

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

**September 2021**

**A Report to Alpha Marine  
On behalf of GE Wind Energy**

**February 2022**



## Table of Contents

<b>1. Introduction</b>		<b>1</b>
<b>2. Methodology</b>		<b>4</b>
2.1	Beam trawls	4
2.2	Anchor Dredge Sampling	4
2.3	Particle Size Analysis (PSA)	5
2.4	Data Analysis	7
<b>3. Results</b>		<b>8</b>
3.1	Beam Trawls	8
3.2	Anchor Dredge Samples	15
3.3	Biotope Classification	26
<b>4. Discussion and Conclusions</b>		<b>28</b>
<b>5. References</b>		<b>30</b>
<b>6. Appendices</b>		<b>31</b>
Appendix 6.1	Species List for Beam Trawl Survey; September 2021	31
Appendix 6.2	Species List for Anchor Dredge Survey; September 2021	33
Appendix 6.3	Total results from the Beam Trawl September 2021	35
Appendix 6.4	Total fish numbers and lengths	39
Appendix 6.5	Anchor dredge raw data, September 2021	40
Appendix 6.6	Particle Size Analysis: September 2021.	47

## 1. INTRODUCTION

Aquatic Services Unit, University College Cork, was requested by Alpha Marine, on behalf of Arklow Energy Ltd., to undertake a final benthic biological survey, as part of a post construction monitoring programme for the Arklow Bank Offshore Windfarm. The following report outlines the work undertaken for this survey. Fieldwork for this report was undertaken on the 09<sup>th</sup> and 10<sup>th</sup> September 2021.

The Arklow Bank Offshore Wind Farm lies 13 km east of Arklow town and consists of seven 3.6 MW turbines. Construction was begun in 2002 with the building of these seven turbines. A baseline survey of the Arklow Bank area and cable route was conducted in 2000–01 (pre-construction), consisting of three 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 following two used Agassiz trawls and anchor dredges. Only qualitative data was produced from the anchor dredge samples and species were recorded as present/absent.

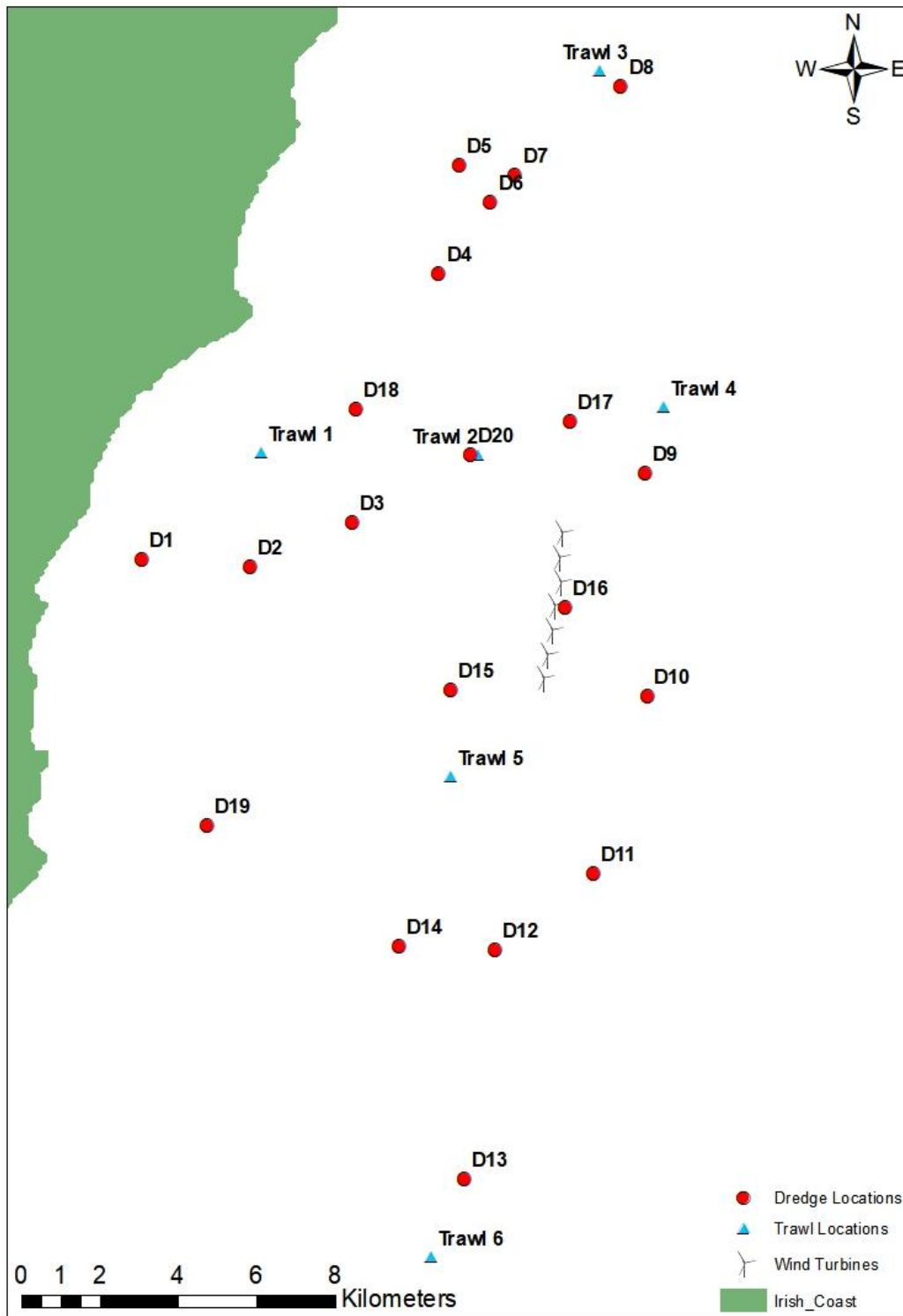
The initial surveys undertaken in June/July 2004 were taken using Day Grabs, and these encountered severe problems with the mixed ground. Subsequent surveys were undertaken using semi-quantitative anchor dredges to assess the benthic infauna and associated sediments. In addition, semi-quantitative beam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

The locations of the sampling positions of the current survey are consistent with previous monitoring surveys. These sampling locations were specified by the client and are presented in Figure 1.1 and in Table 1.1. The positions of the current stations do not coincide with the positions of the baseline survey.

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

	Beam Trawl Co-ordinates			
	Trawl In		Trawl Out	
	Easting	Northing	Easting	Northing
Trawl 1	698387	5855878	698351	5857193
Trawl 2	704000	5858026	703870	5857206
Trawl 3	706812	5866632	706835	5867039
Trawl 4	708616	5857868	708599	5858500
Trawl 5	703317	5848104	703299	5849009
Trawl 6	702991	5837351	702974	5836776

	Anchor Dredge Co-ordinates			
	Dredge In		Dredge Out	
	Easting	Northing	Easting	Northing
D01	695341	5854436	695406	5854492
D02	698102	5854272	698105	5854644
D03	700688	5855442	700690	5855523
D04	702819	5861823	702742	5861668
D05	703294	5864580	703182	5864498
D06	704111	5863651	704117	5863542
D07	704729	5864365	704799	5864287
D08	707392	5866646	707298	5866542
D09	708144	5856804	708161	5856680
D10	708273	5851127	708247	5851047
D11	706977	5846590	707019	5846666
D12	704494	5844621	704464	5844520
D13	703793	5838766	703499	5838634
D14	702052	5844658	702046	5844850
D15	703265	5851217	703285	5851107
D16	706152	5853365	706255	5853414
D17	706215	5858081	706262	5858211
D18	700766	5858324	700779	5858209
D19	697098	5847676	697036	5847654
D20	703686	5857206	703682	5857097



**Figure 1.1** Anchor Dredge (● numbered D1 to D20) and Beam Trawl locations (▲ numbered Trawl 1 to Trawl 6) for the present monitoring survey (September 2021). These stations correspond to locations sampled in previous surveys.

## 2. METHODOLOGY

All sampling was undertaken from the MV Husky, based out of Wicklow Port. The present survey was completed over the course of the 09<sup>th</sup> and 10<sup>th</sup> September 2021. The sampling methodologies employed followed those used from previous surveys undertaken at the site since 2005.

### 2.1 Beam trawls

All trawls were taken using a 2m Beam Trawl equipped with tickler chains and a 4 mm mesh cod-end, as per previous surveys. All tows were 10-15 mins duration over the ground at a speed of ~2 knots (where possible, depending on current and wind), with a warp of 2½ times water depth. Once on board, the contents were placed into a sorting table and photographed prior to processing.

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

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

### 2.2 Anchor Dredge Sampling

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

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

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

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

As per previous surveys, only one of the three sampling units per site was processed and analysed. Samples were manually sorted by eye, using a binocular microscope where necessary. Sorted

samples were then stored in 70% alcohol until identification. Samples were sent to qualified taxonomists (Thomson Environmental Consultants) for identification to species level, where possible, and enumeration. The remaining sub-samples are currently held in storage by Alphamarine.

### 2.3 Particle Size Analysis (PSA)

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

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

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

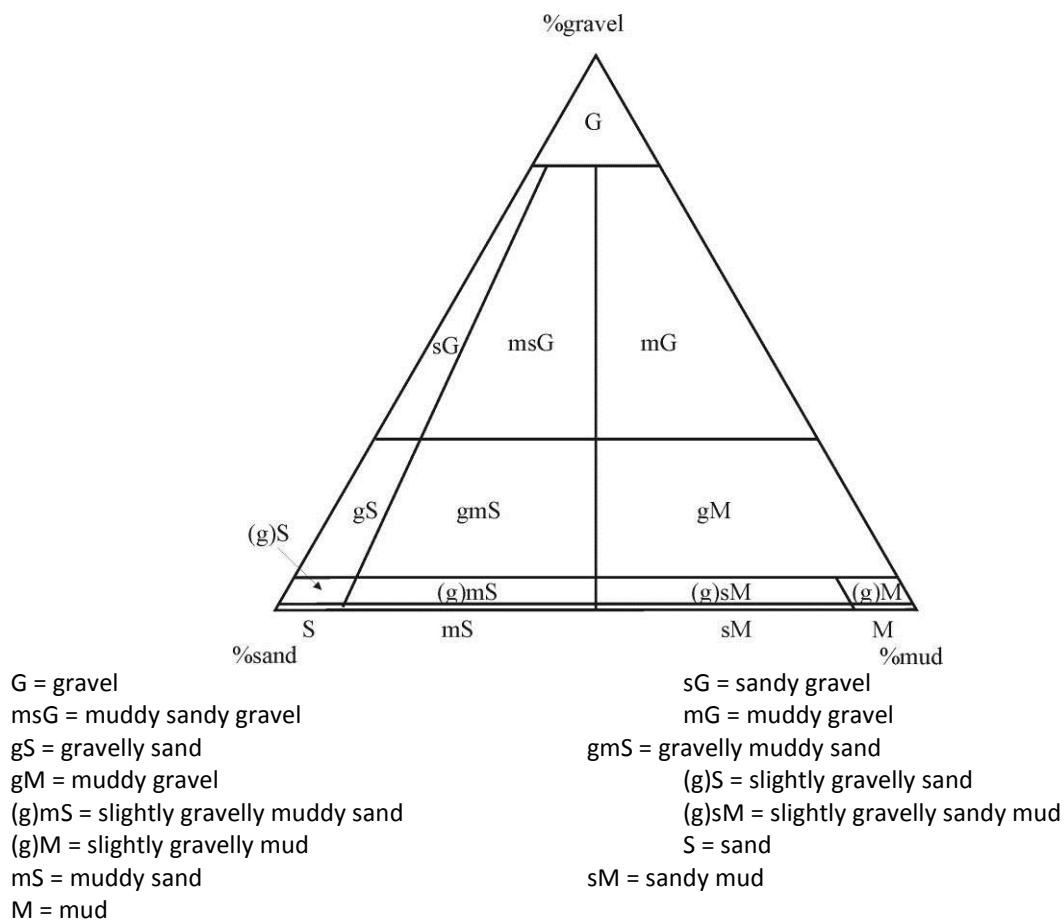
Sieve Series Sizes (mm)							
4.0	2.0	1.0	0.5	0.25	0.125	0.63	<0.63

**Table 2.3.2** Classification used for defining sediment type (from Buchanan & Kain, 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 2.3.3** Classification of sediment sorting using standard deviation of mean Phi, as described by Buchanan & Kain (1984).

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



**Figure 2.3.1** Sediment classification after Folk (1954). “Gravel” is greater than 2 mm and “mud” is less than 63 µm.

## 2.4 Data Analysis

On completion of the sample processing and identification the data was analysed using diversity indices and multivariate analysis to identify the current community structure across the survey area and assess change compared to previous surveys. Statistical analysis between the baseline survey and some subsequent surveys was undertaken previously and was not repeated in the present survey. An assessment on the distribution of the benthic communities identified in the present survey was made against the distribution of those communities from previous surveys. This mirrors the approach taken in previous reports.

Multivariate analysis, using non-metric multidimensional scaling (nMDS), was performed on the raw datasets using PRIMER v 5 (Clarke & Warwick, 1994). Diversity indices were calculated using the BIODIV computer programme (Baev & Penev, 1995).

### 2.4.1 Beam Trawls

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

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

### 2.4.2 Anchor dredge samples

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

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

The initial monitoring report (Hydroserv, 2004) compared pooled replicates between the sites taken with a 0.1 m<sup>2</sup> Day Grab. This information was compared to information obtained in the baseline survey of 2000 (Ecoserve, 2001). Analysis indicated that comparisons between these two surveys were incompatible due to inherent differences in the sampling equipment used. A resurvey was undertaken in October 2004 using the current sampling methodology (anchor dredge and beam-trawl sampling methods). This report indicated that the assemblages reported in October 2004 were broadly similar to those identified in the baseline survey (Ecoserve, 2001), although direct comparisons were difficult due to the different sampling methods used (Hydroserv, 2005).

### 3. RESULTS

#### 3.1 Beam Trawls

Raw data from the beam trawls are presented in the appendices (Appendix 6.3), in addition to information on fish species and lengths (Appendix 6.4). A total of 185 taxa were identified in the present survey. Of these 185 taxa, 16 are fish species. Overall, the number of taxa identified is in keeping with previous surveys; the total number of taxa is higher than the June 2006 (98 taxa), June 2005 (47 taxa) and October 2004 (51 taxa) surveys, and similar to those identified in 2007 (177 taxa), 2008 (170 taxa), 2009 (132 taxa) 2010 (158 taxa) and 2011 (186 taxa).

The number of fish species and abundances found at each trawl location in the 2006 – 2011 surveys, as well as the present survey, are presented in Figures 3.1.1 and 3.1.2. The total number of fish taxa identified in the present survey (16 taxa) is higher than those identified in previous surveys (14 – June 2006, 7 – May 2007, 12 – May 2008, 10 – June 2009, 12 – June 2010 and 14 – June 2011). In addition, the number of fish caught in the present survey (74 individuals) is similar that caught in June 2005 (74) and October 2004 (80), but higher than other previous surveys (55 – June 2006, 18 – May 2007, 33 – May 2008, 32 – June 2009, 33 – June 2010 and 52 – June 2011). In the present survey, Trawls 1 and 5 had the highest number of species (9) and Trawl 5 also had the highest number of individuals (26). No fish taxa were recorded in two trawls during the present survey (Trawl 3 and Trawl 4).

Important commercial fish were limited to 1 Plaice (*Pleuronectes platessa*), 12 Whiting (*Merlangius merlangus*), 3 Dogfish (*Scyliorhinus caniculus*), and 1 Dab (*Limanda limanda*). Three elasmobranchs were caught in the present survey (3 x *Scyliorhinus caniculus*) compared to 3 (2011), 2 (2010), 1 (2009), 4 (May 2008), 3 (June 2006), 4 (June 2005), 3 (October 2004) respectively. No elasmobranchs were returned during the 2007 survey.

