Environment Waikato Technical Report 2004/08

Regional Estuary Monitoring Programme: Benthic Macrofauna Communities – April 2001 to April 2002

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 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. This report presents the results of monitoring a suite of 26 "indicator" species/taxa characteristic of the intertidal benthic communities. 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.

The five permanent sites in the southern Firth of Thames and Whaingaroa Harbour were sampled in April 2001, October 2001 and April 2002. Two sites from each harbour were additionally sampled in July 2001 and January 2002. 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, with surface scrapes collected and analysed for chlorophyll-*a* and phaeophytin content. For each of the permanent monitoring sites, changes in the assemblages of monitored benthic macrofauna species/taxa over time were shown graphically and examined further using a suite of multivariate statistical methods.

Results from the April 2001 to April 2002 monitoring period indicate that there are distinct differences in the benthic macrofauna communities between sites in each estuary. Although each site displayed some changes in assemblage composition over time, there were no apparent clear or systematic temporal patterns evident in either estuary. The most consistently common species/taxa found at sites in the southern Firth of Thames included the polychaetes *Aonides oxycephala* and capitellids, and the bivalves *Austrovenus stutchburyi, Macomona liliana, Nucula hartvigiana* and *Paphies australis.* For Whaingaroa Harbour, consistently common species/taxa included the polychaetes *Aquilaspio aucklandica*, *Cossura* sp. and capitellids, and the bivalves *Austrovenus stutchburyi* and *Nucula hartvigiana*.

The sediment variable or combination of variables that best explained the assemblage composition for sites in the southern Firth of Thames and Whaingaroa Harbour was the dry weight of shell-hash. However, when analysis included those dates for which chlorophyll-*a* and phaeophytin content was recorded, chlorophyll-*a*, phaeophytin content and the dry weight of shell-hash were the combination of variables that best explained the assemblage composition for the southern Firth of Thames sites.

Since the time-series in this report covers only the first year of monitoring, sufficient data has not yet been collected to enable detailed trend or time-series analysis. Nor is it appropriate at this early stage to ascribe any great significance to apparent trends. Hence, the intention of this report is to provide a baseline from which future year's results can be added to and compared with. In the future it is proposed that information from event-driven catchment studies and monitoring of sites be incorporated into the programme to provide links between catchment processes and estuarine ecosystems.

It is recommended that the monitoring programme continue as outlined in Turner (2001), with a review undertaken after 3-5 years to assess all aspects of the sampling protocol. It is strongly advised that the formal quality control assessment protocols for the sorting, identification and enumeration of benthic core samples continue to be rigorously implemented. Following discussions with scientists at the University of Auckland and NIWA, it is recommended that *Heteromastus filiformis* and other

capitellids be recorded as “Capitellidae”, and that *Boccardia ?syrtis*, *Polydora* and *Pseudopolydora* be recorded as “*Pseudopolydora* complex”.

1 Introduction

In April 2001 Environment Waikato initiated the Regional Estuary Monitoring Programme at permanent monitoring sites in the southern Firth of Thames and Whaingaroa (Raglan) Harbour. The monitoring programme focuses on intertidal sediments and their benthic macrofauna communities[1] as "indicators" of the health of the Region's estuaries. It is a long-term 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 also 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 full in Turner (2000 and 2001).

The results of the pilot study undertaken in April 2001 were presented in Turner et al. (2002). This report presents the benthic macrofauna community data collected over the first year of the programme between April 2001 and April 2002. The complete sediment data are presented in Gibberd and Carter, (in prep.). Sufficient data have not yet been collected to enable detailed trend or time-series analysis, nor is it appropriate at this early stage in the monitoring programme to attribute any changes to either natural variability or some factor associated with catchment activity or estuary development.

The key variables measured in the Regional Estuary Monitoring Programme are:

1 A suite of 26 "indicator" species or taxa[2] characteristic of intertidal sand-flat benthic macrofauna communities, and selected to represent a variety of taxonomic groups and a range of life-histories, ecological niches and feeding methods (see Hewitt et al. 2001).
2 A suite of physical, chemical and biological sediment characteristics:
   - Sediment grain-size;
   - Organic matter content;
   - Benthic microalgal biomass (quantified by chlorophyll-*a* and phaeophytin concentration);
   - Rates of sediment deposition and erosion.

Biological and physical-chemical monitoring must be conducted in parallel as part of an integrated programme of monitoring. Simultaneous monitoring of a number of physical and chemical parameters will enable identification of the relationships between changes in benthic communities and changes in environmental conditions. An integrated monitoring programme will thus be more responsive to detecting trends and changes.

In April 2001, a pilot study was undertaken to establish a baseline for detecting changes in the benthic macrofauna communities and sediment characteristics over time (Turner et al., 2002). The permanent monitoring sites are 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 sand-flat benthic communities and sediment characteristics.

Note that the Regional Estuary Monitoring Programme is based on similar monitoring programmes designed by NIWA and undertaken by other Regional Councils (e.g., Auckland Regional Council).

[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] Note that the term "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 species groups monitored may include more than one species.

2 Methods

The methods are briefly outlined here, for further details see Turner (2001) and Turner et al. (2002).

2.1 Field Sites

Five permanent sites in the southern Firth of Thames (Figure 1) and five sites in Whaingaroa (Raglan) Harbour (Figure 2) have been selected for monitoring. These sites are considered to be representative of the intertidal sand-flats and are distributed throughout the main area of each estuary. The site codes and NZMG GPS co-ordinates are presented in Table 1.

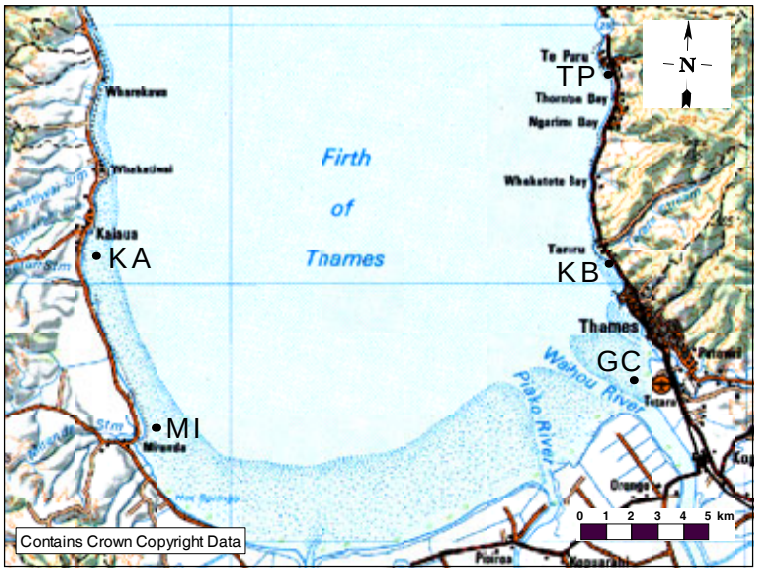

Figure 1: Location of permanent monitoring sites in the southern Firth of Thames.

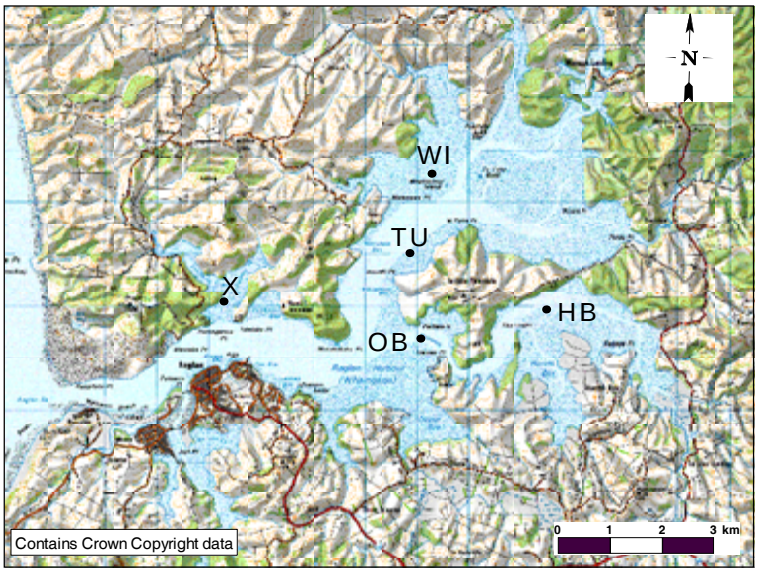

Figure 2: Location of permanent monitoring sites in Whaingaroa Harbour.

Table 1: Details of permanent monitoring sites in southern Firth of Thames and Whaingaroa Harbour.

Estuary	Site Name	Site Code	NZMG GPS Co-ordinates (centre)
Firth of Thames	Kaiaua	KA	2714798E 6451008N[3]
	Miranda	MI	2717134E 6444339N
	Thames (Gun Club)	GC	2735680E 6446167N
	Kuranui Bay	KB	2734709E 6450707N
	Te Puru	TP	2734655E 6458003N
Whaingaroa	Whatitirinui Island	WI	2679307E 6380510N
	Te Puna Point	TU	2678891E 6378988N
	Okete Bay	OB	2679095E 6377346N
	Haroto Bay	HB	2681515E 6377897N
	Ponganui Creek	X	2675315E 6378062N

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.

2.2 Sampling Regime

All five sites in the southern Firth of Thames and Whaingaroa (Raglan) Harbour[4] were sampled in April 2001, October 2001 and April 2002. Two of the sites (Miranda and Kuranui Bay in the southern Firth of Thames; Whatitirinui Island and Okete Bay in Whaingaroa Harbour) were also sampled in July 2001 and January 2002.

2.3 Sample Collection and Processing

2.3.1 Benthic Macrofauna

On each sampling occasion 12[5] core samples (13 cm ø, 15 cm deep) were collected from within each monitoring plot. To ensure adequate dispersion of core samples, 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.

After collection, the macrofauna were separated from the sediment by sieving (500 µm mesh), preserved with 70% isopropyl alcohol in seawater and stained with 0.1% Rose Bengal. In the laboratory, the macrofauna were sorted, with 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, > 5mm). The remaining species (i.e., non-indicator species) were classified into major taxonomic groups and counted. Samples were stored in 50% isopropyl alcohol.

From each site where sufficient numbers of shellfish were available, 20-30 adult-sized individuals of selected bivalve species (*Austrovenus stutchburyi*, *Macomona liliana*, and *Paphies australis*) were selected, frozen and retained for condition analysis.[6] No condition analyses have been undertaken to date.

[3] New position of the permanent monitoring plot at Kaiaua (200 m shoreward in October 2001) due to difficulties with access except during low spring tides.
[4] Note that the site at Ponganui Creek (Site X) was first sampled in October 2001.
[5] See Hewitt et al. (2001) and Turner (2001) for justification. Note that 15 samples were collected on each sampling occasion during the first year, but only 12 samples were processed.
[6] Bivalves for condition analysis were removed during sieving and prior to sample preservation in isopropyl alcohol.

After sorting, the remaining non-living material (e.g., broken shells - hereafter referred to as "shell-hash") was dried at 70°C for 48 hours and weighed to provide information on the dry weight of shell-hash at each site.

2.3.2 Sediment Characteristics

At each site, sediment samples were collected from within the monitoring plot for the analysis of a suite of physical and chemical sediment characteristics. Sediment characteristics such as grain-size, organic matter content and photosynthetic pigment concentration, are known to influence the distribution and abundance of benthic macrofauna.

2.3.2.1 Surficial Sediment Grain-Size

Five replicate bulked surface sediment samples were collected from each monitoring plot on each sampling occasion for grain-size analysis. Samples were stored frozen. Samples were pre-treated with 10% hydrogen peroxide to remove organic material and 1*M* 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 then analysed using a Galai laser sediment analyser.

2.3.2.2 Sediment Organic Matter Content

A 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.

2.3.2.3 Sediment Photosynthetic Pigment Concentration

Five replicate surface sediment scrapes were collected from each monitoring plot on each sampling occasion. Samples were stored in black containers and frozen until analysis. Samples were analysed for chlorophyll-*a* and phaeophytin content. 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*.

Due to a laboratory handling error, there are measurements of chlorophyll-*a* and phaeophytin concentration available for the April, July and October 2001 sampling occasions only.

2.4 Statistical Analysis

Changes in the assemblages of indicator benthic macrofauna species/taxa over time at each of the permanent monitoring sites were examined using multivariate statistical methods (PRIMER v5; PRIMER-E Ltd. Plymouth 2001). Non-metric multidimensional scaling (MDS) ordinations based on Bray-Curtis similarities of species/taxa abundance data provides a visualisation of assemblage composition in a two-dimensional plot. The method of non-metric MDS constructs an ordination (or configuration) of the mean species/taxa abundances on different sampling dates at each of the sites, in which sample points are mapped in a specified number of dimensions (in this case two) in such a way that the rank order of the distances between sample points in the ordination reflects the rank order of the corresponding (dis)similarities in the similarity matrix (Clarke and Warwick, 2001). The stress value is a measure of how accurately the ordination preserves the between-sample point relationships in low-dimensional space, with low values (<0.1) indicating a good ordination with no real prospect that a misleading interpretation has been achieved. Plots of the MDS ordinations of the different sites on different sampling dates allow identification of trends or other patterns of change in the assemblages of indicator benthic macrofauna.

Significance testing for differences in assemblage composition between different sampling dates at each of the sites was undertaken using one-way analysis of similarities randomisation tests based on rank similarities of the samples (PRIMER ANOSIM routine [Analysis of Similarities]). This procedure tests the statistical

significance of differences between groups of samples based on the composition of their benthic macrofauna assemblages. The null hypothesis is that there are no differences in assemblage composition on different sampling dates. The ANOSIM global test was used to indicate whether there were significant differences between any of the sampling dates at each site. The global *R* value gives an indication of the extent of any differences, where values range between 0 (indistinguishable) and 1 (well separated).[7] The significant differences at each site were explored further using ANOSIM pairwise comparison tests. The ANOSIM pairwise comparison test follows on from the global test if significant differences were found to exist, and shows specifically which sampling dates were significantly different from each other as well as the extent of any differences.[8] For each of these comparisons (Date 1 vs. Date 2, Date 1 vs. Date 3, Date 2 vs. Date 3 etc.) the test statistic *(R)* is generated, which indicates the relative similarity of the assemblages between the two sampling dates that are being compared. Note that the nominal levels of Type I error (α = 0.05, i.e., the error rates per comparison) of these comparisons were not corrected to maintain the error rate per site (i.e., the probability that there will be an error in any of all comparisons) at 0.05. Such procedures would have required the nominal level to be set at α = 0.017 for three tests and α = 0.005 for 10 tests and would have increased the risk of Type II errors in each comparison.

Other statistical tests used include the PRIMER SIMPER ("similarity percentages") and BVSTEP routines. SIMPER was used to examine the contribution of each indicator species/taxa to the average Bray-Curtis dissimilarity between two sampling dates identified in the MDS plots and ANOSIM results. Those species with high average contributions relative to the standard deviation are considered to be important in the differentiation of assemblages on the different sampling dates. BVSTEP was used to identify the smallest subset of indicator species/taxa which in combination explain most of the pattern observed in the full set of species/taxa. This is (somewhat arbitrarily) taken to be when the Bray-Curtis similarity matrix of the subset of species/taxa correlates to at least $\rho \geq 0.95$ with the similarity matrix of the full set of species/taxa. BVSTEP differs from SIMPER analysis in that it looks at all the data from all the sampling dates at once rather than comparing pairs of samples.

A square-root transformation was applied to the data to reduce the influence that dominant species/taxa have on the results. Because only a sub-set of the species/taxa in the communities have been monitored, the dominance of taxa in the sub-set does not necessarily reflect their true dominance in the whole community, so it is appropriate to reduce their influence on the analysis (Morrisey et al., 1999). The MDS ordination was based on the mean abundance values for each indicator species/taxa from all the samples at each site on each sampling date. ANOSIM, SIMPER and BVSTEP analyses used the indicator species/taxa data from each replicate sample collected at each site on each sampling date. The number of individuals of each indicator bivalve species in all the size-classes combined was used in all analyses.

The relationship between multivariate assemblage composition and sediment variables (median grain-size, % mud [<63 µm], and dry weight of shell-hash; total nitrogen and total organic carbon content; chlorophyll-*a* and phaeophytin concentration) was examined using the BIO-ENV routine in PRIMER. Separate analyses were undertaken with and without sediment photosynthetic pigment concentrations for which incomplete data sets were available (see Section 2.3.2.3). BIO-ENV analysis used the mean abundance values for each indicator species/taxa from all the samples at each site on each sampling date and the mean values for sediment variables. Sediment variables were log transformed as the BIO-ENV routine requries that environmental variables not show marked skewness across the samples and that the relationships between them are approximately linear. The BIO-ENV routine identifies the subsets of the

[7] *R* values can be interpreted as follows; *R* > 0.75 = well separated, R > 0.5 = overlapping but clearly different, R < 0.25 barely separable (Clarke and Gorley, 2001).

[8] The important message from the ANOSIM pair-wise tests is usually not so much the significance level, but the pair-wise *R* values, since this gives an absolute measure of how separated the groups are (Clarke and Gorley, 2001).

environmental variables which yield the best matches between biological (species abundances) and abiotic (sediment variables) (dis)similarity matrices, as measured by Spearman rank correlation (ρ_s). It is important to note that linking patterns in the benthic macrofauna assemblages to those of sediment variables provides only an indication of which sediment characteristics may be important in contributing to the biological pattern, they do not actually prove cause-and-effect. Causality can only be demonstrated by manipulative field or laboratory experiments (Clarke and Warwick, 2001).

3 Results

3.1 Benthic Macrofauna Community Structure

3.1.1 Southern Firth of Thames

The mean total number of individuals and the major taxonomic group composition (including indicator species/taxa and non-indicator species/taxonomic groups) of the intertidal benthic macrofauna communities at each of the permanent monitoring sites in the southern Firth of Thames on each sampling date between April 2001 and April 2002 are presented in Figure 3.

Over the first year of the monitoring programme, the greatest changes in the total number of individuals and taxonomic composition occurred at KA, GC and TP. The total number of individuals and taxonomic composition were relatively consistent between sampling dates at KB and MI. The benthic macrofauna community at KA was numerically dominated by bivalves (65-78% of individuals on all sampling dates). The total number of individuals and the numbers of the three most abundant taxonomic groups (bivalves, polychaetes, and crustaceans) increased between April 2001 and October 2001. These changes may reflect the shoreward relocation in October 2001 of the permanent monitoring plot on the intertidal flat at this site.

The benthic community at GC was numerically dominated by polychaetes in April 2001 and October 2001 (75% of individuals). In April 2002 there was an increase in the total number of individuals and the abundance of non-indicator bivalves (in particular the exotic species *Musculista senhousi*) and crustaceans. Bivalves numerically dominated the community on this sampling date (46% of individuals).

On all three sampling dates, the benthic macrofauna community at TP was numerically dominated by bivalves (94-99% of individuals). There was a decrease in the total number of individuals in October 2001 and April 2002 compared to the first sampling date in April 2001.

The total number of individuals and taxonomic composition were relatively consistent between sampling dates over the first year of the monitoring programme at KB and MI. In April 2001 and July 2001, the community at KB was numerically dominated by bivalves (50-70% of individuals), but for the remainder of the sampling period polychaetes (43-47% of individuals), and to a lesser extent crustaceans (13-20% of individuals), were more abundant in the community. The community at MI was consistently numerically dominated by polychaetes (75-85% of individuals).

The data is included in full in Appendix 1.

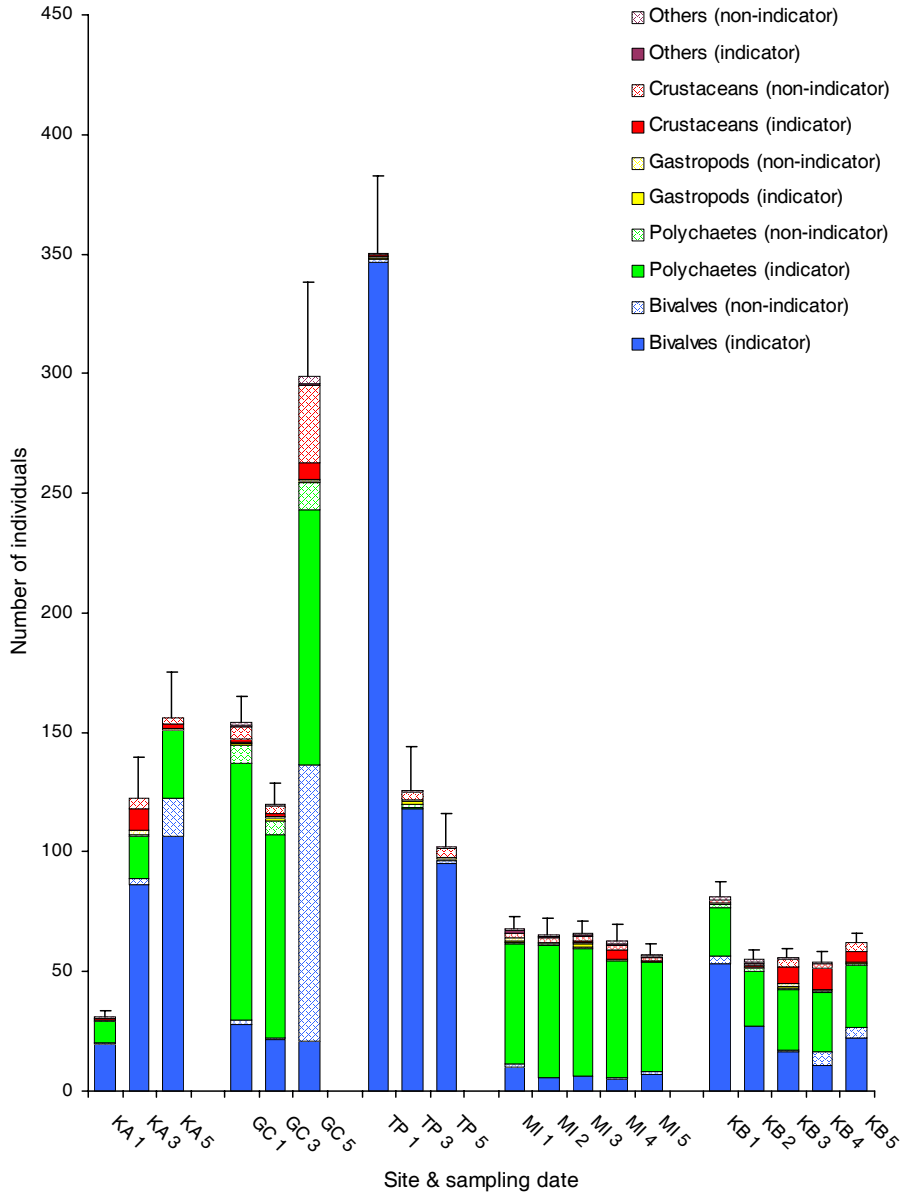

Figure 3: Mean (± standard error) total number of individuals and major taxonomic group composition of intertidal benthic macrofauna communities at the permanent monitoring sites in the southern Firth of Thames between April 2001 and April 2002. Sampling dates: April-01 = 1, July-01 = 2, Oct-01 = 3, Jan-02 = 4, April-02 = 5.

3.1.2 Whaingaroa (Raglan) Harbour

The mean total number of individuals and the major taxonomic group composition (including indicator species/taxa and non-indicator species/taxonomic groups) of the intertidal benthic macrofauna communities at each of the permanent monitoring sites in Whaingaroa (Raglan) Harbour on each sampling date between April 2001 and April 2002 are presented in Figure 4.

Over the first year of the monitoring programme, there were changes in the total number of individuals, and to a lesser extent taxonomic composition at all five sites, with the greatest changes recorded at TU.

The benthic macrofauna communities at WI and TU were generally consistently numerically dominated by bivalves (43-59% of individuals on all sampling dates at WI; 52-57 % of individuals at TU) and to a lesser extent polychaetes (29-48% of individuals

on all sampling dates at WI; 24-32% at TU) over the first year of the monitoring programme. The community at HB was numerically dominated by polychaetes (41-63% of individuals on all sampling dates), and the community at X by bivalves (57-59% of individuals). The community at OB was numerically dominated by polychaetes (68-80% of individuals on all sampling dates), with crustaceans generally the second most numerically abundant taxonomic group (8-18% of individuals).

The data is included in full in Appendix 2.

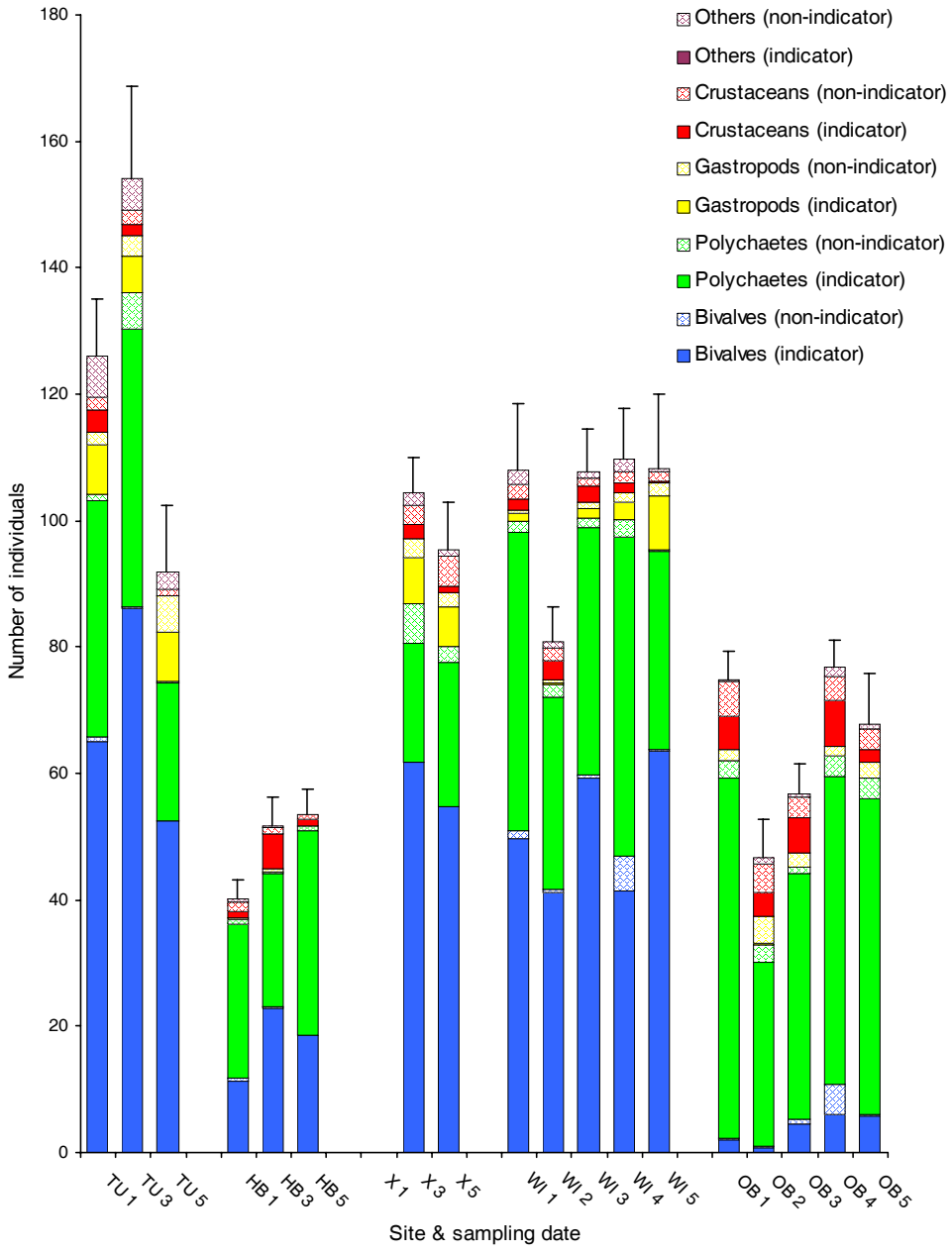

Figure 4: Mean (± standard error) total number of individuals and major taxonomic group composition of intertidal benthic macrofauna communities at the permanent monitoring sites in Whaingaroa Harbour between April 2001 and April 2002. Sampling dates: April-01 = 1, July-01 = 2, Oct-01 = 3, Jan-02 = 4, April-02 = 5.

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 April 2001 and April 2002 are listed in Table 2.

Table 2: The five most common species/taxonomic groups on each sampling date for each permanent monitoring site in the southern Firth of Thames.

	KA	GC	TP	MI	KB
Apr 01	*Theora* *Nucula* *Aricidea* Nereidae *Austrovenus*	*Aonides* *Paphies* Polychaetes *Austrovenus* Isopods	*Nucula* *Austrovenus* *Paphies* Bivalves *Paracorophium*	*Aonides* *Austrovenus* *Macomona* *Anthopleura* *Arthritica*	*Austrovenus* *Arthritica* Capitellidae *Aquilaspio* *Nucula*
July 01				*Aonides* *Macomona* *Austrovenus* Nereidae Capitellidae	*Austrovenus* Capitellidae *Aquilaspio* *Nucula* *Macomona*
Oct 01	*Nucula* Capitellidae Phoxocephalidae *Theora* Shrimps/Mysids	*Aonides* *Paphies* *Austrovenus* Polychaetes Shrimps/Mysids	*Nucula* *Paphies* *Austrovenus* Amphipods *Notoacmea*	*Aonides* *Macomona* *Austrovenus* *Notoacmea* Nereidae	Capitellidae *Austrovenus* *Paracorophium* Shrimps/Mysids *Nucula*
Jan 02				*Aonides* *Paracorophium* *Macomona* Amphipods *Austrovenus*	Capitellidae *Paracorophium* *Austrovenus* Bivalves *Macomona*
Apr 02	*Austrovenus* *Nucula* Bivalves *Magelona* Capitellidae	Bivalves *Aonides* Isopods Nereidae Polychaetes	*Nucula* *Paphies* Amphipods *Austrovenus* Bivalves	*Aonides* *Austrovenus* *Macomona* Nereidae Bivalves	Capitellidae *Austrovenus* Bivalves *Paracorophium* *Magelona*

The most common species/taxonomic groups at MI and TP did not change markedly over the first year of the monitoring programme. At MI the polychaete *Aonides oxycephala* was the most abundant species on every sampling date, with mean abundances varying between 43-51 individuals.core^{-1}. The bivalves *Austrovenus stutchburyi* and *Macomona liliana* were also recorded on every sampling date and were generally the second and third most abundant species, with mean numbers ranging between 1-5 individuals.core^{-1}. Nereid polychaetes were among the most common species on three of the sampling dates with mean abundances of 1-2 individuals.core^{-1}. At TP the three bivalve species (*A. stutchburyi*, *Nucula hartvigiana* and *Paphies australis*) were consistently among the most abundant species recorded at this site, while unidentified amphipods and bivalves were both among the most common species/taxonomic groups on two sampling dates with mean abundances of 1-2 individuals.core^{-1}. There were large variations in the mean abundances of the three bivalve species: 2-108 *A. stutchburyi* individuals.core^{-1}, 72-208 *N. hartvigiana* individuals.core^{-1}, and 21-30 *P. australis* individuals.core^{-1}.

At GC only two species/taxonomic groups (the polychaete *A. oxycephala* and unidentified polychaetes) were consistently among the most common species/taxonomic groups, with mean abundances of between 83-101 *A. oxycephala* individuals.core^{-1} and 6-11 unidentified polychaete individuals.core^{-1}. The bivalves *A. stutchburyi* and *P. australis*, and unidentified isopods, were among the most common species/taxonomic groups on two sampling dates. Unidentified bivalves were the most common species/taxonomic group recorded at this site on one occasion, with a mean abundance of 116 individuals.core^{-1}. At KB two species/taxonomic groups (the bivalve

A. stutchburyi and capitellid polychaetes) were consistently among the most common species, with mean abundances of 6-40 *A. stutchburyi* individuals.core^{-1} and 7-19 capitellid polychaete individuals.core^{-1}. The bivalve *N. hartvigiana* and the corophiid amphipod *Paracorophium* sp. were among the most common species at KB on three sampling dates; and the polychaete *Aquilaspio aucklandica*, the bivalve *M. liliana* and unidentified bivalves were among the most common species/taxonomic groups at this site on two sampling dates.

At KA there was the greatest change in the suite of common species/taxonomic groups over the monitoring period, with only one species (the bivalve *N. hartvigiana*) among the five most common species/taxonomic groups on all three sampling dates. There were large variations in the mean abundance of *N. hartvigiana*: 6-74 individuals.core^{-1}. The bivalves *A. stutchburyi* and *Theora lubrica* and capitellid polychaetes were among the five most common species on two sampling dates. Note that the changes observed between April 2001 and October 2001 at KA may be a reflection of the shoreward relocation of the permanent monitoring plot in October 2001.

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

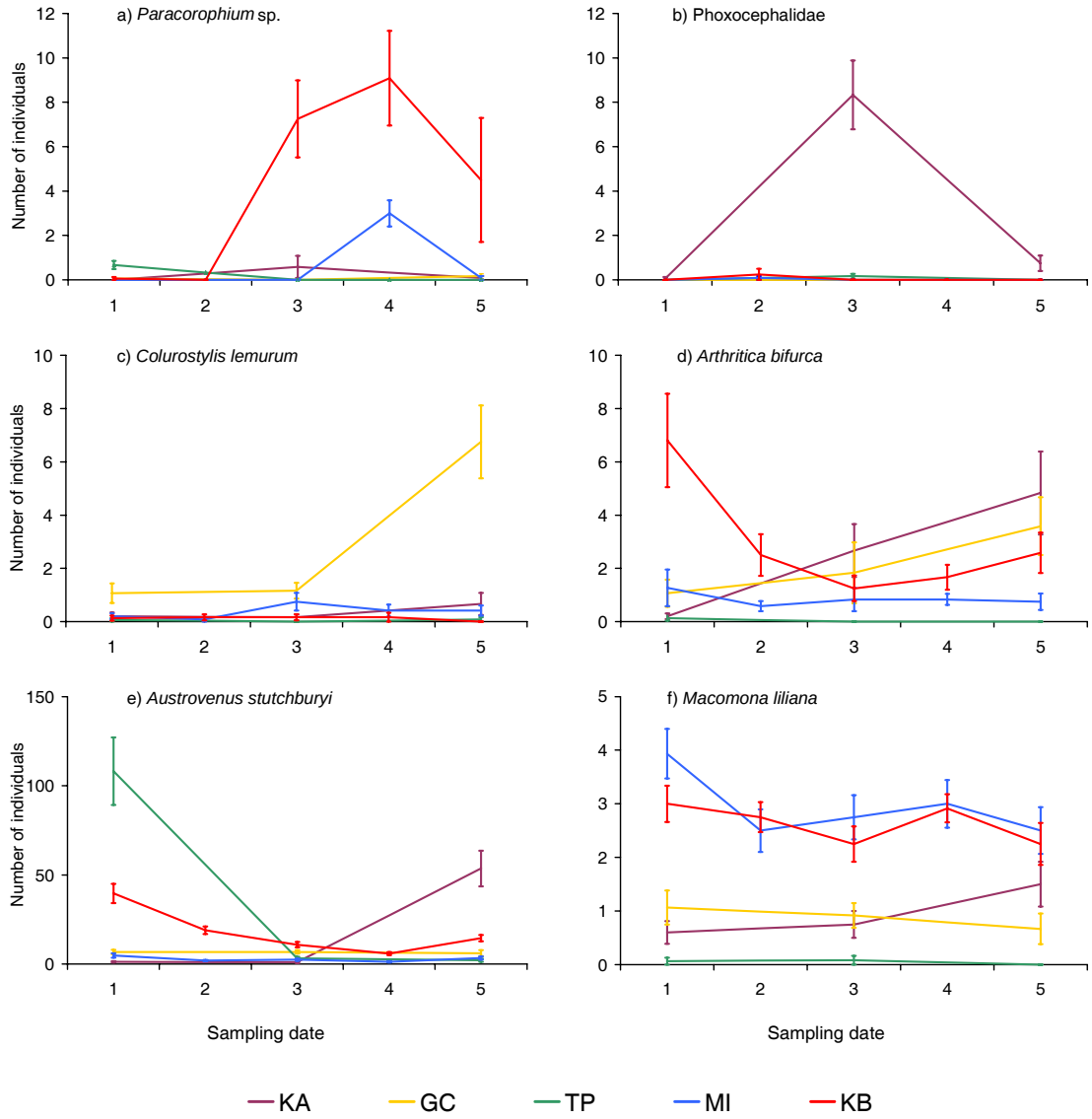

Figure 5: The mean (± standard error) number of selected indicator species/taxa on each sampling date at each of the permanent monitoring sites in the southern Firth of Thames. Sampling dates: April-01 = 1, July-01 = 2, Oct-01 = 3, Jan-02 = 4, April-02 = 5. Note the different scales on the vertical axes.

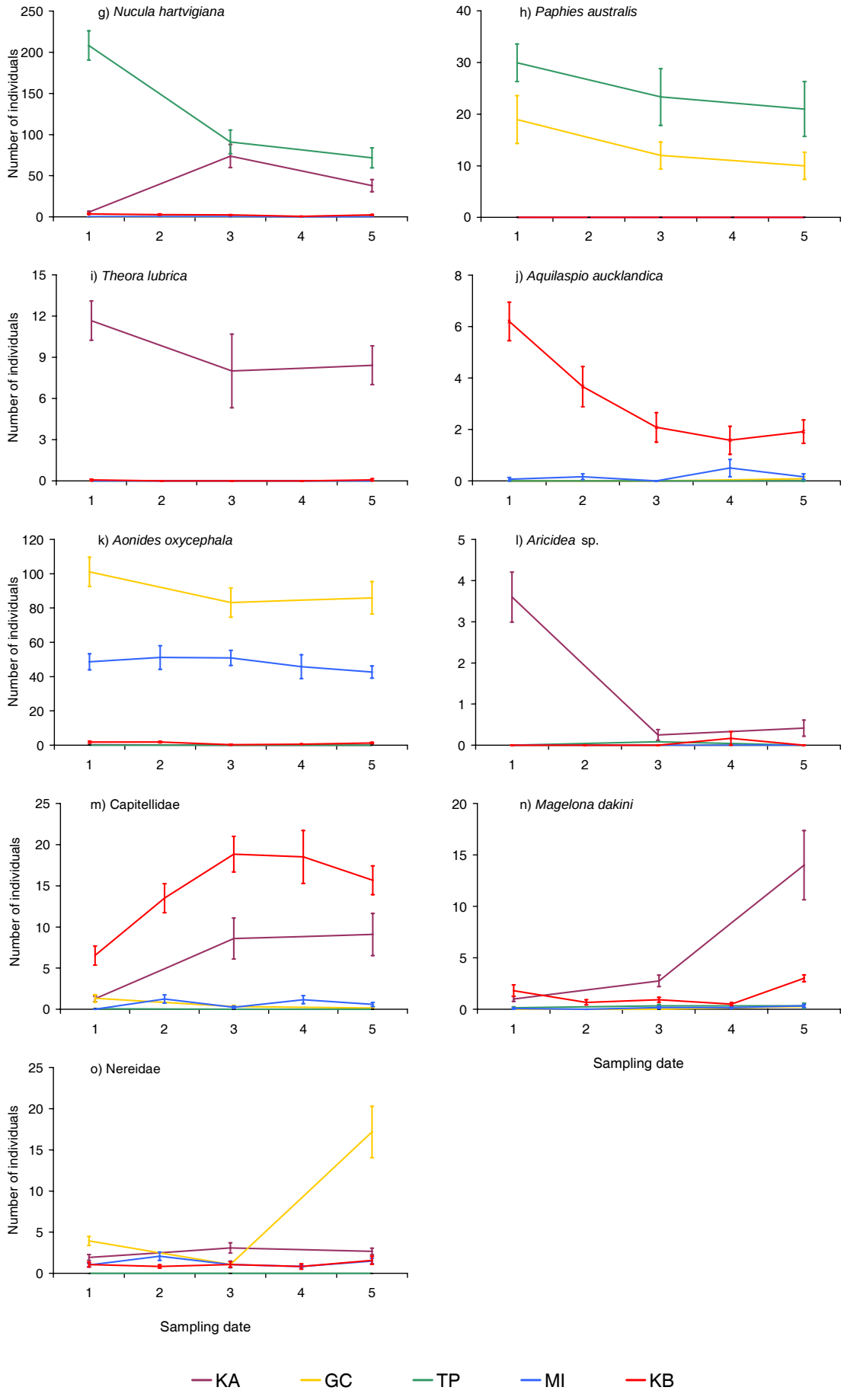

Figure 5. (cont.)

