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Goodwin Sands rMCZ
Post-survey Site Report

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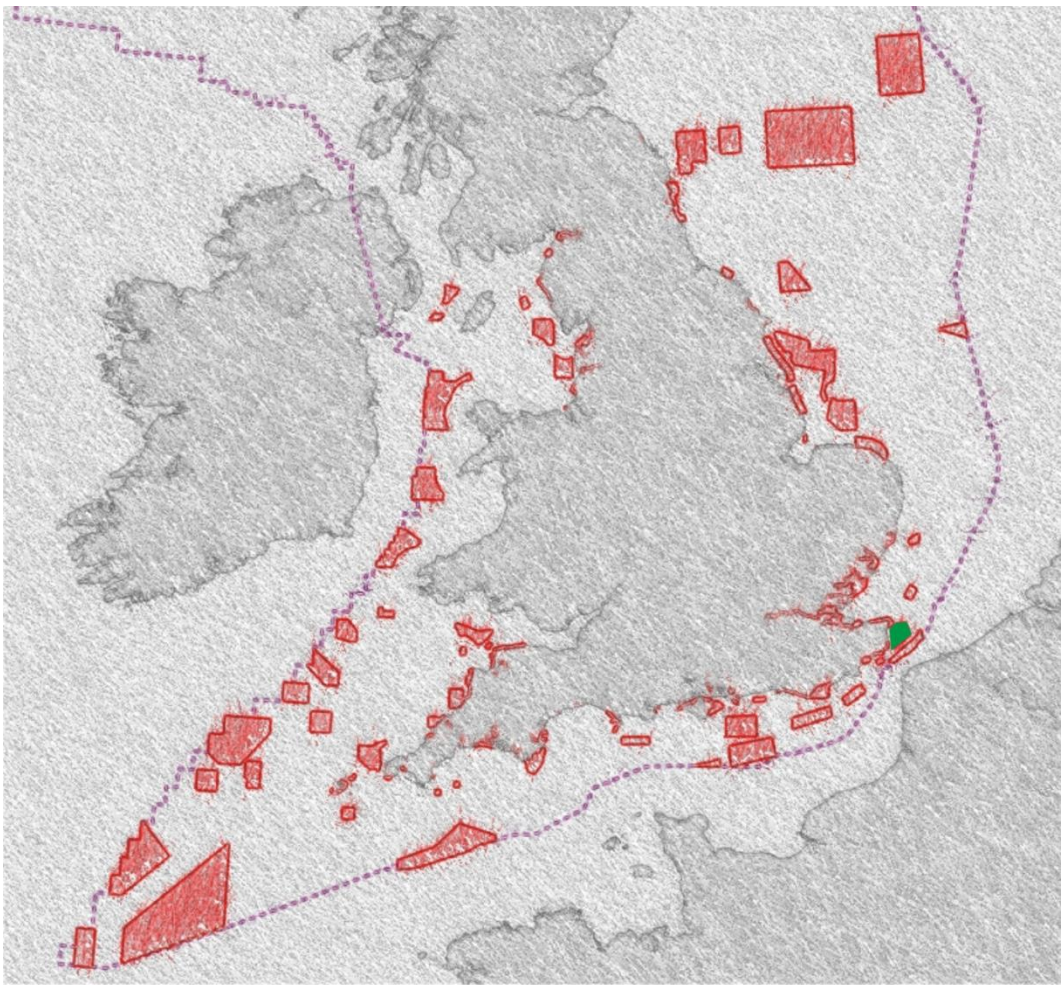

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Cefas Document Control

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Table of Contents

Table of Contents i
List of Tables iii
List of Figures iv
1 Executive Summary: Report Card 1
1.1 Features proposed in the SAD for inclusion within the MCZ designation 1
1.2 Features present but not proposed in the SAD for inclusion within the rMCZ designation 2
1.3 Evidence of human activities occurring within the rMCZ 2
2 Introduction 3
2.1 Location of the rMCZ 3
2.2 Rationale for site position and designation 4
2.3 Rationale for prioritising this rMCZ for additional evidence collection 5
2.4 Survey aims and objectives 5
3 Methods 7
3.1 Acoustic data acquisition 7
3.2 Ground truth sample acquisition 7
3.3 Production of the updated habitat map 9
3.4 Quality of the updated map 12
4 Results 14
4.1 Site Assessment Document (SAD) habitat map 14
4.2 Updated habitat map based on new survey data 14
4.3 Quality of the updated habitat map 16
4.4 Broadscale habitats identified 16
4.5 Habitat FOCI identified 17
4.6 Species FOCI identified 18
4.7 Quality Assurance (QA) and Quality Control (QC) 19
4.8 Data limitations and adequacy of the updated habitat map 19
4.9 Observations of human impacts on the seabed 20
5 Conclusions 21
5.1 Presence and extent of broadscale habitats 21
5.2 Presence and extent of habitat FOCI 21
5.3 Presence and distribution of species FOCI 22
5.4 Evidence of human activities impacting the seabed 22
References 23
Data sources 25

Annexes 26
Annex 1. Broadscale habitat features listed in the ENG. 26
Annex 2. Habitat FOCI listed in the ENG. 27
Annex 3. Low or limited mobility species FOCI listed in the ENG. 28
Annex 4. Highly mobile species FOCI listed in the ENG. 29
Annex 5. Video and stills processing protocol. 30
Appendices 32
Appendix 1. Survey metadata 32
Appendix 2. Outputs from acoustic surveys 39
Appendix 3. Evidence of human activities within the rMCZ 41
Appendix 4. Species list 42
Appendix 5. Analyses of sediment samples: classification and composition 53
Appendix 6. BSH/EUNIS Level 3 descriptions derived from video and stills 56
Appendix 7. Example images from survey for broadscale habitats 60
Appendix 8. Example images from survey for habitat FOCI 61

List of Tables

Table 1. Broadscale habitats for which this rMCZ was proposed for designation. 4
Table 2. Habitat FOCI for which this rMCZ was proposed for designation. 5
Table 3. Species FOCI for which this rMCZ was proposed for designation. 5
Table 4. Habitat FOCI identified in this rMCZ. 18
Table 5. Species FOCI identified in this rMCZ. 19

List of Figures

Figure 1. Location of the Goodwin Sands rMCZ. 4
Figure 2. Location of groundtruthing sampling sites in the Goodwin Sands rMCZ. . 8
Figure 3. Backscatter mosaic generalisation/smoothing prior to autoclassification routine. 10
Figure 4. Iso cluster maximum likelihood classification routine. 11
Figure 5. Habitat map from the Site Assessment Document. 14
Figure 6. Updated map of broadscale habitats based on newly acquired survey data. 15
Figure 7. Overall MESH confidence score for the updated broadscale habitat map. 16
Figure 8. Habitat FOCI identified. 18

1 Executive Summary: Report Card

This report details the findings of a dedicated seabed survey at the Goodwin Sands recommended Marine Conservation Zone (rMCZ). The site is being considered for inclusion in a network of Marine Protected Areas (MPAs) in UK waters, designed to meet conservation objectives under the Marine and Coastal Access Act 2009. Prior to the dedicated survey, the site assessment had been made on the basis of best available evidence, drawn largely from historical data, modelled habitat maps and stakeholder knowledge of the area. The purpose of the survey was to provide direct evidence of the presence and extent of the broadscale habitats (BSH) and habitat FOCI (Features of Conservation Importance) that had been detailed in the original Site Assessment Document (SAD) (Balanced Seas, 2011)

This Executive Summary is presented in the form of a Report Card comparing the characteristics predicted in the original SAD with the updated habitat map and new sample data that result from the analysis of available data. Data analysed was from surveys of the site conducted by the UKHO's Civil Hydrography Programme (CHP) in September, 2009, and by Cefas in January, April, May, and September, 2014. The comparison covers broadscale habitats and habitat FOCI.

1.1 Features proposed in the SAD for inclusion within the MCZ designation

Feature	Extent according to SAD	Extent according to updated habitat map*	Accordance between SAD and updated habitat map	
Broadscale Habitats (BSH)			**Presence**	**Extent**
A3.2 Moderate energy infralittoral rock	0.65 km^2	0 km^2	×	-0.65 km^2
A4.2 Moderate energy circalittoral rock	0.58 km^2	11.19 km^{2*}	✓	10.61 km^2
A5.1 Subtidal coarse sediment	115.55 km^2	133.19 km^2	✓	17.64 km^2
A5.2 Subtidal sand	159.97 km^2	89.48 km^2	✓	-70.49 km^2
Habitat FOCI				
Blue Mussel Beds	312.57 m^2	N/A**	✓	N/A**
Ross Worm (*Sabellaria spinulosa*) Reefs	625.29 m^2	N/A**	✓	N/A**
Species FOCI				
None proposed	N/A	N/A	×	N/A

The rMCZ area incorporates the intertidally exposed Goodwin Sands banks, and these areas were not surveyed. 93% of the rMCZ area was surveyed and classification was only performed on surveyed areas, thus reflected in the updated extent values.

****** Habitat FOCI proposed were observed in ground truth samples but could not be confidently identified in the hydrographic data and thus it was not possible to map the spatial extent of these features.***

1.2 Features present but not proposed in the SAD for inclusion within the rMCZ designation

Feature	Extent according to SAD	Extent according to updated habitat map	Accordance between SAD and updated habitat map	
Broadscale Habitats (BSH)			**Presence**	**Extent**
A5.4 Subtidal mixed sediments	Not listed	24.09 km^2	×	+24.09 km^2
Habitat FOCI				
Subtidal Sands and Gravels	Not listed	222.68 km^2	×	+222.68 km^2
Subtidal Chalk	Not listed	11.19 km^2	×	+11.19 km^2
Species FOCI				
High mobility species				
European Eel (*Anguilla anguilla*)	Occurrence not certain	N/A	×	N/A
Smelt (*Osmerus eperlanus*)	Occurrence not certain	N/A	×	N/A
Undulate Ray (*Raja undulata*)	Occurrence not certain	N/A	×	N/A

1.3 Evidence of human activities occurring within the rMCZ

There is evidence from the multibeam bathymetry and backscatter data of multiple wrecks as well as rare occurrences of trawl scars present within the boundaries of the rMCZ.

2 Introduction

In accordance with the Marine and Coastal Access Act 2009, the UK is committed to the development and implementation of a network of Marine Protected Areas (MPAs). The network will incorporate existing designated sites (e.g., Special Areas of Conservation and Special Protection Areas) along with a number of newly designated sites which, within the English territorial waters and offshore waters of England, Wales and Northern Ireland, will be termed Marine Conservation Zones (MCZs). In support of this initiative, four regional projects were set up to select sites that could contribute to this network because they contain one or more features specified in the Ecological Network Guidance (ENG; Natural England and the JNCC, 2010). The regional projects proposed a total of 127 recommended MCZs (rMCZs) and compiled a Site Assessment Document (SAD) for each site. The SAD summarises what evidence was available for the presence and extent of the various habitat, species and geological features specified in the ENG and for which the site was being recommended.

Due to the scarcity of survey-derived seabed habitat maps in UK waters, these assessments were necessarily made using best available evidence, which included historical data, modelled habitat maps and stakeholder knowledge of the areas concerned.

It became apparent that the best available evidence on features for which some sites had been recommended as MCZs was of variable quality. Consequently, Defra initiated a number of measures aimed at improving the evidence base, one of which took the form of a dedicated survey programme, implemented and co-ordinated by Cefas, to collect and interpret new survey data at selected rMCZ sites. This report provides an interpretation of the survey data collected jointly by the Maritime and Coastguard Agency's (MCA) Civil Hydrography Programme and Cefas. The rMCZ was surveyed by the MCA in July-September, 2009, and further hydrographic and ground truth surveys were conducted by Cefas during three separate surveys in January, April/May, and September/October 2014.

2.1 Location of the rMCZ

The Goodwin Sands rMCZ is located in the southern North Sea (just north of the English Channel), approximately 5 km east offshore from the Kent coast (Figure 1).

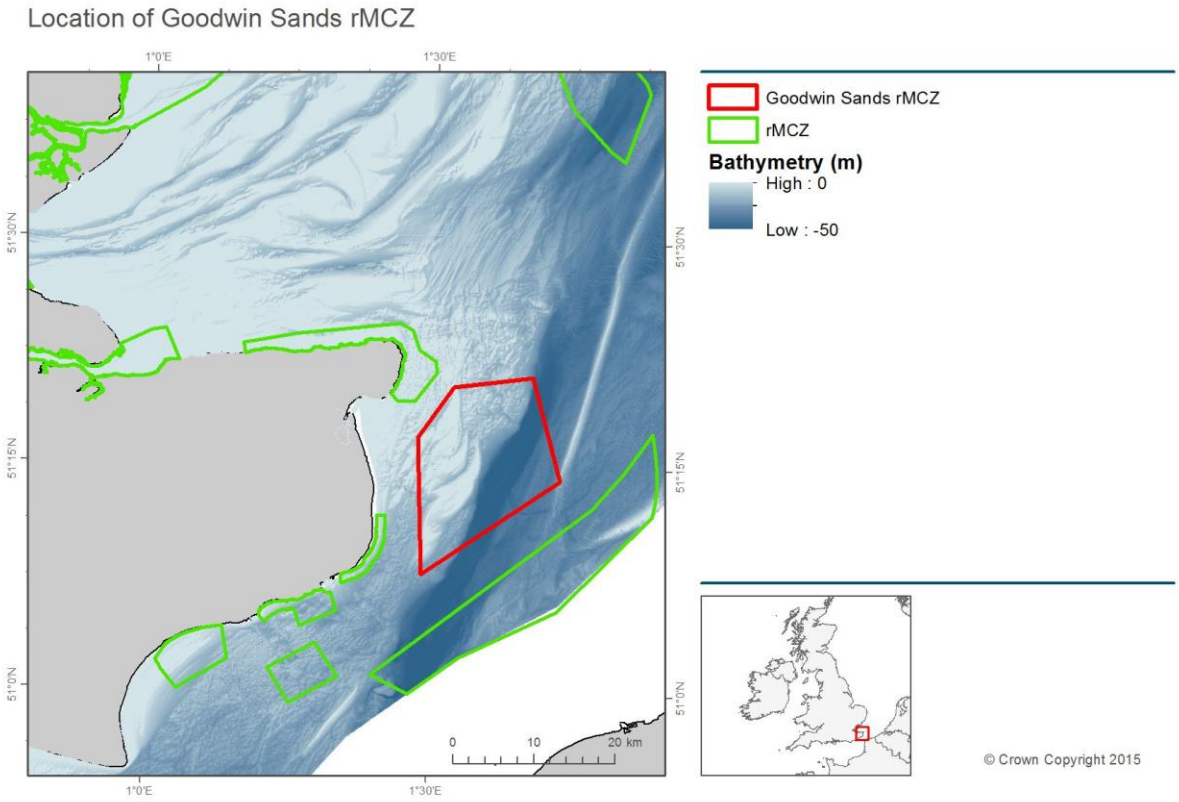

Figure 1. Location of the Goodwin Sands rMCZ. Bathymetry is from the Defra Digital Elevation Model (Astrium, 2011).

2.2 Rationale for site position and designation

The Goodwin Sands rMCZ was included in the proposed network because of its contribution to Ecological Network Guidance (ENG) criteria to broadscale habitats, and its added ecological importance. For a detailed site description Balanced Seas (2011) and 'The Marine Conservation Zone Project: Ecological Network Guidance' (Natural England and the JNCC, 2010).

2.2.1 Broadscale habitats proposed for designation

Four broadscale habitats were included in the recommendations for designation at this site (Table 1). See Annex 1 for full list of broadscale habitat features listed in the ENG.

Table 1. Broadscale habitats for which this rMCZ was proposed for designation.

EUNIS code & Broadscale Habitat	Spatial extent according to the SAD
A3.2 Moderate energy infralittoral rock	0.65 km^2
A4.2 Moderate energy circalittoral rock	0.58 km^2
A5.1 Subtidal coarse sediment	115.55 km^2
A5.2 Subtidal sand	159.97 km^2

2.2.2 Habitat FOCI proposed for designation

Two habitat FOCI were included in the recommendations for designation at this site (Table 2). 'Blue Mussel Beds' and 'Ross Worm (*Sabellaria spinulosa*) Reefs' were observed in ground truth samples but could not be confidently identified in the acoustic data. They are presented on the habitat FOCI map as point observations only as it was not possible to map the spatial extent of these features. Annex 2 presents the habitat FOCI listed in the ENG.

Table 2. Habitat FOCI for which this rMCZ was proposed for designation.

Habitat FOCI	Spatial extent according to SAD
Blue Mussel Beds	312.57 m^2
Ross Worm (*Sabellaria spinulosa*) Reefs	625.29 m^2

2.2.3 Species FOCI proposed for designation

No 'Low or limited mobility species' were included in the recommendations for designation of this rMCZ (Table 3). Three 'Highly mobile species' FOCI were included. The full list of these species FOCI is presented in Annexes 3 and 4.

Table 3. Species FOCI for which this rMCZ was proposed for designation.

Species FOCI	Extent according to SAD
Low or limited mobility species FOCI	
None proposed	None
Highly mobile species FOCI	
European Eel (*Anguilla anguilla*)	Occurrence not certain
Smelt (*Osmerus eperlanus*)	Occurrence not certain
Undulate Ray (*Raja undulata*)	Occurrence not certain

2.3 Rationale for prioritising this rMCZ for additional evidence collection

Prioritisation of rMCZ sites for further evidence collection was informed by a gap analysis and evidence assessment. The prime objective was to elevate the confidence status for as many rMCZs as feasible to support designation in terms of the amount and quality of evidence for the presence and extent of broadscale habitat features and habitat FOCI and, where possible, species FOCI. The confidence status was originally assessed in the SADs according Technical Protocol E (Natural England and the JNCC, 2012).

The confidence score for the presence and extent of broad scale habitats and habitat FOCI reported for the Goodwin Sands rMCZ was Low/Moderate (JNCC and Natural England, 2012). This site was therefore prioritised for additional evidence collection.

2.4 Survey aims and objectives

Primary objectives

- To collect acoustic and groundtruthing data to allow the production of an updated map which could be used to inform the presence of broadscale

habitats and habitat FOCI, and allow estimates to be made of their spatial extent within the rMCZ.

Secondary objectives

- To provide evidence, where possible, of the presence of species FOCI listed in the ENG (Annexes 3 and 4) within the rMCZ.
- To report evidence of human activity occurring within the rMCZ found during the course of the survey.

It should be emphasised that surveys were not primarily designed to address the secondary objectives under the current programme of work.

Whilst the newly collected data will be utilised for the purposes of reporting against the primary objectives of the current programme of work (given above), it is recognised that these data will be valuable for informing the assessment and monitoring of condition of given habitat features in the future.

3 Methods

3.1 Acoustic data acquisition

Two separate acoustic survey datasets were used in the Goodwin Sands rMCZ, one acquired prior to the MCZ programme for the purposes of safety at sea, and another acquired specifically for the rMCZ. In the western sector, existing multibeam bathymetry data were used to assist in the planning and interpretation of seabed habitats. These data were collected in September 2009 as part of the UK's Civil Hydrography Programme (CHP), managed by the Maritime and Coastguard Agency (MCA). The data are archived by the United Kingdom Hydrographic Office (UKHO) and were provided to Cefas as fully processed and cleaned bathymetry data, as well as raw data files for further backscatter processing by Cefas. The bathymetric data were collected and processed in accordance with the International Hydrographic Organisation (IHO) Standards for Hydrographic Surveys - Order 1 (Special Publication 44, Edition 4). Further details on the acquisition and processing of multibeam bathymetry data can be found in HI1294 Report of Survey (2009). Processing of the backscatter data was undertaken by Cefas using the raw data provided. The software package QPS FM Geocoder Toolkit (FMGT) was used to produce fully compensated and corrected backscatter mosaic images, and these were exported as floating point geotiff files for further analysis. Both bathymetry and backscatter datasets were gridded at 2 m resolution for analysis (see Appendix 2 for images derived from acoustic data).

