JNCC/Cefas Partnership Report Series

Report No. 35

CEND0119 Survey Report: Offshore Overfalls MCZ and Offshore Brighton MCZ

Wood, D., Albrecht, J., Hawes, J. & Sperry, J.

August 2020

ISSN 2051-6711

CEND0119 Survey Report: Offshore Overfalls MCZ and Offshore Brighton MCZ

Wood, D., Albrecht, J., Hawes, J. & Sperry, J.

August 2020

ISSN 2051-6711

For further information please contact:

Joint Nature Conservation Committee
Monkstone House
City Road
Peterborough PE1 1JY
www.jncc.gov.uk

This report should be cited as:

Wood, D., Albrecht, J., Hawes, J. & Sperry, J. (2020). CEND0119 Survey Report: Offshore Overfalls MCZ and Offshore Brighton MCZ. JNCC/Cefas Partnership Report No. 35. JNCC, Peterborough, ISSN 2051-6711.

JNCC EQA Statement:

This report is compliant with the JNCC **Evidence Quality Assurance Policy** https://jncc.gov.uk/about-jncc/corporate-information/evidence-quality-assurance/.

Contents

1 Introduction

Cefas and the Joint Nature Conservation Committee (JNCC) undertook a survey of the Offshore Overfalls and Offshore Brighton Marine Conservation Zones (MCZ) between 3 January and 25 January 2019. The following report details the activities undertaken on the survey. Samples were collected at both sites which will be analysed in line with the survey objectives. The results of these analyses will be presented in separate monitoring reports for each site and published on the JNCC website.

1.1 Offshore Overfalls MCZ

Natural England (NE) and JNCC are jointly responsible for Offshore Overfalls (OOVR) MCZ, which straddles the UK territorial waters limit. It is located in the eastern English Channel, approximately 18km south-east of the Isle of Wight and north of the Offshore Brighton MCZ. The site protects 593km^2 of seabed and ranges in depth from 20m to 70m, the deeper areas coinciding with a valley system running through the site from the south to the north-east (Figure 1). The seabed is thought to be composed of subtidal coarse sediment, subtidal mixed sediments and subtidal sand broad-scale habitats (BSH), along with moderate energy circalittoral rock which was recorded sporadically across the MCZ in 2012 (Figure 2).

The BSH ‘A5.2 Subtidal sand’ is located in two isolated patches that fringe the northern margin of the Northern Palaeovalley and is associated with marine bedforms comprised of sediment ripples and waves. The BSH ‘A5.1 Subtidal coarse sediment’ occupies almost three quarters of the MCZ. It is located on the flanks and terraces of the Northern Palaeovalley and within the valley floor. Bedrock structures are observed along the south-east of the site and in an area to the north-west known as the ‘Overfalls’. The BSH ‘A5.4 Subtidal mixed sediments’ lies in the north-east area of the MCZ where it overlies bedrock structures as a thin veneer. The deeper valley is part of the English Channel Outburst Flood Features (Quaternary fluvio-glacial erosion features), which are a designated feature of geomorphological interest. All the subtidal sediment BSH types found within the OOVR MCZ are listed as part of the designation order for the site (Table 1).

For more information on this site, including proposed fisheries management, please refer to the JNCC Site Information Centre (https://jncc.gov.uk/our-work/offshore-overfalls-mpa/).

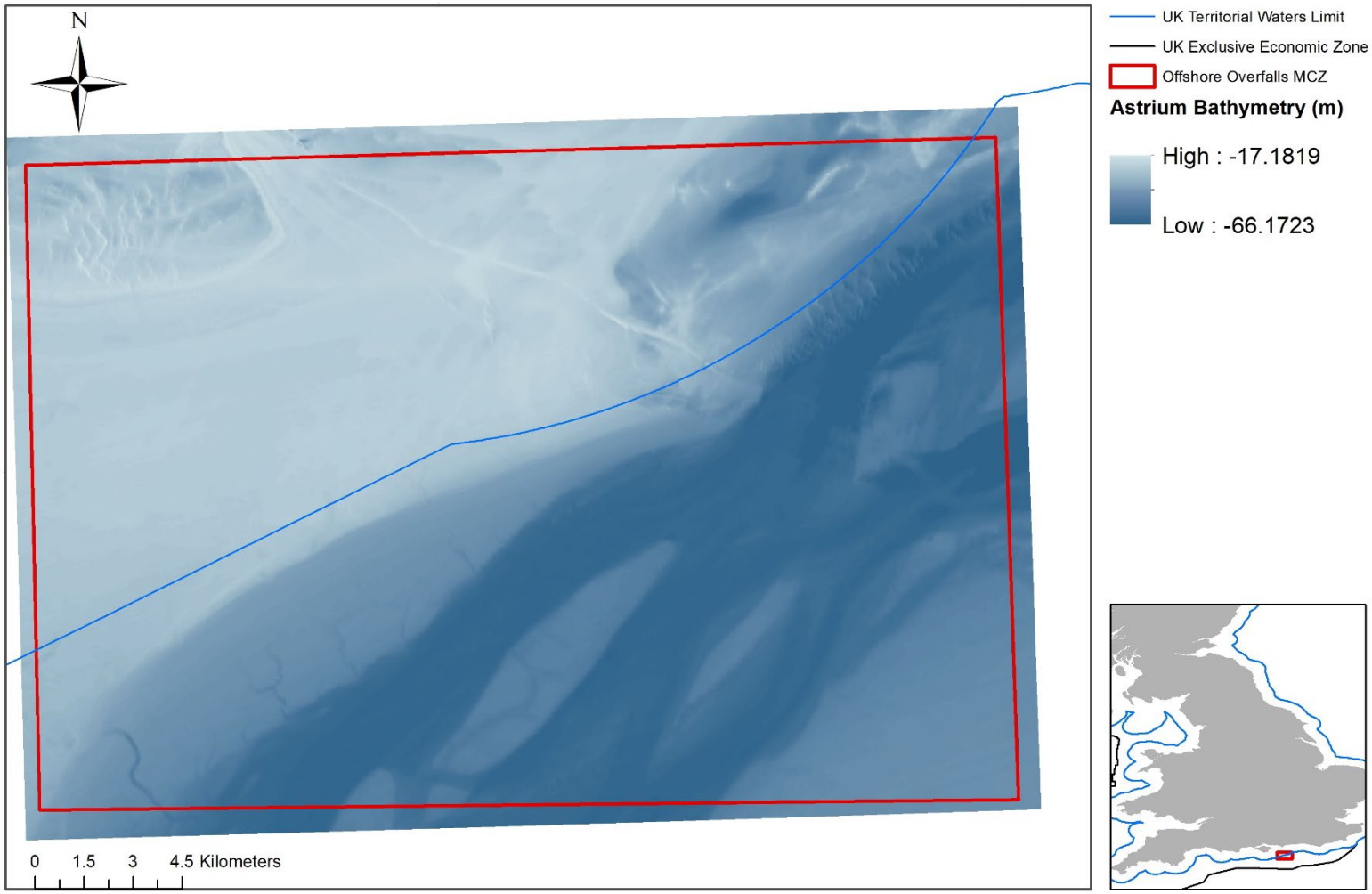

Figure 1. Astrium (1 arc second) bathymetry in metres (ACD) for Offshore Overfalls MCZ showing the Northern Paleovalley. Contains public sector information licensed under the Open Government Licence v3.0. Horizontal Datum WGS84, Projection – UTM Zone 30 N.

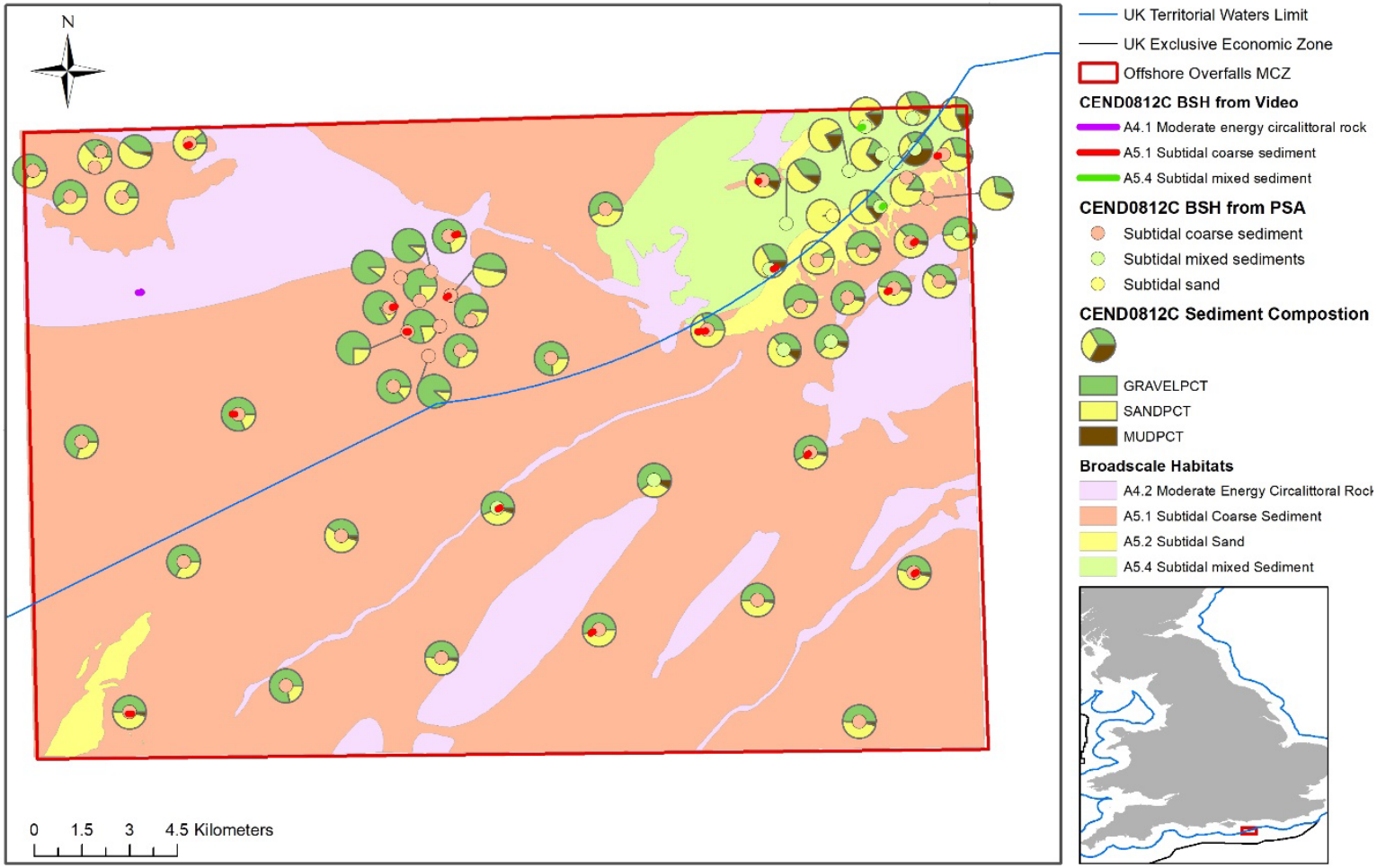

Figure 2. Map showing location of Offshore Overfalls MCZ, CEND0812C survey data (BSH from video transects and PSA as well as percentage of gravel, sand, and mud at each grab station) and the BSH map for the site. BSH map produced in 2015 based on survey CEND0812C data and Defra Astrium digital terrain model (Mellett & Green 2015). Contains public sector information licensed under the Open Government Licence v3.0. Horizontal Datum WGS84, Projection – UTM Zone 30 N.

Table 1. Designated features of OOVR MCZ and associated conservation objectives.

Designated Feature/s	Feature Type	General Management Approach (GMA)
A5.1 Subtidal coarse sediment	Broad-scale habitat	Recover to favourable condition
A5.4 Subtidal mixed sediments	Broad-scale habitat	Recover to favourable condition
A5.2 Subtidal sand	Broad-scale habitat	Recover to favourable condition
English Channel outburst flood features (Quaternary fluvio-glacial erosion features)	Geomorphological Feature	Maintain in favourable condition

1.2 Offshore Brighton MCZ

Offshore Brighton (OBRG) MCZ is situated in the deeper water of the eastern English Channel, 45km from the coast and is located to the south of the OOVR MCZ. Its south-eastern and south-western corners meet the median line with French waters, south of Brighton. The site has a total area of 862km^2 and ranges in depth from 40m to 80m. A BSH map of OBRG was produced in 2015, based on ground truthing data from a 2012 survey (CEND0812C) and the Defra Astrium digital terrain model (Dove & Green 2015). The BSH 'A5.1 Subtidal coarse sediment' is the most widespread, occupying 58% of the MCZ and located mainly in the western area. The BSH 'A5.4 Subtidal mixed sediments' is found in the eastern third of the site and occupies 27% of the area. The regional sediment distribution is influenced by a large-scale geomorphological feature; the English Channel Palaeovalley System. The BSH 'A4.1 High energy circalittoral rock' is exposed where a tributary channel system merges with the deeper paleovalley in the north-west of the site and occupies 15 % of the total MCZ (Figure 3).

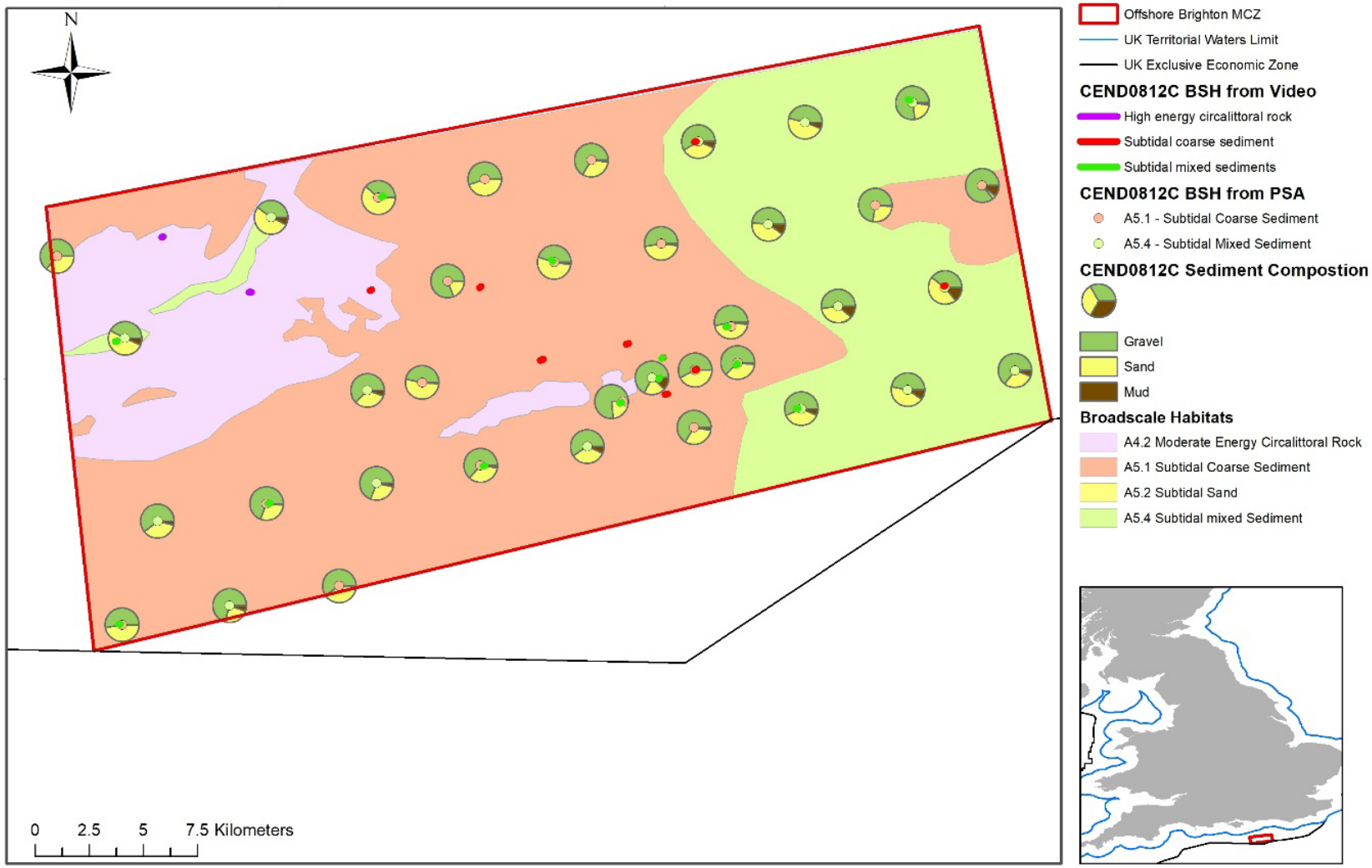

Figure 3. Map showing location of OBRG MCZ, CEND0812C survey data (BSH from video transects and PSA as well as percentage of gravel, sand, and mud at each grab station) and the BSH map for the site. BSH map produced in 2015 based on CEND0812C data and Defra Astrium digital terrain model (Dove & Green 2015). Contains public sector information licensed under the Open Government Licence v3.0. Horizontal Datum WGS84, Projection – UTM Zone 30 N.

