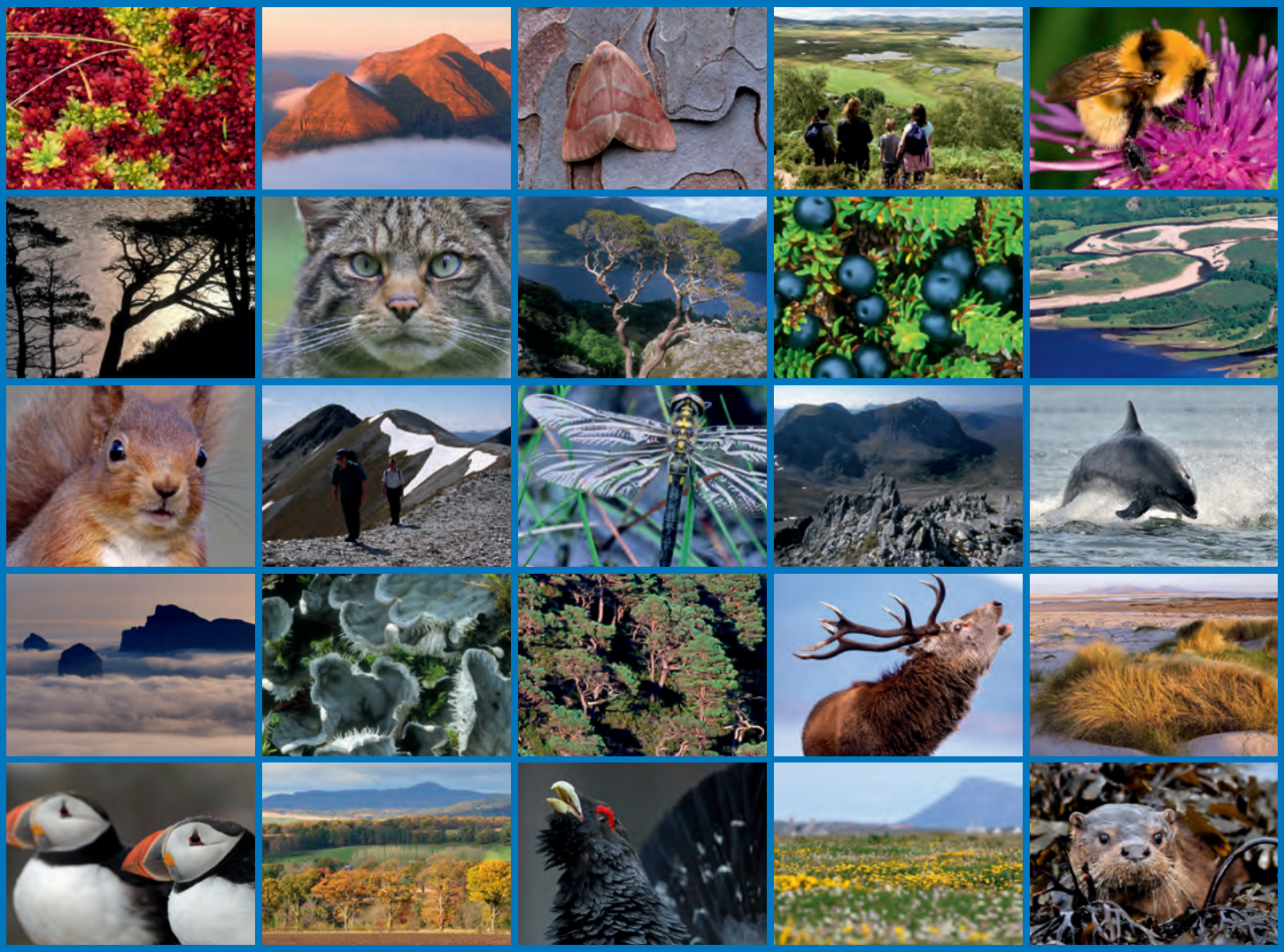
Scottish Natural Heritage
Commissioned Report No. 631

Biological analyses of underwater video from research cruises in the Clyde Sea (Loch Goil and the south of Arran) and in Orkney (Rousay Sound and Stronsay Firth)



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COMMISSIONED REPORT

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For further information on this report please contact:

Lisa Kamphausen
Scottish Natural Heritage
Great Glen House
INVERNESS
IV3 8NW
Telephone: 01463 725236
E-mail: lisa.kamphausen@snh.gov.uk

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COMMISSIONED REPORT

Summary

Biological analyses of underwater video from research cruises in the Clyde Sea (Loch Goil and the south of Arran) and in Orkney (Rousay Sound and Stronsay Firth

Commissioned Report No. 631
Contractor: Dr Colin Moore
Year of publication: 2013

Background

Scottish Natural Heritage and the Joint Nature Conservation Committee have generated a focused list of habitats and species of importance in Scottish waters - the Priority Marine Features (PMFs), which are regarded as priorities for conservation action in territorial waters. A subset of these biological features, together with a list of large-scale features of functional importance to Scotland's seas (collectively termed MPA search features) have driven the identification of a network of 33 locations currently under consideration by the Scottish Government as possible Nature Conservation Marine Protected Areas (pMPAs). To ensure that the network meets the legislative obligations for MPAs, other features representative of Scotland's seas more generally have also been recommended for formal designation as protected features of these new sites. The combination of MPA search features and representative features recommended for protection within a pMPA are collectively referred to as proposed protected features (PPFs). The aim of the present investigation was to improve knowledge of the occurrence and distribution of species and habitats of recognised conservation importance in Scottish waters, particularly PPFs and other PMFs, but also to take into consideration other importance measures. This was achieved through the analysis of seabed video and still photographic imagery collected during research cruises within pMPAs in Loch Goil, off the South of Arran (Clyde Sea) and in Rousay Sound (Orkney), and in the area of a proposed tidal energy test facility in Stronsay Firth (Orkney).

Main findings

- In Loch Goil all records of features of conservation importance were restricted to the outer half of the loch. These included burrowed mud supporting fairly low densities of megafaunal burrowers in deeper water (**SS.SMu.CFiMu.SpnMeg**), and two records of sparse *Pachycerianthus multiplicatus*. Silty, mixed, stony sediments on the sill near the mouth of the loch and in adjacent shallow water areas supported dense burrowing sea cucumbers (**SS.SMx.CMx.CIlo.ModHo**), with two uncertain examples of sandy mud (**SS.SMu.CSaMu.VirOphPmax**) also being recorded here in areas of more homogeneous sediments.
- Burrowed mud supporting a rich megafaunal component (**SS.SMu.CFiMu.SpnMeg**) was found to be extensively distributed in deeper water around the south of Arran. An inshore band of coarse sediments around the more exposed Arran coastline included the widespread presence of dead maerl and coarse sand with burrowing sea cucumbers (**SS.SMp.Mrl.Pcal.Nmix**), with patches of fairly sparse living maerl (**SS.SMp.Mrl.Pcal.Nmix**) also encountered at three sites. Kelp and seaweed

communities on a sandy substrate (**SS.SMp.KSwSS.LsacR.Sa**) were recorded in the more sheltered Whiting Bay. The presence of siphons of *Arctica islandica* emerging from sandy mud was widely recorded around Arran, becoming abundant at one site.

- The only habitat of recognised conservation importance observed in Rousay Sound was uncertain or poor examples of **SS.SMp.KSwSS.LsacR.Sa**, with most of the algal component apparently derived from drift material.
- Dense *Modiolus modiolus* was recorded, at least in patches, at three sites in the tide-swept Stronsay Firth (**SS.SBR.SMus.ModT**). However, the mussels appeared to contribute little to the biodiversity of the habitat, which appeared to be poorly developed.

For further information on this project contact:
Lisa Kamphausen, Scottish Natural Heritage, Great Glen House, Inverness, IV3 8NW.
Tel: 01463 725236 or lisa.kamphausen@snh.gov.uk
For further information on the SNH Research & Technical Support Programme contact:
Knowledge & Information Unit, Scottish Natural Heritage, Great Glen House, Inverness, IV3 8NW.
Tel: 01463 725000 or research@snh.gov.uk

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Acknowledgements

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1. INTRODUCTION

Provisions to designate new Marine Protected Areas (MPAs) within Scottish waters have been introduced through the Marine (Scotland) Act 2010 and the UK Marine and Coastal Access Act 2009. Scottish Natural Heritage (SNH) and the Joint Nature Conservation Committee (JNCC) have generated a focused list of habitats and species of importance in Scottish waters - the Priority Marine Features (PMFs) (SNH, 2012), which are regarded as priorities for conservation action in territorial waters.

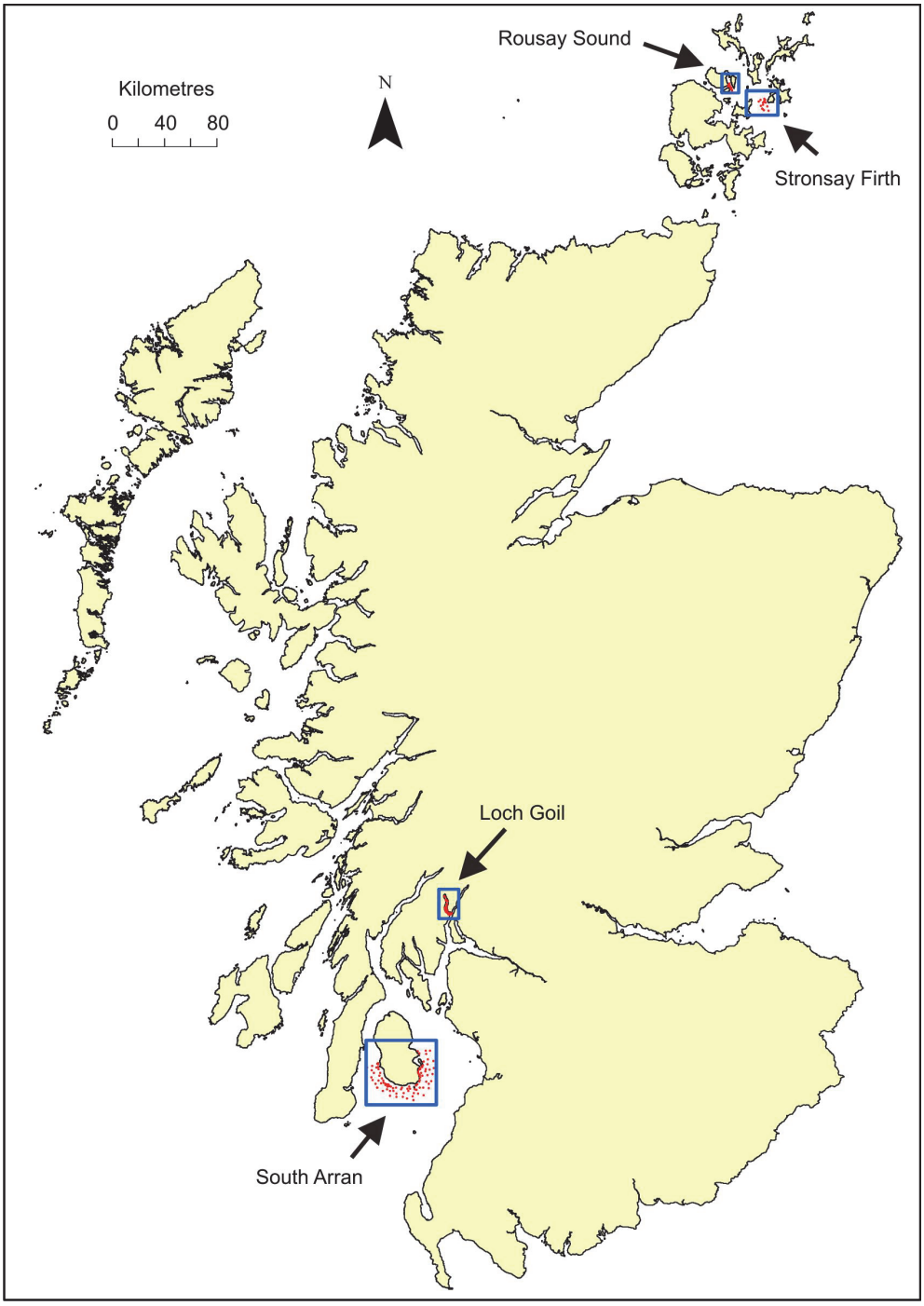

Figure 1. Distribution of survey locations (blue boxes) and sites (red dots). Reproduced by permission of Ordnance Survey on behalf of HMSO. © Crown copyright and database right [2013]. All rights reserved. Ordnance Survey Licence number 100017908.

A subset of these biological features, together with a list of large-scale features of functional importance to Scotland's seas (collectively termed MPA search features - see Marine Scotland, 2011 for list) have driven the identification of a network of 33 areas currently under consideration by the Scottish Government as possible Nature Conservation MPAs (pMPAs). To ensure that the network meets the legislative obligations for MPAs, other features representative of Scotland's seas more generally have also been recommended for formal designation as protected features of these new sites. The combination of MPA search features and representative features recommended for protection within a pMPA are collectively referred to as proposed protected features (PPFs). Appendix 1 shows details of the PPFs of the three pMPAs covered in this report.

The aim of the present investigation was to improve knowledge of the occurrence and distribution of species and habitats of recognised conservation importance in four locations through the analysis of seabed video and still photographic imagery collected during research cruises by SNH and Marine Scotland Science (MSS) in 2013. This included consideration of not only PPFs and other PMFs, but also taking cognisance of other importance measures. Survey areas included Loch Goil, which lies within the Upper Loch Fyne and Loch Goil pMPA, much of the South Arran pMPA, and the southern region of Rousay Sound, which forms part of the Wyre and Rousay Sounds pMPA. A fourth area, Stronsay Firth, is not under consideration for MPA status, but is being proposed as a location for a tidal energy test facility.

2. METHODS

Survey details are given in Table 1. Video images were obtained from dropdown video drifts. For the Orkney surveys the camera frame also carried a vertically-orientated, digital stills camera, which took photographs of the seabed at intervals, and a laser scaling system. Track and depth data were displayed on a video overlay system for the Orkney surveys, with start and end depths and positions provided for the Clyde surveys. All depths were converted to depth below chart datum, employing TotalTide software (Admiralty, Taunton) to determine tidal rise at the most appropriate secondary port.

Table 1. Survey details

Survey	Organisation	Vessel	Cruise	Date	No. sites
Loch Goil	SNH	*Sir John Murray*	N/A	19-20/03/2013	27
South Arran	SNH	*Sir John Murray*	N/A	18-27/03/2013 15-16/07/2013	92
Rousay Sound	MSS	*FRV Alba na Mara*	0213A	11/02/2013	10
Stronsay Firth	MSS	*FRV Alba na Mara*	0213A	8-9/02/2013	14

The images were used to describe the nature of the seabed in terms of the physical structure and the species assemblages. Species present were, as far as possible, identified and quantified using the semi-quantitative MNCR SACFOR scale (Hiscock, 1996), details of which can be found in the appendices. Based on the physical and biological attributes, biotopes were allocated (Connor *et al.*, 2004). Runs traversing a sequence of biotopes were split into corresponding segments, with the transition points recorded using the time, and in the case of the Orkney surveys, position and depth. Segmentation of runs was not practicable in the case of mosaics of recurring biotopes, in which case all biotopes observed were simply listed.

Runs and run segments were assessed for the presence of PPFs and other PMFs, as well as for the presence of species and habitats of recognised conservation importance according to a number of additional criteria, including citation on the following lists: the IUCN Red List of Threatened Species (lower risk category) (IUCN, 2013), the OSPAR List of Threatened and/or Declining Species and Habitats (OSPAR, 2008) and the Scottish Biodiversity List (Scottish Government, 2013).

3. RESULTS

The presence and distribution of habitats, biotopes and species in each survey area is summarised in this section, but presented in detail for each site in Appendix 3, with site location data in Appendix 2. In this section PPF biotopes and species are highlighted using red text. Appendix 4 provides an inventory of the biotopes recorded, as well as PPF species, together with illustrative photographs and lists of their occurrence.

3.1 Loch Goil (Figure 2)

Most of Loch Goil is floored by mud, with stations in the inner half below 40 m depth exhibiting evidence of reduced sediments in the form of black marbling and patches of *Beggiatoa* sp. Dipper and Beaver (1999) noted that stagnation occurs in the deeper waters of Loch Goil below the thermocline in summer. The visible fauna was dominated by dense *Oxydromus flexuosus*, accompanied at some sites by large numbers of emergent faunal tubes. In general sea pens and megafaunal burrows were absent. The sites displaying these characteristics have been ascribed to **SS.SMu.IFiMu.Beg**, although certainty would require the acquisition of infaunal data.

Mud is also extensively distributed in the outer half and mouth of Loch Goil at depths of 25 - 58 m. The habitat is largely of low topographic relief supporting fairly sparse megafaunal burrowers, especially *Nephrops norvegicus* and *Calocaris macandreae*, and occasional to frequent *Virgularia mirabilis* (**SS.SMu.CFiMu.SpnMeg**). Coarser sediments were recorded close to the mouth of the loch, particularly on the sill at depths of 21 - 26 m, where silty, mixed, stony sediments supported large numbers of burrowing holothurians. Although the characterising species, *Modiolus modiolus* and *Cerianthus lloydii*, were unrecorded from most of these stations, the records have been ascribed to the biotope **SS.SMx.CMx.Cllo.ModHo**, in accordance with previous interpretations (Dipper and Beaver, 1999), except where the holothurians were accompanied by dense *Ophiothrix fragilis* (**SS.SMx.CMx.OphMx**). Areas of more homogeneous muddy sediments here, supporting *V. mirabilis* have been assigned to **SS.SMu.CSaMu.VirOphPmax**.

Protanthea simplex was widely distributed in Loch Goil attached to a variety of solid substrata, such as drift algae, but was the dominant species on silted bedrock at two sites (**CR.LCR.BrAs.NeoPro.FS**). A total of four specimens of *Pachycerianthus multiplicatus* were observed at two sites in the outer part of the loch.

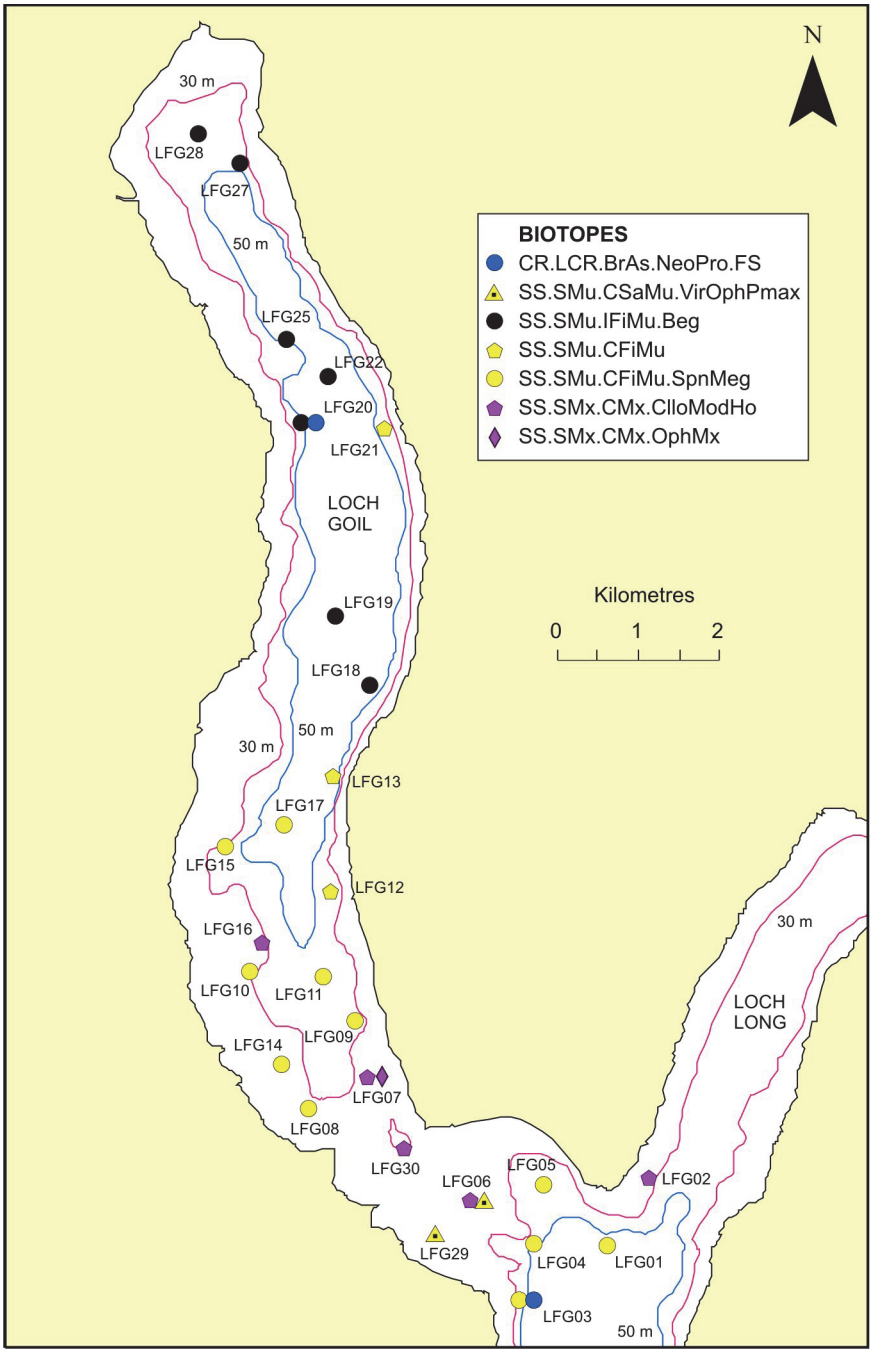

Figure 2. Distribution of biotope records in Loch Goil. Reproduced by permission of Ordnance Survey on behalf of HMSO. © Crown copyright and database right [2013]. All rights reserved. Ordnance Survey Licence number 100017908.

