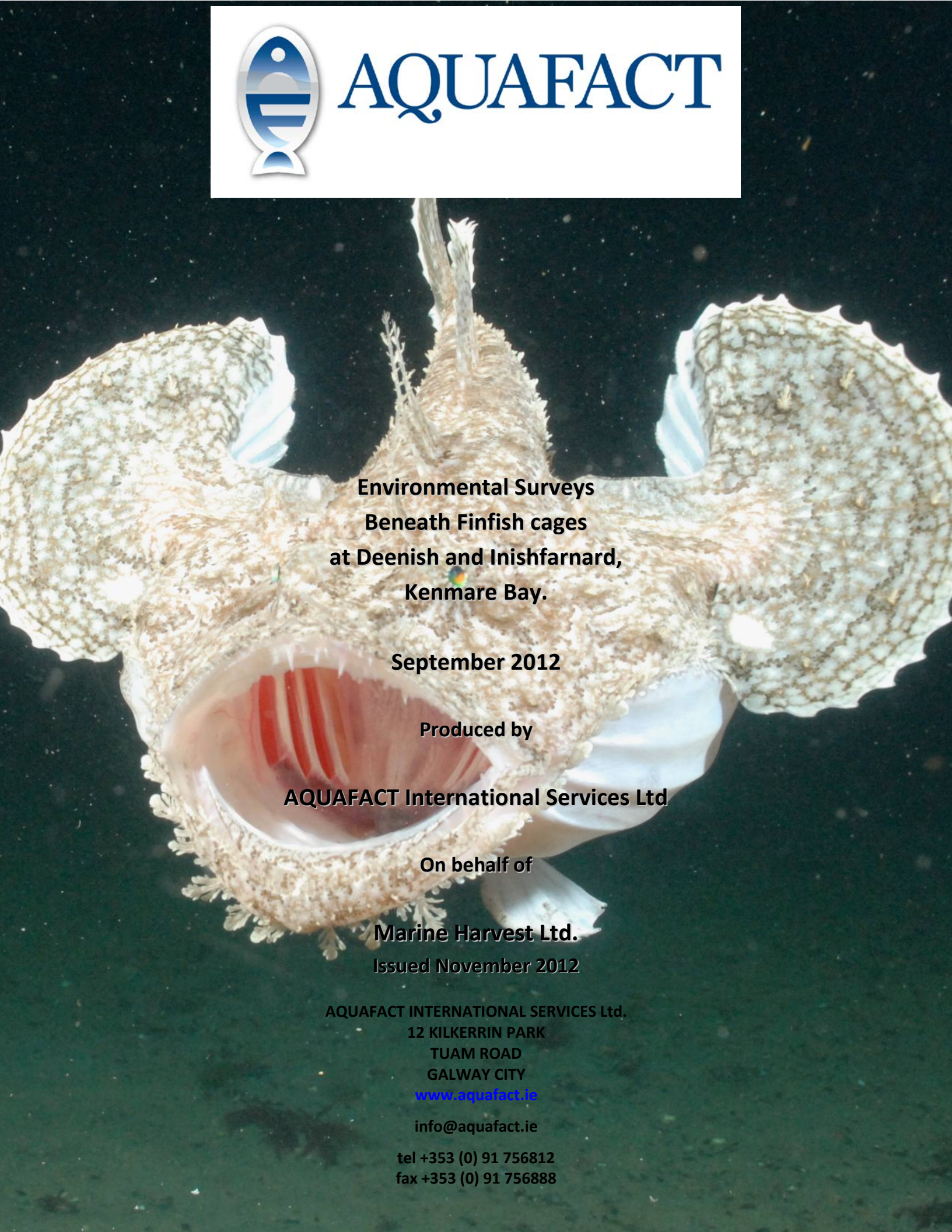

Environmental Surveys Beneath Finfish cages at Deenish and Inishfarnard, Kenmare Bay.

September 2012

Produced by

AQUAFACT International Services Ltd

On behalf of

Marine Harvest Ltd.

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1. Introduction

This report documents the environmental conditions of the seabed at two Marine Harvest Ireland finfish (*Salmo salar*) aquaculture sites in Kenmare Bay, Co. Kerry / Cork on September, 2012 (see Figure 1.1). One of the sites investigated during the current work is situated close to Deenish Island, County Kerry on the northern shore of Kenmare River. The second site is located at Inishfarnard, County Cork, off Kilcatherine point, on the southern shore of Kenmare Bay.

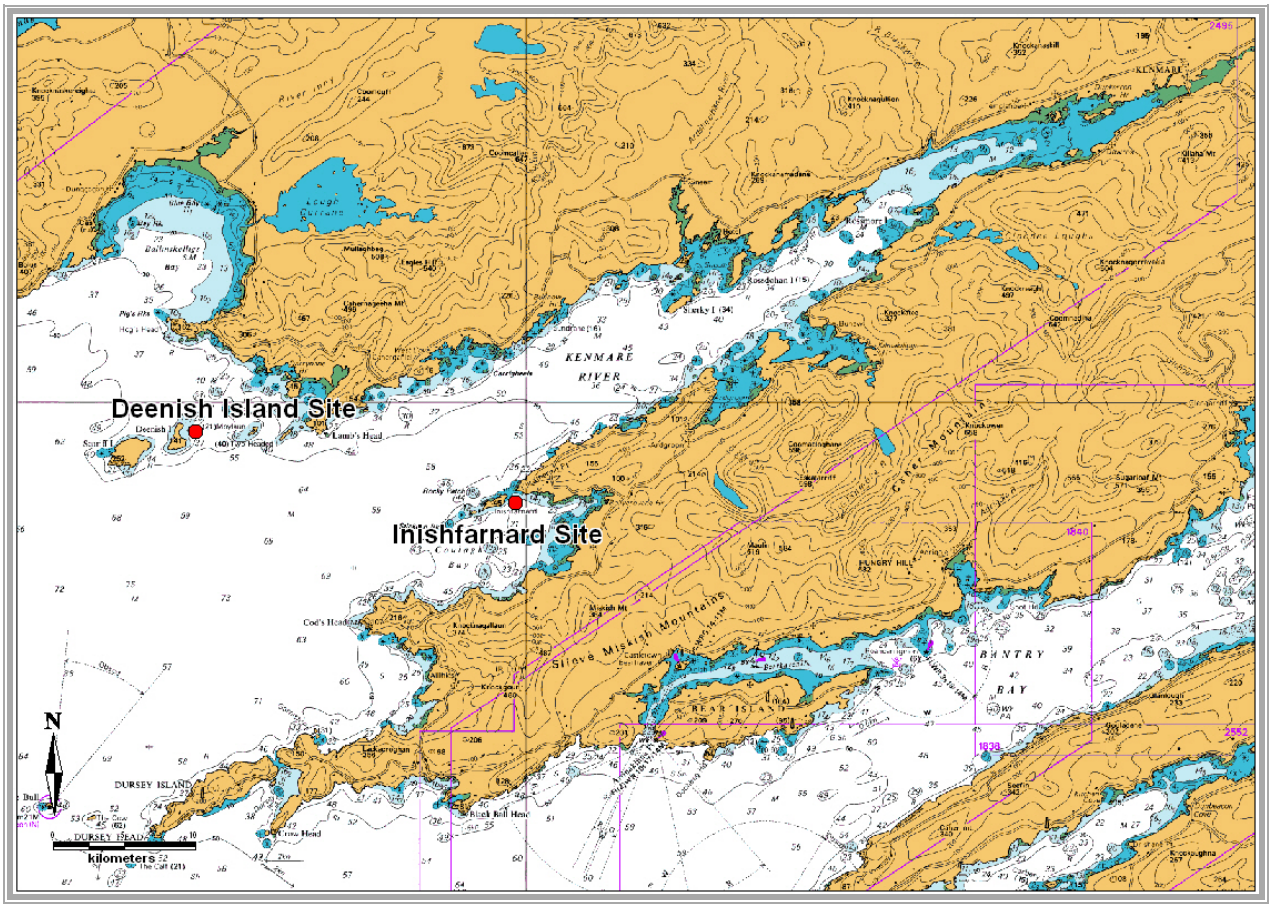


Figure 1.1. Map showing the location of the two sites surveyed in Kenmare Bay

Kenmare Bay, Co. Kerry, is a long and narrow, south-west facing bay. It is a deep, drowned glacial valley and the bedrock is mainly Old Red Sandstone which forms reefs along the middle of the bay throughout its length. Exposure to prevailing winds and swells at the mouth diminishes towards the head of the bay.

Numerous islands and inlets along the length of the bay provide further areas of additional shelter in which a variety of habitats and unusual communities occur.

Two Natura 2000 sites are of relevance for the Deenish site (see Figure 1.2). Deenish Island is located in the outer reaches of the Kenmare River cSAC (site code: 002158) and the island forms part of the Deenish Island and Scariff Island SPA (site code: 004175). The Kenmare River cSAC is of relevance to the Inishfarnard site.

Kenmare River cSAC has a very wide range of marine communities from exposed coast to ultra-sheltered areas. The site contains three marine habitats listed on Annex I of the EU Habitats Directive, namely reefs, large shallow bay and caves. There is also an extremely high number of rare and notable marine species present (24) and some uncommon communities. Kenmare River is the only known site in Ireland for the northern sea-fan, *Swiftia pallida* and is the only known area where this species and the southern sea-fan *Eunicella verrucosa* co-occur. Midway along the south coast of Kenmare River, a series of sea caves stretch back into the cliff. They typically support encrusting sponges, ascidians and bryozoans.

Deenish Island and Scariff Island are small- to medium-sized islands situated between 5 and 7 km west of Lamb's Head off the Co. Kerry coast; they are thus very exposed to the force of the Atlantic Ocean. The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Fulmar, Manx Shearwater, Storm Petrel, Lesser Black-backed Gull and Arctic Tern. Scariff is the larger of the two. It is steep-sided all the way around and rises to a peak of 252m. The highest cliffs are on the south side. The island vegetation is a mix of maritime grassland, areas dominated by Bracken and heathy areas with Ling Heather. There are the ruins of a monastic settlement and a cottage in the north-east sector of the island. Deenish is less rugged than Scariff, and rises to 144m in its southern half; the northern half is lower and flatter. The vegetation is mostly grassland, with some heath occurring on the higher ground. Old fields are now overgrown with Bracken and brambles. The sea areas to 500m around the islands are included inside the SPA boundary to provide a 'rafting' area for shearwaters.

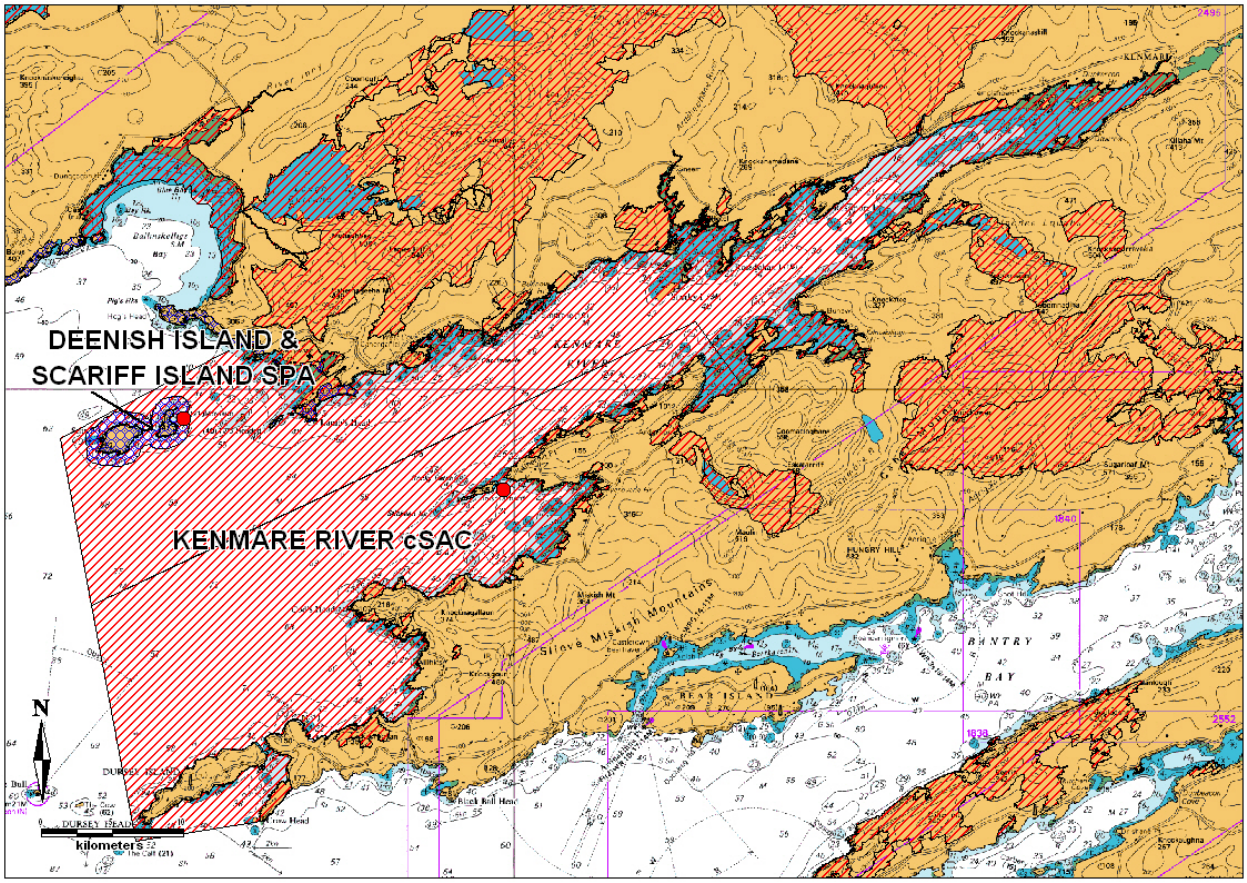


Figure 1.2. Map showing the locations of the relevant cSAC and SPA.

1.1. Offshore finfish farms – benthic monitoring

The main objective of the survey was to assess the overall state of the environment in relation to the salmon production process. The site was surveyed according to the revised Benthic Monitoring Guidelines laid down by the Department of Agriculture, Fisheries and Food (December 2008). The benthic monitoring requirements at a fish farm are dependent on the level of biomass held at the site and the local hydrography. Table 1.1 below sets out the level of benthic monitoring required based on tonnage produced and mean current speeds at a fish farm:

Table 1.1. Matrix of production tonnage versus current speed to determine level of benthic monitoring required.

	MEAN CURRENT SPEED (CMS^{-1})		
TONNAGE	**<5**	**5-10**	**>10**
0-499	Level I	Level I	Level I
500-999	Level II	Level I	Level I
>1000	Level II	Level II	Level I

The current speed is a mean value calculated from maximum current measurements over spring and neap tidal cycles at the surface and near the bottom. The tonnage refers to the maximum biomass predicted for each site. An annual survey must be carried out at each site (production and smolt) operated by a company. A level I or level II survey may be carried out as follows:

Level I: Video/photographic and visual observations and recordings shall be made at the following stations:

- At a minimum of 2 sites directly beneath the cages
- At the edges of the cages
- Two transects at right angles to each other. Along each transect sampling stations at +/- 10m, +/- 20m, +/- 50m and + 100m from the cages
- At a control site

In addition to the above, the following samples/measurements shall be taken at the same stations as above. These will be used to calculate sediment quality parameters.

- A minimum of one Redox potential reading shall be made at each sampling station.
- A single sediment sample for Organic Carbon measurement.

Level II: In addition to the above, two replicate grab samples shall be captured at each of the sample stations for faunal analysis. The exact locations of sampling points should be agreed in advance with the Department of Agriculture Fisheries and Food (DAFF). The identification and abundance of macro-faunal invertebrates shall be estimated and tabulated. Identification of fauna to the level of species will be required.

The current surveys at the Deenish and Inishfarnard sites were carried out at Level II.

It is important to take note that the exact position of the individual cage structures are not permanently fixed to a single position and there is a relatively large lateral movement due to depth, wind, currents and tides. For this reason bottom stations particularly at the under , edge and 10m zones are taken at the time of sampling but may vary relative to the overlying cage position under various environmental conditions.

2. Sampling Procedure & Processing

All survey work took place on the September 2012. The dive at the Deenish site was conducted at a maximum depth of 23.2m and underwater visibility on the day was good at approximately 3 to 5m at Inishfarnard and up to 19m at Deenish. The dive at the Inishfarnard site was conducted at a maximum depth of 23m and underwater visibility on the day was good with the exception of a high suspended load in the upper water column. Cage layouts at the time of survey, dive entry points and benthic transects followed by the divers are shown in Figures 3.2 & 3.9 for Deenish and Figures 3.23 and 3.30 for Inishfarnard (Section 3).

Disinfection

Prior to each dive survey for each location all diving equipment, suits and boats are thoroughly disinfected utilizing both a dipping and spraying protocol.

2.1. Dive survey

Two dive transects (one parallel with the direction of the prevailing current and one perpendicular to the prevailing current) were laid out from the sea surface at each site using a boat equipped with a GPS mapper. Cage locations were noted as DGPS positions using a Trimble GeoXT, which is capable of sub-meter horizontal accuracy using real time corrections from the integrated EGNOS (European Geostationary Navigation Overlay System) receiver. Acoustic beacons were deployed to assist the divers in locating transect marks while underwater. The underwater survey itself involved the direct observation, sampling and recording (photographic and written) of benthic conditions by qualified

biologists at a number of sites along the transects:

- directly under the cage (T1 Under)
- under the edge of the cage (T1 Edge)
- at 10m (T1 10m, T1 10m), 20m (T1 20m, T2 20m), 50m (T1 50m, T2 50m) and 100m (T1 100m) from the cages.

A reference station (Ref) was also assessed to give a representation of ambient benthic conditions in the area immediately surrounding the cage installations and served for comparison purposes. As such, it represents the 'undisturbed' condition of the seafloor surrounding the sites – it was taken at a distance greater than 200m from the cage installations.

All dives were carried out by highly experienced, qualified biologists who made notes of features and species encountered during the dives – these were transcribed to logs upon surfacing. In addition to standard SCUBA gear the divers were equipped with:

- A high end dSLR camera for photographing epibenthos. Photographs were taken at the prescribed stations along each transect and observations on benthic conditions at the site were noted down. The camera used was a Nikon D200 in a Subal ND20 underwater housing fitted with a 12-24mm lens and two INON strobes.
- A hand-held dSPI camera for photographing sediment profiles, i.e. images were taken of the sediment in cross profile at depths of to 23cm (Mean redox measurements were made using digital sediment profile imagery (SPI). This unit uses a Canon EOS 450D camera with Nikkor optics).
- A SONAR receiver & compass for underwater navigation.
- Two × 5cm diameter corers for taking faunal samples (for the Under station only, grabs were used for all other stations).
- Pre-labelled bags to take sediment samples for organic carbon analysis.
- Dive slates and waterproof pencils for making notes.
- Torches.

The divers photographed representative areas of the sediment and fauna and recorded observations in situ at the various stations investigated. Notes were completed during discussion immediately on

surfacing and a map of the dive track was drawn up. Observations recorded during the dive may include:

- Presence of bacterial mats and uneaten food
- Presence of farm-derived litter
- Presence of gas bubbles or anoxic areas
- Animals visible or evidence of their presence
- Macroalgae visible
- Sediment colour and texture – among other things.

By noting the species of animals present and their densities, any tracks of animals or the presence of species that are known to be connected with certain states of benthic enrichment, the health of the benthos (including the highlighting of some potential problems) may be gauged.

An acoustic beacon was dropped on a buoyed line at the end of the 100m transect to allow the divers (equipped with an acoustic receiver unit) to determine their distance from this mark. This also allowed simplified underwater navigation – the unit gives the divers both range and direction of the beacon.

2.2. Sediment Profile Imagery (SPI)

A Sediment Profile Image (SPI) was also acquired at each of the stations mentioned above. These images were acquired using a diver-deployed sediment profile imaging camera system. This system is comprised of a digital SLR camera in a water-tight pressure vessel that is mounted above a prism that penetrates the upper 25cm of sediment (see Figure 2.1 for image). The sediment profile is viewed through a plexiglass window. Its image is reflected to the camera lens via a plane mirror. Illumination is provided by an internally-mounted strobe.

The diver depresses the unit into the seafloor and manually triggers the camera. This process is repeated at each station investigated. The prism unit is filled with distilled water – thus ambient water clarity is never a limiting factor in image quality.

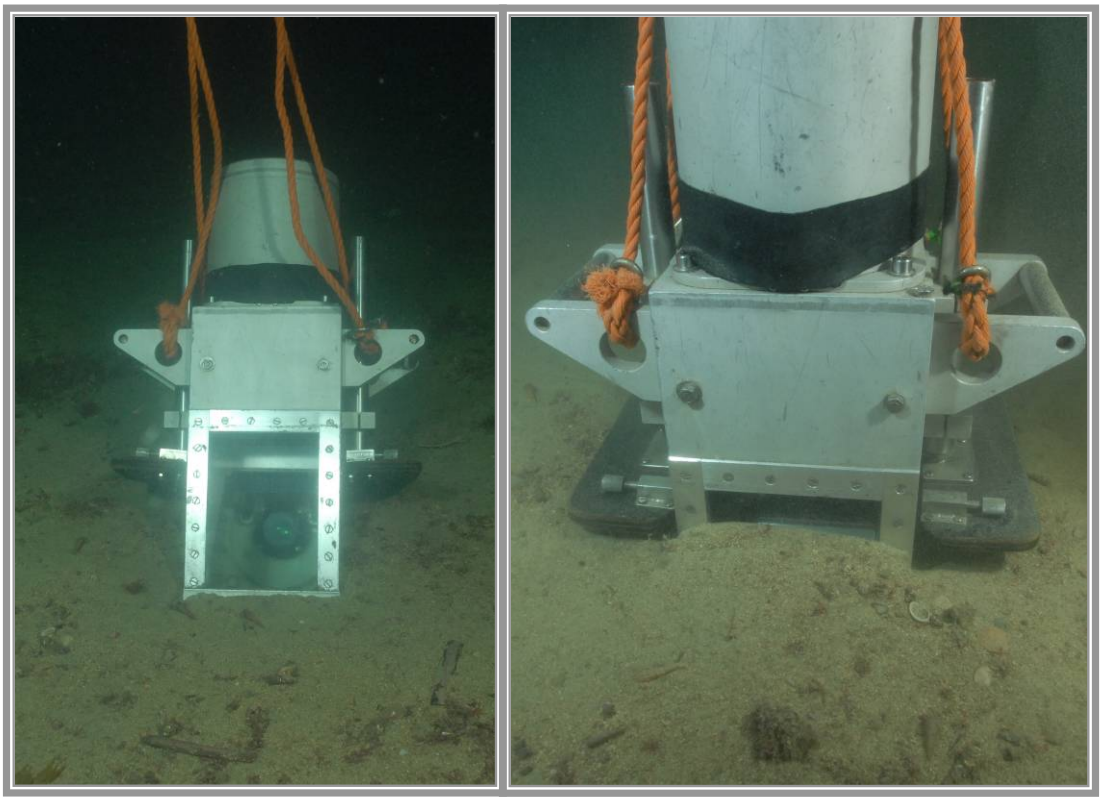


Figure 2.1. Diver operated Sediment Profile Imaging camera. The left-hand image gives a view of the camera at the sediment surface. The right-hand image shows the SPI camera when inserted into the sediment.

A great deal of information about benthic processes is available from sediment profile images. Measurable parameters, many of which are calculated directly by image analysis, include physical/chemical parameters (i.e. sediment type measured as grain size major mode, prism penetration depth providing a relative indication of sediment shear strength, sediment surface relief, condition of mud clasts, redox potential discontinuity depth and degree of contrast, sediment gas voids) and biological parameters (i.e. infaunal successional stage of a well documented successional paradigm for soft marine sediments (see Pearson and Rosenberg, 1978), degree of sediment reworking, dominant faunal type, epifauna and infauna, depth of faunal activity, presence of microbial aggregations).

For the purposes of the current survey the primary feature of interest is the depth of oxygen penetration into the sediments in the vicinity of the finfish cages (this information is required to satisfy the requirements of the Benthic Monitoring Protocol (DAFF, 2008). In this case the apparent redox potential discontinuity or ARPD depth is measured. Features of particular interest that may be gleaned from SPI images taken in sediments in the vicinity of finfish cages include the presence of:

- uneaten feed pellets (and depth of this material)
- faecal casts
- and depth of shell gravel deposits
- of gas voids in the sediment (refer to Figure 2.2)

Figure 2.2. Typical sediment profile images with examples of features.

2.3. Sampling for faunal analysis

Sediment samples for faunal analysis were collected in one of two ways:

- Using handheld (15cm diameter) corers at the under cage station.
- Using a small (0.) van Veen grab at all other stations.

At each station, two replicate grab/core samples were collected. The faunal returns were sieved on a 1 mm mesh sieve, stained with Rhodamine dye, fixed with 10% buffered formalin and preserved in 70% alcohol. Samples were then sorted under a microscope (x 10 magnification) back in the laboratory, into four main groups: polychaeta, mollusca, crustacea and others. The 'others' group consisted of echinoderms, nematodes, nemerteans, cnidarians and other lesser phyla. The taxa were then identified to species level where possible.

2.3.1. Data Processing

The faunal replicates for each station were combined to give a total abundance for each station prior to analyses. A data matrix of all the combined faunal abundance data was compiled and used for statistical analyses. The faunal analysis was carried out using PRIMER ® (Plymouth Routines in Multivariate Ecological Research).

Univariate statistics in the form of diversity indices were calculated on the combined replicate data. The following diversity indices were calculated:

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 (=)

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

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

where: is the proportion of the total count accounted for by the taxa

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 diversity index incorporates both of these parameters.