All the subtidal sediment types and the circalittoral rock found within OBRG MCZ are listed as designated features (Table 2).

Table 2. Designated features of OBRG MCZ (adapted from the OBRG conservation advice statement).

Designated Feature/s	Feature Type	General Management Approach (GMA)
A4.1 High energy circalittoral rock	Broad-scale habitat	Recover to favourable condition.
A5.1 Subtidal coarse sediment	Broad-scale habitat	Recover to favourable condition.
A5.4 Subtidal mixed sediments	Broad-scale habitat	Recover to favourable condition.

The Conservation Objective for OBRG MCZ is that the designated features:

- so far as already in favourable condition, remain in such condition; and
- so far as not already in favourable condition, be brought into such condition, and remain in such condition.

Supplementary Advice on Conservation Objectives (SACO) has been provided for OBRG. Please see the conservation advice statement and SACO for more details; both can be found on the conservation advice tab of the Site Information Centre (https://jncc.gov.uk/our-work/offshore-brighton-mpa/#conservation-advice). For more information on this site, including the proposed fisheries management, please refer to JNCC's Site Information Centre (https://jncc.gov.uk/our-work/offshore-brighton-mpa/).

2 Aims and objectives

2.1 Aims

The aim of the CEND0119 survey was to acquire a robust initial sentinel monitoring (Type 1, Table 3) dataset to contribute to the development of a monitoring time series for OOVR and OBRG, against which the rate and direction of change in the condition of the MPA features can be inferred in the long term. This dataset will also help to assess the effectiveness of management measures that may be implemented. Data from this survey will form part of a monitoring time series, and future repeated monitoring and evidence gathering will be required to fully investigate and understand the long-term variability in any parameters measured.

Table 3. The definition of Type 1 monitoring as described by Kröger and Johnston (2016).

Definition of monitoring types
Sentinel monitoring of long-term trends (Type 1 monitoring) – Objective: to measure rate and direction of long-term change. This type of monitoring provides the context to distinguish directional trends from short-scale variability in space and time by representing variability across space at any one time and documenting changes over time. To achieve this objective efficiently, a long-term commitment to regular and consistent data collection is necessary; this means time-series must be established as their power in identifying trends is far superior to any combination of independent studies.

2.2 Monitoring objectives

Monitoring objectives for CEND0119 are summarised here but more details of the aims and objectives will be provided in the monitoring report for each site.

2.2.1 Offshore Overfalls (OOVR) MCZ monitoring objectives

The monitoring objectives for OOVR were:

- **Monitoring Objective 1**: Collect evidence to inform the extent, distribution and physical structure of the BSH of OOVR.
- **Monitoring Objective 2**: Collect evidence to inform Type 1 (sentinel) monitoring of the distribution and biological structure and function of the 'A5.1 Subtidal coarse sediment', 'A5.4 Subtidal mixed sediments' and 'A5.2 Subtidal sand' features of OOVR.
- **Monitoring Objective 3**: Collect evidence to inform Type 1 (sentinel) monitoring of the distribution and biological structure and function of the undesignated Circalittoral rock feature at OOVR.
- **Monitoring Objective 4**: Collect evidence to inform Type 1 (sentinel) monitoring of the supporting processes relating to 'A5.1 Subtidal coarse sediment', 'A5.4 Subtidal mixed sediments' and 'A5.2 Subtidal sand' features of Offshore Overfalls.

2.2.2 Offshore Brighton (OBRG) MCZ monitoring objectives

The monitoring objectives for OBRG were:

- **Monitoring Objective 1**: Collect evidence to inform Type 1 (sentinel) monitoring of the extent, distribution, biological structure and function, within the 'A4.1 High energy

circalittoral rock', 'A5.1 Subtidal coarse sediment' and 'A5.4 Subtidal mixed sediments' features associated with the Offshore Brighton MCZ.

- **Monitoring Objective 2**: Collect evidence to inform Type 1 (sentinel) monitoring of the extent, distribution and physical structure of the 'A4.1 High energy circalittoral rock', 'A5.1 Subtidal coarse sediment' and 'A5.4 Subtidal mixed sediments' features of OBRG.
- **Monitoring Objective 3**: Collect evidence to inform Type 1 (sentinel) monitoring of the supporting processes relating to 'A4.1 High energy circalittoral rock', 'A5.1 Subtidal coarse sediment' and 'A5.4 Subtidal mixed sediments' features of OBRG.

2.3 Survey objectives

The survey objectives shown in this section were developed to address the monitoring objectives while taking into consideration the logistics of acquiring the samples. Survey objectives were developed for both Offshore Overfalls and Offshore Brighton.

In addition to meeting monitoring objectives, an additional survey objective was added for both sites to meet a request for benthic faunal samples to use in a DNA meta-barcoding project.

2.3.1 Offshore Overfalls (OOVR) survey objectives

The survey objectives for OOVR are described in Table 4 and linked to the monitoring objectives above (Section 2.2.1). All survey objectives were completed during CEND0119.

Table 4. Survey objectives for OOVR and assessment of whether the objective was completed or not.

Survey objective	Detail/rationale	Monitoring objective	Gear	Complete or not complete
Collect multibeam (MBES) data from the area of OOVR with no existing acoustic data	Only part of the MCZ has previously been surveyed with MBES. The area of OOVR with no previous MBES data acquisition is to be surveyed to acquire 100% MBES coverage.	1	MBES	Complete
Camera stations for monitoring	An equidistant triangular grid of 60 stations was planned to collect a single five-minute (50m) camera transect (stills taken every 10 seconds). Notes were made during the data acquisition were used inform suitability for grab sampling at each station.	1, 2, 3 and 4	Drop camera	Complete
Camera stations for monitoring (increased replication)	Replicate camera transects were made (up to a total of five replicates) at a subset of eight of the OOVR monitoring camera stations.	1, 2, 3 and 4	Drop camera	Complete
Camera stations for ground truthing	Up to 20 ground truthing stations located in the area of previously acquired MBES data at OOVR. As additional set of ground truthing stations would be located in the area of newly acquired multibeam at OOVR.	1 and 4	Drop camera	Complete
Grab stations for monitoring and ground truthing	A single grab would be collected from all stations which have been deemed suitable for grab sampling, based on the previously run camera transects.	1 and 2	0.1m^2 Hamon grab	Complete
Grab stations for monitoring (increased replication)	A subset of the stations suitable for grab sampling would be selected as higher replication stations. High replicate stations will be chosen to include representation from both coarse and mixed sediment BSH. Grab replicates will be increased (up to a total of five replicates).	1 and 2	0.1m^2 Hamon grab	Complete
Grab stations for monitoring the 'A5.2 Subtidal sand' BSH	A 0.1m^2 Hamon grab survey is planned for the two larger areas of subtidal sand at OOVR. An equidistant grid of seven stations has been generated for each of the two larger areas of sublittoral sand. Three replicate samples will be collected from each station. Derivatives of the PSA and infauna data can be used to test the null hypothesis that there is no difference between T0 and a future T1 grab survey of the sublittoral sand at OOVR.	1 and 2	0.1m^2 Hamon grab	Complete
DNA samples from Invalid Hamon grab deployments	Where possible, invalid 0.1m^2 Hamon grab samples would be processed for DNA samples.	N/A	0.1m^2 Hamon grab	Complete

2.3.2 Offshore Brighton (OBRG) survey objectives

The survey objectives for OBRG are described in Table 5 and linked to the monitoring objectives in section 2.2.2 above.

Table 5. Survey objectives for OBRG and assessment of whether the objective was completed or not.

Survey objective	Detail	Monitoring objective	Gear	Complete or not complete
Camera stations for monitoring Rock BSH	An equidistant triangular grid of 24 stations across the rock BSH at OBRG would be sampled to collect a single five-minute (50m) camera transect (stills taken every 10 seconds).	1, 2 and 3	Drop camera	Complete
Camera stations for monitoring sediment BSH	An equidistant triangular grid of 52 stations across the sediment BSH at OBRG would be sampled to collect a single five-minute (50m) camera transect (stills taken every 10 seconds). Notes made during the data acquisition would inform suitability for grab sampling at each station.	1, 2 and 3	Drop camera	Complete
Camera stations for monitoring (increased replication)	At a subset of eight of the OBRG monitoring camera stations, camera transect replicates would be increased (up to a total of five replicates).	1, 2 and 3	Drop camera	Complete
Camera stations for ground truthing	Six x 15-minute camera transect stations located across OBRG in order to ground truth the current BSH map.	1, 2 and 3	Drop camera	Complete
Grab stations for monitoring and ground truthing	A single grab would be collected from all stations which have been deemed suitable for grab sampling, based on previously run video transects.	1 and 2	0.1m^2 Hamon grab	Complete
Grab stations for monitoring (increased replication)	A subset of the stations suitable for grab sampling would be selected as higher replication stations (up to a total of five replicates). High replicate stations would be chosen to include representation from both coarse and mixed sediment BSH.	1 and 2	0.1m^2 Hamon grab	Complete
Collect multibeam (MBES) data from the area of rock BSH at OBRG	If time allows MBES data would be acquired from the area of rock BSH at OBRG in order to better delineate the boundary of this feature.	2	-	Complete
DNA samples from Invalid Hamon grab deployments	Where possible, invalid 0.1m^2 Hamon grab samples would be processed for DNA samples.	N/A	0.1m^2 Hamon grab	Complete

3 Survey design and sampling strategy

The survey was designed to address each survey objective. Planned sampling design, and any changes made to the design during the survey, are described for each survey objective for both OOVR and OBRG.

OOVR and OBRG MCZ are known to contain many shipwrecks and other hazards. In planning the survey, existing MBES data along with charts for the area were examined. Where a hazard was identified, an 800m radius safety buffer was placed around the hazard. Survey stations and any deployments were excluded from these safety buffers. Where a station generated using an automated tool placed a station within a safety buffer, the station was manually moved the shortest possible distance required to ensure it was over 800m from the hazard.

3.1 Offshore Overfalls (OOVR) survey design

3.1.1 Acquire multibeam data from the area of OOVR with no existing acoustic data

Multibeam echosounder (MBES) data was previously collected at OOVR by the Maritime and Coastguard Agency (MCA) Civil Hydrography Programme (CHP). There are three CHP survey areas which have data available, HI1279, HI1499 and HI1498 (these were sampled in 2008, 2016 and 2018 respectively). For CEND0119 the objective was to acquire MBES data in the region of OOVR with no existing data (Figure 4).

Historic England identified three wrecks within the planned MBES survey area at OOVR for which new MBES data would be beneficial (Figure 4, Table 6). MBES data collected from multiple passes in different directions would provide better information for understanding the condition of the wreck. The ‘Alaska’ was chosen as the location of the first MBES calibration attempt. If this was unsuccessful, the ‘Polandia’ would be used as an alternative calibration site.

MBES bathymetry and backscatter would be processed aboard the RV *Cefas Endeavour*. Object Based Image Analysis (OBIA) would be carried out on the newly acquired MBES bathymetry and backscatter data. The processed MBES products would then be used to inform the location of ground truthing camera and grab stations at OOVR.

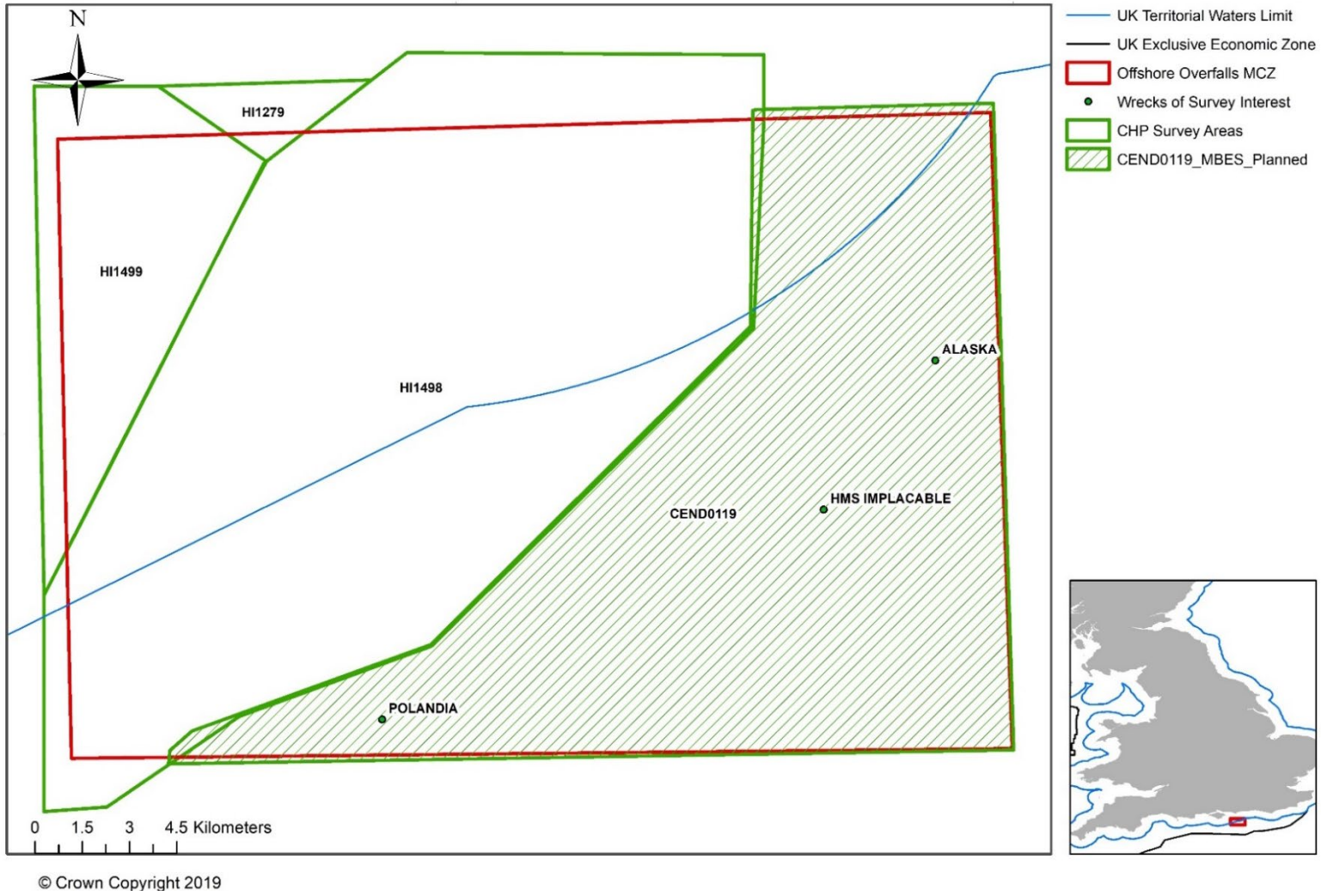

Figure 4. Map showing the areas where the MCA has collected MBES at OOVR and the remaining area to be surveyed during CEND0119. The locations of the three wrecks of interest identified by Historic England are also shown. Contains public sector information licensed under the Open Government Licence v3.0. Horizontal Datum WGS84, Projection – UTM Zone 30 N.

