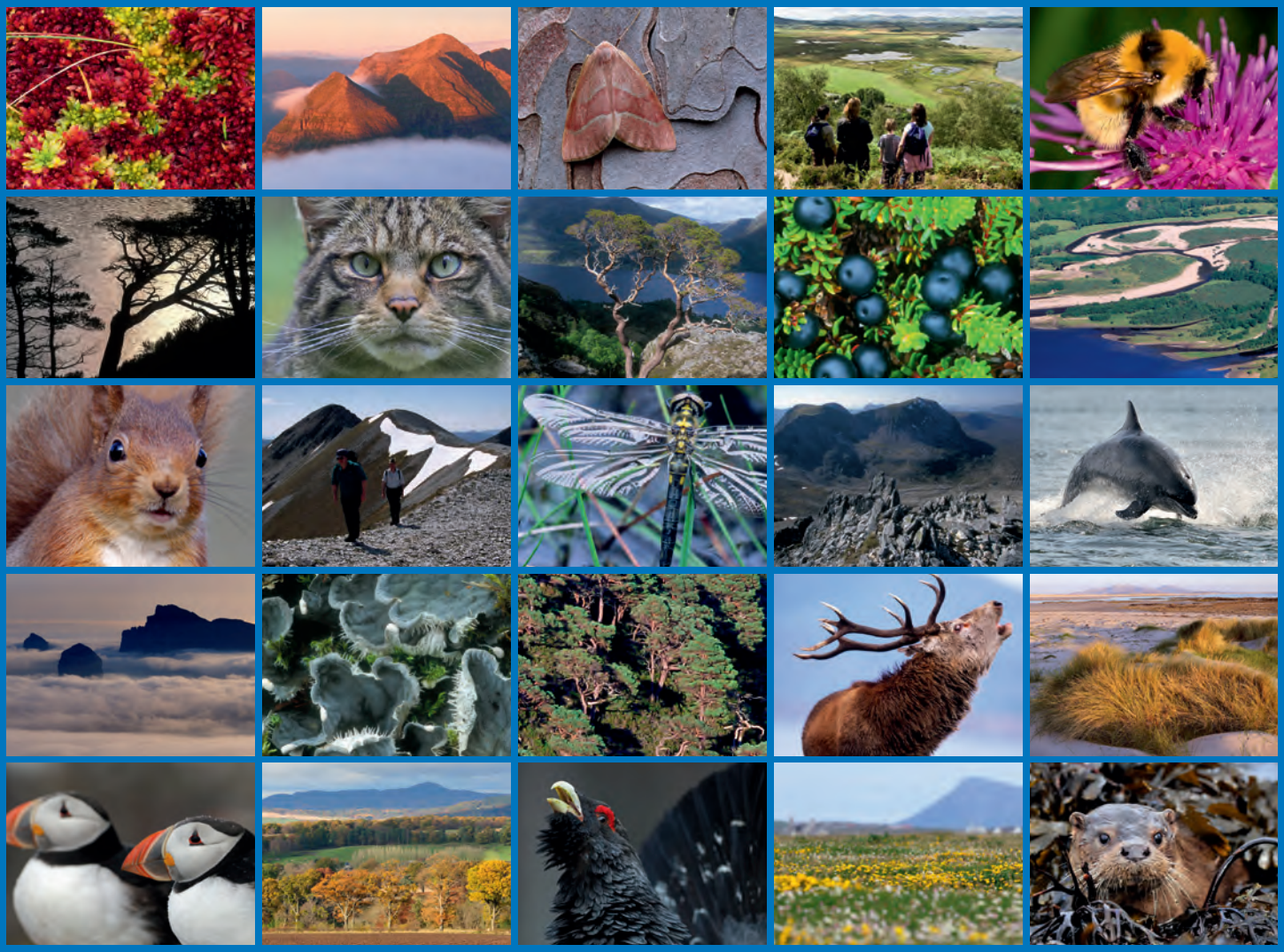
Scottish Natural Heritage
Commissioned Report No. 923

2015 site condition monitoring and site check surveys of marine sedimentary and reef habitats in the Loch nam Madadh SAC, Loch nam Madadh SSSI and Loch an Duin SSSI



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COMMISSIONED REPORT

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2015 site condition monitoring and site check surveys of marine sedimentary and reef habitats in the Loch nam Madadh SAC, Loch nam Madadh SSSI and Loch an Duin SSSI

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COMMISSIONED REPORT

Summary

2015 site condition monitoring and site check surveys of marine sedimentary and reef habitats in the Loch nam Madadh SAC, Loch nam Madadh SSSI and Loch an Duin SSSI

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Keywords

Benthos; monitoring; condition; reefs; maerl; tidal rapids; mudflats; sandbanks; SAC: SCM.

Background

The Loch nam Madadh SAC was established to afford protection for the marine features subtidal sandbanks, intertidal mudflats and sandflats, reefs, lagoons and large shallow inlets and bays. An aim of the current study was to carry out site condition monitoring (SCM) of the sandbanks feature of the SAC, in order to identify any deterioration in the condition of the feature and to form a judgement on its current condition. A further aim was to perform site check surveys (a more rapid condition assessment between full SCM surveys) of the remaining protected features, apart from the saline lagoons. A survey of the tidal rapids feature of the Loch an Duin SSSI and the Loch nam Madadh SSSI, both of which overlap with the SAC, was also undertaken. SCM was inaugurated in the SAC in 2004, which provided a baseline for the current study. The SCM work largely took the form of an extensive drop-down video survey and infaunal survey of the loch system, together with more detailed surveying of the sandbanks feature along transects at selected maerl bed sites. The site check work principally involved surveying along relocatable transects established at mudflat, reef and tidal rapids locations.

Main findings

- Changes in biotope distribution within the sublittoral sandbanks feature between the 2004 baseline and 2015 surveys occurred at five sites as a result of a reduction in algal cover of the sediment, a decrease in stone cover and, at one site, the development of a megafaunal burrowing community.

- The infaunal survey revealed temporal fluctuations in taxon richness at sites ascribed to **SS.SMp.KSwSS** biotopes, possibly resulting from the patchy nature of the algal cover. A significant temporal decrease in infaunal taxon richness was recorded at one of the maerl sites (ML04), possibly due to the smaller sample size in 2015. There was no corresponding significant decrease in Shannon-Wiener diversity, nor in epibiotic taxon richness. Significant temporal changes in sediment composition were recorded at most sites sampled.

- Species compositional changes were found at all maerl bed sites. These included the establishment of the invasive alga, *Dasysiphonia japonica* at three of the sites, but not at a density that could be said to be modifying the community structure.

- All temporal changes recorded for the sublittoral sandbanks feature were considered to have arisen through natural processes or as a result of localised spatial variation or positional differences between the surveys. No deterioration in the condition of the sublittoral sandbanks feature was identified and it is recommended that the feature be assigned the condition category "Favourable Maintained".

- Little temporal change was recorded for the mudflats of the SAC, apart from an apparent reduction in the depth of the anaerobic zone at one site (Strom Dearg), possibly correlating with a reduction in bioturbation resulting from a decrease in the density of *Arenicola marina*. However, the evidence for this was not strong, and there is no indication that the change is not naturally induced.

- Change in the distribution of biotopes between surveys at one reef site, Madadh Beag, resulted from a change in the dominance of kelp species, which was considered to represent natural temporal variability.

- A significant temporal reduction in the abundance of *Axinella infundibuliformis* was recorded at Madadh Beag, where creeling was taking place within the habitat. However, there was insufficient evidence to infer correlation. The highly rugose boulder substrate is likely to afford protection from physical damage, and there was no corresponding significant reduction in the density of *Swiftia pallida*. Significant temporal variation in the density of *Caryophyllia smithii* was recorded at three of the four reef sites examined, but at no sites for *Swiftia pallida*.

- No significant temporal differences in condition were observed at any of the three tidal rapids locations. An MNCR phase 2 survey recorded an increase in taxon richness in the **LR.HLR.FT.AscT** zone at Leiravay rapids in 2015, but this was considered to probably merely reflect a difference in sampling intensity.

- Within the large shallow inlets and bays feature of the SAC two biotopes were recorded in the 2004 but not the 2015 survey, with **SS.SMp.Mrl.Pcal.R** replacing **SS.SMp.KSwSS.LsacR.CbPb** at one site, and **CR.LCR.BrAs.AmenCio** replacing **CR.LCR** at another site. These changes were believed to reflect differences in location and video quality respectively.

- The site check surveys of mudflats, reefs and large shallow inlets and bays features of the Loch nam Madadh SAC and the tidal rapids feature of the Loch an Duin SSSI and the Loch nam Madadh SSSI revealed no evidence for deterioration in condition of the features and it is recommended that all these features be assigned the condition category "Favourable Maintained".

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1. INTRODUCTION

Loch nam Madadh (Loch Maddy), located in the north-east of North Uist in the Outer Hebrides (Figure 1), has been designated as a Special Area of Conservation (SAC) under the EC Habitats Directive (92/43 EEC) on the basis of the presence of a number of outstanding examples of habitats listed in Annex I of the Directive. It is regarded as an excellent example of the feature 'large shallow inlets and bays', being the most complex and the second largest fjardic sea loch in the EU, with a highly irregular coastline and at least 22 sills and basins. The whole of the site (occupying 2320 ha) fits within this category and it contains a diverse assemblage of shallow, sheltered and often tide-swept reef and sediment habitats and communities. The site also contains 13 outstanding examples of the feature, 'lagoons', which constitute the most extensive and diverse system of saline lagoons in the EU. The feature 'reefs' is represented by a range of high quality bedrock and boulder shores and sublittoral rock subject to a wide variety of wave exposure and some extremely diverse examples of tidal rapids. Sediment shores, mostly small in extent, occur widely over the site and fall within the Annex 1 category 'mudflats and sandflats not covered by seawater at low tide'. Finally, 'sandbanks which are slightly covered by the seawater all the time' (or simply 'subtidal sandbanks') are represented by a wide variety of sediment communities including swards of seagrass *Zostera marina* on shallow muds and coarse shell and gravel communities in tide-swept channels. The latter include rich beds of maerl. Loch Maddy also qualifies as an SAC as a high quality site for the otter, *Lutra lutra*, an Annex II species. It has been selected as one of a series of sites around the UK coast which will contribute to the maintenance of the geographic range and status of otter populations.

Parts of the SAC are also designated as Sites of Special Scientific Interest (SSSIs) (Figure 1). Loch an Duin SSSI (which is also a Ramsar site) was designated in part for its marine habitat features, which comprise saline lagoons and tidal rapids. Loch nam Madadh SSSI also incorporates a number of saline lagoons, as well as the intertidal areas of much of the southern region of the SAC. Its designated features include mudflats, reefs, tidal rapids, saline lagoons and the stonewort, *Lamprothamnion papulosum*.

The principal objective of the work described in this report was to carry out site condition monitoring (SCM) of the Loch nam Madadh SAC in order to assess the condition of the subtidal sandbanks feature. In order to promote a uniform approach to the monitoring of the condition of features, guidance has been drawn up on the general approach to be taken in condition monitoring (JNCC, 1998) and for specific habitats, such as inshore sublittoral sediment (JNCC, 2004). JNCC (2004) lists 7 attributes of inshore sublittoral sediment habitats and corresponding targets that could form the basis of site condition monitoring of subtidal sandbanks (Table 1). These targets have been incorporated into the monitoring plan for the SAC and are detailed in the Site Attribute Table (Table 9.1, Annex 9).

In order to help detect any changes to the habitats, species populations or earth science features of protected sites in Scotland between SCM assessments, a new monitoring method called Site Check was introduced by SNH in 2012 (SNH, 2014). This is intended as a rapid methodology for assessment of change in condition of the feature of interest. A further aim of the 2015 work was to carry out site check surveys of the following designated features of the SAC: mudflats and sandflats, reefs and large shallow inlets and bays. Lagoons were not included in the remit of this study, which therefore excludes the large embayment Loch Yeor in the upper region of the SAC (Figure 1) from consideration in the current report. The site check work also included monitoring of the tidal rapids feature of the Loch an Duin and Loch nam Madah SSSIs. All examples of this feature also fall within the Loch nam Madadh SAC.

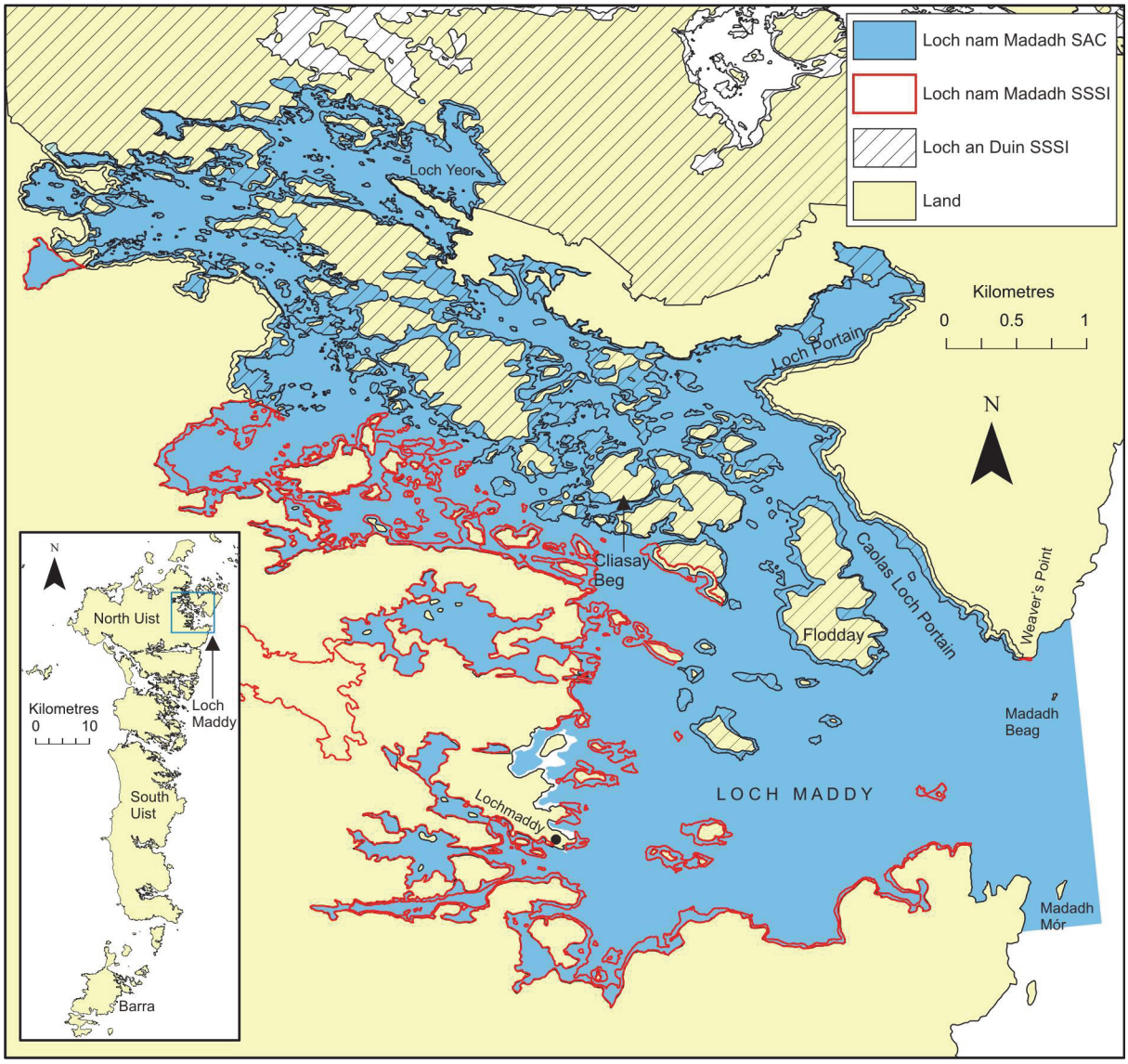


Figure 1. The location of Loch nam Madadh SAC, Loch nam Madadh SSSI and Loch an Duin SSSI, with inset showing the location of Loch Maddy within the Outer Hebrides.

The richness of the Loch Maddy habitats has attracted the attention of marine scientists for many years, resulting in a number of reports relevant to management of the SAC. Lewis (1957) described several shores in Loch Maddy and the survey of British shores by Powell *et al.* (1979) included a small number of sites within the SAC, as did the survey by Rostron (1984). Several intertidal and subtidal marine sites were studied by Howson (1991) using MNCR survey techniques. Broadscale mapping of the SAC was carried out by Entec in 1995-96 (Entec, 1996), although habitats were mapped at the lifeform, rather than the biotope level. Loch Maddy has been used as a test area for the development of techniques suitable for the monitoring of SACs and this work has produced some valuable data on the distribution, composition and diversity of the biotopes of the area and some indications of the levels of temporal change in some of these biotopes (Howson & Davison, 1999, 2000; Foster-Smith *et al.,* 2000).

Table 1. Generic attributes that should be used to define the condition of inshore sublittoral sediment features in site condition monitoring. The first four are mandatory. Targets exclude naturally-induced changes.

Attribute	Target
Extent	No change in extent of inshore sublittoral sediment habitat
Topography	No alteration in topography of the inshore sublittoral sediment
Sediment type	No change in composition of sediment types across the feature
Distribution of biotopes	Maintenance of the distribution of biotopes
Extent of sub-feature	No change in extent of the inshore sublittoral sediment biotope(s) identified for the site
Species composition of representative or notable biotopes	No decline in biotope quality as a result of reduction in species richness or removal of notable species
Species population measures: - population structure of a species - presence or abundance of specified species	Maintain age/size class structure of a (named) species. Maintain presence or abundance of positive indicator species. No increase in presence or abundance of negative indicator species.

Site condition monitoring of the Loch nam Madadh SAC was established in 2004 (Moore *et al*., 2006) with a baseline survey of the marine features of interest: subtidal sandbanks, coastal lagoons, mudflats and sandbanks, reefs (including tidal rapids) and large shallow inlets and bays. This work involved the establishment of a series of transects (including five reef, three tidal rapids, four maerl and two intertidal sediment) employing intertidal and diver surveying methods. Information on the distribution and diversity of subtidal biotopes was supplemented by drop-down video sampling at 73 sites and infaunal sampling at 30 sites, chosen to provide good geographical coverage of the SAC.

In drawing up the management scheme for the SAC, activities with the capability of causing deterioration of the habitats and associated communities were identified and are described in detail by Comhairle nan Eilean Siar (2000, 2007). These include:

- Creel fishing for prawns (*Nephrops norvegicus*), velvet crabs (*Necora puber*), green crabs (*Carcinus maenas*), brown crabs (*Cancer pagurus*) and lobsters (*Homarus gammarus*). The prawns are fished on the deeper muddy sediments, with the other species sought on rock or on the fringes of rocky areas.
- Diver fishing for the king scallop, *Pecten maximus*, on sandy and gravelly substrates.
- Benthic trawling for *Nephrops* on mud.
- Dredging for queen (*Aequipecten opercularis*) and king scallops on sandy ground, especially close to rock/sand boundaries.
- Fin fish farming which produces localised organic pollution and the discharge of anti-lice chemical treatments. Currently, there are two active Atlantic salmon farm sites, in south Caolas Loch Portain and to the west of Flodday (Figure 3).
- Shellfish farming. There is currently one active mussel farm site in north Caolas Loch Portain (Figure 3).

- Effluent discharge from Lochmaddy and scattered coastal habitations via septic tanks and from approved sheep dip sites.
- Boating activities, such as moorings, anchoring, risk of pollution.
- Recreational activities, especially canoeing, scuba diving, angling, nature watching and walking.
- Shore gathering of cast seaweed (*Ascophyllum nodosum*) for fertiliser and winkles (*Littorina littorea*).
- Land drainage, with the risk of altering salinity and nutrient levels in lagoons.
- Forestry, particularly the preparation of land for afforestation.

There appears to be no firm evidence for any significant adverse impact by any of these activities within the SAC, but this may merely reflect the lack of investigation. ScotMap data (Scottish Government, 2014) indicates that the level of fishing activity in the SAC by smaller commercial vessels (<15 m in length) is very low. No dredging is believed to have occurred since the establishment of the SAC, with local fisherman notifying dredgers seen in the vicinity that dredging should not be carried out within the loch. Hand cutting of seaweed is known to be taking place within the SAC, although details of quantity and location are unavailable.

2. METHODS

2.1 Site condition monitoring of subtidal sandbanks

2.1.1 Spot video survey

For the planning of the 2015 survey all biotope records from the 2004 baseline survey were updated to the 2004 biotope classification (Connor *et al*., 2004), based on a simple translation of codes. Re-inspection of the 2004 video was necessary at this time in a few cases, but was largely deferred until later to facilitate comparison of the footage from both years.

All 73 sites examined in the July 2004 baseline survey (Moore *et al*., 2006) were revisited during the period 4 - 14 July 2015. This included some rocky reef sites to inform the reef site check survey (section 2.3). Site locations are shown in Figure 2 and locational and methodological details provided in Table 2.1 (Annex 2).

For most sites a dropdown video system was used from the vessel, *RV Serpula*, consisting of a Panasonic NV-GS150 3 chip digital video camera within a Seapro housing held within a frame and illuminated by twin 100 watt lamps. A 100 m umbilical cable carried the video signal to a Sony Video Walkman for real-time observation and for recording on miniDV tape. At each station the camera was deployed from a drifting vessel for around 2 - 3 minutes, noting the times, depths and precise positions at the start and end of the drift using dGPS attached to the frame of the vessel. These data, as well as brief notes on substrates and biota, were entered onto a *pro forma* (Table 1.1, Annex 1). The *pro forma* also contained site data (depths and biotopes) from the baseline survey, so that the position could be checked for any likely positional inaccuracies.

At sites that could not be accessed from a hard boat, video material was collected from an inflatable using a small drop-down video system (mini dropdown), with footage acquired by a GoPro Hero4 Silver camera or by diver using a hand-held video camera (Canon Legria HF S30) (see Table 2.1, Annex 2).

The video material from each station was processed in the laboratory, with notes being taken on the substrate and the biota present, where possible employing the SACFOR scale of abundance. Where there were distinct changes in biotope at a site (rather than the presence of biotope mosaics), the video run was split into segments based on the video time code. Biotopes were allocated based on the classification scheme of Connor *et al.* (2004).

Where comparison with the video results from the baseline survey indicated a possible temporal difference in the initial biotope recorded, the 2004 footage was re-examined and the baseline biotope updated if necessary. The superior quality of the 2015 video footage facilitated the reanalysis of the historical material.

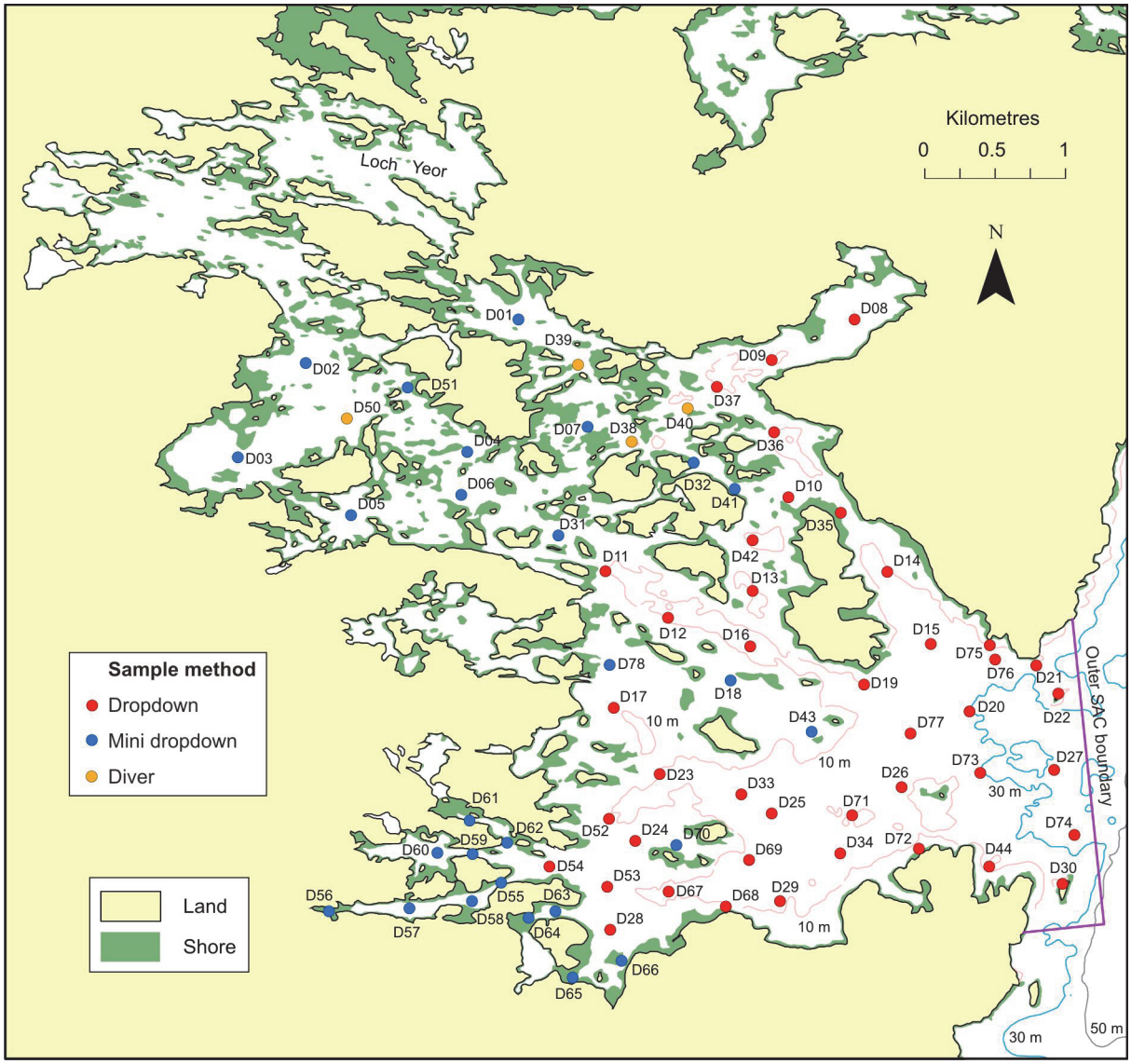


Figure 2. Location of sites for the spot video survey, showing sampling methodology employed.

2.1.2 Infaunal survey

A subset of 20 of the 30 sites examined in 2004, representative of the range of sublittoral sediment biotopes within the SAC, was selected for study during the period 11 - 14 July 2015. The locations of these sites are shown in Figure 3 and further sampling details provided in Table 3.1 (Annex 3).

At 14 sites a single 0.1 m^2 Van Veen grab sample was collected using the vessel *RV Serpula*. A subsample of c.150 ml sediment was taken from the surface of the grab contents for particle size analysis and the remaining material sieved on a 1 mm mesh screen, the sievings being retained in borax-buffered 5% formalin. At the remaining six sites, which were inaccessible by hard boat, an inflatable was used to deploy divers, who collected eight 20 cm long sediment cores of diameter 10.3 cm (total area 0.0667 m^2) at each site, which were subsequently pooled and then processed as for the grab samples. At each site one 20 cm long core of diameter 5 cm was collected for particle size analysis.

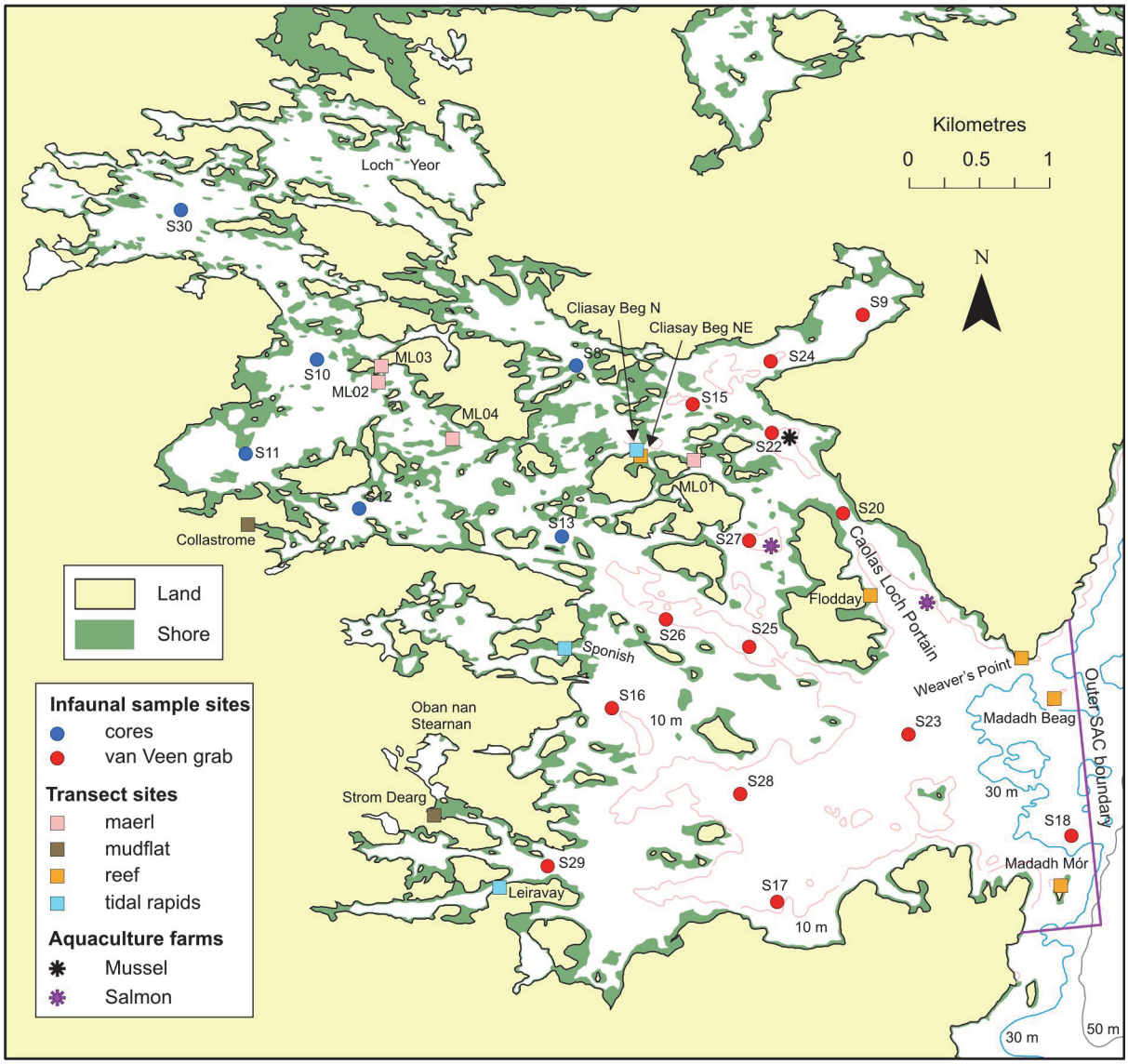


Figure 3. Location of sites for the infaunal and transect surveys. Active aquaculture farms are also shown.

The infauna from the sievings was sorted, identified and counted by Fugro EMU Ltd (Edinburgh). Species diversity indices for each station were calculated using the Primer statistical package (Primer-E Ltd, Ivybridge). Multidimensional scaling was used (within Primer) to assist with the ascription of sites to biotopes by the examination of similarities in faunal composition between sites. Observational information on the epibiota from the video survey was also used in biotope allocation.

Sediment samples for grain size analysis were dry sieved using a nest of sieves from -4 to 4 phi at 0.5 phi intervals, following separation and measurement of the silt/clay fraction by puddling the sample of known weight, which had been soaked in sodium hexametaphosphate, through a 63 micron sieve. The sediment grain size parameters, median grain diameter and phi quartile deviation, were obtained by interpolation of the cumulative weight percentage curves.

2.1.3 Maerl bed survey

The four maerl grounds examined in 2004 were resurveyed in 2015 (Figure 3, Table 4.1 - Annex 4).

At each site a diver survey of the area was conducted along a belt transect using MNCR phase 2 methodology. A shot line was deployed marking the location of the site and a 25 m tape transect line was marked out on the seabed by running out a measuring tape from the base of the shot line along the 2004 bearing, and recording the depth at both ends of the tape. A band 2 m either side of the tape was surveyed by two surveyors, who noted the presence, and where possible, estimates of the abundance of all conspicuous biota, collecting material which needed to be identified in the laboratory, including a representative collection of maerl. A checklist of taxa observed on the previous survey of the site was available on one side of a diver recording slate to enhance survey comparability, although recording was not restricted to this suite of taxa. The transect band was videoed using a hand-held digital video camera (Canon Legria HF). This involved the diver meandering along the full distance of the transect belt referencing the transect tape at intervals, recording both wide-angle footage of the habitat and close-up footage of the species. The aim was to retain a visual record of the nature of the habitat and community and to provide material that could be used for supplementing the species inventory for the site and to aid in subsequent description of the habitat. Still photographs of the habitat and associated community were also taken for the same purpose using two Fuji Finepix S2 Pro cameras with 14 mm wide-angle and 90 mm macro lenses.

At each site four replicate core samples were taken in areas of living maerl using a 10.3 cm diameter corer to a depth of 20 cm. The macrobenthic infauna was extracted and studied using the same methodology as described above for the grab samples. An additional 20 cm deep sediment core of 5 cm diameter was taken for particle size analysis using the same methodology as described above for the grab samples.

The diver species records and those derived from the study of the collected epibiota and imagery in the laboratory were collated to produce a species list for the transect band with, where possible, SACFOR abundance estimates.

Infaunal diversity measures were calculated using Primer, which was also employed for examination of spatial and temporal differences in species composition using non-metric multidimensional scaling (MDS), analysis of similarities (ANOSIM) and similarity percentages (SIMPER). Temporal change in mean abundance and species diversity measures at the transect sites were assessed using *t* tests.

In addition to the derivation of an overall estimate of live and dead maerl percentage cover along the transect, carried out during the MNCR phase 2 surveying, live and dead maerl cover within the transect band was also assessed using diver estimates of percentage cover within random 0.25 m^2 quadrats. Quadrats were positioned along the transect using tape distances derived from random numbers (constrained by the avoidance of non-overlapping quadrats). The location of the quadrat perpendicular to the tape was determined randomly using single integer random numbers between 1 and 4, where 1 was alongside the tape, 2 was 50 cm from the tape (i.e. the width of the quadrat) etc. Two surveyors were employed, one on each side of the tape, where they each deployed 10 quadrats. In order to assess the degree of inter-worker variability and to reduce this variability, at each site five of the quadrats were assessed independently by both surveyors. At each site ten of the quadrats were photographed. The original intention was to survey maerl density within a band 4 m either side of the transect tape, where this was not rendered impossible due to incursion by reef habitats, in order to reduce the influence of maerl patchiness on temporal comparisons.

This proved possible at only one site, ML01, where random numbers between one and eight were used to position the quadrat perpendicular to the tape.

2.2 Mudflats and sandflats site check survey

Mudflats were surveyed on 3 - 4 July 2015 at the same two locations as in the 2004 site condition monitoring baseline survey (Moore *et al*., 2006), Collastrome at the head of Loch Minish, and Strom Dearg in the channel leading to the lagoon, Oban nan Stearnan (Figure 3, Tables 5.1, 5.2 - Annex 5). No sandflats were examined in either year.

Site check of the mudflats involved checking the presence and sequence of biotopes along the two transects, which extended from the permanent marker above MHWS to the bottom of the mudflat. To facilitate the recording of all necessary data two *pro formas* were developed (Annex 1, Tables 1.2 and 1.3). For *in situ* comparative purposes, these contained the results from the baseline survey, including a sketch of the distribution of habitats along the transect. At each of the 4 stations examined in 2004 (2 per transect), located using differential GPS, the sediment type and depth of the anaerobic layer was recorded and the habitat photographed using stills and video cameras. Photos were taken of five replicate randomly placed 0.25 m^2 quadrats at each station. The biota at each of the 4 stations was assessed by digging over an area of sediment of c.1 m^2 and by surface observations of features such as *Arenicola marina* casts and *Lanice conchilega* tubes, with abundance recorded on the SACFOR scale (Hiscock, 1996). For smaller organisms an area of sediment of approximately 250 cm^2 (based on spade dimensions) was dug out and sieved using a 1 mm mesh. This material was retained for identification and quantification in the laboratory using the SACFOR scale. Based on the physical and biological data recorded, biotopes were subsequently assigned to each of the 4 stations (Connor *et al.* 2004). The habitats along the rest of the transect were inspected for any significant divergence from that described in 2004, including any perceived changes in the positions of habitat zone boundaries. These were recorded using a 50 m tape.

Signs of anthropogenic impact, such as pollution or the disposal of waste materials, was noted along the transects and by a more extensive inspection of the mudflats at each location.

2.3 Reefs site check survey

During the establishment of site condition monitoring in 2004 (Moore *et al*., 2006) MNCR phase 2 surveying was carried out in all biotope zones identified along relocatable transects at five reef sites extending from the intertidal into the subtidal. The same locations were examined during the period 5 - 9 July 2015 but in less detail (Figure 3, Table 6.1 - Annex 6). At each site a negatively buoyant line calibrated in 1 m increments was run down the shore from the permanent site marker established by the baseline survey; with the aid of the 2004 transect relocation data and photographs and employing the same compass bearing. The line was continued into the subtidal by divers, weighted at intervals to conform to major topographical features, and terminated in the sediment plain beyond the inshore reef band. The sequence of zones (or biotopes) within a band 2 m to either side of the line was checked against those of the baseline survey, with distances along the line being recorded at zonal boundaries. Divers also recorded depths at zonal boundaries. For comparative purposes divers were equipped with the zonal data from the baseline survey on slates, whereas shore workers employed a *pro forma* (printed on waterproof paper) which contained this historical information (Table 1.4, Annex 1). Imagery was collected along the whole transect using a Canon Legria HF video camera and Fuji Finepix S2 Pro digital still cameras with 14 mm wide-angle and 90 mm macro lenses subtidally and a Nikon Coolpix S32 for video and still images intertidally. The imagery included five replicate, haphazardly located 0.25 m^2 photoquadrats within each intertidal zone. The aim of all the imagery collection was

to retain a visual record of the nature of the habitats and biota along the transect in case it might be of value in future temporal comparisons. One biotope zone was selected for MNCR phase 2 surveying within a band 2 m either side of the transect line at each location. This was **CR.MCR.EcCr.CarSwi** at Weaver's Point, Madadh Beag and Madadh Mór, **CR.LCR.BrAs.AmenCio** at Flodday and **IR.LIR.K.Lsac.Ft** at Cliasay Beg NE.

After the conclusion of the survey, the opportunity to repeat species quantification work carried out during the baseline survey was afforded by the presence of a scientific dive team in Loch Maddy from 13 - 14 August 2015 aboard the vessel, *Halton*, sheltering in the loch from poor weather during a subsequent research cruise. The density of *Swiftia pallida*, *Axinella infundibuliformis* and *Porella compressa* was assessed within the **CR.MCR.EcCr.CarSwi** biotope at Weaver's Point, Madadh Beag and Madadh Mór at the same locations and using the same methodology as in the baseline survey. A 10 m tape was laid along a depth contour, the depths at each end of the tape recorded, and the number of individuals of the taxa counted within a band 1 m either side of the tape by swimming along each side with a 1 m rule (to derive abundance estimates per 20 m^2). Ten such counts were made at each location within the depth range employed by the baseline survey.

The density of *Caryophyllia smithii* was assessed at the same locations and using the same methodology as in the baseline survey at Flodday, Weaver's Point, Madadh Beag and Madadh Mór. At each location a 20 m tape was laid along the same depth contour as in the baseline survey and counts of *C. smithii* made in 20 randomly positioned 0.0625 m^2 quadrats along the tape. To do this the diver was issued with a set of random distances along the tape at 25 cm intervals using both sides of the tape. Thus the possibility of overlapping quadrats was avoided.

Any signs of anthropogenic activities or impacts within the region of the transect locations were noted.

2.4 Tidal rapids site check survey

As all three tidal narrows sites, Sponish, Leiravay and Cliasay Beg N, include examples of species-rich, tide-swept biotopes on the shore, the site check survey work was based on examination of littoral biotopes as a proxy for the condition of the site as a whole. Sublittoral biotopes were also included in the 2004 baseline survey. The site locations are shown in Figure 3 and positional data provided in Table 7.1 (Annex 7). A 50 m measurement tape was attached to the permanent transect markers established by the baseline survey, and run down the shore with the aid of the 2004 transect relocation data and photographs, and employing the same compass bearing. The sequence of zones (or biotopes) along the line was checked against those of the baseline survey, with distances along the tape being recorded at zonal boundaries. A *pro forma* was employed to ensure all data were collected and this also contained the historical information for the site (Table 1.4, Annex 1). Still and video imagery were collected along the transect using a Nikon Coolpix S32 to provide a permanent visual record of conditions and to aid biotope assignement. Five replicate 0.25 m^2 photoquadrats were taken within each biotope zone for the same reason.

At each location an MNCR phase 2 survey was carried out in the most species-rich, tide-swept biotope. This was **LR.HLR.FT.FserT** at Sponish and Cliasay Beg N, and **LR.HLR.FT.AscT** at Leiravay.

Any signs of anthropogenic activities or impacts within the region of the transect locations were noted.

2.5 Large shallow inlets and bays site check survey

No additional field survey work was carried out to address the assessment of condition of the large shallow inlets and bays feature. Data derived from the other site condition monitoring and site check surveys were utilised.