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

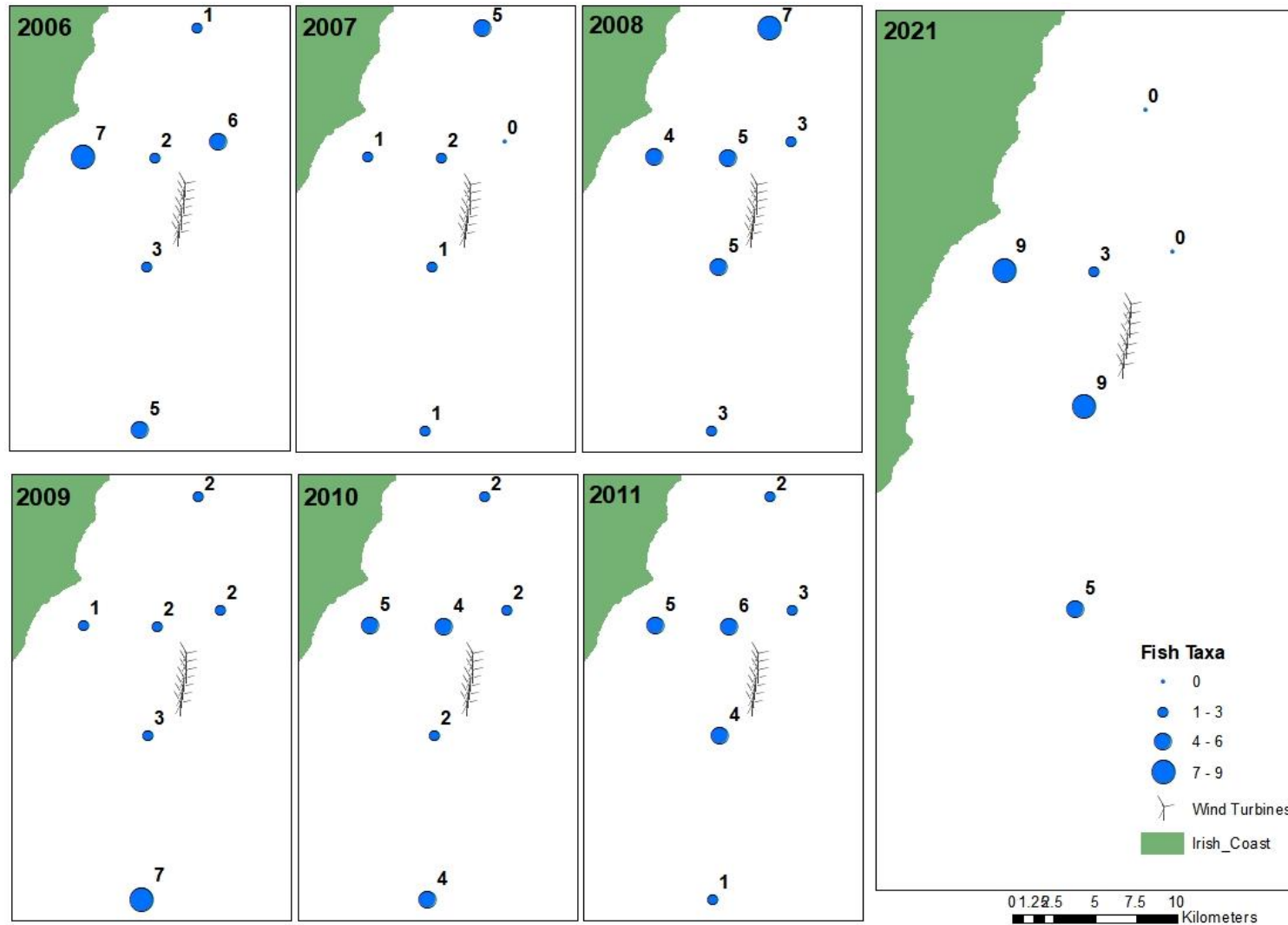
The beam trawl surveys yielded a total of 185 taxa, which is in keeping with more recent previous surveys. Total numbers of countable organisms (2,440) is similar to that identified in 2011 (2,523), although numbers identified in the present survey are still reduced from levels identified in 2007. This is related to the non-sampling of a *Sabellaria* reef identified in Trawl 3 that year. A reduced number of *Sabellaria alveolata* (204 individuals) were collected in Trawl 3 during the present survey, but numbers recorded are much lower than recorded in 2007, indicating that although the identified *Sabellaria* reef is present, distribution in the area can be described as patchy. Nineteen taxa were found in numbers  $\geq 20$  over the whole survey area, compared with 20 taxa in 2011, 20 taxa in 2010, 15 taxa in 2009, 9 taxa in 2008 and 19 taxa in 2007. Abundances and diversity have remained similar across the trawls compared to those identified previously (1,783 in June 2006, 4,367 in May 2007, 898 in May 2008, 1,779 in June 2009, 1,819 in June 2010 & 2,523 in June 2011). A complete list of the most countable faunal species identified in the present survey is presented in Table 3.1.1.

The highest numbers of taxa encountered at the trawl sites were found in Trawls 1 and 5 (115 and 108 taxa respectively). These stations also had the highest number of countable taxa (76 and 80 respectively). Trawls 3 & 5 returned the highest abundances during the present survey (730 and 1113 respectively). The most abundant species present in the survey area are the shrimp species

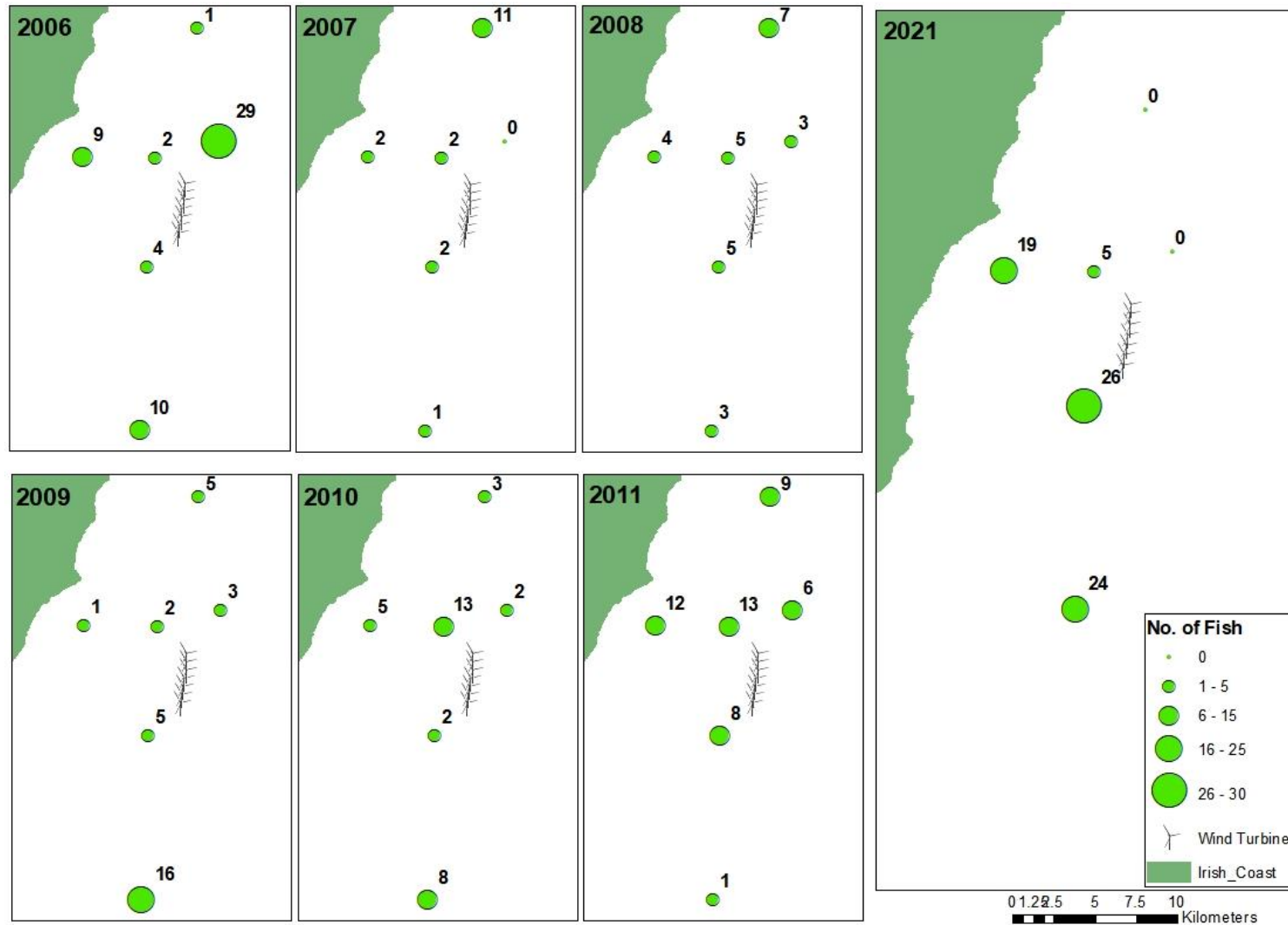
*Pandalus montagui* and *Crangon almanni*, the reef forming polychaete *Sabellaria alveolata*, and the encrusting barnacle *Balanus crenatus*.

**Table 3.1.1** Numbers of the 10 most common countable faunal species found in September 2021 compared to abundances found in June 2011, June 2010, June 2009, May 2008, May 2007, and June 2006 beam trawl surveys

	2021	2011	2010	2009	2008	2007	2006
<i>Pandalus montagui</i>	502	170	287	406	16	13	187
<i>Crangon almanni</i>	339	238	218	124	68	52	53
<i>Sabellaria alveolata</i>	224	651	4	3	111	2083	668
<i>Balanus crenatus</i>	174	0	4	245	68	34	P
<i>Liocarcinus holsatus</i>	107	6	0	0	1	8	5
PLATYHELMINTHES	90	0	0	0	0	0	0
<i>Sabellaria spinulosa</i>	73	28	14	16	8	8	0
<i>Epimeria (Epimeria) cornigera</i>	72	3	2	0	0	0	1
<i>Ascidella</i>	68	P	P	P	3	56	0
<i>Aequipecten opercularis</i>	49	4	0	0	1	9	118



**Figure 3.1.1** Total number of fish taxa per trawl site (June 2006, May 2007, May 2008, June 2009, June 2010, June 2011 & September 2021)



**Figure 3.1.2** Total number of fish per trawl site (June 2006, May 2007, May 2008, June 2009, June 2010, June 2011 & September 2021)

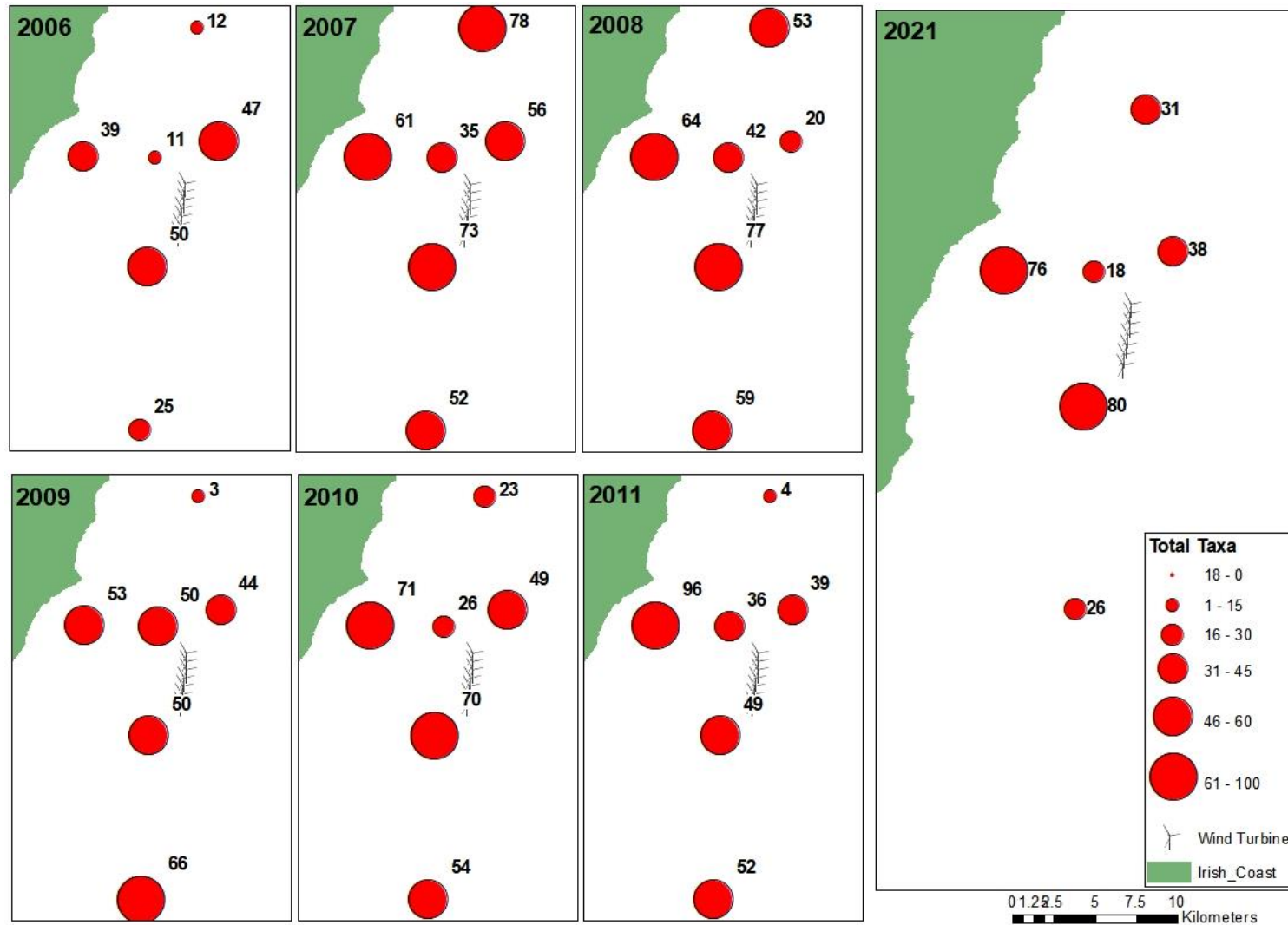
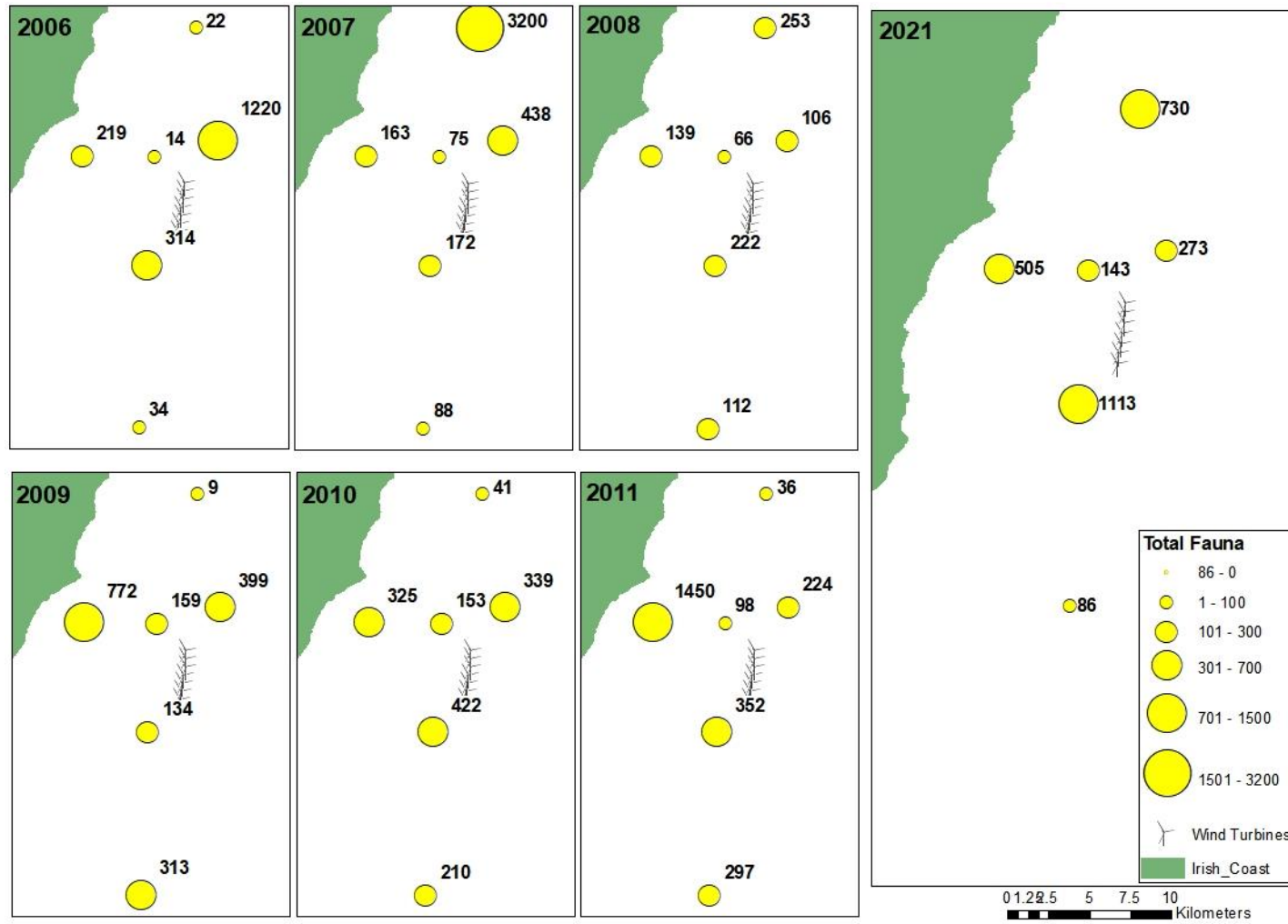
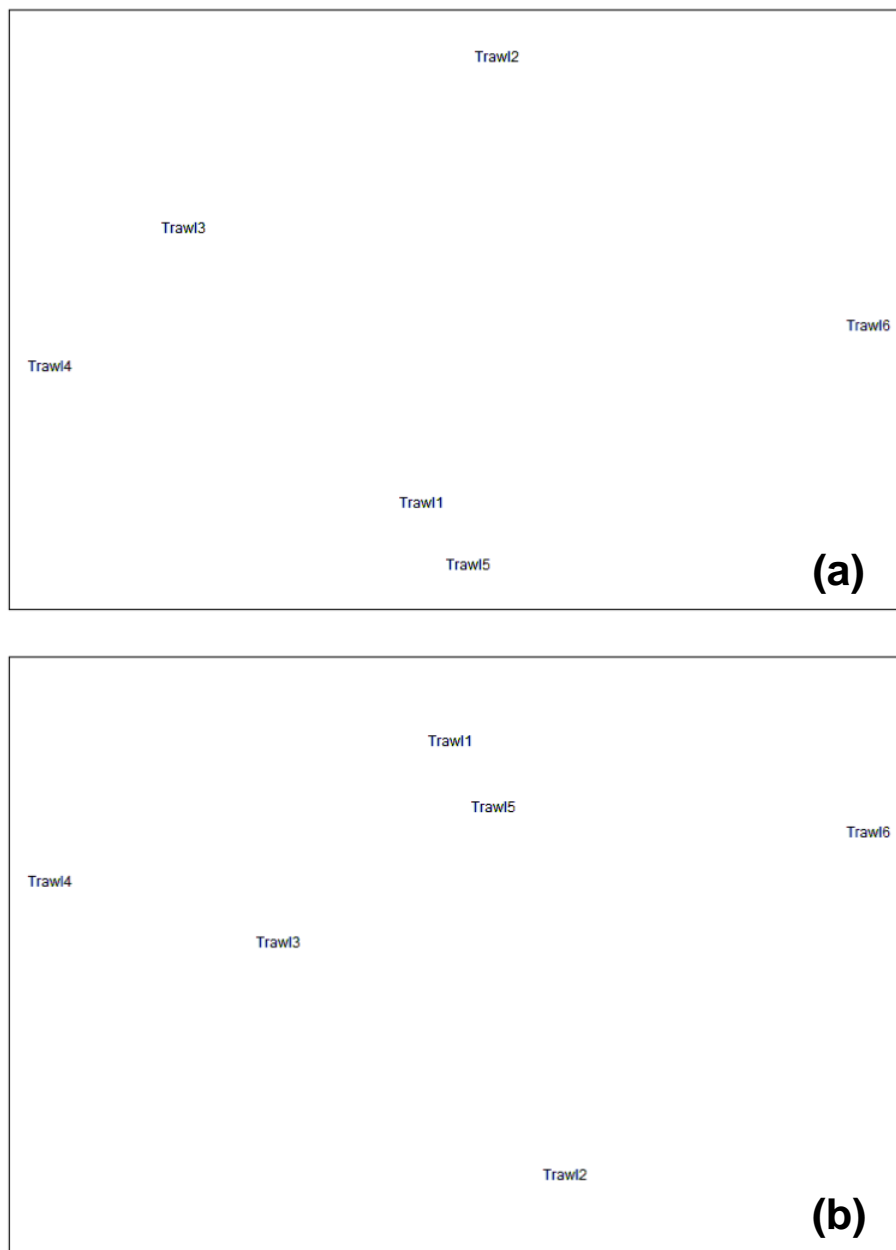


