
PHF	"Capitellidae"		14	14	13	5	12	13	12	8	7	10	6	21	**135**	**11.3**
PMD	*Magelona dakini*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PNIC	Nereidae		0	2	2	0	2	2	1	0	0	1	0	1	**11**	**0.9**
POP	*Orbinia papillosa*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PPAR	Paraonidae		0	0	1	0	0	0	0	0	0	0	0	1	**2**	**0.2**
	NON INDICATOR SPECIES															
CAMPH	Amphipods		3	0	2	2	1	3	6	8	3	5	2	1	**36**	**3.0**
CCRAB	Crabs		2	1	0	2	2	3	3	1	0	1	0	1	**16**	**1.3**
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
CISO	Isopods		1	0	0	0	1	0	0	0	0	0	0	1	**3**	**0.3**
COST	Ostracods		0	1	0	0	0	3	2	1	0	0	2	0	**9**	**0.8**
CSHR	Shrimps/Mysids		0	0	0	0	0	1	0	0	0	0	0	0	**1**	**0.1**
COTH	Other Crustaceans		3	6	3	8	3	3	47	12	1	8	5	7	**106**	**8.8**
BOTH	Bivalves		0	0	0	1	0	0	0	1	0	1	2	1	**6**	**0.5**
GOTH	Gastropods		4	1	7	0	3	1	0	4	1	0	0	1	**22**	**1.8**
EFEZ	*Fellaster zealandiae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
EHOL	Holuthurians		0	0	0	0	0	1	0	0	0	0	0	0	**1**	**0.1**
ONEM	Nemerteans		3	3	1	2	1	0	4	2	0	8	2	2	**28**	**2.3**
POTH	Polychaetes		8	2	4	0	4	1	8	7	3	4	5	4	**50**	**4.2**
OOLIG	Oligochaetes		0	0	1	0	3	2	1	0	0	0	9	0	**16**	**1.3**
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
OEDW	*Edwardsia*		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	1	1	0	0	0	**3**	**0.3**
	TOTAL		**128**	**125**	**125**	**125**	**112**	**134**	**222**	**168**	**114**	**127**	**152**	**112**	**1644**	**137.0**

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	INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN
			1	2	3	4	5	6	7	8	9	10	11	12		
	AMPHIPODS															
ACOR	*Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
APHOX	*Phoxocephalidae*		0	1	2	0	1	0	1	1	2	1	3	1	**13**	**1.1**
	BIVALVES	**SIZE**														
BAB<2	*Arthritica bifurca*	<2	0	0	0	0	3	0	1	6	0	6	11	1	**28**	**2.3**
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		Total	0	0	0	0	3	0	1	6	0	6	11	1	**28**	**2.3**
BAS<5	*Austrovenus stutchburyi*	<5	8	6	9	14	10	17	11	22	6	16	18	15	**152**	**12.7**
BAS>5		>5	9	11	13	12	26	27	1	32	3	32	25	12	**203**	**16.9**
BAS-COND		Cond.analysis	9	0	0	4	0	7	3	11	0	0	0	11	**45**	**3.8**
		Total	26	17	22	30	36	51	15	65	9	48	43	38	**400**	**33.3**
BML<5	*Macamona liliana*	<5	9	3	4	2	3	3	16	8	6	2	1	5	**62**	**5.2**
BML5-15		5-15	1	0	1	1	0	1	0	1	0	1	1	0	**7**	**0.6**
BML>15		>15	4	1	3	1	2	2	1	3	3	2	3	3	**28**	**2.3**
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		Total	14	4	8	4	5	6	17	12	9	5	5	8	**97**	**8.1**
BNH<2	*Nucula hartvigiana*	<2	3	0	4	1	3	7	6	5	1	2	3	8	**43**	**3.6**
BNH>2		>2	17	11	7	6	12	14	17	26	0	17	17	23	**167**	**13.9**
		Total	20	11	11	7	15	21	23	31	1	19	20	31	**210**	**17.5**
BPA<5	*Paphies australis*	<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	*Theora lubrica*	<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**
	CUMACEANS															
CCL	*Colurostylis lemurum*		1	0	0	1	0	3	0	1	1	1	1	1	**10**	**0.8**
	GASTROPODS															
GCA	*Cominella adspera*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
GNHE	*Notoacmea* sp.		3	4	10	2	2	5	0	1	0	4	5	7	**43**	**3.6**
	OTHER															
OAN	*Anthopleura aureoradiata*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
	POLYCHAETES															
PAA	*Aquilaspio aucklandica*		16	18	14	11	20	32	26	25	10	4	17	23	**216**	**18.0**
PAGL	*Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PAO	*Aonides oxycephala*		0	0	1	0	0	1	0	1	0	1	0	0	**4**	**0.3**
PAR	*Aricidea* sp.		0	0	0	0	0	0	0	1	0	0	0	0	**1**	**0.1**
PBOC	Pseudopolydora complex		0	0	0	0	0	0	0	0	1	1	0	1	**3**	**0.3**
PCOS	*Cossura* sp.		0	0	0	0	0	0	0	0	0	0	0	1	**1**	**0.1**
PEUC	*Euchone* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PGE	*Goniada* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PGLY	*Glycera* sp.		1	0	0	0	2	1	1	0	0	2	0	1	**8**	**0.7**
PHF	"Capitellidae"		23	15	12	13	20	21	22	27	11	18	20	32	**234**	**19.5**
PMD	*Magelona dakini*		0	1	0	0	0	0	0	0	0	0	0	0	**1**	**0.1**
PNIC	Nereidae		2	0	2	4	3	0	2	4	1	2	0	3	**23**	**1.9**
POP	*Orbinia papillosa*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PPAR	Paraonidae		0	1	0	1	0	0	0	0	0	0	0	2	**4**	**0.3**
	NON INDICATOR SPECIES															
CAMPH	Amphipods		2	1	3	4	3	12	0	0	4	4	7	0	**40**	**3.3**
CCRAB	Crabs		0	1	0	0	0	0	1	1	0	1	1	2	**7**	**0.6**
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
CISO	Isopods		4	0	0	0	0	0	0	0	0	0	0	0	**4**	**0.3**
COST	Ostracods		2	0	1	0	0	0	0	0	0	0	0	1	**4**	**0.3**
CSHR	Shrimps/Mysids		0	0	0	0	1	0	0	0	0	0	0	0	**1**	**0.1**
COTH	Other Crustaceans		0	1	0	2	4	5	1	7	0	2	4	5	**31**	**2.6**
BOTH	Bivalves		0	0	0	1	0	0	1	0	0	0	0	0	**2**	**0.2**
GOTH	Gastropods		1	2	1	1	2	0	3	2	0	3	0	2	**17**	**1.4**
EFEZ	*Fellaster zealandiae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
EHOL	Holuthurians		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
ONEM	Nemerteans		3	5	0	1	1	4	1	1	5	2	0	3	**26**	**2.2**
POTH	Polychaetes		0	0	2	2	2	0	2	0	3	0	2	8	**21**	**1.8**
OOLIG	Oligochaetes		1	2	0	0	1	3	0	0	0	0	0	4	**11**	**0.9**
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
OEDW	*Edwardsia*		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	1	0	0	0	2	**6**	**0.5**
	TOTAL		**119**	**84**	**89**	**84**	**121**	**165**	**117**	**187**	**57**	**124**	**139**	**177**	**1466**	**122.2**

