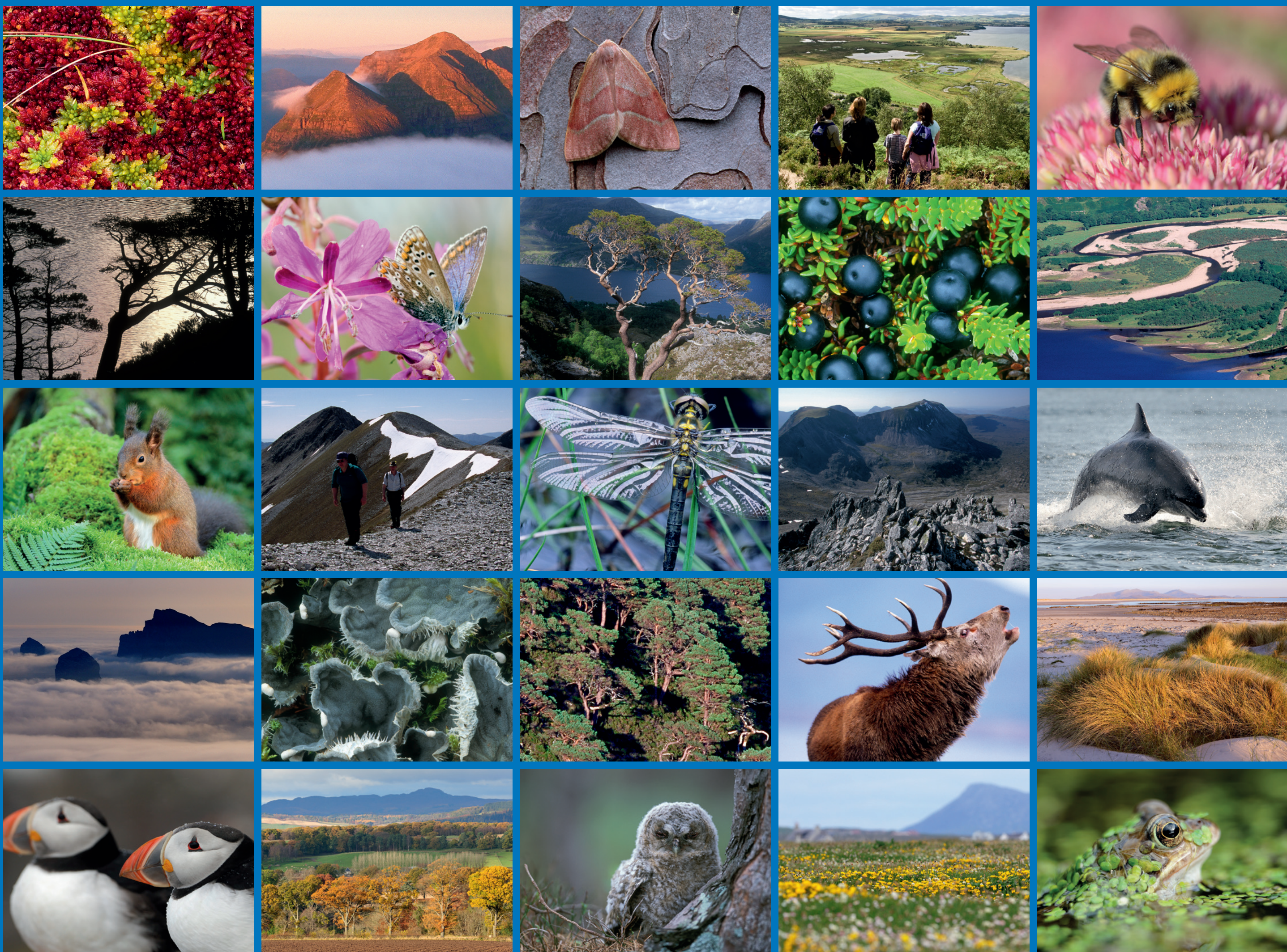
Scottish Natural Heritage
Commissioned Report No. 943

2015 site condition monitoring of marine sedimentary and reef habitats in Loch Laxford SAC



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COMMISSIONED REPORT

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2015 site condition monitoring of marine sedimentary and reef habitats in Loch Laxford SAC

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COMMISSIONED REPORT

Summary

2015 site condition monitoring of marine sedimentary and reef habitats in Loch Laxford SAC

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Keywords

benthos; monitoring; condition; reefs; maerl; sediment; SAC; SCM; marine

Background

Loch Laxford SAC was established to afford protection for the marine features 'large shallow inlets and bays' and 'reefs'. The aim of the current 2015 study was to carry out site condition monitoring (SCM) of the designated features of the SAC, in order to identify any deterioration in the condition of the features and to form a judgement on their current condition. SCM was inaugurated in the SAC in 2009, which provided a baseline for the current study. The 2015 SCM work largely took the form of a drop-down video survey, together with more detailed surveying along relocatable transects at locations of reef habitats, mixed reef and sediment habitats and through maerl beds.

Main findings

- At the drop-down video and relocatable transect sites examined in both the 2009 baseline and current surveys all biotopes found in 2009 were also recorded in 2015 apart from five. Recorded absences were probably due to methodological differences between surveys or poor video quality, except at one site where natural temporal variability in kelp dominance is considered to have caused the biotope change.

- Good evidence for a change in biotope distribution was obtained at two drop-down video sites and in three sections along two mixed reef and sediment transects. In each case the change was considered to have resulted from natural temporal variability in the algal community.

- All recorded temporal changes in species composition identified along the mixed reef and sediment transects were considered to be consistent with natural temporal fluctuation or to have arisen through methodological differences between surveys.

- At the three maerl bed transect sites studied no temporal change in infaunal taxon richness was recorded, nor change in epibiotic taxon richness that was not likely to have arisen from methodological differences between the surveys. Recorded changes in infaunal species composition were considered to have resulted from natural variation, except along one transect, where a temporal reduction in organic enrichment originating from an adjacent mussel farm may have influenced the change.

- A temporal reduction in live maerl cover at one of the transect sites was considered to have resulted from enhanced, natural, hydrodynamic activity, which had transformed the sediment plain observed in 2009 to a series of sediment waves with concentration of live maerl in the troughs. A concomitant reduction in the density of filamentous and foliose algal community resulted in a switch in nominated biotope from **SS.SMp.Mrl.Pcal.R** to **SS.SMp.Mrl.Pcal.Nmix**.

- The invasive red alga, *Dasysiphonia japonica*, was only recorded at one maerl site in 2009 but all three sites in 2015. However, its low density indicates that it is currently exerting little ecological impact on the maerl community.

- Although wider monitoring coverage of the habitats of the SAC is recommended for future condition assessment, based on the available evidence it is recommended that the inlets and bays and the reefs features should be assigned to the condition category "Favourable Maintained".

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Table of Contents **Page**

Acknowledgements

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1. INTRODUCTION

Loch Laxford is located 24 km to the south of Cape Wrath at the north-western tip of mainland Scotland (Figure 1). The SAC consists of the main loch, with its complex fjardic shape and numerous small islands, and two large subsidiary lochs, Loch Dùghaill and Loch a'Chadh-Fi, extending from its north shore.

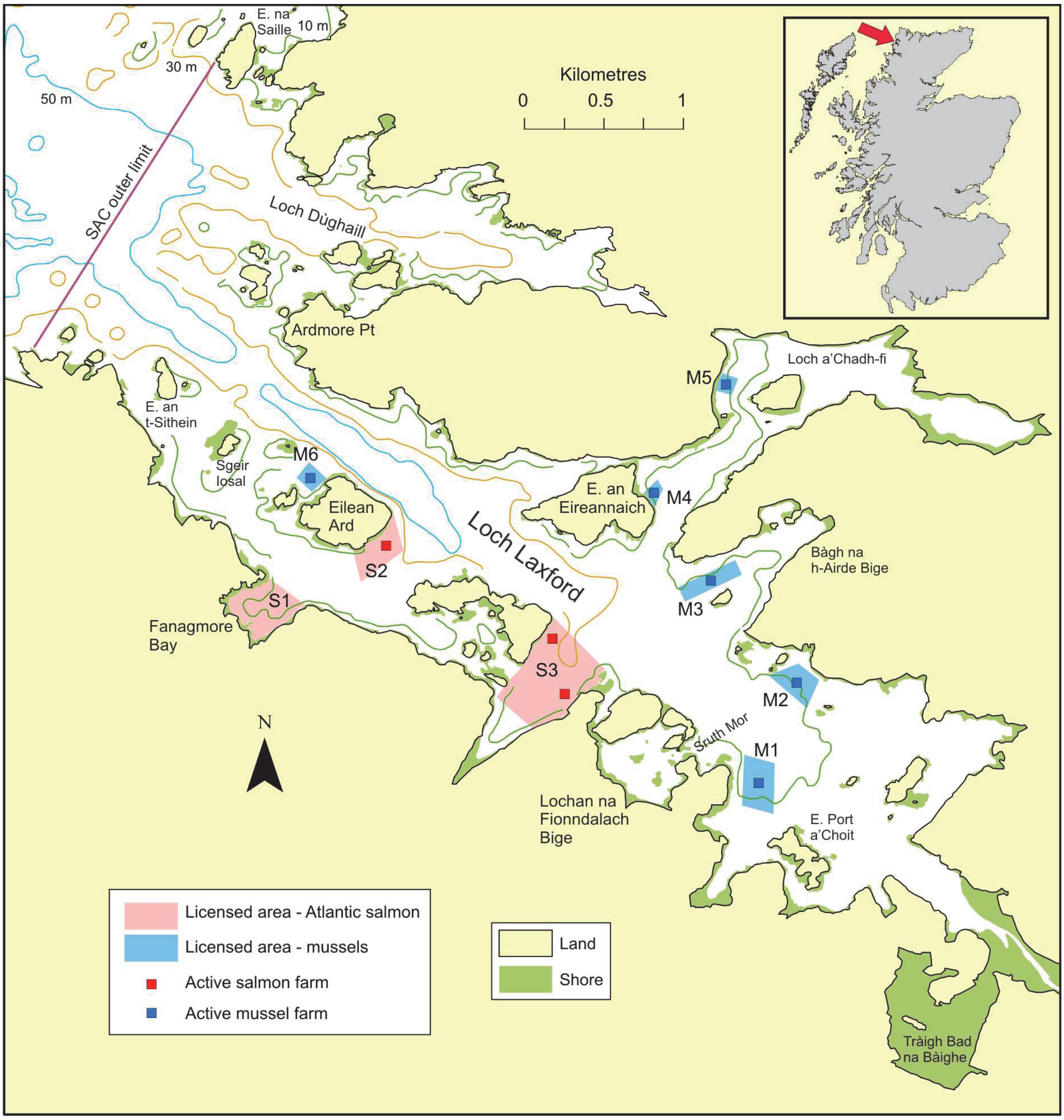

Figure 1. The location of Loch Laxford SAC and included aquaculture facilities.

The Loch Laxford system was designated as a Special Area of Conservation (SAC) in 2005 under the EC Habitats Directive (92/43/EEC). All of the site apart from Loch Dùghaill was already a Marine Consultation Area. The SAC designation was based on the presence of two Annex 1 interest features. The area was judged to be one of the best examples in the UK of a 'large shallow inlet and bay'. Although this Annex 1 feature incorporates reef habitats, in view of their extensive presence 'reefs' have been designated as a second qualifying feature in their own right.

1.1 Condition monitoring of Loch Laxford SAC

The objective of the work described in this report was to carry out site condition monitoring (SCM) of Loch Laxford SAC in order to assess the condition of the 'large shallow inlets and bays' and 'reefs' features.

In order to ensure 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 (Joint Nature Conservation Committee, 1998). Thus, for the purposes of monitoring, each feature is represented by a series of attributes, which are measurable indicators of the condition of the feature at the site. For each attribute (e.g. extent of a habitat or presence of representative/notable biotopes), a target is set which is considered to correspond to the favourable condition of the feature. In the case of the Loch Laxford SAC the Annex I 'large shallow inlets and bays' and 'reefs' features fall under the Common Standards Monitoring guidance produced, respectively, for inlets and bays, and littoral rock and inshore sublittoral rock (Joint Nature Conservation Committee, 2004a,b). The Joint Nature Conservation Committee (ibid.) lists the attributes of these habitats and corresponding targets that should form the basis of the site condition monitoring (Tables 1 and 2).

Table 1. Site attributes that should be utilised to define the condition of inlets and bays (Joint Nature Conservation Committee, 2004a).

Attribute	Target
Extent	No change in extent of whole feature
Diversity of component habitats	Maintain the variety of habitats identified for the site, allowing for natural succession or known cyclical change.
Distribution / spatial pattern of habitats	Maintain the distribution and/or spatial arrangement of biotopes, allowing for natural succession or known cyclical change.
Water quality	Target values should default to appropriate national or international standards where appropriate. If sufficient local data are available to establish the baseline condition, site-specific targets can be set.

Table 2. Site attributes that should be utilised to define the condition of littoral and inshore sublittoral rock features in site condition monitoring (Joint Nature Conservation Committee, 2004b). The use of the first three attributes is mandatory.

Attribute	Target
Extent	No change in extent of intertidal rock and inshore sublittoral rock
Biotope composition of the intertidal rock and inshore sublittoral rock	Maintain the variety of biotopes identified for the site, allowing for natural succession or known cyclical changes.
Distribution of biotopes. Spatial arrangement of biotopes at specified locations	Maintain the distribution and/or spatial arrangement of biotopes, allowing for natural succession or known cyclical changes.
Extent of sub-feature or representative/notable biotopes	No change in the extent of the biotope(s) identified for the site, allowing for natural succession or known cyclical changes.
Presence of representative or notable biotopes	Maintain the presence of the specified biotope, allowing for natural succession or known cyclical changes.
Species composition of representative or notable biotopes	No decline in biotope quality due to change in species composition or loss of notable species, allowing for natural succession or known cyclical changes.
Presence and/or abundance of specified species	Maintain presence and/or abundance of specified species, and absence of specified species (such as an undesirable or non-native species)

1.2 Previous marine biological studies

As part of the Scottish Marine Biological Association/Marine Biological Association intertidal survey of Great Britain, three sites were examined in Loch Laxford in 1979 (Powell *et al*., 1980; Bishop and Holme, 1980). They regarded the inner part of the loch as a site of marine biological importance, highlighting in particular Tràigh Bad na Bàighe, a sediment-filled inlet with extensive areas of muddy sand. They also noted the presence of *Ascophyllum nodosum* ecad *mackaii* here, previously recorded as occurring in large beds at the head of the loch by Gibb (1957). Tràigh Bad na Bàighe is the only extensive habitat of its type on the west coast of Sutherland and it was rated of national conservation importance. They also examined the shallow tidal rapids site at Sruth Mor, which was rated of local importance in view of its moderately rich rocky reef community.

As a follow-on to the SMBA/MBA study, in the same year Smith (1981) also examined Sruth Mor, with emphasis on the molluscs, although also describing the general zonation in the channel. She regarded this site as one of the richest shores in west Sutherland.

The first sublittoral survey of the loch was carried out in 1984 by a team led by Smith (1985). Records of interest include maerl off Sgeir Iosal, abundant *Modiolus modiolus*, together with maerl, in the inner loch north-east of Eilean Port a'Choit (**SS.SBR.SMus.ModHAs**) and the presence of *Leptometra celtica* in the mouth of the SAC.

A joint UMBS Millport/MNCR team surveyed the littoral and sublittoral habitats of the loch, together with those in Lochs Inchard, Broom and Little Loch Broom, in 1991 (Holt, 1991). Further data are presented on the communities of Tràigh Bad na Bàighe, including observation of a dense bed of *Mytilus edulis* in the entrance channel. The survey included littoral and sublittoral sites at the tidal rapids at Sruth Mor, where both *Lithothamnion glaciale* and *Phymatolithon calcareum* were recorded as frequent on coarse sediment in the channel (**SS.SMp.Mrl.Lgla**). Holt (1991) also recorded *P. calcareum* as rare on a plain of coarse shell sand south of Eilean an t-Sithein (**SS.SSa.IMuSa.EcorEns**) and as frequent in the troughs of duned shell gravel southeast of Glas Leac (**SS.SMp.Mrl.Pcal.Nmix**). In line with the findings of Smith (1985), Holt (1991) observed the rock surface beneath the kelp forests and parks to be generally heavily grazed by *Echinus esculentus*, but at a very exposed rock pinnacle at the mouth of the loch, Bodha Druim, foliose algae richly coated the rock and stipes (**IR.HIR.KFaR.LhypR.Ft**), accompanied on vertical faces by a rich fauna of polyclinids, *Corynactis viridis*, *Alcyonium digitatum* and a hydroid/bryozoan turf (**IR.HIR.KFaR.LhypRVt**). Below the kelp, a rich circalittoral turf community included *Flustra foliacea*, *Securiflustra securifrons*, *Cliona celata*, *Axinella infundibuliformis*, *Corynactis viridis*, *Antedon bifida* and *Corella compressa* (ascribed in Marine Recorder to **CR.MCR.EcCr.AdigVt**).

The littoral habitats of part of the SAC (excluding the outermost part of Loch Laxford and the whole of Loch Dùghaill) were mapped by Environment and Resource Technology Ltd (1994) in 1994. They provide distribution maps of the 12 biotopes they identified using the 1994 MNCR biotope classification scheme (Connor, 1994), including the *Ascophyllum nodosum* ecad *mackaii* biotope. Environment and Resource Technology Ltd (1994) also mapped the sublittoral biotopes; however, coverage was severely restricted by the weather conditions.

Biotope mapping of the littoral habitats of the SAC (excluding a short stretch of exposed shore at the western extremity) was also carried out in 2001 by Posford Haskoning Ltd (2001). Due to the narrow nature of the shores, much of the coastline was only mapped at a higher biotope complex level, although detailed biotope zonation sequences are provided for 64 sites.

Bates *et al.* (2004) carried out a sublittoral broadscale biotope mapping survey of the SAC in 2001. As in previous studies most of the infralittoral was found to be dominated by *Saccharina latissima* and grazed *L. hyperborea* biotopes, but communities with rich faunal and algal components were recorded in the more exposed locations **(IR.HIR.KFaR.LhypFa**, **IR.HIR.KFaR.LhypR.Ft**). In the circalittoral records of note include the finding of *Swiftia pallida* along the north-east coast of Eilean Ard. This appears to be the northernmost recorded location of the species for the UK, with additional, more recent Seasearch records from the same location (National Biodiversity Network Gateway, 2016). *Funiculina quadrangularis* was also recorded at a single site west of Eilean an Eireannaich (**SS.SMu.CFiMu.SpnMeg.Fun**) and patchy maerl adjacent to a mussel farm north-west of Eilean Ard (**SS.SMp.Mrl.Pcal**).

In addition to the major surveys described above, a number of more limited marine biological studies have been carried out (Howson and Chambers, 2000). Walker (1947) and Gibb (1950) included Loch Laxford in a survey of the fucoid resources in Scotland, reporting that Loch Laxford contained around 116 tons of fucoids per mile, with the main species being *Ascophyllum nodosum*, *Fucus vesiculosus* and *F. serratus*. As part of a wider study Lewis (1957) described the distribution of a number of littoral species within Loch Laxford. MacKinnon (1986) reported the species records of an Eastwood Sub-Aqua Club expedition to Loch Laxford.

Site condition monitoring of the SAC was established in 2009 (Moore *et al.*, 2010). This provided a baseline biological data set to facilitate assessing existing and future condition of the designated features. The main approach taken was to perform a video survey of the sublittoral reef and sediment habitats at 135 sites, together with infaunal grab sampling of sediments at 30 sites, and to survey the shore and near-shore reef and sediment biotopes along relocatable transects at eleven sites. Surveys were also performed along transects at three maerl sites and the distribution of *Ascophyllum nodosum* ecad *mackaii*, and beds of the mussel, *Mytilus edulis*, were examined at the head of Loch Laxford. Comparison with the results of previous surveys of the SAC revealed no temporal change in reef extent, or in biotope composition or distribution of the inlet and bay or the reef features of the SAC that could not be explained by methodological differences or natural drivers. Little evidence of significant adverse anthropogenic impact on the interest features of the SAC was revealed. The presence of a mussel farm at one of the maerl sites was found to be causing localised modification of the habitat through the deposition of dead shells and this was considered to be possibly modifying the community composition and distribution of the maerl biotope. The introduced Pacific red alga, *Dasysiphonia japonica*, was recorded predominantly in the vicinity of a salmon farm site, but there was no evidence to suggest that its presence was adversely affecting the ecology of the loch.

1.3 Human usage of Loch Laxford SAC

Loch Laxford is situated in a remote and very sparsely populated region of the Highlands, with human access to most of the coastline very difficult, except by boat. Despite the presence of several sheltered anchorages, due to its northerly location and lack of relevant facilities, the level of visiting recreational craft is likely to be very low. Tourist activities in the loch include sea kayaking from the adventure school based in the upper basin of Loch. a'Chadh-Fi and wildlife pleasure cruises (Laxford Cruises) operating throughout the summer from Fanagmore. Loch Laxford is not a widely recognised locality for scuba diving, with probably a very low level of activity.

Local creel boats work the loch system for *Nephrops*, lobsters and crabs (Dipper and Johnston, 2005). The intensity of fishing is unknown, although Scotmap data (Kafas *et al.*, 2014) indicates that the level of fishing activity by smaller creel, dredge and trawl vessels (<15 m in length) is very low. It should be noted that 'The Inshore Fishing (Prohibition of Fishing and Fishing Methods) (Scotland) Order 2015' came into effect on 8th February 2016, which prohibits any future use of demersal dredges, trawls or seine nets within the SAC (Scottish Government, 2016a).

There are currently three licences for Atlantic salmon farm sites and six for mussel sites. Figure 1 shows the distribution of the licensed areas, with the locations of currently active farm sites. The mussel sites appear to be continuously occupied, whereas the salmon farms are subject to a system of fallowing for at least one year in every three (Loch Duart Ltd, 2015). Substantial areas of the inner region of the loch are occupied by mussel lines, whilst in the outer part of the loch a mussel farm off the north-west of Eilean Ard (M6) lies within 40 m of an area of seabed supporting maerl (Bates *et al.*, 2004). The salmon farms were believed to have contributed to high levels of imposex recorded in dogwhelk populations in the loch, resulting from the release of tributyltin (TBT) from antifouling coatings (Davies *et al.*, 1987). Evidence from elsewhere would suggest that it is likely that recovery will now have taken place following the banning of this usage of TBT in 1987.

Paracentrotus lividus is a sea urchin with its northern distributional limit defined approximately by the 8°C winter isotherm (Boudouresque and Verlaque, 2007). Although recorded sporadically elsewhere on the Scottish West coast, caged urchins were introduced and subsequently removed from Loch Laxford as part of a polyculture experiment to investigate the possibility of farming this species in association with Atlantic salmon at sites off Eilean Ard (Figure 1, S2) and Bagh na Fionndalach Moire (Figure 1, S3) (Cook and Kelly, 2007). There are some concerns relating to the impact of the possible establishment of this species on the ecology of the loch (SNH, pers comm.). Another introduced species, the Japanese skeleton shrimp, *Caprella mutica*, was recorded at a Laxford salmon farm site in 2004 (Cook *et al.*, 2007). The species is indigenous to north-east Asia but is currently one of the most rapidly spreading species in Europe. Often associated with man-made structures, especially fish farms on the west coast of Scotland, it is thought to be spreading through the movement of vessels. It is an aggressive species, outcompeting the native European *Caprella linearis* for space.

As a preliminary investigation into the maximization of macroalgal production as part of a polyculture system with Atlantic salmon, the nutrient plume around the Eilean Ard cage site (Figure 1, S2) was studied by Sanderson *et al*. (2008). They found enhanced levels of seawater ammonium out to a distance of at least 50 m, sufficient to enhance macroalgal growth (Sanderson, 2006). Clearly there is the potential for some impact on natural algal communities in the vicinity.

2. METHODS

The survey was carried out during the period 6th - 9th August 2015 from the vessel *MV Halton*. The timing of the work was opportunistic, the survey representing a contingency plan to utilise poor weather downtime during a scheduled cruise designed to carry out surveys of St Kilda and North Rona. The aim was to adopt a similar methodological approach to that of the 2009 baseline SCM survey of the SAC (Moore *et al*., 2010) but the reduction in time available necessitated some reduction in the scope of the survey.

2.1 Drop-down video survey

A subset of 70 sites was selected from the 135 examined during the baseline survey (Moore *et al*., 2010). These were chosen to provide good geographical coverage of the SAC, but were limited to depths of approximately >10 m due to the larger vessel employed in 2015. Site locations are shown in Figure 2 and details provided in Table 1.1 (Annex 1).

The drop-down video system consisted 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 5 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. The vessel track was also recorded at 5 second intervals.

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 biotope recorded, the 2009 footage was re-examined and the baseline biotope updated if necessary.

2.2 Reef and mixed reef/sediment transects

Relocatable transects were established at nine sites in 2009 in order to examine biotope diversity and distribution of reef and sediment habitats, as well as the species composition of representative reef biotopes. Only three transects were selected for study in 2015, representing a wide geographical and exposure range (outer, middle and inner loch) (Figure 2). The outer site (XX09) was not examined in 2009 due to adverse weather conditions. Relocation details for this site are presented in Table 2.7 (Annex 2). Summarial details for all three sites are provided in Table 3, and location information in Table 2.6 (Annex 2).

The route of the transect was marked by a 200 m graduated line attached to the transect marker (a wooden peg or metal piton). The line followed a constant bearing down the shore and extended into the subtidal, where it was laid along the seabed by divers, with the addition of weights at strategic points. To provide temporal consistency the transect coding employed in 2009 was retained. The intertidal section traversed rock and has been coded LL09IRnn, whilst the subtidal section traversed rock (LL09SRnn), and in two cases, sediment habitats (LL09SSnn) (Table 3). nn represents the transect number. The entire transect has been coded LL09XXnn, or for brevity, XXnn.

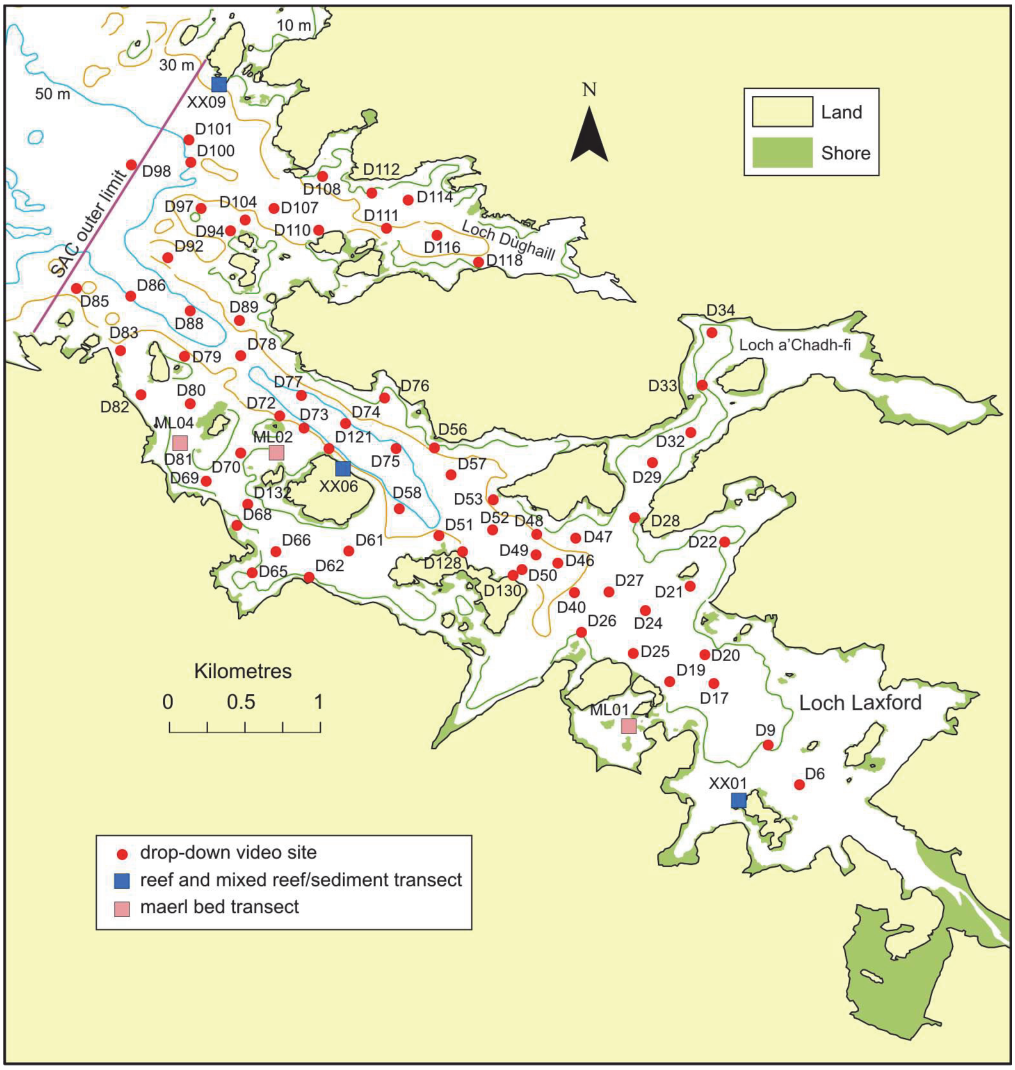

Figure 2. Location of sites for the drop-down video and transect surveys.

The transect was split up into a series of zones which were defined in terms of differences in the composition of the biological community and/or by changes in substrate type. All subtidal work was carried out with the use of scuba. Zone boundaries along the transect were recorded in terms of distance along the graduated line and vertical height relative to the station marker. Intertidally, this height was determined using an inclinometer; subtidally, the depth of water was measured. Subtidally, the depth and distance was also measured at 5 metre intervals, enabling a detailed profile of the transect to be subsequently drawn. Heights on the shore were related to chart datum by levelling the water's edge to the station marker and determining the tidal rise at this time using TotalTide. Depths were also converted to chart datum by subtracting the tidal rise at the time of recording.