Figure 3.1.3 Total number of invertebrate taxa per trawl site (June 2006, May 2007, May 2008, June 2009, June 2010, June 2011 & September 2021)



**Figure 3.1.4** Total number of countable invertebrates per trawl site (June 2006, May 2007, May 2008, June 2009, June 2010, June 2011 & September 2021)

As with previous surveys multivariate analysis of the community structure reveals the presence of no distinct community structure, based on both the presence/absence dataset (Figure 3.2.5a) and the dataset with non-countable colonial organisms removed (Figure 3.2.5b).



**Figure 3.1.5** (a) Multivariate analysis (nMDS plot) on the 2021 trawl data, colonial data included (Stress = 0.01).  
(b) Multivariate analysis of the countable fauna, non-countable colonial data removed (Stress = 0.01).

### 3.2 Anchor Dredge Samples

#### 3.2.1 Particle Size Analysis

Data for the full Particle Size Assessment is presented in Appendix 6.6. Table 3.2.1 presents a summary of the results and a visual assessment based on the on-board field notes. Results from the present survey are in line with findings from previous surveys, with minor variations in particle size analysis at selected locations throughout the survey area. These minor variations are considered to be related to the heterogenous nature of the sediment across the survey site. The dominant sediment type in the area consists of sands and gravelly sands (Figure 3.2.1). A distribution map of the sediment encountered in the present survey is presented in Figure 3.2.2. The seabed on the Arklow bank consists of slightly gravelly sands (D16), with the deeper eastern part of the bank consisting primarily of gravelly sands (D09 & D10) and sandy gravels (D11). The extensive area to the west of the Arklow Bank contains sands and gravelly sands. Two stations are classified as 100% gravel (D5 & D7), located in the northern area of the survey area. Six stations are classified as gravelly sands (D01, D03, D04, D15, D17 & D20), with four stations classified as slightly gravelly sands (D02, D08, D13 & D19). Two stations were identified with a minor muddy element (D01 & D14). One station was identified as sandy gravels (D18). Two stations are classified as sands (D05 and D12).

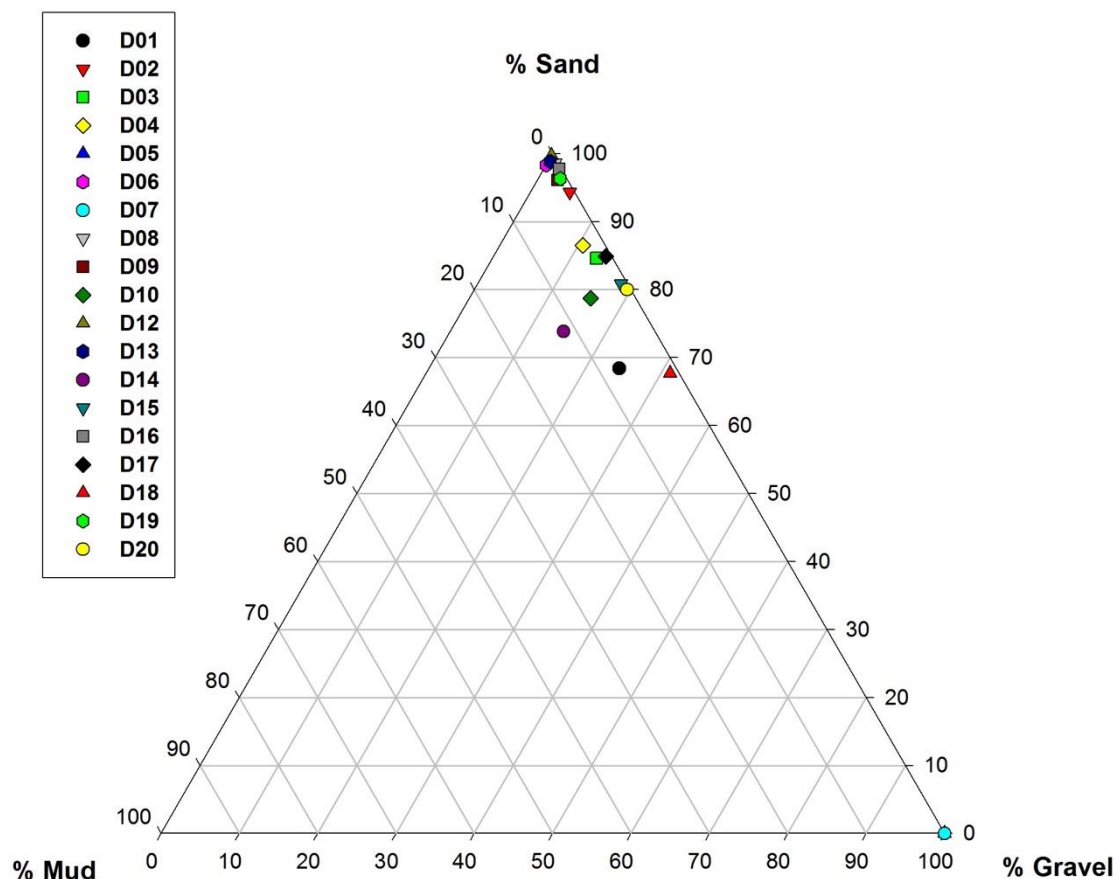
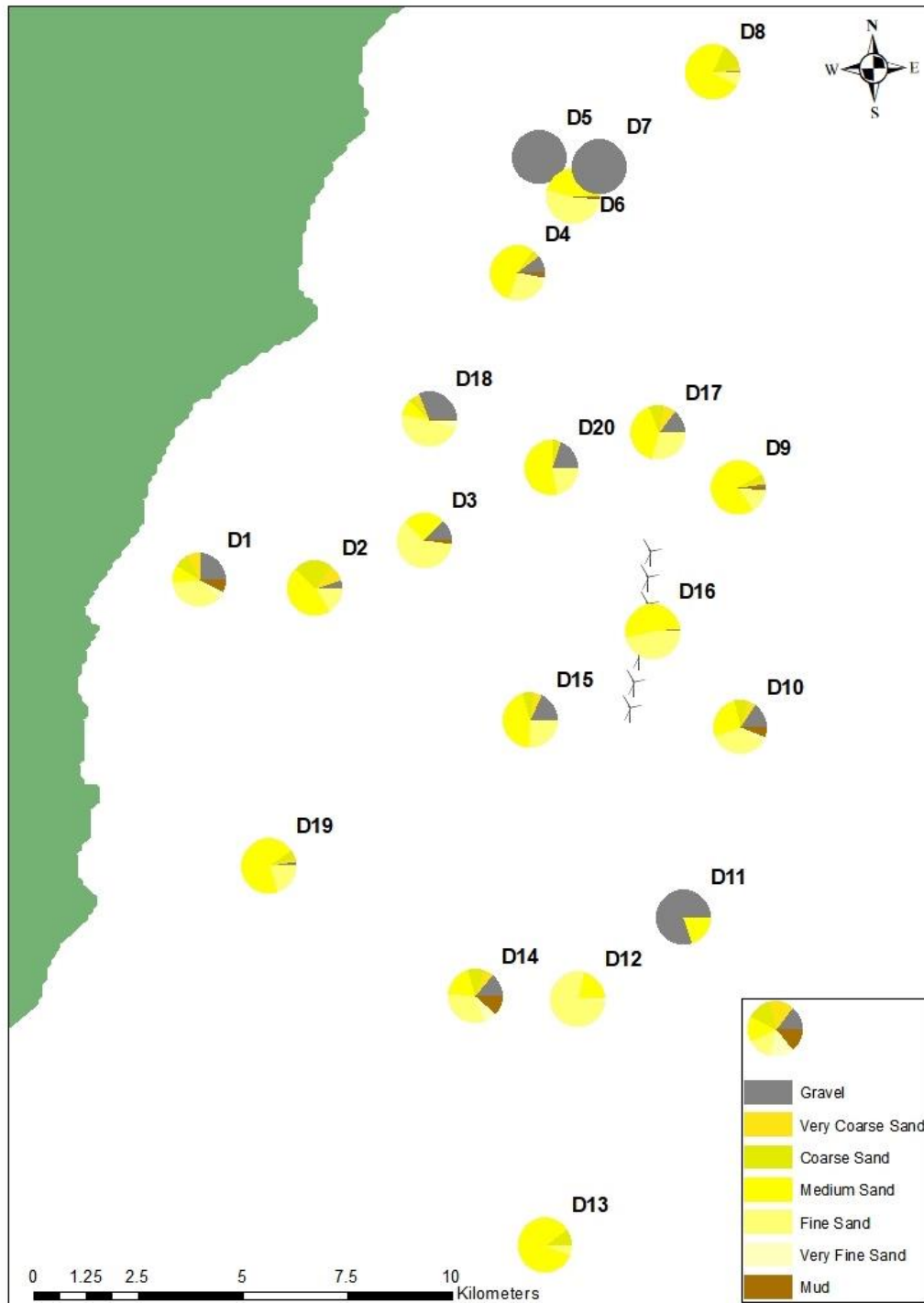


Figure 3.2.1 Ternary plot of PSA results from the September 2021 survey.



**Figure 3.2.2** Distribution of sediment type as determine from the anchor dredge samples in September 2021. Site numbers are shown.

**Table 3.2.1** Classification of sediment types at September 2021 grab stations according to methods after Buchanan & Kain (1984) and Folk & Ward (1954), together with visual assessment of sediments from notes taken at the time. Folk and Ward classification for the most recent survey from June 2011 is also given for comparison.

Site Code	Classification after Buchanan	Textural Group (September 2021)	Textural Group (June 2011)	Visual assessment
1	Very Fine Gravelly Fine Sand	Gravelly Sand [gS]	Gravelly Sand [gS]	Gravelly Sand
2	Slightly Very Fine Gravelly Medium Sand	Slightly Gravelly Sand [(g)S]	Gravelly Sand [gS]	Gravelly Sand
3	Fine Gravelly Fine Sand	Gravelly Sand [gS]	Slightly Gravelly Sand [(g)S]	Gravelly Sand
4	Fine Gravelly Medium Sand	Gravelly Sand [gS]	Slightly Gravelly Sand [(g)S]	<i>Sabellaria</i> reef
5	Gravel	Gravel [G]	Gravel [G]	Gravel
6	Moderately Well Sorted Fine Sand	Sand [S]	Gravelly Sand [gS]	<i>Sabellaria</i> reef
7	Gravel	Gravel [G]	Sandy Gravel [sG]	Gravel with occasional <i>Sabellaria</i> tubes
8	Slightly Very Fine Gravelly Medium Sand	Slightly Gravelly Sand [(g)S]	Gravelly Sand [gS]	Coarse Sand
9	Slightly Very Fine Gravelly Medium Sand	Slightly Gravelly Sand [(g)S]	Gravelly Sand [gS]	Medium to coarse sand
10	Very Fine Gravelly Fine Sand	Gravelly Sand [gS]	Sandy Gravel [gS]	Gravelly Sand
11	No Record	No Record	Muddy Sandy Gravel [msG]	<i>Sabellaria</i> reef with sandy gravels
12	Well Sorted Fine Sand	Sand [S]	Sand [S]	Sand
13	Slightly Very Fine Gravelly Medium Sand	Slightly Gravelly Sand [(g)S]	Slightly Gravelly Sand [(g)S]	Coarse Sand
14	Fine Gravelly Very Coarse Silty Fine Sand	Gravelly Muddy Sand [gMS]	Gravelly Sand [gS]	Muddy Gravelly Sand
15	Fine Gravelly Medium Sand	Gravelly Sand [gS]	Gravelly Sand [gS]	Gravelly Sand
16	Slightly Fine Gravelly Medium Sand	Slightly Gravelly Sand [(g)S]	Sand [S]	Medium Sand
17	Very Fine Gravelly Medium Sand	Gravelly Sand [gS]	Sandy Gravel [sG]	Coarse Sand
18	Sandy Fine Gravel	Sandy Gravel [sG]	Gravelly Sand [gS]	Sandy shell gravel
19	Slightly Fine Gravelly Medium Sand	Slightly Gravelly Sand [(g)S]	Gravelly Muddy Sand [gMS]	Sand
20	Fine Gravelly Medium Sand	Gravelly Sand [gS]	Sandy Gravel [sG]	Sand

### 3.2.2 Biota

#### 3.2.2.1 Abundance and diversity

A full taxonomic list of all species identified for the September 2021 survey is presented in Appendix 6.2 with a full data matrix, including abundance data, presented in Appendix 6.5. Graphical representations of the distribution of the identified taxa across the survey sites during the present survey in addition to previous surveys are also presented (Figures 3.2.3 – 3.2.6). In total, 6,355 individuals from 189 countable taxa were recorded in the present survey. An additional 49 colonial taxa were recorded, resulting in 238 taxa in total identified in September 2021. Overall abundances and diversity have increased compared to the most recent survey from 2011 (2876 individuals from 149 countable taxa and 20 colonial taxa). Total number of taxa is similar to previous surveys from 2010 to 2007 (218 in 2010, 209 in 2009, 242 in 2008, 254 in 2007), with faunal abundances showing similar levels to 2010 (8,396) and 2008 (7,737). Abundances are much reduced to numbers of individuals collected in 2009 (12,653) and 2007 (17,837). These reductions are as a direct result in a decrease in keelworm (*Spirobranchus lamarckii*<sup>1</sup>) abundances which dominated the surveys in those years.