Table 6. Wrecks of interest to Historic England at OOVR MCZ.

Wreck (year of loss)	Depth and wreck description	Notes
Polandia (1917)	Depth 57.2m. Wreck length 105m, width 15m, height 10.7m and lying at 152/332 degrees, with the bow at 152 degrees. Sitting upright with bow separate.	We are interested in the condition of this wreck given length of time from date of loss.
Alaska (1939)	Depth 67.4m. Wreck length up to 120m, width 19m and height 10m, orientated 020/200 degrees.	Wreck site formation is important to understand in reference to record of salvage directed at this site.
HMS Implacable (1949)	Depth 61m. No contemporary survey records or descriptions available.	A derelict wooden warship scuttled by Royal Navy.

3.1.2 Camera stations for monitoring

An R script was used to generate an equidistant triangular grid of stations within the OOVR site. Sixty stations were located across the MCZ using a 3.5km spaced grid (Figure 5). These stations were sampled following the methods and equipment described in section 4.1.1 and Appendix 2 respectively.

3.1.3 Camera stations for monitoring (increased replication)

A subset of stations was selected from the grid of 60 stations for increased replication (five replicate transects for epifaunal data, section 4.1.2). Eight stations were chosen with the aim to have stations in each of the designated sediment BSHs present (Figure 5).

This will enable us to build a comprehensive picture of the communities' present within each BSH and across the site. Still images derived from multiple 50m replicate transects will provide density values for taxa at each station, alongside an indication of intra-station variability in community structure. This is based on the rationale that greater transect lengths result in likely higher geographic variability in habitat types surveyed in a single line, and thus that longer transects increase inherent within-station variability. Multiple, shorter, transects should therefore allow for a greater understanding of the communities and habitats present within a station. Recent work by Lim *et al.* (2018) has indicated that still images from replicate parallel transects, taken across small areas, yield highly resolved epifaunal community datasets which can account for intra-station variability and provide a basis for monitoring of these communities. Video data will be analysed to record instances of marine litter and notable taxa. However, these will not form part of the feature monitoring dataset.

3.1.4 Camera stations for ground truthing

Time was allowed for up to 20 drop camera stations to be manually located throughout each of the MCZs, to ground truth MBES data. In practice the ground truthing stations were selected in two batches. The first were selected using the CHP MBES data and the second using the newly acquired MBES data from this survey.

At OOVR seven manually selected stations were identified prior to the survey, from the data acquired from the CHP HI1498 region. Identification of these stations was achieved through OBIA, with an initial segmentation of the MBES data (Figure 5) allowing classification of areas of homogenous backscatter intensity and topography. During CEND0119, seven additional ground truthing stations were chosen across the eastern area of the MCZ, after

review and analysis of the MBES data acquired during the CEND0119 survey and using a comparable approach to OBIA segmentation and classification (see section 6.1 for more details on data collected at OOVR).

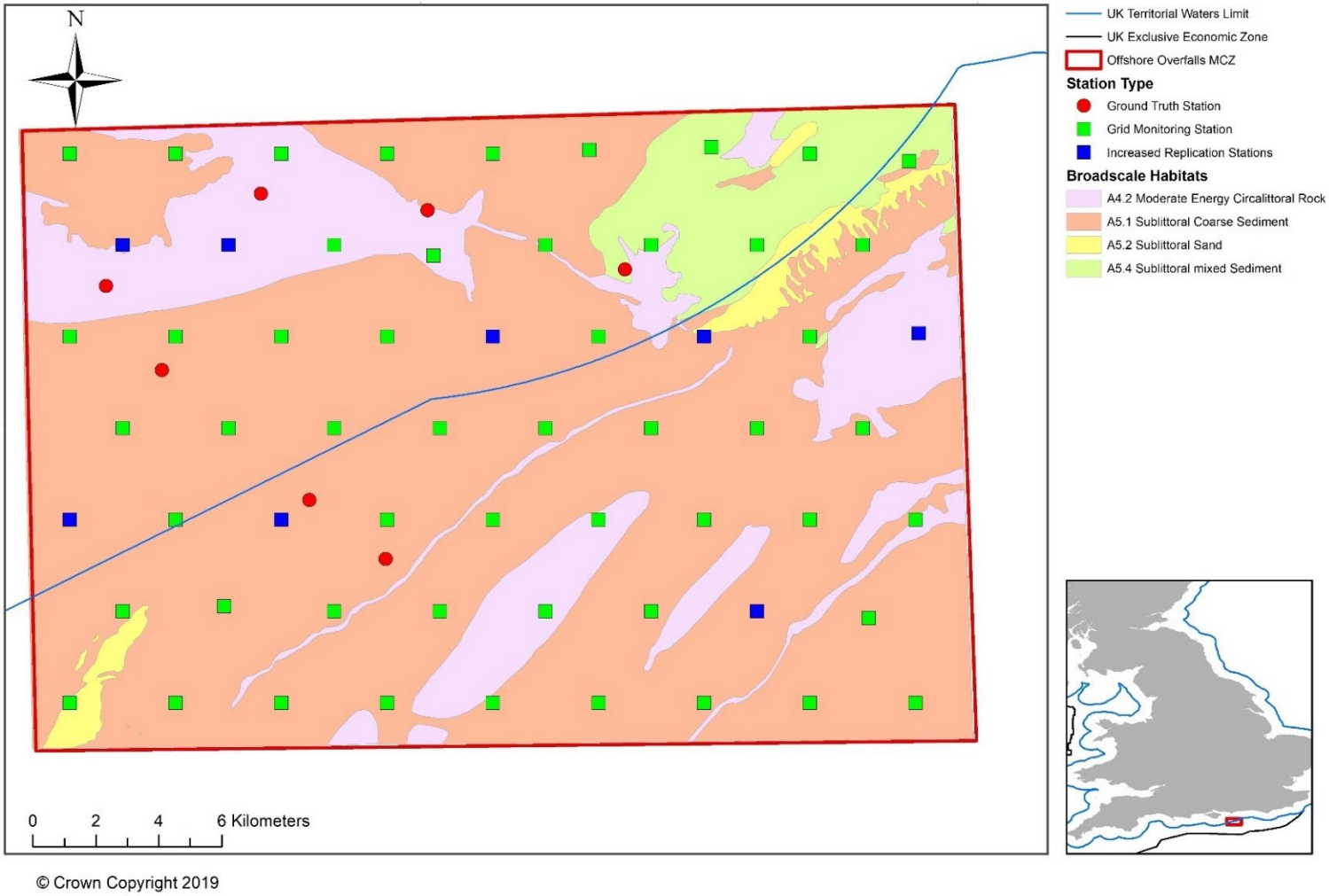

Figure 5. Planned camera stations at OOVR, including both gridded (square) and manually located ground-truthing (circle) stations. Ground truthing stations positioned based on initial segmentation on the HI1498 MCA MBES, with a plan to add further stations after the segmentation of MBES data collected during CEND0119. BSH map produced in 2015 based on survey CEND0812C data and Defra Astrium digital terrain model (Mellett & Green 2015). Contains public sector information licensed under the Open Government Licence v3.0. Horizontal Datum WGS84, Projection – UTM Zone 30 N.

3.1.5 Grab stations for monitoring and ground truthing

A single replicate grab sample would be collected from a subset of the camera stations for monitoring and camera stations for ground truthing, where the substrate type was deemed suitable to grab. As described in section 4.1, each video station would be assessed for grab suitability score before sampling was attempted. As a precaution, stations were selected pre-survey which could be used for grab sampling in the case that it was not possible to use the camera first at a station due to equipment problems or weather (Figure 6); however, these were not needed in practice as all grab stations were visited with the drop camera first.

3.1.6 Grab stations for monitoring (increased replication)

A subset of the stations where grabs were possible would be used as increased replication stations; these stations where chosen during the survey. Increased replication will improve the understanding of small scale variability within each sampling station and, considering the small area of the site which is suitable to grab, allow for an assessment of whether stations would be suitable to use as fixed monitoring stations which could be revisited in the future to monitor change over time. It will also increase the likelihood of oversampling to allow for a more accurate post hoc power analysis to confirm how many samples are required to detect change at each station.

Five replicate grab samples will be collected within a 50m radius bull ring of the planned sampling station. Initially the plan was to collect three replicates but, as more time was available than expected and fewer stations than expected were suitable for grab sampling, the number of replicates was increased.

3.1.7 Grab stations for monitoring the ‘A5.2 Subtidal sand’ BSH

Sublittoral sand has the smallest and most patchy area of all the designated BSH at OOVR, consisting of three distinct areas of sand wave or bank features (as seen from MCA and CEND0119 bathymetry). Pre-survey, the gridded sampling strategy at OOVR had very little representation of the sublittoral sand BSH (Figure 5). Due to good weather conditions during the survey an additional survey objective was added in order to survey the ‘A5.2 Subtidal sand’ BSH at OOVR.

Subtidal sand is expected to support a particularly low abundance and diversity of epifauna. Therefore, a 0.1m^2 Hamon grab survey was proposed for the two larger areas of subtidal sand at OOVR in order to sample infauna communities and particle size distribution. An equidistant grid of seven stations was generated for the two larger areas of sublittoral sand, with three replicates samples attempted at each station (14 stations in total, Figure 7).

3.1.8 DNA samples from Invalid Hamon grab deployments

This survey objective is opportunistic and will use samples which are not suitable to include in the monitoring dataset. Only grab samples with a volume ≥4L will be considered valid for monitoring during CEND0119. Any samples which are smaller than 4L can be used to collect specimens for DNA analysis. This threshold has been applied in order to reject samples where the grab may not have penetrated as deep into the substrate as it should and to increase consistency and comparability between each grab sample collected.

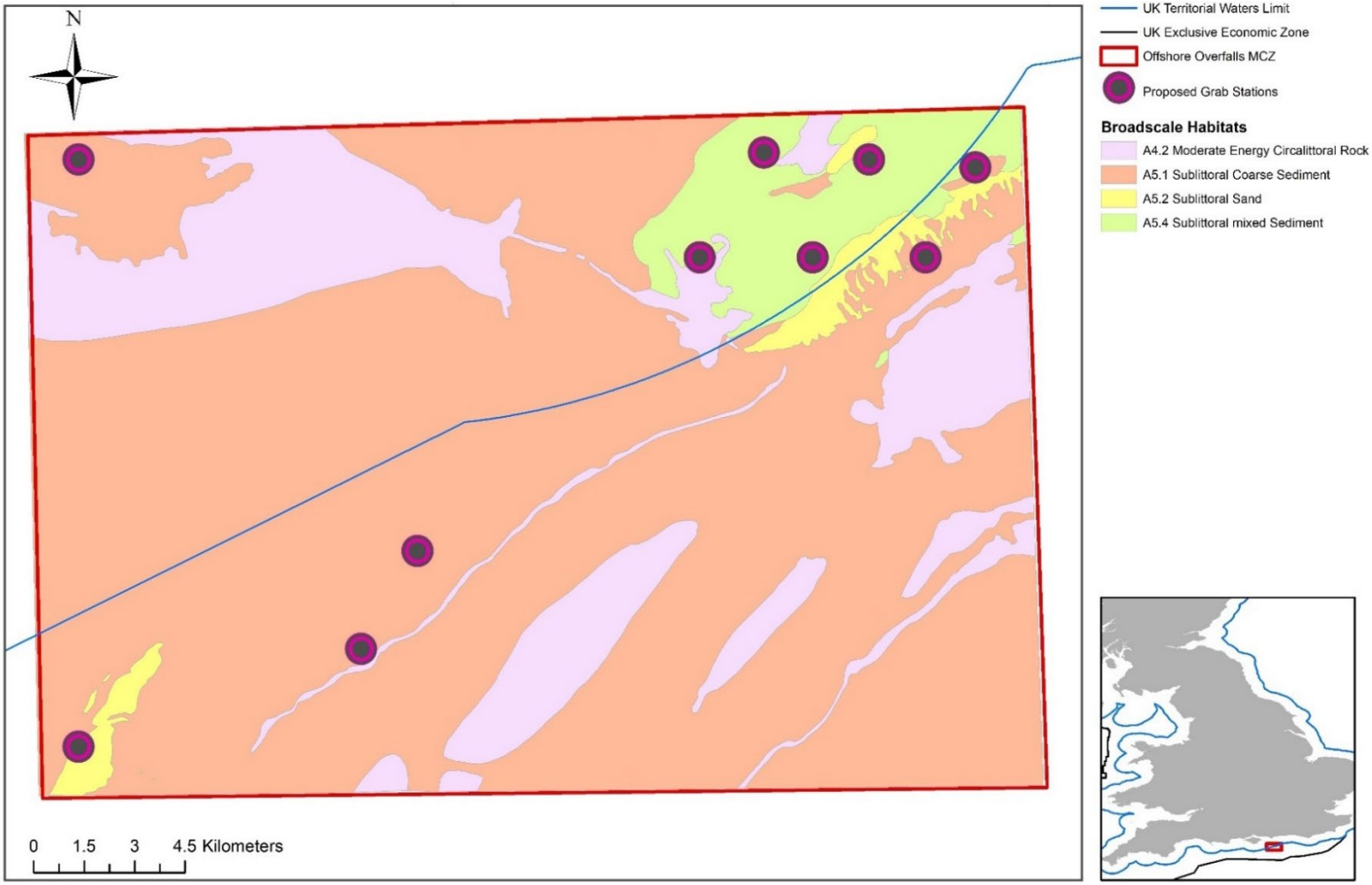

Figure 6. OOVR – Subset of grid stations planned to be used as grab stations in case stations could not be sampled with the drop camera first (assessed prior to the survey as those showing the potential for grab success, from 2012 data). BSH map produced in 2015 based on survey CEND0812C data and Defra Astrium digital terrain model (Mellett & Green 2015). Contains public sector information licensed under the Open Government Licence v3.0. Horizontal Datum WGS84, Projection – UTM Zone 30 N.