By examining time-plots of individual species/taxa it is possible to see how their numbers have changed through time at each site. A brief discussion of the patterns of abundance of selected indicator species/taxa at different sites over the monitored period follows. Since the time-series covers a period of only one year, detailed discussion and identification of trends in patterns of abundance through time is still premature. Some of the observed changes in species/taxa abundances may be indicative of seasonal variation and/or longer-term cycles or trends. Information from subsequent years will provide further information regarding the significance and nature of these patterns.

The corophiid amphipod *Paracorophium* sp. was most common at KB and MI, where an increase in abundance was recorded between October 2001 and January 2002, followed by a decrease in abundance in April 2002 (Figure 5(a)). The phoxocephalid amphipods were most common at KA, where they occurred in greatest abundance in October 2001 and in low abundances in April 2001 and 2002 (Figure 5(b)). The cumacean *Colurostylis lemerum* was most common at GC, where an increase in abundance was recorded over the first year of the monitoring programme, with the greatest increase occurring between October 2001 and April 2002 (Figure 5(c)).

The abundance of the bivalve *Macomona liliana* declined over the first year of the monitoring programme at MI and was reasonably consistent at KB (Figure 5(f)). There was a decrease in the abundance of *Theora lubrica* at KA (Figure 5(i)), with a decrease in the abundance of large (> 5 mm shell length) individuals at this site in October 2001. There was a decrease in the abundance of *Nucula hartvigiana* over the year at TP, in particular of small (< 2 mm) individuals; and an increase at KA, where the greatest abundance occurred in October 2001, again particularly of small individuals (Figure 5(g)). There was a decrease in the abundance of *Paphies australis* at TP and GC over the first year of the monitoring programme (Figure 5(h)). Different size classes were recorded at each site, with individuals < 5 mm and 5-15 mm in length occurring at GC, and individuals > 15 mm occurring at TP. There was a decrease in the abundance of *Arthritica bifurca* at KB (Figure 5(d)), which was a reflection of a decrease in the abundance of small (< 2 mm) individuals over the year. At KA and GC there was an increase in abundance of *A. bifurca* (Figure 5(d)). This was a reflection of an increase in the abundance of both small (< 2 mm) and large (> 2 mm) individuals at KA and an increase of small individuals at GC. There was a decrease in the abundance of *Austrovenus stutchburyi* at TP and to a lesser extent at KB, and an increase in abundance at KA over the first year of the monitoring programme (Figure 5(e)). The changes recorded at TP and KB were a reflection of a decrease in the abundance of small (< 5 mm) individuals, and the increase at KA reflected an increase in both small and large (> 5 mm) individuals.

The abundance of some species/taxa of polychaetes was fairly consistent at the sites where they were most common during the first year of the monitoring programme. For example, *Aonides oxycephala* at GC and MI (Figure 5(k)). There was a decrease in the abundance of some polychaete species/taxa at the sites where they were most common. For example, *Aquilaspio aucklandica* decreased in abundance at KB (Figure 5(j)), and *Aricidea* sp. decreased at KA (Figure 5(l)). There was an increase in the abundance of other species. For example, capitellids increased in abundance at KB and KA (Figure 5(m)), *Magelona dakini* increased at KA (Figure 5(n)) and nereids increased at GC (Figure 5(o)). Note that the changes observed between April 2001 and October 2001 at KA may be a reflection of the shoreward relocation of the permanent monitoring plot in October 2001.

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 April 2001 and April 2002 are listed in Table 3.

The most common monitored species/taxonomic groups at four of the sites, TU, HB, X and WI, did not change markedly over the first year of the monitoring programme. At X four species (the bivalves *Austrovenus stutchburyi* and *Nucula hartvigiana*; the polychaete *Aquilaspio aucklandica*; and the limpet *Notoacmea* sp.) were among the most common species on both sampling dates. The abundances of all four species were consistent over the monitored period: 22-33 *A. stutchburyi* individuals.core^{-1}; 22-24 *N. hartvigiana* individuals.core^{-1}; 13-15 *A. aucklandica* individuals.core^{-1}; and 6-7 *Notoacmea* sp. individuals.core^{-1}.

At TU the bivalves *A. stutchburyi* and *N. hartvigiana* and the polychaete *A. aucklandica* were the three most abundant species on every sampling date, with mean abundances varying between 28-48 *A. stutchburyi* individuals.core^{-1}, 18-19 *N. hartvigiana* individuals.core^{-1} and 14-24 *A. aucklandica* individuals.core^{-1}. The limpet *Notoacmea* sp. was among the most common species on two sampling dates. At HB the bivalve *A. stutchburyi* and the capitellid and nereid polychaetes were consistently among the most common species/taxonomic groups recorded at this site on all the sampling dates, while the bivalves *Arthritica bifurca* and *Macomona liliiana* were both among the most common species on two sampling dates. *Austrovenus stutchburyi*, capitellids and nereids varied in mean abundance between 6-15 individuals.core^{-1}, 14-20 individuals.core^{-1}, and 3-9 individuals.core^{-1} respectively.

Table 3: The five most common species/taxonomic groups on each sampling date for each permanent monitoring site in Whaingaroa Harbour.

	TU	HB	X	WI	OB
Apr 01	*Austrovenus*	Capitellidae		*Austrovenus*	*Cossura*
	Aquilaspio	*Austrovenus*		Capitellidae	Capitellidae
	Nucula	*Macomona*		*Macomona*	*Aquilaspio*
	Notoacmea	Nereidae		*Aquilaspio*	*Aricidea*
	Anthopleura	*Aquilaspio*		Nereidae	*Euchone*
July 01				*Austrovenus*	*Cossura*
				Capitellidae	Gastropods
				Macomona	Capitellidae
				Aquilaspio	Phoxocephalidae
				Nereidae	Polychaetes
Oct 01	*Austrovenus*	*Austrovenus*	*Austrovenus*	*Austrovenus*	*Cossura*
	Aquilaspio	Capitellidae	*Nucula*	Capitellidae	Capitellidae
	Nucula	*Arthritica*	*Aquilaspio*	*Macomona*	Phoxocephalidae
	Arthritica	Amphipods	*Notoacmea*	*Aquilaspio*	Nereidae
	Capitellidae	Nereidae	Polychaetes	*Nucula*	*Austrovenus*
Jan 02				Capitellidae	*Cossura*
				Austrovenus	Capitellidae
				Macomona	Phoxocephalidae
				Nucula	Bivalves
				Aquilaspio	Polychaetes
Apr 02	*Austrovenus*	Capitellidae	*Nucula*	*Austrovenus*	*Cossura*
	Nucula	Nereidae	*Austrovenus*	Capitellidae	Capitellidae
	Aquilaspio	*Arthritica*	*Aquilaspio*	*Nucula*	Polychaetes
	Notoacmea	*Austrovenus*	*Macomona*	*Notoacmea*	Nereidae
	Macomona	*Macomona*	*Notoacmea*	*Macomona*	*Theora*

At WI three species/taxonomic groups (the bivalves *A. stutchburyi*, *M. liliana* and capitellid polychaetes) were consistently among the most common on all sampling dates, with mean abundances varying between 24-43 *A. stutchburyi* individuals.core^{-1}, 8-18 *M. liliana* individuals.core^{-1} and 18-35 capitellid polychaetes individuals.core^{-1}. The polychaete *A. aucklandica* was among the five most common species on four sampling dates, the bivalve *N. hartvigiana* was among the most common on three sampling dates, and nereid polychaetes on two sampling dates.

At OB the polychaete *Cossura* sp. was the most abundant species on every sampling date, with mean abundances varying between 20-29 individuals.core^{-1}. Capitellid polychaetes were also recorded on every sampling date, with mean numbers ranging between 4-13 individuals.core^{-1}. Phoxocephalid amphipods and unidentified

polychaetes were among the most common species/taxonomic groups on three of the sampling dates. There was considerable variability among the other most common species/taxonomic groups on different sampling dates.

The mean abundances of selected indicator species/taxa at each of the sites on each sampling date are shown in Figure 6.

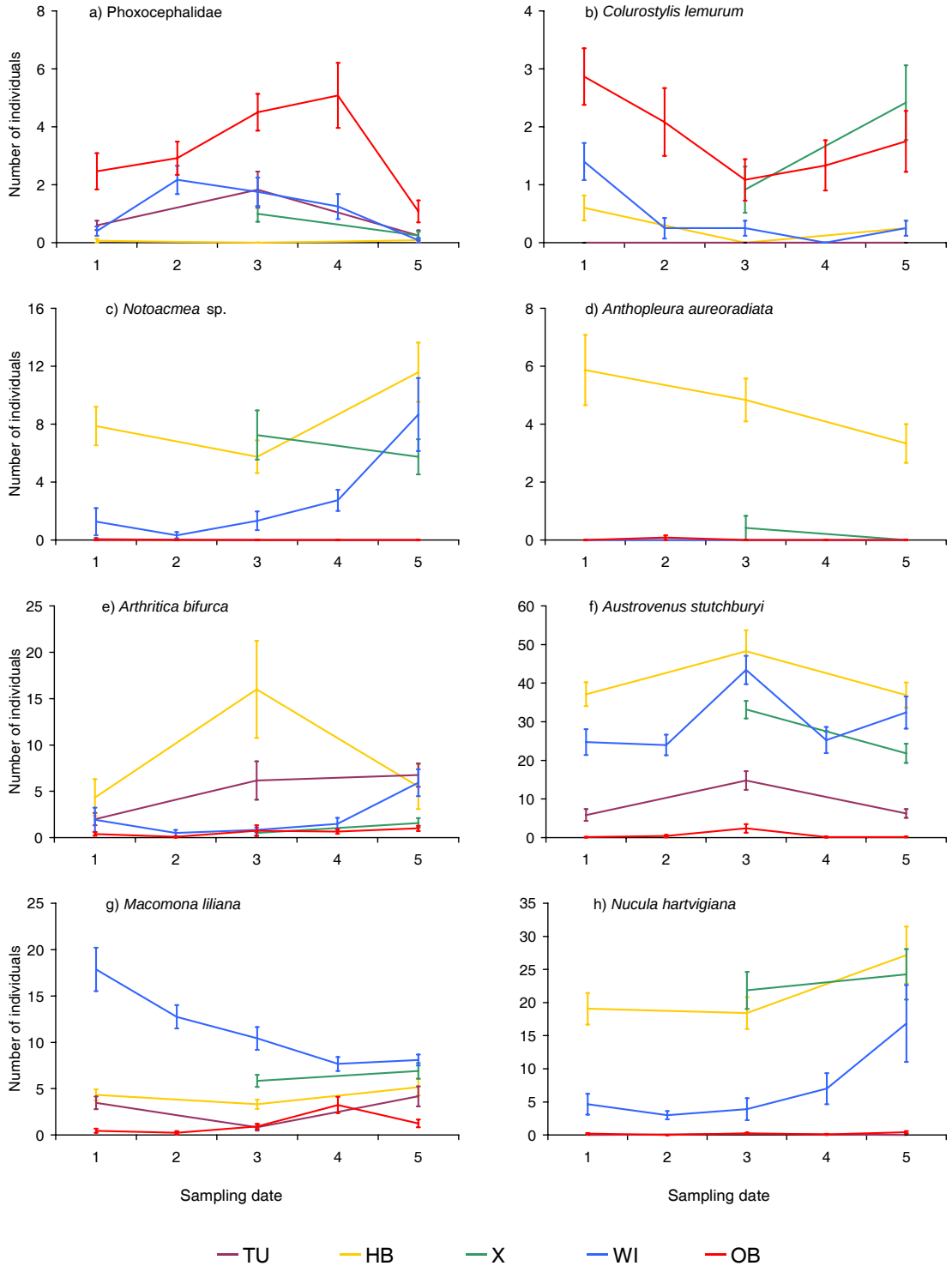

Figure 6: The mean (± standard error) number of selected indicator species/taxa on each sampling date at each of the permanent monitoring sites in Whaingaroa Harbour. Sampling dates: April-01 = 1, July-01 = 2, Oct-01 = 3, Jan-02 = 4, April-02 = 5. Note the different scales on the vertical axis.

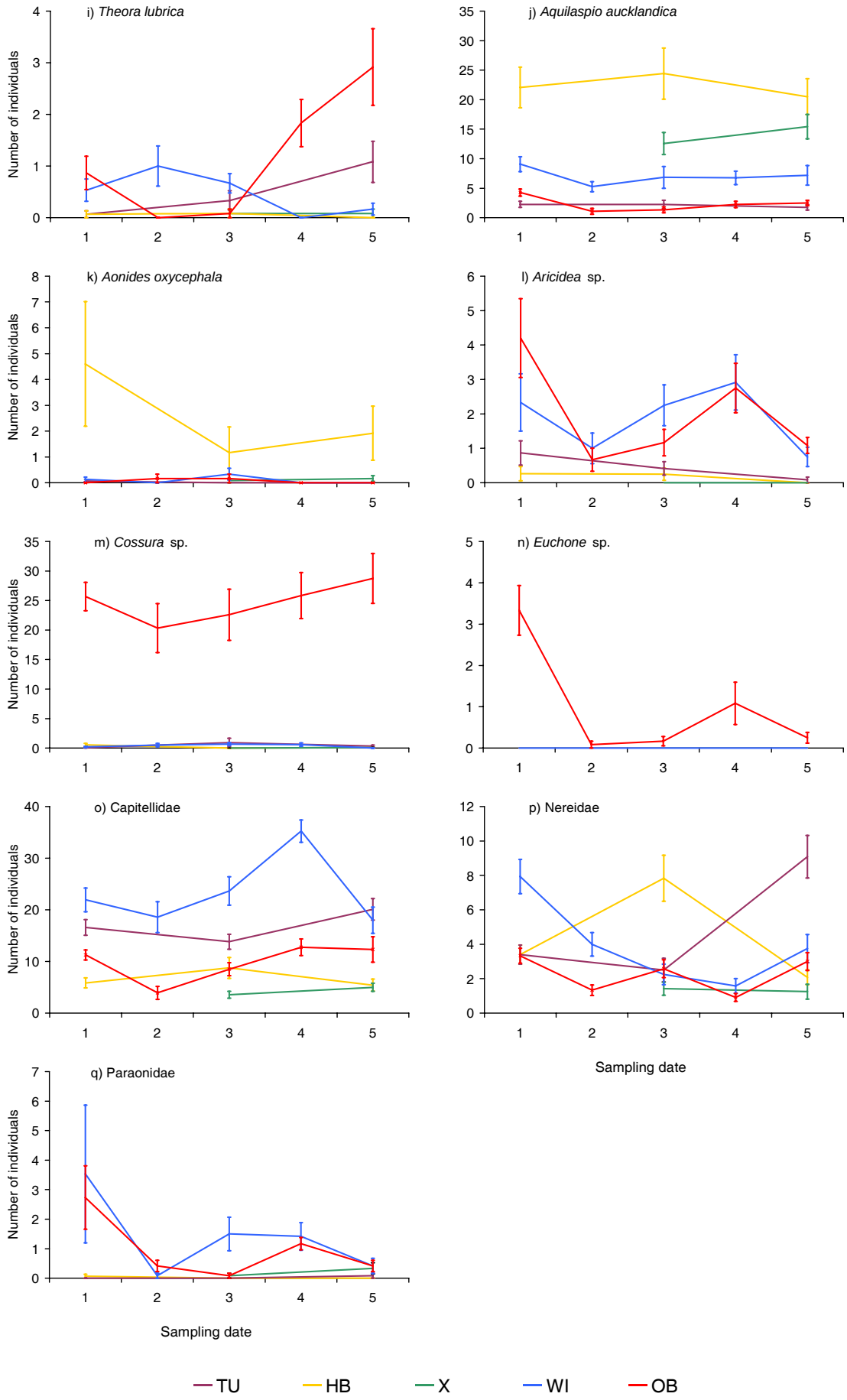

Figure 6. (cont.)

By examining time-plots of individual species/taxa (Figure 6) it is then possible to see how their numbers have changed through time at each site. A brief discussion of the patterns of abundance of selected species/taxa at different sites over the monitored period follows. Since the time-series covers a period of only one year, detailed discussion and identification of trends in patterns of abundance through time is still premature. Some of the observed changes in species/taxa abundances may be indicative of seasonal variation and/or longer-term cycles or trends. Information from subsequent years will provide further information regarding the significance and nature of these patterns.

There was an increase in the abundance of phoxocephalid amphipods between April 2001 and January 2002, followed by a decline in April 2002 at OB, where they were most common (Figure 6(a)). The lowest abundance of the cumacean *Colurostylis lemerum* was recorded in October 2001 at OB and X, where it was most common, with greater abundances occurring in April 2001 and 2002 (Figure 6(b)).

There were different patterns in the abundance of the limpet *Notoacmea* sp. over the first year of the monitoring programme at the three sites where it was most common (TU, X and WI) (Figure 6(c)). AT TU, abundance was highest in April 2002, with the lowest abundance recorded in October 2001. At X abundance was fairly consistent between October 2001 and April 2002. AT WI, lowest abundance was recorded in July 2001, which increased to April 2002. There was a general decrease in the abundance of the anemone *Anthopleura aureoradiata* over the first year at TU, the site where it was most common, with the highest abundance recorded in April 2001 and the lowest abundance recorded in April 2002 (Figure 6(d)).

The abundance of the bivalve *Macomona liliana* was fairly consistent at four of the sites over the first year of the monitoring programme, but showed a decrease at WI (Figure 6(g)), which was a reflection of a decrease in the abundance of small (< 5 mm shell length) individuals. There was an increase in the abundance over the first year of *Theora lubrica* at OB where it was most common (Figure 6(i)). This was a reflection of an increase in the abundance of small (< 5 mm) individuals. The abundance of *Nucula hartvigiana* was fairly consistent at TU and X, where it was most common (Figure 6(h)). At TU however, there was a change in the relative abundances of the different size classes, with small (< 2 mm) individuals decreasing and large (> 2 mm) individuals increasing over the first year of the monitoring programme. There was an increase in the abundance of *N. hartvigiana* at WI (Figure 6(h)), which was primarily a reflection of an increase in the abundance of large individuals. There was an increase in the abundance of *Arthritica bifurca* at HB and WI (Figure 6(e)). This was a reflection of an increase in the abundance of small (< 2 mm) individuals over the year. At TU highest abundance of *A. bifurca* was recorded in October 2001, reflecting an increase in the abundance of both small and large (> 2 mm) individuals, and lowest abundances were recorded in April 2001 and April 2002 (Figure 6(e)). The abundance of *Austrovenus stutchburyi* was highest at TU, WI, X and HB in October 2001, with lower abundances recorded at other times (Figure 6(f)). At all these sites this was a reflection of a peak in the abundance of small individuals (< 5 mm) in October 2001.

The abundances of some species/taxa of polychaetes were fairly consistent during the first year of the monitoring programme at the sites where they were most common. For example, *Aquilaspio aucklandica* at all five sites (Figure 6(j)), *Aonides oxycephala* at TU (Figure 6(k)) and *Cossura* sp. at OB (Figure 6(m)). There was a decrease in the abundance of some polychaete species/taxa at sites where they were most common. For example, *Euchone* sp. decreased in abundance at OB (Figure 6(n)), and paraonids decreased in abundance at WI and OB (Figure 6(q)). There were varying abundances of some species over the first year of the monitoring programme. For example, *Aricidea* sp. at OB and WI (Figure 6(l)) and capitellids at WI, HB and OB (Figure 6(o)). The patterns of abundance of some species/taxa have varied among the sites. Nereids, for example, showed a general decline in abundance at WI over the first year,

an increase at HB, and at TU the greatest abundance was recorded in October 2001, with low abundances occurring in April 2001 and 2002 (Figure 6(p)).

3.3 Changes in the Composition of Indicator Species/Taxa Assemblages

3.3.1 Southern Firth of Thames

The non-metric multi-dimensional scaling (MDS) ordination of the square-root transformed benthic macrofauna assemblage data at each of the five permanent monitoring sites over the period April 2001-April 2002 is presented in Figure 7.

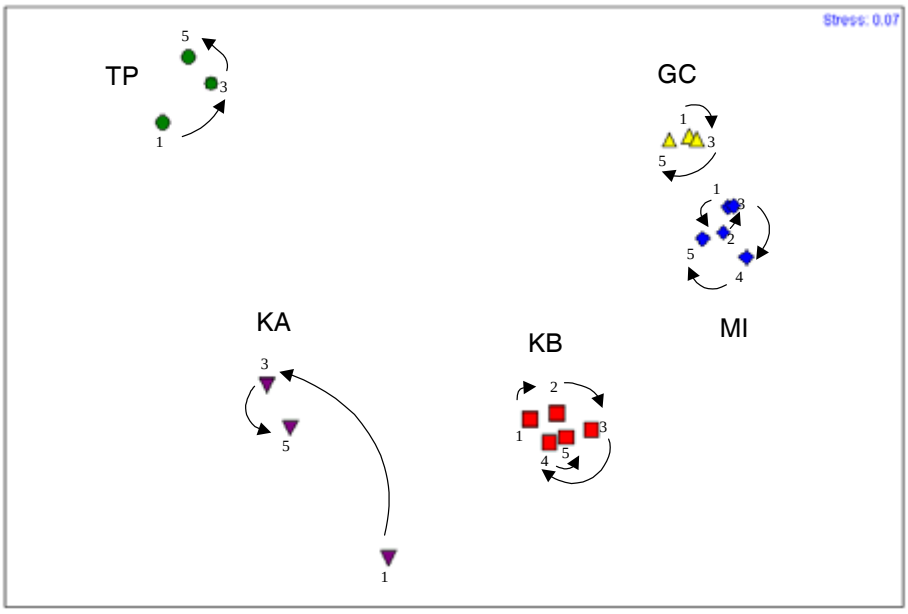

Figure 7: Non-metric multi-dimensional scaling (MDS) ordination of the square-root transformed southern Firth of Thames benthic macrofauna assemblage data based on mean abundance values for each indicator species/taxa from all the samples at each site on each sampling date. Note that axis values are arbitrary and are not given. Sampling dates: April-01 = 1, July-01 = 2, Oct-01 = 3, Jan-02 = 4, April-02 = 5.

The MDS plot provides a visual representation of the relative similarities of the assemblages of indicator species/taxa at the various sites and sampling times. The distances between points (samples) reflects their relative dissimilarity in species composition: points that are close together have very similar assemblages, points which are far apart have few species in common, or the same species but at different levels of abundance. The arrowed lines linking the points indicate the direction of change through time, where the longer the line the more the assemblages have changed. The low stress value (0.07) for the two-dimensional ordination indicates that an acceptable representation of the similarities in assemblage composition was achieved.

The MDS plot shows that the five sites form separate clusters, indicating that the assemblages at each site were distinctly different from each other, and that these differences persisted over the monitored period. The assemblages were most similar at GC and MI, and the assemblage at TP was least similar to those at the other sites.

The MDS plot also shows that at each site some change in assemblage composition occurred over time. The assemblages at GC, MI and KB showed relatively small changes through time during the first year of the monitoring programme, their positions

in the MDS plot changing between sampling dates within a relatively small area of the plot. The largest changes occurred in the assemblages at KA, and to a lesser extent TP, between April 2001 and October 2001 relative to the magnitude of changes among subsequent sampling dates at these sites. Note that the changes observed between April 2001 and October 2001 at KA may be a reflection of the shoreward relocation of the permanent monitoring plot in October 2001.

Within each of the site groups, the points representing the different times of sampling do not appear to exhibit any particularly clear or systematic patterns of change during the first year of the monitoring programme; nor were there consistent patterns of change evident among the different site groups. If for example, there was a consistent trend in the composition of the assemblage at a particular site, we might expect that the points representing different times would show a progression across the plot with points further apart in time lying further apart on the plot. Any patterns of change or trends are expected to become more evident as additional temporal data is added over longer time periods.

The ANOSIM global test was used to indicate whether there were significant differences between any of the sampling dates at each site. Results from the ANOSIM global tests indicate that for all of the five sites, there were significant differences in assemblage composition between sampling dates at the $P < 0.01$ level. The high global R value at KA (0.795)[9] indicates clear separation between sampling dates. The mid-range global R values at KB, TP and GC (0.536, 0.447 and 0.306, respectively) indicates separation with a degree of overlap. The relatively low global R value at MI (0.184) indicates that the assemblage compositions were barely separable between sampling dates even though they were found to be significantly different.

The significant differences at each site were explored further using ANOSIM pairwise comparison tests, with results presented in Table 4.

Table 4: ANOSIM pairwise tests of the square-root transformed southern Firth of Thames benthic macrofauna assemblage data based on mean abundance values for each indicator species/taxa from all the samples at each site on each sampling date.

Pairwise	KA		GC		TP		MI		KB	
Comparison	*R*	*P*	*R*	*P*	*R*	*P*	*R*	*P*	*R*	*P*
Apr-01, Jul-01	-	-	-	-	-	-	0.190	**	0.381	**
Apr-01, Oct-01	0.797	**	0.086	ns	0.587	**	0.010	ns	0.846	**
Apr-01, Jan-02	-	-	-	-	-		0.390	**	0.878	**
Apr-01, Apr-02	0.827	**	0.382	**	0.662	**	0.150	**	0.637	**
Jul-01, Oct-01	-	-	-	-	-	-	0.149	**	0.609	**
Jul-01, Jan-02	-	-	-	-	-	-	0.230	**	0.705	**
Jul-01, Apr-02	-	-	-	-	-	-	0.018	ns	0.440	**
Oct-01, Jan-02	-	-	-	-	-	-	0.340	**	0.083	ns
Oct-01, Apr-02	0.749	**	0.465	**	0.011	ns	0.156	**	0.218	**
Jan-02, Apr-02	-	-	-	-	-	-	0.200	**	0.415	**

** $P < 0.01$
* $P < 0.05$
ns $P > 0.05$
- no pairwise comparison as the site was not sampled on all possible dates

At KA all three sampling dates (April 2001, October 2001, April 2002) were significantly different from each other. The high pairwise R values ($R > 0.749$) at KA indicate that assemblages were clearly different on each sampling date. The assemblages present at GC in April 2001 and October 2001 were not significantly different from each other, but were both significantly different from April 2002. A look at the pairwise R values for these dates indicates that although they were significantly different, there was a degree of overlap in assemblage composition ($R < 0.465$). The assemblages present at TP in

[9] R values can be interpreted as follows; $R > 0.75$ = well separated, $R > 0.5$ = overlapping but clearly different, $R < 0.25$ barely separable (Clarke and Gorley, 2001).

April 2001 were significantly different to those in October 2001 and April 2002, but there was no significant difference between the assemblages in October 2001 and April 2002. The greatest differences at TP occurred between April 2001 and April 2002 (R = 0.662). The assemblages at MI were significantly different among all the sampling dates, except between April 2001 and October 2001, and July 2001 and April 2002. The pairwise R values for MI were not particularly high ($R < 0.390$) indicating a degree of overlap in assemblage composition over all the sampling dates. The assemblages at KB were significantly different for all the sampling dates (April 2001, July 2001, October 2001, January 2002 and April 2002), with the exception that there was no significant difference between October 2001 and January 2002. Furthermore, at KB, four out of the six pairwise comparisons not containing April 2002 had relatively high R values ($R > 0.609$) indicating clear separation in assemblage composition over these sampling dates. However, R values for all combinations of sampling dates after and including October 2001 at KB were relatively low ($R < 0.415$), indicating a degree of overlap in assemblage composition for these times.

These results suggest that there are likely to be seasonal and potentially annual differences among the benthic macrofauna assemblages at each of the sites in the southern Firth of Thames. However, there is insufficient information available from just one year of monitoring to assess whether there are consistent patterns of change through time at each site. If these turn out to be real features of the intertidal benthic communities they will need to be considered in any understanding of longer-term patterns of community change.

The smallest combination of indicator species/taxa at each of the sites in the southern Firth of Thames which best accounts for the pattern represented by the full set of indicator species/taxa over the first year of the monitoring programme were determined by BVSTEP, and are listed in Table 5. The five species/taxa which contributed most to determining the Bray-Curtis dissimilarities between all the sampling dates during the first year of the monitoring programme at each of the sites were ascertained using SIMPER, and are listed in Table 6. With respect to the SIMPER results, species/taxa are ordered by their average contribution to the total average dissimilarity between Sample Dates. The percentage of the total dissimilarity that is contributed by each species is also given, and these percentages are then cumulated. Note that only the first five species are listed in each case, which for the southern Firth of Thames sites accounted for between 45-95% of the dissimilarity between sample dates.

The combination of indicator species/taxa that best accounted for the pattern of the full set of indicator species/taxa over the first year of the monitoring programme, and the indicator species/taxa which contributed most to the dissimilarities between sampling dates, differed among the monitoring sites. At TP three species from the suite of 26 indicator species accounted for nearly all of the full pattern (ρ = 0.990) (Table 5). Three bivalves (*Austrovenus stutchburyi, Nucula hartvigiana* and *Paphies australis*) were consistently important in contributing to the differences in assemblage composition among sampling dates at this site (Table 6). At KA seven species/taxa accounted for nearly all of the full pattern (ρ = 0.951) (Table 5). Different suites of species/taxa were important in contributing to the differences among sampling dates at KA, but two species/taxa (the bivalve *N. hartvigiana* and capitellid polychaetes) were consistently important (Table 6). At GC 8 species/taxa accounted for nearly all of the full pattern (ρ = 0.954) (Table 5). Four species/taxa (the polychaetes *Aonides oxycephala* and nereids; and the bivalves *Arthritica bifurca* and *P. australis*) were consistently important in contributing to the differences in assemblage composition among the sampling dates (Table 6). At KB 10 species/taxa from the suite of 26 indicator species accounted for nearly all of the full pattern (ρ = 0.950) (Table 5). Four species (the bivalve *A. stutchburyi;* the polychaetes *Aquilaspio aucklandica* and capitellids; and corophiid amphipods) were consistently important in contributing to the differences in assemblage composition among sampling dates at KB (Table 6). At MI 12 species/taxa accounted for nearly all of the full pattern (ρ = 0.950) (Table 5). Two species (the polychaete *A. oxycephala* and the bivalve *A. stutchburyi*) were

consistently important in contributing to the differences in assemblage composition among sampling dates at MI (Table 6).

The differences between the sampling dates were most pronounced at KA (also reflected in the MDS ordination in Figure 7), where the highest average dissimilarity was recorded (i.e., assemblage composition was least similar between sampling dates). Note that this may reflect the shoreward relocation in October 2001 of the permanent monitoring plot on the intertidal flat at this site. Bray-Curtis dissimilarities between sampling dates were smallest (also reflected in the MDS ordination in Figure 7) at GC and MI (i.e., assemblage composition was most similar between sampling dates).

Table 5: BVSTEP analysis to identify the smallest subset of indicator species/taxa whose similarity matrix across all the sample dates at each permanent monitoring site in the southern Firth of Thames correlates with that for the full indicator species/taxa set, at ρ ≥0.95.

Site	Correlation (ρ)	Species/Taxa
KA	0.951	Phoxocephalidae *Austrovenus stutchburyi* *Nucula hartvigiana* *Aricidea* sp. *Goniada* sp. Capitellidae Nereidae
GC	0.954	*Arthritica bifurca* *Austrovenus stutchburyi* *Macomona liliana* *Paphies australis* *Colurostylis lemurum* *Notoacmea* sp. Nereidae *Aonides oxycephala*
TP	0.990	*Austrovenus stutchburyi* *Nucula hartvigiana* *Paphies australis*
MI	0.950	*Paracorophium* sp. *Arthritica bifurca* *Austrovenus stutchburyi* *Macomona liliana* *Nucula hartvigiana* *Colurostylis lemurum* *Notoacmea* sp. *Anthopleura aureoradiata* *Aonides oxycephala* *Glycera* sp. Capitellidae Nereidae
KB	0.950	*Paracorophium* sp. *Arthritica bifurca* *Austrovenus stutchburyi* *Nucula hartvigiana* *Aquilaspio aucklandica* *Aonides oxycephala* *Glycera* sp. Capitellidae *Magelona dakini* Nereidae

Table 6: SIMPER analysis breakdown of average dissimilarity between Sample Dates at each of the permanent monitoring sites in the southern Firth of Thames into contributions from each indicator species/taxa.

KA	Species/Taxa	Average Abundance Date 1	Average Abundance Date 2	Average Dissimilarity	Contribution %	Cum. Contribution %
KA Apr-01 & Oct-01 dissimilarity = 57.39	*Nucula hartvigiana*	5.67	73.92	15.44	26.90	26.90
	Phoxocephalidae	0.07	8.33	7.16	12.48	39.38
	Capitellidae *(H. filiformis)*	1.27	8.58	5.08	8.86	48.24
	Theora lubrica	11.67	8.00	4.30	7.49	55.73
	Aricidea sp.	3.60	0.25	4.16	7.24	62.97
KA Apr-01 & Apr-02 dissimilarity = 56.29	*Austrovenus stutchburyi*	1.27	53.67	14.68	26.08	26.08
	Nucula hartvigiana	5.67	37.92	8.50	15.11	41.19
	Magelona dakini	1.00	14.00	6.23	11.07	52.26
	Capitellidae *(H. filiformis)*	1.27	9.08	4.54	8.07	60.33
	Arthritica bifurca	0.20	4.83	3.91	6.95	67.29
KA Oct-01 & Apr-02 dissimilarity = 43.78	*Austrovenus stutchburyi*	1.08	53.67	12.13	27.71	27.71
	Nucula hartvigiana	73.92	37.92	6.85	15.65	43.37
	Phoxocephalidae	8.33	0.75	4.19	9.57	52.93
	Magelona dakini	2.75	14.00	3.61	8.25	61.19
	Capitellidae *(H. filiformis)*	8.58	9.08	3.07	7.00	68.19
GC	**Species/Taxa**	**Average Abundance Date 1**	**Average Abundance Date 2**	**Average Dissimilarity**	**Contribution %**	**Cum. Contribution %**
GC Apr-01 & Oct-01 dissimilarity = 26.39	*Aonides oxycephala*	101.13	83.17	4.86	18.40	18.4
	Paphies australis	18.93	12.00	4.63	17.53	35.93
	Nereidae	3.93	1.08	2.90	10.99	46.92
	Arthritica bifurca	1.07	1.83	2.19	8.28	55.2
	Austrovenus stutchburyi	6.80	6.83	2.18	8.24	63.44
GC Apr-01 & Apr-02 dissimilarity = 33.99	*Aonides oxycephala*	101.13	85.92	4.93	14.50	14.50
	Paphies australis	18.93	10.00	4.57	13.45	27.95
	Nereidae	3.93	17.17	4.46	13.13	41.08
	Colurostylis lemurum	1.07	6.75	3.83	11.28	52.36
	Arthritica bifurca	1.07	3.58	2.72	7.99	60.35
GC Oct-01 & Apr-02 dissimilarity = 36.05	Nereidae	1.08	17.17	6.72	18.64	18.64
	Aonides oxycephala	83.17	85.92	5.05	14.02	32.66
	Paphies australis	12.00	10.00	3.96	10.98	43.64
	Colurostylis lemurum	1.17	6.75	3.69	10.23	53.87
	Arthritica bifurca	1.83	3.58	3.31	9.19	63.06
TP	**Species/Taxa**	**Average Abundance Date 1**	**Average Abundance Date 2**	**Average Dissimilarity**	**Contribution %**	**Cum. Contribution %**
TP Apr-01 & Oct-01 dissimilarity = 42.89	*Austrovenus stutchburyi*	108.27	3.33	17.20	40.11	40.11
	Nucula hartvigiana	208.13	91.08	12.24	28.54	68.65
	Paphies australis	29.93	23.33	6.25	14.57	83.22
	Paracorophium sp.	0.67	0.00	1.30	3.03	86.25
	Notoacmea sp.	0.00	1.00	1.23	2.87	89.12
TP Apr-01 & Apr-02 dissimilarity = 45.63	*Austrovenus stutchburyi*	108.27	2.25	19.59	42.94	42.94
	Nucula hartvigiana	208.13	71.67	14.25	31.22	74.16
	Paphies australis	29.93	21.00	6.64	14.55	88.71
	Paracorophium sp.	0.67	0.00	1.39	3.04	91.76
	Cominella adspersa	0.60	0.42	1.28	2.81	94.57
TP Oct-01 & Apr-02 dissimilarity = 33.88	*Nucula hartvigiana*	91.08	71.67	10.92	32.24	32.24
	Paphies australis	23.33	21.00	10.81	31.89	64.13
	Austrovenus stutchburyi	3.33	2.25	4.06	11.98	76.11
	Notoacmea sp.	1.00	0.00	1.85	5.46	81.58
	Magelona dakini	0.33	0.33	1.83	5.41	86.99

Table 6. (cont.)

MI	Species/Taxa	Average Abundance Date 1	Average Abundance Date 2	Average Dissimilarity	Contribution %	Cum. Contribution %
MI Apr-01 & Jul-01 dissimilarity = 31.43	*Aonides oxycephala*	48.67	51.17	5.36	17.04	17.04
	Austrovenus stutchburyi	4.87	2.08	3.58	11.37	28.42
	Anthopleura aureoradiata	1.53	0.42	3.19	10.15	38.57
	Capitellidae *(H. filiformis)*	0.00	1.25	2.92	9.29	47.86
	Arthritica bifurca	1.27	0.58	2.63	8.36	56.22
MI Apr-01 & Oct-01 dissimilarity = 28.89	*Aonides oxycephala*	48.67	50.92	4.75	16.46	16.46
	Austrovenus stutchburyi	4.87	2.50	3.78	13.08	29.54
	Arthritica bifurca	1.27	0.83	2.65	9.19	38.73
	Notoacmea sp.	0.80	1.17	2.59	8.96	47.69
	Anthopleura aureoradiata	1.53	0.83	2.33	8.06	55.76
MI Jul-01 & Oct-01 dissimilarity = 30.76	*Aonides oxycephala*	51.17	50.92	4.98	16.18	16.18
	Notoacmea sp.	0.50	1.17	2.68	8.71	24.89
	Nereidae	2.08	1.08	2.67	8.69	33.58
	Capitellidae *(H. filiformis)*	1.25	0.25	2.64	8.58	42.16
	Austrovenus stutchburyi	2.08	2.50	2.48	8.06	50.22
MI Apr-01 & Jan-02 dissimilarity = 36.23	*Aonides oxycephala*	48.67	45.83	6.12	16.90	16.90
	Paracorophium sp.	0.00	3.00	5.11	14.11	31.01
	Austrovenus stutchburyi	4.87	1.33	4.30	11.86	42.88
	Arthritica bifurca	1.27	0.83	2.89	7.97	50.85
	Anthopleura aureoradiata	1.53	0.67	2.69	7.43	58.28
MI Jul-01 & Jan-02 dissimilarity = 33.78	*Aonides oxycephala*	51.17	45.83	6.29	18.63	18.63
	Paracorophium sp.	0.00	3.00	5.19	15.37	34.00
	Capitellidae *(H. filiformis)*	1.25	1.17	2.77	8.19	42.19
	Austrovenus stutchburyi	2.08	1.33	2.52	7.47	49.67
	Nereidae	2.08	0.83	2.33	6.89	56.56
MI Oct-01 & Jan-02 dissimilarity = 35.00	*Aonides oxycephala*	50.92	45.83	5.76	16.46	16.46
	Paracorophium sp.	0.00	3.00	5.09	14.55	31.01
	Austrovenus stutchburyi	2.50	1.33	2.79	7.96	38.98
	Notoacmea sp.	1.17	0.17	2.78	7.96	46.93
	Arthritica bifurca	0.83	0.83	2.57	7.33	54.26
MI Apr-01 & Apr-02 dissimilarity = 31.25	*Aonides oxycephala*	48.67	42.67	4.83	15.47	15.47
	Austrovenus stutchburyi	4.87	3.50	3.93	12.56	28.03
	Anthopleura aureoradiata	1.53	0.50	3.14	10.04	38.06
	Arthritica bifurca	1.27	0.75	2.85	9.10	47.17
	Nereidae	1.00	1.50	2.49	7.98	55.14
MI Jul-01 & Apr-02 dissimilarity = 29.33	*Aonides oxycephala*	51.17	42.67	4.80	16.38	16.38
	Austrovenus stutchburyi	2.08	3.50	2.93	10.00	26.38
	Capitellidae *(H. filiformis)*	1.25	0.58	2.72	9.26	35.64
	Nereidae	2.08	1.50	2.61	8.89	44.53
	Arthritica bifurca	0.58	0.75	2.31	7.86	52.39
MI Oct-01 & Apr-02 dissimilarity = 31.21	*Aonides oxycephala*	50.92	42.67	4.50	14.43	14.43
	Notoacmea sp.	1.17	0.00	3.21	10.29	24.72
	Austrovenus stutchburyi	2.50	3.50	3.18	10.20	34.92
	Nereidae	1.08	1.50	2.64	8.45	43.37
	Arthritica bifurca	0.83	0.75	2.50	8.02	51.39
MI Jan-02 & Apr-02 dissimilarity = 33.73	*Aonides oxycephala*	45.83	42.67	5.45	16.16	16.16
	Paracorophium sp.	3.00	0.08	5.17	15.32	31.49
	Austrovenus stutchburyi	1.33	3.50	3.58	10.62	42.11
	Capitellidae *(H. filiformis)*	1.17	0.58	2.62	7.76	49.87
	Arthritica bifurca	0.83	0.75	2.44	7.25	57.11

Table 6. (cont.)

