Arklow Bank Offshore Windfarm Environmental Monitoring
Benthic Ecology Survey Report

June 2006

A Report to HydroServ Projects Ltd

February 2007

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1. INTRODUCTION

Aquatic Services Unit, University College Cork, were requested by Hydroserv projects Ltd., on behalf of Arklow Energy Ltd., to undertake a benthic biological survey as part of a post construction monitoring programme for the Arklow Bank Offshore Windfarm. The following report outlines the work undertaken for this survey. Work for this report was undertaken on 19th June 2006.

The Arklow Bank Offshore Wind Farm lies 13km east of Arklow town and consists of seven 3.6 MW turbines. Construction was begun in 2002 with the building of these seven turbines. However, it is a possibility that large numbers of additional turbines may be built in the general area in the future. A baseline survey of the Arklow bank area and cable route was conducted in 2000-01 (pre-construction), consisting of 3 sampling periods: June 2000, September 2000 and April 2001. Various sampling techniques were used during the baseline survey; the first survey used otter trawls and anchor dredges, while the second two used Agassiz trawls and anchor dredges. Only qualitative data was produced from the anchor dredge samples and species were recorded as present/absent. Plankton was also sampled and temperature/salinity profiles generated.

The initial surveys undertaken in June/July 2004 were taken using Day Grabs, and these encountered severe problems with the hard ground. Subsequent surveys were undertaken using semi-quantitative anchor dredges to assess the benthic infauna and associated sediments. In addition, semi-quantitative beam trawls were used to assess benthic epifauna and benthic fish communities.

The locations of the sampling positions of the current survey are consistent with previous monitoring surveys. These sampling locations were specified by the client and are presented in Figure 1.1. and presented as a table in Table 1.1. These positions are the same as those sampled in the surveys of 2004 (both surveys) and 2005. As reported in the previous survey, the positions of the current stations do not coincide with the positions of the baseline survey.

Beam Trawl Co-ordinates				
	Trawl In		Trawl Out	
	Easting	Northing	Easting	Northing
Trawl 1	698352	5856687	698372	5857043
Trawl 2	703883	5857158	703915	5857717
Trawl 3	706865	5866881	5866441	706996
Trawl 4	708588	5858288	708727	5857667
Trawl 5	703200	5848090	703203	5848737
Trawl 6	703050	5836790	703164	5837584

Anchor Dredge Co-ordinates				
	Dredge In		Dredge Out	
	Easting	Northing	Easting	Northing
D1	695402	5854458	695303	5854408
D2	698107	5854328	697993	5854460
D3	700709	5855464	700573	5855419
D4	702816	5861679	702699	5861667
D5	703258	5864458	703142	5864656
D6	704097	5863608	704073	5863392
D7	704814	5864323	704673	5864486
D8	707378	5866604	707388	5866536
D9	708123	5856767	708375	5856692
D10	708310	5851134	708250	5851108
D11	707015	5846725	706985	5846570
D12	704511	5844545	704525	5844573
D13	703820	5838940	703777	5838721
D14	702059	5844771	702003	5844656
D15	703255	5851143	703237	5851262
D16	706181	5853365	706164	5853427
D17	706205	5858180	706254	5858143
D18	700802	5858202	700720	5858292
D19	697082	5847631	697019	5847713
D20	703657	5857125	703667	5857228

Table 1.1. Positions of the sampling positions for the ongoing monitoring programme at the Arklow Bank Offshore Windfarm. All locations are presented in UTM CM 9°W. Zone 29N.

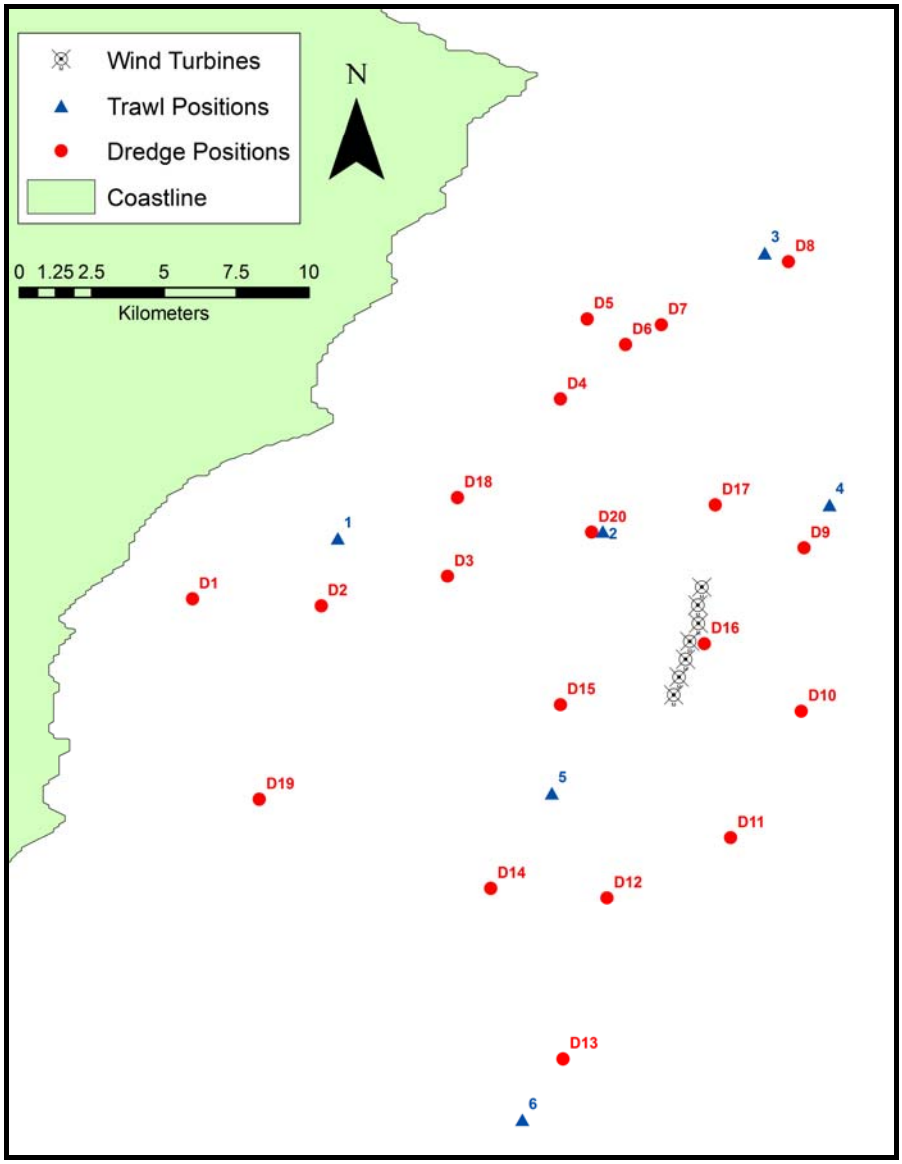


Figure 1.1 Anchor Dredge (● numbered 1 to 20) and Beam Trawl locations (▲ numbered 1 to 6) for the present monitoring survey (June 2006). These stations correspond to locations sampled in June/July 2004; October 2004 and June 2005.

2. METHODOLOGY

All sampling was undertaken from the MV Husky, based out of the Port of Arklow. The present survey was completed in a single day.

2.1 Beam trawls

All trawls were taken using a 2m Beam Trawl, equipped with tickler chains and a 4mm mesh cod-end, as per previous surveys. All tows were 15 mins duration over the ground at a speed of 2 knots, with a warp of 2 ½ times water depth. This equated to a distance of approximately 300m. Once on board, the contents were placed into a sorting table and photographed prior to processing.

Fish species (both commercial and non-commercial) were separated, counted and measured using a graduated fish board before being returned. Elasmobranchs were also counted, measured and sexed prior to being returned. Colonial organisms, such as hydroids, bryozoans etc.) were marked present or absent.

Organisms were identified in the field, where possible. Organisms which were difficult to identify were retained in formalin for later processing. There was no sub-sampling undertaken in the present survey. Where samples were deemed to be too large, larger specimens were identified, counted and returned. All other specimens were retained for later identification and enumeration.

2.2 Anchor Dredge Sampling

At each sample station, a single anchor dredge sample was obtained with no replication of samples. The anchor dredge was deployed 20m in advance of the target and sufficient warp was paid out. The dredge was then dragged through the target to 20m beyond the target point. Where this proved unsuccessful, the process was repeated and the anchor dredge was dragged a further distance.

After successful deployment and retrieval of the anchor dredge, the sample was transferred to a large container. The sample was labelled and photographed. Field notes were taken to include information such as sample number, date and time of sampling, a visual description of the sample, an estimate of the volume of the sample and any other information in relation to the sampling effort.

A small sub-sample (~ 400g) was removed and transferred to a labelled container for Particle Size Analysis. (PSA). This sample was placed in a cooler box whilst aboard the vessel and transferred immediately to a freezer on return to the laboratory until processing.

The remaining dredge sample was the sub-divided into three identical sampling units. Each unit was sieved through a 1.0mm mesh using a gentle puddling motion. Sediment which passed through the sieve was discarded, and the material retained on the sieve was transferred to a labelled container and fixed with 40% buffered formalin to a final concentration of 4% minimum. A waterproof label was then added to the sample bucket and the sample number was written on the outside of the sample container.

As per previous surveys, only one of the three sampling units per site was processed and analysed. Samples were manually sorted by eye, using a binocular microscope where necessary. Sorted samples were then stored in 70% alcohol until identification. Samples were sent to Unicomarine Ltd. for identification (a company which have been implementing the NMBAQC scheme on behalf of its committee since its inception in 1994). Here the samples were identified to species level, where possible, counted and logged. The remaining sub-samples are held in storage.

2.3 Particle Size Analysis (PSA)

On arrival at the laboratory, Particle Size Analysis (PSA) samples were immediately stored in a freezer until processing. Samples were dried to a constant weight at a temperature of 100°C. Prior to dry-sieving, samples were pre-treated using the methods employed by Buchanan and Kain (1984). Dried samples were then sieved through a series of nested sieves (Endecott BS410/1986) using an electronic sieve shaker. A list of sieves used is displayed in Table 2.3.1.

Sediment grainsize distribution and statistics were then calculated for each of the sediment samples using the GRADISTAT package (Blott & Pye, 2001). This package was used to determine the mean and median particle sizes and determination of sorting co-efficient. Each sample was ascribed to a sediment type (Figure 2.3.1) based on Folk (1954) with size division based on the Wentworth Scale (Table 2.3.2). Sorting co-efficient terms are defined in Table 2.3.3.

Sieve Series Sizes (mm)							
4.0	2.0	1.0	0.5	0.25	0.125	0.63	<0.63

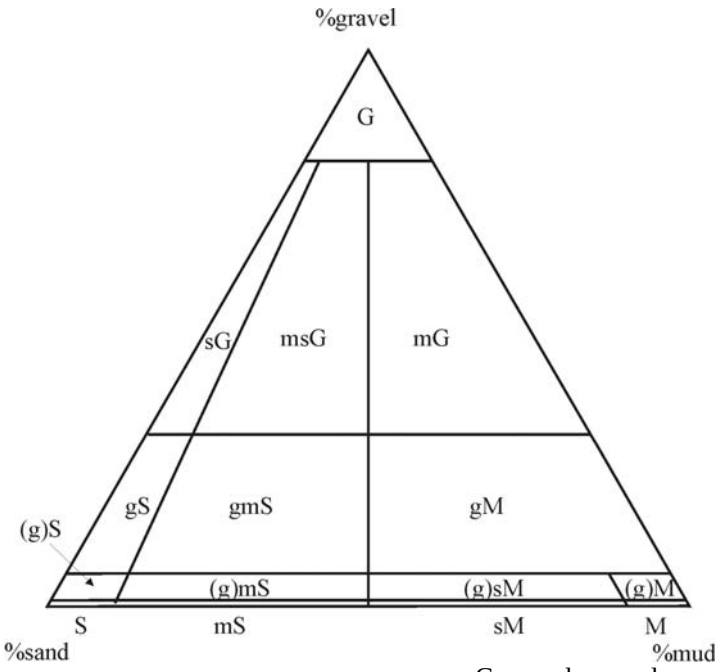
Table 2.3.1 Sieve series sizes (mm) used for particle size analysis (PSA).

Wentworth Scale (mm)	Phi units	Sediment types
>256 mm	<-8	Boulders
64 - 256 mm	-8 to -6	Cobble
4 - 64 mm	-6 to -2	Pebble
2 - 4 mm	-2 to -1	Granule
1 - 2 mm	-1 to 0	Very coarse sand
0.5 - 1 mm	0 - 1	Coarse sand
250 - 500 µm	1 - 2	Medium sand
125 - 250 µm	2 - 3	Fine sand
63 - 125 µm	3 - 4	Very fine sand
<63 µm	>4	Silt

Table 2.3.2 Classification used for defining sediment type (from Buchanan & Kain, 1984).

Standard Deviation of mean Phi	Classification
<0.35	Very well sorted
0.35 - 0.5	Well sorted
0.5 - 0.71	Moderately well sorted
0.71 - 1	Moderately sorted
1 - 2	Poorly sorted
2 - 4	Very poorly sorted
>4	Extremely poorly sorted

Table 2.3.3 Classification used defining degree of sediment sorting (from Buchanan & Kain, 1984).



G = gravel
msG = muddy sandy gravel
gS = gravelly sand
gM = muddy gravel
(g)mS = slightly gravelly muddy sand
(g)M = slightly gravelly mud
mS = muddy sand
M = mud

sG = sandy gravel
mG = muddy gravel
gmS = gravelly muddy sand
(g)S = slightly gravelly sand
(g)sM = slightly gravelly sandy mud
S = sand
sM = sandy mud

Figure 2.3.1 Sediment classification after Folk (1954) as also used by the BGS. "Gravel" is greater than 2mm and "mud" is less than 63µm.

2.4 Data Analysis

On completion of the sample processing and identification the data was analysed using a variety of univariate and multivariate analyses to determine community structure and assess change compared to previous surveys.

As stated in the previous report (Hydroserv, 2006), different types of sampling gear have been used in previous surveys, as well as different levels of species identification. Therefore the present report will compare the current dataset against the previous two surveys (Hydroserv 2006 for the June 2005 survey and Hydroserv 2005 for the October 2004 survey). Statistical analysis between the previous surveys and the baseline survey have been undertaken in the previous surveys and will not be addressed in the current report.

Multivariate analysis was performed on the raw datasets using PRIMER *v* 5 (Clarke & Warwick, 1994). The data was subjected to a variety of multivariate analyses, including non-metric Multi Dimensional Scaling (MDS).

2.4.1 Beam Trawls

In the present survey, as in previous surveys, a total of 6 beam trawls taken across the survey area. Although this number of trawls is quite small and results from multivariate analysis can only be described as descriptive, it was considered a useful exercise to compare against the results of the previous surveys.

Square-root transformations were performed on the abundance data with colonial organisms removed. In addition the beam trawl data was subjected to analysis on the presence/absence dataset including all identified taxa.

2.4.2 Anchor dredge samples

As in previous reports, a variety of univariate, multivariate and graphical techniques were used to provide the information concerning species diversity and community structure.

Multivariate analysis was based on square-root transformed abundances of species present, which allows for a sensible balance between the rare and common species. Multi-Dimension Scaling (MDS) ordination was based on the Bray-Curtis similarity coefficient. Stress values are provided for each MDS plot. It is important to note that these stress values represent the relationship between the various samples. In brief, a stress value of <0.05 indicates that there is an excellent representation of the relationship between the various samples, <0.1 indicates good ordination and <0.2 indicates a potentially useful 2-dimensional picture (Clarke and Warwick, 1994). In order to investigate the effect of the environmental data on the stations, sample clustering determined from the above analysis was repeated with mean sediment particle size superimposed.

The initial monitoring report (Hydroserv, 2004) compared pooled replicates between the sites taken with a $0.1m^2$ Day Grab. This information was compared to information obtained in the baseline survey of 2000. Anlaysis indicate that comparisons between these two surveys were incompatible due to inherent differences in the sampling equipment used. A resurvey was undertaken in October 2004 using the current sampling methodology (anchor dredge and beam-trawl sampling methods). This report indicated that the assemblages reported in October 2004 were broadly similar to those identified in the baseline survey (Ecoserve, 2001), although direct comparisons were difficult due to the different sampling methods used (Hydroserv 2005). Last years report (Hydroserv, 2006) analysed the data of June 2005 against the data of October 2004. In addition, comparisons were also made against the September 2000 data.

3. RESULTS

3.1 Beam Trawls

Raw data from the beam trawls are presented in Appendix 6.3, in addition to information on fish species and lengthsd. A total of 98 taxa were identified in the present survey. Of these 98 taxa, 14 were fish species. The total number of taxa is considerably higher than the June 2005 (47 taxa) and the October 2005 (51 taxa) surveys.

The number of fish species and abundances found at each trawl location in October 2004, June 2005 and the present survey are presented in Figures 3.1.1 and 3.1.2. The total number of fish taxa identified in the present survey (14 species) is similar to both previous surveys (13 – June 2005 and 9 – October 2004). In total, the number of fish caught in the present survey (55 individuals) is marginally lower than both previous surveys (74 – June 2005 and 80 – October 2004). In the present survey, the inshore station, Trawl 1, had the highest number of species. However, the furthest east station (Trawl 4) had the highest abundances. This is as a result of the presence of 15 Butterfish (*Pholis gunnellus*) and 8 Pogge (*Agonus catophractus*). Overall, with the exception of trawl station 4, fish abundances are quite low, ranging from 1 individual in trawl station 3 to 10 individuals in trawl station 6.

Important commercial fish were limited to 3 Dab (*Limanda limanda*), 3 Whiting (*Merlangius merlangus*), 6 Plaice (*Pleuronectes platessa*), 1 Thornback Ray (*Raja clavata*), 2 Lesser Spotted Dogfish (*Scylliorhynus caniculus*), 1 Sole (*Solea solea*) and 1 Thickback Sole (*Microchirus variegates*). Only three elasmobranchs were caught in the present survey compared to 4 in the previous survey and 3 in October 2004.