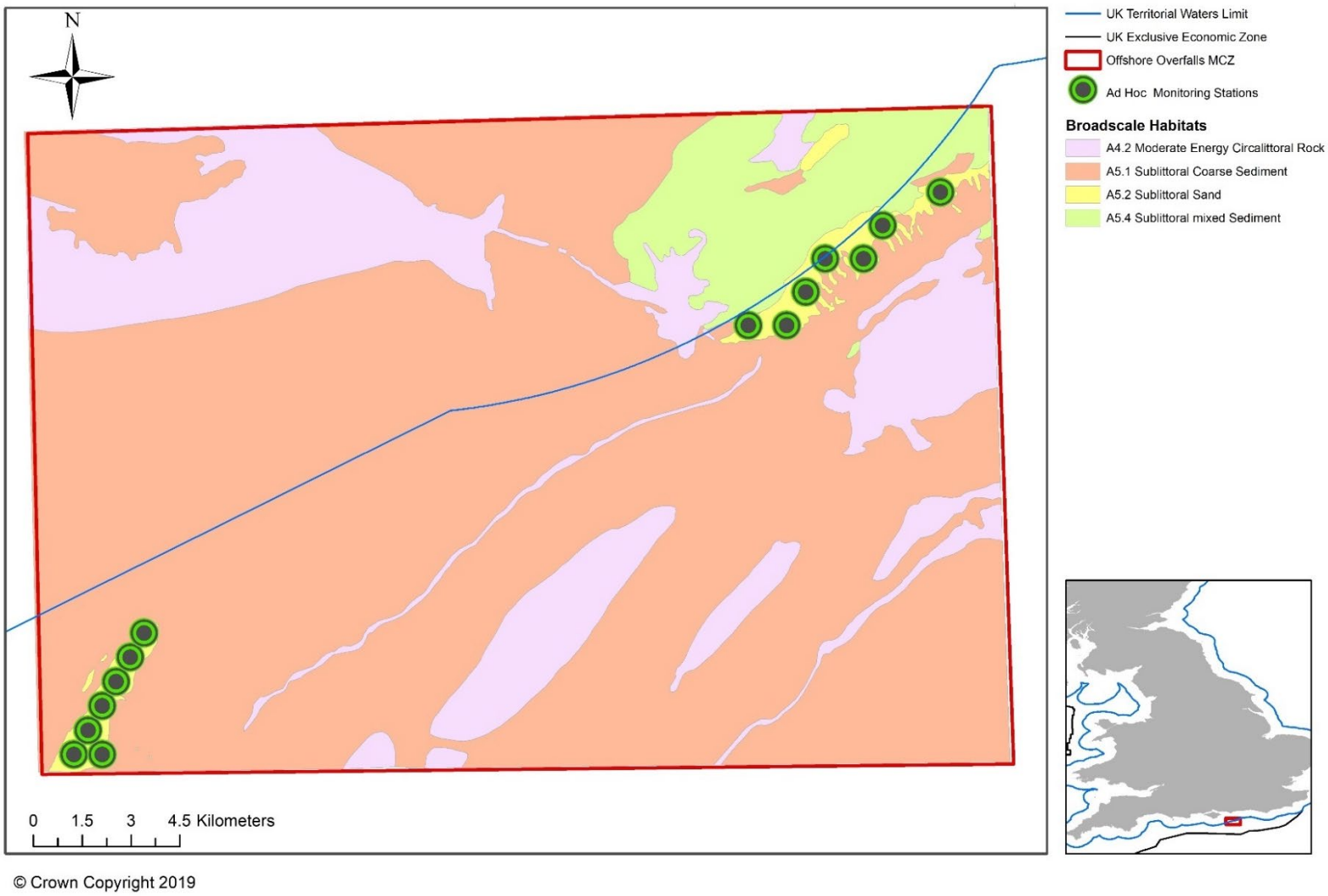

Figure 7. OOVR Location of ad hoc additional grab stations added while on survey grab targeting the 'A5.2 Subtidal sand' BSH. Horizontal Datum WGS84, Projection – UTM Zone 30 N.

3.2 Offshore Brighton (OBRG) survey design

A total of 76 (initially 51 but increased during the survey) monitoring stations and 6 ground truthing stations were planned at OBRG.

3.2.1 Camera stations for monitoring Rock BSH

An equidistant grid of points was generated for the whole of the OBRG MCZ and clipped to the area of 'A4.2 moderate energy circalittoral rock'. Twenty-four stations were planned on the rock at a spacing of 2.5km (Figure 8). Initially this was a grid of 16 stations at a spacing of 2.8km; however, this grid was tightened during the survey before sampling started at OBRG. This change was made as more time was available than expected and increasing the sample number will allow for oversampling which can be used to conduct a more accurate power analysis for planning future surveys to OBRG or similar areas.

3.2.2 Camera stations for monitoring sediment BSH

An equidistant grid of points was generated for the whole of the OBRG MCZ and clipped to the area of 'A5.1 Subtidal coarse sediment' and 'A5.4 Subtidal mixed sediments'. Fifty-two stations were planned on the rock at a spacing of 4km (Figure 8). Initially this was a grid of 35 stations at a spacing of 4.8km; however, this grid was tightened during the survey before sampling started at OBRG. This change was made as more time was available than expected (Appendix 4) and increasing the sample number will allow for oversampling which can be used to conduct a more accurate power analysis for planning future surveys to OBRG or similar areas.

3.2.3 Camera stations for monitoring (increased replication)

A subset of six stations was targeted for increased replication with five planned transects. These stations were planned to have equal representation of each of the three BSH recorded at OBRG (Figure 8).

3.2.4 Camera stations for ground truthing

Six stations were manually located to allow targeting of major topographic features observed within areas of homogenous bathymetry (and likely similar substrata). Investigation of the community structures present at these stations will allow for any variability induced by seabed topography to be included within the monitoring data set. The six additional stations were located according to the following:

- Features of topographic interest were targeted manually (involving movement of stations by no more than 1km) by review of derived morphometric layers, including: Terrain Ruggedness Index, Relative Slope Position and Profile Curvature.
- The features identified included the tributaries and southern section of the paleo valley channel, running NE to SW across the NW section of the site, with varying slope lengths and channel depths. Along these an extensive area of pronounced ruggedness characterised by frequent low and steep 'outcrops' adjacent to the southern edge of the main paleo valley, within the centre of the mapped 'A4.1 High energy circalittoral rock' habitat.
- Similar targeting was also applied to the topographically heterogenous section in the NE of the site, ensuring that both the rugged depression/channel feature and the smooth plain were sampled. The large area closed depression in the southern central section of the site has also been targeted for more extensive sampling.

The inclusion of manually located stations brought the total to 54 (Figure 8). Each of these stations was sampled using a drop camera.

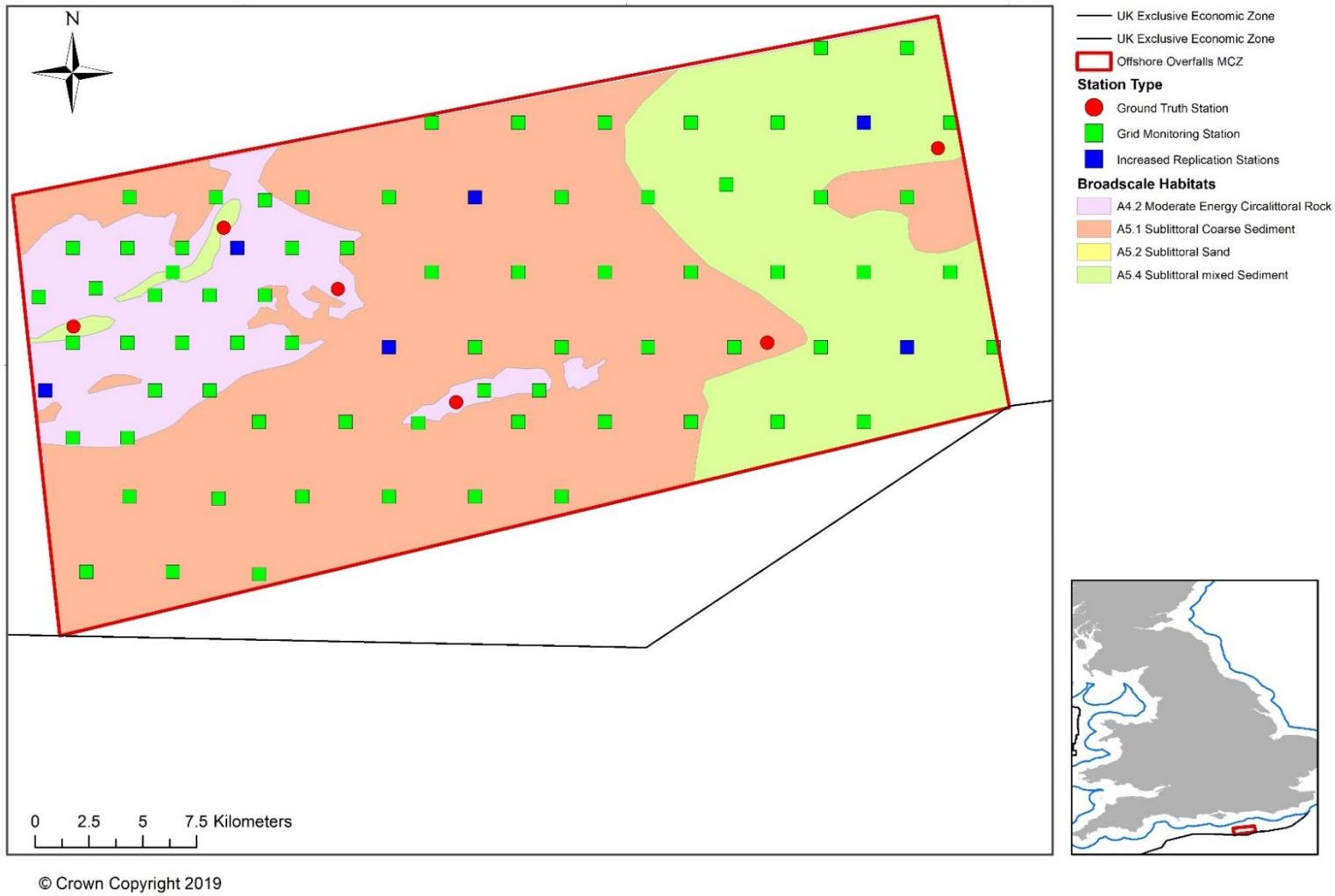

Figure 8. Location of the planned drop camera stations at OBRG. Those stations located by grid are in green; those stations proposed for increased replication are shown with blue squares; and stations selected for ground truthing of the identified features are shown with red circles. BSH map produced in 2015 based on CEND0812C data and Defra Astrium digital terrain model (Dove & Green 2015). Contains public sector information licensed under the Open Government Licence v3.0. Horizontal Datum WGS84, Projection – UTM Zone 30 N.

3.2.5 Grab stations for monitoring and ground truthing

A single replicate grab sample was collected from a subset of the camera stations for monitoring and camera stations for ground truthing, where the substrate type was deemed suitable to grab. As described in section 4.1, each video station will be assessed for grab suitability score before sampling is attempted. As a precaution, stations were selected pre-survey which could be used for grab sampling in the case that it was not possible to use the camera first at a station due to equipment problems or weather (Figure 9); however, these were not needed in practice as all grab stations were visited with the drop camera first.

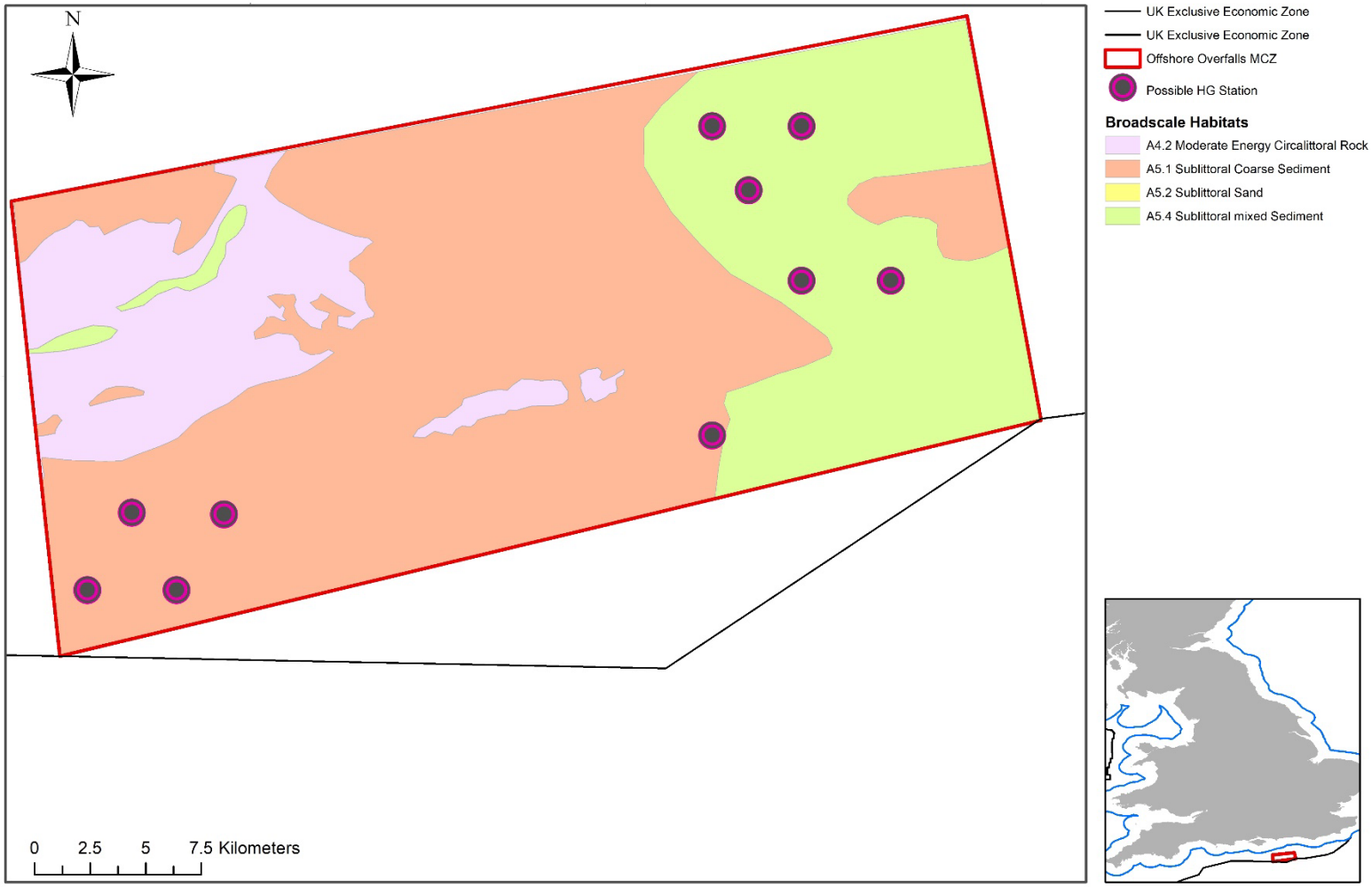

Figure 9. OBRG – Subset of grid stations planned to be used as grab stations in case stations could not be sampled with the drop camera first (assessed prior to the survey as those showing the potential for grab success, from 2012 data). BSH map produced in 2015 based on CEND0812C data and Defra Astrium digital terrain model (Dove & Green 2015). Contains public sector information licensed under the Open Government Licence v3.0. Horizontal Datum WGS84, Projection – UTM Zone 30 N.

3.2.6 Grab stations for monitoring (increased replication)

This followed the same process as for OOVR, described in section 3.1.3. In practice, five replicate samples were attempted at every station deemed suitable for grab sampling at OBRG, due to the small number of suitable stations and the time available (see section 6.2 for details of samples collected at OBRG).

3.2.7 Collect multibeam (MBES) data from the area of rock BSH at OBRG

The boundary between the rock and sediment habitats at OBRG is not well defined due to limitations of data input into the creation of the habitat map for the site. As there was some additional time available at the end of the survey, the decision was made to use this time to collect as much multibeam data from the rock BSH at OBRG as possible.

3.2.8 DNA samples from Invalid Hamon grab deployments

The sampling strategy for this objective is the same as described in section 3.1.8.

4 Sampling methods

The survey of the two sites was undertaken aboard the RV *Cefas Endeavour*. Details of the vessel and the equipment used are provided in Appendix 2. The survey operations and protocols are described below.

4.1 Seabed imagery

Video and stills imagery were collected using a drop camera (Appendix 2). Collection was conducted to fulfil two discrete objectives: the production of the habitat map and the collection of still images to form a first point in a time series for monitoring purposes.

The number of images and image quality were checked after each transect to allow for operational changes to be made if necessary (for example changing camera focus). Images will be filtered and selected for quality prior to processing.

To assist with grab sampling, each camera transect was also given a 'potential grab success' score from 1 to 5, with stations scoring ≥3 deemed suitable for grab sampling (Table 7).

Table 7. Potential grab success scores and their definition.

