JOINT NATURE CONSERVATION COMMITTEE

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**No. 423**

# Broad-scale biotope mapping of potential reefs in the Irish Sea (north-west of Anglesey)

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**Abbreviations**

| | |
|---|---|
| BGS | British Geological Survey |
| CCW | Countryside Council for Wales |
| JNCC | Joint Nature Conservation Committee |
| MI | Marine Institute |
| NMW | Amgueddfa Cymru - National Museum Wales |
| SAC | Special Area of Conservation |
| UCC | University College Cork |

# Contents

# Executive Summary

The aim of this study was to investigate an area identified as potentially containing bedrock, stony or biogenic reef, protected habitats listed under Annex I of the EU 'Habitats Directive' (92/42/EEC).

To the north and northwest of Anglesey (approximately 11-16 nautical miles (nm) offshore) four such areas had been identified by the British Geological Survey, covering an area of approximately 140km$^2$ (Graham *et al.*, 2001). These mapped areas, which were identified as potential bedrock or stony reef, defined the four Survey Areas for this project.

It was also anticipated that areas of biogenic reef may also be found within the survey areas, due to historic records of *Modiolus modiolus* in the vicinity.

Between 9 and 14 August 2005, JNCC, in collaboration with the Countryside Council for Wales and University College Cork, surveyed these four areas from the *Celtic Voyager*. High resolution multibeam bathymetry and backscatter data were obtained for all four survey areas. Seventeen grab samples were obtained in three of the four survey areas. None were taken in Area 3. Twenty-nine video tows were obtained from all four survey areas.

The results from the current study suggest that the seabed in this study area was broadly characterised by complex topography and mixed sediment mosaics, which were home to benthic communities in tide swept environments.

Analysis of the infaunal component of the grab samples showed that all samples belonged to the same biotope, "*Mediomastus fragilis, Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel" (SS.SCS.CCS.MedLumVen). This community was characterised by the sea spider *Achelia echinata*, the bristle worms *Aonides paucibranchiata* and *Mediomastus fragilis*, the polychaetes Harmothoinae, and the common mussel *Mytilus edulis*.

A range of biological communities were determined from the video analysis. Some were typical of boulder areas subjected to moderate tidal streams, and were typified by faunal crusts, including species such as the bryozoan *Flustra foliacea,* the soft coral *Alcyonium digitatum*, hydroids and other encrusting fauna. In one of the survey areas, very high densities of the brittle star *Ophiothrix fragilis,* along with lower numbers of *Ophiocomina nigra*, were present, blanketing the underlying rocky substrate. Gravelly substrates were also common throughout the survey areas, supporting biological communities that did not easily match existing biotopes within the Marine Habitat Classification.

Faunal and substrate observations made throughout the survey area were relatively comparable with those observed in other studies nearby, as well as with some of the biotope predictions made by the HABMAP project. All of these studies indicated a highly complex area, with mixed sediments and biotopes mosaics occurring within small areas that could not be easily discerned without fine scale ground-truthing work.

Annex I reef was observed in patches throughout the four study areas, although these were concentrated in two of the four survey areas, with the other two areas having only a few small patches of isolated reef habitat. Where Annex I reef was found, it was comprised of boulders

and cobbles, which although scoured in places, supported epifauna such as *Pomatoceros triqueter/lamarcki* and *Alcyonium digitatum,* with hydroids such as *Abietinaria abietina* also common. Along video tows, reef habitat tended to alternate with more gravelly areas of non-reef habitat.

No biogenic reefs (formed by either *Modiolus modiolus* or *Sabellaria spinulosa*) were encountered through the survey.

Although Annex I reef was found in a number of locations, indicating that this could be an area of conservation interest, further work is required to compare the results of the current study with other known areas of reef within the Irish Sea, in order to decide on the most appropriate site for consideration as an SAC.

# 1. Introduction

## 1.1 Background to study

Implementation of the EU ‘Habitats Directive’ (92/42/EEC) in UK marine waters, which involved the designation of Special Areas of Conservation (SACs), alongside Special Protection Areas (SPAs) established under the earlier ‘Birds Directive’ (79/409/EEC) was initially confined to the area within UK territorial seas (i.e. within 12 nautical miles). The SACs and SPAs collectively form the Natura 2000 network of sites. In 1999, a UK court judgement resulted in the decision being taken to extend the designation of SACs into the UK offshore marine area, which includes those waters beyond 12nm and within the British fishery limits and the seabed within the UK Continental Shelf Designated Area. This judgement was ultimately transcribed into UK legislation through the Offshore Marine Conservation (Natural habitats, & c.) Regulations which came into force on 21 August 2007 (Statutory Instruments 2007 No. 1842), and the Joint Nature Conservation Committee (JNCC) was tasked with advising the UK Government on suitable areas to designate as SACs and SPAs in offshore waters.

The habitats listed on Annex I of the Habitats Directive (known hereafter as Annex I habitats) that are known to occur in offshore waters are:

- H1110, Sandbanks which are slightly covered by sea water all the time
- H1170, Reefs; and
- H1180, Submarine structures made by leaking gases

The first stage in the process of designating SACs in offshore waters was to collate existing data on known or likely occurrence of Annex I Habitats in UK offshore waters. This initial data collation exercise was completed in 2002 and culminated in the publication of a technical report, “Natura 2000 in UK Offshore Waters: Advice to support the implementation of the EC Habitats and Birds Directives in UK offshore waters” (Johnston *et al.*, 2002). This report listed areas where Annex I habitats were known or likely to occur, supported by scientific information. Several areas within the Irish Sea were identified as potentially containing Annex I reef.

In the context of the EC Habitats Directive, Annex I reefs are described as being “hard compact substrata on solid and soft bottoms, which arise from the sea floor in the sublittoral and littoral zone” (EC 2007, Box 1).

Three types of reefs are recognised in UK waters; bedrock reefs, stony reefs (including cobble and boulder reefs) and biogenic reefs made by cold-water corals, ross worms (*Sabellaria spinulosa*) or horse mussels (*Modiolus modiolus*). Whilst the definition of bedrock reef is relatively straightforward, the definition of stony reefs can be more problematic, and so further guidance will be developed by JNCC and the Country Agencies (Countryside Council for Wales, Natural England, Scottish Natural Heritage, Environment Agency Northern Ireland) to assist with this process.

**1170 "Reefs"**
**Definition of the habitat:**
Reefs can be either biogenic concretions or of geogenic origin. They are hard compact substrata on solid and soft bottoms, which arise from the sea floor in the sublittoral and littoral zone. Reefs may support a zonation of benthic communities of algae and animal species as well as concretions and corallogenic concretions.

Clarifications:
"*Hard compact substrata*" are: rocks (including soft rock, e.g., chalk), boulders and cobbles (generally >64 mm in diameter).
"*Biogenic concretions*" are defined as: concretions, encrustations, corallogenic concretions and bivalve mussel beds originating from dead or living animals, i.e. biogenic hard bottoms which supply habitats for epibiotic species.
"*Geogenic origin*" means: reefs formed by non biogenic substrata.
"*Arise from the sea floor*" means: the reef is topographically distinct from the surrounding seafloor.
"*Sublittoral and littoral zone*" means: the reefs may extend from the sublittoral uninterrupted into the intertidal (littoral) zone or may only occur in the sublittoral zone, including deep water areas such as the bathyal.
Such hard substrata that are covered by a thin and mobile veneer of sediment are classed as reefs if the associated biota are dependent on the hard substratum rather than the overlying sediment.
Where an uninterrupted zonation of sublittoral and littoral communities exist, the integrity of the ecological unit should be respected in the selection of sites.
A variety of subtidal topographic features are included in this habitat complex such as: Hydrothermal vent habitats, sea mounts, vertical rock walls, horizontal ledges, overhangs, pinnacles, gullies, ridges, sloping or flat bed rock, broken rock and boulder and cobble fields.

**Box 1.** Definition of Annex I Reefs (from CEC 2007)

Currently there are six SACs in the Irish Sea that have been designated with bedrock or stony reef habitat as a qualifying feature (Strangford Lough; Pembrokeshire Marine; Y Fenai a Bae Conwy/Menai Strait and Conwy Bay; Pen Llŷn a'r Sarnau; Cardigan Bay; Luce Bay and Sands). These SACs cover a range of types of reef, including soft and hard rock, low to high topographic complexity, reduced to full salinity, and low to high energy, however none include deep circalittoral reefs (>50m water depth). Therefore, the network of UK marine SACs would be improved by the inclusion of deeper, offshore reefs.

One of the main aims of this project therefore, was to obtain information on the extent and characteristics of such reefs in the Irish Sea, to enable gaps in the UK network of marine SACs to be filled.

To the north and northwest of Anglesey, the British Geological Survey (BGS) identified an extensive area of bedrock outcrops forming a submerged platform extension of the Pre-Cambrian rocks found on the Skerries and at Carmel Head (BGS 1:250,000 seabed sediment map). In places these outcrops extend beyond the 12nm Territorial Waters Limit. These rock outcrops were identified as areas of potential Annex I habitat by BGS, as part of a JNCC contract to map Annex I habitats within UK offshore waters (Graham *et al.,* 2001).

The geological interpretations also indicated that the Irish Sea as a whole had very extensive areas of glacial till and outwash deposits overlying the bedrock, which are classified on the

BGS seabed sediment maps as 'gravel' and which (according to the modified Folk classification used) can include cobbles and boulders. The reworking of these sediments during the marine transgression has, in areas with moderate to strong tidal currents and in bedload parting zones, left the seabed with a superficial coarse lag. Depending on the nature and morphology of the glacial deposits, the lag often comprises boulders and cobbles. Where these boulders and cobbles form a stable substratum, elevated above the surrounding areas, they can be classified as "reefs". Due to lack of data, it was not possible for BGS to map specific patches of Annex I reef within these broader gravel areas, and therefore all of the gravel areas were identified as having the potential to contain Annex I stony reef (Graham *et al.*, 2001).

The mapped areas identified as potential bedrock or stony reef defined the four survey areas for this project, as described in section 1.3.1.

It was anticipated that areas of biogenic reef may also be found within the survey areas, as patches of *Modiolus modiolus* had previously been recorded within this part of the Irish Sea, although the present day extent of any *M. modiolus* reefs is unknown (Johnston *et al.*, 2002) (Section 1.3.1).

In the summer of 2005, the opportunity arose for JNCC to collaborate with partners of the INTERREG funded HABMAP project (http://www.habmap.org) who were surveying areas in the southern Irish Sea. Additional funding, provided by establishing a Memorandum of Agreement between JNCC, Countryside Council for Wales (CCW) and University College, Cork (UCC) allowed the HABMAP survey to be extended by seven days, which enabled the areas of potential Annex I habitat to be surveyed. This collaborative survey would provide much needed data on the extent and characteristics of Annex I habitats in offshore waters, as well as provide additional data to support the validation of the HABMAP modelling outputs. By collaborating in this way, the cost of surveying was much reduced. The project also provided additional benefits to the INTERREG funded MESH project (Mapping European Seabed Habitats, http://www.searchmesh.net), by enabling MESH Recommended Operating Guidelines to be tested, and by providing valuable data on seabed habitats within the MESH study area. Due to conflicts in timing, it ultimately not possible to incorporate the data obtained through this current study into the HABMAP validation process, which took place in January 2008. It will be used, however, to support future work of CCW, in particular with the ongoing HABMAP project extension.

This report presents the approach used for seabed habitat mapping within this study, the results of this survey, and describes the conservation interest of the areas surveyed.

## 1.2 Background to approaches in seabed habitat mapping

Traditionally, seafloor habitats have been investigated through the use of direct sampling devices such as grabs, trawls and dredges or visual techniques such as diver observations or underwater video/photography. These techniques are however limited in their spatial coverage. Grabs provide information only on a very small seabed area (e.g., 0.1m$^2$) whilst towed gear such as beam trawls gather information over a wider area (e.g., towing a 2m beam for 100s of metres). Visual techniques such as diver survey or underwater videos allow seabed habitats to be observed *in situ*, and can provide valuable information about the spatial relationship of adjacent habitats because they cover a reasonably large area of seabed (e.g., video with field of view for 0.5m may be towed for several hundreds of metres). However all of these techniques still provide information for only a relatively small area of seabed.

The advent of acoustic imaging techniques such as multibeam echosounders and sidescan sonar has allowed large areas of seabed to be mapped to a high resolution in a relatively short space of time. Multibeam echosounders emit a swath of 'sound' towards the seafloor, and record the speed at which these signals are reflected back to the source. The speed of acoustic return can be used to calculate water depth, and once cleaned and processed, these soundings data can be used to produce a 3-D image of the seafloor. Vessel mounted multibeam echosounder systems can image the seafloor at speeds of around four to eight knots, with a swath width varying from hundreds to thousands of metres (depending on water depth). Adjacent lines of multibeam data can be mosaiced to produce a complete topographic map of an area of seabed. Such techniques allow rapid mapping of the seabed, and enable users to be able to visualise the topographic nature of the seafloor in a given area.

Whilst these acoustic techniques were primarily designed to provide information on the bathymetry of the seafloor, the strength of the reflected acoustic signal (backscatter) can also provide information about the physical nature of the seafloor (Kostylev *et al.,* 2001; Todd *et al.,* 1999). Although the exact nature of the relationship between backscatter amplitudes and the physical characteristics of the seafloor is complex and not fully understood, backscatter amplitudes can still be used to determine changes in seafloor character. Where ground-truthing data such as sediment samples are available, these can be used to try to determine the nature of the relationship between acoustic signature and sediment type. A reasonable assumption can then be made that wherever the same acoustic signature occurs, the nature of the sediment would also be similar. However, the nature of the sediment is only one of the parameters that can contribute to backscatter amplitude, and other factors such as the overlying biology can also affect backscatter, and so such an assumption should be treated with caution. Therefore, whilst backscatter should not be used in isolation, if it is used alongside bathymetry, biological and geological data, it can provide an additional layer of information that can be used to map seabed habitats (Kostylev *et al.,* 2001; Todd *et al.,* 1999; Todd *et al.,* 2000).

As with bathymetric data, backscatter amplitude can be mosaiced to produce a mapped product. This map can then be investigated, either by eye or using automated techniques (e.g., QTC Multiview) in various software packages to delineate areas with different backscatter characteristics. Whilst the resulting map is essentially a map of acoustic facies (where acoustic facies are areas with a similar acoustic signature), due to the close relationship between benthic communities and the physical nature of the seafloor (Gray 1974; Rhoads 1974), these acoustic facies can be characterised by the benthic habitats recorded within them. If biological ground-truthing data can allow such a relationship to be established in a given area, then the relationship can be used to extrapolate across the whole of the acoustically mapped area. For example, if a number of acoustically similar areas have been delineated (acoustic signature 'a'), and biological samples collected in some of these areas are revealed to be biological community type 'b', then it may be assumed that wherever acoustic signature 'a' is found, biological community 'b' can also be found. Naturally, the greater the number of biological ground-truthing samples there are, the greater confidence there can be in such assumptions.

There are obviously limitations to the approach. For example where the seafloor is particularly acoustically complex or where changes occur very gradually and clear acoustic facies can not be delineated. A further problem can occur due to the different resolutions at which acoustic and biological data are obtained. For example acoustic mapped products (bathymetry and backscatter) are often gridded, and depending on the resolution of the data collected, data may be gridded to metres or tens of metres. If data has been 'binned' into a grid of several metres, then changes in acoustic signature which can be delineated are likely to be in the order of tens of metres, to be confident that the change in acoustic signature is 'real' rather than an artefact of the data. Importantly, the biological techniques used to ground-truth such acoustic data may be measuring changes on a much smaller scale. These different resolutions may make it very difficult or even impossible to match changes in biology to changes in acoustic data and thus determine any relationships between the two (Davies *et al.,* 2008). For this reason, a robust ground-truthing strategy should be undertaken using a suite of different ground-truthing techniques, such as grab samples, and underwater video/photography.

A final limitation is that there is often insufficient biological data available to ground-truth the acoustic data. It is relatively easy to quickly cover large areas of seafloor with acoustic techniques; however biological sampling is more time intensive, both in the collection and subsequent analysis. Therefore biological sampling can be a major cost in terms of both time and money. Due to limited resources on many projects, the necessary volume of ground-truthing data required to produce a robust habitat map is often not achieved. This is particularly problematic in heterogeneous areas, a fact which may only be discovered once the survey is in progress, and the number of biological samples to be taken has been pre-determined. The end result is that there is insufficient biological information to adequately ground-truth the acoustic data and relationships between acoustic facies and biological communities cannot be made with any confidence, or cannot be made at all. In such situations, data can be presented as layers, and preliminary assessment of relationships between acoustic facies and biological communities can be made, but it is not possible to produce a full coverage habitat map.

The method of using a combination of acoustic and biological survey techniques to produce seabed habitat maps is now widely used, and methods are continually improving. It has been successfully applied to large scale projects (James *et al.,* 2007 and Mackie *et al.,* 2006) as well as more focussed studies (Brown *et al.,* 2002; Brown *et al.,* 2004; Davies *et al.,* 2008; Kostylev *et al.,* 2001). Recently, the Mapping European Seabed Habitats (MESH) project has attempted to draw together seabed habitat mapping expertise, compile existing habitat maps across the project area, promote consistent habitat mapping techniques and provide habitat mapping guidance to both those involved in habitat mapping, and end users of such maps.

The use of seabed habitat maps can be wide ranging, and have provided tools for, among other things, Marine Protected Area (MPA) identification, marine spatial planning, impact assessment and monitoring (e.g., Boyd *et al.,* 2004; James *et al.,* 2007; Mackie *et al.,* 2006; Pickrill and Todd 2003).

## 1.3 Survey Areas

### 1.3.1 Location

Four patches of potential Annex I reef within UK offshore waters (outside 12nm) of the Irish Sea were targeted within this study, covering a total area of approximately 140km$^2$ (Table 1 and Figure 1). The four survey areas area each located between approximately 11 – 16nm from the coast of Anglesey.

**Table 1.** Details of four survey areas.

| Survey Area | Approximate area (km$^2$) | Target |
|---|---|---|
| Area 1 | 50 | Part of large gravel area, identified on BGS seabed sediment map |
| Area 2 | 44 | Gravel patch |
| Area 3 | 23 | Diamicton patch |
| Area 4 | 24 | Part of large rock area |

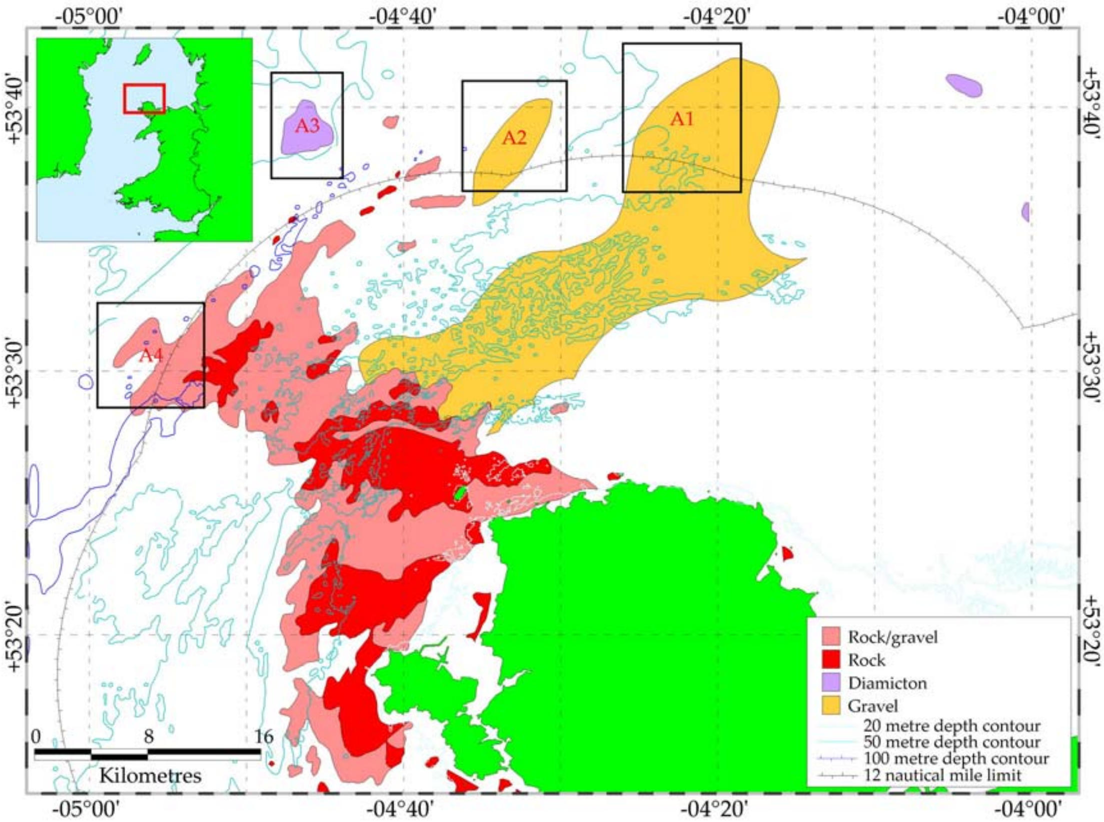



**Figure 1.** Four survey areas investigated within this project, encompassing areas of predicted occurrence of Annex I reef. Areas of potential Annex I reef are coloured according to the sediment type (seabed habitat derived from BGS 1:250,000 seabed sediment maps, © NERC).

### 1.3.2 Physical environment

The Irish Sea contains a deep channel running down its centre, which is roughly orientated north to south, and ranges from 80m to 110m in depth. This channel shelves on either side, with the four survey areas in this report lying on the eastern shelf edge, in depths ranging from 40m to 100m.

A salinity gradient exists from north to south of the Irish Sea, with the northern Irish Sea having a lower salinity due to increased riverine inputs (Bowden 1950). The salinity of the four survey areas within this project is between 34 and 35ppt, due to their location south of the reduced salinity area. In addition, although a seasonal stratification occurs in the northern Irish Sea this does not occur within the area of study (Proudman Oceanographic Laboratory data, as presented in Connor *et al.*, 2006). The tidal currents in this part of the Irish Sea are high, particularly around the north and west of Anglesey (Proudman Oceanographic Laboratory data, as presented in Connor *et al.*, 2006).

The seabed of the Irish Sea is strongly influenced by historic processes, resulting in a complex mixture of relict and modern features. A number of glaciation events have markedly influenced the seabed physiography and shallow sub-sediments. Glacial retreat following the last glaciations resulted in deposition of diamicton; a poorly sorted gravelly, sandy and muddy sediment (Holmes and Tappin 2005). In addition, glacial deposits were subject to surf zone processes during the marine transgression (Rees 2000).

In this region of the Irish Sea the nature of the seabed sediments is largely sedimentary. Survey areas 1 and 2 lie within an extensive gravel plain, including a mixture of gravel, sandy gravel and muddy sandy gravel (Figure 2). Area 3 encompasses a small patch of diamicton. The seabed sediment map produced by the BGS shows Area 4 to be the only one of the four study areas that includes areas of rock, encompassing a finger of rock extending from a large sub-sea platform of pre-Cambrian rock that reaches the north-west coast of Anglesey (Rees 2005).

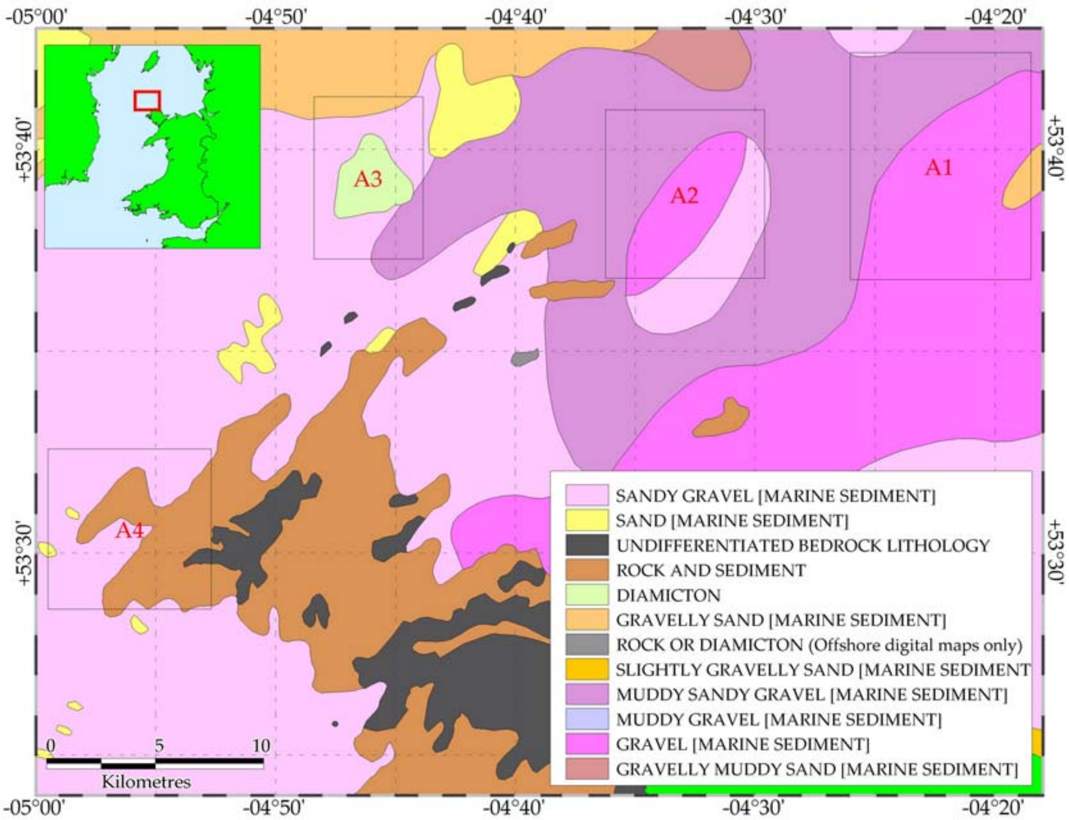



**Figure 2.** Distribution of surficial sediments around Anglesey (BGS DigSBS250, license 2003/062).

The recently completed UKSeaMap project produced a predictive landscape map (Connor *et al.*, 2006; Figure 3) in which 'marine landscape types' were described and mapped across the whole of the UK sea area. The landscape types, derived by carrying out a supervised classification of physical data sets relating to seabed substratum, light attenuation, depth, bottom temperature, wave-base and near-bed stress, were physical in their description. Overlaying the four study areas in NW Anglesey on the UKSeaMap landscape types reveals the following marine landscapes: Areas 1 and 3 both contain a mixture of Shallow coarse sediment plain – moderate tide stress, Shelf coarse sediment plain – moderate tide stress, and Shelf mixed sediment plain – moderate tide stress. Area 2 also includes both the Shelf coarse and Shelf mixed sediment plain – moderate tide stress. Finally Area 4 includes the Shelf coarse sediment plain – moderate tide stress as well as Aphotic rock and Shelf mound or pinnacle.

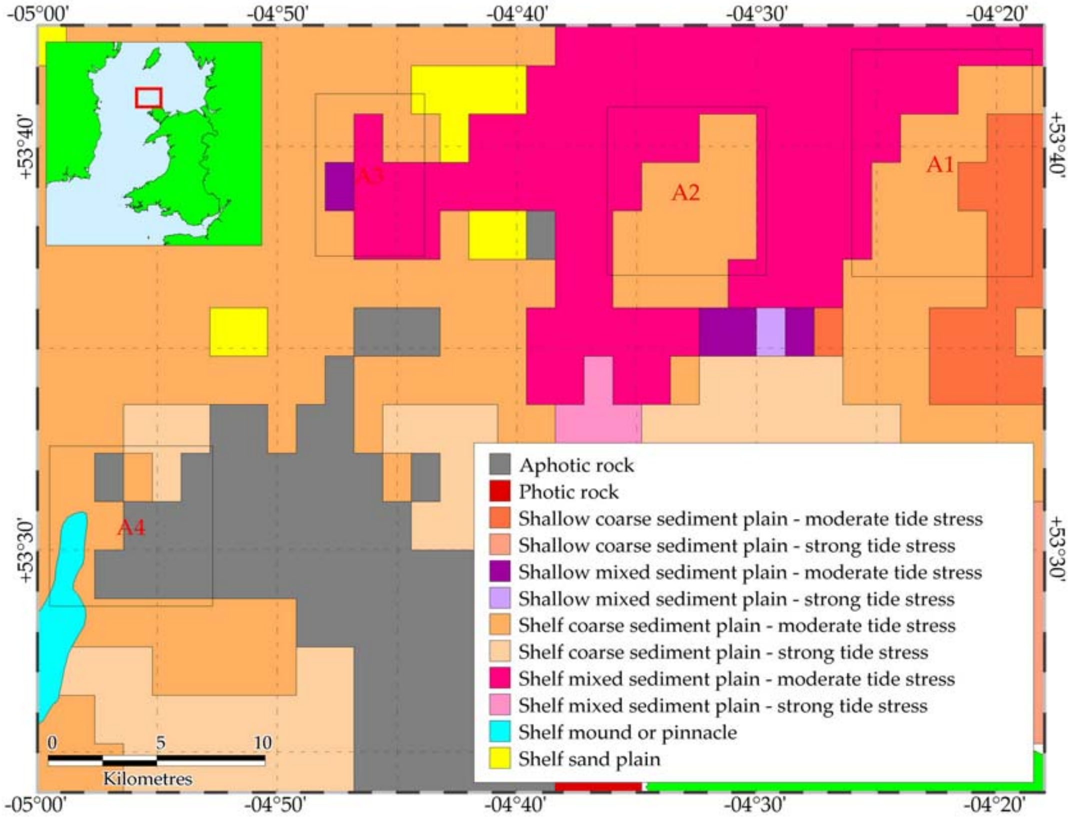



**Figure 3.** Marine landscapes predicted for study region (From Connor *et al.*, 2006).

Both the BGS seabed sediment map and UKSeaMap (which uses information from the BGS sediment map) indicate that the three northern study areas (Areas 1, 2 and 3) lie within a large area of coarse and mixed sediment plain. The nature of the seabed changes further south, with increased tidal stress and a large area of rock, which extends from the coast of Anglesey westward into the Irish Sea.

### 1.3.3 Biology

Although the biology of the Irish Sea has been well studied in some areas, the study area for this project has received little attention historically. Previous biological research in the Irish Sea has been well documented (e.g., Mackie *et al.*, 1995; Wilson *et al.*, 2001) and will not be dealt with in detail here. Many historic studies have tended to focus on impact studies (e.g., relating to sewage sludge or dredge disposal (Rees *et al.*, 1992)), be very geographically focussed (e.g., more attention in Liverpool Bay, Morecambe Bay or coastal areas, or linked to industrial activities (e.g., surveys to support oil and gas exploration), and therefore have limited application to the current project.

In general, studies within the part of the Irish Sea north and west of Anglesey have described coarse sediment communities, strongly influenced by the high tidal currents that operate in the area (Hensley 1995; Mackie *et al.*, 1995; Wilson *et al.*, 2001). Mackie (1990) produced a generalised map of Irish Sea faunal communities based on previous studies and personal observations (Figure 4). Work completed through the BIOMÔR benthic biodiversity studies in the southern Irish Sea increased knowledge of the biological assemblages present (Mackie *et al.*, 1995; Wilson *et al.*, 2001).

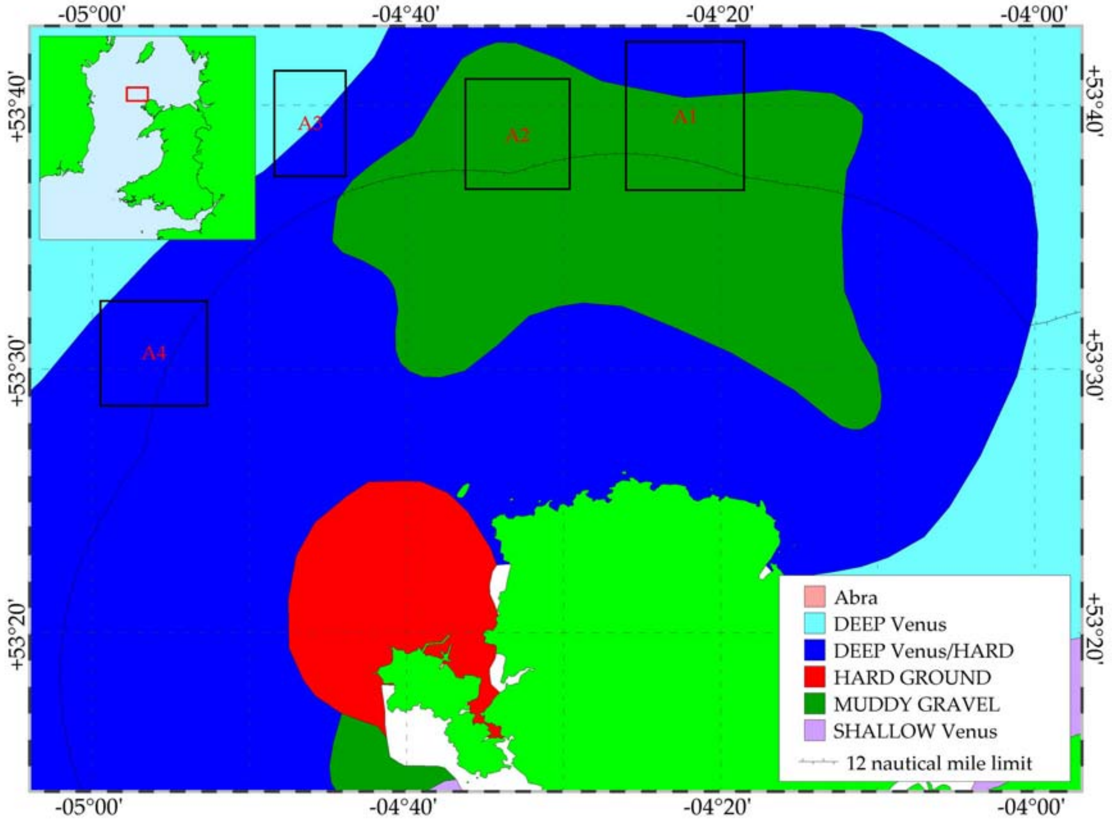



**Figure 4.** Map of faunal assemblages (Mackie *et al.*, 1995).

The faunal assemblages described by Mackie (1990) in the vicinity include:

- A Deep Venus community which is equivalent to the Polychaete-rich deep Venus community in offshore mixed sediments biotope (SS.SMx.OMx.PoVen) described in the Marine Habitat Classification for Britain and Ireland version 04.05 (Connor *et al.*, 2004, hereafter referred to as The Marine Habitat Classification), and
- A Deep Venus/Hard community, which has no direct equivalent within the Marine Habitat Classification, but which is most closely related to Sublittoral mixed sediment biotope complex (SS.SMx).

Both of these assemblages extend through much of the central Irish Sea. Also present within the study areas are regions of muddy and sandy gravel (equivalent to deep circalittoral coarse and sublittoral mixed sediment biotope complexes within The Marine Habitat Classification).

Other studies have noted the presence of beds of the horse mussel, *Modiolus modiolus*, throughout the Irish Sea, documented by Rees (2005). As part of the Department for Business, Enterprise & Regulatory Reform (formerly the Department of Trade and Industry) Strategic Environmental Assessment for the SEA6 region, Rees (2005) conducted additional survey work in an area thought to contain *M. modiolus* beds. This involved limited side-scan surveying around locations where *Modiolus* clumps had been recorded in the past, followed by targeted dredge sampling of features that might represent mussel aggregations. Four of the locations surveyed were found to contain beds and other locations may also have contained beds, but the patchiness of the habitat meant that successful targeting of the beds was difficult (Rees 2005). Although these areas of high *M. modiolus* density were within the vicinity of the current study areas, none occurred within any of the four study area boundaries. *Modiolus modiolus* beds are an important feature of conservation interest, being protected under the EU Habitats Directive as a sub-type of Annex I Reef (sub-type: biogenic) and under the OSPAR convention on the Initial List of Threatened and Declining Habitats and Species (OSPAR 2004). Rees (2005) also recorded several locations where *Sabellaria spinulosa* occurred in high densities. In general, these formed ‘crusts’, but in one location, the *S. spinulosa* colonies were fully developed into reef structures, although it was not possible to determine their extent. Whilst the *S. spinulosa* reef was recorded inshore of the current project study areas, several records of *S. spinulosa* crust lay within and around the four study areas of this project. As with *M. modiolus*, *S. spinulosa* reefs are protected under both the EU Habitats Directive (as a sub-type of Annex I Reef) and OSPAR.

Most recently the HABMAP project has developed predicted seabed biotope maps for the southern Irish Sea (Robinson *et al.*, 2007). Through this project, biological and physical datasets were collated within a Geographic Information System (GIS) and the spatial relationship between physical and biological parameters was then used to create a rule-based predictive tool. The project resulted in the production of a series of maps showing the predicted distribution of biotopes, based on their observed relationships with the physical environment in the study area. A final biotope map for the area was also produced, and the confidence with which biotopes were likely to occur in any given area was assessed against known occurrences as detailed in the Marine Habitat Classification biotope manual (Connor *et al.*, 2004). In areas where more than one biotope was predicted, these were ranked in order of their confidence scores, so that the final visual representation of the map showed the most confident prediction for every area (though information on all biotopes was retained within the GIS). This map predicted that the four study areas of the current project were likely to be predominantly characterised by *Flustra foliacea* and *Hydrallmania falcata* on tideswept circalittoral mixed sediment (SS.SMx.CMx.FluHyd). Other biotopes were also predicted to be present throughout the four study areas, although with a lower confidence. The predictions made by the HABMAP project in this area were thought to be less reliable than elsewhere in the HABMAP study area, due to the lack of offshore input data available for use in the model.

## 1.4 Objectives

The aim of the project was to improve understanding of the habitats and communities present beyond 12nm north of Anglesey in order to support nature conservation initiatives such as the EU Habitats Directive and the sustainable use of seas around the United Kingdom.

This was to be achieved by fulfilling the following objectives:

- Map the distribution of biotopes within the four study areas;
- Identify and map the extent of areas of Annex I reef, as defined by the EC Habitats Directive (92/43/EEC) within the study areas;
- Provide sufficient biological and acoustic data to allow the subsequent assessment of potential Annex I reef habitat against the interpretation of Annex I reef according to the EU Habitats Directive; and
- Provide biological and acoustic data to supplement that obtained by the INTERREG funded HABMAP project in order to help that project achieve its own objectives.

# 2. Methodology

## 2.1 Survey strategy and vessel

The survey was achieved through means of a collaborative agreement between JNCC and the partners of the INTERREG funded HABMAP project. The survey was conducted between 9 and 14 August 2005 and led by JNCC. Biological work was undertaken by staff from JNCC and CCW. UCC led on the acquisition of acoustic data, and assistance was provided by staff from the Marine Institute and Fugro (Table 2).

**Table 2**. Survey personnel present on cruise.

| Survey personnel | Organisation |
|---|---|
| Charlotte Johnston (Principle Scientific Officer) | Joint Nature Conservation Committee |
| Kerry Howell | Joint Nature Conservation Committee |
| Charles Lindenbaum | Countryside Council for Wales |
| Katrien Van Landeghem | University College Cork |
| Fabio Sacchetti | Marine Institute |
| Veronique Jegat | Marine Institute |
| Ian Devine | Fugro |

The research vessel used was the *RV Celtic Voyager* (contracted from the Marine Institute) as this vessel was already conducting survey work in the area for HABMAP. The *RV Celtic Voyager* is a 31.4m multi-purpose research vessel, owned and managed by the Marine Institute, Ireland (Figure 5).

**Figure 5**. The Marine Institute's research vessel, the *RV Celtic Voyager*.

As previously mentioned, four survey areas had been chosen for investigation on the basis of their potential to contain Annex I reef habitat. The aim of the survey was to obtain 100% multibeam coverage of each survey area, and, following an initial assessment of the data, obtain ground-truth data of the different ground-types and features of interest using underwater video and grabs. Sampling locations were chosen following an initial analysis of the backscatter data whilst on board the vessel, and the aim was to obtain 30 video tows/drops and 10 grab stations across all four survey areas.

## 2.2 Navigation

A Fugro Survey Ltd Starfix- HP GPS unit was installed on the vessel as the primary positioning source. The specified accuracy for Starfix HP is 0.2m (horizontal) and 0.3m (vertical) at the 95% confidence level. As well as horizontal positioning, derived GPS height from the HP system is used as an optional source of observed tide for bathymetric sounding reduction.

## 2.3 Acoustic data collection

### 2.3.1 Multibeam

Multibeam data were acquired using the Kongsberg Simrad EM1002 multibeam echosounder, hull-mounted on the *RV Celtic Voyager*, operating at a frequency of 93kHz (the outer ±20°) and 98kHz (inner ±50° swath centred at nadir), and utilising the MERLIN software package. Swath width varied between 300 and 500m depending on depth. Ideally, the swath was kept at a maximum of 68° that covers about 4.7 times the water depth. Line spacing was approx. 200m providing an overlap of 15–20%. Three Sound Velocity Profile drops were made throughout the cruise to allow calibration according to water conditions.

### 2.3.2 Single-beam

Single-beam data were acquired using the Simrad EA400 system currently installed on the *RV Celtic Voyager*. 129 lines of single beam data were collected at two frequencies, 38kHz and 200kHz, and served as a back-up only. Because multibeam data were successfully acquired over all areas, no further processing of the single-beam data was carried out.

## 2.4 Seabed sampling

### 2.4.1 Selection of sampling stations

Sampling stations were chosen to target particular features identified from the multibeam bathymetric and backscatter data as it was acquired. The priority for biological sampling was to obtain information about Annex I reef habitats, rather than to comprehensively ground-truth all acoustic ground types present within the study areas. As this objective focussed on the acquisition of data from hard substrata (because these areas would be more likely to support Annex I reef) the preferred sampling strategy was therefore to use videos to examine features anticipated to be on hard or rough ground (as determined from the acoustic data). As a lower priority, grab samples were used to target areas anticipated to contain softer sediment. Due to the limited time available on the survey for biological sampling, features for which initial interpretation suggested would be more likely to be Annex I reef were preferentially targeted. This meant that due to time constraints, not all four survey areas were sampled with all techniques.

### 2.4.2 Grab samples

Grab samples were obtained using a modified 0.1m$^2$ Van-Veen grab, provided by National Museum Wales (Figure 6). The aim was to obtain two replicate samples at each sampling station; however the strong currents and lack of dynamic positioning on the vessel resulted in some replicates being a considerable distance apart. The hardness of the seabed made obtaining samples in some areas difficult. Sampling was attempted three times before stations were abandoned and grabs with the greatest volumes of material were retained. The approximate volumes of the grab samples were assessed prior to processing. For each grab, the initial decanted animal fraction was washed through a 0.5mm sieve and preserved separately. The residue was sieved through a 1mm and 0.5mm stack and the fractions preserved separately in sample buckets. All samples were preserved in 4% formaldehyde in seawater solution stained with Rose Bengal.

A small sub-sample of sediment was taken from one replicate of each set of grabs for Particle Size Analysis (PSA).

**Figure 6**. NMW Van Veen grab being deployed.

### 2.4.3 Video samples

Two camera systems were used for obtaining video footage of the seabed. A larger towed video sledge was used where the seabed appeared to be relatively smooth, and a drop-down video camera was used where the seabed terrain was more rugged.

The towed video sledge was the Marine Institute's standard camera sledge, consisting of a Konsberg OE14-366/67 camera mounted on an aluminium frame (Figure 7a). This system was deployed over the stern of the vessel.

The second camera was a drop-down video system (provided by CCW) consisting of a Sony Model DCR-TRV950 3 chip colour camcorder fitted into a tubular anodized aluminium housing with an Aphibico 70 degree optical widener, allowing wide angle to macro use of the camcorder zoom lens. The system had two High Intensity Discharge video lamps powered and switched from the surface unit. Removable diffusers were fitted to provide an even floodlit effect over the field of view. Two small lasers (controlled from the surface unit) were mounted in parallel inside the camera housing exactly 10cm apart. The resulting laser beams are visible on the sea floor providing a horizontal scale of 10cm. The drop-down camera system was mounted on a relatively small, lightweight frame, enabling it to be deployed using a light duty winch and cable from the side of the vessel (Figure 7b). The deployment from the side of the vessel allowed easy visual communication between the winch operators and the drop-down video camera operator.

**Figure 7**
**(a)** Marine Institute towed video sledge. **(b)** CCW drop-down video camera.

The video surface unit comprised an 'Underwater Kinetics' type waterproof suitcase containing a Sony GV-D1000 Digital, Mini-DV Format. The system included a title and camera depth labelling system that overlaid data onto the surface image for recording and viewing. The case also contained the controls for the underwater camera and lights. During operation a live video signal was fed to the surface unit and displayed on a small monitor. This allowed footage to be reviewed in real time, and enabled the height of the camera frame off the seabed to be controlled more accurately

The video signal was also sent from the recording MiniDV surface unit to a DVD recorder where the video was also additionally simultaneously recorded. The video signal was then sent from this recorder and displayed on a 14" TV monitor for the video operator and also transmitted to the wheelhouse via a signal booster and coaxial cable for the captain. During operation the approximate position of the video camera was automatically logged. The position was derived from the ship's position, using a layback calculation based on the vessel heading, water depth and cable length.

Audio communication was maintained throughout operations through the use of handheld radios so that the wheelhouse, the person recording the videos position, the two winch operators and video camera operator were all in close communication with one another. This was essential, particularly in rugged areas, where the drop-camera had to be hauled up and down frequently in order to maintain a set height off the seabed.

During deployment, the video footage was reviewed, and hand-written notes were made onto a Video Log Sheet (Appendix 9.1). Start and end times and their relative positions were recorded, along with basic metadata about each video tow, and notes of any problems that had been encountered (e.g., problems caused by strong currents or with any equipment). A brief description of the visible fauna and of the seabed sediment-type was also recorded.

## 2.5 Data processing and analysis

Multibeam processing, interpretation and analysis were completed by the University College, Cork through contract to JNCC (Van Landeghem and Wheeler 2007).

### 2.5.1 Multibeam bathymetry and backscatter

**Swath bathymetry processing**

The raw sounding data were processed using CARIS© HIPS and SIPS (v5.4), a hydrographic software package that allows data to be cleaned, and exported into georeferenced products that can be used in other applications. Data cleaning was achieved by correction of tidally induced artefacts, and by manually isolating outliers to discard erroneous data points.

Depths were corrected for tidal range drawing on the POLPRED software package that makes use of one or more of Proudman Oceanographic Laboratory's hydrodynamic models to compute and visualise tidal levels and currents.

In CARIS HIPS, the corrected soundings were gridded to a Bathymetry Associated with Statistical Error (BASE) surface. A BASE surface is a multi-attributed, georeferenced image which can be enhanced with sun-illumination and a customized colour map. A range-weighting scheme, based on a sounding’s distance from a node, is always applied when creating a BASE surface. As a second weighting scheme, the swath angle was chosen based on a beam's intersection angle with the seafloor. Therefore, the weight a sounding contributes to the BASE surface varies by the sounding's grazing angle with the seafloor. In an area with overlapping survey lines, the grazing angle weight ensures that a higher weight priority is given to beams from the inner part of a swath than to the outer beams from adjacent survey lines, as these generally provide higher quality data. Soundings with an angle between 90° and 75° were given a weight of 1.0. The weight decreases linearly to 0.01 as the grazing angles with the seafloor decreases to 15°.

A BASE surface can be exported in common image formats like TIFFs, georeferenced image formats like GeoTIFFs or as raw ASCII xyz data of the BASE grid cells. The georeferenced export outputs have the same coordinate system in which the BASE surface was gridded. They are particularly relevant in studies like these as they can be read into other mapping packages such as ArcGIS (ArcView). The GeoTIFF format is excellent for the presentation of bathymetric data with a high resolution image. Similarly, backscatter information can be used to generate mosaics in CARIS HIPS that can also be exported as a GeoTIFF.

When creating a BASE surface, sounding data can be gridded to different resolutions, depending on requirements and how the resulting data will be subsequently used. Higher resolution BASE surfaces (e.g., 5m and 2m) contain additional detail that significantly increases computation time in comparison to lower resolutions (e.g., 10m). If the BASE surface is going to be exported into a GeoTIFF, the additional computational time to produce a high resolution image may be acceptable. However, if the BASE surface is to be exported as raw xyz data of the BASE grid cells, the large file size of the resulting xyz data may cause problems when subsequently imported into other software packages such as ArcGIS.

After several tests, a gridding resolution of 3m was chosen to create a BASE surface from which a GeoTIFF of the bathymetry was created, and a gridding resolution of 10m chosen to create a BASE surface from which to export xyz data. A backscatter mosaic was also generated in CARIS HIPS and exported at a resolution of 5m.

In order to carry out subsequent analysis on the bathymetry data (e.g., to calculate slope) it was necessary to produce a raster of bathymetry-derived data in ArcView. The 10m resolution BASE surface was therefore exported into an ASCII xyz text file (using the tool Export Wizard>BASE surface to ASCII). This output text file contains information of meters easting, meters northing and positive values of depth for every node. Golden Software Grapher version 4.0 was therefore used to convert depth values to negative values, and the file then exported as a .csv file.

In ArcView, the .csv file was imported and the xyz information plotted. In CARIS, the data were originally projected in UTM zone 30N, and a re-projection of the spatial reference was needed so that all points plotted in geographic coordinate system WGS 1984. This projection was performed using a tool in ArcToolbox (Data Management Tools>Projections and Transformations). The individual points were then interpolated to create a GIS raster.

Using the Spatial Analyses tool in ArcView, kriging was selected as the statistical terrain generation method. Kriging is an advanced geostatistical procedure that generates an estimated surface from a scattered set of points with z values. Unlike the other interpolation methods supported by Spatial Analyst, kriging involves an interactive investigation of the spatial behaviour of the phenomenon represented by the z values before the user selects the best estimation method for generating the output surface. For every sounding of the swath, the kriging estimate of the depth is obtained from the soundings of its neighbourhood (Chauvet 1994). The cell size of all rasters was fixed at 10m ($8.9892 \times 10^{-5}$ decimal degrees), to match the input resolution. The resulting output was an ESRI grid that could subsequently be used to calculate various statistics.

### Calculation of slope, aspect and rugosity

The spatial analysis functions of a geographic information system (GIS) allow the extraction of several derived products from bathymetric data, such as slope, aspect, and rugosity. Through a set of standard algorithms these derived products, and the relationships between them, can be examined to classify the benthic landscape.

Slope information gives an impression of the steepness of the terrain and can be used for further analysis. The output measurement units for slope can be in degrees or percentages. In this project the slope unit is presented in degrees.

A map with aspect values displays the steepest down slope direction from each cell to its neighbours for an entire region. It is most commonly used with an elevation raster to identify the direction of slope. The values of the output raster are the compass bearing of the maximum slope.

Rugosity can best be defined as the ratio of surface area to planar area. Rugosity is essentially a measure of terrain complexity or "bumpiness" of the terrain.

Via the ArcGIS Spatial Analyst toolbar, slope values were calculated. The Slope function calculates the maximum rate of change between each cell and its neighbours. Every cell in the output raster has a slope value. The lower the slope value, the flatter the terrain; the higher the slope value, the steeper the terrain.

Aspect values were calculated via the same ArcGIS Spatial Analyst toolbar. Aspect is measured clockwise in degrees from 0° (due north) to 359°. The value of each cell in an aspect dataset indicates the direction the cell's slope faces. Flat areas having no down slope direction are given a value of -1. Physically similar habitats are likely to support similar biological communities. Aspect is a measure of slope orientation and joined with current orientation can be a very useful parameter. The linear pattern in the backscatter data and the orientation of the asymmetry of the sediment waves reveal the predominant tidal direction in each survey area.

The aspect rasters were then re-classified using the Spatial Analyst tool in ArcView and the slope orientation values were categorised into 3 classes: slopes facing the dominant tidal currents (up-slope), slopes facing away from those currents (down-slope) and slopes where currents run along-slope. In order to categorise the aspect, it was necessary to determine the dominant tidal current. Profiles over sand waves in the survey areas were made in CARIS HIPS and exported in Microsoft Office Excel 2003. Their asymmetry confirmed a dominant flood current to the ENE–NNE. The exact azimuth of the dominant current direction in each of the different survey areas was defined in ArcGIS. The angles to which the slopes are orientated were changed accordingly in the 4 aspect rasters. As tidal currents obviously reverse direction with the tide, it is perhaps the comparison between aspects classified as along-slope versus up- or down-slope aspects that are the most relevant.

With “x” being the azimuth of the dominant current in each area, the aspect values were classified as shown in Table 3a and 3b (Figure 8).

**Table 3.** Classification of aspect, in relation to the dominant current.

**a.** Determination of along-, down-, and up-slope currents

| **Class** | **Dominant current direction** | **Relationship to azimuth (x)** |
|---|---|---|
| Class 1 | Along-slope | x -135° to x - 45° and x + 45° to x + 135° |
| Class 2 | Down-slope | x - 45° to x + 45° |
| Class 3 | Up-slope | x + 135° to x - 225° |

**b**. Calculated along-, down-, and up-slope currents for each of four study areas.

| **Current direction** | **Colour code** | **Where x = 83° (Area 1)** | **Where x = 81° (Area 2)** | **Where x = 68° (Area 3)** | **Where x = 53° (Area 4)** |
|---|---|---|---|---|---|
| Along-slope | Yellow | 128°–218° and 308°–38° | 126°–216° and 306°–36° | 113°–203° and 293°–23° | 98°–188° and 278°–8° |
| Down-slope | Green | 38°–128° | 36°–126° | 23°–113° | 8°–98° |
| Up-slope | Red | 218°–308° | 216°–306° | 203°–293° | 188°–278° |

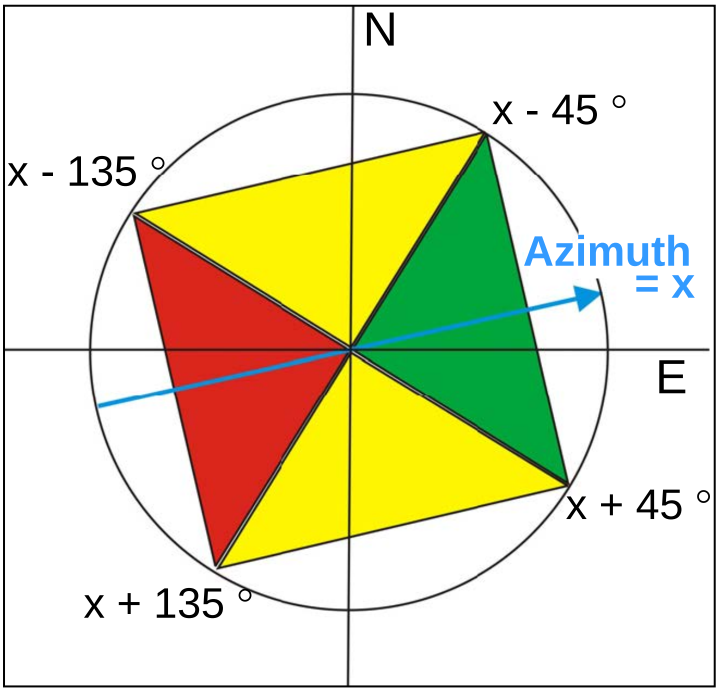



**Figure 8.** Classification of aspect values. Blue arrow: azimuth of the dominant tidal current direction.

The Benthic Terrain Modeller (BTM) is a collection of ArcGIS-based terrain visualization tools that can be used by coastal and marine resource managers to examine the deepwater benthic environment using input bathymetric datasets. It uses a process developed to derive rugosity from an input bathymetric dataset (Jenness 2003). This methodology creates an output that is similar to a Triangulated Irregular Network (TIN). The BTM was developed as part of a cooperative agreement between the Oregon State University (OSU) Department of Geosciences and the National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center. The algorithms and methods that were utilized within the tool were developed and refined by the OSU project team, under the direction of Dawn Wright.

With this software extension, the Bathymetric Position Index (BPI) was calculated. Bathymetric Position Index (BPI) is a measure of where a referenced location is relative to the locations surrounding it and has proved to be useful for seafloor classification (White *et al.*, 2007). The BPI of the Digital Terrain Models (DTMs) collected for this project was calculated on a large and fine scale, but the high complexity of the seafloor morphology with a high density of seabed features in Areas 1 and 2 did not result in easily distinguishable regions. The BPI method was therefore not used as a parameter for the seafloor morphology analysis presented here.

Similar to BPI dataset creation, rugosity derivation relies, in part, on a neighbourhood analysis using a 3 grid cell by 3 grid cell neighbourhood. An algorithm was passed through the Raster Map Algebra Operation object within Spatial Analyst that calculates the planar distance between the centre point of the centre cell and of each of the eight surrounding cells in the neighbourhood. Next, using the Pythagorean Theorem, the surface distance was calculated for each planar distance using the difference in elevation between the cells. The result of this function was sixteen separate grid datasets with each cell value equal to this surface distance.

The area formed by three adjacent sides was calculated, resulting in eight triangular surface area grids (Figure 9). These grid datasets were combined to obtain a surface area dataset for the input bathymetric dataset. Finally, a dataset to represent the ratio of surface area to planar area was created, thus representing rugosity for the study area. Rugosity values close to 1 indicate flat, smooth locations; higher values indicate areas of high-relief.

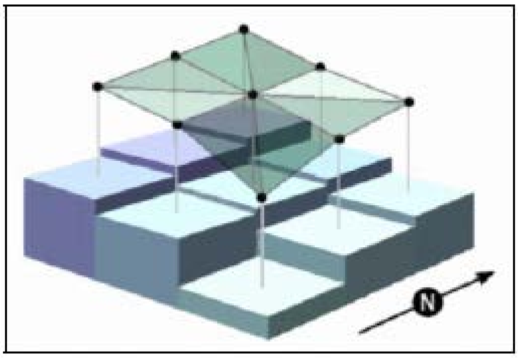



**Figure 9.** Representation of the surface area dataset created from the rugosity builder (Jenness 2003).

## Backscatter processing

The Simrad EM1002 system also provides quantitative seafloor-backscatter data that can be displayed in a sidescan-sonar-like image. The backscatter images can be used to gain insight into the spatial distribution of seafloor properties. A time series of echo amplitudes from each beam is recorded at 0.2 to 2.0ms sampling rate, depending on the water depth. The echo amplitudes are sampled at a much faster rate than the beam spacing and can be processed from beam-to-beam to produce a backscatter image with the theoretical resolution of the sampling interval (15cm at 0.2ms). The amplitude information can be placed in its geometrically correct position relative to the across-track profile because the angular direction of each range sample is known. The EM1002 software corrects the amplitude time series for gain changes, propagation losses, predicted beam patterns and for the insonified area (with the simplifying assumptions of a flat seafloor and Lambertian scattering). Subsequent processing uses real seafloor slopes and applies empirically derived beam-pattern corrections to produce a quantitative estimate of seafloor backscatter across the swath.

Generally, high backscatter intensity for a large angular range is associated with rock or coarse-grained sediment and low-backscatter intensity characterizes finer-grained sediments (Brekhovskikh and Lysanov 1982). However, direct observations, using video and sampling techniques are needed to verify such interpretations. Preliminary distinction of regions with similar backscatter values can be made and is of great relevance in the initial stages of habitat mapping. Patterns of seafloor topography represent regions of geomorphological feature types and the physiography governing the spatial distributions of benthic habitats.

## Delineating acoustically distinct regions

Interpretation of the bathymetry and backscatter data was carried out to determine acoustically distinct regions within the four study areas. Backscatter intensity can be linked to physical properties of the surficial sediments (texture, dewatering, compaction, density, porosity, velocity), and to bottom roughness produced by features such as ripples, benthic reworking, pebbles, rock surfaces, bioherms etc. It can reveal significant information aiding remote sea-floor characterization (e.g., Goff *et al.*, 2000).

Because of the complexity of the backscatter pattern in the surveyed areas, backscatter texture and morphological information derived from the bathymetry data is combined with the backscatter intensities in order to define acoustic similarities and differences. This technique is often used while mapping the seabed (e.g., Dartnell and Gardner 2004).

Textural classes derived from bathymetry and backscatter data were developed by visual delineation of similar backscatter signatures. These classes were combined with morphological features identified from the bathymetry data to give a complete set of acoustic ground types.

For every polygon, four main acoustic parameters were described; backscatter intensity, backscatter texture, seafloor morphology; and prominent small and large scale features.

Backscatter intensities were classified relative to each other for each survey area. It is not good practise to interpolate backscatter intensities over different survey areas as apart from local bottom slope and near nadir reflection; backscatter strength also varies with depth. The intensity allocated to a polygon ideally reflects the ground type signature and not acoustic shadows and survey artefacts; however it was not always possible to make that distinction perfectly.

Backscatter texture was described with respect to the predominant backscatter intensity. The variations in backscatter occur on a very small scale in most regions of the survey areas and high detail delineation would lead to an indistinguishable clew of polygons.

Seabed morphology was described on a coarse scale, with featureless parts of the seabed separated from those with irregular morphology, regardless of the backscatter values.

Seabed features of a certain dimension can be recognised in the bathymetry data. Identification of some features was based on previous research and experience. The acoustic signature of a *Modiolus* mussel bed for example has been well documented in the HABMAP dataset in Caernarfon Bay (Lindenbaum *et al.*, 2008; Robinson *et al.*, 2007). Within this data set a similar acoustic signature was observed, and a similar interpretation was thus applied to the data. The definition of steep slopes is based on the sea floor slope index by Valentine *et al.*, (2005).

Each of these four parameters (backscatter intensity, backscatter texture, seafloor morphology, and prominent small and large scale features) were described for every polygon, and this was recorded, in text format (maximum length of 50 characters), in the GIS attribute table (Table 4). The combination of the four attributes was also summarised in one sentence, as an additional attribute for each polygon (ORIG_HAB).

**Table 4.** List of attributes assigned to each polygon in interpreted acoustic shapefile.

| Attribute field | Parameter | Values |
|---|---|---|
| BACKSC_INT | Backscatter intensity | Low, medium and/or high |
| BACKSC_TEX | Backscatter texture | Homogenous, mottled and/or banded |
| MORPHOLOGY | Seafloor morphology | Featureless or irregular |
| FEATURES | Prominent small and large scale seabed features | Boulders, rock outcrop, mussel bed, steep slopes (>10º) etc. |
| ORIG_HAB | Overall acoustic character | Combination of above four attributes |

To tie the polygons together in a full coverage, the snapping function in ArcGIS was used to prevent the creation of overlapping or sliver polygons. To make sure vertices coincided where they should be identical, the Integrate tool in ArcToolbox (Data Management Tools>Feature class) was applied.

To decrease the number of polygons and to make the shapefiles more manageable, polygons with identical acoustic signature were merged using the Editor Tool within ArcToolbox (Editor>Merge). Non-adjacent polygons with the same ground type were hence combined in a multipart polygon.

The resulting four GIS vector files containing the acoustic ground types for each survey area were accompanied by shapefile attribute tables according to the MESH Data Exchange Format (DEF).

### 2.5.2 Grabs Samples: Particle size analysis

#### Laboratory analysis

The eight sediment samples obtained underwent Particle Size Analysis (PSA) by Emu Ltd. Samples were analysed according to Emu Ltd's in-house Methods for the Determination of Particle Size Distribution. Sediment was initially wet-sieved on a 63µm sieve to determine the <63µm fraction, and then the >63µm fraction was dry-sieved following Emu Ltd's standard methods (MET/01, Emu Ltd. 2005). When the fine sediment fraction (i.e. <63µm) comprised more than 5% of the sediment sample, full analysis of the fine sediment fraction was undertaken using a Malvern laser diffractor (MET/02, Emu Ltd 2004).

#### Statistical analysis

Results of the Particle Size Analysis completed by Emu Ltd were provided to University College Cork for statistical analysis (Appendix 9.2). Data were analysed using "GRADISTAT" (Blott and Pye 2001), a particle size distribution and statistics package, as recommended by MESH guidance (Passchier 2007).

The percentage of sediment retained by 12 different sieve apertures (as determined by Emu Ltd) were input into GRADISTAT, and the following statistics were calculated using the Method of Moments in Microsoft Visual Basic programming language for each sample: mean, mode(s), sorting (standard deviation), skewness, kurtosis, D10, D50, D90, D90/D10, D90-D10, D75/D25 and D75-D25. GRADISTAT calculates particle size parameters arithmetically and geometrically (in microns) and logarithmically (using the phi scale) (Krumbein and Pettijohn 1938). Linear interpolation is also used to calculate statistical parameters by the Folk and Ward (1957) graphical method and derive physical descriptions (such as “very coarse sand” and “moderately sorted”).

GRADISTAT also provides a physical description of the textural group to which the sample belongs and a sediment name (such as “fine gravelly coarse sand”) after Folk (1954) (Figure 10). Also included is a table giving the percentage of particles falling into each size fraction, modified from Udden (1914) and Wentworth (1922) (Figure 11). The set of statistical methods used in this program are attached at Appendix 9.3.

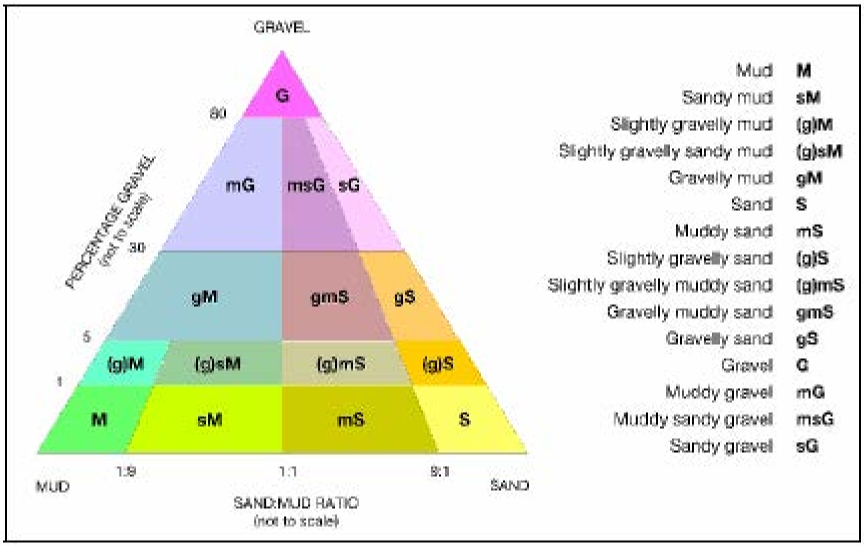



**Figure 10.** Grain-size classification based on Folk (1954).

| Grain Size phi | Grain Size mm | Descriptive term | |
|---|---|---|---|
| | | Very Large | Boulder |
| -10 | 1024 | | |
| | | Large | Boulder |
| -9 | 512 | | |
| | | Medium | Boulder |
| -8 | 256 | | |
| | | Small | Boulder |
| -7 | 128 | | |
| | | Very small | Boulder |
| -6 | 64 | | |
| | | Very coarse | Gravel |
| -5 | 32 | | |
| | | Coarse | Gravel |
| -4 | 16 | | |
| | | Medium | Gravel |
| -3 | 8 | | |
| | | Fine | Gravel |
| -2 | 4 | | |
| | | Very fine | Gravel |
| -1 | 2 | | |
| | | Very coarse | Sand |
| 0 | 1 | | |
| | microns | Coarse | Sand |
| 1 | 500 | | |
| | | Medium | Sand |
| 2 | 250 | | |
| | | Fine | Sand |
| 3 | 125 | | |
| | | Very fine | Sand |
| 4 | 63 | | |
| | | Very coarse | Silt |
| 5 | 31 | | |
| | | Coarse | Silt |
| 6 | 16 | | |
| | | Medium | Silt |
| 7 | 8 | | |
| | | Fine | Silt |
| 8 | 4 | | |
| | | Very fine | Silt |
| 9 | 2 | | |
| | | Clay | |

**Figure 11.** Size scale adopted in the GRADISTAT program, modified from Udden (1914) and Wentworth (1922).

### 2.5.3 Samples: Biology

#### Laboratory sorting and identification

Grab samples were delivered to the National Museum Wales and the formalin removed outdoors by washing the contents with fresh water. The samples were fractionated by first elutriating the infauna and any residual fine sediments (mud) into a 0.5mm mesh sieve. The elutriated fraction from each sample was separately labelled and bottled in 80% ethanol (with 2% propylene glycol). The residue of each sample was further fractionated by passing the sediment through coarser sieves (e.g., 1mm, 2mm mesh as appropriate) held above the standard 0.5 mm mesh sieve. The fractions from each sample were separately labelled and preserved as for the elutriated fraction.

Initial sorting of the sample fractions was undertaken at the Museum marine laboratory. Fauna were first sorted into the following major groups; annelids, arthropods, molluscs, echinoderms, epifauna and ‘others’. The elutriated fractions were processed using dissection microscopes and incident light from fibre optic lights. The Rose Bengal stained specimens of the coarser fractions were separated in illuminated white sorting trays by eye. All shell and gravel/stones with encrusting organisms were retained for epifaunal species assessment.

Further subdivision of faunal groups was undertaken as much as possible prior to identification, for example arthropods were subdivided into pycnogonids, acari, amphipods, isopods, tanaids, cumaceans, crabs/shrimps and barnacles.

Identification of fauna to species level (where possible) was undertaken by a team of expert taxonomists (Table 5) and data were presented in Excel spreadsheets in a format suitable for further analysis. All species identified were fully enumerated, apart from epifauna attached to gravels or stones, which were recorded as presence/absence only.

**Table 5.** List of expert taxonomists responsible for identification of different faunal groups.

| Faunal Group | Taxonomist/Identifier |
|---|---|
| Annelida | Teresa Darbyshire and Andrew Mackie (National Museum Wales) |
| Sipuncula & Amphipoda | Dale Rostron (SubSea Survey) |
| Phoronida, Nemertea, Turbellaria | Andrew Mackie (National Museum Wales) |
| Mollusca | Anna Holmes, Jennifer Gallichan, Harriet Wood and Graham Oliver (National Museum Wales) |
| Pycnogonida, Acari, Isopoda & Tanaidacea | Roger Bamber (Natural History Museum) |
| Cumacea | Roni Robbins (Natural History Museum) |
| Decapoda, Cirripedia & Chordata | Ivor Rees (School of Ocean Sciences, Bangor University) |
| Echinodermata | Andrew Cabrinovic (Natural History Museum) |
| Epifauna (Bryozoa, Hydroida etc) | Christine Howson (independent consultant) |

**Multivariate analyses and biotope assignment**

For the infaunal and epifaunal data from grab samples, the number of taxonomic groups was reduced slightly; organisms identified to a taxonomic level coarser than species (e.g., to genus, order), were summed to create one indeterminate category at that taxonomic level (e.g., *Autolytus* indeterminate and *Autolytus* juveniles were summed to create one *Autolytus* indeterminate category). This ensured that each taxonomic group in the dataset was unique. An ‘aggregation file’ was also created, which classified each group to different taxonomic levels (genus, family, order), and thus enabled pooling of the data to family, order, class and phylum level for analysis if necessary.

For the infaunal data, univariate diversity measures were calculated in order to examine species abundance and diversity in the area. Following this, data were aggregated to different taxonomic levels (genus, family and order) and three new datasets were created. In order to investigate the relationship between the samples, all three datasets were imported into the multivariate statistical software PRIMER v6 (Plymouth Routines in Multivariate Ecological Research, Version 6.1.10). All datasets were subjected to a square root transformation, which was considered appropriate to downgrade the contribution of a small number of more abundant taxa. In order to investigate the relationship between the samples, a resemblance matrix was created for each dataset. CLUSTER and SIMPROF analyses were conducted using the Bray-Curtis coefficient to divide the samples into significant clusters. SIMPER analysis was then used to determine which species were contributed to each cluster.

The epifaunal data from grab samples, which were in a presence/absence format, were imported into PRIMER v6 also, and CLUSTER, SIMPER and SIMPROF analyses were similarly conducted.