3. RESULTS

3.1 Site condition monitoring of subtidal sandbanks

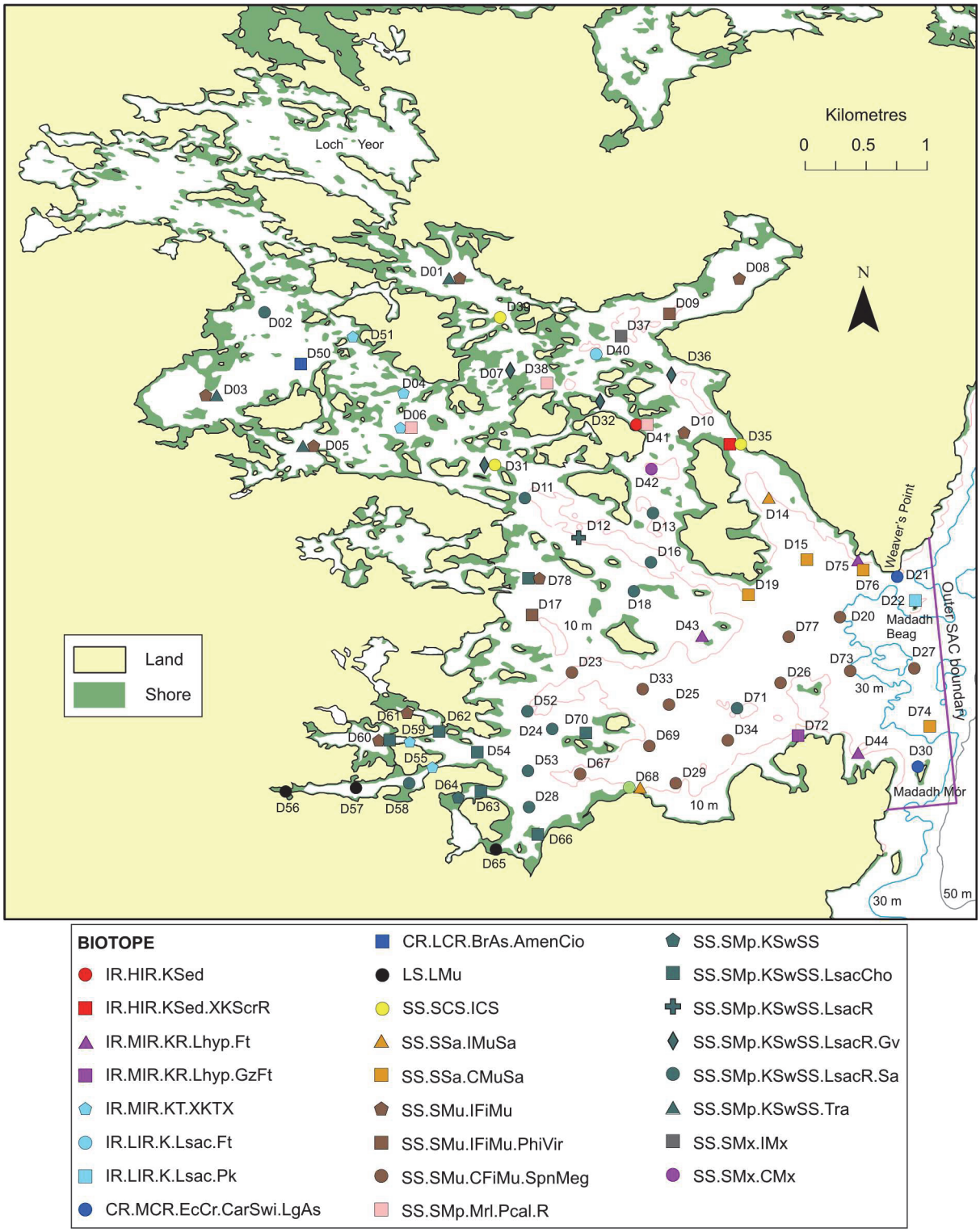
3.1.1 Video survey

The results from the analysis of the 73 video survey sites are provided in Table 2.1 (Annex 2) (positional, temporal and depth data) and Table 2.2 (Annex 2) (habitat and community data). The distribution of the biotopes recorded at these sites is illustrated in Figure 4 and the frequencies of the initial biotopes are given in Table 2.

A total of 25 biotopes was recorded at the start of video runs in 2015 (Figure 4; Table 2). The total number of initial biotope records in 2015 (82 - see Table 2) exceeds the number of sites surveyed (73), as biotope mosaics were observed at the start of a small number of sites.

Sediments within the main basin of Loch Maddy beyond the 10 m depth contour were largely muds supporting a megafaunal burrowing community including *Nephrops norvegicus* and callianassid shrimps and generally fairly sparse *Virgularia mirabilis*. Although ascribed to the biotope **SS.SMu.CFiMu.SpnMeg**, several of the shallower sites (above the 15 m depth contour) supported *Philine aperta*, with egg masses in particular in evidence, diatom films, and relatively sparse megafaunal burrowing populations and so displayed affinities with **SS.SMu.IFiMu.PhiVir**. In the more exposed eastern region of the main basin muddy sands were also present at a few sites, down to a depth of 45 m (**SS.SSa.CMuSa**). Sediments supporting patchy algal turfs and *Saccharina latissima* were widely recorded above a depth of 13 m in the more sheltered western region of the outer basin, predominantly in the form of sands (**SS.SMp.KSwSS.LsacR.Sa**), but also as muddy sand and mud with *S. latissima* and *Chorda filum* (**SS.SMp.KSwSS.LsacCho**). Bedrock and boulders on sand off Weaver's Point and Madadh Mór between depths of 18 and 26 m supported dense *Caryophyllia smithii* and a fairly sparse accompanying fauna including *Swiftia pallida* (locally common) and hydroid patches (**CR.MCR.EcCr.CarSwi.LgAs**).

To the north and west of the main basin, the complex system of channels and sills included a variety of tide-swept biotopes, especially forests and parks of mixed kelps, generally dominated by *Laminaria hyperborea*, on mixed substrates of coarse sand, gravel, pebbles, cobbles and boulders (**IR.MIR.KT.XKTX**), as well as *Saccorhiza polyschides* and other kelps on bedrock boulders and cobbles (**IR.HIR.KSed**). Maerl beds composed of *Phymatolithon calcareum*, common at least locally, and supporting an algal turf dominated by foliose and filamentous red algae and *Dictyota dichotoma* were recorded at three sites (**SS.SMp.Mrl.Pcal.R**). In the most sheltered, innermost regions of the fjardic system, mud plains generally supported diatomaceous films and *Arenicola marina* (**SS.SMu.IFiMu**).



BIOTOPE		
IR.HIR.KSed	CR.LCR.BrAs.AmenCio	SS.SMp.KSwSS
IR.HIR.KSed.XKScrR	LS.LMu	SS.SMp.KSwSS.LsacCho
IR.MIR.KR.Lhyp.Ft	SS.SCS.ICS	SS.SMp.KSwSS.LsacR
IR.MIR.KR.Lhyp.GzFt	SS.SSa.IMuSa	SS.SMp.KSwSS.LsacR.Gv
IR.MIR.KT.XKTX	SS.SSa.CMuSa	SS.SMp.KSwSS.LsacR.Sa
IR.LIR.K.Lsac.Ft	SS.SMu.IFiMu	SS.SMp.KSwSS.Tra
IR.LIR.K.Lsac.Pk	SS.SMu.IFiMu.PhiVir	SS.SMx.IMx
CR.MCR.EcCr.CarSwi.LgAs	SS.SMu.CFiMu.SpnMeg	SS.SMx.CMx
	SS.SMp.Mrl.Pcal.R	

Figure 4. Distribution of initial biotopes recorded during the 2015 SCM video survey.

Table 2. Frequency of initial biotopes recorded during the 2015 SCM video survey and at the same 73 sites during the 2004 SCM video survey.

Biotope	2015	2004
IR.HIR.KSed	1	2
IR.HIR.KSed.XKScrR	1	
IR.MIR.KR.Lhyp.Ft	3	2
IR.MIR.KR.Lhyp.GzFt	1	2
IR.MIR.KT.XKTX	5	6
IR.LIR.K.Lsac.Ft	1	1
IR.LIR.K.Lsac.Pk	1	1
CR.MCR.EcCr.CarSwi.LgAs	2	2
CR.LCR		1
CR.LCR.BrAs.AmenCio	1	
LS.LMu	3	3
SS.SCS.ICS	3	1
SS.SSa.IMuSa	2	1
SS.SSa.CMuSa	4	4
SS.SMu.IFiMu	8	6
SS.SMu.IFiMu.PhiVir	2	1
SS.SMu.CFiMu.SpnMeg	12	11
SS.SMx.IMx	1	
SS.SMx.CMx	1	1
SS.SMp.KSwSS	1	3
SS.SMp.KSwSS.LsacCho	7	6
SS.SMp.KSwSS.LsacR	1	4
SS.SMp.KSwSS.LsacR.CbPb		1
SS.SMp.KSwSS.LsacR.Gv	3	4
SS.SMp.KSwSS.LsacR.Sa	12	9
SS.SMp.KSwSS.Tra	3	3
SS.SMp.Mrl.Pcal.R	3	1

Table 2 compares the frequencies of initial biotopes recorded at the same sites by the 2015 and 2004 surveys. This amounts to different biotopes being recorded at 10 sites. The physical and biological descriptions of these sites in both years are summarised in Table 2.3 (Annex 2), which also provides a commentary on the likely cause of differences at each site.

Two of the temporal differences are uncertain as a consequence of the doubt concerning the accuracy of biotope assignations, resulting from poor video quality in 2004 (D06 and D43). Temporal changes at the remaining eight sites are summarised in Table 3. At four of these sites it is considered likely that the temporal differences in recorded biotopes result from locational differences (D09; D35; D38 and D71). Evidence for this is supported by marked differences in the nature of the substrate or the depth of the video run. Real temporal change appears to have taken place at four sites. Change at two of these sites (D08, D61) occurred principally by the disappearance of loose algal mats in 2015. At site D11 a change in sub-biotope resulted from a reduction in the proportion of gravel and stones in 2015, whilst at site D69 the flat, relatively unworked, mud plain recorded in 2004 gained a burrowing megafaunal and sea pen community in 2015. All these changes are consistent with natural temporal variation, although the transformation at site D69 could also possibly result from greater anthropogenic, physical disturbance, such as trawling activity, prior to the 2004 survey. In any event these changes do not signify a temporal reduction in the condition of these habitats.

Table 3. Summary of temporal changes in initial biotopes between the 2004 and 2015 SCM video surveys.

Site	2004 biotope	2015 biotope	Nature of change
D08	SS.SMp.KSwSS	SS.SMu.IFiMu	Dense accumulation of drift weed and *Chorda filum* in 2004
D09	SS.SMp.KSwSS.LsacR	SS.SMu.IFiMu.PhiVir	Megafaunal burrowers and *Virgularia* present in 2015. Temporal difference in location likely.
D11	SS.SMp.KSwSS.LsacR.Gv	SS.SMp.KSwSS.LsacR.Sa	Sediment with more gravel and stones in 2004
D35	SS.SMp.KSwSS.LsacR	IR.HIR.KSed.XKScrR & SS.SCS.ICS	Boulders supporting kelp forest absent in 2004. Temporal difference in location likely.
D38	SS.SMp.KSwSS.LsacR.CbPb	SS.SMp.Mrl.Pcal.R	Sediment with significantly greater component of cobbles and pebbles in 2004 and maerl apparently lacking. Temporal difference in location likely.
D61	SS.SMp.KSwSS	SS.SMu.IFiMu	Sediment covered with loose algal mat in 2004
D69	SS.SMu.IFiMu	SS.SMu.CFiMu.SpnMeg	In 2004 seabed flatter with denser diatom film and no megafaunal burrows or *Virgularia* discernible
D71	SS.SMu.IFiMu	SS.SMp.KSwSS.LsacR.Sa	2015 algal turf absent in 2004. 2004 faunal burrows and mounds absent in 2015. Temporal difference in location likely.

3.1.2 Infaunal survey

The detailed results of the grain size analysis of the sediment samples from the infaunal survey are given in Table 3.2 (Annex 3), with summarial descriptors provided in Table 3.3 (Annex 3) and graphical presentation in Figure 3.1 (Annex 3). The species abundance data are given in Table 3.4 (Annex 3) and the distribution of biotopes at the sample sites illustrated in Figure 5.

Total abundance and species diversity measures for the 2015 infaunal survey are given in Table 3.5 (Annex 3) and a comparison of the data with the baseline survey is provided in Table 4.

There is insignificant overall temporal change in infaunal abundance, with a mean of 399 ind./0.1 m^2 in 2004 and 328 ind./0.1 m^2 in 2015 (paired *t* test, p = 0.788). There are some marked temporal changes, both positive and negative, at individual sites (Table 4), the largest at site S30 possibly associated with the change in recorded biotope (see below). Similarly, the overall temporal change in taxon richness is minimal, with means of 50 and 49 taxa recorded in 2004 and 2015 respectively (p = 0.888). However, there were some considerable changes in richness recorded at individual sites (Table 4). The larger changes were generally associated with sites allocated to **KSwSS** biotopes in one or both years, where the patchy algal turfs may engender corresponding spatial variability in infaunal diversity. The 147% change in richness at site S28 is not readily explained; however, this represents a temporal increase in diversity and so is not considered to be indicative of deterioration in the condition of the habitat.

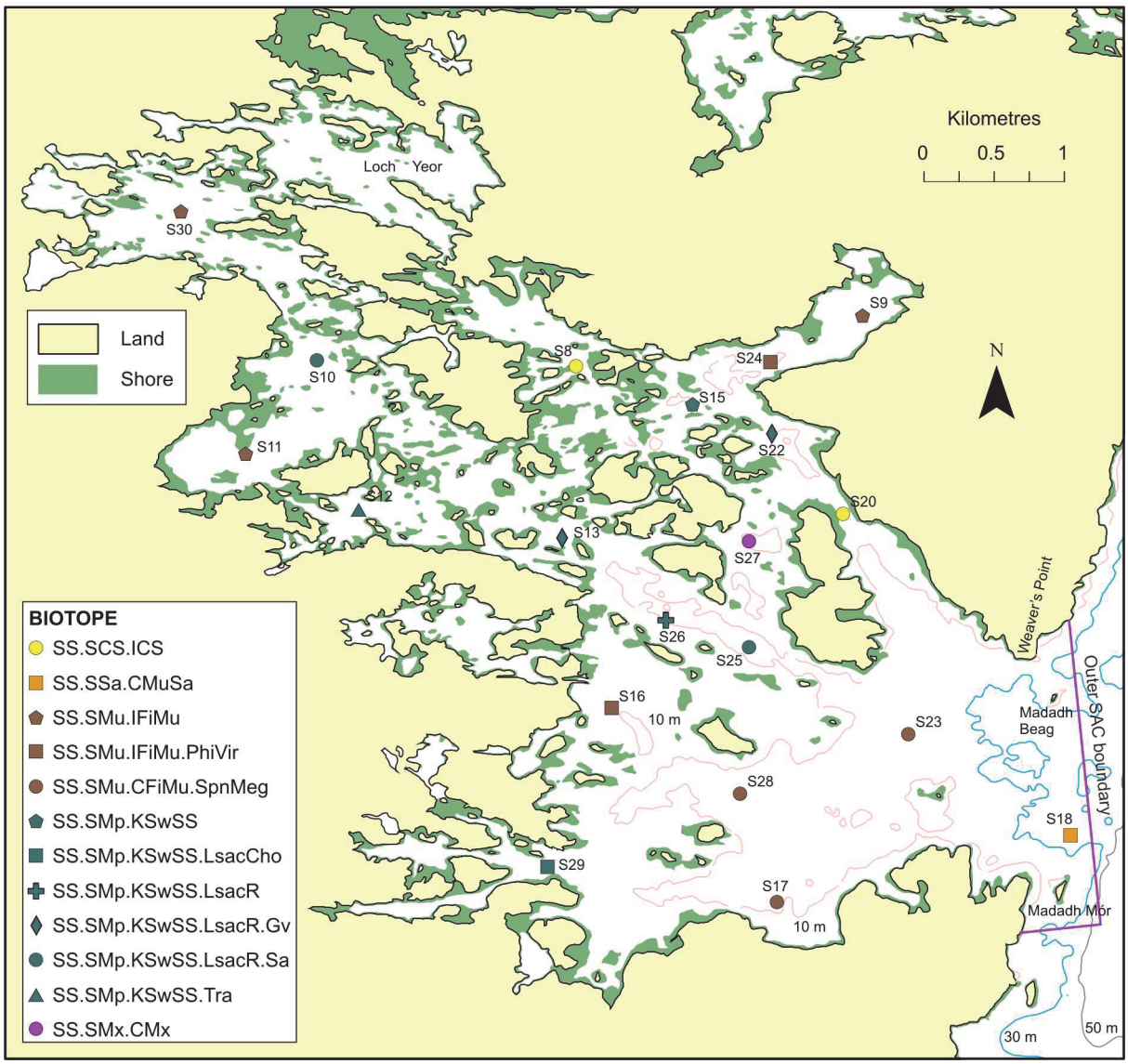


Figure 5. Distribution of biotopes recorded during the 2015 SCM infaunal survey.

Similarity of species composition at the 20 survey sites is shown in the MDS plot in Figure 6, which was based on log-transformed species abundance data. This plot, together with consideration of the species composition and associated video data, was employed to assign biotopes. The MDS plot shows spatial patterns in community composition related to a trend of increasing silt/clay content (along the horizontal axis) and depth (along the vertical axis).

Temporal changes in biotope were recorded at four sites (Table 4). At two of these sites (S20, S24, corresponding to video sites D35, D09), the change is likely to have arisen from locational differences (see Table 3). At site S30 the temporal change from **SS.SMp.KSwSS.Tra** to **SS.SMu.IFiMu** reflected the absence of a *Trailliella* mat in 2015. The disappearance of this mat may well be responsible for the large reduction in infaunal density at this site (Table 4). A similar reduction in algal cover at site S9 (video site D08) characterised a temporal change from **SS.SMp.KSwSS** to **SS.SMu.IFiMu**. Comparison of the species composition at sites in 2015 (Table 3.4, Annex 3) and in 2004 (Moore *et al*., 2006) indicates that no temporal changes are evident, such as the introduction of invasive

species or the appearance or marked abundance increase of pollution indicators, that are suggestive of deterioration in the condition of the habitats. It should be noted that one site in 2015 (S27) was approximately 15 m from salmon cages in the channel west of Flodday, but there was no temporal change in biotope recorded, nor significant change in abundance or taxon richness, and the species composition did not signify any impact of organic enrichment. The location and sediment composition at this site indicates the likely presence of strong tidal currents.

Table 4. Total abundance (no./0.1 m^2), number of taxa and biotopes recorded for infaunal grab and core samples taken at the same sites in 2015 and 2004. Also shown is the temporal change in taxon richness from 2004 to 2015 as a percentage of the 2004 value. Biotope changes emphasized using red text.

Site	Total abundance		No. taxa			2015 biotope	2004 biotope
	2015	2004	2015	2004	% change		
S8	827	1188	70	90	-22	SS.SCS.ICS	SS.SCS.ICS
S9	86	276	22	37	-41	SS.SMu.IFiMu	SS.SMp.KSwSS
S10	174	291	30	49	-39	SS.SMp.KSwSS.LsacR.Sa	SS.SMp.KSwSS.LsacR.Sa
S11	143	590	24	28	-14	SS.SMu.IFiMu	SS.SMu.IFiMu
S12	456	806	28	30	-7	SS.SMp.KSwSS.Tra	SS.SMp.KSwSS.Tra
S13	488	350	56	47	19	SS.SMp.KSwSS.LsacR.Gv	SS.SMp.KSwSS.LsacR.Gv
S15	617	840	65	121	-46	SS.SMp.KSwSS	SS.SMp.KSwSS
S16	247	85	35	29	21	SS.SMu.IFiMu.PhiVir	SS.SMu.IFiMu.PhiVir
S17	162	162	36	38	-5	SS.SMu.CFiMu.SpnMeg	SS.SMu.CFiMu.SpnMeg
S18	174	239	68	76	-11	SS.SSa.CMuSa	SS.SSa.CMuSa
S20	654	646	87	78	12	SS.SCS.ICS	SS.SMp.KSwSS.LsacR
S22	625	429	81	91	-11	SS.SMp.KSwSS.LsacR.Gv	SS.SMp.KSwSS.LsacR.Gv
S23	89	84	29	23	26	SS.SMu.CFiMu.SpnMeg	SS.SMu.CFiMu.SpnMeg
S24	108	41	30	17	76	SS.SMu.IFiMu.PhiVir	SS.SMp.KSwSS.LsacR
S25	548	396	93	77	21	SS.SMp.KSwSS.LsacR.Sa	SS.SMp.KSwSS.LsacR.Sa
S26	226	51	45	27	67	SS.SMp.KSwSS.LsacR	SS.SMp.KSwSS.LsacR
S27	386	253	78	78	0	SS.SMx.CMx	SS.SMx.CMx
S28	154	75	42	17	147	SS.SMu.CFiMu.SpnMeg	SS.SMu.CFiMu.SpnMeg
S29	118	32	36	9	300	SS.SMp.KSwSS.LsacCho	SS.SMp.KSwSS.LsacCho
S30	281	1145	26	31	-16	SS.SMu.IFiMu	SS.SMp.KSwSS.Tra

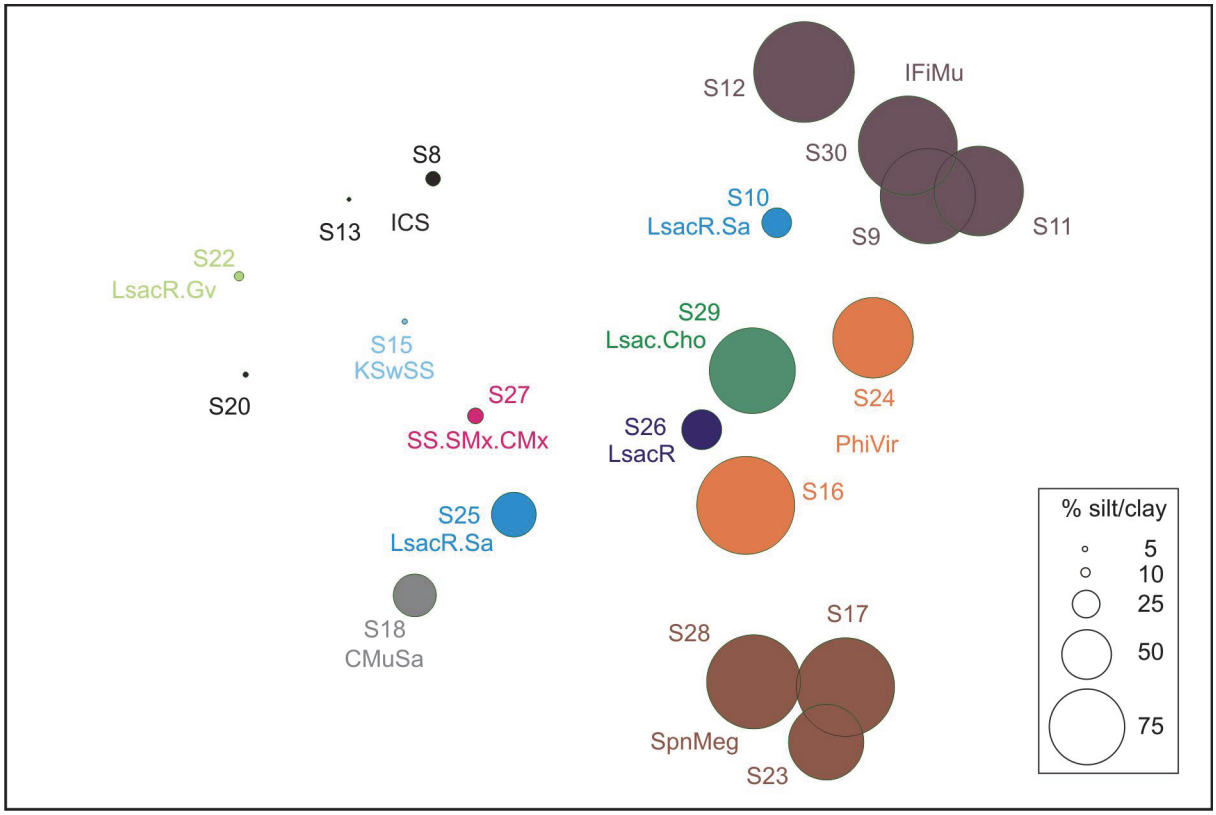


Figure 6. Non-metric multidimensional scaling ordination of species abundance data from the infaunal SCM survey at 20 sites. Allocated biotopes are shown, together with silt/clay content. Stress = 0.11.

Widespread differences between the sediment composition in 2004 and 2015 were recorded, exceeding 10% for certain sediment fractions at 14 of the 20 sites (Table 5). The largest change was at the diver-sampled site S13 where fine sand was recorded in 2004 and coarse sand in 2015. However, this is probably due to a locational difference as the diver recorded the presence of a kelp forest at the 2004 target position, so the nearest sediment area at the target depth was selected. There were probably also locational differences at sites S20 and S24 (see above). At the remaining sites percentages varied by up to 26% but with no consistent temporal or spatial pattern. There is no cause to believe that any of these changes are not due to natural temporal or localised spatial variability in sediment composition.

Table 5. Summary of sediment composition at grab sites and maerl transect sites where temporal change in at least one particle size category exceeded 10%. Temporal change since 2004 is shown, with vales >10% highlighted in red.

Site	2015					% change since 2004				
	% gravel	% coarse sand	% medium sand	% fine sand	% silt/clay	gravel	coarse sand	medium sand	fine sand	silt/clay
S8	3.47	65.32	6.89	10.14	14.19	2.39	-13.77	2.47	6.40	2.51
S10	0.00	18.13	17.51	35.71	28.64	-0.06	-2.56	-23.27	8.55	17.35
S13	0.37	67.72	26.09	1.92	3.90	0.37	62.25	-7.27	-53.04	-2.31
S15	0.35	59.35	22.40	13.01	4.89	-7.13	25.96	10.90	-18.65	-11.08
S16	0.00	0.78	0.98	4.26	93.97	0.00	0.05	-0.85	-10.77	11.57
S17	0.00	0.92	0.48	4.06	94.54	0.00	0.35	-0.20	-10.53	10.38
S18	3.01	33.89	8.07	13.90	41.12	0.43	-9.54	-3.90	-3.72	16.74
S20	10.71	72.78	10.36	1.00	5.15	10.08	2.36	-11.55	-1.30	0.41
S22	0.99	69.84	13.42	6.96	8.79	-7.88	14.77	5.47	-3.83	-8.53
S23	0.46	4.71	4.31	18.01	72.51	-1.13	3.40	3.12	-12.52	7.13
S24	0.47	5.08	4.26	13.00	77.18	0.47	4.49	3.31	6.51	-14.79
S25	3.02	26.54	10.41	17.09	42.95	-1.81	-6.10	-1.47	-5.43	14.81
S26	4.24	16.15	8.23	32.99	38.40	2.13	4.31	1.69	3.48	-11.62
S30	0.00	0.34	1.05	3.80	94.81	0.00	-1.38	-1.92	-17.53	20.82
ML01	7.29	59.41	16.47	7.88	8.96	-11.32	12.14	-0.27	-1.08	0.53
ML02	18.83	55.21	6.19	4.98	14.78	-24.02	6.78	3.50	2.42	11.31
ML03	21.17	55.58	9.30	3.63	10.31	-14.48	8.86	1.45	-0.71	4.89

3.1.3 Maerl bed survey

The results of the MNCR phase 2 and associated survey work at the four maerl bed locations previously examined in 2004 are reported here. Physical and biological descriptions of the transects are provided in Table 4.1 (Annex 4).

Modification of some of the 2004 recorded site positions had to be made to achieve comparable depths in 2015 (2004 depth values are also provided in Table 4.1, Annex 4) and agreement with the site position in relation to the relocation photographs provided in the baseline survey report (Moore *et al*., 2006, Table A28). In spite of this, the depth at the start of transect ML01 differed by 1.7 m and by a distance of 47 m. Start depths differed by 1.2 m at ML02 (although highly localised depth change occurs over this bed of duned maerl) and by a distance of 38 m. Start position and depth at ML03 were virtually identical to those recorded for 2004, although it was observed that a typographical error in the 2004 report gave the transect bearing as 220°M (212°T) instead of 120°M. At ML04 there was a distinct GPS error in the 2004 recorded position, placing the transect 70 m away in the wrong channel, and so the relocation photographs and depths were used to identify the correct position. This relocation appeared to be successful, with the habitat closely matching that found in 2004 and start and end depths differing by 0.7 m and 0.0 m respectively.

3.1.3.1 Epibiota

SACFOR abundances of all taxa recorded along the transects are listed in Table 4.2 (Annex 4) and taxon richness shown in Table 7. *Phymatolithon calcareum* was the dominant maerl species at all sites, with *Lithothamnion glaciale* also recorded at all sites, although only as hedgehog stones.

Estimates of the percentage cover of live maerl obtained during the MNCR phase 2 survey are provided in Table 6. Also shown in the table are mean values of live and dead maerl derived from quadrat measurements, with detailed results for each quadrat given in Table 4.3 (Annex 4).

At each site maerl density within quadrats was assessed independently by two surveyors at five of the 20 quadrat locations. Two-way ANOVA (surveyor x site with site as a random factor) of arcsine transformed percentages shows no significant difference in density measurements by the two surveyors ($p = 0.101$), although mean differences varied by up to 13% (Table 6). Table 6 also provides an overall measurement of mean live maerl cover along each transect based on all quadrats, where duplicated measures at the same quadrat location have first been averaged. These values are fairly close to those derived independently by the experienced MNCR surveyor, except at site ML02, where the difference is 19 - 24% (Table 6).

Table 6. Estimates of live and dead maerl percentage cover at the four MNCR transect sites. Mean values for live and dead maerl are given for each site with standard error, as well as mean values of live maerl derived from all quadrat locations where estimates were obtained independently by two recorders. Also shown are overall estimates for the transect obtained by a third experienced MNCR phase 2 recorder.

Transect	Mean live % cover for repeated quadrat locations			Mean live % cover for all quadrat locations	Mean dead % cover for all quadrat locations	Overall estimate of live % cover by MNCR recorder
	Recorder 1	Recorder 2	Difference (%)			
ML01	4.2 ±1.8	5.6 ±1.4	1.4	27.23 ±7.8	2.2 ±0.6	30
ML02	20.0 ±7.9	33.0 ±11.2	13	26.1 ±5.2	53.3 ±7.3	45-50
ML03	41.0 ±4.0	48.0 ±9.7	7	50.6 ±6.5	18.7 ±3.5	60
ML04	3.4 ±0.8	6.2 ±1.7	2.8	3.3 ±0.5	1.1 ±0.2	10-15

Recorded epibiotic taxon richness vales are similar in 2004 and 2015 for sites ML01, ML02 and ML03 (Table 7). A more pronounced change was observed at station ML04, where the higher value recorded in 2015 was due principally to the larger algal component. However, several of the additional species were associated with the sparse kelp plants found within the transect belt in 2015 and the remaining difference is possibly no more than would be expected from slight variation in the intensity of effort.

The percentage of taxa refound in 2015 appears fairly low (41 - 49%, see Table 7). While this reflects some change in composition, most of the differences will result from the recording of sparse or cryptic elements of the community that could be easily overlooked, or highly vagile species with sporadic appearance in the surveyed zone.

Some distinct temporal differences in recorded species composition or dominance are evident. At sites ML01 and ML03 the abundance of the *Trailliella* phase of *Bonnemaisonia hamifera* was far less abundant in 2015, but *Sacccharina latissima* and *Chorda filum* were more abundant and the invasive alga, *Dasysiphonia* (=*Heterosiphonia*) *japonica* became established. *Chorda filum* and *S. latissima* were both common at site ML02 in 2015 but were unrecorded in 2004. Both species were also present at site ML04 in 2015, together with *D. japonica*, but all were unrecorded in 2004.

There is no indication of a temporal change in biotopes at the four maerl sites. The maerl at sites ML01 and ML03 was found to support rich algal turfs and so these beds are consequently referred to **SS.SMp.Mrl.Pcal.R**. The strongly current-swept site ML04 supported a very sparse erect algal flora and a sparse visible fauna including occasional *Neopentadactyla mixta*. The site is biologically close to the lower infralittoral biotope, **SS.SMp.Mrl.Pcal.NMix**, but it has been ascribed to **SS.SMp.Mrl.Pcal**, due to the shallowness of the habitat (2 - 3 m depth). In 2004 the site was regarded as a mosaic of **SS.SMp.Mrl.Pcal** and **CGS.Ven.Neo**, but is interpreted here as an impoverished maerl bed. At site ML02 extensive areas of maerl supporting a sparse epibiota were interrupted by patches of dense algal turf. As in 2004, the bed has been ascribed to **SS.SMp.Mrl.Pcal**.

Table 7. Comparison of epibiotic taxon richness and live maerl cover derived by MNCR phase 2 surveys along transects in 2015 and 2004.

Transect	No. epibiota taxa			Live maerl cover (%)	
	2015	2004	% shared taxa	2015	2004
ML01	98	88	49	30	>50
ML02	82	78	41	45-50	60
ML03	90	100	44	60	50
ML04	61	46	43	10-15	6

No quadrat measurement of maerl density was carried out in 2004. Densities based on overall estimates made during the MNCR phase 2 survey are provided in Table 7. Similar live maerl cover vales were obtained in both years at sites ML02, ML03 and ML04. At site ML01 denser maerl was recorded in 2004, and reviewing the video from both years tends to confirm this. However, the positional and depth data for the transects suggests a temporal difference in location. Given the patchiness of the maerl in this channel, noted in both 2004 and 2015, it should not be concluded that the difference in recorded maerl cover values reflects real temporal change.

3.1.3.2 Infauna

Species abundance data for the four replicate core samples taken at the four maerl sites are presented in Table 4.4 (Annex 4) and total abundance and diversity measures in Table 4.5 (Annex 4).

Multidimensional scaling analysis of log-transformed species abundance data (Figure 7) shows that species composition differs between sites and temporally at each site. This is confirmed by ANOSIM analysis ($p = 0.029$ for all comparisons). Use of the SIMPER routine within PRIMER reveals the taxa principally responsible for the temporal differences. At site ML01 juvenile anomiids and *Socarnes erythrophthalmus* were more abundant and *Crassicorophium bonellii* and juvenile ophiuroids less abundant in 2015. At site ML02 *Mediomastus fragilis*, nematodes, *Aonides oxycephala* and *S. erythrophthalmus* were more abundant and *Leptocheirus pectinatus* less abundant in 2015. At site ML03 *Crenella decussata*, *Polycirrus* sp., *Rissoa parva*, *Ceratia proxima* and unidentified polynoid worms were all more abundant in 2015, whereas at site ML04 *Pisione remota*, *Leptocheirus hirsutimanus* and juvenile ophiuroids were less abundant. None of the compositional changes are suggestive of anthropogenic influences.

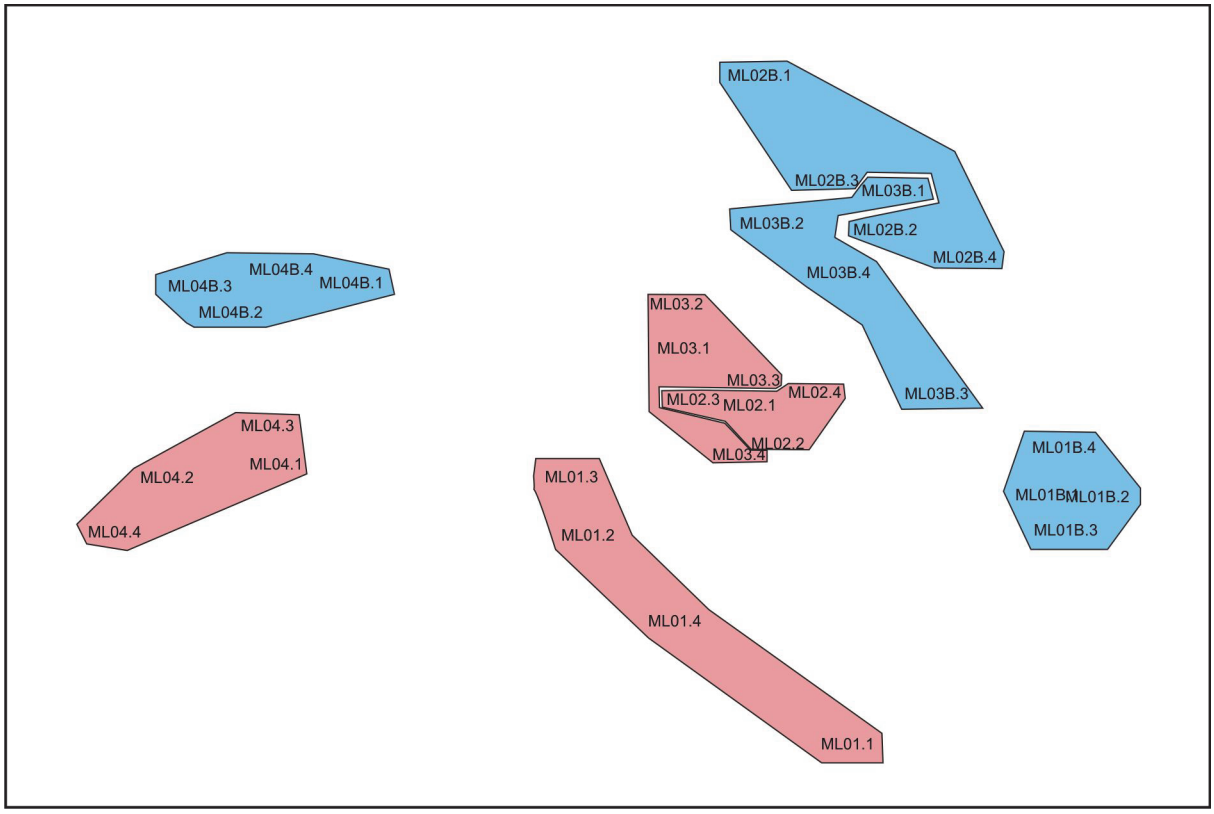


Figure 7. Non-metric multidimensional scaling ordination of infaunal species abundance data from four replicate core samples at four transect sites in 2004 and 2015. Replicates are grouped by site; pink clusters (2015) and blue clusters (2004). Stress = 0.13.

A temporal comparison of mean abundance and diversity measures is provided in Table 8. Infaunal abundance increased significantly between the two surveys at ML02 (*t* test, p = 0.03) but decreased at ML04 (p = 0.04). The only significant change in taxon richness was a temporal decline at site ML04 (p = 0.03). However, as taxon richness can be strongly dependent upon sample size, the recorded reduction in richness may be merely a consequence of the lowered abundance. Indeed, Shannon-Wiener diversity, which is less influenced by sample size, showed no significant temporal change at this site, although there was a temporal increase at ML03 (p = 0.01).

Table 8. Comparison of mean taxon richness, Shannon-Wiener diversity (log_2) and total abundance (with standard error) in four replicate 10.3 cm diameter core samples derived from surveys along transects in 2015 and 2004.

Transect	No. taxa		Total abundance		Diversity (Shannon-Wiener)	
	2015	2004	2015	2004	2015	2004
ML01	49.50	46.50	199.00	189.00	4.790	4.316
	±4.27	±5.42	±35.99	±20.00	±0.087	±0.229
ML02	48.00	40.50	305.25	180.25	4.439	4.136
	±2.83	±4.91	±40.36	±17.59	±0.091	±0.270
ML03	48.25	36.75	276.75	240.25	4.631	4.008
	±2.95	±5.15	±19.22	±42.99	±0.080	±0.116
ML04	18.75	29.00	77.50	156.75	3.465	3.881
	±2.39	±2.52	±16.58	±16.34	±0.205	±0.135

3.1.3.3 Sediment composition

The detailed results of the grain size analysis of the sediment samples taken from the transects are given in Table 4.6 (Annex 4), with summarial descriptors provided in Table 4.7 (Annex 4) and graphical presentation in Figure 4.1 (Annex 4). Large temporal differences (>10%) between the 2004 and 2015 surveys were recorded at three sites (Table 5). However, it cannot be assumed that this represents real temporal change, due to the high degree of spatial variability in sediment composition, which is frequently clearly discernible over the area of a maerl bed. At site ML02 the duned nature of the maerl material overlying a stratum of muddy sand is likely to have lead to the recorded temporal change in silt/clay content, due to the varying thickness of the overlying maerl layer.

3.2 Mudflats and sandflats site check survey

Full details of the data recorded during the site check survey are provided in Annex 5 (Tables 5.1 - 5.4).

No temporal change was recorded in the presence of biotopes at the two locations, with both biotopes recorded in 2004 (**LS.LMu.MEst.HedMac** at Collastrome and **LS.LMu.MEst.NhomMacStr** at Strom Dearg), still being present in 2015. The faunal composition at all stations was similar to that recorded in 2004, although the mud at station SD1 (Strom Dearg) appeared more densely hummocked by *Arenicola marina* in 2004, when the density was assessed as abundant, compared to common (but with abundant patches) in 2015. The recorded depth of the black layer here also differed (>10 cm in 2004, <1 cm in 2015). No marked changes in zonal boundaries were observed in 2015; minor recorded differences at Strom Dearg were probably due to the diffuse nature of the boundary, possibly accompanied by errors in the 2004 observations.

No evidence of deterioration in the condition of the sediment flat feature from anthropogenic activities was recorded. Old wreckage of a car was present at Collastrome, although this was scattered on the fucoid dominated rocks above the sediment flat, apart from one wheel.

