



**Arklow Bank Offshore Windfarm Environmental Monitoring
Benthic Ecology Survey Report**

Surveys 9th –10th November 2005

A report to Hydroserv Projects Ltd

June 2006

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1. INTRODUCTION

Centre for Marine and Coastal Studies (CMACS Ltd) has been requested by HydroServ Projects Ltd. for Arklow Energy Ltd to provide scientific support for environmental monitoring of Arklow Bank Offshore Windfarm (OWF). The survey reported in this document was carried out from 9th to 10th November 2005 as part of post construction monitoring of the Arklow OWF.

The Arklow Bank Offshore Windfarm lies 13km east of Arklow (County Wicklow, Republic of Ireland) and currently consists of seven 3.6 MW turbines. Construction was begun in 2002 with the building of these seven turbines. However, it is a possibility 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.

Surveys during June / July 2004 using Day grabs encountered severe problems with hard ground, and it was impossible to obtain samples from many of the sites (see monitoring report for June/July 2004). For the October 2004 and subsequent monitoring surveys, including this one, it was decided that semi quantitative anchor dredges would be used to sample infauna and sediments. As with the June/July 2004 survey semi-quantitative beam trawls were used to sample epifauna and benthic fish communities. The locations of both the beam trawl and grab sites for these surveys were specified by the client and are displayed in Figure 1. They are identical to those sampled in June/July 2004. None of the anchor dredge sites coincide with any of the baseline survey sites, although many of them are within a few hundred metres. Samples were successfully obtained at all sites in the case of both beam trawls and anchor dredges. It is not clear how closely any of the beam trawl sites coincide with the sites surveyed for the baseline surveys.

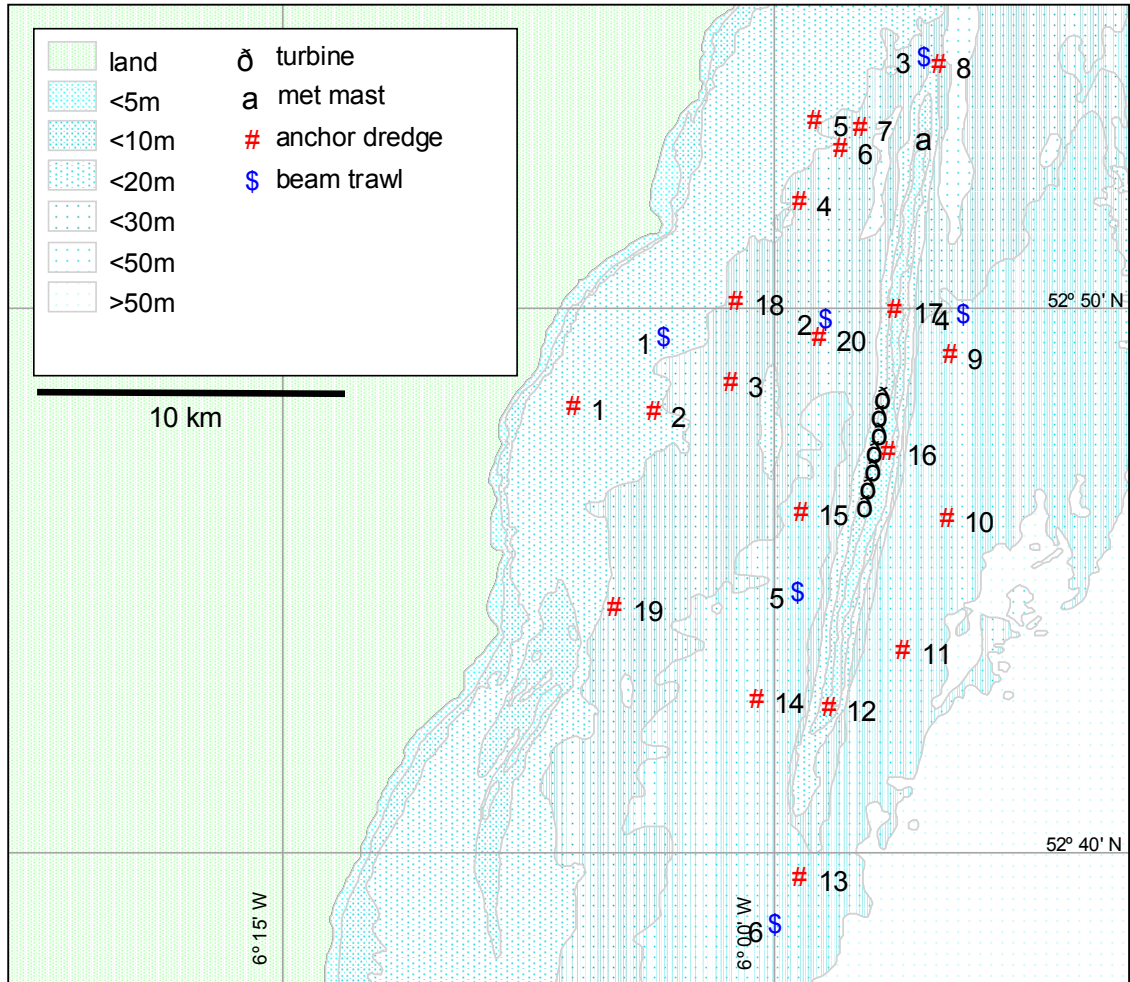


Figure 1 Dredge sites (numbered 1 to 20) and trawl locations (numbered 1 to 6) for all monitoring surveys including this one (9th – 10th November 05).

2. METHODOLOGY

All benthic grabbing and beam trawl surveys were undertaken out of the Port of Arklow using the work vessel 'MV Husky', a 25m workboat supplied by Hydrosurvey Projects Ltd. Surveys were conducted on a daily basis with the vessel returning to its berth at the end of each day. Health and safety was considered important at all times with the project risk assessment forming the main guidelines. The following section details survey dates in addition to the methods used for the beam trawl and benthic grab surveys.

2.1 Beam trawls

Beam trawl surveys were undertaken on the 9th and 10th November 2005 during daylight hours using a 2m beam trawl equipped with a chain matrix and 4mm square mesh cod-end (Figure 2) towed from the 'Husky'. Tows were carried out into the current for a distance of 300m at a speed of 2 knots equating to approximately 15mins over the ground, with a warp length of a minimum of 2.5 times the water depth to allow the gear to fish the bottom properly. Once on board the contents of each trawl were photographed prior to being sorted (these can be provided on CD at the clients request).

All organisms were identified in the field where possible, although a few invertebrates were retained for confirmation of identification. Commercial fish species were measured using a graduated fish board and elasmobranchs were measured and sexed. Colonial organisms (such as hydroids and bryozoans) and also barnacles, which can be extremely numerous, were quantified according to a suitable scale of abundance, based on visual assessment (see Appendix 6.3).

Sub-sampling was required where extremely large numbers of organisms were encountered. In this case the entire catch was initially pre-sorted in order to remove and quantify all fish and any large or obvious specimens. The remaining material was then sub-sampled to an appropriate fraction with care being taken to ensure that this was a fair representation of the entire catch. This was carefully sorted and all animals identified and recorded. These numbers were then multiplied by the appropriate factor to get an estimate of the true number in the sample remainder, and these estimates added to those found during the initial search.

2.2 Anchor Dredge Sampling

The dredge survey was undertaken on 9th and 10th November 2005 using a standard anchor dredge (Figure 2). At each of the twenty sites (see Figure 1) a single sample was obtained, with no replication of samples. In general the anchor dredge was dropped around 20m in advance of the target, sufficient warp paid out, and the anchor dredge then dragged through the target point. On the first attempt it was generally dragged through to approximately 20m beyond the target point, and if this provided a poor sample the process was repeated with a longer pull.

Once an acceptable sample was received a digital photograph was taken, a small sub-sample (circa 400 g) suitable for particle size determination was taken, and then, wherever possible, three identical 10 litre faunal sub-samples taken, sieved and preserved. Field notes were taken, to include sample number, date and time of sample, a brief visual description of the sample, an

estimate of volume of each sub-sample before sieving, and any pertinent additional information such as difficulties in sampling. The sediment sub-samples were stored in a cool location and transferred to a freezer once ashore. The faunal sub-samples were then sieved through a 1.0 mm mesh as gently as possible, sediments passing through the sieve were discarded and the material retained on the sieve was carefully transferred to a labelled bucket and fixed with buffered 10% formalin solution to a final concentration of at least 5%. A separate waterproof label duplicating the main external label was added to the sample bucket.

It was decided by the client that one of the three faunal subsamples was to be worked up in each case, and analysis of the samples was then carried by an experienced laboratory taking part in the UK's NMBAQC (National Marine Biological Analytical Control) scheme, with samples being thoroughly sorted to remove all organisms which were then identified, where possible, to species level, counted and logged. The remaining sub-samples were held in storage in case of loss of the first samples.



Figure 2 The anchor dredge (left) and 2m beam trawl (right) used during the November 2005 surveys.

2.3 Geological Analysis

Once at the laboratory the sediment sub samples from each of the grabs underwent particle size analysis. Firstly they were dried to a constant weight at a set temperature of 105°C before being sieved using an Endecott BS410/1986 sieve series and an Endecott EFL2 mk3 electronic shaker with the sieve sizes displayed in Table 1.

Table 1 Sieve series sizes (mm) used for particle size analysis (PSA).

Seive size												
63 mm	31.5 mm	16 mm	8 mm	4 mm	2 mm	1 mm	500 µm	250 µm	125 µm	63 µm	Pan (<63 µm)	

The weights of the sediment retained on each of the sieve series were then used to calculate the mean and median particle sizes, and the determination of sorting index by calculating the standard deviation of Phi. These were then used to determine sediment type according to the Folk and Ward classification system as used by the British Geological Survey (BGS; Figure 3) and also the definitions as used by Buchanan *et al* (1984) (see Table 2 and Table 3).

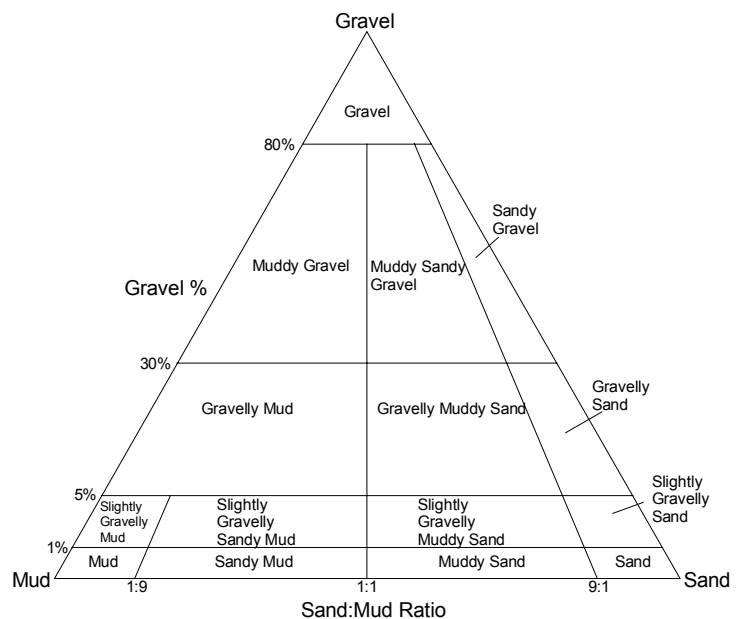
Table 2 Classification used for defining sediment type (from Buchanan, 1984).

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 3 Classification used defining degree of sediment sorting (from Buchanan, 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

Figure 3 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

Once all laboratory analysis was completed the data was then subjected to various analyses. A summary of the different methods used in the baseline study and the study performed by CMACS Ltd are displayed in Table 4.

2.4.1 Beam Trawls

Due to the different types of trawl equipment used and the different number of trawls for each of the baseline and the monitoring surveys it is very difficult to postulate any suitable analysis for the trawl data other than descriptive. The low number of trawls per survey renders the use of statistical analysis inaccurate and the fact that data was recorded only on a presence/absence basis in the baseline surveys means that community comparisons are extremely difficult. As the beam trawl used in these monitoring surveys is more similar to the Agassiz trawls than the larger otter trawls of the baseline it is more practical to use the Agassiz trawls as a means of community comparison rather than the results from the otter trawl surveys.

2.4.2 Anchor dredge samples

Once the raw data had been obtained from the sorted samples and organized into electronic format, analysis was undertaken, mainly using PRIMER Version 5 (see Clark and Warwick, 1994, for an introduction to PRIMER). A variety of univariate and multivariate techniques were used to provide information concerning species richness, universal features of community structure and diversity indices. Unlike the attempts at Day Grab sampling carried out in June/July 2004, no replication was attempted on this survey - each site was sampled only once.

Multivariate analysis was based on square-root transformed abundance of species found, which provides a sensible balance between rare and common species, and using the Bray-Curtis similarity coefficient (Bray and Curtis, 1957) or, where appropriate, presence / absence data only.

Multi-Dimension Scaling (MDS) plots based on the Bray-Curtis similarity coefficient were used as the visual output from the multivariate analysis. Stress values are provided for each MDS plot, whereby 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, the MDS plot from the above analysis was repeated with mean sediment particle size superimposed.

In the first monitoring report (reporting the June/July 2004 surveys; CMACS Ltd, 2004) comparison was made between the sites in the 2004 grab survey to identify any differences or similarities between the communities of organisms found at those sites. These were based on pooled data for the replicate samples at each site. The data from the June 2000 dredge survey was compared with the data from the 2004 grab survey, which simply highlighted the fact that the survey methods were so different (anchor dredge versus Day Grabs) that comparison was pointless. In subsequent reports, a comparison was made between the dredge surveys in September 2005, and those of the monitoring surveys of October 2004 and June 2005 to assess whether there were any differences or similarities between sites in different seasons. Day grab data from June 2004 were also included for completeness. Comparisons were also made with the

September 2000 data, and in order to do this the June 2005 and October 2004 data had to be reduced to presence / absence data in order to make the data comparable.

For this report, it is considered that continued inclusion of Day grab data from June/July 2004 is pointless. However, some comparison has continued to be made with the September 2000 baseline data.

Table 4 Methods of analysis during the 2000 and 2004/05 surveys.

Baseline survey			Post-construction survey		
Date	Survey method	Analysis	Date	Survey method	Analysis
Trawl Survey					
June 2000	Otter trawl	Descriptive	July 2004 June 2005	2m Beam trawl	Descriptive, comparison with Agassiz trawls. Key species' abundance mapped
Sept 2000	Agassiz trawl	Descriptive	October 2004 November 2005	2m Beam trawl	
April 2001	Agassiz trawl	Descriptive			
Grab / dredge Survey					
June 2000	Anchor dredge	Descriptive	June/July 200 June 20054	Day grab Anchor dredge	Descriptive including comparison with 2000 data. MDS plots. Sediment description
Sept 2000	Anchor dredge	Descriptive	October 2004 November 2005	Anchor dredge	

3. RESULTS

3.1 Beam Trawls

Raw data from the beam trawl surveys are displayed in Appendix 6.3 with fish length data and elasmobranch sex information in Appendix 6.4. A total of 55 taxa were recorded in November 2005 with 11 of these being fish species (a species list is given in Appendix 6.1). This is marginally lower than the total of 61 taxa which were recorded in July 2004 of which 17 were fish species, and somewhat similar to the October 2004 (51 taxa of which 9 were fish) and June 2005 figures (47 taxa of which 13 were fish). These figures are all at least broadly comparable with, or arguably richer than, the baseline survey Agassiz trawls in which a total of 60 taxa, (8 fish species), and 23 taxa (4 fish species) were recorded in September 2000 and the April 2001 respectively. In the baseline surveys the autumn trawls were richer than the spring trawls, but in this work there is so far no clear trend except for fish, which have been generally more numerous, and with more species, in the autumn surveys.

The number of fish species found at each trawl location in October 2004 and November 2005 is displayed in Figure 4 and the number of individual fish recorded at each trawl location in Figure

5. In comparison with the October 2004 surveys, numbers of fish species were broadly similar in November 2005, while numbers of individuals were lower. The main exception was at inshore site 1, where the numbers of both species and individuals was higher than the previous autumn. Even here, however, the numbers were still low, however, with only 3 sand gobies, 3 poor cod, 2 dragonets, and single individuals of other species. Numbers of both species and individuals are noticeably lower, overall, than in the July 2004 and June 2005 surveys, however.

Sand gobies, a highly variable species which tends to be much more abundant in summer than in winter, were once again present in this survey (in small number at sites 1, and 5), having been, surprisingly, completely absent in June 2005. The northern site 3 continues to be consistently particularly poor in both species and individuals.

Potentially commercially important fish were limited to single individuals of whiting, plaice, sole, dab, and dogfish, together with four spotted rays.

A total of five elasmobranchs (one dogfish, and four spotted rays, with no thornback rays) were caught in November 2005, compared to three (two dogfish and a thornback ray) in October 2004.

While it must be acknowledged that small beam trawls are a far from ideal survey method for fish, and routinely subject to very large variations in catches, overall it still seems clear from the four surveys carried out so far that benthic fish populations at the sites surveyed are generally low.

The beam trawl surveys yielded a total of 44 invertebrate faunal species (see Appendix 6.3) as compared to 43, 42 and 36 in July 04, October 2004 and June 05 respectively respectively. As in June 2005, total numbers of countable invertebrate organisms were very low at only 688 (cf 3,527 and 1,784 in July and October 2004 and 467 in June 2005). This drop seemed to be consistent over all invertebrate groups (see summary in Table 5); only seven species were found in numbers totalling over twenty for the whole survey; these were *Psammechinus miliaris* (sea urchin), *Crangon crangon* (brown Shrimp), *Pagurus bernhardus* (common hermit crab), *Asterias rubens* (common starfish), *Macropodia rostrata* (long legged spider crab), *Pandalus montagui* (pink shrimp), and *Pandalus brevis* (prawn). With the exception of *P. brevis*, which was previously unrecorded, these were broadly the same dominant species as in the previous surveys although *Asterias rubens* (common starfish) was particularly poorly represented in the June 2005 survey. Some species have so far only been abundant in the October 2004 samples, such as the variegated scallop *Chlamys variegata* and the brittle star *Ophiura albida*, although these were only found in small numbers.

The drop in numbers of taxa and individuals in both June and November 2005 occurred at most sites. Comparing this survey with the October 2004 survey (that being broadly the same time of year; see Figure 6 and Figure 7) the distribution of richer and less rich sites was broadly similar, the richest sites being 1 and 5, particularly in terms of numbers of individuals. On this occasion site 6 was marginally richer in taxa and individuals whilst site two was rather poorer.

As in previous surveys, the bryozoan *Flustra foliacea* was also relatively common and was recorded at all trawl locations with highest abundance at sites 1, 5 and 6. In general, bushy hydroids and bryozoans, including *Flustra*, were fairly widespread and probably more abundant than in previous surveys.