To cover the remainder of the rMCZ, Cefas acquired further acoustic data in April and May 2014 (Cruise code: CEND0614, Lyman et al., 2014). Processing of the acoustic data followed the same protocols as listed above for the CHP data, and the two datasets were combined into single bathymetry and backscatter floating point geotiffs gridded at 2 m resolution. Each survey achieved 100% coverage, but there remains a small, unsurveyed gap between the CHP and Cefas data (Appendix 2). There are further gaps in the data record over the Goodwin Sands banks themselves, which were periodically exposed by low tides and thus could not be surveyed. In total, 93% of the rMCZ area was surveyed.

3.2 Ground truth sample acquisition

Ground truth samples were collected during three separate surveys, two of which were conducted by Cefas in January and April/May, 2014 (Cruise code: CEND0114, Nicolaus and Ware, 2014; Cruise code: CEND0614, Lyman et al., 2014 respectively). A further inshore survey was conducted on behalf of Cefas in September/October 2014 by the Environment Agency (EA) (Project code: C5784A; Miller and Godsell, 2014).

Across the Goodwin Sands rMCZ, ground truth samples were collected from 372 stations (Figure 2; Appendix 1). A combination of physical sediment grabs and seabed imagery were acquired during each survey. Unless stated otherwise, video and still images were analysed using an established protocol developed and used by Cefas (Coggan et al., 2007). As part of the January 2014 survey, groundtruthing samples were acquired from the RV *Cefas Endeavour* in the deeper areas of the Goodwin Sands rMCZ following a 2 km triangular lattice grid, as there was no

acoustic data available to inform site selection. Groundtruthing was achieved using sediment grabs and drop-camera (DC) video and stills at 39 stations. Sediment grabs were acquired using a 0.1 m² mini Hamon grab, and were sub-sampled for particle size analysis (PSA). Complete sediment analysis was conducted post cruise by Cefas scientists, and samples were classified into both Folk and EUNIS BSH classes. Video and stills imagery were acquired with a drop-camera (DC) system, which was deployed at all stations. Video transects lasting a minimum of 2 minutes were carried out as standard during the tow, though longer video transects (minimum 10 minutes) were carried out at a subset of stations (ca. ⅓ of stations).

Groundtruthing samples were acquired from shallower areas of the Goodwin Sands rMCZ with site selection informed by preliminary acoustic data interpretation. Groundtruthing samples were collected at 23 stations in April/May 2014 using the same acquisition and instrument setup as described for the January 2014 survey.

Finally, during the September/October 2014 survey, groundtruthing samples were taken aboard the coastal survey vessels *Thames Guardian* and *Solent Guardian* within the inshore areas of the Goodwin Sands rMCZ. Groundtruthing was achieved using sediment grabs and drop-camera (DC) video and stills imagery at 86 stations. All the ground-truthing stations were initially surveyed using drop camera equipment (DC). A preliminary assessment of the video footage and still images collected was subsequently carried out to identify locations suitable for sediment grab deployment. Sediment grabs were acquired using a 0.1m² mini Hamon grab, and were sub-sampled for PSA.

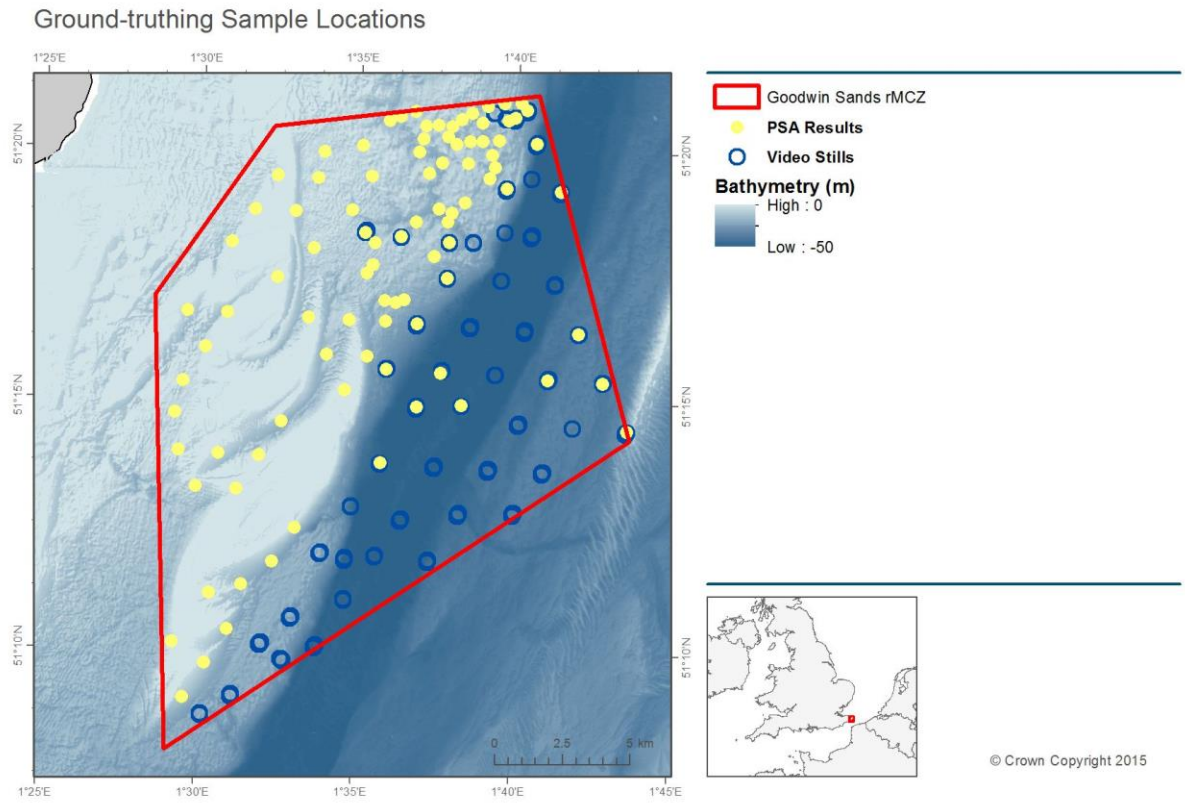

Figure 2. Location of groundtruthing sampling sites in the Goodwin Sands rMCZ. Bathymetry displayed is from Defra's Digital Elevation Model (Astrium, 2011).

3.3 Production of the updated habitat map

All new maps and their derivatives have been based on a WGS84 datum. A new habitat map for the site was produced by analysing and interpreting the available acoustic data (as detailed above) and the ground-truth data collected by the dedicated surveys of this site. The process is a combination of two approaches, auto-classification (image analysis) and expert interpretation, as described below. The routine for auto-classification is flexible and dependent on site-specific data, allowing for application of a bespoke routine to maximise the acoustic data available.

ArcGIS was used to perform an initial unsupervised classification on the backscatter image. The single-band backscatter mosaic was filtered and smoothed prior to the application of an Iso cluster/maximum likelihood classification routine. Python scripting language was used to automate the workflow. Each stage in the process is numbered and described in detail below.

Stage 1. Data preparation

Prior to analysis, the bathymetry and backscatter data were re-sampled onto a common grid at 2 m resolution. This data preparation results in a spatial grid with a single value for bathymetry (depth) and a single value for backscatter (acoustic reflectance) in each 2 m by 2 m grid cell, and it is these data values that were used in the rest of the process.

Stage 2. Derivatives calculated

From the bathymetry data a range of derivatives were calculated, as detailed in Table .

Table 4. Description of derivatives calculated for bathymetry using ArcGIS/Fledermaus.

Derivative	Description
Slope	The slope in degrees using the maximum change in elevation of each cell and its 8 neighbours (3*3)
Roughness/Rugosity	Calculated as the difference between the maximum and minimum value of each cell and its 8 neighbours (3*3)
Aspect	Identifies the downslope direction of the maximum rate of change in value from each cell to its neighbours. It can be thought of as the slope direction.

Stage 3. Unsupervised classification

The following steps outline the routine performed using standard ArcGIS functionality to automatically classify the single-band backscatter mosaic. This functionality was accessed and performed using a single Python script.

Smoothing/generalisation of the backscatter image

The initial step involved the generalisation and smoothing of the single band backscatter mosaic prior to application of the classification tools, to remove the influence of noise and 'striping' from within the backscatter image. This makes the production of smooth, topologically correct, 'realistic' polygons easier for later modification and attribution during the manual phase.

The raster was down-sampled to a 20 m resolution. Focal statistics were used to populate the cell values of a new 3 m resolution grid based on the mean of a 3 x

3 cell neighbourhood. The focal statistic command was repeated up to 10 times to ensure a smooth, noise-free grid, as illustrated in Figure 3. The initial coarse resolution ensures the removal of any striping whilst maintaining the general trend in sediment distribution. Converting the raster back to a finer resolution is essential for the production of smooth, realistic vector output. The choice of cell size combination is crucial in determining feature size to be preserved. The cell size is chosen after consultation with the mapping geologist regarding the most appropriate scale of mapping in order to maximise the removal of noise from the data set, whilst preserving the required feature visibility.

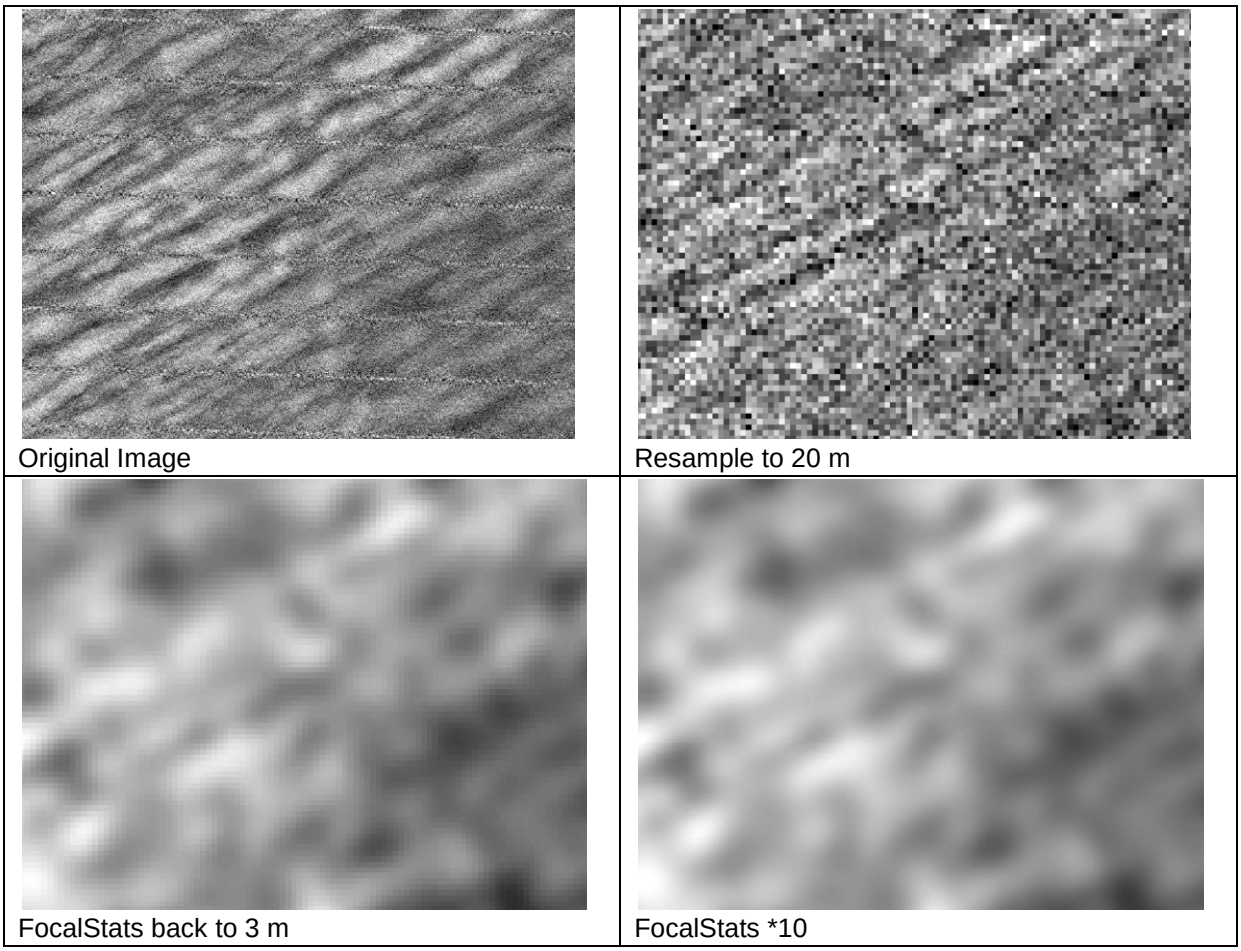

Figure 3. Backscatter mosaic generalisation/smoothing prior to autoclassification routine.

ArcGIS Iso Cluster Unsupervised Classification Tool

This tool is part of the classification toolset available on the image classification toolbar within ArcGIS 10.1. The Iso cluster tool was chosen as it produced the best results from the single band image of backscatter intensity. The tool uses an iterative clustering procedure, also known as a migrating means technique, to find the natural groupings of cells and produce a signature file to be used as an input requirement for the maximum likelihood tool. The analyst chooses an unrealistically high number of potential sediment classes to group each cell into. The algorithm separates each cell into one of these clusters/groupings by calculating an arbitrary mean for each and assigning a cell to the most suitable cluster based on the shortest Euclidean distance. The mean of each group is then recalculated based on this first

reiteration of groupings. The process is repeated for the number of iterations specified, which should be greater than the number of classes and enough to ensure that the movement of cells across classes has become stable.

The maximum likelihood classification tool uses the output signature file from the Iso cluster procedure to create a classified raster. The tool will consider the variance and co-variance of the class signature when assigning each cell to one of the classes. With the assumption that the distribution of a class sample is normal, a class can be characterised by the mean vector and the covariance matrix. The statistical probability is computed for each class to determine the membership of cells to a class. An a priori probability weighting option is the default value of the maximum likelihood routine, whereby each cell is assigned to the class to which it has the highest probability of being a member.

Raster to polygon conversion

The classified raster obtained from the above steps is converted to a vector polygon shapefile to produce a final fully attributed, topologically clean, smooth vector dataset (Figure 4).

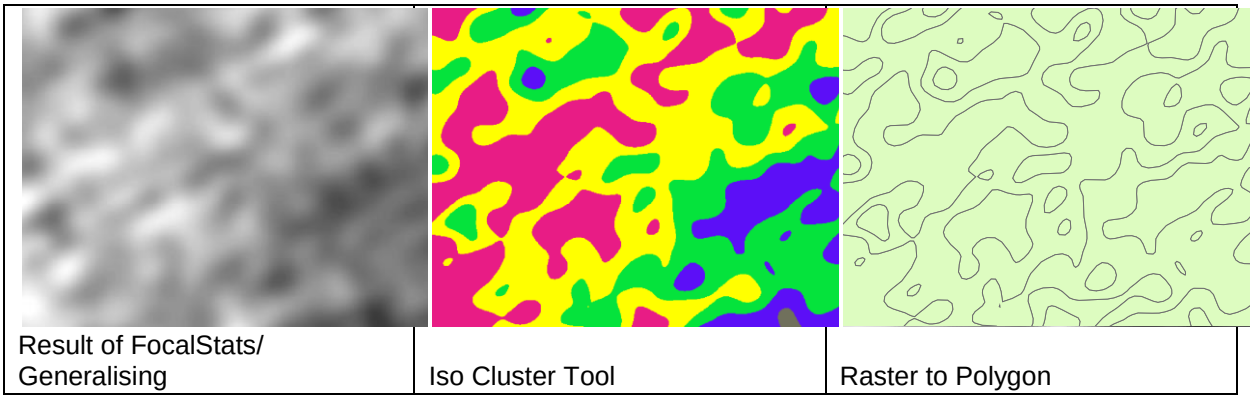

Figure 4. Iso cluster maximum likelihood classification routine.

The resultant classified output represents a numeric, thematic map. The number of classes created is simply an over-estimation of the potential number of sediment types present in the study area. The analyst can assess the resulting map and change the number of classes until satisfied all likely changes in seabed substrate have been represented.

Stage 4. Expert judgement

The vectorised output of the semi-automated process is reviewed manually to assign sedimentological classifications in accordance with the EUNIS habitat classification system. An appreciation of the geological characteristics of the area also means that the analyst can sense check the outputs. Polygons can be amended, modified and merged to best represent the acoustic data, groundtruthing samples with the influence of geological judgement.

In this case, final mapped boundaries between rock and sediment substrate classes are dependent on assessing the bathymetry, backscatter, and derived products together with the ground-truthing data, as the backscatter data alone, on which the semi-automated classification is conducted, does not provide a unique correlation between backscatter amplitude and sediment class.

As confirmed by the grab samples, high backscatter intensities indicate gravel percentages of greater than 5%, indicating either 'coarse' or 'mixed' sediments. The practical result is that both 'coarse' and 'mixed' sediment areas are similarly sensed by the clustering process. The expert analyst must utilize the groundtruthing results to further sub-divide these areas of high backscatter into segregated 'coarse' and 'mixed' classes. Taking into account that the PSA data provide a more quantitative assessment of sediment fractions than that of the video/still image analysis, the PSA data were used as the primary groundtruthing dataset for purposes of mapping broadscale habitats.

As the video and still imagery provided the only evidence of the BSH 'A4.2 Moderate energy circalittoral rock', these groundtruthing observations were extrapolated according to the bathymetry and backscatter data to map the extent of rock at the seabed. Areas where rock was observed at the seabed are also regularly characterized by coarse sediment waves. Because of this and the variable occurrence of coarse vs. sand dominated sediments adjacent to rock across the site, manual interpretation was used in favour of a semi-automated approach to map the extent of rock.

Habitat FOCI 'Blue Mussel Beds' and 'Ross Worm (*Sabellaria spinulosa*) Reefs' were also observed on the video/stills imagery but could not be confidently and consistently identified using the acoustic data. It was thus not possible to map the geographic extent of these features and they are presented as point observations only.

3.4 Quality of the updated map

The technical quality of the updated habitat map was assessed using the MESH Confidence Assessment Tool[1], originally developed by an international consortium of marine scientists working on the MESH (Mapping European Seabed Habitats) project. This tool considers the provenance of the data used to make a biotope/habitat map, including the techniques and technology used to characterise the physical and biological environment and the expertise of the people who had made the map. In its original implementation, it was used to make an auditable judgement of the confidence that could be placed in a range of existing, local biotope maps that had been developed using different techniques and data inputs, but were to be used in compiling a full coverage map for north-west Europe. Where two of the original maps overlapped, that with the highest MESH confidence score would take precedence in the compiled map.