Potential Grab Success score	Definition
1	Rock, boulders
2	Lots of rock, boulders or obstruction
3	Appears 'grabbable' but with some obstructions
4	Large areas of suitable seabed, some boulders, cobbles
5	Minimal obstructions. Typically, sands, muds or similar fine sediment

An ESM2 logger was attached to the camera frame to record a suite of environmental variables across the horizontal profile of each video tow. The ESM2 logger was fitted with a conductivity/temperature (CT) sensor and two optical backscatter sensors to gather salinity and turbidity data.

The RV *Cefas Endeavour's* 'ferrybox' is an underway continuous logging system and was operated throughout CEND0119. This instrument measures the surface values of the same parameters recorded using the ESM2 logger, with an additional sensor measuring variable fluorescence (a measure of phytoplankton photosynthetic efficiency). These data will provide high-quality physical parameters to relate to various benthic observations. These data will also be used to support Cefas' shelf sea modelling activities.

4.1.1 Method for single replicate camera stations monitoring

All the stations generated as part of the equidistant grid of points at both MCZs will be used for Type 1 monitoring of the MCZs. These stations are surveyed with single replicate transect. For each transect the DC system was towed at approximately 0.3 knots for six minutes in order to travel a minimum distance of 50m across the station bullring. Still images were captured at approximately 10 second intervals where visibility was not obscured. Still images are considered the primary sampling method for the monitoring dataset. The video footage was recorded to aid in the assessment of, for example, certain taxa and anthropogenic features of interest. Although, transects are shorter than typical for a monitoring survey the increased still image frequency means there is an increased number

of replicate images per station (20–30 images taken before filtering rather than 15), concentrated in a smaller area.

4.1.2 Method for increased replication camera transects for monitoring

At increased replication stations, transects were collected following the same method as for single replicate stations, except five transects were collected for each station. The starting point of each replicate tow was within the bullring. Parallel transects were positioned in the bullring so that they did not overlap. The exact orientation of the transects was dependent on the weather conditions. The exact starting position of the transect was decided by the officer on watch on the bridge, based on the weather conditions, with a minimum repositioning of 15m and is considered random. When weather conditions were favourable, it was possible to use Dynamic Positioning (DP) to move between transects without fully recovering the drop camera. However, the camera was recovered onto the deck before turning when tides, wind or swell increased the risks of turning with survey equipment deployed. The decision on what to do with the drop camera between replicate transects was made by the bridge.

4.1.3 Imagery for ground truthing broad-scale habitat map

Ground truthing stations employed single replicate drop camera transects and followed the same method as the single replicate monitoring transects (section 4.1.1), except the tow duration was 15-minute duration (150m). These longer transects would increase the chances of encountering small scale geomorphological features, such as gravel banding, which may not be identifiable from acoustic data alone.

4.2 Grab sampling

A 0.1m^2 mini Hamon grab was used in preference to a 0.25m^2 Hamon grab following recommendations outlined in Boyd *et al.* (2006). Grab samples were conducted to fulfil two discrete objectives: the production of the habitat map and the collection of sediment samples to form a first point in a time series for monitoring purposes. Additionally, grabs were collected as either single replicates or had multiple replicates within a station (see sections 3.1 and 3.2 for details on the number of replicates acquired and the reasons for this).

All grab samples with a volume ≥4L and with no evidence of obstructions (such as cobble stones) in the jaws were deemed valid for monitoring and ground truthing purposes. Valid samples were processed by taking a sub-sample for Particle Size Analysis (PSA) and then sieving the remaining sample through a 1mm sieve. The >1mm fraction was preserved in formalin solution for infaunal analysis.

At increased replication stations, three attempts were made at acquiring a valid sample for each replicate. All attempts were made within a 50m bullring centred on the sampling station with the vessel moving 10m between each attempt.

4.2.1 DNA samples

Where time allowed, invalid grab samples (sample volume <4L) were processed following a similar protocol to that of infauna samples for monitoring:

- Process the sample as normal but put in a 10L bucket.
- Add lots of water and pour off the animals through the 1mm sieve.
- Repeat until left with most of animals.
- Store in ethanol in the freezer (-20^{o}C) and replace the ethanol after 12 hours.

5 Survey narrative

All times are in GMT.

03 January 2019: The RV *Cefas Endeavour* final mobilisation operations were carried out on Wednesday 3 January 2019. Scientific crew joined the vessel at 14:30 in readiness for a vessel induction at 15:00. The vessel left Lowestoft Port on the high tide at 19:30.

04 January: The vessel continued the transit to the survey area. At 11:00 the master held an introduction toolbox. This was followed by an Abandon Ship muster drill. The vessel reached the calibration wreck target in Offshore Overfalls at 13:00. Calibration operations were carried out on the SS Alaska wreck for 3.5 hours. The multibeam run-lines for Offshore Overfalls were started at 16:30 and continued into day three. Conductivity Temperature Depth (CTD) drops for sound velocity profile where carried out 13:19.

05 January: MBES sampling continued through the whole day without incident. CTD drops were carried out at 04:56 and 17:38.

06 January: MBES sampling continued throughout the day with CTD drops carried out at 00:30 and 12:05.

07 January: MBES sampling continued with CTD drops carried out at 00:19 and 13:20. Eight in-fill lines were run on the transit from the south-east corner of the sampling area (line code MBES_135) to the start of line MBES_078. MBES__074. The survey was aborted twice due weather conditions. On the first attempt the vessel missed the start of line. On the second attempt the strong winds made it impossible to hold a line in SW to NE direction. In order to continue collecting data we decided to run-lines from NE to SW only. Running lines in only one direction (as opposed to running each line in alternate direction) is less efficient as it means transiting back to the start of the next line. To minimise time lost due to transiting we moved to the much shorter lines in the SW corner of the survey area (starting with line MBES_047) at 20:38.

08 January: The weather conditions improved, and we were able to return to running efficient alternating lines at 01:50 starting from line MBES_049. Sampling continued throughout the day. The MBES software SIS (Seafloor Information Systems) crashed at 16:35 leaving a five-minute gap in the data to be filled later. CTD drops were made at 00:25 and 12:39.

09 January: A near miss occurred while a member of staff was turning on the CTD. The winch was accidently triggered lifting the CTD unexpectedly past the staff members face. A revised safety toolbox was carried out for both shifts to prevent a repeat. Two CTD drops were carried out at 02:03 and 02:43. The latter was carried out due to suspicions over the quality of the data from the first drop. A third CTD drop was carried out at 13:06. The MBES survey continued throughout the day.

10 January: CTD drops were made at 00:54, 12:17 and 19:02. The MBES surveying continued without incident until 21:15 when the vessel headed inshore. A member of staff needed to be transferred off due to a family emergency.

11 January: The vessel returned to site at 02:30 where the MBES survey recommenced. CTD drops where made 08:11 and 18:33. MBES acquisition was delayed due to a crash of the Inertial Measurement Unit (IMU) at approximately 18:35 which affected the SIS software.

The issue was fixed while the CTD data was being downloaded so only a few minutes were lost. In addition, a firefighting drill was held at 11:30.

12 January: Line running and MBES acquisition was suspended due to a crash, at 02:00, of the IMU which affected the SIS software. The problems resulted in 45 minutes equipment downtime while the issues were resolved. The MBES surveying recommenced at 02:45 and continued until the all run-lines and cross-lines, excluding in-fills were completed at 16:10. A CTD drop was made at 08:09. Toolbox safety talks were held at 10:30 and 16:20 for night and day shift respectively in preparation for camera and grab sampling. A toolbox safety talk was held on the bridge for both shifts before deployment of the camera and grab (10:30 and 16:20 for night and day shift respectively). The deck-based component of the camera toolbox safety talk was then carried out at 17:30 with day shift. At 18:00, the DP failed when coming on to the first camera station. The DP did not receive either of its two GPS inputs. We returned to MBES operations and completed in-fill line Infill12 at 20:33. A member of scientific crew was able to fix the GPS feed issue allowing camera sampling to begin at 21:10.

13 January: Night shift held the deck-based part of the camera safety toolbox talk at 00:00. Camera sampling continued for the whole day without incident.

14 January: Drop camera transects were carried out all day. They were paused to make MBES in-fill runs as we progressed around the site.

15 January: Drop camera operations continued with Hamon grab samples being taken at sites where the ground was suitable. The final MBES in-fill lines were run between 04:00 and 09:15, completing the MBES survey of Offshore Overfalls. Grab and camera operations then recommenced. Survey operations were stopped at 13:35 to allow sufficient time to prepare for crew change in Shoreham-by-the-Sea. The vessel transited to Shoreham and docked at approximately 18:00. A full crew change took place, plus ten scientists (six off, four on).

16 January: The vessel took on food and water supplies and repairs were made to the X-Band radar. It is worth noting that Shoreham Port has a lock and that total clearance between the sides of the lock and the RV *Cefas Endeavour* is only 2m. There was some risk that we would not be able to leave Shoreham due to poor weather preventing passage through the lock. The vessel left at dock at approximately 18:50, however, and was able to pass through the lock without issue at 19:50. We transited to Offshore Overfalls arriving at approximately 23:00. A toolbox safety talk was carried out for day shift before camera operations resumed at 23:45.

17 January: After a toolbox safety talk for night shift, drop camera operations were carried out at Offshore Overfalls. The remaining original ground truthing station was completed. Six additional ground truthing stations were then completed within the MBES survey area. The vessel then left of Offshore Overfalls at 06:30 and transited to Offshore Brighton, arriving at 08:00. Drop camera operations began, focusing in the rock BSH.

18 January: Drop camera operations continued throughout the day. The rock BSH component was completed just before 09:30. Shortly after this the drop camera system developed a second fault and the topside Multiplexing Unit (MUX) was swapped out, resulting in two hours equipment downtime. Sampling recommenced at 11:30 and continued without major issue for the rest of the day. Hamon grabs were attempted at two sites but were unsuccessful. One site did yield two small samples that were processed for DNA samples. Progress between stations was occasionally slowed by heavy shipping traffic and strong tides.

19 January: Drop camera transects continued throughout the day at Offshore Brighton. Grab samples were collected at stations where the video picture indicated the ground would be suitable. There was a 30-minute period of equipment downtime when the navigation software Tower repeatedly crashed at 08:15. Tower was rolled back, with work recommencing at 08:45.

20 January: Camera transects were made at Offshore Brighton until 10:30. The vessel then transited to Offshore Overfalls arriving at 12:00. Replicate grab samples were collected from all stations previously successfully grabbed. Replicate grabs were also attempted at additional set of stations, identified from the MBES data, as likely to be sand.

21 January: There were very strong tides due to the full moon. The total lunar eclipse was observed at around 05:00. Despite the conditions, progress was only slowed rather than stopped. Grabbing followed by camera transects were carried out all day at Offshore Overfalls.

22 January: Strong winds and tides resulted in the final camera transect of Offshore Overfalls (OOVR020) being aborted at 00:30. The vessel left Offshore Overfalls and transited to Offshore Brighton, arriving at 03:10. The gale force winds and strong tides meant weather downtime until 05:45. Sampling recommenced at 05:55 and continued throughout the day. The storm in the early hours had left staff fatigued so the pace was slowed accordingly.

23 January: Grabbing operations continued until 01:45 when the wind became too strong to hold station. Weather prevented further work until 03:00. MBES run-lines where then carried out until 19:45. The final grab station was completed at 20:45. A cross-line was then made across the MBES block before the vessel transited back to Offshore Overfalls. The final camera station (OOVR020) was completed by 23:30. The vessel then began its transit back to Lowestoft Port.

24 January: The vessel reached Lowestoft Port at approximately 23:00.

25 January: The vessel was demobilised marking the end of the survey.

6 Environmental data acquisition

6.1 Offshore Overfalls

The weather throughout CEND0119 was quite exceptional. Only 03:30 hours of weather downtime were recorded. In addition, downtime due to equipment and vessel issues was also minimal (Appendix 3). The first objective was to complete a MBES survey of the area of OOVR with no existing acoustic data; 100% coverage of the survey block was achieved (Figure 10).

The Kongsberg EM2040 single head MBES system was calibrated successfully over the wreck of the Alaska in advance of acquisition of survey lines, to determine any errors in pitch, roll and heading that would affect the quality of the MBES data. Results of this calibration are available on request. Sound velocity profiles were collected using a calibrated mini SAIV CTD probe and imported into the Kongsberg SIS (Seafloor Information Systems) acquisition software before data acquisition. CTD profiles were collected at the following spatio-temporal intervals: at the calibration site; at each new survey area; at least once every 12 hours of active survey; and when a significant (>3.0ms^{-1}) discrepancy was observed between the loaded Sound Velocity (SV) profile and the continuously monitored SV value at the EM2040 transducer.

Survey line planning was adjusted to achieve a swathe coverage of ~200m, and an overlap of ~15% between adjacent survey lines. The data were acquired through the Kongsberg SIS software and processed onboard using Caris HIPS & SIPS software for bathymetric processing and QPS FMGT software for backscatter processing. The EM2040 was operated at a frequency of 300kHz and a Medium depth setting throughout the survey operations. This ensured that the best quality datasets for both bathymetry and backscatter were obtained. Vessel motion data were monitored throughout acquisition, particularly during periods of poor weather conditions. Survey lines were acquired in only one direction when the vessel heave was considered too large to remove during processing. Survey line spacing and MBES parameters, e.g. beam angle, were adjusted during acquisition to ensure maximum coverage was achieved.

All camera stations were sampled with all objectives met. Single transects monitoring were carried out at 60 stations (MCZ objectives 1, 2, 3 and 4, section 2.2.1). An additional four replicate samples were carried out at eight of the 60 stations (Figure 11, Table 8). All monitoring camera stations resulted in a minimum of 20 high-quality images per replicate transect with the total number of images varying between 22 and 36.

In addition to the seven ground truthing camera stations planned pre-survey (section 3.1.4) a further seven ground truthing stations were located and sampled during the survey, resulting in a total of 14 ground truthing stations; six of the seven additional stations were located to ground truth the newly acquired MBES data. The seventh station (Station code OOVR_GT14) was included to better characterise the Overfalls area in the north-west of the site (Figure 11, Table 8). Station OOVR_GT14 was located between stations OOVR_GT1 and OOVR_GT7 during the survey. Both stations were on relatively steep slopes either side of a plateau. Because potential Sabellaria reef had been observed at both stations, OOVR_GT14 was positioned to determine presence or absence of Sabellaria on the plateau and provide more information of the potential distribution of this feature for future survey planning.

The video data recorded by the drop camera were reviewed before grabbing operations began (see section 4.1 for details of potential grab success scores). The footage revealed

only 12 stations suitable for grabbing – fewer than was originally expected. A second review, to make sure scores given were consistent and accurate, reduced the number of monitoring stations deemed suitable to grab to nine. Of these, seven stations yielded successful samples (Figure 12). One replicate was acquired from two stations (OOVR049 and OOVR050). Five stations were chosen for increased replication, where the goal was to acquire five replicate grab samples. This was successful at three stations (OOVR50, OOVR058, and OOVR059); however, at OOVR001 and OOVR060 only three and four replicates were achieved respectively. In total, 24 grab samples were collected (Table 9).

Due to the minimal amount of downtime on CEND0119 an additional set of 14 grab stations were added to sample the ‘A5.2 Subtidal sand’ BSH. Three replicate grab attempts were made at each station, but this was not always achieved, resulting in 31 samples. Grab success was much lower in the southern sand area and it was not possible to collect three valid samples at most of these stations (Figure 12).

Six invalid (<4L) samples were processed for DNA species collection (Table 9). These will be analysed outside of the Defra MPA Programme. Please contact JNCC for further details.

Ferrybox data were collected continuously throughout the survey. ESM2 data were recorded on every camera transect. Both datasets will be reviewed and analysed post-survey. The results will be included in the monitoring report.

