



## **Supplementary Environmental Information**

### *An Assessment of Temporal Variation of Benthic Invertebrate Communities in the Humber Estuary*

#### *Supplementary Report EX 34.2*

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**An Assessment of Temporal  
Variation of Benthic Invertebrate  
Communities in the Humber Estuary**

**Humber Estuary Review of  
Consents for the Habitats Directive.  
Review of Benthic Data Stage 2**

Report to Environment Agency

Institute of Estuarine and Coastal  
Studies  
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22 February, 2006

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**Report: YBB091**





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For and on behalf of the Institute of  
Estuarine and Coastal Studies

Approved by: \_\_\_\_\_

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## **EXECUTIVE SUMMARY**

## 1. INTRODUCTION

Several areas of the Humber estuary have been designated, for some time, as candidate Special Protection Areas (cSPA, under the Wild Birds Directive), candidate Special Areas of Conservation (cSAC, under the Habitats Directive), Ramsar sites, and Sites of Special Scientific Interest. However, the entire Humber estuary is now a proposed SAC and proposed SPA with such sites collectively making up a network of conservation areas across Europe known as Natura 2000 (English Nature, 2003). As a competent Authority under the Habitats Regulations, the Environment Agency is required to assess the possible effects of all activities / regulated discharges on Natura 2000 sites. In order to meet obligations to prevent deterioration of Natura 2000 sites, the Environment Agency, in conjunction with English Nature and the Countryside Council for Wales, is required to review all consents which may affect the integrity of these sites.

As part of this process, it is necessary to assess the health of the benthic communities of the Humber estuary and to identify any indications of response to or impact of any of the activities taking place on the estuary. The Environment Agency carry out routine monitoring of the intertidal and subtidal benthic communities within the estuary but a number of these data sets have not as yet been widely reported. Analyses of these data will take place in two stages, the first including analysis of recent data sets in order to identify areas of the estuary which may potentially be impacted and the second to include analysis of longer term data sets, examining spatial and temporal trends in the benthic communities in the estuary. This information will be related to the ecological functioning of the estuary and to update the Humber site characterisation report with recommendations for future monitoring programmes. The present report focuses on stage two and has the following objectives:

- Analysis of routine intertidal and subtidal data from 1979 to 2004 and a whole estuary grid survey from 1980 to 1995.
- Identification of any potentially impacted areas/communities
- Graphical presentation of the key features of the communities at each sampling site.
- Assess the variation over time of the benthic communities and if possible compare such variation with temporal trends in water/sediment quality
- Draw conclusions on status of the benthic communities in relation to water quality



## 2. METHODS

A number of recent benthic data sets, covering the intertidal and subtidal areas of the entire estuary, were provided by the Environment Agency and are summarised in Table 1. In addition, the most recent data from discharge specific monitoring programmes for Tioxide, Ciba Geigy, SCM and Courtaulds were provided. Given the large amount of data available it was not feasible to carry out the full suite of analysis which can be used to describe benthic community structure. Rather, a few simple univariate and multivariate tools were used to describe basic community structure, allow a broad assessment of the status of the benthos, and highlight any potential areas of impact due to reduced water quality.

No environmental data was available for this study (which limits the amount of interpretation possible) but nevertheless the data available should allow an assessment of ecological health of the benthos. Temporal analysis of the data will be carried out in a separate study, but in order to put the data into context, a few years of data has been assessed in most cases which will allow some assessment of inherent variability.

**Table 1. Summary of the data provided by The Environment Agency.**

Data set	Years	Number of sites
Intertidal North	1989 to 2003	12: Mid shore with upper and lower shore sites at some stations
Intertidal South	1981 to 2004	9 Mid shore with lower shore sites at some stations
Subtidal	1979 to 2004	14
Quinquennial (5 yearly)	1980 to 1995	72

### Univariate analysis.

Univariate methods involve analysis of a single component of a data set (e.g. abundance or number of species) and are useful in that they can be used to determine whether or not community differences can be attributed to conditions causing stress since they usually give an absolute or derived value. This can be used to make an assessment of the severity of change on a spatial and temporal scale. In general, replicate data was provided for intertidal data sets (5 x 0.01m<sup>2</sup> cores / site for each year) whilst subtidal data were provided as the sum of three replicates (3 x 0.1m<sup>2</sup>). In most cases a standardised number of replicates were used for each survey area. However, at some sites/years different numbers of replicates were used for sampling (e.g. for the Humber south bank). Consequently, for multivariate analysis of the South Bank dataset average abundance per core was used as opposed the total abundance per site. Any possible bias in the results due to sampling method were taken into account during interpretation but in practice these subtle differences in sampling regime were not particularly evident.

Due to the different sampling methods used and possible differences in levels of taxonomic resolution, the intertidal north and south bank and the subtidal (routine and quinquennial) data sets were analysed separately. Initial analysis of community structure was carried out by calculating the summed (and/or mean) abundance, percentage contribution to the community (dominance) and cumulative percentage dominance of each species for each site. This enables a rapid assessment of community structure for individual sites if required (e.g. to assess the presence or absence of pollution tolerant or pollution indicator species).

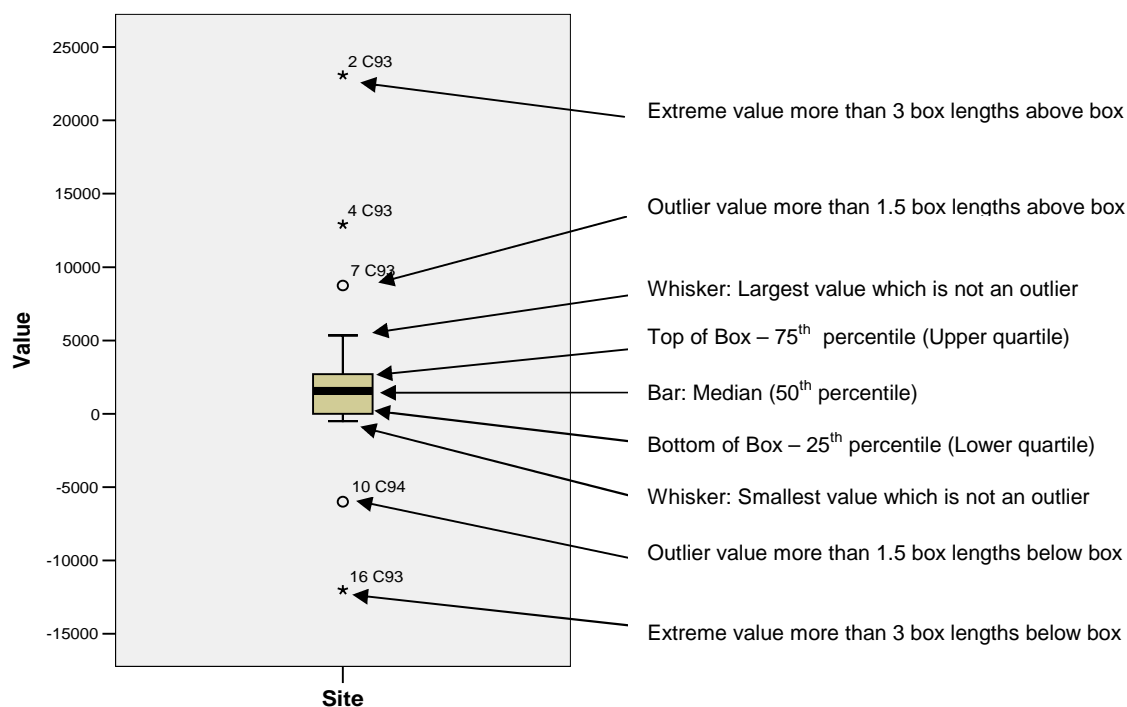
The following primary and derived biological parameters values were then calculated (using PRIMER version 5) for each site and summarised on maps using MapInfo<sup>TM</sup> (version 7.8) GIS software.

- The total number of taxa at each site (S)
- The total abundance of animals at each site (A) (expressed as number / 0.3 m<sup>2</sup> for subtidal sites and number / 0.0079 m<sup>2</sup> for intertidal sites).
- The abundance ratio (A/S) (a measure of dominance where high values indicate that the community is composed of very few species, occurring in high numbers).
- Shannon's diversity index (H') which incorporates the number of species together with the distribution (or evenness) of the individuals between the species. Increasing values of H' indicate increasing diversity.
- Pielou's evenness (J') gives a measure of evenness and describes the distribution of individuals between the species. High values of J' (approaching 1) indicate an even distribution (and higher diversity) whilst low values (close to 0) indicate that the majority of organisms belong to very few species (low diversity).

Whilst these indices are probably the most widely used for benthic analysis, the use of derived diversity indices (such as H' and J) are less effective in estuarine conditions particularly in dynamic naturally species poor habitats (such as the upper estuary). Consequently, these metrics can sometimes only provide limited information on species diversity and evenness. Following preliminary analysis it was decided to limit detailed analysis to just three of the metrics (number of species, abundance and Shannon's diversity) which are widely used (and reported). Whilst univariate parameters (such as H') may be of limited use in some habitats, they have been used in many other studies of Humber benthos and could allow comparison with historic data if required.

In order to summarise the biological parameters at each site over time a number of charting methods have been applied including the use of boxplots. These essentially give a graphical description of the range of values for a given parameter (e.g. for a site) which is useful to summarise the large amounts of data provided for this study. An example of a box plot is given in Figure 1.

The box plot is primarily used to summarise the central tendency for a parameter and give some information about its variability. It also provides some information on outliers or extreme values. These are statistical measures and would not necessarily indicate anything detrimental or unusual (in the biological sense) about the community parameter. These measures are purely an objective way of assessing sites which have somewhat (statistically) different values. Whilst multivariate analysis is likely to be a more robust method to detect outliers the boxplots provide an additional method for detecting sites with different characteristics. They are however likely to be very conservative as a means of describing outliers in the sense used to describe community structure and in most cases (given the inherent variability in biological parameters) will not imply disturbed or impacted communities. However, they can be used to rapidly assess the range of values in a dataset and any sites flagged as outliers or extreme values can be subsequently checked for any anomalies (e.g. high abundances of pollution tolerant taxa).



**Figure 1. Example of a box plot.**

## Multivariate techniques

Univariate techniques have the advantage that a value can be attached to observed changes (e.g. a diversity index) and can rapidly summarise a large amount of data into a single index or metric. However, these techniques are not species specific and two communities with entirely different taxonomic compositions could appear to have the same structure using these techniques. Multivariate techniques compare communities based on their component species and the relative importance of each in terms of abundance or biomass. A commonly used technique is the calculation of the Bray-Curtis similarity index which represents the overall similarity between each pair of samples. This similarity matrix can then be presented graphically in the form of a dendrogram which allows identification of groups of sites with distinct community structures, implying that the different patterns of the species present are consistent within the different groups. Elliott (1994) recommended that, in order to show robust trends, a combination of these techniques should be used. Whilst a wealth of multivariate analysis tools exist for benthic community analysis, for the purposes of the current study two techniques were used.

- Classification (cluster analysis) of the species data to derive groups of sites with similar species composition
- Ordination of the species data to derive 2D graphical representations of the similarity between sites

The multivariate analysis of the abundance data was carried out in order to describe the broad patterns and assemblages within the area. Classification (cluster analysis) of the data was undertaken using the Bray-Curtis similarity coefficient and grouped average (UPGMA)

clustering technique followed by a non metric MDS (multi dimensional scaling) ordination both using the PRIMER package (PRIMER-E, 2001). Cluster analysis is used to display graphically the similarity between sites based upon their species composition whereby the similarity between sites is calculated (in this case using the Bray-Curtis similarity coefficient) to produce a similarity matrix showing the percent similarity of sites (0% indicating no species in common and 100% indicating an identical community). These values are then used to plot a dendrogram or tree diagram in which sites are linked at their respective similarity to other sites and consequently it is possible to define groups of sites with similar species composition at a predefined level of similarity. Non metric MDS graphically displays the (rank) similarity between sites as a 2 dimensional plot in which the distances between sites indicates the level of similarity between them. The stress value associated with an MDS plot indicates the how faithful the plot is in representing the similarity between sites with low values (below 0.2) indicating a reasonable fit. The station groupings derived from cluster analysis have subsequently been superimposed onto the MDS plots and input into GIS. In addition the PRIMER routine ANOSIM has been used to test for differences in species composition between sites and different years.

The PRIMER software package (PRIMER-E, 2001) was used for analysis and abundance data was log transformed prior to analysis. Following analysis the main groups of sites derived from cluster analysis were analysed to provide summary tables of mean abundance (mean A) for each species in each group and also the % occupancy of each species in each group (% occ) – the proportion on sites in the group in which it occurs. Due to the large amount of data analysed it was not feasible to derive extremely detailed site groupings. Rather, a broad assessment of the main assemblages was attempted and any obvious outliers or anomalous site(s) which may potentially be impacted examined in more detail. Due to the large numbers of sites involved interpretation of the results of cluster analysis and ordination is problematic particularly with regard to detecting subtle temporal trends. Therefore, cluster analysis was also carried out on a site by site basis to give a simplified description of changes in community type through the time series. This analysis was carried out for the midshore intertidal and routine subtidal datasets.

The top five dominant taxa at each site for each year have also been tabulated in order to allow a rapid assessment of changes in characteristic species from one year to another. In addition, the numbers of pollution or disturbance tolerant species were also examined for trends. Typical examples of such taxa include capitellid polychaetes and tubificid oligochaetes. Whilst these species may form a part of a normal estuarine community, extreme abundances (or dominance over other taxa) in some habitats may indicate disturbance e.g. due to organic enrichment. The locations of sampling sites for each dataset are provided as maps in Figures 2 to 4.

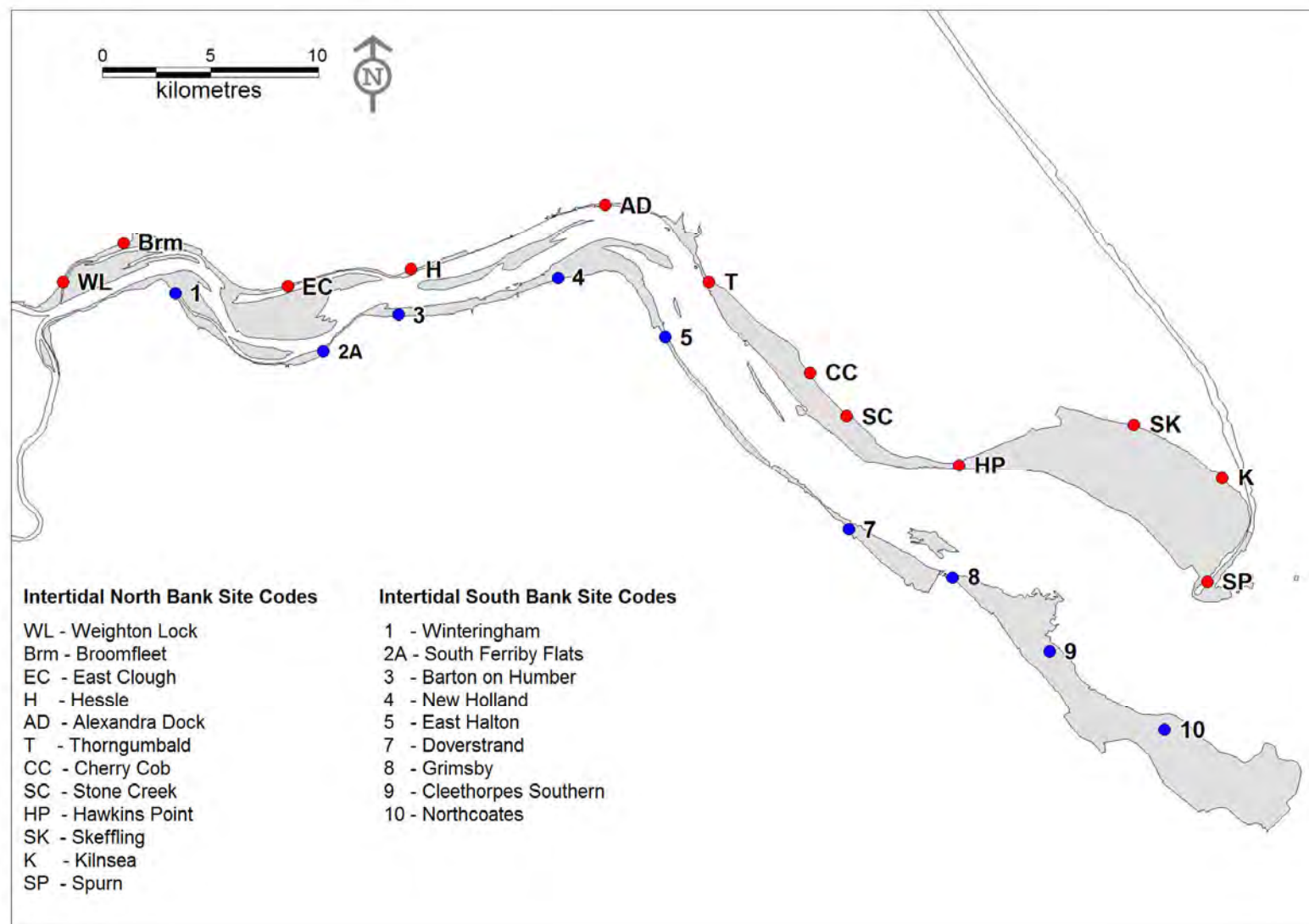


Figure 2. Routine intertidal survey stations.

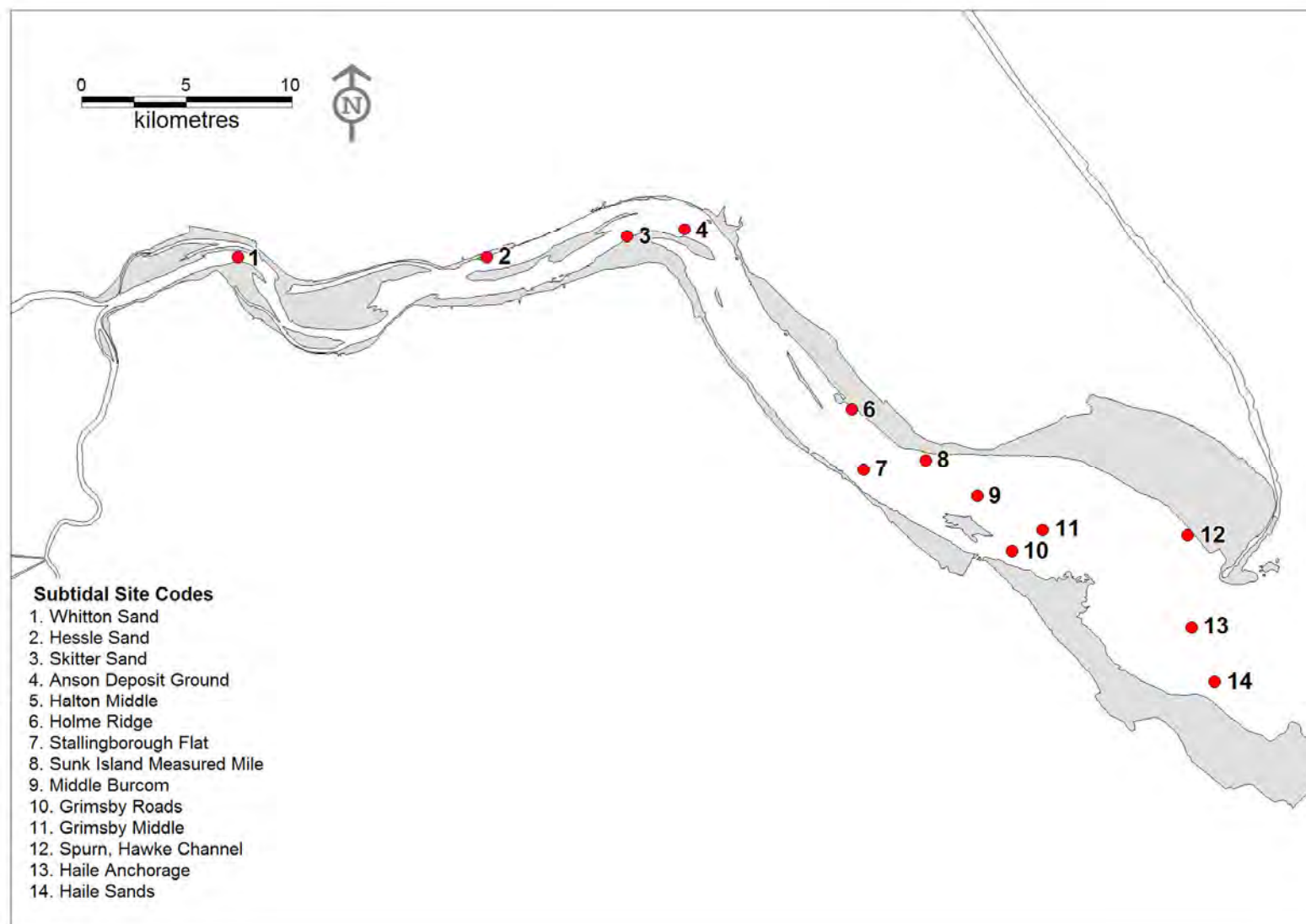
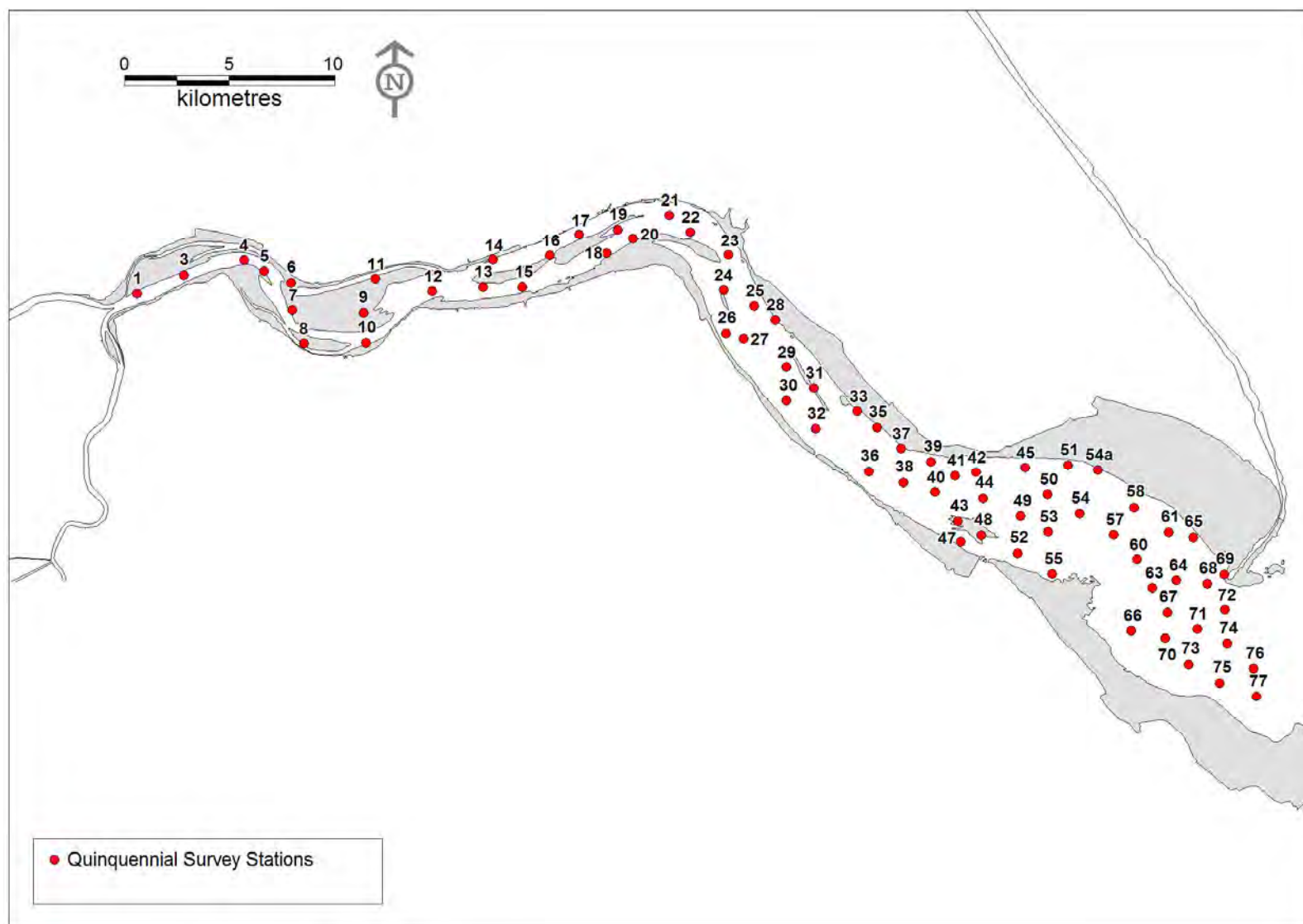


Figure 3. Routine subtidal survey stations.



**Figure 4. Quinquennial survey stations.**

### 3. WATER QUALITY OF THE HUMBER

In order to assess any potential changes in community structure with regard to water quality it is useful to highlight any major trends in contaminant discharges. However, it is not the purpose of this report to carry out an exhaustive review of changes in water quality over the past 20 years although recent studies (e.g. Thomson *et al.*, 2004), Environment Agency Humber reports (EA, 1998; EA, 1997) and data from the Environment Agency WIMS system indicate that water quality in the Humber has generally improved with regard to most contaminants over the past decade.

Whilst a wealth of water quality data exists for the Humber, it is difficult to directly correlate such information with the results of routine benthic sampling regimes and such analysis has not been attempted within this study. However, it is useful to identify some key water quality parameters for which long term data is available which may provide a useful summary of overall water quality in the Humber and adjoining tidal waters. To date, trends in dissolved oxygen (DO), Biological Oxygen Demand (BOD) and Ammonia concentrations have been assessed to ascertain if any major trends in these parameters can be matched with trends in the benthic data. A summary of these parameters is given in Figures 5 to 10. In addition, it was decided that whilst a detailed quantitative correlation between water/sediment quality and trends in the benthic community structure might not be feasible in the current study it would be informative to develop a 'timeline' of significant water quality impacts which may also be used to assist interpretation of the benthic data set. A preliminary timeline is given in Table 2.

**Table 2. Preliminary water quality timeline.**

Year	Month (approx)*	Discharge / event	Change	Likely significance / impact
1983	July	Pyewipe [Grimsby sewage]	New Long sea o/f operates	"+++
	Sept	<b>Sivand oil spill</b>	6 k-tonnes of crude escaped	"+++ *
1986	Nov	Riby St [Grimsby sewage]	Sewer o/f closes / abated	"+++
1989	Summer ?	TiO2 [SCM* & Tioxide]	O/f's relocated	"++
			Tioxide goes from lower P-W flats, to main channel	"+++
1990		Capper Pass closed		
1991	{Summer}	British Sugar [Brigg]	Discharge ceased	
1993		CIBA-Geigy (= Novartis)	O/f moved from P-W flats to Burcom shoal	"+ / ++?
1995		Cleethorpes Sthn o/f	Discharge ceased	(+)
1997	Spring	Courtaulds (= Acordis)	Discharge [viscose ] halved	(+)
1998		Thorne STW converted to secondary treatment 1998		
1999	May	Pyewipe [Grimsby sewage]	Secondary treatment intro'd	
1999		Selby STW converted to secondary treatment 1999		
1999		Goole STW started Late 1999 (formerly crude)		
1995-2000		<b>AMP2</b>		
2000		Hydro Agri (= Fisons)	Closed	
2000	September	Hull East & West stopped treatment	Sewage was transferred to & treated at Hull WWTW	
2000		Hull East Crude Outfall Ceased late 2000		
2000		Hull STW Started Late 2000		
2000		Sandall STW Nitrification started 2000.		
2001	May	Courtaulds (= Acordis)	Discharge [viscose ] closed	
2001	January	UWWTD conditions started	Secondary treatment intro'd	
2001		Hull West Crude Outfall Ceased late 2001		
2002	Feb to May	Hull West had a break down	discharging crude sewage into Humber	
2000-2005		<b>AMP3</b>		



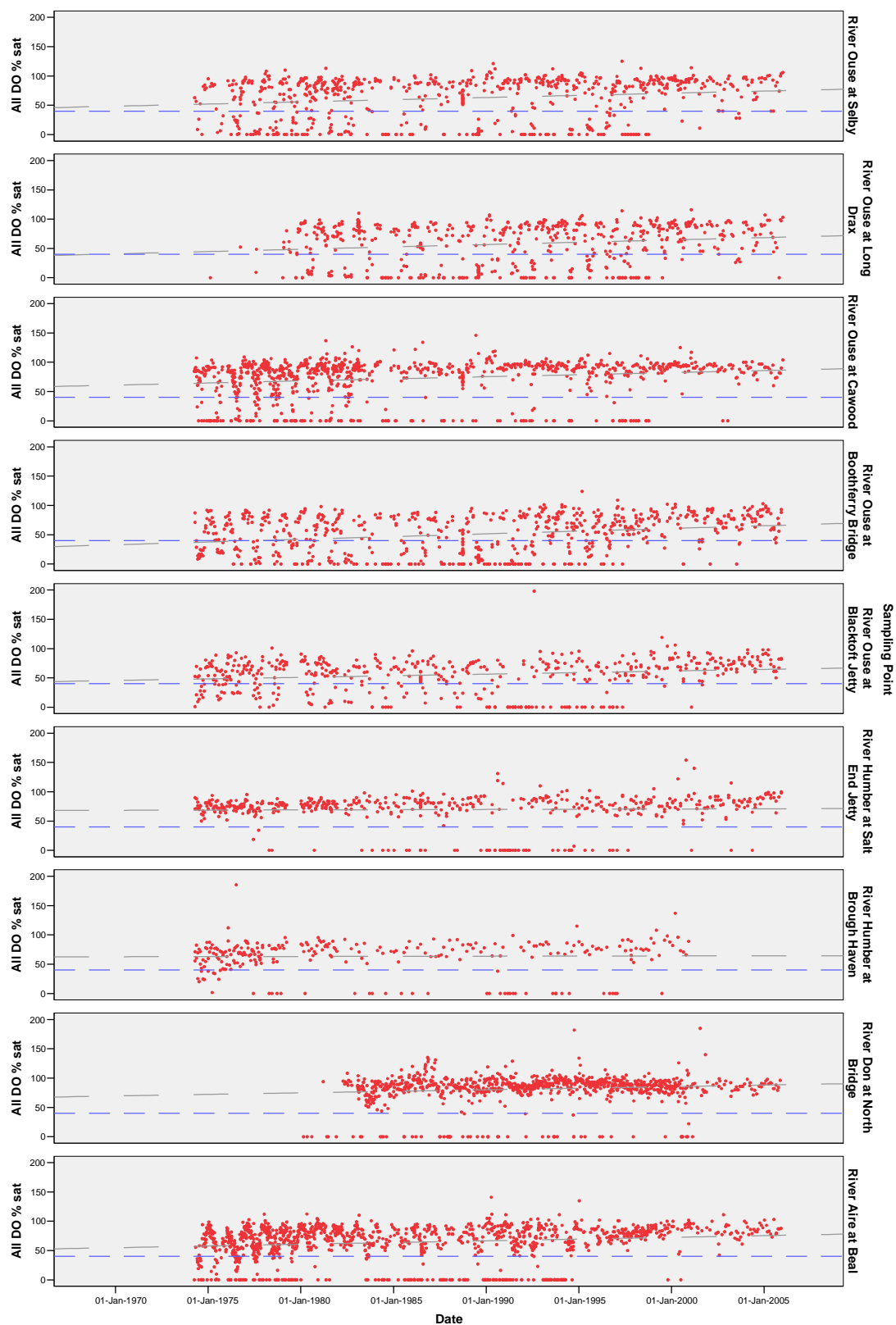


Figure 5. Variation of DO at selected sampling points.

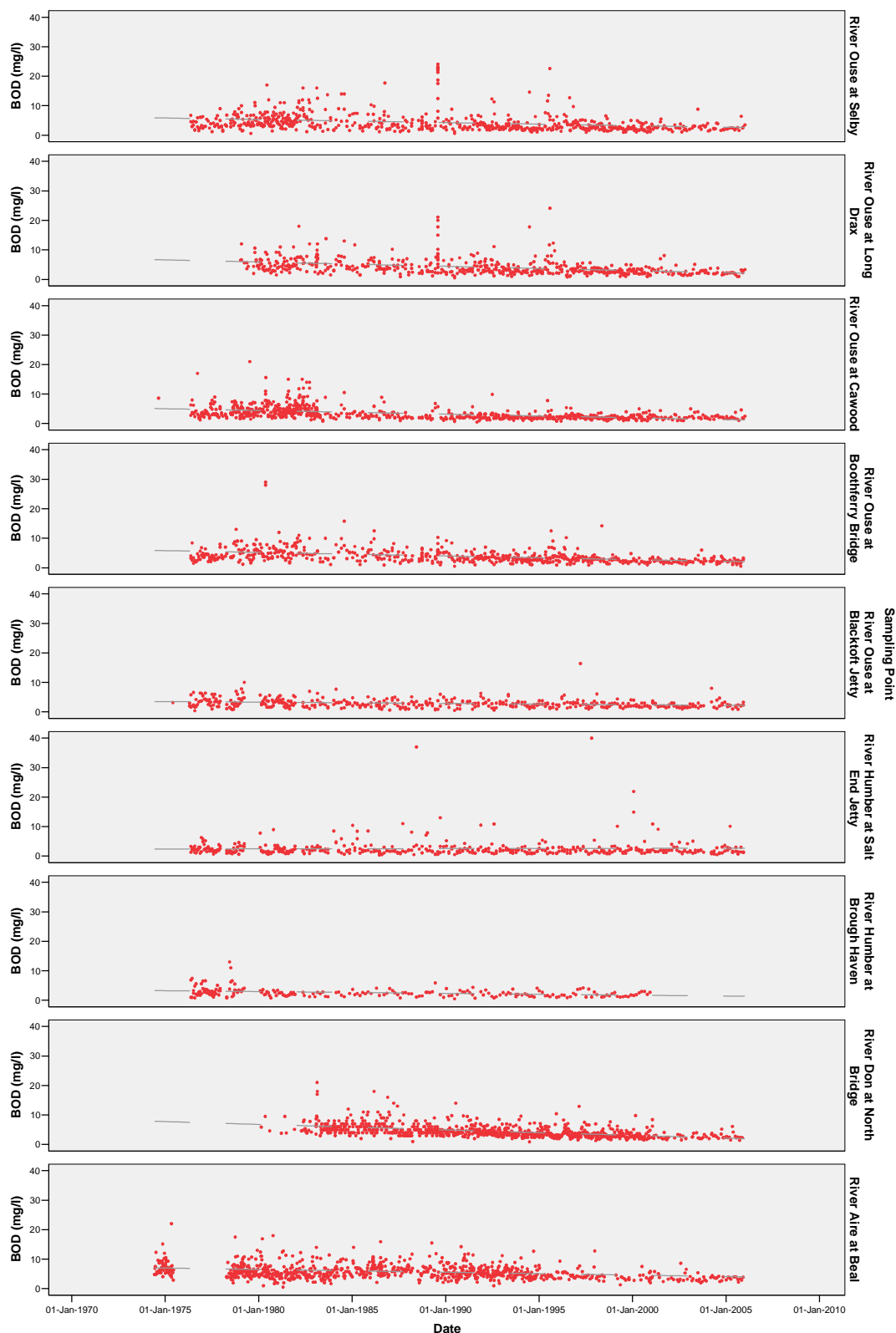


Figure 6. Variation of BOD at selected sampling points.

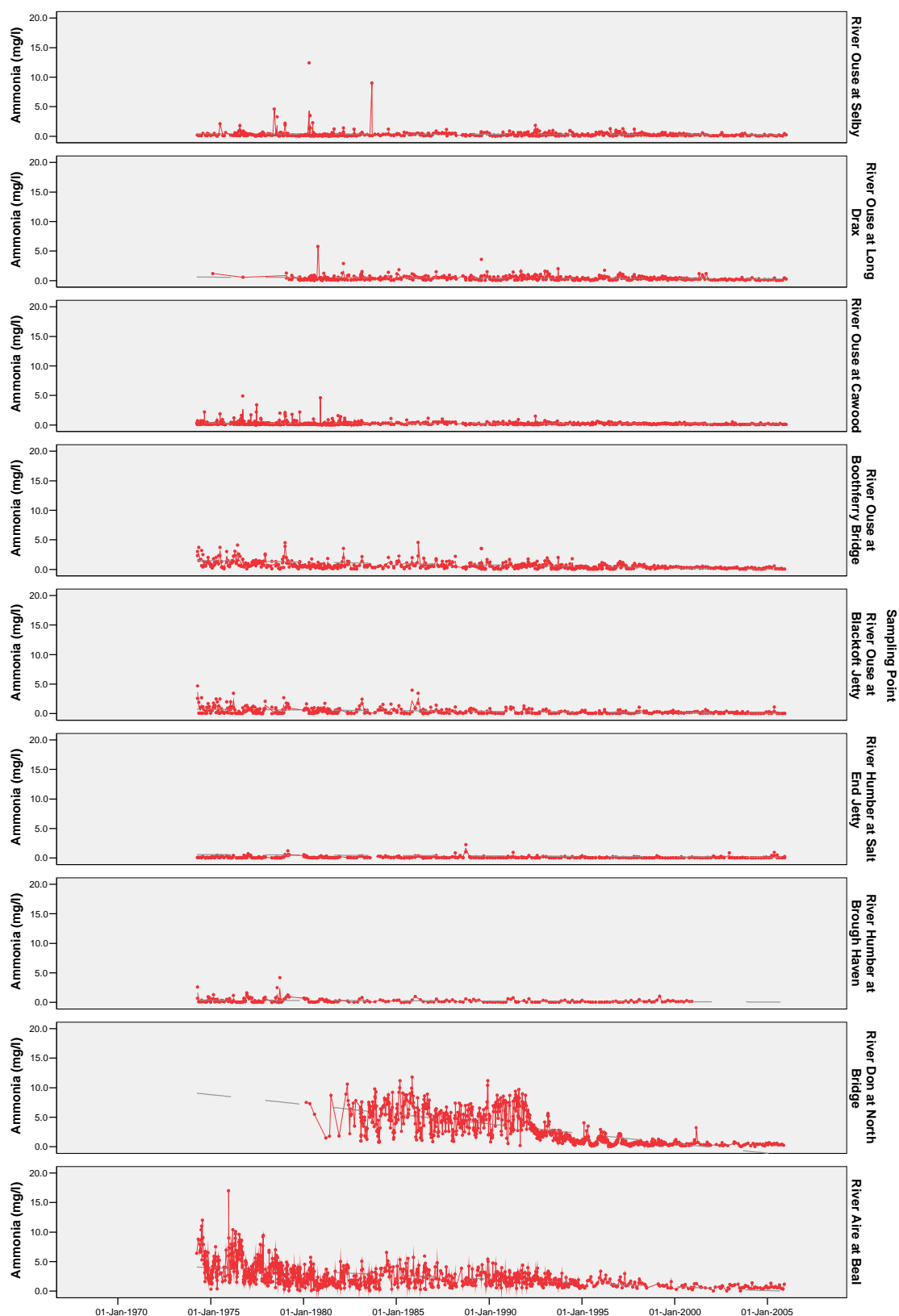


Figure 7. Variation of Ammonia at selected sampling points.

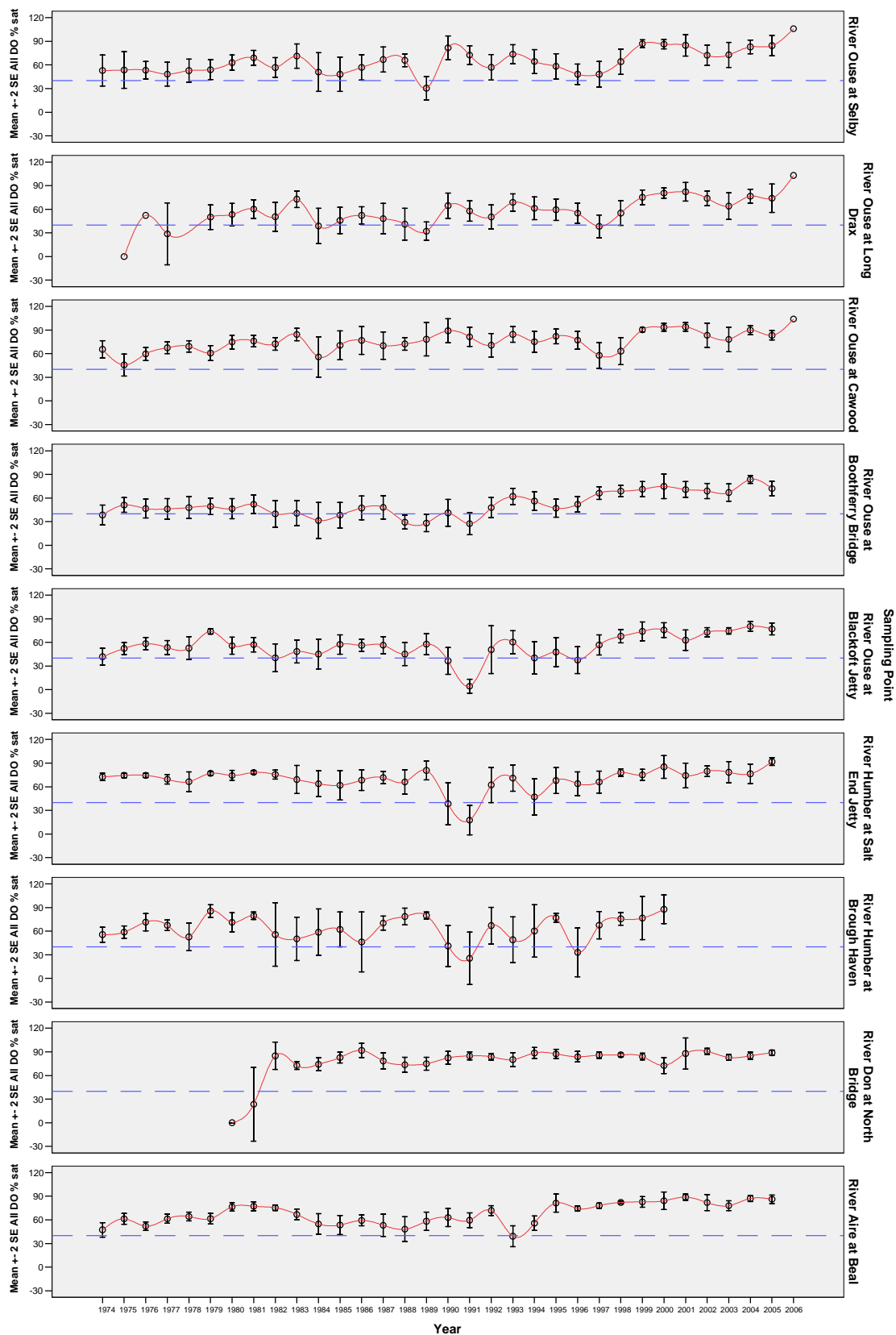


Figure 8. Mean DO at selected sampling points.

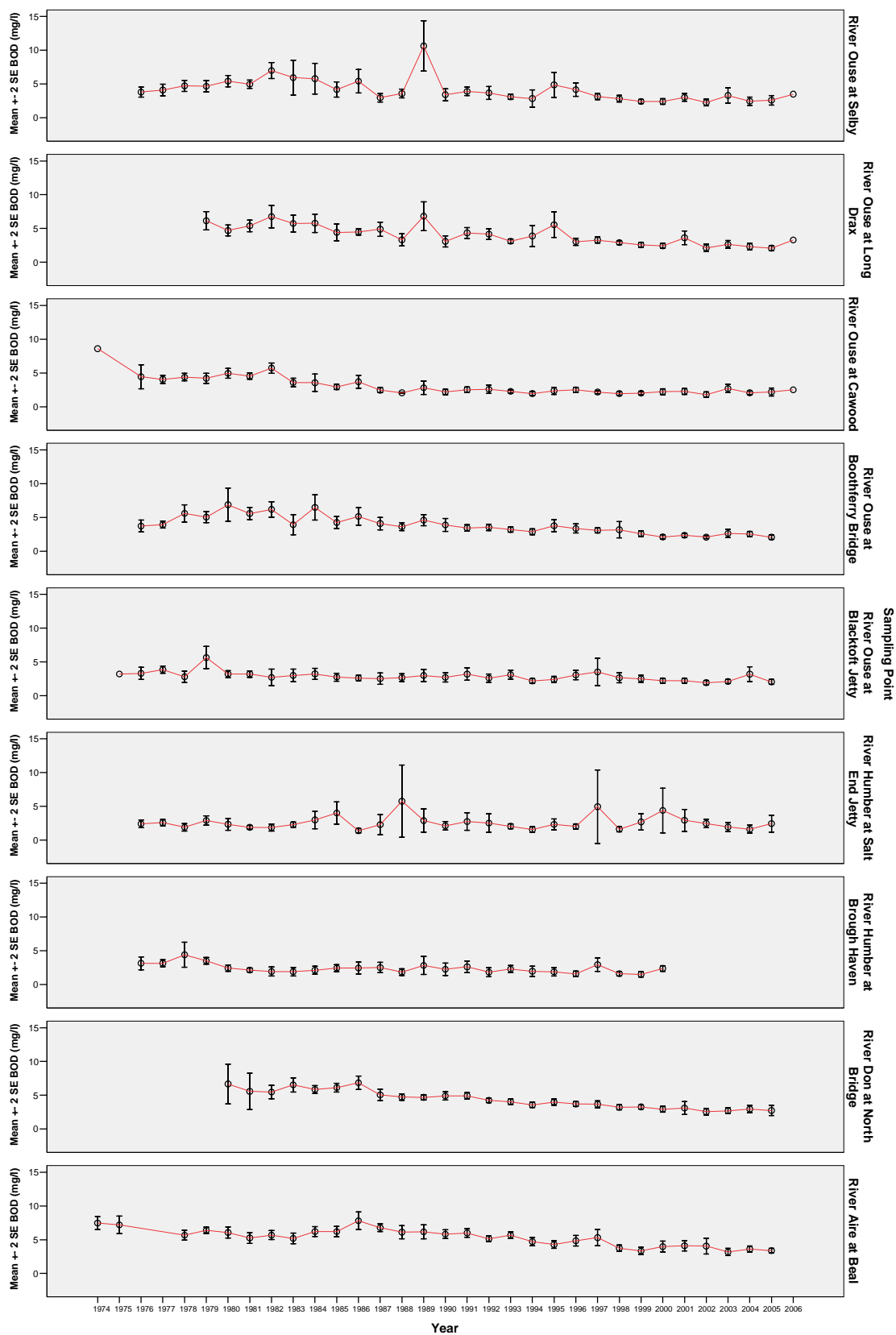


Figure 9. Mean BOD at selected sampling points.

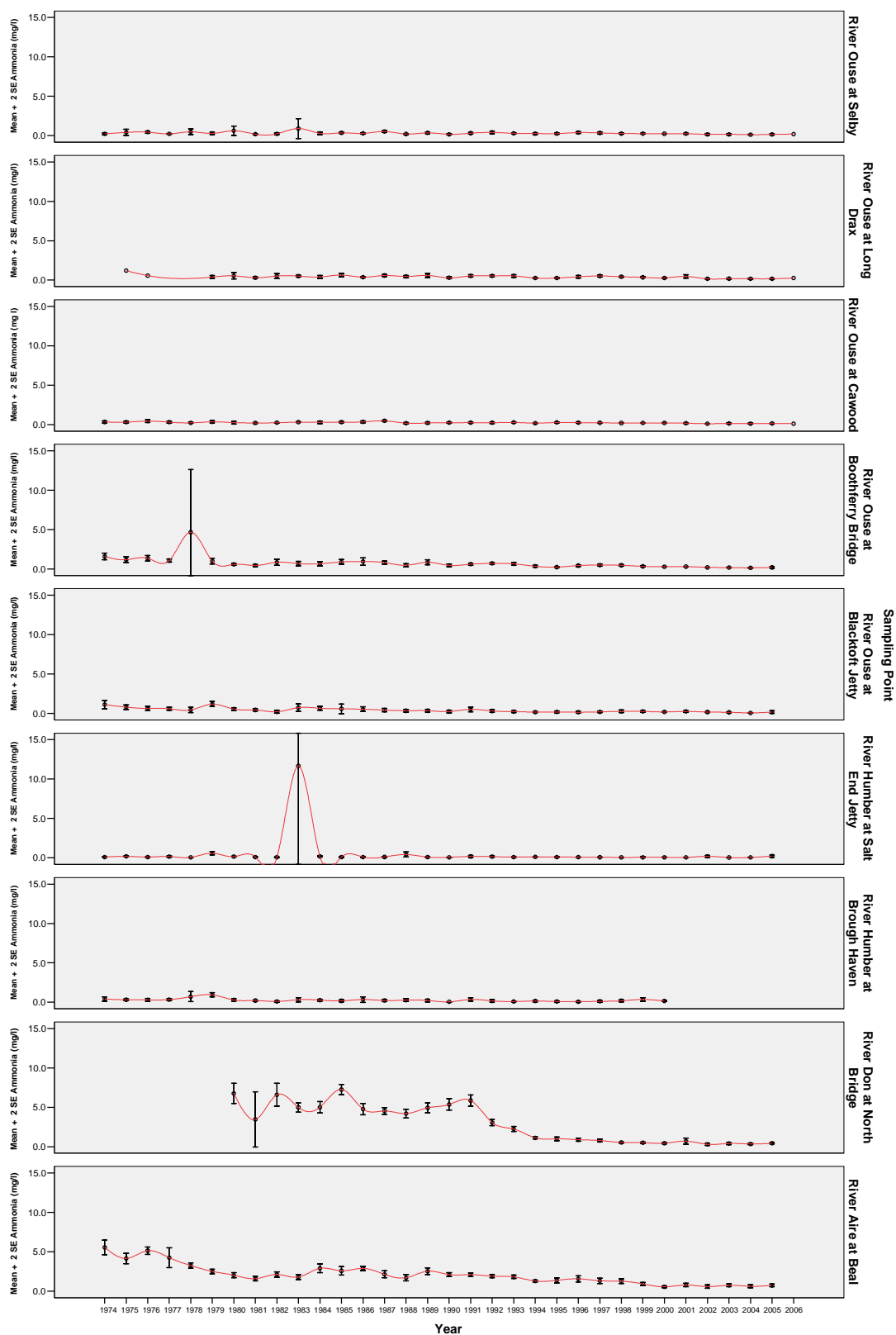


Figure 10. Mean Ammonia at selected sampling points.

## 4. RESULTS

### 4.1. North Bank Intertidal

#### 4.1.1. UNIVARIATE ANALYSIS

As described in Section 2 the number of species (S), numbers of individuals (A) and Shannon's diversity (H') have been calculated for each site from 1989 to 2003. The variation in these parameters over time have been summarised for each site in Table 3 and shown as a series of bar charts in Figures 11 to 13 and boxplots in Figures 14 to 16. The trends over time for each site have also been shown in a series of scatter plots in Figures 17 to 19.

As described in the stage 1 report (Allen *et al.*, 2006) the number of species increases down the estuary from Weighton Lock to Spurn and this pattern has remained relatively consistent over time. In the upper estuary (Weighton Lock to Hessle) the average number of species over time ranged from 3 to 5 species per site. In the middle estuary (Alexandra Dock to Stone Creek) mean numbers of species over time ranged from 8 to 11 whilst in the outer estuary from Hawkins Point to Spurn the highest numbers of species were found with average values ranging from 13 to 15 species per site. The abundance of animals at the sites were variable and mean abundances (from 1989 to 2003) ranged from 180 to 1931 per site with the highest abundances recorded at Cherry Cob and Stone Creek in the mid-outer estuary. Shannon's diversity (H') also increased down the estuary with mean values over time ranging from 0.80 at Weighton Lock to 2.50 at Spurn.

**Table 3. Summary of biological parameters for the Humber north bank intertidal sites from 1989 to 2003.**

Site	Number of Species			Number of Individuals (Abundance)			Shannon's Diversity (H')		
	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum
Weighton Lock	4	1	9	289	1	2387	.80	.00	2.11
Broomfleet	5	2	7	611	7	1844	.99	.10	2.35
East Clough	5	2	8	337	5	1055	1.41	.43	2.02
Hessle	3	1	7	180	1	1542	1.02	.00	2.58
Alexandra Dock	8	2	12	157	2	567	2.02	.63	3.02
Thorngumbald	8	4	12	500	18	3089	1.61	.57	2.53
Cherry Cob	12	6	15	1913	718	5403	1.83	1.28	2.32
Stone Creek	11	7	17	1757	694	3644	1.69	.87	2.13
Hawkins Point	13	10	15	853	377	2050	2.10	1.46	2.59
Skeffling	13	9	19	1001	114	2451	2.44	1.35	3.13
Kilnsea	12	8	15	561	176	1236	2.27	1.76	2.55
Spurn	15	10	24	345	42	1576	2.50	.74	3.62

Whilst the general trends in species richness, abundance and diversity have remained broadly consistent over time Figures X to X show that there has been some temporal variation at each site. In terms of the number of species, certain sites have remained relatively consistent (e.g. East Clough and Kilnsea) whilst others exhibit higher variability. For example, the Alexandra Dock midshore site the number of species has generally increased slightly over time whilst at the low shore a reduction in numbers of species occurred from 1994 to 1996. Whilst the trend lines in Figure X show a slight increase at number of sites and a slight decrease at others (e.g. Skeffling mid shore) these trends are

relatively weak. Whilst there is a degree of variability over time there appears to be no significant temporal trends in terms of the number of species although certain years at Hessle and Alexandra Dock did show quite low numbers of species.

The number of individuals at each site shows a high degree of variability over time as might be expected in a dynamic estuarine environment particularly at Thorngumbald, Cherry Cob and Stone Creek although there does not appear to be any consistent pattern. Shannon's diversity is also variable with some sites showing a slight increase over time (e.g. Hawkins Point) whilst other sites such as Hessle and Alexandra Dock (low Shore) exhibit decreased diversities in certain years (1990 and 1994-1995). As with other parameters there appears to be no consistent trend in Shannon's diversity over time.



