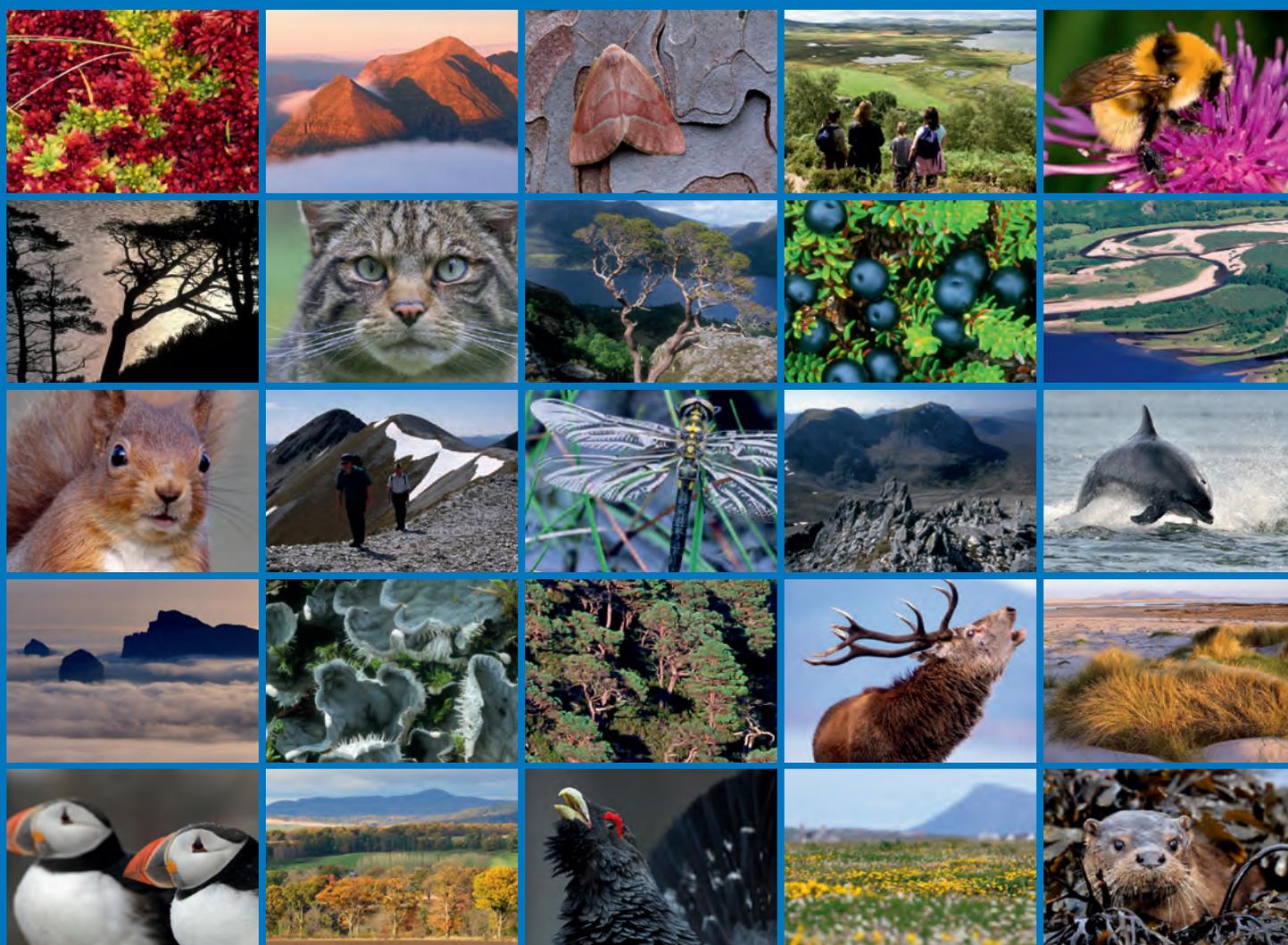


2014 site check survey and biotope mapping of the intertidal sediment flats of the Loch Moidart and Shiel Woods SAC





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COMMISSIONED REPORT

Commissioned Report No. 809

2014 site check survey and biotope mapping of the intertidal sediment flats of the Loch Moidart and Shiel Woods SAC

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COMMISSIONED REPORT

Summary

2014 site check survey and biotope mapping of the intertidal sediment flats of the Loch Moidart and Shiel Woods SAC

Commissioned Report No. 809

Project No: 14988

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Benthos; mudflat; monitoring; survey; biotope; mapping.

Background

In addition to woodland and otter features, Loch Moidart and Shiel Woods SAC is also noted for its sediment flats, which form one of the most extensive areas of this feature in western Scotland. The purpose of the current study was to carry out a survey in order to identify any temporal deterioration in the condition of the intertidal mudflats and sandflats feature and to form a judgement on its current condition. Site condition monitoring (SCM) was inaugurated at this site in 2003, which provides a baseline for the current study. In this study the full SCM survey methodology was replaced with a more rapid assessment technique, termed Site Check, introduced by SNH in 2012. This principally involved assessment of the condition of the sedimentary habitats along the representative, relocatable transects established in 2003, but monitoring fewer parameters.

As there has been no previous mapping of the distribution of sediment flat habitats within the SAC, this formed an additional objective of the current study. The Site Check survey results were therefore supplemented by additional ground truthing to map the distribution of intertidal sediment biotopes.

Main findings

- No evidence of temporal change in the biotope composition of the sediment flats since the 2003 baseline survey was recorded.
- A minor change in the distribution of biotopes was recorded along one transect, with **LS.LSa.MuSa.MacAre** replacing **LS.LSa.MuSa.HedMacEte** at one station. However, this was only predicated on the perceived absence of the characterising *Hediste diversicolor* in 2014, and the changed biotope ascription did not represent a significant change in the character or condition of the habitat.
- The prescribed targets for the occurrence of the positive indicator species *Arenicola marina*, *Hediste diversicolor* and *Corophium volutator* were met.

- Localised temporal changes in apparent sediment composition at one station and anaerobic layer depth at two stations were recorded, but these were consistent with natural variability.
- No anthropogenic activities or events were identified which appear to be influencing the condition of the sediment flat feature.
- The results of the Site Check survey provide no good evidence that there has been any deterioration in the condition of the sediment flat feature since 2003 and indicate that the feature should be assigned to the condition category "Favourable Maintained".
- The biotope mapping survey revealed that the intertidal component of the Loch Moidart estuarine system is overwhelmingly dominated by sedimentary substrates with muddy sand predominating in most areas. In the upper reaches of the system the sediments tend to be poorly sorted with varying proportions of gravel, pebbles and cobbles. This is particularly prominent on the margins of the main river channel but also applies to the broader sediment flats. The sediments of the outer part of the estuary tend to be more homogeneous and include areas of cleaner rippled sand in addition to muddy sand and mud. The sediments at the head of the estuary are characterised by *Hediste diversicolor*, *Corophium volutator* and oligochaete worms. Most sediments in this area are allocated to the **LS.LMu.UEst.Hed.OI** and **LS.LMu.MEst.HedMac** biotopes. The sediments of a much more extensive adjacent mid estuary area are broadly similar but subject to less freshwater influence. These are again characterised by *H. diversicolor* and *C. volutator* and also support dense populations of *Arenicola marina*. The majority of this region is allocated to the estuarine **LS.LSa.MuSa.HedMacEte** biotope which grades into the more marine **LS.LSa.MuSa.MacAre** biotope that occupies most of the extensive sedimentary areas of the outer estuary. The upper margin of the intertidal sediment is generally formed by saltmarsh in areas near the head of the estuary. Elsewhere, there are usually rocky substrates at the sediment boundary and these tend to be dominated by *Ascophyllum nodosum* (**LR.LLR.F.Asc** or **LR.LLR.F.Asc.X**).
- The presence of two priority marine features was noted during the survey work. Small beds of the egg wrack (*Ascophyllum nodosum* ecad *mackaii*), constituting the biotope **LR.LLR.FVS.Ascmac**, were observed on mixed substrata above the sediment flats in embayments at the north-east of Shona Beag and scattered individuals of the native oyster, *Ostrea edulis*, were also recorded at three locations in the same area.

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1. INTRODUCTION

The Loch Moidart and Shiel Woods SAC was designated in 2005. The qualifying interest features include woodlands, the otter (*Lutra lutra*) and intertidal sediment flats, the latter forming the focus of interest for the current study.

Loch Moidart is a fjordic sea loch located to the north-east of the Ardnamurchan peninsula on the west coast of Scotland. It contains one of the largest expanses of intertidal sediment flats in western Scotland. The loch is generally sheltered and the distribution of sediments is more strongly influenced by tidal currents than by wave exposure. The intertidal sediments are predominantly muddy sands, although areas of soft mud and clean sand are also present. The sediments are influenced by two main sources of freshwater, the River Moidart flowing into the head of the loch and the River Shiel entering the south side of the loch beyond the western extremity of the SAC.

There have been few published studies of the sedimentary habitats within Loch Moidart. As part of the Marine Nature Conservation Review, Howson (1990) examined three sites on the intertidal sediments of the Moidart SAC. Wilkinson and Scanlan (1987) examined four sites within Loch Moidart but concentrated on the algal flora, with little information provided on sediments or fauna. They did record extensive beds of *Ascophyllum nodosum* ecad *mackaii* (**LR.LLR.FVS.Ascmac**) in an area of mud and shingle in the North Channel, where Howson (1990) also observed this alga to cover "tens of square metres". Cordah BMT Ltd (2000) carried out a macrobenthic survey of the sediments in 2000. This provided good spatial coverage of the SAC and included species abundance and granulometric data for 17 stations.

Site condition monitoring (SCM) of the sediment flat feature commenced in 2003 (Moore *et al.*, 2004) with the establishment of a series of 16 relocatable stations along five transects across the sediment flats, which were believed to reflect the biological and environmental diversity of the sedimentary habitats. Each transect was initially divided into a number of zones that appeared to represent the different shore levels, substrates and possible biotopes, with a sample station identified within each zone. At each station one 3.4 cm diameter core sample was taken for sediment particle size analysis and eight pooled 10.3 cm diameter cores for faunal analysis, which were supplemented by recording the conspicuous biota revealed from digging over an area of approximately 1 m². The depth of the anaerobic layer was recorded and photos and videos taken, including five replicate photo quadrats of the sediment surface. The transect profile was measured using a surveyor's level to record height and distance of all stations and zone boundaries from the permanent transect marker, and to record the height in relation to sea level, and hence chart datum. Moore *et al.* (2004) include a Site Attribute Table defining the approach to subsequent SCM surveys of the Loch Moidart mudflats and sandflats feature. This is reproduced in Annex 3.

In order to help detect any changes to the habitats, species populations or earth science features of protected sites in Scotland between SCM assessments, a new monitoring method called Site Check was introduced by SNH in 2012 (SNH, 2014a). This is intended as a rapid methodology for assessment of change in condition of the feature of interest. The principal aim of the current study was to carry out a site check of the condition of the mudflats and sandflats feature of the Loch Moidart and Shiel Woods SAC. As there has been no previous mapping of the distribution of sediment flat habitats within the SAC, this formed an additional objective of the current study. The Site Check survey results were therefore supplemented by additional ground truthing to map the distribution of sediment flat biotopes.

2. METHODS

2.1 Site Check

Site Check of the sediment flats involved checking the presence and sequence of biotopes along the five transects surveyed in 2003. To facilitate the recording of all necessary data a *pro forma* was developed (Annex 1). At each of the 16 stations examined in 2003 (Figure 1), located using differential GPS, the sediment type and depth of the anaerobic layer was recorded and the habitat photographed using stills and video cameras. This included still photos of five replicate randomly placed 0.25 m² quadrats. The biota was assessed by digging over an area of sediment of c.1 m² and by surface observations of features such as *Arenicola marina* casts and *Lanice conchilega* tubes, with abundance recorded on the SACFOR scale (Hiscock, 1996). For smaller organisms an area of sediment of approximately 250 cm² was dug out and sieved using a 1 mm mesh and estimates of species abundance made using the SACFOR scale. Some of the biological material was retained for identification in the laboratory. Based on the physical and biological data recorded, biotopes were subsequently assigned. The habitats along the rest of the transect were inspected for any significant divergence from that described in 2003, including any perceived changes in the positions of habitat zone boundaries.

Signs of anthropogenic impact, such as pollution or the disposal of waste materials, was noted along the transects. This was also recorded over the sediment flats as a whole during the accompanying biotope mapping survey.

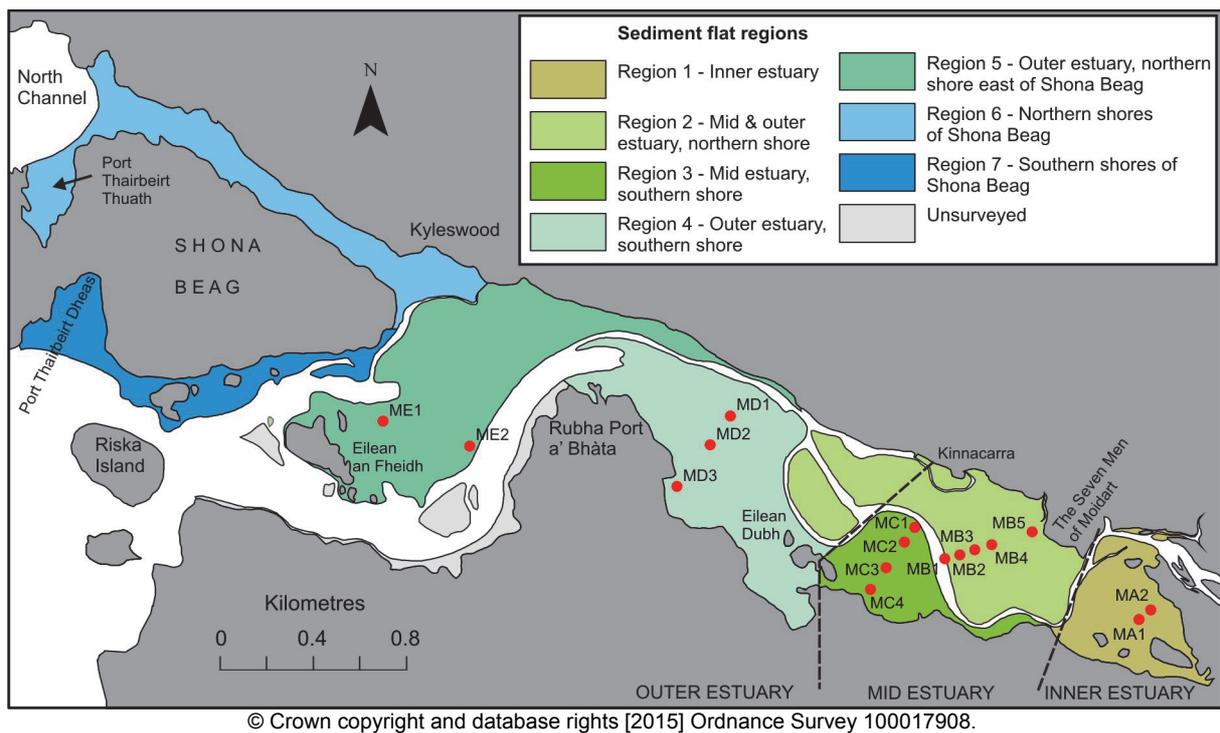


Figure 1. Loch Moidart SAC sediment flats with regional subdivisions and estuarine zones employed in the text. Also shown are the locations of stations along five transects (MA - ME) used in the Site Check survey.

2.2 Biotope mapping

To aid biotope mapping aerial imagery was available from May 2007 and July 2013. As the more recent material was recorded close to high tide, the 2007 imagery was largely used within ArcGIS 9.3 for preparation of a wireframe map of the sediment flats, which involved their division into 36 polygons (Figure 2). This was based on regional variation in the appearance of the imagery, which was assumed to, at least in part, reflect variation in habitat type. Data from the 2003 SCM transects (Moore *et al.*, 2004) was also used in the process.

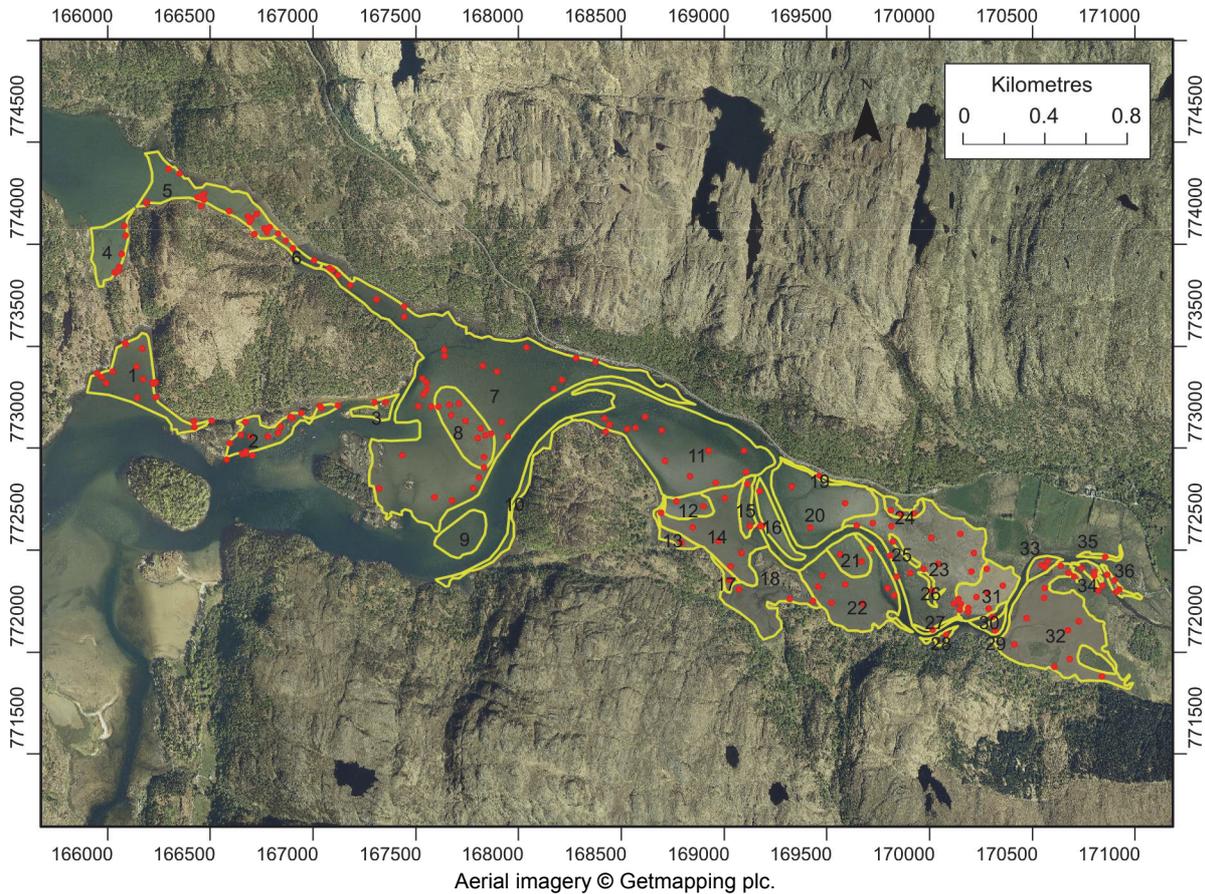


Figure 2. Wire frame map of Loch Moidart overlying 2007 aerial imagery, showing numbered polygons in yellow and 2014 target note sites (red markers).

The wireframe map with aerial imagery was available in the field on a series of laminated sheets. It was also uploaded to a large-screen, sunlight-readable differential GPS receiver (Garmin Montana 600). One team of 2 - 3 recorders surveyed the area, largely within three hours either side of low water springs by walking each of the polygons, where possible, employing target notes at fixed locations to record the characteristics of the habitat (Figure 2, Annex 4 - Tables 4.1, 4.2). Where appropriate, descriptions of habitats between target point positions were also recorded. Field data collected to aid subsequent biotope identification included physical habitat characteristics, biotic surface features and the infauna revealed by digging over an area of c. 1 m², with retention of specimens where necessary for laboratory identification. In many cases it was also felt necessary to supplement digover material by sieving sediment from an area of c. 250 cm² using a 1 mm mesh. Field observations were supplemented by still and video photography. The wireframe laminates were used for sketching the distribution of perceived habitats in the field and to aid investigation of conspicuous features on the aerial imagery. In general, biotope ascription to areas was deferred until the results of infaunal analysis were available and, in view of the limited information available at individual target sites, biotopes were assigned to areas, rather than

individual sites. Preliminary sketches of the distribution of biotopes were produced within ArcGIS 10.2 using the drawing facility, with the finalised map converted into biotope polygons. To provide context, the adjacent saltmarsh habitat was incorporated into the final map based on the results of a June 2012 SNH survey. The biotope mapping GIS project employed the OSGB 1936 coordinate system and British National Grid projection.

3. RESULTS

3.1 Site Check

Full details of the data recorded during the Site Check survey are provided in Annex 2 (Tables 2.1 and 2.2).

No temporal change was recorded in the presence of biotopes, with all three biotopes recorded in 2003 (**LS.LSa.MuSa.MacAre**, **LS.LSa.MuSa.HedMacEte** and **LS.LMu.MEst.HedMac**), still being present in 2014. There was however, a recorded change in the sequence of biotopes along transect MD, with **LS.LSa.MuSa.MacAre** replacing **LS.LSa.MuSa.HedMacEte** at the uppermost station (MD3). This resulted from a slight temporal change in the recorded biota, with *Hediste diversicolor* (characteristic of **LS.LSa.MuSa.HedMacEte**) not being observed in 2014. However, only a single individual of *Hediste* was recorded at the station in 2003. The recorded change in assigned biotope is indistinct and does not represent a significant change in the character or condition of the site. Identification of the boundaries between habitat zones along the transects can be difficult due to gradual transitions. However, no marked changes in boundaries were observed in 2014, with a few minor differences recorded, but amounting to a few metres at most.

No evidence of deterioration in the condition of the sediment flat feature from anthropogenic activities was recorded.

3.2 Biotope mapping (Figures 3, 4)

3.2.1 General overview of main trends

To aid description of the distribution of habitats the Loch Moidart estuary can be split into three major zones containing a total of seven regions (Figure 2). The 'inner estuary' is taken as the area to the east of a line running south from the Seven Men of Moidart. The 'middle estuary' is taken as the area west of the inner estuary and east of a line running approximately southwest from Kinncarra. The 'outer estuary' lies west of the middle estuary and includes the shores of Shona Beag. Details of the data recorded during the mapping survey are provided in Annex 4.

The substrates are predominantly muddy sand throughout the system. There is no clear gradient in sediment mud content along the estuary and areas of soft muddy sediment occur in the outer estuary as well as in the inner estuary. However, significant areas of relatively clean sand are largely restricted to sandbanks in the outer estuary. Sediments in the inner and middle estuary tend to be less well sorted than those in the outer estuary. This is particularly pronounced at the margins of the river channel where banks of poorly sorted gravel and pebbles are typical in the inner and middle estuary, whereas channel banks of the outer estuary tend to have a composition similar to their adjacent sediment flats. Similarly, the broad sediment flats of the inner and middle estuary tend to have a significant cover of gravel, pebbles and cobbles (sometimes supporting fucoid dominated biotopes). In the outer estuary the sediment flats tend to be more homogeneous with areas of coarser poorly sorted material being largely restricted to localised raised banks of sediment.