The aim was to assign each sample to a biotope within the Marine Habitat Classification for Britain and Ireland v04.05 (hereon referred to as the Marine Habitat Classification) (Connor *et al.*, 2004). This was done using both the results of the multivariate analyses and expert judgement. In order to assign samples to biotopes, the outputs from the CLUSTER and SIMPER analyses of the biological data were examined to determine whether there was sufficient evidence for each of the clusters identified to represent different biotopes. The sediment information was also examined and visualised using the Bubble Plot function in PRIMER. Using all of this information together, it was determined whether each of the biological clusters identified as ‘significant’ by the SIMPROF analysis could be considered to represent different biotopes, or whether different clusters might instead represent variation within the same biotopes.

All grab stations were presented in a GIS environment, with results of the various analyses included as attributes for each sample point.

### 2.5.4 Video

#### Post-survey interpretation

The video footage was interpreted to obtain semi-quantitative information on the nature of the substratum and species present, and to identify the biotopes that were present and determine boundaries between them.

The entire video from each tow was first reviewed, and the approximate boundaries between biotopes or biotope complexes were noted by recording the time at which major changes in seabed and habitat type occurred. Biotopes and biotope complexes were identified according to the Marine Habitat Classification (Connor *et al.*, 2004).

Following the biotope assessment, each section of video was again reviewed in turn and subjected to a more detailed interpretation. For every section of video the substratum was described and recorded as percentage cover of Marine Nature Conservation Review (MNCR) substratum types (based on the Wentworth scale). Any other features of the substratum, such as evidence of physical damage, were noted. All visible taxa were identified to the lowest possible taxonomic level, and their abundance recorded using the semi-quantitative SACFOR scale (Appendix 9.4). The identification of taxa and determination of abundance was aided by the laser-scaling device, which projected two laser beams on to the seabed at a fixed 10cm horizontal distance. If it was not possible to identify fauna to any taxonomic level, then the life-forms present were described (e.g., faunal turf, algal crust) and their abundance noted according to the SACFOR scale.

Metadata were also recorded for each section of video (e.g., start and end time, start and end position, depth). A subjective assessment of video quality was also made and assigned to each video tow (good, moderate or poor quality).

All data were recorded on a spreadsheet, in a format suitable for further analysis.

Text files containing logged video position were imported into the GIS software MapInfo®. Points were then created using the positional information held in the text file. Additional logged data such as date and time were then imported into the GIS. Other information derived from the video analysis (e.g., sediment description, biotope) was then added to each video point. Data were also exported for use in the GIS software ESRI ArcGIS.

Ship logging points were merged into a single polyline to represent each video tow, using ArcGIS. This polyline was further sub-divided into sections, each of which corresponded to a biotope or biotope complex, as described above. Each section was attributed with the metadata described above, and with a brief description of the sediment. A frame grab was extracted from each section of video, and these were hyperlinked to the corresponding polyline. This allowed the location of each video tow to be represented, along with a still image example of the seabed footage.

### Multivariate analyses

The biological data from video samples were manipulated in a number of ways prior to analysis. The following changes were made to the species data:

- All fish species were removed
- Faunal Turf and Faunal Crusts were removed. This was done because these groups were ubiquitous throughout the samples and therefore would not help in discriminating clusters.

The physical data used in the analysis was restricted to sediment information and depth information only.

For the purposes of the multivariate analysis, each ‘section’ of video tow was treated as a sample. The data were imported into PRIMER v6 statistical software. No transformation of data was required prior to analysis because data collected on a semi-quantitative scale such as SACFOR are equivalent to ‘raw count’ data that have been strongly transformed.

Within PRIMER, the CLUSTER routine and SIMPROF test were used to divide biological samples into significantly ($p<0.05$) different clusters (Clarke and Gorley 2006, and, Clarke and Warwick 2001, for further detail of the routines available within PRIMER software). From these analyses, two major clusters and several smaller clusters were identified. These were all symbolised on an MDS plot and a SIMPER analysis was conducted to identify which species contributed to the similarity of the clusters. The BVSTEP procedure was then used to identify which combination of species was most closely correlated with the whole species matrix. This procedure effectively aims to identify the smallest subset of species which describes most of the pattern shown by the full dataset (Clarke and Gorley 2006). A BioEnv analysis was also carried out to establish the relationship between the biological and physical datasets.

Some analyses were also conducted on the sediment data to determine any patterns shown, including CLUSTER analysis. The sediment data for each sample were averaged according to the biological clusters so that a sediment profile could be obtained for each cluster.

### Biotope Assignments

Each sample was assigned to a biotope within the Marine Habitat Classification manual (Connor *et al.*, 2004). This was done using both the results of the multivariate analyses and expert judgement. The biotope assignment involved two steps:

1. In order to assign samples to biotopes, the outputs from the CLUSTER, SIMPER and BVSTEP analyses of the biological data were examined to determine whether there was sufficient evidence for each of the clusters identified to represent different biotopes. The sediment information was also examined and visualised using the using Bubble Plot function in PRIMER. As a result, it was determined that not all of the biological clusters identified as ‘significant’ by the SIMPROF analysis could be considered to represent different biotopes, and some clusters with very similar species and sediment profiles were placed into the same biotope.

2. Further examination of individual samples was required in order to refine the initial biotope assignments. At this stage, individual samples were *visually* assessed to ensure that samples placed within the same biotope were similar both in terms of biological composition and sediment characteristics. The aim of this step was to identify any instances where samples were grouped within a particular cluster during the CLUSTER analysis, but sediment characteristics or other biological characteristics indicated that it did not belong in that particular cluster. This could occur for example, where a poor quality video gave an inaccurate representation of the biological communities.

### Identification of Annex I Reef habitat

Once biotopes had been assigned to each video sample, samples were reviewed and the presence of Annex I reef within each sample recorded. The characteristics of some of the biotopes found were such that they would not support Annex I reef habitat, therefore all samples assigned to these biotopes were automatically classified as ‘non-reef.’ Other video samples assigned to biotopes that could potentially contain Annex I reef were each reviewed and the sediment profile scrutinised in order to come to a judgement as to whether the sample contained Annex I reef. In particular, the percentage substrate corresponding to particles >64mm was reviewed. This was in light of EU Guidance which describes Annex I reef habitat as being comprised of cobbles, boulders or bedrock, where cobbles are particles >64mm diameter (Section 1.1, Box 1 and, for comparison, Figure 11).

## 2.6 Data integration and presentation

All data were brought into a GIS environment so different layers of data could be overlain and spatial relationships investigated. The spatial reference system used for all data was the Geographical Coordinate System (GCS) WGS 1984. All maps produced were projected in UTM zone 30N within the same coordinate system.

# 3. Results

The survey successfully achieved four and a half days of data collection (aside from transit time). Unfortunately, due to the vessel having to return to port early for repairs, this was one day short of the planned survey duration. In general there was no weather down-time, but strong tidal currents and lack of dynamic positioning made video sampling difficult, and resulted in a relatively short window of opportunity during which sampling could be undertaken. Survey Area 4 was the first area to be surveyed, and minor logistical difficulties were encountered (e.g., problems with the set up of equipment, etc.). However these were soon rectified and surveying continued smoothly. Due to the reduction in planned survey duration, all of the planned activities and sampling were not achieved; in particular no grab samples were obtained from survey Area 3. Nonetheless, the survey was largely successful, with high quality multibeam data collected over the four study areas.

In the following sections the results of each sampling technique are presented.

## 3.1 Multibeam bathymetry and backscatter

High-resolution multibeam bathymetry was obtained for all four survey areas. Full coverage was obtained, with a horizontal accuracy of less than 2m error, and a vertical resolution of greater than 0.2% of water depth (F. Fitzpatrick, Marine Institute, Galway, pers. comm. 2005). In general, the data obtained was of very good quality, although the south-eastern part of Area 1 appeared to be affected by artefacts. No reason could be found for the apparent deterioration of quality in this area.

Although distinct acoustic facies (section 2.5.1) could be delineated for each of the four survey areas, these were not found to provide additional information which could be used to create habitat maps over and above that already provided by the individual layers (bathymetry, backscatter, slope, aspect and rugosity). Therefore, these acoustic facies will not be discussed further here, although more detail can be found in Van Landeghem and Wheeler (2007).

### 3.1.1 Area 1

The regional bathymetry of survey Area 1 gently sloped from about 40m water depth in the east to about 70m in the west (Figure 12). Across this area a north-east striking hinge of the Quadrant 109 Arch, a major anticline in Carboniferous strata (Jackson *et al.*, 1995) is present. Backscatter intensity showed some variation, with linear streaks running approximately along the direction of the dominant current (Figure 13). The backscatter intensity was not of sufficiently high amplitude to suggest the presence of direct bedrock outcrop, indicating that a thin Quaternary sediment cover was draped over the hinge of the anticline. Video footage and surficial sediment samples (Section 3.4; Blyth-Skyrme and Lindenbaum 2007; Van Landeghem and Wheeler 2007) showed that the sediment cover in both survey Areas 1 and 2 consisted of diamicton and its residual lag deposits, containing large to very large boulders. The largest boulders can be identified on the multibeam bathymetry data. This mixture of coarse sediment is represented by the high backscatter intensities with locally a mottled appearance.

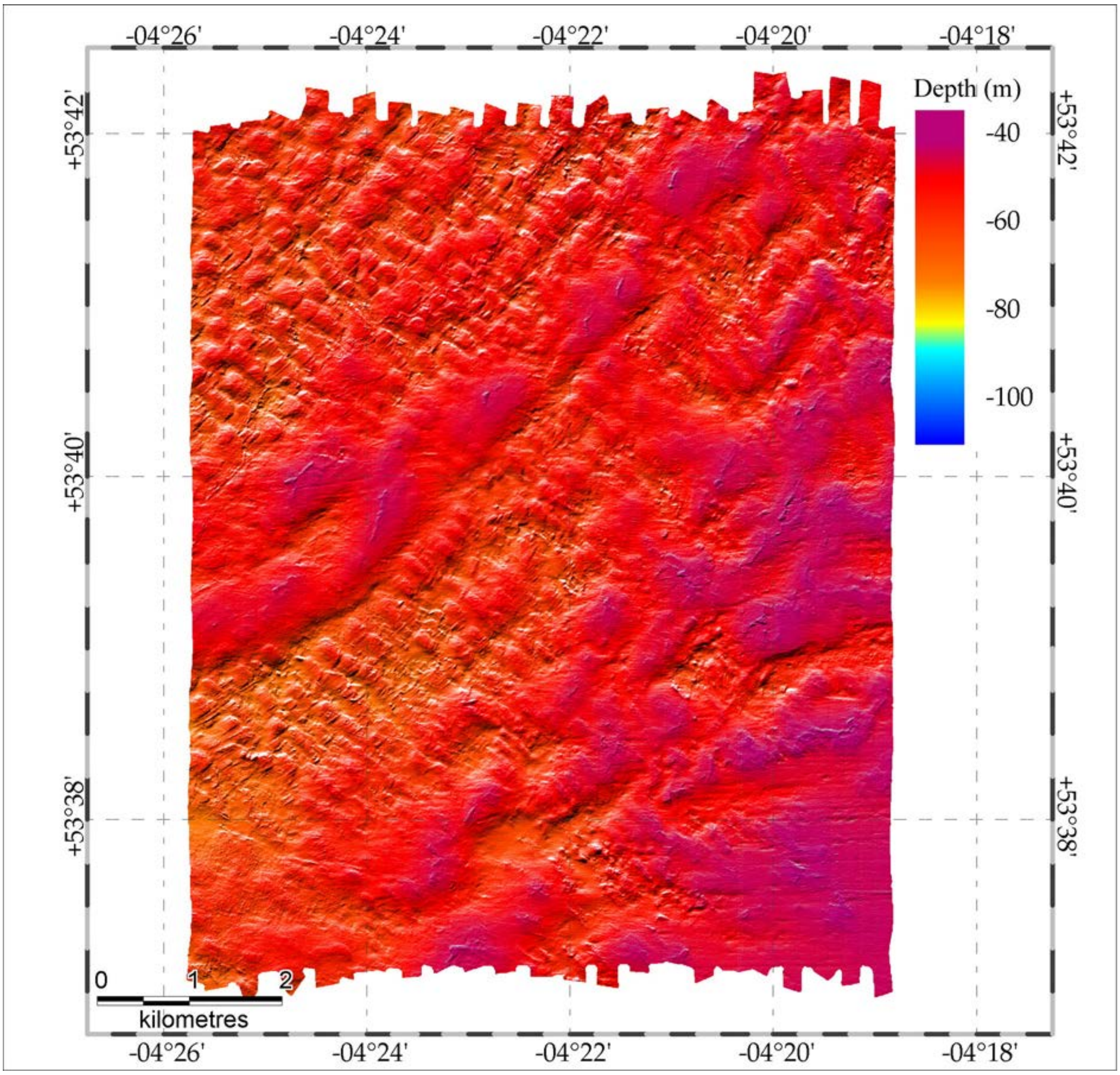



**Figure 12.** Bathymetry image of Area 1.

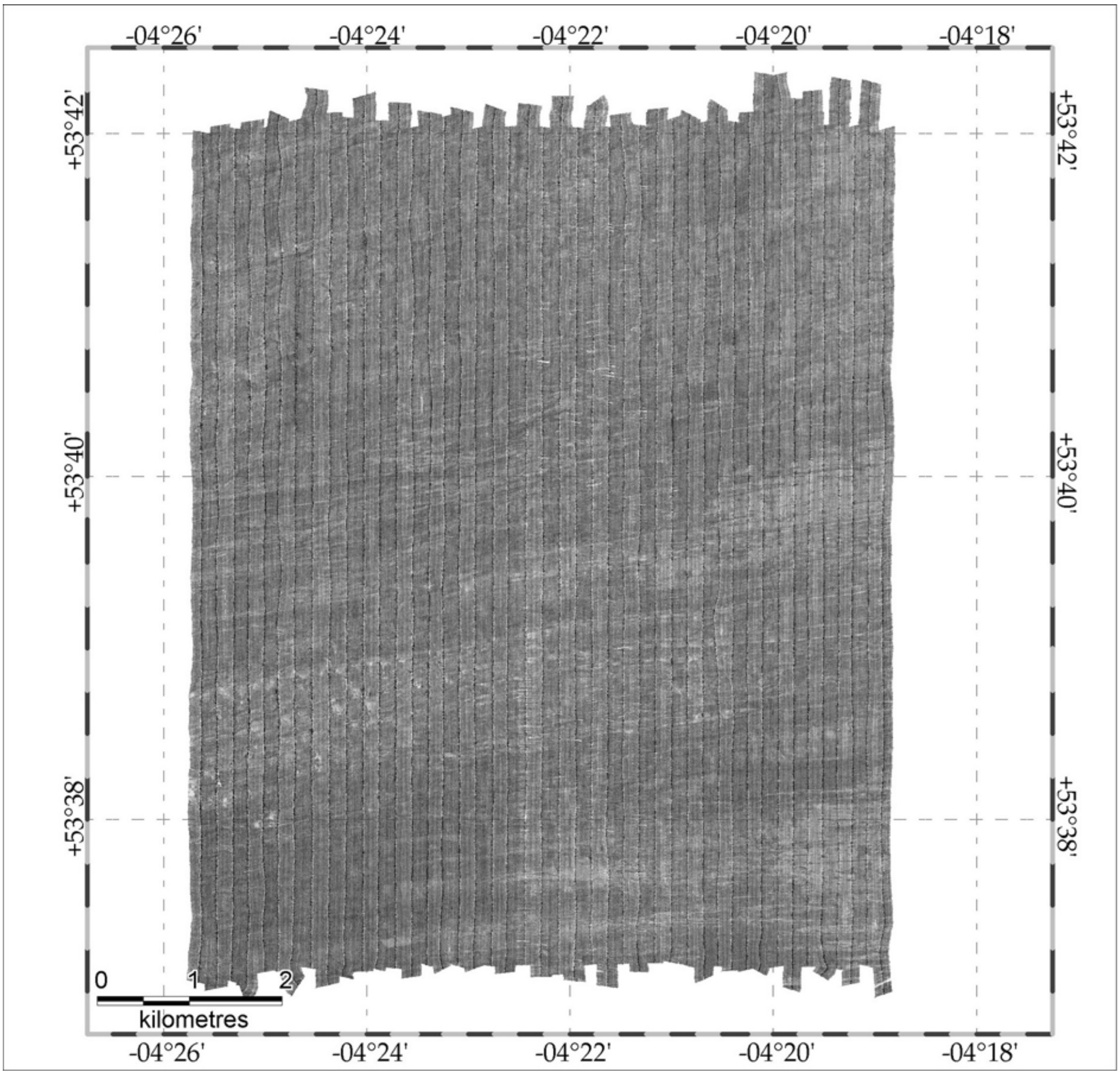



**Figure 13.** Backscatter image of Area 1.

The multibeam data showed straight to curvilinear ridges around the crest of the anticline. These were aligned parallel to each other and were interpreted as *ribbed moraines*. These palaeo-ice flow transverse ridges were found to have an average width of 120m, range from 100–900m in length and from 1–9m in height (Van Landeghem *et al.*, 2008). The slopes of the ribbed moraines were generally quite gentle with values under 5° (Figure 14), often between 5° and 8° and rarely exceeding 10° (Van Landeghem and Wheeler 2007). Changes in the rugosity over the survey area appeared to mainly reflect slope variability (Figure 15). Straight and thin lineations in lower backscatter intensities were also visible. These were interpreted as sedimentary structures due to the present day tidal currents (Van Landeghem *et al.*, 2008).

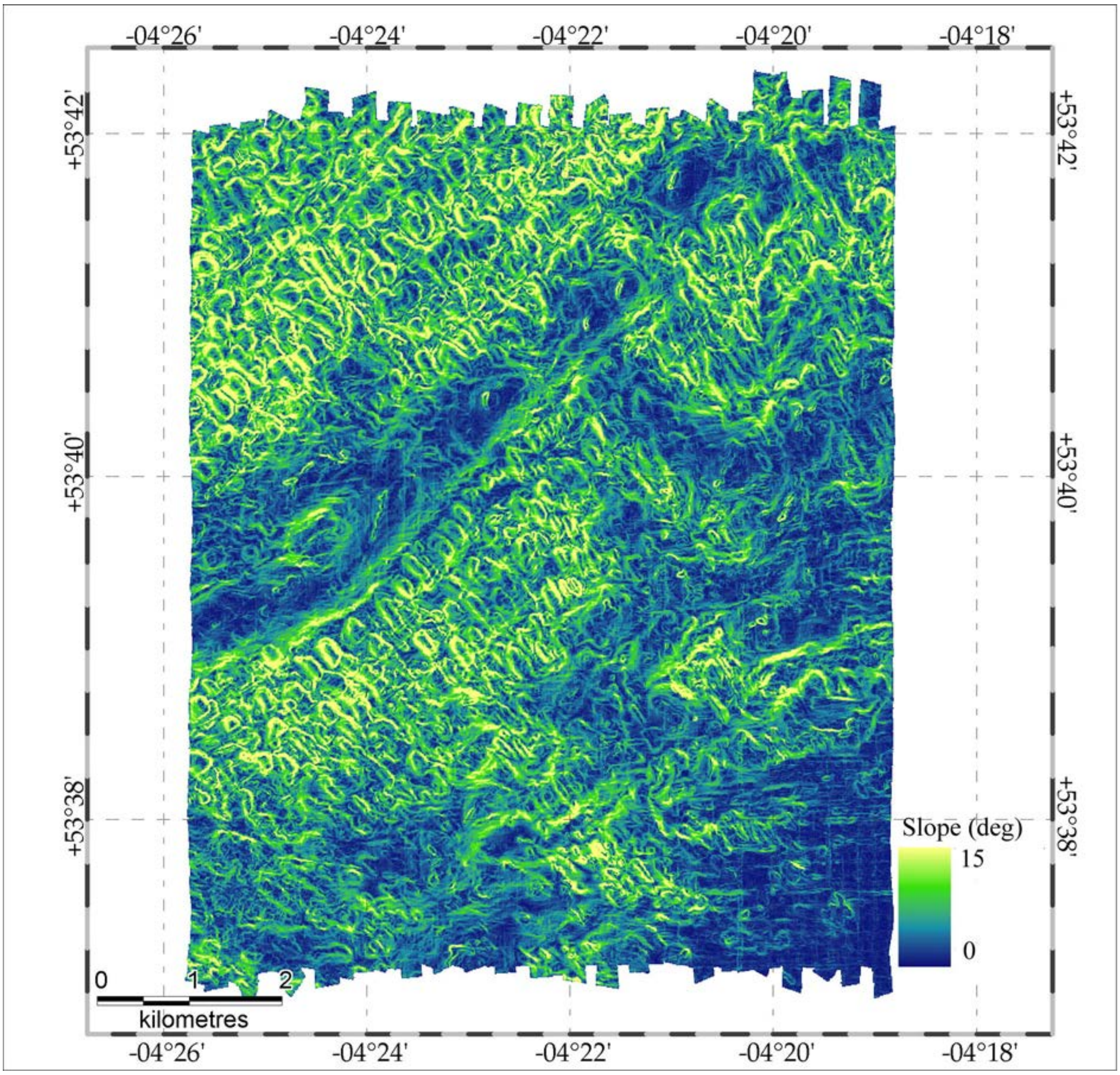



**Figure 14.** Raster with slope values in survey Area 1.

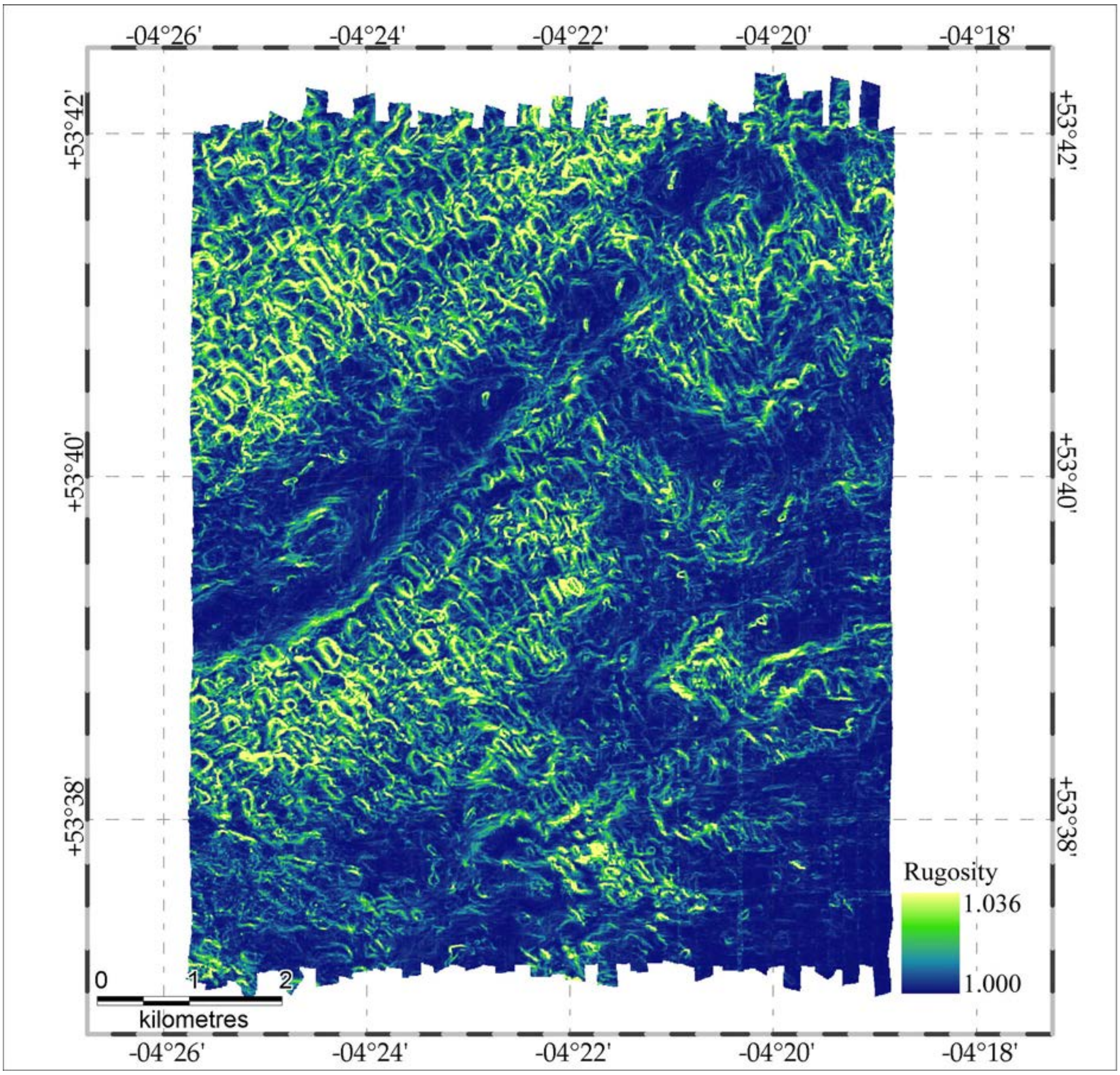



**Figure 15.** Raster with rugosity values in survey Area 1.

The classified aspect layer indicates that with the dominant current direction approximately north-east, and the moraine orientation approximately perpendicular, the current tends to run over the moraines rather than along (Figure 16).

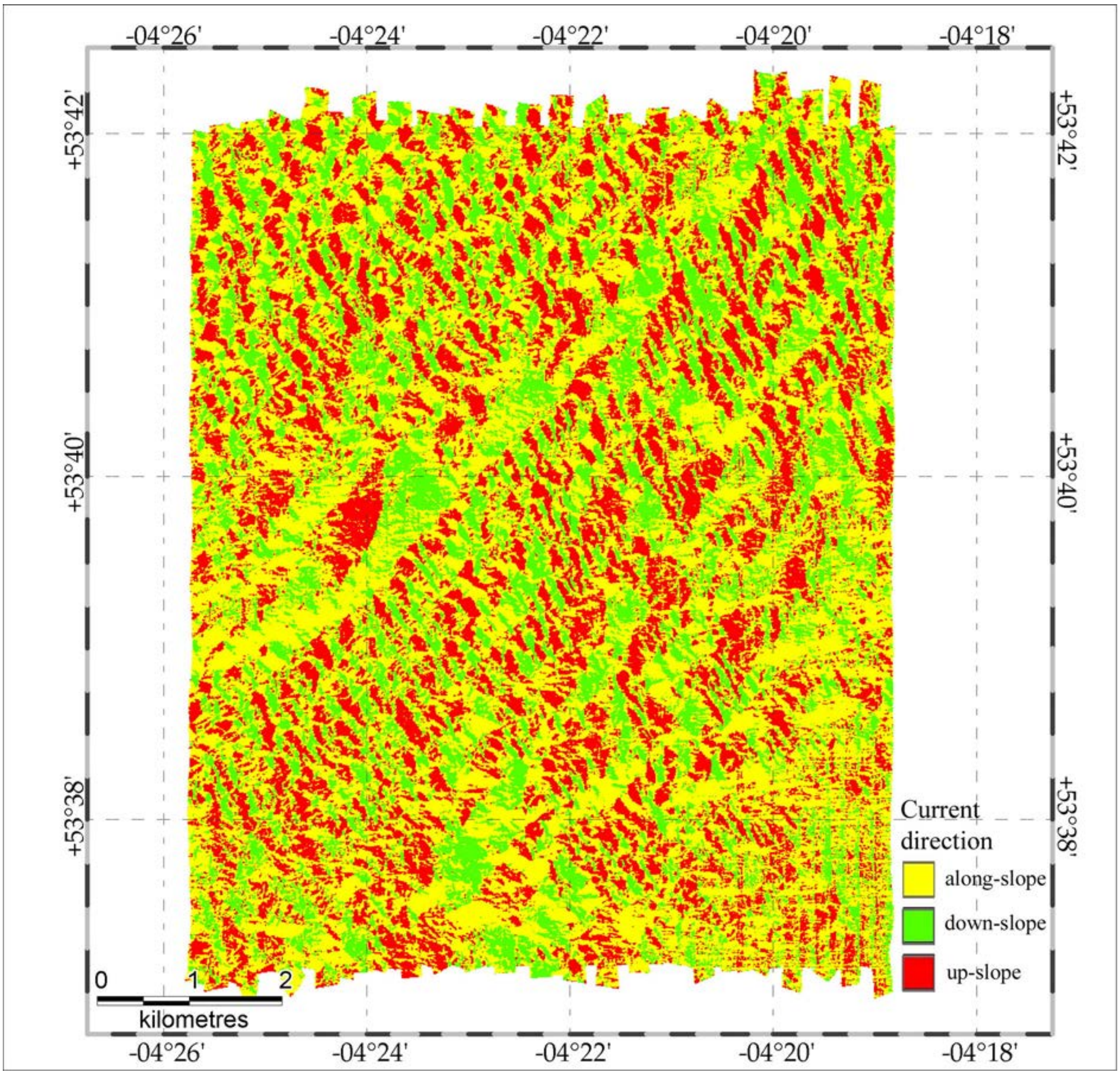



**Figure 16.** Aspect image of Area 1. Aspect is categorised according to dominant tidal current direction (azimuth 83º).

### 3.1.2 Area 2

In survey Area 2, the regional bathymetry sloped westwards towards 100m deep (Figure 17).

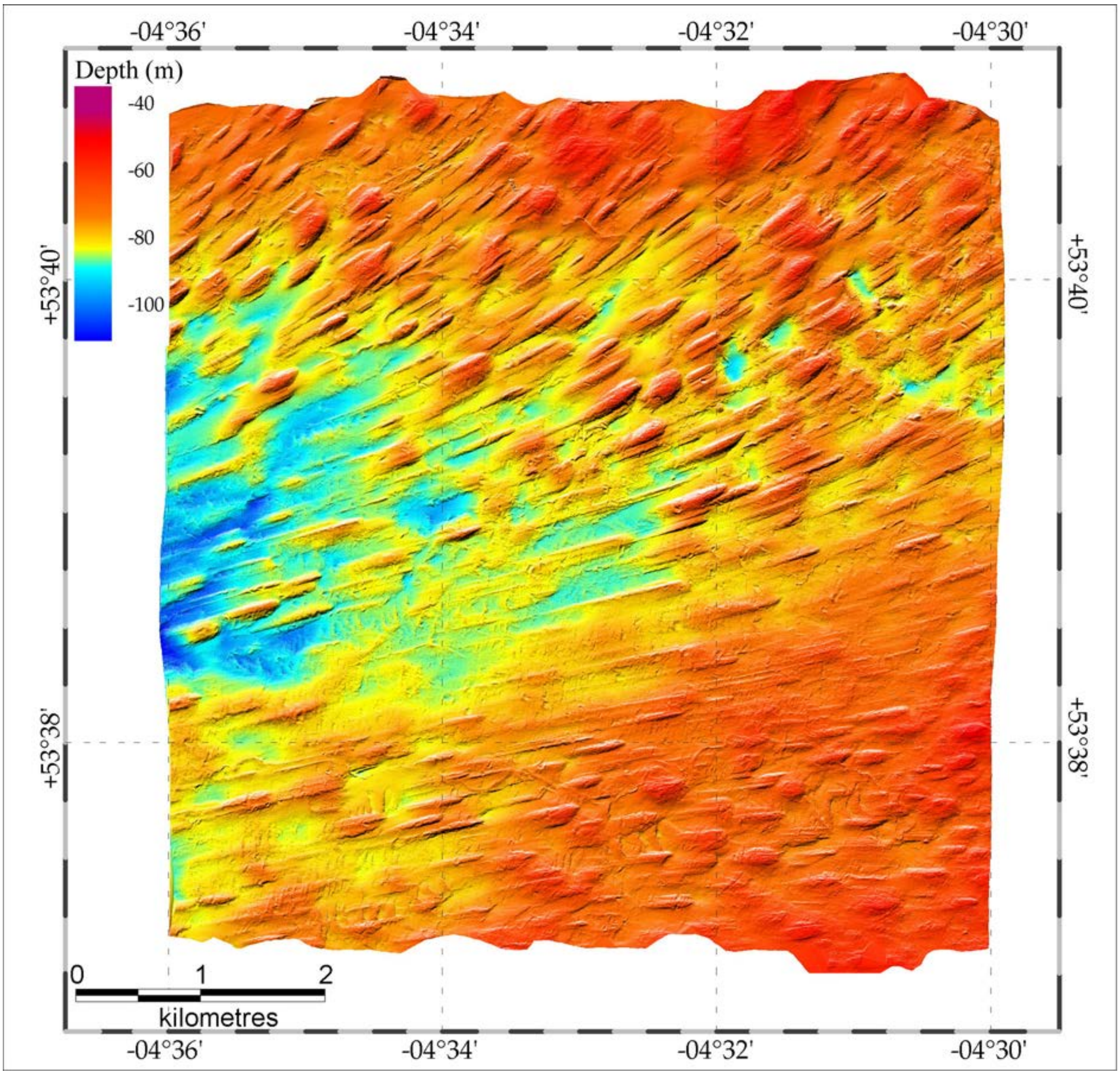



**Figure 17.** Bathymetry image of Area 2.

Many *drumlins* were present within this study area, identifiable as linear, ovate bedforms with a steep stoss side and a tapering lee side. These palaeo-ice flow parallel bedforms were 100–400m long and 1–20m high (Van Landeghem *et al.*, 2008). Most of the lee sides were steeper than 10°, with values up to 24° (Figure 18). In this area the glacial features were aligned in a similar direction to the current, resulting in the current running along-slope, in contrast to Area 1 (Figure 19). As with Area 1, the rugosity and slope of Area 2 demonstrated a similar pattern (Figure 20).

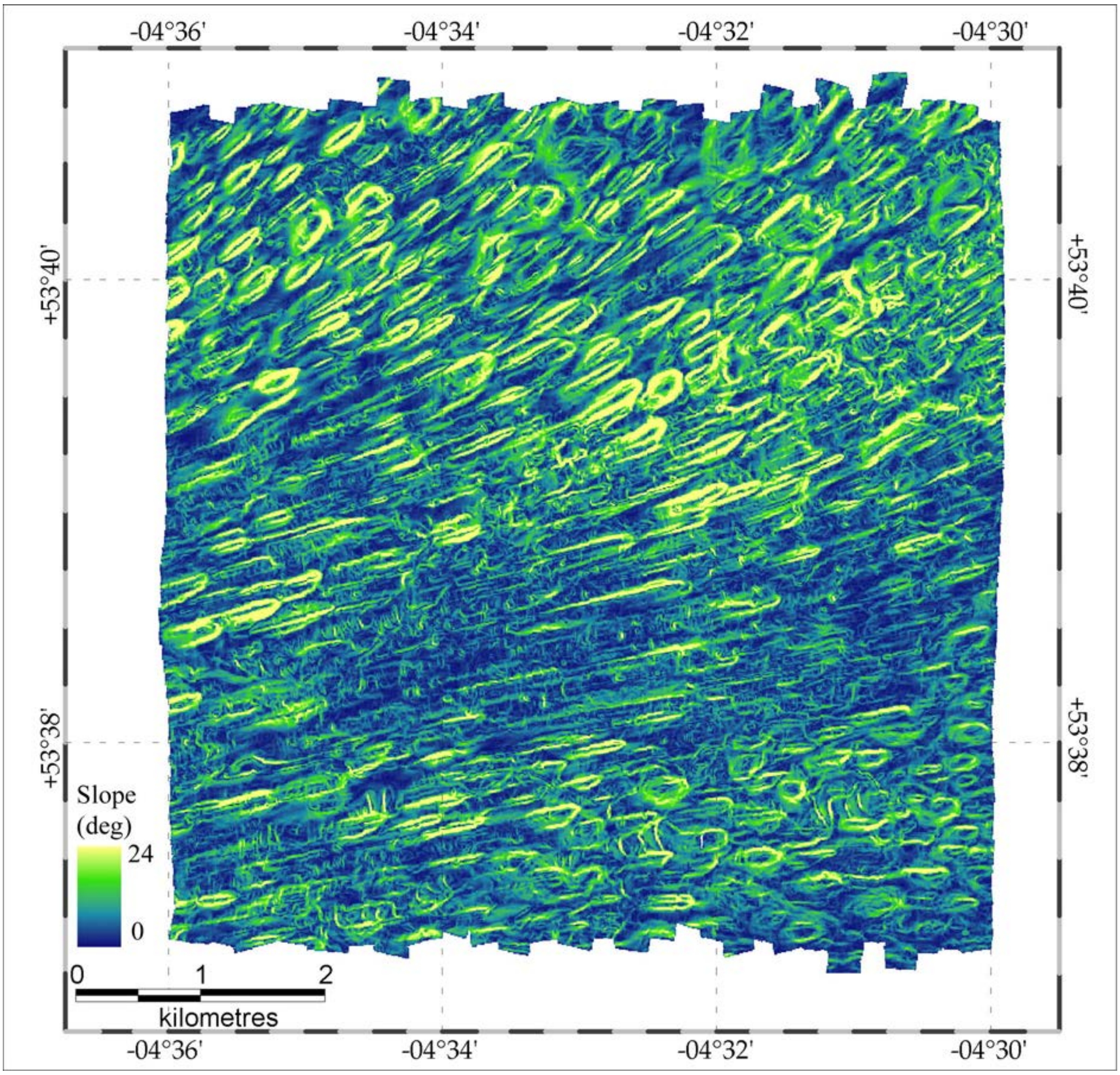



**Figure 18.** Raster with slope values in survey Area 2.

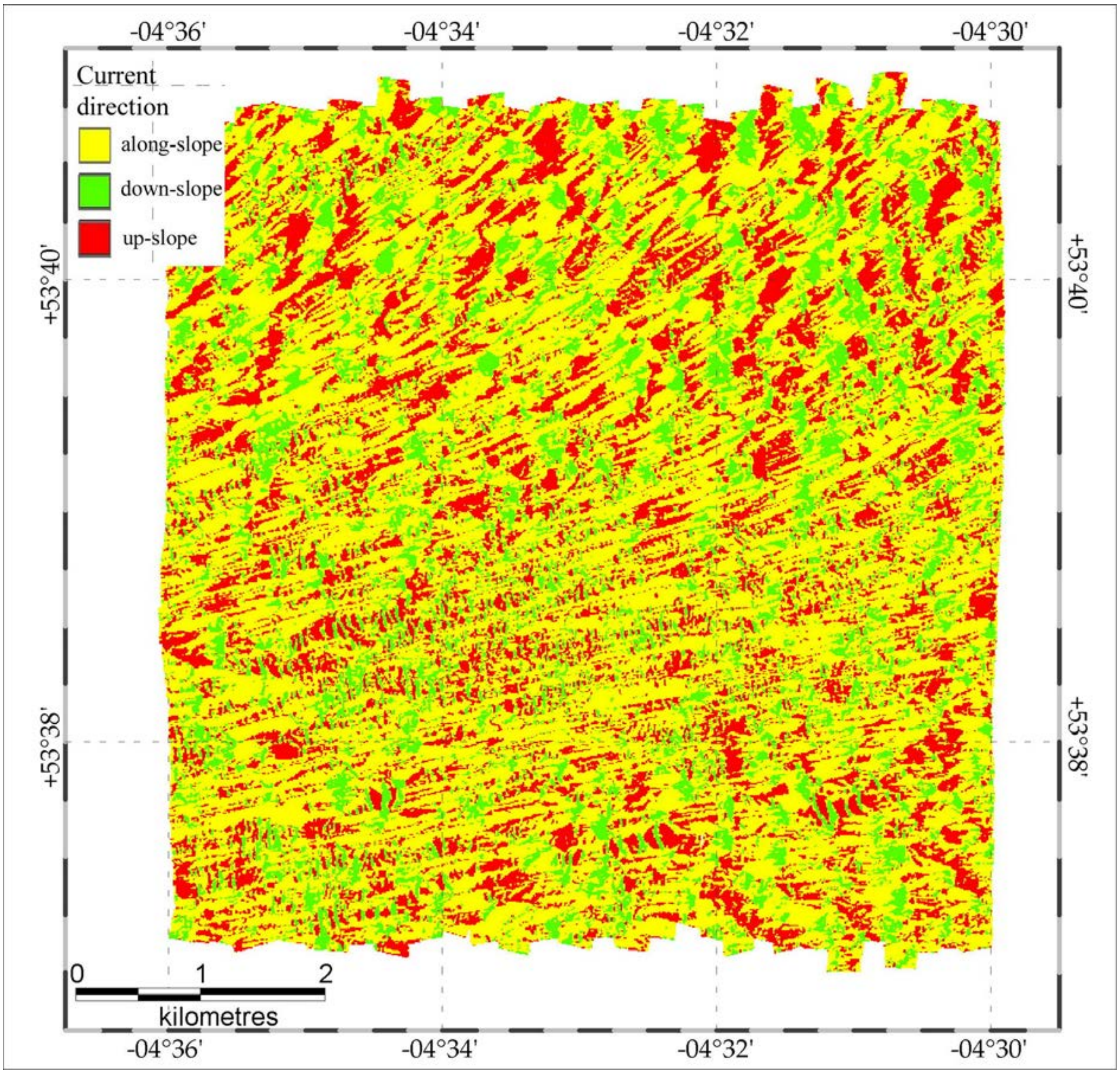



**Figure 19.** Aspect image of Area 2. Aspect is categorised according to dominant tidal current direction (azimuth 81º).

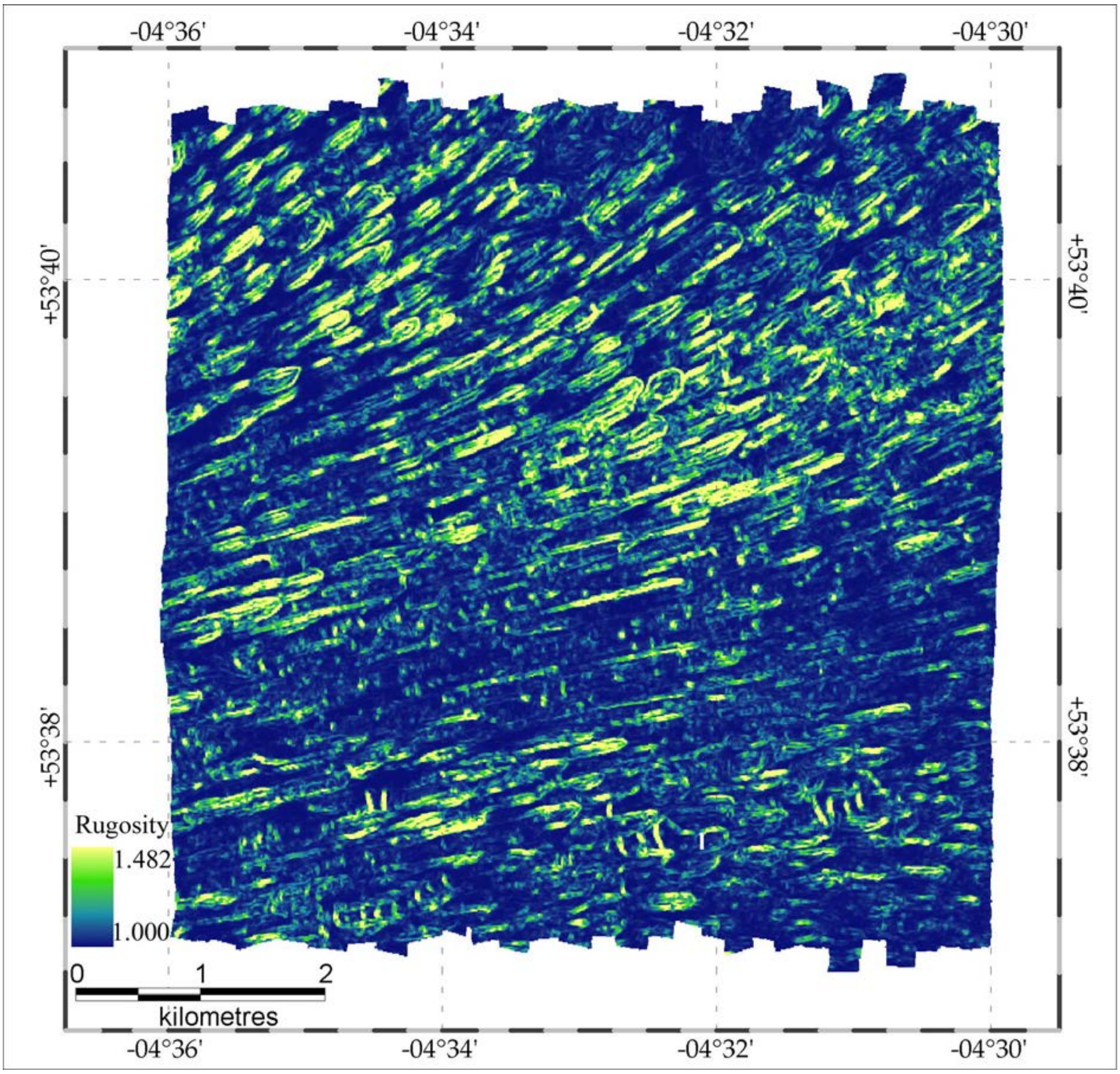



**Figure 20.** Raster with rugosity values in survey Area 2.

The bathymetric data revealed many flutes, up to 1400m long with an average length of 500m (Van Landeghem *et al.*, 2008). Large groups of small symmetrical ridges were also recorded, with average lengths of 100m, widths of 20m and heights of 2m. They were thought to be De Geer moraines. Sub-rounded to elongated depressions were also highly abundant. These were on average about 40m wide and ranged from 100–300m in length. These depressions often had a raised rim of about 1m high and were interpreted to be elongated iceberg pits (Van Landeghem *et al.*, 2008). Some sediment wave trains were present in the south of Area 2 but did not cover a large area. Their crests were visible through lower backscatter intensity values, indicative of finer sediment compared to the surrounding area (Figure 21). Long, winding, narrow and sharp-crested ridges of about 1m high were visible running sinuously through the terrains of survey Areas 1 and 2. These features were interpreted as *eskers*.

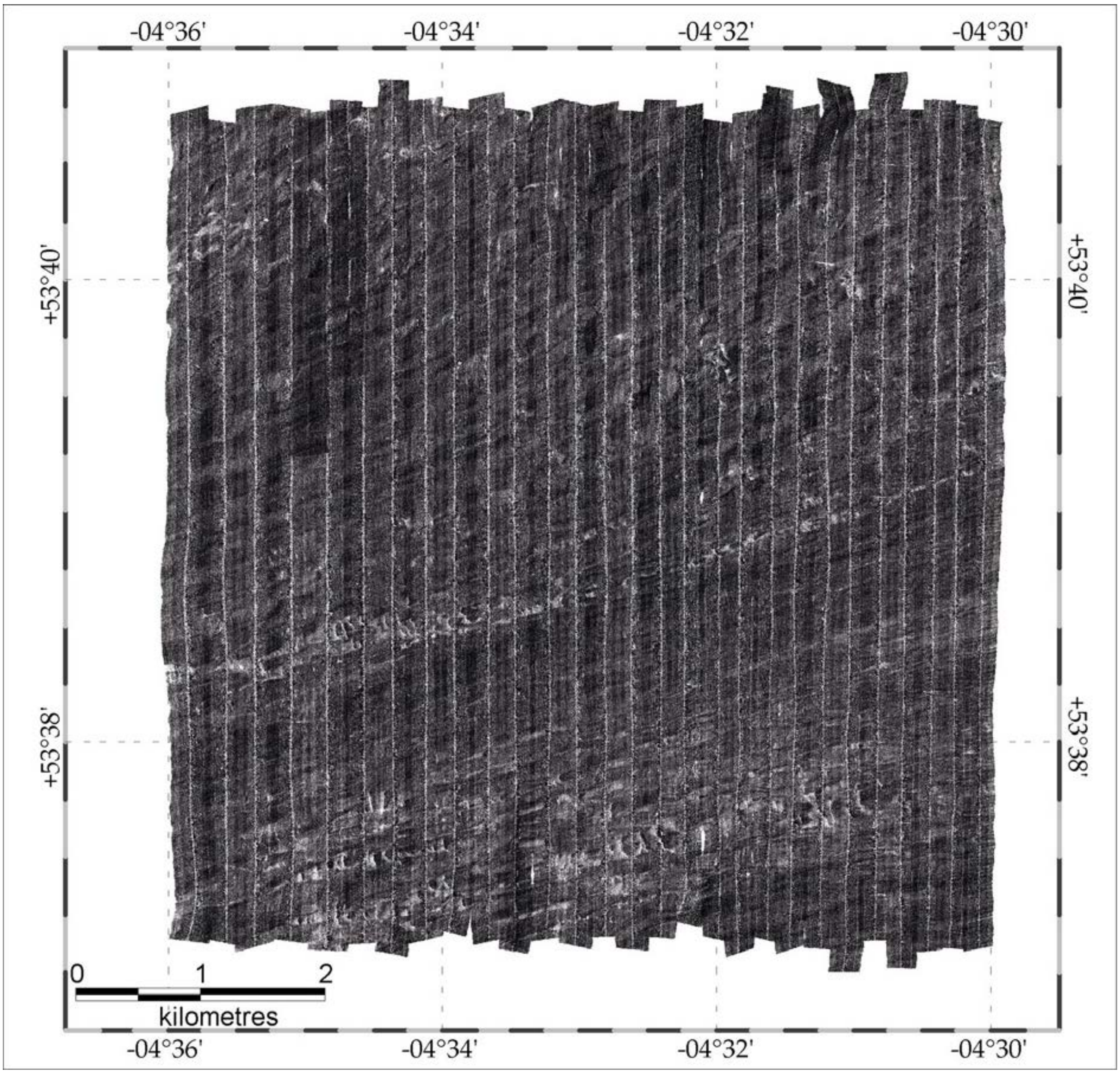



**Figure 21.** Backscatter image of Area 2.

### 3.1.3 Area 3

Survey Area 3 was for the most part a shallow platform with water depths of approximately 30m (Figure 22). Backscatter intensity values were low on this platform with linear streaks of higher backscatter running across it (Figure 23). The lineations had a similar direction to the prevailing currents, thus suggesting that the higher backscatter could be caused by tidally induced scour leaving behind a coarser lag. Large boulders were visible on the swath bathymetry data in abundance.

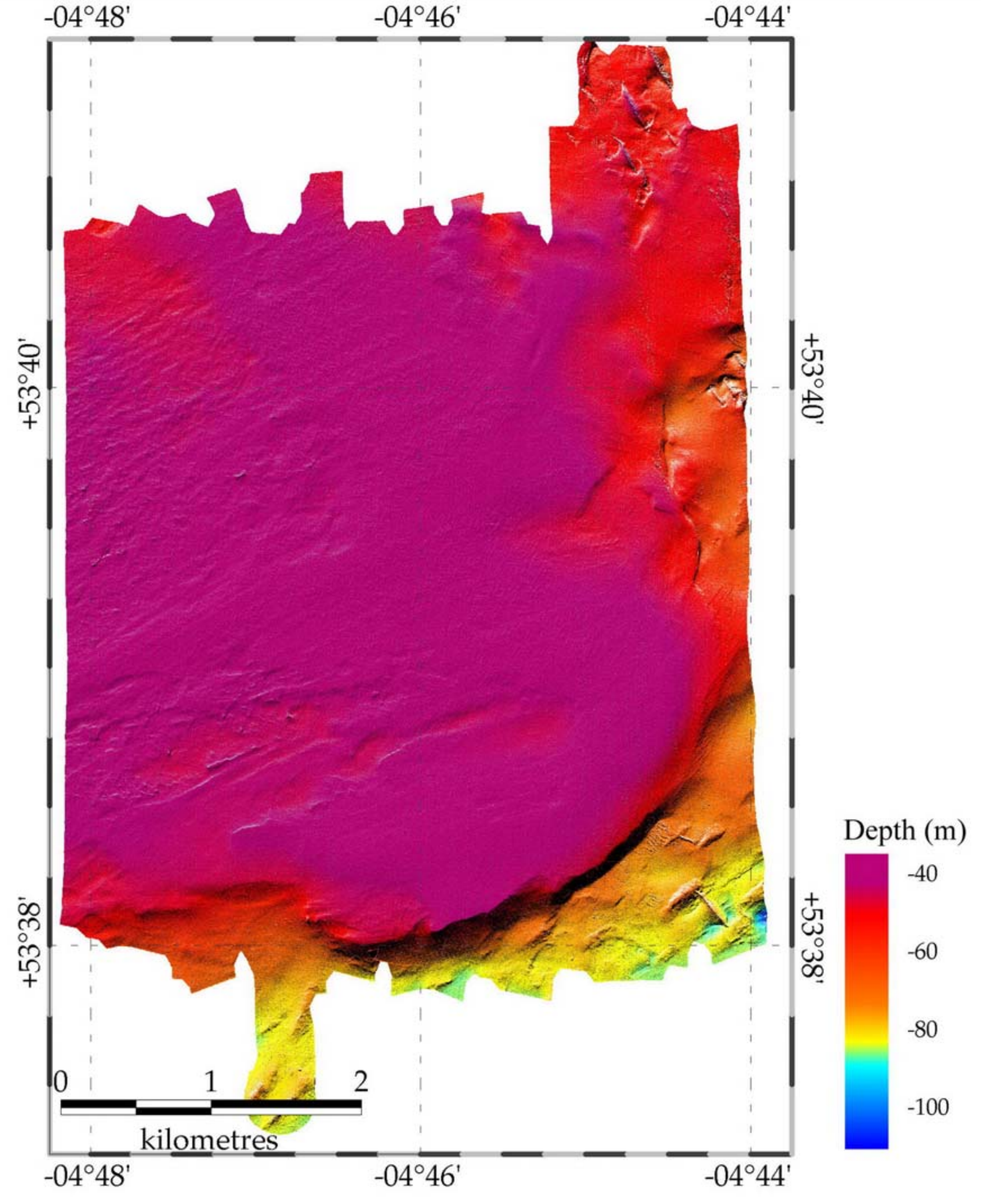



**Figure 22.** Bathymetry image of Area 3.

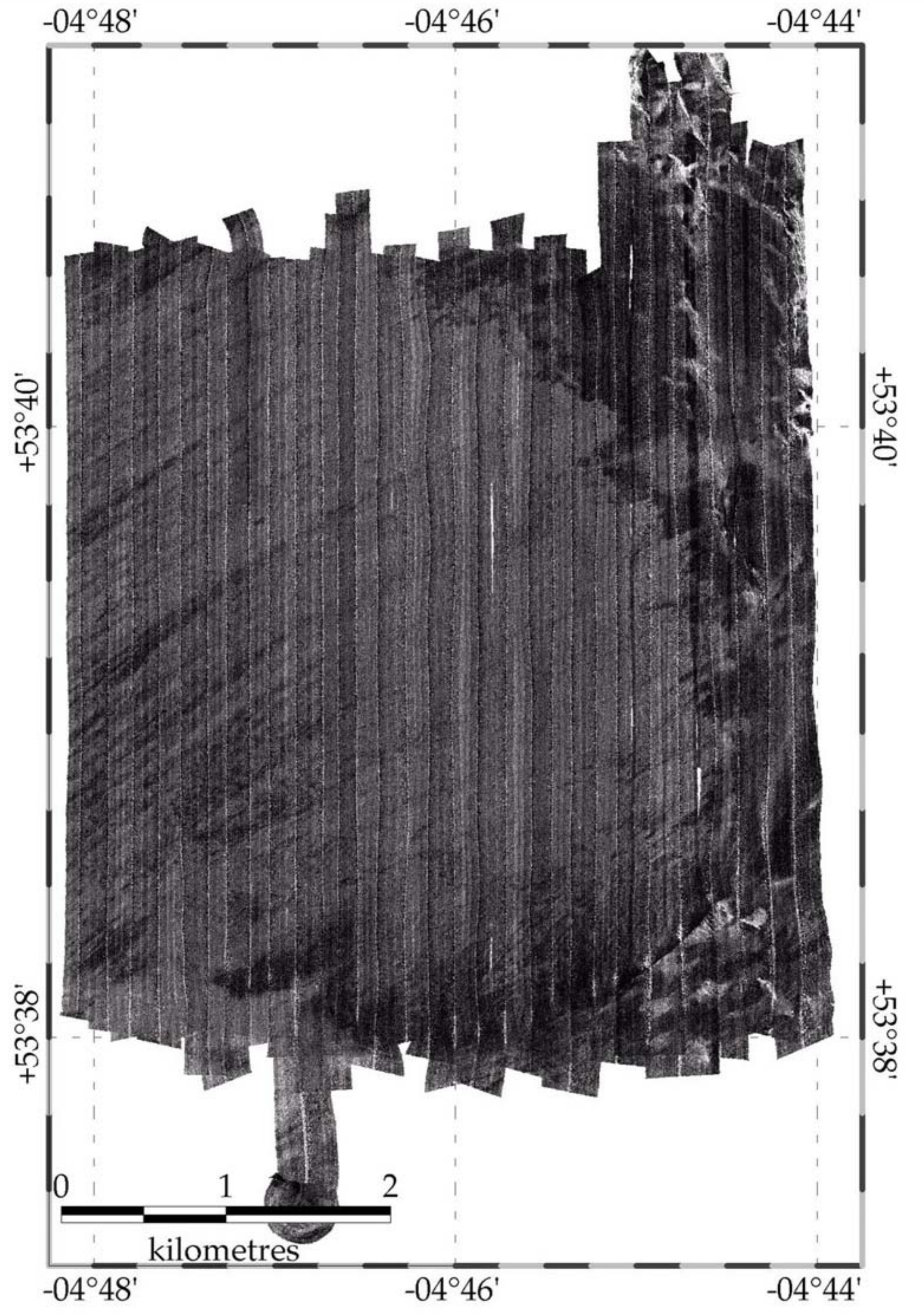



**Figure 23.** Backscatter image of Area 3.

The exposed rock platform had a steep edge with slope values along the edge regularly exceeding 10° (Figure 24). The steepest parts along the edge were up to 20° steep. The currents run along-slope on the southern edge of the platform, and up-slope along the eastern edge (Figure 25).

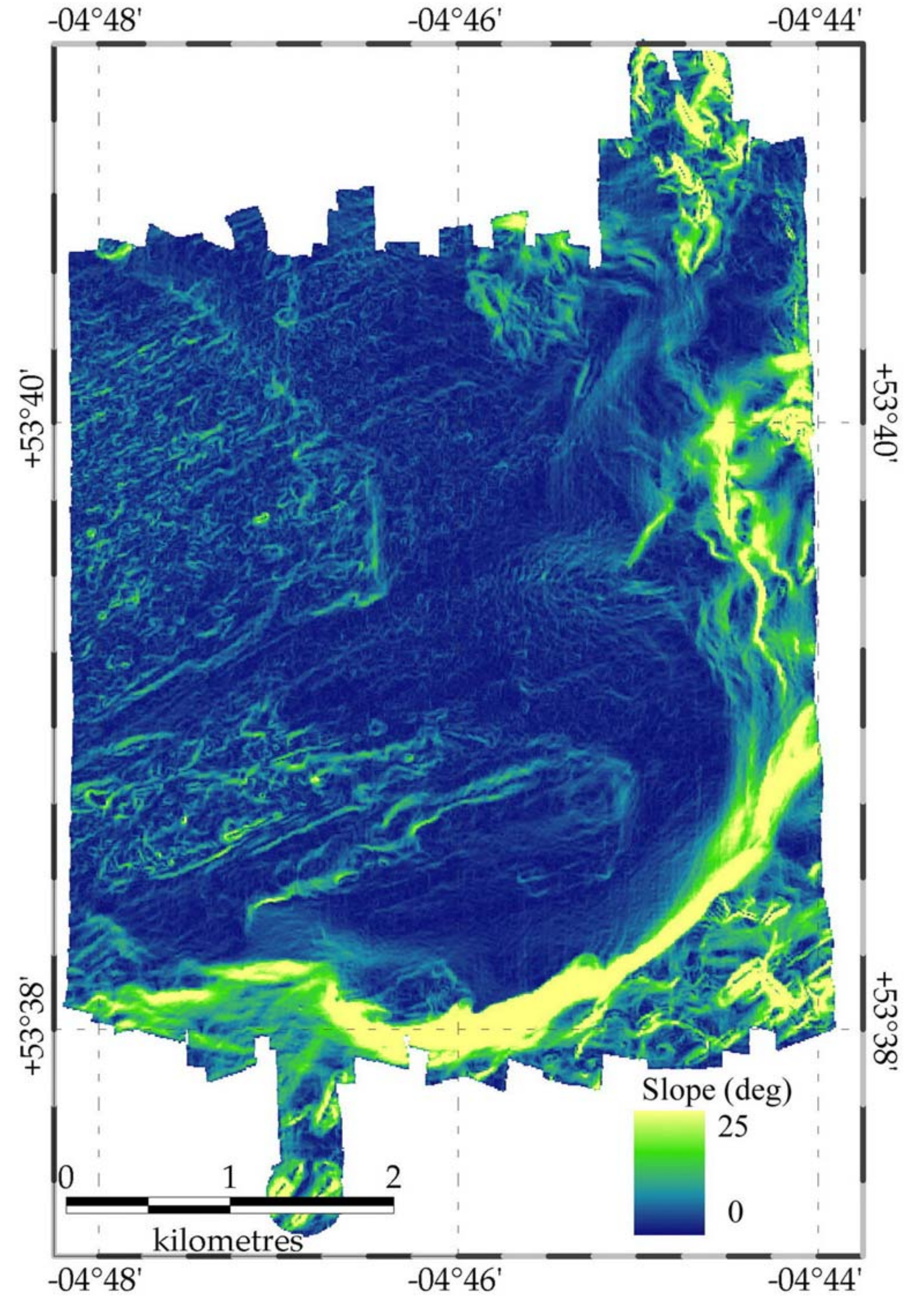



**Figure 24.** Raster with slope values in survey Area 3.

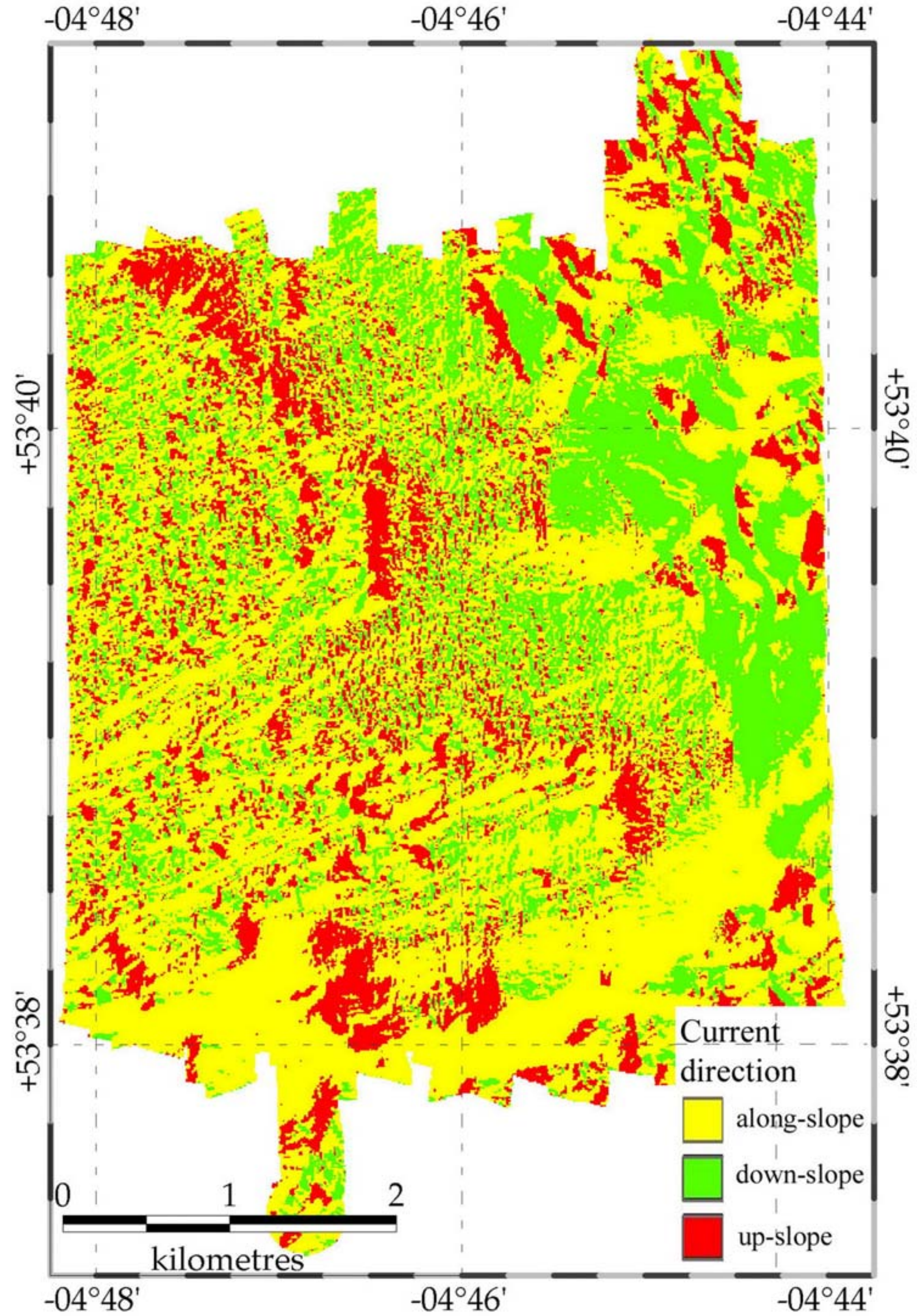



**Figure 25.** Aspect image of Area 3. Aspect is categorised according to dominant tidal current direction (azimuth 68º).

The lower part of the seabed lies at water depths of about 100m and was characterised by generally higher values for backscatter intensity. Six drumlins were present at these depths with a similar size and shape to the drumlins in survey area 2 (Van Landeghem *et al.*, 2008). High, straight and symmetrical sediment waves were present in the south-eastern and north-eastern edge of the area. The ridges were between 150m and 400m wide and up to 18m high. The bedform slopes were 15–20° steep. These sediment waves were clearly represented by lower values on the backscatter imagery. The rugosity values indicated that aside from these areas, the seabed was generally very flat (Figure 26).

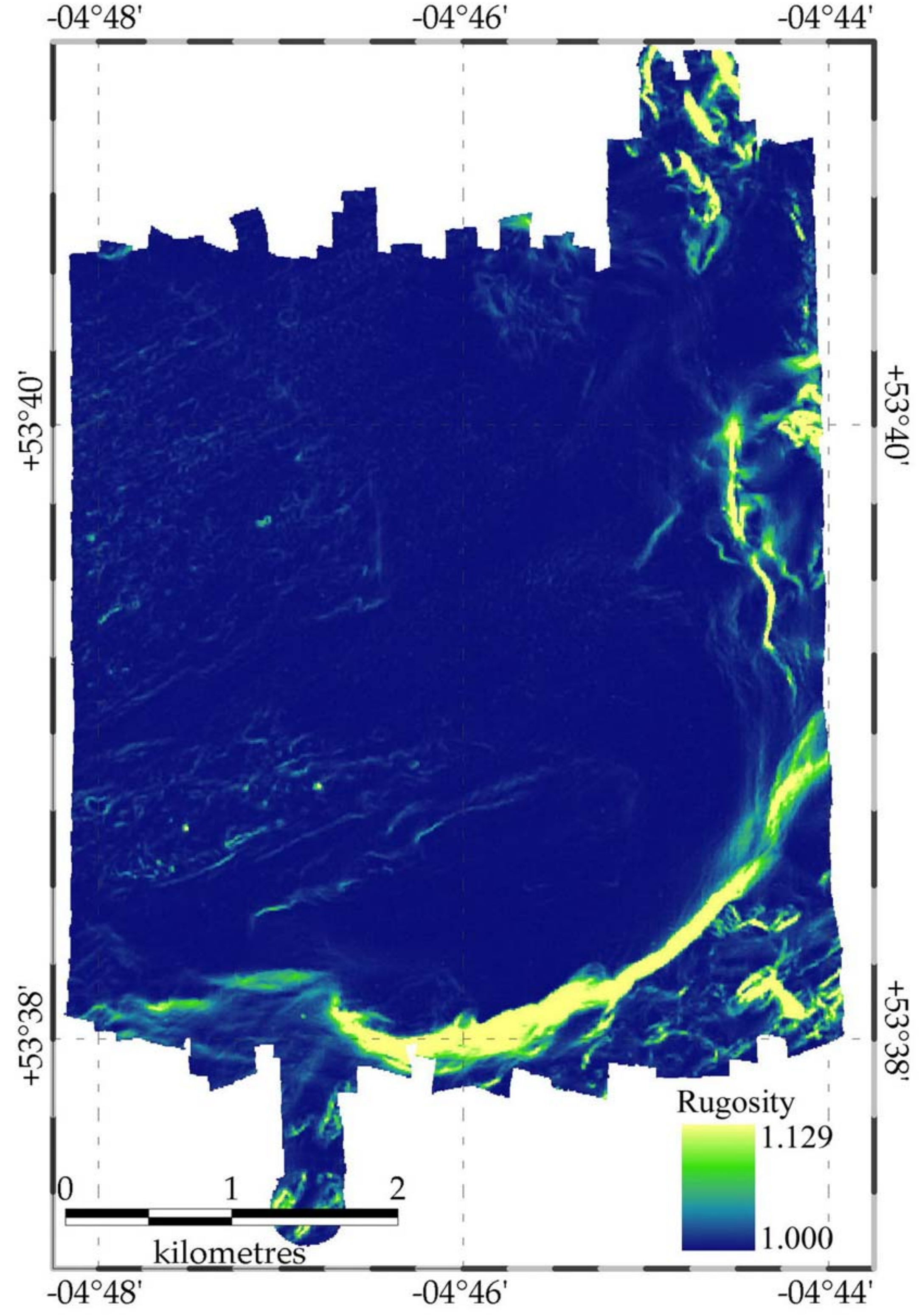



**Figure 26.** Raster with rugosity values in survey Area 3.

### 3.1.4 Area 4

In survey Area 4 bedrock outcrop was the dominant seabed feature, streamlined by *glacial scour* (Figure 27). The areas of bedrock outcrop could also be identified from a mottled pattern in slightly lower values in backscatter intensity (Figure 28). The presence of linear *boulder trains* was observed from swath bathymetry data (Van Landeghem *et al.*, 2008). The regional bathymetry ranged from 50m to 115m. Scattered around the area, some high, straight and symmetrical sediment waves were visible, with similar dimensions as the ones occurring in survey Area 3. The steepest slopes in Area 4 were associated with these sediment waves and with the edges of the rock outcrop (Figure 29), the latter having slopes of up to 30°. The dominant tidal current direction in this area was 53º (Figure 30).