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	INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN
			1	2	3	4	5	6	7	8	9	10	11	12		
	AMPHIPODS															
ACOR	*Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
APHOX	*Phoxocephalidae*		1	0	0	1	1	0	0	1	2	2	0	0	8	0.7
	BIVALVES	**SIZE**														
BAB<2	*Arthritica bifurca*	<2	1	4	4	0	0	2	7	5	2	0	4	7	36	3.0
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	1	4	4	0	0	2	7	5	2	0	4	7	36	3.0
BAS<5	*Austrovenus stutchburyi*	<5	14	9	13	8	3	4	10	6	11	3	5	7	93	7.8
BAS>5		>5	10	32	15	8	11	14	13	27	18	11	32	11	202	16.8
BAS-COND		Cond.analysis	1	1	0	0	0	3	1	0	3	1	0	0	10	0.8
		Total	25	42	28	16	14	21	24	33	32	15	37	18	305	25.4
BML<5	*Macomona liliana*	<5	8	7	9	3	11	4	4	7	16	10	13	2	94	7.8
BML5-15		5-15	3	1	1	0	1	3	1	3	1	2	0	0	16	1.3
BML>15		>15	2	2	3	2	3	1	2	2	3	3	2	4	29	2.4
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	13	10	13	5	15	8	7	12	20	15	15	6	139	11.6
BNH<2	*Nucula hartvigiana*	<2	2	6	1	2	2	1	2	6	4	2	5	1	34	2.8
BNH>2		>2	3	16	5	1	1	1	3	3	1	1	8	1	44	3.7
		Total	5	22	6	3	3	2	5	9	5	3	13	2	78	6.5
BPA<5	*Paphies australis*	<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	*Theora lubrica*	<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
	CUMACEANS															
CCL	*Colurostylis lemurum*		0	0	2	0	0	1	1	2	1	0	0	1	8	0.7
	GASTROPODS															
GCA	*Cominella adspera*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE	*Notoacmea* sp.		5	1	0	0	1	0	1	2	5	2	4	0	21	1.8
	OTHER															
OAN	*Anthopleura aureoradiata*		6	5	3	2	0	2	2	6	8	2	6	1	43	3.6
	POLYCHAETES															
PAA	*Aquilaspio aucklandica*		9	16	13	8	8	5	10	16	6	16	19	2	128	10.7
PAGL	*Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	*Aonides oxycephala*		6	0	1	0	0	0	0	0	0	0	1	0	8	0.7
PAR	*Aricidea* sp.		0	9	2	5	4	4	5	1	4	1	2	2	39	3.3
PBOC	Pseudopolydora complex		1	1	0	1	0	0	3	1	1	1	1	1	11	0.9
PCOS	*Cossura* sp.		0	1	0	2	0	0	1	0	0	1	0	0	5	0.4
PEUC	*Euchone* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGE	*Goniada* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGLY	*Glycera* sp.		0	0	1	0	1	0	1	0	0	0	1	1	5	0.4
PHF	"Capitellidae"		21	32	29	21	15	18	25	23	33	22	17	25	281	23.4
PMD	*Magelona dakini*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PNIC	Nereidae		1	7	3	8	2	5	13	5	5	5	6	9	69	5.8
POP	*Orbinia papillosa*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PPAR	Paraonidae		1	1	0	1	1	0	0	1	1	0	0	0	6	0.5
	NON INDICATOR SPECIES															
CAMPH	Amphipods		0	0	1	2	2	1	0	3	2	0	1	1	13	1.1
CCRAB	Crabs		0	0	0	1	0	1	0	0	0	0	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	0	0	0	0	0	0	0	0	0	0	0	0.0
COST	Ostracods		1	0	0	0	1	0	0	0	0	1	0	0	3	0.3
CSHR	Shrimps/Mysids		0	0	0	0	0	0	0	0	0	1	1	0	2	0.2
COTH	Other Crustaceans		0	0	1	0	0	0	0	0	2	0	0	0	3	0.3
BOTH	Bivalves		3	2	0	0	0	0	0	0	0	0	1	0	6	0.5
GOTH	Gastropods		9	2	0	1	0	0	2	3	0	0	1	1	19	1.6
EFEZ	*Fellaster zealandiae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
EHOL	Holuthurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
ONEM	Nemerteans		3	0	1	4	1	0	0	1	1	4	1	3	19	1.6
POTH	Polychaetes		3	3	1	4	11	4	5	2	4	4	5	1	47	3.9
OOLIG	Oligochaetes		0	0	0	1	0	1	0	0	0	0	0	0	2	0.2
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OEDW	*Edwardsia*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OTHER	Misc. Other		0	0	1	0	1	0	2	0	0	0	5	0	9	0.8
	TOTAL		114	158	110	86	81	75	114	126	134	95	142	83	1318	109.8