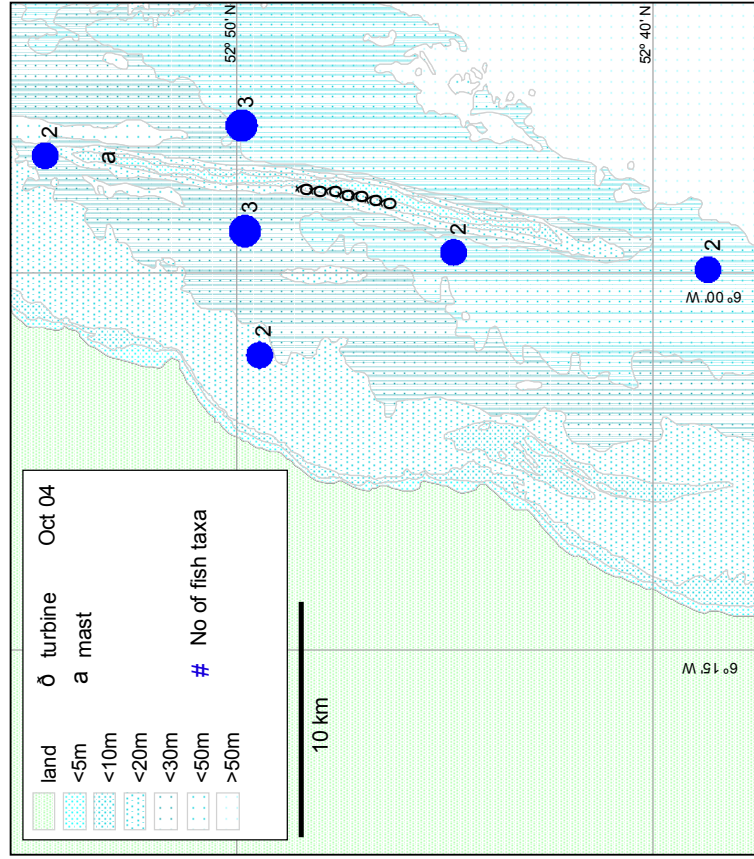
The Ross worm, *Sabellaria spp*¹ was absent from all sites during this survey and that of June 2005, whereas at site 4 it was found in small clumps in both July and October 2004. *Sabellaria* spp were also found in the dredge samples (see below).

Table 5 Numbers of the most common countable faunal species found in the July 2004, October 2004, June 2005 and November 2005 beam trawl surveys (limited to those species where at least 20 specimens were found in any one survey).

Latin name	Common name	Jul-04	Oct-04	June 05	Nov 05
<i>Psammechinus miliaris</i>	Sea urchin	496	464	162	215
<i>Crangon crangon</i>	Brown Shrimp	427	130	38	80
<i>Pagurus bernhardus</i>	Common hermit crab	802	583	95	68
<i>Asterias rubens</i>	Common Starfish	295	100	8	67
<i>Macropodia rostrata</i>	Long legged spider crab	98	128	28	62
<i>Pandalus montagui</i>	Pink shrimp	725	99	65	57
<i>Pandalus brevisrostris</i>	Prawn	0	0	0	21
<i>Ophiura albida</i>	Brittle star	0	36	2	15
<i>Calliostoma zizyphinum</i>	Painted top shell	36	2	1	10
<i>Buccinum undatum</i>	Common Whelk	60	43	24	8
<i>Liocarcinus holsatus</i>	Flying crab	18	31	6	8
<i>Pisidia longicornis</i>	Long clawed porcelain crab	52	1	4	7
<i>Crossaster papposus</i>	Common sun star	56	21	6	5
<i>Merlangius merlangus</i>	Whiting	8	1	24	1
<i>Henricia oculata</i>	Blood Sea star	28	4	3	1
<i>Liocarcinus depurator</i>	Harbour crab	44	1	0	1
<i>Chlamys varia</i>	Variegated scallop	0	57	0	0
<i>Liocarcinus marmoreus</i>	Marbled swimming crab	108	0	2	0
<i>Pandalus propinquus</i>	prawn	48	0	0	0
<i>Macropodia tenuirostris</i>	Spider crab	36	0	0	0
<i>Ophiothrix fragilis</i>	Brittlestar	28	0	1	0
<i>Eurynome aspera</i>	Short legged spider crab	22	0	0	0
<i>Leptochiton sp</i>	Chiton	20	0	0	0

¹ Unusually, *Sabellaria alveolata*, which is relatively uncommon in subtidal *Sabellaria* aggregations, was present in the dredge samples as well as *Sabellaria spinulosa*. Both species were also recorded in the baseline surveys. "Ross" normally refers to *S. spinulosa* but in this report it is sometimes used more loosely to refer to mixtures of the two species

October 2004



November 2005

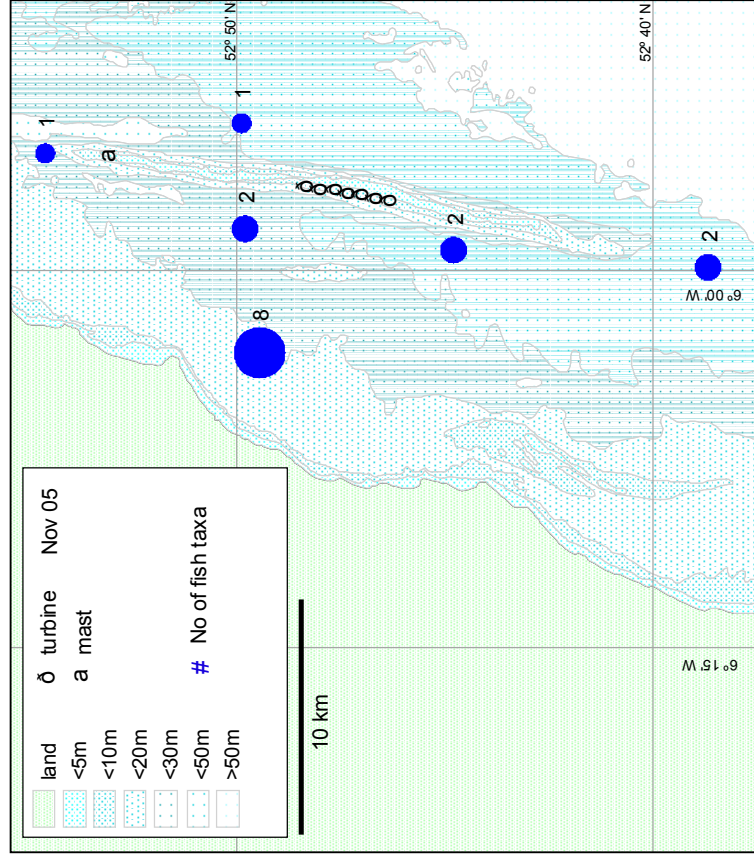
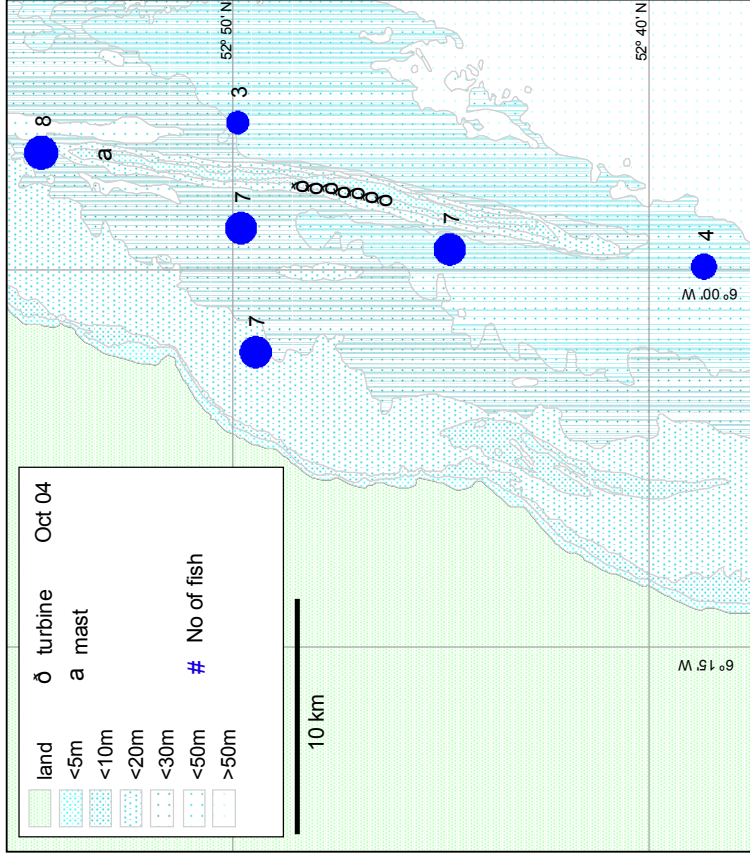


Figure 4 Total number of fish taxa per trawl site (October 2004 & November 2005)

October 2004



November 2005

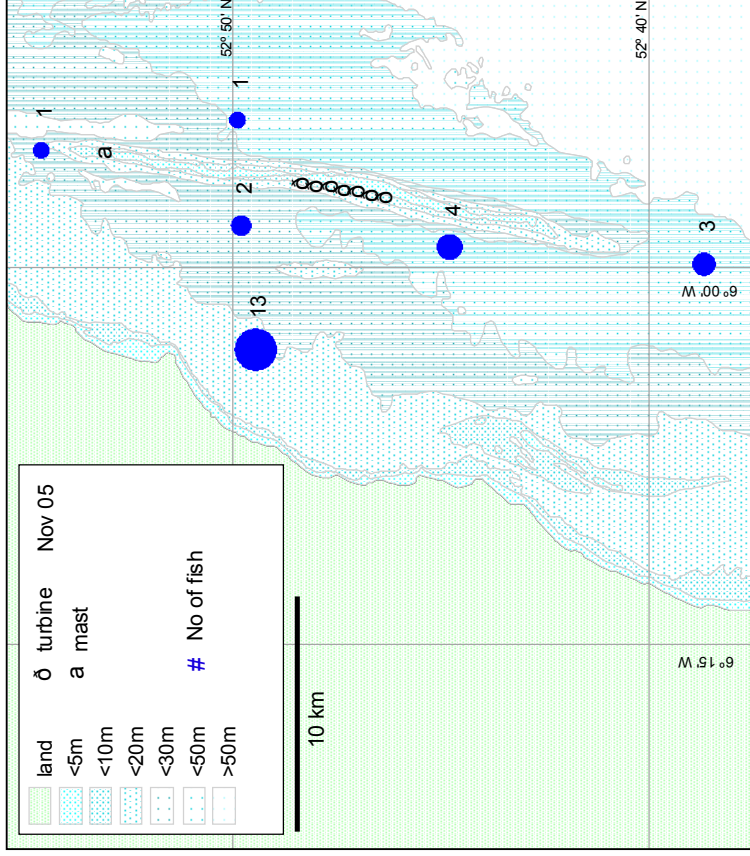
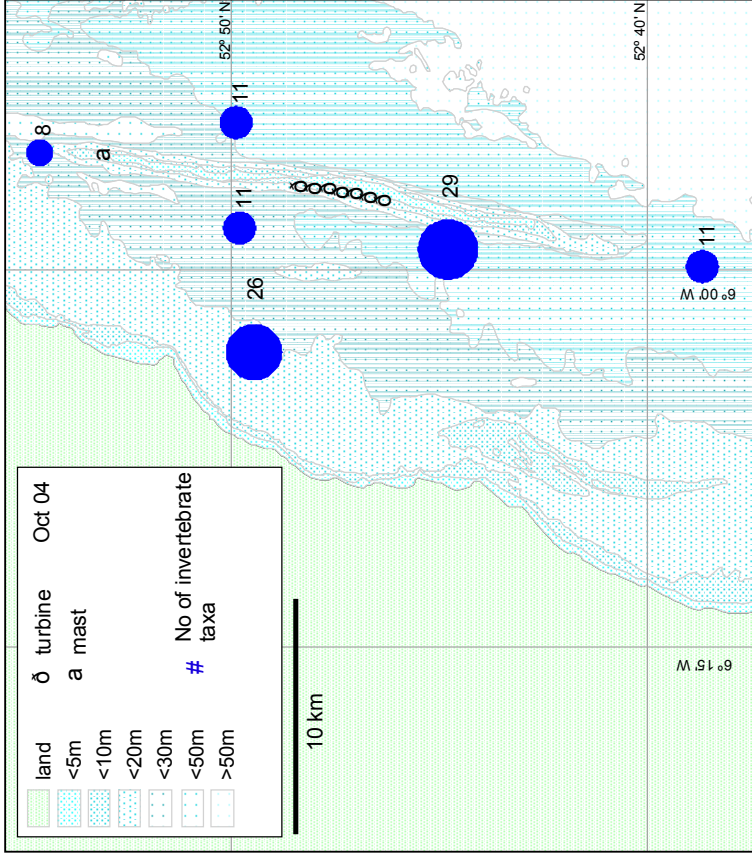


Figure 5 Total number of fish individuals per trawl site (October 2004 & November 2005)

October 2004



November 2005

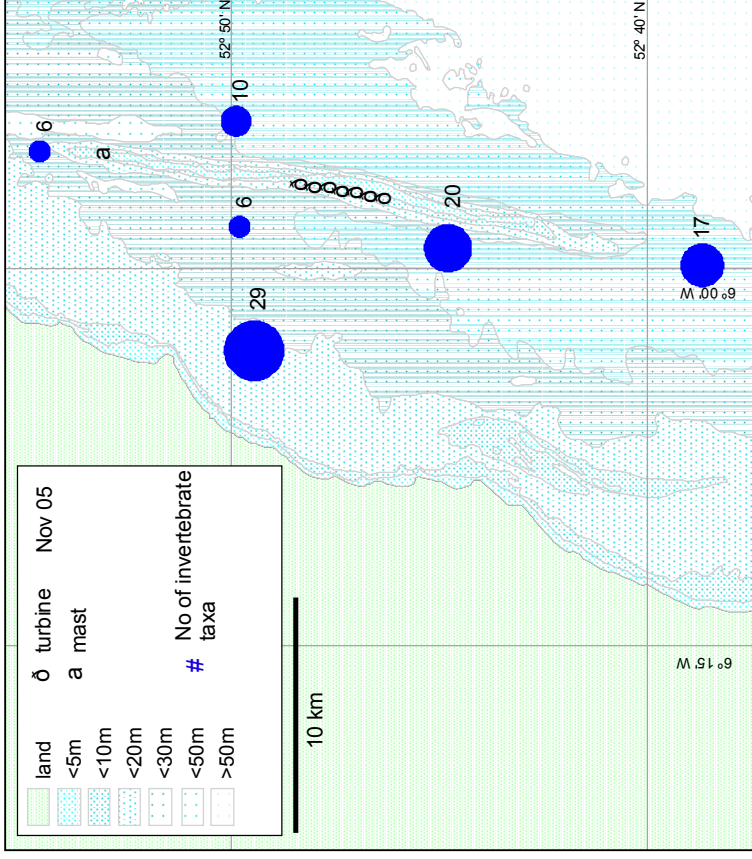
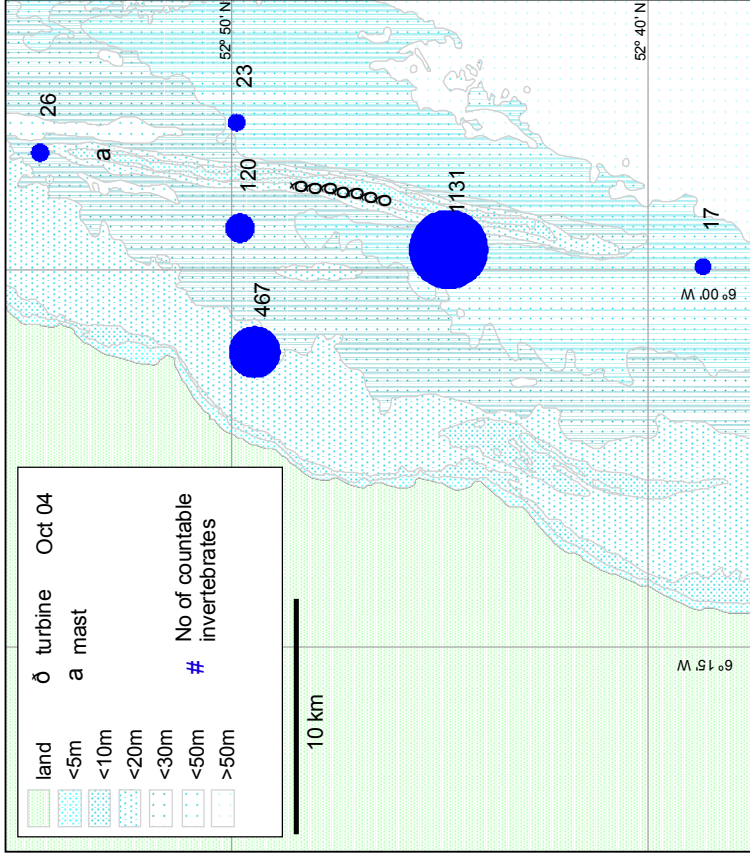


Figure 6 Number of invertebrate faunal taxa per trawl site (October 2004 & November 2005)

October 2004



November 2005

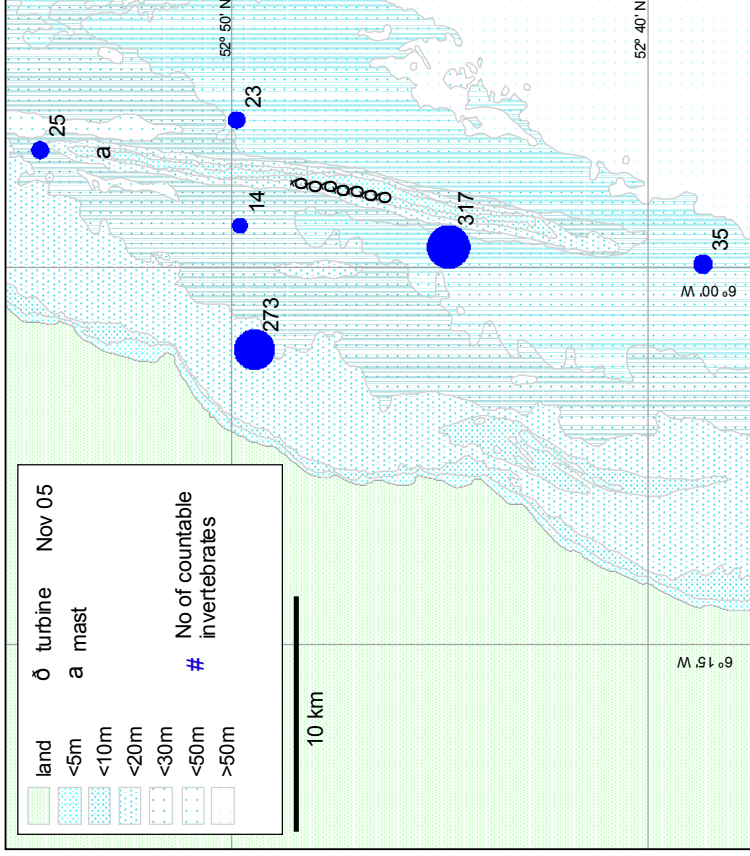


Figure 7 Total number of countable invertebrate fauna per trawl site (October 2004 & November 2005)

3.2 Anchor Dredge Samples

3.2.1 Geophysical analysis

Total data for the particle size analysis is presented in Appendix 6.6 including the percentage sieve weights and phi results. A summary of the sediment types after Buchanan and BGS is presented in Table 6, together with the visual assessment based on notes taken at the time. From the results it can be seen that there is a range of sediment types from very well sorted fine sands to very coarse gravels. Those sites of mainly medium sand also contained small quantities of broken shell fragments and pebbles.

The map presented in Figure 8, in combination with Table 6, shows that those sites located on top of the bank (12, 16 and 17) as well as those immediately to the north and south (8 and 13) were all composed of very well sorted or well sorted fine or medium sands, while the deeper sites both inshore and offshore were composed of coarser materials with the exceptions of sites 3 and 19. It can be seen from Table 6, which also includes Folk and Ward descriptions from the October 2004 surveys, that there is very close correlation between these (November 2005) results and those from October 2004, and the above generalised pattern of sediment distribution was very similar in October 2004. The main differences appear to be at site 6, which was previously recorded as gravel, but on this occasion was analysed as sand, and site 7, previously gravel, but this time slightly gravelly sand. However, the observations made at the time of sampling indicated the presence of muddy gravel with mussels and *Sabellaria* spp at site 6, and gravel and *Sabellaria* at site 7, and these observations are supported by the sample photographs. Thus, it appears that the subsamples were not particularly representative of the whole sample, although it is possible that this was at least partly due to disintegration of the *Sabellaria* tubes (which are made from sand) during the drying and sieving process. Thus, as in October 2004, it appears that the coarsest sites were clustered together in the north of the area, although it is not known if this is part of a wider trend on the local seabed.