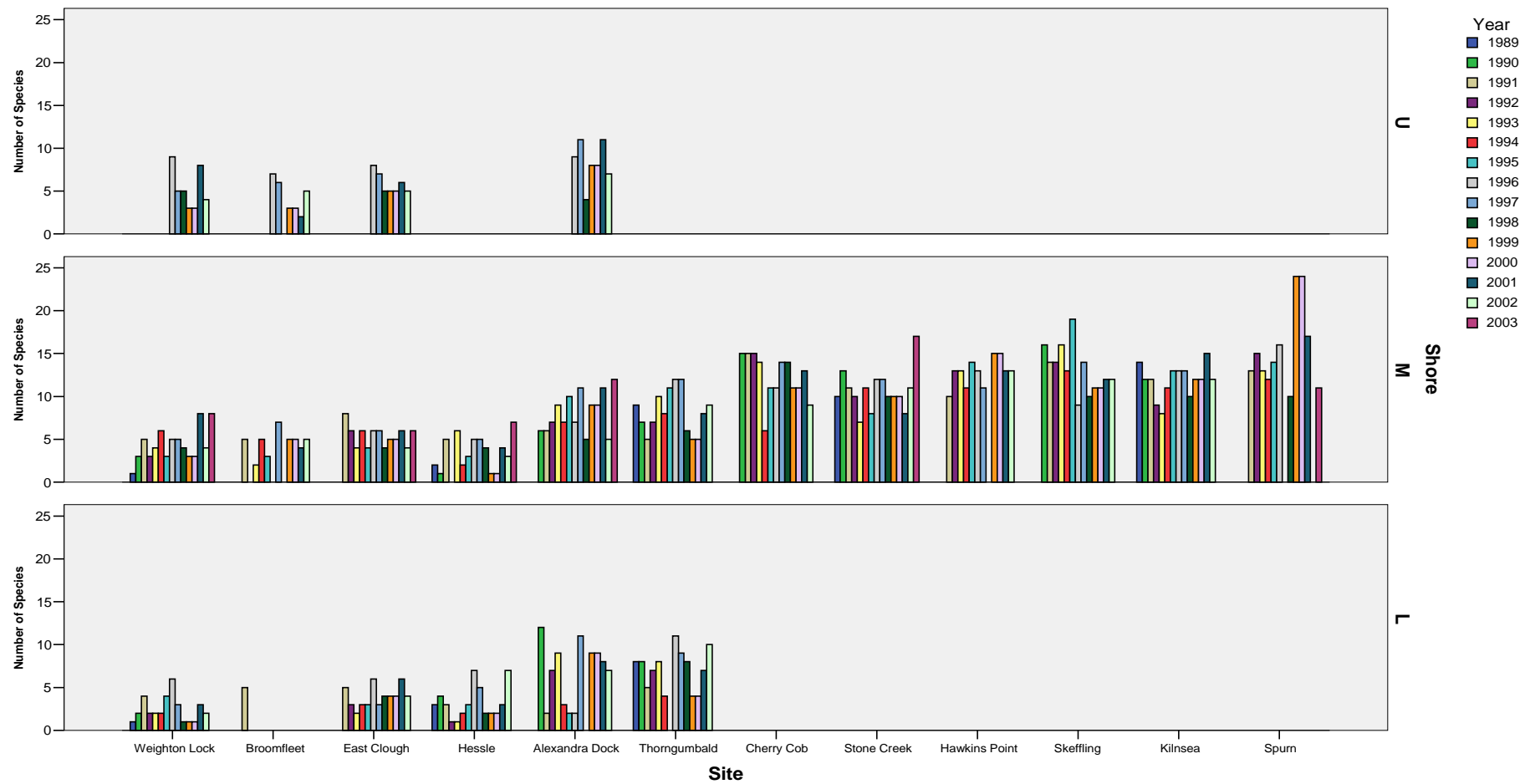
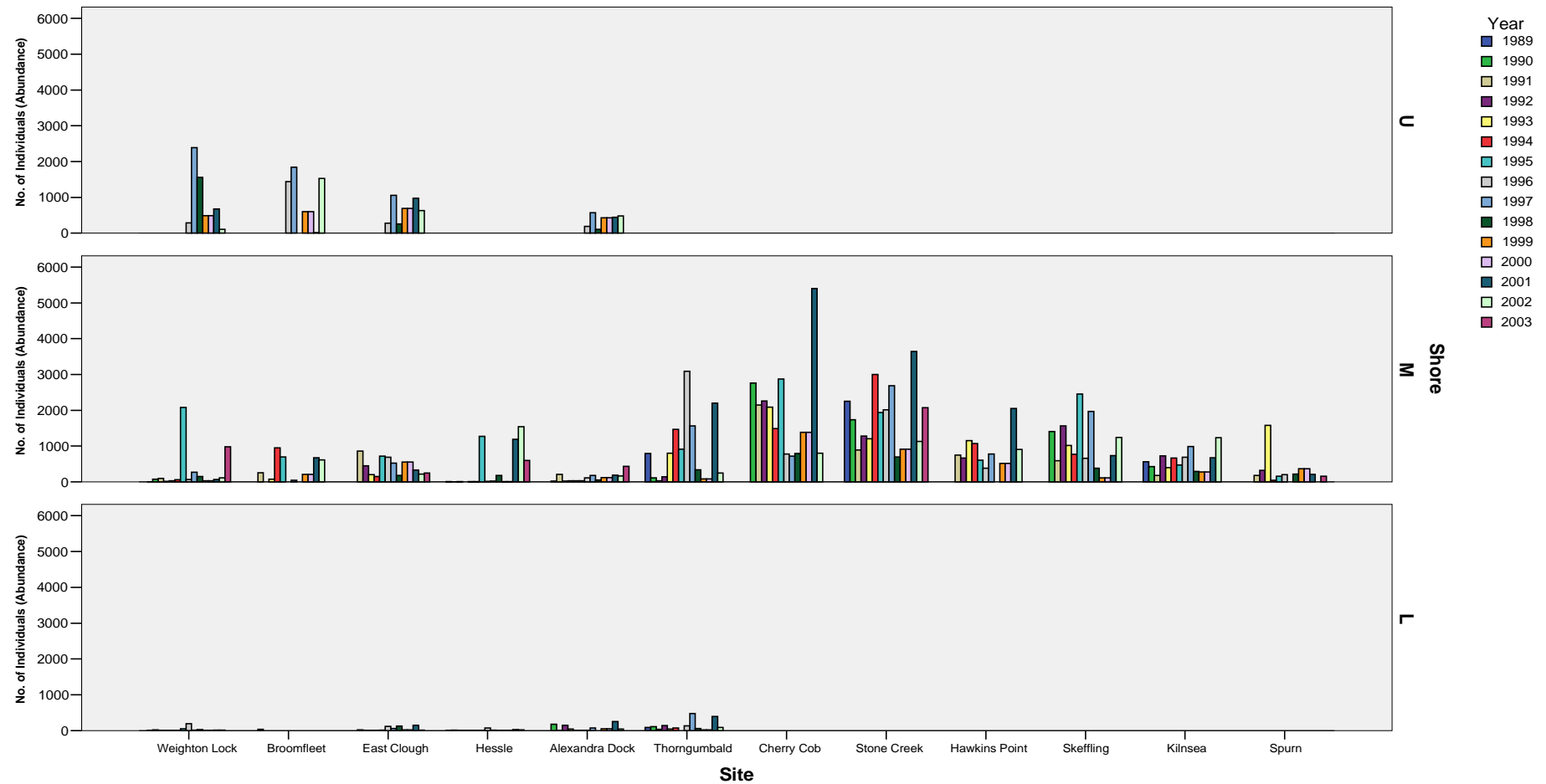


Figure 11. Number of species between 1989 and 2003 for Humber North Bank intertidal sites.



**Figure 12. Number of individuals between 1989 and 2003 for Humber North Bank intertidal sites.**

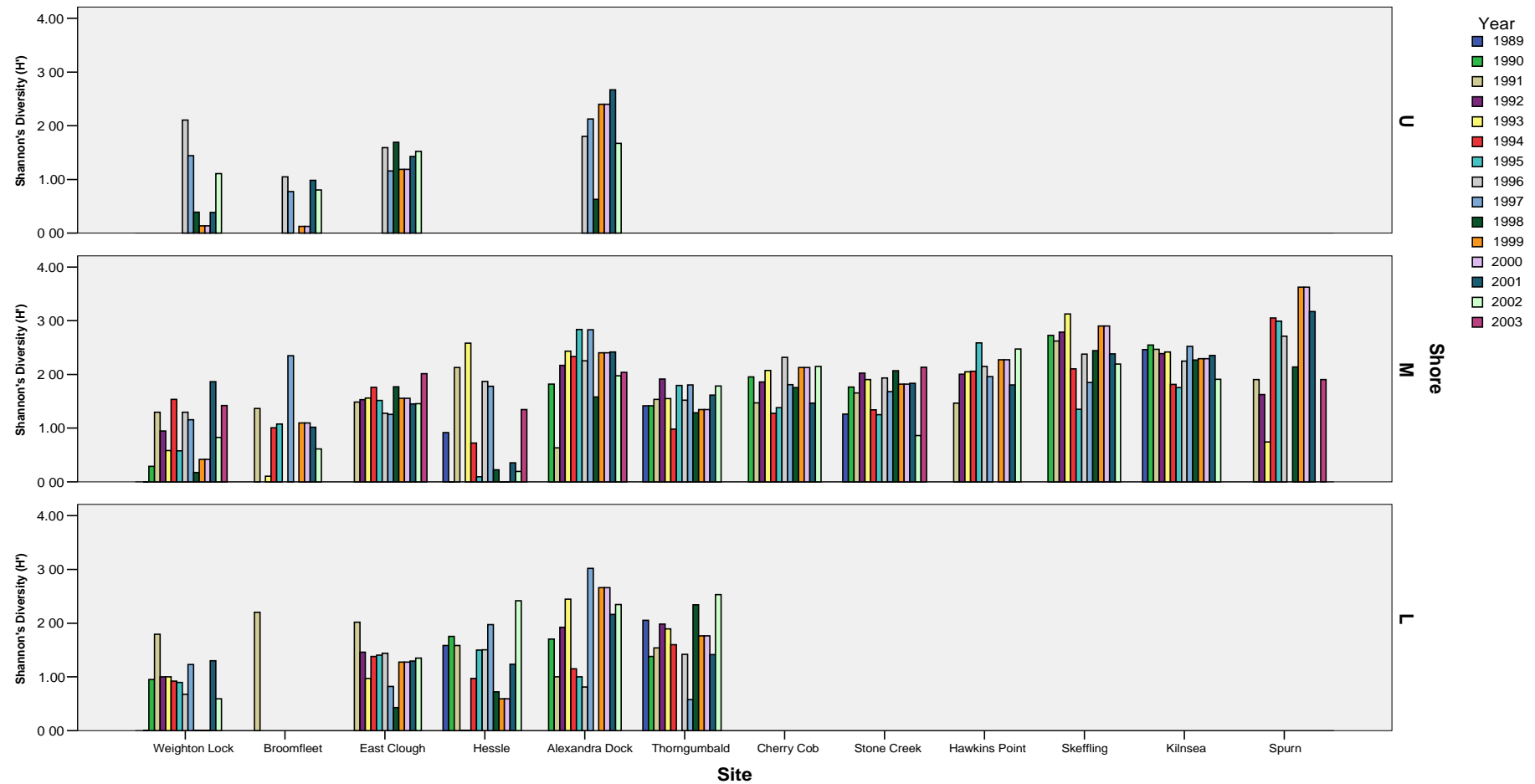


Figure 13. Shannon's Diversity ( $H'$ ) between 1989 and 2003 for Humber North Bank intertidal sites.

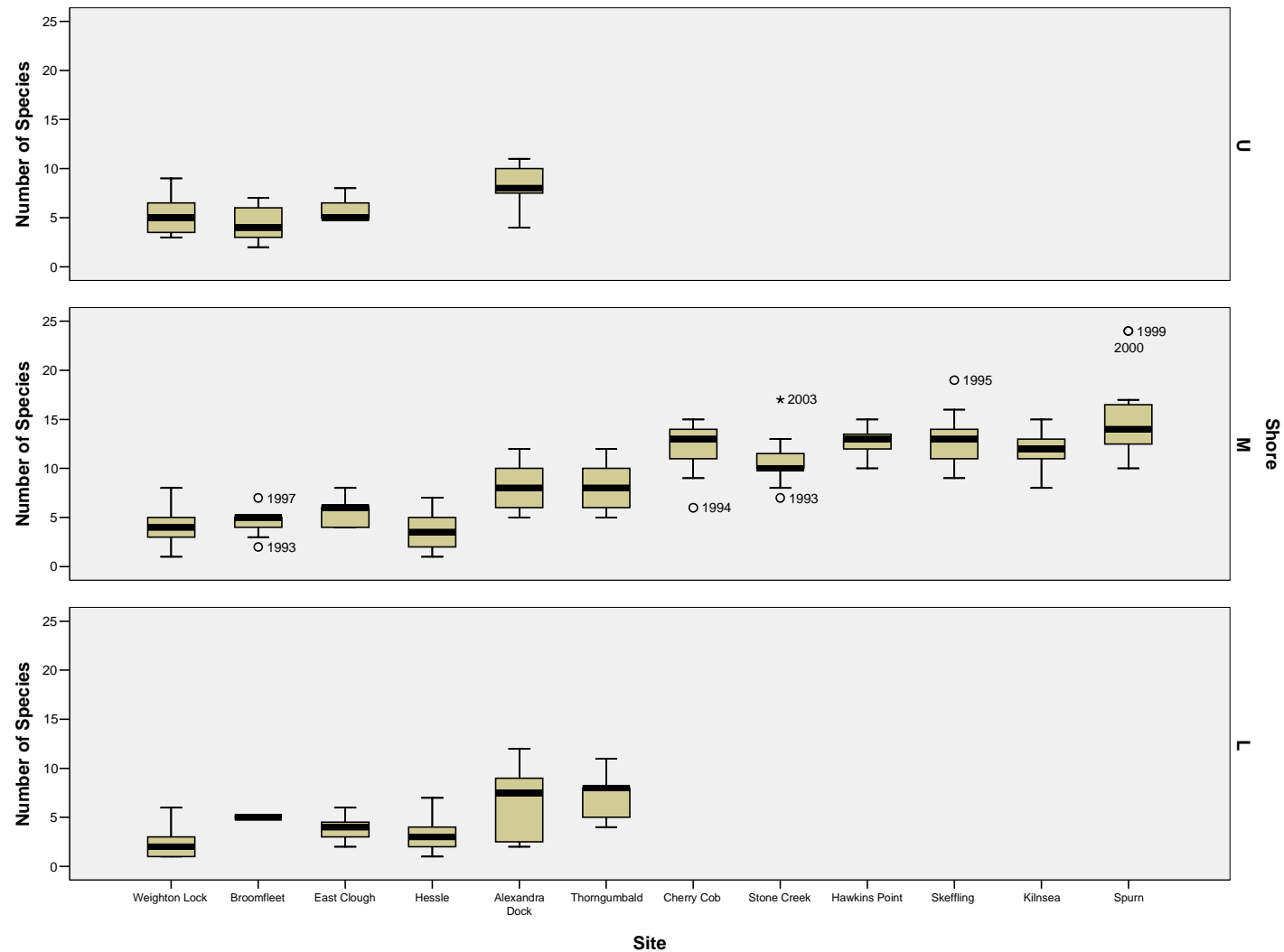


Figure 14. Boxplots showing variability in number of species (between 1989 and 2003) for Humber North Bank intertidal sites.

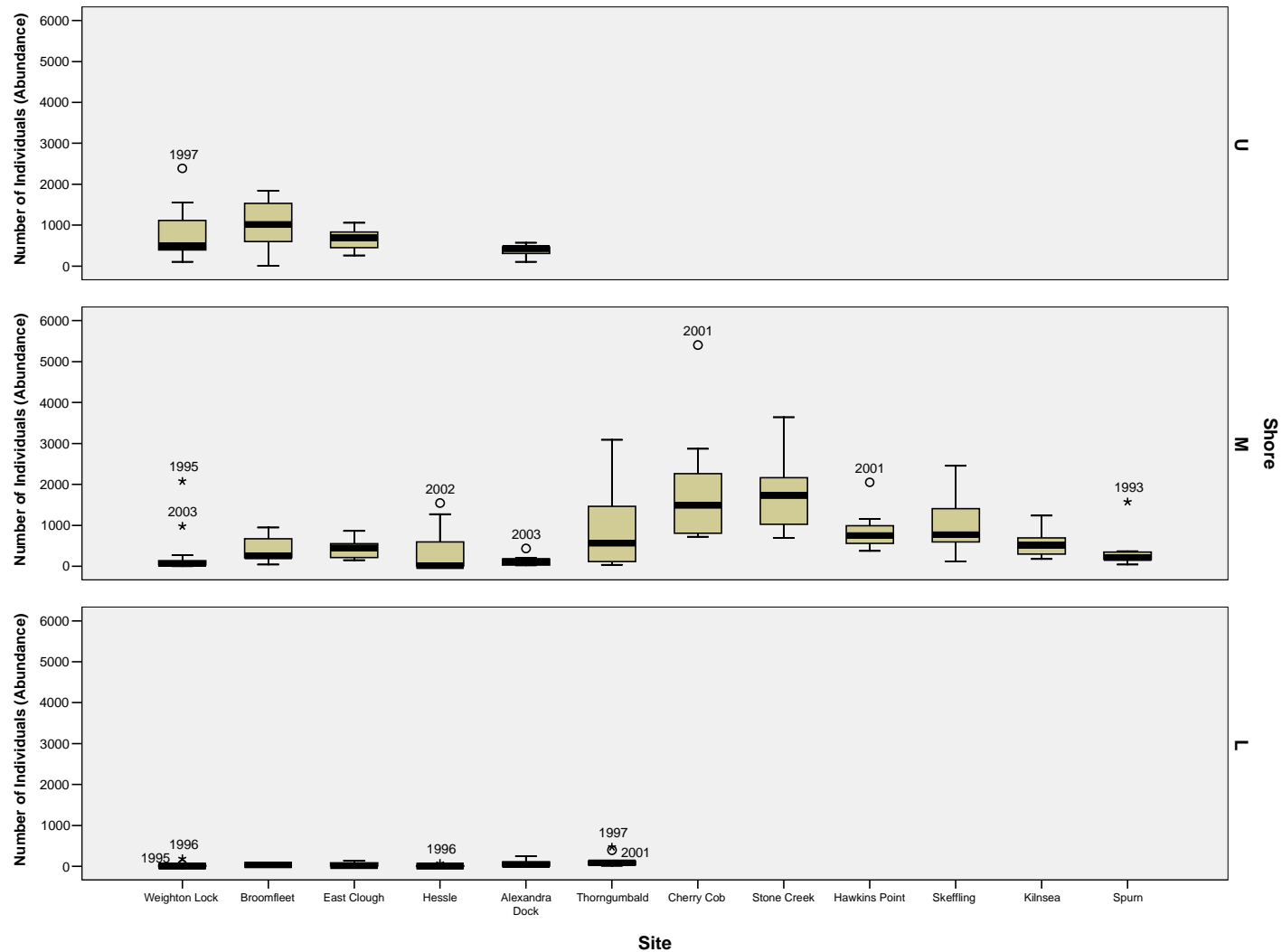


Figure 15. Boxplots showing variability in abundance (between 1989 and 2003) for Humber North Bank intertidal sites.

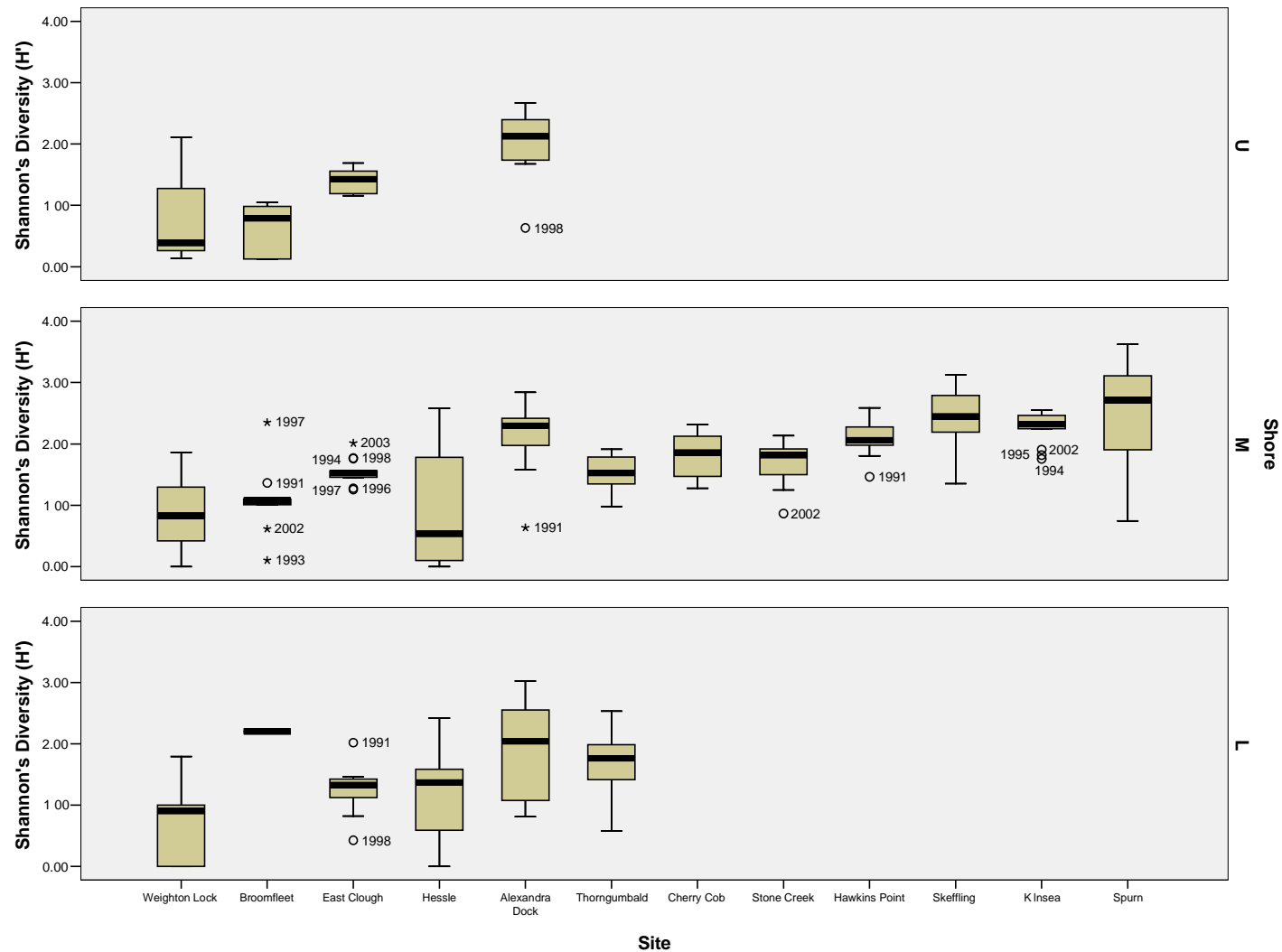


Figure 16. Boxplots showing variability in  $H'$  diversity (between 1989 and 2003) for Humber North Bank intertidal sites.

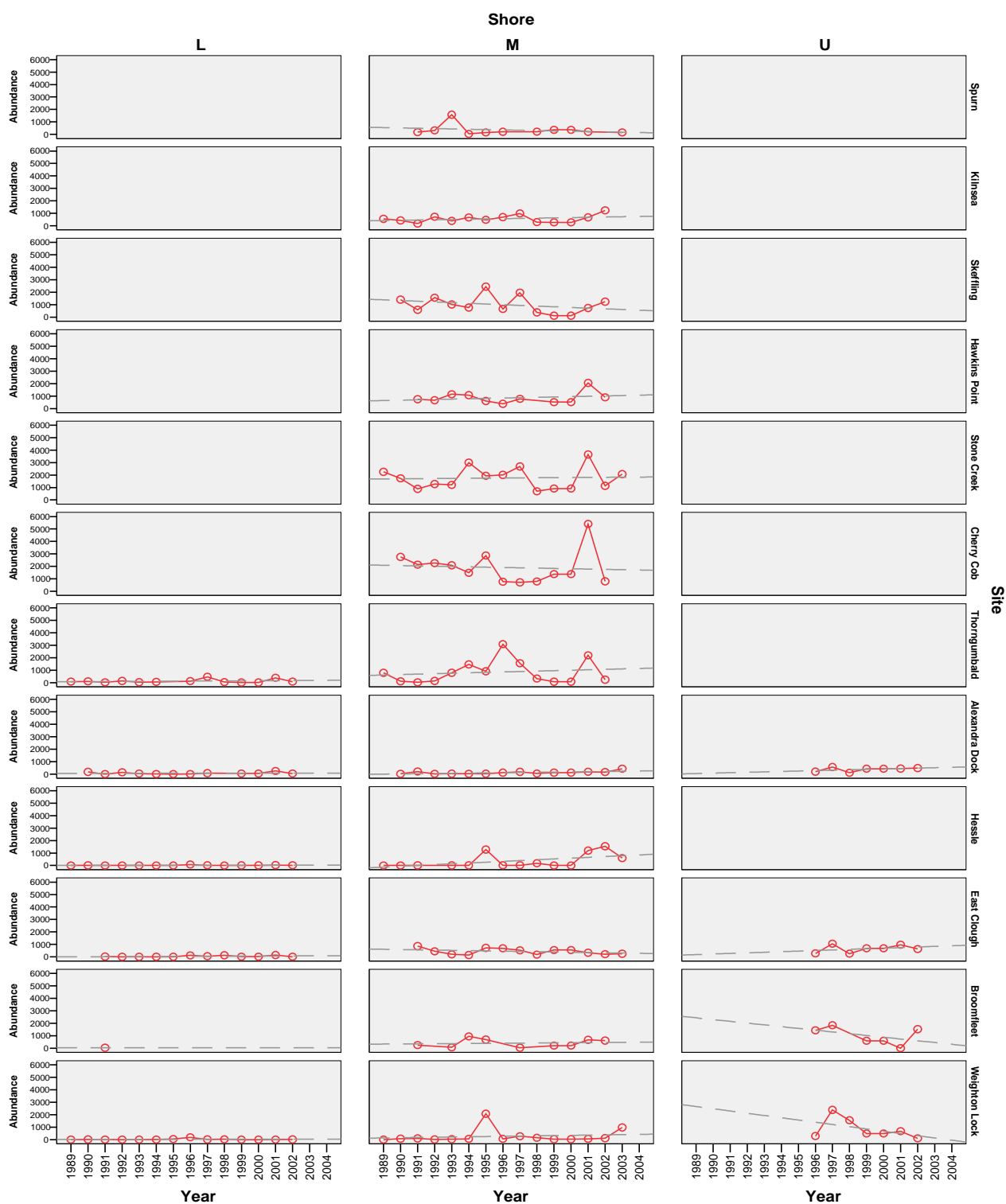


Figure 17. Trends in the number of species (between 1989 and 2003) for Humber North Bank intertidal sites.

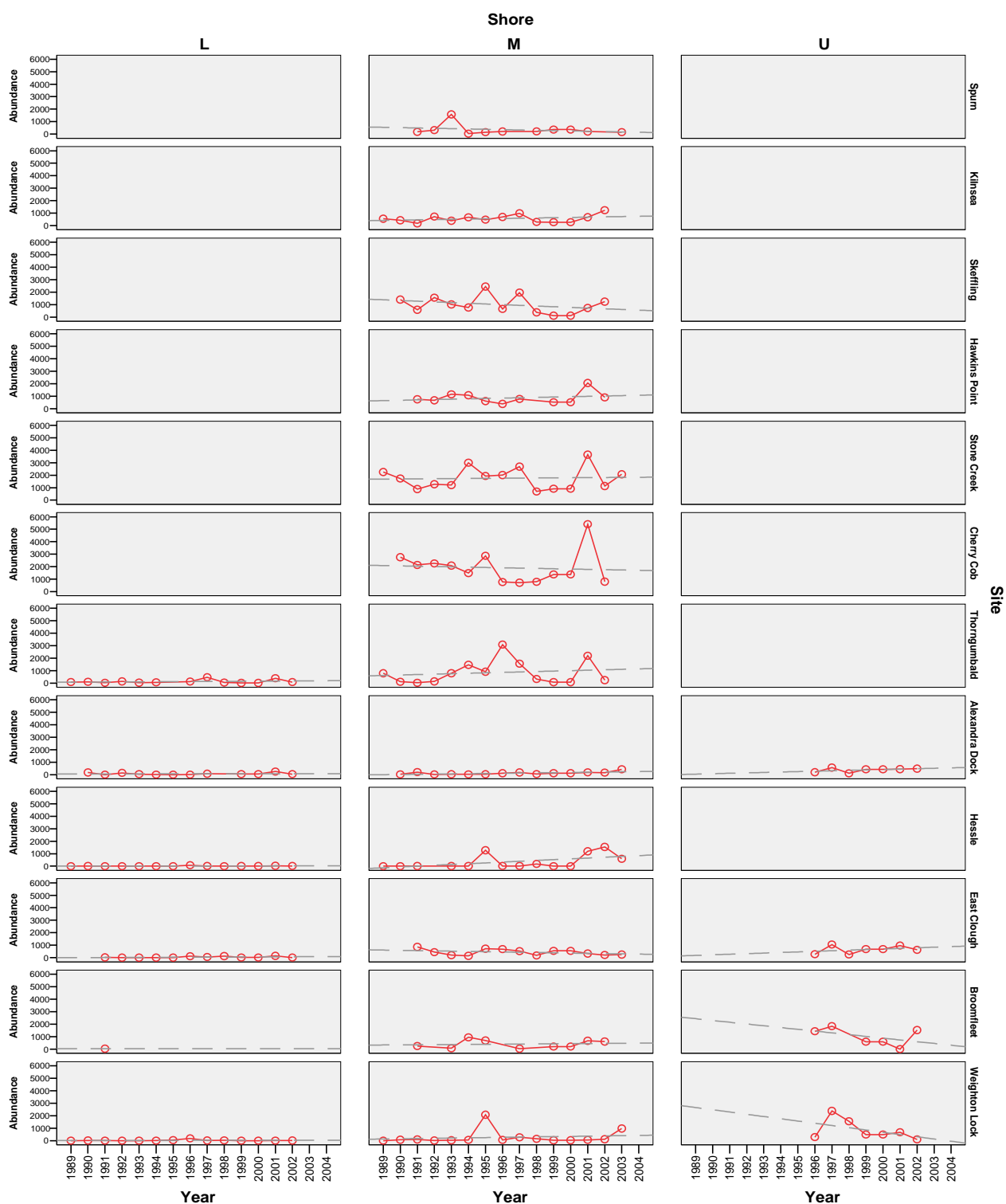


Figure 18. Trends in the number of individuals (between 1989 and 2003) for Humber North Bank intertidal sites.



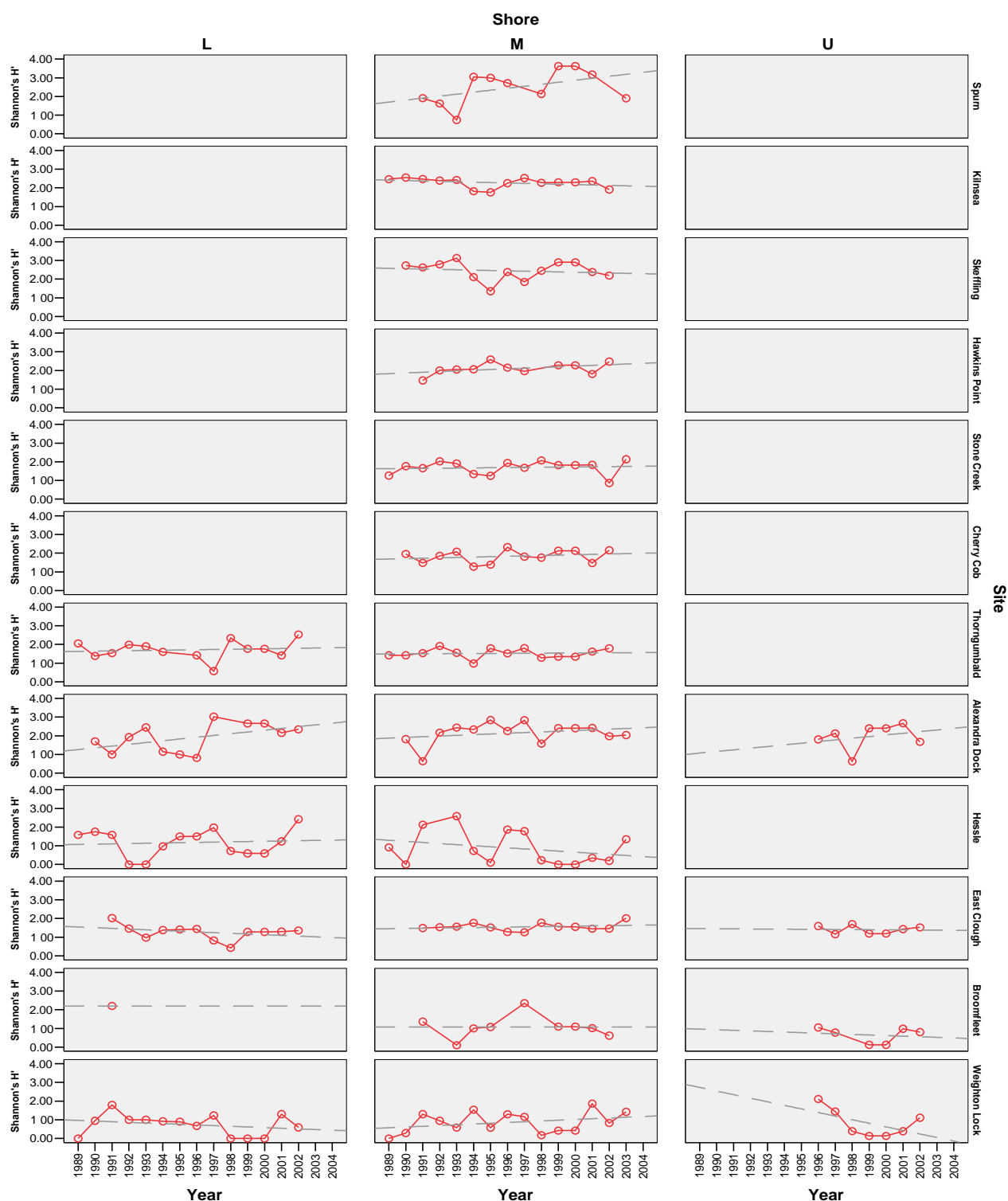


Figure 19. Trends in Shannon's diversity (between 1989 and 2003) for Humber North Bank intertidal sites.

#### 4.1.2. MULTIVARIATE ANALYSIS

The results of cluster analysis and MDS for the north bank intertidal dataset from 1989 to 2003 are given in Figures 20 and 21. In general, the main trends identified from the stage 1 report (Allen et al., 2006) have remained broadly consistent over time with the main groups of sites split on the basis of their position on the estuary. Eleven main site groups have been derived from cluster analysis some of which are split further. These divisions appear to split the estuary into upper estuarine sites (groups 10 to 11), mid to upper estuarine sites (groups 5 to 9), mid to outer estuarine sites (groups 1 to 3) and outer estuary sites (group 4). Further groups are evident within these groups which split the sites on the basis of year and shore height. Whilst, there appears to be no consistent temporal trend evident in terms of site groups some sites e.g. Hessle show significant variation over time.

Characteristic species within each site group are given in Table 6. Group 1 contains two impoverished outlier sites from Hessle low shore in 1991 and 1992 containing only low numbers of *Streblospio shrubsolii* and the oligochaetes *Heterochaeta costata* and *Lumbricillus* sp. Groups 2 to 4 contain the majority of sites from the mid to outer estuary (Thorngumbald, Cherry Cob, Stone Creek, Hawkins Point, Skeffling and Kilnsea) but also contain occasional sites from Alexandra Dock. These sites have moderate numbers of species and largely characterised by oligochaetes including *Tubificoides benedii*, the bivalve *Macoma balthica* and polychaetes such as *Hediste diversicolor*, *Streblospio shrubsolii* and *Pygospio elegans*.

Group 5 consists of the Spurn sites which were relatively variable over time with species such as *Hydrobia ulvae*, *Psammodrillus balanoglossoides*, *Paraonis fulgens* and Opheliidae and Syllidae polychaetes. Groups 6 to 10 comprise of the majority of mid to upper estuarine sites (East Clough, Hessle, Alexandra Dock and occasional sites from Weighton Lock). Groups 6 and 7 are relatively impoverished and characterised by low numbers of *Corophium volutator* and *Hediste diversicolor* whilst group 8 contains a few sites from 1995 characterised by unidentified Oligochaetes, *Paranais litoralis* and *Corophium volutator*. Groups 9 and 10 contain the majority of the mid to upper estuarine sites with the sites in group 9 being impoverished low shore sites from Hessle and Weighton Lock and characterised by *Heterochaeta costata*. The sites in Group 10 are also characterised by *Heterochaeta costata* but with a wider range of associated species and higher abundances. Sites in group 11 are from the extreme upper estuary at Weighton Lock and Broomfleet. These sites are somewhat similar to those in group 9 and characterised by *Paranais litoralis* and *Heterochaeta costata* but with lower species richness.

Using the ANOSIM procedure in the PRIMER package tests were carried out for differences in species similarity for both site and year. The results of these tests indicated that the sites were significantly different in terms of species composition (Rho = 0.587; p=0.001) which is unsurprising given the strong environmental gradients in the Humber. However, a weaker but still significant difference between years was also detected (Rho = 0.252; p=0.001).

Whilst the above analysis indicates that spatial trends in species composition are more apparent than temporal trends, the large number of sites involved hampers interpretation of the analysis with regard to temporal changes of individual sites. Consequently, cluster analysis was also carried out on each site independently for the mid shore (which had the longest time series) in order to allow a simple assessment of variability in terms of species

composition over time. The results of cluster analysis are given in Figure and the top 5 ranked taxa (by abundance) for each site/year is given in Appendix 1. These allow a rapid assessment of the change in key taxa over time.

The results shown in Figure 22 indicate that at the majority of sites no clear temporal trend is evident with similarities between years moderately high (>50%). Some sites such as Hessle and Spurn show a higher degree of variability between years whilst at Cherry Cob and Stone Creek some difference is evident between sites from the 1990 to 1995 compared with those from 1996 to 2002. The dominant taxa at each site given in appendix 1 indicate that at most stations some variation is apparent although this is often a change in rank dominance of taxa as opposed to a wholesale shift in community composition. In the upper to mid estuarine sites there is some variation in dominance between oligochaetes such as *Heterochaeta costata* and *Paranais litoralis* and polychaetes such as *Hediste diversicolor* or the amphipod *Corophium volutator* which fluctuate in dominance from one year to the next. At Thorngumbald tubificid oligochaetes have reduced somewhat in later years with *Macoma balthica* becoming more dominant and a similar pattern is evident at Skeffling. At Kilnsea the dominant taxa varies between *Cerastoderma edule*, *Pygospio elegans* and *Macoma balthica* with *Streblospio shrubsolei* also becoming more dominant from 1999.

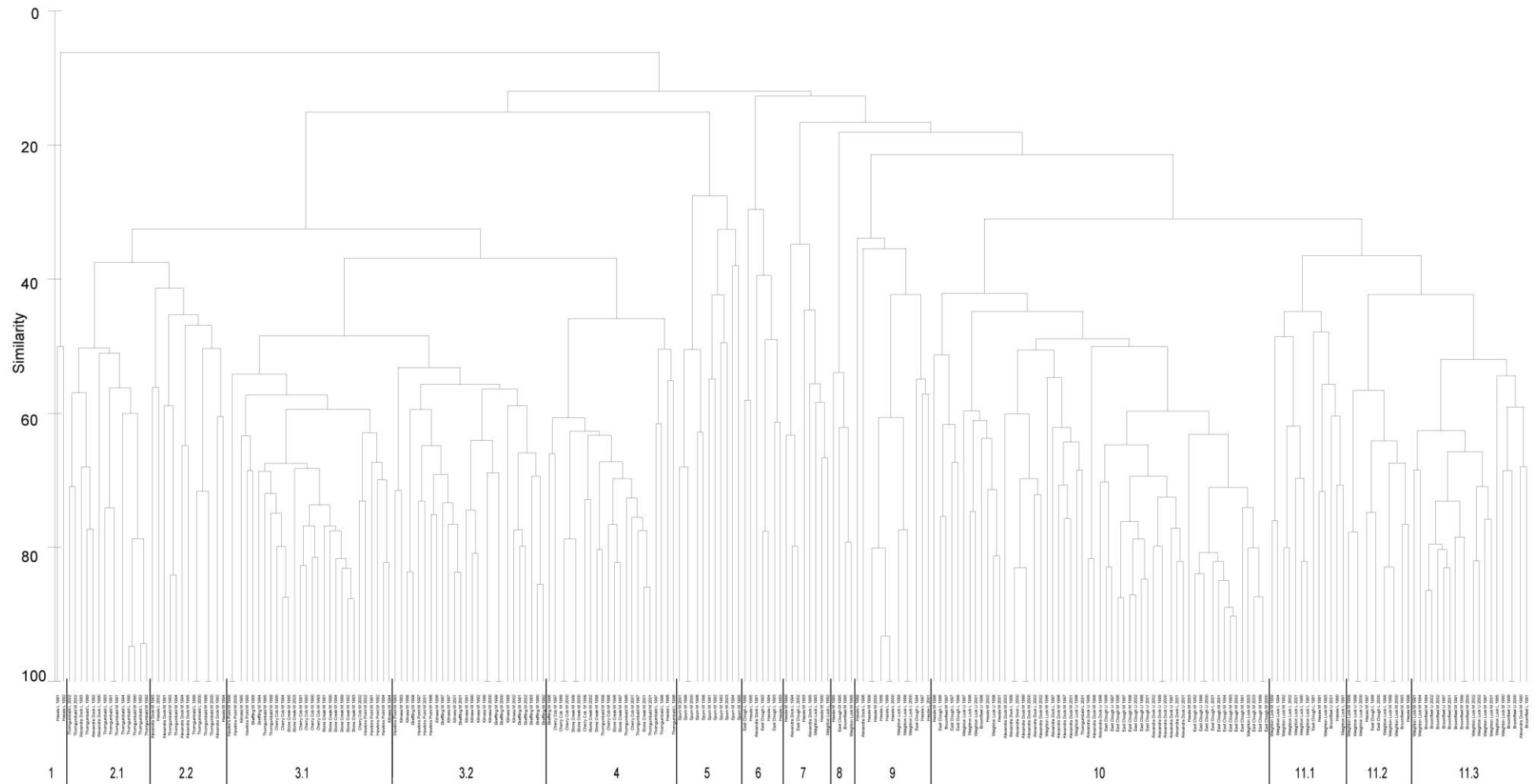


Figure 20. Results of cluster analysis for Humber north bank intertidal sites from 1989 to 2003.

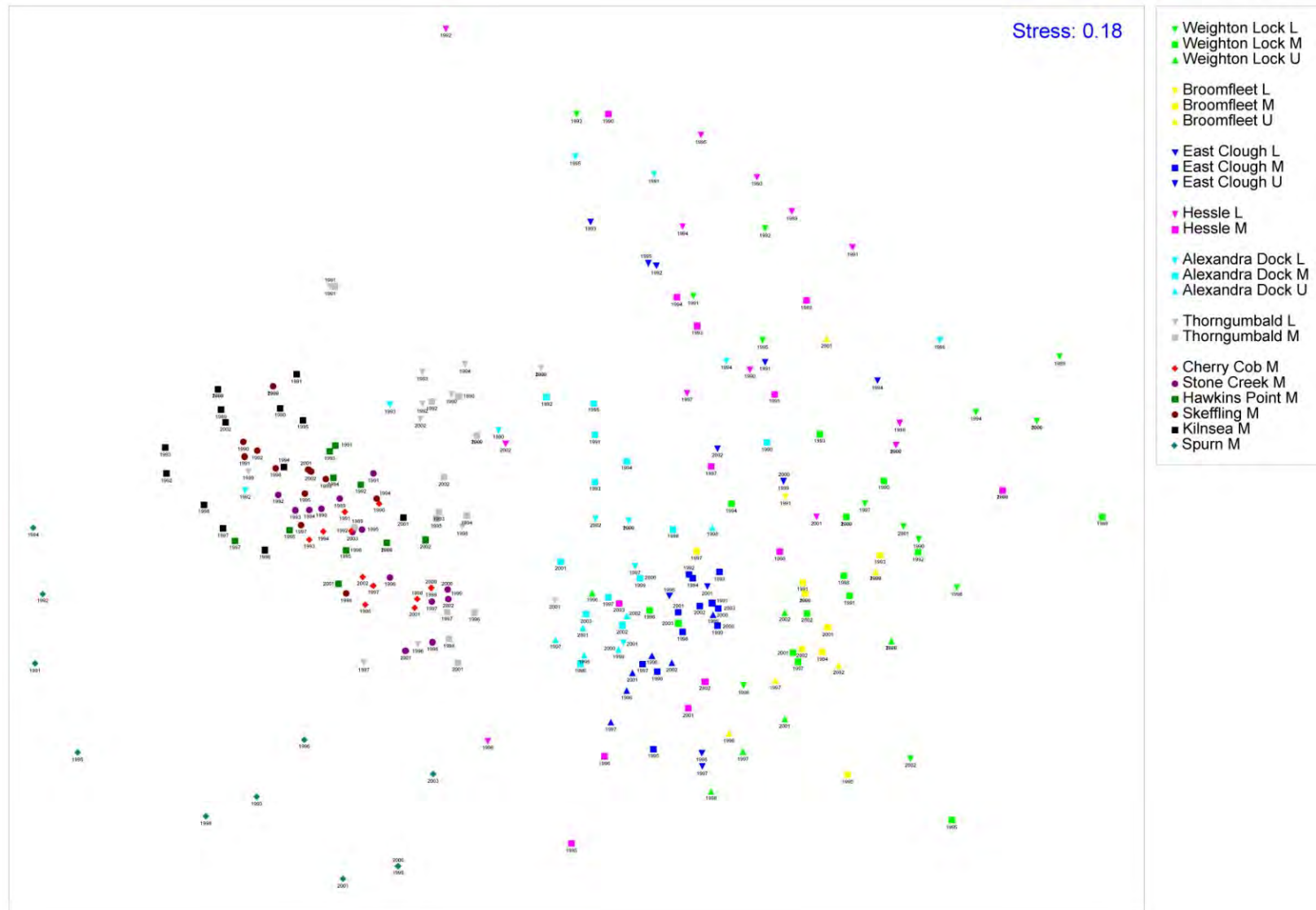
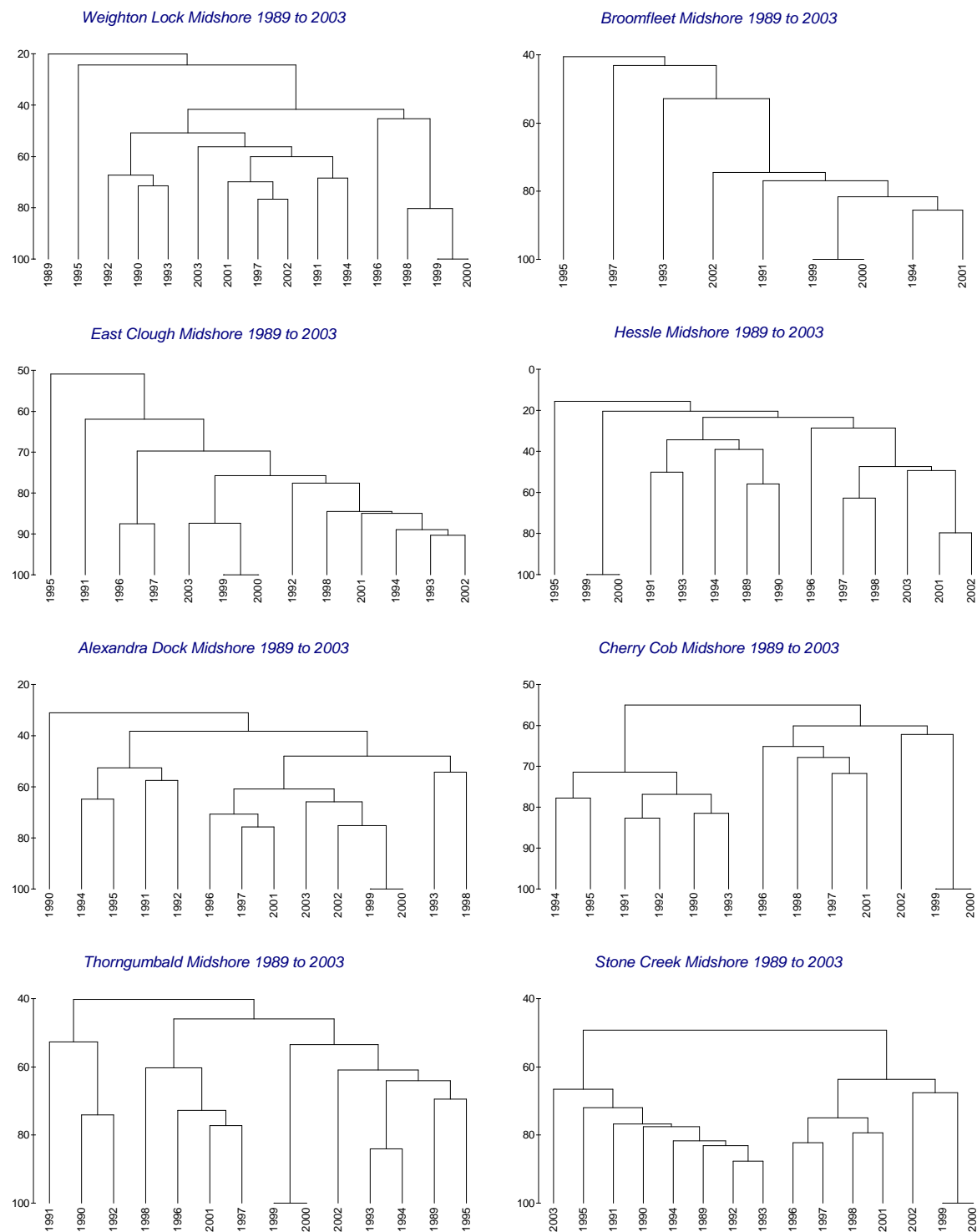


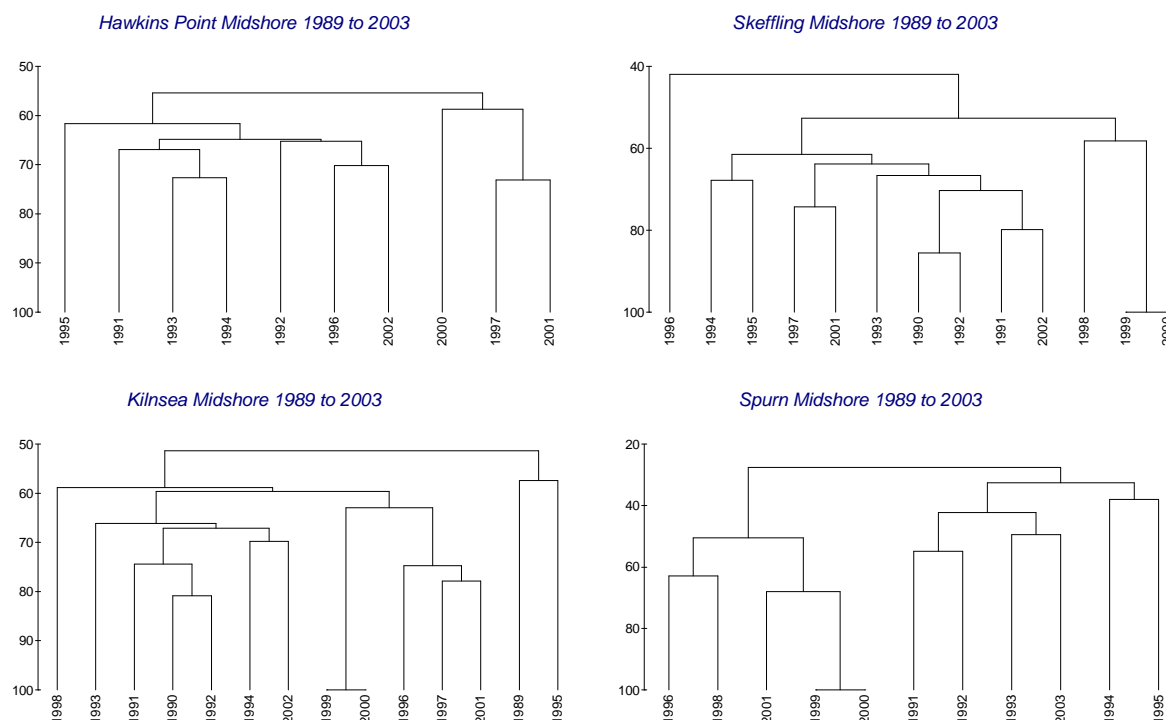
Figure 21. MDS plot for Humber north bank intertidal sites from 1989 to 2003.

**Table 6. Characteristic species within intertidal north bank site groups derived from cluster analysis.**

1	Mean A	% occ	2.1	Mean A	% occ	2.2	Mean A	% occ	3.1	Mean A	% occ	3.2	Mean A	% occ
Streblospio shrubsolii	1.00	100.00	Tubificoides benedii	48.43	100.00	Corophium volutator	141.23	84.62	Tubificoides benedii	758.04	96.43	Macoma balthica	160.92	100.00
Heterochaeta costata	0.50	50.00	Macoma balthica	25.43	100.00	Tubificoides benedii	33.85	92.31	Macoma balthica	280.18	100.00	NEMATODA	124.31	38.46
Lumbricillus	0.50	50.00	Streblospio shrubsolii	9.43	64.29	Macoma balthica	22.15	84.62	Pygospio elegans	131.00	100.00	Pygospio elegans	114.54	96.15
			Corophium volutator	5.43	57.14	Hediste diversicolor	12.08	100.00	Hydrobia ulvae	78.71	96.43	Streblospio shrubsolii	93.92	76.92
			Nephtys hombergii	3.29	71.43	Eteone	1.23	46.15	Eteone	31.32	100.00	Tubificoides benedii	74.81	69.23
			Pygospio elegans	2.57	57.14	Streblospio shrubsolii	1.00	38.46	Hediste diversicolor	29.96	100.00	Cerastoderma edule	51.19	92.31
			Nephtys	2.14	28.57	Heterochaeta costata	1.00	15.38	Manayunkia aestuarina	28.04	42.86	Hydrobia ulvae	36.58	88.46
			Hydrobia ulvae	2.07	35.71	Pygospio elegans	0.77	30.77	Enchytraeidae	18.57	25.00	Nephtys	30.50	57.69
			Eteone	1.36	50.00	Paranais litoralis	0.54	30.77	Nephtys	11.71	35.71	Nephtys hombergii	23.65	96.15
			Hediste diversicolor	1.21	57.14	OLIGOCHAETA	0.54	7.69	PELECYPODA	10.29	10.71	Retusa obtusa	16.23	84.62
Mean No. of Species	2.00		Mean No. of Species	7.57		Mean No. of Species	6.46		Mean No. of Species	12.11		Mean No. of Species	12.38	
Mean Abundance	2.00		Mean Abundance	103.86		Mean Abundance	215.92		Mean Abundance	1424.29		Mean Abundance	777.15	
4	Mean A	% occ	5	Mean A	% occ	6	Mean A	% occ	7	Mean A	% occ	8	Mean A	% occ
Enchytraeidae	527.86	95.45	Hydrobia ulvae	181.36	100.00	Corophium volutator	1.71	100.00	Hediste diversicolor	2.63	100.00	OLIGOCHAETA	560.50	100.00
NEMATODA	365.64	77.27	Streptosyllis websteri	33.55	54.55	Hediste diversicolor	0.71	28.57	Heterochaeta costata	0.63	50.00	Paranais litoralis	517.75	75.00
Tubificoides benedii	318.77	100.00	Psammodrillus balanoglossoides	18.82	54.55	OLIGOCHAETA	0.71	28.57	Corophium volutator	0.25	25.00	Corophium volutator	93.50	75.00
Macoma balthica	76.14	100.00	POLYCHAETA	16.64	36.36	Streblospio shrubsolii	0.71	28.57	Paranais litoralis	0.25	25.00	Hediste diversicolor	19.50	50.00
Hediste diversicolor	65.68	100.00	Opheliidae	12.73	36.36	Macoma balthica	0.43	14.29	POLYCHAETA	0.25	25.00	Lembos longipes	0.25	25.00
Manayunkia aestuarina	23.86	77.27	Paraonis fulgens	12.18	63.64	POLYCHAETA	0.14	14.29	Tubificoides benedii	0.25	25.00			
Abra tenuis	13.00	36.36	Syllidae	9.36	27.27	Tubificoides benedii	0.14	14.29	Enchytraeidae	0.13	12.50			
Eteone	4.77	63.64	NEMERTEA	8.55	45.45				Pygospio elegans	0.13	12.50			
Hydrobia ulvae	4.45	54.55	Enchytraeidae	7.73	45.45									
Pygospio elegans	2.23	40.91	Microphthalmus	4.91	18.18									
Mean No. of Species	10.41		Mean No. of Species	15.36		Mean No. of Species	2.29		Mean No. of Species	2.75		Mean No. of Species	3.25	
Mean Abundance	1409.73		Mean Abundance	345.27		Mean Abundance	4.57		Mean Abundance	4.50		Mean Abundance	1191.50	
9	Mean A	% occ	10	Mean A	% occ	11.1	Mean A	% occ	11.2	Mean A	% occ	11.3	Mean A	% occ
Heterochaeta costata	4.62	100.00	Heterochaeta costata	210.42	96.49	Paranais litoralis	7.46	100.00	Heterochaeta costata	134.82	100.00	Paranais litoralis	226.15	100.00
Streblospio shrubsolii	1.23	23.08	Paranais litoralis	59.25	45.61	Heterochaeta costata	2.08	61.54	Paranais litoralis	1.36	63.64	Heterochaeta costata	182.45	95.00
Corophium volutator	0.46	30.77	Enchytraeidae	58.63	89.47	Corophium volutator	1.00	53.85	Hediste diversicolor	1.27	63.64	Enchytraeidae	3.80	40.00
NEMATODA	0.46	15.38	Corophium volutator	54.81	80.70	Tubificoides benedii	0.38	15.38	Corophium volutator	0.82	45.45	Corophium volutator	3.30	80.00
Pygospio elegans	0.15	15.38	Hediste diversicolor	41.09	87.72	Enchytraeidae	0.31	23.08	Tipulidae	0.64	27.27	Lumbricillus	0.75	15.00
Polydora	0.08	7.69	NEMATODA	10.49	50.88	Hediste diversicolor	0.23	23.08	Macoma balthica	0.09	9.09	Streblospio shrubsolii	0.35	15.00
Scolecopsis squamata	0.08	7.69	Streblospio shrubsolii	5.68	38.60	Lumbricillus	0.23	7.69	NEMATODA	0.09	9.09	Amphichaeta sannio	0.35	10.00
Tubificoides benedii	0.08	7.69	COLLEMBOLA	3.49	10.53	Amphichaeta sannio	0.15	7.69	Streblospio shrubsolii	0.09	9.09	Hediste diversicolor	0.30	20.00
			ACAR FORMES	2.39	19.30	Macoma balthica	0.08	7.69				Tipulidae	0.25	15.00
			Manayunkia aestuarina	2.07	28.07	Streblospio shrubsolii	0.08	7.69				Tubificidae	0.25	15.00
Mean No. of Species	2.08		Mean No. of Species	6.72		Mean No. of Species	3.08		Mean No. of Species	3.27		Mean No. of Species	4.80	
Mean Abundance	7.15		Mean Abundance	452.23		Mean Abundance	12.00		Mean Abundance	139.18		Mean Abundance	418.85	



**Figure 22. Results of cluster analysis for midshore Humber north bank sites.**



**Figure 23 (cont.). Results of cluster analysis for midshore Humber north bank sites.**

#### 4.1.3. INDICATOR SPECIES

As described in Section 2 species such as *Capitella capitata* and tubificid oligochaetes can tolerate lower water/sediment quality. Whilst populations of such taxa are common in estuarine benthic systems a large increase in numbers with a corresponding decrease in diversity of other taxa may be indicative of disturbance e.g. due to organic enrichment. The variation over time in numbers of these taxa have been examined and the results given in Figures 24 and 25. The only sites with significant number of tubificid oligochaetes are those at Thorngumbald, Cherry Cob, Stone Creek and Skeffling. At these sites numbers of tubificids are generally lower in latter years whilst peak abundances were generally in the early to mid 1990s (particularly 1994-1995). It is not known if these changes are related to water quality or whether changes in the sediment regime has modified the species composition as reported at Saltend over the last 10 years (Allen, 2004). Numbers of capitellid polychaetes were low throughout the area so are not described further.