WI October 2008

	INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN
			1	2	3	4	5	6	7	8	9	10	11	12		
	AMPHIPODS															
ACOR	*Corophiidae*		0	0	1	0	0	0	0	0	0	0	0	0	1	0.1
APHOX	*Phoxocephalidae*		0	0	0	0	2	1	1	0	0	0	1	3	8	0.7
	BIVALVES	**SIZE**														
BAB<2	*Arthritica bifurca*	<2	0	4	8	5	1	0	7	2	9	0	3	1	40	3.3
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	4	8	5	1	0	7	2	9	0	3	1	40	3.3
BAS<5	*Austrovenus stutchburyi*	<5	2	2	8	5	3	0	1	3	2	2	3	1	32	2.7
BAS>5		>5	7	9	4	0	7	21	9	33	10	16	32	14	162	13.5
BAS-COND		Cond.analysis	0	0	3	0	3	0	0	0	0	0	0	2	8	0.7
		Total	9	11	15	5	13	21	10	36	12	18	35	17	202	16.8
BML<5	*Macomona liliana*	<5	4	3	1	5	13	11	9	12	9	9	15	7	98	8.2
BML5-15		5-15	0	0	2	0	0	1	2	2	1	2	1	2	13	1.1
BML>15		>15	1	3	0	0	5	2	0	0	2	3	2	3	21	1.8
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	5	6	3	5	18	14	11	14	12	14	18	12	132	11.0
BNH<2	*Nucula hartvigiana*	<2	3	1	5	8	2	2	1	3	1	1	10	2	39	3.3
BNH>2		>2	0	2	11	2	4	6	0	5	0	0	5	0	35	2.9
		Total	3	3	16	10	6	8	1	8	1	1	15	2	74	6.2
BPA<5	*Paphies australis*	<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	*Theora lubrica*	<5	0	0	0	0	1	1	0	0	0	0	0	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	1	1	0	0	0	0	0	0	2	0.2
	CUMACEANS															
CCL	*Colurostylis lemurum*		0	0	1	0	1	1	0	1	0	3	2	1	10	0.8
	GASTROPODS															
GCA	*Cominella adspera*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE	*Notoacmea* sp.		2	0	8	8	0	4	1	3	0	10	1	0	37	3.1
	OTHER															
OAN	*Anthopleura aureoradiata*		0	0	1	2	2	6	1	4	2	0	4	1	23	1.9
	POLYCHAETES															
PAA	*Aquilaspio aucklandica*		7	2	23	13	9	3	4	12	7	19	12	8	119	9.9
PAGL	*Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	*Aonides oxycephala*		0	1	1	1	0	0	0	1	0	1	0	0	5	0.4
PAR	*Aricidea* sp.		2	3	6	3	3	4	3	2	3	5	11	1	46	3.8
PBOC	Pseudopolydora complex		1	1	1	1	0	1	0	0	0	1	1	0	7	0.6
PCOS	*Cossura* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PEUC	*Euchone* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGE	*Goniada* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGLY	*Glycera* sp.		0	2	0	0	0	0	0	0	1	1	1	1	6	0.5
PHF	"Capitellidae"		24	18	44	19	13	26	21	15	32	25	23	21	281	23.4
PMD	*Magelona dakini*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PNIC	Nereidae		0	2	4	2	0	0	3	2	6	3	1	2	25	2.1
POP	*Orbinia papillosa*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PPAR	Paraonidae		0	1	4	0	0	0	0	0	0	1	0	0	6	0.5
	NON INDICATOR SPECIES															
CAMPH	Amphipods		4	0	0	3	2	6	1	3	1	2	1	0	23	1.9
CCRAB	Crabs		6	3	5	2	1	5	2	3	7	3	5	1	43	3.6
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	0	0	0	0	0	0	1	0.1
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	1	1	1	1	0	0	0	1	2	0	0	7	0.6
BOTH	Bivalves		0	0	4	0	0	2	1	1	1	2	1	0	12	1.0
GOTH	Gastropods		1	1	4	1	2	0	2	3	2	4	3	1	24	2.0
EFEZ	*Fellaster zealandiae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
EHOL	Holuthurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
ONEM	Nemerteans		3	0	1	1	1	3	1	1	0	0	1	2	14	1.2
POTH	Polychaetes		1	0	7	3	0	1	1	1	2	1	4	0	21	1.8
OOLIG	Oligochaetes		0	0	1	0	0	0	0	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	*Edwardsia*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OTHER	Misc. Other		1	0	3	0	0	1	1	0	0	0	1	1	8	0.7
	TOTAL		**70**	**59**	**163**	**85**	**76**	**108**	**72**	**112**	**99**	**116**	**144**	**75**	**1179**	**98.3**