3.2 South Arran (Figure 3)

Along the more wave-exposed, southern coastline of Arran, coarse sediment habitats were predominantly recorded above the 20 m depth contour, mostly in the form of waves of coarse sand, maerl gravel and stone gravel. Most of these sites displayed little evidence of the infaunal component (**SS.SCS.CCS**), but *Neopentadactyla mixta* was recorded at six sites over a wide area from Drumadoon Point in the west to Bennan Head in the east (**SS.SCS.CCS.Nmix**). Sparse live rhodoliths of *Phymatolithon calcareum* were recorded at several of these coarse sediment sites, but patches of higher density (around 10% cover)

were observed at three sites to the west of Cleiteadh Mór. These patches have been regarded as fairly low quality examples of the maerl biotope, **SS.SMp.Mrl.Pcal.Nmix**. At a number of sites in this area of the coastline the coarse sediments were accompanied by boulders, cobbles and pebbles, with the larger stones at several sites supporting a patchy turf of red filamentous algae, together with a sparse encrusting community dominated by pink coralline algae and serpulid worms (tentatively assigned to **IR.HIR.KFaR.FoR**). Coarse sand (**SS.SCS.CCS**) was also recorded in deeper water (47 - 53 m) to the south of Pladda in an area of accelerated tidal currents, with a sparse visible fauna, apart from dense patches of *Ophiocomina nigra* (**SS.SMx.CMx.OphMx**).

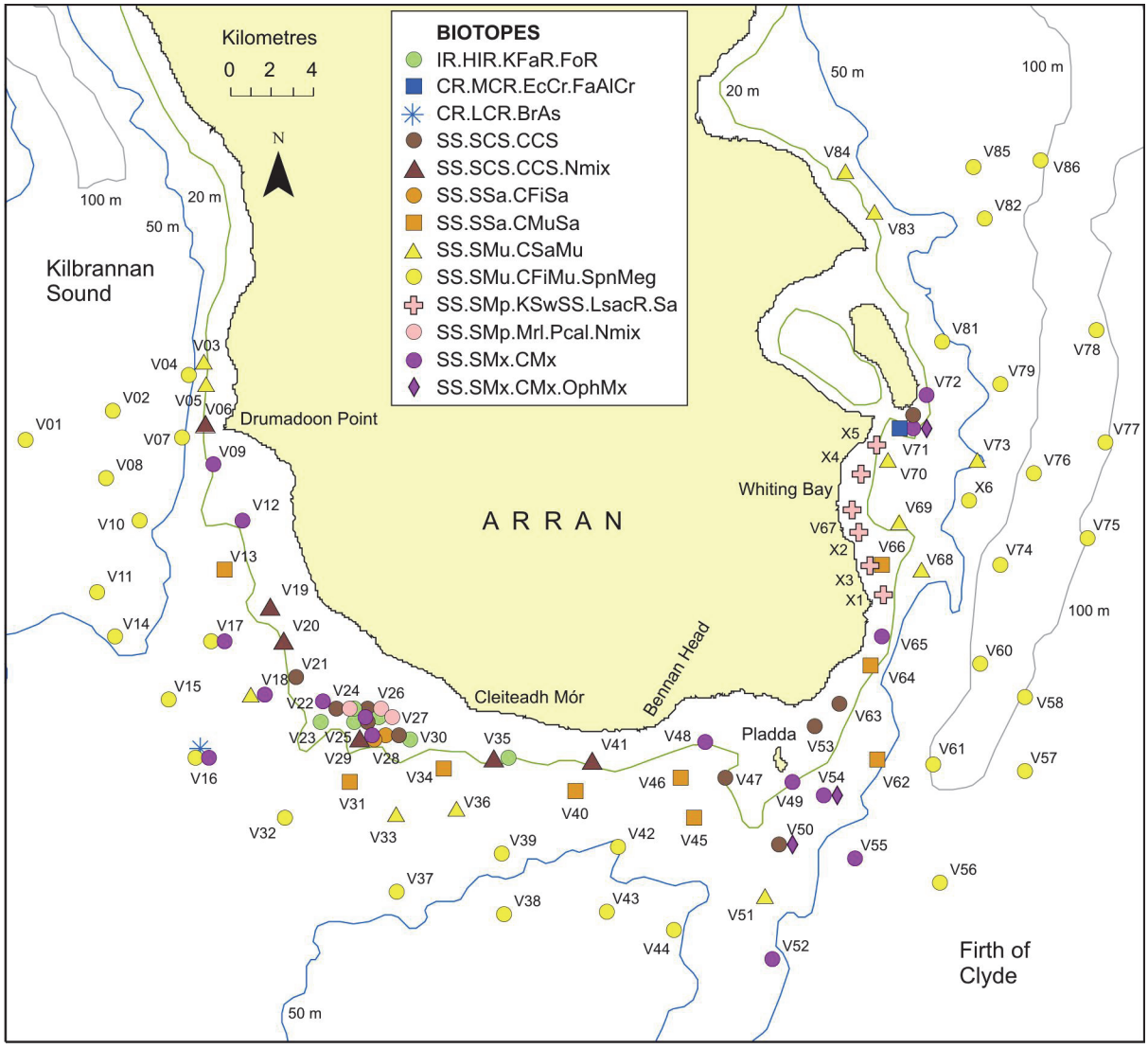

Figure 3. Distribution of biotope records around the south of Arran. Reproduced by permission of Ordnance Survey on behalf of HMSO. © Crown copyright and database right [2013]. All rights reserved. Ordnance Survey Licence number 100017908.

In Whiting Bay a shelly sand substrate at 9 - 18 m depth mostly supported a patchy algal cover, much of which was possibly drift material, but included apparently healthy *Saccharina latissima* and red algae. These records have been mainly regarded as poor examples of **SS.SMp.KSwSS.LsacR.Sa**, although at the shallowest site (X4) the flora was well developed, with dense *S. latissima*, red algae and *Desmarestia aculeata*.

Beyond the 20 m depth contour the seabed off the south of Arran is largely sedimentary in nature with a general trend of decreasing grain size with depth. An inshore narrow band of muddy-sand at a depth of 25 - 45 m merges into a narrow band of sandy-mud, generally at 29 - 49 m, with burrowed mud being extensively recorded at depths of 39 - 121 m.

The infauna of the muddy-sand band was represented by emergent tubes and small holes, including probably those of bivalve siphons. The epifauna was variable in nature but most sites supported populations of *Asterias rubens*, *Porania pulvillus* and hydroid tufts on scattered stones (**SS.SSa.CMuSa**).

The infaunal community of the sandy-mud band was generally represented by emergent tubes, polychaete casts and small holes, including those probably produced by small bivalves. In addition, five of the 12 sites exhibited emergent siphons of *Arctica islandica*. These were abundant at one site (V68), where a partially emergent shell confirmed their identity. Most of the sandy-mud sites supported sparse, small, megafaunal burrows. Widely recorded epifauna included *Porania pulvillus*, *Asterias rubens* and *Turritella communis* (**SS.SMu.CSaMu**).

The characteristics of the burrowed mud habitat varied with depth. A relatively stiff mud with possibly a relatively high sand content was recorded at depths of 39 - 61 m, where it supported moderate densities of burrowing megafauna, dominated by *Calocaris macandreae* (frequent) and *Nephrops norvegicus*, and including *Lumpenus lampretaeformis* and possibly *Callianassa subterranea*. At depths of 55 - 121 m soft muds supported a much richer megafaunal community with *C. macandreae* common or abundant, *N. norvegicus* common and *L. lampretaeformis* also present. Sea pens were generally absent, with sparse *Pennatula phosphorea* and *Virgularia mirabilis* recorded at a minority of the stiffer mud sites and sparse *V. mirabilis* at just two of the soft mud sites. All burrowed mud sites have been ascribed to **SS.SMu.CFiMu.SpnMeg**.

Mixed substrates were widely distributed in the surveyed area in the form of coarse sands, muddy-sands or sandy-muds overlain with varying proportions of gravel, pebbles, cobbles and boulders (**SS.SMx.CMx**). Diversity appeared fairly low with stones sparsely encrusted with serpulid worms and, in shallower waters, pink coralline algae, and often supporting sparse clumps of hydroids. Motile forms typically included *Munida rugosa*, *Asterias rubens*, *Marthasterias glacialis* and *Porania pulvillus*, with *Antedon* sp. and *Cerianthus lloydii* locally abundant. At two sites where boulders and cobbles became dense, circalittoral reef biotopes were recognised. **CR.MCR.EcCr.FaAlCr** was tentatively recorded at one site on the infra/circalittoral boundary, where the stones supported pink encrusting algae and a fairly sparse algal turf, whilst **CR.LCR.BrAs** was tentatively assigned to a deeper site (31 - 42 m) where silted stones were encrusted with serpulid worms, *Parasmittina trispinosa* and pink coralline algae and supported dense aggregations of *Antedon* sp. and hydroids.

3.3 Rousay Sound (Figure 4)

All survey sites in Rousay Sound lay within a narrow depth range of 13 - 22 m and the predominant substrate was a slightly shelly fine sand with scattered shells. This was populated by large numbers of *Myxicola* sp., but the epifaunal component was very sparse (**SS.SSa.IFiSa**). Maerl was recorded at a single site (RS4), but only as a sparse, surficial scatter of live and dead rhodoliths. Dead, algal, drift material was widely distributed over the surveyed area but formed dense patches, apparently in association with attached red algae and possibly living *Saccharina latissima*, to the east of Wyre Sound. This habitat has been tentatively ascribed to **SS.SMp.KSwSS.LsacR.Sa**, although it represents at best a poor example of the biotope. Small bedrock outcrops and boulders supported a patchy red algal turf and sparse kelp; however, poor image clarity only permitted biotope identification to the level of infralittoral rock (**IR**).

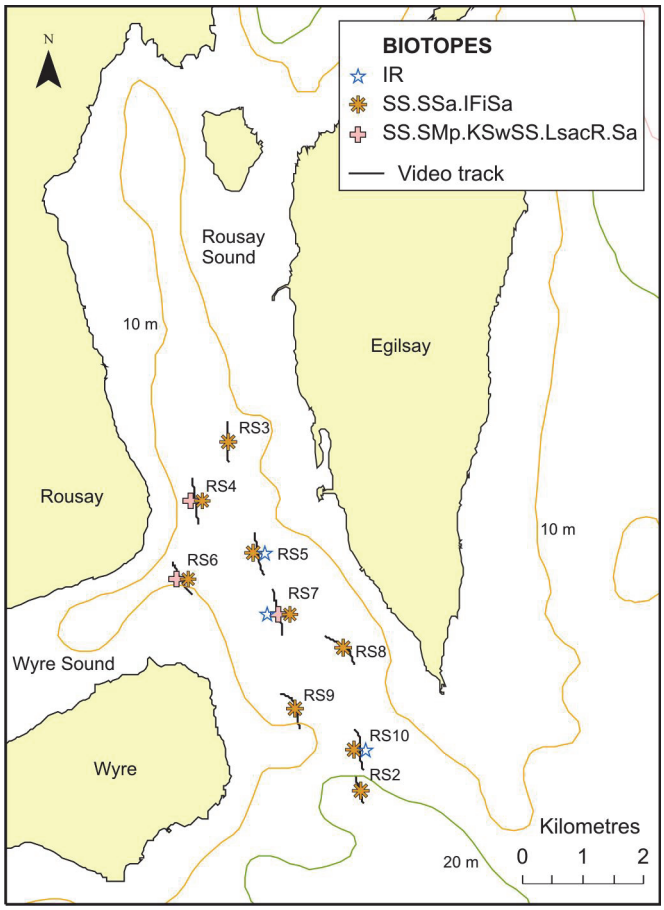

Figure 4. Distribution of biotope records in Rousay Sound. Reproduced by permission of Ordnance Survey on behalf of HMSO. © Crown copyright and database right [2013]. All rights reserved. Ordnance Survey Licence number 100017908.

3.4 Stronsay Firth (Figure 5)

Tidal currents close to the northern limit of the surveyed area attain 4.3 kt (UK Hydrographic Office, 2011) and the seabed in the area supports tide-swept, sand-scoured, low-diversity habitats. The substrate largely consists of cobbles, boulders and pebbles, varying in density and lying on, or with an infill of, coarse sand and shell gravel. Scattered over the area are patches of low-profile, outcropping bedrock. Rock surfaces are encrusted with pink coralline algae and sparse serpulid worms and bryozoans and support a fauna dominated by *Urticina felina*, with a patchy hydroid and bryozoan turf including *Flustra foliacea*, and a low density of *Alcyonium digitatum*. Faunal composition is similar over much of the surveyed area, but biotope ascription is not unequivocal. Bedrock outcrops have been assigned to **CR.MCR.EcCr.FaAlCr.Flu** and mixed cobble and sediment areas to **SS.SMx.CMx.FluHyd**, but the distinction is not always clear cut. Furthermore, both habitats also show affinities with **CR.MCR.EcCr.UrtScr**, to which one site to the north-west of Ness of Ork (RS1), displaying abundant *U. felina* and apparently lacking *F. foliacea*, has been tentatively referred.

Sparse encrusting sponges were present at a few sites, but extensive developments of cushion forms, possibly *Myxilla incrustans* and *Amphilectus fucorum*, were observed at one of the northernmost and possibly most tide-swept sites (STS14), which has been referred to the biotope **CR.HCR.FaT.CTub.CuSp**. Dense *Modiolus modiolus* shells on shell gravel and

coarse sand displaying a very sparse visible biota (**SS.SMx.CMx**) were widely distributed in relatively shallow water (21 - 33 m depth) on the eastern side of the channel off Rothiesholm Head. Fairly dense live specimens (common - abundant) were observed at three of the deeper sites (33 - 37 m) (**SS.SBR.SMus.ModT**). From the limited evidence available they appeared to contribute little to structuring the habitat and supported a sparse associated fauna.

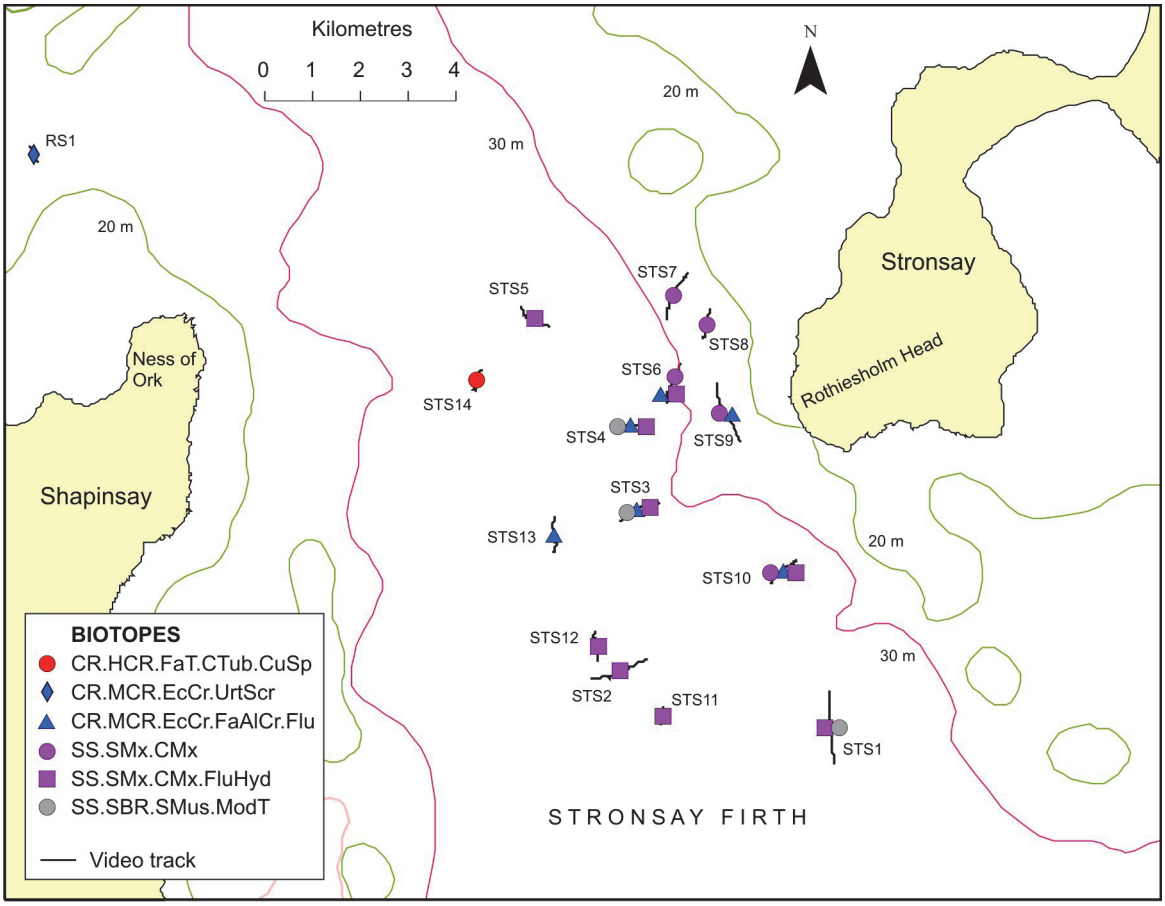

Figure 5. Distribution of biotope records in Stronsay Firth. Reproduced by permission of Ordnance Survey on behalf of HMSO. © Crown copyright and database right [2013]. All rights reserved. Ordnance Survey Licence number 100017908.

4. DISCUSSION

This section considers the conservation importance of the species and habitats encountered during the surveys and also provides a summary appraisal of the distribution of PPFs and any other PMFs. The conservation importance of species and habitats and their occurrence in each of the survey locations are summarised in Table 2. A number of biotopes listed in the lower part of the table fall within broad habitat types included in the Scottish Biodiversity List (Scottish Government, 2013) but are generally of wide occurrence. Only one non-PMF species, *Echinus esculentus*, has been afforded any formal conservation status, being included on the IUCN Red List of Threatened Species as a near-threatened species (IUCN, 2013). However, *Echinus esculentus* was widely recorded, reflecting its healthy status in Scottish waters.