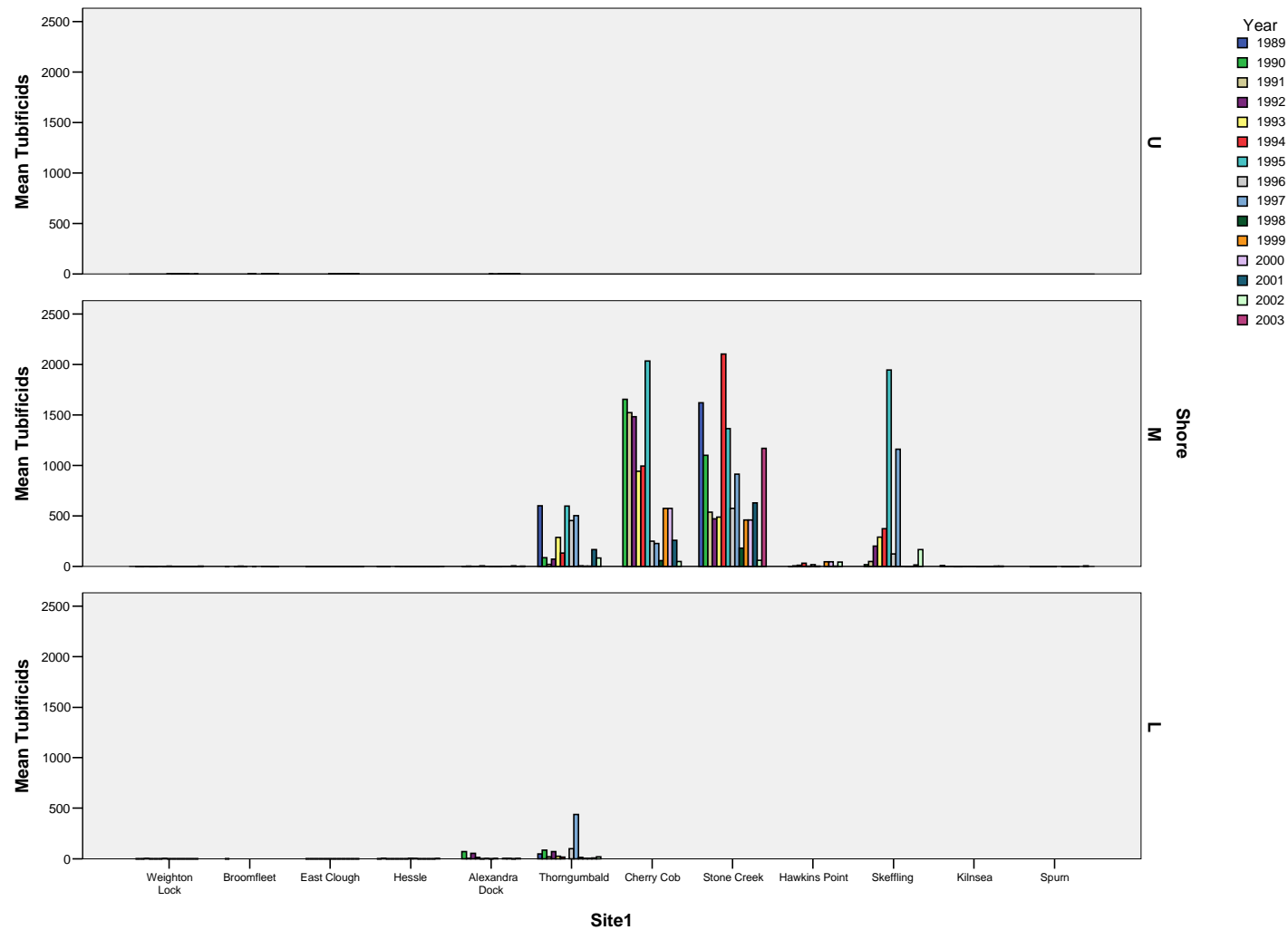
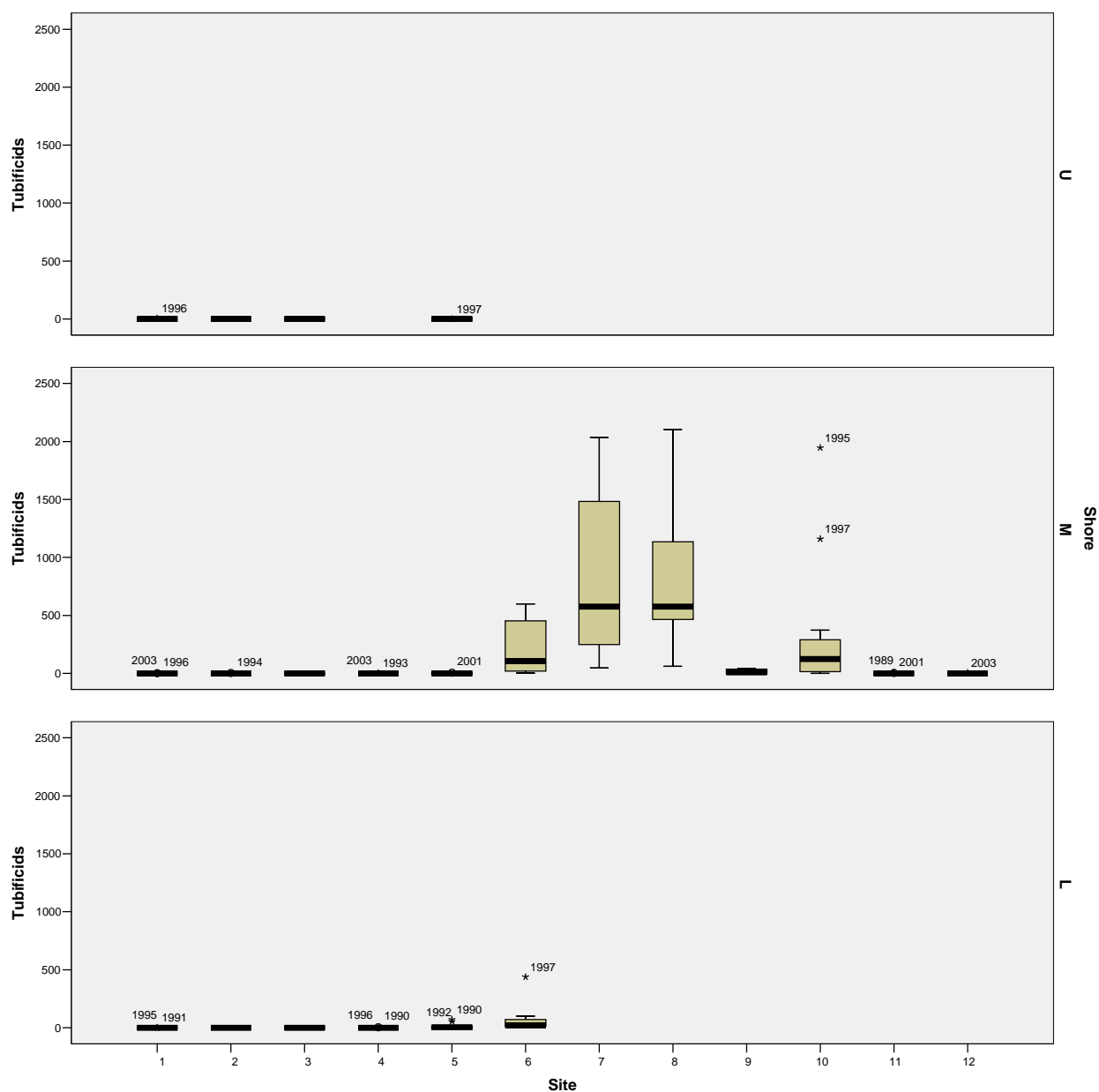


Figure 24. Number of tubificid oligochaetes at Humber north bank sites from 1989 to 2003.



**Figure 25. Boxplots showing variation in numbers of tubificid oligochaetes at Humber north bank sites from 1989 to 2003.**

#### 4.1.4. CONCLUSIONS

- Intertidal communities of the North Bank of the Humber from 1989 to 2003 appear to be typical estuarine communities largely structured according to salinity, shore height and sediment type/mobility.
- Temporal trends less apparent compared with spatial trends but still significant. In many cases these are related to changes in rank dominance of taxa rather than major changes in community structure and likely to be within natural variation.
- The sites exhibited moderate temporal variation with regards to community structure, species richness, abundance and diversity with some sites/years with impoverished communities. However, the majority of these are likely to be due to natural variability.
- Some areas with elevated numbers of tubificid oligochaetes in the early-mid 1990s but numbers decrease thereafter. It is uncertain if such trends reflect improvements in water quality or changes to the sedimentary regime.
- Some indications of a slight trend of increasing species richness and diversity over time at certain sites whilst a decrease in diversity was noted at Hessle and Alexandra Dock in the mid 1990s. It is uncertain if this is related to water quality or tidal stress/sedimentary disturbance. In addition some taxa such as oligochaetes were not identified to species level in 1995 which may also have reduced the apparent diversity of the sites.
- No major indications of change between 1989 and 2003 which can be directly related to water quality at the routine sampling stations although these are generally sited away from discharge locations.

## 4.2. South Bank Intertidal

### 4.2.1 UNIVARIATE ANALYSIS

The numbers of species (S), numbers of individuals (A) and Shannon's diversity (H') have been calculated for each site from 1981 to 2004. The variation in these parameters over time have been summarised for each site in Table 7 and shown as a series of bar charts in Figures 26 to 28 and boxplots in Figures 29 to 31. The trends over time for each site have also been shown in a series of scatter plots (with interpolated linear trend lines superimposed) in Figures 32 to 34. A consistent pattern of increasing species richness and Shannon's diversity down the estuary is evident whilst the numbers of species and diversity is generally lower on the low shore (presumably due to tidal stress in many cases). Species richness is lowest in the upper estuary at sites 1 to 2/2A with a maximum of six species recorded and Shannon's diversity of ranging from 0 to 2.23. Sites 3 to 6 in the mid estuary have intermediate numbers of species and diversity with up to 13 species per site and diversity values ranging from 0 to 2.69. The mid-outer estuary sites (7 to 10) show the highest species richness and diversity (although this may in part be related to the larger sampling size used at some of these sites) with up to 21 species per site and H' diversity generally averaging above 2. Abundance of animals is much more variable with values ranging from 0 to 5220 animals per site (from 5 cores). Sites 6, 7 and 8 in the mid estuary tend to show the highest abundances.

In terms of temporal trends in these parameters a degree of variability is evident at most sites. Certain sites e.g. sites 7, 9 and 10 exhibit a subtle increase in species richness and diversity over time whilst others are highly variable with fluctuating values and some periods with very low diversity. Sites 4 and 5 in particular are variable with a period of lower diversity in the early 1990s. However, these fluctuations are relatively small and are likely to be within the natural limits of variation in many cases e.g. due to variation in sediment/tidal regime. Abundances are often highly variable as might be expected particularly in the mid estuarine sites 6 to 8 where communities are often characterised by high abundances of polychaetes and oligochaetes which tend to fluctuate dramatically over time. It is uncertain if any of these sites are subject to regular disturbance but changes in sediment type or tidal regime would account for some of this variation.

**Table 7. Summary of biological parameters at Humber south bank intertidal sites.**

Station		Number of Species			Number of Individuals (Abundance)			Shannon's Diversity (H')		
		Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum
1	1	4	2	5	504	12	3668	1.01	.05	2.23
	2	2	0	6	13	0	176	.63	.00	2.03
	2A	2	0	3	19	0	91	.72	.00	1.58
	3	5	0	12	234	0	958	1.28	.00	2.69
	4	8	5	13	482	26	1545	1.34	.41	2.64
	5	8	2	13	684	7	2386	1.19	.33	2.44
	6	9	5	13	1286	12	4765	1.66	.73	2.26
	7	10	6	17	818	22	5220	1.79	.36	3.04
	8	12	4	20	726	33	3627	2.01	.55	3.16
	9	12	6	21	143	23	971	2.58	1.12	3.59
	10	11	7	17	101	39	262	2.53	1.45	3.25

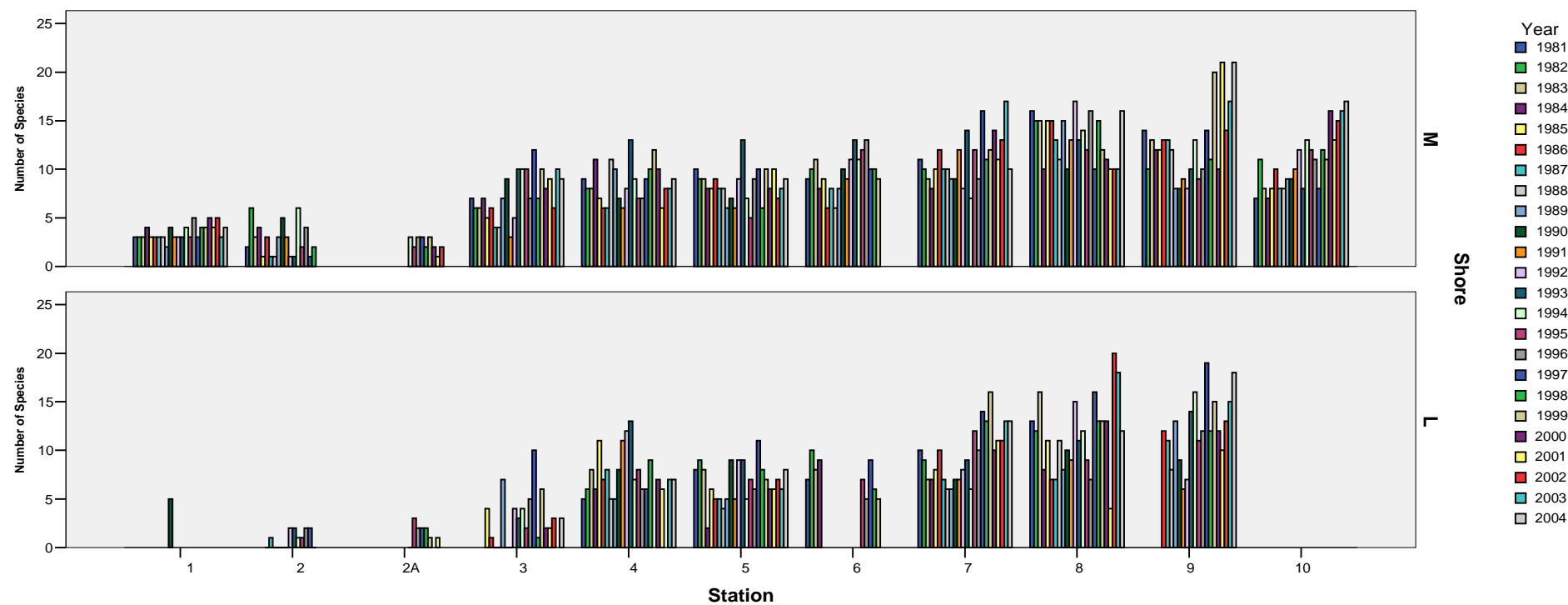


Figure 26. Number of species between 1981 and 2004 for Humber south bank intertidal sites.

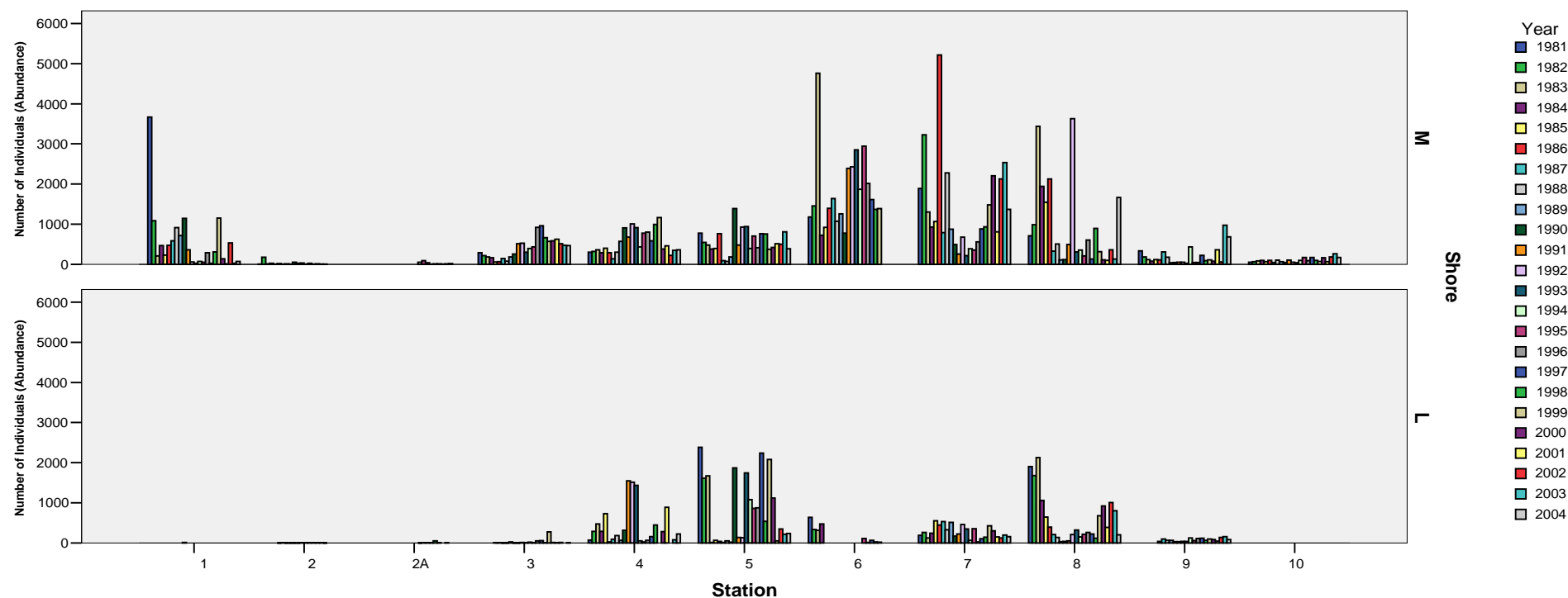


Figure 27. Number of individuals (per site) between 1981 and 2004 for Humber south bank intertidal sites.

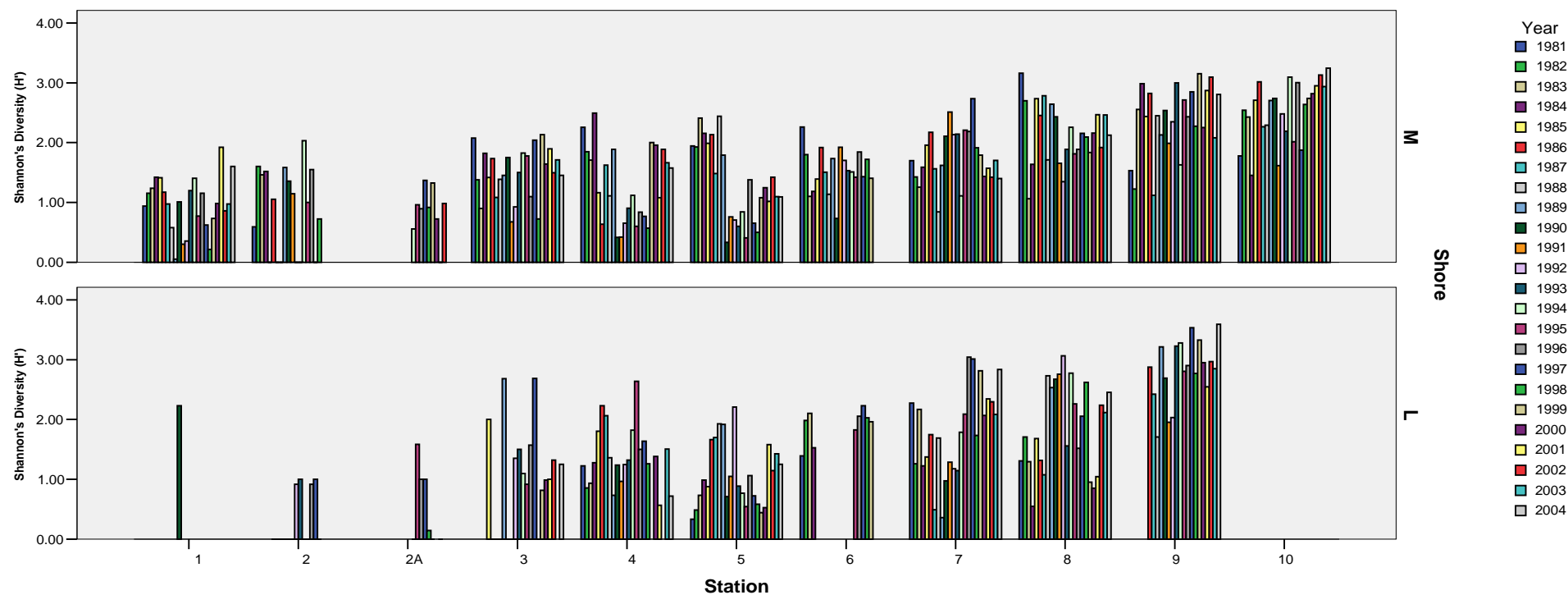


Figure 28. Shannon's Diversity ( $H'$ ) between 1981 and 2004 for Humber south bank intertidal sites.

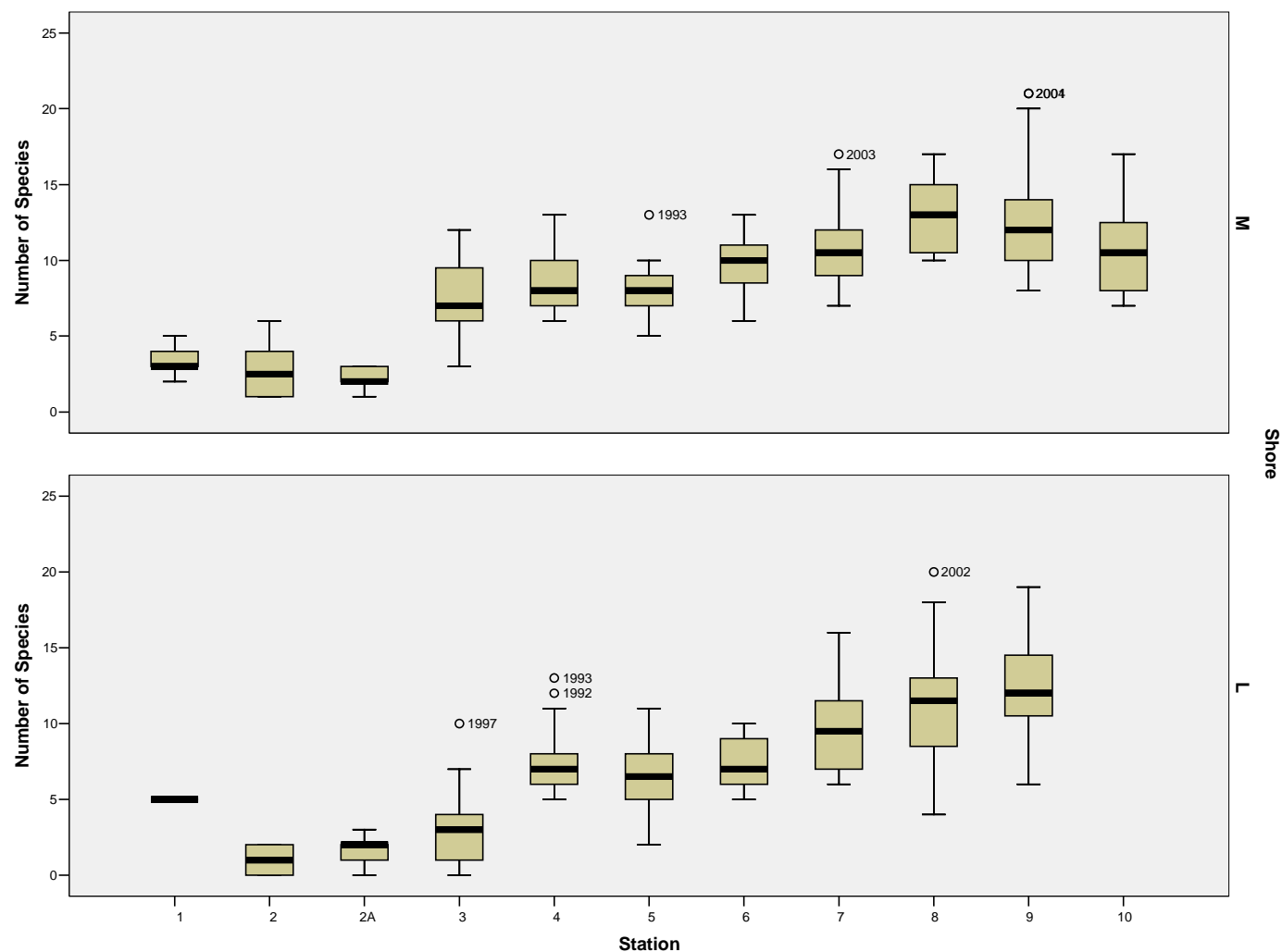


Figure 29. Boxplots showing variability in number of species (between 1981 and 2004) for Humber south bank intertidal sites.



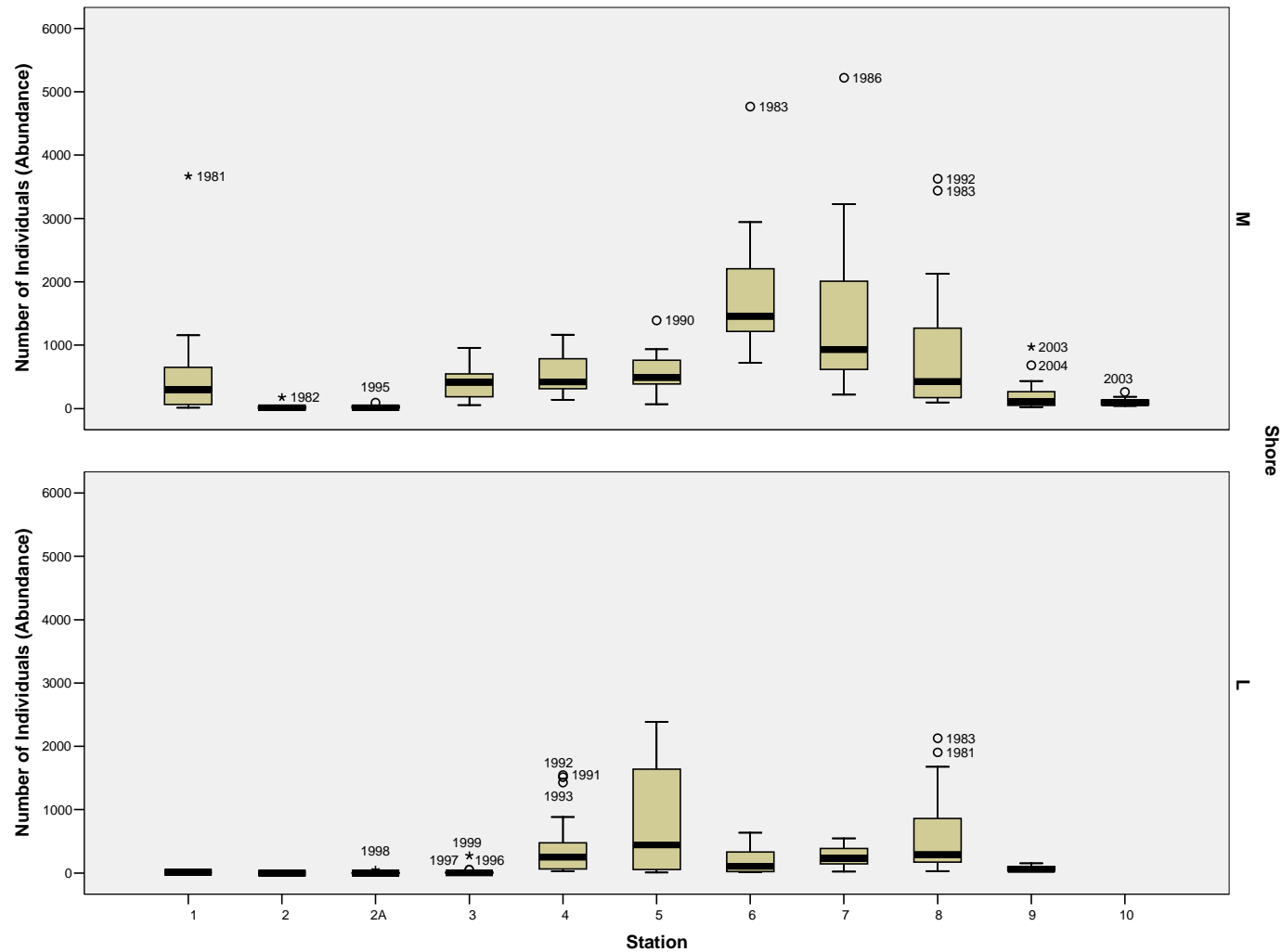


Figure 30. Boxplots showing variability in number of individuals (between 1981 and 2004) for Humber south bank intertidal sites.

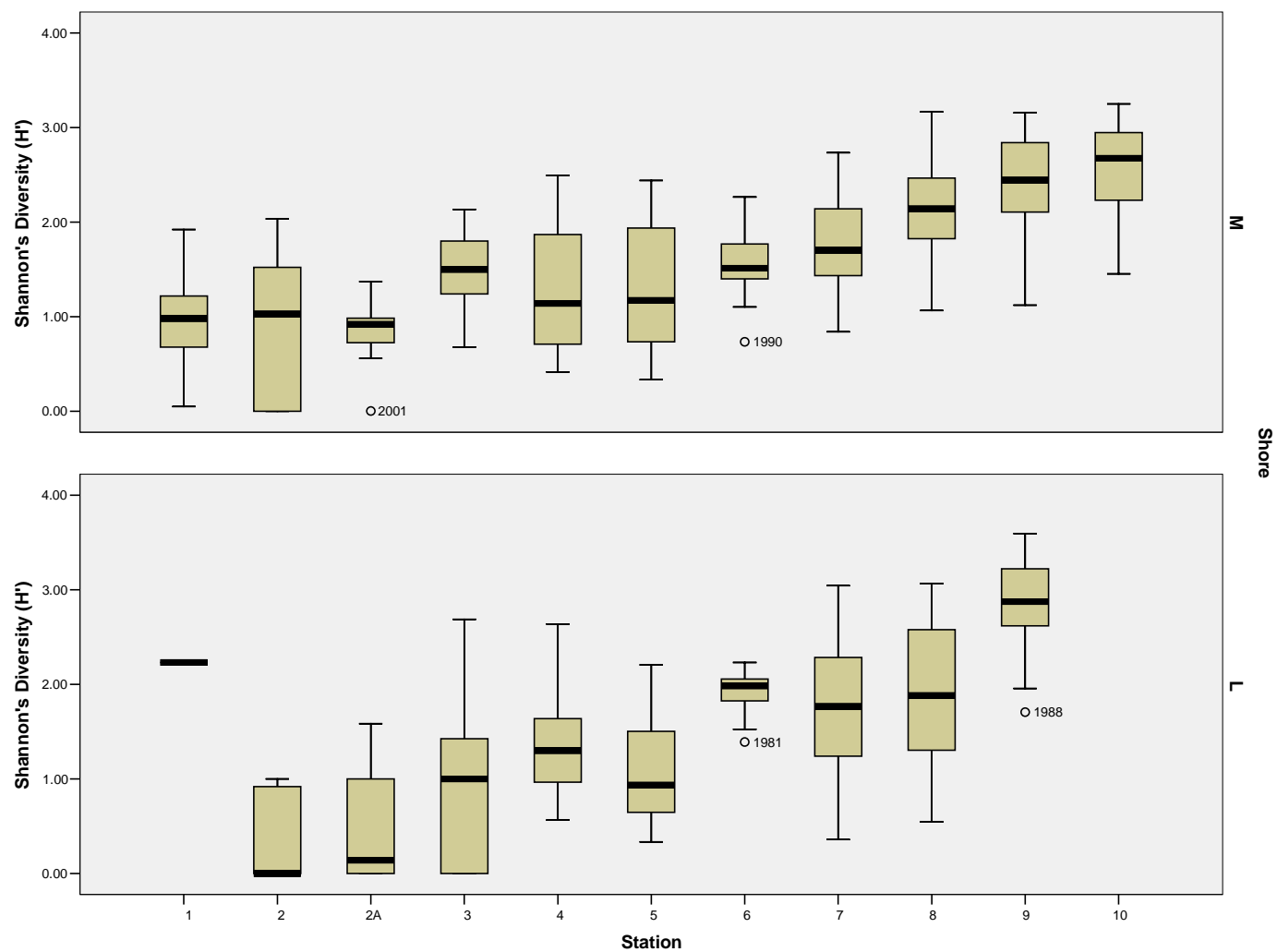
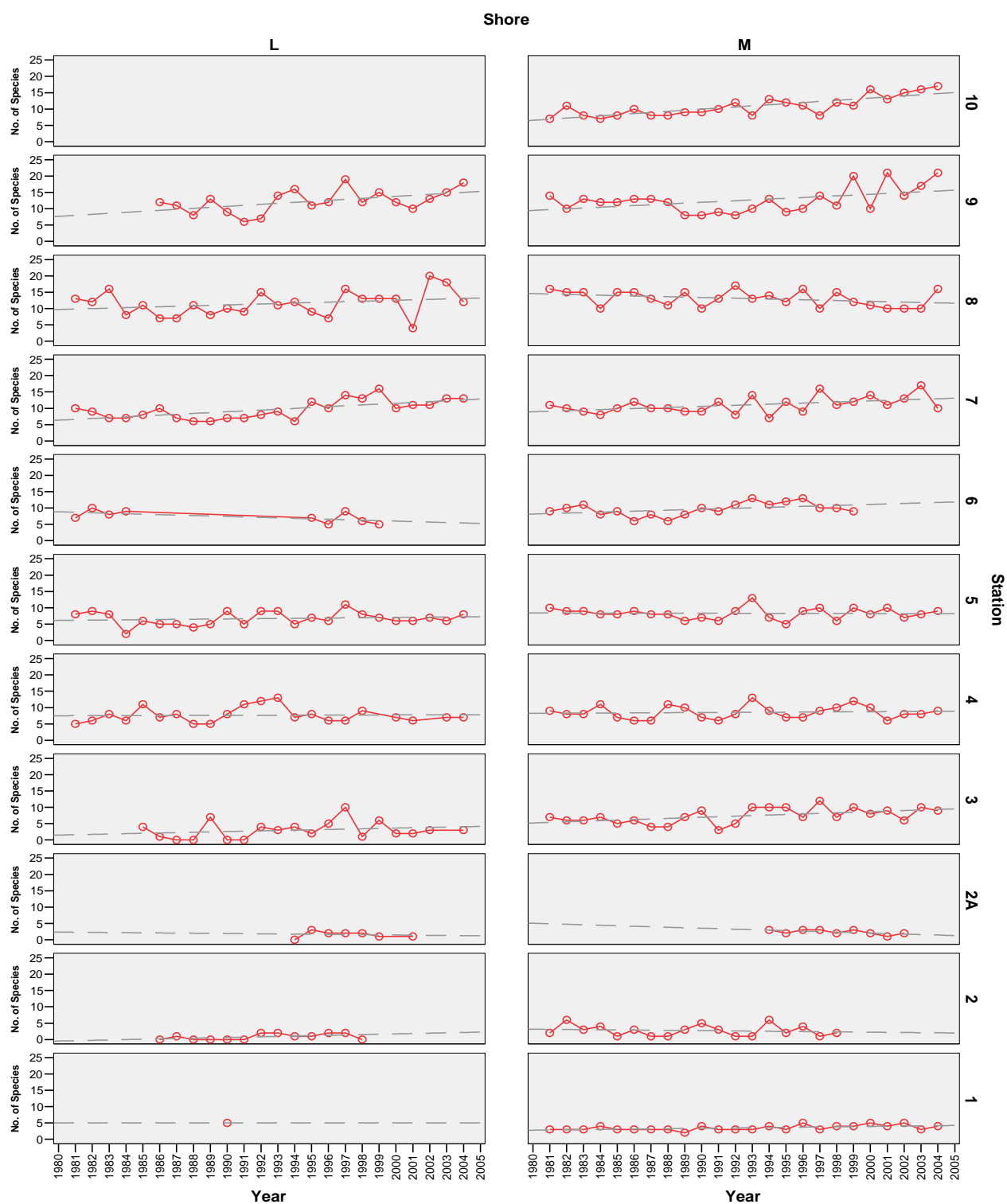
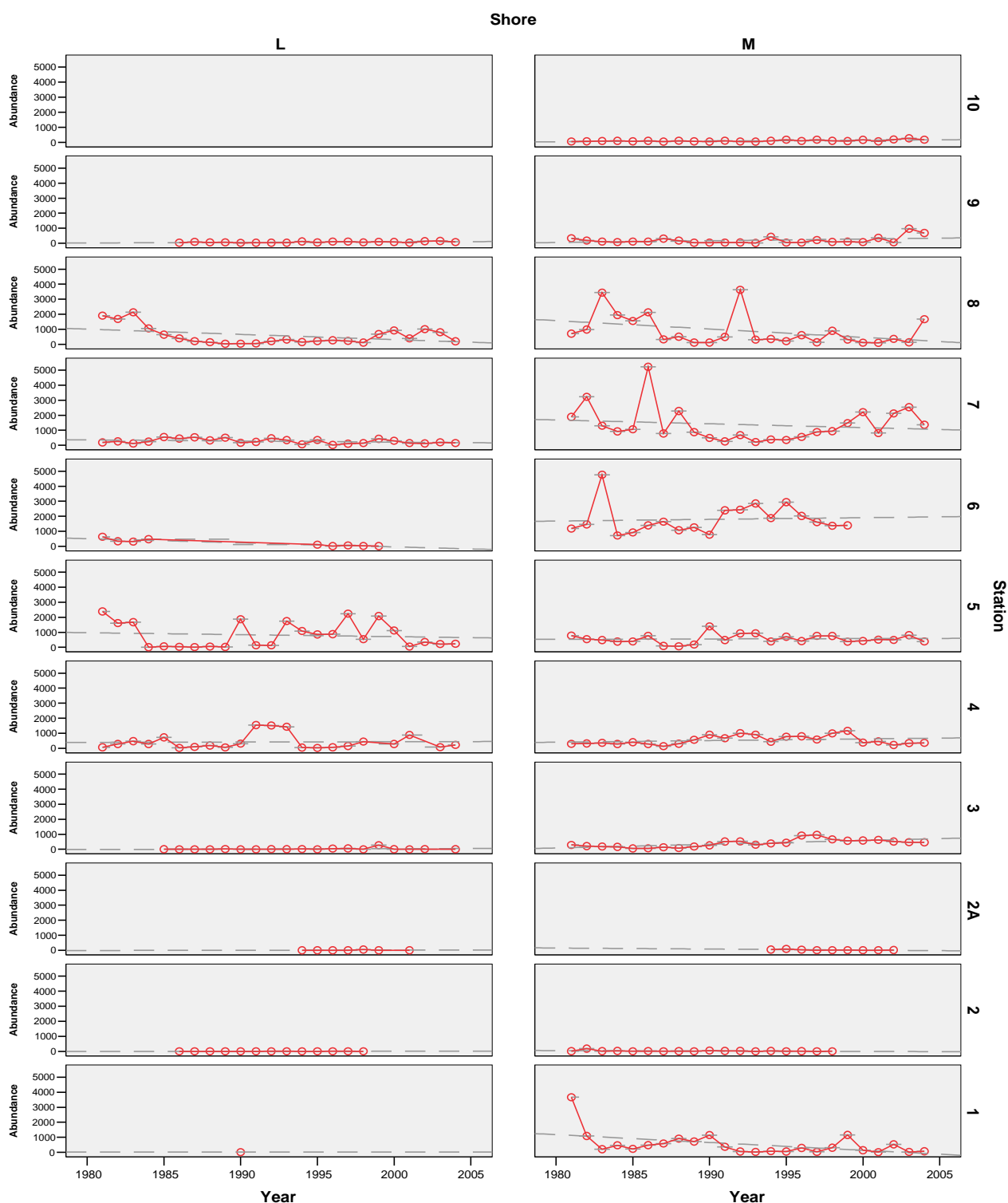


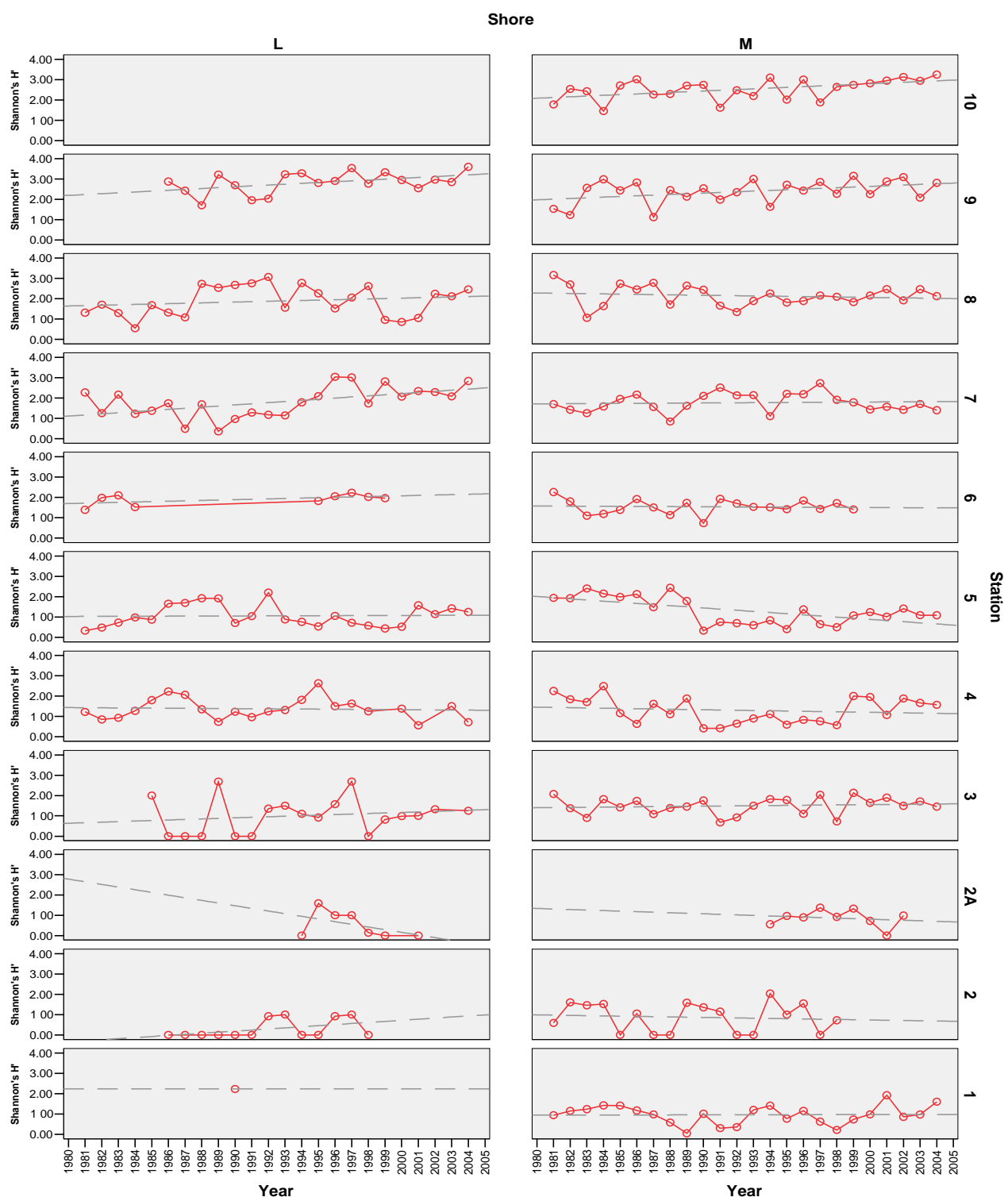
Figure 31. Boxplots showing variability in Shannon's diversity (between 1981 and 2004) for Humber south bank intertidal sites.



**Figure 32. Trends in the number of species (between 1981 and 2004) for Humber south bank intertidal sites.**



**Figure 33. Trends in the number of individuals (between 1981 and 2004) for Humber south bank intertidal sites.**



**Figure 34. Trends in Shannon's diversity (between 1981 and 2004) for Humber south bank intertidal sites.**

#### 4.2.2 MULTIVARIATE ANALYSIS

The results of cluster analysis and MDS for the south bank intertidal dataset from 1981 to 2004 are given in Figures 35 and 36. In general, the main trends identified from the stage 1 report (Allen et al., 2006) have remained broadly consistent over time with the main groups of sites split on the basis of their position on the estuary. Twenty one main site groups have been derived from cluster analysis some of which are divided further. Cluster analysis appears to split the estuary into upper estuarine sites (groups 8 and 9 and groups 17 to 21), mid to upper estuarine sites (groups 11 to 16) and outer estuary sites (groups 4 to 6). Further groups are evident within these groups which further split the sites on the basis of year and shore height. Whilst, there appears to be no consistent temporal trend evident in terms of site groups and many sites remain clustered together over time some sites (particularly the upper estuarine sites) show significant variation over time.

The characteristic species within each site group have been given in Table 8. Groups 1 to 4 contain a number of outliers from the upper and lower estuary (sites, 2, 3, 9 and 10). These sites are impoverished and have a variable species composition which includes low numbers of amphipod crustaceans, polychaetes and occasional *Capitella* which indicates that they were taken from a dynamic mobile habitat. The sites in group 5 and 6 are from sites 9 and 10 from the outer estuary and are characterised by amphipods such as *Urothoe* spp. and *Bathyporeia* spp along with polychaetes including *Nephtys cirrosa* and *Paraonis fulgens*. Such species are typical of relatively saline sands and are typical in outer estuarine habitats.

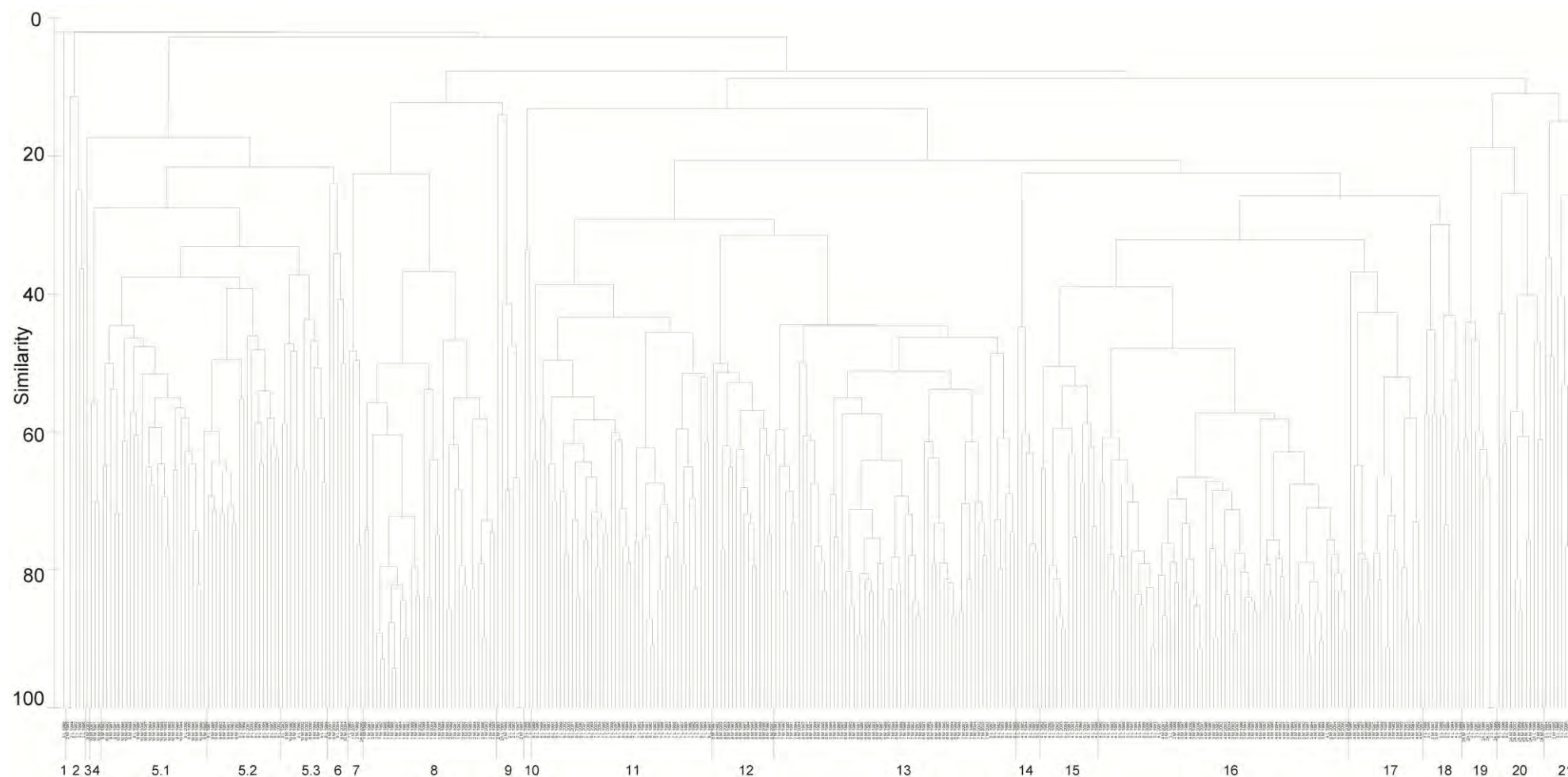
Sites in groups 8 and 9 are from the extreme upper estuary and characterised by oligochaetes such as *Paranais litoralis* and *Heterochaeta costata* with occasional *Hediste diversicolor*, *Corophium volutator* and *Streblospio shrubsolii*. Group 9 contains 2 outliers (3L 1989 and 7L 1996) with sparse fauna and are probably tideswept variants of the communities in group 11 and 12 which are mid estuarine sites at either low water, (sites 6 and 7) or mid shore (site 8) characterised by *Tharyx/Aphelochaeta* spp. and *Tubificoides oligochaetes*. Groups 13 and 14 comprises of the same sites from the middle estuary but at different tidal elevations (low shore site 8 and mid shore sites 6 and 7). These habitats are characterised by *Tubificoides benedii*, *Paranais litoralis* and *Macoma balthica* (sites 6 and 7) or *Polydora* sp. and *Pygospio elegans* (site 8).

Groups 15 and 16 are from the mid to upper estuary and contain the majority of sites 3, 4 and 5. These habitats are characterised by moderate numbers of polychaetes such as *Streblospio shrubsolii* and *Pygospio elegans* along with *Corophium volutator*. A similar community is evident in group 17 which also consists of sites 3 and 4 but generally from the 1980s with an increased dominance of *Hediste diversicolor* and oligochaetes. The remaining groups (18 to 21) are comprised of a few quite variable outlier sites from the mid to upper estuary with very low species richness/abundance.

The results of cluster analysis on individual midshore sites (Figure 32) indicate that many of the sites are quite variable over time (particularly in the upper estuary which is presumably affected by frequent channel movements) with sites from different year exhibiting similarities of 20% to 40%. Some sites, notably sites 4, 5, 8 and 9 show some consistent temporal variation with sites from the 1980s somewhat separate from sites from 1990 to 2004. At site 4 these differences are due to the change in dominance from *Paranais litoralis* in the 1980s

to *Corophium volutator* in latter years. A similar pattern was evident at site 5 where the dominant species changed from *Macoma balthica*, *Strebliospio elegans*, *Pygospio elegans* and *Tubificoides benedii* to *Corophium volutator*. At site 8 the dominant taxa in the 1980s were *Hydobia ulvae*, *Tubificoides* spp. and occasionally *Capitella* sp. whilst from 1989 onwards *Aphelochaeta/Tharyx* sp. and *Pygospio elegans* become more dominant. At site 9 there is a slight shift from 1980 to 1990 as the dominant taxa changes from *Paraonis fulgens* to amphipods such as *Urothoe* spp. and *Bathyporeia* sp with *Nephtys cirrosa*.

Using the ANOSIM procedure in the PRIMER package tests were carried out for differences in species similarity for both site and year. The results of these tests indicated that the sites were significantly different in terms of species composition ( $Rho = 0.731$ ;  $p=0.001$ ). However, a much weaker but still significant difference between years was also detected ( $Rho = 0.131$ ;  $p=0.001$ ).



**Figure 35. Results of cluster analysis for Humber south bank intertidal sites from 1981 to 2004.**



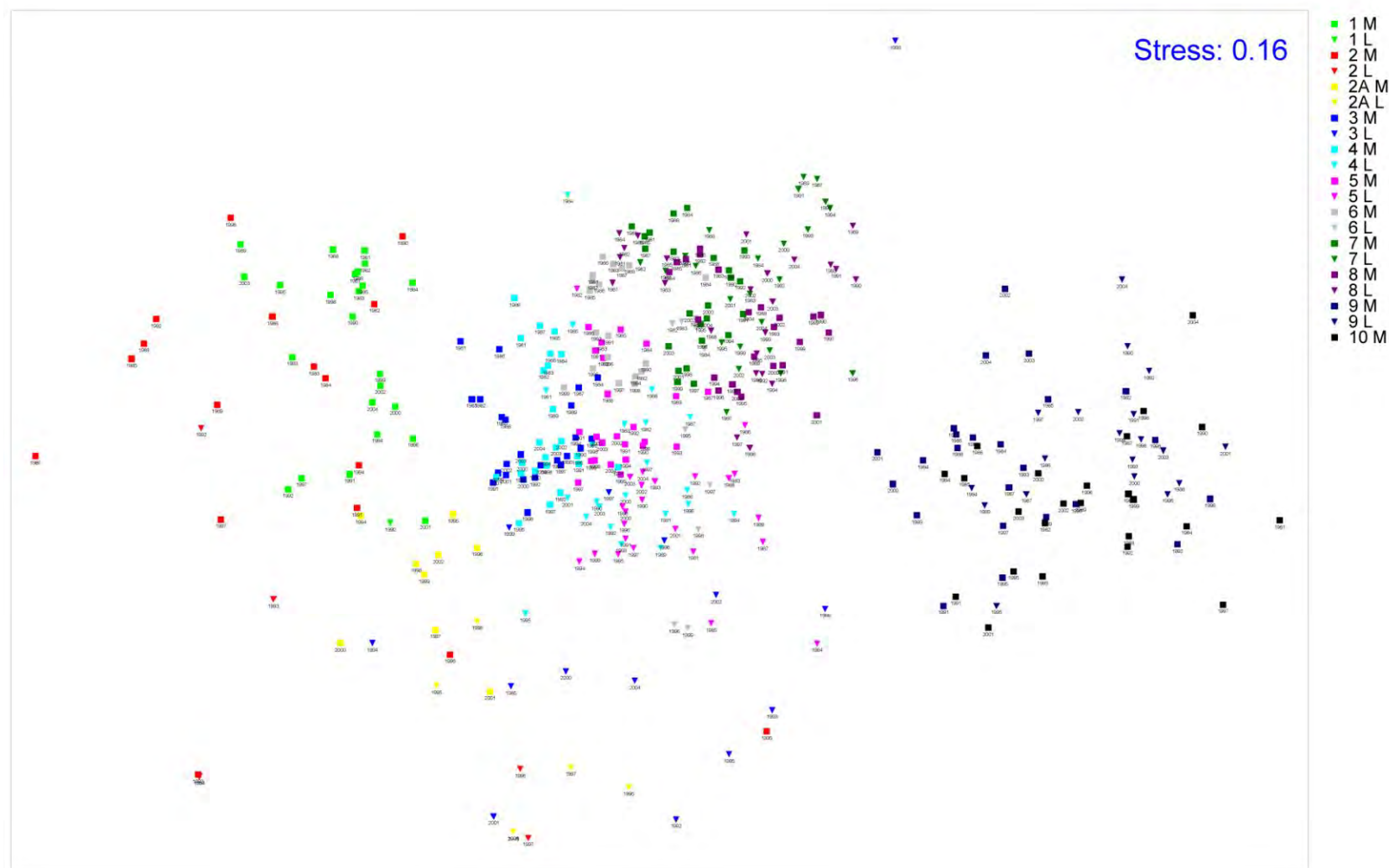


Figure 36. Results of MDS for Humber south bank intertidal sites from 1981 to 2004.