The upper margin of the sediment flats in the inner and large parts of the middle estuary are usually bordered by saltmarsh habitats. In most of the middle and outer estuary the sediments tend to be bordered by rocky substrates supporting typical sheltered shore furoid zones (i.e. **LR.LLR.F.Asc**, **LR.LLR.F.Fves**, **LR.LLR.F.Fspi**, **LR.LLR.F.Pel**, **LR.FLR.Lic.Ver** and **LR.FLR.Lic.YG**) which are dominated by *Ascophyllum nodosum* in most locations.

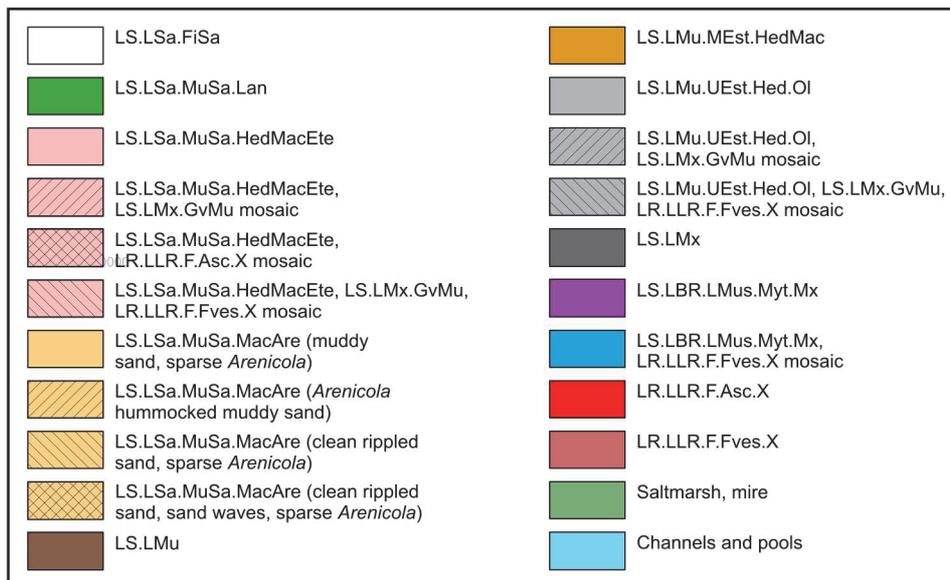
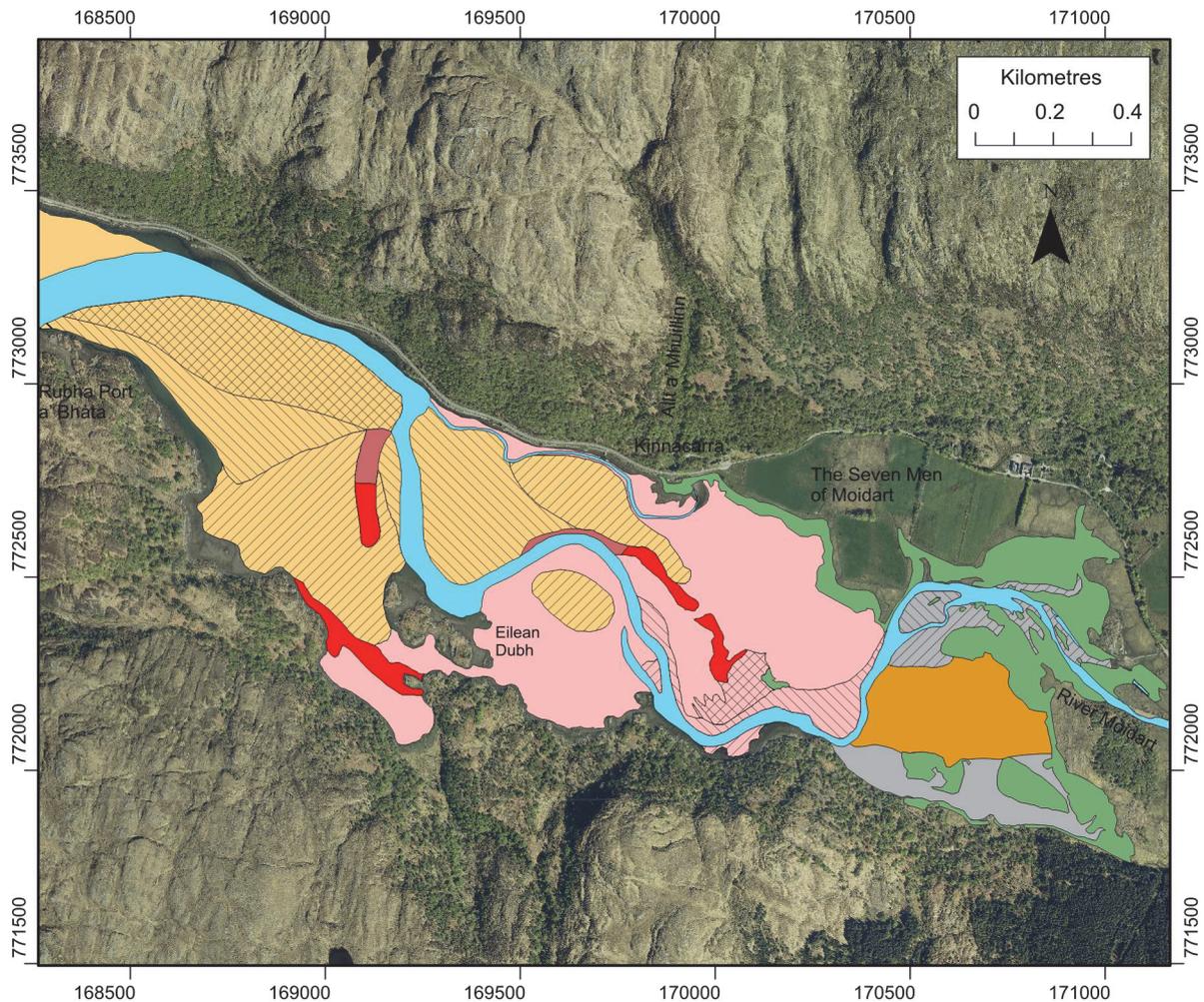
There are distinct distributional trends along the axis of the estuary in the case of most of the more abundant infaunal taxa. Oligochaetes are present throughout the system but tend to be most abundant (particularly in the case of *Baltidrilus costatus*) in the inner estuary. *Hediste diversicolor* and *Corophium volutator* are largely restricted to the inner and middle estuary where they are often abundant. *Scrobicularia plana* is also restricted to these regions but abundances are not high. *Arenicola marina* is a conspicuous component of the infauna and occurs throughout the system but abundances tend to be considerably higher in the middle estuary. *Macoma balthica* is also found throughout the system but more frequently recorded in the middle estuary. *Nephtys hombergii* was recorded from throughout the system but occurred in distinctly higher abundance in the outer estuary. Other taxa characteristic of the outer estuary include *Alitta* (= *Neanthes*) *virens* and mats of Cyanophyta, which were both restricted to the outer estuary sediments. *Scoloplos armiger* was also restricted to the outer estuary although records are rather infrequent.

A variety of biotopes occur throughout the system but a relatively small number of these account for the vast majority of the intertidal area. In the inner estuary there are significant areas of saltmarsh and of the sedimentary biotopes **LS.LMu.UEst.Hed.OI** and **LS.LMu.MEst.HedMac**. The vast majority of the middle estuary sediments were allocated to the **LS.LSa.MuSa.HedMacEte** biotope which grades into the broadly defined **LS.LSa.MuSa.MacAre**, typical of the majority of the outer estuary.

3.2.2 Region 1 - Inner estuary (Figure 3)

The head of the Loch Moidart estuary consists of a predominantly muddy intertidal area which is located roughly southeast of the Seven Men of Moidart. The main freshwater input arises from the River Moidart and several minor tributaries feeding into the northern part of the inner estuary. The River Moidart flows westward along the northern part of this region before meandering southward to meet the southern margin of the estuary and continuing westward. Additionally, small freshwater inputs such as the Allt na Glaice Moire and the Allt Teang' Emilstoin feed into the southern part of the region.

Saltmarsh habitats cover a significant part of the area and form the upper boundary of the marine intertidal sediment habitats in most cases. The northern part of the region contains the main river channel of the River Moidart and consists of a complex mosaic of saltmarsh, drainage channels and sediment patches. Although the sediment is predominantly muddy, it is poorly sorted and patchy. Sand, gravel, pebbles and cobbles may be present in varying proportions either on the surface or below a superficial mud layer. Overall, banks of cobbles and pebbles form a mosaic with areas of softer gravelly mud. Fucoids (mainly *Fucus spiralis*, but *Fucus vesiculosus* and *Fucus ceranoides* are also present) develop in patches where cobbles provide a sufficiently stable substrate. To the south of this northern saltmarsh mosaic is an expanse of mudflat occupying the central part of this inner estuary region. The substrate is moderately firm muddy sand with scattered surface gravel and pebbles. Cobbles are sparsely scattered over the surface of the mudflat and support small patches of *Fucus vesiculosus*. Nearer the southern margin of the region the sediment becomes softer and muddier in areas between and to the south of two large isolated patches of saltmarsh.



Aerial imagery © Getmapping plc.

Figure 3. Distribution of sediment flat biotopes and adjacent habitat types within the eastern half of the Loch Moidart and Shiel Woods SAC.

The sediment infauna of the entire region is characterised by *Hediste diversicolor*, *Corophium volutator* and oligochaetes, and the abundance of *Arenicola marina* is much lower than on the mudflats farther down the estuary. The mudflats in the centre of the region, where *Macoma balthica* was recorded, are allocated to the biotope **LS.LMu.MEst.HedMac**, and in the south of the region to **LS.LMu.UEst.Hed.OI**. **LS.LMu.UEst.Hed.OI** also occupies the north of the region but is regarded as forming a mosaic here with **LS.LMx.GvMu** and **LR.LLR.F.Fves.X**

3.2.3 Region 2 - Mid & outer estuary, northern shore (Figure 3)

West of the inner estuary region the main river channel flows along the southern margin of the estuary for some 400 m before meandering through extensive sediment flats until it meets the northern margin of the estuary some 700 m west of Kinnacarra. This forms the boundary delimiting an extensive area of sediment on the northern shore of the estuary. A major northward meander of the river channel effectively divides the region into an eastern sector (mid estuary) and a western sector (outer estuary). A line running southwest from Kinnacarra to the bend at the north of the meander is the approximate boundary of this division. The Allt a' Mhuillinn and some smaller water courses enter the area along the north shore and merge to form a channel that flows westward along the northern margin of the estuary until it meets the main river channel at the western limit of this region.

In the eastern sector the sediments are predominantly firm muddy sand with variable amounts of scattered pebbles and cobbles on the surface. Larger cobbles are typically colonised by fucoid algae (*Fucus vesiculosus* or *Ascophyllum nodosum*) and in some places these may reach abundances sufficient to warrant the designation of a **LR.LLR.F.Fves.X** or a **LR.LLR.F.Asc.X** biotope. Such habitats form a prominent ridge-like feature (~400 m long by ~30 m wide) that runs parallel with the river channel (southeast to northwest) and separates the extensive areas of inshore sediments from a narrower band of sediment near the river channel. This ridge is composed of numerous cobbles and boulders on muddy sand and these support sufficiently dense *Ascophyllum nodosum* to justify a **LR.LLR.F.Asc.X** biotope designation.

The sediments inshore (northeast) of the ridge are predominantly muddy sands with scattered clumps of fucoids on cobbles. There is some variation over the area with the sediments located closer (within ~150 m) to the saltmarsh shore having a higher cover of surface gravel and small pebbles and with fucoids dominated by *Fucus vesiculosus*. Farther out towards the ridge there are fewer surface pebbles, *Arenicola* is more abundant and fucoid clumps are dominated by *Ascophyllum nodosum*.

The sediments southwest of the ridge are rather more variable. There are extensive areas of homogeneous muddy sand which are prominently hummocked by *Arenicola marina* and lack surface pebbles and gravel. Nearer the river channel there is a relatively narrow (~20 to 40 m) fringing band of mixed sediment with varying proportions of pebbles and cobbles mixed with the muddy sand. Localised patches of **LR.LLR.F.Fves.X** have developed where the cobbles are sufficiently stable, and *Ascophyllum nodosum*, *Fucus serratus* and *Fucus ceranoides* are also present. This fringing band of mixed sediments can be followed upstream to the eastern boundary of the region where it meets the saltmarsh edge. The band becomes significantly broader (>100 m) where a meander of the river channel sweeps round the southeast boundary of the region. In this area the gravel and pebbles are commonly swept into linear ridges aligned with the river channel and it is likely that in flood conditions the river flows over the top of these sediments at all states of the tide. Again, the substrate is patchy with stable areas colonised by fucoids (mainly *Fucus vesiculosus* but *Fucus ceranoides* is also present) and poorly sorted muddy sand providing a matrix for the embedded pebbles and cobbles.

Other distinct habitat patches within this eastern sector of the region include a distinct island of saltmarsh to the northwest of the wide area of mixed river channel substrates and a region of muddy sand with a high cover of fucoid clumps that lies between the saltmarsh island and the southeast tip of the **LR.LLR.F.Asc.X** ridge.

Arenicola marina is a prominent feature over this whole eastern sector and *Hediste diversicolor*, *Macoma balthica* and *Corophium volutator* were regularly encountered in the dig-over samples. The sediments over most of the area approximate to the description of the **LS.LSa.MuSa.HedMacEte** biotope. However, there is undoubtedly some local variation, particularly in the mixed sediments along the river margin, where **LS.LSa.MuSa.HedMacEte** can be regarded as forming a mosaic with **LS.LMx.GvMu**, **LR.LLR.F.Fves.X** and **LR.LLR.F.Asc.X**.

In the western sector of the region (west of the line running southwest from Kinnacarra) there is a transition in sediment type. The sediments tend to become increasingly better sorted and less muddy and lack the surface pebbles and cobbles with fucoid clumps that characterise much of the eastern sector.

Initially the sediment appears indistinguishable from that encountered to the southeast of the ridge feature in the eastern sector. It consists of firm, slightly muddy sand with prominent *Arenicola* hummocks and small pools of water between the hummocks. Further west there is a transition to drier sandier sediment with pronounced surface ripples and fewer *Arenicola* hummocks. This extensive raised bank of rippled sand extends to the river channel on the western margin of the region.

These substrate differences are reflected in the composition of the biota and, in contrast to the eastern sector of the region, *Hediste diversicolor*, *Macoma balthica* and *Corophium volutator* are absent. The habitat is allocated to the broadly defined **LS.LSa.MuSa.MacAre** biotope.

Variations in this general picture can be found along the margins of the main water channels. In the south of the sector there is a narrow (~5 to 10 m wide) fringe of steep, soft, poorly sorted muddy sediment along the margin of the main channel. Cobbles in this zone are colonised by fucoids (mainly *Fucus vesiculosus*) and indicate a **LR.LLR.F.Fves.X** biotope. The water channel of the Allt a' Mhuillinn which runs along the northern margin of the sector has similarly muddy banks and these are tentatively allocated to the **LS.LSa.MuSa.HedMacEte** biotope.

The upper boundary of the sediment habitats is formed by saltmarsh in the eastern sector of the region. In areas directly adjacent to and to the west of Kinnacarra the upper shore is anthropogenically modified. For most of this area there is an embankment of boulders supporting the directly adjacent road. The boulders are colonised by a typical zonation sequence of sheltered rocky shore fucoids with the majority of the area dominated by *Ascophyllum nodosum* (**LR.LLR.F.Asc**). Scattered boulders and cobbles in the sediments at the foot of the embankment are similarly colonised, and patches of **LR.LLR.F.Asc.X** are formed where there is sufficient substrate.

3.2.4 Region 3 - Mid estuary, southern shore (Figure 3)

This region lies to the southwest of the boundary between the eastern and western sectors of Region 2. The river channel forms the eastern and northwestern boundary. Eilean Dubh and associated rock outcrops form the western boundary.

The sediment appears broadly similar across the entire extent of this region and consists of slightly muddy, fine sand with prominent *Arenicola* hummocks. The infauna is generally

characterised by *Hediste diversicolor*, *Macoma balthica* and *Corophium volutator* and the majority of the region has been allocated to the **LS.LSa.MuSa.HedMacEte** biotope. However, a large (~250 m by ~125 m) patch towards the north of the region consists of firmer, less muddy, fine sand and lacks both *Hediste diversicolor* and *Corophium volutator*. Accordingly, this area has been allocated to the **LS.LSa.MuSa.MacAre** biotope.

In one area near the river channel in the eastern part of the region there was noted to be a higher proportion of gravel than found over the region as a whole. This matches the pattern of sediment distribution on the corresponding northern shore where a fringe of mixed sediment was found directly adjacent to the river channel.

The upper shore margin of this region is generally rocky with the typical zonation sequence of sheltered rocky shore fucoids. The majority of the area is dominated by *Ascophyllum nodosum* with **LR.LLR.F.Asc** predominating in areas of solid bedrock and **LR.LLR.F.Asc.X** predominating in areas where cobbles and boulders fringe the margin of the land.

3.2.5 Region 4 - Outer estuary, southern shore (Figure 3)

This region covers the sediments of the southern shore from Eilean Dubh to Rubha Port a' Bhata where the main river channel meanders southwards again to run close against the southern margin of the estuary. The sediments across the region are rather variable, ranging from soft muddy sand in the sheltered embayment southwest of Eilean Dubh to firm, rippled sand in the west of the region. Correspondingly, there is a transition from the mid estuary **LS.LSa.MuSa.HedMacEte** biotope to the more marine **LS.LSa.MuSa.MacAre** biotope.

The embayment southwest of Eilean Dubh receives freshwater input from three small burns and has a dividing band of **LR.LLR.F.Asc.X** running southeast to northwest across the bay. Within this band there is a high density of sub-surface cobbles supporting numerous patches of *Ascophyllum nodosum*. Between the patches the sediment consists of soft muddy sand with *Arenicola* hummocks and appears indistinguishable from the sediments both north and south of the band. Both *Hediste diversicolor* and *Corophium volutator* are present in the sediments of this embayment and it is allocated to the **LS.LSa.MuSa.HedMacEte** biotope.

To the northwest of the embayment the sediment remains as muddy sand with prominent *Arenicola* hummocks but becomes increasingly firm and the lack of *Hediste diversicolor* and *Corophium volutator* indicates the transition to the **LS.LSa.MuSa.MacAre** biotope.

At a distance of ~400 m to the northwest of Eilean Dubh there is a change in the character of the sediment. The hummocked muddy sand seen immediately to the northwest of Eilean Dubh changes to much drier firmer rippled sand with relatively low abundances of *Arenicola* (a similar pattern to that seen in the western sector of Region 2). A further distinction can be made within this area, with sediments adjacent to the main river channel (forming a band ~150 m wide in the north of this region) having large sand waves (wavelengths up to 7 m and amplitude of up to 50 cm) in addition to the surface ripples. This would seem to indicate powerful tidal currents in the area. *Nephtys cirrosa* was recorded within a dig-over sample and it is possible that more intensive sampling might provide evidence for the presence of other biotopes such as an impoverished, variable salinity version of **LS.LSa.FiSa.Po.Ncir**.

An additional significant feature within the region is an elongate (~50 m x ~300 m) raised bank of coarse pebbly sediment and shell fragments. The southern tip of this bank is about 100 m north-northwest of Eilean Dubh and it extends northwards approximately parallel to the adjacent main river channel. Cobbles on this bank support sparse *Mytilus edulis* and patches of fucoid algae, with *Fucus vesiculosus* (**LR.LLR.F.Fves.X**) dominating towards the

north of the bank and *Ascophyllum nodosum* (**LR.LLR.F.Asc.X**) dominating towards the south.

It should be noted that there is scope for considerable local variation within this broad region, particularly in the softer sediments in the upper shore areas and along the banks of drainage channels. It is probable that a more intensive sampling program would detect additional localised estuarine biotopes within the region.

The upper shore margin of this region is generally rocky, with the typical zonation sequence of sheltered rocky shore fucoids. The majority of the area is dominated by *Ascophyllum nodosum*, with **LR.LLR.F.Asc** predominating in areas of solid bedrock and **LR.LLR.F.Asc.X** predominating in areas where cobbles and boulders fringe the margin of the land.