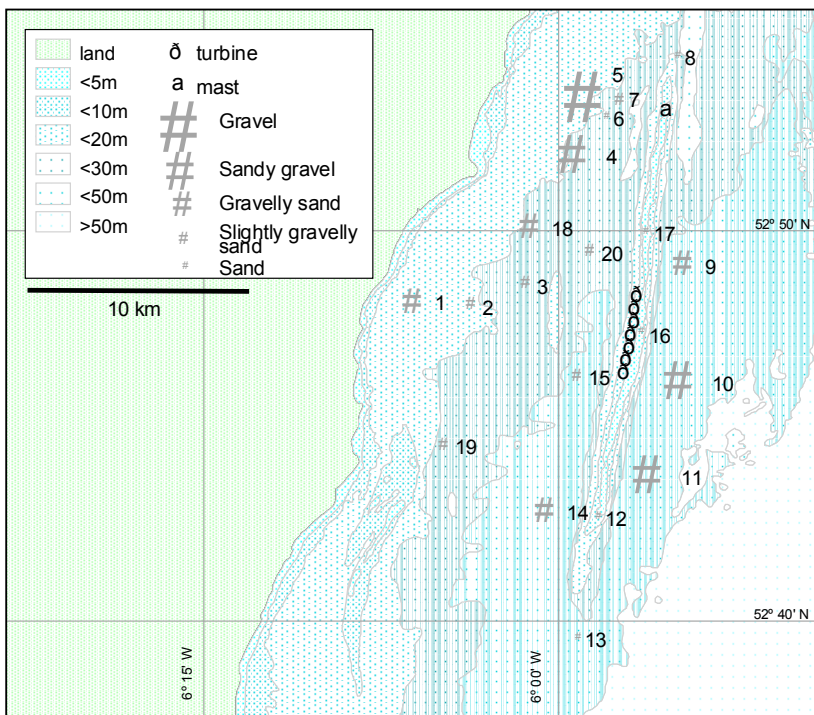


Figure 8 Distribution of sediment type as determined from particle size analysis of the anchor dredge sub-samples in Nov 2005. Site numbers are shown. Sediments at sites 6 and 7 are thought, from photographs and descriptions, to have been coarser than suggested from these results.

Table 6 Classification of sediment types at November 2005 grab stations according to methods after Buchanan 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 October 2004 survey is also given for comparison.

Site Code	Classification after Buchanan	Folk Triangles after BGS	Folk Triangles after BGS (October 2004 results for comparison)	Visual assessment
1	Poorly sorted medium sand	Gravelly Sand	Gravelly Sand	Slightly muddy sand with shells and gravel, lumps of clay
2	Moderately sorted medium sand	Slightly Gravelly Sand	Gravelly Sand	Slightly gravelly sand, slightly muddy
3	Well sorted fine sand	Slightly Gravelly Sand	Slightly Gravelly Sand	Coarse gravelly sand with a few stones
4	Poorly sorted very coarse sand	Sandy Gravel	Gravel (no sample, based on obs)	Coarse sand, stones, tube worms, polychaetes, bivalves and shell and shell fragments
5	Moderately sorted pebble	Gravel	Sandy Gravel	Coarse sand with stones
6	Moderately sorted medium sand	Sand	Gravel (no sample, based on obs)	Muddy gravel with mussels and Sabellaria
7	Well sorted medium sand	Slightly Gravelly Sand	Gravel (no sample, based on obs)	Gravel and Sabellaria
8	Very well sorted medium sand	Sand	Sand	Well sorted medium to fine sands
9	Poorly sorted coarse sand	Gravelly Sand	Gravelly Sand	Stone sand and gravel with <i>Sabellaria</i> chunks
10	Very poorly sorted granule	Sandy Gravel	Sandy Gravel	Sandy gravel and stones
11	Very poorly sorted granule	Sandy Gravel	Sandy Gravel	Stoney, pebbly cobbly mixture with maddy coarse sands and shell/shell fragments
12	Very well sorted fine sand	Sand	Sand	Fine compacted sands
13	Very well sorted medium sand	Sand	Sand	Coarse sand
14	Poorly sorted medium sand	Gravelly Sand	Sandy Gravel	Sand gravel and shell
15	Moderately sorted medium sand	Slightly Gravelly Sand	Gravelly Sand	Coarse gravelly/shelly sands with many shell fragments
16	Very well sorted fine sand	Sand	Sand	Fine compacted sand
17	Well sorted medium sand	Sand	Slightly Gravelly Sand	Fine compacted sand
18	Very poorly sorted coarse sand	Gravelly Sand	Sandy Gravel	Gravelly, slightly muddy sands with many stones with tube worms
19	Moderately well sorted fine sand	Slightly Gravelly Sand	Slightly Gravelly Sand	Sands with some small clay pieces and pebbles
20	Moderately sorted medium sand	Slightly Gravelly Sand	Gravelly Sand	Coarse, slightly gravelly sand

3.2.2 Biota

The following section presents the biota results from the November 2005 Anchor dredge survey and makes some comparisons with the data, where applicable, from the October 2004 survey and from the baseline surveys undertaken in September 2000. Limited comparisons are made with the June/July 2004 survey which was undertaken with a Day Grab.

3.2.2.1 Abundance and diversity

A taxonomic list of all the species recorded in the November 2005 survey is presented in Appendix 6.2 with full data displayed in Appendix 6.5. Overall 47,460 countable individuals from 313 taxa were recorded from the twenty samples. This survey, like the June 2005 survey (49,811 individuals from 346 taxa), had higher numbers of individuals and taxa than in the October 2004 survey (31,919 countable individuals from 300 taxa), and this does not, therefore, represent a seasonal trend. The increased numbers of individuals compared to October 2004 appear to be due mainly to larger numbers of the most abundant species, particularly the tubeworm *Pomatoceros triqueter* and the reef-building ross worms *Sabellaria alveolata* and *S. spinulosa*. These numbers are also, not surprisingly, much higher than the 1,258 individuals from 180 taxa at eight sites sampled by duplicate Day Grabs in June/July 2004.

Number of taxa and individuals recorded at each site for the anchor dredge survey are displayed as distribution maps in Figure 9 (number of taxa) and Figure 10 (number of individuals). As in October 2004, it is clear that the sites along, and immediately to the north and south, of the Arklow Bank are all particularly poor in both species and individuals, and that this is related to the well sorted sandy nature of the sediments at these sites (see Figure 8). Many other sites are much richer in either taxa, numbers of organisms, or both, particularly offshore from the Arklow Bank and along the north west edge of the survey area. There was little relationship between numbers of both taxa and organisms and Shannon Wiener diversity indices (Figure 11 and Table 7). Relatively high Shannon Wiener diversities are often associated with small numbers of both taxa and individuals, so long as they are relatively evenly distributed, as at site 8 in Nov 2005. In fact, as in previous surveys, the rather less well-known Margalef's species richness gives what seems intuitively to be a better indication of true diversity.

The list of most abundant taxa (Table 8) is very different to the list of dominant species found in the Day Grabs from June/July 2004, but this is unsurprising since on that occasion all of the coarser sites proved impossible to sample. The most abundant taxa are reasonably comparable with those of the October 2004 and June 2005 surveys, the most notable difference being the high abundance of the edible mussel *Mytilus edulis* at site 6 in June 2005. It is noteworthy that *Sabellaria alveolata*, which is more generally associated with the intertidal, is once again highly abundant at sites 9 and, more especially, 7 (as opposed to site 6 in previous surveys), and was again more abundant than *S. spinulosa*. Both species were found during the baseline surveys.

3.2.2.2 Multivariate analysis

Further statistical analysis has also been undertaken on the grab sample data through the use of PRIMER. Except where stated, multidimensional scaling (MDS) plots have been prepared using square-root transformed data in order to moderate the influence of very abundant taxa.

Multidimensional scaling analysis shows the relationships between the communities found at the different sites (Figure 13). Clearly sites 2,4,5,6,7,9,10,11,14 and 18 all have very similar communities (Figure 13a), and by superimposing the sediment type over the MDS plot (Figure 13b), it can be seen that sediment type has a very clear structuring role in the communities. The only difference between this pattern and those of October 2004 and June 2005 is that site 2 was not quite so closely associated with this group in the previous surveys. The closely clustering sites listed above are all the very rich sites, typically with large amounts of gravel (note that it has been pointed out in section 3.2.1 that the sediment sub-sample from site 6 seems to have under-

reported the gravel content at this site), as a result of which they have large numbers of epifaunal invertebrates such as the tubeworms *Pomatoceros triqueter*, *P. larmarckii* and *Hydroides norvegica*, the tunicate *Dendrodoa grossularia*, barnacles *Balanus crenatus* and *Verruca stroemia*, the chiton *Leptochiton asellus*; the colony forming tubeworms *Sabellaria spinulosa* and *S. alveolata* which are often associated with harder substrates where there is a good supply of suspended sand (discussed further below), and numerous other organisms, including which, while not strictly epifauna, are often associated with stoney sediments (Table 8). The very sandy sites tend not to cluster well together; this probably represents the fact that they have extremely species poor fauna; these are sites 8,12,13,16 and 17 where there were 4 or fewer countable fauna except at site 8 (13 countable fauna) consisting largely of small numbers of worms typical of disturbed sandy areas, including *Nephtys cirrosa* and *Ophelia borealis*, although there were also small amounts of encrusting byzoa and other colonial organisms. Clearly, even if the overall fauna is extremely similar the random nature of sampling from within such a sparsely populated community would lead to mathematical dissimilarity as has occurred here.

This pattern is very similar to that observed in the October 2004 and June 2005 surveys, where almost exactly the same rich sites were closely clustered together (except for site 2 being a little more closely associated with the rich sites in this survey, and site 1 a little less so). This is emphasised in Figure 14, which displays the results of the cluster analysis undertaken upon the anchor dredge data of November 2005 with those of October 2004 and June 2005. The most noticeable disparities are, again, with the less rich sites, notably sites 12 and 13, and to a lesser extent site 8, and again this can probably be attributed to random variations in sampling from within sparsely populated communities.

Previous reports comparing the anchor dredge data with the data from Day grabs obtained in June 2004 have clearly demonstrated that there is only an extremely poor relationship between the data from the two different survey methods (CMACS 2005; CMACS 2006), and this comparison has, therefore, not been repeated here.

It can be seen from Figure 15 that there is no similarity between the data from the baseline survey undertaken in September 2000 and that undertaken in this monitoring survey (November 2005). There are a number of significant differences between the surveys which mean that this is not surprising; the surveys were carried out using different gear (anchor-style dredge with large net mesh in 2000, also sometimes called a biological dredge; anchor dredge with closed metal base in monitoring surveys). In 2000 the samples were identified mainly on board the boat and this would undoubtedly have meant that large numbers of small organisms would have been missed. This is reflected in the fact that the numbers of taxa recorded in the 2000 and 2001 surveys (61-83) were far lower than in the 2004/2005 monitoring surveys (313 in Nov 2005). The surveys were carried out at different locations and, the length of the tows in September 2000 was more variable than in 2004, the length of tow depending upon the nature of the ground, and being up to seven minutes on some occasions (Ecoserve, 2001). The seasons in which the surveys were carried out were slightly different, of course. Finally, the 2000 data consist of presence/absence data only, whereas full counts were carried out here, but this was counteracted by carrying out the MDS comparisons using presence/absence data only, however. This lack of similarity was also found during the October 2004 and June 2005 surveys (CMACS 2005; CMACS 2006).

There are, nevertheless, broad similarities between the baseline data and the data presented here. Both surveys found very sparse communities on the sands along, and immediately to the north

and south of, the Arklow Bank, and richer communities associated with coarser, gravely sediments elsewhere, especially offshore from the Arklow Bank and to the north-west of the survey area. Both surveys found evidence of clumps or aggregations of *Sabellaria spinulosa* and/or *S. alveolata* in broadly the same areas (principally the north end of the survey site and just offshore from the Arklow Bank, plus small amounts elsewhere such as just offshore from Arklow Harbour, Figure 12).

Table 7 Univariate descriptors of abundance and richness in the 20 dredge samples from November 2005

Sample	No of taxa S	No of countable individuals N	Margalef's species richness S	Shannon- Wiener diversity index $H'(\log_e)$
1	32	53	7.60	3.15
2	63	370	10.40	2.47
3	22	37	5.42	2.57
4	105	13729	10.91	0.41
5	83	6416	9.35	0.62
6	79	1086	11.13	2.36
7	110	10645	11.20	1.58
8	6	4	2.79	1.79
9	113	3954	13.51	1.72
10	127	1972	16.58	1.98
11	77	1644	10.25	1.65
12	1	1	0.00	0.00
13	6	13	1.89	1.73
14	147	1946	19.24	2.87
15	18	30	4.71	2.40
16	2	2	1.44	0.69
17	5	3	2.49	1.61
18	110	5541	12.64	1.00
19	9	10	3.03	2.01
20	9	4	3.64	2.20

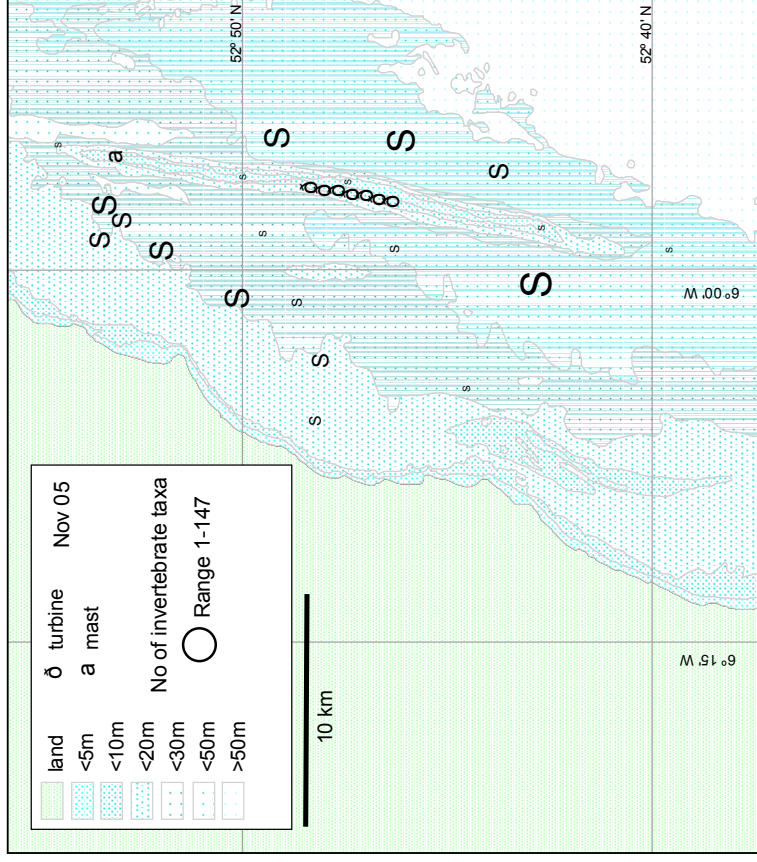
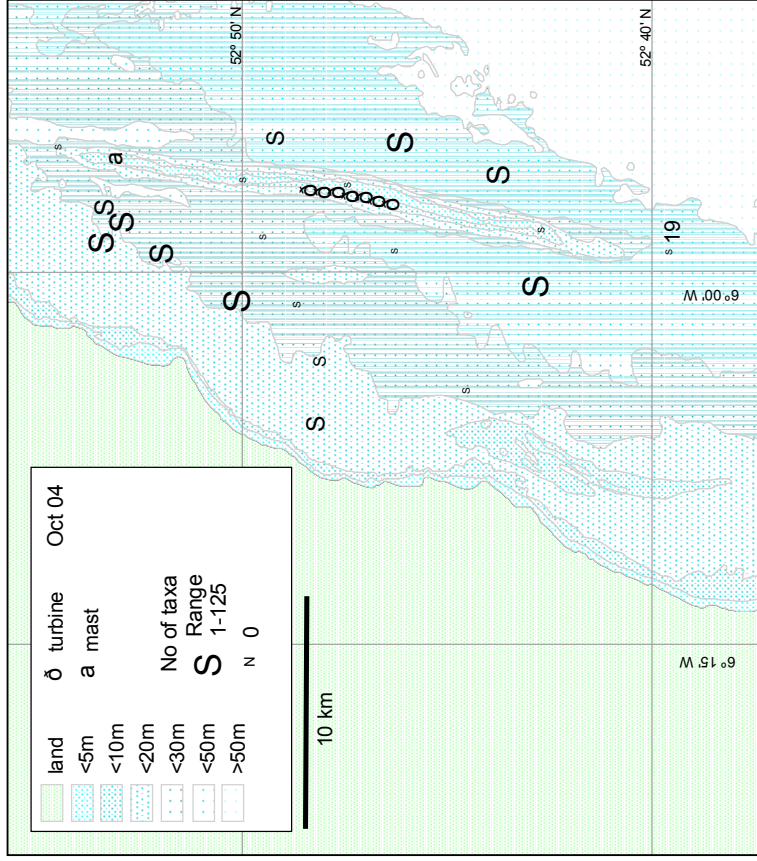


Figure 9 Number of taxa found at each dredge survey site in October 2004 and November 2005