KB	Species/Taxa	Average Abundance Date 1	Average Abundance Date 2	Average Dissimilarity	Contribution %	Cum. Contribution %
KB Apr-01 & Jul-01 dissimilarity = 31.03	*Austrovenus stutchburyi*	39.67	19.00	4.83	15.55	15.55
	Capitellidae *(H. filiformis)*	6.53	13.50	3.47	11.18	26.72
	Arthritica bifurca	6.80	2.50	3.32	10.69	37.42
	Aquilaspio aucklandica	6.20	3.67	2.48	7.99	45.41
	Aonides oxycephala	1.93	1.83	2.37	7.62	53.03
KB Apr-01 & Oct-01 dissimilarity = 40.76	*Austrovenus stutchburyi*	39.67	10.92	7.29	17.88	17.88
	Paracorophium sp.	0.07	7.25	5.92	14.52	32.40
	Capitellidae *(H. filiformis)*	6.53	18.83	4.98	12.23	44.63
	Arthritica bifurca	6.80	1.25	4.18	10.26	54.89
	Aquilaspio aucklandica	6.20	2.08	3.36	8.25	63.14
KB Jul-01 & Oct-01 dissimilarity = 36.39	*Paracorophium* sp.	0.00	7.25	6.42	17.63	17.63
	Austrovenus stutchburyi	19.00	10.92	3.38	9.29	26.92
	Capitellidae *(H. filiformis)*	13.50	18.83	2.93	8.06	34.97
	Aonides oxycephala	1.83	0.33	2.82	7.76	42.73
	Aquilaspio aucklandica	3.67	2.08	2.81	7.72	50.45
KB Apr-01 & Jan-02 dissimilarity = 46.27	*Austrovenus stutchburyi*	39.67	5.92	9.73	21.02	21.02
	Paracorophium sp.	0.07	9.08	6.99	15.11	36.13
	Capitellidae *(H. filiformis)*	6.53	18.50	4.97	10.75	46.88
	Aquilaspio aucklandica	6.20	1.58	4.09	8.84	55.72
	Arthritica bifurca	6.80	1.67	3.82	8.25	63.97
KB Jul-01 & Jan-02 dissimilarity = 40.45	*Paracorophium* sp.	0.00	9.08	7.60	18.79	18.79
	Austrovenus stutchburyi	19.00	5.92	5.31	13.13	31.92
	Capitellidae *(H. filiformis)*	13.50	18.50	3.36	8.31	40.23
	Aquilaspio aucklandica	3.67	1.58	3.28	8.11	48.35
	Nucula hartvigiana	2.83	0.58	3.23	7.99	56.34
KB Oct-01 & Jan-02 dissimilarity = 31.88	*Paracorophium* sp.	7.25	9.08	3.77	11.83	11.83
	Capitellidae *(H. filiformis)*	18.83	18.50	3.51	11.00	22.83
	Nucula hartvigiana	2.33	0.58	3.01	9.45	32.28
	Austrovenus stutchburyi	10.92	5.92	2.85	8.93	41.22
	Aquilaspio aucklandica	2.08	1.58	2.74	8.58	49.80
KB Apr-01 & Apr-02 dissimilarity = 34.77	*Austrovenus stutchburyi*	39.67	14.58	5.86	16.84	16.84
	Capitellidae *(H. filiformis)*	6.53	15.67	4.05	11.66	28.50
	Arthritica bifurca	6.80	2.58	3.47	9.97	38.47
	Paracorophium sp.	0.07	4.50	3.46	9.95	48.43
	Aquilaspio aucklandica	6.20	1.92	3.02	8.70	57.12
KB Jul-01 & Apr-02 dissimilarity = 32.26	*Paracorophium* sp.	0.00	4.50	3.74	11.59	11.59
	Magelona dakini	0.67	3.00	3.04	9.41	21.00
	Nucula hartvigiana	2.83	2.50	2.73	8.45	29.45
	Austrovenus stutchburyi	19.00	14.58	2.57	7.97	37.42
	Aquilaspio aucklandica	3.67	1.92	2.51	7.78	45.21
KB Oct-01 & Apr-02 dissimilarity = 31.40	*Paracorophium* sp.	7.25	4.50	4.38	13.95	13.95
	Arthritica bifurca	1.25	2.58	2.76	8.79	22.74
	Magelona dakini	0.92	3.00	2.56	8.16	30.90
	Capitellidae *(H. filiformis)*	18.83	15.67	2.54	8.09	38.99
	Nucula hartvigiana	2.33	2.50	2.53	8.06	47.05
KB Jan-02 & Apr-02 dissimilarity = 34.92	*Paracorophium* sp.	9.08	4.50	4.95	14.18	14.18
	Austrovenus stutchburyi	5.92	14.58	3.82	10.93	25.11
	Magelona dakini	0.50	3.00	3.34	9.58	34.69
	Capitellidae *(H. filiformis)*	18.50	15.67	3.15	9.03	43.72
	Nucula hartvigiana	0.58	2.50	2.90	8.31	52.03

There were no consistent patterns evident in the dissimilarities between sampling dates among the different monitoring sites. For example, there was little indication that assemblage composition at any of the sites was becoming increasingly dissimilar over time – with the possible exception of TP. The combination of indicator species/taxa that best accounted for the pattern for the full set of indicator species/taxa over the first year of the monitoring programme, and the indicator species/taxa which contributed most to the dissimilarities between sampling dates, differed among the monitoring sites.

3.3.2 Whaingaroa (Raglan) Harbour

The MDS ordination of the square-root transformed benthic macrofauna assemblage data at each of the five permanent monitoring sites over the period April 2001-April 2002 is presented in Figure 8.

The MDS plot shows that the five sites form separate clusters, indicating that the assemblages at each site were distinctly different from each other, and that these differences persisted over the monitored period. The assemblages were most similar at TU and X, and the assemblage at OB was least similar to those at the other sites. The low stress value (0.06) indicates that an acceptable representation of the similarities in assemblage composition was achieved.

The MDS plot also shows that at each site some change in assemblage composition occurred over time. The assemblages at TU and X showed relatively small changes through time during the first year of the monitoring programme, their positions in the MDS plot changing between sampling dates within a relatively small area of the plot. The largest changes occurred in the assemblages at OB, and to a lesser extent HB and WI. Within each of the site groups, the points representing the different times of sampling do not appear to exhibit any particularly clear or systematic patterns of change during the first year of the monitoring programme. Any patterns of change or trends are expected to become more evident as additional temporal data is added over longer time periods.

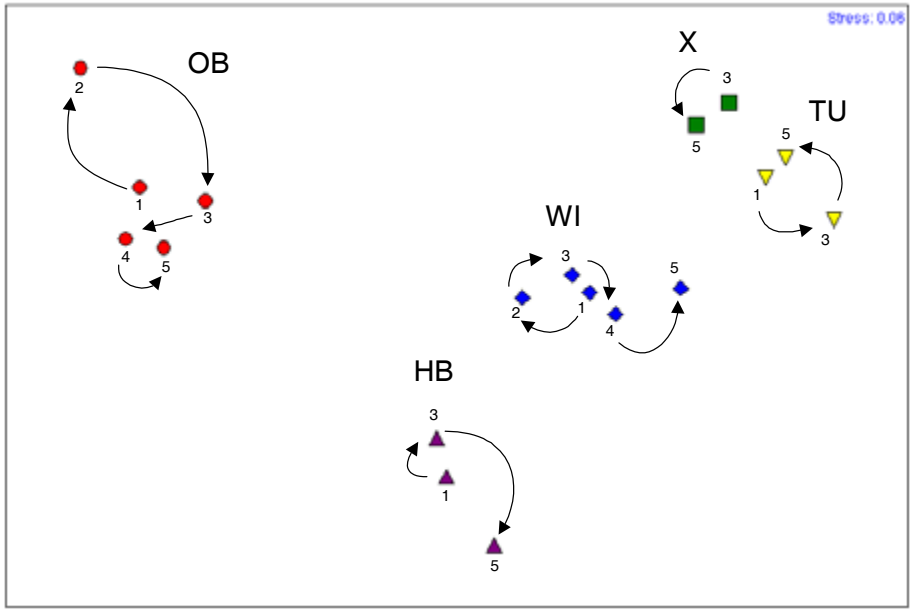

Figure 8: Non-metric multi-dimensional scaling (MDS) ordination of the square-root transformed Whaingaroa Harbour benthic macrofauna assemblage data based on mean abundance values for each indicator species/taxa from all the samples at each site on each sampling date. Note that axis values are arbitrary and are not given. Sampling dates: April-01 = 1, July-01 = 2, Oct-01 = 3, Jan-02 = 4, April-02 = 5.

The ANOSIM global test was used to indicate whether there were significant differences between any of the sampling dates at each site. Results from the ANOSIM global tests indicate that there were significant differences ($P < 0.03$) in assemblage composition at TU, HB, WI and OB over the sampling dates. There was no significant difference between the assemblages at X in October 2001 and April 2002 (note this site was not sampled in April 2001). Although assemblage compositions at TU, HB, WI and OB were significantly different, the global R values were relatively low ($R < 0.347$) indicating overlap in assemblage composition between sampling dates at all of these sites.

The significant differences at each site were explored further using ANOSIM pairwise comparison tests, with results presented in Table 7.

Table 7: ANOSIM tests of the square-root transformed Whaingaroa Harbour benthic macrofauna assemblage data based on mean abundance values for each indicator species/taxa from all the samples at each site on each sampling date.

Pairwise	TU		HB		X [1]		WI		OB	
Comparison	*R*	*P*	*R*	*P*	*R*	*P*	*R*	*P*	*R*	*P*
Apr-01, Jul-01	-	-	-	-	-	-	0.207	**	0.503	**
Apr-01, Oct-01	0.151	*	0.215	**	-	-	0.258	**	0.480	**
Apr-01, Jan-02	-	-	-	-	-	-	0.434	**	0.383	**
Apr-01, Apr-02	0.041	ns	0.203	**	-	-	0.337	**	0.352	**
Jul-01, Oct-01	-	-	-	-	-	-	0.212	**	0.117	*
Jul-01, Jan-02	-	-	-	-	-	-	0.494	**	0.421	**
Jul-01, Apr-02	-	-	-	-	-	-	0.478	**	0.381	**
Oct-01, Jan-02	-	-	-	-	-	-	0.238	**	0.345	**
Oct-01, Apr-02	0.192	**	0.348	**	0.098	ns	0.364	**	0.305	**
Jan-02, Apr-02	-	-	-	-	-	-	0.306	**	0.227	**

[1] Site X was only sampled in October 2001 and April 2002, so the R value presented is in affect the global R value.

** $P < 0.01$
* $P < 0.05$
ns $P > 0.05$
- no pairwise comparison as the site was not sampled on all possible dates

At WI and OB all five sampling dates (April 2001, July 2001, October 2001, January 2002 and April 2002) were significantly different from each other. At HB all three sampling dates (April 2001, October 2001, April 2002) were significantly different from each other. At TU the assemblages present in October 2001 were significantly different to those in April 2001 and April 2002, but there was no significant difference among the assemblages in April 2001 and April 2002. For all sites, the pairwise R values were typically low ($R < 0.503$) indicating that although there were significant differences in assemblage composition over the sampling dates, there was also a degree of overlap with some sampling dates being barely separable.

There is insufficient information available from just one year of monitoring to assess whether there are consistent patterns of change through time at each site, but the results suggest that there are likely to be seasonal, and potentially annual, differences among the benthic macrofauna assemblages at each of the sites in Whaingaroa (Raglan) Harbour. If these turn out to be real features of the intertidal benthic communities they will need to be considered in any understanding of longer-term patterns of community change.

The smallest combination of indicator species/taxa at each of the sites in Whaingaroa Harbour which best accounts for the pattern for the full set of indicator species/taxa over the first year of the monitoring programme are listed in Table 8. The five species/taxa which contributed most to determining the Bray-Curtis dissimilarities between all the sampling dates during the first year of the monitoring programme at each of the sites are listed in Table 9. Species/taxa are ordered by their average contribution to the total average dissimilarity between Sample Dates. The percentage

of the total dissimilarity that is contributed by each species is also given, and these percentages are then cumulated. Note that only the first five species are listed in each case, which for the Whaingaroa Harbour sites accounted for between 39-59% of the dissimilarity between sample dates.

Table 8: BVSTEP analysis to identify the smallest subset of indicator species/taxa whose similarity matrix across all the sample dates at each permanent monitoring site in Whaingaroa Harbour correlates with that for the full indicator species/taxa set, at ρ ≥0.95.

Site	Correlation (ρ)	Species/Taxa
TU	0.960	*Arthritica bifurca* *Austrovenus stutchburyi* *Macomona liliana* *Nucula hartvigiana* *Notoacmea* sp.
HB	0.955	*Anthopleura aureoradiata* *Aquilaspio aucklandica* *Aonides oxycephala* *Cossura* sp. Capitellidae Nereidae
X	0.960	Phoxocephalidae *Arthritica bifurca* *Austrovenus stutchburyi* *Macomona liliana* *Theora lubrica*
WI	0.954	*Aquilaspio aucklandica* Polydorids Capitellidae Nereidae Paraonidae
OB	0.951	Phoxocephalidae *Arthritica bifurca* *Austrovenus stutchburyi* *Nucula hartvigiana* *Colurostylis lemurum*
		Notoacmea sp. *Aquilaspio aucklandica* *Glycera* sp. Capitellidae Nereidae
		Phoxocephalidae *Arthritica bifurca* *Austrovenus stutchburyi* *Macomona liliana* *Nucula hartvigiana*
		Notoacmea sp. *Aquilaspio aucklandica* *Aricidea* sp. Polydorids Capitellidae Nereidae Paraonidae
		Phoxocephalidae *Austrovenus stutchburyi* *Macomona liliana* *Theora lubrica* *Colurostylis lemurum*
		Aquilaspio aucklandica *Aricidea* sp. *Cossura* sp. *Goniada* sp. *Glycera* sp. Capitellidae Nereidae Paraonidae

Table 9: SIMPER analysis breakdown of average dissimilarity between Sample Dates at each of the permanent monitoring sites in Whaingaroa Harbour into contributions from each indicator species/taxa.

TU	Species/Taxa	Average Abundance Date 1	Average Abundance Date 2	Average Dissimilarity	Contribution %	Cum. Contribution %
TU Apr-01 & Oct-01 dissimilarity = 26.11	*Arthritica bifurca*	4.33	16.00	4.13	15.81	15.81
	Austrovenus stutchburyi	37.13	48.25	2.65	10.16	25.97
	Aquilaspio aucklandica	22.07	24.42	2.46	9.40	35.37
	Aonides oxycephala	4.60	1.17	2.01	7.71	43.08
	Notoacmea sp.	7.87	5.75	1.91	7.31	50.39
TU Apr-01 & Apr-02 dissimilarity = 25.58	*Nucula hartvigiana*	19.07	27.17	2.93	11.47	11.47
	Arthritica bifurca	4.33	5.50	2.71	10.61	22.07
	Aquilaspio aucklandica	22.07	20.50	2.58	10.07	32.15
	Aonides oxycephala	4.60	1.92	2.45	9.58	41.73
	Notoacmea sp.	7.87	11.58	2.19	8.57	50.30
TU Oct-01 & Apr-02 dissimilarity = 25.87	*Arthritica bifurca*	16.00	5.50	3.57	13.79	13.79
	Nucula hartvigiana	18.42	27.17	2.84	10.99	24.79
	Austrovenus stutchburyi	48.25	36.92	2.62	10.12	34.90
	Aquilaspio aucklandica	24.42	20.50	2.49	9.61	44.51
	Nereidae	7.83	2.08	2.42	9.37	53.89
HB	**Species/Taxa**	**Average Abundance Date 1**	**Average Abundance Date 2**	**Average Dissimilarity**	**Contribution %**	**Cum. Contribution %**
HB Apr-01 & Oct-01 dissimilarity = 38.74	*Austrovenus stutchburyi*	5.87	15.25	6.59	17.01	17.01
	Arthritica bifurca	2.00	6.17	5.31	13.70	30.72
	Macomona liliana	3.47	0.83	4.39	11.32	42.04
	Aquilaspio aucklandica	2.27	2.25	3.56	9.19	51.23
	Nereidae	3.40	2.50	3.14	8.12	59.34
HB Apr-01 & Apr-02 dissimilarity = 34.17	*Arthritica bifurca*	2.00	6.75	5.24	15.33	15.33
	Nereidae	3.40	9.08	4.08	11.93	27.26
	Austrovenus stutchburyi	5.87	6.50	3.62	10.59	37.85
	Macomona liliana	3.47	4.17	3.43	10.05	47.90
	Capitellidae *(H. filiformis)*	16.60	20.08	2.99	8.76	56.66
HB Oct-01 & Apr-02 dissimilarity = 38.19	Nereidae	2.50	9.08	5.16	13.52	13.52
	Austrovenus stutchburyi	15.25	6.50	4.98	13.05	26.56
	Arthritica bifurca	6.17	6.75	4.90	12.84	39.40
	Macomona liliana	0.83	4.17	4.34	11.37	50.77
	Capitellidae *(H. filiformis)*	13.83	20.08	3.21	8.40	59.17
X	**Species/Taxa**	**Average Abundance Date 1**	**Average Abundance Date 2**	**Average Dissimilarity**	**Contribution %**	**Cum. Contribution %**
X Oct-01 & Apr-02 dissimilarity = 25.94	*Nucula hartvigiana*	21.83	24.25	3.06	11.81	11.81
	Notoacmea sp.	7.25	5.75	2.92	11.25	23.06
	Austrovenus stutchburyi	33.17	21.83	2.73	10.52	33.58
	Aquilaspio aucklandica	12.58	15.42	2.35	9.06	42.64
	Colurostylis lemurum	0.92	2.42	2.25	8.68	51.32

Table 9. (cont.)

WI	Species/Taxa	Average Abundance Date 1	Average Abundance Date 2	Average Dissimilarity	Contribution %	Cum. Contribution %
WI Apr-01 & Jul-01 dissimilarity = 30.67	*Austrovenus stutchburyi*	24.73	24.00	2.76	9.01	9.01
	Capitellidae *(H. filiformis)*	21.93	18.58	2.49	8.12	17.12
	Macomona liliana	17.87	12.75	2.33	7.60	24.73
	Aquilaspio aucklandica	9.07	5.25	2.25	7.34	32.07
	Nucula hartvigiana	4.67	3.00	2.20	7.16	39.23
WI Apr-01 & Oct-01 dissimilarity = 32.90	*Austrovenus stutchburyi*	24.73	43.42	3.75	11.38	11.38
	Nereidae	7.93	2.25	3.04	9.25	20.64
	Nucula hartvigiana	4.67	3.92	2.50	7.59	28.22
	Macomona liliana	17.87	10.42	2.50	7.58	35.81
	Aquilaspio aucklandica	9.07	6.83	2.30	7.00	42.80
WI Jul-01 & Oct-01 dissimilarity = 29.44	*Austrovenus stutchburyi*	24.00	43.42	3.77	12.81	12.81
	Capitellidae *(H. filiformis)*	18.58	23.67	2.53	8.60	21.41
	Nucula hartvigiana	3.00	3.92	2.42	8.22	29.63
	Aquilaspio aucklandica	5.25	6.83	2.17	7.38	37.01
	Nereidae	4.00	2.25	2.04	6.95	43.95
WI Apr-01 & Jan-02 dissimilarity = 33.37	Nereidae	7.93	1.58	3.23	9.67	9.67
	Macomona liliana	17.87	7.67	2.93	8.77	18.44
	Austrovenus stutchburyi	24.73	25.25	2.84	8.51	26.95
	Capitellidae *(H. filiformis)*	21.93	35.25	2.74	8.21	35.16
	Nucula hartvigiana	4.67	7.00	2.68	8.04	43.20
WI Jul-01 & Jan-02 dissimilarity = 30.74	Capitellidae *(H. filiformis)*	18.58	35.25	3.82	12.43	12.43
	Nucula hartvigiana	3.00	7.00	2.67	8.68	21.11
	Austrovenus stutchburyi	24.00	25.25	2.64	8.59	29.71
	Notoacmea sp.	0.33	2.75	2.59	8.44	38.15
	Aricidea sp.	1.00	2.92	2.28	7.41	45.56
WI Oct-01 & Jan-02 dissimilarity = 29.84	*Austrovenus stutchburyi*	43.42	25.25	3.55	11.91	11.91
	Nucula hartvigiana	3.92	7.00	2.96	9.94	21.84
	Capitellidae *(H. filiformis)*	23.67	35.25	2.54	8.52	30.37
	Notoacmea sp.	1.33	2.75	2.23	7.49	37.85
	Aquilaspio aucklandica	6.83	6.75	2.06	6.91	44.76
WI Apr-01 & Apr-02 dissimilarity = 35.14	*Nucula hartvigiana*	4.67	16.83	4.18	11.90	11.90
	Notoacmea sp.	1.27	8.67	4.01	11.42	23.31
	Arthritica bifurca	1.93	5.92	3.62	10.30	33.61
	Austrovenus stutchburyi	24.73	32.42	3.10	8.82	42.43
	Macomona liliana	17.87	8.08	2.77	7.90	50.33
WI Jul-01 & Apr-02 dissimilarity = 34.12	*Notoacmea* sp.	0.33	8.67	4.48	13.14	13.14
	Nucula hartvigiana	3.00	16.83	4.44	13.00	26.14
	Arthritica bifurca	0.50	5.92	3.87	11.33	37.47
	Capitellidae *(H. filiformis)*	18.58	18.00	2.91	8.54	46.02
	Austrovenus stutchburyi	24.00	32.42	2.88	8.44	54.46
WI Oct-01 & Apr-02 dissimilarity = 33.92	*Nucula hartvigiana*	3.92	16.83	4.55	13.42	13.42
	Notoacmea sp.	1.33	8.67	3.83	11.30	24.72
	Arthritica bifurca	0.83	5.92	3.01	8.86	33.58
	Austrovenus stutchburyi	43.42	32.42	2.89	8.53	42.11
	Capitellidae *(H. filiformis)*	23.67	18.00	2.56	7.55	49.66
WI Jan-02 & Apr-02 dissimilarity = 31.45	*Nucula hartvigiana*	7.00	16.83	4.01	12.76	12.76
	Capitellidae *(H. filiformis)*	35.25	18.00	3.75	11.91	24.67
	Notoacmea sp.	2.75	8.67	3.18	10.10	34.76
	Arthritica bifurca	1.50	5.92	3.11	9.89	44.65
	Austrovenus stutchburyi	25.25	32.42	2.90	9.21	53.86

Table 9. (cont.)

OB	Species/Taxa	Average Abundance Date 1	Average Abundance Date 2	Average Dissimilarity	Contribution %	Cum. Contribution %
OB Apr-01 & Jul-01 dissimilarity = 44.99	Capitellidae *(H. filiformis)*	11.27	3.92	5.57	12.37	12.37
	Cossura sp.	25.67	20.33	4.86	10.81	23.18
	Euchone sp.	3.33	0.08	4.48	9.95	33.13
	Aquilaspio aucklandica	4.27	1.08	4.22	9.39	42.52
	Aricidea sp.	4.20	0.67	4.10	9.11	51.63
OB Apr-01 & Oct-01 dissimilarity = 38.28	*Cossura* sp.	25.67	22.58	4.37	11.42	11.42
	Euchone sp.	3.33	0.17	3.69	9.64	21.05
	Aricidea sp.	4.20	1.17	3.14	8.21	29.26
	Aquilaspio aucklandica	4.27	1.33	2.98	7.79	37.05
	Paraonidae	2.73	0.08	2.98	7.79	44.84
OB Jul-01 & Oct-01 dissimilarity = 43.61	*Cossura* sp.	20.33	22.58	7.06	16.20	16.20
	Capitellidae *(H. filiformis)*	3.92	8.50	5.51	12.63	28.83
	Austrovenus stutchburyi	0.42	2.42	3.34	7.65	36.47
	Colurostylis lemurum	2.08	1.08	3.06	7.03	43.50
	Aquilaspio aucklandica	1.08	1.33	2.90	6.64	50.14
OB Apr-01 & Jan-02 dissimilarity = 34.14	*Cossura* sp.	25.67	25.83	3.10	9.09	9.09
	Macomona liliana	0.47	3.25	2.99	8.77	17.86
	Euchone sp.	3.33	1.08	2.81	8.23	26.09
	Phoxocephalidae	2.47	5.08	2.58	7.55	33.64
	Aricidea sp.	4.20	2.75	2.45	7.19	40.83
OB Jul-01 & Jan-02 dissimilarity = 47.54	Capitellidae *(H. filiformis)*	3.92	12.75	6.19	13.01	13.01
	Cossura sp.	20.33	25.83	5.56	11.69	24.71
	Macomona liliana	0.25	3.25	4.19	8.81	33.52
	Aricidea sp.	0.67	2.75	3.62	7.61	41.13
	Theora lubrica	0.00	1.83	3.21	6.75	47.87
OB Oct-01 & Jan-02 dissimilarity = 39.30	*Cossura* sp.	22.58	25.83	4.95	12.61	12.61
	Macomona liliana	0.92	3.25	2.89	7.35	19.96
	Theora lubrica	0.08	1.83	2.70	6.86	26.82
	Aricidea sp.	1.17	2.75	2.53	6.45	33.27
	Austrovenus stutchburyi	2.42	0.17	2.52	6.41	39.68
OB Apr-01 & Apr-02 dissimilarity = 34.55	*Euchone* sp.	3.33	0.25	3.36	9.72	9.72
	Cossura sp.	25.67	28.75	3.20	9.25	18.98
	Aricidea sp.	4.20	1.08	2.75	7.95	26.93
	Theora lubrica	0.87	2.92	2.75	7.95	34.87
	Paraonidae	2.73	0.42	2.52	7.29	42.17
OB Jul-01 & Apr-02 dissimilarity = 47.21	Capitellidae *(H. filiformis)*	3.92	12.33	6.25	13.24	13.24
	Cossura sp.	20.33	28.75	5.86	12.42	25.67
	Theora lubrica	0.00	2.92	4.36	9.24	34.91
	Aquilaspio aucklandica	1.08	2.50	3.56	7.53	42.44
	Phoxocephalidae	2.92	1.08	3.27	6.93	49.37
OB Oct-01 & Apr-02 dissimilarity = 39.75	*Cossura* sp.	22.58	28.75	5.30	13.34	13.34
	Phoxocephalidae	4.50	1.08	3.68	9.26	22.60
	Theora lubrica	0.08	2.92	3.64	9.15	31.75
	Austrovenus stutchburyi	2.42	0.17	2.63	6.61	38.36
	Capitellidae *(H. filiformis)*	8.50	12.33	2.62	6.58	44.94
OB Jan-02 & Apr-02 dissimilarity = 36.16	*Cossura* sp.	25.83	28.75	3.88	10.74	10.74
	Phoxocephalidae	5.08	1.08	3.39	9.36	20.10
	Macomona liliana	3.25	1.25	2.75	7.61	27.72
	Capitellidae *(H. filiformis)*	12.75	12.33	2.38	6.57	34.29
	Theora lubrica	1.83	2.92	2.37	6.55	40.83

The combination of indicator species/taxa that best accounted for the pattern for the full set of indicator species/taxa over the first year of the monitoring programme, and the indicator species/taxa which contributed most to the dissimilarities between sampling dates, differed among the monitoring sites. At HB 9 species from the suite of 26 indicator species accounted for nearly all of the full pattern (ρ = 0.955) (Table 8). Four species/taxa (the bivalves *Austrovenus stutchburyi*, *Arthritica bifurca* and *Macomona liliana*; and nereid polychaetes) were consistently important in contributing to the differences in assemblage composition among sampling dates at this site (Table 9). At TU 11 species/taxa accounted for nearly all of the full pattern (ρ = 0.960) (Table 8). Two species (the polychaete *Aquilaspio aucklandica* and the bivalve *A. bifurca*) were consistently important in contributing to the differences among sampling dates at TU (Table 9). At X 10 species/taxa accounted for nearly all of the full pattern (ρ = 0.960) (Table 8). At WI 12 species/taxa from the suite of 26 indicator species accounted for nearly all of the full pattern (ρ = 0.954) (Table 8). Two species (the bivalves *A. stutchburyi* and *Nucula hartvigiana*) were consistently important in contributing to the differences in assemblage composition among sampling dates at WI (Table 9). At OB 13 species/taxa accounted for nearly all of the full pattern (ρ = 0.951) (Table 8). One species (*Cossura* sp.) was consistently important in contributing to the differences in assemblage composition among sampling dates at OB.

The differences between the sampling dates were most pronounced at OB (also reflected in the MDS ordination in Figure 8), where the highest average dissimilarity was recorded (i.e., assemblage composition was least similar between sampling dates). Bray-Curtis dissimilarities between sampling dates were smallest (also reflected in the MDS ordination in Figure 8) at TU and X (i.e., assemblage composition was most similar between sampling dates). There were no consistent patterns evident in the dissimilarities between sampling dates among the different monitoring sites.

3.4 Sediment Characteristics

3.4.1 Surficial Sediment Grain-Size and Shell-hash

3.4.1.1 Southern Firth of Thames

There was a decrease in the median grain-size at KA, MI, GC and KB over the first year of the monitoring programme (Figure 9(a)). The greatest decrease occurred at GC, which was also the site where the largest median grain-size was recorded. The sediment at GC was the most sorted of the southern Firth of Thames sites, and contained predominantly medium and coarse sand and gravel, with a very low percentage of clay and silt (Gibberd and Carter, in prep.). The proportion of mud (< 63 μm) in the sediment between April 2001 and April 2002 was consistently low (< 2.2%, 1.2%, 1.8% and 0.8%, respectively) at MI, GC, KB and TP (Figure 9(b)). The MI sediment was dominated by fine and very fine sand, with moderate (usually 10-30%) medium and coarse sand content (Gibberd and Carter, in prep.). The sediment at KB and TP had similar grain-size distributions and both sites were poorly sorted, with medium sand accounting consistently for 15-20% of the sediment by volume (Gibberd and Carter, in prep.). The KA site was consistently the muddiest site, but was poorly sorted and highly variable (Gibberd and Carter, in prep.). There was an increase in the proportion of mud in the sediment at KA between April 2001 (1.3% ± 0.2)[10] and October 2001 (17.9% ± 2.9), with the proportion decreasing again in April 2002 (3.0% ± 0.3) (Figure 9(b)). Note that the changes recorded at KA may reflect the shoreward relocation in October 2001 of the permanent monitoring plot on the intertidal flat at this site. Gravels present at KA (23.2% ± 6.5) and MI (15.6% ± 4.8) in April 2001 had almost completely disappeared from subsequent sediment samples (Gibberd and Carter, in prep.).

The dry weight of shell-hash in the sediment remained reasonably consistent at MI and KB between April 2001 and April 2002 (Figure 9(c)). There were increases in the dry

[10] All values are standard errors unless noted otherwise.

weight of shell-hash at GC and TP (Figure 9(c)). The most marked increase was recorded at GC, which was also the site with the greatest dry weight of shell-hash. Mean dry weight of shell-hash increased from 889.3 (± 64.7) g.core^{-1} [11] at GC in April 2001 to 1338.5 (± 133.3) g.core^{-1} in April 2002. There was a decrease in dry weight of shell-hash at KA (Figure 9(c)).

The data are included in full in Appendix 3.

3.4.1.2 Whaingaroa (Raglan) Harbour

The sediment at all five sites in Whaingaroa (Raglan) Harbour was very poorly sorted with polymodal particle size distributions (Gibberd and Carter, in prep.). In April 2001, the sediment at all five monitoring sites showed similar particle size distributions, being predominantly sandy with a high percentage of coarse sand and gravel (Gibberd and Carter, in prep.). There was a decrease in the median grain-size at HB, WI, TU and OB between April 2001 and October 2001 reflecting lower gravel and coarse sand content, and an increase over the period to April 2002 at HB, WI and TU (Figure 10(a)). There was an increase in the proportion of mud (< 63 µm) in the sediment between April 2001 and April 2002 at HB, which was the site with the highest proportion of mud in the sediment (Figure 10(b)). The proportion of mud at HB increased from a mean of 6.6% (± 1.7) in April 2001 to 15.8% (± 4.9) in April 2002. This coincided with a gradual decrease in the content of coarse sand and gravel (Gibberd and Carter, in prep.). At TU, WI and OB there was an increase in the proportion of mud over the winter-spring period (July and October), with proportions decreasing over the following summer-autumn period (January and April) (Figure 10(b)). Overall there were no consistent increases or decreases in the proportion of mud in the sediments at these sites over the first year of the monitoring programme. Sediments at TU were dominated by very fine sand and fine sand (Gibberd and Carter, in prep.). The gravel content at TU was quite variable, ranging between 21.5% (± 5.5) in April 2001 and 1.4% (± 1.2) in October 2001 (Gibberd and Carter, in prep.). The composition of the sediment at WI varied during the study period but there was no apparent trend (Gibberd and Carter, in prep.). The sediment at OB was consistently dominated by fine and very fine sand, except for the first sampling time in April 2001, when a large gravel and coarse sand content was present (Gibberd and Carter, in prep.). The smallest change in the proportion of mud was recorded at X (Figure 10(b)).

The dry weight of shell-hash in the sediment remained reasonably consistent at each of the five sites between April 2001 and April 2002 (Figure 10(c)).

The data are included in full in Appendix 3.

3.4.2 Sediment Organic Matter Content

3.4.2.1 Southern Firth of Thames

There was an increase in the mean total organic carbon and total nitrogen content of surficial sediments at KA, the muddiest site, between April 2001 (total organic carbon: 0.31 (± 0.01) g.100 g^{-1}; total nitrogen: 0.06 (± 0.00) g.100 g^{-1}) and April 2002 (total organic carbon: 1.49 (± 0.62) g.100 g^{-1}; total nitrogen: 0.16 (± 0.01) g.100 g^{-1}) (Figure 9(d) and 3(e)). At the other four sites, while there was an indication of variability in the mean total nitrogen content of the sediments over the first year of the monitoring programme, there were no consistent increases or decreases evident (Figure 9(e)). The mean total organic carbon content was similarly reasonably consistent at MI, GC, KB and TP (Figure 9(d)).

The data are included in full in Appendix 4.

[11] Shell-hash dry weights are reported per 13 cm ø, 15 cm deep core.

3.4.2.2 Whaingaroa (Raglan) Harbour

The greatest mean total organic carbon (0.79 (± 0.01) g.100 g^{-1} in October 2001) and total nitrogen (0.11 (± 0.00) g.100 g^{-1} in April 2001 and 0.11 (± 0.00) g.100 g^{-1} in October 2001) content of surficial sediments were consistently recorded at HB, the muddiest site (Figure 10(d) and 4(e)). There were relatively small changes in the mean total organic carbon or total nitrogen content over the first year of the monitoring programme at this site. At the other four sites there was an indication of variability in the mean total nitrogen content of the sediments over the first year of the monitoring programme, with the highest contents generally recorded in winter-spring (July and October), and the lowest contents in summer-autumn (January and April) (Figure 10(e)). However, there were generally no consistent decreases or increases evident at these sites. The mean total organic carbon content of the sediments was reasonably consistent at TU, OB and X, but declined at WI (Figure 10(d)).

The data are included in full in Appendix 4.

3.4.3 Sediment Photosynthetic Pigment Concentration

3.4.3.1 Southern Firth of Thames

Mean chlorophyll-*a* concentration was reasonably consistent at KA and TP between April 2001 and October 2001 (the period for which data are available), but there was an indication of a decrease in mean chlorophyll-*a* concentration at GC and KB and an increase at MI over the same period (Figure 9(f)).

There was an increase in mean phaeophytin concentration at KA and GC between April 2001 and October 2001, a decrease over the same period at MI and TP, with reasonably consistent mean phaeophytin concentrations at KB (Figure 9(g)).

The data are included in full in Appendix 5.

3.4.3.2 Whaingaroa (Raglan) Harbour

Mean chlorophyll-*a* concentration was variable between April 2001 and October 2001 at WI and OB, with the greatest concentrations being recorded in July 2001 (Figure 10(f)). There was an indication of an increase in mean chlorophyll-*a* concentration at HB and a decrease at TU over April 2001 and October 2001 period (Figure 10(f)).

Mean phaeophytin concentration increased between April 2001 and July 2001 and subsequently declined again in October 2001at WI and OB, was reasonably consistent at TU and increased at HB (Figure 10(g)).

The data are included in full in Appendix 5.