As mentioned in previous reports, the use of small (2m) beam trawls are a far from ideal survey method for fish sampling. However, it has been shown to be quite effective for most bottom dwelling fish species (ICES 2003). Results from the present survey concur with findings in the previous reports in that benthic fish populations are quite low in surveyed area.

The beam trawl surveys yielded a total of 98 faunal species, which was considerably higher than that recorded in June 2005 (36 taxa) and October 2004 (42 taxa). Total numbers of countable organisms was also increased from last year (from 541 in 2005 to 1783 in the present survey). In addition, eleven species were found in numbers $\geq$ 20 over the whole survey area. A complete list of the most countable faunal species identified in the present survey is presented in Table 3.1.1.

The highest numbers of taxa encountered at the trawl sites were found at trawl stations 4 and 5 (47 and 50 taxa respectively). These stations also had the highest number of countable taxa (41 and 39 respectively), mirrored in the highest number of individuals at these two stations (1220 and 314 respectively). This was caused by the presence of a *Sabellaria* reef at trawling station 4, with 615 individual worms being recorded, as well as 227 reef dwelling *Pisidia longicornis*. High densities at trawl station 5 was caused by the occurrence of two shrimp species, *Crangon almani* and *Pandalus montagui*, as well as elevated numbers of the urchin species, *Psammechinus miliaris*.

The *Sabellaria* reef encountered in trawl station 4 is marked as absent in June 2005 and recorded as occasional in the October 2004 survey. 106 individuals were recorded in June 2004 (Hydroserv, 2004). These biogenic structures exist for many years, and as such it is unlikely that this is a new record for the area. It is likely that previous surveys missed sampling through the reef as a result of the localised spatial distribution of the reef.

	June 2006	June 2005	October 2004
Sabellaria alveolata	668	0	0
Pisidia longicornis	238	4	1
Pandalus montagui	187	65	99
Psammechinus miliaris	130	162	464
Aequipecen opercularis	118	0	0
Pagurus bernhardus	69	95	583
Crangon almanni	53	38	130
Asterias rubens	39	8	100
Macropodia rostrata	36	28	128
Ascidia conchilega	30	0	4
Antedon bifida	20	0	0
Liocarcinus (juv)	19	0	0
Pholis gunellus	15	0	0
Buccinum undatum	11	24	43
Calliostoma zizyphinum	11	1	2
Agonus catophractus	10	4	0

Table 3.1.1 Numbers of the most common countable faunal species found in the June 2006, June 2005 and October 2004 beam trawl surveys

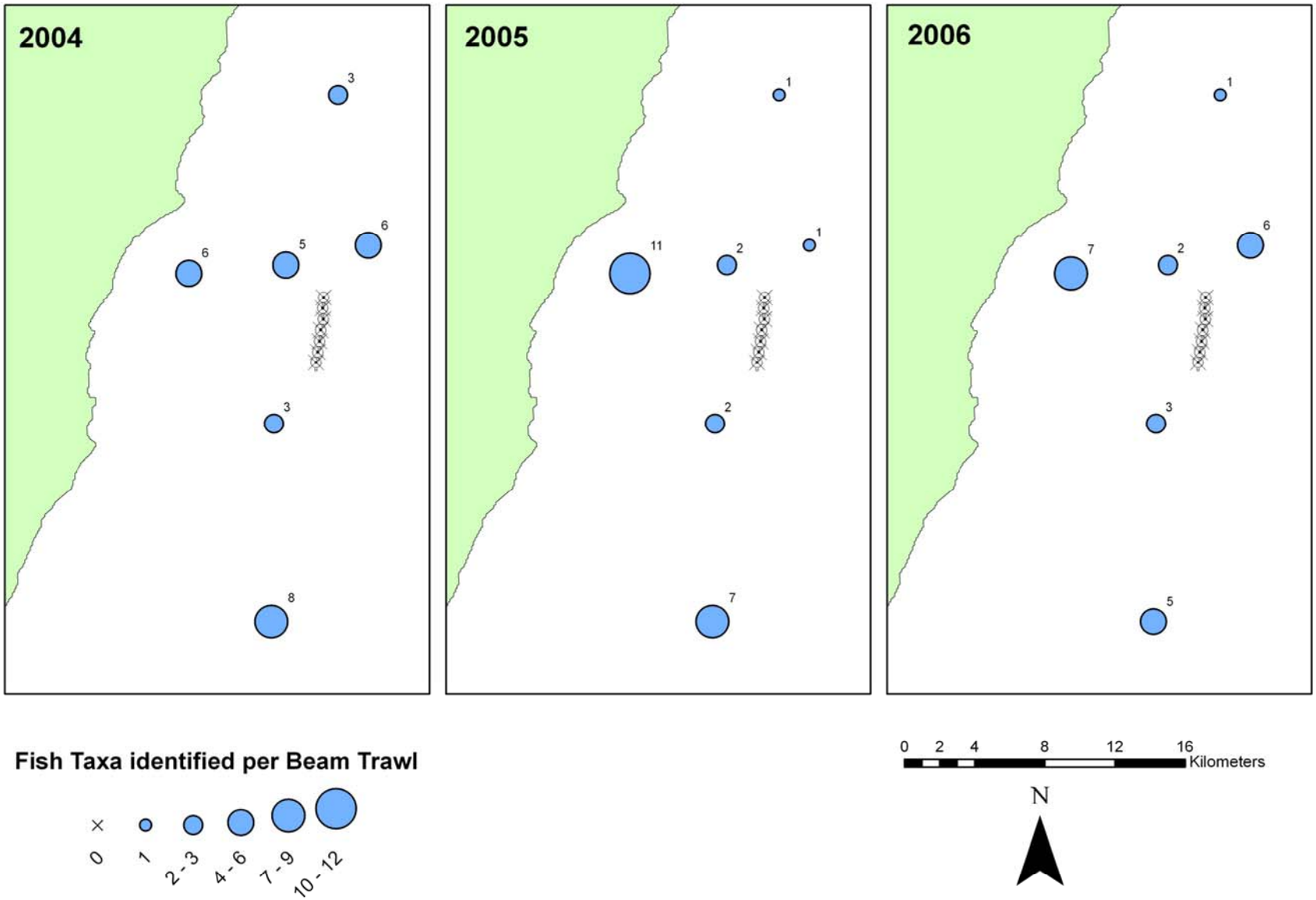


Figure 3.1.1 Total number of fish taxa per trawl site (October 2004, June 2005 & June 2006)

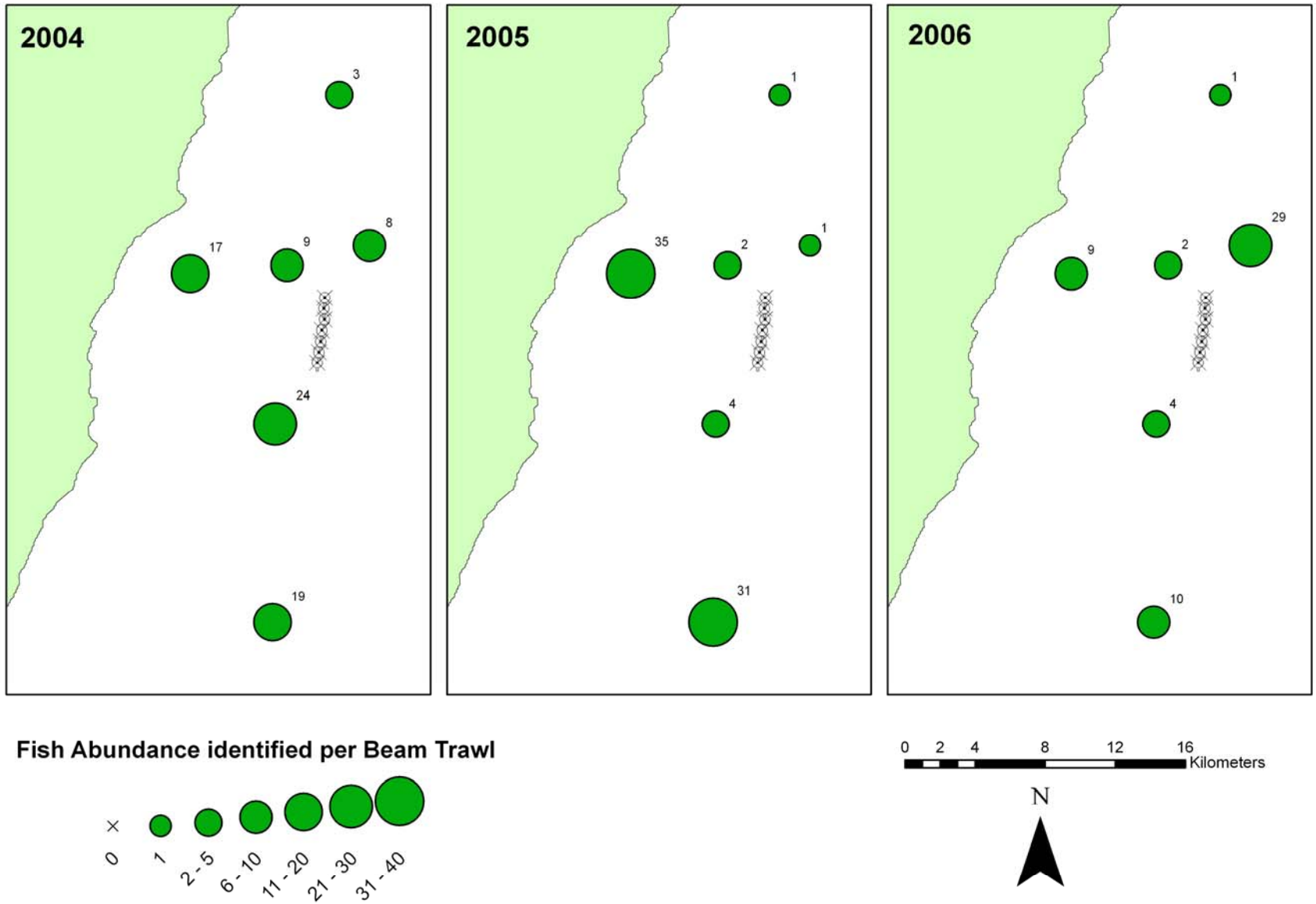


Figure 3.1.2 Total number of fish per trawl site (October 2004, June 2005 & June 2006)

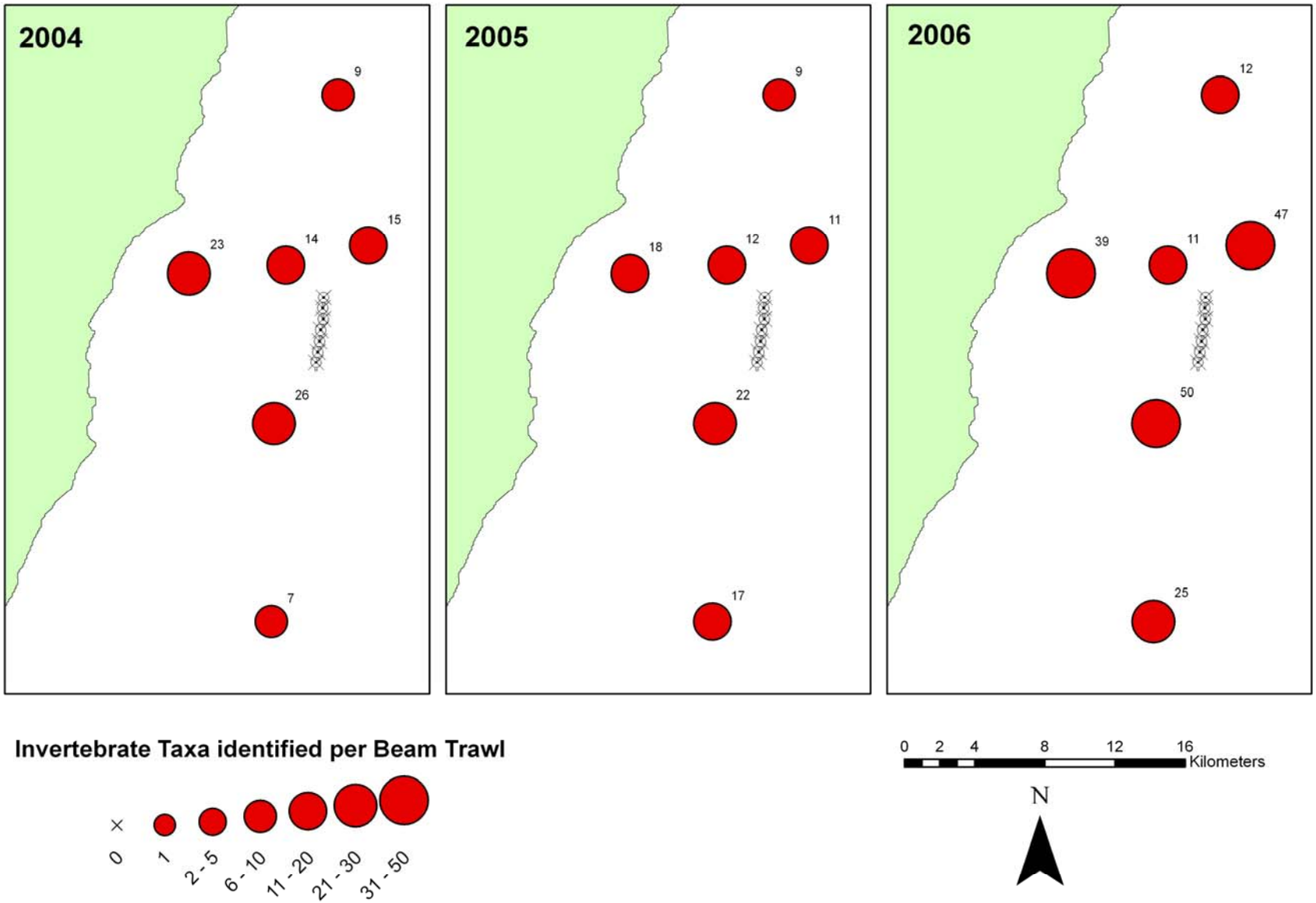


Figure 3.1.3 Total number of invertebrate taxa per trawl site (October 2004, June 2005 & June 2006)

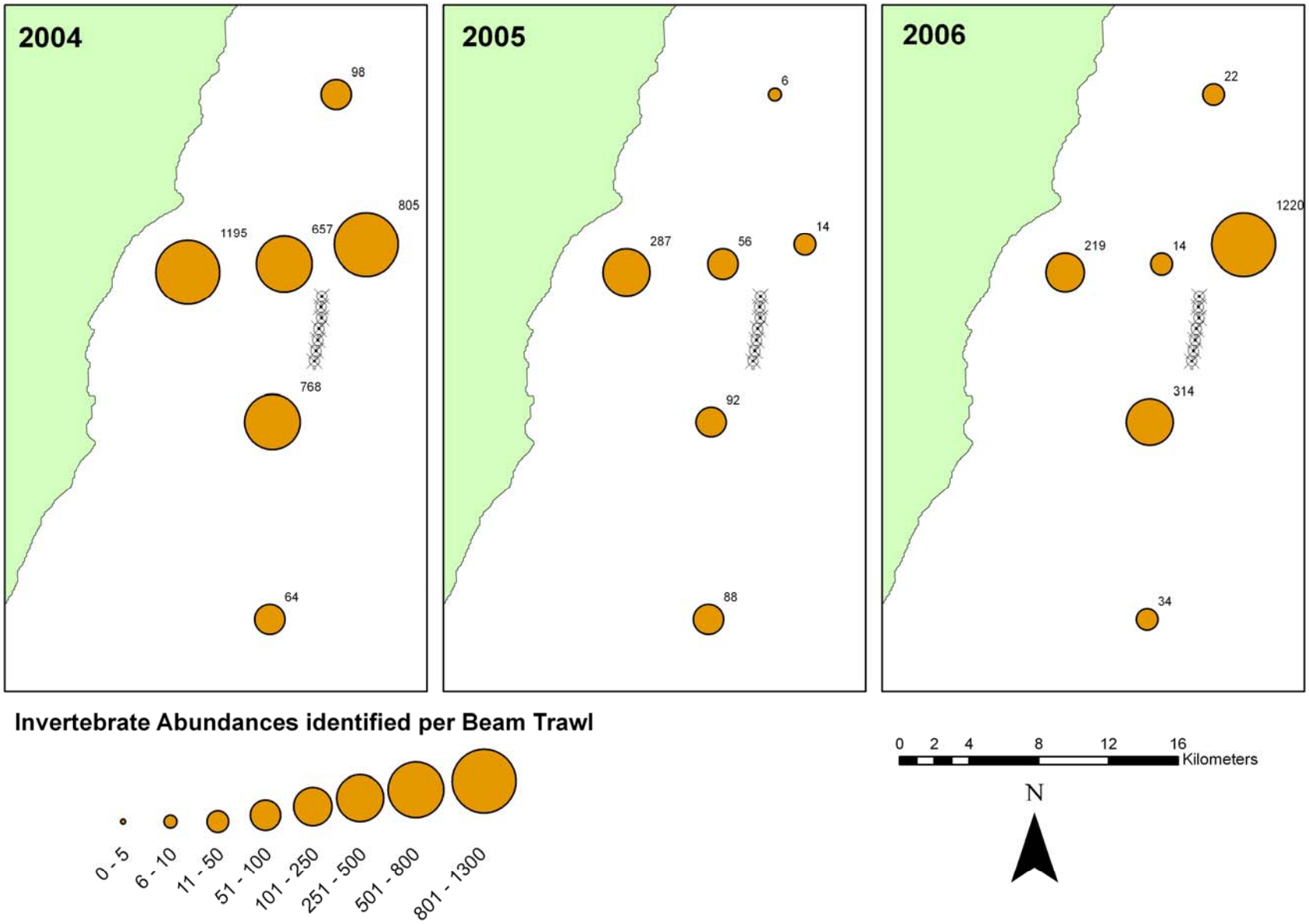


Figure 3.1.4 Total number of countable invertebrates per trawl site (October 2004, June 2005 & June 2006)

A multivariate analysis of the community structure reveals two distinct communities, based on both the presence/absence dataset (Figure 3.2.5) and the dataset with colonial organisms removed (Figure 3.1.6). These two communities do not appear to be related to geographical proximity to the development and are likely a reflection of the prevalent sedimentary conditions at each of the locations.