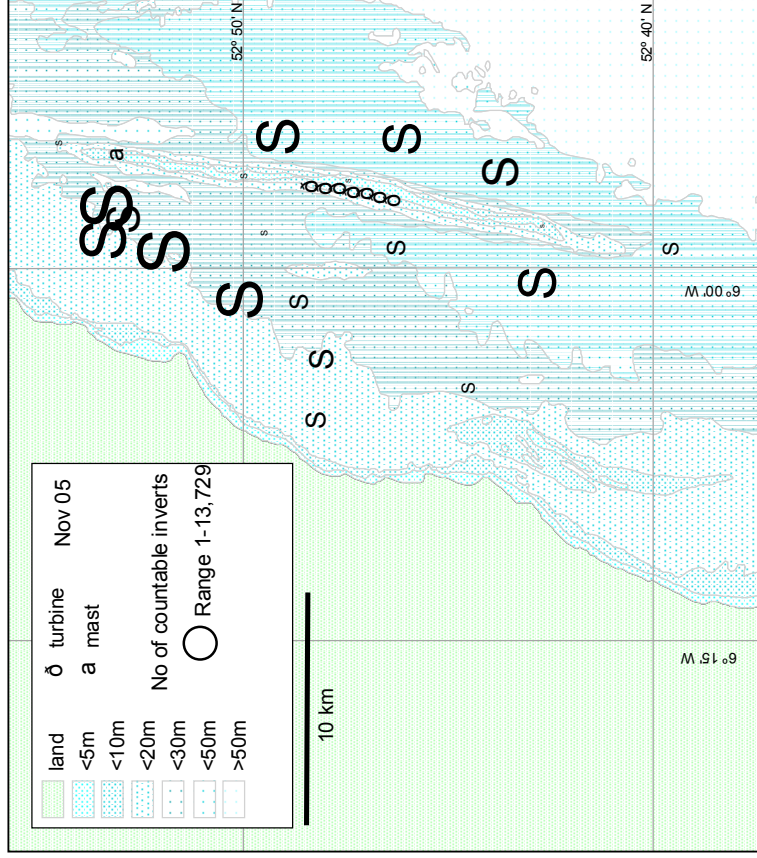
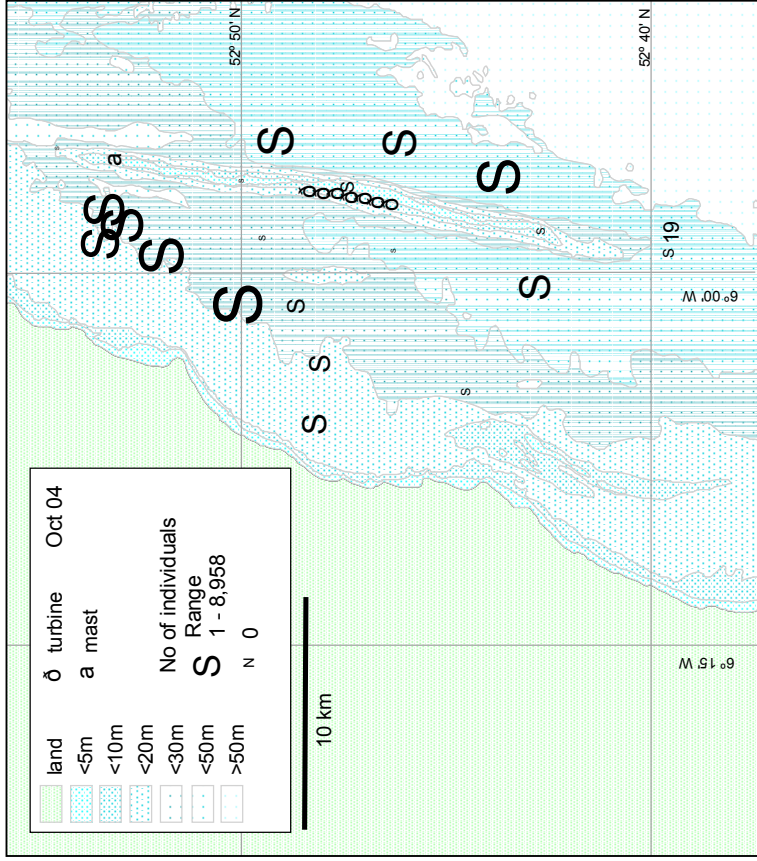


Figure 10 Total number of individuals found at each dredge location in October 2004 and June 2005

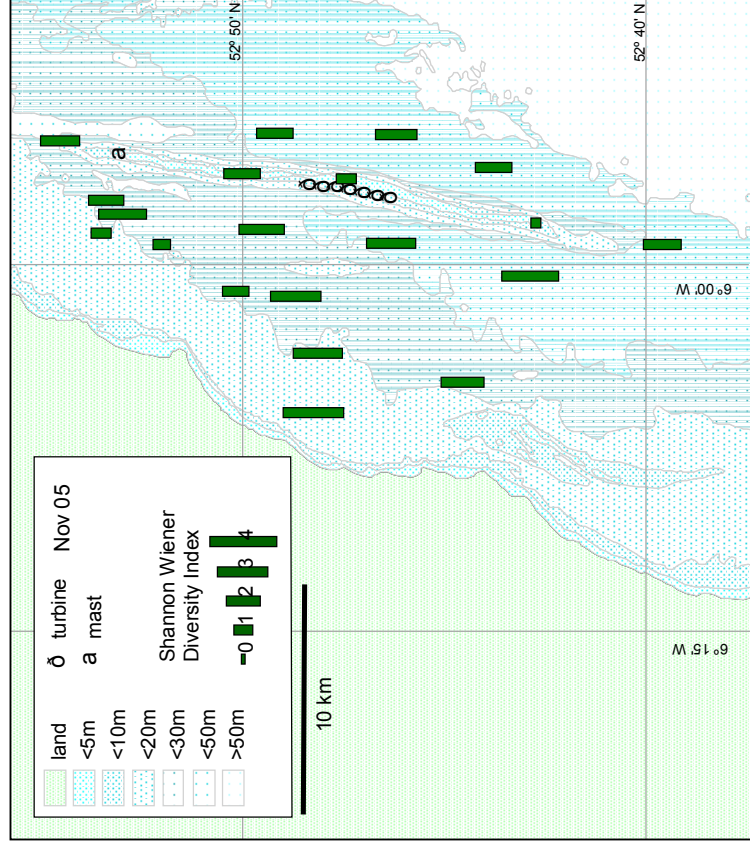
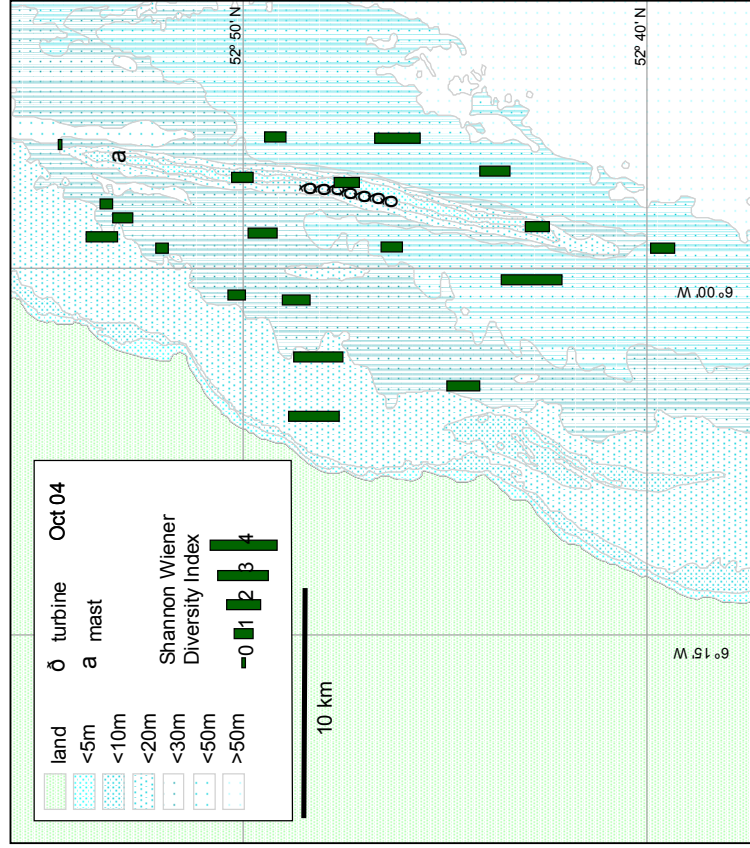


Figure 11 Shannon Wiener diversity indices at each dredge location in October 2004 and November 2005

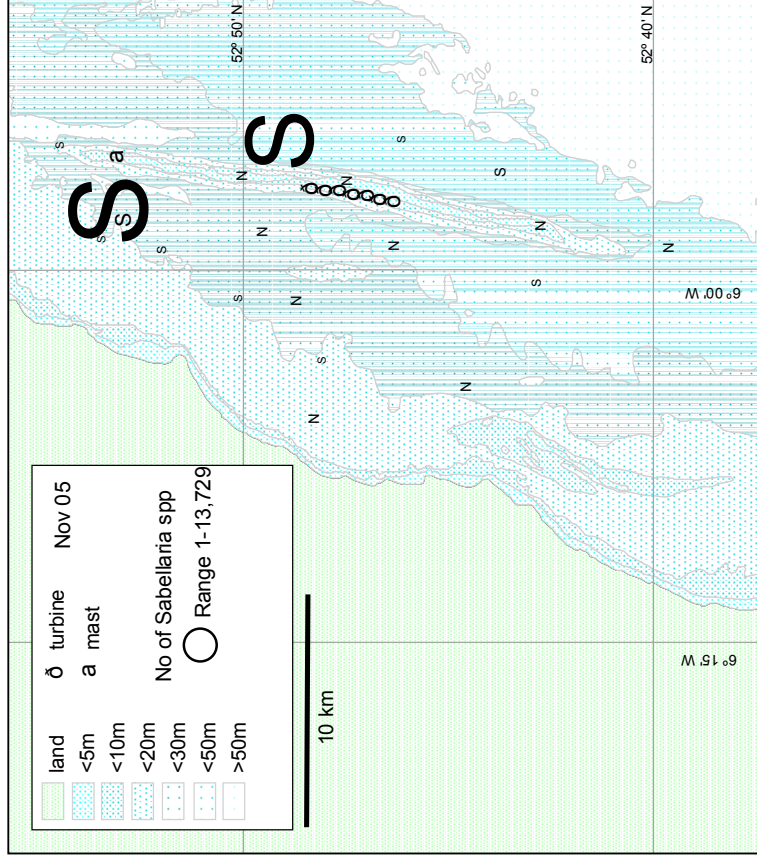
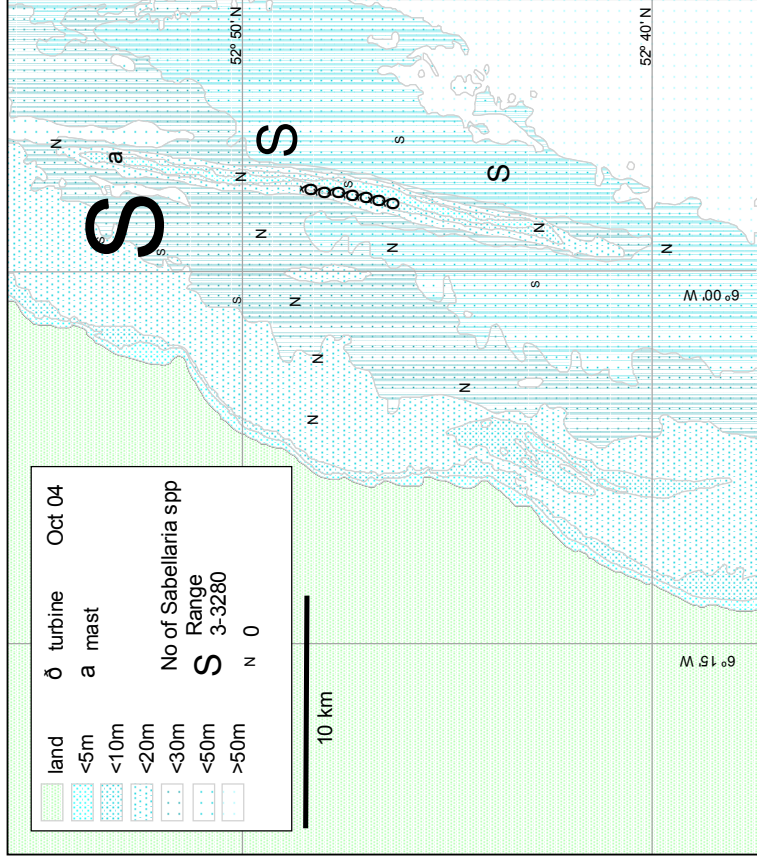


Figure 12 Total number of *Sabellaria* spp found at each dredge sample site in October 2004 and November 2005

Table 8 List of the most abundant taxa in descending order of abundance from the anchor dredge survey of November 2005. All taxa where more than 60 individuals in total were recorded are shown.

Group	Family	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
Annelida	Serpulidae	Pomateros triquetra		158	12	12960	5796		624	313	264	612			531					4560	1		25831
Annelida	Sabellariidae	Sabellaria alveolata				3	1	263	7124	1	2400												9792
Tunicata	Styelidae	Dendrodoa grossularia		84	2	99	164		276	13	1216	699			560					226			3339
Annelida	Sabellariidae	Sabellaria spinulosa		6		37	7	68	795	420	10	112		1	32					12			1499
Crustacea	Porcellanidae	Pisidia longicornis				6	19	55	459	167	7				25					18			757
Crustacea	Balanidae	Balanus crenatus					1	20	342	252													615
Mollusca	Nuculidae	Nucula nucleus	1		159	5	5	50				1			5					281			507
Mollusca	Mytilidae	Mytilus edulis						432	63														495
Annelida	Sabellidae	Jasmineira elegans	1		25	3	4	121		20										7			181
Annelida	Syllidae	Typosyllis variegata	1		13	12	10	104		15	10						1					1	167
Crustacea	Balanidae	Balanus balanus					119		36											1			156
Crustacea	Verrucidae	Verruca stroemia			72			8				38	1							27			155
Mollusca	Leptochitonidae	Leptochiton asellus			9		3		1	4	42	14			65					12			150
Annelida	Serpulidae	Hydroides norvegica	10						24	1		21			85					2			143
Mollusca	Mytilidae	Mytilus sp. juv.			1	3			82	P	4	1			20	12				5			128
Annelida	Maldanidae	Clymenura johnstoni	11		27			17	4	1	31	4			10					14			119
Annelida	Phyllocididae	Eumida bahusensis			43	45	3			3					3					20			117
Mollusca	Anomiidae	Anomida sp.			7	1		1	1	2	8	80			9					3			111
Nematoda		Nematoda spp.	3		4	4	1	10	71	11	5	1								2			108
Mollusca	Nuculidae	Nucula sp. (juv.)					7					1								96			104
Annelida	Polynoidae	Harmothoe sp.			9	10	12	16		32	2				7					2			90
Annelida	Polynoidae	Lepidonotus			14	21	11	23		3	3	1			5					10			88
Chidaria		Actinaria			19	3	3	17		1	13				26					5			87
Annelida	Orbiniidae	Scoloplos armiger	1								4	7			64			1					77
Annelida	Trichobranchida	Thelepus setosus			28	22	2	3		1					1					14			71
Mollusca	Trochidae	Gibbula umbilicalis	1		9	9	1	14							14					21			70
Mollusca	Hiatellidae	Hiatella arctica			12	6		28		12	4				2					5			69
Crustacea	Corophiidae	Unciola crenatipalma				1	4	31		32													68
Annelida	Scalibregmatida	Scalibregma inflatum	2												62								64
Mollusca	Scrobiculariidae	Abra alba	2				2	8		6	15				31								64
Sipuncula	Golfingiidae	Golfingia elongata			2	2	4	24		23	1				2					2			60

*Mytilidae sp juv

a)

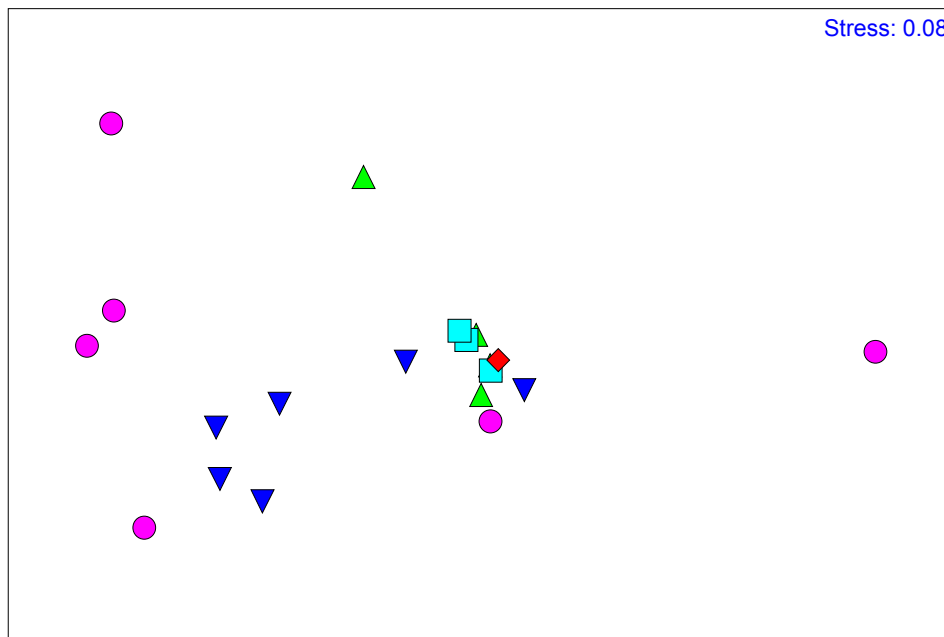
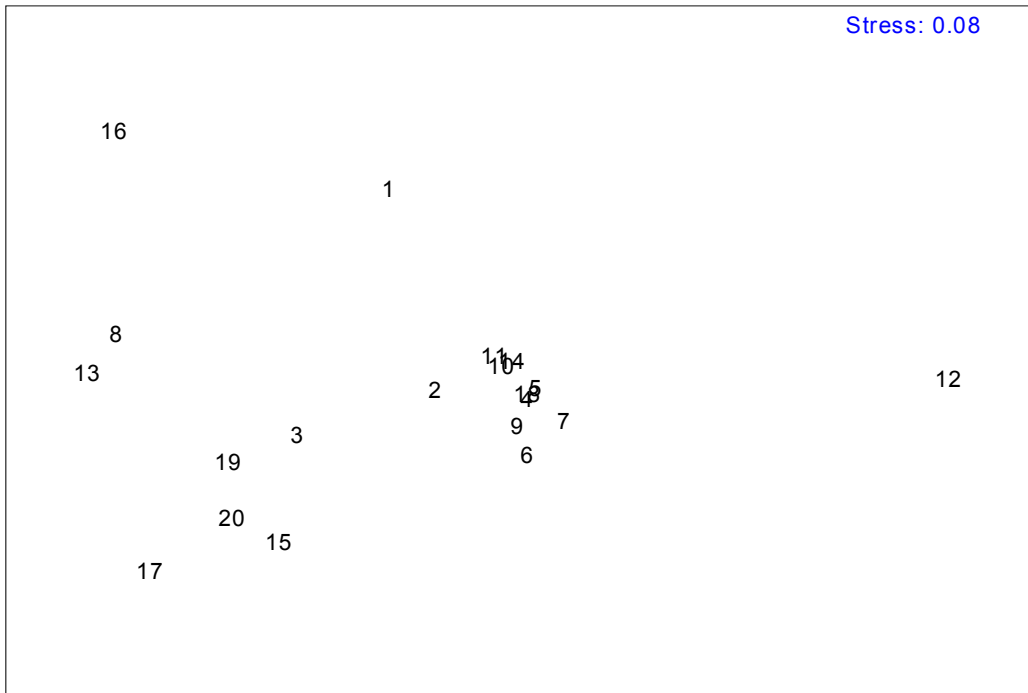


Figure 13 Multi-dimensional scaling plot of faunal data from the anchor dredge survey, November 2005

- a) with site labels superimposed
- b) with sediment type as classified according to BGS methods superimposed .