**Table 8. Characteristic species within intertidal south bank site groups derived from cluster analysis.**

1	Mean A	% occ	2	Mean A	% occ	3	Mean A	% occ	4	Mean A	% occ	5.1	Mean A	% occ
Macoma balthica	0.20	100.0	Capitella capitata	0.36	20 00	Nephtys hombergii	2.00	100 0	Eurydice pulchra	6.22	100 0	Urothoe spp.	4.44	100 0
			Gammarus spp.	0.21	60 00	Cumacea	0.90	100 0	Haustorius spp.	1.73	100 0	Paraonis fulgens	2.23	96.15
			Enchytraeidae	0.13	60 00	Glycera tridactyla	0.50	100 0	NEMERTEA	1.27	100 0	Bathyporeia spp.	1.67	88.46
			Hediste diversicolor	0.05	20 00	Bathyporeia spp.	0.40	100 0	Bathyporeia spp.	0.85	100 0	NEMERTEA	0.84	76.92
			Pygospio elegans	0.05	20 00	Cerastoderma edule	0.40	100 0	Urothoe spp.	0.60	66.67	Nephtys cirrosa	0.60	88.46
			Arenicola marina	0.04	20 00	NEMERTEA	0.30	100 0	Paraonis fulgens	0.55	100 0	Haustorius spp.	0.36	50.00
			Corophium volutator	0.04	20 00	Nephtys spp. juv.	0.30	100 0	Scolecopsis squamata	0.40	100 0	Spio spp.	0.34	19.23
					Anatides maculata	0.20	100 0	Nephtys cirrosa	0.12	66.67	Pygospio elegans	0.25	34.62	
					Corophium arenarium	0.20	100 0	Ensis spp.	0.07	33.33	Cerastoderma spp. juv.	0.21	26.92	
					Capitella capitata	0.10	100 0	Pontocrates/Periculoides	0.07	33.33	Spio martinensis	0.21	38.46	
Mean No. of Species	1.00		Mean No. of Species	2.20		Mean No. of Species	14 00		Mean No. of Species	9.33		Mean No. of Species	10.04	
Mean abundance	0.20		Mean abundance	0.88		Mean abundance	5.70		Mean abundance	12 00		Mean abundance	12.45	

5.2	Mean A	% occ	5.3	Mean A	% occ	6	Mean A	% occ	7	Mean A	% occ	8	Mean A	% occ
Paraonis fulgens	12.01	100 00	Pygospio elegans	3.13	58 33	Harpacticoida	14.70	80.00	Paranais litoralis	0.94	100.00	Paranais litoralis	43.24	76.47
Tanaidacea	2.14	95.00	Spio martinensis	2.37	100.00	Nematoda	8.10	60.00	Corophium volutator	0.28	60.00	Heterochaeta costatus	38.95	100.00
Nephtys cirrosa	1.29	100 00	Nephtys cirrosa	1.32	100.00	Paraonis fulgens	2.88	0	Heterochaeta costatus	0.21	60.00	Hediste diversicolor	2.85	67.65
Bathyporeia spp.	1.22	90.00	NEMERTEA	1.27	41 67	NEMERTEA	2.80	80.00	Hediste (Nereis) diversicolor	0.12	20.00	Corophium volutator	1.90	41.18
Urothoe spp.	0.83	85.00	Bathyporeia spp.	0.89	100.00	Ensis spp.	2.28	20.00	Enchytraeidae	0.08	20.00	Streblospio shrubsolii	0.51	11.76
Pygospio elegans	0.69	40.00	Paraonis fulgens	0.77	91 67	Hydrobia ulvae	2.12	80.00	Streblospio shrubsolii	0.08	20.00	Enchytraeidae	0.06	14.71
Spio martinensis	0.67	60.00	Urothoe spp.	0.77	58 33	Pygospio elegans	1.88	40.00	Macoma balthica	0.04	20.00	Macoma balthica	0.05	5 88
NEMERTEA	0.54	55.00	Cumacea	0.68	75 00	Cerastoderma edule	1.86	60.00				Tubificid spp. juv.	0.05	2 94
Nephtys spp. juv.	0.41	25.00	Harpacticoida	0.52	8.33	Spio martinensis	1.34	80.00				Tubificoides swirencoides	0.02	8 82
Spiophanes bombyx	0.41	75.00	Spiophanes bombyx	0.43	50 00	Tanaissus lilljeborgi	0.84	40.00				Tubificoides benedii	0.02	5 88
Mean No. of Species	12.55		Mean No. of Species	12.17		Mean No. of Species	18 80		Mean No. of Species	3.00		Mean No. of Species	3.53	
Mean abundance	22.38		Mean abundance	13.81		Mean abundance	45 30		Mean abundance	1.75		Mean abundance	87.70	

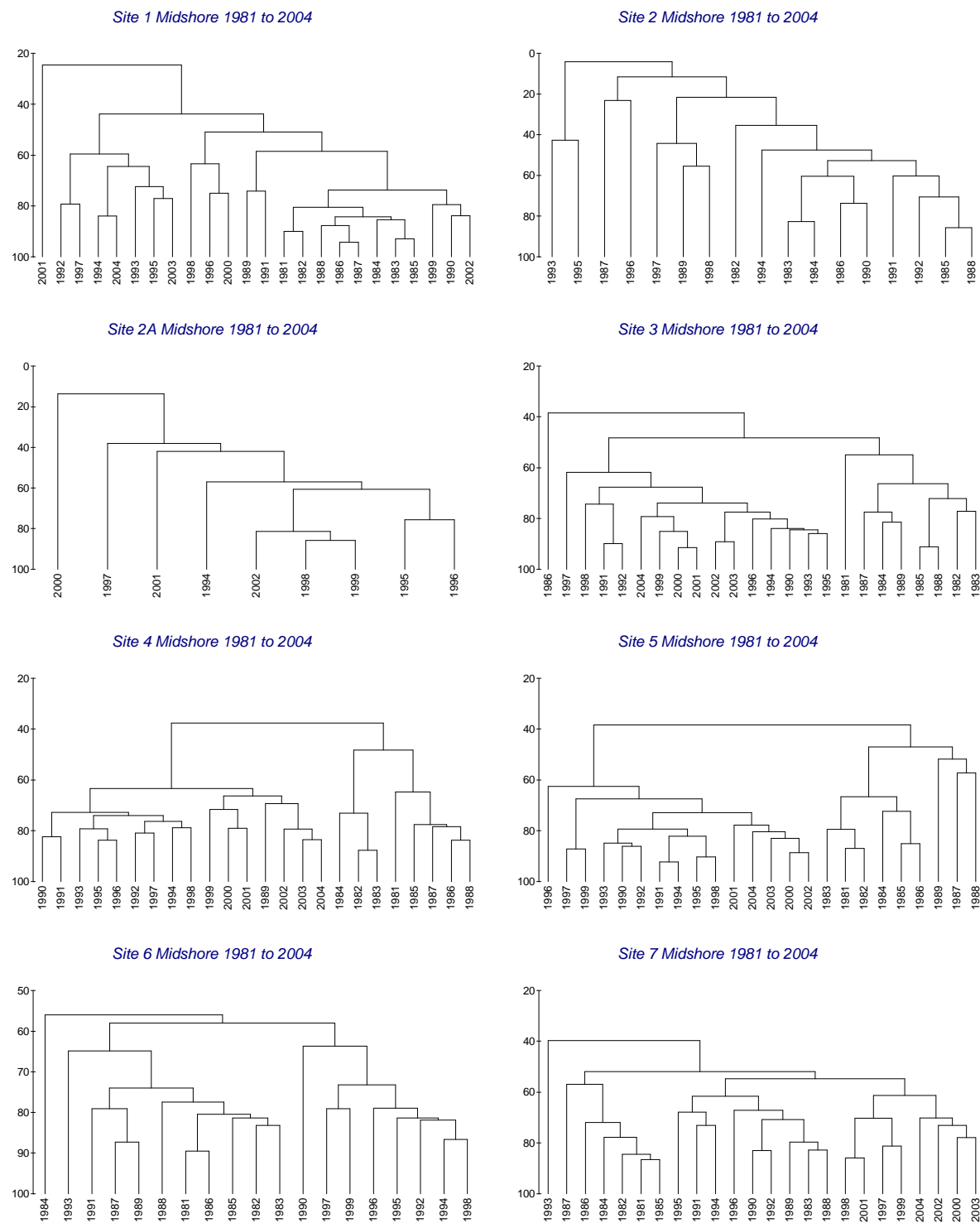
9	Mean A	% occ	10	Mean A	% occ	11	Mean A	% occ	12	Mean A	% occ	13	Mean A	% occ
Heterochaeta costatus	0.20	85.71	Pygospio elegans	0.70	100.00	Tharyx/Aphelocheata	18.76	89.13	Hydrobia ulvae	53.11	93.75	Tubificoides benedii	140.71	100.00
Hediste diversicolor	0.11	42.86	Eteone longa/flava	0.60	100.00	Tubificoides swirencoides	17 27	97.83	Pygospio elegans	24 59	100.00	Paranais litoralis	41.17	64.52
Corophium volutator	0.03	14.29	Gammarus spp.	0.50	50 00	Tubificoides benedii	14.47	97.83	Tharyx/Aphelocheata spp.	8.55	100.00	Macoma balthica	34.05	0
Paranais litoralis	0.03	14.29	Spiophanes bombyx	0.50	50 00	Pygospio elegans	4.44	80.43	Cerastoderma spp. juv.	6.40	37.50	Hydrobia ulvae	26.43	58.06
Streblospio shrubsolii	0.03	14.29	Polydora spp.	0.40	50 00	Streblospio shrubsolii	2.52	69.57	Macoma balthica	3.58	87.50	Corophium volutator	23.60	32.26
Tubificoides benedii	0.03	14.29	Hydrobia ulvae	0.30	100.00	Nephtys hombergii	1.51	91.30	Eteone longa/flava	2.25	87.50	Pygospio elegans	16.29	95.16
			Marenzelleria viridis	0.30	50 00	Nephtys spp. juv.	1.46	58.70	Nephtys hombergii	1.39	87.50	Capitella spp.	10.88	50.00
			Tharyx/Aphelocheata	0.30	50 00	Macoma balthica	0.78	76.09	Scoloplos armiger	0.65	75.00	Hediste diversicolor	5.85	67.74
			Tubificoides swirencoides	0.20	50 00	Paranais litoralis	0.64	21.74	Bivalve spp.	0.63	12.50	Tharyx/Aphelocheata spp.	4.69	56.45
			Anatides maculata	0.10	50 00	Hydrobia ulvae	0.53	34.78	Corophium volutator	0.61	62.50	Eteone longa/flava	3.05	79.03
Mean No. of Species	1.86		Mean No. of Species	8.50		Mean No. of Species	10 24		Mean No. of Species	12.44		Mean No. of Species	10.76	
Mean abundance	0.43		Mean abundance	4.30		Mean abundance	64 53		Mean abundance	104.55		Mean abundance	317 91	

**Table 8 (cont.). Characteristic species within intertidal south bank site groups derived from cluster analysis.**

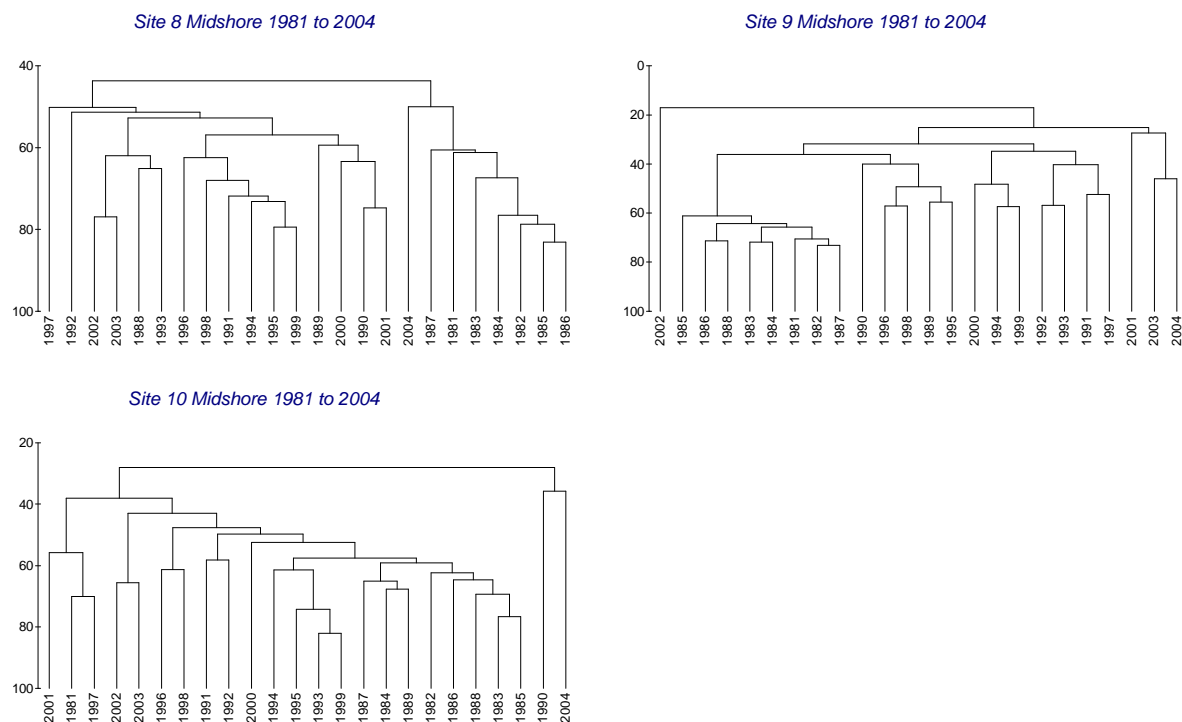
14	Mean A	% occ	15	Mean A	% occ	16	Mean A	% occ	17	Mean A	% occ	18	Mean A	% occ
Polydora spp.	235.79	100.0	Streblospio shrubsolii	28.11	100.0	Corophium volutator	117.59	100.0	Hediste diversicolor	17.12	100.0	Pygospio elegans	3.29	81.82
Pygospio elegans	27.04	100.0	Corophium volutator	5.75	66.67	Streblospio shrubsolii	8.78	93.75	Streblospio shrubsolii	15.91	100.0	Macoma balthica	1.36	45.45
Alkmaria romijni	8.38	16.67	Pygospio elegans	2.05	100.0	Polydora spp.	4.71	26.56	Paranais litoralis	13.28	63.16	Tubificoides benedii	1.20	72.73
Streblospio shrubsolii	4.58	83.33	Tubificoides benedii	1.90	66.67	Hediste diversicolor	4.37	78.13	Manayunkia aestuarina	6.30	57.89	Streblospio shrubsolii	0.96	81.82
Enchytraeidae	2.83	100.0	Hediste diversicolor	0.54	60.00	Macoma balthica	4.01	81.25	Pygospio elegans	6.07	100.0	Corophium volutator	0.60	36.36
Tubificoides benedii	0.79	33.33	Macoma balthica	0.53	73.33	Pygospio elegans	3.59	78.13	Macoma balthica	4.31	89.47	Polydora spp.	0.25	27.27
Arenicola marina	0.63	50.00	Polydora spp.	0.42	6.67	Manayunkia aestuarina	1.51	45.31	Eteone longa/flava	0.90	52.63	Paranais litoralis	0.24	9.09
Hediste diversicolor	0.33	66.67	Eteone longa/flava	0.26	46.67	Nereis spp. juv.	1.48	37.50	Enchytraeidae	0.66	31.58	Hediste diversicolor	0.13	36.36
Macoma balthica	0.17	66.67	Spionidae spp. Juv.	0.11	20.00	Enchytraeidae	0.78	57.81	Tubificoides benedii	0.58	15.79	Eteone longa/flava	0.11	36.36
Eteone longa/flava	0.17	50.00	Ampharete (Juvenile)	0.10	13.33	Tubificoides benedii	0.47	40.63	Heterochaeta costatus	0.45	47.37	Alkmaria romijni	0.07	18.18
Mean No. of Species	8.00		Mean No. of Species	6.80		Mean No. of Species	8.36		Mean No. of Species	7.32		Mean No. of Species	5.45	
Mean abundance	281.17		Mean abundance	40.15		Mean abundance	148.76		Mean abundance	66.37		Mean abundance	8.49	

19	Mean A	% occ	20	Mean A	% occ	21	Mean A	% occ
Corophium volutator	0.22	100.0	Corophium volutator	2.68	100.0	Streblospio shrubsolii	0.49	77.78
Hediste diversicolor	0.07	11.11	Hediste diversicolor	1.83	58.33	Enchytraeidae	0.44	33.33
Streblospio shrubsolii	0.04	22.22	Macoma balthica	0.23	25.00	Tubificoides benedii	0.22	55.56
Nereis spp. juv.	0.02	11.11	Bivalve spp.	0.12	8.33	Corophium volutator	0.18	33.33
Ostracoda	0.02	11.11	Tubificoides benedii	0.10	25.00	Spionidae spp. Juv.	0.18	11.11
Polydora spp.	0.02	11.11	Tharyx/Aphelochaeta	0.10	16.67	Macoma balthica	0.13	11.11
Tharyx/Aphelochaeta	0.02	11.11	Nereis spp. juv.	0.05	16.67	Eteone longa/flava	0.11	11.11
			Pygospio elegans	0.03	16.67	Gammarus spp.	0.04	22.22
			Eteone longa/flava	0.03	8.33	Hediste diversicolor	0.04	11.11
			Enchytraeidae	0.02	8.33	Alkmaria romijni	0.02	11.11
Mean No. of Species	1.78		Mean No. of Species	3.17		Mean No. of Species	3.22	
Mean abundance	0.42		Mean abundance	5.25		Mean abundance	1.95	



**Figure 37. Results of cluster analysis for midshore Humber south bank sites.**



**Figure 37 (cont.). Results of cluster analysis for midshore Humber south bank sites.**

#### 4.2.3 INDICATOR SPECIES

Numbers of *Capitella* and tubificid oligochaetes at each site from 1981 to 2004 are given in Figures 38 to 41. Significant numbers of *Capitella* were only sporadically recorded at site 6, 7 and 8 in the middle estuary and peak numbers were recorded in the mid 1980s, most notably from 1983 to 1986. Numbers of tubificid oligochaetes were also primarily found at sites 6 to 8. At site 6 (midshore) numbers have been relatively consistent with a slight increase in 1993-1995 whilst at sites 7 and 8 peak numbers were recorded in the early 1980s and then largely decreased thereafter.

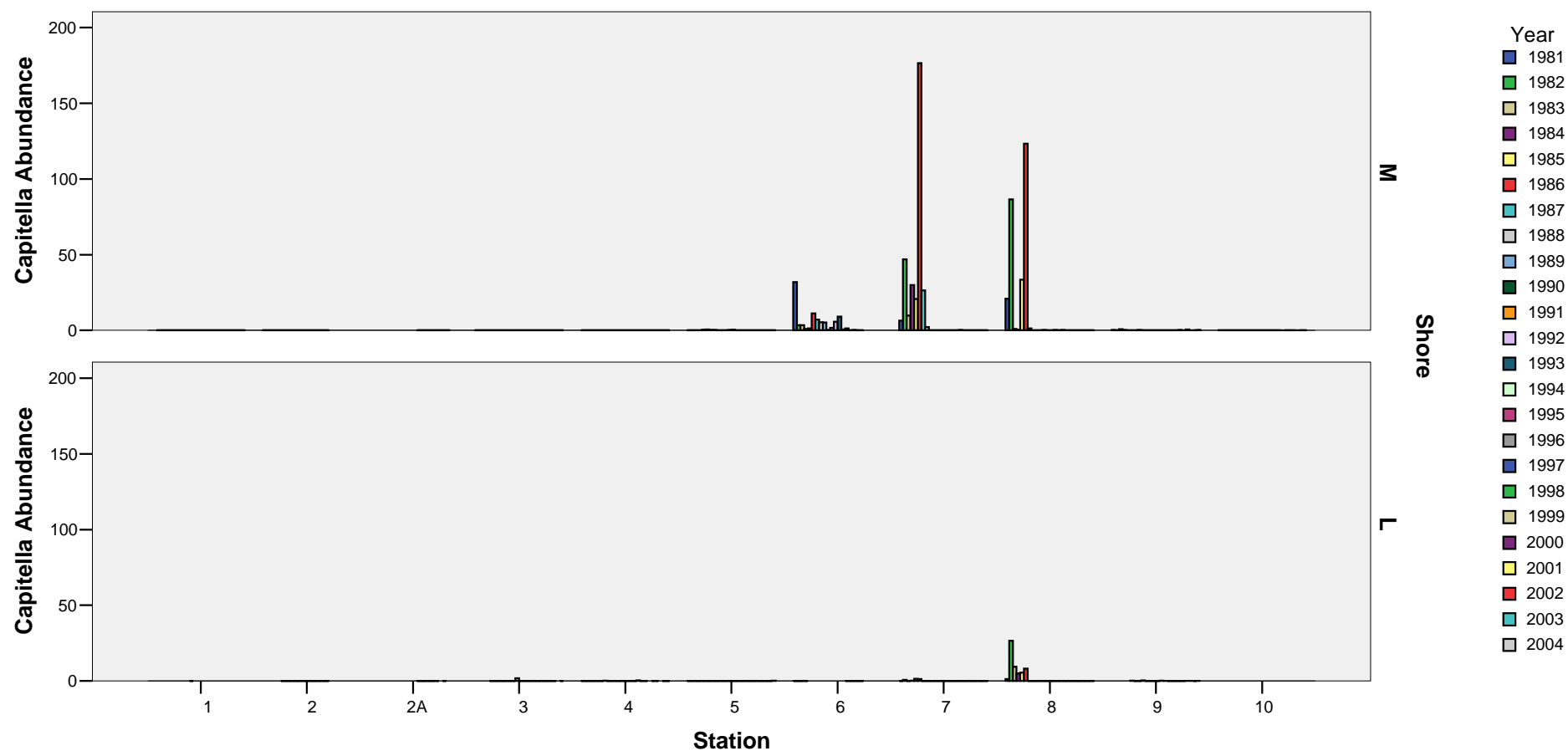


Figure 38. Number of *Capitella* at Humber south bank sites from 1981 to 2004.

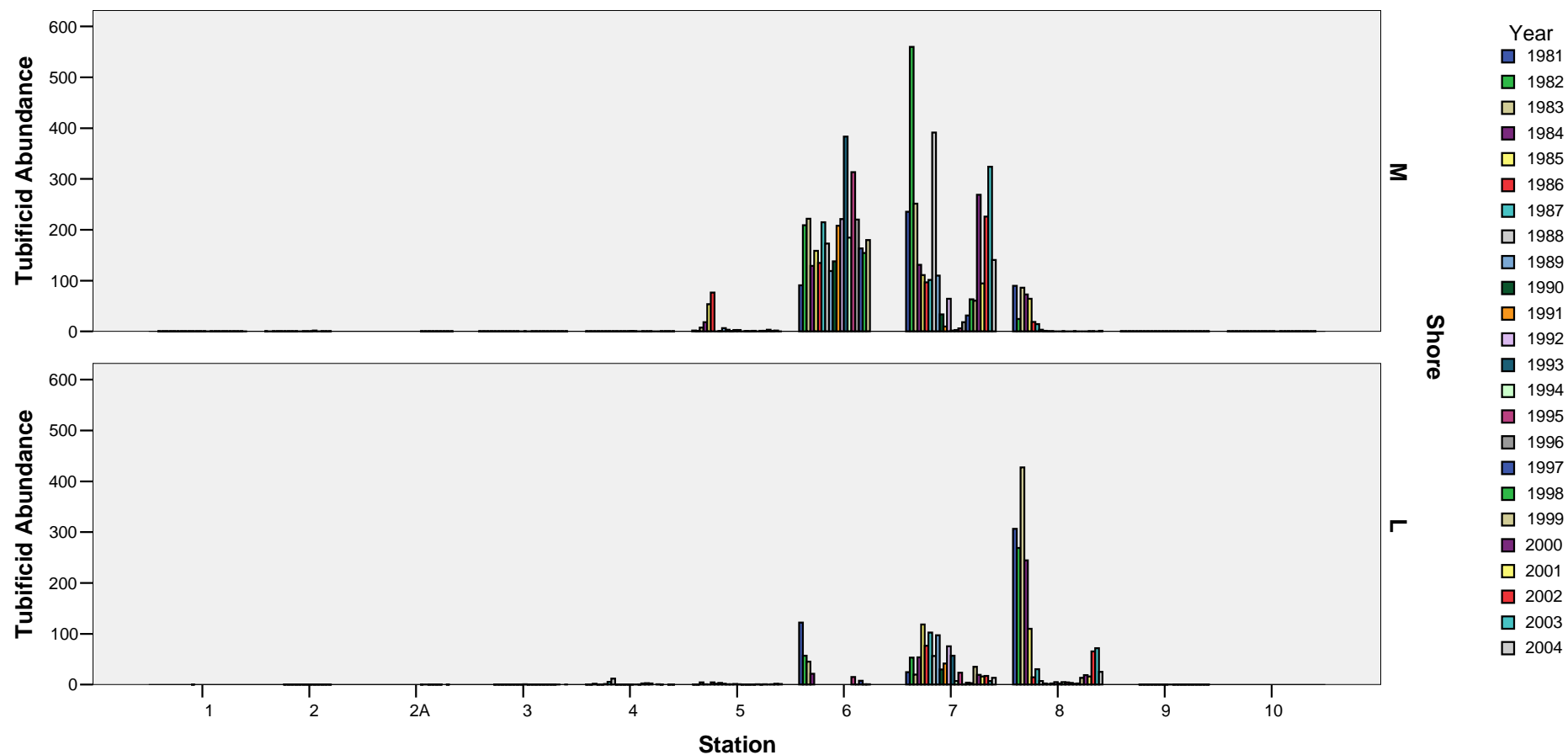


Figure 39. Number of tubificid oligochaetes at Humber south bank sites from 1981 to 2004.

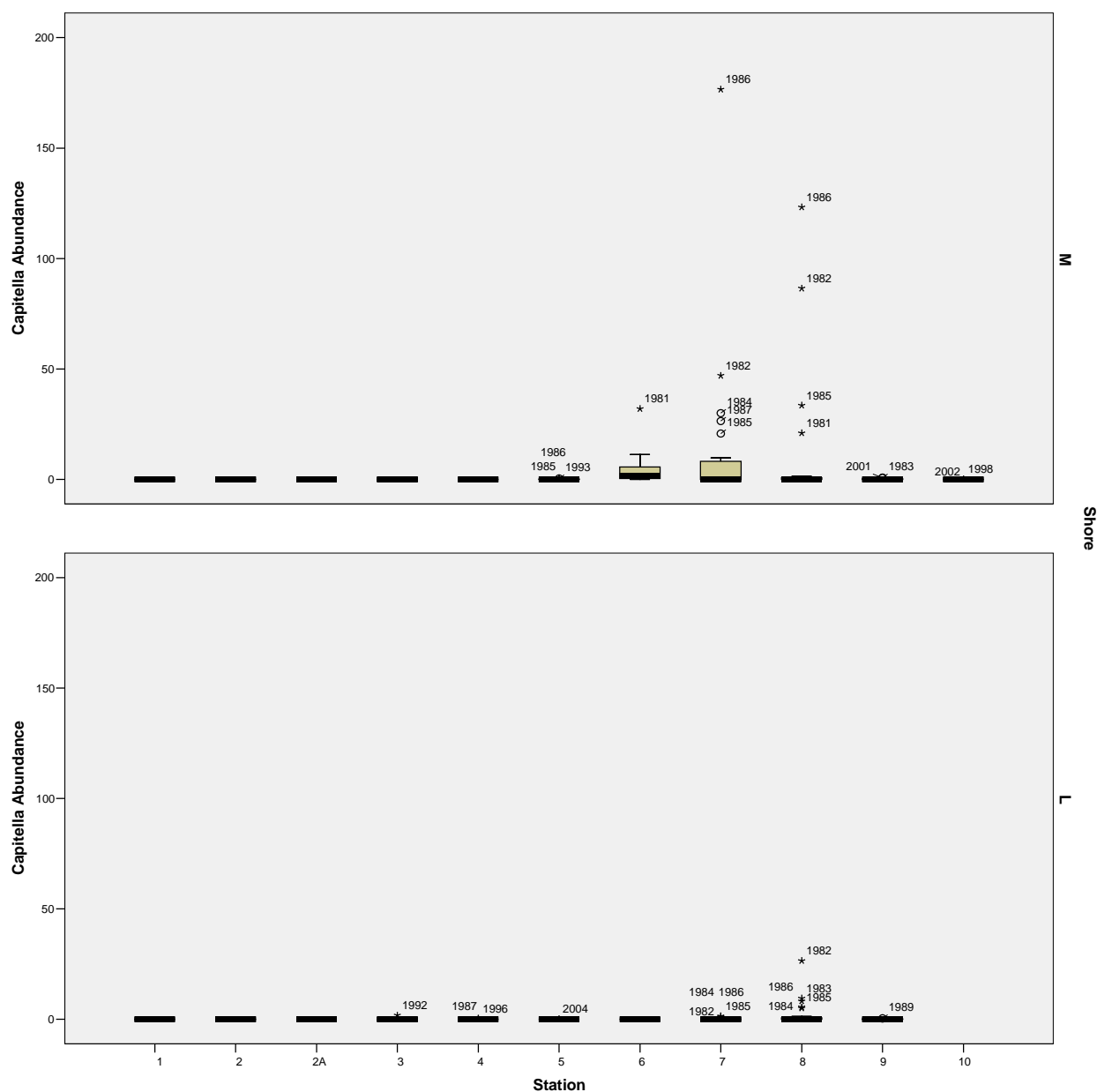
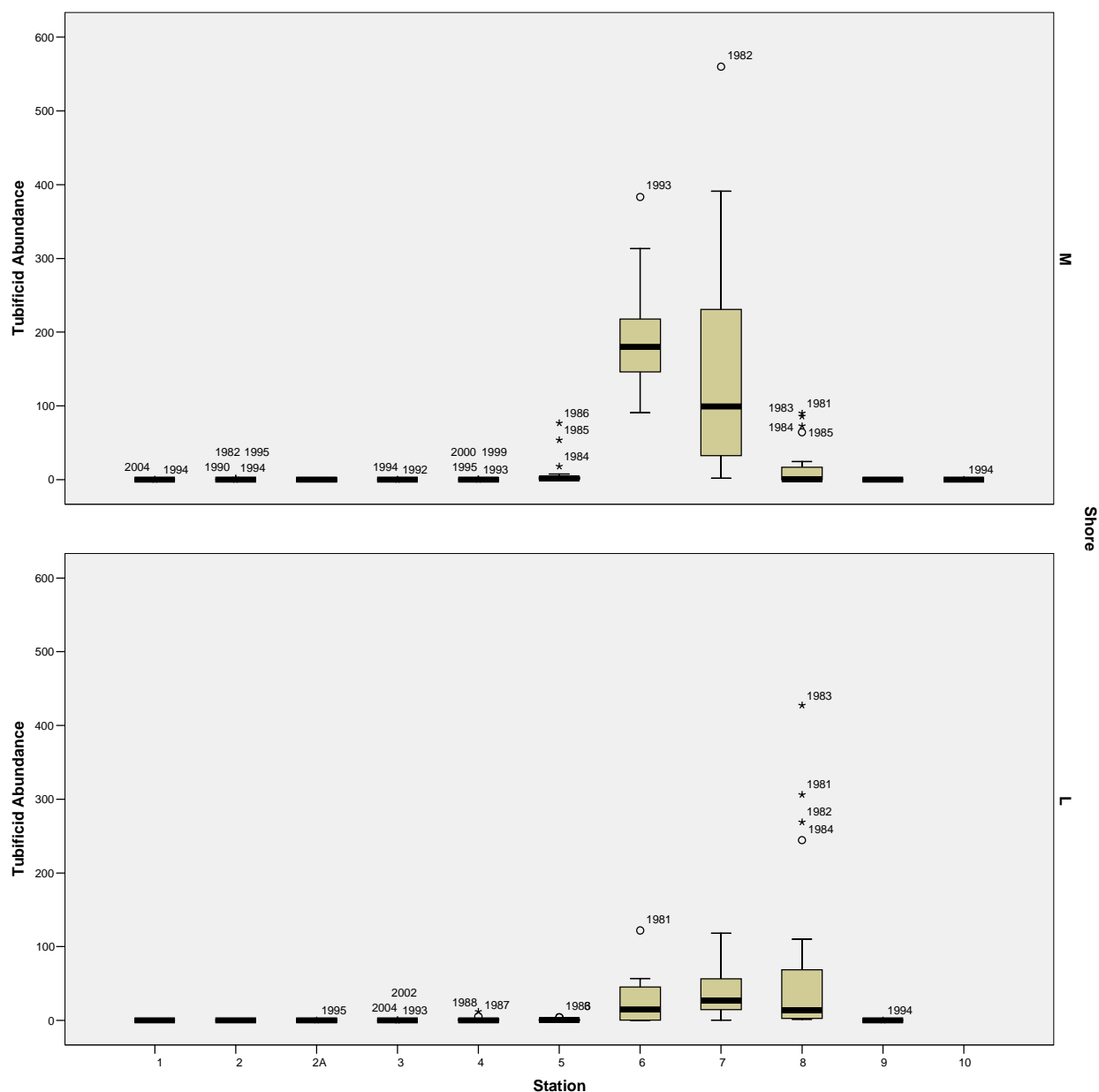


Figure 40. Boxplots showing variation in numbers of *Capitella* at Humber north bank sites from 1989 to 2003.





**Figure 41. Boxplots showing variation in numbers of tubificid oligochaetes at Humber north bank sites from 1989 to 2003.**

#### 4.2.4 CONCLUSIONS

- Communities largely appear typical for an estuarine intertidal habitat and primarily structured according to salinity, shore height and sediment type.
- Some communities are relatively impoverished but these appear to be typical for such habitats. Much of the variation in community structure described may be within the limits expected in a dynamic estuary.
- There was some indication of an increase in species richness and diversity over time at some sites whilst at others a modest decrease was evident in the early 1990s.
- Some relatively high abundances of *Capitella* and tubificid oligochaetes evident in certain years/sites. Some of these are typical estuarine communities but others in the mid estuary may be indicative of mild organic enrichment. Numbers generally decrease from the mid 1980s onwards although it is not known if this is related to increases in water quality.
- Temporal trends less apparent compared with spatial trends but still significant. In many cases these are related to changes in rank dominance of taxa rather than major changes in community structure and likely to be within natural variation.
- No major indications of change between 1981 and 2004 which can be directly related to water quality at the routine sampling stations although these are generally sited away from discharge locations.

### 4.3 Routine Subtidal Sites

#### 4.3.1 UNVARIATE ANALYSIS

The results of univariate analysis for the subtidal sites have been summarised in Table 9 and Figures 42 to 50. As described in the stage 1 report and in common with the intertidal surveys species richness and diversity tends to increase down the estuary and this patterns is broadly consistent from 1979 to 2004. Lowest numbers of species and H' diversity are found in the upper to mid estuary with maximum numbers of species generally less than 6 per site and H' diversity values less than 2. The mid to outer subtidal sites (with the exception of site 11) are characterised by a richer faunal community with up to 54 species recorded in the outer estuary and H' diversity values generally between 2 to 3. As shown for the intertidal sites the abundance of animals is highest in the mid-outer estuary particularly towards the south shore of the Humber. Site 7 shows the highest abundances with up to 48300 animals per 0.3m<sup>2</sup> whilst lowest abundances were generally recorded at site 1 although low abundances were also recorded in the outer estuary e.g. sites 9 and 11.

**Table 9. Summary of biological parameters for Humber subtidal sites 1979 to 2004.**

		Number of Species			Number of Individuals (Abundance)			Shannon's Diversity (H')		
		Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum
Site	1	3	1	9	21	3	72	.93	.00	2.51
	2	5	2	8	61	8	353	1.35	.21	2.30
	3	5	1	11	38	3	263	1.29	.00	2.75
	4	5	2	9	55	3	361	1.39	.10	2.70
	5	7	1	11	122	1	1108	1.73	.00	2.78
	6	8	3	15	39	4	119	2.38	1.25	3.58
	7	19	11	27	13081	1677	48344	1.06	.30	2.02
	8	11	5	22	39	9	138	2.75	1.11	3.45
	9	10	4	14	48	7	94	2.48	.82	3.18
	10	27	14	42	5269	1523	14814	1.70	.51	2.80
	11	8	4	11	20	4	38	2.53	1.36	3.12
	12	26	14	39	1824	551	5543	2.22	1.33	2.95
	13	15	7	25	107	14	581	2.90	1.46	3.86
	14	33	18	54	2017	81	11117	2.61	.95	3.69

Some temporal variation in the biological parameters is also evident at many of the sites and although there does not appear to be any major trends over time it is noticeable that H' diversity and species richness reduces somewhat at a number of sites in the late 1980s to early 1990s whilst at sites 8 and 12 in the outer estuary some low diversities were recorded in 2000 to 2002. Whilst these changes are relatively small and probably within the expected limits of variation for the estuary they may indicate some change to the benthos during this period. However, the subtidal areas of the Humber are subject to considerable sediment movement (and reworking) which in conjunction to movements of the channels and variations in freshwater input leads to a highly dynamic habitat.

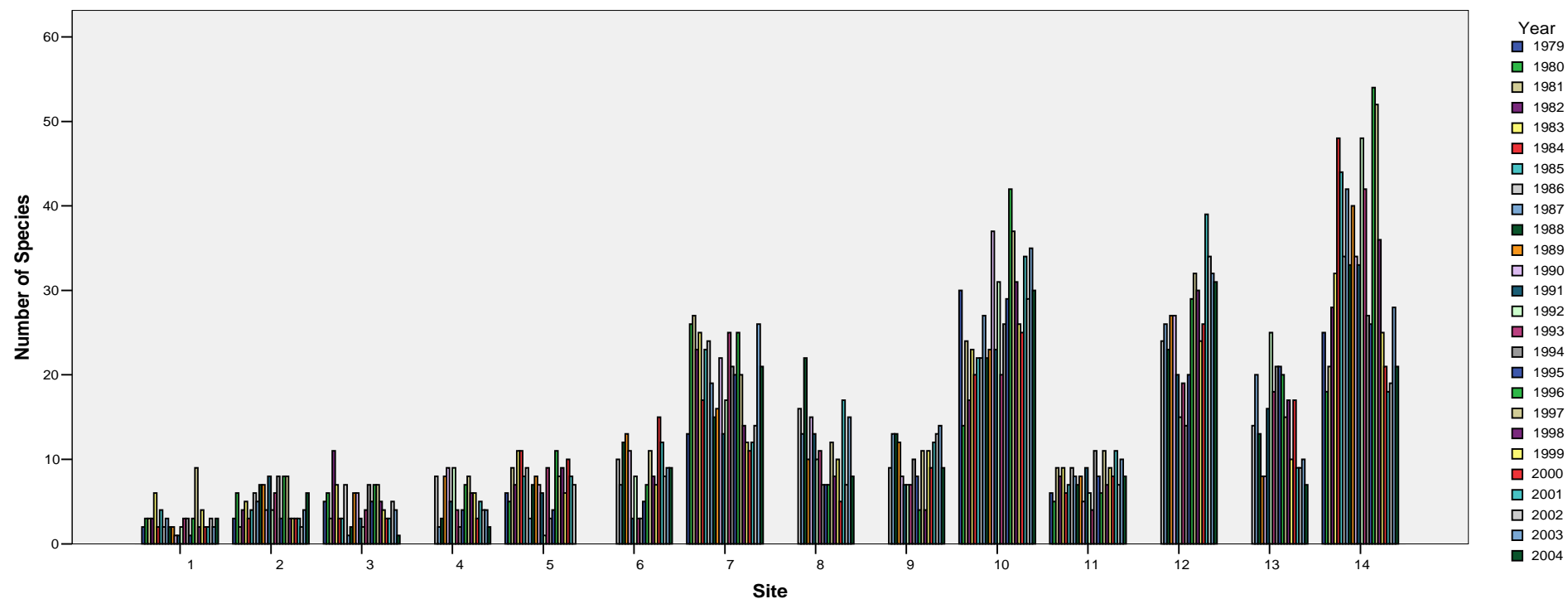


Figure 42. Number of species between 1979 and 2004 for Humber subtidal sites.

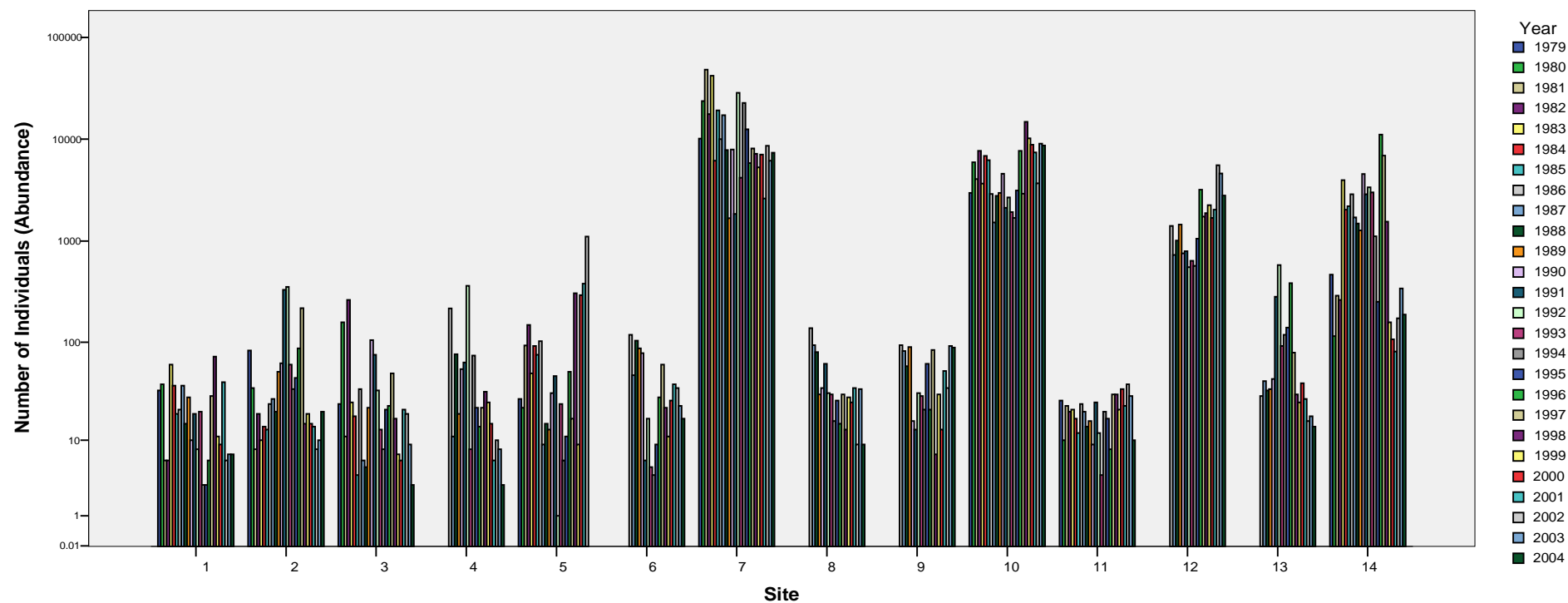


Figure 43. Number of individuals (per site) between 1979 and 2004 for Humber subtidal sites.

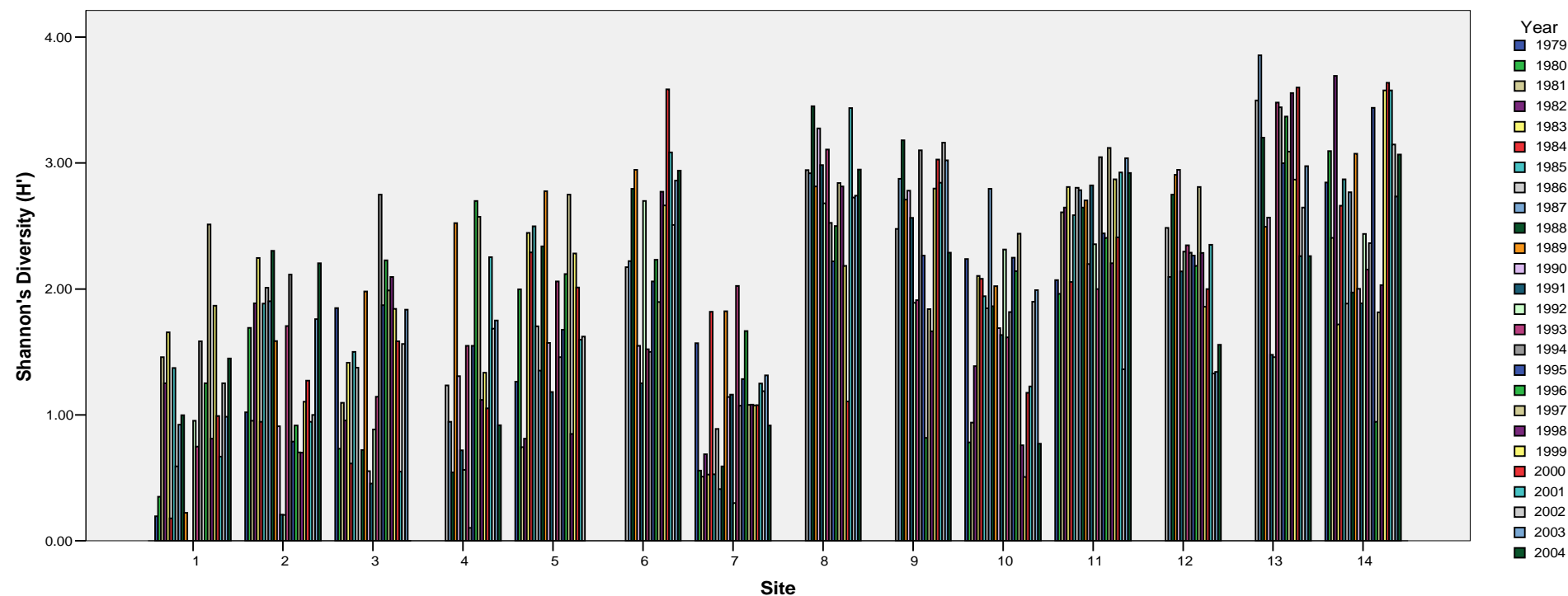


Figure 44. Shannon's Diversity (H') between 1981 and 2004 1979 and 2004 for Humber subtidal sites.

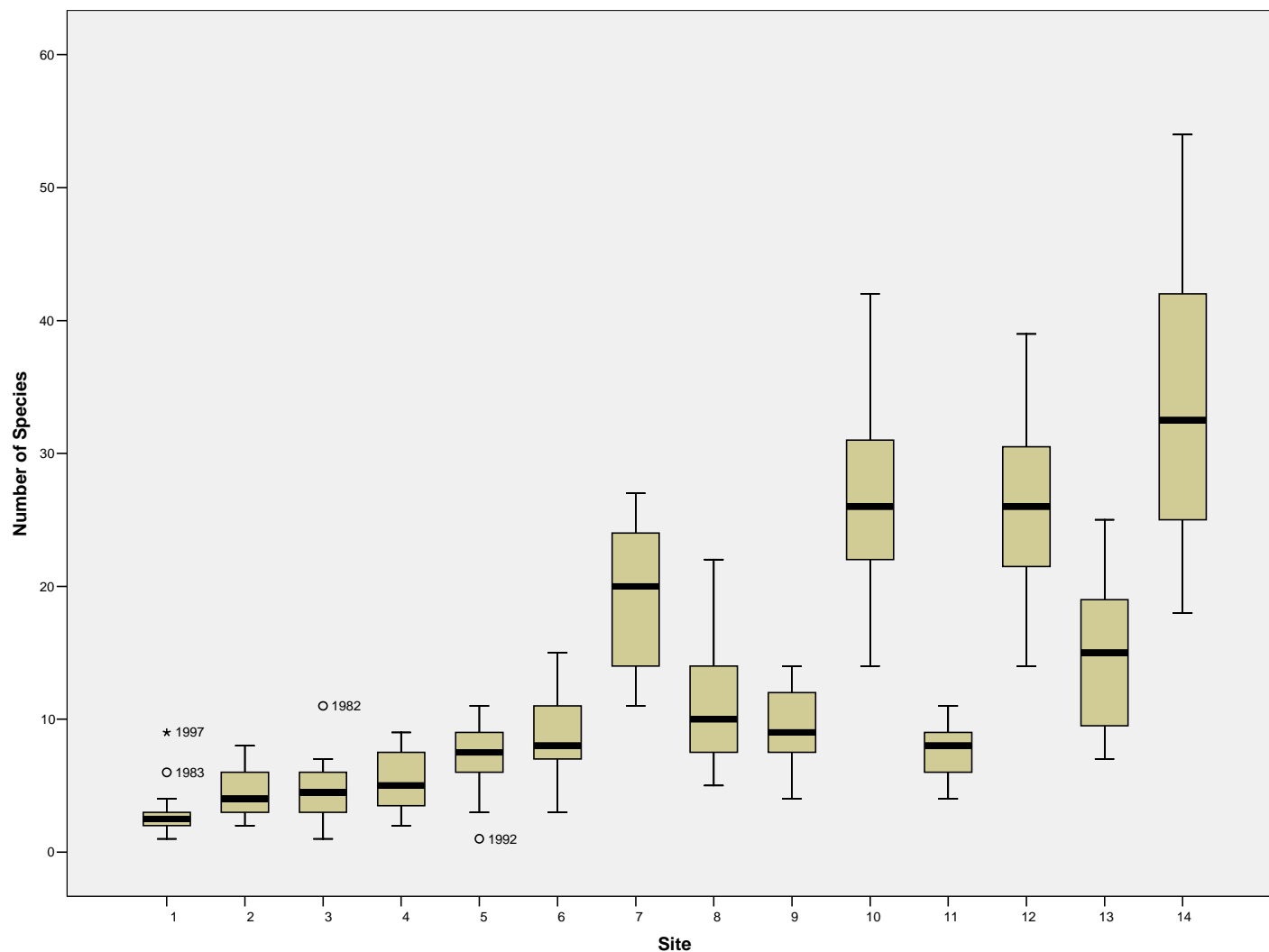


Figure 45. Boxplots showing variability in number of species (between 1979 and 2004) for Humber subtidal sites.

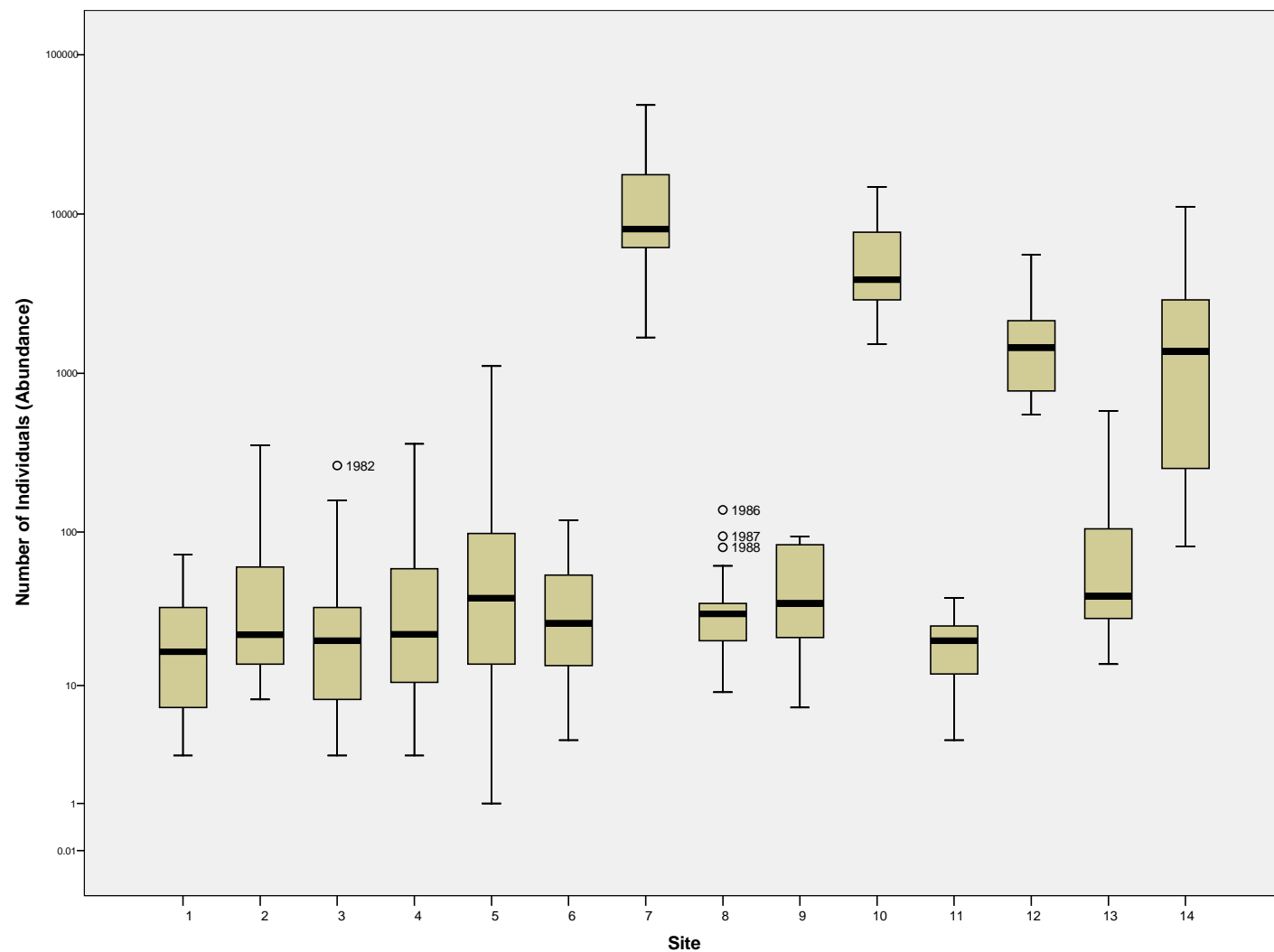


Figure 46. Boxplots showing variability in number of individuals (between 1979 and 2004) for Humber subtidal sites sites.