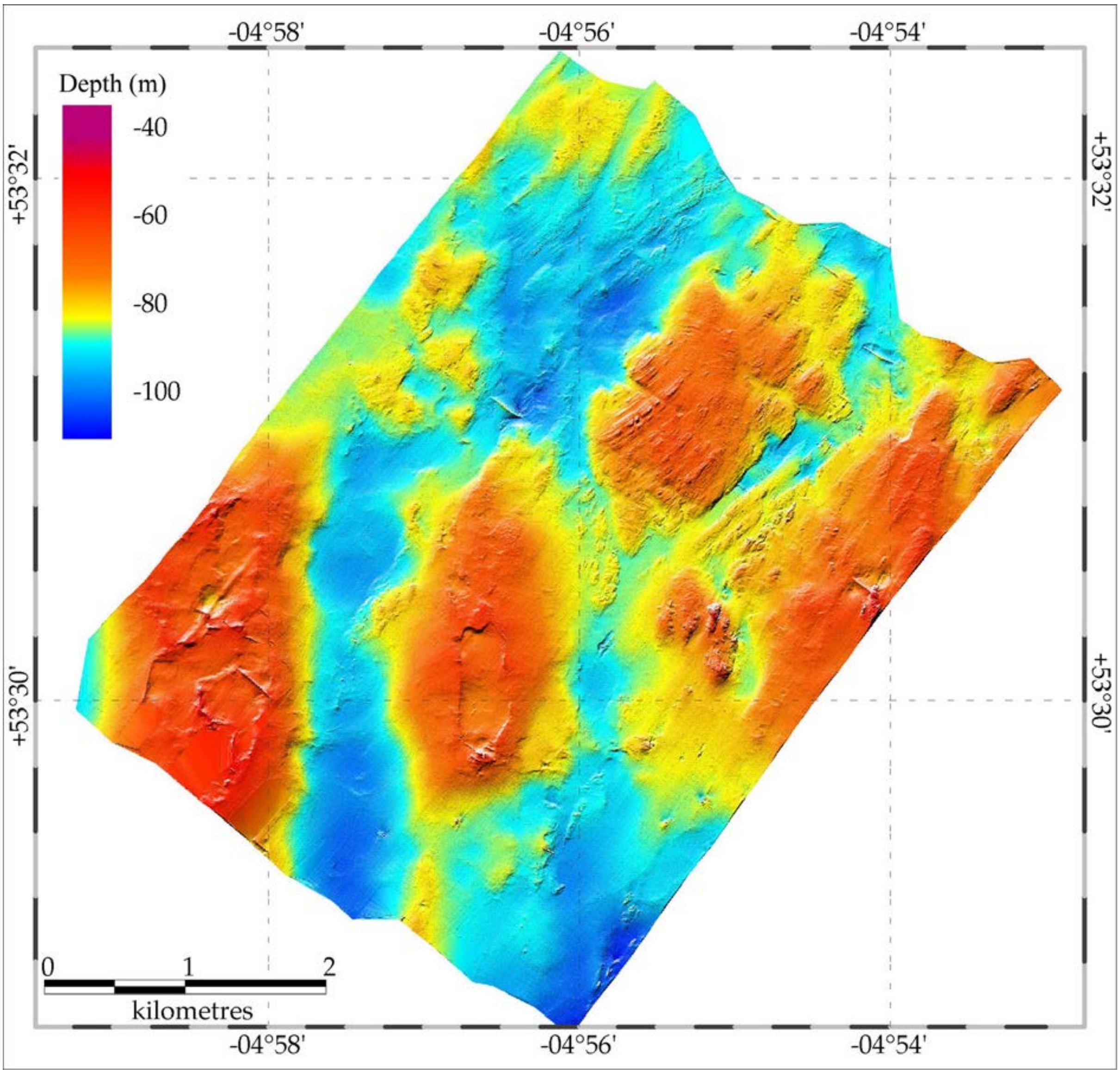



**Figure 27.** Bathymetry image of Area 4.

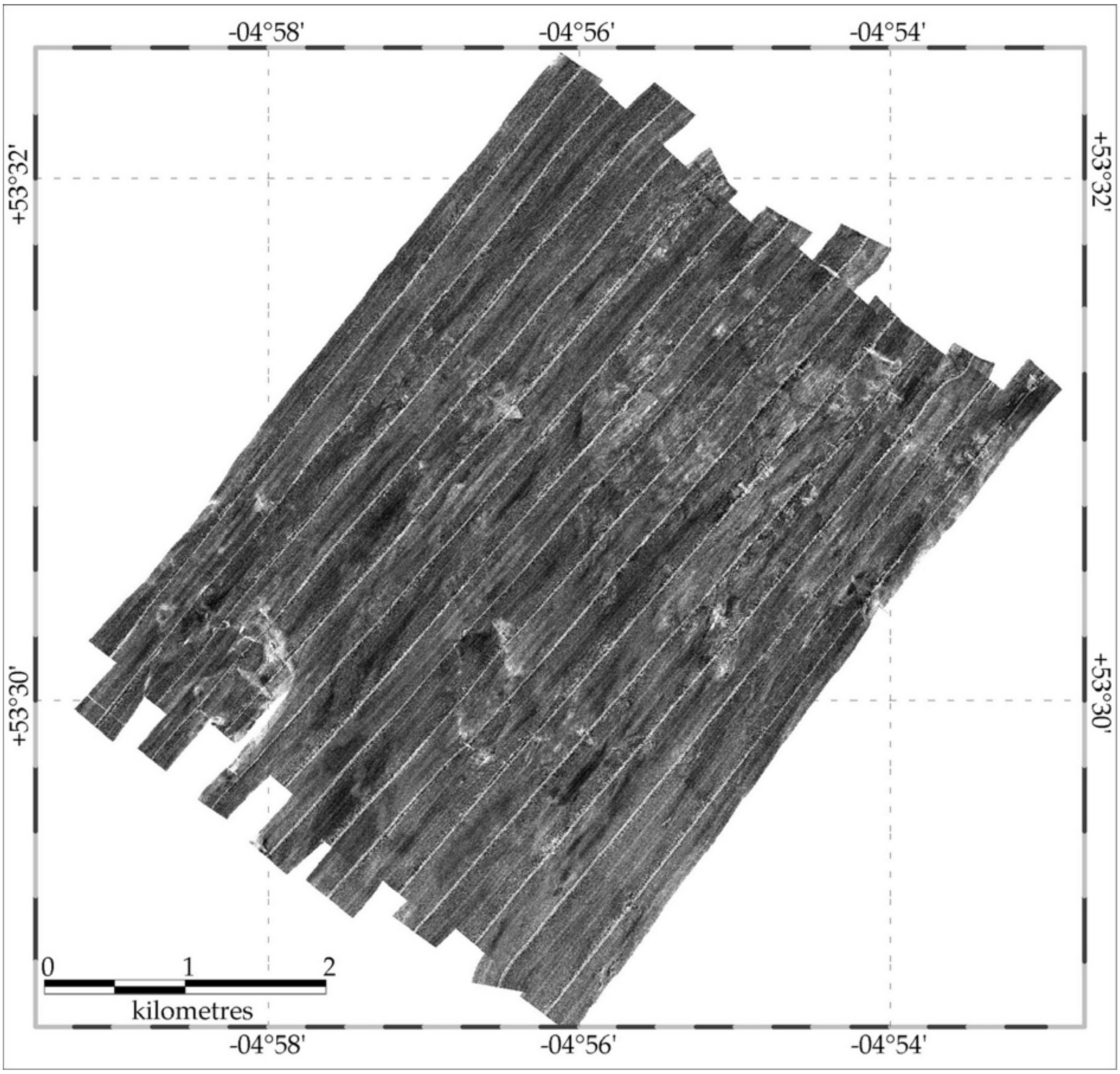



**Figure 28.** Backscatter image of Area 4.

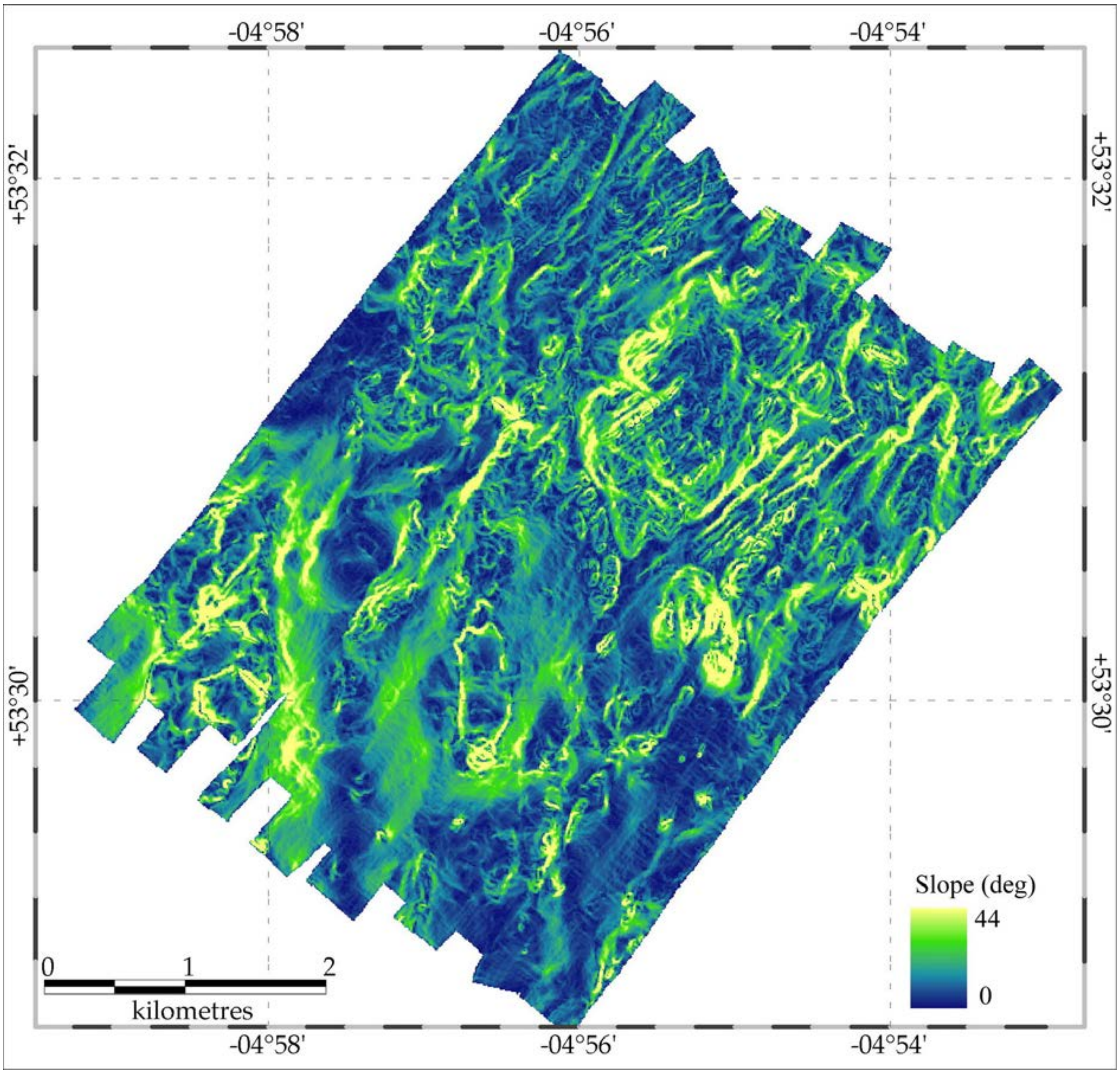



**Figure 29.** Raster with slope values in survey Area 4.

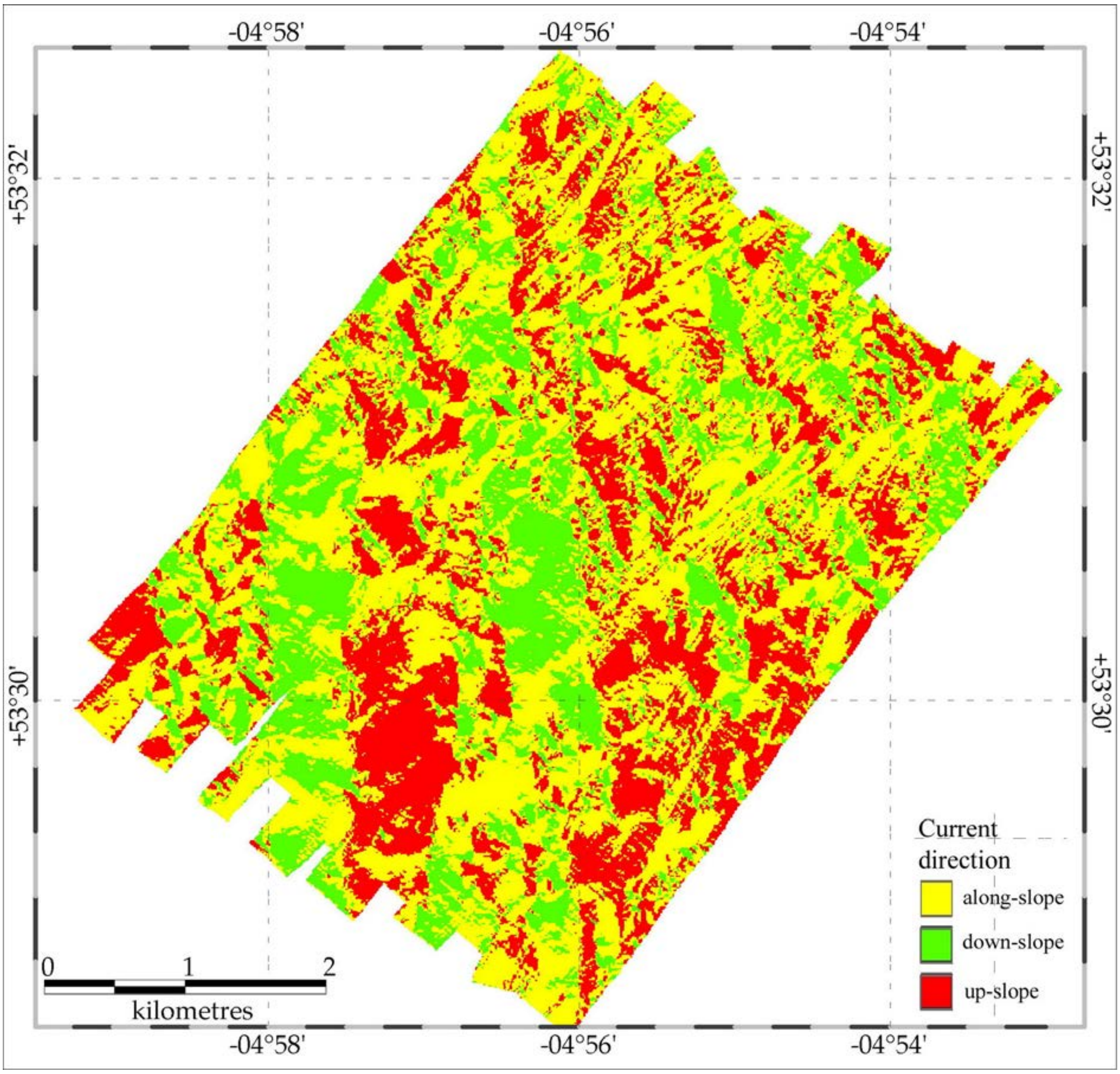



**Figure 30.** Aspect image of Area 4. Aspect is categorised according to dominant tidal current direction (azimuth 53º).

Areas of outcropping rock had the highest rugosity within the study area. In general Area 4 had a moderate level of rugosity in comparison to Areas 1, 2 and 3 (Figure 31).

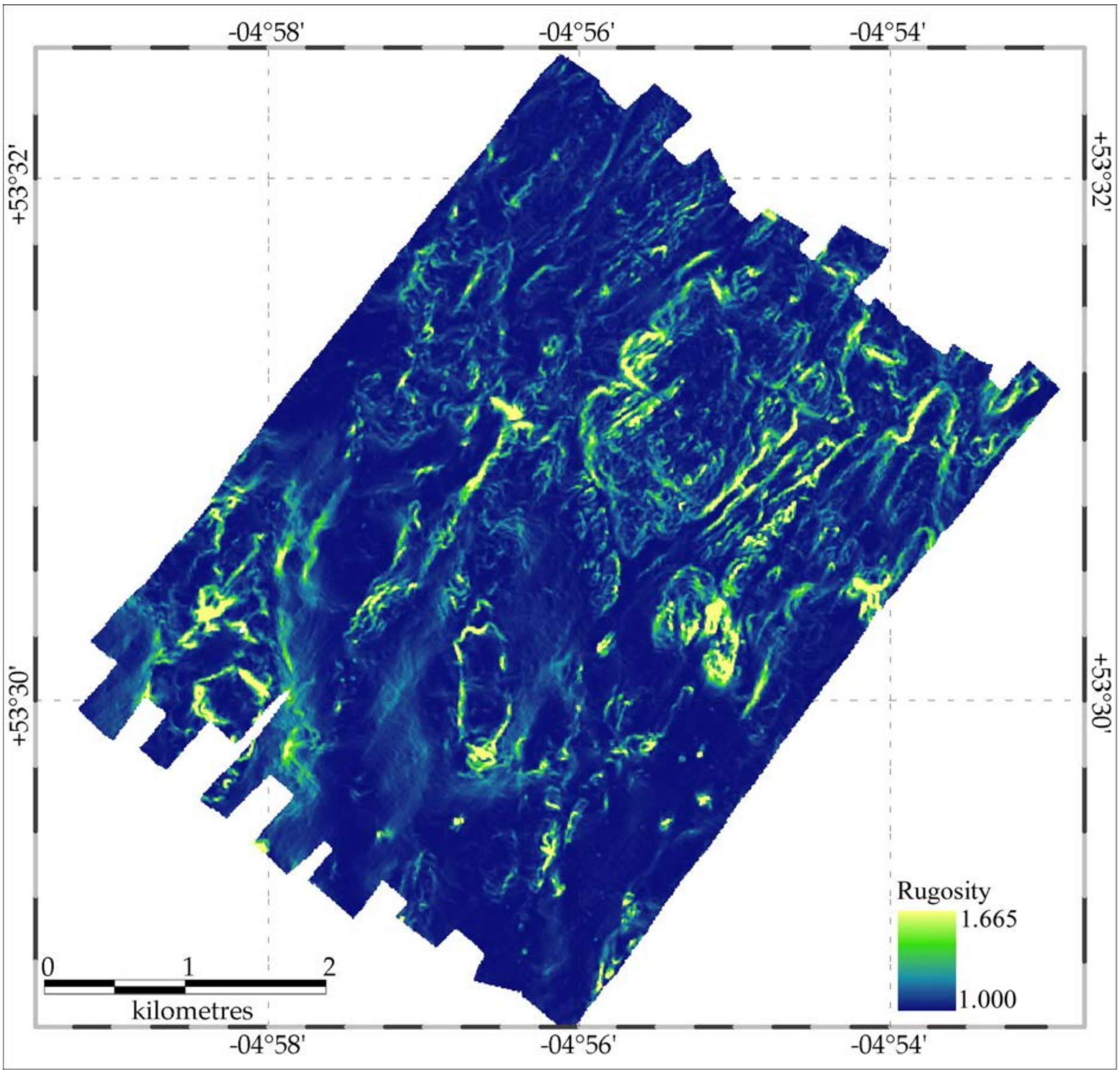
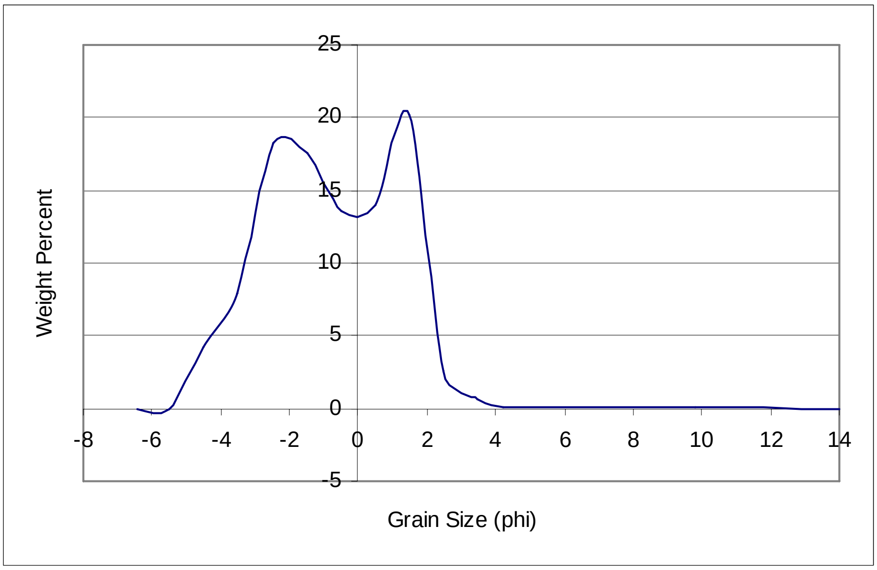



**Figure 31.** Raster with rugosity values in survey Area 4.

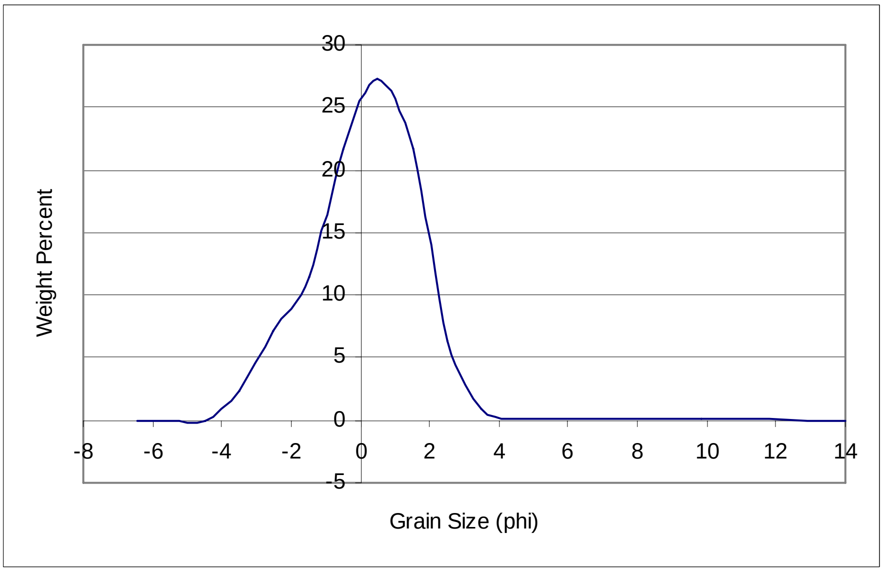
## 3.2 Sediment sample analyses

A total of eight sediment samples were obtained from the study area, and of these, four were collected in survey Area 1, two in survey Area 2, none in survey Area 3 and two in survey Area 4. The strong tidal streams and lack of dynamic positioning on the vessel resulted in relatively few sediment samples being taken, all of which were widely distributed.

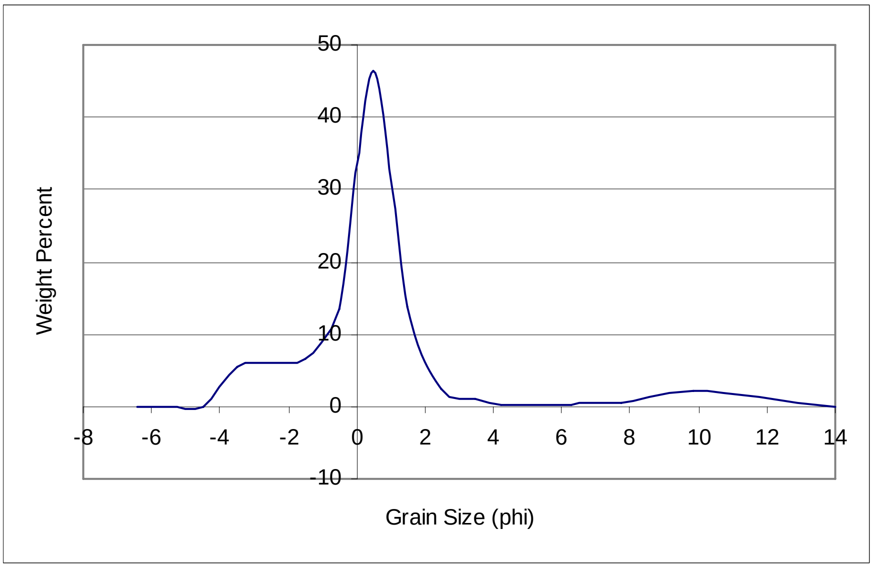
Of the eight samples analysed, three were uni-modal (samples 131.1, 26.2, 40.1), but the remaining samples were either bi- (samples 17.2, 30.1, 35.1) or tri-modal (18.1, 41.1). The particle size distributions for the eight are shown in Figure 32 (a to h).



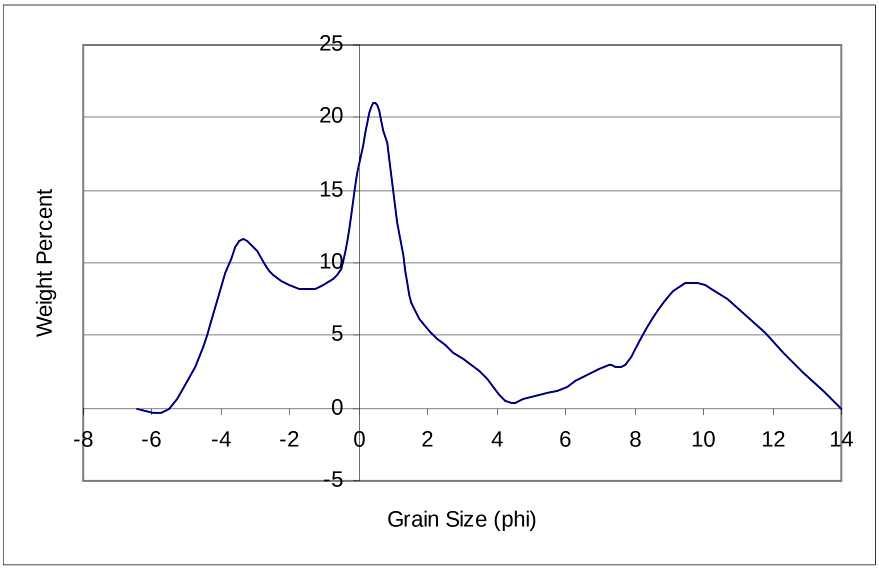

a) Sample 35.1 (Area 1): Poorly sorted Sandy Gravel, bimodal distribution (-2.5Φ, 1.5Φ).



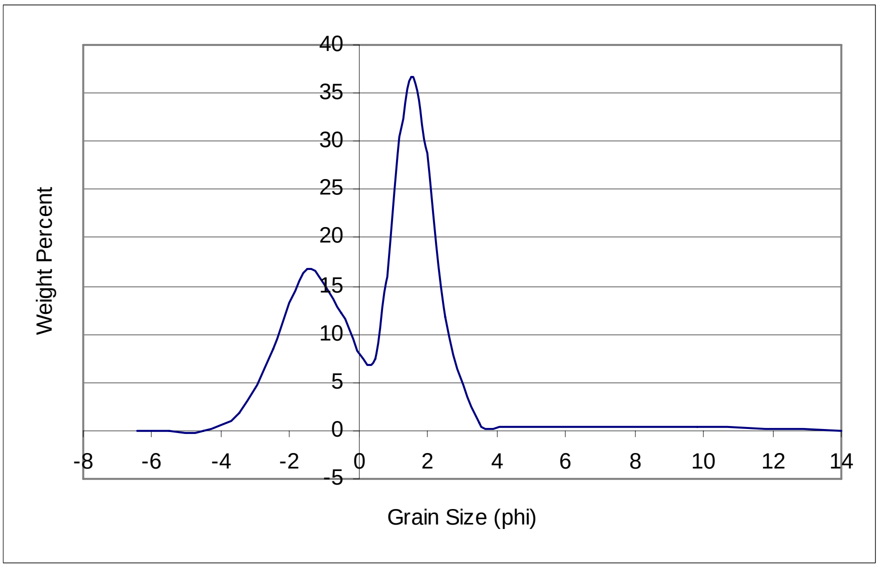

b) Sample 36.2 (Area 1): Poorly sorted Gravelly Sand, unimodal distribution (0.5Φ).



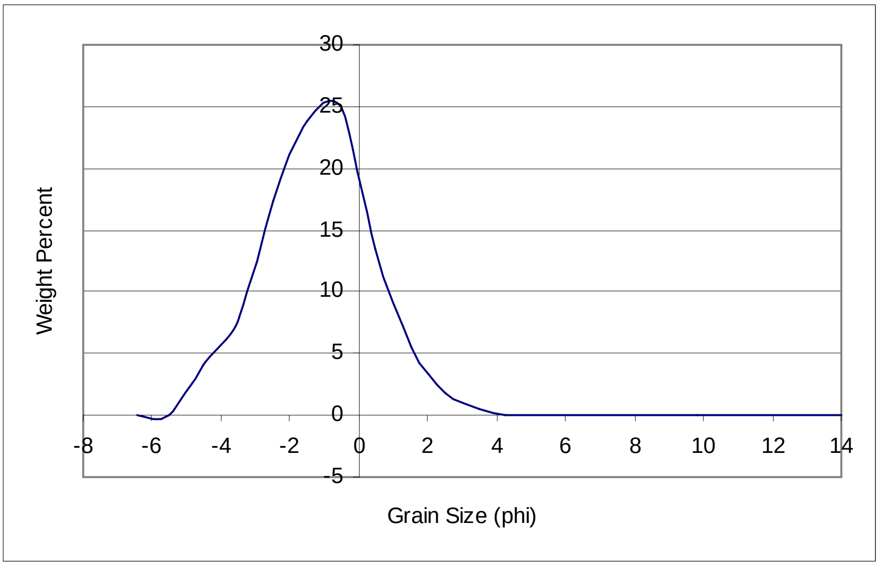

c) Sample 40.1 (Area 1): Poorly sorted Gravelly Sand, unimodal distribution (0.5Φ).



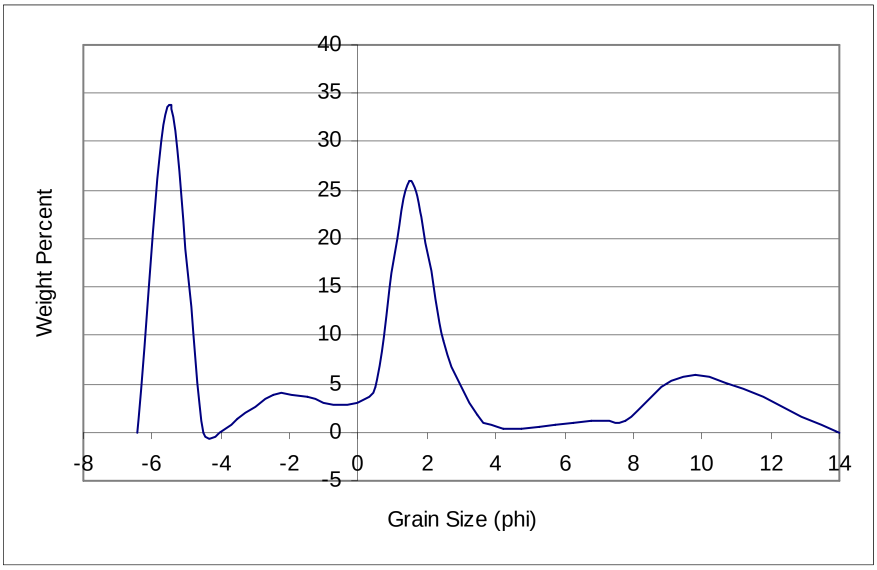

d) Sample 41.1 (Area 1): Extremely poorly sorted Muddy Sandy Gravel, trimodal distribution (-3.5Φ, 0.5Φ, 10 Φ).



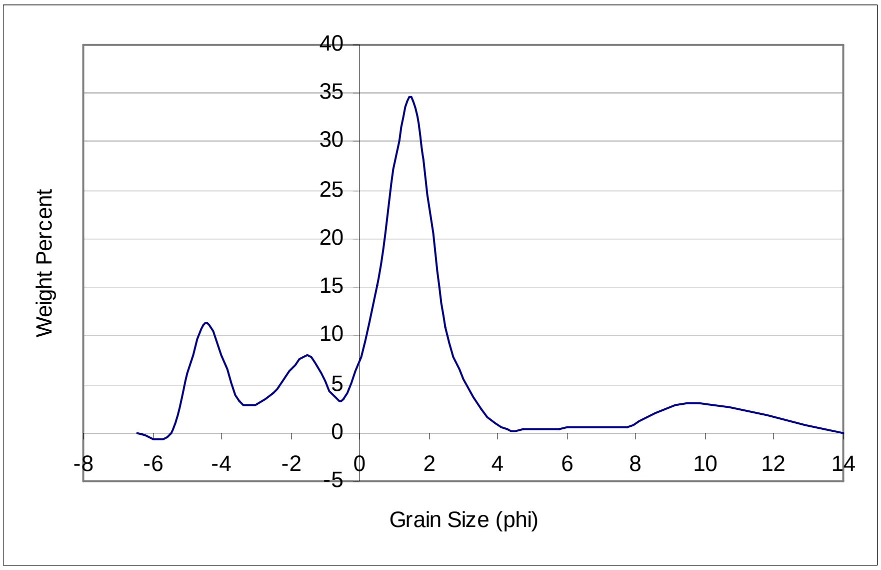

e) Sample 30.1 (Area 2): Poorly sorted Gravelly Sand, bimodal distribution (-1.5Φ, 1.5Φ).




f) Sample 31.1 (Area 2): Poorly sorted Sandy Gravel, unimodal distribution (-0.5Φ).




g) Sample 17.2 (Area 4): Extremely poorly sorted Muddy Sandy Gravel, bimodal distribution (-5.5Φ, 1.5Φ).




h) Sample 18.1 (Area 4): Very poorly sorted Gravelly Sand, trimodal distribution (-4.5Φ, -1.5Φ, 1.5Φ).

**Figure 32.** Particle size distributions using the phi scale and referenced with sorting, textural group and the mode(s) (from Van Landeghem and Wheeler 2007).

Where the sediment distribution is bi- or tri-modal, single value parameters such as mean, skew or kurtosis do not provide a very good representation of the sediment characteristics of the sample (full results are presented at Appendix 9.5). In such cases it can be more useful to review the results in a more descriptive way, looking at the distribution (sample type) and the textural group (Table 6). From the particle size analyses of the collected sediment, it was assumed that the dominant seabed material in all four survey areas was diamicton. The percentage of mud, sand and gravel was variable and the sorting typically very poor.

**Table 6.** Description of sediment type from each of the eight sediment samples based on Particle Size Analysed. For each sample, the sorting and distribution (sample type), textural group based on Folk (1954) and sediment name (incorporating textural group and description of sediment) are provided.

| | **Sample** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **35.1 Area 1** | **36.2 Area 1** | **40.1 Area 1** | **41.1 Area 1** | **30.1 Area 2** | **31.1 Area 2** | **17.2 Area 4** | **18.1 Area 4** |
| **SAMPLE TYPE:** | Bimodal, Poorly Sorted | Unimodal, Poorly Sorted | Unimodal, Poorly Sorted | Trimodal, Extremely Poorly Sorted | Bimodal, Poorly Sorted | Unimodal, Poorly Sorted | Bimodal, Extremely Poorly Sorted | Trimodal, Very Poorly Sorted |
| **TEXTURAL GROUP:** | Sandy Gravel | Gravelly Sand | Gravelly Sand | Muddy Sandy Gravel | Gravelly Sand | Sandy Gravel | Muddy Sandy Gravel | Gravelly Sand |
| **SEDIMENT NAME:** | Sandy Fine Gravel | Very Fine Gravelly Coarse Sand | Very Fine Gravelly Coarse Sand | Fine Silty Sandy Medium Gravel | Very Fine Gravelly Medium Sand | Sandy Very Fine Gravel | Muddy Sandy Very Coarse Gravel | Coarse Gravelly Medium Sand |

The relationship between the sediment samples and the modified Folk Classification indicate that the samples from all three survey areas investigated were generally within the gravelly sand/sandy gravel parts of the Folk Classification diagram (Figure 33).

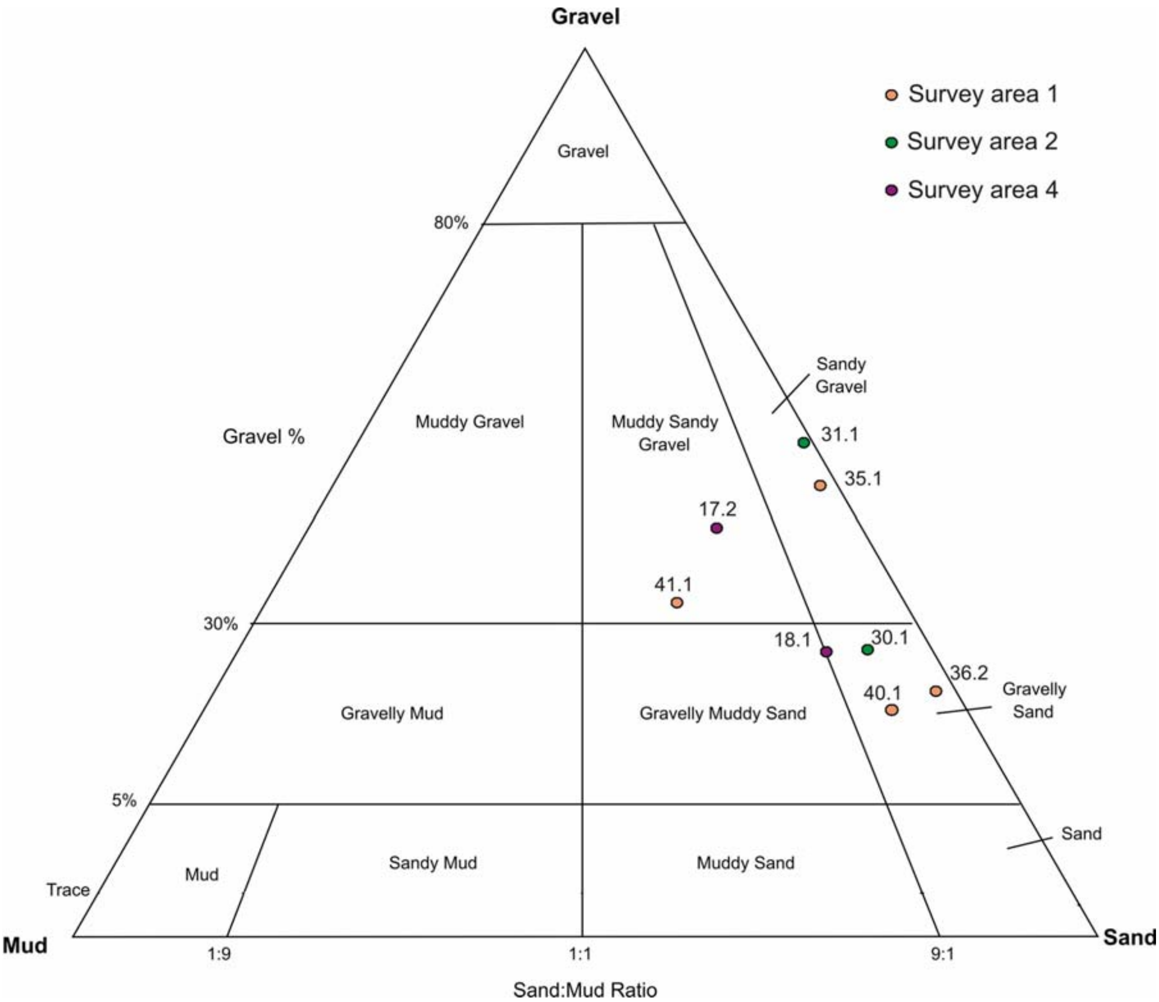



**Figure 33.** Sediment samples plotted on the modified Folk diagram (Pantin 1991) (from Van Landeghem and Wheeler 2007).

### 3.2.1 Relationship between sediment and backscatter

Sediment samples can be used for ground-truthing and to correlate between sediment type, acoustic ground type and benthic fauna (e.g., Goff *et al.,* 2000). Due to the small number of samples obtained, coverage was limited with only a small percentage (6.3%) of all acoustic signatures "truthed". In the three areas from which samples were obtained, the seafloor was very complex, and there was little correlation between the eight sediment samples and their corresponding acoustic signature, allowing only a very tentative extrapolation from acoustic ground type to sedimentary environment:

- 'Very low' and 'low' backscatter values appeared to correspond to Sandy Diamict. The ground type was interpreted as Sandy around sediment waves with a morphology typical for sand waves in the present current regime.
- 'Medium' backscatter values appeared to correspond to Diamict which could be either Sandy or Gravelly.
- 'High' backscatter values appeared to correspond to Gravelly Diamict.

Polymodal versus unimodal distributions were not found to correspond to distinct backscatter values. There was also no direct link between the mode(s) of the sediment and the backscatter signal. The backscatter in these survey areas may therefore be driven by fine scale (cm) rugosity and geotechnical properties (pore pressure and shear strength) and/or influenced by biological factors.

Where bathymetry data suggested the presence of rock outcrop, this was not confirmed by high backscatter intensity values, as would be expected.

## 3.3 Grab samples

Seventeen successful grab samples were obtained from three survey areas (Areas 1, 2 and 4) ranging in volume from 1–9 litres. Two of these samples (41.2 and 41.3) were considered to be inadequate (1 litre each by volume) and so were pooled into one combined sample (41.2). Within Area 3, towed video was used rather than drop-down, due to the relatively flat topography revealed by the multibeam. As the towed video and grab were both deployed from the same ‘A’ frame, it was not possible to use the two gear types interchangeably. Video was thus used as the primary technique, with the aim of obtaining grab samples if time allowed. In this case, the lack of available time resulted in no grab samples being obtained from within Area 3.

### 3.3.1 Infauna

Some 13,831 individual organisms representing 820 taxa (predominantly identified to species) were found in the grab samples. The organisms identified belonged to six phyla/subphyla: Annelida, Chelicerata, Crustacea, Echinodermata, Mollusca, and Sipuncula. The annelids (mostly polychaetes) were dominant at all except station 35, with molluscs or crustaceans second most abundant (Figure 34, Appendix 9.6).

Univariate diversity measures were calculated for the dataset and are shown in Table 7 below. Shannon diversity was relatively consistent across the samples, though there was some variability in the numbers of species found at different stations. The majority of taxa were found in low numbers within samples, with a small number of taxa being slightly more abundant. No taxa were found to be extremely abundant (e.g., thousands per grab) and this relative ‘lack’ of dominance was reflected in the generally high Pielou’s evenness values. Both Shannon diversity and Pielou’s evenness showed low variability between samples and stations. However, samples collected at Stations 35 and 36 appeared to contain relatively fewer species than those from other stations.

**Table 7.** Diversity indices calculated for infaunal grab samples

| Sample | No. species S | No. individuals N | Pielou's evenness J' | Shannon Diversity H'(loge) |
|---|---|---|---|---|
| **17.1** | 158 | 2156 | 0.8 | 4.0 |
| **17.2** | 165 | 2169 | 0.8 | 4.0 |
| **18.1** | 128 | 968 | 0.8 | 4.1 |
| **18.2** | 111 | 690 | 0.8 | 4.0 |
| **30.1** | 103 | 649 | 0.8 | 3.8 |
| **30.2** | 126 | 758 | 0.8 | 4.1 |
| **31.1** | 98 | 924 | 0.7 | 3.4 |
| **31.2** | 145 | 1166 | 0.8 | 4.2 |
| **35.1** | 103 | 486 | 0.8 | 3.8 |
| **35.2** | 23 | 39 | 0.9 | 3.0 |
| **36.1** | 61 | 176 | 0.9 | 3.6 |
| **36.2** | 72 | 270 | 0.9 | 3.8 |
| **40.1** | 132 | 814 | 0.8 | 4.1 |
| **40.2** | 132 | 865 | 0.8 | 4.1 |
| **41.1** | 137 | 1249 | 0.8 | 4.1 |
| **41.2** | 83 | 452 | 0.8 | 3.6 |

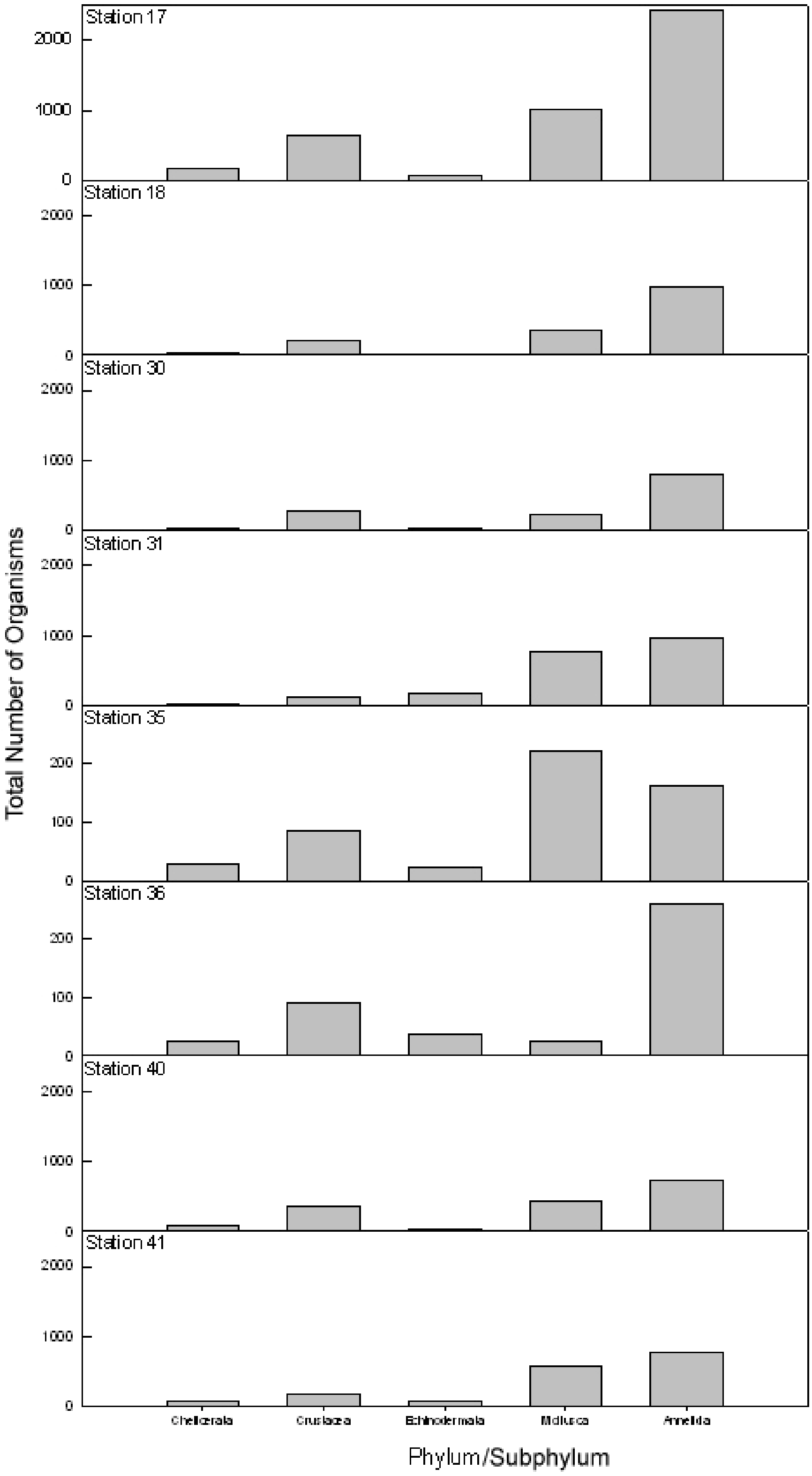



**Figure 34.** Relative abundance of different phyla at within grab samples at each station (replicate samples pooled per station). Note changes in y-axis scale for stations 35 and 36.

### 3.3.2 Infaunal assemblages

A CLUSTER and SIMPROF (5%) analysis of the full species level dataset produced five significant clusters (Figure 35) of two or more samples. Because individual clusters contained very few samples, it was difficult to determine how meaningful they were. Therefore, SIMPROF and CLUSTER analyses were repeated for the (aggregated) Genus and Family datasets. These analyses produced broadly similar descriptions of the community, with some clusters consistently appearing regardless of the taxonomic level at which the datasets were analysed. The recurrence of particular clusters at different taxonomic levels increased the level of confidence in the clusters.

There were also several samples that did not fall into any cluster. Analysing data at different taxonomic levels did not help to resolve this problem because these samples appeared to relate differently to the clusters depending on the taxonomic level at which the data were being analysed. A further SIMPROF analysis was conducted on the species level data, this time at the stricter 1% level, to attempt to identify a sm aller number of the most significant clusters. However, this resulted in only minor changes and did not aid in the interpretation of the data. Therefore the 5% SIMPROF analysis on species level data was utilised for all further analyses.

Finally, a SIMPER analysis for clusters containing two samples or more was carried to determine the main species contributing to each cluster (Figure 35, Table 8).

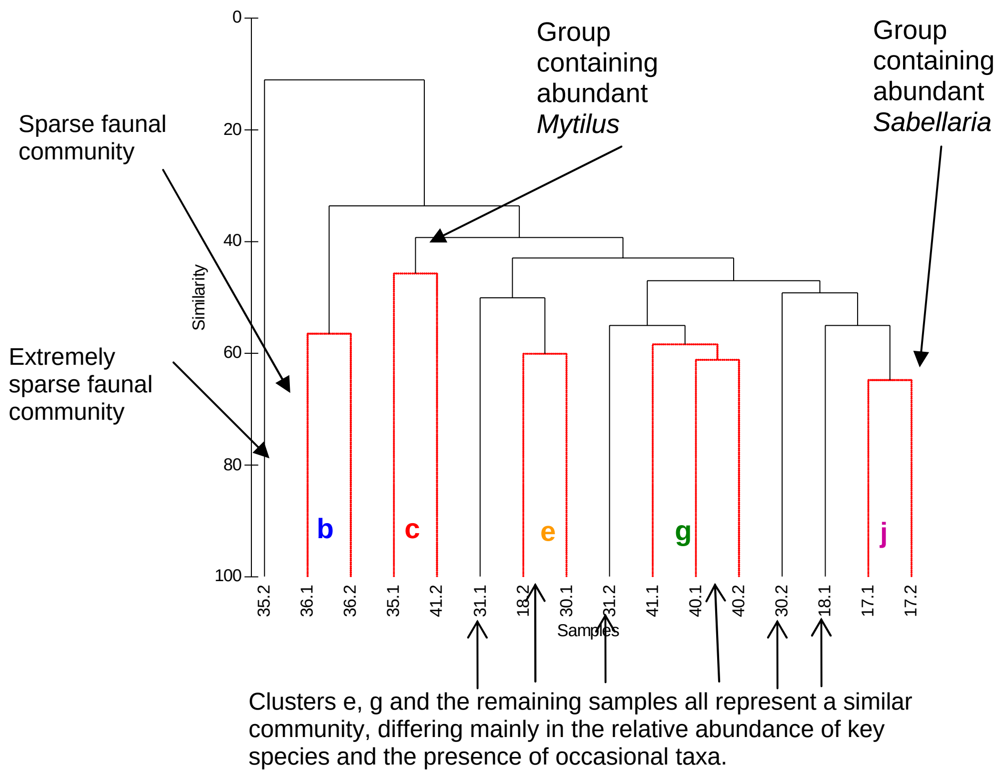



**Figure 35.** Final Species level cluster diagram. Black lines indicate significantly (p=0.05) different clusters identified by the SIMPROF analysis.

The clusters identified through the analysis differed from each other primarily due to variation in the *relative* abundance of species and not because they represented very different species assemblages. Clusters ‘e’ and ‘g’ represented similar communities dominated by *Aonides paucibranchiata,* Harmothoinae and *Mediomastus fragilis*. Cluster ‘b’ represented a very sparse faunal community, while cluster ‘j’ was characterised by abundant *Sabellaria* and cluster ‘c’ contained abundant *Mytilus edulis*. Samples 31.1 and 31.2, neither of which clustered with any other samples, contained communities similar to those in clusters ‘e’ and ‘g’, differing only in the relative abundance of key taxa. Samples 30.2 and 18.1 were most similar to clusters ‘c’ and ‘j’ respectively, but again contained lower numbers of certain taxa. Sample 35.2 differed from most other samples. It contained fewer taxa than any other sample, and those taxa that were present were in very low numbers.

**Table 8.** Infaunal communities found, according to CLUSTER, SIMPROF and SIMPER analyses.

| Species | Average Abundance (no. of individuals) | Cumulative % similarity | Samples |
|---|---|---|---|
| **Cluster g** Average similarity: 59.3 | | | |
| Harmothoinae sp. Indet. | 9.2 | 5.0 | *40.1* |
| *Mediomastus fragilis* | 5.6 | 8.1 | *40.2* |
| *Aonides paucibranchiata* | 5.6 | 10.9 | *41.1* |
| *Achelia echinata* | 5.2 | 13.7 | |
| *Gibbula tumida* | 6.4 | 16.4 | |
| *Cressa dubia* | 6.2 | 19.1 | |
| *Leptochiton asellus* | 5.4 | 21.8 | |
| *Lepidonotus squamatus* | 5.1 | 23.9 | |
| *Glycera lapidum* | 3.6 | 25.9 | |
| *Amphipholis squamata* | 4.5 | 27.9 | |
| **Cluster b** Average similarity: 56.5 | | | |
| *Mediomastus fragilis* | 4.0 | 6.4 | *36.1* |
| *Aonides paucibranchiata* | 4.1 | 12.1 | *36.2* |
| *Cressa dubia* | 3.3 | 17.5 | |
| *Amphipholis squamata* | 3.8 | 23.0 | |
| Harmothoinae sp. Indet. | 3.7 | 27.9 | |
| *Paradoneis cf. ilvana* | 2.9 | 32.2 | |
| *Achelia echinata* | 2.5 | 35.9 | |
| *Guernea coalita* | 2.3 | 39.6 | |
| *Lumbrineris gracilis* | 2.4 | 43.3 | |
| *Pholoe tuberculata* | 2.1 | 46.5 | |
| **Cluster c** Average similarity: 45.7 | | | |
| *Mytilus edulis* | 7.8 | 9.6 | *35.1* |
| Harmothoinae sp. Indet. | 5.4 | 14.5 | *41.2* |
| *Cressa dubia* | 4.1 | 19.1 | |
| *Achelia echinata* | 3.5 | 23.5 | |
| *Amphipholis squamata* | 3.5 | 27.8 | |
| *Hiatella arctica* | 3.7 | 32.0 | |
| *Lepidonotus squamatus* | 3.7 | 35.8 | |
| *Pholoe* sp. B | 3.1 | 39.4 | |
| *Gibbula tumida* | 4.6 | 42.8 | |
| *Sphenia binghami* | 3.0 | 46.1 | |
| **Cluster e** Average similarity: 60.1 | | | |
| *Aonides paucibranchiata* | 8.7 | 6.2 | *30.1* |
| *Mediomastus fragilis* | 8.2 | 12.1 | *18.2* |
| *Mytilus edulis* | 6.5 | 16.6 | |
| *Leptochiton asellus* | 4.8 | 19.5 | |
| Harmothoinae sp. Indet. | 4.0 | 22.4 | |
| *Glycera lapidum* | 4.2 | 25.4 | |
| *Chone filicaudata* | 4.1 | 28.1 | |
| *Timoclea ovata* | 4.0 | 30.5 | |
| *Laonice bahusiensis* | 3.3 | 32.9 | |
| *Clymenura johnstoni* | 3.2 | 35.3 | |
| **Cluster j** Average similarity: 64.8 | | | |
| *Sabellaria spinulosa* | 14.2 | 3.7 | *17.1* |
| Harmothoinae sp. Indet. | 10.2 | 7.0 | *17.2* |
| *Sphenia binghami* | 8.8 | 9.9 | |
| *Mediomastus fragilis* | 8.6 | 12.9 | |
| *Mytilus edulis* | 13.0 | 15.7 | |
| *Sabellides octocirrata* | 7.8 | 18.4 | |
| *Pholoe* sp. B | 7.9 | 20.8 | |
| *Ampharete lindstroemi* | 6.9 | 23.2 | |
| *Ampelisca spinipes* | 6.6 | 25.4 | |
| *Achelia echinata* | 6.5 | 27.4 | |

### 3.3.3 Infaunal biotopes

Within the Marine Habitat Classification (Connor *et al.*, 2004; also Appendix 9.7), the biotope that most closely resembled the communities described above is *Mediomastus fragilis*, *Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel (SS.SCS.CCS.MedLumVen). There are insufficient samples to determine whether the clusters identified represent the natural range of variation within one biotope or whether each cluster represents a genuinely distinct sub-group of that biotope. Data collected by Mackie *et al.,* (1995) and Robinson *et al.,* (2007) also suggest that this biotope and variants of it make up a significant proportion of the offshore southern Irish Sea benthos. It is acknowledged that it is quite variable over time and that there may be several as yet undefined sub-biotopes within it (Connor *et al.,* 2004). The *Sabellaria*-dominated (Area 4) or *M. edulis*-dominated (Area 1) communities may constitute such variants, though they could also belong to the biotope, *Sabellaria spinulosa* on stable circalittoral mixed sediment (SS.SBR.PoR.SspiMx). More data would need to be collected to clarify these theories with any certainty.

Another biotope within the Marine Habitat Classification, Polychaete-rich deep *Venus* community in offshore mixed sediments (SS.SMx.OMx.PoVen) (Connor *et al.*, 2004), is very similar to SS.SCS.CCS.MedLumVen, and it could be argued that the samples collected here belong to the former biotope. In fact, these two biotopes are difficult to distinguish. Few data were available to describe them when the classification was created and at present, there remain insufficient data to allow them to be to be clearly differentiated.

### 3.3.4 Comparison with data collected during the HABMAP project

During the HABMAP project (Robinson *et al.,* 2007; also briefly described in Section 5 of this report), grab sample data were collected (using identical techniques to those employed during this study) in the Irish Sea across an area broader than that covered by this study. The data collected during the HABMAP study were combined with those collected as part of this project and a multivariate analysis was conducted within PRIMER on square root transformed data. The MDS plot and cluster diagram resulting from this analysis are shown in Figures 36 and 37 respectively. Note that Robinson *et al.,* (2007) employed a logarithmic transformation on combined replicate data in their original analyses.

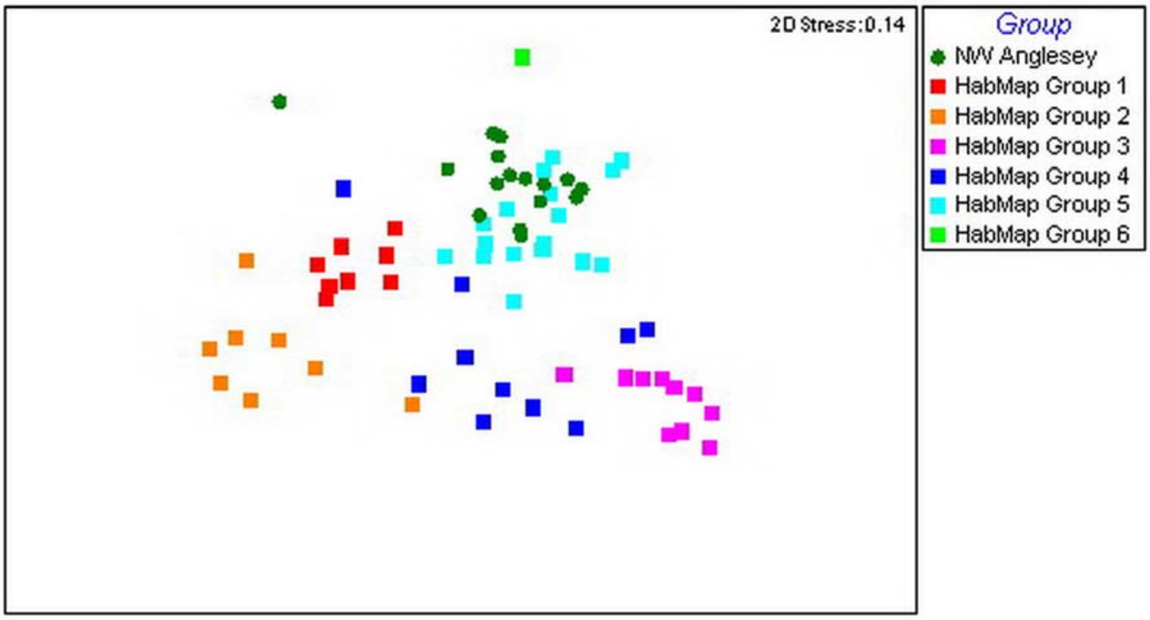



**Figure 36.** MDS plot of the HABMAP data combined with data collected during this project. The circular symbols representing the data collected during the current project (except the sparse sample 35.2) group out closely with Group 5 as defined during the HABMAP project.

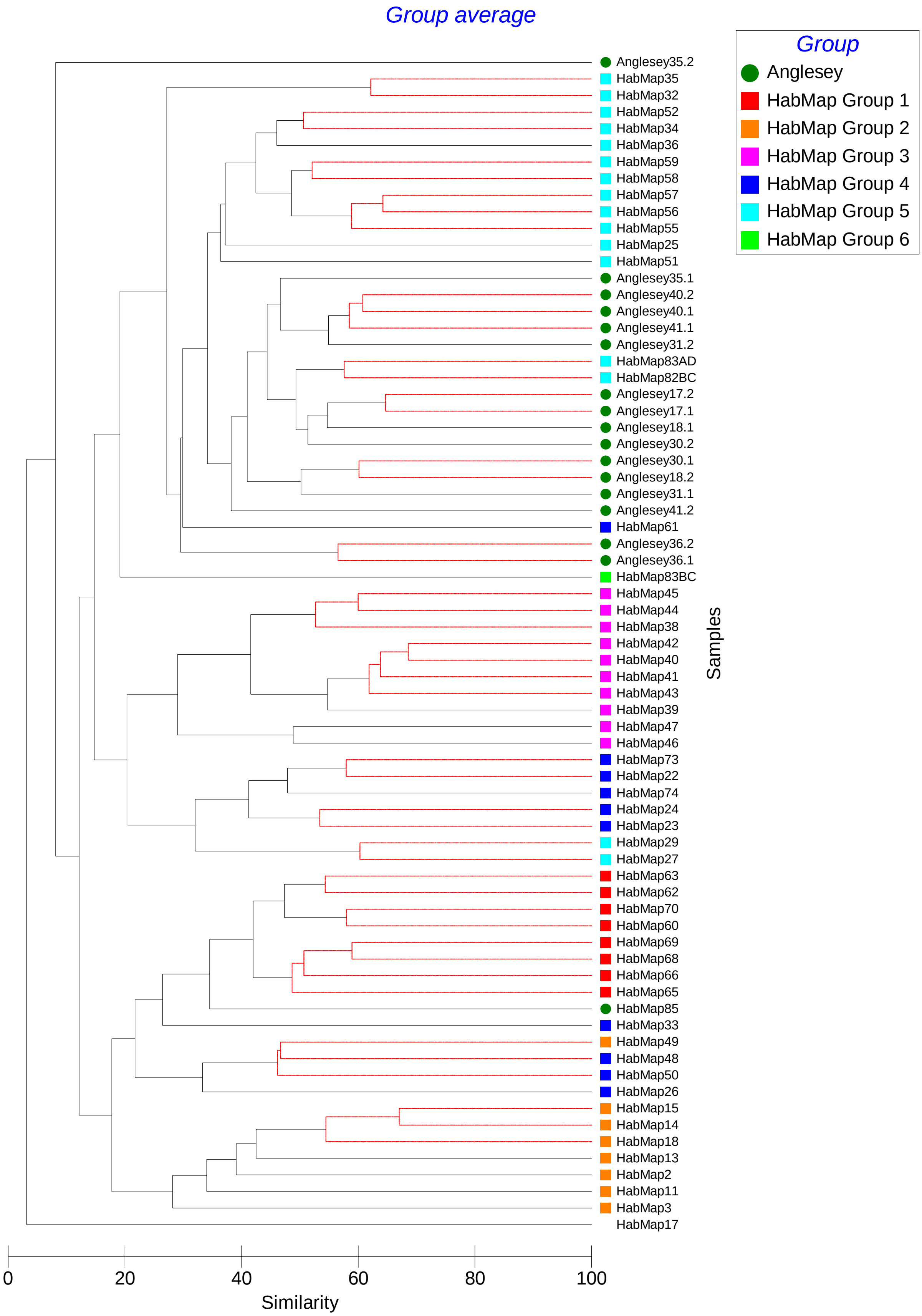



**Figure 37.** Cluster diagram of HABMAP data combined with data collected during this project. Black lines indicate significantly (p=0.05) different clusters identified by the SIMPROF analysis.

**Table 9.** Infaunal biotope assessments from HABMAP project (From Robinson *et al.*, 2007)

| **Group** | **Group 5a** | **Group 5b** | **Group 5c** | **Group 5d** |
|---|---|---|---|---|
| **Sediments** | Sand to Sandy Gravel (mostly with gravel) | Sandy gravel and gravelly sand | (gravelly) Muddy Sand and Gravelly Muddy Sand | Sandy Gravel |
| **Depth** | 38–39m & 75–172m | 32–38m | 34–38m | 135–194m |
| **Dominant Species** | *Aonides paucibranchiata*<br>*Pomatoceros lamarckii*<br>*Timoclea ovata*<br>Harmothoinae juv<br>*Laonice bahusiensis*<br>*Filogranula gracilis*<br>*Modiolus modiolus*<br>*Josephella marenzelleri*<br>*Ampharete lindtoemi*<br>*Caecum glabrum*<br>*Mediomastus fragilis*<br>*Ophiactis balli*<br>*Gibbula tumida*<br>*Leptochiton asellus*<br>*Glycymeris glycymeris*<br>*Polycirrus* spp. | *Aphelochaeta marioni*<br>*Mediomastus fragilis*<br>*Pomatoceros lamarckii*<br>*Ampharete lindstreomi*<br>*Caulleriella zetlandica*<br>*Scalibregma inflatum*<br>*Aonides paucibranchiata*<br>*Lumbrineris gracilis*<br>*Clymenura tricirrata*<br>*Abra alba*<br>*Poecilochaetus serpens*<br>*Prxillella affinis*<br>*Anobothrus gracilis*<br>*Timoclea ovata*<br>*Laevicardium crassum*<br>*Paradoneis lyra* | *Aphelochaeta marioni*<br>Harmothoinae juv<br>*Abra alba*<br>*Scalibregma inflatum*<br>*Modiolus modiolus*<br>*Onoba semicostata*<br>*Ophiothrix fragilis*<br>*Lepidonotus squamatus*<br>*Adyte pellucida*<br>*Mediomastus fragilis*<br>*Caulleriella zetlandica*<br>*Pholoe* sp. B<br>*Alvania semistriata*<br>*Nucula nucleus*<br>*Caulleriella alata*<br>*Psamathe fusca* | *Filograna implexa*<br>*Cressa dubia*<br>*Jassa falcata*<br>*Nucula suculata*<br>*Gammaropsis maculata*<br>*Harmothoinae* juv<br>*Lepidonotus squamatus*<br>*Sphenia binghami*<br>*Chlamys varia*<br>*Pholoe* sp B<br>*Phthisica marina*<br>*Mytilus edulis*<br>*Achelia echinata*<br>*Medoimastus fragilis*<br>*Stenothoe marina*<br>*Sabellides octocirrata* |
| **Biotope** | SS.SCS.CCS.MedLumVen including SS.SBR.SMus.ModMx | SS.SCS.CCS.MedLumVen | SS.SBR.Smus.ModT | SS.SMx.Omx/ SS.SBR.Smus.ModCvar |

The analysis showed that the communities identified within this study very closely resembled those identified in 'Group 5' of the HABMAP study (summarised in Table 9), giving further confidence to the assignment of all samples within the current study to the same biotope (as described in Section 3.3.3 above). During the HABMAP project, Group 5 was further divided into four sub-groups (5a, 5b, 5c, 5d), and the samples collected during this study appeared to cluster most closely with Group 5a, which was also assigned to *Mediomastus fragilis, Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel (SS.SCS.CCS.MedLumVen). This biotope was predicted through the HABMAP model to occur fairly widely within this part of the Irish Sea, although predicted occurrence within the four study areas was patchy and generally of low confidence (Figure 38).

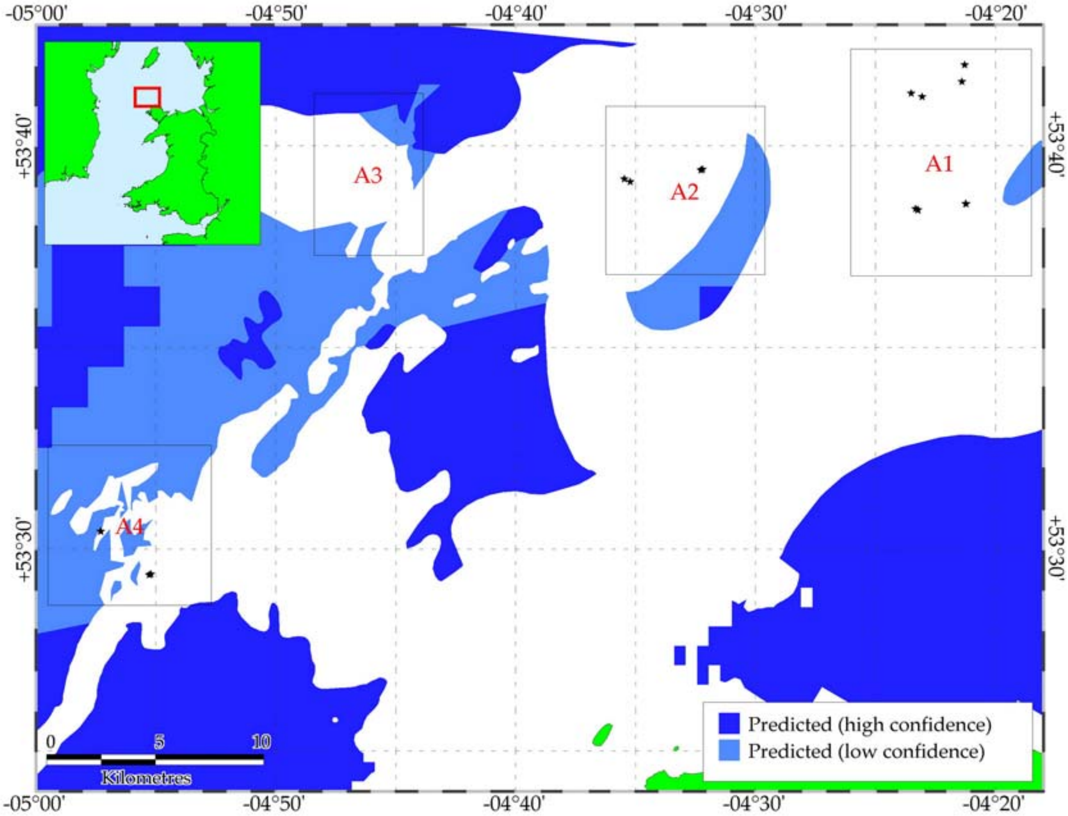



**Figure 38.** Predicted distribution of *Mediomastus fragilis*, *Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel (SS.SCS.CCS.MedLumVen), as determined by the HABMAP model. Stars denote occurrence of SS.SCS.CCS.MedLumVen as determined through grab sampling within the current study.

### 3.3.5 Epifauna

Excluding encrusting polychaetes, and surface-dwelling crustaceans and echinoderms, a total of 107 'epifaunal' taxa were identified from the grab samples. The bryozoans (61 taxa) and the hydroids (30 taxa) were the most diverse representatives (Appendix 9.8). The CLUSTER and SIMPROF analyses on the epifaunal (presence/absence) data from grab samples revealed three significantly different clusters (one of which, Cluster A, contained only one sample, 35.2, which also clustered out separately in the infaunal analysis), with the majority of epifaunal samples falling into the same cluster (Cluster C). The species making the largest contribution to the similarity within Clusters B and C according to the SIMPER analysis are shown in Table 10. This result is also illustrated in the cluster diagram in Figure 39. No further analysis was performed on the epifaunal data from grabs because the video data were considered to be a more accurate assessment of the larger epifaunal species in the area and covered a greater geographical area.