A band 2 m either side of the tape was surveyed intertidally and subtidally using MNCR phase 2 survey methodology. Within each zone records were taken of substrate type and biota using the MNCR SACFOR scale of abundance, with collection of material for laboratory examination where *in situ* identification was not possible. Notes were available derived from the baseline survey on the anticipated biotopes and the dominant taxa likely to be encountered. Abundance was assessed over the zone as a whole, except where stated otherwise. Subtidally, a digital video camera (Canon Legria HF) and Nikon digital SLR still cameras with wide-angle and close-up lenses were used to make representative visual recordings of the transect zones and biota. Intertidally, a Nikon Coolpix S32 camera was mainly used for recording equivalent video and still imagery, as well as for the collection of five haphazardly positioned 0.25 m^2 photoquadrats of each 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. Based on the physical and biological data collected, biotopes were subsequently allocated to each zone using Connor *et al.* (2004).

Table 3. Summary of all transects (reef and mixed reef/sediment and maerl bed) surveyed.

Full code and site name	Brief code name	Section code	Habitat type	Date
LL09XX01 Eilean Port a'Choit W	XX01	IR01 SR01 SS01	intertidal reef subtidal reef subtidal sediment	09/08/2015
LL09XX06 Eilean Ard NE	XX06	IR06 SR06 SS06	intertidal reef subtidal reef subtidal sediment	08/08/2015
LL09XX09 Eilean na Saille S	XX09	IR09 SR09	intertidal reef subtidal reef	06/08/2015
LL09ML01 Sruth Mor SW	ML01	ML01	maerl bed	08/08/2015
LL09ML02 Eilean Ard NW	ML02	ML02	maerl bed	07/08/2015
LL09ML04 Sgeir Iosal SW	ML04	ML04	maerl bed	07/08/2015

Recorded distances between points along the transects were converted to horizontal distances by trigonometry and the height and distance data used to construct transect profiles using Excel. The profiles were then imported into a graphics package (CorelDraw) for annotations summarising the substrate type, dominant biota and biotopes along the transects.

2.3 Maerl bed transects

Transect surveys were carried out by divers at the same three maerl bed sites examined by the 2009 baseline survey (Moore *et al*., 2010). The sites are listed in Table 3, with their locations shown in Figure 2 and further locational and sampling details provided in Table 3.1 (Annex 3). At each site the transect start position was marked with a shot line for the duration of the survey and the dGPS position recorded. 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 employing the same bearing as used in 2009. The depths at both ends of the tape were recorded. A band 2 m either side of the tape was surveyed by divers using MNCR phase 2 methodology. Two surveyors noted the presence, and where possible, estimates of the abundance of conspicuous biota, collecting material which needed to be identified in the laboratory. Video footage was collected using a Canon Legria HF digital video camera. The diver covered 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 Nikon digital SLR still cameras with wide-angle and close-up lenses. To facilitate future temporal comparisons of maerl cover, a

Nikon D200 still camera with 10.0 - 17.0 mm lens was used to photograph 0.25 m^2 quadrats placed at 19 - 25 non-overlapping locations along the transect tape. Quadrat positions were selected using random numbers, with quadrats placed adjacent to the tape and to both sides.

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 sediment was then sieved on a 1 mm mesh screen and the sievings retained in borax-buffered 5% formalin. The infauna from the sievings was sorted, identified and counted by Precision Marine Survey Ltd (East Yorkshire).

An additional 20 cm sediment core of 5 cm diameter was taken for particle size analysis. Sediment samples 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 µm sieve. The sediment grain size parameters, median grain size and phi quartile deviation, were obtained by interpolation of the cumulative weight percentage curves.

The diver species records and those derived from the study of the collected epibiota, video footage and still photographs were collated to produce a species list for the transect band with, where possible, SACFOR abundance estimates. Based on the physical and biological data collected, biotopes were subsequently allocated using Connor *et al.* (2004).

3. RESULTS

3.1 Drop-down video survey

The results from the analysis of the 70 video survey sites are provided in Table 1.1 (Annex 1) (positional, temporal and depth data) and Table 1.2 (Annex 1) (habitat and community data). The distribution of the biotopes recorded at these sites is illustrated in Figure 3.

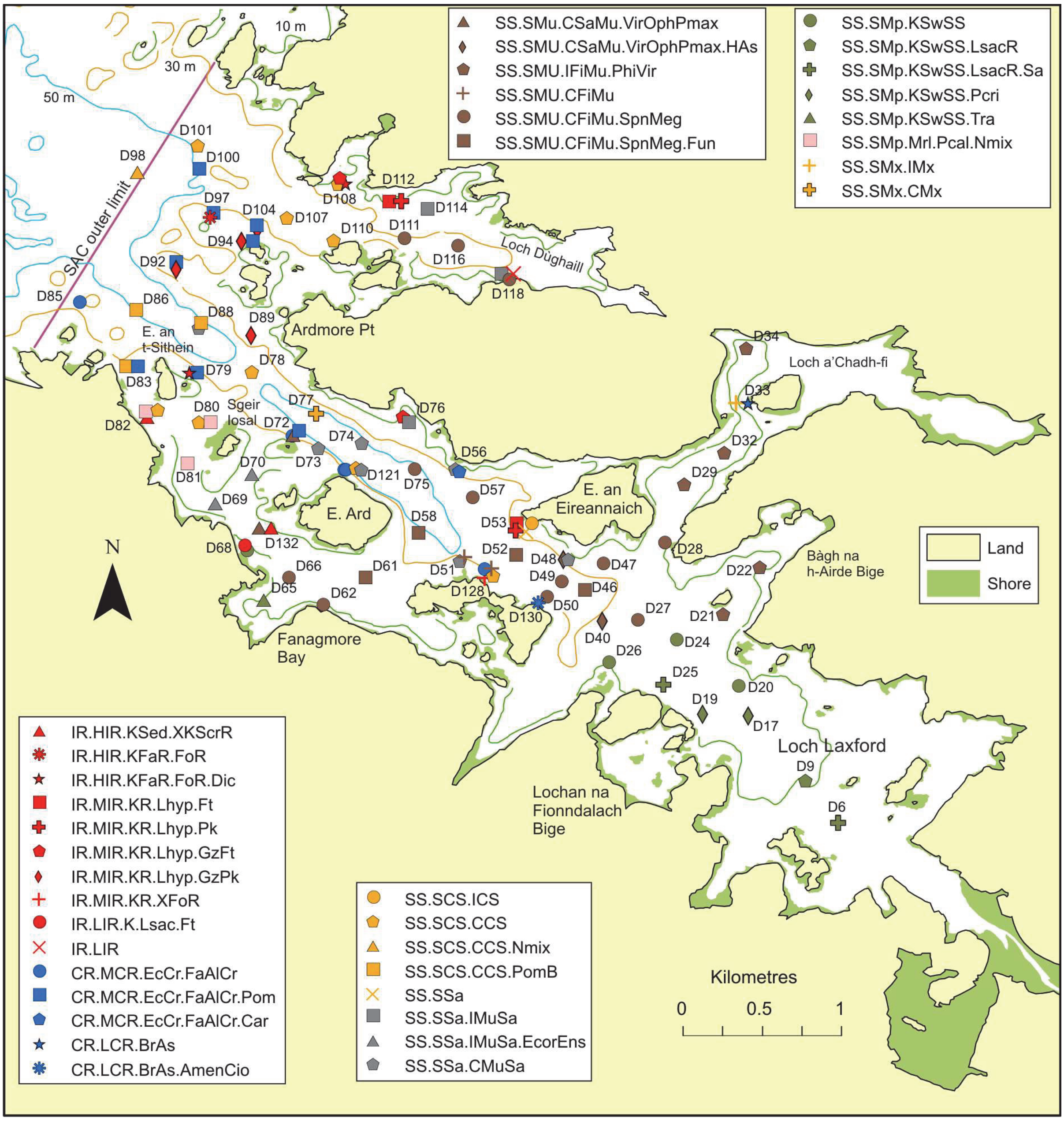

Figure 3. Distribution of biotopes recorded during the 2015 SCM video survey.

Coarse sediments were widely distributed in the outer, more exposed regions of Loch Laxford and Loch Dùghaill from depths of 13 - 59 m, as waves of coarse sand and shell gravel (**SS.SCS.CCS**) or dense pebbles and cobbles encrusted with serpulid worms on coarse sand (**SS.SCS.CCS.PomB**). In the absence of infaunal sample data many of the examples of **SS.SCS.CCS** could not be more precisely assigned, although the visible presence of *Neopentadactyla mixta* at the deepest site (**SS.SCS.CCS.Nmix**) may be indicative of its wider distribution. At the three shallowest sites (13 - 18 m), between the islands of Eilean an t-Sithein and Sgeir Iosal, the waves of coarse sand and gravel were found to support live maerl, with *Phymatolithon calcareum* recorded as frequent - common in the wave troughs (**SS.SMp.Mrl.Pcal.Nmix**).

Circalittoral reef biotopes were also widely recorded in the outer region of the SAC as bedrock and boulder substrates at depths of 16 - 47 m supporting crusts of pink coralline algae, *Parasmittina trispinosa* and *Spirobranchus* spp. (**CR.MCR.EcCr.FaAlCr**), with the latter species abundant at most sites (**CR.MCR.EcCr.FaAlCr.Pom**). The size of the survey vessel limited access to the infralittoral environment but a number of lower infralittoral bedrock and boulder sites from 13 - 19 m depth in the outer region of the SAC were found to support parks of *Laminaria hyperborea* (mostly **IR.MIR.KR.Lhyp.GzPk**), or algal turfs (**IR.HIR.KFaR.FoR**, **FoR.Dic**). *Laminaria hyperborea* forests (**IR.MIR.KR.Lhyp.Ft**) were recorded at two sites from 9 - 12 m depth.

In the inner regions of Loch Laxford and Loch Dùghaill, east of Ardmore Point sedimentary habitats were very widely recorded, mainly in the form of muds at depths of 15 - 51 m in the main channels of both lochs. These supported a megafaunal burrowing community including *Nephrops norvegicus*. The sea pens *Pennatula phosphorea* and *Virgularia mirabilis* were generally fairly sparse (**SS.SMU.CFiMu.SpnMeg**), with *V. mirabilis* replaced by *Funiculina quadrangularis* in the central region of Loch Laxford between Eilean Ard and south of Eilean an Eireannaich (**SS.SMU.CFiMu.SpnMeg.Fun**). Circalittoral muddy sand (**SS.SSa.CMuSa**), generally supporting *Munida rugosa*, was recorded at several sites, particularly in a transitional region in the main channel of Loch Laxford north of Eilean Ard between the coarse sand and gravel sediments to the west and muds to the east. Infralittoral fine - medium sand, slightly muddy in places and generally with a surface scatter of *Ensis* shells and sparse algal tufts, was recorded at depths of around 14 - 19 m (**SS.SSa.IMuSa**, **IMuSa.EcorEns**). In the very sheltered embayments of Bàgh na h-Airde Bige and Loch a'Chadh-Fi shallow muds at 9 - 13 m depth supported adults and the egg masses of *Philine aperta*, as well as *Sagartiogeton laceratus*, *V. mirabilis* and *P. phosphorea* (**SS.SMU.IFiMu.PhiVir**).

In the inner region of Loch Laxford beyond Eilean an Eireannaich the substrate recorded was generally muddy sand with scattered gravel, pebbles and occasional cobbles at depths of 6 - 16 m. Visually, the community was dominated by algae. At some sites the stones supported a park of *Saccharina latissima* and a turf of filamentous red algae (**SS.SMp.KSwSS.LsacR**, **LsacR.Sa**). At other sites the turf was sparse and generally accompanied by a patchy algal mat (**SS.SMp.KSwSS**), which consisted of dense *Phyllophora crispa* at two sites (**SS.SMp.KSwSS.Pcri**). In Fanagmore Bay the sediment was almost completely covered by a mat of *Trailliella*-like algae (**SS.SMp.KSwSS.Tra**).

Reef biotopes were recorded at 20 of the 70 video sites in 2015, the same number that was found at these sites in the 2009 baseline survey (Moore *et al.*, 2010).

A change in biotope ascription was recorded at 20 of the 70 video sites between the 2009 and 2015 surveys. Biotope changes are shown in Table 1.2 (Annex 1), which also provides a commentary on the likely cause of differences at each site. Biotope change is considered to be uncertain at six of the sites, largely due to insufficient evidence from the video footage. Details of temporal differences at the remaining fourteen sites are summarized in Table 4. Change in the recorded biotope at twelve of these sites is considered to have certainly or possibly resulted from locational differences. Real temporal change appears to have taken place at two sites (D97, D112) where a natural increase in the density of the algal turf was largely responsible for a change in biotope allocation from grazed habitats recorded in 2009

(**IR.MIR.KR.Lhyp.GzPk**) to richer algal turf habitats (respectively **IR.HIR.KFaR.FoR** and **IR.MIR.KR.Lhyp.Pk**) in 2015.

Table 4. Summary of temporal changes in biotopes between the 2009 and 2015 SCM video surveys.

Site	2009 biotope	2015 biotope	Nature of change
D24	**SS.SMp.KSwSS** **SS.SMu.ISaMu**	**SS.SMp.KSwSS**	Sparser algal turf in 2015. Stonier sediment in 2015 and video runs >64 m apart, so temporal biotope change possibly due to locational difference.
D25	**SS.SMp.KSwSS**	**SS.SMp.KSwSS.LsacR.Sa**	Algal cover denser in 2009 and appears to be mostly a loose mat. Difference may be due to 2 m deeper run in 2009.
D33	**IR.MIR.KR.XFoR** **SS.SMx.IMx**	**SS.SMx.IMx** **CR.LCR.BrAs**	Rock with dense algae in 2009 (**XFoR**), although **BrAs** recorded in 2001, so difference possibly due to locational difference or natural variation in algal abundance.
D51	**CR.MCR.EcCr.FaAlCr.Car**	**SS.SSa.CMuSa**	Locational difference
D73	**SS.SMp.Mrl.Pcal.Nmix**	**SS.SSa.CMuSa**	Location difference and much deeper run in 2015
D80	**SS.SCS.CCS.PomB**	**SS.SCS.CCS** **SS.SMp.Mrl.Pcal.Nmix**	Stone cover much reduced in 2015. 2015 run shallower, possibly explaining the lack of maerl in 2009
D85	**CR.HCR.XFa**	**CR.MCR.EcCr.FaAlCr**	Location difference of >85 m between surveys probably responsible for biotope difference
D88	**SS.SCS.CCS.MedLumVen**	**SS.SSa.CMuSa**	Much more gravel in 2009, possibly due to locational difference (>60 m)
D89	**CR.MCR.EcCr.FaAlCr.Car**	**IR.MIR.KR.Lhyp.GzPk**	Biotope difference presumably due to difference in location (>70 m) and shallower depth in 2015
D94	**CR.MCR.EcCr.FaAlCr**	**IR.MIR.KR.Lhyp.GzPk** **CR.MCR.EcCr.FaAlCr.Pom**	Due to transcription error 2015 site was in the wrong location and far distant from the 2009 site and in much shallower water
D97	**CR.MCR.EcCr.FaAlCr.Pom** **IR.MIR.KR.Lhyp.GzPk**	**IR.HIR.KFaR.FoR**	Algal turf poorly developed in 2009 and kelp conspicuously present. Start of 2015 run very close to end of 2009 run so probably temporal change in algal cover
D100	**SS.SCS.CCS.MedLumVen** **CR.MCR.EcCr.FaAlCr.Pom**	**CR.MCR.EcCr.FaAlCr.Pom**	Initial biotope differs, possibly due to positional difference (>65 m)
D112	**IR.MIR.KR.Lhyp.GzPk**	**IR.MIR.KR.Lhyp.Ft** **IR.MIR.KR.Lhyp.Pk**	Algal turf (both *Dictyota* and reds) significantly denser in 2015
D128	**IR.LIR.K.Lsac.Ft**	**IR.MIR.KR.XFoR**	Despite initial depth reading in 2015, 2009 run was clearly shallower

3.2 Reef and mixed reef/sediment transect survey

Details of the component zones identified along the transects are provided in Table 2.1 (Annex 2) and profile data in Table 2.2 (Annex 2)

3.2.1 Eilean Port a'Choit W (XX01) (Figure 4)

This site near the head of Loch Laxford was chosen to be representative of the sheltered upper region of the loch and because it was close to a source of potential anthropogenic influence in the form of a mussel farm. SACFOR abundance estimates of the biota recorded along the transect are given in Table 2.3 (Annex 2).

For the most part the shore consisted of highly uneven bedrock, very steep in places. The gently sloping but highly irregular supralittoral zone supported a lichen flora dominated by *Ramalina siliquosa* and *Xanthoria parietina* (**LR.FLR.Lic.YG**). Below this zone a steep irregular rock slope supported bands of *Verrucaria maura* with *Lichina confinis* (**LR.FLR.Lic.Ver.Ver**), *Pelvetia canaliculata* with crusts of *V. maura* and *Hildenbrandia* spp. (**LR.LLR.F.Pel**) and *Fucus spiralis* with a *Hildenbrandia* crust (**LR.LLR.F.Fspi.FS**). No distinct *Fucus vesiculosus* zone was recognised although the species was locally abundant in the lower region of the *F. spiralis* zone. The most extensive littoral zone consisted of a blanket of *Ascophyllum nodosum* over highly uneven bedrock. Beneath the blanket *Semibalanus balanoides* and *Patella vulgata* were respectively abundant and common and there were turfs of *Gelidium pusillum* and *Cladophora rupestris* (**LR.LLR.F.Asc.FS**). Below the *Ascophyllum* zone, the *Cladophora* turf became profuse beneath a dense canopy of *Fucus serratus* (**LR.LLR.F.Fserr.FS**). This zone was not exposed at the time of the survey and was only briefly examined by diver.

Sublittorally, a near-vertical rock wall extended from 0.2 m above chart datum to a depth of 2.5 m, supporting a patchy cover of *Saccharina latissima* (common overall, but abundant locally) and a dense red algal turf dominated by *Phyllophora crispa* and *Chondrus crispus* and with dense patches of *Ascidiella scabra* (**IR.LIR.K.Lsac.Ft**). The wall gave way to a gently sloping plain of muddy sand extending to the end of the transect at 4.6 m depth. Densely scattered pebbles supported an algal turf dominated by *Trailliella*, as well as dense *Chorda filum* and *Desmarestia viridis*. *Saccharina latissima* was abundant above a depth of 3.6 m, where the pebble cover was augmented by scattered cobbles, but was more patchily distributed below this depth. This underlay the distinction between the two zones S2 and S3 but they have both been assigned to the biotope **SMp.KSwSS.LsacR**.

The sequence of littoral biotopes along the transect was similar to that recorded in 2009 (Moore *et al*., 2010), the only difference being the replacement of the **LR.LLR.F.Fves.FS** zone recorded in the earlier survey with a zone of **LR.LLR.F.Fspi.FS** in the current study. *Fucus vesiculosus* and *F spiralis* were present in both years, the biotope change representing a switch in dominance of the two species within a narrow band of 0.85 m width. No other significant temporal changes in the species composition of littoral zones were evident.

As in 2009 the vertical rock wall supported a patchy *Saccharina latissima* forest (**IR.LIR.K.Lsac.Ft**), although change in the algal understorey was apparent. Whereas the turf was strongly dominated by the *Trailliella* stage of *Bonnemaisonia hamifera* in 2009 (superabundant), it was unrecorded here in 2015, which may be related to the recorded temporal increase in algal taxa from 6 to 18. Below the rock wall the stony, muddy sand plain was assigned to **SMp.KSwSS.LsacR** in 2009, with patches dominated by *Trailiella* and devoid of *S. latissima* considered to represent **SMp.KSwSS.Tra**. In 2015 the whole of the sediment plain was referred to **SMp.KSwSS.LsacR**, as the *Trailliella* was considered to be largely attached, rather than forming a loose mat. Re-inspection of the 2009 imagery suggests that this was probably also the case in 2009 and so there is no strong evidence for a temporal change in biotope composition. Species composition appears similar in both years, although *Desmarestia viridis* (common - abundant in 2015) was unrecorded in 2009.

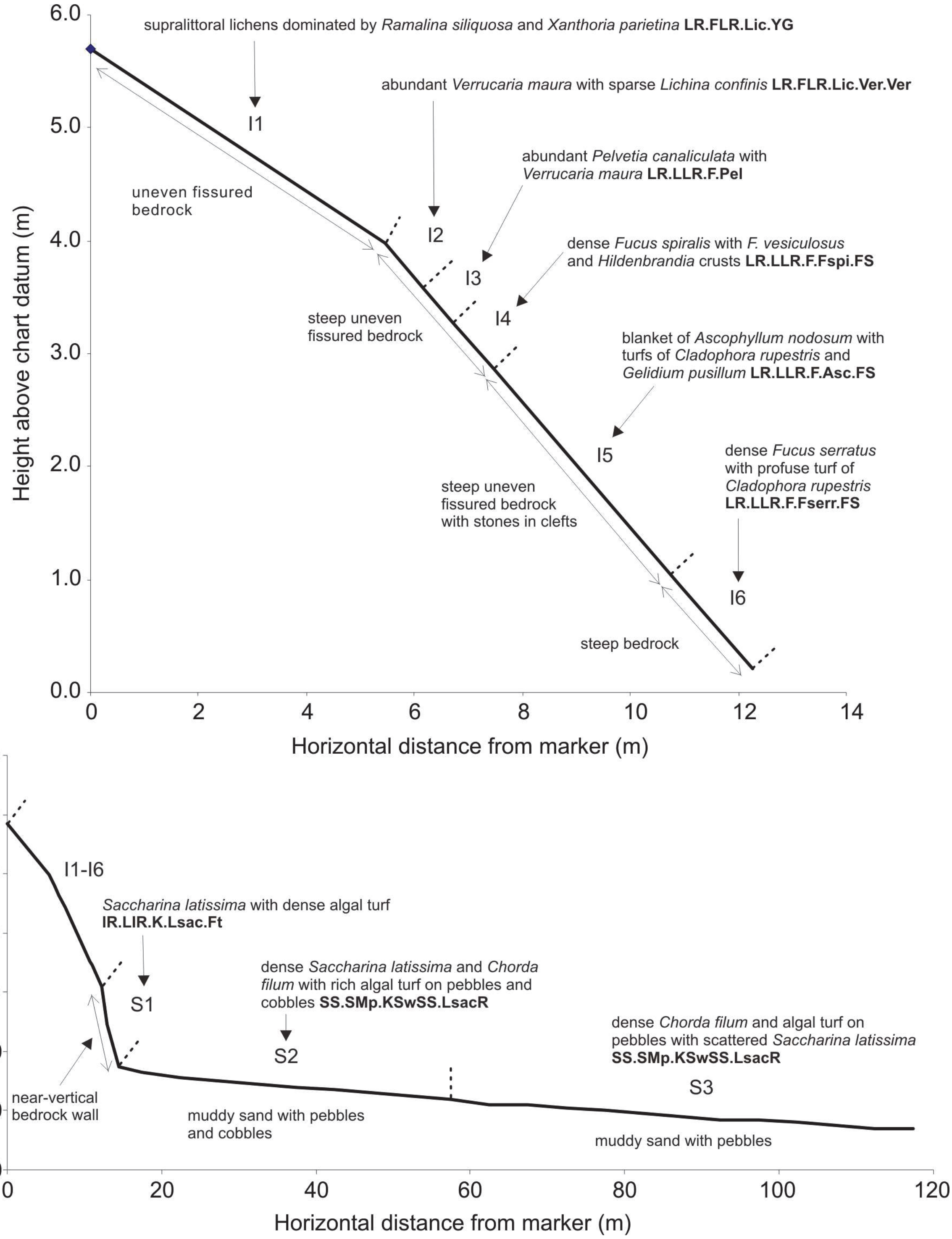

Figure 4. Eilean Port a'Choit W (XX01) transect profile with summary of the substrates, dominant biota and biotopes recorded within the component zones. Upper diagram shows details of the intertidal zones.

3.2.2 Eilean Ard NE (XX06) (Figure 5)

The Eilean Ard NE transect was located midway along the very steep north-east coast of the island. It was selected to represent an example of the ascidian and *Antedon* dominated circalittoral biotope, **CR.LCR.BrAs.AntAsH**, typical of the middle of Loch Laxford, and as the only site in the region where *Swiftia pallida* has been recorded (Bates *et al.*, 2004). There was also good comparative data available for both the shore (Posford Haskoning Ltd, 2001) and for the sublittoral reef habitats (Bates *et al.*, 2004). SACFOR abundance estimates for the biota recorded along the transect in 2015 are given in Table 2.4 (Annex 2).

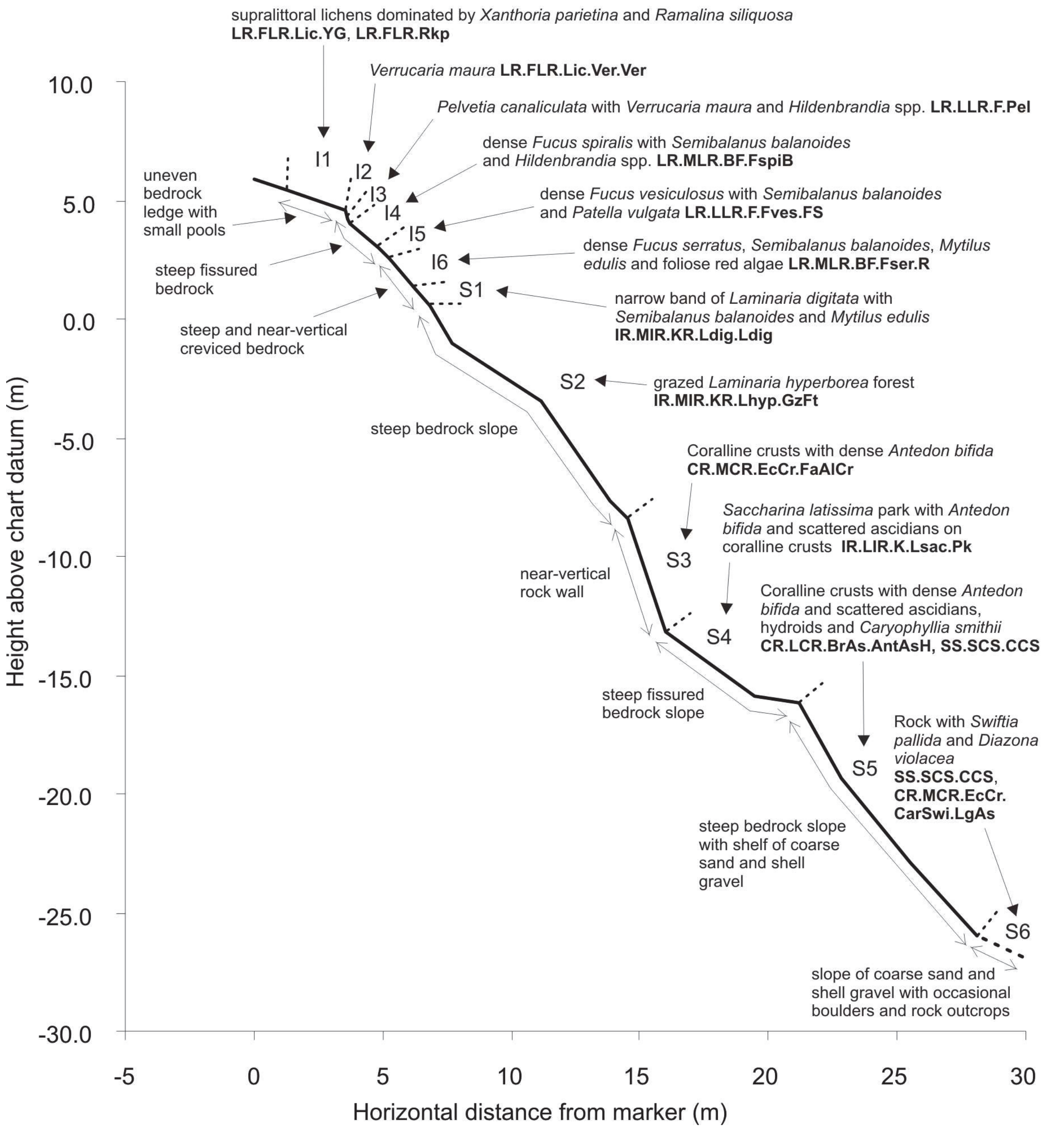

Figure 5. Eilean Ard NE (XX06) transect profile with summary of the substrates, dominant biota and biotopes recorded within the component zones.