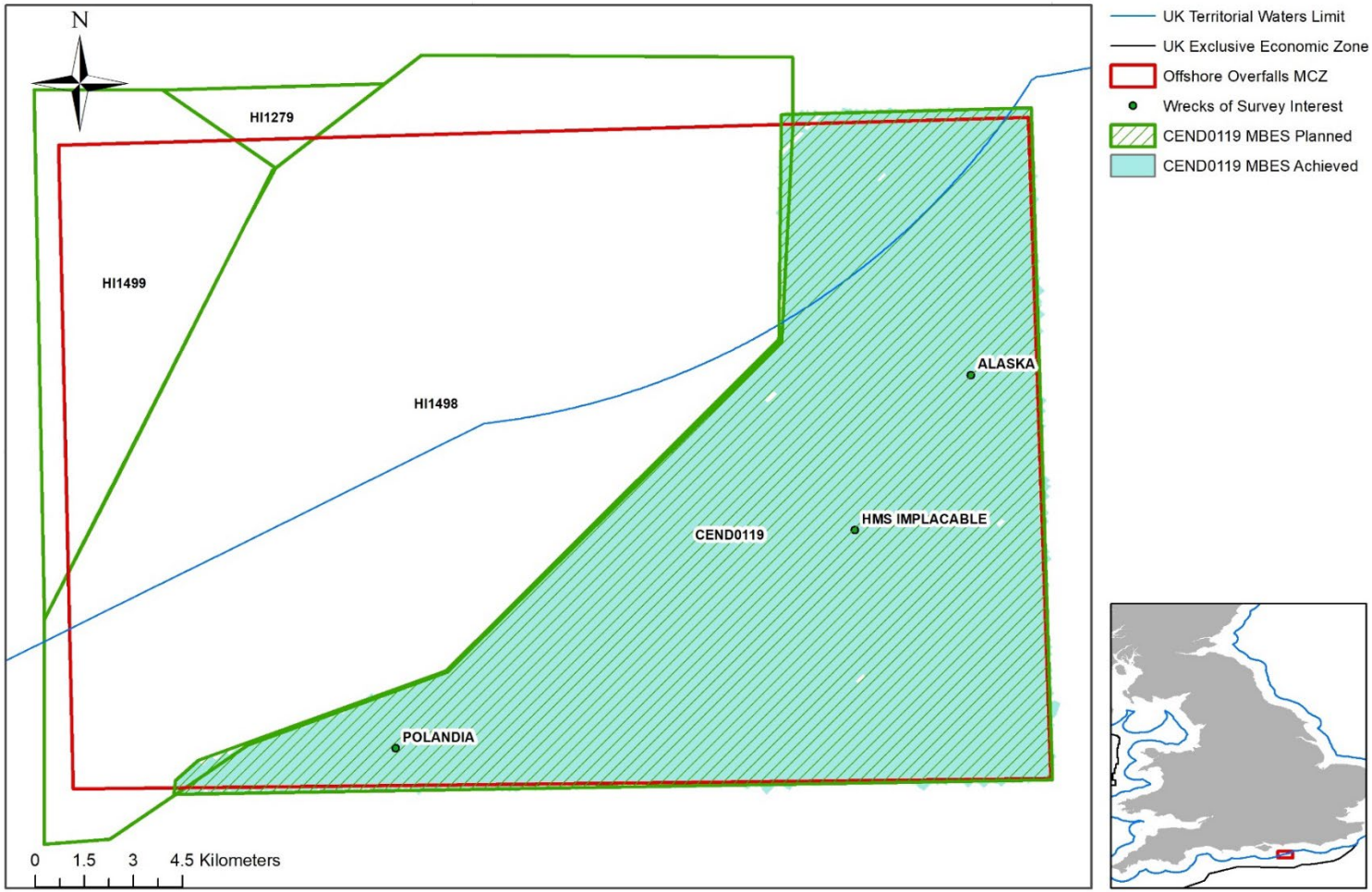

Figure 10. Achieved MBES extent acquired from Offshore Overfalls MCZ during CEND0119. Horizontal Datum WGS84, Projection – UTM Zone 30 N.

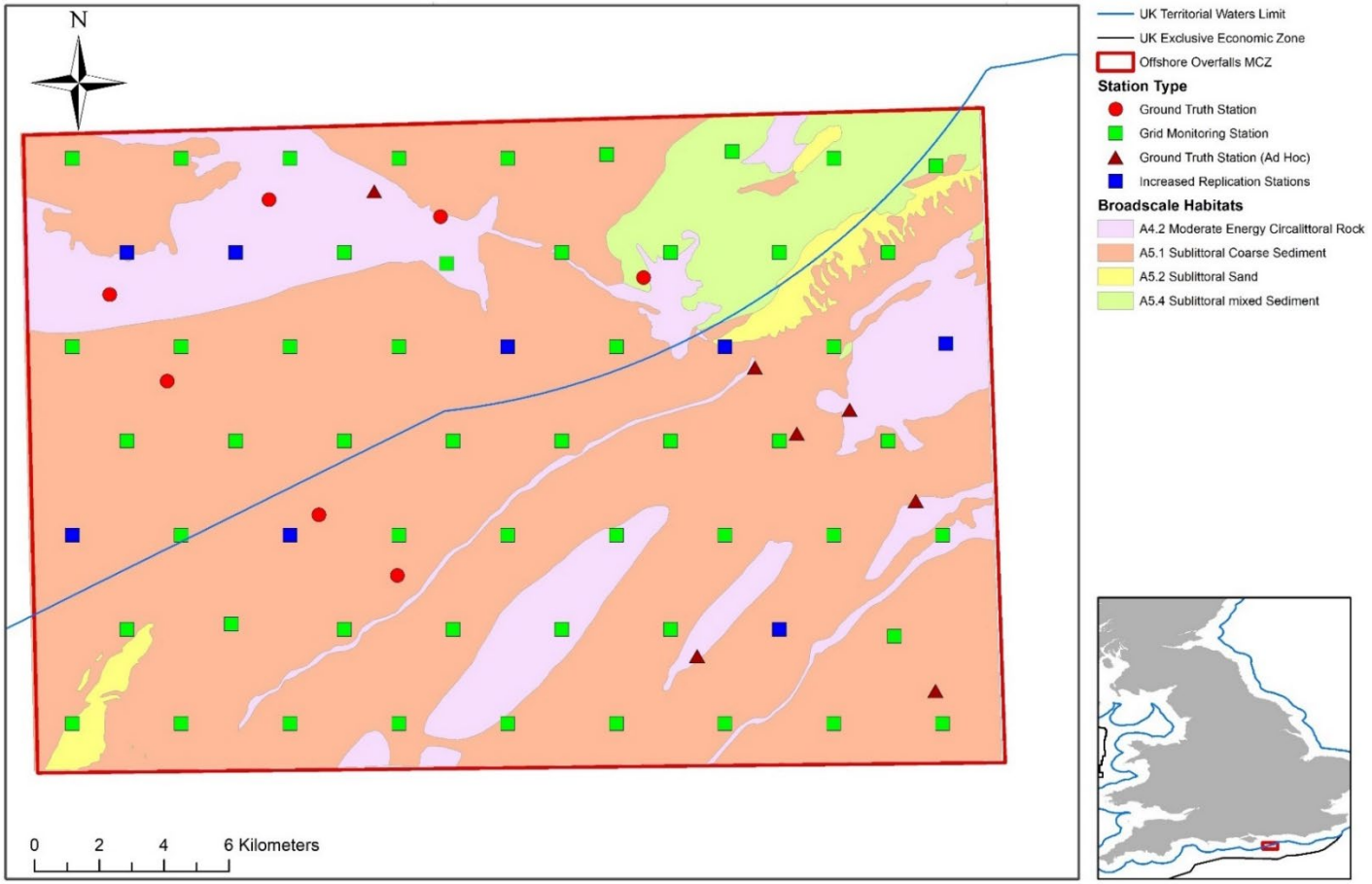

Figure 11. Achieved camera stations at OOVR, including both gridded and manually located ground truthing stations. Ground truthing stations positioned based on initial segmentation on the HI1498 MCA MBES and on initial segmentation of MBES data collected during CEND0119. BSH map produced in 2015 based on survey CEND0812C data and Defra Astrium digital terrain model (Mellett & Green 2015). Contains public sector information licensed under the Open Government Licence v3.0. Horizontal Datum WGS84, Projection – UTM Zone 30 N.

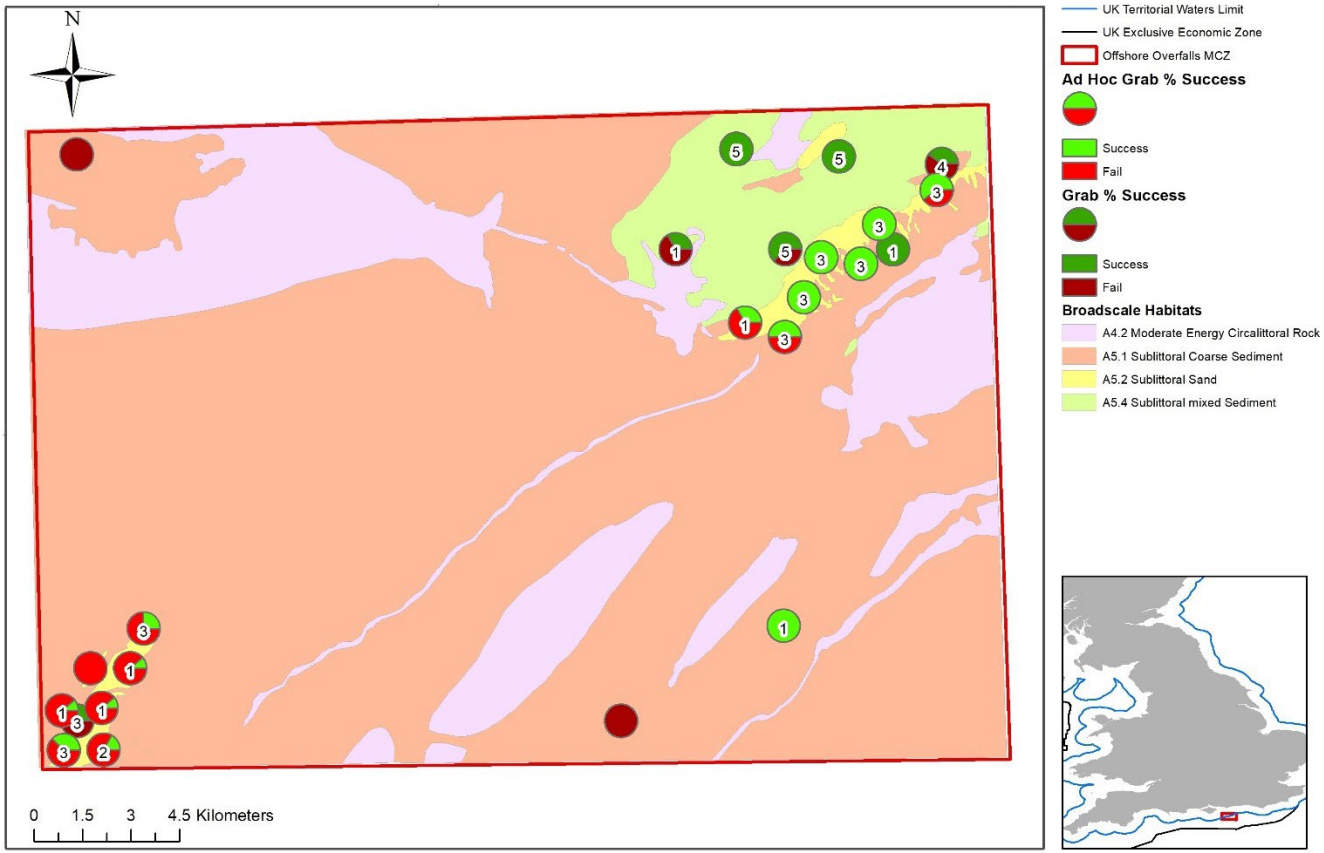

Figure 12. Location of all stations sampled with mini Hamon grab at OOVR. Pie charts indicate percentage successful samples from all attempts at the station, numbers indicate number of successful replicates achieved. BSH map produced in 2015 based on survey CEND0812C data and Defra Astrium digital terrain model (Mellett & Green 2015). Contains public sector information licensed under the Open Government Licence v3.0. Horizontal Datum WGS84, Projection – UTM Zone 30 N.

Table 8. Drop camera stills and video sampling at Offshore Overfalls. *20 stations were originally estimated; this number was revised once the MBES data were reviewed.

Survey objective	Monitoring objective	Stations planned	Stations attempted	Replicates	Additional stations	Additional stations sampled	Total samples
Camera stations for monitoring	1.2, 1.3, 2.1, 3.1, 4	60	60	1 x 5 min transect	—	—	60
Camera stations for monitoring (increased replication)	1.2, 1.3, 2.1, 3.1, 4	8	8	4 x 5 min transects	—	—	32
Camera stations for ground truthing	1.2, 1.3, 4	~20*	7	1 x 15 min transect	7	7	14

Table 9. Mini Hamon grab sampling for PSA and macrofauna at Offshore Overfalls. Note that invalid samples and failed attempts are not included. *It was estimated that 20 stations would be grab-able; however, in practice only 12 showed suitable substrate.

Survey objective	Monitoring objective	Stations planned	Stations attempted	Replicates	Additional stations	Additional stations sampled	Total samples
Grab stations for monitoring and ground truthing	1.4, 2.2	~20*	12	1	—	—	7
Grab stations for monitoring (increased replication)	1.4, 2.2			4	7		17
Grab stations for monitoring the 'A5.2 Subtidal sand' BSH	1.4, 2.2	—	—	3	14	14	31
DNA samples from Invalid Hamon grab deployments	—	—	—	—	—	—	6

6.2 Offshore Brighton

The survey of OBRG began after the MBES and initial drop camera survey of OOVR. All 76 stations from the equidistant grid were successfully sampled. A further six stations were re-sampled with four additional replicate transects each as per the survey plan (Figure 13).

The stills and video footage from the drop camera were examined and rated 1–5 on estimated likelihood of achieving a successful grab, as described in section 4.1. Attempts were made at 17 stations to get sediment and macrofauna samples with the mini Hamon grab (Figure 14). One station (OBRG038) was attempted with a single replicate but abandoned due to poor weather and was not returned too. Seven stations were sampled with a single grab only. Nine of these stations were re-sampled with attempts to get five replicates. One of these stations (OBRG041) had attempts to get three successful replicates rather than five, due to an error. The station was not revisited due to prioritisation of other objectives.

Five invalid (<4 litre) samples were processed for DNA species collection. These will be analysed outside of the Defra MPA Programme. Please contact JNCC for further details.

Ferrybox data were collected continuously throughout the survey. ESM2 data were recorded on every camera transect. Both datasets will be reviewed and analysed post-survey. The results will be included in the monitoring report.

Due to the minimal downtime it was decided to add a final objective of a MBES survey of part of the 'A4.2 Moderate energy circalittoral rock' BSH. Two blocks were survey across the site, with a cross-line made across both blocks (Figure 15). The additional MBES data will help better determine the boundary of the rock feature and update existing BSH maps.

Table 10. Drop camera stills and video sampling at Offshore Brighton.