Table 2. Species and biotopes recorded during the surveys of recognised conservation importance and their frequency of occurrence in each survey location. Importance indicators are SBL = Scottish Biodiversity List of Habitats and Species, Osp = OSPAR List of Threatened and/or Declining Species and Habitats, IUCN = IUCN Red List of Threatened Species, PMF = Priority Marine Feature, SF = MPA Search Feature, PPF = Proposed Protected Feature

Biotope/species	SBL	Osp	IUCN	PMF	SF	PPF	Loch Goil	South Arran	Rousay	Stronsay
SS.SCS.CCS.Nmix	●			●	●	●		6		
SS.SMu.CFiMu.SpnMeg	●	●		●	●	●	11	34		
SS.SMp.KSwSS.LsacR.Sa	●			●	●	●		6	3	
SS.SMp.Mrl.Pcal.Nmix	●	●		●	●	●		3		
SS.SBR.SMus.ModT	●			●	●					3
SS.SMu.CSaMu.VirOphPmax	●					●	2			
SS.SMx.CMx.Cllo.ModHo	●					●	5			
Arctica islandica		●		●		●		7		
Arctica islandica aggregation		●		●	●	●		1		
Pachycerianthus multiplicatus				●	●	●	2			
Echinus esculentus			●				7	13	3	13
CR.HCR.FaT.CTub	●									1
SS.SCS.CCS	●							10		
SS.SSa.IFiSa	●								9	
SS.SSa.CFiSa	●							2		
SS.SSa.CMuSa	●							9		
SS.SMu.CSaMu	●							12		
SS.SMu.CFiMu	●						3			
SS.SMx.CMx	●							16		5
SS.SMx.CMx.FluHyd	●									9
SS.SMx.CMx.OphMx	●						1	3		

Four PPFs were recorded in Loch Goil, two of which were also PMFs (Figure 6). The PMF burrowed mud appeared to be restricted to deeper water (below 25 m) in the outer region of the loch either side of the sill near the loch mouth. The visual impression of the habitat was of a poorly developed example of **SS.SMu.CFiMu.SpnMeg**, with fairly low densities of megafaunal burrowers and sea pens. The component species, *Pachycerianthus multiplicatus*, was recorded in low numbers at two sites. The sill and adjacent shallower areas to each side display coarser and more heterogeneous sediments supporting two components of the 'sublittoral mud and mixed sediment communities' proposed protected

feature. **SS.SMx.CMx.CIloModHo** appears to be widely distributed, with two tentative records of **SS.SMu.CSaMu.VirOphPmax**.

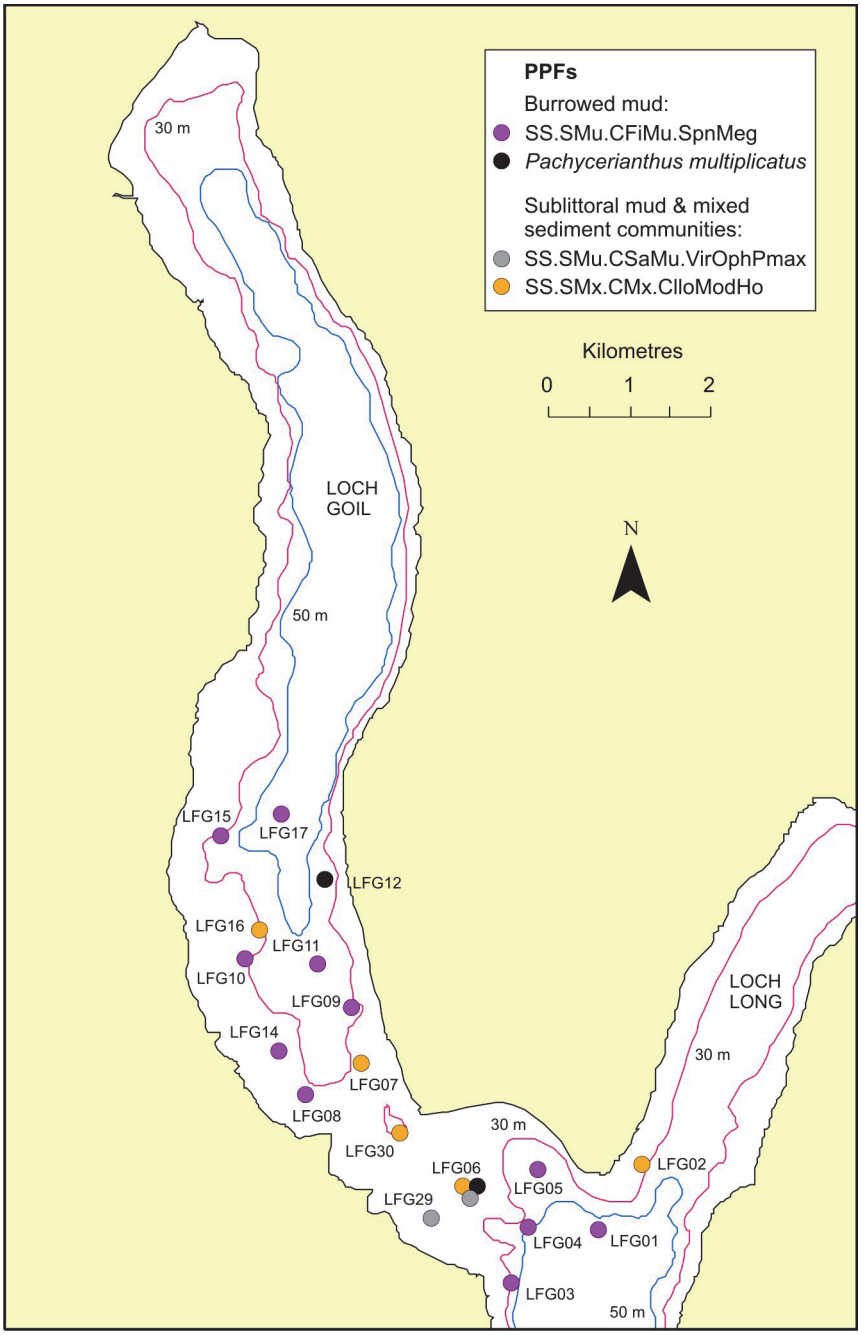

Figure 6. Distribution of records of proposed protected feature biotopes and species (PPFs) in Loch Goil. Reproduced by permission of Ordnance Survey on behalf of HMSO. © Crown copyright and database right [2013]. All rights reserved. Ordnance Survey Licence number 100017908.

Around the south of Arran most of the seabed within the surveyed area was composed of PPFs, all six of which are also PMFs (Figure 7). This includes an extensive development of high quality burrowed mud (**SS.SMu.CFiMu.SpnMeg**) in deeper water, with a rich megafaunal component. An inshore band of coarse sediments around the more exposed Arran coastline includes widespread presence of dead maerl and coarse sand with

burrowing sea cucumbers (**SS.SMp.Mrl.Pcal.Nmix**), although the withdrawal behaviour of the characterising species, *Neopentadactyla mixta*, may have led to an underestimation of its extent. Poorly developed maerl beds (**SS.SMp.Mrl.Pcal.Nmix**) were encountered at three of the shallowest sites surveyed off the south coast and so denser beds may be present in shallower waters. The more sheltered Whiting Bay supported kelp and seaweed communities on a sandy substrate (**SS.SMp.KSwSS.LsacR.Sa**), although most records were poor quality and tenuous examples of the biotope. The presence of *Arctica islandica* was widely recorded, chiefly in the band of sandy-mud off Arran. Although dense siphons were only observed at a single site, constituting the MPA search feature 'aggregations of *Arctica islandica*', this probably does not reflect the importance of the region for this feature, due to the often poor video image quality. This is supported by the results of the 2012 SNH survey of the area (Moore and Atkinson, 2012), which recorded aggregations of *Arctica islandica*-like siphons (now confirmed as this species) at two additional locations.

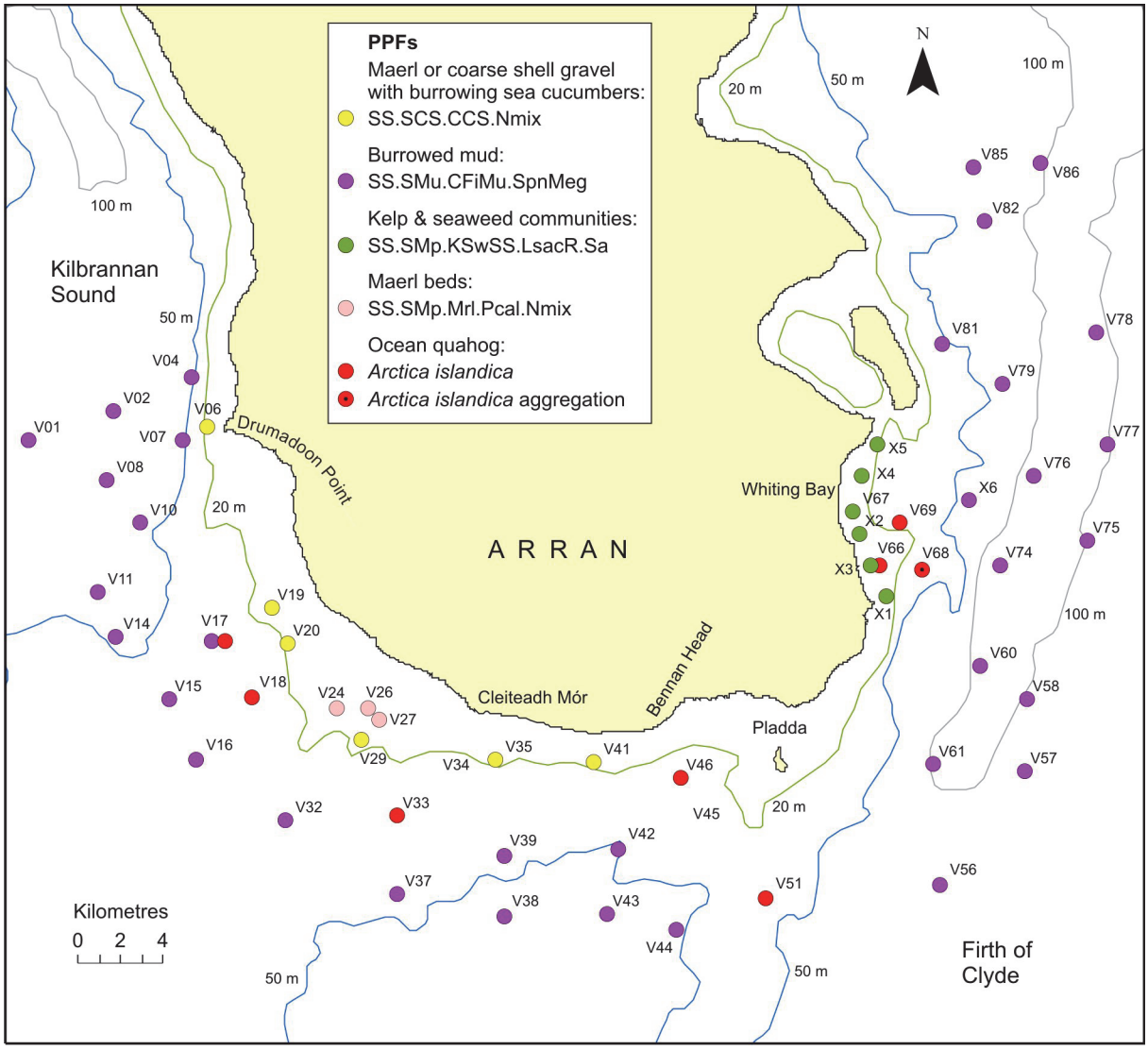

Figure 7. Distribution of records of proposed protected feature biotopes and species (PPFs) around the south of Arran. Reproduced by permission of Ordnance Survey on behalf of HMSO. © Crown copyright and database right [2013]. All rights reserved. Ordnance Survey Licence number 100017908.

The only PPF observed in Rousay Sound was uncertain or poor examples of the biotope **SS.SMp.KSwSS.LsacR.Sa**, although the February timing of the survey may have influenced the development of the algal component (Figure 8). A 2011 dropdown video survey (Hirst *et al*., in prep.) extended coverage to the northern half of Rousay Sound, where similar examples of the biotope were recorded at similar depths. Hirst *et al.* (in prep.) also provide an indicative map of maerl bed distribution in Rousay Sound, which shows a broad band running along most of the western side of the sound. The current survey suggests that this may overestimate maerl bed extent.

Dense *Modiolus* shells were widely distributed along the eastern side of Stronsay Firth and live *Modiolus modiolus* was recorded as common or abundant at least in patches at three sites nearer to the centre of the channel (**SS.SBR.SMus.ModT**) (Figure 8). The mussels appeared to contribute little to the biodiversity of the habitat. The presence of live *Modiolus* was only discernible on some of the better quality still images and so the extent of coverage of this biotope, even along the video runs where it was recorded, is unknown. Given the depth range of the area (reaching at least 41 m), it is suggested that any further work on the assessment of *Modiolus* distribution should focus on the acquisition of high quality still imagery.

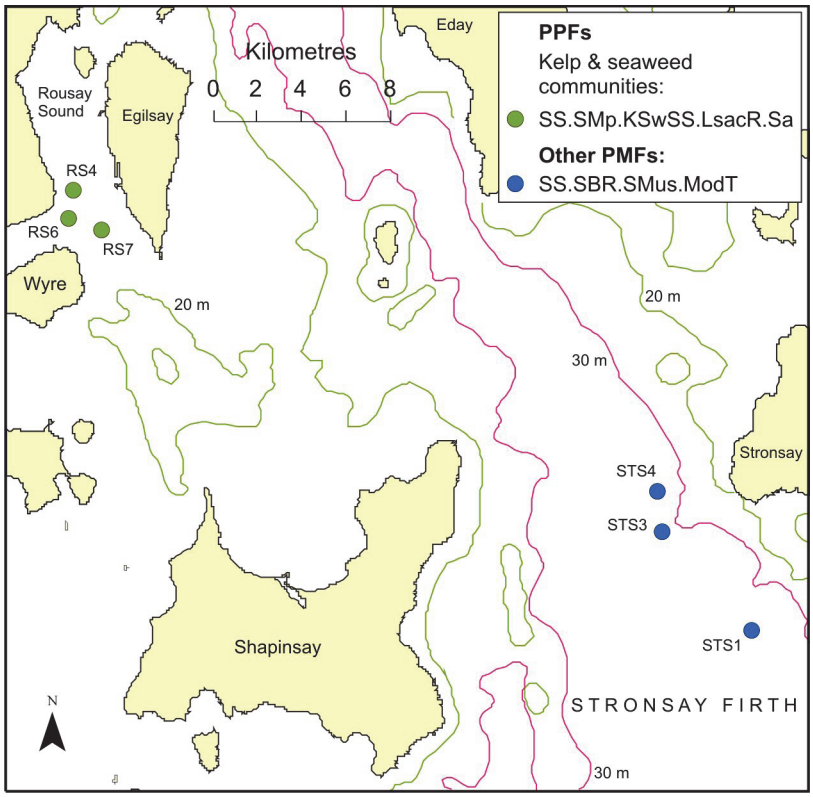

Figure 8. Distribution of records of proposed protected feature biotopes (PPFs) and other priority marine feature biotopes (PMFs) in Rousay Sound and Stronsay Firth. Reproduced by permission of Ordnance Survey on behalf of HMSO. © Crown copyright and database right [2013]. All rights reserved. Ordnance Survey Licence number 100017908.

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APPENDIX 1: PROPOSED PROTECTED FEATURES (PPFS) OF THE THREE PMPAS COVERED IN THIS REPORT

possible MPA	Proposed protected features	Component biotopes (04.05) or species
South Arran	Burrowed mud	SS.SMu.CFiMu.SpnMeg SS.SMu.CFiMu.MegMax *Funiculina quadrangularis* *Pachycerianthus multiplicatus*
	Herring spawning grounds	*no specific biotope*
	Kelp and seaweed communities	SS.SMp.KSwSS
	Maerl beds	SS.SMp.Mrl
	Maerl or coarse shell gravel with burrowing sea cucumbers	SS.SCS.CCS.Nmix
	Ocean quahog (species)	*Arctica islandica*
	Seagrass beds	LS.LMp.LSgr.Znol SS.SMp.SSgr.Zmar
	Shallow tide-swept coarse sands with burrowing bivalves	SS.SCS.ICS.MoeVen
Upper Loch Fyne and Loch Goil	Burrowed mud	SS.SMu.CFiMu.SpnMeg SS.SMu.CFiMu.MegMax *Funiculina quadrangularis* *Pachycerianthus multiplicatus*
	Flame shell beds	SS.SMx.IMx.Lim
	Horse mussel beds	SS.SBR.SMus.ModT SS.SBR.SMus.ModMx SS.SBR.SMus.ModHAs SS.SBR.SMus.ModCvar
	Ocean quahog (species)	*Arctica islandica*
	Sublittoral mud and mixed sediment communities	SS.SMu.IFiMu[.Ocn] SS.SMu.CSaMu SS.SMu.OMu[.StyPse] SS.SMx.CMx.ClloModHo
Wyre and Rousay Sounds	Kelp and seaweed communities on sublittoral sediment	SS.SMp.KSwSS
	Maerl beds	SS.SMp.Mrl

APPENDIX 2: POSITIONAL AND TEMPORAL DETAILS OF VIDEO SEQUENCES RECORDED DURING THE SURVEYS. WHERE THERE IS MORE THAN ONE ENTRY FOR A SITE, THIS REFLECTS SPLITTING OF THE VIDEO RUN AMONGST DIFFERENT HABITAT TYPES

Survey	Site ID	Date	Start latitude	Start longitude	End latitude	End longitude	Depth CD start (m)	Depth CD end (m)	Time start (UTC)	Time end (UTC)
Loch Goil	LFG01	20/03/2013	56.096958	-4.862686	56.096581	-4.863789	58.1		08:31:00	08:36:00
Loch Goil	LFG02	20/03/2013	56.101540	-4.857779	56.100239	-4.859199	21.2		08:45:00	08:52:00
Loch Goil	LFG03	20/03/2013	56.093540	-4.872666	56.093414	-4.873172	45.3		09:03:00	09:10:00
Loch Goil	LFG04	19/03/2013	56.097282	-4.870209	56.096470	-4.872210	54.4		16:31:00	16:37:00
Loch Goil	LFG05	19/03/2013	56.100613	-4.869115	56.100487	-4.871036	56.4		16:43:00	16:48:00
Loch Goil	LFG06	19/03/2013	56.099518	-4.876821	56.099472	-4.879719	24.5		16:15:00	16:21:00
Loch Goil	LFG07	19/03/2013	56.106907	-4.890068	56.107246	-4.889150	25.8		11:44:00	11:50:00
Loch Goil	LFG07	19/03/2013	56.106907	-4.890068	56.107246	-4.889150	25.8		11:44:00	11:50:00
Loch Goil	LFG08	20/03/2013	56.105106	-4.895156	56.105167	-4.896847	27.6		09:46:00	09:51:00
Loch Goil	LFG09	19/03/2013	56.110775	-4.890917	56.110470	-4.890625	36.8		11:55:00	12:01:00
Loch Goil	LFG10	19/03/2013	56.114109	-4.902745	56.113228	-4.902378	27.6		15:43:00	15:49:00
Loch Goil	LFG11	19/03/2013	56.113640	-4.894908	56.112835	-4.893947	40.7		12:07:00	12:13:00
Loch Goil	LFG12	19/03/2013	56.119026	-4.894206	56.118088	-4.893136	47.7		12:20:00	12:26:00
Loch Goil	LFG13	19/03/2013	56.126202	-4.893368	56.125088	-4.893100	59.6		12:45:00	12:51:00
Loch Goil	LFG14	19/03/2013	56.107769	-4.898823	56.107956	-4.899137	30.5		16:02:00	16:04:00
Loch Goil	LFG15	19/03/2013	56.121895	-4.905161	56.120531	-4.905379	24.7	34.7	15:30:00	15:36:00
Loch Goil	LFG16	20/03/2013	56.115402	-4.900796	56.115471	-4.901595	24.7		10:01:00	10:10:00
Loch Goil	LFG17	19/03/2013	56.123199	-4.898793	56.122078	-4.898651	57.6		12:33:00	12:38:00
Loch Goil	LFG18	19/03/2013	56.131744	-4.889389	56.130573	-4.889219	77.4		13:27:00	13:33:00
Loch Goil	LFG19	19/03/2013	56.136322	-4.892731	56.134495	-4.893423	80.4		13:41:00	13:49:00
Loch Goil	LFG20	19/03/2013	56.147850	-4.896203	56.146900	-4.897448	73.8		15:07:00	15:15:00
Loch Goil	LFG20	19/03/2013	56.147850	-4.896203	56.146900	-4.897448	73.8		15:07:00	15:15:00
Loch Goil	LFG21	20/03/2013	56.146835	-4.887444	56.146980	-4.887752	50.8		10:31:00	10:36:00
Loch Goil	LFG22	19/03/2013	56.150333	-4.893380	56.149845	-4.894465	74.3		14:02:00	14:11:00
Loch Goil	LFG25	19/03/2013	56.152771	-4.898787	56.152225	-4.898053	67.2		14:18:00	14:26:00