3.3 Reefs site check survey

Results from the survey of the distribution of biotopes along the relocatable transects at the five rocky reef sites are provided in Tables 6.2 - 6.6 (Annex 6), where differences with the findings of the 2004 surveys are recorded. SACFOR abundances recorded during the MNCR phase 2 survey of targeted zones at each site are given in Tables 6.7 - 6.11 (Annex 6).

At Cliasay Beg NE the sequence of biotope zones recorded in 2004 was unchanged in 2015 and there was very little temporal difference in the position of zonal boundaries (Table 6.2, Annex 6). However, a change in composition of the *Fucus serratus* zone (**LR.LLR.F.Fserr.FS**) was noted, with an increase in abundance of *Ulva* spp. (*Enteromorpha* form) from common to superabundant. This accompanied, and may be a consequence of, a recorded decrease in the cover of *F. serratus* from abundant to common.

The MNCR phase 2 survey carried out in zone 7 recorded a similar community to that found in 2004, with a slope of small to medium silty boulders supporting a dense forest of cape-form *Saccharina latissima* and a fauna dominated by ascidians, particularly *Ascidia mentula*, didemnids and polyclinids (**IR.LIR.K.Lsac.Ft**) (Table 6.7, Annex 6). One temporal change in composition observed was the introduction of the invasive alga, *Dasysiphonia japonica*, which formed a dominant member of the algal understorey in 2015. Taxon richness was very similar in 2004 (50) and 2015 (54). No evidence of anthropogenic impact was discernible at this site.

No temporal change in the sequence of biotopes was observed at Flodday (Table 6.3, Annex 6). Zonal widths were very similar in both years; however, depths recorded at the lower margins of the **IR.MIR.KR.Lhyp.Ft** and **IR.HIR.KFaR.FoR.Dic** zones were 2 - 3 m deeper in 2015, which implies that the route of the transect was slightly different in the two surveys. Given the difficulty often experienced in the definition of zonal margins, significant temporal change in the depth distribution of biotopes should not be concluded.

The MNCR phase 2 survey was carried out in zone 9, where the same biotope was recorded as in 2004 (**CR.LCR.BrAs.AmenCio**). A substrate of vertical rock with overhangs followed by a steep boulder slope was encrusted with pink coralline algae and supported a fauna of dense *Caryophyllia smithii*, patches of *Corynactis viridis* on vertical and overhanging faces, and ascidians, especially *Ascidia mentula*, *A. virginea* and *Clavelina lepadiformis* (Table 6.8, Annex 6). A patchy red algal turf included *Dasysiphonia japonica* as a minor component. Taxon richness was similar in 2004 (60) and 2015 (65). There was a slight difference in the route of the transect through this biotope, the transect line traversing a major overhang (or shallow cave) in 2004. This lay just beyond the transect band in 2015 but was briefly surveyed anyway for consistency. The temporal difference in routing was also manifest in the presence of a boulder slope at the bottom of the zone in 2015, compared to a bedrock slope in 2004. No evidence of anthropogenic impact was recorded along the transect.

The sequence of biotopes recorded along the transect at Weaver's Point was as in 2004, with similar zonal widths (Table 6.4, Annex 6). Recorded subtidal zonal boundary depths differed by up to 3 m.

The MNCR phase 2 survey recorded the same biotope in zone 9 as in 2004 (**CR.MCR.EcCr.CarSwi.LgAs**). An irregular silty bedrock slope with small patches of sediment on ledges supported dense *Caryophyllia smithii*, coralline crusts, hydroid patches and frequent *Swiftia pallida*, *Axinella infundibuliformis*, *Ascidia mentula* and *Diazona violacea* (Table 6.9, Annex 6). The suite of dominant taxa was similar in both years, although the hydroid *Aglaophenia* sp., abundant in 2004, was not recorded in 2015. Recorded taxon richness was 48 in 2015, which is lower than that found in 2004 (59), although the 2004 figure is reduced to a more comparable 52 if the under-boulder fauna is excluded. Boulders were not turned over in 2015.

No temporal changes in the distribution of biotopes were recorded along the intertidal section of the transect at Madadh Beag (Table 6.5, Annex 6), although a large sea swell prevented access to the sublittoral fringe. In the upper infralittoral an upper band of *Laminaria hyperborea* forest (**IR.MIR.KR.Lhyp.Ft**) followed by a kelp forest dominated by *Saccorhiza polyschides* (**IR.HIR.KSed.LsacSac**) was recognised in 2015. In 2004 the only biotope recorded here was **IR.MIR.KR.Lhyp.Ft**, although *S. polyschides* and *Saccarina latissima* were recorded as respectively frequent and common in the lower region of the zone, so there may not have been a real temporal change in biotope, just a shift in kelp dominance. In the lower infralittoral the *S. polyschides* forest gave way to a park of *S. polyschides* in 2015 (**IR.HIR.KSed.LsacSac**). This replaced the *S. latissima* park (**IR.LIR.K.Lsac.Pk**) recorded in 2004, when no *S. polyschides* were observed here. *Saccorhiza polyschides* is a fast-growing opportunistic species that can rapidly colonise rock disturbed by such processes as wave action, and so the shift in biotope at this exposed location can be regarded as a natural process.

Below the *Saccorhiza polyschides* park in 2015 a substrate of bedrock and boulders supported dense *Caryophyllia smithii*, coralline crusts, hydroid patches and occasional *Swiftia pallida* (**CR.MCR.EcCr.CarSwi.LgAs**). The recorded upper boundary of this zone was 3 m shallower than in 2004, but the boundary was ill-defined. The MNCR phase 2 survey of this zone (Table 6.10, Annex 6) recorded a similar fauna to that found in 2004, although the sponge component was reduced. Taxon richness was lower in 2015 (50) than

in 2004 (64), although the 2004 value becomes similar (57) if the cryptic habitats not investigated in 2015 (such as boulder undersurfaces) are excluded.

No evidence of anthropogenic impact on the condition of the habitats along the transect was evident, although creel fishing for wrasse was taking place at the time of the survey, with a creel line passing through the **CR.MCR.EcCr.CarSwi.LgAs** zone.

Landing at Madadh Mór was rendered impossible due to the sea conditions and so the transect line was attached to an existing intermediate transect marker piton at the base of the sea cliff, which extended throughout the littoral section of the transect. This negated checking of intertidal zonal widths. However, all 2004 biotope zones in the intertidal and subtidal were still present in 2015 (Table 6.6, Annex 6). Subtidal zonal widths were similar in both years, although the boundary between zones 3 (**IR.HIR.KFaR.LhypFa**) and 4 (**IR.HIR.KFaR.FoR**) was recorded as being 5 m deeper in 2015. However, the boundary was diffuse, with a band of relatively sparse kelp present here.

The MNCR phase 2 survey recorded the same biotope in zone 5 as in 2004 (**CR.MCR.EcCr.CarSwi.LgAs**). Boulders were encrusted with pink coralline algae and supported abundant *Caryophyllia smithii*, with hydroid patches and occasional *Swiftia pallida* (Table 6.11, Annex 6). The hydroid fauna was rather better developed here than at the other transect sites exhibiting this community, and in places the biotope approached **CR.HCR.XFa.SwiLgAs**. The fauna was similar to that found in 2004, with a comparable level of taxon richness (58 in 2015, 51 in 2004).

No evidence of anthropogenic disturbance was seen at Madadh Mór, although as at Madadh Beag, creel fishing for wrasse was being carried out at the time of the survey, with the creel line passing through the transect in the **CR.MCR.EcCr.CarSwi.LgAs** zone.

Replicated belt transect counts of *Swiftia pallida* and *Axinella infundibuliformis* in 2004 and 2015 permit the assessment of temporal density change in the **CR.MCR.EcCr.CarSwi.LgAs** zones at Weaver's Point and Madadh Beag. The raw data are provided in Table 6.12 (Annex 6) and summarised in Table 9. A Mann-Whitney U test revealed no significant temporal change in *Swiftia* density at either Weaver's Point ($p = 0.495$) or Madadh Beag ($p = 0.068$). There was also no change in *Axinella* density at Weaver's Point ($p = 0.204$), but a temporal decline from a mean of 2.5 to 0.4 individuals per 20 m^2 was recorded at Madadh Beag ($p = 0.042$). Although *Axinella infundibuliformis* might be expected to be sensitive to physical disturbance produced by creeling, which was being carried out in the surveyed area, the high rugosity of the boulder habitat suggests that this is unlikely to be a cause of temporal decline, which may be natural. Temporal change in *Caryophyllia smithii* density (see Table 6.13, Annex 6, for raw data and Tables 9 for mean values) was recorded at most sites with increases at Weaver's Point ($p = 0.001$) and Madadh Beag ($p = 0.021$), a decrease at Flodday ($p = 0.001$) and no change at Madadh Mór ($p = 0.664$). There is no reason to believe that these recorded changes do not reflect natural temporal fluctuations or possibly spatial patchiness.

Table 9. Density of Swiftia pallida, Axinella infundibuliformis and Caryophyllia smithii at rocky reef transect sites in 2004 and 2015. The table shows mean counts (with median in brackets) within 20 m^2 belt transects (Swiftia, Axinella) and 0.0625 m^2 quadrats (Caryophyllia). N/A = not assessed.

Site	*Swiftia*		*Axinella*		*Caryophyllia*	
	2004	**2015**	**2004**	**2015**	**2004**	**2015**
Flodday	N/A	N/A	N/A	N/A	47.1 (46.5)	23.6 (22.5)
Weaver's Point	14.6 (9.5)	16.4 (16.5)	0.9 (1.0)	2.1 (1.5)	19.0 (19.5)	29.6 (31.5
Madadh Beag	9.5 (7.5)	5.5 (1.5)	2.5 (1.0)	0.4 (0.0)	28.9 (26.5)	39.6 (41.0)
Madadh Mór	N/A	0.0 (0.0)	N/A	0.0 (0.0)	10.8 (11.0)	8.8 (6.5)

3.4 Tidal rapids site check survey

Results from the survey of the distribution of biotopes along the intertidal sections of the relocatable transects at the three tidal narrows sites are provided in Tables 7.2 - 7.4 (Annex 7), where differences with the findings of the 2004 surveys are recorded. SACFOR abundances recorded during the MNCR phase 2 survey of targeted zones at each site are given in Tables 7.5 - 7.7 (Annex 7).

The biotope sequence at Sponish Rapids followed that recorded in 2004 (Table 7.2, Annex 7). A minor collapse in the bank at the top of the transect adjacent to the footpath caused a slight modification in the proportions of grass and stones making up the habitat of zone 1 but the biological characteristics of the zone were unchanged. Biotope zonal widths were similar in both years; slight differences in zonal boundaries in the uppermost zones were probably due in part to the loss of the original transect marker stake, which necessitated its replacement using the GPS position and 2004 relocation photographs as guides. The *Laminaria hyperborea* forest at the bottom of the transect (zone 7) was insufficiently exposed by the tide to permit detailed comparisons with 2004.

The MNCR phase 2 survey was carried out in zone 6 where boulders, cobbles and pebbles supported dense *Fucus serratus*, *Ulva* spp., *Cladophora rupestris* and a rich fauna including *Caryophyllia smithii*, polyclinids and other ascidians such as *Dendrodoa grossularia*, and bryozoans, especially *Alcyonidium hirsutum* (**LR.HLR.FT.FserT**). The species composition (Table 7.6, Annex 7) was similar to that observed in 2004, as was the number of taxa recorded (66 in 2015, 63 in 2004).

The distribution of biotopes along the transect at Leiravay Rapids closely matched that found in 2004 (Table 7.3, Annex 7), although the lowest kelp zone (7) was not sufficiently uncovered to permit comparison.

At Leiravay the most diverse and most extensive intertidal zone (5) was the tide-swept bed of *Ascophyllum nodosum* on boulders (**LR.HLR.FT.AscT**), which was selected for MNCR phase 2 survey. The blanket of *A. nodosum*, densely colonised by *Clava multicornis* overlay a red and green algal turf dominated by *Cladophora rupestris* (Table 7.6, Annex 7). Boulder undersurfaces harboured dense populations of *Dendrodoa grossularia*, polyclinids and *Grantia compressa*. The faunal community was similar to that found in 2004 but taxon richness was higher in 2015 (44) than in 2004 (29). This is largely explained by additional algal species recorded within the algal turf. This may be a reflection of greater sampling and subsequent sample analysis in 2015, although this may not explain the lack of the recording of *C. rupestris* in 2004.

The sequence of intertidal biotopes recorded along the transect at Cliasay Beg N agreed with that in 2004, and there was little difference in zonal widths (Table 7.4, Annex 7).

The *Fucus serratus* zone (6) was selected for MNCR phase 2 survey at this site, where boulders and cobbles supported a dense cover of *F. serratus* and *Ulva prolifera*, with an understorey dominated by *Cladophora rupestris* and *C. sericea*, and fairly dense populations of ascidians and bryozoans, especially *Ascidia mentula*, *Dendrodoa grossularia* and *Alcyonidium* species (Table 7.7, Annex 7). The composition of the community was similar to that recorded in 2004, as was taxon richness (41 in 2015, 39 in 2004).

No evidence of anthropogenic disturbance was noted at any of the tidal rapids sites. Minor, localised collapse of the low bank of soil and stones at the top of the transect at Sponish Rapids appeared to be due to natural erosion.

4. DISCUSSION

4.1 Site Condition monitoring of subtidal sandbanks

Monitoring of the condition of this feature should consider seven attributes of which four require compulsory assessment (JNCC, 2004). All attributes have been selected for monitoring within the Loch nam Madadh SAC by SNH (see Moore *et al*., 2006). These are listed in Table 9.1 (Annex 9) of this report.

Following monitoring of the feature, its condition is assessed by assignment to one of seven categories (SNH, 2010):

- Favourable Maintained - the attribute targets set for the natural features have been met, and the natural feature is likely to be secure on the site under present conditions.
- Favourable Recovered - the condition of the natural feature has recovered from a previous unfavourable condition, and attribute targets are now being met.
- Unfavourable Recovering - one or more of the attribute targets have not been met on the site, but management measures are in place to improve the condition.
- Unfavourable No Change - one or more of the attribute targets have not been met, and recovery is unlikely under the present management or other activity on the site.
- Unfavourable Declining - one or more of the attribute targets have not been met, evidence suggests that condition will worsen unless remedial action is taken.
- Partially Destroyed - something has happened on the site which has removed part of the natural features, there is no prospect of restoring the destroyed area.
- Totally Destroyed - the natural feature is no longer present, there is no prospect of restoring it.

This section derives an assessment of condition following consideration of the degree to which the targets set for each of the measured attributes have been met. For each attribute, the targets (as devised through Moore *et al*., 2006), methods for assessment of adherence to the target, and the results of assessment are summarised in Table 9.1 (Annex 9).

4.1.1 Extent

No human activities have been identified, such as land reclamation and shoreline development, that are likely to have influenced the extent of the sandbank feature. A small marina development was established at Lochmaddy in 2014 but this will have no significant impact on feature extent. The 2015 point site video survey of 73 stations recorded sedimentary biotopes at 60 sites (Table 2.2, Annex 2), the same figure as in 2004. There is no evidence for a temporal change in the extent of the feature.

4.1.2 Topography

The prescribed methodology for the measurement of topographical change involving depth recording at point stations (Table 9.1, Annex 9) will only detect extreme variations in depth unless there is a high level of precision in position fixing and if measurements are referred to a fixed local datum. Allowing for the degree of tidal rise by the use of tidal prediction algorithms can lead to significant errors depending upon the atypicality of the meteorological conditions. In Loch Maddy the situation is exacerbated by poor knowledge of the tidal regime throughout much of the SAC, particularly in the inner regions of the fjardic system, where there can be considerable modification of the tidal phase and amplitude. For this reason the depths cited in this report and earlier reports on the loch should be regarded as approximate. A further problem is that unlike in the open sea, depths within the intricate system of channels within the SAC are likely to have a high degree of spatial variability. Notwithstanding these considerations there was little temporal variation in depth recorded at

most of the infaunal sample sites (Table 3.1, Annex 3). Differences in excess of 1 m were observed at three of the 20 sites, all of which were in the inner regions of the loch system and so subject to potentially significant error in depth measurement based on tidal predictions of sea level. Unlike the infaunal survey, depth recording during the video sampling in 2004 and 2015 was carried out from a moving vessel and employed different vessels and equipment in both years and so is not considered suitable for temporal comparisons.

No activities, coastal developments or events are known to have occurred since the last monitoring exercise that are likely to have caused changes in the topography of the sediment. It is concluded that there is no evidence to suggest that there has been a significant temporal change in the topography of the sandbank feature.

4.1.3 Sediment character

The target set by the site attribute table is that change in any of the major particle size categories (gravel, coarse sand, medium sand, fine sand and silt/clay) should not exceed 10%. This limit was breached at most of the 24 infaunal sites sampled in both survey years. However, these changes could be explained by natural temporal or localised spatial variation in sediment composition, as well as locational differences in the case of some sites. There is no indication of deterioration in the condition of the subtidal sandbank feature resulting from recorded changes in sediment composition.

4.1.4 Distribution and spatial pattern of biotopes

Real temporal change in biotope was considered to have occurred at four of the video survey sites. At two sites a reduction in algal cover led to a switch from **SS.SMp.KSwSS** to **SS.SMu.IFiMu**. A decrease in the density of stones caused a change from **SS.SMp.KSwSS.LsacR.Gv** to **SS.SMp.KSwSS.LsacR.Sa** at the third site, while at the fourth site the development of a burrowing megafaunal community characterised a switch from **SS.SMu.IFiMu** to **SS.SMu.CFiMu.SpnMeg**. At a further site (S30) that was not included in the 2004 or 2015 video surveys, infaunal sampling indicated a change from **SS.SMp.KSwSS.Tra** to **SS.SMu.IFiMu**, reflecting the absence of a *Trailliella* mat in 2015. All these changes are considered to represent natural temporal variability and do not signify deterioration in the condition of the habitats.

4.1.5 Extent of sub-feature

It is required that there should be no reduction in extent of the maerl biotopes, **SS.SMp.Mrl.Pcal** and **SS.SMp.Mrl.Pcal.R**. The latter biotope was in fact recorded at more spot video sites in 2015 (3) than in 2004 (1). However, this is presumed to be due to a locational difference at one of these sites and possibly due to the inadequate detail visible in the 2004 imagery at a second site. **SS.SMp.Mrl.Pcal** was recorded at two of the maerl transect sites in both 2004 and 2015.

Due to the patchy nature of the distribution of maerl within the intricate system of tide-swept channels of Loch Maddy a detailed assessment of maerl extent would necessitate a considerable investment of survey time. Based on the very limited data available, there is no evidence to suggest that a temporal decrease in the extent of maerl biotopes has occurred.

4.1.6 Species composition of representative or notable biotopes

The infaunal survey revealed temporal fluctuations in species richness (both increases and decreases) at sites ascribed to **SS.SMp.KSwSS** biotopes, possibly resulting from the effect of the patchy algal cover overlying the sedimentary substrate. At the four maerl transect sites higher numbers of epibiotic taxa were recorded at three sites and a slightly lower

number at the fourth site in 2015. No significant temporal decrease in infaunal Shannon-Wiener diversity was observed at any of the four sites. A reduction in taxon richness recorded at one site may have been due, at least in part, to the smaller sample size in 2015.

Temporal changes in species composition were evident at all four of the maerl transect sites but not such as to indicated a reduction in the condition of the habitat. Changes included the establishment of the invasive alga, *Dasysiphonia japonica* at three of the sites. In view of its low abundance it is considered unlikely to be modifying the community structure. At sites ML03 and ML04 it covered less than 1% of the substrate. The algal flora at site ML01 was dominated by brown algae, with *D. japonica* coverage at around 5 - 10%. There was no evidence of a temporal reduction in algal diversity here, with 37 taxa recorded in 2009 and 44 in 2015. The principal temporal change in the algal community at this site was a marked reduction in coverage by the invasive *Bonnemaisonia hamifera*, from >40% to 1-5% cover. This is unlikely to be linked to the introduction of *D. japonica* in view of its relatively low density here, and evidence from site ML03, where a similar gross temporal reduction in *B. hamifera* occurred, but where *D. japonica* was very sparse (<1% cover).

4.1.7 Species population measures

The presence of two maerl species, *Phymatolithon calcareum* and *Lithothamnion glaciale*, has been selected for monitoring (Table 9.1, Annex 9). Both were recorded at all four maerl transect sites in 2015. Similar live maerl densities (effectively *P. calcareum* as the strongly dominant species) were recorded at three of the sites in both survey years. A reduction at the fourth site is considered to possibly reflect a locational difference.

4.1.8 Overall condition assessment

The result of the 2015 site condition monitoring of the subtidal sandbanks of the Loch Maddy SAC is that the feature should be assigned to the condition category "Favourable Maintained". This does not signify, however, that there are not localised impacts on the condition of sedimentary habitats in the close vicinity of aquaculture facilities. Appropriate detailed surveys to examine the nature and scale of such possible impacts were not within the remit of the 2015 study.

4.2 Mudflats and sandflats site check survey

Although less ambitious in scope than full site condition monitoring, the form of site check survey used here does allow most of the conservation targets set out in the Site Attribute Table (Annex 9, Table 9.2) to be addressed.

4.2.1 Extent

No activities or events have been identified which appear to be influencing the extent of the sediment flats feature. No reduction in the extent of mudflat habitat was recorded along the relocatable transects.

4.2.2 Biotope composition

The two biotopes recorded on mudflats in 2004 (**LS.LMu.MEst.HedMac** at Collastrome and **LS.LMu.MEst.NhomMacStr** at Strom Dearg) were still present in 2015.

4.2.3 Distribution of biotopes

No significant changes in the distribution of biotopes were recorded along the transects in 2015.

4.2.4 Species composition of representative biotopes

The level of sampling intensity employed in the site check survey was insufficient to permit detailed assessment of change in biotope quality due to changes in species composition, although the data acquired indicate that faunal composition was similar in both years. It is possible that the population of *Arenicola marina* at one of the stations at Strom Dearg has undergone a slight temporal reduction in density.

4.2.5 Sediment character

In the absence of particle size analysis of the sediments, no objective measure of change in sediment composition is possible. In general, there was a high degree of similarity in the sediments observed in both survey years. A shallower depth for the anaerobic layer was recorded at the upper station at Strom Dearg in 2015 (<1 cm compared to >10 cm in 2004), although imagery from 2015 suggests this involves a slight greying of the sediment, rather than the presence of a clearly definable black layer. If the change is real, it may reflect a greater degree of bioturbation of the sediment in 2004 resulting from the greater *Arenicola* density. In any event, the depth of the anaerobic layer is not included in the Site Attribute Table (Annex 9, Table 9.2).

4.2.6 Topography

No activities or events have been identified which appear to be influencing the topography of the sediment flats feature. No reprofiling of transects was carried out in 2015, but there is no suggestion from visual observations along the transects that significant temporal change in topography has occurred.

4.2.7 Overall condition assessment

The results of the site check survey provide no good evidence that there has been any deterioration in the condition of the sediment flats feature and indicate that the feature should be assigned to the condition category "Favourable Maintained".

4.3 Reefs site check survey

As with the sediment flats survey, the reefs site check survey was less ambitious in scope than full site condition monitoring, although it allowed most of the conservation targets prescribed in the Site Attribute Table (Annex 9, Table 9.3) to be addressed.

4.3.1 Extent

No activities or events have been identified which appear to be influencing the extent of the reefs feature. The position of the reef/sediment boundary at the lower end of the reef transects varied by up to 6 m (at Madadh Mór) between the 2004 baseline and 2015 surveys (Tables 6.2 - 6.6, Annex 6), but this is highly dependent upon the precise route followed by the transect line and is not evidence of temporal change, especially at sites such as Madadh Mór, where the boundary is diffuse.

4.3.2 Biotope composition

All biotopes recorded in 2004 were also found to be present in 2015.

4.3.3 Distribution of biotopes

The only temporal change in biotope sequence recorded along the transects was in the infralittoral zone at Madadh Beag. Here, changes in dominance of the kelp species caused the recognition in 2015 of a zone of **IR.HIR.KSed.LsacSac** spanning the lower region of the

Laminaria hyperborea forest (**IR.MIR.KR.Lhyp.Ft**) recorded in both years, and a park of *Saccharina latissima* (**IR.LIR.K.Lsac.Pk**) recorded in 2004. This biotope shift is considered to represent a natural temporal process.

4.3.4 Extent of sub-feature

Of the biotopes selected for assessment of changes in extent (Table 9.3, Annex 9), temporal differences in the widths of the biotope zones along the transects were minimal (≤2 m) for **LR.HLR.FT.AscT** at Cliasay Beg NE, **IR.MIR.KR.Lhyp.Ft** at Flodday and Weaver's Point and **IR.HIR.KFaR.LhypFa** at Madadh Mór. Temporal increases in the recorded zonal width of **CR.MCR.EcCr.CarSwi.LgAs** of 6.5 m and 4.0 m at Weaver's Point and Madadh Mór respectively, may be the result of variation in the route of the transect line, as well as the diffuse nature of the zonal boundaries. A temporal reduction in the width of the **IR.MIR.KR.Lhyp.Ft** zone at Madadh Beag was due to the change in dominance of the kelp species. All these recorded changes can be considered to result from natural processes or measurement error and do not represent evidence of changes in the extent of the biotopes over the SAC as a whole.

4.3.5 Species composition of representative biotopes

Of the biotopes selected for assessment in the site attribute table (Table 9.3, Annex 9), only **CR.MCR.EcCr.CarSwi.LgAs** was examined in sufficient detail by the site check methodology to assess temporal change. Allowing for slight differences in methodology between the baseline and 2015 surveys, the MNCR phase 2 surveys of the biotope at Weaver's Point, Madadh Beag and Madadh Mór recorded similar epibiotic taxon richness values and a similar suite of dominant taxa in both years at all sites, although some taxa varied in abundance, such as *Caryophyllia smithii* and *Axinella infundibuliformis*. A significant temporal decline in the density of the latter species was recorded at Madadh Beag, where creeling was taking place. However, this activity is thought unlikely to be responsible for this change, as the highly rugose boulder substrate is likely to afford protection from physical damage, and there was no corresponding significant reduction in the density of *Swiftia pallida*, which might be expected to share a similar sensitivity to physical abrasion. There is insufficient evidence to suggest that any temporal changes in the species composition of the biotope have not been the result of natural processes.

4.3.6 Presence of specified species

The specified species, *Swiftia pallida* and *Axinella infundibuliformis*, were found at the same sites where they were recorded in the 2004 baseline survey (Weaver's Point, Madadh Beag and Madadh Mór (*Swiftia* only)).

4.3.7 Overall condition assessment

The results of the site check survey provide no good evidence that there has been any deterioration in the condition of the reefs feature and indicate that the feature should be assigned to the condition category "Favourable Maintained".

4.4 Tidal rapids site check survey

As with surveys described above, the tidal rapids site check survey was less ambitious in scope than full site condition monitoring. As no previous site attribute table had been formulated for this feature, a new table for the purposes of site condition monitoring is presented in Table 9.4 (Annex 9). Most of the conservation targets described therein can be addressed by the results of the site check survey, although temporal comparisons are restricted to the littoral sections of the survey transects.

4.4.1 Extent

No activities or events have been identified which appear to be influencing the extent of the tidal rapids feature.

4.4.2 Biotope composition

All littoral biotopes recorded in 2004 were also found to be present in 2015.

4.4.3 Distribution of biotopes

The sequence of littoral biotopes along the three transects was the same in 2015 as in the baseline survey.

4.4.4 Extent of sub-feature

Zonal widths of the specified, littoral, tide-swept biotopes, **LR.HLR.FT.AscT** and **LR.HLR.FT.FserT**, were similar at all sites in both survey years, with a maximum variation of 1.1 m. This falls within the range of possible measurement error.

4.4.5 Species composition of representative biotopes

Species composition and taxon richness were largely similar for the specified biotopes, **LR.HLR.FT.AscT** and **LR.HLR.FT.FserT**, in both survey years. The MNCR phase 2 survey revealed an increase in taxon richness from 29 to 44 in 2015, but this may merely reflect a difference in sampling intensity.

4.4.6 Overall condition assessment

No evidence of anthropogenic disturbance was noted at any of the tidal narrows sites. The results of the site check survey provide no good evidence that there has been any deterioration in the condition of the tidal rapids feature and indicate that the feature should be assigned to the condition category "Favourable Maintained".

4.5 Large shallow inlets and bays site check survey

The site attribute table from Moore *et al.* (2006) is presented in Table 9.5 (Annex 9). This recognises four categories of habitats: littoral sediments, inshore sublittoral sediments, lagoons and littoral and inshore rock. Lagoons did not fall within the remit of the 2015 study.

4.5.1 Extent

No activities, events or developments with the potential to reduce the extent of the feature have been identified.

4.5.2 Habitat diversity

All biotopes recorded during the spot video, infaunal, maerl, reefs, tidal rapids and sediment flat surveys in 2004 were found in 2015, apart from two. At video site D38 a maerl bed (**SS.SMp.Mrl.Pcal.R**) was found in 2015, where **SS.SMp.KSwSS.LsacR.CbPb** was recorded in 2004. The difference in physical habitat with a loss of the high density of cobbles and pebbles in 2015 suggested a locational difference was responsible for the different biotope assignment. At video site D50, where **CR.LCR.BrAs.AmenCio** was recorded in 2015, the poor video quality of the 2004 footage only permitted ascription to the higher biotope **CR.LCR**, although it is likely that there was no temporal change in biotope. It is concluded that there is no good evidence for a reduction in the diversity of habitats throughout the feature.

4.5.3 Distribution of habitats

No temporal change was recorded in the distribution of littoral sediment or littoral rock habitats. Distributional changes in inshore sublittoral sediment habitats are summarised in section 4.1.4 and in inshore rock in section 4.3.3. All such changes that are not likely to have resulted from locational errors are considered to represent natural temporal variability and do not signify deterioration in the condition of the habitats.

4.5.4 Water quality

No water quality monitoring data appears to be currently available for Loch Maddy. There is no evidence from the biota observed during the 2015 survey work that water quality has deteriorated since the baseline survey.

4.5.5 Overall condition assessment

There is no evidence of anthropogenic activities having caused any deterioration in the condition of the large shallow inlets and bays feature, although detailed surveys to assess the nature and scale of any localised impacts around aquaculture facilities did not form a component of the 2015 work. Based on the available evidence it is recommended that the feature should be assigned to the condition category "Favourable Maintained".

4.6 Recommendations

The SAT prescription that there should be no reduction in the extent of maerl biotopes cannot be addressed by the assessment of temporal deviation from a historical measure of the aerial extent of maerl. Rather than the presence of discrete maerl beds, maerl is patchily but extensively distributed within the tide-swept channels of the SAC. Following the acoustic mapping survey of the loch in 1995-96, Entec (1996) provided habitat maps showing the predicted distribution of mixed maerl and kelp forest communities. It was found to be difficult to separate the acoustic signatures of maerl and kelp forest, such that other areas of mapped kelp habitats were considered to possibly also support maerl. This is emphasised by the site condition monitoring work, where fairly dense maerl was recorded at video site D41 and along maerl transect ML01 in a region predicted to support kelp biotopes. Temporal change in maerl extent is better assessed using a relative measure, such as the frequency of sites supporting maerl biotopes. The number of observational sites established by the 2004 baseline survey within maerl habitats permits only coarse assessment of temporal change in extent, and so an increase in sampling intensity is recommended. In view of the difficulty in observing live maerl by remote observational methods due to the presence of kelp and dense algal turfs, as well as rapid camera movement in the tide-swept conditions, such observations are better carried out by diver.

To permit temporal comparisons of condition of the mudflats within the SAC, the 2015 site check survey was restricted to examination of the two mudflat transects studied in the baseline survey. As remarked by Moore *et al*. (2006), intertidal sedimentary areas are spread widely throughout the SAC but mostly as small patches of mud and sand. Future monitoring work could usefully address a more extensive range of locations, possibly replacing the transect approach with observations of condition at single sites. This approach would be hampered by the poor understanding of the tidal regime in much of the SAC. Improved understanding of this would also facilitate determination of the relationship between measured depths and chart datum, which can only be crudely approximated at present. Appropriate survey work would necessitate the deployment of tide gauge recorders at several locations throughout the Loch Maddy system.

The 2015 site check survey of reefs differed from the full SCM carried out in 2004 in the restriction of MNCR phase 2 surveying to specific biotope zones, and in the lack of shore

profiling. It is believed that neither of these restrictions significantly degraded the capability to detect deterioration in the condition of the feature, and that this approach could be adopted by full SCM work within the SAC in future. It facilitated a more rapid assessment of condition, while allowing more time to concentrate on biotopes considered to be of higher conservation importance. Similar replacement of the 2004 methodology for SCM of tidal rapids by the 2015 site check approach is suggested, although given the presence of highly diverse, tide-swept biotopes on the shore and sublittorally, MNCR phase 2 surveys within an SCM programme should preferably comprise representatives from both environments.

Hand cutting of seaweed is known to be taking place within the SAC, presumably resulting from the establishment of a North Uist company processing *Ascophyllum nodosum* in 2012. Given the potential for this practice to influence the condition of the reef feature of the Loch nam Madadh SAC and the tidal rapids feature of the Loch nam Madadh and Loch an Duin SSSIs, details of this activity need to be monitored and resultant or potential impacts assessed.

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ANNEX 1: SURVEY DATA RECORING FORMS

Annex 1.1. Dropdown video survey recording form.

Loch Maddy 2015 video survey ***Surveyors:***

Site code	**Target biotope**:		**Target depth** (m):
Vessel/Diver		**Date**	
SCM video site		**Maerl extent site**	

Time in			
GPS waypoint in		**Latitude & longitude in**	
Depth BSL in			

Time out			
GPS waypoint out		**Latitude & longitude out**	
Depth BSL out			

Substrate notes	
Biological notes & abundance estimates	
Video footage (tape no)	

Annex 1.2. Mudflat site check station and zone recording form. Form pre-populated with historical 2004 data.

LOCH MADDY MUDFLAT SITE CHECK 2015 DATE: TEAM:

SEDIMENT STATION AND ZONE RECORDING FORM TRANSECT:

STATION (e.g. SD1)	C1
TIME (BST hh:mm:ss)	
GPS (WGS84, dec. degrees) if different from target	57.61783 -7.19279
WPT NO.	
SUBSTRATE (M,SM,MS,fS,mS,cS,G etc)	soft mud
MOISTURE (standing, w'logged,damp,dry)	waterlogged
SURFACE FEATURES (e.g. rippled)	flat
DEPTH OF BLACK LAYER (cm)	0.5 cm
HABITAT NOTES	
BIOTA ABUNDANCES (surface)	Arenicola 30 cm
BIOTA ABUNDANCES (digover)	

BIOTOPE:	HedMac	HABITAT PHOTO IDs	

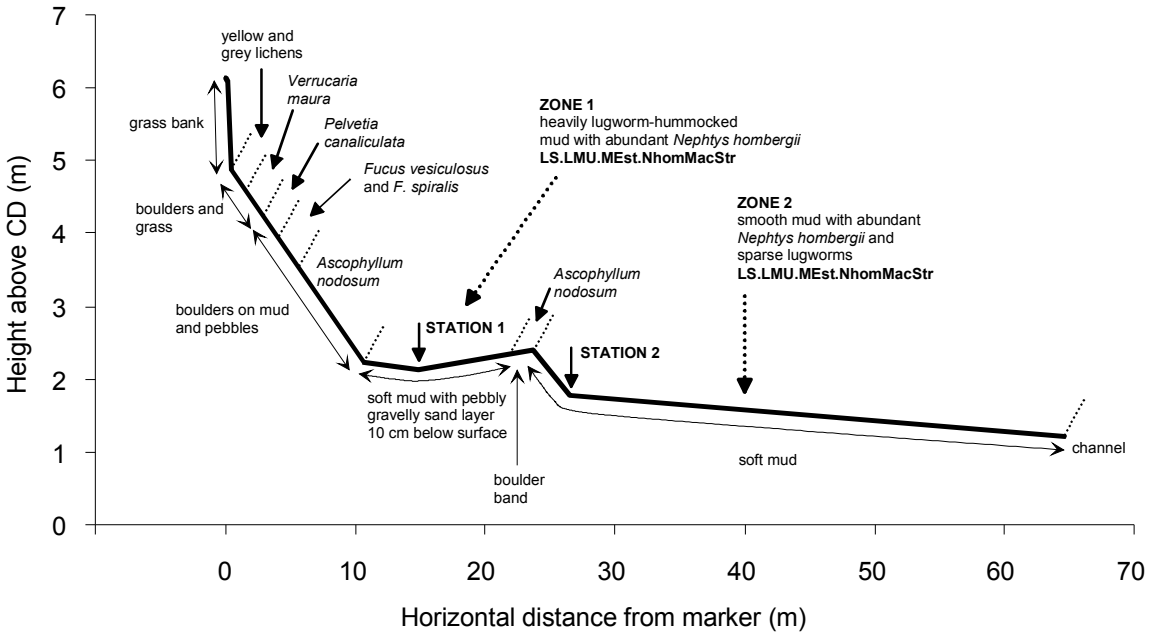
PHOTO QUADRATS IDs		ID SPECIMENS COLLECTED (Y/N)	
VIDEO ID			

ZONE EXTENT AND NATURE AS IN 2004 (Y/N) NOTE DIFFERENCE IF ANY	
ANTHROPOGENIC IMPACTS WITHIN ZONE	

Annex 1.3. Mudflat site check station and zone boundary recording form. Form pre-populated with historical 2004 data.

Strom Dearg Site Check transect DATE:

Feature	Tape distance (m)	Latitude	Longitude
peg	0.00	57.59899	-7.17186
top of grass bank	0.15		
base of grass bank	1.40		
bottom of yellow/grey lichens	3.50		
bottom of *Verrucaria* band	5.00		
bottom of *Pelvetia* band	5.90		
bottom of *Fucus* band	6.50		
Ascophyllum/ zone 1 boundary	11.90	57.59908	-7.17175
station 1	16.10	57.59910	-7.17172
zone 1/ boulder boundary	19.00	57.59917	-7.17165
boulder/ zone 2 boundary	24.90	57.59919	-7.17163
station 2	27.90	57.59923	-7.17158
channel	66.00	57.59953	-7.17128



Annex 1.4. Reef and tidal rapids site check intertidal recording form. Form pre-populated with historical 2004 data.

Weaver's Point REEF DATE: SURVEYORS:

Feature	Tape distance (m)	Substrate	Biogenic features of zone	Biotopes
Marker	0.00			
zone 1		Steep fissured bedrock slope	Yellow and grey lichens with small patches of grass and heather	LR.FLR.Lic.YG
zone 1/2 boundary	9.00			
zone 2		Steep bedrock slope with many crevices	Superabundant *Verrucaria maura* and abundant *Melarhaphe neritoides*	LR.FLR.Lic.Ver.Ver
zone 2/3 boundary	13.25			
zone 3		Steep bedrock slope with many crevices and small pools	*Pelvetia* and barnacles	LR.MLR.BF.PelB
zone 3/4 boundary	15.00			
zone 4		Steep bedrock slope with many crevices and small pools	Stunted *Fucus vesiculosus* and barnacle mosaic	LR.MLR.BF.FvesB LR.FLR.Rkp.Cor
zone 4/5 boundary	18.75			
zone 5		Steep bedrock slope	Dense *Laminaria digitata* with cushions of colonial ascidians and sponges	IR.MIR.KR.Ldig.Ldig

ANNEX 2: VIDEO SCM SURVEY DATA

Table 2.1. Site details for the 2015 spot video survey.