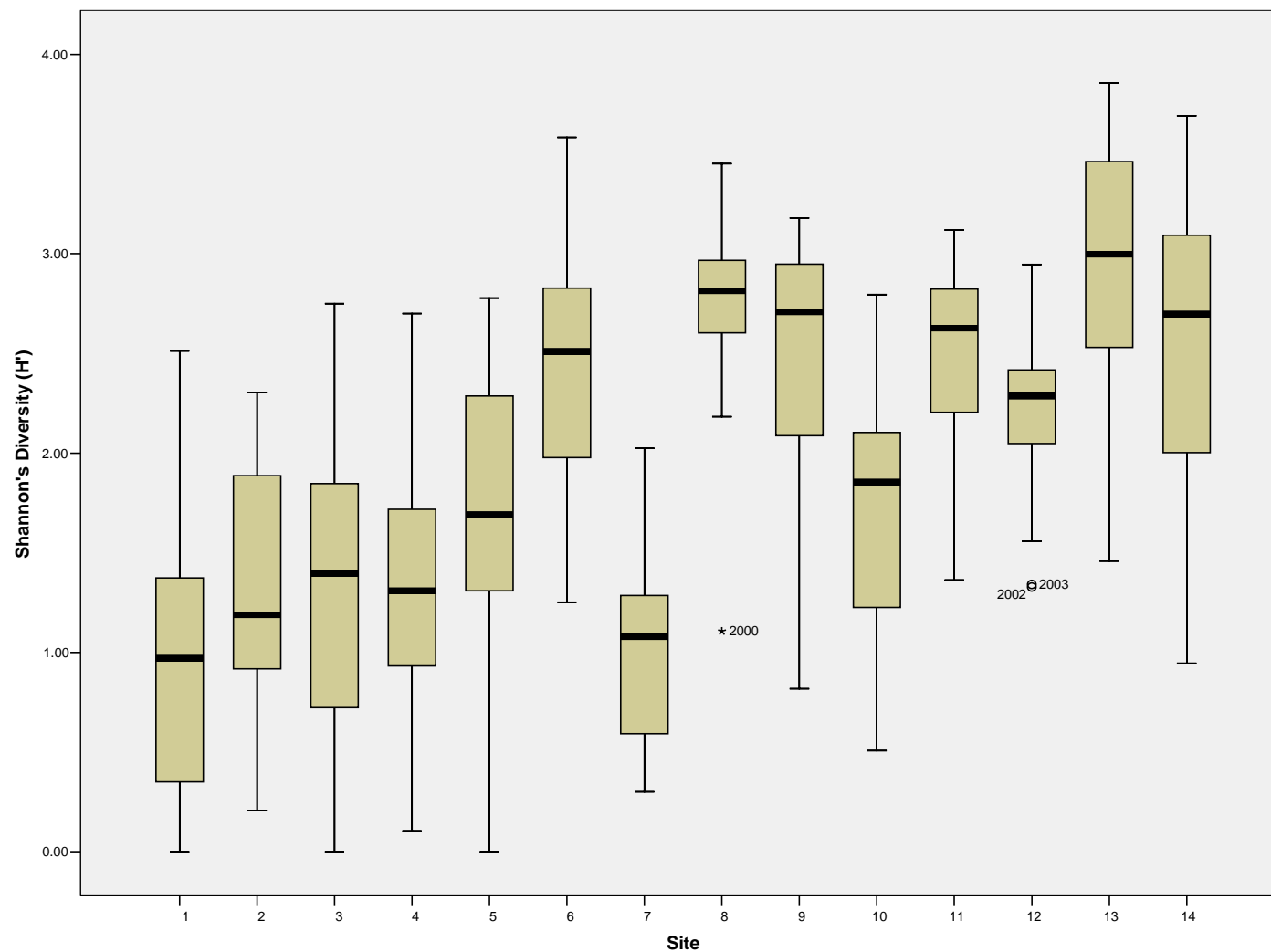
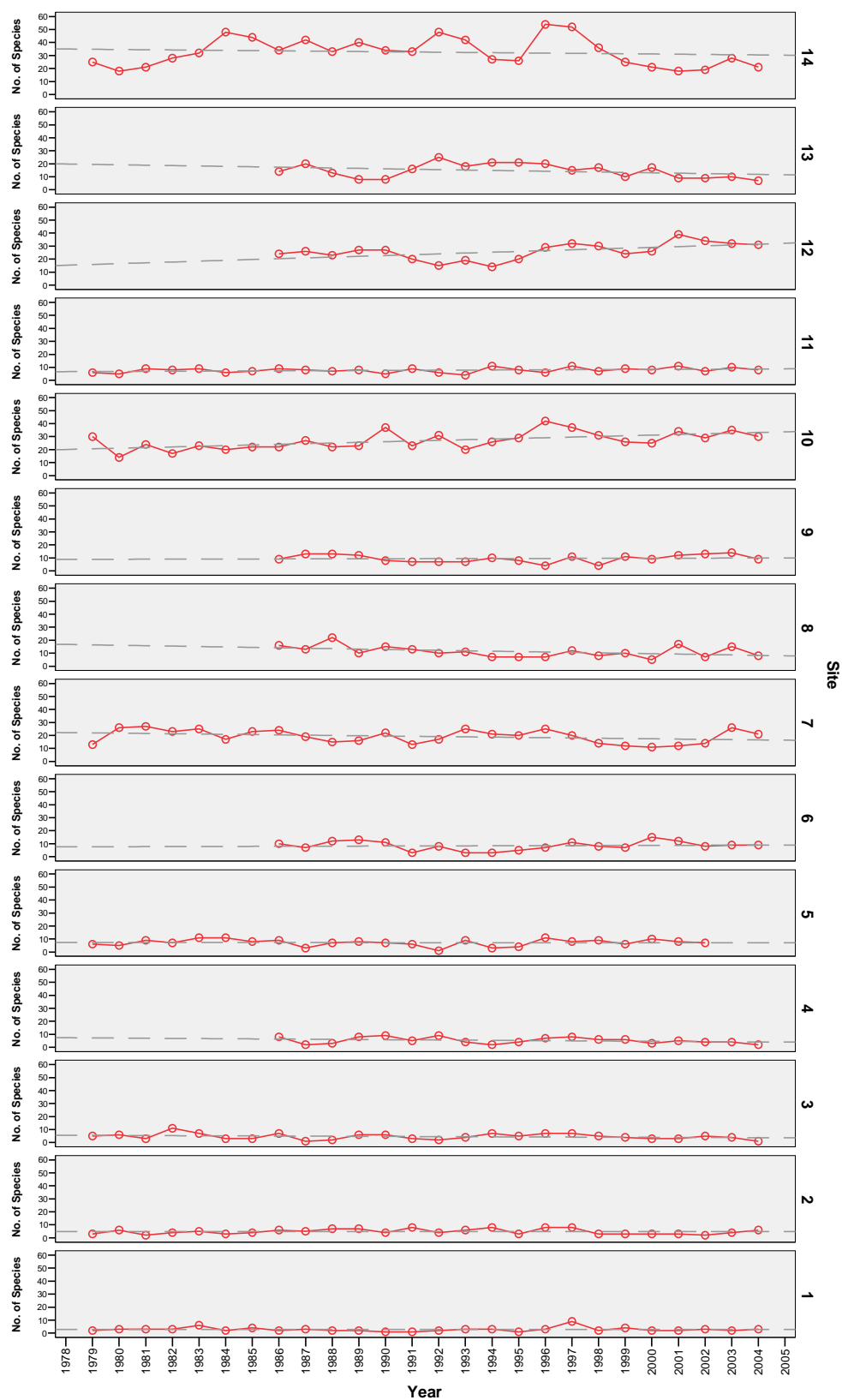
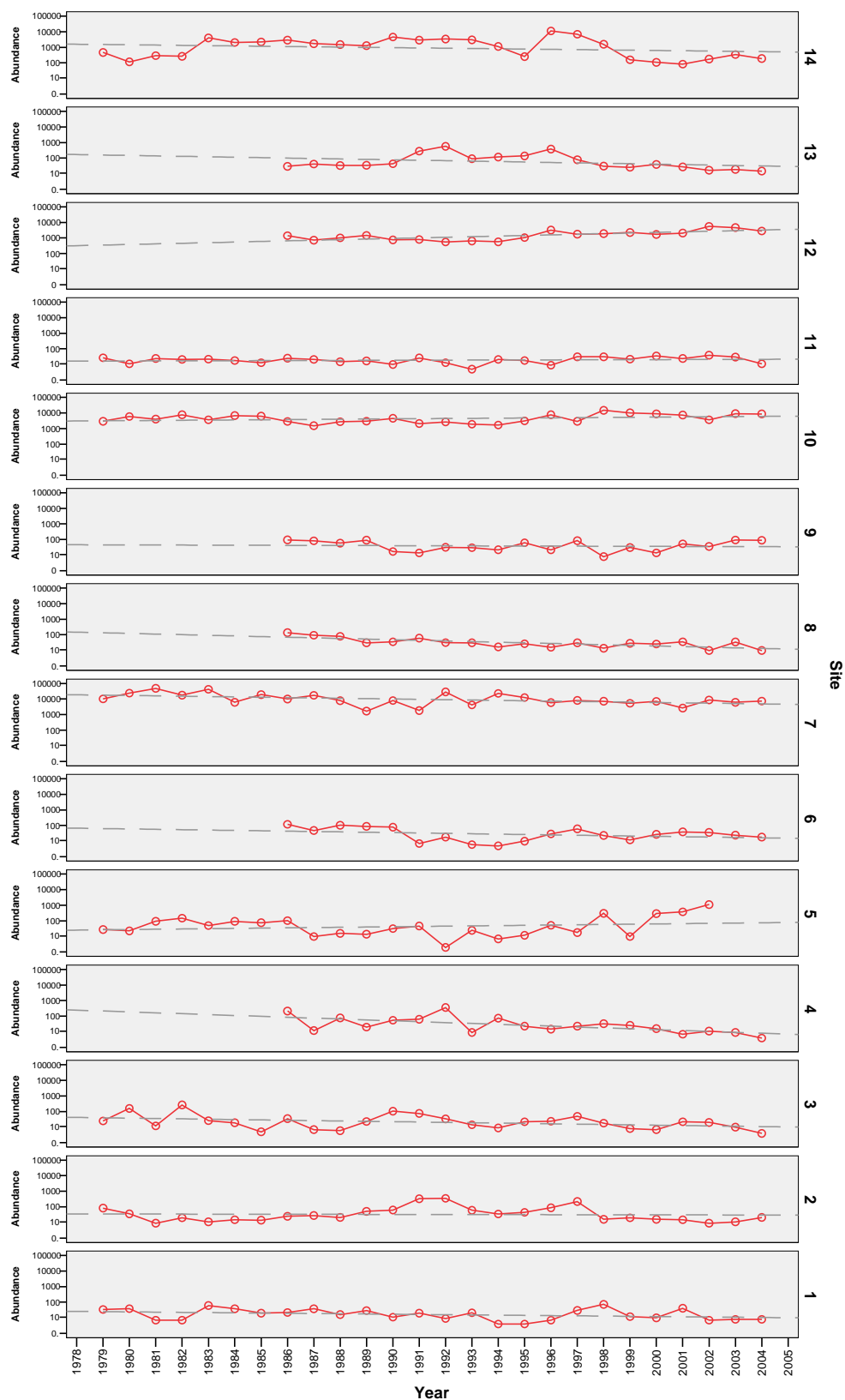


Figure 47. Boxplots showing variability in Shannon's diversity (between 1979 and 2004) for Humber subtidal sites.



**Figure 48. Trends in the number of species (between 1979 and 2004) for Humber subtidal sites.**



**Figure 49. Trends in the number of individuals (between 1979 and 2004) for Humber subtidal sites.**

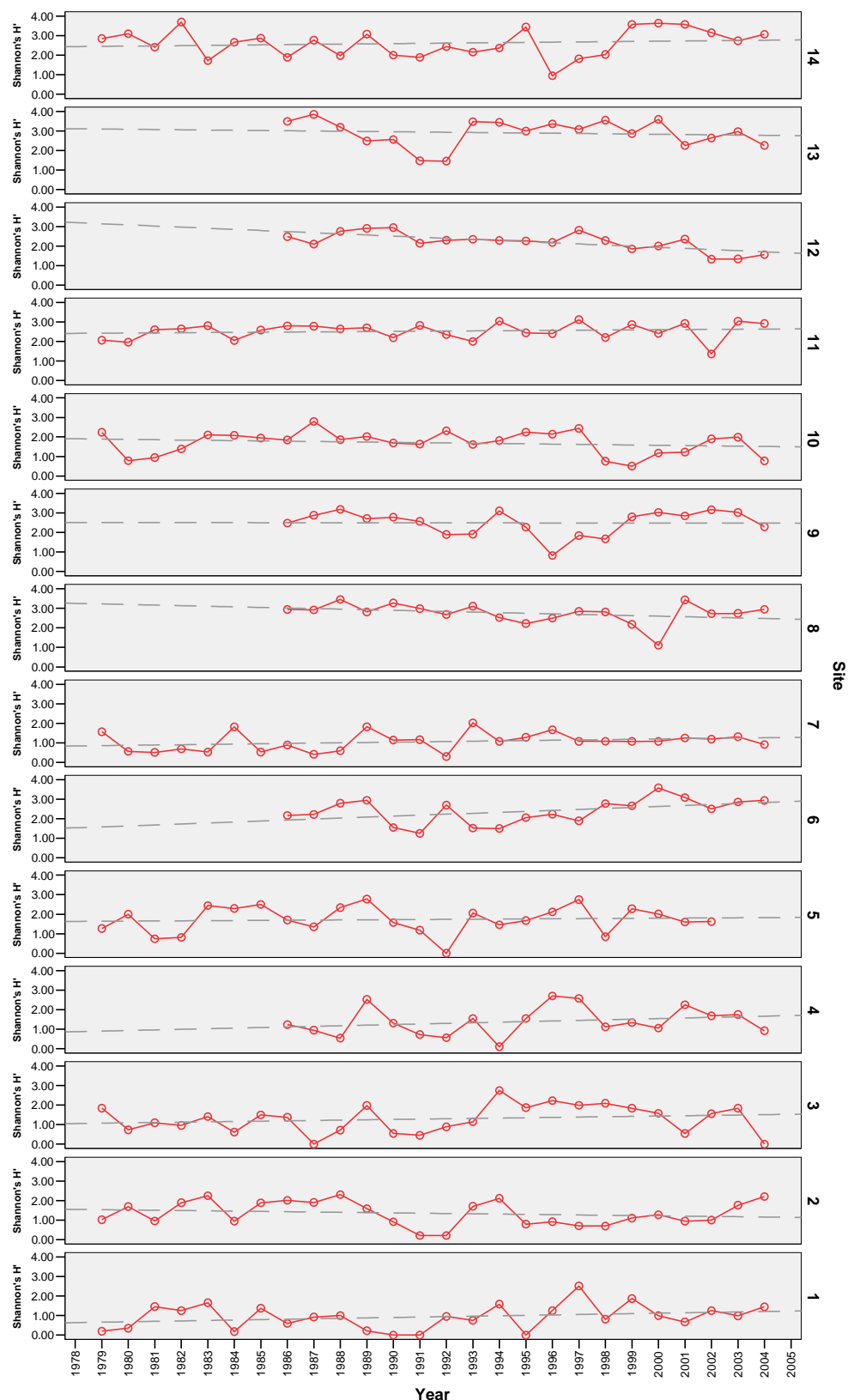


Figure 50. Trends in Shannon's diversity (between 1979 and 2004) for Humber subtidal sites.

#### 4.3.2 MULTIVARIATE ANALYSIS

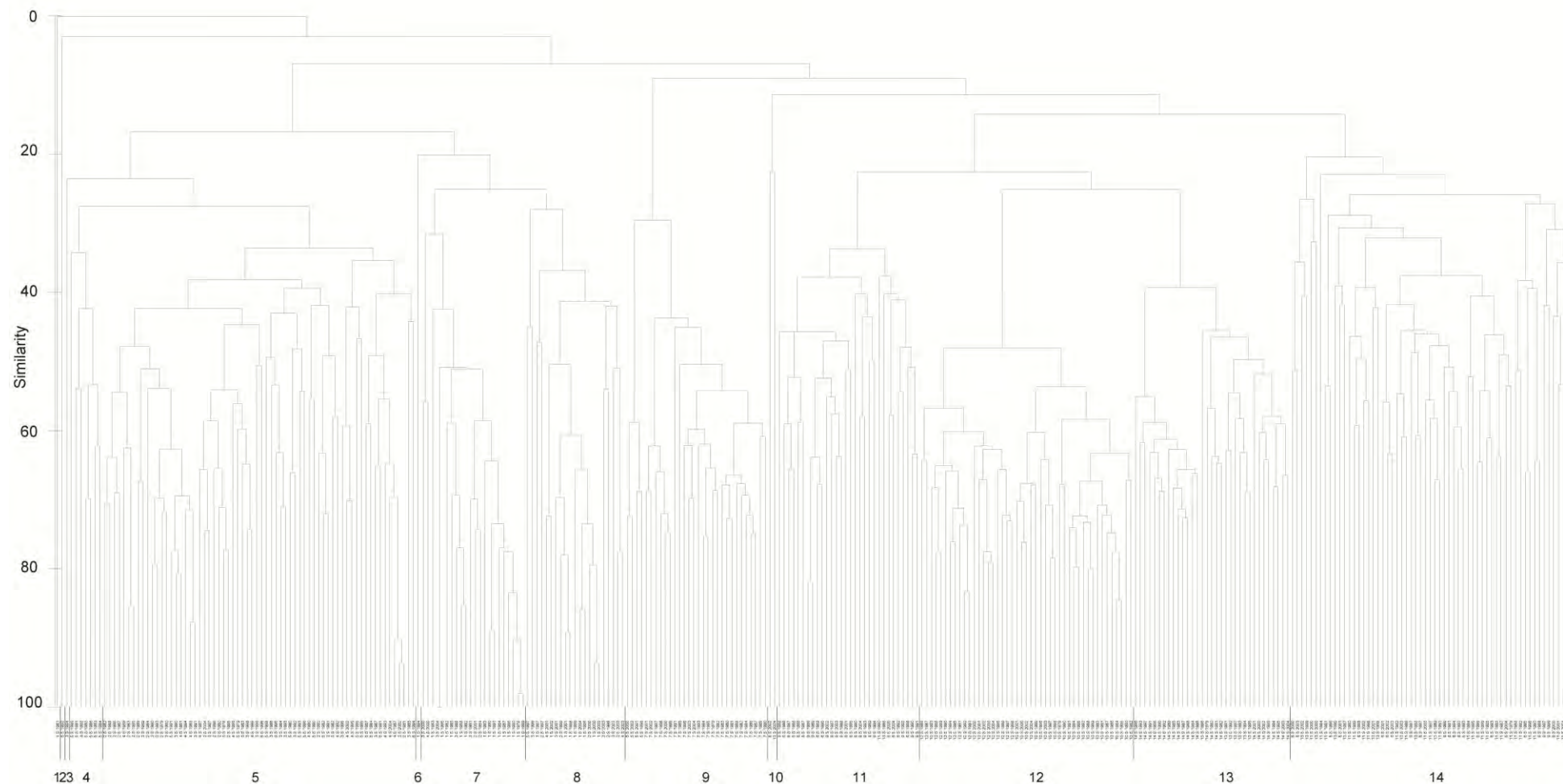
The results of cluster analysis and MDS ordination are given in Figures 51 and 52 and illustrate the degree of variation in terms of species composition through the estuary. Site similarities ranged from 5% to >80% and as described for the intertidal sites the main trends are related to position in the estuary as might be expected. Fourteen main groups were derived from cluster analysis further sub-divisions evident within them. Groups 1 to 3 contained a three outlier sites (1 s 1981, 5 s 1992 and 3 s 1994) from the upper estuary with very low numbers of animals. Groups 4 and 5 comprised of sites from upper estuary (sites 2 to 5) and were characterised by moderate numbers of *Capitella capitata* with either polychaetes or amphipods and mysids with occasional *Tubificoides benedii*.

Site 6 is an outlier group containing one site with an impoverished fauna similar to that found in groups 7 and 8 which primarily consist of sites 1 and 2 from the extreme upper estuary. The characteristic taxa in this group is similar to that in groups 4 and 5 with low numbers of the mysid *Neomysis integer* and the amphipod *Gammarus salinus*. Low numbers of *Capitella* are also found here and the community is characteristic of upper estuary mobile sands. Group nine contains the majority of samples from site 7 in the mid estuary and heavily dominated by *Polydora* spp. along with *Corophium volutator*, *Pygospio elegans* and *Arenicola marina*.

Site 10 contains two outliers characterised by the mysid *Mesopodopsis slabberi* whilst group 11 contains site 9 and to a lesser extent site 6 in the mid to outer estuary and is characterised by *Spio martinensis*, *Nephtys* spp., *Macoma balthica* and *Scoloplos armiger* with some *Aphelocheata* spp. and *Tubificoides benedii*. Sites 10 and 12 in the outer estuary are almost all within group 12 which is and are heavily dominated by *Aphelocheata/Tharyx* spp. and *Tubificoides* spp. along with other polychaetes such as *Polydora* spp. *Pygospio elegans*, *Scoloplos armiger* and *Streblospio shrubsolii*. Group 13 contains the outer most sites (13 and 14) which are dominated by spionid polychaetes including *Spiophanes bombyx* and *Spio martinensis* along with *Chaetozone setosa*, *Nephtys cirrosa*, *Scoloplos armiger* and *Capitella capitata* presumably in relatively mobile marine sands/muddy sands. Group 14 contains a variety of mid to outer estuary sites (primarily sites 6, 8 and 11) with somewhat variable species composition and appears to be somewhat impoverished and presumably tidally influenced outer estuarine sands characterised by *Nephtys cirrosa* but with varying abundances of *Spio martinensis*, the isopod *Eurydice pulchra*, *Capitella capitata* and the mysid *Gastrosaccus spinifer*.

Analysis of individual sites by cluster analysis was carried out and the results are given in Figure 53 with the top five dominant taxa given in Appendix 1. At most sites a relatively high degree of variation is evident with similarities between years generally ranging from 20% to 70%. In many cases there is no consistent temporal trend which possibly reflects the high natural variability in terms of tidal and sediment regime and freshwater flow. Some temporal trends are evident, for example at site 2 the dominant species is *Capitella capitata* for most years until 1998 when *Neomysis integer* and *Gammarus salinus* become more dominant. At site 7 *Corophium volutator* becomes more dominant than *Polydora* spp. in 1999 to 2002 whilst at site 9 from 1986 to 1995 *Nephtys* sp. are generally the dominant taxa whilst from 1996 to 2000 *Capitella capitata* becomes more dominant. At site 10 *Aphelocheata/Tharyx* spp. becomes more dominant than *Tubificoides* spp from 1996 to 2004.

Using the ANOSIM procedure in the PRIMER package, tests were carried out for differences in species similarity for both site and year. The results of these tests indicated that the sites were significantly different in terms of species composition ( $Rho = 0.543$ ;  $p=0.001$ ). However, a much weaker but still significant difference between years was also detected ( $Rho = 0.188$ ;  $p=0.001$ ).



**Figure 51. Results of cluster analysis for Humber south bank subtidal sites from 1979 to 2004.**

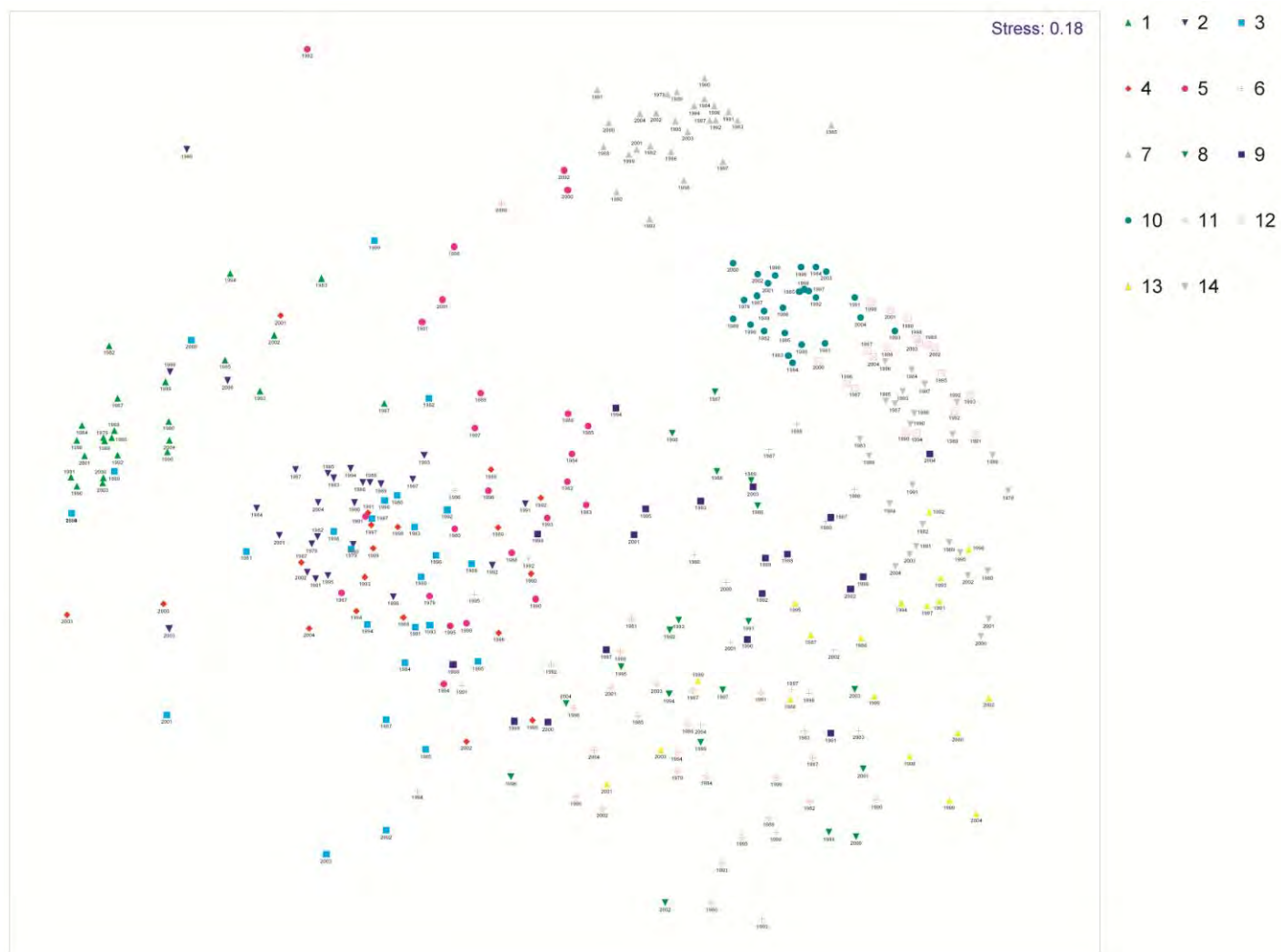
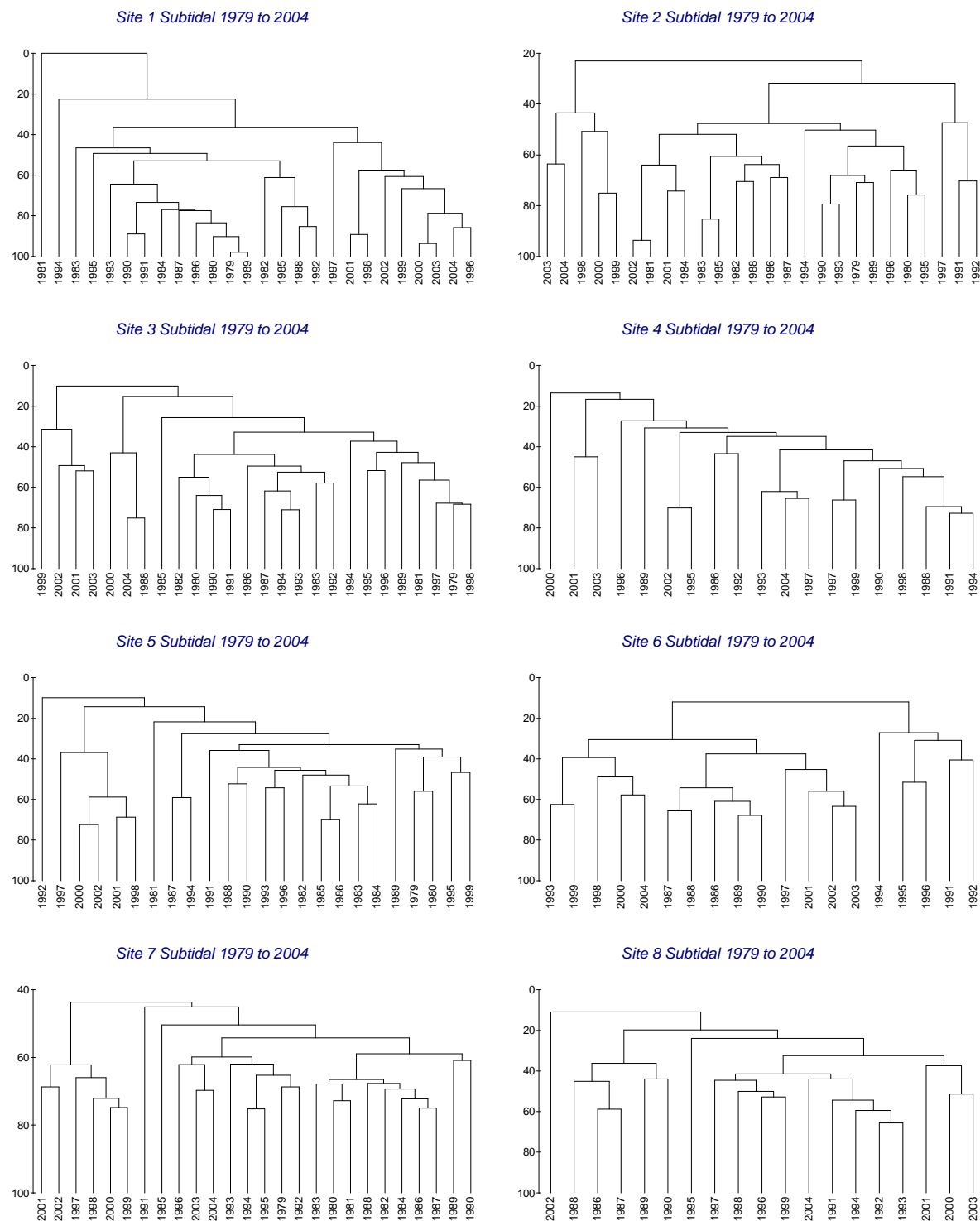


Figure 52. Results of MDS for Humber subtidal sites from 1979 to 2004.

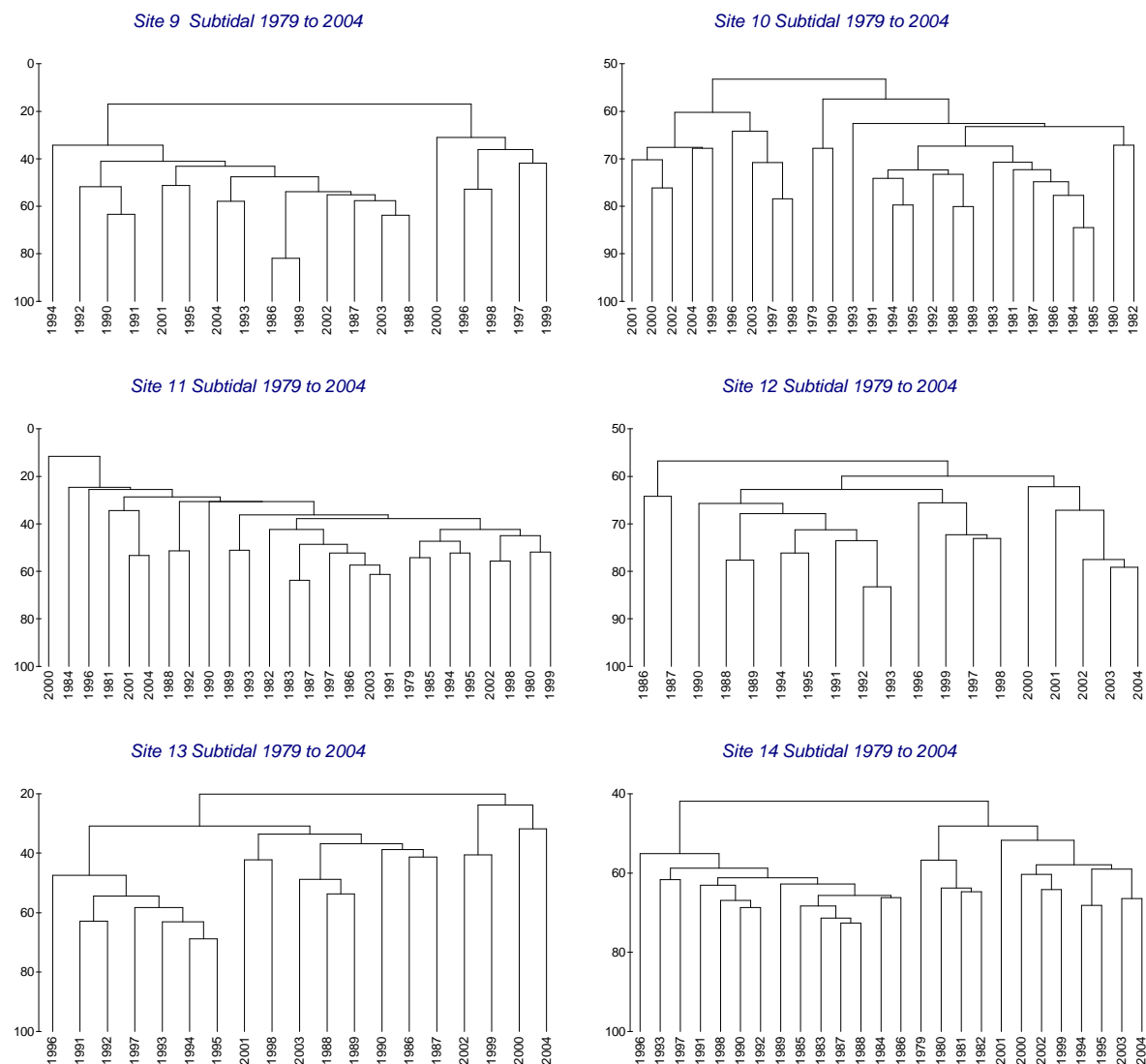


**Table 10. Characteristic species within intertidal south bank site groups derived from cluster analysis.**

1	Mean A	% occ	2	Mean A	% occ	3	Mean A	% occ	4	Mean A	% occ	5	Mean A	% occ
Limnodrilus hoffmeisteri	3.00	100.00	Polydora spp.	1.00	100.00	Streblospio shrubsolii	2.00	100.00	Capitella sp. (juv)	35.14	85.71	Capitella capitata	40.73	100.00
Tubifex tubifex	2.00	100.00				Aphelochoeta/Tharyx	1.00	100.00	Capitella capitata	33.14	85.71	Neomysis integer	3.14	62.12
Paranais litoralis	1.00	100.00				Capitella capitata	1.00	100.00	Arenicola marina	6.57	57.14	Gammarus spp.	1.14	30.30
						Corophium volutator	1.00	100.00	Tubificoides benedii	4.71	28.57	Polydora spp.	0.95	36.36
						Crangon crangon	1.00	100.00	Macoma balthica	2.14	85.71	Haustorius arenarius	0.77	24.24
						Haustorius arenarius	1.00	100.00	Polydora spp.	1.86	85.71	Arenicola marina	0.73	13.64
						Neomysis integer	1.00	100.00	Eteone spp.	1.71	85.71	Gammarus salinus	0.47	13.64
									Nephtys hombergii	1.71	42.86	Aphelochoeta/Tharyx	0.36	12.12
									Pygospio elegans	0.86	57.14	Eteone spp.	0.35	24.24
									Nephtys spp. (juv)	0.57	42.86	Tubificoides benedii	0.32	19.70
Mean No. of Species	3.00		Mean No. of Species	1.00		Mean No. of Species	7.00		Mean No. of Species	9.14		Mean No. of Species	5.29	
Mean Abundance	6.00		Mean Abundance	1.00		Mean Abundance	8.00		Mean Abundance	91.57		Mean Abundance	51.79	
6	Mean A	% occ	7	Mean A	% occ	8	Mean A	% occ	9	Mean A	% occ	10	Mean A	% occ
Melita pellucida	1.00	100.00	Neomysis integer	14.50	100.00	Gammarus salinus	9.95	100.00	Polydora spp.	8655.10	96.67	Mesopodopsis slabberi	4.00	100.00
Neomysis integer	1.00	100.00	Gammarus spp.	2.14	50.00	Capitella capitata	9.43	14.29	Corophium volutator	1318.53	70.00	Nephtys spp. (juv)	1.50	100.00
Tubificoides benedii	1.00	100.00	Polydora spp.	0.86	9.09	Neomysis integer	3.48	76.19	Levinsonia gracilis	602.50	3.33	Corophium insidiosum	1.00	50.00
			Capitella sp. (juv)	0.59	9.09	Haustorius arenarius	0.71	19.05	Enchytraeidae spp.	161.53	60.00	Hydrobia ulvae	1.00	50.00
			Capitella capitata	0.18	13.64	Aphelochoeta/Tharyx	0.38	23.81	Pygospio elegans	150.20	96.67	Abra alba	0.50	50.00
			Nereis diversicolor	0.14	13.64	Crangon crangon	0.33	28.57	Arenicola marina	109.37	93.33	Capitella sp. (juv)	0.50	50.00
									Anatides					
			Crangon crangon	0.14	9.09	Corophium volutator	0.24	9.52	maculata/mucosa	86.00	70.00	Crangon crangon	0.50	50.00
			Tubificoides pseudogaster	0.14	9.09	Polydora spp.	0.24	9.52	Proceraea cornuta	48.53	63.33	Nephtys cirrosa	0.50	50.00
			Corophium volutator	0.09	4.55	Hediste diversicolor	0.19	9.52	Halacaridae spp.	33.63	70.00	Nephtys hombergii	0.50	50.00
			Haustorius arenarius	0.09	4.55	Eurydice pulchra	0.14	9.52	NEMERTEA sp.	31.53	73.33	Pseudocuma longicornis	0.50	50.00
Mean No. of Species	3.00		Mean No. of Species	2.50		Mean No. of Species	4.00		Mean No. of Species	17.83		Mean No. of Species	7.00	
Mean Abundance	3.00		Mean Abundance	19.18		Mean Abundance	26.24		Mean Abundance	11406.37		Mean Abundance	11.50	
11	Mean A	% occ	12	Mean A	% occ	13	Mean A	% occ	14	Mean A	% occ			
Spio martinensis	10.00	80.00	Aphelochoeta/Tharyx	2206.69	100.00	Spiophanes bombyx	838.55	100.00	Nephtys cirrosa	4.73	83.33			
Nephtys hombergii	9.90	96.67	Tubificoides			Spio martinensis	450.70	100.00	Spio martinensis	2.65	58.33			
Nephtys spp. (juv)	5.70	73.33	swirencoides/amplivasatus	473.02	100.00	Chaetozona setosa	44.45	96.97	Capitella capitata	2.28	55.00			
Macoma balthica	5.40	70.00	Pygospio elegans	244.82	91.11	Nephtys cirrosa	33.88	100.00	Eurydice pulchra	2.27	71.67			
Scoloplos armiger	4.90	63.33	Polydora spp.	209.69	64.44	Scoloplos armiger	30.03	90.91	Gastrosaccus spinifer	1.90	40.00			
Aphelochoeta/Tharyx	3.57	60.00	Tubificoides pseudogaster	195.36	46.67	Capitella capitata	24.64	60.61	Aphelochoeta/Tharyx	1.05	36.67			
Nephtys cirrosa	3.33	56.67	Streblospio shrubsolii	82.31	75.56	Nephtys spp. (juv)	23.64	87.88	Scoloplos armiger	1.00	45.00			
Tubificoides benedii	3.00	66.67	Scoloplos armiger	78.07	100.00	Nephtys hombergii	22.76	84.85	Mytilidae sp. (juv)	0.75	45.00			
Capitella capitata	1.83	46.67	Tubificoides benedii	52.78	82.22	Eumida bahusiensis/sanguinea	21.27	60.61	Nephtys spp. (juv)	0.70	26.67			
Polydora spp.	1.63	36.67	Spiophanes bombyx	44.13	68.89	Periculodes longimanus	18.18	66.67	Bathyporeia pelagica	0.62	15.00			
			Nephtys spp. (juv)	38.80	95.56									
Mean No. of Species	11.00		Mean No. of Species	26.47		Mean No. of Species	29.85		Mean No. of Species	9.08				
Mean Abundance	56.50		Mean Abundance	3814.42		Mean Abundance	1640.24		Mean Abundance	24.87				



**Figure 53. Results of cluster analysis for Humber subtidal sites.**



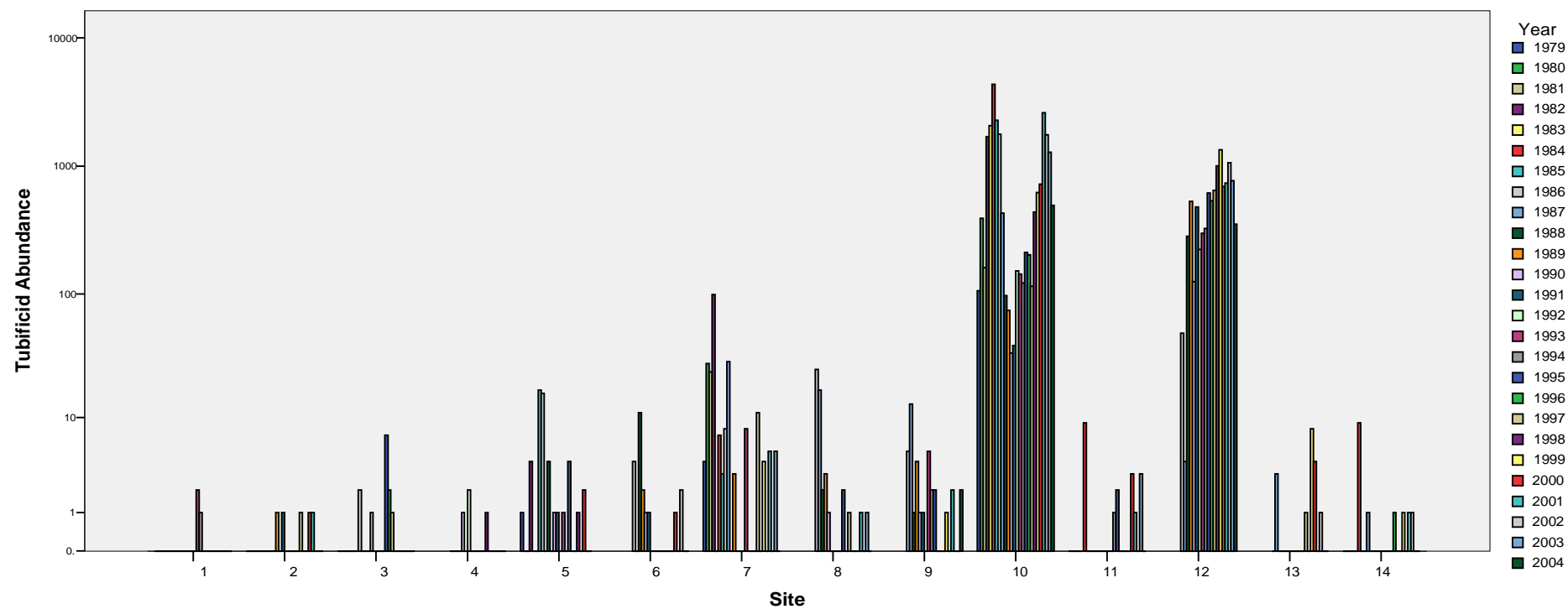
**Figure 53 (cont.). Results of cluster analysis for midshore Humber south bank sites.**

#### 4.3.3 INDICATOR SPECIES

The temporal variation in abundances of tubificid oligochaetes and *Capitella* are shown in Figures 54 to 57. Numbers of tubificids are variable and occur throughout the estuary in varying numbers. Peak densities are found at sites 10 and 12 and high densities are particularly recorded at site 10 in 1984. A relatively large decrease in numbers of tubificids is evident at site 10 in 1990 to 1991. Numbers of *Capitella* are also variable but particularly high at site 2 (1991, 1992 and 1997), site 3 (1980, 1982, 1990 and 1991), site 4 (1986 and 1992) and site 14 (1983, 1996 and 1997).

#### 4.3.4 CONCLUSIONS

- The main benthic communities described between 1979 and 2004 are typical for subtidal estuarine habitats and range from impoverished tide swept upper estuarine or marine sand communities to those indicative of more stable muddy sands and muds.
- Biological parameters and communities are relatively consistent over time and the main patterns in community composition related to position in the estuary. Significant differences detected between sites as may be expected given the range of habitats. A weaker but significant difference between years was also found.
- The variation evident in community structure between years is in most cases likely to be within the natural limits of variation and most changes in over time likely to be related to changes in the physical environment (sediment type and tidal regime).
- However, some evidence for elevated numbers of pollution/disturbance tolerant taxa in some areas particularly in earlier years possibly related to mild organic enrichment.
- No major changes in community structure which might be related to water quality were evident at the routine monitoring stations although these do not include sites in close proximity to discharge sites and the highly dynamic nature of the subtidal habitats may mask more subtle trends.



**Figure 54. Number of tubificid oligochaetes at Humber subtidal sites from 1979 to 2004.**

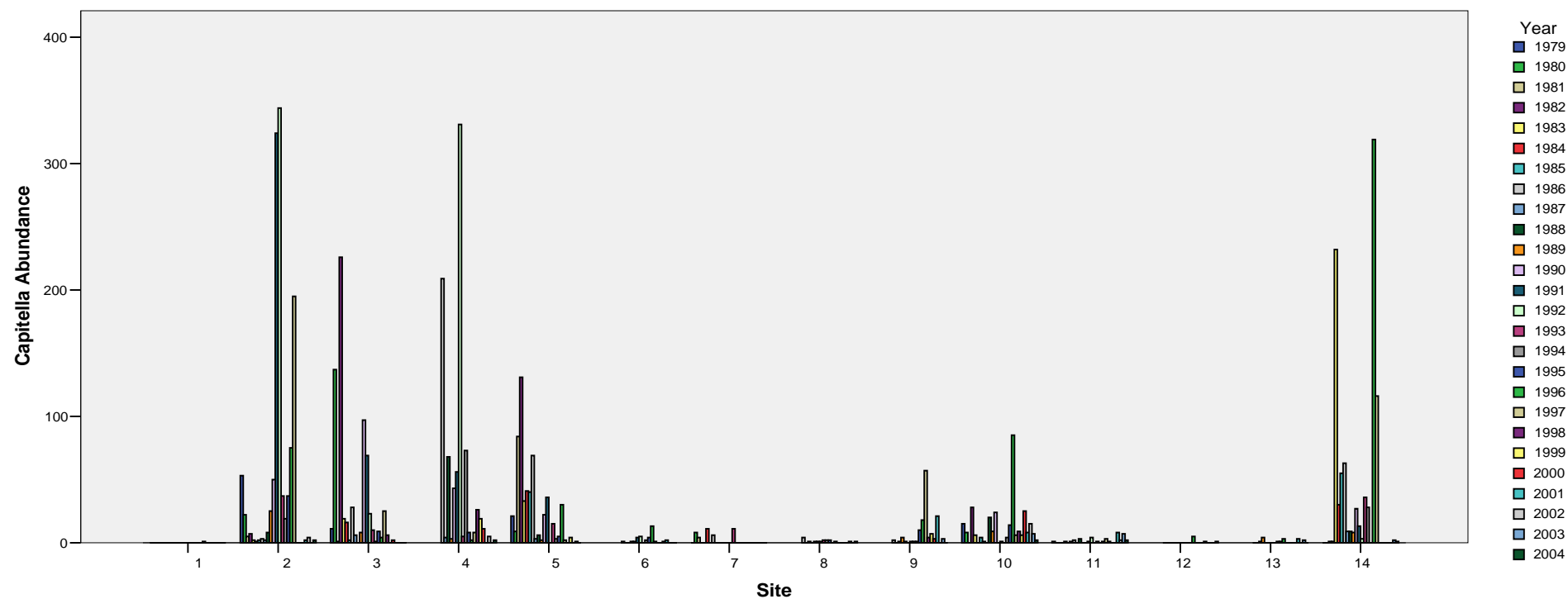
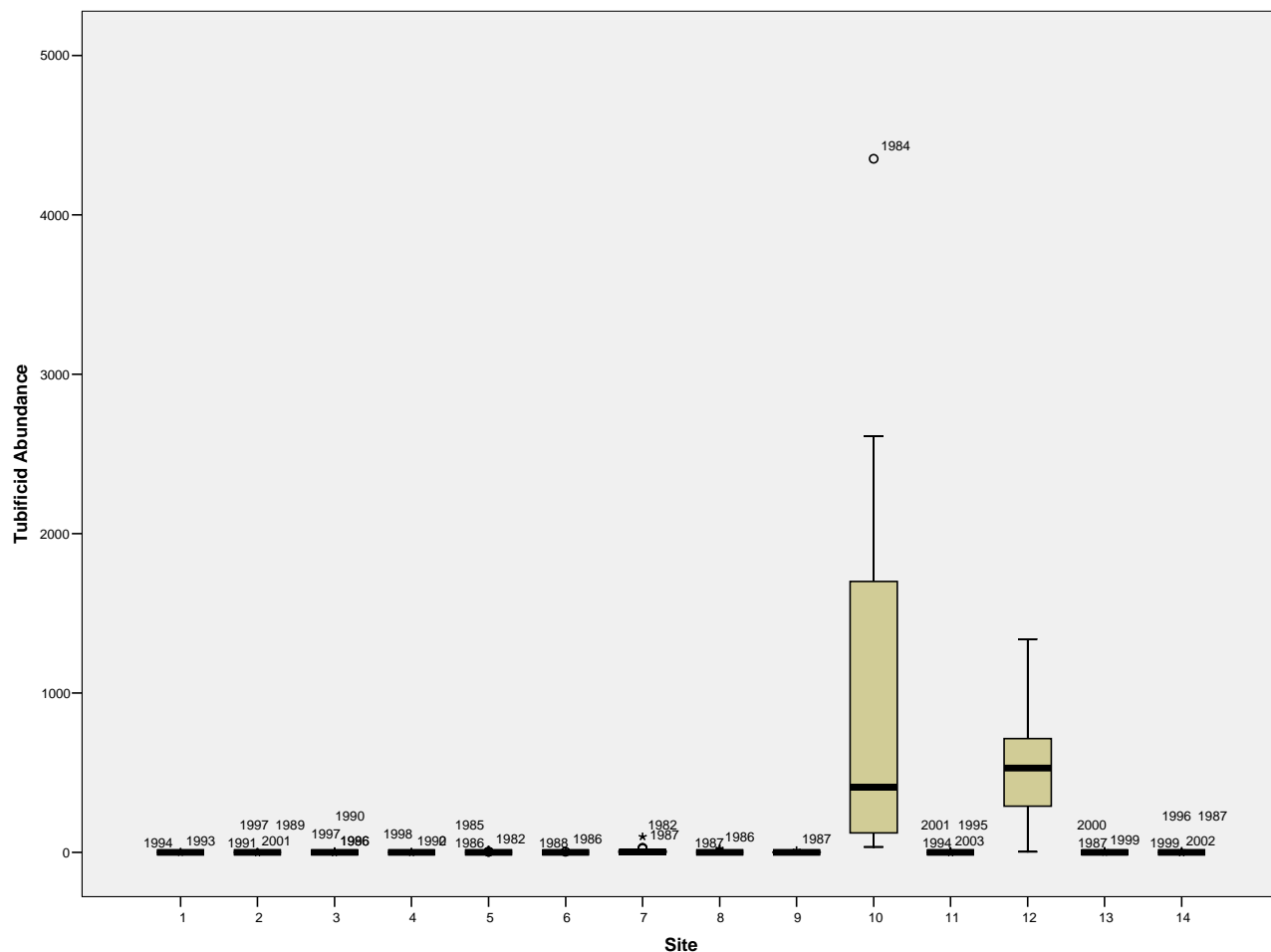


Figure 55. Number of *Capitella* at Humber subtidal sites from 1979 to 2004.



**Figure 56. Boxplots showing variation in numbers of tubificid oligochaetes at Humber subtidal sites from 1979 to 2004.**

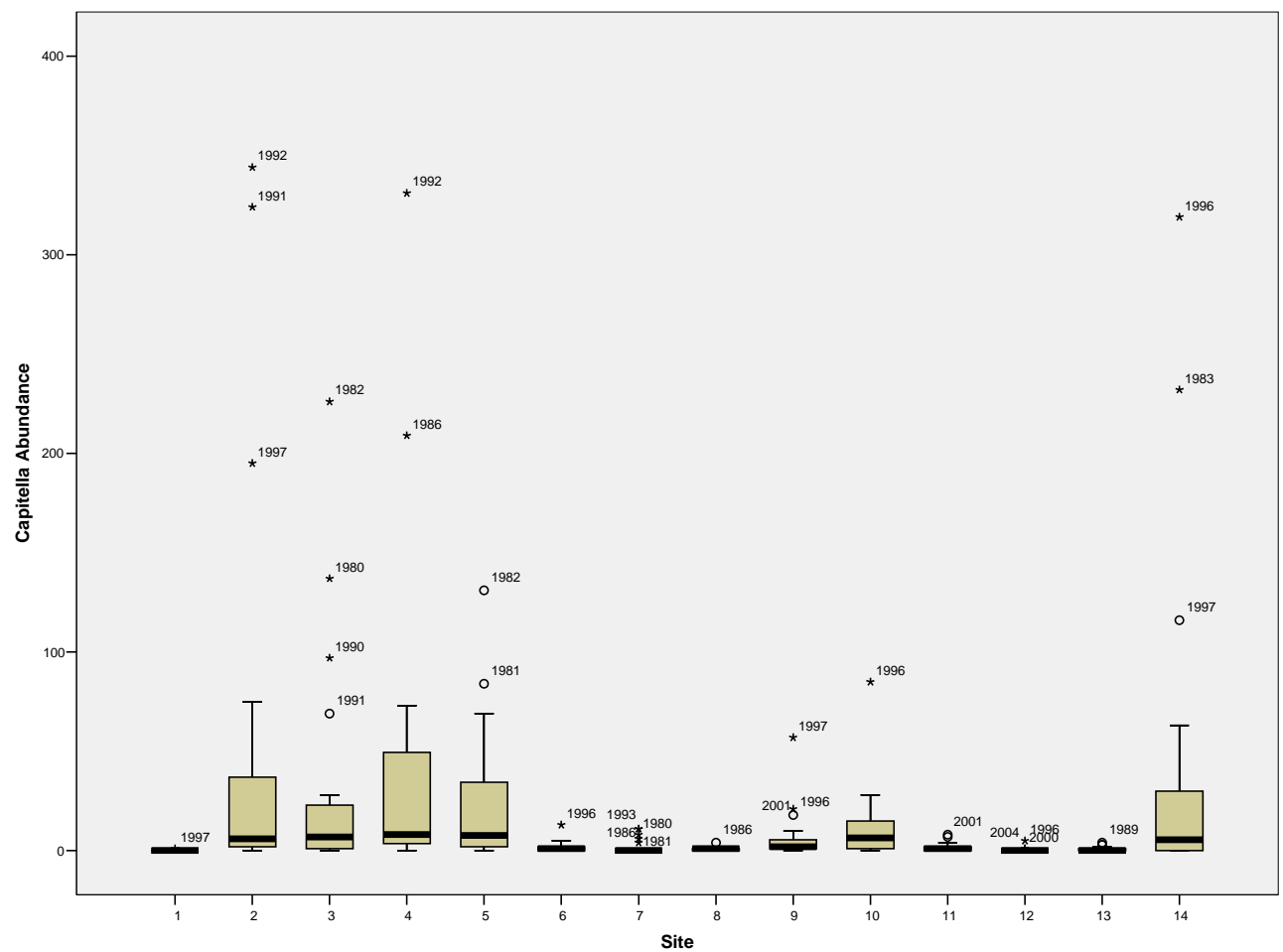


Figure 57. Boxplots showing variation in numbers of *Capitella* at Humber subtidal sites from 1979 to 2004.



## 4.4 Quinquennial Subtidal Sites

### 4.4.1 UNIVARIATE ANALYSIS

The quinquennial survey regime was carried out on four sampling occasions (1980, 1985, 1990 and 1995) and primarily provides information on the spatial distribution of communities as opposed to long term temporal trends. However, some differences between years were apparent as shown in Figures 58 to 63. The typical pattern of increased species richness and diversity down the estuary is apparent at all years and numbers of species and H' diversity are generally similar between each sampling event. However, a slight reduction in diversity and species richness is evident in the 1995 survey.

### 4.4.2 MULTIVARIATE ANALYSIS

Cluster analysis for the quinquennial sites from each year has been carried out and the results are summarised in Figures 64 to 67. Whilst the surveys provide less information on temporal variation than the routine sites the quinquennial surveys provide a broader scale 'snapshot' of the estuary which incorporates a wider range of habitats than the routine studies. In spatial terms a broadly similar pattern of communities is evident each year with the estuary divided into approximately four main zones including an upper estuary zone often characterised by an impoverished community with species such as *Neomysis integer* and *Gammarus salinus* along with oligochaetes. In the mid estuary is a variable community which may be characterised by species such as *Arenicola marina*, *Capitella capitata*, *Macoma balthica*, tubificid oligochaetes and elements of the upper estuary community. Further downstream is a range of mid to outer estuarine habitats which is quite variable but largely dominated by polychaetes such as *Nephtys* spp. and spionids in more mobile sediments and cirratulids such as *Aphelocheata/Tharyx* spp. and tubificid oligochaetes in muddier areas. The outer estuary is generally characterised by mobile sands with a variety of more marine taxa such as *Magelona* spp. *Chaetozone setosa*, *Eteone* sp., *Scoloplos armiger*, *Abra* sp. and occasional amphipods.

Some interesting trends are evident. For example in 1985 a range of more marine species were recorded some distance up the estuary possibly due to decreased freshwater input in previous years. The presence of the *Capitella* dominated community in the middle estuary is also of note and was present in all years (aside from 1985) to a greater or lesser degree. This community has historically been linked to organic enrichment in the estuary (Gameson *et al.*, 1982; Environment Agency, 2000). Populations of *Capitella* have been recorded in both the intertidal and subtidal routine surveys in some years but the quinquennial surveys give a slightly more detailed picture of its distribution. Whilst *Capitella* is a common species in estuarine habitats the communities described here (and particularly in 1980) may well be indicative of moderate organic enrichment. It is of note that such communities have generally declined in recent years possibly due to the effects of secondary treatment and reduced organic loadings to the estuary from the 1980s onwards.

#### 4.4.3 CONCLUSIONS

- A wide variety of faunal assemblages were found which appear to be primarily structured by physical factors (salinity, sediment type, tidal regime).
- Highly variable in terms of species richness, abundance and diversity but no direct evidence for reduced water quality.
- Some evidence of modification to the communities due to freshwater inputs
- A number of impoverished communities were evident but these are largely considered to be related to mobility of the sediments.
- Some mid estuarine sites had moderately high numbers of *Capitella capitata* possibly indicating moderate organic enrichment in the 1980s. However, these communities may also be indicative of moderate stress due to sediment instability.
- There was no direct evidence for major changes in benthic community structure relating to changes in water quality between 1980 and 1995 although such changes may be masked by the natural variability of the system.