The bedrock cliffs fringing the coastline continued down the shore and sublittorally to a depth of 26 m in a sequence of vertical or near-vertical walls and very steep slopes, with occasional ledges which trapped sediment pockets. Most of the supralittoral zone occupied a ledge, with the somewhat uneven rock being encrusted with lichens, particularly *Ramalina siliquosa* and *Xanthoria parietina* (**LR.FLR.Lic.YG**). Small pools were present but were not examined in detail (**LR.FLR.Rkp**). Below this zone the upper shore was of steep, fissured rock, which supported bands of *V. maura* (**LR.FLR.Lic.Ver.Ver**), *Pelvetia canaliculata* with extensive crusts of *Hildenbrandia* spp. and *V. maura* (**LR.LLR.F.Pel**) and *Fucus spiralis* with extensive developments of *Hildenbrandia* spp. and *Semibalanus balanoides* (**LR.MLR.BF.FspiB**). Dense *Fucus vesiculosus* clothed the middle of the shore. Beneath the fucoid sward there was abundant *S. balanoides* and frequent *Patella vulgata*, with *Nucella lapillus* common and *Actinia equina* concentrated in the fissures (**LR.LLR.F.Fves.FS**). At the bottom of the shore a band of *Fucus serratus* was accompanied by abundant foliose red algae, predominantly *Palmaria palmata*, *Mastocarpus stellatus* and *Porphyra umbilicalis*, together with dense *Mytilus edulis* and *S. balanoides* (**LR.MLR.BF.Fser.R**). This was followed by a narrow band of *Laminaria digitata*, overlying dense *S. balanoides* and *M. edulis* (**IR.MIR.KR.Ldig.Ldig**). From 0.6 m above chart datum to a depth of 8.4 m a steep rock slope supported a forest of *Laminaria hyperborea*. The rock surface was extensively encrusted with coralline red algae and gave the general appearance of being fairly heavily grazed by *Echinus esculentus*, although a patchy algal turf was present dominated by frequent *Phycodrys rubens*, *Callophyllis laciniata* and *Dictyota dichotoma*, with occasional *Dasysiphonia japonica* as a minor component. The biotope falls between **IR.MIR.KR.Lhyp.Ft** and **Lhyp.GzFT**, but has been assigned to the latter. Below 8.4 m down to 26 m the steep, rocky substrate supported a similar community, although this was split into zones based on slight compositional changes, depth and inclination. The rock was extensively covered in crusts, mostly of coralline algae but also *Parasmittina trispinosa* and *Spirobranchus triqueter*, with the erect fauna dominated by dense patches of *Antedon bifida*, with scattered ascidians, especially *Ascidia mentula*, and *Caryophyllia smithii*. A near-vertical rock wall from a depth of 8.4 m to 13.2 m supported a relatively sparse fauna, apart from *A. bifida* (tentatively assigned to **CR.MCR.EcCr.FaAlCr**), but with the transition to a steep bedrock slope from the base of the wall, the rock supported frequent *Saccharina latissima* and a sparse, patchy algal turf (tentatively assigned to **IR.LIR.K.Lsac.Pk**). From a depth of 16.2 m to 26.0 m the kelp was lost, with the rock supporting frequent *A. mentula*, as well as *Ciona intestinalis*, scattered hydroids and *Novocrania anomala* (**CR.LCR.BrAs.AntAsH**). Pockets of sediment were also present, with an extensive area of coarse sand and gravel supporting *Cerianthus lloydii* retained by a ledge (**SS.SCS.CCS**). The transect line terminated at a depth of 26 m, at the boundary between the coastal reef band and a slope of coarse sand and shell gravel (**SS.SCS.CCS**). Beyond the transect scattered boulders and small bedrock outcrops supported occasional *Swiftia pallida*, *Diazona violacea* and *C. smithii*, as well as *Axinella infundibuliformis* and scattered hydroids (**CR.MCR.EcCr.CarSwi.LgAs**).

No temporal change was recorded in the sequence of littoral biotopes between the 2009 and 2015 surveys. Apparently significant changes in the abundance of a small number of taxa were recorded. The presence of abundant small littorinids in the *Pelvetia*, *Fucus spiralis* and *F. vesiculosus* zones, possibly *Littorina neglecta*, was unrecorded in 2009, although the nature of their cryptic habitat may have caused them to have been overlooked. One distinct temporal difference is the establishment of dense *Mytilus edulis* on the lower shore in 2015, unrecorded along the transect in 2009.

Temporal change in the sequence of sublittoral biotopes was evident, although this was principally due to a change in the density of kelp. In 2009 the grazed *Laminaria hyperborea* forest (**IR.MIR.KR.Lhyp.GzFT**) gave way at its lower margin to a mixed *Saccharina latissima* and *L. hyperborea* forest, dominated by abundant *S. latissima* (**IR.LIR.K.LhypLsac.Gz**). In 2015, however, although frequent *S. latissima* plants were observed within the **IR.MIR.KR.Lhyp.GzFT** zone, no similar enhancement in dominance of the species at the lower margin of the kelp forest was discernible. In both years the kelp forest terminated at a marked transition in the topography from a bedrock slope to a near-vertical rock wall (zone 4 in 2009, zone 3 in 2015). The wall was extensively encrusted with coralline algae but, apart from dense clumps of *Antedon bifida*, supported a fairly sparse fauna, particularly in comparison with deeper transect zones. Although the wall was ascribed to **CR.LCR.BrAs.AntAsH** in 2009, it is felt that it is probably a better fit to **CR.MCR.EcCr.FaAlCr** in both survey years. At the base of the wall in 2015 the bedrock slope from a depth of 13.2 m to 16.2 m supported a park of frequent *S. latissima*, which has been tentatively assigned to **IR.LIR.K.Lsac.Pk**. Although *S. latissima* was recorded here in 2009, re-inspection of the video footage suggests the density was significantly lower, resulting in the ascription of the habitat to a different biotope, **CR.LCR.BrAs.AntAsH**. Below the lower limit of the 2015 transect at 26 m depth, scattered boulders and small bedrock outcrops on the slope of coarse sediment were observed to support *Swiftia pallida*, *Caryophyllia smithii*, scattered hydroids and ascidians such as *Diazona violacea* and *Ascidia virginea*. This habitat was considered to represent the biotope **CR.MCR.EcCr.CarSwi.LgAs**. This biotope was unrecorded in 2009, although the presence of *S. pallida* was noted at a depth of around 27 m on rock outcrops beyond the transect survey band, and review of the 2009 video footage confirms that patches of the same *Swiftia* biotope were present at that time.

3.2.3 Eilean na Saille S (XX09) (Figure 6)

This transect was located off the southern tip of the island Eilean na Saille, at the northern entrance to Loch Dùghaill. Although this site was not examined during the baseline SCM survey (Moore *et al*., 2010), its inclusion in future monitoring was recommended in order to provide better representation of the outer region of the SAC. Some temporal comparative data for the area is available for the shore (Posford Haskoning Ltd, 2001) and for the sublittoral reef habitats (Bates *et al*., 2004). SACFOR abundance estimates for the biota recorded along the transect in 2015 are given in Table 2.5 (Annex 2).

The shore consisted of a bedrock slope which continued sublittorally beyond the lower end of the transect at a depth of 26.2 m. Sublittorally the slope was interrupted in places by ledges containing small gullies, boulders and cobbles. The transect marker piton was located in a zone dominated by *Verrucaria maura*, *Melaraphe neritoides* and *Littorina saxatilis* (**LR.FLR.Lic.Ver.Ver**). A zone of fairly sparse yellow and grey lichens was observed to be present above the start of the transect (**LR.FLR.Lic.YG**). The *Verrucaria* zone gave way to a band of dense *Porphyra umbilicalis* and barnacles, dominated by *Chthamalus* spp., with both *C. stellatus* and *C. montagui* present (**LR.HLR.MusB.Cht.Cht**). Small pools, mostly associated with a cleft running down the zone, contained dense aggregations of *Actinia equina* (**LR.FLR.Rkp**). Barnacles dominated the rock in the following zone. *Semibalanus balanoides* juveniles were widely distributed here, but the upper region of this zone was dominated by adult chthamalids (**LR.HLR.MusB.Cht.Cht**) and the middle and lower regions by adult *S. balanoides* (**LR.HLR.MusB.MytB**). Small pools contained *Corallina officinalis* and *A. equina* (**LR.FLR.Rkp.Cor.Cor**), the latter species also present in fissures, together with dense *Mytilus edulis*. Dense *S. balanoides* continued into the next zone (**LR.HLR.MusB.MytB**), but this zone was characterized by a band of abundant filamentous red algae dominated by *Aglaothamnion sepositum*. The sublittoral fringe could not be examined in detail due to strong surge conditions, but was observed to support dense *Alaria esculenta* and *S. balanoides* (**IR.HIR.KFaR.Ala.Myt**). Most of the infralittoral section of the transect passed through a forest of *Laminaria hyperborea*. This consisted of a relatively narrow upper band from a depth of 0.9 m to 5.0 m, where the rock supported a dense turf of foliose red algae and *L. digitata* was common. This zone has been ascribed to **IR.HIR.KFaR.LhypR.Ft**, although the presence of frequent sponge cushions and *Sagartia elegans* places it also close to **IR.HIR.KFaR.LhypFa**. From a depth of 5.0 m to 17.3 m the kelp forest continued but with a reduced density of algal turf and faunal cushions (**IR.MIR.KR.Lhyp.Ft**).

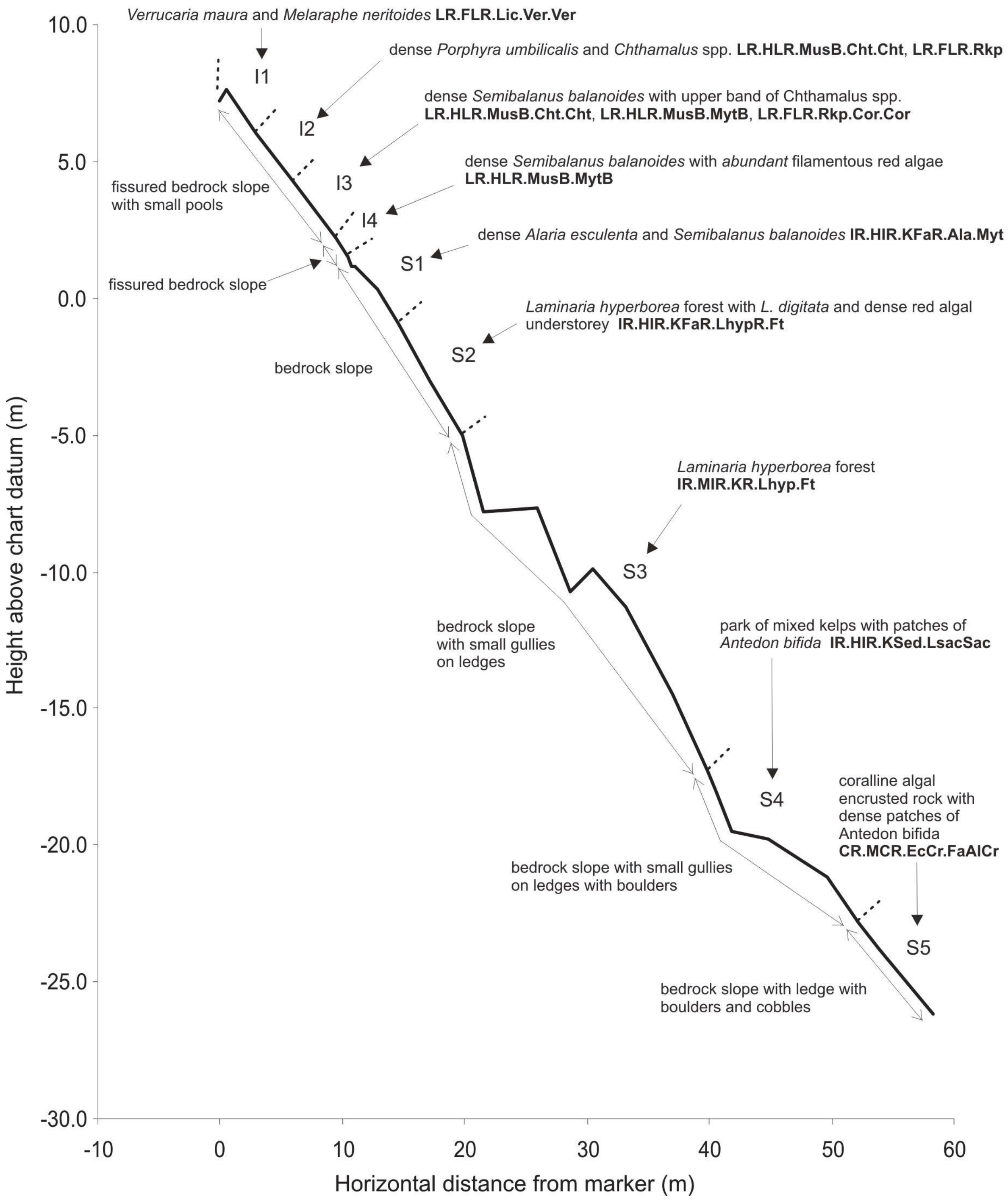

Figure 6. Eilean na Saille S (XX09) transect profile with summary of the substrates, dominant biota and biotopes recorded within the component zones.

Below the forest, a park of small *Saccharina latissima* and *L. hyperborea* extended to a depth of 22.8 m. The rock was encrusted with red and brown algae and supported frequent *Dictyota dichotoma* and patches of *Antedon bifida* (tentatively ascribed to **IR.HIR.KSed.LsacSac**). Below the kelp zones to the end of the transect at a depth of 26.2 m the bedrock slope was extensively encrusted with coralline algae and *Parasmittina trispinosa* and supported dense patches of *A. bifida* and numerous *Echinus esculentus* (**CR.MCR.EcCr.FaAlCr**).

Detailed temporal changes along this transect cannot be investigated as this site was not examined during the 2009 baseline survey (Moore *et al*., 2010). In 2001 Posford Haskoning (2001) mapped the dominant shore habitat around the southern coastline of Eilean na Saille as **LR.HLR.MusB**, and at a site close to the 2015 transect described the presence of bands of **LR.FLR.Lic.YG**, **LR.FLR.Lic.Ver.Ver**, **LR.HLR.MusB.Sem.Sem** and **LR.HLR.MusB.MytB**. This is in broad agreement with the zonation pattern found in 2015, although chthamalids dominated the uppermost barnacle zone in 2015. As part of the 2001 sublittoral broadscale mapping programme Bates *et al.* (2004) examined the biotope sequence at a site close to that of the 2015 transect. In place of the kelp forests recorded in 2015 (**IR.HIR.KFaR.LhypR.Ft** above **IR.MIR.KR.Lhyp.Ft**), they reported **IR.HIR.KFaR.LhypFa** above **IR.MIR.KR.Lhyp.GzFt** at similar depth ranges to the corresponding biotopes of 2015. Some compositional changes are apparent between the surveys, although separate species lists were not provided for these zones in the 2001 study, which complicates temporal comparisons. As noted above, although the upper forest was assigned to **IR.HIR.KFaR.LhypR.Ft** in 2015, it is also close to **IR.HIR.KFaR.LhypFa**, and there is no strong evidence for a temporal change in biotope between the surveys. In 2001 the rock of the lower kelp forest was of a grazed appearance and this perhaps reflects the greater density of *Echinus esculentus* recorded in the earlier study (SACFOR estimates of common in 2001, occasional in 2015).

In both 2015 and 2001 the zones of kelp forests gave way to kelp parks at depths of respectively 17 and 14 m. The park was dominated by *Saccharina latissima* in 2015 (**IR.HIR.KSed.LsacSac**) but by *Laminaria hyperborea* (**IR.MIR.KR.Lhyp.GzPk**) in 2001. Below the kelp park coralline algal encrusted rock supporting dense patches of *Antedon bifida* was recorded in both years from depths of 23 m and 19 m in 2015 and 2001 respectively. This was attributed to **CR.MCR.EcCr.FaAlCr** in 2015 but to **CR.MCR.EcCr.CarSp.PenPcom** in 2001. *Antedon bifida* dominated rock in 2001 was assigned to the biotope **CR.FaV.Ant** under the 1997 biotope classification scheme (Connor *et al*., 1997), which has no direct equivalent in the current classification (version 15.03 - JNCC, 2015). Some differences in species composition between the surveys of this depth zone are apparent, particularly the presence of *Corynactis viridis* (common) only in 2001, although these are explicable in terms of slight locational differences (possibly resulting in topographical variation) or natural temporal variability.

3.3 Maerl bed transect surveys

General details of the three maerl beds selected for survey are given in Table 3.1 (Annex 3) and detailed composition of the epibiota recorded by diving in Table 3.2 (Annex 3).

3.3.1 ML01

Transect ML01 was located within the lagoon-like, Lochan na Fionndalach Bige, at the south-western end of the tidal rapids channel at Sruth Mor. The sediment consisted of a mix of coarse sand, shell and maerl gravel with a surface scatter of dead shells, locally dense, at a depth of 4.5 - 5.1 m. In the second half of the transect the substrate became a more homogeneous coarse, shelly sand with markedly fewer shells. Live maerl was sparse and consisted mainly of *Phymatolithon calcareum*, but with some hedgehog stones of *Lithothamnion glaciale* also present. Denser live *P. calcareum* (possibly frequent locally) was associated with denser patches of shells. *Saccharina latissima* and *Halidrys siliquosa* were frequent and the sediment supported a patchy algal turf, better developed in areas of dense shell material. Dominant turf formers included *Cystoclonium purpureum* and *Polysiphonia fucoides*, with the invasive alga, *Dasysiphonia japonica*, a minor component (occasional). Dominant faunal taxa recorded included *Carcinus maenas*, *Liocarcinus depurator*, *Ascidiella scabra* and *Ensis* siphons. In all, 69 taxa were recorded along the transect. The habitat can be considered a sparse and patchy maerl bed and has been ascribed to the biotope **SS.SMp.Mrl.Pcal.R**. However, it could also be considered to consist of a mosaic of patches of this biotope where shell density is high and possibly **SS.SCS.ICS** in areas of more homogeneous coarse sand and shell gravel, where maerl was extremely sparse.

A sparse maerl bed dominated by *Phymatolithon calcareum* (rare) but with hedgehog stones of *Lithothamnion glaciale* was recorded at this site in both 2009 (Moore *et al*., 2010) and 2015. In both years overall live maerl density was no more than 1 - 5% cover, although this possibly attained around 10% (frequent) in some patches of dense shell material. Holt (1991) carried out an MNCR phase 2 survey in the same area in 1991 describing maerl as sparse, although recording SACFOR values of frequent for both *P. calcareum* and *L. glaciale* equivalent to a total maerl cover of 20 - 38%. This reduction in recorded maerl density between 1991 and 2009 may have been due to patchiness and slight differences in location of the survey sites, although prior to the 2009 transect survey reconnaissance of the wider area was carried out by divers and this failed to reveal richer maerl densities in the vicinity (Moore *et al*., 2010). As a cover of 20 - 38% seems incompatible with the description of sparse maerl, the evidence for real temporal change is poor. There is no evidence for a temporal change in live maerl density between the 2009 and 2015 surveys.

Fewer epibiotic taxa were recorded during the MNCR survey in 2009 (54) than in 2015 (69). This difference will be due in part to the methodological approaches used. In 2009 the MNCR phase 2 survey recorded conspicuous taxa, but this was accompanied by a more exhaustive algal collection designed to provide an inventory of all macroalgal species present. This brought the total epibiotic taxon count in 2009 to 109. Results from the 2015 survey included a number of inconspicuous taxa only identified subsequently from collected material. Given no temporal change one would expect the 2015 taxon count to lie between the two 2009 values, which it does. No marked changes in epibiotic species composition were apparent between the 2009 and 2015 surveys. The presence of the invasive red alga, *Dasysiphonia japonica*, was noted in both years at low density

3.3.2 ML02

Transect ML02 was sited close to a mussel farm northwest of Eilean Ard at a depth of 17.8 - 17.9 m. The sediment was markedly finer than ML01, consisting of muddy sand with maerl gravel. There was a fairly dense scatter of drift kelp and sparsely scattered bivalve shells, including *Arctica islandica*. Live *Phymatolithon calcareum* was patchily distributed but with an overall cover of 30 - 40%. The maerl bed supported a very sparse associated algal flora, which included occasional *Dasysiphonia japonica*. Visible fauna was also sparse, with the more conspicuous elements including frequent *Neopentadactyla mixta*, *Pagurus bernhardus* and *Amphiura* sp. 51 taxa were recorded along the transect, which has been ascribed to the biotope **SS.SMp.Mrl.Pcal**.

The maerl bed recorded at this site in 2015 was very similar to that described at the same location in 2009 (Moore *et al.*, 2010). Estimated live maerl cover was 20 - 30% in 2009 and 30 - 40% in 2015, insufficiently different to suggest temporal change. The patches of dead mussel shells observed in 2009, presumably originating from the adjacent mussel farm, were no longer apparent in 2015 but there was little change evident in the epibiota, which was sparse in both years. *Dasysiphonia japonica* was only recorded here in 2015 but it was sparse and may have been present in 2009, when the filamentous red algae were not identified. The site is only 250 m from Eilean Ard, where the species was found to be locally frequent in 2009.

More epibiotic taxa were recorded here in 2015 (51) than in 2009 (33). This is unlikely to represent real temporal change. The difference is largely due to the absence of a detailed algal census at this site in 2009 and the inclusion of a range of small, inconspicuous algal and faunal taxa in 2015.

3.3.3 ML04

This site was located in the channel between Sgeir Iosal and the southern coastline of Loch Laxford at a depth of 15.0 - 15.2 m. The substrate was of maerl gravel thrown into waves of wavelength of around 2 m and amplitude of approximately 30 - 40 cm. Live *Phymatolithon calcareum* had an overall cover of around 20 - 30% but was patchily distributed with values reaching around 60 - 70% in the wave troughs. The associated algal flora appeared sparse, with scattered *Saccharina latissima* and small tufts of reds and browns, particularly *Pterothamnion plumula*. *Dasysiphonia japonica* was recorded here as rare. The visible faunal element also appeared sparse, dominant forms including frequent *Neopentadactyla mixta* and *Pagurus bernhardus*. 67 taxa were recorded along the transect, which has been ascribed to **SS.SMp.Mrl.Pcal.Nmix**.

In 2009 this site was regarded as representing the richest maerl bed studied in the SAC, with a live maerl cover of 60 - 70% (Moore *et al*., 2010). Although such densities were present locally in 2015, the overall density of 20 - 30% appears to represent real temporal change. This is likely to be related to the considerably different morphology of the seabed, which was flat in 2009 but thrown into waves of maerl gravel in 2015 through natural hydrodynamic activity. Such activity is likely to have led to burial or translocation of some of the live maerl material. Review of the imagery from both years confirms that there is a concomitant reduction in the density of the associated filamentous and foliose algal community, leading to a switch in nominated biotope from **SS.SMp.Mrl.Pcal.R** to **SS.SMp.Mrl.Pcal.Nmix**. *Dasysiphonia japonica* was not recorded in the earlier survey, but was only present at very low density (rare) in 2015. There is little evidence of a distinct temporal change in the composition of the epibiotic faunal community.

There is no evidence of an overall reduction in species richness at this site. 68 epibiotic taxa were recorded along the transect in 2015, compared to 36 *in situ* records of taxa in 2009. Similar richness values are obtained if data from the additional algal collection made in 2009 are included and the cryptic bryozoans recorded in 2015 are excluded (viz. totals of 66 and 58 taxa in 2015 and 2009 respectively).

3.3.4 Maerl infauna

Species abundance data for the four replicate core samples taken at the three maerl sites are presented in Table 3.3 (Annex 3) and total abundance and diversity measures in Table 3.4 (Annex 3). Sediment particle size data are provided in Table 3.5 (Annex 3), with summarial descriptors in Table 3.6 (Annex 3) and graphical illustration in Figure 3.1 (Annex 3).

Multidimensional scaling analysis of the log-transformed species abundance data (Figure 7) indicates that species composition differs between sites and temporally at each site. This is largely supported by ANOSIM analysis ($p<0.05$), although the temporal difference at site ML02 is on the borderline of significance ($p=0.057$). Use of the SIMPER routine within PRIMER reveals the taxa principally responsible for the temporal differences. At site ML01 such taxa included the polychaete *Malmgreniella mcintoshi*, only present in 2009, the small gastropod *Onoba semicostata* only recorded in 2015 and the bivalve *Kurtiella bidentata* more abundant in 2015. At site ML02 the principal temporal difference was the dominance of *Pseudopolydora paucibranchiata* in the 2009 samples (when it was superabundant) and its absence in the 2015 core samples. This polychaete is commonly associated with the presence of organic enrichment (e.g. Borja *et al*., 2004). It should be noted that some specimens of *Pseudopolydora* or *Polydora* were observed within the maerl by divers during the 2015 MNCR epibiota survey, so *P. paucibranchiata* may have also been present in 2015. The principal taxa responsible for the temporal difference in composition at ML04 were juvenile amphiurids and the gastropod *Alvania beanii*, both more abundant in 2015.

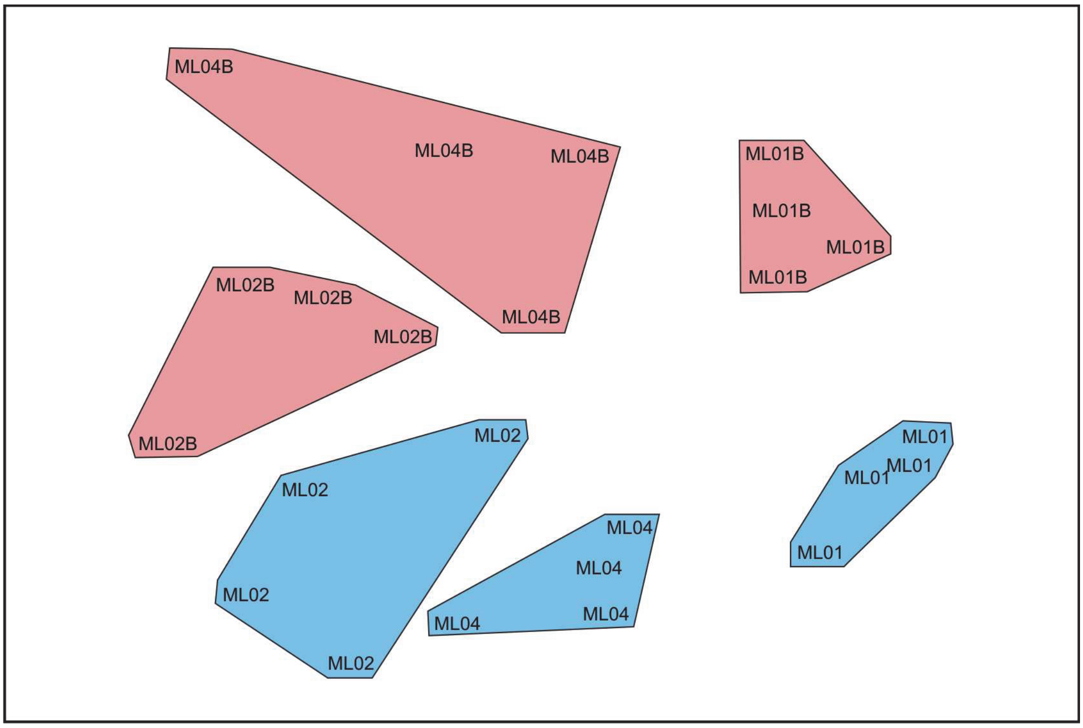

Figure 7. Non-metric multidimensional scaling ordination of infaunal species abundance data from four replicate core samples at three transect sites in 2009 and 2015. Replicates are grouped by site; pink clusters (2009) and blue clusters (2015). Stress = 0.17.

A temporal comparison of mean abundance and diversity measures is provided in Table 5. No significant temporal changes in mean infaunal abundance, taxon richness or diversity were recorded at any of the three maerl sites (p>0.1, t test).

Table 5. Comparison of mean taxon richness, Shannon-Wiener diversity (log_2) and total abundance (with standard errors) in four replicate 10.3 cm diameter core samples derived from surveys along transects in 2015 and 2009. Bracketed values include colonial and microscopic taxa not included in 2009 analysis.

Transect	No. taxa		Total abundance		Diversity (Shannon-Wiener)	
	2015	2009	2015	2009	2015	2009
ML01	23.25 ±2.87 (25.00)	26.50 ±4.05 (26.50)	106.75 ±25.70	96.75 ±21.42	3.644 ±0.161	3.984 ±0.105
ML02	35.75 ±1.49 (36.50)	40.25 ±3.84 (40.25)	70.75 ±4.64	89.50 ±15.25	4.789 ±0.087	4.541 ±0.100
ML04	34.25 ±2.93 (34.25)	31.00 ±7.58 (31.00)	76.00 ±10.33	60.50 ±14.98	4.420 ±0.142	4.354 ±0.334

4. DISCUSSION

4.1 Site Condition monitoring of the inlets and bays feature

Monitoring of the condition of this feature should consider four attributes, which are listed in Table 1 (Joint Nature Conservation Committee, 2004a). Maerl beds are a component of this complex feature and the Common Standards Monitoring Guidance (Joint Nature Conservation Committee, 2004c) provides scope for the monitoring of such habitats, where they reflect the condition of the complex feature. The Site Attribute Table for the inlets and bays feature therefore incorporated two additional monitoring requirements for maerl beds under the attributes 'species composition of representative or notable biotopes' and 'presence or abundance of specified species' (Moore *et al*., 2010). The Site Attribute Tables are reproduced in Annex 4.

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, methods for assessment of adherence to the target, and the results of assessment are summarised in Table 4.1 (Annex 4).

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 feature.

4.1.2 Diversity of component habitats

Intertidal sediment transects were not examined in 2015. Twenty-one intertidal reef biotopes were recorded along transects in 2009. All were refound in 2015 apart from seven (see Table 4.1, Annex 4) which were all only present in 2009 on transects not examined in 2015.

Of the 59 sublittoral biotopes recorded along transects or during the video survey in 2009, 35 were recorded in 2015. Of the 24 biotopes not refound 19 were only present in 2009 at sites not examined in 2015 (see Table 4.1, Annex 4). **SS.SCS.CCS.MedLumVen** was not refound in 2015 as its identity requires the availability of infaunal data, which were not collected in 2015. **SS.SSa.IMuSa.ArelSa** and **SS.SMu.ISaMu** were not refound in 2015, probably due to slight differences in sample locations between the surveys. **SS.SMu.CSaMu** was not refound in 2015 but its presence in 2009 was uncertain due to the inadequacy of the video footage. **IR.LIR.K.LhypLsac.Gz** was not refound due to a temporal change in the dominance of kelp species, which is likely to represent natural temporal variability.

Considering only the video sites and transects that were examined in both surveys, a total of 48 biotopes were recorded in 2009 and 53 in 2015. It is concluded that there is no evidence for a temporal reduction in the diversity of biotopes, although some minor change in biotope identity may have resulted from natural factors.

4.1.3 Distribution/spatial pattern of habitats

A change in biotope ascription was recorded at 20 of the 70 video sites studied in 2015 (Table 4.1, Annex 4) . However, allowing for uncertainties resulting from differences in sampling locations and deficiencies in video footage, good evidence for real temporal change in biotope identity was only present at two sites, where an increase in the density of the algal turf, considered to be due to natural variation, underpinned the biotope change (Table 4: sites D97, D112).