Appendix 2 continued

Survey	Site ID	Date	Start latitude	Start longitude	End latitude	End longitude	Depth CD start (m)	Depth CD end (m)	Time start (UTC)	Time end (UTC)
Loch Goil	LFG27	19/03/2013	56.163418	-4.903016	56.162975	-4.904189	40.0		14:35:00	14:42:00
Loch Goil	LFG28	19/03/2013	56.165241	-4.907916	56.164688	-4.908542	43.0		14:48:00	14:53:00
Loch Goil	LFG29	20/03/2013	56.097794	-4.881395	56.097141	-4.882634	17.4		09:19:00	09:25:00
Loch Goil	LFG30	20/03/2013	56.102970	-4.884644	56.102470	-4.886260	24.5		09:33:00	09:39:00
South Arran	V01	26/03/2013	55.505100	-5.439044	55.504322	-5.441207	82.0	81.0	15:58:00	16:04:00
South Arran	V02	26/03/2013	55.511921	-5.402203	55.511368	-5.403858	79.9	80.9	15:41:00	15:46:00
South Arran	V03	26/03/2013	55.523338	-5.363606	55.522980	-5.365098	30.8	36.8	12:07:00	12:13:00
South Arran	V04	26/03/2013	55.520324	-5.369733	55.519466	-5.371212	52.8	60.8	12:19:00	12:25:00
South Arran	V05	26/03/2013	55.518181	-5.363216	55.517532	-5.364122	28.7	32.7	11:57:00	12:03:00
South Arran	V06	26/03/2013	55.508587	-5.362802	55.507835	-5.363954	15.7	14.7	11:45:00	11:51:00
South Arran	V07	26/03/2013	55.505180	-5.372971	55.504425	-5.374894	54.9	55.9	12:34:00	12:41:00
South Arran	V08	26/03/2013	55.495632	-5.405101	55.494728	-5.406823	80.7	82.7	15:24:00	15:29:00
South Arran	V09	26/03/2013	55.498646	-5.360297	55.498131	-5.361172	19.7	23.7	11:33:00	11:39:00
South Arran	V10	26/03/2013	55.485348	-5.390844	55.484539	-5.392408	69.6	71.6	15:08:00	15:14:00
South Arran	V11	26/03/2013	55.468422	-5.408943	55.467605	-5.410276	69.4	71.4	14:46:00	14:50:00
South Arran	V12	26/03/2013	55.485527	-5.347576	55.484940	-5.348436	18.7	18.7	11:13:00	11:20:00
South Arran	V13	26/03/2013	55.473125	-5.355335	55.473022	-5.356706	31.7	30.7	11:00:00	11:06:00
South Arran	V14	26/03/2013	55.457478	-5.401237	55.456768	-5.402901	58.2	59.2	14:31:00	14:36:00
South Arran	V15	26/03/2013	55.442352	-5.378787	55.441505	-5.381009	41.0	48.0	14:13:00	14:18:00
South Arran	V16	26/03/2013	55.428265	-5.366776	55.427273	-5.369356	30.8	41.8	13:57:00	14:02:00
South Arran	V16	26/03/2013	55.428265	-5.366776	55.427273	-5.369356	30.8	41.8	13:57:00	14:02:00
South Arran	V17	26/03/2013	55.456474	-5.360488	55.455585	-5.362582	41.4	40.4	13:21:00	13:28:00
South Arran	V18	26/03/2013	55.443336	-5.342791	55.442520	-5.345115	33.6	32.6	13:40:00	13:46:00
South Arran	V19	26/03/2013	55.464306	-5.335260	55.464165	-5.336828	16.7	17.7	10:47:00	10:52:00
South Arran	V20	26/03/2013	55.455902	-5.328801	55.455639	-5.330619	16.7	17.7	10:34:00	10:41:00
South Arran	V21	26/03/2013	55.447598	-5.323606	55.447094	-5.326811	19.8	20.8	10:20:00	10:28:00
South Arran	V22	26/03/2013	55.441738	-5.313114	55.441471	-5.314821	15.8	19.8	10:08:00	10:14:00
South Arran	V23	26/03/2013	55.436352	-5.314057	55.436466	-5.315830	20.9	20.9	09:57:00	10:01:00

Appendix 2 continued

Survey	Site ID	Date	Start latitude	Start longitude	End latitude	End longitude	Depth CD start (m)	Depth CD end (m)	Time start (UTC)	Time end (UTC)
South Arran	V24	18/03/2013	55.440220	-5.306334	55.439545	-5.310213	16.9		12:28:00	12:35:00
South Arran	V25	18/03/2013	55.436985	-5.298645	55.436245	-5.302597	14.9		12:16:00	12:23:00
South Arran	V26	18/03/2013	55.440269	-5.292918	55.439468	-5.296478	16.6		11:50:00	11:57:00
South Arran	V26	18/03/2013	55.440269	-5.292918	55.439468	-5.296478	16.6		11:50:00	11:57:00
South Arran	V27	18/03/2013	55.437519	-5.287461	55.436966	-5.292805	17.1		11:35:00	11:44:00
South Arran	V28	18/03/2013	55.433502	-5.284677	55.432991	-5.288622	21.2		11:23:00	11:30:00
South Arran	V28	18/03/2013	55.433502	-5.284677	55.432991	-5.288622	21.2		11:23:00	11:30:00
South Arran	V28	18/03/2013	55.433502	-5.284677	55.432991	-5.288622	21.2		11:23:00	11:30:00
South Arran	V29	18/03/2013	55.432789	-5.295951	55.431969	-5.299518	21.0		12:04:00	12:10:00
South Arran	V29	18/03/2013	55.432789	-5.295951	55.431969	-5.299518	21.0		12:04:00	12:10:00
South Arran	V30	18/03/2013	55.432465	-5.275303	55.432053	-5.278072	17.3		11:13:00	11:18:00
South Arran	V31	27/03/2013	55.422233	-5.302338	55.421707	-5.302809	26.7	26.7	08:22:00	08:25:00
South Arran	V32	27/03/2013	55.413314	-5.329230	55.412880	-5.330760	39.8	38.8	08:03:00	08:08:00
South Arran	V33	27/03/2013	55.414238	-5.282220	55.413521	-5.283214	32.6	32.6	08:35:00	08:40:00
South Arran	V34	18/03/2013	55.425438	-5.260590	55.424927	-5.263672	27.3		13:57:00	14:02:00
South Arran	V35	18/03/2013	55.427877	-5.239607	55.427208	-5.241395	16.4		10:52:00	10:57:00
South Arran	V36	27/03/2013	55.415836	-5.256041	55.415161	-5.257844	35.3	35.3	09:25:00	09:29:00
South Arran	V37	27/03/2013	55.395447	-5.281302	55.394707	-5.282976	46.5	48.5	08:52:00	08:58:00
South Arran	V38	27/03/2013	55.390259	-5.235805	55.389442	-5.237278	55.1	55.1	09:58:00	10:02:00
South Arran	V39	27/03/2013	55.405025	-5.236161	55.403980	-5.238080	49.2	51.2	09:42:00	09:47:00
South Arran	V40	18/03/2013	55.420475	-5.205263	55.419331	-5.208146	37.2		14:22:00	14:27:00
South Arran	V41	18/03/2013	55.427479	-5.197963	55.426515	-5.199277	18.5		10:33:00	10:39:00
South Arran	V42	27/03/2013	55.406578	-5.187221	55.405628	-5.188965	51.9	52.9	10:33:00	10:38:00
South Arran	V43	27/03/2013	55.390774	-5.192516	55.389912	-5.193908	54.9	54.9	10:17:00	10:22:00
South Arran	V44	27/03/2013	55.386524	-5.163355	55.385929	-5.164474	55.7	57.7	10:52:00	10:57:00
South Arran	V45	27/03/2013	55.413505	-5.154394	55.412506	-5.157105	42.6	41.6	12:09:00	12:15:00
South Arran	V46	18/03/2013	55.423650	-5.161130	55.422317	-5.162820	34.1		14:43:00	14:49:00
South Arran	V47	18/03/2013	55.423653	-5.141124	55.422417	-5.144753	22.0		14:58:00	15:04:00

Appendix 2 continued

Survey	Site ID	Date	Start latitude	Start longitude	End latitude	End longitude	Depth CD start (m)	Depth CD end (m)	Time start (UTC)	Time end (UTC)
South Arran	V48	18/03/2013	55.432300	-5.150832	55.431171	-5.152109	20.6		10:10:00	10:17:00
South Arran	V49	16/07/2013	55.422516	-5.113365	55.421646	-5.113634	25.6		11:48:31	11:54:04
South Arran	V50	27/03/2013	55.408005	-5.117800	55.405960	-5.120917	52.6	46.6	11:53:00	11:59:00
South Arran	V51	27/03/2013	55.394367	-5.124695	55.394154	-5.126245	57.6	58.6	11:36:00	11:43:00
South Arran	V52	27/03/2013	55.378902	-5.121313	55.378845	-5.122989	39.9	38.9	10:18:00	11:25:00
South Arran	V53	16/07/2013	55.435318	-5.104625	55.435352	-5.104459	12.7		11:27:20	11:32:54
South Arran	V54	27/03/2013	55.419361	-5.099814	55.418243	-5.102281	35.1	38.1	13:35:00	13:40:00
South Arran	V54	27/03/2013	55.419361	-5.099814	55.418243	-5.102281	35.1	38.1	13:35:00	13:40:00
South Arran	V55	16/07/2013	55.403690	-5.087381	55.403259	-5.087945	51.6		09:36:07	09:41:56
South Arran	V56	16/07/2013	55.397777	-5.050762	55.397442	-5.051315	86.5		09:17:10	09:22
South Arran	V57	16/07/2013	55.425018	-5.015570	55.424446	-5.015481	80.4		08:53:19	08:58:48
South Arran	V58	16/07/2013	55.442432	-5.014462	55.442101	-5.014612	100.3		08:35:21	08:40:28
South Arran	V59	16/07/2013	55.451790	-4.999538	55.451645	-4.999597	86.2		08:22:34	08:24:28
South Arran	V60	16/07/2013	55.450142	-5.034572	55.450443	-5.033838	120.8		10:46:25	10:52:39
South Arran	V61	16/07/2013	55.426437	-5.054555	55.426384	-5.054536			10:24:39	10:30:13
South Arran	V62	27/03/2013	55.427921	-5.076723	55.426998	-5.078552	45.3	44.3	13:54:00	13:59:00
South Arran	V63	16/07/2013	55.440967	-5.093874	55.440952	-5.093369	16.8		11:16:33	11:21:37
South Arran	V64	27/03/2013	55.450974	-5.079417	55.448734	-5.081953	31.6	30.6	14:15:00	14:21:00
South Arran	V65	27/03/2013	55.458168	-5.075290	55.456169	-5.077270	18.8	18.8	14:35:00	14:42:00
South Arran	V66	27/03/2013	55.475441	-5.075869	55.473351	-5.077055	25.2	31.2	15:08:00	15:15:00
South Arran	V67	15/07/2013	55.487461	-5.088652	55.487976	-5.088053	13.6	13.6	13:28:50	13:35
South Arran	V68	27/03/2013	55.473911	-5.058236	55.472786	-5.059155	51.0	54.0	14:54:00	15:00:00
South Arran	V69	27/03/2013	55.485653	-5.067080	55.483809	-5.069511	44.4	43.4	15:25:00	15:30:00
South Arran	V70	27/03/2013	55.500488	-5.071738	55.498772	-5.074877	32.6	30.6	15:43:00	15:49:00
South Arran	V71	27/03/2013	55.507870	-5.061765	55.507038	-5.063913	19.7	12.7	15:58:00	16:04:00
South Arran	V71	27/03/2013	55.507870	-5.061765	55.507038	-5.063913	19.7	12.7	15:58:00	16:04:00
South Arran	V71	27/03/2013	55.507870	-5.061765	55.507038	-5.063913	19.7	12.7	15:58:00	16:04:00
South Arran	V71	27/03/2013	55.507870	-5.061765	55.507038	-5.063913	19.7	12.7	15:58:00	16:04:00

Appendix 2 continued

Survey	Site ID	Date	Start latitude	Start longitude	End latitude	End longitude	Depth CD start (m)	Depth CD end (m)	Time start (UTC)	Time end (UTC)
South Arran	V72	15/07/2013	55.514984	-5.057080	55.515270	-5.056081	21.8	21.8	12:59:41	13:04:54
South Arran	V73	15/07/2013	55.499332	-5.035808	55.500145	-5.034566	48.5	48.5	13:51:40	13:57:13
South Arran	V74	15/07/2013	55.474193	-5.025830	55.474815	-5.025599	104.3	104.3	14:31:44	14:35
South Arran	V75	15/07/2013	55.480190	-4.988701	55.480957	-4.988677	94.2	94.2	14:57:07	15:02:30
South Arran	V76	15/07/2013	55.495857	-5.011268	55.496574	-5.010847	107.4	107.4	14:09:11	14:14:20
South Arran	V77	15/07/2013	55.503586	-4.980600	55.504188	-4.979923	104.1	104.1	15:18:18	15:23:22
South Arran	V78	15/07/2013	55.530384	-4.984835	55.531155	-4.984494	105.3	105.3	11:41:11	11:46:48
South Arran	V79	15/07/2013	55.517639	-5.025119	55.518494	-5.024895	75.9	75.9	12:41:20	12:45:51
South Arran	V80	15/07/2013	55.535713	-5.021141	55.536369	-5.020330	88.4	88.4	11:23:00	11:27:00
South Arran	V81	15/07/2013	55.527870	-5.050629	55.528461	-5.049908	60.6	60.6	11:02:54	11:09:25
South Arran	V82	15/07/2013	55.557487	-5.032146	55.557899	-5.031466	95.9	95.9	09:40:00	09:45:00
South Arran	V83	15/07/2013	55.559517	-5.078716	55.559555	-5.078355	35.9	35.9	10:16:25	10:22:06
South Arran	V84	15/07/2013	55.568878	-5.091314	55.569366	-5.090870	32.8	32.8	10:31:00	10:36:12
South Arran	V85	15/07/2013	55.570240	-5.036976	55.570721	-5.036502	96.9	96.9	09:56:09	10:01:25
South Arran	V86	15/07/2013	55.571468	-5.008441	55.571964	-5.007623	93.9	93.9	09:21:00	09:26:00
South Arran	X1	16/07/2013	55.466251	-5.075035	55.468067	-5.074193	10.3		12:34:10	12:39:31
South Arran	X2	16/07/2013	55.481548	-5.086000	55.482521	-5.085333	13.1		13:05:29	13:11:05
South Arran	X3	16/07/2013	55.473942	-5.080946	55.474895	-5.080941	18.2		12:52:03	12:57:12
South Arran	X4	16/07/2013	55.496101	-5.084499	55.496540	-5.084158	9.3		13:26:19	13:31:18
South Arran	X5	16/07/2013	55.503338	-5.078715	55.503788	-5.077413	15.8		13:41:49	13:47:20
South Arran	X6	16/07/2013	55.489391	-5.039052	55.490639	-5.038215	69.7		14:00:28	14:05:51
Stronsay Firth	RS1	11/02/2013	59.103633	-2.831983	59.101983	-2.830100	28.4	28.3	10:51:12	10:56:23
Rousay Sound	RS2	11/02/2013	59.116717	-2.931850	59.118917	-2.933150	22.4	21.4	11:28:47	11:39:09
Rousay Sound	RS3	11/02/2013	59.142400	-2.951683	59.145500	-2.951883	19.2	19.2	12:17:42	12:27:20
Rousay Sound	RS4	11/02/2013	59.137717	-2.956050	59.141383	-2.957050	19.5	17.3	12:39:55	12:50:21
Rousay Sound	RS5	11/02/2013	59.133900	-2.946483	59.137300	-2.947867	16.1	21.0	13:01:45	13:11:15
Rousay Sound	RS6	11/02/2013	59.132367	-2.956900	59.134950	-2.959917	17.8	13.3	13:20:14	13:28:35
Rousay Sound	RS7	11/02/2013	59.129417	-2.943800	59.132817	-2.945183	19.4	13.4	13:42:48	13:52:22

Appendix 2 continued

Survey	Site ID	Date	Start latitude	Start longitude	End latitude	End longitude	Depth CD start (m)	Depth CD end (m)	Time start (UTC)	Time end (UTC)
Rousay Sound	RS8	11/02/2013	59.127117	-2.933167	59.129300	-2.937733	22.0	15.8	14:06:35	14:16:16
Rousay Sound	RS9	11/02/2013	59.122233	-2.941167	59.124983	-2.944150	17.4	23.4	14:26:38	14:36:18
Rousay Sound	RS10	11/02/2013	59.119217	-2.931933	59.122317	-2.933450	21.9	20.2	14:48:51	14:58:12
Stronsay Firth	STS1	08/02/2013	59.051383	-2.683067	59.044400	-2.682083	34.9	37.5	08:47:29	09:01:16
Stronsay Firth	STS2	08/02/2013	59.054367	-2.716733	59.052500	-2.727250	39.5	39.7	09:43:59	10:00:14
Stronsay Firth	STS3	08/02/2013	59.069350	-2.714633	59.067567	-2.721867	33.8	32.0	10:16:39	10:31:21
Stronsay Firth	STS4	08/02/2013	59.076800	-2.715767	59.076833	-2.723933	34.5	36.2	10:42:51	10:59:11
Stronsay Firth	STS5	08/02/2013	59.086233	-2.734867	59.088317	-2.740350	34.2	34.4	11:11:10	11:21:25
Stronsay Firth	STS6	08/02/2013	59.082767	-2.710600	59.080083	-2.712917	30.6	33.0	17:00:17	17:07:56
Stronsay Firth	STS6	08/02/2013	59.080083	-2.712917	59.078683	-2.713267	33.0	33.3	17:07:56	17:12:15
Stronsay Firth	STS7	08/02/2013	59.091433	-2.709067	59.086867	-2.713367	21.0	26.8	17:28:49	17:44:11
Stronsay Firth	STS8	08/02/2013	59.087883	-2.705000	59.084933	-2.706383	24.2	25.0	17:53:48	18:00:19
Stronsay Firth	STS9	08/02/2013	59.081033	-2.703733	59.075083	-2.699233	29.5	30.3	18:07:06	18:17:14
Stronsay Firth	STS10	09/02/2013	59.063967	-2.689200	59.061650	-2.694017	32.2	32.2	08:49:57	09:02:15
Stronsay Firth	STS11	09/02/2013	59.050050	-2.713883	59.048283	-2.714733	41.2	40.4	09:16:33	09:21:45
Stronsay Firth	STS12	09/02/2013	59.057100	-2.726500	59.054233	-2.725900	37.0	39.0	09:44:44	09:54:20
Stronsay Firth	STS13	09/02/2013	59.068067	-2.734033	59.064633	-2.734350	32.6	33.3	10:15:09	10:30:27
Stronsay Firth	STS14	09/02/2013	59.082050	-2.747133	59.080083	-2.748833	36.3	36.6	10:47:38	10:57:17

APPENDIX 3: PHYSICAL AND BIOLOGICAL DESCRIPTIONS OF THE SURVEY SITES. SITE ID CODES CORRESPOND WITH THOSE IN APPENDIX 1. PPF CODES USED ARE AS FOLLOWS: HABITATS - BM (BURROWED MUD), KS (KELP AND SEAWEED COMMUNITY ON SUBLITTORAL SEDIMENT), MB (MAERL BED), SMS (SUBLITTORAL MUD AND MIXED SEDIMENT COMMUNITIES); SPECIES - AI (*ARCTICA ISLANDICA*), AA (*ARCTICA ISLANDICA* AGGREGATION), PM (*PACHYCERIANTHUS MULTIPLICATUS*). HM DENOTES HORSE MUSSEL BED (PMF BUT NOT PPF AT RECORDED LOCATION)