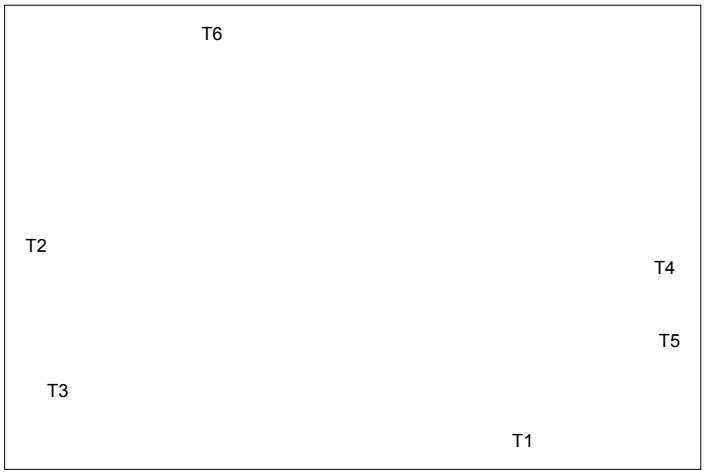


Figure 3.1.5 Multivariate analysis (nMDS plot) on the 2006 trawl data (Stress = 0.01). The results from analysis of the countable fauna is not shown, but results were similar (Stress = 0.01)

A comparison of the trawl data across the last three surveys reveals very little pattern (Figure 3.1.6). Overall, data from 2004 and 2005 are more similar to each other, than some of the stations from 2006. This is most likely linked to the presence of more numerous taxa in the 2006 trawl dataset. It is not currently known whether this is a true increase in biodiversity, or of a reflection of some taxa being missed in previous surveys. It must also be acknowledged that single beam trawls are not an optimal survey strategy as a result of gear selectivity and differential returns, but also due to small positioning induced error, and as such a degree of caution must be exercised in interpreting the results.

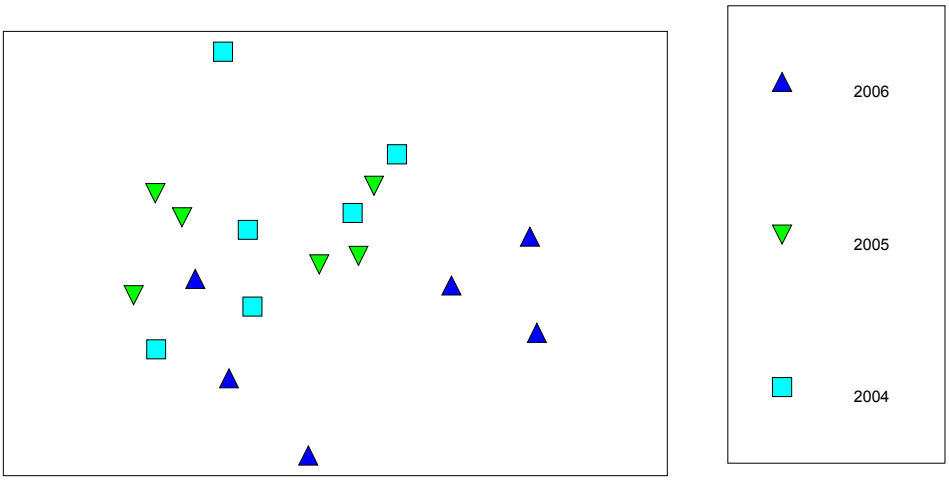


Figure 3.1.6. Comparison of trawl dataset (presence-absence only) across the 2004, 2005 and 2006 surveys.

3.2 Anchor Dredge Samples

3.2.1 Particle Size Analysis

Data is presented in full for the particle size analysis in Appendix 6.6. Table 3.2.1 also presents a summary of the results and a visual assessment based on the on-board field notes. As can be seen from the results, there is an extensive range of sediments present within the survey area (Figure 3.2.1). These sediments range from very well sorted fine gravels (at one location) to moderately sorted fine sands (at one location), with a range of types in between. The reported distribution and generalised pattern is consistent with those reported for previous surveys. A distribution map of the sediment data is presented in Figure 3.2.2. As can be seen, all sites which are present on top of the Arklow bank consist of well sorted medium sands. The sites immediately north (station 8) and south (station 12) of the bank also contain medium sand, though station 8 is considered poorly sorted. As previously reported, the deeper stations both inshore and offshore of the bank, consist of coarser materials. However, there is some variation between the results obtained in the present survey against those presented for 2005. Station 6 is recorded as sand in the present survey, although it should be noted that this site had live shells removed prior to particle size analysis. In addition, Station 5 which as recorded as gravel in 2005 has been classified as sandy gravel in the present survey. It is also possible that this variation in PSA results may reflect some local heterogeneity in the sediment within the survey area.

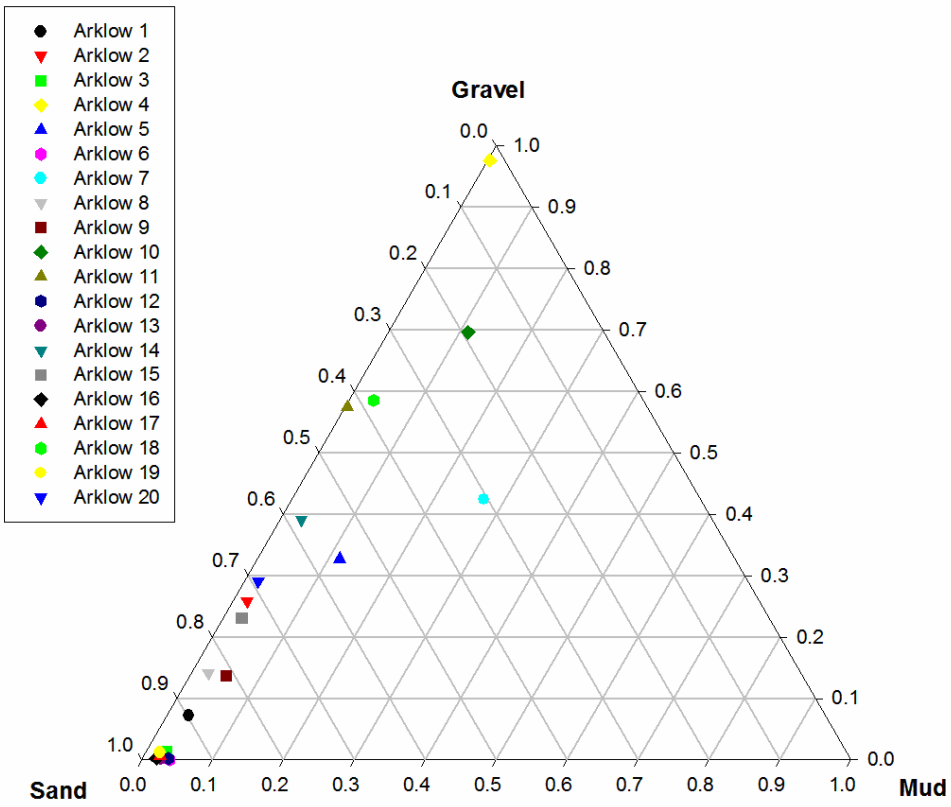


Figure 3.2.1 Ternary plot of PSA results from June 2006 Survey.

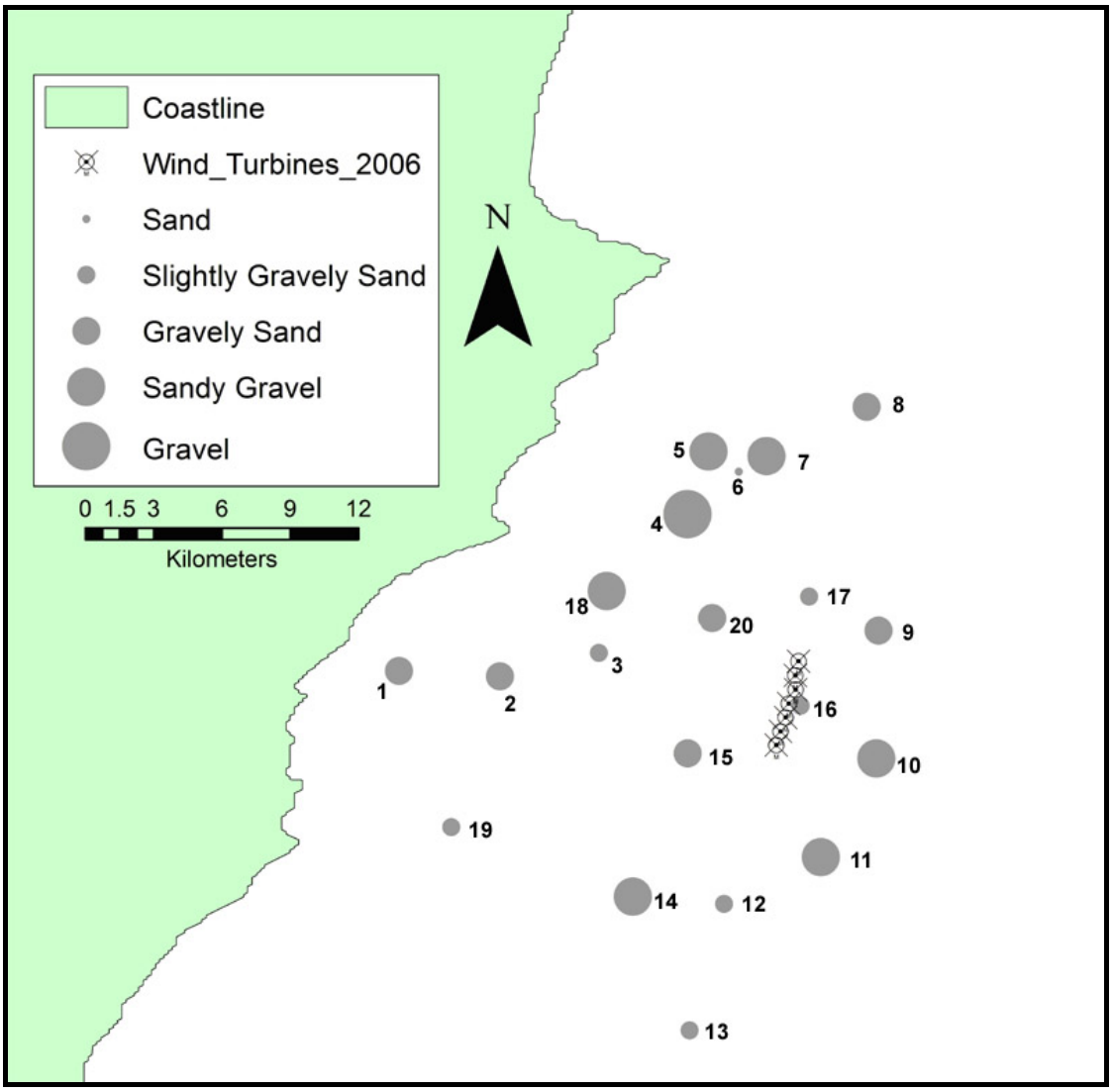


Figure 3.2.2 Distribution of sediment type as determine from the anchor dredge samples in June 2006. Site numbers are shown**.**

Site Code	Classification after Buchanan	Textural Group (June 2006)	Textural Group (June 2005)	Visual assessment
1	Poorly sorted fine sand	Gravely Sand [gS]	Gravely Sand [gS]	Gravely Sand containing some shell
2	Very poorly sorted coarse sand	Gravely Sand [gS]	Gravely Sand [gS]	Large amounts of fine shell gravel in sand
3	Well sorted fine sand	Slightly Gravely Sand [(g)S]	Sand [S]	Sand
4	Very well sorted fine gravel	Gravel [G]	Sandy Gravel [sG]	Gravel and cobbles with associated epifauna
5	Very poorly sorted coarse sand	Sandy Gravel [sG]	Gravel [G]	Sandy gravel with records of *Psammechinus*, tubeworms and large cobbles.
6	Moderately sorted fine sand	Sand [S][1]	Gravely Sand [gS]	Gravely sand with amounts of shell present
7	Very poorly sorted medium sand	Sandy Gravel [sG]	Sandy Gravel [sG]	Gravel with *Flustra* present
8	Poorly sorted medium sand	Gravely Sand [gS]	Slightly Gravely Sand [(g)S]	Sand with occasional shell fragments
9	Poorly sorted medium sand	Gravely Sand [gS]	Slightly Gravely Sand [(g)S]	Sandy gravel. *Asteria* present, in addition to tubeworms and shells
10	Very poorly sorted medium sand	Sandy Gravel [sG]	Sandy Gravel [sG]	Gravel with large cobbles present. Associated epifauna also present.
11	Very poorly sorted medium sand	Sandy Gravel [sG]	Sandy Gravel [sG]	Sandy gravel, some tubeworms present on gravel
12	Moderately well sorted medium sand	Slightly Gravely Sand [(g)S]	Sand [S]	Fine sand
13	Well sorted medium sand	Slightly Gravely Sand [(g)S]	Sand [S]	Coarse sand
14	Very poorly sorted coarse sand	Sandy Gravel [sG	Sandy Gravel [sG]	Sandy gravel, some shell
15	Poorly sorted coarse sand	Gravely Sand [gS]	Gravely Sand [gS]	Shell gravel in fine sand
16	Moderately well sorted medium sand	Slighlty Gravely Sand [(g)S]	Slightly Gravely Sand [(g)S]	Sand
17	Well sorted medium sand	Slighlty Gravely Sand [(g)S]	Slightly Gravely Sand [(g)S]	Sand
18	Very poorly sorted very coarse sand	Sandy Gravel [sG]	Sandy Gravel [sG]	Sandy Gravel, some muddy lumps in sand matrix
19	Well sorted fine sand	Slighlty Gravely Sand [(g)S]	Slightly Gravely Sand [(g)S]	Sand, with occasional muddy clumps. *Asteria* present.
20	Poorly sorted coarse sand	Gravely Sand [gS]	Gravely Sand [gS]	Gravelly Sand and pebbles.

Table 3.2.1 Classification of sediment types at June 2006 grab stations according to methods after Buchanan & Kain and Folk & Ward, as used by BGS (see methods), together with visual assessment of sediments from notes taken at the time. Folk and ward classification for the June 2005 survey is also given for comparison.

[1] Large shell were removed from the PSA prior to dry sieving

3.2.2 Biota

Results from the June 2006 survey are presented here. In addition, comparisons have been made with the results obtained in the June 2005 and October 2004 Anchor Dredge surveys. No comparisons were made with the June/July 2004 survey which was undertaken using a 0.1m^2 Day Grab as the sampling methodologies were deemed too dissimilar to allow for meaningful comparisons to be made (see previous reports [Hydroserv 2005 and Hydroserv 2006]).

3.2.2.1 Abundance and diversity

A full taxonomic list of all species identified for the June 2006 survey is presented in Appendix 6.2. The full data matrix, including abundance data is presented in Appendix 6.5. In total, there were 24,779 individuals from 262 countable taxa recorded in the present survey. There were an additional 55 colonial taxa recorded, resulting in 317 taxa in total recorded in June 2006. This is considerably lower than than the numbers of countable taxa and their total abundances from the two previous surveys (49,811 individuals from 346 countable taxa inJune 2005 and 31,919 individuals from 300 taxa in October 2004). At present it is not known whether this represents an annual or seasonal trend, or whether it is local variation as a result of the sediment heterogeneity.

The large decrease in numbers are as a result of several species which were present in previous surveys being absent or much reduced in the present dataset. *Mytilus edulis* which was present in large numbers at Station 6 in 2005 (4,908) was much reduced in the current dataset (297). In addition, large numbers of *Sabellaria* spp. which were present in 2004 and 2005 at stations 6 (3,589 in June 2005; 3,200 in October 2004) & 9 (322 in June 2005; 1440 in October 2004) are also much reduced in the current dataset (0 at station 6 and 594 at station 9). However, it should be noted that 290 *Sabellaria* spp. were recorded for station 7 in the present survey compared to 204 in June 2005 and 8 in October 2004.

The total number of taxa and individuals recorded at each station is presented in Figure 3.2.3 (number of taxa) and Figure 3.2.4 (number of individuals). The general trend observed in 2004 and 2005 is reflected in the current survey. The stations immediately to the north and south of the the Arklow Bank are again particularly poor in both species and abundances. In addition, the stations which are offshore of the Arklow Bank and a band of stations which are present along the north-west edge of the survey area are much richer in taxa and abundances (Table 3.2.2).

Overall, values for Margalef's species richness have reduced in 19 of the 20 stations. The largest difference occurred at station 6, where there was a large reduction in both species number and taxa. The large decrease in species can be attributed in part to the zero abundances which have been recorded for *Sabellaria* spp. There was also a much reduced abundance recorded for the mussel *Mytilus edulis*.

An examination of the most abundant taxa (Table 3.2.3) also reveals significant differences against both previous surveys. Only 17 species were present with greater than 70 individuals across the survey area. This is much smaller than the figure reported in 2005 (35 taxa) but is only marginally smaller than the figure reported in 2004 (19).

It is also interesting to note that the large increases in abundances across both years are as a result of very high abundances of the most abundant individuals (*Pomatoceros triqueter/lamarcki*, *Sabellaria* spp. and *Mytilus edulis*). These species are recorded for the present survey, however at much reduced abundances. The reason for this variation is not clear; however it may partly be explained by seasonal/annual variation and also sediment heterogeneity, as evident in comparisons with the particle size data from previous surveys.

3.2.2.2 Multivariate analysis

All multivariate analysis was undertaken using the statistical packagae PRIMER *v* 5.