Site	Date	Latitude start	Longi-tude start	Latitude end	Longi-tude end	Depth start (m)	Depth end (m)	Gear	Video time (start)	Video time (end)
D01	05/07/2015	57.63045	-7.16043	57.63071	-7.16067	1.0	1.0	Mini dropdown	00:00:05	00:03:00
D02	12/07/2015	57.62830	-7.18588	57.62822	-7.18582	5.8	5.1	Mini dropdown	00:00:44	00:02:49
D03	12/07/2015	57.62232	-7.19427	57.62223	-7.19437	0.7	0.6	Mini dropdown	00:00:05	00:03:34
D04	11/07/2015	57.62207	-7.16708	57.62218	-7.16708	4.6	3.6	Mini dropdown	00:00:13	00:03:26
D05	12/07/2015	57.61838	-7.18110	57.61847	-7.18125	0.5	0.5	Mini dropdown	00:00:04	00:02:36
D06	11/07/2015	57.61953	-7.16765	57.61942	-7.16822	5.2	5.9	Mini dropdown	00:00:08	00:02:33
D07	05/07/2015	57.62352	-7.15243	57.62377	-7.15236	6.0	4.2	Mini dropdown	00:00:06	00:02:15
D07	05/07/2015	57.62352	-7.15243	57.62377	-7.15236	6.0	4.2	Mini dropdown	00:02:15	00:03:01
D08	13/07/2015	57.62985	-7.12062	57.62978	-7.12032	1.9	2.0	Dropdown	00:00:02	00:02:25
D09	13/07/2015	57.62740	-7.13035	57.62723	-7.13012	6.6	10.7	Dropdown	00:00:31	00:02:09
D10	13/07/2015	57.61863	-7.12878	57.61852	-7.12838	3.5	3.9	Dropdown	00:00:03	00:01:54
D11	14/07/2015	57.61413	-7.15082	57.61392	-7.15067	3.5	8.7	Dropdown	00:00:05	00:01:50
D12	14/07/2015	57.61112	-7.14363	57.61083	-7.14313	10.5	10.3	Dropdown	00:00:04	00:02:21
D13	14/07/2015	57.61275	-7.13333	57.61282	-7.13307	9.3	8.2	Dropdown	00:00:04	00:02:26
D14	13/07/2015	57.61367	-7.11743	57.61357	-7.11715	14.4	13.4	Dropdown	00:00:05	00:01:37
D15	13/07/2015	57.60903	-7.11245	57.60872	-7.11150	27.9	28.3	Dropdown	00:00:04	00:02:51
D16	14/07/2015	57.60915	-7.13380	57.60888	-7.13325	12.2	12.2	Dropdown	00:00:03	00:02:27
D17	14/07/2015	57.60552	-7.15030	57.60532	-7.14990	7.5	7.2	Dropdown	00:00:05	00:03:50
D18	14/07/2015	57.60707	-7.13623	57.60686	-7.13596	3.7	3.9	Mini dropdown	00:00:04	00:03:46
D19	14/07/2015	57.60655	-7.12053	57.60632	-7.12038	20.5	22.6	Dropdown	00:00:10	00:02:56
D20	14/07/2015	57.60473	-7.10810	57.60432	-7.10757	29.0	29.7	Dropdown	00:00:04	00:04:32
D21	13/07/2015	57.60757	-7.10013	57.60728	-7.09948	19.0	25.7	Dropdown	00:00:08	00:03:00
D22	13/07/2015	57.60580	-7.09770	57.60585	-7.09740	12.7	17.5	Dropdown	00:00:25	00:01:37
D23	14/07/2015	57.60117	-7.14503	57.60083	-7.14490	12.0	13.0	Dropdown	00:00:07	00:02:46
D24	14/07/2015	57.59707	-7.14798	57.59713	-7.14785	5.2	3.8	Dropdown	00:00:04	00:01:50
D25	14/07/2015	57.59863	-7.13185	57.59887	-7.13120	16.7	16.9	Dropdown	00:00:28	00:03:31
D26	14/07/2015	57.59998	-7.11652	57.59968	-7.11633	16.3	13.2	Dropdown	00:00:07	00:02:35
D27	13/07/2015	57.60077	-7.09813	57.60072	-7.09765	37.2	39.3	Dropdown	00:00:04	00:04:21
D28	14/07/2015	57.59140	-7.15147	57.59162	-7.15133	5.8	6.6	Dropdown	00:00:04	00:03:12
D29	14/07/2015	57.59282	-7.13123	57.59268	-7.13083	11.4	11.0	Dropdown	00:00:04	00:02:55
D30	13/07/2015	57.59355	-7.09803	57.59400	-7.09798	17.9	21.5	Dropdown	00:00:04	00:01:11
D30	13/07/2015	57.59355	-7.09803	57.59400	-7.09798	17.9	21.5	Dropdown	00:01:11	00:02:18
D30	13/07/2015	57.59355	-7.09803	57.59400	-7.09798	17.9	21.5	Dropdown	00:02:18	00:03:25
D31	11/07/2015	57.61662	-7.15630	57.61668	-7.15615	6.6	6.2	Mini dropdown	00:00:09	00:01:58

Table 2.1 continued

Site	Date	Latitude start	Longi-tude start	Latitude end	Longi-tude end	Depth start (m)	Depth end (m)	Gear	Video time (start)	Video time (end)
D32	05/07/2015	57.62109	-7.14020	57.62117	-7.14025	6.2	2.2	Mini dropdown	00:01:52	00:03:00
D32	05/07/2015	57.62109	-7.14020	57.62117	-7.14025	6.2	2.2	Mini dropdown	00:03:00	00:03:41
D33	14/07/2015	57.59982	-7.13543	57.59965	-7.13485	14.8	15.2	Dropdown	00:00:02	00:02:35
D34	14/07/2015	57.59588	-7.12392	57.59575	-7.12348	14.8	13.9	Dropdown	00:00:06	00:04:08
D35	13/07/2015	57.61765	-7.12255	57.61802	-7.12273	5.0	6.1	Dropdown	00:00:06	00:03:24
D36	13/07/2015	57.62287	-7.13032	57.62282	-7.13028	9.9	10.7	Dropdown	00:00:04	00:02:52
D37	13/07/2015	57.62587	-7.13708	57.62593	-7.13698	10.4	11.6	Dropdown	00:00:05	00:04:00
D38	13/07/2015	57.62252	-7.14739	57.62242	-7.14695	11.7		Diver	00:00:04	00:04:03
D39	13/07/2015	57.62747	-7.15357	57.62792	-7.15367	8.6	8.6	Diver	00:00:04	00:04:09
D40	13/07/2015	57.62456	-7.14056	57.62470	-7.14057	3.6	7.9	Diver	00:00:04	00:03:20
D40	13/07/2015	57.62456	-7.14056	57.62470	-7.14057	3.6	7.9	Diver	00:03:20	00:04:30
D41	05/07/2015	57.61929	-7.13525	57.61920	-7.13445	2.2	2.0	Mini dropdown	00:00:07	00:04:17
D42	14/07/2015	57.61600	-7.13340	57.61603	-7.13320	14.4	14.7	Dropdown	00:00:03	00:00:43
D43	14/07/2015	57.60362	-7.12710	57.60343	-7.12696	2.5	2.5	Mini dropdown	00:00:04	00:04:17
D44	14/07/2015	57.59472	-7.10618	57.59473	-7.10557	10.2	8.9	Dropdown	00:00:04	00:02:06
D50	12/07/2015	57.62445	-7.18113	57.62430	-7.18133	15.6	15.6	Diver	00:00:04	00:06:59
D51	11/07/2015	57.62635	-7.17382	57.62652	-7.17398	2.7	3.2	Mini dropdown	00:00:04	00:01:49
D52	14/07/2015	57.59842	-7.15132	57.59837	-7.15117	7.9	8.8	Dropdown	00:00:03	00:02:23
D53	14/07/2015	57.59405	-7.15143	57.59405	-7.15082	7.3	8.2	Dropdown	00:00:04	00:02:39
D54	14/07/2015	57.59552	-7.15833	57.59552	-7.15777	3.6	3.9	Dropdown	00:00:02	00:02:22
D55	04/07/2015	57.59449	-7.16456	57.59468	-7.16364	0.3	0.8	Mini dropdown	00:00:14	00:03:40
D56	04/07/2015	57.59300	-7.18472	57.59304	-7.18503	-2.2	-2.1	Mini dropdown	00:00:18	00:02:15
D57	04/07/2015	57.59313	-7.17511	57.59328	-7.17566	-1.1	-1.2	Mini dropdown	00:00:12	00:02:40
D58	04/07/2015	57.59338	-7.16777	57.59350	-7.16805	1.1	0.8	Mini dropdown	00:00:09	00:03:48
D59	14/07/2015	57.59639	-7.16757	57.59645	-7.16809	0.6	0.5	Mini dropdown	00:00:07	00:04:19
D60	14/07/2015	57.59657	-7.17182	57.59669	-7.17114	3.8	1.0	Mini dropdown	00:00:05	00:03:50
D61	14/07/2015	57.59856	-7.16783	57.59842	-7.16733	-1.9	-1.9	Mini dropdown	00:00:04	00:00:50
D61	14/07/2015	57.59856	-7.16783	57.59842	-7.16733	-1.9	-1.9	Mini dropdown	00:00:50	00:03:02
D61	14/07/2015	57.59856	-7.16783	57.59842	-7.16733	-1.9	-1.9	Mini dropdown	00:03:02	00:03:42
D62	14/07/2015	57.59711	-7.16350	57.59692	-7.16312	1.0	0.5	Mini dropdown	00:00:04	00:01:38
D62	14/07/2015	57.59711	-7.16350	57.59692	-7.16312	1.0	0.5	Mini dropdown	00:01:38	00:03:24

Table 2.1 continued

Site	Date	Latitude start	Longi-tude start	Latitude end	Longi-tude end	Depth start (m)	Depth end (m)	Gear	Video time (start)	Video time (end)
D62	14/07/2015	57.59711	-7.16350	57.59692	-7.16312	1.0	0.5	Mini dropdown	00:03:24	00:04:18
D63	14/07/2015	57.59261	-7.15798	57.59261	-7.15749	-0.4	-0.1	Mini dropdown	00:00:04	00:04:41
D64	14/07/2015	57.59225	-7.16111	57.59209	-7.16127	-1.5	-2.3	Mini dropdown	00:00:04	00:03:02
D64	14/07/2015	57.59225	-7.16111	57.59209	-7.16127	-1.5	-2.3	Mini dropdown	00:03:02	00:04:40
D65	14/07/2015	57.58833	-7.15612	57.58816	-7.15569	-1.4	-1.5	Mini dropdown	00:00:04	00:03:19
D66	14/07/2015	57.58936	-7.15033	57.58931	-7.14983	-0.2	-0.3	Mini dropdown	00:00:04	00:03:49
D67	14/07/2015	57.59370	-7.14432	57.59368	-7.14385	12.6	13.7	Dropdown	00:00:05	00:02:33
D68	14/07/2015	57.59262	-7.13767	57.59253	-7.13717	7.6	7.1	Dropdown	00:00:07	00:02:01
D69	14/07/2015	57.59562	-7.13473	57.59565	-7.13430	14.3	14.0	Dropdown	00:00:06	00:03:06
D70	14/07/2015	57.59671	-7.14336	57.59646	-7.14302	4.3	4.4	Mini dropdown	00:00:04	00:03:40
D71	14/07/2015	57.59823	-7.12252	57.59807	-7.12228	11.5	8.7	Dropdown	00:00:06	00:02:18
D72	14/07/2015	57.59607	-7.11432	57.59598	-7.11420	6.7	3.9	Dropdown	00:00:04	00:01:19
D73	14/07/2015	57.60073	-7.10693	57.60067	-7.10670	29.5	29.7	Dropdown	00:00:08	00:04:04
D74	13/07/2015	57.59648	-7.09620	57.59642	-7.09582	44.8	45.1	Dropdown	00:00:03	00:02:00
D75	13/07/2015	57.60887	-7.10543	57.60867	-7.10522	8.0	15.0	Dropdown	00:00:03	00:00:49
D75	13/07/2015	57.60887	-7.10543	57.60867	-7.10522	8.0	15.0	Dropdown	00:00:49	00:01:00
D76	13/07/2015	57.60813	-7.10477	57.60828	-7.10317	20.1	9.4	Dropdown	00:00:05	00:02:40
D76	13/07/2015	57.60813	-7.10477	57.60828	-7.10317	20.1	9.4	Dropdown	00:02:40	00:04:52
D76	13/07/2015	57.60813	-7.10477	57.60828	-7.10317	20.1	9.4	Dropdown	00:04:52	00:05:40
D77	14/07/2015	57.60337	-7.11520	57.60308	-7.11522	21.9	22.1	Dropdown	00:00:04	00:03:24
D78	14/07/2015	57.60823	-7.15065	57.60776	-7.15015	5.9	6.0	Mini dropdown	00:00:08	00:03:17

Table 2.2. Substrates, biota and biotopes recorded during the 2015 spot video survey, with initial biotopes recorded during the 2004 baseline survey and notes on temporal biotope matches. Red text indicates revised biotope assignments based on review of video.

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D01	mud with small black anaerobic patches	patchy algal mat, apparently largely filamentous reds (locally S). *Chorda filum* (C), *Asperococcus bullosus* (R), *Ulva* sp. (R), *Saccharina latissima* (O, but possibly drift material), *Arenicola marina* mounds? (P at low density)	SS.SMp.KSwSS.Tra SS.SMu.IFiMu		SS.SMp.KSwSS.Tra SS.SMu.IFiMu	
D02	medium sand with scattered pebbles, cobbles and shell material	patchy algal turf (F, locally A) with foliose and filamentous reds (F, locally A), *Dictyota dichotoma* (R) and *Ulva* sp. (R), *Saccharina latissima* (O) and drift kelp. *Arenicola marina* (O), Paguridae sp. (P), *Asterias rubens* (O)	SS.SMp.KSwSS.LsacR.Sa		SS.SMp.KSwSS.LsacR.Sa	
D03	mud	dense *Ophiocomina nigra* (S) for most of run but with patches of filamentous algal mat (locally S). *Arenicola marina* (R), brown diatomaceous film (C)	SS.SMu.IFiMu SS.SMp.KSwSS.Tra	IFiMu poor biotope fit as dense *Ophiocomina*. Could be OphMx but not mixed substrate	SS.SMp.KSwSS.Tra SS.SMu.IFiMu	ophiuroids apparently present within mat in 2004 but density on open mud much less in 2004

Table 2.2 continued

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D04	mixed coarse sediment of stone and maerl gravel, pebbles and scattered cobbles and boulders	dense patches of *Laminaria hyperborea* (C, locally A), *Saccharina latissima* (P) and a patchy algal turf of foliose and filamentous red algae (F) including *Dilsea carnosa*, browns with *Chorda filum* (A) and *Dictyota dichotoma* (F), and *Ulva* sp. (R). Scattered thalli of *Phymatolithon calcareum* (R)	IR.MIR.KT.XKTX	uncertain biotope. Could be LhypTX	IR.MIR.KT.XKTX	
D05	mud	patchy algal mat, largely filamentous reds (locally S). *Chorda filum* (O), *Asperococcus bullosus* (R), *Ulva* spp. (R)	SS.SMp.KSwSS.Tra SS.SMu.IFiMu		SS.SMp.KSwSS.Tra	
D06	coarse sand, gravel and pebbles with scattered cobbles and boulders	patchy kelp including *Laminaria hyperborea* (locally A) and *Saccharina latissima* (P), and turf of *Dictyota dichotoma* (A) and foliose and filamentous red algae (C); *Chorda filum* (O). Stones encrusted with pink coralline algae, including *Lithothamnion glaciale* (P) and *Balanus* spp. (F). *Phymatolithon calcareum* apparently F locally and possibly C over large areas, although visibility poor. *Echinus esculentus* (F)	IR.MIR.KT.XKTX SS.SMp.Mrl.Pcal.R	both biotopes uncertain	IR.MIR.KT.XKTX	Pcal.R could be present in 2004, but no close-up imagery to check for maerl presence.

Table 2.2 continued

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D07	coarse sand, gravel and pebbles	predominantly dense algal turf on coarse sand and gravel substrate with some pebbles, dominated by *Dictyota dichotoma* (A) and filamentous and foliose red algae (C). *Saccharina latissima* (F), *Chorda filum* (C, locally A), *Ulva* spp. (P). *Asterias rubens* (P), *Sabella pavonina* (P), *Necora puber*? (P). Thalli of *Phymatolithon calcarium* are present beneath the algal turf at the start of the run, although the density of live material cannot be determined	SS.SMp.KSwSS.LsacR.Gv	biotope uncertain. Pcal.R could be present initially	SS.SMp.KSwSS.LsacR.Gv	Pcal.R (originally assessed as present in 2004) could be present in 2015 but visibility inadequate. Visibility too poor in both years to suggest a loss of Pcal.R.
D07	boulders and cobbles on sand	boulders encrusted with pink coralline algae (P) and support mixed kelps including *Saccharina latissima* (P), *Saccorhiza polyschides* (P) and *Laminaria hyperborea* (P), and turf of filamentous and foliose red algae and *Dictyota dichotoma*. *Echinus esculentus* (P)	IR.MIR.KT.XKTX			

Table 2.2 continued

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D08	mud	brown diatomaceous film (A)	SS.SMu.IFiMu		SS.SMp.KSwSS	Dense accumulation of drift weed in 2004. Dense *Chorda* also in 2004, although possibly resulting from same processes as causing the drift weed
D09	mud with small rock outcrop	*Virgularia mirabilis* (F), thalassinidean shrimp burrows (F), brown diatomaceous film (A). Rock supporting foliose red algae (P), *Saccharina latissima* (P), *Polymastia penicillus* (P) and *Caryophyllia smithii* (P)	SS.SMu.IFiMu.PhiVir	biotope uncertain. Depth suggests PhiVir though no *Philine* and moderate density of burrowing megafauna	SS.SMp.KSwSS.LsacR	Difference possibly due to slightly shallower run in 2004
D10	mud	brown diatomaceous film (A), *Arenicola marina* (O), *Liocarcinus* spp. (O), *Carcinus maenas* (P) and much drift algae, especially *Saccharina latissima*, *Asperococcus bullosus*, *Chorda filum*, *Ulva* spp., filamentous reds and *Desmarestia* spp.?	SS.SMu.IFiMu		SS.SMu.IFiMu	

Table 2.2 continued

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D11	muddy sand with gravel, pebbles and scattered boulders	patchy *Saccharina latissima* (locally C) and sparse patchy algal turf of filamentous (O) and foliose (R) reds and *Chorda filum* (P). *Carcinus maenas* (P), *Caryophyllia smithii* (R)	SS.SMp.KSwSS.LsacR.Sa	biotope uncertain. IMuSa also possible, at least in part	SS.SMp.KSwSS.LsacR.Gv	More gravel and stones in 2004
D12	silty shelly sand with scattered pebbles and occasional cobbles	patchy algal turf including filamentous and foliose reds (F) and occasional *Saccharina latissima*. *Arenicola marina*? (P), *Carcinus maenas* (O), *Asterias rubens* (P)	SS.SMp.KSwSS.LsacR	biotope uncertain. IMuSa or SMx.IMx also possible, at least in part	SS.SMp.KSwSS.LsacR	
D13	shelly sand	algal turf including filamentous and foliose reds (A), browns including *Dictyota dichotoma* (O), *Chorda filum* (F), *Desmarestia* spp. (P) and *Saccharina latissima* (C), and *Ulva* sp. (R). *Nemertesia ramosa* (F), small teleost (P)	SS.SMp.KSwSS.LsacR.Sa		SS.SMp.KSwSS.LsacR	
D14	shelly sand with scattered gravel and pebbles	much drift *Saccharina latissima* and other algae. Probably attached filamentous red algae (R)	SS.SSa.IMuSa	biotope uncertain	SS.SSa.IMuSa	
D15	muddy sand	sparse megafaunal burrows and mounds, spatangid tests, small teleost (P) and kelp debris	SS.SSa.CMuSa	biotope uncertain	SS.SSa.CMuSa	

Table 2.2 continued

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D16	shelly sand with scattered boulders	algal turf dominated by filamentous and foliose reds (A, locally S) including *Delesseria sanguinea* (P), with *Dictyota dichotoma* (P), *Ulva* sp. (R) and *Saccharina latissima* (O). *Asterias rubens* (O), *Echinus esculentus* (O), small teleost shoal (P). Boulders support pink coralline algae (P), *Metridium senile* (R), *Caryophyllia smithii* (O) and *Clavelllina lepadiformis* (P)	SS.SMp.KSwSS.LsacR.Sa	biotope uncertain	SS.SMp.KSwSS.LsacR.Sa	
D17	mud	brown diatomaceous film (A), *Virgularia mirabilis* (F), *Philine aperta*? (O), Paguridae spp. (O), *Carcinus maenas* (O), *Liocarcinus* sp. (P), small teleost (P), algal debris	SS.SMu.IFiMu.PhiVir		SS.SMu.IFiMu.PhiVir	
D18	slightly gravelly sand	initially patchy algal turf of filamentous red algae (F) and *Ulva* sp. (F), with *Chorda filum* (F), *Desmarestia* sp. (P) and *Saccharina latissima* (C). *Echinus esculentus* (P). Then dense forest of *S. latissima* (A) (substrate not visible), with *Saccorhiza polyschides* (P). Fronds support *Gibbula cineraria* (F-C)	SS.SMp.KSwSS.LsacR.Sa	*Saccharina latissima* forest biotope possibly also present, though substrate not seen	SS.SMp.KSwSS.LsacR.Sa	
D19	shelly muddy sand	sparse algal clumps, probably largely drift material. *Cerianthus lloydii* (R), *Ophiura* sp. (R), *Callionymus lyra* (R)	SS.SSa.CMuSa		SS.SSa.CMuSa	

Table 2.2 continued

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D20	mud	fairly well-developed megafaunal burrowing community including *Nephrops norvegicus* (C), *Calocaris macandreae* (F) and possibly *Jaxea nocturna* (P), with *Sagartiogeton laceratus* (C), *Asterias rubens* (O), *Turritella communis* (F) and spatangid tests (P)	SS.SMu.CFiMu.SpnMeg		SS.SMu.CFiMu.SpnMeg	
D21	bedrock and boulders on shelly muddy sand	rock supporting dense *Caryophyllia smithii* (A), as well as *Swiftia pallida* (O, locally C), sparse hydroids including *Nemertesia ramosa* (P), *Clavellina lepadiformis* (P), *Diazona violacea*? (P) and *Alcyonium digitatum* (R). *Echinus esculentus* (O), *Asterias rubens* (O), small teleost (P).	CR.MCR.EcCr.CarSwi.LgAs	uncertain biotope. Possibly XFa.SwiLgAs but hydroid and sponge fauna apparently poor	CR.MCR.EcCr.CarSwi.LgAs	

Table 2.2 continued

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D22	bedrock and boulders	park of *Saccharina latissima* (F) with sparse *Laminaria hyperborea* (O) and turf of red algae, with filamentous (A locally) and foliose (P) species, as well as *Desmarestia aculeata*? (P). Rock encrusted with pink coralline algae (A, at least locally) and supporting *Metridium senile* (P) and *Caryophyllia smithii* (C locally). *Echinus esculentus* (C), Asteroidea sp. (P), *Cancer pagurus* (P)	IR.LIR.K.Lsac.Pk		IR.LIR.K.Lsac.Pk	
D23	mud	sediment with brown diatomaceous film (C) and well-developed megafaunal burrowing community including probably *Calocaris macandreae* (P) and possibly *Callianassa subterranea* (P) and *Maxmuelleria lankesteri* (P). *Virgularia mirabilis* (R)	SS.SMu.CFiMu.SpnMeg	uncertain biotope. Could be MegMax	SS.SMu.CFiMu.SpnMeg	
D24	gravelly sand	patchy cover of *Saccharina latissima* (C, locally A) with turf of filamentous and foliose red algae (C), *Desmarestia aculeata* (O), *Chorda filum* (C), *Dictyota dichotoma* (P), *Asperococcus bullosus* (P) and *Ulva* sp. (O).	SS.SMp.KSwSS.LsacR.Sa		SS.SMp.KSwSS.LsacR.Sa	

Table 2.2 continued

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D25	mud	sediment with brown diatomaceous film (A) and well-developed megafaunal burrowing community including *Nephrops norvegicus* and possibly *Callianassa subterranea* (P) and *Maxmuelleria lankesteri* (P). *Virgularia mirabilis* (O), *Pennatula phosphorea*? (R), *Cerianthus lloydii* (R), Paguridae sp. (R), *Ophiura ophiura* (R), spatangid tests (P)	SS.SMu.CFiMu.SpnMeg	uncertain biotope. Could be MegMax	SS.SMu.CFiMu.SpnMeg	
D26	mud	sediment with brown diatomaceous film (A) and fairly sparsely-developed megafaunal burrowing community including *Nephrops norvegicus* (F). *Virgularia mirabilis* (R), *Liocarcinus* spp. (O), *Cancer pagurus* (O), *Chaetopterus variopedatus*? (R)	SS.SMu.CFiMu.SpnMeg		SS.SMu.CFiMu.SpnMeg	
D27	mud	moderate density of megafaunal burrows including *those of Nephrops norvegicus* (1 animal visible) and smaller forms. *Sagartiogeton laceratus* (C), *Turritella communis* shells (P) spatangid tests (P)	SS.SMu.CFiMu.SpnMeg		SS.SMu.CFiMu.SpnMeg	

Table 2.2 continued

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D28	slightly silty sand	dense *Saccharina latissima* for much of run (A) with *Ulva* sp. C (locally S), *Chorda filum* (P) and filamentous red algae (F). *Asterias rubens* (P), *Carcinus maenas*? (P)	SS.SMp.KSwSS.LsacR.Sa	uncertain biotope as *S. latissima* dense for most of run	SS.SMp.KSwSS.LsacR.Sa	
D29	mud	moderate density of megafaunal burrows present including *those of Nephrops norvegicus* (C); *Virgularia mirabilis* (O), *Philine aperta* (O) including egg masses, brown diatomaceous film (C), *Asterias rubens* (R), spatangid tests (P)	SS.SMu.CFiMu.SpnMeg	uncertain biotope, intermediate between PhiVir and SpnMeg	SS.SMu.CFiMu.SpnMeg	Mud more topographically complex in 2004 with more well-developed mounds. *Philine* not seen but visibility comparatively poor
D30	scattered boulders on sand	boulders encrusted with pink coralline algae (C), *Parasmittina trispinosa* (R) and possibly *Spirobranchus* spp. (P) and supporting a patchy algal turf of foliose and filamentous reds (C), a patchy hydroid turf including *Nemertesia ramosa* (F) and *N. antennina*, *Caryophyllia smithii* (C, locally A), *Alcyonidium diaphanum* (F), *Clavelina lepadiformis* (P) and *Swiftia pallida* (R). *Echinus esculentus* (C)	CR.MCR.EcCr.CarSwi.LgAs	uncertain biotope, intermediate between CarSwi.LgAs and KFaR.FoR (adjacent biotope) and XFa.SwiLgAs locally	CR.MCR.EcCr.CarSwi.LgAs	

Table 2.2 continued

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D30	waves of coarse sand with gravel and pebbles, especially in troughs	*Echinus esculentus* (P), stones encrusted with pink coralline algae (P) and serpulid worms (P) and supporting sparse hydroids (R)	SS.SCS.CCS			
D30	silty gravelly sand with pebbles	*Cerianthus lloydii* (C), hydroids (R), *Alcyonidium diaphanum* (R)	SS.SMx.CMx	uncertain biotope		
D31	gravelly coarse sand with pebbles	patchy algal turf including *Dictyota dichotoma* (C, locally S), filamentous and foliose reds (C), *Ulva* sp. (R) and *Chorda filum* (O). Live *Phymatolithon calcareum* possibly present	SS.SMp.KSwSS.LsacR.Gv SS.SCS.ICS	uncertain biotopes	SS.SMp.KSwSS.LsacR.Gv SS.SCS.ICS	
D32	gravelly, shelly, coarse sand with pebbles	patchy algal turf including filamentous and foliose reds (C), *Dilsea carnosa* (R), *Ulva* sp. (P), with *Saccharina latissima* (F)	SS.SMp.KSwSS.LsacR.Gv	uncertain biotope. Close to LsacR.Sa	SS.SMp.KSwSS.LsacR.Gv	Initial biotope match
D32	rock	mostly dense kelp including *Saccharina latissima* (A) and *Saccorhiza polyschides* (P), with dense understorey of filamentous red algae (A), *Ulva* sp. (P) and brown algae including *Desmarestia* sp? (P, probably *D. viridis*). *Echinus esculentus* (P), *Gibbula cineraria* (P) on kelp fronds	IR.HIR.KSed	uncertain biotope		

Table 2.2 continued

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D33	mud	mud moderately densely worked by megafaunal burrowers with many small mounds; burrowers include *Nephrops norvegicus* (F), *Calocaris macandreae*? (P), *Callianassa subterranea*? (P) and *Jaxea nocturna*? (P). *Amphiura* spp. (A), *Lesueurigobius friesii*? (P), egg masses of *Philine aperta* (P), *Virgularia mirabilis* (O), *Liocarcinus* sp. (P), *Asterias rubens* (P), spatangid tests (P, probably *Echinocardium cordatum*), brown diatomaceous film (A)	SS.SMu.CFiMu.SpnMeg	elements of PhiVir	SS.SMu.CFiMu.SpnMeg	
D34	mud	mud moderately densely worked by megafaunal burrowers with small mounds and burrowers including *Nephrops norvegicus* (F-C), *Amphiura* spp. (C), egg masses and possibly adults of *Philine aperta* (P), *Virgularia mirabilis* (O), *Sagartiogeton laceratus* (O), *Asterias rubens* (P), Paguridae spp. (O), spatangid tests, brown diatomaceous film (C)	SS.SMu.CFiMu.SpnMeg	uncertain biotope, intermediate between PhiVir and SpnMeg	SS.SMu.CFiMu.SpnMeg	

Table 2.2 continued

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D35	coarse shelly sand with cobbles and boulders	stones encrusted with pink coralline algae (P) and serpulid worms (P) and supporting forest of *Laminaria hyperborea* (A), *Saccharina latissima* (F) and *Saccorhiza polyschides* (P), with *Desmarestia* spp. (O) and *Ulva* sp. (P). Kelp stipes heavily epiphytised with red foliose red algae; fronds with *Membranipora mambranacea* (P). *Chorda filum* (R), *Lanice conchilega* (P)	IR.HIR.KSed.XKScrR SS.SCS.ICS	uncertain biotopes	SS.SMp.KSwSS.LsacR	boulders supporting kelp forest in 2015 absent in 2004, presumably due to difference in location
D36	shell gravel on sand	patchy algal turf with around 35% cover including filamentous reds (C), foliose red (F, probably *Nitophyllum punctatum*), *Dictyota dichotoma* (P), *Chorda filum* (P) and *Saccharina latissima* (O)	SS.SMp.KSwSS.LsacR.Gv		SS.SMp.KSwSS.LsacR.Gv	

Table 2.2 continued

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D37	poorly sorted mix of gravel, pebbles, cobbles and sand	stones encrusted with pink coralline algae (P) and serpulid worms (P) and supporting a patchy 30% cover of algae dominated by red filamentous forms (C), foliose reds (F) and *Dictyota dichotoma* (P), as well as hydroids including *Nemertesia ramosa* (F). Sparse live *Phymatolithon calcareum* (R), *Asterias rubens* (P). Fleeting and unclear view of boulders with dense algal turf, *Echinus esculentus* (P) and *Alcyonium digitatum* (P) as camera descends at start of run	SS.SMx.IMx	uncertain biotope. Also close to KSwSS	IR.HIR.KSed SS.SMx.IMx	KSed recorded briefly at start of run in 2004

Table 2.2 continued

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D38	shell gravel with varying mixtures of pebbles and cobbles (locally dense) and scattered boulders	generally sparse and patchy maerl bed with *Phymatolithon calcareum* (O, but locally C). Stones encrusted with pink coralline algae (P), brown algae (R), serpulids (P) and *Balanus* spp. (P) and supporting *Dictyota dichotoma* (O), *Saccharina latissima* (F), *Laminaria hyperborea* (O), filamentous and foliose red algae (F), *Clavelina lepadiformis* (O) and hydroids (R). *Asterias rubens* (O), *Henricia* sp. (P), *Echinus esculentus* (F), *Carcinus maenas* (O), small teleost (P), *Gibbula cineraria* (P), *Calliostoma zizyphinum* (P)	SS.SMp.Mrl.Pcal.R	poorly developed example of the biotope	SS.SMp.KSwSS.LsacR.CbPb	substrate different in 2004 - dense pebbles and cobbles throughout. Biotope change possibly due to locational difference and/or translocation of maerl
D39	shell gravel with sand, stone gravel, scattered pebbles and occasional cobbles	sparse clumps of filamentous and foliose red algae (O-F) and *Laminaria hyperborea* (P). Some stones encrusted with pink coralline algae (P). *Lanice conchilega* (R), *Chaetopterus variopedatus*? (O), *Carcinus maenas* (O), *Gibbula cineraria* (P)	SS.SCS.ICS		SS.SCS.ICS	

Table 2.2 continued

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D40	silty, shelly sand with scattered boulders and cobbles?	forest of *Saccharina latissima* (A) with understorey of filamentous and foliose red algae (P) including *Delesseria sanguinea*, *Ulva* spp. (P) and *Dictyota dichotoma* (P); *Chorda filum* (P). *Asterias rubens* (P), *Necora puber* (P), *Gibbula cineraria* (P), *Ctenolabrus rupestris* (P)	IR.LIR.K.Lsac.Ft		IR.LIR.K.Lsac.Ft	
D40	silty, shelly sand with scattered shells	dense turf of filamentous red algae (S), largely composed of balls of the tetrasporophyte phase of *Bonnemaisonia hamifera* and/or *Asparagopsis armata*. Also present are *Saccharina latissima* (O), foliose red algae (P), *Ulva* spp. (P), *Dictyota dichotoma* (P), *Chorda filum* (C), *Desmarestia* sp.? (P) and *Asperococcus bullosus* (P). *Carcinus maenas* (P), Gobiidae sp. (P)	SS.SMp.KSwSS	close to Tra but more diverse and filamentous red algae possibly largely attached		

Table 2.2 continued

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D41	boulder patches? on coarse sand and maerl gravel	patches of dense *Laminaria hyperborea* (A) with *Saccorhiza polyschides* (P) and *Chorda filum* (C). Kelp fronds support *Membranipora membranacea* and stipes with red algae. Boulder-free areas with live *Phymatolithon calcareum* (C) and dense patchy algal turf including *Dictyota dichotoma* (A), filamentous and foliose red algae (F) including *Dilsea carnosa* (R), *Ulva* sp. (P), *Desmarestia* spp. (P), *Chorda filum* (C) and *Saccharina latissima* (F)	IR.HIR.KSed SS.SMp.Mrl.Pcal.R		IR.HIR.KSed SS.SMp.Mrl.Pcal.R	
D42	silty shell gravel and sand with pebbles and occasional cobbles and boulders	pebbles with serpulid worms (P)	SS.SMx.CMx	uncertain biotope	SS.SMx.CMx	

Table 2.2 continued

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D43	cobbles and boulders	dense *Laminaria hyperbore*a forest (A-S) with fronds supporting filamentous red algae (P) and *Gibbula cineraria* (C) and stipes with foliose reds (P). Stones encrusted with pink coralline algae (P) and supporting algal turf dominated by filamentous and foliose reds (C), with *Desmarestia* sp. (P). *Ulva* sp. (P), *Echinus esculentus* (P), *Henricia* sp. (P)	IR.MIR.KR.Lhyp.Ft		IR.MIR.KR.Lhyp.GzFt	2004 biotope could be same but limited view of rock surface. Temporal reduction in grazing pressure could result in change
D44	rock	dense *Laminaria hyperbore*a forest (A-S) with fronds supporting *Membranipora membranacea* (P) and *Gibbula cineraria* (C) and stipes with foliose reds, including *Phycodrys rubens* (P). Rock with patchy red foliose algal turf (P). *Echinus esculentus* (P), *Asterias rubens* (P), teleost (P)	IR.MIR.KR.Lhyp.Ft	uncertain biotope. Limited visibility of rock surface	IR.MIR.KR.Lhyp.Ft	

Table 2.2 continued

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D50	silted boulders	rock encrusted with pink coralline algae (A) and supporting *Caryophyllia smithii* (C), *Metridium senile* (R), *Alcyonium digitatum* (R), *Sycon ciliatum* (P), *Clavelina lepadiformis* (F, locally A), *Ascidia mentula* (F, locally A), hydroids (O), *Porella compressa*? (R) and filamentous red algae (R). Motile forms include *Echinus esculentus* (C), *Carcinus maenas* (P), *Hyas araneus* (P), *Calliostoma zizyphinum* (P) and *Ctenolabrus rupestris* (P)	CR.LCR.BrAs.AmenCio		CR.LCR	poor video quality in 2004 and slight difference in location judging by boulder size and density, but probably same biotope
D51	pebbles, cobbles and boulders	stones encrusted with pink coralline algae, including *Lithothamnion glaciale*, *Balanus* spp. (P) and *Halichondria panicea (P on some larger stones)*, and supporting patchy forest of *Laminaria hyperborea* (A) and understorey of foliose red algae including *Cryptopleura ramosa* (P), *Corallina officinalis* (P) and *Dilsea carnosa* (P), and *Dictyota dichotoma*, which is S over extensive areas. *Necora puber*? (P)	IR.MIR.KT.XKTX	uncertain biotope. Could be LhypTX	IR.MIR.KT.XKTX	

Table 2.2 continued

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D52	slightly silty and shelly sand	patchy algal turf of filamentous and foliose reds (C, locally A), *Ulva* sp. (O), *Saccharina latissima* (P, but possibly drift) and drift kelp. *Philine aperta* egg mass (P)	SS.SMp.KSwSS.LsacR.Sa	uncertain biotope	SS.SMp.KSwSS.LsacR.Sa	
D53	slightly silty and shelly sand	algal turf of filamentous and foliose reds (A), *Ulva* sp. (R), *Saccharina latissima* (F). Syngnathidae *sp.* (P)	SS.SMp.KSwSS.LsacR.Sa		SS.SMp.KSwSS.LsacR.Sa	
D54	sandy mud or muddy sand	algal turf of filamentous and foliose reds (C), *Ulva* sp. (R), *Chorda filum* (F), *Asperococcus bullosus* (R), *Saccharina latissima* (F). *Virgularia mirabilis* (O), *Carcinus maenas* (O), *Liocarcinus* sp. (P), small megafaunal burrows (R)	SS.SMp.KSwSS.LsacCho	uncertain biotope	SS.SMp.KSwSS.LsacCho	
D55	pebbles, cobbles and gravel with scattered boulders	stones encrusted with pink coralline algae, including *Lithothamnion glaciale*, Balanus spp. (P) and supporting patchy forest of *Laminaria hyperborea* (A) and *Saccharina latissima* (P) and understorey of filamentous and foliose red algae (C) including *Cryptopleura ramosa* (P) and *Dilsea carnosa* (P), and *Ulva* sp. (O); *Chorda filum* (C), *Halidrys siliquosa* (P). *Necora puber*? (P), *Asterias rubens* (O)	IR.MIR.KT.XKTX	uncertain biotope	IR.MIR.KT.XKTX	
D56	mud	*Arenicola marina* casts (C)	LS.LMu		LS.LMu	

Table 2.2 continued

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D57	mud	*Arenicola marina* casts (F)	LS.LMu		LS.LMu	
D58	medium sand	patchy algal turf containing filamentous red algae (C), *Ulva* spp. (F), *Saccharina latissima* (C), *Chorda filum* (C) and *Asperococcus bullosus* (P), although much of the material could be drift. *Arenicola marina* (R), *Carcinus maenas* (O), *Pomatoschistus* sp. (P)	SS.SMp.KSwSS.LsacR.Sa	additional biotope could possibly be recognised where algae is sparse, such as IFiSa or IMuSa	SS.SMp.KSwSS.LsacR.Sa	
D59	coarse sand, gravel, pebbles, cobbles and scattered boulders	forest of *Laminaria hyperborea* (A) with fronds supporting *Obelia geniculata* (P) and some stipes dense filamentous red algae, as well as Porifera sp. (P). Understorey of dense filamentous and foliose red algae (C, but locally S) including *Delesseria sanguinea* (P) and *Dilsea carnosa* (P), and *Ulva* spp. (O); *Chorda filum* (C), *Balanus* spp. on stones. *Asterias rubens* (P), solitary ascidians (P)	IR.MIR.KT.XKTX	uncertain biotope	IR.MIR.KT.XKTX	

Table 2.2 continued

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D60	mud	brown diatomaceous film (A), *Arenicola marina* (O) with areas of patchy algal turf including filamentous reds (C), *Ulva* sp. (F), *Asperococcus bullosus* (R), *Chorda filum* (O) and *Saccharina latissima* (C), although some of the material is likely to be drift. *Sagartiogeton laceratus* (R), *Asterias rubens* (P)	SS.SMu.IFiMu SS.SMp.KSwSS.LsacCho	LsacCho uncertain	SS.SMu.IFiMu	
D61	mud with black anaerobic marbling	bare mud with crab tracks	SS.SMu.IFiMu	uncertain biotope as recorded depth suggests intertidal, but habitat is below *Saccharina* zone	SS.SMp.KSwSS	sediment covered with loose algal mat in 2004
D61	boulders on mud?	dense silted, *Saccharina latissima* forest with dense understorey of filamentous red algae (A) and *Ulva* spp. (P); *Halidrys siliquosa* (F), *Chorda filum* (C), *Asperococcus bullosus* (P), Ectocarpaceae sp. (P).	IR.LIR.K.Lsac.Ft	uncertain biotope as substrate not visible		
D61	boulders	*Fucus serratus* (S), *Ascophyllum nodosum* (P), filamentous red algae (C), *Ulva* spp. (F)	LR.MLR.BF.Fser.Bo	uncertain biotope as only brief view of substrate		
D62	muddy sand	dense *Saccharina latissima* (A), with *Chorda filum* (C) and apparently sparse *Ulva* spp. (P) and filamentous red algae (P)	SS.SMp.KSwSS.LsacCho		SS.SMp.KSwSS.LsacCho	

Table 2.2 continued

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D62	muddy sand	*Arenicola marina* (A), tufts of filamentous green algae (O), possibly a brown diatomaceous film (P), *Chorda filum* (O), *Carcinus maenas* (P)	SS.SMu.IFiMu	uncertain biotope		
D62	rock	Dense *Ulva* sp. (S, *Enteromorpha* type) with filamentous red algae (P), *Ascophyllum nodosum* (R), *Asperococcus bullosus* (R) *Chorda filum* (O) and Ectocarpaceae sp. (P)	IR.LIR			
D63	muddy sand	dense, silted *Saccharina latissima (A)* with *Chorda filum* (F, locally A) and patches of filamentous red algae (P), Ectocarpaceae sp. (P) and *Ulva* spp. (F, locally A). *Arenicola marina* (P)	SS.SMp.KSwSS.LsacCho		SS.SMp.KSwSS.LsacCho	
D64	mixed substrate of sand, gravel and pebbles (at least in one small visible patch)	dense *Saccharina latissima (A)* with *Laminaria hyperborea* (P) and *Chorda filum* (F); *Ulva* spp. (F), filamentous and foliose red algae (P). Kelp fronds support *Gibbula* sp. (P) and *Electra pilosa* (P). *Carcinus maenas* (P)	SS.SMp.KSwSS	higher biotope as substrate barely visible	SS.SMp.KSwSS	
D64	pebbles present	*Himanthalia elongata* (C, locally S), *Saccharina latissima* (P), *Laminaria* spp. (P), *Fucus vesiculosus* (P), *F. serratus* (P), *Ulva* spp. (P), filamentous red algae (P)	LR.HLR.FR.Him			