The PRIMER ® manual (Clarke & Warwick, 2001) was used to carry out multivariate analyses on the station-by-station faunal data. All species/abundance data were fourth root transformed and used to

prepare a Bray-Curtis similarity matrix in PRIMER®. The fourth root transformation was used in order to down-weigh the importance of the highly abundant species and allow the mid-range and rarer species to play a part in the similarity calculation. The similarity matrix was then 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 is 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. The CLUSTER programme was set to include a series of 'similarity profile' (SIMPROF) permutation tests, which look for statistical evidence of genuine clusters in samples which are *a priori* unstructured. SIMPROF performs tests at every node of a completed dendrogram, that the group being sub-divided has 'significant' internal structure. The test results are displayed in a colour convention on the dendrogram plot (samples connected by red lines cannot be significantly differentiated).

The Bray-Curtis similarity matrix was also subjected to a non-metric multi-dimensional scaling (MDS) algorithm (Kruskall & Wish, 1978), using the PRIMER ® program MDS. This programme produces 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 and 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.

2.4. Sampling for organic carbon analysis

An additional grab/core sample was taken at each of the stations and used for organic carbon analyses. All samples were stored in pre-labelled plastic bags, kept in cold freezer boxes onboard the vessel and frozen at -20°C on return to the lab.

Organic carbon analysis was carried out by OMAC laboratories using the Loss on Ignition (LOI) technique. This method involves oven drying the sediment sample in a muffle furnace (450°C for a period of 6 hours) after which time 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.

3. Results

3.1. Deenish

3.1.1. Recent Stocking History

Fish were stocked to the Deenish cages on March 2012. The Deenish Island site was fallow for a period of 5 weeks (January - March 2012) prior to stocking. Approximately 405,000 fish with a mean weight of 80.4g (32.6 tonnes) were transferred to the site in March 2012. At the time of the survey approximately 238,600 fish remained on site with an average weight of 800g (190.9 tonnes). Discounting mortalities due to AGD, this gives an onsite production biomass of 158.3 tonnes prior to the survey. Mean current speed at the site is approximately 0.3ms^{-1}.

Figure 3.1. View of cages at Deenish Island site, viewed at sea, September 2012.

3.1.2. Seabed Physical Characteristics

The seabed was composed of a mix of sediment types with areas of:

- Sand – The seabed at the under cage and cage edge stations was composed of fine-medium sand. The seafloor at the 10m and 20m stations was composed of a slightly coarser sand mix.
- Shell gravel and sand mix – the seafloor beyond the 20m stations was composed of sand with coarse shelly gravel armouring.

3.1.3. Photographic Record; Transect 1

This transect began beneath the north westernmost cage moored on site (see Figure 3.2). A total of six stations were investigated. Numerous jelly fish*, Aurelia aurita, Chrysaora hysoscella* and *Aploemia uvaria* were noted in the water column at this site.

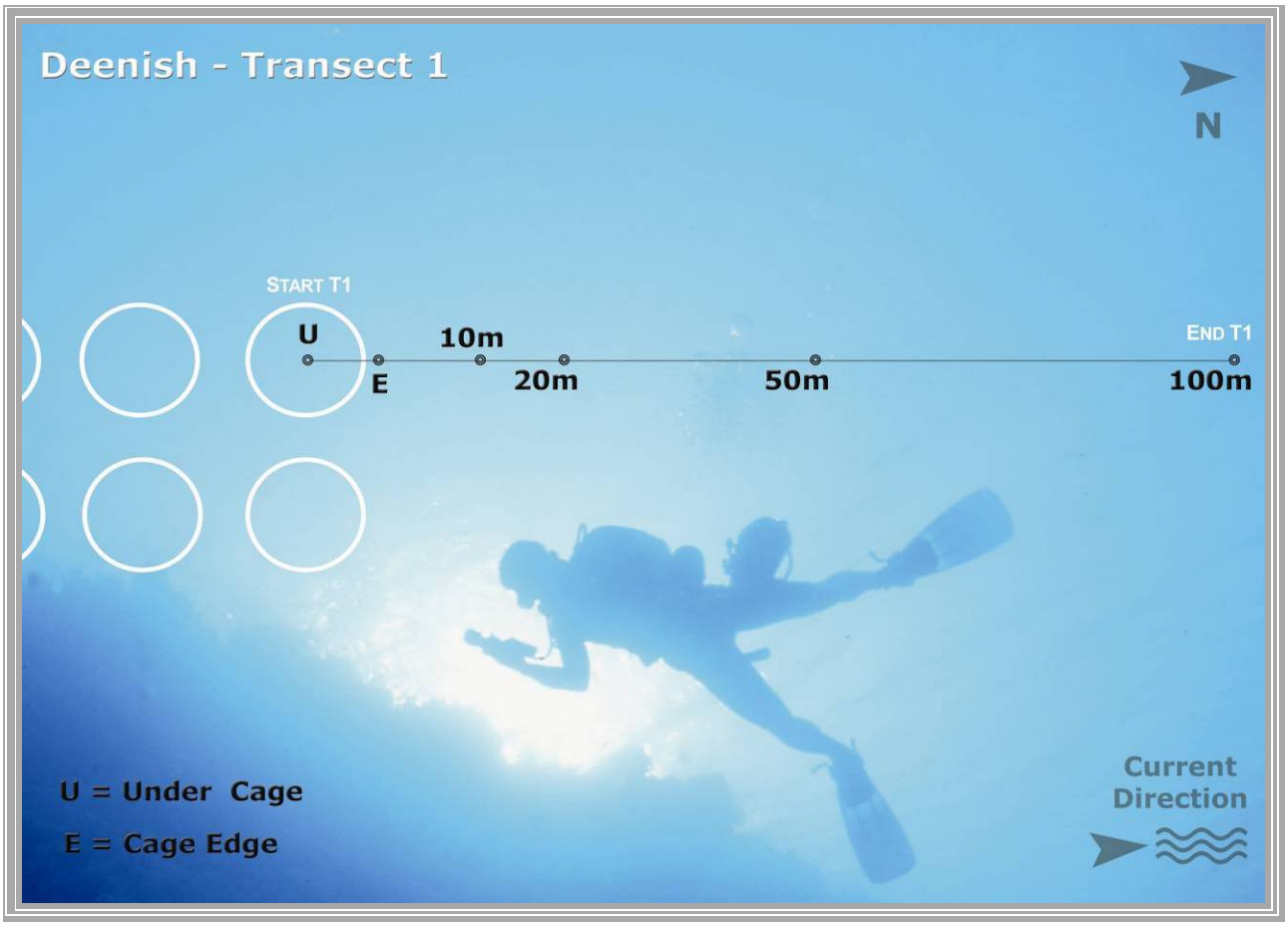


Figure 3.2. Transect 1 seafloor station layout, Deenish Island site, September 2012.

3.1.3.1. Under Cage Location

The cages on site were stocked at the time of the study. There were some signs on the seafloor that finfish cages were overlying the site:

- Light scattering of uneaten food;
- A scattering of faecal casts ;
- Shallow ARPD depths at this station;
- Layer of *Beggiatoa* spp. * (white layer in image); and
- Accumulation of finer sediments.

A number of small hermit crabs (Paguridae), common starfish (*Asterias rubens*) and *Marthasterias glacialis*, numerous brittlestars (Amphiuridae sp.) and anemones (*Cerianthus lloydii*) were noted. Speckled through the underlying sediment were discarded mussel shells (*Mytilus edulis*) probably derived from the structures on the cage system above. The mean ARPD at this station measured 2.1cm.

* *Beggiatoa* spp. – gliding, colourless filamentous sulphur bacteria, thriving in low oxygen/high organic environments. Commonly referred to as sewage fungus. Visible as a whitish layer or as white patches in benthic photographs.

Figure 3.3. T1 – Under cage, Deenish Island site, September 2012

3.1.3.2. Edge of Cage Location

Flat fine to medium sand with some mussel shell. There were some signs on the seafloor that finfish cages were overlying the site:

- A scattering of uneaten feed pellets;
- A small number of faecal casts;
- A layer of Beggiatoa spp.; and
- Relatively shallow ARPD depth.

Drifting algal material (kelp frond fragments), sea slugs (Faceliniidae and Aeolidiidae) and hermit crabs (Paguridae) were recorded. The starfish *Asterias rubens*, *Marthasterias glacialis* and *Luidia ciliaris* were common at this station. The mean ARPD at this site was 0.5cm.

Figure 3.4. T1 – Cage edge, Deenish Island, September 2012.

3.1.3.3. 10m from Cage

The seafloor at the 10m station was composed of sand scattered with redundant mussel shells. There were some signs that finfish cages were nearby:

- Small patches of feed material; and
- A very light scattering of faecal casts.

The seafloor at this site was dominated by the brittle stars Amphiuridae sp. In the image below the wispy extensions through the shot are the feeding arms of brittle stars. Other species of note were the anemone *Ceranthus lloydii* and faecal casts of *Arenicola* sp. The ARPD at this station ranged from 0.1 to 6.4cm with a mean of 3.2cm. The highly variable ARPD is probably due to the bioturbating activity of the ophiuroids, Amphiuridae sp.

Figure 3.5. T1 – 10m, Deenish Island, September 2012.

3.1.3.4. 20m from Cage

The seafloor at the 20m station was composed of relatively flat fine to medium sand. There were no

signs of the nearby finfish rearing operation. The seafloor at this site was also dominated by the infaunal brittlestars, Amphiuridae sp. The sediment surface was covered in a thin layer of benthic diatoms. A king scallop (*Pecten maximus*), sand mason (*Lanice conchilega*), small fragments of drifting algal material, brittlestars (*Ophiura* sp.) and burrowing brittlestars (Amphiuridae sp.) were observed. Other species of note were swimming crabs *Necor puber*. Drift weed was common. The average ARPD at this station measured 3.1cm.

Figure 3.6. T1 – 20m, Deenish Island, September 2012.

3.1.3.5. 50m from Cage

The seafloor at the 50m station was composed predominantly of sand with shell gravel armouring. As at the previous stations the brittle star Amphiuridae sp. occurred in high densities. Small plants of a common epilithic and epiphytic red seaweed (*Phycodrys rubens*) were noted attached to some of the larger shell fragments. Mean ARPD was 4.7cm with a range of 0.5 to 4.7cm.

Figure 3.7. T1 – 50m, Deenish Island, September 2012.

3.1.3.6. 100m from Cage

A sand, shell and pebble gravel seafloor was observed at this station. There were no apparent signs of impact from the nearby finfish rearing operation. Scallops were common in this region. On moving further along this transect the bottom became much coarser and became dominated by a *Mytilus* shell debris covering the entire area.

Small starfish (probably juvenile *Asterias* sp. or *Marthasterias* sp.), high densities of Amphiuridae sp. and numerous anemones (*Cerianthus lloydii*), calcareous tube worms (*Pomatoceros* sp.) and drift algae (*Alaria esculenta*) were noted in the sandy region. On moving over the coarser shelly areas the starfish *Asterias, Marthasterias* and *Luidia* were common. Numerous small monk fish as featured on the front cover of this report were observed at this site.

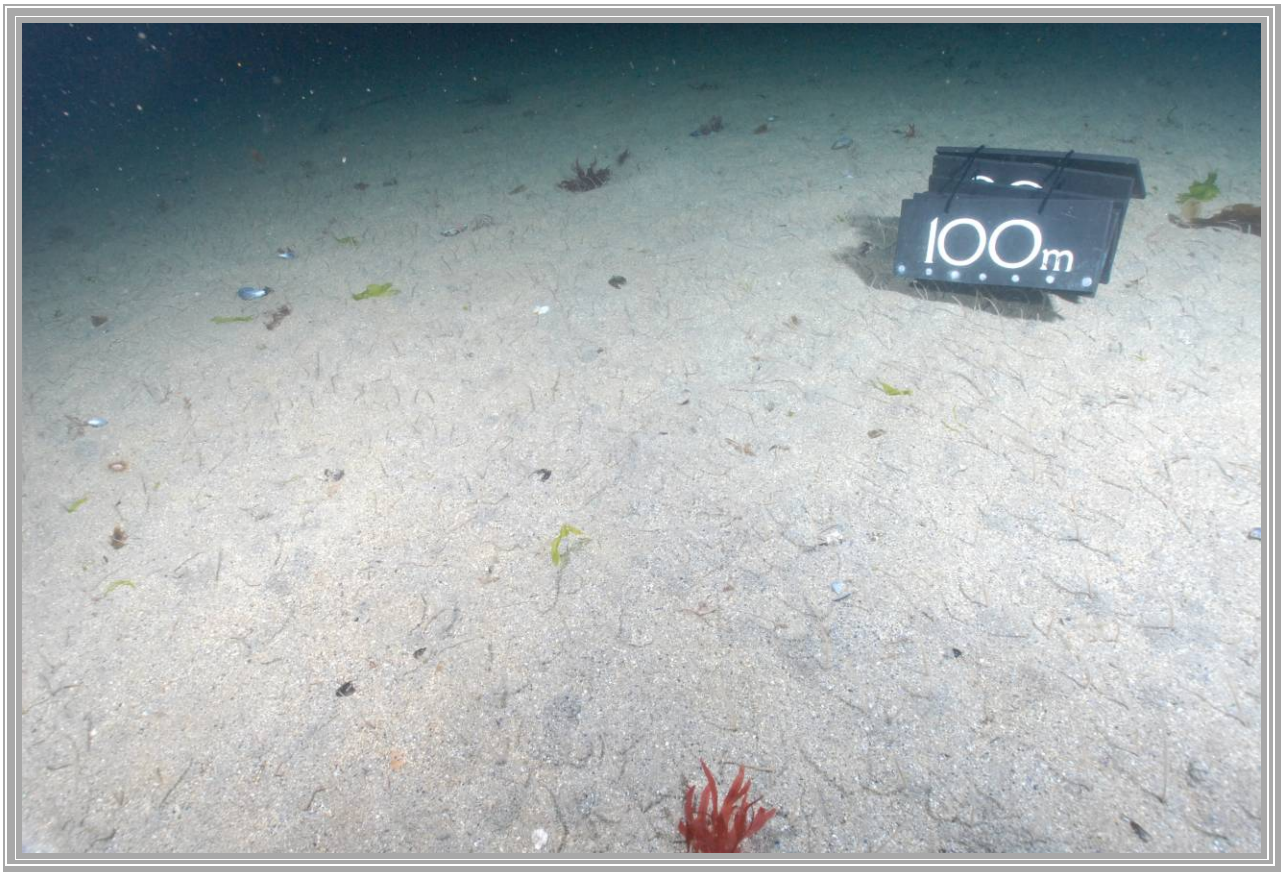
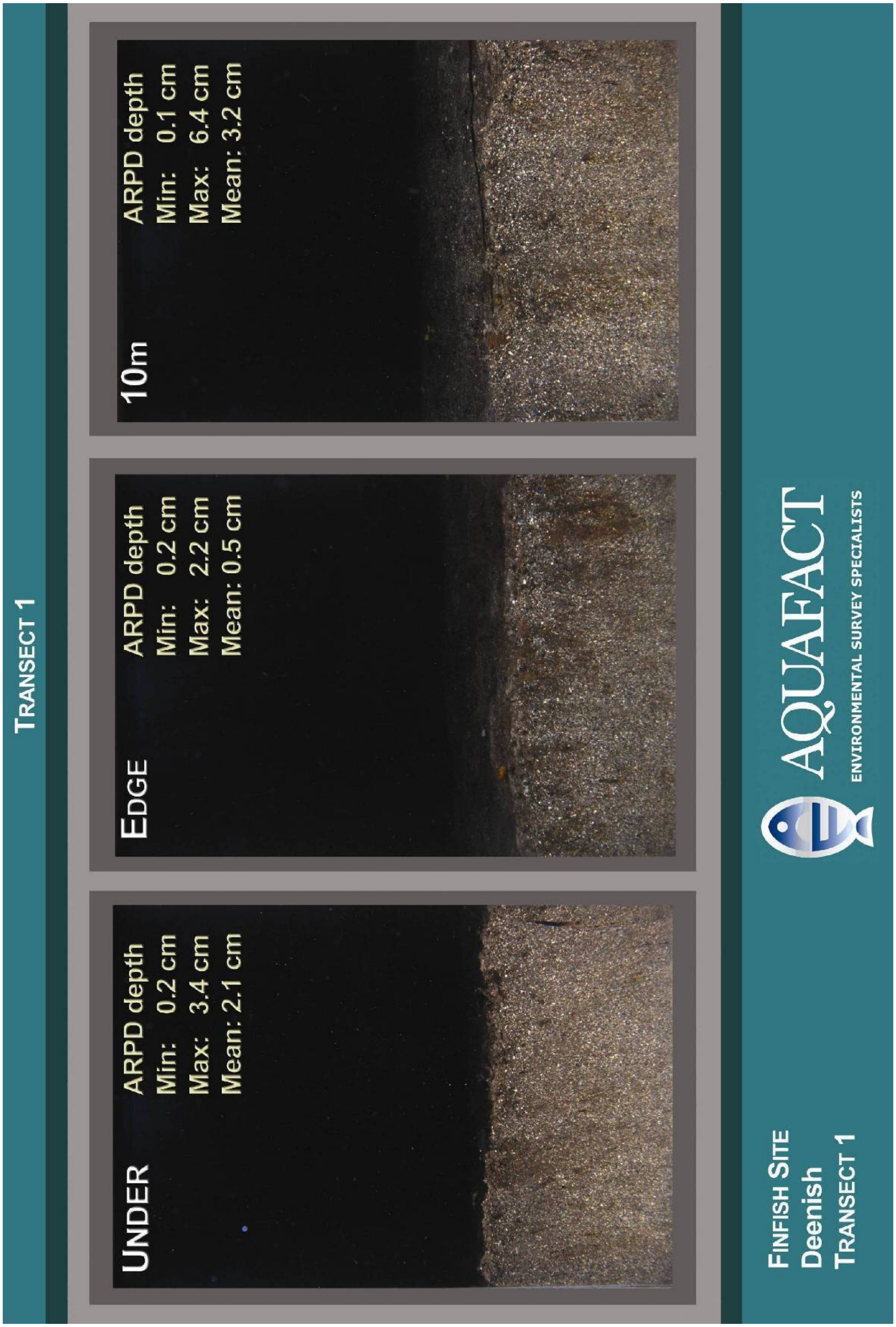


Figure 3.8. T1 – 100m, Deenish Island, September 2012.

3.1.4. Sediment Profile Imagery – Transect 1

The following two plates present sediment profile images taken at the six stations visited on Transect 1 of the Deenish site. They display a single image and the maximum and minimum apparent redox potential discontinuity (ARPD) depths measured at each station. Each image is 15.5cm × 25cm. ARPD depths ranged from a minimum of 0.1cm (T1 10m) to a maximum of >7cm (T1 100m). The composition of sediments at each station can be seen – fine sand at the under cage station to a coarser shelly gravelly sand at the outer end of the transect. Uneaten feed and faecal material can be seen as a thin layer at the under cage station. APRD range can range considerably at any one station and is due to the deep bioturbating activity of the infaunal ophiuroids, Amphiuridae sp.. The seafloor at this site is probably relatively mobile and experiences winter surges churning the benthic sands on a regular basis.


TRANSECT 1
UNDER
ARPD depth
Min: 0.2 cm
Max: 3.4 cm
Mean: 2.1 cm
EDGE
ARPD depth
Min: 0.2 cm
Max: 2.2 cm
Mean: 0.5 cm
10m
ARPD depth
Min: 0.1 cm
Max: 6.4 cm
Mean: 3.2 cm
FINFISH SITE
Deenish
TRANSECT 1
AQUAFACT
ENVIRONMENTAL SURVEY SPECIALISTS


TRANSECT 1
20m
ARPD depth
Min: 0.8 cm
Max: 4.5 cm
Mean: 3.1 cm
50m
ARPD depth
Min: 0.5 cm
Max: 4.7 cm
Mean: 2.6 cm
100m
ARPD depth
Min: 0.2 cm
Max: >7.0 cm
Mean - cm
AQUAFACT
ENVIRONMENTAL SURVEY SPECIALISTS
FINFISH SITE
Deenish
TRANSECT 1

3.1.5. Photographic Record; Transect 2

This transect began beneath the same cage as Transect 1. A total of five stations were investigated on Transect 2 (See Figure 3.9) with an additional (Reference) station investigated just over 200m from the cage edge.

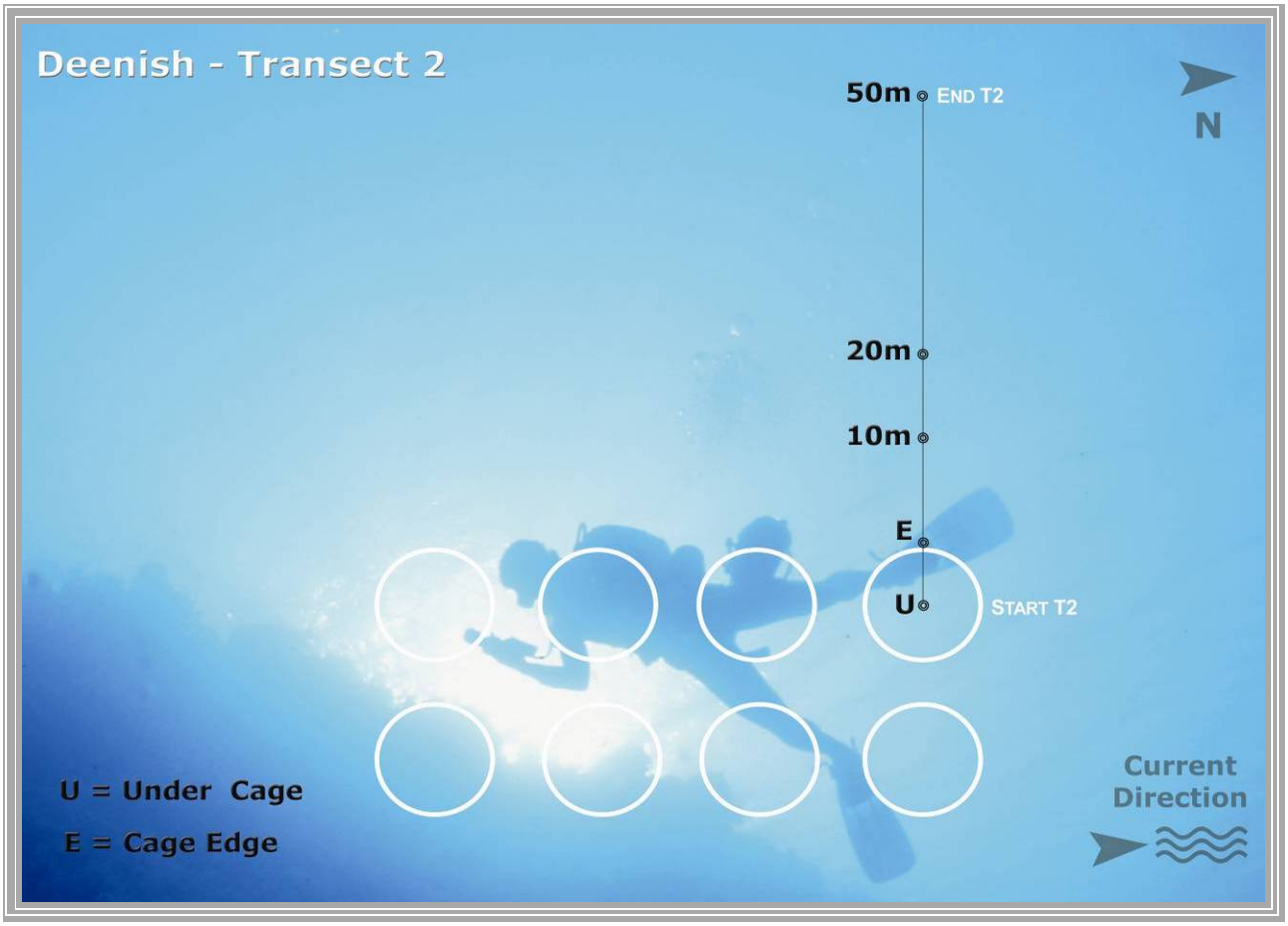


Figure 3.9. Transect 2 seafloor station layout, Deenish Island site, September 2012.

3.1.5.1. Under Cage Location

This station was located beneath the same cage as the *Under Cage* station on Transect 1. Seafloor conditions are therefore similar. There were some signs on the seafloor that finfish cages were overlying the site:

- Scattering of uneaten feed pellets and faecal casts;
- Shallow ARPD depths at this station; and
- Light layer of *Beggiatoa* spp. (white layer in image).

A number of small gobies (*Pomatoschistus* sp.), numerous common starfish (*Asterias rubens*), numerous brittlestars Amphiuridae sp. and nudibranchs were noted. Some small fragments of drifting kelp were noted. The mean ARPD in this area was 3.2cm with a wide range of measurements from 0.5 to 5.1cm.

Figure 3.10. T2 – Under cage, Deenish Island, September 2012.

3.1.5.2. Edge of Cage Location

Fine-medium sands with a small amount of shell gravel. There were some obvious signs on the seafloor that finfish cages were overlying the site:

- Feed pellets and faecal casts on the seabed;
- Spots of the sulphur reducing bacteria *Beggiatoa* spp.; and
- Shallow ARPD depths.

Numerous small anemones (*Cerianthus* sp.) were noted.

Figure 3.11. T2 – Cage edge, Deenish Island, September 2012.