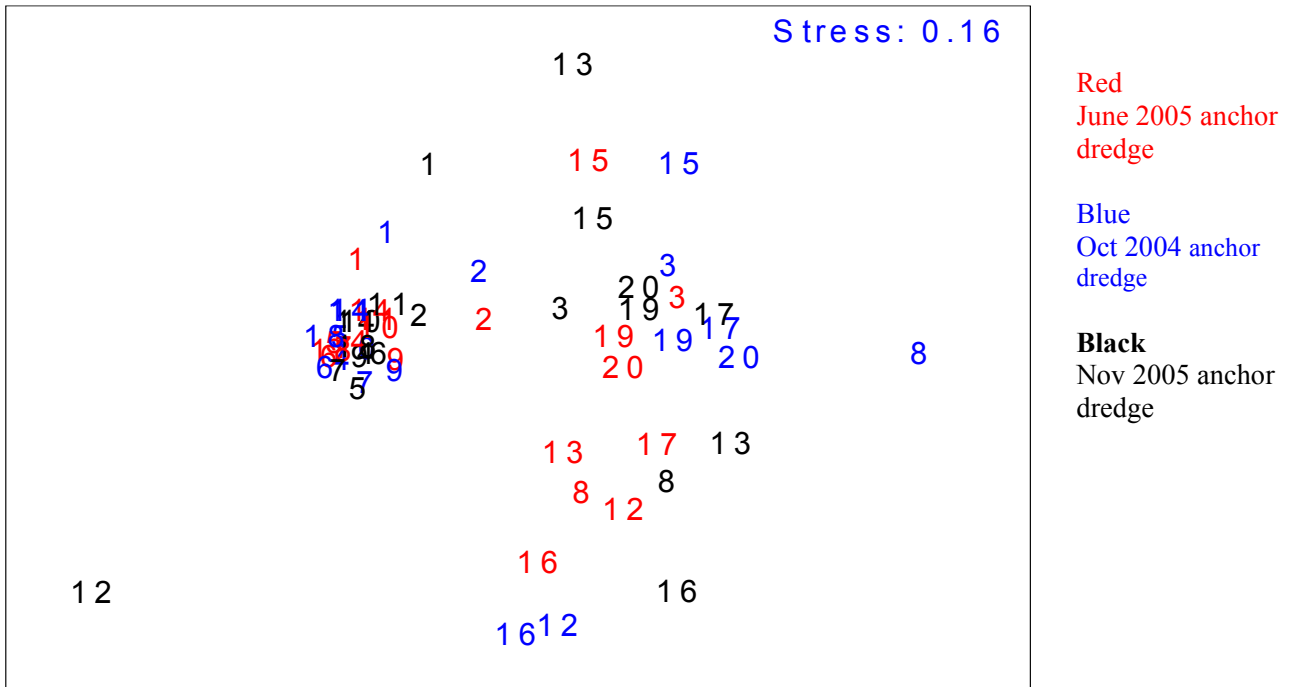


Figure 14 Multi-dimensional scaling plot of faunal data from November 2005 anchor dredges, together with those from October 2004 and June 2005, based on square-root transformed data.

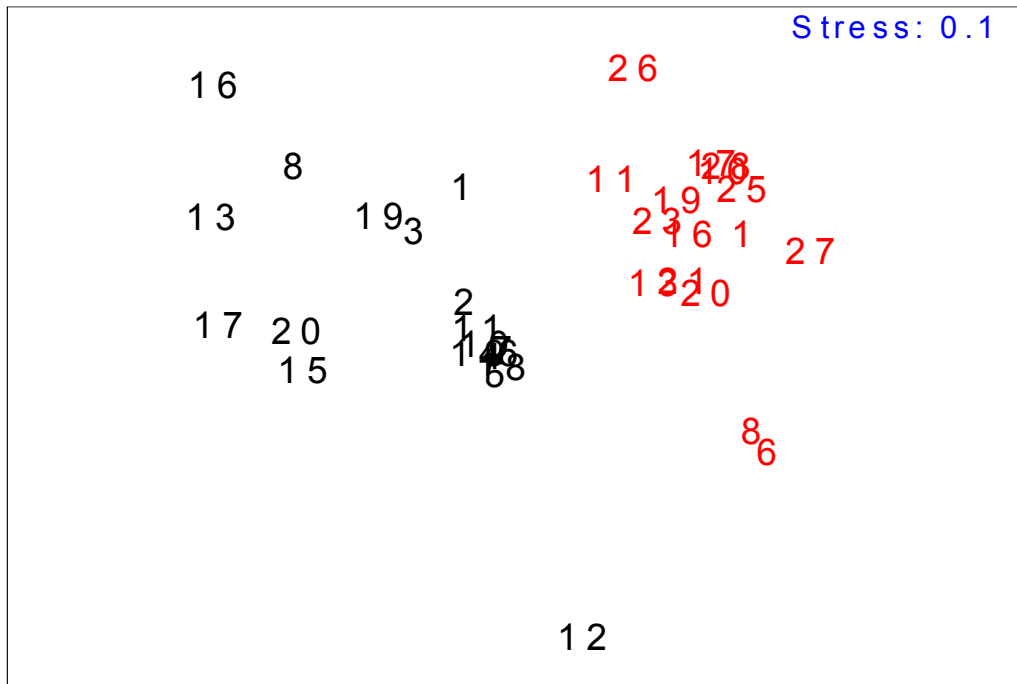


Figure 15 Cluster analysis of September 2000 (red) and November 2005 (black) anchor dredge data, based on presence / absence only. **Note that site numbers are not necessarily comparable in these surveys.**

4. Discussion and Conclusions

The large range of habitats and sediment types found in the Central and Southern Irish Sea support a diverse fish fauna, including many commercially important species. Several commercially exploited species such as whiting, haddock and herring make up a large percentage of the total fish biomass. The region of the Irish Sea investigated for this survey is characterised by hard and soft substratum with the sandy areas typified by the abundance of flatfish and juvenile gadoids with rocky/gravel assemblages being dominated by larger fish including elasmobranchs, gurnards, cod, large whiting and only a few species of flatfish (NERC, 1998). The results from this survey, as in June/July 2004, indicate that the fish species broadly resemble these assemblages with species of invertebrates, hydroids and algae generally associated with hard substrata being broadly coupled with fish such as the elasmobranchs and whiting. Flatfish seem to be mostly associated with the inshore site 1, and, as for fish in general, appear so far to have been more numerous in the summer (July 2004 and June 2005) surveys than the autumn (October 2004 and November 2005) surveys. Numbers of fish in the area appear to be generally low, however. Sand gobies appear, as is usually the case, to be highly variable in number, having been absent in June 2005, but once again present in this survey.

The sea bed around Arklow Bank is composed of current swept coarse sediments which consist of compact sand, with gravel, shell and/or cobbles in varying proportions, and has been described as being the most widespread habitat in the western Irish Sea. The fauna is characterised by erect hydroids (typically *Hydrallmania falcata*, *Sertularia argentea* (also widely known as *Sertularia cupressina*) and *Nemertesia* spp.) that attach to cobbles or shell (Keegan *et al.*, 1987). The bryozoan *Flustra foliacea* is abundant on bedrock exposed to strong currents and sand scour. All of these species were found regularly during this and previous surveys. Other habitats in this region include banks of cobbles and coarse sands characterised by the polychaetes *Nephtys cirrosa*, *Ophelia borealis* and *Lanice conchilega*, and the bivalve *Spisula elliptica* (Keegan *et al.*, 1987). Although all of these species were found in this survey, they were, as previously, all at very low abundance and showed little close association with each other, although it is possible that the small number of sample sites may be at least partly responsible for this.

As in the baseline survey no rare, unusual or vagrant species were recorded during the beam trawl survey. However the sand goby, *Pomatoschistus minutus* (which was the most numerous species recorded) is protected under Annex III of the Bern Convention and is thus considered to be of high importance mainly because of its significance to the maintenance of food web stability. However, sand gobies are considered to be very abundant (Potts & Swaby, 1996) and widely distributed throughout Irish and UK waters being described as frequent in occurrence by Hayward & Ryland (1990). Numbers found in this area in this and previous surveys appear to be generally very low, however.

Other species of importance found during this survey were the reef-forming worms, *Sabellaria spinulosa* (ross worm) and *Sabellaria alveolata* (honeycomb worm) found both inside and outside of the Arklow Bank; these tube dwelling worms are widely considered to be of importance due to their ability to produce biogenic reef. Such biogenic reefs are considered to be important due to their ability to stabilise sediments providing an environment for other species to colonise creating a reef environment (Holt *et al.*, 1998). In the wider British Isles *Sabellaria alveolata* is much more common intertidally than subtidally, and particularly unusual beyond 2 or 3 metres depth, but in the Arklow area it is consistently occurring in 20m or more, and it has previously been found both here and elsewhere on the eastern Irish coast in similar situations (Ecoserve, 2001). Areas containing such biogenic reef structures, containing both *Sabellaria* species, off Wicklow

Head have been proposed as Special Areas of Conservation (SACs), the Irish Government's response to requirements for protection of species and habitats under the EU Habitats directive, although no statutory conservation measures have yet been assigned. No very significant clumps were yielded during the trawls in either July or October 2004, nor any at all in either of the 2005 surveys, suggesting that very extensive biogenic reef is probably not present in those areas, although some small aggregations were encountered at site 4 (close to anchor dredge site number nine, where large numbers were also encountered in the October 2004 anchor dredge survey) in both July 2004 and October 2004 beam trawl surveys. However, no trawl sites are situated close to the main area of *Sabellaria* encountered in the anchor dredge surveys, which is to the north west of the Arklow Bank. *Sabellaria* communities seemed to have broadly similar distributions in all of the monitoring surveys as was found in the baseline surveys. As is widely reported elsewhere, they are strongly associated with rich and diverse communities. This may at least partly be as a direct result of their presence, since they can stabilise mobile substrate and create additional habitat for other organisms to dwell on or in; but it may also be simply a case of the habitat in which they occur, (which tends to have a large proportion of cobble and stones with an immediately adjacent supply of mobile sand), also being suitable for a large variety of other species.

Given the very limited number of trawls and dredges used within the surveys it is very difficult to draw any more detailed observations, especially when data was recorded on a presence or absence basis within the baseline survey. This renders the possibility of any effects of the windfarm development at the community level being extremely difficult to identify, as it ignores the fact that natural fluctuations within populations may occur, as well as the fact that small beam and Agassiz trawls, and anchor dredges, are generally regarded as semi-quantitative at best.

The lack of numerical baseline data also makes it very difficult to attribute whether any changes within the local populations are as a result of impacts from the windfarm or if they are just interannual fluctuations or variations at the population level. Comparison between the data sets generated during the baseline surveys in 2000 and 2001 and those from the 2004 surveys are extremely difficult given the lack of numerical baseline dredge data, the differing methods used in both trawl and dredge surveys, and also the different locations and the different number of samples used within each survey.

Nevertheless, when viewed overall at the species level the assemblages appear to be broadly similar to those found in the baseline surveys with broadly similar species of invertebrates and fish (including commercial species) being recorded in the November 2005 survey. However, the detailed composition of the benthic communities found in the baseline and all of the 2004 and 2005 anchor dredge surveys clearly differ greatly as evidenced by MDS analysis, and this is probably directly attributable to the differing sampling methods utilised on each occasion. It is recommended that all future monitoring surveys continue to use a similar method of survey methodology to allow direct future comparisons.

There is no obvious reason for the very low number of countable organisms found in the beam trawls during these, and also the June 2005, surveys. The drop was fairly widespread and seems unlikely to be related to the development of the windfarm, however, and is in contrast to the anchor dredge results where the numbers of taxa and organisms found seemed high in this survey. It is likely that this simply represents natural fluctuations in populations of benthic organisms.

It is probably unwise, given the relatively small scale of the survey, to place too much emphasis on the results for individual species or even individual samples and it is likely that the results

from this study will increase in value, and allow a slightly greater level of analysis, when more surveys have been carried out.

7. References

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6. APPENDICES

Appendix 6.1 Species List for Beam Trawl Surveys 9th –10th November 2005

Taxon	Family	Authority
Porifera		
<i>Halichondria panicea</i>	Halichondriidae	Pallas, 1766
Cnidaria		
<i>Tubularia indivisa</i>	Tubulariidae	Linnaeus, 1758
<i>Hydrallmania falcata</i>	Sertulariidae	(Linnaeus, 1758)
<i>Sertularella gayi</i>	Sertulariidae	(Lamouroux, 1821)
<i>Sertularia cupressina</i>	Sertulariidae	Linnaeus, 1758
<i>Abietinaria abietina</i>	Sertulariidae	(Linnaeus, 1758)
<i>Nemertesia antennina</i>	Plumulariidae	(Linnaeus, 1758)
<i>Metridium senile</i>	Metridiidae	Linnaeus, 1761
Annelida		
<i>Aphrodita aculeata</i>	Aphroditidae	Linnaeus, 1758
<i>Serpula vermicularis</i>	Serpulidae	Linnaeus, 1767
<i>Pomatoceros</i> sp.	Serpulidae	Philippi, 1844
Crustacea		
<i>Balanus</i> sp.	Balanidae	Costa, 1778 (mostly <i>B. crenatus</i>)
<i>Idotea</i> sp.	Idoteidae	Fabricius, 1798
<i>Pandalina brevirostris</i>	Pandalidae	(Rathke, 1837)
<i>Pandalus montagui</i>	Pandalidae	Leach, 1814
<i>Processa canaliculata</i>	Palaemonidae	Leach, 1815
<i>Pasiphaeo sivado</i>	Pasiphaeidae	(Risso, 1816)
<i>Crangon crangon</i>	Crangonidae	Linnaeus, 1758
<i>Philoceras trispinosus</i>	Crangonidae	Formerly <i>Crangon trispinosus</i> of Hailstone, 1835, also called <i>Pontophilus trispinosus</i>
<i>Pagurus bernhardus</i>	Paguridae	Linnaeus, 1758
<i>Pisidia longicornis</i>	Porcellanidae	Linnaeus, 1767
<i>Hyas coarctatus</i>	Majidae	Leach, 1815
<i>Macropodia rostrata</i>	Majidae	Linnaeus, 1761
<i>Liocarcinus depurator</i>	Portunidae	Linnaeus, 1758
<i>Liocarcinus holsatus</i>	Portunidae	Fabricius, 1798
<i>Necora puber</i>	Portunidae	Linnaeus, 1767
<i>Pilumnus hirtellus</i>	Xanthidae	(Linnaeus, 1761)
<i>Xantho</i> sp. (<i>Xantho pilipes</i> was recorded in anchor dredges)	Xanthidae	Leach, 1814
<i>Achaeus cranchii</i>	Majida	Leach, 1817
<i>Inachus dorsettensis</i>	Majidae	Pennant, 1777
Mollusca		
<i>Facelina auriculata</i>	Facelinidae	(O F Muller, 1776)
<i>Calliostoma zizyphinum</i>	Trochidae	Linnaeus, 1758
<i>Buccinum undatum</i>	Buccinidae	Linnaeus, 1758
<i>Sepiola atlantica</i>	Sepiolidae	Orbigny in Férussac & Orbigny, 1840
Bryozoa		
<i>Alcyonidium diaphanum</i>	Alcyonidiidae	Hudson, 1762
<i>Eucratea loricata</i>	Eucrateidae	(Linnaeus, 1758)
<i>Flustra foliacea</i>	Flustridae	Linnaeus, 1758

Taxon	Family	Authority
Echinodermata		
<i>Crossaster papposus</i>	Solasteridae	Linnaeus, 1767
<i>Henricia oculata</i>	Echinasteridae	Pennant, 1777) records in previous suveys ascribed to <i>H. sanguinolenta</i> were almost certainly this species
<i>Asterias rubens</i>	Asteriidae	Linnaeus, 1758
<i>Ophiura albida</i>	Ophiuridae	Forbes, 1839
<i>Ophiothrix fragilis</i>	Ophiotrichidae	(Abildgaard, 1789)
<i>Psammechinus miliaris</i>	Parechinidae	Gmelin, 1778
Chordata		
<i>Ascidia conchilega</i>	Asciidae	O F Müller, 1776
<i>Scyliorhinus caniculus</i>	Scyliorhinidae	Linnaeus, 1758
<i>Raja clavata</i>	Rajidae	Linnaeus, 1758
<i>Raja montagui</i>	Rajidae	Fowler, 1910
<i>Merlangius merlangus</i>	Gadidae	Linnaeus, 1758
<i>Trisopterus minutus</i>	Gadidae	Linnaeus, 1758
<i>Ammodytes tobianus</i>	Ammodytidae	Linnaeus, 1758
<i>Callionymus lyra</i>	Callionymidae	Linnaeus, 1758
<i>Pleuronectes platessa</i>	Pleuronectidae	Linnaeus, 1758
<i>Limanda limanda</i>	Pleuronectidae	Linnaeus, 1758
<i>Pomatoschistus minutus</i>	Gobiidae	Pallas, 1770
<i>Solea solea</i>	Soleidae	Linnaeus, 1758

Appendix 6.1 continued

Appendix 6.2 Species List for Anchor Dredge Survey 9th and 10th November 2005

GROUP & Family	NAME
ANNELIDA	
	Oligochaeta spp.
	Hesionidae sp.
Acoetidae	Dodecaceria fimbriata?
Ampharetidae	Ampharete acutifrons
Ampharetidae	Ampharete finmarchica?
Ampharetidae	Ampharete lindstroemi
Ampharetinae	Ampharetinae
Capitellidae	Capitella capitata
Capitellidae	Mediomastus fragilis
Capitellidae	Notomastus sp.
Chaetopteridae	Spiochaetopterus typicus
Cirratulidae	Aphelochaeta sp.
Cirratulidae	Caulleriella alata
Cirratulidae	Caulleriella zetlandica
Cirratulidae	Cirratulidae sp.
Cirratulidae	Cirriformia tentaculata
Cirratulidae	Tharyx killariensis
Dorvilleidae	Protodorvillea kefersteini
Eunicidae	Marphysa bellii
Eunicidae	Nematonereis unicornis
Euprosinidae	Euprosine foliosa
Flabelligeridae	Flabelligera affinis
Glyceridae	Glycera lapidum
Glyceridae	Glycera oxycephala
Glyceridae	Glycera tridactyla
Goniadidae	Glycinde nordmanni
Goniadidae	Goniada maculata
Hesionidae	Psamathe fusca
Hesionidae	Syllidia armata
Lumbrineridae	Lumbrineris gracilis
Lumbrineridae	Lumbrineris sp.
Maldanidae	Clymenura johnstoni
Maldanidae	Clymenura sp.
Maldanidae	Euclymeninae
Maldanidae	Micromaldane ornithochaeta
Maldanidae	Nicomache personata
Maldanidae	Nicomache sp.
Maldanidae	Petaloproctus
Maldanidae	Petaloproctus tenuis borealis
Nephtyidae	Nephtys caeca

Nephtyidae	Nephtys cirrosa
Nephtyidae	Nephtys hombergii
Nephtyidae	Nephtys kersivalensis
Nephtyidae	Nephtys sp. (juv.)
Nereididae	Nereis longissima
Nereididae	Nereis zonata
Oeonidae	Notocirrus scoticus
Opheliidae	Ophelia borealis
Opheliidae	Ophelina acuminata
Opheliidae	Travisia forbesi
Orbiniidae	Scoloplos armiger
Oweniidae	Owenia fusiformis
Paraonidae	Aricidea suecica
Paraonidae	Paradoneis lyra
Pectinariidae	Lagis koreni
Pholoidae	Pholoe baltica
Pholoidae	Pholoe inornata
Phyllodocidae	Anaitides groenlandica
Phyllodocidae	Eteone longa/flava (agg.)
Phyllodocidae	Eulalia bilineata
Phyllodocidae	Eulalia viridis
Phyllodocidae	Eumida bahusiensis
Phyllodocidae	Eumida sp.
Phyllodocidae	Hypereteone foliosa
Phyllodocidae	Phyllococe groenlandica
Phyllodocidae	Pterocirrus sp.
Polynoidae	Gattyana cirrosa
Polynoidae	Harmothoe impar
Polynoidae	Harmothoe sp.
Polynoidae	Harmothoe spinifera
Polynoidae	Lepidonotus squamatus
Polynoidae	Malmagrenilla ljunmani
Polynoidae	Malmgrenia arenicolae
Polynoidae	Malmgrenia sp.
Polynoidae	Polynoe scolopendrina
Sabellariidae	Sabellaria alveolata
Sabellariidae	Sabellaria spinulosa
Sabellidae	Branchiomma bombyx
Sabellidae	Chone filicaudata
Sabellidae	Demonax cambrensis
Sabellidae	Jasmineira elegans
Sabellidae	Megalomma vesiculosum
Sabellidae	Pseudopotamilla reniformis

