An Roinn
Cultúir, Oidhreachta agus Gaeltachta

Department of
Culture, Heritage and the Gaeltacht

EUROPEAN COMMUNITIES (BIRDS & NATURAL HABITATS) REGULATIONS, 2011.

To:
Dr Brendan O'Connor
AQUAFACT International Services Ltd
12 Kilkerrin Park
Liosbaun Industrial Estate
Tuam Road
Galway

Pertaining to protected habitats within:
Special Area of Conservation (002165) - Lower River Shannon

I refer to your proposal to:
In accordance with the Notice of Notifiable Actions, Habitat Type 1.1
Section A.

To: Conduct marine scientific research

and hereby inform you that:

[ ] The Minister's consent is granted as requested
[YES] The Minister's consent is granted subject to the following conditions

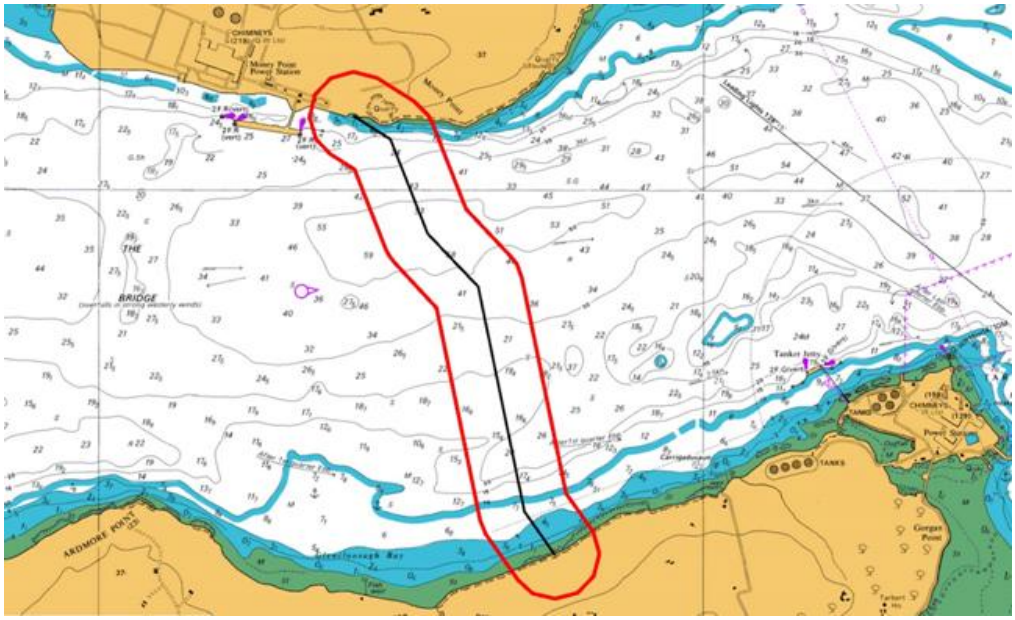
- The proposed project is not subject to a licence or permission granted by another Government Department
- This consent does not alter the designated status of the Special Areas of Conservation
- This consent shall remain valid from the date of issue to 31st December, 2020

[ ] The Minister's consent is refused,
(Reason(s) stated at Appendix A hereunder).

Signed : David Lyons (*Wildlife Inspector*)

Date : 19th March 2020

Marine Sediment and Benthic Studies
Shannon Cable Crossing,
Co. Kerry & Co. Clare.



Produced by

AQUAFACT International Services Ltd

On behalf of

Mott MacDonald

March 2020

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Report Approval Sheet

Client	Mott MacDonald
Report Title	Marine Sediment and Benthic Studies Shannon Cable Crossing, Co. Kerry & Co. Clare.
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1	Draft	25.03.2020	JN1408 Shannon Cable Crossing benthic survey draft.1	E. McCormack	B.O'Connor
2	Final	27.03.2020	JN1408 Shannon Cable Crossing Benthic Survey final	E. McCormack	B.O'Connor

AQUAFACT

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1. Introduction

Mott McDonald commissioned AQUAFACT to carry out a marine benthic survey of the Shannon Cable crossing cable route in order to characterise the baseline environment in terms of its sediment composition and faunal communities. The proposed cable laying involves the installation of four high voltage electricity cables between Moneypoint Power Station, Co. Clare and Kilpaddoge Substation, Co. Kerry (located approximately 1.5km northwest of Tarbert village). An infaunal grab sampling survey was carried out along the route of the cable crossing illustrated in Figure 1.1 below.

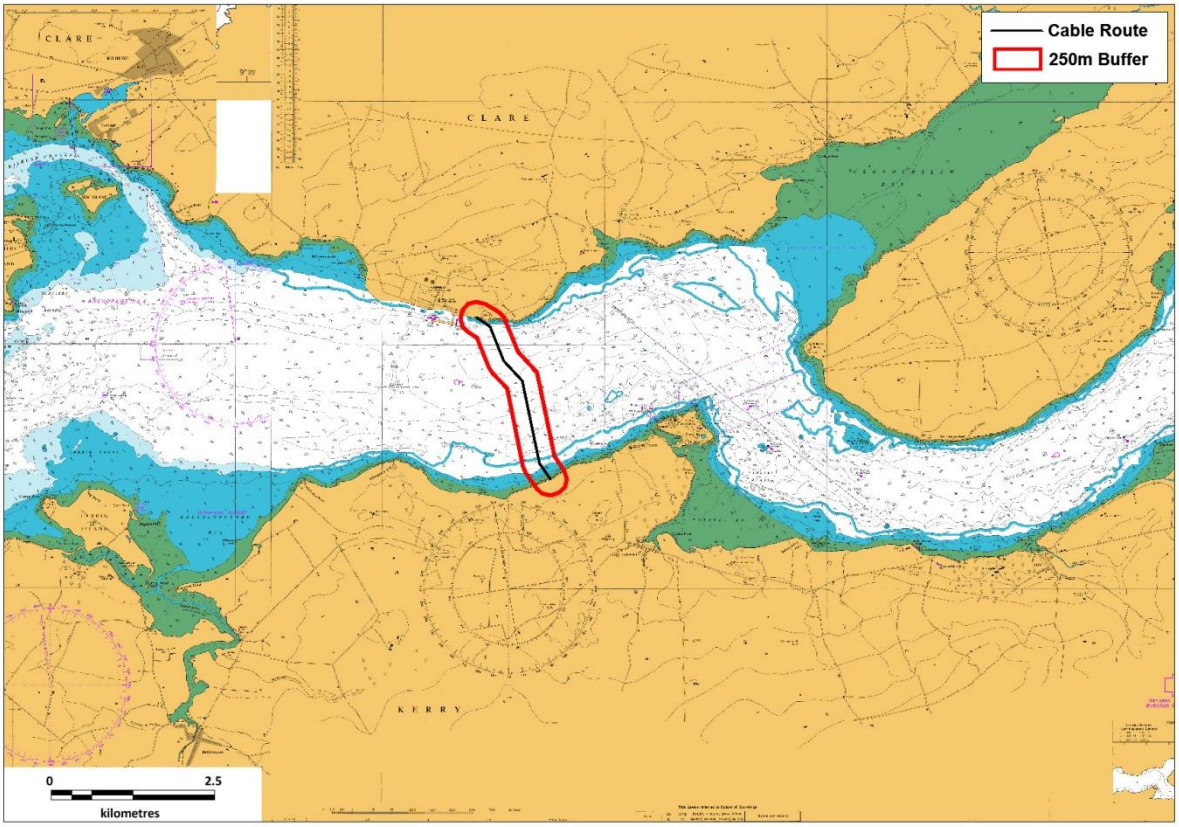


Figure 1.1: Location of the proposed cable route across the Shannon.

2. Benthic Grab Survey

2.1. Materials & Methods

2.1.1. Sampling Procedure

To carry out the subtidal benthic assessment of the Shannon Cable route, AQUAFACT sampled a total of 7 stations. Sampling took place on the 17th December 2019 from a Shannon Foynes Port work vessel. Sea state was calm with a slight (5kt) southeasterly breeze. Figure 2.1 shows the location of the grab stations sampled on the 17th December and Table 2.1 shows the station coordinates and depths. One station, SC10 could not be grab-sampled due to the nature of the substrate – hard ground.

AQUAFACT has in-house standard operational procedures for benthic sampling and these were followed for this project. Additionally, the recently published MESH report on "Recommended Standard methods and procedures" was adhered to.

A 0.1m^2 Day grab was used to sample the grab sites. On arrival at each sampling station, the vessel location was recorded using DGPS (latitude/longitude). Additional information such as date, time, site name, sample code and depth were recorded in a data sheet.

Three replicate grab samples were taken at each of the six viable stations for faunal analysis and a fourth sample was collected for sediment grain size and organic carbon analysis. The grab deployment and recovery rates did not exceed 1 metre/sec. This was to ensure minimal interference with the sediment surface as the grab descended. Upon retrieval of the grab a description of the sediment type was noted in the sample data sheet. Notes were also made on colour, texture, smell and presence of animals.

A digital image of each sample (including sample label) was taken and these images can be seen in Appendix 1. The grab sampler was cleaned between stations to prevent cross contamination.

The samples collected for faunal analysis were carefully and gently sieved on a 1mm mesh sieve as a sediment water suspension for the retention of fauna. Great care was taken during the sieving

process in order to minimise damage to taxa such as spionids, scale worms, phyllodocids and amphipods. The sample residue was carefully flushed into a pre-labelled (internally and externally) container from below. Each label contained the sample code and date. The samples were stained with Eosin-briebrich scarlet and fixed in 4% w/v buffered formaldehyde solution upon returning to the laboratory. These samples were ultimately preserved in 70% alcohol prior to processing.

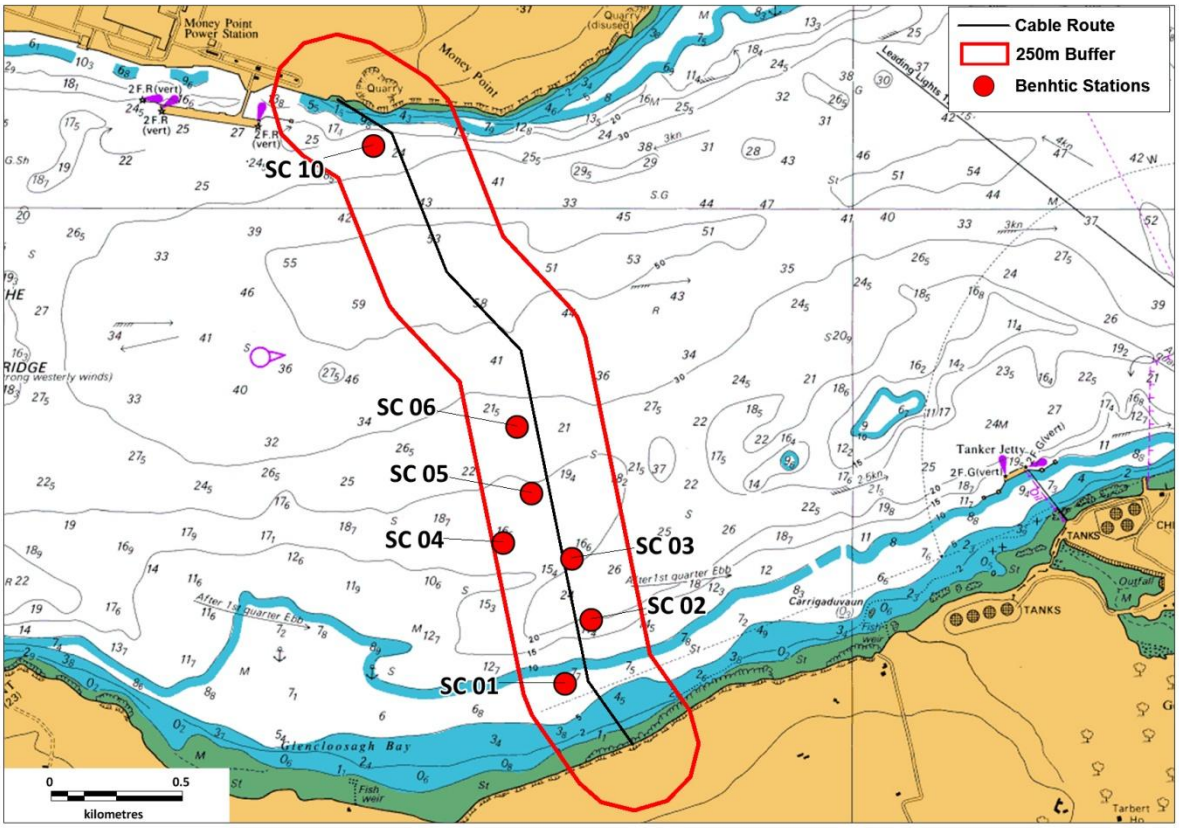


Figure 2.1: Location of the grab stations sampled on the 17th December 2020.