Abundances for the reef forming polychaete *Sabellaria* spp. have increased compared to results obtained in 2011, with a total of 2951 individuals recorded from the present survey compared to 618 individuals in 2011. Results from 2021 are consistent with findings from 2010 (2,866 individuals) and 2009 (3,994 individuals) and reflect the patchy distribution of these reef habitats. Although *Sabellaria* worms were identified at eight sites in the survey area, they were present in large numbers (>500) at only 3 of these (D4 – 1067, D6 – 1115; D11 – 617). As mentioned previously, this variation in abundances across all the years can be explained by the heterogeneous nature of the seabed and the scattered distribution of these reefs across the survey area.

The most abundant species present in the current survey are broadly similar to those identified in previous surveys (Table 3.2.3). Thirteen taxa were present with greater than 70 individuals across the survey area in 2021. This compares to 5 taxa in 2011, 10 taxa in 2010, 10 taxa in 2009, 7 taxa in 2008, 11 taxa in 2007, and 17 in 2006.

The highest recorded Margalef's species richness score in the present survey was found at D09 (9.9). Overall species richness scores increased in 8 of the 20 sites during the present survey compared to the most recent survey of 2011. Although the number of countable fauna increased at 14 stations during the present survey compared to 2011, the most significant changes in the present survey were reductions at sites D02 (0 from 27 in 2011 and a highest recorded value of 254 in 2009), and D19 (2 from 17 in 2011 and a highest recorded value of 45 in 2007). The sites with the most notable increase were D06 (1,420 from 642 in 2011 and a highest recorded value of 801 in 2010) and D18 (380 from 34 in 2011, although numbers remain reduced compared to all other previous surveys from 2006 to 2010).

---

<sup>1</sup> For comparisons with previous reports, it should be noted that the keelworm *Pomatoceros lamarckii* has been updated to the currently accepted name of *Spirobranchus lamarckii*.

### 3.2.2.2 Multivariate analysis

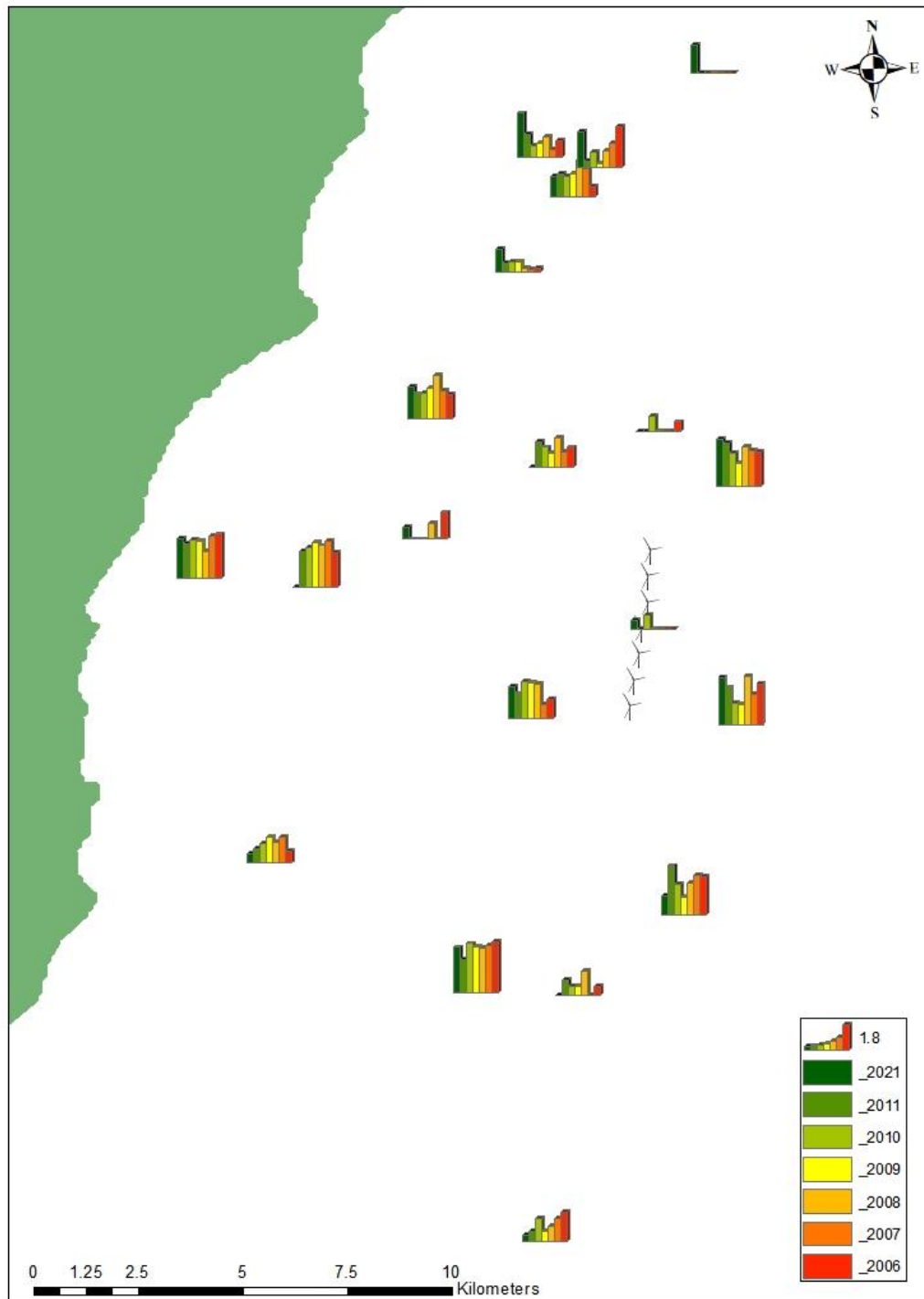
Non-metric multi-dimensional scaling (MDS) analysis was performed on the 2021 dataset. No obvious pattern has been identified in the data set due to the large degree of variation in faunal abundances across the site. The stations with large numbers of fauna present in the seabed tended to show stronger similarity than areas with less faunal diversity. This is similar to the results obtained in previous surveys, where no obvious similarity existing between the sandy sites with less fauna diversity, although some similarity was evident between the gravelly sites and sites with a greater faunal diversity.

**Table 3.2.2** Univariate descriptors of abundance and richness in the 20 dredge samples from September 2021.

	Number of Taxa (S)	Number of Individuals (N)	Simpson's Dominance Index (d)	Shannon- Wiener Diversity Index (H')	Margalef's Species Richness (Dmg)
D1	46	317	0.115	2.79	7.81
D2	0	0	-	-	-
D3	4	14	0.541	0.895	1.14
D4	62	1410	0.407	1.7	8.41
D5	42	303	0.065	3.12	7.18
D6	47	1420	0.489	1.4	6.34
D7	46	1110	0.131	2.51	6.41
D8	7	7	0.143	1.95	3.08
D9	56	258	0.0268	3.37	9.9
D10	50	186	0.0561	3.35	9.38
D11	29	706	0.24	1.31	4.27
D12	0	0	-	-	-
D13	2	6	0.722	0.451	0.558
D14	47	213	0.0643	3.23	8.58
D15	12	17	0.135	2.28	3.88
D16	2	2	0.5	0.693	1.44
D17	1	2	1	0	0
D18	43	380	0.243	2.2	7.07
D19	2	2	0.5	0.693	1.44
D20	1	2	1	0	0





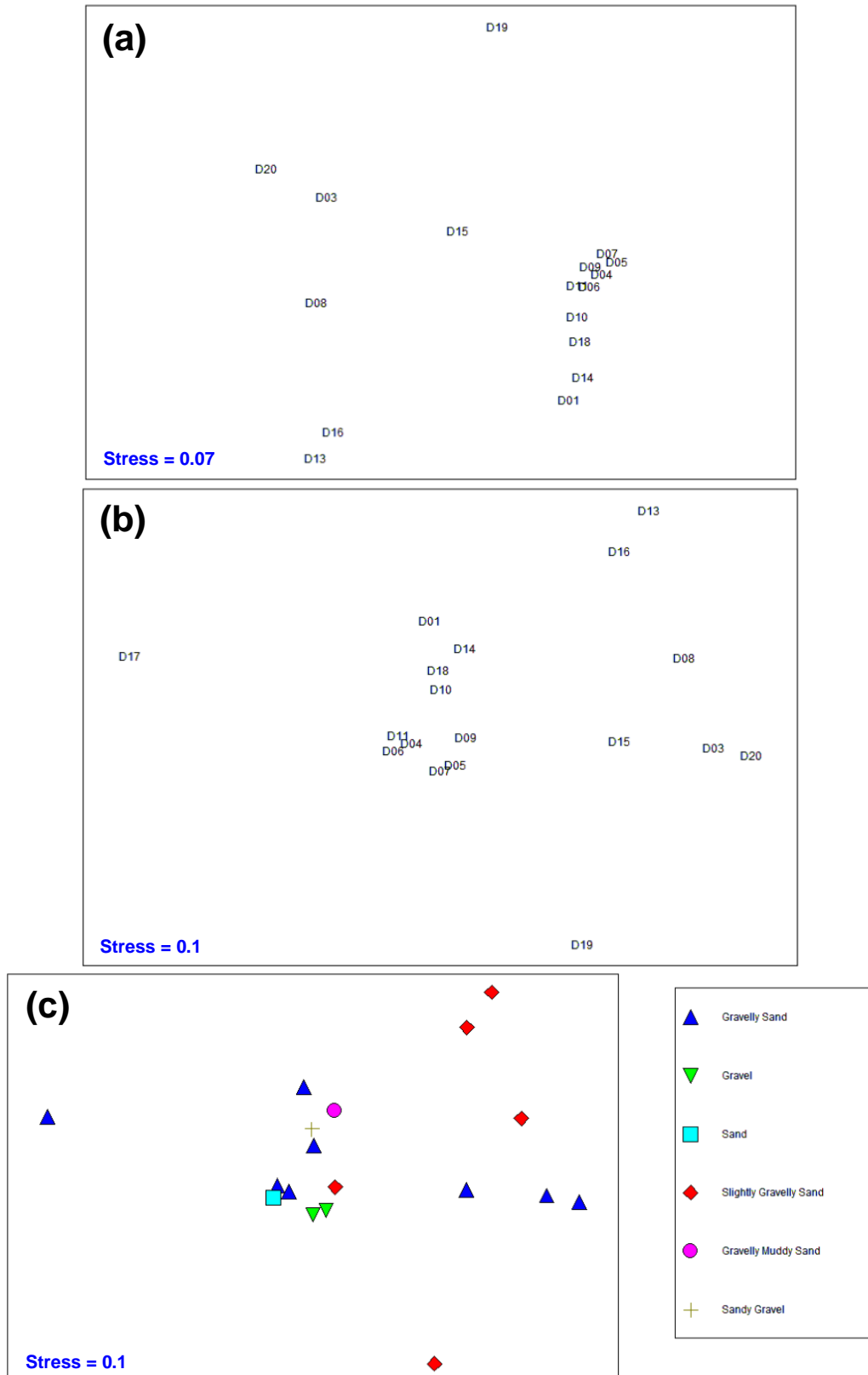


**Figure 3.2.5** Shannon Wiener diversity indices per anchor dredge (June 2006, May 2007, May 2008, June 2009, June 2010, June 2011 & September 2021)



**Table3.2.3** List of the most abundant taxa (where >70 individuals were recorded across the survey area) in descending order of abundance from the anchor dredge survey of September 2021.

	D01	D02	D03	D04	D05	D06	D07	D08	D09	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20
<i>Sabellaria alveolata</i>	-	-	-	873	-	974	-	-	12	-	208	-	-	-	-	-	-	-	-	-
<i>Sabellaria spinulosa</i>	-	-	-	194	10	141	77	-	31	21	409	-	-	-	-	-	-	1	-	-
<i>Verruca stroemia</i>	-	-	-	2	48	-	293	-	-	6	-	-	-	-	-	-	-	-	-	-
<i>Spirobranchus lamarcki</i>	-	-	-	15	27	4	174	-	5	7	7	-	-	1	-	-	-	46	-	-
<i>Nucula nucleus</i>	-	-	-	-	-	9	71	-	-	-	-	-	-	-	-	-	-	174	-	-
<i>Dipolydora coeca</i> agg.	-	-	-	2	27	-	157	-	3	13	-	-	-	-	-	-	-	-	-	-
<i>Hiatella arctica</i>	-	-	-	39	13	42	54	-	16	-	-	-	-	-	-	-	-	-	-	-
<i>Pisidia longicornis</i>	-	-	-	22	5	102	3	-	4	-	8	-	-	1	-	-	-	-	-	-
<i>Dendrodoa grossularia</i>	-	-	-	4	9	-	49	-	2	23	7	-	-	4	-	-	-	23	-	-
<i>Abra alba</i>	78	-	-	1	-	3	3	-	-	5	2	-	-	-	-	-	-	11	-	-
<i>Serpulidae</i>	-	-	-	-	16	-	62	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Scoloplos armiger</i>	33	-	-	-	-	-	-	-	-	20	1	-	-	18	-	-	-	3	-	-
<i>Polycarpa fibrosa</i>	5	-	-	48	4	8	4	-	4	-	-	-	-	-	-	-	-	-	-	-



**Figure 3.2.7** Multi-dimensional scaling plot of faunal data from the anchor dredge survey, September 2021 [(a) Presence/Absence data (with D17 removed); (b) Abundance data, non-countable colonial organisms removed; (c) Abundance data, non-countable colonials removed and granulometric results superimposed]

### 3.3 Biotope Classification

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

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

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

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

**Table 3.3.2** Biotope classifications identified in the present survey (September 2021).

Biotope Classification		Biotope Classification	
<b>Station 1</b>	IGS.FaS Shallow sand faunal communities [No Change]	<b>Station 11</b>	MCR.CSAb Circalittoral <i>Sabellaria</i> reefs. [No Change]
<b>Station 2</b>	IGS.Mob Sparse fauna in infralittoral mobile clean sand [Previously reported as IGS.FaS Shallow sand faunal communities]	<b>Station 12</b>	IGS.Mob Sparse fauna in infralittoral mobile clean sand [No Change]
<b>Station 3</b>	IGS.Mob Sparse fauna in infralittoral mobile clean sand [No Change]	<b>Station 13</b>	IGS.Mob Sparse fauna in infralittoral mobile clean sand [No Change]
<b>Station 4</b>	MCR.CSAb Circalittoral <i>Sabellaria</i> reefs. [Previously reported as MCR.Flu.SerHyd <i>Sertularia cupressina</i> and <i>Hydrallmania falcata</i> on tide swept circalittoral cobbles and pebbles]	<b>Station 14</b>	MCR.Flu.Flu <i>Flustra foliacea</i> on slightly scoured silty circalittoral rock or mixed substrata. [Previously reported as MCR Circalittoral rock or mixed substrata in moderately exposed environments.]
<b>Station 5</b>	MCR.Flu.SerHyd <i>Sertularia cupressina</i> and <i>Hydrallmania falcata</i> on tide swept circalittoral cobbles and pebbles] [Previously reported as MCR Circalittoral rock or mixed substrata in moderately exposed environments.]	<b>Station 15</b>	IGS.Mob Sparse fauna in infralittoral mobile clean sand [No Change]
<b>Station 6</b>	MCR.CSAb Circalittoral <i>Sabellaria</i> reefs. [No Change]	<b>Station 16</b>	IGS.Mob Sparse fauna in infralittoral mobile clean sand [No Change]
<b>Station 7</b>	MCR Circalittoral rock or mixed substrata in moderately exposed environments. [No change]	<b>Station 17</b>	IGS.Mob Sparse fauna in infralittoral mobile clean sand [No Change]
<b>Station 8</b>	IGS.Mob Sparse fauna in infralittoral mobile clean sand [No Change]	<b>Station 18</b>	MCR.Flu.Flu <i>Flustra foliacea</i> on slightly scoured silty circalittoral rock or mixed substrata. [No Change]
<b>Station 9</b>	MCR.Flu.Flu ( <i>Flustra foliacea</i> on slightly scoured silty circalittoral rock or mixed substrata). [No Change]	<b>Station 19</b>	IGS.Mob Sparse fauna in infralittoral mobile clean sand [No Change]
<b>Station 10</b>	MCR Circalittoral rock or mixed substrata in moderately exposed environments. [No Change]	<b>Station 20</b>	IGS.Mob Sparse fauna in infralittoral mobile clean sand [No Change]

#### 4. DISCUSSION AND CONCLUSIONS

The survey site within the vicinity of the Arklow Bank windfarm consists of a range of sediments, ranging from sands to gravels and this is reflected in the benthic species identified during the survey. The benthic habitats present determine the species of fish which are expected to occur in the area, with certain species of fish typical of these benthic habitats. In gravel to sandy areas (such as those present in the survey area) in depths of <50m, species diversity has been shown to be good with many elasmobranchs, gadoid, wrasse and flatfish species present (Nash, 1990). Overall fish species and abundances are similar to those observed from previous surveys and all species identified during the present survey are considered common in the local area and within the Irish Sea (Ellis *et al.*, 2000).