**Table 10.** Species making the biggest contribution to similarity within epifaunal Clusters B and C according to SIMPER analysis. Cluster A contained only one sample (35.2).

| Species | % Contribution | Cumulative % contribution | Samples |
|---|---|---|---|
| **Cluster C** | | | **Area 1**: 35.1; 36.1; 36.2; 40.1; 40.2; 41.1. **Area 4**: 17.1; 17.2; 18.1; 18.2. **Area 2**: 30.1; 30.2; 31.2. |
| *Escharella immersa* | 6.4 | 6.4 | |
| *Entalophoroecia deflexa* | 5.5 | 11.9 | |
| *Disporella hispida* | 5.5 | 17.4 | |
| *Hydrallmania falcata* | 4.7 | 22.1 | |
| *Fenestrulina malusii* | 4.4 | 26.5 | |
| *Dendrodoa grossularia* | 4.4 | 30.8 | |
| *Beania mirabilis* | 3.7 | 34.5 | |
| *Amphiblestrum flemingii* | 3.7 | 38.2 | |
| *Sertularia argentea* | 3.5 | 41.7 | |
| *Callopora dumerilii* | 3.5 | 45.2 | |
| **Cluster B** | | | **Area 2**: 31.1. **Area 1**: 41.2. |
| *Entalophoroecia deflexa* | 9.1 | 9.1 | |
| *Disporella hispida* | 9.1 | 18.2 | |
| *Alcyonidium sp.* | 9.1 | 27.3 | |
| *Conopeum reticulum* | 9.1 | 36.4 | |
| *Electra pilosa* | 9.1 | 45.5 | |
| *Callopora dumerilii* | 9.1 | 54.6 | |
| *Scrupocellaria scruposa* | 9.1 | 63.6 | |
| *Chorizopora brongniartii* | 9.1 | 72.7 | |
| *Escharella immerse* | 9.1 | 81.8 | |
| *Escharella variolosa* | 9.1 | 90.9 | |

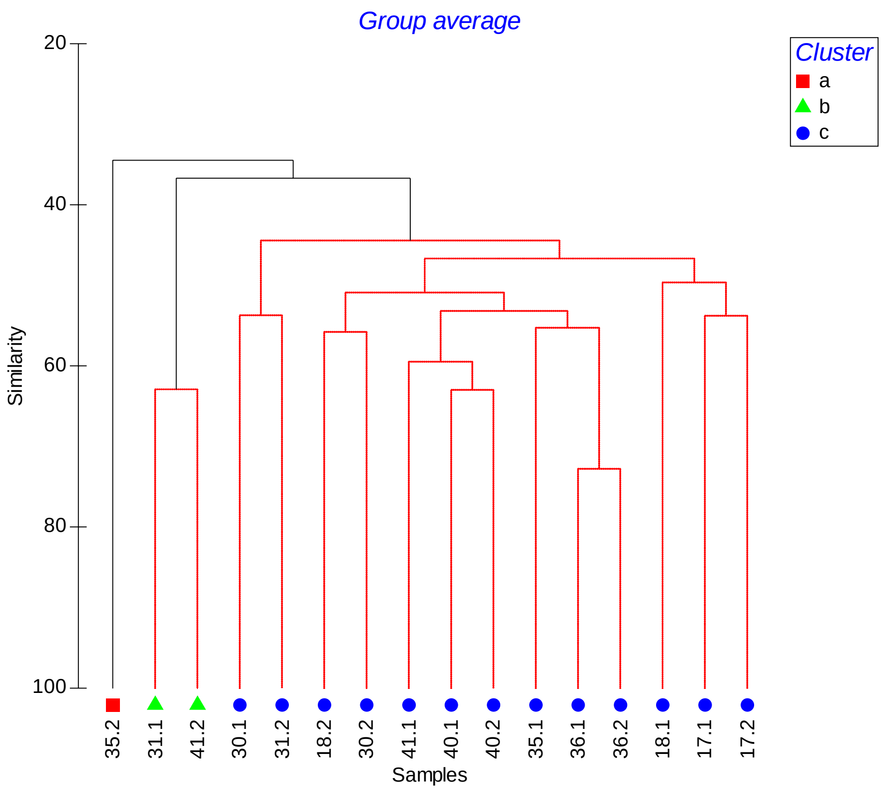



**Figure 39.** Cluster diagram of the epifaunal data from grab samples. Black lines indicate significantly (P<0.05) different clusters identified by the SIMPROF analysis.

## 3.4 Video analysis

Twenty-nine successful videos were obtained from four survey areas (20 drop-down video and nine towed video). The duration of each video ranged from 4 to 27 minutes and in total 383 minutes of footage was obtained (full results available in Appendix 9.9). The depths of the video ranged from 40m in Area 3 to 98m in Area 4.

Overall the video footage was of acceptable quality. The main problems encountered were in keeping the camera down on the seabed, particularly in the deeper areas and whilst the tide was not at slack water. The second main problem was with the camera focusing on the large suspended particulates in the water column rather that on the seabed.

### 3.4.1 Epifaunal assemblages

The initial CLUSTER and SIMPROF analyses on the biological video data identified 17 significant (p=0.05) clusters. Of these 17, nine (clusters a to i) contained only one sample and thus were not considered to be robust clusters representing true ecological groupings. Details of the remaining eight clusters (j to q) are given in Table 11, including the species making the greatest contribution as identified by the SIMPER and BVSTEP analyses. The MDS plot and cluster diagram resulting from the multivariate analysis are shown in Figures 40 and 41.

The BioEnv analysis did not reveal any strong correlations between the biological data and the sediments data (% sediment category determined from visual assessment of video), and the CLUSTER analysis of the sediments data could not be related to the clusters emerging from the biological analysis. Thus, the sediments data were averaged according to the biological clusters, producing a sediment profile for each cluster (Table 11).

**Table 11.** Results of CLUSTER, SIMPROF and SIMPER analyses. Shows only clusters containing more than one sample. Clusters a to i, (samples 29.S2; 29.S3; 29.S1; 37.S6; 27.S6; 27.S3; 27.S10; 27.S1; 29.S4) each contained only one sample.

| | Cluster j | Cluster k | Cluster l | Cluster m | Cluster n | Cluster o | Cluster p | Cluster q |
|---|---|---|---|---|---|---|---|---|
| **Main species contributing to cluster (from SIMPER analysis, green highlighting indicates species identified by BVSTEP)** | *Asterias rubens* | *Macropodia rostrata* | *Flustra foliacea* | *Pomatoceros* sp. | *Alcyonium digitatum* | *Echinus esculentus* | *Asterias rubens* | *Flustra foliacea* |
| | | *Asterias rubens* | *Asterias rubens* | *Alcyonium digitatum* | *Pomatoceros* sp. | *Asterias rubens* | *Echinus esculentus* | *Alcyonium digitatum* |
| | | *Flustra foliacea* | *Nemertesia ramosa* | *Flustra foliacea* | *Asterias rubens* | *Nemertesia falcata* | *Aequipecten opercularis* | *Urticina eques* |
| | | *Urticina eques* | *Hydrallmania falcata* | *Abietinaria abietina* | | *Alcyonium digitatum* | *Alcyonium digitatum* | *Pagurus bernhardus* |
| | | *Ascidiella scabra* | | *Echinus esculentus* | | | *Pagurus bernhardus* | *Asterias rubens* |
| | | *Crossaster papposus* | | *Urticina eques* | | | *Crossaster papposus* | *Echinus esculentus* |
| | | | | *Asterias rubens* | | | *Urticina eques* | *Nemertesia antennina* |
| | | | | *Hydrallmania falcata* | | | | *Pomatoceros* sp. |
| **Depth range (m)** | 42–75 | 57–71 | 48–81 | 41–81 | 43–81 | 43–86 | 40–98 | 65–92 |
| **No. Stations** | 2 | 3 | 8 | 19 | 3 | 3 | 6 | 4 |
| **No. Samples** | 2 | 4 | 16 | 49 | 5 | 4 | 7 | 4 |

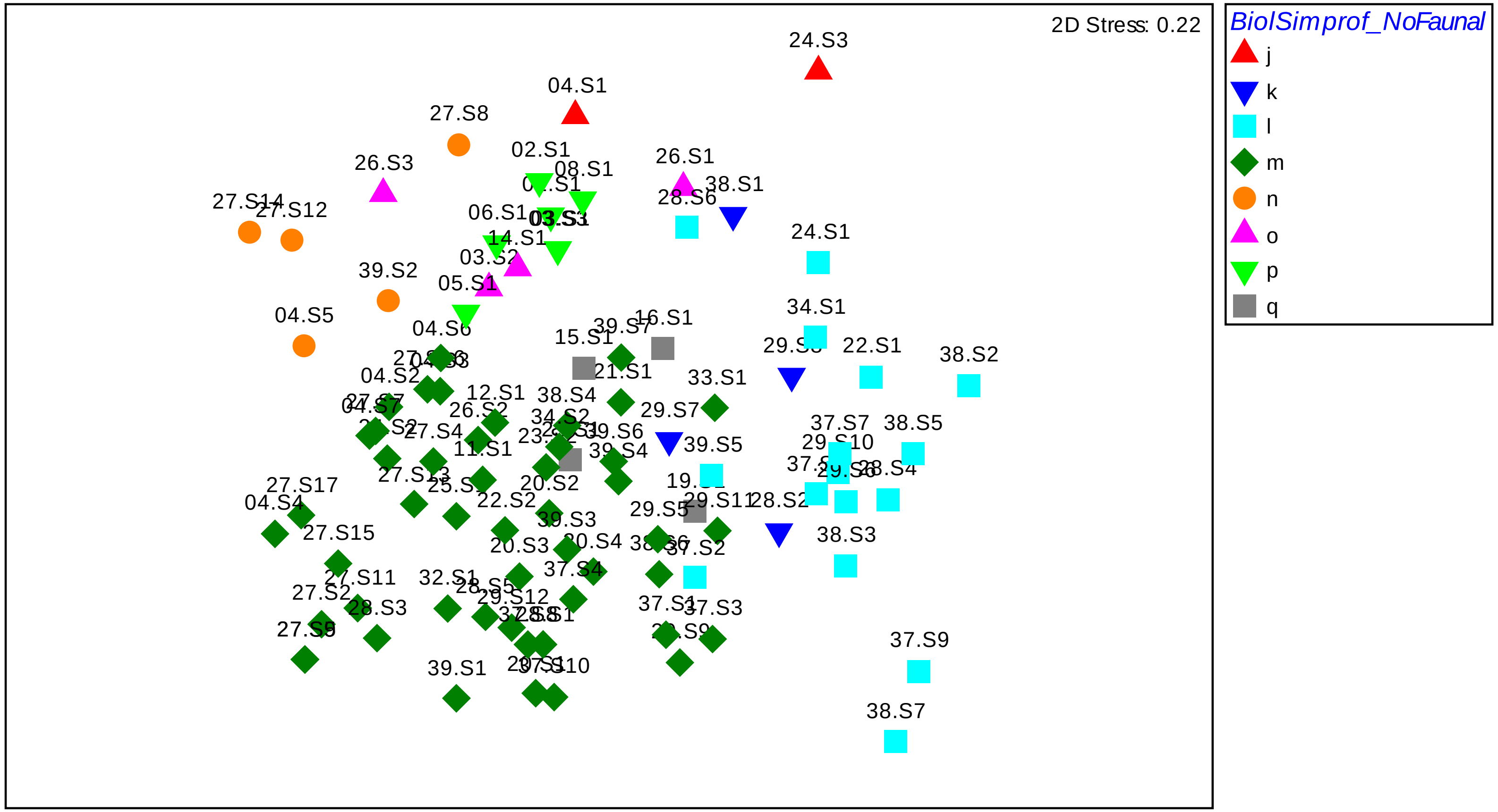



**Figure 40.** MDS plot showing the video sample data with significantly different clusters symbolised (SIMPROF p=0.05). Clusters a–i do not appear on this MDS plot because each of these represented outlying samples.

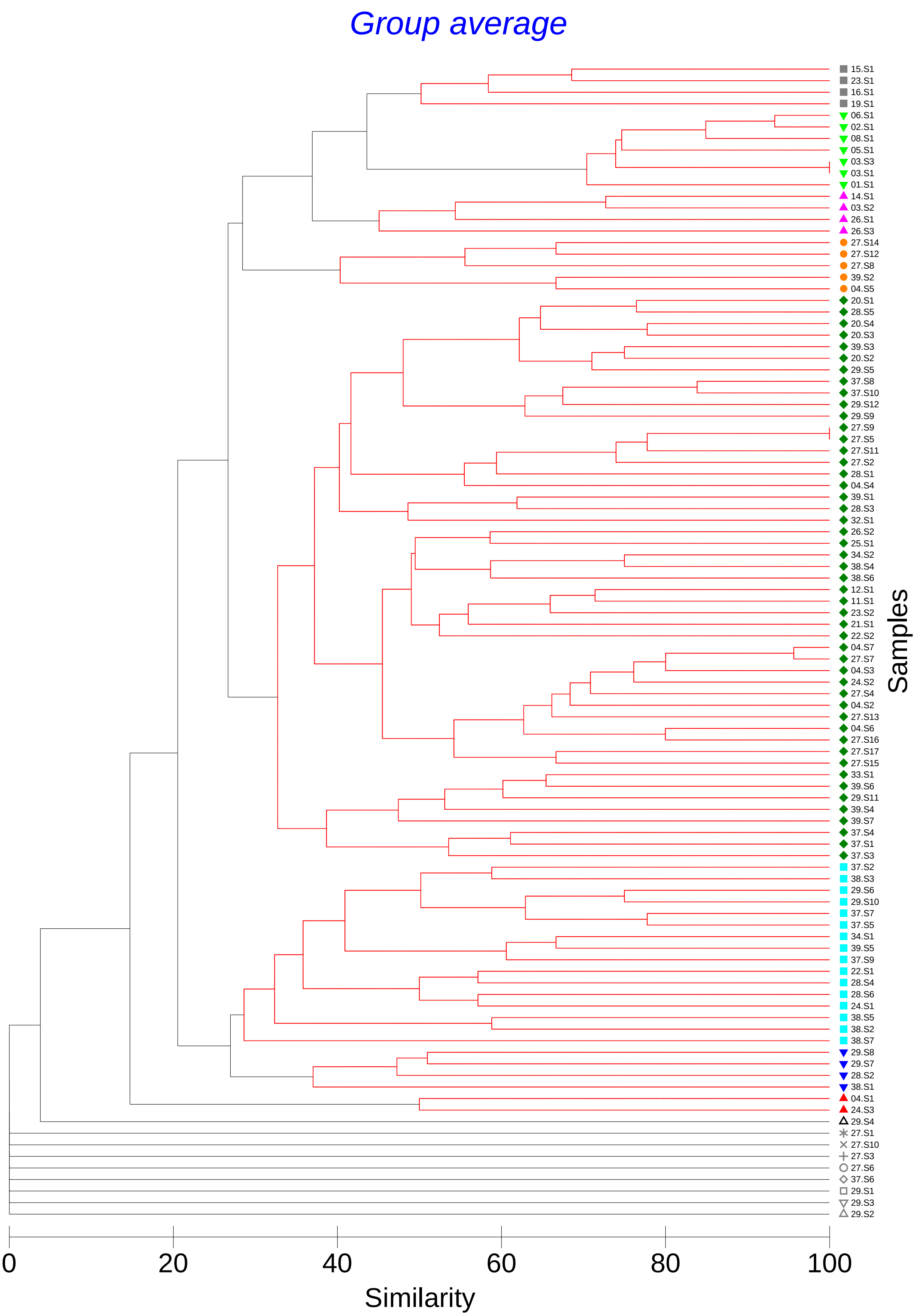



**Figure 41.** The cluster diagram resulting from the CLUSTER analysis. Black lines indicate significantly (p=0.05) different clusters identified by the SIMPROF analysis

### 3.4.2 Epifaunal biotope assignment

The output from the CLUSTER, SIMPER and BVSTEP analyses were examined along with the average physical profile to determine whether there was sufficient evidence for each of the clusters identified to represent different biotopes. From the eight larger clusters (j–q) described in Table 11, five major ‘biotope types’ were initially identified, with several clusters that had very similar species and sediment profiles being combined and placed into the same biotope (Table 12). The remaining nine clusters (individual samples) were visually examined, described and assigned to biotopes.

**Table 12.** Biological clusters included within initial biotope assignments.

| Biotope | Clusters included |
|---|---|
| 1 (Rock & boulders) | d, m |
| 2 (Cobble dominated) | i, o, q |
| 3 (Empty shells) | p |
| 4 (Gravel dominated) | k, l, n |
| 5 (Barren gravel) | a, b, c, e, f, g, h, i, j |

Further visual examination of individual samples within each of the five biotopes was carried out to identify where samples appeared to have markedly different sediment or physical characteristics from the other samples within the biotope grouping. This resulted in 19 samples being re-assigned to a different biotope. Following this visual examination of samples, it was decided that two of the biotope groups would benefit from being further sub-divided.

Firstly, there appeared to be a high diversity of sediment profiles within Biotope 1, with some samples having a sediment profile with a greater proportion of boulders and cobbles, whereas other samples had fewer boulders and a greater proportion of finer sediments (pebbles, gravel and sand). Although the difference was not statistically significant, it appeared that the split between the two sediment profiles was supported by a difference in the relative abundance of key species. The group of samples with more boulders and cobbles supported a higher abundance of *Alcyonium digitatum* relative to *Flustra foliacea*, whereas the group of samples with more pebbles, gravel and sand contained a higher abundance of *F. foliacea* relative to *A. digitatum*. Therefore, Biotope 1 was split into Biotope 1a and 1b, which reflected an existing split within the Marine Habitat Classification.

The last part of the biotope analysis was to select and examine samples with very high densities of brittlestars (*Ophiothrix fragilis* and *Ophiocomina nigra*). Samples where brittlestar density was described as common, abundant or superabundant were examined, and four samples were found to contain sufficient densities of brittlestars to be considered brittlestar beds. These samples were examined and assigned to one of the two biotopes within the Marine Habitat Classification that describe brittlestar beds. Each of these biotopes is in very different sections of the classification, based primarily on substrate composition:

- Brittlestar bed on faunal and algal encrusted, exposed to moderately wave-exposed circalittoral rock (CR.MCR.EcCr.FaAlCr.Bri).
- *Ophiothrix fragilis* and/or *Ophicomina nigra* brittlestar beds on sublittoral mixed sediment (SS.SMx.CMx.OphMx).

All of the biotopes found within this area are described in the biotope descriptions below.

### 3.4.3 Epifaunal biotope descriptions

**Biotope 1a: CR.MCR.EcCr.FaAlCr.Adig - *Alcyonium digitatum, Pomatoceros triqueter*, algal and bryozoan crusts on wave-exposed circalittoral rock**

**Biotope description**

Boulder and cobble dominated substrate. Boulders quite grazed in appearance, often with *Echinus esculentus* common. Substrate usually colonised by *Pomatoceros* sp. and *Alcyonium digitatum*, but hydroids such as *Abietinaria abietina* also common.

**Match to Marine Habitat Classification**

This biotope is very similar to CR.MCR.EcCr.FaAlCr but occurs deeper than the maximum depth defined for this biotope. It contains a rich epifauna, but appears to be dominated by *A. digitatum*.

**Species profile**

The following shows the average abundance of the most common taxa in this biotope. Because species abundances were recorded in the semi-quantitative SACFOR scale, the average abundance given is indicative of the relative abundance of each taxon, and does not represent a true average. The abundances are also described in terms of the SACFOR categories that most closely approximate them:

| Species | Av.Abundance | Link to SACFOR Scale |
|---|---|---|
| *Pomatoceros* sp. | *3.00* | *Frequent* |
| *Alcyonium digitatum* | *2.45* | *Frequent/Occasional* |
| *Echinus esculentus* | *1.91* | *Occasional/Rare* |
| *Flustra foliacea* | *1.64* | *Occasional/Rare* |
| *Abietinaria abietina* | *1.55* | *Occasional/Rare* |
| *Nemertesia antennina* | *1.36* | *Rare/Occasional* |
| *Asterias rubens* | *1.00* | *Rare* |
| *Urticina eques* | *1.18* | *Rare/Occasional* |

**Sediment profile**

The following shows the average abundance of substrate types in this biotope:

| Substrate type | Average % |
|---|---|
| *Empty Shells* | *5.18* |
| *Total Rock & Boulders* | *36.18* |
| *Cobbles* | *25.91* |
| *Pebbles* | *12.27* |
| *Gravel* | *10.45* |
| *Total Sand/Mud* | *10.00* |

## Depth range

41–86m

## Location information for Biotope 1a

This biotope was assigned to the following samples:

Area 1: Samples 37.S4, 37.S8, 38.S6;
Area 2: Samples 26.S2, 27.S9, 28.S3;
Area 3: Samples 04.S2;
Area 4: Samples 12.S1, 14.S1, 20.S3, 21.S1.

## Comments

When Biotope 1 was examined, it was found that the boulder and cobble dominated samples (Biotope 1a) were colonised by high densities of *A. digitatum*, while for Biotope 1b (pebble, gravel and sand dominated) *F. foliacea* was more common. This supported a split already existing within the Marine Habitat Classification. Therefore, because this subdivision was supported by biological and physical information (albeit based on visual examination), Biotope 1 was split into Biotope 1a and 1b.


(a)


(b)

**Figure 42.** Images of Biotope 1a CR.MCR.EcCr.FaAlCr.Adig. (a) Sample 26.S2; (b) Sample 21.S1

## Biotope 1b: CR.MCR.EcCr.FaAlCr.Flu - *Flustra foliacea* on slightly scoured silty circalittoral rock

### Biotope description

Boulders on mixed finer substrates including gravel, pebbles and cobbles. Abundant epifauna, particularly *Pomatoceros* sp. and *Flustra foliacea*.

### Match to Marine Habitat Classification

This biotope is very similar to CR.MCR.EcCr.FaAlCr but occurs deeper than the maximum depth defined for this biotope. This biotope characteristically has areas of cobble, gravel or sand between the boulders, creating a scouring effect, allowing it to support the scour-tolerant *F. foliacea*. This is a close fit to CR.MCR.EcCr.FaAlCr.Flu.

### Species profile

The following shows the average abundance of the most common taxa in this biotope. Because species abundances were recorded in the semi-quantitative SACFOR scale, the average abundance given is indicative only of the relative abundance of each taxon, and does not represent a true average. The abundances are also described in terms of the SACFOR categories that most closely approximate them:

| Species | Av.Abundance | Link to SACFOR Scale |
|---|---|---|
| *Pomatoceros* sp. | *3.33* | *Frequent/Common* |
| *Flustra foliacea* | *1.94* | *Occasional/Rare* |
| *Abietinaria abietina* | *1.79* | *Occasional/Rare* |
| *Alcyonium digitatum* | *1.64* | *Occasional/Rare* |
| *Urticina eques* | *1.12* | *Rare/Occasional* |
| *Echinus esculentus* | *1.03* | *Rare/Occasional* |
| *Asterias rubens* | *0.79* | *Rare* |

### Sediment profile

The following shows the average abundance of substrate types in this biotope:

| Substrate type | Average % |
|---|---|
| *Empty shells* | *7.73* |
| *Total rock & boulders* | *15.45* |
| *Cobbles* | *17.55* |
| *Pebbles* | *12.48* |
| *Gravel* | *16.21* |
| *Total sand/mud* | *29.06* |

### Depth range

41–81m

## Location information for Biotope 1b

This biotope was assigned to the following samples:

Area 1: Samples 34.S2, 37.S1, 37.S10, 37.S2, 37.S6, 38.S4, 39.S1, 39.S3, 39.S7;
Area 2: Samples 24.S2, 25.S1, 27.S11, 27.S13, 27.S15, 27.S16, 27.S17, 27.S2, 27.S4, 27.S5, 27.S7, 28.S1, 28.S5, 29.S12, 29.S5, 29.S7, 29.S9;
Area 3: Samples 04.S4, 04.S7;
Area 4: Samples 11.S1, 20.S1, 20.S2, 20.S4, 22.S2, 23.S2.

## Comments

When Biotope 1 was examined, it was found that the boulder and cobble dominated samples (Biotope 1a) were colonised by high densities of *A. digitatum*, while for Biotope 1b (pebble, gravel and sand dominated) *F. foliacea* was more common. This supported a split already existing within the Marine Habitat Classification. Therefore, because this subdivision was supported by biological and physical information (albeit based on visual examination), Biotope 1 was split into Biotope 1a and 1b.


(a)


(b)

**Figure 43.** Images of Biotope 1b CR.MCR.EcCr.FaAlCr.Flu. (a) Sample 34.S2; (b) Sample 25.S1

## Biotope 2: SS.SMx.CMx.FluHyd.1 – A community on Circalittoral Mixed Sediment currently not identified within the Marine Habitat Classification

### Biotope description

Stable mixed sediments dominated primarily by cobbles, pebbles and gravels, and colonised by abundant *Flustra foliacea*, *Alcyonium digitatum* and *Pomatoceros* sp. The biotope often consists of abundant cobbles or pebbles in a mosaic of finer gravels. Small boulders can occasionally be found.

### Match to Marine Habitat Classification

It appears to be very similar to SS.SMx.CMx.FluHyd, but is deeper than the maximum depth defined for this biotope (50m). Therefore here it is recorded as variant 1 of SS.SMx.CMx.FluHyd. This biotope is typically associated with lag deposits derived from glacial till that are present though much of the Irish Sea (Allen and Rees 1999, Rees 2004).

### Species profile

The following shows the average abundance of the most common taxa in this biotope. Because species abundances were recorded in the semi-quantitative SACFOR scale, the average abundance given is indicative only of the relative abundance of each taxon, and does not represent a true average. The abundances are also described in terms of the SACFOR categories that most closely approximate them:

| Species | Av.Abundance | Link to SACFOR Scale |
|---|---|---|
| *Flustra foliacea* | *2.29* | *Occasional/Frequent* |
| *Echinus esculentus* | *1.43* | *Rare/Occasional* |
| *Asterias rubens* | *1.50* | *Rare/Occasional* |
| *Alcyonium digitatum* | *1.36* | *Rare/Occasional* |
| *Pomatoceros* sp. | *1.36* | *Rare/Occasional* |
| *Urticina eques* | *1.00* | *Rare* |
| *Pagurus bernhardus* | *0.86* | *Rare* |
| *Nemertesia antennina* | *0.79* | *Rare* |
| *Nemertesia ramosa* | *0.64* | *Rare* |

### Sediment profile

The following shows the average abundance of substrate types in this biotope:

| Substrate type | Average % |
|---|---|
| *Empty shells* | *6.36* |
| *Total rock & boulders* | *2.14* |
| *Cobbles* | *10.50* |
| *Pebbles* | *22.50* |
| *Gravel* | *29.14* |
| *Total sand/mud* | *29.36* |

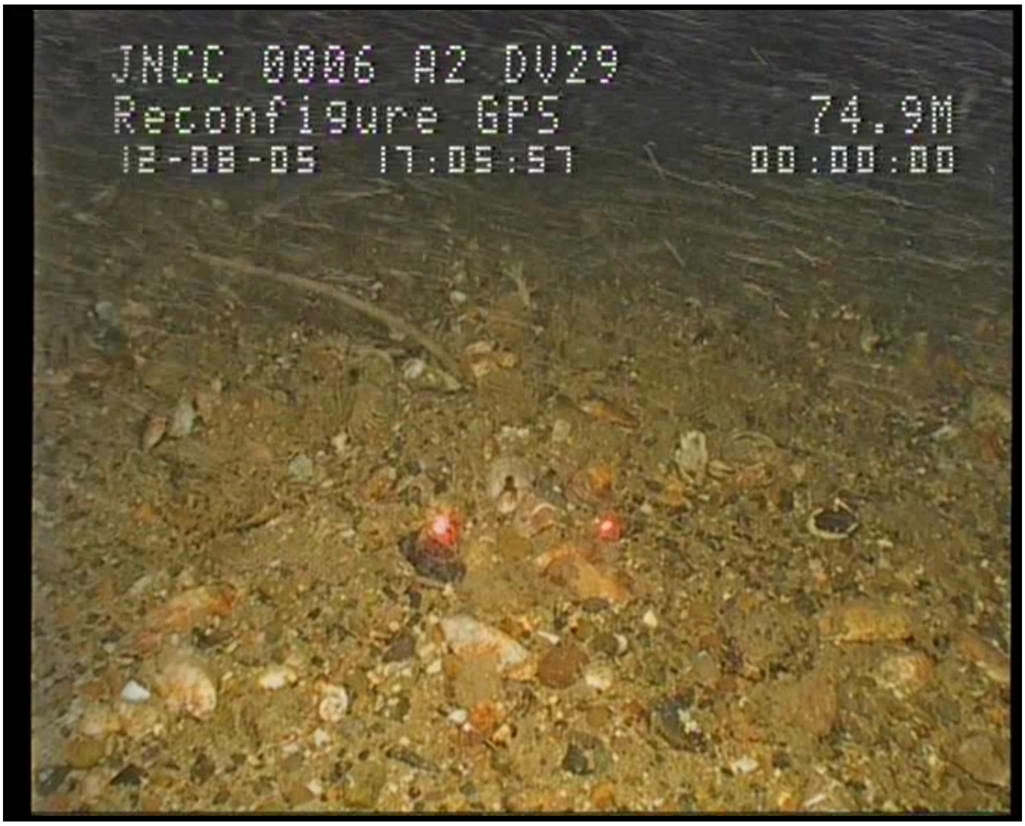
## Depth range

41–92m

## Location information for Biotope 2

This biotope was assigned to the following samples:

Area 1: Samples 39.S6;
Area 2: Samples 26.S1, 26.S3, 28.S2, 29.S11, 29.S4, 29.S6;
Area 3: Samples 03.S2, 04.S3;
Area 4: Samples 15.S1, 16.S1, 19.S1, 23.S1.




(a)


(b)

**Figure 44.** Images of Biotope 2 SS.SMx.CMx.FluHyd.1. (a) Sample 29.S6; (b) Sample 29.S11

## Biotope 3: SS.SMx.CMx.1 - A community on Sublittoral Mixed Sediment currently not identified within the Marine Habitat Classification

### Biotope description

This biotope is composed of shell-dominated substrate, which is almost entirely made up of empty *Modiolus modiolus* shells. The shells are frequently so abundant that they obscure the underlying sediment. The shells can be clean, but are also often colonised by *Alcyonium digitatum.* Mobile species are especially abundant, particularly the echinoderms *Asterias rubens, Echinus esculentus* and *Crossaster papposus*.

### Match to Marine Habitat Classification

There is no direct match for this biotope within the Marine Habitat Classification at present, although this habitat has been previously been recorded off the Lleyn peninsula and North of Anglesey in water depths of 70m, described as ‘current swept *Modiolus* shell aggregations and shelly gravel (Allen and Rees 1999, I. Rees, pers. comm.). This is likely to belong in the section SS.SMx.CMx and will be called SS.SMx.CMx.1

### Species profile

The following shows the average abundance of the most common taxa in this biotope. Because species abundances were recorded in the semi-quantitative SACFOR scale, the average abundance given is indicative only of the relative abundance of each taxon, and does not represent a true average. The abundances are also described in terms of the SACFOR categories that most closely approximate them:

| **Species** | **Av.Abundance** | **Link to SACFOR Scale** |
|---|---|---|
| *Asterias rubens* | *1.23* | *Rare/Occasional* |
| *Alcyonium digitatum* | *0.92* | *Rare* |
| *Echinus esculentus* | *0.77* | *Rare* |
| *Crossaster papposus* | *0.92* | *Rare* |
| *Pagurus bernhardus* | *0.54* | *Rare* |
| *Pomatoceros* sp. | *0.62* | *Rare* |
| *Aequipecten opercularis* | *0.54* | *Rare* |

### Sediment profile

The following shows the average abundance of substrate types in this biotope:

| **Substrate type** | **Average %** |
|---|---|
| *Empty shells* | *29.23* |
| *Total rock & boulders* | *0.08* |
| *Cobbles* | *4.69* |
| *Pebbles* | *13.77* |
| *Gravel* | *30.00* |
| *Total sand/mud* | *23.00* |

## Depth range

40–60m

## Location Information for Biotope 3

This biotope was assigned to the following samples:

Area 1: Samples 38.S1, 38.S3, 38.S5, 38.S7;
Area 3: Samples 01.S1, 02.S1, 03.S1, 03.S3, 04.S1, 04.S5, 04.S6, 05.S1, 06.S1.

## Comments

The biological communities within Biotope 3 are not unique, but the substrate type is very different to what was seen in any of the other biotopes identified in this analysis, and therefore this was treated as an individual biotope. Moreover, Biotope 3 appears to be geographically quite distinct. Although small patches are found in study areas 1 and 4, it accounts for almost all of Area 3 and as such may be an important indicator of the location of former *M. modiolus* beds. No biotope currently within the SS.SMx.CMx section adequately matches these samples.

(a)

(b)

**Figure 45**. Images of Biotope 3 SS.SMx.CMx.1. (a) Sample 01.S1; (b) Sample 04.S6

## Biotope 4: SS.SMx.CMx.FluHyd.2 - A community on Circalittoral Mixed Sediment currently not identified within the Marine Habitat Classification

### Biotope description

Coarse stable gravel with a high sand fraction, abundant *Flustra foliacea and Asterias rubens.* Other attached species also common, including the hydroid *Hydrallmania falcata* and *Alcyonium digitatum.* Gravel is the main substrate, but larger particles are also common, including empty shells and pebbles. Occasional areas of coarse sand can also be found.

### Match to Marine Habitat Classification

This biotope appears very similar to SS.SMx.CMx.FluHyd. It is different from Biotope 2 (SS.SMx.CMx.FluHyd.1) in that it contains lower abundance of species and has a finer substratum of gravel and therefore is recorded as variant 2 of SS.SMx.CMx.FluHyd. Like Biotope 2, it is currently below the maximum limit currently defined for this biotope. Biotopes 2 and 4 may represent the same biotope (see comments below).

### Species profile

The following shows the average abundance of the most common taxa in this biotope. Because species abundances were recorded in the semi-quantitative SACFOR scale, the average abundance given is indicative only of the relative abundance of each taxon, and does not represent a true average. The abundances are also described in terms of the SACFOR categories that most closely approximate them:

| Species | Av.Abundance | Link to SACFOR Scale |
|---|---|---|
| *Asterias rubens* | *1.41* | *Rare/Occasional* |
| *Flustra foliacea* | *1.59* | *Occasional/Rare* |
| *Alcyonium digitatum* | *0.53* | *Rare* |
| *Hydrallmania falcata* | *0.71* | *Rare* |
| *Nemertesia antennina* | *0.41* | *Rare* |
| *Pagurus bernhardus* | *0.35* | *Rare* |

### Sediment profile

The following shows the average abundance of substrate types in this biotope:

| Substrate type | Average % |
|---|---|
| *Empty shells* | *11.59* |
| *Total rock & boulders* | *0.24* |
| *Cobbles* | *2.76* |
| *Pebbles* | *18.12* |
| *Gravel* | *33.00* |
| *Total sand/mud* | *34.29* |

### Depth range

49–98m

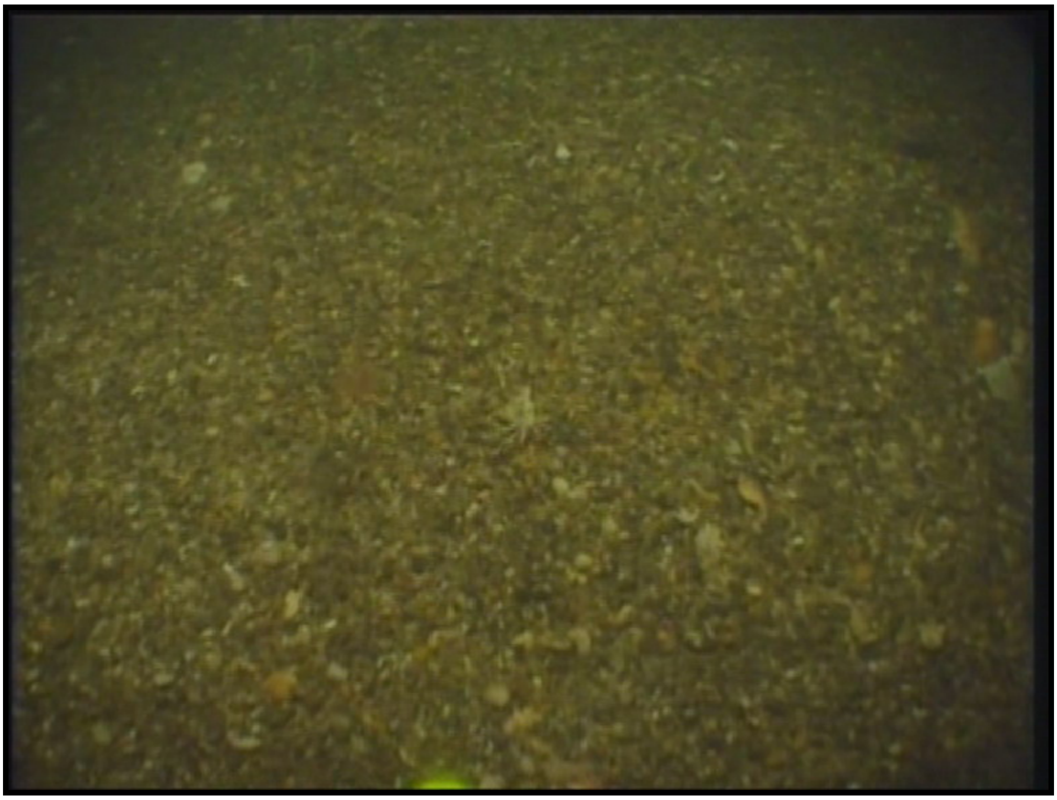
## Location information for Biotope 4

This biotope was assigned to the following samples:

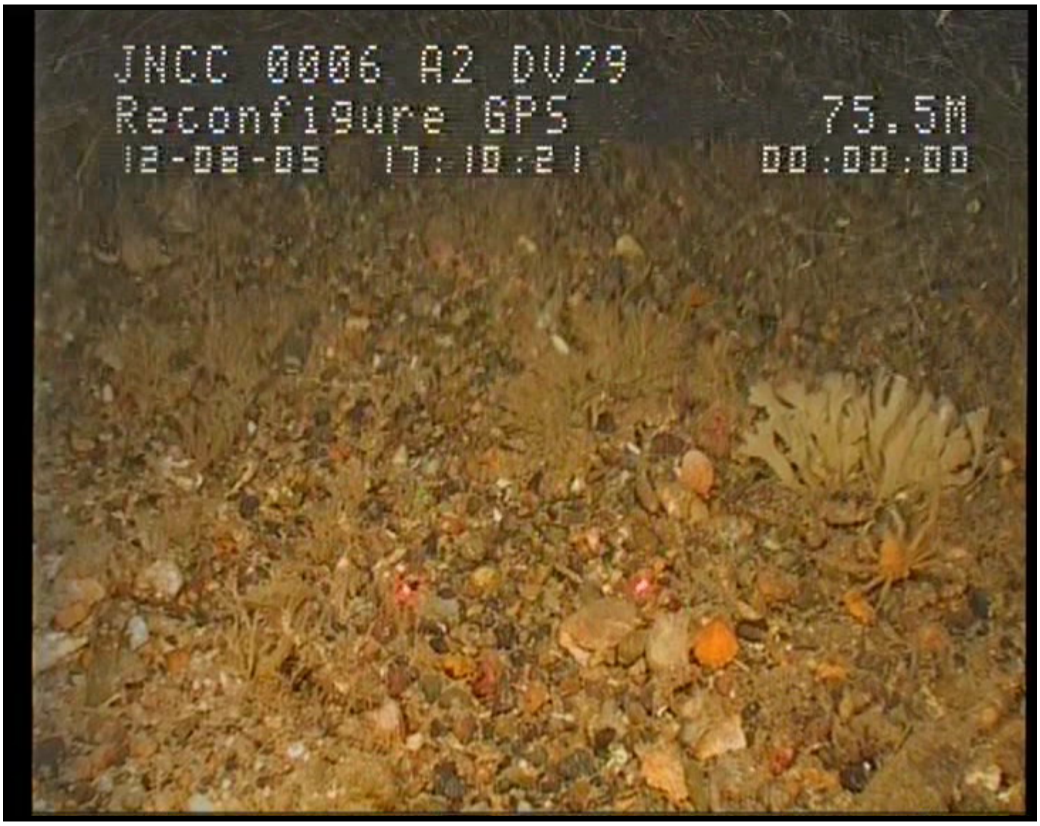
Area 1: Samples 34.S1, 37.S3, 37.S5, 37.S7, 37.S9, 39.S2, 39.S5;
Area 2: Samples 24.S1, 27.S12, 27.S14, 27.S8, 28.S4, 28.S6, 29.S10, 29.S8;
Area 4: Samples 08.S1, 22.S1.

## Comments

From a sediment perspective, this biotope is very similar to SS.SCS.CCS.Pkef or SS.SCS.CCS.MedLumVen but since there are not any infaunal data, it is difficult to match it directly to either of these biotopes (which are currently defined primarily by their infaunal profile). The visible fauna however are more similar to SS.SMx.CMx.FluHyd, and so it may actually belong in this biotope (along with Biotope 2). In the Outer Bristol Channel, Mackie *et al.*, (2006) recorded this biotope in rocky areas associated with the infaunal Polychaete-rich deep *Venus* community in offshore mixed sediments (SS.SMX.Omx.PoVen) and *Sabellaria spinulosa* on stable circalittoral mixed sediment (SS.SBR.PoR.SspiMx) biotopes. Biotopes 2 and 4 appear to differ only in the relative abundance of fauna and the slightly coarser nature of the substrates in Biotope 2.



(a)




(b)

**Figure 46.** Images of Biotope 4 SS.SMx.CMx.FluHyd.2. (a) Sample 08.S1; (b) Sample 29.S8

## Biotope 5: SS.SCS.CCS.1 – A community on Circalittoral Coarse Sediment currently not identified within the Marine Habitat Classification

### Biotope description

Coarse to sandy featureless gravel with very sparse visible epifauna.

### Match to Marine Habitat Classification

There is no direct match for this biotope within the Marine Habitat Classification at present. It would appear to belong in the section SS.SCS.CCS and will be called SS.SCS.CCS.1 here.

### Species profile

This biotope has very sparse fauna, the only visible epifauna being rare *Asterias rubens.*

### Sediment profile

The following shows the average abundance of substrate types in this biotope:

| **Substrate type** | **Average %** |
|---|---|
| *Empty Shells* | 8.13 |
| *Total Rock/Boulders* | 5.00 |
| *Cobbles* | 0.63 |
| *Pebbles* | 31.25 |
| *Gravel* | 33.75 |
| *Total Sand/Mud* | 21.25 |

### Depth range

66–82m

### Location information for Biotope 5

This biotope was assigned to the following samples:

Area 2: Samples 24.S3, 27.S1, 27.S10, 27.S3, 27.S6, 29.S1, 29.S2, 29.S3.

### Comments

The samples in this biotope may actually form part of Biotope 4. They have been separated in this instance because there is no visible epifauna here compared to the relatively diverse nature of Biotope 4, making these samples biologically distinct from those in Biotope 4.


(a)


(b)

**Figure 47.** Images of Biotope 5 SS.SCS.CCS.1. (a) Sample 27.S10; (b) Sample 27.S1

## Biotope 6a: CR.MCR.EcCr.FaAlCr.Bri - Brittlestar bed on faunal and algal encrusted, exposed to moderately wave-exposed circalittoral rock

### Biotope description

Dense brittlestar bed on boulders, cobbles and pebbles; composed primarily of *Ophiothrix fragilis*, but with some *Ophiocomina nigra*.

### Match to Marine Habitat Classification

This biotope is most similar to CR.MCR.EcCr.FaAlCr.Bri. It was placed here rather than within the similar biotope SS.SMx.CMx.OphMx due to the sediment type, which is made up of boulders and bedrock. If brittlestars were absent the remaining biological community would resemble the biotope CR.MCR.EcCr.FaAlCr.

### Species profile

The following shows the average abundance of the most common taxa in this biotope. Because species abundances were recorded in the semi-quantitative SACFOR scale, the average abundance given is indicative only of the relative abundance of each taxon, and does not represent a true average. The abundances are also described in terms of the SACFOR categories that most closely approximate them:

| Species | Av.Abundance | Link to SACFOR Scale |
|---|---|---|
| *Ophiothrix fragilis* | *5.50* | *Abundant/Superabundant* |
| *Asterias rubens* | *3.00* | *Frequent* |
| *Ophiocomina nigra* | *2.00* | *Occasional* |
| *Ciona intestinalis* | *1.00* | *Rare* |
| *Crossaster papposus* | *1.00* | *Rare* |

### Sediment profile

The following shows the average abundance of substrate types in this biotope:

| Substrate type | Average % |
|---|---|
| *Empty shells* | *15* |
| *Total rock & boulders* | *11* |
| *Cobbles* | *20* |
| *Pebbles* | *20* |
| *Gravel* | *20* |
| *Total sand/mud* | *14* |

### Depth range

46–55m

### Location information for Biotope 6a

This biotope was assigned to the following samples:

Area 1: Samples 32.S1, 33.S1.


(a)


(b)

**Figure 48.** Images of Biotope 6a: CR.MCR.EcCr.FaAlCr.Bri (a) Sample 32.S1; (b) Sample 33.S1

## Biotope 6b: SS.SMx.CMx.OphMx - *Ophiothrix fragilis* and/or *Ophicomina nigra* brittlestar beds on sublittoral mixed sediment

### Biotope description

Dense brittlestar bed on mixed coarse sediment composed primarily of *Ophiothrix fragilis*, but with some *Ophiocomina nigra*.

### Match to Marine Habitat Classification

This biotope is a close match to SS.SMx.CMx.OphMx. It was placed here rather than within the similar biotope CR.MCR.EcCr.FaAlCr.Bri due to the mixed coarse sediments on which it was found. If brittlestars were absent the remaining biological community would resemble the biotope SS.SMx.CMx.FluHyd.

### Species profile

The following shows the average abundance of the most common taxa in this biotope. Because species abundances were recorded in the semi-quantitative SACFOR scale, the average abundance given is indicative only of the relative abundance of each taxon, and does not represent a true average. The abundances are also described in terms of the SACFOR categories that most closely approximate them:

| Species | Av.Abundance | Link to SACFOR Scale |
|---|---|---|
| *Ophiothrix fragilis* | *4.50* | *Common/Abundant* |
| *Asterias rubens* | *1.50* | *Rare/Occasional* |
| *Flustra foliacea* | *2.50* | *Occasional/Frequent* |

### Sediment profile

The following shows the average abundance of substrate types in this biotope:

| Substrate type | Average % |
|---|---|
| *Empty shells* | *20* |
| *Total rock & boulders* | *2.5* |
| *Cobbles* | *11* |
| *Pebbles* | *27.5* |
| *Gravel* | *30* |
| *Total sand/mud* | *9* |

### Depth range

48–57m

### Location information for Biotope 6b

This biotope was assigned to the following samples:

Area 1: Samples 38.S2, 39.S4.


(a)


(b)

**Figure 49.** Images of Biotope 6b: SS.SMx.CMx.OphMx (a) Sample 39.S4; (b) Sample 38.S2

### 3.4.4 Epifaunal biotope distribution

The most common biotope identified was CR.MCR.EcCr.FaAlCr.Flu, which was present in all four survey areas, although least common in Area 3. In Areas 1 and 2, this biotope was found in association with drumlins and moraines (Figure 50) In Area 4, it tended to be associated with large rocky outcrops, including the slopes, tops and ridges (Figure 51).

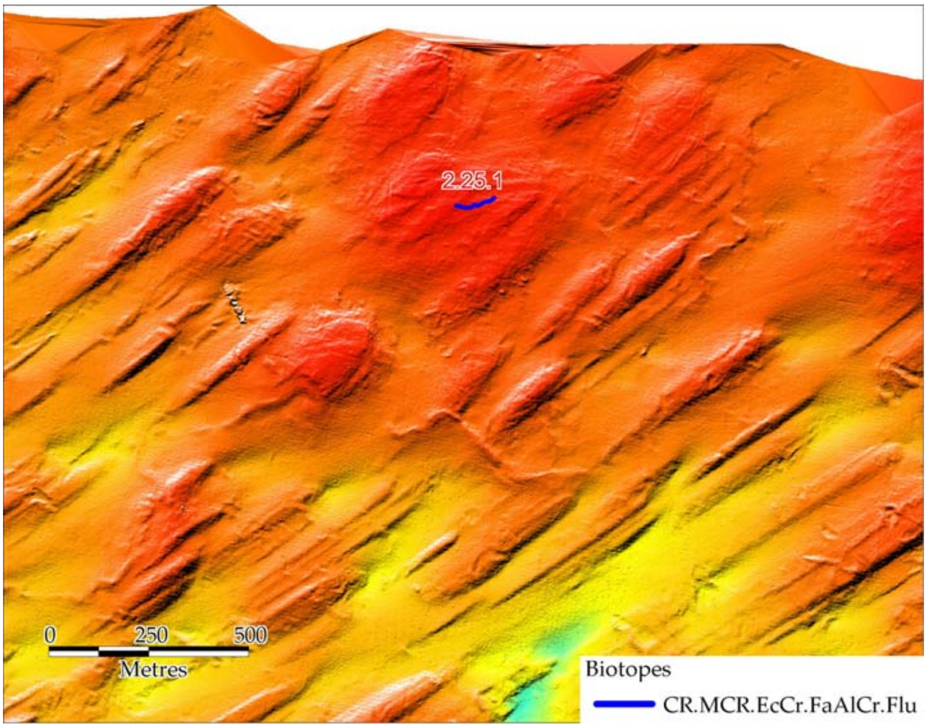



**Figure 50.** CR.MCR.EcCr.FaAlCr.Flu in Area 2.

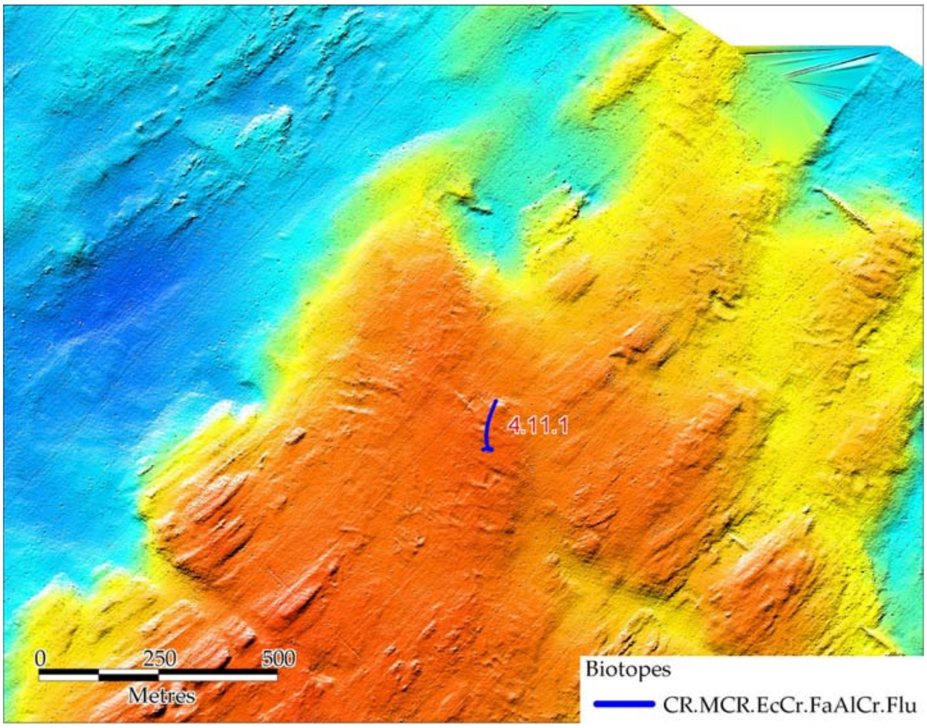



**Figure 51.** CR.MCR.EcCr.FaAlCr.Flu in Area 4.

The related biotope, CR.MCR.EcCr.FaAlCr.Adig was also moderately common and was again present in all four survey areas. This biotope was found associated with the same features as CR.MCR.EcCr.FaAlCr.Flu, i.e. drumlins, moraines or rocky trails, and the slopes, tops and ridges of rock outcrops (Figure 52).

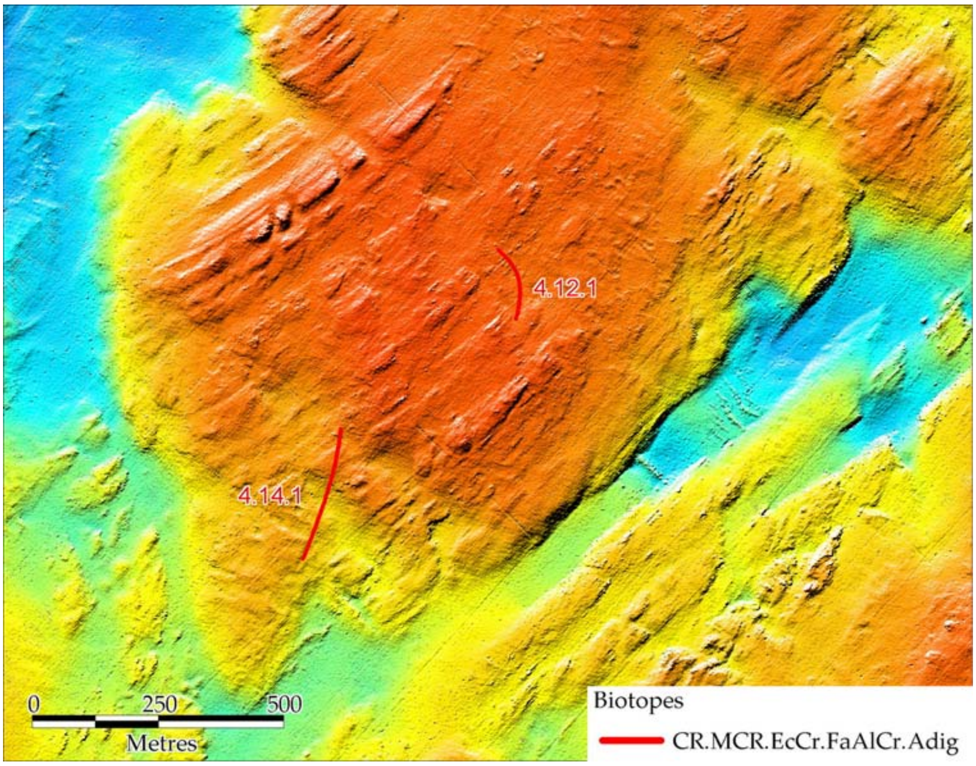



**Figure 52**. CR.MCR.EcCr.FaAlCr.Adig associated with rock outcrop in Area 4.

SS.SMx.CMx.FlyHyd.1 and SS.SMx.CMx.FlyHyd.2 were also moderately common throughout the four survey areas. The coarser sediment biotope SS.SMx.CMx.FlyHyd.1 was present in all four areas, but was most common in Areas 2 and 4. It tended to be associated with the rocky ridges of drumlins and moraines, and with the tops and slopes of outcropping rocky features (Figure 53). In Area 4 it was also found occurring in the crater of a large rock outcrop, and at the base of a rock outcrop (Figure 54). This biotope is typically associated with lag deposits derived from glacial till that are present though much of the Irish Sea (Allen and Rees 1999, Rees 1992, Rees 2004). SS.SMx.CMx.FlyHyd.2 was similarly found in the crater of a large rock feature but also occurred in the flatter areas in between the topographic highs of the rock outcrops (Figure 55). Although the pattern was not conclusive it appeared to mainly occur on the slopes and bottom of the rocky areas, and in association with the slopes rather than tops of drumlins and moraines, and with areas of lower topography.

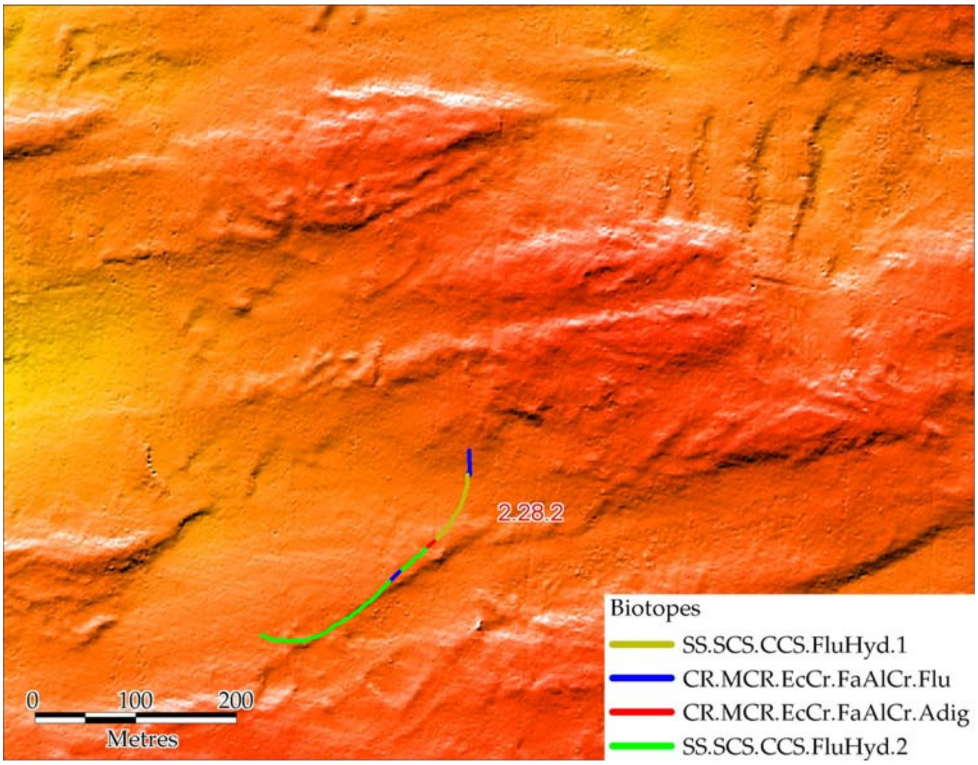



**Figure 53**. SS.SMx.CMx.FlyHyd.1 along rocky ridge in Area 2.

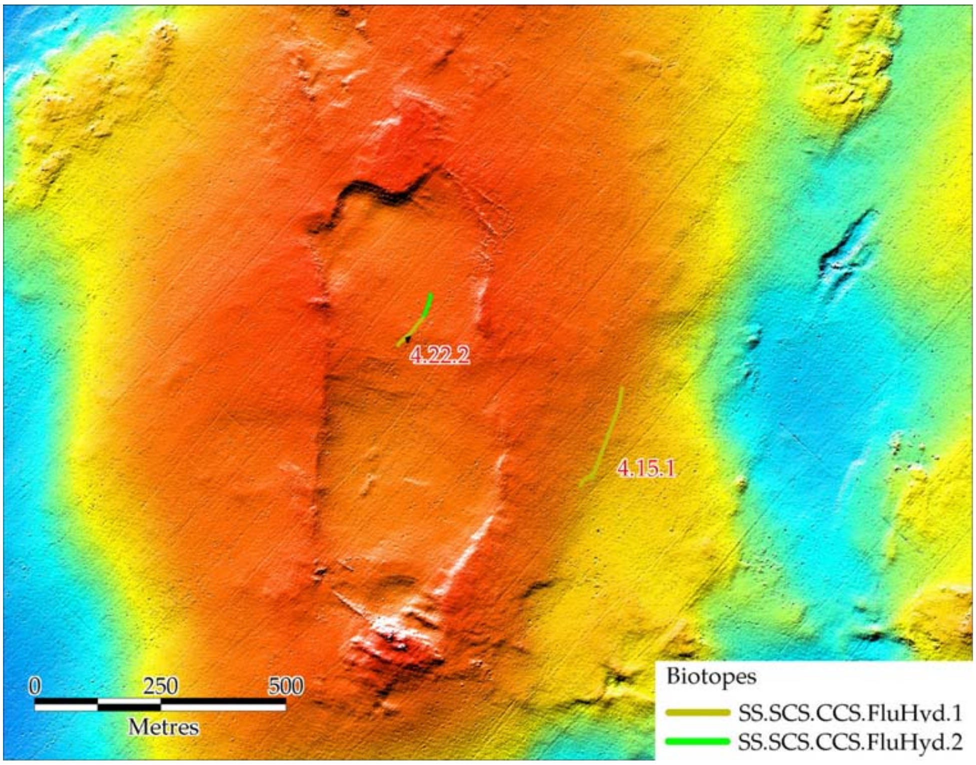



**Figure 54**. SS.SMx.CMx.FlyHyd.1 on rock outcrop in Area 4.

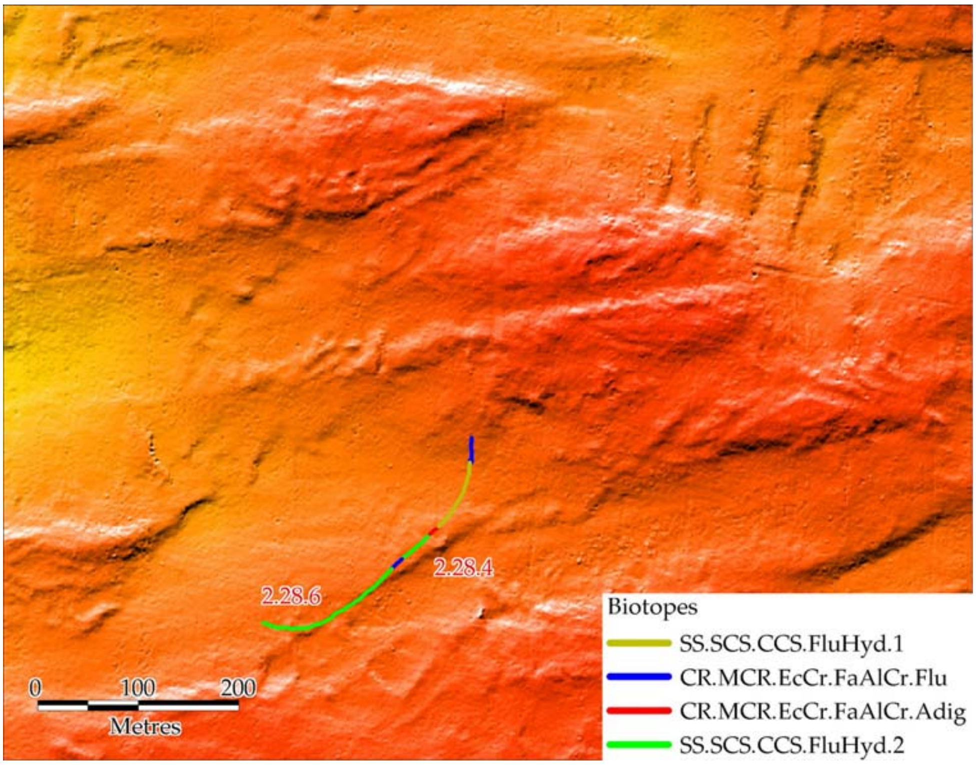



**Figure 55.** SS.SMx.CMx.FlyHyd.2 on areas of flat seabed between rock features, in Area 2

The biotope SS.CCS.CCS.1 was found only within Area 2. This biotope, characterised by a very sparse epifaunal community, was uncommon and no particular pattern in its distribution was noted (Figure 56).

Two biotopes were found that were defined by the presence of dense beds of brittlestars (*Ophiothrix fragilis* and *Ophiocomina nigra*). The first of these which was associated with coarser substrate (CR.MCR.EcCr.FaAlCr.Bri) occurred only within two video tows in Area 2. The second biotope, SS.SMx.CMx.OphMx, which tended to be associated with more mixed sediment, was also infrequent, occurring only within two video tows in Area 1. Similar dense beds of brittlestars have been recorded in the Irish Sea, west of the Lleyn peninsula in water depths of 60m (Rees 1992).

Finally, the biotope SS.SMx.CMx.1, which was characterised by a high proportion of empty shells of the horse mussel *Modiolus modiolus*, was found mainly within Area 3, where it was the main biotope present on the plateau. It also occurred within one video tow in Area 1, but was not present in Areas 2 or 4. This biotope has previously been recorded north of Anglesey in water depths of 70m, and off the Lleyn peninsula, where it has been described as ‘current swept *Modiolus* shell aggregations and shelly gravel (Allen and Rees 1999, I. Rees pers. comm.).

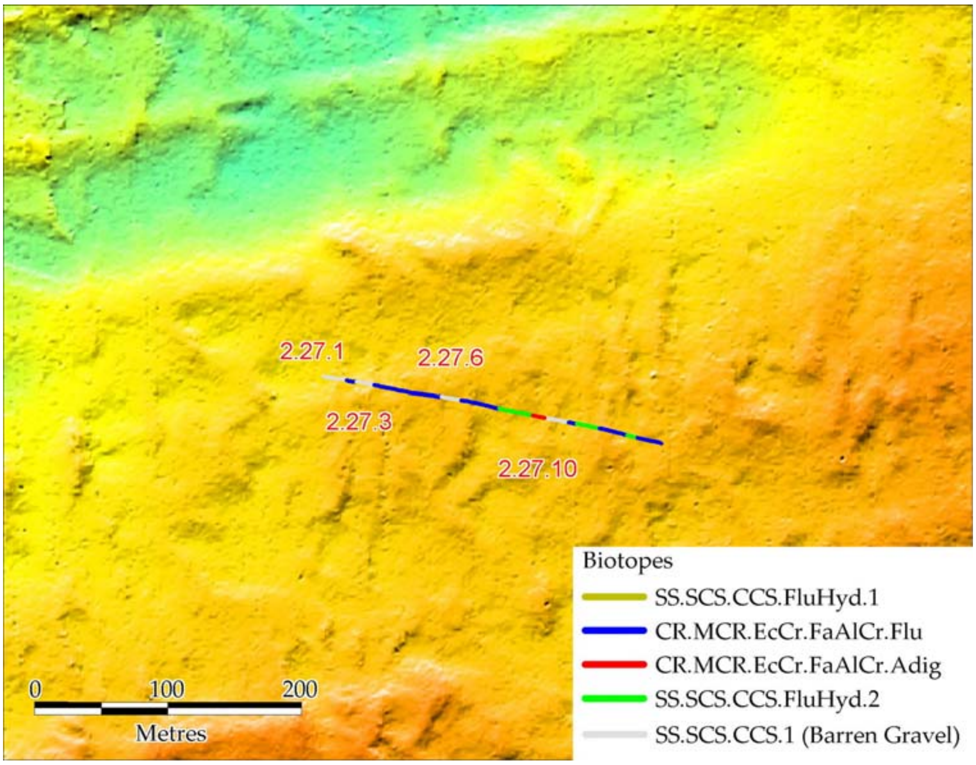



**Figure 56**. SS.CCS.CCS.1 in Area 2.

## 3.5 Presence and distribution of Annex I reef habitat

Of the eight biotopes found within the four study areas, it was determined that six did not correspond to Annex I reef. One biotope exclusively correlated with Annex I reef (CR.MCR.EcCr.FaAlCr.Adig), and a further biotope (CR.MCR.EcCr.FaAlCr.Flu) contained some video samples that were comprised of, or contained Annex I reef patches and some that did not (Table 13). All samples assigned to biotope CR.MCR.EcCr.FaAlCr.Flu were reviewed in more detail, in particular taking note of the sediment profile, and the way in which the larger particles (cobbles and boulders) were spatially distributed along the seafloor, and also reviewing the epifaunal community that was present. This process and the outcomes are outlined in Figure 57 and the samples which were determined to contain Annex I reef are summarised in Table 14.