Table 2.1: Station coordinates and depths at the grab stations.

Station	Latitude	Longitude	Depth (m)
SC1	52.58416	-9.40017	11
SC2	52.58635	-9.39872	20.6
SC3	52.58843	-9.39981	19.7
SC4	52.58898	-9.40364	18.7
SC5	52.59068	-9.40208	20.1
SC6	52.59295	-9.40289	23.7
SC10	52.60254	-9.41097	18.9

2.1.2. Sample Processing

All faunal samples were placed in an illuminated shallow white tray and sorted first by eye to remove large specimens and then sorted under a stereo microscope (x 10 magnification). Following the removal of larger specimens, the samples were placed into Petri dishes, approximately one half teaspoon at a time and sorted using a binocular microscope at x25 magnification.

The fauna was sorted into four main groups: Polychaeta, Mollusca, Crustacea and others. The 'others' group consisted of echinoderms, nematodes, nemerteans, cnidarians and other lesser phyla. The fauna were maintained in stabilised 70% industrial methylated spirit (IMS) following retrieval and identified to species level where practical using a binocular microscope, a compound microscope and all relevant taxonomic keys. After identification and enumeration, specimens were separated and stored to species level.

The sediment granulometric analysis was carried out by AQUAFACT using the traditional granulometric approach. Traditional analysis involved the dry sieving of approximately 100g of sediment using a series of Wentworth graded sieves. The process involved the separation of the sediment fractions by passing them through a series of sieves. Each sieve retained a fraction of the sediment, which were later weighed and a percentage of the total was calculated. Table 2.2 shows the classification of sediment particle size ranges into size classes. Sieves, which corresponded to the range of particle sizes (Table 2.2), were used in the analysis. Appendix 2 provides the detailed granulometric methodology.

Table 2.2: The classification of sediment particle size ranges into size classes (adapted from Buchanan, 1984).

Range of Particle Size	Classification	Phi Unit
<63µm	Silt/Clay	>4 Ø
63-125 µm	Very Fine Sand	4 Ø, 3.5 Ø
125-250 µm	Fine Sand	3 Ø, 2.5 Ø
250-500 µm	Medium Sand	2 Ø, 1.5 Ø
500-1000 µm	Coarse Sand	1 Ø, 1.5 Ø
1000-2000 µm (1 – 2mm)	Very Coarse Sand	0 Ø, -0.5 Ø
2000 – 4000 µm (2 – 4mm)	Very Fine Gravel	-1 Ø, -1.5 Ø
4000 -8000 µm (4 – 8mm)	Fine Gravel	-2 Ø, -2.5 Ø
8 -64 mm	Medium, Coarse & Very Coarse Gravel	-3 Ø to -5.5 Ø
64 – 256 mm	Cobble	-6 Ø to -7.5 Ø

Range of Particle Size	Classification	Phi Unit
>256 mm	Boulder	< -8 Ø

The additional sediment samples collected from the faunal stations had their organic carbon analysis performed by ALS Laboratories in Loughrea using the Loss on Ignition method. Appendix 2 provides the methodology.

2.1.3. Data Analysis

Statistical evaluation of the faunal data was undertaken using PRIMER v.6 (Plymouth Routines in Ecological Research). Univariate statistics in the form of diversity indices are calculated. Numbers of species and numbers of individuals per sample will be calculated and the following diversity indices will be utilised:

1) Margalef's species richness index (D) (Margalef, 1958),

$$D = \frac{S-1}{\log_2 N}$$

where: N is the number of individuals

S is the number of species

2) Pielou's Evenness index (J) (Pielou, 1977)

$$J = \frac{H'(observed)}{H'_{max}}$$

where: H'_{max} is the maximum possible diversity, which could be achieved if all species were equally abundant (= $\log_2 S$)

3) Shannon-Wiener diversity index (H') (Pielou, 1977)

$$H' = -\sum_{i=1}^{S} p_i (\log_2 p_i)$$

where: p_I is the proportion of the total count accounted for by the i^{th} taxa

4) Effective number of species (ENS) (Hill, 1973; Jost, 2006)

$$H = \exp(H')$$

Where H' is the Shannon-Weiner diversity index.

Species richness is a measure of the total number of species present for a given number of

individuals. Evenness is a measure of how evenly the individuals are distributed among different species. The Shannon-Wiener index incorporates both species richness and the evenness component of diversity (Shannon & Weaver, 1949). The diversity index is then converted to effective numbers of species to reflect 'true diversities' (Hill, 1973, Jost, 2006) that can then be compared across communities (MacArthur, 1965; Jost, 2006). The effective number of species (ENS) is equivalent to the number of equally abundant species that would be needed in each sample to give the same value of a diversity index, *i.e.* Shannon-Weiner Diversity index. The ENS behaves as one would intuitively expect when diversity is doubled or halved, while other standard indices of diversity do not (Jost, 2006). If the ENS of one community is twice that of another then it can be said that that community is twice as diverse as the other.

The PRIMER programme (Clarke & Warwick, 2001) was used to carry out multivariate analyses on the station-by-station faunal data. All species/abundance data from the grab surveys was 4th root transformed and used to prepare a Bray-Curtis similarity matrix in PRIMER ®. The 4th root transformation was used in order to allow the less abundant species to play a part in the similarity calculation. All species/abundance data from the samples was used to prepare a Bray-Curtis similarity matrix. The similarity matrix was then be used in classification/cluster analysis. The aim of this analysis was to find "natural groupings' of samples, *i.e.* samples within a group that are more similar to each other, than they are similar to samples in different groups (Clarke & Warwick, *loc. cit.*). The PRIMER programme CLUSTER carried out this analysis by successively fusing the samples into groups and the groups into larger clusters, beginning with the highest mutual similarities then gradually reducing the similarity level at which groups are formed. The result was represented graphically in a dendrogram, the x-axis representing the full set of samples and the y-axis representing similarity levels at which two samples/groups are said to have fused. SIMPROF (Similarity Profile) permutation tests were incorporated into the CLUSTER analysis to identify statistically significant evidence of genuine clusters in samples which are *a priori* unstructured.

The Bray-Curtis similarity matrix was also be subjected to a non-metric multi-dimensional scaling (MDS) algorithm (Kruskal & Wish, 1978), using the PRIMER programme MDS. This programme produced an ordination, which is a map of the samples in two- or three-dimensions, whereby the placement of samples reflects the similarity of their biological communities, rather than their simple geographical location (Clarke & Warwick, 2001). With regard to stress values, they give an indication of how well the multi-dimensional similarity matrix is represented by the two-dimensional plot. They are calculated by comparing the interpoint distances in the similarity matrix with the corresponding

interpoint distances on the 2-d plot. Perfect or near perfect matches are rare in field data, especially in the absence of a single overriding forcing factor such as an organic enrichment gradient. Stress values increase, not only with the reducing dimensionality (lack of clear forcing structure), but also with increasing quantity of data (it is a sum of the squares type regression coefficient). Clarke & Warwick (*loc. cit*.) have provided a classification of the reliability of MDS plots based on stress values, having compiled simulation studies of stress value behaviour and archived empirical data. This classification generally holds well for 2-d ordinations of the type used in this study. Their classification is given below:

- Stress value < 0.05: Excellent representation of the data with no prospect of misinterpretation.
- Stress value < 0.10: Good representation, no real prospect of misinterpretation of overall structure, but very fine detail may be misleading in compact subgroups.
- Stress value < 0.20: This provides a useful 2-d picture, but detail may be misinterpreted particularly nearing 0.20.
- Stress value 0.20 to 0.30: This should be viewed with scepticism, particularly in the upper part of the range, and discarded for a small to moderate number of points such as < 50.
- Stress values > 0.30: The data points are close to being randomly distributed in the 2-d ordination and not representative of the underlying similarity matrix.

Each stress value must be interpreted both in terms of its absolute value and the number of data points. In the case of this study, the moderate number of data points indicates that the stress value can be interpreted more or less directly. While the above classification is arbitrary, it does provide a framework that has proved effective in this type of analysis.

The species, which are responsible for the grouping of samples in cluster and ordination analyses, were identified using the PRIMER programme SIMPER (Clarke & Warwick, 1994). This programme determined the percentage contribution of each species to the dissimilarity/similarity within and between each sample group.

In order to assess the benthic ecological quality of the community, the AZTI Marine Biotic Index (AMBI) was calculated. AMBI offers a 'pollution or disturbance classification' which represents the benthic community health (*sensu* Grall & Glémarec, 1997). Individuals are put into one of five ecological sensitivity groups (Group I - very sensitive to disturbance/pollution; Group II - indifferent

to disturbance/pollution; Group III - tolerant to disturbance/pollution; Group IV - second-order opportunists and Group V - first order opportunists) and the AMBI score is calculated as a weighted average of the sensitivity scores of each replicate sample. Assemblages with high proportions of sensitive taxa are indicative of areas with low levels of disturbance and stations dominated by opportunistic taxa reflect impacted areas.

2.2. Results

2.2.1. Fauna

The taxonomic identification of the benthic infauna across all 6 grab stations sampled the Shannon cable crossing route yielded a total count of 122 taxa ascribed to 8 phyla. The 122 taxa consisted of 2,689 individuals. Of the 122 taxa recorded, 89 were identified to species level. The remaining 32 could not be identified to species level as they were juveniles (13 taxa), partial/damaged (18 taxa) or indeterminate (2 taxa). Appendix 3 shows the faunal abundances from the sampled sites.

Of the 122 taxa present, 1 was a nematode (roundworm), 2 were sipunculids (acorn worms), 51 were annelids (segmented worms), 36 were arthropods (sea spiders, crabs, prawns), 24 were molluscs (mussels, cockles, snails), 3 were bryozoans (moss animals), 3 were echinoderms (brittlestars, starfish, sea cucumbers, and 2 were chordates (tunicates).

2.2.1.1. Univariate Analysis

Univariate statistical analyses were carried out on the combined station-by-station faunal data. In addition all colonial, epifaunal, parasitic and fish species were removed prior to analysis. The following parameters were calculated and can be seen in Table 2.3: taxon numbers, number of individuals, richness, evenness, Shannon-Weiner diversity and Effective species numbers (Hill numbers based on the Shannon-Weiner diversity). Taxon numbers ranged from 18 (SC5) to 73 (SC2). Number of individuals ranged from 56 (SC6) to 1,505 (SC2). Richness ranged from 4.19 (SC5) to 9.84 (SC2). Evenness ranged from 0.48 (SC1) to 0.87 (SC5). Shannon-Weiner diversity ranged from 1.9 (SC1) to 2.83 (SC4). Effective species numbers (exponential of Shannon-Weiner diversity) ranged from 6.67 (SC1) to 16.98 (SC4) indicating the station SC4 is effectively over 2.5 times as diverse as station SC1. Figure 2.2 shows these community indices in graphical form.

Table 2.3: Univariate measures of community structure.