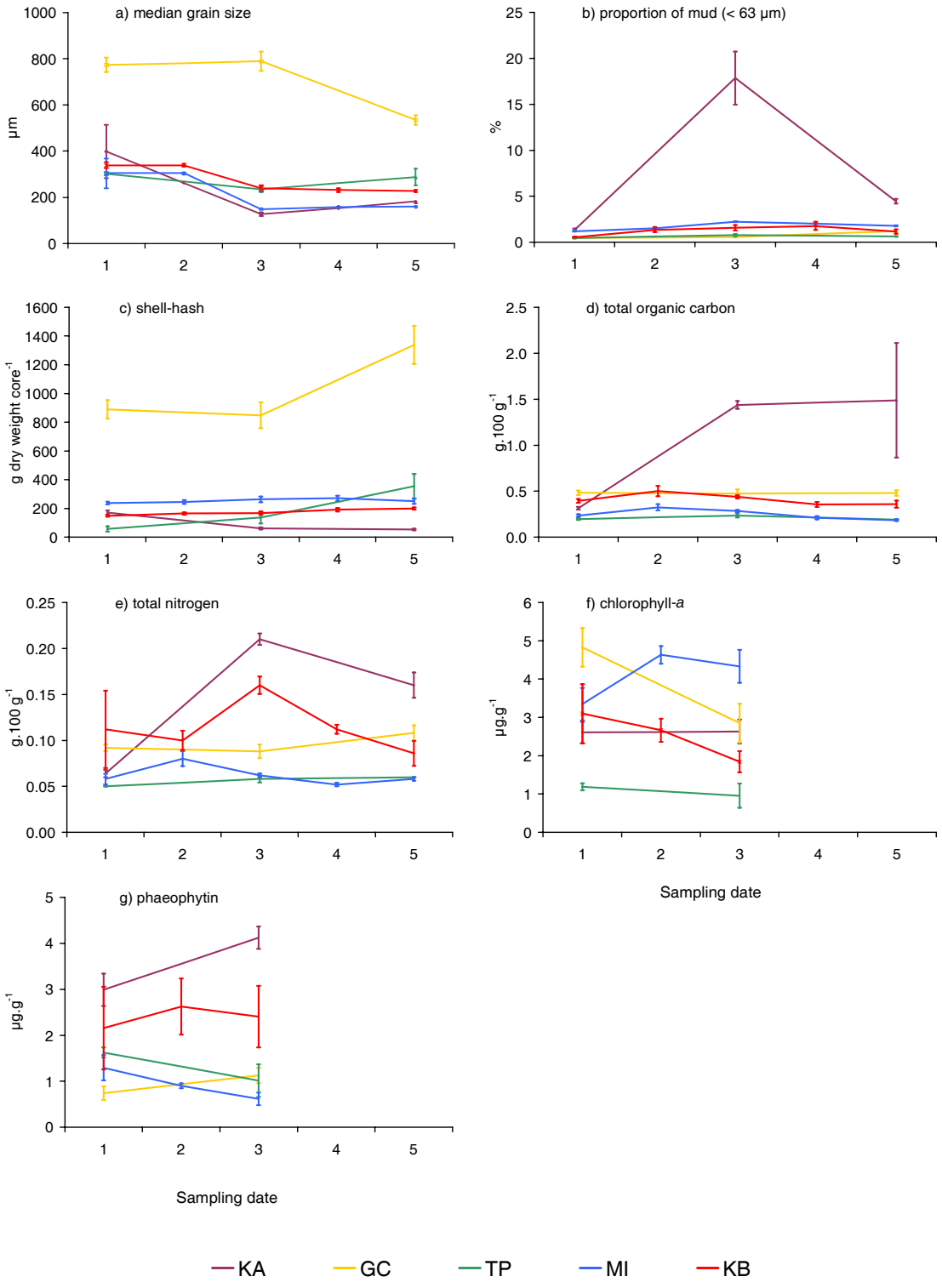

Figure 9: **Mean (± standard error) a) median grain-size, b) proportion of mud (< 63 µm), c) shell-hash dry weight, d) total organic carbon content, e) total nitrogen content, f) chlorophyll-*a* concentration and g) phaeophytin concentration of the sediment at the permanent monitoring sites in the southern Firth of Thames between April 2001 and April 2002. Sampling dates: April-01 = 1, July-01 = 2, Oct-01 = 3, Jan-02 = 4, April-02 = 5.**

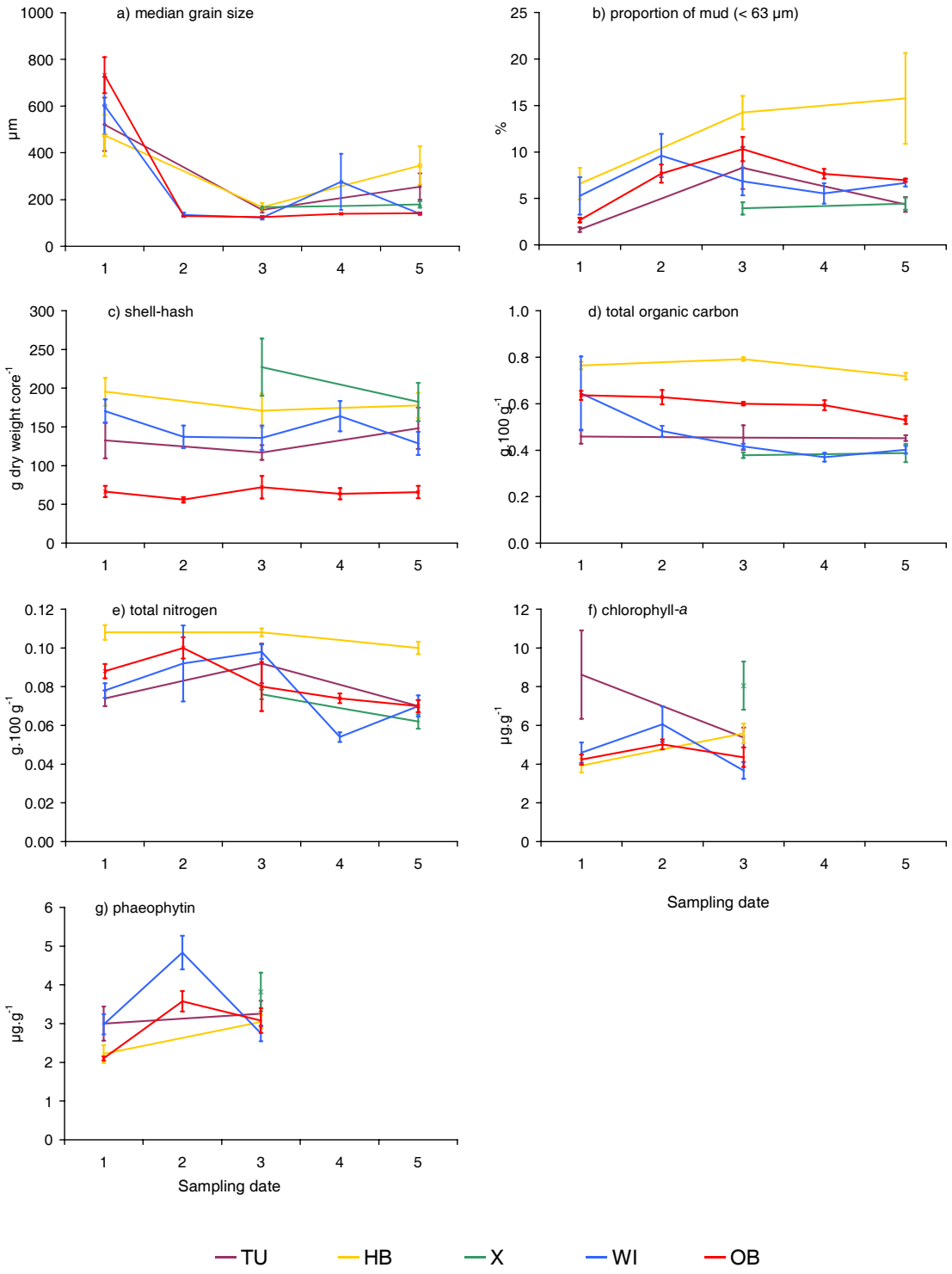

Figure 10: Mean (± standard error) a) median grain-size, b) proportion of mud (< 63 µm), c) shell-hash dry weight, d) total organic carbon content, e) total nitrogen content, f) chlorophyll-*a* concentration and g) phaeophytin concentration of the sediment at the permanent monitoring sites in Whaingaroa Harbour between April 2001 and April 2002. Sampling dates: April-01 = 1, July-01 = 2, Oct-01 = 3, Jan-02 = 4, April-02 = 5.

3.5 Linking Assemblage Composition to Sediment Characteristics

The intent of the Regional Estuary Monitoring Programme is to document existing environmental conditions (e.g., sediment grain-size, organic matter content, plant photosynthetic pigments), how these change in space and time, and to link these changes with changes in the benthic macrofauna communities. Such an integrated monitoring programme is more responsive to detecting overall trends. However, it is important to note that the linking of patterns in the benthic macrofauna assemblages to those of the measured sediment characteristics does not necessarily mean they are the cause of or explain the full ecological pattern, but is more an indication as to what may be influencing the macrofauna assemblages. Causality can only be demonstrated by manipulative field or laboratory experiments, where the effects of a single factor on community structure is investigated whilst all other factors are held constant or controlled (Clarke and Warwick, 2001).

3.5.1 Southern Firth of Thames

The single sediment variable which best explained the patterns of macrofauna assemblage composition, was dry weight of shell-hash (Spearman rank correlation coefficient ρ_s = 0.364). This was the highest correlation obtained in the BIO-ENV analysis. The best 2-sediment variable combination was dry weight of shell-hash and the proportion of mud (< 63 µm) in the surficial sediments (ρ_s = 0.335). The best 3-sediment variable combination retained dry weight of shell-hash and the proportion of mud, and added in total organic carbon content (ρ_s = 0.311) or total nitrogen content (ρ_s = 0.310). If the BIO-ENV analysis is repeated to include only those sampling dates for which there is data for chlorophyll-*a* and phaeophytin concentration, the overall optimum correlation was for the 3-sediment variable combination of dry weight of shell-hash, chlorophyll-*a* and phaeophytin concentration (ρ_s = 0.734).

3.5.2 Whaingaroa (Raglan) Harbour

The single sediment variable which best explained the patterns of assemblage composition, was dry weight of shell-hash (Spearman rank correlation coefficient ρ_s = 0.689). This was the highest correlation obtained in the BIO-ENV analysis. The best 2-sediment variable combination was dry weight of shell-hash and total organic carbon content of the surficial sediments (ρ_s = 0.661). The best 3-sediment variable combination retained dry weight of shell-hash and total organic carbon content and added in the proportion of mud (< 63 µm) (ρ_s = 0.615). Note that there was little difference in the results if the BIO-ENV analysis is repeated to include only those sampling dates for which there is data for chlorophyll-*a* and phaeophytin concentration. The highest correlation was for dry weight of shell-hash (ρ_s = 0.667). The best 2-sediment variable combination was dry weight of shell-hash and total organic carbon content (ρ_s = 0.630), and the next best correlation was achieved for the 4-sediment variable combination which retained dry weight of shell-hash and total organic carbon content and added in the proportion of mud and median grain-size (ρ_s = 0.535).

4 Discussion

Since the time-frame covered by this report is only the first year of the monitoring programme, detailed discussion and identification of trends or patterns of change in the monitored benthic macrofauna communities through time is premature. At present we are building up a picture of short-term changes (their nature, size and frequency) that affect these communities. 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.

In association with monitoring for long-term changes, in the future it is proposed that event-driven monitoring of sites will be incorporated into the current Regional Estuary

Monitoring Programme's sampling regime. An example could be intensive short-term monitoring of benthic communities and sediment characteristics over a period of significant rainfall, which can drive estuarine ecosystems through direct regulation of salinity, vertical stratification, nutrient input and sedimentation rates. Furthermore, sediment and nutrient runoff information from independent event-driven catchment studies could also be integrated into the analysis, which would provide an important link between catchment processes and their impact on estuarine ecosystems. This will further increase our ability to identify, measure and link changes detected as part of the long-term monitoring programme with the causes of these changes, as well as enabling the effects of particular events to be distinguished from existing variation or trends.

5 Recommendations

1. The Regional Estuary Monitoring Programme should continue as outlined in Turner (2001). Monitoring should continue to be undertaken at two of the sites in each estuary at 3-monthly intervals (January, April, July and October) and at the three remaining sites at 6-monthly intervals (April and October) (Tables 10 and 11).

Table 10: Recommended 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/Jly/Oct	Apr/Oct	Apr/Jly/Oct	Apr/Oct
2002	Apr/Oct	Jan/Apr/Jly/Oct	Apr/Oct	Jan/Apr/Jly/Oct	Apr/Oct
2003	Apr/Oct	Jan/Apr/Jly/Oct	Apr/Oct	Jan/Apr/Jly/Oct	Apr/Oct
2004	Apr/Oct	Jan/Apr/Jly/Oct	Apr/Oct	Jan/Apr/Jly/Oct	Apr/Oct
2005	Apr/Oct	Jan/Apr/Jly/Oct	Apr/Oct	Jan/Apr/Jly/Oct	Apr/Oct

Table 11: Recommended 3- and 6-monthly sampling schedule at the five permanent monitoring sites in Whaingaroa Harbour.

	KA	MI	GC	KB	TP
2001	Apr/Oct	Apr/Jly/Oct	Apr/Oct	Apr/Jly/Oct	Apr/Oct
2002	Apr/Oct	Jan/Apr/Jly/Oct	Apr/Oct	Jan/Apr/Jly/Oct	Apr/Oct
2003	Apr/Oct	Jan/Apr/Jly/Oct	Apr/Oct	Jan/Apr/Jly/Oct	Apr/Oct
2004	Apr/Oct	Jan/Apr/Jly/Oct	Apr/Oct	Jan/Apr/Jly/Oct	Apr/Oct
2005	Apr/Oct	Jan/Apr/Jly/Oct	Apr/Oct	Jan/Apr/Jly/Oct	Apr/Oct

A review of the monitoring programme should be undertaken after 3-5 years to assess whether any changes can be implemented in terms of frequency of sampling or the number of sites sampled, and/or the number of samples collected on each sampling occasion.

Continued monitoring will provide a measure of the patterns of temporal change in the sediment characteristics and the associated benthic communities. From these time-series it will be possible to distinguish trends from short-term variability, and thereby identify long-term changes in the sediment and benthic communities.

2. The Regional Estuary Monitoring Programme has implemented formal quality control and assessment protocols for the sorting, identification and enumeration of benthic core samples (Turner et al., 2002; see Appendix 6), and these need to continue to be rigorously implemented.

3. Rather than focusing on monitoring one or two species ("indicator species") which are presumed to be representative of the whole community in terms of their response to environmental changes, the Regional Estuary Monitoring Programme monitors a suite of 26 selected benthic macrofauna species and taxa. While monitoring a suite of species is more costly than monitoring only one or two indicator species, because it requires the identification and counting of more species of macrofauna, changes in a number of species present at the same site are more indicative of potential environmental stress than changes in a single

species. By including a suite of species, the monitoring programme will be more likely to detect unexpected effects and will also provide a larger-scale picture of ecological changes.

NIWA were commissioned to recommend a suite of species to be monitored (Hewitt et al., 2001). The species were chosen to represent a range of different taxonomic groups (including, bivalve and gastropod molluscs, polychaete worms, and several types of crustaceans) and different life-styles (predators, filter-feeders and deposit-feeders). The following 26 species and taxa were recommended as an appropriate suite of indicator species for the southern Firth of Thames and Whaingaroa Harbour (Table 12):

Table 12: List of 26 recommended indicator species/taxa to be monitored in the southern Firth of Thames and Whaingaroa Harbour.

Order	Taxa	Order	Taxa
Amphipoda	*Paracorophium* sp.	Polychaeta	*Aglaophamus* sp.
	Phoxocephalidae		*Aquilaspio aucklandica*
Bivalvia	*Arthritica bifurca*		*Aonides oxycephala*
	Austrovenus stutchburyi		*Aricidea* sp.
	Macomona liliana		*Boccardia* ?*syrtis*
	Nucula hartvigiana		*Cossura* sp.
	Paphies australis		*Euchone* sp.
	Theora lubrica		*Glycera* sp.
Cnidaria	*Anthopleura aureoradiata*		*Goniada* sp.
Cumacea	*Colurostylis lemurum*		*Heteromastus filiformis*
Gastropoda	*Cominella adspersa*		*Magelona dakini*
	Notoacmea sp.		Nereidae
			Orbinia papillosa
			Paraonidae

This suite of species and taxa should continue to be monitored. With the principal exception of the introduced bivalve (*Musculista senhousi*) at GC in April 2002, the majority of species/taxa recorded at each of the monitoring sites are included in this suite of monitored species with non-indicator species making relatively small contributions numerically to the macrofauna communities (see Figures 5 and 6).

Following discussions with scientists at the University of Auckland and NIWA, the following changes have been implemented:

1) *Heteromastus filiformis* and other capitellids recorded as “Capitellidae”.
2) *Boccardia* ?*syrtis*, *Polydora* and *Pseudopolydora* recorded as “*Pseudopolydora* complex”.

The distinguishing characteristic for *Heteromastus filiformis*, as opposed to other capitellids, is that only capillary setae are present on the first 5 setigers and thereafter only hooded hooks are present for the rest of the body (Hewitt et al. 2001). Capitellids are generally small, with few highly visible distinguishing characteristics, and the generic identification of capitellids is accepted as being difficult (e.g., Fauchald 1977). Some difficulties have been encountered with identifying capitellids (in particular smaller individuals) as *Heteromastus filiformis* as distinct from other species – even using high-power microscopy to examine each specimen – and it is likely that the greater number of specimens have been identified as “*Heteromastus filiformis*”. In recognition that there is likely to be variability between staff (at different organisations) in terms of ability to identify capitellids to species-level and that there is a risk of mis-identification; that only a sub-set of all samples are subject to quality-control checks; as well as the need to balance the cost of the programme (additional costs are likely to be incurred if each individual has to be examined under a high-power microscope for identification) and the level of information provided, it is recommended that a more conservative approach be adopted and all the capitellids in the samples should be classified as Capitellidae. It is acknowledged that by adopting this approach, there will be a loss

of some biodiversity and species-specific information (for example, not all species of capitellids exhibit the same response to organic enrichment). Nevertheless, the intent of the monitoring programme is to provide a general indication of ecological quality from a suite of monitored species, rather than seeking to target species that are precise indicators of specific forms of impact (for example, capitellids are generally abundant under conditions of organic enrichment, but the species may vary, and conversely, the presence of capitellids is not necessarily an indication of enrichment). It should also be noted that, from the detailed examinations of the specimens that have been undertaken to date, the majority of capitellids in the samples are *Heteromastus filiformis* in any case, with other species occurring occasionally.

Boccardia ?*syrtis* belongs to a sub-family of the spionids, the polydorids, which are characterised by a distinctive 5th setiger consisting of modified setae (Hewitt et al. 2001). The genus *Boccardia* displays two types of stout spines: one type has a bulbous, bristle-top end, and the other is a simple falcate spine (Hewitt et al. 2001). Some difficulties have been encountered with identifying polydorids (in particular smaller individuals where it is difficult to verify spine morphology) as *Boccardia ?syrtis* as distinct from other species of polydorids (e.g., *Polydora* and *Pseudopolydora*) – even using high-power microscopy to examine each specimen – and it is likely that the greater number of specimens have been identified as "*Boccardia ?syrtis*". For similar reasons and caveats outlined for *Heteromastus filiformis* (above) it is recommended that all the polydorids in the samples should be classified in the "*Pseudopolydora* complex".

Examination of the non-monitored species/taxa at sites in both the southern Firth of Thames and Whaingaroa Harbour has identified some species/taxonomic groups which occurred in high numbers. At this stage it is not proposed that changes to the list of monitored species should be implemented. However, it is important that the non-monitored species should continue to be identified (at least to taxonomic group) and counted to provide a broad description of the changes in macrofauna communities occurring at each site. This will provide a fuller description of the macrofauna communities and be useful in identifying potential incursions of introduced species such as *Musculista sentousi*.

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

KA April 2001

INDICATOR SPECIES			CORE NUMBER															TOTAL	MEAN
			1	2	3	4	5	6	7	10	12	14	15	16	17	18	19		
AMPHIPODS																			
ACOR	*Corophiidae*		0	0	0	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	1	1	0.1
BIVALVES		**SIZE**																	
BAB	*Arthritica bifurca*	<2	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	2	0.1
		>2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0.1
		Total	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	3	0.2
BAS	*Austrovenus stutchburyi*	<5	3	3	1	1	1	0	0	1	4	2	2	1	0	0	0	19	1.3
		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	3	3	1	1	1	0	0	1	4	2	2	1	0	0	0	19	1.3
BML	*Macamona liliana*	<5	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	2	0.1
		5-15	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	3	0.2
		>15	0	0	1	0	0	0	0	0	1	1	0	0	0	1	0	4	0.3
		Total	1	1	1	0	1	0	0	0	3	1	0	0	0	1	0	9	0.6
BNH	*Nucula hartvigiana*	<2	2	1	1	4	2	3	0	0	1	1	8	4	12	1	0	40	2.7
		>2	1	11	2	1	2	3	4	0	5	1	0	8	3	2	2	45	3.0
		Total	3	12	3	5	4	6	4	0	6	2	8	12	15	3	2	85	5.7
BPA	*Paphies australis*	<5	0	0	0	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	0	0.0
		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.1
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.1
BTHL	*Theora lubrica*	<5	6	0	4	10	9	8	11	0	5	0	0	5	7	13	4	82	5.5
		>5	1	13	2	7	11	2	8	0	2	14	14	2	7	3	7	93	6.2
		Total	7	13	6	17	20	10	19	0	7	14	14	7	14	16	11	175	11.7
CUMACEANS																			
CCL	*Colurostylis lemurum*		0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	3	0.2
GASTROPODS																			
GCA	*Cominella adspera*		0	0	0	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	0	0.0
OTHER																			
OAN	*Anthopleura aureoradiata*		0	0	0	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	0	0.0
PAGL	*Aglaophamus* sp.		3	3	2	0	0	1	1	0	1	0	0	0	1	0	0	12	0.8
PAO	*Aonides oxycephala*		0	1	0	0	0	0	1	0	1	0	0	0	0	0	1	4	0.3
PAR	*Aricidea* sp.		0	1	3	3	6	6	4	0	4	2	4	2	5	6	8	54	3.6
PBOC	Polydorids *(Boccardia syrtis)*		0	0	0	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	0	0.0
PEUC	*Euchone* sp.		0	0	0	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	0	0.0
PGLY	*Glycera* sp.		0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	3	0.2
PHF	Capitellidae *(Heteromastus filiformis)*		1	0	0	3	0	1	3	0	2	0	1	0	2	4	2	19	1.3
PMD	*Magelona dakini*		1	3	0	0	1	2	1	1	0	1	0	3	1	0	1	15	1.0
PNIC	Nereidae		1	3	1	0	1	2	1	0	2	2	4	1	3	4	4	29	1.9
POP	*Orbinia papillosa*		0	0	0	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	0	0.0
NON INDICATOR SPECIES																			
CAMPH	Amphipods		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CCRAB	Crabs		0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.1
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		0	0	0	1	0	1	0	0	1	0	0	0	2	0	0	5	0.3
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CSHR	Shrimps/Mysids		1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0.1
COTH	Other Crustaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BOTH	Bivalves		0	0	1	2	0	1	0	0	2	0	0	1	2	0	1	10	0.7
GOTH	Gastropods		0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	3	0.2
EFEZ	*Fellaster zealandiae*		1	1	1	0	0	0	0	0	0	1	1	0	0	0	0	5	0.3
EHOL	Holuthurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
ONEM	Nemerteans		0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0.1
POTH	Polychaetes		0	1	2	1	0	1	0	1	1	0	0	1	0	0	0	8	0.5
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OFLAT	Flatworm		0	0	0	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	0	0.0
OTHER	Misc. Other		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
TOTAL			**22**	**42**	**21**	**35**	**35**	**32**	**38**	**4**	**36**	**27**	**34**	**28**	**46**	**34**	**33**	**467**	**31.1**

KA October 2001

INDICATOR SPECIES		SIZE	CORE NUMBER 1	2	3	5	6	8	9	10	11	13	14	15	TOTAL	MEAN
AMPHIPODS																
ACOR	*Corophiidae*		0	6	0	0	0	0	0	1	0	0	0	0	7	0.6
APHOX	*Phoxocephalidae*		2	14	6	6	19	5	9	7	1	5	13	13	100	8.3
BIVALVES		**SIZE**														
BAB	*Arthritica bifurca*	<2	0	0	3	2	2	0	0	1	2	11	2	1	24	2.0
		>2	0	0	0	4	1	0	0	0	0	1	1	1	8	0.7
		Total	0	0	3	6	3	0	0	1	2	12	3	2	32	2.7
BAS	*Austrovenus stutchburyi*	<5	0	0	2	0	2	0	2	0	1	0	0	2	9	0.8
		>5	0	0	1	0	1	0	1	0	0	0	0	1	4	0.3
		Total	0	0	3	0	3	0	3	0	1	0	0	3	13	1.1
BML	*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	2	0	0	1	0	0	3	0.3
		>15	1	1	0	0	0	0	1	1	1	0	1	0	6	0.5
		Total	1	1	0	0	0	0	3	1	1	1	1	0	9	0.8
BNH	*Nucula hartvigiana*	<2	19	29	70	2	87	25	89	9	91	53	16	72	562	46.8
		>2	0	6	47	7	6	8	37	50	36	27	19	82	325	27.1
		Total	19	35	117	9	93	33	126	59	127	80	35	154	887	73.9
BPA	*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
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL	*Theora lubrica*	<5	4	5	9	1	35	4	11	6	6	4	0	4	89	7.4
		>5	1	1	0	1	1	0	0	0	0	2	0	1	7	0.6
		Total	5	6	9	2	36	4	11	6	6	6	0	5	96	8.0
CUMACEANS																
CCL	*Colurostylis lemurum*		0	1	0	0	0	0	1	0	0	0	0	0	2	0.2
GASTROPODS																
GCA	*Cominella adspera*		0	0	0	0	0	0	0	0	0	0	0	1	1	0.1
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	1	0	0	1	0.1
PAO	*Aonides oxycephala*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAR	*Aricidea* sp.		0	1	0	0	1	1	0	0	0	0	0	0	3	0.3
PBOC	Polydorids *(Boccardia syrtis)*		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	2	0	0	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	4	4	0	3	3	6	0	1	1	4	1	27	2.3
PGLY	*Glycera* sp.		2	0	0	0	0	0	0	1	0	2	0	2	7	0.6
PHF	Capitellidae *(Heteromastus filiformis)*		3	3	12	0	7	4	11	6	1	8	31	17	103	8.6
PMD	*Magelona dakini*		1	4	1	4	3	3	4	1	0	7	3	2	33	2.8
PNIC	Nereidae		2	1	3	9	2	5	2	2	4	3	2	2	37	3.1
POP	*Orbinia papillosa*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PPAR	Paraonidae		0	0	0	0	0	0	1	0	0	0	1	0	2	0.2
NON INDICATOR SPECIES																
CAMPH	Amphipods		0	0	0	0	1	0	0	0	0	0	0	0	1	0.1
CCRAB	Crabs		1	0	0	0	0	0	1	1	1	0	0	1	5	0.4
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		0	0	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		6	8	4	6	4	0	7	0	4	0	5	1	45	3.8
COTH	Other Crustaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BOTH	Bivalves		3	0	6	0	7	3	4	0	2	0	1	2	28	2.3
GOTH	Gastropods		0	1	3	1	1	1	4	2	2	0	2	3	20	1.7
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	0	0	0	0	0	0	0	0	0.0
POTH	Polychaetes		0	0	0	0	1	0	1	0	0	3	1	0	6	0.5
OOLIG	Oligochaetes		0	0	0	0	0	0	1	0	0	0	0	0	1	0.1
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OEDW	*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			**45**	**85**	**171**	**43**	**184**	**62**	**195**	**88**	**153**	**131**	**102**	**209**	**1468**	**122.3**

KA April 2002

INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN
		2	3	4	5	6	7	8	9	10	12	13	14		
AMPHIPODS															
ACOR *Corophiidae*		0	0	1	0	0	0	0	0	0	0	0	0	1	0.1
APHOX *Phoxocephalidae*		0	2	0	1	0	0	0	4	0	1	0	1	9	0.8
BIVALVES	**SIZE**														
BAB *Arthritica bifurca*	<2	0	0	4	2	3	7	4	9	0	3	5	4	41	3.4
	>2	0	0	0	0	1	12	0	0	0	0	4	0	17	1.4
	Total	0	0	4	2	4	19	4	9	0	3	9	4	58	4.8
BAS *Austrovenus stutchburyi*	<5	30	21	33	26	34	21	53	55	26	51	120	111	581	48.4
	>5	8	4	10	6	7	1	1	2	6	2	7	9	63	5.3
	Total	38	25	43	32	41	22	54	57	32	53	127	120	644	53.7
BML *Macamona liliana*	<5	1	0	0	0	4	1	0	0	1	1	1	1	10	0.8
	5-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	>15	1	0	1	0	1	0	1	0	1	1	0	2	8	0.7
	Total	2	0	1	0	5	1	1	0	2	2	1	3	18	1.5
BNH *Nucula hartvigiana*	<2	3	2	0	7	6	3	2	10	5	11	3	5	57	4.8
	>2	6	5	5	31	30	34	14	73	58	52	32	58	398	33.2
	Total	9	7	5	38	36	37	16	83	63	63	35	63	455	37.9
BPA *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
	Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL *Theora lubrica*	<5	2	2	4	5	9	7	1	14	5	8	2	3	62	5.2
	>5	2	2	2	1	3	8	4	4	4	5	3	1	39	3.3
	Total	4	4	6	6	12	15	5	18	9	13	5	4	101	8.4
CUMACEANS															
CCL *Colurostylis lemurum*		0	0	5	0	1	0	0	0	0	0	1	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.		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	1	1	0.1
PAO *Aonides oxycephala*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAR *Aricidea* sp.		0	0	1	2	0	0	0	0	1	1	0	0	5	0.4
PBOC Polydorids *(Boccardia syrtis)*		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.		2	2	4	0	3	0	0	0	0	0	9	6	26	2.2
PGLY *Glycera* sp.		0	0	0	1	0	0	0	0	0	0	0	0	1	0.1
PHF Capitellidae *(Heteromastus filiformis)*		3	2	1	3	9	2	10	23	26	19	9	2	109	9.1
PMD *Magelona dakini*		4	6	4	6	41	23	5	12	7	27	12	21	168	14.0
PNIC Nereidae		3	1	5	2	2	1	1	4	4	2	4	3	32	2.7
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	2	1	0	4	0.3
NON INDICATOR SPECIES															
CAMPH Amphipods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CCRAB Crabs		0	0	0	0	0	1	0	1	0	0	0	0	2	0.2
CCUM Cumaceans		0	1	0	2	0	1	0	0	0	4	1	0	9	0.8
CISO Isopods		0	0	0	0	0	1	0	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		2	1	2	0	1	0	0	2	4	5	1	2	20	1.7
COTH Other Crustaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BOTH Bivalves		21	4	4	6	24	18	24	6	34	7	19	25	192	16.0
GOTH Gastropods		1	0	0	0	1	0	0	2	1	3	0	0	8	0.7
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	0	0	0	0	0	0	0	0	0.0
POTH Polychaetes		0	0	0	0	0	0	1	0	0	0	0	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	1	1	0.1
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		**89**	**55**	**86**	**101**	**181**	**141**	**121**	**221**	**183**	**205**	**234**	**257**	**1874**	**156.2**

GC April 2001

INDICATOR SPECIES		SIZE	CORE NUMBER 1	2	3	4	5	7	9	10	11	12	14	16	17	18	19	TOTAL	MEAN
AMPHIPODS																			
ACOR	*Corophiidae*		0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0.1
APHOX	*Phoxocephalidae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BIVALVES		**SIZE**																	
BAB	*Arthritica bifurca*	<2	0	0	0	0	0	0	1	0	1	0	1	7	4	0	2	16	1.1
		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	1	0	1	0	1	7	4	0	2	16	1.1
BAS	*Austrovenus stutchburyi*	<5	5	3	3	6	6	3	8	5	0	9	5	16	14	14	5	102	6.8
		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	5	3	3	6	6	3	8	5	0	9	5	16	14	14	5	102	6.8
BML	*Macamona liliana*	<5	1	0	0	0	0	0	0	0	1	0	0	1	4	1	2	10	0.7
		5-15	0	0	1	0	1	0	0	1	0	1	0	0	1	0	0	5	0.3
		>15	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0.1
		Total	1	0	1	0	1	0	0	1	1	1	1	1	5	1	2	16	1.1
BNH	*Nucula hartvigiana*	<2	0	0	0	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	1	2	0	0	3	0.2
		Total	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	3	0.2
BPA	*Paphies australis*	<5	6	4	11	1	45	17	8	8	5	56	7	3	0	9	15	195	13.0
		5-15	8	3	2	0	5	8	2	2	1	5	31	4	1	16	1	89	5.9
		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	14	7	13	1	50	25	10	10	6	61	38	7	1	25	16	284	18.9
BTHL	*Theora lubrica*	<5	0	0	0	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	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CUMACEANS																			
CCL	*Colurostylis lemurum*		0	4	2	1	0	4	0	1	0	2	0	0	2	0	0	16	1.1
GASTROPODS																			
GCA	*Cominella adspera*		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE	*Notoacmea* sp.		2	0	0	1	0	1	2	0	0	1	1	1	5	1	0	15	1.0
OTHER																			
OAN	*Anthopleura aureoradiata*		0	0	0	0	1	0	0	0	0	1	2	0	0	0	0	4	0.3
POLYCHAETES																			
PAA	*Aquilaspio aucklandica*		0	0	0	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	0	0.0
PAO	*Aonides oxycephala*		64	82	126	125	67	77	157	59	74	124	59	113	130	138	122	1517	101.1
PAR	*Aricidea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PBOC	Polydorids *(Boccardia syrtis)*		1	0	0	2	0	1	0	1	0	0	0	0	0	0	0	5	0.3
PCOS	*Cossura* sp.		0	0	1	0	0	0	0	0	0	0	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	0	0.0
PGE	*Goniada* sp.		0	0	0	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	0	0.0
PHF	Capitellidae *(Heteromastus filiformis)*		1	0	0	7	1	0	1	0	2	1	2	2	2	0	1	20	1.3
PMD	*Magelona dakini*		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PNIC	Nereidae		3	5	4	1	0	8	5	5	4	4	5	3	7	2	3	59	3.9
POP	*Orbinia papillosa*		0	0	0	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	0	0.0
NON INDICATOR SPECIES																			
CAMPH	Amphipods		0	1	0	0	0	0	0	0	0	1	1	2	1	0	0	6	0.4
CCRAB	Crabs		2	0	0	1	0	2	1	0	0	0	1	0	1	0	1	9	0.6
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		2	6	4	11	4	0	2	1	4	1	2	14	4	3	4	62	4.1
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CSHR	Shrimps/Mysids		0	0	0	0	1	0	0	0	0	0	2	0	0	2	0	5	0.3
COTH	Other Crustaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BOTH	Bivalves		3	2	2	1	3	0	4	4	0	4	1	1	2	2	1	30	2.0
GOTH	Gastropods		2	0	0	0	0	1	0	1	0	0	1	0	0	0	0	5	0.3
EFEZ	*Fellaster zealandiae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
EHOL	Holuthurians		0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1
ONEM	Nemerteans		0	0	0	0	0	0	0	0	1	0	2	0	0	1	2	6	0.4
POTH	Polychaetes		2	8	12	10	7	3	11	1	6	11	4	7	11	16	6	115	7.7
OOLIG	Oligochaetes		0	0	0	1	0	0	0	4	2	1	1	0	0	1	1	11	0.7
OFLAT	Flatworms		0	0	0	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	0	1	0	1	0	0	0	3	0.2
OTHER	Misc. Other		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
TOTAL			**102**	**118**	**169**	**168**	**141**	**126**	**203**	**93**	**101**	**223**	**129**	**176**	**191**	**206**	**166**	**2312**	**154.1**

GC October 2001

INDICATOR SPECIES		SIZE	CORE NUMBER 1	3	4	5	6	7	8	10	11	12	13	15	TOTAL	MEAN
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	*Arthritica bifurca*	<2	0	0	0	7	0	0	2	0	0	0	12	0	21	1.8
		>2	0	0	0	1	0	0	0	0	0	0	0	0	1	0.1
		Total	0	0	0	8	0	0	2	0	0	0	12	0	22	1.8
BAS	*Austrovenus stutchburyi*	<5	3	11	6	8	4	4	7	5	2	7	10	5	72	6.0
		>5	0	0	2	4	1	0	1	0	0	0	1	1	10	0.8
		Total	3	11	8	12	5	4	8	5	2	7	11	6	82	6.8
BML	*Macamona liliana*	<5	0	0	0	0	0	1	0	0	1	1	0	0	3	0.3
		5-15	0	0	0	0	0	1	0	2	0	0	0	0	3	0.3
		>15	0	0	0	1	0	0	1	0	0	1	1	1	5	0.4
		Total	0	0	0	1	0	2	1	2	1	2	1	1	11	0.9
BNH	*Nucula hartvigiana*	<2	0	0	0	0	0	0	1	0	0	0	0	0	1	0.1
		>2	0	0	0	1	0	0	0	0	0	0	0	0	1	0.1
		Total	0	0	0	1	0	0	1	0	0	0	0	0	2	0.2
BPA	*Paphies australis*	<5	4	6	2	8	1	0	3	22	0	2	2	13	63	5.3
		5-15	9	5	0	4	25	1	6	6	13	1	2	8	80	6.7
		>15	0	0	0	0	0	0	1	0	0	0	0	0	1	0.1
		Total	13	11	2	12	26	1	10	28	13	3	4	21	144	12.0
BTHL	*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																
CCL	*Colurostylis lemurum*		0	1	3	1	0	1	0	1	1	1	2	3	14	1.2
GASTROPODS																
GCA	*Cominella adspera*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE	*Notoacmea* sp.		2	2	0	2	0	1	0	1	2	0	6	1	17	1.4
OTHER																
OAN	*Anthopleura aureoradiata*		0	0	0	0	0	0	0	1	0	0	0	0	1	0.1
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*		31	116	63	66	62	128	99	52	102	96	73	110	998	83.2
PAR	*Aricidea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PBOC	Polydorids *(Boccardia syrtis)*		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	1	0	0	0	0	1	0.1
PHF	Capitellidae *(Heteromastus filiformis)*		0	0	1	0	1	0	0	0	0	1	1	0	4	0.3
PMD	*Magelona dakini*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PNIC	Nereidae		1	1	0	1	1	0	1	2	0	2	4	0	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	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	2	0	2	0.2
CCRAB	Crabs		2	0	0	1	0	0	0	0	0	0	0	0	3	0.3
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	1	0	0	0	1	4	0.3
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CSHR	Shrimps/Mysids		1	1	1	11	0	1	1	5	0	6	0	1	28	2.3
COTH	Other Crustaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BOTH	Bivalves		0	2	1	0	0	1	2	1	0	1	0	1	9	0.8
GOTH	Gastropods		0	2	0	1	0	1	0	1	0	0	1	1	7	0.6
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		0	0	0	0	0	0	0	0	0	1	0	0	1	0.1
POTH	Polychaetes		0	13	5	7	0	7	12	2	1	2	17	4	70	5.8
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OFLAT	Flatworms		0	1	1	0	0	0	0	0	0	0	0	0	2	0.2
OEDW	*Edwardsia*		0	1	0	0	0	0	0	0	0	0	0	1	2	0.2
OTHER	Misc. Other		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
TOTAL			**54**	**162**	**85**	**124**	**96**	**147**	**137**	**103**	**122**	**122**	**134**	**151**	**1437**	**119.8**