Subsequent to the MESH project, the confidence assessment tool has been applied to provide a benchmark score that reflects the technical quality of newly developed habitat/biotope maps. Both physical and biological survey data are required to achieve the top mark of 100 but, as the current exercise requires the mapping of broadscale physical habitats not biotopes, it excludes the need for biological data. In the absence of biological data, the maximum score attainable for a purely physical map is 88.

[1] http://emodnet-seabedhabitats.eu/confidence/confidenceAssessment.htm [Accessed 19/01/2015]

In applying the tool to the current work, none of the weighting options were altered; that is, the tool was applied in its standard form, as downloaded from the internet.

4 Results

4.1 Site Assessment Document (SAD) habitat map

The SAD habitat map (Figure 5) was produced using modelled data from the UKSeaMap (McBreen, 2010). For further details see Balanced Seas (2011).

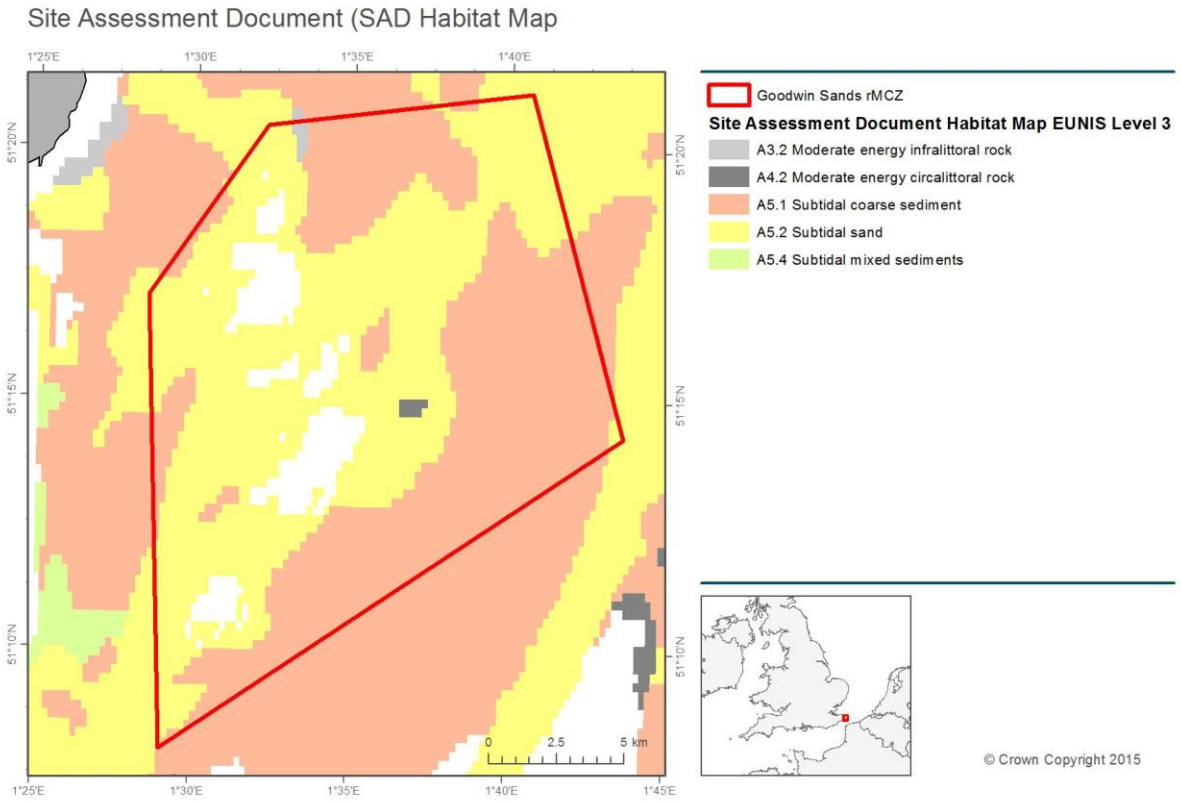

Figure 5. Habitat map from the Site Assessment Document.

4.2 Updated habitat map based on new survey data

The updated habitat map resulting from an integrated analysis of the pre-existing CHP survey data from 2009, and the 2014 dedicated survey data is presented in Figure 6.

The list of benthic taxa found in the grab and video samples is presented in Appendix 4; a total of 395 infaunal and 57 epifaunal taxa were recorded. No species FOCI listed in the ENG were recorded.

A summary of the PSA of the grab samples is given in Appendix 5. Of the 93 stations where a sample was obtained, coarse sediment was recorded at 26 stations, sand at 43 stations, mud at 2 stations and mixed sediment at 22 stations.

The analysis of the seabed video and stills is summarised in Appendix 6. Example images taken during the survey of the BSHs and habitat FOCI recorded in the video analysis are given in Appendices 7 and 8 respectively.

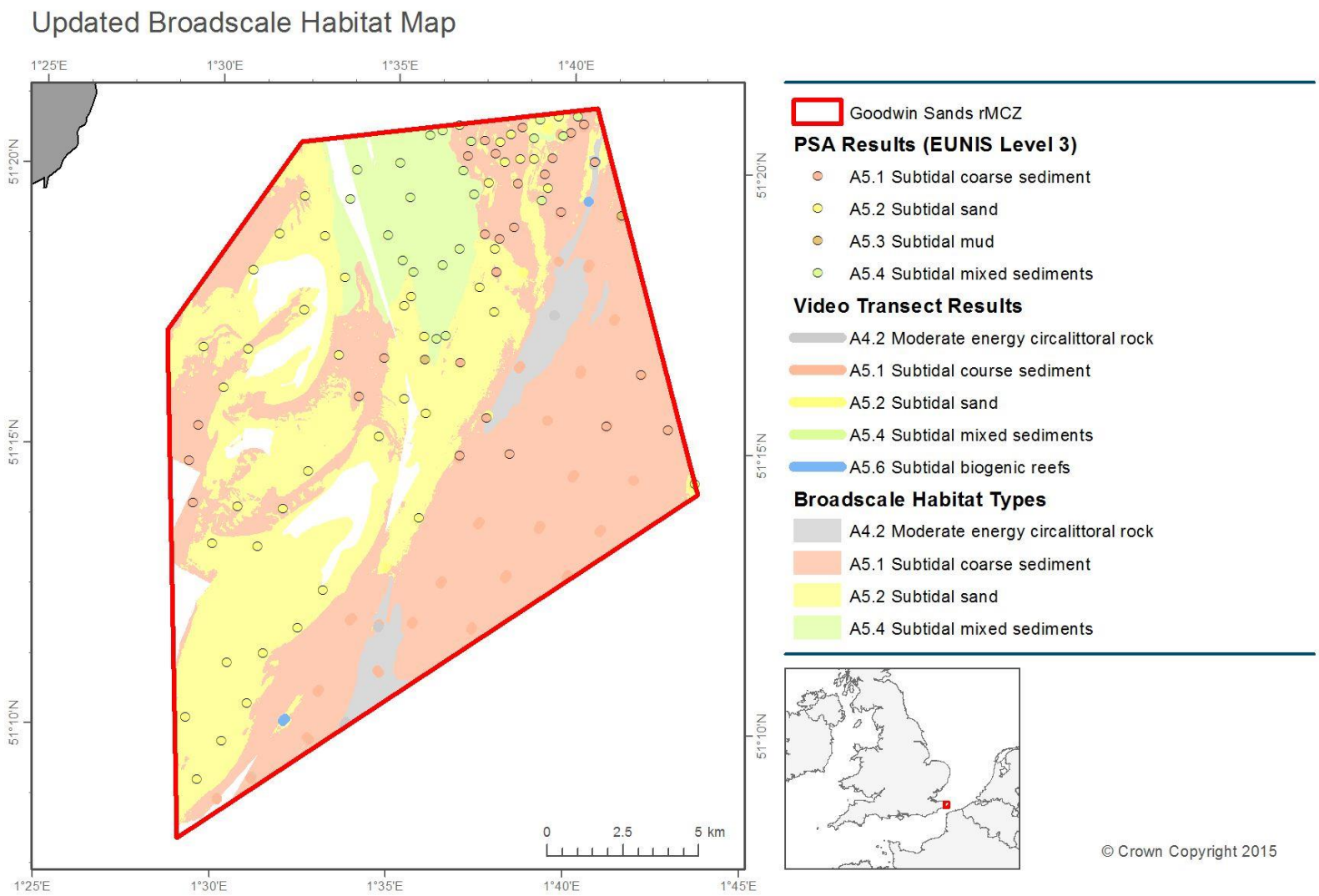

Figure 6. Updated map of broadscale habitats based on newly acquired survey data.

4.3 Quality of the updated habitat map

This map attained a score of 83 from the MESH Confidence Assessment Tool (Figure 7), which is good, given that the maximum possible score for a purely physical map is 88.

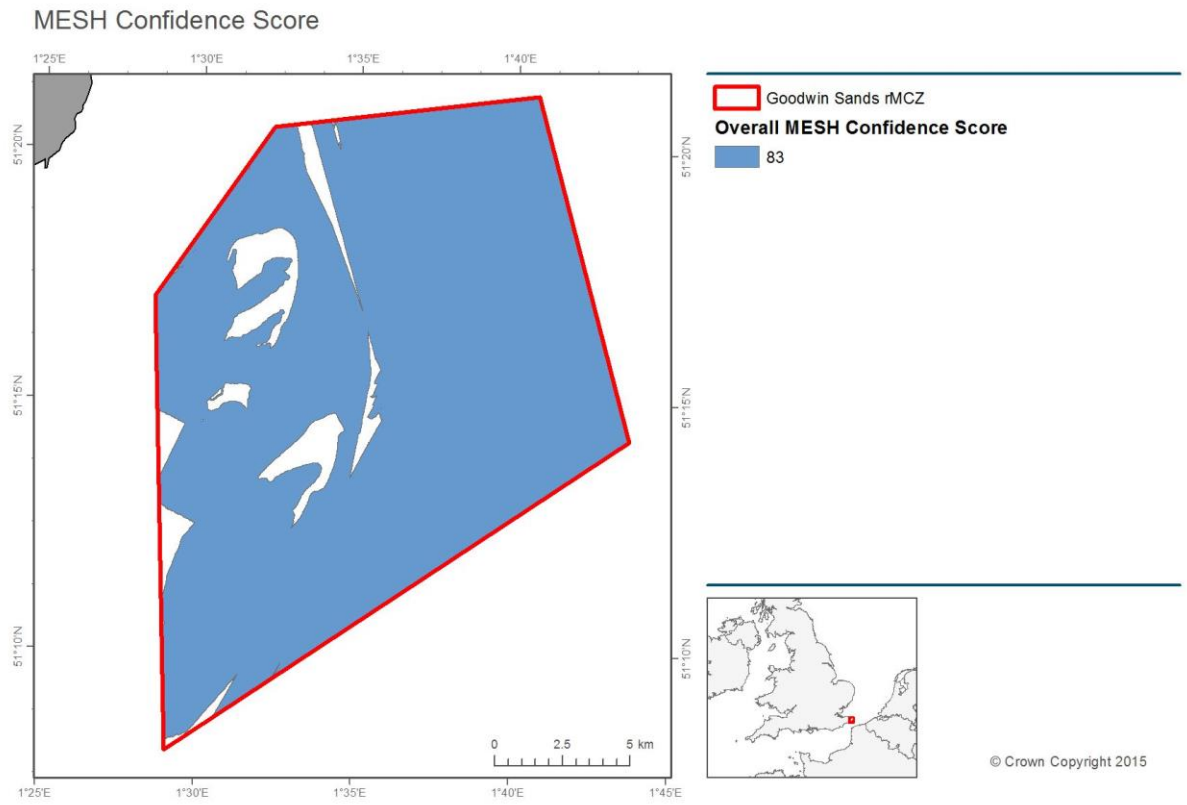

Figure 7. Overall MESH confidence score for the updated broadscale habitat map.

4.4 Broadscale habitats identified

'A5.1 Subtidal coarse sediment' is the most widespread habitat type, occupying 52% of the rMCZ (Figure 6; Table 5). 'A5.2 Subtidal sand' occupies 35%, 'A5.4 Subtidal mixed sediments' occupy 9%, and 'A4.2 Moderate energy circalittoral rock' occupies 4% of the rMCZ.

According to the SAD, this rMCZ incorporates two notable large-scale geomorphological features which influence the regional sediment distribution: the Goodwin Sands banks; and an erosional valley associated with the English Channel palaeovalley system. The Goodwin Sands banks are sand-dominated features which formed during the Holocene transgression, and are sub-aerially exposed in places during low tides (e.g. D'Olier, 2009). The banks are maintained by active sediment influx and local hydrodynamic conditions. Multiple mobile sand wave fields are active along the margins of the banks. The distribution of 'A5.2 Subtidal sand' is predominantly associated with the extent of the Goodwin Sands banks and affiliated mobile sand waves.

The English Channel palaeovalleys are wide and frequently flat valleys as they incise bedrock, in this case Cretaceous Chalk. Their origin is disputed; they may be the result of catastrophic flooding following the outburst of a glacial lake in the North Sea, previously damned by the Dover Isthmus (e.g. Gupta et al., 2007), or may result from more steady-state erosion from the drainage of Northern European river systems that fed the North Sea basin and English Channel (e.g. Mellett et al., 2013). A large palaeovalley extends NNE-SSW across the rMCZ area and is dominated by 'A5.1 Subtidal coarse sediment'. The valley terrace in the far east of the area is also dominated by 'A5.1 Subtidal coarse sediment'. 'A4.2 Moderate energy circalittoral rock' is mapped in places along the eastern margin of the palaeovalley where no superficial sediment is present. There is likely further rock exposed at seabed within, and along the margins of the valley as confirmed by several video/stills imagery observations; however it is not possible to extrapolate these point observations according to the acoustic data. The bases of the valleys are frequently characterized by gravel and cobble-rich sediment waves atop bedrock. In places bedrock is exposed within the troughs of these waves, but in other places this relationship does not hold. As the acoustic backscatter data provides an ambiguous signal between the coarse sediment and rock at these fine scales, the occurrences of 'A4.2 Moderate energy circalittoral rock' were mapped only where we were confident that both the sample and acoustic data predict the dominant presence of rock at seabed.

'A5.4 Subtidal mixed sediments' are mapped exclusively within the northern part of the rMCZ area. Acoustically, these areas cannot be discriminated from 'A5.1 Subtidal coarse sediment' as both exhibit similar backscatter intensities and there are no distinguishing morphological characteristics observed within the bathymetry data. For this reason, the extent of 'A5.4 Subtidal mixed sediments' is manually mapped according to PSA sample results where it shares a boundary with 'A5.1 Subtidal coarse sediment'. The results from the unsupervised (clustering) classification were honoured where both 'A5.4 Subtidal mixed sediments' and 'A5.1 Subtidal coarse sediment' border 'A5.2 Subtidal sand'.

Table 5. Broadscale habitats identified in this rMCZ.

Broadscale Habitat Type (EUNIS Level 3)	Spatial extent according to the SAD	Spatial extent according to the updated habitat map
A3.2 Moderate energy infralittoral rock	0.65 km^2	0 km^2
A4.2 Moderate energy circalittoral rock	0.58 km^2	11.19 km^2
A5.1 Subtidal coarse sediment	115.55 km^2	133.19 km^2
A5.2 Subtidal sand	159.97 km^2	89.48 km^2
A5.4 Subtidal mixed sediments	Not listed	24.09 km^2

4.5 Habitat FOCI identified

The SAD estimates the presence of 'Blue Mussel Beds' (312.57 m^2) and 'Ross Worm (*Sabellaria spinulosa*) Reefs' (625.29 m^2) (Table 6; Figure 8). These features could not be confidently identified using the acoustic bathymetry or backscatter data and were observed on video and stills imagery only. For this reason they are presented on the habitat FOCI map as point observations only as it was not possible to extrapolate the spatial extent of these features according to the acoustic data.

Of the surveyed areas, 'Subtidal Sands and Gravels' occupy 222.68 km^2, or approximately 86% of the surveyed area. 'Subtidal Chalk' occupies 11.19 km^2, or

approximately 4% of the surveyed area. The habitat FOCI 'Subtidal Chalk' was not listed in the SAD.

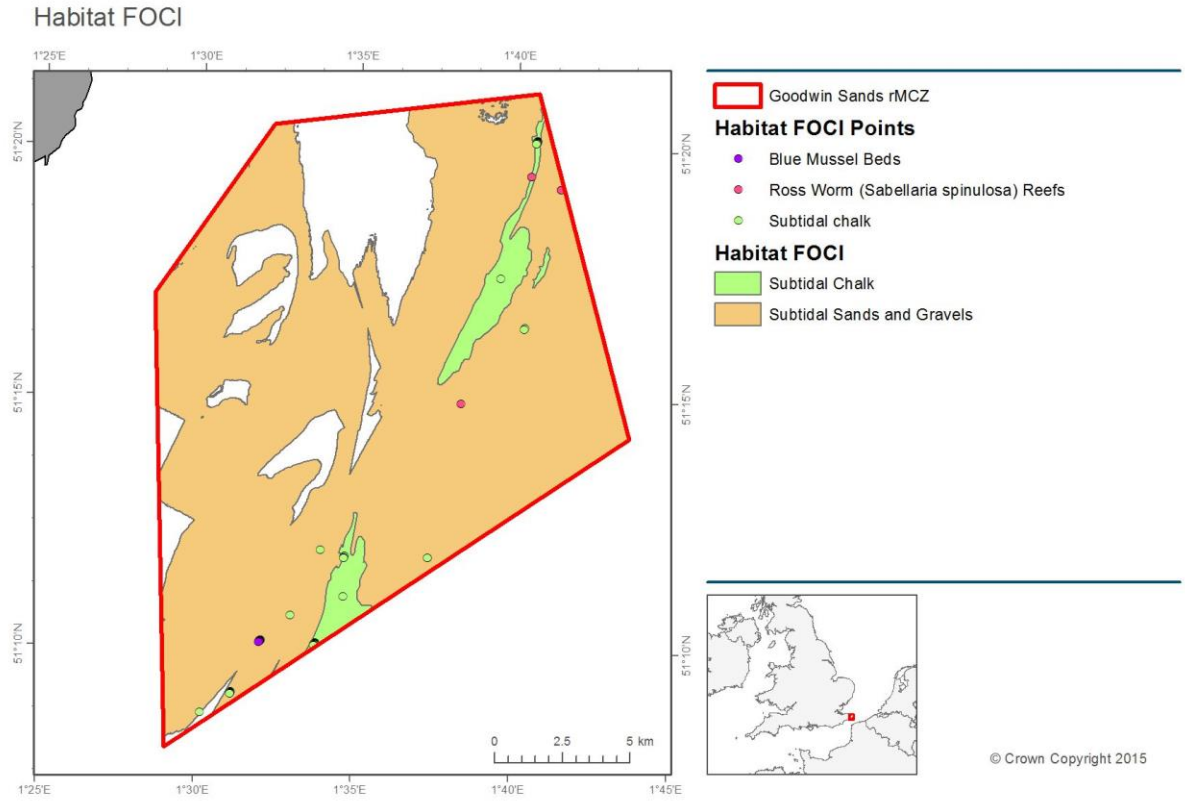

Figure 8. Habitat FOCI identified.

Table 4. Habitat FOCI identified in this rMCZ.