Non-metric multi-dimensional scaling (MDS) analysis was performed on the 2006 dataset. Figure 3.2.7 shows the relationships between the different stations. As can be seen from Fig. 3.2.7 a & b, sites 2,4,5,7,9,10,11,14 and 18 all have very similar communities (which was also evident in the 2005 dataset). All these sites have a relatively large gravel component, and if the sediment type is superimposed over the MDS plot (Figure 3.2.7.c) then it is clear that this large gravel component has a very clear structuring role in this community type. These closely clustering sites are characterised by the presence of large numbers of epifaunal invertebrates such as the tubeworm *Pomatoceros lamarcki*, the tunicate *Dendrodoa grossularia*, the barnacle *Balanus crenatus*, the long-clawed porcelain crab *Pisidia longicornis* and the chiton *Leptochiton asellus*. In addition, these sites also contain relatively high numbers of the colony forming tubeworms *Sabellaria* spp. and *Serpulidae* sp. All these species are typical of hard benthos, containing large volumes of coarse gravel, cobble and bedrock.

The sandier sites did not cluster well together. With the exception of stations 1, 2 & 6 all these stations consisted of <20 individuals per dredge. Station 8 returned 0 fauna in the present survey. Station 12 returned 2 individuals; 1 *Lumbrineris gracilis* and 1 *Gastrosaccus spinifer*. Station 16 only returned a single specimen of *Lagis koreni*. The reduced diversity evident at these sites is reflected in the poor community structure seen here.

This pattern is very similar to those observed in the October 2004 and June 2005 surveys. In these surveys, the gravel sites clustered close together, dominated by rich and diverse faunal abundances. The sandier sites showed little similarity, reflecting the species poor nature of these habitats. A comparison of the three sampling years together (Figure 3.2.8) shows that all the gravel sites tend to cluster together, indicating a relatively good degree of similarity in community structure. However, the sandier locations tended to show little structure, reflecting the poor species diversity at these sites. As can be seen from the results there is very little similarity between the sandier sites across the years. This appears to be as a result of the random nature of the sampling at these sites and the sparse nature of the fauna found there.

No analysis was undertaken using the present dataset against the baseline data. As reported previously, there was no similarity between the data from the baseline survey in 2000 and that undertaken in October 2004 and June 2005. As such it was deemed unnecessary to continue this comparison using the present dataset.

However, broad similarities do exist between the data obtained in the baseline survey and those obtained in the present survey. As previously reported, both surveys found very sparse communities within the mobile sands, and species rich communities within the gravely sediments.

	Number of Taxa (S)	Number of Individuals (N)	Simpson's Dominance Index (d)	Shannon-Wiener Diversity Index (H')	Margelef's Species Richness (Dmg)
D1	30	68	6.87	3.14	6.87
D2	36	179	6.75	2.47	6.75
D3	7	8	2.89	1.91	2.89
D4	64	12896	6.66	0.29	6.76
D5	107	4531	12.6	1.21	12.70
D6	12	347	1.88	0.687	1.88
D7	78	1433	10.6	2.83	10.90
D8	0	0	-	-	-
D9	76	1159	10.6	2.48	10.60
D10	64	374	10.6	2.93	10.60
D11	44	200	8.12	2.69	8.12
D12	2	2	1.44	0.693	1.44
D13	8	9	3.19	2.04	3.19
D14	103	743	15.4	3.63	15.3
D15	5	13	1.56	1.33	1.56
D16	1	1	-	-	-
D17	2	2	1.44	0.693	0.91
D18	87	2793	10.8	1.66	11.00
D19	4	17	1.06	0.885	1.06
D20	4	4	2.16	1.39	2.16

Table 3.2.2 Univariate descriptors of abundance and richness in the 20 dredge samples from June 2006. No individuals were returned for Dredge Station 8.

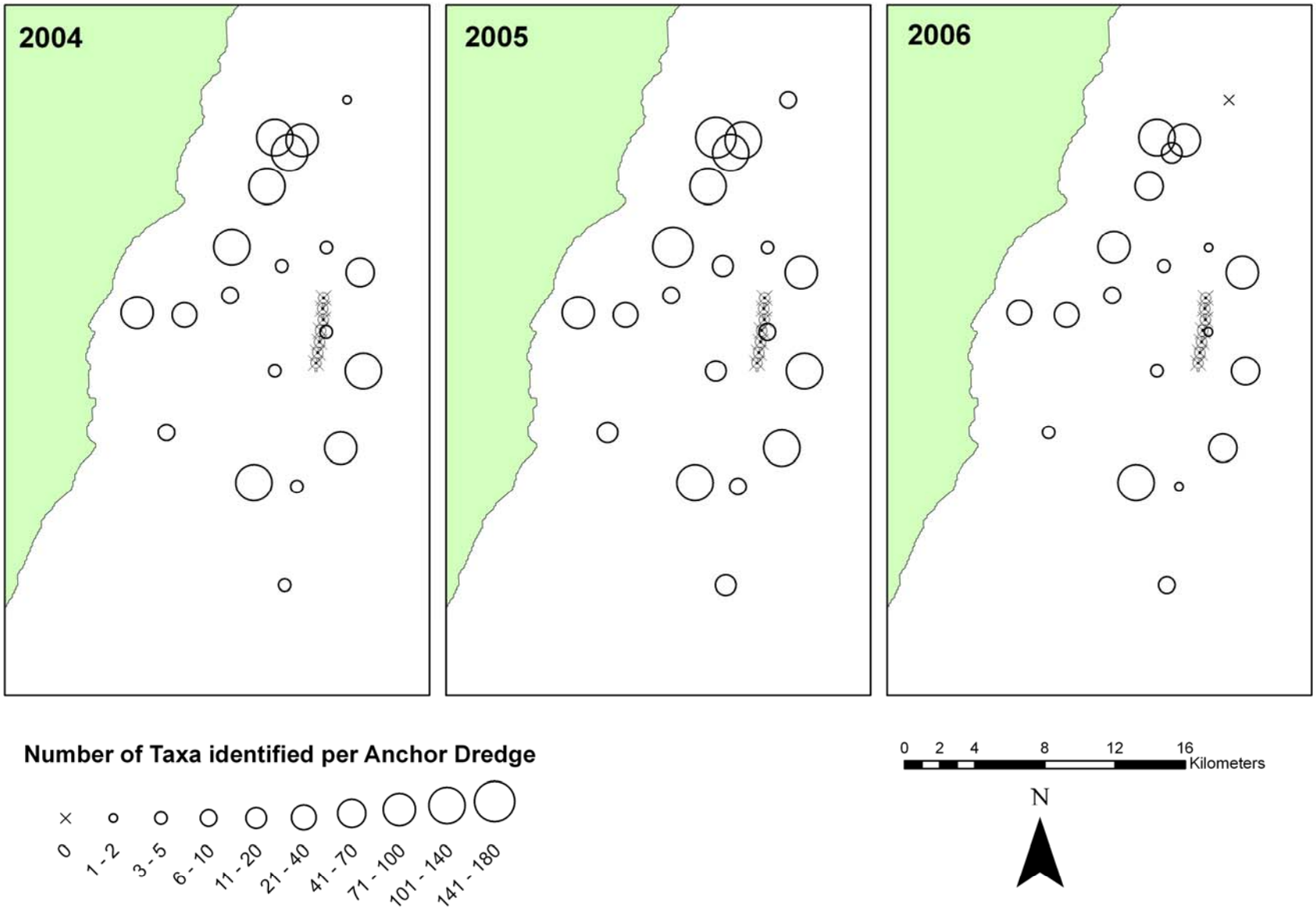


Figure 3.2.3 Total number of taxa per anchor dredge site (October 2004, June 2005 & June 2006)

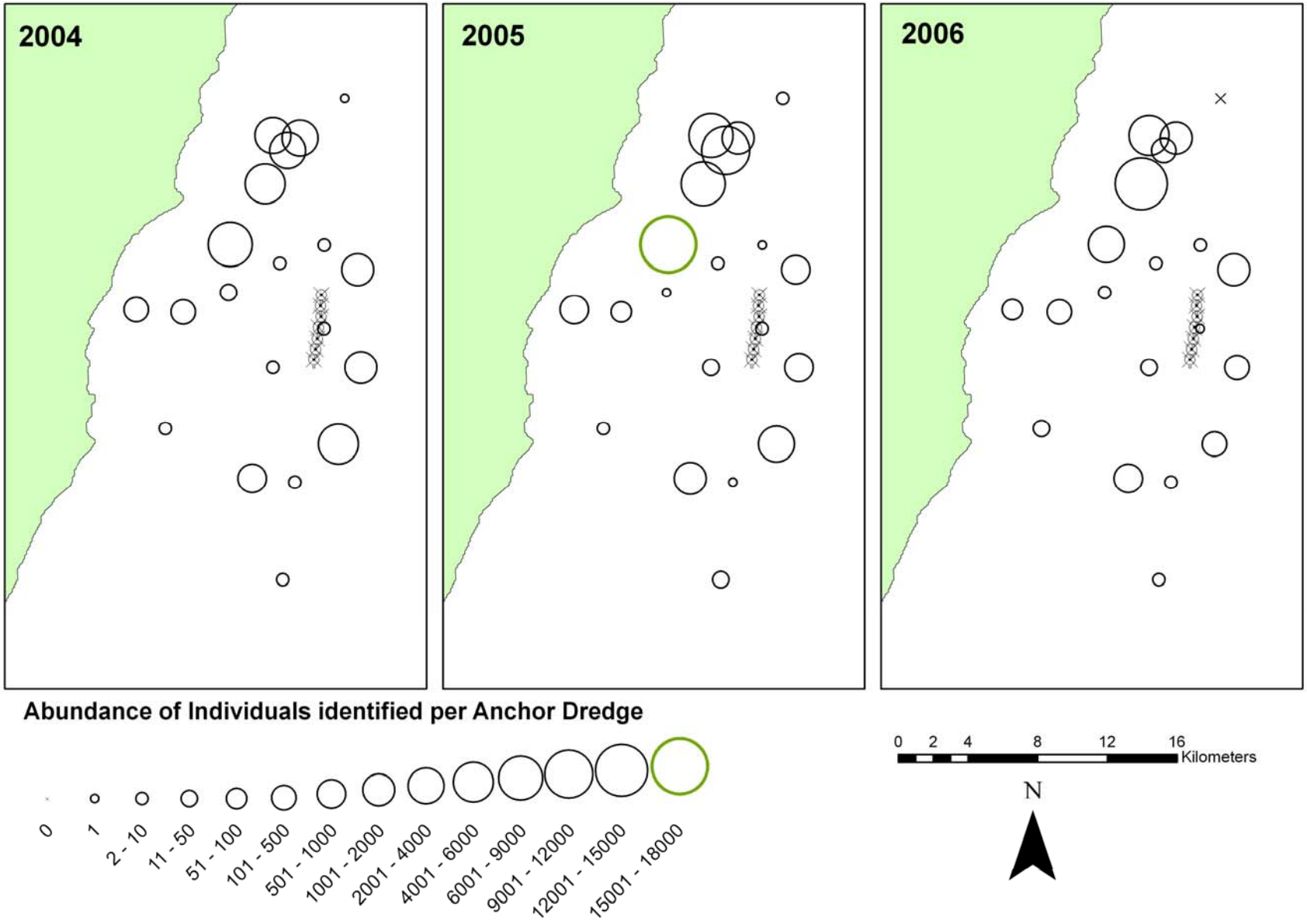


Figure 3.2.4 Total number of countable invertebrates per anchor dredge site (October 2004, June 2005 & June 2006)

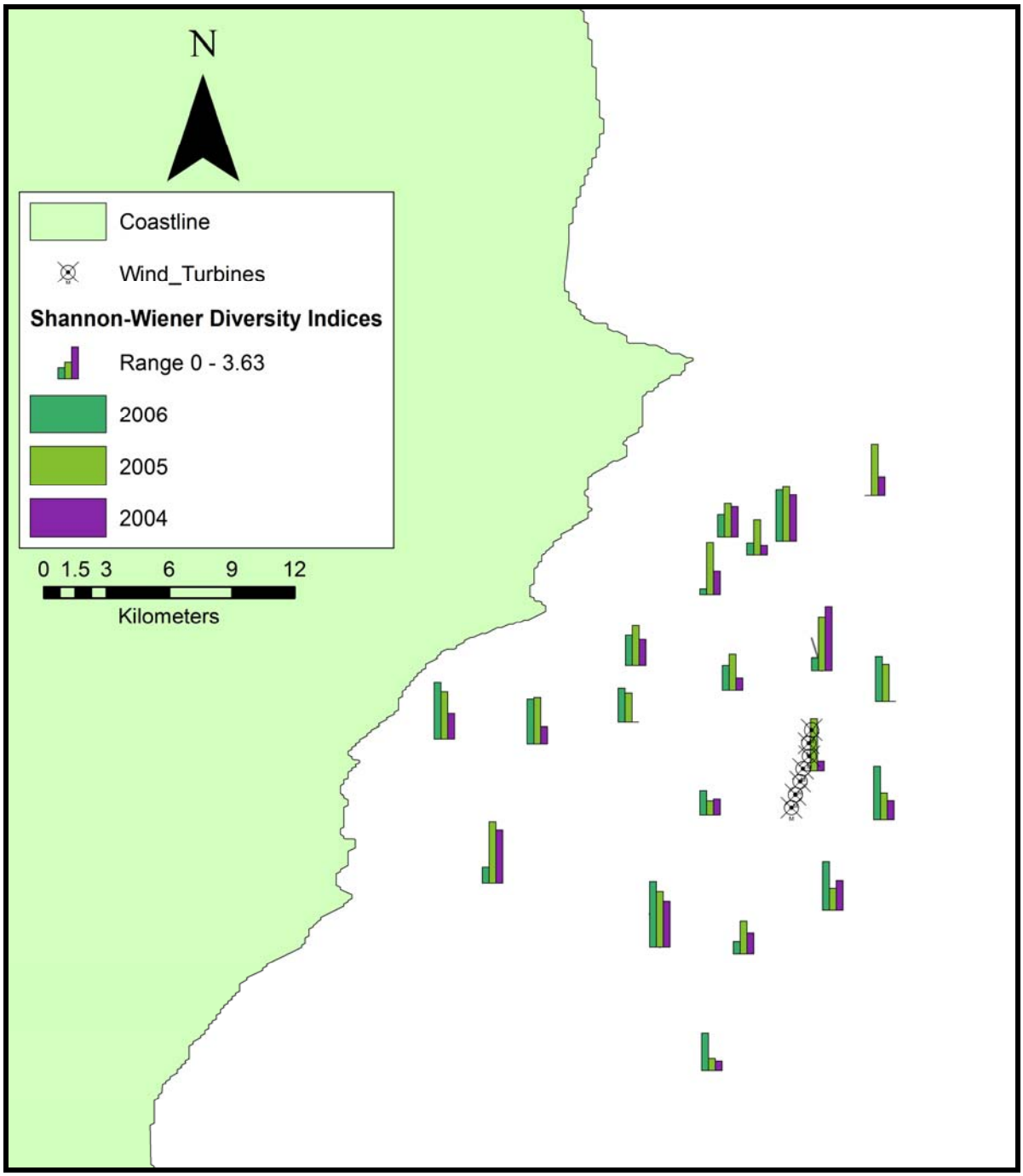


Figure 3.2.5 Shannon Wiener diversity indices per anchor dredge site (October 2004, June 2005 & June 2006)

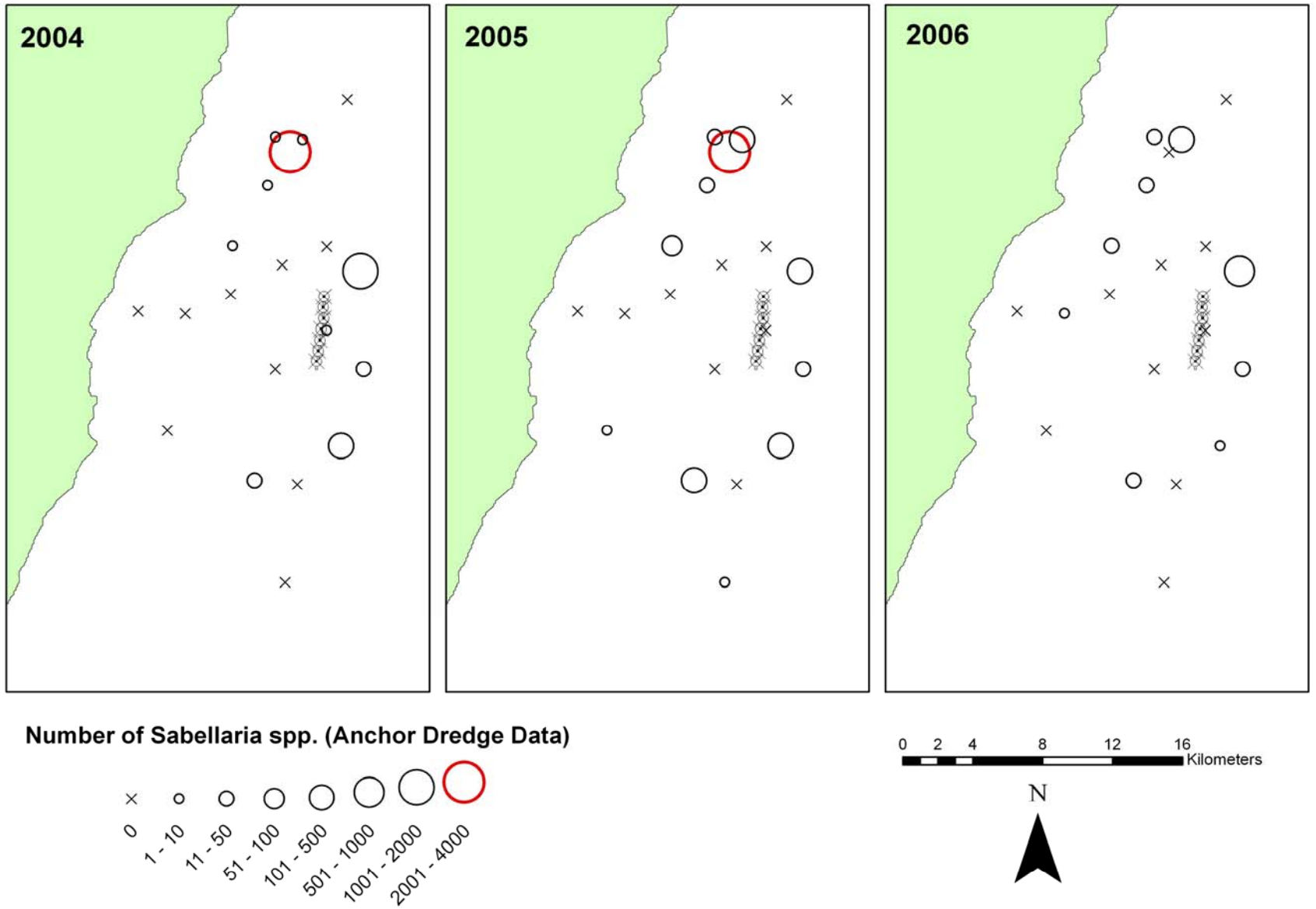


Figure 3.2.6 Total number of *Sabellaria* spp found at each dredge sample site in October 2004 and June 2005