Table 2.2 continued

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D65	mud	*Arenicola marina* (C), *Carcinus maenas* (O), patchy turf of fine, filamentous green algae (F, locally A), *Ulva* sp. (R)	LS.LMu		LS.LMu	
D66	muddy sand	scattered *Saccharina latissima* (F) and *Chorda filum* (F) and patches of algal turf/mat with *Ulva* spp. (C locally), decaying filamentous red algae and filamentous brown/other species of decaying red algae. *Carcinus maenas* (P), *Arenicola marina* (C for much of run), *Pomatoschistus* sp. (P). Small patches of *Beggiatoa* (R)	SS.SMp.KSwSS.LsacCho	uncertain biotope	SS.SMp.KSwSS.LsacCho	
D67	muddy sand or sandy mud	*Virgularia mirabilis* (C), sparse megafaunal mounds (P), *Carcinus maenas* (P), *Asterias rubens* (P). Much algal detritus	SS.SMu.CFiMu.SpnMeg	uncertain biotope. Poor example of type	SS.SMu.CFiMu.SpnMeg	
D68	silty shelly sand	Fairly sparse and patchy algal turf including filamentous reds (F), *Ulva* sp. (O), *Desmarestia aculeata*? (P) and *Saccharina latissima* (F) and *Chorda filum* (F). *Liocarcinus* sp.? (P), *Callionymus lyra* (P)	SS.SMp.KSwSS.LsacR.Sa SS.SSa.IMuSa	uncertain biotopes. Very sparse algal areas ascribed to IMuSa	SS.SMp.KSwSS.LsacR.Sa	

Table 2.2 continued

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D69	mud	mud with brown diatomaceous film (C) and megafaunal mounds and burrows including *Nephrops norvegicus* (F); *Virgularia mirabilis* (F), *Amphiura* spp. (A, at least locally). *Philine aperta* egg masses (O) and sparse adults may be present (R). *Macropodia* sp. (R), drift *Saccharina latissima* (R)	SS.SMu.CFiMu.SpnMeg	uncertain biotope, intermediate between PhiVir and SpnMeg	SS.SMu.IFiMu	in 2004 seabed flatter with denser diatom film and no megafuanal burrows or *Virgularia* discernible
D70	muddy sand	dense *Saccharina latissima (A)* with *Chorda filum* (F) Ectocarpaceae sp. (P) and *Ulva* spp. (P). *Arenicola marina* hummocks (C, at least locally). *Gibbula cineraria* (P) on kelp fronds. Brachiura sp. (P), *Spinachia spinachia* (P) and shoal of small teleosts.	SS.SMp.KSwSS.LsacCho	uncertain biotope	SS.SMp.KSwSS.LsacCho	
D71	silty, shelly sand	around 50% cover by algal turf dominated by filamentous reds (A), with foliose reds (O, including *Notophyllum punctatum*?), *Desmarestia* spp. (P) and *Saccharina latissima* (F). Small teleosts (P)	SS.SMp.KSwSS.LsacR.Sa	uncertain biotope	SS.SMu.IFiMu	2004 run mostly deeper so locational difference
D72	boulders? on sand	dense forest of *Laminaria hyperborea* (A) with stipes supporting foliose red algae. Rock with *Asterias rubens* (P) and little sign of algal turf, though rarely visible	IR.MIR.KR.Lhyp.GzFt	highly uncertain biotope	IR.MIR.KR.Lhyp.GzFt	

Table 2.2 continued

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D73	mud	moderate density of megafaunal burrows including *Nephrops norvegicus* (P) and *Calocaris macandreae*? (P). *Lesueurigobius friesii*? (P), *Sagartiogeton laceratus* (C), *Turritella communis* (P), spatangid tests (P)	SS.SMu.CFiMu.SpnMeg		SS.SMu.CFiMu.SpnMeg	
D74	muddy shelly sand	*Hydroid tufts (R), Alcyonidium diaphanum* (F), *Chaetopterus variopedatus* (P), *Marthasterias glacialis* (P)	SS.SSa.CMuSa		SS.SSa.CMuSa	
D75	boulders	*Laminaria hyperborea* forest (A) with boulders supporting a patchy algal turf (C-A) and *Echinus esculentus* (C)	IR.MIR.KR.Lhyp.Ft		IR.MIR.KR.Lhyp.Ft	
D75	boulders	*Laminaria hyperborea* (F), *Saccharina latissima?* (P), algal turf (A), *Echinus esculentus* (C)	IR.LIR.K.LhypLsac.Pk	highly uncertain biotope - visibility poor		
D76	shelly muddy sand with sparsely scattered cobbles and pebbles	stones support serpulid worms (P) and *Clavelina lepadiformis* (R). Much algal debris. Some *Saccharina latissima* may be functional. *Asterias rubens* (P), occasional mounds	SS.SSa.CMuSa		SS.SSa.CMuSa	

Table 2.2 continued

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D76	silty shelly sand with scattered gravel, pebbles and cobbles	*Saccharina latissima* (F), patchy algal turf including filamentous and foliose reds (F) and *Dictyota dichotoma* (P). *Asterias rubens* (P), *Echinus esculentus* (O). Stones support pink coralline algae (P), serpulid worms (P), *Alcyonidium diaphanum* (P) and *Clavelina lepadiformis* (R)	SS.SMp.KSwSS.LsacR.Sa	uncertain biotope		
D76	cobbles and boulders on shelly, gravelly sand	Park of *Saccharina latissima* (F) and *Laminaria hyperborea* (P) with stones also supporting filamentous and foliose red algae (P) and *Dictyota dichotoma* (P, locally A), pink coralline algae (P) and *Caryophyllia smithii* (R). *Asterias rubens* (P), *Echinus esculentus* (P)	IR.LIR.K.LhypLsac.Pk	uncertain biotope		
D77	mud	mud with brown diatomaceous film (F) and lightly burrowed by megafauna including *Nephrops norvegicus* (P). *Sagartiogeton laceratus* (C), *Turritella* shells (P), *Asterias rubens* (P), *Amphiura* spp. (locally A), numerous spatangid tests	SS.SMu.CFiMu.SpnMeg	uncertain biotope	SS.SMu.CFiMu.SpnMeg	

Table 2.2 continued

Site	Substrate	Biota	Biotope (2015)	Biotope comments	Initial biotope (2004)	Temporal match notes
D78	mud	plain of flat mud with occasional megafaunal mounds and brown diatomaceous film (S) interrupted by areas of dense algae (possibly much of it drift) composed of *Saccharina latissima* (F, locally A), *Chorda filum* (F), *Asperococcus bullosus* (R), *Ulva* sp. (F, locally A), filamentous red algae (P). *Asterias rubens* (P)	SS.SMp.KSwSS.LsacCho SS.SMu.IFiMu	LsacCho uncertain	SS.SMp.KSwSS.LsacCho	

Table 2.3. Details of differences recorded at sites between the 2004 and 2015 SCM video surveys.

Site	2015 survey				2004 survey				Biotope change	Comments
	Depth (m)	**Substrate**	**Biota**	**Biotope**	**Depth (m)**	**Substrate**	**Biota**	**Biotope**		
D08	1.9-2.0	Mud	Brown diatomaceous film (A)	SS.SMu.IFiMu	1.8-1.4	Mud	*Chorda filum* (C), *Saccharina latissima* drift (F), loose filamentous algae 95% cover	SS.SMp.KSwSS	Yes	Dense accumulation of drift weed in 2004. Dense *Chorda* also in 2004, although possibly resulting from same processes as causing the drift weed
D09	6.6-10.7	Mud with small rock outcrop	*Virgularia mirabilis* (F), thalassinidean shrimp burrows (F), brown diatomaceous film (A). Rock supporting foliose red algae (P), *Saccharina latissima* (P), *Polymastia penicillus* (P) and *Caryophyllia smithii* (P)	SS.SMu.IFiMu.PhiVir	5.8-6.8	Mud with scattered cobbles and boulders?	*Saccharina latissima* (F), *Chorda filum* (O)	SS.SMp.KSwSS.LsacR	Yes	Difference possibly due to slightly shallower run in 2004
D11	3.5-8.7	Muddy sand with gravel, pebbles and scattered boulders	Patchy *Saccharina latissima* (locally C) and sparse patchy algal turf of filamentous (O) and foliose (R) reds and *Chorda filum* (P). *Carcinus maenas* (P), *Caryophyllia smithii* (R)	SS.SMp.KSwSS.LsacR.Sa	3.0-7.1	Coarse sand/gravel with scattered cobbles and occasional boulder patches	Algal turf (C-A), *Saccharina latissima* (O-F), *Echinus esculentus* (O)	SS.SMp.KSwSS.LsacR.Gv	Yes	More gravel and stones in 2004

Table 2.3 continued

Site	2015 survey				2004 survey				Biotope change	Comments
	Depth (m)	Substrate	Biota	Biotope	Depth (m)	Substrate	Biota	Biotope		
D35	5.0--6.1	Coarse shelly sand with cobbles and boulders	Stones encrusted with pink coralline algae (P) and serpulid worms (P) and supporting forest of *Laminaria hyperborea* (A), *Saccharina latissima* (F) and *Saccorhiza polyschides* (P), with *Desmarestia* spp. (O) and *Ulva* sp. (P). Kelp stipes heavily epiphytised with red foliose red algae; fronds with *Membranipora mambranacea* (P). *Chorda filum* (R), *Lanice conchilega* (P)	IR.HIR.KSed.XKScrR, SS.SCS.ICS	7.4-4.8	Medium sand	*Ulva* spp. (O), *Saccharina latissima* (F), *Dictyota dichotoma* (P), algal turf (C)	SS.SMp.KSwSS.LsacR	Yes	Boulders supporting kelp forest in 2015 absent in 2004, presumably due to difference in location
D38	11.7	Shell gravel with varying mixtures of pebbles and cobbles (locally dense) and scattered boulders	Generally sparse and patchy maerl bed with *Phymatolithon calcareum* (O, but locally C). Stones encrusted with pink coralline algae (P), brown algae (R), serpulids (P) and *Balanus* spp. (P) and supporting *Dictyota dichotoma* (O), *Saccharina latissima* (F), *Laminaria hyperborea* (O), filamentous and foliose red algae (F), *Clavelina lepadiformis* (O) and hydroids (R). *Asterias rubens* (O), *Henricia* sp. (P), *Echinus esculentus* (F), *Carcinus maenas* (O), small teleost (P), *Gibbula cineraria* (P), *Calliostoma zizyphinum* (P)	SS.SMp.Mrl.Pcal.R	10.9-4.4	Cobbles and pebbles	*Echinus esculentus* (F), *Dictyota dichotoma* (F), coralline crusts (C), *Asterias rubens* (F), *Sabella pavonina* (O), algal turf (C), bryozoan turf? (P)	SS.SMp.KSwSS.LsacR.CbPb	Yes	Substrate different in 2004 - dense pebbles and cobbles throughout. Biotope change possibly due to locational difference and/or translocation of maerl
D61	-1.9--1.9	Mud with black anaerobic marbling	Bare mud with crab tracks	SS.SMu.IFiMu	-1.0--0.2	Mud	*Chorda filum* (locally A), *Saccharina latissima* (locally C), *Halidrys siliquosa* (O), patchy algal mat	SS.SMp.KSwSS	Yes	Sediment covered with loose algal mat in 2004

Table 2.3 continued

Site	2015 survey				2004 survey				Biotope change	Comments
	Depth (m)	**Substrate**	**Biota**	**Biotope**	**Depth (m)**	**Substrate**	**Biota**	**Biotope**		
D69	14.3-14.0	Mud	Mud with brown diatomaceous film (C) and megafaunal mounds and burrows including *Nephrops norvegicus* (F); *Virgularia mirabilis* (F), *Amphiura* spp. (A, at least locally). *Philine aperta* egg masses (O) and sparse adults may be present (R). *Macropodia* sp. (R), drift *Saccharina latissima* (R)	SS.SMu.CFiMu.SpnMeg	14.0-15.9	Muddy sand or mud	Dense brown microalgal film	SS.SMu.IFiMu	Yes	In 2004 seabed flatter with denser diatom film and no megafuanal burrows or *Virgularia* discernible
D71	11.5-8.7	Silty, shelly sand	Around 50% cover by algal turf dominated by filamentous reds (A), with foliose reds (O, including *Notophyllum punctatum*?), *Desmarestia* spp. (P) and *Saccharina latissima* (F). Small teleosts (P)	SS.SMp.KSwSS.LsacR.Sa	11.2-13.6	Muddy sand	Brown microalgal film, megafaunal burrows (O), megafaunal mounds (O)	SS.SMu.IFiMu	Yes	2004 run mostly deeper so locational difference
D06	5.2-5.9	Coarse sand, gravel and pebbles with scattered cobbles and boulders	Patchy kelp including *Laminaria hyperborea* (locally A) and *Saccharina latissima* (P), and turf of *Dictyota dichotoma* (A) and foliose and filamentous red algae (C); *Chorda filum* (O). Stones encrusted with pink coralline algae, including *Lithothamnion glaciale* (P) and *Balanus* spp. (F). *Phymatolithon calcareum* apparently F locally and possibly C over large areas, although visibility poor. *Echinus esculentus* (F)	IR.MIR.KT.XKTX & SS.SMp.Mrl.Pcal.R	4.5-3.8	Boulders and cobbles on sand	*Laminaria hyperborea* (A)	IR.MIR.KT.XKTX	Un-certain	Pcal.R could be present in 2004 but no close-up imagery to check for maerl presence.

Table 2.3 continued

Site	2015 survey				2004 survey				Biotope change	Comments
	Depth (m)	**Substrate**	**Biota**	**Biotope**	**Depth (m)**	**Substrate**	**Biota**	**Biotope**		
D43	2.5-2.5	Cobbles and boulders	Dense *Laminaria hyperbore*a forest (A-S) with fronds supporting filamentous red algae (P) and *Gibbula cineraria* (C) and stipes with foliose reds (P). Stones encrusted with pink coralline algae (P) and supporting algal turf dominated by filamentous and foliose reds (C), with *Desmarestia* sp. (P). *Ulva* sp. (P), *Echinus esculentus* (P), *Henricia* sp. (P)	IR.MIR.KR.Lhyp.Ft	2.2-1.2	Boulders	*Laminaria hyperborea* (S), coralline crusts (C), rich foliose red algae on stipes, *Clavelina lepadiformis* (P), *Echinus esculentus* (O), *Asterias rubens* (O)	IR.MIR.KR.Lhyp.GzFt	Un-certain	2004 biotope could be same but limited view of rock surface. Temporal reduction in grazing pressure could result in change

ANNEX 3: INFAUNAL SCM SURVEY DATA

Table 3.1. Details of infaunal sampling sites for the 2015 SCM survey. Also shown for comparison are the depths of the sites in 2004 and the recorded temporal depth change between surveys.

Site	Date	Time (UT)	Field notes	Gear	Latitude	Longitude	Depth 2015 (m)	Depth 2004 (m)	Temporal depth change (m)
S8	13/07/2015	13:35:18		Cores	57.62745	-7.15352	8.6	7.4	1.2
S9	13/07/2015	13:12:28	Soft sulphurous mud	Van Veen	57.63020	-7.11918	1.7	1.2	0.5
S10	12/07/2015	11:54:12		Cores	57.62829	-7.18440	4.4	6.6	-2.2
S11	12/07/2015	13:28:56		Cores	57.62243	-7.19318	1.7	1.5	0.2
S12	13/07/2015	15:17:08	Mud	Cores	57.61867	-7.17986	0.8	0.8	0
S13	13/07/2015	17:18:41	Clean coarse poorly sorted sand	Cores	57.61654	-7.15577	5.9	5.7	0.2
S15	13/07/2015	11:27:42	Medium sand	Van Veen	57.62480	-7.13972	8.1	7.9	0.2
S16	14/07/2015	10:18:30	Mud	Van Veen	57.60553	-7.15037	7.5	7.5	0
S17	14/07/2015	09:53:49	Mud	Van Veen	57.59282	-7.13132	11.5	11.6	-0.1
S18	13/07/2015	16:40:39	Muddy sand	Van Veen	57.59658	-7.09610	46.3	46.8	-0.5
S20	13/07/2015	11:03:25	Medium - coarse sand	Van Veen	57.61755	-7.12217	7.5	6.8	0.7
S22	13/07/2015	11:16:27	Coarse sand	Van Veen	57.62283	-7.13043	10.3	9.5	0.8
S23	13/07/2015	16:55:10	Mud	Van Veen	57.60333	-7.11515	22.1	23	-0.9
S24	13/07/2015	11:55:18	Mud	Van Veen	57.62738	-7.13033	6.9	5.5	1.4
S25	14/07/2015	12:30:19	Muddy sand	Van Veen	57.60918	-7.13382	11.5	11.5	0
S26	14/07/2015	12:20:37	Muddy sand	Van Veen	57.61108	-7.14363	10.5	10.5	0
S27	14/07/2015	12:48:30	Muddy sand	Van Veen	57.61597	-7.13347	14.1	14.4	-0.3
S28	14/07/2015	10:06:00	Mud	Van Veen	57.59983	-7.13533	14.8	15.1	-0.3
S29	14/07/2015	16:44:25	Mud	Van Veen	57.59550	-7.15853	3.4	3.2	0.2
S30	11/07/2015	11:24:01	Mud	Cores	57.63807	-7.20012	-0.6	0.3	-0.9

Table 3.2. Percentage of total sediment sample collected by sieves at 0.5 phi interval mesh sizes at 2015 infaunal survey sample sites.

Sieve (phi)	Site									
	S8	**S9**	**S10**	**S11**	**S12**	**S13**	**S15**	**S16**	**S17**	**S18**
-3.5	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.19
-3.0	0.64	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.61
-2.5	1.25	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.00	1.00
-2.0	1.58	0.00	0.00	0.00	0.00	0.19	0.27	0.00	0.00	1.22
-1.5	3.48	0.00	0.47	0.00	0.00	0.89	1.07	0.00	0.00	3.69
-1.0	4.61	0.00	1.01	0.20	0.00	3.40	8.05	0.00	0.03	5.02
-0.5	15.00	0.13	2.02	0.13	0.00	2.36	5.23	0.09	0.17	7.52
0.0	20.76	0.18	3.07	0.52	0.08	8.68	13.64	0.07	0.22	6.68
0.5	14.94	0.00	5.06	0.72	0.21	19.47	15.57	0.27	0.25	6.49
1.0	6.52	0.39	6.49	0.93	0.23	32.93	15.78	0.36	0.25	4.50
1.5	3.78	0.68	8.09	1.52	0.25	18.85	10.84	0.37	0.11	4.18
2.0	3.11	0.94	9.43	1.09	0.30	7.24	11.56	0.61	0.37	3.89
2.5	2.86	1.36	10.17	2.01	0.39	1.22	6.34	0.59	0.36	3.83
3.0	3.28	1.51	11.86	2.22	0.59	0.54	4.58	0.91	0.58	3.76
3.5	2.54	1.43	6.84	2.41	0.61	0.14	1.51	1.09	0.59	3.34
4.0	1.46	1.98	6.85	2.33	0.79	0.03	0.57	1.68	2.53	2.97
>4.0	14.19	91.40	28.64	85.94	96.53	3.90	4.89	93.97	94.54	41.12

Sieve (phi)	Site									
	S20	**S22**	**S23**	**S24**	**S25**	**S26**	**S27**	**S28**	**S29**	**S30**
-3.5	0.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-3.0	4.39	0.00	0.00	0.00	0.00	0.70	0.90	0.00	0.00	0.00
-2.5	2.97	0.39	0.00	0.00	1.27	1.35	1.98	0.00	0.00	0.00
-2.0	2.75	0.59	0.46	0.47	1.74	2.19	2.01	0.00	0.00	0.00
-1.5	7.18	3.95	0.32	0.30	4.41	2.71	3.60	0.06	0.00	0.00
-1.0	14.92	7.69	0.49	0.17	7.32	2.52	9.30	0.40	0.03	0.00
-0.5	7.37	15.06	0.38	0.43	2.47	3.04	4.20	0.61	0.03	0.00
0.0	16.03	16.42	0.75	1.10	4.01	2.46	9.55	0.50	0.04	0.06
0.5	14.98	16.13	1.35	1.46	4.22	2.40	10.22	0.55	0.06	0.09
1.0	12.30	10.59	1.42	1.61	4.11	3.02	8.10	0.62	0.14	0.19
1.5	6.52	8.08	1.57	2.00	5.21	3.24	7.94	0.59	0.80	0.44
2.0	3.84	5.34	2.74	2.26	5.20	4.99	6.82	0.79	1.98	0.61
2.5	0.60	3.79	2.40	2.48	5.61	5.68	6.28	0.70	2.51	0.80
3.0	0.20	2.24	3.84	3.31	5.89	13.13	7.43	1.08	4.61	1.05
3.5	0.14	0.62	5.69	3.49	3.15	9.71	4.10	1.38	3.59	0.98
4.0	0.08	0.31	6.09	3.72	2.43	4.47	2.35	2.58	3.85	0.97
>4.0	5.15	8.79	72.51	77.18	42.95	38.40	15.22	90.14	82.36	94.81

Table 3.3. Particle size characteristics of sediments at the 2015 infaunal survey sample sites. $MD_{ø}$ = median grain diameter in phi units, Md_{μ} = median grain diameter in microns, $QD_{ø}$ = phi quartile deviation, ND = not determined.

Site	$MD_{ø}$	MD_{μ}	$QD_{ø}$	% silt/clay	% sand	% gravel	% fine sand	% medium sand	% coarse sand
S8	0.10	933	1.20	14.19	82.34	3.47	10.14	6.89	65.32
S9	>4	<63	ND	91.40	8.60	0.00	6.28	1.62	0.70
S10	2.70	154	ND	28.64	71.36	0.00	35.71	17.51	18.13
S11	>4	<63	ND	85.94	14.06	0.00	8.96	2.61	2.49
S12	>4	<63	ND	96.53	3.47	0.00	2.38	0.55	0.53
S13	0.70	616	0.40	3.90	95.73	0.37	1.92	26.09	67.72
S15	0.70	616	0.90	4.89	94.76	0.35	13.01	22.40	59.35
S16	>4	<63	ND	93.97	6.03	0.00	4.26	0.98	0.78
S17	>4	<63	ND	94.54	5.46	0.00	4.06	0.48	0.92
S18	2.60	165	ND	41.12	55.87	3.01	13.90	8.07	33.89
S20	-0.20	1149	0.95	5.15	84.14	10.71	1.00	10.36	72.78
S22	0.20	871	0.90	8.79	90.22	0.99	6.96	13.42	69.84
S23	>4	<63	ND	72.51	27.03	0.46	18.01	4.31	4.71
S24	>4	<63	ND	77.18	22.34	0.47	13.00	4.26	5.08
S25	2.90	134	ND	42.95	54.03	3.02	17.09	10.41	26.54
S26	3.10	117	ND	38.40	57.37	4.24	32.99	8.23	16.15
S27	1.00	500	1.55	15.22	79.89	4.89	20.15	14.76	44.97
S28	>4	<63	ND	90.14	9.86	0.00	5.74	1.38	2.75
S29	>4	<63	ND	82.36	17.64	0.00	14.56	2.78	0.30
S30	>4	<63	ND	94.81	5.19	0.00	3.80	1.05	0.34

Table 3.4. Abundance of infauna (no./0.1m^2) in samples from SCM infaunal survey. Nomenclature follows WoRMS (2015).

Taxon	Site																			
	S8	S9	S10	S11	S12	S13	S15	S16	S17	S18	S20	S22	S23	S24	S25	S26	S27	S28	S29	S30
Virgularia mirabilis								1.0												
Cerianthus lloydii										1.0					1.0					
Edwardsia claparedii			1.5				2.0		1.0						2.0		2.0			
Caryophyllia (Caryophyllia) smithii										1.0										
Platyhelminthes spp.										3.0	12.0	1.0								
Nemertea spp.	1.5										2.0	2.0			2.0					
Tubulanus polymorphus	1.5						1.0								2.0			1.0		
Cerebratulus spp.											2.0				4.0		1.0			
Nematoda spp.	76.5	3.0			112.5					6.0	44.0	105.0				8.0				
Sipuncula spp. juv.												40.0								
Thysanocardia procera								4.0	2.0				1.0		2.0					
Phascolion (Phascolion) strombus strombus										1.0			1.0				1.0	2.0		
Pisione remota						3.0					10.0	9.0								
Aphrodita aculeata juv.										1.0										
Polynoidae spp. juv.	1.5									5.0	1.0				4.0					
Polynoidae spp. indet.			1.5									11.0		1.0			2.0			1.5
Gattyana cirrhosa											1.0		1.0						1.0	
Harmothoe antilopes									3.0			1.0			1.0					
Harmothoe imbricata											1.0									
Harmothoe glabra																	2.0			
Malmgreniella arenicolae																	2.0			
Pholoe inornata		1.0								5.0	6.0	2.0			3.0					
Pholoe baltica										4.0	1.0				1.0		1.0	2.0		
Eteone longa agg.	1.5									2.0	2.0						1.0		1.0	
Pseudomystides limbata						4.5					2.0	9.0								
Phyllodoce mucosa	1.5						6.0	1.0			1.0					2.0			1.0	
Phyllodoce rosea																	1.0			
Eulalia mustela										2.0					1.0					
Eumida bahusiensis											6.0						2.0			

Table 3.4 continued

Taxon	Site																			
	S8	**S9**	**S10**	**S11**	**S12**	**S13**	**S15**	**S16**	**S17**	**S18**	**S20**	**S22**	**S23**	**S24**	**S25**	**S26**	**S27**	**S28**	**S29**	**S30**
Eumida sanguinea												5.0					3.0			
Nereiphylla lutea										1.0	1.0									
Paranaitis kosteriensis																	1.0			
Glycera alba	1.5								1.0						3.0		3.0			
Glycera fallax	6.0					3.0	6.0				4.0	1.0					2.0			
Glycera lapidum						16.5	14.0			2.0	22.0	21.0			3.0		4.0			
Glycinde nordmanni										1.0								1.0		
Goniada maculata										4.0							1.0			
Goniadella gracilis						9.0						2.0								
Sphaerodorum gracilis											2.0									
Podarkeopsis capensis										1.0					2.0					
Psamathe fusca	6.0						1.0				16.0	6.0					1.0			
Oxydromus flexuosus								3.0	3.0						2.0	3.0	1.0		1.0	
Eurysyllis tuberculata										1.0	2.0	2.0								
Trypanosyllis (Trypanosyllis) coeliaca											1.0	5.0								
Syllis parapari										1.0	3.0	1.0								
Syllis mauretanica						31.5					3.0	28.0								
Odontosyllis fulgurans										1.0										
Syllides benedicti							1.0			2.0										
Parexogone hebes	16.5						2.0			1.0			1.0							
Exogone naidina		4.0	10.5	25.5	132.0									1.0		1.0				87.0
Exogone verugera										1.0					4.0					
Sphaerosyllis bulbosa											4.0	9.0								
Sphaerosyllis taylori	3.0		6.0		12.0	3.0				1.0	3.0			2.0					1.0	1.5
Autolytinae sp.														1.0						
Nereididae spp. juv.												1.0								1.5
Nereis zonata															1.0					
Nephtys spp. juv.	1.5	3.0						1.0	1.0		1.0		1.0	2.0	1.0	5.0	2.0		13.0	
Nephtys hombergii			7.5	3.0	3.0			2.0	1.0					5.0		7.0			11.0	1.5

Table 3.4 continued

Taxon	Site																			
	S8	**S9**	**S10**	**S11**	**S12**	**S13**	**S15**	**S16**	**S17**	**S18**	**S20**	**S22**	**S23**	**S24**	**S25**	**S26**	**S27**	**S28**	**S29**	**S30**
Nephtys kersivalensis	1.5				3.0										1.0		4.0			
Nephtys incisa								1.0	3.0				1.0					2.0		
Aponuphis bilineata						1.5				3.0	1.0				1.0					
Nothria sp.										1.0										
Lysidice unicornis										4.0	2.0									
Lumbrineridae sp. juv.															7.0	1.0				
Lumbrineris cingulata/aniara								1.0		17.0	3.0				70.0		33.0			
Abyssoninoe hibernica									1.0				2.0					6.0		
Notocirrus scoticus									1.0											
Ophryotrocha spp.					6.0											1.0				
Parougia eliasoni																1.0				
Protodorvillea kefersteini						16.5	37.0				5.0	3.0					8.0			
Leitoscoloplos mammosus			6.0		1.5														3.0	
Scoloplos (Scoloplos) armiger	43.5																2.0			
Aricidea (Aricidea) minuta	3.0						1.0										4.0			
Levinsenia gracilis								2.0	2.0	2.0					2.0	1.0		5.0		
Paradoneis lyra							13.0	1.0			4.0	2.0			5.0		30.0			
Apistobranchus tullbergi															25.0					
Poecilochaetus serpens												1.0								
Aonides oxycephala	36.0						2.0				6.0				5.0		2.0			
Aonides paucibranchiata						16.5	24.0			1.0	16.0	12.0								
Laonice bahusiensis							2.0			1.0	4.0	10.0			3.0					
Malacoceros fuliginosus						4.5														
Dipolydora caulleryi											1.0									
Dipolydora quadrilobata	1.5						2.0	1.0												
Prionospio fallax										4.0		1.0		3.0		44.0	3.0		3.0	
Aurospio banyulensis							5.0			7.0	7.0	9.0			6.0		4.0			
Prionospio cirrifera	1.5									1.0	2.0				5.0		3.0			
Prionospio cf. *multibranchiata*																		1.0		
Pseudopolydora cf. *paucibranchiata*		2.0				1.5	1.0								6.0		4.0	1.0	1.0	1.5

Table 3.4 continued

Taxon	Site																			
	S8	**S9**	**S10**	**S11**	**S12**	**S13**	**S15**	**S16**	**S17**	**S18**	**S20**	**S22**	**S23**	**S24**	**S25**	**S26**	**S27**	**S28**	**S29**	**S30**
Pseudopolydora pulchra	1.5		3.0			7.5	18.0					3.0			1.0	1.0	6.0		1.0	3.0
Scolelepis (Parascolelepis) tridentata						1.5														
Paraspio decorata						10.5	2.0									2.0				
Spio filicornis	3.0			1.5			1.0									2.0				
Spiophanes kroyeri										1.0			1.0		2.0			3.0		
Magelona sp. indet.									1.0											
Magelona alleni															2.0					
Magelona minuta															1.0			2.0		
Spiochaetopterus typicus															1.0					
Caulleriella alata	111.0				1.5						1.0	1.0								
Chaetozone setosa																1.0				
Chaetozone vivipara					1.5															
Chaetozone zetlandica											2.0									
Chaetozone sp. D										3.0							4.0			
Cirratulus caudatus																		1.0		
Aphelochaeta marioni	24.0																			
Tharyx killariensis	10.5															1.0				
Monticellina sp.										2.0			1.0		1.0					
Diplocirrus glaucus								1.0	2.0			4.0	15.0		6.0	5.0	8.0	10.0		
Capitella spp.					6.0															
Dasybranchus sp.									1.0									1.0		
Mediomastus fragilis	216.0				1.5	66.0	305.0				199.0	20.0			1.0		38.0		4.0	
Notomastus spp.	4.5					6.0	1.0	2.0	1.0	1.0	3.0	19.0			3.0	1.0	1.0			
Arenicola marina juv.																				3.0
Maldanidae spp. juv.																		6.0		
Clymenura spp.																		3.0		
Euclymene oerstedi										1.0										
Praxillella affinis							5.0		1.0				1.0		24.0		6.0			
Rhodine spp.									1.0						2.0			1.0		

Table 3.4 continued

Taxon	Site																			
	S8	**S9**	**S10**	**S11**	**S12**	**S13**	**S15**	**S16**	**S17**	**S18**	**S20**	**S22**	**S23**	**S24**	**S25**	**S26**	**S27**	**S28**	**S29**	**S30**
Ophelina acuminata			3.0				2.0									2.0	1.0		1.0	
Scalibregma inflatum							1.0	9.0			4.0				6.0	5.0	8.0			
Scalibregma celticum	3.0										3.0	4.0			15.0		7.0			
Polygordius spp. indet.				1.5		10.5					8.0	17.0								
Owenia borealis	1.5		1.5				1.0			1.0					2.0	5.0		1.0		
Galathowenia oculata	15.0	1.0	46.5				11.0	1.0		1.0				1.0	10.0			1.0		
Pectinariidae sp. indet.																		1.0		
Amphictene auricoma															1.0	1.0				
Lagis koreni										1.0									1.0	
Pectinaria (Pectinaria) belgica													1.0							
Melinna palmata			3.0					62.0	2.0				1.0		47.0		7.0	8.0	1.0	
Ampharete falcata										4.0					3.0					
Ampharete lindstroemi agg.	1.5	18.0	25.5	4.5	39.0		4.0	10.0		2.0					12.0	2.0	5.0	1.0	1.0	73.5
Amphicteis gunneri																		1.0		
Ampharete octocirrata															19.0					
Sosane sulcata															3.0					
Terebellides stroemii			4.5				2.0	22.0		3.0	1.0	2.0	1.0	1.0	22.0	5.0	9.0	1.0	5.0	
Amphitritides gracilis																	2.0			
Lanice conchilega								1.0		1.0		2.0			1.0		3.0			
Phisidia aurea												2.0								
Pista mediterranea	1.5					43.5	19.0			1.0	22.0	32.0			14.0		8.0			
Lysilla loveni									3.0											
Polycirrus spp.								1.0		16.0	22.0	1.0			6.0		4.0	2.0		
Chone duneri							6.0				2.0	12.0					2.0			
Paradialychone filicaudata										1.0										
Euchone rubrocincta							1.0								3.0					
Euchone southerni												3.0								
Jasmineira caudata							2.0			10.0	4.0	1.0			7.0	1.0	6.0			
Laonome kroyeri	3.0						1.0													
Serpulidae spp. Indet.											4.0									

Table 3.4 continued

Taxon	Site																			
	S8	**S9**	**S10**	**S11**	**S12**	**S13**	**S15**	**S16**	**S17**	**S18**	**S20**	**S22**	**S23**	**S24**	**S25**	**S26**	**S27**	**S28**	**S29**	**S30**
Hydroides elegans											1.0									
Spirobranchus lamarcki											30.0									
Paranais litoralis					3.0															10.5
Tubificidae spp.	48.0	1.0				1.5	9.0							1.0			3.0		4.0	
Tubificoides benedii	13.5	9.0		3.0	28.5														1.0	
Enchytraeidae spp.	19.5					16.5	9.0				13.0	5.0								
Anoplodactylus petiolatus										1.0										
Ostracoda spp.	10.5			1.5		6.0	6.0			3.0	6.0				2.0					
Nebalia bipes											2.0	3.0								
Apherusa bispinosa						1.5						1.0								
Monoculodes carinatus	6.0					3.0											1.0			
Perioculodes longimanus		1.0			9.0									1.0					1.0	1.5
Synchelidium maculatum							1.0					1.0					6.0			
Amphilochoides serratipes							1.0													
Peltocoxa brevirostris											1.0									
Leucothoe incisa						10.5						11.0								
Talitrus saltator				1.5																
Urothoe elegans	3.0						10.0				2.0									
Urothoe marina						39.0	1.0				18.0	13.0								
Harpinia antennaria	1.5	2.0	1.5	9.0									1.0	3.0						4.5
Harpinia crenulata	1.5		7.5		4.5							1.0		5.0						
Harpinia laevis		1.0																		
Harpinia pectinata	3.0														1.0			1.0		
Metaphoxus fultoni	7.5			1.5							1.0	5.0					1.0			
Hippomedon denticulatus												1.0								
Lysianassa plumosa											13.0	4.0								
Tmetonyx similis	1.5					1.5	1.0									1.0				
Tryphosella horingi											6.0									
Atylus vedlomensis	7.5					10.5					1.0	4.0								
Guernea (Guernea) coalita						1.5														

Table 3.4 continued

Taxon	Site																			
	S8	**S9**	**S10**	**S11**	**S12**	**S13**	**S15**	**S16**	**S17**	**S18**	**S20**	**S22**	**S23**	**S24**	**S25**	**S26**	**S27**	**S28**	**S29**	**S30**
Ampelisca brevicornis	1.5			6.0	1.5	13.5								8.0		1.0			5.0	31.5
Ampelisca diadema	3.0						1.0					1.0				2.0				
Ampelisca tenuicornis	1.5	3.0	9.0	1.5	31.5			1.0												16.5
Ampelisca typica	3.0						5.0								1.0		4.0			
Animoceradocus semiserratus											5.0									
Cheirocratus spp. indet. (female)	4.5						1.0									1.0				
Cheirocratus intermedius																1.0				
Cheirocratus sundevalli	6.0																			
Melita hergensis										1.0			1.0							
Megamphopus cornutus	3.0					3.0														
Photis longicaudata		3.0	9.0		4.5	3.0									11.0					7.5
Aoridae spp. indet. (female)				1.5		1.5													1.0	3.0
Leptocheirus hirsutimanus	1.5					12.0					1.0	64.0								
Leptocheirus pectinatus	3.0					3.0	3.0				2.0	9.0			1.0		1.0			
Microdeutopus anomalus																				4.5
Microdeutopus versiculatus	3.0			3.0	1.5	1.5						2.0					1.0			
Corophiidae sp. indet.										1.0										
Crassicorophium bonellii																				1.5
Pariambus typicus		1.0	1.5		25.5										4.0	3.0	1.0		3.0	4.5
Phtisica marina	4.5				3.0	1.5									2.0				1.0	
Gnathia sp. indet. (female)										1.0		1.0								
Gnathia oxyuraea										2.0										
Idotea chelipes			1.5																	
Astacilla dilatata							1.0			1.0										
Tanaopsis graciloides	33.0						22.0			4.0							2.0			
Bodotria arenosa						1.5														
Eudorella emarginata		3.0	3.0	16.5				2.0						13.0		1.0			3.0	7.5
Pseudocuma (Pseudocuma) longicorne					1.5															
Diastylis rugosa	1.5		1.5		1.5	1.5	2.0				1.0	3.0		2.0						

Table 3.4 continued

Taxon	Site																			
	S8	**S9**	**S10**	**S11**	**S12**	**S13**	**S15**	**S16**	**S17**	**S18**	**S20**	**S22**	**S23**	**S24**	**S25**	**S26**	**S27**	**S28**	**S29**	**S30**
Paguridae sp. juv.											1.0									
Galathea intermedia											1.0						1.0			
Majidae sp. juv.											1.0									
Atelecyclus rotundatus										1.0										
Portunidae sp. juv.	1.5																			
Scutopus ventrolineatus									1.0											
Chaetoderma nitidulum																		1.0		
Leptochiton asellus										4.0	4.0	1.0								
Lepidochitona cinerea											5.0									
Tectura virginea											11.0									
Peringia ulvae	1.5	3.0		3.0																
Onoba semicostata						1.5													1.0	
Ceratia proxima				4.5										1.0						
Turritella communis													12.0					1.0		
Parthenina decussata												1.0								
Brachystomia eulimoides													1.0							
Euspira nitida											1.0				1.0		1.0	1.0		
Cylichna cylindracea													1.0							
Philine spp.				1.5					1.0											1.5
Retusa obtusa			1.5	1.5										4.0						
Nudibranchia	1.5									1.0	16.0				1.0	2.0	1.0			
Nucula sp. juv.															1.0					
Nucula nitidosa								1.0	2.0											
Nucula sulcata									2.0				2.0							
Yoldiella philippiana									1.0											
Crenella decussata												1.0			6.0					
Musculus subpictus											1.0	1.0			4.0	1.0	1.0			
Modiolus sp. juv.											2.0	5.0			1.0					
Limaria hians							1.0				1.0				1.0					
Anomiidae spp. juv.											4.0	5.0		1.0						

Table 3.4 continued

Taxon	Site																			
	S8	**S9**	**S10**	**S11**	**S12**	**S13**	**S15**	**S16**	**S17**	**S18**	**S20**	**S22**	**S23**	**S24**	**S25**	**S26**	**S27**	**S28**	**S29**	**S30**
Lucinoma borealis	1.5						5.0										6.0			
Myrtea spinifera										2.0			2.0							
Thyasira sp. juv.								2.0							1.0	5.0			8.0	
Thyasira flexuosa	1.5		1.5				2.0	5.0							7.0	4.0	27.0	1.0		
Kurtiella bidentata		6.0		15.0	1.5	3.0	1.0	2.0	73.0	2.0			4.0	2.0	8.0		11.0	1.0	3.0	
Acanthocardia sp. juv.			3.0						1.0									2.0		1.5
Parvicardium scabrum	1.5					3.0	3.0					5.0			14.0		3.0			
Spisula elliptica						3.0														
Spisula subtruncata								1.0												
Lutraria lutraria															1.0					
Ensis spp. Juv.			1.5			24.0	4.0					3.0		1.0			5.0	1.0	2.0	
Ensis sp. indet.						1.5					1.0									
Ensis magnus						1.5						1.0								
Phaxas pellucidus		1.0																		
Tellina fabula		1.0														1.0				
Moerella donacina						3.0	1.0					4.0					3.0			
Gari tellinella						16.5					3.0	7.0					3.0			
Abra spp. juv.			3.0			9.0	2.0	25.0	5.0						8.0	39.0	12.0	4.0	6.0	3.0
Abra alba	9.0			1.5		4.5	9.0	53.0						1.0	2.0	38.0	9.0	1.0	13.0	
Abra nitida								21.0	7.0				2.0	8.0	2.0	4.0		2.0	7.0	
Abra prismatica	3.0																1.0			
Arctica islandica juv.														1.0						
Veneridae spp. juv.			4.5								2.0	2.0		1.0		1.0	1.0			
Gouldia minima												1.0								
Dosinia spp juv			1.5			10.5	4.0			2.0		1.0		1.0	4.0	2.0	4.0		1.0	
Dosinia exoleta						1.5									3.0					
Polititapes rhomboides	1.5						3.0					2.0					1.0			
Chamelea striatula			1.5																	
Clausinella fasciata	1.5									1.0	1.0	1.0								

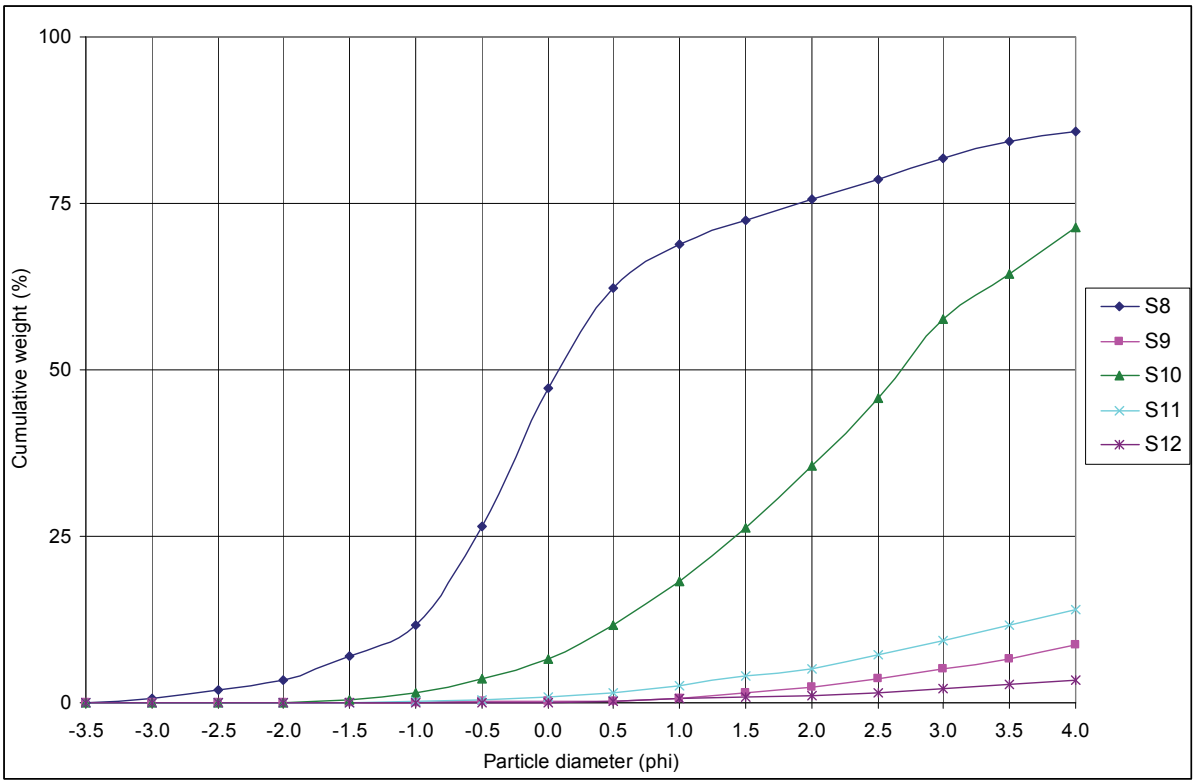
Table 3.4 continued

Taxon	Site																			
	S8	**S9**	**S10**	**S11**	**S12**	**S13**	**S15**	**S16**	**S17**	**S18**	**S20**	**S22**	**S23**	**S24**	**S25**	**S26**	**S27**	**S28**	**S29**	**S30**
Timoclea ovata						4.5	3.0			2.0	2.0	1.0			12.0		6.0		1.0	
Mysia undata								1.0							1.0					
Mya sp. juv.						7.5	1.0	1.0				2.0		1.0	1.0		2.0		6.0	
Corbula gibba							1.0	2.0	2.0				1.0	1.0	4.0	3.0		1.0	1.0	
Hiatella arctica											1.0									
Lyonsia norwegica															1.0					
Thracia spp. juv.						1.5						4.0			1.0					
Thracia convexa									4.0				1.0		1.0					
Thracia villosiuscula							1.0					9.0								
Sepietta sp.					1.5															
Phoronis spp.									1.0											
Asteroidea spp. juv.										1.0	1.0	1.0								
Ophiuroidea spp. juv.	3.0	1.0	1.5		1.5		1.0	2.0	8.0	4.0	6.0		15.0	5.0	37.0	7.0	5.0	28.0		3.0
Ophiocomina nigra				13.5																
Amphiura chiajei									3.0	2.0			7.0		2.0			8.0		
Amphiura filiformis									18.0				9.0		8.0			34.0		
Amphipholis squamata	3.0										7.0	16.0			2.0		8.0			
Ophiura albida																				1.5
Echinocyamus pusillus															1.0					
Leptopentacta elongata								1.0												
Leptosynapta bergensis				12.0					1.0							1.0				
Oestergrenia digitata																		1.0		
Labidoplax media		18.0		9.0	16.5								1.0	30.0				2.0		3.0
Enteropneusta									1.0											
Ascidiacea spp. Juv.	1.5					1.5														
Chaetognatha sp.	1.5																			

Table 3.5. Abundance and diversity measures for infauna from the 2015 SCM infaunal survey, together with ascribed biotope. J' = Pielou evenness index, H' = Shannon-Wiener diversity index based on different log bases.