Site ID	Substrate	Biota	Biotope	PPF
LFG01	Flat mud	Mud perforated by many small holes (< 1 cm diameter) and sparse megafaunal burrows including *Nephrops norvegicus* (O, 1 animal seen) and possibly *Calocaris macandreae* (P). *Asterias rubens* (O), *Pagurus bernhardus* (O), *Liocarcinus* sp. (O), *Munida rugosa* (O), small teleost (P)	SS.SMu.CFiMu.SpnMeg	BM
LFG02	Slope of mixed silty sediment with gravel and pebbles and scattered cobbles and boulders	Stones support *Alcyonium digitatum* (R), *Protanthea simplex* (O) and *Bolocera tuediae* (R). Burrowing holothurians (F), *Asterias rubens* (F), *Munida rugosa* (F), *Echinus esculentus* (C), *Liocarcinus depurator* (O), *Aequipecten opercularis*? (P)	SS.SMx.CMx.ClloModHo	SMS
LFG03	Soft mud with outcropping bedrock towards end of run	Mud perforated by small holes and with sparse megafaunal burrows including *Nephrops norvegicus* (O, 1 animal seen). *Munida rugosa* (F), *Virgularia mirabilis*? (R), *Asterias rubens* (O). Silted rock supporting *Protanthea simplex* (F on rock)	SS.SMu.CFiMu.SpnMeg CR.LCR.BrAs.NeoPro.FS	BM
LFG04	Soft mud	Poor visibility. Mud perforated by small holes (< 1 cm diameter) and sparse megafaunal burrows including *Nephrops norvegicus* (O, 2 animals seen) and possibly *Calocaris macandreae* (P). *Asterias rubens* (P), *Munida rugosa* (P), Caridea spp. (P), small teleost (P)	SS.SMu.CFiMu.SpnMeg	BM
LFG05	Soft mud	Poor visibility. Mud perforated by small holes (< 1 cm diameter) and megafaunal burrows including *Nephrops norvegicus* (F, 3 animals seen) and possibly *Calocaris macandreae* (P). *Asterias rubens* (P), *Munida rugosa* (F), Caridea sp. (O), *Echinus esculentus* (P), small teleost (P)	SS.SMu.CFiMu.SpnMeg	BM

Appendix 3 continued

Site ID	Substrate	Biota	Biotope	PPF
LFG06	Mixed silty sediment with gravel, pebbles and scattered cobbles and boulders, with patches of more homogeneous muddy sand or sandy mud	Stones support *Alcyonium digitatum* (R, locally F) and *Antedon* sp. (R), with sediment fauna of frequent burrowing holothurians, including *Thyonidium drummondi?*, and *Pachycerianthus multiplicatus* (R), and *Virgularia mirabilis* (C in more homogeneous substrate patches). *Asterias rubens* (O), *Henricia* sp. (R), *Echinus esculentus* (F), *Munida rugosa* (F)	SS.SMx.CMx.CIloModHo SS.SMu.CSaMu.VirOphPmax	SMS SMS PM
LFG07	Silty sand with gravel and pebbles	Dense burrowing holothurians (A) including *Thyonidium drummondi*?, with *Ophiothrix fragilis* (C), *Alcyonium digitatum* (F), *Asterias rubens* (O), *Aequipecten opercularis* (P), *Virgularia mirabilis* (P), *Liocarcinus* sp. (P), *Munida rugosa* (P) and *Echinus esculentus* (P)	SS.SMx.CMx.CIloModHo	SMS
LFG07	Mixed muddy sand sediment with cobbles and boulders	Dense *Ophiothrix fragilis* (S) and burrowing holothurians (A) including *Thyonidium drummondi*?. *Alcyonium digitatum* (F), *Asterias rubens* (P), *Echinus esculentus* (P)	SS.SMx.CMx.OphMx	
LFG08	Soft mud	Very sparse megafaunal burrows including possibly *Calocaris macandreae* (P) and *Callianassa subterranea* (P). *Virgularia mirabilis* (F), *Munida rugosa* (F), *Asterias rubens* (O), *Liocarcinus* sp. (P), teleost (P), Paguridae sp. (P), *Aphrodita aculeata* (P), *Thyonidium drummondi*? (P)	SS.SMu.CFiMu.SpnMeg	BM
LFG09	Mud	Mud burrowed by *Calocaris macandreae* (F) and supporting *Virgularia mirabilis* (F) and burrowing holothurians (F). *Asterias rubens* (P), *Munida rugosa* (F)	SS.SMu.CFiMu.SpnMeg	BM
LFG10	Mud	Mud burrowed by *Calocaris macandreae* (O) and small *Nephrops norvegicus* (P) and supporting sparse *Virgularia mirabilis* (O) and polychaete tubes. *Asterias rubens?* (R), *Munida rugosa* (F), teleost (P)	SS.SMu.CFiMu.SpnMeg	BM

Appendix 3 continued

Site ID	Substrate	Biota	Biotope	PPF
LFG11	Mud	Mud burrowed by *Calocaris macandreae* (F) and possibly sparse *Callianassa subterranea* (O) and supporting *Virgularia mirabilis* (F). Scattered stones support *Protanthea simplex* (O), *Metridium senile*? (R) and *Ophiothrix fragilis* (F). *Asterias rubens* (O), *Munida rugosa* (O), *Liocarcinus* sp. (P), Brachyura sp. (O), *Ophiura* sp. (P), burrowing holothurians (O)	SS.SMu.CFiMu.SpnMeg	BM
LFG12	Mud	Very sparse small burrows. Debris (possibly largely algal) supports *Protanthea simplex* (F, locally A), while mud supports *Pachycerianthus multiplicatus* (F, 3 specimens seen), *Cerianthus lloydii* (O) and burrowing holothurians (O). *Asterias rubens* (F), *Munida rugosa* (O), Buccinidae sp. (P), *Ophiura* sp. (P), Brachyura sp. (P)	SS.SMu.CFiMu	PM
LFG13	Mud	Emergent infaunal tubes (possibly polychaetes) dense in places. *Protanthea simplex* (O) on debris (possibly algal). *Asterias rubens* (O), Teleostei sp. (P)	SS.SMu.CFiMu	
LFG14	Mud	Sparse megafaunal burrows including *Nephrops norvegicus* (F, 1 animal seen). *Amphiura* spp. (A, at least locally), *Virgularia mirabilis* (O), burrowing holothurian (P), *Munida rugosa* (P), *Metridium senile*? (P)	SS.SMu.CFiMu.SpnMeg	BM
LFG15	Mud	Fairly sparse megafaunal burrows including *Nephrops norvegicus* (P, 2 animals seen), *Calocaris macandreae* (P) and possibly *Callianassa subterranea* (P). *Virgularia mirabilis* (O), emergent polychaete tubes (P) including those of *Sabella pavonina* and probably *Chaetopterus variopedatus*. *Asterias rubens* (O), teleost spp. (O), *Munida rugosa* (O). Scattered algal debris supports *Protanthea simplex* (O, locally F)	SS.SMu.CFiMu.SpnMeg	BM
LFG16	Sandy mud with increasing quantities of pebbles, cobbles and occasional boulders	Dense burrowing holothurians (C, locally A), with *Ophiothrix fragilis* (F), *Asterias rubens* (F), *Munida rugosa* (F), *Echinus esculentus* (F), *Ophiura* sp. (P), Brachyura sp. (R), *Modiolus modiolus* (O), *Buccinum undatum* (P), teleost sp. (P), polychaete tubes (P) and Paguridae spp. (R). Stones support sparse *Alcyonium digitatum* (R) and *Protanthea simplex* (R). Habitat initially transitional between mud and mixed substrate biotope, exhibiting sparse small burrows	SS.SMx.CMx.CIloModHo	SMS
LFG17	Mud	Sparse megafaunal burrows including small *Nephrops norvegicus* (F) and *Calocaris macandreae* (O). *Virgularia mirabilis* (O), polychaete tubes (P), *Munida rugosa* (O), *Asterias rubens*? (P), teleost sp. (P)	SS.SMu.CFiMu.SpnMeg	BM

Appendix 3 continued

Site ID	Substrate	Biota	Biotope	PPF
LFG18	Mud with black marbling - reduced	Mostly out of focus. Dense tubes emerging from sediment (possibly polychaetes) and dense *Oxydromus flexuosus* on mud surface (C). Sparse burrows.	SS.SMu.IFiMu.Beg	
LFG19	Mud with black marbling - reduced	Mostly out of focus. Sparse patches of *Beggiatoa* sp. Very dense *Oxydromus flexuosus* (A) with its epitokes? also abundant	SS.SMu.IFiMu.Beg	
LFG20	Mud with dark grey marbling - reduced	Dense emergent small tubes, possibly of polychaete origin and occasional sabellid-type tubes. *Oxydromus flexuosus* (C), *Protanthea simplex* (R), teleost sp. (P). Dense *Meganyctiphanes norvegica*? in water column	SS.SMu.IFiMu.Beg	
LFG20	Probably superficial mud covering rock slope	Clumps of *Sabella pavonina* tubes (F) and *Protanthea simplex* (F, locally C). Ascidiacea spp. (P) including *Ciona intestinalis* (unattached). *Ophiothrix fragilis* (R)	CR.LCR.BrAs.NeoPro.FS	
LFG21	Mud	Clumps of *Sabella pavonina* tubes with some worms emergent (F). Tubes and other hard surfaces provide attachment for *Protanthea simplex* (F). *Munida rugosa* (F), teleost sp. (P), Paguridae sp. (P), Brachyura sp. (P), *Meganyctiphanes norvegica*? in water column	SS.SMu.CFiMu	
LFG22	Mud with black marbling - reduced	Mostly out of focus. Sparse patches of *Beggiatoa* sp. Dense *Oxydromus flexuosus* (A). Dense fine emergent tubes, possibly of polychaete origin	SS.SMu.IFiMu.Beg	
LFG25	Mud with black marbling - reduced	Mostly out of focus. Dense *Oxydromus flexuosus* (C). Dense fine emergent tubes, possibly of polychaete origin. Also larger tubes, including *Sabella pavonina* (O). Ascidiacea spp. (O)	SS.SMu.IFiMu.Beg	
LFG27	Mud with black marbling - reduced	Mostly out of focus. Patches of *Beggiatoa* sp. *Protanthea simplex* on algal debris (F), *Asterias rubens* (P), Brachyura sp. (P)	SS.SMu.IFiMu.Beg	
LFG28	Mud or sandy mud with black marbling - reduced	Possible patches of *Beggiatoa* sp. (P). Little evidence of life. Brachyura sp. (P), leaf litter	SS.SMu.IFiMu.Beg	

Appendix 3 continued

Site ID	Substrate	Biota	Biotope	PPF
LFG29	Slightly shelly sandy mud with sparse, scattered cobbles and boulders	Sediment supporting *Virgularia mirabilis* (F) and burrowing holothurians (O), Stones encrusted with pink coralline algae (P) and *Spirobranchus* spp. (P) and supporting *Alcyonium digitatum* (R). *Asterias rubens* (O), *Munida rugosa* (P), Pectinidae sp. (P)	SS.SMu.CSaMu.VirOphPmax	SMS
LFG30	Dense gravel and pebbles with sparse boulders on silty sand	Dense burrowing holothurians (C, locally A) with stones supporting *Alcyonium digitatum* (R). *Asterias rubens* (O), *Henricia* sp. (P), *Liocarcinus depurator* (P), *Munida rugosa* (F), teleost sp. (P) and *Echinus esculentus* (C)	SS.SMx.CMx.CIloModHo	SMS
V01	Soft mud	Densely burrowed by megafauna including *Calocaris macandreae* (A) and *Nephrops norvegicus* (P, 2 animals seen)	SS.SMu.CFiMu.SpnMeg	BM
V02	Soft mud	Densely burrowed by megafauna including *Calocaris macandreae* (C) and *Nephrops norvegicus* (P, 5 animals seen). *Asterias rubens* (O)	SS.SMu.CFiMu.SpnMeg	BM
V03	Sandy mud or muddy sand	Infauna represented by polychaete casts, small holes, infaunal tubes and small mounds and megafaunal burrows (possibly mostly *Callianassa subterranea*). *Porania pulvillus* (R), *Turritella communis* (C), *Astropecten irregularis*? (R)	SS.SMu.CSaMu	
V04	Mud	Moderate density of megafaunal burrows including *Nephrops norvegicus* (C, 2 animals seen) and *Calocaris macandreae* (F). Asteroidea sp. (R)	SS.SMu.CFiMu.SpnMeg	BM
V05	Sandy mud or muddy sand	Infauna represented by small holes, bivalve siphons?, infaunal tubes (possibly including *Chaetopterus variopedatus*) and sparse small mounds and megafaunal burrows (possibly *Callianassa subterranea* and *Nephrops norvegicus*). *Porania pulvillus* (O), *Turritella communis* (C), *Cerianthus lloydii* (P), *Luidia ciliaris (P)*	SS.SMu.CSaMu	
V06	Waves of coarse sand with some dead maerl; shells, gravel and pebbles in troughs	Very sparse rhodoliths of live *Phymatolithon calcareum* (R), *Neopentadactyla mixta* (O), *Asterias rubens* (C), *Marthasterias glacialis* (P), *Porania pulvillus* (O), errant polychaete (P), pink coralline algae (O)	SS.SCS.CCS.Nmix	MC

Appendix 3 continued

Site ID	Substrate	Biota	Biotope	PPF
V07	Mud	Moderate density of megafaunal burrows including *Nephrops norvegicus* (P) and *Calocaris macandreae* (P). *Lumpenus lampretaeformis* (P), *Asterias rubens* (O), *Luidia ciliaris* (P), *Turritella communis* shells (P but occupancy uncertain), teleost sp. (P), *Aphrodita aculeata* (R)	SS.SMu.CFiMu.SpnMeg	BM
V08	Soft mud	Visibility poor, but mud clearly densely burrowed by megafauna including *Calocaris macandreae* (C) and *Nephrops norvegicus* (C, 4 animals seen). *Asterias rubens* (P)	SS.SMu.CFiMu.SpnMeg	BM
V09	Poorly sorted sandy sediment with many shells, gravel and pebbles	Sediment with many infaunal tubes, small holes and bivalve siphons. *Asterias rubens* (F), *Henricia* sp. (O), *Pecten maximus* (P), pink coralline algae (R)	SS.SMx.CMx	
V10	Soft mud	Densely burrowed by megafauna including *Calocaris macandreae* (C) and *Nephrops norvegicus* (C, 4 animals seen)	SS.SMu.CFiMu.SpnMeg	BM
V11	Soft mud	Densely burrowed by megafauna including *Calocaris macandreae* (C) and *Nephrops norvegicus* (C, 7 animals seen)	SS.SMu.CFiMu.SpnMeg	BM
V12	Waves of medium sand with gravel and shells in troughs and scattered dead maerl, initially with dense shell patches	Sediment with small holes and infaunal tubes and small *Cerianthus lloydii*? (P). *Asterias rubens* (F), *Porania pulvillus* (O), *Marthasterias glacialis* (P), Paguridae sp. (R), *Cancer pagurus* (P), pink coralline algae (O)	SS.SMx.CMx	
V13	Shelly muddy sand	Infauna represented by polychaete casts, small mounds (possibly including *Callianassa subterranea*), small holes and bivalve siphons. *Ophiura ophiura* (P), *Porania pulvillus* (O), *Turritella communis* shells (probably unoccupied), *Aporrhais pespelecani* shells (occupancy uncertain)	SS.SSa.CMuSa	
V14	Soft mud	Densely burrowed by megafauna including *Calocaris macandreae* (C) and *Nephrops norvegicus* (C, 2 or 3 animals seen). *Lumpenus lampretaeformis*? (P)	SS.SMu.CFiMu.SpnMeg	BM

Appendix 3 continued

Site ID	Substrate	Biota	Biotope	PPF
V15	Mud or sandy mud	Sediment with small holes, infaunal tubes, polychaete casts and moderate density of megafaunal burrows including *Calocaris macandreae* (P), *Nephrops norvegicus* (P) and possibly *Callianassa subterranea* (P). *Turritella communis* (C), *Asterias rubens* (O), *Pennatula phosphorea*? (O)	SS.SMu.CFiMu.SpnMeg	BM
V16	Dense, generally silted, cobbles and boulders with patches of mixed muddy sand with gravel and pebbles	Stones lightly encrusted with *Spirobranchus* spp.(F, locally C), *Parasmittina trispinosa* (R) and pink coralline algae (R) and with some dense patches of hydroids (F) and *Antedon* sp. (A, but overall O). *Luidia ciliaris* (P), *Porania pulvillus* (O), *Echinus esculentus* (P). Mixed areas with similar fauna, accompanied by a small patch of *Ophiocomina nigra* (R, locally A)	CR.LCR.BrAs SS.SMx.CMx	
V16	Mud	Small holes and infaunal tubes, with moderate density of megafaunal burrows including *Calocaris macandreae* (P). *Asterias rubens* (P)	SS.SMu.CFiMu.SpnMeg	BM
V17	Mud with patches of sandy mud with gravel, pebbles, cobbles and boulders	Mud with moderate density of megafaunal burrows including *Calocaris macandreae* (F), *Nephrops norvegicus* (P) and probably *Callianassa subterranea* (P). Also small holes, infaunal tubes, polychaete casts and sparse, *Arctica islandica* siphons. *Turritella communis* shells (occupancy uncertain), Brachyura sp. (R), Asteroidea sp. (R). In mixed substrate areas stones support sparse serpulid worms (R), hydroid patches (F), erect bryozoans (P), *Antedon* sp. (F), Actiniaria sp. (R) and *Echinus esculentus* (P), with *Goneplax rhomboides* and *Lumpenus lampretaeformis* also present	SS.SMu.CFiMu.SpnMeg SS.SMx.CMx	BM AI
V18	Sandy mud with mixed areas also including gravel, pebbles, cobbles and boulders	Sediment with small holes, infaunal tubes, polychaete casts and low density of small megafaunal burrows. Small paired siphon? holes and sparse presence of *Arctica islandica* siphons and valves. *Turritella communis* shells (P, occupancy uncertain), *Liocarcinus* sp. (P), *Asterias rubens* (P), *Porania pulvillus* (P). In mixed areas stones support hydroid patches (P) and *Metridium senile*? (R), with *Munida rugosa* also present	SS.SMu.CSaMu SS.SMx.CMx	AI
V19	Waves of medium sand with shells and gravel in troughs	*Neopentadactyla mixta* (P), pink coralline algae on gravel (R), *Asterias rubens* (P), *Liocarcinus* sp. (P), small bivalve siphons (P)	SS.SCS.CCS.Nmix	MC

Appendix 3 continued

Site ID	Substrate	Biota	Biotope	PPF
V20	Waves of coarse sand, stone and maerl gravel, with gravel, pebbles and shells in troughs	Poor visibility for most of run. *Neopentadactyla mixta* (P), *Asterias rubens* (P), *Porania pulvillus* (P), gravel and pebbles with pink coralline algae (O)	SS.SCS.CCS.Nmix	MC
V21	Waves of coarse sand and gravel, then waves of dead maerl, with shells, gravel and pebbles in troughs	Sparse live rhodoliths of *Phymatolithon calcareum* (R). Stones with pink coralline algae (R) and serpulid worms (P). *Asterias rubens* (P)	SS.SCS.CCS	
V22	Very mixed substrate of shelly sand with gravel, pebbles, cobbles and boulders	Stones sparsely encrusted with serpulid worms (P) and pink coralline algae (O) and supporting sparse patches of filamentous (O) and foliose (R) red algae. *Marthasterias glacialis* (F), *Asterias rubens* (C), *Luidia ciliaris* (P), *Crossaster papposus* (F), *Echinus esculentus* (C), *Porania pulvillus* (O), *Astropecten irregularis*? (O)	SS.SMx.CMx	
V23	Cobbles and boulders on mixed coarse sand sediment	Stones support a patchy red filamentous algal turf (F), pink coralline algae (O), serpulid worms (P), *Parasmittina trispinosa* (R) and Ascidiacea spp. (F). *Marthasterias glacialis* (F), *Asterias rubens* (C), *Luidia ciliaris* (P), *Crossaster papposus* (P), *Echinus esculentus* (F), *Porania pulvillus* (O)	IR.HIR.KFaR.FoR	
V24	Stone gravel and dead maerl, the latter locally in waves. Scattered pebbles, cobbles and boulders, with boulder patches	Live rhodoliths of *Phymatolithon calcareum* generally sparse (overall R), but possibly F in patches. *Asterias rubens* (C), *Porania pulvillus* (O), *Marthasterias glacialis* (P). Boulders with very sparse red algae (R), serpulid worms (P) and pink coralline algae (R)	SS.SCS.CCS SS.SMp.Mrl.Pcal.Nmix	MB