3.1.5.3. 10m from Cage

Fine-medium sand with a small amount of mussel shell. There were no obvious signs that a finfish rearing facility was nearby, though some small patches of *Beggiatoa* spp. cover were noted. Burrowing brittlestars (Amphiuridae sp.), a benthic biofilm layer, seven-armed starfish (*Luidia ciliaris*) and numerous anemones (*Cerianthus lloydii*) were recorded. Faecal casts from the polychaete *Arenicola* sp. are noted in the image below and also contribute to highly variable ARPD that ranged from 1.5 to 6.4cm at this station.

Figure 3.12. T2 - 10m, Deenish Island, September 2012.

3.1.5.4. 20m from Cage

A relatively flat fine-medium sand seafloor with some shell gravel. There were no obvious signs that a finfish farm was nearby. Biological features encountered included high densities of the burrowing brittlestars (Amphiuridae sp.) and numerous anemones, *Cerianthus lloydii*. The Mean ARPD at this station was 3.4cm.

Figure 3.13. T2 – 20m, Deenish Island, September 2012.

3.1.5.5. 50m from Cage

The seafloor at this station was similar to the 20m station and consisted of a medium sand with some shell debris. Numerous gobies (*Pomatoschistus* sp.), small red algal plants (*Phycodrys* sp.) and a king scallop (*Pecten maximus*) were recorded. Amphiuridae sp. and *Ceranthus lloydii* were also common at this station. Mean ARPD was 4.5cm and ranged in depth from 2.3 to 7.6cm due to the high density of bioturbating species in the sediment.

Figure 3.14. T2 – 50m, Deenish Island, September 2012.

3.1.6. Reference Station

This photograph was taken at a distance of approximately 200m from the cage edge. Sediments at the reference station were composed of sand and shell gravel forming a relatively flat seabed. There were no apparent signs of impact from the nearby finfish rearing operation:

- Seafloor 'clean' and free of feed/faecal material, *Beggiatoa* spp. cover;
- No items of farm debris; and
- Presence of 'normal' flora and fauna for this area.

Amphiuridae sp. populations were also dense at this location as were the tube anemones (*Cerianthus lloydii*), gobies (*Pomatoschistus* sp.), calcareous tube worms (*Pomatoceros* sp.) and a seven-armed starfish (*Luidia ciliaris*). Scallops, *Pecten maximus*, were noted throughout this site. Mean ARPD was >4.3cm.

Figure 3.15. Reference Station, Deenish Island, September 2012.

3.1.7. Sediment Profile Imagery – Transect 2 & Reference

The following two plates present sediment profile images taken at the five stations visited on Transect 2 of the Deenish site. A sediment profile image was also taken at the Reference station. They display a single image and the maximum and minimum apparent redox potential discontinuity (ARPD) depths measured at each station. Each image is 15.5cm × 25cm. Along Transect 2, ARPD depths ranged from a minimum of 0.1cm (T2 Edge) to a maximum of >7.6cm (T2 20m). ARPD depths at the Reference station ranged from >3.3cm to >4.4cm. The composition of sediments at each station can be seen. Sediment type varied from fine/medium sands under and close to the cage compared with higher proportions of gravel and shell with increasing distance from the cage. ARPDs ranged from 0.5 to greater than 6cm with a high degree of variability due in part to the dense populations of the infaunal ophiuroid, Amphiuridae sp.


TRANSECT 2
UNDER
ARPD depth
Min: 0.5 cm
Max: 5.1 cm
Mean: 3.2 cm
EDGE
ARPD depth
Min: 0.1 cm
Max: 6.9 cm
Mean: 2.1 cm
10m
ARPD depth
Min: 1.5 cm
Max: >6.4 cm
Mean: - cm
AQUAFACT
ENVIRONMENTAL SURVEY SPECIALISTS
FINFISH SITE
Deenish
TRANSECT 2


TRANSECT 2
20m
ARPD depth
Min: 0.5 cm
Max: 6.3 cm
Mean: 3.4 cm
50m
ARPD depth
Min: 2.3 cm
Max: 7.6 cm
Mean: 4.5 cm
Ref.
ARPD depth
Min: >3.3 cm
Max: >4.3 cm
Mean - cm
FINFISH SITE
Deenish
TRANSECT 2
AQUAFACT
ENVIRONMENTAL SURVEY SPECIALISTS

3.1.8. Transect Species List

Table 3.1 shows a list of species observed during the dives at the Deenish fish farm site.

Table 3.1. Species noted during dives on the seabed beneath the Deenish cages, September 2012.

Group	Species	Common Name
(Cnidaria) Hexacorallia	*Cerianthus lloydii*	Tube anemone
(Annelida) Polychaeta	*Pomatoceros* sp.	Tube worm
	Lanice conchilega	The sand mason
	Chaetopterus variopedatus	Parchment tube worm
(Mollusca) Bivalvia	*Pecten maximus*	King scallop
	Faceliniidae	Sea slugs
	Aeolidiida	Sea slugs
	Nudibranch	Sea slugs
(Arthropoda) Decapoda	Paguridae	Hermit crab
Echinodermata	*Luidia ciliaris*	Seven armed starfish
	Asterias rubens	Common starfish
	Marthasterias sp	Starfish
	Ophiura sp.	Brittlestar
	Amphiuridae sp.	Brittlestar
(Chordata) Osteiichthyes	*Pomatoschistus* sp.	Gobies
Rhodophyta	*Delesseria* sp.	Sea beech
	Phycodrys rubens	Sea oak
Ochrophyta	*Alaria esculenta*	Edible kelp

3.1.9. Supplementary Photos

A view of a seven-armed starfish (*Luidia ciliaris*) moving over the seabed with high densities of the infaunal Amphiuridae sp. and the anemone *Cerianthus lloydii* can be seen in Figure 3.16.

Figure 3.16. Seven-armed starfish (*Luidia ciliaris*) and brittlestars *Amphiuridae sp* – Deenish Island, September 2012.

The image shown in Figure 3.17 was taken just beyond the Reference station at the Deenish Island site. The main subject of this image is sea urchins (*Marthasterias glacialis*). Figure 3.18 shows dense populations of the sea anemones *Urticina felina* which were common at the interface of the soft sedimentary seafloor and the rocky reef outcrops. Figure 3.19 shows a Monkfish observed at the site.

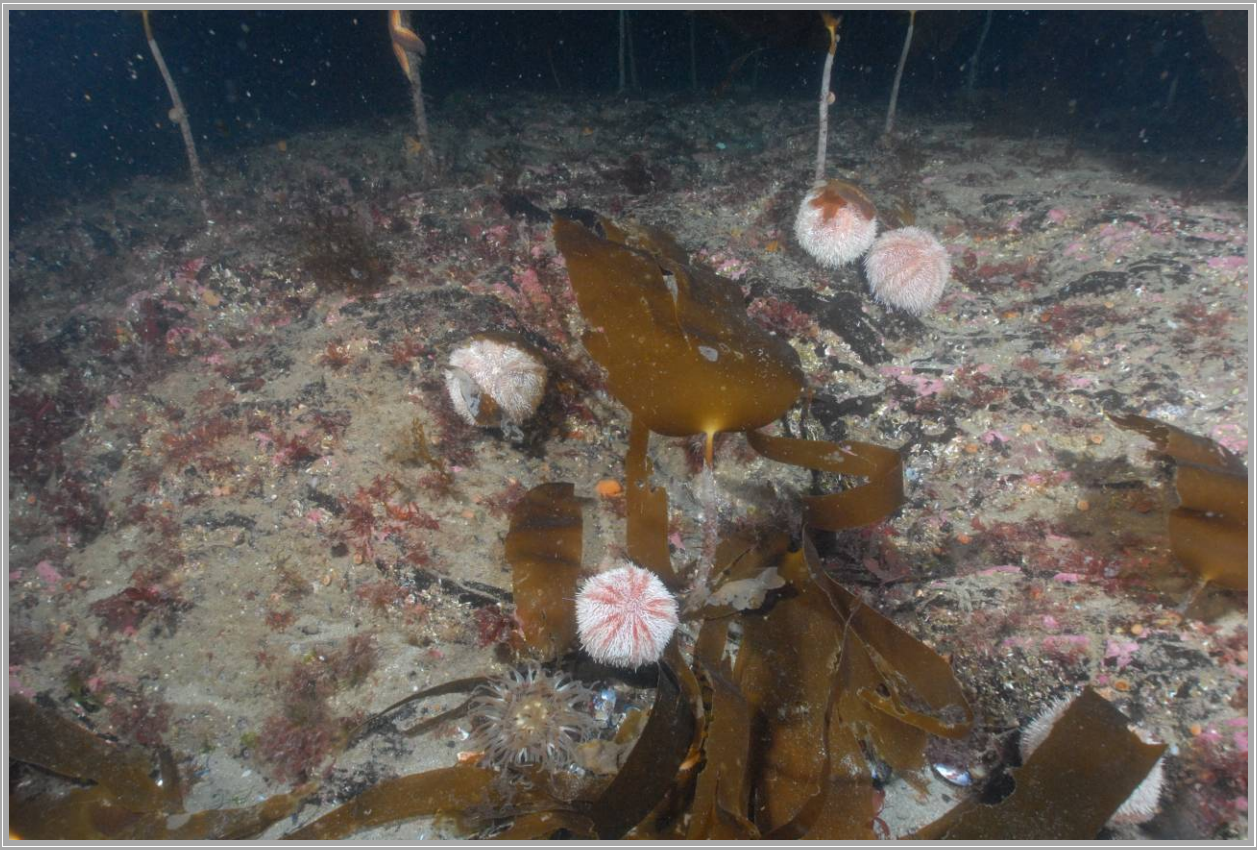


Figure 3.17. Sea urchins *Marthasterias glacialis*, Deenish Island, September 2012.

Figure 3.18. Dense populations of the sea anemones *Urticina felina* were common at the interface of the soft sedimentary seafloor and the rocky reef outcrops.

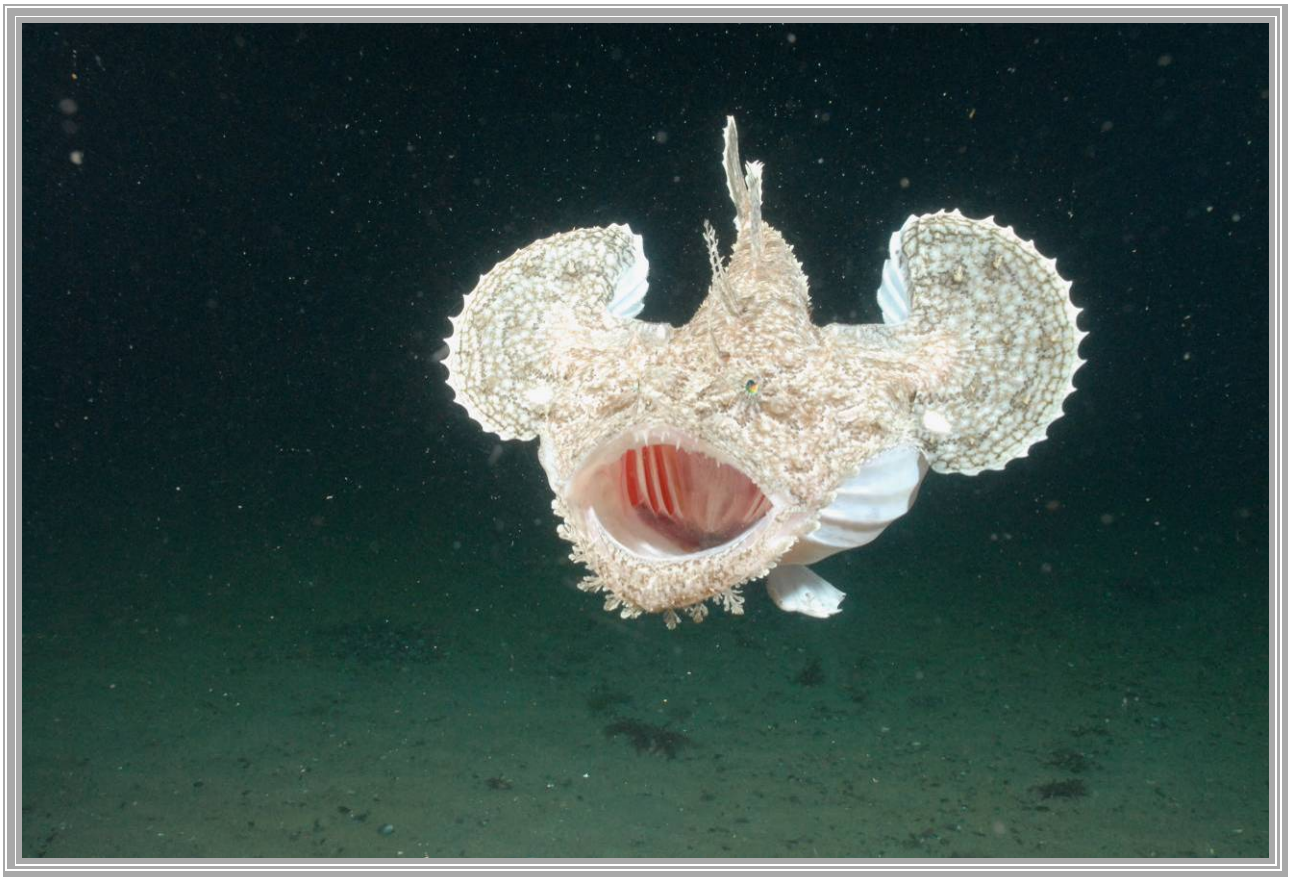


Figure 3.19. Monkfish, Deenish Island, September 2012.

3.1.10. Benthic Macrofaunal Analysis

The taxonomic identification of the benthic infauna across all 11 stations sampled at the Deenish fish farm site yielded a total count of 206 taxa accounting for 24,647 individuals, ascribed to 8 phyla. A complete listing of the taxa abundance is provided in Appendix 1. Of the 209 taxa present, 1 could not be enumerated as it was colonial (a sponge). One hundred and twenty-seven taxa were identified to species level, the remaining 82 could not be identified to species level as they were juveniles, partial/damaged or indeterminate.

Of the 206 taxa enumerated, 86 were annelids (segmented worms), 47 were crustaceans (crabs, shrimps, prawns), 51 were molluscs (mussels, cockles, snails etc.), 15 were echinoderms (starfish, brittlestars, sea cucumbers), 4 were cnidarians (jellyfish, anemones, corals etc), 1 was a nemertean (ribbon worm) and 1 was a nematodes (round worms).

3.1.10.1. Univariate Analysis

Univariate statistical analyses were carried out on the combined replicate station-by-station faunal data. The following parameters were calculated and can be seen in Table 3.2; taxon numbers, number of individuals, richness, evenness and diversity. Taxon numbers ranged from 17 (T1 Under) to 108 (T1 50m). Numbers of individuals ranged from 38 (T2 50m) to 8,175 (T1 Edge). Richness ranged from 1.81 (T1 Under) to 15.78 (T1 50m). Evenness ranged from 0.13 (REF) to 0.93 (T2 50m). Diversity ranged from 0.6 (REF) to 5.04 (T1 50m).

Table 3.2: Diversity indices.

Station	No. Taxa	No. Individuals	Richness	Evenness	Diversity
T1 Under	17	6966	1.81	0.35	1.41
T1 Edge	24	8175	2.55	0.30	1.37
T1 10m	31	3022	3.74	0.30	1.51
T1 20m	21	2514	2.55	0.33	1.43
T1 50m	108	881	15.78	0.75	5.04
T1 100m	72	873	10.48	0.57	3.55
T2 Edge	26	406	4.16	0.41	1.91
T2 10m	37	192	6.85	0.69	3.62
T2 20m	27	111	5.52	0.71	3.39
T2 50m	21	38	5.50	0.93	4.10
REF	27	1469	3.57	0.13	0.60

3.1.10.2. Multivariate analysis

The dendrogram and the MDS plot can be seen in Figures 3.20 and 3.21 respectively. The stress value of the MDS is 0.06 which indicates good representation of the data. SIMPROF analysis revealed 5 statistically significant groupings between the 11 stations (the stations joined by red lines could not be statistically differentiated from each other).

The dendrogram shows a clear divide between the stations. For the most part, the outer stations along T1 and the T2 stations grouped apart from the stations under, at the edge of and close to the cage (along T1).

Group a contained stations T1 50m and T1 100m. These stations formed a group at a similarity level of 40.14% and this group separated from all the other stations at a 15.7% level of similarity. Six species accounted for 57.6% of the faunal abundance of this group: the crustacean *Pisidia longicornis* (23.7%; 415 individuals), Nematoda sp. (9.7%; 170 individuals), the brittlestar *Amphipholis squamata* (9.7%; 170 individuals), the polychaetes *Pomatoceros lamarcki* (5.7%; 100 individuals), *Pomatoceros* sp. (4.9%; 85 individuals) and *Capitella* sp. (4.1%; 71 individuals). The remaining c. 42% of the faunal abundance was made up of a further 138 species, of which the polychaete *Phloe inornata* accounted for 3.5% of it (61 individuals). These stations were the richest and most diverse of all the stations sampled. *Pisidia longicornis* and *Amphipholis squamata* is a species very sensitive to organic enrichment and present in unpolluted conditions. Nematoda sp. are species tolerant to excess organic enrichment. They may occur under normal conditions but their populations are stimulated by organic enrichment. *Pomatoceros lamarcki* and *Pomatoceros* sp. are species indifferent to enrichment, always present in low densities with non-significant variations with time. *Capitella* sp. are first order opportunistics, which proliferate in reduced sediments. *Pholoe inornata* is a second order opportunist.

Group b contained stations T1 10, T2 20m and T2 50m, all forming a group at a 43.54% similarity level and separated from the remaining station at a 20.68% similarity level. Four species accounted for almost 60% of the faunal abundance of the group: Nematoda sp. (37.8%; 129 individuals), the crustacean *Perioculodes longimanus* (10%; 34 individuals), the brittlestar *Amphipholis squamata* (7%; 24 individuals) and the crustacean *Pariambus typicus* (4.7%; 16 individuals). The remaining c. 40% of the faunal abundance was accounted for by a further 51 species, of which the polychaete *Magelona filiformis* accounted for 3.5% of it (12 individuals). These stations had moderate levels of richness and diversity. *Perioculodes longimanus* is a species indifferent to enrichment, always present in low densities with non-significant variations with time. *Pariambus typicus* are species tolerant to excess organic enrichment. They may occur under normal conditions but their populations are stimulated by organic enrichment and *Magelona filiformis* is a species very sensitive to organic enrichment and present in unpolluted conditions.

Group e contained stations T1 Under, T1 Edge, T1 10m and T1 20m. This group had an average within group similarity of 56.1%. Three species accounted for 96.8% of the faunal abundance of this group: Nematoda sp. (65.1%; 13,468 individuals) and the polychaetes *Capitella* sp. (21.7%; 4,482 individuals) and *Caulleriella alata* (10%; 2,070 individuals). The remaining 3.2% of the faunal abundance was

accounted for by an additional 54 species, of which the polychaete *Malacoceros* sp. accounted for 0.9% of it (188 individuals). These stations had the lowest levels of richness and diversity. *Caulleriella alata* is a second order opportunist and *Malacoceros* sp. is a species tolerant to excess organic enrichment. It may occur under normal conditions but their populations are stimulated by organic enrichment.

Group d contained station T2 Edge only. This station grouped away from **Group e** at a 37.78% similarity level. Two species accounted for 87.4% of the faunal abundance: the polychaete *Capitella* sp. (51.7%; 210 individuals) and Nematoda sp. (35.7%; 145 individuals). The remaining 12.6% of the faunal abundance was accounted for by an additional 24 species with the polychaete *Phyllodoce mucosa* accounting for 2.2% of it (9 individuals). Diversity and richness were low at this station. *Phyllodoce mucosa* is a species tolerant to excess organic enrichment. It may occur under normal conditions but their populations are stimulated by organic enrichment.

Group c contained the Reference station only. This station grouped away from **Groups d** and **e** at a 29.41% similarity level. One species accounted for 93.4% of the faunal abundance at this station; Nematoda sp. (1,372 individuals). The remaining 6.6% was accounted for by a further 26 species with the crustacean *Photis longicaudata* accounting for 1.8% of it (26 individuals). Diversity at this station was understandably low. *Photis longicaudata* is a species very sensitive to organic enrichment and present in unpolluted conditions.

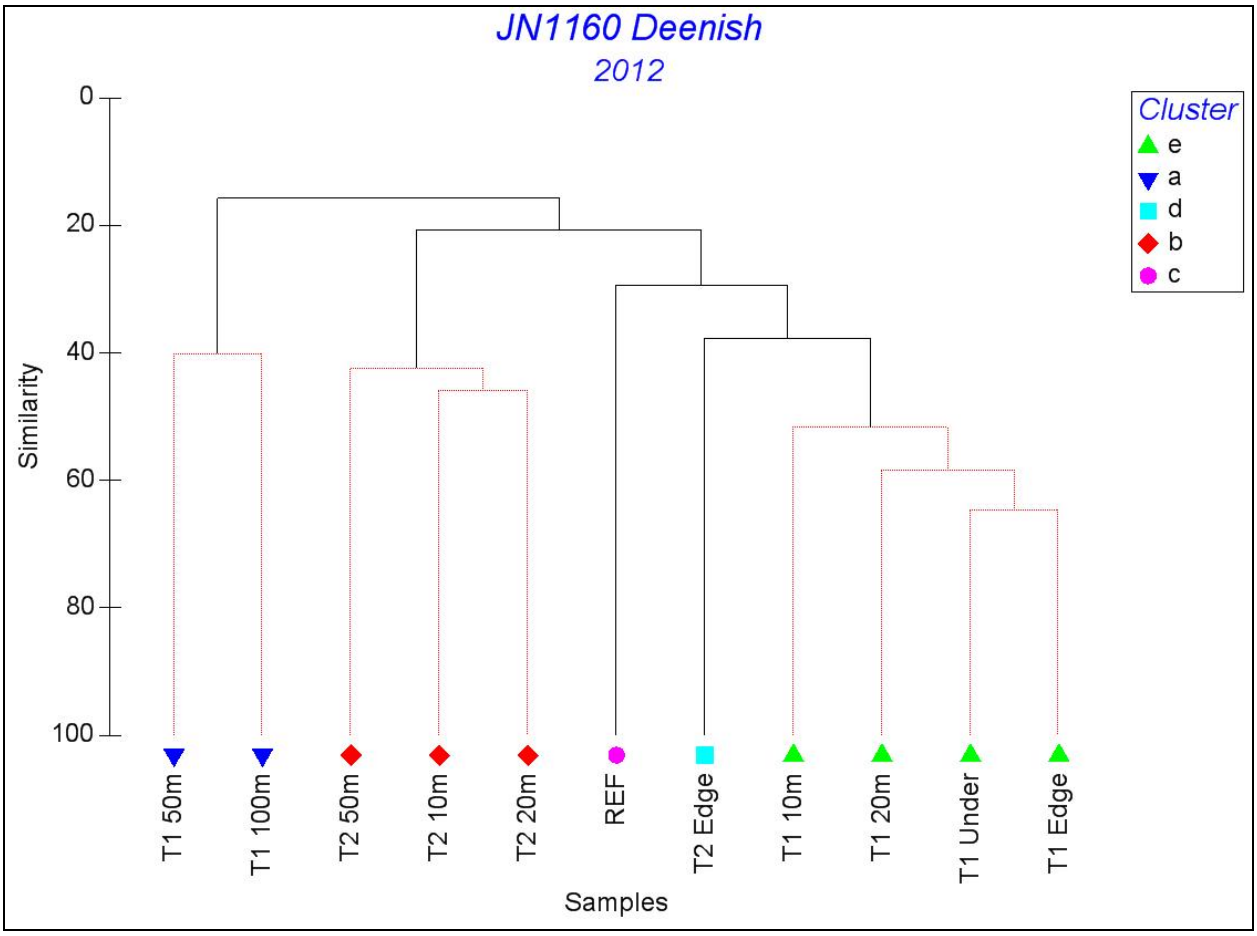


Figure 3.20: Dendrogram produced from Cluster analysis.

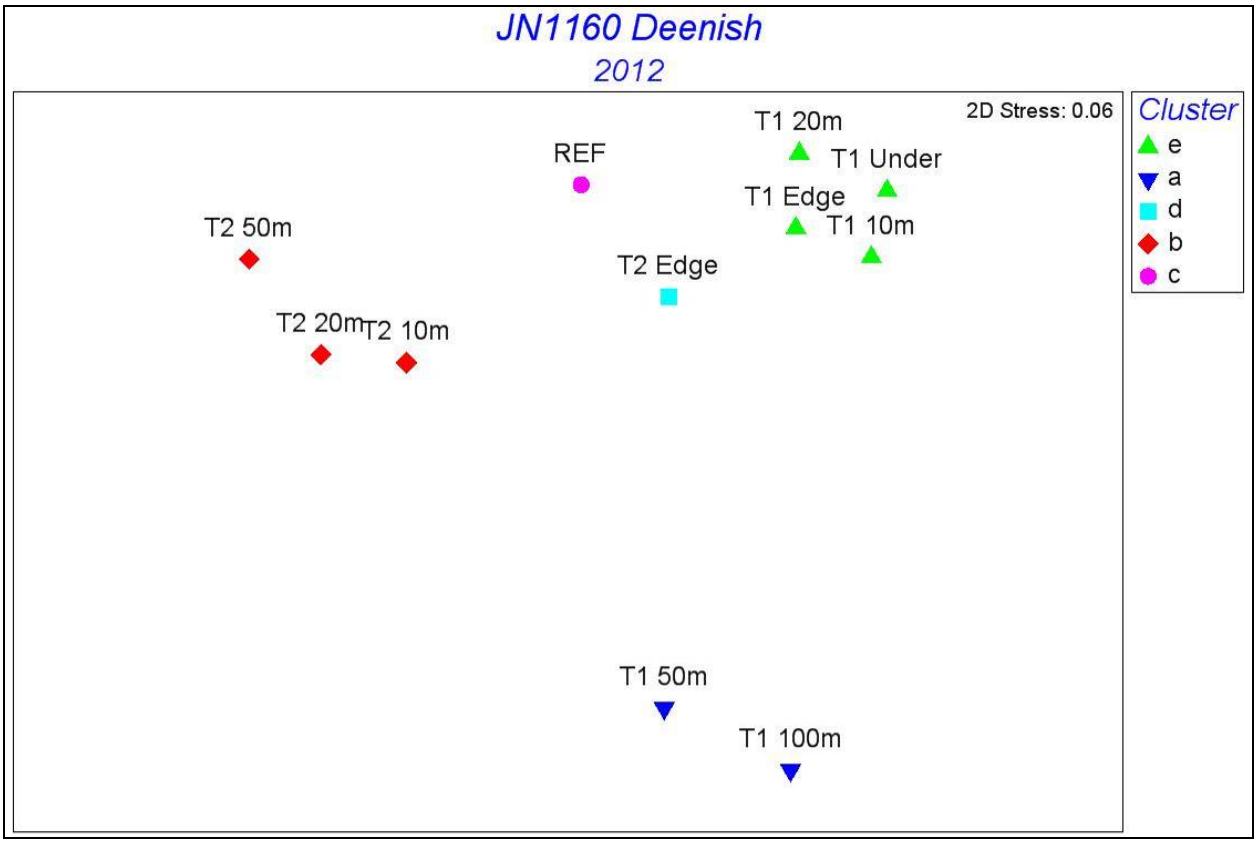


Figure 3.21: MDS plot.