GC April 2002

INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN
		1	2	3	4	5	6	8	9	10	11	13	15		
AMPHIPODS															
ACOR *Corophiidae*		0	0	1	0	0	1	0	0	0	0	0	0	2	0.2
APHOX *Phoxocephalidae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BIVALVES	**SIZE**														
BAB *Arthritica bifurca*	<2	2	0	9	0	1	2	5	4	2	3	12	0	40	3.3
	>2	0	0	0	0	0	0	1	1	0	0	0	1	3	0.3
	Total	2	0	9	0	1	2	6	5	2	3	12	1	43	3.6
BAS *Austrovenus stutchburyi*	<5	2	4	1	0	2	12	5	8	7	2	20	5	68	5.7
	>5	0	1	0	0	1	0	0	0	0	0	1	2	5	0.4
	Total	2	5	1	0	3	12	5	8	7	2	21	7	73	6.1
BML *Macamona liliana*	<5	0	0	0	0	1	0	0	0	0	0	0	0	1	0.1
	5-15	1	0	0	0	0	0	0	0	0	0	1	1	3	0.3
	>15	0	0	0	0	1	0	0	0	0	0	0	0	1	0.1
	Total	1	0	0	0	2	0	0	0	0	0	1	1	5	0.4
BNH *Nucula hartvigiana*	<2	0	0	0	0	0	0	0	1	0	0	0	0	1	0.1
	>2	0	0	2	0	2	0	0	0	2	1	0	0	7	0.6
	Total	0	0	2	0	2	0	0	1	2	1	0	0	8	0.7
BPA *Paphies australis*	<5	2	14	4	1	11	7	0	12	17	3	1	10	82	6.8
	5-15	1	4	4	1	0	5	0	6	12	6	0	8	47	3.9
	>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	Total	3	18	8	2	11	12	0	18	29	9	1	18	129	10.8
BTHL *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															
CCL *Colurostylis lemurum*		7	9	0	4	9	6	4	17	6	2	3	13	80	6.7
GASTROPODS															
GCA *Cominella adspera*		0	0	1	0	0	2	0	0	0	1	0	0	4	0.3
GNHE *Notoacmea* sp.		0	0	1	0	0	0	0	1	0	1	6	0	9	0.8
OTHER															
OAN *Anthopleura aureoradiata*		0	0	2	0	0	0	1	1	2	0	0	0	6	0.5
POLYCHAETES															
PAA *Aquilaspio aucklandica*		0	0	0	0	0	0	0	0	0	0	0	1	1	0.1
PAGL *Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO *Aonides oxycephala*		101	107	74	10	107	66	44	112	75	98	114	116	1024	85.3
PAR *Aricidea* sp.		0	0	0	1	0	0	0	0	0	0	0	0	1	0.1
PBOC Polydorids *(Boccardia syrtis)*		0	1	1	1	0	1	19	0	1	0	3	1	28	2.3
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	1	1	0	0	0	2	1	0	5	0.4
PHF Capitellidae *(Heteromastus filiformis)*		0	0	0	0	0	0	1	0	0	0	0	0	1	0.1
PMD *Magelona dakini*		0	0	0	0	0	0	0	1	1	0	1	0	3	0.3
PNIC Nereidae		11	8	25	1	9	24	29	31	13	16	32	5	204	17.0
POP *Orbinia papillosa*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PPAR Paraonidae		0	0	0	1	0	0	0	0	0	0	0	0	1	0.1
NON INDICATOR SPECIES															
CAMPH Amphipods		0	0	6	0	0	1	0	0	0	0	0	0	7	0.6
CCRAB Crabs		2	0	2	0	0	2	2	0	0	0	0	2	10	0.8
CCUM Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO Isopods		1	22	34	4	18	49	7	30	53	21	20	86	345	28.8
COST Ostracods		0	0	0	0	0	0	2	0	0	0	0	0	2	0.2
CSHR Shrimps/Mysids		4	1	3	0	0	2	0	0	0	2	7	0	19	1.6
COTH Other Crustaceans		0	1	0	0	0	1	0	0	0	0	0	0	2	0.2
BOTH Bivalves		4	23	165	4	48	178	415	74	115	87	88	177	1378	114.8
GOTH Gastropods		0	1	0	0	0	1	0	1	1	0	2	0	6	0.5
EFEZ *Fellaster zealandiae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
EHOL Holuthurians		1	0	0	2	2	3	0	0	3	1	1	0	13	1.1
ONEM Nemerteans		2	0	7	1	1	1	3	2	4	0	4	0	25	2.1
POTH Polychaetes		3	9	30	5	8	10	0	21	21	0	8	13	128	10.7
OOLIG Oligochaetes		0	0	0	0	0	0	0	0	0	8	0	0	8	0.7
OFLAT Flatworms		0	0	0	0	0	1	0	0	0	1	0	0	2	0.2
OEDW *Edwardsia*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OTHER Misc. Other		0	14	0	0	0	0	0	0	0	0	0	0	14	1.2
TOTAL		144	219	372	36	222	376	538	323	335	255	325	441	3586	298.8

TP April 2001

INDICATOR SPECIES		SIZE	CORE NUMBER 4	5	6	7	8	9	10	11	12	13	14	15	17	18	20	TOTAL	MEAN
AMPHIPODS																			
ACOR	*Corophiidae*		1	1	0	1	2	0	0	0	1	1	1	0	2	0	0	10	0.7
APHOX	*Phoxocephalidae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BIVALVES		**SIZE**																	
BAB	*Arthritica bifurca*	<2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0.1
		>2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0.1
		Total	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	2	0.1
BAS	*Austrovenus stutchburyi*	<5	134	107	143	148	42	314	105	141	78	107	119	50	32	38	26	1584	105.6
		>5	2	0	0	0	8	11	1	1	1	0	0	8	3	5	0	40	2.7
		Total	136	107	143	148	50	325	106	142	79	107	119	58	35	43	26	1624	108.3
BML	*Macamona liliana*	<5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1
		5-15	0	0	0	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	0	0.0
		Total	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1
BNH	*Nucula hartvigiana*	<2	145	96	116	83	36	112	80	117	120	153	105	37	15	18	79	1312	87.5
		>2	153	94	112	145	129	96	158	191	138	90	132	135	30	80	127	1810	120.7
		Total	298	190	228	228	165	208	238	308	258	243	237	172	45	98	206	3122	208.1
BPA	*Paphies australis*	<5	0	0	0	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	0	0.0
		>15	39	43	44	35	19	3	28	37	38	38	37	18	0	27	43	449	29.9
		Total	39	43	44	35	19	3	28	37	38	38	37	18	0	27	43	449	29.9
BTHL	*Theora lubrica*	<5	0	0	0	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	0	0.0
		Total	0	0	0	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	1	1	0.1
GASTROPODS																			
GCA	*Cominella adspera*		0	0	0	2	1	0	3	0	1	0	1	0	0	0	1	9	0.6
GNHE	*Notoacmea* sp.		0	0	0	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	0	0.0
POLYCHAETES																			
PAA	*Aquilaspio aucklandica*		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAGL	*Aglaophamus* sp.		0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	3	0.2
PAO	*Aonides oxycephala*		0	0	0	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	0	0.0
PBOC	Polydorids *(Boccardia syrtis)*		0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0.1
PCOS	*Cossura* sp.		0	0	0	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	0	0.0
PGE	*Goniada* sp.		0	0	0	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	0	0.0
PHF	Capitellidae *(Heteromastus filiformis)*		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1
PMD	*Magelona dakini*		0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	2	0.1
PNIC	Nereidae		0	0	0	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	0	0.0
PPAR	Paraonidae		0	0	0	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	4	0	0	4	0.3
CCRAB	Crabs		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		0	0	0	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	0	0.0
CSHR	Shrimps/Mysids		0	0	0	0	0	1	1	1	0	0	0	1	0	0	1	5	0.3
COTH	Other Crustaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BOTH	Bivalves		0	0	1	0	0	7	1	0	0	0	3	1	1	0	1	15	1.0
GOTH	Gastropods		2	0	0	2	0	0	1	0	1	1	0	0	0	0	1	8	0.5
EFEZ	*Fellaster zealandiae*		0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0.1
EHOL	Holuthurians		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
ONEM	Nemerteans		0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0.1
POTH	Polychaetes		0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0.1
OOLIG	Oligochaetes		0	0	0	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	0	0.0
OEDW	*Edwardsia*		0	0	0	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	0	0.0
TOTAL			477	342	416	416	239	546	378	488	380	390	398	250	92	168	280	5260	350.7

TP October 2001

INDICATOR SPECIES		SIZE	CORE NUMBER 1	4	5	6	7	8	9	10	11	12	13	15	TOTAL	MEAN
AMPHIPODS																
ACOR	*Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
APHOX	*Phoxocephalidae*		1	1	0	0	0	0	0	0	0	0	0	0	2	0.2
BIVALVES		**SIZE**														
BAB	*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
BAS	*Austrovenus stutchburyi*	<5	0	0	3	1	1	0	1	0	0	2	3	2	13	1.1
		>5	3	2	0	11	2	0	0	1	3	4	1	0	27	2.3
		Total	3	2	3	12	3	0	1	1	3	6	4	2	40	3.3
BML	*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	1	1	0.1
		Total	0	0	0	0	0	0	0	0	0	0	0	1	1	0.1
BNH	*Nucula hartvigiana*	<2	0	10	10	2	0	1	9	16	4	2	0	20	74	6.2
		>2	86	122	119	121	32	79	97	99	63	30	10	161	1019	84.9
		Total	86	132	129	123	32	80	106	115	67	32	10	181	1093	91.1
BPA	*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	29	42	46	21	0	20	39	42	0	0	0	41	280	23.3
		Total	29	42	46	21	0	20	39	42	0	0	0	41	280	23.3
BTHL	*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																
CCL	*Colurostylis lemurum*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GASTROPODS																
GCA	*Cominella adspera*		1	1	0	0	0	0	1	0	2	0	0	0	5	0.4
GNHE	*Notoacmea* sp.		0	0	3	1	0	0	3	2	0	0	0	3	12	1.0
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	1	0	0	1	0	0	0	2	0.2
PAO	*Aonides oxycephala*		0	0	0	0	0	1	0	0	0	0	0	0	1	0.1
PAR	*Aricidea* sp.		0	0	0	0	0	0	0	0	0	0	1	0	1	0.1
PBOC	Polydorids *(Boccardia syrtis)*		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	1	0	0	0	0	0	0	0	0	0	0	1	0.1
PHF	Capitellidae *(Heteromastus filiformis)*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PMD	*Magelona dakini*		0	0	0	0	1	0	0	0	1	1	1	0	4	0.3
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		2	0	0	1	6	2	0	0	0	0	3	3	17	1.4
CCRAB	Crabs		0	0	2	0	0	0	0	0	0	0	2	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	1	1	1	0	0	0	0	0	1	4	0.3
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CSHR	Shrimps/Mysids		0	1	0	0	0	1	0	0	1	0	2	0	5	0.4
COTH	Other Crustaceans		2	0	0	0	1	0	0	0	0	1	1	1	6	0.5
BOTH	Bivalves		0	0	0	0	1	0	0	0	2	1	0	1	5	0.4
GOTH	Gastropods		0	1	1	0	0	0	2	0	1	0	1	2	8	0.7
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	3	0	0	0	3	1	1	0	8	0.7
POTH	Polychaetes		1	0	0	0	2	0	0	0	4	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	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			**125**	**181**	**184**	**159**	**50**	**106**	**152**	**160**	**85**	**44**	**26**	**236**	**1508**	**125.7**

TP April 2002

INDICATOR SPECIES		SIZE	CORE NUMBER 1	2	3	5	6	7	8	10	11	12	14	15	TOTAL	MEAN
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	*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**
BAS	*Austrovenus stutchburyi*	<5	0	0	1	0	0	0	0	0	0	0	0	0	**1**	**0.1**
		>5	8	0	0	0	9	3	0	0	0	2	3	1	**26**	**2.2**
		Total	8	0	1	0	9	3	0	0	0	2	3	1	**27**	**2.3**
BML	*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**
		Total	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
BNH	*Nucula hartvigiana*	<2	0	8	1	7	22	8	7	4	3	4	0	5	**69**	**5.8**
		>2	34	111	49	75	142	22	81	99	34	44	27	73	**791**	**65.9**
		Total	34	119	50	82	164	30	88	103	37	48	27	78	**860**	**71.7**
BPA	*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	1	0	0	0	**1**	**0.1**
		>15	0	35	41	37	3	0	35	38	25	0	0	37	**251**	**20.9**
		Total	0	35	41	37	3	0	35	38	26	0	0	37	**252**	**21.0**
BTHL	*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																
CCL	*Colurostylis lemurum*		0	0	1	0	0	0	0	0	0	0	0	0	**1**	**0.1**
GASTROPODS																
GCA	*Cominella adspera*		0	0	0	0	2	0	3	0	0	0	0	0	**5**	**0.4**
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	1	0	**1**	**0.1**
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	Polydorids *(Boccardia syrtis)*		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	0	0	0	**0**	**0.0**
PHF	Capitellidae *(Heteromastus filiformis)*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PMD	*Magelona dakini*		0	0	0	0	0	1	0	0	0	0	3	0	**4**	**0.3**
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	2	0	2	0	1	2	5	9	8	**29**	**2.4**
CCRAB	Crabs		0	0	0	0	1	0	0	0	0	0	0	0	**1**	**0.1**
CCUM	Cumaceans		0	0	0	0	0	0	0	1	0	0	0	0	**1**	**0.1**
CISO	Isopods		0	0	2	3	1	2	0	0	0	1	0	1	**10**	**0.8**
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
CSHR	Shrimps/Mysids		0	0	0	0	0	0	0	1	4	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		2	0	0	2	0	1	1	2	2	4	0	2	**16**	**1.3**
GOTH	Gastropods		0	0	0	0	1	0	1	1	0	2	0	1	**6**	**0.5**
EFEZ	*Fellaster zealandiae*		0	0	0	0	0	4	0	0	0	0	3	0	**7**	**0.6**
EHOL	Holuthurians		1	0	0	0	0	0	0	0	0	0	0	0	**1**	**0.1**
ONEM	Nemerteans		0	0	0	0	0	0	0	0	0	0	1	0	**1**	**0.1**
POTH	Polychaetes		0	0	0	0	0	0	0	0	0	0	1	1	**2**	**0.2**
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
OEDW	*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			**45**	**154**	**95**	**126**	**181**	**43**	**128**	**147**	**71**	**62**	**48**	**129**	**1229**	**102.4**

MI April 2001

INDICATOR SPECIES			CORE NUMBER															TOTAL	MEAN
			2	5	6	8	10	11	12	13	14	15	16	17	18	19	20		
AMPHIPODS																			
ACOR	*Corophiidae*		0	0	0	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	0	0.0
BIVALVES		**SIZE**																	
BAB	*Arthritica bifurca*	<2	0	0	0	0	0	2	1	0	0	6	0	0	1	0	9	19	1.3
		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	2	1	0	0	6	0	0	1	0	9	19	1.3
BAS	*Austrovenus stutchburyi*	<5	1	2	4	5	0	2	9	3	0	0	3	0	6	9	2	46	3.1
		>5	0	1	2	2	1	1	1	3	0	2	0	0	11	0	3	27	1.8
		Total	1	3	6	7	1	3	10	6	0	2	3	0	17	9	5	73	4.9
BML	*Macamona liliana*	<5	0	1	0	1	0	0	2	1	1	1	1	0	1	0	1	10	0.7
		5-15	2	0	0	1	1	1	0	1	1	0	1	0	0	3	1	12	0.8
		>15	3	2	4	2	2	3	4	1	2	1	2	2	1	6	2	37	2.5
		Total	5	3	4	4	3	4	6	3	4	2	4	2	2	9	4	59	3.9
BNH	*Nucula hartvigiana*	<2	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	3	0.2
		>2	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	2	0.1
		Total	0	0	0	1	0	2	1	0	0	0	0	0	1	0	0	5	0.3
BPA	*Paphies australis*	<5	0	0	0	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	0	0.0
		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL	*Theora lubrica*	<5	0	0	0	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	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CUMACEANS																			
CCL	*Colurostylis lemurum*		0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	3	0.2
GASTROPODS																			
GCA	*Cominella adspera*		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE	*Notoacmea* sp.		0	0	0	1	0	3	1	0	1	0	0	0	1	1	4	12	0.8
OTHER																			
OAN	*Anthopleura aureoradiata*		3	1	1	1	4	1	2	0	2	1	0	4	2	1	0	23	1.5
POLYCHAETES																			
PAA	*Aquilaspio aucklandica*		0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.1
PAGL	*Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	*Aonides oxycephala*		52	56	24	79	57	10	43	42	69	45	51	42	60	70	30	730	48.7
PAR	*Aricidea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PBOC	Polydorids *(Boccardia syrtis)*		0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	2	0.1
PCOS	*Cossura* sp.		0	0	0	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	0	0.0
PGE	*Goniada* sp.		0	0	0	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	0	0	1	2	0.1
PHF	Capitellidae *(Heteromastus filiformis)*		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PMD	*Magelona dakini*		0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0.1
PNIC	Nereidae		2	1	1	2	0	2	2	0	2	1	0	1	1	0	0	15	1.0
POP	*Orbinia papillosa*		1	0	0	0	1	0	0	0	2	0	2	0	0	0	0	6	0.4
PPAR	Paraonidae		0	0	0	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	1	0	0	0	2	1	4	0.3
CCRAB	Crabs		0	0	0	1	2	1	0	1	1	1	0	1	0	1	0	9	0.6
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		0	1	0	2	2	0	0	0	0	3	0	0	1	0	1	10	0.7
COST	Ostracods		0	0	0	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	0	0.0
COTH	Other Crustaceans		0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0.1
BOTH	Bivalves		1	1	0	0	0	0	0	1	6	0	0	0	0	2	0	11	0.7
GOTH	Gastropods		1	1	1	2	2	3	0	2	1	0	0	0	2	1	0	16	1.1
EFEZ	*Fellaster zealandiae*		0	0	0	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	0	0.0
ONEM	Nemerteans		0	0	0	0	0	1	0	1	0	3	1	0	0	0	1	7	0.5
POTH	Polychaetes		1	0	0	0	1	1	0	0	1	0	3	0	0	0	0	7	0.5
OOLIG	Oligochaetes		0	0	0	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	0	0.0
OEDW	*Edwardsia*		0	0	0	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	0	0.0
TOTAL			67	67	38	100	74	33	66	56	90	65	65	51	90	97	57	1016	67.7

MI July 2001

INDICATOR SPECIES		SIZE	CORE NUMBER 1	2	5	6	7	8	9	10	12	13	14	15	TOTAL	MEAN
AMPHIPODS																
ACOR	*Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
APHOX	*Phoxocephalidae*		0	0	0	1	0	0	0	0	0	0	0	0	**1**	**0.1**
BIVALVES		**SIZE**														
BAB	*Arthritica bifurca*	<2	0	1	1	1	0	2	0	0	0	1	0	1	**7**	**0.6**
		>2	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		Total	0	1	1	1	0	2	0	0	0	1	0	1	**7**	**0.6**
BAS	*Austrovenus stutchburyi*	<5	1	1	1	0	1	0	0	0	2	1	2	0	**9**	**0.8**
		>5	1	0	0	2	2	3	0	2	1	2	2	1	**16**	**1.3**
		Total	2	1	1	2	3	3	0	2	3	3	4	1	**25**	**2.1**
BML	*Macamona liliana*	<5	0	0	2	0	0	0	0	0	0	0	0	0	**2**	**0.2**
		5-15	0	0	1	1	1	0	0	0	1	2	0	1	**7**	**0.6**
		>15	2	2	3	2	1	0	2	3	2	1	2	1	**21**	**1.8**
		Total	2	2	6	3	2	0	2	3	3	3	2	2	**30**	**2.5**
BNH	*Nucula hartvigiana*	<2	0	0	0	1	0	1	0	0	0	0	0	0	**2**	**0.2**
		>2	0	0	0	0	0	0	0	0	1	1	0	0	**2**	**0.2**
		Total	0	0	0	1	0	1	0	0	1	1	0	0	**4**	**0.3**
BPA	*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**
		Total	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
BTHL	*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																
CCL	*Colurostylis lemurum*		0	0	0	0	0	0	0	0	0	0	1	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	0	0	1	0	0	0	0	2	1	2	0	**6**	**0.5**
OTHER																
OAN	*Anthopleura aureoradiata*		0	0	2	0	2	0	0	0	0	1	0	0	**5**	**0.4**
POLYCHAETES																
PAA	*Aquilaspio aucklandica*		0	0	0	0	0	0	0	0	1	1	0	0	**2**	**0.2**
PAGL	*Aglaophamus* sp.		0	0	0	1	0	0	0	0	0	0	0	0	**1**	**0.1**
PAO	*Aonides oxycephala*		32	44	46	44	19	116	66	41	43	56	45	62	**614**	**51.2**
PAR	*Aricidea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PBOC	Polydorids *(Boccardia syrtis)*		0	0	0	1	0	0	0	0	0	0	0	1	**2**	**0.2**
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.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PGLY	*Glycera* sp.		0	0	0	0	0	1	0	0	0	0	0	0	**1**	**0.1**
PHF	Capitellidae *(Heteromastus filiformis)*		6	1	0	3	0	0	1	1	0	1	1	1	**15**	**1.3**
PMD	*Magelona dakini*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PNIC	Nereidae		2	1	1	1	0	3	5	2	1	6	1	2	**25**	**2.1**
POP	*Orbinia papillosa*		0	0	0	0	0	0	0	0	1	0	0	0	**1**	**0.1**
PPAR	Paraonidae		0	0	0	0	1	0	0	0	0	0	0	0	**1**	**0.1**
NON INDICATOR SPECIES																
CAMPH	Amphipods		0	0	0	0	1	0	0	0	0	0	0	0	**1**	**0.1**
CCRAB	Crabs		0	0	0	0	0	1	2	0	0	0	0	1	**4**	**0.3**
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
CISO	Isopods		1	1	1	4	5	0	0	0	0	1	1	0	**14**	**1.2**
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
CSHR	Shrimps/Mysids		1	0	0	0	0	0	0	0	1	0	0	0	**2**	**0.2**
COTH	Other Crustaceans		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
BOTH	Bivalves		0	0	0	0	0	0	0	0	0	1	0	0	**1**	**0.1**
GOTH	Gastropods		1	0	1	0	0	0	1	0	1	1	0	0	**5**	**0.4**
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		2	0	0	1	0	0	2	0	1	3	1	1	**11**	**0.9**
POTH	Polychaetes		1	0	0	0	0	0	3	0	1	0	1	0	**6**	**0.5**
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	1	**1**	**0.1**
OFLAT	Flatworms		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			**50**	**51**	**59**	**64**	**33**	**127**	**83**	**49**	**59**	**80**	**59**	**73**	**787**	**65.6**

MI October 2001

INDICATOR SPECIES		SIZE	CORE NUMBER 1	2	4	5	6	8	9	10	11	12	13	14	TOTAL	MEAN
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	*Arthritica bifurca*	<2	0	0	0	0	0	0	0	0	1	0	3	4	**8**	**0.7**
		>2	0	0	1	0	0	0	0	0	0	0	1	0	**2**	**0.2**
		Total	0	0	1	0	0	0	0	0	1	0	4	4	**10**	**0.8**
BAS	*Austrovenus stutchburyi*	<5	0	0	2	1	0	1	2	0	0	0	1	3	**10**	**0.8**
		>5	0	2	3	0	1	3	4	1	1	1	0	4	**20**	**1.7**
		Total	0	2	5	1	1	4	6	1	1	1	1	7	**30**	**2.5**
BML	*Macamona liliana*	<5	1	0	0	1	0	0	0	0	0	0	0	0	**2**	**0.2**
		5-15	0	1	1	1	0	0	2	0	0	1	0	1	**7**	**0.6**
		>15	1	2	2	4	1	2	2	1	2	3	2	2	**24**	**2.0**
		Total	2	3	3	6	1	2	4	1	2	4	2	3	**33**	**2.8**
BNH	*Nucula hartvigiana*	<2	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		>2	1	0	0	0	0	0	0	0	3	0	0	0	**4**	**0.3**
		Total	1	0	0	0	0	0	0	0	3	0	0	0	**4**	**0.3**
BPA	*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**
		Total	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
BTHL	*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																
CCL	*Colurostylis lemurum*		1	0	0	0	1	0	0	4	1	1	1	0	**9**	**0.8**
GASTROPODS																
GCA	*Cominella adspera*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
GNHE	*Notoacmea* sp.		1	0	1	1	1	2	0	2	3	0	2	1	**14**	**1.2**
OTHER																
OAN	*Anthopleura aureoradiata*		0	2	2	0	1	0	1	1	1	1	0	1	**10**	**0.8**
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*		62	54	33	30	55	49	45	24	63	71	61	64	**611**	**50.9**
PAR	*Aricidea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PBOC	Polydorids *(Boccardia syrtis)*		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.		1	1	0	0	0	0	0	0	0	0	0	0	**2**	**0.2**
PGLY	*Glycera* sp.		0	0	1	0	0	1	1	1	0	0	0	0	**4**	**0.3**
PHF	Capitellidae *(Heteromastus filiformis)*		1	0	0	0	0	0	0	0	0	1	0	1	**3**	**0.3**
PMD	*Magelona dakini*		1	0	0	0	0	0	0	0	0	0	1	0	**2**	**0.2**
PNIC	Nereidae		0	0	2	1	1	1	1	0	5	1	1	0	**13**	**1.1**
POP	*Orbinia papillosa*		0	1	0	0	0	0	1	0	0	0	1	0	**3**	**0.3**
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	0	1	0	1	0	2	0	0	**5**	**0.4**
CCRAB	Crabs		0	0	0	0	1	0	0	1	1	1	0	1	**5**	**0.4**
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
CISO	Isopods		0	0	0	2	0	0	0	0	2	0	0	1	**5**	**0.4**
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
CSHR	Shrimps/Mysids		0	1	0	1	1	0	2	1	2	0	0	0	**8**	**0.7**
COTH	Other Crustaceans		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
BOTH	Bivalves		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
GOTH	Gastropods		0	1	0	0	1	0	1	0	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	1	1	0	1	0	1	0	0	0	1	1	**6**	**0.5**
POTH	Polychaetes		0	1	1	0	1	1	0	1	0	2	1	0	**8**	**0.7**
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	1	**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	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
TOTAL			**71**	**67**	**50**	**42**	**66**	**61**	**63**	**38**	**87**	**86**	**79**	**85**	**795**	**66.3**

MI January 2002

INDICATOR SPECIES		SIZE	CORE NUMBER 1	2	3	5	6	8	9	10	12	13	14	15	TOTAL	MEAN
AMPHIPODS																
ACOR	*Corophiidae*		1	4	2	0	5	7	3	4	3	3	0	4	36	3.0
APHOX	*Phoxocephalidae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BIVALVES		**SIZE**														
BAB	*Arthritica bifurca*	<2	0	0	1	1	2	0	1	1	1	0	2	1	10	0.8
		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	1	1	2	0	1	1	1	0	2	1	10	0.8
BAS	*Austrovenus stutchburyi*	<5	0	1	0	0	1	0	0	3	1	0	0	0	6	0.5
		>5	1	3	0	1	0	1	0	0	0	1	0	3	10	0.8
		Total	1	4	0	1	1	1	0	3	1	1	0	3	16	1.3
BML	*Macamona liliana*	<5	0	0	0	0	1	0	0	0	0	1	0	2	4	0.3
		5-15	1	1	1	1	0	0	2	1	0	0	0	1	8	0.7
		>15	1	3	2	1	1	3	2	2	2	2	1	4	24	2.0
		Total	2	4	3	2	2	3	4	3	2	3	1	7	36	3.0
BNH	*Nucula hartvigiana*	<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
BPA	*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
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL	*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																
CCL	*Colurostylis lemurum*		0	0	0	1	2	0	0	0	0	2	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	1	0	0	0	1	0	2	0.2
OTHER																
OAN	*Anthopleura aureoradiata*		0	1	1	1	0	0	2	0	1	0	0	2	8	0.7
POLYCHAETES																
PAA	*Aquilaspio aucklandica*		0	0	0	0	0	0	1	0	4	0	1	0	6	0.5
PAGL	*Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	*Aonides oxycephala*		26	25	62	38	54	48	10	39	96	53	25	74	550	45.8
PAR	*Aricidea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PBOC	Polydorids *(Boccardia syrtis)*		0	0	0	0	0	0	0	0	1	0	0	0	1	0.1
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	2	0	0	1	0	0	0	0	1	4	0.3
PHF	Capitellidae *(Heteromastus filiformis)*		0	0	0	1	1	6	2	2	0	1	0	1	14	1.2
PMD	*Magelona dakini*		0	0	0	0	1	0	0	0	0	0	1	0	2	0.2
PNIC	Nereidae		1	1	1	0	1	0	1	1	2	0	1	1	10	0.8
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	0	0	0	0	0	0.0
NON INDICATOR SPECIES																
CAMPH	Amphipods		2	3	3	1	3	4	4	0	0	4	2	0	26	2.2
CCRAB	Crabs		1	0	1	0	0	0	0	0	0	0	0	0	2	0.2
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CSHR	Shrimps/Mysids		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
COTH	Other Crustaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BOTH	Bivalves		1	0	1	0	0	0	1	0	1	0	1	0	5	0.4
GOTH	Gastropods		1	0	1	1	0	1	0	1	0	1	2	1	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		1	2	0	0	0	1	2	0	0	0	1	2	9	0.8
POTH	Polychaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
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			**37**	**44**	**76**	**49**	**72**	**71**	**33**	**54**	**112**	**68**	**38**	**97**	**751**	**62.6**

MI April 2002

INDICATOR SPECIES			CORE NUMBER												TOTAL	MEAN
			1	2	3	4	6	7	8	9	11	12	13	14		
AMPHIPODS																
ACOR	*Corophiidae*		0	0	0	0	0	1	0	0	0	0	0	0	1	0.1
APHOX	*Phoxocephalidae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BIVALVES		**SIZE**														
BAB	*Arthritica bifurca*	<2	2	0	1	2	0	0	0	1	0	1	0	0	7	0.6
		>2	1	0	1	0	0	0	0	0	0	0	0	0	2	0.2
		Total	3	0	2	2	0	0	0	1	0	1	0	0	9	0.8
BAS	*Austrovenus stutchburyi*	<5	3	1	1	2	1	7	2	0	4	8	6	3	38	3.2
		>5	0	0	0	0	0	0	0	0	1	2	0	1	4	0.3
		Total	3	1	1	2	1	7	2	0	5	10	6	4	42	3.5
BML	*Macamona liliana*	<5	0	0	0	1	0	0	0	1	2	0	0	1	5	0.4
		5-15	1	0	0	1	0	0	0	0	1	0	1	0	4	0.3
		>15	1	0	2	2	2	2	3	2	3	2	0	2	21	1.8
		Total	2	0	2	4	2	2	3	3	6	2	1	3	30	2.5
BNH	*Nucula hartvigiana*	<2	0	0	0	0	0	0	0	0	0	1	2	0	3	0.3
		>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	1	2	0	3	0.3
BPA	*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
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL	*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																
CCL	*Colurostylis lemurum*		0	0	0	0	1	1	0	0	0	0	2	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	1	0	0	3	1	1	0	0	0	6	0.5
POLYCHAETES																
PAA	*Aquilaspio aucklandica*		0	0	0	0	0	0	1	0	0	0	1	0	2	0.2
PAGL	*Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	*Aonides oxycephala*		50	41	52	35	27	68	41	33	38	28	57	42	512	42.7
PAR	*Aricidea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PBOC	Polydorids *(Boccardia syrtis)*		0	0	0	1	0	0	0	1	0	0	0	0	2	0.2
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	0	2	0	0	0	0	0	4	0.3
PHF	Capitellidae *(Heteromastus filiformis)*		0	0	1	1	0	3	0	0	0	0	1	1	7	0.6
PMD	*Magelona dakini*		1	1	0	1	0	0	0	0	0	0	1	0	4	0.3
PNIC	Nereidae		2	2	1	0	0	3	2	3	1	1	3	0	18	1.5
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	1	0	0	0	0	0	0	0	0	0	1	0.1
CCRAB	Crabs		0	0	0	0	0	0	0	0	0	1	0	0	1	0.1
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		0	1	0	0	0	1	0	0	3	0	0	0	5	0.4
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CSHR	Shrimps/Mysids		1	1	0	0	0	0	1	1	2	0	1	0	7	0.6
COTH	Other Crustaceans		0	0	0	0	0	0	1	0	0	0	0	0	1	0.1
BOTH	Bivalves		1	4	1	1	1	2	1	0	0	0	0	1	12	1.0
GOTH	Gastropods		0	0	0	1	0	0	0	0	1	3	0	0	5	0.4
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		0	2	1	0	0	0	1	0	2	0	1	1	8	0.7
POTH	Polychaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	2	0	2	0.2
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	1	0	1	0.1
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			**63**	**54**	**62**	**49**	**33**	**88**	**58**	**43**	**59**	**47**	**79**	**53**	**688**	**57.3**

KB April 2001

INDICATOR SPECIES			CORE NUMBER 1	2	3	4	5	6	7	8	9	11	13	14	16	17	20	TOTAL	MEAN
AMPHIPODS																			
ACOR	*Corophiidae*		0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1
APHOX	*Phoxocephalidae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BIVALVES		**SIZE**																	
BAB	*Arthritica bifurca*	<2	2	6	6	3	24	1	1	14	2	12	2	13	0	4	12	102	6.8
		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	2	6	6	3	24	1	1	14	2	12	2	13	0	4	12	102	6.8
BAS	*Austrovenus stutchburyi*	<5	24	25	21	18	16	21	31	40	41	45	34	40	69	83	25	533	35.5
		>5	4	10	3	1	2	5	2	6	2	10	0	1	4	12	0	62	4.1
		Total	28	35	24	19	18	26	33	46	43	55	34	41	73	95	25	595	39.7
BML	*Macamona liliana*	<5	0	0	0	0	0	0	0	1	0	0	0	1	0	2	0	4	0.3
		5-15	0	0	0	1	0	0	0	1	0	0	1	1	1	1	0	6	0.4
		>15	2	1	2	1	1	4	3	1	4	3	2	2	3	3	3	35	2.3
		Total	2	1	2	2	1	4	3	3	4	3	3	4	4	6	3	45	3.0
BNH	*Nucula hartvigiana*	<2	2	2	3	7	2	3	1	3	2	1	1	1	3	7	0	38	2.5
		>2	1	1	0	3	1	1	0	3	3	0	1	0	0	2	1	17	1.1
		Total	3	3	3	10	3	4	1	6	5	1	2	1	3	9	1	55	3.7
BPA	*Paphies australis*	<5	0	0	0	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	0	0.0
		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL	*Theora lubrica*	<5	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0.1
		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0.1
CUMACEANS																			
CCL	*Colurostylis lemurum*		0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0.1
GASTROPODS																			
GCA	*Cominella adspera*		0	0	0	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	0	0.0
OTHER																			
OAN	*Anthopleura aureoradiata*		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
POLYCHAETES																			
PAA	*Aquilaspio aucklandica*		3	3	4	11	8	8	7	11	2	8	4	6	8	3	7	93	6.2
PAGL	*Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	*Aonides oxycephala*		1	5	0	2	4	7	3	0	0	0	1	4	0	0	2	29	1.9
PAR	*Aricidea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PBOC	Polydorids *(Boccardia syrtis)*		0	0	2	0	0	1	3	0	0	1	0	2	4	1	0	14	0.9
PCOS	*Cossura* sp.		0	0	0	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	0	0.0
PGE	*Goniada* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGLY	*Glycera* sp.		2	1	1	1	5	1	0	0	0	3	2	2	1	1	1	21	1.4
PHF	Capitellidae *(Heteromastus filiformis)*		3	0	4	5	16	5	3	9	3	6	7	6	16	7	8	98	6.5
PMD	*Magelona dakini*		1	3	0	3	1	0	2	8	0	2	0	2	4	0	1	27	1.8
PNIC	Nereidae		1	2	0	2	1	0	0	0	0	1	2	3	1	0	3	16	1.1
POP	*Orbinia papillosa*		0	0	0	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	0	0.0
NON INDICATOR SPECIES																			
CAMPH	Amphipods		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CCRAB	Crabs		0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	2	0.1
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		1	2	2	0	2	2	0	0	0	1	1	0	1	0	0	12	0.8
COST	Ostracods		0	0	0	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	0	0	0	1	0.1
COTH	Other Crustaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BOTH	Bivalves		1	2	3	1	7	3	4	6	2	8	1	3	3	1	9	54	3.6
GOTH	Gastropods		1	0	0	1	0	1	2	1	1	1	0	1	3	0	0	12	0.8
EFEZ	*Fellaster zealandiae*		0	0	0	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	0	0.0
ONEM	Nemerteans		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
POTH	Polychaetes		0	1	1	2	6	2	3	1	0	2	0	2	0	0	0	20	1.3
OOLIG	Oligochaetes		1	2	1	1	0	0	0	1	1	0	1	3	3	0	0	14	0.9
OFLAT	Flatworm		0	0	0	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	0	0.0
OTHER	Misc. Other		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
TOTAL			**50**	**67**	**54**	**64**	**96**	**66**	**66**	**106**	**63**	**104**	**61**	**94**	**124**	**127**	**72**	**1214**	**80.9**

KB July 2001

INDICATOR SPECIES		SIZE	CORE NUMBER 1	4	5	6	7	8	9	10	11	12	13	14	TOTAL	MEAN
AMPHIPODS																
ACOR	*Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
APHOX	*Phoxocephalidae*		0	0	0	0	3	0	0	0	0	0	0	0	**3**	**0.3**
BIVALVES		**SIZE**														
BAB	*Arthritica bifurca*	<2	5	9	1	1	1	0	1	1	2	5	1	1	**28**	**2.3**
		>2	1	0	0	0	0	0	1	0	0	0	0	0	**2**	**0.2**
		Total	6	9	1	1	1	0	2	1	2	5	1	1	**30**	**2.5**
BAS	*Austrovenus stutchburyi*	<5	12	7	10	11	6	22	23	7	13	21	14	10	**156**	**13.0**
		>5	7	2	4	4	13	9	7	2	12	3	5	4	**72**	**6.0**
		Total	19	9	14	15	19	31	30	9	25	24	19	14	**228**	**19.0**
BML	*Macamona liliana*	<5	0	1	0	1	2	0	0	0	0	0	0	0	**4**	**0.3**
		5-15	0	0	0	0	0	0	0	1	1	0	0	1	**3**	**0.3**
		>15	2	2	2	3	2	2	4	2	0	3	2	2	**26**	**2.2**
		Total	2	3	2	4	4	2	4	3	1	3	2	3	**33**	**2.8**
BNH	*Nucula hartvigiana*	<2	0	2	0	0	1	0	6	1	0	1	2	0	**13**	**1.1**
		>2	0	5	0	2	4	4	0	1	3	1	1	0	**21**	**1.8**
		Total	0	7	0	2	5	4	6	2	3	2	3	0	**34**	**2.8**
BPA	*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**
		Total	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
BTHL	*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																
CCL	*Colurostylis lemurum*		1	1	0	0	0	0	0	0	0	0	0	0	**2**	**0.2**
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	2	0	1	0	1	0	1	1	0	1	**7**	**0.6**
POLYCHAETES																
PAA	*Aquilaspio aucklandica*		3	7	2	2	2	0	0	5	9	4	5	5	**44**	**3.7**
PAGL	*Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PAO	*Aonides oxycephala*		2	3	3	3	0	1	0	2	5	2	1	0	**22**	**1.8**
PAR	*Aricidea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PBOC	Polydorids *(Boccardia syrtis)*		0	2	1	0	1	0	1	0	1	2	1	1	**10**	**0.8**
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.		2	0	1	0	0	0	2	1	0	1	0	1	**8**	**0.7**
PGLY	*Glycera* sp.		2	2	0	1	0	1	0	0	1	1	2	0	**10**	**0.8**
PHF	Capitellidae *(Heteromastus filiformis)*		9	14	10	15	11	23	12	8	21	24	6	9	**162**	**13.5**
PMD	*Magelona dakini*		1	1	1	0	0	0	1	0	1	0	0	3	**8**	**0.7**
PNIC	Nereidae		1	1	0	0	2	1	1	1	0	2	0	1	**10**	**0.8**
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	0	0	0	0	**0**	**0.0**
NON INDICATOR SPECIES																
CAMPH	Amphipods		0	0	1	0	0	0	0	0	0	0	0	0	**1**	**0.1**
CCRAB	Crabs		0	0	1	0	0	0	1	0	0	0	0	0	**2**	**0.2**
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
CISO	Isopods		0	0	0	0	0	0	2	0	0	0	0	0	**2**	**0.2**
COST	Ostracods		0	0	0	0	0	0	0	0	1	0	1	0	**2**	**0.2**
CSHR	Shrimps/Mysids		1	0	1	0	0	0	0	0	0	1	2	0	**5**	**0.4**
COTH	Other Crustaceans		0	1	0	0	0	0	0	0	0	0	0	0	**1**	**0.1**
BOTH	Bivalves		0	0	2	2	1	0	0	0	0	0	0	1	**6**	**0.5**
GOTH	Gastropods		0	1	1	1	0	2	0	0	2	1	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		0	0	0	0	0	1	0	0	0	0	0	0	**1**	**0.1**
POTH	Polychaetes		0	1	0	0	1	0	0	0	6	0	0	1	**9**	**0.8**
OOLIG	Oligochaetes		5	1	0	0	1	0	2	0	0	0	0	0	**9**	**0.8**
OFLAT	Flatworm		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			**54**	**63**	**43**	**46**	**52**	**66**	**65**	**32**	**79**	**73**	**44**	**43**	**660**	**55.0**