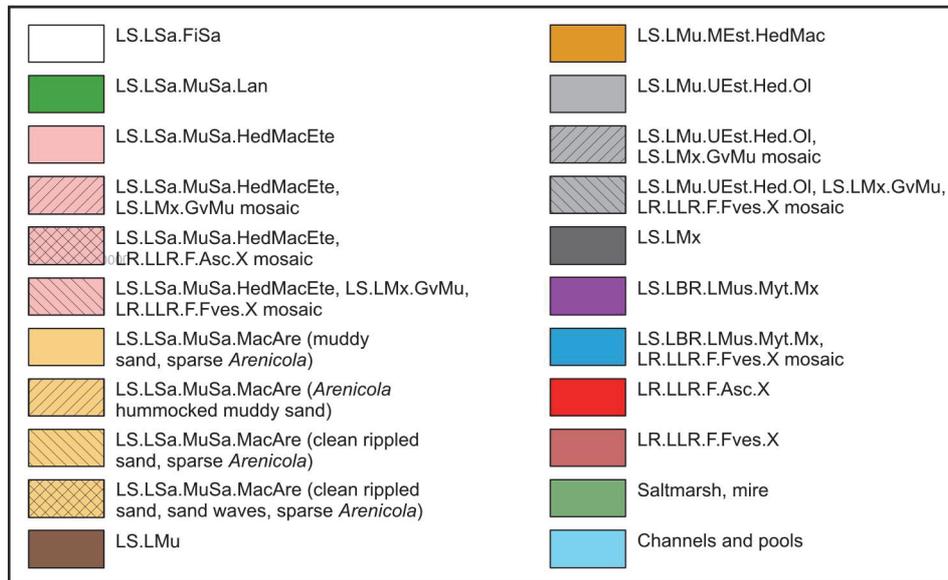
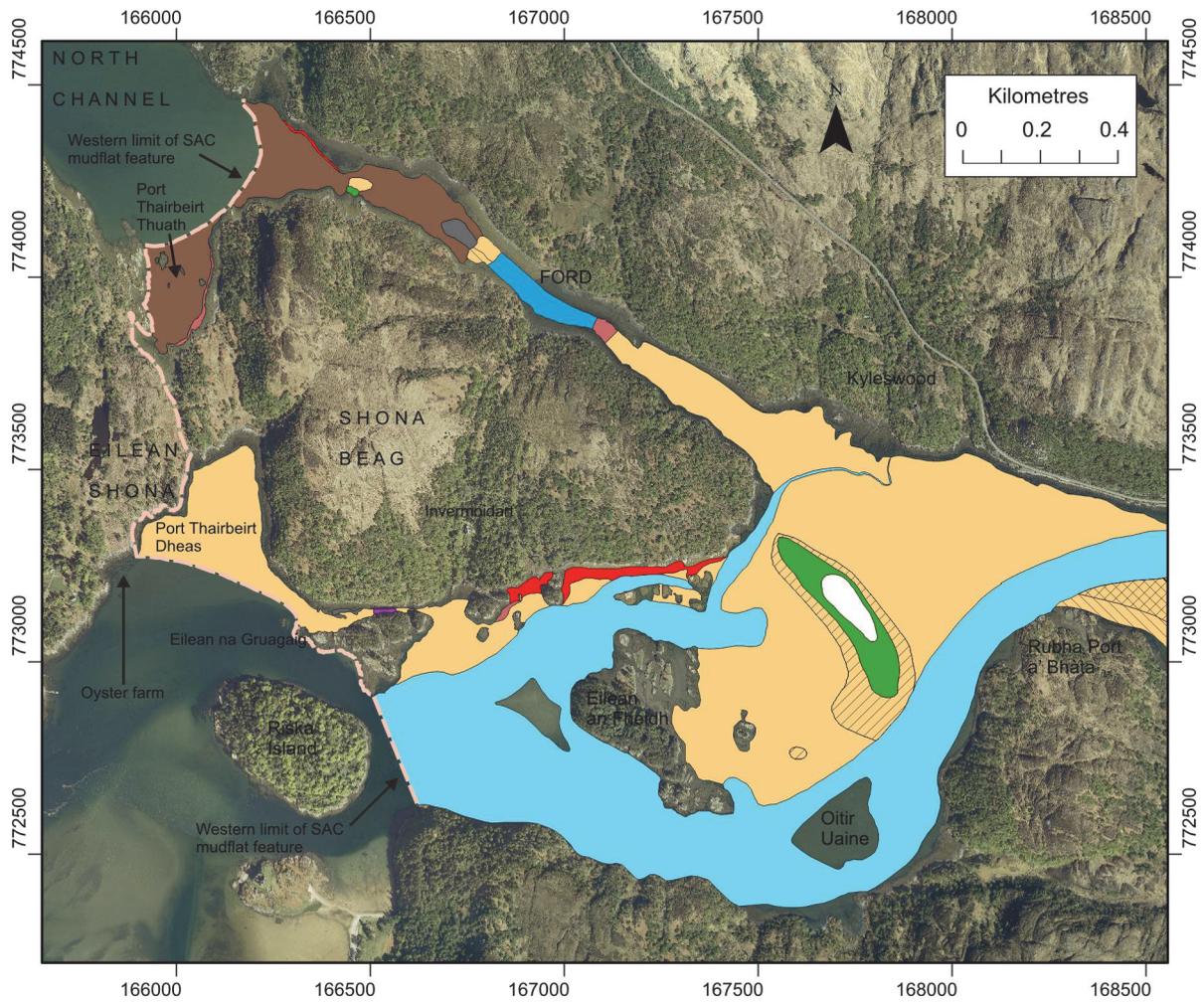
3.2.6 Region 5 - Outer estuary, northern shore east of Shona Beag (Figure 4)

This region covers an area of mudflat extending from the north shore in the vicinity of Kyleswood south to Eilean an Fheidh. It runs close to the rocky shores of the eastern tip of Shona Beag from which it is separated only by a narrow drainage channel.

The majority of this area consists of soft muddy sand with sparse *Arenicola* hummocks. In general appearance it closely resembles the sediments seen immediately to the northwest of Eilean Dubh in Region 4 although *Arenicola* hummocks are less abundant in Region 5. The infauna generally lacks *Hediste diversicolor* and *Corophium volutator*, and at the time of survey, mats of cyanobacterial filaments covered much of the sediment surface. The region as a whole is allocated to the **LS.LSa.MuSa.MacAre** biotope.

Some areas of very soft mud in localised shelter between rocky outcrops and near water channels may show some differences from this general picture, but the only significant area of difference lies in the centre of the region. This consists of an elongate (~500 m x ~100 m) slightly raised bank of sediment aligned southeast to northwest. It extends from near the water channel in the southeast to a point near the eastern tip of Shona Beag. The central apex of the bank has an area of poorly sorted gravelly sand with large numbers of shell fragments and a sparse infauna composed of species typical of the surrounding area (**LS.LSa.FiSa**). Slightly lower on the bank and surrounding this gravelly area is a fringe of firm, slightly rippled sand with dense *Lanice conchilega* and other biota characteristic of a **LS.LSa.MuSa.Lan** biotope. The *Lanice* zone is in its turn surrounded by a fringe of firm, hummocked, slightly rippled, fine sand which is visibly distinct from the muddy sand present over most of the region. However, the infauna is not sufficiently distinct to justify regarding it as a separate biotope and this zone is also allocated to the broadly defined **LS.LSa.MuSa.MacAre** biotope.

The upper shore margin of this region is generally rocky with the typical zonation sequence of sheltered rocky shore fucoids. The majority of the area is dominated by *Ascophyllum nodosum* with **LR.LLR.F.Asc** predominating in areas of solid bedrock and **LR.LLR.F.Asc.X** predominating in areas where cobbles and boulders fringe the margin of the land.



Aerial imagery © Getmapping plc.

Figure 4. Distribution of sediment flat biotopes and adjacent habitat types within the western half of the Loch Moidart and Shiel Woods SAC.

3.2.7 Region 6 - Outer estuary, northern shores of Shona Beag (Figure 4)

Shona Beag is separated from the mainland by a narrow intertidal channel which is crossed by a ford at its narrowest point to give vehicle access to Shona Beag.

In the vicinity of the ford the substrate is a mosaic of cobbles, boulders and sediment patches of variable composition. The conspicuous epibiota is dominated by *Fucus vesiculosus* and *Mytilus edulis* and the area can be regarded as a mosaic of **LR.LLR.F.Fves.X** and **LS.LBR.LMus.Myt.Mx** biotopes. This habitat continues some 200 m southeast along the channel where the cobbles and *Mytilus* clumps become sparse and pebbly gravel predominates. This is a transition zone between the tide-swept narrows and the lower energy muddy sand sediments of the wider channel farther to the southeast. This zone extends only about 50 m along the length of the channel and is best characterised as **LR.LLR.F.Fves.X** due to the mixed substrate and *Fucus vesiculosus* patches on cobbles.

Further to the southeast there is soft muddy sand indistinguishable in appearance and infauna from that which occupies most of Region 5. Accordingly it is also allocated to the **LS.LSa.MuSa.MacAre** biotope. It is virtually contiguous with the corresponding sediments of Region 5, being separated only by drainage channels formed by streams flowing off the north shore in the vicinity of Kyleswood.

Northwest of the ford the mosaic of **LR.LLR.F.Fves.X** and **LS.LBR.LMus.Myt.Mx** continues for about 100 m before reaching a transition to the muddier sediments beyond. In this area the transition is more complex with sand and muddy sand coverage over a stretch of about 60 m along the channel. In this area firm, rippled sand with *Arenicola* predominates near the Shona Beag shore. Near the mainland shore the sediment is muddier and consists of poorly sorted, muddy sand with sparse *Arenicola*. Despite the variation in sediment type the infauna of these areas is not markedly different and both are allocated to the **LS.LSa.MuSa.MacAre** biotope. Beyond this stretch there is a raised gravel bank (~100 m x ~50 m) in the centre of the channel (**LS.LMx**).

Farther northwest along the channel the sediment largely consists of extremely soft sandy mud, which continues almost uninterrupted until it meets the North Channel of Loch Moidart at the low water mark. The most prominent biota in the dig-over samples were *Nephtys hombergii* and *Alitta virens*. This environment is difficult to match convincingly to any within the biotope classification and it is provisionally categorised as within the **LS.LMu** habitat complex. It might be regarded as an extreme muddy variant of the **LS.LSa.MuSa.MacAre** biotope, but the sediment type is really outside the **LS.LSa.MuSa** biotope complex. However, all biotopes listed for the **LS.LMu** habitat complex are more estuarine than is the case for this distinctly marine environment.

The only interruption to this **LS.LMu** habitat is at a slight constriction in the channel where the accelerated tidal flow has caused a coarsening of the sediments. In this area the centre of the channel has considerably firmer, hummocked, and slightly rippled, muddy sand which approximates more closely to the **LS.LSa.MuSa.MacAre** biotope. Connecting this patch to the shore of Shona Beag is a small (~30 m x ~10 m) patch of rippled sand with dense *Lanice conchilega* (**LS.LSa.MuSa.Lan**).

The embayment of Port Thairbeirt Thuath is just to the south of where the channel separating Shona Beag from the mainland meets the North Channel of Loch Moidart. The sediments within this embayment consist entirely of very soft, sandy mud indistinguishable from that found at the northwest end of the channel separating Shona Beag from the mainland and is similarly designated as **LS.LMu**.

The upper shore margin all around the region is generally rocky with the typical zonation sequence of sheltered rocky shore fucoids. The majority of the area is dominated by *Ascophyllum nodosum*, with **LR.LLR.F.Asc** predominating in areas of solid bedrock and **LR.LLR.F.Asc.X** predominating in areas where cobbles and boulders fringe the margin of the land. Commonly, there is a fringe of pebbles, gravel or shell fragments forming a band separating the fucoid dominated rocky shore from the sediment plains that occupy most of the intertidal zone. This fringe may be narrow or absent but in some locations it may be several metres wide and cover a considerable area. Patchy fucoids justify the designation of an **LR.LLR.F.Fves.X** or a **LR.LLR.F.Asc.X** biotope in some cases, in other cases this zone might just be regarded as a gravelly version of the adjacent sediment biotope. In areas of the channel northeast of Shona Beag this mixed fringing margin was found to consist almost entirely of littorinid shells presumably derived from the populations on the adjacent rocks.

Ostrea edulis was found on the gravel fringes of Port Thairbeirt Thuath and in neighbouring areas near the North Channel. In this same area there were unusual isolated clumps of *Hymeniacion perleve* seen over a considerable distance out on the mudflat. There were also dense patches of *Asciidiella scabra* on the shoreline boulders and some of the sheltered embayments contain sizeable areas of *Ascophyllum nodosum* ecad *mackaii* (**LR.LLR.FVS.Ascmac**).

3.2.8 Region 7 - Outer estuary, southern shores of Shona Beag (Figure 4)

The shoreline on the south of Shona Beag has a series of more or less discrete muddy sand sediment areas of varying size separated by rock outcrops and small islands.

The sediments are broadly similar in appearance to those dominating Region 5 and have similar biota, although *Nephtys hombergii* and *Alitta virens* tend to be more abundant. Accordingly, most of these sediments are allocated to the biotope **LS.LSa.MuSa.MacAre**.

The embayment of Port Thairbeirt Dheas is a broad expanse of soft muddy sand which is appreciably firmer towards the head of the bay (north) than it is at the mouth of the bay (south). At the southeastern margin of the bay is a broad expanse of firmer, muddy sediment with large amounts of surface shell and pebble. Around much of the bay there is a fringing margin of dense *Mytilus edulis* (**LS.LBR.LMus.Myt.Mx**) on mixed, pebbly substrates lying between the *Ascophyllum* dominated rocky shore and the mudflat.

Eilean na Gruagaig forms the eastern boundary of the mudflats of Port Thairbeirt Dheas. Directly east of Eilean na Gruagaig is a smaller embayment directly south of Invermoidart. The sediments of this area were found to be generally very similar in appearance and infauna to that already described.

Several smaller sediment areas are present along the shore between the Invermoidart area and the southeast tip of Shona Beag directly adjacent to Region 5. None of these are distinctly different in appearance or biota from those described already and are similarly allocated to the **LS.LSa.MuSa.MacAre** biotope.

The upper shore margin of this region is generally rocky with the typical zonation sequence of sheltered rocky shore fucoids. The majority of the area is dominated by *Ascophyllum nodosum*, with **LR.LLR.F.Asc** predominating in areas of solid bedrock and **LR.LLR.F.Asc.X** predominating in areas where cobbles and boulders fringe the margin of the land. Commonly, there is a fringe of pebbles, gravel or shell fragments forming a band separating the fucoid dominated rocky shore from the sediment plains that occupy most of the intertidal zone. This fringe may be narrow or absent but in some locations it may be several metres wide and cover a considerable area. Patchy fucoids justify the designation of an

LR.LLR.F.Fves.X or a **LR.LLR.F.Asc.X** biotope in some cases; in other cases this zone might just be regarded as a gravelly version of the adjacent sediment biotope.

4. DISCUSSION

4.1 Site Check

Although less ambitious in scope than full site condition monitoring, the form of Site Check survey used here does allow most of the conservation targets addressed in the Site Attribute Table (Annex 3) to be addressed.

4.1.1 Extent

No activities or events have been identified which appear to be influencing the extent of the sediment flat feature. A Pacific oyster farm is located off Eilean Shona, close to the south-western limit of the embayment Port Thairbeirt Dheas (Figure 4). The trestles occupy an area beyond but immediately adjacent to the SAC boundary, although the biotope mapping survey recorded the presence of a small group of old trestles, occupying an area of approximately 25 m², that are located on the sediment flat within the SAC boundary. No reduction in the extent of mudflat habitat was recorded along the relocatable transects.

4.1.2 Biotope composition

No evidence of temporal change in the biotope composition of the sediment flats was recorded, with all biotopes recorded in 2003 being refound in 2014.

4.1.3 Distribution of biotopes

A minor change in the distribution of biotopes was recorded along one transect, with **LS.LSa.MuSa.MacAre** replacing **LS.LSa.MuSa.HedMacEte** at one station. However, the evidence for this is poor and there is no significant change in the character or condition of the habitat.

4.1.4 Species composition of representative biotopes

The level of sampling intensity employed in the Site Check survey was insufficient to assess change in biotope quality due to changes in species composition.

4.1.5 Presence or abundance of specified species

The prescribed targets for positive indicator species have been met, with *Arenicola marina* being recorded as common or abundant at 88% of stations (target, 50%), *Hediste diversicolor* present at 63% (target, 50%) and *Corophium volutator* present at 56% (target, 30%).

4.1.6 Sediment character

In the absence of particle size analysis of the sediments, no objective measure of change in sediment composition is possible. In general, there was a high degree of similarity in the sediments observed in both survey years, although at one station (MA2) the sediment was recorded as muddy sand in 2014, but mud in 2003 (confirmed by particle size analysis). At this station the muddy sediment forms a surficial layer over hard-packed sand, so the temporal change may merely reflect localised redistribution of sediment. This site was only one of two where the change in the depth of the anaerobic layer exceeded the prescribed target of 50% for sediments with a baseline black layer depth of >1 cm. The increase in the depth from 2 cm to 5 cm may be a reflection of the coarsening of the sediment. A reduction

in the black layer depth from 3 cm to 0.3 cm was recorded at station MB1. This site is located adjacent to the River Moidart channel (Figure 1) and so temporal variation in current velocity or channel position may lead to some variability in sediment mobility and consequential sediment chemistry.

4.1.7 Overall condition assessment

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

4.1.8 Recommendations

The major difference in the methodology of the 2014 Site Check survey and that of the 2003 baseline SCM survey lay in the absence of transect profiling and the collection of core samples for infaunal and granulometric analysis. This at least halved the required survey effort. It is considered that little was lost in terms of the power in detecting change in condition of the habitats. However, the use of only semi-quantitative infaunal sampling in 2014 will have caused some reduction in the potential to detect changes in species composition, especially those resulting in the loss of diversity, which often accompanies anthropogenic disturbance.

Infaunal sampling was a necessary component of the 2014 work as it contributed to biotope identification for the accompanying broadscale mapping work, as well as aiding the assessment of change in condition of the mudflats and sandflats feature. If future reduction in Site Check survey effort or use of non-specialist in-house staff with minimal marine biological training is envisaged, the loss of infaunal community data would lead to a significant reduction in the ability to detect change in the condition of the habitat. This could in part be addressed at a coarse-grained level by the recording of a readily-identifiable proxy for the infaunal community, such as the casts of *Arenicola marina*, which are present in high numbers over much of the Moidart sediment flats. However, *A. marina* is considered to have relatively low sensitivity to a number of chemical changes often associated with anthropogenic disturbance (e.g. oxygenation, nutrient and hydrocarbon levels - see Tyler-Walters, 2008) and so a more detailed examination of the infaunal community is preferable. A suitable and practical approach that could be adopted by non-specialist field staff could involve the collection of infaunal core samples for subsequent analysis and interpretive reporting by specialists.

The results of the biotope mapping survey revealed that the transects adopted for the 2014 Site Check survey provided good coverage of the dominant sediment flat biotopes present within the SAC, apart from the region of littoral mud (**LS.LMu**) located along the north-western shoreline of Shona Beag (Figure 4). Incorporation of this area into future Site Check monitoring should be considered, although the very soft nature of the sediment will restrict shore-based work to peripheral areas.

4.2 Biotope mapping

Thirteen biotopes were recorded during the biotope mapping survey but a small number of these account for the vast majority of the intertidal area of the Loch Moidart and Shiel Woods SAC, with **LS.LMu.UEst.Hed.OI** and **LS.LMu.MEst.HedMac** dominating the inner estuary, **LS.LSa.MuSa.HedMacEte** the middle estuary and **LS.LSa.MuSa.MacAre** the outer estuary. Although all of these are considered to represent mudflat biotopes (Maddock, 2011), the most widely distributed biotope, **LS.LSa.MuSa.MacAre**, was found to span a range of sediment types from muddy sand to clean, rippled sand.

The presence of two priority marine features (PMFs - see SNH, 2014b) was noted. Although not classified as a sedimentary biotope, small beds of the egg wrack (*Ascophyllum nodosum* ead *mackaii*), constituting the biotope **LR.LLR.FVS.Ascmac**), up to 25 m² in extent, were observed on mixed substrata above the sediment flats in embayments at the north-east of Shona Beag (target note site M4.60B - see Tables 4.1, 4.2, Annex 4). These beds were in the same general area as beds previously reported by Wilkinson and Scanlan (1987) and Howson (1990). Scattered individuals of the native oyster, *Ostrea edulis*, were also recorded at three locations in the same area.

5. REFERENCES

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ANNEX 1: SITE CHECK FIELD RECORDING FORM

LOCH MOIDART SITE CHECK 2014

DATE:

TEAM:

SEDIMENT STATION AND ZONE RECORDING FORM

STATION (e.g. MB1)			
TIME (BST hh:mm:ss)			
GPS (WGS84, dec. degrees) if different from target			
WPT NO.			
SUBSTRATE (M,SM,MS,fS,mS,cS,G etc)			
MOISTURE (standing, w'logged,damp,dry)			
SURFACE FEATURES (e.g. rippled)			
DEPTH OF BLACK LAYER (cm)			
HABITAT NOTES			
BIOTA ABUNDANCES (surface)			
BIOTA ABUNDANCES (digover)			
BIOTOPE:		HABITAT PHOTO IDs	
PHOTO IDs	QUADRATS		ID SPECIMENS COLLECTED (Y/N)
VIDEO ID			
ZONE EXTENT AND NATURE AS IN 2003 (Y/N)			
NOTE DIFFERENCE IF ANY			
ANTHROPOGENIC IMPACTS WITHIN ZONE			

ANNEX 2: SITE CHECK DATA

Table 2.1. Data recorded along the five relocatable transects in 2014. Some comparative data is also provided from the 2003 survey (Moore et al., 2004). This table provides locational and physicochemical observations. See Table 2.2 for additional data.

Station	Date	Time (UT)	Latitude	Longitude	Substrate 2014	Substrate 2003	Moisture 2014	Surface features 2014	Depth of black layer 2014	Depth of black layer 2003
MA1	08/08/2014	13:00:15	56.78387	-5.75584	Muddy sand, scattered gravel, clay at c. 10 cm	Small erratic ripples of muddy sand with clay layer at 10 cm depth and standing water	Waterlogged - pools of standing water	Flat	4	3
MA2	08/08/2014	13:22:22	56.78427	-5.75504	Muddy sand on hard-packed sand; sparse cobbles and boulders	Mud on hard-packed sand with standing water	Standing water	Flat	5	2
MB1	09/08/2014	10:32:25	56.78581	-5.76968	Poorly sorted slightly silty sand with surface gravel & pebbles (50-60%)	Damp slightly rippled muddy sand with 25% gravel cover	Waterlogged - pools of standing water	Slight hummocks & pits (probably crab digging pits)	0.3	3
MB2	09/08/2014	10:02:50	56.78600	-5.76866	Firm fine slightly silty sand	Slightly rippled muddy sand with standing water	Waterlogged - pools of standing water	Very pronounced hummocks	not recorded	0.5
MB3	09/08/2014	09:34:35	56.78622	-5.76761	Slightly silty soft fine muddy sand with some surface gravel & pebbles (1-5% at the station but higher cover in some other areas of the zone)	Small ripples of muddy sand with 5% cover of gravel, pebbles and occasional cobbles and standing water	Waterlogged - pools of standing water	Pronounced hummocks, no obvious ripples, patchy fucoid algae (5-10%)	0.2	0.2

Table 2.1 continued

Station	Date	Time (UT)	Latitude	Longitude	Substrate 2014	Substrate 2003	Moisture 2014	Surface features 2014	Depth of black layer 2014	Depth of black layer 2003
MB4	09/08/2014	08:59:30	56.78647	-5.76643	Slightly silty fine sand (surface gravel & pebbles <1%). Scattered boulders & cobbles (5-10%), often deeply embedded or slightly sub-surface but marked by attached fucoids	Slightly silty sand with complex small ripples, small lugworm hummocks and standing water	Waterlogged - pools of standing water	No obvious ripples but abundant <i>Arenicola</i> mounds	0.3	0.5
MB5	09/08/2014	08:28:50	56.78704	-5.76365	Slightly silty poorly sorted sand with gravel & pebbles (30-40%) and scattered cobbles & boulders (5-10%)	Slightly silty, waterlogged sand with 30% cover of gravel and pebbles and occasional cobbles and boulders	Waterlogged - pools of standing water	Very slight <i>Arenicola</i> hummocks & pits	0.5	0.5
MC1	08/08/2014	08:59:50	56.78697	-5.77189	Slightly muddy sand	Damp, slightly silty fine sand with lugworm hummocks	Waterlogged - pools of standing water	<i>Arenicola</i> dimpled	0.5	0.3
MC2	08/08/2014	09:35:13	56.78639	-5.77257	Fine sand	Rippled fine sand with <i>Carcinus</i> pits and standing water	Standing water	Slightly rippled; <i>Arenicola</i> dimpled	1	2
MC3	08/08/2014	10:01:14	56.78534	-5.77375	Very slightly muddy sand	Firm muddy sand with lugworm hummocks, <i>Carcinus</i> pits and standing water	Standing water	<i>Arenicola</i> dimpled	1.5-2	0.2

Table 2.1 continued

Station	Date	Time (UT)	Latitude	Longitude	Substrate 2014	Substrate 2003	Moisture 2014	Surface features 2014	Depth of black layer 2014	Depth of black layer 2003
MC4	08/08/2014	10:21:19	56.78449	-5.77476	Slightly muddy sand - muddier than previous sites	Soft lugworm-hummocked muddy sand with standing water	Waterlogged - pools of standing water	<i>Arenicola</i> dimpled	1	0.4
MD1	10/08/2014	10:31:08	56.79088	-5.78523	Fine clean hard packed sand	Waterlogged, rippled, clean fine sand formed into long sand waves, with pools in lows	Waterlogged - pools of standing water	Pronounced ripples and large sand waves perpendicular to main axis of estuary (wavelength 5-7 m, amplitude 10-30 cm)	2.5	2
MD2	10/08/2014	10:06:26	56.78971	-5.78655	Firm fine sand. Clean & well sorted	Clean rippled fine sand with standing water	Waterlogged - pools of standing water	Pronounced ripples	1.5	2
MD3	10/08/2014	09:14:10	56.78804	-5.78871	Soft slightly muddy fine sand	Firm, slightly silty, densely lugworm-hummocked fine sand with standing water	Waterlogged - pools of standing water	Pronounced <i>Arenicola</i> hummocks	0.3	0.1
ME1	11/08/2014	10:53:04	56.78994	-5.80955	Muddy sand	Soft muddy sand with lugworm hummocks and standing water	Waterlogged - pools of standing water	Slight hummocks & pits	0.1	0.2
ME2	11/08/2014	11:26:51	56.78916	-5.80339	Firm fine sand	Firm, slightly silty fine sand with lugworm hummocks and standing water	Waterlogged - pools of standing water	Both ripples & hummocks present	1	0.5

Table 2.2. Data recorded along the five relocatable transects in 2014. Some comparative data is also provided from the 2003 survey (Moore et al., 2004). This table provides biological and anthropogenic impact information, as well as overall and zone boundary comparisons with the 2003 survey. See Table 2.1 for additional data.