WI April 2009

	INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN
			1	2	3	4	5	6	7	8	9	10	11	12		
	AMPHIPODS															
ACOR	*Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
APHOX	*Phoxocephalidae*		2	0	0	1	0	0	1	0	0	0	0	0	**4**	**0.3**
	BIVALVES	**SIZE**														
BAB<2	*Arthritica bifurca*	<2	7	11	0	0	2	0	7	13	3	14	24	7	**88**	**7.3**
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		Total	7	11	0	0	2	0	7	13	3	14	24	7	**88**	**7.3**
BAS<5	*Austrovenus stutchburyi*	<5	45	25	35	36	46	28	40	39	49	43	49	38	**473**	**39.4**
BAS>5		>5	11	6	13	7	12	23	19	21	17	15	25	14	**183**	**15.3**
BAS-COND		Cond.analysis	0	0	3	2	2	4	0	1	3	3	3	5	**26**	**2.2**
		Total	56	31	51	45	60	55	59	61	69	61	77	57	**682**	**56.8**
BML<5	*Macamona liliana*	<5	17	11	19	11	15	17	12	21	19	22	13	12	**189**	**15.8**
BML5-15		5-15	3	7	3	8	2	3	3	5	2	6	4	3	**49**	**4.1**
BML>15		>15	1	2	4	3	4	3	2	0	5	2	5	1	**32**	**2.7**
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		Total	21	20	26	22	21	23	17	26	26	30	22	16	**270**	**22.5**
BNH<2	*Nucula hartvigiana*	<2	1	1	8	3	1	11	7	4	1	1	7	1	**46**	**3.8**
BNH>2		>2	4	0	0	1	2	13	8	6	5	3	2	0	**44**	**3.7**
		Total	5	1	8	4	3	24	15	10	6	4	9	1	**90**	**7.5**
BPA<5	*Paphies australis*	<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	*Theora lubrica*	<5	1	0	2	0	0	1	0	0	0	0	0	1	**5**	**0.4**
BTHL>5		>5	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		Total	1	0	2	0	0	1	0	0	0	0	0	1	**5**	**0.4**
	CUMACEANS															
CCL	*Colurostylis lemurum*		0	0	0	0	0	0	0	0	0	1	0	0	**1**	**0.1**
	GASTROPODS															
GCA	*Cominella adspera*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
GNHE	*Notoacmea* sp.		0	1	0	0	0	1	0	2	0	1	0	0	**5**	**0.4**
	OTHER															
OAN	*Anthopleura aureoradiata*		0	0	2	0	0	1	4	5	3	1	3	0	**19**	**1.6**
	POLYCHAETES															
PAA	*Aquilaspio aucklandica*		5	8	8	0	7	15	11	31	17	6	17	4	**129**	**10.8**
PAGL	*Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PAO	*Aonides oxycephala*		0	0	1	1	0	0	0	0	0	0	0	0	**2**	**0.2**
PAR	*Aricidea* sp.		5	3	7	9	2	2	2	3	0	3	0	4	**40**	**3.3**
PBOC	Pseudopolydora complex		1	0	0	1	0	0	1	1	1	0	1	2	**8**	**0.7**
PCOS	*Cossura* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PEUC	*Euchone* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PGE	*Goniada* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PGLY	*Glycera* sp.		2	2	2	2	0	2	1	0	0	2	1	2	**16**	**1.3**
PHF	"Capitellidae"		42	35	27	24	24	23	28	40	26	36	26	29	**360**	**30.0**
PMD	*Magelona dakini*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PNIC	Nereidae		13	14	9	9	7	3	5	3	6	8	5	4	**86**	**7.2**
POP	*Orbinia papillosa*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PPAR	Paraonidae		3	0	1	0	0	0	1	2	1	0	0	1	**9**	**0.8**
	NON INDICATOR SPECIES															
CAMPH	Amphipods		1	3	0	0	1	1	0	2	3	0	0	0	**11**	**0.9**
CCRAB	Crabs		2	0	0	0	1	0	1	2	1	0	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	1	0	0	0	0	0	**1**	**0.1**
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
CSHR	Shrimps/Mysids		0	0	0	2	0	1	0	0	1	0	0	1	**5**	**0.4**
COTH	Other Crustaceans		1	0	1	1	0	1	0	1	0	0	0	2	**7**	**0.6**
BOTH	Bivalves		1	2	3	0	1	1	0	0	1	1	1	1	**12**	**1.0**
GOTH	Gastropods		2	2	0	0	0	0	2	1	1	0	1	2	**11**	**0.9**
EFEZ	*Fellaster zealandiae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
EHOL	Holuthurians		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
ONEM	Nemerteans		1	0	0	2	3	0	1	1	2	2	0	3	**15**	**1.3**
POTH	Polychaetes		1	1	1	1	0	2	0	1	0	2	0	0	**9**	**0.8**
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
OFLAT	Flatworms		0	1	0	0	0	0	0	0	0	0	0	0	**1**	**0.1**
OEDW	*Edwardsia*		0	0	0	0	0	0	0	1	0	0	0	0	**1**	**0.1**
OTHER	Misc. Other		0	0	0	0	0	0	0	0	1	0	0	0	**1**	**0.1**
	TOTAL		**172**	**135**	**149**	**124**	**132**	**156**	**157**	**206**	**168**	**172**	**189**	**137**	**1897**	**158.1**

OB July 2008

	INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN
			1	2	3	4	5	6	7	8	9	10	11	12		
	AMPHIPODS															
ACOR	*Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
APHOX	*Phoxocephalidae*		5	4	4	1	3	6	4	1	7	3	2	6	**46**	**3.8**
	BIVALVES	**SIZE**														
BAB<2	*Arthritica bifurca*	<2	0	3	1	2	2	2	1	0	0	1	2	0	**14**	**1.2**
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		Total	0	3	1	2	2	2	1	0	0	1	2	0	**14**	**1.2**
BAS<5	*Austrovenus stutchburyi*	<5	0	1	0	1	0	0	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**	**0.0**
BAS-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		Total	0	1	0	1	0	0	0	0	0	0	0	0	**2**	**0.2**
BML<5	*Macamona liliana*	<5	0	0	0	0	1	0	0	0	0	0	1	0	**2**	**0.2**
BML5-15		5-15	0	0	0	0	0	0	1	0	0	0	0	0	**1**	**0.1**
BML>15		>15	1	1	0	2	1	0	0	0	0	1	1	0	**7**	**0.6**
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		Total	1	1	0	2	2	0	1	0	0	1	2	0	**10**	**0.8**
BNH<2	*Nucula hartvigiana*	<2	0	0	0	2	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	0	0	0	2	0	0	0	0	0	0	0	0	**2**	**0.2**
BPA<5	*Paphies australis*	<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	*Theora lubrica*	<5	0	0	0	0	0	2	0	1	0	0	0	0	**3**	**0.3**
BTHL>5		>5	0	0	0	0	0	1	0	0	1	0	0	0	**2**	**0.2**
		Total	0	0	0	0	0	3	0	1	1	0	0	0	**5**	**0.4**
	CUMACEANS															
CCL	*Colurostylis lemurum*		1	0	1	0	0	1	0	0	0	1	0	0	**4**	**0.3**
	GASTROPODS															
GCA	*Cominella adspera*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
GNHE	*Notoacmea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
	OTHER															
OAN	*Anthopleura aureoradiata*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
	POLYCHAETES															
PAA	*Aquilaspio aucklandica*		4	9	7	9	5	10	10	6	4	8	17	14	**103**	**8.6**
PAGL	*Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PAO	*Aonides oxycephala*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PAR	*Aricidea* sp.		0	0	0	0	0	0	0	0	3	0	0	0	**3**	**0.3**
PBOC	Pseudopolydora complex		2	4	0	1	0	0	0	0	0	0	0	1	**8**	**0.7**
PCOS	*Cossura* sp.		5	7	7	14	6	4	11	13	8	9	11	10	**105**	**8.8**
PEUC	*Euchone* sp.		1	1	0	2	2	0	0	0	0	0	2	1	**9**	**0.8**
PGE	*Goniada* sp.		0	0	0	1	0	0	0	0	0	0	0	0	**1**	**0.1**
PGLY	*Glycera* sp.		1	1	0	0	0	0	0	0	0	0	1	0	**3**	**0.3**
PHF	"Capitellidae"		27	30	23	25	16	39	25	29	28	15	23	19	**299**	**24.9**
PMD	*Magelona dakini*		0	0	0	0	0	1	1	0	1	0	0	0	**3**	**0.3**
PNIC	Nereidae		2	2	3	4	1	3	3	2	1	1	2	5	**29**	**2.4**
POP	*Orbinia papillosa*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PPAR	Paraonidae		7	2	4	5	3	0	4	1	6	3	0	5	**40**	**3.3**
	NON INDICATOR SPECIES															
CAMPH	Amphipods		1	1	0	0	1	4	0	0	2	1	1	0	**11**	**0.9**
CCRAB	Crabs		0	0	0	0	0	0	1	1	0	0	2	1	**5**	**0.4**
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
CISO	Isopods		0	2	4	2	0	1	0	2	0	1	0	0	**12**	**1.0**
COST	Ostracods		0	1	4	1	4	1	2	0	4	0	0	0	**17**	**1.4**
CSHR	Shrimps/Mysids		1	0	1	0	0	0	0	0	1	0	0	0	**3**	**0.3**
COTH	Other Crustaceans		0	0	1	0	1	0	0	0	0	0	0	0	**2**	**0.2**
BOTH	Bivalves		1	0	2	0	0	2	1	0	1	2	0	2	**11**	**0.9**
GOTH	Gastropods		7	6	6	2	10	10	5	4	2	7	7	4	**70**	**5.8**
EFEZ	*Fellaster zealandiae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
EHOL	Holuthurians		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
ONEM	Nemerteans		0	1	1	2	2	4	1	1	0	1	1	2	**16**	**1.3**
POTH	Polychaetes		8	10	12	3	18	11	6	2	9	6	2	3	**90**	**7.5**
OOLIG	Oligochaetes		0	0	0	2	0	0	0	0	1	1	0	0	**4**	**0.3**
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
OEDW	*Edwardsia*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
OTHER	Misc. Other		1	1	2	0	0	1	1	0	1	0	2	1	**10**	**0.8**
	TOTAL		**75**	**87**	**83**	**81**	**76**	**103**	**77**	**63**	**80**	**61**	**77**	**74**	**937**	**78.1**