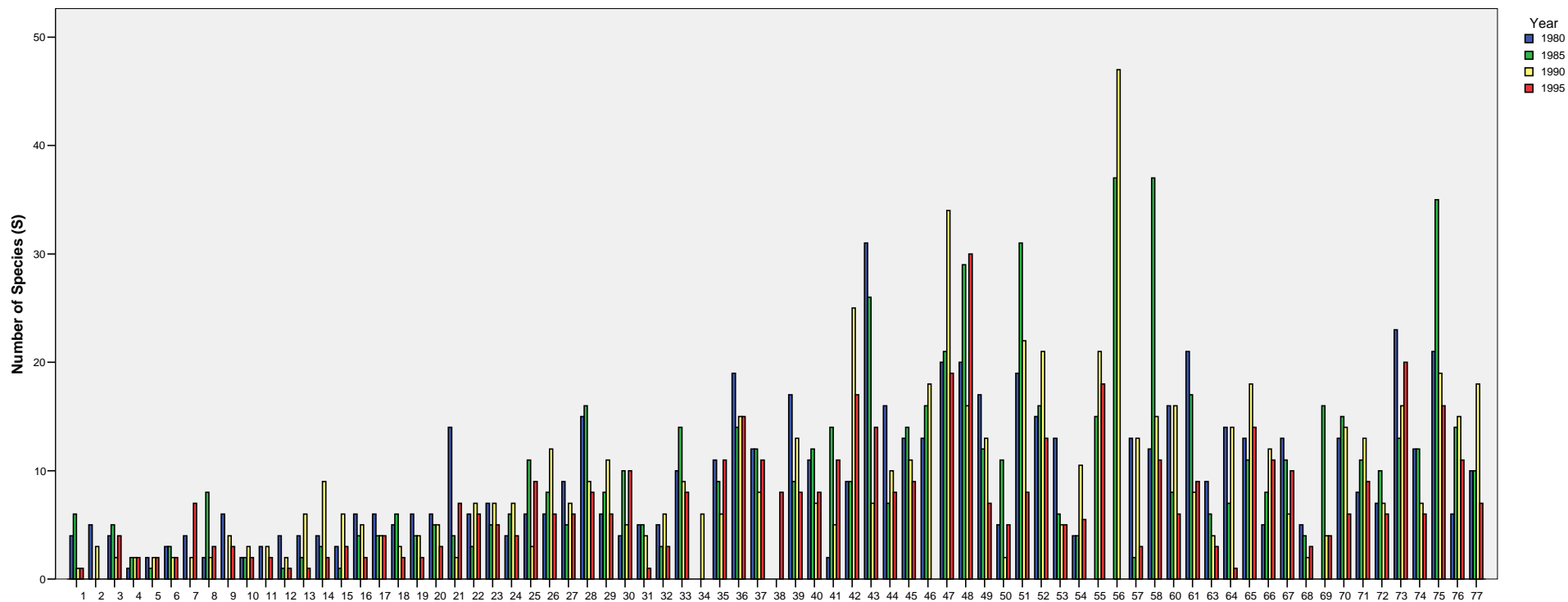


Figure 58. Numbers of species at quinquennial sites between 1980 and 1995.

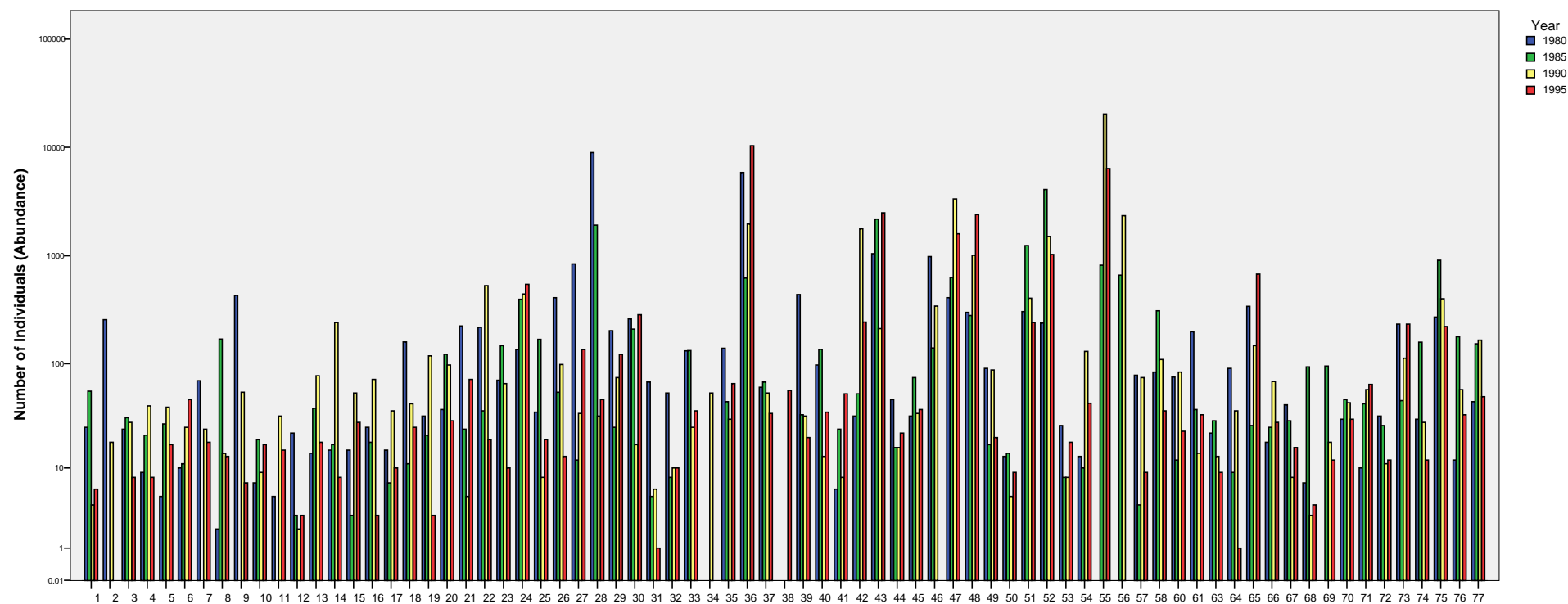


Figure 59. Numbers of individuals at quinquennial sites between 1980 and 1995.

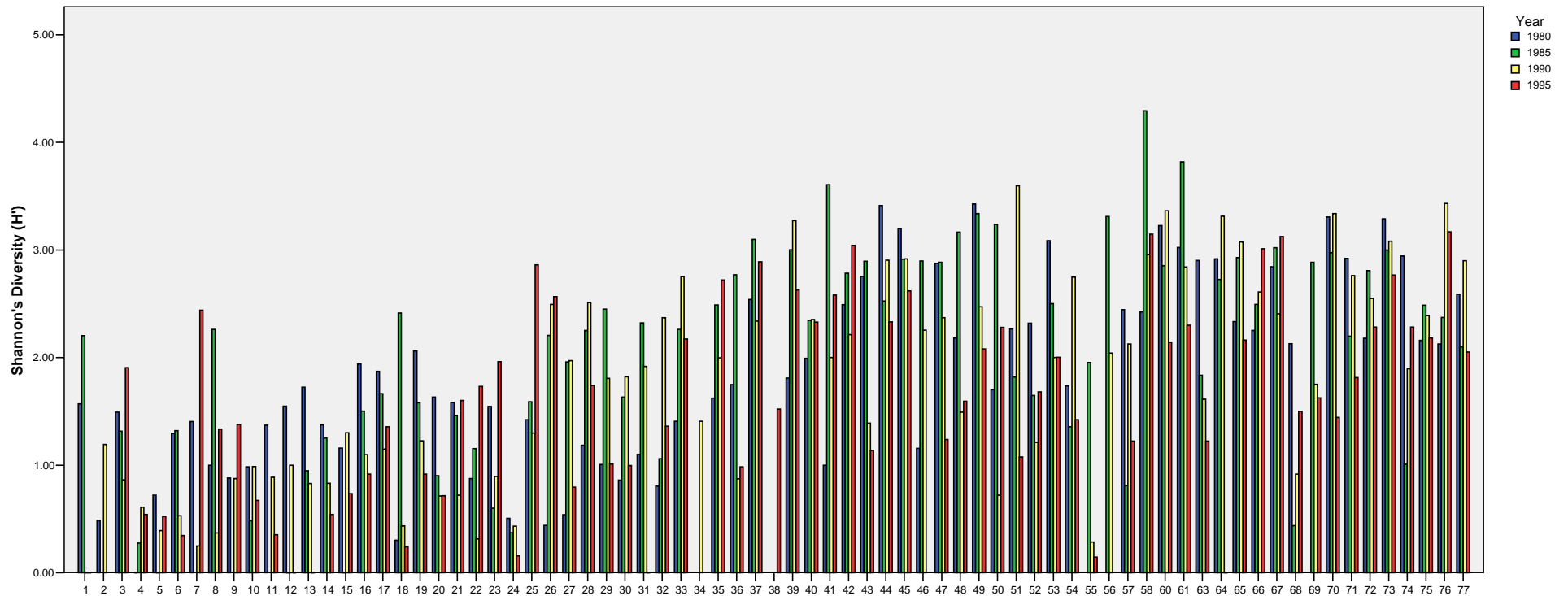


Figure 60. Shannon's diversity ( $H'$ ) at quinquennial sites between 1980 and 1995.

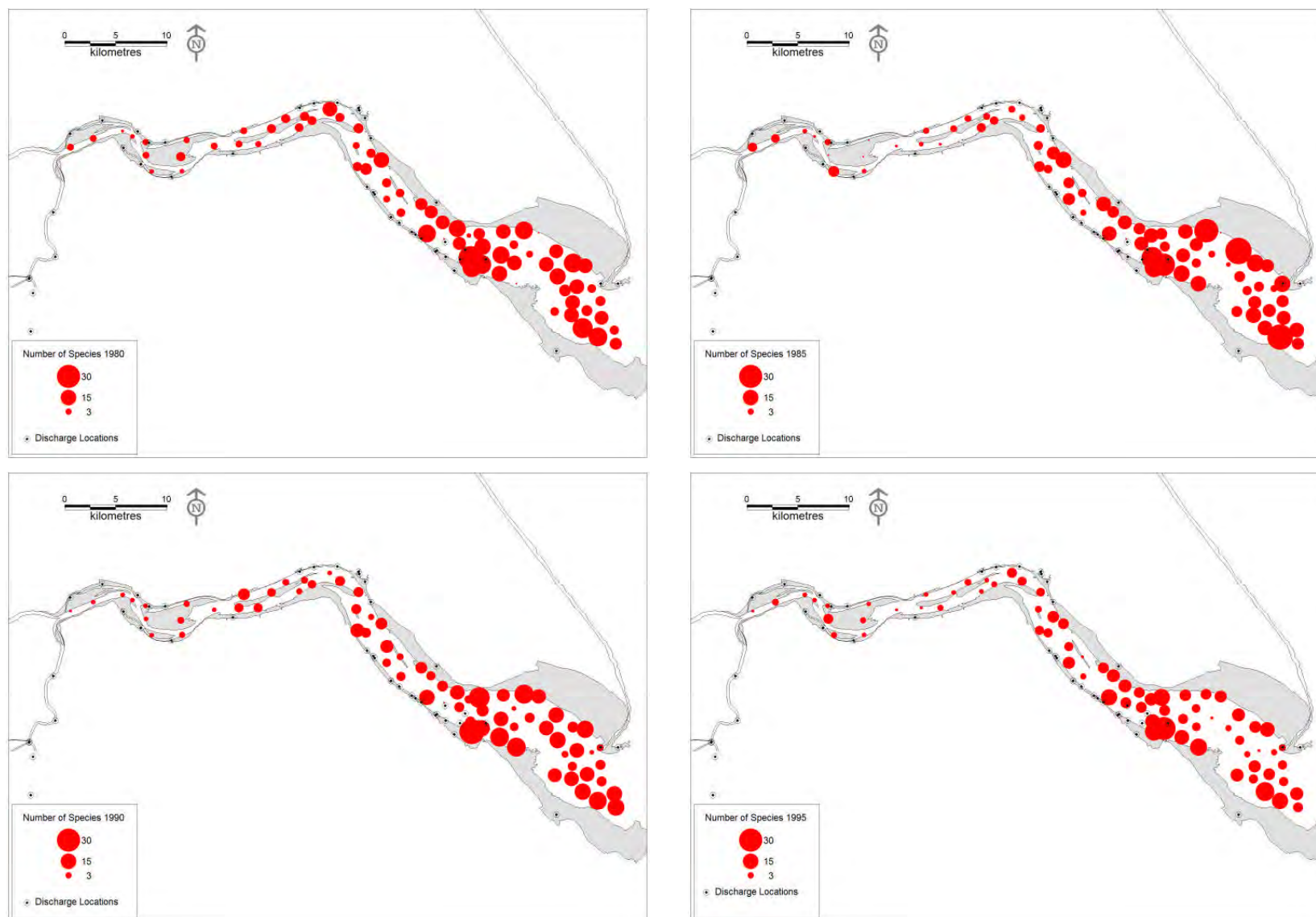
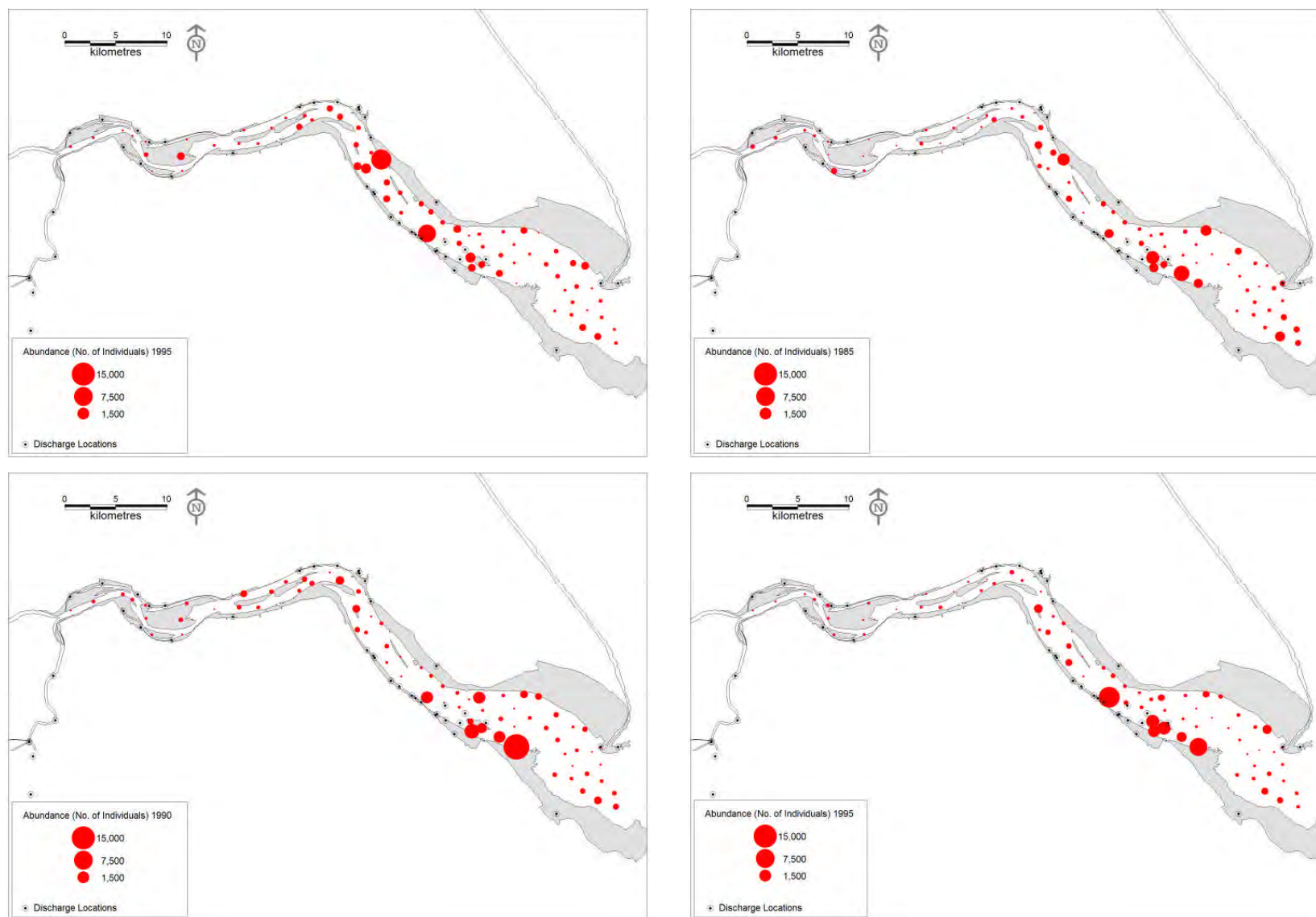


Figure 61. Number of species at the quinquennial sites from 1980 to 1995.



**Figure 62.** Number of individuals at the quinquennial sites from 1980 to 1995.

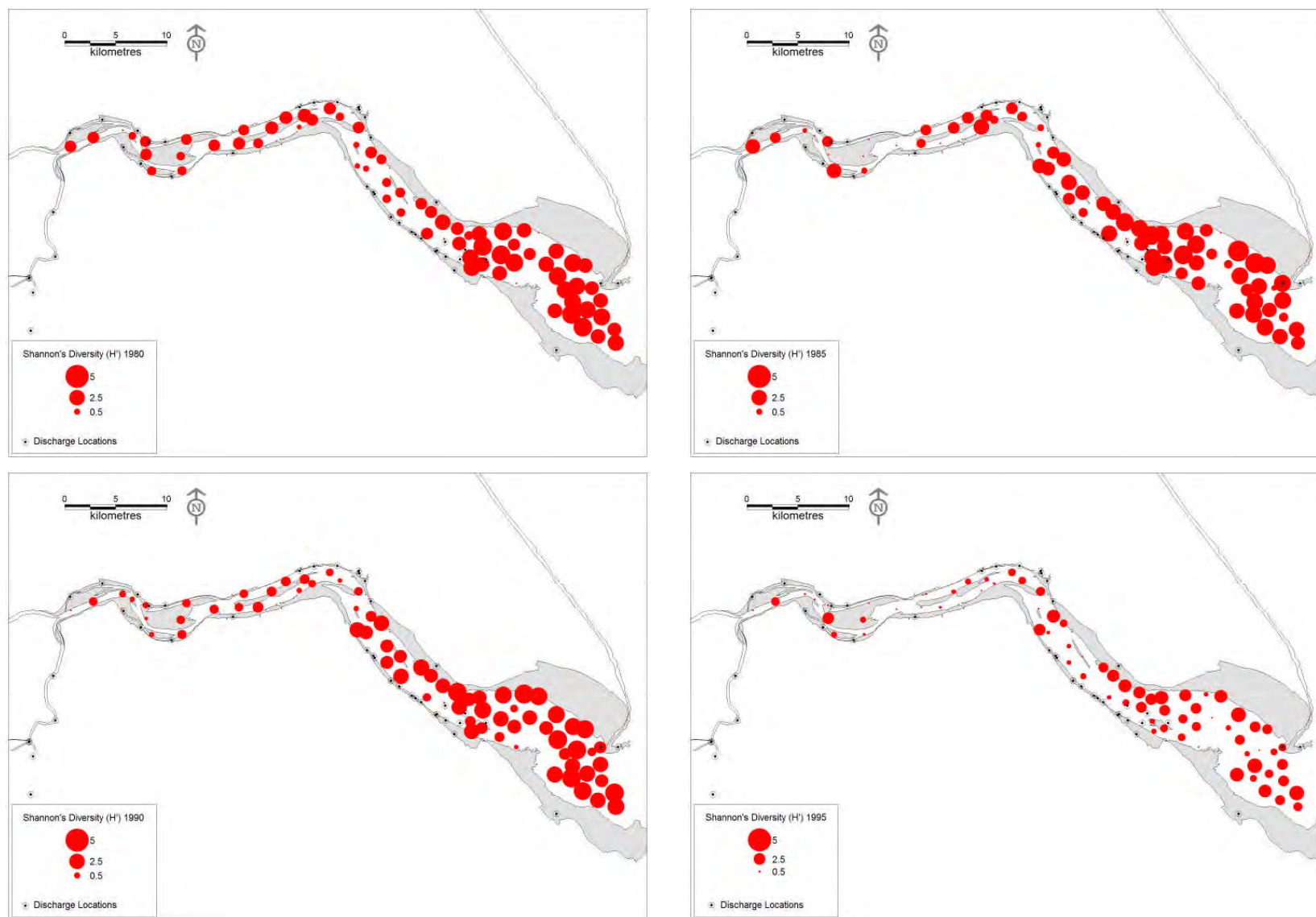


Figure 63. Shannon's Diversity ( $H'$ ) at the quinquennial sites from 1980 to 1995.



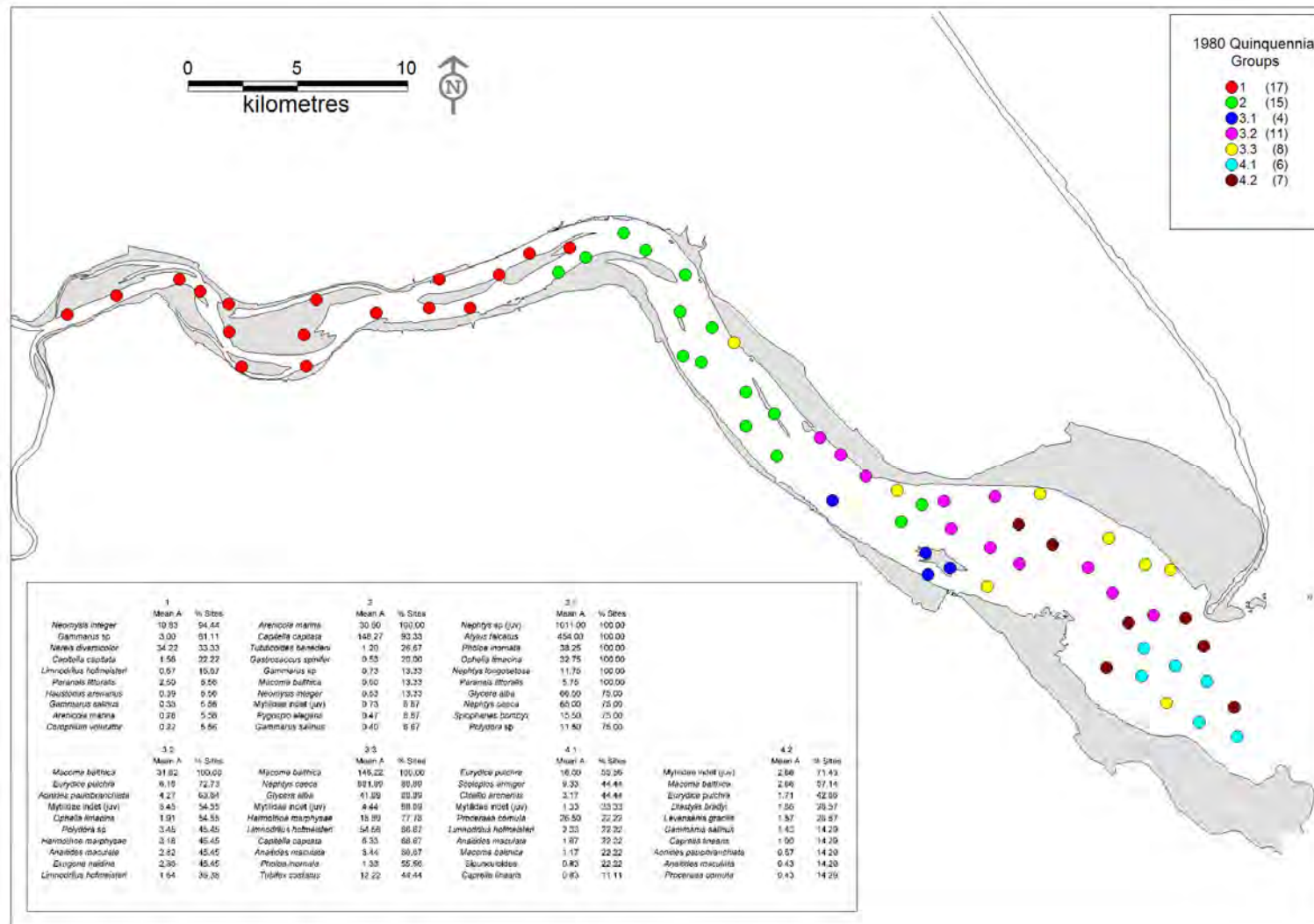


Figure 64. Site groups from cluster analysis for the 1980 quinquennial sites.

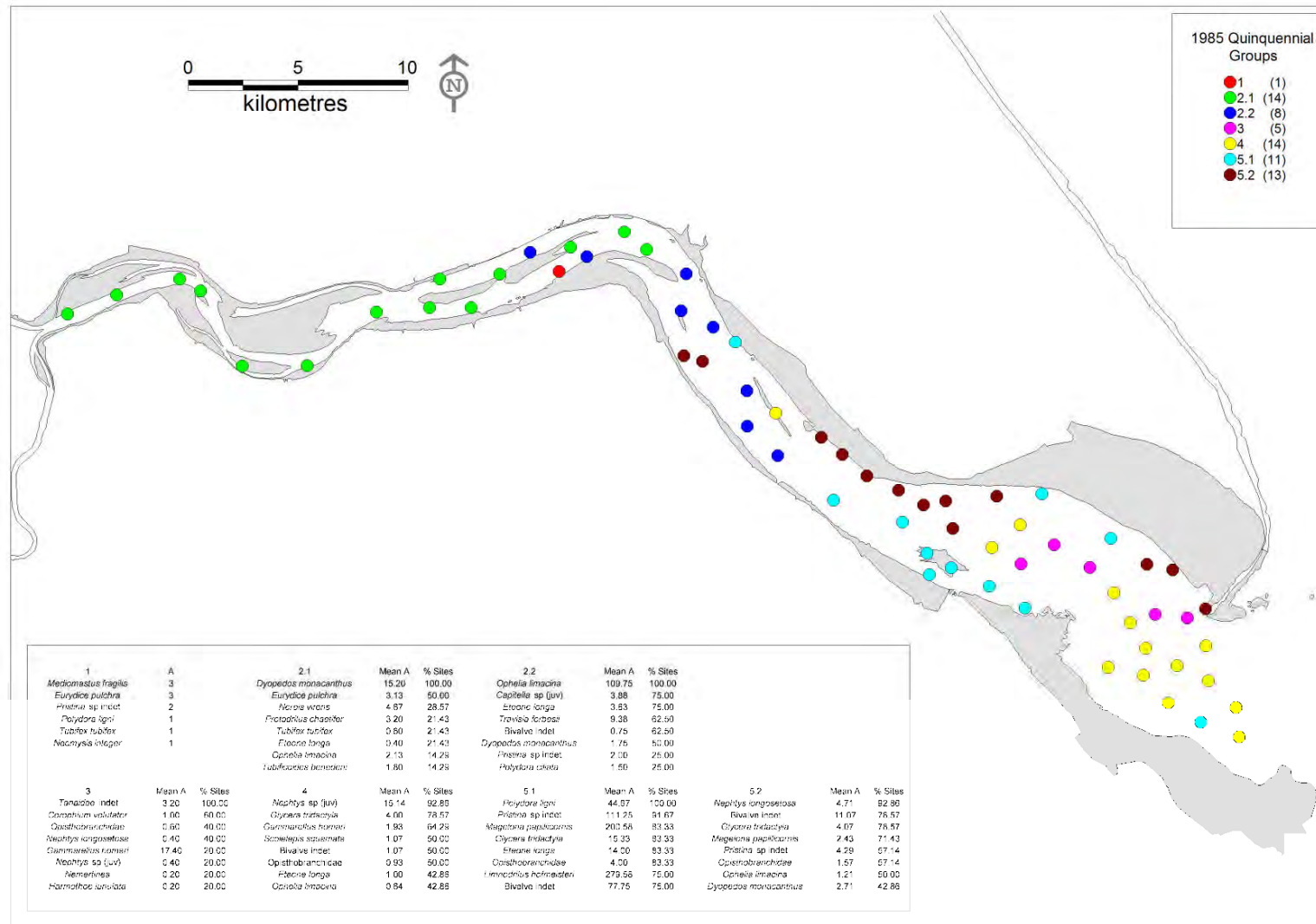


Figure 65 Site groups from cluster analysis for the 1985 quinquennial sites.

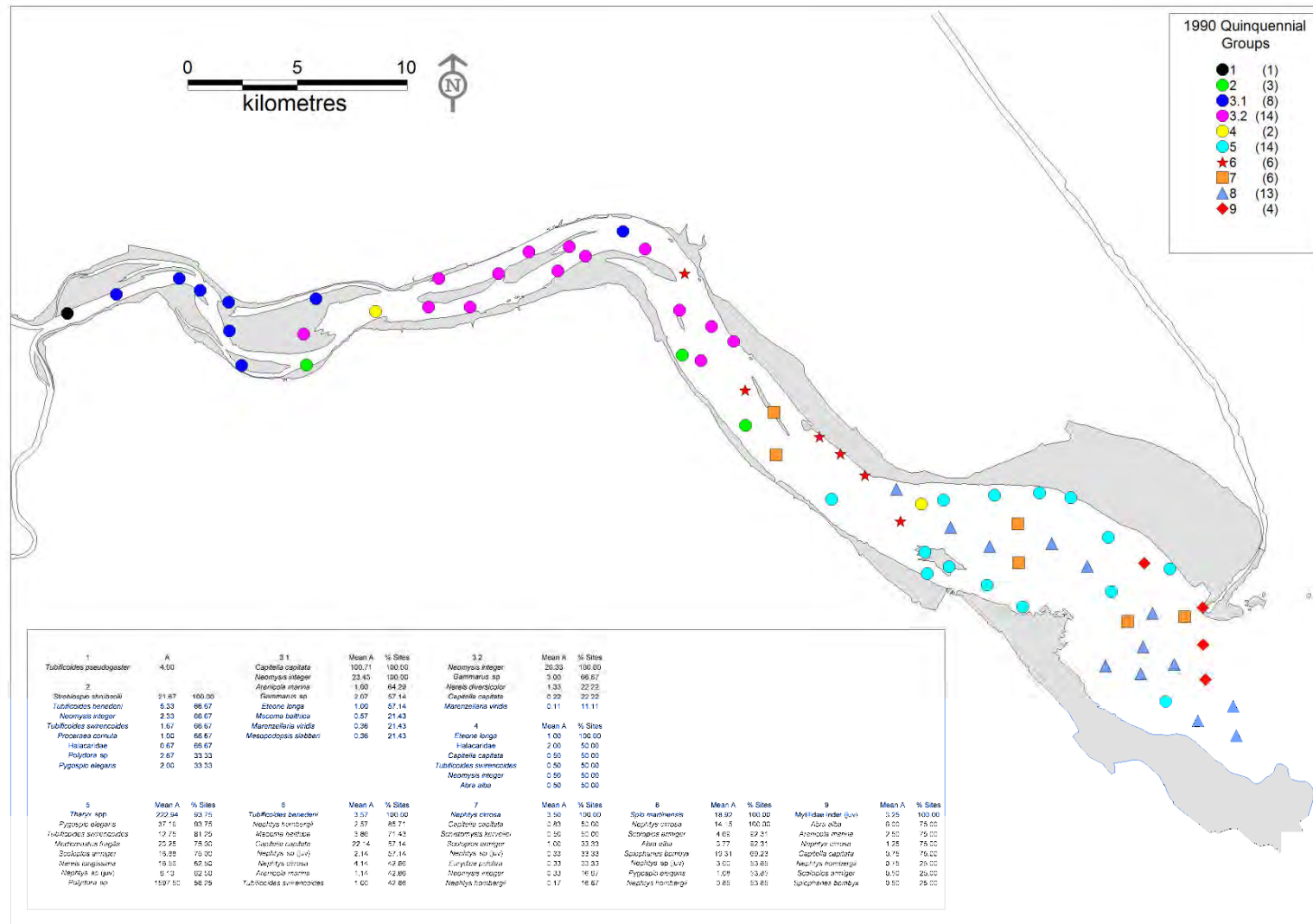


Figure 66. Site groups from cluster analysis for the 1990 quinquennial sites.



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## **APPENDICES**

Top Five Dominant taxa at Humber north bank midshore sites.

Site/Year	Taxa 1	Taxa 2	Taxa 3	Taxa 4	Taxa 5
Weighton Lock M 1989	Paranais litoralis				
% Dominance	100.00				
Weighton Lock M 1990	Paranais litoralis	Heterochaeta costata	Streblospio shrubsolei		
% Dominance	95.83	98.61	100.00		
Weighton Lock M 1991	Heterochaeta costata	Paranais litoralis	Amphichaeta sannio	Lumbricillus	Tubificoides benedii
% Dominance	59.00	94.00	98.00	99.00	100.00
Weighton Lock M 1992	Paranais litoralis	Heterochaeta costata	Enchytraeidae		
% Dominance	78.57	92.86	100.00		
Weighton Lock M 1993	Paranais litoralis	Heterochaeta costata	Hediste diversicolor	Corophium volutator	
% Dominance	90.91	93.94	96.97	100.00	
Weighton Lock M 1994	Paranais litoralis	Heterochaeta costata	Corophium volutator	Hediste diversicolor	Macoma balthica
% Dominance	59.02	88.53	93.44	96.72	98.36
Weighton Lock M 1995	Paranais litoralis	OLIGOCHAETA	Lembos longipes		
% Dominance	86.43	99.95	100.00		
Weighton Lock M 1996	Heterochaeta costata	NEMATODA	Macoma balthica	Enchytraeidae	Tubificoides benedii
% Dominance	74.60	84.13	92.06	96.83	100.00
Weighton Lock M 1997	Paranais litoralis	Heterochaeta costata	Enchytraeidae	Tipulidae	Corophium volutator
% Dominance	72.33	90.04	99.26	99.63	100.00
Weighton Lock M 1998	Heterochaeta costata	Tipulidae	Hediste diversicolor	Paranais litoralis	
% Dominance	98.01	98.68	99.34	100.00	
Weighton Lock M 1999	Heterochaeta costata	Hediste diversicolor	Paranais litoralis		
% Dominance	93.33	96.67	100.00		
Weighton Lock M 2000	Heterochaeta costata	Hediste diversicolor	Paranais litoralis		
% Dominance	93.33	96.67	100.00		
Weighton Lock M 2001	Heterochaeta costata	Paranais litoralis	Enchytraeidae	Tipulidae	COLLEMBOLA
% Dominance	56.25	76.56	90.63	93.75	95.31
Weighton Lock M 2002	Paranais litoralis	Heterochaeta costata	Enchytraeidae	Hediste diversicolor	
% Dominance	83.48	94.78	99.13	100.00	
Weighton Lock M 2003	Paranais litoralis	Heterochaeta costata	Corophium volutator	Enchytraeidae	Hediste diversicolor
% Dominance	58.69	90.80	97.14	98.88	99.39
Broomfleet M 1991	Heterochaeta costata	Paranais litoralis	Lumbricillus	Corophium volutator	Hediste diversicolor
% Dominance	50.99	93.28	97.23	99.61	100.00
Broomfleet M 1993	Heterochaeta costata	Corophium volutator			
% Dominance	98.65	100.00			
Broomfleet M 1994	Paranais litoralis	Heterochaeta costata	Corophium volutator	Tubificidae	Enchytraeidae
% Dominance	65.54	99.05	99.47	99.79	100.00
Broomfleet M 1995	OLIGOCHAETA	Paranais litoralis	Corophium volutator		
% Dominance	62.07	97.85	100.00		
Broomfleet M 1997	Corophium volutator	Enchytraeidae	Paranais litoralis	Hediste diversicolor	Heterochaeta costata
% Dominance	35.56	55.56	75.56	88.89	95.56
Broomfleet M 1999	Paranais litoralis	Heterochaeta costata	Corophium volutator	Tubificidae	Hydrobia ulvae
% Dominance	66.35	97.16	99.05	99.53	100.00
Broomfleet M 2000	Paranais litoralis	Heterochaeta costata	Corophium volutator	Tubificidae	Hydrobia ulvae
% Dominance	66.35	97.16	99.05	99.53	100.00
Broomfleet M 2001	Heterochaeta costata	Paranais litoralis	Corophium volutator	NEMATODA	
% Dominance	62.02	99.26	99.85	100.00	
Broomfleet M 2002	Heterochaeta costata	Paranais litoralis	Enchytraeidae	Corophium volutator	PELECYPODA
% Dominance	88.09	98.37	99.51	99.84	100.00
East Clough M 1991	Paranais litoralis	Heterochaeta costata	Corophium volutator	Amphichaeta sannio	Hediste diversicolor
% Dominance	66.86	83.66	94.44	97.34	99.31
East Clough M 1992	Corophium volutator	Heterochaeta costata	Hediste diversicolor	Paranais litoralis	Macoma balthica
% Dominance	46.97	84.94	98.88	99.33	99.78
East Clough M 1993	Heterochaeta costata	Hediste diversicolor	Corophium volutator	Paranais litoralis	
% Dominance	47.03	75.25	99.51	100.00	
East Clough M 1994	Heterochaeta costata	Corophium volutator	Hediste diversicolor	Enchytraeidae	Streblospio shrubsolei
% Dominance	41.61	70.47	96.64	98.66	99.33
East Clough M 1995	Corophium volutator	OLIGOCHAETA	Hediste diversicolor	Paranais litoralis	
% Dominance	49.93	87.45	96.37	100.00	
East Clough M 1996	Corophium volutator	Hediste diversicolor	Enchytraeidae	Heterochaeta costata	NEMATODA
% Dominance	73.95	84.43	92.14	99.27	99.85
East Clough M 1997	Corophium volutator	Hediste diversicolor	Heterochaeta costata	NEMATODA	Enchytraeidae
% Dominance	76.24	85.36	91.83	96.58	99.81
East Clough M 1998	Heterochaeta costata	Hediste diversicolor	Enchytraeidae	Corophium volutator	
% Dominance	51.37	68.85	84.70	100.00	
East Clough M 1999	Paranais litoralis	Heterochaeta costata	Corophium volutator	Hediste diversicolor	Enchytraeidae
% Dominance	62.07	80.76	93.83	98.73	100.00
East Clough M 2000	Paranais litoralis	Heterochaeta costata	Corophium volutator	Hediste diversicolor	Enchytraeidae
% Dominance	62.07	80.76	93.83	98.73	100.00
East Clough M 2001	Heterochaeta costata	Hediste diversicolor	Corophium volutator	Enchytraeidae	Streblospio shrubsolei
% Dominance	59.39	87.88	97.58	99.09	99.70
East Clough M 2002	Heterochaeta costata	Hediste diversicolor	Corophium volutator	Enchytraeidae	
% Dominance	55.14	85.05	99.07	100.00	
East Clough M 2003	Heterochaeta costata	Hediste diversicolor	Paranais litoralis	Corophium volutator	Enchytraeidae
% Dominance	36.00	61.20	86.00	98.40	99.60

# An Assessment of Temporal Variation of Benthic Invertebrate Communities in the Humber Estuary Environment Agency

Hessle M 1989	Nereis diversicolor	Heterochaeta costata			
% Dominance	66.67	100.00			
Hessle M 1990	Nereis diversicolor				
% Dominance	100.00				
Hessle M 1991	Paranais litoralis	Streblospio shrubsolii	Heterochaeta costata	Nereis diversicolor	Corophium volutator
% Dominance	42.86	57.14	71.43	85.71	100.00
Hessle M 1993	POLYCHAETA	Heterochaeta costata	Nereis diversicolor	Paranais litoralis	Pygospio elegans
% Dominance	16.67	33.33	50.00	66.67	83.33
Hessle M 1994	Corophium volutator	Nereis diversicolor			
% Dominance	80.00	100.00			
Hessle M 1995	OLIGOCHAETA	Nereis diversicolor	Corophium volutator		
% Dominance	98.82	99.92	100.00		
Hessle M 1996	Enchytraeidae	NEMATODA	Streblospio shrubsolii	Nereis diversicolor	Corophium volutator
% Dominance	42.86	78.57	85.71	92.86	100.00
Hessle M 1997	Heterochaeta costata	Corophium volutator	Nereis diversicolor	Streblospio shrubsolii	Macoma balthica
% Dominance	55.00	75.00	90.00	95.00	100.00
Hessle M 1998	Heterochaeta costata	Nereis diversicolor	Corophium volutator	NEMATODA	
% Dominance	97.22	98.33	99.44	100.00	
Hessle M 1999	Heterochaeta costata				
% Dominance	100.00				
Hessle M 2000	Heterochaeta costata				
% Dominance	100.00				
Hessle M 2001	Heterochaeta costata	Enchytraeidae	NEMATODA	Hediste diversicolor	
% Dominance	94.88	98.32	99.58	100.00	
Hessle M 2002	Heterochaeta costata	Hediste diversicolor	Enchytraeidae		
% Dominance	97.41	99.22	100.00		
Hessle M 2003	Heterochaeta costata	Hediste diversicolor	Corophium volutator	PELECYPODA	Hydrobia ulvae
% Dominance	61.68	92.77	96.64	98.32	99.66
Alexandra Dock M 1990	Paranais litoralis	Corophium volutator	Streblospio shrubsolii	Heterochaeta costata	Manayunkia aestuarina
% Dominance	60.00	76.00	84.00	92.00	96.00
Alexandra Dock M 1991	Corophium volutator	Nereis diversicolor	Streblospio shrubsolii	Tubificoides benedii	Eteone
% Dominance	89.37	97.10	98.07	99.03	99.52
Alexandra Dock M 1992	Corophium volutator	Nereis diversicolor	Eteone	Hydrobia ulvae	Pygospio elegans
% Dominance	42.11	73.68	78.95	84.21	89.47
Alexandra Dock M 1993	Heterochaeta costata	Nereis diversicolor	Macoma balthica	Gammaridae	Manayunkia aestuarina
% Dominance	34.38	62.50	81.25	84.38	87.50
Alexandra Dock M 1994	Nereis diversicolor	Tubificoides benedii	Streblospio shrubsolii	Paranais litoralis	Heterochaeta costata
% Dominance	44.83	62.07	72.41	82.76	89.66
Alexandra Dock M 1995	Nereis diversicolor	OLIGOCHAETA	Streblospio shrubsolii	Corophium volutator	Paranais litoralis
% Dominance	26.67	50.00	66.67	76.67	83.33
Alexandra Dock M 1996	NEMATODA	Nereis diversicolor	Enchytraeidae	Heterochaeta costata	Manayunkia aestuarina
% Dominance	35.46	57.27	78.18	92.73	97.27
Alexandra Dock M 1997	Paranais litoralis	NEMATODA	Nereis diversicolor	Enchytraeidae	Heterochaeta costata
% Dominance	21.35	42.70	60.67	76.40	87.08
Alexandra Dock M 1998	Nereis diversicolor	Heterochaeta costata	NEMATODA	Corophium volutator	Macoma balthica
% Dominance	58.33	81.25	95.83	97.92	100.00
Alexandra Dock M 1999	Heterochaeta costata	Nereis diversicolor	Streblospio shrubsolii	Enchytraeidae	ACARIFORMES
% Dominance	37.50	62.50	75.83	86.67	93.33
Alexandra Dock M 2000	Heterochaeta costata	Hediste diversicolor	Streblospio shrubsolii	Enchytraeidae	ACARIFORMES
% Dominance	37.50	62.50	75.83	86.67	93.33
Alexandra Dock M 2001	Streblospio shrubsolii	NEMATODA	Hediste diversicolor	Heterochaeta costata	Tubificoides benedii
% Dominance	42.02	65.43	80.85	86.17	89.36
Alexandra Dock M 2002	Hediste diversicolor	Enchytraeidae	Streblospio shrubsolii	Heterochaeta costata	Tubificoides benedii
% Dominance	37.65	61.11	82.72	99.38	100.00
Alexandra Dock M 2003	Heterochaeta costata	Hediste diversicolor	Streblospio shrubsolii	Enchytraeidae	Abra alba
% Dominance	38.34	74.60	90.53	94.69	96.31
Thorngumbald M 1989	Tubificoides benedii	Nereis diversicolor	Macoma balthica	Eteone	Lumbricillus
% Dominance	75.73	82.30	87.61	91.78	95.07
Thorngumbald M 1990	Tubificoides benedii	Nephtys hombergii	Corophium volutator	Macoma balthica	Lumbricillus
% Dominance	74.14	82.76	88.79	94.83	96.55
Thorngumbald M 1991	Tubificoides benedii	Macoma balthica	Arenicola marina	Nephtys hombergii	Pygospio elegans
% Dominance	64.52	83.87	90.32	96.77	100.00
Thorngumbald M 1992	Tubificoides benedii	Macoma balthica	Nephtys	Corophium volutator	Nephtys hombergii
% Dominance	51.08	74.10	86.33	96.40	97.84
Thorngumbald M 1993	Corophium volutator	Tubificoides benedii	Macoma balthica	Nereis diversicolor	Eteone
% Dominance	53.83	89.84	94.73	97.49	98.62
Thorngumbald M 1994	Corophium volutator	Tubificoides benedii	Macoma balthica	Nereis diversicolor	Manayunkia aestuarina
% Dominance	81.24	90.18	97.95	99.52	99.66
Thorngumbald M 1995	Tubificoides benedii	Macoma balthica	OLIGOCHAETA	Nereis diversicolor	Manayunkia aestuarina
% Dominance	65.39	77.55	86.42	91.46	95.29
Thorngumbald M 1996	Enchytraeidae	Tubificoides benedii	NEMATODA	Manayunkia aestuarina	Nereis diversicolor
% Dominance	67.43	82.13	94.89	96.57	97.93
Thorngumbald M 1997	NEMATODA	Tubificoides benedii	Nereis diversicolor	Enchytraeidae	Macoma balthica
% Dominance	50.77	82.42	89.45	95.27	98.85
Thorngumbald M 1998	NEMATODA	Nereis diversicolor	Macoma balthica	Enchytraeidae	Tubificoides benedii
% Dominance	75.38	83.78	91.59	97.60	99.40
Thorngumbald M 1999	Macoma balthica	Nereis diversicolor	Tubificoides benedii	Eteone	Corophium volutator
% Dominance	65.43	91.36	95.06	97.53	100.00
Thorngumbald M 2000	Macoma balthica	Hediste diversicolor	Tubificoides benedii	Eteone	Corophium volutator
% Dominance	65.43	91.36	95.06	97.53	100.00
Thorngumbald M 2001	Enchytraeidae	NEMATODA	Tubificoides benedii	Hediste diversicolor	Manayunkia aestuarina
% Dominance	61.74	83.08	90.63	97.50	99.36
Thorngumbald M 2002	Macoma balthica	Tubificoides benedii	Streblospio shrubsolii	Hediste diversicolor	Paranais litoralis
% Dominance	50.21	84.77	90.95	94.24	97.12



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Cherry Cob M 1998	Enchytraeidae	NEMATODA	Tubificoides benedii	Nereis diversicolor	Pygospio elegans
% Dominance	50.06	85.71	93.05	95.70	97.22
Cherry Cob M 1999	Tubificoides benedii	Enchytraeidae	Manayunkia aestuarina	Macoma balthica	Abra tenuis
% Dominance	41.53	72.79	83.72	92.76	96.67
Cherry Cob M 1990	Tubificoides benedii	Macoma balthica	Hydrobia ulvae	Pygospio elegans	Manayunkia aestuarina
% Dominance	60.01	73.64	84.81	91.01	93.95
Cherry Cob M 1991	Tubificoides benedii	Macoma balthica	Hydrobia ulvae	Pygospio elegans	Nereis diversicolor
% Dominance	71.04	86.05	93.47	95.76	96.78
Cherry Cob M 1992	Tubificoides benedii	Macoma balthica	Hydrobia ulvae	Paranais frici	Pygospio elegans
% Dominance	65.53	80.03	85.73	90.94	92.84
Cherry Cob M 1993	Tubificoides benedii	Macoma balthica	Hydrobia ulvae	Eteone	Pygospio elegans
% Dominance	45.18	72.11	88.64	92.29	95.69
Cherry Cob M 1994	Tubificoides benedii	Macoma balthica	Nereis diversicolor	Eteone	Hydrobia ulvae
% Dominance	66.76	93.62	95.77	97.58	98.99
Cherry Cob M 1995	Tubificoides benedii	Manayunkia aestuarina	Macoma balthica	Nereis diversicolor	Pygospio elegans
% Dominance	70.91	88.89	93.83	96.86	98.08
Cherry Cob M 1996	Tubificoides benedii	NEMATODA	Macoma balthica	Hydrobia ulvae	Nereis diversicolor
% Dominance	32.30	57.75	83.20	89.54	94.83
Cherry Cob M 1997	NEMATODA	Tubificoides benedii	Macoma balthica	Nereis diversicolor	Nephtys
% Dominance	49.30	80.92	94.57	95.96	97.21
Cherry Cob M 2000	Tubificoides benedii	Enchytraeidae	Manayunkia aestuarina	Macoma balthica	Abra tenuis
% Dominance	41.53	72.79	83.72	92.76	96.67
Cherry Cob M 2001	Enchytraeidae	NEMATODA	Tubificoides benedii	Macoma balthica	Hediste diversicolor
% Dominance	61.00	89.95	94.76	98.09	99.09
Cherry Cob M 2002	Enchytraeidae	Macoma balthica	Pygospio elegans	Tubificoides benedii	Hediste diversicolor
% Dominance	43.09	73.60	83.31	89.29	95.14
Stone Creek M 1989	Tubificoides benedii	Macoma balthica	Pygospio elegans	Eteone	Hydrobia ulvae
% Dominance	71.86	92.72	95.38	96.98	98.45
Stone Creek M 1990	Tubificoides benedii	Macoma balthica	Pygospio elegans	Hydrobia ulvae	Eteone
% Dominance	63.44	78.37	90.25	93.31	96.31
Stone Creek M 1991	Tubificoides benedii	Pygospio elegans	Macoma balthica	Hydrobia ulvae	Eteone
% Dominance	60.31	82.06	94.06	96.64	98.43
Stone Creek M 1992	Tubificoides benedii	Macoma balthica	Hydrobia ulvae	Pygospio elegans	Eteone
% Dominance	36.85	73.24	89.05	94.44	98.04
Stone Creek M 1993	Tubificoides benedii	Macoma balthica	Hydrobia ulvae	Eteone	Pygospio elegans
% Dominance	40.38	74.54	92.95	96.02	98.09
Stone Creek M 1994	Tubificoides benedii	Macoma balthica	Eteone	Pygospio elegans	Hydrobia ulvae
% Dominance	70.20	90.62	94.39	97.40	98.73
Stone Creek M 1995	Tubificoides benedii	Macoma balthica	Nereis diversicolor	Manayunkia aestuarina	Eteone
% Dominance	70.59	92.97	95.76	97.73	99.17
Stone Creek M 1996	NEMATODA	Tubificoides benedii	Macoma balthica	Nereis diversicolor	Eteone
% Dominance	44.90	73.35	89.96	97.66	98.71
Stone Creek M 1997	NEMATODA	Tubificoides benedii	Macoma balthica	Nereis diversicolor	Enchytraeidae
% Dominance	52.49	86.46	91.96	96.35	98.77
Stone Creek M 1998	NEMATODA	Tubificoides benedii	Enchytraeidae	Nereis diversicolor	Macoma balthica
% Dominance	41.21	67.29	84.87	95.53	99.14
Stone Creek M 1999	Tubificoides benedii	Enchytraeidae	Nereis diversicolor	Macoma balthica	Manayunkia aestuarina
% Dominance	50.22	79.76	92.67	96.06	98.36
Stone Creek M 2000	Tubificoides benedii	Enchytraeidae	Hediste diversicolor	Macoma balthica	Manayunkia aestuarina
% Dominance	50.22	79.76	92.67	96.06	98.36
Stone Creek M 2001	Enchytraeidae	NEMATODA	Tubificoides benedii	Hediste diversicolor	Macoma balthica
% Dominance	47.42	75.88	93.14	96.63	98.77
Stone Creek M 2002	Enchytraeidae	Hediste diversicolor	Tubificoides benedii	Pygospio elegans	PELECYPODA
% Dominance	86.25	91.57	96.89	97.96	98.76
Stone Creek M 2003	Tubificoides benedii	PELECYPODA	Macoma balthica	Pygospio elegans	Hydrobia ulvae
% Dominance	56.45	70.26	78.37	86.00	93.48
Hawkins Point M 1991	Pygospio elegans	Hydrobia ulvae	Macoma balthica	Lumbricillus	Eteone
% Dominance	70.40	86.27	93.20	95.47	97.73
Hawkins Point M 1992	Pygospio elegans	Macoma balthica	Nephtys	Nephtys hombergii	Hydrobia ulvae
% Dominance	54.11	74.44	89.39	92.23	94.62
Hawkins Point M 1993	Pygospio elegans	Macoma balthica	Hydrobia ulvae	Nephtys hombergii	Retusa truncatula
% Dominance	38.70	71.22	90.00	95.57	97.22
Hawkins Point M 1994	Pygospio elegans	Macoma balthica	Hydrobia ulvae	Retusa obtusa	Eteone
% Dominance	48.97	80.50	84.52	87.59	90.49
Hawkins Point M 1995	Macoma balthica	Pygospio elegans	Hydrobia ulvae	OLIGOCHAETA	Nereis diversicolor
% Dominance	37.89	57.66	72.49	82.21	89.62
Hawkins Point M 1996	Macoma balthica	Hydrobia ulvae	Eteone	NEMATODA	Tubificoides benedii
% Dominance	61.27	71.88	76.92	81.70	86.47
Hawkins Point M 1997	NEMATODA	Macoma balthica	Pygospio elegans	Nephtys	Nephtys hombergii
% Dominance	54.43	73.81	84.21	94.10	97.56
Hawkins Point M 2000	Macoma balthica	Nephtys	Tubificoides benedii	Hydrobia ulvae	Enchytraeidae
% Dominance	54.28	70.82	79.57	85.21	89.69
Hawkins Point M 2001	NEMATODA	Macoma balthica	Paranais litoralis	Hydrobia ulvae	Pygospio elegans
% Dominance	56.88	75.95	92.98	95.12	96.68
Hawkins Point M 2002	Pygospio elegans	Macoma balthica	Enchytraeidae	Paranais litoralis	Hydrobia ulvae
% Dominance	40.04	63.50	76.66	84.18	90.38

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Skeffling M 1990	Pygospio elegans	Macoma balthica	Nephtys	Streblospio shrubsolii	Retusa obtusa
% Dominance	43.20	54.80	63.99	72.53	81.00
Skeffling M 1991	Macoma balthica	Streblospio shrubsolii	Pygospio elegans	Tubificoides benedii	Retusa obtusa
% Dominance	28.45	52.53	75.42	83.67	89.90
Skeffling M 1992	Pygospio elegans	Nephtys	Tubificoides benedii	Macoma balthica	Streblospio shrubsolii
% Dominance	36.68	49.84	62.62	74.89	85.43
Skeffling M 1993	Tubificoides benedii	Macoma balthica	Pygospio elegans	Retusa truncatula	Eteone
% Dominance	28.36	46.32	58.78	67.62	74.98
Skeffling M 1994	Tubificoides benedii	Nereis diversicolor	Macoma balthica	Eteone	Corophium volutator
% Dominance	48.51	68.35	87.29	93.77	95.20
Skeffling M 1995	Tubificoides benedii	Macoma balthica	Pygospio elegans	Hydrobia ulvae	Eteone
% Dominance	79.40	86.62	89.76	92.13	94.17
Skeffling M 1996	Macoma balthica	Nereis diversicolor	Abra tenuis	Tubificoides benedii	NEMATODA
% Dominance	27.55	51.45	71.39	90.26	96.96
Skeffling M 1997	Tubificoides benedii	NEMATODA	Streblospio shrubsolii	Macoma balthica	Pygospio elegans
% Dominance	58.91	79.38	87.76	93.35	96.90
Skeffling M 1998	Hydrobia ulvae	Cerastoderma edule	NEMATODA	Macoma balthica	Nephtys hombergii
% Dominance	29.35	51.17	69.87	88.05	96.10
Skeffling M 1999	Retusa obtusa	Macoma balthica	Cerastoderma edule	Streblospio shrubsolii	Nephtys
% Dominance	23.68	43.86	56.14	68.42	78.07
Skeffling M 2000	Retusa obtusa	Macoma balthica	Cerastoderma edule	Streblospio shrubsolii	Nephtys
% Dominance	23.68	43.86	56.14	68.42	78.07
Skeffling M 2001	Macoma balthica	NEMATODA	Streblospio shrubsolii	Nephtys	Nephtys hombergii
% Dominance	36.33	64.35	81.22	89.52	92.93
Skeffling M 2002	Macoma balthica	Streblospio shrubsolii	Tubificoides benedii	Pygospio elegans	Nephtys hombergii
% Dominance	38.85	71.00	84.33	91.20	94.99
Kilnsea M 1989	Cerastoderma edule	Macoma balthica	Pygospio elegans	Nephtys cirrosa	Eteone
% Dominance	42.83	61.47	76.70	84.41	90.32
Kilnsea M 1990	Pygospio elegans	Cerastoderma edule	Retusa obtusa	Macoma balthica	Nephtys
% Dominance	33.26	59.49	71.43	80.80	88.76
Kilnsea M 1991	Cerastoderma edule	Pygospio elegans	Macoma balthica	Nephtys hombergii	Retusa obtusa
% Dominance	36.93	60.23	78.41	86.93	93.18
Kilnsea M 1992	Hydrobia ulvae	Pygospio elegans	Cerastoderma edule	Nephtys	Macoma balthica
% Dominance	29.10	54.07	74.90	90.07	96.28
Kilnsea M 1993	Pygospio elegans	Macoma balthica	Cerastoderma edule	Nephtys hombergii	Retusa truncatula
% Dominance	26.97	49.87	72.01	86.26	95.93
Kilnsea M 1994	Pygospio elegans	Macoma balthica	Eteone	Nephtys hombergii	Cerastoderma edule
% Dominance	53.81	85.35	88.04	90.58	93.12
Kilnsea M 1995	Macoma balthica	Spio decorata	Retusa obtusa	Pygospio elegans	Nephtys kersivalensis
% Dominance	69.68	78.53	84.00	88.42	92.00
Kilnsea M 1996	NEMATODA	Macoma balthica	Hydrobia ulvae	Eteone	Streblospio shrubsolii
% Dominance	39.60	75.43	82.23	87.57	90.61
Kilnsea M 1997	NEMATODA	Streblospio shrubsolii	Macoma balthica	Pygospio elegans	Nephtys
% Dominance	33.06	64.51	74.82	83.92	89.59
Kilnsea M 1998	Cerastoderma edule	Macoma balthica	Hydrobia ulvae	Nephtys hombergii	NEMATODA
% Dominance	45.76	64.41	80.00	88.14	93.90
Kilnsea M 1999	Macoma balthica	Cerastoderma edule	Streblospio shrubsolii	Nephtys	Nephtys hombergii
% Dominance	49.09	68.00	78.55	86.55	93.09
Kilnsea M 2000	Macoma balthica	Cerastoderma edule	Streblospio shrubsolii	Nephtys	Nephtys hombergii
% Dominance	49.09	68.00	78.55	86.55	93.09
Kilnsea M 2001	NEMATODA	Streblospio shrubsolii	Macoma balthica	Nephtys hombergii	Nephtys
% Dominance	48.44	66.17	83.01	86.44	89.42
Kilnsea M 2002	Streblospio shrubsolii	Macoma balthica	Cerastoderma edule	Pygospio elegans	Nephtys hombergii
% Dominance	56.63	77.43	85.11	92.23	97.17
Spurn M 1991	Hydrobia ulvae	Syllidae	Ophelina acuminata	Nephtys cirrosa	Protodrilidae
% Dominance	47.00	85.25	89.07	91.80	93.44
Spurn M 1992	Hydrobia ulvae	Syllidae	POLYCHAETA	Pygospio elegans	Spio armata
% Dominance	72.36	81.37	89.75	92.24	93.48
Spurn M 1993	Hydrobia ulvae	POLYCHAETA	Enchytraeidae	Tanaissus lilljeborgi	Pygospio elegans
% Dominance	88.20	95.62	97.59	98.41	98.99
Spurn M 1994	POLYCHAETA	Hydrobia ulvae	Syllidae	Pygospio elegans	Tanaissus lilljeborgi
% Dominance	33.33	47.62	57.14	66.67	73.81
Spurn M 1995	Hydrobia ulvae	Psammodrillus balanoglossoides	POLYCHAETA	OLIGOCHAETA	Streptosyllis websteri
% Dominance	22.44	42.95	58.97	72.44	83.33
Spurn M 1996	Streptosyllis websteri	balanoglossoides	NEMATODA	Pygospio elegans	Opheliidae
% Dominance	41.26	61.65	74.27	80.10	83.98
Spurn M 1998	Hydrobia ulvae	Streptosyllis websteri	Psammodrillus balanoglossoides	NEMATODA	Travisia forbesii
% Dominance	37.50	66.67	88.89	93.06	96.30
Spurn M 1999	Streptosyllis websteri	Opheliidae	Paraonis fulgens	NEMERTEA	Psammodrillus balanoglossoides
% Dominance	19.73	34.25	45.75	56.44	65.75
Spurn M 2000	Streptosyllis websteri	Opheliidae	Paraonis fulgens	NEMERTEA	Psammodrillus balanoglossoides
% Dominance	19.73	34.25	45.75	56.44	65.75
Spurn M 2001	Streptosyllis websteri	Paraonis fulgens	Opheliidae	Psammodrillus balanoglossoides	Hydrobia ulvae
% Dominance	28.71	46.89	59.33	67.46	74.64
Spurn M 2003	Hydrobia ulvae	Enchytraeidae	Tanaissus lilljeborgi	Paraonis fulgens	PELECYPODA
% Dominance	67.09	75.32	80.38	84.81	88.61

Top Five Dominant taxa at Humber south bank midshore sites.