A total of 185 taxa were identified in the trawls during the present survey. Of these 185 taxa, 16 are fish species with 4 commercially important species identified. Overall, the number of taxa recorded is in keeping with previous surveys; the total number of taxa is higher than the June 2006 (98 taxa), June 2005 (47 taxa) and October 2004 (51 taxa) surveys and is similar to those identified in May 2007 (177 taxa), May 2008 (170 taxa), June 2010 (132 taxa) and June 2011 (186 taxa). Faunal abundances (2,440) are also similar to those recorded in 2011 (2,523) and increased from other years, although numbers are much reduced to the highest numbers recorded in 2007 where a *Sabellaria* reef was surveyed at Trawl 3. Although *Sabellaria alveolata* were recorded at Trawl 3 during the present survey, numbers are much reduced to numbers from 2007.

The current distribution of the biotopes across the survey area remains consistent with previous surveys, including the baseline survey undertaken in 2000. The samples along the extent of the Arklow Bank (D08, D17, D16 and D12) have all been classified as 'Sparse fauna in infralittoral mobile clean sand' (IGS.Mob). Samples along the western edge of the bank (D20, D15, D19 & D03), as well as the southern most site (D13) have also been classified as Sparse fauna in infralittoral mobile clean sand' (IGS.Mob). This conforms with findings from the baseline survey, which identified similar patterns in the distribution of low diversity sites along the extent, and immediately adjacent to the sand bank. All these sites with low species diversity all consisted of clean mobile, sand with a shell gravel element.

The inner situation (D01) has been classified as 'Shallow sand faunal communities' IGS.FaS, which is unchanged from the previous surveys in 2010 and 2011, but had previously been classified as '*Sertularia cupressina* and *Hydrallmania falcata* on tide swept sublittoral cobbles or pebbles in coarse sand' (IGS.FaS.ScupHyd). Station D02 shows the greatest change in faunal composition when compared to previous surveys. No fauna was recorded at the site during the present survey, and as a result it has been classified as 'Sparse fauna in infralittoral mobile clean sand' (IGS.Mob). This station has previously been classified as 'Circalittoral rock or mixed substrata in moderately exposed environments' (MCR) and 'Shallow sand faunal communities' (IGS.FaS).

The western edge of the Arklow Bank consists of several biotopes. Station D09 has been classified as '*Flustra foliacea* on slightly scoured silty circalittoral rock or mixed substrata' (MCR.Flu.Flu), which is consistent with findings at this station since 2007. Station D10 has been classified as 'Circalittoral rock or mixed substrata in moderately exposed environments' (MCR) which is no change from 2011 consistent with findings from 2006 to 2008. In 2009 and 2010 this site was classified as a *Sabellaria* reef.

A single station (D05) has been classified as *Sertularia argentea*, *S. cupressina* and *Hydrallmania falcata* on tide swept circalittoral cobbles and pebbles. This classification, although changed since

2011, was previously identified at this site from 2006 – 2008. A single station (D07) has been classified as Circalittoral rock or mixed substrata in moderately exposed environments' (MCR) which is unchanged from 2011 and years when *Sabellaria* reefs were not identified at this station. A further two stations (D14 and D18) have been classified as '*Flustra* foliacea on slightly scoured silty circalittoral rock or mixed substrata' (MCR.Flu.Flu), which have been identified in these locations in previous reports.

*Sabellaria* reef habitats are listed under Annex I of the EU Habitats Directive (Code 1170: Reefs), playing an important role in stabilising sediments, as well as improving species diversity and community stability (Holt *et al.*, 1998). These reef communities have been identified at three locations during the present survey (Stations D04, D06 and D11). Although reef communities have been identified previously at sites D06 and D11, this is the first record of a *Sabellaria* reef community at site D04, although *Sabellaria alveolata* and *Sabellaria spinulosa* have been identified in low numbers at this site previously. The sporadic nature of reporting highlights the patchy nature of the reefs across the survey area, with reef communities identified at seven distinct sample stations since 2005. The largest number of reef sites identified within the survey area was in 2005, when a total of 5 reef sites were identified; four reef sites were identified in 2010, three reef sites were identified in 2021, 2009 & 2004; two sites in 2006 & 2011; one site in 2007; and no reef sites were identified in 2008.

As with previous surveys in the area, no rare or unusual species have been recorded from the present survey. Although a change is noted in the faunal abundances and diversity at a single station (D02) compared to previous surveys, overall results from the present survey indicate that there is very little variation at the community level across the survey area between the habitats recorded in the present survey and the habitats recorded from the baseline and previous monitoring surveys. The reason for this change at site D02 is unclear, but due to its distance from the wind turbines on the Arklow Bank, the change is not considered to be from windfarm activities.

## 5. REFERENCES

- Baev, P.V. & Penez, L.D. (1995) BIODIV: program for calculating biological diversity parameters, similarity, niche overlap, and cluster analysis. Pensoft, Sofia, Bulgaria, 1995
- Blott, S.J. & Pye, K., 2001. Gradistat: A grain size distribution and statistics package for the analysis of unconsolidated sediments. *Earth Surface Processes and Landforms*, **26**: 1237-1248
- Buchanan, J.D. & Kain, J.M. 1984 Measurement of the physical and chemical environment. In: N. L. Holme & A. D. McIntyre (Eds.), *Methods for the study of marine benthos*. Blackwell Scientific Publications, Oxford: 30–50.
- Clark, K.R. & Warwick, R.M. 1994. *Change in Marine Communities: An Approach to Statistical Analysis and Interpretation*. Natural Environment Research Council and Plymouth Marine Laboratory: 144 pp.
- Connor, D.W., Dalkin, M.J., Hill, T.O., Holt, R.H.F. & Sanderson, W.G. 1997. Marine Nature Conservation Review: marine biotope classification for Britain and Ireland. Volume 2. Sublittoral biotopes. Version 97.06. JNCC Report, No. 230.
- Ecoserve, 2001. A marine ecological study of the Arklow Bank for a proposed offshore wind park development. Chapter 1. Baseline survey. April 2001.
- Ellis, J.R., Rogers, S.I. & Freeman, S.M. 2000 Demersal Assemblages in the Irish Sea, St. Georges Channel and Bristol Channel. *Estuarine, Coastal and Shelf Science*, **51**: 299-315
- Folk, R.L. 1954. The distinction between grain size and mineral composition in sedimentary-rock nomenclature. *Journal of Geology*, **62**, 344-359.
- Holt, T.J., Rees, E.I., Hawkins, S.J., & Seed, R., 1998. Biogenic Reefs (volume IX). An overview of dynamic and sensitivity characteristics for conservation management of marine SACs. Scottish Association for Marine Sciences (UK Marine SACs Project), Oban, Scotland, UK; 170 pages
- Hydroserv. 2004. Arklow Bank Offshore Windfarm Environmental Monitoring Benthic Ecology Survey Report. Spring/Summer 2004. Report to Arklow Energy Ltd.
- Hydroserv. 2005. Arklow Bank Offshore Windfarm Environmental Monitoring Benthic Ecology Survey Report. October 2004. Report to Arklow Energy Ltd.
- Hydroserv. 2006. Arklow Bank Offshore Windfarm Environmental Monitoring Benthic Ecology Survey Report. June 2005. Report to Arklow Energy Ltd.
- ICES 2003. Study Group on Survey Trawl Gear for the IBTS Western and Southern Areas. ICES CM 2003/B:01. 21pp.
- Island Shipping, 2007. Arklow Bank Offshore Windfarm Environmental Monitoring Benthic Ecology Survey Report. June 2006. Report to Arklow Energy Ltd.
- Island Shipping, 2008. Arklow Bank Offshore Windfarm Environmental Monitoring Benthic Ecology Survey Report. May 2007. Report to Arklow Energy Ltd.
- Island Shipping, 2009. Arklow Bank Offshore Windfarm Environmental Monitoring Benthic Ecology Survey Report. May 2008. Report to Arklow Energy Ltd.
- Island Shipping, 2010. Arklow Bank Offshore Windfarm Environmental Monitoring Benthic Ecology Survey Report. June 2009. Report to Arklow Energy Ltd.
- Island Shipping, 2011. Arklow Bank Offshore Windfarm Environmental Monitoring Benthic Ecology Survey Report. June 2010. Report to Arklow Energy Ltd.
- Island Shipping, 2012. Arklow Bank Offshore Windfarm Environmental Monitoring Benthic Ecology Survey Report. June 2011. Report to Arklow Energy Ltd.
- Nash, R.D.M. 1990 Fish assemblages in the Irish Sea in *the Irish Sea, An Environmental Review. Part One: Nature Conservation*. Liverpool University Press.

## 6. APPENDICES

### Appendix 6.1 Species List for Beam Trawl Survey; September 2021

ANIMALIA	<i>Thelepus cincinnatus</i>	<i>Schistomysis kervillei</i>
PORIFERA	<i>Thelepus setosus</i>	<i>Hippolyte varians</i>
Cliona	Sabellidae	<i>Eualus pusiolus</i>
CNIDARIA	<i>Jasmineira</i>	<i>Crangon allmanni</i>
ACTINIARIA	<i>Sabella pavonina</i>	<i>Philocheras trispinosus</i>
<i>Alcyonium digitatum</i>	Serpulidae	<i>Pandalina brevirostris</i>
ANTHOATHECATA	Spirorbinae	<i>Pandalus montagui</i>
<i>Hydractiniidae</i>	<i>Hydroides norvegica</i>	<i>Pisidia longicornis</i>
LEPTOTHECATA	<i>Spirobranchus lamarcki</i>	<i>Pagurus bernhardus</i>
<i>Campanulariidae</i>	<i>Sabellaria alveolata</i>	<i>Macropodia rostrata</i>
<i>Calycella</i>	<i>Sabellaria spinulosa</i>	<i>Hyas coarctatus</i>
<i>Halecium</i>	CHELICERATA	<i>Pilumnus hirtellus</i>
<i>Nemertesia</i>	<i>Achelia echinata</i> agg.	<i>Liocarcinus corrugatus</i>
<i>Sertulariidae</i>	Nymphon	<i>Liocarcinus holsatus</i>
<i>Hydrallmania falcata</i>	<i>Anoplodactylus petiolatus</i>	<i>Necora puber</i>
PLATYHELMINTHES	<i>Anoplodactylus pygmaeus</i>	<i>Monodaeus couchii</i>
NEMERTEA	CRUSTACEA	<i>Acanthochitona</i>
NEMATODA	COPEPODA	<i>Leptochiton</i>
ENTOPROCTA	<i>Sacculina</i>	AEOLIDIOIDEA
<i>Barentsia</i>	<i>Scalpellum scalpellum</i>	<i>Doto</i>
<i>Pedicellina</i>	<i>Balanus balanus</i>	<i>Onchidorididae</i>
<i>Golfingia elongata</i>	<i>Balanus crenatus</i>	MOLLUSCA
ANNELIDA	<i>Verruca stroemia</i>	<i>Acanthodoris pilosa</i>
<i>Pholoe inornata</i>	AMPHIPODA	<i>Lacuna crassior</i>
<i>Polynoidae</i>	<i>Stenothoe marina</i>	<i>Buccinum undatum</i>
<i>Adyte hyalina</i>	<i>Epimeria (Epimeria)</i>	<i>Calliostoma zizyphinum</i>
<i>Alentia gelatinosa</i>	<i>cornigera</i>	<i>Hiatella arctica</i>
<i>Gattyana cirrhosa</i>	<i>Iphimedia obesa</i>	<i>Abra alba</i>
<i>Harmothoe</i>	<i>Nototropis swammerdamei</i>	<i>Mytilidae Juvenile</i>
<i>Harmothoe clavigera</i>	<i>Ampelisca spinipes</i>	<i>Modiolus modiolus</i>
<i>Harmothoe impar</i>	<i>Abludomelita obtusata</i>	<i>Musculus subpictus</i>
<i>Lepidonotus squamatus</i>	Aoridae	<i>Mytilus edulis</i> agg.
<i>Glycera lapidum</i>	<i>Aora typica</i>	Anomiidae
<i>Nereis</i>	<i>Unciola crenatipalma</i>	<i>Heteranomia squamula</i>
<i>Nereis zonata</i>	Corophiidae	<i>Aequipecten opercularis</i>
<i>Eusyllis blomstrandii</i>	<i>Gammaropsis maculata</i>	<i>Spisula elliptica</i>
<i>Myrianida</i>	<i>Gammaropsis nitida</i>	<i>Sepiola atlantica</i>
<i>Syllis variegata</i>	Caprellidae	<i>Eledone cirrhosa</i>
<i>Syllis armillaris</i> agg.	<i>Pariambus typicus</i>	BRYOZOA
<i>Eulalia bilineata</i>	<i>Pseudoprotella phasma</i>	<i>Aetea</i>
<i>Eulalia ornata</i>	<i>Astacilla longicornis</i>	<i>Hippoporina</i>
<i>Notomastus</i>	<i>Gnathia dentata</i>	<i>Schizomavella</i>
<i>Dipolydora coeca</i> agg.	<i>Janira maculosa</i>	<i>Bugulidae</i>
<i>Ampharetidae</i>	<i>Mysidae</i>	<i>Bicellariella ciliata</i>
<i>Thelepus</i>	<i>Gastrosaccus spinifer</i>	<i>Callopora discreta</i>

<i>Callopora lineata</i>	<i>Hyperplus lanceolatus</i>
<i>Cradoscrupocellaria reptans</i>	<i>Calionymus lyra</i>
<i>Scrupocellaria scruposa</i>	<i>Pleuronectes platessa</i>
<i>Cellaria</i>	<i>Phoils gunnellus</i>
<i>Celleporina caliciformis</i>	<i>Goby</i> indet
<i>Turbicellepora avicularis</i>	<i>Sciliorhynchus canicula</i>
<i>Chorizopora brongniartii</i>	<i>Limanda limanda</i>
<i>Conopeum reticulatum</i>	<i>Gaidropsarus vulgaris</i>
<i>Electra pilosa</i>	<i>Trispoterus minutus</i>
<i>Eucratea loricatea</i>	<i>Merlangius merlangus</i>
<i>Fenestrulina delicia</i>	<i>Liparis liparis</i>
<i>Chartella papyracea</i>	<i>Blenny</i> indet
<i>Flustra foliacea</i>	<i>Eutriglia gurnardus</i>
<i>Haplopoma impressum</i>	
<i>Celleporella hyalina</i>	
<i>Scruparia</i>	
<i>Alcyonidioides mytili</i>	
<i>Alcyonidium diaphanum</i>	
<i>Alcyonidium parasiticum</i>	
<i>Amathia</i>	
<i>Amathia lendigera</i>	
<i>Vesicularia spinosa</i>	
<i>Walkeria uva</i>	
<i>Crisia</i>	
<i>Microeciella suborbicularis</i>	
<i>Tubulipora liliacea</i>	
<b>ECHINODERMATA</b>	
<i>Asterias rubens</i>	
<b>CRINOIDEA</b>	
<i>Psammechinus miliaris</i>	
<i>Amphipholis squamata</i>	
<i>Ophiothrix fragilis</i>	
<i>Ophiura albida</i>	
<i>Crassoster papposus</i>	
<b>TUNICATA</b>	
ASCIDIACEA Type1	
ASCIDIACEA Type2	
<i>Didemnidae</i>	
<i>Asciella</i>	
<i>Polycarpa fibrosa</i>	
<b>CHLOROPHYTA</b>	
<b>RHODOPHYTA</b>	
<i>Ceramium</i>	
<b>CILIOPHORA</b>	
<i>Folliculinidae</i>	
<b>OCHROPHYTA</b>	
<b>PISCES</b>	
<i>Agonus cataphractus</i>	
<i>Ammodytes</i> sp.	