3.1.11. Organic Carbon Analysis & ARPD Depths

Table 3.3 gives the organic carbon results for the Deenish site. Organic carbon values ranged from 1.43% (Reference) to 5.74% (T1 100m). Table 3.4 shows in tabular form the ARPD depths from the SPI images from Deenish (see Sections 3.1.4 and 3.1.7).

Table 3.3 : Organic carbon results from the Deenish stations (% values, Loss on Ignition at 450°C).

T1	Under	Edge	10m	20m	50m	100m
LOI %	4.46	5.59	3.27	1.92	1.66	5.74
T2	**Under**	**Edge**	**10m**	**20m**	**50m**	**REF**
LOI %	-	4.78	2.66	2.39	1.98	1.43

Table 3.4: ARPD Depths for Deenish, Kenmare Bay, September 2012

Station		Transect 1	Transect 2
Under	Range (cm)	0.2-3.4	0.5-5.1
	Mean (cm)	2.1	3.2
Edge	Range (cm)	0.2-2.2	0.1-6.9
	Mean (cm)	0.5	2.1
10m	Range (cm)	0.1-6.4	1.5- >6.4
	Mean (cm)	3.2	-
20m	Range (cm)	0.8-4.5	0.5-6.3
	Mean (cm)	3.1	3.4
50m	Range (cm)	0.5-4.7	2.3-7.6
	Mean (cm)	2.6	4.5
100m	Range (cm)	0.2- >7.0	-
	Mean (cm)	-	-
Reference	Range (cm)	-	>3.3 - >4.3
	Mean (cm)	-	-

3.2. Inishfarnard

3.2.1. Recent Stocking History

Approximately 216,300 fish, with an average weight of 1.764kg (381.6 tonnes) were transferred from the Deenish site on January 2012. At the time of the survey approximately 171,190 fish remained on site with an average weight of 5.0kg (856 tonnes). Discounting mortalities due to jellyfish and AGD, his gives an onsite production biomass of 474.4 tonnes prior to the survey.

Figure 3.22. Cages at the Inishfarnard site, viewed at sea, September 2012.

3.2.2. Seabed Physical Characteristics

The seabed was composed of a mix of seafloor types with areas of:

- Firm muddy sand – directly under, at the edge of and 10m from the cage
- Medium/coarse sand with shell gravel further away from the cage.

There was some obvious evidence on the seafloor that indicated proximity to a fish farming operation.

3.2.3. Photographic record; Transect 1

This transect began beneath the north-easternmost cage (see Figure 3.23) and ended approximately 100m to the east. A total of six stations were investigated.

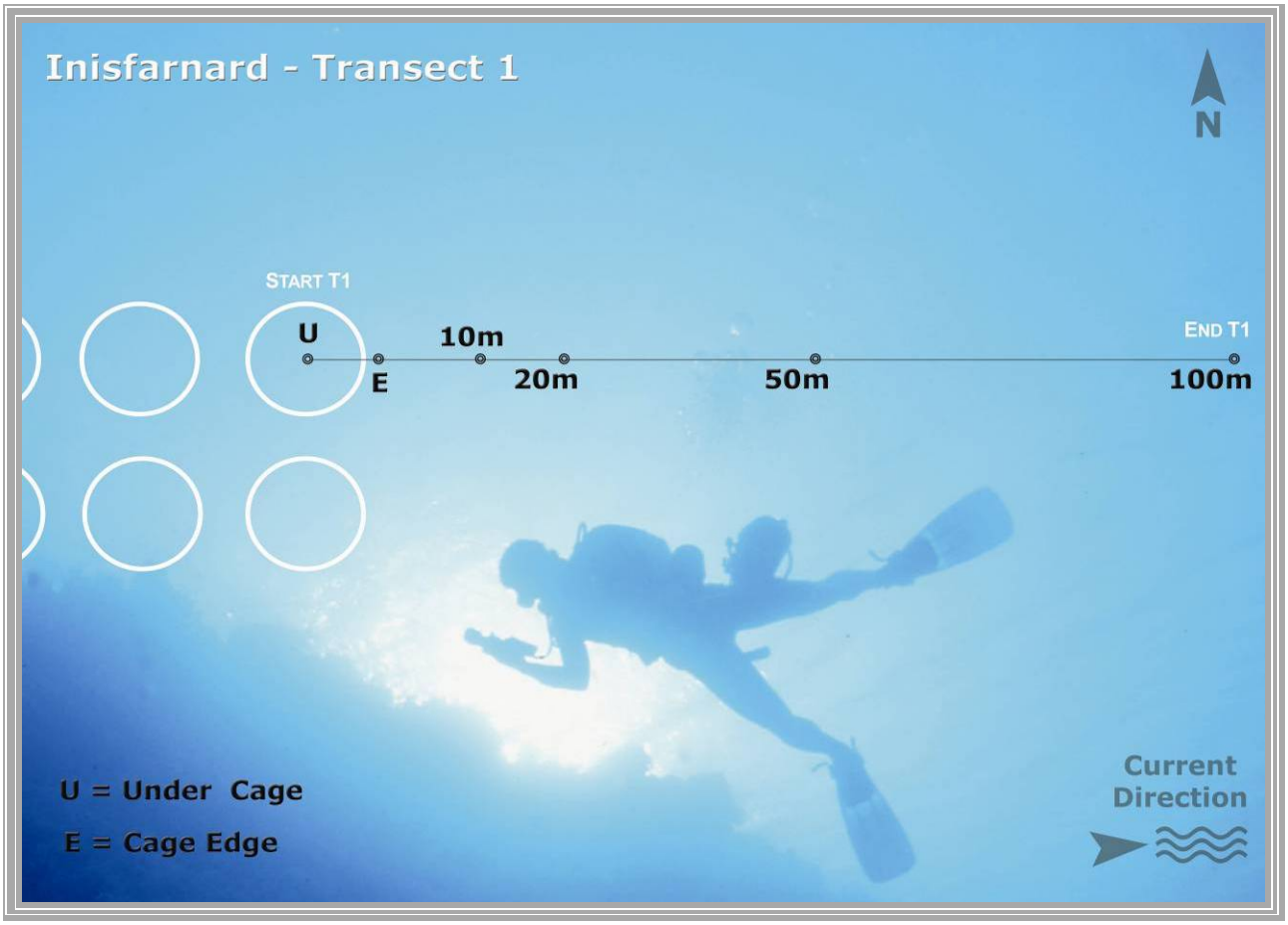


Figure 3.23. Transect 1 seafloor station layout, Inishfarnard site, September 2012.

3.2.3.1. Under Cage Location

The cages on site were stocked at the time of the survey. The seafloor here was composed of firm sand with a silt/mud fraction. There were obvious signs on the seafloor that finfish cages were overlying the site:

- Waste feed pellets and faecal casts;
- Some zones with *Beggiatoa* spp. at the sediment surface; and
- Shallow ARPD depths.

Small fragments of drift algal material were noted as were algal debris floating over the sediment surface. The mean ARPD at this location was 0.1cm and consistent with a thin muddy veneer overlying coarser sands (Section 3.2.4).

Figure 3.24. T1 – Under cage, Inishfarnard site, Kenmare River, September 2012.

3.2.3.2. Edge of Cage Location

Firm muddy sand with a covering of shell and broken shell. There were some signs on the seafloor that finfish cages were overlying the site:

- Waste feed pellets and faecal casts;
- Spots of *Beggiatoa* spp. at the sediment surface; and
- Shallow ARPD depths.

Fragments of drifting algae and clumps of *Mytilus edulis* were noted. Mean ARPD was 0.1cm

Figure 3.25. T1 – Cage edge, Inishfarnard site, Kenmare River, September 2012.

3.2.3.3. 10m from Cage

The seafloor at the 10m station was composed primarily of firm muddy sand with shelly debris. There were some signs that finfish cages were nearby:

- Spots of *Beggiatoa* spp. at the sediment surface; and
- Shallow ARPD depths.

Specimens of a burrowing brittlestar (*Amphipholis squamata*), crab, *Cancer pagurus*, tube anemones (*Cerianthus lloydii*) and the starfish (*Luidia ciliaris*) were recorded at this station. *Pecten maximus* and the swimming crab *Necor puber* were also observed. Mean ARPD was recorded at 1.1m

Figure 3.26. T1 – 10m, Inishfarnard site, Kenmare River, September 2012.

3.2.3.4. 20m from Cage

The seafloor at the 20m station was composed of a mix of coarse and medium sand with some shell gravel. There were some signs of the nearby finfish rearing operation:

- Shallow ARPD.

Infaunal component at this site would appear to be sparse. Mean ARPD was 0.7cm

Figure 3.27. T1 – 20m, Inishfarnard site, Kenmare River, September 2012.

3.2.3.5. 50m from Cage

Medium and coarse sand with shell grave continued at this site. There were little if any signs of impact from the nearby finfish rearing operation:

- Seafloor 'clean' and free of feed/faecal material; and
- Substrate conditions and species typical of this site.

A specimen of edible crab (*Cancer pagurus*), numerous juvenile starfish (*Asterias rubens*) and calcareous tube worms (*Pomatoceros* sp.) were noted. Drifting fragments of algal fronds were recorded at the sediment surface. Mean ARPD at this site was 2.4cm.

Figure 3.28. T1 – 50m, Inishfarnard site, Kenmare River, September 2012.

3.2.3.6. 100m from Cage

A seafloor composed of medium and coarse sand with shell gravel and algal debris. There were no apparent signs of impact from the nearby finfish rearing operation:

- Seafloor 'clean' and free of feed/faecal material; and
- No items of farm debris recorded.

Species recorded included tube anemones (*Cerianthus lloydii*), the parchment tube worm (*Chaetopterus variopedatus*), seaweed (*Phycodrys* sp.) and gobies (*Pomatoschistus* sp.). This station marked the end of Transect 1. Mean ARPD at this site was 3.7cm.

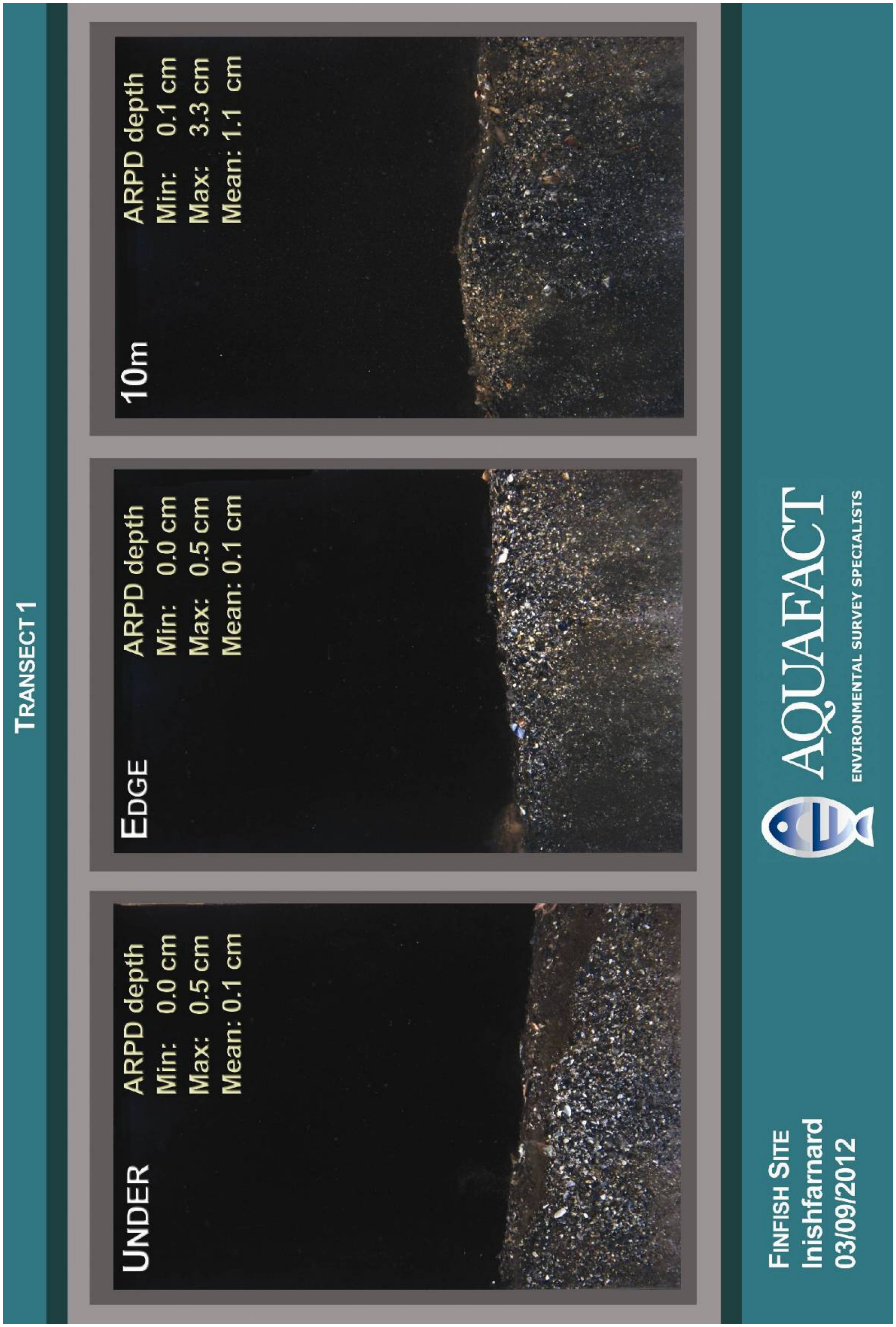
Figure 3.29. T1 – 100m, Inishfarnard site, Kenmare River, September 2012.

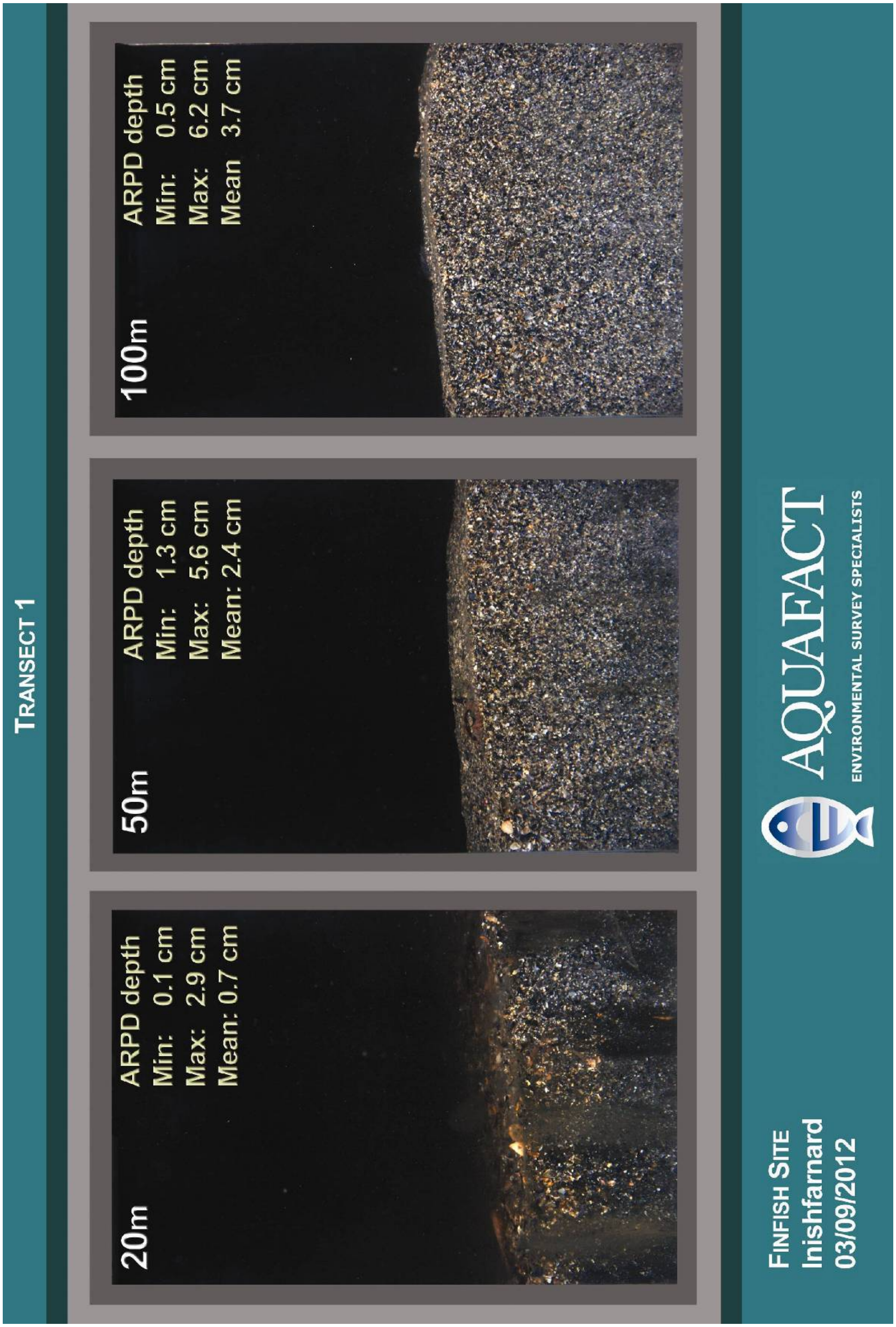
3.2.4. Sediment Profile Imagery - Transect 1

The following two plates present sediment profile images taken at the six stations visited on Transect 1 of the Inishfarnard site. They display a single image and the maximum and minimum apparent redox potential discontinuity (ARPD) depths measured at each station. Each image is 15.5cm × 25cm. ARPD depths ranged from a minimum of 0.0cm (T1 Under, T1 Edge) to a maximum of 6.2cm (T1 100m). The composition of sediments at each station can be seen. The variation of the shell fraction in surface sediments can be seen from station to station – increasing with increasing distance from the cages.

Uneaten feed and faecal material can be seen as a thin layer at the sediment water interface at the under cage station. On moving away from the cage structures the images show a higher reflectance indicating higher levels of oxygenated sediments at depth. In addition the proportion of coarser sands and shell debris increases with distance from the cages and is obvious in the transect images.

Polychaetes can be observed at depth at the 20m station and contribute to the increasing ARPD depths from this station outward.


TRANSECT 1
UNDER
ARPD depth
Min: 0.0 cm
Max: 0.5 cm
Mean: 0.1 cm
EDGE
ARPD depth
Min: 0.0 cm
Max: 0.5 cm
Mean: 0.1 cm
10m
ARPD depth
Min: 0.1 cm
Max: 3.3 cm
Mean: 1.1 cm
FINFISH SITE
Inishfarnard
03/09/2012
AQUAFACT
ENVIRONMENTAL SURVEY SPECIALISTS


Transect 1
20m
ARPD depth
Min: 0.1 cm
Max: 2.9 cm
Mean: 0.7 cm
50m
ARPD depth
Min: 1.3 cm
Max: 5.6 cm
Mean: 2.4 cm
100m
ARPD depth
Min: 0.5 cm
Max: 6.2 cm
Mean 3.7 cm
Finfish Site
Inishfarnard
03/09/2012
AQUAFACT
Environmental Survey Specialists

3.2.5. Photographic record - Transect 2

This transect began beneath the same cage as Transect 1 (see Figure 3.30). A total of five stations were investigated on Transect 2 with an additional (Reference) station investigated just over 200m from the cage edge.

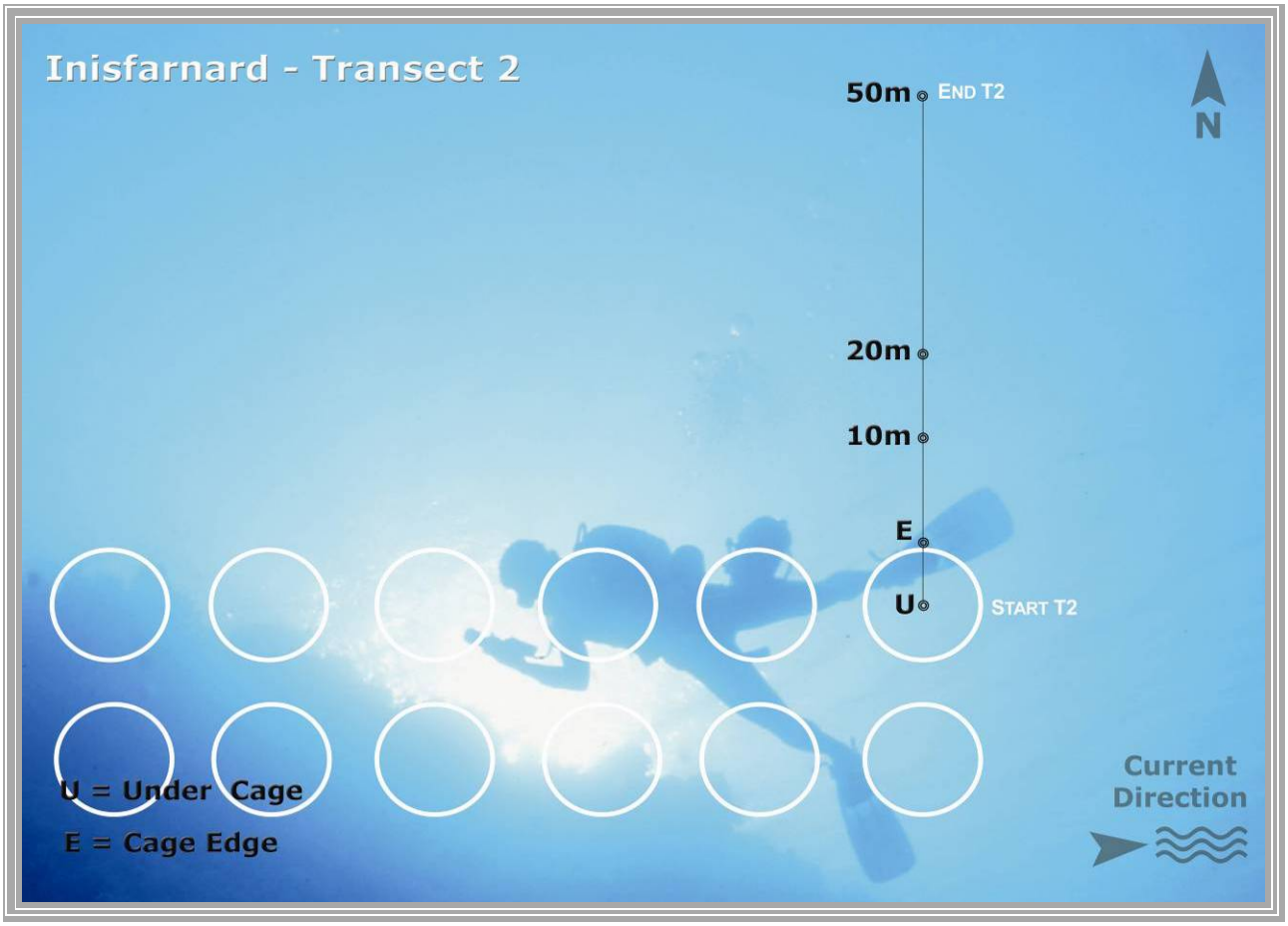


Figure 3.30. Transect 2 seafloor station layout, Inishfarnard site, September 2012.

3.2.5.1. Under Cage Location

This station was located beneath the same cage as the *Under Cage* station on Transect 1. Seafloor conditions are therefore similar. There were some signs on the seafloor that finfish cages were overlying the site:

- Uneaten feed pellets;
- A scattering of faecal casts;
- Spots of *Beggiatoa* spp. overlying the sediment (medium sand); and

- Poor infaunal activity.

Mean ARPD at this site was at the surface.

Figure 3.31. T2 – Under cage, Inishfarnard site, Kenmare River, September 2012.

3.2.5.2. Edge of Cage Location

Medium sand with silt and high organic content. The bottom contained a high proportion of shell and shell debris at this station. There were some obvious signs on the seafloor that finfish cages were overlying the site:

- A scattering of uneaten feed pellets; and
- Spots of *Beggiatoa* spp.