KB October 2001

INDICATOR SPECIES			CORE NUMBER												TOTAL	MEAN
			3	5	6	7	8	9	10	11	12	13	14	15		
AMPHIPODS																
ACOR	*Corophiidae*		5	3	13	20	11	12	11	0	2	3	4	3	87	7.3
APHOX	*Phoxocephalidae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BIVALVES		**SIZE**														
BAB	*Arthritica bifurca*	<2	4	0	0	0	1	0	2	1	0	1	1	5	15	1.3
		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	4	0	0	0	1	0	2	1	0	1	1	5	15	1.3
BAS	*Austrovenus stutchburyi*	<5	5	13	7	3	6	5	1	3	10	10	3	6	72	6.0
		>5	2	8	7	7	13	2	3	6	4	3	3	1	59	4.9
		Total	7	21	14	10	19	7	4	9	14	13	6	7	131	10.9
BML	*Macamona liliana*	<5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		5-15	0	1	0	0	0	0	1	0	0	1	0	0	3	0.3
		>15	1	3	3	1	4	2	1	1	3	2	2	1	24	2.0
		Total	1	4	3	1	4	2	2	1	3	3	2	1	27	2.3
BNH	*Nucula hartvigiana*	<2	0	0	0	0	0	0	0	1	0	0	0	0	1	0.1
		>2	0	3	1	3	0	2	0	1	2	4	3	4	23	1.9
		Total	0	3	1	3	0	2	0	2	2	4	3	4	24	2.0
BPA	*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
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL	*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																
CCL	*Colurostylis lemurum*		1	0	0	0	0	0	0	0	0	0	0	1	2	0.2
GASTROPODS																
GCA	*Cominella adspera*		0	0	0	0	0	0	0	1	0	0	0	0	1	0.1
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	1	0	0	0	0	0	0	0	0	1	0.1
POLYCHAETES																
PAA	*Aquilaspio aucklandica*		5	5	2	0	1	3	5	1	0	0	2	1	25	2.1
PAGL	*Aglaophamus* sp.		0	0	0	0	0	1	1	0	0	0	0	0	2	0.2
PAO	*Aonides oxycephala*		0	0	3	0	1	0	0	0	0	0	0	0	4	0.3
PAR	*Aricidea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PBOC	Polydorids *(Boccardia syrtis)*		0	0	0	0	0	1	1	0	0	0	2	0	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	3	0	0	3	0.3
PGLY	*Glycera* sp.		2	2	1	1	1	1	1	3	0	0	0	4	16	1.3
PHF	Capitellidae *(Heteromastus filiformis)*		32	19	24	9	16	8	20	11	26	14	26	21	226	18.8
PMD	*Magelona dakini*		1	1	2	2	1	0	1	0	0	2	1	0	11	0.9
PNIC	Nereidae		2	0	0	1	0	0	1	3	1	3	2	0	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	0	0	0	0	0	0	0	0	0	0.0
NON INDICATOR SPECIES																
CAMPH	Amphipods		0	0	1	0	1	0	0	0	0	0	0	0	2	0.2
CCRAB	Crabs		0	0	0	0	0	1	1	0	0	1	0	0	3	0.3
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		0	0	1	0	0	0	1	0	1	0	0	0	3	0.3
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CSHR	Shrimps/Mysids		8	3	5	0	1	1	3	2	1	2	1	2	29	2.4
COTH	Other Crustaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BOTH	Bivalves		1	1	0	1	0	0	1	1	0	0	0	0	5	0.4
GOTH	Gastropods		1	0	1	0	2	1	9	0	0	0	1	0	15	1.3
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	0	0	0	0	0	0	0	0	0	0	0.0
POTH	Polychaetes		0	1	0	0	0	1	8	0	0	0	0	1	11	0.9
OOLIG	Oligochaetes		4	0	0	0	0	0	0	0	0	0	0	0	4	0.3
OFLAT	Flatworm		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			**74**	**63**	**71**	**49**	**59**	**41**	**72**	**35**	**50**	**49**	**51**	**50**	**664**	**55.3**

KB January 2002

INDICATOR SPECIES		SIZE	CORE NUMBER 1	2	3	4	5	6	8	11	12	13	14	15	TOTAL	MEAN
AMPHIPODS																
ACOR	*Corophiidae*		10	25	4	23	5	7	9	1	8	7	4	6	109	9.1
APHOX	*Phoxocephalidae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BIVALVES		**SIZE**														
BAB	*Arthritica bifurca*	<2	5	2	1	0	0	2	4	0	1	1	2	1	19	1.6
		>2	0	0	0	0	0	0	0	0	0	0	1	0	1	0.1
		Total	5	2	1	0	0	2	4	0	1	1	3	1	20	1.7
BAS	*Austrovenus stutchburyi*	<5	4	2	4	0	5	4	4	2	3	1	3	2	34	2.8
		>5	4	1	1	3	2	9	2	3	3	5	4	0	37	3.1
		Total	8	3	5	3	7	13	6	5	6	6	7	2	71	5.9
BML	*Macamona liliana*	<5	0	0	1	0	1	1	0	0	0	0	0	0	3	0.3
		5-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		>15	2	3	2	3	3	3	4	2	3	3	1	3	32	2.7
		Total	2	3	3	3	4	4	4	2	3	3	1	3	35	2.9
BNH	*Nucula hartvigiana*	<2	0	0	0	0	0	1	2	0	0	0	1	0	4	0.3
		>2	0	0	1	0	0	1	0	0	0	0	0	1	3	0.3
		Total	0	0	1	0	0	2	2	0	0	0	1	1	7	0.6
BPA	*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
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL	*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																
CCL	*Colurostylis lemurum*		0	2	0	0	0	0	0	0	0	0	0	0	2	0.2
GASTROPODS																
GCA	*Cominella adspera*		0	0	0	0	0	0	0	0	0	1	0	0	1	0.1
GNHE	*Notoacmea* sp.		0	0	0	1	0	0	0	0	0	0	0	0	1	0.1
OTHER																
OAN	*Anthopleura aureoradiata*		0	0	0	0	1	0	0	1	0	0	0	0	2	0.2
POLYCHAETES																
PAA	*Aquilaspio aucklandica*		2	1	3	5	5	2	0	1	0	0	0	0	19	1.6
PAGL	*Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	*Aonides oxycephala*		0	1	0	2	3	1	0	0	0	0	0	1	8	0.7
PAR	*Aricidea* sp.		0	2	0	0	0	0	0	0	0	0	0	0	2	0.2
PBOC	Polydorids *(Boccardia syrtis)*		2	1	1	1	0	1	0	0	0	3	0	1	10	0.8
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	1	2	3	2	0	0	1	2	2	2	17	1.4
PHF	Capitellidae *(Heteromastus filiformis)*		33	14	17	10	12	14	38	23	13	6	7	35	222	18.5
PMD	*Magelona dakini*		1	1	0	0	0	1	1	0	1	0	0	1	6	0.5
PNIC	Nereidae		0	3	1	0	0	3	1	0	1	0	1	0	10	0.8
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	0	0	0	0	0	0.0
NON INDICATOR SPECIES																
CAMPH	Amphipods		2	1	1	0	0	1	1	0	1	1	0	1	9	0.8
CCRAB	Crabs		1	0	0	0	0	0	0	0	0	0	0	0	1	0.1
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		2	0	0	3	1	0	3	1	0	0	1	0	11	0.9
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	0	0	0	0	1	0.1
COTH	Other Crustaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BOTH	Bivalves		6	6	5	3	5	5	5	5	6	7	8	5	66	5.5
GOTH	Gastropods		0	0	1	0	0	0	2	0	0	2	1	0	6	0.5
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	0	0	0	1	0	0	0	0	0	0	2	0.2
POTH	Polychaetes		0	2	0	0	1	0	0	0	1	0	1	1	6	0.5
OOLIG	Oligochaetes		4	0	2	0	0	0	0	1	0	0	0	0	7	0.6
OFLAT	Flatworm		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			78	70	46	57	47	59	76	40	42	39	37	60	651	54.3

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INDICATOR SPECIES		SIZE	CORE NUMBER 1	2	4	5	6	8	10	11	12	13	14	15	TOTAL	MEAN
AMPHIPODS																
ACOR	*Corophiidae*		3	0	2	0	3	0	3	35	1	3	1	3	54	4.5
APHOX	*Phoxocephalidae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BIVALVES		**SIZE**														
BAB	*Arthritica bifurca*	<2	0	8	2	1	2	1	0	2	3	0	3	7	29	2.4
		>2	0	0	0	0	0	1	0	0	1	0	0	0	2	0.2
		Total	0	8	2	1	2	2	0	2	4	0	3	7	31	2.6
BAS	*Austrovenus stutchburyi*	<5	23	9	15	6	19	6	8	10	4	11	5	7	123	10.3
		>5	6	4	2	4	4	5	4	5	3	5	7	3	52	4.3
		Total	29	13	17	10	23	11	12	15	7	16	12	10	175	14.6
BML	*Macamona liliana*	<5	1	0	1	0	1	0	0	2	0	1	1	0	7	0.6
		5-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		>15	2	2	1	0	2	1	3	3	1	0	2	3	20	1.7
		Total	3	2	2	0	3	1	3	5	1	1	3	3	27	2.3
BNH	*Nucula hartvigiana*	<2	3	0	1	0	0	1	1	1	0	0	0	0	7	0.6
		>2	0	3	1	0	0	4	1	4	0	0	6	1	20	1.7
		Total	3	3	2	0	0	5	2	5	0	0	6	1	27	2.3
BPA	*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
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL	*Theora lubrica*	<5	0	0	0	0	0	0	0	0	1	0	0	0	1	0.1
		>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	1	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	1	0	0	0	0	0	0	0	0	0	1	0.1
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	5	3	1	4	1	2	1	3	1	2	0	23	1.9
PAGL	*Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	*Aonides oxycephala*		0	1	0	1	4	3	2	1	0	1	1	2	16	1.3
PAR	*Aricidea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PBOC	Polydorids *(Boccardia syrtis)*		3	0	0	1	6	3	0	1	0	1	2	1	18	1.5
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	1	1	1	2	0	1	2	0	2	1	12	1.0
PHF	Capitellidae *(Heteromastus filiformis)*		12	21	11	17	7	20	17	7	13	23	26	14	188	15.7
PMD	*Magelona dakini*		3	4	2	3	3	3	1	2	4	5	2	4	36	3.0
PNIC	Nereidae		1	1	0	2	0	5	0	3	4	2	1	0	19	1.6
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	1	0	0	0	0	0	0	0	0	0	1	0.1
CCRAB	Crabs		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		3	0	1	0	1	0	1	1	0	1	0	1	9	0.8
COST	Ostracods		0	0	0	0	0	0	0	1	0	0	0	0	1	0.1
CSHR	Shrimps/Mysids		0	3	5	1	7	8	4	2	0	0	0	1	31	2.6
COTH	Other Crustaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BOTH	Bivalves		13	5	4	7	9	3	4	3	0	2	1	4	55	4.6
GOTH	Gastropods		0	0	0	0	0	1	1	0	1	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	0	0	0	1	0	0	1	1	0	3	0.3
POTH	Polychaetes		1	1	1	1	1	1	0	1	1	0	0	4	12	1.0
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	1	0	1	0.1
OFLAT	Flatworms		1	0	1	0	0	0	0	0	0	0	0	0	2	0.2
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			**76**	**67**	**56**	**46**	**74**	**69**	**53**	**86**	**42**	**57**	**64**	**56**	**746**	**62.2**

Appendix 2 - Whaingaroa Harbour species/taxonomic group abundances

TU April 2001

			CORE NUMBER																
INDICATOR SPECIES			1	2	3	4	6	8	11	12	13	14	15	17	18	19	20	TOTAL	MEAN
AMPHIPODS																			
ACOR	*Corophiidae*		0	0	0	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	1	1	0.1
BIVALVES		**SIZE**																	
BAB	*Arthritica bifurca*	<2	10	0	11	3	1	2	0	4	0	0	1	0	0	1	29	62	4.1
		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	0.2
		Total	10	0	11	3	1	2	0	4	0	0	1	0	0	4	29	65	4.3
BAS	*Austrovenus stutchburyi*	<5	6	0	6	12	16	5	11	8	6	16	14	10	5	7	5	127	8.5
		>5	17	28	43	25	23	31	38	52	32	24	0	41	33	22	21	430	28.7
		Total	23	28	49	37	39	36	49	60	38	40	14	51	38	29	26	557	37.1
BML	*Macamona liliana*	<5	1	5	0	2	0	2	3	1	0	1	3	1	0	2	1	22	1.5
		5-15	3	1	0	1	0	0	1	0	0	0	0	0	0	0	0	6	0.4
		>15	1	2	0	4	2	2	3	2	2	3	3	2	4	5	2	37	2.5
		Total	5	8	0	7	2	4	7	3	2	4	6	3	4	7	3	65	4.3
BNH	*Nucula hartvigiana*	<2	4	10	16	26	6	5	2	1	8	7	2	6	3	7	3	106	7.1
		>2	6	1	3	13	6	3	21	17	24	26	10	17	13	9	11	180	12.0
		Total	10	11	19	39	12	8	23	18	32	33	12	23	16	16	14	286	19.1
BPA	*Paphies australis*	<5	0	0	0	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	0	0.0
		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL	*Theora lubrica*	<5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1
		>5	0	0	0	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	0	0	0	1	0.1
CUMACEANS																			
CCL	*Colurostylis lemurum*		0	0	1	0	1	0	1	1	1	3	1	0	0	0	0	9	0.6
GASTROPODS																			
GCA	*Cominella adspera*		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE	*Notoacmea* sp.		4	0	8	11	7	4	10	5	7	10	3	2	18	14	15	118	7.9
OTHER																			
OAN	*Anthopleura aureoradiata*		3	6	5	0	3	2	7	15	3	4	17	4	9	3	7	88	5.9
POLYCHAETES																			
PAA	*Aquilaspio aucklandica*		33	15	23	13	10	4	25	13	24	32	22	12	13	35	57	331	22.1
PAGL	*Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	*Aonides oxycephala*		0	0	0	0	7	0	0	16	33	12	0	0	0	0	1	69	4.6
PAR	*Aricidea* sp.		0	0	3	0	0	0	0	0	0	0	0	0	0	1	0	4	0.3
PBOC	Polydorids *(Boccardia syrtis)*		0	0	0	0	0	0	0	1	0	0	0	0	4	0	0	5	0.3
PCOS	*Cossura* sp.		0	1	0	0	1	0	0	3	0	0	0	0	0	0	3	8	0.5
PEUC	*Euchone* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGE	*Goniada* sp.		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1
PGLY	*Glycera* sp.		0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	2	0.1
PHF	Capitellidae *(Heteromastus filiformis)*		15	6	4	1	2	3	10	5	5	11	5	3	4	5	9	88	5.9
PMD	*Magelona dakini*		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1
PNIC	Nereidae		6	1	6	4	4	3	5	5	0	3	1	1	1	5	6	51	3.4
POP	*Orbinia papillosa*		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PPAR	Paraonidae		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1
NON INDICATOR SPECIES																			
CAMPH	Amphipods		3	1	8	2	0	1	22	0	2	9	0	0	1	0	3	52	3.5
CCRAB	Crabs		1	1	0	0	1	0	5	1	1	3	0	1	1	2	1	18	1.2
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	2	0.1
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0.1
CSHR	Shrimps/Mysids		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
COTH	Other Crustaceans		0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0.1
BOTH	Bivalves		2	0	1	0	0	3	1	0	1	1	0	0	1	1	2	13	0.9
GOTH	Gastropods		0	1	6	0	6	1	2	0	1	5	1	2	2	0	2	29	1.9
EFEZ	*Fellaster zealandiae*		0	0	0	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	0	0.0
ONEM	Nemerteans		1	0	0	1	0	0	1	1	0	0	0	2	0	0	2	8	0.5
POTH	Polychaetes		1	0	0	0	1	0	2	0	2	0	1	0	0	3	5	15	1.0
OOLIG	Oligochaetes		1	0	0	0	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	0	0.0
OEDW	*Edwardsia*		0	0	0	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	0	0.0
TOTAL			**118**	**83**	**145**	**119**	**97**	**72**	**170**	**151**	**154**	**170**	**84**	**104**	**112**	**126**	**186**	**1891**	**157.6**

TU October 2001

INDICATOR SPECIES			CORE NUMBER												TOTAL	MEAN
			1	2	3	4	5	6	8	9	10	11	14	15		
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	*Arthritica bifurca*	<2	18	8	3	7	5	35	18	4	3	0	32	10	**143**	**11.9**
		>2	2	0	0	8	0	27	2	1	1	0	8	0	**49**	**4.1**
		Total	20	8	3	15	5	62	20	5	4	0	40	10	**192**	**16.0**
BAS	*Austrovenus stutchburyi*	<5	14	3	12	13	18	17	20	24	23	22	32	27	**225**	**18.8**
		>5	3	15	12	54	31	52	27	30	39	28	33	30	**354**	**29.5**
		Total	17	18	24	67	49	69	47	54	62	50	65	57	**579**	**48.3**
BML	*Macamona liliana*	<5	2	1	0	0	2	0	0	0	1	3	0	0	**9**	**0.8**
		5-15	1	1	1	0	2	3	2	1	2	0	0	3	**16**	**1.3**
		>15	2	0	2	1	0	0	2	0	4	1	2	1	**15**	**1.3**
		Total	5	2	3	1	4	3	4	1	7	4	2	4	**40**	**3.3**
BNH	*Nucula hartvigiana*	<2	5	3	4	1	3	2	3	6	4	1	6	8	**46**	**3.8**
		>2	11	3	21	16	18	25	8	24	21	8	20	0	**175**	**14.6**
		Total	16	6	25	17	21	27	11	30	25	9	26	8	**221**	**18.4**
BPA	*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	1	0	0	0	0	0	0	0	**1**	**0.1**
		Total	0	0	0	0	1	0	0	0	0	0	0	0	**1**	**0.1**
BTHL	*Theora lubrica*	<5	0	0	0	0	0	0	0	0	0	0	1	0	**1**	**0.1**
		>5	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		Total	0	0	0	0	0	0	0	0	0	0	1	0	**1**	**0.1**
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.		2	0	7	2	6	8	5	11	2	11	11	4	**69**	**5.8**
OTHER																
OAN	*Anthopleura aureoradiata*		2	2	3	8	8	7	4	6	5	4	8	1	**58**	**4.8**
POLYCHAETES																
PAA	*Aquilaspio aucklandica*		16	63	25	9	22	39	10	25	28	25	22	9	**293**	**24.4**
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	2	12	0	0	0	0	**14**	**1.2**
PAR	*Aricidea* sp.		0	1	0	0	0	0	0	0	0	2	0	0	**3**	**0.3**
PBOC	Polydorids *(Boccardia syrtis)*		0	0	0	0	1	0	0	0	1	0	0	0	**2**	**0.2**
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.		2	1	1	1	1	2	0	1	3	2	4	0	**18**	**1.5**
PHF	Capitellidae *(Heteromastus filiformis)*		12	13	6	3	6	25	12	3	1	8	15	1	**105**	**8.8**
PMD	*Magelona dakini*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PNIC	Nereidae		6	16	8	4	6	14	12	3	2	11	9	3	**94**	**7.8**
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	0	0	0	0	**0**	**0.0**
NON INDICATOR SPECIES																
CAMPH	Amphipods		4	0	0	0	0	6	0	0	0	7	3	0	**20**	**1.7**
CCRAB	Crabs		1	5	1	0	2	3	4	0	1	4	4	4	**29**	**2.4**
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	0	**0**	**0.0**
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
CSHR	Shrimps/Mysids		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
COTH	Other Crustaceans		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
BOTH	Bivalves		0	0	0	0	0	1	0	0	0	0	0	0	**1**	**0.1**
GOTH	Gastropods		4	1	0	4	10	3	5	1	3	3	2	4	**40**	**3.3**
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	0	0	0	0	0	0	0	0	0	**0**	**0.0**
POTH	Polychaetes		5	9	0	1	10	19	2	7	5	7	0	3	**68**	**5.7**
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
OEDW	*Edwardsia*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
OTHER	Misc. Other [chiton]		0	0	1	0	0	0	0	0	0	0	0	1	**2**	**0.2**
TOTAL			**112**	**145**	**107**	**132**	**152**	**288**	**138**	**159**	**149**	**147**	**212**	**109**	**1850**	**154.2**

TU April 2002

INDICATOR SPECIES			CORE NUMBER 1	2	3	4	5	6	7	8	10	11	12	14	TOTAL	MEAN
AMPHIPODS																
ACOR	*Corophiidae*		0	0	1	0	0	0	0	0	0	0	0	0	1	0.1
APHOX	*Phoxocephalidae*		0	0	0	0	0	0	0	1	0	0	0	0	1	0.1
BIVALVES		**SIZE**														
BAB	*Arthritica bifurca*	<2	5	7	1	2	25	5	5	2	0	2	2	0	56	4.7
		>2	1	1	0	1	6	0	0	0	0	1	0	0	10	0.8
		Total	6	8	1	3	31	5	5	2	0	3	2	0	66	5.5
BAS	*Austrovenus stutchburyi*	<5	6	8	4	8	7	15	7	14	3	15	9	6	102	8.5
		>5	21	28	30	39	46	26	18	39	20	34	16	24	341	28.4
		Total	27	36	34	47	53	41	25	53	23	49	25	30	443	36.9
BML	*Macamona liliana*	<5	3	1	0	0	4	2	1	4	0	7	3	1	26	2.2
		5-15	0	1	1	4	0	1	0	0	0	3	1	2	13	1.1
		>15	0	3	4	4	2	1	2	2	1	3	1	0	23	1.9
		Total	3	5	5	8	6	4	3	6	1	13	5	3	62	5.2
BNH	*Nucula hartvigiana*	<2	0	0	2	1	4	2	9	3	0	0	2	0	23	1.9
		>2	0	15	44	36	37	25	43	26	16	17	17	27	303	25.3
		Total	0	15	46	37	41	27	52	29	16	17	19	27	326	27.2
BPA	*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
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL	*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																
CCL	*Colurostylis lemurum*		0	0	1	1	0	0	0	0	0	1	0	0	3	0.3
GASTROPODS																
GCA	*Cominella adspera*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE	*Notoacmea* sp.		1	11	15	14	3	13	13	10	10	6	29	14	139	11.6
OTHER																
OAN	*Anthopleura aureoradiata*		3	3	2	7	8	1	1	4	2	5	3	1	40	3.3
POLYCHAETES																
PAA	*Aquilaspio aucklandica*		24	13	24	35	23	26	34	9	2	7	28	21	246	20.5
PAGL	*Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	*Aonides oxycephala*		0	0	2	3	1	1	0	2	1	13	0	0	23	1.9
PAR	*Aricidea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PBOC	Polydorids *(Boccardia syrtis)*		2	0	0	1	1	0	0	0	0	1	2	1	8	0.7
PCOS	*Cossura* sp.		1	0	0	0	0	0	0	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.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGLY	*Glycera* sp.		1	1	1	1	1	1	0	2	0	0	0	0	8	0.7
PHF	Capitellidae *(Heteromastus filiformis)*		7	7	4	3	6	10	4	3	0	0	14	7	65	5.4
PMD	*Magelona dakini*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PNIC	Nereidae		4	3	4	2	1	3	0	0	0	3	2	3	25	2.1
POP	*Orbinia papillosa*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PPAR	Paraonidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
NON INDICATOR SPECIES																
CAMPH	Amphipods		0	0	1	0	0	0	0	0	0	0	0	0	1	0.1
CCRAB	Crabs		2	0	3	0	5	1	1	0	0	2	4	3	6	0.5
CCUM	Cumaceans		0	0	0	0	0	0	1	0	0	0	0	0	1	0.1
CISO	Isopods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
COST	Ostracods		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CSHR	Shrimps/Mysids		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
COTH	Other Crustaceans		0	0	0	0	0	0	0	0	0	0	0	2	2	0.2
BOTH	Bivalves		0	0	0	2	0	0	0	0	0	0	0	0	2	0.2
GOTH	Gastropods		2	4	7	10	9	6	6	6	2	4	7	5	68	5.7
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	0	0	1	1	0	0	0	1	4	0.3
POTH	Polychaetes		0	0	0	0	2	0	0	1	0	0	0	0	3	0.3
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OEDW	*Edwardsia*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OTHER	Misc. Other [chiton]		0	0	0	0	0	0	1	0	0	0	1	0	2	0.2
TOTAL			**83**	**106**	**152**	**174**	**191**	**139**	**147**	**129**	**57**	**124**	**141**	**118**	**1546**	**128.8**

HB April 2001

INDICATOR SPECIES		CORE NUMBER 1	2	3	4	5	7	9	10	12	14	16	17	18	19	20	TOTAL	MEAN
AMPHIPODS																		
ACOR *Corophiidae*		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0.1
APHOX *Phoxocephalidae*		0	0	0	1	1	1	0	1	1	0	1	0	1	2	0	9	0.6
BIVALVES	**SIZE**																	
BAB *Arthritica bifurca*	<2	1	4	1	0	8	1	0	0	4	1	4	0	0	0	0	24	1.6
	>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	6	0.4
	Total	1	4	1	0	8	1	0	0	4	1	4	0	0	0	6	30	2.0
BAS *Austrovenus stutchburyi*	<5	2	1	4	0	2	8	2	6	5	0	9	12	15	4	2	72	4.8
	>5	0	0	0	1	0	2	0	3	0	0	2	0	7	1	0	16	1.1
	Total	2	1	4	1	2	10	2	9	5	0	11	12	22	5	2	88	5.9
BML *Macamona liliana*	<5	6	2	3	4	0	1	2	1	0	4	3	8	6	1	4	45	3.0
	5-15	0	2	0	0	0	0	0	1	0	0	1	0	3	0	0	7	0.5
	>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	Total	6	4	3	4	0	1	2	2	0	4	4	8	9	1	4	52	3.5
BNH *Nucula hartvigiana*	<2	0	0	0	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	0	0.0
	Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BPA *Paphies australis*	<5	0	0	0	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	0	0.0
	>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL *Theora lubrica*	<5	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0.1
	>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	Total	0	0	0	0	0	0	0	0	0	1	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	0	0.0
GASTROPODS																		
GCA *Cominella adspera*		0	0	0	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	1	0	0	0	0	0	0	1	0.1
OTHER																		
OAN *Anthopleura aureoradiata*		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
POLYCHAETES																		
PAA *Aquilaspio aucklandica*		4	2	1	2	4	1	0	0	1	1	3	3	7	0	5	34	2.3
PAGL *Aglaophamus* sp.		0	0	0	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	1	0	1	0.1
PAR *Aricidea* sp.		2	0	0	0	2	0	1	0	0	5	1	0	1	0	1	13	0.9
PBOC Polydorids *(Boccardia syrtis)*		2	1	1	1	0	1	0	1	0	0	1	0	1	0	2	11	0.7
PCOS *Cossura* sp.		0	0	0	1	0	0	0	0	0	0	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	0	0.0
PGE *Goniada* sp.		0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	3	0.2
PGLY *Glycera* sp.		1	1	1	0	0	0	0	1	0	0	0	0	0	1	0	5	0.3
PHF Capitellidae *(Heteromastus filiformis)*		15	15	21	18	21	14	7	11	23	14	24	16	28	9	13	249	16.6
PMD *Magelona dakini*		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PNIC Nereidae		5	2	5	4	2	1	2	6	0	3	8	3	1	4	5	51	3.4
POP *Orbinia papillosa*		0	0	0	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	0	0.0
NON INDICATOR SPECIES																		
CAMPH Amphipods		0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	2	0.1
CCRAB Crabs		0	1	0	0	1	0	1	0	1	0	0	1	0	1	3	9	0.6
CCUM Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO Isopods		0	4	0	1	0	1	7	0	1	0	0	0	0	0	0	14	0.9
COST Ostracods		0	0	0	0	0	0	0	1	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	0	0.0
COTH Other Crustaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BOTH Bivalves		0	0	0	0	1	0	1	0	0	0	0	0	0	3	0	5	0.3
GOTH Gastropods		0	0	0	0	1	0	0	3	1	0	0	0	0	0	0	5	0.3
EFEZ *Fellaster zealandiae*		0	0	0	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	0	0.0
ONEM Nemerteans		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
POTH Polychaetes		2	1	0	0	0	0	1	0	0	1	1	0	0	2	1	9	0.6
OOLIG Oligochaetes		0	0	0	0	4	0	0	0	0	0	0	0	1	0	2	7	0.5
OFLAT Flatworms		0	0	0	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	0	0.0
OTHER Misc. Other		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
TOTAL		40	36	38	34	47	31	26	35	38	30	58	43	73	29	44	602	50.2

HB October 2001

INDICATOR SPECIES		CORE NUMBER 1	2	3	4	5	6	7	8	9	11	12	15	TOTAL	MEAN
AMPHIPODS															
ACOR *Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
APHOX *Phoxocephalidae*		2	5	3	0	1	1	7	0	1	0	1	1	**22**	**1.8**
BIVALVES	**SIZE**														
BAB *Arthritica bifurca*	<2	1	10	21	5	2	0	10	0	4	3	0	18	**74**	**6.2**
	>2	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
	Total	1	10	21	5	2	0	10	0	4	3	0	18	**74**	**6.2**
BAS *Austrovenus stutchburyi*	<5	6	9	7	15	2	23	15	19	16	24	10	32	**178**	**14.8**
	>5	0	0	0	0	0	0	2	1	0	2	0	0	**5**	**0.4**
	Total	6	9	7	15	2	23	17	20	16	26	10	32	**183**	**15.3**
BML *Macamona liliana*	<5	1	3	0	0	0	0	3	0	0	0	1	2	**10**	**0.8**
	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**
	Total	1	3	0	0	0	0	3	0	0	0	1	2	**10**	**0.8**
BNH *Nucula hartvigiana*	<2	1	0	0	0	0	0	1	0	0	0	0	0	**2**	**0.2**
	>2	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
	Total	1	0	0	0	0	0	1	0	0	0	0	0	**2**	**0.2**
BPA *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**
	Total	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
BTHL *Theora lubrica*	<5	1	0	0	0	0	0	1	0	0	0	0	0	**2**	**0.2**
	>5	0	0	0	2	0	0	0	0	0	0	0	0	**2**	**0.2**
	Total	1	0	0	2	0	0	1	0	0	0	0	0	**4**	**0.3**
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*		4	2	0	3	7	2	4	0	0	5	0	0	**27**	**2.3**
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	2	1	0	1	0	1	0	0	0	**5**	**0.4**
PBOC Polydorids *(Boccardia syrtis)*		1	0	1	1	0	1	0	0	2	2	0	0	**8**	**0.7**
PCOS *Cossura* sp.		0	1	0	0	0	0	0	0	0	0	9	1	**11**	**0.9**
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	1	0	0	0	2	0	0	1	0	0	1	**6**	**0.5**
PHF Capitellidae *(Heteromastus filiformis)*		11	16	13	27	10	7	13	17	13	11	12	16	**166**	**13.8**
PMD *Magelona dakini*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PNIC Nereidae		2	6	4	1	0	0	6	1	6	2	1	1	**30**	**2.5**
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	2	2	3	2	2	11	3	2	13	3	1	**44**	**3.7**
CCRAB Crabs		1	0	1	1	0	1	0	1	1	1	4	1	**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	1	0	0	0	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	0	0	0	0	0	**0**	**0.0**
COTH Other Crustaceans		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
BOTH Bivalves		0	0	1	0	1	2	0	0	0	0	0	0	**4**	**0.3**
GOTH Gastropods		0	0	1	0	0	0	0	2	0	0	5	0	**8**	**0.7**
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	0	0	0	0	0	0	0	0	0	0	**1**	**0.1**
POTH Polychaetes		0	0	1	0	0	0	0	0	0	0	1	0	**2**	**0.2**
OOLIG Oligochaetes		0	0	0	0	0	0	0	0	0	1	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	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
TOTAL		**32**	**56**	**55**	**61**	**26**	**41**	**74**	**44**	**47**	**64**	**47**	**74**	**621**	**51.8**

HB April 2002

INDICATOR SPECIES			CORE NUMBER												TOTAL	MEAN
			1	2	3	4	5	6	7	8	9	11	12	15		
AMPHIPODS																
ACOR	*Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
APHOX	*Phoxocephalidae*		2	5	3	0	1	1	7	0	1	0	1	1	**22**	**1.8**
BIVALVES		**SIZE**														
BAB	*Arthritica bifurca*	<2	1	10	21	5	2	0	10	0	4	3	0	18	**74**	**6.2**
		>2	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		Total	1	10	21	5	2	0	10	0	4	3	0	18	**74**	**6.2**
BAS	*Austrovenus stutchburyi*	<5	6	9	7	15	2	23	15	19	16	24	10	32	**178**	**14.8**
		>5	0	0	0	0	0	0	2	1	0	2	0	0	**5**	**0.4**
		Total	6	9	7	15	2	23	17	20	16	26	10	32	**183**	**15.3**
BML	*Macamona liliana*	<5	1	3	0	0	0	0	3	0	0	0	1	2	**10**	**0.8**
		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**
		Total	1	3	0	0	0	0	3	0	0	0	1	2	**10**	**0.8**
BNH	*Nucula hartvigiana*	<2	1	0	0	0	0	0	1	0	0	0	0	0	**2**	**0.2**
		>2	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		Total	1	0	0	0	0	0	1	0	0	0	0	0	**2**	**0.2**
BPA	*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**
		Total	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
BTHL	*Theora lubrica*	<5	1	0	0	0	0	0	1	0	0	0	0	0	**2**	**0.2**
		>5	0	0	0	2	0	0	0	0	0	0	0	0	**2**	**0.2**
		Total	1	0	0	2	0	0	1	0	0	0	0	0	**4**	**0.3**
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*		4	2	0	3	7	2	4	0	0	5	0	0	**27**	**2.3**
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	2	1	0	1	0	1	0	0	0	**5**	**0.4**
PBOC	Polydorids *(Boccardia syrtis)*		1	0	1	1	0	1	0	0	2	2	0	0	**8**	**0.7**
PCOS	*Cossura* sp.		0	1	0	0	0	0	0	0	0	0	9	1	**11**	**0.9**
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	1	0	0	0	2	0	0	1	0	0	1	**6**	**0.5**
PHF	Capitellidae *(Heteromastus filiformis)*		11	16	13	27	10	7	13	17	13	11	12	16	**166**	**13.8**
PMD	*Magelona dakini*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PNIC	Nereidae		2	6	4	1	0	0	6	1	6	2	1	1	**30**	**2.5**
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	2	2	3	2	2	11	3	2	13	3	1	**44**	**3.7**
CCRAB	Crabs		1	0	1	1	0	1	0	1	1	1	4	1	**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	1	0	0	0	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	0	0	0	0	0	**0**	**0.0**
COTH	Other Crustaceans		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
BOTH	Bivalves		0	0	1	0	1	2	0	0	0	0	0	0	**4**	**0.3**
GOTH	Gastropods		0	0	1	0	0	0	0	2	0	0	5	0	**8**	**0.7**
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	0	0	0	0	0	0	0	0	0	0	**1**	**0.1**
POTH	Polychaetes		0	0	1	0	0	0	0	0	0	0	1	0	**2**	**0.2**
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	1	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	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
TOTAL			**32**	**56**	**55**	**61**	**26**	**41**	**74**	**44**	**47**	**64**	**47**	**74**	**621**	**51.8**

X October 2001

INDICATOR SPECIES		SIZE	CORE NUMBER 1	2	3	4	5	6	8	9	10	11	12	15	TOTAL	MEAN
AMPHIPODS																
ACOR	*Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
APHOX	*Phoxocephalidae*		2	1	0	1	3	2	0	0	1	1	1	0	**12**	**1.0**
BIVALVES		**SIZE**														
BAB	*Arthritica bifurca*	<2	3	0	1	1	0	0	0	0	0	1	0	0	**6**	**0.5**
		>2	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		Total	3	0	1	1	0	0	0	0	0	1	0	0	**6**	**0.5**
BAS	*Austrovenus stutchburyi*	<5	16	21	21	20	25	9	13	17	22	18	17	8	**207**	**17.3**
		>5	17	10	7	22	15	9	12	15	25	13	22	24	**191**	**15.9**
		Total	33	31	28	42	40	18	25	32	47	31	39	32	**398**	**33.2**
BML	*Macamona liliana*	<5	2	6	2	0	6	3	1	3	3	4	0	0	**30**	**2.5**
		5-15	0	0	1	0	1	2	0	1	0	1	0	1	**7**	**0.6**
		>15	1	2	1	6	2	3	2	0	5	3	4	4	**33**	**2.8**
		Total	3	8	4	6	9	8	3	4	8	8	4	5	**70**	**5.8**
BNH	*Nucula hartvigiana*	<2	3	2	2	3	7	6	2	1	1	4	0	2	**33**	**2.8**
		>2	17	27	1	20	12	16	20	9	24	14	42	27	**229**	**19.1**
		Total	20	29	3	23	19	22	22	10	25	18	42	29	**262**	**21.8**
BPA	*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	1	0	0	1	0	0	0	0	1	0	0	**3**	**0.3**
		Total	0	1	0	0	1	0	0	0	0	1	0	0	**3**	**0.3**
BTHL	*Theora lubrica*	<5	0	0	0	1	0	0	0	0	0	0	0	0	**1**	**0.1**
		>5	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		Total	0	0	0	1	0	0	0	0	0	0	0	0	**1**	**0.1**
CUMACEANS																
CCL	*Colurostylis lemurum*		1	0	1	4	3	0	0	0	0	2	0	0	**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.		5	9	8	8	8	1	5	20	8	15	0	0	**87**	**7.3**
OTHER																
OAN	*Anthopleura aureoradiata*		0	0	0	0	0	0	0	0	0	0	5	0	**5**	**0.4**
POLYCHAETES																
PAA	*Aquilaspio aucklandica*		17	15	9	10	5	19	5	20	13	14	2	22	**151**	**12.6**
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	1	0	0	0	0	**1**	**0.1**
PAR	*Aricidea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PBOC	Polydorids *(Boccardia syrtis)*		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	1	1	1	2	2	2	0	1	1	0	1	**13**	**1.1**
PHF	Capitellidae *(Heteromastus filiformis)*		4	2	2	7	1	4	3	0	5	3	8	4	**43**	**3.6**
PMD	*Magelona dakini*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PNIC	Nereidae		3	1	1	4	2	0	0	3	1	0	1	1	**17**	**1.4**
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	1	0	0	0	0	**1**	**0.1**
NON INDICATOR SPECIES																
CAMPH	Amphipods		1	0	2	0	3	2	0	2	2	4	0	0	**16**	**1.3**
CCRAB	Crabs		0	0	2	3	1	1	1	1	2	2	0	0	**13**	**1.1**
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	1	0	0	0	**1**	**0.1**
COST	Ostracods		0	0	0	0	0	1	1	0	0	0	1	0	**3**	**0.3**
CSHR	Shrimps/Mysids		0	0	0	1	1	0	0	0	1	0	0	0	**3**	**0.3**
COTH	Other Crustaceans		0	0	0	0	0	1	3	0	0	0	0	1	**5**	**0.4**
BOTH	Bivalves		0	0	0	0	0	0	1	0	1	0	0	0	**2**	**0.2**
GOTH	Gastropods		9	1	0	0	1	0	3	3	5	3	10	0	**35**	**2.9**
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		0	0	0	0	1	3	0	0	1	1	0	3	**9**	**0.8**
POTH	Polychaetes		4	4	9	2	3	6	3	5	15	11	10	3	**75**	**6.3**
OOLIG	Oligochaetes		0	0	0	0	0	1	0	0	0	0	0	0	**1**	**0.1**
OFLAT	Flatworms		0	1	0	0	0	0	0	0	0	0	0	0	**1**	**0.1**
OEDW	*Edwardsia*		0	0	0	1	1	0	0	0	1	0	0	0	**3**	**0.3**
OTHER	Misc. Other [Echiuran?; chitons]		0	0	1	0	0	0	0	0	0	0	4	0	**5**	**0.4**
TOTAL			**106**	**105**	**72**	**115**	**104**	**91**	**77**	**102**	**138**	**116**	**127**	**101**	**1254**	**104.5**