Appendix 3 continued

Site ID	Substrate	Biota	Biotope	PPF
V25	Boulders, cobbles and pebbles on coarse sand with pockets of dead maerl towards end of run	Stones support patchy red algal turf including filamentous (C) and foliose (R) forms, Ascidiacea spp. (P) and encrusting biota of pink coralline algae (O), serpulid worms (P) and *Parasmittina trispinosa* (R). Dense asteroids, with *Asterias rubens* (C), *Marthasterias glacialis* (F), *Echinus esculentus* (C) and *Porania pulvillus* (O). *Chaetopterus variopedatus*? (P)	IR.HIR.KFaR.FoR SS.SCS.CCS	
V26	Waves of gravel and dead maerl becoming largely dead maerl, latterly with pebbles and cobbles	Mostly sparse live *Phymatolithon calcareum* (R) but becoming frequent in patches towards end of run. *Marthasterias glacialis* (F), *Asterias rubens* (P), *Astropecten irregularis*? (P)	SS.SCS.CCS SS.SMp.Mrl.Pcal.Nmix	MB
V26	Cobbles and boulders on coarse sand	Stones support a red algal turf of filamentous (C) and foliose (R) forms, pink coralline algae (R), serpulid worms (P) and Ascidiacea spp. (C). *Marthasterias glacialis* (C), *Asterias rubens* (P), *Echinus esculentus* (F), *Porania pulvillus* (R)	IR.HIR.KFaR.FoR	
V27	Coarse sand and maerl gravel with areas of boulders and cobbles initially and cobbles and pebbles latterly	Stones encrusted with pink coralline algae (O) and serpulid worms, with larger stones supporting a red filamentous algal turf (C) and Ascidiacea spp. (P). Live *Phymatolithon calcareum* frequent in places. *Marthasterias glacialis* (C), *Asterias rubens* (F), *Echinus esculentus* (P), *Crossaster papposus* (P), *Chaetopterus variopedatus*? (P)	IR.HIR.KFaR.FoR SS.SMp.Mrl.Pcal.Nmix SS.SMx.CMx	MB
V28	Fine sand with light dusting of shell debris and scattered pebbles	*Asterias rubens* (F). Pebbles sparsely encrusted with serpulid worms (P) and pink coralline algae (R)	SS.SSa.CFiSa	
V28	Waves of maerl gravel with stone gravel and pebbles in	*Asterias rubens* (F) and very sparse live rhodoliths of *Phymatolithon calcareum* (R), Stones encrusted with pink coralline algae (P) and serpulid worms (P)	SS.SCS.CCS	

Appendix 3 continued

Site ID	Substrate	Biota	Biotope	PPF
	troughs			
V28	Dense pebbles and cobbles on sand	*Asterias rubens* (C), *Henricia* sp. (P). Stones sparsely encrusted with serpulid worms (P) and pink coralline algae (R)	SS.SMx.CMx	
V29	Silty gravel and dead maerl becoming waves of dead maerl	Several *Neopentadactyla mixta* observed (P) and infaunal tubes (P), with *Asterias rubens* (F), *Porania pulvillus* (O), *Marthasterias glacialis* (F), *Luidia ciliaris* (F) and Paguridae sp. (P). Stones sparsely encrusted with pink coralline algae (R) and serpulid worms (P)	SS.SCS.CCS.Nmix	MC
V29	Dimpled, shelly, slightly silty, fine-medium sand	Little evidence of life, though visibility poor and sequence short	SS.SSa.CFiSa	
V30	Silty shelly sand with much gravel and surface scatter of pebbles, cobbles and boulders	Stones support a patchy turf of filamentous red algae (C), pink coralline algae (O), serpulid worms (C) including *Spirobranchus* spp. (P), *Parasmittina trispinosa* (R), nudibranch egg strings (P) and ascidians, including *Ascidiella aspersa*? (P). *Asterias rubens* (C), *Porania pulvillus* (O), *Echinus esculentus* (F), *Marthasterias glacialis* (F)	IR.HIR.KFaR.FoR	
V31	Shelly muddy sand with scattered pebbles and cobbles	Sparse stones support hydroids (R). *Asterias rubens* (P), *Porania pulvillus* (O), polychaete casts (P),	SS.SSa.CMuSa	
V32	Mud or sandy mud	Moderate density of megafaunal burrows including *Calocaris macandreae* (F). *Nephrops norvegicus* (P, 1 animal seen) and probably *Callianassa subterranea* (P). Mud also exhibits many small holes, infaunal tubes and polychaete casts. *Ophiocomina nigra* abundant in second half of run (C overall). *Turritella communis* shells (P, occupancy uncertain), hydroids (R), *Cerianthus lloydii* (R), small teleost (R)	SS.SMu.CFiMu.SpnMeg	BM

Appendix 3 continued

Site ID	Substrate	Biota	Biotope	PPF
V33	Sandy mud	Infauna represented by polychaete casts, small holes, infaunal tubes and small mounds and low density of small megafaunal burrows (possibly including *Callianassa subterranea*). Bivalve siphon holes also evident including those of sparse *Arctica islandica* (P). *Porania pulvillus* (O), *Turritella communis* (F), *Ophiura ophiura* (C), hydroids (R)	SS.SMu.CSaMu	AI
V34	Slightly shelly muddy sand	Infauna represented by emergent tubes and small holes, including those produced by bivalve siphons. *Virgularia mirabilis* (R), *Ophiura* sp. (P), *Astropecten irregularis*? (P)	SS.SSa.CMuSa	
V35	Waves of silty gravel and coarse sand with scattered cobbles and boulders and dense boulder patches	Gravel fauna includes *Neopentadactyla mixta* (P), with rock surfaces supporting a patchy turf of filamentous red algae (F, locally C), serpulid worms (F), pink coralline algae (R), hydroid patches (O) and ascidians including *Ascidiella aspersa* (F) and *Ascidia virginea* (P). *Luidia cilairis* (F), *Crossaster papposus* (F), *Porania pulvillus* (O), *Asterias rubens* (F), *Echinus esculentus* (P), *Necora puber* (P)	SS.SCS.CCS.Nmix IR.HIR.KFaR.FoR	MC
V36	Sandy mud	Infauna represented by polychaete casts, small holes (including those of bivalve siphons), infaunal tubes and small mounds and fairly low density of small megafaunal burrows (possibly including *Callianassa subterranea* and *Calocaris macandreae*). *Ophiocomina nigra* (C), *Porania pulvillus* (P), *Turritella communis* (C), *Asterias rubens* (P), *Liocarcinus* sp. (P)	SS.SMu.CSaMu	
V37	Fairly soft mud	Moderate density of megafaunal burrows including *Calocaris macandreae* (F). *Nephrops norvegicus* (P, 1 animal seen) and possibly *Callianassa subterranea* (P). Mud also exhibits many small holes including probably those of bivalve siphons, infaunal tubes and polychaete casts. *Turritella communis* (C), *Asterias rubens* (F), *Pennatula phosphorea* (P), teleost sp. (P)	SS.SMu.CFiMu.SpnMeg	BM
V38	Soft mud	Very poor visibility, but clearly a moderate density of megafaunal burrows including *Nephrops norvegicus* (P, 1 animal seen), and *Calocaris macandreae* (P)	SS.SMu.CFiMu.SpnMeg	BM
V39	Fairly soft mud	Moderate density of megafaunal burrows including *Nephrops norvegicus* (C, 1 animal seen), *Calocaris macandreae* (P) and possibly *Callianassa subterranea* (P). *Turritella communis* (P), *Asterias rubens* (F), small holes in mud (P)	SS.SMu.CFiMu.SpnMeg	BM

Appendix 3 continued

Site ID	Substrate	Biota	Biotope	PPF
V40	Muddy sand	Infauna represented by polychaete casts, small mounds, emergent tubes and small holes, including those produced by bivalve siphons. *Ophiura ophiura* (O), *Asterias rubens* (O), *Luidia ciliaris* (P), *Porania pulvillus* (O), *Turritella communis* (F), *Aporrhais pespelecani shells* (O, but occupancy uncertain), *Liocarcinus* sp. (P), Pleuronectiformes sp. (P), *Callionymus lyra* (P). Patch of *Ophiocomina nigra* (locally C)	SS.SSa.CMuSa	
V41	Gravel and sand, formed into waves in places, with shell and pebbles	Gravel and pebbles encrusted with serpulid worms, including *Spirobranchus* spp. (P), and pink coralline algae (R). *Neopentadactyla mixta* (P), *Asterias rubens* (R)	SS.SCS.CCS.Nmix	MC
V42	Mud	Poor visibility and mostly out of focus. Moderate density of megafaunal burrows including *Nephrops norvegicus* (C, 3 animals seen) and *possibly Callianassa subterranea* (P). *Asterias rubens* (O), *Ophiura ophiura* (F)	SS.SMu.CFiMu.SpnMeg	BM
V43	Soft mud	Moderate density of megafaunal burrows including *Nephrops norvegicus* (C, 5 animals seen) and *Calocaris macandreae* (F). *Lumpenus lampretaeformis* (O)	SS.SMu.CFiMu.SpnMeg	BM
V44	Mud	Moderate to light density of megafaunal burrows including *Nephrops norvegicus* (C) and *Calocaris macandreae* (P). *Pennatula phosphorea* (O), *Virgularia mirabilis* (O), *Ophiura ophiura* (P), *Turritella communis* (P), small holes and infaunal tubes	SS.SMu.CFiMu.SpnMeg	BM
V45	Muddy sand, initially with surface scatter of coarse sand and sparse pebbles and shells	Sparse holes in sediment, *Munida rugosa* (P), *Porania pulvillus* (O), *Asterias rubens*? (P), *Turritella communis* shells (P, occupancy uncertain), *Callionymus lyra* (O), hydroids (R)	SS.SSa.CMuSa	
V46	Muddy sand with much shell material	Infauna represented by polychaete casts, small mounds, emergent tubes and small holes and bivalve siphons, including those of *Arctica islandica*. *Luidia ciliaris* (P), *Porania pulvillus* (O), *Turritella communis* (C), *Aporrhais pespelecani shells* (P), *Henricia* sp.? (R), *Pennatula phosphorea*? (P), hydroid clumps (R), *Pecten maximus* (P)	SS.SSa.CMuSa	AI

Appendix 3 continued

Site ID	Substrate	Biota	Biotope	PPF
V47	Waves of coarse sand and maerl gravel with shells, gravel and small pebbles in troughs	*Asterias rubens* (F), *Porania pulvillus* (O), *Henricia* sp. (R), *Liocarcinus* sp. (R). Small stones encrusted with pink coralline algae (R)	SS.SCS.CCS	
V48	Silty sand with much gravel and scattered pebbles, shells and cobbles	Sediment with sparse *Cerianthus lloydii* (P), *Virgularia mirabilis* (O) and polychaete tubes (P). Stones support a sparse encrusting community of pink coralline algae (R) and serpulid worms (P), as well as sessile erect forms including hydroid patches (O) and *Alcyonium digitatum* (R). *Buccinum undatum* egg mass (P), *Aequipecten opercularis* (R), *Porania pulvillus* (R), *Asterias rubens* (R), *Luidia ciliaris* (P)	SS.SMx.CMx	
V49	Apparently sand with much gravel, shells and possibly pebbles	Poor visibility. *Marthasterias glacialis* (F), *Crossaster papposus*? (P), *Porania pulvillus*? (F), *Echinus esculentus* (P),	SS.SMx.CMx	
V50	Coarse sand with shell material and scattered gravel, pebbles, cobbles and boulders	*Porania pulvillus* (O), Buccinidae sp. (P). Dense patch of *Ophiocomina nigra* (A within patch)	SS.SCS.CCS SS.SMx.CMx.OphMx	
V51	Sandy mud or muddy sand	Small holes, infaunal tubes and polychaete casts. Sparse *Arctica islandica* siphons and valves present, with smaller siphons possibly indicated by paired holes. Sparse megafaunal burrows including *Nephrops norvegicus* (P, 1 animal seen). *Virgularia mirabilis* (O), *Pennatula phosphorea* (O), *Callionymus lyra* (P), *Munida rugosa* (O). Dense *Meganyctiphanes norvegica*? in water column	SS.SMu.CSaMu	AI

Appendix 3 continued

Site ID	Substrate	Biota	Biotope	PPF
V52	Shelly sand with pebbles, cobbles and occasional boulders	Sediment with dense *Cerianthus lloydii* (A). Stones support a patchy hydroid turf (F), possibly a yellow sponge (R) and *Parasmittina trispinosa* (R), and *Antedon* sp. (locally A in aggregations). *Porania pulvillus* (O), Paguridae spp. (P), *Echinus esculentus* (F), *Calliostoma zizyphinum* (P), *Munida rugosa* (O), *Liocarcinus* sp. (P), *Pholis gunnellus*? (P)	SS.SMx.CMx	
V53	Waves of maerl gravel with shells in troughs	Shells bands support algal clumps including filamentous reds (O), *Saccharina latissima* (O) and Phaeophyceae spp. (R). *Cerianthus lloydii* (P), *Asterias rubens* (P), Asteroidea spp. (P), Ophiuroidea sp. (P), pink coralline algae (R), Brachyura sp. (P), sparse live rhodoliths of *Phymatolithon calcareum* (R)	SS.SCS.CCS	
V54	Coarse sand with varying concentrations of gravel, pebbles, cobbles and boulders	Stones sparsely encrusted with serpulid worms (P). *Porania pulvillus* (O)	SS.SMx.CMx	
V54	Coarse sand with gravel, pebbles and cobbles	Stones sparsely encrusted with serpulid worms (P). *Porania pulvillus* (O), *Luidia ciliaris* (P), *Urticina* sp.? (P), *Ophiocomina nigra* (A)	SS.SMx.CMx.OphMx	
V55	Mixed substrate of gravel, pebbles, cobbles and occasional boulders on shelly sand	Stones support hydroid/bryozoan turf (C), serpulid worms (P) and *Antedon* sp. (C). *Echinus esculentus* (F), *Asterias rubens* (F), *Munida rugosa* (F), *Ophiura albida* (P), *Ophiocomina nigra* (C locally), *Cancer pagurus* (F). Ctenophores in water column	SS.SMx.CMx	
V56	Fairly soft mud	Moderate density of megafaunal burrows including *Calocaris macandreae* (F) and *Nephrops norvegicus* (C). *Virgularia mirabilis* (O), small teleost sp. (O), Caridea sp. (O), *Munida rugosa* (P), *Aphrodita aculeata* (P). Dense *Meganyctiphanes norvegica*? in water column	SS.SMu.CFiMu.SpnMeg	BM
V57	Soft mud	Very dense megafaunal burrows including *Calocaris macandreae* (A) and *Nephrops norvegicus* (C). Small teleost spp. (F), *Lumpenus lampretaeformis* (P), Caridea sp. (P). *Meganyctiphanes norvegica*? in water column	SS.SMu.CFiMu.SpnMeg	BM

Appendix 3 continued

Site ID	Substrate	Biota	Biotope	PPF
V58	Soft mud	Very dense megafaunal burrows including *Calocaris macandreae* (A) and *Nephrops norvegicus* (C, 1 animal seen). Teleost sp. (P), Caridea sp. (P). Dense *Meganyctiphanes norvegica*? and ctenophores in water column	SS.SMu.CFiMu.SpnMeg	BM
V59	Presumably mud	No visibility due to suspended mud		
V60	Soft mud	Dense megafaunal burrows including *Calocaris macandreae* (A) and *Nephrops norvegicus* (C, 2 animals seen)	SS.SMu.CFiMu.SpnMeg	BM
V61	Slightly shelly mud	Moderate density of megafaunal burrows including *Calocaris macandreae* (F) and *Nephrops norvegicus* (P, 1 animal seen). *Asterias rubens* (F), Caridea sp. (P). *Meganyctiphanes norvegica*? in water column	SS.SMu.CFiMu.SpnMeg	BM
V62	Muddy sand with scattered gravel, pebbles and cobbles	Sparse holes and faunal tubes in sediment, *Munida rugosa* (O), *Porania pulvillus* (O), *Pagurus bernhardus* (O), *Neptunea antiqua*? (O), Bryozoa sp. (R)	SS.SSa.CMuSa	
V63	Waves of coarse sediment including maerl gravel with shells in troughs	Dense *Cerianthus lloydii* (C), *Liocarcinus* sp. ? (P), Brachyura sp. (P), *Marthasterias glacialis* (P), pink coralline algae on small stones	SS.SCS.CCS	
V64	Muddy sand with sparsely scattered gravel, pebbles and shells	Sparse holes and faunal tubes in sediment, Stones and shells support hydroid tufts (O). *Antedon* sp.? (R), *Asterias rubens* (P), Paguridae sp. (P), *Callionymus lyra* (P)	SS.SSa.CMuSa	
V65	Silty sand with varying concentrations of coarse sand, gravel and pebbles and often dense shell material, especially *Ensis*	Dense *Cerianthus lloydii* for first third of run (A) and infaunal tubes (probably *Cerianthus*). Stones with sparse serpulid worms (P) and hydroids (O), which are also attached to tubes. *Porania pulvillus* (O), *Marthasterias glacialis* (P), drift *Saccharina latissima* (O) and *Zostera marina* (R), *Henricia* sp. (R)	SS.SMx.CMx	

Appendix 3 continued

Site ID	Substrate	Biota	Biotope	PPF
V66	Muddy sand with scattered shell material	Shell material supports hydroid tufts (F). Infauna represented by emergent tubes, small holes, including paired holes (possibly bivalve siphons) and sparse *Arctica islandica* siphons (dead valves also present). Drift *Saccharina latissima* and *Zostera marina*. Pectinidae sp. (R), *Porania pulvillus* (R), *Ophiura ophiura* (P)	SS.SSa.CMuSa	AI
V67	Shelly sand	*Saccharina latissima* (F), filamentous red algae (O), *Ulva* sp. (R), *Cerianthus lloydii* (F), *Chaetopterus variopedatus* (P), *Hyas* sp.? (P)	SS.SMp.KSwSS.LsacR.Sa	KS
V68	Sandy mud with scattered shell material	Dense *Arctica islandica* siphons (A) with firm evidence in the form of a partially exposed shell with protruding siphons. *Luidia ciliaris* (P), *Porania pulvillus* (R), infaunal tubes, small holes and sparse, small megafaunal burrows, *Astropecten irregularis*? (R), *Turritella communis* shells (occupancy uncertain), *Aporrhais pespelicani* shell (occupancy uncertain), *Urticina* sp. (R), hydroids (R), *Munida rugosa* (F)	SS.SMu.CSaMu	AA
V69	Sandy mud	Sparse megafaunal burrows and infaunal tubes. *Ophiura ophiura* (F), *Munida rugosa* (F), *Arctica islandica* siphons (P), *Zostera marina* drift material	SS.SMu.CSaMu	AI
V70	Sandy mud	Fairly sparse infaunal tubes and bivalve siphons. *Munida rugosa* (P), teleost sp. (P), *Aequipecten opercularis* (P), *Porania pulvillus* (O), *Asterias rubens*? (R), *Zostera marina* drift material	SS.SMu.CSaMu	
V71	Sand with thin surface scattering of coarse sand, maerl gravel and shells	*Asterias rubens* (F), *Henricia* sp. (O), burrowing anemones (P), hydroids (R), infaunal tubes (P), live *Phymatolithon calcareum* rhodoliths (R)	SS.SMx.CMx	
V71	Mixed coarse sediment with pebbles, cobbles and shells	Poor visibility. *Ophiocomina nigra* (S)	SS.SMx.CMx.OphMx	
V71	Boulders and cobbles on coarse sediment	Poor visibility. Stones appear unsilted and support pink encrusting algae (C) and a patchy turf of foliose and filamentous red algae (O-F) and brown algae (O), with clumps of *Antedon* sp. (P). *Asterias rubens* (F), *Crossaster papposus* (P), *Echinus esculentus* (F)	CR.MCR.EcCr.FaAlCr	