Temporal comparisons between the 2009 SCM survey of relocatable transects and 2015 are only possible at the two reef/sediment transects examined in 2015: Eilean Port a' Choit W (XX01) and Eilean Ard NE (XX06). The sequence of littoral biotopes was unchanged at both sites, apart from a switch from **LR.LLR.F.Fves.FS** to **LR.LLR.F.Fspi.FS** in one zone at XX01, which represented a natural temporal change in dominance of the two characterizing species, *Fucus vesiculosus* and *F. serratus*.

The sequence of sublittoral biotopes was similar in both years along XX01. The sediment plain at the bottom of the transect was assigned to **SMp.KSwSS.LsacR** in 2009, with patches dominated by *Trailliella* and devoid of *Saccharina latissima* considered to represent **SMp.KSwSS.Tra**. In 2015 the whole of the sediment plain was referred to **SMp.KSwSS.LsacR**, as the *Trailliella* was considered to be largely attached, rather than forming a loose mat. Re-inspection of the 2009 imagery suggests that this was probably also the case in 2009 and so there is no strong evidence for a temporal change in the sequence of biotopes.

Changes in the biotope sequence along the sublittoral section of transect XX06 included the recorded absence of **IR.LIR.K.LhypLsac.Gz** in 2015 and a switch in one zone from **CR.LCR.BrAs.AntAsH** to **IR.LIR.K.Lsac.Pk**. Both these changes are considered to have resulted from natural temporal variation in the density of kelp plants.

It is concluded that there is no evidence for temporal change in biotope distribution that cannot be explained by natural temporal variability.

4.1.4 Water quality

Water quality was not examined as part of the 2015 field survey and the Site Attribute Table prescription for monthly water quality sampling from a series of relocatable stations was not carried out (Table 4.1, Annex 4). However, aspects of water quality within Loch Laxford are monitored by the Scottish Environment Protection Agency (SEPA) and Food Standards Scotland. SEPA has a water quality monitoring station at the head of the loch and has considered it to be in good condition from 2009 to 2013 (the latest year for which information is available) based on quarterly monitoring of a range of chemical, biological, hydrological and morphological monitoring data, including such parameters as dissolved oxygen, dissolved inorganic nitrogen, ammonia and salinity (Scottish Environment Protection Agency, 2016). Most of the SAC is classified by Food Standards Scotland as a shellfish harvesting area and it has been assigned the highest category A status from 2009 to 2015 based on monitoring of the microbiological and chemical contamination of mussels (Scottish Government, 2016b). There is no reason to suspect there has been any deterioration in water quality between 2009 and 2015.

4.1.5 Species composition of representative or notable biotopes

The Site Attribute Table (Table 4.1, Annex 4) prescribes the monitoring of the three maerl bed transects (ML01, ML02, ML04) in order to assess temporal decline in maerl biotope quality due to changes in species composition or reduction in species richness.

Recorded temporal differences in epibiotic species richness at the three sites were considered to result from methodological differences between surveys. No significant temporal changes in infaunal species richness or diversity were recorded at any of the sites. Change in infaunal species composition were considered to result from natural variation, except at transect ML02, where a marked decline in the abundance of *Pseudopolydora paucibranchiata* may have resulted from a temporal decline in organic enrichment originating from the adjacent mussel farm. A temporal reduction in non-maerl algal cover along transect ML04, leading to a switch in biotope from **SS.SMp.Mrl.Pcal.R** to **SS.SMp.Mrl.Pcal.Nmix**, was considered to have resulted from enhanced, natural, hydrodynamic activity, exemplified by the development of sediment waves.

4.1.6 Presence or abundance of specified species

The Site Attribute Table prescription (Table 4.1, Annex 4) is to maintain the abundance of *Phymatolithon calcareum* and for there to be no increase in the abundance of *Dasysiphonia japonica* along the three maerl transects.

No decrease in the abundance of *Phymatolithon calcareum* was recorded between the 2009 and 2015 surveys along transects ML01 and ML02. A temporal reduction in live maerl cover along transect ML04, amounting to around a halving of the 60 - 70% cover in 2009, was considered likely to have been caused by burial or translocation of material by the enhanced, natural, hydrodynamic activity at this site.

Sparse *Dasysiphonia japonica* (rare - occasional) was recorded at all three maerl sites in 2015 but only at ML01 in 2009. Filamentous red algae were so sparse that they were not identified to species at ML02 in 2009 and so the species may have been present then. It is very likely that the 2015 record at ML04 represents colonisation by the species between the survey years, as a detailed algal census was carried out here in 2009. However, its low density at all three sites suggests that it should not be currently considered to be ecologically significant or to represent a reduction in condition of the habitat.

4.2 Site Condition monitoring of the reefs feature

4.2.1 Extent of entire feature

No human activities have been identified that are likely to have influenced the extent of the feature.

4.2.2 Biotope composition of the littoral rock and inshore sublittoral rock

All intertidal reef biotopes present in 2009 were refound in 2015 apart from seven (see Table 4.2, Annex 4). However, all of these were only present along transects not examined in 2015.

Fourteen subtidal reef biotopes were not refound in 2015 but were only recorded in 2009 at sites not examined in 2015 (see Table 4.2, Annex 4). **IR.LIR.K.LhypLsac.Gz** was not refound along transect XX06 in 2015 due to a change in dominance of the kelp species, considered to represent natural temporal variation. Hence, the variety of reef biotopes is considered to have been maintained, subject to allowance for natural temporal change.

4.2.3 Distribution/Spatial arrangement of biotopes

A change in biotope ascription was recorded in 2015 at 9 of the 20 video sites where reef biotopes were found in 2009 (Table 4.2, Annex 4). However, allowing for uncertainties resulting from differences in sampling locations and deficiencies in video footage, good evidence for real temporal change in biotope identity was only present at two sites, where an increase in the density of the algal turf, considered to be due to natural variation, underpinned the biotope change (Table 4: sites D97, D112).

Temporal comparisons between the 2009 SCM survey of relocatable transects and 2015 are only possible at the two reef/sediment transects examined in 2015: Eilean Port a' Choit W (XX01) and Eilean Ard NE (XX06).

The sequence of littoral reef biotopes was unchanged at both sites, apart from a switch from **LR.LLR.F.Fves.FS** to **LR.LLR.F.Fspi.FS** in one zone at XX01, which represented a natural temporal change in dominance of the two characterizing species, *Fucus vesiculosus* and *F. serratus*. The sequence of sublittoral reef biotopes was the same in both years along XX01.

Changes in the biotope sequence along the sublittoral section of transect XX06 included the recorded absence of **IR.LIR.K.LhypLsac.Gz** in 2015 and a switch in one zone from **CR.LCR.BrAs.AntAsH** to **IR.LIR.K.Lsac.Pk**. Both these changes are considered to have resulted from natural temporal variation in the density of kelp plants.

4.2.4 Species composition of representative or notable biotopes

The Site Attribute Table prescribes the monitoring of the nine fixed transects across littoral and sublittoral reef habitats established in 2009 (Moore *et al*., 2010) in order to identify a decline in biotope quality resulting from changes in species composition or loss of notable species. Only two transects were re-examined in 2015.

As noted above, along the intertidal section of transect XX01 there was a temporal change in dominance of *Fucus vesiculosus* and *F. serratus* resulting in a biotope change from **LR.LLR.F.Fves.FS** to **LR.LLR.F.Fspi.FS**. Sublittorally, in 2009 the algal turf of the *Saccharina latissima* forest was strongly dominated by the *Trailliella* stage of *Bonnemaisonia hamifera*, which was unrecorded here in 2015.

Along the intertidal section of transect XX06 the presence of abundant small littorinids in the *Pelvetia*, *Fucus spiralis* and *F. vesiculosus* zones in 2015 was unrecorded in 2009. A band of dense *Mytilus edulis* on the lower shore in 2015, was unrecorded in 2009. Along the sublittoral section of the transect localised changes in the abundance or dominance of *Saccharina latissima* were recorded between the surveys. All of these compositional changes are considered to be probably due to natural temporal fluctuation or methodological differences between surveys.

Detailed algal censuses of selected zones along four of the reef transects were prescribed by the Site Attribute Table but not carried out in 2015. Only one of these zones (Eilean Ard NE zone S5 (=zone S4 in 2015)) was surveyed by standard MNCR phase 2 methods in 2015. The reduced number of algal taxa recorded (6) compared to the 2009 algal census (24) will be strongly influenced by the different methodologies adopted.

4.3 Overall condition assessment

There is no evidence of anthropogenic activities having caused any deterioration in the condition of the inlets and bays feature or the reefs feature since the establishment of site condition monitoring in 2009. Although the nature and scale of localised impacts around aquaculture facilities did not form a component of the 2015 work, one of the maerl transect was located within 100 m of the mussel farm off Eilean Ard. Here, the reduction in the abundance of *Pseudopolydora paucibranchiata* and the density of dead shells of *Mytilus edulis* might suggest some improvement in the condition of the habitat, although it is possible that these recorded differences merely reflect temporal variation in the positioning of the mussel lines. Despite evidence for the continued spread of the invasive alga, *Dasysiphonia japonica* within the SAC, it is not assessed as currently representing a threat to the condition of the designated features.

Based on the available evidence it is recommended that the inlets and bays and the reefs features should be assigned to the condition category "Favourable Maintained".

4.4 Recommendations

While some reduction in monitoring effort from that prescribed by the Site Attribute Tables for the SAC might be considered without significantly reducing the ability to detect deterioration in the condition of the designated features, the short duration of the 2015 survey will have resulted in a reduction in the ability to detect temporal change. This relates particularly to the condition of sedimentary habitats, which are poorly assessed by observational means alone, and to intertidal habitats. The 2015 survey was restricted to the examination of intertidal reef habitats at just three locations throughout the SAC. Future monitoring would benefit from the inclusion of infaunal sampling and from wider coverage of reef and intertidal habitats. Important habitats that were not examined in 2015 but should receive future attention include the sediment flats of Tràigh Bad na Bàighe and the beds of mussels and *Ascophyllum nodosum* ecad *mackaii* at the head of the loch. Some of this work could be carried out by staff with minimal training.

It is clear from the results of the baseline and current SCM surveys that the standard MNCR diver surveying techniques employed can provide only very coarse level identification of temporal trends in species richness of reef communities. Moore *et al*. (2010) proposed the production of a complete algal census at certain sites in order to improve the monitoring of species composition and diversity. This recommendation is reiterated here. The reader is referred to Moore *et al.* (2010) for more detailed discussion of this and alternative approaches.

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ANNEX 1: VIDEO SURVEY DATA

Table 1.1. Site details for the 2015 drop-down video survey.

Site	Sample	Date	Latitude start	Longitude start	Latitude end	Longitude end	Depth start (m)	Depth end (m)	Video time (start)	Video time (end)
D6	D6	08/08/2015	58.38711	-5.05219	58.38740	-5.05217	5.7	6.3	00:00:06	00:05:58
D9	D9	08/08/2015	58.38945	-5.05588	58.38951	-5.05507	8.3	8.2	00:00:06	00:03:28
D17	D17	08/08/2015	58.39300	-5.06226	58.39371	-5.06196	11.9	11.9	00:00:06	00:06:22
D19	D19	08/08/2015	58.39302	-5.06719	58.39354	-5.06681	12.1	12.8	00:00:04	00:05:23
D20	D20	08/08/2015	58.39468	-5.06333	58.39503	-5.06422	13.6	15.8	00:00:05	00:06:49
D21	D21	08/08/2015	58.39870	-5.06527	58.39880	-5.06453	10.6	11.0	00:00:07	00:06:22
D22	D22	08/08/2015	58.40141	-5.06148	58.40170	-5.06178	10.1	9.3	00:00:03	00:05:56
D24	D24	08/08/2015	58.39720	-5.07021	58.39765	-5.07019	13.4	13.8	00:00:05	00:03:27
D25	D25	08/08/2015	58.39461	-5.07148	58.39547	-5.07122	13.5	12.9	00:00:06	00:07:57
D26	D26	08/08/2015	58.39579	-5.07742	58.39669	-5.07689	14.2	15.2	00:00:04	00:08:36
D27	D27	08/08/2015	58.39823	-5.07443	58.39890	-5.07464	15.2	15.5	00:00:06	00:06:03
D28	D28	08/08/2015	58.40267	-5.07177	58.40324	-5.07124	16.3	16.7	00:00:05	00:06:34
D29	D29	08/08/2015	58.40599	-5.06991	58.40653	-5.06987	13.3	12.9	00:00:06	00:05:07
D32	D32	08/08/2015	58.40784	-5.06573	58.40828	-5.06554	10.0	9.7	00:00:08	00:06:29
D33	D33	08/08/2015	58.41066	-5.06459	58.41103	-5.06508	11.0	11.8	00:00:08	00:05:21
D34	D34	08/08/2015	58.41379	-5.06368	58.41396	-5.06350	15.4	12.7	00:00:06	00:05:10
D40	D40	08/08/2015	58.39812	-5.07835	58.39885	-5.07723	17.0	20.4	00:00:05	00:06:37
D46	D46	08/08/2015	58.39984	-5.08028	58.40055	-5.07972	38.8	29.7	00:00:06	00:06:26
D47	D47	07/08/2015	58.40136	-5.07834	58.40166	-5.07730	17.5	13.6	00:00:05	00:05:49
D48	D48.1	07/08/2015	58.40153	-5.08277	58.40152	-5.08222	25.7		00:00:06	00:02:14
D48	D48.2	07/08/2015	58.40152	-5.08222	58.40173	-5.08197		11.9	00:02:14	00:05:51
D49	D49	08/08/2015	58.400280	-5.082820	58.400800	-5.082460	46.5	38.5	00:00:07	00:06:03
D50	D50	08/08/2015	58.39938	-5.08430	58.39917	-5.08452	40.9	31.5	00:00:09	00:04:43

Table 1.1 continued

Site	Sample	Date	Latitude start	Longitude start	Latitude end	Longitude end	Depth start (m)	Depth end (m)	Video time (start)	Video time (end)
D51	D51.1	07/08/2015	58.40125	-5.09388	58.40148	-5.09341	25.1		00:00:07	00:02:57
D51	D51.2	07/08/2015	58.40148	-5.09341	58.40169	-5.09292		45.8	00:02:57	00:05:41
D52	D52	07/08/2015	58.40170	-5.08778	58.40219	-5.08640	43.8	37.3	00:00:10	00:06:18
D53	D53.1	07/08/2015	58.40348	-5.08785	58.40330	-5.08759	9.1		00:00:05	00:02:13
D53	D53.2	07/08/2015	58.40330	-5.08759	58.40333	-5.08742			00:02:13	00:03:24
D53	D53.3	07/08/2015	58.40333	-5.08742	58.40324	-5.08725		14.2	00:03:24	00:04:06
D56	D56.1	07/08/2015	58.40644	-5.09469	58.40632	-5.09422	21.3		00:00:04	00:02:36
D56	D56.2	07/08/2015	58.40632	-5.09422	58.40620	-5.09350		23.9	00:02:36	00:03:47
D57	D57	07/08/2015	58.40488	-5.09269	58.40557	-5.09183	39.9	36.6	00:00:07	00:05:55
D58	D58	07/08/2015	58.40277	-5.09842	58.40315	-5.09733	41.2	50.8	00:00:07	00:05:02
D61	D61	07/08/2015	58.40016	-5.10398	58.40025	-5.10414	23.9	23.4	00:00:06	00:06:21
D62	D62	07/08/2015	58.39856	-5.10843	58.39853	-5.10716	16.8	19.0	00:00:05	00:06:27
D65	D65	07/08/2015	58.39869	-5.11487	58.39875	-5.11424	11.5	12.3	00:00:04	00:03:03
D66	D66	07/08/2015	58.40002	-5.11226	58.40018	-5.11103	20.8	21.2	00:00:04	00:05:07
D68	D68.1	07/08/2015	58.40148	-5.11680	58.40175	-5.11706	7.2		00:00:04	00:06:05
D68	D68.2	07/08/2015	58.40175	-5.11706	58.40175	-5.11696		8.7	00:06:05	00:07:08
D69	D69	07/08/2015	58.40405	-5.12042	58.40432	-5.12102	17.6	16.4	00:00:04	00:06:05
D70	D70	07/08/2015	58.40580	-5.11662	58.40643	-5.11578	17.9	17.7	00:00:06	00:06:10
D72	D72.1	07/08/2015	58.40805	-5.11232	58.40808	-5.11230	23.7		00:00:06	00:00:35
D72	D72.2	07/08/2015	58.40808	-5.11230	58.40834	-5.11165			00:00:35	00:04:37
D72	D72.3	07/08/2015	58.40834	-5.11165	58.40834	-5.11155		43.3	00:04:37	00:05:03
D73	D73	07/08/2015	58.40739	-5.10949	58.40767	-5.10878	42.1	60.1	00:00:05	00:03:08
D74	D74	07/08/2015	58.40774	-5.10485	58.40825	-5.10415	53.3	27.1	00:00:07	00:04:04
D75	D75	07/08/2015	58.40636	-5.09902	58.40665	-5.09734	48.0	35.3	00:00:07	00:07:54
D76	D76.1	07/08/2015	58.40931	-5.10052	58.40918	-5.10021	6.4		00:00:07	00:01:56

Table 1.1 continued

Site	Sample	Date	Latitude start	Longitude start	Latitude end	Longitude end	Depth start (m)	Depth end (m)	Video time (start)	Video time (end)
D76	D76.2	07/08/2015	58.40918	-5.10021	58.40911	-5.10000		14.1	00:01:56	00:05:58
D77	D77	07/08/2015	58.40931	-5.10989	58.40958	-5.10883	54.5	37.1	00:00:06	00:05:50
D78	D78	07/08/2015	58.41158	-5.11693	58.41249	-5.11626	38.7	29.7	00:00:08	00:06:42
D79	D79.1	06/08/2015	58.41142	-5.12334	58.41145	-5.12283	18.0		00:00:04	00:03:00
D79	D79.2	06/08/2015	58.41145	-5.12283	58.41147	-5.12240		30.0	00:03:00	00:05:27
D80	D80	07/08/2015	58.40863	-5.12250	58.40943	-5.12235	20.5	18.1	00:00:05	00:05:57
D81	D81	07/08/2015	58.40628	-5.12355	58.40649	-5.12407	12.5	12.6	00:00:04	00:05:31
D82	D82.1	07/08/2015	58.40907	-5.12810	58.40915	-5.12823	12.4		00:00:06	00:01:58
D82	D82.2	07/08/2015	58.40915	-5.12823	58.40923	-5.12844		16.0	00:01:58	00:06:34
D83	D83	06/08/2015	58.41166	-5.13055	58.41201	-5.13015	23.0	25.7	00:00:04	00:05:45
D85	D85	06/08/2015	58.41523	-5.13576	58.41606	-5.13472	28.1	37.9	00:00:04	00:06:10
D86	D86	06/08/2015	58.41489	-5.12962	58.41507	-5.12904	52.0	56.6	00:00:05	00:04:52
D88	D88.1	06/08/2015	58.41412	-5.12279	58.41425	-5.12259	55.4		00:00:04	00:02:05
D88	D88.2	06/08/2015	58.41425	-5.12259	58.41429	-5.12233		49.4	00:02:05	00:03:55
D89	D89	07/08/2015	58.41366	-5.11721	58.41405	-5.11711	13.4	16.1	00:00:06	00:02:28
D92	D92.1	06/08/2015	58.41728	-5.12552	58.41756	-5.12545	16.6		00:00:06	00:01:58
D92	D92.2	06/08/2015	58.41756	-5.12545	58.41796	-5.12466		28.6	00:01:58	00:06:24
D94	D94	06/08/2015	58.41899	-5.11857	58.41946	-5.11744	19.2	15.5	00:00:04	00:06:10
D97	D97.1	06/08/2015	58.42026	-5.12194	58.42052	-5.12160	19.0		00:00:07	00:01:11
D97	D97.2	06/08/2015	58.42052	-5.12160	58.42007	-5.12088		16.4	00:01:11	00:04:29
D98	D98	06/08/2015	58.42270	-5.12997	58.42320	-5.12867	58.9	55.5	00:00:17	00:07:49
D100	D100	06/08/2015	58.42300	-5.12329	58.42344	-5.12220	42.4	34.3	00:00:18	00:05:57
D101	D101	06/08/2015	58.42430	-5.12358	58.42535	-5.12303	45.0	45.0	00:00:08	00:04:56
D104	D104.1	06/08/2015	58.41968	-5.11689	58.41992	-5.11690	16.2		00:00:05	00:02:14
D104	D104.2	06/08/2015	58.41992	-5.11690	58.42027	-5.11612		27.3	00:02:14	00:05:50

Table 1.1 continued

Site	Sample	Date	Latitude start	Longitude start	Latitude end	Longitude end	Depth start (m)	Depth end (m)	Video time (start)	Video time (end)
D107	D107	06/08/2015	58.42039	-5.11372	58.42101	-5.11339	39.1	39.3	00:00:05	00:05:26
D108	D108.1	06/08/2015	58.42238	-5.10830	58.42240	-5.10824	13.1		00:00:07	00:00:34
D108	D108.2	06/08/2015	58.42240	-5.10824	58.42246	-5.10808			00:00:34	00:01:11
D108	D108.3	06/08/2015	58.42246	-5.10808	58.42265	-5.10782		10.9	00:01:11	00:03:45
D110	D110	06/08/2015	58.41918	-5.10858	58.41965	-5.10773	38.6	39.2	00:00:05	00:05:53
D111	D111	06/08/2015	58.41944	-5.10090	58.41990	-5.10000	28.3	26.3	00:00:05	00:05:31
D112	D112	06/08/2015	58.42148	-5.10267	58.42136	-5.10126	11.6	9.9	00:00:07	00:05:15
D114	D114	06/08/2015	58.42113	-5.09851	58.42147	-5.09753	18.9	19.0	00:00:07	00:05:26
D116	D116	06/08/2015	58.41911	-5.09514	58.41950	-5.09409	31.3	27.4	00:00:04	00:05:15
D118	D118.1	06/08/2015	58.41760	-5.09032	58.41730	-5.08945	24.3		00:00:09	00:03:47
D118	D118.2	06/08/2015	58.41730	-5.08945	58.41784	-5.08885		23.6	00:03:47	00:06:11
D121	D121.1	07/08/2015	58.40622	-5.10663	58.40623	-5.10648	30.1		00:00:04	00:01:42
D121	D121.2	07/08/2015	58.40623	-5.10648	58.40627	-5.10583		47.1	00:01:42	00:02:41
D128	D128.1	07/08/2015	58.40035	-5.09116	58.40037	-5.09112	11.1		00:00:06	00:00:32
D128	D128.2	07/08/2015	58.40037	-5.09112	58.40045	-5.09098			00:00:32	00:01:38
D128	D128.3	07/08/2015	58.40045	-5.09098	58.40056	-5.09088			00:01:38	00:02:51
D128	D128.4	07/08/2015	58.40056	-5.09088	58.40091	-5.09016		42.0	00:02:51	00:07:17
D130	D130	08/08/2015	58.39903	-5.08529	58.39942	-5.08536	10.9	32.9	00:00:11	00:07:59
D132	D132	07/08/2015	58.40278	-5.11561	58.40339	-5.11619	16.0	15.7	00:00:05	00:05:46

Table 1.2. Substrates, biota and biotopes (classified as reef or non-reef) recorded during the 2015 drop-down video survey, with biotopes recorded during the 2009 baseline survey and notes on temporal biotope matches. Red text indicates revised 2009 biotope assignments based on review of video.

Sample	Substrate	Biota	Biotope 2015	Biotope comments	Reef 2015	Biotope 2009	Temporal match notes
D6	Shelly muddy sand with scattered pebbles and occasional cobbles	Kelp (C), mostly *Saccharina latissima,* supporting *Obelia geniculata*. Algal turf (A) strongly dominated by filamentous red algae (A). Stones support sparse serpulid worms (P). Carcinus *maenas*? (P).	SS.SMp.KSwSS. LsacR.Sa	uncertain biotope. *Saccharina* relatively dense	non-reef	SS.SSA.IMuSa. AreISa SS.SMp.KSwSS	SS.SSA.IMuSa .AreISa only present briefly at start of 2009 footage
D9	Shelly, slightly muddy sand with fairly dense cover of pebbles and sparser cobbles	Stones support park of *Saccharina latissima* (F) and filamentous red algal turf (S), as well as pink coralline algae (O) and serpulid worms (P). Sediment mounds present, possibly those of *Arenicola marina.*	SS.SMp.KSwSS. LsacR		non-reef	SS.SMp.KSwSS .LsacR	
D17	Slightly muddy sand with dense pebbles	Patchy but locally dense mat of *Phyllophora crispa* (A-S). Stones support pink coralline algae (P) and serpulid worms (P). *Asterias rubens* (F), *Saccharina latissima* (O), *Buccinum undatum* (R).	SS.SMp.KSwSS. Pcri		non-reef	SS.SMp.KSwSS .Pcri	
D19	Sand with surface scatter of pebbles	Patchy but locally dense mat of *Phyllophora crispa* (A-S). Stones support pink coralline algae (P) and serpulid worms (P). *Liocarcinus* sp. (R), *Asterias rubens* (O), *Solaster endeca* (P), *Saccharina latissima* (O), sediment mounds (possibly *Arenicola marina*), shoal of small teleosts (P).	SS.SMp.KSwSS. Pcri		non-reef	SS.SMp.KSwSS .Pcri	

Table 1.2 continued

Sample	Substrate	Biota	Biotope 2015	Biotope comments	Reef 2015	Biotope 2009	Temporal match notes
D20	Muddy sand with scattered gravel and pebbles	Very patchy algal mat, and possibly sparse turf (overall F-C, locally S) dominated by filamentous reds and *Phyllophora crispa*; *Saccharina latissima* (O). Stones supporting encrusting pink coralline algae (R) and serpulid worms (P). *Antedon* sp. (R), *Asterias rubens* (O), *Crossaster papposus* (P), *Echinus esculentus* (O), *Carcinus maenas* (R), *Liocarcinus* spp. (R), small teleost (R), Actiniaria sp. (R), patches of *Beggiatoa* (R).	SS.SMp.KSwSS		non-reef	SS.SMp.KSwSS	
D21	Slightly sandy mud	Mud with sparse small mounds and small burrows and supporting sparse *Pennatula phosphorea* (R), *Virgularia mirabilis* (R) and *Philine aperta* egg masses (R). *Cerianthus lloydii*? (R), Paguridae sp. (R), *Carcinus maenas* (R), Brachyura sp. (R), *Turritella communis* shells (R), *Asterias rubens* (O), small teleost (R),	SS.SMU.IFiMu.PhiVir	uncertain biotope	non-reef	SS.SMU.CSaMu	*Amphiura* arms clearly more evident in 2009 (apparently absent in 2015). However, video very short in 2009 and could be the same biotope.
D22	Mud	Mud with cover of brown, diatomaceous film and supporting sparse *Virgularia mirabilis* (R) and *Philine aperta* (adults P, egg masses O). Paguridae sp. (R).	SS.SMU.IFiMu.PhiVir		non-reef	SS.SMU.IFiMu.PhiVir	

Table 1.2 continued

Sample	Substrate	Biota	Biotope 2015	Biotope comments	Reef 2015	Biotope 2009	Temporal match notes
D24	Muddy sand with scattered gravel and pebbles	Stones encrusted with pink coralline algae (R) and serpulid worms (P) and supporting sparse hydroids (R), including *Nemertesia ramosa*, and a fairly sparse algal turf dominated by filamentous reds (O-F). *Metridium senile* (R), *Liocarcinus* sp. (R), *Turritella communis* shells (P), *Asterias rubens* (R), small sediment mounds (P).	SS.SMp.KSwSS	highly uncertain biotope	non-reef	SS.SMp.KSwSS SS.SMu.ISaMu	Sparser algal turf in 2015. Stonier sediment in 2015 and video runs >64 m apart, so temporal biotope change possibly due to locational difference.
D25	Muddy sand with scattered gravel and pebbles	Stones encrusted with pink coralline algae (R) and serpulid worms (P) and supporting a fairly sparse algal turf dominated by filamentous reds (F, locally C); *Saccharina latissima* (R). *Virgularia mirabilis* (O), *Liocarcinus* sp. (R), *Pecten maximus* (R), *Asterias rubens* (O), small sediment mounds (P).	SS.SMp.KSwSS. LsacR.Sa	uncertain biotope	non-reef	SS.SMp.KSwSS	Algal cover denser in 2009 and appears to be mostly a loose mat. Difference may be due to 2 m deeper run in 2009.
D26	Muddy sand with scattered gravel, pebbles and occasional cobbles	Stones encrusted with pink coralline algae (R) and serpulid worms (P). Very patchy algal mat (F-C), with some material possibly attached, mostly filamentous reds but including sparse *Phyllophora crispa* (R). *Virgularia mirabilis*? (R), *Inachus* sp. (P), *Munida rugosa* (R), *Turritella communis* shells (P), *Asterias rubens* (O), *Henricia* sp.? (R), *Ophiura* sp. (P), *Echinus esculentus* (O), small sediment mounds (P), very sparse megafaunal burrows (R).	SS.SMp.KSwSS	uncertain biotope. Borderline between algal mat and purely sediment biotope.	non-reef	SS.SMp.KSwSS	Denser algal mat in 2009.