Survey objective	Monitoring objective	Stations planned	Stations attempted	Replicates	Additional stations	Additional stations sampled	Total samples
Camera stations for monitoring	1.1, 1.2, 2.2, 2.3, 3	48	48	1 x 5 min transect	28	28	76
Camera stations for monitoring (increased replication)	1.1, 1.2, 2.2, 2.3, 3	6	6	4 x 5 min transects	—	—	24
Camera stations for ground truthing	1.1, 1.2, 2.2, 2.3, 3	6	6	1 x 15 min transect	—	—	6

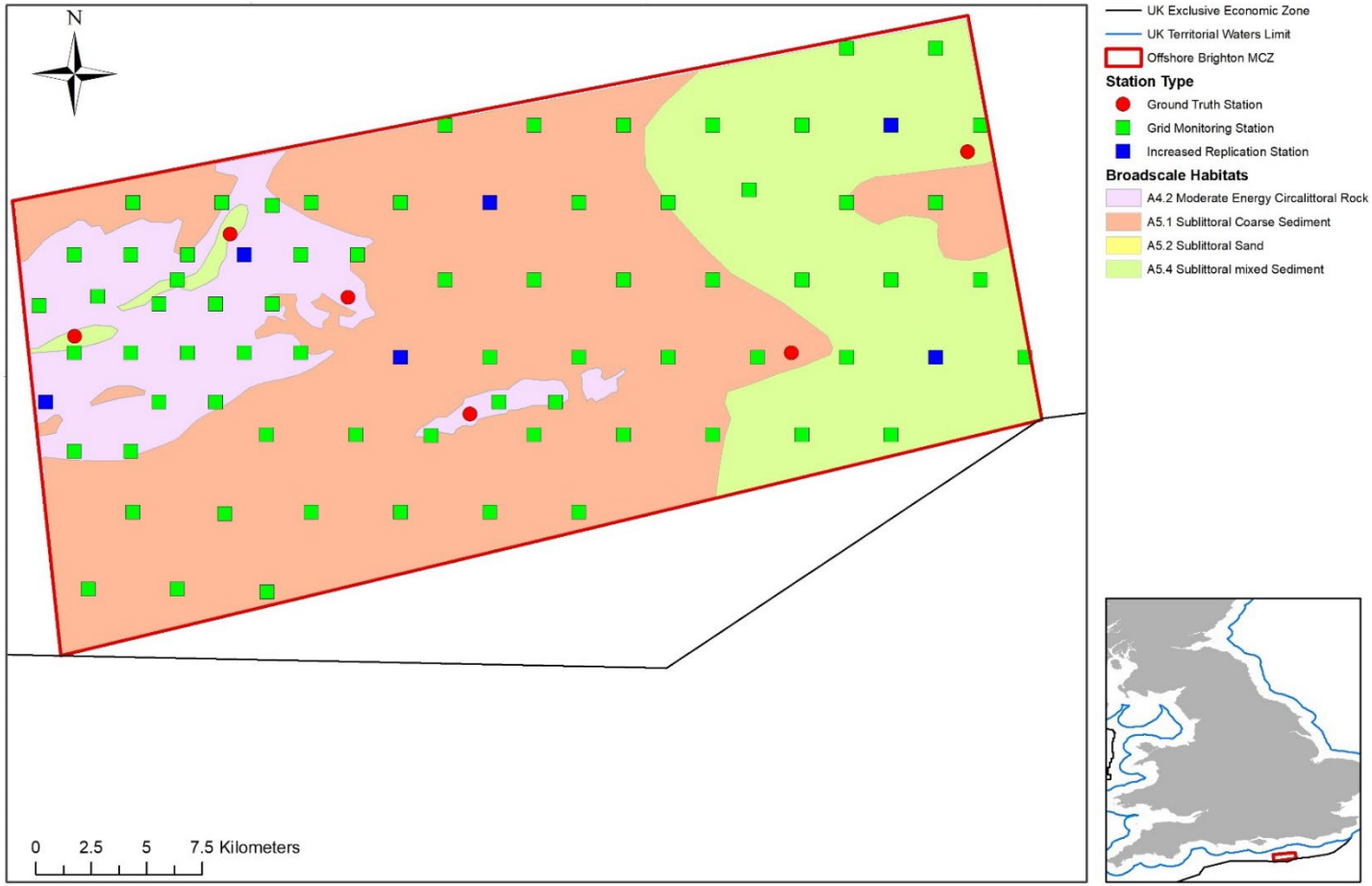

Figure 13. Location of the achieved drop camera stations at OBRG, including those stations proposed for increased replication (blue squares) and for Ground truthing. BSH map produced in 2015 based on CEND0812C data and Defra Astrium digital terrain model (Dove & Green 2015). Contains public sector information licensed under the Open Government Licence v3.0. Horizontal Datum WGS84, Projection – UTM Zone 30 N.

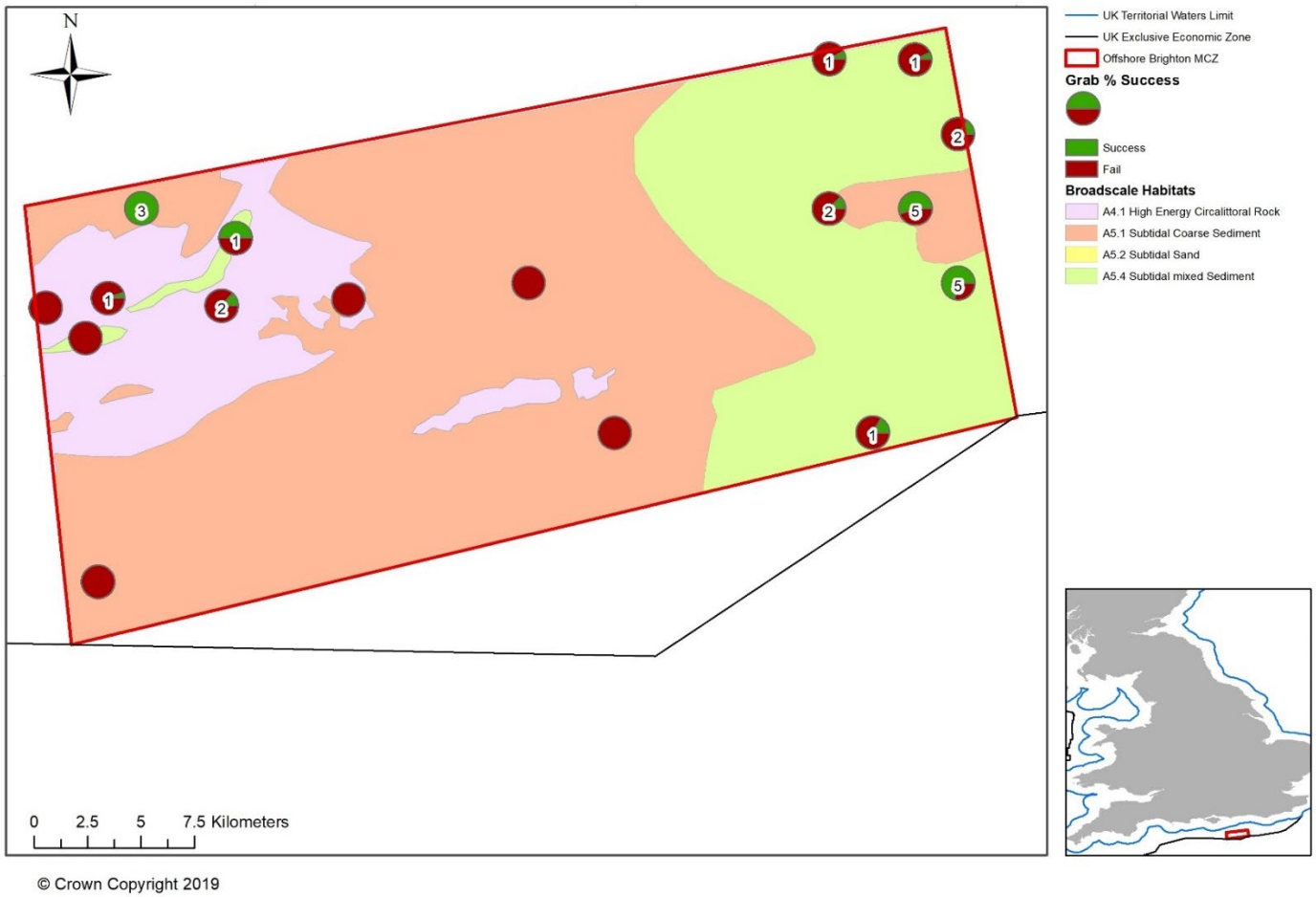

Figure 14. Location of all stations sampled with mini Hamon grab at OBRG. Pie charts indicate percentage successful samples from all attempts at the station, numbers indicate number of successful replicates achieved. BSH map produced in 2015 based on CEND0812C data and Defra Astrium digital terrain model (Dove & Green 2015). Contains public sector information licensed under the Open Government Licence v3.0. Horizontal Datum WGS84, Projection – UTM Zone 30 N.

Table 11. Mini Hamon grab sampling for PSA and macrofauna at Offshore Brighton. Note that invalid samples and failed attempts are not included.

Survey objective	Monitoring objective	Stations attempted	Replicates	Successful stations	Total samples
Grab stations for monitoring and ground truthing	1.3, 2.1	17	1	10	10
Grab stations re-sampled for increased replication	1.3, 2.1	9	4	5	11
DNA samples from Invalid Hamon grab deployments	—	—	–	-	5

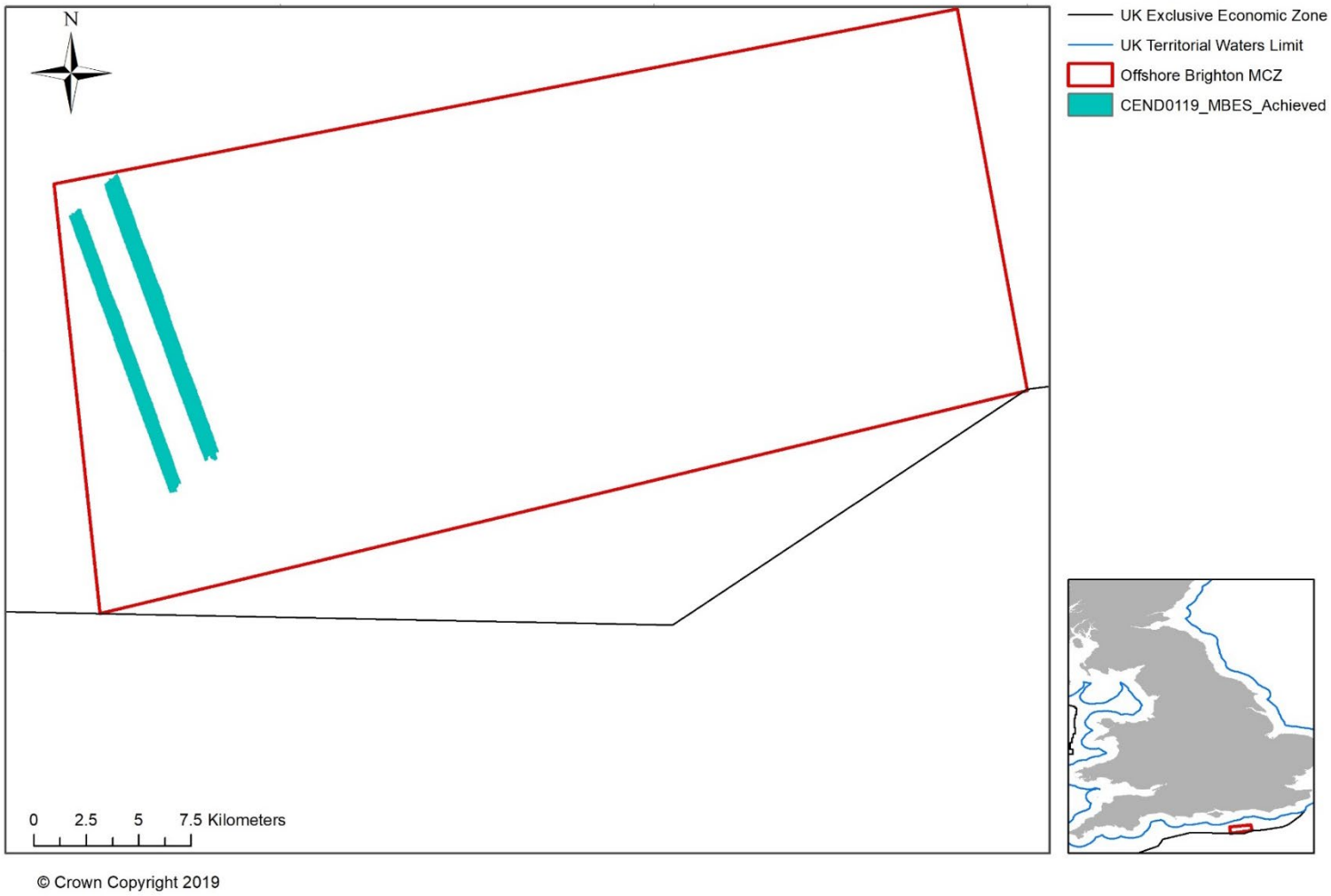

Figure 15. Achieved MBES extent acquired from Offshore Brighton MCZ during CEND0119. Horizontal Datum WGS84, Projection – UTM Zone 30 N.

7 References

Boyd, S.E., Barry, J. & Nicholson, M. 2006. A comparative study of a 0.1m^2 and 0.25m^2 Hamon grab for sampling macrobenthic fauna from offshore marine gravels. Journal of the Marine Biological Association of the United Kingdom.

Dove, D. & Green, S. 2015. Offshore Brighton rMCZ Post-survey Site Report. 52 pp.

Lim, A., Kane, A., Arnaubec, A. & Wheeler, A.J. 2018. Seabed image acquisition and survey design for cold water coral mound characterisation. Marine Geology, 395: 22–32.

Mellett, C. & Green, S. 2015. Offshore Overfalls rMCZ Post-survey Site Report. 54 pp.

8 List of Abbreviations

Acronym	Definition
ACD	Admiralty Chart Datum
BSH	Broad-Scale Habitat
CHP	Civil Hydrographic Programme
CRP	Central Reference Point
CTD	Conductivity, Temperature and Depth
DP	Dynamic Positioning system
EOL	End of line
ESM2	Mini CTD Logger
EUNIS	European Nature Information System
EXIF	Exchangeable image file
GIS	Geographic Information System
GMA	General Management Approach
GMT	Greenwich Mean Time
GPS	Global Positioning System
HIPS	Hydrographic Information Processing System
IMU	Inertial Measurement Unit
JNCC	Joint Nature Conservation Committee
MBES	Multibeam Echosounder
MCA	Maritime and Coastguard Agency
MCZ	Marine Conservation Zone
MESH	Marine European Seabed Habitats
MIST	Marine Instruments and Systems Team
MPA	Marine Protected Area
MUX	Multiplexing Unit
OBIA	Object Based Image Analysis
OBRG	Offshore Brighton
OOVR	Offshore Overfalls
POA	Plan of Action
PSA	Particle Size Analysis
QPS FMGT	QPS Fledermaus Geocoder Toolkit
ROG	Recommend Operation Guidelines
SACFOR	S = Superabundant, A = Abundant, C = Common, F = Frequent, O = Occasional, R = Rare
SACO	Supplementary Advice on Conservation Objectives
SAIV A/S	Manufacturer of hydrographic instruments
SIC	Scientist in Charge
SIPS	Sidescan Information Processing System
SIS	Seafloor Information System
SOL	Start of Line

9 Appendices

Appendix 1. Survey and project team

The survey team for the duration of the fieldwork included Cefas and JNCC marine scientists; 24-hour operations were conducted throughout (Table 12).

Table 12. Survey staff roles for CEND0119.