## Appendix 6.2 Species List for Anchor Dredge Survey; September 2021

## ANIMALIA

## PORIFERA

*Cliona*

## CNIDARIA

## ACTINIARIA

*Edwardsia claparedii**Halcampa**Alcyonium digitatum*

## ANTHOATHECATA

*Campanulariidae**Plumulariidae**Nemertesia**Sertulariidae**Hydrallmania falcata*

## NEMERTEA

## NEMATODA

## ENTOPROCTA

*Barentsia**Pedicellina*

## SIPUNCULA

*Golfingiidae**Golfingia elongata**Golfingia vulgaris vulgaris*

## ANNELIDA

*Pholoe baltica**Pholoe inornata**Adyte hyalina**Alentia gelatinosa**Gattyana cirrhosa**Harmothoe**Lepidonotus squamatus**Malmgrenia**Polynoe scolopendrina**Sthenelais boa**Glycera**Glycera lapidum**Glycera oxycephala**Glycera tridactyla**Glycinde nordmanni**Nereimyra punctata**Eunereis longissima**Nereis**Nereis zonata**Syllidae**Autolytinae**Eusyllis blomstrandii**Odontosyllis fulgurans**Paraehlersia ferrugina**Syllis variegata**Syllis armillaris* agg.*Eteone**Eulalia**Eulalia bilineata**Eulalia ornata**Eumida**Nephtys**Nephtys assimilis**Nephtys caeca**Nephtys cirrosa**Schistomeringos rudolphi**Lysidice unicornis**Paucibranchia bellii**Lumbrineris aniara* agg.*Notocirrus scoticus**Capitellidae**Mediomastus fragilis**Notomastus**Euclymeninae**Euclymene lombricoides**Euclymene oerstedii* agg.*Leiochone**Praxillella affinis**Praxillura longissima**Nicomache**Notoproctus**Ophelina acuminata**Orbiniidae**Scoloplos armiger**Aricidea (Acmira)**catherinae**Asclerocheilus**Scalibregma celticum**Scalibregma inflatum**Poecilochaetus serpens**Spionidae**Dipolydora caulleryi* agg.*Dipolydora coeca* agg.*Laonice**Scolecopsis**Spio**Spiophanes bombyx**Aphelocheata**Caulleriella alata**Chaetozone zetlandica**Dodecaceria**Tharyx killariensis**Ampharetidae**Ampharete lindstroemi* agg.*Ampharete octocirrata**Ampharete oculicirrata**Anobothrus gracilis**Melinna elisabethae**Lagis koreni**Polycirrus**Janice conchilega**Thelepus**Thelepus cincinnatus**Thelepus setosus**Terebellides**Sabellidae**Jasmineira**Jasmineira elegans**Parasabella cambrensis**Sabella pavonina**Serpulidae**Spirorbinae**Hydroides norvegica**Spirobranchus lamarcki**Galathowenia**Owenia**Sabellaria alveolata**Sabellaria spinulosa**Chaetopteridae*

## CHELICERATA

*Achelia echinata* agg.*Callipallene**Anoplodactylus petiolatus*

## CRUSTACEA

## MYODOCOPIDA

## COPEPODA

*Balanus balanus**Balanus crenatus**Verruca stroemia**Parapleustes bicuspis**Iphimedia obesa**Liljeborgia**Nototropis**swammerdamei*

<i>Ampelisca brevicornis</i>	<i>Calliostoma</i>	<i>Fenestulina delicia</i>
<i>Ampelisca spinipes</i>	<i>Steromphala tumida</i>	<i>Flustra foliacea</i>
<i>Urothoe elegans</i>	<i>Hiatella arctica</i>	<i>Haplopoma impressum</i>
<i>Socarnes</i>	<i>Ensis</i>	<i>Celleporella hyalina</i>
<i>erythrophthalmus</i>	<i>Phaxas pellucidus</i>	<i>Microporella ciliata</i>
<i>Bathyporeia elegans</i>	<i>Abra alba</i>	<i>Escharella immersa</i>
<i>Bathyporeia tenuipes</i>	<i>Astarte sulcata</i>	<i>Escharella ventricosa</i>
<i>Gammarellus angulosus</i>	<i>Hemilepton nitidum</i>	<i>Scruparia</i>
<i>Cheirocratus</i>	<i>Sphenia binghami</i>	<i>Alcyonidioides mytili</i>
<i>Othomaera othonis</i>	<i>Mytilidae</i>	<i>Alcyonidium parasiticum</i>
<i>Abludomelita obtusata</i>	<i>Modiolus modiolus</i>	<i>Penetrantia</i>
<i>Aoridae</i>	<i>Musculus discors</i>	<i>Amathia lendigera</i>
<i>Unciola crenatipalma</i>	<i>Musculus subpictus</i>	<i>Vesicularia spinosa</i>
<i>Corophiidae</i>	<i>Mytilus edulis agg.</i>	<i>Crisia</i>
<i>Gammaropsis maculata</i>	<i>Nucula nucleus</i>	<i>Microeciella suborbicularis</i>
<i>Gammaropsis nitida</i>	<i>Anomiidae</i>	<i>Tubulipora liliacea</i>
<i>Photis longicaudata</i>	<i>Heteranomia squamula</i>	<b>PHORONIDA</b>
<i>Pariambus typicus</i>	<i>Aequipecten opercularis</i>	<i>Phoronis</i>
<i>Pseudoprotella phasma</i>	<i>Mimachlamys varia</i>	<b>ECHINODERMATA</b>
<b>ISOPODA</b>	<i>Talochlamys pusio</i>	<i>Antedon bifida</i>
<i>Anthura gracilis</i>	<i>Spisula elliptica</i>	<i>Psammechinus miliaris</i>
<i>Janira maculosa</i>	<i>Timoclea ovata</i>	<i>Echinocyamus pusillus</i>
<i>Gastrosaccus spinifer</i>	<i>Venerupis corrugata</i>	<i>Thyonidium drummondii</i>
<i>Gastrosaccus spinifer</i>	<b>BRYOZOA</b>	<i>Acrocnida brachiata</i>
<i>Eualus pusiulus</i>	<i>Aetea</i>	<i>Amphipholis squamata</i>
<i>Pandalus montagui</i>	<i>Schizomavella</i>	<i>Amphiura filiformis</i>
<i>Pisidia longicornis</i>	<i>Bugulidae</i>	<i>Ophiothrix fragilis</i>
<i>Pagurus bernhardus</i>	<i>Bicelliariella ciliata</i>	<b>TUNICATA</b>
<i>Eurynome</i>	<i>Amphiblestrum auritum</i>	<b>ASCIDIACEA</b>
<i>Hyas coarctatus</i>	<i>Cradoscrupocellaria</i>	<i>Didemnidae</i>
<i>Pilumnus hirtellus</i>	<i>reptans</i>	<i>Asciella</i>
<i>Liocarcinus</i>	<i>Scrupocellaria scruposa</i>	<i>Pyura</i>
<b>MOLLUSCA</b>	<i>Cellepora pumicosa</i>	<i>Dendrodoa grossularia</i>
<i>Acanthochitona crinita</i>	<i>Celleporina caliciformis</i>	<i>Polycarpa fibrosa</i>
<i>Leptochiton asellus</i>	<i>Turbicellepora avicularis</i>	<b>CILIOPHORA</b>
<i>Doto</i>	<i>Conopeum reticulum</i>	<i>Folliculinidae</i>
<i>Goniodorididae</i>	<i>Electra monostachys</i>	<b>PISCES</b>
<i>Onchidorididae</i>	<i>Electra pilosa</i>	<i>Ammodytes sp.</i>
<i>Boreotrophon truncatus</i>	<i>Eucretea loricata</i>	

**Appendix 6.3** Total results from the Beam Trawl September 2021*Trawl Description*

	Trawl 1	Trawl 2	Trawl 3	Trawl 4	Trawl 5	Trawl 6
<b>Description</b>	Good Trawl Sample, contains Bryozoans & Starfish	Good Trawl with shell gravel and occasional bryozoans	Good Trawl Sample with Sabellaria and Echinoderms	Good Trawl Sample contains large amounts of shell and shell gravel	Good Trawl Sample, contains Bryozoans & Starfish	Good Trawl Sample with shell & occasional bryozoansl
<b>Date of hauling</b>	10/09/2021	10/09/2021	09/09/2021	09/09/2021	09/09/2021	09/09/2021
<b>Time of hauling</b>	1220	1135	1816	1716	1342	1242
<b>Layback/warp (m)</b>	100	120	80	120	120	120
<b>Speed of Vessel (kts)</b>	3.3	1.6	1.8	2.1	1.6	2.7
<b>Vessel Bearing</b>	0°	180°	0°	0°	0°	180°

*Species Abundance Matrix, Beam Trawl Survey (September 2021)*

	Trawl1	Trawl2	Trawl3	Trawl4	Trawl5	Trawl6
<i>ANIMALIA</i> (eggs)	P	-	-	-	P	-
<i>PORIFERA</i>	P	P	-	-	-	P
<i>Cliona</i>	-	-	-	P	-	-
<i>ACTINIARIA</i>	1	-	2	-	-	-
<i>Alcyonium digitatum</i>	-	-	-	-	P	-
<i>ANTHOATHECATA</i>	P	P	-	-	P	-
<i>Hydractiniidae</i>	P	P	P	-	P	-
<i>LEPTOTHECATA</i>	-	P	-	-	-	-
<i>Campanulariidae</i>	P	P	P	P	P	-
<i>Calycella</i>	P	-	-	-	P	-
<i>Halecium</i>	P	P	-	-	-	-
<i>Nemertesia</i>	P	-	P	-	P	P
<i>Sertulariidae</i>	P	P	P	P	P	P
<i>Hydrallmania falcata</i>	P	P	P	P	P	P
<i>PLATYHELMINTHES</i>	90	-	-	-	-	-
<i>NEMERTEA</i>	2	-	-	-	2	1
<i>NEMATODA</i>	1	-	-	-	-	-
<i>Barentsia</i>	P	-	-	-	P	-
<i>Pedicellina</i>	P	-	-	P	-	-
<i>Golfingia (Golfingia) elongata</i>	-	-	-	-	1	-
<i>Pholoe inornata</i>	-	-	-	2	-	-
<i>Polynoidae</i>	-	-	-	2	-	-
<i>Adyte hyalina</i>	-	-	-	-	2	-
<i>Alentia gelatinosa</i>	-	-	-	1	-	-
<i>Gattyana cirrhosa</i>	-	-	-	-	1	-
<i>Harmothoe</i>	4	1	-	-	6	-
<i>Harmothoe clavigera</i>	-	-	-	-	3	-
<i>Harmothoe impar</i>	-	-	1	-	-	-
<i>Lepidonotus squamatus</i>	1	-	-	1	4	-
<i>Glycera lapidum</i>	-	-	-	-	1	-
<i>Nereis</i>	1	-	-	-	1	-
<i>Nereis zonata</i>	-	-	-	3	-	-
<i>Eusyllis blomstrandii</i>	-	1	1	-	1	1

	Trawl1	Trawl2	Trawl3	Trawl4	Trawl5	Trawl6
<i>Myrianida</i>	2	-	-	-	3	2
<i>Syllis variegata</i>	2	-	-	3	3	-
<i>Syllis armillaris</i> agg.	-	-	-	3	1	-
<i>Eulalia bilineata</i>	-	-	-	-	1	-
<i>Eulalia ornata</i>	-	-	2	-	-	-
<i>Notomastus</i>	-	-	1	-	-	-
<i>Dipolydora coeca</i> agg.	2	-	-	3	3	-
Ampharetidae	-	-	-	1	-	-
<i>Thelepus</i>	5	-	-	1	-	3
<i>Thelepus cincinnatus</i>	2	-	-	1	16	-
<i>Thelepus setosus</i>	-	-	-	2	-	-
Sabellidae	-	-	-	2	-	-
<i>Jasmineira</i>	2	-	3	-	4	-
<i>Sabella pavonina</i>	6	-	-	-	3	-
Serpulidae	2	-	-	-	-	-
Spirorbinae	P	P	P	-	-	-
<i>Hydroides norvegica</i>	1	-	-	-	1	-
<i>Spirobranchus lamarcki</i>	2	-	3	3	2	-
<i>Sabellaria alveolata</i>	-	-	204	17	3	-
<i>Sabellaria spinulosa</i>	8	-	-	-	65	-
<i>Achelia echinata</i> agg.	12	-	2	-	8	2
Nymphon	6	-	-	-	3	-
<i>Anoplodactylus petiolatus</i>	-	-	-	1	1	-
<i>Anoplodactylus pygmaeus</i>	6	-	-	-	-	-
COPEPODA	1	-	-	-	-	-
<i>Sacculina</i>	-	-	-	-	2	-
<i>Scalpellum scalpellum</i>	2	-	-	-	-	1
<i>Balanus balanus</i>	1	-	-	-	-	-
<i>Balanus crenatus</i>	21	3	11	120	19	-
<i>Verruca stroemia</i>	1	-	1	2	1	-
AMPHIPODA	-	-	-	-	-	1
<i>Stenothoe marina</i>	1	-	-	-	-	-
<i>Epimeria (Epimeria) cornigera</i>	-	-	-	-	70	2
<i>Iphimedia obesa</i>	1	-	-	-	-	-
<i>Nototropis swammerdamei</i>	-	1	-	-	-	-
<i>Ampelisca spinipes</i>	-	-	-	-	3	-
<i>Abludomelita obtusata</i>	3	-	-	-	1	-
Aoridae	-	-	-	-	1	-
<i>Aora typica</i>	10	-	-	-	-	-
<i>Unciola crenatipalma</i>	-	-	-	2	-	-
Corophiidae	1	-	-	-	-	-
<i>Gammaropsis maculata</i>	-	-	1	-	1	-
<i>Gammaropsis nitida</i>	1	2	-	-	-	-
Caprellidae	4	-	-	-	-	-
<i>Pariambus typicus</i>	1	-	-	-	2	1
<i>Pseudoprotella phasma</i>	4	-	2	1	-	-
<i>Astacilla longicornis</i>	1	-	-	-	1	-
<i>Gnathia dentata</i>	-	-	1	-	-	-
<i>Janira maculosa</i>	-	-	-	1	-	-
Mysidae	3	-	-	-	-	-
<i>Gastrosaccus spinifer</i>	1	-	-	-	-	1
<i>Schistomysis kervillei</i>	-	-	-	-	1	-
<i>Hippolyte varians</i>	2	-	-	-	9	-

	Trawl1	Trawl2	Trawl3	Trawl4	Trawl5	Trawl6
<i>Eualus pusiolus</i>	-	-	-	-	3	-
<i>Crangon allmanni</i>	21	61	5	-	242	10
<i>Philocheirus trispinosus</i>	3	12	-	-	-	-
<i>Pandalina brevirostris</i>	-	-	-	-	10	-
<i>Pandalus montagui</i>	52	14	39	12	371	14
<i>Pisidia longicornis</i>	1	1	3	3	4	-
<i>Pagurus bernhardus</i>	4	7	9	1	-	-
<i>Macropodia rostrata</i>	8	-	-	-	18	-
<i>Hyas coarctatus</i>	8	-	-	-	5	1
<i>Pilumnus hirtellus</i>	1	-	-	1	-	-
<i>Liocarcinus corrugatus</i>	-	-	-	1	1	-
<i>Liocarcinus holsatus</i>	6	30	2	7	62	-
<i>Necora puber</i>	-	-	-	-	1	-
<i>Monodaeus couchii</i>	-	-	-	-	1	-
<i>Acanthochitona</i>	-	-	-	-	1	-
<i>Leptochiton</i>	-	-	-	-	1	-
AEOLIDIOIDEA	5	-	-	-	-	-
<i>Doto</i>	-	-	-	-	10	-
<i>Onchidorididae</i>	-	-	-	-	1	-
<i>Acanthodoris pilosa</i>	19	-	-	-	-	-
<i>Lacuna crassior</i>	2	-	-	-	-	-
<i>Buccinum undatum</i>	-	-	1	-	1	-
<i>Calliostoma zizyphinum</i>	-	-	1	-	2	-
<i>Hiatella arctica</i>	1	-	1	8	2	-
<i>Abra alba</i>	-	-	-	-	1	-
<i>Mytilidae Juvenile</i>	11	-	-	3	4	13
<i>Modiolus modiolus</i>	5	-	1	15	1	1
<i>Musculus subpictus</i>	2	-	1	-	1	-
<i>Mytilus edulis agg.</i>	2	-	-	10	-	-
<i>Anomiidae</i>	2	-	2	18	2	2
<i>Heteranomia squamula</i>	-	-	-	-	3	-
<i>Aequipecten opercularis</i>	4	2	5	5	31	2
<i>Spisula elliptica</i>	-	1	-	-	-	1
<i>Sepiolo atlantica</i>	3	-	-	-	-	1
<i>Octopus vulgaris</i>	1	-	-	-	-	-
<i>Aetea</i>	P	P	-	-	-	-
<i>Hippoporina</i>	-	-	-	-	P	-
<i>Schizomavella</i>	-	-	-	-	P	-
<i>Bugulidae</i>	P	P	P	P	P	-
<i>Bicelliella ciliata</i>	P	P	P	P	P	P
<i>Callopora discreta</i>	-	-	P	-	-	-
<i>Callopora lineata</i>	-	-	P	-	-	-
<i>Cradoscrupocellaria reptans</i>	P	-	-	-	-	-
<i>Scrupocellaria scruposa</i>	P	P	P	P	P	P
<i>Cellaria</i>	P	-	-	-	-	-
<i>Celleporina caliciformis</i>	-	-	P	-	-	-
<i>Turbicellepora avicularis</i>	P	P	-	-	P	-
<i>Chorizopora brongniartii</i>	-	-	-	-	P	-
<i>Conopeum reticulum</i>	P	-	P	P	-	-
<i>Electra pilosa</i>	P	P	P	P	P	P
<i>Eucratea loricata</i>	P	P	-	-	P	P
<i>Fenestrulina delicia</i>	-	-	-	-	P	-
<i>Chartella papyracea</i>	P	-	-	-	-	-