Table 1.2 continued

Sample	Substrate	Biota	Biotope 2015	Biotope comments	Reef 2015	Biotope 2009	Temporal match notes
D27	Sandy mud with scattered shell and stone gravel, dense locally.	Sparse megafaunal burrows including those of *Nephrops norvegicus* (O) and small mounds. *Pennatula phosphorea* (R), *Cerianthus lloydii* (R), *Turritella communis* shells (O, locally F), *Nemertesia ramosa*? (R), small teleost (R). Creel present.	SS.SMU.CFiMu. SpnMeg	uncertain biotope. Also close to CSaMu	non-reef	SS.SMU.CFiMu. SpnMeg	
D28	Sandy mud	Sparse megafaunal burrows possibly including those of *Nephrops norvegicus* (O) and small mounds. *Pennatula phosphorea* (F), *Virgularia mirabilis* (R), *Cerianthus lloydii* (R), *Munida rugosa* (R), *Liocarcinus* sp. (R), *Cancer pagurus* (P), *Turritella communis* shells (R), *Nemertesia ramosa* (F).	SS.SMU.CFiMu. SpnMeg	uncertain biotope. Also close to CSaMu	non-reef	SS.SMU.CFiMu. SpnMeg	
D29	Fairly flat mud plain	Mud with patchy brown diatomaceous film and sparse megafaunal burrows and small mounds and supporting *Virgularia mirabilis* (F) and *Pennatula phosphorea* (F). *Sagartiogeton laceratus* (O, locally F), *Cerianthus lloydii* (R), *Munida rugosa* (R), *Philine aperta* (O, locally F) with egg sacs (R), *Aequipecten opercularis* (R), *Asterias rubens* (R), *Echinus esculentus* (R).	SS.SMU.IFiMu.PhiVir		non-reef	SS.SMU.IFiMu. PhiVir	
D32	Flat mud plain	Mud with brown diatomaceous film (A) and very sparse small burrows. *Sagartiogeton laceratus* (O, locally F), *Cerianthus lloydii* (R), *Philine aperta* (O) with egg sacs (P), *Turritella communis* shells (F, many probably occupied) *Aequipecten opercularis* (R), *Asterias rubens* (R), *Lanice conchilega*? (R), Paguridae sp. (R). Isolated boulder encrusted with pink coralline algae (R) and supporting Hydrozoa sp. (R) and *Metridium senile* (R).	SS.SMU.IFiMu.PhiVir		non-reef	SS.SMU.IFiMu. PhiVir	

Table 1.2 continued

Sample	Substrate	Biota	Biotope 2015	Biotope comments	Reef 2015	Biotope 2009	Temporal match notes
D33	Very shelly muddy sand with much broken shell, *Modiolus* shells, gravel, pebbles, occasional cobbles and boulders and small rock outcrops	Stones and shells encrusted with pink coralline algae (O) and serpulid worms (C) and supporting sparse hydroids and/or algal tufts (R). *Virgularia mirabilis* (R), *Carcinus maenas*? (R), *Aequipecten opercularis* (R), *Modiulus modiolus*? (R), *Asterias rubens* (R), *Echinus esculentus* (F), silted bedrock and boulders encrusted with pink coralline algae (F) and serpulid worms C) and supporting hydroid clumps (F) including *Nemertesia ramosa*, *Metridium senile*? (R), *Marthasterias glacialis* (P), *E. esculentus* (F), *Antedon* sp. (P).	SS.SMx.IMx CR.LCR.BrAs	both biotopes uncertain	mixed	SS.SMx.IMx IR.MIR.KR.XFoR	Rock with dense algae in 2009 (XFoR), although BrAs recorded in 2001, so difference possibly due to locational difference or natural variation in algal abundance.
D34	Soft mud	*Sagartiogeton laceratus* (F), *Aequipecten opercularis* (O), *Carcinus maenas* (P).	SS.SMU.IFiMu.PhiVir	biotope uncertain	non-reef	SS.SMU.IFiMu.PhiVir	same biotope as 2009
D40	Muddy sand with scattered gravel, dead maerl and occasional cobbles and boulders	Stones encrusted with pink coralline algae (R) and serpulid worms (P) and supporting hydroids (O) including *Nemertesia ramosa* (R). *Sparse small burrows (P), Pennatula phosphorea* (R), *Munida rugosa* (R), *Turritella communis* shells (P), *Asterias rubens* (O), *Echinus esculentus* (P), live *Phymatolithon calcareum* (R), Pleuronectiformes sp. (P).	SS.SMU.CSaMu.VirOphPmax.HAs	biotope uncertain	non-reef	SS.SMU.CSaMu.VirOphPmax.HAs	same biotope as 2009
D46	Mud	Fairly sparse megafaunal burrows, small mounds (P), *Funiculina quadrangularis* (F), *Pennatula phosphorea* (F), *Cerianthus lloydii* (R), *Munida rugosa* (F), small teleost (R).	SS.SMU.CFiMu.SpnMeg.Fun		non-reef	SS.SMU.CFiMu.SpnMeg	Possibly same biotope as 2009 run very short (c. 15 m), so *Funiculina* possibly missed

Table 1.2 continued

Sample	Substrate	Biota	Biotope 2015	Biotope comments	Reef 2015	Biotope 2009	Temporal match notes
D47	Sandy mud or possibly muddy sand, with surface scatter of shell material	Fairly sparse megafaunal burrows including possibly those of *Nephrops norvegicus*, small mounds (P), *Pennatula phosphorea* (F), *Virgularia mirabilis* (O), *Cerianthus lloydii* (O), Paguridae sp. (R), *Munida rugosa* (O), *Turritella communis* shells (P), *Asterias rubens* (O), *Echinus esculentus* (P).	SS.SMU.CFiMu. SpnMeg	biotope uncertain	non-reef	SS.SMU.CFiMu. SpnMeg	
D48.1	Shelly sandy mud with scattered pebbles, cobbles and boulders	Stones encrusted with serpulid worms and supporting hydroid clumps (O) and *Ascidia mentula*? (R). *Pennatula phosphorea* (R), *Virgularia mirabilis* (R), *Echinus esculentus* (P), *Turritella communis* shells (P), *Munida rugosa* (O).	SS.SMU.CSaMu. VirOphPmax.HAs	biotope uncertain	non-reef	SS.SMU.CSaMu.VirOphPmax.HAs	
D48.2	Muddy sand with much surface gravel and broken shell material and sparsely scattered pebbles, cobbles and boulders	Stones encrusted with pink coralline algae (R) and serpulid worms (P) and supporting hydroid clumps (R) including Nemertesia ramosa. Small mounds (R), *Pennatula phosphorea* (R), *Virgularia mirabilis* (R), Paguridae sp. (R), *Turritella communis* shells (R), *Munida rugosa* (O), Asterias rubens (O).	SS.SSa.CMuSa	biotope uncertain			
	Mud or possibly very muddy sand	Fairly sparse megafaunal burrows and small mounds (P), *Pennatula phosphorea* (F), *Munida rugosa* (O), small *Asterias rubens* (F). Hydroids (R) on very sparsely scattered cobbles.	SS.SMU.CFiMu. SpnMeg		non-reef	SS.SMU.CFiMu. SpnMeg	
D50	Mud	Sparse megafaunal burrows including probably those of *Nephrops norvegicus*, small mounds (P), *Pennatula phosphorea* (R), *Munida rugosa* (R), *Echinus esculentus* (P), small teleost (R).	SS.SMU.CFiMu. SpnMeg	biotope uncertain	non-reef	SS.SMU.CFiMu. SpnMeg	

Table 1.2 continued

Sample	Substrate	Biota	Biotope 2015	Biotope comments	Reef 2015	Biotope 2009	Temporal match notes
D51.1	Muddy sand with scattered shells and broken shell	Much drift algae, *Munida rugosa* (O).	SS.SSa.CMuSa	biotope uncertain	non-reef	CR.MCR.EcCr.FaAlCr.Car	Locational difference
D51.2	Slightly shelly mud	*Munida rugosa* (O).	SS.SMU.CFiMu	biotope uncertain. Visibility poor			
D52	Mud	Sparse megafaunal burrows, small mounds (P), *Pennatula phosphorea* (F), *Funiculina quadrangularis* (O), *Munida rugosa* (O), *Turritella communis* shells (P, some probably occupied), *Pecten maximus* (R), *Echinus esculentus* (P), *Asterias rubens* (O), *Crossaster papposus* (P), *Amphiura* spp. (A)	SS.SMU.CFiMu.SpnMeg.Fun		non-reef	SS.SMU.CFiMu.SpnMeg.Fun	
D53.1	Slope of bedrock and boulders with patches of coarse sand	Forest of *Laminaria hyperborea* (A) with patchy understorey of red algae (apparently F-C). Kelp fronds supporting *Obelia geniculata* and stipes with dense *Antedon* sp. and *Ciona intestinalis* locally. *Echinus esculentus* (P), *Asterias rubens* (P). Rock encrusted with pink coralline algae (P).	IR.MIR.KR.Lhyp.Ft SS.SCS.ICS		mixed	IR.MIR.KR.Lhyp.Ft	
D53.2	Bedrock slope	Park of *Laminaria hyperborea* (F) with turf of red algae (apparently A) and hydroids (C) including *Nemertesia ramosa*. *Echinus esculentus* (F), *Asterias rubens* (O), *Crossaster papposus* (P).	IR.MIR.KR.Lhyp.Pk				
D53.3	Patchy scattering of shelly gravel and coarse sand on fine-medium sand	Sparse red algal tufts (R), *Asterias rubens* (O), *Marthasterias glacialis* (P).	SS.SSa	biotope uncertain			

Table 1.2 continued

Sample	Substrate	Biota	Biotope 2015	Biotope comments	Reef 2015	Biotope 2009	Temporal match notes
D56.1	Shelly muddy sand	*Cerianthus lloydii* (F), *Munida rugosa* (F), *Asterias rubens* (O), *Echinus esculentus* (P).	SS.SSa.CMuSa	biotope uncertain	non-reef	SS.SSa.CMuSa CR.MCR.EcCr.FaAlCr.Car	
D56.2	Silted bedrock	Rock encrusted with pink coralline algae, *Spirobranchus* spp. (C) and supporting *Caryophyllia smithii* (C), hydroid clumps (O) and *Novocrania anomala*? (locally C). *Asterias rubens* (F), *Echinus esculentus* (F), *Munida rugosa* (P).	CR.MCR.EcCr.FaAlCr.Car	biotope uncertain			
D57	Mud	Megafaunal burrows including probably *Nephrops norvegicus* (P), *Pennatula phosphorea* (F), *Munida rugosa* (F), *Turritella communis* shells (P), *Asterias rubens* (F, locally C), *Crossaster papposus* (P).	SS.SMU.CFiMu.SpnMeg		non-reef	SS.SMU.CFiMu.SpnMeg.Fun	Possibly same biotope with sparse *Funiculina* missed in 2015
D58	Mud	Moderate density of megafaunal burrows including probably *Nephrops norvegicus* (P), *Funiculina quadrangularis* (C), *Pennatula phosphorea* (F), *Cerianthus lloydii* (O), *Munida rugosa* (F), *Liocarcinus* sp. (R), *Asterias rubens* (F)	SS.SMU.CFiMu.SpnMeg.Fun		non-reef	SS.SMU.CFiMu.SpnMeg.Fun	
D61	Mud	Moderate density of megafaunal burrows including probably *Nephrops norvegicus* (P), small mounds (P), *Funiculina quadrangularis* (O), *Pennatula phosphorea* (F), *Asterias rubens* (F), small teleost (P)	SS.SMU.CFiMu.SpnMeg.Fun		non-reef	SS.SMU.CFiMu.SpnMeg	Possibly same biotope with sparse *Funiculina* missed in 2009
D62	Shelly mud	Fairly sparse megafaunal burrows including *Nephrops norvegicus* (P), small mounds (P), *Virgularia mirabilis* (O), *Liocarcinus* sp. (R), *Turritella communis* shells (P), *Asterias rubens* (F), *Echinus esculentus* (P), small teleost (R)	SS.SMU.CFiMu.SpnMeg	biotope uncertain	non-reef	SS.SMU.CFiMu.SpnMeg	

Table 1.2 continued

Sample	Substrate	Biota	Biotope 2015	Biotope comments	Reef 2015	Biotope 2009	Temporal match notes
D65	Mud or muddy sand	Almost complete cover of sediment by algal mat (S), strongly dominated by filamentous reds of *Trailliella* type. Also much drift *Saccharina latissima*, some decomposing with white bacterial film. Paguridae sp. (P), *Asterias rubens* (P), *Echinus esculentus* (P).	SS.SMp.KSwSS.Tra		non-reef	SS.SMp.KSwSS.Tra	
D66	Sandy mud	Moderate density of megafaunal burrows including *Nephrops norvegicus* (P), *Virgularia mirabilis* (O), *Pennatula phosphorea* (O), *Cerianthus lloydii* (O), *Liocarcinus* sp. (R), *Asterias rubens* (F), small teleost (R), *Lesueurigobius friesii*? (P).	SS.SMU.CFiMu.SpnMeg		non-reef	SS.SMU.CFiMu.SpnMeg	
D68.1	Shelly muddy sand	Algal cover (C) but much of it probably drift material. Filamentous and foliose red algae (F), Ectocarpaceae sp. (R), *Desmarestia* sp. (R), *Asperococcus bullosus* (O), *Chorda filum* (C locally), *Saccharina latissima* (F), *Ulva* sp. (R), *Cerianthus lloydii* (P), *Gibbula* sp. (P), *Turritella communis* shells (P), *Asterias rubens* (P), Ascidiacea sp. (P).	SS.SMp.KSwSS		mixed	SS.SMp.KSwSS	
D68.2	Rock	Rock encrusted with pink coralline algae and supporting forest of silted *Saccharina latissima* (A)	IR.LIR.K.Lsac.Ft			IR.LIR.K.Lsac.Ft	
D69	Medium? sand with shell material and scattered shells including *Ensis*, and sparse pebbles	Stones and shells encrusted with pink coralline algae (R) and serpulid worms (R). Small sediment mounds, possibly *Arenicola marina* (P), *Liocarcinus* sp. (R), *Asterias rubens* (P), *Echinus esculentus* (P). Drift algae including kelp.	SS.SSa.IMuSa.EcorEns	biotope uncertain	non-reef	SS.SSa.IMuSa.EcorEns	

Table 1.2 continued

Sample	Substrate	Biota	Biotope 2015	Biotope comments	Reef 2015	Biotope 2009	Temporal match notes
D70	Slightly muddy sand with scattered gravel, shell material and shells including *Ensis*, and pebbles	Small sediment mounds, possibly *Arenicola marina* (P) and much drift kelp. Stones and shells encrusted with pink coralline algae (R) and serpulid worms (R). Bonellidae sp. (P), *Inachus* sp. (P), *Asterias rubens* (P), *Echinus esculentus* (F), Gobiidae sp. (P).	SS.SSa.IMuSa.EcorEns	biotope uncertain	non-reef	SS.SSa.IMuSa.EcorEns	
D72.1	Bedrock slope	*Echinus esculentus* (P). Brief glimpse of habitat.	CR.MCR.EcCr.FaAlCr	biotope uncertain. Brief glimpse from distance	reef	CR.MCR.EcCr.FaAlCr	
D72.2	Shelly muddy sand	*Virgularia mirabilis* (O), sparse megafaunal burrows (R), *Munida rugosa* (F), *Asterias rubens* (O), serpulid worms (R).	SS.SMu.CSaMu.VirOphPmax				
D72.3	Bedrock	Rock encrusted with *Spirobranchus* spp. (A) and *Parasmittina trispinosa* (R). *Munida rugosa* (P), *Echinus esculentus* (C), *Asterias rubens* (P).	CR.MCR.EcCr.FaAlCr.Pom				
D73	Patchy thin cover of gravel and shell material on muddy sand	*Munida rugosa* (F), *Pecten maximus* (R), *Phymatolithon calcareum* (R), *Echinus esculentus* (P). Discarded tyre.	SS.SSa.CMuSa	biotope uncertain	non-reef	SS.SMp.Mrl.Pcal.Nmix	Location difference and much deeper run in 2015
D74	Gravelly muddy sand, with some silted boulders at end of run	*Munida rugosa* (O), *Turritella communis* shells (C), *Asterias rubens* (O)	SS.SSa.CMuSa	biotope uncertain	non-reef	SS.SSa.CMuSa	

Table 1.2 continued

Sample	Substrate	Biota	Biotope 2015	Biotope comments	Reef 2015	Biotope 2009	Temporal match notes
D75	Mud	Megafaunal burrows including *Nephrops norvegicus* (F), small mounds and emergent infaunal tubes (P). *Pennatula phosphorea* (O), *Munida rugosa* (F), *Turritella communis* shells (some apparently occupied - P), *Asterias rubens* (O), *Echinus esculentus* (O).	SS.SMU.CFiMu. SpnMeg		non-reef	SS.SMU.CFiMu. SpnMeg	
D76.1	Bedrock and boulders on sand	Forest of *Laminaria hyperborea* (A) with apparently sparse algal understorey (O). *Echinus esculentus* (C), pink encrusting coralline algae (C).	IR.MIR.KR.Lhyp. GzFt	biotope uncertain		SS.SSA.IMuSa	Although initial biotope different, start of 2015 run is shallower and then moves onto same biotope as 2009 as run gets deeper
D76.2	Fine-medium sand with much broken shell material and scattered shells including *Ensis*	Many small sediment mounds, sparse red algal tufts (R), *Liocarcinus* sp. (R).	SS.SSA.IMuSa	biotope uncertain	non-reef		more algae in 2009 and slightly siltier. Initial 2015 biotope differs from 2009 as 2015 run starts shallower
D77	Muddy sand with much shell gravel and scattered pebbles	Small sediment mounds, hydroids (R), *Munida rugosa* (F, locally C), *Turritella communis* shells (P, probably empty), *Pecten maximus* (R), *Asterias rubens* (O), *Echinus esculentus* (R).	SS.SMx.CMx	biotope uncertain. Could be CMuSa	non-reef	SS.SMx.CMx	

Table 1.2 continued

Sample	Substrate	Biota	Biotope 2015	Biotope comments	Reef 2015	Biotope 2009	Temporal match notes
D78	Waves of slightly silty shell gravel and coarse sand with scattered pebbles locally	Pebbles encrusted by serpulid worms (R overall), *Asterias rubens*? (R).	SS.SCS.CCS		non-reef	SS.SCS.CCS.MedLumVen	
D79.1	Bedrock	Bedrock encrusted by pink coralline algae (P), brown algae, *Parasmittina trispinosa* (R) and *Spirobranchus* spp. (A) and supporting algal turf (A) dominated by *Dictyota dichotoma* (A), with foliose red algae (P) and *Saccharina latissima* (O) supporting *Obelia geniculata* (P). Hydroids (C) with *Nemertesia antennina* (C), patches of *Securiflustra securifrons* (locally S), possible accompanied by *Flustra foliacea* (P), and patches of *Antedon* sp. (locally S), *Asterias rubens* (F), *Echinus esculentus* (C), *Ascidia virginea*? (P)	IR.HIR.KFaR.FoR.Dic			CR.MCR.EcCr.FaAlCr	
D79.2	Bedrock, boulders and cobbles	Rock encrusted by pink coralline algae (C), brown algae (P), *Parasmittina trispinosa* (R), *Spirobranchus* spp. (A) and *Balanus* spp. (P). Hydroids (O) with *Nemertesia antennina* (P), *Alcyonium digitatum* (R), *Munida rugosa* (P), dense patches of *Antedon* sp. (locally S), *Asterias rubens* (C), *Echinus esculentus* (C).	CR.MCR.EcCr.FaAlCr.Pom		reef		Initial biotope differs from 2009 as 2015 run started shallower

Table 1.2 continued

Sample	Substrate	Biota	Biotope 2015	Biotope comments	Reef 2015	Biotope 2009	Temporal match notes
D80	Waves of coarse sand and shell gravel with scattered stone gravel, shells and pebbles, especially in troughs	Stones and shells encrusted by pink coralline algae (P) and serpulid worms (P). *Phymatolithon calcareum* generally very sparse (R) but in central part of run locally concentrated in troughs (where F). *Liocarcinus* sp. (R), *Pecten maximus*? (R), *Asterias rubens* (P).	SS.SCS.CCS SS.SMp.Mrl.Pcal.Nmix		non-reef	SS.SCS.CCS.PomB	Stone cover much reduced in 2015. 2015 run shallower possibly explaining the lack of maerl in 2009
D81	Waves of coarse sand, shell gravel and maerl gravel with scattered shells and pebbles	Patchy maerl bed with live *Phymatolithon calcareum* locally C, particularly in wave troughs. Stones and shells encrusted with serpulid worms (P); Asteroidea sp. (P). Sparse tufts of filamentous red algae (O) and foliose red algae (R) and *Saccharina latissima* (R, but possibly drift material).	SS.SMp.Mrl.Pcal.Nmix		non-reef	SS.SMp.Mrl.Pcal	More algal cover in 2009 but possibly largely drift material
D82.1	Bedrock	Mixed kelp forest of *Laminaria hyperborea* (C-A) and *Saccharina latissima* (F) with rock supporting understorey flora (A) including red algae and *Dictyota dichotoma*, and encrusting pink algae (P). Kelp fronds support *Obelia geniculata* (P). *Echinus esculentus* (C).	IR.HIR.KSed.XKScrR	biotope highly uncertain	reef	IR.HIR.KSed.XKScrR IR.HIR.KSed.LsacSac	
D82.2	Waves of shell gravel and coarse sand with scattered shells	Live *Phymatolithon calcareum* concentrated in troughs (where F). Paguridae sp. (P), *Neopentadactyla mixta* (P), Gobiidae sp. (P).	SS.SMp.Mrl.Pcal.Nmix SS.SCS.CCS				

Table 1.2 continued

Sample	Substrate	Biota	Biotope 2015	Biotope comments	Reef 2015	Biotope 2009	Temporal match notes
D83	Dense pebbles and cobbles on coarse sand with bedrock outcrops	Bedrock encrusted by pink coralline algae (F) and *Spirobranchus* spp. (A), with *Echinus esculentus* (C), *Asterias rubens* (C) and patches of *Antedon* sp. (P). Stones encrusted by pink coralline algae (F), serpulid worms (A) including *Spirobranchus* spp. (P), and *Balanus balanus* (P), with *Asterias rubens* (F) and sparse hydroids (R).	SS.SCS.CCS.PomB CR.MCR.EcCr.FaAlCr.Pom		mixed	SS.SCS.CCS.PomB	Patches of FaAlCr.Pom not recorded in 2009 but runs >60 m apart
D85	Bedrock, with boulders towards end of run	Rock encrusted by pink coralline algae (F), *Parasmittina trispinosa* (P) and *Spirobranchus* spp. (A) and supporting patches of *Flustra foliacea* (O) and *Securiflustra securifrons* (P), sparse *Alcyonium digitatum* (R), *Caryophyllia smithii* (locally C) and dense cover of *Antedon* sp. (A-S over large areas). *Echinus esculentus* (C), *Asterias rubens* (F), shoal of small teleosts.	CR.MCR.EcCr.FaAlCr	Poor visibility for much of run prevents ascription to sub-biotope	reef	CR.HCR.XFa	Location difference of >85 m between surveys probably responsible for biotope difference
D86	Dense pebbles, cobbles and some boulders on coarse sand	Rock encrusted by pink coralline algae, *Parasmittina trispinosa* (R) and *serpulid worms* (A). *Munida rugosa* (R), *Echinus esculentus* (O), *Asterias rubens* (R), Asteroidea sp. (R).	SS.SCS.CCS.PomB	biotope uncertain. Also close to FaAlCr.Pom	non-reef	SS.SCS.CCS.PomB	
D88.1	Slightly silty sand with scattered gravel, broken shell and pebbles	Stones with serpulid worms (R). *Ophiura* sp. (P), Turritella communis shells (R, probably unoccupied).	SS.SSa.CMuSa	biotope uncertain	non-reef	SS.SCS.CCS.MedLumVen	Much more gravel in 2009, possibly due to locational difference (>60 m)
D88.2	Dense gravel, pebbles and cobbles on sand	Stones encrusted by serpulid worms (A) and *Balanus* spp. (P), and with *Alcyonidium diaphanum* (R). *Munida rugosa* (R), *Echinus esculentus* (P), *Porania pulvillus* (R).	SS.SCS.CCS.PomB	biotope uncertain			

Table 1.2 continued

Sample	Substrate	Biota	Biotope 2015	Biotope comments	Reef 2015	Biotope 2009	Temporal match notes
D89	Mostly bedrock with pockets of pebbles, cobbles and boulders	Rock encrusted by pink coralline algae (C), brown algae (P), *Parasmittina trispinosa* (P), serpulid worms (P) and *Balanus* spp. (P) and supporting park of small *Laminaria hyperborea* (C), sparse foliose red algae (R) and possibly sparse *Dictyota dichotoma* (R). *Echinus esculentus* (C), *Asterias rubens* (P), dense clumps of *Antedon* sp. (locally S).	IR.MIR.KR.Lhyp.GzPk		reef	CR.MCR.EcCr.FaAlCr.Car	Biotope difference presumably due to difference in location (>70 m) and shallower depth in 2015
D92.1	Bedrock slope	Rock encrusted by pink coralline algae (P) and serpulid worms (A) and supporting park of small *Laminaria hyperborea* (C), sparse foliose red algae (R) and apparently sparse *Dictyota dichotoma* (P). *Echinus esculentus* (C), *Asterias rubens* (C), dense and widespread areas of *Antedon* sp. (locally S).	IR.MIR.KR.Lhyp.GzPk	biotope uncertain. Visibility poor	reef	IR.MIR.KR.Lhyp.GzPk CR.MCR.EcCr.FaAlCr.Car CR.MCR.EcCr.FaAlCr.Adig	Initial biotope the same
D92.2	Boulders and bedrock	Rock encrusted by pink coralline algae (F), brown algae (P), *Parasmittina trispinosa* (O) and *Spirobranchus* spp. (A) and supporting very sparse foliose red algae (R), hydroids (R), *Caryophyllia smithii* (locally C but generally sparse) and *Alcyonidium diaphanum* (P), with dense clumps of *Antedon* sp. (locally S). *Asterias rubens* (C), *Porania pulvillus* (R), *Echinus esculentus* (C) small teleosts (P), Balanidae sp. (P).	CR.MCR.EcCr.FaAlCr.Pom				

Table 1.2 continued

Sample	Substrate	Biota	Biotope 2015	Biotope comments	Reef 2015	Biotope 2009	Temporal match notes
D94	Uneven bedrock with boulder patches in lows	Rock encrusted by pink coralline algae (P), brown algae (P) and *Spirobranchus* spp. (A) and supporting dense clumps of *Antedon* sp. (locally S). *Asterias rubens* (F), *Echinus esculentus* (C) small teleosts (P), Balanidae sp. (P). Shallower areas support a park of small *Laminaria hyperborea* (C) with apparently sparse understorey algae (O) including foliose reds.	IR.MIR.KR.Lhyp. GzPk CR.MCR.EcCr.FaAlCr.Pom	GzPk uncertain as visibility poor	reef	CR.MCR.EcCr.FaAlCr	Due to transcription error 2015 site was in the wrong location and far distant from the 2009 site and in much shallower water
D97.1	Bedrock	Rock encrusted by pink coralline algae (C) and *Spirobranchus* spp. (A) and supporting dense clumps of *Antedon* sp. (locally S). *Asterias rubens* (C), *Echinus esculentus* (C). Algal turf apparently C, including foliose reds (P) and possibly *Dictyota dichotoma* (P). Small kelp plants possibly present but sparse at most.	IR.HIR.KFaR.FoR	biotope uncertain. Visibility poor	reef	CR.MCR.EcCr.FaAlCr.Pom IR.MIR.KR.Lhyp.GzPk	Algal turf poorly developed in 2009 and kelp conspicuously present. Start of 2015 run very close to end of 2009 run so probably temporal change in algal cover
D97.2	Bedrock and boulders	Rock encrusted by pink coralline algae (C), brown algae (P), *Parasmittina trispinosa* (P) and *Spirobranchus* spp. (A) and supporting clumps of hydroids (O), *Urticina* sp. (P), *Alcyonidium diaphanum* (P) and *Antedon* sp. (P). *Asterias rubens* (P), *Stichastrella rosea* (P), *Luidia ciliaris* (P), *Echinus esculentus* (C), Balanidae sp. (P).	CR.MCR.EcCr.FaAlCr.Pom				

Table 1.2 continued

Sample	Substrate	Biota	Biotope 2015	Biotope comments	Reef 2015	Biotope 2009	Temporal match notes
D98	Waves of shell gravel	Sparse biota visible. *Liocarcinus* sp. (R), *Asterias rubens* (O), *Neopentadactyla mixta* (P - 1 seen),	SS.SCS.CCS.Nmix		non-reef	SS.SCS.CCS.MedLumVen	Could be same biotope, as Nmix possibly epibiotic overlay of MedLumVen
D100	Dense boulders and cobbles on silty sediment	Rock encrusted by *Parasmittina trispinosa* (O), *Spirobranchus* spp. (A) and *Balanus* spp. (P) and supporting clumps of hydroids (R), *Porella compressa* (O) and *Novocrania anomala*? (P). *Munida rugosa* (P), *Asterias rubens* (O), *Stichastrella rosea* (O), *Echinus esculentus* (F), *Pawsonia saxicola* (P), teleost spp. (P).	CR.MCR.EcCr.FaAlCr.Pom		reef	SS.SCS.CCS.MedLumVen CR.MCR.EcCr.FaAlCr.Pom	Initial biotope differs, possibly due to positional difference (>65 m)
D101	Waves of shell gravel and probably coarse sand, with scattered shells concentrated in troughs	Sparse biota visible. Serpulid worms (R) on shells	SS.SCS.CCS		non-reef	SS.SCS.CCS.MedLumVen	
D104.1	Bedrock	Rock encrusted by pink coralline algae (P), brown algae (P) and *Spirobranchus* spp. (C) and supporting a park of *Laminaria hyperborea* (C) and a patchy algal turf dominated by *Dictyota dichotoma* (F, locally C) and with apparently very sparse red algae (P). Dense and extensive patches of *Antedon* sp. (S locally). *Echinus esculentus* (C), *Asterias rubens* (F), *Marthasterias glacialis* (P), Balanidae sp. (P).	IR.MIR.KR.Lhyp.GzPk	biotope uncertain. Intermediate between Lhyp.Pk and Lhyp.GzPk	reef	IR.MIR.KR.Lhyp.GzPk	Although biotope uncertain, same biotope as 2009