**Table 13.** Correlation between video biotopes and Annex I reef habitat.

| Biotope | Sediment | Interpretation | Annex I reef |
|---|---|---|---|
| CR.MCR.EcCr.FaAlCr.Adig | | Video footage shows dense epifaunal community typical of reef habitat | Yes |
| CR.MCR.EcCr.FaAlCr.Flu | Samples cover continuum from cobble/boulder dominated substrata to gravel dominated | Biotope includes continuum of reef to non-reef type habitats | Some occurrences reef |
| CR.MCR.EcCr.FaAlCr.Bri | Sediment includes boulders, cobbles, gravel and pebbles, but with only 30% of sediment cobble or larger. | Sediment too fine to fit with reef definition | No |
| SS.SMx.CMx.FlyHyd.1 | Sediment mainly gravel and pebbles | Sediment too fine to fit with reef definition | No |
| SS.SMx.CMx.FlyHyd.2 | Sediment predominantly gravel, pebbles and coarse sand | Sediment too fine to fit with reef definition | No |
| SS.SCS.CCS.1 | Sediment mainly gravel and pebbles | Sediment too fine to fit with reef definition | No |
| SS.SMx.CMx.1 | Sediment predominantly pebbles and gravel with high proportion of empty shells | Sediment too fine to fit with reef definition | No |
| SS.SMx.CMx.OphMx | Sediment predominantly pebbles and gravel | Sediment too fine to fit with reef definition | No |

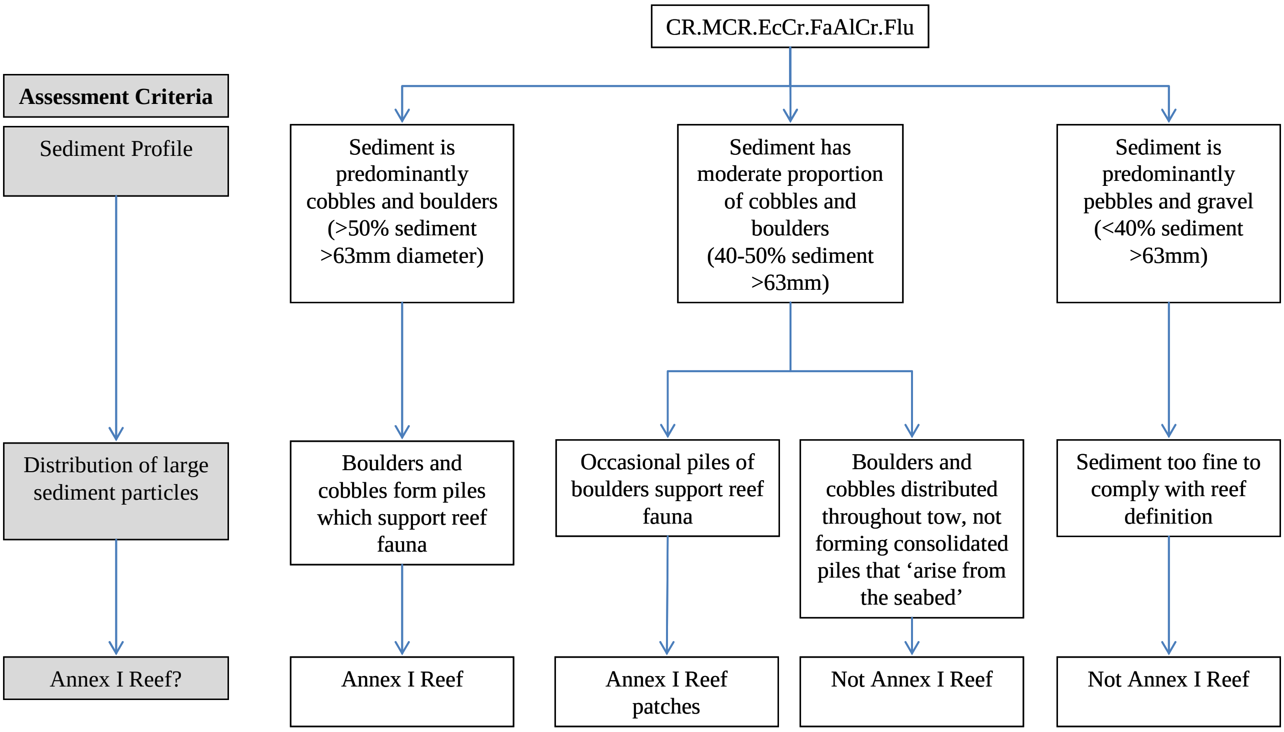


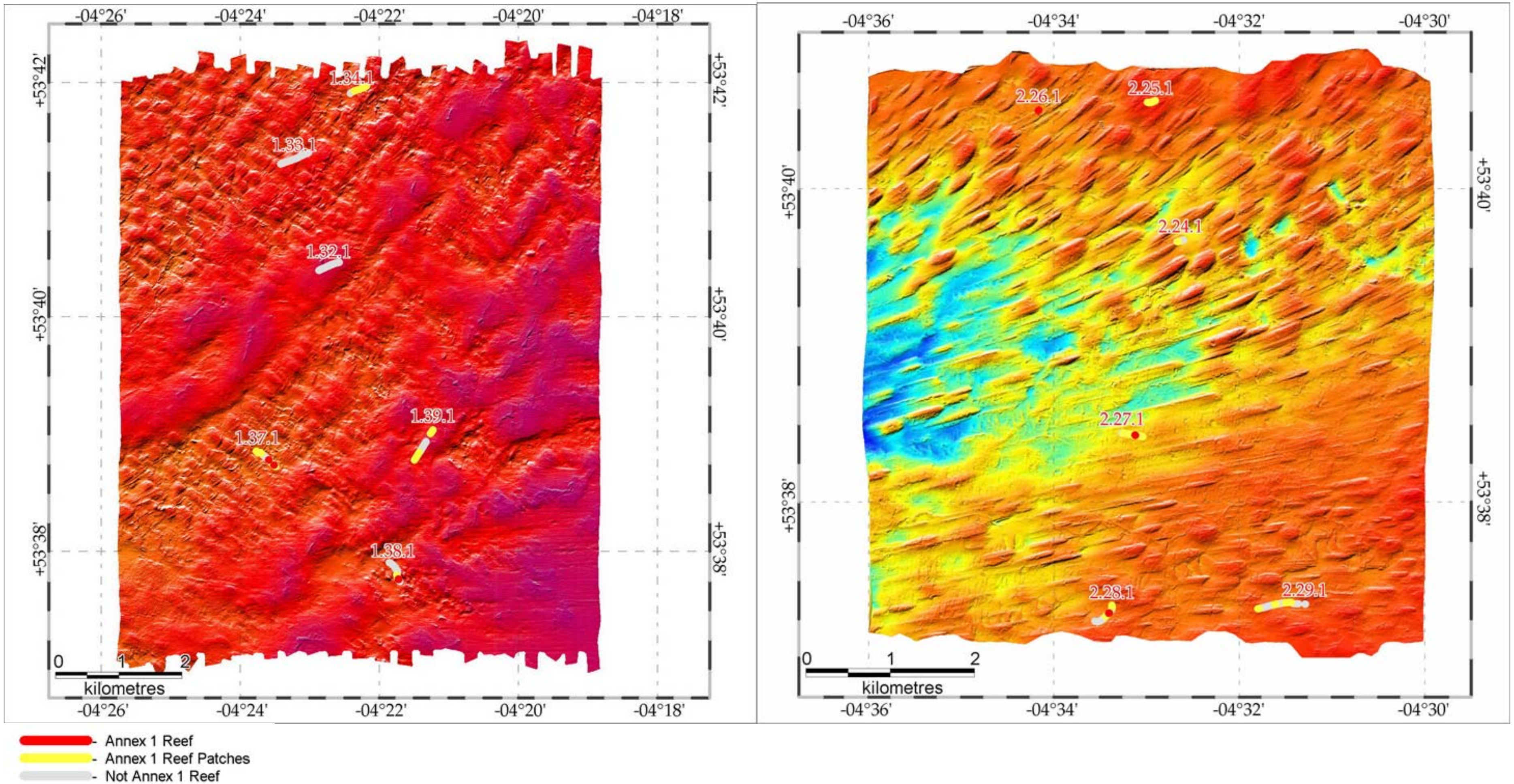

**Figure 57.** Process used to determine presence of Annex I reef within biotope CR.MCR.EcCr.FaAlCr.Flu.

**Table 14.** Summary of video samples containing Annex I reef.

| Biotope | Samples with Annex I reef present throughout | Samples containing patches of Annex I reef present in sample |
|---|---|---|
| CR.MCR.EcCr.FaAlCr.Adig | **Area 1**:<br>1.37.4, 1.37.8, 1.38.6<br>**Area 2**:<br>2.26.2, 2.27.9, 2.28.3,<br>**Area 3**:<br>3.4.2<br>**Area 4**:<br>4.12.1, 4.14.1, 4.20.3, 4.21.1 | |
| CR.MCR.EcCr.FaAlCr.Flu | **Area 2**:<br>2.27.4, 2.27.7, 2.27.11, 2.29.12,<br>**Area 4**:<br>4.11.1, 4.23.2 | **Area 2**:<br>2.25.1, 2.28.5, 2.29.5 |

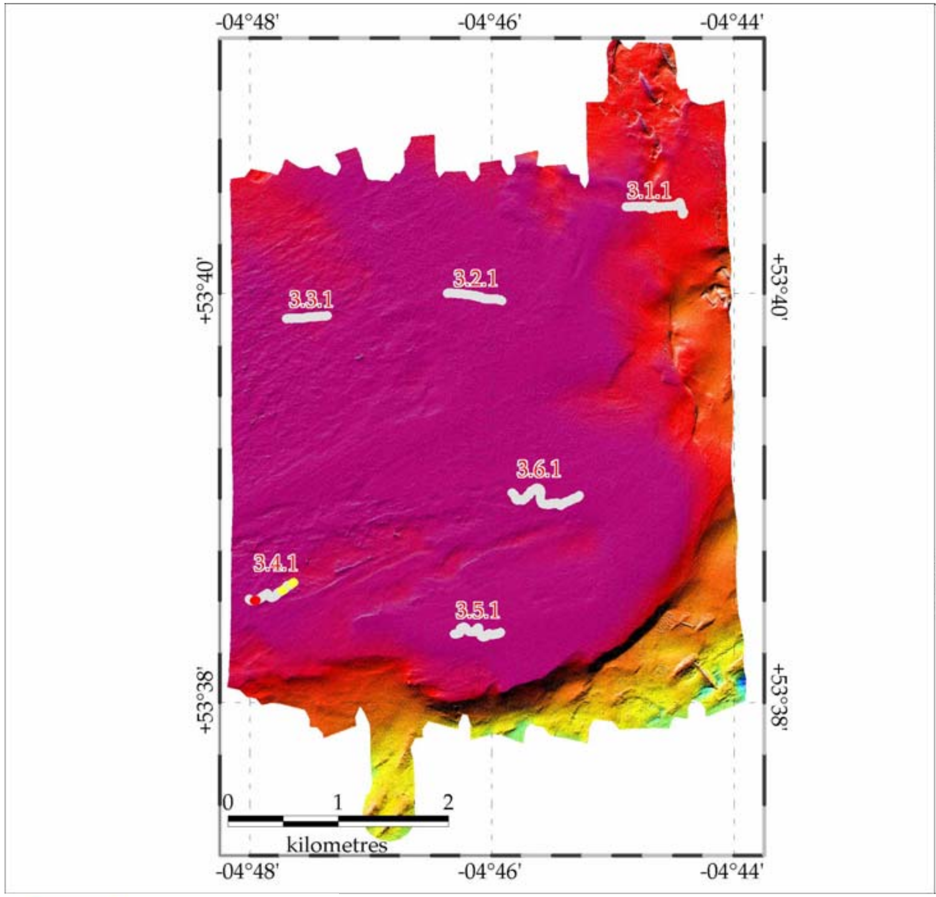
Occurrences of Annex I reef tended to be focussed in Area 2 and Area 4, with Areas 1 and 3 having only a few small patches of isolated reef habitat (Figure 58a to d).

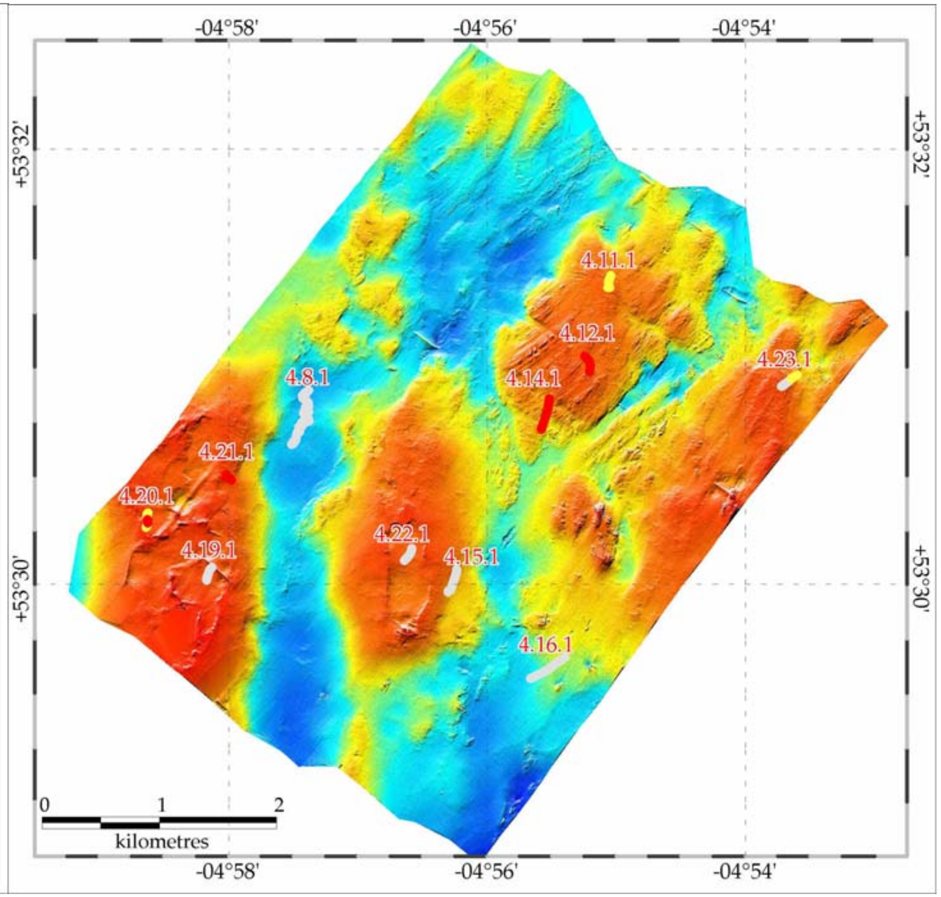
In general, reef habitat was patchy in its distribution, tending to regularly alternate with non-reef habitat along the seafloor. Within Area 2, occurrences of reef were associated with drumlins. Ten patches of reef were observed, averaging 29m of a video tow. In Area 4, reef patches were associated with rocky features visible on the multibeam bathymetry images (Figure 59). Some of these rocky features appeared to extend beyond the boundaries of the study area, indicating that occurrences of reef would also extend beyond the study area. Seven patches of reef were observed in this area from the video footage, averaging 106m in length. Of all the video samples where Annex I reef was found, only one contained a mixture of bedrock and boulder reef, with the remaining samples containing mixed boulder and cobble reef (stony reef sub-type of Annex I reef).




**(a) Area 1** **(b) Area 2**

**Figure 58a to d.** Video tracks symbolised according to presence of Annex I reef, overlain on multibeam bathymetry (coloured by depth)




**(c) Area 3** **(d) Area 4**

**Figure 58a to d.** Video tracks symbolised according to presence of Annex I reef, overlain on multibeam bathymetry (coloured by depth)

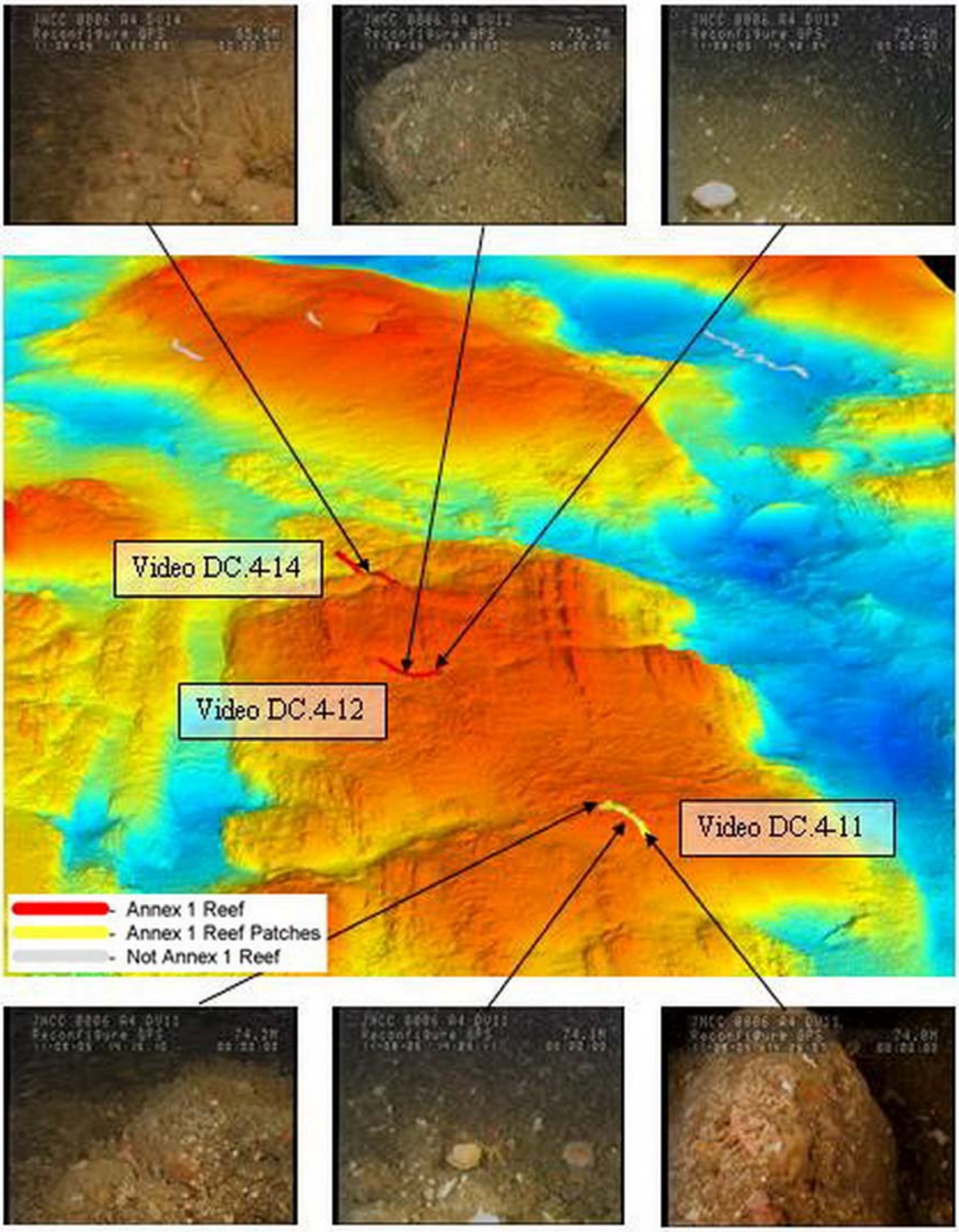



**Figure 59.** Video track of samples 4-11, 4-12, and 4-14 symbolised according to presence of Annex I reef. Images show frame grabs taken along the length of the tow.

Further detail on the distribution of Annex I habitat within each of the study areas is provided in Section 4.

# 4. Integrated assessment

The results of the acoustic and biological data analysis and interpretation were integrated in order to provide an overview of each of the areas surveyed. The biological results of the North Anglesey survey work were also compared with those from other studies in the region surrounding the four survey areas in order to give a more complete environmental overview of the region. Relatively little data from other studies was located directly within the four areas surveyed during the current project, though data points pertaining to grab samples and images were found within a few kilometres of the blocks. These originated from the Irish Sea Pilot survey (ERT Ltd. 1995), and from an investigation into the distribution of *Modiolus modiolus*, carried out as part of the Strategic Environmental Assessment (SEA6) (Rees 2005). In addition to previous survey data, the results were also examined in relation to modelled biotope maps generated during the HABMAP project (Robinson *et al.*, 2007). However, it should be noted that modelled habitat predictions in the four survey areas were based on physical data of unknown confidence, and BGS sediment data of low confidence (as reported in Robinson *et al.*, 2007).

## 4.1 Area 1

Survey Area 1 was the most north-easterly of the four survey areas. It was characterised by the presence of ribbed moraines, which were visible as parallel ridges on the multibeam bathymetry. These moraines, oriented NW–SE, ranged in depth from 40–70m and were surrounded by deeper areas from which the moraines arose. The moraines were commonly 200–250m in length, 100–120m wide, and in places were found to be up to 9m high, although heights of 2–3m were more common. The moraines were not clearly visible in the backscatter data, however, thin lineations of lighter backscatter were observed, running across the area in a roughly E–W direction, approximately aligned to the dominant current. These streaks could be associated with the movement of modern fine sediments across the area along the direction of the predominant currents. The stronger currents could also prevent the bedform features from being buried or eroded.

The ground-truthing data obtained from video and grabs showed a substrate that ranged from coarse sand and gravel to coarser pebbles and cobbles with occasional boulders. The alternating pattern of dark and light backscatter streaks appeared to be reflected in changes in substrate type observed on the video footage; a number of tows running across these streaks showed an alternating pattern of shell, gravel and coarse sand substrata with boulder and cobble substrata. The substrate was also moderately shelly, with scatterings of empty *Modiolus modiolus* shells. Where grabs were obtained, the sediment tended to be gravelly and sandy.

Due to the variety and scale of the features imaged by the multibeam, it was to be expected that the habitats would similarly show a very complex distribution, with small-scale changes.

Eight grab samples were obtained within Area 1. Samples obtained from the tops of moraines and lower slopes of the rocky outcrops demonstrated variations of the SS.SCS.CCS.MedLumVen biotope, with some samples containing abundant *Mytilus edulis* (cluster c) and some samples being relatively impoverished (cluster b). The one sample taken from a deeper area in between seabed features contained a very spare infaunal community (sample 35.2). Due to the low number of samples taken it was not possible to determine any relationships between the infaunal community and the underlying acoustic data.

All but one of the eight biotopes determined from the video analysis were present within Area 1. The impoverished biotope SS.SCS.CCS.1 was not recorded. The biotopes associated with coarser sediment (CR.MCR.EcCr.FaAlCr.Adig, CR.MCR.EcCr.FaAlCr.Bri, CR.MCR.EcCr.FaAlCr.Flu and SS.SMx.CMx.FlyHyd.1) were generally found associated with the tops and slopes of the rocky moraines, whereas SS.SMx.CMx.FlyHyd.2, which is characterised by finer sediment, tended to be on the slopes of the moraines. The brittlestar dominated biotope, SS.SMx.CMx.OphMx was also present on the slopes of moraines, however brittlestar beds are known to move over time, so this pattern of distribution could alter. Areas dominated by empty *Modiolus modiolus* shells (biotope SS.SMx.CMx.1) were found on both the slopes of moraines and the top of a rock outcrop, however no live adult *M. modiolus* were recorded anywhere in the area either within video footage or grab samples, although one grab sample (41.1) did contain significant numbers of live juvenile *M. modiolus*.

Very little Annex I reef habitat was recorded in Area 1. Only three small patches of reef were observed on the video footage (max 12m length of tow), and these were essentially patches of boulders that occurred in an otherwise gravel dominated habitat.

The faunal and substrate observations made throughout survey Area 1 are moderately comparable to those observed in other studies nearby, as well as with some of the biotope predictions made by the HABMAP project. All of these data sources indicate that the area is highly complex, with mixed sediments and mosaics of different biotopes occurring within small areas that cannot be easily discerned without fine scale ground-truthing work.

HABMAP predicted biotope maps for survey area 1 were based mainly on underlying BGS seabed sediment designations in this area, since little additional survey data was available on which to base modelled outputs. The biotope SS.SSa.IMuSa was predicted in the north and east of Area 1, with a low confidence score (only scoring 3.98 out of a maximum value of 8.00). In contrast, video tows from the same location obtained during the current study (tows 1.33 and 1.34), recorded biotopes SS.SMx.CMx.FlyHyd.2 on pebbles and gravel and CR.MCR.EcCr.FaAlCr.Bri and CR.MCR.EcCr.FaAlCr.Flu on boulders and cobbles, while results of infaunal analyses on grabs from the same location indicated communities belonged to the SS.SCS.CCS.MedLumVen biotope. This comparison clearly indicated that the HABMAP prediction did not accurately reflect the nature of the benthic community in the north / north-west of Area 1.

The remainder of survey Area 1 was predicted by the HABMAP project to contain the tide swept mixed sediment biotope SS.SMx.CMx.FluHyd (with a confidence value of 6.04 out of 8.00), possibly as a mosaic with other rock and sediment biotopes, which corresponded with the mixed nature of the sediments observed in the current study. Grab samples taken during this project in the southern and central regions of Area 1 were identified as the biotope SS.SCS.CCS.MedLumVen. This same biotope was also predicted by the HABMAP model in the east of the survey area, though this had a lower confidence score, and was predicted in combination with other biotopes such as SS.SMx.CMx.FluHyd and SS.SCS.CCS.PomB (*Pomatoceros triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles) with low confidence.

Video tows from the centre and south of Area 1 showed the substrate to be mixed, with frequent patches of cobbles and boulders. Visible epifauna was mostly assigned to the biotopes CR.MCR.EcCr.FaAlCr.Bri, SS.SMx.CMx.FlyHyd, CR.MCR.EcCr.FaAlCr.Flu, and CR.MCR.EcCr.FaAlCr.Adig with a patch of SS.SMx.CMx.1 (*M. modiolus*) being observed at the southern end of the survey area. In general the results showed some similarities with the HABMAP predictions for mixed sediment biotopes in the area, though indicated that boulders, cobbles and associated rock biotopes were more likely to occur than predicted during the HABMAP modelling work. This is likely due to the fact that the sediment map used for this area did not accurately reflect the sediment types observed during the North Anglesey survey work, adversely affecting the quality of the model's outputs.

No other survey data records were available for comparative purposes within Area 1. However, grab sample data collated during the Irish Sea Pilot (ERT Ltd. 1995) from approximately 11.3km North East of the study area had recorded the biotope SS.SCS.CCS.MedLumVen (as predicted by the HABMAP study in the east of area 1). Still images taken approximately 7.6km south of the area by Ivor Rees (as ground-truthing for a survey carried out as part of SEA6) showed the seabed was composed of lag gravel with overlying linear features and mounds, possibly with *M. modiolus* shells (Rees 2005). This tied in with the substrate types observed throughout parts of Survey Area 1, along with the observation of *M. modiolus* shells in the southern most video tow (1.38).

## 4.2 Area 2

Area 2 lay to the west of Area 1, and was slightly deeper, with a depth range of 50–100m. Area 2 was characterised by a series of around 200 drumlins, 100m–400m in length, which were present throughout the study area. Associated with the drumlins were long flutes forming tails of up to 1400m in length. Other glacial features were also abundant in the area. The drumlin and flute features were visible in both the bathymetry and backscatter data. Video footage revealed the substrate was generally characterised by gravel, pebbles and cobbles with occasional areas of boulder piles from the glacial till forming the drumlins.

In some locations, lower backscatter intensity values were associated with sediment waves, which ran perpendicular to the dominant tidal current. Video footage indicated these sediment waves were formed by coarse sand, which contrasted with the surrounding diamicton and lag deposits. In general the substratum was not very shelly, and where grabs were obtained these indicated the sediment to be very poorly sorted coarse sand and very fine gravel.

As with Area 1, it was anticipated that the complex topography of the area would result in a similarly complex distribution of habitats. This was indeed found to be the case, with frequent changes in biotopes recorded along the video tows. These changes in biotopes occurred on a very fine scale (often tens of metres), which meant that it was not possible to confidently determine any relationships between the distribution of biotopes and changes in the acoustic properties of the seafloor, which were mapped on a similar scale (10m resolution), although some patterns could be observed. The alternating pattern of light and dark backscatter, aligned to the direction of the dominant current, appeared to be reflected in the alternating habitats observed on the video footage. Where video tows crossed changes in backscatter, the observed habitat appeared to alternate between finer gravel, cobble and sand habitat and coarser boulder habitat. However, due to the resolution, and the small number of video tows that actually crossed changes in backscatter, the specific location of changes in the backscatter and biotope could not be matched (e.g., Video 2.28, see Figure 60).

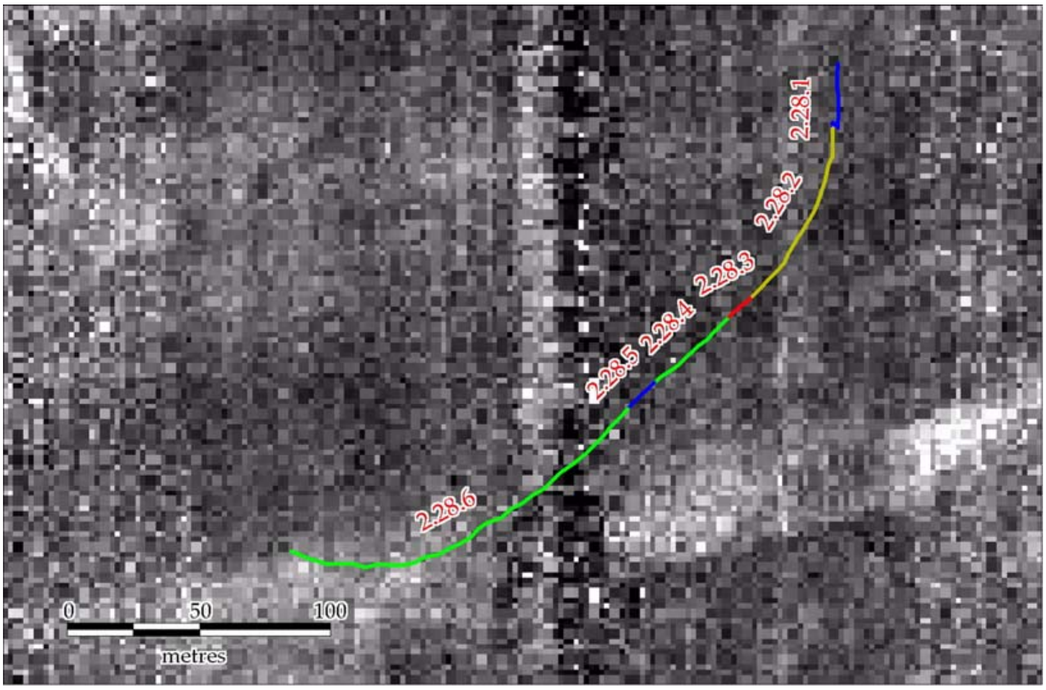



**Figure 60.** Video tow 2.28 symbolised according to biotope, draped over backscatter

In Area 2, five of the eight biotopes identified from the videos were present, representing typically scour-tolerant communities. The most commonly occurring of these was CR.MCR.EcCr.FaAlCr.Flu, which was present throughout the area, although SS.SMx.CMx.FlyHyd.1, SS.SMx.CMx.FlyHyd.2 and SS.SCS.CCS.1 were also common. SS.SMx.CMx.FlyHyd.1 seemed to occur mainly on the larger rock features and on the tops of drumlins, whilst the other biotopes present, which were characterised by more gravelly substrata, were associated with the slopes and flatter areas in between bedform features. No dense beds of brittlestars were observed in this area, nor were there any areas with high abundance of empty *M. modiolus* shells that were common in other study areas.

The observed biotopes were compared to those predicted by the HABMAP project. The HABMAP project predicted three different biotopes in Area 2, with results being very similar to Area 1. The biotope SS.SSa.IMuSa was again predicted with low confidence in the north and west of the survey area, while SS.SMx.CMx.FluHyd was predicted in the central, south and eastern parts of the survey area with reasonable confidence (scoring 6.04 out of 8), along with the less likely SS.SMu.CSaMu.LkorPpel biotope (which was predicted with a lower confidence score of 4.79). Again, these predictions were based on original BGS sediment data, which was found to be inconsistent with the actual sediment types recorded in many areas sampled during the current study. Biotopes recorded during video work were similar to those in Area 1, with SS.SMx.CMx.FlyHyd being observed on mixed sediment in the centre and north of the survey area (as predicted by HABMAP) along with three further biotopes that were not predicted by HABMAP; CR.MCR.EcCr.FaAlCr.Adig and CR.MCR.EcCr.FaAlCr.Flu on cobbles, pebbles and boulders, and SS.SCS.CCS (barren gravel). Videos in the south of the survey area similarly reported a mix of biotopes and substrates, again with SS.SMx.CMx.FlyHyd being commonly observed (matching the FluHyd HABMAP prediction), along with the additional biotopes (not predicted by

HABMAP) SS.SCS.CCS, CR.MCR.EcCr.FaAlCr.Adig and CR.MCR.EcCr.FaAlCr.Flu in areas where boulders, pebbles and cobbles were more predominant.

Only four grab samples were obtained in this area, all of which represented the same characteristic circalittoral coarse sand biotope, SS.SCS.CCS.MedLumVen. All of the samples were obtained from the top of drumlin flutes. No other grab data from other studies was available for comparative purposes within Area 2.

As in Area 1, results from Area 2 showed this to be composed of complex mixed substrates that were home to both infaunal and epifaunal communities. Further detailed ground-truthing survey work would be required to map habitats in more detail in this area.

Area 2 had a number of patches of Annex I reef that were identified through the video analysis. In general these were moderately small patches of reef (average length 29m) which occurred within the area of drumlins, and which tended to be found alternating with other non-reef habitats. For example, patches of Annex I reef of biotopes CR.MCR.EcCr.FaAlCr.Adig and CR.MCR.EcCr.FaAlCr.Flu tended to be found alternating with patches of SS.SMx.CMx.FlyHyd.1 which was not Annex I reef. The areas of reef did not appear to follow any pattern that could be correlated with the interpreted acoustic data, or any other pre-existing data that was reviewed, and so it was not possible to delineate an area of Annex I reef. However, due to the close association with the drumlins, and the fact that the drumlin field appeared to continue beyond the boundaries of the study area, it is likely that occurrences of Annex I reef would also be found in the immediate area outside the boundaries of Area 2.

## 4.3 Area 3

Area 3 was dominated by an extensive shallow plateau at about 30m water depth, clearly visible on the bathymetry, with steep slopes along the plateau edge. In common with Areas 1 and 2, the backscatter image for this area showed streaks running along the direction of the dominant tidal current, which could result from the effects of tidal scour, leaving behind lines of coarser gravelly sediment. The majority of video tows in this area did not cross any marked changes in backscatter amplitude. However, one tow in this area (3.3) ran across dark streaks in the backscatter, and appeared to show a correlation, whereby patches of SS.SMx.CMx.FlyHyd.1 corresponded to darker streaks on the backscatter, whereas elsewhere the sediment was more shelly, and represented by lighter backscatter (Figure 61).

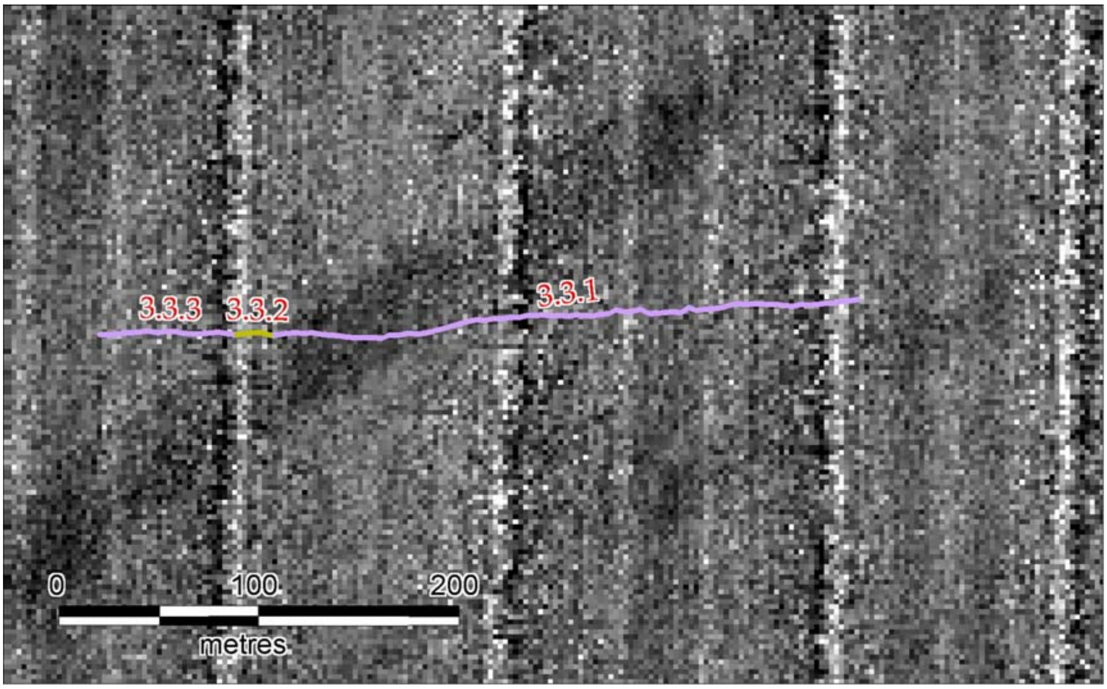



**Figure 61.** Video tow 3.3 overlain on backscatter

In other parts of Area 3 the changes in backscatter observed were more complex and varied on a finer scale. For example video tow 3.4 passed over an area of more complex backscatter with darker streaks. Frequent changes in the substrate were observed, however, spatially, the changes in biotope did not seem to match the changes in backscatter, perhaps due to the degree of error in positioning exceeding the resolution of the observed changes.

No grabs were taken within Area 3, but analysis of the video footage indicated that the sediment was predominantly compact gravel and sand with loose empty *Modiolus modiolus* shells scattered on the surface. The average abundance of shells in this area was the highest of all four study areas (average 22% cover by visual assessment). Occasional patches of coarser cobble and gravel substrate with boulders also occurred.

A feature of interest within Area 3 was the presence of large isolated sediment waves, up to 12m high. These sediment waves were trochoidal type, nearly symmetrical in cross section and transverse to the tidal flow. These features have also been recorded elsewhere in the Irish Sea during the HABMAP project, but have not been previously described and their origin is unknown. No ground-truthing samples were obtained over this feature within Area 3.

Modelled biotope predictions from the HABMAP project within Area 3 reflected the underlying BGS sediment designations, with predicted rock, pebble and cobble biotopes dominating the raised shelf area. As in Areas 1 and 2, some discrepancy was noted in Area 3 between the BGS sediment maps and the observed sediments, with BGS delineating the raised shelf area that dominated the region as diamicton, as opposed to the mixed gravelly sediments observed during video tows in the area. This naturally led to some discrepancies between biotopes predicted by the HABMAP project and biotopes observed within the current study.

Biotopes predicted with reasonable confidence in Area 3 included CR.HCR.XFa.FluCoAs, CR.HCR.XFa.SpNemAdia (Sparse sponges, *Nemertesia* spp., and *Alcyonidium diaphanum* on circalittoral mixed substrata) and CR.HCR.XFa.CvirCri (*Corynactis viridis* and a mixed turf of crisiids, *Bugula, Scrupocellaria,* and *Cellaria* on moderately tide-swept exposed circalittoral rock) (all with confidence scores between 5.00 and 6.00), with SS.SCS.CCS.PomB being predicted with lower confidence. However, actual video and grab results from five locations on the raised shelf showed the sediment to be mixed, with embedded boulders, gravel and shell. Biotopes observed during video tows generally reflected this type of substrate, with SS.SMx.CMx being the most commonly observed biotope, in contrast to the biotopes predicted by the HABMAP study. However, a patch of CR.MCR.EcCr.FaAlCr.Flu was observed on the southern edge of the shelf, suggesting that rock biotopes did occur in the survey area, albeit less frequently than predicted by the HABMAP study. It is likely that patches of underlying rock and or boulders were also present elsewhere in the survey area.

Surrounding the raised shelf, HABMAP biotope predictions of reasonably good confidence included SS.SCS.CCS.MedLumVen and SS.SMx.CMx.FluHyd in the north, east and southwest, along with a small area of SS.SSa.IMuSa of low confidence in the southeast. These were a reasonable match with video results in the north east of Area 3 where a mixed sediment biotope was observed.

No grab data from other studies, either within or around survey Area 3 were available. However, *Modiolus* shells were abundant in Area 3, along with other areas designated with the biotope CR.MCR.EcCr.FaAlCr.Adig that could be associated with live *Modiolus* (Sanderson *et al.,* 2008); this population could potentially be linked to others noted during the BIOMÔR survey and by Ivor Rees off the North and West coast of Anglesey as observed during the SEA6 surveys (Rees 2005).

Within Area 3, only one small patch of Annex I reef was found (23m in length). This patch was in a video tow that was otherwise dominated by *M. modiolus* shells (SS.SMx.CMx.1) and SS.SMx.CMx.FlyHyd.1. There was no distinct acoustic signature that corresponded to the reef patch. The multibeam appeared to indicate rougher ground, but other areas with a similar appearance on the multibeam were revealed to be mainly the shelly SS.SMx.CMx.1. Thus, overall it is unlikely that this study area would contain more than small isolated patches of Annex I reef.

## 4.4 Area 4

The main seabed features visible in Area 4 were bedrock outcrops, which were streamlined by glacial scour. The outcrops were frequently accompanied by scour marks from present day tides.

Variations in backscatter were observed across the survey, but in contrast to the other three survey areas, changes in backscatter amplitude did not appear to correspond to dominant tidal current direction. In the eastern side of the study area, patches of lighter backscatter appeared to correspond to the flatter areas in between topographic highs. Areas of bedrock outcrop were associated with a mottled pattern in backscatter intensity, perhaps reflecting patterns in the overlying sediment.

The nature of the seafloor, as revealed by grab samples and video analysis, was one with areas of coarse sand waves over cobbles and boulders, areas of cobble and pebble substrate with occasionally boulders, and some areas where small boulders and cobbles appeared to form a more stable substrate. Very little shell was observed in the area in comparison to some of the other study areas. Bedrock was only observed in one video tow. Where grabs were obtained the sediment was very poorly sorted coarse and very coarse sand.

Throughout Area 4, a number of high, symmetrical sediment waves were present, with similar dimensions as the sediment waves in Area 3. A video tow across one of these features indicated the substrate to be moderately scoured gravel and pebbles with coarse sand (tow 4.19.1), supporting a scour-tolerant epifaunal community.

Within this study area four of the eight biotopes defined using the video data were observed, all reasonably frequently. Despite the changes in backscatter, slope, rugosity and aspect that were observed in this area, there did not appear to be any strong correlation between any of these parameters and the biotopes. The clearest patterns could be seen when comparing the distribution of biotopes and the seabed features observed on the bathymetry. CR.MCR.EcCr.FaAlCr.Adig and CR.MCR.EcCr.FaAlCr.Flu tended to be observed with the larger rocky outcrops that were visible, on the slopes and tops of the outcrops as well as on the rocky ridges. SS.SMx.CMx.FlyHyd.1 was most frequently observed on the flatter, deeper areas, such as the crater of the rock feature, the base of rocky outcrops and on the rocky slopes. Finally, SS.SMx.CMx.FlyHyd.2 was also observed within the rocky crater and also on the flatter areas in between the rock outcrops.

Predictive biotope maps from the HABMAP study suggested Area 4 was dominated by mixed sediment biotopes (as in the other survey areas), with SS.SMx.CMx.FluHyd being predicted with relatively good confidence (6.04 out of 8) and SS.SCS.CCS.MedLumVen being predicted with lower confidence (4.70 out of 8). Both of these biotopes were observed in grab and video samples from Area 4 in the current study. A few small patches of SS.SMu.CSaMu.LkorPpel were also predicted with lower confidence in Area 4, though no ground-truthing data was available to confirm or refute these. In general, video tows and bathymetric data revealed a complex mix of topographies, substrates and biotopes throughout Area 4; biotopes observed in video footage changed frequently in some areas in accordance with the changing nature of the seabed. This heterogeneity was not shown in the HABMAP modelled outputs.

As with Area 3, no additional data was available for comparative purposes from within Area 4. However, grab sample data collected during the Irish Sea Pilot survey 3–4km east and west of Area 4 reported the occurrence of biotopes SS.SCS.CCS.MedLumVen and SS.SMx.OMx.PoVen, suggesting that (as for the other survey areas), coarse and mixed circalittoral sediment biotopes were common in the region (Rees 2003). Grab samples taken as part of the current study in the southeast of survey Area 4 contained abundant *S. spinulosa*. It should be noted that *S. Spinulosa* crusts are known to be present throughout this part of the Irish Sea, though were only specifically found in high numbers in Area 4 (e.g., Rees 2005).

Several patches of Annex I reef were observed in Area 4 (7 sections, total length 747m). These were on average 106m in length, and some covered the length of entire tows. The reef patches were correlated with the large rocky features (e.g., outcrops or craters) that were visible on the multibeam bathymetry. The rock outcrop visible in the south-west of the study area corresponds with a topographic feature identified in the UKSeaMap project as a ‘shelf mound or pinnacle’ that was defined on the basis of slope and bathymetry (Figure 62) (Connor *et al.,* 2006). The feature follows the 80m bathymetric contour and clearly extends beyond the boundaries of the study area. It is therefore likely that Annex I reef, associated with this rocky feature, would also extend beyond the study area, although it would be difficult to determine with any confidence the likely abundance of reef within the feature as a whole, as only a small area of this topographic feature has been ground-truthed within this study.

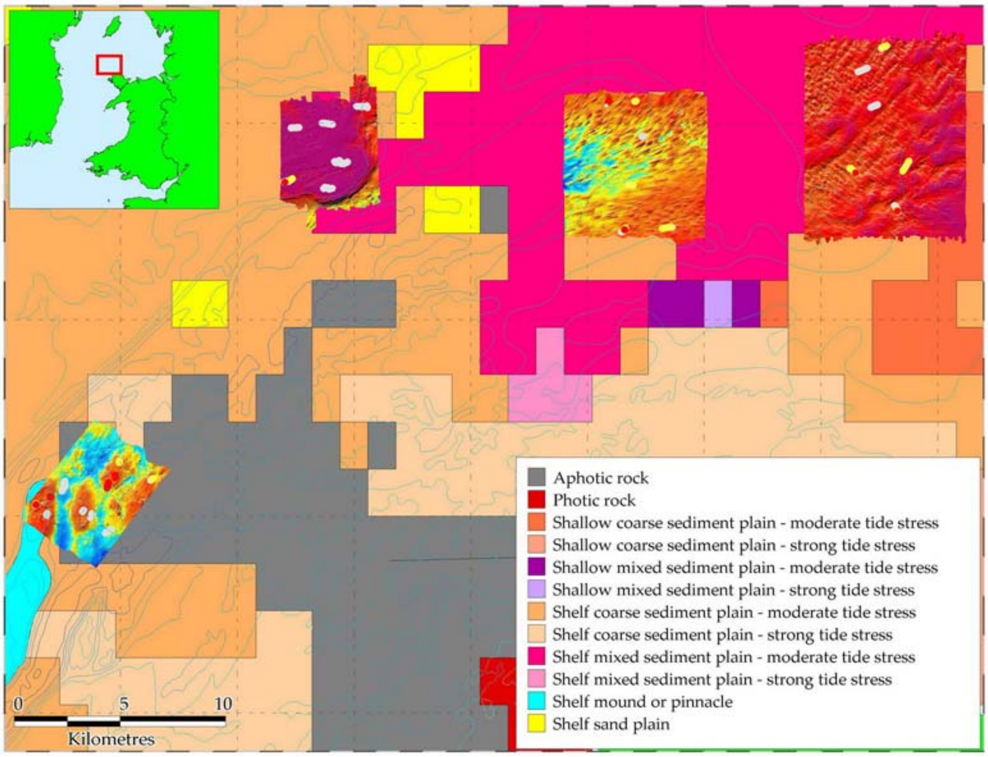



**Figure 62.** Annex I reef identified by video analysis, overlain on features identified by UKSeaMap (Connor *et al.*, 2006).

# 5. Areas of conservation interest

The two study areas that contained the most Annex I reef were Areas 2 and 4. Area 2 included patches of boulder reef that were associated with the drumlins. These complied with the definition of reef according to the EU Habitats Directive (CEC 2007) in that they were comprised of cobbles and boulders, were topographically distinct from the surrounding area, and supported a typical reef fauna, comprised of hydroids, soft corals and bryozoans. Due to the limited biological sampling, reef habitat was only recorded on a relatively small number of occasions. However the association with the drumlins means that it can be assumed that many of the other drumlins that were not sampled would also support reef habitat. The area of drumlins obviously extended beyond the survey area, hence patchy boulder reef habitat would be greater than the $44km^2$ surveyed. Unfortunately no other data exists that can indicate exactly how far beyond the survey area drumlins and associated reef may be present.

Within Area 4, the reef was again primarily boulder and cobble reef, although in one place bedrock was observed. The multibeam data indicated that bedrock does outcrop in this area, so it could be that additional sampling would reveal a mixed bedrock and boulder reef. Despite the different seabed features with which the reef was associated, the reef fauna was very similar to that found in Area 2. Again the data indicated that areas of reef could extend beyond the survey area. Some of the reef areas were associated with a rock outcrop, the extent of which was modelled within UKSeaMap, covering an area of $29km^2$ (Connor *et al.*, 2006). Therefore it is likely that further instances of reef would be found beyond the extent of the study area, if additional sampling were undertaken.

All stony reef habitat observed appeared to be typical of boulder communities subjected to strong tidal currents, such as the mixed cobble reefs found within Pen Llyn a'r Sarnau, Cardigan Bay and Pembrokeshire Marine SACs. In order to determine whether these areas would be progressed towards designation within an SAC, further work is required, to compare the communities observed to those within other existing SACs and Areas of Search for SACs (areas where Annex I habitats are thought to be present, and that could be designated as SACs in future). In addition, consideration would need to be given as to whether further survey work would be required in order to determine the full extent of the reef areas.

# 6. Summary and conclusions

## 6.1 Overview of results

i. High resolution multibeam bathymetry and backscatter data were obtained for all four survey areas.

ii. Seventeen grab samples were obtained in three of the four survey areas. None were taken in Area 3.

iii. Twenty-nine video tows were obtained from all four survey areas.

iv. The results from each of the four survey areas suggest the seabed is broadly characterised by complex topography and mixed sediment mosaics that are home to benthic communities that thrive in tide swept environments.

## 6.2 Interpretation of acoustic data

i. The multibeam bathymetry revealed a variety of interesting seabed features, indicating the different characteristics of the four study areas. Study Areas 1 and 2 covered a depth range of 40–100m and contained numerous glacial features, such as ribbed moraines and drumlins. Area 3 was characterised by a shallow plateau whereas Area 4 had a number of rock outcrops.

ii. Backscatter amplitude showed variations within each of the study areas. Changes in backscatter in Areas 1, 2 and 3 were aligned to the dominant current direction, suggesting movement of finer sediments by strong tidal currents.

iii. In general, variation in backscatter intensity corresponded with changes in substrata and associated habitat, although on a fine scale such changes could not be accurately matched. This could be a result of the different sampling scales of acoustic versus direct (grabs, video) sampling.

## 6.3 Interpretation of biological data

i. Analysis of the infaunal component of the 17 grab samples showed that all samples belonged to the same biotope, "*Mediomastus fragilis*, *Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel" (SS.SCS.CCS.MedLumVen).

ii. Samples were characterised primarily by the sea spider *Achelia echinata*, the bristle worms *Aonides paucibranchiata* and *Mediomastus fragilis*, the polychaetes Harmothoinae, and the common mussel *Mytilus edulis*.

iii. Insufficient samples were obtained to determine whether the clusters identified through multivariate analysis represented the natural range of variation within one biotope or whether each cluster represents a genuinely distinct sub-group of that biotope. The prevalence of SS.SCS.CCS.MedLumVen throughout the Irish Sea, and its known variability could indicate that there are distinct sub-biotopes still to be described.

iv. A range of biological communities were determined from the video analysis. Existing biotopes with the Marine Habitat Classification were found to describe some of these communities. Strong tidal currents were found to be a significant factor in determining the biological communities present.

v. Three of the biotopes observed on video were typical of boulder areas subjected to moderate tidal streams (CR.MCR.EcCr.FaAlCr.Flu, CR.MCR.EcCr.FaAlCr.Adig and CR.MCR.EcCr.FaAlCr.Bri). Gravelly sediment was frequently observed in between boulders in these areas, causing scouring in some places. Although two of these biotopes (CR.MCR.EcCr.FaAlCr.Flu and CR.MCR.EcCr.FaAlCr.Adig) were very similar in biological composition, CR.MCR.EcCr.FaAlCr.Adig was associated with a higher presence of boulders and supported more of the soft coral, *Alcyonium digitatum*; CR.MCR.EcCr.FaAlCr.Flu had a higher abundance of scour-tolerant *Flustra foliacea*.

vi. In four video tows in Area 1 very high densities of the brittle star *Ophiothrix fragilis,* along with lower numbers of *Ophiocomina nigra,* were present, blanketing the underlying rocky substrate (CR.MCR.EcCr.FaAlCr.Bri and SS.SMx.CMx.OphMx).

vii. Gravelly substrates were also common throughout the survey areas, supporting biological communities that did not easily match existing biotopes within the Marine Habitat Classification. For two of these biotopes, the closest match was SS.SMx.CMx.FlyHyd, although the physical and biological characteristics of these two biotopes were distinct, suggesting that further development of this part of the Marine Habitat Classification may be required. The third gravelly biotope had a very sparse epifauna and therefore insufficient biological information to assign a more precise biotope than SS.SCS.CCS, which is described mainly by its physical characteristics. It could be that this was the same biotope as the SS.SCS.CCS.MedLumVen determined from the infaunal data, but without grab samples from the same location, this could not be confirmed.

viii. Some video tows revealed a seabed characterised by high densities of empty *M. modiolus* shells. No biotope within the existing Marine Habitat Classification adequately matched this community, although if grab samples had been taken in the same location then the infaunal component may have assisted with the matching process. Very few epifauna were observed amongst the empty shells. However, dredge samples taken from similar habitats elsewhere in the Irish Sea have also been found to be relatively impoverished (I. Rees, pers. comm.).

ix. Some of the difficulties encountered with biotope assignation highlight the incompleteness of the existing Marine Habitat Classification in relation to the offshore environment. Data from this study will feed into work, led by JNCC, to improve the Marine Habitat Classification and develop additional biotopes.

## 6.4 Relationship between acoustic and biological data

i. In Areas 1 and 2, changes in slope and aspect were complex, and occurred at a very fine scale. Furthermore, slope and aspect were calculated from a 10m grid, whereas changes in biological communities appeared to occur at a much finer scale. This made it difficult to draw any firm conclusions about relationships between these parameters and the biological communities found.

ii. Area 4 also had complex changes in slope and aspect but again there was no strong correlation between any of these parameters and the biotopes. Area 3 had the most simple topography of the four study areas, however as all biological samples were taken from the top of the plateau, it was not possible to determine any relationships between the distribution of the biological communities across the top, slope and base of the plateau.

iii. Rugosity was calculated for all four survey areas, but although variations were observed, they appeared to mainly reflect slope variability and did not offer any additional value when attempting to determine the distribution of biological communities across the areas. Rugosity was re-calculated using a higher resolution BASE layer (1m rather than 10m) but this did not result in any improvement; rather, it produced a poorer quality output due to the increased number of artefacts visible. Therefore, rugosity in this project was found to be a less valuable tool to aid habitat mapping than initially expected.

iv. In all of the four study areas, the parameters derived from the bathymetry (slope, aspect and rugosity) did not appear to strongly correlate to changes in the biology. This could have been due to the differences in resolution and scale of the different sampling techniques, and was probably also due to insufficient biological samples being obtained in such a complex area. The lack of USBL on the video camera may also have exacerbated these difficulties, as there may have been a degree of inaccuracy in the calculated video position. Any relationships between the acoustic and biological data that could be determined were done by visually assessing the bathymetry image in relation to the mapped biotopes.

v. Due to the issues described above, it was not possible to produce a habitat map for any of the four study areas. In order to fully map the areas, extensive additional biological sampling would be required, with replicate sampling taken over particular seabed features, and planning sampling to map the small-scale patchiness that occurs.

## 6.5 Identification of Annex I habitats

i. Annex I reef was found in patches throughout the four study areas, although these were concentrated in Areas 2 and 4, with Areas 1 and 3 having only a few small patches of isolated reef habitat. Where Annex I reef was found, it was comprised of boulders and cobbles, which although scoured in places, supported epifauna such as *Pomatoceros triqueter/lamarcki* and *Alcyonium digitatum*, with hydroids such as *Abietinaria abietina* also common. Along video tows, reef habitat tended to alternate with non-reef habitat, which were more gravelly.

ii. Annex I reef was linked to the biotopes CR.MCR.EcCr.FaAlCr.Adig and CR.MCR.EcCr.FaAlCr.Flu. In all instances where CR.MCR.EcCr.FaAlCr.Adig was observed, it fitted the definition of Annex I reef. The biotope CR.MCR.EcCr.FaAlCr.Flu expressed some variation, ranging from more gravelly sediment to sediment with a greater abundance of cobbles and boulders. Where the sediment had a higher abundance of cobbles and boulders (40–50% or more) the habitat found was Annex I reef, but where the sediment had a lower abundance of cobbles and boulders, or where these larger particles were more sparsely distributed, the habitat did not appear to fit the definition of Annex I reef.

iii. Annex I reef in Area 2 was associated with drumlins, which were formed by piles of boulders and cobbles. It is expected that if additional biological sampling of the drumlins were undertaken in this area, more occurrences of reef would be found. In comparison to Area 2, the moraines in Area 1 tended to have much fewer cobbles and only in three short sections of video tow were there sufficient cobbles and boulders to support a reef community. Area 4 had a number of reef patches that were associated with rocky outcrops. As with Area 2, the reef in Area 4 was almost all boulder/cobble reef and supported a similar reef fauna. However, in one location, mixed bedrock and boulder reef was observed.

iv. A number of grab samples contained moderate abundance of juvenile *Modiolus modiolus* but no adults were obtained within the samples. No live *M. modiolus* shells were observed in the video footage although empty shells were very abundant in Area 3, and in some locations in Area 1. Hence, whilst *M. modiolus* reefs are known to be present in the wider region, no reefs were sampled within this study.

v. Two grab samples contained abundant *Sabellaria spinulosa* although initial observations indicated that these were more likely to have been from *S. spinulosa* crusts rather than *S. spinulosa* reefs (A. Mackie pers. comm.). No *S. spinulosa* crusts (or reefs) were observed within the video footage. This may be due to the quality of the video footage being insufficient to detect such features, although no video samples were obtained in the vicinity of the grab samples that contained abundant *S. spinulosa*.

## 6.6 Quality issues with the results

i. The acoustic data was of very high quality overall, although the south-eastern part of Area 1 was affected by artefacts. Further cleaning and processing of this data could be carried out to try to achieve a higher quality product for this area.

ii. Due to time limitations and logistical difficulties, no grab samples could be obtained in Area 3.

iii. Due to the strong tidal currents in the area, efforts were made to sample only during slack water, however the tight schedule and limited survey time available meant that this was not possible in all cases. Therefore, some videos were affected by strong currents, resulting in the camera moving too fast over the seabed and obtaining reduced quality footage. However, the majority of samples were of good quality. In future, it would be recommended that in areas of high currents, every effort should be made to restrict video work to slack water.

iv. Some problems were also caused by auto-focus functionality of the camera, which resulted in the focus fixing on suspended particles where turbidity was high. In future, consideration should be given to using a manual focus with a high depth of field.

v. Within this study only video footage was obtained. It is recommended that where possible still images should be taken to complement the video. These would provide additional help in the identification of fauna, particularly the smaller or more cryptic species. A stills camera mounted on the same frame as the video camera, focusing on the same patch of seabed, could be used either to obtain regular images throughout the tow, or to obtain clear images of particular fauna to aid identification.

vi. The lack of an ultra-short baseline (USBL) system for acoustic positioning on the video camera meant that in some cases there was a mis-match between the logged position of the camera and the location of features visible on the video footage. This created problems when trying to match acoustic and biological data.

vii. Particle Size Analysis was conducted for eight of the grab samples, which was insufficient to allow the acoustic data to be properly ground-truthed. Further interpretation of the acoustic data could be achieved if additional samples were obtained.

## 6.7 General conclusions

i. The results from the current study suggest that the seabed in this study area was broadly characterised by complex topography and mixed sediment mosaics, which were home to benthic communities in tide swept environments. Faunal and substrate observations made throughout the survey area were relatively comparable with those observed in other studies nearby, as well as with some of the biotope predictions made by the HABMAP project. All of these studies indicated a highly complex area, with mixed sediments and biotopes mosaics occurring within small areas that could not be easily discerned without fine scale ground-truthing work.

ii. This study was hampered by the lack of biological data available to ground-truth the acoustic results. Full coverage habitat maps could not be produced for the four survey areas. It is recommended that further survey work be carried out within this region of the Irish Sea, to build on the current study and further delineate and characterise the biological communities present, in particular those representing Annex I reef habitat.

iii. Whilst Annex I reef was found in a number of locations, indicating that this could be an area of conservation interest, further work is required to compare the results of the current study with other known areas of reef within the Irish Sea, in order to decide on the most appropriate site for consideration as an SAC.

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# 9. Appendices

## 9.1 Video log sheet

**SUBLITTORAL HABITAT RECORDING FORM**

JOINT NATURE CONSERVATION COMMITTEE

| | | | |
|---|---|---|---|
| **Survey Name** | | | |
| **Event Ref** | | **Video No.** | |
| **Event Name** | | | |

| | Sample Ref | Start time | Start lat/long | End time | End lat/long | Duration | Method |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |

| 1 | 2 | 3 | |
|---|---|---|---|
| m | | | **DEPTH LIMITS** |
| | | | Upper (from sea level) |
| | | | Lower " |
| | | | Upper (from chart datum) |
| | | | Lower " |
| ✓ | | | **DEPTH BAND** |
| | | | 0-5 m |
| | | | 5-10 m |
| | | | 10-20 m |
| | | | 20-30 m |
| | | | 30-50 m |
| | | | >50 m |
| ✓ | | | **ZONE** |
| | | | Sublittoral fringe |
| | | | Infralittoral |
| | | | - upper |
| | | | - lower |
| | | | Circalittoral |
| | | | - upper |
| | | | - lower |
| | | | Not applicable |
| ✓ | | | **MODIFIERS** |
| | | | … |
| | | | … |
| | | | … |
| | | | … |
| | | | … |

| % | | | **SUBSTRATUM** | |
|---|---|---|---|---|
| | | | Bedrock | |
| | | | Boulders | |
| | | | - very large | >1024 mm |
| | | | - large | 512-1024 mm |
| | | | - small | 256-512 mm |
| | | | Cobbles | 64-256 mm |
| | | | Pebbles | 16-64 mm |
| | | | Gravel | 4-16 mm |
| | | | - stone | |
| | | | - shell | |
| | | | - dead maerl | |
| | | | - live maerl | |
| | | | Sand | |
| | | | - coarse | 1-4 mm |
| | | | - medium | 0.25-1 mm |
| | | | - fine | 0.063-0.25 mm |
| | | | Mud | <0.063 mm |
| | | | Shells (empty) | |
| | | | Artificial | |
| | | | - metal | |
| | | | - concrete | |
| | | | - wood | |
| 100 | 100 | 100 | Total | |

| % | | | **INCLINATION** | |
|---|---|---|---|---|
| | | | Overhangs | |
| | | | Vertical faces | (80-100°) |
| | | | Very steep faces | (40-80°) |
| | | | Upper faces | (0-40°) |
| | | | Underboulders | |
| 100 | 100 | 100 | Total | |

| 1-5 | | | **FEATURES - ROCK** | |
|---|---|---|---|---|
| | | | Surface relief | (even-rugged) |
| | | | Texture | (smooth-pitted) |
| | | | Stability | (stable-mobile) |
| | | | Scour | (none-scoured) |
| | | | Silt | (none-silted) |
| | | | Fissures >10mm | (none-many) |
| | | | Crevices <10mm | (none-many) |
| | | | Boulder/ cobble/pebble shape | (rounded-angular) |
| ✓ | | | | |
| | | | Gully | |
| | | | Cave | |
| | | | Tunnel | |
| | | | Boulder / cobble - on rock | |
| | | | Boulder/ cobble- on sediment | |
| | | | Boulder holes | |

| 1-5 | | | **FEATURES - SEDIMENT** | |
|---|---|---|---|---|
| | | | Firmness | (firm-soft) |
| | | | Stability | (stable-mobile) |
| | | | Sorting | (well-poor) |
| ✓ | | | | |
| | | | Mounds / casts | |
| | | | Burrows / holes | |
| | | | Waves / dunes | (>10 cm high) |
| | | | Ripples | (<10 cm high) |
| | | | Subsurface coarse layer | |

| No. | BIOTOPE DESCRIPTION (clearly describe substrata; main cover species / taxa; any unusual or rare features / species) |
|---|---|
| 1 | **Biotope Code (MNCR 04.05)** |
| | |
| 2 | **Biotope Code (MNCR 04.05)** |
| | |
| 3 | **Biotope Code (MNCR 04.05)** |
| | |

## 9.2 Results of PSA from Emu

**Table 15** Raw PSA weight data

| Site name | 17.2, area 4 | 18.1, area 4 | 30.1, area 2 | 31.1, area 2 | 35.1, area 1 | 36.2, area 1 | 40.1, area 1 | 41.1, area 1 |
|---|---|---|---|---|---|---|---|---|
| Lab registration no. | WL017221 | WL017222 | WL017223 | WL017224 | WL017225 | WL017226 | WL017227 | WL017228 |
| Total start dry weight (g) | 383.390 | 468.480 | 173.040 | 339.300 | 181.840 | 228.060 | 489.720 | 122.830 |
| Dry weight after wet split (g) | 333.790 | 434.900 | N/a | N/a | N/a | N/a | 465.190 | 95.340 |
| Difference (g) | 49.600 | 33.580 | N/a | N/a | N/a | N/a | 24.530 | 27.490 |
| Sieve aperture (µm) | (g) | (g) | (g) | (g) | (g) | (g) | (g) | (g) |
| 63000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 31500 | 129.323 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 16000 | 0.000 | 52.686 | 0.000 | 13.903 | 7.648 | 0.000 | 0.000 | 5.158 |
| 8000 | 5.007 | 14.884 | 3.048 | 26.997 | 14.479 | 5.456 | 26.388 | 14.164 |
| 4000 | 14.600 | 19.600 | 14.557 | 58.892 | 33.217 | 16.093 | 29.817 | 11.264 |
| 2000 | 14.179 | 37.157 | 28.912 | 81.015 | 31.837 | 26.122 | 32.913 | 10.064 |
| 1000 | 10.867 | 16.395 | 21.001 | 84.865 | 24.610 | 49.187 | 65.453 | 11.825 |
| 500 | 17.946 | 71.096 | 12.857 | 45.602 | 25.500 | 62.242 | 226.647 | 25.882 |
| 250 | 99.362 | 161.840 | 63.478 | 18.711 | 36.697 | 49.196 | 66.983 | 8.820 |
| 125 | 36.066 | 50.906 | 20.460 | 6.380 | 4.706 | 14.347 | 11.511 | 5.422 |
| >63 | 6.120 | 9.498 | 1.255 | 1.590 | 1.114 | 2.216 | 4.827 | 2.621 |
| <63 | 0.313 | 0.831 | 7.466 | 1.217 | 1.667 | 2.622 | 0.643 | 0.115 |
| Total weight | 333.783 | 434.893 | 173.034 | 339.172 | 181.475 | 227.481 | 465.182 | 95.335 |

**Table 16** Fractional data as a percentage of total start dry weight

| Site name | 17.2, area 4 | 18.1, area 4 | 30.1, area 2 | 31.1, area 2 | 35.1, area 1 | 36.2, area 1 | 40.1, area 1 | 41.1, area 1 |
|---|---|---|---|---|---|---|---|---|
| Lab registration no. | WL017221 | WL017222 | WL017223 | WL017224 | WL017225 | WL017226 | WL017227 | WL017228 |
| Sieve Aperture (μm) | % | % | % | % | % | % | % | % |
| 63000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 31500 | 33.731 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 16000 | 0.000 | 11.246 | 0.000 | 4.099 | 4.214 | 0.000 | 0.000 | 4.199 |
| 8000 | 1.306 | 3.177 | 1.762 | 7.960 | 7.979 | 2.398 | 5.388 | 11.531 |
| 4000 | 3.808 | 4.184 | 8.413 | 17.363 | 18.304 | 7.074 | 6.089 | 9.170 |
| 2000 | 3.698 | 7.931 | 16.709 | 23.886 | 17.543 | 11.483 | 6.721 | 8.193 |
| 1000 | 2.834 | 3.500 | 12.137 | 25.021 | 13.561 | 21.622 | 13.365 | 9.627 |
| 500 | 4.681 | 15.176 | 7.430 | 13.445 | 14.052 | 27.361 | 46.281 | 21.071 |
| 250 | 25.917 | 34.546 | 36.685 | 5.517 | 20.222 | 21.626 | 13.678 | 7.181 |
| 125 | 9.407 | 10.866 | 11.824 | 1.881 | 2.593 | 6.307 | 2.351 | 4.414 |
| >63 | 1.596 | 2.027 | 0.725 | 0.469 | 0.614 | 0.974 | 0.986 | 2.134 |
| <63 | 13.019 | 7.345 | 4.315 | 0.359 | 0.919 | 1.153 | 5.140 | 22.474 |

**Result: Histogram Table**

| | | |
|---|---|---|
| ID: 17.2, Area4/WL017221 | Run No: 2 | Measured: 15/9/2005 15:16PM |
| File: J1110702 | Rec. No: 41 | Analysed: 15/9/2005 15:16PM |
| Path: C:\SIZERMU\DATA\ | | Source: Analysed |

| | | |
|---|---|---|
| Sampler: Internal | | Measured Beam Obscuration: 20.0 % |
| Presentation: 4OHD | Analysis: Polydisperse | Residual: 0.195 % |
| Modifications: None | | |

| | | |
|---|---|---|
| Conc. = 0.0095 %Vol | Density = 1.500 g/cm^3 | S.S.A.= 1.9317 m^2/g |
| Distribution: Volume | D[4, 3] = 12.36 um | D[3, 2] = 2.07 um |
| D(v, 0.1) = 0.71 um | D(v, 0.5) = 4.54 um | D(v, 0.9) = 29.18 um |
| Span = 6.270E+00 | Uniformity = 2.304E+00 | |

| Size (um) | Volume In % | Size (um) | Volume In % | Size (um) | Volume In % | Size (um) | Volume In % |
|---|---|---|---|---|---|---|---|
| 0.313 | | 7.80 | | 22.00 | | 62.00 | |
| | 45.89 | | 8.37 | | 4.33 | | 1.94 |
| 3.90 | | 11.00 | | 31.00 | | 125.0 | |
| | 9.25 | | 7.71 | | 3.51 | | |
| 5.50 | | 15.60 | | 44.00 | | | |
| | 9.06 | | 6.06 | | 2.82 | | |
| 7.80 | | 22.00 | | 62.00 | | | |

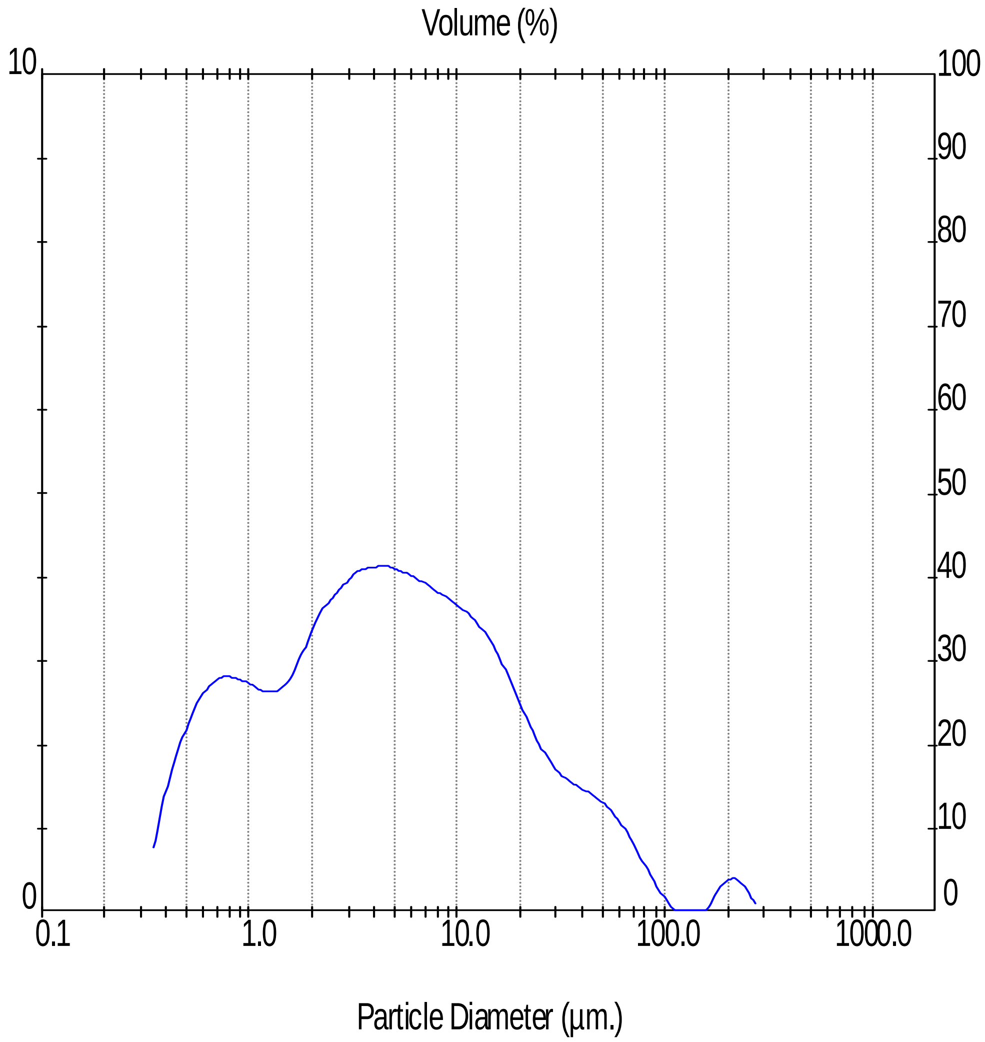


**Figure 63.** Laser diffraction test results for site 17.2, area 4

**Result: Histogram Table**

| | | |
|---|---|---|
| ID: 18.1, Area4/WL017222 | Run No: 3 | Measured: 15/9/2005 15:30PM |
| File: J1110702 | Rec. No: 42 | Analysed: 15/9/2005 15:30PM |
| Path: C:\SIZERMU\DATA\ | | Source: Analysed |

| | | |
|---|---|---|
| Sampler: Internal | | Measured Beam Obscuration: 20.3 % |
| Presentation: 4OHD | Analysis: Polydisperse | Residual: 0.186 % |
| Modifications: None | | |

| | | |
|---|---|---|
| Conc. = 0.0105 %Vol | Density = 1.500 g/cm^3 | S.S.A.= 1.7944 m^2/g |
| Distribution: Volume | D[4, 3] = 14.09 um | D[3, 2] = 2.23 um |
| D(v, 0.1) = 0.74 um | D(v, 0.5) = 5.30 um | D(v, 0.9) = 42.69 um |
| Span = 7.917E+00 | Uniformity = 2.257E+00 | |

| Size (um) | Volume In % | Size (um) | Volume In % | Size (um) | Volume In % | Size (um) | Volume In % |
|---|---|---|---|---|---|---|---|
| 0.313 | | 7.80 | | 22.00 | | 62.00 | |
| | 42.27 | | 7.60 | | 5.40 | | 4.47 |
| 3.90 | | 11.00 | | 31.00 | | 125.0 | |
| | 8.65 | | 6.73 | | 5.61 | | |
| 5.50 | | 15.60 | | 44.00 | | | |
| | 8.48 | | 5.74 | | 4.98 | | |
| 7.80 | | 22.00 | | 62.00 | | | |