			1	2	3	4	5	6	7	9	10	11	12	13	14	15	16	17	18	19	20	Total
Annelid	Serpulidae	*Pomatoceros lamarcki*	0	52	0	12312	3632	0	435	12	75	18	0	0	21	0	0	0	1810	0	0	18367
Annelid	Serpulidae	*Serpulidae sp.*	0	0	0	312	126	0	109	7	11	7	0	0	20	0	0	0	220	0	0	812
Tunicata	Styellidae	*Dendrodoa grossularia*	0	51	0	22	38	0	115	166	71	76	0	0	62	0	0	0	54	0	0	655
Annelid	Sabellaridae	*Sabellaria spinulosa*	0	1	0	17	14	0	170	232	42	7	0	0	23	0	0	0	18	0	0	524
Annelid	Sabellaridae	*Sabellaria alveolata*	0	0	0	8	0	0	120	362	0	0	0	0	0	0	0	0	0	0	0	490
Mollusc	Nuculidae	*Nucula nucleus*	0	0	2	12	106	11	8	0	1	0	0	0	5	0	0	0	251	0	0	396
Mollusc	Mytilidae	*Mytilus edulis*	0	0	0	9	0	297	17	1	1	0	0	0	0	0	0	0	0	0	0	325
Mollusc	Scrobicularidae	*Abra alba*	6	1	0	0	4	18	7	26	4	1	0	0	102	0	0	0	1	0	0	170
Mollusc	Leptochitonidae	*Leptochiton asellus*	0	1	0	14	15	0	8	2	42	7	0	0	61	0	0	0	18	0	0	168
Annelid	Maldanidae	*Clymenura johnstoni*	1	4	1	2	63	0	14	0	2	11	0	0	35	1	0	0	24	0	0	158
Crustacea	Urothoidae	*Urothoe elegans*	1	2	1	8	10	6	47	2	0	0	0	0	0	0	0	0	78	0	0	155
Crustacea	Porecellanidae	*Pisidia longicornis*	0	0	0	3	6	2	27	101	1	0	0	0	5	0	0	0	1	0	0	146
Annelid	Serpulidae	*Pomatoceros triqueter*	0	0	0	24	96	0	0	0	0	0	0	0	0	0	0	0	7	0	0	127
Annelid	Spionidae	*Spio armata (agg)*	0	0	0	2	35	0	14	15	0	1	0	1	8	0	0	0	8	0	0	84
Annelid	Sabellidae	*Jasmineira elegans*	0	0	0	1	16	0	10	30	1	0	0	0	1	0	0	0	24	0	0	83
Annelid	Orbiniidae	*Scoloplos armiger*	5	4	0	0	1	0	0	2	5	2	0	0	58	0	0	0	2	0	0	79
Annelid	Lumbrineridae	*Lumbrineris gracilis*	1	1	0	1	0	0	1	5	8	8	1	0	51	0	0	0	0	0	0	77

Table3.2.3 List of the most abundant taxa in descending order of abundance from the anchor dredge survey of June 2006. All taxa where more than 70 individuals in total were recorded are shown.

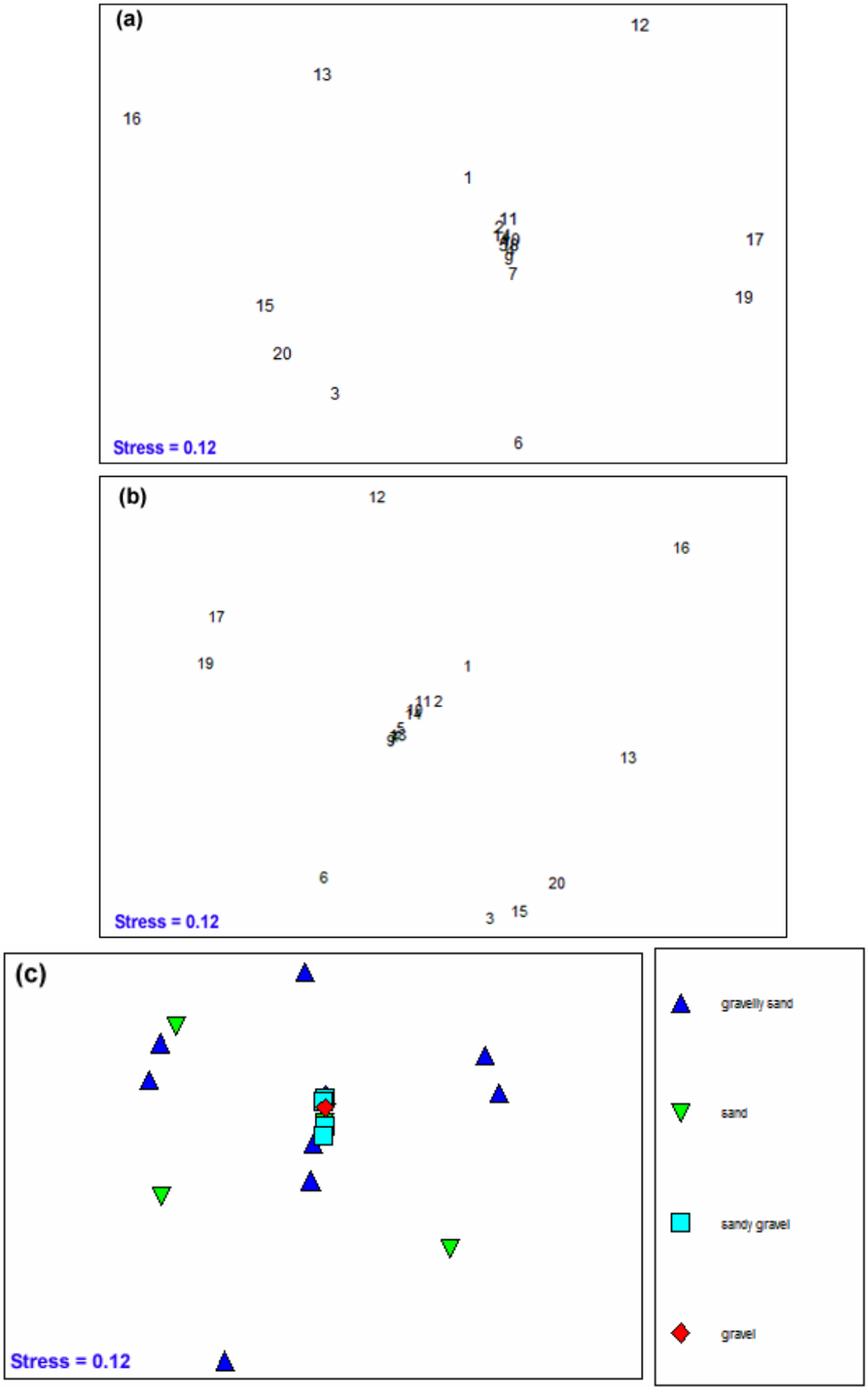


Figure 3.2.7 Multi-dimensional scaling plot of faunal data from the anchor dredge survey, June 2006. [(a) Presence/Absence data; (b) Abundance data, colonial organisms removed; (c) Rotated nMDS plot of dredge dataset (abundance data; No colonial's), with sedimentary environment superimposed]

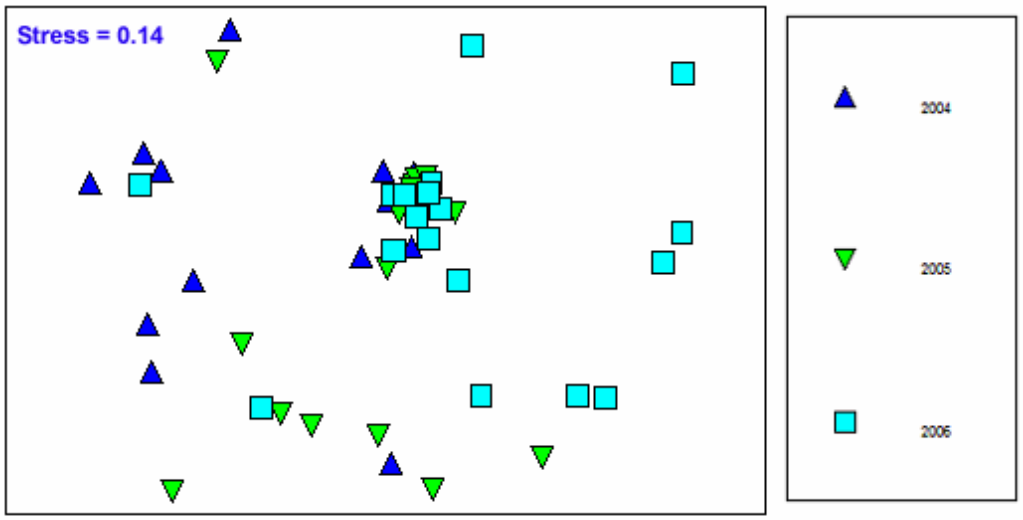


Figure 3.2.8 Comparison of dredge dataset (non-colonial abundance data only) across the 2004, 2005 and 2006 surveys.

3.3 Biotope Classification

Because of the nature of the current monitoring survey and the inherent differences in sampling protocol undertaken in both study types, direct comparison of the datasets is difficult. As such, it is easier to assess the communities identified in each of the surveys to assess potential change in the benthos compared to the baseline survey. The baseline survey undertaken in 2000 identified six separate biotopes within the survey (Ecoserve 2001) area using the 1997 JNCC classification system (Connor *et al*, 1997). These are presented in Table 3.3.1.

Biotope Classification	Description of Biotope	Approximate location within the survey area
IGS.Mob	Sparse fauna in infralittoral mobile clean sand	Along the Arklow Bank and to the south-west of the survey area. Small presence closer inshore near Arklow.
IGS.Scup.Hyd	*Sertularia cupressina* and *Hydrallmania falcata* on tide swept sublittoral cobbles or pebbles in coarse sand	Immediately surrounding the Arklow Bank, and also dominating the north-east corner of the survey area
MCR.CSab	Circalittoral *Sabellaria* reefs	Present north-west of the survey area. Also small patches located to the west of the survey area towards Arklow.
MCR	Circalittoral rock or mixed substrata in moderately exposed environments.	Immediately to the east of the Arklow Bank.
MCR.Flu	*Flustra foliacea* and other hydroid/bryozoan turf species on slightly scoured circalittoral rock or mixed substrata	To the north-west of the survey area surrounding MCR.CSab
IMS	Infralittoral clean or muddy sand	Immediately within the vicinity of Arklow Town.

Table 3.3.1 Biotope classifications identified in baseline survey (Ecoserve, 2001)

The current data is presented in Table 3.3.2 with the sampling positions broadly classified using the JNCC classification scheme for marine biotopes. To facilitate comparison with the baseline data, the 1997 JNCC classification was used (Connor *et al*., 1997).

	Biotope Classification		Biotope Classification
Station 1	MCR Circalittoral rock or mixed substrata in moderately exposed environments.	***Station 11***	MCR Circalittoral rock or mixed substrata in moderately exposed environments.
Station 2	MCR Circalittoral rock or mixed substrata in moderately exposed environments.	***Station 12***	IGS.Mob Sparse fauna in infralittoral mobile clean sand
Station 3	IGS.Mob Sparse fauna in infralittoral mobile clean sand	***Station 13***	IGS.Mob Sparse fauna in infralittoral mobile clean sand
Station 4	MCR.Flu.SerHyd *Sertularia argentea*, *S. cupressina* and *Hydrallmania falcata* on tide swept circalittoral cobbles and pebbles	***Station 14***	IGS.Mob Sparse fauna in infralittoral mobile clean sand
Station 5	MCR.Flu.SerHyd *Sertularia argentea*, *S. cupressina* and *Hydrallmania falcata* on tide swept circalittoral cobbles and pebbles	***Station 15***	IGS.Mob Sparse fauna in infralittoral mobile clean sand
Station 6	MCR.Myt.Has *Mytilus edulis* beds with hydroids and ascidians in tide swept moderately exposed circalittoral rock and mixed sediments	***Station 16***	IGS.Mob Sparse fauna in infralittoral mobile clean sand
Station 7	MCR.CSab Circalittoral *Sabellaria* reefs	***Station 17***	IGS.Mob Sparse fauna in infralittoral mobile clean sand
Station 8	IGS.Mob Sparse fauna in infralittoral mobile clean sand	***Station 18***	MCR Circalittoral rock or mixed substrata in moderately exposed environments.
Station 9	MCR.CSab Circalittoral *Sabellaria* reefs	***Station 19***	IGS.Mob Sparse fauna in infralittoral mobile clean sand
Station 10	MCR Circalittoral rock or mixed substrata in moderately exposed environments.	***Station 20***	IGS.Mob Sparse fauna in infralittoral mobile clean sand

Table 3.3.2 Biotope classifications identified in the present survey (June 2006).

4. DISCUSSION AND CONCLUSIONS

The survey area which is investigated in the present survey is characterised by a range of sediments ranging from fine sands to gravel and this is reflected in the fish and invertebrate species found in the present survey.

Previous reviews have shown that the fish species expected to be found in these habitats are pretty similar. In sandy areas <50m depth species diversity is reported to be pretty high with many elasmobranchs, gadoids, wrasses and flatfish. This is similar to species found in gravel areas <50m depth (Nash, 1990). Species found in the present survey are consistent with those found in previous surveys. The most abundant species in the present survey was the Butterfish (*Pholis gunnellus*), a species which has not been previously recorded in the area. Other notable species include a variety of flatfish and elasmobranchs which have been identified in previous trawl surveys and are considered common throughout the survey area and within the Irish Sea (Ellis *et al*., 2000).

There have been no records in the present survey of rare or unusual species. This is concurrent with findings in previous surveys with no rare or unusual species recorded in the survey area.

The sand goby, *Pomatoschistus minutus*, which was recorded in previous surveys (July 2004 & October 2004), is not recorded in the present survey. It was also not recorded in the previous survey of June 2005.

Other species of importance found during the present survey include the reef forming Serpulid worms, *Sabellaria alveolata* and *Sabellaria spinulosa*. These are found across the survey area, although extensive reefs have only been reported in localised parts. These biogenic reefs are very important and are listed under Annex I of the EU Habitats Directive (Code 1170: Reefs). These reefs play an important role in stabilising sediments, in addition to improving species diversity and community stability (Holt *et al*., 1998). In the present survey, a large number of *Sabellaria* spp. were encountered at trawl station 4. This area returned no *Sabellaria* in 2005 and a limited number in 2004. In contrast, the dredge sample 14 showed much reduced numbers compared to those found in 2005 and 2004. Dredge sample 6 returned 0 *Sabellaria* in the present survey compared to 3,589 in 2005 and 3,280 in 2005. As these reefs have the ability to exist for many years, it is likely that although these reefs are present in the area as large patchy mounds. As such, this variation in results over the years is possibly related to sampling induced differences in terms of sample positioning.

A detailed look of the biotope community's reveals a similar pattern to that found in the baseline survey. The Arklow Bank samples (dredge stations 8, 12, 16 & 17) in addition to the samples located to the south and west of the bank (dredge stations 3, 13, 14, 15, 19 & 20) are all classified as IGS.Mob (Sparse fauna in infralittoral mobile clean sand). This is concurrent with the results of the baseline survey which showed similar distribution patterns for this community type (although it was interspersed with IGS.Scup.Hyd [*Sertularia cupressina* and *Hydrallmania falcata* on tide swept sublittoral cobbles or pebbles in coarse sand])

Immediately to the east of the Arklow Bank two stations are classified as MCR (Circalittoral rock or mixed substrata in moderately exposed environments). This corresponds with a similar distribution pattern for this habitat type in the baseline survey. Further dredge stations are classified as MCR across the survey area. The three inner shore sites (dredge stations 1, 2 & 18) all correspond to the MCR biotope classification. Further classification of these three stations is difficult due to the decreased faunal abundances at these sites.

A single station, dredge station 6, is classified s MCR.Myt.Has (*Mytilus edulis* beds with hydroids and ascidians in tide swept moderately exposed circalittoral rock and mixed sediments). This station is the only sampling station to return relatively large abundances of *Mytilus edulis*, although it is important to note that these abundances are down from the

previous survey (June 2005 – 4,908 individuals). In addition, no *Sabellaria* spp. have been recorded for this station during the present survey.

Two stations in the immediate vicinity of station 6, (dredge stations 4 & 5) are classified as MCRFlu.SerHyd (*Sertularia argentea*, *S. cupressina* and *Hydrallmania falcata* on tide swept circalittoral cobbles and pebbles). This corresponds with the classification of MCR.Flu (*Flustra foliacea* and other hydroid/bryozoan turf species on slightly scoured circalittoral rock or mixed substrata) from the baseline survey for the same region.

Two stations (dredge stations 7 & 9) are classified as MCR.CSab (Circalittoral *Sabellaria* reefs). The baseline survey indicates the presence of *Sabellaria* reefs in the north-west section of the grid in close proximity to station 7, indicating that this is a well established reef.