OB October 2008

	INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN
			1	2	3	4	5	6	7	8	9	10	11	12		
	AMPHIPODS															
ACOR	*Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
APHOX	*Phoxocephalidae*		3	2	0	0	2	1	0	7	4	3	14	5	41	3.4
	BIVALVES	**SIZE**														
BAB<2	*Arthritica bifurca*	<2	2	1	2	0	1	3	3	2	1	1	2	3	21	1.8
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	2	1	2	0	1	3	3	2	1	1	2	3	21	1.8
BAS<5	*Austrovenus stutchburyi*	<5	1	0	0	0	1	0	0	1	2	0	0	1	6	0.5
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	1	0	0	0	1	0	0	1	2	0	0	1	6	0.5
BML<5	*Macamona liliana*	<5	3	1	0	0	1	0	1	0	1	2	0	0	9	0.8
BML5-15		5-15	0	0	0	0	0	0	1	0	0	1	0	0	2	0.2
BML>15		>15	1	0	0	0	0	0	1	0	0	0	0	1	3	0.3
BML-COND		Cond.analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	4	1	0	0	1	0	3	0	1	3	0	1	14	1.2
BNH<2	*Nucula hartvigiana*	<2	1	0	0	0	0	0	0	1	0	0	0	0	2	0.2
BNH>2		>2	1	0	0	0	0	0	0	0	0	0	0	0	1	0.1
		Total	2	0	0	0	0	0	0	1	0	0	0	0	3	0.3
BPA<5	*Paphies australis*	<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	*Theora lubrica*	<5	0	0	0	0	0	0	0	1	0	0	0	0	1	0.1
BTHL>5		>5	0	0	0	0	0	0	0	0	0	1	0	0	1	0.1
		Total	0	0	0	0	0	0	0	1	0	1	0	0	2	0.2
	CUMACEANS															
CCL	*Colurostylis lemurum*		2	0	0	1	0	0	0	0	0	1	0	1	5	0.4
	GASTROPODS															
GCA	*Cominella adspera*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE	*Notoacmea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	OTHER															
OAN	*Anthopleura aureoradiata*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	POLYCHAETES															
PAA	*Aquilaspio aucklandica*		2	7	9	5	4	10	13	11	15	8	7	14	105	8.8
PAGL	*Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	*Aonides oxycephala*		0	0	0	0	0	0	0	0	0	0	0	1	1	0.1
PAR	*Aricidea* sp.		1	0	0	1	0	0	0	0	0	0	1	0	3	0.3
PBOC	Pseudopolydora complex		0	0	0	1	1	1	0	0	1	0	0	0	4	0.3
PCOS	*Cossura* sp.		2	4	9	8	7	12	12	11	10	5	16	14	110	9.2
PEUC	*Euchone* sp.		0	0	1	0	2	3	0	3	1	0	0	0	10	0.8
PGE	*Goniada* sp.		0	0	0	0	0	0	0	0	0	0	0	1	1	0.1
PGLY	*Glycera* sp.		0	1	0	0	1	0	1	0	1	0	1	0	5	0.4
PHF	"Capitellidae"		23	35	30	22	40	25	31	28	34	40	26	41	375	31.3
PMD	*Magelona dakini*		0	1	0	0	0	2	0	0	0	0	0	0	3	0.3
PNIC	Nereidae		4	3	2	1	6	4	3	2	3	2	2	3	35	2.9
POP	*Orbinia papillosa*		0	0	0	0	0	0	0	0	0	0	0	1	1	0.1
PPAR	Paraonidae		4	4	4	2	1	4	2	9	14	3	2	4	53	4.4
	NON INDICATOR SPECIES															
CAMPH	Amphipods		2	0	2	1	0	2	2	3	7	1	0	1	21	1.8
CCRAB	Crabs		2	0	1	2	5	2	2	1	3	2	2	1	23	1.9
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		0	1	0	1	0	0	0	0	1	0	0	0	3	0.3
COST	Ostracods		1	3	0	0	1	1	1	0	0	0	1	2	10	0.8
CSHR	Shrimps/Mysids		0	0	0	1	0	0	0	1	3	0	0	0	5	0.4
COTH	Other Crustaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BOTH	Bivalves		3	0	3	0	3	1	1	1	0	4	1	5	22	1.8
GOTH	Gastropods		4	8	1	3	6	5	4	4	7	4	2	4	52	4.3
EFEZ	*Fellaster zealandiae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
EHOL	Holuthurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
ONEM	Nemerteans		3	1	0	1	0	0	0	0	0	1	1	1	8	0.7
POTH	Polychaetes		5	5	3	4	2	4	9	2	2	6	5	5	52	4.3
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	1	1	0.1
OEDW	*Edwardsia*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OTHER	Misc. Other		1	1	1	1	0	0	1	0	1	1	1	1	9	0.8
	TOTAL		71	78	68	55	84	80	88	88	111	86	84	111	1004	83.7