Sabellidae	<i>Sabella pavonina</i>
Sabellidae	<i>Sabella</i> sp.
Scalibregmatidae	<i>Asclerocheilus intermedius</i>
Scalibregmatidae	<i>Scalibregma celticum</i>
Scalibregmatidae	<i>Scalibregma inflatum</i>
Serpulidae	<i>Hydroides norvegica</i>
Serpulidae	<i>Pomatoceros lamarcki</i>
Serpulidae	<i>Pomatoceros</i> sp.
Serpulidae	<i>Pomatoceros triqueter</i>
Sigalionidae	<i>Sthenelais boa</i>
Spionidae	<i>Aonides paucibranchiata</i>
Spionidae	<i>Laonice bahusiensis</i>
Spionidae	<i>Malacoceros</i> sp.
Spionidae	<i>Polydora caeca</i>
Spionidae	<i>Polydora ciliata</i>
Spionidae	<i>Polydora flava</i>
Spionidae	<i>Scolelepis (Scolelepis)</i>
Spionidae	<i>Scolelepis (Scolelepis)</i> sp.
Spionidae	<i>Spio armata</i> (agg.)
Spionidae	<i>Spio decorata</i>
Spionidae	<i>Spiophanes bombyx</i>
Spionidae	<i>Spiophanes kroyeri</i>
Spirorbidae	<i>Spirorbidae</i> spp.
Syllidae	<i>Autolytus</i> sp.
Syllidae	<i>Eusyllis blomstrandii</i>
Syllidae	<i>Exogone verugera</i>
Syllidae	<i>Odontosyllis fulgurans</i>
Syllidae	<i>Procerastea nematodes</i>
Syllidae	<i>Sphaerosyllis bulbosa</i>
Syllidae	<i>Sphaerosyllis</i> sp.
Syllidae	<i>Sphaerosyllis taylori</i>
Syllidae	<i>Syllides benedicti</i>
Syllidae	<i>Syllis cornuta</i>
Syllidae	<i>Typosyllis armillaris</i>
Syllidae	<i>Typosyllis variegata</i>
Terebellidae	<i>Lanice conchilega</i>
Terebellidae	<i>Nicolea venustula</i>
Terebellidae	<i>Polycirrus medusa</i>
Terebellidae	<i>Polycirrus</i> sp.
Trichobranchidae	<i>Terebellides stroemi</i>
Trichobranchidae	<i>Thelepus cincinnatus</i>
Trichobranchidae	<i>Thelepus setosus</i>
Trichobranchidae	<i>Thelepus</i> sp. (juv.)
BRYOZOA	
Acoetidae	<i>Dodecaceria fimbriata?</i>
Ampharetidae	<i>Ampharete acutifrons</i>
Ampharetidae	<i>Ampharete finmarchica?</i>

Ampharetidae	<i>Ampharete lindstroemi</i>
Ampharetinae	<i>Ampharetinae</i>
Capitellidae	<i>Capitella capitata</i>
Capitellidae	<i>Mediomastus fragilis</i>
Capitellidae	<i>Notomastus</i> sp.
Chaetopteridae	<i>Spiochaetopterus typicus</i>
Cirratulidae	<i>Aphelocheata</i> sp.
Cirratulidae	<i>Caulleriella alata</i>
Cirratulidae	<i>Caulleriella zetlandica</i>
Cirratulidae	<i>Cirratulidae</i> sp.
Cirratulidae	<i>Cirriformia tentaculata</i>
Cirratulidae	<i>Tharyx killariensis</i>
Dorvilleidae	<i>Protodorvillea kefersteini</i>
Eunicidae	<i>Marphysa bellii</i>
Eunicidae	<i>Nematoneis unicornis</i>
Euprosinidae	<i>Euprosine foliosa</i>
Flabelligeridae	<i>Flabelligera affinis</i>
Glyceridae	<i>Glycera lapidum</i>
Glyceridae	<i>Glycera oxycephala</i>
Glyceridae	<i>Glycera tridactyla</i>
Goniadidae	<i>Glycinde nordmanni</i>
Goniadidae	<i>Goniada maculata</i>
Hesionidae	<i>Psamathe fusca</i>
Hesionidae	<i>Syllidia armata</i>
Lumbrineridae	<i>Lumbrineris gracilis</i>
Lumbrineridae	<i>Lumbrineris</i> sp.
Maldanidae	<i>Clymenura johnstoni</i>
Maldanidae	<i>Clymenura</i> sp.
Maldanidae	<i>Euclymeninae</i>
Maldanidae	<i>Micromaldane ornithochaeta</i>
Maldanidae	<i>Nicomache personata</i>
Maldanidae	<i>Nicomache</i> sp.
Maldanidae	<i>Petaloproctus</i>
Maldanidae	<i>Petaloproctus tenuis borealis</i>
Nephtyidae	<i>Nephtys caeca</i>
Nephtyidae	<i>Nephtys cirrosa</i>
Nephtyidae	<i>Nephtys hombergii</i>
Nephtyidae	<i>Nephtys kersivalensis</i>
Nephtyidae	<i>Nephtys</i> sp. (juv.)
Nereididae	<i>Nereis longissima</i>
Nereididae	<i>Nereis zonata</i>
Oeonidae	<i>Notocirrus scoticus</i>
Opheliidae	<i>Ophelia borealis</i>
Opheliidae	<i>Ophelina acuminata</i>
Opheliidae	<i>Travisia forbesi</i>
Orbiniidae	<i>Scoloplos armiger</i>
Oweniidae	<i>Owenia fusiformis</i>

Paraonidae	<i>Aricidea suecica</i>
Paraonidae	<i>Paradoneis lyra</i>
Pectinariidae	<i>Lagis koreni</i>
Pholoidae	<i>Pholoe baltica</i>
Pholoidae	<i>Pholoe inornata</i>
Phyllococidae	<i>Anaitides groenlandica</i>
Phyllococidae	<i>Eteone longa/flava</i> (agg.)
Phyllococidae	<i>Eulalia bilineata</i>
Phyllococidae	<i>Eulalia viridis</i>
Phyllococidae	<i>Eumida bahusiensis</i>
Phyllococidae	<i>Eumida</i> sp.
Phyllococidae	<i>Hypereteone foliosa</i>
Phyllococidae	<i>Phyllodoce groenlandica</i>
Phyllococidae	<i>Pterocirrus</i> sp.
Polynoidae	<i>Gattyana cirrosa</i>
Polynoidae	<i>Harmothoe impar</i>
Polynoidae	<i>Harmothoe</i> sp.
Polynoidae	<i>Harmothoe spinifera</i>
Polynoidae	<i>Lepidonotus squamatus</i>
Polynoidae	<i>Malmgrenilla ljunmani</i>
Polynoidae	<i>Malmgrenia arenicolae</i>
Polynoidae	<i>Malmgrenia</i> sp.
Polynoidae	<i>Polynoe scolopendrina</i>
Sabellariidae	<i>Sabellaria alveolata</i>
Sabellariidae	<i>Sabellaria spinulosa</i>
Sabellidae	<i>Branchioma bombyx</i>
Sabellidae	<i>Chone filicaudata</i>
Sabellidae	<i>Demonax cambrensis</i>
Sabellidae	<i>Jasmineira elegans</i>
Sabellidae	<i>Megalomma vesiculosum</i>
Sabellidae	<i>Pseudopotamilla reniformis</i>
Sabellidae	<i>Sabella pavonina</i>
Sabellidae	<i>Sabella</i> sp.
Scalibregmatidae	<i>Asclerocheilus intermedius</i>
Scalibregmatidae	<i>Scalibregma celticum</i>
Scalibregmatidae	<i>Scalibregma inflatum</i>
Serpulidae	<i>Hydroides norvegica</i>
Serpulidae	<i>Pomatoceros lamarcki</i>
Serpulidae	<i>Pomatoceros</i> sp.
Serpulidae	<i>Pomatoceros triqueter</i>
Sigalionidae	<i>Sthenelais boa</i>
Spionidae	<i>Aonides paucibranchiata</i>
Spionidae	<i>Laonice bahusiensis</i>
Spionidae	<i>Malacoceros</i> sp.
Spionidae	<i>Polydora caeca</i>
Spionidae	<i>Polydora ciliata</i>
Spionidae	<i>Polydora flava</i>

Spionidae	<i>Scolelepis (Scolelepis) bonnieri</i>
Spionidae	<i>Scolelepis (Scolelepis) sp.</i>
Spionidae	<i>Spio armata</i> (agg.)
Spionidae	<i>Spio decorata</i>
Spionidae	<i>Spiophanes bombyx</i>
Spionidae	<i>Spiophanes kroyeri</i>
Spirorbidae	<i>Spirorbidae</i> spp.
Syllidae	<i>Autolytus</i> sp.
Syllidae	<i>Eusyllis blomstrandii</i>
Syllidae	<i>Exogone verugera</i>
Syllidae	<i>Odontosyllis fulgurans</i>
Syllidae	<i>Procerastea nematodes</i>
Syllidae	<i>Sphaerosyllis bulbosa</i>
Syllidae	<i>Sphaerosyllis</i> sp.
Syllidae	<i>Sphaerosyllis taylori</i>
Syllidae	<i>Syllides benedicti</i>
Syllidae	<i>Syllis cornuta</i>
Syllidae	<i>Typosyllis armillaris</i>
Syllidae	<i>Typosyllis variegata</i>
Terebellidae	<i>Lanice conchilega</i>
Terebellidae	<i>Nicolea venustula</i>
Terebellidae	<i>Polycirrus medusa</i>
Terebellidae	<i>Polycirrus</i> sp.
Trichobranchidae	<i>Terebellides stroemi</i>
Trichobranchidae	<i>Thelepus cincinnatus</i>
Trichobranchidae	<i>Thelepus setosus</i>
Trichobranchidae	<i>Thelepus</i> sp. (juv).
CHELICERATA	
Ammotheidae	<i>Achelia echinata</i>
Nymphonidae	<i>Nymphon brevistrore</i>
Phoxichilidiidae	<i>Anoplodactylus petiolatus</i>
Pycnogonidae	<i>Pycnogonum littorale</i>
CNIDARIA	
	Actinaria
	<i>Atheca</i> sp.
Alcyoniidae	<i>Alcyonium digitatum</i>
Bougainvillidae	<i>Bougainvillia</i> sp.
Campanulariidae	<i>Campanulariidae</i>
Campanulariidae	<i>Clytia hemisphaerica</i>
Campanulariidae	<i>Laomedea flexuosa</i>
Corynidae	<i>Coryne</i> sp.
Edwardsiidae	<i>Edwardsia claparedii</i>
Kirchenpaueriinae	<i>Kirchenpaueria pinnata</i>
Lovenellidae	<i>Calycella syringa</i>
Plumulariidae	<i>Plumularia setacea</i>
Sertulariidae	<i>Abietinaria abietina</i>
Sertulariidae	<i>Abietinaria</i> sp.

Sertulariidae	<i>Diphasia</i> sp.
Sertulariidae	<i>Hydrallmania falcata</i>
Sertulariidae	<i>Sertularella gayi</i>
Sertulariidae	<i>Sertularia cupressina</i>
Tubulariidae	<i>Tubularia indivisa</i>
CRUSTACEA	
	Mysidacea sp.
Ampeliscidae	<i>Ampelisca spinipes</i>
Amphiloichidae	<i>Amphiloichus manudens</i>
Anthuridae	<i>Anthura gracilis</i>
Aoridae	<i>Aora gracilis</i>
Aoridae	<i>Leptocheirus hirsutimanus</i>
Balanidae	<i>Balanus balanus</i>
Balanidae	<i>Balanus crenatus</i>
Bodotriidae	<i>Bodotria scorpioides</i>
Callianassidae	<i>Callianassidae</i> sp.
Corophiidae	<i>Corophium bonnellii</i>
Corophiidae	<i>Corophium sextonae</i>
Corophiidae	<i>Unciola crenatipalma</i>
Dexaminidae	<i>Atylus falcatus</i>
Dexaminidae	<i>Atylus vedlomensis</i>
Dexaminidae	<i>Tritaeta gibbosa</i>
Gnathiidae	<i>Gnathia oxyuraea</i>
Gnathiidae	<i>Gnathia</i> sp. Female
Hippolytidae	<i>Hippolyte</i> sp.
Iphimediidae	<i>Iphimedia eblanae</i>
Iphimediidae	<i>Iphimedia minuta</i>
Iphimediidae	<i>Iphimedia obesa</i>
Isaeidae	<i>Gammaropsis maculata</i>
Isaeidae	<i>Gammaropsis nitida</i>
Isaeidae	<i>Photis longicaudata</i>
Ischyroceridae	<i>Erichthonius punctatus</i>
Janiridae	<i>Janira maculosa</i>
Leucothoidae	<i>Leucothoe spinicarpa</i>
Liljeborgiidae	<i>Liljeborgia pallida</i>
Lysianassidae	<i>Acidostoma obesum</i>
Lysianassidae	<i>Nannonyx spinimanus</i>
Lysianassidae	<i>Orchomene humilis</i>
Lysianassidae	<i>Orchomene nanus</i>
Lysianassidae	<i>Orchomene</i> sp.
Majidae	<i>Eurynome spinosa</i>
Majidae	<i>Hyas coarctatus</i>
Majidae	<i>Hyas</i> spjuv.
Majidae	<i>Macropodia rostrata</i>
Majidae	<i>Macropodia</i> sp. (juv).
Melittidae	<i>Cheirocratus</i> sp. Female
Melittidae	<i>Abلودomelita obtusata</i>

Melittidae	<i>Cheirocratus intermedius</i>
Melittidae	<i>Maera othonis</i>
Mysidae	<i>Gastrosaccus spinifer</i>
Paguridae	<i>Paguridae</i> sp.
Paguridae	<i>Pagurus bernhardus</i>
Phtisicidae	<i>Pseudoprotella phasma</i>
Pinnotheridae	<i>Pinnotheres pisum</i>
Pleustidae	<i>Parapleustes bicuspis</i>
Podoceridae	<i>Dyopedos porrectus</i>
Pontoporeiidae	<i>Bathyporeia elegans</i>
Porcellanidae	<i>Pisidia longicornis</i>
Portunidae	<i>Liocarcinus</i> sp. (juv).
Sphaeromatidae	<i>Sphaeroma</i> sp.
Urothoidae	<i>Urothoe elegans</i>
Verrucidae	<i>Verruca stroemia</i>
Xanthidae	<i>Pilumnus hirtellus</i>
Xanthidae	<i>Pilumnus</i> sp.
Xanthidae	<i>Xantho pilipes</i>
ECHINODERMATA	
Amphiuridae	<i>Amphipholis squamata</i>
Amphiuridae	<i>Amphiura brachiata</i>
Amphiuridae	<i>Amphiura</i> sp. (juv).
Asteriidae	<i>Asterias rubens</i>
Echinidae	<i>Psammechinus miliaris</i>
Ophiotrichidae	<i>Ophiotrix fragilis</i>
Ophiuridae	<i>Ophiura albida</i>
Ophiuridae	<i>Ophiura</i> sp. (juv).
ENTOPROCTA	
Pedicellinidae	<i>Pedicellina</i> sp.
MOLLUSCA	
	Nudibranchia spp.
Acanthochitonidae	<i>Acanthochitona crinita</i>
Anomiidae	<i>Anomiidae</i> sp.
Anomiidae	<i>Pododesmus patelliformis</i>
Astartidae	<i>Goodallia triangularis</i>
Cardiidae	<i>Parvicardium ovale</i>
Glycymerididae	<i>Glycymeris glycymeris</i>
Hiatellidae	<i>Hiatella arctica</i>
Ischnochitonidae	<i>Ischnochiton albus</i>
Leptochitonidae	<i>Leptochiton asellus</i>
Mactridae	<i>Spisula elliptica</i>
Mactridae	<i>Spisula</i> sp.
Montacutidae	<i>Mysella bidentata</i>
Muricidae	<i>Ocenebra erinacea</i>
Muricidae	<i>Trophon truncatus</i>
Myacidae	<i>Mya truncata</i>
Myacidae	<i>Sphenia binghami</i>

Mytilidae	<i>Modiolarca tumida</i>
Mytilidae	<i>Modiolula phaseolina</i>
Mytilidae	<i>Modiolus</i> sp. (juv.)
Mytilidae	<i>Musculus discors</i>
Mytilidae	<i>Musculus</i> sp. (juv.)
Mytilidae	<i>Mytilidae</i> sp. (juv.)
Mytilidae	<i>Mytilus edulis</i>
Nuculidae	<i>Nucula nucleus</i>
Nuculidae	<i>Nucula</i> sp. (juv.)
Onchidorididae	<i>Onchidorididae</i> sp.
Pectinidae	<i>Aequipecten opercularis</i>
Pectinidae	<i>Chlamys varia</i>
Pharidae	<i>Phaxas pellucidus</i>
Pholadidae	<i>Barnea candida</i>
Psammobiidae	<i>Gari fervensis</i>
Pyramidellidae	<i>Odostomia turrata</i>
Rissoidae	<i>Onoba semicostata</i>
Scrobiculariidae	<i>Abra alba</i>
Scrobiculariidae	<i>Abra prismatica</i>
Trochidae	<i>Calliostoma zizyphinum</i>
Trochidae	<i>Gibbula tumida</i>
Trochidae	<i>Gibbula umbilicalis</i>
Trophidae	<i>Limacia clavigera</i>
Turridae	<i>Mangelia nebula</i>
Turridae	<i>Raphitoma</i> sp.
Veneridae	<i>Timoclea ovata</i>
Veneridae	<i>Veneridae</i> sp. (juv.)
NEMATODA	
	Nematoda spp.
NEMERTEA	
	Nemertea spp.
PHORONIDA	

Phoronidae	<i>Phoronis</i> spp.
PISCES	
None recorded	None recorded
PLATYHELMINTHES	
	<i>Turbellaria</i> sp.
PORIFERA	
	Porifera crusts indet.
Chalindae	<i>Haliclona cinerea</i>
Leucosolenidae	<i>Leucosolenia complicata</i>
Sycettidae	<i>Scypha ciliata</i>
Tethyidae	<i>Tethya aurantium</i>
PROTOZOA	
	Foraminiferida
Folliculinidae	<i>Lagotia viridis</i>
SIPUNCULA	
Golfingiidae	<i>Golfingia elongata</i>
Golfingiidae	<i>Golfingia</i> sp.
Phascolionidae	<i>Phascolion strombus</i>
TUNICATA	
	<i>Tunicata</i> spp.
Asciidae	<i>Ascidia conchilega</i>
Asciidae	<i>Asciella aspersa</i>
Asciidae	<i>Asciella</i> sp.
Molgulidae	<i>Molgula</i> sp.
Styelidae	<i>Dendrodoa grossularia</i>
Styelidae	<i>Polycarpa fibrosa</i>
Styelidae	<i>Polycarpa rustica</i>

Appendix 6.3 Total results from the Beam Trawl survey undertaken 9th and 10th November 2005

A Field notes

Description	Site number					
	1	2	3	4	5	6
	Mostly hydroids/bryozoa, some shell	Clean, 1 empty ray egg	A few shells mainly Buccinum	Clean, a few hydroids and shells	Shelly, some hydroids	Clean except for a few shells and some hydroids
Date of hauling	10 th Nov-05	10 th Nov-05	9 th Nov-05	9 th Nov-05	9 th Nov-05	9 th Nov-05
Time of hauling	12:55	12:20	16:00	15:15	15:10	09:50

B Contents of beam trawls. Taxa with null values have been recorded in previous surveys.