Table 1.2 continued

Sample	Substrate	Biota	Biotope 2015	Biotope comments	Reef 2015	Biotope 2009	Temporal match notes
D104.2	Steep bedrock slope onto boulders and cobbles on sand and bedrock	Rock encrusted by pink coralline algae (C), *Parasmittina trispinosa* (O) and *Spirobranchus* spp. (C-A). *Caryophyllia smithii* (locally F), *Munida rugosa* (P), *Echinus esculentus* (C), *Asterias rubens* (F), *Luidia ciliaris* (P), Ascidiacea sp. (R).	CR.MCR.EcCr.FaAlCr.Pom				
D107	Waves of shell gravel and coarse sand, with coarser shell material concentrated in troughs	Sparse biota visible. Serpulid worms (R) on shell material, *Asterias rubens* (O).	SS.SCS.CCS		non-reef	SS.SCS.CCS.MedLumVen	
D108.1	Waves of coarse sand or shell gravel with isolated boulders	Boulder with *Laminaria hyperborea*? (P).	SS.SCS.CCS			IR.MIR.KR.Lhyp.GzFt	
D108.2	Bedrock slope	Rock encrusted by pink coralline algae (P), and *serpulid worms* (P) and supporting patchy dense turf of *Dictyota dichotoma* (A) and sparse kelp (*Laminaria hyperborea*?) (O, although possibly drift material). *Marthasterias glacialis* (P).	IR.HIR.KFaR.FoR.Dic	biotope uncertain. Visibility poor. Could be kelp park			
D108.3	Bedrock	Rock encrusted by pink coralline algae (P), and supporting a forest of *Laminaria hyperborea* (A), with *Saccharina latissima* (R) and an apparently sparse understorey flora, although *Dictyota dichotoma* locally F. Kelp fronds support *Obelia geniculata* (P) and *Membranipora membranacea* (P). *Echinus esculentus* (P), *Asterias rubens* (P).	IR.MIR.KR.Lhyp.GzFt		reef		

Table 1.2 continued

Sample	Substrate	Biota	Biotope 2015	Biotope comments	Reef 2015	Biotope 2009	Temporal match notes
D110	Silty coarse sand, gravel and broken shell material, with small mounds and patches of finer sand, becoming waves of coarse sand with shelly gravel	Scattered stones with serpulid worms (R). *Munida rugosa* (R), *Pecten maximu*s? (R), *Asterias rubens* (O)	SS.SCS.CCS	biotope uncertain at start of run	non-reef	CR.MCR.EcCr.FaAlCr SS.SCS.CCS.MedLumVen	2015 run close to end of 2009 run, where biotope is the same
D111	Cohesive muddy sand	Frequent megafaunal burrows and mounds. *Turritella communis* shells (P), *Asterias rubens* (P).	SS.SMU.CFiMu.SpnMeg	highly uncertain biotope	non-reef	SS.SMU.CFiMu.SpnMeg	
D112	Bedrock with boulders and cobbles on coarse sand in deeper water	Run spans forest of *Laminaria hyperborea* (A), and in deeper water, park of *L. hyperborea* (F-C). Rock encrusted with pink coralline algae (P), brown algae (P) and serpulid worms (P) and with a patchy algal turf dominated by *Dictyota dichotoma* (A) and reds (locally A). *Echinus esculentus* (F), *Asterias rubens* (P), *Marthasterias glacialis* (P), *Luidia ciliaris* (P).	IR.MIR.KR.Lhyp.Ft IR.MIR.KR.Lhyp.Pk		reef	IR.MIR.KR.Lhyp.GzPk	Algal turf (both Dictyota and reds) significantly denser in 2015
D114	Fine - medium sand with surface scatter of shell gravel and shells including *Ensis*	Many small sediment mounds and some emergent infaunal tubes. Sparse algal tufts (R) including *Dictyota dichotoma*. Shell material supports serpulid worms (R). *Ophiura* sp. (P).	SS.SSa.IMuSa	biotope uncertain	non-reef	SS.SSa.IMuSa	

Table 1.2 continued

Sample	Substrate	Biota	Biotope 2015	Biotope comments	Reef 2015	Biotope 2009	Temporal match notes
D116	Mud	Fairly dense megafaunal burrows including probably *Calocaris macandreae* and *Nephrops norvegicu*s. *Virgularia mirabilis* (R), *Pennatula phosphorea* (R), *Asterias rubens* (R).	SS.SMU.CFiMu.SpnMeg		non-reef	SS.SMU.CFiMu.SpnMeg	
D118.1	Flat bedrock with patchy covering of silty sand with some shell gravel and coarse sand. *Ensis* shells.	Visibility poor but apparently complex habitat mosaic due to varying thickness of sediment veneer over bedrock. Attached *Saccharina latissima* probably O, although drift material present as well; scattered tufts of smaller algae (O-F) including *Dictyota dichotoma*. *Asterias rubens* (O). Much of run segment will be shallower than the depth recorded, as run loops inshore before deepening in subsequent run segment.	SS.SSa.IMuSa IR.LIR		non-reef	SS.SMU.CFiMu.SpnMeg	
D118.2	Muddy sand or sandy mud with broken shell	Fairly low density of megafaunal mounds and burrows present. *Asterias rubens* (O).	SS.SMU.CFiMu.SpnMeg	biotope uncertain. Intermediate between SpnMeg and MuSa			
D121.1	Bedrock slope with pockets of silty coarse sand	Visibility poor. Rock encrusted with pink coralline algae (P) and serpulid worms (P) and supporting sparse hydroids (R), *Porella compressa*? (R) and *Caryophyllia smithii* (P). *Munida rugosa* (P), *Liocarcinus* sp. (R), *Buccinum undatum*? (P), *Echinus esculentus* (F), *Asterias rubens* (F).	CR.MCR.EcCr.FaAlCr SS.SCS.CCS	CCS uncertain	mixed	SS.SCS.CCS	No FaAlCr in 2009 but slight difference in location
D121.2	Bedrock slope with pockets of gravelly muddy sand	Visibility poor. Rock encrusted with serpulid worms (locally C) and supporting sparse hydroids (R) and *Caryophyllia smithii* (locally C). *Munida rugosa* (F), *Echinus esculentus* (F), *Asterias rubens* (F).	CR.MCR.EcCr.FaAlCr SS.SSa.CMuSa	CMuSa uncertain			

Table 1.2 continued

Sample	Substrate	Biota	Biotope 2015	Biotope comments	Reef 2015	Biotope 2009	Temporal match notes
D128.1	Steep bedrock slope	Rock encrusted with pink coralline algae (P) and supporting algal turf (A) and *Nemertesia ramosa* (P). *Echinus esculentus* (F), *Asterias rubens* (F), Balanidae sp. (P).	IR.MIR.KR.XFoR	biotope uncertain; visibility poor	reef	IR.LIR.K.Lsac.Ft	Despite initial depth reading in 2015, 2009 run is clearly shallower
D128.2	Steep bedrock slope with pockets of sand	Rock encrusted with pink coralline algae (F) and serpulid worms (C). *Echinus esculentus* (F), *Antedon* sp.? (R), *Asterias rubens* (F), Ascidiacea spp. (P, possibly O).	CR.MCR.EcCr.FaAlCr	biotope uncertain; visibility poor. Could be BrAs biotope			
D128.3	Slope of silty shell gravel and sand	Sparse serpulid worms on gravel.	SS.SCS.CCS	biotope uncertain			
D128.4	Shelly sandy mud or cohesive muddy sand	Fairly sparse megafaunal burrows, *Munida rugosa* (F), *Turritella communis* shells (P), *Asterias rubens* (O), *Echinus esculentus* (P).	SS.SMU.CFiMu	biotope uncertain			
D130	Silted bedrock slope	Rock encrusted with pink coralline algae (C) and serpulid worms (C) and supporting dense *Ciona intestinalis* (C, locally A), *Caryophyllia smithii* (C), sparse hydroids (R), *Novocrania anomala*? (P) and initially clumps of *Antedon* sp. (P). *Echinus esculentus* (C), *Asterias rubens* (F), *Porania pulvillus* (R), Balanidae sp. (P).	CR.LCR.BrAs.AmenCio		reef	CR.LCR.BrAs.AmenCio	
D132	Shelly muddy sand with occasional boulders and low-lying bedrock outcrops	Sediment supporting occasional *Virgularia mirabilis*, and with *Asterias rubens* (F) and *Turritella communis* shells (P, probably unoccupied). Rock probably sediment influenced, encrusted with pink coralline algae and supporting *Laminaria hyperborea* (C), *Saccharina latissima* (F) and turf of algae and hydroids. *Antedon* sp (locally S), *A. rubens* (F), *Echinus esculentus* (P).	SS.SMu.CSaMu.VirOphPmax IR.HIR.KSed.XKScrR	both biotopes uncertain	mixed	SS.SMu.CSaMu.VirOphPmax	end of 2015 run corresponds with 2009 run, where the biotope is the same

ANNEX 2: REEF AND MIXED REEF/SEDIMENT TRANSECT DATA

Table 2.1 Zone boundaries, substrates, dominant biota and biotopes recorded along three reef and mixed reef/sediment transects

Zone	Tape distance (m)		Height above chart datum (m)		Substrate	Biogenic features of zone	Biotopes
	upper	lower	max	min			
TRANSECT: EILEAN PORT A' CHOIT W (XX01)							
I1	0.0	5.7	5.7	4.0	uneven fissured bedrock	supralittoral lichens dominated by *Ramalina siliquosa* and *Xanthoria parietina*	LR.FLR.Lic.YG
I2	5.7	6.5	4.0	3.6	steep uneven fissured bedrock	abundant *Verrucaria maura* with sparse *Lichina confinis*	LR.FLR.Lic.Ver.Ver
I3	6.5	7.2	3.6	3.3	steep uneven fissured bedrock	abundant *Pelvetia canaliculata* with *Verrucaria maura*	LR.LLR.F.Pel
I4	7.2	8.0	3.3	2.9	steep uneven fissured bedrock	dense *Fucus spiralis* with *F. vesiculosus* and *Hildenbrandia* crusts	LR.LLR.F.Fspi.FS
I5	8.0	11.8	2.9	1.0	steep uneven fissured bedrock with stones in clefts	blanket of *Ascophyllum nodosum* with turfs of *Cladophora rupestris* and *Gelidium pusillum*	LR.LLR.F.Asc.FS
I6	11.8	13.5	1.0	0.20	steep bedrock	dense *Fucus serratus* with profuse turf of *Cladophora rupestris*	LR.LLR.F.Fserr.FS
S1	13.5	17.0	0.20	-2.50	near-vertical bedrock wall	*Saccharina latissima* with dense algal turf	IR.LIR.K.Lsac.Ft
S2	17.0	60.0	-2.50	-3.60	muddy sand with pebbles and cobbles	dense *Saccharina latissima* and *Chorda filum* with rich algal turf on pebbles and cobbles	SS.SMp.KSwSS.LsacR
S3	60.0	120.0	-3.60	-4.60	muddy sand with pebbles	dense *Chorda filum* and algal turf on pebbles with scattered *Saccharina latissima*	SS.SMp.KSwSS.LsacR
TRANSECT: EILEAN ARD NE (LL09IR06, LL09SR06 & LL09SS06)							
I1	1.4	3.7	5.4	4.6	uneven bedrock ledge with small pools	supralittoral lichens dominated by *Xanthoria parietina* and *Ramalina siliquosa*	LR.FLR.Lic.YG, LR.FLR.Rkp
I2	3.7	4.2	4.6	4.2	steep fissured bedrock	*Verrucaria maura*	LR.FLR.Lic.Ver.Ver
I3	4.2	4.4	4.2	4.0	steep fissured bedrock	*Pelvetia canaliculata* with *Verrucaria maura* and *Hildenbrandia* spp.	LR.LLR.F.Pel
I4	4.4	5.9	4.0	3.0	steep fissured bedrock	dense *Fucus spiralis* with *Semibalanus balanoides* and *Hildenbrandia* spp.	LR.MLR.BF.FspiB

Table 2.1 continued

Zone	Tape distance (m)		Height above chart datum (m)		Substrate	Biogenic features of zone	Biotopes
	upper	lower	max	min			
I5	5.9	6.6	3.0	2.5	steep fissured bedrock	dense *Fucus vesiculosus* with *Semibalanus balanoides* and *Patella vulgata*	LR.LLR.F.Fves.FS
I6	6.6	8.1	2.5	1.3	steep and near-vertical creviced bedrock	dense *Fucus serratus*, *Semibalanus balanoides, Mytilus edulis* and foliose red algae	LR.MLR.BF.Fser.R
S1	8.1	9.0	1.3	0.6	steep and near-vertical creviced bedrock	narrow band of *Laminaria digitata* with *Semibalanus balanoides* and *Mytilus edulis*	IR.MIR.KR.Ldig.Ldig
S2	9.0	21.0	0.6	-8.4	steep bedrock slope	grazed *Laminaria hyperborea* forest	IR.MIR.KR.Lhyp.GzFt
S3	21.0	26.0	-8.4	-13.2	near-vertical rock wall	coralline crusts with dense *Antedon bifida*	CR.MCR.EcCr.FaAlCr
S4	26.0	32.0	-13.2	-16.2	steep fissured bedrock slope	*Saccharina latissima* park with *Antedon bifida* and scattered ascidians on coralline crusts	IR.LIR.K.Lsac.Pk
S5	32.0	44.0	-16.2	-26.0	steep bedrock slope with shelf of coarse sand and shell gravel	coralline crusts with dense *Antedon bifida* and scattered ascidians, hydroids and *Caryophyllia smithii*	CR.LCR.BrAs.AntAsH SS.SCS.CCS
S6	44.0		-26.0		slope of coarse sand and shell gravel with occasional boulders and rock outcrops	rock with *Swiftia pallida* and *Diazona violacea*	SS.SCS.CCS CR.MCR.EcCr.CarSwi.LgAs
TRANSECT: EILEAN NA SAILLE S (XX09)							
I1	0.0	3.5	7.2	6.1	fissured bedrock slope with small pools	*Verrucaria maura* and *Melaraphe neritoides*	LR.FLR.Lic.Ver.Ver
I2	3.5	7.2	6.1	4.2	fissured bedrock slope with small pools	dense *Porphyra umbilicalis* and *Chthamalus spp.*	LR.HLR.MusB.Cht.Cht LR.FLR.Rkp
I3	7.2	11.1	4.2	2.2	fissured bedrock slope with small pools	dense *Semibalanus balanoides* with upper band of *Chthamalus* spp.	LR.HLR.MusB.Cht.Cht LR.HLR.MusB.MytB LR.FLR.Rkp.Cor.Cor
I4	11.1	12.8	2.2	1.2	fissured bedrock slope	dense *Semibalanus balanoides* with abundant filamentous red algae	LR.HLR.MusB.MytB,
S1	12.8	17.0	1.2	-0.9	bedrock slope	dense *Alaria esculenta* and *Semibalanus balanoides*	IR.HIR.KFaR.Ala.Myt

Table 2.1 continued

Zone	Tape distance (m)		Height above chart datum (m)		Substrate	Biogenic features of zone	Biotopes
	upper	lower	max	min			
S2	17.0	23.0	-0.9	-5.0	bedrock slope	*Laminaria hyperborea* forest with *L. digitata* and dense red algal understorey	IR.HIR.KFaR.LhypR.Ft,
S3	23.0	49.0	-5.0	-17.3	bedrock slope with small gullies on ledges	*Laminaria hyperborea* forest	IR.MIR.KR.Lhyp.Ft
S4	49.0	60.0	-17.3	-21.2	bedrock slope with small gullies on ledges with boulders	park of mixed kelps with patches of *Antedon bifida*	IR.HIR.KSed.LsacSac
S5	60.0	70.0	-21.2	-26.2	bedrock slope with ledge with boulders and cobbles	coralline algal encrusted rock with dense patches of *Antedon bifida*	CR.MCR.EcCr.FaAlCr

Table 2.2. Profile data recorded along three reef or combined reef/sediment transects.

Feature	Tape distance (m)	Height above chart datum (m)	Horizontal distance (m)
TRANSECT: EILEAN PORT A' CHOIT W (XX01)			
marker stake	0.0	5.7	0.0
zone I1/I2 boundary	5.7	4.0	5.5
zone I2/I3 boundary	6.5	3.6	6.2
zone I3/I4 boundary	7.2	3.3	6.7
zone I4/I5 boundary	8.0	2.9	7.5
zone I5/I6 boundary	11.8	1.0	10.8
	12.0	0.9	10.9
zone I6/S1 boundary	13.5	0.2	12.3
	15.0	-1.1	13.0
zone S1/S2 boundary	17.0	-2.5	14.4
	20.0	-2.7	17.4
	25.0	-2.9	22.4
	30.0	-3.0	27.4
	35.0	-3.1	32.4
	40.0	-3.2	37.4
	45.0	-3.3	42.4
	50.0	-3.4	47.4
	55.0	-3.5	52.4
zone S2/S3 boundary	60.0	-3.6	57.4
	65.0	-3.8	62.4
	70.0	-3.8	67.4
	75.0	-3.9	72.4
	80.0	-4.0	77.4
	85.0	-4.1	82.4
	90.0	-4.2	87.4
	95.0	-4.3	92.4
	100.0	-4.3	97.4
	105.0	-4.4	102.4
	110.0	-4.5	107.4
	115.0	-4.6	112.4
	120.0	-4.6	117.4
TRANSECT: EILEAN ARD NE (XX06)			
marker stake	0.0	5.9	0.0
zone I1 upper boundary	1.4	5.4	1.3
zone I1/I2 boundary	3.7	4.6	3.5
zone I2/I3 boundary	4.2	4.2	3.6
zone I3/I4 boundary	4.4	4.0	3.7
zone I4/I5 boundary	5.9	3.0	4.8
zone I5/I6 boundary	6.6	2.5	5.3
zone I6/S1 boundary	8.1	1.3	6.2
zone S1/S2 boundary	9.0	0.6	6.8
	10.0	-1.0	7.8
	15.0	-3.5	12.1
	20.0	-7.7	14.8

Table 2.2 continued

Feature	**Tape distance (m)**	**Height above chart datum (m)**	**Horizontal distance (m)**
zone S2/S3 boundary	21.0	-8.4	15.6
zone S3/S4 boundary	26.0	-13.2	17.0
	30.0	-15.9	19.9
zone S4/S5 boundary	32.0	-16.2	21.9
	35.0	-19.3	24.9
	40.0	-22.9	28.4
lower zone S5 boundary	44.0	-26.0	30.9
zone S6 (beyond transect)			
TRANSECT: EILEAN NA SAILLE S (XX09)			
marker piton	0.0	7.2	0.0
crest of rock ridge	0.6	7.6	0.5
zone I1/I2 boundary	3.5	6.1	2.9
zone I2/I3 boundary	7.2	4.2	6.1
zone I3/I4 boundary	11.1	2.2	9.5
ledge	12.3	1.5	10.4
zone I4/S1 boundary	12.8	1.2	10.8
	13.0	1.2	11.0
	15.0	0.3	12.9
zone S1/S2 boundary	17.0	-0.9	14.6
	20.0	-3.0	17.2
zone S2/S3 boundary	23.0	-5.0	19.8
	25.0	-7.8	21.5
	30.0	-7.7	25.9
	35.0	-10.7	28.6
	37.0	-9.9	30.5
	40.0	-11.3	33.1
	45.0	-14.5	37.0
zone S3/S4 boundary	49.0	-17.3	39.8
	50.0	-18.0	40.5
	52.0	-19.5	41.9
	55.0	-19.8	44.9
zone S4/S5 boundary	60.0	-21.2	49.7
	63.0	-22.8	52.2
	65.0	-23.8	53.9
	70.0	-26.2	58.3

Table 2.3. SACFOR abundance records for species recorded in zones during the MNCR phase 2 survey of the transect at Eilean Port a' Choit W (XX01). Symbols as follows: () locally, [1]in pools, [2]in crevices. Nomenclature follows WoRMS (2016).

Taxon	**Zone**								
	I1	**I2**	**I3**	**I4**	**I5**	**I6**	**S1**	**S2**	**S3**
Suberites ficus									O
Hydractinia echinata								R	R
Obelia geniculata							O	O	O
Dynamena pumila					F	P	O		
Actinia equina					P				
Chaetopterus variopedatus									O
Terebellidae indet.									R
Sabellidae indet.							F	F	F
Spirobranchus triqueter							O	O	
Spirorbinae indet.					(A)		F	O	
Semibalanus balanoides			P	F	A				
Balanus crenatus									O
Amphipoda indet.			P	P	P				
Ligia oceanica			P						
Pagurus bernhardus								F	F
Macropodia sp.								R	
Necora puber								R	
Carcinus maenas								O	O
Collembola sp.					P				
Leptochiton asellus								R	
Tectura sp.								O	
Patella vulgata				F	C				
Gibbula cineraria								F	F
Littorina littorea					P				
Littorina obtusata				C	C				
Littorina saxatilis			(A[2])	O	F				
Buccinum undatum								O	
Nucella lapillus					P				
Philine aperta									R
Acanthodoris pilosa							R		
Pleurobranchus membranaceus eggs								R	
Mya truncata									O
Mytilus edulis					P				
Aequipecten opercularis								F	F
Pecten maximus								O	O
Callopora craticula								O	O
Scrupocellaria scruposa							R		
Electra pilosa							F	O	
Celleporella hyalina							F	O	O
Membranipora membranacea							F		
Alcyonidium gelatinosum					P		F		
Alcyonidium hirsutum					P	P	O		

Table 2.3 continued

Taxon	**Zone**								
	I1	**I2**	**I3**	**I4**	**I5**	**I6**	**S1**	**S2**	**S3**
Flustrellidra hispida							F		
Disporella hispida								O	O
Amphipholis squamata									O
Ophiura albida								O	
Asterias rubens								F	F
Crossaster papposus								R	R
Echinus esculentus									O
Ciona intestinalis							R		
Dendrodoa grossularia								R	
Ascidiella aspersa								R	
Ascidiella scabra							F(A)	F	F
Gadidae juveniles								O	O
Verrucaria maura	P	A	C	O					
Xanthoria parietina	F	R							
Ramalina siliquosa	C	R							
Grey lichens indet.	P								
Tephromela atra var. *atra*	P								
Lichina confinis		R							
Bryophyta sp.	P								
Poaceae spp.	P								
Armeria maritima	P								
Bonnemaisonia asparagoides							F		
Bonnemaisonia hamifera (Trailliella)								A	A
Corallinaceae indet. encrusting					R	A	F	F	R
Gelidium pusillum					A				
Cystoclonium purpureum								O	O
Dilsea carnosa							R		
Chondrus crispus							A	O	
Phyllophora crispa							A		
Gracilaria gracilis								R	R
Hildenbrandia spp.			F	C	F				
Lomentaria clavellosa								O	O
Lomentaria articulata				O	F				
Ceramium nodulosum?								O	O
Ptilota gunneri							F		
Acrosorium ciliolatum							R		
Cryptopleura ramosa							F		
Delesseria sanguinea							F		
Membranoptera alata							O		
Phycodrys rubens							C		
Polysiphonia fibrillosa?								O	O
Vertebrata lanosa					F				
Rhodophyceae indet. encrusting							O	O	R
Desmarestia viridis								C	A
Asperococcus bullosus								F	C
Stilophora tenella?								O	O
Ectocarpaceae indet.								F	F

Table 2.3 continued

Taxon	**Zone**								
	I1	**I2**	**I3**	**I4**	**I5**	**I6**	**S1**	**S2**	**S3**
Ascophyllum nodosum				F	S	R			
Fucus serratus					(O)	S			
Fucus spiralis			F	A					
Fucus vesiculosus				(A)					
Pelvetia canaliculata			A	O					
Chorda filum								A	A
Saccharina latissima							C	A	F
Cladophora rupestris					(S)	S			
Cladophora sp.				O				R	R
Ulva sp.								O	F
Codium sp.								R	R
Filamentous green alga indet.									O

Table 2.4. SACFOR abundance records for species recorded in zones during the MNCR phase 2 survey of the transect at Eilean Ard NE (XX06). Symbols as follows: () locally, [1]in pools, [2]in crevices. Nomenclature follows WoRMS (2016).

Taxon	**Zone**											
	I1	**I2**	**I3**	**I4**	**I5**	**I6**	**S1**	**S2**	**S3**	**S4**	**S5**	**S6**
Axinella infundibuliformis												R
Hemimycale columella												R
Hymedesmia (Hymedesmia) paupertas									R		R	R
Halichondria (Halichondria) panicea						P						
Suberites carnosus												P
Porifera sp. orange encrusting											O	
Bougainvillia muscus?											F	
Obelia dichotoma											O	
Obelia geniculata								F		F		
Kirchenpaueria pinnata											O	
Nemertesia antennina										O	O	
Nemertesia ramosa												O
Dynamena pumila				R	O	O						
Alcyonium digitatum								R	R			
Swiftia pallida												O
Caryophyllia (Caryophyllia) smithii									O	O	F	O
Actinia equina				(C[2])	(C[2])	(C[2])						
Sagartia elegans									O			
Cerianthus lloydii											O	
Lineus longissimus											R	
Eupolymnia nebulosa										O	R	
Spirobranchus triqueter								O	O	F	F	
Spirorbinae indet.									F			
Semibalanus balanoides			O	S	A	C	A					
Balanus balanus										O	F	O
Balanus crenatus								F	F	O		
Chthamalus montagui			O	P								
Idotea sp.						P						
Ligia oceanica			R									
Pagurus bernhardus										O	O	
Munida rugosa											O	R
Hyas sp.									O			
Pycnogonida sp.									O	O		
Collembola sp.				C								
Patella pellucida								F				
Patella vulgata				F	F	F						
Gibbula cineraria								F		F		R
Calliostoma zizyphinum								F	F			
Lacuna vincta								F				
Littorina obtusata			R	R		O						
Littorina saxatilis		O	F	O								
Melarhaphe neritoides			A	A	A							
Nucella lapillus				C	C	C						

Table 2.4 continued

Taxon	Zone											
	I1	**I2**	**I3**	**I4**	**I5**	**I6**	**S1**	**S2**	**S3**	**S4**	**S5**	**S6**
Nucella lapillus eggs					P							
Gastropoda eggs					P							
Diaphorodoris luteocincta									R			
Dendronotus frondosus									R			
Flabellina browni									R			
Hiatella arctica									O			
Musculus subpictus								R				
Modiolus spat								R				
Mytilus edulis				R	F	A	A					
Anomiidae indet.											F	
Schizomavella (Schizomavella) linearis											R	
Porella compressa												R
Dendrobeania murrayana									R		R	
Cauloramphus spiniferum									O			
Cradoscrupocellaria reptans?									F			
Scrupocellaria scruposa											O	
Cellaria sp.									R			
Cellepora pumicosa									F			
Celleporina caliciformis									F			
Membraniporella nitida									O			
Electra pilosa									C			
Escharoides coccinea									F			
Celleporella hyalina									C			
Membranipora membranacea								F				
Fenestrulina malusii									O			
Microporella ciliata									O			
Parasmittina trispinosa									P	F	C	O
Alcyonidium diaphanum											O	R
Alcyonidium hirsutum						O						
Flustrellidra hispida						R						
Crisiidae spp.											R	
Disporella hispida									O			
Tubulipora sp.									O			
Novocrania anomala											C	
Antedon bifida								F	C	C	A	O
Antedon petasus											O	O
Amphipholis squamata												R
Ophiactis balli											O	
Ophiura albida											O	
Asterias rubens								O		O	F	
Marthasterias glacialis										R	R	
Henricia sanguinolenta								R				
Porania (Porania) pulvillus								R				
Echinus esculentus								F	F	O	C	
Pawsonia saxicola								R		O		
Ciona intestinalis											O	
Diazona violacea												O

Table 2.4 continued

Taxon	**Zone**											
	I1	**I2**	**I3**	**I4**	**I5**	**I6**	**S1**	**S2**	**S3**	**S4**	**S5**	**S6**
Clavelina lepadiformis												R
Aplidium punctum											R	
Botrylloides leachii									O		F	
Botryllus schlosseri								O	O		O	
Polycarpa sp.											R	
Ascidia mentula									P	F	F	
Ascidia virginea												P
Corella parallelogramma											R	
Boltenia echinata									R			
Ascidiacea sp.									P			
Gadidae juveniles										O	R	
Molva molva											R	
Callionymus lyra										R		
Callionymus reticulatus												F
Thorogobius ephippiatus										P		
Ctenolabrus rupestris												P
Labrus bergylta												P
Pholis gunnellus										R		
Verrucaria maura	P	S	C									
Xanthoria parietina	F	R										
Ramalina siliquosa	F	R										
Grey lichens indet.	P											
Grey-green lichen indet.	P											
Brown lichen indet.	P											
Tephromela atra var. *atra*	P											
Bryophyta sp.	O											
Poaceae spp.	F											
Armeria maritima	O											
Porphyra umbilicalis					O	C						
Bonnemaisonia hamifera (Trailliella)										O		
Corallinaceae indet. encrusting								A	A	A	C	O
Rhodophyllis sp.									O		R	
Callophyllis laciniata								F				
Kallymenia reniformis								O			R	
Mastocarpus stellatus				P	O	C						
Schottera nicaeensis									O			
Hildenbrandia spp.			(A)	(A)								
Palmaria palmata				F	F	C						
Lomentaria articulata						R						
Rhodymenia ardissonei									O			
Plumaria plumosa						F						
Cryptopleura ramosa									O		O	
Delesseria sanguinea											O	
Hypoglossum hypoglossoides								R		R		
Membranoptera alata					O							
Nitophyllum punctatum											R	
Phycodrys rubens								F	F		O	
Dasysiphonia japonica								O				

Table 2.4 continued

Taxon	**Zone**											
	I1	**I2**	**I3**	**I4**	**I5**	**I6**	**S1**	**S2**	**S3**	**S4**	**S5**	**S6**
Brongniartella byssoides										O	R	
Rhodophyceae indet. encrusting									O		O	
Desmarestia aculeata									O			
Dictyota dichotoma								F	F	F	O	
Elachista fucicola						P						
Leathesia marina						R						
Fucus serratus				F	F	A						
Fucus spiralis				A	C							
Fucus vesiculosus				F	A	O						
Pelvetia canaliculata			A									
Laminaria digitata						R	S					
Laminaria hyperborea								S				
Saccharina latissima								F		F		
Cladophora rupestris				O								
Cladophora sp.						R						
Ulva lactuca						O						

Table 2.5. SACFOR abundance records for species recorded in zones during the MNCR phase 2 survey of the transect at Eilean na Saille S (XX09). Symbols as follows: () locally, [1]in pools, [2]in crevices. Nomenclature follows WoRMS (2016).