Infaunal site	Video site	Sample area (m^2)	No. taxa	Abund. (no./0.1m^2)	J'	H'_e	H'_2	Biotope
S8	D39	0.067	70	827	0.699	2.970	4.285	SS.SCS.ICS
S9	D8	0.100	22	86	0.829	2.563	3.697	SS.SMu.IFiMu
S10	D2	0.067	30	174	0.810	2.755	3.975	SS.SMp.KSwSS.LsacR.Sa
S11	D3	0.067	24	143	0.859	2.731	3.940	SS.SMu.IFiMu
S12	D5	0.067	28	456	0.682	2.271	3.277	SS.SMp.KSwSS.Tra
S13	D31	0.067	56	488	0.848	3.412	4.923	SS.SMp.KSwSS.LsacR.Gv
S15	D40	0.100	65	617	0.595	2.484	3.584	SS.SMp.KSwSS
S16	D17	0.100	35	247	0.696	2.475	3.571	SS.SMu.IFiMu.PhiVir
S17	D29	0.100	36	162	0.670	2.401	3.464	SS.SMu.CFiMu.SpnMeg
S18	D74	0.100	68	174	0.903	3.809	5.495	SS.SSa.CMuSa
S20	D35	0.100	87	654	0.738	3.296	4.755	SS.SCS.ICS
S22	D36	0.100	81	625	0.804	3.531	5.094	SS.SMp.KSwSS.LsacR.Gv
S23	D77	0.100	29	89	0.814	2.741	3.954	SS.SMu.CFiMu.SpnMeg
S24	D9	0.100	30	108	0.804	2.733	3.943	SS.SMu.IFiMu.PhiVir
S25	D16	0.100	93	548	0.833	3.774	5.445	SS.SMp.KSwSS.LsacR.Sa
S26	D12	0.100	45	226	0.759	2.890	4.170	SS.SMp.KSwSS.LsacR
S27	D42	0.100	78	386	0.869	3.787	5.464	SS.SMx.CMx
S28	D33	0.100	42	154	0.788	2.944	4.248	SS.SMu.CFiMu.SpnMeg
S29	D54	0.100	36	118	0.882	3.162	4.561	SS.SMp.KSwSS.LsacCho
S30	N/A	0.067	26	281	0.679	2.213	3.192	SS.SMu.IFiMu

Figure 3.1. Particle size analysis of sediment collected at infaunal survey stations, showing cumulative weight of sediment retained on sieves at 0.5 phi intervals.



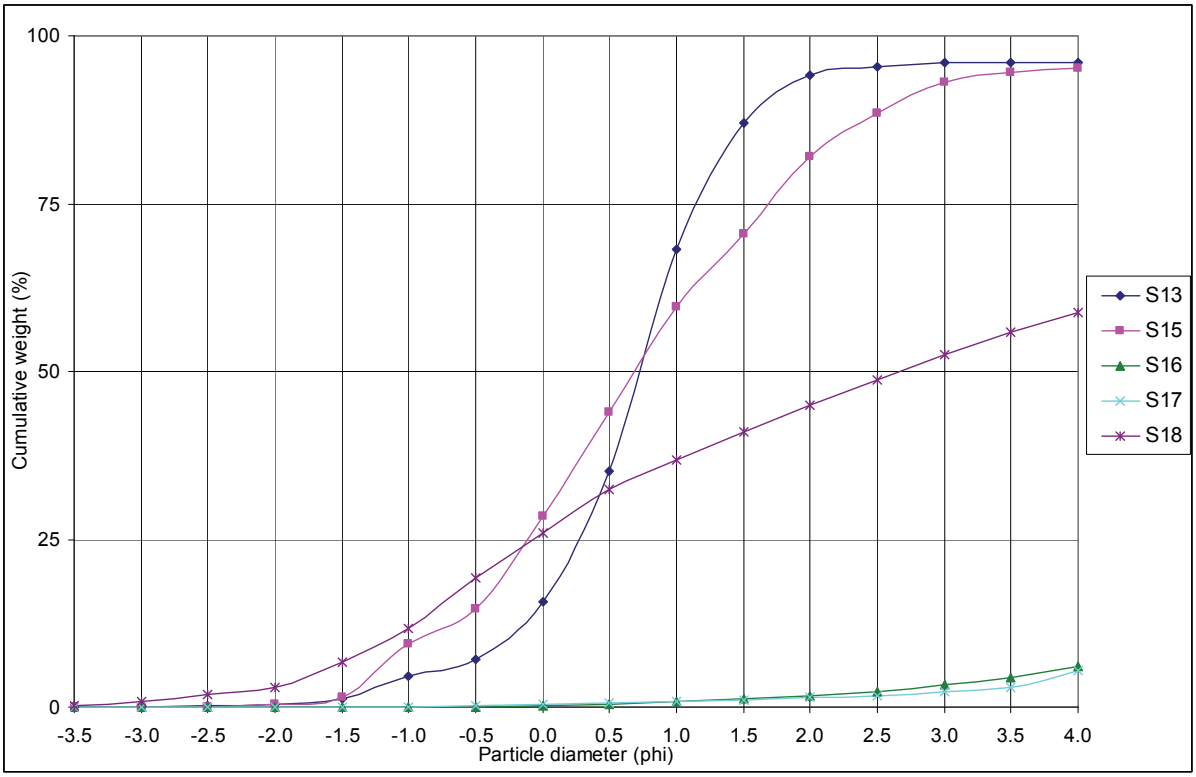
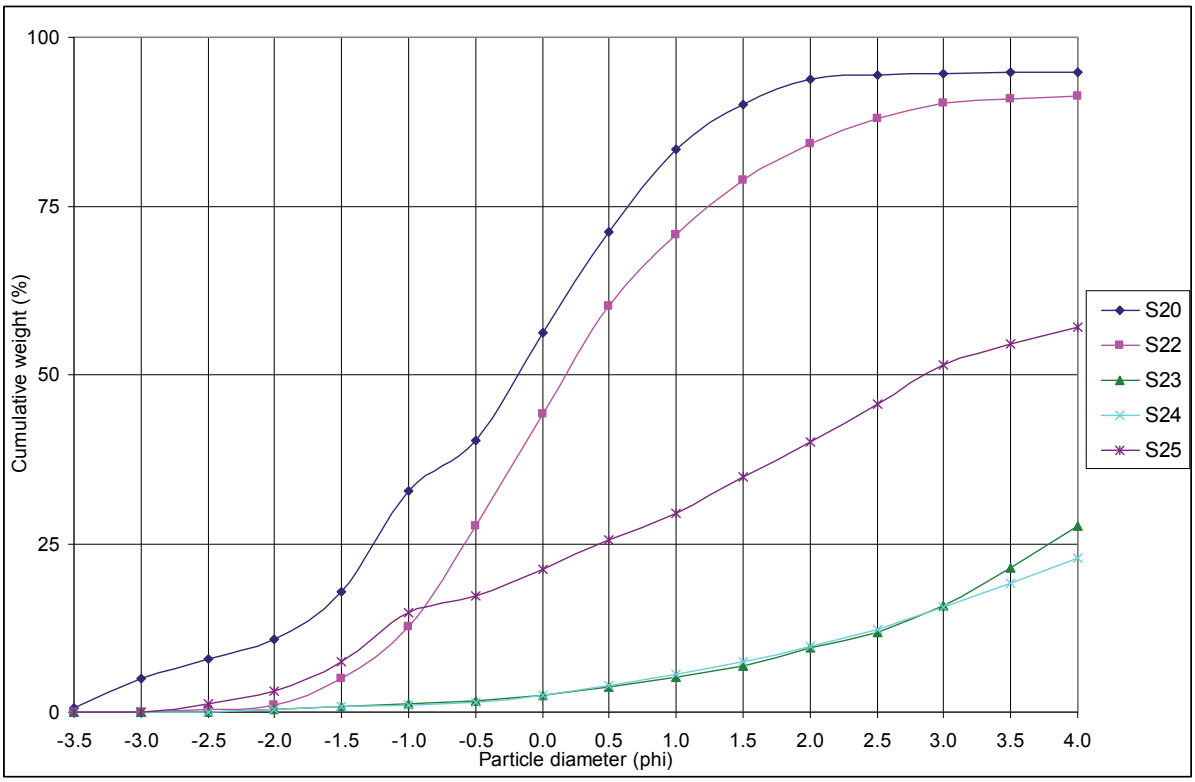
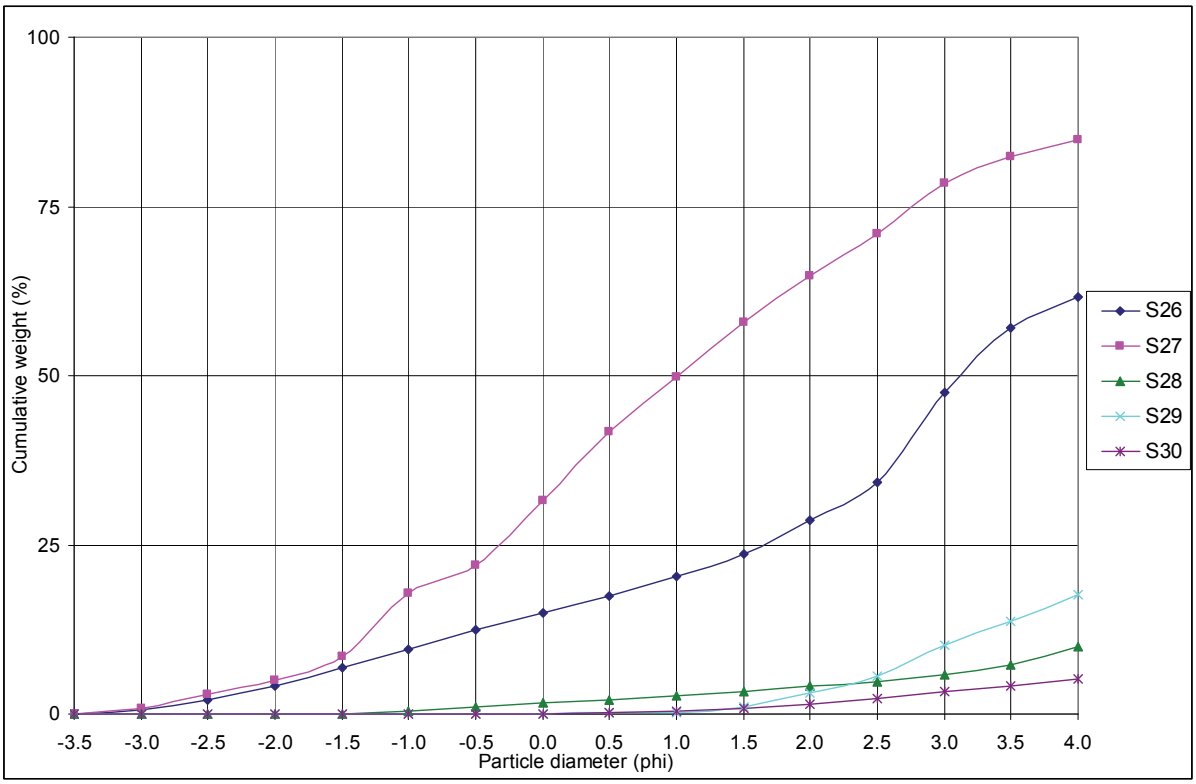


Figure 3.1 continued





ANNEX 4: MAERL SCM SURVEY DATA

Table 4.1. Descriptions of 2015 maerl transects where MNCR phase 2 surveys were carried out. 2004 maerl transect depths in brackets.

Site	Date	Position (transect start)	Position (transect end)	Tran-sect bearing (°T)	Depth tran-sect start (m)	Depth tran-sect end (m)	Habitat description	Biotope
ML01	06-Jul-15	57.62120 -7.13979	57.62132 -7.14014	302	7.1 (5.4)	(6.4)	Patchy live maerl (overall c. 30% but locally 60%) on coarse sand and maerl gravel with rocky reef just intruding into transect band at end of transect. *Phymatolithon calcareum* strongly dominant (C, locally A) with sparse *Lithothamnion glaciale* hedgehog stones (R). The maerl supported an algal turf dominant by browns, especially *Dictyota dichotoma* (C), small *Saccharina latissima* (C) and *Chorda filum* (C). Red algae relatively sparse, dominated by *Dasysiphonia japonica* (F).	SS.SMp.Mrl. Pcal.R
ML02	10-Jul-15	57.62675 -7.17714	57.62675 -7.17755	269	1.2 (2.4)	0.6 (0.6)	Mobile substrate of maerl and maerl gravel on base of muddy sand, the maerl material thrown into irregular dunes up to at least 0.5 m high, with pebbles and some outcropping rock supporting *Laminaria hyperborea* (locally A) and *Saccorhiza polyschides* (F). Live maerl with cover of around 45 - 50% dominated by *Phymatolithon calcareum* (A) but *Lithothamnion glaciale* formed dense patches locally (O, locally C). Patchy algal turf dominated by browns, especially *Dictyota dichotoma* (A), with *Chorda filum* (C) and *Saccharina latissima* (C). Maerl contained dense small *Ophiocomina nigra* (S), and *Ophiothrix fragilis* (F).	SS.SMp.Mrl. Pcal

Table 4.1 continued

Site	Date	Position (transect start)	Position (transect end)	Tran-sect bearing (°T)	Depth tran-sect start (m)	Depth tran-sect end (m)	Habitat description	Biotope
ML03	11-Jul-15	57.62777 -7.17676	57.62769 -7.17638	112	-0.2 (-0.1)	-0.1 (0.3)	Substrate of maerl gravel on muddy sand with dense pebbles and cobbles in southern half of transect. Live maerl with cover of around 60%, dominated by *Phymatolothon calcareum* (A), but with hedgehog stones of *Lithothamnion glaciale* locally C (R overall); these were often large (up to 12 cm) and well-developed. The maerl supported a dense algal turf dominated by *Dictyota dichotoma*, accompanied by dense *Chorda filum* (S) and *Saccharina latissima* (A). Red algae were much less abundant and were dominated by *Corallina officinalis* (F) and *Bonnemaisonia hamifera* (*Trailliella* phase) (F), with sparse *Dasysiphonia japonica* (R).	SS.SMp.Mrl.Pcal.R
ML04	12-Jul-15	57.62300 -7.16847	57.62300 -7.16888	272	2.2 (1.5)	3.4 (3.4)	Substrate of mobile shell sand and maerl gravel supported sparse live maerl, with overall cover of between 10 - 15%, but denser patches of up to 30 - 40% near start of transect. Live maerl predominantly *Phymatolithon calcareum* (F) with sparse hedgehog stones of *Lithothamnion glaciale* (R). Sparse algae include scattered *Saccharina latissima* (F), *Halidrys siliquosa* (R) and *Dasysiphonia japonica* (R). Visible fauna also sparse, including *Pomatoschistus pictus* (F), *Neopentadactyla mixta* (O), *Chaetopterus variopedatus* (O), *Liocarcinus depurator* (O) and *Carcinus maenas* (O).	SS.SMp.Mrl.Pcal

Table 4.2. SACFOR abundance estimates of epibiota within band transects at four maerl sites derived by MNCR phase 2 diver survey. Nomenclature follows WoRMS (2015).

Taxon	**Transect**			
	ML01	ML02	ML03	ML04
Porifera sp. white			R	
Pione vastifica	R	P		
Pione vastifica?				P
Leuconia sp.		P		
Amphilectus fucorum	R		R	
Haliclona sp.			P	
Mycale sp.	P			
Mycale (Aegogropila) rotalis			P	
Suberites sp.	R			
Leucosolenia complicata	R	P		
Anemonia viridis	O	O	F(O)	O
Urticina felina		P	P	
Sagartia elegans			P	
Lucernariopsis campanulata			P	
Obelia geniculata	P		R	
Turbellaria indet.	P	P		
Nemertea indet.		P	P	
Glycera sp.		P	P	
Chaetopterus variopedatus	F	O	P	O
Arenicola marina			F	
Flabelligera affinis			P	
Eupolymnia nebulosa		P		
Lanice conchilega	O			
Sabellidae indet.	P	P		
Sabella pavonina	F			
Spirobranchus spp.	P		O	
Spirobranchus triqueter		R		P
Spirorbinae indet.	R	P	P	
Spirorbis (Spirorbis) corallinae		P	P	
Harmothoe sp.		P	P	
Nereididae sp.		P	P	
Polychaeta indet.		P		
Balanus spp.		R	R	R
Balanus crenatus	R	P	P	
Balanus balanus	R			
Verruca stroemia	R	P		
Caprellidae indet.		P	P	P
Mysida sp.			P	
Paguridae indet.			P	

Table 4.2 continued

Taxon	Transect			
	ML01	ML02	ML03	ML04
Pagurus bernhardus		P	O(F)	P
Liocarcinus depurator				O
Liocarcinus corrugatus		P		
Necora puber	P	P		P
Carcinus maenas	P	O	F	O
Cancer pagurus	P	P	P	P
Inachus sp.				p
Gammaridae indet.		P	P	
Crangon crangon				P
Aplysia punctata	P			
Tectura virginea	O	P	O	
Patella sp.			P	
Patella pellucida		P		P
Doridídae sp.		P	P	
Onchidoris sp.	P			
Doris pseudoargus			F	
Diaphorodoris luteocincta	P			
Flabellina sp.?	P			
Nudibranchia sp.	P			
Pecten maximus	F(O)		P	
Anomiidae indet.		O	(A)	P
Monia patelliformis	O			
Gibbula magus	P		P	
Gibbula cineraria	F	O	F	(C)
Lutraria sp. siphons	P			P
Hiatella arctica		P	P	
Aequipecten opercularis	P			
Tricolia pullus	P			
Lacuna vincta	P		P	
Rissoidae indet.	P		(F)	P
Rissoidae sp.		P		
Euspira nitida egg cases	P			P
Euspira nitida	P			
Tonicella rubra		P		
Tonicella sp.			P	
Callochiton septemvalvis			P	
Polyplacophora indet.	P		P	
Nassarius incrassatus	P			
Bryozoa sp. encrusting	P			
Crisidia cornuta	R			
Electra pilosa		P		

Table 4.2 continued

Taxon	Transect			
	ML01	ML02	ML03	ML04
Membranipora membranacea		R	R	
Asterias rubens	C	F		P
Marthasterias glacialis	F			
Ophiothrix fragilis		F	(A)	
Ophiothrix fragilis juv.	P			
Ophiocomina nigra		S	(A)	
Amphipholis squamata	P			
Ophiura albida	O			
Echinus esculentus	F	P		
Neopentadactyla mixta				O
Polyclinidae sp.	P	R		
Didemnidae sp.	P	R		
Diplosoma listerianum?	R			
Pollachius pollachius			P	P
Gadus morhua			P	
Spinachia spinachia			P	
Myoxocephalus scorpius	P			
Symphodus melops			P	
Pholis gunnellus	P		P	
Ammodytes tobianus?				P
Callionymus lyra	P			P
Gobiusculus flavescens			P	
Pomatoschistus pictus	F	F	F	F
Colaconema daviesii				P
Colaconema sp.		R		
Asparagopsis armata			R	
Bonnemaisonia asparagoides	R		R	
Bonnemaisonia hamifera	O	R	F	R
Dilsea carnosa	P	R	R	
Kallymenia reniformis	R			
Dudresnaya verticillata		R		
Gloiosiphonia capillaris			R	
Callophyllis laciniata		R		
Corallina officinalis	R	F	F	R
Lithothamnion glaciale	R	O	R	R
Melobesia membranacea	R			R
Phymatolithon calcareum	C	A	A	F
Corallinaceae pink crust	P	R	P	P
Corallinaceae pink crust 2		R		
Chondrus crispus		R	O	R
Gracilariaceae sp.				R

Table 4.2 continued

Taxon	Transect			
	ML01	ML02	ML03	ML04
Plocamium cartilagineum	R		R	R
Cystoclonium purpureum		R		R
Phyllophora crispa	R			
Cruoria pellita		R		
Cruoria sp.?			P	
Halarachnion ligulatum	R			
Peyssonnelia dubyi	R	P	R	
Scinaia interrupta	R			
Chylocladia verticillata				R
Chylocladia verticillata?	R			
Lomentaria clavellosa?				R
Lomentaria sp. juv.?	R			
Rhodophyllis divaricata	P			
Callithamnion sp.?				R
Ceramium nodulosum				R
Ceramium pallidum			R	
Membranoptera alata		R		
Hypoglossum hypoglossoides	R	R	R	R
Erythroglossum laciniatum?	R			
Cryptopleura ramosa	R	R		P
Delesseria sanguinea	R			
Phycodrys rubens		R		P
Nitophyllum punctatum		R		R
Brongniartella byssoides	O	R		R
Polysiphonia elongata	O			R
Polysiphonia stricta			R	
Polysiphonia sp.	R			
Rhodomela confervoides	R			R
Dasysiphonia japonica	F		R	R
Heterosiphonia plumosa	R	R		
Pterosiphonia parasitica	R			
Chromophycota sp.		R		
Chromophycota indet. crusts	R	P	P	P
Pseudolithoderma extensum	R	R	P	
Cutleria multifida		R	P	
Elachista flaccida		R	P	
Pylaiella littoralis		P		
Ectocarpus fasciculatus				P
Ectocarpus siliculosus?	P			
Ectocarpus sp.		P	P	
Sphacelaria cirrosa	R			

Table 4.2 continued

Taxon	Transect			
	ML01	ML02	ML03	ML04
Sphacelaria sp.			R	P
Mesogloia sp.?		R	R	
Dictyota dichotoma	C	A	A	R
Desmarestia aculeata	R	R		
Desmarestia viridis	R			P
Desmarestia ligulata	R			
Asperococcus bullosus	R		O	
Leathesia marina			R	
Chordaria flagelliformis			R	
Chorda filum	C	C	S	P
Laminaria spp. juv.			P	
Laminaria hyperborea	P	O	C	P
Saccharina latissima	C	C	A	F
Saccorhiza polyschides		O	P	
Himanthalia elongata			P	
Halidrys siliquosa	R		F	R
Ulva lactuca	R	R	R	
Ulva compressa	R	R	R	R
Ulva rigida				R
Cladophora sp.				P
Eugomontia sacculata?			P	
Ostreobium quekettii	R	P		P

Table 4.3. Quadrat (50 x 50 cm) measures of maerl substrates along 25 m x 4 m wide band transects (ML02-4) and 25 m x 8 m wide transect (ML01) by two recorders, AL (Alastair Lyndon) and RG (Rebecca Grieve). Quadrat positioned along the transect using random numbers to the left (Lx) or right (Rx) of the transect tape. Quadrat displacement shows random lateral offset from the tape; 1 = contiguous with the tape, 2 = 0.5 m, 3 = 1.0 m, 4 = 1.5 m etc. Recording method: 1 = quadrat position only assessed by one worker, 2 = assessed by both workers.

Transect	Recorder	Quadrat	Transect distance (m)	Quadrat displace-ment	Live maerl (%)	Dead maerl (%)	Recording method	Photo
ML01	AL	L1	1.22	5	80	2	1	
ML01	AL	L2	2.43	4	90	5	1	
ML01	AL	L3	9.35	8	1	<1	1	
ML01	AL	L4	10.42	4	1	<1	1	
ML01	AL	L5	11.84	2	85	2	1	
ML01	AL	L6	16.01	3	15	2	1	
ML01	AL	L7	19.52	1	95	2	1	
ML01	AL	L8	20.57	3	25	<1	1	
ML01	AL	L9	22.81	3	20	<1	1	
ML01	AL	L10	23.91	1	25	<1	1	
ML01	AL	R1	1.09	1	10	5	2	
ML01	AL	R2	3.45	8	2	1	2	
ML01	AL	R3	4.46	8	7	1	2	
ML01	AL	R4	10.48	6	1	5	2	
ML01	AL	R5	11.06	4	1	10	2	
ML01	RG	R1	1.09	1	8	1	2	Y
ML01	RG	R2	3.45	8	3	0	2	Y
ML01	RG	R3	4.46	8	10	0	2	Y
ML01	RG	R4	10.48	6	3	5	2	Y
ML01	RG	R5	11.06	4	4	7	2	Y
ML01	RG	R6	12.7	3	5	10	1	Y
ML01	RG	R7	15.99	1	70	0	1	Y
ML01	RG	R8	19.23	8	5	2	1	Y
ML01	RG	R9	19.74	6	2	0	1	Y
ML01	RG	R10	21.11	6	1	0	1	Y
ML02	AL	L1	0	3	10	85	1	
ML02	AL	L2	4.13	4	3	95	1	
ML02	AL	L3	5.22	3	8	90	1	
ML02	AL	L4	6.04	1	2	80	1	
ML02	AL	L5	7.3	2	<1	85	1	
ML02	AL	L6	8.74	2	5	90	1	
ML02	AL	L7	14.56	1	25	20	1	
ML02	AL	L8	17.36	3	25	10	1	
ML02	AL	L9	21.29	2	75	20	1	
ML02	AL	L10	22.2	1	30	5	1	
ML02	AL	R1	0.37	2	15	85	2	
ML02	AL	R2	2.06	3	20	80	2	
ML02	AL	R3	5.91	1	5	40	2	
ML02	AL	R4	6.56	1	10	75	2	
ML02	AL	R5	13.57	3	50	50	2	
ML02	RG	R1	0.37	2	20	80	2	Y

Table 4.3 continued

Transect	Recorder	Quadrat	Transect distance (m)	Quadrat displace-ment	Live maerl (%)	Dead maerl (%)	Recording method	Photo
ML02	RG	R2	2.06	3	35	65	2	Y
ML02	RG	R3	5.91	1	10	25	2	Y
ML02	RG	R4	6.56	1	25	75	2	Y
ML02	RG	R5	13.57	3	75	25	2	Y
ML02	RG	R6	14.92	3	30	70	1	Y
ML02	RG	R7	17.27	1	80	20	1	Y
ML02	RG	R8	18.41	4	40	60	1	Y
ML02	RG	R9	20.44	4	20	5	1	Y
ML02	RG	R10	23.67	2	35	30	1	Y
ML03	AL	L1	0	3	50	30	1	
ML03	AL	L2	4.13	4	30	1	1	
ML03	AL	L3	5.22	3	5	15	1	
ML03	AL	L4	6.04	1	5	5	1	
ML03	AL	L5	7.3	2	50	10	1	
ML03	AL	L6	8.74	2	10	1	1	
ML03	AL	L7	14.56	1	80	20	1	
ML03	AL	L8	17.36	1	70	15	1	
ML03	AL	L9	21.29	1	20	20	1	
ML03	AL	L10	22.2	1	80	1	1	
ML03	AL	R1	0.37	2	50	50	2	
ML03	AL	R2	2.06	3	50	30	2	
ML03	AL	R3	5.91	1	30	25	2	
ML03	AL	R4	6.56	1	35	10	2	
ML03	AL	R5	13.57	3	40	60	2	
ML03	RG	R1	0.37	2	60	40	2	Y
ML03	RG	R2	2.06	3	70	20	2	Y
ML03	RG	R3	5.91	1	60	30	2	Y
ML03	RG	R4	6.56	1	20	80	2	Y
ML03	RG	R5	13.57	3	30	5	2	Y
ML03	RG	R6	14.92	3	80	5	1	Y
ML03	RG	R7	17.27	1	95	0	1	Y
ML03	RG	R8	18.41	4	95	0	1	Y
ML03	RG	R9	20.44	4	40	30	1	Y
ML03	RG	R10	23.67	2	80	45	1	Y
ML04	AL	L1	0	3	2	<1	1	
ML04	AL	L2	4.13	4	2	1	1	
ML04	AL	L3	5.22	3	1	1	1	
ML04	AL	L4	6.04	1	2	<1	1	
ML04	AL	L5	7.3	2	4	1	1	
ML04	AL	L6	8.74	2	2	1	1	
ML04	AL	L7	14.56	1	5	2	1	
ML04	AL	L8	17.36	3	4	2	1	
ML04	AL	L9	21.29	2	3	1	1	
ML04	AL	L10	22.2	1	1	<1	1	
ML04	AL	R1	0.37	2	5	<1	2	
ML04	AL	R2	2.06	3	5	5	2	
ML04	AL	R3	5.91	1	4	2	2	

Table 4.3 continued

Transect	Recorder	Quadrat	Transect distance (m)	Quadrat displace-ment	Live maerl (%)	Dead maerl (%)	Recording method	Photo
ML04	AL	R4	6.56	1	2	2	2	
ML04	AL	R5	13.57	3	1	1	2	
ML04	RG	R1	0.37	2	10	1	2	Y
ML04	RG	R2	2.06	3	10	5	2	Y
ML04	RG	R3	5.91	1	5	0	2	Y
ML04	RG	R4	6.56	1	5	1	2	Y
ML04	RG	R5	13.57	3	1	0	2	Y
ML04	RG	R6	14.92	3	1	0	1	Y
ML04	RG	R7	17.27	1	8	1	1	Y
ML04	RG	R8	18.41	4	4	1	1	Y
ML04	RG	R9	20.44	4	2	0	1	Y
ML04	RG	R10	23.67	2	0	0	1	Y

Table 4.4. Abundance of infauna recorded in each of four replicate 10.3 cm diameter cores collected from band transects at four maerl sites. *Nomenclature follows WoRMS (2015).*

Taxon	Replicate															
	ML01.1	ML01.2	ML01.3	ML01.4	ML02.1	ML02.2	ML02.3	ML02.4	ML03.1	ML03.2	ML03.3	ML03.4	ML04.1	ML04.2	ML04.3	ML04.4
Edwardsia claparedii						1		2								
Platyhelminthes spp.			1	1		1	1									
Nematoda spp.		4	20	22	9	15	2	14	7	8	3	9	23	9	35	20
Sipuncula spp. juv.			2		1	3			2			1	1		1	2
Golfingia (Golfingia) margaritacea	1	3	2	11	1	5	4	1			1	2			1	
Golfingia (Golfingia) vulgaris vulgaris		2					1	1			1					
Pisione remota														1	2	
Polynoidae spp. Juv.			2	1			2		1	1	8	5	1			
Polynoidae spp. indet.	2	1	1		5	9		2		1	3	14		1		1
Harmothoe antilopes												1				
Harmothoe imbricata												1				
Malmgrenia mcintoshi									1		1					
Pholoe inornata		2	2	2	2		1	3			1					
Pseudomystides limbata		1														
Eulalia mustela							1									
Eumida sanguinea				2	2	1						2		1		
Glycera lapidum	1	3	3		4	3	5	1	3	1	1	1	5	2	3	5
Goniadella gracilis				3												
Sphaerodorum gracilis		1	1						1	2	1					
Hesiospina aurantiaca										1		1				
Psamathe fusca			1							2	1					
Eurysyllis tuberculata		1					1	1	1							
Syllis columbretensis			1	1												
Trypanosyllis (Trypanosyllis) coeliaca			1				1		1			1	2			1
Syllis mauretanica		8	9	7	1				1	1	1	1	11	3	20	11
Odontosyllis ctenostoma											1	1				

Table 4.4 continued

Taxon	Replicate															
	ML01.1	ML01.2	ML01.3	ML01.4	ML02.1	ML02.2	ML02.3	ML02.4	ML03.1	ML03.2	ML03.3	ML03.4	ML04.1	ML04.2	ML04.3	ML04.4
Syllides benedicti									1			1				
Sphaerosyllis bulbosa			1				4		3	6	2	2	10		3	
Sphaerosyllis taylori			2													
Nereis zonata												2				
Platynereis dumerilii			2	1					1		3	1				
Nephtys kersivalensis	1															
Protodorvillea kefersteini	1	3	3	1	2							1				
Schistomeringos neglecta			1	1					1			1	1	2	10	7
Aonides oxycephala	4	2			7	11	1	65	7	11	15	21				
Aonides paucibranchiata	1	1		1												
Laonice bahusiensis				2	1	1			1							
Malacoceros fuliginosus	3															
Dipolydora coeca		1														
Dipolydora caulleryi	1															
Aurospio banyulensis		2	1						1							
Prionospio cirrifera				2												
Flabelligera affinis				1												
Macrochaeta clavicornis			1	1					1			1				
Capitella sp.								1								
Mediomastus fragilis	7	5	1	1	28	5	32	21	23	29	11	22				
Notomastus spp.				1	2		1		1			1			1	
Clymenura spp.					4	2	2					1				
Euclymene droebachiensis										1						
Praxillella affinis					1		1	2								
Polyophthalmus pictus				1												
Scalibregma inflatum	1															
Polygordius spp. Indet.			7	4			1	41					4	6	4	6
Terebellides stroemii				2	1											
Trichobranchus glacialis					1	3		1	2	3		2				
Eupolymnia nesidensis				1	2		2			1						

Table 4.4 continued

Taxon	Replicate															
	ML01.1	**ML01.2**	**ML01.3**	**ML01.4**	**ML02.1**	**ML02.2**	**ML02.3**	**ML02.4**	**ML03.1**	**ML03.2**	**ML03.3**	**ML03.4**	**ML04.1**	**ML04.2**	**ML04.3**	**ML04.4**
Pista mediterranea		1														
Polycirrus spp.		2		1		3	4	1	7	21	4	14		1	1	
Chone duneri			1													
Jasmineira caudata							1	1								
Sabella discifera			1													
Hydroides elegans	1															
Spirobranchus triqueter			2	1	2	1	1				1		1			
Tubificidae sp.	1															
Tubificoides benedii	1								3	4		3				
Tubificoides pseudogaster agg.										1						
Enchytraeidae spp.		3	3	7	1	1	2	2	12	2	3	9	4			
Ostracoda spp.					1	1	1	3	1	2	1					
Nebalia bipes					2											
Apherusa bispinosa			1													
Leucothoe incisa		2	1		8		4	2	5	2	3		1	1	2	
Urothoe elegans	2			2	6		1	1								
Urothoe marina			1													
Harpinia antennaria													1			
Harpinia crenulata					1			1								
Harpinia pectinata			1													
Metaphoxus fultoni			1	1				1								
Lysianassa ceratina	9	2	10	38	17	37	16	59	9	2	20	22				
Orchomene humilis			1	2												
Socarnes erythrophthalmus	1	8	17	18	19	2	60	54	12	9	9	1	2		11	
Liljeborgia pallida					2											
Atylus vedlomensis			1													
Dexamine spinosa			1													
Ampelisca tenuicornis														1		
Animoceradocus semiserratus	1	7	8	6	18	12	26	13	5	10	5	2				
Cheirocratus sp. indet. (female)		1	3	2	1		1		1							

Table 4.4 continued

Taxon	Replicate															
	ML01.1	**ML01.2**	**ML01.3**	**ML01.4**	**ML02.1**	**ML02.2**	**ML02.3**	**ML02.4**	**ML03.1**	**ML03.2**	**ML03.3**	**ML03.4**	**ML04.1**	**ML04.2**	**ML04.3**	**ML04.4**
Cheirocratus sundevalli					1		1									
Gammaropsis maculata					1											
Gammaropsis lobata		2	1		9	2		2	5	1						
Leptocheirus hirsutimanus	1	10	16	5	1	7	4		4	5	1		5	2	1	
Leptocheirus pectinatus	3	10	18	6	22	2	9	2	33	35	17	23	1		3	
Microdeutopus versiculatus					1			2	3	1	5	5				
Corophiidae sp. indet.	1															
Crassicorophium bonellii				6	52	21	22	32	28	13	17	73				
Caprella acanthifera												6				
Gnathia sp. juv.										3						
Gnathia sp. indet. (female)					1											
Gnathia vorax					1											
Cymodoce truncata	3		5	4	3	1	1	11	3		4	3				
Janira maculosa					1	1	3	3	1		1	12				
Munna spp.											1	1				
Idotea spp.							2	6	1		2					
Vaunthompsonia cristata	2	1			2		2	1								
Galathea intermedia	7	1		10												
Pisidia longicornis	4			6												
Majidae sp. juv.			1													
Leptochiton asellus			1	1				3								
Lepidochitona cinerea	1		1	3	1	4			1		3					
Acanthochitona crinita								1								
Tectura virginea		1		5		1	2									
Patella pellucida	1	1	1		1		1				1					
Gibbula tumida		1							1							
Gibbula cineraria				2		2		1			1	1				
Rissoa parva		11	4				4	4	5	3	11	8				
Alvania beanii		3	2	1												
Alvania punctura	6	4	1				5	1								

Table 4.4 continued

Taxon	Replicate															
	ML01.1	**ML01.2**	**ML01.3**	**ML01.4**	**ML02.1**	**ML02.2**	**ML02.3**	**ML02.4**	**ML03.1**	**ML03.2**	**ML03.3**	**ML03.4**	**ML04.1**	**ML04.2**	**ML04.3**	**ML04.4**
Onoba semicostata	5	6	2	3	4		7	2	2	8	2	6				
Ceratia proxima							8	5	4	6	20	2				
Euspira nitida													1			
Buccinidae sp. juv.	1															
Nudibranchia sp		1														
Nucula nucleus	1						1									
Crenella decussata						5	13	5	27	23	10	4				
Musculus discors			1	7		1	1	3	1		3					
Musculus subpictus		3		7		2					1	1				
Modiolus sp. juv.	5		2	1	2	1	3	3			1	2	2		2	2
Limaria hians			1									1				
Limatula subauriculata		1			3		1		3	4	3	1	5	2	5	1
Pectinidae sp. juv.	1															
Palliolum tigerinum			1													
Anomiidae spp. Juv.	18	2	32	26	2	13		5	3	1	6	8				
Lucinoma borealis									2			1				
Lasaea adansoni								4	1							
Kellia suborbicularis								1								
Kurtiella bidentata						1				5						
Parvicardium scabrum										2						
Spisula sp. juv.															1	
Spisula elliptica														2		
Ensis magnus		1														
Gari tellinella		1	1				2		3	1		1		2	3	
Abra sp. juv.				2												
Abra alba	1															
Dosinia sp. juv.					1										1	
Dosinia exoleta														1		
Polititapes rhomboides	1		1							1						
Clausinella fasciata															1	

Table 4.4 continued

Taxon	Replicate															
	ML01.1	**ML01.2**	**ML01.3**	**ML01.4**	**ML02.1**	**ML02.2**	**ML02.3**	**ML02.4**	**ML03.1**	**ML03.2**	**ML03.3**	**ML03.4**	**ML04.1**	**ML04.2**	**ML04.3**	**ML04.4**
Timoclea ovata		1	1													
Mya sp. juv.												1				
Hiatella arctica	19	4	7	14	6	3	4	4			2	2				
Thracia sp. juv.									1	1						
Thracia villosiuscula												1		1	1	1
Ophiuroidea spp. Juv.	1	1	4		16	8	13	13	19	8	8	6	1	1		
Ophiothrix fragilis						1										
Ophiocomina nigra						17										
Amphipholis squamata	6	17	19	21	12	1	18		16	26	12	9	6	5	7	2
Ascidiacea sp. juv.	1															

Table 4.5. Community descriptors for the infauna from each of four replicate 10.3 cm diameter cores collected from band transects at four maerl sites. Diversity indices include the Shannon-Wiener function using $\log_e$ (H'_e) and $\log_2$ (H'_2) and Peliou's evenness index (J').