Station	No. Taxa	No. Individuals	Richness	Evenness	Shannon-Weiner Diversity	Effective Species No.
	S	N	d	J'	H'(loge)	exp(H')
SC1	50	732	7.43	0.48	1.90	6.67
SC2	73	1505	9.84	0.58	2.49	12.02
SC3	24	129	4.73	0.81	2.58	13.21
SC4	33	175	6.20	0.81	2.83	16.98
SC5	18	58	4.19	0.87	2.52	12.39
SC6	20	56	4.72	0.82	2.45	11.62

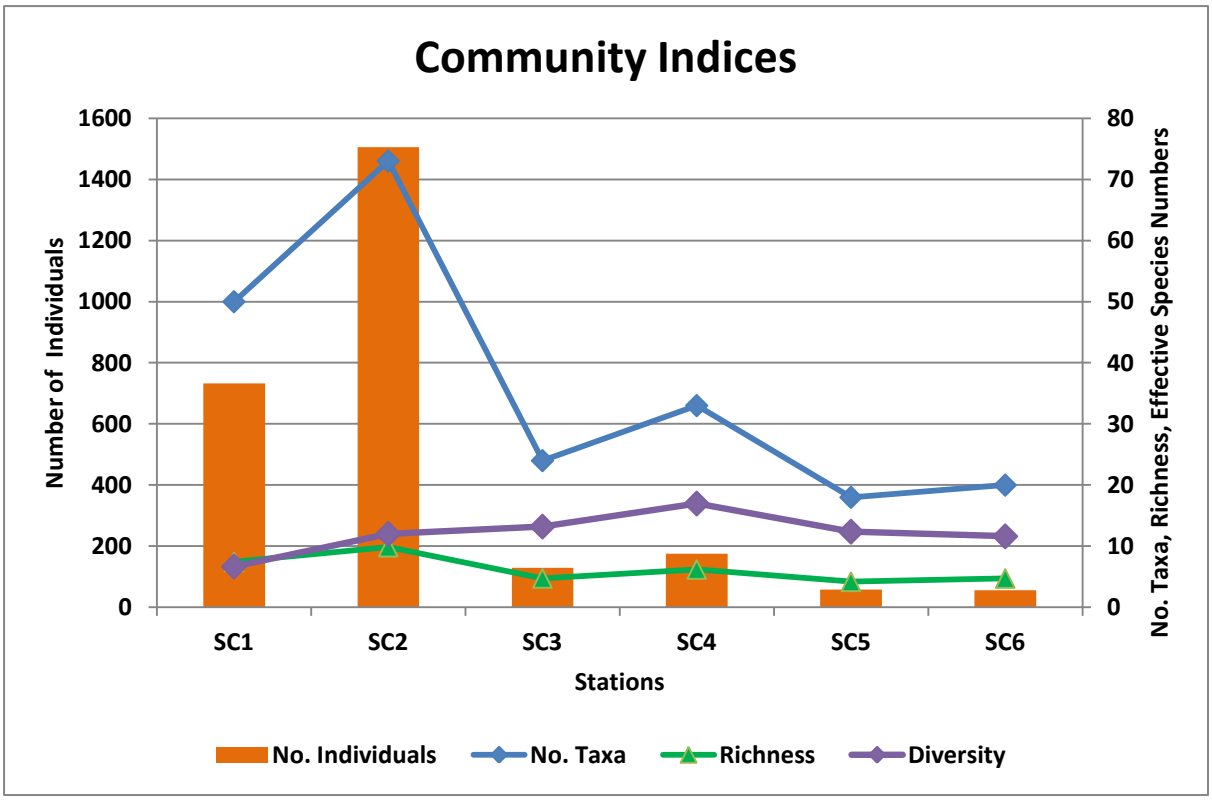


Figure 2.2: Community indices. Diversity is expressed in effective species numbers.

2.2.1.2. Multivariate Analysis

The same data set used above for the univariate analyses was also used for the multivariate analyses. The dendrogram and the MDS plot can be seen in Figures 2.3 and 2.4 respectively. The stress level of 0.0 on the MDS plot indicates an excellent representation of the data with no prospect of misinterpretation. SIMPROF analysis revealed 2 statistically significant groupings between the 6

stations (the samples connected by red lines cannot be significantly differentiated). The two groups separated from each other at a 26.96% similarity level.

- Group a: Stations SC1 and SC2
- Group b: Stations SC3, SC4, SC5 and SC6

Group a contained stations SC1 and SC2 and had a within group similarity level of 52.67%. This group contained 89 taxa comprising 2,237 individuals. Of the 87 taxa, 42 were present twice or less. Five species accounted for just over 73% of the faunal abundance of this group; the bivalve *Nucula nucleus* (960 individuals, 44.28% abundance), the polychaetes *Paradoneis lyra* (257 individuals, 11.85% abundance, the sipunculan worms *Golfingia* sp. (juv) (234 individuals, 10.79% abundance) and *Golfingia (Golfingia) elongata* (70 individuals, 3.23% abundance) and Nematoda (39 individuals, 3.18% abundance). SIMPER analysis could not be carried out on this group as it only contained two stations. *Nucula nucleus, Golfingia* sp. (juv) and *Golfingia (Golfingia) elongata* are very sensitive to organic enrichment and present under unpolluted conditions. *Paradoneis lyra* and Nematoda are tolerant to excess organic enrichment, they occur under normal conditions but their populations are stimulated by organic enrichment. While the number of taxa and individuals was highest in this group the species richness and diversity were average due to the abundance of a few species.

Group b contained stations SC3, SC4, SC5 and SC6 and had a within group similarity of 44.27%. This group contained 56 taxa comprising 418 individuals. Of the 56 taxa, 34 were present twice or less. Seven species accounted for almost 67% of the faunal abundance of this group; the polychaetes *Paradoneis lyra* (80 individuals, 19.14% abundance), *Scoloplos armiger* (33 individuals, 7.89% abundance), *Paradoneis* sp. (damaged) (28 individuals, 6.7% abundance) and *Notomastus latericeus* (19 individuals, 4.55% abundance), the bivalve molluscs *Nucula nitidosa* (34 individuals, 8.13% abundance) and *Nucula nucleus* (31 individuals, 7.42% abundance) and Nematoda (41 individuals, 9.81% abundance). SIMPER analysis revealed Nematoda, *Nephtys cirrosa, Paradoneis lyra, Nucula nucleus* and *Paradoneis* sp. (damaged) as the characterizing species of this group. SIMPER results are presented in Appendix 4. Nematoda, *Paradoneis lyra* and *Paradoneis* sp. are tolerant to excess organic enrichment, they occur under normal conditions but their populations are stimulated by organic enrichment. *Nephtys cirrosa* are indifferent to enrichment, typically present in low densities with non-significant variations over time. *Nucula nucleus* are very sensitive to organic enrichment and present under unpolluted conditions. The number of taxa and individuals and species richness were below average. Diversity was highest at station SC4 within this group.

SIMPER analysis revealed that the dissimilarity between the two groups is as a result of the following species being present in Group a and absent from Group b: *Pholoe inornata, Pholoe baltica, Achelia echinata,* Polynoidae (damaged), *Euphilomedes sinister, Othomaera othonis, Apseudes talpa* and *Anoplodactylus petiolatus.* These results are presented in Appendix 4.

Both groups containing the six stations surveyed can be ascribed to the habitat 'Subtidal sand to mixed sediment with *Nucula nucleus* community complex'. This is one of ten benthic community habitat types occurring in the Lower River Shannon SAC (NPWS, 2012) and has previously been recorded in this vicinity in the course of this project (AQUAFACT, 2008, 2009, 2019) as illustrated in Figure 2.5.

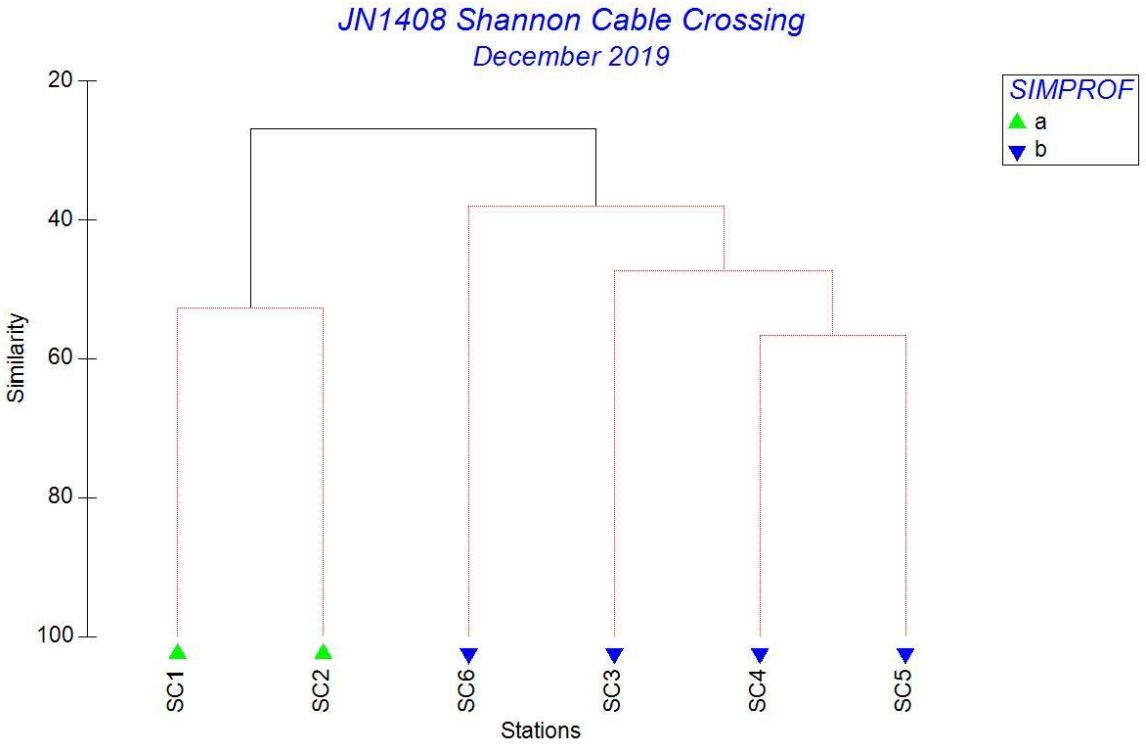


Figure 2.3: Dendrogram produced from Cluster analysis.

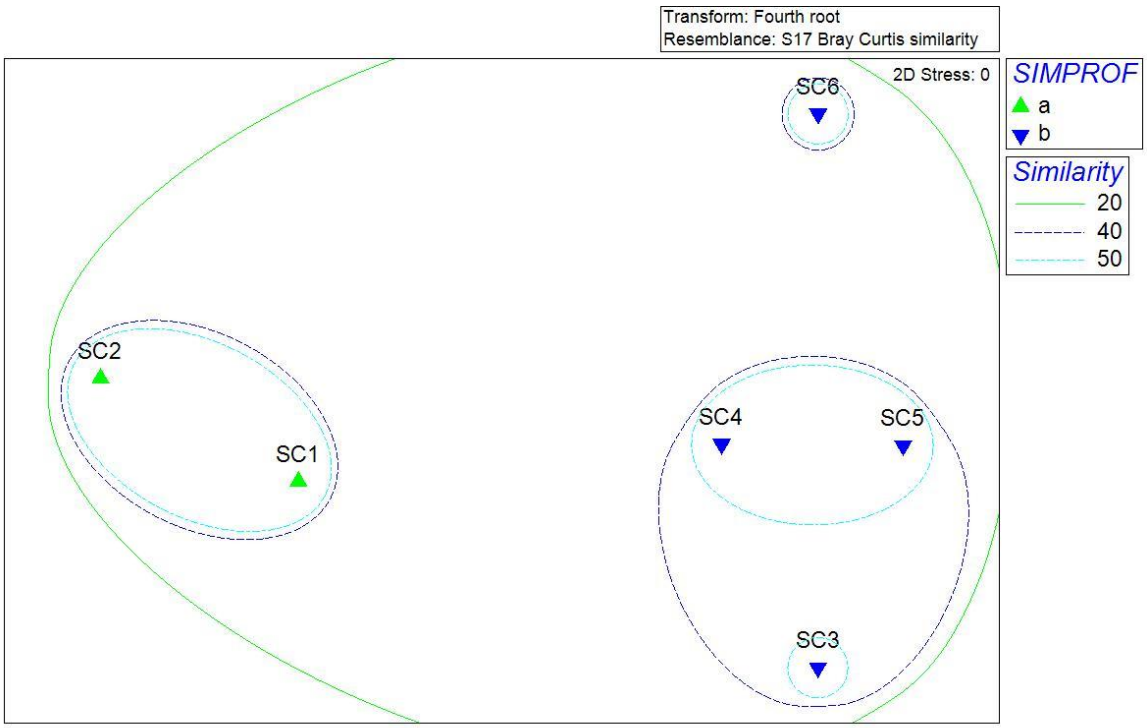


Figure 2.4: MDS plot.