Site/Year	Taxa 1	Taxa 1	Taxa 1	Taxa 1	Taxa 1
<b>1 M 1981</b>	Paranais litoralis	Heterochaeta costatus	Hediste diversicolor		
Cum % A	72.519	98.391	100		
<b>1 M 1982</b>	Paranais litoralis	Heterochaeta costatus	Hediste diversicolor		
Cum % A	57.38	96.679	100		
<b>1 M 1983</b>	Heterochaeta costatus	Paranais litoralis	Hediste diversicolor		
Cum % A	66.667	87.44	100		
<b>1 M 1984</b>	Paranais litoralis	Heterochaeta costatus	Hediste diversicolor	Macoma balthica	
Cum % A	51.188	88.769	99.136	100	
<b>1 M 1985</b>	Paranais litoralis	Heterochaeta costatus	Hediste diversicolor		
Cum % A	44.298	87.719	100		
<b>1 M 1986</b>	Heterochaeta costatus	Paranais litoralis	Hediste diversicolor		
Cum % A	49.895	96.842	100		
<b>1 M 1987</b>	Heterochaeta costatus	Paranais litoralis	Hediste diversicolor		
Cum % A	72.945	97.089	100		
<b>1 M 1988</b>	Heterochaeta costatus	Paranais litoralis	Hediste diversicolor		
Cum % A	87.199	99.562	100		
<b>1 M 1989</b>	Heterochaeta costatus	Paranais litoralis			
Cum % A	99.441	100			
<b>1 M 1990</b>	Heterochaeta costatus	Paranais litoralis	Corophium volutator	Streblospio shrubsolii	
Cum % A	59.895	99.564	99.913	100	
<b>1 M 1991</b>	Heterochaeta costatus	Corophium volutator	Hediste diversicolor		
Cum % A	95.028	99.724	100		
<b>1 M 1992</b>	Heterochaeta costatus	Corophium volutator	Enchytraeidae		
Cum % A	94.545	98.182	100		
<b>1 M 1993</b>	Paranais litoralis	Heterochaeta costatus	Corophium volutator		
Cum % A	52	96	100		
<b>1 M 1994</b>	Heterochaeta costatus	Corophium volutator	Paranais litoralis	Tubificoides swirencoides	
Cum % A	58.108	87.838	98.649	100	
<b>1 M 1995</b>	Heterochaeta costatus	Paranais litoralis	Hediste diversicolor		
Cum % A	82	98	100		
<b>1 M 1996</b>	Corophium volutator	Paranais litoralis	Heterochaeta costatus	Enchytraeidae	Hediste diversicolor
Cum % A	67.361	95.139	98.958	99.653	100
<b>1 M 1997</b>	Heterochaeta costatus	Corophium volutator	Hediste diversicolor		
Cum % A	88.462	96.154	100		
<b>1 M 1998</b>	Paranais litoralis	Heterochaeta costatus	Paranais frici	Corophium volutator	
Cum % A	97.377	98.689	99.344	100	
<b>1 M 1999</b>	Paranais litoralis	Heterochaeta costatus	Corophium volutator	Hediste diversicolor	
Cum % A	84.662	97.227	99.827	100	
<b>1 M 2000</b>	Paranais litoralis	Heterochaeta costatus	Corophium volutator	Hediste diversicolor	Streblospio shrubsolii
Cum % A	81.159	89.855	97.826	99.275	100
<b>1 M 2001</b>	Paranais litoralis	Hediste diversicolor	Corophium volutator	Streblospio shrubsolii	
Cum % A	38.462	61.538	84.615	100	
<b>1 M 2002</b>	Heterochaeta costatus	Paranais litoralis	Corophium volutator	Hediste diversicolor	Streblospio shrubsolii
Cum % A	80.718	96.597	99.622	99.811	100
<b>1 M 2003</b>	Heterochaeta costatus	Paranais litoralis	Gammaridae		
Cum % A	75	95.833	100		
<b>1 M 2004</b>	Heterochaeta costatus	Paranais litoralis	Corophium volutator	Tubificoides swirencoides	
Cum % A	41.176	79.412	98.529	100	
<b>2 M 1982</b>	Heterochaeta costatus	Paranais litoralis	Hediste diversicolor	Enchytraeidae	Amphichaeta sannio
Cum % A	56.25	78.977	96.591	98.864	99.432
<b>2 M 1983</b>	Hediste diversicolor	Heterochaeta costatus	Paranais litoralis		
Cum % A	46.154	84.615	100		
<b>2 M 1984</b>	Heterochaeta costatus	Hediste diversicolor	Paranais litoralis	Enchytraeidae	
Cum % A	54.545	86.364	95.455	100	
<b>2 M 1985</b>	Heterochaeta costatus				
Cum % A	100				
<b>2 M 1986</b>	Heterochaeta costatus	Paranais litoralis	Hediste diversicolor		
Cum % A	72.222	94.444	100		
<b>2 M 1987</b>	Hediste diversicolor				
Cum % A	100				
<b>2 M 1988</b>	Heterochaeta costatus				
Cum % A	100				
<b>2 M 1989</b>	Hediste diversicolor	Heterochaeta costatus	Paranais litoralis		
Cum % A	33.333	66.667	100		
<b>2 M 1990</b>	Paranais litoralis	Heterochaeta costatus	Hediste diversicolor	Hydrobia ulvae	Tubificoides benedii
Cum % A	54.167	93.75	95.833	97.917	100
<b>2 M 1991</b>	Heterochaeta costatus	Corophium volutator	Hediste diversicolor		
Cum % A	62.5	95.833	100		
<b>2 M 1992</b>	Heterochaeta costatus				
Cum % A	100				
<b>2 M 1993</b>	Enchytraeidae				
Cum % A	100				
<b>2 M 1994</b>	Heterochaeta costatus	Tubificid spp. juv.	Hediste diversicolor	Tubificoides benedii	Enchytraeidae
Cum % A	41.667	75	83.333	91.667	95.833
<b>2 M 1995</b>	Enchytraeidae	Tubificoides benedii			

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Cum % A	50	100			
<b>2 M 1996</b>	Corophium volutator	OLIGOCHAETA	Enchytraeidae	Hediste diversicolor	
Cum % A	62.5	75	87.5	100	
<b>2 M 1997</b>	Heterochaeta costatus				
Cum % A	100				
<b>2 M 1998</b>	Paranais litoralis	Heterochaeta costatus			
Cum % A	80	100			
<b>3 M 1981</b>	Hediste diversicolor	Streblospio shrubsolii	Paranais litoralis	Heterochaeta costatus	Macoma balthica
Cum % A	35.862	58.966	82.069	97.931	98.966
<b>3 M 1982</b>	Streblospio shrubsolii	Hediste diversicolor	Heterochaeta costatus	Pygospio elegans	Manayunkia aestuarina
Cum % A	54.46	92.488	98.122	99.061	99.531
<b>3 M 1983</b>	Hediste diversicolor	Streblospio shrubsolii	Heterochaeta costatus	Pygospio elegans	Cyathura carinata
Cum % A	84.239	91.304	97.283	98.913	99.457
<b>3 M 1984</b>	Hediste diversicolor	Pygospio elegans	Macoma balthica	Streblospio shrubsolii	Eteone longa/flava
Cum % A	53.333	79.394	88.485	95.758	98.788
<b>3 M 1985</b>	Hediste diversicolor	Streblospio shrubsolii	Pygospio elegans	Heterochaeta costatus	Macoma balthica
Cum % A	60	90.909	94.545	98.182	100
<b>3 M 1986</b>	Nereis spp. juv.	Hediste diversicolor	Macoma balthica	Pygospio elegans	Streblospio shrubsolii
Cum % A	46.875	82.813	93.75	96.875	98.438
<b>3 M 1987</b>	Hediste diversicolor	Macoma balthica	Pygospio elegans	Streblospio shrubsolii	
Cum % A	78.571	87.143	94.286	100	
<b>3 M 1988</b>	Hediste diversicolor	Streblospio shrubsolii	Pygospio elegans	Heterochaeta costatus	
Cum % A	55	91.25	97.5	100	
<b>3 M 1989</b>	Hediste diversicolor	Pygospio elegans	Streblospio shrubsolii	Eteone longa/flava	Heterochaeta costatus
Cum % A	66.848	82.065	96.196	97.283	98.37
<b>3 M 1990</b>	Corophium volutator	Hediste diversicolor	Streblospio shrubsolii	Pygospio elegans	Macoma balthica
Cum % A	56.031	78.21	92.996	97.276	98.444
<b>3 M 1991</b>	Corophium volutator	Hediste diversicolor	Macoma balthica		
Cum % A	84.436	99.027	100		
<b>3 M 1992</b>	Corophium volutator	Hediste diversicolor	Streblospio shrubsolii	Macoma balthica	Tubificoides benedii
Cum % A	77.567	97.148	99.049	99.81	100
<b>3 M 1993</b>	Corophium volutator	Streblospio shrubsolii	Hediste diversicolor	Manayunkia aestuarina	Macoma balthica
Cum % A	68.227	84.281	94.649	95.987	97.324
<b>3 M 1994</b>	Corophium volutator	Streblospio shrubsolii	Hediste diversicolor	Pygospio elegans	Macoma balthica
Cum % A	46.31	81.934	93.13	95.929	97.201
<b>3 M 1995</b>	Corophium volutator	Streblospio shrubsolii	Hediste diversicolor	Manayunkia aestuarina	Pygospio elegans
Cum % A	51.382	75.806	95.161	96.544	97.926
<b>3 M 1996</b>	Corophium volutator	Hediste diversicolor	Pygospio elegans	Streblospio shrubsolii	Macoma balthica
Cum % A	79.716	87.786	94.111	99.019	99.564
<b>3 M 1997</b>	Corophium volutator	Streblospio shrubsolii	Pygospio elegans	Nereis spp. juv.	Manayunkia aestuarina
Cum % A	57.933	72.651	82.568	89.353	93.528
<b>3 M 1998</b>	Corophium volutator	Hediste diversicolor	Nereis spp. juv.	Streblospio shrubsolii	Enchytraeidae
Cum % A	88.066	95.166	98.187	98.943	99.547
<b>3 M 1999</b>	Corophium volutator	Streblospio shrubsolii	Hediste diversicolor	Nereis spp. juv.	Manayunkia aestuarina
Cum % A	47.452	71.353	81.722	91.037	95.958
<b>3 M 2000</b>	Corophium volutator	Streblospio shrubsolii	Hediste diversicolor	Nereis spp. juv.	Heterochaeta costatus
Cum % A	58.603	81.09	91.823	98.978	99.319
<b>3 M 2001</b>	Corophium volutator	Streblospio shrubsolii	Nereis spp. juv.	Hediste diversicolor	Heterochaeta costatus
Cum % A	40.351	76.555	88.198	98.086	99.043
<b>3 M 2002</b>	Streblospio shrubsolii	Corophium volutator	Hediste diversicolor	Nematoda	Heterochaeta costatus
Cum % A	58.949	81.518	98.249	98.833	99.416
<b>3 M 2003</b>	Streblospio shrubsolii	Corophium volutator	Hediste diversicolor	Heterochaeta costatus	Macoma balthica
Cum % A	44.842	81.684	96.421	97.895	98.737
<b>3 M 2004</b>	Corophium volutator	Streblospio shrubsolii	Hediste diversicolor	Nereis spp. juv.	Cyathura carinata
Cum % A	69.742	87.339	92.918	96.137	97.639
<b>4 M 1981</b>	Paranais litoralis	Hediste diversicolor	Manayunkia aestuarina	Amphichaeta sannio	Macoma balthica
Cum % A	46.823	68.896	80.268	87.291	91.639
<b>4 M 1982</b>	Hediste diversicolor	Manayunkia aestuarina	Streblospio shrubsolii	Macoma balthica	Eteone longa/flava
Cum % A	46.44	75.542	92.879	97.833	98.452
<b>4 M 1983</b>	Manayunkia aestuarina	Hediste diversicolor	Streblospio shrubsolii	Macoma balthica	Spionidae spp. Juv.
Cum % A	58.217	80.78	93.315	96.379	98.05
<b>4 M 1984</b>	Manayunkia aestuarina	Macoma balthica	Hediste diversicolor	Eteone longa/flava	Streblospio shrubsolii
Cum % A	40.559	55.594	68.881	81.818	91.259
<b>4 M 1985</b>	Paranais litoralis	Macoma balthica	Manayunkia aestuarina	Hediste diversicolor	Streblospio shrubsolii
Cum % A	79.851	88.806	92.537	95.522	97.761
<b>4 M 1986</b>	Paranais litoralis	Macoma balthica	Streblospio shrubsolii	Hediste diversicolor	Manayunkia aestuarina
Cum % A	89.86	96.503	97.552	98.601	99.301
<b>4 M 1987</b>	Paranais litoralis	Macoma balthica	Hediste diversicolor	Pygospio elegans	Streblospio shrubsolii
Cum % A	60.145	82.609	92.029	97.826	99.275
<b>4 M 1988</b>	Paranais litoralis	Macoma balthica	Hediste diversicolor	Streblospio shrubsolii	Pygospio elegans
Cum % A	82.566	89.803	93.092	95.066	96.711
<b>4 M 1989</b>	Corophium volutator	Hediste diversicolor	Manayunkia aestuarina	Macoma balthica	Streblospio shrubsolii
Cum % A	63.732	74.296	83.275	88.556	93.486
<b>4 M 1990</b>	Corophium volutator	Hediste diversicolor	Macoma balthica	Manayunkia aestuarina	Enchytraeidae
Cum % A	94.254	97.348	99.006	99.669	99.779
<b>4 M 1991</b>	Corophium volutator	Macoma balthica	Hediste diversicolor	Pygospio elegans	Alkmaria romijni
Cum % A	94.065	97.478	98.813	99.703	99.852
<b>4 M 1992</b>	Corophium volutator	Manayunkia aestuarina	Macoma balthica	Enchytraeidae	Streblospio shrubsolii

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Cum % A	91.235	93.725	95.418	96.813	98.108
<b>4 M 1993</b>	Corophium volutator	Enchytraeidae	Manayunkia aestuarina	Pygospio elegans	Hediste diversicolor
Cum % A	87.596	91.109	93.963	95.39	96.707
<b>4 M 1994</b>	Corophium volutator	Macoma balthica	Enchytraeidae	Hediste diversicolor	Nereis spp. juv.
Cum % A	81.713	87.963	91.898	95.833	97.917
<b>4 M 1995</b>	Corophium volutator	Enchytraeidae	Manayunkia aestuarina	Hediste diversicolor	Streblospio shrubsolii
Cum % A	90.968	96.129	97.677	99.097	99.484
<b>4 M 1996</b>	Corophium volutator	Macoma balthica	Enchytraeidae	Hediste diversicolor	Pygospio elegans
Cum % A	86.733	92.365	96.496	97.998	98.874
<b>4 M 1997</b>	Corophium volutator	Macoma balthica	Manayunkia aestuarina	Bivalve spp.	Enchytraeidae
Cum % A	89.438	92.675	94.549	96.422	97.615
<b>4 M 1998</b>	Corophium volutator	Nereis spp. juv.	Hediste diversicolor	Macoma balthica	Streblospio shrubsolii
Cum % A	92.346	94.763	97.08	98.288	99.295
<b>4 M 1999</b>	Corophium volutator	Streblospio shrubsolii	Manayunkia aestuarina	Nereis spp. juv.	Hediste diversicolor
Cum % A	46.134	70.275	89.863	94.416	98.11
<b>4 M 2000</b>	Corophium volutator	Hediste diversicolor	Streblospio shrubsolii	Nereis spp. juv.	Manayunkia aestuarina
Cum % A	55.703	72.944	84.085	94.164	96.552
<b>4 M 2001</b>	Corophium volutator	Streblospio shrubsolii	Hediste diversicolor	Nereis spp. juv.	Heterochaeta costatus
Cum % A	79.913	89.738	95.197	98.472	99.782
<b>4 M 2002</b>	Corophium volutator	Macoma balthica	Hediste diversicolor	Streblospio shrubsolii	Enchytraeidae
Cum % A	49.091	70.909	91.818	96.364	98.636
<b>4 M 2003</b>	Corophium volutator	Streblospio shrubsolii	Macoma balthica	Hediste diversicolor	Nematoda
Cum % A	62.899	77.971	88.116	97.391	98.841
<b>4 M 2004</b>	Corophium volutator	Streblospio shrubsolii	Hediste diversicolor	Macoma balthica	Enchytraeidae
Cum % A	69.89	81.492	88.122	94.751	96.685
<b>5 M 1981</b>	Streblospio shrubsolii	Hediste diversicolor	Pygospio elegans	Macoma balthica	Enchytraeidae
Cum % A	55.67	73.067	85.954	92.655	97.423
<b>5 M 1982</b>	Streblospio shrubsolii	Pygospio elegans	Hediste diversicolor	Macoma balthica	Eteone longa/flava
Cum % A	56.434	73.713	87.316	93.934	96.324
<b>5 M 1983</b>	Pygospio elegans	Hediste diversicolor	Streblospio shrubsolii	Paranais litoralis	Tubificoides benedii
Cum % A	28.274	54.678	76.091	86.694	93.139
<b>5 M 1984</b>	Macoma balthica	Pygospio elegans	Tubificoides benedii	Eteone longa/flava	Hediste diversicolor
Cum % A	34.908	65.617	84.514	93.963	97.375
<b>5 M 1985</b>	Tubificoides benedii	Macoma balthica	Pygospio elegans	Paranais litoralis	Hediste diversicolor
Cum % A	54.569	74.619	84.264	91.117	94.924
<b>5 M 1986</b>	Tubificoides benedii	Pygospio elegans	Macoma balthica	Hediste diversicolor	Paranais litoralis
Cum % A	50.197	68.807	78.768	87.811	95.413
<b>5 M 1987</b>	Macoma balthica	Pygospio elegans	Eteone longa/flava	Amphichaeta sannio	Capitella capitata
Cum % A	54.945	92.308	94.505	95.604	96.703
<b>5 M 1988</b>	Pygospio elegans	Macoma balthica	Paranais litoralis	Corophium volutator	Tubificoides benedii
Cum % A	33.824	58.824	77.941	85.294	91.176
<b>5 M 1989</b>	Macoma balthica	Tubificoides benedii	Eteone longa/flava	Pygospio elegans	Corophium volutator
Cum % A	57.838	76.216	89.189	94.054	98.378
<b>5 M 1990</b>	Corophium volutator	Macoma balthica	Tubificoides benedii	Pygospio elegans	Eteone longa/flava
Cum % A	95.687	97.915	99.209	99.641	99.784
<b>5 M 1991</b>	Corophium volutator	Macoma balthica	Pygospio elegans	Hediste diversicolor	Tubificoides benedii
Cum % A	86.902	93.971	98.545	99.168	99.792
<b>5 M 1992</b>	Corophium volutator	Macoma balthica	Tubificoides benedii	Pygospio elegans	Hediste diversicolor
Cum % A	87.702	96.764	98.382	99.029	99.568
<b>5 M 1993</b>	Corophium volutator	Macoma balthica	Tubificoides benedii	NEMERTEA	Pygospio elegans
Cum % A	91.889	95.731	97.118	98.079	98.933
<b>5 M 1994</b>	Corophium volutator	Macoma balthica	Pygospio elegans	Eteone longa/flava	Nereis spp. juv.
Cum % A	83.887	94.629	98.977	99.233	99.488
<b>5 M 1995</b>	Corophium volutator	Macoma balthica	Tubificoides benedii	Pygospio elegans	Streblospio shrubsolii
Cum % A	93.768	98.584	99.15	99.575	100
<b>5 M 1996</b>	Macoma balthica	Corophium volutator	Pygospio elegans	Eteone longa/flava	Nephtys hombergii
Cum % A	56.204	93.674	96.837	98.54	99.027
<b>5 M 1997</b>	Corophium volutator	Bivalve spp.	Macoma balthica	Nereis spp. juv.	Tubificoides benedii
Cum % A	90.67	95.401	96.978	97.898	98.817
<b>5 M 1998</b>	Corophium volutator	Macoma balthica	Hediste diversicolor	Streblospio shrubsolii	Pygospio elegans
Cum % A	92.053	98.013	98.675	99.338	99.868
<b>5 M 1999</b>	Corophium volutator	Bivalve spp.	Macoma balthica	Tubificoides benedii	Nereis spp. juv.
Cum % A	82.842	89.812	94.102	95.71	97.051
<b>5 M 2000</b>	Corophium volutator	Macoma balthica	Streblospio shrubsolii	Tubificoides benedii	Nereis spp. juv.
Cum % A	75.592	86.493	95.972	97.63	98.578
<b>5 M 2001</b>	Corophium volutator	Streblospio shrubsolii	Macoma balthica	Tubificoides benedii	Heterochaeta costatus
Cum % A	83.529	89.804	94.118	97.647	98.235
<b>5 M 2002</b>	Corophium volutator	Macoma balthica	Streblospio shrubsolii	Tubificoides benedii	Eteone longa/flava
Cum % A	66.532	85.081	96.774	98.387	98.992
<b>5 M 2003</b>	Corophium volutator	Macoma balthica	Streblospio shrubsolii	Nematoda	Tubificoides benedii
Cum % A	79.332	90.099	95.916	98.391	99.629
<b>5 M 2004</b>	Corophium volutator	Macoma balthica	Streblospio shrubsolii	Pygospio elegans	Tubificoides benedii
Cum % A	74.026	95.584	97.922	98.442	98.961
<b>6 M 1981</b>	Tubificoides benedii	Pygospio elegans	Paranais litoralis	Macoma balthica	Capitella spp.
Cum % A	30.847	60.678	75.763	88.051	98.898
<b>6 M 1982</b>	Tubificoides benedii	Paranais litoralis	Pygospio elegans	Hediste diversicolor	Macoma balthica
Cum % A	57.457	79.931	91.684	94.296	96.495
<b>6 M 1983</b>	Paranais litoralis	Tubificoides benedii	Pygospio elegans	Macoma balthica	Capitella spp.

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Cum % A	74.921	93.536	98.3	99.349	99.643
<b>6 M 1984</b>	Tubificoides benedii	Macoma balthica	Eteone longa/flava	Pygospio elegans	Capitella spp.
Cum % A	71.766	93.602	97.357	98.748	99.305
<b>6 M 1985</b>	Tubificoides benedii	Paranais litoralis	Pygospio elegans	Macoma balthica	Hediste diversicolor
Cum % A	69.172	88.453	95.752	97.495	98.366
<b>6 M 1986</b>	Tubificoides benedii	Paranais litoralis	Pygospio elegans	Macoma balthica	Capitella spp.
Cum % A	48.35	72.525	88.235	95.552	99.57
<b>6 M 1987</b>	Tubificoides benedii	Paranais litoralis	Pygospio elegans	Capitella capitata	Macoma balthica
Cum % A	65.65	80.598	95.119	97.315	99.329
<b>6 M 1988</b>	Tubificoides benedii	Macoma balthica	Paranais litoralis	Hediste diversicolor	Pygospio elegans
Cum % A	80.766	87.302	90.943	94.211	97.479
<b>6 M 1989</b>	Tubificoides benedii	Paranais litoralis	Pygospio elegans	Macoma balthica	Capitella capitata
Cum % A	47.255	85.442	90.851	95.943	98.011
<b>6 M 1990</b>	Tubificoides benedii	Corophium volutator	Pygospio elegans	Macoma balthica	Paranais litoralis
Cum % A	89.249	93.912	96.244	98.187	99.093
<b>6 M 1991</b>	Tubificoides benedii	Paranais litoralis	Corophium volutator	Pygospio elegans	Macoma balthica
Cum % A	43.46	73.924	89.344	97.284	99.331
<b>6 M 1992</b>	Tubificoides benedii	Corophium volutator	Pygospio elegans	Macoma balthica	Capitella capitata
Cum % A	45.473	85.35	93.539	97.572	98.765
<b>6 M 1993</b>	Tubificoides benedii	Paranais litoralis	Corophium volutator	Pygospio elegans	Capitella capitata
Cum % A	67.287	84.942	93.822	95.823	97.438
<b>6 M 1994</b>	Tubificoides benedii	Corophium volutator	Pygospio elegans	Hediste diversicolor	Macoma balthica
Cum % A	49.438	91.118	95.559	97.485	99.09
<b>6 M 1995</b>	Tubificoides benedii	Corophium volutator	Hediste diversicolor	Pygospio elegans	Macoma balthica
Cum % A	53.263	92.998	96.159	98.266	99.252
<b>6 M 1996</b>	Tubificoides benedii	Corophium volutator	Pygospio elegans	Macoma balthica	Eteone longa/flava
Cum % A	54.14	82.449	89.241	93.803	96.133
<b>6 M 1997</b>	Tubificoides benedii	Corophium volutator	Hediste diversicolor	Macoma balthica	Bivalve spp.
Cum % A	50.651	93.366	95.846	97.458	98.45
<b>6 M 1998</b>	Tubificoides benedii	Corophium volutator	Macoma balthica	Pygospio elegans	Hediste diversicolor
Cum % A	56.423	83.723	90.219	96.131	98.467
<b>6 M 1999</b>	Tubificoides benedii	Corophium volutator	Hediste diversicolor	Nereis spp. juv.	Heterochaeta costatus
Cum % A	64.769	90.706	95.605	98.127	98.775
<b>7 M 1981</b>	Tubificoides benedii	Paranais litoralis	Macoma balthica	Capitella spp.	Eteone longa/flava
Cum % A	49.868	75.49	96.983	98.359	99.153
<b>7 M 1982</b>	Tubificoides benedii	Paranais litoralis	Macoma balthica	Capitella spp.	Eteone longa/flava
Cum % A	69.405	85.307	92.126	97.954	99.628
<b>7 M 1983</b>	Tubificoides benedii	Macoma balthica	Pygospio elegans	Paranais litoralis	Capitella spp.
Cum % A	77.283	87.874	92.172	95.395	98.388
<b>7 M 1984</b>	Tubificoides benedii	Macoma balthica	Capitella spp.	Eteone longa/flava	Nephtys hombergii
Cum % A	56.602	82.792	95.779	99.242	99.675
<b>7 M 1985</b>	Tubificoides benedii	Macoma balthica	Paranais litoralis	Capitella spp.	Eteone longa/flava
Cum % A	41.541	77.538	87.97	95.771	97.932
<b>7 M 1986</b>	Paranais litoralis	Macoma balthica	Capitella spp.	Pygospio elegans	Tubificoides benedii
Cum % A	44.1	61.494	78.41	89.215	98.467
<b>7 M 1987</b>	Tubificoides benedii	Capitella capitata	Macoma balthica	Eteone longa/flava	Hediste diversicolor
Cum % A	63.959	80.711	94.924	97.843	98.731
<b>7 M 1988</b>	Tubificoides benedii	Macoma balthica	Pygospio elegans	Nephtys hombergii	Eteone longa/flava
Cum % A	85.733	92.362	97.937	98.771	99.298
<b>7 M 1989</b>	Tubificoides benedii	Macoma balthica	Pygospio elegans	Eteone longa/flava	Nephtys hombergii
Cum % A	62.971	82.286	92.8	96.686	98.629
<b>7 M 1990</b>	Tubificoides benedii	Macoma balthica	Nephtys spp. juv.	Pygospio elegans	Nephtys hombergii
Cum % A	34.356	67.689	82.209	95.706	98.773
<b>7 M 1991</b>	Macoma balthica	Tubificoides benedii	Pygospio elegans	Nephtys hombergii	Tharyx/Aphelocheata spp.
Cum % A	43.359	61.719	75.391	83.984	89.453
<b>7 M 1992</b>	Tubificoides benedii	Macoma balthica	Pygospio elegans	Nephtys hombergii	Nephtys spp. juv.
Cum % A	47.633	67.751	81.361	89.201	96.746
<b>7 M 1993</b>	Nephtys spp. juv.	Macoma balthica	Nephtys hombergii	Tubificoides benedii	Hydrobia ulvae
Cum % A	32.258	63.594	90.783	94.47	95.853
<b>7 M 1994</b>	Macoma balthica	Pygospio elegans	Nephtys hombergii	Tubificoides benedii	Tharyx/Aphelocheata spp.
Cum % A	81.558	88.052	91.948	95.844	98.182
<b>7 M 1995</b>	Macoma balthica	Tharyx/Aphelocheata spp.	Streblospio shrubsolii	Tubificoides benedii	Nephtys spp. juv.
Cum % A	54.494	68.539	77.809	85.955	91.573
<b>7 M 1996</b>	Macoma balthica	Pygospio elegans	Tubificoides benedii	Eteone longa/flava	Tharyx/Aphelocheata spp.
Cum % A	45.504	64.029	80.396	88.849	97.122
<b>7 M 1997</b>	Corophium volutator	Bivalve spp.	Tubificoides benedii	Tharyx/Aphelocheata spp.	Macoma balthica
Cum % A	24.545	43.636	61.591	78.068	90
<b>7 M 1998</b>	Tubificoides benedii	Corophium volutator	Macoma balthica	Tharyx/Aphelocheata spp.	Nephtys hombergii
Cum % A	33.868	66.987	94.444	97.436	98.397
<b>7 M 1999</b>	Corophium volutator	Tubificoides benedii	Bivalve spp.	Macoma balthica	Tharyx/Aphelocheata spp.
Cum % A	56.93	77.417	92.022	96.89	97.769
<b>7 M 2000</b>	Tubificoides benedii	Macoma balthica	Nematoda	Tharyx/Aphelocheata spp.	Corophium volutator
Cum % A	60.915	89.991	97.6	98.143	98.641
<b>7 M 2001</b>	Tubificoides benedii	Corophium volutator	Macoma balthica	Tharyx/Aphelocheata spp.	Nephtys hombergii
Cum % A	58.128	88.547	94.335	97.291	98.522
<b>7 M 2002</b>	Tubificoides benedii	Macoma balthica	Hydrobia ulvae	Corophium volutator	Nematoda
Cum % A	53.176	93.082	96.753	98.118	99.012
<b>7 M 2003</b>	Tubificoides benedii	Nematoda	Macoma balthica	Corophium volutator	Pygospio elegans

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Cum % A	63.916	78.405	92.302	95.223	96.447
<b>7 M 2004</b>	Tubificoides benedii	Macoma balthica	Streblospio shrubsolii	Tharyx/Aphelocheata spp.	Eteone longa/flava
Cum % A	51.353	94.148	95.83	97.293	98.317
<b>8 M 1981</b>	Tubificoides pseudogaster	Tubificoides swirencoides	Capitella spp.	Hediste diversicolor	Macoma balthica
Cum % A	26.977	43.785	55.65	65.395	73.446
<b>8 M 1982</b>	Capitella spp.	Hydrobia ulvae	Tharyx/Aphelocheata spp.	Macoma balthica	Tubificoides benedii
Cum % A	35.163	58.13	69.309	79.472	86.484
<b>8 M 1983</b>	Hydrobia ulvae	Tubificoides pseudogaster	Tharyx/Aphelocheata spp.	Tubificoides benedii	Macoma balthica
Cum % A	82.863	89.409	94.123	97.585	98.138
<b>8 M 1984</b>	Hydrobia ulvae	Tubificoides benedii	Macoma balthica	Tharyx/Aphelocheata spp.	Pygospio elegans
Cum % A	67.37	82.347	88.626	93.412	96.397
<b>8 M 1985</b>	Hydrobia ulvae	Macoma balthica	Tubificoides benedii	Tharyx/Aphelocheata spp.	Capitella spp.
Cum % A	34.151	50.549	66.688	75.791	84.442
<b>8 M 1986</b>	Hydrobia ulvae	Capitella spp.	Pygospio elegans	Macoma balthica	Tubificoides benedii
Cum % A	32.109	55.32	77.213	90.348	93.879
<b>8 M 1987</b>	Hydrobia ulvae	Tubificoides benedii	Hediste diversicolor	Pygospio elegans	Macoma balthica
Cum % A	29.448	50.613	69.018	78.221	85.89
<b>8 M 1988</b>	Hydrobia ulvae	Pygospio elegans	Macoma balthica	Tubificoides benedii	Nephtys hombergii
Cum % A	63.618	82.306	90.06	93.439	96.421
<b>8 M 1989</b>	Pygospio elegans	Nephtys hombergii	Hydrobia ulvae	Hediste diversicolor	Tharyx/Aphelocheata spp.
Cum % A	48.214	58.929	67.857	75.893	82.143
<b>8 M 1990</b>	Pygospio elegans	Hydrobia ulvae	Tharyx/Aphelocheata spp.	Scoloplos armiger	Nephtys hombergii
Cum % A	38.462	64.957	77.778	85.47	91.453
<b>8 M 1991</b>	Hydrobia ulvae	Tharyx/Aphelocheata spp.	Pygospio elegans	Eteone longa/flava	Scoloplos armiger
Cum % A	62.653	79.592	94.49	96.327	97.143
<b>8 M 1992</b>	Hydrobia ulvae	Cerastoderma spp. juv.	Pygospio elegans	Eteone longa/flava	Tharyx/Aphelocheata spp.
Cum % A	71.933	85.773	96.774	97.463	98.098
<b>8 M 1993</b>	Hydrobia ulvae	Pygospio elegans	Tharyx/Aphelocheata spp.	Nephtys spp. juv.	Nephtys hombergii
Cum % A	64.61	74.026	81.169	87.662	92.857
<b>8 M 1994</b>	Pygospio elegans	Hydrobia ulvae	Tharyx/Aphelocheata spp.	Eteone longa/flava	Macoma balthica
Cum % A	50.847	67.797	84.181	87.853	91.243
<b>8 M 1995</b>	Pygospio elegans	Tharyx/Aphelocheata spp.	Eteone longa/flava	Hydrobia ulvae	Macoma balthica
Cum % A	61.611	82.464	88.152	93.365	94.787
<b>8 M 1996</b>	Pygospio elegans	Tharyx/Aphelocheata spp.	Eteone longa/flava	Macoma balthica	Corophium volutator
Cum % A	55.058	79.934	91.542	94.196	96.02
<b>8 M 1997</b>	Hydrobia ulvae	Spionidae spp. Juv.	Pygospio elegans	Tharyx/Aphelocheata spp.	Eteone longa/flava
Cum % A	51.908	65.649	79.389	90.076	95.42
<b>8 M 1998</b>	Pygospio elegans	Hydrobia ulvae	Tharyx/Aphelocheata spp.	Bivalve spp.	Corophium volutator
Cum % A	39.799	77.258	87.514	92.754	94.872
<b>8 M 1999</b>	Pygospio elegans	Tharyx/Aphelocheata spp.	Hydrobia ulvae	Eteone longa/flava	Nephtys hombergii
Cum % A	58.36	78.549	91.483	94.322	96.215
<b>8 M 2000</b>	Tharyx/Aphelocheata spp.	Pygospio elegans	Macoma balthica	Nephtys hombergii	Hydrobia ulvae
Cum % A	46.847	76.577	83.784	89.189	92.793
<b>8 M 2001</b>	Hydrobia ulvae	Pygospio elegans	Tharyx/Aphelocheata spp.	Bathyporeia spp.	Scoloplos armiger
Cum % A	34.375	59.375	80.208	85.417	89.583
<b>8 M 2002</b>	Hydrobia ulvae	Macoma balthica	Tharyx/Aphelocheata spp.	Nephtys hombergii	Scoloplos armiger
Cum % A	50.279	81.844	89.385	92.737	94.693
<b>8 M 2003</b>	Macoma balthica	Hydrobia ulvae	Tharyx/Aphelocheata spp.	Nephtys hombergii	Pygospio elegans
Cum % A	36.434	67.442	75.969	82.946	88.372
<b>8 M 2004</b>	Hydrobia ulvae	Macoma balthica	Tharyx/Aphelocheata spp.	Nematoda	Streblospio shrubsolii
Cum % A	48.592	76.153	83.104	89.155	94.787
<b>9 M 1981</b>	Paraonis fulgens	Spio martinensis	Tanaidacea	NEMERTEA	Bathyporeia spp.
Cum % A	75.224	85.075	87.761	90.149	92.537
<b>9 M 1982</b>	Paraonis fulgens	Tanaidacea	Spio martinensis	Bathyporeia spp.	NEMERTEA
Cum % A	80.541	87.027	90.811	94.054	96.216
<b>9 M 1983</b>	Paraonis fulgens	Tanaidacea	Nephtys cirrosa	NEMERTEA	Bathyporeia spp.
Cum % A	44.737	65.789	72.807	79.825	85.965
<b>9 M 1984</b>	Paraonis fulgens	Tanaidacea	NEMERTEA	Bathyporeia spp.	Eteone longa/flava
Cum % A	33.766	48.052	58.442	68.831	77.922
<b>9 M 1985</b>	Paraonis fulgens	Hydrobia ulvae	Bathyporeia spp.	Spio spp.	Tanaidacea
Cum % A	53.913	62.609	70.435	76.522	82.609
<b>9 M 1986</b>	Paraonis fulgens	Pygospio elegans	Bathyporeia spp.	Tanaidacea	NEMERTEA
Cum % A	35.455	52.727	66.364	77.273	83.636
<b>9 M 1987</b>	Paraonis fulgens	Tanaidacea	Nephtys cirrosa	Bathyporeia spp.	Urothoe spp.
Cum % A	83.495	87.379	90.938	94.498	96.764
<b>9 M 1988</b>	Paraonis fulgens	Pygospio elegans	Nephtys cirrosa	Tanaidacea	Bathyporeia spp.
Cum % A	48.295	67.045	75	81.818	86.932
<b>9 M 1989</b>	Paraonis fulgens	Bathyporeia spp.	Spio martinensis	Nephtys cirrosa	NEMERTEA
Cum % A	54.286	71.429	80	85.714	91.429
<b>9 M 1990</b>	Spio martinensis	Paraonis fulgens	Nephtys cirrosa	Urothoe brevicornis	Bathyporeia spp.
Cum % A	30.233	51.163	69.767	83.721	93.023
<b>9 M 1991</b>	Urothoe spp.	Bathyporeia spp.	Haustorius spp.	Cerastoderma spp. juv.	Ensis spp.
Cum % A	50	81.25	85.417	89.583	91.667
<b>9 M 1992</b>	Urothoe spp.	Nephtys cirrosa	Cerastoderma spp. juv.	Scolecipis sp	Cumacea
Cum % A	46.939	61.224	73.469	81.633	89.796
<b>9 M 1993</b>	Nephtys cirrosa	Cumacea	Spio martinensis	Urothoe spp.	Cerastoderma spp. juv.
Cum % A	26.087	43.478	56.522	69.565	78.261
<b>9 M 1994</b>	Pygospio elegans	Spio martinensis	Bathyporeia spp.	NEMERTEA	Urothoe spp.

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Cum % A	71.132	80.37	89.146	92.379	94.457
<b>9 M 1995</b>	Bathyporeia spp.	Urothoe spp.	Nephtys cirrosa	Paraonis fulgens	NEMERTEA
Cum % A	24.444	48.889	64.444	80	86.667
<b>9 M 1996</b>	Paraonis fulgens	Urothoe spp.	Nephtys cirrosa	Tanaidacea	Spiophanes bombyx
Cum % A	42.553	65.957	78.723	85.106	89.362
<b>9 M 1997</b>	Urothoe spp.	Bathyporeia spp.	NEMERTEA	Spio spp.	Spionidae spp. Juv.
Cum % A	30	55.455	72.727	79.091	83.182
<b>9 M 1998</b>	Urothoe spp.	Amphipoda spp. Juv.	Paraonis fulgens	Bathyporeia spp.	Nephtys cirrosa
Cum % A	39.326	62.921	86.517	91.011	93.258
<b>9 M 1999</b>	Spio martinensis	Bathyporeia spp.	Cumacea	Pygospio elegans	Nephtys cirrosa
Cum % A	35.185	53.704	62.037	70.37	76.852
<b>9 M 2000</b>	Pygospio elegans	Cumacea	Spio martinensis	Bathyporeia spp.	Nephtys cirrosa
Cum % A	49.367	65.823	82.278	88.608	91.139
<b>9 M 2001</b>	Ensis spp.	Pygospio elegans	NEMERTEA	Eteone longa/flava	Paraonis fulgens
Cum % A	31.667	55.556	74.167	79.444	84.444
<b>9 M 2002</b>	Nephtys hombergii	Cumacea	Glycera tridactyla	Cerastoderma edule	Bathyporeia spp.
Cum % A	35.088	50.877	59.649	66.667	73.684
<b>9 M 2003</b>	Nematoda	Harpacticoida	Spio martinensis	Bathyporeia spp.	Tanaidacea
Cum % A	41.401	81.462	86.509	90.01	91.967
<b>9 M 2004</b>	Harpacticoida	Hydrobia ulvae	Cerastoderma edule	Paraonis fulgens	NEMERTEA
Cum % A	43.695	56.891	69.208	77.713	83.284
<b>10 M 1981</b>	Eurydice pulchra	Haustorius spp.	Paraonis fulgens	Scolecipis squamata	NEMERTEA
Cum % A	62	78	88	92	96
<b>10 M 1982</b>	Paraonis fulgens	Urothoe spp.	Spio martinensis	Bathyporeia spp.	NEMERTEA
Cum % A	37.879	60.606	77.273	84.848	89.394
<b>10 M 1983</b>	Urothoe spp.	Bathyporeia spp.	Paraonis fulgens	Nephtys cirrosa	Cumacea
Cum % A	33.333	59.259	79.012	85.185	90.123
<b>10 M 1984</b>	Urothoe spp.	Paraonis fulgens	NEMERTEA	Nephtys cirrosa	Haustorius spp.
Cum % A	70.213	86.17	92.553	95.745	97.872
<b>10 M 1985</b>	Urothoe spp.	Nephtys cirrosa	Paraonis fulgens	Pygospio elegans	Bathyporeia spp.
Cum % A	28.333	43.333	58.333	73.333	86.667
<b>10 M 1986</b>	Bathyporeia spp.	Urothoe spp.	Cerastoderma spp. juv.	Paraonis fulgens	Hydrobia ulvae
Cum % A	20.408	35.714	50	64.286	77.551
<b>10 M 1987</b>	Paraonis fulgens	NEMERTEA	Nephtys cirrosa	Bathyporeia spp.	Urothoe spp.
Cum % A	47.5	67.5	80	85	90
<b>10 M 1988</b>	Urothoe spp.	Paraonis fulgens	Bathyporeia spp.	Spio spp.	Haustorius spp.
Cum % A	39.604	63.366	82.178	89.109	93.069
<b>10 M 1989</b>	Paraonis fulgens	NEMERTEA	Urothoe spp.	Haustorius spp.	Eurydice pulchra
Cum % A	22.951	44.262	63.934	81.967	86.885
<b>10 M 1990</b>	Urothoe brevicornis	NEMERTEA	Cumacea	Spio martinensis	Nephtys cirrosa
Cum % A	30	52.5	65	75	85
<b>10 M 1991</b>	Urothoe spp.	Bathyporeia spp.	Haustorius spp.	Paraonis fulgens	Bivalve spp.
Cum % A	62.745	88.235	91.176	94.118	95.098
<b>10 M 1992</b>	Urothoe spp.	Haustorius spp.	Eurydice pulchra	Bathyporeia spp.	Cerastoderma spp. juv.
Cum % A	52	66	72	78	84
<b>10 M 1993</b>	Urothoe spp.	Paraonis fulgens	Bathyporeia spp.	Nephtys cirrosa	Pontocrates/Periculoides spp.
Cum % A	48.718	66.667	82.051	89.744	92.308
<b>10 M 1994</b>	Urothoe spp.	NEMERTEA	Pygospio elegans	Bathyporeia spp.	Paraonis fulgens
Cum % A	30.928	45.361	59.794	68.041	76.289
<b>10 M 1995</b>	Urothoe spp.	Paraonis fulgens	Bathyporeia spp.	NEMERTEA	Nephtys cirrosa
Cum % A	56.725	77.778	86.55	90.058	92.982
<b>10 M 1996</b>	Paraonis fulgens	Urothoe spp.	NEMERTEA	Scolecipis squamata	Eurydice pulchra
Cum % A	22.472	43.82	61.798	70.787	78.652
<b>10 M 1997</b>	Eurydice pulchra	NEMERTEA	Bathyporeia spp.	Haustorius spp.	Urothoe spp.
Cum % A	61.538	75.148	84.024	91.124	94.675
<b>10 M 1998</b>	Urothoe spp.	NEMERTEA	Scolecipis squamata	Paraonis fulgens	Haustorius spp.
Cum % A	29.897	57.732	74.227	83.505	89.691
<b>10 M 1999</b>	Urothoe spp.	Bathyporeia spp.	Paraonis fulgens	Nephtys cirrosa	Spio spp.
Cum % A	32.432	54.054	71.622	78.378	83.784
<b>10 M 2000</b>	Spio spp.	Paraonis fulgens	Urothoe spp.	Bathyporeia spp.	Hydrobia ulvae
Cum % A	32.919	61.491	72.05	80.124	83.23
<b>10 M 2001</b>	Haustorius spp.	Urothoe spp.	NEMERTEA	Bathyporeia spp.	Eurydice pulchra
Cum % A	30.303	48.485	63.636	75.758	83.333
<b>10 M 2002</b>	NEMERTEA	Spio martinensis	Urothoe spp.	Cumacea	Nephtys cirrosa
Cum % A	30.27	48.108	60.541	67.027	73.514
<b>10 M 2003</b>	NEMERTEA	Harpacticoida	Spio martinensis	Urothoe spp.	Paraonis fulgens
Cum % A	23.664	47.328	65.267	80.534	85.496
<b>10 M 2004</b>	Paraonis fulgens	Harpacticoida	NEMERTEA	Urothoe brevicornis	Bathyporeia pelagica
Cum % A	25.294	42.941	57.059	67.647	77.059
<b>2A M 1994</b>	Hediste diversicolor	Nereis spp. juv.	Corophium volutator		
Cum % A	89.583	97.917	100		
<b>2A M 1995</b>	Corophium volutator	Hediste diversicolor			
Cum % A	61.538	100			
<b>2A M 1996</b>	Hediste diversicolor	Corophium volutator	Spiophanes bombyx		
Cum % A	76.923	97.436	100		
<b>2A M 1997</b>	Hediste diversicolor	Streblospio shrubsolii	Corophium volutator		
Cum % A	60	80	100		
<b>2A M 1998</b>	Hediste diversicolor	Corophium volutator			



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Cum % A	66.667	100			
<b>2A M 1999</b>	Hediste diversicolor	Corophium volutator	Nereis spp. juv.		
Cum % A	50	91.667	100		
<b>2A M 2000</b>	Paranais litoralis	Corophium volutator			
Cum % A	80	100			
<b>2A M 2001</b>	Corophium volutator				
Cum % A	100				
<b>2A M 2002</b>	Corophium volutator	Hediste diversicolor			
Cum % A	57.895	100			

Top Five Dominant taxa at Humber subtidal sites.

Site/Year	Taxa 1	Taxa 2	Taxa 3	Taxa 4	Taxa 5
1 S 1979	Neomysis integer	Gammarus spp.			
Cum % A	96.97	100			
1 S 1980	Neomysis integer	Crangon crangon	Gammarus spp.		
Cum % A	94.737	97 368	100		
1 S 1981	Limnodrilus hoffmeisteri	Tubifex tubifex	Paranais litoralis		
Cum % A	50	83 333	100		
1 S 1982	Gammarus spp.	Nereis diversicolor	Neomysis integer	Achelia echinata	Aora gracilis
Cum % A	66.667	83 333	100	100	100
1 S 1983	Neomysis integer	Polydora spp.	Gammarus spp.	Proceraea cornuta	Manayunkia aestuarina
Cum % A	55	85	93 333	96 667	98.333
1 S 1984	Neomysis integer	Nereis diversicolor	Achelia echinata	Aora gracilis	Atylus vedlomensis
Cum % A	97.297	100	100	100	100
1 S 1985	Gammarus spp.	Neomysis integer	Enchytraeidae spp.	Polydora spp.	Achelia echinata
Cum % A	63.158	89.474	94.737	100	100
1 S 1986	Neomysis integer	Gammarus spp.			
Cum % A	85.714	100			
1 S 1987	Neomysis integer	Gammarus spp.	Nereis diversicolor	Achelia echinata	Aora gracilis
Cum % A	75.676	97 297	100	100	100
1 S 1988	Gammarus spp.	Neomysis integer			
Cum % A	53.333	100			
1 S 1989	Neomysis integer	Gammarus spp.			
Cum % A	96.429	100			
1 S 1990	Neomysis integer				
Cum % A	100				
1 S 1991	Neomysis integer				
Cum % A	100				
1 S 1992	Neomysis integer	Gammarus spp.	Ampharete balthica	Amphipoda sp. indet.	Anatides groenlandica
Cum % A	62.5	100	100	100	100
1 S 1993	Neomysis integer	Tubificoides pseudogaster	Mytilidae sp. (juv)		
Cum % A	85	95	100		
1 S 1994	Melita pellucida	Tubificoides benedii	Neomysis integer		
Cum % A	33.333	66 667	100		
1 S 1995	Neomysis integer				
Cum % A	100				
1 S 1996	Neomysis integer	Crangon crangon	Gammarus salinus		
Cum % A	66.667	83 333	100		
1 S 1997	Gammarus salinus	Neomysis integer	Streblospio shrubsolii	Aphelochaeta/Tharyx	Marenzelleria viridis
Cum % A	41.379	62 069	72.414	82.759	86.207
1 S 1998	Gammarus salinus	Neomysis integer			
Cum % A	75	100			
1 S 1999	Neomysis integer	Hediste diversicolor	Gammarus salinus	Corophium volutator	
Cum % A	36.364	63 636	90 909	100	
1 S 2000	Neomysis integer	Gammarus salinus			
Cum % A	55.556	100			
1 S 2001	Gammarus salinus	Neomysis integer			
Cum % A	82.5	100			
1 S 2002	Gammarus salinus	Aphelochaeta/Tharyx	Neomysis integer		
Cum % A	66.667	83 333	100		
1 S 2003	Neomysis integer	Gammarus salinus			
Cum % A	57.143	100			
1 S 2004	Gammarus salinus	Neomysis integer	Crangon crangon		
Cum % A	42.857	85.714	100		
2 S 1979	Capitella capitata	Neomysis integer	Manayunkia aestuarina		
Cum % A	63.855	98.795	100		
2 S 1980	Capitella capitata	Haustorius arenarius	Neomysis integer	Gammarus spp.	Nereis diversicolor
Cum % A	62.857	80	88 571	94 286	97.143
2 S 1981	Capitella capitata	Neomysis integer			
Cum % A	62.5	100			
2 S 1982	Capitella capitata	Gammarus spp.	Neomysis integer	Crangon crangon	
Cum % A	36.842	63.158	89.474	100	
2 S 1983	Polydora spp.	Gammarus spp.	Neomysis integer	Capitella capitata	Nereis diversicolor
Cum % A	30	50	70	90	100
2 S 1984	Neomysis integer	Crangon crangon	Capitella capitata	Achelia echinata	Aora gracilis
Cum % A	78.571	92 857	100	100	100
2 S 1985	Neomysis integer	Polydora spp.	Gammarus spp.	Capitella capitata	
Cum % A	38.462	69 231	84 615	100	
2 S 1986	Gammarus spp.	Neomysis integer	Capitella capitata	Aricidea minuta	Pygospio elegans
Cum % A	37.5	75	87 5	91 667	95.833
2 S 1987	Neomysis integer	Gammarus spp.	Marenzelleria sp.	Capitella capitata	Polydora spp.
Cum % A	44.444	74 074	88 889	96 296	100
2 S 1988	Capitella capitata	Gammarus spp.	Neomysis integer	Nereis diversicolor	Halacaridae spp.
Cum % A	40	65	80	85	90
2 S 1989	Capitella capitata	Neomysis integer	Marenzelleria viridis	Nereis sp. (juv)	Eteone spp.
Cum % A	49.02	90.196	92.157	94.118	96.078
2 S 1990	Capitella capitata	Neomysis integer	Polydora spp.	Gammarus spp.	