Mean ARPD at this site 0.3cm

Figure 3.32. T2 – Cage edge, Inishfarnard site, Kenmare River, September 2012.

3.2.5.3. 10m from Cage

Medium/coarse sand with some shell gravel. There were some slight signs on the seafloor that finfish cages were close by:

- Occasional uneaten feed pellets; and
- A patchy layer of *Beggiatoa* spp.

A substantial amount of decaying algal material was noted on the seafloor at this station and at all stations on this transect. The edible crab, *Cancer pagurus* and the starfish *Luidia ciliaris* were recorded as were numerous small tube anemones (*Cerianthus lloydii*). Mean ARPD was 0.6cm.

Figure 3.33. T2 - 10m, Inishfarnard site, Kenmare River, September 2012.

3.2.5.4. 20m from Cage

Medium/coarse sand with shell gravel.

- Seafloor free of feed and faecal material

Numerous tube anemones (*Cerianthus lloydii*) were recorded. Mean ARPD was 4.3cm and indicated the presence of infaunal bioturbating species

Figure 3.34. T2 – 20m, Inishfarnard site, Kenmare River, September 2012.

3.2.5.5. 50m from Cage

The seabed here was composed of medium/coarse sand with shells and a shell gravel fraction. Occasional fragments drifting algal fronds and parchment worms (*Chaetopterus variopedatus*) were noted. Mean ARPD was 5.2cm

Figure 3.35. T2 – 50m, Inishfarnard site, Kenmare River, September 2012.

3.2.6. Reference Station

This photograph was taken at a distance of approximately 200m from the cage edge. Sediments at the reference station were composed of medium/coarse sand with shell gravel and occasional cobbles. There were no apparent signs of impact from the nearby finfish rearing operation:

- Seafloor 'clean' and free of feed/faecal material, *Beggiatoa* spp. cover; and
- Presence of 'normal' flora and fauna for this area.

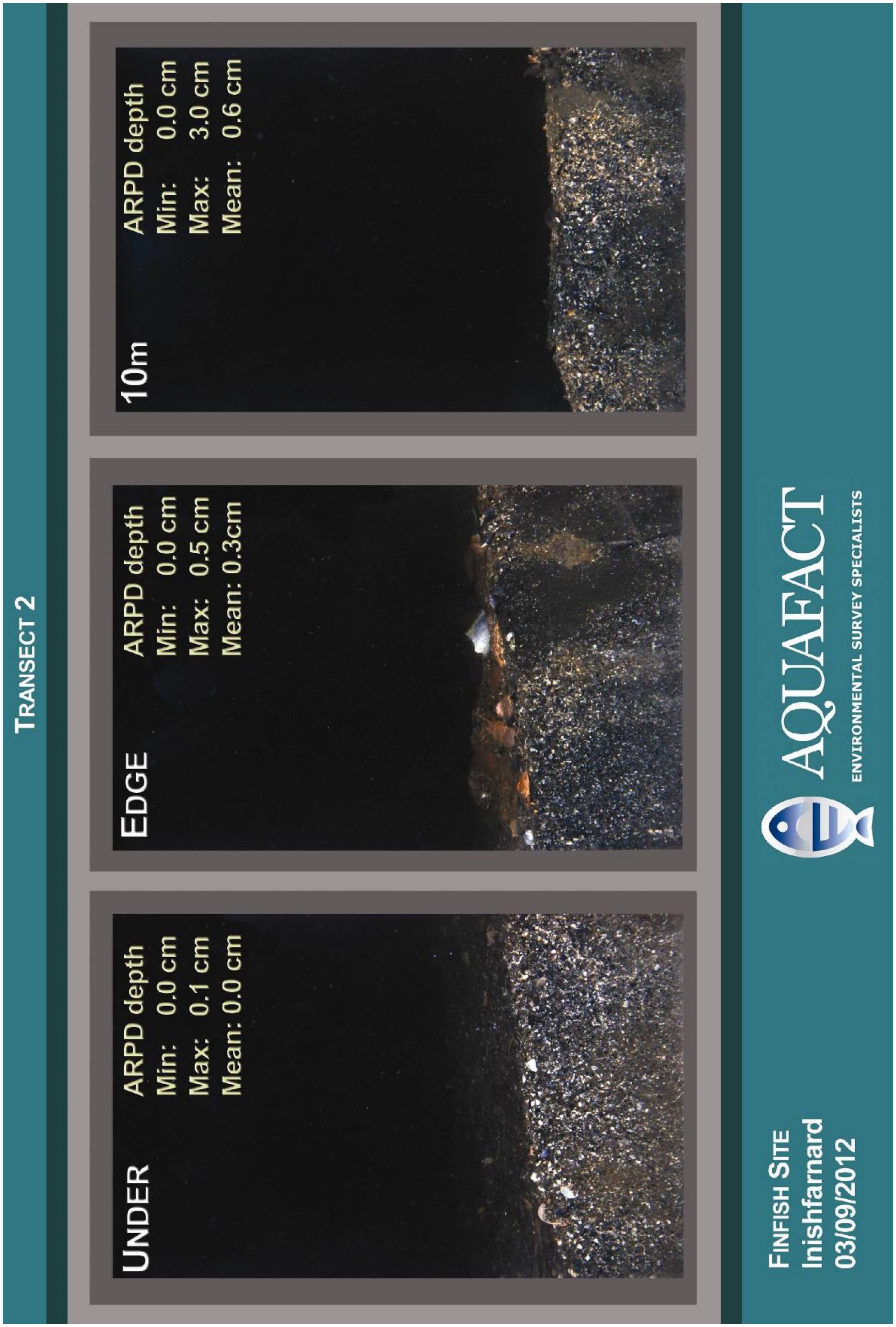
Numerous tube anemones (*Cerianthus lloydii*), parchment worms (*Chaetopterus variopedatus*) and a king scallop *Pecten maximus* were noted. Drifting fragments of algal fronds were recorded. Mean ARPD was 3.6cm.

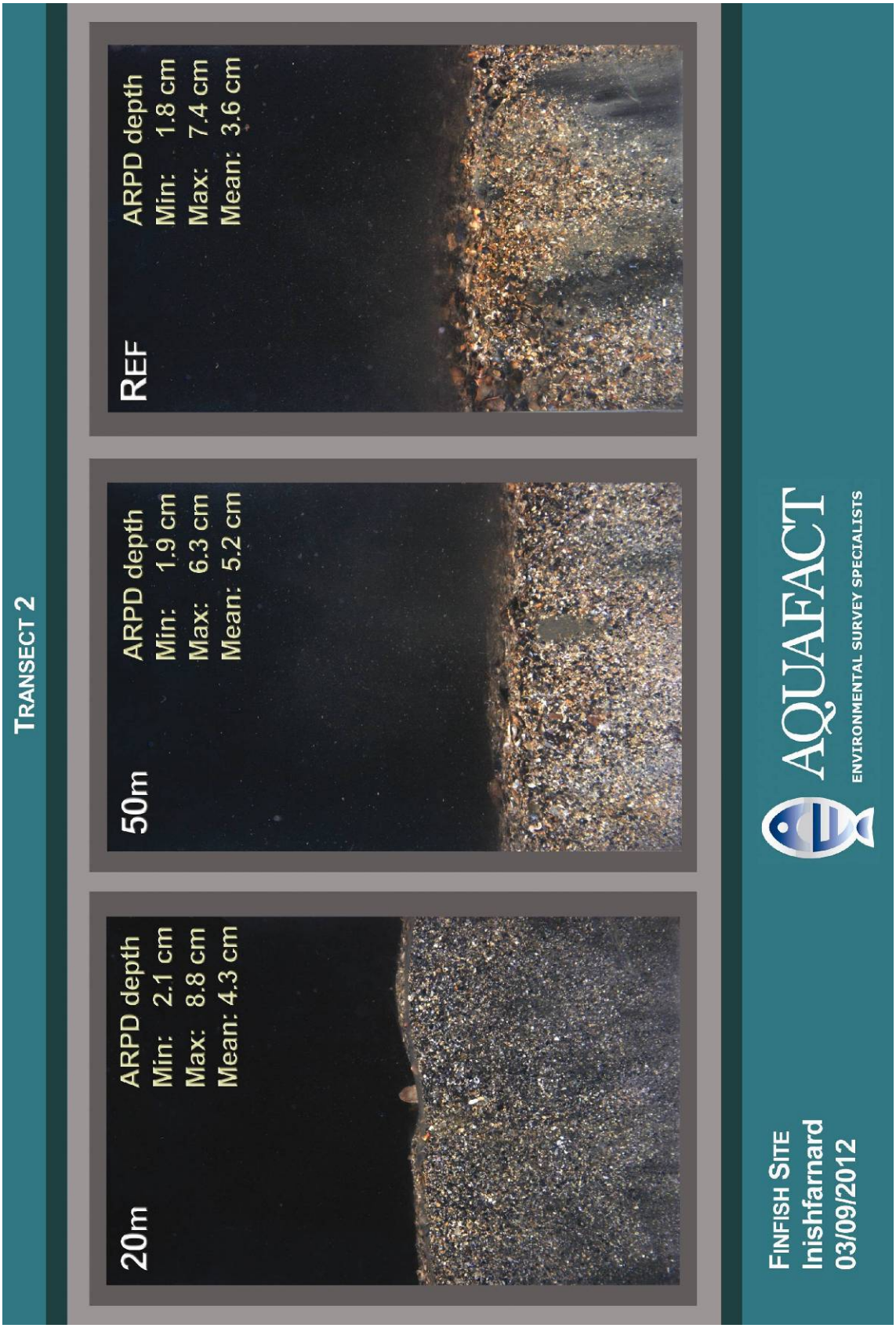
Figure 3.36. Reference Station, Inishfarnard site, Kenmare River, September 2012.

3.2.7. Sediment Profile Imagery Transect 2 & Reference

The following two plates present sediment profile images taken at the five stations visited on Transect 2 of the Inishfarnard site and the reference station. They display a single image and the maximum and minimum apparent redox potential discontinuity (ARPD) depths measured at each station. Each image is 15.5cm × 25cm. Along Transect 2, ARPD depths ranged from a minimum of 0.0cm (T2 Under, T2 Edge, T2 10m) to a maximum of 8.8cm (T2 20m). ARPD depths ranged from 1.8cm to 7.4cm at the Reference station. The composition of sediments at each station can be seen. The variation of the shell fraction in surface sediments can be seen from station to station – increasing with increasing distance from the cages. Stations close to the cage installation had a fine silt layer at the sediment water interface with evidence of deeper bioturbating species at depth. Images from the edge station show the effect of individual species whereby oxygenated sediments are observed at depth due to the irrigation activity of infaunal species. On moving away from the cages the profile images show the abundance of a coarser

fraction of sediments becoming obvious as does the higher reflectance oxygenated sediments at depth.


TRANSECT 2
UNDER
ARPD depth
Min: 0.0 cm
Max: 0.1 cm
Mean: 0.0 cm
EDGE
ARPD depth
Min: 0.0 cm
Max: 0.5 cm
Mean: 0.3cm
10m
ARPD depth
Min: 0.0 cm
Max: 3.0 cm
Mean: 0.6 cm
FINFISH SITE
Inishfarnard
03/09/2012
AQUAFACT
ENVIRONMENTAL SURVEY SPECIALISTS


TRANSECT 2
20m
ARPD depth
Min: 2.1 cm
Max: 8.8 cm
Mean: 4.3 cm
50m
ARPD depth
Min: 1.9 cm
Max: 6.3 cm
Mean: 5.2 cm
REF
ARPD depth
Min: 1.8 cm
Max: 7.4 cm
Mean: 3.6 cm
AQUAFACT
ENVIRONMENTAL SURVEY SPECIALISTS
FINFISH SITE
Inishfarnard
03/09/2012

3.2.8. Transect Species List

Table 3.5 gives the species recorded during the dive survey at the Inishfarnard fish farm site on the September 2012.

Table 3.5: Species recorded during the dive at the Inishfarnard fish farm site.

Group	Species	Common Name
(Cnidaria) Hexacorallia	*Cerianthus lloydii*	Tube anemone
(Annelida) Polychaeta	*Pomatoceros* sp. *Chaetopterus variopedatus*	Tube worm Parchment tube worm
(Arthropoda) Decapoda	*Cancer pagurus*	Edible crab
Echinodermata	*Luidia ciliaris* *Asterias rubens* *Amphiuridae sp.*	Seven armed starfish Common starfish Brittlestar
(Chordata) Osteiichthyes	*Pomatoschistus* sp.	Gobies
Rhodophyta	*Phycodrys sp.*	Sea oak

3.2.9. Benthic Macrofaunal Analysis

The taxonomic identification of the benthic infauna across all 11 stations sampled at the Inishfarnard fish farm site yielded a total count of 196 taxa accounting for 20,732 individuals, ascribed to 12 phyla. A complete listing of the taxa abundance is provided in Appendix 2. Of the 196 taxa present, 113 were identified to species level, the remaining 83 could not be identified to species level as they were juvenile, partial/damaged or indeterminate.

Of the 196 taxa enumerated, 85 were annelids (segmented worms), 54 were crustaceans (crabs, shrimps, prawns), 38 were molluscs (mussels, cockles, snails etc.), 8 were echinoderms (starfish, brittlestars, sea cucumbers), 4 were cnidarians (sea anemones, corals, jellyfish etc), 1 was a chelicerata (sea spider), 1 was a hemichordate (worm-like creatures closely related to Chordata and Echinodermata), 1 was a sipulculid (peanut worms), 1 was a cephalochordate (lancelet), 1 was a nemertean (ribbon worms), 1 was a nematoda (round worms) and 1 was a platyhelminthean (flat worm).

3.2.9.1. Univariate Analysis

Univariate statistical analyses were carried out on the combined replicate station-by-station faunal data. The following parameters were calculated and can be seen in Table 3.6; taxon numbers, number of individuals, richness, evenness and diversity. Taxon numbers ranged from 24 (T2 Edge) to 76 (T1 50m). Numbers of individuals ranged from 326 (T1 20m) to 9,397 (T1 Under). Richness ranged from 2.85 (T2 Edge) to 11.18 (REF). Evenness ranged from 0.35 (T2 Edge) to 0.77 (T1 20m). Diversity ranged from 1.61 (T2 Edge) to 4.61 (T1 20m).

Table 3.6: Diversity indices.

Station	No. Taxa	No. Individuals	Richness	Evenness	Diversity
T1 Under	35	9397	3.72	0.45	2.29
T1 Edge	46	1586	6.11	0.45	2.50
T1 10m	68	1172	9.48	0.54	3.26
T1 20m	63	326	10.71	0.77	4.61
T1 50m	76	976	10.90	0.54	3.37
T1 100m	63	358	10.54	0.61	3.63
T2 Edge	24	3181	2.85	0.35	1.61
T2 10m	35	1304	4.74	0.37	1.89
T2 20m	43	471	6.82	0.48	2.61
T2 50m	45	1438	6.05	0.44	2.42
REF	71	523	11.18	0.72	4.45

3.2.9.2. Multivariate analysis

The dendrogram and the MDS plot can be seen in Figures 3.37 and 3.38 respectively. The stress value of the MDS is 0.06 which indicates a good representation of the data with no real prospect for misinterpretation. SIMPROF analysis revealed 8 statistically significant groupings between the 11 stations (the stations joined by red lines could not be statistically differentiated from each other).

The Reference station grouped alone (**Group a**) and separated away from all other stations at a similarity level of 26.07%. This station had high levels of richness and diversity. Five species accounted for almost 60% of the faunal abundance at this station: the brittlestar *Amphipholis squamata* (22.8%;

119 individuals), the chiton *Leptochiton cancellatus* (14.7%; 77 individuals), the bivalves *Mytilidae* sp. (8.8%; 46 individuals) and the scaleworms *Polynoidae* sp. (8.6%; 45 individuals) and *Pholoe inornata* (4.6%; 24 individuals). The remaining c. 40% was accounted for by an additional 66 species, of which the crab *Pisisia longicornis* accounted for 3.3% of it (17 individuals). *Amphipholis squamata, Leptochiton cancellatus* and *Pisidia longicornis* are very sensitive to organic enrichment and present in unpolluted conditions. *Mytilidae* sp. are tolerant of excess organic matter enrichment. These species may occur under normal conditions but their populations are stimulated by organic enrichment. *Pholoe inornata* is a second order opportunist. *Polynoidae* sp. are indifferent to enrichment, always present in low densities with non-significant variations with time.

The remaining 10 stations split in two; **Groups b, c** and **d** split from **Groups e, f, g** and **h** at a similarity level of 38.21%. **Group d** contained stations T2 Edge and T2 10m. These stations formed a group at a similarity level of 63.33%. These stations had low levels of richness and diversity. Three species accounted for 95% of the faunal abundance of this group: the polychaete *Caulleriella alata* (59.2%; 2,653 individuals), Nematoda sp. (24.2%; 1,083 individuals) and the polychaete *Capitella* sp. (12.1%; 544 individuals). The remaining 5% was accounted for by a further 39 species, with the gastropod *Caecum trachea* accounting for 0.7% of it (31 individuals). *Capitella* sp. is a first order opportunist that thrives in reduced sediments. *Caulleriella alata* is a second order opportunist and Nematodes are tolerant of excess organic matter enrichment. These species may occur under normal conditions but their populations are stimulated by organic enrichment. *Caecum trachea* is very sensitive to organic enrichment and present in unpolluted conditions.

Station T1 Edge (**Group c**) joined **Group d** at a similarity level of 51.8%. This station had moderate levels of richness and diversity. Four species accounted for c. 87% of the faunal abundance at this station: Nematoda sp. (37%; 586 individuals), the polychaete *Capitella* sp. (36%; 570 individuals), the bivalve *Mytilus edulis* (8.1%; 128 individuals) and the polychaete *Caulleriella alata* (6.4%; 102 individuals). The remaining c. 13% was accounted for by a further 42 species, of which the bivalves *Mytililidae* sp. accounted for 2.7% of it (43 individuals). *Mytilus edulis* is tolerant of excess organic matter enrichment. This species may occur under normal conditions but their populations are stimulated by organic enrichment.

Station T1 Under (**Group b**) joined **Groups c** and **d** at a similarity level of 48.17%. This station had low

richness levels and moderate diversity. Three species accounted for 87% of the faunal abundance: Nematoda sp. (41.5%; 3,896 individuals) and the polychaetes *Caulleriella alata* (29.6%; 2,784 individuals) and *Capitella* sp. (15.6%; 1,464 individuals). The remaining 13% was accounted for by a further 32 species, of which Nemertea sp. accounted for 3.6% of it (336 individuals). Nemerteans are tolerant of excess organic matter enrichment. They may occur under normal conditions but their populations are stimulated by organic enrichment.

The remaining 6 stations made up a further 4 groups. **Group g** contained stations T1 10m and T2 50m and formed a group at a similarity level of 65.48%. This group had moderate to high richness and diversity levels. Four species accounted for c. 80% of the faunal abundance: Nematoda sp. (47.8%; 1,247 individuals), the polychaetes *Capitella* sp. (16.8%; 438 individuals) and *Mediomastus fragilis* (10%; 260 individuals) and the copepod *Miraciidae* sp. (4.1%; 106 individuals. The remaining c. 20% was accounted for by an additional 72 species, of which the polychaete *Caulleriella alata* accounted for 3.6% of it (93 individuals). *Mediomastus fragilis* is a second order opportunist.

Group h contained stations T1 20m and T1 50m. This group had a 56.98% similarity level and joined **Group g** at a 51.68%. These stations had high richness and diversity levels. Four species accounted for the top 60% of the faunal abundance: Nematoda sp. (46.1%; 600 individuals), the polychaete *Caulleriella alata* (5.5%; 72 individuals), the copepods *Miraciidae* sp. (5.2%; 68 individuals) and the polychaete *Mediomastus fragilis* (3.2%; 42 individuals). The remaining 40% of the faunal abundance was made up by a further 94 species, of which the amphipod *Photis longicaduata* accounted for 2.9% of it (38 individuals). *Photis longicaduata* is very sensitive to organic enrichment and present in unpolluted conditions.

Station T2 20m (**Group f**) separated from **Groups g** and **h** at a 46.9% similarity level. This station had moderate richness and diversity levels. Three species accounted for 76% of the faunal abundance: Nematoda sp. (61.4%; 289 individuals) and the polychaetes *Capitella* sp. (8.3%; 39 individuals) and *Phyllodoce mucosa* (6.4%; 30 individuals). The remaining 24% of the faunal abundance was made up of a further 40 species, of which the polychaete *Pholoe inornata* accounted for 2.6% of it (12 individuals). *Phyllodoce mucosa* is tolerant of excess organic matter enrichment. It may occur under normal conditions but their populations are stimulated by organic enrichment.

Station T1 100m (**Group e**) separated from **Groups f, g** and **h** at a 42.84% similarity level. This station had high richness and relatively high diversity levels. Three species accounted for 62% of the faunal abundance: Nematoda sp. (47.2%; 169 individuals), the gastropod *Caecum trachea* (12%; 43 individuals) and polychaetes *Mediomastus fragilis* (3.1%; 11 individuals). The remaining 38% of the faunal abundance was made up of a further 60 species, of which the brittlestar *Amphipholis squamata* accounted for 2.8% (10 individuals).

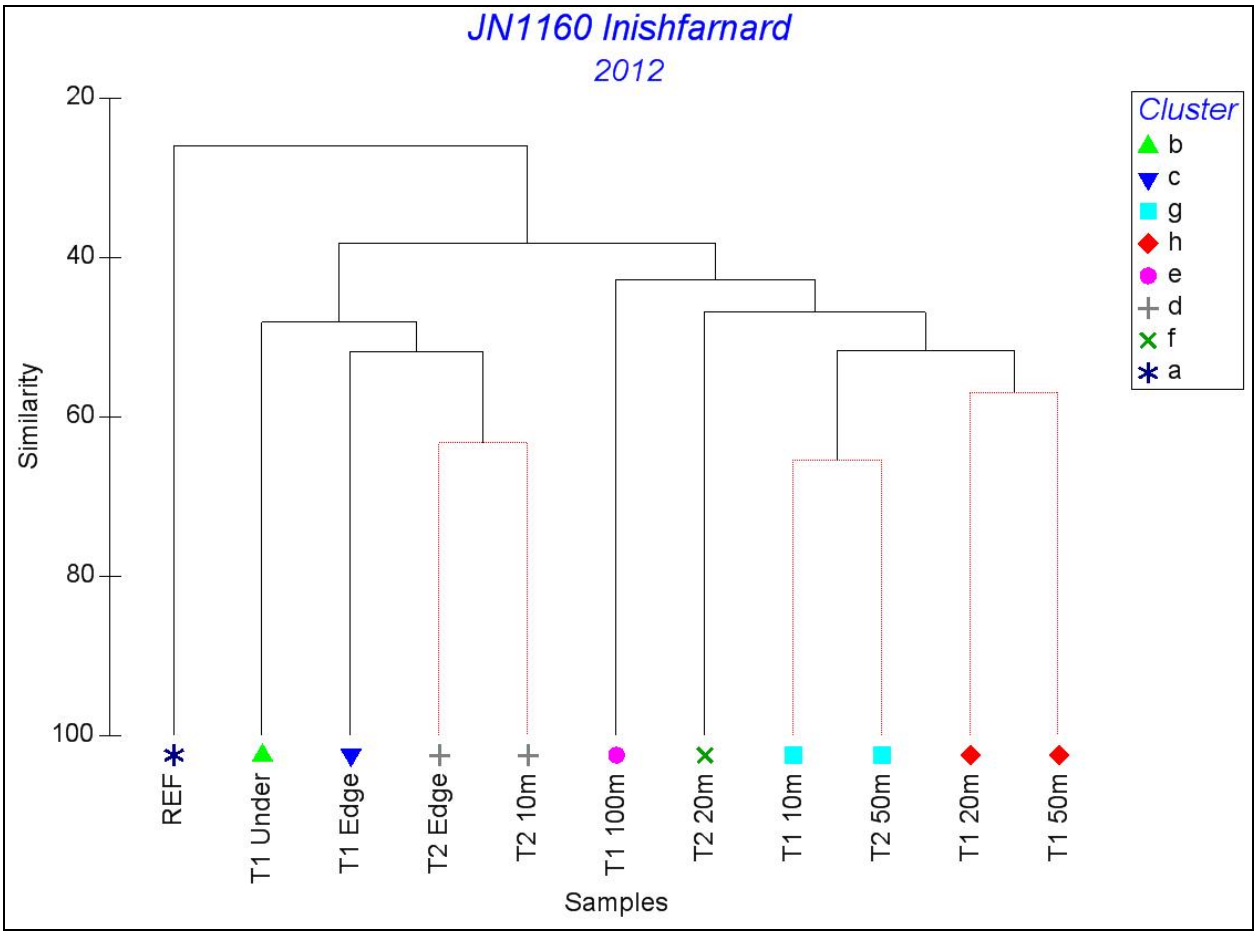


Figure 3.37: Dendrogram produced from Cluster analysis.