Appendix 3 continued

Site ID	Substrate	Biota	Biotope	PPF
V71	Maerl gravel and shells	Poor visibility. *Cerianthus lloydii* (P), infaunal tubes (P), *Ophiocomina nigra* (P), *Marthasterias glacialis* (P), *Asterias rubens*? (P), pink coralline algae on stones (P)	SS.SCS.CCS	
V72	Sand with surface cover of varying concentrations of coarse sand and shells includng *Ensis*	Poor visibility. *Asterias rubens* (F), *Porania pulvillus* (P), *Munida rugosa* (P), drift kelp and other weed	SS.SMx.CMx	
V73	Sandy mud or muddy sand with scattered shell material	Poor visibility. *Munida rugosa* (F), *Nemertesia ramosa*? (O). Boulders towards end of run with patchy hydroid turf (P)	SS.SMu.CSaMu	
V74	Soft mud	Very poor visibility. *Calocaris macandreae* burrows (P)	SS.SMu.CFiMu.SpnMeg	BM
V75	Soft mud	Very dense megafaunal burrows including *Calocaris macandreae* (A) and *Nephrops norvegicus* (C, 4 animals seen). Teleost spp. (O), Caridea sp. (P)	SS.SMu.CFiMu.SpnMeg	BM
V76	Soft mud	Very dense megafaunal burrows including *Calocaris macandreae* (C) and *Nephrops norvegicus* (P, 3 animals seen)	SS.SMu.CFiMu.SpnMeg	BM
V77	Soft mud	Poor visibility. Dense megafaunal burrows including *Calocaris macandreae* (C, possibly A) and *Nephrops norvegicus* (P, 4 animals seen)	SS.SMu.CFiMu.SpnMeg	BM
V78	Soft mud	Dense megafaunal burrows including *Calocaris macandreae* (A) and *Nephrops norvegicus* (C, 1 animal seen). Teleost sp. (P); *Meganyctiphanes norvegica*? in water column	SS.SMu.CFiMu.SpnMeg	BM
V79	Soft mud	Dense megafaunal burrows including *Calocaris macandreae* (C) and *Nephrops norvegicus* (C, 1 animal seen). *Virgularia mirabilis* (P), *Munida rugosa* (P), *Lumpenus lampretaeformis* (O), Pleuronectiformes sp. (P), teleost sp. (P). *Meganyctiphanes norvegica*? in water column	SS.SMu.CFiMu.SpnMeg	BM
V80	Presumably mud	No visibility due to suspended mud, possibly resulting from dredging activity		
V81	Mud	Fairly lightly burrowed by megafauna including *Nephrops norvegicus* (C, 3 animals seen). *Virgularia mirabilis* (O), *Pennatula phosphorea* (P), Pleuronectiformes sp. (P), *Asterias rubens* (P)	SS.SMu.CFiMu.SpnMeg	BM

Appendix 3 continued

Site ID	Substrate	Biota	Biotope	PPF
V82	Soft mud	Dense megafaunal burrows including *Calocaris macandreae* (C) and *Nephrops norvegicus* (C, 1 animal seen). *Meganyctiphanes norvegica*? and ctenophores in water column	SS.SMu.CFiMu.SpnMeg	BM
V83	Shelly sand mud or muddy sand	Dense small paired holes (C, probably bivalve siphons). *Munida rugosa* (F), *Asterias rubens* (P), branching bryozoan? (O), *Pagurus prideauxi*? (P) with *Adamsia carciniopados*? (P), Paguridae sp. (P),	SS.SMu.CSaMu	
V84	Sandy mud with scattered cobbles and pebbles locally	Dense small paired holes (C, probably bivalve siphons). Sparse megafaunal burrows including *Nephrops norvegicus* (P, 1 animal seen). *Munida rugosa* (F), Brachyura sp. (O), *Callionymus lyra*? (P)	SS.SMu.CSaMu	
V85	Soft mud	Dense megafaunal burrows including *Calocaris macandreae* (C) and *Nephrops norvegicus* (C, 3 animals seen). *Cerianthus lloydii* (R), teleost sp. (P), Caridea sp. (P), Pleuronectiformes sp. (P). *Meganyctiphanes norvegica*? and ctenophores in water column	SS.SMu.CFiMu.SpnMeg	BM
V86	Soft mud	Dense megafaunal burrows including *Calocaris macandreae* (C, locally A) and *Nephrops norvegicus* (C, 5 animals seen). Teleost sp. (P); *Meganyctiphanes norvegica*? in water column	SS.SMu.CFiMu.SpnMeg	BM
X1	Fine-medium sand with much shell material and dense shells in places	*Saccharina latissima* (F), filamentous red algae (F), Phaephyceae spp. (F) including *Desmarestia aculeata* (P), *Cerianthus lloydii* (P), *Asterias rubens* (F), *Luidia ciliaris* (F), *Marthasterias glacialis*? (P), *Porania pulvillus* (P), *Liocarcinus* sp. (P)	SS.SMp.KSwSS.LsacR.Sa	KS
X2	Shelly sand	Poor visibility. Patchy algal turf, some of which is probably drift material, including *Saccharina latissima* (P), filamentous red algae (P) and *Ulva* sp. (P). *Porania pulvillus*? (P), Brachyura sp. (P)	SS.SMp.KSwSS.LsacR.Sa	KS
X3	Sand with shell material	Apparently much drift weed but healthy-looking *Saccharina latissima* (F) and filamentous red algae (P). *Porania pulvillus* (P), Paguridae sp. (P), Pleuronectiformes sp. (P), Brachyura sp. (P)	SS.SMp.KSwSS.LsacR.Sa	KS
X4	Shelly sand	Dense algal cover including *Saccharina latissima* (C, locally A), filamentous red algae (C), foliose red algae (F), *Desmarestia aculeata* (F). Small teleosts (P), *Pecten maximus* (P)	SS.SMp.KSwSS.LsacR.Sa	KS

Appendix 3 continued

Site ID	Substrate	Biota	Biotope	PPF
X5	Fine-medium shelly sand with many Ensis shells	Patchy algal cover, much of which appears to be drift material. *Saccharina latissima* (F), Brachyura sp. (P), *Liocarcinus* sp. (P)	SS.SMp.KSwSS.LsacR.Sa	KS
X6	Fairly soft mud with trawl scarring	Moderate density of megafaunal burrows including *Calocaris macandreae* (F) and *Nephrops norvegicus* (C, 1 animal seen). *Asterias rubens* (F), *Urticina* sp.? (P)	SS.SMu.CFiMu.SpnMeg	BM
RS1	Bedrock and dense cobbles and boulders with coarse sand/shell gravel infill	Rock encrusted with pink coralline algae (C), sparse serpulid worms (F) and yellow (R) and orange (R) sponges, and supporting dense *Urticina felina* (A) but otherwise a fairly sparse biota of hydroids clumps (P) including *Tubularia indivisa*, *Alcyonium digitatum* (R), *Echinus esculentus* (P), Asterias rubens (P), *Antedon* sp. (P) and *Laminaria hyperborea* (R)	CR.MCR.EcCr.UrtScr	
RS2	Slightly shelly fine sand with sparsely scattered cobbles, pebbles and shells (especially *Ensis*)	Scatter of drift algae, appearing largely dead. Stones encrusted with serpulid worms (R) and pink coralline algae (R). *Myxicola* sp. (C), *Asterias rubens* (P), Brachyura sp. (P)	SS.SSa.IFiSa	
RS3	Slightly shelly fine sand with sparsely scattered shells including *Ensis* and *Arctica*	Light scatter of drift algae, appearing largely dead. *Myxicola* sp. (locally C),	SS.SSa.IFiSa	
RS4	Slightly shelly fine sand with patches of scattered gravel, pebbles and shells	Generally light scatter of drift algae with sparse, possibly living, *Saccharina latissima* (O), and possible attached algae, especially reds, in more heterogeneous patches. *Myxicola* sp. (C), Very sparse live rhodoliths of *Phymatolithon calcareum* (R) and a few dead maerl thalli also present	SS.SMp.KSwSS.LsacR.Sa SS.SSa.IFiSa	KS

Appendix 3 continued

Site ID	Substrate	Biota	Biotope	PPF
RS5	Slightly shelly fine sand with scattered shells and isolated boulders and small bedrock outcrops	Drift algae with possibly very sparse live plants of *Saccharina latissima*. *Myxicola* sp. (C), *Asterias rubens* (O). Rock with encrusting pink algae (P), a patchy red algal turf (C) and apparently sparse kelp	SS.SSa.IFiSa IR	
RS6	Slightly shelly fine sand with scattered shells and sparse boulders, cobbles and pebbles	Sediment with patchy algal cover (overall F but dense patches (A) and areas where virtually absent, especially towards the end of the run). Much of the algae appears to be drift material but some filamentous red clumps attached, as well as possibly *Ulva* sp.. Some *Saccharina latissima* present of healthy appearance (O). *Myxicola* sp. (locally C), *Echinus esculentus* (O), *Asterias rubens* (P), *Pecten maximus* (P), *Sabella pavonina* (P), pink coralline algae on stones and shells	SS.SMp.KSwSS.LsacR.Sa SS.SSa.IFiSa	KS
RS7	Slightly shelly fine sand with scattered shells, especially *Ensis*, and sparse pebbles, boulders and bedrock outcrop	Sediment with *Myxicola* sp. (locally C) and patchy algal cover (overall F but dense patches (A) and areas where virtually absent). Much of the algae appears to be drift material but some clumps possibly attached. Some *Saccharina latissima* present but probably drift material. Boulders and bedrock with turf of filamentous red algae (C), pink coralline algae (P), *Echinus esculentus* (P) and possibly sparse kelp. *Asterias rubens* (O)	SS.SMp.KSwSS.LsacR.Sa SS.SSa.IFiSa IR	KS
RS8	Slightly shelly fine sand with sparsely scattered shells and isolated boulders	Sparse scatter of algal drift material. *Myxicola* sp. (P), *Asterias rubens* (P), *Cancer pagurus* (P), teleost sp.? (P)	SS.SSa.IFiSa	

Appendix 3 continued

Site ID	Substrate	Biota	Biotope	PPF
RS9	Slightly shelly fine sand with patches of surficial gravel, pebbles and shells, and sparse boulders and possibly small bedrock outcrops	Sediment with scattered algae, appearing to be largely drift material. *Myxicola* sp. (P), Brachyura sp. (P), Galatheidae sp. (P). Rock surfaces encrusted with pink coralline algae (P)	SS.SSa.IFiSa	
RS10	Slightly shelly fine sand with scattered shells cobbles and pebbles and occasional boulders and bedrock outcrops	Sediment with scattered algae, appearing to be largely drift material. *Myxicola* sp. (locally C), *Asterias rubens* (O), *Sabella pavonina* (P), Brachyura sp. (P). Rock encrusted with pink coralline algae (A) and supporting a patchy red algal turf (F) and sparse kelp including *Laminaria hyperborea*? (P). *Echinus esculentus* (P), *Porania pulvillus* (P)	SS.SSa.IFiSa IR	
STS1	Pebbles, *Modiolus* shells and scattered cobbles and boulders on shelly coarse sand, with small bedrock outcrops. Power cable	Stones sparsely encrusted with serpulid worms (F) and pink coralline algae (R) and support sparse patches of bryozoans (O), including *Flustra foliacea*? (P), hydroids (R), *Laminaria hyperborea* (R), Balanidae sp. (R) and Buccinidae sp. eggs (P). *Urticina felina* (C), *Echinus esculentus* (P), Asteroidea spp. (O). Live *Modiolus modiolus* is locally common	SS.SMx.CMx.FluHyd SS.SBR.SMus.ModT	HM
STS2	Dense cobbles on shell gravel	Stones encrusted with serpulid worms (C), red encrusting bryozoans (P), *Parasmittina trispinosa* (R) and Balanidae spp. (P) and support sparse patches of bryozoans (R), including *Flustra foliacea*? (P), hydroids? (R), and *Alcyonium digitatum* (R). *Urticina felina* (C), *Echinus esculentus* (F), *Asterias rubens* (P), *Crossaster papposus* (P)	SS.SMx.CMx.FluHyd	

Appendix 3 continued

Site ID	Substrate	Biota	Biotope	PPF
STS3	Scoured, low-profile bedrock and dense cobbles and boulders with infill and small pockets of shell gravel with pebbles and *Modiolus* shells in places	Rock encrusted with pink coralline algae (C, locally A), serpulid worms (C) including *Spirobranchus* spp. (P), and Balanidae spp. (F), and supporting a patchy hydroid/bryozoan turf (F) including *Flustra foliacea* (P) and hydroids (P), and *Alcyonium digitatum* (O). *Urticina felina* (C, locally A), *Buccinum undatum* (P), Buccinidae sp. eggs (P), *Echinus esculentus* (F), *Asterias rubens* (F), Asteroidea spp. indet. (P), *Crossaster papposus* (O), *Pecten maximus* (P), *Calliostoma zizyphinum* (P), *Cancer pagurus* (P), *Nucella lapillus*? (P), teleost sp. (P). *Modiolus modiolus* is at least locally common in an area of more mixed substrate	CR.MCR.EcCr.FaAlCr.Flu SS.SMx.CMx.FluHyd SS.SBR.SMus.ModT	HM
STS4	Dense pebbles and cobbles with coarse sediment and scattered boulders and bedrock outcrops	Rock encrusted with pink coralline algae (O), serpulid worms (F), *Parasmittina trispinosa* (R) and Balanidae spp. (P), and supporting a patchy hydroid/bryozoan turf (C) including *Flustra foliacea* (P), an encrusting yellow sponge? (R) and *Alcyonium digitatum* (R). *Urticina felina* (C), Buccinidae sp. eggs (P), *Echinus esculentus* (O), *Asterias rubens* (F), Asteroidea spp. indet. (P), *Crossaster papposus* (F). *Modiolus modiolus* is at least locally abundant	CR.MCR.EcCr.FaAlCr.Flu SS.SMx.CMx.FluHyd SS.SBR.SMus.ModT	HM
STS5	Dense cobbles with pebbles, occasional boulders and coarse sediment infill	Rock encrusted with pink coralline algae (O), serpulid worms (F), *red encrusting bryozoans* (R) and very sparse yellow sponge (R), and supporting a sparse hydroid/bryozoan turf (P) including *Flustra foliacea* (P) and *Alcyonium digitatum* (O, locally F). *Urticina felina* (C-A), *Echinus esculentus* (F), *Asterias rubens* (O), *Henricia* sp. (P)	SS.SMx.CMx.FluHyd	
STS6	Dense *Modiolus* shells on coarse sand and shell gravel	Dead *Modiolus modiolus* shells with sparse serpulid worms (F) and red encrusting bryozoans (R)	SS.SMx.CMx	

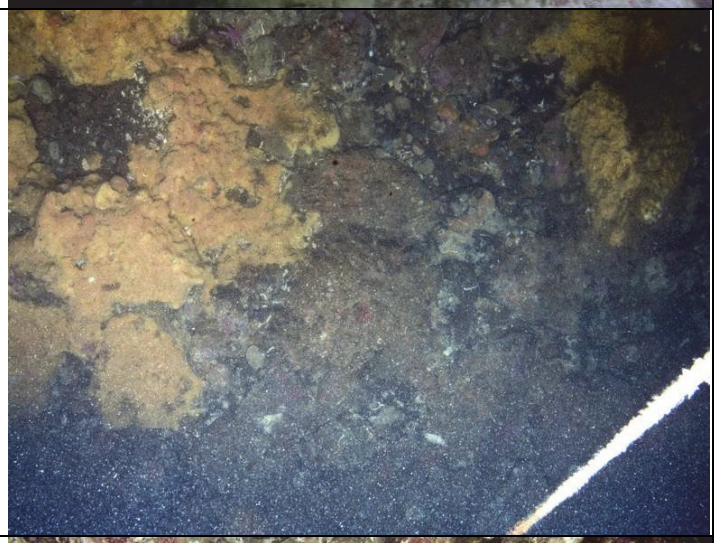
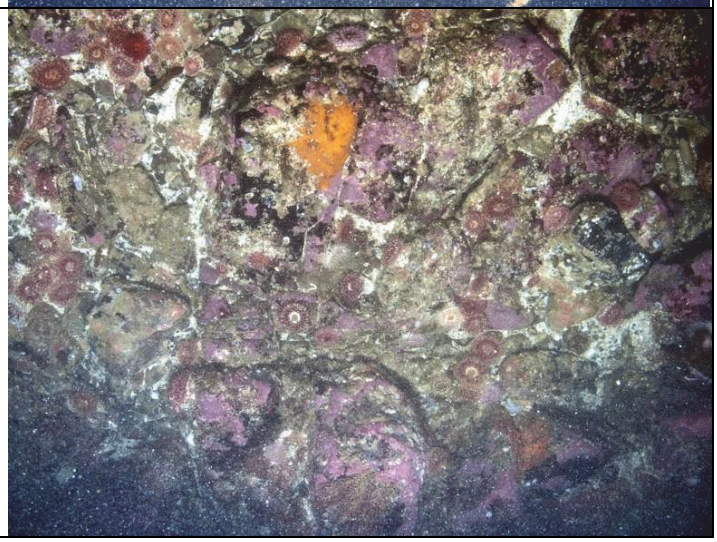
Appendix 3 continued

Site ID	Substrate	Biota	Biotope	PPF
STS6	Cobbles, pebbles and gravel with coarse sand and shell gravel and patches of low-profile, outcropping bedrock and bouders	Rock surfaces encrusted with pink coralline algae (O, but S on bedrock and boulders), serpulid worms (F) and *Parasmittina trispinosa*? (R) and supporting hydroid/bryozoan turf (F), including *Flustra foliacea* (P) and hydroids (P), and very sparse algal clumps (R), possibly including *Laminaria hyperborea*. *Urticina felina* (C), *Echinus esculentus* (P), *Crossaster papposus*? (P)	SS.SMx.CMx.FluHyd CR.MCR.EcCr.FaAlCr.Flu	
STS7	Dense *Modiolus* shells on coarse sand and shell gravel	Dead *Modiolus* shells with sparse serpulid worms (F), red encrusting bryozoans (R) and pink coralline algae (R). One live *Modiolus modiolus* observed	SS.SMx.CMx	
STS8	Dense *Modiolus* shells on coarse sand	Dead *Modiolus* shells with sparse serpulid worms (F), red encrusting bryozoans (R) and pink coralline algae (R)	SS.SMx.CMx	
STS9	Dense *Modiolus* shells on coarse sand and shell gravel with areas of low-profile bedrock outcrops and patches of scattered cobbles and boulders	Dead *Modiolus* shell areas with very sparse visible fauna including serpulid worms (F) and red encrusting bryozoans (R); teleost sp. (P). Bedrock and cobble areas with similar biota of encrusting coralline algae (S), serpulid worms (P), *Urticina felina* (P), hydroid and bryozoan turf (F) including *Flustra foliacea* (P) and hydroids (P), *Echinus esculentus* (P)	SS.SMx.CMx CR.MCR.EcCr.FaAlCr.Flu	
STS10	Dense pebbles and cobbles with coarse sediment, patches of dense *Modiolus* shells, and scattered boulders and bedrock outcrops	Rock encrusted with pink coralline algae (R, but A on boulders and bedrock), serpulid worms (F), *Parasmittina trispinosa* (R) and Balanidae spp. (P), and supporting a patchy hydroid/bryozoan turf (F, locally C) including *Flustra foliacea* (P) and hydroids (P), and *Alcyonium digitatum* (R). *Urticina felina* (C), Buccinidae sp. eggs (P), *Echinus esculentus* (O), *Asterias rubens* (O)	CR.MCR.EcCr.FaAlCr.Flu SS.SMx.CMx.FluHyd SS.SMx.CMx	