OB April 2009

	INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN
			1	2	3	4	5	6	7	8	9	10	11	12		
	AMPHIPODS															
ACOR	*Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
APHOX	*Phoxocephalidae*		1	3	0	0	2	1	3	2	2	4	2	2	22	1.8
	BIVALVES	**SIZE**														
BAB<2	*Arthritica bifurca*	<2	0	2	0	0	0	0	3	0	0	4	1	1	11	0.9
BAB>2		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	2	0	0	0	0	3	0	0	4	1	1	11	0.9
BAS<5	*Austrovenus stutchburyi*	<5	1	0	0	1	1	0	1	1	1	0	0	0	6	0.5
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	1	0	0	1	1	0	1	1	1	0	0	0	6	0.5
BML<5	*Macamona liliana*	<5	1	5	1	2	1	0	1	1	1	3	2	1	19	1.6
BML5-15		5-15	0	0	0	0	1	0	0	0	0	1	3	0	5	0.4
BML>15		>15	0	0	0	1	0	0	0	0	0	0	0	1	2	0.2
BML-COND		Cond.analysis	0	1	0	0	0	0	0	0	0	0	0	0	1	0.1
		Total	1	6	1	3	2	0	1	1	1	4	5	2	27	2.3
BNH<2	*Nucula hartvigiana*	<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	*Paphies australis*	<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	*Theora lubrica*	<5	1	0	0	0	0	0	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	1	0	0	0	0	0	0	0	0	0	1	0	2	0.2
	CUMACEANS															
CCL	*Colurostylis lemurum*		1	1	1	0	0	0	0	2	0	0	0	0	5	0.4
	GASTROPODS															
GCA	*Cominella adspera*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE	*Notoacmea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	OTHER															
OAN	*Anthopleura aureoradiata*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	POLYCHAETES															
PAA	*Aquilaspio aucklandica*		6	15	12	4	9	12	16	18	10	5	11	3	121	10.1
PAGL	*Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	*Aonides oxycephala*		0	0	0	0	0	0	0	0	0	0	1	0	1	0.1
PAR	*Aricidea* sp.		0	1	2	1	1	1	1	2	1	0	2	0	12	1.0
PBOC	Pseudopolydora complex		1	1	0	0	0	1	0	1	0	1	1	1	7	0.6
PCOS	*Cossura* sp.		10	2	9	12	9	13	11	13	13	24	9	14	139	11.6
PEUC	*Euchone* sp.		16	6	2	0	2	0	0	0	2	1	0	0	29	2.4
PGE	*Goniada* sp.		0	1	0	0	0	0	0	0	0	0	0	0	1	0.1
PGLY	*Glycera* sp.		0	0	0	1	1	1	1	0	2	1	2	1	10	0.8
PHF	"Capitellidae"		24	29	34	22	23	23	24	26	24	29	37	35	330	27.5
PMD	*Magelona dakini*		0	0	0	0	2	0	0	0	0	0	0	0	2	0.2
PNIC	Nereidae		4	3	4	2	11	8	7	7	3	6	6	3	64	5.3
POP	*Orbinia papillosa*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PPAR	Paraonidae		2	0	4	4	0	3	2	3	2	2	1	1	24	2.0
	NON INDICATOR SPECIES															
CAMPH	Amphipods		2	0	2	0	2	1	3	0	0	1	0	4	15	1.3
CCRAB	Crabs		0	0	3	0	2	0	0	1	1	0	0	0	7	0.6
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	1	1	0.1
CISO	Isopods		2	1	1	0	0	0	1	0	0	1	0	1	7	0.6
COST	Ostracods		0	0	1	0	0	0	2	0	0	1	1	0	5	0.4
CSHR	Shrimps/Mysids		0	0	0	1	0	2	0	0	0	0	0	0	3	0.3
COTH	Other Crustaceans		0	0	0	0	0	0	0	1	2	0	0	0	3	0.3
BOTH	Bivalves		0	2	0	0	1	0	1	1	3	0	0	1	9	0.8
GOTH	Gastropods		0	4	2	3	8	3	2	2	0	1	3	1	29	2.4
EFEZ	*Fellaster zealandiae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
EHOL	Holuthurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
ONEM	Nemerteans		4	1	0	2	0	1	0	2	0	0	2	1	13	1.1
POTH	Polychaetes		6	6	4	3	1	3	3	1	6	3	2	1	39	3.3
OOLIG	Oligochaetes		1	0	0	0	0	0	0	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	*Edwardsia*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OTHER	Misc. Other		0	0	1	1	0	0	1	0	1	1	0	1	6	0.5
	TOTAL		83	84	83	60	77	73	83	84	74	89	87	74	951	79.3

Appendix 3 – Dry weight shell-hash

Southern Firth of Thames

July 2008

Site	Sample No.	Shell hash weight (g)
MI	1	209.7
	2	378.8
	3	586.6
	4	614.3
	5	363.1
	6	212.7
	7	159.8
	8	453.2
	9	640.6
	10	680.4
	11	286.6
	12	199.9
KB	1	154.0
	2	160.0
	3	141.1
	4	200.6
	5	171.3
	6	233.1
	7	174.3
	8	222.0
	9	133.9
	10	184.5
	11	204.9
	12	176.2

Whaingaroa Harbour

Site	Sample No.	Shell hash weight (g)
WI	1	201.5
	2	150.5
	3	136.7
	4	130.3
	5	96.5
	6	85.0
	7	60.4
	8	78.3
	9	83.8
	10	98.5
	11	158.9
	12	100.2
OB	1	77.7
	2	59.3
	3	88.2
	4	88.5
	5	50.3
	6	67.3
	7	41.2
	8	73.2
	9	23.0
	10	35.6
	11	55.2
	12	20.3