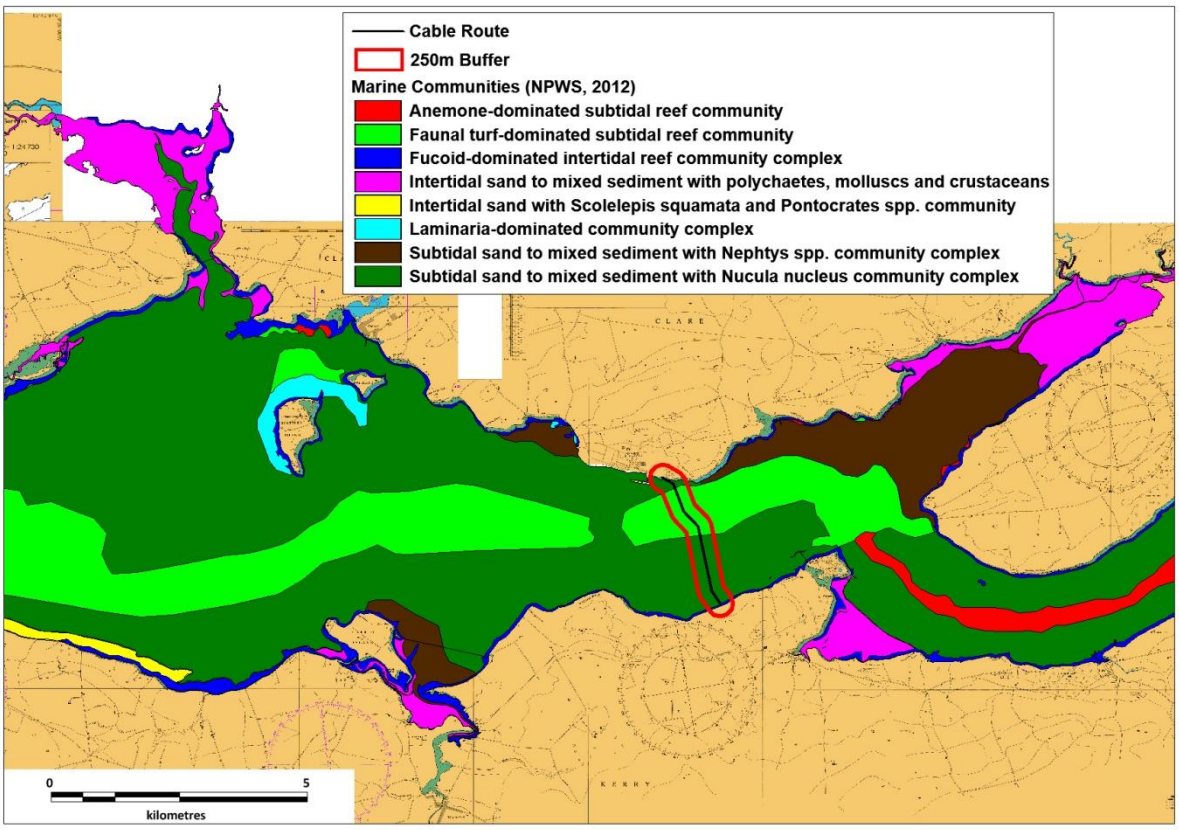


Figure 2.5: Marine habitats in the vicinity of the cable route (NPWS, 2012).

2.2.1.3. AMBI analysis

Table 2.4 shows the mean AMBI results from the analysis of faunal samples. Stations SC1 and SC2 were classified as undisturbed. All other stations were classified as slightly disturbed. Figure 2.6 presents histograms of the AMBI results indicating the relative abundance of species based on sensitivities.

Table 2.4: AMBI Results

Stations	I (%)	II (%)	III (%)	IV (%)	V (%)	Not assigned (%)	AMBI	BI from Mean AMBI	Disturbance Classification
SC1	76.32	2.50	20.26	0.92	0	0.7	0.687	1	Undisturbed
SC2	66.64	11.01	19.13	3.22	0	1.1	0.884	1	Undisturbed
SC3	48.84	10.08	38.76	2.33	0	0	1.419	2	Slightly disturbed
SC4	21.30	11.24	67.46	0.00	0	3.4	2.192	2	Slightly disturbed
SC5	12.07	18.97	68.97	0.00	0	0	2.353	2	Slightly disturbed
SC6	32.14	17.86	50.00	0.00	0	0	1.768	2	Slightly disturbed

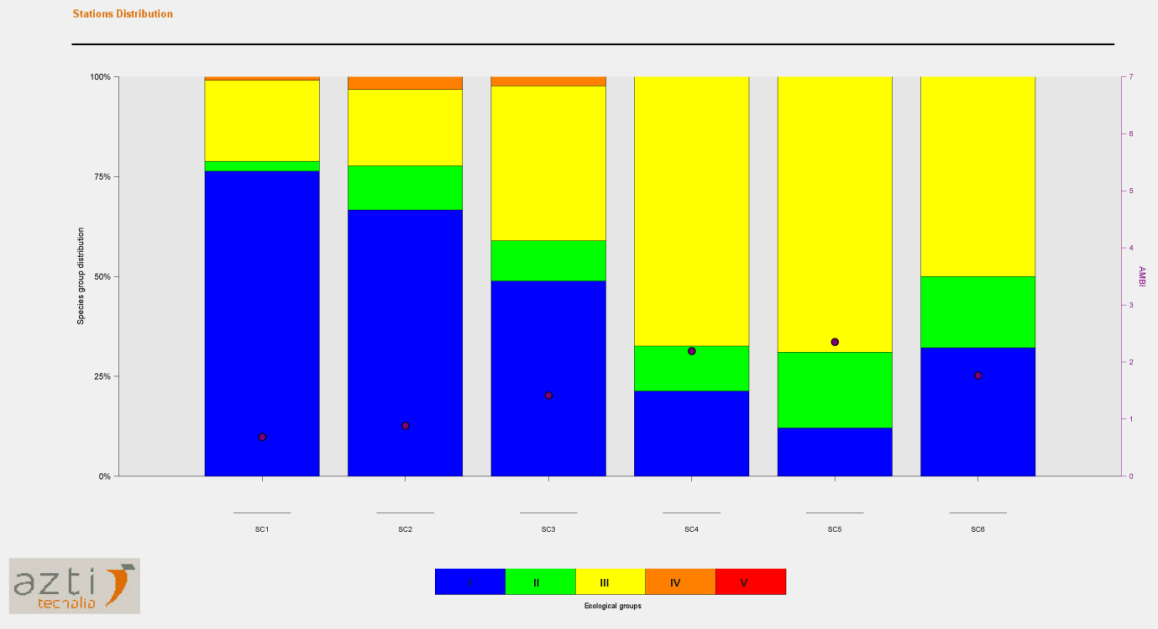


Figure 2.6: AMBI results histogram.

2.2.2. Sediment

Table 2.6 shows the sediment characteristics of the faunal stations in along the Shannon Cable crossing. A digital image of each sediment sample can be seen in Appendix 1.

The sediment sampled along the Shannon Cable route was classified as muddy sandy gravel, sand, gravelly sand and slightly gravelly sand according to Folk (1954). One station SC10 could not be grab-sampled as this station was classified as hard ground. No medium gravel-boulders were recorded. Highest levels of fine gravel were observed at SC1 (54.3%). Highest levels of very fine gravel and very coarse sand were found at SC2 (14.2% and 12.4% respectively). Highest levels of coarse sand were found at SC6 (9.7%). Highest levels of medium sand were found at SC5 (44.7%). Highest levels of fine sand were found at SC3 (54.7%), with highest levels of very fine sand and silt-clay at SC4 (14.9% and 9.4% respectively). Figure 2.7 shows the breakdown of sediment composition at each station and Figure 2.8 illustrates the sediment type according to Folk (1954).

Table 2.6 also displays the organic matter values recorded at each station. Organic matter values ranged from 2.33 (SC3) to 6.14 (SC1).

Table 2.5: Sediment characteristics of the faunal stations sampled in along the Shannon Cable Crossing. LOI refers to the % organic carbon loss on ignition.

Station	>8mm	Fine Gravel (>4mm)	Very Fine Gravel (2-4mm)	Very Coarse Sand (1-2mm)	Coarse Sand (0.5-1mm)	Medium Sand (0.25-0.5mm)	Fine Sand (125-250mm)	Very Fine Sand (62.5-125mm)	Silt-Clay (<63mm)	Folk (1954)	LOI
SC1	0.0	54.3	8.2	8.1	6.9	5.1	5.3	6.5	5.5	Muddy sandy gravel	6.14
SC2	0.0	35.7	14.2	12.4	7.9	5.9	10.9	7.8	5.1	Muddy sandy gravel	4.71
SC3	0.0	0.1	0.4	0.8	4.8	31.6	54.7	5.2	2.4	Sand	2.33
SC4	0.0	0.3	0.7	1.6	2.3	16.1	54.6	14.9	9.4	Slightly gravelly sand	5.04
SC5	0.0	0.1	0.1	0.3	4	44.7	48.3	2.1	0.6	Sand	2.52
SC6	0.0	4.8	1.8	2.2	9.7	39.1	30.9	6.9	4.6	Gravelly sand	3.01

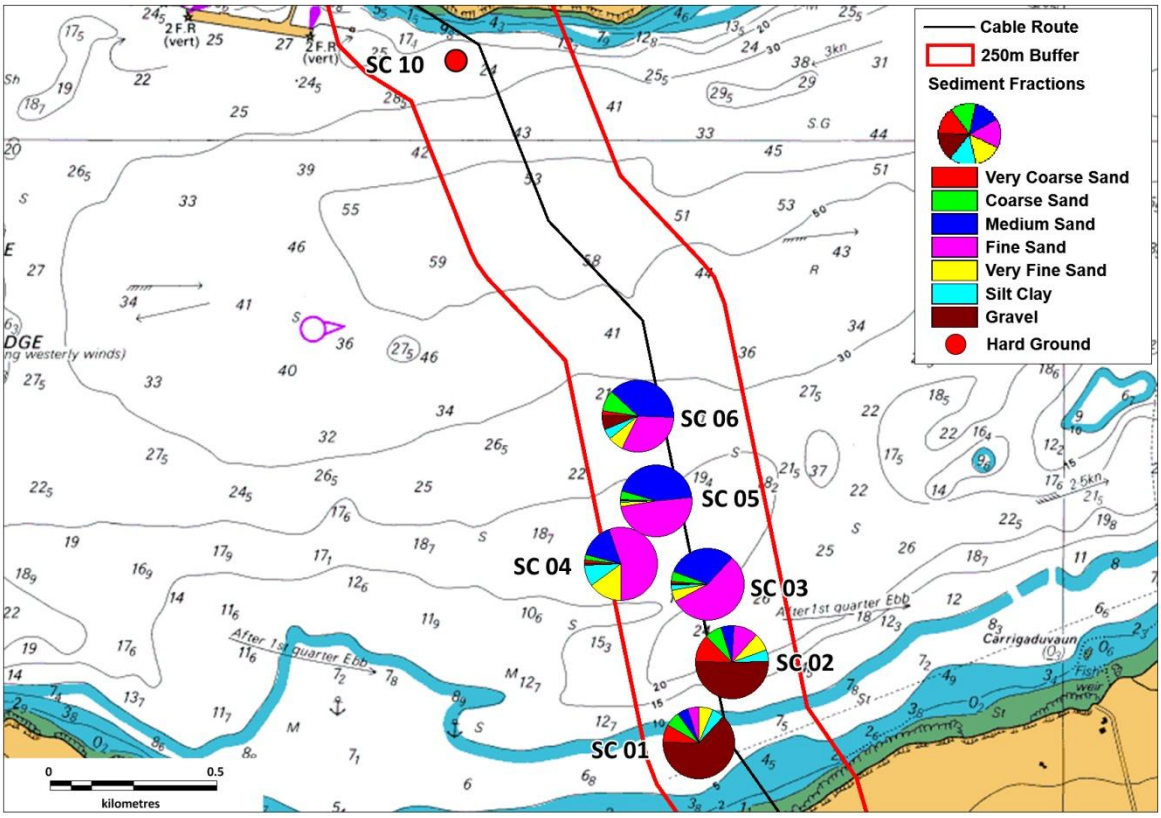


Figure 2.7: A breakdown of sediment type at each station along the cable route.