Appendix 3 continued

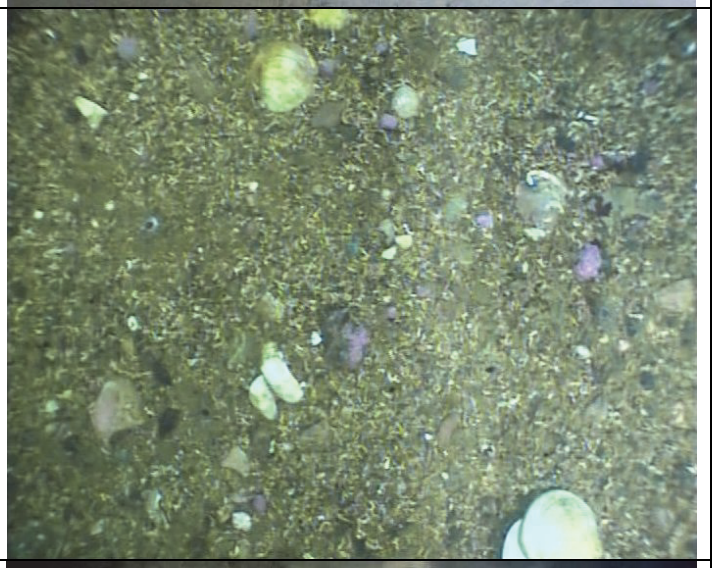
Site ID	Substrate	Biota	Biotope	PPF
STS11	Dense pebbles and cobbles with coarse sediment including shell gravel	Stones encrusted with pink coralline algae (R) and serpulid worms (F) and supporting patches of hydroids (P) and *Alcyonium digitatum* (O). *Urticina felina* (C), *Echinus esculentus* (P), *Asterias rubens* (P), Ophiuroidea spp. (locally C). One live *Modiolus modiolus* observed	SS.SMx.CMx.FluHyd	
STS12	Dense pebbles and cobbles with shell gravel	Poor visibility. Stones encrusted with pink coralline algae (R), red bryozoans (F) and serpulid worms (C) including *Spirobranchus* spp. (P), and supporting patches of hydroids (P), *Alcyonium digitatum* (P), *Flustra foliacea* (P) and sparse encrusting (R) and cushion (R) sponges. *Urticina felina* (C-A), *Echinus esculentus* (F)	SS.SMx.CMx.FluHyd	
STS13	Scoured, low-profile bedrock and dense cobbles and boulders with infill and pockets of shell gravel	Rock encrusted with pink coralline algae (O), serpulid worms (F) and sparse sponges, and supporting a patchy hydroid/bryozoan turf (F) including *Flustra foliacea* (P) and hydroids (P), and *Alcyonium digitatum* (R). *Urticina felina* (A), *Echinus esculentus* (F), *Asterias rubens* (F)	CR.MCR.EcCr.FaAlCr.Flu	
STS14	Dense cobbles and boulders with shell gravel infill	Rock encrusted with pink coralline algae (O), serpulid worms (C) and red bryozoans, with extensive developments of *Myxilla incrustans*? (O, locally C) and *Amphilectus fucorum?* (O, locally C). *Alcyonium digitatum* (R), hydroids (R), *Urticina felina* (P), *Echinus esculentus* (F), *Asterias rubens* (O), *Calliostoma zizyphinum* (P), *Henricia* sp. (P)	CR.HCR.FaT.CTub.CuSp	

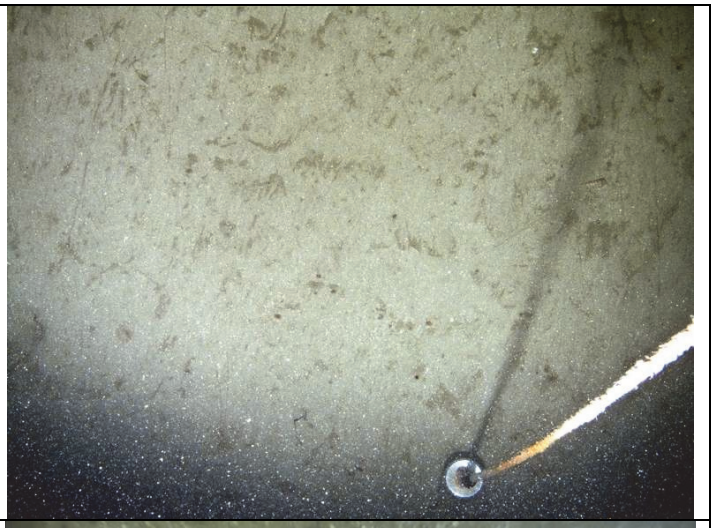
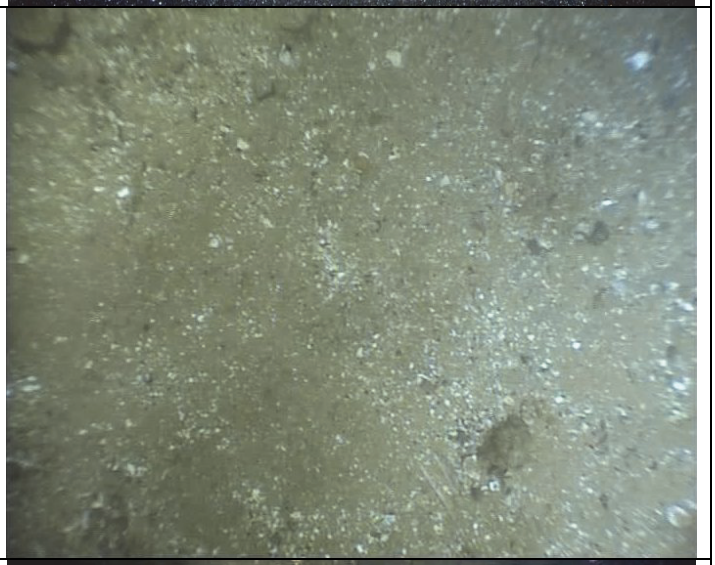
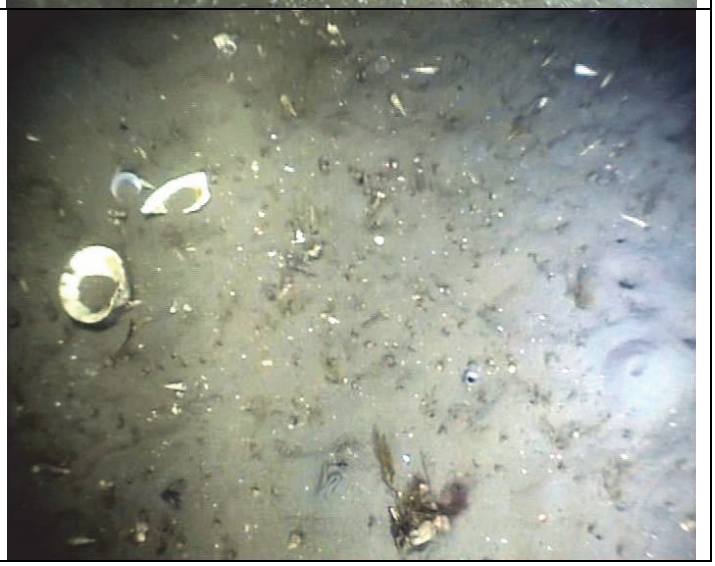
APPENDIX 4: BIOTOPES AND PPF SPECIES RECORDED WITH SITES OF OCCURRENCE AND ILLUSTRATIVE PHOTOGRAPH OR VIDEO FRAME GRAB. BIOTOPE CODES AND SPECIES IN RED ARE PPFS, WITH OTHER PMFS IN BLUE. ITALICISED SITES INDICATE PROVENANCE OF IMAGE. SEE CONNOR *ET AL*. (2004) FOR FULL BIOTOPE DESCRIPTION

IR.HIR.KFaR.FoR Foliose red seaweeds on exposed lower infralittoral rock V23, V25, V26, V27, V30, *V35*	
CR.HCR.FaT.CTub.CuSp *Tubularia indivisa* and cushion sponges on tide-swept turbid circalittoral rock *STS14*	
CR.MCR.EcCr.UrtScr *Urticina felina* and sand-tolerant fauna on sand-scoured or covered circalittoral rock *RS1*	

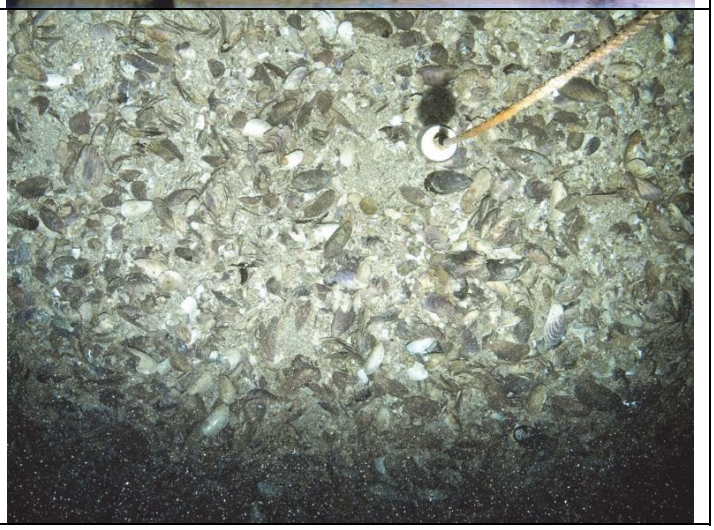
Appendix 4 continued

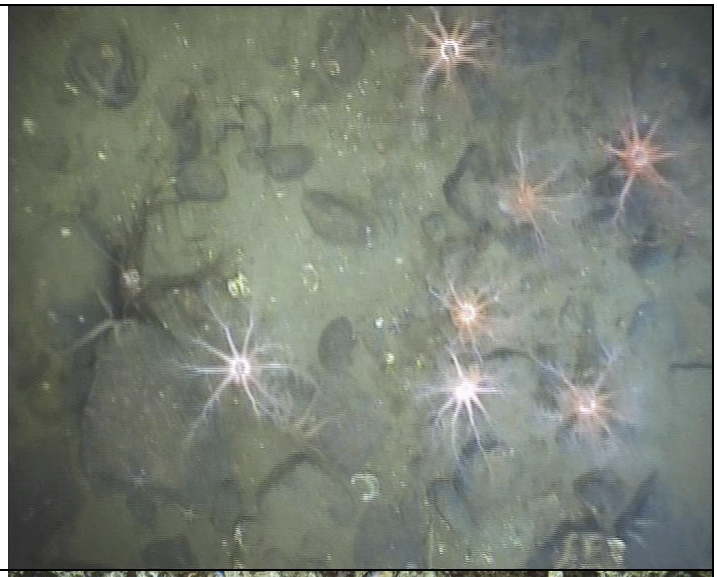
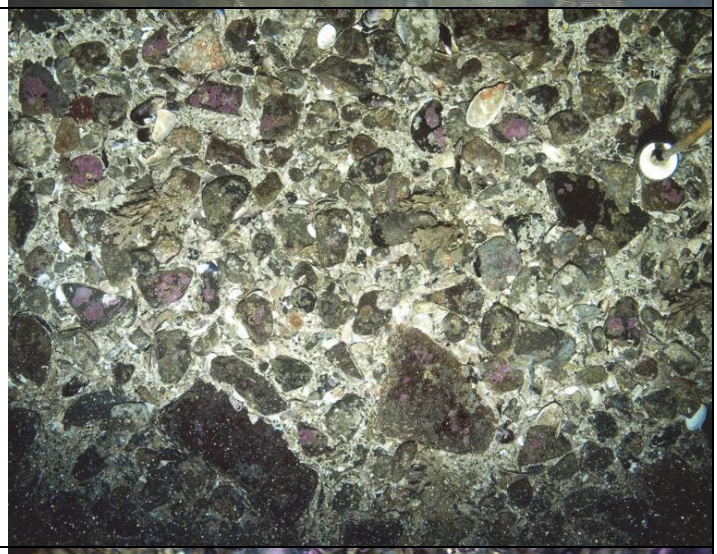
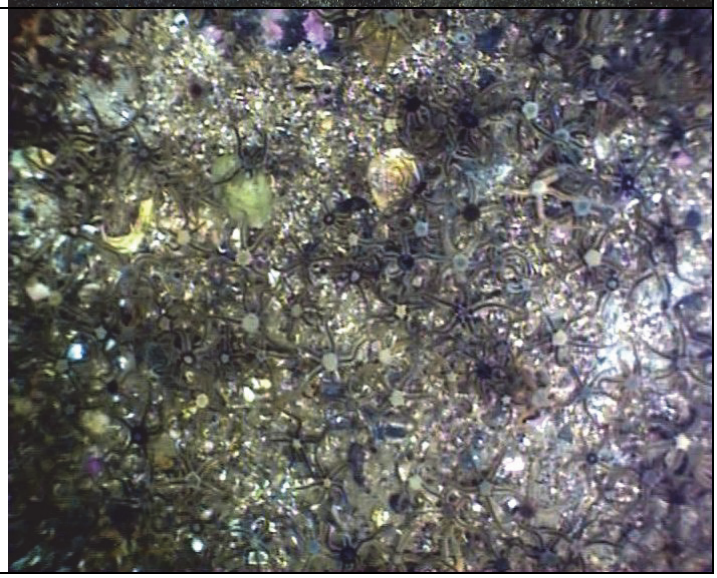
CR.MCR.EcCr.FaAlCr Faunal and algal crusts on exposed to moderately wave-exposed circalittoral rock *V71*	
CR.MCR.EcCr.FaAlCr.Flu *Flustra foliacea* on slightly scoured silty circalittoral rock *STS3*, STS4, STS6, STS9, STS10, STS13	
CR.LCR.BrAs Brachiopods and ascidians *V16*	

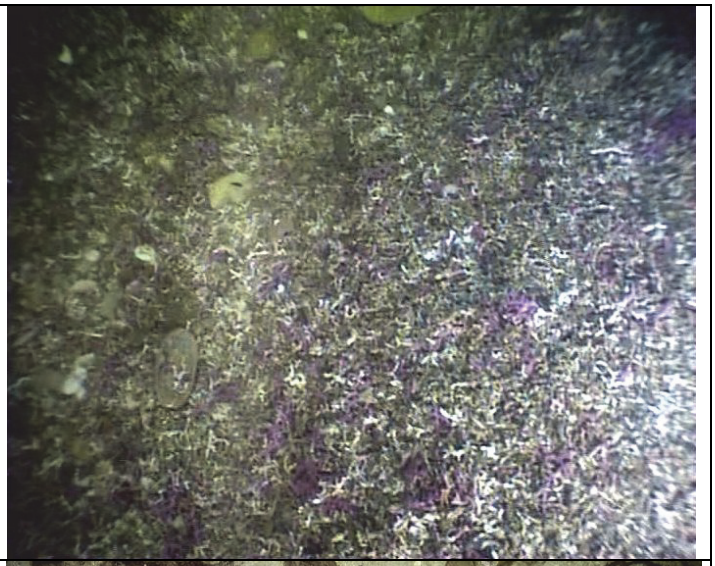
CR.LCR.BrAs.NeoPro.FS *Neocrania anomala* and *Protanthea simplex* on very wave-sheltered circalittoral rock LFG03, *LFG20*	
SS.SCS.CCS Circalittoral coarse sediment V21, V24, V25, V26, V28, V47, V50, V53, V63, *V71*	
SS.SCS.CCS.Nmix *Neopentadactyla mixta* in circalittoral shell gravel or coarse sand V06, V19, V20, V29, V35, *V41*	

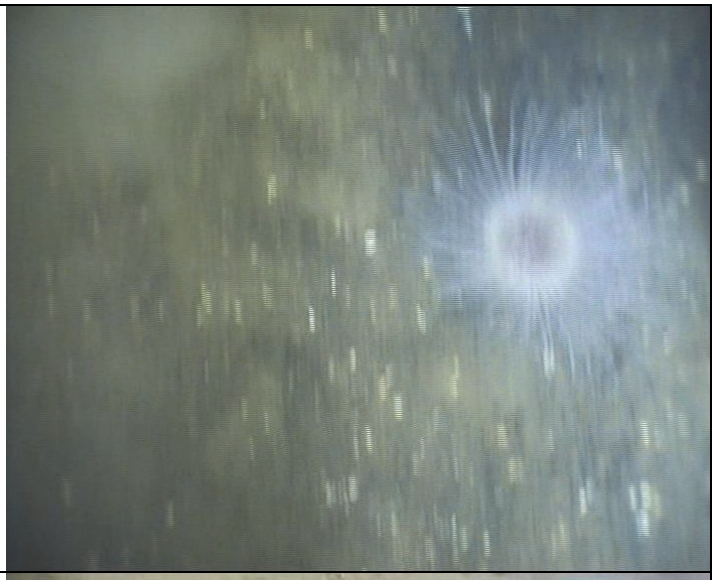
SS.SSa.IFiSa Infralittoral fine sand RS2, RS3, RS4, RS5, RS6, RS7, *RS8*, RS9, RS10	
SS.SSa.CFiSa Circalittoral fine sand *V28*, V29	
SS.SSa.CMuSa Circalittoral muddy sand V13, V31, V34, V40, V45, *V46*, V62, V64, V66	

SS.SMu.IFiMu.Beg *Beggiatoa* spp. on anoxic sublittoral mud LFG18, LFG19, LFG20, *LFG22*, LFG25, LFG27, LFG28	
SS.SMu.CSaMu Circalittoral sandy mud V03, V05, V18, *V33*, V36, V51, V68, V69, V70, V73, V83, V84	
SS.SMu.CSaMu.VirOphPmax *Virgularia mirabilis* and *Ophiura* spp. with *Pecten maximus* on circalittoral sandy or shelly mud *LFG06*, LFG29	

SS.CMu.CFiMu Circalittoral fine mud LFG12, *LFG13*, LFG21	
SS.SMu.CFiMu.SpnMeg Seapens and burrowing megafauna in circalittoral fine mud LFG01, LFG03, LFG04, LFG05, LFG08, LFG09, LFG10, LFG11, LFG14, LFG15, LFG17, V01, V02, V04, V07, V08, V10, V11, V14, V15, V16, V17, V32, V37, V38, V39, V42, V43, V44, V56, V57, V58, V60, V61, V74, V75, V76, V77, V78, V79, V81, V82, V85, *V86*, X6	
SS.SMx.CMx Circalittoral mixed sediment V09, V12, V16, V17, V18, V22, V27, V28, V48, V49, V52, V54, V55, V65, V71, V72, *STS6*, STS7, STS8, STS9, STS10	

SS.SMx.CMx.CIlo.ModHo Sparse *Modiolus modiolus*, dense *Cerianthus lloydii* and burrowing holothurians on sheltered circalittoral stones and mixed sediment LFG02, LFG06, LFG07, *LFG16*, LFG30	
SS.SMx.CMx.FluHyd *Flustra foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment STS1, STS2, STS3, STS4, STS5, *STS6*, STS10, STS11, STS12	
SS.SMx.CMx.OphMx *Ophiothrix fragilis* and/or *Ophiocomina nigra* brittlestar beds on sublittoral mixed sediment LFG07, V50, V54, *V71*	

SS.SMp.Mrl.Pcal.Nmix *Phymatolithon calcareum* maerl beds with *Neopentadactyla mixta* and other echinoderms in deeper infralittoral clean gravel or coarse sand V24, *V26*, V27	
SS.SMp.KSwSS.LsacR.Sa *Laminaria saccharina* and filamentous red algae on infralittoral sand V67, X1, X2, X3, X4, X5, RS4, *RS6*, RS7	
SS.SBR.SMus.ModT *Modiolus modiolus* beds with hydroids and red seaweeds on tide-swept circalittoral mixed substrata STS1, STS3, *STS4*	

Pachycerianthus multiplicatus (Fireworks anemone) *LFG06*, LFG12	
Arctica islandica (Ocean Quahog) V17, V18, V33, V46, V51, V66, *V68* (aggregation),V69 Picture shows siphons with inset of semi-exposed shell and siphons	

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Policy and Advice Directorate, Great Glen House,
Leachkin Road, Inverness IV3 8NW
T: 01463 725000

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