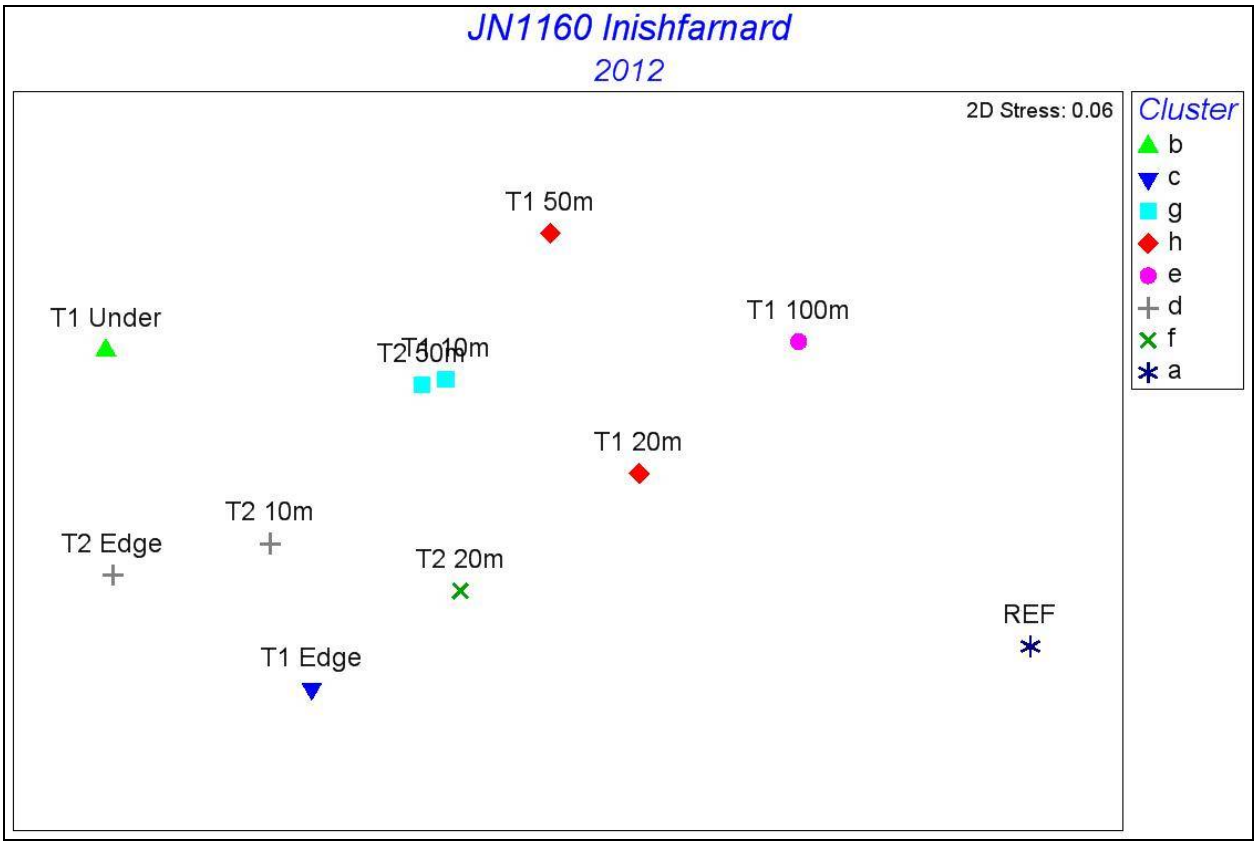


Figure 3.38: MDS plot.

3.2.10. Organic Carbon Analysis & ARPD Depths

Table 3.7 shows the organic carbon results from the Inishfarnard stations. Organic carbon levels ranged from 5.99% (Reference) to 14.01 (T1 Under). Table 3.8 shows in tabular form the ARPD depths from the SPI images from Inishfarnard (see Sections 3.2.4 and 3.2.7).

Table 3.7: Organic carbon results for Inishfarnard (% values, Loss on Ignition at 450°C).

T1	Under	Edge	10m	20m	50m	100m
LOI %	14.01	12.65	7.46	8.12	9.29	8.18
T2	**Under**	**Edge**	**10m**	**20m**	**50m**	**REF**
LOI %	-	12.32	10.37	7.27	8.64	5.99

Table 3.8: ARPD Depths for Inishfarnard, Kenmare Bay, September 2012

Station		Transect 1	Transect 2
Under	Range (cm)	0.0-0.5	0.0-0.1
	Mean (cm)	0.1	0.0
Edge	Range (cm)	0.0-0.5	0.0-0.5
	Mean (cm)	0.1	0.3
10m	Range (cm)	0.1-3.3	0.0-3.0
	Mean (cm)	1.1	0.6
20m	Range (cm)	0.1-2.9	2.1-8.8
	Mean (cm)	0.7	4.3
50m	Range (cm)	1.3-5.6	1.9-6.3
	Mean (cm)	2.4	5.2
100m	Range (cm)	0.5-6.2	-
	Mean (cm)	3.7	-
Reference	Range (cm)	-	1.8-7.4
	Mean (cm)	-	3.6

4. Discussion

The extent to which an overlying fish farm impacts the seafloor is largely dependent on:

- the feeding regime at that farm, i.e. the amount of food that eventually ends up on the seafloor;
- the degree of current movement at the site in question; and
- the depth of water at that site.

These factors combine to form either erosional or depositional locations where organic material is either dispersed or accumulates, and subsequently affects the receiving environment, in this case the seafloor. The type of animal community living at a particular site will also play a role in determining bottom conditions there. The influence of feeding activities of populations of starfish, polychaete worms, anemones, crabs and finfish at the Deenish and Inishfarnard sites largely determine the level of impact

of overlying farm operations on the benthos there.

Faunal feeding activity can remove large amounts of waste organic material from the seabed beneath a farm facility – with groups of mobile fauna capable of consuming large quantities of material. The fallowing schedule at a site also has a large bearing on benthic impact – most notably the length of time cages have been on site since the last fallow period. The presence of opportunistic deposit feeders such as *Capitella* sp., most notably at the under cage and cage edge stations will tend to help keep the benthic organics in a state of equilibrium at the fish farm sites. Sedimentary organic carbon levels were moderate on the Deenish site (ranged from 1.43 to 5.74%) and high at all stations investigated at the Inishfarnard site.

Mobile epibenthic scavengers such as starfish, fish and crabs also help in reducing the amount of waste material on the seafloor. This potential speed of the removal of waste was demonstrated in a previous study where photographic evidence was collected showing that epibenthic macrofauna were capable of removing, in less than 7 days, fish feed pellets spread at a density of 3.4kg dry weight per on the sediment under a marine fish farm (Smith *et al.*, 1997).

Results from previous surveys of the seafloor beneath the Inishfarnard and Deenish Island cage blocks showed few obvious signs of impact and in general, the surface appearance of the seafloor was healthy beyond the 10m-20m stations.

Based on the benthic photographic records taken during the current surveys, little habitat degradation is obvious beyond the 10m station on both transects at the Deenish site and beyond the 20m station on both transects at the Inishfarnard site.

Detailed faunal analysis of grab and core samples showed a clear divide between the stations closest to the cage and those furthest away at the Deenish site. The faunal results show that the impacts of the fish farm extend at least 10m but less than 20m from the cage on both transects. These locations group well (Group e) in the Cluster analysis with the species which dominated in and around the cages ranged from species that are tolerant to excess organic matter enrichment (e.g. *Caulleriella alata* sp.) to first order opportunistic species that proliferate in reduced sediments (e.g. *Capitella* sp.). The stations 50m and further from the cages (Group b and a) were dominated by species very sensitive to organic

enrichment and present under unpolluted conditions (e.g. *Pisidia longicornis*, *Amphipholis squamata, and Pholoe inornata).* These stations were the richest and most diverse of all the stations sampled.

The grab and core analysis at the Inishfarnard site revealed that the stations, with the exception of the Reference station, are generally grouped into two cohorts. The stations clustered under and at the edge of the cage contained large numbers of first-order opportunistic species, which thrive in areas of organic enrichment (e.g. *Capitella* sp.) and had low levels of richness and diversity. Organic carbon levels at these locations ranged from 14.01 to 7.46 and are relatively high for this type of environment. The other group's e, f, g, and h, in general had high richness and diversity levels and in the case of group g was populated by the amphipod *Photis longicaduata* that is very sensitive to organic enrichment and present in unpolluted conditions. The Reference station grouped alone (**Group a**) at this site and separated away from all other stations at a similarity level of 26.07%. This station had high levels of richness and diversity.

5. Conclusion

Benthic audit surveys were carried out at the Deenish and Inishfarnard fishfarm sites operated by Marine Harvest Ireland Ltd. on September 2012. The survey followed the DCMNR Level II monitoring protocols. In the present surveys beneath the cage blocks there were some obvious signs of impact from the farming operation on the benthos:

- Some waste feed/faecal material (and bacterial mat) was present within the 10m station at both Inishfarnard and at the Deenish farm sites;
- Organic carbon carbon levels were elevated at the under and edge stations; and
- Species composition in the undercage locations were reflective of organic enrichment.

Detailed faunal analysis at the Deenish site showed a clear divide between the stations closest to the cage and those furthest away. The faunal results show that any significant impacts of the fish farm extend to less than 10m from the cage installations.

Detailed faunal analysis at the Inishfarnard site also show that the impacts of the fish farm extend at

least 20m but less than 50m from the cage on both transects.

Based on the results of the dive survey no major signs of impact were readily appreciable beyond the 20m stations on all transects – no waste feed or faecal material was noted, ARPD depths were good beyond the cage edge stations and no bacterial mat or outgassing was recorded. Results of the detailed analysis of benthic fauna showed that the impact of the fish farm was limited to within the 10m station the Deenish site and out to approximately 20m from the cages at the Inishfarnard site.

The good benthic conditions at Inishfarnard can largely be attributed to:

- the favourable hydrographic conditions at the sites;
- the relatively low stocking densities and tonnages held in the cages;
- the feeding activities of benthic fauna; and
- good animal husbandry practice.

6. References

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Appendix 1

Faunal Grab Species List – Deenish

Station			T1 Under A	T1 Under B	T1 Edge A	T1 Edge B	T1 10m A	T1 10m B	T1 20m A	T1 20m B	T1 50m A	T1 50m B	T1 100m A
PORIFERA	C	1											
DESMOSPONGIAE	C	152											
Clionidae	C	471											
Cliona celata	C	480										+	
CNIDARIA	D	1											
ANTHOZOA	D	583											
Anthozoa sp.	D	583									1		
HEXACORALLIA	D	627											
CERIANTHARIA	D	628											
Cerianthidae	D	630											
Cerianthus lloydii	D	632									1		
ACTINIARIA	D	662											
Actiniaria sp.	D	662			1							1	
Edwardsiidae	D	759											
Edwardsiidae sp.	D	759								1			
NEMATODA	HD	1											
Nematoda sp.	HD	1	2264	2156	3380	2088	628	1323	1033	596	95	73	1
NEMERTEA	G	1											
Nemertea sp.	G	1							3	1			1
ANNELIDA	P	1											
POLYCHAETA	P	2											
PHYLLODOCIDA	P	3											
Polynoidae	P	25											
Polynoidae sp.	P	25									29	20	6
Lepidonotus clava	P	81											1
Pholoidae	P	90											
Pholoe sp.	P	91										1	
Pholoe inornata	P	92									13	23	20
Pholoe baltica (sensu Petersen)	P	95									5	3	
Sigalionidae	P	96											
Sthenelais sp.	P	106											
Phyllodocidae	P	114											

Station			T1 Under A	T1 Under B	T1 Edge A	T1 Edge B	T1 10m A	T1 10m B	T1 20m A	T1 20m B	T1 50m A	T1 50m B	T1 100m A
Phyllodocidae sp.	P	114						1			3	1	1
Eteone longa aggregate	P	118									2	2	
Eteone longa	P	118						2					
Phyllodoce mucosa	P	145			1	7			1				
Glyceridae	P	254											
Glyceridae sp.	P	254					1						
Glycera sp.	P	255									7	4	
Glycera alba	P	256											
Glycera lapidum	P	260									13	3	
Goniadidae	P	266											
Goniadidae sp.	P	266									1		
Sphaerodoridae	P	277											
Ephesiella peripatus	P												4
Sphaerodorum gracilis	P	291									1	2	
Hesionidae	P	293											
Hesionidae sp.	P	293									5		
Psamthe fusca	P	305											
Nereimyra punctata	P	311										1	3
Podarkeopsis capensis	P	319							1				
Syllidia armata	P	321											1
Syllidae	P	346											
Syllis sp.	P	358										2	
Trypanosyllis coeliaca	P	362									5	1	
Amblyosyllis formosa	P	375											1
Odontosyllis sp.	P	385										1	
Odontosyllis fulgurans	P	387											1
Exogoninae	P	410											
Sphaerosyllis sp.	P	424										1	
Sphaerosyllis bulbosa	P	425									5	1	
Myrianida prolifera	P	444											1
Nereididae	P	458											
Nereididae sp.	P	458					1						
Eunereis longissima	P	475					1	1					

Station			T1 Under A	T1 Under B	T1 Edge A	T1 Edge B	T1 10m A	T1 10m B	T1 20m A	T1 20m B	T1 50m A	T1 50m B	T1 100m A
Nephtyidae	P	490											
Nephtys sp.	P	494										1	
Nephtys cirrosa	P	498											
AMPHIMOMIDA	P	511											
Amphinomidae	P	512											
Euphrosine borealis	P	526											1
EUNICIDA	P	536											
Eunicidae	P	553											
Eunicidae sp.	P	553									1	3	1
Eunice harassii	P	556										2	
Nematonereis unicornis	P	568											
Lumbrineridae	P	569											
Lumbrineris cf cingulata	P												
Dorvilleidae	P	598											
Ophryotrocha sp.	P	613							1				
Protodorvillea kefersteini	P	638									5	2	
ORBINIIDA	P	654											
Paraonidae	P	674											
Paradoneis lyra	P	699											
SPIONIDA	P	707											
Spionidae	P	720											
Spionidae sp.	P	720				1					2	2	
Aonides sp.	P	721			3						1		
Aonides paucibranchiata	P	723							2				
Malacoceros sp.	P	736	132	56									
Malacoceros fuliginosus	P	737		128	11								
Dipolydora sp.	P	748											1
Dipolydora caulleryi	P	751									1		1
Dipolydora coeca	P	750											1
Dipolydora flava	P	754											1
Prionospio sp.	P	763										3	
Spio sp.	P	787											
Magelonidae	P	802											

Station			T1 Under A	T1 Under B	T1 Edge A	T1 Edge B	T1 10m A	T1 10m B	T1 20m A	T1 20m B	T1 50m A	T1 50m B	T1 100m A
Magelona sp.	P	803											
Magelona alleni	P	804											
Magelona filiformis	P	805											
Cirratulidae	P	822											
Cirratulidae sp.	P	822			13						1	4	
Cirratulid Type A	P					1				1			
Caulleriella alata	P	829	4	172	974	70	3	360	444	43	1	1	1
Chaetozone christiei	P												
Cirriformia tentaculata	P	839					1						
Tharyx killariensis	P	846						2					
FLABELLIGERIDA	P	872											
Flabelligeridae	P	873											
Flabelligera sp.	P	880											1
CAPITELLIDA	P	902											
Capitellidae	P	903											
Capitella sp.	P	906	860	1116	1202	335	190	426	166	187	35	36	
Mediomastus fragilis	P	919		4							9	7	
Arenicolidae	P	928											
Arenicola marina	P	931		2									
OPHELIIDA	P	992											
Scalibregmatidae	P	1020											
Scalibregma sp.	P	1025										1	
Scalibregma inflatum	P	1027									1	1	
POLYGORDIIDA	P	1060											
Polygordiidae	P	1061											
Polygordius sp.	P	1062									2		
OWENIIDA	P	1089											
Oweniidae	P	1090											
Galathowenia oculata	P	1093											
Owenia fusiformis	P	1098	2	4		1			2				
TEREBELLIDA	P	1099											
Pectinariidae	P	1100											
Pectinariidae sp.	P	1100			1				1	1			

Station			T1 Under A	T1 Under B	T1 Edge A	T1 Edge B	T1 10m A	T1 10m B	T1 20m A	T1 20m B	T1 50m A	T1 50m B	T1 100m A
Pectinaria (Amphictene) auricoma	P	1102										1	
Lagis koreni	P	1107	2	1								2	
Ampharetidae	P	1118											
Ampharete sp.	P	1133											
Terebellidae	P	1179											
Terebellidae sp.	P	1179										1	
Lanice conchilega	P	1195									2	1	
Polycirrus sp.	P	1235											1
SABELLIDA	P	1256											
Serpulidae	P	1324											
Serpulidae sp.	P	1324									2	7	
Hydroides norvegica	P	1334									21	9	5
Pomatoceros sp.	P	1339									5	2	27
Pomatoceros lamarcki	P	1340					2					5	25
OLIGOCHAETA	P	1402											
TUBIFICIDA	P	1403											
Tubificidae	P	1425											
Tubificoides sp.	P	1487											
Tubificoides pseudogaster aggregate	P	1498											
Tubificoides benedii	P	1490									1		
Enchytraeidae	P	1501											
Enchytraeidae sp.	P	1501									1		
CRUSTACEA	R	1											
MAXILLOPODA	R	13											
CIRRIPEDIA	R	14											
BALANOIDEA	R	59											
Balanidae	R	73											
Balanus balanus	R	76											
COPEPODA	R	142											
CYCLOPOIDA	R	617											
HARPACTICOIDA	R	785											
Miraciidae	R	1144											

Station			T1 Under A	T1 Under B	T1 Edge A	T1 Edge B	T1 10m A	T1 10m B	T1 20m A	T1 20m B	T1 50m A	T1 50m B	T1 100m A
Miraciidae sp.	R	1144									1		
OSTRACODA	R	2412											
Ostracoda sp.	R	2412									5		
MALACOSTRACA	S	1											
LEPTOSTRACA	S	3											
Nebaliidae	S	4											
Nebalia sp.	S	4	8	9	6	3	18			12			
Nebalia sp. A	S						1						
Nebalia cf herbstii	S	8										1	
EUMALACOSTRACA	S	23											
AMPHIPODA	S	97											
Amphipoda sp.	S	97										1	
Oedicerotidae	S	118											
Perioculodes longimanus	S	131									1	1	
Urothoidae	S	245											
Urothoe elegans	S	248											
Urothoe marina	S	249											
Phoxocephalidae	S	252											
Metaphoxus fultoni	S	265										1	
Lysianassidae	S	271											
Lysianassidae sp.	S	271									1		
Lysianassa plumosa	S	305										1	
Socarnes sp.	S	329										1	
Tryphosella sarsi	S	344											1
Tryphosella lowryi	S										1		
Iphimediidae	S	377											
Iphimedia perplexa	S	383											2
Dexaminidae	S	408											
Atylus swammerdamei	S	412											
Ampeliscidae	S	422											
Ampelisca sp.	S	423											
Ampelisca brevicornis	S	427											
Ampelisca typica	S	442					1						

Station			T1 Under A	T1 Under B	T1 Edge A	T1 Edge B	T1 10m A	T1 10m B	T1 20m A	T1 20m B	T1 50m A	T1 50m B	T1 100m A
Pontoporeiidae	S	450											
Bathyporeia sp.	S	451											
Melitidae	S	495											
Animoceradocus semiserratus	S	502									9	3	6
Cheirocratus sp.	S	503									3		
Cheirocratus sundevalli	S	506										8	
Gammarella fucicola	S	514										9	
Othomaera othonis	S	519									1	1	1
Photidae	S												
Photis longicaudata	S	552											
Ischyroceridae	S	558											
Jassa herdmani	S				1								
Aoridae	S	577											
Leptocheirus pectinatus	S	589									1		
Caprellidae	S	639											
Pariambus typicus	S	651			1				1	1			
ISOPODA	S	790											
Gnathiidae	S	792											
Gnathia sp.	S	793									1		
Janiridae	S	883											
Janiridae sp.	S	883										14	
Janira maculosa	S	892			1						4		7
TANAIDACEA	S	1099											
Tanaidacea sp.	S	1099											1
CUMACEA	S	1183											
Bodotriidae	S	1184											
Iphinoe trispinosa	S	1203											
DECAPODA	S	1276											
PAGUROIDEA	S	1436											
Paguridae	S	1445											
Paguridae sp.	S	1445			1								
Anapagurus hyndmanni	S	1448									5	2	2
Galatheidae	S	1469											

Station			T1 Under A	T1 Under B	T1 Edge A	T1 Edge B	T1 10m A	T1 10m B	T1 20m A	T1 20m B	T1 50m A	T1 50m B	T1 100m A
Galathea intermedia	S	1472									1		6
Porcellanidae	S	1480											
Pisidia longicornis	S	1482									1	50	179
BRACHYURA	S	1485											
Brachyura sp.	S	1485			2								
Leucosiidae	S	1502											
Ebalia sp.	S	1504										1	
Ebalia tuberosa	S	1508										1	
Majidae	S	1512											
Eurynome sp.	S	1535											
BRACHYRHYNCHA	S	1567											
Branchyrhyncha sp.	S	1567										1	
Portunidae	S	1569											
Liocarcinus sp.	S	1577									1		1
Goneplacidae	S	1603											
Xantho sp.	S	1618										1	
MOLLUSCA	W	1											
POLYPLACOPHORA	W	46											
NEOLORICATA	W	47											
Leptochitonidae	W	48											
Leptochiton sp.	W	51									1	1	
Leptochiton asellus	W	53									2	2	
Leptochiton cancellatus	W	54									8	11	2
Acanthochitonidae	W	83											
Acanthochitona crinita	W	86											
GASTROPODA	W	88											
Gastropoda sp.	W	88						1		1	1	1	
ARCHAEOGASTROPODA	W	90											
Trochidae	W	140											
Trochidae sp.	W	140										3	
Gibbula sp.	W	157									5	11	1
Gibbula cineraria	W	163											
Gibbula magus	W	159										1	

Station			T1 Under A	T1 Under B	T1 Edge A	T1 Edge B	T1 10m A	T1 10m B	T1 20m A	T1 20m B	T1 50m A	T1 50m B	T1 100m A
PATELLOGASTROPODA	W	219											
Lottiidae	W	221											
Tectura virginea	W	224											15
MESOGASTROPODA	W	256											
Rissoidae	W	324											
Rissoa parva	W	334										2	1
Onoba aculeus	W	386						1					
Onoba semicostata	W	371											4
Caecidae	W	411											
Caecum trachea	W	414									2		
Caecum glabrum	W	418									11		
Naticidae	W	482											
Euspira pulchella	W	491						1			2	1	
NEOGASTROPODA	W	670											
Buccinidae	W	702											
Nassarius sp.	W	743	2	34	24	4	5	4	4	2	1	12	5
Nassarius incrassatus	W	747		1			3		1		6	5	1
Nassarius pygmaeus	W	748	1		20					1			10
HETEROSTROPHA	W	878											
Pyramidellidae	W	906											
Ondina sp.	W	957											
Ondina diaphana	W	959						1					
OPISTHOBRANCHIA	W												
CEPHALASPIDEA	W	1002											
Cylichnidae	W	1024											
Cylichna cylindracea	W	1028											
Philinidae	W	1035											
Philine catena	W	1039											
Philine scabra	W	1045							1	1			
NUDIBRANCHIA	W	1243											
Nudibranchia sp.	W	1243											2
PELECYPODA	W	1560											
Bivalvia sp.	W	1560									1		1

Station			T1 Under A	T1 Under B	T1 Edge A	T1 Edge B	T1 10m A	T1 10m B	T1 20m A	T1 20m B	T1 50m A	T1 50m B	T1 100m A
MYTILOIDA	W	1689											
Mytilidae	W	1691											
Mytilidae sp.	W	1691	2	1	8	3	5	7			3	6	14
Mytilus edulis	W	1695	2			7	18	2	1	3			
OSTREOIDA	W	1752											
Pectinidae	W	1768											
Palliolum furtivum	W												
Anomiidae	W	1805											
Anomiidae sp.	W	1805									2	1	1
VENEROIDA	W	1815											
Lucinidae	W	1817											
Lucinoma borealis	W	1829						1					
Thyasiridae	W	1833											
Thyasira sp.	W	1836										3	
Thyasira flexuosa	W	1837											
Montacutidae	W	1888											
Tellimya ferruginosa	W	1902						3					
Kurtiella bidentata	W	1906	2		1	3		1			3	7	
Astartidae	W	1921											
Goodallia triangularis	W	1929									1		
Pharidae	W	1995											
Phaxas pellucidus	W	2006											
Tellinidae	W	2008											
Tellinidae sp.	W	2008									2		
Angulus fabula	W	2019											
Angulus donacina	W	2021		1									
Angulus pygmaea	W	2023									1	3	
Psammobiidae	W	2042											
Gari sp.	W	2044									1		
Gari fervensis	W	2051											
Veneridae	W	2086											
Veneridae sp.	W	2086									1	1	
Clausinella fasciata	W	2100						1				2	

Station			T1 Under A	T1 Under B	T1 Edge A	T1 Edge B	T1 10m A	T1 10m B	T1 20m A	T1 20m B	T1 50m A	T1 50m B	T1 100m A
Timoclea ovata	W	2104									1		
Dosinia sp.	W	2126			1		2						
Dosinia lupinus	W	2128					1		1				
MYOIDA	W	2140											
Myidae	W	2142											
Corbulidae	W	2153											
Hiatella arctica	W	2166										1	1
PHOLADOMYOIDA	W	2220											
Thraciidae	W	2226											
Thracia sp.	W	2228						1				1	
Thracia phaseolina	W	2231						1					
ECHINODERMATA	ZB	1											
ASTEROIDEA	ZB	18											
Asteroidea sp.	ZB	18										1	1
FORCIPULATIDA	ZB	95											
Asteriidae	ZB	96											
Asterias rubens	ZB	100					1						
OPHIUROIDEA	ZB	105											
Ophiuroidea sp.	ZB	105											
OPHIURIDA	ZB	121											
Ophiotrichidae	ZB	122											
Ophiothrix fragilis	ZB	124									1	1	
Ophiactidae	ZB	140											
Ophiactis balli	ZB	143											1
Amphiuridae	ZB	148											
Amphiuridae sp.	ZB	148										5	
Amphipholis squamata	ZB	161									56	39	43
Ophiuridae	ZB	165											
Ophiura sp.	ZB	166										3	
Ophiura albida	ZB	168											
ECHINOIDEA	ZB	181											
Echinoidea sp.	ZB	181											
ECHINOIDA	ZB	190											