	Trawl1	Trawl2	Trawl3	Trawl4	Trawl5	Trawl6
<i>Flustra foliacea</i>	P	P	P	P	P	P
<i>Haplopoma impressum</i>	-	-	P	-	-	-
<i>Celleporella hyalina</i>	P	-	-	-	P	-
<i>Scruparia</i>	P	-	-	-	-	-
<i>Alcyonidioides mytili</i>	P	-	P	P	P	-
<i>Alcyonidium diaphanum</i>	P	P	P	P	P	-
<i>Alcyonidium parasiticum</i>	P	P	-	-	P	P
<i>Amathia</i>	P	-	-	-	-	-
<i>Amathia lendigera</i>	P	P	-	-	-	-
<i>Vesicularia spinosa</i>	P	P	P	P	P	P
<i>Walkeria uva</i>	P	-	-	-	-	-
<i>Crisia</i>	P	P	P	-	P	P
<i>Microeciella suborbicularis</i>	-	-	-	P	-	-
<i>Tubulipora liliacea</i>	-	P	P	-	-	-
<i>Asterias rubens</i>	13	-	4	-	20	-
CRINOIDEA	-	-	P	-	-	-
<i>Psammechinus miliaris</i>	1	-	1	7	15	-
<i>Amphipholis squamata</i>	1	-	-	6	2	-
<i>Ophiothrix fragilis</i>	-	-	-	1	1	-
<i>Ophiura albida</i>	-	-	-	-	3	-
<i>Crassoster papposus</i>	1	-	-	-	10	-
ACTINOPTERYGII	-	-	-	-	-	1
Triglidae	-	1	-	-	-	-
ASCIDIACEA Type1	5	-	1	-	2	1
ASCIDIACEA Type2	P	-	P	P	-	-
Didemnidae	P	-	-	P	-	-
Asciadiella	59	-	7	1	1	-
<i>Polycarpa fibrosa</i>	28	1	4	2	4	-
CHLOROPHYTA	-	-	-	P	-	-
<i>Ceramium</i>	P	-	P	-	-	-
Folliculinidae	P	P	-	P	P	-
OCHROPHYTA	-	-	P	-	-	-
<i>Agonus cataphractus</i>	2	-	-	-	4	-
<i>Ammodytes marinus</i>	1	3	-	-	2	7
<i>Hyperplus lanceolatus</i>	1	-	-	-	-	-
<i>Calionymus lyra</i>	1	-	-	-	-	-
<i>Pleuronectes platessa</i>	1	-	-	-	-	-
<i>Phoils gunnellus</i>	8	-	-	-	-	-
<i>Goby indet</i>	1	-	-	-	-	1
<i>Sciliorhynchus canicula (eggs)</i>	3	-	-	-	-	-
<i>Sciliorhynchus canicula</i>	-	-	-	-	1	2
<i>Limanda limanda</i>	1	1	-	-	3	-
<i>Gaidropsarus vulgaris</i>	-	1	-	-	-	-
<i>Trisopterus minutus</i>	-	-	-	-	10	3
<i>Merlangius merlangus</i>	-	-	-	-	1	11
<i>Liparis liparis</i>	-	-	-	-	3	-
<i>Blenny Indet</i>	-	-	-	-	1	-
<i>Eutriglia gurnardus</i>	-	-	-	-	1	-

**Appendix 6.4** Total fish numbers and lengths

	Trawl 1	Trawl 2	Trawl 3	Trawl 4	Trawl 5	Trawl 6
<i>Callionymus lyra</i> (Dragonet)	1 [116]					
<i>Pleuronectes platessa</i> (Plaice)	1 [210]					
<i>Agonus cataphractus</i> (Pogge)					4 [46, 50, 40, 50]	
<i>Pholis gunnellus</i> (Butterfish)	8 [70, 70 ,70 ,70 ,70, 70 ,70 70]					
<i>Ammodytes marinus</i> (Lesser Sandeel)		3 [64, 55, 58]			2 [58, 57]	7 [62, 58, 60, 58, 60, 61, 65]
<i>Hyperoplus lanceolatus</i> (Greater Sandeel)	1 [182]					
<i>Merlangius merlangius</i> (Whiting)					1 [96]	11 [165, 114, 100, 99, 110, 87, 134, 150, 97, 75, 95]
<i>Scyliorhinus caniculus</i> (Lesser Spotted Dogfish)	3 [All Egg Cases with live embryos]				1 [590]	2 [560, 500]
<i>Trisopterus minutus</i> (Poor Cod)	2 [96, 78]				10 [130, 137, 92, 95, 114, 114, 105, 116, 102, 80]	3 [99, 121, 116]
<i>Gaidropsarus vulgaris</i> (3 Bearded Rockling)		1 [70]				
<i>Limanda limanda</i> (Dab)	1 [x]	1 [60]			3 [45, 45, 65]	
<i>Eutriglia gurnardus</i> (Grey Gurnard)		1 [x]			1 [67]	
<i>Liparis liparis</i> (Seasnail)					3 [36, 34, 35]	
Goby Indet.	1 [36]					1 [21]
Blenny Indet					1 [23]	

[Measurements in mm (where possible) of all fish species; September 2021]. [x]– Denotes where no measurements were taken.

**Appendix 6.5** Species Abundance Matrix - Anchor Dredge Survey, September 2021

		D01	D02	D03	D04	D05	D06	D07	D08	D09	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20
ANIMALIA	ANIMALIA	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PORIFERA	PORIFERA	-	-	-	P	P	P	-	-	-	P	-	-	-	-	-	-	-	-	-	-
PORIFERA	<i>Cliona</i>	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-
CNIDARIA	ACTINIARIA	1	-	-	-	1	3	1	-	2	4	-	-	-	1	-	-	-	-	-	-
CNIDARIA	<i>Edwardsia claparedii</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-
CNIDARIA	<i>Halcampa</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-
CNIDARIA	<i>Alcyonium digitatum</i>	P	-	-	P	-	-	-	-	P	P	-	-	-	P	-	-	-	-	-	-
CNIDARIA	ANTHOATHECATA	P	-	-	P	P	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-
CNIDARIA	<i>Campanulariidae</i>	-	-	-	P	P	-	P	-	P	P	-	-	-	-	-	-	-	-	-	-
CNIDARIA	<i>Plumulariidae</i>	-	-	-	P	P	-	-	-	P	P	-	-	-	-	-	-	-	-	-	-
CNIDARIA	<i>Nemertesia</i>	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CNIDARIA	<i>Sertulariidae</i>	-	-	-	-	P	-	P	-	P	P	-	-	-	P	-	-	-	P	-	-
CNIDARIA	<i>Hydrallmania falcata</i>	-	-	-	P	P	P	-	-	P	P	P	-	-	P	P	-	-	P	-	-
NEMERTEA	NEMERTEA	3	-	-	-	-	1	1	-	8	1	1	-	-	1	1	-	-	3	-	-
NEMATODA	NEMATODA	-	-	-	2	-	2	-	-	2	2	2	-	-	-	-	-	-	-	-	-
ENTOPROCTA	<i>Barentsia</i>	-	-	-	-	P	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-
ENTOPROCTA	<i>Pedicellina</i>	-	-	-	-	-	-	-	-	-	P	P	-	-	-	-	-	-	-	-	-
SIPUNCULA	<i>Golfingiidae</i>	-	-	-	-	4	-	19	-	11	2	-	-	-	-	-	-	-	-	-	-
SIPUNCULA	<i>Golfingia elongata</i>	2	-	-	1	-	3	-	1	-	-	1	-	-	-	-	-	-	-	-	-
SIPUNCULA	<i>Golfingia vulgaris</i>	-	-	-	2	-	4	-	-	3	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Pholoe baltica</i>	-	-	-	-	-	-	-	-	1	-	-	-	-	2	-	-	-	-	-	-
ANNELIDA	<i>Pholoe inornata</i>	-	-	-	1	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Adyte hyalina</i>	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Alentia gelatinosa</i>	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Gattyana cirrhosa</i>	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Harmothoe</i>	-	-	-	7	1	8	-	-	3	1	7	-	-	2	-	-	-	-	-	-
ANNELIDA	<i>Lepidonotus squamatus</i>	-	-	-	3	3	6	4	1	7	-	1	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Malmgrenia</i>	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Polynoe scolopendrina</i>	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Sthenelais boa</i>	1	-	-	-	-	-	-	-	-	2	-	-	-	2	-	-	-	3	-	-
ANNELIDA	<i>Glycera</i>	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Glycera lapidum</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-
ANNELIDA	<i>Glycera oxycephala</i>	-	-	2	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	2
ANNELIDA	<i>Glycera tridactyla</i>	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
ANNELIDA	<i>Glycinde nordmanni</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-

		D01	D02	D03	D04	D05	D06	D07	D08	D09	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20
ANNELIDA	<i>Nereimyra punctata</i>	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Eunereis longissima</i>	1	-	-	1	-	1	-	-	-	2	2	-	-	2	-	-	-	-	-	-
ANNELIDA	<i>Nereis</i>	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Nereis zonata</i>	-	-	-	-	-	1	-	-	-	-	2	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Syllidae</i>	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Autolytinae</i>	-	-	-	-	1	-	3	-	1	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Eusyllis blomstrandii</i>	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Odontosyllis fulgurans</i>	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-
ANNELIDA	<i>Paraehlersia ferrugina</i>	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Syllis variegata</i>	-	-	-	9	2	4	7	-	4	1	1	-	-	-	-	-	-	-	2	-
ANNELIDA	<i>Syllis armillaris</i>	-	-	-	2	10	1	19	-	12	-	-	-	-	-	1	-	-	-	-	-
ANNELIDA	<i>Eteone</i>	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Eulalia</i>	1	-	-	3	-	2	-	-	-	-	2	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Eulalia bilineata</i>	-	-	-	-	1	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Eulalia ornata</i>	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Eumida</i>	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Nephtys</i>	1	-	-	1	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-
ANNELIDA	<i>Nephtys assimilis</i>	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Nephtys caeca</i>	1	-	-	-	-	1	-	-	-	6	-	-	-	3	-	-	-	-	3	-
ANNELIDA	<i>Nephtys cirrosa</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
ANNELIDA	<i>Schistomeringos rudolphi</i>	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-
ANNELIDA	<i>Lysidice unicornis</i>	-	-	-	-	-	-	-	-	-	1	-	-	-	9	-	-	-	-	-	-
ANNELIDA	<i>Paucibranchia bellii</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
ANNELIDA	<i>Lumbrineris aniara</i>	4	-	-	-	-	2	-	-	2	5	3	-	-	13	5	1	-	3	-	-
ANNELIDA	<i>Notocirrus scoticus</i>	2	-	-	-	-	-	-	-	-	1	-	-	-	6	-	-	-	-	3	-
ANNELIDA	<i>Capitellidae</i>	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Mediomastus fragilis</i>	3	-	-	-	-	-	-	-	-	2	-	-	-	1	-	-	-	-	-	-
ANNELIDA	<i>Notomastus</i>	2	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Euclymeninae</i>	4	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	7	-
ANNELIDA	<i>Euclymene lombricoides</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
ANNELIDA	<i>Euclymene oerstedii</i>	4	-	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-	-	-	-
ANNELIDA	<i>Leiochone</i>	3	-	-	1	1	-	-	-	4	2	1	-	-	13	-	-	-	-	39	-
ANNELIDA	<i>Praxillella affinis</i>	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	4	-
ANNELIDA	<i>Praxillura longissima</i>	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-
ANNELIDA	<i>Nicomache</i>	-	-	-	-	-	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Notoproctus</i>	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Ophelina acuminata</i>	-	-	-	-	-	1	-	-	-	1	-	-	-	2	-	-	-	-	1	-
ANNELIDA	<i>Orbiniidae</i>	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-

		D01	D02	D03	D04	D05	D06	D07	D08	D09	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20
ANNELIDA	<i>Scoloplos armiger</i>	33	-	-	-	-	-	-	-	-	20	1	-	-	18	-	-	-	3	-	-
ANNELIDA	<i>Aricidea catherinae</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
ANNELIDA	<i>Asclerocheilus</i>	-	-	-	-	1	-	2	1	1	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Scalibregma celticum</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	1	-	-
ANNELIDA	<i>Scalibregma inflatum</i>	1	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Poecilochaetus serpens</i>	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Spionidae</i>	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Dipolydora caulleryi</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
ANNELIDA	<i>Dipolydora coeca</i>	-	-	-	2	27	-	157	-	3	13	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Laonice</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-
ANNELIDA	<i>Scolelepis</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	1	-	-
ANNELIDA	<i>Spio</i>	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	2	-	-
ANNELIDA	<i>Spiophanes bombyx</i>	3	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Aphelocheata</i>	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	2	-	-
ANNELIDA	<i>Caulleriella alata</i>	2	-	-	-	-	-	-	-	-	-	-	-	-	2	2	-	-	1	-	-
ANNELIDA	<i>Chaetozone zetlandica</i>	4	-	-	-	-	-	-	-	-	2	-	-	-	1	-	-	-	1	-	-
ANNELIDA	<i>Dodecaceria</i>	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Tharyx killariensis</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
ANNELIDA	<i>Ampharetidae</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	31	-	-	-	-	-	-
ANNELIDA	<i>Ampharete lindstroemi</i>	57	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Ampharete octocirrata</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
ANNELIDA	<i>Ampharete oculicirrata</i>	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Anobothrus gracilis</i>	-	-	-	-	-	-	-	-	-	4	-	-	-	29	-	-	-	-	-	-
ANNELIDA	<i>Melinna elisabethae</i>	-	-	-	-	-	-	-	-	2	3	-	-	-	5	-	-	-	-	-	-
ANNELIDA	<i>Lagis koreni</i>	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Polycirrus</i>	-	-	-	1	-	-	3	-	-	1	-	-	-	-	1	-	-	-	1	-
ANNELIDA	<i>Lanice conchilega</i>	14	-	-	-	-	-	-	-	4	1	-	-	-	6	-	-	-	16	-	-
ANNELIDA	<i>Thelepus</i>	-	-	-	2	14	-	4	-	1	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Thelepus cincinnatus</i>	-	-	-	-	-	-	-	-	2	-	1	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Thelepus setosus</i>	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
ANNELIDA	<i>Terebellides</i>	-	-	-	-	-	-	-	-	-	1	-	-	-	6	-	-	-	-	-	-
ANNELIDA	<i>Sabellidae</i>	3	-	-	7	-	2	8	-	-	3	-	-	-	2	-	-	-	1	-	-
ANNELIDA	<i>Jasmineira</i>	-	-	-	-	-	-	-	-	19	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Jasmineira elegans</i>	-	-	-	21	-	14	7	-	-	8	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Parasabella cambrensis</i>	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Sabella pavonina</i>	11	-	-	1	-	1	-	-	-	2	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Serpulidae</i>	-	-	-	-	16	-	62	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Spirorbinae</i>	-	-	-	-	P	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-