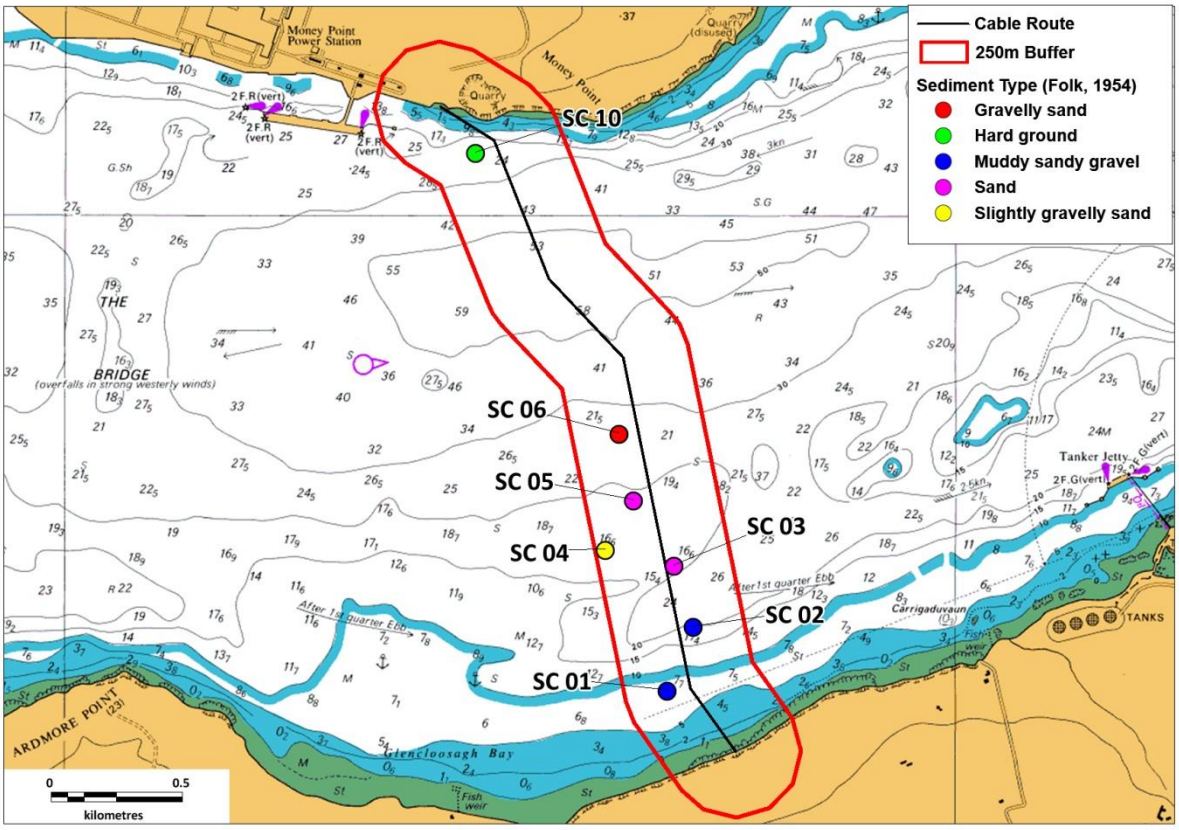


Figure 2.8: Sediment type according to Folk (1954) along the cable route

3. Discussion

Detailed faunal analysis of grab samples along the proposed submarine cable route in the Shannon Estuary showed a statistical divide of 2 groups between the stations surveyed. All six stations can be classified as belonging to the NPWS habitat 'Subtidal sand to mixed sediment with *Nucula nucleus* community complex'. There was a clear divide however between the stations where gravel formed a large part of the sediment matrix (Group a: SC1 and SC2) and the other finer sediment stations (Group b: SC3, SC4, SC5 and SC6). This is reflected in the species present in Group a that are absent in Group b. Group a was dominated by species that are very sensitive to organic enrichment and present under unpolluted conditions (*Nucula nucleus, Golfingia* sp. (juv) and *Golfingia (Golfingia) elongata*) and species that are tolerant to excess organic enrichment occurring under normal conditions but their populations are stimulated by organic enrichment (*Paradoneis lyra* and Nematoda). Group b was dominated by species that are tolerant to excess organic enrichment occurring under normal conditions but their populations are stimulated by organic enrichment (Nematoda, *Paradoneis lyra* and *Paradoneis* sp.), species indifferent to enrichment, typically present in low densities with non-significant variations over time (*Nephtys cirrosa*) and species that are very sensitive to organic enrichment and present under unpolluted conditions (*Nucula nucleus*). Species richness and diversity were average in all six stations with highest diversity recorded in station SC4. AMBI results from the analysis of the faunal replicate samples classified stations SC1 and SC2 as undisturbed. All of the remaining grab stations were classified as slightly disturbed.

The NPWS habitat 'Subtidal sand to mixed sediment with *Nucula nucleus* community complex' occurs within the Lower River Shannon SAC (site code 002165) in the area from Foynes Island to Kilcredaun Point and is also recorded due west of Leck Point and to the south of Kilbaha Bay. It comprises approximately 4196 hectares or 17.2% of the Annex I habitat Estuaries in the Lower Shannon SAC.

The Shannon Estuary is a highly turbid environment and any minor increases in suspended sediments due to cable laying activities will be insignificant in comparison to background levels. Furthermore, the habitat 'Subtidal sand to mixed sediment with *Nucula nucleus* community complex' includes species that are typically tolerant (*Nucula* spp, *Scoloplos armiger, Nephtys cirrosa* and *Notomastus* sp.) or have low sensitivity (*Golfingia* spp.) to smothering and increased sedimentation.

Immediately following the cable laying, the void on the seabed will fill in on itself through tidal activity. The vibrations caused by cable laying will cause infaunal or tube dwelling species such as anemones, annelids, crustaceans, molluscs or echinoderms to react by retracting into the sea bed or tube. This reaction will be temporary and will cease once the activities cease. The minor disturbances to the seabed will have no measureable impacts on this habitat.

4. References

AQUAFACT, 2008. Marine Ecological Surveys for a proposed submarine cable route in the Shannon Estuary. 94pp.

AQUAFACT, 2009. Marine Ecological Surveys for a proposed submarine cable route in the Shannon Estuary. 65pp.

AQUAFACT, 2019. Ecological Assessment of three cable route crossings in the Shannon Estuary. 24pp.

Clarke, K.R. & R.M. Warwick. 2001. Changes in marine communities: An approach to statistical analysis and interpretation. 2nd Edition. *Primer-E Ltd.*

Folk, R.L. 1954. The distinction between grain size and mineral composition in sedimentary rock nomenclature. *Journal of Geology* **62 (4):** 344-359.

Hill, M. 1973. Diversity and evenness: a unifying notation and its consequences. *Ecology* **54**: 427–432.

Jost, L. 2006. Entropy and diversity. *Oikos* **113**: 363–375.

MacArthur, R.H. 1965. Patterns of species diversity. *Biological Reviews* **40**: 510–533.

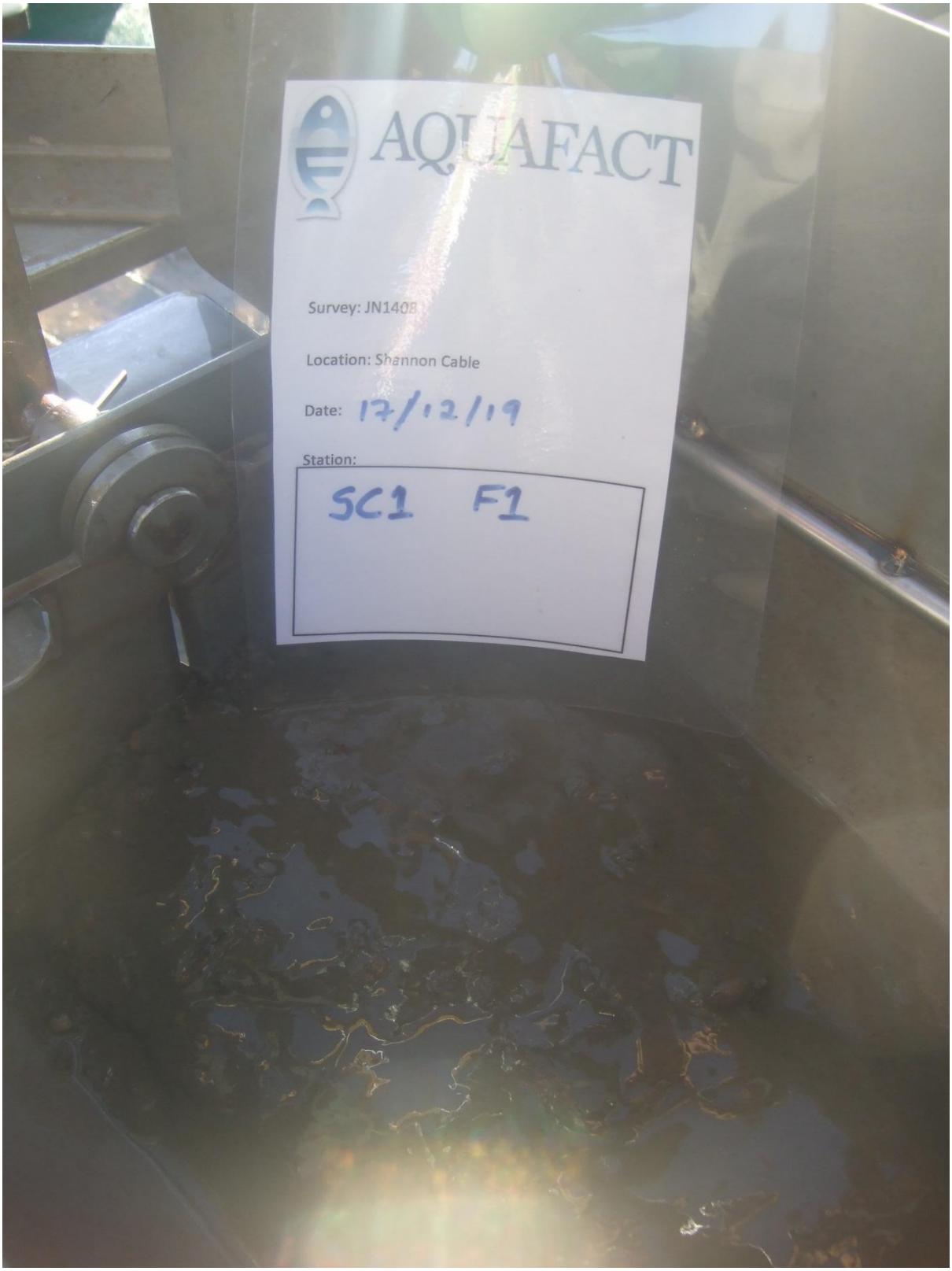
Margalef, D.R. 1958. Information theory in ecology. *General Systems* **3:** 36-71.

NPWS, 2012. Lower River Shannon SAC (site code: 2165). Conservation objectives supporting document – marine habitats and species. 33pp.

Pielou, E.C. 1977. Mathematical ecology. Wiley-Water science Publication, John Wiley and Sons. pp.385.

Shannon, C.E. & W. Weaver. 1949. The mathematical theory of communication. University of Illinois Press, Urbana.