Sample	No. taxa	Abundance	J'	H'_e	H'_2
ML01.1	40	128	0.854	3.151	4.546
ML01.2	46	149	0.895	3.426	4.942
ML01.3	60	241	0.827	3.385	4.883
ML01.4	52	278	0.840	3.319	4.789
ML02.1	52	295	0.809	3.196	4.610
ML02.2	40	211	0.834	3.075	4.437
ML02.3	52	307	0.793	3.133	4.520
ML02.4	48	408	0.750	2.903	4.188
ML03.1	52	282	0.831	3.282	4.735
ML03.2	41	268	0.837	3.110	4.487
ML03.3	46	232	0.869	3.327	4.800
ML03.4	54	325	0.782	3.121	4.502
ML04.1	21	88	0.830	2.527	3.645
ML04.2	19	44	0.898	2.644	3.814
ML04.3	23	119	0.778	2.440	3.521
ML04.4	12	59	0.803	1.995	2.878
ML01B.1	59	217	0.780	3.180	4.588
ML01B.2	39	131	0.861	3.155	4.552
ML01B.3	52	214	0.788	3.114	4.492
ML01B.4	36	194	0.702	2.517	3.631
ML02B.1	28	191	0.719	2.397	3.458
ML02B.2	41	224	0.755	2.804	4.046
ML02B.3	41	143	0.799	2.966	4.280
ML02B.4	52	163	0.835	3.298	4.758
ML03B.1	31	250	0.753	2.584	3.729
ML03B.2	30	151	0.803	2.730	3.938
ML03B.3	52	354	0.751	2.966	4.279
ML03B.4	34	206	0.803	2.833	4.087
ML04B.1	28	170	0.832	2.773	4.000
ML04B.2	28	118	0.849	2.830	4.083
ML04B.3	24	145	0.760	2.414	3.483
ML04B.4	36	194	0.765	2.742	3.956

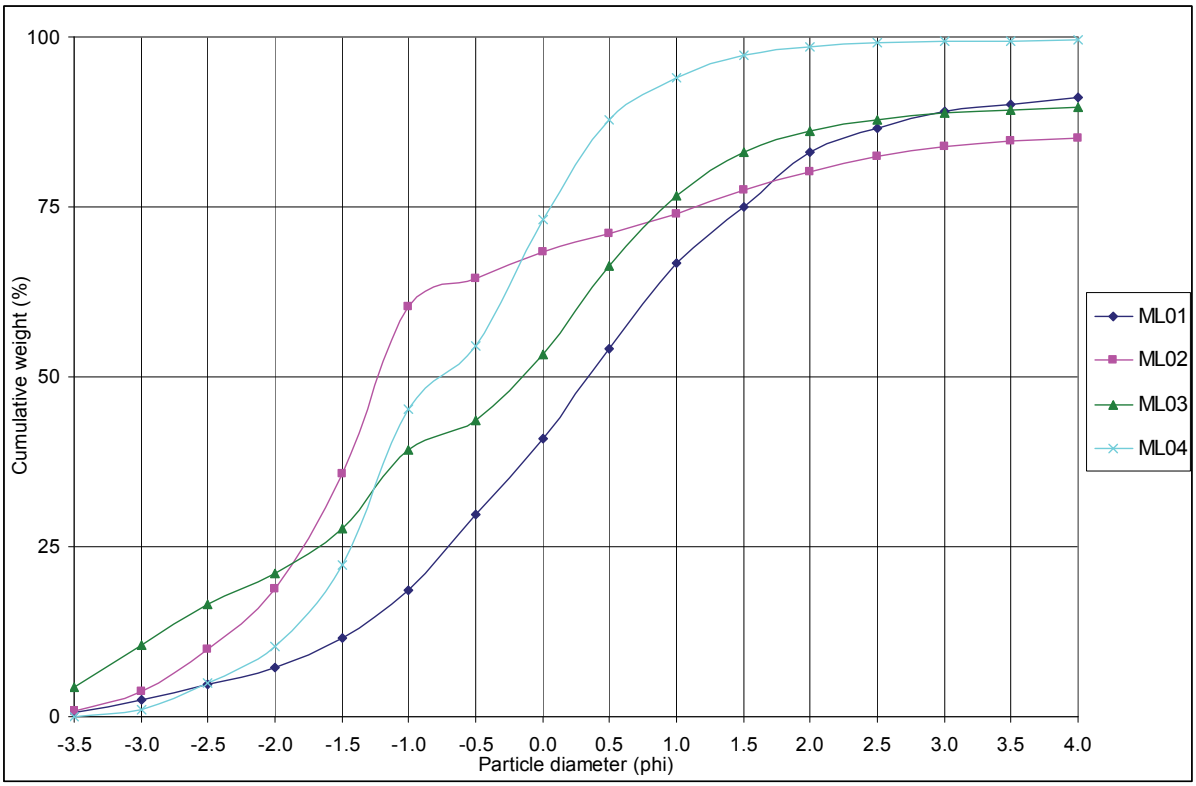
Table 4.6. Percentage of total sediment sample collected by sieves at 0.5 phi interval mesh sizes at four maerl transect sites.

Sieve (phi)	Site			
	ML01	**ML02**	**ML03**	**ML04**
-3.5	0.69	0.75	4.24	0.00
-3.0	1.81	3.03	6.29	0.99
-2.5	2.22	6.12	5.98	3.95
-2.0	2.57	8.94	4.66	5.42
-1.5	4.30	16.83	6.59	11.89
-1.0	6.94	24.73	11.44	22.91
-0.5	11.20	4.02	4.49	9.35
0.0	11.16	3.96	9.59	18.72
0.5	13.25	2.75	12.93	14.57
1.0	12.54	2.92	10.53	6.15
1.5	8.27	3.39	6.24	3.34
2.0	8.20	2.81	3.06	1.26
2.5	3.33	2.14	1.71	0.54
3.0	2.55	1.48	1.09	0.27
3.5	1.14	0.79	0.46	0.11
4.0	0.86	0.57	0.38	0.13
>4.0	8.96	14.78	10.31	0.42

Table 4.7. Particle size characteristics of sediments from four maerl transect sites. $MD_{ø}$ = median grain diameter in phi units, Mdμ = median grain diameter in microns, $QD_{ø}$ = phi quartile deviation.

Site	$MD_{ø}$	$MD_{μ}$	$QD_{ø}$	% silt/clay	% sand	% gravel	% fine sand	% medium sand	% coarse sand
ML01	0.30	812	1.10	8.96	83.75	7.29	7.88	16.47	59.41
ML02	-1.20	2297	1.45	14.78	66.38	18.83	4.98	6.19	55.21
ML03	-0.10	1072	1.30	10.31	68.52	21.17	3.63	9.30	55.58
ML04	-0.80	1741	0.70	0.42	89.23	10.35	1.05	4.59	83.59

Figure 4.1. Particle size analysis of sediment collected at maerl transect sites, showing cumulative weight of sediment retained on sieves at 0.5 phi intervals.



ANNEX 5: MUDFLAT SITE CHECK SURVEY DATA

Table 5.1. Location and physico-chemical data recorded along the mudflat transect at Collastrome on 03 July 2015, with comparative data from the 2004 baseline survey. Transect bearing = 104°T.

Feature	Time (UT)	Distance from peg (m)	Distance from peg 2004 (m)	Latitude	Longitude	Substrate	Moisture	Surface features	Depth of black layer (cm)	Depth of black layer 2004 (cm)
Marker peg		0.0	0.0	57.61786	-7.19313					
bottom of grass bank		6.4	6.4							
bottom of *Pelvetia* zone		8.6	8.6							
bottom of *Fucus* zone		11.3	10.0							
Ascophyllum / zone 1 boundary		16.3	16.3	57.61782	-7.19288					
Station C1 (zone 1)	13:16:07	21.7	21.7	57.61780	-7.19279	soft mud	waterlogged	flat; *Arenicola* casts	<1	0.5
Station C2 (zone 1)	13:54:58	227.0	235.0	57.61750	-7.18939	soft mud	waterlogged	*Arenicola* hummocks	<1	1.0
water's edge			282.0	57.61715	-7.18833	Waterline inaccessible in 2015 but on bearing of c. 220 degrees true from stated fix (see left) on shore				

Table 5.2. Location and physico-chemical data recorded along the mudflat transect at Strom Dearg on 04 July 2015, with comparative data from the 2004 baseline survey. Transect bearing = 31°T.

Feature	Time (UT)	Distance from peg	Distance from peg 2004	Latitude	Longitude	Substrate	Moisture	Surface features	Depth of black layer (cm)	Depth of black layer 2004 (cm)
Marker peg		0.0	0.0	57.59899	-7.17186					
top of grass bank		0.3	0.2							
base of grass bank		1.4	1.4							
bottom of yellow/grey lichens		3.5	3.5							
bottom of *Verrucaria* band		5.0	5.0							
bottom of *Pelvetia* zone		5.5	5.9							
bottom of *Fucus* zone		6.5	6.5							
Ascophyllum / zone 1 boundary		11.9	11.9							
Station SD1 (zone 1)	12:50:34	16.1	16.1	57.59908	-7.17172	soft mud with firm gravel / pebble layer ~10 cm below surface	waterlogged	*Arenicola* hummocks	<1	>10
zone 1 / boulder boundary		23.3	19.0							

Table 5.2 continued

Feature	Time (UT)	Distance from peg	Distance from peg 2004	Latitude	Longitude	Substrate	Moisture	Surface features	Depth of black layer (cm)	Depth of black layer 2004 (cm)
boulder / zone 2 boundary		27.4	24.9							
Station SD2 (zone 2)	13:16:27	31.5	27.9	57.59922	-7.17161	soft mud. >=30 cm deep with firm gravel / pebble layer below surface	waterlogged	*Arenicola* hummocks	<1	<0.5
channel		approx. 66	66.0							

Table 5.3. Biological data and impacts recorded along the mudflat transect at Collastrome in 2015, with temporal comparisons with 2004 baseline survey.

Station	Biota abundance (SACFOR)	Biotope	Anthropogenic impacts 2015	Overall comparison with 2004 records of zone
C1 (zone 1)	Nematoda spp. F, Nemertea sp. C, *Hediste diversicolor* C, *Leitoscoloplos mammosus* C, *Arenicola marina* C, *Manayunkia aestuarina* C, *Tubificoides benedii* F, *Corophium volutator* A	LS.LMu.MEst.HedMac	Wreckage of car in fucoid zone on north shore, midway between stations C1 and C2 (57.61783 N 7.19112 W). Appears very old (>20 years?).	Upper boundary of zone unchanged. Habitat and biota unchanged
C2 (zone 1)	*Eteone longa* C, *Hediste diversicolor* C, *Leitoscoloplos mammosus* A, *Arenicola marina* A, *Ampharete acutifrons* C, *Manayunkia aestuarina* C, *Tubificoides benedii* C, Gammaridae sp. F, *Corophium volutator* F, *Jaera* sp. F, *Crangon crangon* F, *Scrobicularia plana* juv. C	LS.LMu.MEst.HedMac	None apparent	Precise position of lower boundary (water's edge) not fixed in 2015 but similar to 2004. Habitat and biota unchanged

Table 5.4. Biological data and impacts recorded along the mudflat transect at Strome Dearg in 2015, with temporal comparisons with 2004 baseline survey.

Station	Biota abundance (SACFOR)	Biotope	Anthro-pogenic impacts 2015	Overall comparison with 2004 records of zone
SD1 (zone 1)	*Nephtys hombergii* A, *Arenicola marina* C (locally A), *Ampharete acutifrons* A, *Tubificoides benedii* A, *Macoma balthica* C	LS.LMu.MEst.NhomMacStr	None apparent	Upper zone boundary identical, lower boundary differs by 4 m, in part probably due to diffuse nature of boundary and possible error in 2004. Apparent reduction in black layer depth. Otherwise, habitat and biota unchanged, apart from reduction in *Arenicola* density from A to C (locally A)
SD2 (zone 2)	*Exogone naidina* F, *Nephtys hombergii* A, *Arenicola marina* C, *Tubificoides benedi*i C, *Jaera* sp. F, *Crangon crangon* C, *Carcinus maenas* P, *Macoma balthica* C	LS.LMu.MEst.NhomMacStr	None apparent	Upper zone boundary differs by 2.5 m, possibly due to diffuse nature of boundary. Lower boundary (channel) similar in both years. Habitat and biota unchanged

ANNEX 6: REEF SITE CHECK SURVEY DATA

Table 6.1. Date and location data for the four reef transect site check surveys. Transect end positions based on 2004 baseline data.

Site	Date	Latitude start	Long-itude start	Latitude end	Longitude end	Bearing °T	Depth start (m)	Depth end (m)
Cliasay Beg NE	05-06/07/2015	57.62166	-7.14629	57.62165	-7.14514	91	-5.4	
Flodday	08/07/2015	57.61225	-7.11919	57.61258	-7.11869	39	-8.1	14.8
Weaver's Point	07/07/2015	57.60799	-7.10145	57.60751	-7.10133	172	-14.5	24.3
Madadh Beag	09/07/2015	57.60535	-7.09764	57.60467	-7.09833	208	-7.2	26.3
Madadh Mór	07/07/2015	57.59336	-7.09753	57.59371	-7.09822	313	-14.0	20.3

Table 6.2. Site check data form for the reef transect at Cliasay Beg NE. Text in black represents 2004 baseline data confirmed also in 2015, except in cases where red text added, which denotes changed values in 2015. Blue text signifies 2004 data not checked in 2015.

Feature	Tape distance (m)	Depth CD (m)	Substrate	Biogenic features of zone	Biotope
marker - stake	0.0	-5.4			
upper zone 1 boundary	0.7	-5.2			
zone 1			boulders (50%), cobbles (40%) and pebbles (5%) with patches of gravel (2.5%) and grass (2.5%)	yellow, grey and green lichens on tops of boulders	LR.FLR.Lic.YG
zone 1/2 boundary	3.0	-4.8	Indistinct boundary in both years		
zone 2			boulders (50%), cobbles (40%) and pebbles (5%) with patches of gravel (2.5%) and grass (2.5%)	abundant *Verrucaria maura* on cobbles and lower region of boulders	LR.FLR.Lic.Ver.Ver
zone 2/3 boundary	3.0	-4.4			
zone 3			boulders (40%), cobbles (50%), pebbles (8%) and gravel (2%)	*Pelvetia* with sparse *Fucus spiralis*	LR.LLR.F.Pel
zone 3/4 boundary	4.7 5.0	-3.9			
zone 4			boulders (60%), cobbles (35%) and pebbles (5%)	superabundant *Fucus vesiculosus*	LR.LLR.F.Fves
zone 4/5 boundary	5.0 5.5	-3.5			
zone 5			boulders (60%), cobbles (30%), pebbles (5%) and gravel (2%) on muddy shelly sand (3%)	superabundant *Ascophyllum*	LR.HLR.FT.AscT

Table 6.2 continued

Feature	Tape distance (m)	Depth CD (m)	Substrate	Biogenic features of zone	Biotope
zone 5/6 boundary	12.0	-1.5			
zone 6			gradual slope of small silty boulders	Dense *Fucus serratus* with clumps of *Himanthalia*. Lower density *F. serratus* in 2015 (C), but with denser *Ulva* spp. (S - mostly *Enteromorpha* type)	LR.LLR.F.Fserr.FS
zone 6/7 boundary	14.0 13.6	-0.8			
zone 7			gradual slope of small-medium silty boulders	dense forest of cape-form *Laminaria saccharina* with rich ascidian fauna	IR.LIR.K.Lsac.Ft
zone 7/8 boundary	21.0	2.3			
zone 8			plain of muddy sand with areas of pebbles and cobbles	areas of dense *Laminaria saccharina* and *Chorda filum*	SS.SMp.KSwSS.LsacR
zone 8/9 boundary	40.0	-2.8			
zone 9			gentle slope of medium boulders with small muddy patches between boulders	dense forest of cape-form *Laminaria saccharina* with rich ascidian fauna and small patches of *Beggiatoa* on sediment	IR.LIR.K.Lsac.Ft
zone 9/10 boundary	65.0	1.1			
zone 10			gentle slope of medium boulders with small muddy patches between boulders	dense *Fucus serratus*	LR.LLR.F.Fserr.FS
end of transect	70.0	1.7			

Table 6.3. Site check data form for the reef transect at Flodday. Text in black represents 2004 baseline data confirmed also in 2015, except in cases where red text added, which denotes changed values in 2015. Blue text signifies 2004 data not checked in 2015.

Feature	Tape distance (m)	Depth CD (m)	Substrate	Biogenic features of zone	Biotopes
Marker	0.0	-8.1			
zone 1			uneven sloping bedrock	yellow, grey and black lichens	LR.FLR.Lic.YG
zone 1/2 boundary	8.5	-5.8			
zone 2			fissured sloping bedrock	superabundant *Verrucaria maura*	LR.FLR.Lic.Ver.Ver
zone 2/3 boundary	12.0	-4.5			
zone 3			fissured sloping bedrock	abundant *Pelvetia*	LR.LLR.F.Pel
zone 3/4 boundary	13.5	-3.1			
zone 4			fissured sloping bedrock with small vertical faces	abundant *Fucus spiralis* and *Verrucaria mucosa*	LR.LLR.F.Fspi
zone 4/5 boundary	15.5 15.0	-2.2			
zone 5			slightly fissured sloping bedrock	abundant *Fucus vesiculosus*	LR.LLR.F.Fves
zone 5/6 boundary	17.0	-2.1			
zone 6			sloping bedrock with small crevices	superabundant *Fucus serratus*	LR.LLR.F.Fserr.FS, LR.FLR.Rkp.Cor
zone 6/7 boundary	23.5 25.0	-1.6 -1.5			

Table 6.3 continued

Feature	Tape distance (m)	Depth CD (m)	Substrate	Biogenic features of zone	Biotopes
zone 7			irregular bedrock platform with shallow gullies	*Laminaria hyperborea* forest	IR.MIR.KR.Lhyp.Ft
zone 7/8 boundary	49.5 50.5	4.7 8.6			
zone 8			vertical bedrock with overhangs	foliose red and brown algae with *Caryophyllia*	IR.HIR.KFaR.FoR.Dic
zone 8/9 boundary	52.5 52.0	7.7 10.0			
zone 9			vertical bedrock with overhangs giving way to steep bedrock slope. Lower slope in 2015 composed of boulders	*Corynactis* dominated overhangs, with *Caryophyllia* dominant elsewhere	CR.LCR.BrAs.AmenCio
zone 9/10 boundary	59.0	14.0 14.8			
zone 10			muddy shelly sand	*Virgularia* and *Cerianthus* common	SS.SMu.CSaMu.VirOphPmax
end of transect	59.0 60.0	14.0 14.8			

Table 6.4. Site check data form for the reef transect at Weaver's Point. Text in black represents 2004 baseline data confirmed also in 2015, except in cases where red text added, which denotes changed values in 2015. Blue text signifies 2004 data not checked in 2015.

Feature	Tape distance (m)	Depth CD (m)	Substrate	Biogenic features of zone	Biotopes
Marker	0.0	-14.5			
zone 1			steep fissured bedrock slope	yellow and grey lichens with small patches of grass and heather	LR.FLR.Lic.YG
zone 1/2 boundary	9.0 7.5	-8.8			
zone 2			steep bedrock slope with many crevices	superabundant *Verrucaria maura* and abundant *Melarhaphe neritoides*	LR.FLR.Lic.Ver.Ver
zone 2/3 boundary	13.3 13.0	-5.5			
zone 3			steep bedrock slope with many crevices and small pools	*Pelvetia* and barnacles	LR.MLR.BF.PelB
zone 3/4 boundary	15.0 14.5	-4.0			
zone 4			steep bedrock slope with many crevices and small pools	stunted *Fucus vesiculosus* and barnacle mosaic	LR.MLR.BF.FvesB LR.FLR.Rkp.Cor
zone 4/5 boundary	18.8 19.0	-1.2			
zone 5			steep bedrock slope	dense *Laminaria digitata* with cushions of colonial ascidians and sponges	IR.MIR.KR.Ldig.Ldig
zone 5/6 boundary	22.0	-0.8 -0.1			
zone 6			steep bedrock slope	*Laminaria hyperborea* forest with sparse understorey of foliose red and brown algae	IR.MIR.KR.Lhyp.Ft
zone 6/7 boundary	34 36	10.5 13.1			
zone 7			very steep bedrock slope with some vertical faces and overhangs	patchy *Laminaria saccharina* forest with understorey of foliose red and brown algae; cup corals on rock surfaces and dense *Corynactis* on overhangs	IR.LIR.K.Lsac.Ft
zone 7/8 boundary	38.5 41.0	14.3 17.4			

Table 6.4 continued

Feature	Tape distance (m)	Depth CD (m)	Substrate	Biogenic features of zone	Biotopes
zone 8			silty vertical bedrock below which was 2 m wide band of small boulders, then 4 m wide area of muddy sand, then 3 m high ridge of silty bedrock, then slope of silty bedrock	foliose red and brown algae with cup corals and sparse hydroids and *Echinus*	IR.HIR.KFaR.FoR.Dic
zone 8/9 boundary	60.0 52.0	18.8 16.3			
zone 9			silty bedrock slope with small patches of sediment on ledges	dense *Caryophyllia* and coralline crusts and sparse *Swiftia*, axinellid sponges and hydroids	CR.MCR.EcCr.CarSwi.LgAs
zone 9/10 boundary	70.0 68.5	23.9 24.2			
zone 10			muddy shell sand with occasional pebbles and cobbles	*Ophiura albida* and *Cerianthus* with *Alcyonidium diaphanum* and *Caryophyllia* on available hard substrates	SS.SMu.CSaMu.VirOphPmax
end of transect	72.0	23.9 24.3			

Table 6.5. Site check data form for the reef transect at Madadh Beag. Text in black represents 2004 baseline data confirmed also in 2015, except in cases where red text added, which denotes changed values in 2015. Blue text signifies 2004 data not checked in 2015.

Feature	Tape distance (m)	Depth CD (m)	Substrate	Biogenic features of zone	Biotopes
Marker	0.0	-7.2			
additional piton	7.3		Piton missing in 2015		
zone 1/2 boundary	12.2	-4.4			
zone 2			Basalt bedrock blocks with fissures	Barnacle/limpet dominated rock with dense patches of small mussels and *Porphyra* O-F over zone	LR.HLR.MusB.MytB
zone 2/3 boundary	27.8	-1.5	Not checked due to swell	Not checked due to swell	
zone 3			Fissured bedrock	*Laminaria digitata* forest with *Alaria* in upper part of zone and understorey of encrusting coralline algae, barnacles, sponges and encrusting ascidians. Not checked due to swell	IR.HIR.KFaR.Ala.Ldig, IR.MIR.KR.Ldig.Ldig. Not checked due to swell
zone 3/4 boundary	34.3	-1.0			
zone 4			Fissured bedrock	*Laminaria hyperborea* forest of old plants with diverse stipe, understorey and fissure-dwelling species in strong tidal flow. Upper part of forest had more *Palmaria palmata*, *Halichondria panicea*, *Dynamena pumila* and *Flustrellidra hispida* than lower down, where there were more *Corynactis viridis*, *Alcyonidium digitatum* and *Ascidia mentula* and a greater diversity. *Saccharina latissima* and *Saccorhiza polyschides* present mainly in lower 2 m of zone. Lower 4 metres (from 6.9 to 11.2 m depth and from 46 to 52 m along the tape) interpreted as *Saccorhiza* forest in 2015.	IR.MIR.KR.Lhyp.Ft IR.MIR.KR.Lhyp.Ft & IR.HIR.KSed.LsacSac
zone boundary 4/5	57.3 52.0	11.3 11.2			

Table 6.5 continued

Feature	Tape distance (m)	Depth CD (m)	Substrate	Biogenic features of zone	Biotopes
zone 5			Steeply sloping bedrock with ledges, vertical faces, large boulders and fissures below the kelp forest	Park of *Saccharina latissima* with suite of foliose and filamentous brown and red algae just above the circalittoral zone. Cup corals and jewel anemones both common on sloping and vertical surfaces respectively. *Saccorhiza polyschides* park	IR.LIR.K.Lsac.Pk IR.HIR.KSed.LsacSac
zone 5/6 boundary	64.3 57.0	18.0 15.0			
zone 6			Bedrock and boulders	*Swiftia pallida* present and abundant cup corals. Boulders harbouring cryptic species such as *Pawsonia saxicola* and *Pyura squamulosa*	CR.MCR.EcCr.CarSwi. LgAs
zone 6/7 boundary	89.3	28.5	Too deep (>30 m below sea level) for checking in 2015		
zone 7			Muddy shell sand	Sparse fauna including *Virgularia* and *Lanice*	SS.SMu.CSaMu.VirOph Pmax
end of transect	92.3 78.5	28.7 26.3		Muddy sand visible beyond end of tape in 2015	

Table 6.6. Site check data form for the reef transect at Madadh Mór. Text in black represents 2004 baseline data confirmed also in 2015, except in cases where red text added, which denotes changed values in 2015. Blue text signifies 2004 data not checked in 2015.

Feature	Tape distance (m)	Depth below CD (m)	Substrate	Biogenic features of zone	Biotopes
marker - stake	0.0	-14.0			
upper zone 1 boundary	1.0	-13.9			
zone 1			vertical rock cliff	mostly superabundant *Verrucaria maura* but with dense patches of yellow and grey lichens and *Ramalina*	LR.FLR.Lic.Ver.Ver, LR.FLR.Lic.YG
marker - piton	10.5	-4.7			
zone 1/2 boundary	11.0	-4.2			
zone 2			vertical rock cliff	dense barnacles with *Patella* and *Actinia*	LR.HLR.MusB.Sem.Sem
zone 2/3 boundary	14.0	-1.2 -1.4			
zone 3			steep bedrock with vertical faces	*Laminaria hyperborea* forest with narrow upper band of *L. digitata* and dense understorey of anemones	IR.HIR.KFaR.LhypFa, IR.MIR.KR.Ldig.Ldig
lower boundary *L. digitata*	14.5	-0.7 -0.5			
zone 3/4 boundary	18.0 22.0	2.6 7.6			
zone 4			steep bedrock with vertical faces giving way to large and very large boulders	high cover of foliose red algae and abundant *Corynactis* on vertical faces	IR.HIR.KFaR.FoR
zone 4/5 boundary	40.0 42.0	15.8			

Table 6.6 continued

Feature	Tape distance (m)	Depth below CD (m)	Substrate	Biogenic features of zone	Biotopes
zone 5			large to very large boulders giving way to medium to very large boulders (80%) with silty coarse shell sand patches (20%); rock surfaces silty	rock surfaces with dense coralline crusts and *Caryophyllia* and sparse *Swiftia*, *Raspailia* and *Porella*	CR.MCR.EcCr.CarSwi.LgAs
zone 5/6 boundary	65.0 71.0	20.5 20.2			
zone 6			slightly silty shell sand with pebbles	sparse epifauna of hydroids and *Alcyonidium* on pebbles and *Chaetopterus*, *Lanice*, *Pecten* and *Virgularia* on sediment	SS.SMu.CSaMu.VirOphPmax
end of transect	75.0	20.7 20.3			

*Table 6.7. SACFOR abundance data for taxa recorded within zone 7 (**IR.LIR.K.Lsac.Ft**) during the MNCR phase 2 survey along the reef transect at Cliasay Beg NE.*

Taxon	SACFOR
Polymastia penicillus	R
Halichondria sp.	P
Porifera sp. yellow	R
Caryophyllia (Caryophyllia) smithii	F
Parazoanthus sp.?	R
Terebellidae indet.	C
Spirorbinae spp	P
Balanus spp. juv.	P
Carcinus maenas	P
Cancer pagurus	P
Gibbula cineraria	F
Nassarius incrassatus	P
Lacuna vincta	P
Monia patelliformis	C
Alcyonidium diaphanum	P
Alcyonidium sp.	P
Crisia sp.	P
Electra pilosa	P
Scrupocellaria scruposa	R
Membranipora membranacea	R
Henricia sanguinolenta	F
Clavelina lepadiformis	R
Polyclinidae sp. stalked	P
Didemnidae sp.	R
Didemnidae sp. grey	P
Didemnidae sp. white	P
Diplosoma sp.?	R

Taxon	SACFOR
Lissoclinum perforatum?	R
Ascidia mentula	A
Corella parallelogramma	P
Dendrodoa grossularia	C
Botryllus schlosseri	R
Labridae spp.	P
Erythrotrichia carnea	P
Rhodothamniella floridula	P
Corallinaceae indet. pink crusts	O
Cystoclonium purpureum	F
Dilsea carnosa	R
Callophyllis laciniata	R
Kallymenia reniformis	R
Cryptopleura ramosa	R
Phycodrys rubens	P
Dasysiphonia japonica	C
Pterosiphonia parasitica	P
Brongniartella byssoides	P
Ectocarpus sp.	F
Sphacelaria cirrosa	P
Asperococcus fistulosus	P
Desmarestia viridis	R
Chorda filum	C
Saccharina latissima	S
Saccorhiza polyschides	P
Ulva compressa	R
Ulva lactuca	R

*Table 6.8. SACFOR abundance data for taxa recorded within zone 9 (**CR.LCR.BrAs.AmenCio**) during the MNCR phase 2 survey along the reef transect at Flodday.*

Taxon	SACFOR
Porifera sp. yellow encrusting	R
Sycon ciliatum	P
Leucosolenia sp.	P
Cliona celata	R
Myxilla (Myxilla) incrustans	R
Kirchenpaueria pinnata	P
Halecium beanii	P
Nemertesia ramosa	F
Alcyonium digitatum	R
Metridium senile	R
Sagartia elegans	R
Corynactis viridis	P
Caryophyllia (Caryophyllia) smithii	A
Spirobranchus spp.	P
Serpula vermicularis	P
Protula tubularia	P
Terebellidae indet.	P
Arenicola marina	P
Spirorbinae spp.	P
Balanus crenatus	P
Balanus indet.	R
Necora puber	O
Pagurus bernhardus	P
Galathea sp.	P
Calliostoma zizyphinum	P
Gibbula cineraria	F
Nassarius incrassatus	O
Onchidorididae sp.	P
Limacia clavigera?	P
Monia patelliformis	P
Palliolum tigerinum	P
Novocrania anomala	P
Parasmittina trispinosa	R

Taxon	SACFOR
Electra pilosa	R
Asterias rubens	P
Marthasterias glacialis	F
Crossaster papposus	P
Ophiothrix fragilis	R
Ophiuridae sp. juv.	P
Echinus esculentus	C
Pawsonia saxicola	O
Clavelina lepadiformis	P
Ascidia mentula	F
Ascidia virginea	F
Ciona intestinalis	O
Pyura squamulosa	P
Pyura microcosmus	P
Trisopterus minutus?	P
Labrus mixtus	F
Gaidropsarus vulgaris	P
Kallymenia reniformis	R
Bonnemaisonia hamifera	C
Corallinaceae pink crust	A
Callophyllis laciniata	R
Compsothamnion thuyoides	O
Delesseria sanguinea	O
Phycodrys rubens	P
Dasysiphonia japonica	O
Heterosiphonia plumosa	R
Brongniartella byssoides	A
Polysiphonia sp.	P
Pterosiphonia parasitica	P
Ectocarpus sp.	R
Dictyota dichotoma	R
Laminaria hyperborea	P

*Table 6.9. SACFOR abundance data for taxa recorded within zone 9 (**CR.MCR.EcCr.CarSwi.LgAs**) during the MNCR phase 2 survey along the reef transect at Weaver's Point.*

Taxon	**SACFOR**
Porifera sp. yellow encrusting	R
Cliona celata	R
Axinella infundibuliformis	F
Haliclona (Haliclona) urceolus	R
Kirchenpaueria pinnata	P
Nemertesia antennina	A
Nemertesia ramosa	P
Schizotricha frutescens	P
Swiftia pallida	F
Cerianthus lloydii	P
Caryophyllia (Caryophyllia) smithii	A
Chaetopterus variopedatus	P
Serpulidae sp.	P
Balanus balanus	P
Balanus sp. spat	P
Caridea sp.	P
Pagurus bernhardus	O
Macropodia rostrata	P
Tricolia pullus	P
Polycera faeroensis	P
Aequipecten opercularis	O
Crisia sp.	P
Crisidia cornuta	P
Electra pilosa	P

Taxon	**SACFOR**
Alcyonidium diaphanum	C
Parasmittina trispinosa	R
Asterias rubens	F
Marthasterias glacialis	P
Ophiothrix fragilis	R
Echinus esculentus	F
Clavelina lepadiformis	R
Ciona intestinalis?	R
Ascidia mentula	F
Ascidia virginea	O
Styela sp.?	P
Diazona violacea	F
Lissoclinum perforatum?	R
Didemnidae sp.	R
Bonnemaisonia asparagoides	P
Plocamium cartilagineum	R
Callophyllis laciniata	R
Kallymenia reniformis	O
Corallinaceae indet. crusts	C
Delesseria sanguinea	F
Heterosiphonia plumosa	F
Pterosiphonia parasitica	P
Dictyota dichotoma	O
Phaeophyceae indet. crusts	R

*Table 6.10. SACFOR abundance data for taxa recorded within zone 6 (**CR.MCR.EcCr.CarSwi.LgAs**) during the MNCR phase 2 survey along the reef transect at Madadh Beag.*

Taxon	SACFOR
Porifera sp. red encrusting	R
Nemertesia antennina	F
Nemertesia ramosa	P
Kirchenpaueria pinnata?	P
Hydrozoa sp.	P
Alcyonium digitatum	R
Swiftia pallida	O
Sagartia elegans?	P
Corynactis viridis	P
Caryophyllia (Caryophyllia) smithii	A
Chaetopterus variopedatus	P
Spirobranchus spp.	P
Serpula vermicularis	P
Balanus crenatus	P
Balanus indet. spat	R
Calliostoma zizyphinum	P
Polycera faeroensis	P
Crisia aculeata	P
Porella compressa	P
Parasmittina trispinosa	R
Bryozoa crusts indet.	R
Alcyonidium diaphanum	P
Asterias rubens	F
Marthasterias glacialis	P
Ophiuridae sp. juv.	P

Taxon	SACFOR
Echinus esculentus	C
Pawsonia saxicola	O
Clavelina lepadiformis	R
Diazona violacea	P
Ascidia mentula	F
Corella parallelogramma	P
Pyura squamulosa	P
Didemnidae sp.	P
Scyliorhinus sp.	P
Pollachius pollachius	P
Labrus mixtus	C
Ctenolabrus rupestris	P
Conger conger	P
Trisopterus minutus	P
Bonnemaisonia hamifera	R
Corallinaceae pink crust	A
Corallinaceae red crust	R
Kallymenia reniformis	R
Rhodophyllis divaricata	R
Pterothamnion plumula	R
Compsothamnion thuyoides	O
Hypoglossum hypoglossoides	P
Delesseria sanguinea	R
Brongniartella byssoides	O
Rhodophyta red crust	P

*Table 6.11. SACFOR abundance data for taxa recorded within zone 5 (**CR.MCR.EcCr.CarSwi.LgAs**) during the MNCR phase 2 survey along the reef transect at Madadh Mór.*

Taxon	SACFOR	Taxon	SACFOR
Sycon ciliatum?	P	*Luidia ciliaris*	P
Leucosolenia complicata	P	*Henricia oculata*	O
Suberites carnosus	P	*Asterias rubens*	F
Haliclona (Haliclona) urceolus	P	*Marthasterias glacialis*	P
Nemertesia antennina	C	*Ophiothrix fragilis*	P
Nemertesia ramosa	C	*Echinus esculentus*	C
Kirchenpaueria pinnata	P	*Pawsonia saxicola*	O
Aglaophenia tubulifera	P	*Clavelina lepadiformis*	R
Schizotricha frutescens	P	*Ascidia mentula*	F
Alcyonium digitatum	R	*Ascidia virginea*	P
Swiftia pallida	O	*Diazona violacea*	P
Metridium senile	R	Didemnidae indet.	P
Caryophyllia (Caryophyllia) smithii	A	*Ciona intestinalis*	P
Lineus sp.	P	*Pollachius pollachius*	P
Spirobranchus spp.	P	*Labrus mixtus*	P
Protula tubularia	P	Corallinaceae indet. crusts	S
Balanus spp.	R	*Kallymenia reniformis*	R
Balanus balanus	R	*Plocamium cartilagineum*	P
Cancer pagurus	P	*Rhodophyllis divaricata*	P
Gibbula cineraria	O	*Pterothamnion plumula*	P
Calliostoma zizyphinum	P	*Compsothamnion thuyoides*	P
Acanthodoris pilosa	P	*Delesseria sanguinea*	R
Janolus hyalinus?	P	*Phycodrys rubens*	O
Alcyonidium diaphanum	C	*Heterosiphonia plumosa*	O
Crisia sp.	P	*Polysiphonia* sp.	P
Electra pilosa	P	*Brongniartella byssoides*	P
Scrupocellaria scruposa	P	*Pterosiphonia parasitica*	P
Bugulina flabellata	P	Rhodophyta red crust	P
Parasmittina trispinosa	R	*Dictyota dichotoma*	O

Table 6.12. Counts of Swiftia pallida, Axinella infundibuliformis and Porella compressa along 10 band transects of area 20 m^2 at Weaver's Point, Madadh Beag and Madadh Mór on 13 August 2015.

Site	*Swiftia*	*Axinella*	*Porella*	Start depth (m)	End depth (m)
Weaver's Point	18	2	0	21.5	21.1
Weaver's Point	16	2	0	20.1	20.2
Weaver's Point	5	8	1	19.2	19.7
Weaver's Point	20	0	0	19.7	19.7
Weaver's Point	11	1	0	19.7	19.1
Weaver's Point	19	1	0	22.8	22.4
Weaver's Point	13	2	0	23.0	23.2
Weaver's Point	5	4	0	23.2	23.2
Weaver's Point	17	1	0	20.5	20.8
Weaver's Point	40	0	0	20.8	20.7
Madadh Beag	8	0	2	23.9	23.5
Madadh Beag	25	0	0	22.0	21.6
Madadh Beag	1	2	0	19.7	19.1
Madadh Beag	7	0	1	23.1	22.9
Madadh Beag	12	2	1	19.5	20.4
Madadh Beag	2	0	2	24.5	23.3
Madadh Beag	0	0	6	22.4	23.3
Madadh Beag	0	0	4	21.7	20.2
Madadh Beag	0	0	4	20.2	20.9
Madadh Beag	0	0	7	19.8	19.4
Madadh Mór	0	0	5	18.5	18.1
Madadh Mór	0	0	3	18.1	17.8
Madadh Mór	0	0	6	17.0	17.1
Madadh Mór	0	0	7	17.2	17.2
Madadh Mór	0	0	9	17.2	17.3
Madadh Mór	0	0	0	18.3	18.7
Madadh Mór	0	0	0	18.7	18.6
Madadh Mór	0	0	0	16.5	17.7
Madadh Mór	0	0	0	17.7	18.2
Madadh Mór	0	0	1	18.2	18.6

Table 6.13. Counts of Caryophyllia smithii in 20 random 0.0625 m^2 quadrats along a 25 m transect at four sites in Loch Maddy on 14 August 2015, together with depth details.