Habitat FOCI	Spatial extent according to the SAD	Spatial extent according to the updated habitat map
Blue Mussel Beds	312.57 km^2	N/A*
Ross Worm (*Sabellaria spinulosa*) Reefs	625.29 km^2	N/A*
Subtidal Sands and Gravels	Not listed**	222.68km^2
Subtidal Chalk	Not listed	11.19 km^2

* ***These features are presented on the habitat FOCI map as point observations only as it was not possible to extrapolate the spatial extent of these features according to the acoustic data.***
*****The presence of habitat FOCI 'Subtidal Sands and Gravels' is not listed in the SAD, but inferred by the listing of BSH classes 5.1 and 5.2.***

4.6 Species FOCI identified

No species FOCI were recorded from the newly acquired survey data (Table 5). The list of species identified from grab and video samples collected by the dedicated 2014 surveys as presented in Appendix 4.

Table 5. Species FOCI identified in this rMCZ.

Species FOCI	Previously recorded within rMCZ	Identified during evidence gathering survey
Low or Limited Mobility Species FOCI	None recorded	None recorded
Highly Mobile Species FOCI	None recorded	None recorded

4.7 Quality Assurance (QA) and Quality Control (QC)

4.7.1 Acoustic data

The acoustic data utilised for production of the updated habitat map were collected under the CHP as well as by the RV *Cefas Endeavour*. The acquisition and processing of the bathymetry data complied with the International Hydrographic Organisation (IHO) Standards for Hydrographic Surveys-Order 1 (Special Publication 44, Edition 4). The accompanying multibeam backscatter data were reviewed and processed by specialist Cefas staff to ensure these data were suitable for use in the subsequent interpretations and production of the updated habitat map.

4.7.2 Particle Size Analysis of sediments

PSA was carried out by Cefas scientists following standard laboratory practice following the recommendations of the National Marine Biological Analytical Quality Control (NMBAQC) scheme (Mason, 2011). Results of the PSA are shown in Appendix 5.

4.7.3 Infaunal samples from grabs

Infaunal samples were processed by MIES and APEM following standard laboratory practices, and results checked following the recommendations of the National Marine Biological Analytical Quality Control (NMBAQC) scheme (Worsfold et al., 2010).

4.7.4 Video and still images and analysis

Video and photographic stills were processed by OceanEcology Ltd in accordance with the guidance documents developed by Cefas and the Joint Nature Conservation Committee (JNCC) for the acquisition and processing of video and stills data (Coggan and Howell, 2005; JNCC, in prep.; summarised in Annex 5).

4.8 Data limitations and adequacy of the updated habitat map

The quality of the derived habitat map is assessed to be High (MESH assessment tool). A source of potential misclassification of habitats arises from the location of groundtruthing samples in relation to habitat types.

The surveys have provided substantial, robust evidence for the presence of the mapped habitats. However, as it is impractical (and undesirable) to sample the entire area of the site with grabs and video, there is a chance that a BSH or FOCI may exist within the site but has not been recorded, especially if it was limited in

extent. Given the relatively homogeneous nature of the site, the likelihood of this is low.

The precise location of the boundaries between the broadscale habitats depicted on the new habitat map should be regarded as indicative, not definitive. In nature, such boundaries are rarely abrupt. Instead it is typical for one BSH to grade into another across a transitional boundary. In contrast, the mapped boundaries are abrupt and have been placed using best professional judgment. This may have implications when calculating the overall extent of any of the mapped habitats or FOCI.

4.8.1 Presence of species FOCI

No species FOCI were included in the recommendations for proposal of this rMCZ, or recorded during the dedicated 2014 surveys conducted.

4.9 Observations of human impacts on the seabed

A large number (59) of wrecks are visible in the multibeam bathymetry for this site, as shown in Appendix 3. Most of the wrecks rest on the seabed in and around the Goodwin Sands banks. Occasional trawl marks are also found in the north of the rMCZ (Appendix 3).

5 Conclusions

5.1 Presence and extent of broadscale habitats

5.1.1 Presence

- The 2009 CHP, and 2014 dedicated surveys have confirmed the presence of the 'A4.2 Moderate energy circalittoral rock', 'A5.1 Subtidal coarse sediments' and 'A5.2 Subtidal sand' broadscale habitats that were included in the recommendations made by the SAD for designating this site as an MCZ.

- The 2009 CHP, and 2014 dedicated surveys have not confirmed the presence of the 'A3.2 Moderate energy infralittoral rock' broadscale habitat that was included in the recommendations made by the SAD for designating this site as an MCZ.

- The 2009 CHP, and 2014 dedicated surveys have confirmed the presence of 'A5.4 Subtidal mixed sediments' broadscale habitat. This BSH was not included in the recommendations made by the SAD for designating this site as an MCZ.

5.1.2 Extent

- The spatial extent of the 'A4.2 Moderate energy circalittoral rock' BSH on the updated habitat map is 11.19 km^2. This is 10.61 km^2 more than its spatial extent in the SAD habitat map.

- The spatial extent of the 'A5.1 Subtidal coarse sediment' BSH on the updated habitat map is 133.19 km^2. This is 17.64 km^2 more than its spatial extent in the SAD habitat map.

- The spatial extent of the 'A5.2 Subtidal sand' BSH on the updated habitat map is 89.48 km^2. This is 70.49 km^2 less than its spatial extent in the SAD habitat map.

- The spatial extent of the 'A5.4 Subtidal mixed sediments' BSH on the updated habitat map is 24.09 km^2. This was not identified in the SAD habitat map.

5.2 Presence and extent of habitat FOCI

5.2.1 Presence

- The 2009 CHP and 2014 dedicated surveys have confirmed the presence of the habitat FOCI 'Blue Mussel Beds' that was included in the recommendations made by the SAD for designating this site as an MCZ.

- The 2009 CHP and 2014 dedicated surveys have confirmed the presence of the habitat FOCI 'Ross Worm (*Sabellaria spinulosa*) Reefs' that was included in the recommendations made by the SAD for designating this site as an MCZ.

- The 2009 CHP, and 2014 dedicated surveys have confirmed the presence of the habitat FOCI 'Subtidal Sands and Gravels' and 'Subtidal chalk' at this site. These habitat FOCI were not included in the recommendations made by the SAD for designating this site as an MCZ.

5.2.2 Extent and distribution

- The spatial extent of the habitat FOCI 'Blue Mussel Beds' was not possible to determine as the ground truth observations could not be extrapolated according to the acoustic data. This habitat FOCI was listed as 312.57 m^2 in the SAD.

- The spatial extent of the habitat FOCI 'Ross Worm (*Sabellaria spinulosa*) Reefs' was not possible to determine as the ground truth observations could not be extrapolated according to the acoustic data. This habitat FOCI was listed as 625.29 m^2 in the SAD.

- The spatial extent of the habitat FOCI 'Subtidal Sands and Gravels' on the updated habitat map is 222.68 km^2. This was not identified in the SAD habitat map.

- The spatial extent of the habitat FOCI 'Subtidal Chalk' on the updated habitat map is 11.19 km^2. This was not identified in the SAD habitat map.

5.3 Presence and distribution of species FOCI

5.3.1 Low or limited mobility species

- No 'Low or limited mobility' species FOCI were recorded at this site by the 2014 dedicated survey. These observations are consistent with the evidence presented in the SAD.

5.3.2 Highly mobile species FOCI

- No highly mobile species FOCI were recorded at this site by the 2012 dedicated survey. These observations are consistent with the evidence presented in the SAD.

5.4 Evidence of human activities impacting the seabed

Fifty-nine wrecks are visible in the multibeam bathymetry for this site, as shown in Appendix 3. Occasional trawl marks are also found in the north of the rMCZ area (Appendix 3).

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Data sources

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Annexes

Annex 1. Broadscale habitat features listed in the ENG.

Broadscale Habitat Type	EUNIS Level 3 Code
High energy intertidal rock	A1.1
Moderate energy intertidal rock	A1.2
Low energy intertidal rock	A1.3
Intertidal coarse sediment	A2.1
Intertidal sand and muddy sand	A2.2
Intertidal mud	A2.3
Intertidal mixed sediments	A2.4
Coastal saltmarshes and saline reed beds	A2.5
Intertidal sediments dominated by aquatic angiosperms	A2.6
Intertidal biogenic reefs	A2.7
High energy infralittoral rock*	A3.1
Moderate energy infralittoral rock*	A3.2
Low energy infralittoral rock*	A3.3
High energy circalittoral rock**	A4.1
Moderate energy circalittoral rock**	A4.2
Low energy circalittoral rock**	A4.3
Subtidal coarse sediment	A5.1
Subtidal sand	A5.2
Subtidal mud	A5.3
Subtidal mixed sediments	A5.4
Subtidal macrophyte-dominated sediment	A5.5
Subtidal biogenic reefs	A5.6
Deep-sea bed***	A6

**** Infralittoral rock includes habitats of bedrock, boulders and cobble which occur in the shallow subtidal zone and typically support seaweed communities***
***** Circalittoral rock is characterised by animal dominated communities, rather than seaweed dominated communities***
****** The deep-sea bed*** **broadscale habitat** ***encompasses several different habitat sub-types, all of which should be protected within the MPA network. The*** **broadscale habitat** ***deep-sea bed habitat is found only in the south-west of the MCZ project area and MCZs identified for this*** **broadscale habitat** ***should seek to protect the variety of sub-types known to occur in the region.***

Annex 2. Habitat FOCI listed in the ENG.

Habitat Features of Conservation Importance (FOCI)
Blue Mussel Beds (including Intertidal Beds on Mixed and Sandy Sediments)**
Cold-Water Coral Reefs ***
Coral Gardens***
Deep-Sea Sponge Aggregations***
Estuarine Rocky Habitats
File Shell Beds***
Fragile Sponge and Anthozoan Communities on Subtidal Rocky Habitats
Intertidal Underboulder Communities
Littoral Chalk Communities
Maerl Beds
Horse Mussel (*Modiolus modiolus*) Beds
Mud Habitats in Deep Water
Sea-Pen and Burrowing Megafauna Communities
Native Oyster (*Ostrea edulis*) Beds
Peat and Clay Exposures
Honeycomb Worm (*Sabellaria alveolata*) Reefs
Ross Worm (*Sabellaria spinulosa*) Reefs
Seagrass Beds
Sheltered Muddy Gravels
Subtidal Chalk
Subtidal Sands and Gravels
Tide-Swept Channels

**** Habitat FOCI have been identified from the 'OSPAR List of Threatened and/or Declining Species and Habitats' and the 'UK List of Priority Species and Habitats (UK BAP)'.***
***** Only includes 'natural' beds on a variety of sediment types. Excludes artificially created mussel beds and those which occur on rocks and boulders.***
****** Cold-Water Coral Reefs, Coral Gardens, Deep-Sea Sponge Aggregations and File Shell Beds currently do not have distributional data which demonstrate their presence within the MCZ project area.***

Annex 3. Low or limited mobility species FOCI listed in the ENG.

Group	Scientific name	Common Name
Brown Algae	*Padina pavonica*	Peacock's Tail
Red Algae	*Cruoria cruoriaeformis* *Grateloupia montagnei* *Lithothamnion corallioides* *Phymatolithon calcareum*	Burgundy Maerl Paint Weed Grateloup's Little-Lobed Weed Coral Maerl Common Maerl
Annelida	*Alkmaria romijni*** *Armandia cirrhosa***	Tentacled Lagoon-Worm** Lagoon Sandworm**
Teleostei	*Gobius cobitis* *Gobius couchi* *Hippocampus guttulatus* *Hippocampus hippocampus*	Giant Goby Couch's Goby Long Snouted Seahorse Short Snouted Seahorse
Bryozoa	*Victorella pavida*	Trembling Sea Mat
Cnidaria	*Amphianthus dohrnii* *Eunicella verrucosa* *Haliclystus auricula* *Leptopsammia pruvoti* *Lucernariopsis campanulata* *Lucernariopsis cruxmelitensis* *Nematostella vectensis*	Sea-Fan Anemone Pink Sea-Fan Stalked Jellyfish Sunset Cup Coral Stalked Jellyfish Stalked Jellyfish Starlet Sea Anemone
Crustacea	*Gammarus insensibilis*** *Gitanopsis bispinosa* *Pollicipes pollicipes* *Palinurus elephas*	Lagoon Sand Shrimp** Amphipod Shrimp Gooseneck Barnacle Spiny Lobster
Mollusca	*Arctica islandica* *Atrina pectinata* *Caecum armoricum*** *Ostrea edulis* *Paludinella littorina* *Tenellia adspersa***	Ocean Quahog Fan Mussel Defolin's Lagoon Snail** Native Oyster Sea Snail Lagoon Sea Slug**

**** Species FOCI have been identified from the 'OSPAR List of Threatened and/or Declining Species and Habitats', the 'UK List of Priority Species and Habitats (UK BAP)' and Schedule 5 of the Wildlife and Countryside Act.***

***** Those lagoonal species FOCI may be afforded sufficient protection through coastal lagoons designated as SACs under the EC Habitats Directive. However, this needs to be assessed by individual regional projects.***

Annex 4. Highly mobile species FOCI listed in the ENG.

Group	Scientific name	Common Name
Teleostei	*Osmerus eperlanus* *Anguilla anguilla*	Smelt European Eel
Elasmobranchii	*Raja undulata*	Undulate Ray

**** Species FOCI have been identified from the 'OSPAR List of Threatened and/or Declining Species and Habitats', the 'UK List of Priority Species and Habitats (UK BAP)' and Schedule 5 of the Wildlife and Countryside Act.***

Annex 5. Video and stills processing protocol.

The purpose of the analysis of the video and still images is to identify which habitats exist in a video record, provide semi-quantitative data on their physical and biological characteristics and to note where one habitat changes to another. A minimum of 10% of the videos should be re-analysed for QA purposes.

Video Analysis

- The video record is initially viewed rapidly (at approximately 4x normal speed) in order to segment it into sections representing different habitats. The start and end points of each segment are logged, and each segment subsequently subject to more detailed analysis. Brief changes in habitat type lasting less than one minute of the video record are considered as incidental patches and are not logged.

- For each segment, note the start and end time and position from the information on the video overlay. View the segment at normal or slower than normal speed, noting the physical and biological characteristics, such as substrate type, seabed character, species and life forms present. For each taxon record an actual abundance (where feasible) or a semi quantitative abundance (e.g. SACFOR scale).

- Record the analyses on the video pro-forma provided (paper and/or electronic), which is a modified version of the Sublittoral Habitat Recording Form used in the Marine Nature Conservation Review (MNCR) surveys.

- When each segment has been analysed, review the information recorded and assign the segment to one of the broadscale habitat (BSH) types or habitat FOCI listed in the Ecological Network Guidance (as reproduced in Annexes 1 and 2 above). Note also any species FOCI observed (as per Annex 3 above).

Stills analysis

- Still images should be analysed separately, to supplement and validate the video analysis, and provide more detailed (i.e. higher resolution) information than can be extracted from a moving video image.

- For each segment of video, select three still images that are representative of the BSH or FOCI to which the video segment has been assigned. For each image, note the time and position it was taken, using information from the associated video overlay.

- View the image at normal or greater than normal magnification, noting the physical and biological characteristics, such as substrate type, seabed character, species and life forms present. For each taxon record an actual abundance (where feasible) or a semi quantitative abundance (e.g. SACFOR scale).

- Record the analysis on the stills pro-forma provided (paper and/or electronic), which is a modified version of the Sublittoral Habitat Recording Form used in the MNCR surveys. Assign each still image to the same BSH or habitat FOCI as its ‘parent’ segment in the video.

Taxon identification

In all analyses, the identification of taxa should be limited to a level that can be confidently achieved from the available image. Hence, taxon identity could range from the 'life form' level (e.g. sponge, hydroid, anemone) to the species level (e.g. *Asterias rubens*, *Alcyonium digitatum*). Avoid the temptation to guess the species identity if it cannot be determined positively from the image. For example, *Spirobranchus* sp. would be acceptable, but *Spirobranchus triqueter* would not, as the specific identification normally requires the specimen to be inspected under a microscope.

Appendices

Appendix 1. Survey metadata

Groundtruthing Survey CEND 01/14

Date sampled	Time sampled	Station code	Station number	Gear code	Latitude (degrees)	Longitude (degrees)
15/01/2014	20:41	GWSD026	190	HG	51.34748	1.67099
15/01/2014	20:47	GWSD026	190	HG	51.34753	1.67103
15/01/2014	21:09	GWSD031	191	HG	51.33651	1.67646
15/01/2014	21:14	GWSD031	191	HG	51.33649	1.67639
15/01/2014	21:20	GWSD031	191	HG	51.33646	1.67635
15/01/2014	22:37	GWSD035	194	HG	51.32032	1.68927
15/01/2014	22:43	GWSD035	194	HG	51.32029	1.68932
15/01/2014	22:51	GWSD035	194	HG	51.32069	1.68956
15/01/2014	23:17	GWSD025	195	HG	51.32142	1.66077
16/01/2014	01:29	GWSD030	199	HG	51.30501	1.67366
16/01/2014	01:37	GWSD030	199	HG	51.30503	1.67369
16/01/2014	01:42	GWSD030	199	HG	51.30504	1.67367
16/01/2014	03:54	GWSD033	203	HG	51.25792	1.68405
16/01/2014	04:19	GWSD037	204	HG	51.2735	1.7
16/01/2014	04:23	GWSD037	204	HG	51.27347	1.70001
16/01/2014	05:13	GWSD038	207	HG	51.25716	1.71308
16/01/2014	05:17	GWSD038	207	HG	51.25715	1.71307
16/01/2014	05:24	GWSD038	207	HG	51.25719	1.71313
16/01/2014	05:45	GWSD039	208	HG	51.24135	1.72629
16/01/2014	06:45	GWSD036	211	HG	51.24196	1.69721
16/01/2014	06:49	GWSD036	211	HG	51.24192	1.6972
16/01/2014	06:53	GWSD036	211	HG	51.24191	1.69719
16/01/2014	07:15	GWSD032	212	HG	51.22712	1.6816
16/01/2014	07:19	GWSD032	212	HG	51.22709	1.68168
16/01/2014	07:22	GWSD032	212	HG	51.22708	1.68168
16/01/2014	11:07	GWSD023	218	HG	51.25901	1.65566
16/01/2014	11:12	GWSD023	218	HG	51.25898	1.65564
16/01/2014	11:18	GWSD023	218	HG	51.25908	1.65575
16/01/2014	11:45	GWSD020	219	HG	51.24926	1.63855
16/01/2014	11:52	GWSD020	219	HG	51.24915	1.63847
16/01/2014	11:59	GWSD020	219	HG	51.24915	1.63847
16/01/2014	13:14	GWSD017	222	HG	51.25987	1.62713
16/01/2014	13:22	GWSD017	222	HG	51.2599	1.62714
16/01/2014	13:55	GWSD021	223	HG	51.27538	1.64254
16/01/2014	14:01	GWSD021	223	HG	51.27542	1.64258
16/01/2014	14:08	GWSD021	223	HG	51.27533	1.64249
16/01/2014	15:12	GWSD018	226	HG	51.29101	1.62959
16/01/2014	15:18	GWSD018	226	HG	51.2913	1.62981
16/01/2014	15:40	GWSD014	227	HG	51.27615	1.61443
16/01/2014	16:34	GWSD011	230	HG	51.26089	1.59849
16/01/2014	16:52	GWSD013	231	HG	51.2486	1.61474
16/01/2014	18:33	GWSD010	234	HG	51.2297	1.59597
16/01/2014	18:59	GWSD012	235	HG	51.21069	1.60719
16/01/2014	19:04	GWSD012	235	HG	51.21065	1.60716
16/01/2014	19:09	GWSD012	235	HG	51.21061	1.60716
16/01/2014	22:37	GWSD009	241	HG	51.19862	1.59385
15/01/2014	20:23	GWSD026	189	DC SOL	51.34716	1.670819
15/01/2014	20:33	GWSD026	189	DC EOL	51.34778	1.671133
15/01/2014	21:42	GWSD031	192	DC SOL	51.33647	1.676574