Station			T1 Under A	T1 Under B	T1 Edge A	T1 Edge B	T1 10m A	T1 10m B	T1 20m A	T1 20m B	T1 50m A	T1 50m B	T1 100m A
Parechinidae	ZB	191											
Psammechinus miliaris	ZB	193											1
Echinidae	ZB	194											
Echinocyamus pusillus	ZB	212									1	1	
SPATANGOIDA	ZB	213											
Loveniidae	ZB	221											
Echinocardium sp.	ZB	222										1	
Echinocardium flavescens	ZB	224											
HOLOTHURIOIDEA	ZB	229											
APODIDA	ZB	289											
Synaptidae	ZB	290											
Leptosynapta sp.	ZB	291									1		

Station			T1 100m B	T2 Edge A	T2 Edge B	T2 10m A	T2 10m B	T2 20 m A	T2 20m B	T2 50m A	T2 50m B	Ref A	Ref B
PORIFERA	C	1											
DESMOSPONGIAE	C	152											
Clionidae	C	471											
Cliona celata	C	480											
CNIDARIA	D	1											
ANTHOZOA	D	583											
Anthozoa sp.	D	583											
HEXACORALLIA	D	627											
CERIANTHARIA	D	628											
Cerianthidae	D	630											
Cerianthus lloydii	D	632											
ACTINIARIA	D	662											
Actiniaria sp.	D	662									1		
Edwardsiidae	D	759											
Edwardsiidae sp.	D	759				2		1	1	2			1
NEMATODA	HD	1											
Nematoda sp.	HD	1	1	107	38	25	53	27	18	2	4	1368	4
NEMERTEA	G	1											
Nemertea sp.	G	1	1	1		1	3						1
ANNELIDA	P	1											
POLYCHAETA	P	2											
PHYLLODOCIDA	P	3											
Polynoidae	P	25											
Polynoidae sp.	P	25	5			1		1					
Lepidonotus clava	P	81											
Pholoidae	P	90											
Pholoe sp.	P	91											
Pholoe inornata	P	92	5									1	
Pholoe baltica (sensu Petersen)	P	95	2										
Sigalionidae	P	96											
Sthenelais sp.	P	106					1						
Phyllodocidae	P	114											

Station			T1 100m B	T2 Edge A	T2 Edge B	T2 10m A	T2 10m B	T2 20 m A	T2 20m B	T2 50m A	T2 50m B	Ref A	Ref B
Phyllodocidae sp.	P	114			1	1	1						
Eteone longa aggregate	P	118					1						
Eteone longa	P	118											
Phyllodoce mucosa	P	145			9		2					5	
Glyceridae	P	254											
Glyceridae sp.	P	254						1					
Glycera sp.	P	255	2		1	1	1			1			1
Glycera alba	P	256				5	1						
Glycera lapidum	P	260											
Goniadidae	P	266											
Goniadidae sp.	P	266				1	1	2	1				
Sphaerodoridae	P	277											
Ephesiella peripatus	P		1										
Sphaerodorum gracilis	P	291	1										
Hesionidae	P	293											
Hesionidae sp.	P	293											
Psamthe fusca	P	305	1										
Nereimyra punctata	P	311											
Podarkeopsis capensis	P	319											
Syllidia armata	P	321											
Syllidae	P	346											
Syllis sp.	P	358											
Trypanosyllis coeliaca	P	362											
Amblyosyllis formosa	P	375											
Odontosyllis sp.	P	385											
Odontosyllis fulgurans	P	387											
Exogoninae	P	410											
Sphaerosyllis sp.	P	424											
Sphaerosyllis bulbosa	P	425											
Myrianida prolifera	P	444											
Nereididae	P	458											
Nereididae sp.	P	458											
Eunereis longissima	P	475											

Station			T1 100m B	T2 Edge A	T2 Edge B	T2 10m A	T2 10m B	T2 20 m A	T2 20m B	T2 50m A	T2 50m B	Ref A	Ref B
Nephtyidae	P	490											
Nephtys sp.	P	494					1						
Nephtys cirrosa	P	498											2
AMPHIMOMIDA	P	511											
Amphinomidae	P	512											
Euphrosine borealis	P	526											
EUNICIDA	P	536											
Eunicidae	P	553											
Eunicidae sp.	P	553	1										
Eunice harassii	P	556											
Nematonereis unicornis	P	568	1										
Lumbrineridae	P	569											
Lumbrineris cf cingulata	P		1			1							
Dorvilleidae	P	598											
Ophryotrocha sp.	P	613											
Protodorvillea kefersteini	P	638										4	
ORBINIIDA	P	654											
Paraonidae	P	674											
Paradoneis lyra	P	699				1							
SPIONIDA	P	707											
Spionidae	P	720											
Spionidae sp.	P	720	1	3		3	2	1				11	
Aonides sp.	P	721	1										
Aonides paucibranchiata	P	723	2										
Malacoceros sp.	P	736											
Malacoceros fuliginosus	P	737											
Dipolydora sp.	P	748											
Dipolydora caulleryi	P	751											
Dipolydora coeca	P	750											
Dipolydora flava	P	754											
Prionospio sp.	P	763				1	1						
Spio sp.	P	787					1						
Magelonidae	P	802											

Station			T1 100m B	T2 Edge A	T2 Edge B	T2 10m A	T2 10m B	T2 20 m A	T2 20m B	T2 50m A	T2 50m B	Ref A	Ref B
Magelona sp.	P	803					1			1			
Magelona alleni	P	804		1		1	1						
Magelona filiformis	P	805				7		2		3			
Cirratulidae	P	822											
Cirratulidae sp.	P	822		1			1			1			1
Cirratulid Type A	P												
Caulleriella alata	P	829											
Chaetozone christiei	P					1				3			
Cirriformia tentaculata	P	839											
Tharyx killariensis	P	846											
FLABELLIGERIDA	P	872											
Flabelligeridae	P	873											
Flabelligera sp.	P	880											
CAPITELLIDA	P	902											
Capitellidae	P	903											
Capitella sp.	P	906		210		1	2	2			1	1	
Mediomastus fragilis	P	919											
Arenicolidae	P	928											
Arenicola marina	P	931											
OPHELIIDA	P	992											
Scalibregmatidae	P	1020											
Scalibregma sp.	P	1025											
Scalibregma inflatum	P	1027											
POLYGORDIIDA	P	1060											
Polygordiidae	P	1061											
Polygordius sp.	P	1062											
OWENIIDA	P	1089											
Oweniidae	P	1090											
Galathowenia oculata	P	1093							1	1			1
Owenia fusiformis	P	1098				1					2		
TEREBELLIDA	P	1099											
Pectinariidae	P	1100											
Pectinariidae sp.	P	1100											

Station			T1 100m B	T2 Edge A	T2 Edge B	T2 10m A	T2 10m B	T2 20 m A	T2 20m B	T2 50m A	T2 50m B	Ref A	Ref B
Pectinaria (Amphictene) auricoma	P	1102					1		1			1	
Lagis koreni	P	1107		1									
Ampharetidae	P	1118											
Ampharete sp.	P	1133				1							
Terebellidae	P	1179											
Terebellidae sp.	P	1179											
Lanice conchilega	P	1195											
Polycirrus sp.	P	1235											
SABELLIDA	P	1256											
Serpulidae	P	1324											
Serpulidae sp.	P	1324											
Hydroides norvegica	P	1334	9										
Pomatoceros sp.	P	1339	51										
Pomatoceros lamarcki	P	1340	70										
OLIGOCHAETA	P	1402											
TUBIFICIDA	P	1403											
Tubificidae	P	1425											
Tubificoides sp.	P	1487											1
Tubificoides pseudogaster aggregate	P	1498				2						1	2
Tubificoides benedii	P	1490			1								
Enchytraeidae	P	1501											
Enchytraeidae sp.	P	1501											
CRUSTACEA	R	1											
MAXILLOPODA	R	13											
CIRRIPEDIA	R	14											
BALANOIDEA	R	59											
Balanidae	R	73											
Balanus balanus	R	76	1										
COPEPODA	R	142											
CYCLOPOIDA	R	617											
HARPACTICOIDA	R	785											
Miraciidae	R	1144											

Station			T1 100m B	T2 Edge A	T2 Edge B	T2 10m A	T2 10m B	T2 20 m A	T2 20m B	T2 50m A	T2 50m B	Ref A	Ref B
Miraciidae sp.	R	1144											
OSTRACODA	R	2412											
Ostracoda sp.	R	2412											
MALACOSTRACA	S	1											
LEPTOSTRACA	S	3											
Nebaliidae	S	4											
Nebalia sp.	S	4	5	1								1	1
Nebalia sp. A	S												
Nebalia cf herbstii	S	8											2
EUMALACOSTRACA	S	23											
AMPHIPODA	S	97											
Amphipoda sp.	S	97							1			1	
Oedicerotidae	S	118											
Perioculodes longimanus	S	131				12	9	12			1		
Urothoidae	S	245											
Urothoe elegans	S	248										1	3
Urothoe marina	S	249										10	
Phoxocephalidae	S	252											
Metaphoxus fultoni	S	265											
Lysianassidae	S	271											
Lysianassidae sp.	S	271											
Lysianassa plumosa	S	305											
Socarnes sp.	S	329											
Tryphosella sarsi	S	344											
Tryphosella lowryi	S												
Iphimediidae	S	377											
Iphimedia perplexa	S	383											
Dexaminidae	S	408											
Atylus swammerdamei	S	412										1	
Ampeliscidae	S	422											
Ampelisca sp.	S	423							1				
Ampelisca brevicornis	S	427			1				2				
Ampelisca typica	S	442							1			1	4

Station			T1 100m B	T2 Edge A	T2 Edge B	T2 10m A	T2 10m B	T2 20 m A	T2 20m B	T2 50m A	T2 50m B	Ref A	Ref B
Pontoporeiidae	S	450											
Bathyporeia sp.	S	451								1			
Melitidae	S	495											
Animoceradocus semiserratus	S	502											
Cheirocratus sp.	S	503											
Cheirocratus sundevalli	S	506											
Gammarella fucicola	S	514											
Othomaera othonis	S	519	9										
Photidae	S												
Photis longicaudata	S	552											26
Ischyroceridae	S	558											
Jassa herdmani	S				1								
Aoridae	S	577											
Leptocheirus pectinatus	S	589											
Caprellidae	S	639											
Pariambus typicus	S	651				10	3	1	1		1		
ISOPODA	S	790											
Gnathiidae	S	792											
Gnathia sp.	S	793											
Janiridae	S	883											
Janiridae sp.	S	883											
Janira maculosa	S	892	12										
TANAIDACEA	S	1099											
Tanaidacea sp.	S	1099											
CUMACEA	S	1183											
Bodotriidae	S	1184											
Iphinoe trispinosa	S	1203				1		1					
DECAPODA	S	1276											
PAGUROIDEA	S	1436											
Paguridae	S	1445											
Paguridae sp.	S	1445											
Anapagurus hyndmanni	S	1448											
Galatheidae	S	1469											

Station			T1 100m B	T2 Edge A	T2 Edge B	T2 10m A	T2 10m B	T2 20 m A	T2 20m B	T2 50m A	T2 50m B	Ref A	Ref B
Galathea intermedia	S	1472	2										
Porcellanidae	S	1480											
Pisidia longicornis	S	1482	185										
BRACHYURA	S	1485											
Brachyura sp.	S	1485	1										
Leucosiidae	S	1502											
Ebalia sp.	S	1504											
Ebalia tuberosa	S	1508											
Majidae	S	1512											
Eurynome sp.	S	1535	1										
BRACHYRHYNCHA	S	1567											
Branchyrhyncha sp.	S	1567			1							1	
Portunidae	S	1569											
Liocarcinus sp.	S	1577	1										2
Goneplacidae	S	1603											
Xantho sp.	S	1618											
MOLLUSCA	W	1											
POLYPLACOPHORA	W	46											
NEOLORICATA	W	47											
Leptochitonidae	W	48											
Leptochiton sp.	W	51											
Leptochiton asellus	W	53											
Leptochiton cancellatus	W	54	2										
Acanthochitonidae	W	83											
Acanthochitona crinita	W	86	1										
GASTROPODA	W	88											
Gastropoda sp.	W	88											
ARCHAEOGASTROPODA	W	90											
Trochidae	W	140											
Trochidae sp.	W	140											
Gibbula sp.	W	157	3	1									
Gibbula cineraria	W	163	1										
Gibbula magus	W	159											

Station			T1 100m B	T2 Edge A	T2 Edge B	T2 10m A	T2 10m B	T2 20 m A	T2 20m B	T2 50m A	T2 50m B	Ref A	Ref B
PATELLOGASTROPODA	W	219											
Lottiidae	W	221											
Tectura virginea	W	224	7										
MESOGASTROPODA	W	256											
Rissoidae	W	324											
Rissoa parva	W	334	2										
Onoba aculeus	W	386											
Onoba semicostata	W	371											
Caecidae	W	411											
Caecum trachea	W	414											
Caecum glabrum	W	418											
Naticidae	W	482											
Euspira pulchella	W	491								1			
NEOGASTROPODA	W	670											
Buccinidae	W	702											
Nassarius sp.	W	743	9	1									
Nassarius incrassatus	W	747	4										
Nassarius pygmaeus	W	748	10										
HETEROSTROPHA	W	878											
Pyramidellidae	W	906											
Ondina sp.	W	957		1									
Ondina diaphana	W	959											
OPISTHOBRANCHIA	W												
CEPHALASPIDEA	W	1002											
Cylichnidae	W	1024											
Cylichna cylindracea	W	1028		1		1							
Philinidae	W	1035											
Philine catena	W	1039								1			
Philine scabra	W	1045											
NUDIBRANCHIA	W	1243											
Nudibranchia sp.	W	1243											
PELECYPODA	W	1560											
Bivalvia sp.	W	1560											

Station			T1 100m B	T2 Edge A	T2 Edge B	T2 10m A	T2 10m B	T2 20 m A	T2 20m B	T2 50m A	T2 50m B	Ref A	Ref B
MYTILOIDA	W	1689											
Mytilidae	W	1691											
Mytilidae sp.	W	1691		3	2	4	3					4	4
Mytilus edulis	W	1695		3									
OSTREOIDA	W	1752											
Pectinidae	W	1768											
Palliolum furtivum	W		1										
Anomiidae	W	1805											
Anomiidae sp.	W	1805	2										
VENEROIDA	W	1815											
Lucinidae	W	1817											
Lucinoma borealis	W	1829											
Thyasiridae	W	1833											
Thyasira sp.	W	1836											
Thyasira flexuosa	W	1837	1	1	3			4					
Montacutidae	W	1888											
Tellimya ferruginosa	W	1902			1								
Kurtiella bidentata	W	1906		6					1				
Astartidae	W	1921											
Goodallia triangularis	W	1929											
Pharidae	W	1995											
Phaxas pellucidus	W	2006							1				
Tellinidae	W	2008											
Tellinidae sp.	W	2008											
Angulus fabula	W	2019		1	3			2	1	1	1		
Angulus donacina	W	2021											
Angulus pygmaea	W	2023	1		1								
Psammobiidae	W	2042											
Gari sp.	W	2044											
Gari fervensis	W	2051											1
Veneridae	W	2086											
Veneridae sp.	W	2086				1	1				1		
Clausinella fasciata	W	2100	4										

Station			T1 100m B	T2 Edge A	T2 Edge B	T2 10m A	T2 10m B	T2 20 m A	T2 20m B	T2 50m A	T2 50m B	Ref A	Ref B
Timoclea ovata	W	2104											
Dosinia sp.	W	2126								2	1		
Dosinia lupinus	W	2128											
MYOIDA	W	2140											
Myidae	W	2142											
Corbulidae	W	2153											
Hiatella arctica	W	2166											
PHOLADOMYOIDA	W	2220											
Thraciidae	W	2226											
Thracia sp.	W	2228						2					
Thracia phaseolina	W	2231					1						
ECHINODERMATA	ZB	1											
ASTEROIDEA	ZB	18											
Asteroidea sp.	ZB	18	1										
FORCIPULATIDA	ZB	95											
Asteriidae	ZB	96											
Asterias rubens	ZB	100											
OPHIUROIDEA	ZB	105											
Ophiuroidea sp.	ZB	105	1						1				
OPHIURIDA	ZB	121											
Ophiotrichidae	ZB	122											
Ophiothrix fragilis	ZB	124											
Ophiactidae	ZB	140											
Ophiactis balli	ZB	143											
Amphiuridae	ZB	148											
Amphiuridae sp.	ZB	148											
Amphipholis squamata	ZB	161	32			7	1	8	4	1	3		
Ophiuridae	ZB	165											
Ophiura sp.	ZB	166											
Ophiura albida	ZB	168	1										
ECHINOIDEA	ZB	181											
Echinoidea sp.	ZB	181						1					
ECHINOIDA	ZB	190											

Station			T1 100m B	T2 Edge A	T2 Edge B	T2 10m A	T2 10m B	T2 20 m A	T2 20m B	T2 50m A	T2 50m B	Ref A	Ref B
Parechinidae	ZB	191											
Psammechinus miliaris	ZB	193											
Echinidae	ZB	194											
Echinocyamus pusillus	ZB	212											
SPATANGOIDA	ZB	213											
Loveniidae	ZB	221											
Echinocardium sp.	ZB	222				1	2	1			1		
Echinocardium flavescens	ZB	224				3		6					
HOLOTHURIOIDEA	ZB	229											
APODIDA	ZB	289											
Synaptidae	ZB	290											
Leptosynapta sp.	ZB	291											

Appendix 2

Faunal Grab Species List – Inishfarnard

Station			T1 Under A	T1 Under B	T1 Edge A	T1 Edge B	T1 10m A	T1 10m B	T1 20m A	T1 20m B	T1 50m A	T1 50m B	T1 100m A
CNIDARIA	D	1											
ANTHOZOA	D	583											
Anthozoa sp.	D	583						2					
HEXACORALLIA	D	627											
CERIANTHARIA	D	628											
Cerianthidae	D	630											
Cerianthus lloydii	D	632					1		1				
ACTINIARIA	D	662											
Actiniaria sp.	D	662							1				
Edwardsiidae	D	759											
Edwardsiidae sp.	D	759		1			2			1			7
PLATYHELMINTHES	F	1											
TURBELLARIA	F	2											
Turbellaria sp.	F	2				2							
NEMATODA	HD	1											
Nematoda sp.	HD	1	2328	1568	477	109	263	298	19	59	321	201	101
NEMERTEA	G	1											
Nemertea sp.	G	1	336			9	1	5		2	2	2	
SIPUNCULA	N	1											
SIPUNCULIDEA	N	2											
GOLFINGIIFORMES	N	10											
Golfingiidae	N	11											
Golfingiidae sp.	N	11									1		
ANNELIDA	P	1											
POLYCHAETA	P	2											
PHYLLODOCIDA	P	3											
Pisionidae	P	13											
Pisione remota	P	15	4				1				3	2	
Polynoidae	P	25											
Polynoidae sp.	P	25				2	2		1	1		3	3
Malmgreniella ljungmani	P	66											
Pholoidae	P	90											
Pholoe inornata	P	92			1		5	1	3			3	

Station			T1 Under A	T1 Under B	T1 Edge A	T1 Edge B	T1 10m A	T1 10m B	T1 20m A	T1 20m B	T1 50m A	T1 50m B	T1 100m A
Pholoe baltica (sensu Petersen)	P	95	4		1	1	2	4	4	1	1	6	
Phyllodocidae	P	114											
Phyllodocidae sp.	P	114				1		4					
Eteone longa aggregate	P	118					3	3	1	1			2
Pseudomystides limbata	P	136									3	1	1
Phyllodoce mucosa	P	145				2	2		1	2			
Eulalia cf. mustela	P	155											
Glyceridae	P	254											
Glycera sp.	P	255					6		2	5	11	1	2
Glycera alba	P	256											
Glycera lapidum	P	260					2		2	1	1	3	1
Glycera oxycephala	P	262					3						
Goniadidae	P	266											
Goniadidae sp.	P	266						1					1
Sphaerodoridae	P	277											
Ephesiella peripatus	P												
Sphaerodorum gracilis	P	291											
Hesionidae	P	293											
Hesionidae sp.	P	293		1			1	1	1	2		4	1
Hesiospina aurantiaca	P										1		
Kefersteinia cirrata	P	305								4		5	3
Syllidia armata	P	321	4										
Syllidae	P	346											
Syllidae sp.	P	346					1				1		1
Syllis cornuta	P	349			1		1	1					
Syllis columbretensis	P					1							
Eurysyllis tuberculata	P	355											
Syllis sp.	P	358							1			1	
Syllis pontxioi	P										1		
Trypanosyllis coeliaca	P	362											1
Syllis parapari	P												
Syllis garciai	P						1	1	1			10	2
Eusyllis blomstrandi	P	380											

Station			T1 Under A	T1 Under B	T1 Edge A	T1 Edge B	T1 10m A	T1 10m B	T1 20m A	T1 20m B	T1 50m A	T1 50m B	T1 100m A
Exogoninae	P	410											
Sphaerosyllis sp.	P	424									1	1	
Sphaerosyllis bulbosa	P	425					2						
Sphaerosyllis hystrix	P	427					2						
Sphaerosyllis taylori	P	430											
Myrianida sp.	P	434											
Nereididae	P	458											
Nereididae sp.	P	458				1							
Eunereis longissima	P	475	4										
Nephtyidae	P	490											
Nephtys sp.	P	494					2		1			1	
Nephtys cirrosa	P	498											2
EUNICIDA	P	536											
Onuphidae	P	537											
Onuphidae sp.	P	537									1		
Hyalinoecia bilineata	P	539							1				
Eunicidae	P	553											
Eunicidae sp.	P	553											
Eunice harassii	P	556						1					
Nematonereis unicornis	P	568							1				
Lumbrineridae	P	569											
Lumbrineridae sp.	P	569				1			1	1			
Lumbrineris cf cingulata	P												
Dorvilleidae	P	598											
Ophryotrocha sp.	P	613	20	28		2	10	12		1	13	6	
Protodorvillea kefersteini	P	638	44	12		3	36	9	1	3	7	15	2
Schistomeringos rudolphi	P	643								1		4	
ORBINIIDA	P	654											
Paraonidae	P	674											
Aricidea (Acmira) cerrutii	P	685					10			1	21	3	1
Paradoneis lyra	P	699											
SPIONIDA	P	707											
Spionidae	P	720											

Station			T1 Under A	T1 Under B	T1 Edge A	T1 Edge B	T1 10m A	T1 10m B	T1 20m A	T1 20m B	T1 50m A	T1 50m B	T1 100m A
Spionidae sp.	P	720		12			5	2					
Aonides sp.	P	721					6	1		1			
Aonides oxycephala	P	722				1	7				1		
Aonides paucibranchiata	P	723	4										
Malacoceros sp.	P	736	12		12								
Malacoceros fuliginosus	P	737	36	24	16								
Prionospio sp.	P	763					1					1	
Magelonidae	P	802											
Magelona alleni	P	804						1			1		
Cirratulidae	P	822											
Cirratulidae sp.	P	822	1	140				3	4		1	3	
Caulleriella alata	P	829	2148	636	99	3	47	33	17	4	39	12	
Cirriformia tentaculata	P	839		176	3		1						
FLABELLIGERIDA	P	872											
Flabelligeridae	P	873											
Diplocirrus stopbowitzi	P								1				4
CAPITELLIDA	P	902											
Capitellidae	P	903											
Capitella sp.	P	906	808	656	542	28	34	40	5	11	7	5	4
Mediomastus fragilis	P	919	24	8		12	31	47	9	10	12	11	5
Notomastus sp.	P	920						2					
OPHELIIDA	P	992											
Opheliidae	P	993											
Polyophthalmus pictus	P	1019											
Scalibregmatidae	P	1020											
Scalibregma inflatum	P	1027							3			1	
OWENIIDA	P	1089											
Oweniidae	P	1090											
Oweniidae sp.	P	1090											
TEREBELLIDA	P	1099											
Pectinariidae	P	1100											
Pectinariidae sp.	P	1100					2						
Pectinaria (Amphictene)	P	1102				1	2	1			1		

Station			T1 Under A	T1 Under B	T1 Edge A	T1 Edge B	T1 10m A	T1 10m B	T1 20m A	T1 20m B	T1 50m A	T1 50m B	T1 100m A
auricoma													
Lagis koreni	P	1107				1							
Ampharetidae	P	1118											
Ampharetinae sp.	P	1125						1					
Terebellidae	P	1179											
Pista sp.	P	1216					2	2	1	1		2	
Pista malmgreni	P											2	
Polycirrus sp.	P	1235								1	1		
SABELLIDA	P	1256											
Sabellidae	P	1257											
Sabellidae sp.	P	1257											
Jasmineira sp	P	1287					1		2		4	4	
Serpulidae	P	1324											
Serpulidae sp.	P	1324				1			4			2	
Hydroides norvegica	P	1334					5				3	3	
Pomatoceros sp.	P	1339			1				2				
Pomatoceros lamarcki	P	1340	12			1			5		1		
OLIGOCHAETA	P	1402											
TUBIFICIDA	P	1403											
Tubificidae	P	1425											
Tubificoides benedii	P	1490	4				4						
Enchytraeidae	P	1501											
Enchytraeidae sp.	P	1501		8			2	1	1		5	6	1
CHELICERATA	Q	1											
PYCNOGONIDA	Q	2											
Ammotheidae	Q	13											
Ammotheidae sp.	Q	13							1				
CRUSTACEA	R	1											
MAXILLOPODA	R	13											
CIRRIPEDIA	R	14											
THORACICA	R	15											
Verrucidae	R	39											
Verruca stroemia	R	41					1						