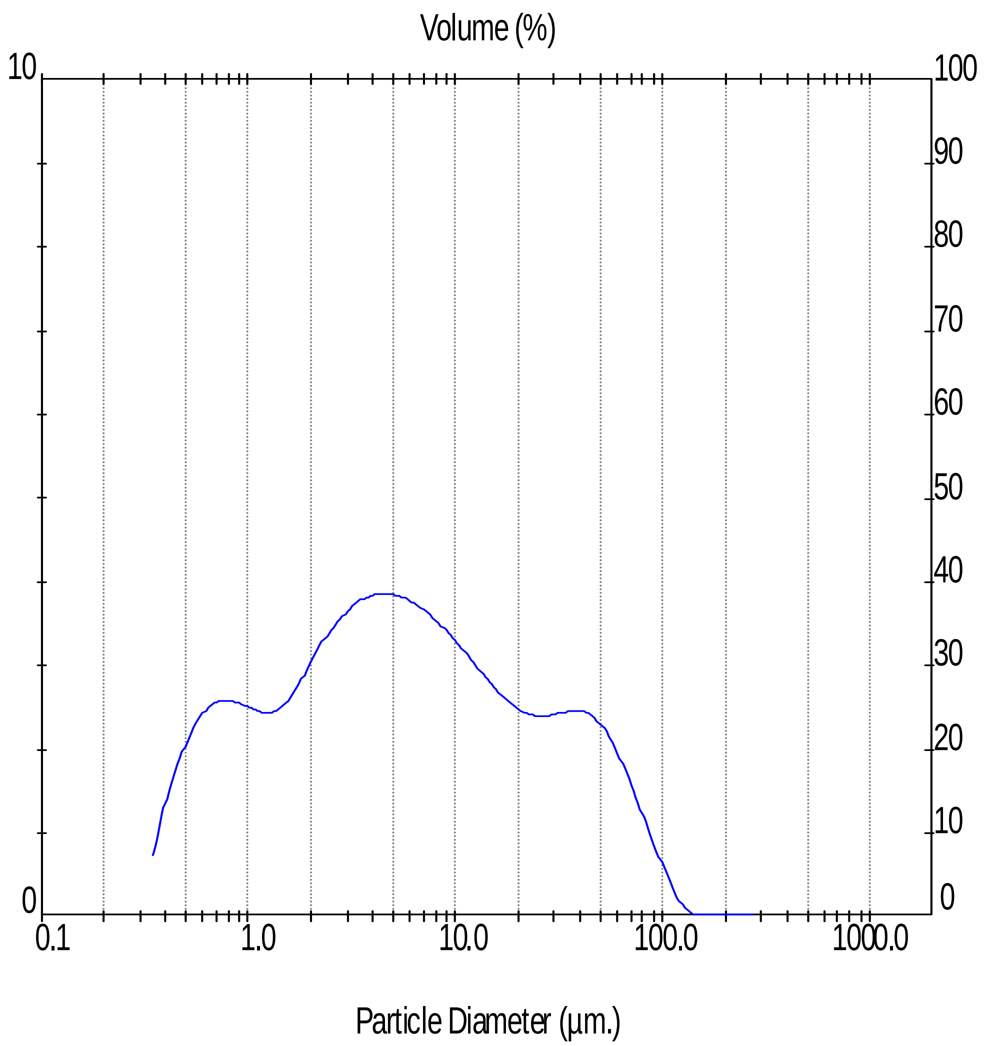


**Figure 64.** Laser diffraction test results for site 18.1, area 4

**Result: Histogram Table**

| | | |
|---|---|---|
| ID: 40.1, Area1/WL017227 | Run No: 5 | Measured: 15/9/2005 15:53PM |
| File: J1110702 | Rec. No: 44 | Analysed: 15/9/2005 15:53PM |
| Path: C:\SIZERMU\DATA\ | | Source: Analysed |

| | | |
|---|---|---|
| Sampler: Internal | | Measured Beam Obscuration: 20.3 % |
| Presentation: 4OHD | Analysis: Polydisperse | Residual: 0.199 % |
| Modifications: None | | |

| | | |
|---|---|---|
| Conc. = 0.0102 %Vol | Density = 1.500 g/cm^3 | S.S.A.= 1.8056 m^2/g |
| Distribution: Volume | D[4, 3] = 12.97 um | D[3, 2] = 2.22 um |
| D(v, 0.1) = 0.75 um | D(v, 0.5) = 4.97 um | D(v, 0.9) = 38.56 um |
| Span = 7.608E+00 | Uniformity = 2.198E+00 | |

| Size (um) | Volume In % | Size (um) | Volume In % | Size (um) | Volume In % | Size (um) | Volume In % |
|---|---|---|---|---|---|---|---|
| 0.313 | | 7.80 | | 22.00 | | 62.00 | |
| | 43.78 | | 7.46 | | 5.55 | | 3.46 |
| 3.90 | | 11.00 | | 31.00 | | 125.0 | |
| | 8.76 | | 6.71 | | 5.54 | | |
| 5.50 | | 15.60 | | 44.00 | | | |
| | 8.37 | | 5.86 | | 4.48 | | |
| 7.80 | | 22.00 | | 62.00 | | | |

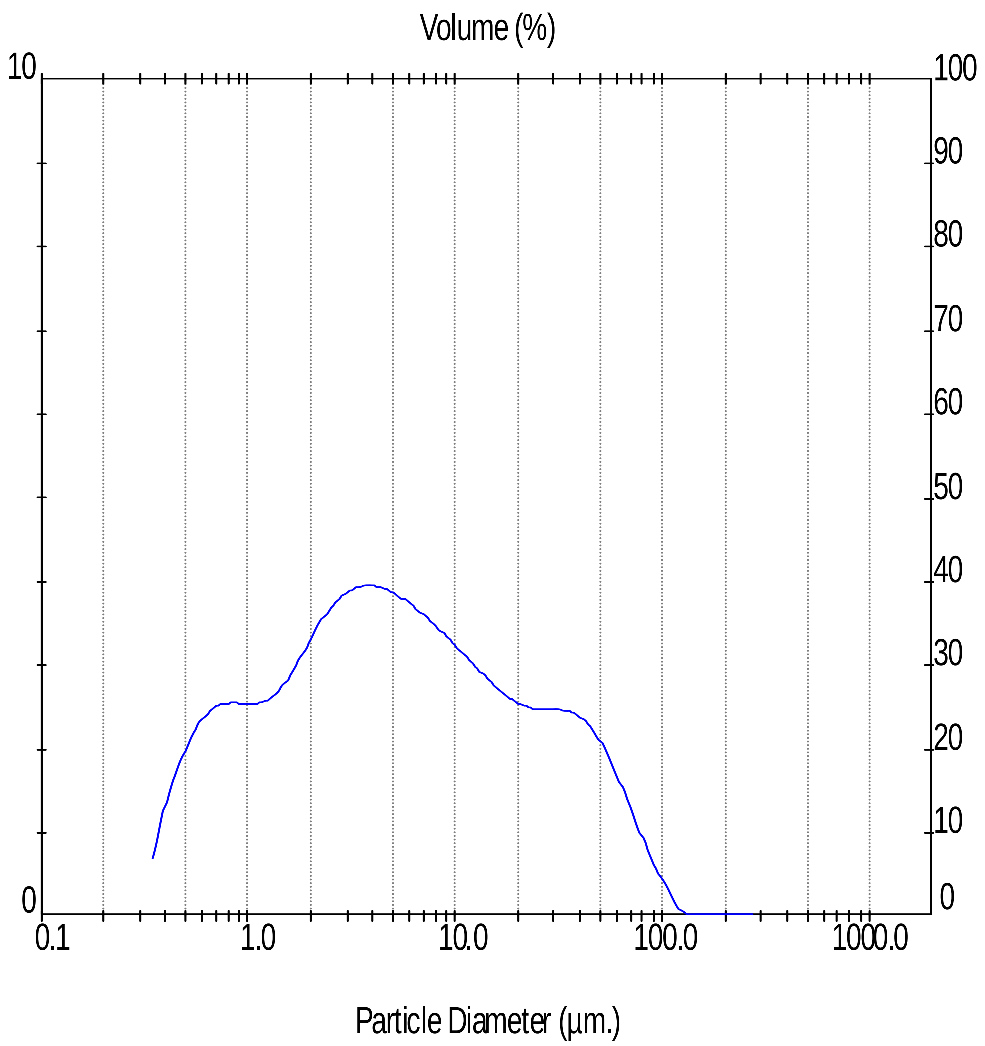


**Figure 65.** Laser diffraction test results for site 40.1, area 4

**Result: Histogram Table**

| | | |
|---|---|---|
| ID: 41.1, Area1/WL017228 | Run No: 6 | Measured: 15/9/2005 16:05PM |
| File: J1110702 | Rec. No: 45 | Analysed: 15/9/2005 16:05PM |
| Path: C:\SIZERMU\DATA\ | | Source: Analysed |

| | | |
|---|---|---|
| Sampler: Internal | | Measured Beam Obscuration: 20.6 % |
| Presentation: 4OHD | Analysis: Polydisperse | Residual: 0.163 % |
| Modifications: None | | |

| | | |
|---|---|---|
| Conc. = 0.0118 %Vol | Density = 1.500 g/cm^3 | S.S.A.= 1.5328 m^2/g |
| Distribution: Volume | D[4, 3] = 10.34 um | D[3, 2] = 2.61 um |
| D(v, 0.1) = 0.96 um | D(v, 0.5) = 5.33 um | D(v, 0.9) = 24.10 um |
| Span = 4.343E+00 | Uniformity = 1.454E+00 | |

| Size (um) | Volume In % | Size (um) | Volume In % | Size (um) | Volume In % | Size (um) | Volume In % |
|---|---|---|---|---|---|---|---|
| 0.313 | | 7.80 | | 22.00 | | 62.00 | |
| | 38.09 | | 10.79 | | 3.81 | | 1.80 |
| 3.90 | | 11.00 | | 31.00 | | 125.0 | |
| | 13.13 | | 8.18 | | 3.04 | | |
| 5.50 | | 15.60 | | 44.00 | | | |
| | 13.11 | | 5.55 | | 2.36 | | |
| 7.80 | | 22.00 | | 62.00 | | | |

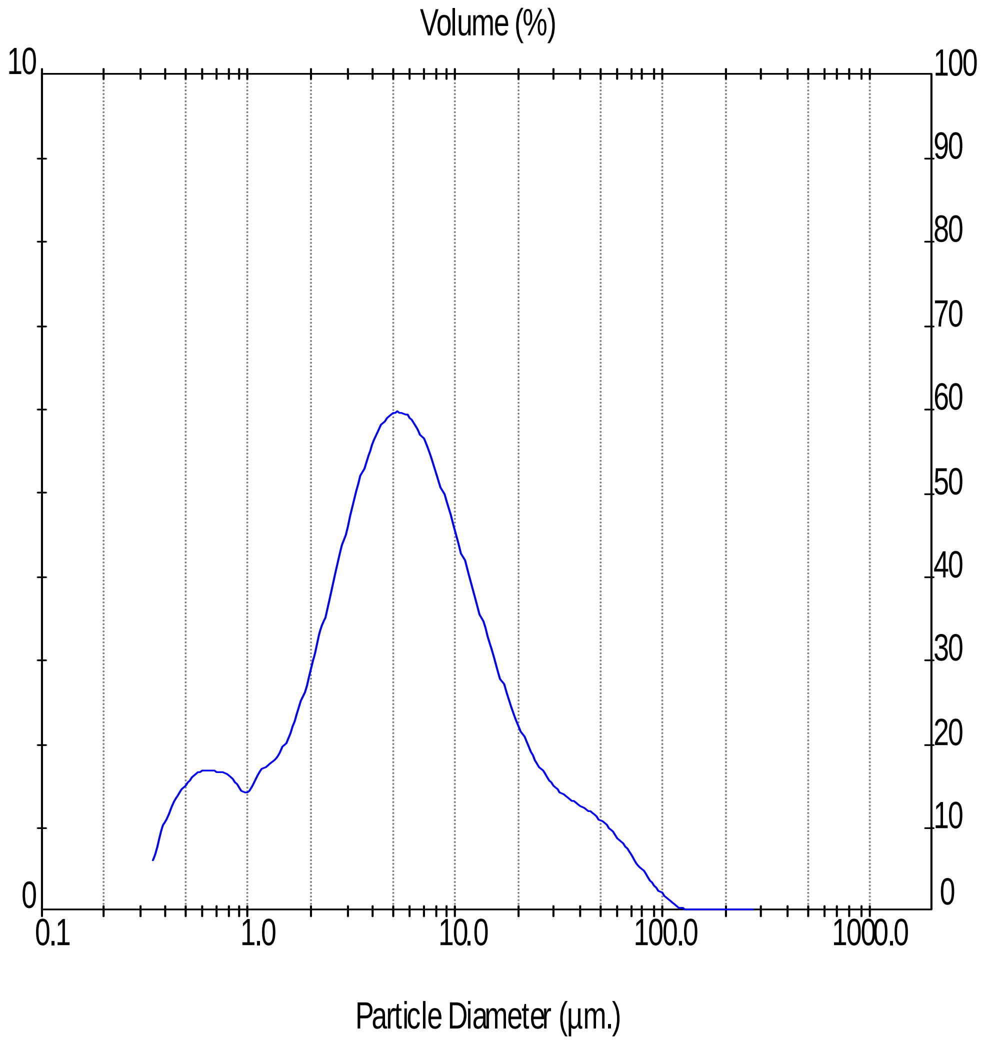


**Figure 66.** Laser diffraction test results for site 41.1, area 4

# 9.3 Particle Size Analyses – Statistical methods

(a) Arithmetic Method of Moments

| Mean | Standard Deviation | Skewness | Kurtosis |
|---|---|---|---|
| $\bar{x}_a = \frac{\Sigma f m_m}{100}$ | $\sigma_a = \sqrt{\frac{\Sigma f (m_m - \bar{x}_a)^2}{100}}$ | $Sk_a = \frac{\Sigma f (m_m - \bar{x}_a)^3}{100 \sigma_a{}^3}$ | $K_a = \frac{\Sigma f (m_m - \bar{x}_a)^4}{100 \sigma_a{}^4}$ |

(b) Geometric Method of Moments

| Mean | Standard Deviation | Skewness | Kurtosis |
|---|---|---|---|
| $\bar{x}_g = \exp \frac{\Sigma f \ln m_m}{100}$ | $\sigma_g = \exp \sqrt{\frac{\Sigma f (\ln m_m - \ln \bar{x}_g)^2}{100}}$ | $Sk_g = \frac{\Sigma f (\ln m_m - \ln \bar{x}_g)^3}{100 \ln \sigma_g{}^3}$ | $K_g = \frac{\Sigma f (\ln m_m - \ln \bar{x}_g)^4}{100 \ln \sigma_g{}^4}$ |

| Sorting ($\sigma_g$) | | Skewness ($Sk_g$) | | Kurtosis ($K_g$) | |
|---|---|---|---|---|---|
| Very well sorted | < 1.27 | Very fine skewed | < $^-$1.30 | Very platykurtic | < 1.70 |
| Well sorted | 1.27 – 1.41 | Fine skewed | $^-$1.30 – $^-$0.43 | Platykurtic | 1.70 – 2.55 |
| Moderately well sorted | 1.41 – 1.62 | Symmetrical | $^-$0.43 – $^+$0.43 | Mesokurtic | 2.55 – 3.70 |
| Moderately sorted | 1.62 – 2.00 | Coarse skewed | $^+$0.43 – $^+$1.30 | Leptokurtic | 3.70 – 7.40 |
| Poorly sorted | 2.00 – 4.00 | Very coarse skewed | > $^+$1.30 | Very leptokurtic | > 7.40 |
| Very poorly sorted | 4.00 – 16.00 | | | | |
| Extremely poorly sorted | > 16.00 | | | | |

(c) Logarithmic Method of Moments

| Mean | Standard Deviation | Skewness | Kurtosis |
|---|---|---|---|
| $\bar{x}_\phi = \frac{\Sigma f m_\phi}{100}$ | $\sigma_\phi = \sqrt{\frac{\Sigma f (m_\phi - \bar{x}_\phi)^2}{100}}$ | $Sk_\phi = \frac{\Sigma f (m_\phi - \bar{x}_\phi)^3}{100 \sigma_\phi{}^3}$ | $K_\phi = \frac{\Sigma f (m_\phi - \bar{x}_\phi)^4}{100 \sigma_\phi{}^4}$ |

| Sorting ($\sigma_\phi$) | | Skewness ($Sk_\phi$) | | Kurtosis ($K_\phi$) | |
|---|---|---|---|---|---|
| Very well sorted | < 0.35 | Very fine skewed | > $^+$1.30 | Very platykurtic | < 1.70 |
| Well sorted | 0.35 – 0.50 | Fine skewed | $^+$0.43 – $^+$1.30 | Platykurtic | 1.70 – 2.55 |
| Moderately well sorted | 0.50 – 0.70 | Symmetrical | $^-$0.43 – $^+$0.43 | Mesokurtic | 2.55 – 3.70 |
| Moderately sorted | 0.70 – 1.00 | Coarse skewed | $^-$0.43 – $^-$1.30 | Leptokurtic | 3.70 – 7.40 |
| Poorly sorted | 1.00 – 2.00 | Very coarse skewed | < $^-$1.30 | Very leptokurtic | > 7.40 |
| Very poorly sorted | 2.00 – 4.00 | | | | |
| Extremely poorly sorted | > 4.00 | | | | |

(d) Logarithmic (Original) Folk and Ward (1957) Graphical Measures

| Mean | Standard Deviation | Skewness | Kurtosis |
|---|---|---|---|
| $M_Z = \frac{\phi_{16} + \phi_{50} + \phi_{84}}{3}$ | $\sigma_I = \frac{\phi_{84} - \phi_{16}}{4} + \frac{\phi_{95} - \phi_5}{6.6}$ | $Sk_I = \frac{\phi_{16} + \phi_{84} - 2\phi_{50}}{2(\phi_{84} - \phi_{16})} + \frac{\phi_5 + \phi_{95} - 2\phi_{50}}{2(\phi_{95} - \phi_5)}$ | $K_G = \frac{\phi_{95} - \phi_5}{2.44(\phi_{75} - \phi_{25})}$ |

| Sorting ($\sigma_I$) | | Skewness ($Sk_I$) | | Kurtosis ($K_G$) | |
|---|---|---|---|---|---|
| Very well sorted | < 0.35 | Very fine skewed | $^{+}0.3$ to $^{+}1.0$ | Very platykurtic | < 0.67 |
| Well sorted | 0.35 – 0.50 | Fine skewed | $^{+}0.1$ to $^{+}0.3$ | Platykurtic | 0.67 – 0.90 |
| Moderately well sorted | 0.50 – 0.70 | Symmetrical | $^{+}0.1$ to $^{-}0.1$ | Mesokurtic | 0.90 – 1.11 |
| Moderately sorted | 0.70 – 1.00 | Coarse skewed | $^{-}0.1$ to $^{-}0.3$ | Leptokurtic | 1.11 – 1.50 |
| Poorly sorted | 1.00 – 2.00 | Very coarse skewed | $^{-}0.3$ to $^{-}1.0$ | Very leptokurtic | 1.50 – 3.00 |
| Very poorly sorted | 2.00 – 4.00 | | | Extremely leptokurtic | > 3.00 |
| Extremely poorly sorted | > 4.00 | | | | |

(e) Geometric Folk and Ward (1957) Graphical Measures

| Mean | Standard Deviation |
|---|---|
| $M_G = \exp\frac{\ln P_{16} + \ln P_{50} + \ln P_{84}}{3}$ | $\sigma_G = \exp\left(\frac{\ln P_{16} - \ln P_{84}}{4} + \frac{\ln P_5 - \ln P_{95}}{6.6}\right)$ |
| **Skewness** | **Kurtosis** |
| $Sk_G = \frac{\ln P_{16} + \ln P_{84} - 2(\ln P_{50})}{2(\ln P_{84} - \ln P_{16})} + \frac{\ln P_5 + \ln P_{95} - 2(\ln P_{50})}{2(\ln P_{25} - \ln P_5)}$ | $K_G = \frac{\ln P_5 - \ln P_{95}}{2.44(\ln P_{25} - \ln P_{75})}$ |

| Sorting ($\sigma_G$) | | Skewness ($Sk_G$) | | Kurtosis ($K_G$) | |
|---|---|---|---|---|---|
| Very well sorted | < 1.27 | Very fine skewed | $^{-}0.3$ to $^{-}1.0$ | Very platykurtic | < 0.67 |
| Well sorted | 1.27 – 1.41 | Fine skewed | $^{-}0.1$ to $^{-}0.3$ | Platykurtic | 0.67 – 0.90 |
| Moderately well sorted | 1.41 – 1.62 | Symmetrical | $^{-}0.1$ to $^{+}0.1$ | Mesokurtic | 0.90 – 1.11 |
| Moderately sorted | 1.62 – 2.00 | Coarse skewed | $^{+}0.1$ to $^{+}0.3$ | Leptokurtic | 1.11 – 1.50 |
| Poorly sorted | 2.00 – 4.00 | Very coarse skewed | $^{+}0.3$ to $^{+}1.0$ | Very leptokurtic | 1.50 – 3.00 |
| Very poorly sorted | 4.00 – 16.00 | | | Extremely leptokurtic | > 3.00 |
| Extremely poorly sorted | > 16.00 | | | | |

**Figure 67:** Statistical formulae used in the calculation of grain size parameters. *f* is the frequency in percent; *m* is the mid-point of each class interval in metric ($m_m$) or phi ($m_\Phi$) units; $P_x$ and $\Phi_x$ are grain diameters, in metric or phi units respectively, at the cumulative percentile value of x.

## 9.4 SACFOR abundance scale

**Abundance scale use of littoral and sublittoral taxa**
(see also http://www.jncc.gov.uk/page-2684)

| Growth form | | | Size of individuals/colonies | | | | Density | |
|---|---|---|---|---|---|---|---|---|
| **% cover** | **Crust/ meadow** | **Massive/ turf** | **<1cm** | **1–3 cm** | **3–15 cm** | **>15 cm** | | |
| >80% | S | | S | | | | >1/0.001 $m^2$ (1x1 cm) | >10,000 / $m^2$ |
| 40–79% | A | S | A | S | | | 1–9/0.001 $m^2$ | 1000–9999 / $m^2$ |
| 20–39% | C | A | C | A | S | | 1–9 / 0.01 $m^2$ (10 x 10 cm) | 100–999 / $m^2$ |
| 10–19% | F | C | F | C | A | S | 1–9 / 0.1 $m^2$ | 10–99 / $m^2$ |
| 5–9% | O | F | O | F | C | A | 1–9 / $m^2$ | |
| 1–5% or density | R | O | R | O | F | C | 1–9 / 10$m^2$ (3.16 x 3.16m) | |
| <1% or density | | R | | R | O | F | 1–9 / 100 $m^2$ (10 x 10m) | |
| | | | | | R | O | 1–9 / 1000 $m^2$ (31.6 x 31.6m) | |
| | | | | | | R | <1/1000 $m^2$ | |

**Key:**
S = Superabundant
A= Abundant
C = Common
F = Frequent
O = Occasional
R = Rare

## 9.5 Full PSA sample statistics including laser diffraction results.

| | | 35.1, Area 1 | 36.2, Area 1 | 40.1, Area 1 | 41.1, Area 1 | 30.1, Area 2 | 31.1, Area 2 | 17.2, Area 4 | 18.1, Area 4 |
|---|---|---|---|---|---|---|---|---|---|
| Method of Moments Logarithmic (ϕ) | Mean $(\bar{x}_\phi)$: | -0.714 | 0.216 | 0.418 | 1.156 | 0.714 | -1.134 | -0.321 | 0.640 |
| | Sorting $(\sigma_\phi)$: | 2.088 | 1.734 | 2.242 | 4.103 | 2.410 | 1.680 | 4.538 | 3.007 |
| | Skewness $(Sk_\phi)$: | 0.778 | 1.168 | 1.781 | 0.792 | 1.391 | 0.783 | 0.457 | 0.502 |
| | Kurtosis $(K_\phi)$: | 5.635 | 9.052 | 9.260 | 2.630 | 6.655 | 6.943 | 2.479 | 4.456 |
| Folk and Ward Method (μM) | Mean $(M_G)$: | 1675.9 | 893.0 | 886.5 | 390.8 | 704.1 | 2239.6 | 1468.5 | 811.2 |
| | Sorting $(\sigma_G)$: | 3.834 | 2.938 | 3.385 | 21.91 | 3.458 | 3.090 | 19.42 | 7.547 |
| | Skewness $(Sk_I)$: | -0.019 | 0.113 | 0.115 | -0.339 | 0.393 | 0.014 | 0.248 | 0.268 |
| | Kurtosis $(K_G)$: | 0.738 | 1.036 | 2.015 | 1.125 | 0.804 | 1.057 | 0.823 | 1.471 |
| Folk and Ward Method (ϕ) | Mean | -0.745 | 0.163 | 0.174 | 1.355 | 0.506 | -1.163 | -0.554 | 0.302 |
| | Sorting | 1.939 | 1.555 | 1.759 | 4.453 | 1.790 | 1.628 | 4.279 | 2.916 |
| | Skewness | 0.019 | -0.113 | -0.115 | 0.339 | -0.393 | -0.014 | -0.248 | -0.268 |
| | Kurtosis | 0.738 | 1.036 | 2.015 | 1.125 | 0.804 | 1.057 | 0.823 | 1.471 |

| | | 35.1, Area 1 | 36.2, Area 1 | 40.1, Area 1 | 41.1, Area 1 | 30.1, Area 2 | 31.1, Area 2 | 17.2, Area 4 | 18.1, Area 4 |
|---|---|---|---|---|---|---|---|---|---|
| Folk and Ward Method (Description) | Mean: | Very Coarse Sand | Coarse Sand | Coarse Sand | Medium Sand | Coarse Sand | Very Fine Gravel | Very Coarse Sand | Coarse Sand |
| | Sorting: | Poorly Sorted | Poorly Sorted | Poorly Sorted | Extremely Poorly Sorted | Poorly Sorted | Poorly Sorted | Extremely Poorly Sorted | Very Poorly Sorted |
| | Skewness: | Symmetrical | Coarse Skewed | Coarse Skewed | Very Fine Skewed | Very Coarse Skewed | Symmetrical | Coarse Skewed | Coarse Skewed |
| | Kurtosis: | Platykurtic | Mesokurtic | Very Leptokurtic | Leptokurtic | Platykurtic | Mesokurtic | Platykurtic | Leptokurtic |
| | Mode 1 (μm): | 375.0 | 750.0 | 750.0 | 750.0 | 375.0 | 1500.0 | 47250.0 | 375.0 |
| | Mode 2 (μm): | 6000.0 | | | 12000.0 | 3000.0 | | 375.0 | 23750.0 |
| | Mode 3 (μm): | | | | 4.700 | | | | 3000.0 |
| | Mode 1 (ϕ): | 1.500 | 0.500 | 0.500 | 0.500 | 1.500 | -0.500 | -5.477 | 1.500 |
| | Mode 2 (ϕ): | -2.500 | | | -3.500 | -1.500 | | 1.500 | -4.489 |
| | Mode 3 (ϕ): | | | | 7.754 | | | | -1.500 |
| | $D_{10}$ (μm): | 305.8 | 262.9 | 270.1 | 4.604 | 167.2 | 547.9 | 12.85 | 130.1 |
| | $D_{50}$ (μm): | 1809.4 | 828.6 | 758.7 | 787.1 | 467.6 | 2201.5 | 504.5 | 454.2 |
| | $D_{90}$ (μm): | 9678.9 | 3874.7 | 4732.5 | 11290.2 | 4057.9 | 9570.9 | 51297.8 | 17247.4 |
| | ($D_{90}$ / $D_{10}$) (μm): | 31.65 | 14.74 | 17.52 | 2452.1 | 24.27 | 17.47 | 3992.8 | 132.6 |
| | ($D_{90}$ - $D_{10}$) (μm): | 9373.2 | 3611.9 | 4462.4 | 11285.6 | 3890.7 | 9023.0 | 51285.0 | 17117.2 |
| | ($D_{75}$ / $D_{25}$) (μm): | 9.539 | 4.132 | 2.694 | 29.85 | 7.418 | 4.352 | 146.9 | 8.318 |
| | ($D_{75}$ - $D_{25}$) (μm): | 4409.3 | 1331.7 | 883.7 | 3834.1 | 1871.0 | 3675.7 | 37434.3 | 2012.8 |

| | | 35.1, Area 1 | 36.2, Area 1 | 40.1, Area 1 | 41.1, Area 1 | 30.1, Area 2 | 31.1, Area 2 | 17.2, Area 4 | 18.1, Area 4 |
|---|---|---|---|---|---|---|---|---|---|
| | $D_{10}$ (ϕ): | -3.275 | -1.954 | -2.243 | -3.497 | -2.021 | -3.259 | -5.681 | -4.108 |
| | $D_{50}$ (ϕ): | -0.855 | 0.271 | 0.398 | 0.345 | 1.097 | -1.139 | 0.987 | 1.139 |
| | $D_{90}$ (ϕ): | 1.709 | 1.928 | 1.889 | 7.763 | 2.581 | 0.868 | 6.282 | 2.942 |
| | ($D_{90}$ / $D_{10}$) (ϕ): | -0.522 | -0.986 | -0.842 | -2.220 | -1.277 | -0.266 | -1.106 | -0.716 |
| | ($D_{90}$ - $D_{10}$) (ϕ): | 4.984 | 3.882 | 4.131 | 11.26 | 4.601 | 4.127 | 11.96 | 7.051 |
| | ($D_{75}$ / $D_{25}$) (ϕ): | -0.415 | -1.518 | -1.911 | -1.464 | -1.598 | 0.059 | -0.375 | -1.560 |
| | ($D_{75}$ - $D_{25}$) (ϕ): | 3.254 | 2.047 | 1.430 | 4.899 | 2.891 | 2.122 | 7.198 | 3.056 |
| | % Gravel: | 48.0% | 21.0% | 18.2% | 33.1% | 26.9% | 53.3% | 42.5% | 26.5% |
| | % Sand: | 51.0% | 77.9% | 76.8% | 44.8% | 68.8% | 46.3% | 44.7% | 66.5% |
| | % Mud: | 0.9% | 1.2% | 5.0% | 22.1% | 4.3% | 0.4% | 12.8% | 7.0% |
| | % V Coarse Gravel: | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 33.0% | 0.0% |
| | % Coarse Gravel: | 4.2% | 0.0% | 0.0% | 4.2% | 0.0% | 4.1% | 0.8% | 11.2% |
| | % Medium Gravel: | 8.0% | 2.4% | 5.4% | 11.5% | 1.8% | 8.0% | 1.3% | 3.2% |
| | % Fine Gravel: | 18.3% | 7.1% | 6.1% | 9.2% | 8.4% | 17.4% | 3.8% | 4.2% |
| | % V Fine Gravel: | 17.5% | 11.5% | 6.7% | 8.2% | 16.7% | 23.9% | 3.7% | 7.9% |
| | % V Coarse Sand: | 13.6% | 21.6% | 13.4% | 9.6% | 12.1% | 25.0% | 2.8% | 3.5% |
| | % Coarse Sand: | 14.1% | 27.4% | 46.3% | 21.1% | 7.4% | 13.4% | 4.7% | 15.2% |

| | | 35.1, Area 1 | 36.2, Area 1 | 40.1, Area 1 | 41.1, Area 1 | 30.1, Area 2 | 31.1, Area 2 | 17.2, Area 4 | 18.1, Area 4 |
|---|---|---|---|---|---|---|---|---|---|
| | % Medium Sand: | 20.2% | 21.6% | 13.7% | 7.2% | 36.7% | 5.5% | 25.9% | 34.5% |
| | % Fine Sand: | 2.6% | 6.3% | 2.4% | 4.4% | 11.8% | 1.9% | 9.4% | 10.9% |
| | % V Fine Sand: | 0.6% | 1.0% | 1.2% | 2.6% | 0.7% | 0.5% | 1.9% | 2.4% |
| | % V Coarse Silt: | 0.1% | 0.1% | 0.5% | 1.2% | 0.4% | 0.0% | 0.8% | 0.8% |
| | % Coarse Silt: | 0.1% | 0.1% | 0.6% | 2.1% | 0.4% | 0.0% | 1.4% | 0.8% |
| | % Medium Silt: | 0.1% | 0.1% | 0.7% | 4.3% | 0.4% | 0.0% | 2.1% | 1.1% |
| | % Fine Silt: | 0.1% | 0.1% | 0.9% | 5.9% | 0.4% | 0.0% | 2.4% | 1.3% |
| | % V Fine Silt: | 0.1% | 0.1% | 0.6% | 2.4% | 0.4% | 0.0% | 1.7% | 0.9% |
| | % Clay: | 0.5% | 0.6% | 1.6% | 6.2% | 2.2% | 0.2% | 4.4% | 2.3% |

# 9.6 Grab sample data (infauna)

| Station | 17.1 | 17.2 | 18.1 | 18.2 | 30.1 | 30.2 | 31.1 | 31.2 | 35.1 | 35.2 | 36.1 | 36.2 | 40.1 | 40.2 | 41.1 | 41.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Pisione remota* | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 6 |
| *Aphrodita aculeata* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *Hermonia hystrix* | 2 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Adyte pellucida* | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 5 | 7 | 0 | 1 | 0 |
| *Harmothoinae* sp. juv | 110 | 91 | 30 | 17 | 15 | 59 | 2 | 53 | 50 | 0 | 19 | 9 | 83 | 65 | 94 | 15 |
| *Harmothoinae* sp. indet. | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 8 | 0 |
| *Malmgrenia* sp. | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Harmothoe* sp. | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 19 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| *Harmothoe extenuata* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| *Harmothoe fragilis* | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| *Harmothoe glabra* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Harmothoe impar* ? | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Harmothoe pagenstecheri* | 1 | 5 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 |
| *Malmgrenia marphysae* | 4 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Lepidonotus squamatus* | 34 | 61 | 30 | 5 | 2 | 18 | 2 | 15 | 20 | 0 | 0 | 2 | 14 | 15 | 62 | 9 |
| *Polynoe scolopendrina* | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Pholoe* sp. B | 51 | 79 | 26 | 7 | 1 | 7 | 0 | 12 | 8 | 0 | 1 | 0 | 15 | 16 | 12 | 11 |
| *Pholoe tuberculata* | 8 | 13 | 2 | 4 | 1 | 10 | 1 | 27 | 1 | 0 | 5 | 4 | 9 | 7 | 27 | 0 |
| *Sthenelais boa* | 7 | 2 | 0 | 1 | 0 | 4 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Sthenelais zetlandica* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| *Eteone* cf. *flava*? | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Eteone* cf. *longa* | 1 | 1 | 2 | 1 | 3 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 3 | 0 |

| **Station** | **17.1** | **17.2** | **18.1** | **18.2** | **30.1** | **30.2** | **31.1** | **31.2** | **35.1** | **35.2** | **36.1** | **36.2** | **40.1** | **40.2** | **41.1** | **41.2** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Hesionura elongata* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 7 |
| *Mysta picta* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| *Pseudomystides limbata* | 1 | 0 | 0 | 0 | 1 | 0 | 3 | 5 | 0 | 0 | 0 | 0 | 2 | 3 | 1 | 0 |
| *Pseudomystides spinachia*? | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Notophyllum foliosum* | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Phyllodoce lineata*? | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Eulalia* sp. juv. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| *Eulalia bilineata* | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 1 |
| *Eulalia expusilla* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| *Eulalia microoculata* | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 5 | 0 | 0 |
| *Eulalia mustela* | 0 | 0 | 1 | 2 | 3 | 1 | 4 | 1 | 1 | 0 | 1 | 1 | 10 | 1 | 3 | 0 |
| *Eulalia tripunctata* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| *Eumida* sp. juv. | 19 | 10 | 12 | 0 | 3 | 20 | 1 | 5 | 1 | 0 | 1 | 0 | 3 | 1 | 4 | 1 |
| *Eumida bahusiensis* | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Eumida ockelmanni* | 4 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Eumida sanguinea* | 7 | 3 | 0 | 0 | 1 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 0 |
| *Phyllodoce* sp. | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Pirakia punctifera* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *Pterocirrus macroceros* | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Glycera* sp. juv. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| *Glycera alba* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| *Glycera gigantea* | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Glycera lapidum* | 7 | 16 | 17 | 21 | 15 | 2 | 23 | 20 | 3 | 2 | 3 | 8 | 14 | 15 | 11 | 3 |
| *Glycera oxycephala* | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| Station | 17.1 | 17.2 | 18.1 | 18.2 | 30.1 | 30.2 | 31.1 | 31.2 | 35.1 | 35.2 | 36.1 | 36.2 | 40.1 | 40.2 | 41.1 | 41.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Goniadidae* juv. | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Glycinde nordmanni* | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Goniada* sp. juv. | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Goniadella* sp. juv. | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Goniadella gracilis* | 0 | 0 | 0 | 0 | 4 | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 3 | 2 | 1 | 0 |
| *Commensodorum commensalis* | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| *Sphaerodorum gracilis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Eurysyllis tuberculata* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 2 | 0 | 2 | 1 |
| *Trypanosyllis coeliaca* | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 2 | 2 | 1 |
| *Syllis* sp. E | 2 | 2 | 1 | 2 | 4 | 0 | 0 | 4 | 5 | 0 | 1 | 3 | 8 | 13 | 7 | 2 |
| *Syllis* sp. X | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| *Syllis* spp. | 13 | 7 | 1 | 0 | 1 | 6 | 0 | 8 | 1 | 2 | 2 | 0 | 2 | 9 | 20 | 2 |
| *Amblyosyllis formosa* | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 3 | 0 | 0 | 0 | 4 | 3 | 3 | 0 |
| *Eusyllis blomstrandi* | 6 | 10 | 13 | 6 | 8 | 12 | 16 | 21 | 25 | 1 | 10 | 12 | 38 | 17 | 37 | 16 |
| *Eusyllis lamelligera* | 4 | 7 | 1 | 0 | 0 | 7 | 0 | 4 | 4 | 0 | 2 | 0 | 2 | 0 | 10 | 3 |
| *Pionosyllis* spp. | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 0 |
| *Odontosyllis ctenostoma* | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| *Syllides benedicti* | 0 | 4 | 0 | 3 | 5 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| *Syllides* sp. Y | 5 | 1 | 1 | 2 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 |
| *Dioplosyllis cirrosa* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| *Opisthodonta pterochaeta* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| *Opisthodonta* sp. A | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 |
| *Streptosyllis bidentata* | 0 | 0 | 0 | 1 | 4 | 0 | 0 | 0 | 0 | 2 | 1 | 4 | 1 | 0 | 0 | 2 |
| *Brania swedmarki* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 3 |

| Station | 17.1 | 17.2 | 18.1 | 18.2 | 30.1 | 30.2 | 31.1 | 31.2 | 35.1 | 35.2 | 36.1 | 36.2 | 40.1 | 40.2 | 41.1 | 41.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Exogone hebes* | 4 | 33 | 29 | 16 | 4 | 2 | 5 | 4 | 0 | 0 | 1 | 0 | 0 | 4 | 1 | 0 |
| *Exogone furcifera* | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| *Exogone naidina* | 0 | 1 | 1 | 1 | 1 | 0 | 2 | 2 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 |
| *Exogone verugera* | 22 | 6 | 10 | 7 | 1 | 0 | 1 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 0 |
| *Sphaerosyllis bulbosa* | 0 | 6 | 5 | 4 | 4 | 0 | 8 | 11 | 3 | 1 | 14 | 36 | 9 | 15 | 32 | 0 |
| *Sphaerosyllis erinaceus* | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Sphaerosyllis taylori* | 2 | 3 | 2 | 1 | 11 | 1 | 5 | 11 | 6 | 0 | 5 | 8 | 7 | 9 | 12 | 2 |
| *Sphaerosyllis tetralix* | 0 | 1 | 0 | 0 | 0 | 2 | 2 | 27 | 1 | 0 | 2 | 1 | 3 | 2 | 3 | 0 |
| *Sphaerosyllis* sp. X | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 2 | 0 | 0 | 2 | 2 | 5 | 1 | 2 | 0 |
| *Sphaerosyllis* sp. Y | 0 | 2 | 0 | 2 | 3 | 0 | 10 | 8 | 5 | 0 | 10 | 38 | 25 | 18 | 14 | 1 |
| *Autolytus* spp. | 12 | 34 | 11 | 9 | 6 | 5 | 3 | 25 | 10 | 1 | 8 | 11 | 37 | 5 | 33 | 5 |
| *Proceraea* sp. | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 2 | 0 | 5 | 0 | 1 | 2 |
| *Procerastea helleziana* | 0 | 2 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Hesionidae* juv. | 0 | 0 | 0 | 0 | 0 | 6 | 4 | 0 | 9 | 0 | 0 | 0 | 0 | 2 | 0 | 2 |
| *Gyptis* sp. juv. | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Gyptis propinqua* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 |
| *Gyptis rosea* | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 2 | 0 | 1 | 0 | 2 | 0 | 5 | 0 |
| *Psamathe fusca* | 5 | 8 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 |
| *Podarke pallida* | 1 | 3 | 1 | 0 | 0 | 2 | 4 | 4 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 |
| *Podarkeopsis capensis* | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Syllidia armata* | 1 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| *Nereididae* sp. | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 0 |
| *Nereis elitoralis* | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| *Nereis longissima* | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| Station | 17.1 | 17.2 | 18.1 | 18.2 | 30.1 | 30.2 | 31.1 | 31.2 | 35.1 | 35.2 | 36.1 | 36.2 | 40.1 | 40.2 | 41.1 | 41.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Nereis zonata* | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 1 |
| *Aglaophamus rubella* | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Nephtys* sp. juv. | 3 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| *Nephtys* sp. indet. | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Nephtys kersivalensis* | 4 | 1 | 0 | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| *Euphrosine* sp. juv. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| *Marphysa bellii* | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Nematonereis unicornis* | 6 | 5 | 4 | 4 | 2 | 0 | 2 | 0 | 1 | 0 | 4 | 1 | 2 | 4 | 7 | 1 |
| *Lumbrineris* sp. juv. | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Lumbrineris gracilis* | 36 | 6 | 21 | 16 | 3 | 8 | 1 | 9 | 1 | 0 | 7 | 5 | 8 | 4 | 24 | 1 |
| *Drilonereis* sp. indet. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Notocirrus scoticus* | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ?*Ougia* spp. | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Parougia* spp. | 5 | 0 | 0 | 0 | 1 | 1 | 3 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| *Protodorvillea kefersteini* | 3 | 3 | 1 | 0 | 1 | 1 | 10 | 4 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 1 |
| *Schistomeringos neglecta* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| *Schistomeringos rudolphi* | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Orbiniidae* indet. | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Orbinia* sp. juv. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *Scoloplos armiger* | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Aricidea catherinae* | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| *Aricidea cerrutii* | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| *Aricidea* cf. *philbinae* | 1 | 3 | 6 | 5 | 6 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| *Cirrophorus branchiatus* | 0 | 5 | 0 | 1 | 0 | 0 | 2 | 1 | 1 | 0 | 0 | 1 | 2 | 1 | 0 | 0 |

| **Station** | **17.1** | **17.2** | **18.1** | **18.2** | **30.1** | **30.2** | **31.1** | **31.2** | **35.1** | **35.2** | **36.1** | **36.2** | **40.1** | **40.2** | **41.1** | **41.2** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Paradoneis* cf. *ilvana* | 3 | 5 | 3 | 2 | 1 | 1 | 12 | 2 | 4 | 0 | 7 | 10 | 13 | 15 | 5 | 1 |
| *Paradoneis lyra* | 1 | 1 | 6 | 4 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 4 | 14 | 5 | 18 | 1 |
| *Poecilochaetus serpens* | 1 | 0 | 5 | 5 | 17 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 1 |
| ?*Atherospio* sp. (Genus A?) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| *Aonides paucibranchiata* | 5 | 26 | 57 | 66 | 94 | 1 | 83 | 32 | 2 | 2 | 12 | 23 | 18 | 40 | 38 | 4 |
| *Laonice* sp. | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Laonice bahusiensis* | 11 | 24 | 7 | 10 | 12 | 0 | 19 | 24 | 6 | 0 | 3 | 3 | 5 | 32 | 39 | 2 |
| *Prionospio cirrifera* | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Prionospio multibranchiata* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Polydora* sp. | 0 | 1 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| *Polydora caeca* ? | 7 | 12 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Polydora caulleryi* | 28 | 37 | 13 | 3 | 2 | 5 | 5 | 10 | 0 | 0 | 0 | 0 | 1 | 1 | 14 | 8 |
| *Polydora hermaphroditica* | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Polydora sanctijosephi*? | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| *Aurospio banyulensis* | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| *Pseudopolydora* sp. juv. | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Pseudopolydora pulchra* | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Scolelepis* sp. juv. | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Scolelepis foliosa* | 1 | 2 | 0 | 2 | 3 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Spio* sp. A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| *Spio* sp. | 1 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Spio armata* | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| *Spiophanes bombyx* | 0 | 1 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Spiophanes kroyeri* | 30 | 19 | 9 | 8 | 6 | 12 | 1 | 2 | 0 | 0 | 1 | 1 | 0 | 0 | 4 | 0 |

| **Station** | **17.1** | **17.2** | **18.1** | **18.2** | **30.1** | **30.2** | **31.1** | **31.2** | **35.1** | **35.2** | **36.1** | **36.2** | **40.1** | **40.2** | **41.1** | **41.2** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Chaetopterus variopedatus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Phyllochaetopterus socialis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| *Apistobranchus tenuis* | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Cirratulidae* sp. indet. | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Aphelochaeta* sp. | 0 | 0 | 0 | 3 | 2 | 0 | 0 | 2 | 1 | 0 | 1 | 0 | 0 | 3 | 1 | 0 |
| *Aphelochaeta marioni* | 0 | 0 | 0 | 2 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Caulleriella alata* | 11 | 1 | 1 | 2 | 6 | 6 | 3 | 2 | 1 | 0 | 0 | 1 | 6 | 5 | 4 | 0 |
| *Caulleriella zetlandica* | 2 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Cirratulus* sp. | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Monticellina dorsobranchialis* | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Tharyx killariensis* | 0 | 1 | 0 | 1 | 0 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *Diplocirrus* sp. A | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| *Flabelligera affinis* | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 4 | 2 | 9 | 4 |
| *Pherusa flabellata* | 1 | 3 | 0 | 0 | 0 | 2 | 0 | 3 | 2 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| *Macrochaeta clavicornis* | 0 | 0 | 0 | 1 | 0 | 0 | 5 | 7 | 0 | 0 | 2 | 0 | 0 | 3 | 2 | 0 |
| *Macrochaeta helgolandica* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 1 |
| *Capitella capitata* | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Mediomastus fragilis* | 76 | 76 | 69 | 61 | 88 | 36 | 95 | 79 | 2 | 0 | 17 | 15 | 30 | 28 | 46 | 8 |
| *Notomastus* sp. B | 16 | 11 | 8 | 7 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 0 |
| *Notomastus* sp. C | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Notomastus* sp. D | 0 | 3 | 5 | 0 | 2 | 2 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 3 | 0 | 0 |
| *Notomastus* sp. E | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| *Notomastus* sp. juv. | 4 | 3 | 3 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Maldanidae* sp. indet. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

| **Station** | **17.1** | **17.2** | **18.1** | **18.2** | **30.1** | **30.2** | **31.1** | **31.2** | **35.1** | **35.2** | **36.1** | **36.2** | **40.1** | **40.2** | **41.1** | **41.2** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Euclymeninae* spp. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Clymenura* sp. | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Clymenura johnstoni* | 2 | 0 | 1 | 5 | 11 | 0 | 0 | 1 | 0 | 1 | 0 | 4 | 0 | 1 | 8 | 0 |
| *Clymenura tricirrata* | 1 | 0 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Euclymene* sp. | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Praxillella affinis* | 18 | 21 | 11 | 9 | 25 | 3 | 0 | 6 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| *Nicomachinae* sp. indet. | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Nicomache trispinata* | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Notoproctus* sp. | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Ophelia* sp. juv. | 0 | 0 | 0 | 1 | 5 | 0 | 2 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 |
| *Ophelia celtica* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 |
| *Ophelina acuminata* | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| *Asclerocheilus* sp. (no eyes) | 5 | 5 | 3 | 5 | 2 | 1 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 3 | 0 | 0 |
| *Asclerocheilus* sp. (with eyes) | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Scalibregma celticum* | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 2 | 2 | 4 | 1 | 1 | 0 |
| *Scalibregma inflatum* | 31 | 3 | 1 | 5 | 5 | 9 | 0 | 2 | 0 | 0 | 1 | 2 | 1 | 1 | 1 | 0 |
| *Galathowenia* sp. | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Owenia fusiformis* | 0 | 1 | 0 | 0 | 2 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| *Lagis koreni* | 8 | 2 | 0 | 1 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Sabellaria spinulosa* | 360 | 318 | 83 | 8 | 1 | 24 | 0 | 2 | 10 | 0 | 0 | 1 | 0 | 57 | 32 | 18 |
| *Ampharetidae* juv. | 0 | 1 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 2 | 0 |
| *Melinna elisabethae* | 21 | 2 | 1 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Melinna* sp. juv. | 38 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| *Ampharete lindstroemi* | 48 | 48 | 10 | 9 | 21 | 10 | 20 | 15 | 3 | 0 | 0 | 0 | 2 | 11 | 10 | 7 |

| **Station** | **17.1** | **17.2** | **18.1** | **18.2** | **30.1** | **30.2** | **31.1** | **31.2** | **35.1** | **35.2** | **36.1** | **36.2** | **40.1** | **40.2** | **41.1** | **41.2** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Anobothrus gracilis* | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Sabellides octocirrata* | 65 | 64 | 44 | 14 | 7 | 6 | 0 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 8 | 4 |
| *Terebellides stroemi* | 10 | 9 | 4 | 4 | 1 | 7 | 0 | 7 | 1 | 0 | 0 | 1 | 2 | 2 | 5 | 1 |
| *Trichobranchus glacialis* | 1 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Trichobranchus* sp. juv. | 5 | 4 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *Terebellidae* juv. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 10 | 1 |
| *Amphitritinae* sp. | 6 | 3 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 1 | 0 |
| *Amphitritides gracilis* | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| *Axionice maculata* | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | 0 |
| *Eupolymnia nesidensis* | 13 | 1 | 2 | 1 | 1 | 7 | 0 | 2 | 1 | 0 | 1 | 0 | 1 | 2 | 0 | 0 |
| *Lanice conchilega* | 0 | 2 | 6 | 0 | 5 | 0 | 4 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Nicolea venustula* | 2 | 1 | 0 | 1 | 4 | 0 | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 8 | 0 |
| *Nicolea zostericola* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *Phisidia aurea* | 2 | 1 | 6 | 5 | 7 | 7 | 1 | 29 | 2 | 0 | 0 | 2 | 2 | 2 | 5 | 0 |
| *Pista cristata* | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| *Polycirrinae indet.* | 1 | 2 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *Lysilla nivea* | 0 | 0 | 1 | 4 | 3 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 3 | 3 | 0 | 0 |
| *Polycirrus* spp. | 4 | 2 | 2 | 5 | 11 | 3 | 6 | 9 | 1 | 0 | 2 | 7 | 4 | 6 | 6 | 1 |
| *Polycirrus aurantiacus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| *Polycirrus medusa* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 4 | 0 | 0 |
| *Polycirrus norvegicus* | 8 | 3 | 0 | 0 | 8 | 2 | 0 | 4 | 0 | 0 | 0 | 1 | 1 | 3 | 8 | 6 |
| *?Streblosoma* spp. | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *Streblosoma* sp. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Thelepus* sp. juv. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |

| **Station** | **17.1** | **17.2** | **18.1** | **18.2** | **30.1** | **30.2** | **31.1** | **31.2** | **35.1** | **35.2** | **36.1** | **36.2** | **40.1** | **40.2** | **41.1** | **41.2** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Thelepus cincinnatus* | 2 | 0 | 8 | 1 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Thelepus setosus* | 2 | 6 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| *Sabellidae* juv. | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 |
| *Sabellinae* sp. juv. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *Branchiomma bombyx* | 11 | 4 | 1 | 0 | 0 | 8 | 0 | 3 | 2 | 0 | 3 | 0 | 1 | 3 | 8 | 12 |
| *Chone* sp. juv. | 7 | 5 | 9 | 0 | 0 | 5 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Chone filicaudata* | 4 | 8 | 8 | 13 | 21 | 0 | 32 | 17 | 0 | 1 | 2 | 6 | 2 | 0 | 5 | 0 |
| *Euchone* sp. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Euchone rubrocincta* | 6 | 2 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Demonax torulis* | 3 | 2 | 0 | 2 | 0 | 1 | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Jasmineira caudata* | 0 | 13 | 6 | 3 | 17 | 2 | 7 | 15 | 3 | 0 | 0 | 0 | 1 | 2 | 13 | 5 |
| *Jasmineira elegans* | 138 | 45 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| *Jasmineira* sp. | 0 | 17 | 0 | 0 | 0 | 9 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Pseudopotamilla reniformis* | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| *Sabella* sp. | 3 | 2 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| *Fabriciola baltica* | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Fabricia/Fabriciola* sp. | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Serpulidae* sp. indet. | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 |
| *Apomatus similis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *Hydroides norvegica* | 6 | 8 | 17 | 8 | 4 | 8 | 18 | 9 | 1 | 0 | 5 | 2 | 0 | 10 | 15 | 0 |
| *Josephella marenzelleri* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *Pomatoceros* sp. | 1 | 0 | 12 | 0 | 0 | 0 | 5 | 26 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Pomatoceros lamarckii* | 7 | 2 | 2 | 4 | 4 | 0 | 0 | 4 | 2 | 0 | 1 | 2 | 2 | 10 | 18 | 2 |
| *Pomatoceros triqueter* | 0 | 1 | 0 | 0 | 0 | 2 | 5 | 1 | 0 | 0 | 2 | 2 | 3 | 0 | 2 | 0 |

| **Station** | **17.1** | **17.2** | **18.1** | **18.2** | **30.1** | **30.2** | **31.1** | **31.2** | **35.1** | **35.2** | **36.1** | **36.2** | **40.1** | **40.2** | **41.1** | **41.2** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Serpula* sp. juv. | 9 | 17 | 29 | 14 | 0 | 2 | 22 | 43 | 1 | 0 | 1 | 5 | 0 | 8 | 6 | 5 |
| *Filograna implexa* | 137 | 3 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 42 |
| *Filogranula gracilis* | 0 | 0 | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 5 | 0 | 0 |
| *Metavermilia multicristata* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| *Circeis spirillum*? | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 2 | 1 | 2 | 0 | 0 |
| *Janua pagenstecheri* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| *Spirorbis* sp. | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| *Tubificidae* spp. | 0 | 24 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 |
| *Grania* spp. | 0 | 1 | 4 | 1 | 6 | 0 | 10 | 0 | 0 | 0 | 1 | 1 | 1 | 5 | 0 | 1 |
| *Golfingia elongata* | 3 | 0 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 8 | 5 | 11 | 8 | 0 |
| *Golfingia vulgaris* | 7 | 2 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 13 | 0 |
| *Nephasoma minutum* | 3 | 4 | 0 | 0 | 1 | 1 | 3 | 0 | 1 | 0 | 0 | 1 | 2 | 1 | 2 | 0 |
| *Phascolion strombus strombus* | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 1 | 0 |
| SIPUNCULA Indet | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Phoronis* sp. | 1 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 4 | 4 | 4 | 1 |
| NEMERTEA | 18 | 2 | 8 | 16 | 9 | 9 | 14 | 5 | 3 | 0 | 7 | 13 | 2 | 16 | 18 | 4 |
| TURBELLARIA | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 |
| ENTEROPNEUSTA sp. A | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| *Abra alba* | 37 | 0 | 0 | 0 | 15 | 3 | 8 | 42 | 0 | 0 | 0 | 0 | 3 | 5 | 6 | 0 |
| *Abra nitida* | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Abra prismatica* | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Aequipecten opercularis* | 0 | 0 | 0 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Alvania semistriata* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ANOMIIDAE indet. | 0 | 0 | 8 | 0 | 0 | 12 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| **Station** | **17.1** | **17.2** | **18.1** | **18.2** | **30.1** | **30.2** | **31.1** | **31.2** | **35.1** | **35.2** | **36.1** | **36.2** | **40.1** | **40.2** | **41.1** | **41.2** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Astarte sulcata* | 0 | 4 | 4 | 3 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 3 | 1 | 1 | 11 | 1 |
| BIVALVE indet. | 10 | 0 | 13 | 10 | 0 | 0 | 4 | 9 | 0 | 1 | 0 | 0 | 1 | 1 | 4 | 0 |
| *Buccinum undatum* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *Caecum glabrum* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| *Calliostoma zizyphinum* | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| cf. *Macellomenia palifera* | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Chaetoderma nitidulum* | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| CHITON? | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 0 |
| *Chlamys* Juv. | 26 | 41 | 17 | 0 | 0 | 11 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Chlamys sulcata* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Chlamys varia* | 0 | 28 | 0 | 0 | 3 | 0 | 0 | 14 | 2 | 1 | 0 | 1 | 8 | 10 | 14 | 4 |
| *Circomphalus casina* | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 1 | 0 | 0 | 0 |
| *Coracuta obliquata* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *Diodora graeca* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| DORIDIDAE Indet. | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Dosinia exoleta* | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Emarginula fissura* | 1 | 4 | 2 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 2 | 0 | 8 | 0 |
| *Ensis ensis* | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Ensis* spp. | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Eulimella laevis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| *Gari depressa* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *Gari fervensis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *Gari indet.* | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| GASTROPODA Indet. | 5 | 0 | 5 | 0 | 1 | 2 | 28 | 0 | 6 | 0 | 0 | 0 | 0 | 10 | 0 | 0 |

| Station | 17.1 | 17.2 | 18.1 | 18.2 | 30.1 | 30.2 | 31.1 | 31.2 | 35.1 | 35.2 | 36.1 | 36.2 | 40.1 | 40.2 | 41.1 | 41.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Gibbula cineraria* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 |
| *Gibbula tumida* | 2 | 17 | 3 | 30 | 0 | 0 | 2 | 34 | 43 | 0 | 0 | 0 | 18 | 87 | 33 | 7 |
| *Glycymeris glycymeris* | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 1 | 0 | 4 | 6 | 2 | 0 | 0 |
| *Goodallia triangularis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *Gouldia minima* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| *Hanleya hanleyi* | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Hemilepton nitidum* | 0 | 23 | 7 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 8 | 0 | 2 | 0 |
| *Heteranomia squamula* | 0 | 6 | 0 | 6 | 5 | 2 | 0 | 24 | 3 | 0 | 0 | 3 | 5 | 5 | 21 | 8 |
| *Hiatella arctica* | 38 | 21 | 1 | 0 | 2 | 12 | 1 | 3 | 11 | 0 | 0 | 0 | 4 | 8 | 18 | 16 |
| *Hydrobia ulvae*? | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| *Laevicardium crassum* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *Laevicardium* Juv. | 0 | 0 | 14 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Leptochiton asellus* | 20 | 37 | 21 | 32 | 15 | 6 | 14 | 32 | 6 | 0 | 0 | 0 | 16 | 35 | 40 | 3 |
| *Lima hians* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| *Lima loscombi* | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 1 | 2 | 4 | 2 | 0 |
| *Lutraria lutraria* | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Lyonsia norvegica* Juv. | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Modiolarca subpicta* | 4 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 |
| *Modiolus modiolus* [juv.] | 0 | 8 | 2 | 1 | 0 | 1 | 18 | 28 | 0 | 0 | 0 | 0 | 2 | 4 | 23 | 0 |
| *Moerella donacina* | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MOLLUSCA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| *Montacuta ferruginosa* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 |
| *Montacuta* Juv. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *Musculus discors* | 0 | 0 | 5 | 2 | 0 | 1 | 0 | 0 | 3 | 5 | 0 | 0 | 1 | 2 | 17 | 1 |

| **Station** | **17.1** | **17.2** | **18.1** | **18.2** | **30.1** | **30.2** | **31.1** | **31.2** | **35.1** | **35.2** | **36.1** | **36.2** | **40.1** | **40.2** | **41.1** | **41.2** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Mya truncata* | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Mysella bidentata* | 0 | 0 | 0 | 3 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 4 | 5 | 1 | 3 |
| *Mytilus edulis* | 66 | 322 | 27 | 35 | 64 | 69 | 100 | 34 | 66 | 0 | 0 | 0 | 28 | 46 | 131 | 66 |
| *Nematomenia banyulensis* | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| *Neolepton sulcatulum* | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Neomenia carinata* | 0 | 3 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Nucula Indet* | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Nucula hanleyi* | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Nucula sulcata* | 0 | 11 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Nuculoma tenuis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 0 |
| *Nuculana minuta* | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NUDIBRANCH Indet. | 4 | 3 | 1 | 3 | 4 | 5 | 7 | 4 | 1 | 0 | 0 | 0 | 14 | 11 | 9 | 2 |
| *Odostomia* | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Onoba semicostata* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| *Palliolum tigerinum* | 16 | 4 | 4 | 9 | 12 | 0 | 12 | 21 | 5 | 0 | 0 | 0 | 3 | 9 | 0 | 0 |
| *Partulida pellucida* | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| *Parvicardium scabrum* | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Parvicardium* Juv. | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PECTINIDAE Juv. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Pusillina inconspicua* | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 |
| *Pusillina sarsi* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Rissoa parva* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| *Rissoella diaphana* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 3 | 0 |
| *Sphenia binghami* | 72 | 86 | 23 | 17 | 0 | 7 | 5 | 9 | 7 | 0 | 0 | 0 | 1 | 10 | 44 | 11 |

| **Station** | **17.1** | **17.2** | **18.1** | **18.2** | **30.1** | **30.2** | **31.1** | **31.2** | **35.1** | **35.2** | **36.1** | **36.2** | **40.1** | **40.2** | **41.1** | **41.2** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Spisula elliptica* | 0 | 0 | 0 | 17 | 4 | 0 | 148 | 13 | 0 | 0 | 0 | 0 | 9 | 11 | 4 | 48 |
| *Spisula ovalis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Spisula subtruncata* | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Tapes rhomboides* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 |
| *Tellina pygmaea* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 4 | 0 | 0 | 0 | 2 | 3 | 0 | 0 |
| *Thracia* Indet. | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Thracia phaseolina* | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 6 | 8 | 3 | 1 |
| *Thracia villosiuscula* | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 |
| *Timoclea ovata* | 14 | 9 | 3 | 23 | 10 | 0 | 36 | 55 | 13 | 1 | 0 | 3 | 5 | 8 | 19 | 1 |
| *Tricolia pullus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Velutina velutina* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *Venerupis corrugata* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Nymphon brevirostre* | 6 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 0 | 10 | 1 | 5 | 1 |
| *Nymphon brevitarse* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| *Achelia echinata* | 36 | 52 | 23 | 2 | 7 | 23 | 4 | 12 | 12 | 4 | 8 | 5 | 28 | 21 | 53 | 12 |
| *Anoplodactylus petiolatus* | 13 | 19 | 17 | 1 | 3 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 12 | 0 | 1 |
| *Callipallene brevirostris* | 20 | 27 | 12 | 2 | 4 | 8 | 0 | 15 | 11 | 1 | 2 | 3 | 7 | 1 | 38 | 4 |
| *Endeis spinosa* | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 3 | 0 | 0 | 0 |
| *Pycnogonum litorale* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| *Copidognathus rhodostigma* | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 |
| *Arhodeoporus gracilipes* | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| *Simognathus leiomerus* | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| *Rhodinicola elongata* | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Munna minuta* | 41 | 24 | 5 | 1 | 1 | 12 | 0 | 0 | 2 | 0 | 0 | 0 | 6 | 1 | 2 | 4 |

| **Station** | **17.1** | **17.2** | **18.1** | **18.2** | **30.1** | **30.2** | **31.1** | **31.2** | **35.1** | **35.2** | **36.1** | **36.2** | **40.1** | **40.2** | **41.1** | **41.2** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Anthura gracilis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 4 | 0 | 0 | 0 |
| *Eurydice inermis* | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Janira maculosa* | 0 | 2 | 2 | 0 | 0 | 3 | 0 | 0 | 4 | 0 | 1 | 0 | 4 | 1 | 0 | 0 |
| *Microjaera anisopoda* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| *Gnathia praniza* larvae & females | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Pseudoparatanais batei* | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| *Tanaopsis graciloides* | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Akanthophoreus gracilis* | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Leptognathia paramanca* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| *Pseudotanais jonesi* | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *Eudorella truncatula* | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Nannastacus unguiculatus* | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 1 | 1 | 3 | 1 |
| *Cumella pygmaea* | 10 | 8 | 1 | 1 | 0 | 1 | 1 | 9 | 3 | 0 | 0 | 3 | 2 | 9 | 3 | 0 |
| *Eusirus longipes* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Synchelidium maculatum* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| *Parapleustes bicuspis* | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| *Stenopleustes nodifer* | 9 | 21 | 2 | 0 | 0 | 3 | 0 | 0 | 2 | 0 | 0 | 3 | 15 | 3 | 4 | 1 |
| *Amphilocus manudens* | 3 | 11 | 4 | 0 | 0 | 7 | 1 | 3 | 7 | 0 | 1 | 1 | 9 | 6 | 5 | 1 |
| *Amphilocus indet* | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Gitana sarsi* | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 3 | 0 | 1 | 2 | 7 | 1 | 1 | 0 |
| *Peltocoxa brevirostris* | 0 | 5 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| *Leucothoe richiardii* | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| *Cressa dubia* | 29 | 89 | 25 | 13 | 5 | 19 | 0 | 6 | 21 | 2 | 11 | 11 | 56 | 11 | 62 | 13 |
| *Metopa ?bruzelii* | 5 | 12 | 5 | 2 | 0 | 7 | 0 | 1 | 0 | 0 | 0 | 0 | 42 | 0 | 7 | 0 |

| Station | 17.1 | 17.2 | 18.1 | 18.2 | 30.1 | 30.2 | 31.1 | 31.2 | 35.1 | 35.2 | 36.1 | 36.2 | 40.1 | 40.2 | 41.1 | 41.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Parametopa kervillei* | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Stenothoe marina* | 3 | 6 | 2 | 1 | 3 | 14 | 0 | 0 | 1 | 0 | 0 | 2 | 8 | 4 | 5 | 0 |
| *Harpinia pectinata* | 4 | 1 | 2 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Lysianassa plumosa* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| *Orchomene humilis* | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| *Argissa hamatipes* | 0 | 11 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Iphimedia eblanae* | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Iphimedia obesa* | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 |
| *Liljeborgia pallida* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 2 | 0 | 0 |
| *Atylus vedlomensis* | 0 | 0 | 0 | 2 | 5 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| *Guernea coalita* | 0 | 0 | 3 | 6 | 12 | 0 | 20 | 3 | 2 | 1 | 5 | 6 | 3 | 4 | 0 | 0 |
| *Ampelisca diadema* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *Ampelisca spinipes* | 47 | 39 | 37 | 7 | 2 | 38 | 17 | 0 | 1 | 0 | 0 | 0 | 2 | 4 | 7 | 3 |
| *Melphidippella macra* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 |
| *Ceradocus semiserratus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Cheirocratus sundevalli* | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 |
| *Cheirocratus* sp | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 5 | 7 | 1 | 0 |
| *Maera othonis* | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 11 | 0 | 0 | 0 |
| *Maera* sp | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 |
| *Maerella tenuimana* | 0 | 0 | 3 | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 1 | 2 | 0 |
| *Gammaropsis maculata* | 9 | 30 | 8 | 0 | 0 | 25 | 0 | 2 | 3 | 0 | 0 | 3 | 8 | 1 | 6 | 0 |
| *Gammaropsis palmata* | 16 | 10 | 1 | 6 | 8 | 3 | 2 | 6 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 0 |
| *Gammaropsis* indet | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 1 | 0 | 0 |
| *Gammaropsis cornuta* | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| **Station** | **17.1** | **17.2** | **18.1** | **18.2** | **30.1** | **30.2** | **31.1** | **31.2** | **35.1** | **35.2** | **36.1** | **36.2** | **40.1** | **40.2** | **41.1** | **41.2** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Ericthonius punctatus* | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Ericthonius* sp | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| *Jassa* sp | 18 | 11 | 2 | 0 | 0 | 2 | 0 | 3 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 0 |
| *Microjassa cumbrensis* | 9 | 2 | 4 | 2 | 1 | 6 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Aora gracilis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| *Aoriidae* indet | 0 | 1 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| *Autonoe longipes* | 0 | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Leptocheirus hirsutimanus* | 1 | 0 | 0 | 1 | 0 | 0 | 2 | 4 | 1 | 0 | 0 | 0 | 2 | 3 | 3 | 1 |
| *Unciola crenatipalma* | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Unciola planipes* | 0 | 0 | 4 | 11 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Dyopedos porrectus* | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Caprella linearis* | 16 | 36 | 17 | 0 | 0 | 1 | 0 | 3 | 3 | 0 | 1 | 17 | 24 | 3 | 4 | 0 |
| *Parvipalpus capillaceus* | 0 | 4 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Phtisica marina* | 8 | 4 | 1 | 0 | 0 | 37 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Pseudoprotella phasma* | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Eualus pusiolus* | 2 | 3 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 3 | 0 | 3 | 0 | 4 | 0 |
| *Pandalina brevirostris* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Upogebia* Juv. | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 3 | 0 |
| *Anapagurus laevis* | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PAGURIDAE Juv. | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| *Galathea squamifera* | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Galathea* Juv. | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| *Atelecyclus rotundatus* | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *Ebalia tuberosa* | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 2 | 8 | 3 | 0 |

| **Station** | **17.1** | **17.2** | **18.1** | **18.2** | **30.1** | **30.2** | **31.1** | **31.2** | **35.1** | **35.2** | **36.1** | **36.2** | **40.1** | **40.2** | **41.1** | **41.2** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Ebalia tumefacta* | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Ebalia* Juv. | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Eurynome spinosa* | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 |
| *Eurynome* Juv. | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 |
| *Hyas coarctatos* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 2 | 3 | 0 | 0 |
| *Inachus* Juv. | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| *Liocarcinus* Juv. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| *Monodaeus couchi* | 6 | 4 | 1 | 1 | 1 | 4 | 1 | 4 | 0 | 0 | 1 | 2 | 2 | 0 | 2 | 1 |
| *Pisidia longicornis* | 17 | 8 | 0 | 0 | 0 | 16 | 1 | 6 | 0 | 0 | 1 | 4 | 18 | 17 | 7 | 5 |
| *Balanus balanus* | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 1 | 0 | 0 |
| *Balanus crenatus* | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| *Verruca stroemia* | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Crossaster papposus* | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Asterias rubens* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Echinocyamus pusillus* | 0 | 0 | 0 | 0 | 5 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *Psammechinus miliaris* | 6 | 4 | 1 | 3 | 6 | 7 | 2 | 19 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 1 |
| *Leptosynapta* Juv. | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Thyone fusus* | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CUCUMARIIDAE Juv. | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| HOLOTHUROIDEA Juv. | 5 | 0 | 8 | 2 | 1 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 6 | 5 | 0 |
| *Ophiocomina nigra* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| *Ophiothrix fragilis* | 3 | 4 | 2 | 1 | 0 | 3 | 0 | 0 | 1 | 0 | 4 | 1 | 3 | 0 | 4 | 1 |
| *Amphipholis squamata* | 28 | 33 | 8 | 5 | 6 | 5 | 6 | 44 | 13 | 2 | 11 | 19 | 12 | 12 | 44 | 11 |
| *Amphiura securigera* | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

| **Station** | **17.1** | **17.2** | **18.1** | **18.2** | **30.1** | **30.2** | **31.1** | **31.2** | **35.1** | **35.2** | **36.1** | **36.2** | **40.1** | **40.2** | **41.1** | **41.2** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Amphiuridae* Juv. | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| OPHIUROIDEA Juv. | 1 | 1 | 1 | 4 | 6 | 0 | 34 | 57 | 6 | 0 | 1 | 2 | 3 | 8 | 13 | 0 |

## 9.7 List of Biotope Codes used within this project

Taken from The Marine Habitat Classification for Britain and Ireland Version 04.05 (Connor *et al.*, 2004).