Overall results indicate that there are large differences between the current dataset and those obtained for the June 2005 and October 2004 surveys. These differences relate to the numbers of taxa encountered and the numbers of individuals in each of the anchor dredge samples. The opposite appears to be the case for the beam trawl survey. Numbers of taxa and countable fauna are increased when compared to results obtained in previous surveys. This is a reversal on last years survey, where the opposite was noted (a notable decrease in the number of taxa and countable invertebrates in the trawl survey and an increase in taxa and organisms from the anchor dredge results).

MDS analysis of the datasets, however, indicates similarity's in the faunal structure of each dataset across the years. The gravel dominated sites all cluster together, irrespective of year, and there is a large degree of variation in the sand sites, related to the sparse number of taxa and individuals encountered in these sites.

Overall results from the present survey indicate that there is very little variation at the community level between the communities recorded in the present survey and the communities recorded in the baseline survey. There do however, appear to be large changes in both the taxa numbers and individual abundance between the current survey and previous surveys (October 2004 and June 2005). The reasons for these are unclear, although it may be related in part to the sediment heterogeneity and small scale, localised changes in the area, which is typical of mixed communities which are present here.

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6. APPENDICES

Appendix 6.1 Species List for Beam Trawl Survey; June 2006

PISCES
Agonus catophractus
Ammodytes tobianus
Callionymus lyra
Echiichthys vipera
Limanda limanda
Merlangius merlangus
Pleuronectes platessa
Raja clavata
Scyiliorhynus caniculus
Solea solea
Microchirus variegatus
Aspitirigla cuculus
Pholis gunnellus
Taurulus bubalis

CRUSTACEA
Aora gracilis
Balanus crenatus
Cancer pagurus
Crangon almanni
Hyas araneus
Hyas coarctatus
Galathea intermedia
Epimeria cornigera
Eualus pusiolus
Liocarcinus (juv)
Liocarcinus depurator
Liocarcinus corrugatus
Liocarcinus holsatus
Liocarcinus marmoreus
Liocarcinus pusillus
Macropodia rostrata
Pagurus bernhardus
Pisidia longicornis
Necora puber
Xantho incissus
Pandalus montagui
Unciola crenatipalma
Pinnotheres pisum
Philocheras trispinosus
Liljeborgia pallida

MOLLUSCA
Aequipecen opercularis
Anomia ephippium
Buccinum undatum
Calliostoma zizyphinum
Chlamys varia
Colus
Donax vittattus
Leptochiton asellus
Mytilus edulis
Trivia monacha
Sepiola atlantica
Spisula solida

ANNELIDA
Aphrodita aculeata
Glycera lapidum (agg)
Harmothoe impar
Hermonia hystrix
Lanice conchilega
Lepidonotus squamatus
Nephys sp.
Nereis longissima
Nereis zonata
Pomatoceros sp.
Melita obtusata
Sabellaria alveolata
Sertularia sp.
Sabella discifera
Thelepus setosus
Owenia fusiformis

BRYOZOA
Alcyonidium diaphanum
Alcyonium digitatum
Conopeum reticulatum
Electra pilosa
Eucratea loricata
Flustra foliacea
Vesicularia spinosa

CNIDARIA
ACTINIARIA
Abietinaria abietina
Hydrallmania falcata
Hydractinia echinata
Metridium senile
Virgularia sp.
Rhizocaulus verticillatus

ECHINODERMATA
Antedon bifida
Astarte sulcata
Asterias rubens
Crossaster papposus
Ophiothrix fragilis
Psammechinus miliaris

TUNICATA
Ascidia conchilega
Botryllus schlosseri
Unidentified tunicate

CHORDATA
Gaidropsaurus vulgaris

CHELICERATA
Endeis spinosa
Pycnogonum littorale

NEMERTEA
Nemertesia

PORIFERA
Suberites sp.
Scypha ciliata

Appendix 6.2 Species List for Anchor Dredge Survey; June 2006

ANNELIDA

Aphrodita aculeata
Adyte assimilis
Gattyana cirrosa
Harmothoe extenuata
Harmothoe impar
Harmothoe pagenstecheri
Malmgreniella arenicolae
Lepidonotus squamatus
Polynoe scolopendrina
Pholoe baltica
Pholoe inornata
Sthenelais (juv)
Sthenelais limicola
Sthenelais boa
Eteone longa (agg)
Phyllodoce groenlandica
Phyllodoce longipes
Eulalia aurea
Eulalia bilineata
Eulalia expusilla
Eulalia ornata
Eulalia viridis
Eumida bahusiensis
Eumida sanguinea
Glycera lapidum (agg)
Glycera tridactyla
Goniada maculata
Sphaerodorum gracilis
Psamathe fusca
Nereimyra punctata
Syllis
Syllidia armata
Ehlersia cornuta (agg)
Ehlersia cornuta (Type A)
Ehlersia ferrugina
Typosyllis
Typosyllis armillaris
Typosyllis variegata
Eusyllis blomstrandi
Odontosyllis fulgurans
Exogone verugera
Exogone hebes
Sphaerosyllis taylori (epitoke)
Sphaerosyllis taylori
Streptosyllis websteri (epitoke)
Autolytus (epitoke)
Autolytus
Procerastea
Nereididae (juv)
Nereis longissima
Nereis zonata
Nephtys (juv)
Nephtys caeca
Nephtys cirrosa
Nephtys kersivalensis
Nematonereis unicornis
Lumbrineris gracilis
Drilonereis
Notocirrus scoticus
Protodorvillea kefersteini
Scoloplos armiger
Aricidea cerrutii
Aricidea catherinae
Paradoneis lyra
Poecilochaetus serpens
Aonides oxycephala
Aonides paucibranchiata
Laonice bahusiensis
Malacoceros tetracerus
Polydora caeca (agg)
Polydora caulleryi
Pseudopolydora pulchra
Scolelepis korsuni
Spio armata (agg)
Spiophanes bombyx
Spiophanes kroyeri
Aphelochaeta (Type A)
Aphelochaeta marioni
Caulleriella alata
Caulleriella zetlandica
Dodecaceria
Tharyx killariensis
Mediomastus fragilis
Notomastus
Peresiella clymenoides
Clymenura
Euclymene oerstedii
Praxillella affinis
Micromaldane ornithochaeta
Nicomache personata
Ophelina acuminata
Asclerocheilus intermedius
Scalibregma celticum
Scalibregma inflatum
Owenia fusiformis
Lagis koreni
Sabellaria alveolata
Sabellaria spinulosa
Ampharete lindstroemi
Anobothrus gracilis
Sabellides octocirrata
Trichobranchus glacialis
Amphitritides gracilis
Lanice conchilega
Nicolea venustula
Nicolea zostericola
Polycirrus
Thelepus cincinnatus
Thelepus setosus
Branchiomma bombyx
Chone
Demonax cambrensis
Euchone rubrocincta
Jasmineira elegans
Pseudopotamilla reniformis
Sabella pavonina
Sabella discifera
Serpulidae
Hydroides norvegica
Pomatoceros lamarcki
Pomatoceros triqueter
Circeis spirillum
Tubificoides benedii

BRYOZOA

Crisia
Tubulipora
Eurystrotos compacta
Disporella hispida
Alcyonidium diaphanum
Alcyonidium gelatinosum
Alcyonidium mytili
Alcyonidium parasiticum
Vesicularia spinosa
Amathia lendigera
Bowerbankia
Aetea
Eucratea loricata
Membranipora membranacea
Conopeum reticulatum
Electra monostachys
Electra pilosa
Flustra foliacea
Chartella papyracea
Callopora dumerilli
Amphiblestrum auritum
Bugula avicularia
Bugula plumosa
Bugula turbinata
Bicellariella ciliata
Scrupocellaria scruposa
Hippothoa divaricata
Chorizopora brongniarti
Escharella immersa
Escharella variolosa
Escharella ventricosa
Hippoporina pertusa
Schizomavella auriculata
Microporella ciliata
Fenestrulina malusii
Cellepora pumicosa
Turbicellepora avicularis
Buskea dichotoma

CHELICERATA

Nymphon brevirostre
Anoplodactylus petiolatus

CNIDARIA

ATHECATA
Tubularia sp.
Coryne
Eudendrium
Bougainvilliidae
Calycella syringa
Campanulina pumila
Halecium
Abietinaria abietina
Diphasia attenuata
Hydractinia echinata
Hydrallmania falcata
Sertularella gayi
Sertularia cupressina
Kirchenpaueria pinnata
Nemertesia antennina
Plumularia setacea
Campanulariidae
Clytia hemisphaerica
Alcyonium digitatum
ACTINIARIA
Edwardsiidae
Edwardsia claparedii

COPEPODA

COPEPODA (Parasitic)
COPEPODA

CRUSTACEA

Verruca stroemia
Balanus balanus
Balanus crenatus
Clistosaccus paguri
Doropygus
MYODOCOPIDA
Parapleustes bicuspis
Stenopleustes nodifera
Amphilochus manudens
Amphilochus neapolitanus
Cressa dubia
Stenothoe marina
Urothoe elegans
Harpinia antennaria
bathyporeia guilliamsoniana
Bathyporeia tenuipes
Leucothoe incisa
Liljeborgia pallida
Atylus guttatus
Tritaeta gibbosa
Ampelisca diadema
Ampelisca spinipes
Atylus falcatus
Megaluropus agilis
Abludomelita obtusata
Cheirocratus (female)
Cheirocratus intermedius
Maera othonis
Gammaropsis maculata
Gammaropsis nitida
Gammaropsis palmata
Photis longicaudata
Photis pollex
Ericthonius (female)
Ericthonius punctatus
Aora gracilis
Autonoe longipes
Leptocheirus hirsutimanus
Leptocheirus pectinatus
Pontocrates arenarius
Monocorophium sextonae
Crassicorophium bonnellii
Unciola crenatipalma
Gnathiidae (female)
Gnathia dentata
Gnathia oxyuraea
Gnathia vorax
Anthura gracilis
Cymodoce truncata
Janira maculosa
Pleurocrypta porcellanae
Tanaopsis graciloides
Bodotria scorpioides
Monopseudocuma gilsoni
Gastrosaccus spinifer
Hippolytidae (juv)
Eualus pusiolus
Pandalus montagui
Philocheras trispinosus
Crangon almanni
Paguridae (juv)
Pagurus bernhardus
Pagurus pubescens
Pisidia longicornis
Hyas araneus (juv)
Hyas araneus
Hyas coarctatus
Macropodia rostrata
Liocarcinus (juv)
Liocarcinus pusillus
Liocarcinus corrugatus
Liocarcinus holsatus
Pinnotheres pisum
Monodaeus couchi
Meganyctiphanes norvegicus

ECHINODERMATA
Antedon bifida
Crossaster papposus (juv)
Asterias rubens
Ophiothrix fragilis
Ophiothrix fragilis (juv)
Amphipholis squamata
Acrocnida brachiata
Amphiura filiformis
Ophiura albida
ECHINOIDA (juv)
Psammechinus miliaris
Psammechinus miliaris (juv)
Pedicellina

MOLLUSCA
Leptochiton asellus
Acanthochitona crinitus
Acanthochitona fascicularis
Diodora graeca
Gibbula tumida
Buccinum undatum
NUDIBRANCHIA (eggs)
Doto
Aeolidiidae
Nucula nucleus
Mytilus edulis
Mytilus edulis (juv)
Macoma balthica
Musculus costulatus
Modiolarca tumida
Modiolus (juv)
Modiolus modiolus
Limaria loscombi
Pectinidae (juv)
Anomiidae (juv)
Pododesmus patelliformis
Diplodonta rotundata
Lyonsia norwegica
Astartidae (juv)
Astarte sulcata
Spisula (juv)
Spisula solida
Abra alba
Circomphalus casina
Tapes rhomboides (juv)
Timoclea ovata
Mya truncata
Mya truncata (juv)
Sphenia binghami
Hiatella arctica

NEMATODA
Nematoda spp.

NEMERTEA
Nemertea spp.

PHORONIDA
Phoronis

PISCES
Callionymus (juv)

PORIFERA
Porifera Indet.
Scypha ciliata

RHODOPHYTA
Corallinaceae

SIPUNCULA
Golfingia elongata
Golfingia vulgaris
Nephasoma minutum
Phascolion strombus

TUNICATA
ASCIDIACEA (juv)
ASCIDIACEA (larva)
Didemnidae
Ciona intestinalis
Ascidiidae
Ascidiella
Ascidiella aspersa
Polycarpa fibrosa
Polycarpa pomaria
Dendrodoa grossularia
Molgula sp.

Appendix 6.3 Total results from the Beam Trawl June 2006

Trawl Description

	Trawl 1	Trawl 2	Trawl 3	Trawl 4	Trawl 5	Trawl 6
Description	Good trawl. Sample contained large amounts of bryozoans and stones. Large abundances of *Flustra* present	Relatively small volume present in Trawl. Consisted of bryozoans and shell gravel.	Relatively small volume present in Trawl. Consisted of bryozoans and shell gravel.	Good sample. Trawl contained large numbers of Queen Scallop and Pink Shrimp. Trawl contained very large numbers of *Sabellaria* reef.	Large boulder present in trawl. Trawl also contained Urchins, crab and shrimp.	Good Trawl. Large numbers of fish present, including Ray and Dogfish. Sediment matrix consists of shell gravel. Trawl retrieved in fading light.
Date of hauling	19th June 2006	19th June 2006	19th June 2006	19th June 2006	19th June 2006	19th June 2006
Time of hauling	21:40	19:03	16:18	15:24	10:37	12:15
Layback/warp (m)	75	125	125	150	175	200
Speed of Vessel (kts)	2.2	1.9	2.1	2.0	2.5	2.1
Vessel Bearing	0°	0°	180°	180°	0°	180°
Distance of Trawl (m)	360m	560m	460m	640m	645m	800m

Table of Contents for the Beam Trawls taken during the course of the June 2006 Survey.

	Trawl 1	Trawl 2	Trawl 3	Trawl 4	Trawl 5	Trawl 6
Agonus catophractus	1	-	-	8	1	-
Ammodytes tobianus	1	1	-	-	-	-
Callionymus lyra	-	-	-	-	1	-
Echiichthys vipera	-	-	-	-	-	2
Limanda limanda	1	-	-	-	2	-
Merlangius merlangus	-	1	-	2	-	-
Pleuronectes platessa	2	-	1	-	-	3
Raja clavata	-	-	-	-	-	1
Scyiliorhynus caniculus	-	-	-	1	-	1
Solea solea	1	-	-	-	-	-
Microchirus variegatus	1	-	-	-	-	-
Aspitirigla cuculus	-	-	-	1	-	3
Pholis gunnellus	-	-	-	15	-	-
Taurulus bubalis	2	-	-	2	-	-
Abietinaria abietina	P	-	-	-	P	-
ACTINIARIA	1	-	-	-	-	-
Aequipecen opercularis	-	-	-	116	2	-
Alcyonidium diaphanum	-	P	-	-	-	P
Alcyonium digitatum	-	-	-	-	P	-
Anomia ephippium	-	-	-	P	3	-
Antedon bifida	-	-	-	20	-	-
Aora gracilis	-	-	-	-	1	-
Aphrodita aculeata	-	-	-	-	1	-
Ascidia conchilega	8	-	-	20	2	-
Astarte sulcata	2	-	-	-	-	-

	Trawl 1	Trawl 2	Trawl 3	Trawl 4	Trawl 5	Trawl 6
Asterias rubens	13	-	1	15	9	1
Balanus crenatus	P	-	-	P	P	P
Botryllus schlosseri	-	-	-	-	P	-
Buccinum undatum	8	-	-	1	2	-
Calliostoma zizyphinum	4	-	-	2	5	-
Cancer pagurus	-	-	-	2	-	-
Chlamys varia	-	-	-	2	1	-
Colus sp.	1	-	-	-	-	-
Conopeum reticulatum	-	-	-	-	-	P
Crangon almanni	3	3	1	5	40	1
Crossaster papposus	2	-	-	-	2	-
Donax vittattus	1	-	-	4	-	-
Electra pilosa	-	-	-	-	-	P
Endeis spinosa	-	-	1	-	-	-
Epimeria cornigera	-	-	-	-	1	-
Eualus pusiolus	-	-	-	2	-	-
Eucratea loricata	-	-	-	P	P	-
Flustra foliacea	P	P	P	P	P	P
Gaidropsaurus vulgaris	-	-	-	2	-	-
Galathea intermedia	-	-	-	-	1	-
Glycera lapidum (agg)	-	-	-	-	-	1
Harmothoe impar	-	-	-	3	2	-
Hermonia hystrix	-	-	-	-	5	-
Hyas araneus	4	-	-	1	1	-
Hyas coarctatus	-	-	-	-	4	-
Hydractinia echinata	-	-	-	-	-	P
Hydrallmania falcata	P	P	P	P	P	P
Lanice conchilega	P	-	-	-	-	-
Lepidonotus squamatus	-	-	-	4	2	-
Leptochiton asellus	5	-	-	-	P	-
Liljeborgia pallida	-	-	-	2	-	-
Liocarcinus (juv)	-	-	-	1	16	2
Liocarcinus depurator	-	-	-	-	4	-
Liocarcinus corrugatus	1	-	-	2	-	-
Liocarcinus holsatus	-	-	-	5	-	-
Liocarcinus marmoreus	-	-	-	-	-	1
Liocarcinus pusillus	-	-	-	-	1	-
Macropodia rostrata	10	-	-	3	23	-
Melita obtusata	1	-	-	-	-	-
Metridium senile	1	-	-	2	2	2
Mytilus edulis	-	-	-	3	2	-
Necora puber	-	-	-	2	-	-
NEMERTEA	-	-	-	-	-	1
Nemertesia	P	-	P	-	-	-
Nephys sp.	-	-	-	1	-	-
Nereis longissima	-	-	-	2	-	-
Nereis zonata	-	-	-	1	3	-
Ophiothrix fragilis	-	-	-	3	-	-
Owenia fusiformis	-	-	-	1	-	-
Pagurus bernhardus	26	2	11	-	22	8
Pandalus montagui	4	2	-	98	83	-
Philocheras trispinosus	-	3	-	-	-	1

	Trawl 1	Trawl 2	Trawl 3	Trawl 4	Trawl 5	Trawl 6
Pinnotheres pisum	-	-	-	-	1	-
Pisidia longicornis	-	2	3	227	6	-
Pomatoceros sp.	P	-	-	-	P	-
Psammechinus miliaris	69	-	-	15	46	-
Pycnogonum littorale	-	-	-	-	1	-
Rhizocaulus verticillatus	P	-	-	-	-	-
Sabella discifera	-	-	-	2	1	-
Sabellaria alveolata	>40	-	3	615	10	-
Scypha ciliata	1	-	-	-	-	-
Sepiola atlantica	-	-	-	-	2	2
Sertularia sp.	P	P	P	P	P	P
Spisula solida	-	-	-	-	-	4
Suberites sp.	-	-	-	-	P	-
Thelepus setosus	-	-	-	-	1	-
Trivia monacha	-	-	1	-	-	-
Unciola crenatipalma	-	-	-	4	-	-
Virgularia sp.	P	-	-	-	-	-
Vesicularia spinosa	-	-	-	-	-	P
Xantho incissus	-	-	-	-	2	-
Unidentified tunicate	5	-	-	3	-	-
Number of organsims	***179***	***14***	***22***	***1220***	***314***	***34***
Collonial	***10***	***4***	***4***	***6***	***11***	***9***
Countable taxa	***29***	***7***	***8***	***41***	***39***	***16***
Total taxa	***39***	***11***	***12***	***47***	***50***	***25***

Appendix 6.4 Total fish lengths (mm) of all fish species June 2006.