Taxon	**Zone**								
	I1	**I2**	**I3**	**I4**	**S1**	**S2**	**S3**	**S4**	**S5**
Leucosolenia botryoides							O		
Leucosolenia sp.						R			
Sycon ciliatum							O		
Myxilla (Myxilla) incrustans						R	R		
Halichondria (Halichondria) panicea		P[1]	O			O	O		
Hymeniacidon perlevis						F			
Craterolophus convolvulus								R	
Clytia hemisphaerica						O			
Obelia geniculata						C	C	F	
Nemertesia antennina								R	
Nemertesia ramosa								R	
Abietinaria abietina							O	R	
Amphisbetia operculata						O	O		
Sertularia argentea						O	O		
Alcyonium digitatum						R		R	
Caryophyllia (Caryophyllia) smithii							O	O	O
Actinia equina		(A[1,2])	(A[1])						
Urticina felina			P[1]			O	O		R
Metridium dianthus								R	
Sagartia elegans		P[1]	P[1]			F	O		R
Corynactis viridis								O	
Eulalia viridis			P						
Spirobranchus triqueter						O	O	O	O
Semibalanus balanoides		C	(S)	(S)	S				
Balanus balanus								R	
Balanus crenatus						O	O	R	R
Chthamalus spp.		(S)	(S)						
Chthamalus montagui		P	P						
Chthamalus stellatus	R	P	P						
Amphipoda indet.		A							
Caprella sp.?								R	
Isopoda indet.			P						
Palaemon serratus								O	
Pagurus bernhardus								R	
Patella pellucida							O		
Patella ulyssiponensis		P[1]	P[1]						
Patella vulgata			C						
Gibbula cineraria						O	O	R	R
Calliostoma zizyphinum						O	O	O	
Lacuna vincta						O	O		
Littorina saxatilis	(C)	P							
Melarhaphe neritoides	(C)	S	S						
Trivia monacha							O	R	
Nucella lapillus			C						

Table 2.5 continued

Taxon	**Zone**								
	I1	**I2**	**I3**	**I4**	**S1**	**S2**	**S3**	**S4**	**S5**
Aplysia punctata						O	O	O	
Rostanga rubra								R	
Doto sp.							O	O	
Limacia clavigera							R	R	
Polycera faeroensis							R		
Polycera quadrilineata							O		
Mytilus edulis		O	(A[2])						
Schizomavella (Schizomavella) linearis								P	
Scrupocellaria scruposa						O	O		
Cellepora pumicosa						O	O		
Electra pilosa						A	O	O	
Membranipora membranacea						O	O	R	
Parasmittina trispinosa							O	O	F
Oshurkovia littoralis							O		
Alcyonidium hirsutum						O	O		
Crisiidae spp.						F			
Antedon bifida						R	O	C	A
Ophiura albida								R	
Asterias rubens						R	O	O	
Marthasterias glacialis							R	R	
Stichastrella rosea									R
Luidia ciliaris							R	R	
Henricia sanguinolenta						R	O		
Porania (Porania) pulvillus							R	R	
Crossaster papposus							R		R
Echinus esculentus						O	O	O	C
Pawsonia saxicola								R	R
Clavelina lepadiformis						R	R	O	R
Aplidium nordmanni						R			
Polyclinum aurantium						O			
Diplosoma spongiforme						F	O		
Lissoclinum perforatum							O		
Botrylloides leachii						O			
Botryllus schlosseri						F	O		
Ascidia virginea								R	
Gadidae juveniles								F	F
Labrus bergylta							O		
Labrus mixtus									R
Taurulus bubalis						R			
Verrucaria maura	F	P							
Porphyra umbilicalis	R	S	P						
Asparagopsis sp.?						O			
Corallina officinalis			(A[1])			O			
Corallinaceae indet. encrusting					F	O	F	F	A
Rhodophyllis sp.									R
Dilsea carnosa							R	R	
Callophyllis laciniata						C	O	R	

Table 2.5 continued

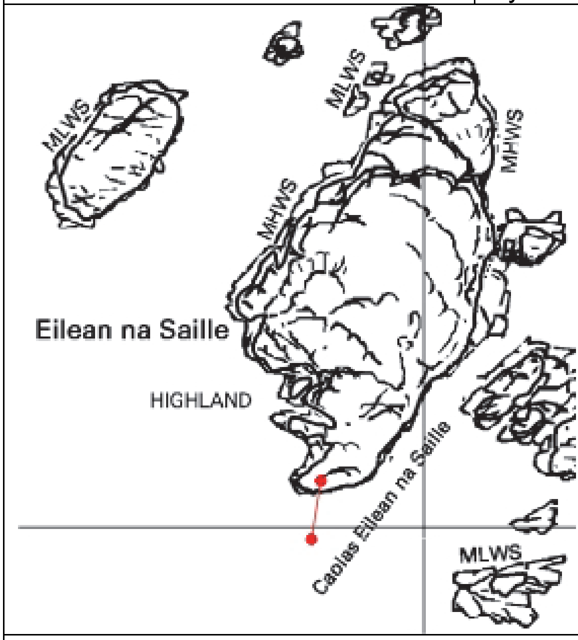
Taxon	**Zone**								
	I1	**I2**	**I3**	**I4**	**S1**	**S2**	**S3**	**S4**	**S5**
Kallymenia reniformis						O	F	R	
Palmaria palmata						C			
Plocamium cartilagineum						F	R		
Lomentaria orcadensis							R		
Aglaothamnion sepositum		P[1]	P	P					
Callithamnion tetragonum						F	F		
Ceramium shuttleworthianum		O	P						
Ceramium virgatum				P					
Ptilota gunneri						C	F		
Cryptopleura ramosa						F	O		
Delesseria sanguinea						F	F	R	
Erythroglossum laciniatum						O	O		
Hypoglossum hypoglossoides									R
Membranoptera alata						C			
Phycodrys rubens						C	F		
Odonthalia dentata						F			
Polysiphonia stricta						O			
Rhodophyceae indet. encrusting								F	F
Filamentous red algae			C	A					
Cutleria multifida (Aglaozonia)							F	F	
Desmarestia ligulata						R		O	
Desmarestia viridis							R	R	
Dictyota dichotoma						F	F	F	
Alaria esculenta					A	F			
Laminaria digitata						C			
Laminaria hyperborea						S	A	O	
Saccharina latissima							O	F	

Table 2.6. Reef and mixed reef/sediment transect location details. Further relocation details and associated imagery for transects XX01 and XX06 are provided in Moore et al. (2010).

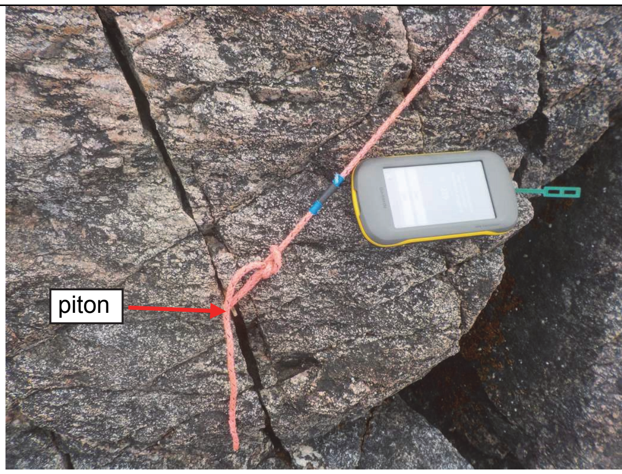
Full code and site name	**Brief code name**	**Date**	**Latitude (transect start)**	**Longitude (transect start)**	**Latitude (transect end)**	**Longitude (transect end)**	**Transect bearing (deg T)**	**Depth transect start (m)**	**Depth transect end (m)**
LL09XX01 Eilean Port a'Choit W	XX01	09/08/2015	58.38603	-5.05897	58.38695	-5.05995	331	-5.7	4.6
LL09XX06 Eilean Ard NE	XX06	08/08/2015	58.40505	-5.10497	58.40525	-5.10469	36	-5.9	26.0
LL09XX09 Eilean na Saille S	XX09	06/08/2015	58.42765	-5.12036	58.42713	-5.12046	186	-7.2	26.2

Table 2.7. Relocation data for reef transect Eilean na Saille S (XX09)

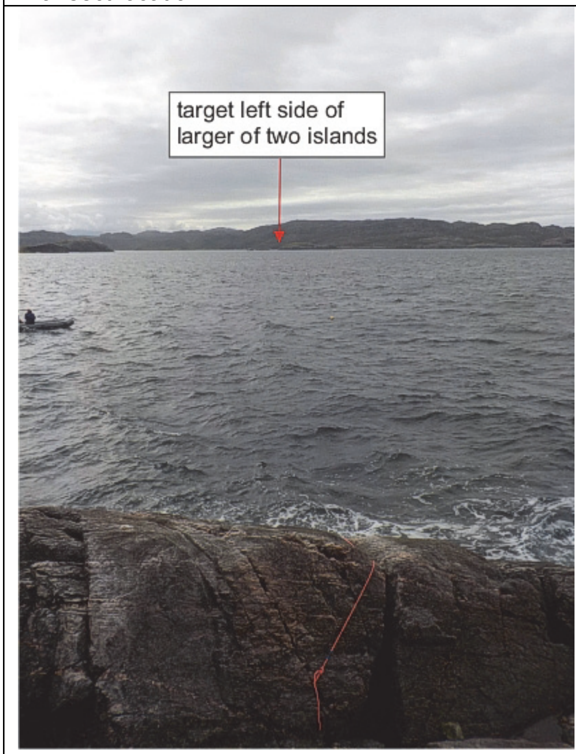
Transect name	Eilean na Saille
Site code	XX09 (LL09IR09, LL09SR09)
Position of marker	58.42765°N 5.120355°W
Type of marker	Metal piton in rock fissure
Bearing of transect from top (°T)	186
Position of offshore transect end	58.42713°N 5.12046°W
Access	By boat



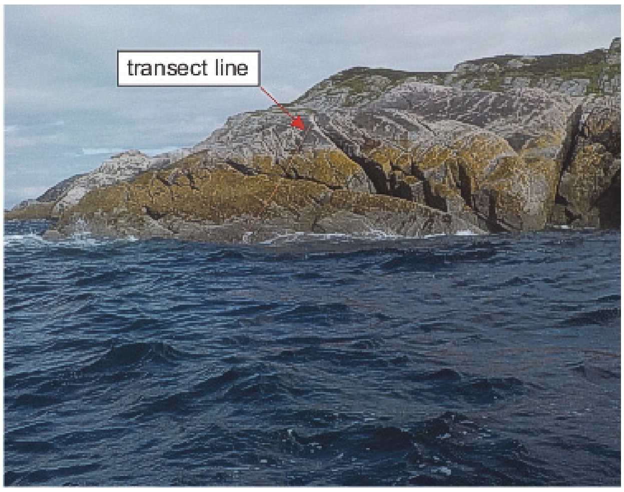
Transect location



0545.jpg Transect marker piton in fissure



0549.jpg View down transect



0538.jpg View of transect from 58.42740°N 5.12030°W, bearing 356°T

ANNEX 3: MAERL TRANSECT DATA

Table 3.1. Site details for the three maerl bed transects studied.

Site	Location	Date	Position (transect start)	Position (transect end)	Transect bearing (°T)	Depth transect start (m)	Depth transect end (m)	Habitat description	Biotope
ML01	Srut Mor	08/08/2015	58.39030 -5.07172	58.39036 -5.07131	76	5.1	4.5	Heterogeneous mix of coarse sand, shell and maerl gravel with a surface scatter of dead shells, locally dense. Live maerl was sparse and consisted mainly of *Phymatolithon calcareum*, but with some hedgehog stones of *Lithothamnion glaciale* also present. Denser live *P. calcareum* (possibly frequent locally) was associated with denser patches of shells. *Saccharina latissima* and *Halidrys siliquosa* were frequent and the sediment supported a patchy algal turf, better developed in areas of dense shell material. Dominant turf formers included *Cystoclonium purpureum* and *Polysiphonia fucoides*, with *Dasysiphonia japonica* occasional. Dominant faunal taxa recorded included *Carcinus maenas*, *Liocarcinus depurator*, *Ascidiella scabra* and *Ensis* siphons. 69 epibiotic taxa were recorded.	SS.SMp.Mrl.Pcal.R
ML02	Eilean Ard NW	07/08/2015	58.40584 -5.11251	58.40585 -5.11208	86	17.8	17.9	Muddy sand with maerl gravel with a fairly dense scatter of drift kelp. Live *Phymatolithon calcareum* was patchily distributed but with an overall cover of 30 - 40%. Sparse associated algal flora, which included occasional *Dasysiphonia japonica*. Visible fauna also sparse, with the more conspicuous elements including frequent *Neopentadactyla mixta*, *Pagurus bernhardus* and *Amphiura* sp.. 51 epibiotic taxa recorded.	SS.SMp.Mrl.Pcal

Table 3.1. continued

Site	Location	Date	Position (transect start)	Position (transect end)	Transect bearing (deg T)	Depth transect start (m)	Depth transect end (m)	Habitat description	Biotope
ML04	Sgeir Iosal SW	07/08/2015	58.40626-5.12353	58.40628 -5.12310	86	15.2	15.0	Substrate of maerl gravel waves of wavelength c. 2 m and amplitude c.30 - 40 cm. Live *Phymatolithon calcareum* with overall cover of c. 20 - 30% but patchily distributed with values reaching c. 60 - 70% in wave troughs. Associated algal flora sparse, with scattered *Saccharina latissima* and small tufts of reds and browns, particularly *Pterothamnion plumula*. *Dasysiphonia japonica* present but rare. Visible fauna sparse, dominant forms including frequent *Neopentadactyla mixta* and *Pagurus bernhardus*. 67 epibiotic taxa recorded.	SS.SMp.Mrl.Pcal. Nmix

Table 3.2. SACFOR abundance records for epibiota recorded along transects through three maerl bed sites. Nomenclature follows WoRMS (2016).

Taxon	**Site**		
	ML01	**ML02**	**ML04**
Sycon ciliatum		O	
Porifera sp. orange encrusting		R	
Suberites ficus?		O	
Cliona celata	O	O	R
Hydractinia echinata	R		
Obelia geniculata	O		O
Adamsia carciniopados	R	R	
Lineus longissimus			R
Aphrodita aculeata		R	
Polydora/Pseudopolydora sp.		P	
Lanice conchilega	O	O	O
Terebellidae indet.			O
Serpula vermicularis?		R	
Spirobranchus triqueter	R	O	O
Balanus balanus?		O	R
Balanus crenatus		R	
Palaemon serratus		R	
Pagurus bernhardus	O	F	F
Pagurus prideaux	R	R	
Galathea intermedia	O	O	O
Galathea strigosa?			R
Atelecyclus rotundatus			R
Cancer pagurus	O		
Inachus sp.		O	O
Macropodia sp.			R
Hyas araneus	R		
Liocarcinus corrugatus			R
Liocarcinus depurator	F	R	O
Necora puber	R		
Carcinus maenas	F		
Acanthochitona sp.?		R	R
Tectura	O	F	F
Lacuna vincta		O	O
Littorina obtusata	R		
Natica sp.		O	
Natica egg masses		O	
Buccinum undatum (juveniles)		O	
Calliostoma zizyphinum			O

Table 3.2 continued

Taxon	**Site**		
	ML01	**ML02**	**ML04**
Gibbula cineraria		F	F
Philine aperta		O	
Ensis sp. siphons	F		R
Anomiidae indet.		R	O
Aequipecten opercularis		R	
Pecten maximus		R	R
Eledone cirrhosa			P
Callopora craticula	O		
Electra pilosa	O		
Haplopoma impressum	O		
Celleporella hyalina	O		R
Membranipora membranacea	O		
Microporella ciliata		R	
Amathia lendigera	O		
Crisia eburnea	O		
Disporella hispida	O	R	
Tubulipora sp.			R
Antedon bifida		O	O
Amphiura securigera?		F	
Ophiopsila annulosa			O
Ophiura albida		O	O
Asterias rubens	O	O	O
Marthasterias glacialis	R		
Astropecten irregularis			R
Luidia ciliaris		O	R
Crossaster papposus	R		
Echinus esculentus	R	R	R
Neopentadactyla mixta		F	F
Diplosoma spongiforme	F		
Ascidiella scabra	F		O
Corella parallelogramma			R
Dendrodoa grossularia	R		
Callionymus reticulatus			O
Pholis gunnellus			R
Pomatoschistus pictus	O		O
Porphyropsis coccinea			O
Gelidium sp.?	R		
Gelidiella calcicola?		R	
Calliblepharis ciliata	R		
Cystoclonium purpureum	F		
Rhodophyllis divaricata			R

Table 3.2 continued

Taxon	**Site**		
	ML01	**ML02**	**ML04**
Dilsea carnosa	R		
Furcellaria lumbricalis	R		
Halarachnion ligulatum			R
Phyllophora crispa	O	O	R
Phyllophora pseudoceranoides	R		
Scinaia interrupta	R		R
Plocamium cartilagineum			R
Rhodophyceae indet. crusts	F	O	O
Corallinaceae indet. crusts	F	F	F
Lithothamnion glaciale	R		
Phymatolithon calcareum	R	C	C
Bonnemaisonia asparagoides			O
Bonnemaisonia hamifera (*Trailliella*)	O		
Aglaothamnion tenuissimum			R
Ceramium botryocarpum	R		
Pterothamnion plumula	R	R	F
Griffithsia corallinoides		R	
Ptilothamnion sphaericum?		R	R
Spermothamnion repens		R	
Spermothamnion strictum		R	R
Apoglossum ruscifolium			R
Cryptopleura ramosa			R
Delesseria sanguinea	R		
Erythroglossum laciniatum			R
Phycodrys rubens	O		R
Dasysiphonia japonica	O	O	R
Brongniartella byssoides	R		O
Odonthalia dentata	R		
Polysiphonia elongata	R		O
Polysiphonia fucoides	F		R
Polysiphonia nigra	R		
Rhodomela confervoides	O		
Ectocarpaceae indet.	O		
Asperococcus bullosus	R		
Sphacelaria plumosa		R	
Sphacelaria sp.	R		
Sporochnus pedunculatus			O
Stilophora sp.	R		
Cutleria multifida (*Aglaozonia*)	R		
Desmarestia aculeata			R
Desmarestia viridis	R	R	R

Table 3.2 continued

Taxon	Site		
	ML01	**ML02**	**ML04**
Dictyota dichotoma	R	O	O
Halidrys siliquosa	F		
Chorda filum	O		
Laminaria hyperborea			O
Saccharina latissima	F		F
Ulva sp.	R		
Cladophora sp.	R		R

Table 3.3. Abundance of infauna in each of four replicate 10.3 cm diameter cores taken from three maerl beds.

Taxon	**Site**	**ML01**				**ML02**				**ML04**			
	Replicate	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Lagotia viridis		P											
Sycon ciliatum						2			1				
Peachia cylindrica									1				
Actiniaria sp. juv												1	
Diphasia attenuata/rosacea		P											
Platyhelminthes sp.						1							
Nematoda >1mm		30	2	26	31		1			4		2	1
Nemertea spp.		1	3		1		1	1		1		1	3
Protodorvillea kefersteini				25						1		3	4
Schistomeringos neglecta					1								
Lysidice unicornis											2		
Hilbigneris gracilis						5	1		4	2	2	1	4
Aponuphis bilineata				1		2			1		P		
Chrysopetalum debile												1	
Glycera lapidum		5	1	2	1		1			1		1	
Gyptis propinqua						1							
Gyptis rosea											1		
Hesiospina aurantiaca										1		1	1
Kefersteinia cirrata		1		10	5								
Oxydromus pallidus			3										
Psamathe fusca								1					
Nephtys kersivalensis							1						
Platynereis dumerilii								1					1
Pholoe baltica						2			2	1	1		1
Pholoe inornata				1					1	1		1	1
Eulalia viridis									1		1		
Eumida ockelmanni				2							1		
Paranaitis kosteriensis							1						
Harmothoe sp.				1									
Harmothoe fragilis						1							
Harmothoe impar											1	1	2
Malmgrenia mcintoshi										1	2	1	1
Lepidonotus squamatus													1
Pisione remota				1									
Syllis variegata												1	
Trypanosyllis (Trypanosyllis) coeliaca				2						1	1		
Aonides oxycephala			1										
Laonice sarsi									1				
Microspio mecznikowianus				2			1						
Caulleriella alata				1									
Cirriformia tentaculata		1	2	5	3								
Aricidea (Acmira) cerrutii												3	
Paradoneis sp.								1					
Paradoneis armata													3
Paradoneis lyra						1			3			3	

Table 3.3 continued

Taxon	**Site**	**ML01**				**ML02**				**ML04**			
	Replicate	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Paraonides											2		
Paraonidae spp.							1						
Scalibregma celticum						3					1		
Scalibregma inflatum									1				
Capitella sp.					1								
Mediomastus fragilis		16	7	9	9	2	2	1	1	2	2	3	1
Notomastus sp.		2		5			1						
Notomastus latericeus						2		2		2	2		
Clymenura sp. juv									1				
Euclymene oerstedi						1		3	4				
Maldanidae spp. juv/indet						4							
Galathowenia oculata									1				
Owenia fusiformis						4			1				
Diplocirrus glaucus						1		1	1				
Diplocirrus stopbowitzi						1							
Amphictene auricoma								1					
Terebellides stroemii						1		2					
Pista cristata						1		1		1	1		
Pista mediterranea							3						
Polycirrus sp.		3	4	6					3				
Polycirrus norvegicus						1						1	1
Terebellidae sp. juv											1		
Paradialychone filicaudata										1			
Dialychone sp.					1								
Jasmineira sp. (damaged)		1	1										
Jasmineira caudata								1			1	1	
Jasmineira elegans						1							
Sabellidae sp. juv								1					
Hydroides norvegica						1		2	1			1	
Spirobranchus lamarcki												1	
Spirobranchus triqueter													1
Polygordius sp. (damaged)				3						1			
Grania spp.				2						1			
Golfingia sp. juv												2	
Golfingia (Golfingia) vulgaris vulgaris										1			
Phascolion (Phascolion) strombus strombus								1					
Austrominius modestus									1				
Verruca stroemia					2								
Cirripedia sp.												1	
Bodotria scorpioides						3							
Vaunthompsonia cristata								1					
Ampelisca typica								1					
Apherusa bispinosa				1									
Cheirocratus sp. ♀				1									
Cheirocratus sundevalli		2			4								
Corophium sp. (damaged)				P									
Leptocheirus sp. (damaged)		1											

Table 3.3 continued

Taxon / Site	ML01				ML02				ML04			
Replicate	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Leptocheirus hirsutimanus	4											
Leptocheirus pectinatus				1								
Isaeidae sp.		1										
Leucothoe incisa				1								
Leucothoe lilljeborgi	2											
Lysianassa sp. (damaged)						1						
Lysianassa plumosa					6	5	5					
Tryphosella sarsi					1							
Animoceradocus semiserratus				2	1	3		1	1		1	1
Othomaera othonis							1		2			
Gammarella fucicola							2					
Parametaphoxus fultoni				2								
Galathea intermedia					3	2	3	1		3		3
Anapagurus hyndmanni							1					
Liocarcinus sp. (damaged)										1		
Pisidia longicornis												2
Portunoidea sp. juv												1
Acanthochitona crinita							1					
Callochiton septemvalvis					2							
Stenosemus albus					2							
Lepidochitona (Lepidochitona) cinerea										1		
Tonicella marmorea				2								
Leptochiton asellus			2	1		5	1				1	2
Leptochiton cancellatus											2	
Diaphana minuta					1							
Eatonina fulgida									2			
Eulima bilineata						1						
Euspira nitida								1				
Alvania beanii						9	2		29	6	9	
Manzonia crassa												1
Onoba semicostata	3	2	5	26		6		1		2	2	16
Nassarius reticulatus												4
Tectura virginea						6						
Testudinalia testudinalis			1		2		1					1
Patella pellucida									1			1
Gibbula cineraria	1	1							1			
Gibbula tumida							1	2	1	1		
Gastropoda sp. indet									1			
Hiatella arctica					1	1		1				
Parvicardium pinnulatum				1				1				
Parvicardium scabrum						1		1	1		3	
Gari fervensis											1	
Abra alba						1						
Moerella sp.	1		1									
Moerella donacina									1			
Moerella pygmaea									2		1	
Tellinoidea sp.									1			
Goodallia triangularis								1	1		2	

Table 3.3 continued

Taxon	**Site**	**ML01**				**ML02**				**ML04**			
	Replicate	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Lucinoma borealis			4			1		1					
Myrtea spinifera							1						
Thyasira flexuosa						1	3	3	2				
Mya truncata												1	
Crenella decussata									1				
Modiolus modiolus		1		2			4						3
Musculus sp. (damaged)					1								
Mytilus edulis juv.						6		7			1		
Mytilidae juv.									3	2		1	
Nucula nucleus							1	4	1				
Clausinella fasciata										2		2	1
Dosinia sp. juv					3					1			
Dosinia exoleta			1	1		1	1	2	5			11	9
Dosinia lupinus			3										
Polititapes rhomboides					1						1		
Tapes sp. juv												1	
Timoclea ovata								1		1		2	1
Kurtiella tumidula				1									
Kurtiella bidentata		6	1	24	29		1	1		2		5	
Thracia phaseolina					1								
Thracia villosiuscula							1	1					
Electra pilosa						P							
Eucratea loricata			P		P								
Flustra foliacea			P										
Scruparia chelata		P											
Crisia eburnea					P								
Leptometra celtica										1			
Amphipholis squamata		4	2	11	7		6	1	2	1	1	1	1
Amphiuridae spp. juv			6		6	10		6	3	5	6	4	18
Amphiuridae spp.							3						
Ophiura albida									2				
Ophiuroidea sp. juv								2					
Psammechinus miliaris						1							
Echinocyamus pusillus										4			
Leptosynapta bergensis						1		1					
Branchiostoma													1

Table 3.4. Community descriptors for the infauna from each of four replicate 10.3 cm diameter cores collected from transects at three maerl sites. Diversity indices include the Shannon-Wiener function using log_e (H'_e) and log_2 (H'_2) and Pielou's evenness index (J'). The total number of taxa is given, as well as the taxon count excluding colonial and microscopic species, as these were not included in the 2009 baseline survey (Moore et al., 2010).

Core	No. taxa	No. taxa ex. col.	Abundance	J'	H'_e	H'_2
ML01.1	22	19	85	0.762	2.242	3.235
ML01.2	20	18	45	0.926	2.676	3.860
ML01.3	30	30	155	0.803	2.730	3.939
ML01.4	28	26	143	0.753	2.455	3.541
ML02.1	39	37	79	0.918	3.316	4.783
ML02.2	32	32	76	0.909	3.151	4.547
ML02.3	39	39	70	0.935	3.426	4.943
ML02.4	36	35	58	0.952	3.384	4.882
ML04.1	39	39	86	0.806	2.951	4.258
ML04.2	27	27	46	0.934	3.079	4.442
ML04.3	39	39	81	0.910	3.334	4.809
ML04.4	32	32	92	0.834	2.890	4.169

Table 3.5. Percentage of total sediment sample collected by sieves at 0.5 phi interval mesh sizes at three maerl transect sites.

Sieve (phi)	Site		
	ML01	ML02	ML04
-3.5	1.45	0.00	0.33
-3.0	2.12	0.11	1.69
-2.5	5.70	0.14	5.15
-2.0	10.73	0.71	6.84
-1.5	15.32	2.71	8.85
-1.0	12.00	5.46	10.93
-0.5	11.31	6.65	15.25
0.0	10.41	5.66	10.06
0.5	9.96	4.56	12.04
1.0	5.69	3.22	8.15
1.5	3.26	3.87	6.09
2.0	1.72	4.00	3.37
2.5	0.88	4.60	1.25
3.0	0.61	6.81	0.63
3.5	0.33	6.28	0.34
4.0	0.24	6.59	0.26
>4	8.28	38.63	8.78

Table 3.6. Particle size characteristics of sediments from three 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	-0.89	1853	1.07	8.28	71.72	20.00	2.06	4.97	64.68
ML02	3.10	117		38.63	60.41	0.96	24.28	7.87	28.26
ML04	-0.46	1376	1.08	8.78	77.21	14.01	2.48	9.46	65.27

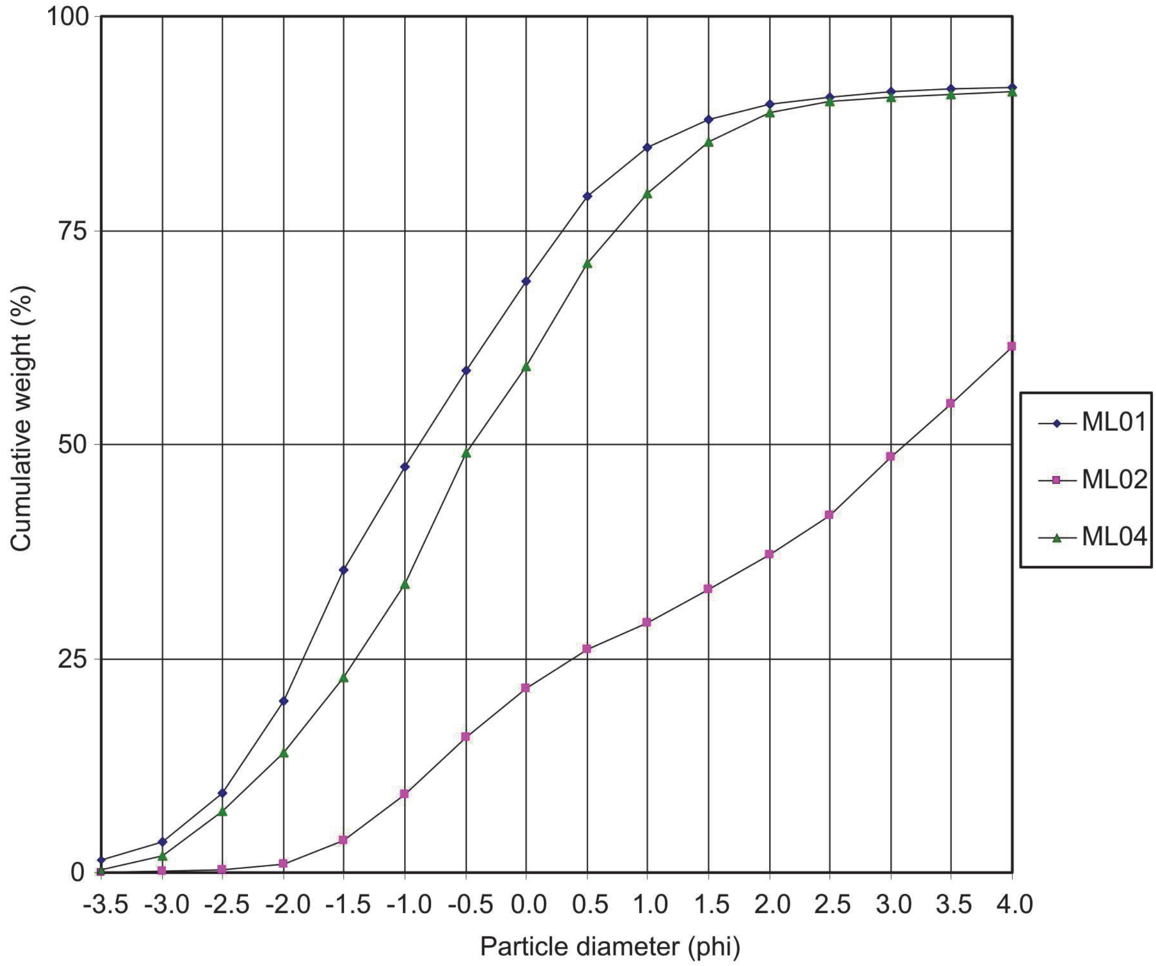


Figure 3.1. Particle size analysis of sediment collected at three maerl transect sites, showing cumulative weight of sediment retained on sieves at 0.5 phi intervals.