		D01	D02	D03	D04	D05	D06	D07	D08	D09	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20
ANNELIDA	<i>Hydroides norvegica</i>	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Spirobranchus lamarcki</i>	-	-	-	15	27	4	174	-	5	7	7	-	-	1	-	-	-	46	-	-
ANNELIDA	<i>Galathowenia</i>	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Owenia</i>	-	-	-	-	-	-	-	-	-	2	-	-	-	2	-	-	-	1	-	-
ANNELIDA	<i>Sabellaria alveolata</i>	-	-	-	873	-	974	-	-	12	-	208	-	-	-	-	-	-	-	-	-
ANNELIDA	<i>Sabellaria spinulosa</i>	-	-	-	194	10	141	77	-	31	21	409	-	-	-	-	-	-	1	-	-
ANNELIDA	<i>Chaetopteridae</i>	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-
CHELICERATA	<i>Achelia echinata</i>	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CHELICERATA	<i>Callipallene</i>	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CHELICERATA	<i>Anoplodactylus petiolatus</i>	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	MYODOCOPIDA	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	COPEPODA	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	<i>Balanus balanus</i>	-	-	-	5	9	-	11	-	1	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	<i>Balanus crenatus</i>	-	-	-	21	-	21	-	-	4	1	14	-	-	-	-	-	-	-	-	-
CRUSTACEA	<i>Verruca stroemia</i>	-	-	-	2	48	-	293	-	-	6	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	<i>Parapleustes bicuspis</i>	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	<i>Iphimedia obesa</i>	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	<i>Liljeborgia</i>	-	-	1	2	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	<i>Nototropis swammerdamei</i>	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	<i>Ampelisca brevicornis</i>	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	<i>Ampelisca spinipes</i>	1	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	6	-	-
CRUSTACEA	<i>Urothoe elegans</i>	-	-	-	1	-	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CRUSTACEA	<i>Socarnes erythrophthalmus</i>	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	<i>Bathyporeia elegans</i>	-	-	10	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	<i>Bathyporeia tenuipes</i>	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	<i>Gammarellus angulosus</i>	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	<i>Cheirocratus</i>	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	<i>Othomaera othonis</i>	-	-	-	-	2	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-
CRUSTACEA	<i>Abludomelita obtusata</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CRUSTACEA	<i>Aoridae</i>	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	<i>Unciola crenatipalma</i>	-	-	-	-	-	-	-	-	20	-	4	-	-	-	-	-	-	-	-	-
CRUSTACEA	<i>Corophiidae</i>	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	<i>Gammaropsis maculata</i>	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	<i>Gammaropsis nitida</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
CRUSTACEA	<i>Photis longicaudata</i>	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	<i>Pariambus typicus</i>	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	<i>Pseudoprotella phasma</i>	1	-	-	4	-	-	-	-	28	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	ISOPODA	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-

		D01	D02	D03	D04	D05	D06	D07	D08	D09	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20
CRUSTACEA	<i>Anthura gracilis</i>	-	-	-	-	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	<i>Janira maculosa</i>	-	-	-	-	-	1	1	-	1	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	<i>Gastrosaccus spinifer</i>	-	-	-	-	-	-	-	1	-	-	-	-	5	-	-	1	-	-	-	-
CRUSTACEA	<i>Eualus pusiolus</i>	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	<i>Pandalus montagui</i>	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	<i>Pisidia longicornis</i>	-	-	-	22	5	102	3	-	4	-	8	-	-	1	-	-	-	-	-	-
CRUSTACEA	<i>Pagurus bernhardus</i>	-	-	-	-	3	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-
CRUSTACEA	<i>Eurynome</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
CRUSTACEA	<i>Hyas coarctatus</i>	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CRUSTACEA	<i>Pilumnus hirtellus</i>	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-
CRUSTACEA	<i>Liocarcinus</i>	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	<i>Acanthochitona crinita</i>	-	-	-	-	3	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-
MOLLUSCA	<i>Leptochiton asellus</i>	-	-	-	-	7	-	1	-	-	2	-	-	-	8	-	-	-	-	3	-
MOLLUSCA	<i>Doto</i>	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	<i>Goniodorididae</i>	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	<i>Onchidorididae</i>	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	<i>Boreotrophon truncatus</i>	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	<i>Calliostoma</i>	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	<i>Steromphala tumida</i>	-	-	-	-	1	-	5	-	-	-	-	-	-	-	-	-	-	-	1	-
MOLLUSCA	BIVALVIA	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	<i>Hiatella arctica</i>	-	-	-	39	13	42	54	-	16	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	<i>Ensis</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
MOLLUSCA	<i>Phaxas pellucidus</i>	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	<i>Abra alba</i>	78	-	-	1	-	3	3	-	-	5	2	-	-	-	-	-	-	-	11	-
MOLLUSCA	<i>Astarte sulcata</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
MOLLUSCA	<i>Hemilepton nitidum</i>	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	<i>Sphenia binghami</i>	-	-	-	10	7	6	26	-	7	2	5	-	-	-	-	-	-	-	-	-
MOLLUSCA	<i>Mytilidae Juv</i>	16	-	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	<i>Modiolus modiolus</i>	-	-	-	3	1	3	7	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	<i>Musculus discors</i>	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	<i>Musculus subpictus</i>	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	<i>Mytilus edulis</i>	-	-	-	7	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	<i>Nucula nucleus</i>	-	-	-	-	-	9	71	-	-	-	-	-	-	-	-	-	-	-	174	-
MOLLUSCA	<i>Anomiidae</i>	-	-	-	4	6	-	4	-	2	-	1	-	-	-	-	-	-	-	-	-
MOLLUSCA	<i>Heteranomia squamula</i>	-	-	-	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	<i>Aequipecten opercularis</i>	-	-	-	11	1	5	-	-	1	-	2	-	-	-	-	-	-	-	2	-
MOLLUSCA	<i>Mimachlamys varia</i>	-	-	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCA	<i>Talochlamys pusio</i>	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

		D01	D02	D03	D04	D05	D06	D07	D08	D09	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20
MOLLUSCA	<i>Spisula elliptica</i>	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
MOLLUSCA	<i>Timoclea ovata</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-
MOLLUSCA	<i>Venerupis corrugata</i>	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
BRYOZOA	<i>Aetea</i>	-	-	-	P	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BRYOZOA	<i>Schizomavella</i>	-	-	-	-	-	P	P	-	-	-	P	-	-	-	-	-	-	P	-	-
BRYOZOA	<i>Bugulidae</i>	-	-	-	P	P	P	-	-	-	P	P	-	-	-	-	-	-	P	-	-
BRYOZOA	<i>Bicelliella ciliata</i>	-	-	-	P	P	P	P	-	P	P	P	-	-	-	-	-	-	P	-	-
BRYOZOA	<i>Amphiblestrum auritum</i>	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-
BRYOZOA	<i>Cradoscrupocellaria reptans</i>	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BRYOZOA	<i>Scrupocellaria scruposa</i>	-	-	-	-	P	P	P	-	-	-	-	-	-	-	-	-	-	-	-	-
BRYOZOA	<i>Cellepora pumicosa</i>	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-
BRYOZOA	<i>Celleporina caliciformis</i>	-	-	-	P	P	P	-	-	-	-	P	-	-	-	-	-	-	P	-	-
BRYOZOA	<i>Turbicellepora avicularis</i>	-	-	-	P	P	-	P	-	-	P	-	-	-	P	-	-	-	P	-	-
BRYOZOA	<i>Conopeum reticulum</i>	P	-	-	-	-	-	P	-	P	-	-	-	-	-	-	-	-	P	-	-
BRYOZOA	<i>Electra monostachys</i>	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BRYOZOA	<i>Electra pilosa</i>	-	-	-	P	P	P	P	-	P	P	P	-	-	-	P	-	-	-	-	-
BRYOZOA	<i>Euratea loricata</i>	P	-	-	P	P	P	-	-	-	-	-	-	-	-	P	-	-	P	-	-
BRYOZOA	<i>Fenestrulina delicia</i>	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-
BRYOZOA	<i>Flustra foliacea</i>	-	-	-	P	-	P	P	-	P	P	P	-	-	-	P	-	-	-	P	-
BRYOZOA	<i>Haplopoma impressum</i>	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BRYOZOA	<i>Celleporella hyalina</i>	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BRYOZOA	<i>Microporella ciliata</i>	-	-	-	-	P	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-
BRYOZOA	<i>Escharella immersa</i>	-	-	-	-	P	-	P	-	P	P	P	-	-	-	-	-	-	P	-	-
BRYOZOA	<i>Escharella ventricosa</i>	-	-	-	-	-	-	-	-	-	P	P	-	-	-	-	-	-	P	-	-
BRYOZOA	<i>Scruparia</i>	-	-	-	-	P	-	P	-	-	-	-	-	-	-	-	-	-	P	-	-
BRYOZOA	<i>Alcyonidioides mytili</i>	-	-	-	-	-	-	P	-	-	P	-	-	-	-	-	-	-	-	-	-
BRYOZOA	<i>Alcyonidium parasiticum</i>	P	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-
BRYOZOA	<i>Penetrantia</i>	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BRYOZOA	<i>Amathia lendigera</i>	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BRYOZOA	<i>Vesicularia spinosa</i>	P	-	P	P	-	-	P	-	-	P	P	-	-	-	-	-	-	P	-	-
BRYOZOA	<i>Crisia</i>	P	-	-	P	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BRYOZOA	<i>Microeciella suborbicularis</i>	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-
BRYOZOA	<i>Tubulipora liliacea</i>	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PHORINIDA	<i>Phoronis</i>	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-
ECHINODERMATA	<i>Antedon bifida</i>	-	-	-	2	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ECHINODERMATA	<i>Psammechinus miliaris</i>	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ECHINODERMATA	<i>Echinocyamus pusillus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
ECHINODERMATA	<i>Thyonidium drummondii</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-

		D01	D02	D03	D04	D05	D06	D07	D08	D09	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20
ECHINODERMATA	<i>Acrocrida brachiata</i>	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ECHINODERMATA	<i>Amphipholis squamata</i>	-	-	-	1	-	1	-	-	6	-	-	-	-	1	-	-	-	-	-	-
ECHINODERMATA	<i>Amphiura filiformis</i>	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ECHINODERMATA	<i>Ophiothrix fragilis</i>	-	-	-	-	27	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-
PISCES	<i>Ammodytes tobianus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
TUNICATA	ASCIDIACEA Type 1	-	-	-	39	11	8	4	-	-	4	2	-	-	-	-	-	-	1	-	-
TUNICATA	ASCIDIACEA Type 2	P	-	-	P	P	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-
TUNICATA	<i>Didemnidae</i>	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TUNICATA	<i>Asciella</i>	-	-	-	3	1	5	2	-	1	-	-	-	-	-	-	-	-	-	-	-
TUNICATA	<i>Pyura</i>	-	-	-	-	5	-	7	-	1	4	-	-	-	-	-	-	-	-	-	-
TUNICATA	<i>Dendrodoa grossularia</i>	-	-	-	4	9	-	49	-	2	23	7	-	-	4	-	-	-	23	-	-
TUNICATA	<i>Polycarpa fibrosa</i>	5	-	-	48	4	8	4	-	4	-	-	-	-	-	-	-	-	-	-	-
CILIOPHORA	Folliculinidae	-	-	-	P	P	P	P	-	P	P	-	-	-	-	-	-	-	-	-	-
	<i>Total Taxa (Sept 2021)</i>	56	0	6	84	67	60	65	9	68	69	41	0	2	51	16	2	1	58	3	1
	<i>Total Individuals (Sept 2021)</i>	317	0	14	1409	303	1417	1114	7	258	186	706	0	6	213	17	2	2	380	2	2
	<i>Total Taxa (June 2011)</i>	38	17	0	4	18	50	28	1	44	60	54	3	2	16	6	3	1	12	6	6
	<i>Total Individuals (June 2011)</i>	208	27	0	29	38	642	1349	1	114	232	141	3	2	24	7	1	1	34	17	6
	<i>Total Taxa (June 2010)</i>	42	20	1	30	10	48	49	0	19	67	38	2	9	69	16	3	3	69	5	5
	<i>Total Individuals (June 2010)</i>	161	46	2	743	172	801	1720	0	97	1670	1320	3	27	242	46	4	3	1320	8	11
	<i>Total Taxa (June 2009)</i>	47	61	0	49	22	63	53	2	10	48	61	5	4	66	16	1	1	64	9	3
	<i>Total Individuals (June 2009)</i>	380	254	0	1529	84	587	4355	3	34	1474	2613	31	16	243	24	1	2	912	17	5
	<i>Total Taxa (May 2008)</i>	24	42	3	49	52	64	50	0	20	48	17	6	3	34	13	1	1	83	6	11
	<i>Total Individuals (May 2008)</i>	94	144	2	4666	737	306	891	0	26	115	65	7	3	73	21	1	0	471	12	17
	<i>Total Taxa (May 2007)</i>	40	45	2	44	83	73	51	1	31	55	38	2	5	74	13	1	1	67	13	4
	<i>Total Individuals (May 2007)</i>	50	71	1	6158	9061	796	573	0	25	169	74	0	5	169	5	1	0	594	45	3
	<i>Total Taxa (June 2006)</i>	39	56	11	94	131	17	102	0	94	83	64	2	8	128	5	1	2	116	4	4
	<i>Total Individuals (June 2006)</i>	68	179	8	12896	4531	347	1433	0	1159	374	200	2	9	742	13	1	3	2793	17	4
	<i>Total Taxa (June 2005)</i>	95	38	6	121	155	128	129	8	96	117	108	7	19	125	13	9	5	167	13	15
	<i>Total Individuals (June 2005)</i>	816	67	1	7872	7806	9669	1887	2	590	897	2216	1	12	1584	39	5	1	16324	8	14
	<i>Total Taxa (Oct 2004)</i>	74	40	9	102	113	106	76	1	70	116	99	4	4	115	3	5	3	125	7	5
	<i>Total Individuals (Oct 2004)</i>	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: September 2021.

Site Code	4mm	2mm	1mm	0.5mm	0.25mm	0.125mm	0.063mm	<0.063mm	Mean phi	skewness	kurtosis	Classification after Buchanan	Folk Triangles after BGS
D01	11.90	12.40	8.62	7.94	10.35	37.76	3.66	7.36	1.182	-0.326	0.952	Gravelly Sand	Very Fine Gravelly Fine Sand
D02	1.73	3.24	10.48	22.32	45.07	16.29	0.15	0.74	1.550	-0.192	1.143	Slightly Gravelly Sand	Slightly Very Fine Gravelly Medium Sand
D03	11.17	2.09	0.35	0.25	24.23	59.67	0.18	2.06	2.332	-0.701	2.004	Gravelly Sand	Fine Gravelly Fine Sand
D04	8.02	2.53	2.12	3.01	53.40	26.25	1.78	2.90	2.030	-0.026	2.100	Gravelly Sand	Fine Gravelly Medium Sand
D05*	100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	Gravel	Gravel
D06	0.00	0.00	0.30	1.58	44.19	50.85	1.35	1.73	2.346	-0.388	0.586	Sand	Moderately Well Sorted Fine Sand
D07*	100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	Gravel	Fravel
D08	0.00	1.03	2.68	14.13	73.54	8.26	0.04	0.33	1.533	-0.312	2.579	Slightly Gravelly Sand	Slightly Very Fine Gravelly Medium Sand
D09	0.61	1.95	1.70	4.01	75.52	14.64	0.25	1.30	1.933	0.238	2.803	Slightly Gravelly Sand	Slightly Very Fine Gravelly Medium Sand
D10	6.51	9.03	4.87	8.10	27.03	34.83	3.83	5.80	1.454	-0.301	1.372	Gravelly Sand	Very Fine Gravelly Fine Sand
D11*	80	0.00	0.00	20	0.00	0.00	0.00	0.00	-	-	-	Sandy Gravel	Sandy Gravel
D12	0.00	0.00	0.00	0.43	21.86	76.04	1.38	0.29	2.474	-0.549	1.632	Sand	Well Sorted Fine Sand
D13	0.00	0.26	0.23	9.61	83.11	5.82	0.08	0.90	1.737	-0.028	2.565	Slightly Gravelly Sand	Slightly Very Fine Gravelly Medium Sand
D14	7.28	7.17	5.42	9.68	18.60	32.50	7.62	11.73	1.952	-0.256	1.612	Gravelly Muddy Sand	Fine Gravelly Very Coarse Silty Fine Sand
D15	12.07	6.26	4.72	6.52	44.70	24.57	0.29	0.87	1.076	-0.523	1.156	Gravelly Sand	Fine Gravelly Medium Sand
D16	1.37	0.65	0.07	0.33	50.69	46.38	0.18	0.33	2.141	0.402	0.584	Slightly Gravelly Sand	Slightly Fine Gravelly Medium Sand
D17	6.82	7.50	7.18	8.54	40.13	28.64	0.42	0.78	1.368	-0.449	1.114	Gravelly Sand	Very Fine Gravelly Medium Sand
D18	21.35	9.78	4.43	2.78	8.69	48.47	3.33	1.17	1.087	-0.835	0.539	Sandy Gravel	Sandy Fine Gravel
D19	1.41	1.41	2.04	5.35	68.71	20.14	0.07	0.85	1.977	0.230	2.657	Slightly Gravelly Sand	Slightly Fine Gravelly Medium Sand
D20	17.66	1.84	1.69	2.51	53.61	21.94	0.20	0.55	0.777	-0.589	4.557	Gravelly Sand	Fine Gravelly Medium Sand

\* No grainsize retained. Visual estimation of Particle Size.