APPENDIX 1 PHOTOGRAPHIC LOG


AQUAFACT
Survey: JN1408
Location: Shannon Cable
Date: 17/12/19
Station:
SC1 F1

SC1 F1 Grab

SC1 F1 Sieve

SC1 F2 Grab

SC1 F2 Sieve

SC1 F3 Grab


AQUAFACT
Survey: JN1408
Location: Shannon Cable
Date: 12/12/19
Station:
SC1 F3

SC1 F3 Sieve


AQUAFACT
Survey: JN1408
Location: Shannon Cable
Date: 17/12/19
Station:
SC2 F1

SC2 F3 Grab

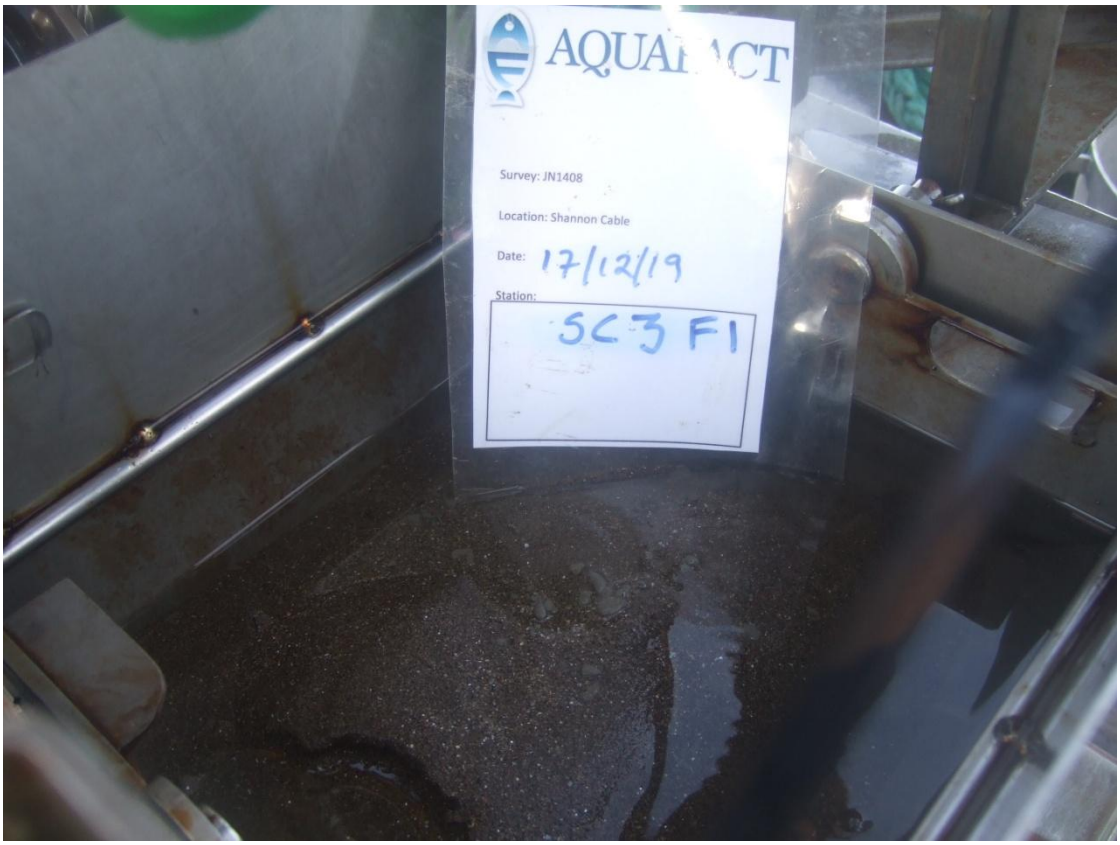
SC2 F1 Sieve

SC2 F2 Grab

SC2 F2 Sieve

SC2 F3 Grab

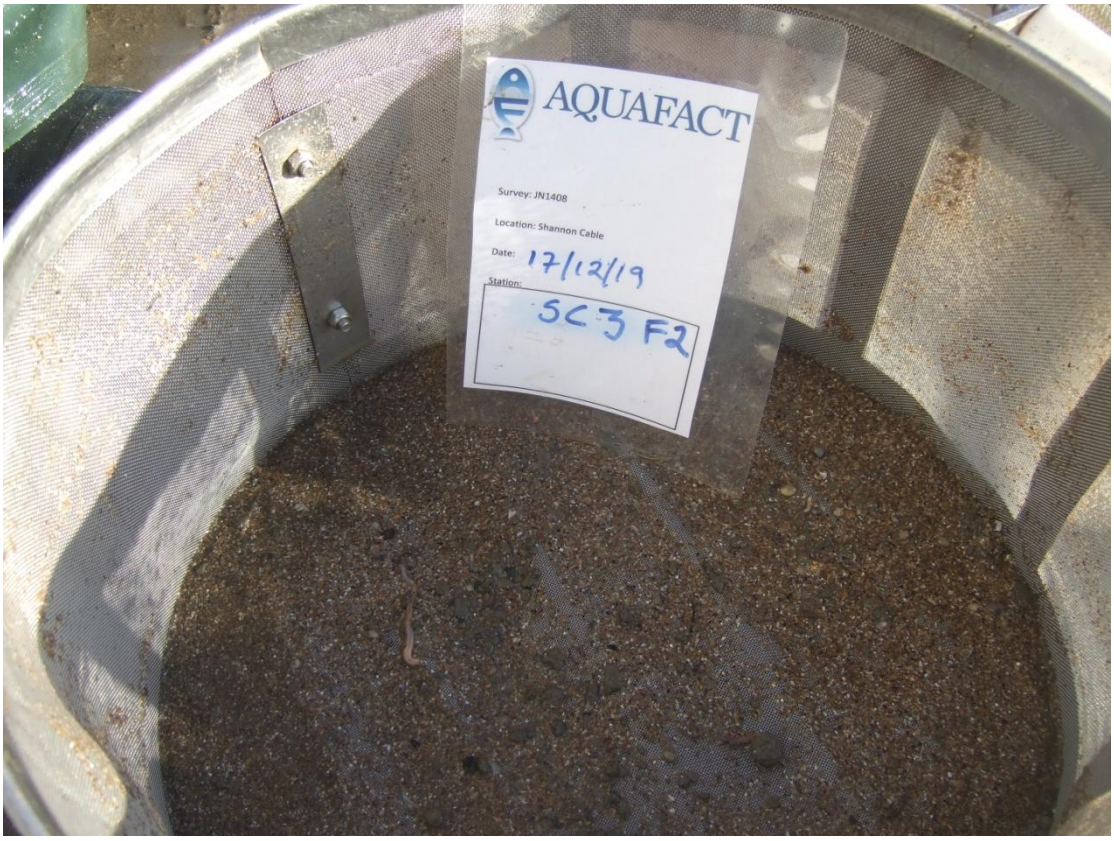
SC2 F3 Sieve



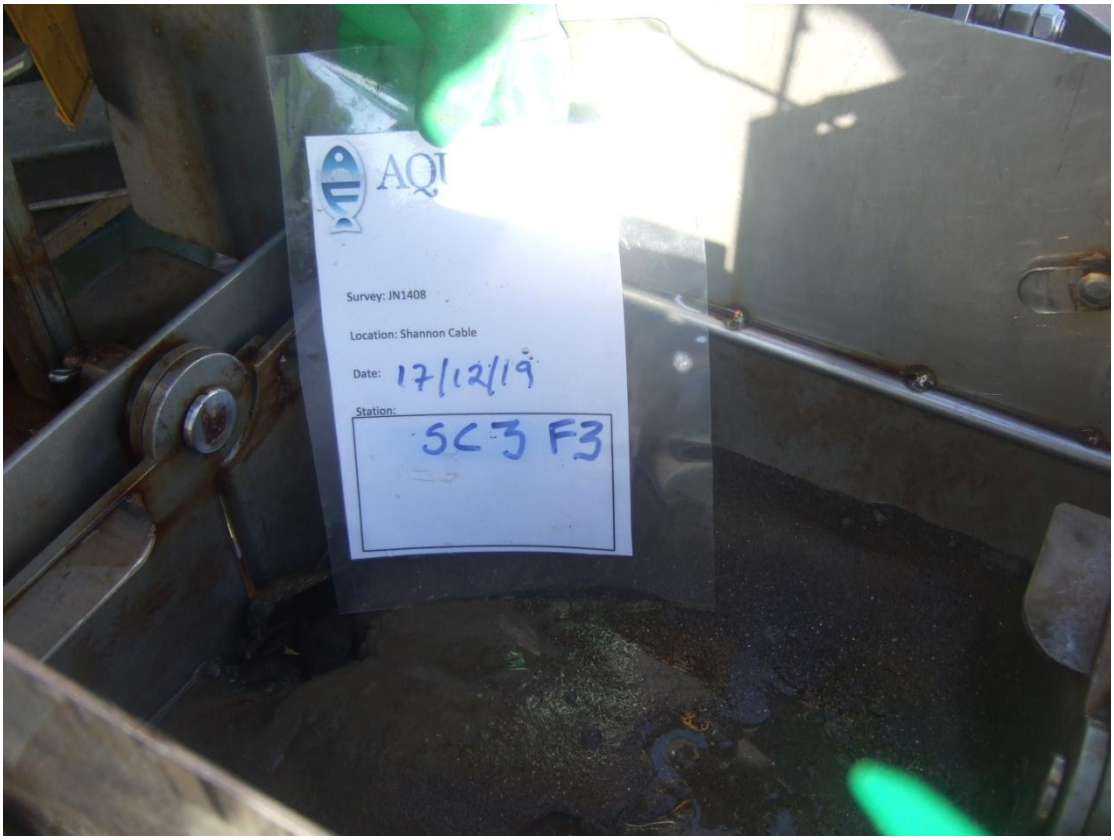
SC3 F1 Grab

SC3 F1 Sieve

SC3 F2 Grab



SC3 F2 Sieve



SC3 F3 Grab

SC2 F3 Sieve

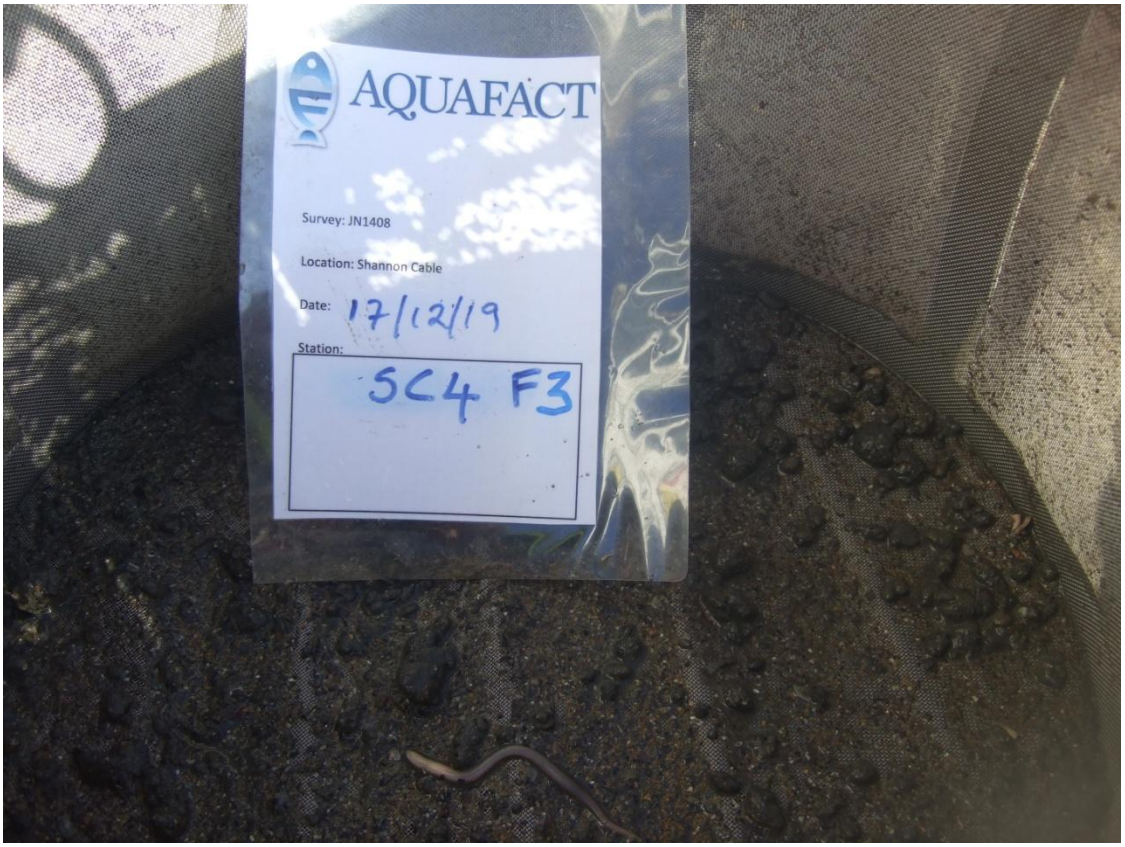
SC4 F1 Grab

SC4 F1 Sieve

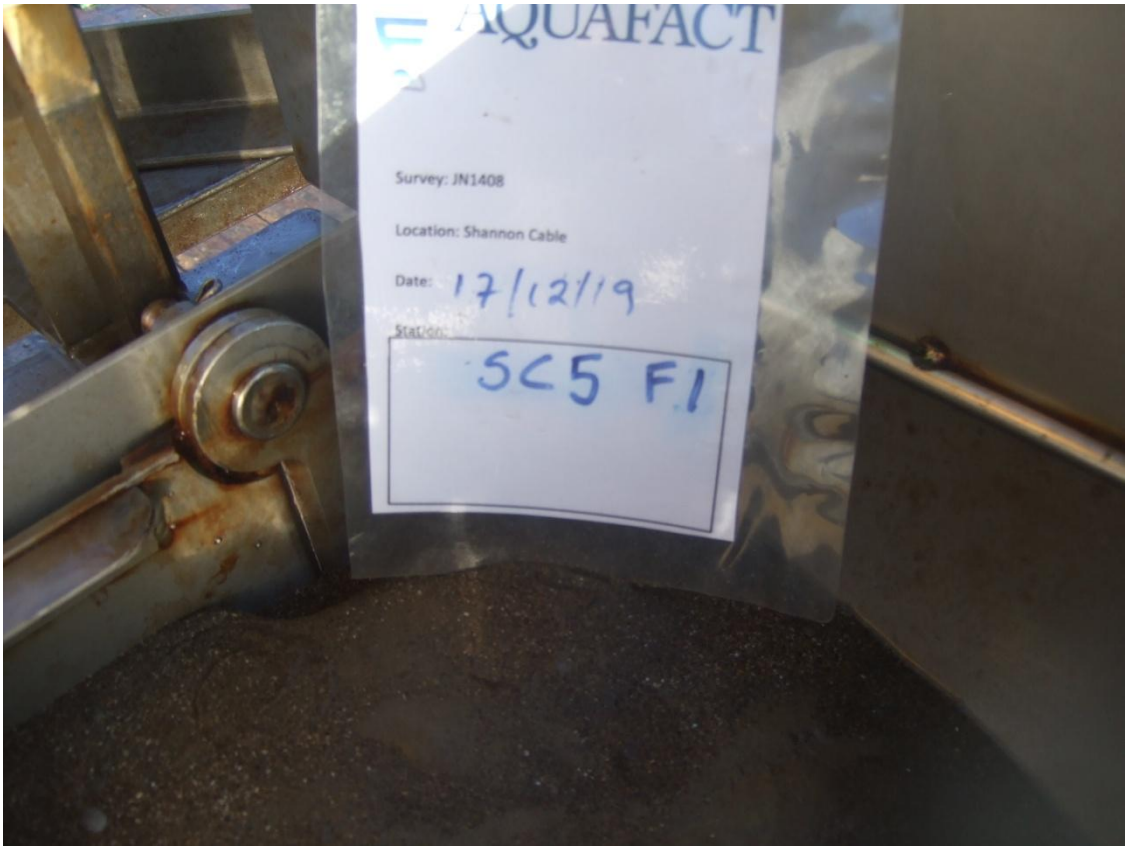
SC4 F2 Grab

SC4 F2 Sieve

SC4 F3 Grab



SC4 F3 Sieve



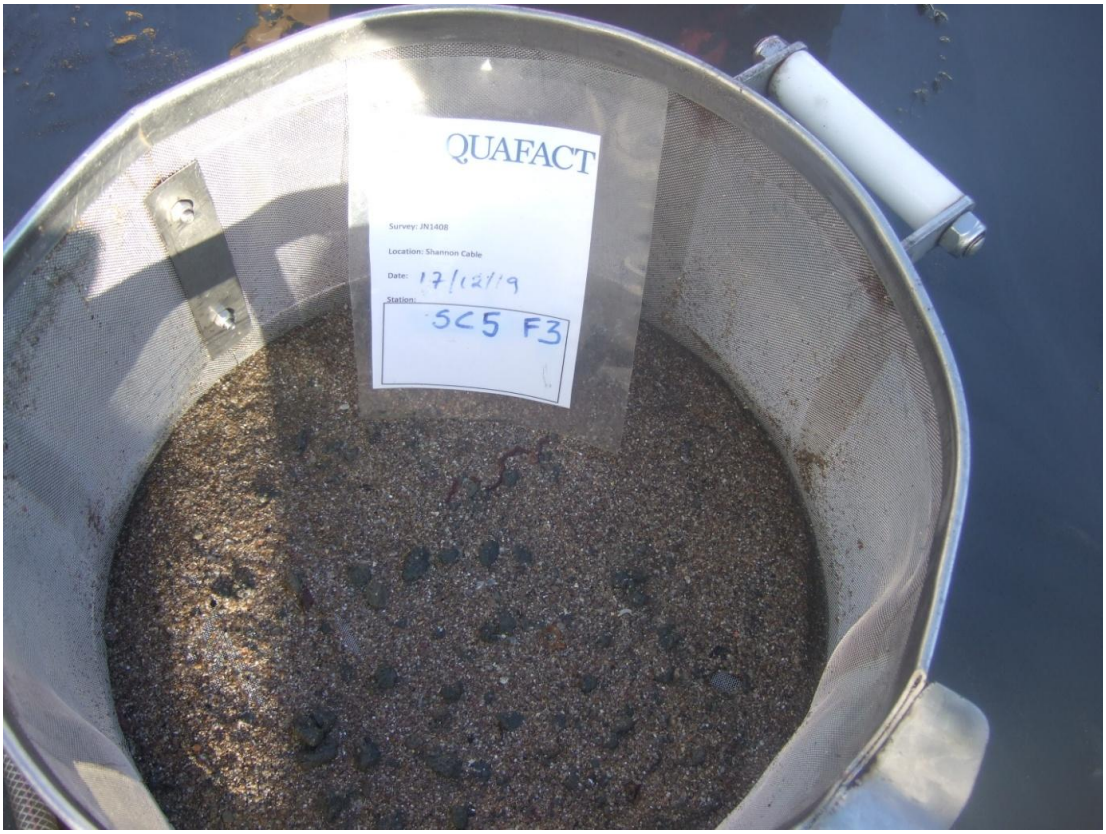
SC5 F1 Grab

SC5 F1 Sieve

SC5 F2 Grab

SC5 F2 Sieve

SC5 F3 Grab



SC5 F3 Sieve

SC6 F1 grab

SC6 F1 Sieve

SC6 F2 Grab

SC6 F2 Sieve

SC6 F3 Grab


AQUAFACT
Survey: JN1408
Location: Shannon Cable
Date: 17/12/19
Station:
SC6 F3

SC6 F3 Sieve

APPENDIX 2 SEDIMENT ANALYSIS

AQUAFACT carry out the granulometric analysis using the traditional granulometric technique. We have all of the necessary equipment required *e.g.* Wentworth graded sieves, Easysize computer software, hydrogen peroxide, sodium hexametaphosphate, drying oven, beakers, mixers, electronic scales. We have carried out sediment analysis for all subtidal sampling programmes that we have been involved in.

AQUAFACT employ the following methodology for the granulometric analysis:

1. Approximately 100g of dried sediment (previously washed in distilled water and dried) is weighed out and placed in a labelled 1L glass beaker to which 100ml of a 6 percent hydrogen peroxide solution is then added. This is allowed to stand overnight in a fume hood.
2. The beaker is placed on a hot plate and heated gently. Small quantities of hydrogen peroxide are added to the beaker until there is no further reaction. This peroxide treatment removes any organic material from the sediment which can interfere with grain size determination.
3. The beaker is then emptied of sediment and rinsed into a 63µm sieve. This is then washed with distilled water to remove any residual hydrogen peroxide. The sample retained on the sieve is then carefully washed back into the glass beaker up to a volume of approximately 250ml of distilled water.
4. 10ml of sodium hexametaphosphate solution is added to the beaker and this solution is stirred for ten minutes and then allowed to stand overnight. This treatment helps to dissociate the clay particles from one another.
5. The beaker with the sediment and sodium hexametaphosphate solution is washed and rinsed into a 63µm sieve. The retained sampled is carefully washed from the sieve into a labelled aluminium tray and placed in an oven for drying at 100ºC for 24 hours.
6. The dried sediment should then be passed through a Wentworth series of analytical sieves (>8,000 to 63µm; single phi units). The weight of material retained in each sieve is weighed and recorded. The material passing through the 63µm sieve is also weighed and the value added to the value measured in Point 5 above.
7. The total silt/clay fraction is determined by subtracting all weighed fractions from the initial starting weight of sediment as the less than 63µm fraction was lost during the various washing stages.
8. The reporting of sediment samples will be as percentages within the following range of particle sizes:

- PSA % <63
- PSA % 63<125
- PSA % 125<250
- PSA % 250<500
- PSA % 500<1000
- PSA % 1000<2000
- PSA % 2000<4000
- PSA % 4000<8000
- PSA % ≥8000

The grain size data will be used to determine Folk (1954) classification, which is standard in all AQUAFACT's reports.

The organic matter (Loss on Ignition) is carried out by ALS Labs in Loughrea using the following methodology:

1. The collected sediments are transferred to aluminium trays, homogenised by hand and dried in an oven at 100º C for 24 hours.
2. A sample of dried sediment is placed in a mortar and pestle and ground down to a fine powder.
3. 1g of this ground sediment is weighed into a pre-weighed crucible and placed in a muffle furnace at 450ºC for a period of 6 hours.
4. The sediment samples are then allowed to cool in a desiccator for 1 hour before being weighed again.
5. The organic content of the sample is determined by expressing as a percentage the weight of the sediment after ignition over the initial weight of the sediment.

APPENDIX 3 SPECIES INVENTORY

JN 1408 Shannon Cable 17/12/2019																			
Station	**AphiaID**	**SC1 F1**	**SC1 F2**	**SC1 F3**	**SC2 F1**	**SC2 F2**	**SC2 F3**	**SC3 F1**	**SC3 F2**	**SC3 F3**	**SC4 F1**	**SC4 F2**	**SC4 F3**	**SC5 F1**	**SC5 F2**	**SC5 F3**	**SC6 F1**	**SC6 F2**	**SC6 F3**
Nematoda	799	6		2	60		1	7		1		20	8	2	1		1	1	