Date sampled	Time sampled	Station code	Station number	Gear code	Latitude (degrees)	Longitude (degrees)
15/01/2014	21:52	GWSD031	192	DC EOL	51.33566	1.676095
15/01/2014	22:19	GWSD035	193	DC SOL	51.32058	1.689541
15/01/2014	22:29	GWSD035	193	DC EOL	51.31979	1.68916
15/01/2014	23:29	GWSD025	196	DC SOL	51.32131	1.660739
15/01/2014	23:39	GWSD025	196	DC EOL	51.32064	1.660435
16/01/2014	00:27	GWSD024	197	DC SOL	51.29039	1.65812
16/01/2014	00:29	GWSD024	197	DC EOL	51.29022	1.65798
16/01/2014	01:07	GWSD030	198	DC SOL	51.3054	1.674102
16/01/2014	01:17	GWSD030	198	DC EOL	51.30467	1.673493
16/01/2014	02:17	GWSD034	200	DC SOL	51.28958	1.686787
16/01/2014	02:23	GWSD034	200	DC EOL	51.28911	1.686488
16/01/2014	02:53	GWSD029	201	DC SOL	51.27431	1.671257
16/01/2014	03:04	GWSD029	201	DC EOL	51.27348	1.670691
16/01/2014	03:35	GWSD033	202	DC SOL	51.25845	1.684455
16/01/2014	03:45	GWSD033	202	DC EOL	51.25767	1.683861
16/01/2014	04:35	GWSD037	205	DC SOL	51.27354	1.700117
16/01/2014	04:38	GWSD037	205	DC EOL	51.27335	1.699924
16/01/2014	05:02	GWSD038	206	DC SOL	51.25735	1.713306
16/01/2014	05:04	GWSD038	206	DC EOL	51.25721	1.713181
16/01/2014	05:58	GWSD039	209	DC SOL	51.24117	1.726147
16/01/2014	06:08	GWSD039	209	DC EOL	51.24042	1.725577
16/01/2014	06:34	GWSD036	210	DC SOL	51.24215	1.697416
16/01/2014	06:36	GWSD036	210	DC EOL	51.24203	1.697315
16/01/2014	08:01	GWSD032	213	DC SOL	51.22672	1.681492
16/01/2014	08:11	GWSD032	213	DC EOL	51.22742	1.682218
16/01/2014	08:43	GWSD027	214	DC SOL	51.21286	1.666276
16/01/2014	08:55	GWSD027	214	DC EOL	51.21369	1.666918
16/01/2014	09:28	GWSD022	215	DC SOL	51.2282	1.653376
16/01/2014	09:38	GWSD022	215	DC EOL	51.22738	1.652761
16/01/2014	10:07	GWSD028	216	DC SOL	51.24335	1.669071
16/01/2014	10:17	GWSD028	216	DC EOL	51.24273	1.66848
16/01/2014	10:55	GWSD023	217	DC SOL	51.25931	1.655913
16/01/2014	10:57	GWSD023	217	DC EOL	51.2591	1.655725
16/01/2014	12:32	GWSD020	220	DC SOL	51.2491	1.638444
16/01/2014	12:34	GWSD020	220	DC EOL	51.2491	1.63844
16/01/2014	13:00	GWSD017	221	DC SOL	51.26011	1.627382
16/01/2014	13:02	GWSD017	221	DC EOL	51.25996	1.627232
16/01/2014	14:22	GWSD021	224	DC SOL	51.275141	1.642347
16/01/2014	14:32	GWSD021	224	DC EOL	51.274405	1.641704
16/01/2014	15:02	GWSD018	225	DC SOL	51.291263	1.629771
16/01/2014	15:04	GWSD018	225	DC EOL	51.291102	1.629639
16/01/2014	15:51	GWSD014	228	DC SOL	51.276001	1.614308
16/01/2014	16:01	GWSD014	228	DC EOL	51.275287	1.613785
16/01/2014	16:25	GWSD011	229	DC SOL	51.261112	1.598568
16/01/2014	16:27	GWSD011	229	DC EOL	51.260975	1.598499
16/01/2014	17:45	GWSD013	232	DC SOL	51.248515	1.614729
16/01/2014	17:55	GWSD013	232	DC EOL	51.247727	1.614384
16/01/2014	18:21	GWSD010	233	DC SOL	51.229444	1.595836
16/01/2014	18:23	GWSD010	233	DC EOL	51.229615	1.595931
16/01/2014	19:20	GWSD012	236	DC SOL	51.210674	1.6072
16/01/2014	19:30	GWSD012	236	DC EOL	51.211417	1.607778
16/01/2014	19:52	GWSD016	237	DC SOL	51.228472	1.624438
16/01/2014	20:02	GWSD016	237	DC EOL	51.22917	1.625059
16/01/2014	20:35	GWSD019	238	DC SOL	51.212686	1.637521
16/01/2014	20:45	GWSD019	238	DC EOL	51.213441	1.638176
16/01/2014	21:40	GWSD015	239	DC SOL	51.197909	1.622259

Date sampled	Time sampled	Station code	Station number	Gear code	Latitude (degrees)	Longitude (degrees)
16/01/2014	21:50	GWSD015	239	DC EOL	51.19702	1.62174
16/01/2014	22:21	GWSD009	240	DC SOL	51.198971	1.593945
16/01/2014	22:26	GWSD009	240	DC EOL	51.198595	1.59367
18/01/2014	00:29	GWSD008	244	DC SOL	51.214835	1.580576
18/01/2014	00:31	GWSD008	244	DC EOL	51.214698	1.580467
18/01/2014	01:08	GWSD006	245	DC SOL	51.199794	1.565378
18/01/2014	01:17	GWSD006	245	DC EOL	51.19925	1.564596
18/01/2014	01:57	GWSD007	246	DC SOL	51.183854	1.578196
18/01/2014	02:02	GWSD007	246	DC EOL	51.183413	1.578592
18/01/2014	02:35	GWSD005	247	DC SOL	51.168606	1.562944
18/01/2014	02:47	GWSD005	247	DC EOL	51.167685	1.561971
18/01/2014	03:13	GWSD004	248	DC SOL	51.178156	1.550292
18/01/2014	03:23	GWSD004	248	DC EOL	51.177472	1.549532
18/01/2014	03:45	GWSD003	249	DC SOL	51.169457	1.534478
18/01/2014	03:55	GWSD003	249	DC EOL	51.168798	1.533634
18/01/2014	04:21	GWSD002	250	DC SOL	51.152076	1.51914
18/01/2014	04:31	GWSD002	250	DC EOL	51.151521	1.518802
18/01/2014	04:49	GWSD001	251	DC SOL	51.145588	1.503158
18/01/2014	05:10	GWSD001	251	DC EOL	51.145057	1.503014

Key: HG – mini Hamon Grab

Groundtruthing Survey CEND 06/14

Date sampled	Time sampled	Station code	Station number	Gear code	Latitude (degrees)	Longitude (degrees)
01/05/2014	12:44:25	GWSD137	196	HG	51.2769727	1.597555
01/05/2014	12:49:21	GWSD137	196	HG	51.2769348	1.597564
01/05/2014	13:12:26	GWSD138	197	HG	51.2840078	1.607099
01/05/2014	131651	GWSD138	197	HG	51.284098	1.607124
01/05/2014	140559	GWSD110	199	HG	51.2829979	1.60266
01/05/2014	141012	GWSD110	199	HG	51.2829999	1.602708
01/05/2014	141440	GWSD110	199	HG	51.2830258	1.602656
01/05/2014	143136	GWSD154	200	HG	51.2837093	1.59707
01/05/2014	145919	GWSD134	202	HG	51.2926482	1.587163
01/05/2014	151706	GWSD156	203	HG	51.2955284	1.590588
01/05/2014	152026	GWSD156	203	HG	51.2955043	1.590574
01/05/2014	152336	GWSD156	203	HG	51.2954663	1.590553
01/05/2014	153921	GWSD155	204	HG	51.3028748	1.591227
01/05/2014	154216	GWSD155	204	HG	51.3028587	1.591179
01/05/2014	164113	GWSD105	206	DC SOL	51.3069208	1.586742
01/05/2014	165103	GWSD105	206	DC EOL	51.3061707	1.586232
01/05/2014	165700	GWSD105	207	HG	51.306129	1.586202
01/05/2014	170009	GWSD105	207	HG	51.3061738	1.586177
01/05/2014	170352	GWSD105	207	HG	51.3062167	1.586178
01/05/2014	172537	GWSD111	208	HG	51.3049319	1.605172
01/05/2014	172845	GWSD111	208	HG	51.3049253	1.605177
01/05/2014	173151	GWSD111	208	HG	51.3049749	1.605203
01/05/2014	173936	GWSD111	209	DC SOL	51.3048965	1.605151
01/05/2014	174126	GWSD111	209	DC EOL	51.3047529	1.605076
01/05/2014	182453	GWSD142	211	DC SOL	51.2988954	1.62288
01/05/2014	182723	GWSD142	211	DC EOL	51.2987142	1.622705
01/05/2014	183432	GWSD142	212	HG	51.2986757	1.622671
01/05/2014	184735	GWSD159	213	HG	51.3033049	1.630703
01/05/2014	185552	GWSD159	214	DC SOL	51.3031881	1.630598
01/05/2014	185732	GWSD159	214	DC EOL	51.3030658	1.630505

Date sampled	Time sampled	Station code	Station number	Gear code	Latitude (degrees)	Longitude (degrees)
01/05/2014	191437	GWSD145	214	DC SOL	51.3101519	1.630184
01/05/2014	191617	GWSD145	214	DC EOL	51.3101848	1.629878
01/05/2014	192359	GWSD145	216	HG	51.3101989	1.629721
01/05/2014	194027	GWSD119	217	HG	51.3131204	1.631792
01/05/2014	195430	GWSD130	218	HG	51.3165096	1.638433
01/05/2014	201401	GWSD143	219	HG	51.314494	1.624837
01/05/2014	203612	GWSD115	220	HG	51.309798	1.61302
01/05/2014	203929	GWSD115	220	HG	51.3098271	1.613042
01/05/2014	204224	GWSD115	221	HG	51.3098324	1.61304
01/05/2014	210440	GWSD108	221	HG	51.3153315	1.595581
01/05/2014	210738	GWSD108	221	HG	51.3153473	1.595594
01/05/2014	211029	GWSD108	221	HG	51.3153469	1.595597
01/05/2014	212822	GWSD103	222	HG	51.313633	1.578763
01/05/2014	213124	GWSD103	222	HG	51.3136446	1.578791
01/05/2014	213406	GWSD103	222	HG	51.3136357	1.578785
01/05/2014	215519	GWSD106	223	HG	51.3248319	1.588987
01/05/2014	215821	GWSD106	223	HG	51.32483	1.58898
01/05/2014	220239	GWSD106	223	HG	51.3248475	1.588976
01/05/2014	222022	GWSD104	224	HG	51.3351895	1.584158
01/05/2014	222325	GWSD104	224	HG	51.3351927	1.584163
01/05/2014	222613	GWSD104	224	HG	51.3352004	1.58415
01/05/2014	225150	GWSD101	225	HG	51.3350289	1.563005
01/05/2014	225443	GWSD101	225	HG	51.335032	1.563045
01/05/2014	225759	GWSD101	225	HG	51.3350512	1.562991
01/05/2014	233113	GWSD157	226	HG	51.3434272	1.598117
01/05/2014	233607	GWSD157	226	HG	51.3434679	1.598133
02/05/2014	3454	GWSD113	229	HG	51.3449585	1.603826
02/05/2014	10511	GWSD139	230	HG	51.3465773	1.611786
02/05/2014	12416	GWSD125	231	HG	51.3419698	1.617284
02/05/2014	14211	GWSD158	232	HG	51.3422232	1.623935
02/05/2014	14712	GWSD158	232	HG	51.3421521	1.623915
02/05/2014	20213	GWSD118	233	HG	51.3419549	1.631271
02/05/2014	20744	GWSD118	233	HG	51.3418972	1.631254
02/05/2014	21246	GWSD118	233	HG	51.3418179	1.631291
02/05/2014	22948	GWSD122	234	HG	51.3441805	1.636526
02/05/2014	23412	GWSD122	234	HG	51.3442078	1.636474
02/05/2014	32223	GWSD162	236	HG	51.346401	1.641593
02/05/2014	32641	GWSD162	236	HG	51.3464172	1.641561
02/05/2014	34635	GWSD161	237	HG	51.3487313	1.650008
02/05/2014	35216	GWSD161	237	HG	51.3487166	1.649902
02/05/2014	41600	GWSD153	238	HG	51.3496251	1.65883
02/05/2014	43622	GWSD132	239	HG	51.3498845	1.667978
02/05/2014	44105	GWSD132	239	HG	51.3498969	1.667988
02/05/2014	44529	GWSD132	239	HG	51.349944	1.668041
02/05/2014	50052	GWSD131	240	HG	51.3503373	1.674066
02/05/2014	50518	GWSD131	240	HG	51.3503855	1.67403
02/05/2014	50914	GWSD131	240	HG	51.350413	1.674007
02/05/2014	53304	GWSD124	241	HG	51.3450206	1.664732
02/05/2014	54208	GWSD124	242	DC SOL	51.3449857	1.664704
02/05/2014	55220	GWSD124	242	DC EOL	51.3441197	1.664413
02/05/2014	60500	GWSD160	243	HG	51.3440753	1.661086
02/05/2014	62046	GWSD149	244	HG	51.3431089	1.647367
02/05/2014	62410	GWSD149	244	HG	51.3430948	1.647394
02/05/2014	70004	GWSD120	245	HG	51.3384331	1.629375
02/05/2014	70343	GWSD120	245	HG	51.338387	1.629354
02/05/2014	70737	GWSD120	245	HG	51.3383412	1.629334

Date sampled	Time sampled	Station code	Station number	Gear code	Latitude (degrees)	Longitude (degrees)
02/05/2014	73141	GWSD141	247	HG	51.3376134	1.61593
02/05/2014	74645	GWSD116	248	HG	51.3333099	1.614018
02/05/2014	80341	GWSD147	249	HG	51.3359513	1.633746
02/05/2014	82103	GWSD128	250	HG	51.3370037	1.641042
02/05/2014	83618	GWSD151	251	HG	51.3370257	1.647417
02/05/2014	84052	GWSD151	251	HG	51.3371094	1.647488
02/05/2014	85659	GWSD129	252	HG	51.3373727	1.656323
02/05/2014	90111	GWSD129	252	HG	51.3374377	1.65637
02/05/2014	90602	GWSD129	252	HG	51.337447	1.656336
02/05/2014	92713	GWSD123	253	HG	51.3325	1.652688
02/05/2014	93157	GWSD123	253	HG	51.3323864	1.652741
02/05/2014	93631	GWSD123	253	HG	51.3324564	1.652836
02/05/2014	95741	GWSD152	254	HG	51.3285107	1.654256
02/05/2014	102024	GWSD133	255	HG	51.3246473	1.651415
02/05/2014	102419	GWSD133	255	HG	51.3246846	1.65146
02/05/2014	104212	GWSD148	256	HG	51.3295647	1.640006
02/05/2014	105702	GWSD127	257	HG	51.331792	1.633334
02/05/2014	110035	GWSD127	257	HG	51.3318368	1.633348
02/05/2014	110349	GWSD127	257	HG	51.3318443	1.633326
02/05/2014	112121	GWSD144	258	HG	51.3297155	1.626184
02/05/2014	112516	GWSD144	258	HG	51.3297378	1.626187
02/05/2014	112850	GWSD144	258	HG	51.3298184	1.626262
02/05/2014	114355	GWSD117	259	HG	51.3261671	1.619465
02/05/2014	114859	GWSD117	259	HG	51.3261882	1.619502
05/05/2014	144049	GWSD221	341	DC SOL	51.1640969	1.545167
05/05/2014	145139	GWSD221	341	DC EOL	51.1634747	1.546206
05/05/2014	163853	GWSD215	343	DC SOL	51.1980036	1.578228
05/05/2014	164839	GWSD215	343	DC EOL	51.1972379	1.57776
05/05/2014	181919	GWSD220	346	DC SOL	51.3033836	1.643281
05/05/2014	182119	GWSD220	346	DC EOL	51.3032377	1.64316
05/05/2014	184312	GWSD218	347	DC SOL	51.3069201	1.660043
05/05/2014	184513	GWSD218	347	DC EOL	51.3067468	1.65996
05/05/2014	191010	GWSD219	348	DC SOL	51.3248712	1.673737
05/05/2014	191150	GWSD219	348	DC EOL	51.32473	1.673717
05/05/2014	193713	GWSD214	349	DC SOL	51.344578	1.659738
05/05/2014	194013	GWSD214	349	DC EOL	51.3447711	1.659505
05/05/2014	195050	GWSD213	350	DC SOL	51.3463998	1.653752
05/05/2014	195310	GWSD213	350	DC EOL	51.3465377	1.653522

Key: HG – mini Hamon Grab

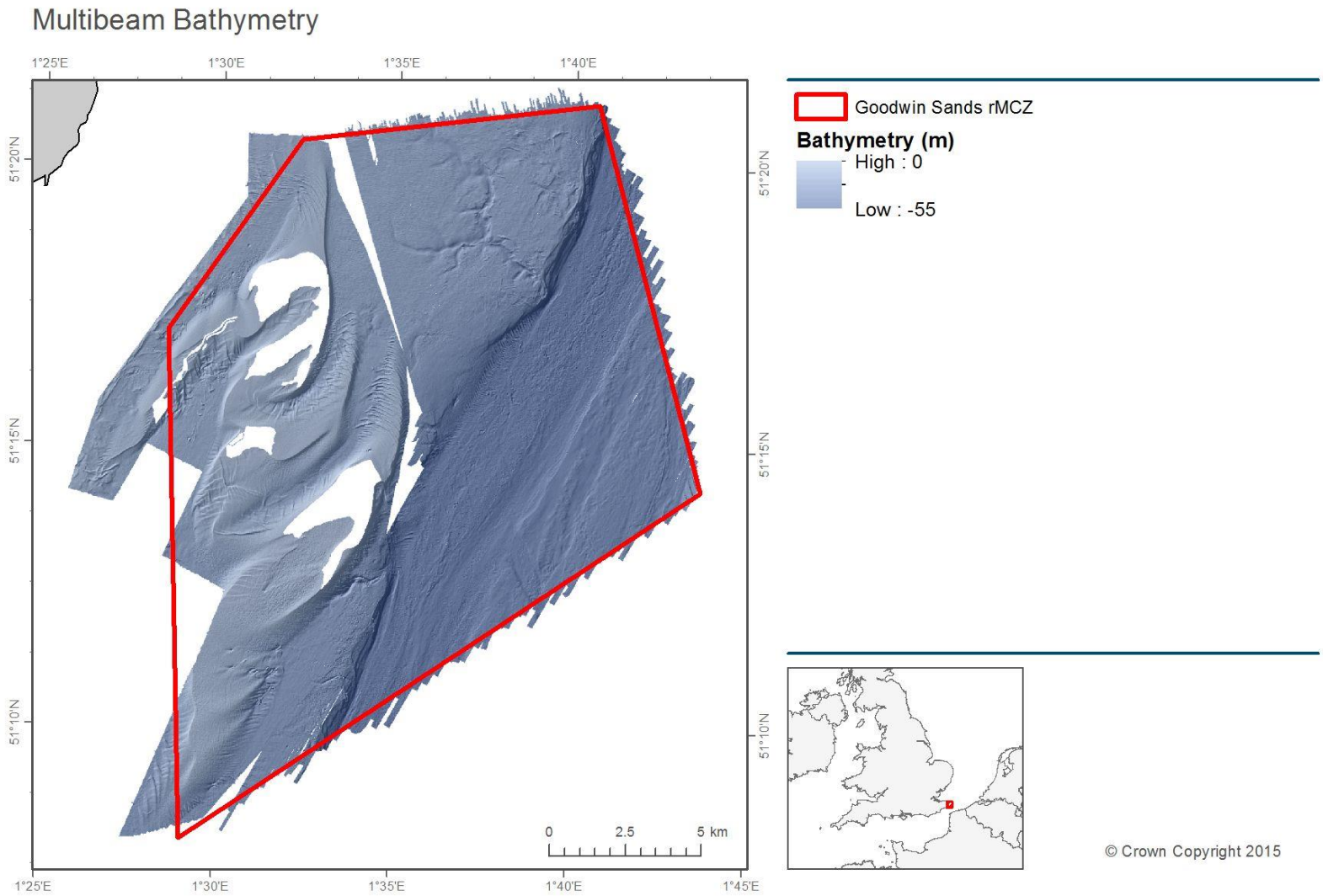
Groundtruthing Survey by the EA Goodwin Sands rMCZ (Inshore)