Note, biotope codes with asterix do not exist within current classification, but have been derived for the purposes of this study.

| **Biotope code** | **Biotope description** |
|---|---|
| CR.MCR.EcCr.FaAlCr.Adig | *Alcyonium digitatum*, *Pomatoceros triqueter*, algal and bryozoan crusts on wave-exposed circalittoral rock |
| CR.MCR.EcCr.FaAlCr.Bri | Brittlestar bed on faunal and algal encrusted, exposed to moderately wave-exposed circalittoral rock |
| CR.MCR.EcCr.FaAlCr.Flu | *Flustra foliacea* on slightly scoured silty circalittoral rock |
| CR.HCR.XFa.CvirCri | *Corynactis viridis* and a mixed turf of crisiids, *Bugula*, *Scrupocellaria*, and *Cellaria* on moderately tide-swept exposed circalittoral rock |
| CR.HCR.XFa.FluCoAs | *Flustra foliacea* and colonial ascidians on tide-swept moderately wave-exposed circalittoral rock |
| CR.HCR.XFa.SpNemAdia | Sparse sponges, *Nemertesia* spp., and *Alcyonidium diaphanum* on circalittoral mixed substrata |
| SS.SBR.PoR.SspiMx | *Sabellaria spinulosa* on stable circalittoral mixed sediment |
| SS.SCS.CCS.1* | A community on Circalittoral Coarse Sediment currently not identified within the Marine Habitat Classification |
| SS.SCS.CCS.MedLumVen | *Mediomastus fragilis*, *Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel |
| SS.SCS.CCS.PomB | *Pomatoceros triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles |
| SS.SSa.IFiSa.ScupHyd | *Sertularia cupressina* and *Hydrallmania falcata* on tide-swept sublittoral sand with cobbles or pebbles |
| SS.SSa.IMuSa | Infralittoral muddy sand |
| SS.SMu.CSaMu.LkorPpel | *Lagis koreni* and *Phaxas pellucidus* in circalittoral sandy mud |
| SS.SMx | Sublittoral mixed sediment biotope complex |
| SS.SMx.CMx. | Circalittoral mixed sediment |
| SS.SMx.CMx.1* | A community on Sublittoral Mixed Sediment currently not identified within the Marine Habitat Classification |
| SS.SMx.CMx.FluHyd | *Flustra foliacea* and *Hydrallmania falcata* on tideswept circalittoral mixed sediment *Flustra foliacea* and *Hydrallmania falcata* on tideswept circalittoral mixed sediment |
| SS.SMx.CMx.FluHyd.1* | A community on Circalittoral Mixed Sediment currently not identified within the Marine Habitat Classification |
| SS.SMx.CMx.FluHyd.2* | A community on Circalittoral Mixed Sediment currently not identified within the Marine Habitat Classification |
| SS.SMx.CMx.OphMx | *Ophiothrix fragilis* and/or *Ophicomina nigra* brittlestar beds on sublittoral mixed sediment |
| SS.SMx.OMx.PoVen | Polychaete-rich deep Venus community in offshore mixed sediments |

## 9.8 Grab sample data (epifauna)

| Station | 17.1 | 17.2 | 18.1 | 18.2 | 30.1 | 30.2 | 31.1 | 31.2 | 35.1 | 35.2 | 36.1 | 36.2 | 40.1 | 40.2 | 41.1 | 41.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Porifera* indet. Enc. | P | | | | | P | | | | | | | | | | |
| *Scypha ciliata* | P | | P | | | | | | | | | | | | | |
| *Polymastia* sp. | | | | | | | | | | | | | | P | | |
| *Haliclona oculata* | | | | | | | | | | | | | | P | | |
| Hydroid stolonal indet | | | | P | | | | | | | | | | | | |
| *Hydrallmania falcata* | | P | P | P | P | P | | P | P | | P | P | P | | P | |
| *Sarsia lovenii* | P | | | | | | | | | | | | | | | |
| *Eudendrium* sp. (no polyps) | | | | | P | | | | | | | | | | | |
| *Eudendrium* ?*album* | | P | | | | | | | | | | | | | | |
| *Modeeria rotunda* | | | | | | | | | P | P | | | | | | |
| *Calycella syringa* | | P | | | P | | | | | | P | P | | | P | |
| *Lafoea dumosa* | | | | | | | | | | | | | | | P | |
| *Halecium undulatum* | | | | | | | | | P | | | | | | | |
| *Abietinaria abietina* | | | | | | | P | | | | | | | | | |
| *Diphasia attenuata* | P | | P | | | | | | | | P | P | P | P | | |
| *Diphasia fallax* | | | | | | | | | P | | | | | | | |
| *Diphasia rosacea* | | | | | | | | | P | | | | | | | |
| *Sertularella gaudichaudii* | | P | | | | P | | | | | P | | P | P | | |
| *Sertularella gayi* | | | | | | | | | | | | | | | P | |
| *Sertularella rugosa* | | | P | | | | | | | | | | | | P | |
| *Sertularella tenella* | P | P | P | P | P | | | | | | | | P | P | P | |
| *Sertularia argentea* | P | P | P | P | P | | | | P | | P | | P | P | P | |
| *Antennella secundaria* | | P | | | | | | | | | | | | | | |

| Station | 17.1 | 17.2 | 18.1 | 18.2 | 30.1 | 30.2 | 31.1 | 31.2 | 35.1 | 35.2 | 36.1 | 36.2 | 40.1 | 40.2 | 41.1 | 41.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Halopteris catharina* | | P | | | | | | | | | | | | | | |
| *Nemertesia antennina* | P | | | | | P | | | P | | | P | | | | |
| *Nemertesia ramosa* | | | | | | | | | P | | | | | | | |
| *Plumularia setacea* | | | | | P | | | | | | | | | | | |
| *Aglaophenia tubulifera* | P | P | | | | P | | | | | | | | | | |
| *Campanularia hincksii* | | | | | | | | | | | | | | | P | |
| *Orthopyxis integra* | | | | | | | | | | | P | P | | | | |
| *Rhizocaulus verticillatus* | | | | | | | | | | | P | | | | | |
| *Clytia hemisphaerica* | | | | | | | | | | | | | | | P | |
| *Laomedea flexuosa* | | | | | | | | | | | P | P | | | | |
| *Obelia dichotoma* | | | | P | | | | | | | | | | | | |
| *Alcyonium digitatum* | | | | P | | P | | | | | | | | P | | |
| *Anemone* indet | P | P | P | P | | P | | P | | | | | | | P | |
| Crisiid stolons | | | P | | | | | | | | | | | | | |
| *Filicrisia geniculata* | | P | | | | | | | | | | | | | | |
| *Crisidia cornuta* | P | P | | | | | | | P | | P | P | P | | P | |
| *Crisia aculeata* | P | | | | | | | | | | | | P | | | |
| *Crisia denticulata* | | | | | | | | | | | P | | | | | |
| *Crisia eburnea* | P | P | | | | | | | P | P | P | P | P | | P | |
| *Tubulipora liliacea* | | | | | | P | | P | P | | | | | | | |
| *Tubulipora lobifera* | | P | P | P | | P | | | P | | P | P | | P | P | |
| *Tubulipora penicillata* | | | | P | | | | | | | P | | | | | |
| *Eurystrotos compacta* | P | | | P | P | P | | P | | | P | P | P | P | | |
| *Plagioecia patina* | | P | | | P | | | P | | | | | | P | | |
| *Diplosolen obelia* | | | | P | | P | | | | | | P | | P | P | |

| Station | 17.1 | 17.2 | 18.1 | 18.2 | 30.1 | 30.2 | 31.1 | 31.2 | 35.1 | 35.2 | 36.1 | 36.2 | 40.1 | 40.2 | 41.1 | 41.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Entalophoroecia deflexa* | | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P |
| *Disporella hispida* | P | P | P | P | P | | P | P | P | P | P | P | P | P | P | P |
| *Alcyonidium* enc. sp. | P | | | P | | | P | | P | | | | P | | | P |
| *Alcyonidium ?albidum* | | | | | | | | | | | P | | | | | |
| ?*Nolella dilatata* on ascidian test | | | | | | | | | | | | | P | | | |
| *Walkeria uva* | | | | | | | | | | | | | | | P | |
| *Mimosella verticillata* | | | | | | | | | | | P | P | | | | |
| *Penetrantia concharum* | | | | | | | | | | | | | P | | | |
| *Vesicularia spinosa* | P | P | P | | | | | | | | | | P | | | |
| *Amathia lendigera* | P | P | P | | | P | | | P | | P | P | P | P | P | |
| *Aetea anguina* | | | | | | P | | | P | | | | | | | |
| *Eucratea loricata* | P | | | P | | | | | | | | | | | | |
| *Conopeum reticulum* | | | | | | | P | P | | | | P | | P | | P |
| *Electra pilosa* | | | P | | | P | P | P | P | | P | P | P | P | P | P |
| *Pyripora catenularia* | | | P | P | | | | | P | P | P | P | P | | | P |
| *Flustra foliacea* | P | P | P | | | | | | | P | | | P | P | | |
| *Flustra foliacea* basal layer only | | | | P | | | | | | | | | | | | |
| *Callopora dumerilii* | P | P | | P | | P | P | P | P | | P | | P | P | P | P |
| *Alderina imbellis* | | | | | | P | | | | | | | | | | |
| *Amphiblestrum auritum* | | | | | | | | | | | | | P | P | | |
| *Amphiblestrum flemingii* | P | | | P | P | P | | P | P | | P | | P | P | P | P |
| *Bugula flabellata* | | P | | | | P | | | | | | | P | P | P | |
| *Bugula plumosa* | P | P | P | | | | | | | | | | P | | | |
| *Bicellariella ciliata* | | | | | | P | | | P | | | P | P | P | P | |
| *Beania mirabilis* | P | | P | P | P | P | | | P | | P | P | P | | P | |

| Station | 17.1 | 17.2 | 18.1 | 18.2 | 30.1 | 30.2 | 31.1 | 31.2 | 35.1 | 35.2 | 36.1 | 36.2 | 40.1 | 40.2 | 41.1 | 41.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Scrupocellaria scruposa* | P | | | | P | | P | | P | | P | | P | P | P | P |
| *Micropora coriacea* | | | | | | | | | | | | | | | | P |
| *Cellaria fistulosa* | | | | | | | | | P | P | | | P | | P | |
| *Cellaria sinuosa* | P | | | | | | | | P | P | | | | P | | |
| *Puellina bifida* | | | | | | | | | | | | | P | | | |
| *Puellina innominata* | | | | | | | P | | | | | | | P | | |
| *Hippothoa divaricata* | | | | | | | | | | | | P | | | | |
| *Hippothoa flagellum* | P | P | | P | P | P | P | P | | P | P | | | P | | |
| *Chorizopora brongniartii* | | | | | | | P | P | P | | P | P | P | P | P | P |
| *Escharella immersa* | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P |
| *Escharella variolosa* | P | P | P | P | | P | P | | P | P | | | P | | P | P |
| *Escharella ventricosa* | | P | P | P | P | | | P | | | P | P | | P | | P |
| *Porella concinna* | | | | P | P | P | | P | | | P | P | P | P | P | |
| *Schizoporella hesperia* | | | | | | | | | | | | | | P | | |
| *Escharina hyndmanni* | | | | | P | | P | | | | | | | P | | P |
| *Escharina johnstoni* | | | | | | | | | | | | | | P | P | P |
| *Smittoidea reticulata* | | | | | | P | | | | | | | | | | |
| *Schizomavella auriculata* | | | P | | P | P | | P | P | | P | | P | P | | |
| *Schizomavella cuspidata* | | | | | | | | | | | P | | | | | |
| *Schizomavella linearis* | | | P | P | | P | P | | | | | | P | P | P | |
| *Microporella ciliata* | | | P | | | | | P | | | | P | P | P | P | P |
| *Fenestrulina malusii* | P | | P | P | | P | | P | P | P | P | P | P | P | P | P |
| *Cellepora pumicosa* | | | | | | P | | P | P | | P | P | P | P | P | |
| *Schizotheca fissa* | | | | | | | | | | | | | P | | | |
| *Ascidian* indet. | | | | | | | | | | | | | | P | P | |

| Station | 17.1 | 17.2 | 18.1 | 18.2 | 30.1 | 30.2 | 31.1 | 31.2 | 35.1 | 35.2 | 36.1 | 36.2 | 40.1 | 40.2 | 41.1 | 41.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Didemnidae* indet. | | | P | | | | | | | | | | | | | |
| *Perophora listeri* | P | P | | | | P | | | | | P | P | | | | |
| *Ascidiella scabra* | P | P | | P | | | | | | | | | P | P | | |
| *Ascidia mentula* | | P | | | | | | | | | | | | | | |
| *Ascidia virginea* | | | | | | | | | | | | | | | | P |
| *Polycarpa pomaria* | P | | | | | | | | | | | | | P | | |
| *Dendrodoa grossularia* | P | P | P | P | P | P | | | | P | P | P | P | P | P | |
| *Pyura tessellata* | | | | | | | | | | | | | | P | | |
| ?*Molgula* sp. small solitary gravel enc. | P | | P | | P | | | | | | | | | P | P | P |

# 9.9 Video analysis data

| Sample Reference | 1.32.1 | 1.33.1 | 1.34.1 | 1.34.2 | 1.37.1 |
|---|---|---|---|---|---|
| Sample | DC.1-32.S1 | DC.1-33.S1 | DC.1-34.S1 | DC.1-34.S2 | DC.1-37.S1 |
| Section | 1 | 1 | 1 | 2 | 1 |
| Area | 1 | 1 | 1 | 1 | 1 |
| Video Line No. | 32 | 33 | 34 | 34 | 37 |
| Event Name | 1-32 | 1-33 | 1-34 | 1-34 | 1-37 |
| Event reference | DC.1-32 | DC.1-33 | DC.1-34 | DC.1-34 | DC.1-37 |
| Video Section No. | 1 | 1 | 1 | 2 | 1 |
| Gear type | DC | DC | DC | DC | DC |
| Date (dd/mm/yy) | 13/08/2005 | 13/08/2005 | 13/08/2005 | 13/08/2005 | 13/08/2005 |
| Start Time | 10:36 | 11:00 | 11:26 | 11:27 | 16:02 |
| Duration (mins) | 08:37 | 09:24 | 01:22 | 04:08 | 01:36 |
| Visual quality of sample (poor/moderate/good) | Good | Poor | Poor | Poor | |
| Time (hh:mm:ss) | 10:36:21 | 11:00:22 | 11:26:25 | 11:27:47 | 16:02:14 |
| Notes | | Too fast | Too fast | Too fast | |
| Length (m) | 344 | 466 | 70 | 210 | 43 |
| Speed (m/s) | 0.67 | 0.83 | 0.85 | 0.85 | 0.45 |
| Sediment description | Occasional boulders on a flat plain of cobbles, pebbles and gravel | Occasional boulders on a flat plain of cobbles, pebbles and gravel. Also accumulations of empty *Glycymeris* shells. | Compact pebbles and gravel with shells on surface | Occasional boulders on a flat plain of cobbles, pebbles and gravel | Compact pebbles and gravel with empty shells on surface and occasional boulders |
| Start of line latitude | 53.67326 | 53.68838 | 53.69842 | 53.69877 | 53.64757 |
| Start of line longitude | -4.38113 | -4.39028 | -4.37357 | -4.37271 | -4.39613 |
| End of line latitude | 53.67441 | 53.68996 | 53.69877 | 53.69944 | 53.64735 |
| End of line longitude | -4.37631 | -4.38375 | -4.37271 | -4.36987 | -4.3956 |
| Depth Below Chart Datum Upper | -46 | -52 | -56.5 | -55.5 | -64.4 |
| Depth Below Chart Datum Lower | -48 | -54.5 | -60 | -58.5 | -65 |
| Substratum type | Mixed sediments | Mixed sediments | Mixed sediments | Mixed sediments | Mixed sediments |
| Shells - empty | 15 | 15 | 10 | 15 | 20 |
| Bedrock | | | | | |
| Very Large Boulders >1024mm | | | | | |
| Large Boulders (512 - 1024mm) | 1 | 1 | | | 1 |
| Small Boulders (256 - 512mm) | 10 | 10 | | 5 | 9 |
| Cobbles | 20 | 20 | 10 | 10 | 15 |
| Pebbles | 20 | 20 | 30 | 20 | 20 |
| Gravel | 20 | 20 | 40 | 30 | 30 |
| Coarse sand | 10 | 10 | 10 | 20 | 5 |
| Medium sand | 4 | 4 | | | |
| Fine sand | | | | | |
| Mud/silt | | | | | |
| Habitat Category | 4 | 4 | 1 | 4 | 4 |
| Biota description | *Ophiothrix* bed on faunal turf covered boulders and cobbles | *Ophiothrix* bed on faunal turf covered boulders and cobbles | Sparse fauna | Faunal turf and crusts on boulders, more sparse fauna on gravel and pebbles | Faunal turf and crusts on boulders, more sparse fauna on gravel and pebbles |

| Sample Reference | 1.37.10 | 1.37.2 | 1.37.3 | 1.37.4 | 1.37.5 |
|---|---|---|---|---|---|
| Sample | DC.1-37.S10 | DC.1-37.S2 | DC.1-37.S3 | DC.1-37.S4 | DC.1-37.S5 |
| Section | 10 | 2 | 3 | 4 | 5 |
| Area | 1 | 1 | 1 | 1 | 1 |
| Video Line No. | 37 | 37 | 37 | 37 | 37 |
| Event Name | 1-37 | 1-37 | 1-37 | 1-37 | 1-37 |
| Event reference | DC.1-37 | DC.1-37 | DC.1-37 | DC.1-37 | DC.1-37 |
| Video Section No. | 10 | 2 | 3 | 4 | 5 |
| Gear type | DC | DC | DC | DC | DC |
| Date (dd/mm/yy) | 13/08/2005 | 13/08/2005 | 13/08/2005 | 13/08/2005 | 13/08/2005 |
| Start Time | 16:17 | 16:05 | 16:06 | 16:12 | 16:12 |
| Duration (mins) | 01:08 | 00:53 | 05:37 | 00:17 | 02:00 |
| Visual quality of sample (poor/moderate/good) | | | | | Moderate |
| Time (hh:mm:ss) | 16:17:39 | 16:05:10 | 16:06:51 | 16:12:28 | 16:12:45 |
| Notes | | | | | Too fast |
| Length (m) | 27 | 21 | 126 | 7 | 49 |
| Speed (m/s) | 0.4 | 0.4 | 0.37 | 0.41 | 0.41 |
| Sediment description | Boulders and mixed sediments | Sandy gravel and pebbles with empty shells and occasional boulders | Compact gravel with few small boulders | Boulders | Gravel and coarse sands |
| Start of line latitude | 53.64554 | 53.64738 | 53.6471 | 53.64634 | 53.64629 |
| Start of line longitude | -4.3918 | -4.39511 | -4.39466 | -4.39319 | -4.39312 |
| End of line latitude | 53.64539 | 53.64725 | 53.64635 | 53.64629 | 53.64602 |
| End of line longitude | -4.39154 | -4.39489 | -4.39324 | -4.39312 | -4.39266 |
| Depth Below Chart Datum Upper | -61.5 | -66 | -64.5 | -64.5 | -62.5 |
| Depth Below Chart Datum Lower | -62.2 | -66.9 | -67 | -64.5 | -64.5 |
| Substratum type | Rock | Mixed sediments | Mixed sediments | Rock | Mixed sediments |
| Shells - empty | 20 | 15 | 15 | 15 | 15 |
| Bedrock | | | | | |
| Very Large Boulders >1024mm | | | | | |
| Large Boulders (512 - 1024mm) | 5 | 5 | | 5 | |
| Small Boulders (256 - 512mm) | 20 | 10 | 1 | 15 | |
| Cobbles | 10 | 5 | 1 | 20 | 2 |
| Pebbles | 5 | 10 | 15 | 15 | 10 |
| Gravel | 15 | 20 | 38 | 10 | 40 |
| Coarse sand | 20 | 30 | 25 | 15 | 30 |
| Medium sand | 5 | 5 | 5 | 5 | 3 |
| Fine sand | | | | | |
| Mud/silt | | | | | |
| Habitat Category | 3 | 4 | 1 | 3 | 1 |
| Biota description | Scoured turf and crusts | Faunal turf and crusts on boulders, more sparse fauna on the sandy gravel. | Short faunal turf | Scoured turf and crusts | Short faunal turf |

| Sample Reference | 1.37.6 | 1.37.7 | 1.37.8 | 1.37.9 | 1.38.1 |
|---|---|---|---|---|---|
| Sample | DC.1-37.S6 | DC.1-37.S7 | DC.1-37.S8 | DC.1-37.S9 | DC.1-38.S1 |
| Section | 6 | 7 | 8 | 9 | 1 |
| Area | 1 | 1 | 1 | 1 | 1 |
| Video Line No. | 37 | 37 | 37 | 37 | 38 |
| Event Name | 1-37 | 1-37 | 1-37 | 1-37 | 1-38 |
| Event reference | DC.1-37 | DC.1-37 | DC.1-37 | DC.1-37 | DC.1-38 |
| Video Section No. | 6 | 7 | 8 | 9 | 1 |
| Gear type | DC | DC | DC | DC | DC |
| Date (dd/mm/yy) | 13/08/2005 | 13/08/2005 | 13/08/2005 | 13/08/2005 | 13/08/2005 |
| Start Time | 16:14 | 16:15 | 16:17 | 16:17 | 16:37 |
| Duration (mins) | 00:45 | 01:32 | 00:10 | 00:27 | 05:12 |
| Visual quality of sample (poor/moderate/good) | Poor | Poor | | | Good |
| Time (hh:mm:ss) | 16:14:45 | 16:15:30 | 16:17:02 | 16:17:12 | 16:37:00 |
| Notes | Too fast | | | | |
| Length (m) | 22 | 35 | 5 | 7 | 111 |
| Speed (m/s) | 0.49 | 0.38 | 0.5 | 0.26 | 0.36 |
| Sediment description | Large Boulders in coarse sand | Sandy gravel and pebbles with empty shells on top | Boulder pile | Gravel, coarse sand and shell | Shell, gravel and coarse sand |
| Start of line latitude | 53.64599 | 53.64586 | 53.64561 | 53.64559 | 53.6317 |
| Start of line longitude | -4.39259 | -4.39233 | -4.39192 | -4.39188 | -4.36425 |
| End of line latitude | 53.64586 | 53.64563 | 53.64559 | 53.64554 | 53.63108 |
| End of line longitude | -4.39233 | -4.39197 | -4.39188 | -4.3918 | -4.36298 |
| Depth Below Chart Datum Upper | -61.7 | -61.5 | 61.5 | -62.1 | -57 |
| Depth Below Chart Datum Lower | -62.7 | -62.1 | -62 | -62.2 | -60 |
| Substratum type | Rock | Mixed sediments | Rock | Mixed sediments | Mixed sediments |
| Shells - empty | 5 | 15 | 10 | 10 | 30 |
| Bedrock | | | | | |
| Very Large Boulders >1024mm | | | | | |
| Large Boulders (512 - 1024mm) | 30 | | 10 | | |
| Small Boulders (256 - 512mm) | 10 | | 35 | | |
| Cobbles | 5 | 10 | 10 | | 2 |
| Pebbles | | 20 | 5 | 5 | 15 |
| Gravel | | 40 | 5 | 50 | 40 |
| Coarse sand | | 10 | 20 | 30 | 10 |
| Medium sand | | 5 | 5 | 5 | 3 |
| Fine sand | | | | | |
| Mud/silt | | | | | |
| Habitat Category | 3 | 1 or 2 | 3 or 6 | 1 | 1 |
| Biota description | Scoured turf and crusts | Sparse short turf | Scoured turf and crusts | Sparse short turf | Sparse short turf |

| Sample Reference | 1.38.2 | 1.38.3 | 1.38.4 | 1.38.5 | 1.38.6 |
|---|---|---|---|---|---|
| Sample | DC.1-38.S2 | DC.1-38.S3 | DC.1-38.S4 | DC.1-38.S5 | DC.1-38.S6 |
| Section | 2 | 3 | 4 | 5 | 6 |
| Area | 1 | 1 | 1 | 1 | 1 |
| Video Line No. | 38 | 38 | 38 | 38 | 38 |
| Event Name | 1-38 | 1-38 | 1-38 | 1-38 | 1-38 |
| Event reference | DC.1-38 | DC.1-38 | DC.1-38 | DC.1-38 | DC.1-38 |
| Video Section No. | 2 | 3 | 4 | 5 | 6 |
| Gear type | DC | DC | DC | DC | DC |
| Date (dd/mm/yy) | 13/08/2005 | 13/08/2005 | 13/08/2005 | 13/08/2005 | 13/08/2005 |
| Start Time | 16:42 | 16:44 | 16:47 | 16:48 | 16:51 |
| Duration (mins) | 01:48 | 03:58 | 00:42 | 03:10 | 00:50 |
| Visual quality of sample (poor/moderate/good) | Good | Good | Moderate | Moderate | Moderate |
| Time (hh:mm:ss) | 16:42:12 | 16:44:00 | 16:47:58 | 16:48:40 | 16:51:50 |
| Notes | | | bit short and too quick with out enough close ups | not always on bottom | |
| Length (m) | 45 | 70 | 19 | 45 | 12 |
| Speed (m/s) | 0.42 | 0.35 | 0.45 | 0.24 | 0.24 |
| Sediment description | Shell, gravel and coarse sand | Shell, gravel and coarse sand | Large boulders on gravel and shell | Shell, gravel and coarse sand | Large boulders and cobbles |
| Start of line latitude | 53.63108 | 53.63084 | 53.62997 | 53.6298 | 53.62943 |
| Start of line longitude | -4.36298 | -4.36271 | -4.36248 | -4.36245 | -4.36212 |
| End of line latitude | 53.63084 | 53.62997 | 53.6298 | 53.62943 | 53.62931 |
| End of line longitude | -4.36271 | -4.36248 | -4.36245 | -4.36212 | -4.36203 |
| Depth Below Chart Datum Upper | -52.5 | -48 | -55 | -57 | -57.8 |
| Depth Below Chart Datum Lower | -57 | -55 | -56 | -58 | -58 |
| Substratum type | Mixed sediments | Mixed sediments | Rock | Mixed sediments | Rock |
| Shells - empty | 30 | 30 | 15 | 30 | 10 |
| Bedrock | | | | | |
| Very Large Boulders >1024mm | | | | | |
| Large Boulders (512 - 1024mm) | | | 15 | | 15 |
| Small Boulders (256 - 512mm) | | | 10 | | 20 |
| Cobbles | 2 | 2 | 2 | 2 | 30 |
| Pebbles | 15 | 15 | 10 | 15 | 2 |
| Gravel | 40 | 40 | 30 | 40 | 8 |
| Coarse sand | 10 | 10 | 15 | 10 | 10 |
| Medium sand | 3 | 3 | 3 | 3 | 5 |
| Fine sand | | | | | |
| Mud/silt | | | | | |
| Habitat Category | 1 | 1 | 3 | 1 | 6 |
| Biota description | Brittlestar bed | Sparse short turf | Scoured turf and crusts | Sparse short turf | Dense turf on boulders and between on seafloor |

| Sample Reference | 1.38.7 | 1.39.1 | 1.39.2 | 1.39.3 | 1.39.4 |
|---|---|---|---|---|---|
| Sample | DC.1-38.S7 | DC.1-39.S1 | DC.1-39.S2 | DC.1-39.S3 | DC.1-39.S4 |
| Section | 7 | 1 | 2 | 3 | 4 |
| Area | 1 | 1 | 1 | 1 | 1 |
| Video Line No. | 38 | 39 | 39 | 39 | 39 |
| Event Name | 1-38 | 1-39 | 1-39 | 1-39 | 1-39 |
| Event reference | DC.1-38 | DC.1-39 | DC.1-39 | DC.1-39 | DC.1-39 |
| Video Section No. | 7 | 1 | 2 | 3 | 4 |
| Gear type | DC | DC | DC | DC | DC |
| Date (dd/mm/yy) | 13/08/2005 | 13/08/2005 | 13/08/2005 | 13/08/2005 | 13/08/2005 |
| Start Time | 16:52 | 17:23 | 17:23 | 17:25 | 17:29 |
| Duration (mins) | 02:23 | 00:15 | 01:22 | 00:27 | 01:44 |
| Visual quality of sample (poor/moderate/good) | moderate | moderate | poor | Moderate | moderate |
| Time (hh:mm:ss) | 16:52:40 | 17:23:43 | 17:23:58 | 17:25:20 | 17:29:10 |
| Notes | | | | | |
| Length (m) | 36 | 12 | 44 | 18.5 | 66 |
| Speed (m/s) | 0.25 | 0.8 | 0.54 | 0.69 | 0.63 |
| Sediment description | Compact gravel and coarse sand | Small boulders, cobbles and pebbles | Gravel, cobbles and occasional boulders | Coarse sand waves and scoured boulders | Pebbles, cobbles, and gravel. |
| Start of line latitude | 53.62931 | 53.65059 | 53.6505 | 53.65018 | 53.64893 |
| Start of line longitude | -4.36203 | -4.35378 | -4.35388 | -4.35427 | -4.35543 |
| End of line latitude | 53.62902 | 53.6505 | 53.65018 | 53.65004 | 53.64844 |
| End of line longitude | -4.36175 | -4.35388 | -4.35427 | -4.35442 | -4.35599 |
| Depth Below Chart Datum Upper | -57.7 | -49.2 | -49.2 | -49.3 | -48.6 |
| Depth Below Chart Datum Lower | -58.4 | -49.4 | -49.9 | -49.5 | -49.5 |
| Substratum type | Mixed sediments | Mixed sediments | Mixed sediments | Mixed sediments | Mixed sediments |
| Shells - empty | 20 | 15 | 15 | 10 | 10 |
| Bedrock | | | | | |
| Very Large Boulders >1024mm | | | | | |
| Large Boulders (512 - 1024mm) | | | | 2 | |
| Small Boulders (256 - 512mm) | | 30 | 1 | 13 | 5 |
| Cobbles | 2 | 15 | 5 | | 20 |
| Pebbles | 15 | 10 | 19 | | 40 |
| Gravel | 30 | 15 | 40 | 15 | 20 |
| Coarse sand | 30 | 10 | 15 | 50 | 5 |
| Medium sand | 3 | 5 | 5 | 10 | |
| Fine sand | | | | | |
| Mud/silt | | | | | |
| Habitat Category | 1 | 5 | 4 | 3 | 4 |
| Biota description | Sparse short turf | Rich turf covered boulders | Short turf | Sound scoured fauna on boulders. | Rich turf covered boulders and cobbles |

| Sample Reference | 1.39.5 | 1.39.6 | 1.39.7 | 2.24.1 | 2.24.2 |
|---|---|---|---|---|---|
| Sample | DC.1-39.S5 | DC.1-39.S6 | DC.1-39.S7 | DC.2-24.S1 | DC.2-24.S2 |
| Section | 5 | 6 | 7 | 1 | 2 |
| Area | 1 | 1 | 1 | 2 | 2 |
| Video Line No. | 39 | 39 | 39 | 24 | 24 |
| Event Name | 1-39 | 1-39 | 1-39 | 2-24 | 2-24 |
| Event reference | DC.1-39 | DC.1-39 | DC.1-39 | DC.2-24 | DC.2-24 |
| Video Section No. | 5 | 6 | 7 | 1 | 2 |
| Gear type | DC | DC | DC | DC | DC |
| Date (dd/mm/yy) | 13/08/2005 | 13/08/2005 | 13/08/2005 | 12/08/2005 | 12/08/2005 |
| Start Time | 17:30 | 17:31 | 17:34 | 9:16 | 9:19 |
| Duration (mins) | 00:41 | 02:25 | 04:20 | 03:19 | 00:33 |
| Visual quality of sample (poor/moderate/good) | moderate | moderate | moderate | Good | Good |
| Time (hh:mm:ss) | 17:30:54 | 17:31:35 | 17:34:00 | 09:16:11 | 09:19:30 |
| Notes | | | | | |
| Length (m) | 29.4 | 106.7 | 135.5 | 72 | 10.3 |
| Speed (m/s) | 0.72 | 0.74 | 0.75 | 0.36 | 0.31 |
| Sediment description | Coarse sand, shell and gravel | Gravel, pebbles and cobbles | Boulders amongst gravel, cobbles and pebbles | Coarse sand waves with shell and gravel between | Very large boulders, cobbles and sand between. |
| Start of line latitude | 53.64844 | 53.64821 | 53.6474 | 53.66119691 | 53.66103085 |
| Start of line longitude | -4.35599 | -4.35621 | -4.35707 | -4.543318199 | -4.544317989 |
| End of line latitude | 53.64821 | 53.6474 | 53.64637 | 53.66103085 | 53.66101412 |
| End of line longitude | -4.35621 | -4.35707 | -4.35816 | -4.544317989 | -4.544458623 |
| Depth Below Chart Datum Upper | -49.4 | -49.7 | -50 | -76 | -75 |
| Depth Below Chart Datum Lower | -49.9 | -50.6 | -52.5 | -81 | -76 |
| Substratum type | Mixed sediments | Mixed sediments | Mixed sediments | Mixed sediments | Mixed sediments |
| Shells - empty | 15 | 15 | 5 | 15 | |
| Bedrock | | | | | |
| Very Large Boulders >1024mm | | | | | 1 |
| Large Boulders (512 - 1024mm) | | | 1 | | |
| Small Boulders (256 - 512mm) | 1 | 1 | 9 | | 4 |
| Cobbles | | 9 | 10 | | 20 |
| Pebbles | | 25 | 18 | 1 | 20 |
| Gravel | 14 | 35 | 37 | 14 | 10 |
| Coarse sand | 60 | 10 | 15 | 65 | 40 |
| Medium sand | 10 | 5 | 5 | 5 | 5 |
| Fine sand | | | | | |
| Mud/silt | | | | | |
| Habitat Category | 1 | 4 | 4 | 7 | 5 |
| Biota description | Short turf | Short turf | Turf and crusts on boulders. Brittlestars on seafloor | Sparse epifauna on coarse mobile sand. | Large boulders support faunal crusts and Dead Men's Fingers. Small boulders support faunal turf. |

| Sample Reference | 2.24.3 | 2.25.1 | 2.26.1 | 2.26.2 | 2.26.3 |
|---|---|---|---|---|---|
| Sample | DC.2-24.S3 | DC.2-25.S1 | DC.2-26.S1 | DC.2-26.S2 | DC.2-26.S3 |
| Section | 3 | 1 | 1 | 2 | 3 |
| Area | 2 | 2 | 2 | 2 | 2 |
| Video Line No. | 24 | 25 | 26 | 26 | 26 |
| Event Name | 2-24 | 2-25 | 2-26 | 2-26 | 2-26 |
| Event reference | DC.2-24 | DC.2-25 | DC.2-26 | DC.2-26 | DC.2-26 |
| Video Section No. | 3 | 1 | 1 | 2 | 3 |
| Gear type | DC | DC | DC | DC | DC |
| Date (dd/mm/yy) | 12/08/2005 | 12/08/2005 | 12/08/2005 | 12/08/2005 | 12/08/2005 |
| Start Time | 9:20 | 9:38 | 9:58 | 10:00 | 10:07 |
| Duration (mins) | 00:23 | 07:47 | 02:11 | 06:56 | 02:04 |
| Visual quality of sample (poor/moderate/good) | Good | Good | Good | Good | Good |
| Time (hh:mm:ss) | 09:20:03 | 09:38:19 | 09:58:30 | 10:00:41 | 10:07:37 |
| Notes | | | | | |
| Length (m) | 9.75 | 107 | 5 | 25 | 10 |
| Speed (m/s) | 0.42 | 0.23 | 0.04 | 0.06 | 0.08 |
| Sediment description | Coarse sand waves with shell and gravel between | Mainly cobbles and pebble with occasional small boulders | Compact gravel pebbles and coarse sand. | large stacked boulder reef | Compact gravel pebbles and coarse sand. |
| Start of line latitude | 53.66101412 | 53.67607005 | 53.67502346 | 53.67500194 | 53.67503338 |
| Start of line longitude | -4.544458623 | -4.548431504 | -4.569397126 | -4.569403697 | -4.569418902 |
| End of line latitude | 53.66099791 | 53.67587327 | 53.67500194 | 53.67503338 | 53.67503222 |
| End of line longitude | -4.544560403 | -4.549894338 | -4.569403697 | -4.569418902 | -4.569486319 |
| Depth Below Chart Datum Upper | -74 | -55 | -75.6 | -75.25 | -76.4 |
| Depth Below Chart Datum Lower | -75 | -57 | -75.9 | -76.5 | -76.9 |
| Substratum type | Mixed sediments | Mixed sediments | Mixed sediments | Rock | Mixed sediment |
| Shells - empty | 5 | 20 | 10 | | 9 |
| Bedrock | | | | | |
| Very Large Boulders >1024mm | | | | 10 | |
| Large Boulders (512 - 1024mm) | | 2 | | 30 | |
| Small Boulders (256 - 512mm) | | 10 | | 20 | |
| Cobbles | | 33 | 2 | 30 | 1 |
| Pebbles | | 15 | 10 | 8 | 20 |
| Gravel | | 10 | 48 | 2 | 60 |
| Coarse sand | 80 | 10 | 20 | | 5 |
| Medium sand | 15 | | 5 | | |
| Fine sand | | | | | |
| Mud/silt | | | 5 | | 5 |
| Habitat Category | 7 | 5 | 1 | 6 | 1 |
| Biota description | Sparse epifauna on coarse mobile sand. | Small boulders and cobbles support scour tolerant community of bryozoans and cnidarians | Compact silty gravel support a short faunal turf with occasional echinoderms | Large stacked boulder pile (dromolite?) supports a faunal turf and crusts | Compact silty gravel supports a short faunal turf with occasional echinoderms |

| Sample Reference | 2.27.1 | 2.27.10 | 2.27.11 | 2.27.12 | 2.27.13 |
|---|---|---|---|---|---|
| Sample | DC.2-27.S1 | DC.2-27.S10 | DC.2-27.S11 | DC.2-27.S12 | DC.2-27.S13 |
| Section | 1 | 10 | 11 | 12 | 13 |
| Area | 2 | 2 | 2 | 2 | 2 |
| Video Line No. | 27 | 27 | 27 | 27 | 27 |
| Event Name | 2-27 | 2-27 | 2-27 | 2-27 | 2-27 |
| Event reference | DC.2-27 | DC.2-27 | DC.2-27 | DC.2-27 | DC.2-27 |
| Video Section No. | 1 | 10 | 11 | 12 | 13 |
| Gear type | DC | DC | DC | DC | DC |
| Date (dd/mm/yy) | 12/08/2005 | 12/08/2005 | 12/08/2005 | 12/08/2005 | 12/08/2005 |
| Start Time | 10:46 | 10:52 | 10:52 | 10:52 | 10:53 |
| Duration (mins) | 00:43 | 00:39 | 00:08 | 00:38 | 00:45 |
| Visual quality of sample (poor/moderate/good) | Good | Good | Good | Good | Good |
| Time (hh:mm:ss) | 10:46:01 | 10:52:00 | 10:52:39 | 10:52:47 | 10:53:25 |
| Notes | | | | | |
| Length (m) | 18 | 19 | 5.97 | 18 | 21.5 |
| Speed (m/s) | 0.42 | 0.49 | 0.75 | 0.47 | 0.48 |
| Sediment description | Compact gravel | Compact gravel | Boulders, cobbles with gravel and coarse sand | Compact gravely sand | Boulders |
| Start of line latitude | 53.64066371 | 53.64041922 | 53.64039287 | 53.64038428 | 53.6403557 |
| Start of line longitude | -4.554500294 | -4.551977754 | -4.551697524 | -4.551610276 | -4.551345945 |
| End of line latitude | 53.64064103 | 53.64039287 | 53.64038428 | 53.6403557 | 53.64031454 |
| End of line longitude | -4.554233473 | -4.551697524 | -4.551610276 | -4.551345945 | -4.551032709 |
| Depth Below Chart Datum Upper | -81 | -80.25 | -80.3 | -79.25 | -78.25 |
| Depth Below Chart Datum Lower | -82 | -80.7 | -80.6 | -80.25 | -78.75 |
| Substratum type | Mixed sediments | Mixed sediments | Rock | Mixed sediments | Mixed sediments |
| Shells - empty | 10 | 10 | | 10 | 5 |
| Bedrock | | | | | |
| Very Large Boulders >1024mm | | | | | |
| Large Boulders (512 - 1024mm) | | | 15 | | |
| Small Boulders (256 - 512mm) | | | 25 | | 5 |
| Cobbles | | | 20 | 1 | 25 |
| Pebbles | 40 | 40 | 10 | 9 | 15 |
| Gravel | 40 | 40 | 10 | 20 | 5 |
| Coarse sand | 5 | 5 | 15 | 50 | 40 |
| Medium sand | 5 | 5 | 5 | 10 | 5 |
| Fine sand | | | | | |
| Mud/silt | | | | | |
| Habitat Category | 1 | 1 | 6 | 1 | 3 |
| Biota description | Gravel with sparse short faunal turf | Gravel with sparse short faunal turf | Faunal turf, crusts and *Pomatoceros* on boulders | Faunal turf, Dead Men's Fingers and other fauna attached to stable pebbles in the compact sediment | Scoured fauna on boulders consisting mainly of *Pomatoceros* |

| Sample Reference | 2.27.14 | 2.27.15 | 2.27.16 | 2.27.17 | 2.27.2 |
|---|---|---|---|---|---|
| Sample | DC.2-27.S14 | DC.2-27.S15 | DC.2-27.S16 | DC.2-27.S17 | DC.2-27.S2 |
| Section | 14 | 15 | 16 | 17 | 2 |
| Area | 2 | 2 | 2 | 2 | 2 |
| Video Line No. | 27 | 27 | 27 | 27 | 27 |
| Event Name | 2-27 | 2-27 | 2-27 | 2-27 | 2-27 |
| Event reference | DC.2-27 | DC.2-27 | DC.2-27 | DC.2-27 | DC.2-27 |
| Video Section No. | 14 | 15 | 16 | 17 | 2 |
| Gear type | DC | DC | DC | DC | DC |
| Date (dd/mm/yy) | 12/08/2005 | 12/08/2005 | 12/08/2005 | 12/08/2005 | 12/08/2005 |
| Start Time | 10:54 | 10:54 | 10:54 | 10:54 | 10:46 |
| Duration (mins) | 00:16 | 00:14 | 00:08 | 00:17 | 00:19 |
| Visual quality of sample (poor/moderate/good) | Good | Good | Good | Good | Good |
| Time (hh:mm:ss) | 10:54:10 | 10:54:26 | 10:54:40 | 10:54:48 | 10:46:44 |
| Notes | | | | | |
| Length (m) | 7.4 | 6.37 | 4 | 8 | 8.6 |
| Speed (m/s) | 0.46 | 0.46 | 0.5 | 0.47 | 0.45 |
| Sediment description | Compact gravely, pebbly sand | Boulders and cobbles | Boulders and coarse sand | Gravel, with cobbles, pebbles, coarse sand and a very large boulder | Boulders and cobbles with coarse sand waves between |
| Start of line latitude | 53.64031454 | 53.64029837 | 53.64028722 | 53.64028722 | 53.64064103 |
| Start of line longitude | -4.551032709 | -4.550915508 | -4.550822823 | -4.550822823 | -4.554233473 |
| End of line latitude | 53.64029837 | 53.64028722 | 53.64028722 | 53.6402672 | 53.64063164 |
| End of line longitude | -4.550915508 | -4.550822823 | -4.550822823 | -4.550651119 | -4.554108437 |
| Depth Below Chart Datum Upper | -80 | -79.5 | -79.5 | -79.5 | -81 |
| Depth Below Chart Datum Lower | -80 | -79.9 | -79.5 | -79.5 | -81 |
| Substratum type | Mixed sediments | Mixed sediments | Mixed sediments | Mixed sediments | Mixed sediments |
| Shells - empty | 2 | 10 | | 5 | |
| Bedrock | | | | | |
| Very Large Boulders >1024mm | | | | 2 | |
| Large Boulders (512 - 1024mm) | | | | | 1 |
| Small Boulders (256 - 512mm) | | 2 | | | 9 |
| Cobbles | 7 | 30 | 10 | 10 | 20 |
| Pebbles | 20 | 30 | 5 | 18 | 15 |
| Gravel | 35 | 15 | 5 | 50 | 5 |
| Coarse sand | 30 | 10 | 75 | 10 | 50 |
| Medium sand | 6 | 3 | 5 | 5 | |
| Fine sand | | | | | |
| Mud/silt | | | | | |
| Habitat Category | 1 and 2 | 5 | 3 | 4 | 3 |
| Biota description | Abundant faunal turf, with some Dead Men's Fingers and other fauna attached to stable pebbles and cobbles in the compact sediment | Faunal turf covered boulders and cobbles | Scoured community of *Pomatoceros*, Dead Men's Fingers and anemones. | Mainly turf covered boulder with one very large erratic covered in faunal crusts | Mainly *Pomatoceros* with a short turf on the boulders. |

| Sample Reference<br>Sample | 2.27.3<br>DC.2-27.S3 | 2.27.4<br>DC.2-27.S4 | 2.27.5<br>DC.2-27.S5 | 2.27.6<br>DC.2-27.S6 | 2.27.7<br>DC.2-27.S7 |
|---|---|---|---|---|---|
| Section | 3 | 4 | 5 | 6 | 7 |
| Area | 2 | 2 | 2 | 2 | 2 |
| Video Line No. | 27 | 27 | 27 | 27 | 27 |
| Event Name | 2-27 | 2-27 | 2-27 | 2-27 | 2-27 |
| Event reference | DC.2-27 | DC.2-27 | DC.2-27 | DC.2-27 | DC.2-27 |
| Video Section No. | 3 | 4 | 5 | 6 | 7 |
| Gear type | DC | DC | DC | DC | DC |
| Date (dd/mm/yy) | 12/08/2005 | 12/08/2005 | 12/08/2005 | 12/08/2005 | 12/08/2005 |
| Start Time | 10:47 | 10:47 | 10:49 | 10:49 | 10:49 |
| Duration (mins) | 00:27 | 01:45 | 00:07 | 00:29 | 00:59 |
| Visual quality of sample (poor/moderate/good) | Good | Good | Good | Good | Good |
| Time (hh:mm:ss) | 10:47:03 | 10:47:30 | 10:49:15 | 10:49:22 | 10:49:51 |
| Notes | | | | | |
| Length (m) | 13 | 48 | 3.5 | 15 | 29.5 |
| Speed (m/s) | 0.48 | 0.46 | 0.5 | 0.52 | 0.5 |
| Sediment description | Gravel | Boulders, cobbles with gravel and coarse sand | Small boulders with coarse sand waves between | Gravel | Boulders, cobbles with gravel and coarse sand |
| Start of line latitude | 53.64063164 | 53.64061351 | 53.64054664 | 53.64054519 | 53.64052512 |
| Start of line longitude | -4.554108437 | -4.553919206 | -4.553203975 | -4.553150993 | -4.552927509 |
| End of line latitude | 53.64061351 | 53.64054664 | 53.64054519 | 53.64052512 | 53.64047435 |
| End of line longitude | -4.553919206 | -4.553203975 | -4.553150993 | -4.552927509 | -4.552494936 |
| Depth Below Chart Datum Upper | -80 | -79.5 | -79.5 | -79.75 | -79.75 |
| Depth Below Chart Datum Lower | -81 | -80.5 | -80 | -80.1 | -80.75 |
| Substratum type | Mixed sediments | Mixed sediments | Mixed sediments | Mixed sediments | Mixed sediments |
| Shells - empty | 10 | 15 | 5 | 10 | 10 |
| Bedrock | | | | | |
| Very Large Boulders >1024mm | | | | | |
| Large Boulders (512 - 1024mm) | | | | | |
| Small Boulders (256 - 512mm) | | 20 | 20 | | 20 |
| Cobbles | | 30 | | | 30 |
| Pebbles | 40 | 10 | 5 | 40 | 10 |
| Gravel | 40 | 20 | 10 | 40 | 20 |
| Coarse sand | 5 | 5 | 60 | 5 | 10 |
| Medium sand | 5 | | | 5 | |
| Fine sand | | | | | |
| Mud/silt | | | | | |
| Habitat Category | 1 | 3 | 3 | 1 | 3 |
| Biota description | Gravel with sparse short faunal turf | *Pomatoceros*, faunal turf, crusts and Dead Men’s Fingers on the small boulders | *Pomatoceros* and faunal turf common on boulders | Gravel with sparse short faunal turf | Faunal turf, *Pomatoceros* and Dead Men’s Fingers on small boulders and cobbles |

| Sample Reference | 2.27.8 | 2.27.9 | 2.28.1 | 2.28.2 | 2.28.3 |
|---|---|---|---|---|---|
| Sample | DC.2-27.S8 | DC.2-27.S9 | DC.2-28.S1 | DC.2-28.S2 | DC.2-28.S3 |
| Section | 8 | 9 | 1 | 2 | 3 |
| Area | 2 | 2 | 2 | 2 | 2 |
| Video Line No. | 27 | 27 | 28 | 28 | 28 |
| Event Name | 2-27 | 2-27 | 2-28 | 2-28 | 2-28 |
| Event reference | DC.2-27 | DC.2-27 | DC.2-28 | DC.2-28 | DC.2-28 |
| Video Section No. | 8 | 9 | 1 | 2 | 3 |
| Gear type | DC | DC | DC | DC | DC |
| Date (dd/mm/yy) | 12/08/2005 | 12/08/2005 | 12/08/2005 | 12/08/2005 | 12/08/2005 |
| Start Time | 10:50 | 10:51 | 16:23 | 16:24 | 16:28 |
| Duration (mins) | 00:52 | 00:18 | 01:34 | 03:34 | 00:26 |
| Visual quality of sample (poor/moderate/good) | Good | Good | poor | Good | Good |
| Time (hh:mm:ss) | 10:50:50 | 10:51:42 | 16:23:16 | 16:24:50 | 16:28:24 |
| Notes | | Good boulder but then lifts off seabed | | | |
| Length (m) | 26 | 9.4 | 24 | 73 | 10 |
| Speed (m/s) | 0.5 | 0.52 | 0.26 | 0.34 | 0.38 |
| Sediment description | Gravel | Boulders, cobbles with gravel and coarse sand | Small boulders on gravel and coarse sand | Compact cobbles, gravel and coarse sand | Boulders on pebbles and gravel |
| Start of line latitude | 53.64047435 | 53.64043395 | 53.62229 | 53.62207 | 53.62149 |
| Start of line longitude | -4.552494936 | -4.552112701 | -4.55623 | -4.55625 | -4.55669 |
| End of line latitude | 53.64043395 | 53.64041922 | 53.62207 | 53.62149 | 53.62142 |
| End of line longitude | -4.552112701 | -4.551977754 | -4.55625 | -4.55669 | -4.55682 |
| Depth Below Chart Datum Upper | -80.25 | -80.5 | -69.5 | -69.75 | -69.75 |
| Depth Below Chart Datum Lower | -80.5 | -80.5 | -71 | -71 | -69.75 |
| Substratum type | Mixed sediments | Rock | Mixed sediments | Mixed sediments | Rock |
| Shells - empty | 5 | | 5 | 5 | 5 |
| Bedrock | | | | | |
| Very Large Boulders >1024mm | | | | | |
| Large Boulders (512 - 1024mm) | | 20 | | | 30 |
| Small Boulders (256 - 512mm) | | 15 | 25 | | 10 |
| Cobbles | 1 | 20 | 15 | 5 | 5 |
| Pebbles | 40 | 20 | 10 | 40 | 10 |
| Gravel | 30 | 20 | 10 | 25 | 25 |
| Coarse sand | 20 | 5 | 30 | 20 | 15 |
| Medium sand | 4 | | 5 | 5 | |
| Fine sand | | | | | |
| Mud/silt | | | | | |
| Habitat Category | 1 | 6 | 3 | 2 | 6 |
| Biota description | Gravel with sparse short faunal turf and occasional Dead Men's fingers | Faunal turf on tops of boulders *Pomatoceros* and crusts on sides | Faunal turf on cobbles and boulders | Dense faunal turf on stable compact cobbles and pebbles | Faunal turf on cobbles and boulders |

| Sample Reference | 2.28.4 | 2.28.5 | 2.28.6 | 2.29.1 | 2.29.10 |
|---|---|---|---|---|---|
| Sample | DC.2-28.S4 | DC.2-28.S5 | DC.2-28.S6 | DC.2-29.S1 | DC.2-29.S10 |
| Section | 4 | 5 | 6 | 1 | 10 |
| Area | 2 | 2 | 2 | 2 | 2 |
| Video Line No. | 28 | 28 | 28 | 29 | 29 |
| Event Name | 2-28 | 2-28 | 2-28 | 2-29 | 2-29 |
| Event reference | DC.2-28 | DC.2-28 | DC.2-28 | DC.2-29 | DC.2-29 |
| Video Section No. | 4 | 5 | 6 | 1 | 10 |
| Gear type | DC | DC | DC | DC | DC |
| Date (dd/mm/yy) | 12/08/2005 | 12/08/2005 | 12/08/2005 | 12/08/2005 | 12/08/2005 |
| Start Time | 16:28 | 16:30 | 16:31 | 16:59 | 17:11 |
| Duration (mins) | 01:33 | 00:37 | 05:35 | 00:08 | 00:25 |
| Visual quality of sample (poor/moderate/good) | Good | Good | Good | Poor | Moderate |
| Time (hh:mm:ss) | 16:28:50 | 16:30:23 | 16:31:00 | 16:59:10 | 17:11:56 |
| Notes | | | | not on bottom for long | |
| Length (m) | 39 | 15 | 147 | 2.6 | 15.7 |
| Speed (m/s) | 0.42 | 0.41 | 0.44 | 0.33 | 0.63 |
| Sediment description | Compact cobbles, gravel and coarse sand | Boulders on pebbles and gravel | Compact pebbles, gravel and coarse sand | Compact gravel, pebbles and shell. | cobbles in coarse sand |
| Start of line latitude | 53.62142 | 53.62119 | 53.6211 | 53.62242 | 53.62237 |
| Start of line longitude | -4.55682 | -4.55724 | -4.55739 | -4.52147 | -4.52698 |
| End of line latitude | 53.62119 | 53.6211 | 53.62121 | 53.62242 | 53.62234 |
| End of line longitude | -4.55724 | -4.55739 | -4.5572 | -4.52151 | -4.52715 |
| Depth Below Chart Datum Upper | -69 | -69 | -68.75 | -66.7 | -67.75 |
| Depth Below Chart Datum Lower | -70 | -69 | -69.75 | -67 | -67.75 |
| Substratum type | Mixed sediments | Mixed sediments | Mixed sediments | Mixed sediments | Mixed sediments |
| Shells - empty | 5 | 15 | 15 | 5 | 5 |
| Bedrock | | | | | |
| Very Large Boulders >1024mm | | | | | |
| Large Boulders (512 - 1024mm) | | 2 | | | |
| Small Boulders (256 - 512mm) | | 30 | 1 | | |
| Cobbles | 2 | 15 | 1 | | 5 |
| Pebbles | 20 | 10 | 25 | 40 | 5 |
| Gravel | 60 | 20 | 40 | 45 | 10 |
| Coarse sand | 10 | 8 | 15 | 8 | 60 |
| Medium sand | 3 | | 3 | 2 | 15 |
| Fine sand | | | | | |
| Mud/silt | | | | | |
| Habitat Category | 1 | 5 | 2 | 1 | 3 |
| Biota description | Gravel with sparse short faunal turf | Thick turf and crust covered boulders with short sparse turf on gravel between. | Short sparse faunal turf and *Pomatoceros* | Short turf on stable pebbles and gravel | Scour tolerant *Flustra* on exposed cobbles |

| Sample Reference<br>Sample | 2.29.11<br>DC.2-29.S11 | 2.29.12<br>DC.2-29.S12 | 2.29.2<br>DC.2-29.S2 | 2.29.3<br>DC.2-29.S3 | 2.29.4<br>DC.2-29.S4 |
|---|---|---|---|---|---|
| Section | 11 | 12 | 2 | 3 | 4 |
| Area | 2 | 2 | 2 | 2 | 2 |
| Video Line No. | 29 | 29 | 29 | 29 | 29 |
| Event Name | 2-29 | 2-29 | 2-29 | 2-29 | 2-29 |
| Event reference | DC.2-29 | DC.2-29 | DC.2-29 | DC.2-29 | DC.2-29 |
| Video Section No. | 11 | 12 | 2 | 3 | 4 |
| Gear type | DC | DC | DC | DC | DC |
| Date (dd/mm/yy) | 12/08/2005 | 12/08/2005 | 12/08/2005 | 12/08/2005 | 12/08/2005 |
| Start Time | 17:12 | 17:17 | 17:02 | 17:03 | 17:05 |
| Duration (mins) | 04:44 | 00:25 | 00:01 | 00:16 | 00:15 |
| Visual quality of sample (poor/moderate/good) | Moderate | Moderate | Very Poor | Poor | Moderate |
| Time (hh:mm:ss) | 17:12:21 | 17:17:05 | 17:02:46 | 17:03:15 | 17:05:05 |
| Notes | | | Only a glimpse of the seabed | | |
| Length (m) | 176 | 39 | 1 | 6.8 | 30 |
| Speed (m/s) | 0.62 | 0.62 | 1 | 0.43 | 0.2 |
| Sediment description | Cobbles and gravel | Boulder stack | Boulders on coarse sand and gravel | Compact gravel, pebbles and shell. | Stable gravel, pebbles and cobbles |
| Start of line latitude | 53.62234 | 53.62195 | 53.62246 | 53.62247 | 53.62247 |
| Start of line longitude | -4.52715 | -4.52976 | -4.52271 | -4.52291 | -4.52359 |
| End of line latitude | 53.62195 | 53.62193 | 53.62246 | 53.62247 | 53.6226 |
| End of line longitude | -4.52976 | 53.62193 | -4.52271 | -4.52298 | -4.52397 |
| Depth Below Chart Datum Upper | -62.5 | -62.7 | -68.6 | -68.6 | -68.75 |
| Depth Below Chart Datum Lower | -67.5 | -63.4 | -68.6 | -68.6 | -69.75 |
| Substratum type | Mixed sediments | Mixed sediments | Rock | Mixed sediments | Mixed sediments |
| Shells - empty | 5 | 5 | 5 | 10 | 5 |
| Bedrock | | | | | |
| Very Large Boulders >1024mm | | | | | |
| Large Boulders (512 - 1024mm) | | | 30 | | |
| Small Boulders (256 - 512mm) | | 40 | 10 | | |
| Cobbles | 10 | 20 | 5 | | 15 |
| Pebbles | 20 | 10 | 10 | 40 | 40 |
| Gravel | 40 | 5 | 25 | 40 | 20 |
| Coarse sand | 20 | 15 | 15 | 8 | 15 |
| Medium sand | 5 | 5 | | 2 | 5 |
| Fine sand | | | | | |
| Mud/silt | | | | | |
| Habitat Category | 2 | 5 | 6 | 1 | 2 |
| Biota description | Short faunal turf and occasional brittlestars on stable substratum | Faunal turf covered stack of small boulders | Faunal turf on boulders | Sparse faunal turf | Faunal turf on cobbles |

| Sample Reference<br>Sample | 2.29.5<br>DC.2-29.S5 | 2.29.6<br>DC.2-29.S6 | 2.29.7<br>DC.2-29.S7 | 2.29.8<br>DC.2-29.S8 | 2.29.9<br>DC.2-29.S9 |
|---|---|---|---|---|---|
| Section | 5 | 6 | 7 | 8 | 9 |
| Area | 2 | 2 | 2 | 2 | 2 |
| Video Line No. | 29 | 29 | 29 | 29 | 29 |
| Event Name | 2-29 | 2-29 | 2-29 | 2-29 | 2-29 |
| Event reference | DC.2-29 | DC.2-29 | DC.2-29 | DC.2-29 | DC.2-29 |
| Video Section No. | 5 | 6 | 7 | 8 | 9 |
| Gear type | DC | DC | DC | DC | DC |
| Date (dd/mm/yy) | 12/08/2005 | 12/08/2005 | 12/08/2005 | 12/08/2005 | 12/08/2005 |
| Start Time | 17:05 | 17:05 | 17:06 | 17:08 | 17:11 |
| Duration (mins) | 00:20 | 00:50 | 01:40 | 03:28 | 00:28 |
| Visual quality of sample (poor/moderate/good) | Moderate | Moderate | Moderate | Moderate | Moderate |
| Time (hh:mm:ss) | 17:05:20 | 17:05:30 | 17:06:20 | 17:08:00 | 17:11:28 |
| Notes | | | | | |
| Length (m) | 4.7 | 22.6 | 47.2 | 108 | 18 |
| Speed (m/s) | 0.24 | 0.45 | 0.47 | 0.52 | 0.64 |
| Sediment description | Small boulders and cobbles | Gravel | Small boulders, cobbles, pebbles and gravel | Pebbles and gravel | Small boulders and cobbles on pebbles and gravel |
| Start of line latitude | 53.6226 | 53.6226 | 53.62259 | 53.62256 | 53.62241 |
| Start of line longitude | -4.52397 | -4.52411 | -4.52438 | -4.52509 | -4.52671 |
| End of line latitude | 53.6226 | 53.62259 | 53.62256 | 53.62241 | 53.62237 |
| End of line longitude | 53.6226 | -4.52438 | -4.52509 | -4.52671 | -4.52698 |
| Depth Below Chart Datum Upper | -69.8 | -69 | -69 | -69.5 | -67.75 |
| Depth Below Chart Datum Lower | -69.9 | -69.8 | -70 | -71 | -69.25 |
| Substratum type | Mixed sediments | Mixed sediments | Mixed sediments | Mixed sediments | Mixed sediments |
| Shells - empty | 5 | 5 | 10 | 10 | 5 |
| Bedrock | | | | | |
| Very Large Boulders >1024mm | | | | | |
| Large Boulders (512 - 1024mm) | | | | | |
| Small Boulders (256 - 512mm) | 15 | | 5 | | 10 |
| Cobbles | 25 | 5 | 15 | 1 | 5 |
| Pebbles | 10 | 20 | 10 | 30 | 20 |
| Gravel | 10 | 30 | 30 | 40 | 30 |
| Coarse sand | 30 | 30 | 20 | 15 | 20 |
| Medium sand | 5 | 10 | 10 | 4 | 10 |
| Fine sand | | | | | |
| Mud/silt | | | | | |
| Habitat Category | 5 | 1 | 4 | 2 | 4 |
| Biota description | Faunal turf on small boulders | Short faunal turf | Faunal turf on boulders | Short faunal turf | Short faunal turf on stable substratum |

| Sample Reference | 3.01.1 | 3.02.1 | 3.03.1 | 3.03.2 | 3.03.3 |
|---|---|---|---|---|---|
| Sample | TV.3-01.S1 | TV.3-02.S1 | TV.3-03.S1 | TV.3-03.S2 | TV.3-03.S3 |
| Section | 1 | 1 | 1 | 2 | 3 |
| Area | 3 | 3 | 3 | 3 | 3 |
| Video Line No. | 01 | 02 | 03 | 03 | 03 |
| Event Name | 3-01 | 3-02 | 3-03 | 3-03 | 3-03 |
| Event reference | TV.3-01 | TV.3-02 | TV.3-03 | TV.3-03 | TV.3-03 |
| Video Section No. | 1 | 1 | 1 | 2 | 3 |
| Gear type | TV | TV | TV | TV | TV |
| Date (dd/mm/yy) | 10/08/2005 | 10/08/2005 | 10/08/2005 | 10/08/2005 | 10/08/2005 |
| Start Time | 12:53 | 13:38 | 14:18 | 14:30 | 14:31 |
| Duration (mins) | 18:45 | 22:48 | 12:00 | 00:45 | 02:38 |
| Visual quality of sample (poor/moderate/good) | Moderate | Moderate | Moderate | Moderate | Moderate |
| Time (hh:mm:ss) | 12:53:24 | 13:38:54 | 14:18:22 | 14:30:18 | 14:31:19 |
| Notes | | | | | |
| Length (m) | 700 | 500 | 290 | 20 | 65 |
| Speed (m/s) | 0.62 | 0.37 | 0.4 | 0.44 | 0.44 |
| Sediment description | Compact gravel and sand with layer of loose empty *Modiolus* shells scattered on surface | Compact gravel and sand with layer of loose empty *Modiolus* shells scattered on surface | Compact gravel and sand with layer of loose empty *Modiolus* shells scattered on surface | Partly embedded small boulders in compact gravel and pebbles. | Compact gravel and sand with layer of loose empty *Modiolus* shells scattered on surface |
| Start of line latitude | 53.67329 | 53.666082 | 53.664855 | 53.664633 | 53.66463 |
| Start of line longitude | -4.740245 | -4.765328 | -4.7896 | -4.793662 | -4.794042 |
| End of line latitude | 53.673758 | 53.666687 | 53.664638 | 53.664628 | 53.664613 |
| End of line longitude | -4.748223 | -4.772817 | -4.793602 | -4.793977 | -4.79501 |
| Depth Below Chart Datum Upper | -45 | -40 | -42.75 | -42.9 | -43.5 |
| Depth Below Chart Datum Lower | -51 | -41 | -44.5 | -43.6 | -44.1 |
| Substratum type | Mixed sediments | Mixed sediments | Mixed sediments | Mixed sediments | Mixed sediments |
| Shells - empty | 20 | 50 | 25 | 10 | 25 |
| Bedrock | | | | | |
| Very Large Boulders >1024mm | | | | | |
| Large Boulders (512 - 1024mm) | | | | | |
| Small Boulders (256 - 512mm) | | | | 1 | |
| Cobbles | 5 | 5 | 5 | 9 | 5 |
| Pebbles | 20 | 15 | 15 | 25 | 15 |
| Gravel | 40 | 20 | 40 | 25 | 40 |
| Coarse sand | 10 | 5 | 10 | 20 | 10 |
| Medium sand | 5 | 5 | 5 | 10 | 5 |
| Fine sand | | | | | |
| Mud/silt | | | | | |
| Habitat Category | 1 | 1 | 1 | 4 | 1 |
| Biota description | Sparse fauna with occasional Queen Scallops, Dead Men's Fingers and common starfish | Very Sparse fauna. Similar to Video 1 but very few Queen Scallops, and Dead Men's Fingers | Very Sparse fauna. Similar to Video 1 but very few Queen Scallops, and Dead Men's Fingers | Sparse fauna on mixed sediment. But on the small embedded boulders/cobbles there are many Dead Men's Fingers. | Very Sparse fauna. Similar to Video TV.3-03.S1 but very few Queen Scallops, and Dead Men's Fingers |

| Sample Reference | 3.04.1 | 3.04.2 | 3.04.3 | 3.04.4 | 3.04.5 |
|---|---|---|---|---|---|
| Sample | TV.3-04.S1 | TV.3-04.S2 | TV.3-04.S3 | TV.3-04.S4 | TV.3-04.S5 |
| Section | 1 | 2 | 3 | 4 | 5 |
| Area | 3 | 3 | 3 | 3 | 3 |
| Video Line No. | 04 | 04 | 04 | 04 | 04 |
| Event Name | 3-04 | 3-04 | 3-04 | 3-04 | 3-04 |
| Event reference | TV.3-04 | TV.3-04 | TV.3-04 | TV.3-04 | TV.3-04 |
| Video Section No. | 1 | 2 | 3 | 4 | 5 |
| Gear type | TV | TV | TV | TV | TV |
| Date (dd/mm/yy) | 10/08/2005 | 10/08/2005 | 10/08/2005 | 10/08/2005 | 10/08/2005 |
| Start Time | 15:03 | 15:05 | 15:05 | 15:18 | 15:18 |
| Duration (mins) | 02:00 | 00:30 | 12:30 | 00:20 | 02:30 |
| Visual quality of sample (poor/moderate/good) | Moderate | Moderate | Moderate | Moderate | Moderate |
| Time (hh:mm:ss) | 15:03:00 | 15:05:00 | 15:05:30 | 15:18:00 | 15:18:20 |
| Notes | | | | | |
| Length (m) | 50.4 | 22.8 | 290 | 11 | 60 |
| Speed (m/s) | 0.42 | 0.76 | 0.39 | 0.55 | 0.4 |
| Sediment description | Compact gravel and sand with layer of loose empty *Modiolus* shells scattered on surface | Mainly small boulders, with cobbles and gravel with loose empty *Modiolus* shells scattered on surface | Patchy small boulders, cobbles and gravel with loose empty *Modiolus* shells scattered on surface | Sand and small embedded boulders | Compact gravel and sand with layer of loose empty *Modiolus* shells scattered on surface |
| Start of line latitude | 53.64176 | 53.64162167 | 53.64166333 | 53.64215167 | 53.64222667 |
| Start of line longitude | -4.800115 | -4.799491667 | -4.799153333 | -4.796296667 | -4.796213333 |
| End of line latitude | 53.64162167 | 53.64166333 | 53.64215167 | 53.64222667 | 53.642865 |
| End of line longitude | -4.799491667 | -4.799153333 | -4.796296667 | -4.796213333 | -4.79485 |
| Depth Below Chart Datum Upper | -41.5 | -41.3 | -40.95 | -41.25 | -42.7 |
| Depth Below Chart Datum Lower | -42 | -41.8 | -42.75 | -42.55 | -43.3 |
| Substratum type | Mixed sediments | Mixed sediments | Mixed sediments | Mixed sediments | Mixed sediments |
| Shells - empty | 20 | 5 | 20 | 5 | 30 |
| Bedrock | | | | | |
| Very Large Boulders >1024mm | | | | | |
| Large Boulders (512 - 1024mm) | | | | | |
| Small Boulders (256 - 512mm) | | 60 | 10 | 10 | |
| Cobbles | 10 | 15 | 15 | 10 | |
| Pebbles | 20 | 10 | 10 | | 5 |
| Gravel | 30 | 5 | 20 | | 30 |
| Coarse sand | 20 | 5 | 15 | 30 | 20 |
| Medium sand | 10 | | 10 | 40 | 10 |
| Fine sand | | | | 5 | 5 |
| Mud/silt | | | | | |
| Habitat Category | 1 | 6 | 4 | 3 | 1 |
| Biota description | Very Sparse fauna. Similar to Video TV.3-03.S1 but no Queen Scallops, or Dead Men's Fingers | Area supports many large colonies of *Cliona celata.* | Area mainly supports Dead Men’s Fingers, common urchins and a faunal turf | Mainly *Pomatoceros triqueter* and faunal turf on boulders amongst sand | Sparsely colonised |

| Sample Reference | 3.04.6 | 3.04.7 | 3.05.1 | 3.06.1 | 4.08.1 |
|---|---|---|---|---|---|
| Sample | TV.3-04.S6 | TV.3-04.S7 | TV.3-05.S1 | TV.3-06.S1 | TV.4-08.S1 |
| Section | 6 | 7 | 1 | 1 | 1 |
| Area | 3 | 3 | 3 | 3 | 4 |
| Video Line No. | 04 | 04 | 05 | 06 | 08 |
| Event Name | 3-04 | 3-04 | 3-05 | 3-06 | 4-08 |
| Event reference | TV.3-04 | TV.3-04 | TV.3-05 | TV.3-06 | TV.4-08 |
| Video Section No. | 6 | 7 | 1 | 1 | 1 |
| Gear type | TV | TV | TV | TV | TV |
| Date (dd/mm/yy) | 10/08/2005 | 10/08/2005 | 10/08/2005 | 10/08/2005 | 11/08/2005 |
| Start Time | 15:20 | 15:22 | 15:49 | 17:51 | 13:09 |
| Duration (mins) | 01:50 | 00:40 | 23:56 | 26:48 | 22:47 |
| Visual quality of sample (poor/moderate/good) | Moderate | Moderate | Moderate | Moderate | Moderate |
| Time (hh:mm:ss) | 15:20:50 | 15:22:40 | 15:49:47 | 17:51:17 | 13:09:30 |
| Notes | | | | | |
| Length (m) | 58 | 9.8 | 550 | 875 | 780 |
| Speed (m/s) | 0.53 | 0.25 | 0.38 | 0.42 | 0.57 |
| Sediment description | A few small boulders, cobbles within gravel covered with loose empty *Modiolus* shells scattered on surface | Lots of boulders | Compact gravel and sand with layer of loose empty *Modiolus* shells scattered on surface | Coarse mixed sediment plain with abundant empty *Modiolus* shells | Coarse sand and gravel sediments in small waves |
| Start of line latitude | 53.642865 | 53.64305667 | 53.63891 | 53.65045 | 53.51485833 |
| Start of line longitude | -4.79485 | -4.79413 | -4.771848333 | -4.763938333 | -4.956358333 |
| End of line latitude | 53.64305667 | 53.643115 | 53.63905 | 53.650215 | 53.51071167 |
| End of line longitude | -4.79413 | -4.793993333 | -4.765463333 | -4.754651667 | -4.958566667 |
| Depth Below Chart Datum Upper | -42 | -44.25 | -40.65 | -41 | -94.5 |
| Depth Below Chart Datum Lower | -44.25 | -44.5 | -41.1 | -42 | -98 |
| Substratum type | Mixed sediments | Mixed sediments | Mixed sediments | Mixed sediments | Mixed sediments |
| Shells - empty | 30 | 5 | 30 | 40 | 15 |
| Bedrock | | | | | |
| Very Large Boulders >1024mm | | | | | |
| Large Boulders (512 - 1024mm) | | | | | |
| Small Boulders (256 - 512mm) | 1 | 5 | | | |
| Cobbles | 19 | 40 | 1 | 3 | 1 |
| Pebbles | 20 | 25 | 2 | 7 | 9 |
| Gravel | 15 | 20 | 10 | 15 | 30 |
| Coarse sand | 10 | 5 | 40 | 30 | 35 |
| Medium sand | 5 | | 17 | 5 | 10 |
| Fine sand | | | | | |
| Mud/silt | | | | | |
| Habitat Category | 4 | 5 | 1 | 1 | 1 |
| Biota description | Cobbles and pebbles have faunal turf, *Pomatoceros triqqueter* and frequently Dead Men's Fingers | Cobbles, which are sometimes in piles, support a lot of *Pomatoceros triqueter* and faunal turf | Very Sparse fauna. Similar to Video TV.3-03.S1 but very few Queen Scallops, and Dead Men's Fingers | Sparse fauna on this mobile sediment plain. | Cobbles support a small faunal turf |