Station			T1 Under A	T1 Under B	T1 Edge A	T1 Edge B	T1 10m A	T1 10m B	T1 20m A	T1 20m B	T1 50m A	T1 50m B	T1 100m A
BALANOIDEA	R	59											
Balanidae	R	73											
Balanidae sp.	R	73											
COPEPODA	R	142											
Copepoda sp.	R	142	1			1							
CYCLOPOIDA	R	617											
Cyclopoida sp.	R	617		1									
HARPACTICOIDA	R	785											
Longipediidae	R	787											
Longipedia minor	R	791	1	1			1				1		
Miraciidae	R	1144											
Miraciidae sp.	R	1144	2	264			105				68		
Bulbamphiasus imus	R	1179	16					5			6		
OSTRACODA	R	2412											
Ostracoda sp.	R	2412											
MALACOSTRACA	S	1											
LEPTOSTRACA	S	3											
Nebaliidae	S	4											
Nebalia sp.	S		1	1	5			2			1		
Nebalia cf herbstii	S	8											
Sarsinebalia typhlops	S	11									3		
EUMALACOSTRACA	S	23											
AMPHIPODA	S	97											
Amphipoda sp.	S	97						1		1	4		
Oedicerotidae	S	118											
Monoculodes carinatus	S	125									1		
Stenothoidae	S	187											
Metopa sp.	S	190											
Urothoidae	S	245											
Urothoe sp.	S	246							1		1		
Urothoe elegans	S	248									9		
Urothoe marina	S	249							10		3	3	4
Phoxocephalidae	S	252											

Station			T1 Under A	T1 Under B	T1 Edge A	T1 Edge B	T1 10m A	T1 10m B	T1 20m A	T1 20m B	T1 50m A	T1 50m B	T1 100m A
Metaphoxus fultoni	S	265											
Lysianassidae	S	271											
Lysianassa sp.	S	302							1				
Lysianassa plumosa	S	305							2			1	
Dexaminidae	S	408											
Atylus swammerdamei	S	412											
Atylus vedlomensis	S	413											2
Guernea coalita	S	418									1		
Ampeliscidae	S	422											
Ampelisca sp.	S	423									1		1
Ampelisca brevicornis	S	427											2
Ampelisca typica	S	442									1		
Melitidae	S	495											
Melitidae sp.	S	495								1			
Animoceradocus semiserratus	S	502											
Cheirocratus sp.	S	503											
Othomaera othonis	S	519											
Isaeidae	S	537											
Gammaropsis lobata	S	540											
Photidae	S												
Photis sp.	S	551								1			
Photis longicaudata	S	552				4	5	4	21	16	1		
Ischyroceridae	S	558											
Jassa sp.	S	568	1										
Aoridae	S	577											
Aoridae sp.	S	577								1	3		
Leptocheirus pectinatus	S	589											
Caprellidae	S	639											
Caprella acanthifera group	S					2							
ISOPODA	S	790											
Isopoda sp.	S	790				1							
Cirolanidae	S	841											
Conilera cylindracea	S	849									3		

Station			T1 Under A	T1 Under B	T1 Edge A	T1 Edge B	T1 10m A	T1 10m B	T1 20m A	T1 20m B	T1 50m A	T1 50m B	T1 100m A
Janiridae	S	883											
Janira maculosa	S	892											
TANAIDACEA	S	1099											
Anarthruidae	S	1115											
Tanaopsis graciloides	S	1142							1				
CUMACEA	S	1183											
Cumacean sp.	S	1183									1		
Nannastacidae	S	1214											
Campylaspis legendrei	S	1218									1	1	
Diastylidae	S	1244											
Diastylis rugosa	S	1254					1		1		1		
DECAPODA	S	1276											
Decapoda sp.	S	1276											
PAGUROIDEA	S	1436											
Paguridae	S	1445											
Paguridae sp.	S	1445						1					
Anapagurus hyndmanni	S	1448							2				
Pagurus bernhardus	S	1457											
Galatheidae	S	1469											
Galathea intermedia	S	1472											
Porcellanidae	S	1480											
Pisidia longicornis	S	1482			6	32			1	3			
BRACHYURA	S	1485											
Brachyura sp.	S	1485	2			2	1	2	1	6			
Canceridae	S	1563											
Cancer pagurus	S	1566			1								
BRACHYRHYNCHA	S	1567											
Portunidae	S	1569											
Liocarcinus sp.	S	1577											
Goneplacidae	S	1603											
Xantho sp.	S	1618											
MOLLUSCA	W	1											
POLYPLACOPHORA	W	46											

Station			T1 Under A	T1 Under B	T1 Edge A	T1 Edge B	T1 10m A	T1 10m B	T1 20m A	T1 20m B	T1 50m A	T1 50m B	T1 100m A
NEOLORICATA	W	47											
Leptochitonidae	W	48											
Leptochiton sp.	W	51											
Leptochiton asellus	W	53			1				1	1			
Leptochiton cancellatus	W	54			2	2	3		6	4	1	4	1
Ischnochitonidae	W	67											
Callochiton septemvalvis	W	75											
Acanthochitonidae	W	83											
Acanthochitona sp.	W	85							1			1	
Acanthochitona crinita	W	86			1								
GASTROPODA	W	88											
ARCHAEOGASTROPODA	W	90											
Trochidae	W	140											
Gibbula sp.	W	157	1										
PATELLOGASTROPODA	W	219											
Lottiidae	W	221											
Tectura virginea	W	224											
MESOGASTROPODA	W	256											
Rissoidae	W	324											
Rissoa parva	W	334			1	1							1
Onoba semicostata	W	371											
Caecidae	W	411											
Caecum trachea	W	414	5		8	3	21	12	12		15	4	37
Caecum glabrum	W	418											
Naticidae	W	482											
Euspira pulchella	W	491					1	1					
Eulimidae	W	599											
Melanella sp.	W	633					1						
NEOGASTROPODA	W	670											
Buccinidae	W	702											
Nassarius sp.	W	743											
Nassarius incrassatus	W	747	3										
Nassarius pygmaeus	W	748			2	1							

Station			T1 Under A	T1 Under B	T1 Edge A	T1 Edge B	T1 10m A	T1 10m B	T1 20m A	T1 20m B	T1 50m A	T1 50m B	T1 100m A
OPISTHOBRANCHIA	W												
Opisthobranchia sp.	W												
NUDIBRANCHIA	W	1243											
Nudibranchia sp.	W	1243								1			
Dotidae	W	1269											
Doto sp.	W	1270				1							
PELECYPODA	W	1560											
Bivalvia sp.	W	1560											
MYTILOIDA	W	1689											
Mytilidae	W	1691											
Mytilidae sp.	W	1691	7	1	13	30	5	1	4	5		11	
Mytilus edulis	W	1695	17	9	21	107							
Musculus costulatus	W	1720				1							
OSTREOIDA	W	1752											
Anomiidae	W	1805											
Anomiidae sp.	W	1805											1
VENEROIDA	W	1815											
Lucinidae	W	1817											
Lucinoma borealis	W	1829											
Montacutidae	W	1888											
Kurtiella bidentata	W	1906							1			4	
Astartidae	W	1921											
Goodallia triangularis	W	1929											2
Cardiidae	W	1938											
Cardiidae sp.	W	1938										4	
Tellinidae	W	2008											
Tellinidae sp.	W	2008											2
Angulus sp.	W	2018					1						
Moerella donacina	W	2021						1				1	
Angulus pygmaea	W	2023					1	1	1		4		1
Psammobiidae	W	2042											
Gari sp.	W	2044											1
Gari tellinella	W	2049									1		4

Station			T1 Under A	T1 Under B	T1 Edge A	T1 Edge B	T1 10m A	T1 10m B	T1 20m A	T1 20m B	T1 50m A	T1 50m B	T1 100m A
Veneridae	W	2086											
Veneridae sp.	W	2086										4	
Clausinella fasciata	W	2100					1	1					
Dosinia sp.	W	2126											
ECHINODERMATA	ZB	1											
ASTEROIDEA	ZB	18											
Asteroidea sp.	ZB	18										1	
FORCIPULATIDA	ZB	95											
Asteriidae	ZB	96											
Asterias rubens	ZB	100			1								
OPHIUROIDEA	ZB	105											
OPHIURIDA	ZB	121											
Ophiotrichidae	ZB	122											
Ophiothrix fragilis	ZB	124								1			
Amphiuridae	ZB	148											
Amphipholis squamata	ZB	161					1		6			11	7
Ophiuridae	ZB	165											
Ophiura sp.	ZB	166										4	
ECHINOIDEA	ZB	181											
Echinoidea sp.	ZB	181									1		
ECHINOIDA	ZB	190											
Echinidae	ZB	194											
Echinocyamus pusillus	ZB	212											4
HOLOTHURIOIDEA	ZB	229											
DENDROCHIROTIDA	ZB	249											
Phyllophoridae	ZB	258											
Thyone fusus	ZB	262											
HEMICHORDATA	ZC	1											
Hemichordata sp.	ZC	1						3					
CEPHALOCHORDATA													
Branchiostomidae													
Branchiostoma lanceolatum						1	1	1			1		

Station			T1 100m B	T2 Edge A	T2 Edge B	T2 10m A	T2 10m B	T2 20 m A	T2 20m B	T2 50m A	T2 50m B	Ref A	Ref B
CNIDARIA	D	1											
ANTHOZOA	D	583											
Anthozoa sp.	D	583											
HEXACORALLIA	D	627											
CERIANTHARIA	D	628											
Cerianthidae	D	630											
Cerianthus lloydii	D	632	1										1
ACTINIARIA	D	662											
Actiniaria sp.	D	662											
Edwardsiidae	D	759											
Edwardsiidae sp.	D	759							1			1	
PLATYHELMINTHES	F	1											
TURBELLARIA	F	2											
Turbellaria sp.	F	2											
NEMATODA	HD	1											
Nematoda sp.	HD	1	68	596	148	102	237	81	208	307	379		1
NEMERTEA	G	1											
Nemertea sp.	G	1	1				1		5	6	4	3	2
SIPUNCULA	N	1											
SIPUNCULIDEA	N	2											
GOLFINGIIFORMES	N	10											
Golfingiidae	N	11											
Golfingiidae sp.	N	11										11	
ANNELIDA	P	1											
POLYCHAETA	P	2											
PHYLLODOCIDA	P	3											
Pisionidae	P	13											
Pisione remota	P	15											
Polynoidae	P	25											
Polynoidae sp.	P	25					1	1		1		34	11
Malmgreniella ljungmani	P	66	2										
Pholoidae	P	90											
Pholoe inornata	P	92	1					1	11	1		24	

Station			T1 100m B	T2 Edge A	T2 Edge B	T2 10m A	T2 10m B	T2 20 m A	T2 20m B	T2 50m A	T2 50m B	Ref A	Ref B
Pholoe baltica (sensu Petersen)	P	95			2	1			1			2	3
Phyllodocidae	P	114											
Phyllodocidae sp.	P	114	1				1			4			
Eteone longa aggregate	P	118	1			2			1	2			
Pseudomystides limbata	P	136											
Phyllodoce mucosa	P	145						16	14		12		
Eulalia cf. mustela	P	155											1
Glyceridae	P	254											
Glycera sp.	P	255	2			2	1			2		2	
Glycera alba	P	256									1		
Glycera lapidum	P	260	1							2		1	1
Glycera oxycephala	P	262											
Goniadidae	P	266											
Goniadidae sp.	P	266						1					
Sphaerodoridae	P	277											
Ephesiella peripatus	P											4	
Sphaerodorum gracilis	P	291										1	1
Hesionidae	P	293											
Hesionidae sp.	P	293	1							4		9	
Hesiospina aurantiaca	P									1			
Kefersteinia cirrata	P	305								2	1		3
Syllidia armata	P	321								1			
Syllidae	P	346											
Syllidae sp.	P	346											
Syllis cornuta	P	349					1					2	
Syllis columbretensis	P												
Eurysyllis tuberculata	P	355										1	
Syllis sp.	P	358											
Syllis pontxioi	P												
Trypanosyllis coeliaca	P	362	1									2	3
Syllis parapari	P								1				1
Syllis garciai	P		3							4		1	
Eusyllis blomstrandi	P	380											1

Station			T1 100m B	T2 Edge A	T2 Edge B	T2 10m A	T2 10m B	T2 20 m A	T2 20m B	T2 50m A	T2 50m B	Ref A	Ref B
Exogoninae	P	410											
Sphaerosyllis sp.	P	424											
Sphaerosyllis bulbosa	P	425										3	3
Sphaerosyllis hystrix	P	427	1										
Sphaerosyllis taylori	P	430											1
Myrianida sp.	P	434							1				
Nereididae	P	458											
Nereididae sp.	P	458											
Eunereis longissima	P	475											
Nephtyidae	P	490											
Nephtys sp.	P	494									1		
Nephtys cirrosa	P	498											
EUNICIDA	P	536											
Onuphidae	P	537											
Onuphidae sp.	P	537											
Hyalinoecia bilineata	P	539											
Eunicidae	P	553											
Eunicidae sp.	P	553	2										
Eunice harassii	P	556										2	
Nematonereis unicornis	P	568											
Lumbrineridae	P	569											
Lumbrineridae sp.	P	569	1										
Lumbrineris cf cingulata	P											1	
Dorvilleidae	P	598											
Ophryotrocha sp.	P	613			1	1		4	1	4	32		
Protodorvillea kefersteini	P	638	1	2	1	5	3	6	1	29	4		
Schistomeringos rudolphi	P	643				1							
ORBINIIDA	P	654											
Paraonidae	P	674											
Aricidea (Acmira) cerrutii	P	685								4	2		
Paradoneis lyra	P	699	1							1			
SPIONIDA	P	707											
Spionidae	P	720											

Station			T1 100m B	T2 Edge A	T2 Edge B	T2 10m A	T2 10m B	T2 20 m A	T2 20m B	T2 50m A	T2 50m B	Ref A	Ref B
Spionidae sp.	P	720			2				1				1
Aonides sp.	P	721			1		1	1			2		
Aonides oxycephala	P	722			1	4			3	7			
Aonides paucibranchiata	P	723											
Malacoceros sp.	P	736		3			2						
Malacoceros fuliginosus	P	737			3								
Prionospio sp.	P	763											
Magelonidae	P	802											
Magelona alleni	P	804						1					
Cirratulidae	P	822											
Cirratulidae sp.	P	822			20			1		1	1		
Caulleriella alata	P	829	1	1277	627	435	314	1	2	3	10		
Cirriformia tentaculata	P	839		1	11		8				1		
FLABELLIGERIDA	P	872											
Flabelligeridae	P	873											
Diplocirrus stopbowitzi	P		2									1	4
CAPITELLIDA	P	902											
Capitellidae	P	903											
Capitella sp.	P	906		152	274	61	57	6	33	329	35		
Mediomastus fragilis	P	919	6	1	6		7	4	2	76	106	3	2
Notomastus sp.	P	920											
OPHELIIDA	P	992											
Opheliidae	P	993											
Polyophthalmus pictus	P	1019								2			
Scalibregmatidae	P	1020											
Scalibregma inflatum	P	1027											
OWENIIDA	P	1089											
Oweniidae	P	1090											
Oweniidae sp.	P	1090	1										
TEREBELLIDA	P	1099											
Pectinariidae	P	1100											
Pectinariidae sp.	P	1100					1				1		
Pectinaria (Amphictene)	P	1102					1				1		

Station			T1 100m B	T2 Edge A	T2 Edge B	T2 10m A	T2 10m B	T2 20 m A	T2 20m B	T2 50m A	T2 50m B	Ref A	Ref B
auricoma													
Lagis koreni	P	1107		1	1	1	5	1				1	
Ampharetidae	P	1118											
Ampharetinae sp.	P	1125	1						1		1		
Terebellidae	P	1179											
Pista sp.	P	1216											
Pista malmgreni	P												
Polycirrus sp.	P	1235											1
SABELLIDA	P	1256											
Sabellidae	P	1257											
Sabellidae sp.	P	1257										1	
Jasmineira sp	P	1287			1								
Serpulidae	P	1324											
Serpulidae sp.	P	1324						1	1			2	
Hydroides norvegica	P	1334										7	1
Pomatoceros sp.	P	1339							4				1
Pomatoceros lamarcki	P	1340							3				2
OLIGOCHAETA	P	1402											
TUBIFICIDA	P	1403											
Tubificidae	P	1425											
Tubificoides benedii	P	1490		3		3	9	3		1	6		
Enchytraeidae	P	1501											
Enchytraeidae sp.	P	1501						1		11			
CHELICERATA	Q	1											
PYCNOGONIDA	Q	2											
Ammotheidae	Q	13											
Ammotheidae sp.	Q	13											
CRUSTACEA	R	1											
MAXILLOPODA	R	13											
CIRRIPEDIA	R	14											
THORACICA	R	15											
Verrucidae	R	39											
Verruca stroemia	R	41							2				

Station			T1 100m B	T2 Edge A	T2 Edge B	T2 10m A	T2 10m B	T2 20 m A	T2 20m B	T2 50m A	T2 50m B	Ref A	Ref B
BALANOIDEA	R	59											
Balanidae	R	73											
Balanidae sp.	R	73							1				
COPEPODA	R	142											
Copepoda sp.	R	142											
CYCLOPOIDA	R	617											
Cyclopoida sp.	R	617											
HARPACTICOIDA	R	785											
Longipediidae	R	787											
Longipedia minor	R	791									1		
Miraciidae	R	1144											
Miraciidae sp.	R	1144								1			
Bulbamphiasus imus	R	1179									3		
OSTRACODA	R	2412											
Ostracoda sp.	R	2412						1					
MALACOSTRACA	S	1											
LEPTOSTRACA	S	3											
Nebaliidae	S	4											
Nebalia sp.	S												
Nebalia cf herbstii	S	8	1										
Sarsinebalia typhlops	S	11											
EUMALACOSTRACA	S	23											
AMPHIPODA	S	97											
Amphipoda sp.	S	97						1					
Oedicerotidae	S	118											
Monoculodes carinatus	S	125											
Stenothoidae	S	187											
Metopa sp.	S	190		4									
Urothoidae	S	245											
Urothoe sp.	S	246	9										
Urothoe elegans	S	248						1					
Urothoe marina	S	249	2										
Phoxocephalidae	S	252											

Station			T1 100m B	T2 Edge A	T2 Edge B	T2 10m A	T2 10m B	T2 20 m A	T2 20m B	T2 50m A	T2 50m B	Ref A	Ref B
Metaphoxus fultoni	S	265										1	
Lysianassidae	S	271											
Lysianassa sp.	S	302											
Lysianassa plumosa	S	305										2	1
Dexaminidae	S	408											
Atylus swammerdamei	S	412										1	
Atylus vedlomensis	S	413	2					1					
Guernea coalita	S	418	1										
Ampeliscidae	S	422											
Ampelisca sp.	S	423	1							1	1		
Ampelisca brevicornis	S	427											
Ampelisca typica	S	442	1										
Melitidae	S	495											
Melitidae sp.	S	495										1	
Animoceradocus semiserratus	S	502										5	1
Cheirocratus sp.	S	503						3					1
Othomaera othonis	S	519										1	
Isaeidae	S	537											
Gammaropsis lobata	S	540										1	
Photidae	S												
Photis sp.	S	551											
Photis longicaudata	S	552				1	2	10	1	9			
Ischyroceridae	S	558											
Jassa sp.	S	568											
Aoridae	S	577											
Aoridae sp.	S	577	1										
Leptocheirus pectinatus	S	589										1	
Caprellidae	S	639											
Caprella acanthifera group	S												
ISOPODA	S	790											
Isopoda sp.	S	790											
Cirolanidae	S	841											
Conilera cylindracea	S	849	1										

Station			T1 100m B	T2 Edge A	T2 Edge B	T2 10m A	T2 10m B	T2 20 m A	T2 20m B	T2 50m A	T2 50m B	Ref A	Ref B
Janiridae	S	883											
Janira maculosa	S	892										1	
TANAIDACEA	S	1099											
Anarthruidae	S	1115											
Tanaopsis graciloides	S	1142											
CUMACEA	S	1183											
Cumacean sp.	S	1183											
Nannastacidae	S	1214											
Campylaspis legendrei	S	1218	1										
Diastylidae	S	1244											
Diastylis rugosa	S	1254				3					2		
DECAPODA	S	1276											
Decapoda sp.	S	1276					1						
PAGUROIDEA	S	1436											
Paguridae	S	1445											
Paguridae sp.	S	1445		1			1			1			
Anapagurus hyndmanni	S	1448										2	1
Pagurus bernhardus	S	1457		1									
Galatheidae	S	1469											
Galathea intermedia	S	1472										3	1
Porcellanidae	S	1480											
Pisidia longicornis	S	1482		1					2			16	1
BRACHYURA	S	1485											
Brachyura sp.	S	1485	1						2	3			
Canceridae	S	1563											
Cancer pagurus	S	1566											
BRACHYRHYNCHA	S	1567											
Portunidae	S	1569											
Liocarcinus sp.	S	1577											2
Goneplacidae	S	1603											
Xantho sp.	S	1618										1	
MOLLUSCA	W	1											
POLYPLACOPHORA	W	46											

Station			T1 100m B	T2 Edge A	T2 Edge B	T2 10m A	T2 10m B	T2 20 m A	T2 20m B	T2 50m A	T2 50m B	Ref A	Ref B
NEOLORICATA	W	47											
Leptochitonidae	W	48											
Leptochiton sp.	W	51	1									13	
Leptochiton asellus	W	53										2	
Leptochiton cancellatus	W	54	1						2		1	62	15
Ischnochitonidae	W	67											
Callochiton septemvalvis	W	75											1
Acanthochitonidae	W	83											
Acanthochitona sp.	W	85											
Acanthochitona crinita	W	86											
GASTROPODA	W	88											
ARCHAEOGASTROPODA	W	90											
Trochidae	W	140											
Gibbula sp.	W	157										4	
PATELLOGASTROPODA	W	219											
Lottiidae	W	221											
Tectura virginea	W	224	1									2	
MESOGASTROPODA	W	256											
Rissoidae	W	324											
Rissoa parva	W	334										10	
Onoba semicostata	W	371					1						
Caecidae	W	411											
Caecum trachea	W	414	6	17		5	9		6		8	7	
Caecum glabrum	W	418										1	
Naticidae	W	482											
Euspira pulchella	W	491	1							1			
Eulimidae	W	599											
Melanella sp.	W	633											
NEOGASTROPODA	W	670											
Buccinidae	W	702											
Nassarius sp.	W	743					3						
Nassarius incrassatus	W	747											
Nassarius pygmaeus	W	748											

Station			T1 100m B	T2 Edge A	T2 Edge B	T2 10m A	T2 10m B	T2 20 m A	T2 20m B	T2 50m A	T2 50m B	Ref A	Ref B
OPISTHOBRANCHIA	W												
Opisthobranchia sp.	W											1	
NUDIBRANCHIA	W	1243											
Nudibranchia sp.	W	1243											
Dotidae	W	1269											
Doto sp.	W	1270											
PELECYPODA	W	1560											
Bivalvia sp.	W	1560											
MYTILOIDA	W	1689											
Mytilidae	W	1691											
Mytilidae sp.	W	1691	1		6	1	4	6	5			43	3
Mytilus edulis	W	1695		16		1							
Musculus costulatus	W	1720											
OSTREOIDA	W	1752											
Anomiidae	W	1805											
Anomiidae sp.	W	1805				1			1			1	
VENEROIDA	W	1815											
Lucinidae	W	1817											
Lucinoma borealis	W	1829					1						
Montacutidae	W	1888											
Kurtiella bidentata	W	1906	1			1					1	1	
Astartidae	W	1921											
Goodallia triangularis	W	1929	2									2	
Cardiidae	W	1938											
Cardiidae sp.	W	1938	1										
Tellinidae	W	2008											
Tellinidae sp.	W	2008	1										
Angulus sp.	W	2018											
Moerella donacina	W	2021				1							
Angulus pygmaea	W	2023	1										
Psammobiidae	W	2042											
Gari sp.	W	2044											
Gari tellinella	W	2049										5	4

Station			T1 100m B	T2 Edge A	T2 Edge B	T2 10m A	T2 10m B	T2 20 m A	T2 20m B	T2 50m A	T2 50m B	Ref A	Ref B
Veneridae	W	2086											
Veneridae sp.	W	2086										5	
Clausinella fasciata	W	2100										2	
Dosinia sp.	W	2126							1				
ECHINODERMATA	ZB	1											
ASTEROIDEA	ZB	18											
Asteroidea sp.	ZB	18										1	
FORCIPULATIDA	ZB	95											
Asteriidae	ZB	96											
Asterias rubens	ZB	100											
OPHIUROIDEA	ZB	105											
OPHIURIDA	ZB	121											
Ophiotrichidae	ZB	122											
Ophiothrix fragilis	ZB	124										6	
Amphiuridae	ZB	148											
Amphipholis squamata	ZB	161	3									96	23
Ophiuridae	ZB	165											
Ophiura sp.	ZB	166											
ECHINOIDEA	ZB	181											
Echinoidea sp.	ZB	181											
ECHINOIDA	ZB	190											
Echinidae	ZB	194											
Echinocyamus pusillus	ZB	212										5	
HOLOTHURIOIDEA	ZB	229											
DENDROCHIROTIDA	ZB	249											
Phyllophoridae	ZB	258											
Thyone fusus	ZB	262	1										
HEMICHORDATA	ZC	1											
Hemichordata sp.	ZC	1											
CEPHALOCHORDATA													
Branchiostomidae													
Branchiostoma lanceolatum			1										