Date sampled	Time sampled	Station code	Station number	Gear code	Latitude (degrees)	Longitude (degrees)
22/09/2014	15:48:09	GWSD190	1	DC SOL	51.33339	1.56314
22/09/2014	15:49:23	GWSD190	1	DC EOL	51.33292	1.5634
22/09/2014	16:01:53	GWSD197	2	DC SOL	51.31348	1.5701
22/09/2014	16:03:12	GWSD197	2	DC EOL	51.31294	1.57042
22/09/2014	16:17:48	GWSD181	3	DC SOL	51.31428	1.52816
22/09/2014	16:18:51	GWSD181	3	DC EOL	51.31396	1.52817
23/09/2014	07:43:36	GWSD170	4	DC SOL	51.15097	1.493841
23/09/2014	07:44:24	GWSD170	4	DC EOL	51.15062	1.493275
23/09/2014	07:53:40	GWSD173	5	DC SOL	51.16245	1.506383
23/09/2014	07:53:58	GWSD173	5	DC EOL	51.16234	1.506228
23/09/2014	08:17:31	GWSD164	6	DC SOL	51.16931	1.488486

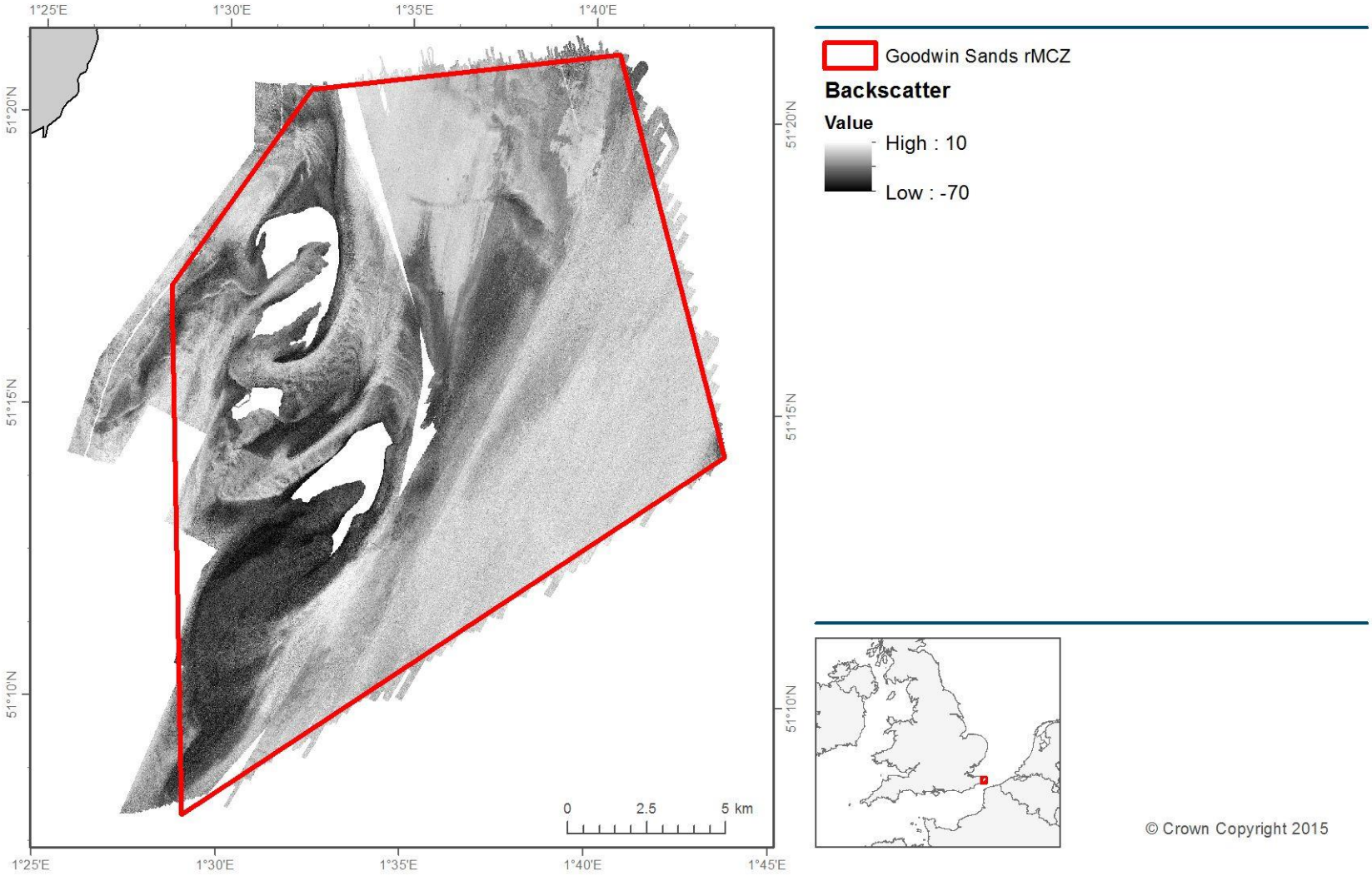
Date sampled	Time sampled	Station code	Station number	Gear code	Latitude (degrees)	Longitude (degrees)
23/09/2014	08:18:15	GWSD164	6	DC EOL	51.16929	1.487995
23/09/2014	08:38:44	GWSD179	7	DC SOL	51.17305	1.517089
23/09/2014	08:39:31	GWSD179	7	DC EOL	51.17283	1.516823
23/09/2014	08:58:22	GWSD191	8	DC SOL	51.208	1.552619
23/09/2014	08:59:35	GWSD191	8	DC EOL	51.20769	1.552344
23/09/2014	09:19:44	GWSD198	9	DC SOL	51.25353	1.57794
23/09/2014	09:21:20	GWSD198	9	DC EOL	51.25319	1.577877
23/09/2014	09:35:18	GWSD199	10	DC SOL	51.27731	1.579164
23/09/2014	09:37:05	GWSD199	10	DC EOL	51.27707	1.579183
23/09/2014	09:49:13	GWSD193	11	DC SOL	51.30135	1.560045
23/09/2014	09:51:19	GWSD193	11	DC EOL	51.30135	1.56042
23/09/2014	10:25:06	GWSD188	12	DC SOL	51.2898	1.535182
23/09/2014	10:26:21	GWSD188	12	DC EOL	51.29025	1.535875
23/09/2014	10:48:21	GWSD168	13	DC SOL	51.25583	1.49099
23/09/2014	10:49:14	GWSD168	13	DC EOL	51.25642	1.491295
23/09/2014	11:02:05	GWSD176	14	DC SOL	51.23185	1.510794
23/09/2014	11:03:00	GWSD176	14	DC EOL	51.23233	1.511375
23/09/2014	11:21:47	GWSD166	15	DC SOL	51.20823	1.492853
23/09/2014	11:22:35	GWSD166	15	DC EOL	51.20883	1.493257
02/10/2014	09:54:00	GWSD190_A1	17	HG	51.33276	1.56384
02/10/2014	09:56:00	GWSD190_A2	17	HG	51.33291	1.56318
02/10/2014	09:59:00	GWSD190_A3	17	HG	51.33294	1.5636
02/10/2014	10:08:00	GWSD194_A1	18	HG	51.32427	1.56064
02/10/2014	10:11:00	GWSD194_A2	18	HG	51.32414	1.56083
02/10/2014	10:22:00	GWSD189_A1	19	HG	51.31305	1.54921
02/10/2014	10:31:00	GWSD197_A1	20	HG	51.31227	1.5702
02/10/2014	10:34:00	GWSD197_A2	20	HG	51.31219	1.57036
02/10/2014	10:36:00	GWSD197_A3	20	HG	51.31222	1.57022
02/10/2014	10:45:00	GWSD193_A1	21	HG	51.30079	1.55876
02/10/2014	10:54:00	GWSD196_A1	22	HG	51.28894	1.56814
02/10/2014	10:56:00	GWSD196_A2	22	HG	51.28886	1.56842
02/10/2014	10:59:00	GWSD196_A3	22	HG	51.28893	1.56834
02/10/2014	11:02:00	GWSD196_A4	22	HG	51.28872	1.56823
02/10/2014	11:04:00	GWSD196_A5	22	HG	51.28893	1.56828
02/10/2014	11:14:00	GWSD192_A1	23	HG	51.27754	1.55668
02/10/2014	11:18:00	GWSD192_A2	23	HG	51.27767	1.5567
02/10/2014	11:19:00	GWSD192_A3	23	HG	51.27774	1.55668
02/10/2014	11:29:00	GWSD199_A1	24	HG	51.27705	1.57816
02/10/2014	11:38:00	GWSD195_A1	25	HG	51.26547	1.56668
02/10/2014	11:47:00	GWSD200_A1	26	HG	51.26504	1.58796
02/10/2014	11:56:00	GWSD198_A1	27	HG	51.25375	1.57629
02/10/2014	12:10:00	GWSD186_A1	28	HG	51.243	1.54333
02/10/2014	12:37:00	GWSD191_A1	29	HG	51.20778	1.55109
02/10/2014	12:46:00	GWSD185_A1	30	HG	51.1964	1.53948
02/10/2014	12:55:00	GWSD182_A1	31	HG	51.18851	1.52379
02/10/2014	12:57:00	GWSD182_A2	31	HG	51.18852	1.52376
02/10/2014	13:01:00	GWSD182_A3	31	HG	51.1888	1.52362
02/10/2014	13:08:00	GWSD174_A1	32	HG	51.18574	1.50671
02/10/2014	13:16:00	GWSD179_A1	33	HG	51.17371	1.51638
02/10/2014	13:26:00	GWSD173_A1	34	HG	51.16235	1.50486
02/10/2014	13:32:00	GWSD170_A1	35	HG	51.15098	1.49343
02/10/2014	13:42:00	GWSD164_A1	36	HG	51.16931	1.48728
02/10/2014	13:51:00	GWSD165_A1	37	HG	51.1863	1.48524
02/10/2014	13:54:00	GWSD165_A2	37	HG	51.18629	1.48534
02/10/2014	13:57:00	GWSD165_A3	37	HG	51.18637	1.48546
02/10/2014	14:00:00	GWSD165_A4	37	HG	51.18625	1.48554

Date sampled	Time sampled	Station code	Station number	Gear code	Latitude (degrees)	Longitude (degrees)
02/10/2014	14:10:00	GWSD166_A1	38	HG	51.2083	1.49103
02/10/2014	14:13:00	GWSD166_A2	38	HG	51.20841	1.49123
02/10/2014	14:15:00	GWSD166_A3	38	HG	51.20861	1.49067
02/10/2014	14:23:00	GWSD171_A1	39	HG	51.22106	1.49841
02/10/2014	14:31:00	GWSD180_A1	40	HG	51.2204	1.51999
02/10/2014	14:38:00	GWSD183_A1	41	HG	51.23171	1.53154
02/10/2014	14:45:00	GWSD176_A1	42	HG	51.23223	1.51028
02/10/2014	14:52:00	GWSD167_A1	43	HG	51.2331	1.48891
02/10/2014	15:01:00	GWSD163_A1	44	HG	51.24574	1.4866
02/10/2014	15:03:00	GWSD163_A2	44	HG	51.24559	1.48672
02/10/2014	15:10:00	GWSD168_A1	45	HG	51.25615	1.49062
02/10/2014	15:14:00	GWSD168_A2	45	HG	51.25637	1.49077
02/10/2014	15:17:00	GWSD168_A3	45	HG	51.25628	1.49053
02/10/2014	15:24:00	GWSD172_A1	46	HG	51.26743	1.50233
02/10/2014	15:33:00	GWSD169_A1	47	HG	51.27951	1.49264
02/10/2014	15:53:00	GWSD177_A1	48	HG	51.27905	1.51371
02/10/2014	16:04:00	GWSD188_A1	49	HG	51.29097	1.54007
02/10/2014	16:23:00	GWSD178_A1	50	HG	51.30246	1.51542
02/10/2014	16:31:00	GWSD181_A1	51	HG	51.31353	1.52738

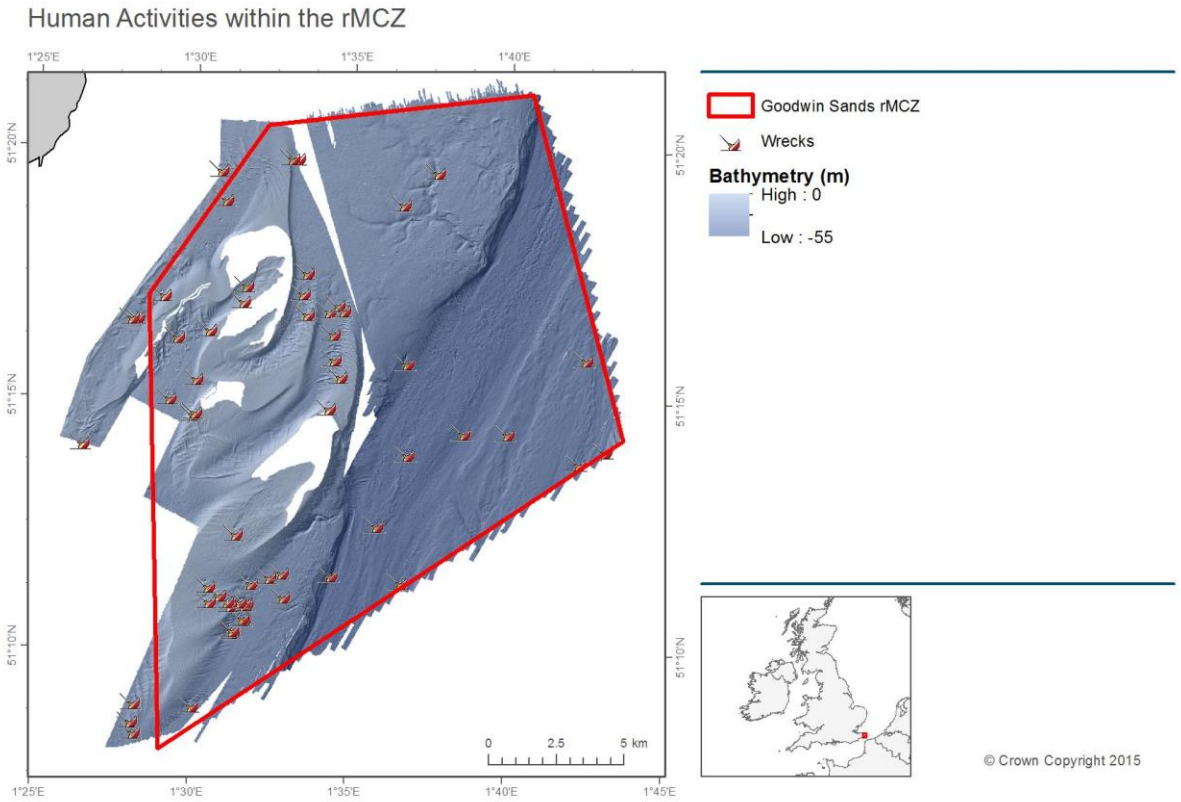
Appendix 2. Outputs from acoustic surveys

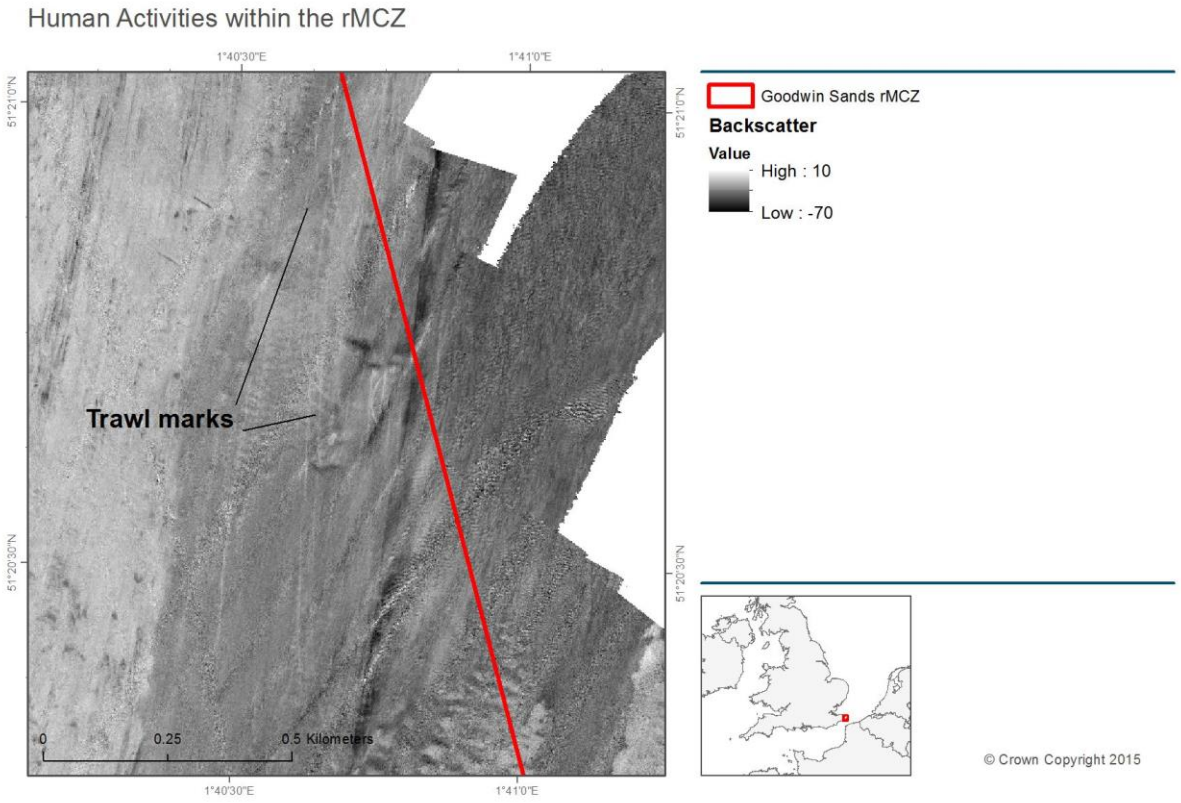


Multibeam Backscatter



Appendix 3. Evidence of human activities within the rMCZ





Appendix 4. Species list

Species list for grab samples (Species FOCI indicated by grey shading, if present). Percentage occurrence was calculated as the 'Number of samples where the species occurs/total number of samples' x 100.