	Trawl 1	Trawl 2	Trawl 3	Trawl 4	Trawl 5	Trawl 6
Agonus catophractus (Pogge)	30 [1]	-	-	110,70,70,75, 60,55,90,90 [8]	50 [1]	-
Ammodytes tobianus (Lesser Sand Eel)	80 [1]	80 [1]	-	-	-	-
Callionymus lyra (Dragonet)	-	-	-	-	180 [1]	-
Echiichthys vipera (Weever)	-	-	-	-	-	130,110 [2]
Limanda limanda (Dab)	170 [1]	-	-	-	140,n/r [2]	-
Merlangius merlangus (Whiting)	-	70 [1]	-	60,60 [2]	-	-
Pleuronectes platessa (Plaice)	15,25 [2]	-	180 [1]	-	-	200,150,200 [3]
Raja clavata (Thornback Ray)	-	-	-	-	-	610 [1]
Scyiliorhynus caniculus (Lesser Spotted Dogfish)	-	-	-	300 [1]	-	460 [1]
Solea solea (Sole)	270 [1]	-	-	-	-	-
Microchirus variegatus (Thickback sole)	n/r [1]	-	-	-	-	-
Aspitirigla cuculus (Red Gurnard)	-	-	-	150 [1]	-	130,150,160 [3]
Pholis gunnellus (Butterfish)	-	-	-	160,140,150, 160,100, 120,170,140, 150,140 80,100,100, 120,80 [15]	-	-
Taurulus bubalis (Sea Scorpion)	120,150 [2]	-	-	200,130 [2]	-	-

Appendix 6.5 Anchor dredge raw data June 2006

		D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20
ANNELIDA	*Aphrodita aculeata*	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Adyte assimilis*	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-
ANNELIDA	*Gattyana cirrosa*	-	-	-	-	-	-	-	-	-	2	-	-	-	1	-	-	-	3	-	-
ANNELIDA	*Harmothoe extenuata*	-	-	-	-	1	-	2	-	3	-	-	-	-	2	-	-	-	-	-	-
ANNELIDA	*Harmothoe impar*	-	-	-	2	5	-	4	-	5	3	-	-	-	5	-	-	-	10	-	-
ANNELIDA	*Harmothoe pagenstecheri*	-	-	-	-	2	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
ANNELIDA	*Malmgreniella arenicolae*	1	-	-	-	1	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-
ANNELIDA	*Lepidonotus squamatus*	-	-	-	7	12	-	23	-	3	-	-	-	-	3	-	-	-	7	-	-
ANNELIDA	*Polynoe scolopendrina*	-	-	-	1	16	-	4	-	-	-	-	-	-	-	-	-	-	9	-	-
ANNELIDA	*Pholoe baltica*	-	-	-	-	2	-	-	-	3	3	-	-	-	8	-	-	-	-	-	-
ANNELIDA	*Pholoe inornata*	-	-	-	1	3	-	3	-	1	4	-	-	-	1	-	-	-	4	-	-
ANNELIDA	*Sthenelais* (juv)	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
ANNELIDA	*Sthenelais limicola*	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Sthenelais boa*	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-
ANNELIDA	*Eteone longa* (agg)	-	-	-	-	1	-	-	-	-	-	-	-	-	6	-	-	-	-	-	-
ANNELIDA	*Phyllodoce groenlandica*	3	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
ANNELIDA	*Phyllodoce longipes*	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
ANNELIDA	*Eulalia aurea*	-	-	-	-	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Eulalia bilineata*	-	-	-	1	-	-	1	-	2	-	-	-	-	2	-	-	-	1	-	-
ANNELIDA	*Eulalia expusilla*	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Eulalia ornata*	-	-	-	3	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Eulalia viridis*	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-
ANNELIDA	*Eumida bahusiensis*	1	-	-	-	3	-	-	-	1	-	-	-	-	-	-	-	-	5	-	-
ANNELIDA	*Eumida sanguinea*	-	-	-	23	8	-	8	-	1	-	-	-	-	1	-	-	-	14	-	-
ANNELIDA	*Glycera lapidum* (agg)	-	1	-	-	2	-	-	-	-	-	-	-	2	1	-	-	-	-	-	1
ANNELIDA	*Glycera tridactyla*	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Goniada maculata*	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
ANNELIDA	*Sphaerodorum gracilis*	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Psamathe fusca*	-	-	-	1	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
ANNELIDA	*Nereimyra punctata*	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-

		D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20
ANNELIDA	*Syllis*	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Syllidia armata*	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Ehlersia cornuta* (agg)	-	-	-	-	1	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Ehlersia cornuta* (Type A)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Ehlersia ferrugina*	-	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Typosyllis*	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Typosyllis armillaris*	-	-	-	2	3	-	7	-	12	-	-	-	-	1	-	-	-	-	-	1
ANNELIDA	*Typosyllis variegata*	-	-	-	3	14	-	13	-	10	-	-	-	-	-	-	-	-	4	-	-
ANNELIDA	*Eusyllis blomstrandi*	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	2	-	-
ANNELIDA	*Odontosyllis fulgurans*	-	-	-	1	3	-	-	-	-	4	-	-	-	3	-	-	-	-	-	-
ANNELIDA	*Exogone verugera*	-	1	-	1	1	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
ANNELIDA	*Exogone hebes*	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Sphaerosyllis taylori* (epitoke)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Sphaerosyllis taylori*	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Streptosyllis websteri* (epitoke)	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Autolytus* (epitoke)	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Autolytus*	-	-	-	4	8	-	-	-	4	3	-	-	-	3	-	-	-	17	-	-
ANNELIDA	*Procerastea*	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Nereididae* (juv)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Nereis longissima*	-	-	-	1	1	-	4	-	11	1	-	-	1	4	-	-	-	-	-	-
ANNELIDA	*Nereis zonata*	-	-	-	-	-	-	-	-	9	1	-	-	-	1	-	-	-	3	-	-
ANNELIDA	*Nephtys* (juv)	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
ANNELIDA	*Nephtys caeca*	-	-	1	-	4	-	-	-	3	-	-	-	-	4	1	-	-	-	-	1
ANNELIDA	*Nephtys cirrosa*	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Nephtys kersivalensis*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Nematonereis unicornis*	-	-	-	-	-	-	-	-	1	-	-	-	-	4	-	-	-	-	-	-
ANNELIDA	*Lumbrineris gracilis*	1	1	-	1	-	-	1	-	5	8	8	1	-	51	-	-	-	-	-	-
ANNELIDA	*Drilonereis*	-	-	-	-	-	-	-	-	-	-	-	-	-	Bit	-	-	-	-	-	-
ANNELIDA	*Notocirrus scoticus*	-	-	-	-	-	-	-	-	-	1	3	-	-	10	-	-	-	-	-	-
ANNELIDA	*Protodorvillea kefersteini*	-	-	-	-	1	-	2	-	1	1	-	-	-	3	-	-	-	-	-	-
ANNELIDA	*Scoloplos armiger*	5	4	-	-	1	-	-	-	2	5	2	-	-	58	-	-	-	2	-	-
ANNELIDA	*Aricidea cerrutii*	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-

		D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20
ANNELIDA	*Aricidea catherinae*	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Paradoneis lyra*	-	-	-	-	-	-	-	-	-	1	3	-	-	4	-	-	-	-	-	-
ANNELIDA	*Poecilochaetus serpens*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Aonides oxycephala*	-	-	-	-	5	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Aonides paucibranchiata*	-	9	1	-	6	-	3	-	3	-	-	-	-	4	-	-	-	-	-	1
ANNELIDA	*Laonice bahusiensis*	-	6	-	1	4	-	-	-	-	-	2	-	-	5	-	-	-	-	-	-
ANNELIDA	*Malacoceros tetracerus*	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Polydora caeca* (agg)	-	-	-	3	6	-	9	-	1	-	-	-	-	-	5	-	-	15	-	-
ANNELIDA	*Polydora caulleryi*	-	3	-	-	-	-	3	-	4	-	1	-	-	2	-	-	-	1	-	-
ANNELIDA	*Pseudopolydora pulchra*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
ANNELIDA	*Scolelepis korsuni*	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Spio armata* (agg)	-	-	-	2	35	-	14	-	15	-	1	-	1	8	-	-	-	8	-	-
ANNELIDA	*Spiophanes bombyx*	2	-	-	-	-	-	-	-	-	1	1	-	1	1	-	-	-	1	-	-
ANNELIDA	*Spiophanes kroyeri*	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
ANNELIDA	*Aphelochaeta* (Type A)	-	-	-	-	3	-	1	-	-	-	-	-	1	1	-	-	-	-	-	-
ANNELIDA	*Aphelochaeta marioni*	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-
ANNELIDA	*Caulleriella alata*	5	2	-	-	1	-	3	-	-	-	-	-	-	6	-	-	-	3	-	-
ANNELIDA	*Caulleriella zetlandica*	3	-	-	-	1	-	-	-	-	1	1	-	-	2	-	-	-	-	-	-
ANNELIDA	*Dodecaceria*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
ANNELIDA	*Tharyx killariensis*	-	-	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-	-	-	-
ANNELIDA	*Mediomastus fragilis*	4	2	-	3	7	-	6	-	1	1	-	-	-	-	-	-	-	2	1	-
ANNELIDA	*Notomastus*	1	-	-	-	-	-	1	-	8	1	-	-	1	4	-	-	-	-	-	-
ANNELIDA	*Peresiella clymenoides*	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Clymenura*	1	4	1	2	63	-	14	-	-	2	11	-	-	35	1	-	-	24	-	-
ANNELIDA	*Euclymene oerstedii*	2	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-
ANNELIDA	*Praxillella affinis*	1	-	-	-	5	-	-	-	-	1	3	-	-	4	1	-	-	1	-	-
ANNELIDA	*Micromaldane ornithochaeta*	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Nicomache personata*	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-
ANNELIDA	*Ophelina acuminata*	2	-	-	-	1	-	-	-	1	1	2	-	-	5	-	-	1	-	3	-
ANNELIDA	*Asclerocheilus intermedius*	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Scalibregma celticum*	-	-	1	-	2	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-
ANNELIDA	*Scalibregma inflatum*	-	-	-	-	-	-	-	-	-	-	-	-	-	20	5	-	-	-	-	-

		D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20
ANNELIDA	*Owenia fusiformis*	-	-	-	-	2	-	-	-	-	-	1	-	-	4	-	-	-	-	-	-
ANNELIDA	*Lagis koreni*	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
ANNELIDA	*Sabellaria alveolata*	-	-	-	8	-	-	120	-	362	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Sabellaria spinulosa*	-	1	-	17	14	-	170	-	232	42	7	-	-	23	-	-	-	18	-	-
ANNELIDA	*Ampharete lindstroemi*	1	-	-	-	-	-	-	-	-	1	3	-	-	12	-	-	-	-	-	-
ANNELIDA	*Anobothrus gracilis*	-	-	-	-	-	-	-	-	-	3	-	-	-	4	-	-	-	-	-	-
ANNELIDA	*Sabellides octocirrata*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Trichobranchus glacialis*	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Amphitritides gracilis*	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Lanice conchilega*	4	-	-	4	1	-	1	-	-	7	12	-	-	18	-	-	-	18	-	-
ANNELIDA	*Nicolea venustula*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
ANNELIDA	*Nicolea zostericola*	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-
ANNELIDA	*Polycirrus*	1	4	-	-	2	-	4	-	-	-	-	-	-	2	-	-	-	1	-	-
ANNELIDA	*Thelepus cincinnatus*	-	-	-	-	7	-	2	-	1	2	-	-	-	6	-	-	-	-	-	-
ANNELIDA	*Thelepus setosus*	-	-	-	10	23	-	8	-	1	1	1	-	-	-	-	-	-	25	-	-
ANNELIDA	*Branchiomma bombyx*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
ANNELIDA	*Chone*	-	-	-	-	1	-	2	-	2	-	1	-	-	-	-	-	-	-	-	-
ANNELIDA	*Demonax cambrensis*	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
ANNELIDA	*Euchone rubrocincta*	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
ANNELIDA	*Jasmineira elegans*	-	-	-	1	16	-	10	-	30	1	-	-	-	1	-	-	-	24	-	-
ANNELIDA	*Pseudopotamilla reniformis*	-	-	-	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Sabella pavonina*	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
ANNELIDA	*Sabella discifera*	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Serpulidae*	-	-	-	312	126	-	109	-	7	11	7	-	-	20	-	-	-	220	-	-
ANNELIDA	*Hydroides norvegica*	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	2	-	-
ANNELIDA	*Pomatoceros lamarcki*	-	52	-	####	3632	-	435	-	12	75	18	-	-	21	-	-	-	1810	-	-
ANNELIDA	*Pomatoceros triqueter*	-	-	-	24	96	-	-	-	-	-	-	-	-	-	-	-	-	7	-	-
ANNELIDA	*Circeis spirillum*	-	-	-	-	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	*Tubificoides benedii*	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-
BRYOZOA	*Crisia*	-	-	-	-	P	-	P	-	-	-	-	-	-	-	-	-	-	P	-	-
BRYOZOA	*Tubulipora*	-	-	-	P	P	-	P	-	-	P	-	-	-	-	-	-	-	P	-	-
BRYOZOA	*Eurystrotos compacta*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-

		D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20
BRYOZOA	*Disporella hispida*	-	P	-	-	-	-	-	-	-	P	P	-	-	-	-	-	-	-	-	-
BRYOZOA	*Alcyonidium diaphanum*	P	-	-	P	-	-	P	-	P	-	-	-	-	P	-	-	-	-	-	-
BRYOZOA	*Alcyonidium gelatinosum*	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-
BRYOZOA	*Alcyonidium mytili*	-	P	-	P	-	P	P	-	P	P	-	-	-	P	-	-	-	P	-	-
BRYOZOA	*Alcyonidium parasiticum*	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-
BRYOZOA	*Vesicularia spinosa*	P	-	-	P	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-
BRYOZOA	*Amathia lendigera*	-	-	-	P	P	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-
BRYOZOA	*Bowerbankia*	-	-	-	P	-	P	-	-	P	-	-	-	-	-	-	-	-	-	-	-
BRYOZOA	*Aetea*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-
BRYOZOA	*Eucratea loricata*	P	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BRYOZOA	*Membranipora membranacea*	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-
BRYOZOA	*Conopeum reticulatum*	P	P	-	P	-	-	P	-	P	-	P	-	-	-	-	-	-	-	-	-
BRYOZOA	*Electra monostachys*	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-
BRYOZOA	*Electra pilosa*	-	P	-	P	P	-	P	-	P	P	P	-	-	P	-	-	-	P	-	-
BRYOZOA	*Flustra foliacea*	-	-	-	P	-	-	P	-	P	P	-	-	-	-	-	-	-	P	-	-
BRYOZOA	*Chartella papyracea*	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BRYOZOA	*Callopora dumerilli*	-	-	-	-	-	-	P	-	P	-	P	-	-	P	-	-	-	P	-	-
BRYOZOA	*Amphiblestrum auritum*	-	P	-	-	-	-	P	-	P	-	-	-	-	-	-	-	-	-	-	-
BRYOZOA	*Bugula avicularia*	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BRYOZOA	*Bugula plumosa*	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BRYOZOA	*Bugula turbinata*	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-
BRYOZOA	*Bicellariella ciliata*	-	P	-	P	P	-	P	-	P	P	-	-	-	P	-	-	-	P	-	-
BRYOZOA	*Scrupocellaria scruposa*	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-
BRYOZOA	*Hippothoa divaricata*	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	P	-	-
BRYOZOA	*Chorizopora brongniarti*	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-
BRYOZOA	*Escharella immersa*	-	P	P	P	P	P	P	-	P	P	P	-	-	P	-	-	-	P	-	-
BRYOZOA	*Escharella variolosa*	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-
BRYOZOA	*Escharella ventricosa*	-	P	-	-	-	-	-	-	-	P	P	-	-	P	-	-	-	-	-	-
BRYOZOA	*Hippoporina pertusa*	-	-	-	-	-	P	-	-	-	P	-	-	-	P	-	-	-	-	-	-
BRYOZOA	*Schizomavella auriculata*	-	P	P	-	-	-	-	-	-	P	P	-	-	P	-	-	-	P	-	-
BRYOZOA	*Microporella ciliata*	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BRYOZOA	*Fenestrulina malusii*	-	P	P	-	-	-	P	-	P	-	-	-	-	P	-	-	-	-	-	-