Station	Biota abundance (SACFOR) 2014	Biotope 2014	Biotope 2003	Upper boundary of zone 2014	Lower boundary of zone 2014	Overall comparison with 2003 records of zone	Anthropogenic impacts 2014
MA1	<i>Eteone longa</i> C, <i>Hediste diversicolor</i> A, <i>Arenicola marina</i> A, Tubificidae spp. P, <i>Tubificoides benedii</i> C, <i>Corophium volutator</i> A, <i>Carcinus maenas</i> C, <i>Macoma balthica</i> C, <i>Scrobicularia plana</i> F, <i>Fucus vesiculosus</i> O	LS.LMu.Mest. HedMac	LS.LMu.Mest. HedMac	Similar to 2003.	Similar to 2003.	Very similar to 2003 description.	None apparent
MA2	<i>Hediste diversicolor</i> A, <i>Arenicola marina</i> P, Tubificidae spp. P, <i>Tubificoides benedii</i> C, <i>Chaetogammarus marinus</i> F, <i>Corophium volutator</i> S, <i>Carcinus maenas</i> C, <i>Macoma balthica</i> A, <i>Scrobicularia plana</i> F, <i>Fucus vesiculosus</i> R, <i>Pelvetia canaliculata</i> R	LS.LMu.Mest. HedMac	LS.LMu.Mest. HedMac	Similar to 2003.	Similar to 2003.	Similar to 2003, except that mud content of sediment may have decreased. This may be responsible in part for a lowering of the black layer.	None apparent
MB1	<i>Hediste diversicolor</i> A, <i>Polydora ciliata</i> A, <i>Pygospio elegans?</i> F, <i>Arenicola marina</i> F, Tubificidae spp. F, <i>Baltidrilus costata</i> C, <i>Corophium volutator</i> O, <i>Fucus vesiculosus</i> O, <i>Fucus ceranoides</i> O, <i>Fucus serratus</i> R	LS.LSa.MuSa .HedMacEte	LS.LSa.MuSa .HedMacEte	Boundary appears to have shifted 2-3 m to the SW. Very minor difference - no new fix taken.	Exact correspondence with 2003 wpt at the edge of the river channel.	Very similar to 2003 description. No ripples noted in 2014 and rather more gravel (but all rather patchy in zone anyway).	None apparent

Table 2.2 continued

Station	Biota abundance (SACFOR) 2014	Biotope 2014	Biotope 2003	Upper boundary of zone 2014	Lower boundary of zone 2014	Overall comparison with 2003 records of zone	Anthropogenic impacts 2014
MB2	<i>Hediste diversicolor</i> F, <i>Nephtys hombergii</i> F, <i>Arenicola marina</i> A, <i>Corophium volutator</i> O, Diatom film P	LS.LSa.MuSa .HedMacEte	LS.LSa.MuSa .HedMacEte	Boundary shifted a few metres to the SW. New MB3/MB2 boundary at 56.78606N, 5.76805W.	Lower boundary appears to have shifted 2-3 m to the SW. Very minor difference - no new fix taken.	Similar to 2003 description but sediment was firm in 2014 - fine silty sand as opposed to the muddy sand described in 2003. Also, no clear ripples in 2014 - just very pronounced hummocks.	None apparent
MB3	<i>Eteone longa</i> C, <i>Hediste diversicolor</i> F, <i>Nephtys hombergii</i> F, Spionidae spp. C, <i>Arenicola marina</i> A, <i>Tubificoides benedii</i> C, <i>Corophium volutator</i> F, <i>Crangon crangon</i> F, <i>Ascophyllum nodosum</i> O, <i>Fucus vesiculosus</i> R	LS.LSa.MuSa .HedMacEte	LS.LSa.MuSa .HedMacEte	Exact correspondence with 2003. SW of this boundary the sediment is similar but has more pebbles and gravel in MB3.	Lower boundary shifted a few metres to the SW. New MB3/MB2 boundary at 56.78606N, 5.76805W.	Corresponds well to 2003 description.	None apparent
MB4	<i>Hediste diversicolor</i> C, <i>Nephtys hombergii</i> C, <i>Arenicola marina</i> A, Tubificidae spp. F, <i>Tubificoides benedii</i> C, <i>Neomysis integer</i> C, <i>Corophium volutator</i> C, <i>Macoma balthica</i> F, <i>Scrobicularia plana</i> F, <i>Ascophyllum nodosum</i> O, <i>Fucus vesiculosus</i> R	LS.LSa.MuSa .HedMacEte	LS.LSa.MuSa .HedMacEte	Corresponds to 2003. MB5/MB4 boundary is a small drainage channel with sediment to the SW of the channel with less gravel & pebbles than MB5.	Exact correspondence with 2003. SW of this boundary the sediment is similar but has more pebbles and gravel in MB3.	Corresponds well to 2003 description except for a lack of obvious ripples in 2014.	None apparent

Table 2.2 continued

Station	Biota abundance (SACFOR) 2014	Biotope 2014	Biotope 2003	Upper boundary of zone 2014	Lower boundary of zone 2014	Overall comparison with 2003 records of zone	Anthropogenic impacts 2014
MB5	<i>Hediste diversicolor</i> A, <i>Arenicola marina</i> C, Enchytraeidae spp. F, <i>Corophium volutator</i> A, <i>Carcinus maenas</i> C, <i>Macoma balthica</i> F, <i>Fucus vesiculosus</i> F, <i>Pelvetia canaliculata</i> R	LS.LSa.MuSa .HedMacEte	LS.LSa.MuSa .HedMacEte	Corresponds to 2003.	Corresponds to 2003. MB5/MB4 boundary is a small drainage channel with sediment to the SW of the channel with less gravel & pebbles than MB5.	Corresponds to 2003 description.	Possible cattle presence? Cow pats seen on adjacent saltmarsh.
MC1	<i>Hediste diversicolor</i> F, <i>Nephtys hombergii</i> F, <i>Arenicola marina</i> A, <i>Corophium volutator</i> O, Diatom film P	LS.LSa.MuSa .HedMacEte	LS.LSa.MuSa .HedMacEte	Similar to 2003.	Similar to 2003.	Corresponds to 2003 description.	None apparent
MC2	<i>Nephtys hombergii</i> F, Spionidae spp. F, <i>Arenicola marina</i> A, <i>Crangon crangon</i> F, <i>Cerastoderma edule</i> juv. C, <i>Scrobicularia plana</i> F, Diatom film F	LS.LSa.MuSa .MacAre	LS.LSa.MuSa .MacAre	Similar to 2003.	Similar to 2003.	Corresponds to 2003 description.	None apparent
MC3	<i>Hediste diversicolor</i> P?, <i>Nephtys hombergii</i> A, <i>Pygospio elegans</i> C, <i>Heteromastus filiformis</i> C, <i>Arenicola marina</i> A, <i>Tubificoides benedii</i> C, <i>Crangon crangon</i> C, <i>Macoma balthica</i> C	LS.LSa.MuSa .HedMacEte	LS.LSa.MuSa .HedMacEte	Similar to 2003.	Similar to 2003.	Corresponds to 2003 description.	None apparent
MC4	<i>Eteone longa</i> C, <i>Hediste diversicolor</i> C, <i>Nephtys hombergii</i> A, <i>Pygospio elegans</i> C, <i>Arenicola marina</i> A, <i>Tubificoides benedii</i> A, <i>Corophium volutator</i> F, <i>Crangon crangon</i> F, <i>Cerastoderma edule</i> juv. C, <i>Macoma balthica</i> F, <i>Scrobicularia plana</i> F, Diatom film P	LS.LSa.MuSa .HedMacEte	LS.LSa.MuSa .HedMacEte	Similar to 2003.	Similar to 2003.	Similar to 2003 description.	None apparent

Table 2.2 continued

Station	Biota abundance (SACFOR) 2014	Biotope 2014	Biotope 2003	Upper boundary of zone 2014	Lower boundary of zone 2014	Overall comparison with 2003 records of zone	Anthropogenic impacts 2014
MD1	<i>Nephtys hombergii</i> F, Spionidae spp. C, <i>Arenicola marina</i> C, <i>Cerastoderma edule</i> juv. C, Diatom film P	LS.LSa.MuSa .MacAre	LS.LSa.MuSa .MacAre	Corresponds to 2003. But transition to MD1 is gradual so boundary position is subjective.	Corresponds to 2003. At LW in 2014 the position of the 2003 boundary was in ~30 cm water depth close to the channel margin. Just inshore of this point there was a low section with shallow water and sediment as described for MD1.	Corresponds to 2003 description.	None apparent
MD2	<i>Nephtys hombergii</i> F, <i>Capitella capitata</i> C, <i>Arenicola marina</i> C, <i>Cerastoderma edule</i> juv. C	LS.LSa.MuSa .MacAre	LS.LSa.MuSa .MacAre	see MD3.	Corresponds to 2003. But transition to MD1 is gradual so boundary position is subjective.	Corresponds to 2003 description.	None apparent
MD3	<i>Nephtys hombergii</i> F, <i>Pygospio elegans</i> A, <i>Arenicola marina</i> A, Tubificidae spp. P, <i>Crangon crangon</i> F, <i>Carcinus maenas</i> C, Diatom film A	LS.LSa.MuSa .MacAre	LS.LSa.MuSa .HedMacEte	Corresponds to 2003 wpt.	Corresponds to 2003. But transition to MD2 is gradual so boundary position is subjective. About 5 m NE of this boundary the transect is crossed by a drainage channel.	Corresponds to 2003 description, although no <i>Hediste</i> or <i>Macoma</i> recorded in 2014.	None apparent

Table 2.2 continued

Station	Biota abundance (SACFOR) 2014	Biotope 2014	Biotope 2003	Upper boundary of zone 2014	Lower boundary of zone 2014	Overall comparison with 2003 records of zone	Anthropogenic impacts 2014
ME1	<i>Nephtys hombergii</i> C, <i>Pygospio elegans</i> F, <i>Arenicola marina</i> C, Sabellidae sp. F, Tubificidae spp. C, <i>Tubificoides benedii</i> A, Chironomidae spp. F, Trichoptera larva F, Cyanophyta mat C, Diatom film A	LS.LSa.MuSa .MacAre	LS.LSa.MuSa .MacAre	Corresponds to 2003. NB the first ~7 m of transect is softer than most of the zone due to drainage channel running along base of rock outcrop - but otherwise similar to ME1.	Corresponds to 2003. Good clear transition to firmer sediment. NB a slightly firmer area of the transect at 56.78987 N, - 5.80683 W but becomes soft again soon thereafter, only becomes firm near the 2003 boundary coordinates.	Close match to 2003 description.	None apparent
ME2	<i>Eteone longa</i> C, <i>Nephtys hombergii</i> A, <i>Scoloplos armiger</i> A, <i>Pygospio elegans</i> C, Spionidae spp. C, <i>Arenicola marina</i> A, <i>Lanice conchilega</i> P, <i>Crangon crangon</i> F, Cyanophyta mat F, Diatom film R	LS.LSa.MuSa .MacAre	LS.LSa.MuSa .MacAre	Corresponds to 2003. Good clear transition to firmer sediment. NB a slightly firmer area of the transect at 56.78987 N, 5.80683 W but becomes soft again soon thereafter, only becomes firm near the 2003 boundary coordinates.	Zone continues to waterline at 56.78910 N, 5.80269 W	Close match to 2003 description.	None apparent

ANNEX 3: SITE ATTRIBUTE TABLE FOR THE MUDFLATS AND SANDFLATS FEATURE OF THE LOCH MOIDART AND SHIEL WOODS SAC WITH THE RESULTS OF THE 2014 SITE CHECK SURVEY. ATTRIBUTES WITH ASTERISKS ARE NON-MANDATORY

Attribute	Target	Prescription	Result
Extent	No decrease in extent of littoral sediment.	<p>At 6 year intervals review activities and events with the potential to reduce extent of feature such as land reclamation, shoreline redevelopment and dredging operations.</p> <p>Evaluate fixed-position shore transect profiles at 6 year intervals for local changes in extent.</p> <p>At 18 year intervals confirm that there has been no change in overall littoral extent (e.g. by siltation or erosion) with aerial photography.</p>	<p>No activities or events have been identified which appear to be influencing the extent of the sediment flat feature.</p> <p>No significant temporal change in extent of mudflat along each transect.</p>
Biotope composition of littoral sediment	Maintain the variety of biotopes identified for the site, allowing for natural succession/ known cyclical change.	<p>Visual survey, dig-over of 1 m² area and core sampling at fixed stations along relocatable transect lines carried out every 6 years. The following biotopes (or equivalents) will be found within the cSAC:</p> <p>LS.LMu.MEst.HedMac</p> <p>LS.LSa.MuSa.HedMac.Ete</p> <p>LS.LSa.MuSa.MacAre</p>	No evidence of temporal change in the biotope composition of the sediment flats was recorded, with all biotopes recorded in 2003 being refound in 2014.
Sediment character: sediment type	No change in composition of sediment type across the feature, allowing for natural succession/known cyclical change.	<p>Core samples to a sediment depth of c. 20 cm at each of 15 stations will be taken every 6 years. Percentage of silt/clay and sand as defined in Hiscock (1996) should not deviate by +/- 10% at each station</p> <p>Hiscock, K. 1996. <i>Marine Nature Conservation Review: Rationale and Methods</i>. Peterborough: JNCC.</p>	No sediment analyses carried out in 2014. Visual evidence suggested temporal change limited to a single station, where localised, naturally-induced redistribution of sediment was probably the cause.

Attribute	Target	Prescription	Result
Distribution of biotopes	Maintain the distribution of biotopes, allowing for natural succession/ known cyclical change.	Visual survey, dig-over of 1 m ² area and core sampling at fixed stations along relocatable transect lines carried out every 6 years. The following biotopes will be found at the indicated relocated transects: Transect MA - LS.LMu.MEst.HedMac Transect MB - LS.LSa.MuSa.HedMacEte Transect MC - LS.LSa.MuSa.HedMacEte, LS.LSa.MuSa.MacAre Transect MD - LS.LSa.MuSa.HedMacEte, LS.LSa.MuSa.MacAre Transect ME - LS.LSa.MuSa.MacAre	A minor change in the distribution of biotopes was recorded along transect MD, with LS.LSa.MuSa.MacAre replacing LS.LSa.MuSa.HedMacEte at one station. However, the evidence for this was poor and there was no significant change in the character or condition of the habitat.
* Species composition of representative or notable biotopes	No decline in biotope quality due to changes in species composition or loss of notable species, allowing for natural succession/known cyclical change.	Visual survey, dig-over of 1 m ² area and core sampling at fixed stations along relocatable transect lines carried out every 6 years. Use of multivariate statistical techniques and diversity measures to assess degree of change.	The level of sampling intensity employed in the Site Check survey was insufficient to assess change in biotope quality due to changes in species composition
* Presence or abundance of specified species	Maintain presence or abundance of named positive indicator species.	Visual survey, dig-over of 1 m ² area and core sampling at fixed stations along relocatable transect lines carried out every 6 years. <i>Arenicola marina</i> will be common to abundant (SACFOR scale) at 50% or more of the sample stations. <i>Hediste diversicolor</i> will be present at 50% or more of the sample stations. <i>Corophium volutator</i> will be present at 30% or more of the sample stations	All targets for presence or abundance of target species were met.
* Sediment character: Oxidation-reduction profile (redox layer)	Average depth to the top of the black layer should not decrease in relation to baseline.	A visual estimation of the depth of anaerobic layer will be taken at 15 stations distributed along 5 relocatable transect every 6 years. The depth of the black layer will not deviate by +/- 50% from the baseline for sediments with a baseline black layer depth of >1 cm.	The target was not met at 2 stations but change is consistent with natural variation.

ANNEX 4: BIOTOPE MAPPING DATA - TARGET NOTES

Table 4.1. Temporal, locational and habitat data (in part) collected at target note sites. See Table 4.2 for additional data.

Site	Date	Latitude	Longitude	Easting	Northing	Wpt	Time (UT)	Substrate	Surface features	Moisture
M1.80	13/08/2014	56.79067	-5.82622	166422	773104	162	12:18:33	Soft muddy sand	Low relief hummocks & pits	Waterlogged, pools of standing water
M1.81	13/08/2014	56.79092	-5.82629	166419	773132	163	12:30:28	Pebbles & gravel (90%) on poorly sorted fine sand	<i>Arenicola</i> mounds in places	Waterlogged, pools of standing water
M1.82	13/08/2014	56.79250	-5.82966	166223	773319	164	12:46:20	Gravel & pebbles (80-90% on poorly sorted muddy sand with occasional boulders (1-5%))	Occasional crab digging pits	Waterlogged, pools of standing water
M1.82A	13/08/2014	56.792548	-5.829498	166234	773324	165				
M1.82B	13/08/2014	56.792550	-5.829748	166218	773325	166				
M1.83	13/08/2014	56.79266	-5.83055	166170	773340	167	12:55:06	Soft muddy sand	Slight pits. No pronounced hummocks	Waterlogged, pools of standing water
M1.84	13/08/2014	56.79401	-5.83072	166168	773491	168	13:07:30	Firm slightly silty fine sand	Slight, low relief hummocks & pits	Waterlogged, pools of standing water
M1.84A	13/08/2014	56.794170	-5.832073	166087	773513	169				
M1.84B	13/08/2014	56.794207	-5.832142	166083	773518	170				
M1.84C	13/08/2014	56.793213	-5.831098	166140	773403	171				
M1.84D	13/08/2014	56.792915	-5.832952	166025	773377	172				
M1.85	13/08/2014	56.79264	-5.83382	165970	773349	173	13:28:58	Soft poorly sorted muddy sand with pebbles & shell fragments (10-20%)	Low relief pits	Waterlogged, pools of standing water
M1.85A	13/08/2014	56.792787	-5.834207	165948	773367	174				
M1.85B	13/08/2014	56.792412	-5.833425	165993	773322	175				
M1.86	13/08/2014	56.79182	-5.83090	166143	773248	176	13:39:45	Soft muddy sand	Very slight low relief pits	Waterlogged, pools of standing water

Table 4.1 continued

Site	Date	Latitude	Longitude	Easting	Northing	Wpt	Time (UT)	Substrate	Surface features	Moisture
M1.86A	13/08/2014	56.791898	-5.829432	166234	773252	177				
M1.86B	13/08/2014	56.791003	-5.824847	166508	773136	178				
M2.87	13/08/2014	56.79104	-5.82217	166671	773131	179	14:00:21	Firm slightly muddy sand	Very slight low relief pits & mounds	Waterlogged, pools of standing water
M2.88	13/08/2014	56.79039	-5.82171	166696	773057	180	14:09:55	Slightly muddy sand	Low relief pits & mounds	Waterlogged, pools of standing water
M2.88A	13/08/2014	56.790447	-5.822513	166647	773067	181				
M2.88B	13/08/2014	56.790062	-5.823300	166596	773026	182				
M2.88C	13/08/2014	56.789333	-5.823513	166579	772946	183				
M2.88D	13/08/2014	56.789608	-5.822313	166654	772973	184				
M2.89	13/08/2014	56.78965	-5.82205	166670	772976	185	14:26:50	Firm fine sand with shells (10-20%) on surface	Slight mounds & pits	Moist but no surface water
M2.89A	13/08/2014	56.789642	-5.821998	166673	772975	186				
M2.89B	13/08/2014	56.789728	-5.822012	166673	772985	187				
M2.89C	13/08/2014	56.789588	-5.821498	166703	772968	188				
M2.89D	13/08/2014	56.790443	-5.820353	166779	773059	189				
M2.90	13/08/2014	56.79061	-5.81954	166829	773075	190	14:43:07	Slightly muddy sand	Low relief hummocks & pits	Waterlogged, pools of standing water
M2.90A	13/08/2014	56.790918	-5.819358	166842	773108	191				
M2.90B	13/08/2014	56.791357	-5.818648	166888	773155	193				
M2.91	13/08/2014	56.79132	-5.81848	166898	773150	194	14:52:07	Soft muddy sand	Very low relief hummocks and pits	Waterlogged, pools of standing water
M2.91A	13/08/2014	56.791572	-5.817775	166943	773176	195				
M2.91B	13/08/2014	56.791905	-5.816342	167033	773208	196				
M2.92	13/08/2014	56.79182	-5.81622	167039	773198	197	15:04:11	Muddy sand	Slight low relief pits & hummocks	Waterlogged, pools of standing water
M2.92A	13/08/2014	56.791993	-5.814912	167120	773213	198				
M3.93	13/08/2014	56.79221	-5.81197	167301	773227	199	15:17:57	Soft slightly silty fine sand	Pronounced hummocks & pits	Moist but no surface water