Taxa	% Occurrence
FORAMINIFERA	
Lagotia viridis	12
HYDROIDS, CORALS, JELLYFISH, ANEMONES	
Actiniaria	38
Hydrallmania falcata	23
Sertularia cupressina	20
Tubularia indivisa	14
Alcyonium digitatum	13
Obelia dichotoma	11
Clytia hemisphaerica	9
Calycella syringa	6
Sertularia (juv.)	4
Cerianthus lloydii	3
Eudendrium rameum	3
Campanulariidae	2
Coryne muscoides	2
Halecium halecinum	2
Hydractinia echinata	2
Bougainvillia ramosa	1
Hydractinia proboscidea	1
Laomedea flexuosa	1
Leuckartiara	1
Sertularella polyzonias	1
Tubularia larynx	1
Tubulariidae	1
Zoantharia	1
FLATWORMS	
Turbellaria	4
RIBBON WORMS	
Nemertea	48
Cerebratulus	1
ROUND WORMS	
Nematoda	14
PEANUT WORMS	
Golfingia vulgaris	11
Golfingia elongata	8
Nephasoma minutum	3
SEGMENTED WORMS	
Sabellaria spinulosa	49
Lumbrineris cingulata	46
Annelida	39
Spirobranchus lamarcki	37
Ophelia borealis	31
Pholoe baltica (sensu Petersen)	31
Goniada maculata	26

Taxa	% Occurrence
Glycera lapidum (agg.)	24
Eunereis longissima	23
Caulleriella alata	22
Notomastus latericeus	22
Mediomastus fragilis	21
Lysidice unicornis	20
Polycirrus medusa	19
Lanice conchilega	18
Nephtys cirrosa	18
Aonides oxycephala	17
Malmgrenia darbouxi	17
Polycirrus norvegicus	17
Spiophanes bombyx	17
Dipolydora flava	16
Dipolydora caulleryi	14
Nephtys (juv.)	14
Lepidonotus squamatus	13
Harmothoe glabra	12
Paradoneis lyra	12
Pholoe inornata (sensu Petersen)	12
Poecilochaetus serpens	12
Syllis parapari	12
Clymenura	11
Dodecaceria	11
Glycinde nordmanni	11
Myrianida	11
Petaloproctus borealis	11
Thelepus cincinnatus	11
Eteone flava (agg.)	10
Jasmineira	10
Lagis koreni	10
Owenia fusiformis	10
Polycirrus	10
Sthenelais boa	10
Ampharete lindstroemi	9
Chaetozone zetlandica	9
Dipolydora giardi	9
Eulalia ornata	9
Glyceridae (juv.)	9
Pseudopotamilla reniformis	9
Syllis variegata	9
Anaitides maculata	8
Eumida (juv.)	8
Eumida sanguinea	8
Galathowenia oculata	8
Magelona johnstoni	8
Scoloplos armiger	8
Thelepus setosus	8
Aonides paucibranchiata	7
Asclerocheilus intermedius	7

Taxa	% Occurrence
Glycera oxycephala	7
Harmothoe clavigera	7
Laonice bahusiensis	7
Polynoidae	7
Scalibregma inflatum	7
Dipolydora coeca	6
Eusyllis blomstrandi	6
Gattyana cirrhosa	6
Lysilla loveni	6
Magelona alleni	6
Marphysa bellii	6
Marphysa sanguinea	6
Polycirrus (juv.)	6
Praxillella (juv.)	6
Protodorvillea kefersteini	6
Schistomeringos rudolphi	6
Syllidia armata	6
Syllis armillaris	6
Anaitides rosea	4
Euclymene	4
Flabelligera affinis	4
Harmothoe impar	4
Nephtys caeca	4
Nereididae (juv.)	4
Polynoe scolopendrina	4
Sphaerodorum gracilis	4
Spirobranchus triqueter	4
Travisia forbesii	4
Anaitides lineata	3
Clymenura tricirrata	3
Eulalia bilineata	3
Eulalia mustela	3
Exogone verugera	3
Harmothoe imbricata	3
Hesionura elongata	3
Lysilla nivea	3
Mysta picta	3
Nicolea venustula	3
Praxillella affinis	3
Pseudopolydora pulchra	3
Spio goniocephala	3
Spio martinensis	3
Terebellides stroemi	3
Amaeana trilobata	2
Aphelochaeta (Type A)	2
Eteone (juv.)	2
Eteone longa (agg.)	2
Euclymene oerstedii	2
Harmothoe	2
Magelona mirabilis	2

Taxa	% Occurrence
Malmgrenia andreapolis	2
Nephtys kersivalensis	2
Notomastus	2
Owenia	2
Paraonis fulgens	2
Pherusa plumosa	2
Pisione remota	2
Podarkeopsis capensis	2
Pseudonotomastus southerni	2
Serpulidae	2
Syllis hyalina	2
Ampharetidae	1
Amphicteis midas	1
Anaitides groenlandica	1
Anaitides longipes	1
Aphelochaeta	1
Aphelochaeta marioni	1
Arenicola marina	1
Arenicolidae (juv.)	1
Atherospio guillei	1
Aurospio banyulensis	1
Capitellidae	1
Caulleriella bioculata	1
Chaetozone	1
Chaetozone christiei	1
Chaetozone setosa	1
Diplocirrus stopbowitzi	1
Dipolydora flava (juv.)	1
Eulalia (juv.)	1
Eumida bahusiensis	1
Eunicidae (juv.)	1
Exogone hebes	1
Glycera alba	1
Glycera tridactyla	1
Goniadidae	1
Grania	1
Harmothoe extenuata	1
Lipobranchius jeffreysii	1
Lumbrineridae	1
Magelona	1
Maldanidae	1
Malmgrenia arenicolae	1
Malmgrenia castanea	1
Megalomma	1
Monticellina	1
Neoamphitrite figulus	1
Nephtys assimilis	1
Nephtys hombergii	1
Nereis pelagica	1
Notoproctus (juv.)	1

Taxa	% Occurrence
Ophelia (juv.)	1
Ophiodromus pallidus	1
Parasabella torulis	1
Perkinsiana rubra	1
Phyllodocidae	1
Pirakia punctifera	1
Polycirrus aurantiacus	1
Prionospio (juv.)	1
Prionospio multibranchiata	1
Protodriloides chaetifer	1
Protodrilus	1
Psamathe fusca	1
Sabellidae	1
Scalibregma celticum	1
Schistomeringos neglecta	1
Scolelepis	1
Scolelepis bonnieri	1
Scolelepis foliosa	1
Sphaerosyllis bulbosa	1
Sphaerosyllis taylori	1
Spionidae	1
Syllides japonicus	1
Syllis armillaris (agg.)	1
Syllis garciai	1
Syllis gerlachi	1
Syllis gracilis	1
Terebellidae (juv.)	1
SEA SPIDERS	
Anoplodactylus petiolatus	4
Nymphon brevirostre	4
Achelia echinata	1
Achelia longipes (agg.)	1
Callipallene brevirostris	1
CRUSTACEANS	
Urothoe brevicornis	28
Unciola crenatipalma	20
Ampelisca spinipes	19
Urothoe elegans	19
Pisidia longicornis	18
Anthura gracilis	14
Dyopedos monacantha	14
Galathea intermedia	13
Gammaropsis maculata	13
Bathyporeia elegans	12
Pagurus bernhardus	12
Bathyporeia pelagica	11
Verruca stroemia	11
Amphilochus neapolitanus	10
Abludomelita obtusata	8
Gastrosaccus spinifer	7

Taxa	% Occurrence
Paguridae (megalopa)	7
Balanus crenatus	6
Stenothoe marina	6
Tanaopsis graciloides	6
Monocorophium sextonae	4
Photis pollex	4
Acidostoma neglectum	3
Atylus swammerdamei	3
Bathyporeia guilliamsoniana	3
Haustorius arenarius	3
Janira maculosa	3
Liocarcinus holsatus	3
Pilumnus hirtellus	3
Anapagurus hyndmanni	2
Atelecyclus rotundatus	2
Bodotria scorpioides	2
Callianassa subterranea	2
Ebalia tuberosa	2
Ericthonius punctatus	2
Iphimedia minuta	2
Liocarcinus pusillus	2
Othomaera othonis	2
Paguridae (zoea)	2
Socarnes erythrophthalmus	2
Urothoe poseidonis	2
Abludomelita gladiosa	1
Ampelisca diadema	1
Amphilochus manudens	1
Amphipoda	1
Aoridae (female)	1
Astacilla longicornis	1
Axius stirhynchus	1
Decapoda	1
Ebalia tumefacta	1
Eurydice pulchra	1
Gammaropsis cornuta	1
Gnathia oxyuraea	1
Hyas coarctatus	1
Iphimedia perplexa	1
Jassa pusilla	1
Lepidepecreum longicorne	1
Macropodia	1
Macropodia linaresi	1
Macropodia rostrata	1
Mesopodopsis slabberi	1
Necora puber	1
Nototropis guttatus	1
Nototropis vedlomensis	1
Paguridae (juv.)	1
Pandalina brevirostris	1

Taxa	% Occurrence
Pariambus typicus	1
Photis longicaudata	1
Pinnotheres pisum	1
Pontocrates arenarius	1
Portunidae (juv.)	1
Pseudoprotella phasma	1
Schistomysis kervillei	1
Stenopleustes nodifera	1
Thoracica (juv.)	1
Thoralus cranchii	1
Upogebia deltaura	1
MOLLUSCS	
Kurtiella bidentata	29
Sphenia binghami	16
Abra (juv.)	12
Abra alba	9
Leptochiton asellus	9
Nucula nucleus	9
Mytilus edulis	8
Doto	7
Buccinum undatum	6
Mya truncata (juv.)	6
Barnea parva	4
Heteranomia squamula	4
Hiatella arctica	4
Mytilidae (juv.)	4
Aequipecten opercularis	3
Anomiidae (juv.)	3
Mytilus edulis (juv.)	3
Mactridae (juv.)	2
Modiolus (juv.)	2
Spisula elliptica	2
Thracia distorta	2
Acanthodoris pilosa (juv.)	1
Calliostoma zizyphinum	1
Dendronotus frondosus	1
Embletonia pulchra	1
Ensis (juv.)	1
Epitonium (juv.)	1
Epitonium clathratulum	1
Fabulina fabula	1
Gibbula cineraria	1
Glycymeris glycymeris	1
Leptochiton cancellatus	1
Lucinoma borealis	1
Lutraria (juv.)	1
Mimachlamys varia	1
Modiolus adriaticus (juv.)	1
Modiolus barbatus	1
Moerella donacina	1

Taxa	% Occurrence
Mya	1
Mya arenaria	1
Odostomia	1
Onchidoris muricata	1
Tergipes tergipes	1
Thracia (juv.)	1
Timoclea ovata	1
Tritonia (juv.)	1
Venerupis senegalensis (juv.)	1
BRYOZOANS	
Conopeum reticulum	20
Electra monostachys	20
Escharella immersa	20
Schizomavella auriculata	19
Aspidelectra melolontha	18
Electra pilosa	14
Schizomavella teresae	13
Bicellariella ciliata	9
Vesicularia spinosa	8
Escharella labiosa	6
Escharella ventricosa	6
Escharina johnstoni	6
Disporella hispida	4
Schizomavella	4
Alcyonidium diaphanum	3
Cyclostomatida	3
Flustra foliacea	3
Reptadeonella violacea	3
Callopora discreta	2
Cellepora pumicosa	2
Porella concinna	2
Puellina	2
Turbicellepora avicularis	2
Alcyonidioides mytili	1
Alcyonidium	1
Alcyonidium parasiticum	1
Hippothoa flagellum	1
Microporella ciliata	1
Phylactella labrosa	1
Plagioecia patina	1
Schizoporella unicornis	1
Triticella	1
HORSESHOE WORMS	
Phoronis	16
SEA STARS, URCHINS, SEA CUCUMBERS	
Amphipholis squamata	30
Ophiuridae (juv.)	19
Psammechinus miliaris	17
Ophiura albida	12
Echinocyamus pusillus	11

Taxa	% Occurrence
Asterias rubens	2
Ophiothrix fragilis	2
HEMICHORDATA	
Rhabdopleura compacta	3
Enteropneusta	1
SEA SQUIRTS	
Dendrodoa grossularia	12
Ascidiacea (juv.)	2
Molgulidae (juv.)	2
Polycarpa pomaria	2
Ascidiella scabra	1
Eugyra arenosa	1
Molgula manhattensis	1
Styela coriacea	1
FISH	
Ammodytidae	1

Species list for video samples (Species FOCI indicated by grey shading, if present). Percentage occurrence was calculated as the 'Number of samples where the species occurs/total number of samples' x 100.

Taxa	% Occurrence
SPONGES	
Porifera	15
Polymastia	2
HYDROIDS, CORALS, JELLYFISH, ANEMONES	
Hydrozoa	64
Actiniaria	53
Ceriantharia	51
Alcyonium digitatum	42
Tubularia	18
Urticina	16
Sertulariidae	13
Nemertesia	13
Halecium	7
Actinothoe sphyrodeta	2
Anthozoa	2
SEGMENTED WORMS	
Serpulidae (tubes)	82
Sabellaria spinulosa (tubes)	18
Lanice conchilega (tubes)	4
CRUSTACEANS	
Paguridae	71
Cirripedia	15
Decapoda	7
Liocarcinus	4
Macropodia	4
Necora puber	4
Pandalidae	4
Ebalia	2
Homarus gammarus	2
Inachus	2
Majidae	2
Palaemonidae	2
Pisidia longicornis	2
MOLLUSCS	
Gibbula	24
Pectinidae	11
Buccinum undatum	4
Calliostoma	4
Mytilidae	4
Mytilus edulis	4
Pecten maximus	2
Polyplacophora	2
BRYOZOANS	
Bryozoa	73
Flustra	27
Electra pilosa	4

Taxa	% Occurrence
Cellaria	2
SEA STARS, URCHINS, SEA CUCUMBERS	
Echinaster sepositus	64
Psammechinus miliaris	24
Ophiurida	20
Ophiura	5
Crossaster papposus	4
Ophiuroidea	4
Henricia	2
SEA SQUIRTS	
Ascidiacea	7
FISH	
Actinopterygii	13
Scyliorhinus canicula	11
Ammodytidae	5
Callionymus	4
Gadidae	4
Pleuronectiformes	4
Pleuronectes platessa	2
Solea solea	2

Appendix 5. Analyses of sediment samples: classification and composition

Station number	Station code	Latitude (degrees)	Longitude (degrees)	Sediment Description	EUNIS Level 3/BSH	Gravel (%)	Sand (%)	Silt/clay (%)
44	GT163	51.24559	1.4867167	coarse sediment	A5.1 - Subtidal Coarse Sediment	59.29	38.35	2.35
36	GT164	51.169312	1.48728	sand and muddy sand	A5.2 - Subtidal Sand	0.00	97.78	2.22
43	GT167	51.233097	1.48891	coarse sediment	A5.1 - Subtidal Coarse Sediment	57.29	40.80	1.90
45	GT168	51.256147	1.4906217	coarse sediment	A5.1 - Subtidal Coarse Sediment	24.11	69.61	6.28
47	GT169	51.279505	1.4926467	sand and muddy sand	A5.2 - Subtidal Sand	0.64	98.60	0.76
35	GT170	51.15098	1.4934267	sand and muddy sand	A5.2 - Subtidal Sand	0.00	100.00	0.00
39	GT171	51.221062	1.498415	sand and muddy sand	A5.2 - Subtidal Sand	0.01	99.01	0.98
46	GT172	51.267425	1.50233	sand and muddy sand	A5.2 - Subtidal Sand	2.04	96.86	1.10
34	GT173	51.162348	1.504865	sand and muddy sand	A5.2 - Subtidal Sand	0.02	99.98	0.00
32	GT174	51.185738	1.506705	sand and muddy sand	A5.2 - Subtidal Sand	0.01	98.50	1.50
42	GT176	51.232223	1.5102717	sand and muddy sand	A5.2 - Subtidal Sand	4.23	94.04	1.73
48	GT177	51.279047	1.513715	sand and muddy sand	A5.2 - Subtidal Sand	1.99	96.67	1.34
50	GT178	51.302462	1.515425	sand and muddy sand	A5.2 - Subtidal Sand	0.09	99.91	0.00
33	GT179	51.173707	1.5163717	sand and muddy sand	A5.2 - Subtidal Sand	0.68	98.47	0.85
40	GT180	51.2204	1.5199883	sand and muddy sand	A5.2 - Subtidal Sand	0.02	99.98	0.00
51	GT181	51.31352	1.527385	sand and muddy sand	A5.2 - Subtidal Sand	0.06	97.79	2.15
31	GT182	51.188798	1.523625	sand and muddy sand	A5.2 - Subtidal Sand	0.00	98.66	1.34
41	GT183	51.231708	1.5315417	sand and muddy sand	A5.2 - Subtidal Sand	3.65	95.40	0.94
16	GT184	51.32481	1.5390183	sand and muddy sand	A5.2 - Subtidal Sand	2.20	96.30	1.50
30	GT185	51.19639	1.5394817	sand and muddy sand	A5.2 - Subtidal Sand	0.01	99.99	0.00
28	GT186	51.242993	1.5433367	sand and muddy sand	A5.2 - Subtidal Sand	0.00	100.00	0.00
49	GT188	51.290963	1.540065	sand and muddy sand	A5.2 - Subtidal Sand	3.39	95.29	1.32
19	GT189	51.313045	1.5492067	sand and muddy sand	A5.2 - Subtidal Sand	0.01	94.71	5.28
17	GT190	51.332938	1.5636083	mixed sediments	A5.4 - Subtidal Mixed Sediments	44.69	49.48	5.82
29	GT191	51.207785	1.5510983	sand and muddy sand	A5.2 - Subtidal Sand	0.00	98.06	1.94
23	GT192	51.277727	1.5566767	sand and muddy sand	A5.2 - Subtidal Sand	3.85	94.74	1.41
21	GT193	51.300787	1.55876	sand and muddy sand	A5.2 - Subtidal Sand	0.11	97.62	2.27
18	GT194	51.32414	1.5608333	mixed sediments	A5.4 - Subtidal Mixed Sediments	50.18	42.34	7.48
25	GT195	51.265465	1.566685	coarse sediment	A5.1 - Subtidal Coarse Sediment	12.96	82.19	4.85
27	GT198	51.253738	1.5762833	sand and muddy sand	A5.2 - Subtidal Sand	0.14	98.50	1.37
24	GT199	51.277045	1.578155	coarse sediment	A5.1 - Subtidal Coarse Sediment	18.17	80.39	1.43
26	GT200	51.265032	1.58796	sand and muddy sand	A5.2 - Subtidal Sand	0.11	98.91	0.98
190	GWSD026	51.34748	1.670994	coarse sediment	A5.1 - Subtidal Coarse Sediment	71.91	25.91	2.18