Southern Firth of Thames

October 2008

Site	Sample No.	Shell hash weight (g)
KA	1	87.6
	2	56.7
	3	101.8
	4	45.9
	5	81.4
	6	58.1
	7	70.5
	8	124.5
	9	89.6
	10	72.0
	11	38.9
	12	135.4
GC	1	483.2
	2	698.8
	3	1014.3
	4	229.7
	5	536.8
	6	523.9
	7	551.0
	8	825.3
	9	669.6
	10	722.8
	11	472.6
	12	450.4
TP	1	129.9
	2	84.4
	3	135.0
	4	165.4
	5	42.6
	6	60.8
	7	41.0
	8	102.4
	9	116.7
	10	56.7
	11	65.9
	12	64.2
MI	1	110.5
	2	433.7
	3	218.1
	4	468.5
	5	338.0
	6	137.1
	7	110.9
	8	121.7
	9	164.4
	10	345.3
	11	202.4
	12	170.7
KB	1	147.3
	2	267.8
	3	166.0
	4	123.5
	5	150.2
	6	134.4
	7	168.3
	8	225.9
	9	190.3
	10	143.5
	11	185.8
	12	155.6

Whaingaroa Harbour

Site	Sample No.	Shell hash weight (g)
TU	1	145.1
	2	67.1
	3	139.2
	4	82.4
	5	71.9
	6	69.3
	7	119.8
	8	95.0
	9	95.7
	10	61.4
	11	133.2
	12	162.4
HB	1	89.2
	2	108.9
	3	197.3
	4	98.7
	5	209.0
	6	146.4
	7	210.6
	8	241.9
	9	96.7
	10	155.0
	11	199.1
	12	257.2
X	1	201.9
	2	352.5
	3	176.6
	4	203.6
	5	151
	6	94.3
	7	229.1
	8	121.2
	9	149.7
	10	194.6
	11	179.1
	12	216
WI	1	543.3
	2	119.8
	3	335.7
	4	148.5
	5	81.1
	6	60.1
	7	74.3
	8	81.8
	9	160.1
	10	94.0
	11	228.4
	12	119.3
OB	1	116.2
	2	65.4
	3	68.7
	4	48.4
	5	55.3
	6	85.7
	7	28.4
	8	48.4
	9	78.5
	10	94.6
	11	43.6
	12	59.1

Southern Firth of Thames

Whaingaroa Harbour

April 2009

Site	Sample No.	Shell hash weight (g)
KA	1	32.4
	2	101.7
	3	78.0
	4	55.6
	5	54.2
	6	50.5
	7	136.6
	8	29.4
	9	47.9
	10	124.6
	11	121.3
	12	126.8
GC	1	688.3
	2	710.9
	3	1245.8
	4	289.9
	5	675.4
	6	616.0
	7	593.3
	8	334.8
	9	648.2
	10	701.2
	11	437.7
	12	625.4
TP	1	37.4
	2	86.0
	3	125.3
	4	175.2
	5	44.0
	6	156.5
	7	41.3
	8	50.0
	9	79.8
	10	250.2
	11	112.8
	12	63.6
MI	1	87.7
	2	206.7
	3	361.3
	4	338.0
	5	163.5
	6	143.0
	7	164.4
	8	79.1
	9	397.7
	10	282.1
	11	169.3
	12	124.8
KB	1	166.0
	2	176.1
	3	69.7
	4	139.4
	5	168.3
	6	223.0
	7	124.7
	8	124.6
	9	240.4
	10	201.6
	11	198.1
	12	120.2

Site	Sample No.	Shell hash weight (g)
TU	NOT	SAMPLED
	NOT	SAMPLED
	NOT	SAMPLED
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	NOT	SAMPLED
	NOT	SAMPLED
	NOT	SAMPLED
	NOT	SAMPLED
	NOT	SAMPLED
	NOT	SAMPLED
HB	1	205.0
	2	107.4
	3	156.7
	4	129.9
	5	112.5
	6	97.0
	7	169.4
	8	382.7
	9	152.7
	10	145.0
	11	283.2
	12	240.4
X	1	131.3
	2	152.5
	3	304.7
	4	305.2
	5	82.9
	6	158.1
	7	116.7
	8	163.7
	9	125.3
	10	210
	11	184.7
	12	428.8
WI	1	82.4
	2	159.4
	3	112.0
	4	84.7
	5	65.0
	6	66.0
	7	72.4
	8	197.3
	9	76.8
	10	126.0
	11	114.3
	12	181.9
OB	1	56.0
	2	75.4
	3	72.7
	4	65.4
	5	89.9
	6	53.2
	7	46.1
	8	78.1
	9	35.0
	10	35.3
	11	41.4
	12	44.4

Appendix 4 – Sediment organic carbon and nitrogen content

Southern Firth of Thames

July 2008

	Total Organic Carbon g/100g dry wt	Dry Matter g/100g as rcvd	Total Nitrogen g/100g dry wt
MI	0.39	59	0.081
	0.28	62	0.063
	0.29	63	0.066
	0.22	66	0.059
	0.39	57	0.082
KB	0.27	69	0.059
	0.37	58	0.077
	0.3	66	0.061
	0.37	62	0.082
	0.32	63	0.092

October 2008

	Total Organic Carbon g/100g dry wt	Dry Matter g/100g as rcvd	Total Nitrogen g/100g dry wt
KA	0.31	65	0.033
	0.31	63	0.031
	0.31	61	0.035
	0.26	65	0.025
	1.3	62	0.280
GC	0.33	63	0.220
	0.41	57	0.031
	0.34	63	0.031
	0.27	62	0.028
	0.32	63	0.033
TP	0.11	68	0.025
	0.1	71	0.029
	0.089	72	0.030
	0.1	65	0.035
	0.1	69	0.025
MI	0.17	67	0.025
	0.27	59	0.030
	0.27	68	0.025
	0.2	68	0.130
	0.21	70	0.026
KB	0.38	58	0.300
	0.42	57	0.035
	0.37	64	0.052
	0.26	64	0.025
	0.34	51	0.037