Table 4.1 continued

Site	Date	Latitude	Longitude	Easting	Northing	Wpt	Time (UT)	Substrate	Surface features	Moisture
M3.94	13/08/2014	56.79223	-5.81113	167353	773226	200	15:26:08	Soft slightly muddy fine sand	Pronounced hummocks	Moist, some standing water
M4.60	12/08/2014	56.79729	-5.83329	166032	773864	128	11:26:10	Very soft sandy mud	Low relief hummocks & pits	Waterlogged, pools of standing water
M4.60A	12/08/2014	56.799307	-5.822298	166715	774051	126				
M4.60B	12/08/2014	56.800407	-5.826717	166452	774189	127				
M4.61	12/08/2014	56.79736	-5.83296	166052	773871	129	11:53:35	Poorly sorted firm muddy sand with surface pebbles (~90%) and occasional boulders	No notable features	Waterlogged, pools of standing water
M4.61A	12/08/2014	56.797547	-5.832952	166054	773892	130				
M4.61B	12/08/2014	56.798098	-5.832757	166069	773952	131				
M4.62	12/08/2014	56.79895	-5.83254	166088	774046	132	12:10:53	Very soft sandy mud	Low relief hummocks & pits	Waterlogged, pools of standing water
M4.62A	12/08/2014	56.799347	-5.832665	166083	774091	133				
M4.62B	12/08/2014	56.800425	-5.831090	166186	774206	134				
M5.63	12/08/2014	56.80046	-5.83100	166191	774209	135	12:36:15	Very soft sandy mud	Slight surface ripples. Low relief hummocks & pits	Waterlogged, pools of standing water
M5.64	12/08/2014	56.80081	-5.82681	166449	774234	136	12:56:53	Firm fine sand	Ripples perpendicular to main axis of channel	Waterlogged, pools of standing water
M5.64A	12/08/2014	56.800692	-5.826462	166470	774219	137				
M5.64B	12/08/2014	56.800783	-5.826757	166452	774231	138				
M5.64C	12/08/2014	56.800785	-5.826972	166439	774232	139				
M5.65	12/08/2014	56.80095	-5.82649	166469	774248	140	13:07:55	Soft, slightly muddy fine sand	Ripples and low relief hummocks	Waterlogged, pools of standing water
M5.66	12/08/2014	56.80178	-5.82854	166350	774348	141	13:18:11	Poorly sorted muddy sand with surface pebbles (~90%)	No notable features	Waterlogged, pools of standing water

Table 4.1 continued

Site	Date	Latitude	Longitude	Easting	Northing	Wpt	Time (UT)	Substrate	Surface features	Moisture
M5.67	12/08/2014	56.80197	-5.82943	166296	774372	142	13:24:32	Soft sandy mud	Low relief hummocks & pits	Waterlogged, pools of standing water
M5.68	12/08/2014	56.80026	-5.82442	166592	774164	143	13:36:50	Soft sandy mud	Low relief hummocks & pits	Waterlogged, pools of standing water
M5.69	12/08/2014	56.80000	-5.82261	166700	774129	144	13:49:27	Firm poorly sorted sand with gravel & pebbles (60-70%)	Low relief, occasional crab digging pit	Wet, but no pools of standing water
M5.69A	12/08/2014	56.799833	-5.822717	166693	774111	145				
M5.69B	12/08/2014	56.800088	-5.822920	166682	774140	146				
M5.69C	12/08/2014	56.800197	-5.822188	166727	774150	147				
M5.69D	12/08/2014	56.799578	-5.821520	166764	774079	148				
M5.70	12/08/2014	56.79941	-5.82133	166775	774059	149	14:04:55	Firm fine sand	Variable, ripples in localised patches and <i>Arenicola</i> hummocks in adjacent patches	Wet, but no pools of standing water
M5.71	12/08/2014	56.79965	-5.82111	166790	774085	150	14:12:11	Soft, slightly silty fine sand. Gravel & pebbles 1-5%	Crab digging pits & low hummocks	Waterlogged, pools of standing water
M5.71A	12/08/2014	56.799388	-5.820447	166829	774054	151				
M6.72	12/08/2014	56.79910	-5.81980	166866	774020	152	14:22:13	Pebbles (~90%) & boulders (~10%)	Irregular surface	Waterlogged, pools of standing water
M6.72A	12/08/2014	56.798772	-5.819177	166902	773981	153				
M6.73	12/08/2014	56.79831	-5.81744	167005	773924	154	14:40:37	Pebbles (~90%) on muddy sand & boulders (~10%)	Irregular surface	Waterlogged, pools of standing water
M6.73A	12/08/2014	56.797993	-5.816193	167079	773884	155				
M7.114	15/08/2014	56.79464	-5.79617	168281	773443	230	15:22:06	Very soft very muddy fine sand	Pits and boulders, very sparse <i>Arenicola</i> casts	Wet
M7.115	15/08/2014	56.79451	-5.79462	168374	773424	231	15:38:00	Very soft very muddy fine sand	Pits bank of boulders on north bank	Wet

Table 4.1 continued

Site	Date	Latitude	Longitude	Easting	Northing	Wpt	Time (UT)	Substrate	Surface features	Moisture
M7.52	11/08/2014	56.79215	-5.80848	167514	773208	105	12:36:14	Muddy sand	Slight hummocks	Waterlogged, pools of standing water
M7.52A	11/08/2014	56.792653	-5.808138	167538	773263	106				
M7.52B	11/08/2014	56.792888	-5.807900	167554	773288	107				
M7.52C	11/08/2014	56.793195	-5.807932	167554	773323	108				
M7.52D	11/08/2014	56.793357	-5.808332	167530	773342	109				
M7.53	11/08/2014	56.79440	-5.80662	167641	773452	110	12:55:45	Muddy sand (slightly firmer than M7.52)	Slight hummocks & pits	Waterlogged, pools of standing water
M7.53A	11/08/2014	56.794693	-5.806695	167639	773485	111				
M7.53B	11/08/2014	56.794072	-5.803577	167825	773405	112				
M7.54	11/08/2014	56.79385	-5.80239	167896	773377	113	13:12:56	Soft muddy sand	Slight hummocks	Waterlogged, pools of standing water
M7.54A	11/08/2014	56.794985	-5.800177	168038	773495	114				
M7.55	11/08/2014	56.79325	-5.79784	168170	773294	115	13:29:50	Soft muddy sand	Slight hummocks	Waterlogged, pools of standing water
M7.55A	11/08/2014	56.793647	-5.797187	168212	773336	116				
M7.55B	11/08/2014	56.791023	-5.801247	167948	773058	117				
M7.55C	11/08/2014	56.791647	-5.801842	167916	773130	118				
M7.55D	11/08/2014	56.791118	-5.802587	167867	773073	119				
M7.55E	11/08/2014	56.788670	-5.803802	167778	772805	120				
M7.56	11/08/2014	56.78806	-5.80542	167675	772743	121	13:52:08	Slightly muddy sand	Slight hummocks	Waterlogged, pools of standing water
M7.57	11/08/2014	56.78818	-5.80680	167592	772761	122	13:59:55	Firm, slightly silty fine sand	Hummocks	Waterlogged, pools of standing water
M7.59	11/08/2014	56.78844	-5.81126	167321	772805	123	14:16:40	Muddy sand	Sparse hummocks	Waterlogged, pools of standing water
M7.74	12/08/2014	56.79792	-5.81597	167093	773875	156	14:50:55	Gravel & pebbles (90%) or muddy sand with scattered boulders (5-10%)	Irregular surface	Waterlogged, pools of standing water
M7.74A	12/08/2014	56.797712	-5.815458	167123	773850	157				

Table 4.1 continued

Site	Date	Latitude	Longitude	Easting	Northing	Wpt	Time (UT)	Substrate	Surface features	Moisture
M7.75	12/08/2014	56.79728	-5.81446	167181	773799	158	14:59:44	Soft muddy sand	Slight low relief hummocks	Waterlogged, pools of standing water
M7.75A	12/08/2014	56.796748	-5.812292	167310	773732	159				
M7.76	12/08/2014	56.79605	-5.81003	167444	773647	160	15:13:52	Soft muddy sand	Slight low relief hummocks & digging pits	Waterlogged, pools of standing water
M7.76A	12/08/2014	56.796497	-5.810067	167444	773697	161				
M8.50	11/08/2014	56.79005	-5.80303	167834	772956	95	12:02:00	Firm medium sand	Ripples and <i>Arenicola</i> mounds	Waterlogged, pools of standing water
M8.50A	11/08/2014	56.789618	-5.803020	167832	772908	94				
M8.50B	11/08/2014	56.791017	-5.803023	167840	773064	96				
M8.50C	11/08/2014	56.791305	-5.803412	167818	773097	97				
M8.50D	11/08/2014	56.790890	-5.803665	167800	773052	98				
M8.51	11/08/2014	56.79162	-5.80471	167741	773136	99	12:18:15	Gravelly medium to coarse sand. Shell fragments 20-30% of surface.	Very slight ripples, no mounds	Waterlogged, pools of standing water
M8.51A	11/08/2014	56.791818	-5.805863	167672	773162	100				
M8.51B	11/08/2014	56.792368	-5.805312	167709	773222	101				
M8.51C	11/08/2014	56.792267	-5.806040	167664	773213	102				
M8.51D	11/08/2014	56.792165	-5.806917	167609	773204	103				
M8.51E	11/08/2014	56.792143	-5.807445	167577	773204	104				
M11.30	10/08/2014	56.79168	-5.78903	168698	773090	52	10:55:07	Fine clean hard packed sand	Pronounced ripples and large transverse sand waves (wavelength 5 - 7 m amplitude 10 - 30 cm)	Waterlogged, pools of standing water
M11.30A	10/08/2014	56.792208	-5.790412	168617	773153	53				
M11.30B	10/08/2014	56.791715	-5.791163	168568	773101	54				
M11.30C	10/08/2014	56.791645	-5.791832	168527	773095	55				

Table 4.1 continued

Site	Date	Latitude	Longitude	Easting	Northing	Wpt	Time (UT)	Substrate	Surface features	Moisture
M11.31	10/08/2014	56.79180	-5.79322	168443	773117	56	11:08:29	Firm fine sand, clean & well sorted	Pronounced ripples	Waterlogged, pools of standing water
M11.31A	10/08/2014	56.791467	-5.793467	168426	773081	57				
M11.31B	10/08/2014	56.792047	-5.793658	168418	773146	58				
M11.32	10/08/2014	56.79033	-5.78865	168713	772938	59	11:29:03	Firm fine sand	Pronounced ripples	Waterlogged, pools of standing water
M11.32A	10/08/2014	56.788602	-5.787527	168771	772742	68				
M11.33	10/08/2014	56.79097	-5.78241	169098	772989	69	12:09:10	Fine to medium sand	Irregular ripples and pronounced sand waves	pools & drainage channels in troughs of sand waves
M11.33A	10/08/2014	56.790057	-5.782142	169109	772886	70				
M13.44	10/08/2014	56.78676	-5.78696	168794	772536	86	14:24:49	Slightly muddy sand	Pronounced hummocks	Waterlogged, pools of standing water
M14.38	10/08/2014	56.78646	-5.78214	169087	772486	76	13:10:34	Soft muddy sand	Pronounced hummocks	Waterlogged, pools of standing water
M14.38A	10/08/2014	56.785863	-5.782973	169032	772422	77				
M14.41	10/08/2014	56.78694	-5.78406	168972	772546	80	13:51:20	Fine sand, slightly silty	Very pronounced hummocks	Waterlogged, pools of standing water
M14.42	10/08/2014	56.78885	-5.78372	169005	772757	82	14:04:04	Firm fine sand	Hummocks	Waterlogged, pools of standing water
M14.42A	10/08/2014	56.789487	-5.784523	168960	772831	83				
M14.42B	10/08/2014	56.788432	-5.785388	168900	772716	84				
M14.43	10/08/2014	56.78748	-5.78617	168847	772613	85	14:17:28	Slightly silty fine sand	Pronounced hummocks	Waterlogged, pools of standing water
M15.34	10/08/2014	56.78953	-5.78201	169113	772827	71	12:23:01	Fine to medium sand with pebbles & shells (40%). Occasional cobbles & small boulders	No ripples	Waterlogged, pools of standing water

Table 4.1 continued

Site	Date	Latitude	Longitude	Easting	Northing	Wpt	Time (UT)	Substrate	Surface features	Moisture
M15.37	10/08/2014	56.78768	-5.78159	169128	772620	75	12:59:22	Fine sand with pebbles & shells (20%). Scattered cobbles & small boulders.	<i>Arenicola</i> hummocks (more to the S)	Waterlogged, pools of standing water
M16.35	10/08/2014	56.78923	-5.78097	169175	772790	72	12:33:40	Firm fine sand	Irregular ripples	Waterlogged, pools of standing water
M16.36	10/08/2014	56.78773	-5.78063	169187	772622	73	12:47:25	Firm fine sand	Irregular ripples	Waterlogged, pools of standing water
M16.36A	10/08/2014	56.787703	-5.780763	169178	772620	74		Soft muddy sand	Pronounced hummocks	Waterlogged, pools of standing water
M17.39	10/08/2014	56.78525	-5.78299	169027	772354	78	13:23:00	Soft muddy sand with occasional cobbles & small boulders	Hummocks & pits	Waterlogged, pools of standing water
M18.108	14/08/2014	56.78457	-5.77813	169320	772262	220	15:10:27	Soft muddy fine sand	<i>Arenicola</i> casts, cobbles with Asc X	Slightly waterlogged
M18.40	10/08/2014	56.78485	-5.78216	169075	772307	79	13:36:48	Soft muddy sand with patches of cobbles & small boulders	Hummocks	Waterlogged, pools of standing water
M19.13	09/08/2014	56.79005	-5.77628	169466	772866	29	12:04:35	Fine muddy sand	<i>Arenicola</i> hummocks & crab digging pits	Waterlogged, pools of standing water
M20.11	09/08/2014	56.78777	-5.77676	169423	772614	27	11:45:25	Firm hard packed fine sand	Pronounced ripples	no surface water
M20.12	09/08/2014	56.78952	-5.77843	169332	772814	28	11:57:01	Firm hard packed fine sand	Pronounced ripples	Waterlogged, pools of standing water
M20.14	09/08/2014	56.78891	-5.77410	169592	772731	31	12:17:44	Fine hard packed sand	Pronounced hummocks	Waterlogged, pools of standing water
M20.14A	09/08/2014	56.788013	-5.770310	169818	772619	32				
M22.1	08/08/2014	56.78516	-5.77592	169458	772320	16	11:08:50	Soft muddy sand	<i>Arenicola</i> hummocks	Waterlogged, pools of standing water
M22.107	14/08/2014	56.78528	-5.77035	169799	772315	218	14:52:04	Firm muddy fine sand	<i>Arenicola</i> cast hummocks and pits	Water logged
M22.107A	14/08/2014	56.784535	-5.776278	169433	772252	219				

Table 4.1 continued

Site	Date	Latitude	Longitude	Easting	Northing	Wpt	Time (UT)	Substrate	Surface features	Moisture
M22.2	08/08/2014	56.78569	-5.77560	169481	772378	17	11:26:35	Slightly muddy sand	<i>Arenicola</i> hummocks	Standing water
M22.3	08/08/2014	56.78665	-5.77433	169565	772481	18	11:39:03	Fine sand	<i>Arenicola</i> hummocks	Standing water
M22.4	08/08/2014	56.78454	-5.77230	169675	772239	19	11:57:10	Slightly muddy sand	<i>Arenicola</i> hummocks	Standing water
M23.10	09/08/2014	56.78796	-5.77311	169647	772622	26	11:37:22	Soft muddy sand with shells & pebbles (~30%)	Small rivulet channels draining adjacent sandflat	Waterlogged, pools of standing water
M23.15	09/08/2014	56.78759	-5.76711	170011	772561	33	12:36:36	Slightly silty fine sand	Pronounced hummocks	Waterlogged, pools of standing water
M23.23	09/08/2014	56.78785	-5.76483	170152	772582	50	14:20:29	Slightly silty fine sand with surface gravel & pebbles (5-10%)	Not recorded	Waterlogged, pools of standing water
M23.7	09/08/2014	56.78671	-5.77033	169809	772474	23	11:07:15	Firm fine sand	Pronounced hummocks & pits	Waterlogged, pools of standing water
M23.9	09/08/2014	56.78809	-5.77181	169727	772633	25	11:26:30	Firm fine sand	<i>Arenicola</i> hummocks	Waterlogged, pools of standing water
M24.112	15/08/2014	56.78862	-5.76863	169925	772681	227	14:43:07	Firm fine sand with some gravel	<i>Carcinus</i> pits, <i>Arenicola</i> casts, <i>Scrobicularia</i> marks present	Wet
M24.112A	15/08/2014	56.788567	-5.769603	169865	772678	228				
M24.113	15/08/2014	56.7887	-5.77046	169813	772696	229	14:58:56	Firmer than last site, fine sand no gravel	Ripples and large hummocks, <i>Arenicola</i> and <i>Scrobicularia</i> marks	Damp
M25.8	09/08/2014	56.78735	-5.77017	169823	772545	24	11:15:42	slightly silty fine sand	<i>Arenicola</i> hummocks	Waterlogged, pools of standing water
M26.16	09/08/2014	56.78526	-5.76684	170013	772301	34	12:50:05	Boulders & cobbles (30-40%). Muddy sand with pebbles (10-20%)	Sediment with <i>Arenicola</i> hummocks	Waterlogged, pools of standing water

Table 4.1 continued

Site	Date	Latitude	Longitude	Easting	Northing	Wpt	Time (UT)	Substrate	Surface features	Moisture
M27.17	09/08/2014	56.78355	-5.76660	170017	772110	35	13:00:00	Poorly sorted sand with gravel & pebbles (20-30%) and boulders & cobbles (10-20%).	Slight hummocks	Damp but no pools of standing water
M27.17A	09/08/2014	56.784482	-5.764547	170148	772207	36				
M27.17B	09/08/2014	56.784767	-5.765053	170119	772240	37				
M27.17C	09/08/2014	56.784978	-5.764720	170141	772263	38				
M27.17D	09/08/2014	56.784735	-5.764457	170155	772235	39				
M27.17E	09/08/2014	56.784603	-5.763867	170191	772218	40				
M27.17F	09/08/2014	56.784418	-5.763858	170190	772197	41				
M28.106	14/08/2014	56.78389	-5.75293	170854	772102	216	14:17:38	Muddy coarse sand with gravel	None	Damp
M28.106A	14/08/2014	56.784992	-5.769848	169828	772281	217				
M29.18	09/08/2014	56.78369	-5.76165	170320	772109	42	13:14:28	Gravelly sand with scattered boulders & cobbles	Some patches of ripples and small ridges of sediment aligned with channel	Damp, some pools of standing water
M30.19	09/08/2014	56.78427	-5.76190	170309	772174	43	13:26:54	Pebbles with occasional sand patches	Not well defined - irregular	Occasional pools of surface water
M30.19A	09/08/2014	56.784608	-5.762260	170289	772213	44				
M31.20	09/08/2014	56.78510	-5.76325	170231	772271	45	13:37:25	Firm fine sand	Scattered <i>Arenicola</i> hummocks	Damp but no pools of standing water
M31.20A	09/08/2014	56.785308	-5.762442	170282	772292	46				
M31.21	09/08/2014	56.78567	-5.76120	170360	772328	47	13:50:21	Poorly sorted sand with surface gravel & pebbles (30-40%)	Very slight hummocks & pits but relatively even	Damp, some pools of standing water

Table 4.1 continued

Site	Date	Latitude	Longitude	Easting	Northing	Wpt	Time (UT)	Substrate	Surface features	Moisture
M31.22	09/08/2014	56.78635	-5.76258	170280	772408	48	14:03:10	Poorly sorted sand with surface gravel & pebbles (~30%) and scattered cobbles & small boulders (1-5%)	Slight hummocks & pits but relatively even	Damp, some pools of standing water
M31.22A	09/08/2014	56.786210	-5.763813	170204	772397	49				
M32.102	14/08/2014	56.78624	-5.75558	170707	772372	211	12:36:18	Slightly soft muddy fine sand	Sparse gravel occasional <i>Carcinus</i> pits and possible <i>Arenicola</i>	Wet
M32.103	14/08/2014	56.78191	-5.75295	170841	771882	212	13:11:41	Slightly soft muddy fine sand	Slightly pitted	Standing water
M32.104	14/08/2014	56.7826	-5.75556	170686	771967	213	13:30:51	Firm muddy fine sand	Slightly pitted	Damp
M32.104A	14/08/2014	56.782225	-5.756757	170610	771930	214				
M32.105	14/08/2014	56.78311	-5.76004	170415	772039	215	13:56:02	Muddy coarse sand with gravel	None	Damp
M32.109	14/08/2014	56.78429	-5.75919	170474	772167	221	16:12:18	Coarse sand with gravel overlain by fine muddy sand	Slightly pocked	Damp
M32.5	08/08/2014	56.785658	-5.757897	170562	772315	21	14:00:05	Silty gravelly sand		Waterlogged
M32.5A	08/08/2014	56.785238	-5.757893	170559	772269	20	13:56:26			
M33.101	14/08/2014	56.78659	-5.75791	170567	772419	206	12:16:20	Firm muddy gravel with cobbles	Riverine cobbles	Damp
M33.101A	14/08/2014	56.786828	-5.757753	170578	772445	207				
M33.101B	14/08/2014	56.786662	-5.758252	170546	772428	208				
M33.101C	14/08/2014	56.786660	-5.756688	170642	772423	209				
M33.101D	14/08/2014	56.786375	-5.756063	170678	772389	210				
M34.100	14/08/2014	56.78634	-5.75398	170805	772378	201	11:45:05	Firm muddy sand with gravel	Very slight hummocks	Wet
M34.100.05	14/08/2014	56.78566	-5.75361	170823	772301	203	12:02:41	Gravel, cobbles, pebbles	River channel	Wet/river

Table 4.1 continued

Site	Date	Latitude	Longitude	Easting	Northing	Wpt	Time (UT)	Substrate	Surface features	Moisture
M34.100.05A	14/08/2014	56.786467	-5.754032	170802	772392	204				
M34.100.05B	14/08/2014	56.786613	-5.755057	170741	772412	205				
M34.100A	14/08/2014	56.785907	-5.753270	170846	772327	202				
M35.111	15/08/2014	56.78716	-5.75321	170857	772467	226	13:26:25	Firm coarse sand with mud and gravel	Terrigenous material, occasional boulders	Wet
M36.110	15/08/2014	56.78577	-5.75192	170927	772308	222	13:00:40	Firm gravel with muddy coarse gravel	Pebbles and cobbles and patches of coarse sand	Pools of standing water
M36.110A	15/08/2014	56.785665	-5.752168	170911	772297	223				
M36.110B	15/08/2014	56.786392	-5.752975	170867	772380	224				
M36.110C	15/08/2014	56.786163	-5.752397	170900	772353	225				

Table 4.2. Habitat data (in part) collected at target note sites. See Table 4.1 for additional data.