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Cum % A	80.645	95.161	98 387	100	
<b>2 S 1991</b>	Capitella capitata	Mysidacea sp. indet.	Tubificoides benedii	Macoma balthica	Eteone spp.
Cum % A	97.885	98.187	98.489	98.792	99.094
<b>2 S 1992</b>	Capitella capitata	Nephtys spp. (juv)	Streblospio shrubsolii	Halacaridae spp.	
Cum % A	97.45	98 584	99.717	100	
<b>2 S 1993</b>	Capitella capitata	Neomysis integer	Gammarus spp.	Pygospio elegans	Polydora spp.
Cum % A	61.667	81 667	86 667	91 667	96.667
<b>2 S 1994</b>	Capitella capitata	Gammarus spp.	Neomysis integer	Enchytraeidae spp.	Arenicola marina
Cum % A	55.882	70 588	79.412	85 294	91.176
<b>2 S 1995</b>	Capitella capitata	Neomysis integer	Haustorius arenarius		
Cum % A	84.091	93.182	100		
<b>2 S 1996</b>	Capitella capitata	Haustorius arenarius	Neomysis integer	DECAPODA sp. (larva)	Crangon crangon
Cum % A	86.207	91 954	94 253	95.402	96.552
<b>2 S 1997</b>	Capitella capitata	Gammarus salinus	Neomysis integer	Crangon crangon	Aphelocheata/Tharyx
Cum % A	89.45	95.413	96.789	97.706	98.624
<b>2 S 1998</b>	Gammarus salinus	Jaera albifrons	Crangon crangon		
Cum % A	86.667	93 333	100		
<b>2 S 1999</b>	Gammarus salinus	Neomysis integer	Arenicola marina		
Cum % A	68.421	94.737	100		
<b>2 S 2000</b>	Neomysis integer	Gammarus salinus	Tubificoides swir/amp		
Cum % A	53.333	93 333	100		
<b>2 S 2001</b>	Neomysis integer	Capitella capitata	Tubificoides pseudogaster		
Cum % A	78.571	92 857	100		
<b>2 S 2002</b>	Capitella capitata	Neomysis integer			
Cum % A	50	100			
<b>2 S 2003</b>	Haustorius arenarius	Gammarus salinus	Neomysis integer	Gastrosaccus spinifer	
Cum % A	50	70	90	100	
<b>2 S 2004</b>	Gammarus salinus	Haustorius arenarius	Neomysis integer	Capitella capitata	Macoma balthica
Cum % A	40	65	80	90	95
<b>3 S 1979</b>	Capitella capitata	Neomysis integer	Haustorius arenarius	Crangon crangon	Pygospio elegans
Cum % A	45.833	75	91 667	95 833	100
<b>3 S 1980</b>	Capitella capitata	Neomysis integer	Gammarus spp.	Macoma balthica	Eteone spp.
Cum % A	86.709	96 835	98.101	98.734	99.367
<b>3 S 1981</b>	Neomysis integer	Haustorius arenarius	Capitella capitata		
Cum % A	72.727	90 909	100		
<b>3 S 1982</b>	Capitella capitata	Arenicola marina	Neomysis integer	Gammarus spp.	Eteone spp.
Cum % A	85.932	91 635	93 916	95 817	96.958
<b>3 S 1983</b>	Capitella capitata	Haustorius arenarius	Neomysis integer	Eteone spp.	Streblospio shrubsolii
Cum % A	76	80	84	88	92
<b>3 S 1984</b>	Capitella capitata	Nereis diversicolor	Eteone spp.		
Cum % A	88.889	94.444	100		
<b>3 S 1985</b>	Capitella capitata	Stenothoe monoculoides	Aphelocheata/Tharyx		
Cum % A	50	75	100		
<b>3 S 1986</b>	Capitella capitata	Capitella sp. (juv)	Tubificoides benedii	Schistomysis kervillei	Gammarus spp.
Cum % A	76.471	82 353	88 235	91.176	94.118
<b>3 S 1987</b>	Capitella capitata	Achelia echinata	Aora gracilis	Atylus vedlomensis	Bodotria pulchella
Cum % A	100	100	100	100	100
<b>3 S 1988</b>	Neomysis integer	Gammarus spp.			
Cum % A	80	100			
<b>3 S 1989</b>	Neomysis integer	Capitella capitata	Marenzelleria viridis	Eteone spp.	Nephtys cirrosa
Cum % A	40.909	77 273	86 364	90 909	95.455
<b>3 S 1990</b>	Capitella capitata	Gammarus spp.	Neomysis integer	Autolytus sp. indet.	Tubificoides benedii
Cum % A	92.381	95 238	97.143	98 095	99.048
<b>3 S 1991</b>	Capitella capitata	Gammarus spp.	Nephtys spp. (juv)		
Cum % A	92	98 667	100		
<b>3 S 1992</b>	Capitella capitata	Polydora spp.			
Cum % A	69.697	100			
<b>3 S 1993</b>	Capitella capitata	Gammarus spp.	Eteone spp.	Mytilidae sp. (juv)	
Cum % A	76.923	84 615	92 308	100	
<b>3 S 1994</b>	Streblospio shrubsolii	Haustorius arenarius	Crangon crangon	Neomysis integer	Capitella capitata
Cum % A	25	37 5	50	62 5	75
<b>3 S 1995</b>	Capitella capitata	Tubificoides swir/amp	Haustorius arenarius	Spio martinensis	Corophium volutator
Cum % A	42.857	76.19	90.476	95 238	100
<b>3 S 1996</b>	Aphelocheata/Tharyx	Capitella capitata	Haustorius arenarius	Tubificoides swir/amp	Crangon crangon
Cum % A	47.826	65 217	78 261	86 957	91.304
<b>3 S 1997</b>	Capitella capitata	Gammarus salinus	Haustorius arenarius	Neomysis integer	Crangon crangon
Cum % A	51.02	73.469	85.714	93 878	95.918
<b>3 S 1998</b>	Capitella capitata	Haustorius arenarius	Neomysis integer	Gammarus salinus	Polydora spp.
Cum % A	35.294	64.706	82 353	94.118	100
<b>3 S 1999</b>	Gammarus salinus	Mytilidae sp. (juv)	Mysidacea sp. indet.	Polydora spp.	
Cum % A	42.857	71.429	85.714	100	
<b>3 S 2000</b>	Capitella sp. (juv)	Corophium volutator	Neomysis integer		
Cum % A	33.333	66 667	100		
<b>3 S 2001</b>	Gammarus salinus	Eurydice pulchra	Neomysis integer		
Cum % A	90.476	95 238	100		
<b>3 S 2002</b>	Gammarus salinus	Haustorius arenarius	Eteone spp.	Nephtys cirrosa	Paranais litoralis
Cum % A	63.158	84 211	89.474	94.737	100
<b>3 S 2003</b>	Gammarus salinus	Eurydice pulchra	Haustorius arenarius	Crangon crangon	

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Cum % A	44.444	66 667	88 889	100	
<b>3 S 2004</b>	Neomysis integer				
Cum % A	100				
<b>4 S 1986</b>	Capitella sp. (juv)	Capitella capitata	Nephtys spp. (juv)	Nephtys caeca	Gammarus spp.
Cum % A	56.944	96.759	97 685	98.148	98.611
<b>4 S 1987</b>	Neomysis integer	Capitella capitata	Achelia echinata	Aora gracilis	Atylus vedlomensis
Cum % A	63.636	100	100	100	100
<b>4 S 1988</b>	Capitella capitata	Gammarus spp.	Aphelochaeta/Tharyx		
Cum % A	89.474	98 684	100		
<b>4 S 1989</b>	Polydora spp.	Capitella capitata	Gammarus spp.	Nephtys cirrosa	Neomysis integer
Cum % A	42.105	57 895	68.421	78 947	84.211
<b>4 S 1990</b>	Capitella capitata	Anoplodactylus pygmaeus	Nephtys spp. (juv)	Neomysis integer	Proceraea cornuta
Cum % A	79.63	85.185	88 889	90.741	92.593
<b>4 S 1991</b>	Capitella capitata	Mysidacea sp. indet.	Gammarus spp.	Neomysis integer	Polydora spp.
Cum % A	88.889	92 063	95 238	98.413	100
<b>4 S 1992</b>	Capitella capitata	Arenicola marina	Tubificoides benedii	Nephtys spp. (juv)	Spio martinensis
Cum % A	91.69	97 23	97.784	98 338	98.892
<b>4 S 1993</b>	Capitella capitata	Caprella linearis	Neomysis integer	Polydora spp.	
Cum % A	62.5	75	87 5	100	
<b>4 S 1994</b>	Capitella capitata	Neomysis integer			
Cum % A	98.649	100			
<b>4 S 1995</b>	Spio martinensis	Capitella capitata	Eurydice pulchra	Haustorius arenarius	
Cum % A	50	86 364	95.455	100	
<b>4 S 1996</b>	Eteone spp.	Aphelochaeta/Tharyx	Eurydice pulchra	Mytilidae sp. (juv)	Capitella capitata
Cum % A	21.429	42 857	57.143	71.429	85.714
<b>4 S 1997</b>	Capitella capitata	Neomysis integer	Anoplodactylus pygmaeus	Gammarus salinus	Haustorius arenarius
Cum % A	36.364	54 545	68.182	81 818	86.364
<b>4 S 1998</b>	Capitella capitata	Corophium volutator	Tubificoides benedii	Gammarus salinus	Neomysis integer
Cum % A	81.25	87 5	90 625	93.75	96.875
<b>4 S 1999</b>	Capitella capitata	Gammarus salinus	Haustorius arenarius	Anoplodactylus pygmaeus	Neomysis integer
Cum % A	76	84	88	92	96
<b>4 S 2000</b>	Capitella sp. (juv)	Neomysis integer	Gastrosaccus spinifer		
Cum % A	73.333	93 333	100		
<b>4 S 2001</b>	Gammarus salinus	Amphipoda sp. indet.	Aphelochaeta/Tharyx	Corophium insidiosum	Neomysis integer
Cum % A	33.333	50	66 667	83 333	100
<b>4 S 2002</b>	Capitella capitata	Haustorius arenarius	Eurydice pulchra	Spio martinensis	
Cum % A	50	80	90	100	
<b>4 S 2003</b>	Haustorius arenarius	Gammarus salinus	Hediste diversicolor	Neomysis integer	
Cum % A	50	75	87 5	100	
<b>4 S 2004</b>	Capitella capitata	Neomysis integer			
Cum % A	66.667	100			
<b>5 S 1979</b>	Capitella capitata	Haustorius arenarius	Pholoe spp.	Proceraea cornuta	Tubificoides benedii
Cum % A	77.778	85.185	88 889	92 593	96.296
<b>5 S 1980</b>	Capitella capitata	Polydora spp.	Gastrosaccus spinifer	Haustorius arenarius	Arenicola marina
Cum % A	40.909	72.727	81 818	90 909	100
<b>5 S 1981</b>	Capitella sp. (juv)	Arenicola marina	Sipuncula spp.	Gammarus spp.	Macoma balthica
Cum % A	90.323	92.473	93 548	94 624	95.699
<b>5 S 1982</b>	Capitella capitata	Macoma balthica	Tubificoides benedii	Aphelochaeta/Tharyx	Eteone spp.
Cum % A	87.919	91 946	94 631	97 315	98.658
<b>5 S 1983</b>	Capitella capitata	Capitella sp. (juv)	Polydora spp.	Anoplodactylus pygmaeus	Mytilidae sp. (juv)
Cum % A	48.98	67 347	75 51	81 633	85.714
<b>5 S 1984</b>	Arenicola marina	Capitella capitata	Capitella sp. (juv)	Macoma balthica	Eteone spp.
Cum % A	39.13	71.739	83 696	88 043	92.391
<b>5 S 1985</b>	Capitella capitata	Capitella sp. (juv)	Tubificoides benedii	Nephtys hombergii	Macoma balthica
Cum % A	29.333	53 333	76	84	90.667
<b>5 S 1986</b>	Capitella capitata	Tubificoides benedii	Arenicola marina	Nephtys hombergii	Macoma balthica
Cum % A	66.019	81 553	88 35	93 204	95.146
<b>5 S 1987</b>	Arenicola marina	Capitella capitata	Neomysis integer		
Cum % A	55.556	88 889	100		
<b>5 S 1988</b>	Capitella capitata	Tubificoides benedii	Mytilidae sp. (juv)	Macoma balthica	Eteone spp.
Cum % A	40	66 667	73 333	80	86.667
<b>5 S 1989</b>	Polydora spp.	Capitella capitata	Pygospio elegans	Nereis diversicolor	Gammarus spp.
Cum % A	30.769	46.154	61 538	69 231	76.923
<b>5 S 1990</b>	Capitella capitata	Anoplodactylus pygmaeus	Nephtys cirrosa	Macoma balthica	Eteone spp.
Cum % A	70.968	80 645	87 097	90 323	93.548
<b>5 S 1991</b>	Capitella capitata	Gammarus spp.	Neomysis integer	Nereis diversicolor	Mysidacea sp. indet.
Cum % A	78.261	89.13	93.478	95 652	97.826
<b>5 S 1992</b>	Polydora spp.				
Cum % A	100				
<b>5 S 1993</b>	Capitella capitata	Eteone spp.	Bodiotria arenosa	Tubificoides benedii	Arenicola marina
Cum % A	62.5	70 833	75	79.167	83.333
<b>5 S 1994</b>	Capitella capitata	Mytilidae sp. (juv)	Arenicola marina		
Cum % A	50	83 333	100		
<b>5 S 1995</b>	Capitella capitata	Tubificoides swir/amp	Petricola pholadiformis	Polydora spp.	
Cum % A	45.455	81 818	90 909	100	
<b>5 S 1996</b>	Capitella capitata	Polydora spp.	Eteone spp.	Gammarus salinus	Crangon crangon
Cum % A	58.824	74 51	82 353	86 275	88.235
<b>5 S 1997</b>	Corophium volutator	Polydora spp.	Gammarus salinus	Capitella capitata	Mysidacea sp. indet.

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Cum % A	23.529	47 059	64.706	76.471	82.353
<b>5 S 1998</b>	Corophium volutator	Polydora spp.	Gammarus salinus	Aphelocheata/Tharyx	Carcinus maenas
Cum % A	86.557	93.443	96.721	97.705	98.361
<b>5 S 1999</b>	Capitella capitata	Achelia echinata	Gammarus salinus	Pygospio elegans	Spio martinensis
Cum % A	44.444	55 556	66 667	77.778	88.889
<b>5 S 2000</b>	Polydora spp.	Corophium volutator	Pygospio elegans	Gammarus salinus	Streblospio shrubsolii
Cum % A	36.301	68 836	92.466	95 205	96.918
<b>5 S 2001</b>	Polydora spp.	Corophium volutator	Neomysis integer	Gammarus salinus	Aphelocheata/Tharyx
Cum % A	50.789	86 842	96 053	98.421	98.947
<b>5 S 2002</b>	Polydora spp.	Pygospio elegans	Corophium volutator	Gammarus salinus	Arenicola marina
Cum % A	49.639	80 596	97.473	99 368	99.639
<b>6 S 1986</b>	Spio martinensis	Nephtys hombergii	Macoma balthica	Scoloplos armiger	Tubificoides benedii
Cum % A	51.261	68 067	83.193	89 916	93.277
<b>6 S 1987</b>	Macoma balthica	Nephtys hombergii	Polydora spp.	Scoloplos armiger	Pygospio elegans
Cum % A	40.426	61.702	82 979	89 362	95.745
<b>6 S 1988</b>	Macoma balthica	Scoloplos armiger	Nephtys hombergii	Tubificoides benedii	Spio martinensis
Cum % A	35.577	51 923	62 5	73 077	81.731
<b>6 S 1989</b>	Spio martinensis	Nephtys spp. (juv)	Macoma balthica	Nephtys hombergii	Scoloplos armiger
Cum % A	34.483	49.425	60 92	71 264	79.31
<b>6 S 1990</b>	Spio martinensis	Nephtys hombergii	Macoma balthica	Nephtys cirrosa	Nephtys spp. (juv)
Cum % A	75.641	82 051	85 897	88.462	91.026
<b>6 S 1991</b>	Capitella capitata	Tubificoides benedii	Nephtys spp. (juv)		
Cum % A	66.667	83 333	100		
<b>6 S 1992</b>	Capitella capitata	Nephtys spp. (juv)	Neomysis integer	Nephtys hombergii	Pycnogonum littorale
Cum % A	29.412	52 941	64.706	76.471	82.353
<b>6 S 1993</b>	Eurydice pulchra	Nephtys cirrosa	Spio martinensis		
Cum % A	40	80	100		
<b>6 S 1994</b>	Capitella capitata	Hydrobia ulvae	Schistomysis kervillei		
Cum % A	50	75	100		
<b>6 S 1995</b>	Capitella capitata	Mytilidae sp. (juv)	Crangon crangon	Pygospio elegans	Polydora spp.
Cum % A	44.444	66 667	77.778	88 889	100
<b>6 S 1996</b>	Capitella capitata	Neomysis integer	Pygospio elegans	Aphelocheata/Tharyx	Crangon crangon
Cum % A	46.429	60.714	75	89 286	92.857
<b>6 S 1997</b>	Spio martinensis	Nephtys cirrosa	Corophium volutator	Paraonis fulgens	Hiatella arctica
Cum % A	63.333	80	86 667	88 333	90
<b>6 S 1998</b>	Nephtys hombergii	Nephtys cirrosa	Nephtys spp. (juv)	Eurydice pulchra	Macoma balthica
Cum % A	22.727	40 909	59 091	72.727	86.364
<b>6 S 1999</b>	Nephtys cirrosa	Eurydice pulchra	Spio martinensis	Mesopodopsis slabberi	Schistomysis kervillei
Cum % A	27.273	45.455	63 636	72.727	81.818
<b>6 S 2000</b>	Spio martinensis	Aphelocheata/Tharyx	Nephtys cirrosa	Macoma balthica	Nephtys hombergii
Cum % A	23.077	34 615	46.154	53 846	61.538
<b>6 S 2001</b>	Mesopodopsis slabberi	Nephtys cirrosa	Scoloplos armiger	Macoma balthica	Capitella capitata
Cum % A	31.579	44.737	57 895	68.421	73.684
<b>6 S 2002</b>	Spio martinensis	Macoma balthica	Nephtys cirrosa	Scoloplos armiger	Tubificoides benedii
Cum % A	31.429	54 286	74 286	85.714	91.429
<b>6 S 2003</b>	Nephtys cirrosa	Macoma balthica	Spio martinensis	Gastrosaccus spinifer	Scoloplos armiger
Cum % A	26.087	43.478	60 87	73 913	82.609
<b>6 S 2004</b>	Spio martinensis	Macoma balthica	Nephtys cirrosa	Nephtys hombergii	Brania limbata
Cum % A	23.529	41.176	58 824	70 588	76.471
<b>7 S 1979</b>	Polydora spp.	Corophium volutator	Enchytraeidae spp.	Pygospio elegans	Arenicola marina
Cum % A	59.337	89.173	92 864	96 082	98.016
<b>7 S 1980</b>	Polydora spp.	Enchytraeidae spp.	Arenicola marina	Pygospio elegans	Proceraea cornuta
Cum % A	93.056	96 564	97.407	97 837	98.259
<b>7 S 1981</b>	Polydora spp.	Enchytraeidae spp.	Arenicola marina	Anaitides maculata	Pygospio elegans
Cum % A	94.01	95.78	97 27	97 874	98.428
<b>7 S 1982</b>	Polydora spp.	Enchytraeidae spp.	Pygospio elegans	Autolytus sp. indet.	Anaitides maculata
Cum % A	91.73	94 258	95.165	95 993	96.735
<b>7 S 1983</b>	Polydora spp.	Enchytraeidae spp.	Pygospio elegans	Proceraea cornuta	Anoplodactylus pygmaeus
Cum % A	93.595	95 684	97.125	98 209	98.718
<b>7 S 1984</b>	Polydora spp.	Anaitides maculata	Pygospio elegans	Enchytraeidae spp.	Nereis longissima
Cum % A	66.591	79.715	86 649	91 818	93.341
<b>7 S 1985</b>	Levinsonia gracilis	Arenicola marina	Pygospio elegans	Enchytraeidae spp.	Proceraea cornuta
Cum % A	94.004	95.429	96.718	97 634	98.112
<b>7 S 1986</b>	Polydora spp.	Arenicola marina	Enchytraeidae spp.	Anaitides maculata	Proceraea cornuta
Cum % A	87.355	92.71	95.742	97 248	97.647
<b>7 S 1987</b>	Polydora spp.	Arenicola marina	Enchytraeidae spp.	Pygospio elegans	Proceraea cornuta
Cum % A	95.325	96 546	97.732	98 616	98.942
<b>7 S 1988</b>	Polydora spp.	Enchytraeidae spp.	Anaitides maculata	Pygospio elegans	Anoplodactylus pygmaeus
Cum % A	91.922	95 859	97 61	98 594	99.029
<b>7 S 1989</b>	Polydora spp.	Nereis longissima	Anaitides maculata	Pygospio elegans	Enchytraeidae spp.
Cum % A	67.203	80 083	88.134	90.4	91.95
<b>7 S 1990</b>	Polydora spp.	Anoplodactylus pygmaeus	Proceraea cornuta	Halacaridae spp.	Autolytus sp. indet.
Cum % A	83.638	88.471	91 819	94 802	95.746
<b>7 S 1991</b>	Polydora spp.	Arenicola marina	Pygospio elegans	Corophium sp. (juv)	Corophium volutator
Cum % A	83.415	87 874	91 028	93.42	94.834
<b>7 S 1992</b>	Polydora spp.	Pygospio elegans	Arenicola marina	Anaitides maculata	Corophium volutator
Cum % A	96.64	98 238	98.72	99 07	99.364
<b>7 S 1993</b>	Polydora spp.	Corophium volutator	Anaitides maculata	Pygospio elegans	Nereis longissima

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Cum % A	58.409	76 569	87.135	90.776	93.412
<b>7 S 1994</b>	Polydora spp.	Corophium volutator	Pygospio elegans	NEMERTEA sp.	Anaitides maculata
Cum % A	73.401	96 564	98 229	98 902	99.104
<b>7 S 1995</b>	Polydora spp.	Corophium volutator	Pygospio elegans	NEMERTEA sp.	Mytilidae sp. (juv)
Cum % A	49.16	96 528	97.731	98 519	98.814
<b>7 S 1996</b>	Polydora spp.	Corophium volutator	Pygospio elegans	Nereis longissima	Corophium sp. (juv)
Cum % A	73.981	82 032	86 262	89.74	92.052
<b>7 S 1997</b>	Polydora spp.	Corophium volutator	NEMERTEA sp.	Pygospio elegans	Crangon crangon
Cum % A	67.2	98 214	98 645	98 818	98.978
<b>7 S 1998</b>	Corophium volutator	Polydora spp.	Aphelocheata/Tharyx	Petricola pholadiformis	Pygospio elegans
Cum % A	65.121	98 292	98.778	99 07	99.347
<b>7 S 1999</b>	Corophium volutator	Polydora spp.	Arenicola marina	Pygospio elegans	Halacaridae spp.
Cum % A	61.943	98 658	99 263	99 528	99.679
<b>7 S 2000</b>	Corophium volutator	Polydora spp.	Halacaridae spp.	NEMERTEA sp.	Mytilidae sp. (juv)
Cum % A	62.257	98 653	99 008	99 277	99.532
<b>7 S 2001</b>	Corophium volutator	Polydora spp.	Nematoda	Pygospio elegans	NEMERTEA sp.
Cum % A	68.375	94 914	96 061	96 979	97.859
<b>7 S 2002</b>	Corophium volutator	Polydora spp.	NEMERTEA sp.	Nematoda	Arenicola marina
Cum % A	67.72	95 993	97 247	98.432	98.862
<b>7 S 2003</b>	Polydora spp.	Corophium volutator	Nematoda	NEMERTEA sp.	Arenicola marina
Cum % A	78.029	89.786	93 017	95 015	96.265
<b>7 S 2004</b>	Polydora spp.	Arenicola marina	Nematoda	Enchytraeidae spp.	Petricola pholadiformis
Cum % A	87.179	91.439	95 388	96.105	96.754
<b>8 S 1986</b>	Nephtys hombergii	Tubificoides benedii	Scoloplos armiger	Macoma balthica	Spio martinensis
Cum % A	31.884	50	65 942	78 986	83.333
<b>8 S 1987</b>	Nephtys hombergii	Macoma balthica	Tubificoides benedii	Sphaerodoropsis minuta	Scoloplos armiger
Cum % A	28.723	50	68 085	75 532	81.915
<b>8 S 1988</b>	Spio martinensis	Scoloplos armiger	Macoma balthica	Nephtys hombergii	Neomysis integer
Cum % A	27.5	47 5	57 5	67 5	72.5
<b>8 S 1989</b>	Nephtys hombergii	Nephtys spp. (juv)	Anaitides maculata	Polydora spp.	Macoma balthica
Cum % A	36.667	50	63 333	73 333	80
<b>8 S 1990</b>	Polydora spp.	Nephtys spp. (juv)	Nephtys hombergii	Diastylis sp. indet	Abra alba
Cum % A	28.571	48 571	60	65.714	71.429
<b>8 S 1991</b>	Nephtys cirrosa	Gastrosaccus spinifer	Nephtys spp. (juv)	Scoloplos armiger	Spio martinensis
Cum % A	24.59	47 541	62 295	73.77	81.967
<b>8 S 1992</b>	Nephtys cirrosa	Spio martinensis	Tanaissus lilljeborgi	Neomysis integer	Nephtys spp. (juv)
Cum % A	41.935	58 065	67.742	74.194	80.645
<b>8 S 1993</b>	Nephtys spp. (juv)	Eurydice pulchra	Nephtys cirrosa	Spio martinensis	Macoma balthica
Cum % A	26.667	40	53 333	66 667	73.333
<b>8 S 1994</b>	Spio martinensis	Nephtys cirrosa	Scoloplos armiger	Capitella capitata	Tanaissus lilljeborgi
Cum % A	31.25	56 25	68.75	81 25	87.5
<b>8 S 1995</b>	Aphelocheata/Tharyx	Eurydice pulchra	Tubificoides benedii	Capitella capitata	Spio martinensis
Cum % A	46.154	69 231	76 923	84 615	92.308
<b>8 S 1996</b>	Eurydice pulchra	Pontocrates altamarinus	Neomysis integer	Schistomysis kervillei	Crangon crangon
Cum % A	33.333	53 333	73 333	80	86.667
<b>8 S 1997</b>	Spio martinensis	Nephtys cirrosa	Eurydice pulchra	Schistomysis kervillei	Pontocrates altamarinus
Cum % A	33.333	60	70	73 333	76.667
<b>8 S 1998</b>	Eurydice pulchra	Nephtys cirrosa	Gastrosaccus spinifer	Schistomysis kervillei	Pontocrates altamarinus
Cum % A	23.077	46.154	61 538	69 231	76.923
<b>8 S 1999</b>	Nephtys cirrosa	Eurydice pulchra	Scoloplos armiger	Tanaissus lilljeborgi	Schistomysis kervillei
Cum % A	60.714	67 857	75	78 571	82.143
<b>8 S 2000</b>	Nephtys cirrosa	Gastrosaccus spinifer	Aphelocheata/Tharyx	Corophium sp. (juv)	Scoloplos armiger
Cum % A	80	88	92	96	100
<b>8 S 2001</b>	Nephtys cirrosa	Cumopsis goodsiri	Pontocrates altamarinus	Schistomysis kervillei	Pseudocuma gilsoni
Cum % A	34.286	42 857	51.429	60	65.714
<b>8 S 2002</b>	Corophium insidiosum	Hydrobia ulvae	Capitella sp. (juv)	Crangon crangon	Mesopodopsis slabberi
Cum % A	22.222	44.444	55 556	66 667	77.778
<b>8 S 2003</b>	Nephtys cirrosa	Aphelocheata/Tharyx	Atylus guttatus	Bathyporeia sp. (juv)	Bathyporeia elegans
Cum % A	52.941	61.765	64.706	67 647	70.588
<b>8 S 2004</b>	Nephtys cirrosa	Capitella capitata	Carcinus maenas	Eurydice pulchra	Mytilidae sp. (juv)
Cum % A	22.222	33 333	44.444	55 556	66.667
<b>9 S 1986</b>	Nephtys cirrosa	Nephtys spp. (juv)	Spio martinensis	Nephtys hombergii	Scoloplos armiger
Cum % A	34.043	56 383	77 66	84 043	90.426
<b>9 S 1987</b>	Nephtys hombergii	Scoloplos armiger	Aphelocheata/Tharyx	Tubificoides benedii	Tubificoides swirl/amp
Cum % A	36.585	53 659	65 854	74 39	81.707
<b>9 S 1988</b>	Scoloplos armiger	Nephtys hombergii	Nephtys cirrosa	Spio martinensis	Schistomysis kervillei
Cum % A	22.414	39 655	53.448	67 241	74.138
<b>9 S 1989</b>	Nephtys cirrosa	Nephtys spp. (juv)	Spio martinensis	Nephtys hombergii	Capitella capitata
Cum % A	31.111	56 667	70	82 222	86.667
<b>9 S 1990</b>	Nephtys hombergii	Nephtys spp. (juv)	Spio martinensis	Nephtys cirrosa	Capitella capitata
Cum % A	25	43.75	62 5	75	81.25
<b>9 S 1991</b>	Nephtys hombergii	Spio martinensis	Nephtys spp. (juv)	Mesopodopsis slabberi	Mysidacea sp. indet.
Cum % A	30.769	53 846	69 231	76 923	84.615
<b>9 S 1992</b>	Nephtys spp. (juv)	Mytilidae sp. (juv)	Nephtys hombergii	Spio martinensis	Macoma balthica
Cum % A	61.29	70 968	80 645	90 323	93.548
<b>9 S 1993</b>	Nephtys spp. (juv)	Tubificoides benedii	Nephtys hombergii	Streblospio shrubsolii	Capitella capitata
Cum % A	58.621	72.414	86 207	89 655	93.103
<b>9 S 1994</b>	Nephtys hombergii	Arenicola marina	Corophium volutator	Mytilidae sp. (juv)	Aphelocheata/Tharyx

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Cum % A	23.81	38 095	52 381	61 905	71.429
<b>9 S 1995</b>	Spio martinensis	Nephtys hombergii	Capitella capitata	Polydora spp.	Aphelocheata/Tharyx
Cum % A	44.262	60 656	77 049	90.164	95.082
<b>9 S 1996</b>	Capitella capitata	Mesopodopsis slabberi	NEMERTEA sp.	Mytilidae sp. (juv)	
Cum % A	85.714	90.476	95 238	100	
<b>9 S 1997</b>	Capitella capitata	Gastrosaccus spinifer	Eurydice pulchra	Mytilidae sp. (juv)	Spio martinensis
Cum % A	67.857	76.19	83 333	88 095	91.667
<b>9 S 1998</b>	Capitella capitata	Eurydice pulchra	Nephtys cirrosa	Mytilidae sp. (juv)	
Cum % A	57.143	71.429	85.714	100	
<b>9 S 1999</b>	Corophium volutator	Mytilidae sp. (juv)	Capitella capitata	Gastrosaccus spinifer	Eurydice pulchra
Cum % A	26.667	50	73 333	76 667	80
<b>9 S 2000</b>	Capitella capitata	Eurydice pulchra	Mysidacea sp. indet.	Aphelocheata/Tharyx	Caprella linearis
Cum % A	23.077	38.462	53 846	61 538	69.231
<b>9 S 2001</b>	Capitella capitata	Nephtys hombergii	Aphelocheata/Tharyx	Macoma balthica	Ascidacea spp. indet.
Cum % A	40.385	55.769	65 385	73 077	78.846
<b>9 S 2002</b>	Aphelocheata/Tharyx	Nephtys hombergii	Nephtys spp. (juv)	Spio martinensis	Pontocrates altamarinus
Cum % A	22.857	42 857	57.143	71.429	77.143
<b>9 S 2003</b>	Aphelocheata/Tharyx	Nephtys hombergii	Scoloplos armiger	Spio martinensis	Macoma balthica
Cum % A	27.174	51 087	65 217	73 913	79.348
<b>9 S 2004</b>	Aphelocheata/Tharyx	Nephtys spp. (juv)	Nephtys hombergii	Scoloplos armiger	Streblospio shrubsolii
Cum % A	35.955	67.416	78 652	89 888	95.506
<b>10 S 1979</b>	Polydora spp.	Aphelocheata/Tharyx	Pygospio elegans	Scoloplos armiger	Tubificoides benedii
Cum % A	51.52	70.743	85 338	89 561	92.939
<b>10 S 1980</b>	Aphelocheata/Tharyx	Tubificoides benedii	Tubificoides swir/amp	Nephtys hombergii	Scoloplos armiger
Cum % A	88.654	93 024	95 243	97.445	99.025
<b>10 S 1981</b>	Aphelocheata/Tharyx	Tubificoides swir/amp	Streblospio shrubsolii	Pygospio elegans	Nephtys hombergii
Cum % A	88.212	90 57	92.436	93 811	95.064
<b>10 S 1982</b>	Aphelocheata/Tharyx	Tubificoides pseudogaster	Tubificoides swir/amp	Tubificoides benedii	Nephtys spp. (juv)
Cum % A	73.738	88 053	93 662	95 862	97.241
<b>10 S 1983</b>	Tubificoides swir/amp	Aphelocheata/Tharyx	Tubificoides benedii	Pygospio elegans	Streblospio shrubsolii
Cum % A	39.885	72 225	88 928	94 013	96.446
<b>10 S 1984</b>	Tubificoides swir/amp	Aphelocheata/Tharyx	Pygospio elegans	Tubificoides benedii	Polydora spp.
Cum % A	54.664	69 216	81 973	90 833	96.395
<b>10 S 1985</b>	Polydora spp.	Tubificoides swir/amp	Aphelocheata/Tharyx	Pygospio elegans	Tubificoides benedii
Cum % A	48.038	79 833	88.131	92 888	97.549
<b>10 S 1986</b>	Tubificoides swir/amp	Aphelocheata/Tharyx	Tubificoides benedii	Nephtys hombergii	Streblospio shrubsolii
Cum % A	57.864	85 067	88.455	91.151	93.432
<b>10 S 1987</b>	Tubificoides swir/amp	Polydora spp.	Pygospio elegans	Aphelocheata/Tharyx	Tubificoides benedii
Cum % A	25.148	47 538	69.14	85 817	88.838
<b>10 S 1988</b>	Aphelocheata/Tharyx	Pygospio elegans	Streblospio shrubsolii	Scoloplos armiger	Aricidea minuta
Cum % A	64.676	82 374	86.187	89 892	92.446
<b>10 S 1989</b>	Pygospio elegans	Aphelocheata/Tharyx	Aricidea minuta	Anaitides maculata	Scoloplos armiger
Cum % A	45.277	84 504	86 824	88 941	90.924
<b>10 S 1990</b>	Polydora spp.	Pygospio elegans	Anaitides maculata	Aphelocheata/Tharyx	Scoloplos armiger
Cum % A	72.969	83 664	87 541	91 026	93.226
<b>10 S 1991</b>	Aphelocheata/Tharyx	Pygospio elegans	Scoloplos armiger	Streblospio shrubsolii	Nephtys spp. (juv)
Cum % A	71.798	82.156	88.795	92.702	94.444
<b>10 S 1992</b>	Aphelocheata/Tharyx	Streblospio shrubsolii	Pygospio elegans	Tubificoides swir/amp	Scoloplos armiger
Cum % A	53.723	70 067	81.162	86.15	90.767
<b>10 S 1993</b>	Aphelocheata/Tharyx	Tubificoides swir/amp	Nephtys spp. (juv)	Scoloplos armiger	Nephtys hombergii
Cum % A	72.883	80.156	86 961	90 857	94.234
<b>10 S 1994</b>	Aphelocheata/Tharyx	Pygospio elegans	Tubificoides swir/amp	Streblospio shrubsolii	Nephtys hombergii
Cum % A	66.548	81.139	87 9	91 637	93.95
<b>10 S 1995</b>	Aphelocheata/Tharyx	Streblospio shrubsolii	Pygospio elegans	Tubificoides swir/amp	Scoloplos armiger
Cum % A	50.224	68 95	84 891	91 325	93.694
<b>10 S 1996</b>	Aphelocheata/Tharyx	Pygospio elegans	Spiophanes bombyx	Scoloplos armiger	Anaitides maculata
Cum % A	58.991	79.177	84.198	88.441	90.97
<b>10 S 1997</b>	Aphelocheata/Tharyx	Pygospio elegans	Streblospio shrubsolii	Polydora spp.	Tubificoides swir/amp
Cum % A	58.396	68.711	76 217	83 036	86.395
<b>10 S 1998</b>	Aphelocheata/Tharyx	Streblospio shrubsolii	Tubificoides pseudogaster	Pygospio elegans	Tubificoides swir/amp
Cum % A	90.522	93 263	95 525	96 578	97.212
<b>10 S 1999</b>	Aphelocheata/Tharyx	Tubificoides pseudogaster	Mediomastus fragilis	Tubificoides swir/amp	Retusa obtusa
Cum % A	92.418	98 237	98 873	99.109	99.275
<b>10 S 2000</b>	Aphelocheata/Tharyx	Tubificoides pseudogaster	Polydora spp.	Phoronis muelleri	Corophium volutator
Cum % A	80.916	89 046	93.128	95 861	97.846
<b>10 S 2001</b>	Aphelocheata/Tharyx	Tubificoides pseudogaster	Mediomastus fragilis	Tubificoides swir/amp	Retusa obtusa
Cum % A	62.229	96 971	97 685	98 062	98.412
<b>10 S 2002</b>	Tubificoides pseudogaster	Aphelocheata/Tharyx	Phoronis muelleri	Streblospio shrubsolii	Scoloplos armiger
Cum % A	47.323	85 376	89 834	94.129	94.999
<b>10 S 2003</b>	Aphelocheata/Tharyx	Tubificoides pseudogaster	Streblospio shrubsolii	Phoronis muelleri	Scoloplos armiger
Cum % A	63.396	76 354	86 931	90.121	92.38
<b>10 S 2004</b>	Aphelocheata/Tharyx	Tubificoides pseudogaster	Phoronis muelleri	Streblospio shrubsolii	Tubificoides swir/amp
Cum % A	89.656	94 257	95.445	96.46	97.475
<b>11 S 1979</b>	Eurydice pulchra	Corophium volutator	Nephtys cirrosa	Mytilidae sp. (juv)	Capitella capitata
Cum % A	38.462	65 385	88.462	92 308	96.154
<b>11 S 1980</b>	Eurydice pulchra	Aphelocheata/Tharyx	Callipallene brevirostris	Gastrosaccus spinifer	Nephtys cirrosa
Cum % A	50	70	80	90	100
<b>11 S 1981</b>	Eurydice pulchra	Polydora spp.	Scoloplos armiger	Schistomysis kervillei	Crangon crangon

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Cum % A	30.435	60 87	73 913	78 261	82.609
<b>11 S 1982</b>	Nephtys cirrosa	Bathyporeia pelagica	Spio martinensis	Bathyporeia pilosa	Mesopodopsis slabberi
Cum % A	30	50	70	80	85
<b>11 S 1983</b>	Scoloplos armiger	Spio martinensis	Nephtys cirrosa	Eurydice pulchra	Corophium sp. (juv)
Cum % A	23.81	47 619	66 667	76.19	80.952
<b>11 S 1984</b>	Tubificoides swir/amp	Eurydice pulchra	Spio martinensis	Polydora spp.	Turbellaria sp.
Cum % A	52.941	64.706	76.471	88 235	94.118
<b>11 S 1985</b>	Nephtys cirrosa	Eurydice pulchra	Polydora spp.	Mediomastus fragilis	Capitella capitata
Cum % A	33.333	50	66 667	75	83.333
<b>11 S 1986</b>	Eurydice pulchra	Nephtys cirrosa	Bathyporeia pelagica	Spio martinensis	Capitella capitata
Cum % A	29.167	50	62 5	75	83.333
<b>11 S 1987</b>	Eurydice pulchra	Nephtys cirrosa	Scoloplos armiger	Mytilidae sp. (juv)	Spio martinensis
Cum % A	20	40	60	75	85
<b>11 S 1988</b>	Nephtys cirrosa	Capitella capitata	Scoloplos armiger	Mysidacea sp. indet.	Gastrosaccus spinifer
Cum % A	21.429	42 857	64 286	78 571	85.714
<b>11 S 1989</b>	Gastrosaccus spinifer	Eurydice pulchra	Nephtys cirrosa	Mysidacea sp. indet.	Atylus guttatus
Cum % A	25	50	68.75	75	81.25
<b>11 S 1990</b>	Nephtys cirrosa	Nephtys spp. (juv)	Spio martinensis	Mediomastus fragilis	Spiophanes bombyx
Cum % A	33.333	55 556	77.778	88 889	100
<b>11 S 1991</b>	Nephtys cirrosa	Scoloplos armiger	Nephtys spp. (juv)	Spio martinensis	Gastrosaccus spinifer
Cum % A	32	48	60	72	80
<b>11 S 1992</b>	Capitella capitata	Nephtys cirrosa	Polydora spp.	Pycnogonum littorale	Schistomysis kervillei
Cum % A	33.333	58 333	75	83 333	91.667
<b>11 S 1993</b>	Eurydice pulchra	Nephtys cirrosa	Mytilidae sp. (juv)	Nephtys spp. (juv)	
Cum % A	25	50	75	100	
<b>11 S 1994</b>	Eurydice pulchra	Nephtys cirrosa	Cirratulidae sp.	Bathyporeia pelagica	Anoplodactylus pygmaeus
Cum % A	30	50	60	65	70
<b>11 S 1995</b>	Eurydice pulchra	Achelia echinata	Tubificoides swir/amp	Anoplodactylus pygmaeus	Bathyporeia elegans
Cum % A	47.059	58 824	70 588	76.471	82.353
<b>11 S 1996</b>	Mytilidae sp. (juv)	Crangon crangon	Nephtys cirrosa	Capitella capitata	Pygospio elegans
Cum % A	37.5	50	62 5	75	87.5
<b>11 S 1997</b>	Nephtys cirrosa	Gastrosaccus spinifer	Spio martinensis	Capitella capitata	Pseudocuma gilsoni
Cum % A	23.333	40	56 667	66 667	73.333
<b>11 S 1998</b>	Gastrosaccus spinifer	Eurydice pulchra	Nephtys cirrosa	Achelia echinata	Pontocrates altamarinus
Cum % A	30	60	86 667	90	93.333
<b>11 S 1999</b>	Nephtys cirrosa	Aphelocheata/Tharyx	Eurydice pulchra	Schistomysis kervillei	Gastrosaccus spinifer
Cum % A	23.81	47 619	61 905	71.429	80.952
<b>11 S 2000</b>	Aphelocheata/Tharyx	Gastrosaccus spinifer	Mysidacea sp. indet.	Tubificoides pseudogaster	Schistomysis spiritus
Cum % A	41.176	58 824	76.471	85 294	91.176
<b>11 S 2001</b>	Capitella capitata	Eurydice pulchra	Ascidacea spp. indet.	Aphelocheata/Tharyx	Gastrosaccus spinifer
Cum % A	34.783	52.174	65 217	69 565	73.913
<b>11 S 2002</b>	Gastrosaccus spinifer	Eurydice pulchra	Capitella capitata	Aphelocheata/Tharyx	Nephtys cirrosa
Cum % A	76.316	84 211	89.474	92.105	94.737
<b>11 S 2003</b>	Capitella capitata	Nephtys cirrosa	Mesopodopsis slabberi	Eurydice pulchra	Tubificoides pseudogaster
Cum % A	24.138	41 379	55.172	65 517	75.862
<b>11 S 2004</b>	Capitella capitata	Mesopodopsis slabberi	Aphelocheata/Tharyx	Cumopsis goodsiri	Eurydice pulchra
Cum % A	20	40	50	60	70
<b>12 S 1986</b>	Pygospio elegans	Aphelocheata/Tharyx	Scoloplos armiger	Nephtys spp. (juv)	Nephtys hombergii
Cum % A	52.134	64 225	74 538	81 366	88.193
<b>12 S 1987</b>	Pygospio elegans	Scoloplos armiger	Nephtys hombergii	Spiophanes bombyx	Anaitides maculata
Cum % A	67.857	74.725	79 533	83 379	86.126
<b>12 S 1988</b>	Tubificoides swir/amp	Aphelocheata/Tharyx	Scoloplos armiger	Nephtys hombergii	Nephtys spp. (juv)
Cum % A	28.004	53 823	77.458	82.423	86.395
<b>12 S 1989</b>	Tubificoides swir/amp	Scoloplos armiger	Aphelocheata/Tharyx	Nephtys spp. (juv)	Spiophanes bombyx
Cum % A	36.508	50 932	65 217	74 051	80.745
<b>12 S 1990</b>	Spiophanes bombyx	Tubificoides swir/amp	Nephtys spp. (juv)	Scoloplos armiger	Aphelocheata/Tharyx
Cum % A	36.556	52.715	65.43	77 351	84.106
<b>12 S 1991</b>	Tubificoides swir/amp	Nephtys spp. (juv)	Spiophanes bombyx	Scoloplos armiger	Levinsonia gracilis
Cum % A	60.377	70.44	78 616	86 541	90.943
<b>12 S 1992</b>	Tubificoides swir/amp	Nephtys spp. (juv)	Scoloplos armiger	Nephtys hombergii	Spiophanes bombyx
Cum % A	40.29	72 958	82 214	87 296	91.652
<b>12 S 1993</b>	Tubificoides swir/amp	Nephtys spp. (juv)	Nephtys hombergii	Scoloplos armiger	Spiophanes bombyx
Cum % A	46.939	70 801	81.476	86 97	90.11
<b>12 S 1994</b>	Tubificoides swir/amp	Nephtys hombergii	Nephtys spp. (juv)	Scoloplos armiger	Levinsonia gracilis
Cum % A	57.293	68 541	77.153	84.183	87.346
<b>12 S 1995</b>	Tubificoides swir/amp	Pygospio elegans	Aphelocheata/Tharyx	Nephtys spp. (juv)	Scoloplos armiger
Cum % A	58.539	70 873	77 324	82 827	87.951
<b>12 S 1996</b>	Aphelocheata/Tharyx	Tubificoides swir/amp	Pygospio elegans	Spiophanes bombyx	Scoloplos armiger
Cum % A	55.838	72 63	81 325	88.732	92.718
<b>12 S 1997</b>	Tubificoides swir/amp	Spiophanes bombyx	Aphelocheata/Tharyx	Pygospio elegans	Scoloplos armiger
Cum % A	37.169	56 387	70 886	77 618	83.544
<b>12 S 1998</b>	Tubificoides swir/amp	Aphelocheata/Tharyx	Spiophanes bombyx	Nephtys hombergii	Scoloplos armiger
Cum % A	53.412	70.469	81 823	86 354	90.672
<b>12 S 1999</b>	Tubificoides swir/amp	Aphelocheata/Tharyx	Pygospio elegans	Scoloplos armiger	Nephtys hombergii
Cum % A	59.573	82 012	90 516	92 565	94.524
<b>12 S 2000</b>	Tubificoides swir/amp	Aphelocheata/Tharyx	Pygospio elegans	Polydora spp.	Nephtys hombergii
Cum % A	41.047	80 607	91 553	93.754	95.36
<b>12 S 2001</b>	Tubificoides swir/amp	Aphelocheata/Tharyx	Pygospio elegans	Nephtys hombergii	Scoloplos armiger



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Cum % A	36.136	63 913	88 594	90 659	92.576
<b>12 S 2002</b>	Aphelochaeta/Tharyx	Tubificoides swir/amp	Pygospio elegans	Scoloplos armiger	Nephtys hombergii
Cum % A	73.715	92 838	94 281	95 58	96.284
<b>12 S 2003</b>	Aphelochaeta/Tharyx	Tubificoides swir/amp	Pygospio elegans	Scoloplos armiger	Scalibregma inflatum
Cum % A	74.924	91 649	93 606	95.433	96.216
<b>12 S 2004</b>	Aphelochaeta/Tharyx	Tubificoides swir/amp	Scoloplos armiger	Scalibregma inflatum	Spiophanes bombyx
Cum % A	74.213	86 695	90.451	92.167	93.562
<b>13 S 1986</b>	Schistomysis kervillei	Spio martinensis	Bathyporeia elegans	Nephtys spp. (juv)	Nephtys hombergii
Cum % A	17.241	34.483	44 828	55.172	65.517
<b>13 S 1987</b>	Bathyporeia pelagica	Nephtys cirrosa	Nymphon rubrum	Schistomysis kervillei	Caprella sp.
Cum % A	21.951	36 585	43 902	51 22	56.098
<b>13 S 1988</b>	Spio martinensis	Nephtys cirrosa	Bathyporeia pilosa	Schistomysis kervillei	Eurydice pulchra
Cum % A	30.303	45.455	57 576	63 636	69.697
<b>13 S 1989</b>	Nephtys cirrosa	Nephtys spp. (juv)	Spio martinensis	Capitella capitata	Eurydice pulchra
Cum % A	35.294	55 882	73 529	85 294	91.176
<b>13 S 1990</b>	Spio martinensis	Nephtys cirrosa	Pontocrates altamarinus	Abra prismatica	Schistomysis kervillei
Cum % A	32.558	53.488	69.767	83.721	88.372
<b>13 S 1991</b>	Spio martinensis	Nephtys cirrosa	Nephtys spp. (juv)	Pontocrates altamarinus	Scoloplos armiger
Cum % A	76.325	84 806	90.459	92 58	94.346
<b>13 S 1992</b>	Spio martinensis	Spiophanes bombyx	Nephtys hombergii	Nephtys spp. (juv)	Pontocrates altamarinus
Cum % A	79.69	85 026	88.124	91 222	92.427
<b>13 S 1993</b>	Spio martinensis	Nephtys cirrosa	Spiophanes bombyx	Magelona mirabilis	Mytilidae sp. (juv)
Cum % A	21.739	40 217	51 087	59.783	67.391
<b>13 S 1994</b>	Spio martinensis	Nephtys cirrosa	Chaetozone setosa	Spiophanes bombyx	Scoloplos armiger
Cum % A	24.37	42 857	56 303	65 546	73.109
<b>13 S 1995</b>	Spio martinensis	Chaetozone setosa	Nephtys cirrosa	Bathyporeia elegans	Scoloplos armiger
Cum % A	30.714	55.714	69 286	80	82.857
<b>13 S 1996</b>	Scoloplos armiger	Spiophanes bombyx	Magelona mirabilis	Chaetozone setosa	Bathyporeia elegans
Cum % A	24.416	42 597	53.766	63 377	70.39
<b>13 S 1997</b>	Spio martinensis	Nephtys cirrosa	Magelona mirabilis	Scoloplos armiger	Spiophanes bombyx
Cum % A	32.911	48.101	59.494	70 886	77.215
<b>13 S 1998</b>	Gastrosaccus spinifer	Nephtys cirrosa	Pontocrates altamarinus	Bathyporeia elegans	Bathyporeia pelagica
Cum % A	30	43 333	50	56 667	60
<b>13 S 1999</b>	Tubificoides swir/amp	Nephtys cirrosa	Mytilidae sp. (juv)	Nephtys hombergii	Aphelochaeta/Tharyx
Cum % A	32	52	64	72	80
<b>13 S 2000</b>	Gastrosaccus spinifer	Bathyporeia elegans	Pontocrates altamarinus	Tubificoides swir/amp	Bathyporeia pilosa
Cum % A	23.077	35 897	48.718	58 974	64.103
<b>13 S 2001</b>	Bathyporeia pelagica	Capitella capitata	Aphelochaeta/Tharyx	Nephtys cirrosa	Bathyporeia elegans
Cum % A	55.556	66 667	74 074	81.481	85.185
<b>13 S 2002</b>	Aphelochaeta/Tharyx	Pseudocuma longicornis	Bathyporeia sarsi	Gastrosaccus spinifer	Glycera tridactyla
Cum % A	43.75	56 25	62 5	68.75	75
<b>13 S 2003</b>	Nephtys cirrosa	Bathyporeia pelagica	Capitella capitata	Nephtys spp. (juv)	Crangon crangon
Cum % A	33.333	44.444	55 556	66 667	72.222
<b>13 S 2004</b>	Mesopodopsis slabberi	Nephtys spp. (juv)	Abra alba	Nephtys cirrosa	Nephtys hombergii
Cum % A	50	64 286	71.429	78 571	85.714
<b>14 S 1979</b>	Spiophanes bombyx	Spio martinensis	Chaetozone setosa	Nephtys cirrosa	Eumida sanguinea
Cum % A	36.617	53 533	67.452	77 944	88.223
<b>14 S 1980</b>	Nephtys cirrosa	Spiophanes bombyx	Chaetozone setosa	Pseudocuma gilsoni	Eteone spp.
Cum % A	34.783	52.174	66 087	71 304	76.522
<b>14 S 1981</b>	Spiophanes bombyx	Nephtys cirrosa	Chaetozone setosa	Spio martinensis	Aricidea minuta
Cum % A	56.055	69 896	77 509	84 083	87.197
<b>14 S 1982</b>	Spiophanes bombyx	Nephtys cirrosa	Bathyporeia elegans	Bathyporeia pilosa	Spio martinensis
Cum % A	22.519	39 695	51 527	59.16	66.031
<b>14 S 1983</b>	Spio martinensis	Spiophanes bombyx	Capitella capitata	Nephtys cirrosa	Nephtys hombergii
Cum % A	64.614	86.118	91 974	93.412	94.775
<b>14 S 1984</b>	Spiophanes bombyx	Scoloplos armiger	Spio martinensis	Anatides maculata	Eumida sanguinea
Cum % A	57.037	68 504	74 065	77 904	80.512
<b>14 S 1985</b>	Spiophanes bombyx	Spio martinensis	Chaetozone setosa	Nephtys cirrosa	Eumida sanguinea
Cum % A	35.05	62 078	72.151	79 535	85.05
<b>14 S 1986</b>	Spiophanes bombyx	Spio martinensis	Scoloplos armiger	Nephtys hombergii	Nephtys spp. (juv)
Cum % A	68.434	81 081	84 927	87.769	89.951
<b>14 S 1987</b>	Spiophanes bombyx	Spio martinensis	Eumida sanguinea	Eteone spp.	Scoloplos armiger
Cum % A	51.7	66 999	72 392	75.498	78.605
<b>14 S 1988</b>	Spiophanes bombyx	Nephtys cirrosa	Spio martinensis	Nephtys spp. (juv)	Chaetozone setosa
Cum % A	69.805	75 925	81.708	85.138	88.433
<b>14 S 1989</b>	Spiophanes bombyx	Eumida sanguinea	Spio martinensis	Nephtys cirrosa	Nephtys spp. (juv)
Cum % A	48.428	56 604	63 994	69 811	73.664
<b>14 S 1990</b>	Spiophanes bombyx	Spio martinensis	Periculodes longimanus	Nephtys hombergii	Chaetozone setosa
Cum % A	53.443	84.774	88 097	89 967	91.683
<b>14 S 1991</b>	Spio martinensis	Spiophanes bombyx	Chaetozone setosa	Nephtys spp. (juv)	Periculodes longimanus
Cum % A	53.412	85 902	89.47	92 587	94.596
<b>14 S 1992</b>	Spiophanes bombyx	Spio martinensis	Abra spp. (juv)	Chaetozone setosa	Nephtys spp. (juv)
Cum % A	47.209	76.485	81 265	85 303	88.42
<b>14 S 1993</b>	Spiophanes bombyx	Spio martinensis	Lanice conchilega	Scoloplos armiger	Abra alba
Cum % A	68.25	75.125	78 379	81 368	84.125
<b>14 S 1994</b>	Spio martinensis	Spiophanes bombyx	Chaetozone setosa	Nephtys cirrosa	Capitella capitata
Cum % A	41.741	71 275	85 099	89 587	92.101
<b>14 S 1995</b>	Spio martinensis	Nephtys cirrosa	Spiophanes bombyx	Bathyporeia elegans	Periculodes longimanus

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Cum % A	22.619	41 27	55.159	67 063	75.794
<b>14 S 1996</b>	<i>Spiophanes bombyx</i>	<i>Capitella capitata</i>	<i>Pygospio elegans</i>	<i>Spio martinensis</i>	<i>Chaetozone setosa</i>
Cum % A	88.666	91 535	93 011	94.405	95.367
<b>14 S 1997</b>	<i>Spio martinensis</i>	<i>Spiophanes bombyx</i>	<i>Pariambus typicus</i>	<i>Capitella capitata</i>	<i>Periculodes longimanus</i>
Cum % A	67.837	86 299	88 244	89 927	91.451
<b>14 S 1998</b>	<i>Spiophanes bombyx</i>	<i>Spio martinensis</i>	<i>Nephtys</i> spp. (juv)	<i>Nephtys hombergii</i>	<i>Periculodes longimanus</i>
Cum % A	66.947	80 595	83 506	86.158	88.745
<b>14 S 1999</b>	<i>Nephtys cirrosa</i>	<i>Chaetozone setosa</i>	<i>Spiophanes bombyx</i>	<i>Retusa obtusa</i>	<i>Nephtys hombergii</i>
Cum % A	27.215	45 57	56 329	62 025	67.089
<b>14 S 2000</b>	<i>Nephtys cirrosa</i>	<i>Chaetozone setosa</i>	<i>Bathyporeia elegans</i>	<i>Spio martinensis</i>	<i>Pseudocuma longicornis</i>
Cum % A	18.692	35 514	50.467	60.748	68.224
<b>14 S 2001</b>	<i>Nephtys cirrosa</i>	<i>Chaetozone setosa</i>	<i>Ensis americanus</i>	<i>Spiophanes bombyx</i>	<i>Bathyporeia elegans</i>
Cum % A	20.988	35 802	49 383	59 259	66.667
<b>14 S 2002</b>	<i>Spiophanes bombyx</i>	<i>Nephtys</i> spp. (juv)	<i>Nephtys cirrosa</i>	<i>Pseudocuma longicornis</i>	<i>Spio martinensis</i>
Cum % A	34.682	52 023	63 006	69 364	75.145
<b>14 S 2003</b>	<i>Spiophanes bombyx</i>	<i>Spio martinensis</i>	<i>Nephtys cirrosa</i>	<i>Bathyporeia elegans</i>	<i>Chaetozone setosa</i>
Cum % A	42.647	69.118	75	79.118	83.235
<b>14 S 2004</b>	<i>Spiophanes bombyx</i>	<i>Nephtys cirrosa</i>	<i>Nephtys</i> spp. (juv)	<i>Chaetozone setosa</i>	<i>Spio martinensis</i>
Cum % A	34.574	48 936	60 638	70.745	80.851