X April 2002

INDICATOR SPECIES		SIZE	CORE NUMBER 1	4	5	6	7	8	10	11	12	13	14	15	TOTAL	MEAN
AMPHIPODS																
ACOR	*Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
APHOX	*Phoxocephalidae*		0	0	1	0	1	0	0	0	0	1	0	0	3	0.3
BIVALVES		**SIZE**														
BAB	*Arthritica bifurca*	<2	0	2	0	0	1	0	1	5	3	0	0	4	16	1.3
		>2	0	1	0	1	0	0	1	0	0	0	0	0	3	0.3
		Total	0	3	0	1	1	0	2	5	3	0	0	4	19	1.6
BAS	*Austrovenus stutchburyi*	<5	1	0	9	3	3	7	2	3	6	2	5	11	52	4.3
		>5	31	4	17	12	22	17	17	25	16	10	16	23	210	17.5
		Total	32	4	26	15	25	24	19	28	22	12	21	34	262	21.8
BML	*Macamona liliana*	<5	0	6	7	6	6	6	0	3	5	3	6	3	51	4.3
		5-15	0	1	0	0	1	0	0	0	2	0	2	1	7	0.6
		>15	2	0	3	3	2	1	2	2	3	2	2	3	25	2.1
		Total	2	7	10	9	9	7	2	5	10	5	10	7	83	6.9
BNH	*Nucula hartvigiana*	<2	5	0	2	2	7	2	1	1	1	4	0	2	27	2.3
		>2	21	0	18	34	48	25	21	19	24	25	12	17	264	22.0
		Total	26	0	20	36	55	27	22	20	25	29	12	19	291	24.3
BPA	*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
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL	*Theora lubrica*	<5	0	1	0	0	0	0	0	0	0	0	0	0	1	0.1
		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	1	0	0	0	0	0	0	0	0	0	0	1	0.1
CUMACEANS																
CCL	*Colurostylis lemurum*		5	3	2	7	1	2	0	0	2	0	5	2	29	2.4
GASTROPODS																
GCA	*Cominella adspera*		0	0	0	0	4	0	0	0	0	0	0	0	4	0.3
GNHE	*Notoacmea* sp.		4	0	12	10	6	5	10	3	2	11	0	6	69	5.8
OTHER																
OAN	*Anthopleura aureoradiata*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
POLYCHAETES																
PAA	*Aquilaspio aucklandica*		2	10	9	18	22	21	14	13	12	30	17	17	185	15.4
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	1	2	0.2
PAR	*Aricidea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PBOC	Polydorids *(Boccardia syrtis)*		0	1	0	0	0	1	0	0	0	0	0	0	2	0.2
PCOS	*Cossura* sp.		0	0	1	0	0	0	0	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.		0	0	0	0	0	0	0	0	0	1	0	0	1	0.1
PGLY	*Glycera* sp.		0	0	0	1	0	1	0	0	1	0	1	1	5	0.4
PHF	Capitellidae *(Heteromastus filiformis)*		1	1	5	5	9	3	8	2	6	8	5	7	60	5.0
PMD	*Magelona dakini*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PNIC	Nereidae		0	3	5	1	0	0	1	0	1	1	1	2	15	1.3
POP	*Orbinia papillosa*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PPAR	Paraonidae		0	1	1	0	0	2	0	0	0	0	0	0	4	0.3
NON INDICATOR SPECIES																
CAMPH	Amphipods		0	3	0	0	0	1	1	0	0	2	0	0	7	0.6
CCRAB	Crabs		1	1	0	1	0	0	1	1	0	3	0	0	8	0.7
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		0	0	0	0	0	0	0	1	1	0	0	1	3	0.3
COST	Ostracods		0	0	7	3	1	3	0	1	0	0	0	1	16	1.3
CSHR	Shrimps/Mysids		0	1	0	0	0	0	0	0	0	0	0	0	1	0.1
COTH	Other Crustaceans		0	1	0	0	0	0	0	0	0	0	0	1	2	0.2
BOTH	Bivalves		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GOTH	Gastropods		2	1	1	3	4	1	7	2	1	3	1	3	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		0	0	1	0	1	0	0	1	2	0	2	1	8	0.7
POTH	Polychaetes		2	1	4	3	6	3	2	1	1	6	0	2	31	2.6
OOLIG	Oligochaetes		0	0	0	0	0	1	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 [chiton]		1	0	0	0	1	0	0	0	0	1	0	0	3	0.3
TOTAL			**78**	**42**	**105**	**113**	**146**	**102**	**89**	**84**	**89**	**113**	**75**	**109**	**1145**	**95.4**

WI April 2001

INDICATOR SPECIES		SIZE	CORE NUMBER 1	2	4	5	6	8	9	10	11	13	14	15	17	18	20	TOTAL	MEAN
AMPHIPODS																			
ACOR	*Corophiidae*		0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	2	0.1
APHOX	*Phoxocephalidae*		1	1	0	1	0	0	1	0	0	2	0	0	0	0	0	6	0.4
BIVALVES		**SIZE**																	
BAB	*Arthritica bifurca*	<2	0	0	0	0	0	0	0	0	19	6	2	2	0	0	0	29	1.9
		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	19	6	2	2	0	0	0	29	1.9
BAS	*Austrovenus stutchburyi*	<5	2	1	2	1	2	5	8	6	6	8	7	25	21	15	14	123	8.2
		>5	7	17	4	9	3	24	25	19	4	18	12	2	13	17	11	185	12.3
		Total	9	18	6	10	5	29	33	25	10	26	19	27	34	32	25	308	20.5
BML	*Macamona liliana*	<5	15	13	19	16	24	2	7	1	16	4	5	11	28	16	27	204	13.6
		5-15	4	2	0	0	6	2	4	0	0	0	0	1	5	5	2	31	2.1
		>15	1	4	2	0	0	2	1	2	3	7	3	4	1	2	1	33	2.2
		Total	20	19	21	16	30	6	12	3	19	11	8	16	34	23	30	268	17.9
BNH	*Nucula hartvigiana*	<2	1	4	0	2	3	0	1	2	6	7	3	2	1	0	1	33	2.2
		>2	2	3	0	0	0	1	0	2	9	15	3	1	0	0	1	37	2.5
		Total	3	7	0	2	3	1	1	4	15	22	6	3	1	0	2	70	4.7
BPA	*Paphies australis*	<5	0	0	0	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	0	0.0
		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL	*Theora lubrica*	<5	1	0	0	0	0	0	0	0	0	0	2	2	1	0	0	6	0.4
		>5	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	0.1
		Total	1	0	0	0	2	0	0	0	0	0	2	2	1	0	0	8	0.5
CUMACEANS																			
CCL	*Colurostylis lemurum*		0	2	2	4	3	1	1	2	3	1	0	0	1	1	0	21	1.4
GASTROPODS																			
GCA	*Cominella adspera*		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE	*Notoacmea* sp.		0	0	0	0	0	0	1	1	0	14	3	0	0	0	0	19	1.3
OTHER																			
OAN	*Anthopleura aureoradiata*		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
POLYCHAETES																			
PAA	*Aquilaspio aucklandica*		9	7	14	4	4	8	1	13	15	17	12	13	7	9	3	136	9.1
PAGL	*Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	*Aonides oxycephala*		0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	2	0.1
PAR	*Aricidea* sp.		3	0	2	0	1	1	3	0	11	0	4	0	1	1	8	35	2.3
PBOC	Polydorids *(Boccardia syrtis)*		0	1	0	0	0	1	3	0	1	0	3	1	3	1	2	16	1.1
PCOS	*Cossura* sp.		1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3	0.2
PEUC	*Euchone* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PGE	*Goniada* sp.		0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	3	0.2
PGLY	*Glycera* sp.		0	3	0	1	0	0	0	0	3	2	1	0	0	0	0	10	0.7
PHF	Capitellidae *(Heteromastus filiformis)*		23	29	22	7	14	1	14	18	39	17	23	23	27	29	34	320	21.3
PMD	*Magelona dakini*		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PNIC	Nereidae		6	4	8	12	1	11	4	11	11	3	8	14	6	8	12	119	7.9
POP	*Orbinia papillosa*		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PPAR	Paraonidae		0	0	6	0	2	1	0	0	35	0	0	8	1	0	0	53	3.5
NON INDICATOR SPECIES																			
CAMPH	Amphipods		0	0	1	0	5	4	1	1	0	0	2	1	0	0	1	16	1.1
CCRAB	Crabs		0	1	0	0	1	3	1	0	0	1	0	1	0	0	1	9	0.6
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	3	0.2
COST	Ostracods		0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	3	0.2
CSHR	Shrimps/Mysids		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
COTH	Other Crustaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BOTH	Bivalves		0	1	0	0	0	0	0	5	0	4	4	0	1	0	4	19	1.3
GOTH	Gastropods		0	0	0	2	2	1	0	1	1	0	0	0	0	0	0	7	0.5
EFEZ	*Fellaster zealandiae*		0	0	0	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	0	0.0
ONEM	Nemerteans		0	8	4	0	0	2	1	2	0	3	2	2	2	3	3	32	2.1
POTH	Polychaetes		0	0	0	0	0	0	3	0	7	12	4	0	0	1	2	29	1.9
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0.1
OFLAT	Flatworms		0	0	0	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	0	0.0
OTHER	Misc. Other		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
TOTAL			**76**	**101**	**87**	**60**	**73**	**71**	**82**	**86**	**191**	**142**	**104**	**115**	**121**	**109**	**129**	**1547**	**103.1**

WI July 2001

INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN
		2	4	5	6	7	8	9	10	11	12	13	15		
AMPHIPODS															
ACOR *Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
APHOX *Phoxocephalidae*		3	3	3	0	1	0	5	4	4	1	1	1	**26**	**2.2**
BIVALVES	**SIZE**														
BAB *Arthritica bifurca*	<2	0	1	0	0	0	0	0	0	4	0	0	1	**6**	**0.5**
	>2	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
	Total	0	1	0	0	0	0	0	0	4	0	0	1	**6**	**0.5**
BAS *Austrovenus stutchburyi*	<5	5	2	4	6	6	2	7	12	3	4	1	4	**56**	**4.7**
	>5	26	14	38	15	8	8	14	23	18	19	22	18	**223**	**18.6**
	Total	31	16	42	21	14	10	21	35	21	23	23	22	**279**	**23.3**
BML *Macamona liliana*	<5	6	2	2	6	16	5	13	6	6	1	1	5	**69**	**5.8**
	5-15	3	3	5	1	6	3	1	2	4	6	8	5	**47**	**3.9**
	>15	2	3	4	4	2	2	2	7	4	2	1	4	**37**	**3.1**
	Total	11	8	11	11	24	10	16	15	14	9	10	14	**153**	**12.8**
BNH *Nucula hartvigiana*	<2	0	0	1	1	4	1	0	1	1	0	1	0	**10**	**0.8**
	>2	0	2	5	2	0	2	2	2	6	0	4	1	**26**	**2.2**
	Total	0	2	6	3	4	3	2	3	7	0	5	1	**36**	**3.0**
BPA *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**
	Total	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
BTHL *Theora lubrica*	<5	0	0	0	0	2	0	1	0	0	0	0	1	**4**	**0.3**
	>5	0	1	1	0	0	0	3	1	0	0	0	2	**8**	**0.7**
	Total	0	1	1	0	2	0	4	1	0	0	0	3	**12**	**1.0**
CUMACEANS															
CCL *Colurostylis lemurum*		0	0	0	0	0	1	0	0	0	0	0	2	**3**	**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	2	0	2	0	0	0	**4**	**0.3**
OTHER															
OAN *Anthopleura aureoradiata*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
POLYCHAETES															
PAA *Aquilaspio aucklandica*		2	5	8	2	7	5	9	0	5	6	1	4	**54**	**4.5**
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	1	0	1	1	0	1	5	3	**12**	**1.0**
PBOC Polydorids *(Boccardia syrtis)*		0	0	1	0	0	0	0	0	0	0	0	1	**2**	**0.2**
PCOS *Cossura* sp.		3	0	0	0	1	0	0	0	0	0	2	0	**6**	**0.5**
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	1	0	0	0	0	0	0	0	**1**	**0.1**
PGLY *Glycera* sp.		0	1	1	0	0	1	2	1	1	0	0	1	**8**	**0.7**
PHF Capitellidae *(Heteromastus filiformis)*		24	1	23	27	43	5	9	15	9	22	18	18	**214**	**17.8**
PMD *Magelona dakini*		0	0	0	0	0	0	1	0	0	0	0	0	**1**	**0.1**
PNIC Nereidae		9	4	5	3	3	4	4	2	2	1	8	3	**48**	**4.0**
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	1	0	0	**1**	**0.1**
NON INDICATOR SPECIES															
CAMPH Amphipods		0	2	0	0	1	0	0	6	0	0	0	0	**9**	**0.8**
CCRAB Crabs		0	0	0	0	0	1	1	0	1	0	6	0	**9**	**0.8**
CCUM Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
CISO Isopods		0	1	0	0	0	0	0	0	0	0	0	0	**1**	**0.1**
COST Ostracods		1	0	0	0	0	0	0	0	0	0	0	0	**1**	**0.1**
CSHR Shrimps/Mysids		1	1	0	1	2	0	6	0	0	0	0	0	**11**	**0.9**
COTH Other Crustaceans		0	0	0	0	0	0	1	0	0	0	0	0	**1**	**0.1**
BOTH Bivalves		2	0	0	0	1	0	0	0	0	0	0	1	**4**	**0.3**
GOTH Gastropods		0	0	0	1	0	0	0	0	0	2	2	0	**5**	**0.4**
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		0	1	1	0	0	3	0	3	0	2	0	0	**10**	**0.8**
POTH Polychaetes		2	2	0	0	2	0	1	3	8	2	0	5	**25**	**2.1**
OOLIG Oligochaetes		0	0	0	0	0	0	0	1	0	0	0	0	**1**	**0.1**
OFLAT Flatworms		0	0	0	0	1	0	0	0	0	0	0	0	**1**	**0.1**
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		**89**	**49**	**102**	**69**	**108**	**43**	**85**	**90**	**78**	**70**	**81**	**80**	**944**	**78.7**

WI October 2001

INDICATOR SPECIES		CORE NUMBER 1	5	6	7	8	9	10	11	12	13	14	15	TOTAL	MEAN
AMPHIPODS															
ACOR *Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
APHOX *Phoxocephalidae*		0	0	1	1	1	0	4	2	2	5	4	1	**21**	**1.8**
BIVALVES	**SIZE**														
BAB *Arthritica bifurca*	<2	0	1	2	0	0	0	0	1	2	0	2	2	**10**	**0.8**
	>2	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
	Total	0	1	2	0	0	0	0	1	2	0	2	2	**10**	**0.8**
BAS *Austrovenus stutchburyi*	<5	8	25	32	27	35	6	13	19	36	31	41	19	**292**	**24.3**
	>5	23	8	17	17	19	19	13	24	12	13	24	4	**193**	**16.1**
	Total	31	33	49	44	54	25	26	43	48	44	65	23	**485**	**40.4**
BML *Macamona liliana*	<5	15	3	9	9	9	1	6	6	4	2	5	2	**71**	**5.9**
	5-15	4	3	1	2	4	1	1	4	0	1	2	0	**23**	**1.9**
	>15	0	2	2	1	0	5	2	1	3	1	1	4	**22**	**1.8**
	Total	19	8	12	12	13	7	9	11	7	4	8	6	**116**	**9.7**
BNH *Nucula hartvigiana*	<2	2	1	2	0	0	3	7	2	0	0	0	3	**20**	**1.7**
	>2	1	0	2	0	1	9	12	0	0	0	2	0	**27**	**2.3**
	Total	3	1	4	0	1	12	19	2	0	0	2	3	**47**	**3.9**
BPA *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**
	Total	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
BTHL *Theora lubrica*	<5	1	0	0	0	1	0	1	1	1	0	0	0	**5**	**0.4**
	>5	0	1	0	0	0	0	0	0	0	2	0	0	**3**	**0.3**
	Total	1	1	0	0	1	0	1	1	1	2	0	0	**8**	**0.7**
CUMACEANS															
CCL *Colurostylis lemurum*		1	0	0	1	0	0	1	0	0	0	0	0	**3**	**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	1	0	1	4	7	3	0	0	0	0	**16**	**1.3**
OTHER															
OAN *Anthopleura aureoradiata*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
POLYCHAETES															
PAA *Aquilaspio aucklandica*		4	2	6	4	9	25	7	7	8	0	8	2	**82**	**6.8**
PAGL *Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PAO *Aonides oxycephala*		0	0	2	0	0	0	0	0	0	0	2	0	**4**	**0.3**
PAR *Aricidea* sp.		6	3	1	0	1	1	1	1	4	0	5	4	**27**	**2.3**
PBOC Polydorids *(Boccardia syrtis)*		0	1	2	0	0	0	0	1	0	0	4	0	**8**	**0.7**
PCOS *Cossura* sp.		0	1	2	0	0	0	0	2	2	1	0	0	**8**	**0.7**
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	1	0	0	1	1	0	0	**3**	**0.3**
PGLY *Glycera* sp.		0	0	1	1	0	2	1	2	0	0	0	0	**7**	**0.6**
PHF Capitellidae *(Heteromastus filiformis)*		17	17	14	17	38	28	17	21	3	17	44	24	**257**	**21.4**
PMD *Magelona dakini*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PNIC Nereidae		1	0	2	4	3	0	0	4	4	3	6	0	**27**	**2.3**
POP *Orbinia papillosa*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PPAR Paraonidae		5	0	0	0	2	4	3	4	0	0	0	0	**18**	**1.5**
NON INDICATOR SPECIES															
CAMPH Amphipods		1	1	0	2	0	0	1	0	2	1	0	0	**8**	**0.7**
CCRAB Crabs		0	0	0	0	0	0	1	1	2	3	2	1	**10**	**0.8**
CCUM Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
CISO Isopods		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
COST Ostracods		0	0	0	1	0	0	0	1	0	1	0	0	**3**	**0.3**
CSHR Shrimps/Mysids		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
COTH Other Crustaceans		1	0	0	0	0	0	0	0	0	0	0	0	**1**	**0.1**
BOTH Bivalves		1	0	1	0	0	0	0	0	0	0	1	4	**7**	**0.6**
GOTH Gastropods		0	1	0	0	0	1	2	1	2	1	3	2	**13**	**1.1**
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	3	1	2	0	1	1	0	1	2	0	**11**	**0.9**
POTH Polychaetes		0	0	0	0	0	11	3	1	0	1	0	4	**20**	**1.7**
OOLIG Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
OFLAT Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
OEDW *Edwardsia*		0	0	0	0	0	0	1	0	0	0	0	0	**1**	**0.1**
OTHER Misc. Other		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
TOTAL		**91**	**70**	**103**	**88**	**126**	**121**	**105**	**110**	**88**	**85**	**158**	**76**	**1221**	**101.8**

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INDICATOR SPECIES		CORE NUMBER 1	2	3	4	5	6	7	10	12	13	14	15	TOTAL	MEAN
AMPHIPODS															
ACOR *Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
APHOX *Phoxocephalidae*		0	0	0	0	1	3	3	2	4	2	0	0	**15**	**1.3**
BIVALVES	**SIZE**														
BAB *Arthritica bifurca*	<2	2	0	0	0	5	0	0	3	6	0	2	0	**18**	**1.5**
	>2	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
	Total	2	0	0	0	5	0	0	3	6	0	2	0	**18**	**1.5**
BAS *Austrovenus stutchburyi*	<5	24	25	6	12	14	14	25	2	9	23	21	5	**180**	**15.0**
	>5	11	12	0	22	11	3	12	7	9	11	15	1	**114**	**9.5**
	Total	35	37	6	34	25	17	37	9	18	34	36	6	**294**	**24.5**
BML *Macamona liliana*	<5	5	5	0	5	3	6	1	1	5	3	1	1	**36**	**3.0**
	5-15	0	4	3	1	4	2	4	2	2	1	2	5	**30**	**2.5**
	>15	2	2	0	4	2	2	0	2	2	4	2	4	**26**	**2.2**
	Total	7	11	3	10	9	10	5	5	9	8	5	10	**92**	**7.7**
BNH *Nucula hartvigiana*	<2	3	3	0	19	2	0	4	3	4	1	9	7	**55**	**4.6**
	>2	1	2	0	9	0	1	3	0	1	0	5	7	**29**	**2.4**
	Total	4	5	0	28	2	1	7	3	5	1	14	14	**84**	**7.0**
BPA *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**
	Total	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
BTHL *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															
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	2	1	8	1	5	4	3	0	1	6	2	**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*		5	9	3	13	9	2	12	6	2	2	8	1	**72**	**6.0**
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.		2	0	3	1	2	1	1	1	4	1	5	5	**26**	**2.2**
PBOC Polydorids *(Boccardia syrtis)*		0	1	1	2	0	1	2	0	0	0	1	1	**9**	**0.8**
PCOS *Cossura* sp.		0	0	0	1	0	2	0	1	3	0	0	0	**7**	**0.6**
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	2	1	1	1	0	0	4	1	1	1	2	**15**	**1.3**
PHF Capitellidae *(Heteromastus filiformis)*		43	33	39	49	24	33	27	3	32	32	45	36	**396**	**33.0**
PMD *Magelona dakini*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PNIC Nereidae		1	0	2	2	1	2	5	0	2	1	3	0	**19**	**1.6**
POP *Orbinia papillosa*		0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PPAR Paraonidae		0	0	3	0	1	3	1	0	1	0	4	4	**17**	**1.4**
NON INDICATOR SPECIES															
CAMPH Amphipods		0	0	0	0	0	0	1	0	1	1	0	0	**3**	**0.3**
CCRAB Crabs		0	0	1	0	1	0	4	3	0	2	0	1	**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	0	0	0	1	0	0	**1**	**0.1**
COST Ostracods		1	2	0	0	0	0	2	0	0	0	0	0	**5**	**0.4**
CSHR Shrimps/Mysids		0	1	0	0	0	0	0	0	0	0	0	0	**1**	**0.1**
COTH Other Crustaceans		0	0	0	0	0	1	0	0	0	0	1	0	**2**	**0.2**
BOTH Bivalves		4	9	5	5	3	18	2	0	5	2	9	5	**67**	**5.6**
GOTH Gastropods		1	0	0	2	1	1	4	2	2	3	2	0	**18**	**1.5**
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	8	1	1	1	1	1	3	0	1	5	0	**24**	**2.0**
POTH Polychaetes		2	1	1	9	2	6	2	0	2	0	1	5	**31**	**2.6**
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	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		**110**	**121**	**70**	**166**	**89**	**107**	**120**	**48**	**97**	**93**	**148**	**92**	**1261**	**105.1**

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INDICATOR SPECIES		CORE NUMBER												TOTAL	MEAN
		1	3	4	5	6	7	9	10	11	12	13	15		
AMPHIPODS															
ACOR *Corophiidae*		0	0	0	0	1	0	0	0	0	0	0	0	1	0.1
APHOX *Phoxocephalidae*		0	0	0	0	0	0	0	0	0	0	1	0	1	0.1
BIVALVES	**SIZE**														
BAB *Arthritica bifurca*	<2	4	2	8	1	8	1	1	1	2	15	3	12	58	4.8
	>2	0	0	0	0	2	0	0	1	0	0	0	1	4	0.3
	Total	4	2	8	1	10	1	1	2	2	15	3	13	62	5.2
BAS *Austrovenus stutchburyi*	<5	1	6	2	9	2	1	21	23	25	4	2	14	110	9.2
	>5	25	13	13	22	25	19	15	31	2	12	11	37	225	18.8
	Total	26	19	15	31	27	20	36	54	27	16	13	51	335	27.9
BML *Macamona liliana*	<5	3	6	3	3	0	7	4	1	0	5	1	0	33	2.8
	5-15	3	2	3	5	5	3	0	3	2	2	2	1	31	2.6
	>15	0	2	0	0	4	0	7	3	3	3	3	8	33	2.8
	Total	6	10	6	8	9	10	11	7	5	10	6	9	97	8.1
BNH *Nucula hartvigiana*	<2	2	2	0	3	4	4	4	2	2	1	0	3	27	2.3
	>2	3	3	0	6	5	6	23	58	9	5	1	11	130	10.8
	Total	5	5	0	9	9	10	27	60	11	6	1	14	157	13.1
BPA *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
	Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL *Theora lubrica*	<5	0	0	0	0	0	0	0	0	0	0	1	0	1	0.1
	>5	0	0	1	0	0	0	0	0	0	0	0	0	1	0.1
	Total	0	0	1	0	0	0	0	0	0	0	1	0	2	0.2
CUMACEANS															
CCL *Colurostylis lemurum*		0	1	0	0	0	0	0	1	0	0	1	0	3	0.3
GASTROPODS															
GCA *Cominella adspera*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
GNHE *Notoacmea* sp.		3	0	1	14	13	3	29	12	12	2	0	15	104	8.7
OTHER															
OAN *Anthopleura aureoradiata*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
POLYCHAETES															
PAA *Aquilaspio aucklandica*		9	7	3	12	4	6	7	21	1	3	1	12	86	7.2
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.		1	3	1	0	0	1	2	0	0	1	0	0	9	0.8
PBOC Polydorids *(Boccardia syrtis)*		0	1	0	0	1	0	1	1	0	1	0	2	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.		1	0	0	2	3	0	1	0	0	0	0	0	7	0.6
PHF Capitellidae *(Heteromastus filiformis)*		15	18	26	24	19	23	11	15	0	3	8	27	189	15.8
PMD *Magelona dakini*		0	0	0	0	0	0	0	0	0	0	0	1	1	0.1
PNIC Nereidae		6	9	4	2	3	5	2	1	1	8	4	0	45	3.8
POP *Orbinia papillosa*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PPAR Paraonidae		1	3	1	0	0	0	0	0	0	0	0	0	5	0.4
NON INDICATOR SPECIES															
CAMPH Amphipods		0	0	0	0	1	0	0	0	0	0	1	0	2	0.2
CCRAB Crabs		1	0	1	1	0	0	1	0	3	1	5	1	14	1.2
CCUM Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO Isopods		0	0	0	0	0	0	0	1	0	0	0	0	1	0.1
COST Ostracods		0	0	0	1	0	0	0	0	0	0	0	0	1	0.1
CSHR Shrimps/Mysids		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
COTH Other Crustaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BOTH Bivalves		1	0	0	0	1	0	0	1	0	0	1	0	4	0.3
GOTH Gastropods		1	0	2	1	1	0	2	2	1	2	0	1	13	1.1
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	1	1	1	1	0	0	0	0	0	0	5	0.4
POTH Polychaetes		0	0	0	1	0	0	1	0	0	0	0	1	3	0.3
OOLIG Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OFLAT Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OEDW *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		81	78	70	108	103	80	132	178	63	68	46	147	1154	96.2

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INDICATOR SPECIES			CORE NUMBER															TOTAL	MEAN
			1	2	3	5	6	8	9	10	11	13	14	15	16	18	19		
AMPHIPODS																			
ACOR	*Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
APHOX	*Phoxocephalidae*		4	6	0	1	4	0	3	3	0	8	4	0	2	1	1	**37**	**2.5**
BIVALVES		**SIZE**																	
BAB	*Arthritica bifurca*	<2	2	0	0	0	0	1	0	0	0	0	0	0	2	1	0	**6**	**0.4**
		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		Total	2	0	0	0	0	1	0	0	0	0	0	0	2	1	0	**6**	**0.4**
BAS	*Austrovenus stutchburyi*	<5	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	**2**	**0.1**
		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		Total	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	**2**	**0.1**
BML	*Macamona liliana*	<5	0	0	0	0	1	0	1	0	0	1	0	0	0	0	1	**4**	**0.3**
		5-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		>15	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	**3**	**0.2**
		Total	0	0	0	1	1	0	1	0	0	1	0	0	0	0	3	**7**	**0.5**
BNH	*Nucula hartvigiana*	<2	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	**2**	**0.1**
		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	**1**	**0.1**
		Total	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	**3**	**0.2**
BPA	*Paphies australis*	<5	0	0	0	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	**0**	**0.0**
		>15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
BTHL	*Theora lubrica*	<5	0	4	0	2	0	0	0	0	0	0	2	0	1	2	2	**13**	**0.9**
		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
		Total	0	4	0	2	0	0	0	0	0	0	2	0	1	2	2	**13**	**0.9**
CUMACEANS																			
CCL	*Colurostylis lemurum*		3	1	1	6	2	2	2	1	3	2	1	7	4	5	3	**43**	**2.9**
GASTROPODS																			
GCA	*Cominella adspera*		0	0	0	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	**0**	**0.0**
OTHER																			
OAN	*Anthopleura aureoradiata*		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
POLYCHAETES																			
PAA	*Aquilaspio aucklandica*		6	3	1	8	5	2	5	5	5	2	2	3	6	9	2	**64**	**4.3**
PAGL	*Aglaophamus* sp.		0	0	0	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	**0**	**0.0**
PAR	*Aricidea* sp.		1	0	2	9	10	2	15	1	2	5	7	0	6	0	3	**63**	**4.2**
PBOC	Polydorids *(Boccardia syrtis)*		0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	**2**	**0.1**
PCOS	*Cossura* sp.		18	19	34	27	35	13	40	36	35	24	15	11	31	21	26	**385**	**25.7**
PEUC	*Euchone* sp.		4	3	2	4	6	1	6	5	4	1	0	1	4	1	8	**50**	**3.3**
PGE	*Goniada* sp.		1	0	1	1	1	1	3	1	2	2	0	3	0	1	1	**18**	**1.2**
PGLY	*Glycera* sp.		1	0	1	1	0	1	0	0	1	1	0	1	1	0	0	**8**	**0.5**
PHF	Capitellidae *(Heteromastus filiformis)*		13	11	8	17	8	18	16	14	12	9	12	8	9	8	6	**169**	**11.3**
PMD	*Magelona dakini*		1	1	0	0	0	0	2	0	0	0	0	0	0	0	0	**4**	**0.3**
PNIC	Nereidae		4	4	6	4	5	3	2	2	4	0	5	1	3	2	5	**50**	**3.3**
POP	*Orbinia papillosa*		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
PPAR	Paraonidae		3	3	1	4	4	2	17	2	1	1	0	0	0	2	1	**41**	**2.7**
NON INDICATOR SPECIES																			
CAMPH	Amphipods		2	4	3	4	4	1	0	4	1	1	4	1	3	5	6	**43**	**2.9**
CCRAB	Crabs		0	1	0	0	2	0	1	1	0	1	1	0	2	1	1	**11**	**0.7**
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	**1**	**0.1**
CISO	Isopods		1	0	0	0	0	0	0	2	0	0	0	0	2	0	0	**5**	**0.3**
COST	Ostracods		0	0	2	0	1	0	0	1	0	5	1	0	0	1	0	**11**	**0.7**
CSHR	Shrimps/Mysids		0	0	0	0	0	0	0	0	0	1	0	2	2	0	0	**5**	**0.3**
COTH	Other Crustaceans		0	0	0	0	0	1	1	0	0	0	0	1	1	0	0	**4**	**0.3**
BOTH	Bivalves		0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	**2**	**0.1**
GOTH	Gastropods		3	4	3	3	2	3	0	1	1	1	1	0	2	1	3	**28**	**1.9**
EFEZ	*Fellaster zealandiae*		0	0	0	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	**0**	**0.0**
ONEM	Nemerteans		0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	**3**	**0.2**
POTH	Polychaetes		7	4	2	3	2	7	1	1	2	3	3	3	2	0	2	**42**	**2.8**
OOLIG	Oligochaetes		0	0	0	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	**0**	**0.0**
OEDW	*Edwardsia*		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0.0**
OTHER	Misc. Other [Phoronid]		0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	**2**	**0.1**
TOTAL			**75**	**69**	**67**	**97**	**94**	**58**	**116**	**81**	**73**	**68**	**59**	**43**	**85**	**63**	**74**	**1122**	**93.5**

OB July 2001

INDICATOR SPECIES			CORE NUMBER												TOTAL	MEAN
			1	2	3	4	5	6	7	8	9	10	11	15		
AMPHIPODS																
ACOR	*Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
APHOX	*Phoxocephalidae*		1	1	1	0	4	4	6	3	4	2	3	6	35	2.9
BIVALVES		**SIZE**														
BAB	*Arthritica bifurca*	<2	0	0	0	1	0	0	0	0	0	0	0	0	1	0.1
		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	1	0	0	0	0	0	0	0	0	1	0.1
BAS	*Austrovenus stutchburyi*	<5	0	0	0	1	0	0	4	0	0	0	0	0	5	0.4
		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	1	0	0	4	0	0	0	0	0	5	0.4
BML	*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	1	0	0	0	0	2	0	3	0.3
		Total	0	0	0	0	0	1	0	0	0	0	2	0	3	0.3
BNH	*Nucula hartvigiana*	<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
BPA	*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
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL	*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																
CCL	*Colurostylis lemurum*		2	2	1	3	3	0	0	1	0	2	4	7	25	2.1
GASTROPODS																
GCA	*Cominella adspera*		0	0	1	0	0	0	0	0	0	0	0	0	1	0.1
GNHE	*Notoacmea* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OTHER																
OAN	*Anthopleura aureoradiata*		0	0	1	0	0	0	0	0	0	0	0	0	1	0.1
POLYCHAETES																
PAA	*Aquilaspio aucklandica*		0	1	0	0	0	0	5	4	1	2	0	0	13	1.1
PAGL	*Aglaophamus* sp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PAO	*Aonides oxycephala*		0	0	2	0	0	0	0	0	0	0	0	0	2	0.2
PAR	*Aricidea* sp.		0	0	0	0	0	0	1	0	3	1	0	3	8	0.7
PBOC	Polydorids *(Boccardia syrtis)*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PCOS	*Cossura* sp.		11	6	18	1	14	11	37	46	42	15	18	25	244	20.3
PEUC	*Euchone* sp.		0	0	0	0	0	0	0	0	0	0	0	1	1	0.1
PGE	*Goniada* sp.		1	0	0	0	0	0	0	1	3	1	1	2	9	0.8
PGLY	*Glycera* sp.		0	1	0	0	0	1	0	0	0	0	0	0	2	0.2
PHF	Capitellidae *(Heteromastus filiformis)*		4	0	10	0	0	1	14	2	6	4	1	5	47	3.9
PMD	*Magelona dakini*		0	0	0	0	0	0	1	0	0	0	0	0	1	0.1
PNIC	Nereidae		3	2	1	0	1	0	1	3	1	0	2	2	16	1.3
POP	*Orbinia papillosa*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PPAR	Paraonidae		1	1	0	0	0	0	2	0	0	1	0	0	5	0.4
NON INDICATOR SPECIES																
CAMPH	Amphipods		1	0	0	1	2	0	0	0	2	0	1	3	10	0.8
CCRAB	Crabs		0	0	1	0	1	1	1	2	0	0	1	3	10	0.8
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	1	1	0.1
CISO	Isopods		0	0	0	1	0	0	0	0	0	0	0	0	1	0.1
COST	Ostracods		0	0	3	0	0	1	0	0	2	0	1	0	7	0.6
CSHR	Shrimps/Mysids		0	0	0	0	0	1	1	0	0	0	1	1	4	0.3
COTH	Other Crustaceans		4	0	0	0	0	0	0	3	0	0	0	0	7	0.6
BOTH	Bivalves		0	0	0	0	0	0	3	0	1	0	0	0	4	0.3
GOTH	Gastropods		8	4	6	2	3	7	1	3	3	8	4	2	51	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		1	1	0	0	0	0	1	1	0	0	1	0	5	0.4
POTH	Polychaetes		8	3	4	0	2	4	1	2	2	7	2	0	35	2.9
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OFLAT	Flatworms		3	0	1	0	0	0	0	2	0	0	0	0	6	0.5
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			**48**	**22**	**50**	**10**	**30**	**32**	**79**	**73**	**70**	**43**	**42**	**61**	**560**	**46.7**

OB October 2001

INDICATOR SPECIES			CORE NUMBER												TOTAL	MEAN
			1	2	3	4	5	6	9	10	11	12	14	15		
AMPHIPODS																
ACOR	*Corophiidae*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
APHOX	*Phoxocephalidae*		9	7	3	6	5	5	1	3	4	2	4	5	54	4.5
BIVALVES		**SIZE**														
BAB	*Arthritica bifurca*	<2	0	0	0	0	0	1	0	0	0	0	1	7	9	0.8
		>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	0	0	1	7	9	0.8
BAS	*Austrovenus stutchburyi*	<5	1	0	0	6	0	0	1	2	2	0	4	13	29	2.4
		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	1	0	0	6	0	0	1	2	2	0	4	13	29	2.4
BML	*Macamona liliana*	<5	0	0	0	2	0	0	0	0	0	0	2	1	5	0.4
		5-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		>15	0	0	0	0	2	0	0	1	1	1	0	1	6	0.5
		Total	0	0	0	2	2	0	0	1	1	1	2	2	11	0.9
BNH	*Nucula hartvigiana*	<2	0	0	0	0	0	0	0	1	0	0	1	0	2	0.2
		>2	1	0	0	0	0	0	0	0	0	0	0	0	1	0.1
		Total	1	0	0	0	0	0	0	1	0	0	1	0	3	0.3
BPA	*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
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL	*Theora lubrica*	<5	0	0	0	1	0	0	0	0	0	0	0	0	1	0.1
		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	0	1	0	0	0	0	0	0	0	0	1	0.1
CUMACEANS																
CCL	*Colurostylis lemurum*		1	0	0	4	1	2	1	2	0	2	0	0	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.		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	1	1	1	1	0	0	0	3	1	0	6	16	1.3
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	2	2	0.2
PAR	*Aricidea* sp.		3	0	1	2	0	1	0	1	2	4	0	0	14	1.2
PBOC	Polydorids *(Boccardia syrtis)*		0	0	0	1	0	0	0	0	1	0	0	0	2	0.2
PCOS	*Cossura* sp.		23	10	13	30	0	15	26	46	32	44	30	2	271	22.6
PEUC	*Euchone* sp.		0	0	1	1	0	0	0	0	0	0	0	0	2	0.2
PGE	*Goniada* sp.		2	1	0	1	1	0	1	1	3	1	1	0	12	1.0
PGLY	*Glycera* sp.		2	1	2	0	1	2	1	0	0	1	0	1	11	0.9
PHF	Capitellidae *(Heteromastus filiformis)*		5	16	5	5	10	8	6	9	15	4	5	14	102	8.5
PMD	*Magelona dakini*		0	0	0	0	0	1	0	0	0	0	0	0	1	0.1
PNIC	Nereidae		3	1	1	3	2	1	6	5	0	3	2	4	31	2.6
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	1	0	0	0	0	0	1	0.1
NON INDICATOR SPECIES																
CAMPH	Amphipods		0	0	0	2	2	0	4	0	0	2	1	2	13	1.1
CCRAB	Crabs		2	1	0	1	2	1	0	0	0	0	0	1	8	0.7
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		0	0	0	0	1	0	1	0	1	1	3	0	7	0.6
COST	Ostracods		1	1	0	0	0	0	0	0	0	1	0	0	3	0.3
CSHR	Shrimps/Mysids		0	0	0	0	0	0	1	1	1	0	0	0	3	0.3
COTH	Other Crustaceans		5	0	0	0	0	0	0	0	0	0	0	0	5	0.4
BOTH	Bivalves		0	0	2	3	0	0	1	2	2	0	0	1	11	0.9
GOTH	Gastropods		3	1	2	3	1	4	4	1	4	0	3	1	27	2.3
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	1	0	1	0	0	0	1	0	0	3	0.3
POTH	Polychaetes		3	1	3	1	1	2	0	1	0	2	0	0	14	1.2
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	2	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	0	0	0	0	0	0	0	0	1	0	1	0.1
TOTAL			**66**	**41**	**34**	**74**	**30**	**44**	**55**	**76**	**71**	**70**	**58**	**63**	**682**	**56.8**