Site code	Depth of black layer (cm)	Waypoint notes	Habitat notes	Sample taken	Biota (SACFOR)
M1.80	~0.1		Inlet leading to channel between islands	Y	<i>Alitta virens</i> C, <i>Nephtys hombergii</i> A, <i>Arenicola marina</i> F, Cyanophyta mat S
M1.81	0.2		Gravel zone between muddy sand and Asc on boulders. ~4-5 m wide at this location, narrower elsewhere.	N	<i>Arenicola marina</i> C, <i>Ascophyllum nodosum</i> O, <i>Fucus vesiculosus</i> O
M1.82	~0.3		Fringing band of pebbles with abundant <i>Mytilus</i>	N	<i>Semibalanus balanoides</i> R, <i>Mytilus edulis</i> F, <i>Fucus vesiculosus</i> R
M1.82A		Upper margin of M1.82		N	
M1.82B		Lower margin of M1.82		N	
M1.83	~0.2			Y	<i>Alitta virens</i> C, <i>Nephtys hombergii</i> C, <i>Scoloplos armiger</i> C, <i>Praunus flexuosus</i> C, Cyanophyta mat O
M1.84	~0.2 variable			Y	<i>Eteone longa</i> C, <i>Nephtys hombergii</i> C, <i>Pygospio elegans?</i> F, <i>Arenicola marina</i> F, <i>Tubificoides benedii</i> C, Chironomidae spp. F, <i>Cerastoderma edule</i> F, <i>Macoma balthica</i> C, Cyanophyta mat O
M1.84A		W boundary of firm sand (M1.84) further W is pebbles with <i>Mytilus</i> (M1.82)		N	
M1.84B		Inner margin of pebbles with <i>Mytilus</i> (M1.82) (~4 m wide band) Asc further up the shore		N	
M1.84C		S of this point sediment becomes more soft. Transition from M1.84 to M1.83		N	

Table 4.2 continued

Site code	Depth of black layer (cm)	Waypoint notes	Habitat notes	Sample taken	Biota (SACFOR)
M1.84D		Lower boundary of pebbles & <i>Mytilus</i> (M1.82) which is ~6 m wide with Asc on its upper margin. Soft muddy sand (M1.83) covers the stretch from wpt 171 to 172.		N	
M1.85	near surface	NB old oyster trestles on shore in this area	Unusually broad area of pebbly sediment between Asc & muddy sand	N	<i>Fucus vesiculosus</i> R
M1.85A		Upper margin of M1.85. Further inshore is Asc on boulders.		N	
M1.85B		Lower margin of M1.85. Further downshore is muddy sand (M1.83)		N	
M1.86	0.2	This area is same as M1.83 which has continued unchanged from wpt 175 to this point		Y	<i>Alitta virens</i> C, Nereidae sp. juv. C, <i>Nephtys hombergii</i> A, <i>Scoloplos armiger</i> A, <i>Arenicola marina</i> O, <i>Praunus flexuosus</i> C, <i>Cerastoderma edule</i> juv. C, Cyanophyta mat O
M1.86A		E boundary of muddy sand (M1.83)		N	
M1.86B		E margin of muddy sand (see wpt 162) from polygon 1. Narrow channel - area of dense <i>Mytilus</i> (~10 x 5 m) in narrowest section then soft mud further east.		N	
M2.87	~0.1			Y	<i>Alitta virens</i> C, <i>Nephtys hombergii</i> A, <i>Arenicola marina</i> F, Tubificidae spp. A, <i>Praunus flexuosus</i> C, Cyanophyta mat A
M2.88	~0.1			Y	<i>Nephtys hombergii</i> C, <i>Arenicola marina</i> F, <i>Tubificoides benedii</i> C, <i>Orchestia gammarellus</i> F, Cyanophyta mat O
M2.88A		From wpt 180-181 all muddy sand (M2.88). Wpt 181 is W boundary of M2.88. Beyond is a 3 m wide band of shell & gravel on muddy sand followed by bedrock with <i>Ascophyllum</i> .		N	

Table 4.2 continued

Site code	Depth of black layer (cm)	Waypoint notes	Habitat notes	Sample taken	Biota (SACFOR)
M2.88B		A boundary with muddy sand (M2.88) to the E and an embayment of pebbles on muddy sand to the W.		N	
M2.88C		Waterline at 1322. Muddy sand (M2.88). ~5 m to SW is a 2 m wide pebble band at the base of a rock outcrop.		N	
M2.88D		W boundary of a patch of relatively coarse sediment (M2.89).		N	
M2.89	~1.5		Crescent shaped bank of sand and shell fragments	Y	<i>Alitta virens</i> C, <i>Scoloplos armiger</i> F, <i>Arenicola marina</i> F, Maldanidae spp. P, <i>Carcinus maenas</i> C, <i>Fucus vesiculosus</i> R
M2.89A		S boundary of a patch of relatively coarse sediment (M2.89).		N	
M2.89B		N boundary of a patch of relatively coarse sediment (M2.89).		N	
M2.89C		E boundary of a patch of relatively coarse sediment (M2.89).		N	
M2.89D		Wpt 188 to 189 all muddy sand (M2.88). Wpt 189 is boundary with ~2 m wide band of pebbles on muddy sand fringing a rock outcrop.		N	
M2.90	not done		same sediment as M2.88	N	<i>Arenicola marina</i> F, Cyanophyta mat O
M2.90A		N boundary of muddy sand. 10 m wide band of pebbles & <i>F.vesX</i> lies to the N.		N	
M2.90B		Walked along boundary between pebbles & muddy sand from wpt 191 to 193 (not sure what happened to wpt 192!).		N	
M2.91	~0.1		Same sediment as M2.88	Y	<i>Alitta virens</i> A, <i>Nephtys hombergii</i> F, <i>Arenicola marina</i> F, Cyanophyta mat O
M2.91A		Walked along boundary between pebbles AscX & muddy sand from wpt 193 to 195. Large rock outcrops just to E of this point.		N	

Table 4.2 continued

Site code	Depth of black layer (cm)	Waypoint notes	Habitat notes	Sample taken	Biota (SACFOR)
M2.91B		Upper boundary of muddy sand. N of this point is AscX on boulders & pebbles.		N	
M2.92	0.1		Drift algae 1-5%, drift ascidians	Y	<i>Alitta virens</i> C, <i>Nephtys hombergii</i> A, <i>Capitella capitata</i> C, <i>Arenicola marina</i> F, Gammaridae sp. F, <i>Carcinus maenas</i> C, <i>Ascidella</i> sp. C, Cyanophyta mat F
M2.92A		E margin of sediment in polygon 2.		N	
M3.93	not recorded		Raised bank of sediment near rocky outcrop / island	Y	<i>Alitta virens</i> C, <i>Nephtys hombergii</i> A, <i>Arenicola marina</i> C, <i>Crangon crangon</i> C, Cyanophyta mat R
M3.94	0.3		Raised bank of soft muddy sand	N	<i>Arenicola marina</i> C, Cyanophyta mat O
M4.60	<0.1		Very soft, too soft to walk upon safely	Y	<i>Nephtys hombergii</i> A, Spionidae spp. C, <i>Arenicola marina</i> C, <i>Crangon crangon</i> F, <i>Carcinus maenas</i> C, Diatom film F
M4.60A		Drift <i>Sargassum</i> noted - also seen at a couple of other places along same shore.		N	
M4.60B		Small (~5x5 m) area <i>Asc. mackaii</i> - also in 2 or 3 other small embayments along this shore.		N	<i>Ascophyllum nodosum mackaii</i> P
M4.61	<0.1		Narrow fringe of pebbles between base of Asc on boulders and the soft mud. = F.vesX	N	<i>Mytilus edulis</i> R, <i>Fucus vesiculosus</i> F
M4.61A		Lower margin pebble band (M4.61) soft mud (M4.60) to W.		N	
M4.61B		Lower margin pebble band (M4.61) soft mud (M4.60) to W. Oysters & <i>Hymeniacidon</i> noted near this point.		N	<i>Hymeniacidon perleve</i> P, <i>Ostrea edulis</i> P
M4.62	<0.1		Very soft, too soft to walk upon safely	Y	<i>Hymeniacidon perleve</i> P, <i>Glycera tridactyla</i> C, <i>Nephtys hombergii</i> A, <i>Arenicola marina</i> C, Ampharetidae sp. C, <i>Ampelisca bevicornis</i> F, Diatom film A
M4.62A		Position of waterline of polygon 4 @ 1325. (see photo).		N	

Table 4.2 continued

Site code	Depth of black layer (cm)	Waypoint notes	Habitat notes	Sample taken	Biota (SACFOR)
M4.62B		Position of waterline of polygon 5 @ 1330. (see photo).		N	
M5.63	<0.1		Very soft, too soft to walk upon safely	Y	<i>Hymeniacion perleve</i> P, <i>Nephtys hombergii</i> A, <i>Arenicola marina</i> F, <i>Asciella</i> sp. C, Diatom film A
M5.64	~2.0		Area of firmer & coarser sediment in a narrow section of the tidal channel	Y	<i>Nephtys hombergii</i> C, <i>Marphysa belli</i> C, <i>Scoloplos armiger</i> A, <i>Lanice conchilega</i> C, <i>Fabulina fabula</i> F, <i>Mytilus edulis</i> F, <i>Ostrea edulis</i> F, <i>Bivalvia</i> juv. indet. F
M5.64A		E boundary of <i>Lanice</i> sand (M5.64)		N	
M5.64B		N boundary of <i>Lanice</i> sand (M5.64)		N	
M5.64C		W boundary of <i>Lanice</i> sand (M5.64)		N	
M5.65	0.2		Area of firmer sediment in a narrow section of the tidal channel adjacent to <i>Lanice</i> sand (M5.64)	Y	<i>Alitta virens</i> A, <i>Nephtys hombergii</i> A, <i>Arenicola marina</i> F, Diatom film R
M5.66	~0.1		Narrow (~ 5 m wide) fringe of pebbles between base of Asc on boulders and the soft mud	N	<i>Hymeniacion perleve</i> R, <i>Ostrea edulis</i> P, <i>Ascophyllum nodosum</i> F, <i>Fucus serratus</i> R
M5.67	~0.1			N	<i>Hymeniacion perleve</i> R, <i>Arenicola marina</i> F
M5.68	0		Very soft muddy sediment in wider part of channel	Y	<i>Nephtys hombergii</i> A, <i>Arenicola marina</i> F, <i>Tubificoides benedii</i> F, Diatom film C
M5.69	0.4		Raised bank of gravelly sediment in centre of channel. Flanked by soft mud to north & south.	Y	<i>Eteone longa</i> C, <i>Alitta virens</i> C, <i>Nephtys hombergii</i> A, <i>Tubificoides benedii</i> F, <i>Semibalanus balanoides</i> R, <i>Mytilus edulis</i> F, <i>Fucus vesiculosus</i> R
M5.69A		S margin of gravel bank (M5.69).		N	
M5.69B		W margin of gravel bank (M5.69).		N	

Table 4.2 continued

Site code	Depth of black layer (cm)	Waypoint notes	Habitat notes	Sample taken	Biota (SACFOR)
M5.69C		N margin of gravel bank (M5.69).		N	
M5.69D		E margin of gravel bank (M5.69).		N	
M5.70	0.8		Patch of sandy sediment in narrows of channel	Y	<i>Nephtys hombergii</i> C, Spionidae spp. C, <i>Arenicola marina</i> C, <i>Cerastoderma edule</i> juv. C
M5.71	near surface		Patch of sandy sediment in narrows of channel	N	<i>Arenicola marina</i> F, <i>Semibalanus balanoides</i> R, <i>Mytilus edulis</i> R, <i>Fucus vesiculosus</i> R
M5.71A		Eastern boundary of M5.71 muddy sand. Further E is pebbles, cobbles & <i>Mytilus</i> .		N	
M6.72	N/A		<i>Mytilus</i> bed in centre of channel	N	<i>Semibalanus balanoides</i> O, <i>Mytilus edulis</i> F, <i>Fucus vesiculosus</i> F
M6.72A		Roadway over ford - dense <i>Mytilus</i> .		N	<i>Mytilus edulis</i> P
M6.73	N/A		<i>Mytilus</i> & <i>F.ves</i> X in centre of channel	N	<i>Semibalanus balanoides</i> O, <i>Mytilus edulis</i> O, <i>Ascophyllum nodosum</i> R, <i>Fucus vesiculosus</i> F
M6.73A		Eastern boundary of M6.72 <i>Mytilus</i> & <i>F.ves</i> .		N	
M7.114	1 mm		Edged with AscX, larger rocks cover in ~60% <i>Mytilus</i>	Y	<i>Alitta virens</i> C, <i>Nephtys hombergii</i> F, Gammaridae sp. 1, <i>Crangon crangon</i> 1, <i>Mytilus edulis</i> P, <i>Pomatoschistus minutus</i> C, <i>Ascophyllum nodosum</i> F, <i>Fucus vesiculosus</i> F, <i>Fucus serratus</i> F
M7.115	1 mm			N	<i>Fucus vesiculosus</i> F, <i>Fucus serratus</i> F
M7.52	~0.2			Y	<i>Nephtys hombergii</i> C, <i>Arenicola marina</i> C, Cyanophyta mat S
M7.52A		NE boundary of muddy sand (M7.52). Rippled sand (ME2) present to the NE.		N	
M7.52B		NE boundary of rippled sand (ME2). <i>Lanice</i> sand (M8.50) to NE.		N	
M7.52C		NW boundary of <i>Lanice</i> sand (M8.50). Muddy sand (M7.52) to N & to W. (NB very narrow fringe (~2-3 m) of rippled sand (ME2) at boundary).		N	

Table 4.2 continued

Site code	Depth of black layer (cm)	Waypoint notes	Habitat notes	Sample taken	Biota (SACFOR)
M7.52D		Margin of stream channel. Muddy sand (M7.52).		N	
M7.53	0.1	Same as M7.52.		Y	<i>Nephtys hombergii</i> C, <i>Arenicola marina</i> F, Tubificidae spp. C, <i>Tubificoides benedii</i> C, <i>Crangon crangon</i> F, Cyanophyta mat S
M7.53A		Margin of stream channel - same stream as wpt 109. Muddy sand (M7.53).		N	
M7.53B		Same as M7.53. From previous wpt to this point.		N	
M7.54	~0.1	Same as M7.53. From previous wpt to this point.		Y	<i>Nephtys hombergii</i> F, <i>Arenicola marina</i> F, Tubificidae spp. A, Gammaridae sp. F, Cyanophyta mat S
M7.54A		Same as M7.54. From previous wpt to this point. Becoming softer towards shore. Remaining substrate towards shore is increasingly soft and has less algal cover but appears to be the same biotope.		N	
M7.55	~0.5	Same as M7.53. From previous wpt to this point		Y	<i>Nephtys hombergii</i> C, <i>Polydora ciliata</i> S, <i>Capitella capitata</i> S, <i>Arenicola marina</i> F, Tubificidae spp. C, <i>Praunus flexuosus</i> C, Gammaridae sp. F, Chironomidae spp. F, Cyanophyta mat S
M7.55A		Margin of deep channel running ~NW-SE. Prevented dry access to sediment banks to the E along N shore of estuary.		N	
M7.55B		Same as M7.55. From previous wpt to this point. The soft muddy sand with filamentous green algae covers all area between here and wpts 111, 114 & 116.		N	
M7.55C		Muddy sand (M7.55) becomes increasingly firmer from this point towards the SW.		N	
M7.55D		Boundary of muddy sand (M7.55) - firm sand (ME2) to the SW.		N	

Table 4.2 continued

Site code	Depth of black layer (cm)	Waypoint notes	Habitat notes	Sample taken	Biota (SACFOR)
M7.55E		Transition - firm sand (ME2) becoming increasingly softer with increasing cover of green filamentous algae.		N	
M7.56	~ 1 (variable)	Appears to be the same as muddy sand (M7.55) - slightly firmer but otherwise similar.		Y	<i>Nephtys hombergii</i> F, <i>Arenicola marina</i> F, Gammaridae sp. C, Chironomidae spp. F, Cyanophyta mat A
M7.57	~0.2	Similar to firm sand (ME2). Limited extent - within ~10 m to S, W & N is a transition back to the muddy sand (M7.55) - this muddy sand is also equivalent to the muddy sand ME1. From wpt 122 to the head of transect ME is all muddy sand (ME1).		N	<i>Arenicola marina</i> C
M7.59	~0.2	Appears similar ME1 but softer.		Y	<i>Alitta virens</i> C, <i>Nephtys hombergii</i> A, <i>Arenicola marina</i> C, <i>Corophium volutator</i> F, Cyanophyta mat C
M7.74	N/A		Transition from M6.72 <i>Mytilus</i> & <i>F.ves</i> to muddy sand further to the E	N	<i>Semibalanus balanoides</i> R, <i>Mytilus edulis</i> R, <i>Fucus vesiculosus</i> O
M7.74A		Eastern boundary of M7.74 gravel & pebbles. Muddy sand to the E.		N	
M7.75	~0.1		This mud appears the same as that seen at ME1 on 11/8/14	Y	<i>Nephtys hombergii</i> A, <i>Pygospio elegans</i> A, <i>Arenicola marina</i> F, Oligochaeta spp. indet. P, Cyanophyta mat S
M7.75A		M7.75 muddy sand remains the same from wpt 158 to 159.		N	
M7.76	~0.1	M7.75 muddy sand remains the same from wpt 159 to 160.	This mud appears the same as that seen at ME1 on 11/8/14	Y	<i>Nephtys hombergii</i> A, <i>Polydora ciliata</i> C, <i>Arenicola marina</i> F, <i>Tubificoides benedii</i> C, <i>Carcinus maenas</i> C, Chironomidae spp. F, <i>Macoma balthica</i> F, Cyanophyta mat S
M7.76A		Gravel & pebble fringe between Asc & Muddy sand (see photos)		N	

Table 4.2 continued

Site code	Depth of black layer (cm)	Waypoint notes	Habitat notes	Sample taken	Biota (SACFOR)
M8.50	~15 (indistinct)		Sand bank	Y	<i>Nephtys cirrosa</i> F, <i>Scoloplos armiger</i> F, <i>Arenicola marina</i> A, Maldanidae spp. P, <i>Lanice conchilega</i> C, <i>Corophium crassicorne</i> F, <i>Crangon crangon</i> F, <i>Macoma balthica</i> F
M8.50A		Transition from firm rippled sand described under ME2 to <i>Lanice</i> sand of M8.50.		N	
M8.50B		Point on NE margin of <i>Lanice</i> sand (M8.50). Firm, rippled sand (ME2) present to NE of this point.		N	
M8.50C		Point on NE margin of <i>Lanice</i> sand (M8.50). Firm, rippled sand (ME2) present to NE of this point.		N	
M8.50D		SE tip of area of sand with shell & pebbles (M8.51). <i>Lanice</i> sand (M8.50) to SE.		N	
M8.51	> 10 (indistinct)		Gravel bank	Y	<i>Nephtys hombergii</i> C, <i>Crangon crangon</i> F, <i>Carcinus maenas</i> C, <i>Cerastoderma edule</i> juv. C
M8.51A		Northern margin sand with shell & pebbles (M8.51). <i>Lanice</i> sand (M8.50) to W.		N	
M8.51B		Northern margin sand with shell & pebbles (M8.51). Narrow (3-4 m wide) fringe of <i>Lanice</i> sand (M8.50), then rippled sand (ME2) present to NE of this point.		N	
M8.51C		Northern margin sand with shell & pebbles (M8.51). <i>Lanice</i> sand (M8.50) to N.		N	
M8.51D		NW boundary of <i>Lanice</i> sand (M8.50). Rippled sand (ME2) present to the W.		N	

Table 4.2 continued

Site code	Depth of black layer (cm)	Waypoint notes	Habitat notes	Sample taken	Biota (SACFOR)
M8.51E		Transition from firm rippled sand described under ME2 to increasingly soft muddy sand with filamentous green algae (M7.52) to the W.		N	
M11.30	2.5	MD1 substrate (mobile megarippled sand) continues unchanged from transect MD to wpt 52.	was noted as identical to MD1	N	
M11.30A		MD1 substrate (mobile megarippled sand) continues unchanged from transect MD to wpt 52 to wpt 53. Wpt 53 is under shallow water at 1200.		N	
M11.30B		S boundary of MD1 sediment. Further S is MD2 sediment.		N	
M11.30C		Position of drainage channel. This channel crosses the top of MD transect, flows NW close to the rocky shore then takes a more N course across the sandflat to the main channel near this point.		N	
M11.31	2.5		Raised sandbank near channel. substrate identical to MD2	Y	<i>Nephtys hombergii</i> F, <i>Arenicola marina</i> C, <i>Cerastoderma edule</i> F
M11.31A		Within narrow band of soft mud on upper shore (MD3). Wpt on lower margin of very soft organically enriched mud with drift algae cover and <i>A. mackaii</i> present.		N	
M11.31B		Boundary with MD1 sand to N and MD2 sand to S.		N	
M11.32	not recorded		Same as MD2	N	<i>Arenicola marina</i> C

Table 4.2 continued

Site code	Depth of black layer (cm)	Waypoint notes	Habitat notes	Sample taken	Biota (SACFOR)
M11.32A		Boundary with MD2 sand to N and MD3 sand to S. MD2 sand is continuous from wpt 59 to wpt 68.		N	
M11.33	~7.0		Same as MD1 but appears higher energy & more mobile	Y	<i>Nephtys cirrosa</i> F, <i>Carcinus maenas</i> C
M11.33A		Upper boundary of mega-rippled sand (MD1).		N	
M13.44	~0.2		Similar to M14.43 - slightly softer	N	<i>Arenicola marina</i> A
M14.38	~0.2			Y	<i>Eteone longa</i> juv? C, <i>Nephtys hombergii</i> F, <i>Arenicola marina</i> A, <i>Tubificoides benedii</i> F, <i>Crangon crangon</i> F, Cyanophyta mat A
M14.38A		Soft muddy sand (M14.38) continuous from wpt 76 - wpt 77. Wpt 77 is at a transition with <i>F. vesX</i> / <i>AscX</i> to the SW.		N	
M14.41	~0.5	Appears same as M14.38 but firmer. Similar substrate from wpt 77 to wpt 80.		Y	<i>Nephtys hombergii</i> F, <i>Pygospio elegans</i> C, <i>Arenicola marina</i> A, Tubificidae spp. A, <i>Tubificoides benedii</i> C, <i>Neomysis integer</i> C, <i>Corophium volutator</i> C, <i>Cerastoderma edule</i> juv. C, Cyanophyta mat C
M14.42	~0.2	This substrate continues E until it meets the W margin of polygon 15.	Same habitat as wpt 80 but hummocks less pronounced	Y	<i>Nephtys hombergii</i> F, <i>Arenicola marina</i> A, <i>Macoma balthica</i> F, Cyanophyta mat S
M14.42A		Boundary - with hummocked sand (M14.42) to the S and rippled sand (MD2) to N.		N	
M14.42B		Sediment as for MD3.		N	
M14.43	~0.1		Similar to M14.42 - gradual transition from wpt 82 to wpt 85 becoming softer and more <i>Arenicola</i> hummocks	N	<i>Arenicola marina</i> A, Filamentous green algae S

Table 4.2 continued

Site code	Depth of black layer (cm)	Waypoint notes	Habitat notes	Sample taken	Biota (SACFOR)
M15.34	~5.0 - indistinct & variable		Raised bank of mixed sediment	Y	<i>Pygospio elegans?</i> F, Tubificidae spp. F, <i>Semibalanus balanoides</i> P, <i>Carcinus maenas</i> C, <i>Patella vulgata</i> P, <i>Mytilus edulis</i> R, <i>Fucus vesiculosus</i> C
M15.37	not recorded			N	<i>Arenicola marina</i> C, <i>Ascophyllum nodosum</i> F, <i>Fucus vesiculosus</i> O
M16.35	~2.5		Mobile sandbank directly adjacent to main channel.	Y	<i>Pygospio elegans</i> C
M16.36	~2.5		Mobile sandbank directly adjacent to main channel.	N	
M16.36A		About 6 m W of wpt 73 - within area of soft muddy sand.		Y	<i>Nephtys hombergii</i> F, <i>Arenicola marina</i> A, <i>Crangon crangon</i> C
M17.39	~0.5		AscX	Y	<i>Polydora ciliata</i> F, <i>Arenicola marina</i> A, <i>Tubificoides benedii</i> A, <i>Corophium volutator</i> A, <i>Ascophyllum nodosum</i> F, <i>Fucus vesiculosus</i> R
M18.108	3		Channel edged with boulders and rocks	Y	<i>Eteone longa</i> C, <i>Hediste diversicolor</i> A, <i>Nephtys hombergii</i> F, <i>Arenicola marina</i> A, <i>Baltidrilus costata</i> P, <i>Tubificoides benedii</i> A, <i>Corophium volutator</i> A, <i>Macoma balthica</i> C, <i>Ascophyllum nodosum</i> O
M18.40	~0.2		NB polygon boundary between here and polygon 17 is a stream channel	Y	<i>Nephtys hombergii</i> F, <i>Arenicola marina</i> A, <i>Corophium volutator</i> C, <i>Carcinus maenas</i> C, <i>Ascophyllum nodosum</i> F, <i>Fucus vesiculosus</i> R
M19.13	~0.1		Narrow band of muddy sediment adjacent to major drainage channel, appears organically enriched. Adjacent to boulder embankment supporting road	Y	<i>Nephtys hombergii</i> C, <i>Pygospio elegans</i> F, <i>Arenicola marina</i> C, <i>Tubificoides benedii</i> A