SCIENTIFIC NAME	COMMON NAME	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Total
Fish								
<i>Limanda limanda</i>	Dab	1	0	0	0	0	0	1
<i>Merlangius merlangus</i>	Whiting	0	1	0	0	0	0	1
<i>Pleuronectes platessa</i>	Plaice	1	0	0	0	0	0	1
<i>Raja clavata</i>	Thornback ray	1	0	0	0	0	0	1
<i>Scyliorhinus caniculus</i>	Lesser spotted dog fish	1	0	0	0	0	0	1
<i>Solea solea</i>	Sole	0	0	0	0	0	1	1
<i>Ammodytes tobianus</i>	Lesser sand eel	0	0	0	0	0	2	2
<i>Callionymus lyra</i>	Dragonet	2	0	0	0	0	0	2
<i>Raja montagui</i>	Spotted ray	1	1	0	1	0	0	3
<i>Trisopterus minutus</i>	Poor cod	3	0	0	0	1	0	4
<i>Pomatoschistus minutus</i>	Sand Goby	3	0	1	0	3	0	7
Crustacea								
<i>Acheaus cranchii</i>	spider crab	1	0	0	0	0	0	1
<i>Balanus</i> sp usually <i>crenatus</i>	Barnacle	0	0	0	0	0	0	1
<i>Crangon crangon</i>	Brown Shrimp	39	12	11	6	3	9	80
<i>Hyas coarctatus</i>	Spider crab	11	0	0	0	5	0	16
<i>Idotea</i> sp		1	0	0	0	0	0	1
<i>Inachus dorsettensis</i>	Spider Crab	2	0	0	0	0	0	2
<i>Liocarcinus depurator</i>	Harbour crab	1	0	0	0	0	0	1
<i>Liocarcinus holsatus</i>	Flying crab	1	0	1	0	6	0	8
<i>Macropodia rostrata</i>	Long legged spider crab	41	0	0	0	18	3	62
<i>Necora puber</i>	Velvet swimming crab	4	0	0	0	0	0	4
<i>Pagurus bernhardus</i>	Common hermit crab	9	1	12	0	39	7	68
<i>Pandalina brevirostris</i>	Prawn	21	0	0	0	0	0	21
<i>Pandalus montagui</i>	Pink shrimp	47	1	0	1	6	2	57
<i>Pasiphaea sivado</i>	Prawn	0	0	0	1	0	0	1
<i>Philoceras trispinosus</i>	Shrimp	1	0	0	0	0	1	2
<i>Pilumnus hirtellus</i>	Hairy crab	2	0	0	0	0	0	2
<i>Pisidia longicornis</i>	Long clawed porcelain crab	0	0	0	1	6	0	7

SCIENTIFIC NAME	COMMON NAME	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Total
<i>Processa canaliculata</i>	Prawn	0	0	0	0	0	2	2
<i>Xantho sp.</i>	Xanthiid crab*	0	0	0	0	15	0	15
Molluscs								
<i>Buccinum undatum</i>	Common Whelk	8	0	0	0	0	0	8
<i>Calliostoma zizyphinum</i>	Painted top shell	7	0	0	0	3	0	10
<i>Facelina auriculata</i>	Nudibranch	0	0	0	0	0	1	1
<i>Sepiolo atlantica</i>	Little cuttle	1	0	1	0	0	1	3
Echinoderms								
<i>Asterias rubens</i>	Common Starfish	9	0	0	14	36	8	67
<i>Crossaster papposus</i>	Common sun star	5	0	0	0	0	0	5
<i>Henricia oculata</i>	Blood Sea star	1	0	0	0	0	0	1
<i>Ophiothrix fragilis</i>	Brittlestar	0	0	0	0	3	0	3
<i>Ophiura albida</i>	Brittle star	0	0	0	0	15	0	15
<i>Psammechinus miliaris</i>	Sea urchin	59	0	0	0	156	0	215
Others								
<i>Abietinaria abietina</i>	Hydroid	F	-	-	O	-	-	1
<i>Alcyonidium diaphanum</i>	Pipeweed	R	-	-	O	-	-	1
<i>Aphrodita aculeata</i>	Sea mouse	1	0	0	0	0	0	1
<i>Ascidia conchilega</i>	Sea squirt	1	0	0	0	6	0	7
<i>Euratea loricata</i>	Bryozoan	-	-	-	-	-	F	1
<i>Flustra foliacea</i>	Bryozoan	F	O	O	O	F	F	1
<i>Halichondria panicea</i>	Bread crumb sponge	-	-	-	-	-	F	1
<i>Hydrallmania falcata</i>	Hydroid	F	R	-	O	O	O	1
<i>Metridium senile</i>	Plumose anemone	0	0	0	0	0	1	1
<i>Nemertesia antennina</i>	Hydroid	O	R	-	-	-	-	1
<i>Pomatoceros sp</i>	Tube worm	-	-	-	-	F	-	1
<i>Serpula vermicularis</i>	Tubeworm	-	-	-	-	O	-	1
<i>Sertularella gayi</i>	Hydroid	-	-	-	-	-	O	1
<i>Sertularia cupressina</i>	Hydroid	O	-	R	O	F	F	1
<i>Tubularia indivisa</i>	Hydroid	-	-	-	-	O	F	1

P	RARE(= PRESENT)	<10 g
O	OCCASIONAL	10-100 g
F	FREQUENT	100-1000 g
C	COMMON	1-10 KG
A	ABUNDANT	>10KG

Appendix 6.3 contd.

Appendix 6.4 Total fish lengths (mm) of main commercial fish species from trawl survey undertaken 9th and 10th November 2005

Sex is also given for elasmobranchs (f = female, m = male).

SPECIES	Site no	1	2	3	4	5	6
Dab		155					
Plaice		218					
Sole							362
Lesser spotted dogfish	m446						
Spotted ray	m118, m674		m494		m459		
Whiting			164				
Poor cod							91

Appendix 6.5 Raw Data for Anchor Dredge Survey 9th and 10th November 2005

Total nos of taxa and organisms are also given for this and the October 2004 surveys for comparison

Taxon	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	G14	G15	G16	G17	G18	G19	G20
Annelida																				
<i>Ampharete acutifrons</i>	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-
<i>Ampharete finnarchica?</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
<i>Ampharete lindstroemi</i>	-	-	-	-	-	-	-	-	-	14	10	-	-	4	-	-	-	-	-	-
Ampharetinae	1	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	-	-	-	-
<i>Anatides groenlandica</i>	-	-	-	-	-	-	-	-	1	1	1	-	-	2	-	-	-	-	-	-
<i>Aonides paucibranchiata</i>	1	9	-	3	-	4	1	-	1	28	3	-	-	-	-	-	-	4	-	-
<i>Aphelochaeta</i> sp.	1	1	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-
<i>Aricidea suecica</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
<i>Asclerocheilus intermedius</i>	-	-	-	1	-	3	-	-	4	-	-	-	-	-	-	-	-	-	-	-
<i>Asclerocheilus intermedius</i>	-	-	-	1	-	3	-	-	4	-	-	-	-	-	-	-	-	-	-	-
<i>Autolytus</i> sp.	-	2	-	3	4	-	10	-	3	2	-	-	-	2	-	-	-	5	-	-
<i>Branchiomma bombyx</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	2	-	-
<i>Capitella capitata</i>	-	-	-	-	-	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Capitella capitata</i>	-	-	-	-	-	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Caulericiella alata</i>	1	-	-	-	-	-	-	-	2	7	1	-	-	12	-	-	-	-	-	-
<i>Caulericiella zetlandica</i>	1	7	-	-	-	-	-	-	-	7	3	-	-	9	-	-	-	-	-	-
<i>Chone filicaudata</i>	-	-	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-	-	-	-
<i>Cirratulidae</i> sp.	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-
<i>Cirriformia tentaculata</i>	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Clymenura johnstoni</i>	-	11	-	27	-	17	4	-	1	31	4	-	-	10	-	-	-	14	-	-
<i>Clymenura johnstoni</i>	-	11	-	27	-	17	4	-	1	31	4	-	-	10	-	-	-	14	-	-
<i>Clymenura</i> sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Clymenura</i> sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Demonax cambrensis</i>	-	-	-	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Dodecaceria fimbriata?</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-

Taxon	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	G14	G15	G16	G17	G18	G19	G20
<i>Eteone longa/flava</i> (agg.)	-	3	-	-	-	-	-	-	-	3	-	-	-	5	-	-	-	-	-	-
Euclymeninae	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Euclymeninae	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
<i>Eulalia bilineata</i>	-	-	-	-	1	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-
<i>Eulalia viridis</i>	-	-	-	4	-	2	29	-	5	-	-	-	-	-	-	-	-	-	-	-
<i>Eumida bahusiensis</i>	-	-	-	43	45	3	-	-	3	-	-	-	-	3	-	-	-	20	-	-
<i>Eumida</i> sp.	-	-	-	-	-	-	-	-	1	1	1	-	-	-	-	-	-	-	-	-
<i>Euprosine foliosa</i>	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Euprosine foliosa</i>	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Eusyllis blomstrandii</i>	-	-	-	1	-	-	-	-	4	4	-	-	-	7	-	-	-	8	-	-
<i>Exogone verugera</i>	-	3	-	-	-	2	-	-	2	21	-	-	-	2	-	-	-	1	-	-
<i>Flabelligera affinis</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
<i>Gattyana cirrosa</i>	-	-	-	-	-	-	-	-	1	-	-	-	-	3	-	-	-	-	-	-
<i>Glycera lapidum</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
<i>Glycera oxycephala</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	1
<i>Glycera tridactyla</i>	1	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Glycinde nordmanni</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
<i>Goniada maculata</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
<i>Harmothoe impar</i>	-	1	-	-	-	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-
<i>Harmothoe</i> sp.	-	-	-	9	10	12	16	-	32	2	-	-	-	7	-	-	-	2	-	-
<i>Harmothoe spinifera</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-
Hesionidae sp.	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Hydroides norvegica</i>	-	10	-	-	-	-	24	-	1	-	21	-	-	85	-	-	-	2	-	-
<i>Hypereteone foliosa</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
<i>Jasmineira elegans</i>	-	1	-	25	3	4	121	-	20	-	-	-	-	-	-	-	-	7	-	-
<i>Lagis koreni</i>	8	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
<i>Lanice conchilega</i>	3	-	-	3	-	-	-	-	-	1	-	-	-	4	-	-	-	5	-	-
<i>Laonice bahusiensis</i>	-	2	-	-	-	-	-	-	5	18	2	-	-	6	-	-	-	-	-	-
<i>Lepidonotus squamatus</i>	-	-	-	14	21	11	23	-	3	-	1	-	-	5	-	-	-	10	-	-

Taxon	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	G14	G15	G16	G17	G18	G19	G20
<i>Lumbrineris gracilis</i>	1	3	-	1	-	1	-	-	-	7	7	-	-	33	-	-	-	-	1	-
<i>Lumbrineris</i> sp.	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
<i>Malacoceros</i> sp.	-	-	-	-	-	-	-	-	2	-	-	-	-	1	-	-	-	-	-	-
<i>Malmgrenilla ljunghmani</i>	-	-	-	-	3	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
<i>Malmgrenia arenicolae</i>	3	-	-	-	-	1	-	-	-	1	-	-	-	4	-	-	-	-	-	-
<i>Malmgrenia</i> sp.	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
<i>Marphysa bellii</i>	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-
<i>Mediomastus fragilis</i>	-	1	-	1	-	8	-	-	3	6	1	-	-	1	1	-	-	-	-	-
<i>Mediomastus fragilis</i>	-	1	-	1	-	8	-	-	3	6	1	-	-	1	1	-	-	-	-	-
<i>Megalomma vesiculosum</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
<i>Micromaldane ornithochaeta</i>	-	5	-	-	-	-	-	-	-	7	4	-	-	5	-	-	-	-	-	-
<i>Nematoneis unicornis</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
<i>Nephtys caeca</i>	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	2	-	-
<i>Nephtys cirrosa</i>	-	8	-	-	-	-	-	1	-	-	-	-	2	-	-	1	-	-	-	-
<i>Nephtys hombergii</i>	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Nephtys kersivalensis</i>	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-
<i>Nephtys</i> sp. (juv.)	-	-	-	-	-	1	-	-	-	-	1	-	-	1	-	-	-	-	-	-
<i>Nereis longissima</i>	-	-	-	1	1	10	5	-	28	-	-	-	-	5	-	-	-	1	-	-
<i>Nereis zonata</i>	-	-	-	-	-	-	-	-	1	5	-	-	-	-	-	-	-	-	-	-
<i>Nicolea venustula</i>	-	-	-	-	-	-	-	-	-	1	-	-	-	3	-	-	-	-	-	-
<i>Nicomache personata</i>	-	-	-	-	-	-	-	-	-	11	2	-	-	-	-	-	-	-	-	-
<i>Nicomache</i> sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
<i>Notocirrus scoticus</i>	-	2	-	-	-	-	-	-	-	3	4	-	-	4	-	-	-	-	-	-
<i>Notomastus</i> sp	-	-	-	-	-	14	-	-	7	3	-	-	-	3	5	-	-	-	-	4
<i>Notomastus</i> sp	-	-	-	-	-	14	-	-	7	3	-	-	-	3	5	-	-	-	-	4
<i>Odontosyllis fulgurans</i>	-	-	-	1	-	-	-	-	2	1	-	-	-	2	-	-	-	1	-	-
<i>Oligochaeta</i> spp.	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Oligochaeta</i> spp.	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Taxon	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	G14	G15	G16	G17	G18	G19	G20	
<i>Ophelia borealis</i>	-	7	10	-	-	-	-	-	1	2	-	-	-	-	-	-	-	-	-	3	-
<i>Ophelina acuminata</i>	-	-	-	-	-	-	-	-	-	2	3	-	-	3	-	-	-	-	-	-	-
<i>Owenia fusiformis</i>	-	-	-	2	-	-	-	-	-	-	2	-	-	3	-	-	-	-	5	-	-
<i>Paradoneis lyra</i>	-	2	1	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-
<i>Petaloproctus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-
<i>Petaloproctus tenuis borealis</i>	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
<i>Pholoe baltica</i>	1	-	-	1	-	1	4	-	1	2	1	-	-	6	-	-	-	-	-	-	-
<i>Pholoe inornata</i>	-	1	-	6	4	8	6	-	4	-	1	-	-	1	-	-	-	-	5	-	-
<i>Phyllodoce groenlandica</i>	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
<i>Polycirrus medusa</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
<i>Polycirrus sp.</i>	2	2	1	3	1	2	4	-	6	2	-	-	-	3	-	-	-	-	2	-	-
<i>Polydora caeca</i>	-	-	-	3	5	-	-	-	-	1	-	-	-	-	-	-	-	-	4	-	-
<i>Polydora ciliata</i>	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
<i>Polydora flava</i>	1	-	-	-	-	1	4	-	-	1	-	-	-	-	-	-	-	-	-	-	-
<i>Polynoe scolopendrina</i>	-	-	-	15	8	-	-	-	-	-	-	-	-	1	-	-	-	-	7	-	-
<i>Pomatoceros lamarcki</i>	-	-	-	-	-	6	-	-	20	-	-	-	-	-	-	-	-	-	-	-	-
<i>Pomatoceros sp.</i>	-	2	-	-	-	1	3	-	7	9	1	-	-	2	-	-	-	-	-	-	1
<i>Pomatoceros triqueter</i>	-	158	12	12960	5796	-	624	-	313	264	612	-	-	531	-	-	-	4560	1	-	-
<i>Procerastea nematodes</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
<i>Protodorvillea kefersteini</i>	-	-	-	-	-	-	-	-	-	1	-	-	-	3	-	-	-	-	-	-	-
<i>Psamathe fusca</i>	-	-	-	-	-	2	1	-	1	-	-	-	-	1	-	-	-	-	-	-	-
<i>Pseudopotamilla reniformis</i>	-	-	-	-	1	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-
<i>Pterocirrus sp.</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
<i>Sabella pavonina</i>	-	1	-	-	-	-	1	-	-	1	1	-	-	3	-	-	-	-	3	-	-
<i>Sabella sp.</i>	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
<i>Sabellaria alveolata</i>	-	-	-	3	1	263	7124	1	2400	-	-	-	-	-	-	-	-	-	-	-	-
<i>Sabellaria spinulosa</i>	-	6	-	37	7	68	795	-	420	10	112	-	-	32	-	-	-	12	-	-	-
<i>Scalibregma celticum</i>	-	-	-	-	-	-	-	-	-	1	-	-	-	6	-	-	-	-	-	-	-

Taxon	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	G14	G15	G16	G17	G18	G19	G20
Scalibregma inflatum	2	-	-	-	-	-	-	-	-	-	-	-	-	62	-	-	-	-	-	-
Scolecipis (Scolecipis) bonnierii	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Scolecipis (Scolecipis) sp.	-	2	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-
Scoloplos armiger	1	-	-	-	-	-	-	-	-	4	7	-	-	64	-	1	-	-	-	-
Sphaerosyllis bulbosa	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
Sphaerosyllis sp.	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Sphaerosyllis taylori	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
Spio armata (agg.)	-	-	-	2	-	6	2	-	-	4	1	-	-	1	-	-	-	6	1	-
Spio decorata	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spiochaetopterus typicus	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-
Spiophanes bombyx	-	-	-	-	-	4	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Spiophanes kroyeri	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Spirorbidae spp.	-	-	-	P	P	P	P	-	-	P	-	-	-	-	-	-	-	P	-	-
Sthenelais boa	-	-	-	-	-	1	-	-	2	2	1	-	-	8	-	-	-	1	-	-
Syllides benedicti	-	-	-	-	-	2	1	-	1	-	-	-	-	-	-	-	-	-	-	-
Syllidia armata	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Syllis cornuta	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Terebellides stroemi	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
Tharyx killariensis	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
Thelepus cinnamatus	-	2	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-
Thelepus setosus	-	-	-	28	22	2	3	-	-	1	-	-	-	1	-	-	-	14	-	-
Thelepus sp. juv.	-	-	-	29	8	1	1	1	1	-	1	-	-	4	-	-	-	6	-	-
Travisia forbesi	-	-	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Typosyllis armillaris	-	-	-	-	-	-	5	1	1	-	-	-	-	4	-	-	-	-	-	-
Typosyllis variegata	-	1	-	13	12	10	104	-	15	10	-	-	-	-	1	-	-	-	-	1
Bryozoa																				
Aetea anguina	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-
Acyonidium diaphanum	P	-	-	-	-	P	P	-	P	P	-	-	-	-	-	-	-	-	-	-

Taxon	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	G14	G15	G16	G17	G18	G19	G20
Aleyonidium gelatinosum	-	-	-	-	-	-	P	-	P	-	P	-	-	-	-	-	-	-	-	-
Aleyonidium sp.	P	-	P	-	-	-	-	-	P	P	P	-	-	P	-	-	-	-	-	-
Bicelliarella ciliata	-	-	-	P	P	P	P	P	-	P	P	-	-	P	-	-	-	P	-	-
Bowerbankia sp.	-	P	-	P	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-
Callopora spp.	-	P	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-
Cellepora pumicosa	-	P	-	P	P	P	P	-	P	P	P	-	-	P	-	-	-	P	-	-
Chorizopora brongniartii	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-
Conopeum reticulum	P	P	P	P	-	P	P	-	P	-	P	-	-	P	-	-	-	-	P	P
Crisia eburnea	-	P	-	P	P	P	P	-	P	P	P	-	-	P	-	-	-	P	-	-
Crisia sp.	-	-	P	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	P	-
Disporella hispida	-	-	-	-	-	-	-	-	-	P	P	-	-	P	P	-	-	-	-	-
Electra crustulenta	-	-	P	P	-	P	P	-	P	-	-	-	-	-	-	-	-	-	-	-
Electra pilosa	P	P	P	P	P	P	P	-	P	P	-	-	-	P	-	-	-	P	-	-
Escharella immersa	-	P	P	P	P	P	P	-	P	P	P	-	-	P	P	-	P	P	P	P
Escharella variolosa	-	-	-	-	-	-	-	-	-	-	-	-	-	P	P	-	-	-	-	-
Escharella ventricosa	-	P	-	P	-	-	-	-	-	P	P	-	-	-	P	-	-	P	-	-
Euratea loricata	-	-	-	P	-	P	-	-	-	P	-	-	-	P	-	-	-	P	-	-
Fenestrulina malusii	-	-	-	-	-	-	-	-	-	P	-	-	-	P	-	-	-	-	-	-
Flustra foliacea	-	P	-	P	-	P	P	-	P	P	-	-	-	-	-	-	-	P	-	-
Microporella ciliata	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-
Schizomavella sp.	-	P	P	P	-	-	-	-	-	P	P	-	-	2	P	-	-	P	-	P
Scruparia spp.	-	-	-	-	P	P	-	-	-	-	-	-	-	-	-	-	-	P	-	-
Scrupocellaria reptans	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-
Scrupocellaria seruposa	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-
Vesicularia spinosa	P	P	-	P	-	P	P	-	P	-	P	-	-	-	-	-	-	P	-	-
Chelicerata																				
Achelia echinata	-	-	-	3	-	-	2	-	1	-	-	-	-	6	-	-	-	3	-	-
Anoploactylus petiolatus	-	1	-	2	-	1	3	-	-	7	2	-	-	23	-	-	-	5	-	-
Nymphon brevistre	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-