| Sample Reference | 4.11.1 | 4.12.1 | 4.14.1 | 4.15.1 | 4.16.1 |
|---|---|---|---|---|---|
| Sample | DC.4-11.S1 | DC.4-12.S1 | DC.4-14.S1 | TV.4-15.S1 | TV.4-16.S1 |
| Section | 1 | 1 | 1 | 1 | 1 |
| Area | 4 | 4 | 4 | 4 | 4 |
| Video Line No. | 11 | 12 | 14 | 15 | 16 |
| Event Name | 4-11 | 4-12 | 4-14 | 4-15 | 4-16 |
| Event reference | DC.4-11 | DC.4-12 | DC.4-14 | TV.4-15 | TV.4-16 |
| Video Section No. | 1 | 1 | 1 | 1 | 1 |
| Gear type | DC | DC | DC | TV | TV |
| Date (dd/mm/yy) | 11/08/2005 | 11/08/2005 | 11/08/2005 | 11/08/2005 | 11/08/2005 |
| Start Time | 14:14 | 14:47 | 15:15 | 16:02 | 16:54 |
| Duration (mins) | 14:31 | 06:16 | 00:07:53 | 14:23 | 18:30 |
| Visual quality of sample (poor/moderate/good) | Good | Good | Poor | Moderate | Moderate |
| Time (hh:mm:ss) | 14:14:40 | 14:47:08 | 15:15:59 | 16:02:25 | 16:54:12 |
| Notes | | | Off bottom for over half of footage. Also poor focussing and quick. Species list under-representative | | |
| Length (m) | 126 | 120 | 250 | 215 | 350 |
| Speed (m/s) | 0.145 | 0.319 | 0.529 | 0.249 | 0.315 |
| Sediment description | Boulders with coarse mixed sediment and empty shells | Bedrock and boulder reef | Small boulders and stable cobbles with patches of gravel and pebbles between. | Mainly pebbles and coarse sand on a flat seabed | Mainly pebbles and coarse Sand on a flat or slightly wavy seabed |
| Start of line latitude | 53.52272833 | 53.51730167 | 53.51406667 | 53.49941 | 53.49277667 |
| Start of line longitude | -4.917781667 | -4.920421667 | -4.925353333 | -4.938401667 | 53.49277667 |
| End of line latitude | 53.52363167 | 53.51630167 | 53.51191833 | 53.50116167 | 53.49440667 |
| End of line longitude | -4.917411667 | -4.920145 | -4.926325 | -4.937235 | -4.923231667 |
| Depth Below Chart Datum Upper | -68 | -70 | -80 | -76 | -85 |
| Depth Below Chart Datum Lower | -71 | -71.5 | -86 | -78 | -92 |
| Substratum type | Rock | Rock | Mixed | Mixed sediments | Mixed sediments |
| Shells - empty | 5 | 2 | | | |
| Bedrock | | 23 | | | |
| Very Large Boulders >1024mm | 5 | 2 | | | |
| Large Boulders (512 - 1024mm) | 5 | 13 | 1 | 1 | 1 |
| Small Boulders (256 - 512mm) | 20 | 20 | 19 | 1 | 1 |
| Cobbles | 35 | 25 | 50 | 3 | 3 |
| Pebbles | 10 | 10 | 20 | 30 | 30 |
| Gravel | 10 | 5 | 10 | 30 | 30 |
| Coarse sand | 5 | | | 25 | 25 |
| Medium sand | 5 | | | 10 | 10 |
| Fine sand | | | | | |
| Mud/silt | | | | | |
| Habitat Category | 6 | 6 | 5 | 5 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| Biota description | Boulders support faunal turf and crusts, Dead Men's Fingers and sponges. | exposed bedrock and boulders support faunal turf and crusts as well as Dead Men's Fingers, | Boulders support faunal turf and crusts, Dead Men's Fingers, starfish and urchins. | Pebbles and gravel seem fairly stable and support a small turf as well as occasional Dead Men's Fingers and anemones | Pebbles and gravel seem fairly stable and support a small turf as well as occasional Dead Men's Fingers and anemones |

| Sample Reference | 4.19.1 | 4.20.1 | 4.20.2 | 4.20.3 | 4.20.4 |
|---|---|---|---|---|---|
| Sample | DC.4-19.S1 | DC.4-20.S1 | DC.4-20.S2 | DC.4-20.S3 | DC.4-20.S4 |
| Section | 1 | 1 | 2 | 3 | 4 |
| Area | 4 | 4 | 4 | 4 | 4 |
| Video Line No. | 19 | 20 | 20 | 20 | 20 |
| Event Name | 4-19 | 4-20 | 4-20 | 4-20 | 4-20 |
| Event reference | DC.4-19 | DC.4-20 | DC.4-20 | DC.4-20 | DC.4-20 |
| Video Section No. | 1 | 1 | 2 | 3 | 4 |
| Gear type | DC | DC | DC | DC | DC |
| Date (dd/mm/yy) | 11/08/2005 | 11/08/2005 | 11/08/2005 | 11/08/2005 | 11/08/2005 |
| Start Time | 20:32 | 20:46 | 20:48 | 20:50 | 20:51 |
| Duration (mins) | 05:17 | 02:13 | 01:59 | 01:05 | 01:57 |
| Visual quality of sample (poor/moderate/good) | Good | Good | Good | Good | Good |
| Time (hh:mm:ss) | 20:32:15 | 20:46:05 | 20:48:18 | | 20:51:22 |
| Notes | | | | | |
| Length (m) | 120 | 20 | 43 | 30 | 47 |
| Speed (m/s) | 0.379 | 0.15 | 0.36 | 0.46 | 0.4 |
| Sediment description | Mainly gravel with some pebbles and coarse sand | Mainly cobbles and pebbles | Coarse sand waves over cobbles and boulders | Mainly cobbles and pebbles | Coarse sand waves over cobbles and boulders |
| Start of line latitude | 53.50131167 | 53.50544833 | 53.50534833 | 53.504965 | 53.504725 |
| Start of line longitude | -4.968821667 | -4.977046667 | -4.977235 | -4.977143333 | -4.977125 |
| End of line latitude | 53.50032167 | 53.50534833 | 53.504965 | 53.504725 | 53.50435833 |
| End of line longitude | -4.96951 | -4.977235 | -4.977143333 | -4.977125 | -4.977335 |
| Depth Below Chart Datum Upper | -65.5 | -63.8 | -63.7 | -63.7 | -60.75 |
| Depth Below Chart Datum Lower | -67.5 | -64.3 | -64 | -63 | -63 |
| Substratum type | Mixed sediments | Mixed sediments | Mixed sediments | Mixed sediments | Mixed sediments |
| Shells - empty | | | | | |
| Bedrock | | | | | |
| Very Large Boulders >1024mm | | | | | 1 |
| Large Boulders (512 - 1024mm) | | | 1 | | |
| Small Boulders (256 - 512mm) | | | 9 | 20 | 6 |
| Cobbles | 10 | 20 | 15 | 40 | 14 |
| Pebbles | 20 | 30 | 4 | 15 | 7 |
| Gravel | 30 | 30 | 1 | 10 | 7 |
| Coarse sand | 30 | 15 | 65 | 10 | 60 |
| Medium sand | 10 | 5 | 5 | 5 | 5 |
| Fine sand | | | | | |
| Mud/silt | | | | | |
| Habitat Category | 3 | 3 | 3 | 3 | 3 |
| Biota description | Pebbles and gravel seem very scoured resulting in the scour tolerant community of bryozoans and cnidarians | Foliose covered bryozoan and hydroid covered cobbles and pebbles | Small boulders and cobbles support scour tolerant community of bryozoans and cnidarians | Foliose covered bryozoan and hydroid covered cobbles and pebbles | Small boulders and cobbles support scour tolerant community of bryozoans and cnidarians |

| Sample Reference | 4.21.1 | 4.22.1 | 4.22.2 | 4.23.1 | 4.23.2 |
|---|---|---|---|---|---|
| Sample | DC.4-21.S1 | DC.4-22.S1 | DC.4-22.S2 | DC.4-23.S1 | DC.4-23.S2 |
| Section | 1 | 1 | 2 | 1 | 2 |
| Area | 4 | 4 | 4 | 4 | 4 |
| Video Line No. | 21 | 22 | 22 | 23 | 23 |
| Event Name | 4-21 | 4-22 | 4-22 | 4-23 | 4-23 |
| Event reference | DC.4-21 | DC.4-22 | DC.4-22 | DC.4-23 | DC.4-23 |
| Video Section No. | 1 | 1 | 2 | 1 | 2 |
| Gear type | DC | DC | DC | DC | DC |
| Date (dd/mm/yy) | 11/08/2005 | 11/08/2005 | 11/08/2005 | 11/08/2005 | 11/08/2005 |
| Start Time | 21:02 | 21:23 | 21:28 | 21:57 | 22:05 |
| Duration (mins) | 06:44 | 04:36 | 09:05 | 07:46 | 04:22 |
| Visual quality of sample (poor/moderate/good) | Good | Good | Moderate | Good | Good |
| Time (hh:mm:ss) | 21:02:00 | 21:23:24 | 21:28:00 | 21:57:29 | 22:05:15 |
| Notes | | | | | |
| Length (m) | 82 | 54 | 72 | 106 | 67 |
| Speed (m/s) | 0.2 | 0.2 | 0.13 | 0.23 | 0.26 |
| Sediment description | Small boulders and stable cobbles with patches of gravel and pebbles between. | Mainly pebble and loose scallop and *Modiolus* shell | Mainly cobbles and pebble with occasional small boulders | Coarse sand waves over cobbles and boulders | Mainly cobbles and pebble with occasional small boulders |
| Start of line latitude | 53.50850167 | 53.50278 | 53.50231333 | 53.51516667 | 53.51573 |
| Start of line longitude | -4.967106667 | -4.943066667 | -4.943283333 | -4.8954 | -4.894103333 |
| End of line latitude | 53.50799 | 53.50231333 | 53.50183167 | 53.51573 | 53.51604167 |
| End of line longitude | -4.966306667 | -4.943283333 | -4.943993333 | -4.894103333 | -4.89331 |
| Depth Below Chart Datum Upper | -64.5 | -68.3 | -67.6 | -65 | -70 |
| Depth Below Chart Datum Lower | -66.25 | -68.5 | -68.4 | -70 | -77 |
| Substratum type | Mixed sediments | Mixed sediments | Mixed sediments | Mixed sediments | Mixed sediments |
| Shells - empty | 10 | 20 | 5 | | 5 |
| Bedrock | | | | | |
| Very Large Boulders >1024mm | | | | | |
| Large Boulders (512 - 1024mm) | 1 | | 1 | | 2 |
| Small Boulders (256 - 512mm) | 4 | | 3 | 10 | 8 |
| Cobbles | 40 | | 45 | 15 | 50 |
| Pebbles | 20 | 50 | 25 | | 20 |
| Gravel | 15 | 20 | 15 | | 10 |
| Coarse sand | 8 | 10 | 6 | 70 | 5 |
| Medium sand | 2 | | | 5 | |
| Fine sand | | | | | |
| Mud/silt | | | | | |
| Habitat Category | 5 | 2 | 5 | 3 | 5 |
| Biota description | Rich area with abundant Dead Men’s Fingers, faunal turf and crusts. Also crabs and anemones, starfish and urchins. | Short sparse faunal turf on shell and compacted pebble seabed | Faunal turf on cobbles and boulders | Small boulders and cobbles support scour tolerant community of bryozoans and cnidarians | Faunal turf on cobbles and boulders |

| Sample Reference | 1.32.1 | 1.33.1 | 1.34.1 | 1.34.2 | 1.37.1 |
|---|---|---|---|---|---|
| Sample | DC.1-32.S1 | DC.1-33.S1 | DC.1-34.S1 | DC.1-34.S2 | DC.1-37.S1 |
| *Alcyonium digitatum* | | F | | C | |
| *Urticia eques* | O | | | | |
| *Metridium senile* | | | | | |
| *Sagartia troglodytes* | | | | | |
| *Sagartia elegans* | | | | | |
| *Pecten maximus* | | | | | |
| *Aequipecten opercularis* | | | | | |
| *Modiolus modiolus* | | | | | |
| *Buccinum undatum* | | | | | |
| *Calliostoma zizyphinum* | | | | | R |
| *Sabella parvonina* | | | R | | |
| *Pomatoceros triqueter* | O | | | O | O |
| *Balanus crenatus*? | O | | | | O |
| Faunal turf | A | A | | C | A |
| Faunal crusts | | | | O | O |
| *Flustra foliacea* | | C | O | O | F |
| *Nemertesia ramosa* | | F | | O | O |
| *Nemertesia antennina* | | O | R | | O |
| *Abietinaria abietina* | C | | | O | |
| *Hydallmania falcata* | | | | | |
| *Pagurus bernhardus* | | | | | |
| *Munida rugosa* | | | | | |
| *Macropodia rostrata* | | | | R | |
| *Inachus* sp. | | | | | |
| *Hyas araneus* | | | | | |
| *Corystes cassivelaunus* | | | | | |
| Crab sp. A | | | | | |
| Crab sp. B | | | | | |
| *Cliona celata* | | | | | |
| *Tethya citrina* | | | | | |
| *Axinella infundibuliformis* | | | | | |
| Porifera indet (massive orange) | | | | | |
| *Ascidiella aspersa* | | | | | |
| *Ascidia virginea* | | | | R | |
| *Ciona intestinalis* | R | R | | | |
| *Ascidiella scabra* | | | | | |
| *Polycarpa pomaria* | | | | | |
| *Alcyonidium diaphanum* | | | | | |
| *Henricia oculata* | | | | | R |
| *Ophiocomina nigra* | O | O | | | |
| *Ophiothrix fragilis* | S | A | | | |
| *Ophiura ophiura* | | | | | |
| *Antedon petasus* | | R | | | O |
| *Anseropoda placenta* | | | | | |
| *Asterias rubens* | F | F | O | O | |
| *Crossaster papposus* | R | R | R | | |
| *Echinus esculentus* | R | C | | O | F |
| *Callionymus lyra* | | | | | |
| *Scyliorhinus canicula* | | | | | |
| *Aspitrigla cuculus* | | | | | |
| *Raja naevus* | | | | | |
| *Raja Montagui* | | | | | |
| Skate (unidentified) | | | | | |
| *Pholis gunnellus* | | | | | |

| Sample Reference<br>Sample | 1.37.10<br>DC.1-37.S10 | 1.37.2<br>DC.1-37.S2 | 1.37.3<br>DC.1-37.S3 | 1.37.4<br>DC.1-37.S4 | 1.37.5<br>DC.1-37.S5 |
|---|---|---|---|---|---|
| *Alcyonium digitatum* | | | R | | |
| *Urticia eques* | | | | R | |
| *Metridium senile* | | | | | |
| *Sagartia troglodytes* | | | | | |
| *Sagartia elegans* | | | | | |
| *Pecten maximus* | | | | | |
| *Aequipecten opercularis* | | | | | |
| *Modiolus modiolus* | | | | | |
| *Buccinum undatum* | | | R | | |
| *Calliostoma zizyphinum* | | R | | | |
| *Sabella parvonina* | | | | | |
| *Pomatoceros triqueter* | C | F | R | C | |
| *Balanus crenatus*? | F | | R | | |
| Faunal turf | | A | F | C | C |
| Faunal crusts | C | C | | O | |
| *Flustra foliacea* | C | C | F | C | F |
| *Nemertesia ramosa* | | C | | | O |
| *Nemertesia antennina* | | | O | O | |
| *Abietinaria abietina* | O | | | | |
| *Hydallmania falcata* | | | | | O |
| *Pagurus bernhardus* | | | | | |
| *Munida rugosa* | | | | | |
| *Macropodia rostrata* | | | | | R |
| *Inachus* sp. | | | | | |
| *Hyas araneus* | | | | | |
| *Corystes cassivelaunus* | | | | | |
| Crab sp. A | | | | | |
| Crab sp. B | | | | | |
| *Cliona celata* | | | | O | |
| *Tethya citrina* | | | | | |
| *Axinella infundibuliformis* | | | | | |
| Porifera indet (massive orange) | | | | | |
| *Ascidiella aspersa* | | | | | |
| *Ascidia virginea* | R | | | | R |
| *Ciona intestinalis* | | R | | R | |
| *Ascidiella scabra* | | | | | |
| *Polycarpa pomaria* | | | | | |
| *Alcyonidium diaphanum* | | | | | |
| *Henricia oculata* | | R | | | |
| *Ophiocomina nigra* | | | | | |
| *Ophiothrix fragilis* | | | | | |
| *Ophiura ophiura* | | | | | |
| *Antedon petasus* | | | R | R | |
| *Anseropoda placenta* | | | | | |
| *Asterias rubens* | | O | | | O |
| *Crossaster papposus* | | | | | |
| *Echinus esculentus* | | | | F | |
| *Callionymus lyra* | | | | | |
| *Scyliorhinus canicula* | | | | | |
| *Aspitrigla cuculus* | | | | | |
| *Raja naevus* | | | | | |
| *Raja Montagui* | | | | | |
| Skate (unidentified) | | | | | |
| *Pholis gunnellus* | | | | | |

| Sample Reference | 1.37.6 | 1.37.7 | 1.37.8 | 1.37.9 | 1.38.1 |
|---|---|---|---|---|---|
| Sample | DC.1-37.S6 | DC.1-37.S7 | DC.1-37.S8 | DC.1-37.S9 | DC.1-38.S1 |
| *Alcyonium digitatum* | | | | | |
| *Urticia eques* | | | | | F |
| *Metridium senile* | | | | | |
| *Sagartia troglodytes* | | | | | |
| *Sagartia elegans* | | | | | |
| *Pecten maximus* | | | | | |
| *Aequipecten opercularis* | | | | | |
| *Modiolus modiolus* | | | | | |
| *Buccinum undatum* | | | | | |
| *Calliostoma zizyphinum* | | | | | |
| *Sabella parvonina* | | | | | R |
| *Pomatoceros triqueter* | | | C | | |
| *Balanus crenatus*? | | | C | | |
| Faunal turf | | C | A | | C |
| Faunal crusts | | | F | | |
| *Flustra foliacea* | | F | C | O | |
| *Nemertesia ramosa* | | O | | | R |
| *Nemertesia antennina* | | | | O | |
| *Abietinaria abietina* | | | O | | |
| *Hydallmania falcata* | | | | | |
| *Pagurus bernhardus* | | | | | |
| *Munida rugosa* | | | | | R |
| *Macropodia rostrata* | | | | | O |
| *Inachus* sp. | | | | | |
| *Hyas araneus* | | | | | |
| *Corystes cassivelaunus* | | | | | |
| Crab sp. A | | | | | |
| Crab sp. B | | | | | |
| *Cliona celata* | | | | | |
| *Tethya citrina* | | | | | |
| *Axinella infundibuliformis* | | | | | |
| Porifera indet (massive orange) | | | | | |
| *Ascidiella aspersa* | | | | | |
| *Ascidia virginea* | | | | | |
| *Ciona intestinalis* | | | | | |
| *Ascidiella scabra* | | | | | |
| *Polycarpa pomaria* | | | | | |
| *Alcyonidium diaphanum* | | | | | |
| *Henricia oculata* | | | | | |
| *Ophiocomina nigra* | | | | | |
| *Ophiothrix fragilis* | | | | | |
| *Ophiura ophiura* | | | | | |
| *Antedon petasus* | | | | | |
| *Anseropoda placenta* | | | | | R |
| *Asterias rubens* | | O | | | O |
| *Crossaster papposus* | | | | | F |
| *Echinus esculentus* | | | F | | |
| *Callionymus lyra* | | | | | |
| *Scyliorhinus canicula* | | | | | |
| *Aspitrigla cuculus* | | | | | |
| *Raja naevus* | | | | | |
| *Raja Montagui* | | | | | |
| Skate (unidentified) | | | | | |
| *Pholis gunnellus* | | | | | |

| Sample Reference | 1.38.2 | 1.38.3 | 1.38.4 | 1.38.5 | 1.38.6 |
|---|---|---|---|---|---|
| Sample | DC.1-38.S2 | DC.1-38.S3 | DC.1-38.S4 | DC.1-38.S5 | DC.1-38.S6 |
| *Alcyonium digitatum* | | | O | | O |
| *Urticia eques* | | | | | |
| *Metridium senile* | | | | | |
| *Sagartia troglodytes* | | | | | |
| *Sagartia elegans* | | | | | |
| *Pecten maximus* | | | | | |
| *Aequipecten opercularis* | | | | | |
| *Modiolus modiolus* | | | | | |
| *Buccinum undatum* | | | | | |
| *Calliostoma zizyphinum* | | | | | |
| *Sabella parvonina* | | R | | | |
| *Pomatoceros triqueter* | | | F | | O |
| *Balanus crenatus*? | | | | | O |
| Faunal turf | C | F | F | C | A |
| Faunal crusts | | | O | | |
| *Flustra foliacea* | R | C | O | O | F |
| *Nemertesia ramosa* | R | F | O | R | O |
| *Nemertesia antennina* | | | | | |
| *Abietinaria abietina* | | | | | |
| *Hydallmania  falcata* | | | | | |
| *Pagurus bernhardus* | | | | | |
| *Munida rugosa* | | | | | |
| *Macropodia rostrata* | | | | | R |
| *Inachus* sp. | | | | | |
| *Hyas araneus* | | | | | |
| *Corystes cassivelaunus* | | | | | |
| Crab sp. A | | | | | |
| Crab sp. B | | | | | |
| *Cliona celata* | | R | | | |
| *Tethya citrina* | | | | | |
| *Axinella infundibuliformis* | | | | | |
| Porifera indet (massive orange) | | | | | |
| *Ascidiella aspersa* | | | | | |
| *Ascidia virginea* | | R | | | O |
| *Ciona intestinalis* | | R | | | |
| *Ascidiella scabra* | | | | | |
| *Polycarpa pomaria* | | | | | |
| *Alcyonidium diaphanum* | | | | | O |
| *Henricia oculata* | | R | | | R |
| *Ophiocomina nigra* | F | O | | | |
| *Ophiothrix fragilis* | A | | | O | |
| *Ophiura ophiura* | | | | | |
| *Antedon petasus* | | | | | |
| *Anseropoda placenta* | | | | | |
| *Asterias rubens* | R | R | O | R | R |
| *Crossaster papposus* | | F | | | |
| *Echinus esculentus* | | | F | | |
| *Callionymus lyra* | | | | | |
| *Scyliorhinus canicula* | | | | | |
| *Aspitrigla cuculus* | | | | | |
| *Raja naevus* | | | | | |
| *Raja Montagui* | | | | | |
| Skate (unidentified) | | | | | |
| *Pholis gunnellus* | | | | | |

| Sample Reference | 1.38.7 | 1.39.1 | 1.39.2 | 1.39.3 | 1.39.4 |
|---|---|---|---|---|---|
| Sample | DC.1-38.S7 | DC.1-39.S1 | DC.1-39.S2 | DC.1-39.S3 | DC.1-39.S4 |
| *Alcyonium digitatum* | | | R | O | O |
| *Urticia eques* | | | | | |
| *Metridium senile* | | | | | |
| *Sagartia troglodytes* | | | | | |
| *Sagartia elegans* | | | | | |
| *Pecten maximus* | | | | | |
| *Aequipecten opercularis* | | | | | |
| *Modiolus modiolus* | | | | | |
| *Buccinum undatum* | | | | | |
| *Calliostoma zizyphinum* | | | | | |
| *Sabella parvonina* | | | | | |
| *Pomatoceros triqueter* | | C | O | C | F |
| *Balanus crenatus*? | | F | | | |
| Faunal turf | C | A | O | F | A |
| Faunal crusts | | | | | |
| *Flustra foliacea* | O | | | C | C |
| *Nemertesia ramosa* | O | | | | |
| *Nemertesia antennina* | | | | | |
| *Abietinaria abietina* | | F | | | |
| *Hydallmania falcata* | | F | | C | C |
| *Pagurus bernhardus* | | | | | |
| *Munida rugosa* | | R | | | F |
| *Macropodia rostrata* | | | | | R |
| *Inachus* sp. | | | | | |
| *Hyas araneus* | | | | | |
| *Corystes cassivelaunus* | | | | | |
| Crab sp. A | | | | | |
| Crab sp. B | | | | | |
| *Cliona celata* | | | | | |
| *Tethya citrina* | | | | | |
| *Axinella infundibuliformis* | | | | | |
| Porifera indet (massive orange) | | | | | R |
| *Ascidiella aspersa* | | | | | |
| *Ascidia virginea* | | | | | |
| *Ciona intestinalis* | R | O | | | |
| *Ascidiella scabra* | | | | | |
| *Polycarpa pomaria* | | | | | |
| *Alcyonidium diaphanum* | O | | | | |
| *Henricia oculata* | | | | | |
| *Ophiocomina nigra* | | | | | |
| *Ophiothrix fragilis* | | A | | | C |
| *Ophiura ophiura* | O | | | | |
| *Antedon petasus* | | | | | O |
| *Anseropoda placenta* | | | | | R |
| *Asterias rubens* | | R | R | R | O |
| *Crossaster papposus* | | | | | R |
| *Echinus esculentus* | | | | | O |
| *Callionymus lyra* | | | | | |
| *Scyliorhinus canicula* | | | | | |
| *Aspitrigla cuculus* | | | | | |
| *Raja naevus* | | | | | |
| *Raja Montagui* | | | | | |
| Skate (unidentified) | | | | | |
| *Pholis gunnellus* | | | | | |

| Sample Reference<br>Sample | 1.39.5<br>DC.1-39.S5 | 1.39.6<br>DC.1-39.S6 | 1.39.7<br>DC.1-39.S7 | 2.24.1<br>DC.2-24.S1 | 2.24.2<br>DC.2-24.S2 |
|---|---|---|---|---|---|
| *Alcyonium digitatum* | | O | C | | C |
| *Urticia eques* | | | O | | R |
| *Metridium senile* | | | | | |
| *Sagartia troglodytes* | | | | | |
| *Sagartia elegans* | | | | | |
| *Pecten maximus* | | | | | |
| *Aequipecten opercularis* | | | | | |
| *Modiolus modiolus* | | | | | |
| *Buccinum undatum* | | R | R | | |
| *Calliostoma zizyphinum* | | | | | |
| *Sabella parvonina* | | | | | |
| *Pomatoceros triqueter* | O | C | | | C |
| *Balanus crenatus*? | | | | | |
| Faunal turf | | C | C | R | C |
| Faunal crusts | | | | | C |
| *Flustra foliacea* | O | F | F | R | |
| *Nemertesia ramosa* | | O | | | |
| *Nemertesia antennina* | O | | | | |
| *Abietinaria abietina* | | | | | O |
| *Hydallmania falcata* | | | | R | |
| *Pagurus bernhardus* | | | | R | |
| *Munida rugosa* | | R | | | |
| *Macropodia rostrata* | | | F | | R |
| *Inachus* sp. | | | | | |
| *Hyas araneus* | | | | | |
| *Corystes cassivelaunus* | | | | | |
| Crab sp. A | | | | | |
| Crab sp. B | | | | | |
| *Cliona celata* | | | | | |
| *Tethya citrina* | | | | | |
| *Axinella infundibuliformis* | | | | | |
| Porifera indet (massive orange) | | | | | |
| *Ascidiella aspersa* | | | | | |
| *Ascidia virginea* | | R | | | |
| *Ciona intestinalis* | | | | | |
| *Ascidiella scabra* | | | | | |
| *Polycarpa pomaria* | | | | | |
| *Alcyonidium diaphanum* | | | | | |
| *Henricia oculata* | | | | | |
| *Ophiocomina nigra* | | O | | | |
| *Ophiothrix fragilis* | | C | C | | |
| *Ophiura ophiura* | | | | | |
| *Antedon petasus* | | | | | |
| *Anseropoda placenta* | | | | | |
| *Asterias rubens* | O | O | | F | |
| *Crossaster papposus* | | O | F | | R |
| *Echinus esculentus* | | O | O | | O |
| *Callionymus lyra* | | | | | |
| *Scyliorhinus canicula* | | | | | |
| *Aspitrigla cuculus* | | | | | |
| *Raja naevus* | | | | | |
| *Raja Montagui* | | | | | |
| Skate (unidentified) | | | | | |
| *Pholis gunnellus* | | | | | |

| Sample Reference<br>Sample | 2.24.3<br>DC.2-24.S3 | 2.25.1<br>DC.2-25.S1 | 2.26.1<br>DC.2-26.S1 | 2.26.2<br>DC.2-26.S2 | 2.26.3<br>DC.2-26.S3 |
|---|---|---|---|---|---|
| *Alcyonium digitatum* | | C | | F | |
| *Urticia eques* | | | | | |
| *Metridium senile* | | R | | | |
| *Sagartia troglodytes* | | | | | |
| *Sagartia elegans* | | | | | |
| *Pecten maximus* | | | | | |
| *Aequipecten opercularis* | | R | | | |
| *Modiolus modiolus* | | | | | |
| *Buccinum undatum* | | | | | |
| *Calliostoma zizyphinum* | | O | | | |
| *Sabella parvonina* | | | | O | R |
| *Pomatoceros triqueter* | | A | | C | R |
| *Balanus crenatus*? | | | | O | |
| Faunal turf | | A | C | C | C |
| Faunal crusts | | C | R | C | R |
| *Flustra foliacea* | | R | | | |
| *Nemertesia ramosa* | | | | R | |
| *Nemertesia antennina* | | R | F | O | R |
| *Abietinaria abietina* | | C | | | |
| *Hydallmania falcata* | | | | | |
| *Pagurus bernhardus* | | | | | |
| *Munida rugosa* | | R | R | R | |
| *Macropodia rostrata* | | F | | R | |
| *Inachus* sp. | | | | | |
| *Hyas araneus* | | | | | |
| *Corystes cassivelaunus* | | | | | |
| Crab sp. A | | | | | |
| Crab sp. B | | | | | |
| *Cliona celata* | | | | R | |
| *Tethya citrina* | | | | | |
| *Axinella infundibuliformis* | | | | | |
| Porifera indet (massive orange) | | | | | |
| *Ascidiella aspersa* | | | | | |
| *Ascidia virginea* | | R | | R | |
| *Ciona intestinalis* | | R | | | |
| *Ascidiella scabra* | | | | | |
| *Polycarpa pomaria* | | | | | |
| *Alcyonidium diaphanum* | | | | | |
| *Henricia oculata* | | | | | |
| *Ophiocomina nigra* | | | | | |
| *Ophiothrix fragilis* | | | | | |
| *Ophiura ophiura* | | | | | |
| *Antedon petasus* | | R | | R | |
| *Anseropoda placenta* | | | | | |
| *Asterias rubens* | R | C | O | O | |
| *Crossaster papposus* | | | | | |
| *Echinus esculentus* | | C | F | F | F |
| *Callionymus lyra* | | | | | |
| *Scyliorhinus canicula* | | | | R | |
| *Aspitrigla cuculus* | | | | | |
| *Raja naevus* | | | | | |
| *Raja Montagui* | | | | | |
| Skate (unidentified) | | | | | |
| *Pholis gunnellus* | | | | R | |

| Sample Reference<br>Sample | 2.27.1<br>DC.2-27.S1 | 2.27.10<br>DC.2-27.S10 | 2.27.11<br>DC.2-27.S11 | 2.27.12<br>DC.2-27.S12 | 2.27.13<br>DC.2-27.S13 |
|---|---|---|---|---|---|
| *Alcyonium digitatum* | | | | O | C |
| *Urticia eques* | | | | R | F |
| *Metridium senile* | | | | | |
| *Sagartia troglodytes* | | | | | |
| *Sagartia elegans* | | | | | |
| *Pecten maximus* | | | | | |
| *Aequipecten opercularis* | | | | | |
| *Modiolus modiolus* | | | | | |
| *Buccinum undatum* | | | | | |
| *Calliostoma zizyphinum* | | | | | |
| *Sabella parvonina* | | | | | |
| *Pomatoceros triqueter* | | | A | | A |
| *Balanus crenatus*? | | | | | |
| Faunal turf | F | O | C | O | C |
| Faunal crusts | | | C | | |
| *Flustra foliacea* | | | | | O |
| *Nemertesia ramosa* | | | | | |
| *Nemertesia antennina* | | | | | |
| *Abietinaria abietina* | | | F | | |
| *Hydallmania falcata* | | | | O | |
| *Pagurus bernhardus* | | | | | |
| *Munida rugosa* | | | | | |
| *Macropodia rostrata* | | | | | |
| *Inachus* sp. | | | | | |
| *Hyas araneus* | | | | | |
| *Corystes cassivelaunus* | | | | | |
| Crab sp. A | | | | | |
| Crab sp. B | | | | | |
| *Cliona celata* | | | | R | |
| *Tethya citrina* | | | | | |
| *Axinella infundibuliformis* | | | | | |
| Porifera indet (massive orange) | | | | | |
| *Ascidiella aspersa* | | | R | | |
| *Ascidia virginea* | | | | | |
| *Ciona intestinalis* | | | | | |
| *Ascidiella scabra* | | | | | |
| *Polycarpa pomaria* | | | | | |
| *Alcyonidium diaphanum* | | | | | |
| *Henricia oculata* | | | | | |
| *Ophiocomina nigra* | | | | | |
| *Ophiothrix fragilis* | | | | | |
| *Ophiura ophiura* | | | | | |
| *Antedon petasus* | | | | | |
| *Anseropoda placenta* | | | | | |
| *Asterias rubens* | | | R | | |
| *Crossaster papposus* | | | | | |
| *Echinus esculentus* | | | | | |
| *Callionymus lyra* | | | | | |
| *Scyliorhinus canicula* | | | | | |
| *Aspitrigla cuculus* | | | | | |
| *Raja naevus* | | | | | |
| *Raja Montagui* | | | | | |
| Skate (unidentified) | | | | | |
| *Pholis gunnellus* | | | | | |

| Sample Reference<br>Sample | 2.27.14<br>DC.2-27.S14 | 2.27.15<br>DC.2-27.S15 | 2.27.16<br>DC.2-27.S16 | 2.27.17<br>DC.2-27.S17 | 2.27.2<br>DC.2-27.S2 |
|---|---|---|---|---|---|
| *Alcyonium digitatum* | O | C | C | F | |
| *Urticia eques* | R | | O | | O |
| *Metridium senile* | | | | | |
| *Sagartia troglodytes* | | | | | |
| *Sagartia elegans* | | | | | |
| *Pecten maximus* | | | | | |
| *Aequipecten opercularis* | | | | | |
| *Modiolus modiolus* | | | | | |
| *Buccinum undatum* | | | | | |
| *Calliostoma zizyphinum* | | | | | |
| *Sabella parvonina* | | | | | |
| *Pomatoceros triqueter* | | C | F | C | A |
| *Balanus crenatus*? | | | | O | |
| Faunal turf | A | A | F | C | C |
| Faunal crusts | | O | | F | |
| *Flustra foliacea* | | | | | |
| *Nemertesia ramosa* | | | | | |
| *Nemertesia antennina* | | | | | |
| *Abietinaria abietina* | | C | | | C |
| *Hydallmania falcata* | | | | | |
| *Pagurus bernhardus* | | | | | |
| *Munida rugosa* | | | | | O |
| *Macropodia rostrata* | | R | | | |
| *Inachus* sp. | | | | | |
| *Hyas araneus* | | | | | |
| *Corystes cassivelaunus* | | | | | |
| Crab sp. A | | | | | |
| Crab sp. B | | | | | |
| *Cliona celata* | | | | | |
| *Tethya citrina* | | | | | |
| *Axinella infundibuliformis* | | | | | |
| Porifera indet (massive orange) | | | | | |
| *Ascidiella aspersa* | | | | | |
| *Ascidia virginea* | | R | | | |
| *Ciona intestinalis* | | O | | O | |
| *Ascidiella scabra* | | | | | |
| *Polycarpa pomaria* | | | | | |
| *Alcyonidium diaphanum* | | | | | |
| *Henricia oculata* | | | | | |
| *Ophiocomina nigra* | | | | | |
| *Ophiothrix fragilis* | | | | | |
| *Ophiura ophiura* | | | | | |
| *Antedon petasus* | | | | | |
| *Anseropoda placenta* | | | | | |
| *Asterias rubens* | | | O | | |
| *Crossaster papposus* | | | | | |
| *Echinus esculentus* | | | | | |
| *Callionymus lyra* | | | | | |
| *Scyliorhinus canicula* | | | | | |
| *Aspitrigla cuculus* | | | | | |
| *Raja naevus* | | | | | |
| *Raja Montagui* | | | | | |
| Skate (unidentified) | | | | | |
| *Pholis gunnellus* | | | | | |

| Sample Reference<br>Sample | 2.27.3<br>DC.2-27.S3 | 2.27.4<br>DC.2-27.S4 | 2.27.5<br>DC.2-27.S5 | 2.27.6<br>DC.2-27.S6 | 2.27.7<br>DC.2-27.S7 |
|---|---|---|---|---|---|
| *Alcyonium digitatum* | | F | | | F |
| *Urticia eques* | | O | | | O |
| *Metridium senile* | | | | | |
| *Sagartia troglodytes* | | | | | |
| *Sagartia elegans* | | | | | |
| *Pecten maximus* | | | | | |
| *Aequipecten opercularis* | | | | | |
| *Modiolus modiolus* | | | | | |
| *Buccinum undatum* | | | | | |
| *Calliostoma zizyphinum* | | R | | | |
| *Sabella parvonina* | | R | | | |
| *Pomatoceros triqueter* | | C | C | | C |
| *Balanus crenatus*? | | | | | |
| Faunal turf | F | C | C | O | C |
| Faunal crusts | | F | | | F |
| *Flustra foliacea* | | | | | |
| *Nemertesia ramosa* | | | | | |
| *Nemertesia antennina* | | | | | |
| *Abietinaria abietina* | | C | C | | |
| *Hydallmania falcata* | | | | | |
| *Pagurus bernhardus* | | | | | |
| *Munida rugosa* | | | | | |
| *Macropodia rostrata* | | | | | |
| *Inachus* sp. | | | | | |
| *Hyas araneus* | | | | | |
| *Corystes cassivelaunus* | | | | | |
| Crab sp. A | | | | | |
| Crab sp. B | | | | | |
| *Cliona celata* | | | | | |
| *Tethya citrina* | | | | | |
| *Axinella infundibuliformis* | | | | | |
| Porifera indet (massive orange) | | | | | |
| *Ascidiella aspersa* | | | | | |
| *Ascidia virginea* | | | | | |
| *Ciona intestinalis* | | | | | |
| *Ascidiella scabra* | | | | | |
| *Polycarpa pomaria* | | | | | |
| *Alcyonidium diaphanum* | | | | | |
| *Henricia oculata* | | | | | |
| *Ophiocomina nigra* | | | | | |
| *Ophiothrix fragilis* | | | | | |
| *Ophiura ophiura* | | | | | |
| *Antedon petasus* | | | | | |
| *Anseropoda placenta* | | | | | |
| *Asterias rubens* | | O | | | |
| *Crossaster papposus* | | | | | |
| *Echinus esculentus* | | O | | | O |
| *Callionymus lyra* | | | | | |
| *Scyliorhinus canicula* | | | | | |
| *Aspitrigla cuculus* | | | | | |
| *Raja naevus* | | | | | |
| *Raja Montagui* | | | | | |
| Skate (unidentified) | | | | | |
| *Pholis gunnellus* | | | | | |

| Sample Reference<br>Sample | 2.27.8<br>DC.2-27.S8 | 2.27.9<br>DC.2-27.S9 | 2.28.1<br>DC.2-28.S1 | 2.28.2<br>DC.2-28.S2 | 2.28.3<br>DC.2-28.S3 |
|---|---|---|---|---|---|
| *Alcyonium digitatum* | O | | | | F |
| *Urticia eques* | | | O | O | |
| *Metridium senile* | | | | | |
| *Sagartia troglodytes* | | | | | |
| *Sagartia elegans* | | | | | |
| *Pecten maximus* | | | | | |
| *Aequipecten opercularis* | | | | R | |
| *Modiolus modiolus* | | | | | |
| *Buccinum undatum* | | | | | |
| *Calliostoma zizyphinum* | | | | | |
| *Sabella parvonina* | | | | | |
| *Pomatoceros triqueter* | | C | C | | F |
| *Balanus crenatus*? | | | | | F |
| Faunal turf | O | A | A | A | A |
| Faunal crusts | | F | | | |
| *Flustra foliacea* | | | F | C | |
| *Nemertesia ramosa* | | | O | | |
| *Nemertesia antennina* | | | | R | |
| *Abietinaria abietina* | | C | C | | C |
| *Hydallmania falcata* | | | | F | C |
| *Pagurus bernhardus* | | | | O | |
| *Munida rugosa* | | | | | O |
| *Macropodia rostrata* | | | F | F | |
| *Inachus* sp. | | | | R | R |
| *Hyas araneus* | | | | | |
| *Corystes cassivelaunus* | | | | | |
| Crab sp. A | | | | | |
| Crab sp. B | | | | | |
| *Cliona celata* | | | | | |
| *Tethya citrina* | | | | | |
| *Axinella infundibuliformis* | | | | | |
| Porifera indet (massive orange) | | | | | |
| *Ascidiella aspersa* | | | | | |
| *Ascidia virginea* | | | | | |
| *Ciona intestinalis* | | | | | |
| *Ascidiella scabra* | | | | F | |
| *Polycarpa pomaria* | | | | | |
| *Alcyonidium diaphanum* | | | | | |
| *Henricia oculata* | | | | | |
| *Ophiocomina nigra* | | | | | |
| *Ophiothrix fragilis* | | | | | |
| *Ophiura ophiura* | | | | | |
| *Antedon petasus* | | | | | |
| *Anseropoda placenta* | | | | | |
| *Asterias rubens* | R | | | R | |
| *Crossaster papposus* | | | | | |
| *Echinus esculentus* | | | | | |
| *Callionymus lyra* | | | | | |
| *Scyliorhinus canicula* | | | | | |
| *Aspitrigla cuculus* | | | | | |
| *Raja naevus* | | | | | |
| *Raja Montagui* | | | | | |
| Skate (unidentified) | | | | | |
| *Pholis gunnellus* | | | | | |

| Sample Reference | 2.28.4 | 2.28.5 | 2.28.6 | 2.29.1 | 2.29.10 |
|---|---|---|---|---|---|
| Sample | DC.2-28.S4 | DC.2-28.S5 | DC.2-28.S6 | DC.2-29.S1 | DC.2-29.S10 |
| *Alcyonium digitatum* | | | | | |
| *Urticia eques* | | O | | | |
| *Metridium senile* | | | | | |
| *Sagartia troglodytes* | | | | | |
| *Sagartia elegans* | | | | | |
| *Pecten maximus* | | | | | |
| *Aequipecten opercularis* | | | | | |
| *Modiolus modiolus* | | | | | |
| *Buccinum undatum* | | | | | |
| *Calliostoma zizyphinum* | | | | | |
| *Sabella parvonina* | | R | | | |
| *Pomatoceros triqueter* | | C | R | | |
| *Balanus crenatus*? | | | | | |
| Faunal turf | F | C | O | O | |
| Faunal crusts | | C | | | |
| *Flustra foliacea* | O | O | | | C |
| *Nemertesia ramosa* | | | | | |
| *Nemertesia antennina* | | | | | |
| *Abietinaria abietina* | | F | | | |
| *Hydallmania falcata* | O | C | O | | |
| *Pagurus bernhardus* | | | O | | |
| *Munida rugosa* | | | | | |
| *Macropodia rostrata* | | | | | |
| *Inachus* sp. | | | | | |
| *Hyas araneus* | | | | | |
| *Corystes cassivelaunus* | | | | | |
| Crab sp. A | | | | | |
| Crab sp. B | | | | | |
| *Cliona celata* | | | | | |
| *Tethya citrina* | | | | | |
| *Axinella infundibuliformis* | | | | | |
| Porifera indet (massive orange) | | | | | |
| *Ascidiella aspersa* | | | | | |
| *Ascidia virginea* | R | | | | |
| *Ciona intestinalis* | | | | | |
| *Ascidiella scabra* | | | | | |
| *Polycarpa pomaria* | | | | | |
| *Alcyonidium diaphanum* | | | | | |
| *Henricia oculata* | | | | | |
| *Ophiocomina nigra* | | | | | |
| *Ophiothrix fragilis* | | | | | |
| *Ophiura ophiura* | | | | | |
| *Antedon petasus* | | | | | |
| *Anseropoda placenta* | | | | | |
| *Asterias rubens* | R | | O | | O |
| *Crossaster papposus* | | | R | | |
| *Echinus esculentus* | | R | | | |
| *Callionymus lyra* | | | | | |
| *Scyliorhinus canicula* | | | | | |
| *Aspitrigla cuculus* | | | | | |
| *Raja naevus* | | | | | |
| *Raja Montagui* | | | | | |
| Skate (unidentified) | | | | | |
| *Pholis gunnellus* | | | | | |

| Sample Reference<br>Sample | 2.29.11<br>DC.2-29.S11 | 2.29.12<br>DC.2-29.S12 | 2.29.2<br>DC.2-29.S2 | 2.29.3<br>DC.2-29.S3 | 2.29.4<br>DC.2-29.S4 |
|---|---|---|---|---|---|
| *Alcyonium digitatum* | | | | | |
| *Urticia eques* | R | F | | | |
| *Metridium senile* | | | | | |
| *Sagartia troglodytes* | | | | | |
| *Sagartia elegans* | | | | | |
| *Pecten maximus* | | | | | |
| *Aequipecten opercularis* | | | | | |
| *Modiolus modiolus* | | | | | |
| *Buccinum undatum* | | | | | |
| *Calliostoma zizyphinum* | | | | | |
| *Sabella parvonina* | | | | | |
| *Pomatoceros triqueter* | O | F | | | |
| *Balanus crenatus*? | | O | | | |
| Faunal turf | C | A | C | O | C |
| Faunal crusts | | F | | | |
| *Flustra foliacea* | C | A | | | |
| *Nemertesia ramosa* | O | | | | |
| *Nemertesia antennina* | O | | | | |
| *Abietinaria abietina* | | A | | | |
| *Hydallmania falcata* | | | | | |
| *Pagurus bernhardus* | | | | | |
| *Munida rugosa* | | | | | |
| *Macropodia rostrata* | | | | | |
| *Inachus* sp. | | | | | |
| *Hyas araneus* | | | | | |
| *Corystes cassivelaunus* | | | | | |
| Crab sp. A | | | | | |
| Crab sp. B | | | | | |
| *Cliona celata* | | | | | |
| *Tethya citrina* | | | | | |
| *Axinella infundibuliformis* | | | | | |
| Porifera indet (massive orange) | | | | | |
| *Ascidiella aspersa* | | | | | |
| *Ascidia virginea* | R | | | | |
| *Ciona intestinalis* | R | | | | |
| *Ascidiella scabra* | | | | | |
| *Polycarpa pomaria* | R | | | | |
| *Alcyonidium diaphanum* | | | | | |
| *Henricia oculata* | R | | | | |
| *Ophiocomina nigra* | C | | | | |
| *Ophiothrix fragilis* | O | | | | |
| *Ophiura ophiura* | | | | | |
| *Antedon petasus* | | | | | |
| *Anseropoda placenta* | | | | | |
| *Asterias rubens* | O | | | | |
| *Crossaster papposus* | | | | | O |
| *Echinus esculentus* | R | O | | | |
| *Callionymus lyra* | | | | | |
| *Scyliorhinus canicula* | | | | | |
| *Aspitrigla cuculus* | | | | | |
| *Raja naevus* | | | | | |
| *Raja Montagui* | | | | | |
| Skate (unidentified) | | | | | |
| *Pholis gunnellus* | | | | | |

| Sample Reference<br>Sample | 2.29.5<br>DC.2-29.S5 | 2.29.6<br>DC.2-29.S6 | 2.29.7<br>DC.2-29.S7 | 2.29.8<br>DC.2-29.S8 | 2.29.9<br>DC.2-29.S9 |
|---|---|---|---|---|---|
| *Alcyonium digitatum* | | | | | |
| *Urticia eques* | O | | O | | |
| *Metridium senile* | | | | | |
| *Sagartia troglodytes* | | | | | |
| *Sagartia elegans* | | | | | |
| *Pecten maximus* | | | | | |
| *Aequipecten opercularis* | | | | | |
| *Modiolus modiolus* | | | | | |
| *Buccinum undatum* | | | | O | |
| *Calliostoma zizyphinum* | | | O | | |
| *Sabella parvonina* | | R | | | |
| *Pomatoceros triqueter* | O | | O | | |
| *Balanus crenatus*? | | | | | F |
| Faunal turf | A | C | C | A | A |
| Faunal crusts | | | | | F |
| *Flustra foliacea* | A | C | F | C | C |
| *Nemertesia ramosa* | | | | R | |
| *Nemertesia antennina* | | | | | |
| *Abietinaria abietina* | | | | | F |
| *Hydallmania falcata* | C | | | | |
| *Pagurus bernhardus* | | | | R | |
| *Munida rugosa* | | | R | | |
| *Macropodia rostrata* | | | O | O | |
| *Inachus* sp. | | | | F | |
| *Hyas araneus* | | | | | |
| *Corystes cassivelaunus* | | | | R | |
| Crab sp. A | | | | | |
| Crab sp. B | | | | | |
| *Cliona celata* | | | | | |
| *Tethya citrina* | | | | | |
| *Axinella infundibuliformis* | | | | | |
| Porifera indet (massive orange) | | | | | |
| *Ascidiella aspersa* | | | | | |
| *Ascidia virginea* | | R | | R | R |
| *Ciona intestinalis* | | | R | | |
| *Ascidiella scabra* | | | O | F | |
| *Polycarpa pomaria* | | | | R | |
| *Alcyonidium diaphanum* | | | | R | |
| *Henricia oculata* | | | R | | |
| *Ophiocomina nigra* | | | | O | R |
| *Ophiothrix fragilis* | | | | | |
| *Ophiura ophiura* | | | | | |
| *Antedon petasus* | | | | | |
| *Anseropoda placenta* | | | | | |
| *Asterias rubens* | O | C | F | F | R |
| *Crossaster papposus* | | | O | O | R |
| *Echinus esculentus* | | | R | O | R |
| *Callionymus lyra* | | | | | |
| *Scyliorhinus canicula* | | | | | |
| *Aspitrigla cuculus* | | | | | |
| *Raja naevus* | | | | | |
| *Raja Montagui* | | | | | |
| Skate (unidentified) | | | | | |
| *Pholis gunnellus* | | | | | |

| Sample Reference<br>Sample | 2.29.5<br>DC.2-29.S5 | 2.29.6<br>DC.2-29.S6 | 2.29.7<br>DC.2-29.S7 | 2.29.8<br>DC.2-29.S8 | 2.29.9<br>DC.2-29.S9 |
|---|---|---|---|---|---|
| *Alcyonium digitatum* | | | | | |
| *Urticia eques* | O | | O | | |
| *Metridium senile* | | | | | |
| *Sagartia troglodytes* | | | | | |
| *Sagartia elegans* | | | | | |
| *Pecten maximus* | | | | | |
| *Aequipecten opercularis* | | | | | |
| *Modiolus modiolus* | | | | | |
| *Buccinum undatum* | | | | O | |
| *Calliostoma zizyphinum* | | | O | | |
| *Sabella parvonina* | | R | | | |
| *Pomatoceros triqueter* | O | | O | | |
| *Balanus crenatus*? | | | | | F |
| Faunal turf | A | C | C | A | A |
| Faunal crusts | | | | | F |
| *Flustra foliacea* | A | C | F | C | C |
| *Nemertesia ramosa* | | | | R | |
| *Nemertesia antennina* | | | | | |
| *Abietinaria abietina* | | | | | F |
| *Hydallmania falcata* | C | | | | |
| *Pagurus bernhardus* | | | | R | |
| *Munida rugosa* | | | R | | |
| *Macropodia rostrata* | | | O | O | |
| *Inachus* sp. | | | | F | |
| *Hyas araneus* | | | | | |
| *Corystes cassivelaunus* | | | | R | |
| Crab sp. A | | | | | |
| Crab sp. B | | | | | |
| *Cliona celata* | | | | | |
| *Tethya citrina* | | | | | |
| *Axinella infundibuliformis* | | | | | |
| Porifera indet (massive orange) | | | | | |
| *Ascidiella aspersa* | | | | | |
| *Ascidia virginea* | | R | | R | R |
| *Ciona intestinalis* | | | R | | |
| *Ascidiella scabra* | | | O | F | |
| *Polycarpa pomaria* | | | | R | |
| *Alcyonidium diaphanum* | | | | R | |
| *Henricia oculata* | | | R | | |
| *Ophiocomina nigra* | | | | O | R |
| *Ophiothrix fragilis* | | | | | |
| *Ophiura ophiura* | | | | | |
| *Antedon petasus* | | | | | |
| *Anseropoda placenta* | | | | | |
| *Asterias rubens* | O | C | F | F | R |
| *Crossaster papposus* | | | O | O | R |
| *Echinus esculentus* | | | R | O | R |
| *Callionymus lyra* | | | | | |
| *Scyliorhinus canicula* | | | | | |
| *Aspitrigla cuculus* | | | | | |
| *Raja naevus* | | | | | |
| *Raja Montagui* | | | | | |
| Skate (unidentified) | | | | | |
| *Pholis gunnellus* | | | | | |

| Sample Reference<br>Sample | 3.01.1<br>TV.3-01.S1 | 3.02.1<br>TV.3-02.S1 | 3.03.1<br>TV.3-03.S1 | 3.03.2<br>TV.3-03.S2 | 3.03.3<br>TV.3-03.S3 |
|---|---|---|---|---|---|
| *Alcyonium digitatum* | O | R | R | C | R |
| *Urticia eques* | R | R | | | |
| *Metridium senile* | | | | | |
| *Sagartia troglodytes* | | | | | |
| *Sagartia elegans* | | | | | |
| *Pecten maximus* | R | | | | |
| *Aequipecten opercularis* | O | R | R | | R |
| *Modiolus modiolus* | | | | | |
| *Buccinum undatum* | R | | R | | R |
| *Calliostoma zizyphinum* | | | | | |
| *Sabella parvonina* | | | | | |
| *Pomatoceros triqueter* | | | R | R | R |
| *Balanus crenatus*? | | | | | |
| Faunal turf | R | R | R | R | R |
| Faunal crusts | | | | | |
| *Flustra foliacea* | | | | | |
| *Nemertesia ramosa* | | | | | |
| *Nemertesia antennina* | | | | | |
| *Abietinaria abietina* | | | | | |
| *Hydallmania falcata* | | | | | |
| *Pagurus bernhardus* | R | R | R | R | R |
| *Munida rugosa* | | | | | |
| *Macropodia rostrata* | | | | | |
| *Inachus* sp. | | | | | |
| *Hyas araneus* | | | | | |
| *Corystes cassivelaunus* | | | | | |
| Crab sp. A | | | | | |
| Crab sp. B | | | | | |
| *Cliona celata* | | | | | |
| *Tethya citrina* | | | | | |
| *Axinella infundibuliformis* | | | | | |
| Porifera indet (massive orange) | | | | | |
| *Ascidiella aspersa* | | | | | |
| *Ascidia virginea* | | | | | |
| *Ciona intestinalis* | | | | | |
| *Ascidiella scabra* | | | | | |
| *Polycarpa pomaria* | | | | | |
| *Alcyonidium diaphanum* | | | | | |
| *Henricia oculata* | | | | | |
| *Ophiocomina nigra* | | | | | |
| *Ophiothrix fragilis* | | | | | |
| *Ophiura ophiura* | | | | | |
| *Antedon petasus* | | | | | |
| *Anseropoda placenta* | | | | | |
| *Asterias rubens* | O | R | O | O | O |
| *Crossaster papposus* | R | R | R | | R |
| *Echinus esculentus* | R | R | O | O | O |
| *Callionymus lyra* | | | | | |
| *Scyliorhinus canicula* | | R | | | |
| *Aspitrigla cuculus* | | | | | R |
| *Raja naevus* | | | | | |
| *Raja Montagui* | | | | | |
| Skate (unidentified) | | | | | |
| *Pholis gunnellus* | | | | | |

| Sample Reference<br>Sample | 3.04.1<br>TV.3-04.S1 | 3.04.2<br>TV.3-04.S2 | 3.04.3<br>TV.3-04.S3 | 3.04.4<br>TV.3-04.S4 | 3.04.5<br>TV.3-04.S5 |
|---|---|---|---|---|---|
| *Alcyonium digitatum* | | C | C | | O |
| *Urticia eques* | R | F | O | O | |
| *Metridium senile* | | | | | |
| *Sagartia troglodytes* | | | | | |
| *Sagartia elegans* | | | | | |
| *Pecten maximus* | | | | | |
| *Aequipecten opercularis* | | | | | |
| *Modiolus modiolus* | | | | | |
| *Buccinum undatum* | | | | | |
| *Calliostoma zizyphinum* | | | | | |
| *Sabella parvonina* | | | | | |
| *Pomatoceros triqueter* | | C | C | C | O |
| *Balanus crenatus*? | | | | | |
| Faunal turf | | F | F | F | O |
| Faunal crusts | | | | | |
| *Flustra foliacea* | | | | | |
| *Nemertesia ramosa* | | | | | |
| *Nemertesia antennina* | | | | | |
| *Abietinaria abietina* | | | | | |
| *Hydallmania falcata* | | | | | |
| *Pagurus bernhardus* | | | R | | R |
| *Munida rugosa* | | | | | |
| *Macropodia rostrata* | | | | | |
| *Inachus* sp. | | | | | |
| *Hyas araneus* | | | | | |
| *Corystes cassivelaunus* | | | | | |
| Crab sp. A | | | | | |
| Crab sp. B | | | | | |
| *Cliona celata* | | A | | | |
| *Tethya citrina* | | | | | |
| *Axinella infundibuliformis* | | | | | |
| Porifera indet (massive orange) | | | | | |
| *Ascidiella aspersa* | | | | | |
| *Ascidia virginea* | | | | | |
| *Ciona intestinalis* | | | | | |
| *Ascidiella scabra* | | | | | |
| *Polycarpa pomaria* | | | | | |
| *Alcyonidium diaphanum* | | | | | |
| *Henricia oculata* | | | | | |
| *Ophiocomina nigra* | | | | | |
| *Ophiothrix fragilis* | | | | | |
| *Ophiura ophiura* | | | | | |
| *Antedon petasus* | | | | | |
| *Anseropoda placenta* | | | | | |
| *Asterias rubens* | R | R | R | | |
| *Crossaster papposus* | | | R | | |
| *Echinus esculentus* | R | F | F | | |
| *Callionymus lyra* | | | | | |
| *Scyliorhinus canicula* | | | | | |
| *Aspitrigla cuculus* | | | | | |
| *Raja naevus* | | | | | |
| *Raja Montagui* | | | | | |
| Skate (unidentified) | | | | | |
| *Pholis gunnellus* | | | | | |

| Sample Reference<br>Sample | 3.04.6<br>TV.3-04.S6 | 3.04.7<br>TV.3-04.S7 | 3.05.1<br>TV.3-05.S1 | 3.06.1<br>TV.3-06.S1 | 4.08.1<br>TV.4-08.S1 |
|---|---|---|---|---|---|
| *Alcyonium digitatum* | F | F | R | R | R |
| *Urticia eques* | | O | R | R | R |
| *Metridium senile* | | | | | |
| *Sagartia troglodytes* | | | | | |
| *Sagartia elegans* | | | | | |
| *Pecten maximus* | | | | | |
| *Aequipecten opercularis* | | | R | R | R |
| *Modiolus modiolus* | | | | | |
| *Buccinum undatum* | | | | | |
| *Calliostoma zizyphinum* | | | | | |
| *Sabella parvonina* | | | | | |
| *Pomatoceros triqueter* | F | A | O | R | |
| *Balanus crenatus*? | | | | | |
| Faunal turf | C | C | R | R | C |
| Faunal crusts | | | | | |
| *Flustra foliacea* | | | | | |
| *Nemertesia ramosa* | | | | | |
| *Nemertesia antennina* | | | | | |
| *Abietinaria abietina* | | | | | |
| *Hydallmania falcata* | | | | | |
| *Pagurus bernhardus* | | | R | R | R |
| *Munida rugosa* | | | | | |
| *Macropodia rostrata* | | | | | |
| *Inachus* sp. | | | | | |
| *Hyas araneus* | | | | | |
| *Corystes cassivelaunus* | | | | | |
| Crab sp. A | | | | | |
| Crab sp. B | | | | | |
| *Cliona celata* | | | | | |
| *Tethya citrina* | | | | | |
| *Axinella infundibuliformis* | | | | | |
| Porifera indet (massive orange) | | | | | |
| *Ascidiella aspersa* | | | | | |
| *Ascidia virginea* | | | | | |
| *Ciona intestinalis* | | | | | |
| *Ascidiella scabra* | | | | | |
| *Polycarpa pomaria* | | | | | |
| *Alcyonidium diaphanum* | | | | | |
| *Henricia oculata* | | | | | |
| *Ophiocomina nigra* | | | | | |
| *Ophiothrix fragilis* | | | | | |
| *Ophiura ophiura* | | | | | |
| *Antedon petasus* | | | | | |
| *Anseropoda placenta* | | | | | R |
| *Asterias rubens* | O | | R | R | O |
| *Crossaster papposus* | R | | | R | R |
| *Echinus esculentus* | | O | O | R | R |
| *Callionymus lyra* | | | R | | |
| *Scyliorhinus canicula* | | | R | R | |
| *Aspitrigla cuculus* | | | | R | |
| *Raja naevus* | | | | | R |
| *Raja Montagui* | | | | | R |
| Skate (unidentified) | | | | | |
| *Pholis gunnellus* | | | | | |

| Sample Reference<br>Sample | 4.11.1<br>DC.4-11.S1 | 4.12.1<br>DC.4-12.S1 | 4.14.1<br>DC.4-14.S1 | 4.15.1<br>TV.4-15.S1 | 4.16.1<br>TV.4-16.S1 |
|---|---|---|---|---|---|
| *Alcyonium digitatum* | C | C | C | O | R |
| *Urticia eques* | O | C | | O | O |
| *Metridium senile* | R | | | | |
| *Sagartia troglodytes* | | | | | |
| *Sagartia elegans* | | | | | |
| *Pecten maximus* | | | | | |
| *Aequipecten opercularis* | | | | | R |
| *Modiolus modiolus* | | | | | |
| *Buccinum undatum* | R | | | R | R |
| *Calliostoma zizyphinum* | F | | | | |
| *Sabella parvonina* | | | | | R |
| *Pomatoceros triqueter* | C | C | | R | |
| *Balanus crenatus*? | | | | | |
| Faunal turf | C | A | A | C | A |
| Faunal crusts | C | C | C | R | |
| *Flustra foliacea* | R | R | | O | C |
| *Nemertesia ramosa* | O | O | | | |
| *Nemertesia antennina* | O | C | O | R | |
| *Abietinaria abietina* | F | | | | |
| *Hydallmania falcata* | | | | | |
| *Pagurus bernhardus* | R | O | | R | R |
| *Munida rugosa* | | R | | | R |
| *Macropodia rostrata* | R | | | R | R |
| *Inachus* sp. | | R | | | |
| *Hyas araneus* | | | | | |
| *Corystes cassivelaunus* | | | | | |
| Crab sp. A | | | | | |
| Crab sp. B | | | | | |
| *Cliona celata* | | | | | R |
| *Tethya citrina* | | | | | R |
| *Axinella infundibuliformis* | R | R | | | |
| Porifera indet (massive orange) | | | | | |
| *Ascidiella aspersa* | | | | | |
| *Ascidia virginea* | | | | | |
| *Ciona intestinalis* | | | | | |
| *Ascidiella scabra* | | | | | |
| *Polycarpa pomaria* | | | | | |
| *Alcyonidium diaphanum* | | | | R | |
| *Henricia oculata* | | | | | |
| *Ophiocomina nigra* | | | | | |
| *Ophiothrix fragilis* | | | | | |
| *Ophiura ophiura* | | | | | |
| *Antedon petasus* | | | | | |
| *Anseropoda placenta* | | | | | R |
| *Asterias rubens* | R | R | F | O | F |
| *Crossaster papposus* | | | | | R |
| *Echinus esculentus* | O | O | F | O | O |
| *Callionymus lyra* | | | | | |
| *Scyliorhinus canicula* | R | | | | |
| *Aspitrigla cuculus* | | | | | |
| *Raja naevus* | | | | | |
| *Raja Montagui* | | | | | |
| Skate (unidentified) | | | | | R |
| *Pholis gunnellus* | | | | | |

| Sample Reference<br>Sample | 4.19.1<br>DC.4-19.S1 | 4.20.1<br>DC.4-20.S1 | 4.20.2<br>DC.4-20.S2 | 4.20.3<br>DC.4-20.S3 | 4.20.4<br>DC.4-20.S4 |
|---|---|---|---|---|---|
| *Alcyonium digitatum* | O | | O | O | |
| *Urticia eques* | R | | O | F | F |
| *Metridium senile* | | | | | |
| *Sagartia troglodytes* | | | | | |
| *Sagartia elegans* | | | | | |
| *Pecten maximus* | | | | | |
| *Aequipecten opercularis* | | | | | |
| *Modiolus modiolus* | | | | | |
| *Buccinum undatum* | | | | | |
| *Calliostoma zizyphinum* | | | R | O | O |
| *Sabella parvonina* | R | | | | |
| *Pomatoceros triqueter* | R | C | F | C | F |
| *Balanus crenatus*? | | | | | |
| Faunal turf | R | F | | A | C |
| Faunal crusts | | | | F | O |
| *Flustra foliacea* | A | C | C | C | C |
| *Nemertesia ramosa* | F | | | | F |
| *Nemertesia antennina* | R | | | O | F |
| *Abietinaria abietina* | | C | | F | F |
| *Hydallmania falcata* | | C | F | F | F |
| *Pagurus bernhardus* | F | | R | | |
| *Munida rugosa* | | | | | |
| *Macropodia rostrata* | | | | O | |
| *Inachus* sp. | | | | | |
| *Hyas araneus* | | R | | R | |
| *Corystes cassivelaunus* | | | | | |
| Crab sp. A | | | | | |
| Crab sp. B | | | | | |
| *Cliona celata* | | | | | |
| *Tethya citrina* | | | | | |
| *Axinella infundibuliformis* | | | | | |
| Porifera indet (massive orange) | | | | | |
| *Ascidiella aspersa* | | | | | |
| *Ascidia virginea* | | | | | |
| *Ciona intestinalis* | | | | | |
| *Ascidiella scabra* | | | | | |
| *Polycarpa pomaria* | | | | | |
| *Alcyonidium diaphanum* | | | | | |
| *Henricia oculata* | | | | | |
| *Ophiocomina nigra* | | | | | |
| *Ophiothrix fragilis* | | | | | |
| *Ophiura ophiura* | | | | | |
| *Antedon petasus* | | | | | |
| *Anseropoda placenta* | | | | | |
| *Asterias rubens* | | | | | R |
| *Crossaster papposus* | | | | | |
| *Echinus esculentus* | | | R | R | O |
| *Callionymus lyra* | | | | | |
| *Scyliorhinus canicula* | | | | | |
| *Aspitrigla cuculus* | R | | | | |
| *Raja naevus* | | | | | |
| *Raja Montagui* | | | | | |
| Skate (unidentified) | | | | | |
| *Pholis gunnellus* | | | | | |

| Sample Reference<br>Sample | 4.21.1<br>DC.4-21.S1 | 4.22.1<br>DC.4-22.S1 | 4.22.2<br>DC.4-22.S2 | 4.23.1<br>DC.4-23.S1 | 4.23.2<br>DC.4-23.S2 |
|---|---|---|---|---|---|
| *Alcyonium digitatum* | A | | O | O | C |
| *Urticia eques* | O | | O | O | R |
| *Metridium senile* | | | | | |
| *Sagartia troglodytes* | R | | | | |
| *Sagartia elegans* | R | | | | |
| *Pecten maximus* | | | | | |
| *Aequipecten opercularis* | | | F | | |
| *Modiolus modiolus* | | | | | |
| *Buccinum undatum* | R | | F | O | R |
| *Calliostoma zizyphinum* | O | | | | |
| *Sabella parvonina* | R | | | | |
| *Pomatoceros triqueter* | | | O | F | F |
| *Balanus crenatus*? | | | O | | |
| Faunal turf | A | C | A | C | A |
| Faunal crusts | C | | | F | C |
| *Flustra foliacea* | O | R | R | A | C |
| *Nemertesia ramosa* | F | O | O | | R |
| *Nemertesia antennina* | F | | | O | |
| *Abietinaria abietina* | C | | C | | O |
| *Hydallmania falcata* | | F | F | | |
| *Pagurus bernhardus* | | R | O | R | O |
| *Munida rugosa* | | | | | |
| *Macropodia rostrata* | O | | R | | O |
| *Inachus* sp. | R | | R | | |
| *Hyas araneus* | | | | | |
| *Corystes cassivelaunus* | | | | | |
| Crab sp. A | R | | | | |
| Crab sp. B | R | | | | |
| *Cliona celata* | | | | | |
| *Tethya citrina* | | | | | |
| *Axinella infundibuliformis* | | | | | R |
| Porifera indet (massive orange) | | | | | |
| *Ascidiella aspersa* | | | | | |
| *Ascidia virginea* | | | | | |
| *Ciona intestinalis* | | | | | |
| *Ascidiella scabra* | | | | | |
| *Polycarpa pomaria* | | | | | |
| *Alcyonidium diaphanum* | | | | | |
| *Henricia oculata* | | | | | |
| *Ophiocomina nigra* | | | | | |
| *Ophiothrix fragilis* | | | | | |
| *Ophiura ophiura* | | | | | |
| *Antedon petasus* | | | | | |
| *Anseropoda placenta* | | | | | |
| *Asterias rubens* | F | R | R | R | R |
| *Crossaster papposus* | | | | | R |
| *Echinus esculentus* | F | | R | R | O |
| *Callionymus lyra* | | | | | |
| *Scyliorhinus canicula* | | | | | |
| *Aspitrigla cuculus* | | R | | | |
| *Raja naevus* | | | | | |
| *Raja Montagui* | | | | | |
| Skate (unidentified) | | | | | |
| *Pholis gunnellus* | | | | | |