Table 4.2 continued

Site code	Depth of black layer (cm)	Waypoint notes	Habitat notes	Sample taken	Biota (SACFOR)
M20.11	~2.0		Dry rippled sand habitat began approximately at the position where we crossed into polygon 20	Y	<i>Nephtys hombergii</i> F, <i>Arenicola marina</i> C
M20.12	~2.0			N	<i>Arenicola marina</i> C
M20.14	~1.0	Since crossing channel after leaving wpt 29 have been in this habitat most of the way to wpt 31. Differs from rippled sand (M20.11) seen elsewhere in polygon 20 - more similar to MB2 hummocked sand.	MB2?	Y	<i>Arenicola marina</i> A, Diatom film C
M20.14A		Wpt 31 to 32 remains the same as M20.14 but is closer to areas of AscX.		N	
M22.1	0.2		Probably same biotope as MC4 though a little muddier	Y	<i>Nephtys hombergii</i> F, <i>Arenicola marina</i> A, <i>Macoma balthica</i> C
M22.107	4 mm		Occasional cobbles, F.ves , pitted muddy sand	Y	<i>Nephtys hombergii</i> F, Spionidae spp. C, <i>Arenicola marina</i> A, <i>Tubificoides benedii</i> A, <i>Corophium volutator</i> C, <i>Macoma balthica</i> F, <i>Scrobicularia plana</i> P, <i>Fucus vesiculosus</i> R
M22.107 A		Transition from polygon 22-18 more muddy.		N	
M22.2	1			Y	<i>Nephtys hombergii</i> F, <i>Arenicola marina</i> A, <i>Praunus flexuosus</i> C, <i>Macoma balthica</i> C, Diatom film C
M22.3	2			Y	<i>Nephtys hombergii</i> F, <i>Arenicola marina</i> A, <i>Crangon crangon</i> C

Table 4.2 continued

Site code	Depth of black layer (cm)	Waypoint notes	Habitat notes	Sample taken	Biota (SACFOR)
M22.4	1			Y	<i>Eteone longa</i> C, <i>Hediste diversicolor</i> F, <i>Nephtys hombergii</i> F, <i>Pygospio elegans</i> C, <i>Arenicola marina</i> A, Tubificidae spp. F, <i>Tubificoides benedii</i> C, <i>Corophium volutator</i> F, <i>Crangon crangon</i> C, <i>Cerastoderma edule</i> juv. C, <i>Macoma balthica</i> C, <i>Scrobicularia plana</i> F
M23.10	~0.1		Pebbly mud with cobbles - relatively steep bank of main estuary channel (FvesX?)	N	<i>Fucus vesiculosus</i> C
M23.15	0.5			Y	<i>Hediste diversicolor</i> A, <i>Arenicola marina</i> A, <i>Tubificoides benedii</i> F, <i>Corophium volutator</i> C
M23.23	~1.0		Gravelly sand & scattered fucoids on upper shore estuarine sediment	Y	<i>Hediste diversicolor</i> F, <i>Arenicola marina</i> C, <i>Corophium volutator</i> F, <i>Macoma balthica</i> F
M23.7			Identical to MB2 on the adjacent transect	N	<i>Arenicola marina</i> A
M23.9	~0.6		Hummocked fine sand - like MB2	N	<i>Arenicola marina</i> A, <i>Crangon crangon</i> P, Diatom film A
M24.112	2		<i>F. cer</i> in South channel at the edge of the polygon	Y	<i>Hediste diversicolor</i> F, <i>Arenicola marina</i> C, <i>Macoma balthica</i> F, <i>Scrobicularia plana</i> F, <i>Ascophyllum nodosum</i> F, <i>Fucus vesiculosus</i> F, <i>Fucus spiralis</i> R
M24.112 A		Transition to firmer substrate with less <i>Fucus</i> and more abundant <i>Arenicola</i> and less gravel.		N	
M24.113	2		<i>F. cer</i> in South channel at the edge of the polygon	Y	<i>Nephtys hombergii</i> F, Spionidae spp. 1, <i>Arenicola marina</i> S, <i>Scrobicularia plana</i> P, <i>Fucus vesiculosus</i> R, <i>Fucus ceranoides</i> R
M25.8	~0.3		Very similar to MB3 on the adjacent transect (AscX?)	N	<i>Arenicola marina</i> A, <i>Ascophyllum nodosum</i> C, <i>Ascophyllum nodosum mackaii</i> P, <i>Fucus vesiculosus</i> F

Table 4.2 continued

Site code	Depth of black layer (cm)	Waypoint notes	Habitat notes	Sample taken	Biota (SACFOR)
M26.16	~0.1		AscX - similar M25.8	N	<i>Arenicola marina</i> A, <i>Ascophyllum nodosum</i> A, <i>Fucus vesiculosus</i> F
M27.17	~1.0	Track from wpt 34 to wpt 35 had transition from M26.16 to M27.17 at approximately the boundary of polygon 26.	Similar to MB1 - mixed gravelly substrate with AscX over much of the area	Y	<i>Hediste diversicolor</i> A, <i>Fabricia sabella?</i> F, Tubificidae spp. C, <i>Corophium volutator</i> C, <i>Ascophyllum nodosum</i> C, <i>Fucus vesiculosus</i> F
M27.17A		Wpts 36 - 40 were taken to outline the boundary of a patch of saltmarsh - these will not correspond to the positions on GPS logger (were done by RC, logger was with DH). NB - logger carried in rucksack & occasionally dumped a few m away from station all throughout the day - if there are small discrepancies trust handheld rather than logger.		N	
M27.17B		Wpts 36 - 40 were taken to outline the boundary of a patch of saltmarsh.		N	
M27.17C		Wpts 36 - 40 were taken to outline the boundary of a patch of saltmarsh.		N	
M27.17D		Wpts 36 - 40 were taken to outline the boundary of a patch of saltmarsh.		N	
M27.17E		Wpts 36 - 40 were taken to outline the boundary of a patch of saltmarsh.		N	
M27.17F		Logger track from wpt 35 to wpt 41 is over terrain similar to M27.17.		N	
M28.106	1		Occasional <i>F. ves</i> on cobbles, large rock covered in Asc X	Y	<i>Hediste diversicolor</i> F, <i>Nephtys hombergii</i> F, <i>Corophium volutator</i> O, <i>Ascophyllum nodosum</i> R, <i>Fucus vesiculosus</i> R
M28.106 A		Change from gravel to sand at east end of polygon 22.		N	

Table 4.2 continued

Site code	Depth of black layer (cm)	Waypoint notes	Habitat notes	Sample taken	Biota (SACFOR)
M29.18	~1.0		River channel gravel/sand bank with <i>F.vesX</i>	Y	<i>Pygospio elegans</i> C, Tubificidae spp. A, <i>Tubificoides benedii</i> C, Enchytraeidae spp. C, <i>Neomysis integer</i> C, <i>Corophium volutator</i> F, <i>Ascophyllum nodosum</i> C, <i>Fucus vesiculosus</i> F
M30.19	~2.0 - poorly defined		Pebble bank of river channel	N	<i>Corophium volutator</i> P, <i>Carcinus maenas</i> P, <i>Fucus vesiculosus</i> C
M30.19A		Transition from pebble & gravel (M30.19) to fine sand of polygon 31.		N	
M31.20	~1.0			Y	<i>Hediste diversicolor</i> A, <i>Arenicola marina</i> C, <i>Baltidrilus costata</i> F, <i>Corophium volutator</i> A, <i>Fucus vesiculosus</i> R
M31.20A		Marks transition from fine sand with <i>Arenicola</i> (M31.20) to area with surface gravel on sand and sparse <i>Arenicola</i> .		N	
M31.21	~0.5			Y	<i>Hediste diversicolor</i> C, <i>Corophium volutator</i> F, <i>Crangon crangon</i> F, <i>Fucus vesiculosus</i> R
M31.22	~0.5 but variable		Upper shore poorly sorted sediment with sparse <i>Arenicola</i> and scattered fucoid patches	Y	<i>Hediste diversicolor</i> C, <i>Arenicola marina</i> O, <i>Corophium volutator</i> C, <i>Macoma balthica</i> F
M31.22A		Lower boundary of gravelly sediment (M31.22) - lower on shore is fine sand (M31.20).		N	
M32.102	1 mm			Y	<i>Hediste diversicolor</i> A, <i>Baltidrilus costata</i> P, Gammaridae sp. F, <i>Corophium volutator</i> A, <i>Carcinus maenas</i> C, <i>Fucus vesiculosus</i> R, <i>Fucus ceranoides</i> R
M32.103	1			Y	<i>Hediste diversicolor</i> A, <i>Corophium volutator</i> A, <i>Fucus vesiculosus</i> R
M32.104	2		A little bit firmer than last site	Y	<i>Hediste diversicolor</i> A, <i>Baltidrilus costata</i> F, <i>Tubificoides benedii</i> C, <i>Corophium volutator</i> S, <i>Carcinus maenas</i> C, <i>Fucus vesiculosus</i> R

Table 4.2 continued

Site code	Depth of black layer (cm)	Waypoint notes	Habitat notes	Sample taken	Biota (SACFOR)
M32.104 A		Transition to more gravel and <i>F.ves.</i>		N	
M32.105			Occasional cobbles and boulders cover in <i>F.ves</i>	Y	<i>Hediste diversicolor</i> A, <i>Baltidrilus costata</i> A, <i>Corophium volutator</i> A, <i>Carcinus maenas</i> C, <i>Fucus vesiculosus</i> R
M32.109	Indistinguishable		Occasional <i>F.ves</i> on cobbles	Y	<i>Hediste diversicolor</i> A, Tubificidae spp. A, <i>Corophium volutator</i> C, <i>Carcinus maenas</i> C, <i>Fucus vesiculosus</i> R
M32.5		Site flooded - no photos.		Y	<i>Hediste diversicolor</i> A, <i>Baltidrilus costata</i> A, <i>Corophium volutator</i> A, Chironomidae spp. P
M32.5A		Marks southern boundary.		N	
M33.101	none		Riverine deposited gravel with muddy sand and <i>F.ves</i>	Y	<i>Corophium volutator</i> O, <i>Fucus vesiculosus</i> C, <i>Fucus ceranoides</i> C
M33.101 A		Saltmarsh east extent.		N	
M33.101 B		Saltmarsh west extent, saltmarsh patch never wider than 10 m north/south.		N	
M33.101 C		East extent of polygon 33 should be increased to here.		N	
M33.101 D		Transition from gravel dominated to muddy sand dominated.		N	
M34.100	1		Occasional <i>F.ves</i> drift	Y	<i>Hediste diversicolor</i> A, Oligochaeta spp. indet. A, <i>Baltidrilus costata</i> P, <i>Corophium volutator</i> C, <i>Carcinus maenas</i> C
M34.100.05	1			N	<i>Fucus vesiculosus</i> R, <i>Fucus ceranoides</i> R
M34.100.05A		North extent of polygon.		N	
M34.100.05B		West extent of polygon.		N	

Table 4.2 continued

Site code	Depth of black layer (cm)	Waypoint notes	Habitat notes	Sample taken	Biota (SACFOR)
M34.100 A		Extent of polygon NE.		N	
M35.111	2 mm		River channel	Y	<i>Hediste diversicolor</i> S, <i>Baltidrilus costata</i> C, <i>Corophium volutator</i> F, <i>Fucus spiralis</i> R
M36.110	3		Bank of the river, with <i>F. spiralis</i> in the channel to the north	Y	Enchytraeidae spp. A, <i>Corophium volutator</i> F, Chironomidae spp. C, Tipulidae sp. larva F, <i>Fucus spiralis</i> R, <i>Fucus ceranoides</i> R
M36.110 A		East extent of saltmarsh.		N	
M36.110 B		West extent of saltmarsh.		N	
M36.110 C		North extent of saltmarsh.		N	

ANNEX 5: PHOTO AND VIDEO LOGS

Table 5.1 Log of photographs associated with quadrats in Loch Moidart

Image identifier	Site code	Date and time (UT)	Latitude (original)	Longitude (original)	Latitude (dec deg)	Longitude (dec deg)	Description	Bearing (degrees T)
SNH_MOIDART_2014_ASCN0061.JPG	MC1	2014-08-08 09:10:34	56.78697	-5.77189	56.78697	-5.77189	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0062.JPG	MC1	2014-08-08 09:10:56	56.78697	-5.77189	56.78697	-5.77189	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0063.JPG	MC1	2014-08-08 09:11:16	56.78697	-5.77189	56.78697	-5.77189	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0064.JPG	MC1	2014-08-08 09:11:34	56.78697	-5.77189	56.78697	-5.77189	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0065.JPG	MC1	2014-08-08 09:11:48	56.78697	-5.77189	56.78697	-5.77189	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0066.JPG	MC1	2014-08-08 09:12:11	56.78697	-5.77189	56.78697	-5.77189	Sediment flat habitat detail	
SNH_MOIDART_2014_ASCN0067.JPG	MC1	2014-08-08 09:12:25	56.78697	-5.77189	56.78697	-5.77189	Sediment flat habitat detail	
SNH_MOIDART_2014_ASCN0071.JPG	MC2	2014-08-08 09:48:17	56.78639	-5.77257	56.78639	-5.77257	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0072.JPG	MC2	2014-08-08 09:48:41	56.78639	-5.77257	56.78639	-5.77257	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0073.JPG	MC2	2014-08-08 09:48:59	56.78639	-5.77257	56.78639	-5.77257	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0074.JPG	MC2	2014-08-08 09:49:13	56.78639	-5.77257	56.78639	-5.77257	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0075.JPG	MC2	2014-08-08 09:49:29	56.78639	-5.77257	56.78639	-5.77257	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0076.JPG	MC2	2014-08-08 09:49:41	56.78639	-5.77257	56.78639	-5.77257	Sediment flat habitat detail	
SNH_MOIDART_2014_ASCN0077.JPG	MC2	2014-08-08 09:49:51	56.78639	-5.77257	56.78639	-5.77257	Sediment flat habitat detail	
SNH_MOIDART_2014_ASCN0080.JPG	MC3	2014-08-08 10:09:06	56.78534	-5.77375	56.78534	-5.77375	Quadrat on sediment flat	

Image identifier	Site code	Date and time (UT)	Latitude (original)	Longitude (original)	Latitude (dec deg)	Longitude (dec deg)	Description	Bearing (degrees T)
SNH_MOIDART_2014_ASCN0081.JPG	MC3	2014-08-08 10:09:21	56.78534	-5.77375	56.78534	-5.77375	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0082.JPG	MC3	2014-08-08 10:09:40	56.78534	-5.77375	56.78534	-5.77375	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0083.JPG	MC3	2014-08-08 10:09:53	56.78534	-5.77375	56.78534	-5.77375	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0084.JPG	MC3	2014-08-08 10:10:07	56.78534	-5.77375	56.78534	-5.77375	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0085.JPG	MC3	2014-08-08 10:10:15	56.78534	-5.77375	56.78534	-5.77375	Sediment flat habitat detail	
SNH_MOIDART_2014_ASCN0086.JPG	MC3	2014-08-08 10:10:29	56.78534	-5.77375	56.78534	-5.77375	Sediment flat habitat detail	
SNH_MOIDART_2014_ASCN0087.JPG	MC3	2014-08-08 10:10:52	56.78534	-5.77375	56.78534	-5.77375	Sediment flat habitat detail	
SNH_MOIDART_2014_ASCN0090.JPG	MC4	2014-08-08 10:29:47	56.78449	-5.77476	56.78449	-5.77476	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0091.JPG	MC4	2014-08-08 10:30:03	56.78449	-5.77476	56.78449	-5.77476	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0092.JPG	MC4	2014-08-08 10:30:15	56.78449	-5.77476	56.78449	-5.77476	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0093.JPG	MC4	2014-08-08 10:30:27	56.78449	-5.77476	56.78449	-5.77476	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0094.JPG	MC4	2014-08-08 10:30:41	56.78449	-5.77476	56.78449	-5.77476	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0095.JPG	MC4	2014-08-08 10:30:56	56.78449	-5.77476	56.78449	-5.77476	Sediment flat habitat detail	
SNH_MOIDART_2014_ASCN0096.JPG	MC4	2014-08-08 10:31:03	56.78449	-5.77476	56.78449	-5.77476	Sediment flat habitat detail	
SNH_MOIDART_2014_ASCN0097.JPG	MC4	2014-08-08 10:33:18	56.78449	-5.77476	56.78449	-5.77476	Sediment flat habitat detail	
SNH_MOIDART_2014_ASCN0113.JPG	MA1	2014-08-08 13:09:03	56.78387	-5.75584	56.78387	-5.75584	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0114.JPG	MA1	2014-08-08 13:09:40	56.78387	-5.75584	56.78387	-5.75584	Quadrat on sediment flat	

Image identifier	Site code	Date and time (UT)	Latitude (original)	Longitude (original)	Latitude (dec deg)	Longitude (dec deg)	Description	Bearing (degrees T)
SNH_MOIDART_2014_ASCN0115.JPG	MA1	2014-08-08 13:09:52	56.78387	-5.75584	56.78387	-5.75584	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0116.JPG	MA1	2014-08-08 13:10:02	56.78387	-5.75584	56.78387	-5.75584	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0117.JPG	MA1	2014-08-08 13:10:16	56.78387	-5.75584	56.78387	-5.75584	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0118.JPG	MA1	2014-08-08 13:10:27	56.78387	-5.75584	56.78387	-5.75584	Sediment flat habitat detail	
SNH_MOIDART_2014_ASCN0119.JPG	MA1	2014-08-08 13:10:50	56.78387	-5.75584	56.78387	-5.75584	Sediment flat habitat detail	
SNH_MOIDART_2014_ASCN0122.JPG	MA2	2014-08-08 13:31:13	56.78427	-5.75504	56.78427	-5.75504	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0123.JPG	MA2	2014-08-08 13:31:22	56.78427	-5.75504	56.78427	-5.75504	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0124.JPG	MA2	2014-08-08 13:31:32	56.78427	-5.75504	56.78427	-5.75504	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0125.JPG	MA2	2014-08-08 13:31:44	56.78427	-5.75504	56.78427	-5.75504	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0126.JPG	MA2	2014-08-08 13:32:00	56.78427	-5.75504	56.78427	-5.75504	Quadrat on sediment flat	
SNH_MOIDART_2014_ASCN0127.JPG	MA2	2014-08-08 13:32:11	56.78427	-5.75504	56.78427	-5.75504	Sediment flat habitat detail	
SNH_MOIDART_2014_ASCN0128.JPG	MA2	2014-08-08 13:32:24	56.78427	-5.75504	56.78427	-5.75504	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0005.JPG	MB5	2014-08-09 08:34:27	56.78704	-5.76365	56.78704	-5.76365	General area	
SNH_MOIDART_2014_DSCN0007.JPG	MB5	2014-08-09 08:34:49	56.78704	-5.76365	56.78704	-5.76365	General area	
SNH_MOIDART_2014_DSCN0008.JPG	MB5	2014-08-09 08:34:55	56.78704	-5.76365	56.78704	-5.76365	General area	
SNH_MOIDART_2014_DSCN0009.JPG	MB5	2014-08-09 08:35:05	56.78704	-5.76365	56.78704	-5.76365	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0010.JPG	MB5	2014-08-09 08:35:18	56.78704	-5.76365	56.78704	-5.76365	Sediment flat habitat detail	

Image identifier	Site code	Date and time (UT)	Latitude (original)	Longitude (original)	Latitude (dec deg)	Longitude (dec deg)	Description	Bearing (degrees T)
SNH_MOIDART_2014_DSCN0012.JPG	MB5	2014-08-09 08:39:01	56.78704	-5.76365	56.78704	-5.76365	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0013.JPG	MB5	2014-08-09 08:39:18	56.78704	-5.76365	56.78704	-5.76365	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0014.JPG	MB5	2014-08-09 08:39:31	56.78704	-5.76365	56.78704	-5.76365	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0015.JPG	MB5	2014-08-09 08:40:01	56.78704	-5.76365	56.78704	-5.76365	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0016.JPG	MB5	2014-08-09 08:40:12	56.78704	-5.76365	56.78704	-5.76365	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0018.JPG	MB4	2014-08-09 09:08:09	56.78647	-5.76643	56.78647	-5.76643	General area	
SNH_MOIDART_2014_DSCN0019.JPG	MB4	2014-08-09 09:08:17	56.78647	-5.76643	56.78647	-5.76643	General area	
SNH_MOIDART_2014_DSCN0020.JPG	MB4	2014-08-09 09:08:21	56.78647	-5.76643	56.78647	-5.76643	General area	
SNH_MOIDART_2014_DSCN0021.JPG	MB4	2014-08-09 09:08:28	56.78647	-5.76643	56.78647	-5.76643	General area	
SNH_MOIDART_2014_DSCN0022.JPG	MB4	2014-08-09 09:08:38	56.78647	-5.76643	56.78647	-5.76643	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0023.JPG	MB4	2014-08-09 09:08:50	56.78647	-5.76643	56.78647	-5.76643	General area	
SNH_MOIDART_2014_DSCN0024.JPG	MB4	2014-08-09 09:09:23	56.78647	-5.76643	56.78647	-5.76643	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0025.JPG	MB4	2014-08-09 09:09:27	56.78647	-5.76643	56.78647	-5.76643	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0026.JPG	MB4	2014-08-09 09:09:41	56.78647	-5.76643	56.78647	-5.76643	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0028.JPG	MB4	2014-08-09 09:15:54	56.78647	-5.76643	56.78647	-5.76643	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0029.JPG	MB4	2014-08-09 09:16:06	56.78647	-5.76643	56.78647	-5.76643	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0030.JPG	MB4	2014-08-09 09:16:18	56.78647	-5.76643	56.78647	-5.76643	Quadrat on sediment flat	