OB January 2002

INDICATOR SPECIES		SIZE	CORE NUMBER 2	3	4	5	6	7	8	9	10	11	13	15	TOTAL	MEAN
AMPHIPODS																
ACOR	*Corophiidae*		0	0	0	11	0	0	3	1	2	2	1	0	20	1.7
APHOX	*Phoxocephalidae*		3	2	4	4	4	1	8	15	7	8	2	3	61	5.1
BIVALVES		**SIZE**														
BAB	*Arthritica bifurca*	<2	0	0	1	0	0	1	2	0	0	2	2	0	8	0.7
		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	1	0	0	1	2	0	0	2	2	0	8	0.7
BAS	*Austrovenus stutchburyi*	<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	2	0	2	0.2
		Total	0	0	0	0	0	0	0	0	0	0	2	0	2	0.2
BML	*Macamona liliana*	<5	3	1	4	0	1	0	0	0	8	3	3	6	29	2.4
		5-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		>15	1	0	0	1	1	1	0	0	1	0	4	1	10	0.8
		Total	4	1	4	1	2	1	0	0	9	3	7	7	39	3.3
BNH	*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	0	0	0	0	0.0
		Total	0	0	0	0	1	0	0	0	0	0	0	0	1	0.1
BPA	*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
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL	*Theora lubrica*	<5	0	0	0	1	0	1	1	4	3	2	1	3	16	1.3
		>5	0	0	2	0	0	0	1	0	2	0	1	0	6	0.5
		Total	0	0	2	1	0	1	2	4	5	2	2	3	22	1.8
CUMACEANS																
CCL	*Colurostylis lemurum*		5	0	1	0	3	0	1	2	1	2	0	1	16	1.3
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*		3	1	4	2	3	3	0	6	2	3	0	0	27	2.3
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	9	5	1	1	2	1	2	3	5	2	2	33	2.8
PBOC	Polydorids *(Boccardia syrtis)*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PCOS	*Cossura* sp.		22	2	14	30	13	47	34	46	22	32	32	16	310	25.8
PEUC	*Euchone* sp.		0	2	2	0	1	0	0	6	2	0	0	0	13	1.1
PGE	*Goniada* sp.		0	1	0	1	0	0	0	1	1	2	2	0	8	0.7
PGLY	*Glycera* sp.		0	2	1	0	2	1	1	0	0	0	1	2	10	0.8
PHF	Capitellidae *(Heteromastus filiformis)*		14	14	23	16	12	12	13	6	11	21	6	5	153	12.8
PMD	*Magelona dakini*		0	1	1	0	0	0	0	1	0	0	0	0	3	0.3
PNIC	Nereidae		1	1	0	1	0	2	2	2	0	0	1	1	11	0.9
POP	*Orbinia papillosa*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PPAR	Paraonidae		2	1	1	2	2	2	1	1	0	1	1	0	14	1.2
NON INDICATOR SPECIES																
CAMPH	Amphipods		1	0	0	0	0	0	0	0	0	1	0	4	6	0.5
CCRAB	Crabs		0	0	0	0	0	2	2	1	0	0	0	4	9	0.8
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
CISO	Isopods		0	0	0	0	0	0	0	0	0	0	1	0	1	0.1
COST	Ostracods		0	1	0	1	0	0	2	0	0	0	0	0	4	0.3
CSHR	Shrimps/Mysids		0	0	0	0	2	0	0	1	0	0	0	0	3	0.3
COTH	Other Crustaceans		4	0	0	0	2	0	0	0	0	0	5	0	11	0.9
BOTH	Bivalves		4	5	2	5	8	1	6	6	6	6	6	4	59	4.9
GOTH	Gastropods		1	2	3	1	0	3	0	2	1	0	3	2	18	1.5
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	1	3	1	6	0	0	2	3	1	0	0	18	1.5
POTH	Polychaetes		4	9	3	3	3	3	6	3	3	1	1	2	41	3.4
OOLIG	Oligochaetes		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OFLAT	Flatworms		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OEDW	*Edwardsia*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
OTHER	Misc. Other [Phoronid]		1	0	0	0	0	0	0	0	0	0	0	0	1	0.1
TOTAL			**70**	**55**	**74**	**81**	**65**	**82**	**84**	**108**	**78**	**92**	**77**	**56**	**922**	**76.8**

OB April 2002

INDICATOR SPECIES			CORE NUMBER												TOTAL	MEAN
			1	3	4	7	8	9	10	11	12	13	14	15		
AMPHIPODS																
ACOR	*Corophiidae*		0	0	0	0	4	0	0	0	0	0	0	0	4	0.3
APHOX	*Phoxocephalidae*		2	0	4	1	0	0	1	3	1	0	0	1	13	1.1
BIVALVES		**SIZE**														
BAB	*Arthritica bifurca*	<2	0	0	2	3	0	1	1	0	2	1	1	1	12	1.0
		>2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	0	2	3	0	1	1	0	2	1	1	1	12	1.0
BAS	*Austrovenus stutchburyi*	<5	0	1	0	0	0	0	0	0	0	0	0	1	2	0.2
		>5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
		Total	0	1	0	0	0	0	0	0	0	0	0	1	2	0.2
BML	*Macamona liliana*	<5	0	0	1	0	0	0	0	3	2	1	1	1	9	0.8
		5-15	0	0	0	0	0	0	0	0	1	0	0	0	1	0.1
		>15	0	1	1	0	0	0	0	0	1	0	2	0	5	0.4
		Total	0	1	2	0	0	0	0	3	4	1	3	1	15	1.3
BNH	*Nucula hartvigiana*	<2	0	0	0	1	0	0	0	1	0	0	0	1	3	0.3
		>2	0	0	0	0	0	1	0	0	1	0	0	0	2	0.2
		Total	0	0	0	1	0	1	0	1	1	0	0	1	5	0.4
BPA	*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
		Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
BTHL	*Theora lubrica*	<5	0	0	2	0	2	0	4	7	2	5	1	6	29	2.4
		>5	0	0	0	0	1	2	1	0	1	0	0	1	6	0.5
		Total	0	0	2	0	3	2	5	7	3	5	1	7	35	2.9
CUMACEANS																
CCL	*Colurostylis lemurum*		0	4	3	5	2	1	1	1	0	0	0	4	21	1.8
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	1	5	2	2	3	4	5	3	3	1	0	30	2.5
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.		2	2	0	1	1	0	1	2	2	1	0	1	13	1.1
PBOC	Polydorids *(Boccardia syrtis)*		0	0	0	1	0	0	0	0	0	0	0	0	1	0.1
PCOS	*Cossura* sp.		13	33	17	40	39	24	10	51	49	18	13	38	345	28.8
PEUC	*Euchone* sp.		0	1	0	1	1	0	0	0	0	0	0	0	3	0.3
PGE	*Goniada* sp.		0	1	0	0	0	0	1	0	2	1	1	1	7	0.6
PGLY	*Glycera* sp.		2	0	0	0	0	0	0	1	1	1	0	0	5	0.4
PHF	Capitellidae *(Heteromastus filiformis)*		18	12	8	14	5	9	6	14	36	9	4	13	148	12.3
PMD	*Magelona dakini*		0	1	1	0	0	0	0	1	3	0	1	0	7	0.6
PNIC	Nereidae		0	2	2	5	4	2	2	3	7	4	3	2	36	3.0
POP	*Orbinia papillosa*		0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
PPAR	Paraonidae		1	0	0	1	2	0	0	1	0	0	0	0	5	0.4
NON INDICATOR SPECIES																
CAMPH	Amphipods		0	0	0	0	0	0	0	1	0	2	0	2	5	0.4
CCRAB	Crabs		0	1	0	1	0	0	1	1	1	0	1	0	6	0.5
CCUM	Cumaceans		0	0	0	0	0	0	0	0	0	0	0	2	2	0.2
CISO	Isopods		0	1	0	0	0	0	0	0	0	0	0	0	1	0.1
COST	Ostracods		1	2	0	0	0	0	0	2	0	0	0	2	7	0.6
CSHR	Shrimps/Mysids		0	0	0	0	1	0	0	0	0	0	0	0	1	0.1
COTH	Other Crustaceans		0	0	0	0	0	0	0	0	1	0	0	1	2	0.2
BOTH	Bivalves		0	0	0	0	0	0	0	1	2	1	0	0	4	0.3
GOTH	Gastropods		8	2	6	1	3	0	1	0	5	1	2	3	32	2.7
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	1	1	0	1	1	0	0	0	4	0.3
POTH	Polychaetes		6	4	3	5	5	4	0	1	3	1	1	4	37	3.1
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 [Phoronid]		0	0	0	0	1	1	0	0	1	0	1	0	4	0.3
TOTAL			**54**	**69**	**55**	**82**	**74**	**49**	**34**	**100**	**128**	**49**	**33**	**85**	**812**	**67.7**

Appendix 3 - Dry weight of shell-hash

April 2001

Southern Firth of Thames

Site	Sample No.	Initial tray weight	Final weight	Shell hash weight (g)
KA	1	6.5	153.4	146.9
	2	6.5	209.3	202.8
	3	6.5	220.9	214.4
	4	6.5	114.0	107.5
	5	6.5	132.3	125.8
	6	6.5	166.8	160.3
	7	6.5	154.2	147.7
	10	6.6	348.0	341.4
	12	6.6	147.6	141.0
	14	6.5	92.1	85.6
	15	6.6	180.6	174.0
	16	6.5	162.7	156.2
	17	6.4	190.2	183.8
	18	6.4	212.9	206.5
	19	6.5	168.2	161.7
GC	1	14.0	907.7	893.7
	2	14.1	945.5	931.4
	3	14.2	1189.4	1175.2
	4	14.0	1082.6	1068.6
	5	14.3	903.8	889.5
	7	13.8	1292.8	1279.0
	9	13.8	704.5	690.7
	10	14.1	1095.8	1081.7
	11	14.1	1128.6	1114.5
	12	14.2	659.7	645.5
	14	13.8	1146.0	1132.2
	16	14.1	589.0	574.9
	17	13.8	516.8	503.0
	18	13.9	570.8	556.9
	19	14.3	816.8	802.5
TP	4	6.4	39.0	32.6
	5	6.6	31.0	24.4
	6	6.5	22.8	16.3
	7	6.6	38.4	31.8
	8	6.6	139.4	132.8
	9	6.3	317.9	311.6
	10	6.5	16.7	10.2
	11	6.7	37.7	31.0
	12	6.6	44.9	38.3
	13	6.6	32.9	26.3
	14	6.4	22.3	15.9
	15	6.4	54.9	48.5
	17	6.4	88.8	82.4
	18	6.7	25.4	18.7
	20	6.6	44.5	37.9
MI	2	6.5	233.0	226.5
	5	6.5	230.6	224.1
	6	6.5	232.3	225.8
	8	6.4	294.7	288.3
	10	6.5	206.1	199.6
	11	6.5	186.4	179.9
	12	6.5	251.4	244.9
	13	6.5	234.7	228.2
	14	6.5	298.0	291.5
	15	6.7	219.6	212.9
	16	6.4	212.5	206.1
	17	6.7	276.8	270.1
	18	6.7	268.3	261.6
	19	6.5	221.4	214.9
	20	6.6	293.8	287.2
KB	1	6.5	147.4	140.9
	2	6.6	182.7	176.1
	3	6.5	159.9	153.4
	4	6.7	179.1	172.4
	5	6.6	149.3	142.7
	6	6.7	153.3	146.6
	7	6.6	138.9	132.3
	8	6.3	204.3	198.0
	9	6.4	128.9	122.5
	11	6.4	164.7	158.3
	13	6.7	167.4	160.7
	14	6.6	120.0	113.4
	16	6.6	149.4	142.8
	17	6.7	130.9	124.2
	20	6.4	135.8	129.4

Whaingaroa Harbour

Site	Sample No.	Initial tray weight	Final weight	Shell hash weight (g)
TU	1	6.6	434.0	427.4
	2	6.5	88.9	82.4
	3	6.5	129.1	122.6
	4	6.5	93.7	87.2
	6	6.5	86.2	79.7
	8	6.4	119.5	113.1
	11	6.4	75.8	69.4
	12	6.4	73.5	67.1
	13	6.5	139.6	133.1
	14	6.6	143.6	137.0
	15	6.5	107.6	101.1
	17	6.4	223.1	216.7
	18	6.6	111.1	104.5
	19	6.5	135.5	129.0
	20	6.4	125.5	119.1
HB	1	6.5	260.4	253.9
	2	6.5	175.2	168.7
	3	6.5	108.7	102.2
	4	6.4	129.9	123.5
	5	6.5	117.3	110.8
	7	6.6	281.4	274.8
	9	6.4	197.6	191.2
	10	6.7	187.6	180.9
	12	6.8	120.1	113.3
	14	6.5	192.5	186.0
	16	6.5	259.1	252.6
	17	6.5	213.3	206.8
	18	6.4	350.1	343.7
	19	6.6	257.1	250.5
	20	6.5	179.6	173.1
X			no sample	
			no sample	
			no sample	
			no sample	
			no sample	
			no sample	
			no sample	
			no sample	
			no sample	
			no sample	
			no sample	
			no sample	
			no sample	
			no sample	
			no sample	
WI	1	6.5	85.4	78.9
	2	6.6	257.0	250.4
	4	6.7	307.5	300.8
	5	6.6	247.8	241.2
	6	6.5	206.9	200.4
	8	6.4	115.9	109.5
	9	6.5	117.1	110.6
	10	6.4	157.8	151.4
	11	6.5	145.8	139.3
	13	6.5	164.3	157.8
	14	6.4	181.8	175.4
	15	6.5	133.0	126.5
	17	6.5	183.2	176.7
	18	6.6	158.4	151.8
	20	6.8	190.1	183.3
OB	1	6.6	86.5	79.9
	2	6.5	68.7	62.2
	3	6.6	63.5	56.9
	5	6.4	134.7	128.3
	6	6.5	61.5	55.0
	8	6.6	85.5	78.9
	9	6.5	59.7	53.2
	10	6.6	44.1	37.5
	11	6.6	40.5	33.9
	13	6.6	42.6	36.0
	14	6.5	110.8	104.3
	15	6.5	46.8	40.3
	16	6.6	53.1	46.5
	18	6.5	99.9	93.4
	19	6.5	99.4	92.9

July 2001

Southern Firth of Thames

Site	Sample No.	Initial tray weight	Final weight	Shell hash weight (g)
MI	1	13.7	261.3	247.6
	2	13.9	311.1	297.2
	3	13.8	304.2	290.4
	4	13.8	262.2	248.4
	5	13.7	338.1	324.4
	6	13.9	282.0	268.1
	7	13.6	226.8	213.2
	8	13.8	167.0	153.2
	9	14.0	194.7	180.7
	10	13.6	235.5	221.9
	11	14.1	197.8	183.7
	12	14.1	264.8	250.7
	13	14.0	296.1	282.1
	14	14.0	329.0	315.0
	15	13.8	209.8	196.0
KB	1	6.6	203.4	196.8
	2	6.7	231.2	224.5
	3	6.8	211.3	204.5
	4	6.7	185.8	179.1
	5	6.6	152.9	146.3
	6	6.7	110.1	103.4
	7	6.7	179.8	173.1
	8	6.5	157.6	151.1
	9	6.3	145.9	139.6
	10	6.4	185.6	179.2
	11	6.4	175.6	169.2
	12	6.6	206.5	199.9
	13	6.5	147.3	140.8
	14	6.7	138.5	131.8
	15	6.7	137.7	131.0

Whaingaroa Harbour

Site	Sample No.	Initial tray weight	Final weight	Shell hash weight (g)
WI	1	13.7	106.4	92.7
	2	6.8	149.2	142.4
	3	6.7	135.4	128.7
	4	13.6	96.2	82.6
	5	6.7	89.7	83.0
	6	13.8	127.5	113.7
	7	6.6	99.5	92.9
	8	6.5	92.5	86.0
	9	6.6	201.0	194.4
	10	6.4	154.4	148.0
	11	14.0	124.1	110.1
	12	13.7	214.3	200.6
	13	13.9	179.2	165.3
	14	6.7	292.0	285.3
	15	14.1	146.8	132.7
OB	1	13.7	81.8	68.1
	2	13.8	79.7	65.9
	3	13.7	92.6	78.9
	4	13.7	64.4	50.7
	5	13.8	73.0	59.2
	6	13.8	81.6	67.8
	7	13.9	75.8	61.9
	8	13.8	73.3	59.5
	9	6.3	30.9	24.6
	10	6.7	63.2	56.5
	11	6.6	69.5	62.9
	12	6.7	56.7	50.0
	13	6.5	64.6	58.1
	14	6.7	44.7	38.0
	15	6.4	45.0	38.6

October 2001

Southern Firth of Thames

Site	Sample No.	Initial tray weight	Final weight	Shell hash weight (g)
KA	1	6.5	55.5	49.0
	2	6.7	95.3	88.6
	3	6.8	72.7	65.9
	5	6.8	121.4	114.6
	6	6.5	37.9	31.4
	8	6.5	54.9	48.4
	9	6.7	27.8	21.1
	10	6.7	69.4	62.7
	11	6.5	108.1	101.6
	13	6.8	71.1	64.3
	14	6.7	40.3	33.6
	15	6.7	60.5	53.8
GC	1	13.7	1190.6	1176.9
	3	27.9	1531.9	1504.0
	4	14.1	1452.7	1438.6
	5	14.1	767.6	753.5
	6	28.0	1779.6	1751.6
	7	14.0	779.2	765.2
	8	14.0	729.3	715.3
	10	13.8	1073.2	1059.4
	11	27.6	1575.0	1547.4
	12	10.0	274.4	264.4
	13	10.1	276.8	266.7
	15	14.4	1188.3	1173.9
TP	1	6.6	30.5	23.9
	4	6.8	55.6	48.8
	5	6.7	64.1	57.4
	6	6.9	37.0	30.1
	7	6.7	398.3	391.6
	8	6.5	62.9	56.4
	9	6.5	35.0	28.5
	10	6.8	37.3	30.5
	11	6.7	241.2	234.5
	12	6.7	325.2	318.5
	13	6.6	351.5	344.9
	15	6.9	78.6	71.7
MI	1	9.8	272.0	262.2
	2	9.9	192.3	182.4
	4	9.7	252.7	243.0
	5	9.8	230.7	220.9
	6	10.0	247.3	237.3
	8	10.4	247.9	237.5
	9	14.4	453.8	439.4
	10	9.9	262.2	252.3
	11	9.7	350.0	340.3
	12	9.7	234.7	225.0
	13	9.8	297.2	287.4
	14	9.7	240.9	231.2
KB	3	14.1	213.9	199.8
	5	13.9	174.2	160.3
	6	6.7	210.8	204.1
	7	13.7	233.8	220.1
	8	13.8	171.5	157.7
	9	13.7	232.7	219.0
	10	14.0	173.5	159.5
	11	6.3	127.6	121.3
	12	6.7	150.3	143.6
	13	13.8	136.0	122.2
	14	13.7	120.2	106.5
	15	14.1	198.7	184.6

Whaingaroa Harbour

Site	Sample No.	Initial tray weight	Final weight	Shell hash weight (g)
TU	1	9.6	119.2	109.6
	2	9.6	107.3	97.7
	3	9.9	188.0	178.1
	4	10.0	87.9	77.9
	5	9.9	149.7	139.8
	6	9.9	121.2	111.3
	8	9.6	137.8	128.2
	9	6.6	101.5	94.9
	10	9.6	115.2	105.6
	11	9.6	188.6	179.0
	14	9.6	104.7	95.1
	15	9.6	96.3	86.7
HB	1	9.9	251.7	241.8
	2	9.7	147.1	137.4
	3	9.9	222.9	213.0
	4	9.9	129.0	119.1
	5	9.8	134.6	124.8
	6	10.0	163.5	153.5
	7	10.0	145.5	135.5
	8	9.6	254.5	244.9
	9	10.0	114.6	104.6
	11	9.9	314.6	304.7
	12	10.1	44.1	34.0
	15	10.5	139.1	128.6
X	1	9.8	148.8	139.0
	2	9.8	197.4	187.6
	3	9.8	146.4	136.6
	4	9.8	151.5	141.7
	5	9.8	123.8	114.0
	6	9.8	151.4	141.6
	8	10.0	152.9	142.9
	9	13.9	455.6	441.7
	10	13.9	312.7	298.8
	11	9.6	302.5	292.9
	12	13.8	510.7	496.9
	15	9.6	202.4	192.8
WI	1	13.9	251.5	237.6
	5	6.7	152.3	145.6
	6	7.3	110.7	103.4
	7	6.8	104.3	97.5
	8	6.7	98.6	91.9
	9	6.8	107.3	100.5
	10	6.9	133.5	126.6
	11	6.7	122.7	116.0
	12	6.4	123.4	117.0
	13	6.8	100.7	93.9
	14	14.1	266.5	252.4
	15	10.1	159.4	149.3
OB	1	9.9	121.4	111.5
	2	9.6	103.3	93.7
	3	9.6	80.2	70.6
	4	9.6	52.8	43.2
	5	9.7	79.6	69.9
	6	9.8	70.6	60.8
	7	6.5	37.1	30.6
	9	6.7	47.8	41.1
	10	6.6	39.9	33.3
	11	7.0	50.1	43.1
	12	6.8	220.4	213.6
	14	14.1	70.1	56.0

January 2002

Southern Firth of Thames

Site	Sample No.	Initial tray weight	Final weight	Shell hash weight (g)
MI	1	9.9	242.7	232.8
	2	10.3	236.1	225.8
	3	13.8	412.2	398.4
	5	13.9	368.7	354.8
	6	10.5	203.3	192.8
	8	10.3	213.7	203.4
	9	10.0	318.7	308.7
	10	9.9	304.9	295.0
	12	9.7	267.5	257.8
	13	10.0	233.2	223.2
	14	9.8	290.7	280.9
	15	10.9	288.0	277.1
KB	1	6.3	161.7	155.4
	2	6.7	231.5	224.8
	3	6.5	152.8	146.3
	4	9.7	196.5	186.8
	5	9.7	191.5	181.8
	6	10.1	165.9	155.8
	8	10.1	196.3	186.2
	11	10.0	222.0	212.0
	12	10.3	229.2	218.9
	13	10.4	309.6	299.2
	14	10.6	186.0	175.4
	15	10.2	164.7	154.5

Whaingaroa Harbour

Site	Sample No.	Initial tray weight	Final weight	Shell hash weight (g)
WI	1	10.3	90.9	80.6
	2	9.7	204.6	194.9
	3	10.0	335.2	325.2
	4	10.7	120.0	109.3
	5	9.7	131.3	121.6
	6	9.8	186.3	176.5
	7	10.1	170.6	160.5
	10	9.6	189.2	179.6
	12	9.6	85.4	75.8
	13	9.6	146.8	137.2
	14	9.9	211.9	202.0
	15	9.9	212.9	203.0
OB	2	6.5	82.9	76.4
	3	6.7	87.8	81.1
	4	6.6	86.0	79.4
	5	6.7	86.2	79.5
	6	6.9	123.9	117.0
	7	6.7	64.9	58.2
	8	6.7	65.6	58.9
	9	6.8	71.8	65.0
	10	6.6	33.4	26.8
	11	6.7	57.9	51.2
	13	6.8	34.5	27.7
	15	6.8	51.0	44.2

April 2002

Southern Firth of Thames

Site	Sample No.	Initial tray weight	Final weight	Shell hash weight (g)
KA	2	10.1	43.9	33.8
	3	10.2	34.8	24.6
	4	9.8	102.1	92.3
	5	10.2	37.8	27.6
	6	9.9	80.1	70.2
	7	9.7	65.2	55.5
	8	9.7	79.0	69.3
	9	10.2	60.8	50.6
	10	9.7	59.7	50.0
	12	9.9	69.2	59.3
	13	10.1	67.3	57.2
	14	9.6	61.7	52.1
GC	1	14.2	940.1	925.9
	2	27.7	1587.5	1559.8
	3	23.8	1528.8	1505.0
	4	27.8	1915.7	1887.9
	5	14.0	754.5	740.5
	6	14.1	1211.2	1197.1
	8	13.9	1144.2	1130.3
	9	28.1	1721.7	1693.6
	10	28.3	1626.1	1597.8
	11	27.8	2172.1	2144.3
	13	14.0	717.1	703.1
	15	14.3	991.0	976.7
TP	1	9.8	395.6	385.8
	2	10.3	187.9	177.6
	3	10.0	209.1	199.1
	5	10.0	262.4	252.4
	6	13.8	720.6	706.8
	7	13.8	1156.5	1142.7
	8	9.9	198.1	188.2
	10	10.2	93.5	83.3
	11	9.9	141.4	131.5
	12	9.9	238.6	228.7
	14	10.2	372.3	362.1
	15	9.9	404.0	394.1
MI	1	9.8	141.8	132.0
	2	9.8	242.4	232.6
	3	10.1	268.3	258.2
	4	1.1	250.0	248.9
	6	9.7	171.5	161.8
	7	10.0	198.5	188.5
	8	10.0	281.2	271.2
	9	9.9	318.4	308.5
	11	9.9	367.7	357.8
	12	9.9	236.0	226.1
	13	9.8	359.5	349.7
	14	10.1	281.1	271.0
KB	1	6.7	206.8	200.1
	2	7.1	216.2	209.1
	4	6.9	226.1	219.2
	5	7.0	229.7	222.7
	6	6.8	169.8	163.0
	8	6.6	154.2	147.6
	10	6.7	218.1	211.4
	11	6.9	208.3	201.4
	12	6.5	236.2	229.7
	13	9.9	175.4	165.5
	14	9.7	239.4	229.7
	15	9.9	206.9	197.0

Whaingaroa Harbour

Site	Sample No.	Initial tray weight	Final weight	Shell hash weight (g)
TU	1	9.9	378.7	368.8
	2	9.8	109.0	99.2
	3	9.6	125.5	115.9
	4	9.3	181.3	172.0
	5	9.6	91.1	81.5
	6	9.6	116.5	106.9
	7	7.1	303.0	295.9
	8	6.7	108.4	101.7
	10	6.7	77.6	70.9
	11	6.9	87.4	80.5
	12	6.8	170.7	163.9
	14	6.8	128.5	121.7
HB	1	9.7	208.6	198.9
	3	9.7	144.8	135.1
	4	10.3	114.7	104.4
	5	9.7	106.9	97.2
	6	9.8	246.8	237.0
	7	9.6	168.5	158.9
	8	10.3	132.2	121.9
	11	10.0	223.3	213.3
	12	10.0	284.5	274.5
	13	9.9	201.3	191.4
	14	9.8	237.0	227.2
	15	9.8	183.5	173.7
X	1	9.5	169.4	159.9
	4	10.5	329.5	319.0
	5	10.3	170.6	160.3
	6	10.1	201.5	191.4
	7	9.9	371.1	361.2
	8	9.7	254.5	244.8
	10	9.9	170.1	160.2
	11	9.9	137.1	127.2
	12	9.6	164.8	155.2
	13	10.1	134.7	124.6
	14	10.0	96.0	86.0
	15	10.1	106.2	96.1
WI	1	9.6	166.2	156.6
	3	10.2	247.2	237.0
	4	9.9	150.5	140.6
	5	10.1	225.8	215.7
	6	9.8	92.6	82.8
	7	10.5	105.8	95.3
	9	9.9	128.0	118.1
	10	9.9	86.4	76.5
	11	9.8	135.6	125.8
	12	9.9	112.9	103.0
	13	10.0	97.5	87.5
	15	9.9	114.0	104.1
OB	1	9.9	106.6	96.7
	3	10.0	74.3	64.3
	4	10.0	60.3	50.3
	7	9.6	28.3	18.7
	8	10.0	79.1	69.1
	9	9.8	46.4	36.6
	10	9.9	53.4	43.5
	11	9.7	85.7	76.0
	12	9.7	96.5	86.8
	13	9.9	55.3	45.4
	14	9.9	97.8	87.9
	15	9.8	125.3	115.5

Appendix 4 – Sediment organic matter content

Southern Firth of Thames

April 2001

	Total Organic Carbon g/100g dry wt	Dry Matter g/100g as rcvd	Total Nitrogen g/100g dry wt
KA	0.35	67.6	0.07
	0.27	69.5	0.05
	0.34	65.8	0.07
	0.31	65.6	0.07
	0.30	66.8	0.06
GC	0.42	64.7	0.10
	0.53	57.1	0.10
	0.42	60.0	0.08
	0.50	58.9	0.09
	0.54	58.1	0.09
TP	0.18	67.6	0.05
	0.20	68.4	0.05
	0.22	66.7	0.05
	0.21	69.9	0.05
	0.17	67.4	0.05
MI	0.19	71.0	0.05
	0.22	70.9	0.05
	0.23	70.2	0.05
	0.25	71.4	0.06
	0.28	71.9	0.08
KB	0.43	65.7	0.28
	0.38	65.5	0.07
	0.33	68.8	0.06
	0.38	65.0	0.07
	0.45	64.3	0.08

July 2001

	Total Organic Carbon g/100g dry wt	Dry Matter g/100g as rcvd	Total Nitrogen g/100g dry wt
MI	0.46	77.1	0.08
	0.29	68.2	0.09
	0.29	71.6	0.09
	0.30	74.3	0.10
	0.28	75.7	0.14
KB	0.68	66.7	0.05
	0.48	58.8	0.08
	0.33	70.0	0.09
	0.51	65.3	0.09
	0.51	72.4	0.06

October 2001

	Total Organic Carbon g/100g dry wt	Dry Matter g/100g as rcvd	Total Nitrogen g/100g dry wt
KA	1.43	31.2	0.21
	1.55	29.4	0.21
	1.47	27.5	0.21
	1.29	30.5	0.19
	1.45	26.4	0.23
GC	0.31	65.3	0.07
	0.47	63.9	0.08
	0.51	68.3	0.08
	0.51	62.8	0.11
	0.57	60.1	0.10
TP	0.21	66.1	0.05
	0.33	67.2	0.06
	0.21	62.8	0.06
	0.22	67.9	0.07
	0.21	64.7	0.05
MI	0.25	72.7	0.06
	0.31	70.6	0.07
	0.27	69.5	0.06
	0.27	72.5	0.06
	0.32	73.2	0.06
KB	0.50	60.1	0.14
	0.42	61.3	0.14
	0.42	62.6	0.16
	0.40	66.0	0.17
	0.46	63.9	0.19

Whaingaroa Harbour

April 2001

	Total Organic Carbon g/100g dry wt	Dry Matter g/100g as rcvd	Total Nitrogen g/100g dry wt
TU	0.42	68.4	0.06
	0.38	72.1	0.08
	0.53	67.3	0.08
	0.43	68.7	0.07
	0.53	66.6	0.08
HB	0.80	58.2	0.11
	0.73	60.6	0.10
	0.79	62.5	0.12
	0.78	60.5	0.11
	0.72	57.5	0.10
X	no sample	no sample	no sample
	no sample	no sample	no sample
	no sample	no sample	no sample
	no sample	no sample	no sample
	no sample	no sample	no sample
WI	0.53	67.7	0.08
	0.47	70.3	0.07
	0.46	68.5	0.07
	1.28	72.2	0.09
	0.48	68.5	0.08
OB	0.68	60.3	0.10
	0.68	60.8	0.09
	0.60	62.5	0.08
	0.63	61.9	0.09
	0.59	61.9	0.08

July 2001

	Total Organic Carbon g/100g dry wt	Dry Matter g/100g as rcvd	Total Nitrogen g/100g dry wt
WI	0.44	66.9	0.17
	0.43	67.4	0.08
	0.47	64.5	0.07
	0.52	62.3	0.07
	0.55	60.7	0.07
OB	0.70	55.6	0.10
	0.67	56.6	0.09
	0.66	56.5	0.09
	0.57	60.9	0.12
	0.54	61.6	0.10

October 2001

	Total Organic Carbon g/100g dry wt	Dry Matter g/100g as rcvd	Total Nitrogen g/100g dry wt
TU	0.38	71.1	0.07
	0.47	68.2	0.09
	0.43	69.3	0.12
	0.65	65.6	0.11
	0.34	74.4	0.07
HB	0.79	58.1	0.10
	0.82	55.3	0.11
	0.79	57.3	0.11
	0.79	57.3	0.11
	0.77	54.9	0.11
X	0.42	70.9	0.08
	0.35	73.0	0.08
	0.37	74.9	0.07
	0.38	73.5	0.08
	0.37	74.4	0.07
WI	0.43	67.2	0.11
	0.41	66.7	0.10
	0.45	67.7	0.10
	0.41	68.2	0.09
	0.38	67.3	0.09
OB	0.61	61.9	0.10
	0.60	62.0	0.12
	0.57	59.2	0.06
	0.61	57.8	0.06
	0.61	59.9	0.06

Southern Firth of Thames

January 2002

	Total Organic Carbon g/100g dry wt	Dry Matter g/100g as rcvd	Total Nitrogen g/100g dry wt
MI	0.19	69.3	0.05
	0.19	70.2	0.06
	0.28	68.2	0.05
	0.19	73.1	0.05
	0.20	71.7	0.05
KB	0.30	68.6	0.12
	0.28	64.9	0.10
	0.39	63.1	0.12
	0.39	60.9	0.10
	0.42	59.3	0.12

April 2002

	Total Organic Carbon g/100g dry wt	Dry Matter g/100g as rcvd	Total Nitrogen g/100g dry wt
KA	0.48	56.7	0.13
	2.73	56.4	0.20
	0.43	62.2	0.13
	0.53	57.6	0.18
	3.27	56.7	0.16
GC	0.58	61.5	0.14
	0.39	63.5	0.09
	0.49	55.1	0.11
	0.45	62.0	0.10
	0.49	61.4	0.10
TP	0.19	64.9	0.06
	0.20	70.6	0.06
	0.18	68.4	0.06
	0.17	66.7	0.06
	0.21	63.6	0.06
MI	0.21	71.6	0.06
	0.17	73.7	0.05
	0.17	72.6	0.06
	0.17	73.7	0.06
	0.20	72.5	0.06
KB	0.33	65.4	0.07
	0.31	64.4	0.07
	0.51	60.2	0.14
	0.36	64.7	0.08
	0.29	66.8	0.07

Whaingaroa Harbour

	Total Organic Carbon g/100g dry wt	Dry Matter g/100g as rcvd	Total Nitrogen g/100g dry wt
WI	0.44	69.3	0.06
	0.33	69.1	0.06
	0.37	70.5	0.05
	0.35	68.4	0.05
	0.36	71.8	0.05
OB	0.66	65.3	0.08
	0.58	62.5	0.07
	0.53	64.0	0.07
	0.59	63.8	0.07
	0.61	64.6	0.08

	Total Organic Carbon g/100g dry wt	Dry Matter g/100g as rcvd	Total Nitrogen g/100g dry wt
TU	0.49	69.8	0.08
	0.47	68.6	0.07
	0.44	72.1	0.07
	0.43	74.4	0.06
	0.43	72.6	0.07
HB	0.73	56.7	0.11
	0.71	58.2	0.10
	0.75	60.6	0.09
	0.67	54.4	0.10
	0.73	56.0	0.10
X	0.48	70.6	0.06
	0.32	71.0	0.05
	0.28	68.0	0.06
	0.40	69.1	0.07
	0.46	69.0	0.07
WI	0.34	69.4	0.06
	0.41	64.7	0.07
	0.41	65.8	0.07
	0.41	72.9	0.06
	0.44	63.6	0.09
OB	0.51	65.0	0.06
	0.52	64.9	0.07
	0.49	65.7	0.07
	0.54	64.4	0.07
	0.59	63.9	0.08

Appendix 5 - Sediment photosynthetic pigment concentration

Southern Firth of Thames

April 2001

	Chlorophyll-*a* µg.g^{-1}	Pheophytin µg.g^{-1}
KA	3.10	3.98
	2.37	2.38
	1.68	2.60
	3.24	3.70
	2.65	2.29
GC	5.65	0.64
	5.15	0.54
	3.87	1.27
	6.02	0.42
	3.44	0.83
TP	1.26	1.44
	0.96	1.34
	1.11	1.60
	1.12	1.87
	1.49	1.88
MI	4.03	1.37
	4.57	0.85
	3.20	0.80
	2.59	1.14
	2.34	2.31
KB	6.10	5.73
	2.82	1.28
	2.01	1.14
	1.87	0.94
	2.69	1.70

July 2001

	Chlorophyll-*a* µg.g^{-1}	Pheophytin µg.g^{-1}
MI	4.48	1.02
	4.22	0.75
	5.27	1.02
	4.11	0.80
	5.08	0.92
KB	2.84	2.85
	2.16	2.74
	1.99	4.71
	3.70	1.67
	2.64	1.16

October 2001

	Chlorophyll-*a* µg.g^{-1}	Pheophytin µg.g^{-1}
KA	3.19	3.60
	2.33	4.30
	1.89	3.89
	3.11	4.71
	no sample	no sample
GC	2.07	1.06
	4.65	0.58
	2.38	1.10
	1.90	1.60
	3.26	1.30
TP	2.19	2.38
	0.45	0.30
	0.60	0.79
	0.68	0.89
	0.86	0.71
MI	5.65	0.10
	2.93	0.61
	4.33	0.75
	4.40	0.87
	4.34	0.76
KB	2.23	2.82
	1.50	4.81
	2.71	1.74
	1.20	0.97
	1.56	1.70

Whaingaroa Harbour

April 2001

	Chlorophyll-*a* µg.g^{-1}	Pheophytin µg.g^{-1}
TU	14.30	2.6
	3.99	2.8
	4.09	2.3
	13.80	4.7
	6.92	2.6
HB	4.90	2.3
	4.28	2.1
	2.70	3.1
	3.95	1.8
	3.80	1.9
X	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample
WI	5.18	3.0
	3.07	2.1
	4.98	3.6
	6.03	3.3
	3.73	3.0
OB	4.51	2.2
	3.72	2.0
	5.13	2.1
	4.02	2.2
	3.78	2.0

July 2001

	Chlorophyll-*a* µg.g^{-1}	Pheophytin µg.g^{-1}
WI	8.26	6.3
	5.61	4.5
	7.48	5.2
	2.97	3.8
	6.01	4.4
OB	4.25	4.3
	5.07	3.0
	5.28	2.9
	5.76	3.9
	4.75	3.8

October 2001

	Chlorophyll-*a* µg.g^{-1}	Pheophytin µg.g^{-1}
TU	5.71	3.2
	5.25	3.5
	6.83	2.4
	3.65	2.8
	5.42	4.4
HB	7.25	3.6
	5.21	2.9
	5.40	3.2
	4.13	2.6
	5.96	2.9
X	4.77	3.0
	12.40	3.7
	7.28	5.7
	7.45	3.0
	8.36	3.8
WI	5.19	3.1
	3.48	2.5
	2.91	2.6
	3.97	2.3
	2.82	3.3
OB	4.75	2.5
	3.39	2.5
	5.35	4.1
	5.36	3.5
	2.94	2.7

Southern Firth of Thames

January 2002

	Chlorophyll-*a* µg.g^{-1}	Pheophytin µg.g^{-1}
MI	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample
KB	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample

April 2002

	Chlorophyll-*a* µg.g^{-1}	Pheophytin µg.g^{-1}
KA	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample
GC	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample
TP	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample
MI	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample
KB	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample

Whaingaroa Harbour

	Chlorophyll-*a* µg.g^{-1}	Pheophytin µg.g^{-1}
WI	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample
OB	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample

	Chlorophyll-*a* µg.g^{-1}	Pheophytin µg.g^{-1}
TU	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample
HB	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample
X	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample
WI	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample
OB	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample
	no sample	no sample

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[12] 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 10% 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 10% 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 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.

[12] 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.