		D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20
BRYOZOA	*Cellepora pumicosa*	-	-	-	P	-	P	P	-	P	P	-	-	-	P	-	-	-	-	-	-
BRYOZOA	*Turbicellepora avicularis*	-	-	P	P	P	-	P	-	-	P	-	-	-	P	-	-	-	-	-	-
BRYOZOA	*Buskea dichotoma*	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-
CHELICERATA	*Nymphon brevirostre*	-	-	-	-	-	-	-	-	1	-	-	-	-	3	-	-	-	1	-	-
CHELICERATA	*Anoplodactylus petiolatus*	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
CNIDARIA	*ATHECATA*	-	-	-	-	-	-	-	-	-	-	P	-	-	P	-	-	-	-	-	-
CNIDARIA	*Tubularia sp.*	-	-	-	-	-	-	-	-	-	P	P	-	-	-	-	-	-	P	-	-
CNIDARIA	*Coryne*	-	-	-	P	P	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-
CNIDARIA	*Eudendrium*	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-
CNIDARIA	*Bougainvilliidae*	P	P	-	P	P	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-
CNIDARIA	*Calycella syringa*	-	P	-	P	-	-	-	-	-	-	P	-	-	P	-	-	-	P	-	-
CNIDARIA	*Campanulina pumila*	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-
CNIDARIA	*Halecium*	-	P	-	P	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-
CNIDARIA	*Abietinaria abietina*	-	-	-	P	P	-	P	-	P	-	-	-	-	-	-	-	-	P	-	-
CNIDARIA	*Diphasia attenuata*	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CNIDARIA	*Hydractinia echinata*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CNIDARIA	*Hydrallmania falcata*	-	P	-	P	P	-	-	-	P	P	P	-	-	P	-	-	-	P	-	-
CNIDARIA	*Sertularella gayi*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-
CNIDARIA	*Sertularia cupressina*	P	P	-	P	P	-	P	-	P	-	P	-	-	P	-	-	-	P	-	-
CNIDARIA	*Kirchenpaueria pinnata*	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CNIDARIA	*Nemertesia antennina*	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-
CNIDARIA	*Plumularia setacea*	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-
CNIDARIA	*Campanulariidae*	P	P	-	P	P	-	-	-	P	P	P	-	-	-	-	-	-	P	-	-
CNIDARIA	*Clytia hemisphaerica*	P	P	-	P	P	-	-	-	P	P	P	-	-	P	-	-	-	P	-	-
CNIDARIA	*Alcyonium digitatum*	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-
CNIDARIA	*ACTINIARIA*	-	-	-	1	4	4	24	-	2	-	-	-	-	6	-	-	-	4	-	-
CNIDARIA	*Edwardsiidae*	-	-	-	-	6	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CNIDARIA	*Edwardsia claparedii*	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
COPEPODA	COPEPODA (Parasitic)	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
COPEPODA	COPEPODA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Verruca stroemia*	-	1	-	-	-	-	12	-	-	2	-	-	-	1	-	-	-	-	-	-
CRUSTACEA	*Balanus balanus*	-	-	-	-	7	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-

		D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20
CRUSTACEA	*Balanus crenatus*	-	-	-	2	5	-	32	-	7	4	3	-	-	-	-	-	-	2	-	-
CRUSTACEA	*Clistosaccus paguri*	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Doropygus*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CRUSTACEA	MYODOCOPIDA	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
CRUSTACEA	*Parapleustes bicuspis*	-	-	-	-	2	-	1	-	-	-	-	-	-	3	-	-	-	1	-	-
CRUSTACEA	*Stenopleustes nodifera*	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
CRUSTACEA	*Amphilochus manudens*	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Amphilochus neapolitanus*	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Cressa dubia*	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
CRUSTACEA	*Stenothoe marina*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CRUSTACEA	*Urothoe elegans*	1	2	1	8	10	6	47	-	2	-	-	-	-	-	-	-	-	78	-	-
CRUSTACEA	*Harpinia antennaria*	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*bathyporeia guilliamsoniana*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	-
CRUSTACEA	*Bathyporeia tenuipes*	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Leucothoe incisa*	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Liljeborgia pallida*	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Atylus guttatus*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Tritaeta gibbosa*	-	-	-	-	3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Ampelisca diadema*	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Ampelisca spinipes*	-	3	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	2	-	-
CRUSTACEA	*Atylus falcatus*	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
CRUSTACEA	*Megaluropus agilis*	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Abludomelita obtusata*	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Cheirocratus (female)*	-	-	-	-	-	-	-	-	1	-	-	-	-	3	-	-	-	1	-	-
CRUSTACEA	*Cheirocratus intermedius*	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Maera othonis*	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-
CRUSTACEA	*Gammaropsis maculata*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CRUSTACEA	*Gammaropsis nitida*	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	1	-	-
CRUSTACEA	*Gammaropsis palmata*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CRUSTACEA	*Photis longicaudata*	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CRUSTACEA	*Photis pollex*	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Ericthonius* (female)	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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CRUSTACEA	*Ericthonius punctatus*	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Aora gracilis*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CRUSTACEA	*Autonoe longipes*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Leptocheirus hirsutimanus*	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Leptocheirus pectinatus*	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Pontocrates arenarius*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
CRUSTACEA	*Monocorophium sextonae*	-	-	1	-	7	-	4	-	4	-	-	-	-	-	-	-	-	7	-	-
CRUSTACEA	*Crassicorophium bonnellii*	-	-	-	-	7	-	7	-	3	-	-	-	-	-	-	-	-	3	-	-
CRUSTACEA	*Unciola crenatipalma*	-	-	-	1	-	2	2	-	12	-	1	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Gnathiidae* (female)	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Gnathia dentata*	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Gnathia oxyuraea*	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Gnathia vorax*	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Anthura gracilis*	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Cymodoce truncata*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CRUSTACEA	*Janira maculosa*	-	-	-	-	4	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-
CRUSTACEA	*Pleurocrypta porcellanae*	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CRUSTACEA	*Tanaopsis graciloides*	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Bodotria scorpioides*	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CRUSTACEA	*Monopseudocuma gilsoni*	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Gastrosaccus spinifer*	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
CRUSTACEA	*Hippolytidae* (juv)	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Eualus pusiolus*	-	-	-	-	2	-	-	-	2	-	-	-	-	-	-	-	-	1	-	-
CRUSTACEA	*Pandalus montagui*	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-
CRUSTACEA	*Philocheras trispinosus*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Crangon almanni*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Paguridae* (juv)	-	3	-	4	1	-	3	-	5	2	2	-	-	9	-	-	-	3	-	-
CRUSTACEA	*Pagurus bernhardus*	-	-	-	1	-	1	2	-	2	2	-	-	-	-	-	-	-	1	-	-
CRUSTACEA	*Pagurus pubescens*	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Pisidia longicornis*	-	-	-	3	6	2	27	-	101	1	-	-	-	5	-	-	-	1	-	-
CRUSTACEA	*Hyas araneus* (juv)	-	-	-	-	2	-	1	-	2	2	-	-	-	-	-	-	-	7	-	-
CRUSTACEA	*Hyas araneus*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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CRUSTACEA	*Hyas coarctatus*	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Macropodia rostrata*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Liocarcinus* (juv)	-	-	-	-	-	2	1	-	-	-	-	-	-	1	-	-	-	2	-	-
CRUSTACEA	*Liocarcinus pusillus*	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Liocarcinus corrugatus*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Liocarcinus holsatus*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Pinnotheres pisum*	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Monodaeus couchi*	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	*Meganyctiphanes norvegicus*	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
ECHINODERMATA	*Antedon bifida*	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
ECHINODERMATA	*Crossaster papposus* (juv)	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
ECHINODERMATA	*Asterias rubens*	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-
ECHINODERMATA	*Ophiothrix fragilis*	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
ECHINODERMATA	*Ophiothrix fragilis* (juv)	-	-	-	-	3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
ECHINODERMATA	*Amphipholis squamata*	-	-	-	1	4	-	1	-	-	3	2	-	-	9	-	-	-	1	-	-
ECHINODERMATA	*Acrocnida brachiata*	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ECHINODERMATA	*Amphiura filiformis*	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ECHINODERMATA	*Ophiura albida*	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
ECHINODERMATA	ECHINOIDA (juv)	-	-	-	-	-	-	-	-	-	1	-	-	-	3	-	-	-	-	-	-
ECHINODERMATA	*Psammechinus miliaris*	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	-	-	5	-	-
ECHINODERMATA	*Psammechinus miliaris* (juv)	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-
ENTOPROCTA	*Pedicellina* sp.	-	-	-	P	P	-	-	-	-	-	-	-	-	P	-	-	-	P	-	-
MOLLUSCA	*Leptochiton asellus*	-	1	-	14	15	-	8	-	2	42	7	-	-	61	-	-	-	18	-	-
MOLLUSCA	*Acanthochitona crinitus*	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	*Acanthochitona fascicularis*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
MOLLUSCA	*Diodora graeca*	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	*Gibbula tumida*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-
MOLLUSCA	*Buccinum undatum*	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	1	-	-
MOLLUSCA	NUDIBRANCHIA (eggs)	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-
MOLLUSCA	*Doto*	-	-	-	2	-	-	-	-	-	-	-	-	-	3	-	-	-	1	-	-
MOLLUSCA	*Aeolidiidae*	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
MOLLUSCA	*Nucula nucleus*	-	-	2	12	106	11	8	-	-	1	-	-	-	5	-	-	-	251	-	-

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MOLLUSCA	*Mytilus edulis*	-	-	-	4	-	297	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	*Mytilus edulis (juv)*	-	-	-	5	-	-	17	-	1	1	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	*Macoma balthica*	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
MOLLUSCA	*Musculus costulatus*	-	-	-	2	7	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	*Modiolarca tumida*	-	-	-	-	-	-	35	-	2	1	-	-	-	1	-	-	-	-	-	-
MOLLUSCA	*Modiolus (juv)*	-	-	-	1	2	-	1	-	1	-	-	-	-	-	-	-	-	2	-	-
MOLLUSCA	*Modiolus modiolus*	-	-	-	-	9	-	1	-	-	-	-	-	-	8	-	-	-	5	-	-
MOLLUSCA	*Limaria loscombi*	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
MOLLUSCA	*Pectinidae* (juv)	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	*Anomiidae* (juv)	-	-	-	2	3	-	-	-	-	10	-	-	-	7	-	-	-	10	-	-
MOLLUSCA	*Pododesmus patelliformis*	-	-	-	2	1	-	-	-	-	1	-	-	-	1	-	-	-	2	-	-
MOLLUSCA	*Diplodonta rotundata*	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
MOLLUSCA	*Lyonsia norwegica*	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
MOLLUSCA	*Astartidae* (juv)	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	*Astarte sulcata*	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-
MOLLUSCA	*Spisula* (juv)	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	*Spisula solida*	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	*Abra alba*	6	1	-	-	4	18	7	-	26	4	1	-	-	102	-	-	-	1	-	-
MOLLUSCA	*Circomphalus casina*	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	*Tapes rhomboides* (juv)	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	*Timoclea ovata*	-	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-
MOLLUSCA	*Mya truncata*	-	-	-	-	P	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	*Mya truncata* (juv)	-	1	-	3	4	-	-	-	1	2	-	-	-	2	-	-	-	2	-	-
MOLLUSCA	*Sphenia binghami*	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	*Hiatella arctica*	-	-	-	3	7	-	9	-	2	-	-	-	-	-	-	-	-	8	-	-
NEMATODA	*Nematoda spp.*	1	-	-	6	5	-	6	-	3	-	-	-	-	1	-	-	-	1	-	-
NEMERTEA	*Nemertea spp.*	7	4	-	3	3	-	2	-	1	1	2	-	-	2	-	-	-	2	-	-
PHORONIDA	*Phoronis*	-	-	-	-	2	-	-	-	-	-	1	-	-	1	-	-	-	2	-	-
PISCES	*Callionymus* (juv)	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
PORIFERA	*Porifera Indet.*	-	P	-	P	P	-	P	-	-	P	P	-	-	P	-	-	-	P	-	-
PORIFERA	*Scypha ciliata*	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RHODOPHYTA	*Corallinaceae*	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

		D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20
SIPUNCULA	*Golfingia elongata*	-	1	-	1	18	-	-	-	4	11	1	-	-	-	-	-	-	3	-	-
SIPUNCULA	*Golfingia vulgaris*	-	-	-	2	-	-	-	-	16	5	-	-	-	-	-	-	-	-	-	-
SIPUNCULA	*Nephasoma minutum*	-	2	-	5	1	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-
SIPUNCULA	*Phascolion strombus*	-	-	-	-	2	-	-	-	-	-	2	-	-	1	-	-	-	3	-	-
TUNICATA	ASCIDIACEA (juv)	-	1	-	21	1	-	16	-	7	2	-	-	-	-	-	-	-	18	-	-
TUNICATA	ASCIDIACEA (larva)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TUNICATA	*Didemnidae*	-	-	-	P	-	-	P	-	-	P	P	-	-	-	-	-	-	-	-	-
TUNICATA	*Ciona intestinalis*	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
TUNICATA	*Ascidiidae*	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	2	-	-
TUNICATA	*Ascidiella*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TUNICATA	*Ascidiella aspersa*	-	-	-	-	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-
TUNICATA	*Polycarpa fibrosa*	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-
TUNICATA	*Polycarpa pomaria*	-	-	-	-	2	-	13	-	-	-	-	-	-	-	-	-	-	-	-	-
TUNICATA	*Dendrodoa grossularia*	-	51	-	22	38	-	115	-	166	71	76	-	-	62	-	-	-	54	-	-
TUNICATA	*Molgula*	1	-	-	1	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
	Total number of Taxa (June 2006)	39	56	11	94	131	17	102	0	94	83	64	2	8	128	5	1	2	116	4	4
	Total number of Individuals (June 2006)	68	179	8	12896	4531	347	1433	0	1159	374	200	2	9	742	13	1	3	2793	17	4
	Total number of Taxa (June 2005)	95	38	6	121	155	128	129	8	96	117	108	7	19	125	13	9	5	167	13	15
	Total number of Individuals (June 2005)	816	67	1	7872	7806	9669	1887	2	590	897	2216	1	12	1584	39	5	1	16324	8	14
	Total number of Taxa (Oct 2004)	74	40	9	102	113	106	76	1	70	116	99	4	4	115	3	5	3	125	7	5
	Total number of Individuals (Oct 2004)	450	101	21	5154	2126	3919	3247	1	1818	1176	4071	6	7	998	3	10	3	8972	9	5

Appendix 6.6 Particle Size Analysis Results June 2006.

Site Code	4mm	2mm	1mm	0.5mm	0.25mm	0.125mm	0.063mm	<0.063mm	Mean phi	skewness	kurtosis	Classification after Buchanan	Folk Triangles after BGS
D1	4.24	2.95	2.68	4.81	12.01	67.51	2.78	3.02	2.38	-0.613	2.216	Poorly Sorted Fine Sand	Gravelly Sand
D2	20.22	5.59	6.33	7.31	24.54	32.15	1.89	1.97	0.80	-0.540	0.588	Very Poorly Sorted Coarse Sand	Gravelly Sand
D3	0.00	1.39	0.17	0.15	21.05	73.87	0.57	2.81	2.47	-0.548	1.629	Well Sorted Fine Sand	Slightly Gravelly Sand
D4	96.90	0.68	0.24	0.25	1.15	0.45	0.05	0.28	-2.23	0.000	0.738	Very Well Sorted Fine Gravel	Gravel
D5	25.29	7.45	7.68	8.61	11.20	24.19	3.97	11.59	0.78	-0.172	0.739	Very Poorly Sorted Coarse Sand	Muddy Sandy Gravel
D6	0.00	0.00	4.90	1.85	31.15	56.84	1.32	3.94	2.38	-0.425	1.219	Moderately Sorted Fine Sand	Sand
D7	40.18	2.21	2.62	1.84	10.92	12.66	2.46	27.12	1.66	0.084	0.612	Very Poorly Sorted Medium Sand	Muddy Sandy Gravel
D8	10.91	3.28	6.26	12.06	57.58	7.43	0.18	2.30	1.08	-0.639	1.762	Poorly Sorted Medium Sand	Gravelly Sand
D9	9.52	4.23	3.69	5.67	47.28	22.43	2.10	5.07	1.46	-0.301	2.409	Poorly Sorted Medium Sand	Gravelly Sand
D10	69.63	0.00	3.93	2.92	5.69	6.17	0.48	11.19	-0.63	0.916	1.161	Very Poorly Sorted Very Coarse Sand	Muddy Sandy Gravel
D11	49.68	7.80	2.86	3.02	15.80	18.69	1.90	0.24	-0.39	0.644	0.534	Very Poorly Sorted Very Coarse Sand	Sandy Gravel
D12	0.00	0.19	0.15	39.99	55.21	0.83	0.00	3.63	1.39	-0.455	0.588	Moderately Well Sorted Medium Sand	Slightly Gravelly Sand
D13	0.00	0.05	0.54	10.22	78.89	7.47	0.19	2.63	1.75	0.016	2.728	Well Sorted Medium Sand	Slightly Gravelly Sand
D14	34.77	4.28	4.88	7.11	12.97	26.77	6.23	3.00	0.51	-0.157	0.530	Very Poorly Sorted Coarse Sand	Sandy Gravel
D15	20.85	2.22	2.42	3.70	50.17	18.05	0.00	2.59	0.73	-0.577	1.057	Poorly Sorted Coarse Sand	Gravelly Sand
D16	0.00	0.28	0.51	55.77	41.52	0.00	0.00	1.93	1.13	0.457	0.583	Moderately Well Sorted Medium Sand	Slightly Gravelly Sand
D17	0.00	0.63	1.41	8.41	75.67	11.48	0.14	2.26	1.76	0.008	2.708	Well Sorted Medium Sand	Slightly Gravelly Sand
D18	52.36	6.14	3.93	3.42	7.69	21.56	1.44	3.44	-0.54	0.861	0.468	Very Poorly Sorted Very Coarse Sand	Sandy Gravel
D19	0.00	1.21	0.14	1.73	69.87	25.14	0.00	1.91	2.04	0.551	0.677	Well Sorted Fine Sand	Slightly Gravelly Sand
D20	19.50	9.51	12.75	12.42	33.50	10.06	0.33	1.93	0.23	-0.335	0.710	Poorly Sorted Coarse Sand	Gravelly Sand