Image identifier	Site code	Date and time (UT)	Latitude (original)	Longitude (original)	Latitude (dec deg)	Longitude (dec deg)	Description	Bearing (degrees T)
SNH_MOIDART_2014_DSCN0031.JPG	MB4	2014-08-09 09:16:31	56.78647	-5.76643	56.78647	-5.76643	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0032.JPG	MB4	2014-08-09 09:16:43	56.78647	-5.76643	56.78647	-5.76643	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0034.JPG	MB3	2014-08-09 09:39:18	56.78622	-5.76761	56.78622	-5.76761	General area	
SNH_MOIDART_2014_DSCN0035.JPG	MB3	2014-08-09 09:39:40	56.78622	-5.76761	56.78622	-5.76761	General area	
SNH_MOIDART_2014_DSCN0036.JPG	MB3	2014-08-09 09:39:46	56.78622	-5.76761	56.78622	-5.76761	General area	
SNH_MOIDART_2014_DSCN0037.JPG	MB3	2014-08-09 09:39:54	56.78622	-5.76761	56.78622	-5.76761	General area	
SNH_MOIDART_2014_DSCN0038.JPG	MB3	2014-08-09 09:40:08	56.78622	-5.76761	56.78622	-5.76761	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0039.JPG	MB3	2014-08-09 09:40:15	56.78622	-5.76761	56.78622	-5.76761	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0040.JPG	MB3	2014-08-09 09:40:19	56.78622	-5.76761	56.78622	-5.76761	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0041.JPG	MB3	2014-08-09 09:40:31	56.78622	-5.76761	56.78622	-5.76761	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0042.JPG	MB3	2014-08-09 09:40:36	56.78622	-5.76761	56.78622	-5.76761	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0043.JPG	MB3	2014-08-09 09:41:00	56.78622	-5.76761	56.78622	-5.76761	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0044.JPG	MB3	2014-08-09 09:41:06	56.78622	-5.76761	56.78622	-5.76761	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0046.JPG	MB3	2014-08-09 09:46:36	56.78622	-5.76761	56.78622	-5.76761	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0047.JPG	MB3	2014-08-09 09:46:53	56.78622	-5.76761	56.78622	-5.76761	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0048.JPG	MB3	2014-08-09 09:47:04	56.78622	-5.76761	56.78622	-5.76761	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0049.JPG	MB3	2014-08-09 09:47:17	56.78622	-5.76761	56.78622	-5.76761	Quadrat on sediment flat	

Image identifier	Site code	Date and time (UT)	Latitude (original)	Longitude (original)	Latitude (dec deg)	Longitude (dec deg)	Description	Bearing (degrees T)
SNH_MOIDART_2014_DSCN0050.JPG	MB3	2014-08-09 09:47:32	56.78622	-5.76761	56.78622	-5.76761	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0052.JPG	MB2	2014-08-09 10:07:42	56.78600	-5.76866	56.78600	-5.76866	General area	
SNH_MOIDART_2014_DSCN0053.JPG	MB2	2014-08-09 10:08:02	56.78600	-5.76866	56.78600	-5.76866	General area	
SNH_MOIDART_2014_DSCN0054.JPG	MB2	2014-08-09 10:08:10	56.78600	-5.76866	56.78600	-5.76866	General area	
SNH_MOIDART_2014_DSCN0055.JPG	MB2	2014-08-09 10:08:18	56.78600	-5.76866	56.78600	-5.76866	General area	
SNH_MOIDART_2014_DSCN0056.JPG	MB2	2014-08-09 10:08:36	56.78600	-5.76866	56.78600	-5.76866	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0057.JPG	MB2	2014-08-09 10:08:48	56.78600	-5.76866	56.78600	-5.76866	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0058.JPG	MB2	2014-08-09 10:09:01	56.78600	-5.76866	56.78600	-5.76866	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0059.JPG	MB2	2014-08-09 10:09:42	56.78600	-5.76866	56.78600	-5.76866	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0061.JPG	MB2	2014-08-09 10:14:54	56.78600	-5.76866	56.78600	-5.76866	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0062.JPG	MB2	2014-08-09 10:15:06	56.78600	-5.76866	56.78600	-5.76866	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0063.JPG	MB2	2014-08-09 10:15:19	56.78600	-5.76866	56.78600	-5.76866	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0064.JPG	MB2	2014-08-09 10:15:33	56.78600	-5.76866	56.78600	-5.76866	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0065.JPG	MB2	2014-08-09 10:15:45	56.78600	-5.76866	56.78600	-5.76866	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0067.JPG	MB1	2014-08-09 10:37:13	56.78581	-5.76968	56.78581	-5.76968	General area	
SNH_MOIDART_2014_DSCN0068.JPG	MB1	2014-08-09 10:37:22	56.78581	-5.76968	56.78581	-5.76968	General area	
SNH_MOIDART_2014_DSCN0069.JPG	MB1	2014-08-09 10:37:31	56.78581	-5.76968	56.78581	-5.76968	General area	

Image identifier	Site code	Date and time (UT)	Latitude (original)	Longitude (original)	Latitude (dec deg)	Longitude (dec deg)	Description	Bearing (degrees T)
SNH_MOIDART_2014_DSCN0070.JPG	MB1	2014-08-09 10:37:37	56.78581	-5.76968	56.78581	-5.76968	General area	
SNH_MOIDART_2014_DSCN0071.JPG	MB1	2014-08-09 10:37:48	56.78581	-5.76968	56.78581	-5.76968	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0072.JPG	MB1	2014-08-09 10:37:56	56.78581	-5.76968	56.78581	-5.76968	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0073.JPG	MB1	2014-08-09 10:38:06	56.78581	-5.76968	56.78581	-5.76968	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0074.JPG	MB1	2014-08-09 10:38:15	56.78581	-5.76968	56.78581	-5.76968	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0075.JPG	MB1	2014-08-09 10:38:21	56.78581	-5.76968	56.78581	-5.76968	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0076.JPG	MB1	2014-08-09 10:38:37	56.78581	-5.76968	56.78581	-5.76968	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0077.JPG	MB1	2014-08-09 10:39:03	56.78581	-5.76968	56.78581	-5.76968	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0078.JPG	MB1	2014-08-09 10:39:20	56.78581	-5.76968	56.78581	-5.76968	General area	
SNH_MOIDART_2014_DSCN0080.JPG	MB1	2014-08-09 10:44:28	56.78581	-5.76968	56.78581	-5.76968	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0081.JPG	MB1	2014-08-09 10:44:38	56.78581	-5.76968	56.78581	-5.76968	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0082.JPG	MB1	2014-08-09 10:44:48	56.78581	-5.76968	56.78581	-5.76968	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0083.JPG	MB1	2014-08-09 10:44:58	56.78581	-5.76968	56.78581	-5.76968	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0084.JPG	MB1	2014-08-09 10:45:08	56.78581	-5.76968	56.78581	-5.76968	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0290.JPG	MD3	2014-08-10 09:18:54	56.78804	-5.78871	56.78804	-5.78871	General area (towards mouth of estuary)	
SNH_MOIDART_2014_DSCN0291.JPG	MD3	2014-08-10 09:19:04	56.78804	-5.78871	56.78804	-5.78871	General area (towards mouth of estuary)	

Image identifier	Site code	Date and time (UT)	Latitude (original)	Longitude (original)	Latitude (dec deg)	Longitude (dec deg)	Description	Bearing (degrees T)
SNH_MOIDART_2014_DSCN0292.JPG	MD3	2014-08-10 09:19:12	56.78804	-5.78871	56.78804	-5.78871	General area (towards north shore)	360
SNH_MOIDART_2014_DSCN0293.JPG	MD3	2014-08-10 09:19:21	56.78804	-5.78871	56.78804	-5.78871	General area (towards head of estuary)	
SNH_MOIDART_2014_DSCN0294.JPG	MD3	2014-08-10 09:19:31	56.78804	-5.78871	56.78804	-5.78871	General area (towards south shore)	180
SNH_MOIDART_2014_DSCN0295.JPG	MD3	2014-08-10 09:19:44	56.78804	-5.78871	56.78804	-5.78871	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0296.JPG	MD3	2014-08-10 09:19:50	56.78804	-5.78871	56.78804	-5.78871	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0297.JPG	MD3	2014-08-10 09:20:04	56.78804	-5.78871	56.78804	-5.78871	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0298.JPG	MD3	2014-08-10 09:20:20	56.78804	-5.78871	56.78804	-5.78871	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0300.JPG	MD3	2014-08-10 09:25:51	56.78804	-5.78871	56.78804	-5.78871	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0301.JPG	MD3	2014-08-10 09:26:13	56.78804	-5.78871	56.78804	-5.78871	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0302.JPG	MD3	2014-08-10 09:26:52	56.78804	-5.78871	56.78804	-5.78871	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0303.JPG	MD3	2014-08-10 09:27:22	56.78804	-5.78871	56.78804	-5.78871	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0304.JPG	MD3	2014-08-10 09:27:39	56.78804	-5.78871	56.78804	-5.78871	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0305.JPG	MD3	2014-08-10 09:27:54	56.78804	-5.78871	56.78804	-5.78871	Quadrat 6	
SNH_MOIDART_2014_DSCN0306.JPG	MD (top of transect)	2014-08-10 09:42:39	56.78735	-5.78945	56.78735	-5.78945	View up transect from lower boundary of fucoids	
SNH_MOIDART_2014_DSCN0307.JPG	MD (top of transect)	2014-08-10 09:42:54	56.78735	-5.78945	56.78735	-5.78945	lower boundary of fucoids	

Image identifier	Site code	Date and time (UT)	Latitude (original)	Longitude (original)	Latitude (dec deg)	Longitude (dec deg)	Description	Bearing (degrees T)
SNH_MOIDART_2014_DSCN0308.JPG	MD (top of transect)	2014-08-10 09:42:59	56.78735	-5.78945	56.78735	-5.78945	View up transect from lower boundary of fucoids	
SNH_MOIDART_2014_DSCN0309.JPG	MD (top of transect)	2014-08-10 09:43:47	56.78735	-5.78945	56.78735	-5.78945	View up transect from lower boundary of fucoids	
SNH_MOIDART_2014_DSCN0310.JPG	MD (top of transect)	2014-08-10 09:44:04	56.78735	-5.78945	56.78735	-5.78945	View up transect from lower boundary of fucoids	
SNH_MOIDART_2014_DSCN0311.JPG	MD (top of transect)	2014-08-10 09:44:54	56.78735	-5.78945	56.78735	-5.78945	Piton & lichen zones	
SNH_MOIDART_2014_DSCN0312.JPG	MD (top of transect)	2014-08-10 09:44:59	56.78735	-5.78945	56.78735	-5.78945	Piton & lichen zones	
SNH_MOIDART_2014_DSCN0313.JPG	MD (top of transect)	2014-08-10 09:45:06	56.78735	-5.78945	56.78735	-5.78945	View down transect over fucoids	
SNH_MOIDART_2014_DSCN0315.JPG	MD2	2014-08-10 10:09:53	56.78971	-5.78655	56.78971	-5.78655	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0316.JPG	MD2	2014-08-10 10:09:58	56.78971	-5.78655	56.78971	-5.78655	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0317.JPG	MD2	2014-08-10 10:10:16	56.78971	-5.78655	56.78971	-5.78655	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0318.JPG	MD2	2014-08-10 10:10:24	56.78971	-5.78655	56.78971	-5.78655	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0319.JPG	MD2	2014-08-10 10:10:33	56.78971	-5.78655	56.78971	-5.78655	General area (towards mouth of estuary)	
SNH_MOIDART_2014_DSCN0320.JPG	MD2	2014-08-10 10:10:40	56.78971	-5.78655	56.78971	-5.78655	General area (towards north shore)	360
SNH_MOIDART_2014_DSCN0321.JPG	MD2	2014-08-10 10:10:47	56.78971	-5.78655	56.78971	-5.78655	General area (towards head of estuary)	

Image identifier	Site code	Date and time (UT)	Latitude (original)	Longitude (original)	Latitude (dec deg)	Longitude (dec deg)	Description	Bearing (degrees T)
SNH_MOIDART_2014_DSCN0322.JPG	MD2	2014-08-10 10:10:55	56.78971	-5.78655	56.78971	-5.78655	General area (towards south shore)	180
SNH_MOIDART_2014_DSCN0323.JPG	MD2	2014-08-10 10:12:04	56.78971	-5.78655	56.78971	-5.78655	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0324.JPG	MD2	2014-08-10 10:12:16	56.78971	-5.78655	56.78971	-5.78655	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0325.JPG	MD2	2014-08-10 10:12:26	56.78971	-5.78655	56.78971	-5.78655	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0326.JPG	MD2	2014-08-10 10:12:37	56.78971	-5.78655	56.78971	-5.78655	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0327.JPG	MD2	2014-08-10 10:12:52	56.78971	-5.78655	56.78971	-5.78655	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0330.JPG	MD1	2014-08-10 10:33:56	56.79088	-5.78523	56.79088	-5.78523	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0331.JPG	MD1	2014-08-10 10:34:06	56.79088	-5.78523	56.79088	-5.78523	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0332.JPG	MD1	2014-08-10 10:34:19	56.79088	-5.78523	56.79088	-5.78523	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0333.JPG	MD1	2014-08-10 10:34:28	56.79088	-5.78523	56.79088	-5.78523	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0334.JPG	MD1	2014-08-10 10:34:42	56.79088	-5.78523	56.79088	-5.78523	General area (towards mouth of estuary)	
SNH_MOIDART_2014_DSCN0335.JPG	MD1	2014-08-10 10:34:49	56.79088	-5.78523	56.79088	-5.78523	General area (towards north shore)	360
SNH_MOIDART_2014_DSCN0336.JPG	MD1	2014-08-10 10:34:54	56.79088	-5.78523	56.79088	-5.78523	General area (towards head of estuary)	
SNH_MOIDART_2014_DSCN0337.JPG	MD1	2014-08-10 10:35:03	56.79088	-5.78523	56.79088	-5.78523	General area (towards south shore)	180
SNH_MOIDART_2014_DSCN0338.JPG	MD1	2014-08-10 10:35:19	56.79088	-5.78523	56.79088	-5.78523	Quadrat on sediment flat	

Image identifier	Site code	Date and time (UT)	Latitude (original)	Longitude (original)	Latitude (dec deg)	Longitude (dec deg)	Description	Bearing (degrees T)
SNH_MOIDART_2014_DSCN0339.JPG	MD1	2014-08-10 10:35:28	56.79088	-5.78523	56.79088	-5.78523	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0340.JPG	MD1	2014-08-10 10:35:42	56.79088	-5.78523	56.79088	-5.78523	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0341.JPG	MD1	2014-08-10 10:35:59	56.79088	-5.78523	56.79088	-5.78523	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0342.JPG	MD1	2014-08-10 10:36:19	56.79088	-5.78523	56.79088	-5.78523	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0536.JPG	ME1	2014-08-11 10:56:12	56.78994	-5.80955	56.78994	-5.80955	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0537.JPG	ME1	2014-08-11 10:56:20	56.78994	-5.80955	56.78994	-5.80955	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0538.JPG	ME1	2014-08-11 10:56:41	56.78994	-5.80955	56.78994	-5.80955	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0539.JPG	ME1	2014-08-11 10:57:03	56.78994	-5.80955	56.78994	-5.80955	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0540.JPG	ME1	2014-08-11 10:57:23	56.78994	-5.80955	56.78994	-5.80955	View up transect	
SNH_MOIDART_2014_DSCN0541.JPG	ME1	2014-08-11 10:57:31	56.78994	-5.80955	56.78994	-5.80955	View to north of transect	360
SNH_MOIDART_2014_DSCN0542.JPG	ME1	2014-08-11 10:57:43	56.78994	-5.80955	56.78994	-5.80955	View down transect	
SNH_MOIDART_2014_DSCN0543.JPG	ME1	2014-08-11 10:57:49	56.78994	-5.80955	56.78994	-5.80955	View to south of transect	
SNH_MOIDART_2014_DSCN0544.JPG	ME1	2014-08-11 10:59:50	56.78994	-5.80955	56.78994	-5.80955	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0545.JPG	ME1	2014-08-11 11:00:19	56.78994	-5.80955	56.78994	-5.80955	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0546.JPG	ME1	2014-08-11 11:00:34	56.78994	-5.80955	56.78994	-5.80955	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0547.JPG	ME1	2014-08-11 11:01:01	56.78994	-5.80955	56.78994	-5.80955	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0548.JPG	ME1	2014-08-11 11:01:33	56.78994	-5.80955	56.78994	-5.80955	Quadrat on sediment flat	

Image identifier	Site code	Date and time (UT)	Latitude (original)	Longitude (original)	Latitude (dec deg)	Longitude (dec deg)	Description	Bearing (degrees T)
SNH_MOIDART_2014_DSCN0551.JPG	ME2	2014-08-11 11:30:52	56.78916	-5.80339	56.78916	-5.80339	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0552.JPG	ME2	2014-08-11 11:31:02	56.78916	-5.80339	56.78916	-5.80339	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0553.JPG	ME2	2014-08-11 11:31:09	56.78916	-5.80339	56.78916	-5.80339	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0554.JPG	ME2	2014-08-11 11:31:16	56.78916	-5.80339	56.78916	-5.80339	Sediment flat habitat detail	
SNH_MOIDART_2014_DSCN0555.JPG	ME2	2014-08-11 11:31:37	56.78916	-5.80339	56.78916	-5.80339	View up transect	
SNH_MOIDART_2014_DSCN0556.JPG	ME2	2014-08-11 11:31:46	56.78916	-5.80339	56.78916	-5.80339	View to north of transect	360
SNH_MOIDART_2014_DSCN0557.JPG	ME2	2014-08-11 11:31:53	56.78916	-5.80339	56.78916	-5.80339	View down transect	
SNH_MOIDART_2014_DSCN0558.JPG	ME2	2014-08-11 11:32:08	56.78916	-5.80339	56.78916	-5.80339	View to south of transect	180
SNH_MOIDART_2014_DSCN0559.JPG	ME2	2014-08-11 11:32:30	56.78916	-5.80339	56.78916	-5.80339	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0560.JPG	ME2	2014-08-11 11:32:45	56.78916	-5.80339	56.78916	-5.80339	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0561.JPG	ME2	2014-08-11 11:32:59	56.78916	-5.80339	56.78916	-5.80339	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0562.JPG	ME2	2014-08-11 11:33:11	56.78916	-5.80339	56.78916	-5.80339	Quadrat on sediment flat	
SNH_MOIDART_2014_DSCN0563.JPG	ME2	2014-08-11 11:33:25	56.78916	-5.80339	56.78916	-5.80339	Quadrat on sediment flat	

Table 5.2 Log of video data collected in Loch Moidart

Site	Date and time start (UT)	Date and time end (UT)	Latitude start	Longitude start	Latitude end	Longitude end	Media ID (original)	MP4 file	Video time code (start)	Video time code (end)	Substrate
MC 1	2014-08-08 09:15:31	2014-08-08 09:15:53	56.78697	-5.77189	56.78697	-5.77189	ASCN0068.MOV	Moidart_2014-08-08_MC1.MP4	00:00:00	00:00:22	mid shore slightly muddy sand flat
MC 2	2014-08-08 09:50:07	2014-08-08 09:50:29	56.78639	-5.77257	56.78639	-5.77257	ASCN0078.MOV	Moidart_2014-08-08_MC2.MP4	00:00:00	00:00:22	mid shore fine sand flat
MC 3	2014-08-08 10:11:12	2014-08-08 10:11:38	56.78534	-5.77375	56.78534	-5.77375	ASCN0088.MOV	Moidart_2014-08-08_MC3.MP4	00:00:00	00:00:26	mid shore slightly muddy sand flat
MC 4	2014-08-08 10:33:29	2014-08-08 10:34:00	56.78449	-5.77476	56.78449	-5.77476	ASCN0098.MOV	Moidart_2014-08-08_MC4.MP4	00:00:00	00:00:31	mid shore slightly muddy sand flat
MA 1	2014-08-08 13:13:52	2014-08-08 13:14:23	56.78387	-5.75584	56.78387	-5.75584	ASCN0120.MOV	Moidart_2014-08-08_MA1.MP4	00:00:00	00:00:31	upper shore muddy sand flat
MA 2	2014-08-08 13:32:43	2014-08-08 13:33:12	56.78427	-5.75504	56.78427	-5.75504	ASCN0129.MOV	Moidart_2014-08-08_MA2.MP4	00:00:00	00:00:29	upper shore muddy sand flat
MB 5	2014-08-09 08:35:39	2014-08-09 08:37:57	56.78704	-5.76365	56.78704	-5.76365	DSCN0011.MOV	Moidart_2014-08-09_MB5.MP4	00:00:00	00:02:18	upper shore slightly muddy gravelly sand flat

Site	Date and time start (UT)	Date and time end (UT)	Latitude start	Longitude start	Latitude end	Longitude end	Media ID (original)	MP4 file	Video time code (start)	Video time code (end)	Substrate
MB 4	2014-08-09 09:11:05	2014-08-09 09:15:22	56.78647	-5.76643	56.78647	-5.76643	DSCN0027.MOV	Moidart_2014-08-09_MB4.MP4	00:00:00	00:04:17	upper shore slightly muddy sand flat
MB 3	2014-08-09 09:41:22	2014-08-09 09:45:34	56.78622	-5.76761	56.78622	-5.76761	DSCN0045.MOV	Moidart_2014-08-09_MB3.MP4	00:00:00	00:04:12	mid shore muddy sand flat
MB 2	2014-08-09 10:10:02	2014-08-09 10:14:05	56.78600	-5.76866	56.78600	-5.76866	DSCN0060.MOV	Moidart_2014-08-09_MB2.MP4	00:00:00	00:04:03	mid shore slightly muddy sand flat
MB 1	2014-08-09 10:39:38	2014-08-09 10:43:59	56.78581	-5.76968	56.78581	-5.76968	DSCN0079.MOV	Moidart_2014-08-09_MB1.MP4	00:00:00	00:04:21	lower shore slightly muddy gravelly sand flat
MD 3	2014-08-10 09:21:04	2014-08-10 09:23:46	56.78804	-5.78871	56.78804	-5.78871	DSCN0299.MOV	Moidart_2014-08-10_MD3.MP4	00:00:00	00:02:42	mid shore slightly muddy sand flat
MD 2	2014-08-10 10:13:18	2014-08-10 10:15:53	56.78971	-5.78655	56.78971	-5.78655	DSCN0328.MOV	Moidart_2014-08-10_MD2.MP4	00:00:00	00:02:35	mid shore fine sand flat
MD 1	2014-08-10 10:36:52	2014-08-10 10:36:55	56.79088	-5.78523	56.79088	-5.78523	DSCN0343.MOV	Moidart_2014-08-10_MD1.MP4	00:00:00	00:00:03	lower shore fine sand flat

Site	Date and time start (UT)	Date and time end (UT)	Latitude start	Longitude start	Latitude end	Longitude end	Media ID (original)	MP4 file	Video time code (start)	Video time code (end)	Substrate
ME 1	2014-08-11 11:02:18	2014-08-11 11:05:38	56.78994	-5.80955	56.78994	-5.80955	DSCN0549.MOV	Moidart_2014-08-11_ME1.MP4	00:00:00	00:03:20	lower shore muddy sand flat
ME 2	2014-08-11 11:34:04	2014-08-11 11:37:02	56.78916	-5.80339	56.78916	-5.80339	DSCN0564.MOV	Moidart_2014-08-11_ME2.MP4	00:00:00	00:02:58	lower shore fine sand flat

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