Whaingaroa Harbour

July 2008

	Total Organic Carbon g/100g dry wt	Dry Matter g/100g as rcvd	Total Nitrogen g/100g dry wt
WI	0.32	70	0.062
	0.35	64	0.069
	0.41	69	0.074
	0.37	69	0.079
	0.36	67	0.077
OB	0.52	62	0.089
	0.56	58	0.087
	0.55	51	0.095
	0.57	56	0.089
	0.58	57	0.086

October 2008

	Total Organic Carbon g/100g dry wt	Dry Matter g/100g as rcvd	Total Nitrogen g/100g dry wt
TU	0.35	71	0.050
	0.33	72	0.025
	0.32	73	0.025
	0.38	73	0.025
	0.34	71	0.035
HB	0.84	55	0.410
	0.88	50	0.110
	0.82	55	0.110
	0.86	56	0.100
	0.9	53	0.110
X	0.39	70	0.062
	0.63	64	0.120
	0.54	67	0.081
	0.43	69	0.074
	0.52	71	0.080
WI	0.47	68	0.077
	0.71	68	0.032
	0.42	67	0.070
	0.37	72	0.029
	0.45	63	0.063
OB	0.68	59	0.076
	0.71	60	0.093
	0.7	60	0.082
	0.69	60	0.081
	0.69	61	0.082

Southern Firth of Thames

April 2009

	Total Organic Carbon g/100g dry wt	Dry Matter g/100g as rcvd	Total Nitrogen g/100g dry wt
KA	0.31	63	0.025
	0.25	67	0.025
	0.37	64	0.073
	0.22	64	0.036
	0.26	64	0.029
GC	0.27	59	0.027
	0.42	49	0.034
	1	64	0.025
	0.34	57	0.032
	0.29	64	0.051
TP	0.11	68	0.030
	0.11	70	0.025
	0.13	71	0.025
	0.12	71	0.025
	0.12	68	0.025
MI	0.55	50	0.093
	1.5	59	0.069
	0.52	55	0.077
	0.53	45	0.045
	0.57	50	0.086
KB	0.52	56	0.120
	0.44	53	0.070
	0.48	57	0.069
	0.46	58	0.074
	0.47	60	0.078

Whaingaroa Harbour

	Total Organic Carbon g/100g dry wt	Dry Matter g/100g as rcvd	Total Nitrogen g/100g dry wt
TU	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
HB	0.75	62	0.083
	0.73	61	0.090
	0.69	65	0.078
	0.59	59	0.072
	0.71	62	0.090
X	0.47	66	0.029
	0.46	72	0.032
	0.38	73	0.025
	0.53	66	0.026
	0.36	68	0.027
WI	0.46	64	0.025
	0.5	64	0.054
	0.52	62	0.027
	0.47	63	0.060
	0.46	68	0.032
OB	0.62	59	0.070
	0.69	62	0.029
	0.61	64	0.067
	0.65	59	0.028
	0.67	59	0.071

Appendix 5 – Sediment photosynthetic pigment concentration

Southern Firth of Thames

July 2008

	Chlorophyll-*a* µg g-1	Phaeophytin µg g-1
MI	17.46	7.63
	19.68	2.90
	14.29	6.51
	12.88	3.48
	13.51	8.07
KB	9.71	2.03
	10.52	5.52
	13.03	5.61
	12.42	5.65
	–	–

October 2008

	Chlorophyll-*a* µg g-1	Phaeophytin µg g-1
KA	15.08	15.08
	14.76	9.84
	0.00	0.00
	14.62	8.46
	18.23	10.97
GC	33.81	0.95
	35.96	5.26
	35.71	0.48
	40.81	3.87
	35.40	5.24
TP	7.06	1.03
	8.03	2.25
	12.64	0.42
	18.31	3.23
	16.52	2.32
MI	18.06	1.79
	12.71	5.93
	18.53	11.76
	10.44	7.65
	12.14	8.00
KB	15.86	2.24
	19.12	4.56
	20.63	21.56
	19.22	10.31
	18.82	8.04

Whaingaroa Harbour

	Chlorophyll-*a* µg g-1	Phaeophytin µg g-1
WI	19.29	6.57
	12.34	6.09
	9.71	8.41
	6.23	5.07
	9.55	8.36
OB	11.94	16.61
	8.28	8.97
	4.51	6.47
	14.29	5.36
	12.81	11.40

	Chlorophyll-*a* µg g-1	Phaeophytin µg g-1
TU	43.80	4.51
	31.53	3.61
	37.26	0.68
	35.07	5.48
	38.03	3.52
HB	40.36	3.64
	41.40	5.80
	35.45	6.91
	32.68	10.00
	–	–
X	38.57	9.7
	42.50	7.7
	30.30	8.5
	38.55	8.0
	33.94	21.4
WI	20.74	3.82
	25.59	3.09
	20.00	3.28
	23.06	4.58
	35.08	3.97
OB	23.39	6.44
	21.67	5.67
	22.50	6.00
	19.50	8.00
	20.49	8.20

Southern Firth of Thames

April 2009

	Chlorophyll-*a* µg g-1	Phaeophytin µg g-1
KA	28.25	29.84
	17.61	9.55
	15.16	6.56
	14.53	4.38
	23.13	34.38
GC	44.41	3.22
	62.45	3.06
	36.09	4.38
	40.88	11.40
	38.75	1.09
TP	8.38	2.65
	2.86	2.43
	10.14	1.97
	4.79	1.27
	10.88	2.06
MI	20.80	18.60
	10.00	4.58
	22.91	11.64
	20.44	2.00
	20.40	7.60
KB	21.61	13.75
	27.74	22.08
	28.95	35.61
	24.66	12.76
	30.33	16.33

Whaingaroa Harbour

	Chlorophyll-*a* µg g-1	Phaeophytin µg g-1
TU		
HB	35.32	8.39
	32.30	13.61
	32.00	11.54
	38.47	14.75
	29.35	6.61
X	29.85	4.24
	32.22	4.17
	32.19	7.26
	28.94	2.12
	32.06	7.65
WI	27.03	12.97
	26.09	12.81
	29.19	15.97
	25.08	6.67
	19.26	9.26
OB	20.00	8.47
	20.81	6.45
	22.34	8.28
	23.73	13.22
	25.59	6.27

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[5] 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:

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

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:

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

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.

[5] 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.