Golfingia sp. (juv)	1648			2	214	15	3			1		3	3				1		
Golfingia (Golfingia) elongata	175026				44	20	6					5			1	1	1	6	
Polynoidae (damaged)	939			3	9	1													
Harmothoe sp. (damaged)	129491	1					1												
Harmothoe extenuata	130762																		
Harmothoe impar	130770																		
Lepidonotus squamatus	130801		1	1	2														
Pholoe sp. (juv)	129439												1						
Pholoe inornata	130601	4			25	24	4												
Pholoe baltica (sensu Petersen)	130599		2		37														
Fimbriosthenelais zetlandica	131066				1														
Phyllodocidae (partial/damaged)	931				2														
Eteone longa agg.	130616													1					
Eulalia sp. (damaged)	129445				1														
Glycera sp. (damaged)	129296											1							
Glycera tridactyla	130130							1	1										
Syllidae (damaged)	948	1			2														
Syllis sp. (damaged)	129680						1												
Syllis columbretensis	131422				7	2	1												
Syllis pontxioi	196003																		
Amblyosyllis formosa	131245																		
Parexogone hebes	757970				1							2							
Sphaerosyllis bulbosa	131379				1														
Nephtys sp. (juv)	129370	1					1		1		2	2							
Nephtys sp. (damaged)	129370	2	1	1															
Nephtys caeca	130355												1						1
Nephtys cirrosa	130357							4	1	1			2	1		1	1		
Nephtys hombergii	130359			1					3	1		1	1	3	3				
Nephtys kersivalensis	130363	1													1				

JN 1408 Shannon Cable 17/12/2019																			
Station	**AphiaID**	**SC1 F1**	**SC1 F2**	**SC1 F3**	**SC2 F1**	**SC2 F2**	**SC2 F3**	**SC3 F1**	**SC3 F2**	**SC3 F3**	**SC4 F1**	**SC4 F2**	**SC4 F3**	**SC5 F1**	**SC5 F2**	**SC5 F3**	**SC6 F1**	**SC6 F2**	**SC6 F3**
Lysidice ninetta	130071		1																
Lysidice unicornis	742232				1	1													
Marphysa sp. (damaged)	129281				1														
Lumbrineris latreilli	130248				2														
Scoloplos armiger	130537							4	1	6	5	6	4	3	1	3			
Paraonidae (damaged)	903				3			7		2	1	8	5	2		2		1	
Paradoneis lyra	130585	45	19	37	126	15	15	14		1	2	25	10	3	1	7	3	13	1
Dipolydora caulleryi	131116				2														
Dipolydora flava	131118				8														
Pygospio elegans	131170										2								
Magelona filiformis	130268												1						
Mediomastus fragilis	129892						2						2		1				
Notomastus sp. (damaged)	129220									1									
Notomastus latericeus	129898	**4**	**11**	**2**	**4**	**2**	**3**			**2**	**1**	**5**	**1**	**4**	**3**	**3**			
Euclymene oerstedii	157376	22	3	10	2			1		1									
Nicomache (Nicomache) minor	334212																		
Ophelia borealis	130491																1		
Scalibregma inflatum	130980				1	1				1									
Cirratulidae (partial/damaged)	919	3	1	3	35	3			2	1									
Flabelligera affinis	130103	1			2														
Sabellaria spinulosa	130867	1			29	7	9											3	
Melinna palmata	129808	8	4		1														
Ampharete lindstroemi agg	129781						1												
Terebellides stroemii	131573				6														
Terebellidae (damaged)	982					1													
Eupolymnia sp. (damaged)	129693				2		1												
Eupolymnia nebulosa	131489				14														
Lanice conchilega	131495																		1
Polycirrus sp. (damaged)	129710																		
Sabellidae (damaged)	985																		

JN 1408 Shannon Cable 17/12/2019																				
Station	**AphiaID**	**SC1 F1**	**SC1 F2**	**SC1 F3**	**SC2 F1**	**SC2 F2**	**SC2 F3**	**SC3 F1**	**SC3 F2**	**SC3 F3**	**SC4 F1**	**SC4 F2**	**SC4 F3**	**SC5 F1**	**SC5 F2**	**SC5 F3**	**SC6 F1**	**SC6 F2**	**SC6 F3**
Jasmineira sp. (damaged)	129533	1																	
Sabella sp. (damaged)	129549									1									
Spirobranchus triqueter	555935																		
Nymphon brevirostre	150520				1														
Achelia echinata	134599		3	5	7														
Callipallene brevirostris	134643			1															
Anoplodactylus petiolatus	134723	1			2	1													
Verruca stroemia	106257	5			1		1												
Canuella perplexa	115723											4	1						
Miraciidae (indet)	115163											1							
Euphilomedes sinister	127866			1	1	3													
Urothoe elegans	103228			1															
Harpinia sp. (juv)	101716	1		1		1													
Harpinia antennaria	102960	2	4	2		1				3	2	2	1		1				
Harpinia crenulata	102963											1							
Metaphoxus simplex	102983	8	6	5	14	15	1				1	1	1						
Ampelisca sp. (damaged)	101445	2	1												1				
Ampelisca brevicornis	101891										2								
Ampelisca diadema	101896																		
Ampelisca spinipes	101928	1																	
Bathyporeia elegans	103058							1											
Abludomelita obtusata	102788																1		
Othomaera othonis	534781		1		2	2													
Gammaropsis maculata	102364				1														
Photis longicaudata	102383	1																	
Corophiidae (damaged)	101376											1							
Monocorophium sextonae	148603	1																	
Corophium volutator	102101										1								
Unciola crenatipalma	102057				3												1		
Gnathia oxyuraea	118995				3														