Station number	Station code	Latitude (degrees)	Longitude (degrees)	Sediment Description	EUNIS Level 3/BSH	Gravel (%)	Sand (%)	Silt/clay (%)
191	GWSD031	51.33646	1.676349	coarse sediment	A5.1 - Subtidal Coarse Sediment	55.27	40.48	4.25
194	GWSD035	51.32069	1.689564	mud and sandy mud	A5.3 - Subtidal Mud	2.36	71.58	26.07
195	GWSD025	51.32142	1.660766	coarse sediment	A5.1 - Subtidal Coarse Sediment	60.52	37.15	2.33
203	GWSD033	51.25792	1.684049	coarse sediment	A5.1 - Subtidal Coarse Sediment	50.06	48.76	1.17
204	GWSD037	51.27347	1.70001	coarse sediment	A5.1 - Subtidal Coarse Sediment	45.05	52.81	2.14
207	GWSD038	51.25719	1.713129	coarse sediment	A5.1 - Subtidal Coarse Sediment	45.88	51.78	2.34
208	GWSD039	51.24135	1.726289	sand and muddy sand	A5.2 - Subtidal Sand	0.00	100.00	0.00
219	GWSD020	51.24915	1.638465	coarse sediment	A5.1 - Subtidal Coarse Sediment	36.84	62.14	1.03
222	GWSD017	51.2599	1.62714	coarse sediment	A5.1 - Subtidal Coarse Sediment	10.50	82.45	7.05
226	GWSD018	51.2913	1.629806	sand and muddy sand	A5.2 - Subtidal Sand	0.00	99.11	0.89
227	GWSD014	51.27615	1.614426	coarse sediment	A5.1 - Subtidal Coarse Sediment	5.43	91.73	2.85
230	GWSD011	51.26089	1.598489	sand and muddy sand	A5.2 - Subtidal Sand	0.00	100.00	0.00
231	GWSD013	51.2486	1.614744	coarse sediment	A5.1 - Subtidal Coarse Sediment	6.74	92.28	0.98
234	GWSD010	51.2297	1.595972	sand and muddy sand	A5.2 - Subtidal Sand	0.09	98.85	1.06
196	GWSD137	51.27694	1.597564	mud and sandy mud	A5.3 - Subtidal Mud	0.57	71.15	28.28
197	GWSD138	51.28401	1.607099	mixed sediments	A5.4 - Subtidal Mixed Sediments	11.54	65.37	23.09
199	GWSD110	51.28303	1.602656	mixed sediments	A5.4 - Subtidal Mixed Sediments	40.38	51.31	8.31
200	GWSD154	51.28371	1.59707	sand and muddy sand	A5.2 - Subtidal Sand	0.33	88.34	11.33
202	GWSD134	51.29265	1.587163	sand and muddy sand	A5.2 - Subtidal Sand	0.15	98.18	1.67
203	GWSD156	51.29547	1.590553	sand and muddy sand	A5.2 - Subtidal Sand	2.32	97.68	0.00
204	GWSD155	51.30286	1.591179	mixed sediments	A5.4 - Subtidal Mixed Sediments	32.08	58.42	9.49
207	GWSD105	51.30613	1.586202	mixed sediments	A5.4 - Subtidal Mixed Sediments	24.29	59.84	15.88
208	GWSD111	51.30493	1.605172	mixed sediments	A5.4 - Subtidal Mixed Sediments	44.95	42.92	12.13
212	GWSD142	51.29868	1.622671	sand and muddy sand	A5.2 - Subtidal Sand	1.12	98.88	0.00
213	GWSD159	51.30331	1.630703	coarse sediment	A5.1 - Subtidal Coarse Sediment	12.20	86.68	1.12
216	GWSD145	51.3102	1.629721	sand and muddy sand	A5.2 - Subtidal Sand	0.01	94.62	5.37
217	GWSD119	51.31312	1.631792	coarse sediment	A5.1 - Subtidal Coarse Sediment	59.60	39.95	0.44
218	GWSD130	51.31651	1.638433	coarse sediment	A5.1 - Subtidal Coarse Sediment	15.00	83.75	1.25
219	GWSD143	51.3145	1.624837	mixed sediments	A5.1 - Subtidal Coarse Sediment	25.07	57.22	17.71
220	GWSD115	51.30983	1.613042	mixed sediments	A5.4 - Subtidal Mixed Sediments	35.10	43.75	21.15
222	GWSD103	51.31364	1.578785	mixed sediments	A5.4 - Subtidal Mixed Sediments	32.79	54.67	12.54
223	GWSD106	51.32483	1.58898	mixed sediments	A5.4 - Subtidal Mixed Sediments	52.13	40.97	6.90
224	GWSD104	51.3352	1.58415	mixed sediments	A5.4 - Subtidal Mixed Sediments	32.85	51.96	15.19
226	GWSD157	51.34347	1.598133	mixed sediments	A5.4 - Subtidal Mixed Sediments	33.22	53.57	13.20
229	GWSD113	51.34496	1.603826	mixed sediments	A5.4 - Subtidal Mixed Sediment	39.21	45.63	15.16

Station number	Station code	Latitude (degrees)	Longitude (degrees)	Sediment Description	EUNIS Level 3/BSH	Gravel (%)	Sand (%)	Silt/clay (%)
230	GWSD139	51.34658	1.611786	sand and muddy sand	A5.2 - Subtidal Sand	3.90	91.38	4.72
231	GWSD125	51.34197	1.617284	mixed sediments	A5.4 - Subtidal Mixed Sediments	53.64	39.60	6.76
232	GWSD158	51.34215	1.623915	coarse sediment	A5.1 - Subtidal Coarse Sediment	7.27	86.23	6.50
233	GWSD118	51.34182	1.631291	sand and muddy sand	A5.2 - Subtidal Sand	5.00	93.54	1.46
234	GWSD122	51.34421	1.636474	sand and muddy sand	A5.2 - Subtidal Sand	4.81	93.90	1.29
236	GWSD162	51.34642	1.641561	coarse sediment	A5.1 - Subtidal Coarse Sediment	24.15	74.74	1.11
237	GWSD161	51.34872	1.649902	mixed sediments	A5.4 - Subtidal Mixed Sediments	19.79	70.15	10.06
238	GWSD153	51.34962	1.65883	sand and muddy sand	A5.2 - Subtidal Sand	4.73	92.58	2.69
239	GWSD132	51.34988	1.667978	mixed sediments	A5.4 - Subtidal Mixed Sediments	22.54	66.47	10.99
241	GWSD124	51.34502	1.664732	coarse sediment	A5.1 - Subtidal Coarse Sediment	20.23	72.02	7.75
243	GWSD160	51.34407	1.661086	mixed sediments	A5.4 - Subtidal Mixed Sediments	5.76	61.78	32.46
244	GWSD149	51.34309	1.647394	mixed sediments	A5.4 - Subtidal Mixed Sediment	14.87	74.65	10.48
245	GWSD120	51.33834	1.629334	coarse sediment	A5.1 - Subtidal Coarse Sediment	51.64	47.48	0.88
247	GWSD141	51.33761	1.61593	coarse sediment	A5.1 - Subtidal Coarse Sediment	11.37	87.49	1.14
248	GWSD116	51.33331	1.614018	mixed sediments	A5.4 - Subtidal Mixed Sediments	54.06	34.29	11.65
249	GWSD147	51.33595	1.633746	sand and muddy sand	A5.2 - Subtidal Sand	1.69	97.07	1.24
250	GWSD128	51.337	1.641042	sand and muddy sand	A5.2 - Subtidal Sand	3.48	94.13	2.39
251	GWSD151	51.33711	1.647488	sand and muddy sand	A5.2 - Subtidal Sand	2.69	94.59	2.72
252	GWSD129	51.33745	1.656336	coarse sediment	A5.1 - Subtidal Coarse Sediment	12.50	82.88	4.62
253	GWSD123	51.33245	1.652836	coarse sediment	A5.1 - Subtidal Coarse Sediment	40.85	53.61	5.54
254	GWSD152	51.32851	1.654256	sand and muddy sand	A5.2 - Subtidal Sand	1.95	79.19	18.86
255	GWSD133	51.32468	1.65146	mixed sediments	A5.4 - Subtidal Mixed Sediments	37.08	54.35	8.57
256	GWSD148	51.32956	1.640006	coarse sediment	A5.1 - Subtidal Coarse Sediment	15.66	82.00	2.34
258	GWSD144	51.32982	1.626262	sand and muddy sand	A5.2 - Subtidal Sand	2.00	96.37	1.64
259	GWSD117	51.32619	1.619502	mixed sediments	A5.4 - Subtidal Mixed Sediments	30.65	57.79	11.56

Appendix 6. BSH/EUNIS Level 3 descriptions derived from video and stills

Station No.	Station Code	Latitude	Longitude	Habitat No.	No. of stills	Sediment Description	EUNIS Level 3/BSH	MNCR Code
189	GWSD026	51.346991	1.6708391	1	12	Sand veneer over coarse sediment and chalk bedrock with Serpulidae and occasional discrete patches of *Sabellaria spinulosa* reef	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
192	GWSD031	51.336603	1.676508	1	8	Dense *Sabellaria spinulosa* reef on attached to underlying chalk bedrock with sand veneer.	A5.6 - Subtidal Biogenic Reef	SS.SBR.PoR
192	GWSD031	51.33605	1.676354	2	6	Chalk bedrock with sand veneer and some coarse sediment, occasional *Sabellaria spinulosa* reef	A4.2 - Moderate Energy Circalittoral Rock	CR.MCR.SfR
193	GWSD035	51.320687	1.6894979	1	7	Sand with discrete areas of *Sabellaria spinulosa* reef and boulders/cobbles	A5.2 - Subtidal Sand	SS.SSa.CFiSa
193	GWSD035	51.320143	1.689291	2	5	Boulders and cobbles with occasional encrusting *Sabellaria spinulosa* reef and sand	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
196	GWSD025	51.321462	1.6607301	1	11	Coarse sediment with Serpulidae and *Alcyonium digitatum*	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
197	GWSD024	51.290721	1.6585479	1	4	Chalk bedrock (bored) with cobbles and pebbles encrusted with Serpulidae	A4.2 - Moderate Energy Circalittoral Rock	CR.MCR.SfR
198	GWSD030	51.305845	1.6746087	1	23	Coarse sediment with encrusting fauna	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
200	GWSD034	51.289899	1.687138	1	12	Coarse sediment with Serpulidae and other sessile fauna	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
201	GWSD029	51.274585	1.6715493	1	21	Coarse sediment and occasional exposed bored chalk bedrock with Serpulidae, Anemones, Ophirothrix and other sessile fauna	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
202	GWSD033	51.258548	1.6845506	1	11	Coarse sediment and sand with sparse fauna	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
205	GWSD037	51.273558	1.7001863	1	4	Coarse sediment and sand with sparse fauna	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS

Station No.	Station Code	Latitude	Longitude	Habitat No.	No. of stills	Sediment Description	EUNIS Level 3/BSH	MNCR Code
206	GWSD038	51.257347	1.7133133	1	3	Coarse sediment and sand with sparse fauna	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
209	GWSD039	51.24132	1.7261969	1	14	Clean sand with sparse fauna	A5.2 - Subtidal Sand	SS.SSa.CFiSa
210	GWSD036	51.2423	1.6974854	1	5	Coarse sediment with shell fragments	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
213	GWSD032	51.226708	1.6814155	1	14	Cobbles and pebbles with encrusting and sessile fauna and occasional mobile echinoderms	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
214	GWSD027	51.212872	1.666206	1	17	Cobbles and pebbles with encrusting, sessile fauna and mobile echinoderms	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
215	GWSD022	51.228146	1.6533885	1	11	Coarse sediment with Serpulidae and encrusting Bryozoans	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
216	GWSD028	51.243354	1.6691398	1	14	Coarse sediment with Serpulidae and encrusting Bryozoans	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
217	GWSD023	51.259485	1.6560891	1	3	Sandy gravel with sparse fauna	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
220	GWSD020	51.249237	1.6386314	1	3	Sand with elevated clumps of *Sabellaria spinulosa* aggregations	A5.6 - Subtidal Biogenic Reef	SS.SBR.PoR
221	GWSD017	51.260549	1.6277873	1	5	Coarse sand with shell and sparse fauna	A5.2 - Subtidal Sand	SS.SSa.CFiSa
224	GWSD021	51.274938	1.6423622	1	13	Pebbles and some cobbles with sand and some exposed chalk bedrock and moble crustaceans and echinoderms	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
225	GWSD018	51.291062	1.6298126	1	4	Sand ripples (mega ripples?) with patches of coarse sediment, sparse fauna	A5.2 - Subtidal Sand	SS.SSa.CFiSa
228	GWSD014	51.275799	1.6143491	1	11	Sand ripples (mega ripples?) with patches of coarse sediment, sparse fauna	A5.2 - Subtidal Sand	SS.SSa.CFiSa
229	GWSD011	51.260918	1.5986642	1	5	Sand ripples, sparse fauna	A5.2 - Subtidal Sand	SS.SSa.CFiSa
232	GWSD013	51.24832	1.6148197	1	12	Sand ripples (mega ripples?) with patches of coarse sediment, sparse fauna	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
233	GWSD010	51.229328	1.5956936	1	3	Sand ripples with shell and no fauna	A5.2 - Subtidal Sand	SS.SSa.CFiSa
236	GWSD012	51.210492	1.6069084	1	11	Cobble reef with abundant Anthozoans and encrusting fauna	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS

Station No.	Station Code	Latitude	Longitude	Habitat No.	No. of stills	Sediment Description	EUNIS Level 3/BSH	MNCR Code
237	GWSD016	51.228315	1.6242482	1	11	Cobble reef with chalk bedrock exposures with hydroid/bryozoan turf and anenomes	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
238	GWSD019	51.212527	1.6372909	1	12	Cobble reef dominated by *Ophiothrix fragilis*, Actiniaria and Alcyonium digitatum	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
239	GWSD015	51.197709	1.6223188	1	11	Cobble reef with exposed chalk bedrock with *Ophiothrix fragilis* and Actiniaria	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
240	GWSD009	51.198922	1.593967	1	6	Cobble reef with sand veneer dominated by *Ophiothrix fragilis*/, Actiniaria and *Alcyonium digitatum*	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
244	GWSD008	51.214566	1.5803666	1	8	Sand and cobbles with encrusting fauna and Paguridae	A5.2 - Subtidal Sand	SS.SSa.CFiSa
245	GWSD006	51.199568	1.5650652	1	11	Chalk cobbles and pebbles with sand chalk bedrock exposures. Sparse fauna.	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
246	GWSD007	51.183576	1.5780199	1	7	Pebbles, sand with chalk exposures with encrusting fauna, hydroids and bryozoans	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
247	GWSD005	51.168891	1.5634462	1	15	Chalk bedrock with cobble, pebble and sand veneer with hydroid/bryozoan turf	A4.2 - Moderate Energy Circalittoral Rock	CR.MCR.SfR
248	GWSD004	51.178111	1.5505416	1	12	Coarse chalk sediment with some exposed chalk bedrock	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
249	GWSD003	51.169455	1.5345796	1	16	*Mytilus edulis* bed mixed with *Sabellaria spinulosa* aggregations on coarse sediment with mobile sands	A5.6 - Subtidal Biogenic Reef	SS.SBR.SMus.MytSS
250	GWSD002	51.152045	1.5192091	1	7	Coarse chalk sediment with some exposed chalk bedrock	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
250	GWSD002	51.151862	1.518977	2	3	Chalk bedrock with coarse sediment and sand veneer	A4.2 - Moderate Energy Circalittoral Rock	CR.MCR.SfR
250	GWSD002	51.151751	1.51891	3	5	Coarse chalk sediment with some exposed chalk bedrock	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
251	GWSD001	51.145568	1.5032405	1	13	Coarse chalk sediment with some exposed chalk bedrock and sand	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
206	GWSD105	51.30692	1.586742	1	14	Coarse sediment with mud veneer & faunal turf	A5.4 - Subtidal Mixed Sediment	SS.SMx.CMx

Station No.	Station Code	Latitude	Longitude	Habitat No.	No. of stills	Sediment Description	EUNIS Level 3/BSH	MNCR Code
209	GWSD111	51.304900	1.605151	1	3	Coarse sediment with mud veneer, with *Alcyonium digitatum, Echinaster sepositus*, Serpulidae & faunal turf	A5.4 - Subtidal Mixed Sediment	SS.SMx.CMx
214	GWSD159	51.303190	1.630598	1	3	Shelly gravel on sand mega ripples with no visible fauna.	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
242	GWSD124	51.344990	1.664704	1	20	Coarse sediment with sand veneer. Serpulidae & *Psammechinus miliaris*	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
341	GWSD221	51.164100	1.545167	1	12	Chalk cobbles & pebbles with Actiniaria & Echinaster sepositus	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
343	GWSD215	51.198000	1.578228	1	8	Chalk stony/cobble reef with areas of bored chalk bedrock with sparse fauna	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
343	GWSD215	51.197480	1.577908	2	3	Bored chalk bedrock reef with sparse fauna	A4.2 - Moderate Energy Circalittoral Rock	CR.MCR.SfR
346	GWSD220	51.303380	1.643281	1	4	Shelly sand with patches of pebbles & sparse fauna	A5.2 - Subtidal Sand	SS.SSa.CFiSa
347	GWSD218	51.306920	1.660043	1	3	Coarse sediment with mobile sand & sparse fauna	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
348	GWSD219	51.324870	1.673737	1	4	*Sabellaria spinulosa* reef with veneer of mobile sands	A5.6 - Subtidal Biogenic Reef	SS.SBR.PoR
349	GWSD214	51.344580	1.659738	1	3	Coarse sediment with mobile sand & sparse fauna	A5.1 - Subtidal Coarse Sediment	SS.SCS.CCS
350	GWSD213	51.346400	1.653752	1	3	Clean sand with no visible fauna	A5.2 - Subtidal Sand	SS.SSa.CFiSa

Appendix 7. Example images from survey for broadscale habitats

Broadscale Habitats	Description	Example Image taken during survey
A4.2 Moderate energy circalittoral rock	Clean medium to fine sands or non-cohesive slightly muddy sands on open coasts, offshore or in estuaries and marine inlets.	
A5.1 Subtidal coarse sediment	Sand veneer over coarse sediment and chalk bedrock with Serpulidae and occasional discrete patches of Sabellaria spinulosa reef	
A5.2 Subtidal sand	Sand ripples with shell and no fauna	
A5.4 Subtidal mixed sediments	Coarse sediment with mud veneer, with *Alcyonium digitatum, Echinaster sepositus*, Serpulidae & faunal turf	

Appendix 8. Example images from survey for habitat FOCI

Habitat FOCI	Description	Example Image taken during survey
Blue Mussel Beds	*Mytilus edulis* bed mixed with *Sabellaria spinulosa* aggregations on coarse sediment with mobile sands	
Ross worm (*Sabellaria spinulosa*) Reefs	Sand with elevated clumps of *Sabellaria spinulosa* aggregations	
Subtidal Sands and Gravels	Sand and gravel seabeds widespread around the UK	
Subtidal Chalk	Bored chalk bedrock reef with sparse fauna	

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