ANNEX 4: SITE ATTRIBUTE TABLES

*Table 4.1. Site attribute table for the **inlets and bays feature** for the Loch Laxford SAC, with the results of the 2015 site condition monitoring survey. * indicate non-mandatory attributes for monitoring.*

Attribute	Target	Method	Result
1 Extent of entire feature	No change in extent of whole feature Note – Feature extent & the implications of activities should be assessed against indicative baseline maps given in Posford Haskoning (2001) and Bates *et al*. (2004)	At 6-yearly intervals (in addition to individual case assessments) review activities that have had the potential to reduce the extent of the feature such as land reclamation, shoreline redevelopment and dredging operations (in consultation with SNH Area Office, relevant authorities and site management groups where applicable). At 18-year intervals confirm that there has been no change in overall extent with aerial photography/satellite imagery.	No human activities have been identified that are likely to have influenced the extent of the feature.
2 Diversity of component habitats	Maintain the variety of habitats identified for the site, allowing for natural succession/known cyclical change. The following biotopes (or equivalents) must be found on the fixed transects: <u>Intertidal sediment:</u> LS.LCS.Sh.BarSh LS.LSa.St.Tal LS.LSa.MuSa.HedMacEte LS.LMx.GvMu.HedMx.Cvol LS.LMp.Sm <u>Intertidal reef:</u> LR.HLR.MusB.MytB	At 6-yearly intervals confirm the diversity of biotopes recorded by the first SCM event (Moore *et al*., 2010) through a programme of remote video sampling, quantitative benthic sampling and MNCR phase 2 level surveys along the fixed transects established by Moore *et al*. (2010). Transects comprise the following habitat types: • two transects across intertidal sediments • nine transects across a combination of intertidal reef, subtidal reef and subtidal sediments	Intertidal sediment transects were not examined in 2015. All intertidal reef biotopes present in 2009 (21) were refound in 2015 apart from seven: LR.HLR.MusB.Sem.Sem LR.HLR.FT.FserT LR.MLR.BF.FvesB LR.LLR.F.FspiX LR.LLR.F.FvesX LR.LLR.FVS.Ascmac LR.FLR.Rkp.G All these biotopes were present along transects not examined in 2015.

Attribute	Target	Method	Result
	LR.HLR.MusB.Cht.Cht LR.HLR.MusB.Sem.Sem LR.HLR.FT.FserT LR.MLR.BF.FspiB LR.MLR.BF.FvesB LR.MLR.BF.Fser.R LR.LLR.F.Pel LR.LLR.F.Fspi.FS LR.LLR.F.FspiX LR.LLR.F.Fves.FS LR.LLR.F.FvesX LR.LLR.F.Asc.FS LR.LLR.F.Fserr.FS LR.FLR.Lic.YG LR.FLR.Lic.Ver.Ver LR.FLR.Rkp LR.FLR.Rkp.Cor.Cor LR.FLR.Rkp.G The following subtidal biotopes (or equivalents) must be found within the SAC (recorded during the remote video sampling and/or on the fixed transects): <u>Subtidal sediment:</u> SS.SCS.CCS SS.SCS.CCS.PomB SS.SCS.CCS.MedLumVen SS.SSa.IMuSa SS.SSa.IMuSa.AreISa SS.SSa.CMuSa SS.SMu.ISaMu SS.SMu.ISaMu.MysAbr		Of the 59 sublittoral biotopes recorded along transects or during the video survey in 2009, 35 were recorded in 2015. Of the 24 biotopes not refound the following were present at sites not examined in 2015: SS.SMu.ISaMu.MysAbr SS.SMu.IFiMu SS.SMu.IFiMu.Are SS.SMx.CMx.ClloMx SS.SMp.KSwSS.LsacMxVs IR.HIR.KFaR.Ala.Ldig IR.HIR.KFaR.LhypRVt IR.MIR.KR.LhypT.Ft IR.MIR.KR.LhypTX.Ft IR.MIR.KR.LhypVt IR.LIR.K.Lsac.Gz IR.LIR.K.LhypCape IR.LIR.Lag.ProtFur IR.FIR.SG.CrSpAsAn CR.HCR.XFa CR.HCR.XFa.CvirCri CR.MCR.EcCr CR.MCR.EcCr.FaAlCr.Adig CR.MCR.EcCr.FaAlCr.Flu The following biotope was not recorded in 2015 due to the absence of infaunal sample data: SS.SCS.CCS.MedLumVen The following biotopes were not recorded in 2015 probably due to slight differences in

Attribute	Target	Method	Result
	SS.SMu.CSaMu SS.SMu.CSaMu.VirOphPmax SS.SMu.C..VirOphPmax.HAs SS.SMu.IFiMu SS.SMu.IFiMu.Are SS.SMu.IFiMu.PhiVir SS.SMu.CFiMu.SpnMeg SS.SMu.CFiMu.SpnMeg.Fun SS.SMX.CMx SS.SMx.CMx.ClloMx SS.SMp.Mrl.Pcal SS.SMp.Mrl.Pcal.R SS.SMp.Mrl.Pcal.Nmix SS.SMp.KSwSS SS.SMp.KSwSS.LsacR SS.SMp.KSwSS.LsacR.Sa SS.SMp.KSwSS.LsacMxVs SS.SMp.KSwSS.Tra SS.SMp.KSwSS.Pcri SS.SMx.IMx (originally SS.SBR.SMus) Subtidal reef: IR.HIR.KFaR.Ala.Myt IR.HIR.KFaR.Ala.Ldig IR.HIR.KFaR.LhypR.Ft IR.HIR.KFaR.LhypRVt IR.HIR.KSed.LsacSac IR.HIR.KSed.XKScrR IR.MIR.KR.Ldig.Ldig IR.MIR.KR.LhypT.Ft IR.MIR.KR.LhypTX.Ft IR.MIR.KR.Lhyp.Ft IR.MIR.KR.Lhyp.Pk		sample locations between the surveys: SS.SSa.IMuSa.AreISa SS.SMu.ISaMu The following biotope was not recorded in 2015, although its presence in 2009 was uncertain due to the inadequacy of the video footage: SS.SMu.CSaMu The following biotope was not refound due to a temporal change in the dominance of kelp species, assumed to be natural: IR.LIR.K.LhypLsac.Gz Considering only the video sites and transects that were examined in both surveys, a total of 48 biotopes were recorded in 2009 and 53 in 2015. It is concluded that there is no evidence for a temporal reduction in the diversity of biotopes, although some minor change in biotope identity may have resulted from natural factors.

Attribute	Target	Method	Result
	IR.MIR.KR.Lhyp.GzFt IR.MIR.KR.Lhyp.GzPk IR.MIR.KR.LhypVt IR.MIR.KR.XFoR IR.LIR.K.LhypLsac.Gz IR.LIR.K.Lsac.Ft IR.LIR.K.Lsac.Pk IR.LIR.K.Lsac.Gz IR.LIR.K.LhypCape IR.LIR.Lag.ProtFur IR.FIR.SG.CrSpAsAn CR.HCR.XFa CR.HCR.XFa.CvirCri CR.MCR.EcCr CR.MCR.EcCr.FaAlCr CR.MCR.EcCr.FaAlCr.Adig CR.MCR.EcCr.FaAlCr.Car CR.MCR.EcCr.FaAlCr.Flu CR.LCR.BrAs.AmenCio CR.LCR.BrAs.AntAsH		
3 Distribution/ spatial pattern of habitats	Maintain the pattern of distribution and/or spatial arrangement of biotopes, allowing for natural succession/known cyclical change. The following biotopes should be found in the given sequence down the shore on the specified transects: <u>Tràigh Bad na Bàighe E</u> LS.LMp.Sm LS.LCS.Sh.BarSh LR.LLR.F.FspiX LR.LLR.F.FvesX	At 6-yearly intervals confirm the geographic distribution of biotopes recorded by the first SCM event (Moore *et al*., 2010) through a programme of remote video sampling, quantitative benthic sampling and MNCR phase 2 level surveys along the eleven fixed transects established by Moore *et al*. (2010). At six-yearly intervals confirm the distribution of *Ascophyllum nodosum* ecad *mackaii* recorded by the first SCM	The littoral sediment transects at Tràigh Bad na Bàighe E and Tràigh Bad na Bàighe W were not examined in 2015. The distribution of *Ascophyllum nodosum* ecad *mackaii* beds and *Mytilus edulis* beds were not examined in 2015. A programme of quantitative benthic sampling was not carried out in 2015. A change in biotope ascription was recorded

Attribute	Target	Method	Result
	LS.LSa.MuSa.HedMacEte <u>Tràigh Bad na Bàighe W</u> LR.FLR.Lic.YG, LS.LSa.St.Tal LS.LMp.Sm LR.LLR.F.FvesX LS.LMx.GvMu.HedMx.Cvol LS.LSa.MuSa.HedMacEte <u>Eilean Port a' Choit W</u> LR.FLR.Lic.YG LR.FLR.Lic.Ver.Ver LR.LLR.F.Pel LR.LLR.F.Fves.FS LR.LLR.F.Asc.FS LR.LLR.F.Fserr.FS IR.LIR.K.Lsac.Ft SS.SMp.KSwSS.LsacR, SS.SMp.KSwSS.Tra SS.SMp.KSwSS.Tra, SS.SMp.KSwSS.LsacR <u>Sruth Mor</u> LR.FLR.Lic.YG, LR.FLR.Rkp LR.FLR.Lic.Ver.Ver LR.LLR.F.Pel LR.LLR.F.Fspi.FS LR.LLR.F.Fves.FS LR.HLR.FT.FserT IR.MIR.KR.LhypT.Ft IR.MIR.KR.LhypTX.Ft <u>Ardmore</u> LR.FLR.Lic.YG LR.FLR.Lic.Ver.Ver LR.LLR.F.Pel	event (Moore *et al*., 2010) at the head of Loch Laxford and in Tr<u>à</u>igh Bad na B<u>à</u>ighe by recording the abundance of the alga along transects and by mapping the periphery of discrete beds, using the methodology given in Moore *et al*. (2010). At six-yearly intervals confirm the distribution of *Mytilus edulis* beds recorded by the first SCM event (Moore *et al*., 2010) in the entrance channel to Tr<u>à</u>igh Bad na B<u>à</u>ighe by mapping the periphery of the beds, using the methodology given in Moore *et al*. (2010).	at 20 of the 70 video sites studied in 2015. However, allowing for uncertainties resulting from differences in sampling locations and deficiencies in video footage, good evidence for real temporal change in biotope identity was only present at two sites, where an increase in the density of the algal turf, considered to be due to natural variation, underpinned the biotope change. Temporal comparisons between the 2009 SCM survey of relocatable transects and 2015 are only possible at the two reef/sediment transects examined in 2015: Eilean Port a' Choit W (XX01) and Eilean Ard NE (XX06). The sequence of littoral biotopes was unchanged at both sites, apart from a switch from LR.LLR.F.Fves.FS to LR.LLR.F.Fspi.FS in one zone at XX01, which represented a natural temporal change in dominance of the two characterising species, *Fucus vesiculosus* and *F. serratus*. The sequence of sublittoral biotopes was similar in both years along XX01. The sediment plain at the bottom of the transect was assigned to SMp.KSwSS.LsacR in 2009, with patches dominated by *Trailiella* and devoid of *Saccharina latissima* considered to represent SMp.KSwSS.Tra. In 2015 the whole of the sediment plain was referred to SMp.KSwSS.LsacR, as the *Trailliella* was considered to be largely

Attribute	Target	Method	Result
	LR.LLR.F.Fves.FS LR.LLR.F.Asc.FS LR.LLR.F.Fserr.FS IR.LIR.Lag.ProtFur IR.LIR.K.Lsac.Ft IR.LIR.K.Lsac.Pk CR.LCR.BrAs.AmenCio CR.LCR.BrAs.AmenCio, SS.SSA.CMuSa SS.SMu.IFiMu.PhiVir <u>Eilean an Eireannaich E</u> LR.FLR.Lic.YG LR.FLR.Lic.Ver.Ver LR.LLR.F.Pel LR.LLR.F.Fspi.FS LR.MLR.BF.FvesB LR.LLR.F.Fserr.FS IR.MIR.KR.Ldig.Ldig IR.LIR.K.LhypCape IR.LIR.K.Lsac.Ft CR.LCR.BrAs.AmenCio SS.SMu.CFiMu.SpnMeg SS.SMu.CFiMu.SpnMeg.Fun <u>Eilean Ard S</u> LR.FLR.Lic.YG, LR.FLR.Rkp LR.FLR.Lic.Ver.Ver, LR.FLR.Rkp.G LR.LLR.F.Pel, LR.FLR.Rkp LR.MLR.BF.FspiB LR.LLR.F.Fves.FS LR.LLR.F.Fserr.FS IR.LIR.K.LhypCape IR.LIR.K.Lsac.Ft CR.LCR.BrAs.AmenCio CR.LCR.BrAs.AmenCio, SS.SMX.CMx.ClloMx CR.LCR.BrAs.AmenCio		attached, rather than forming a loose mat. Re-inspection of the 2009 imagery suggests that this was probably also the case in 2009 and so there is no strong evidence for a temporal change in the sequence of biotopes. Changes in the biotope sequence along the sublittoral section of transect XX06 included the recorded absence of IR.LIR.K.LhypLsac.Gz in 2015 and a switch in one zone from CR.LCR.BrAs.AntAsH to IR.LIR.K.Lsac.Pk. Both these changes are considered to have resulted from natural temporal variation in the density of kelp plants. CR.MCR.EcCr.CarSwi.LgAs was recorded at the bottom of the transect only in 2015, but was considered to have also been present in 2009.

Attribute	Target	Method	Result
	SS.SMu.CSaMu.VirOphPmax SS.SMu.CFiMu.SpnMeg <u>Eilean Ard NE</u> LR.FLR.Lic.YG, LR.FLR.Rkp LR.FLR.Lic.Ver.Ver LR.LLR.F.Pel LR.MLR.BF.FspiB LR.LLR.F.Fves.FS LR.MLR.BF.Fser.R IR.MIR.KR.Ldig.Ldig IR.MIR.KR.Lhyp.GzFt IR.LIR.K.LhypLsac.Gz CR.MCR.EcCr.FaAlCr SS.SCS.CCS, CR.LCR.BrAs.AntAsH CR.LCR.BrAs.AntAsH SS.SCS.CCS <u>Eilean an Sithein N</u> LR.FLR.Lic.YG LR.FLR.Lic.Ver.Ver LR.HLR.MusB.Cht.Cht LR.HLR.MusB.MytB, LR.FLR.Rkp.Cor.Cor IR.HIR.KFaR.Ala.Myt IR.MIR.KR.Ldig.Ldig IR.HIR.KFaR.LhypR.Ft IR.MIR.KR.Lhyp.Ft IR.MIR.KR.Lhyp.Pk CR.MCR.EcCr.FaAlCr <u>Bodha Druim</u> IR.HIR.KFaR.LhypR.Ft IR.HIR.KFaR.LhypRVt CR.HCR.XFa.CvirCri		

Attribute	Target	Method	Result
	<u>Eilean Dubha NE</u> LR.FLR.Lic.YG LR.FLR.Lic.Ver.Ver LR.HLR.MusB.Cht.Cht LR.HLR.MusB.Sem.Sem, LR.FLR.Rkp.Cor.Cor LR.MLR.BF.FvesB IR.HIR.KFaR.Ala.Ldig IR.MIR.KR.Lhyp.GzFt IR.MIR.KR.LhypVt CR.MCR.EcCr IR.FIR.SG.CrSpAsAn CR.MCR.EcCr.FaAlCr.Car SS.SMx.CMx The geographical distribution of the following subtidal biotopes (or equivalents) recorded during the remote video sampling should correspond to that given in Moore *et al*. (2010): <u>Sediment biotopes</u> SS.SCS.CCS SS.SCS.CCS.PomB SS.SCS.CCS.MedLumVen SS.SSa.IMuSa SS.SSa.IMuSa.AreISa SS.SSa.CMuSa SS.SMu.ISaMu SS.SMu.ISaMu.MysAbr SS.SMu.CSaMu SS.SMu.CSaMu.VirOphPmax SS.SMu.CSaMu.VirOphPmax.HAs SS.SMu.IFiMu.PhiVir SS.SMu.CFiMu.SpnMeg SS.SMu.CFiMu.SpnMeg.Fun		

Attribute	Target	Method	Result
	SS.SMX.CMx SS.SMx.CMx.ClloMx SS.SMp.Mrl.Pcal SS.SMp.Mrl.Pcal.R SS.SMp.Mrl.Pcal.Nmix SS.SMp.KSwSS SS.SMp.KSwSS.LsacR SS.SMp.KSwSS.LsacR.Sa SS.SMp.KSwSS.LsacMxVs SS.SMp.KSwSS.Pcri SS.SBR.SMus Reef biotopes IR.HIR.KSed.LsacSac IR.HIR.KSed.XKScrR IR.MIR.KR.Lhyp.Ft IR.MIR.KR.Lhyp.GzFt IR.MIR.KR.Lhyp.GzPk IR.MIR.KR.XFoR IR.LIR.K.Lsac.Ft IR.LIR.K.Lsac.Pk IR.LIR.K.Lsac.Gz CR.HCR.XFa CR.MCR.EcCr.FaAlCr CR.MCR.EcCr.FaAlCr.Adig CR.MCR.EcCr.FaAlCr.Car CR.MCR.EcCr.FaAlCr.Flu CR.MCR.EcCr.FaAlCr.Pom CR.LCR.BrAs.AmenCio CR.LCR.BrAs.AntAsH		

Attribute	Target	Method	Result
4 Water Quality	Target values should default to appropriate national or international standards where appropriate. If sufficient local data are available to establish the baseline condition, site-specific targets can be set.	Every 6th year undertake monthly (for 12 months) water quality sampling from a series of relocatable stations to determine nutrient levels, water chemistry and water clarity.	Water quality monitoring has not been carried out specifically for the purposes of site condition monitoring. However, Loch Laxford has been considered to be in good condition from 2009 to 2013 (last year for which data is available) based on monitoring of water quality and other data by SEPA. Also, most of the SAC is classified as a shellfish harvesting area and this has been assigned the highest category A status from 2009 to 2015 based on monitoring of the microbiological and chemical contamination of mussels. There is no current evidence to suggest that temporal deterioration in water quality has occurred.
5 *Species composition of representative or notable biotopes	No decline in maerl biotope quality on the monitoring transects due to changes in species composition or reduction in species richness allowing for natural succession/ known cyclical change. The following sites and biotopes are to be monitored: LL09ML01 (SS.SMp.Mrl.Pcal.R) LL09ML02 (SS.SMp.Mrl.Pcal) LL09ML04 (SS.SMp.Mrl.Pcal.R)	At 6-yearly intervals undertake MNCR phase 2 level surveys (including the collection of four replicate infaunal core samples and a comprehensive algal inventory) of the three transects across maerl beds established by Moore *et al*. (2010) and compare the species composition with that recorded by Moore *et al*. (2010).	Recorded temporal differences in epibiotic species richness at the three maerl sites were considered to result from methodological differences between surveys. Change in infaunal species composition were considered to result from natural variation, except at transect ML02, where a marked decline in the abundance of *Pseudopolydora paucibranchiata* may have resulted from a temporal decline in organic enrichment originating from an adjacent mussel farm. Temporal reduction in non-maerl algal cover along transect ML04 was considered to have resulted from enhanced, natural, hydrodynamic activity.

Attribute	Target	Method	Result
6 *Presence or abundance of specified species	Maintain abundance of *Phymatolithon calcareum* along the three transects listed in section 5. No increase in the abundance of *Dasysiphonia japonica* along the three transects listed in section 5.	At 6-yearly intervals the abundance of the specified species is to be determined semi-quantitatively as part of the MNCR phase 2 level surveys carried out along the three maerl bed transects established by Moore *et al.* (2010).	No decrease in abundance of *Phymatolithon calcareum* was recorded between the 2009 and 2015 surveys along transects ML01 and ML02. A temporal reduction in live maerl cover along transect ML04 was likely to have been caused by burial or translocation of material by enhanced, natural, hydrodynamic activity. *Dasysiphonia japonica* was recorded at all three maerl sites in 2015 but only at ML01 in 2009. This is likely to represent an abundance increase at ML04 but not necessarily at ML02 where the sparse filamentous red algae were not identified in 2009. In 2015 the species was sparse at all sites (rare - occasional) and its presence is not currently considered to be ecologically significant or represent a reduction in condition of the habitat.

*Table 4.2. Site attribute table for the **reefs** feature for the Loch Laxford SAC, with the results of the 2015 site condition monitoring survey. * indicate non-mandatory attributes for monitoring.*

Attribute	Target	Prescription	Result
1 Extent	No change in extent of littoral rock and inshore sublittoral rock. Note - Reef extent & the implications of activities should be assessed against indicative baseline maps given in Posford Haskoning (2001) and Bates *et al*. (2004)	At six-yearly intervals review activities and events with the potential to reduce extent of feature such as land reclamation and shoreline development. At 18-yearly intervals perform acoustic bathymetric survey.	No human activities have been identified that are likely to have influenced the extent of the feature.

Attribute	Target	Prescription	Result
2 Biotope composition of the littoral rock and inshore sublittoral rock	Maintain the variety of biotopes identified for the site, allowing for natural succession/ known cyclical change. The intertidal reef biotopes (or equivalents) given in section 2 of Table 4.1 must be found on the fixed transects: The subtidal reef biotopes (or equivalents) given in section 2 of Table 4.1 must be found within the SAC (recorded during the remote video sampling and/or on the fixed transects):	At 6-yearly intervals confirm the diversity of biotopes recorded by the first SCM event (Moore *et al.*, 2010) through a programme of remote video sampling and MNCR phase 2 level surveys along the nine fixed transects across littoral and sublittoral reef habitats established by Moore *et al.* (2010).	All intertidal reef biotopes present in 2009 were refound in 2015 apart from seven: LR.HLR.MusB.Sem.Sem LR.HLR.FT.FserT LR.MLR.BF.FvesB LR.LLR.F.FspiX LR.LLR.F.FvesX LR.LLR.FVS.Ascmac LR.FLR.Rkp.G All these biotopes were present along transects not examined in 2015. The following sublittoral reef biotope was not refound due to a temporal change in the dominance of kelp species, assumed to be natural: IR.LIR.K.LhypLsac.Gz The following subtidal reef biotopes were not refound in 2015 but were only recorded in 2009 at sites not examined in 2015: IR.HIR.KFaR.Ala.Ldig IR.HIR.KFaR.LhypRVt IR.MIR.KR.LhypT.Ft IR.MIR.KR.LhypTX.Ft IR.MIR.KR.LhypVt IR.LIR.K.Lsac.Gz IR.LIR.K.LhypCape IR.LIR.Lag.ProtFur IR.FIR.SG.CrSpAsAn CR.HCR.XFa CR.HCR.XFa.CvirCri

Attribute	Target	Prescription	Result
			CR.MCR.EcCr CR.MCR.EcCr.FaAlCr.Adig CR.MCR.EcCr.FaAlCr.Flu The variety of reef biotopes is considered to have been maintained, subject to allowance for natural temporal change.
3 Distribution/Spatial arrangement of biotopes	Maintain the distribution and/or spatial arrangement of littoral and sublittoral biotopes, allowing for natural succession/known cyclical change. The reef biotopes given in section 3 of Table 4.1 should be found in the given sequence down the shore on the specified transects. The reef biotopes are those preceded by LR, IR or CR. The geographical distribution of the subtidal reef biotopes (or equivalents) recorded during the remote video sampling should correspond to that given in Moore *et al*. (2010). See section 3 of Table 4.1 for a list of the biotopes.	At 6-yearly intervals confirm the geographic distribution of biotopes recorded by the first SCM event (Moore *et al*., 2010) through a programme of remote video sampling and MNCR phase 2 level surveys along the nine fixed transects across littoral and sublittoral reef habitats established by Moore *et al*. (2010).	A change in biotope ascription was recorded in 2015 at 9 of the 20 video sites where reef biotopes were found in 2009. However, allowing for uncertainties resulting from differences in sampling locations and deficiencies in video footage, good evidence for real temporal change in biotope identity was only present at two sites, where an increase in the density of the algal turf, considered to be due to natural variation, underpinned the biotope change. Temporal comparisons between the 2009 SCM survey of relocatable transects and 2015 are only possible at the two reef/sediment transects examined in 2015: Eilean Port a' Choit W (XX01) and Eilean Ard NE (XX06). The sequence of littoral reef biotopes was unchanged at both sites, apart from a switch from LR.LLR.F.Fves.FS to LR.LLR.F.Fspi.FS in one zone at XX01, which represented a natural temporal change in dominance of the two characterising species, *Fucus vesiculosus* and *F. serratus*.

Attribute	Target	Prescription	Result
			The sequence of sublittoral reef biotopes was the same in both years along XX01.. Changes in the biotope sequence along the sublittoral section of transect XX06 included the recorded absence of IR.LIR.K.LhypLsac.Gz in 2015 and a switch in one zone from CR.LCR.BrAs.AntAsH to IR.LIR.K.Lsac.Pk. Both these changes are considered to have resulted from natural temporal variation in the density of kelp plants. CR.MCR.EcCr.CarSwi.LgAs was recorded at the bottom of the transect only in 2015, but was considered to have also been present in 2009.
4 *Species composition of representative or notable biotopes	No decline in intertidal and/or subtidal biotope/sub-biotope quality on the monitoring transects due to changes in species composition or loss of notable species allowing for natural succession/ known cyclical change. Biotopes for phase 2 survey are listed in section 3 of Table 4.1. Transect zones and their biotopes for algal census are as follows: Eilean Ard S, zone S2 (IR.LIR.K.Lsac.Ft) Eilean Ard NE, zone S5 (CR.LCR.BrAs.AntAsH) Bodha Druim, zone S1 (IR.HIR.KFaR.LhypR.Ft) Eilean Dubha NE, zone S4 (CR.MCR.EcCr)	At 6-yearly intervals undertake MNCR phase 2 level surveys of the nine fixed transects across littoral and sublittoral reef habitats established by Moore *et al*. (2010) and compare the species composition with that recorded by Moore *et al*. (2010). At 6-yearly intervals determine the species composition and richness of representative/notable biotopes by a census of the algal flora within specified zones of the fixed transects established by Moore *et al.* (2010) using the methods given in Moore *et al* (2010).	Temporal comparisons between the 2009 SCM survey of relocatable transects and 2015 are only possible at the two reef transects examined in 2015: Eilean Port a' Choit W (XX01) and Eilean Ard NE (XX06). Along the intertidal section of transect XX01 there was a temporal change in dominance of *Fucus vesiculosus* and *F serratus* resulting in a biotope change from LR.LLR.F.Fves.FS to LR.LLR.F.Fspi.FS. Sublittorally, in 2009 the algal turf of the *Saccharina latissima* forest was strongly dominated by the *Trailliella* stage of *Bonnemaisonia hamifera*, which was unrecorded here in 2015. Along the intertidal section of transect XX06. the presence of abundant small littorinids in the *Pelvetia*, *Fucus spiralis* and *F. vesiculosus* zones in 2015 was unrecorded

Attribute	Target	Prescription	Result
			in 2009. A band of dense *Mytilus edulis* on the lower shore in 2015, was unrecorded in 2009. Along the sublittoral section of the transect localised changes in the abundance of *Saccharina latissima* were recorded between the surveys. All the above compositional changes are considered to be probably due to natural temporal fluctuation or methodological differences between surveys. Detailed algal censuses were not carried out in 2015. Only one of the 2009 algal census zones (Eilean Ard NE zone S5 (=zone S4 in 2015)) was surveyed by standard MNCR phase 2 methods in 2015. The reduced number of algal taxa recorded (6) compared to the 2009 algal census (24) will be strongly influenced by the different methodology.

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