JN 1408 Shannon Cable 17/12/2019																			
Station	**AphiaID**	**SC1 F1**	**SC1 F2**	**SC1 F3**	**SC2 F1**	**SC2 F2**	**SC2 F3**	**SC3 F1**	**SC3 F2**	**SC3 F3**	**SC4 F1**	**SC4 F2**	**SC4 F3**	**SC5 F1**	**SC5 F2**	**SC5 F3**	**SC6 F1**	**SC6 F2**	**SC6 F3**
Anthura gracilis	118467																		
Janira maculosa	118732																		
Chondrochelia savignyi	880874				4													1	
Tanaopsis graciloides	136458	1			11	3	1						1	1			1	1	
Tanaissus danica	247605			3															1
Apseudes talpa	136285		1		2	1	1												
Eudorella truncatula	110535			1	1						4	5		1	1				
Cumella (Cumella) pygmaea	110567											1							
Pagurus bernhardus	107232				1														
Pisidia longicornis	107188	2			3														
Liocarcinus pusillus	107393					1													
Monodaeus couchii	241154						1												
Leptochiton cancellatus	140201	1				2													
Gastropoda (damaged)	101																		
Gibbula sp. (juv)	138590			1															
Rissoa parva	141365																		
Manzonia crassa	141291					1													
Onoba semicostata	141320	1			1	1													
Hyala vitrea	140129						3												
Tritia sp. (juv)	246140																		
Nudibranch (damaged)	1762			1															
Nucula sp. (juv)	138262	31	10	2	17	3				5	2							3	
Nucula nitidosa	140589							1	14	15		3			1				
Nucula nucleus	140590	150	114	141	281	170	104	2		16	1	1	2	2			2	5	
Mytilidae (juv)	211	1				2													
Musculus subpictus	506128				1														
Anomiidae (juv)	214					1													
Anomia ephippium	138748																		
Kurtiella bidentata	345281				2					1									
Epilepton clarkiae	140366				13														

JN 1408 Shannon Cable 17/12/2019																			
Station	**AphiaID**	**SC1 F1**	**SC1 F2**	**SC1 F3**	**SC2 F1**	**SC2 F2**	**SC2 F3**	**SC3 F1**	**SC3 F2**	**SC3 F3**	**SC4 F1**	**SC4 F2**	**SC4 F3**	**SC5 F1**	**SC5 F2**	**SC5 F3**	**SC6 F1**	**SC6 F2**	**SC6 F3**
Spisula subtruncata	140302									2									
Cardiidae (juv)	229					1													
Parvicardium pinnulatum	181343					1													
Limecola balthica	880017									1									
Abra sp. (juv)	138474											1							
Abra alba	141433	3	4	2	3	2	1				4	1		1	1			1	2
Abra nitida	141435									1									
Abra prismatica	141436																	1	
Veneridae (juv.)	243	1																	
Hiatella arctica	140103				14	4												1	
Crisia denticulata	111695						+						+						
Crisia eburnea	111696					+	+			+			+						
Alcyonidium diaphanum	111597	+				+				+								+	
Ophiothrix fragilis	125131																		
Ophiura sp. (juv)	123574				1														
Thyone fusus	124670	1																	
Oncus planci	124647			1															
Dendrodoa grossularia	103882	31	1																
Molgula sp. (juv)	103509	1			1														

APPENDIX 4 SIMPER ANALYSIS

Table 1: SIMPER analysis of Group b fauna.

Group b					
Average similarity: 44.27					
Species	**Av.Abund**	**Av.Sim**	**Sim/SD**	**Contrib%**	**Cum.%**
Paradoneis lyra	2.07	6.35	6.11	14.34	14.34
Nucula nucleus	1.57	4.45	5.09	10.05	24.39
Nematoda	1.62	4.34	7.31	9.79	34.19
Paraonidae (damaged)	1.52	4.12	5.36	9.31	43.5
Nephtys cirrosa	1.24	3.64	6.13	8.22	51.72
Scoloplos armiger	1.35	2.59	0.9	5.85	57.57
Golfingia (Golfingia) elongata	1.08	2.19	0.89	4.94	62.51
Abra alba	1	2.1	0.89	4.74	67.25
Notomastus latericeus	1.15	2.05	0.88	4.63	71.88
Nephtys hombergii	1.04	1.97	0.87	4.44	76.32
Nucula sp. (juv)	1	1.88	0.88	4.25	80.57
Tanaopsis graciloides	0.8	1.71	0.88	3.87	84.44
Harpinia antennaria	0.95	1.68	0.91	3.79	88.23
Nucula nitidosa	1.16	1.68	0.91	3.79	92.01

Table 4: SIMPER analysis of dissimilarity between Groups a and b

Groups a & b.

Average dissimilarity = 73.04

	Group a	**Group b**				
Species	**Av.Abund**	**Av.Abund**	**Av.Diss**	**Diss/SD**	**Contrib%**	**Cum.%**
Nucula nucleus	4.67	1.57	2.66	5.02	3.64	3.64
Pholoe inornata	2.06	0	1.68	5.81	2.3	5.94
Metaphoxus simplex	2.21	0.33	1.64	2.55	2.25	8.19
Pholoe baltica (sensu Petersen)	1.83	0	1.48	4.72	2.03	10.22
Achelia echinata	1.65	0	1.44	4.51	1.97	12.19
Cirratulidae (partial/damaged)	2.05	0.33	1.43	2.51	1.96	14.15
Euclymene oerstedii	1.81	0.3	1.41	1.45	1.93	16.08
Golfingia sp. (juv)	2.55	0.89	1.34	1.3	1.83	17.91
Polynoidae (damaged)	1.55	0	1.3	11.88	1.78	19.7
Melinna palmata	1.43	0	1.3	2.03	1.78	21.48
Sabellaria spinulosa	1.8	0.33	1.22	2.21	1.67	23.15
Nucula sp. (juv)	2.34	1	1.21	1.57	1.66	24.81
Golfingia (Golfingia) elongata	1.45	1.08	1.2	1.95	1.64	26.44
Verruca stroemia	1.34	0	1.18	3.16	1.62	28.07

	Group a	Group b				
Species	**Av.Abund**	**Av.Abund**	**Av.Diss**	**Diss/SD**	**Contrib%**	**Cum.%**
Scoloplos armiger	0	1.35	1.14	1.53	1.56	29.63
Paradoneis lyra	3.35	2.07	1.09	3.71	1.5	31.13
Pisidia longicornis	1.25	0	1.07	6.34	1.47	32.6
Nephtys cirrosa	0	1.24	1.07	3.93	1.46	34.06
Lepidonotus squamatus	1.19	0	1.03	4.87	1.41	35.46
Euphilomedes sinister	1.21	0	1.01	12.72	1.39	36.85
Othomaera othonis	1.21	0	1.01	12.72	1.39	38.24
Apseudes talpa	1.21	0	1.01	12.72	1.39	39.63
Nucula nitidosa	0	1.16	0.98	1.25	1.34	40.97
Anoplodactylus petiolatus	1.16	0	0.98	11.08	1.34	42.31
Harpinia sp. (juv)	1.09	0	0.96	3.46	1.32	43.62
Syllidae (damaged)	1.09	0	0.93	7.93	1.28	44.9
Flabelligera affinis	1.09	0	0.93	7.93	1.28	46.18
Leptochiton cancellatus	1.09	0	0.93	7.93	1.28	47.45
Onoba semicostata	1.09	0	0.93	7.93	1.28	48.73
Mytilidae (juv)	1.09	0	0.93	7.93	1.28	50.01
Paraonidae (damaged)	0.66	1.52	0.89	1.24	1.21	51.22
Harmothoe sp. (damaged)	1	0	0.87	4.87	1.18	52.41
Hiatella arctica	1.03	0.25	0.78	1.14	1.06	53.47
Nephtys sp. (juv/damaged)	1.25	0.6	0.7	1.09	0.96	54.43
Eupolymnia nebulosa	0.97	0	0.69	0.93	0.94	55.37
Notomastus latericeus	1.88	1.15	0.68	0.92	0.93	56.31
Epilepton clarkiae	0.95	0	0.68	0.93	0.93	57.24
Nephtys hombergii	0.5	1.04	0.65	1.51	0.9	58.13
Syllis columbretensis	0.89	0	0.63	0.93	0.87	59
Tanaissus danica	0.66	0.25	0.63	1.01	0.86	59.86
Ampelisca sp. (damaged)	0.66	0.25	0.63	1.01	0.86	60.72
Eudorella truncatula	1	0.73	0.63	1.85	0.86	61.57
Nematoda	2.24	1.62	0.61	1.52	0.84	62.41
Dipolydora flava	0.84	0	0.6	0.93	0.82	63.23
Abra alba	1.65	1	0.57	1.01	0.79	64.02
Tanaopsis graciloides	1.48	0.8	0.57	1.16	0.77	64.79
Terebellides stroemii	0.78	0	0.56	0.93	0.76	65.56
Harpinia antennaria	1.34	0.95	0.55	0.95	0.75	66.31
Chondrochelia savignyi	0.71	0.25	0.55	1.06	0.75	67.06
Unciola crenatipalma	0.66	0.25	0.51	1.04	0.7	67.76
Lysidice ninetta	0.5	0	0.51	0.93	0.7	68.46
Jasmineira sp. (damaged)	0.5	0	0.51	0.93	0.7	69.15
Callipallene brevirostris	0.5	0	0.51	0.93	0.7	69.85
Urothoe elegans	0.5	0	0.51	0.93	0.7	70.55
Ampelisca spinipes	0.5	0	0.51	0.93	0.7	71.24
Photis longicaudata	0.5	0	0.51	0.93	0.7	71.94

	Group a	Group b				
Species	**Av.Abund**	**Av.Abund**	**Av.Diss**	**Diss/SD**	**Contrib%**	**Cum.%**
Monocorophium sextonae	0.5	0	0.51	0.93	0.7	72.64
Gibbula sp. (juv)	0.5	0	0.51	0.93	0.7	73.33
Nudibranch (damaged)	0.5	0	0.51	0.93	0.7	74.03
Veneridae (juv.)	0.5	0	0.51	0.93	0.7	74.72
Thyone fusus	0.5	0	0.51	0.93	0.7	75.42
Oncus planci	0.5	0	0.51	0.93	0.7	76.12
Mediomastus fragilis	0.59	0.55	0.5	0.99	0.69	76.81
Eupolymnia sp. (damaged)	0.66	0	0.47	0.93	0.64	77.45
Gnathia oxyuraea	0.66	0	0.47	0.93	0.64	78.09
Hyala vitrea	0.66	0	0.47	0.93	0.64	78.73
Nephtys kersivalensis	0.5	0.25	0.47	0.92	0.64	79.37
Scalibregma inflatum	0.59	0.25	0.46	1	0.63	80
Kurtiella bidentata	0.59	0.25	0.46	1	0.63	80.63
Phyllodocidae (partial/damaged)	0.59	0	0.42	0.93	0.58	81.21
Lysidice unicornis	0.59	0	0.42	0.93	0.58	81.79
Lumbrineris latreilli	0.59	0	0.42	0.93	0.58	82.37
Dipolydora caulleryi	0.59	0	0.42	0.93	0.58	82.96
Parexogone hebes	0.5	0.3	0.42	0.97	0.58	83.53
Nephtys caeca	0	0.5	0.42	0.9	0.58	84.11
Fimbriosthenelais zetlandica	0.5	0	0.36	0.93	0.49	84.6
Eulalia sp. (damaged)	0.5	0	0.36	0.93	0.49	85.09
Syllis sp. (damaged)	0.5	0	0.36	0.93	0.49	85.58
Sphaerosyllis bulbosa	0.5	0	0.36	0.93	0.49	86.07
Marphysa sp. (damaged)	0.5	0	0.36	0.93	0.49	86.55
Ampharete lindstroemi agg	0.5	0	0.36	0.93	0.49	87.04
Terebellidae (damaged)	0.5	0	0.36	0.93	0.49	87.53
Nymphon brevirostre	0.5	0	0.36	0.93	0.49	88.02
Gammaropsis maculata	0.5	0	0.36	0.93	0.49	88.51
Pagurus bernhardus	0.5	0	0.36	0.93	0.49	89
Liocarcinus pusillus	0.5	0	0.36	0.93	0.49	89.48
Monodaeus couchii	0.5	0	0.36	0.93	0.49	89.97
Manzonia crassa	0.5	0	0.36	0.93	0.49	90.46