Taxon	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	G14	G15	G16	G17	G18	G19	G20
<i>Pycnogonum littorale</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-
Cnidaria																				
<i>Abietinaria abietina</i>	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-
<i>Abietinaria</i> sp.	-	-	-	P	P	P	P	-	-	P	P	-	-	P	-	-	-	-	-	-
<i>Actinaria</i>	-	-	-	19	3	3	17	-	1	13	-	-	-	26	-	-	-	5	-	-
<i>Athea</i> sp.	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
<i>Bougainvillia</i> sp.	-	-	P	P	-	-	-	-	-	2	P	-	-	P	-	-	-	P	-	-
<i>Calycella syringa</i>	-	P	-	P	-	P	-	-	P	P	P	-	-	P	-	-	-	P	-	-
Campanulariidae	-	-	-	-	-	-	-	-	-	2	-	-	-	2	-	-	-	-	-	-
<i>Clytia hemisphaerica</i>	-	-	-	P	P	-	P	-	P	P	P	-	-	P	-	-	-	P	-	-
<i>Coryne</i> sp.	-	-	-	-	P	-	-	-	-	-	-	-	-	P	-	-	-	P	-	-
<i>Diphasia</i> sp.	-	-	-	-	P	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-
<i>Edwardsia clapedii</i>	-	-	-	-	-	-	-	-	-	1	1	-	-	1	-	-	-	-	-	-
<i>Hydrallmania falcata</i>	-	P	-	P	P	P	P	-	P	P	P	-	-	P	-	-	-	P	-	-
<i>Kirchenpaueria pinnata</i>	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Laomedea flexuosa</i>	-	-	-	-	-	-	P	-	-	P	-	-	-	-	-	-	-	-	-	-
<i>Plumularia setacea</i>	-	-	-	-	-	-	P	-	P	-	-	-	-	-	-	-	-	-	-	-
<i>Sertularella gayi</i>	-	P	-	-	P	-	P	-	-	P	P	-	-	P	-	-	-	P	-	-
<i>Sertularia cupressina</i>	P	P	P	P	P	P	P	-	P	P	P	-	-	P	-	-	-	-	-	-
<i>Tubularia indivisa</i>	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-
Crustacea																				
<i>Abludomelita obtusata</i>	-	-	-	-	-	-	-	-	-	-	5	-	-	3	-	-	-	-	-	-
<i>Acidostoma obesum</i>	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
<i>Ampelisca spinipes</i>	-	-	-	3	1	-	2	-	-	4	8	-	-	2	-	-	-	4	-	-
<i>Amphilocheus manudens</i>	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
<i>Anthura gracilis</i>	-	-	-	1	17	-	-	-	-	-	-	-	-	-	-	-	-	8	-	-
<i>Aora gracilis</i>	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
<i>Atylus falcatus</i>	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-
<i>Atylus vedlomensis</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-

Taxon	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	G14	G15	G16	G17	G18	G19	G20
Balanus balanus	-	-	-	-	119	-	36	-	-	-	-	-	-	-	-	-	-	1	-	-
Balanus crenatus	-	-	-	-	1	20	342	-	252	-	-	-	-	-	-	-	-	-	-	-
Bathyporeia elegans	1	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bodotria scorpoides	-	-	-	1	-	-	-	-	3	1	-	-	-	1	-	-	-	1	-	-
Callianassidae sp.	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Cheirocratus intermedius	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Cheirocratus sp. Female	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-
Corophium bonnellii	-	-	-	-	3	-	51	-	-	-	-	-	-	-	-	-	-	-	-	-
Corophium sextonae	-	-	-	4	18	4	-	-	8	-	-	-	-	-	-	-	-	11	-	-
Dyopodos porrectus	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Erichthonius punctatus	-	-	-	1	-	-	1	-	1	2	-	-	-	-	-	-	-	2	-	-
Eurynome spinosa	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Gammaropsis maculata	-	-	-	-	-	-	8	-	-	1	-	-	-	2	-	-	-	1	-	-
Gammaropsis nitida	-	-	-	2	-	1	-	-	-	-	-	-	-	1	-	-	-	1	-	-
Gastrosaccus spinifer	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Gnathia oxyuraea	-	2	-	1	3	-	-	-	3	-	-	-	-	-	-	-	-	2	-	-
Gnathia sp. Female	-	-	-	1	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Hippolyte sp.	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
Hyas coarctatus	-	-	-	-	-	-	1	-	-	1	-	-	-	2	-	-	-	1	-	-
Hyas sp juv.	-	-	-	2	-	-	1	-	1	-	1	-	-	-	-	-	-	-	-	-
Iphimedia eblanae	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iphimedia minuta	-	-	-	1	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Iphimedia obesa	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Janira maculosa	-	-	-	1	2	1	5	-	4	-	-	-	-	-	-	-	-	-	-	-
Leptocheirus hirsutimanus	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Leucothoe spincarpa	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Liljeborgia pallida	-	-	-	-	-	-	3	-	1	-	-	-	-	-	-	-	-	-	-	-
Liocarcinus sp. juv.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Macropodia rostrata	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-

Taxon	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	G14	G15	G16	G17	G18	G19	G20
Macropodia sp. juv.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maera othonis	-	-	-	1	-	-	-	-	3	1	-	-	-	18	-	-	-	-	-	-
Mysidacea sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Nannonyx spinimanus	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Orchomene humilis	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Orchomene nanus	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Orchomene sp.	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Paguridae sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	1	-	-
Pagurus bernhardus	-	-	-	-	1	-	3	-	4	2	-	-	-	3	-	-	-	5	-	-
Parapleustes bicuspsis	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-
Photis longicaudata	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Pilumnus hirtellus	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Pilumnus sp.	-	-	-	-	-	-	2	-	-	-	-	-	-	2	-	-	-	-	-	-
Pinnotheres pisum	-	-	-	-	1	20	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Pisidia longicornis	-	-	-	6	19	55	459	-	167	7	-	1	-	25	-	-	-	18	-	-
Pseudoprotella phasma	-	-	-	-	-	-	2	-	3	-	-	-	-	-	-	-	-	-	-	-
Sphaeroma sp.	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Tritaeta gibbosa	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unciola crenatipalma	-	-	-	-	1	4	31	-	32	-	-	-	-	-	-	-	-	-	-	-
Urothoe elegans	-	-	-	4	-	13	4	-	2	-	-	-	-	-	-	-	-	3	-	-
Xantho pilipes	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Echinodermata																				
Amphipholis squamata	-	-	-	-	-	-	5	-	-	-	1	-	-	10	-	-	-	-	-	-
Amphiura brachiata	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Amphiura sp. juv.	-	-	-	-	1	-	-	-	-	2	2	-	-	-	-	-	-	2	-	-
Asterias rubens	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-
Asteriidae juv.	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ophiothrix fragilis	-	-	-	-	2	1	14	-	-	1	-	-	-	-	-	-	-	3	-	-
Ophiura albida	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Taxon	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	G14	G15	G16	G17	G18	G19	G20
Ophiura sp. juv.	-	-	-	-	-	-	-	-	-	3	3	-	-	6	-	-	-	1	-	-
Psammechinus miliaris	-	-	-	5	-	-	5	-	-	5	1	-	-	9	-	-	-	9	-	-
Entoprocta																				
Pediceлина sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P
Mollusca																				
Abra alba	2	-	-	-	2	8	-	-	6	15	-	-	-	31	-	-	-	-	-	-
Abra prismatica	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-
Acanthochitona crinita	-	1	-	2	1	-	-	-	-	3	-	-	-	1	-	-	-	-	-	-
Aequipecten opercularis	-	-	-	1	-	-	2	-	2	-	-	-	-	-	-	-	-	-	-	-
Anomiidae sp.	-	-	-	7	1	-	1	-	2	8	80	-	-	9	-	-	-	3	-	-
Barnea candida	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-
Calliostoma zizyphinum	-	-	-	1	-	-	3	-	-	8	-	-	-	4	-	-	-	-	-	-
Chlamys varia	-	-	-	-	-	-	7	-	2	5	-	-	-	-	-	-	-	1	-	-
Gari fervensis	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
Gibbula tumida	-	-	-	6	9	-	2	-	1	9	1	-	-	10	-	-	-	16	-	-
Gibbula umbilicalis	1	1	-	9	9	1	14	-	-	-	-	-	-	14	-	-	-	21	-	-
Glycymeris glycymeris	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Goodallia triangularis	-	-	-	-	-	-	-	-	-	-	-	-	2	-	4	-	-	-	-	-
Hiatella arctica	-	-	-	12	6	-	28	-	12	4	-	-	-	2	-	-	-	5	-	-
Ischnochiton albus	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Limacia clavigera	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Mangelia nebula	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Modiolarca tumida	-	-	-	-	1	-	3	-	4	-	-	-	-	-	-	-	-	-	-	-
Modiolula phaseolina	-	-	-	1	-	-	2	-	-	-	1	-	-	5	-	-	-	2	-	-
Modiolus sp. juv.	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Musculus discors	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-
Musculus sp. juv.	-	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mya truncata	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Mysella bidentata	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-

Taxon	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	G14	G15	G16	G17	G18	G19	G20
Mytilidae sp. juv.	-	-	1	3	-	-	82	-	P	4	1	-	-	20	12	-	-	5	-	-
Mytilus edulis	-	-	-	-	-	432	63	-	-	-	-	-	-	-	-	-	-	-	-	-
Nucula nucleus	-	1	-	159	5	5	50	-	-	1	-	-	-	5	-	-	-	281	-	-
Nucula sp. (juv.)	-	-	-	-	7	-	-	-	-	1	-	-	-	-	-	-	-	96	-	-
Nudibranchia spp.	-	-	-	-	-	-	1	-	-	2	-	-	-	1	-	-	-	-	-	-
Ocenebra erinacea	-	-	-	-	-	-	4	-	-	-	-	-	-	2	1	-	-	2	-	-
Ostomia turrita	-	-	-	13	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Onchidoridae sp.	-	-	-	-	1	-	-	-	-	2	2	-	-	2	-	-	-	-	-	-
Onoba semicostata	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-
Parvicardium ovale	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phaxas pellucidus	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pododesmus patelliformis	-	-	-	-	2	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
Raphitoma sp.	-	1	-	-	-	-	2	-	-	-	-	-	-	-	1	-	-	4	-	-
Sphenia binghami	-	-	-	4	-	-	-	-	7	2	-	-	-	-	-	-	-	-	-	-
Spisula elliptica	-	-	1	1	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-
Spisula sp.	-	-	-	1	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-
Timoclea ovata	-	1	-	1	-	1	-	-	1	1	-	-	-	-	-	-	-	-	-	-
Trophon truncatus	-	-	-	1	1	1	1	-	-	-	-	-	-	2	-	-	-	7	-	-
Veneridae sp. juv.	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Nematoda																				
Nematoda spp.	-	3	-	4	1	10	71	-	11	5	1	-	-	-	-	-	-	2	-	-
Nemertea																				
Nemertea spp.	2	2	-	3	2	3	-	-	8	11	1	-	-	10	2	-	-	6	-	1
Phoronida																				
Phoronis spp.	6	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	3	-	-
Platyhelminthes																				
Turbellaria sp.	-	-	-	-	-	1	-	-	6	-	1	-	-	13	-	-	-	-	-	-
Porifera																				
Porifera crusts indet.	-	P	P	P	P	P	P	P	-	P	-	-	-	-	-	-	-	P	P	-

Taxon	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	G14	G15	G16	G17	G18	G19	G20
<i>Tethya aurantium</i>	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-
<i>Haliclona cinerea</i>	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Leucosolenia complicata</i>	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-
<i>Scypha ciliata</i>	-	-	-	P	P	P	P	-	-	-	-	-	-	-	-	-	-	-	-	-
Protozoa																				
Foraminiferida	-	-	-	P	P	P	-	-	P	P	P	-	-	P	-	-	-	P	-	P
<i>Lagotia viridis</i>	-	P	P	P	P	-	P	P	P	-	-	-	P	P	P	-	P	P	P	P
Sipunicula																				
<i>Golfingia elongata</i>	-	-	-	2	2	4	24	-	23	1	-	-	-	2	-	-	-	2	-	-
<i>Golfingia</i> sp.	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Phascosion strombus</i>	-	4	-	-	-	-	-	-	3	2	2	-	-	-	-	-	-	-	-	-
Tunicata																				
<i>Tunicata</i> spp.	-	-	-	-	-	-	P	-	-	P	-	-	-	-	-	-	-	-	-	-
<i>Polycarpa rustica</i>	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Ascidia conchilega</i>	-	10	-	-	2	-	8	-	3	-	-	-	-	-	-	-	-	2	-	-
<i>Ascidella aspersa</i>	-	-	-	1	7	-	30	-	16	-	-	-	-	-	-	-	-	1	-	-
<i>Ascidella</i> sp.	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	2	-	-
<i>Molgula</i> sp.	-	-	-	-	1	-	13	-	-	3	-	-	-	8	-	-	-	-	-	-
<i>Dendrodoa grossularia</i>	-	84	2	99	164	-	276	-	13	1216	699	-	-	560	-	-	-	226	-	-
<i>Polycarpa fibrosa</i>	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	5	-	-
No of taxa	32	63	22	105	83	79	110	6	113	127	77	1	6	147	18	2	5	110	9	9
No of organisms	53	370	37	13729	6416	1086	10645	4	3954	1972	1644	1	13	1946	30	2	3	5541	10	4
No of taxa June 1995	95	38	6	121	155	128	129	8	96	117	108	7	19	125	13	9	5	167	13	15
No of organisms June 1995	816	67	1	7872	7806	9669	1887	2	590	897	2216	1	12	1584	39	5	1	16324	8	14
No of taxa Oct 04	74	40	9	102	113	106	76	1	70	116	99	4	4	115	3	5	3	125	7	5
No of organisms Oct 04	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 (Raw Data) for November 2005 anchor dredge samples.

Site Code	% 63 mm	% 31.5 mm	% 16 mm	% 8 mm	% 4 mm	% 2 mm	% 1 mm	% 500 um	% 250 um	% 125 um	% 63 um	Mean phi	Mean mm	1 std	skewness	kurtosis	Classification after Buchanan	Folk Triangles after BGS
G1	0.00	3.48	0.93	4.47	7.00	11.06	10.29	9.87	18.82	32.35	1.72	1.45	0.37	1.32	-0.53	1.05	Poorly sorted medium sand	Gravelly Sand
G2	0.00	0.00	0.27	2.96	5.38	6.12	6.66	7.34	29.14	39.83	1.99	1.83	0.28	0.94	-0.56	1.42	Moderately sorted medium sand	Slightly Gravelly Sand
G3	0.00	0.00	0.00	2.03	1.43	0.55	0.41	1.16	58.21	35.68	0.39	2.16	0.22	0.35	0.05	0.99	Well sorted fine sand	Slightly Gravelly Sand
G4	0.00	18.89	29.37	18.08	8.02	4.26	2.45	1.88	8.10	7.82	0.72	-0.90	1.87	1.94	0.64	0.91	Poorly sorted very coarse sand	Sandy Gravel
G5	0.00	66.25	21.22	5.30	2.41	1.22	0.82	0.67	0.74	0.72	0.35	-2.61	6.08	0.72	0.44	1.89	Moderately sorted pebble	Gravel
G6	0.00	0.00	0.00	0.00	0.72	1.20	1.83	2.58	51.26	38.89	2.41	1.91	0.27	0.75	0.00	0.94	Moderately sorted medium sand	Sand
G7	0.00	0.00	0.00	1.06	0.94	2.06	3.60	7.01	76.67	8.21	0.44	1.97	0.26	0.35	-0.19	2.00	Well sorted medium sand	Slightly Gravelly Sand
G8	0.00	0.00	0.00	0.39	0.72	1.24	3.09	7.17	77.14	10.03	0.15	1.98	0.25	0.31	-0.11	1.69	Very well sorted medium sand	Sand
G9	0.00	0.00	6.11	1.74	4.76	4.70	5.97	9.00	46.39	17.81	2.66	0.80	0.57	1.97	-0.53	1.68	Poorly sorted coarse sand	Gravelly Sand
G10	0.00	0.00	8.40	22.62	16.20	8.97	4.90	5.58	17.02	14.97	1.08	-1.11	2.16	2.50	0.27	0.62	Very poorly sorted granule	Sandy Gravel
G11	0.00	19.47	4.90	9.05	9.61	5.84	2.24	3.80	22.38	19.22	2.27	-1.10	2.14	3.19	-0.23	0.61	Very poorly sorted granule	Sandy Gravel
G12	0.00	0.00	0.00	0.00	0.14	0.10	0.10	2.26	62.29	34.79	0.28	2.16	0.22	0.31	0.19	0.80	Very well sorted fine sand	Sand
G13	0.00	0.00	0.00	0.00	0.13	0.57	2.46	8.99	74.74	12.16	0.86	1.99	0.25	0.30	-0.03	1.51	Very well sorted medium sand	Sand
G14	0.00	0.00	2.63	8.46	14.80	12.24	7.58	8.80	14.45	26.27	4.02	1.11	0.46	1.47	-0.39	0.76	Poorly sorted medium sand	Gravelly Sand
G15	0.00	0.00	0.82	3.59	8.71	6.25	6.91	8.76	57.42	7.16	0.33	1.46	0.36	0.96	-0.67	1.45	Moderately sorted medium sand	Slightly Gravelly Sand
G16	0.00	0.00	0.00	0.00	0.57	1.23	2.11	24.20	765.69	355.14	1.79	2.14	0.23	0.30	0.23	0.86	Very well sorted fine sand	Sand
G17	0.00	0.00	0.00	0.21	0.51	1.10	6.67	33.33	57.73	0.45	0.00	1.75	0.30	0.37	-0.29	0.93	Well sorted medium sand	Sand
G18	0.00	12.11	6.85	7.21	9.63	5.52	3.74	4.19	27.22	22.21	1.10	0.65	0.64	2.00	-0.70	0.68	Very poorly sorted coarse sand	Gravelly Sand
G19	0.00	0.00	0.00	1.89	1.76	2.56	2.11	5.26	65.45	17.04	3.13	2.05	0.24	0.51	-0.12	2.48	Moderately well sorted fine sand	Slightly Gravelly Sand
G20	0.00	0.00	0.48	2.57	6.10	9.31	12.12	8.53	52.38	8.28	0.20	1.52	0.35	0.88	-0.61	1.19	Moderately sorted medium sand	Slightly Gravelly Sand