Quadrat no.	Flodday	Weavers Point	Madadh Beag	Madadh Mór
1	15	39	33	16
2	28	18	63	14
3	23	36	56	3
4	32	35	49	0
5	12	41	52	5
6	25	33	44	25
7	34	45	38	10
8	28	36	41	3
9	21	13	42	3
10	21	26	27	3
11	23	17	41	0
12	37	16	29	28
13	55	27	33	7
14	2	41	55	1
15	10	29	41	12
16	22	30	7	6
17	39	35	76	9
18	17	20	24	2
19	6	21	19	12
20	22	33	22	17
Start depth (m)	14.0	19.0	20.8	16.5
End depth (m)	14.1	18.7	21.8	16.7

ANNEX 7: TIDAL RAPIDS SITE CHECK SURVEY DATA

Table 7.1. Date and location data for the three tidal rapids transect site check surveys. Transect end positions based on 2004 baseline data.

Site	Date	Latitude start	Longitude start	Latitude end	Longitude end	Bearing °T	Depth Start (m)
Sponish	03/07/2015	57.60938	-7.15576	57.60922	-7.15562	155	-5.7
Leiravay	04/07/2015	57.59425	-7.16434	57.59438	-7.16444	337	-7.3
Cliasay Beg N	05/07/2015	57.62184	-7.14642	57.62193	-7.14638	12	-5.7

Table 7.2. Site check data form for the tidal rapids transect at Sponish. Text in black represents 2004 baseline data confirmed also in 2015, except in cases where red text added, which denotes changed values in 2015. Blue text signifies 2004 data not checked in 2015.

Feature	Tape distance (m)	Substrate	Biogenic features of zone	Biotopes
north marker - stake	0.0	Marker peg missing, so replaced		
zone 1		boulders (20%), cobbles (20%), pebbles (5%), gravel (2%), coarse sand (2%) and grass (50%). Bank at top of transect partly collapsed reducing grass cover to c.20%	white and grey lichen dominated rock on grass	LR.FLR.Lic.YG
zone 1/2 boundary	1.1 1.7			
zone 2		bedrock (45%), boulders (5%), cobbles (30%), pebbles (10%), gravel (5%), sand (3%) and grass (2%)	abundant *Verrucaria maura*	LR.FLR.Lic.Ver.Ver
zone 2/3 boundary	4.5 5.4			
zone 3		bedrock, boulders, cobbles, pebbles, gravel and coarse sand with small patches of grass	abundant *Pelvetia* with occasional *Fucus spiralis* at lower fringe of zone	LR.LLR.F.Pel
zone 3/4 boundary	7.9			
zone 4		boulders, cobbles, pebbles, gravel and muddy sand	abundant *Fucus spiralis* with sparse barnacles	LR.LLR.F.Fspi
zone 4/5 boundary	8.5 8.2			
zone 5		boulders, cobbles, pebbles, coarse sand and gravel	dense *Ascophyllum* with hydroids, ascidians and bryozoans	LR.HLR.FT.AscT
zone 5/6 boundary	15.0 15.8			
zone 6		boulders, cobbles, pebbles, shell gravel and very coarse sand	dense *Fucus serratus* with hydroids, ascidians and bryozoans	LR.HLR.FT.FserT
zone 6/7 boundary	20.4 20.5			
zone 7		50% cover of scattered boulders (up to 1 m high) on bed of cobbles, pebbles and shell gravel	*Laminaria hyperborea* forest on boulders with *Lanice* and *Chaetopterus* in sediment	IR.MIR.KR.LhypT.Ft

Table 7.3. Site check data form for the tidal rapids transect at Leiravay. Text in black represents 2004 baseline data confirmed also in 2015, except in cases where red text added, which denotes changed values in 2015. Blue text signifies 2004 data not checked in 2015.

Feature	Tape distance (m)	Substrate	Biogenic features of zone	Biotopes
south marker - stake	0.0			
upper zone 1 boundary	3.1			
zone 1		boulders (20%), cobbles (20%) and pebbles (1%) on grass (59%)	yellow and grey lichens on boulders and cobbles on grass	LR.FLR.Lic.YG
zone 1/2 boundary	4.8 4.7			
zone 2		boulders (30%), cobbles (50%), pebbles (15%) and gravel (5%) on sand	abundant *Verrucaria maura* on boulders and cobbles	LR.FLR.Lic.Ver.Ver
zone 2/3 boundary	6.1 6.0			
zone 3		boulders (30%), cobbles (60%), pebbles (5%) and gravel (5%)	*Pelvetia* zone	LR.LLR.F.Pel
zone 3/4 boundary	6.8 7.1			
zone 4		boulders (60%), cobbles (25%), pebbles (10%) and gravel (5%)	mixed *Fucus vesiculosus* and *F. spiralis*	LR.LLR.F.Fves
zone 4/5 boundary	8.5			
zone 5		large boulders (90%), cobbles (5%) and fine sand (5%)	superabundant *Ascophyllum*	LR.HLR.FT.AscT
zone 5/6 boundary	15.8 15.7			
zone 6		bedrock and boulders on shelly sand	superabundant *Fucus serratus*	LR.LLR.F.Fserr
zone 6/7 boundary	17.4 17.8			
zone 7		medium boulders with very small patches of coarse shelly sand	dense forest of mixed kelps, with *Laminaria digitata* dominant; rocks with bryozoan turf and crusts, coralline crusts, hydroids, barnacles and small solitary ascidians and sparse foliose red algae	IR.MIR.KT.LdigT

Table 7.4. Site check data form for the tidal rapids transect at Cliasay Beg N. Text in black represents 2004 baseline data confirmed also in 2015, except in cases where red text added, which denotes changed values in 2015. Blue text signifies 2004 data not checked in 2015.

Feature	Tape distance (m)	Substrate	Biogenic features of zone	Biotopes
south marker - stake	0.0			
zone 1		boulders (85%), cobbles (5%) and grass (10%)	yellow and grey lichens on upper surfaces of boulders, *Verrucaria maura* on lower surfaces	LR.FLR.Lic.YG, LR.FLR.Lic.Ver.Ver
zone 1/2 boundary	2.3			
zone 2		boulders (90%), cobbles (10%)	superabundant *Verrucaria maura* with small amounts of yellow and grey lichens on boulder tops	LR.FLR.Lic.Ver.Ver
zone 2/3 boundary	3.2			
zone 3		boulders (85%), cobbles (15%)	*Pelvetia* zone	LR.LLR.F.Pel
zone 3/4 boundary	3.7			
zone 4		boulders (90%), cobbles (9%), pebbles (1%)	dense *Fucus vesiculosus* with sparse *F. spiralis*	LR.LLR.F.Fves
zone 4/5 boundary	5.0 4.7			
zone 5		boulders (85%), cobbles (10%), pebbles (5%)	superabundant *Ascophyllum* with *Dendrodoa*	LR.HLR.FT.AscT
zone 5/6 boundary	10.0 9.5			
zone 6		boulders (75%), cobbles (25%)	abundant *Fucus serratus* with rich cushion of ascidians, bryozoans and sponges	LR.HLR.FT.FserT
zone 6/7 boundary	11.5 11.9			
zone 7		large boulders with small sand patches at the channel margins with small boulders and 30-40% coarse sand and shell gravel in the centre of the channel	*Laminaria hyperborea* forest with rich associated fauna; *L. digitata* also abundant at southern edge of channel and *L. saccharina* also common in lower current flows towards north end of transect	IR.MIR.KR.LhypT.Ft

*Table 7.5. SACFOR abundance data for taxa recorded within zone 6 (**LR.HLR.FT.FserT**) during the MNCR phase 2 survey along the tidal rapids transect at Sponish.*

Taxon	SACFOR
Sycon ciliatum	P
Grantia compressa	P
Leucosolenia sp.	R
Halichondria (Halichondria) panicea	R
Dynamena pumila	A
Caryophyllia (Caryophyllia) smithii	F
Aphroditidae sp.	P
Nereididae sp.	P
Terebellidae indet.	P
Spirobranchus spp.	P
Spirorbis spp.	C
Semibalanus balanoides	C
Cancer pagurus	P
Carcinus maenas	P
Polyplacophora spp.	P
Doris pseudoargus?	P
Gibbula cineraria	F
Calliostoma zizyphinum	O
Patella vulgata	F
Littorina fabalis/obtusata	P
Littorina obtusata	P
Rissoidae sp.	P
Nucella lapillus	C
Mytilus edulis	R
Hiatella arctica	R
Anomiidae spp.	P
Bryozoa sp.	P
Alcyonidium gelatinosum	P
Alcyonidium hirsutum	P
Amathia sp.	P
Electra pilosa	R
Cradoscrupocellaria reptans	R
Oshurkovia littoralis	P

Taxon	SACFOR
Asterias rubens	F
Polyclinidae sp. orange	P
Polyclinidae sp. white	P
Dendrodoa grossularia	P
Ascidia mentula?	P
Botrylloides leachii	R
Rhodochorton sp.	R
Bonnemaisonia hamifera	R
Lithothamnion sp.	R
Hildenbrandia spp.	P
Chondrus crispus	P
Mastocarpus stellatus	R
Cystoclonium purpureum	R
Lomentaria articulata	P
Plumaria plumosa	R
Membranoptera alata	P
Cryptopleura ramosa	O
Phycodrys rubens	R
Pterosiphonia parasitica	P
Brongniartella byssoides	R
Pylaiella littoralis	R
Sphacelaria cirrosa	R
Cladostephus spongiosus	P
Laminaria digitata	P
Fucus serratus	S
Fucus vesiculosus	R
Ascophyllum nodosum	R
Himanthalia elongata	P
Ulva spp. *Enteromorpha* type	A
Ulva prolifera	P
Ulva lactuca	O
Cladophora rupestris	C
Cladophora sericea	P

*Table 7.6. SACFOR abundance data for taxa recorded within zone 5 (**LR.HLR.FT.AscT**) during the MNCR phase 2 survey along the tidal rapids transect at Leiravay.*

Taxon	SACFOR
Sycon ciliatum	P
Grantia compressa	C
Halichondria (Halichondria) panicea	P
Hymeniacidon perlevis	R
Clava multicornis	A
Dynamena pumila	C
Arenicola marina	P
Spirobranchus triqueter	P
Sipuncula sp.	P
Balanus crenatus	P
Semibalanus balanoides	F
Gammaridea indet.	P
Carcinus maenas	P
Patella vulgata	F
Gibbula cineraria	P
Littorina obtusata	F
Nucella lapillus	C
Mytilus edulis	P
Hiatella arctica	P
Amathia sp.	P
Oshurkovia littoralis	P
Alcyonidium gelatinosum	P

Taxon	SACFOR
Alcyonidium hirsutum	C
Polyclinidae sp. orange	P
Dendrodoa grossularia	A
Gelidium pusillum	O
Chondrus crispus	R
Lomentaria articulata	O
Cystoclonium purpureum	P
Aglaothamnion sp.	P
Callithamnieae sp.	R
Ceramium spp.	R
Plumaria plumosa	P
Membranoptera alata	R
Phycodrys rubens	R
Vertebrata lanosa	O
Polysiphonia sp.	R
Pylaiella littoralis	R
Ascophyllum nodosum	S
Fucus vesiculosus	R
Ulva lactuca	R
Ulva compressa	O
Cladophora rupestris	C
Bryopsis plumosa	P

*Table 7.7. SACFOR abundance data for taxa recorded within zone 6 (**LR.HLR.FT.FserT**) during the MNCR phase 2 survey along the tidal rapids transect at Cliasay Beg N.*

Taxon	SACFOR
Grantia sp.	P
Leucosolenia sp.	P
Halichondria (Halichondria) panicea	R
Nereididae sp.	P
Spirorbinae spp.	A
Semibalanus balanoides	O
Gammaridea sp.	P
Carcinus maenas	C
Nudibranchia sp.	P
Patella vulgata	P
Gibbula cineraria	A
Calliostoma zizyphinum	P
Littorina fabalis/obtusata	F
Littorina obtusata	F
Nucella lapillus	C
Nassarius incrassatus	P
Alcyonidium diaphanum	P
Alcyonidium gelatinosum	P
Alcyonidium hirsutum	P
Electra pilosa	P
Bryozoa sp. red encrusting	P

Taxon	SACFOR
Polyclinidae sp.	P
Didemnidae sp.	P
Ascidia mentula	A
Dendrodoa grossularia	C
Pyura squamulosa	P
Corallinaceae indet. pink crust	R
Chondrus crispus	R
Mastocarpus stellatus	R
Lomentaria articulata	O
Plumaria plumosa	P
Membranoptera alata	P
Ectocarpus sp.	P
Elachista fucicola	P
Fucus serratus	A
Laminaria sp. juv.	P
Ulva prolifera	A
Ulva lactuca	R
Acrosiphonia arcta	P
Cladophora rupestris	C
Cladophora sericea	P

ANNEX 8: LOG OF SPECIMENS COLLECTED

Table 8.1. Specimen reference collection from the SCM surveys. All taxon names follow the nomenclature of WoRMS (2015). Material deposited in the National Museums of Scotland (NMS).

Specimen	Sample
Virgularia mirabilis	S16
Cerianthus lloydii	S25
Edwardsia claparedii	S10
Caryophyllia smithii	S18
PLATYHELMINTHES	S18
Tubulanus polymorphus	S8
Cerebratulus	S27
SIPUNCULA sp. juv.	S22
Golfingia elongata	S25
Golfingia margaritacea	ML01.1
Golfingia vulgaris	ML01.2
Thysanocardia procera	S23
Phascolion strombus	S23
Pisione remota	S13
Aphrodita aculeata juv.	S18
Polynoidae sp. juv.	S8
Polynoidae sp. indet.	S10
Gattyana cirrhosa	S29
Harmothoe antilopes	S17
Harmothoe imbricata	S20
Malmgreniella mcintoshi	ML03.1
Harmothoe glabra	S27
Malmgreniella arenicolae	S27
Pholoe inornata	S9
Pholoe baltica	S28
Pseudomystides limbata	S13
Phyllodoce mucosa	S8
Phyllodoce rosea	S27
Eulalia mustela	S18
Eumida bahusiensis	S27
Eumida sanguinea	S27
Nereiphylla lutea	S20
Paranaitis kosteriensis	S27
Glycera alba	S8
Glycera fallax	S8
Glycera lapidum	S13
Glycinde nordmanni	S28
Goniada maculata	S27
Goniadella gracilis	S12
Sphaerodorum gracilis	S20
Podarkeopsis capensis	S18
Hesiospina aurantiaca	ML03.2
Psamathe fusca	S8
Oxydromus flexuosus	S29

Specimen	Sample
Eurysyllis tuberculata	S22
Syllis columbretensis	ML01.3
Trypanosyllis coeliaca	S22
Syllis parapari	S22
Syllis mauretanica	S13
Odontosyllis ctenostoma	ML03.3
Odontosyllis fulgurans	S18
Syllides benedicti	S18
Parexogone hebes	S8
Exogone naidina	S10
Exogone verugera	S18
Sphaerosyllis bulbosa	S22
Sphaerosyllis taylori	S8
Autolytinae	S24
Nereis zonata	S25
Platynereis dumerilii	ML01.3
Nephtyidae sp. juv.	S8
Nephtys hombergii	S10
Nephtys kersivalensis	S8
Nephtys incisa	S23
Aponuphis bilineata	S13
Nothria sp.	S18
Lysidice unicornis	S18
Lumbrineridae spp juv	S26
Lumbrineris cingulata/aniara	S16
Abyssoninoe hibernica	S23
Notocirrus scoticus	S17
Ophryotrocha sp.	S12
Parougia eliasoni	S26
Protodorvillea kefersteini	S13
Schistomeringos neglecta	ML01.3
Leitoscoloplos mammosus	S10
Scoloplos armiger	S8
Aricidea minuta	S8
Levinsenia gracilis	S16
Paradoneis lyra	S16
Poecilochaetus serpens	S22
Aonides oxycephala	S8
Aonides paucibranchiata	S13
Laonice bahusiensis	S16
Malacoceros vulgaris	S13
Dipolydora coeca	ML01.2
Dipolydora caulleryi	S20
Dipolydora quadrilobata	S8

Table 8.1 continued

Specimen	Sample
Prionospio fallax	S29
Aurospio banyulensis	S27
Prionospio cirrifera	S8
Prionospio cf. multibranchiata	S28
Pseudopolydora cf. paucibranchiata	S13
Pseudopolydora pulchra	S8
Scolelepis (P) tridentata	S13
Spio decorata	S13
Spio filicornis	S8
Spiophanes kroyeri	S23
Magelona sp. indet.	S17
Magelona alleni	S25
Magelona minuta	S28
Spiochaetopterus typicus	S25
Caulleriella alata	S8
Chaetozone setosa	S26
Chaetozone vivipara	S12
Chaetozone zetlandica	S20
Chaetozone sp. D	S27
Cirratulus caudatus	S28
Aphelochaeta marioni	S8
Tharyx killariensis	S8
Monticellina sp.	S23
Diplocirrus glaucus	S23
Flabelligera affinis	ML01.4
Macrochaeta clavicornis	ML01.3
Dasybranchus sp.	S17
Mediomastus fragilis	S8
Notomastus	S8
Arenicola marina juv.	S30
Maldanidae sp. juv.	S28
Clymenura sp.	S28
Euclymene droebachiensis	ML03.2
Euclymene oerstedi	S18
Praxillella affinis	S23
Rhodine sp.	S17
Ophelina acuminata	S10
Polyophthalmus pictus	ML01.4
Scalibregma inflatum	S16
Scalibregma celticum	S8
Polygordius sp. indet.	S11
Owenia borealis	S8
Galathowenia oculata	S8
Pectinariidae sp. indet.	S28
Amphictene auricoma	S26
Lagis koreni	S29
Pectinaria belgica	S23

Specimen	Sample
Melinna palmata	S10
Ampharete falcata	S18
Ampharete lindstroemi agg.	S8
Amphicteis gunneri	S28
Ampharete octocirrata	S25
Sosane sulcata	S25
Terebellides stroemii	S10
Trichobranchus glacialis	ML02.2
Amphitritides gracilis	S27
Lanice conchilega	S16
Eupolymnia nesidensis	ML02.1
Phisidea aurea	S20
Pista malmgreni	S8
Lysilla loveni	S17
Polycirrus	S23
Chone duneri	S27
Paradialychone filicaudata	S18
Euchone rubrocincta	S15
Euchone southerni	S22
Jasmineira caudata	S26
Laonome kroyeri	S8
Sabella discifera	ML01.3
Serpulidae sp indet	S20
Hydroides elegans	S20
Pomatoceros lamarcki	S20
Pomatoceros triqueter	ML01.3
Tubificidae sp.	S8
Tubificoides benedii	S8
Anoplodactylus petiolatus	S18
OSTRACODA	S8
Nebalia bipes	S22
Apherusa bispinosa	S13
Monoculodes carinatus	S8
Perioculodes longimanus	S12
Synchelidium maculatum	S27
Amphilochoides serratipes	S15
Peltocoxa brevirostris	S20
Leucothoe incisa	S13
Talitrus saltator	S11
Urothoe elegans	S8
Urothoe marina	S13
Harpinia antennaria	S8
Harpinia crenulata	S8
Harpinia laevis	S9
Harpinia pectinata	S8
Metaphoxus fultoni	S8
Hippomedon denticulatus	S22

Table 8.1 continued

Specimen	Sample
Lysianassa ceratina	ML01.1
Lysianassa plumosa	S22
Orchomene humilis	ML01.3
Socarnes erythrophthalmus	ML01.1
Tmetonyx similis	S8
Tryphosella horingi	S20
Lilljeborgia pallida	ML02.1
Atylus vedlomensis	S8
Dexamine spinosa	ML01.3
Guernea coalita	S13
Ampelisca brevicornis	S8
Ampelisca diadema	S8
Ampelisca tenuicornis	S8
Ampelisca typica	S8
Animoceradocus semiserratus	S20
Cheirocratus sp indet (female)	S8
Cheirocratus intermedius	S26
Cheirocratus sundevalli	S8
Melita hergensis	S23
Gammaropsis maculata	ML02.1
Gammaropsis lobata	ML01.2
Gammaropsis cornuta	S8
Photis longicaudata	S10
Aoridae sp. indet. (female)	S11
Leptocheirus hirsutimanus	S8
Leptocheirus pectinatus	S8
Microdeutopus anomalus	S30
Microdeutopus versiculatus	S8
Corophiidae sp. indet.	S18
Crassicorophium bonellii	S30
Caprella acanthifera	ML03.4
Pariambus typicus	S10
Phtisica marina	S8
Gnathia sp. female	S22
Gnathia sp. juv.	ML03.2
Gnathia oxyuraea	S18
Gnathia vorax	ML02.1
Cymodoce truncata	ML01.1
Janira maculosa	ML02.1
Munna sp.	ML03.3
Idotea sp.	ML02.3
Idotea chelipes	S10
Astacilla dilatata	S15
Tanaopsis graciloides	S8
Vaunthompsonia cristata	ML01.1
Bodotria arenosa	S13
Eudorella emarginata	S10
Pseudocuma longicorne	S12

Specimen	Sample
Diastylis rugosa	S8
Galathea intermedia	S27
Pisidia longicornis	ML01.1
Majidae sp. juv.	S20
Atelecyclus rotundatus	S18
Scutopus ventrolineatus	S17
Chaetoderma nitidulum	S28
Leptochiton asellus	S22
Lepidochitona cinerea	S20
Acanthochitona crinita	ML02.4
Tectura virginea	S20
Patella pellucida	ML01.1
Gibbula tumida	ML01.2
Gibbula cineraria	ML01.4
Rissoa parva	ML01.2
Alvania beanii	ML01.2
Alvania punctura	ML01.1
Onoba semicostata	S13
Ceratia proxima	S11
Turritella communis	S23
Chrysallida decussata	S22
Odostomia eulimoides	S23
Euspira nitida	S28
Buccinidae sp. juv.	ML01.1
Cylichna cylindracea	S23
Philine	S11
Retusa obtusa	S10
NUDIBRANCHIA	S26
Nucula sp. juv.	S25
Nucula nitidosa	S16
Nucula nucleus	ML01.1
Nucula sulcata	S23
Yoldiella phillippiana	S17
Crenella decussata	S25
Musculus discors	ML01.3
Musculus subpictus	S26
Modiolus sp. juv.	S22
Limaria hians	S25
Limatula subauriculata	ML02.1
Pectinidae sp. juv.	ML01.1
Palliolum tigerinum	ML01.3
Anomiidae sp. juv.	S24
Lucinoma borealis	S8
Myrtea spinifera	S23
Thyasira sp. juv.	S16
Thyasira flexuosa	S8
Lasaea adansoni	ML02.4
Kellia suborbicularis	ML02.4

Table 8.1 continued

Specimen	Sample
Kurtiella bidentata	S11
Acanthocardia sp. juv.	S10
Parvicardium scabrum	S8
Spisula elliptica	S13
Spisula subtruncata	S16
Lutraria lutraria	S25
Ensis sp. juv.	S10
Ensis sp. indet.	S13
Ensis magnus	S13
Phaxas pellucidus	S9
Tellina fabula	S9
Moerella donacina	S13
Gari tellinella	S13
Abrasp juv.	S10
Abra alba	S8
Abra nitida	S29
Abra prismatica	S8
Arctica islandica juv.	S24
Veneridae sp. juv.	S20
Dosinia sp. juv.	S10
Dosinia exoleta	S13
Polititapes rhomboides	S8
Chamelea striatula	S10
Clausinella fasciata	S8
Timoclea ovata	S13
Mysia undata	S16

Specimen	Sample
Mya sp. juv.	S13
Corbula gibba	S29
Hiatella arctica	S20
Lyonsia norwegica	S25
Thracia sp. juv.	S13
Thracia convexa	S23
Thracia villosiuscula	S15
Phoronis	S17
ASTEROIDEA sp. juv.	S22
OPHIUROIDEA sp. juv.	S8
Ophiothrix fragilis	ML02.2
Ophiocomina nigra	S11
Amphiura chiajei	S23
Amphiura filiformis	S23
Amphipholis squamata	S8
Ophiura albida	S30
Echinocyamus pusillus	S25
Leptopentacta elongata	S15
Leptosynapta bergensis	S11
Labidoplax digitata	S28
Labidoplax media	S11
ENTEROPNEUSTA	S17
ASCIDIACEA sp. juv.	S8
Chaetognathia sp.	S8
Sepietta sp. sp ¶ ¶ Acanthocardia sp juv↕	S12

ANNEX 9: SITE ATTRIBUTE TABLES

Table 9.1. Site attribute table for the subtidal sandbanks feature for the Loch nam Madadh SAC, with the results of the 2015 site condition monitoring survey.

Attribute	Target	Method	Result
Extent	No reduction in extent of the inshore sublittoral sediment habitat allowing for natural succession or known cyclical change.	At six year intervals review activities and events with the potential to reduce extent of feature such as land reclamation, shoreline development and dredging operations. At six year intervals survey the extent of the feature by point sampling mapping techniques such as grab sampling or video survey. At 18 year intervals confirm the results of point station survey by acoustic survey.	No human activities identified likely to have influenced the extent of the feature. The 2015 point site video survey of 73 stations recorded sedimentary biotopes at all sites where they were found in 2004. There is no evidence for a temporal change in the extent of the feature.
Topography	No change in topography of the sediment allowing for natural responses to hydrodynamic regime.	At six year intervals review activities and events with the potential to modify the topography such as land reclamation, shoreline development, dredging operations and land use. At six year intervals assess change in topography by recording depth at grab and video survey sample stations and along representative bathymetric transects. At 18 year intervals perform acoustic bathymetric survey throughout the area.	No activities or events are known to have occurred since the last monitoring exercise that are likely to have caused changes in the topography of the sediment. Allowing for positional differences and potential errors introduced by the poor understanding of tidal behaviour in Loch Maddy, no significant temporal variation in topography was identified.

Attribute	Target	Method	Result
Distribution and spatial pattern of biotopes	Maintain the distribution and/or spatial arrangement of biotopes allowing for natural succession/known cyclical change. The following biotopes (and corresponding sub-biotopes) should be recorded where they were found during the baseline video and rocky reef/sediment transect surveys: **SS.SCS.ICS**, **SS.SSa.IMuSa**, **SS.SSa.CMuSa**, **SS.SMu.CSaMu.VirOphPmax**, **SS.SMu.IFiMu**, **SS.SMu.CFiMu.SpnMeg**, **SS.SMp.Mrl.Pcal**, **SS.SMp.Mrl.Pcal.R**, **SS.SMp.KSwSS**, **SS.SMx.CMx**	At six year intervals assess biotope distribution by point station survey and at transect sites where previously recorded.	The only confirmed examples of temporal biotope change occurred at five of the point sample stations, caused by reductions in algal cover, increase in stone density and the development of a burrowing megafaunal community. These changes are not considered to represent an indication of unfavourable condition of the attribute.
Sediment character: sediment type	No change in composition of sediment types across the feature allowing for natural succession/known cyclical change. Assess change in terms of percentage silt/clay, fine sand, medium sand, coarse sand and gravel. Percentage as defined in Hiscock (1996) should not deviate from baseline by +/- 10% at each station. (Hiscock K. 1996. Marine Nature Conservation Review: Rationale and Methods. Peterborough: JNCC).	At six year intervals perform particle size analysis at sites representing the range of sediment types identified. At six year intervals review activities and events with the potential to modify sediment type such as shoreline development, dredging operations and land use.	No anthropogenic activities or events were identified with the potential to modify sediment type. Changes in sediment size fractions exceeding 10% occurred at most sites; however, these changes could be explained by natural temporal or localised spatial variation in sediment composition, as well as locational differences in the case of some sites. There is no indication of deterioration in the condition of the feature resulting from recorded changes in sediment composition.
Extent of sub-feature or representative/ notable biotopes	No reduction in extent of the inshore sublittoral sediment biotopes identified for the site (**SS.SMp.Mrl.Pcal**, **SS.SMp.Mrl.Pcal.R**) allowing for natural succession/ known cyclical change.	At six year intervals assess the extent of the following biotopes by point station survey.	There was no reduction in the frequency of survey sites supporting the maerl biotopes **SS.SMp.Mrl.Pcal** and **SS.SMp.Mrl.Pcal.R**. Based on the very limited data available, there is no evidence to suggest that a temporal decrease in the extent of maerl biotopes has occurred.

Attribute	Target	Method	Result
Species composition of representative or notable biotopes	No decline in biotope quality due to change in species composition or reduction in species richness allowing for natural succession/ known cyclical change.	At six year intervals assess species richness and composition at representative sites of the inshore sediment biotopes of which 4 should be maerl.	The infaunal grab survey of representative sediment biotopes revealed no temporal changes in species richness or composition that could be considered indicative of deterioration of the habitat. A reduction in infaunal taxon richness at one maerl site possibly resulted from the smaller sample size in the 2015 survey. No corresponding decrease in epibiotic taxon richness was present. The invasive alga *Dasysiphonia japonica*, was recorded at three of the maerl sites, but not at a density that could be said to be modifying the community structure.
Species population measures: -Population structure of a species -Presence or abundance of specified species	At the four maerl monitoring sites the following species of maerl should be recorded where they were found during the baseline survey: *Phymatolithon calcareum*, *Lithothamnion glaciale*. At the four maerl monitoring sites there should be no decrease in the density of live maerl.	At six year intervals the presence of selected maerl species and live maerl cover should be determined by diver transect survey at the four maerl monitoring sites.	Both maerl species, *Phymatolithon calcareum* and *Lithothamnion glaciale*, were recorded at the sites where they were found in 2004. Similar live maerl densities were recorded at three of the four sites in both survey years. A reduction at the fourth site is considered to possibly reflect a locational difference.

Table 9.2. Site attribute table for the mudflats and sandflats feature for the Loch nam Madadh SAC, with the results of the 2015 site check survey.

Attribute	Target	Method	Result
Extent	No decrease in extent of littoral sediment.	At 6 year intervals review activities and events with the potential to reduce extent of feature such as land reclamation and shoreline redevelopment. Evaluate fixed-position shore transect profiles at 6 year intervals for local changes in extent. At 12 year intervals confirm that there has been no change in overall littoral extent (e.g. by siltation or erosion) with aerial photography.	No activities or events were identified which appear to be influencing the extent of the sediment flat feature. No reduction in the extent of mudflat habitat was recorded along the relocatable transects.
Biotope composition of littoral sediment	Maintain the variety of biotopes identified for the site, allowing for natural succession/ known cyclical change. The following biotopes will be found within the SAC: **LS.LMu.MEst.HedMac** **LS.LMu.MEst.NhomMacStr**	Visual survey, dig-over of 1 m^2 area and core sampling at fixed stations along relocatable transect lines carried out every 6 years	**LS.LMu.MEst.HedMac** and **LS.LMu.MEst.NhomMacStr** were still present in the SAC in 2015.
Sediment character: sediment type	No change in composition of sediment type across the feature, allowing for natural succession/known cyclical change.	Core samples to a sediment depth of c. 20 cm at each of 4 stations will be taken every 6 years. Percentage of silt/clay and sand as defined in Hiscock (1996) should not deviate by +/- 10% at each station. Hiscock, K. 1996. *Marine Nature Conservation Review: Rationale and Methods.* Peterborough: JNCC.	Particle size analysis of the sediments was not included in the reduced protocol for site check surveying. Visually, there was a high degree of similarity in the sediments observed at all stations in both survey years.

Attribute	Target	Method	Result
Distribution of biotopes	Maintain the distribution of biotopes, allowing for natural succession/ known cyclical change. The following biotopes will be found at the indicated relocated transects: Strom Dearg - **LS.LMu.MEst.NhomMacStr** Collastrome - **LS.LMu.MEst.HedMac**	Visual survey, dig-over of $1m^2$ area and core sampling at fixed stations along relocatable transect lines carried out every 6 years.	As in 2004 **LS.LMu.MEst.HedMac** was still present along the transect at Collastrome in 2015 and **LS.LMu.MEst.NhomMacStr** at Strom Dearg.
*Species composition of representative or notable biotopes	No decline in biotope quality due to changes in species composition or loss of notable species, allowing for natural succession/known cyclical change.	Change in species composition and diversity to be assessed by visual survey, dig-over of $1m^2$ area and replicated core sampling at the fixed stations SD2 and C2 every 6 years.	The level of sampling intensity employed in the site check survey was insufficient to permit detailed assessment of change in biotope quality due to changes in species composition, although the data acquired indicate that faunal composition is similar in both years. It is possible that the population of *Arenicola marina* at one of the stations at Strom Dearg has undergone a slight temporal reduction in density.
*Topography	No change in topography of the littoral sediment, allowing for natural responses to hydrodynamic regime.	Marked changes in topography to be identified by reprofiling along the transects at Strom Dearg and Collastrome every 6 years. Activities and events with the potential to modify profiles to be reviewed every 6 years.	No activities or events have been identified which appear to be influencing the topography of the sediment flat feature. No reprofiling of transects was carried out in 2015, but there is no suggestion from visual observations along the transects that significant temporal change in topography has occurred.

Table 9.3. Site attribute table for the reefs feature for the Loch nam Madadh SAC, with the results of the 2015 site check survey.

Attribute	Target	Method	Result
Extent	No change in extent of littoral rock and inshore sublittoral rock	At 6 year intervals review activities and events with the potential to reduce extent of feature such as land reclamation and shoreline development. At 6 year intervals assess the extent of littoral and sublittoral rock along the fixed transects of the baseline survey.	No activities or events identified which appear to be influencing the extent of the reefs feature. Reef/sediment boundary at the lower end of the reef transects varied by up to 6 m but considered to be due to variation in the route of the transect line.
Biotope composition of the littoral rock and inshore sublittoral rock	Maintain the variety of biotopes identified for the site, allowing for natural succession or known cyclical change.	At 6 year intervals assess the continued existence of reef biotopes recorded along the fixed transects of the baseline survey.	All biotopes recorded in 2004 were also present in 2015.
Distribution of biotopes. Spatial arrangement of biotopes at specified locations	Maintain the distribution and/or spatial arrangement of biotopes, allowing for natural succession/known cyclical change	At 6 year intervals confirm the geographic distribution of reef biotopes along the fixed transects of the baseline survey.	At Madadh Beag changes in dominance of the kelp species caused the recognition in 2015 of a zone of **IR.HIR.KSed.LsacSac** spanning the lower region of the *Laminaria hyperborea* forest (**IR.MIR.KR.Lhyp.Ft**) recorded in both years, and a park of *Saccharina latissima* (**IR.LIR.K.Lsac.Pk**) recorded in 2004. This biotope shift is considered to represent a natural temporal process.
*Extent of sub-feature or representative /notable biotopes	No change in the extent of the following biotopes identified for the site allowing for natural succession/ known cyclical change: **LR.HLR.FT.AscT, IR.MIR.KR.Lhyp.Ft**, **IR.HIR.KFaR.LhypFa**, **CR.MCR.EcCr.CarSwi.LgAs**	Assess the extent of biotopes along the fixed transects of the baseline survey every 6 years:	Temporal increases in the recorded zonal width of **CR.MCR.EcCr.CarSwi.LgAs** at two sites may have been the result of variation in the route of the transect line, as well as the diffuse nature of the zonal boundaries. A temporal reduction in the width of the **IR.MIR.KR.Lhyp.Ft** zone at Madadh Beag was due to the change in dominance of the kelp species. All recorded changes can be considered to result from natural processes or measurement error and do not represent evidence of changes in the extent of the biotopes over the SAC as a whole.

Attribute	Target	Method	Result
*Species composition of representative or notable biotopes	No decline in quality of the following biotopes due to change in species composition or loss of notable species allowing for natural succession/ known cyclical change: **LR.HLR.FT.AscT, IR.MIR.KR.Lhyp.Ft**, **IR.HIR.KFaR.LhypFa**, **CR.MCR.EcCr.CarSwi.LgAs**	Every 6 years assess species composition and diversity by means of MNCR phase 2 surveying in the selected biotopes at all baseline survey sites where they were recorded:	The site check methodology only allowed assessment of **CR.MCR.EcCr.CarSwi.LgAs**. Similar epibiotic species composition and taxon richness was found in 2015 and 2004. A significant temporal decline in the density of *Axinella infundibuliformis* was recorded at Madadh Beag, where creeling was taking place. However, there is insufficient evidence to suggest that this or any other recorded change in species composition of the biotope have not been the result of natural processes.
*Presence and/or abundance of specified species	Maintain presence and/or abundance of the following species: *Swiftia pallida*, *Axinella infundibuliformis*	Every 6 years confirm the continued presence of *Swiftia pallida* and *Axinella infundibuliformis* along all transect sites where these species occurred in the baseline survey.	*Swiftia pallida* and *Axinella infundibuliformis*, were found at the same sites in both years.

Table 9.4. Site attribute table for the tidal rapids feature for the Loch nam Madadh SSSI and Loch an Duin SSSI, with the results of the 2015 site check survey.

Attribute	Target	Method	Result
Extent	No change in extent of tidal rapids habitats	At 6 year intervals review activities and events with the potential to reduce extent of feature such as land reclamation, shoreline development and renewable energy schemes.	No activities or events were identified which appear to be influencing the extent of the tidal rapids feature.
Biotope composition of the littoral rock and inshore sublittoral rock	Maintain the variety of biotopes identified for the site, allowing for natural succession or known cyclical change.	At 6 year intervals assess the continued existence of reef biotopes recorded along the fixed transects of the baseline survey.	All biotopes recorded in 2004 were also present in 2015.
Distribution of biotopes. Spatial arrangement of biotopes at specified locations	Maintain the distribution and/or spatial arrangement of biotopes, allowing for natural succession/known cyclical change	At 6 year intervals confirm the geographic distribution of reef biotopes along the fixed transects of the baseline survey.	The sequence of biotopes along the transects were the same at all sites in 2004 and 2015.
*Extent of sub-feature or representative /notable biotopes	No change in the extent of the following biotopes identified for the site allowing for natural succession/ known cyclical change: **LR.HLR.FT.AscT, LR.HLR.FT.FserT**, **IR.MIR.KT.LdigT** (or equivalent), **IR.MIR.KR.LhypT.Ft** (or equivalent)	Assess the extent of biotopes along the fixed transects of the baseline survey every 6 years.	Zonal widths of the specified, littoral, tide-swept biotopes **LR.HLR.FT.AscT** and **LR.HLR.FT.FserT**, were similar at all sites in both survey years.
*Species composition of representative or notable biotopes	No decline in quality of the following biotopes due to change in species composition or loss of notable species allowing for natural succession/ known cyclical change: **LR.HLR.FT.AscT**, **LR.HLR.FT.FserT**, **IR.MIR.KT.LdigT** (or equivalent), **IR.MIR.KR.LhypT.Ft** (or equivalent)	Every 6 years assess species composition and diversity by means of MNCR phase 2 surveying in the selected biotopes at all baseline survey sites where they were recorded.	Species composition and taxon richness were largely similar for the specified biotopes **LR.HLR.FT.AscT** and **LR.HLR.FT.FserT,** in both survey years. A recorded increase in taxon richness from 29 to 44 in 2015 may reflect a difference in sampling intensity.

Table 9.5. Site attribute table for the large shallow inlets and bays feature for the Loch nam Madadh SAC, with the results of the 2015 site check survey. Note that lagoons did not form a component of the 2015 site check or site condition monitoring surveys.

Attribute	Target	Method	Result
Extent of entire feature	No change in extent of whole feature	At 6 year intervals review activities and events with the potential to reduce extent of the feature such as land reclamation and shoreline development. At 18 year intervals confirm that there has been no change in overall extent by means of aerial photography.	No activities or events were identified which appear to be influencing the extent of the large shallow inlets and bays feature
Diversity of component habitats	Maintain the variety of habitats identified for the site, allowing for natural succession/known cyclical change	At 6 year intervals confirm the diversity of biotopes recorded by the 2004 baseline survey within the following habitat types found within the SAC: • Littoral sediments • Inshore sublittoral sediments • Lagoons • Littoral and inshore rock	All habitats recorded during the baseline survey of littoral sediments, inshore sublittoral sediments and littoral and inshore rock were found in 2015, apart from two. These apparent changes are explicable in terms of a locational difference at one site and poor video quality at the other site in 2004 permitting only higher biotope assignment. It is concluded that there is no good evidence for a reduction in the diversity of habitats throughout the feature.
Distribution/spatial pattern of habitats	Maintain the pattern of distribution of predominant habitats throughout the feature	At 6 year intervals confirm the geographic distribution of biotopes recorded by the 2004 baseline survey within the following habitat types found within the SAC: • Littoral sediments • Inshore sublittoral sediments • Lagoons • Littoral and inshore rock	No temporal change was recorded in the distribution of littoral sediment or littoral rock habitats. Recorded distributional changes in inshore sublittoral sediment habitats and in inshore rock, not likely to have resulted from locational errors, are considered to represent natural temporal variability and do not signify deterioration in the condition of the habitats.
Water quality	No reduction in water quality	Applications for consents for discharging effluents to be continuously monitored. A programme of water quality monitoring to be developed in association with SEPA.	No water quality monitoring data appears to be currently available for Loch Maddy. There is no evidence from the biota observed during the 2015 survey work that water quality has deteriorated since the baseline survey.

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