Cross-shifts	
Cefas Scientist in Charge Cefas Data Manager Acoustics lead and acoustic scientists	
Day Shift 12:00 – 00:00	**Night Shift 00:00 – 12:00**
Cefas Shift Lead Cefas GIS & Survey Planning Lead JNCC Survey Planning Lead Cefas Marine Instrumentation Technician Benthic Ecologist Deck Scientist	Cefas Shift Lead Cefas Benthic Lead Cefas Marine Instrumentation Technician 4x Deck Scientists

Appendix 2. Vessel and equipment used

RV Cefas Endeavour

Port of registry	Lowestoft
Length OA	73.00m (excluding stern roller)
Length extreme	73.916m
Breadth (MLD)	15.80m
Depth (MLD)	8.20m
Design draft	5.00m
Deep draught	5.50m
LBP	66.50m
Gross tonnage	2983 tonnes
Net register tonnage	894 tonnes
Net lightship	2436 tonnes
Deadweight @ 5.00m	784 tonnes
Deadweight @ 5.50m	1244 tonnes
Displacement @ 5.00m	3210 tonnes
Displacement @ 5.50m	3680 tonnes
Builder	Ferguson Shipbuilders Limited, Port Glasgow
Commissioned	2003
Communications	In port BT Tel. Cell phone Voice/Fax/Data Radio TELEX Inmarsat C Fleet 77 (Inmarsat F) and VSAT (Eutelsat) internet access
Endurance	42 days
Complement	Ensuite accommodation for 16 crew and 19 scientists with dedicated hospital facility
Propulsion System	AC/DC Diesel Electric 3 x diesel electric AC generators, individually raft mounted 2 x tandem electric DC motors Single screw
Power generation	3240Kw
Power propulsion	2230Kw
Thrusters	Bow thruster (flush mounted azimuthing) Stern thruster (tunnel)
Trial speed	14.4 knots
Bollard pull	29 tonnes
Call sign	VQHF3
Official number	906938
MMSI	235005270
Lloyds/IMO number	9251107
Side Gantry	7.5 tonne articulated side A-frame

Stern Gantry	25 tonne stern A-frame
Winches	3 x cranes 35tM, heave compensated 2 x trawl winches 2 x drum winches, (1 double) Double barrel survey winch with motion compensation and slip rings Double barrel survey winch with slip rings Double barrel towing winch with slip rings Side-scan sonar winch with slip rings 3 x Gilson winches (one fitted to stern A-frame)
Transducers/Sea tube	Drop keel to deploy transducers outside the hull boundary layer in addition to hull mounted transducers 1.2m diameter sea tube/moon-pool
Acoustic equipment	Kongsberg Simrad: HiPAP 500 positioning sonar EK60, 38/120kHz scientific sounder EA 600, 50/200kHz scientific sounder Scanmar net mensuration system SH80 high frequency omni-directional sonar, Kongsberg EM2040 MBES (0.4° x 1°)-EA600 SBES (12 / 50/ 200)-Olex seabed display/logging system (multibeam option) mounted Scanmar fishing computer transducers
Boats	2 x 8m rigid work and rescue boats with suite of navigational equipment deployed on heave-compensated davits
Laboratories	8 networked laboratories designed for optimum flexibility of purpose 4 serviced deck locations for containerised laboratories
Special features	Dynamic positioning system Intering anti-roll system Local Area Network with scientific data management system Ship-wide general information system CCTV
Class	LRS 100A1+LMC UMS SCM CCS ICC IP ES(2) DP(CM) ICE class 2

Drop camera

The drop camera was equipped with the following camera and specifications:

- Telemetry Operation over fibre optic cable
- 1080p high-definition video camera
- 720p forward facing video camera
- 18 mega pixels underwater digital stills camera
- High power camera flash
- 20W high intensity led lights x 6 (2 forward facing)
- 4 x scaling subsea lasers (spaced at 210mm)
- 250khz precision altimeter
- Combined compass and depth
- Temperature sensor
- Ultra-short base length positioning beacon

Video observations were made with a drop camera (DC) system (Figure 16). The DC was equipped with a high-definition video camera and a separate still image camera unit, in a planar (downwards facing) orientation inside the frame. A second video camera (referred to as the IP camera) was mounted on the exterior of the frame in an oblique (forwards facing) orientation. Illumination was provided by six high intensity LED units distributed around the frame to provide even light across the field of view. The stills camera was fitted with a four-spot (green) laser-scaling device forming a 21cm x 21cm square (Figure 17) within the field of view. Set-up and operation followed the MESH 'Recommended Operating Guidelines (ROG) for underwater video and photographic imaging techniques'[1]. All data (JPEG, RAW image files and video files) were recorded to a computer hard drive before copying to a backup drive. A video overlay was used to provide station metadata, time, height above seabed and GPS position in the recorded video image.

The DC was controlled by a winch operator with sight of the video monitor.

Field notes were made during each camera deployment, noting station and sample metadata, real-time observations of substratum type and taxa, and an initial assessment of the range of BSHs that had been seen.

The internal clock of the camera used on the drop frame was synchronised with GPS time. This clock creates a timestamp in the EXIF data stored in the digital image. Sensors logging bottom temperature, altitude, bearing and depth recorded data for the duration of the tow.

[1] https://www.researchgate.net/publication/281293781_Recommended_operating_guidelines_ROG_for_underwater_video_and_photographic_imaging_techniques

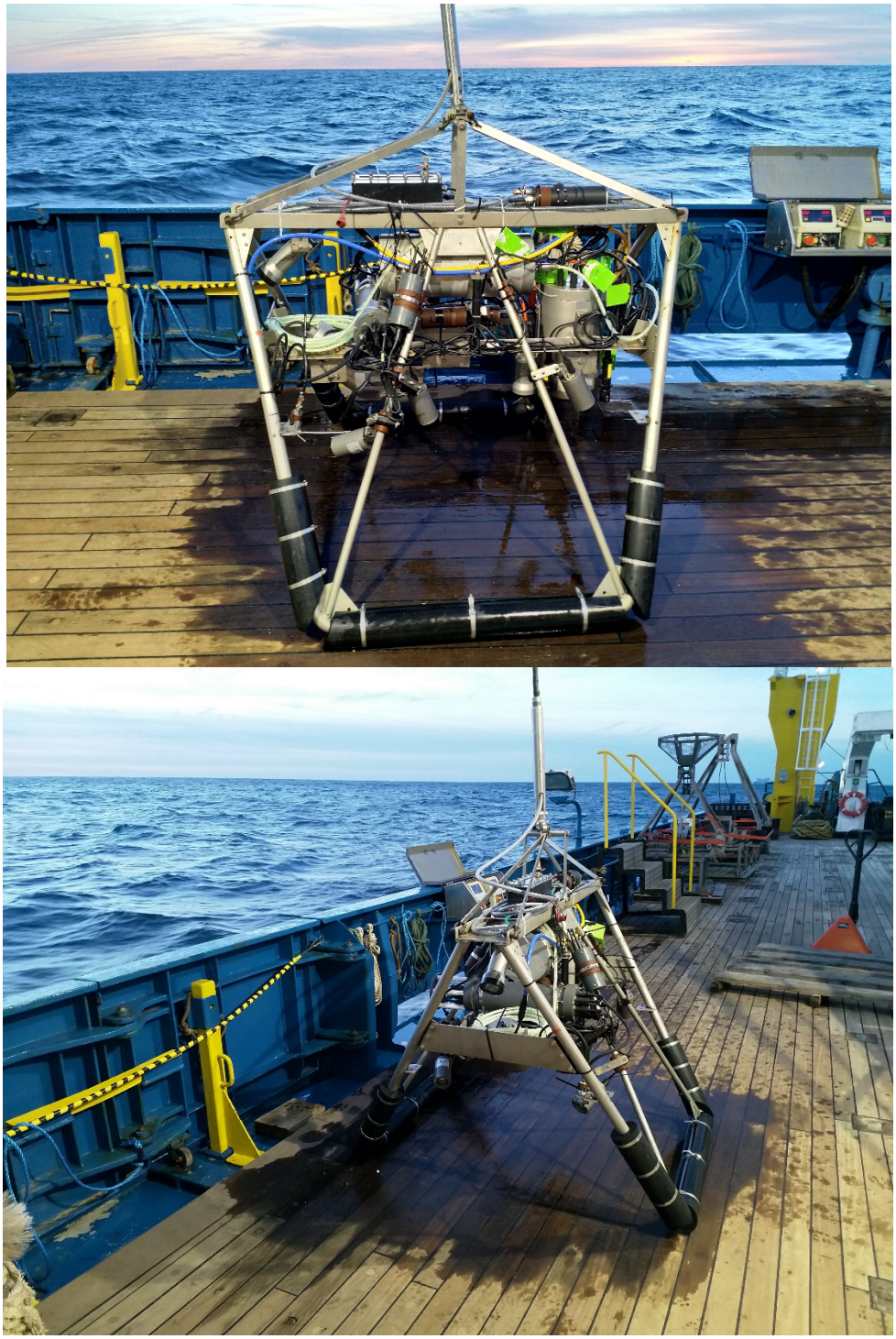

Figure 16. Drop camera video and still imaging system used during CEND0119.

Figure 17. Four-spot laser-scaling (green) forming a 21cm x 21cm square. Diagonal measurement is 30cm.

Hamon grab

The grab system employed for the study comprised a 0.1m^2 mini Hamon grab (Figure 18).

Samples were collected from the planned stations anywhere within a 50m radius bullring centred on the station location. On recovery, the grab was emptied into a large plastic bin and a representative integrated sub-sample of sediment (approximately 0.5L) taken for PSA. The PSA sample was stored in a labelled plastic container and frozen ready for transfer to a laboratory for analysis. The remaining sample was photographed, and the volume of sediment measured and recorded. Benthic fauna was collected by washing the sample with sea water over a 1mm sieve. The retained >1mm fraction was transferred to a labelled container and preserved in buffered 4% formaldehyde for later analysis. A visual assessment was made of the sediment type sampled by the grab and noted on the field records, assigning the sample to a preliminary Folk class and its equivalent EUNIS Level 3 broad-scale habitat (BSH).

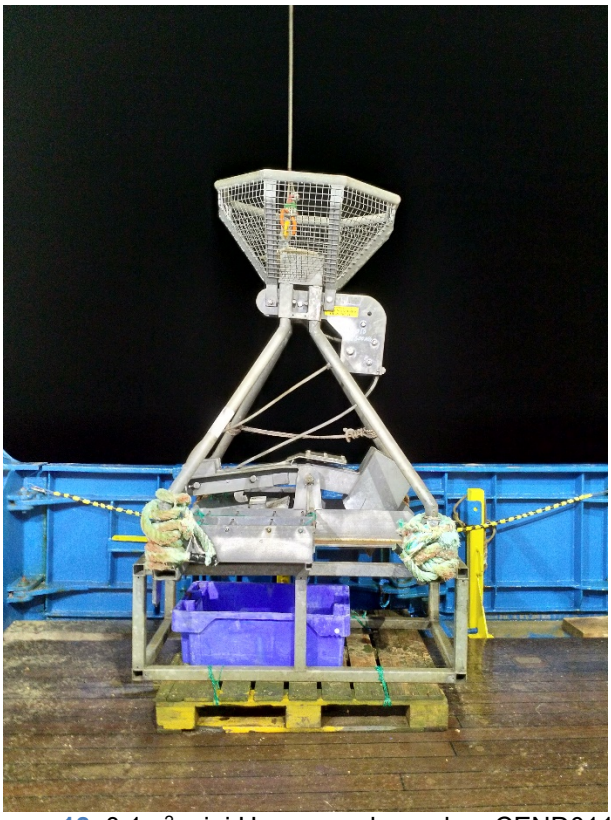

Figure 18. 0.1m^2 mini Hamon grab used on CEND0119.

Positioning software and offsets

Vessel offsets are defined from the pitch roll centre of the vessel, i.e. the Central Reference Point (CRP) is used by the Tower CEMAP software to calculate offsets to deployment gantry.

GPS fixes were recorded using the Tower Navigation system on RV *Cefas Endeavour*. This records the positional coordinates of the gantry from which the sampling equipment is being deployed, automatically compensating for the offset between these gantries and the GPS antenna, as well as the corrected position provided by the Ultra-Short Base Length HiPAP beacon, when in use.

The vessel offsets used to calculate a more accurate position for equipment deployed from the RV *Cefas Endeavour* are shown for the stern gantry, side gantry, and HiPAP (Figures 19-21).

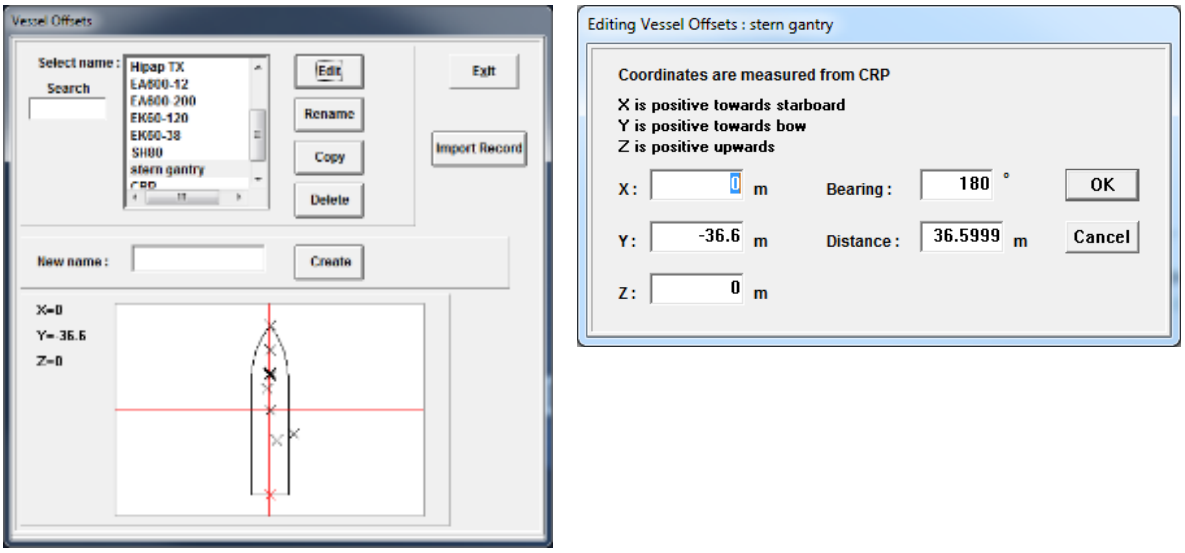

Figure 19. Stern Gantry vessel offsets in the Tower Navigation system.

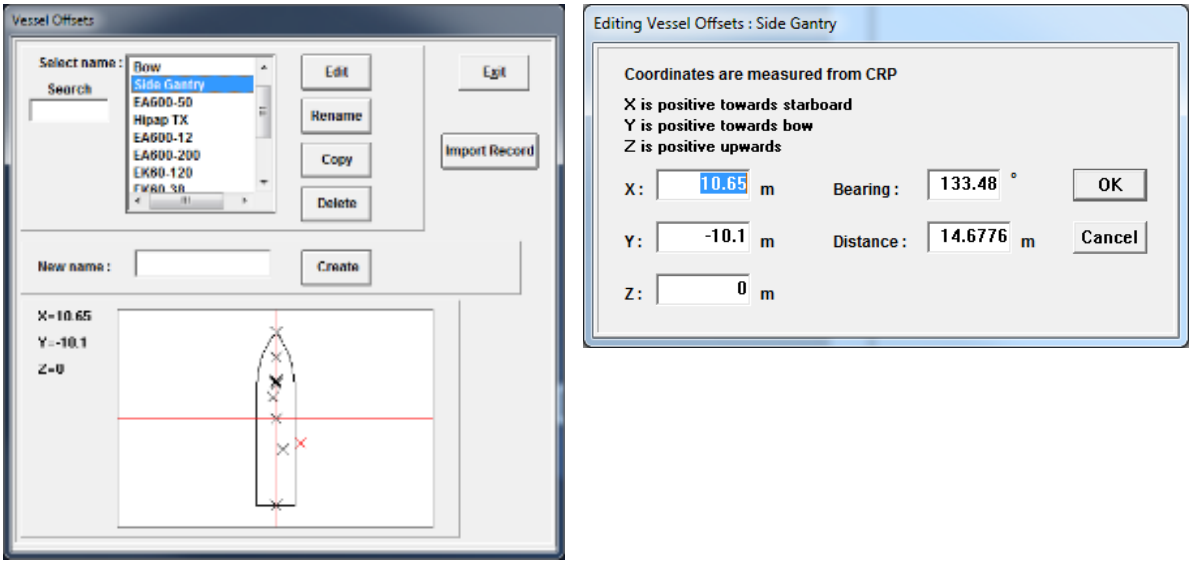

Figure 20. Side Gantry vessel offsets in the Tower Navigation system.

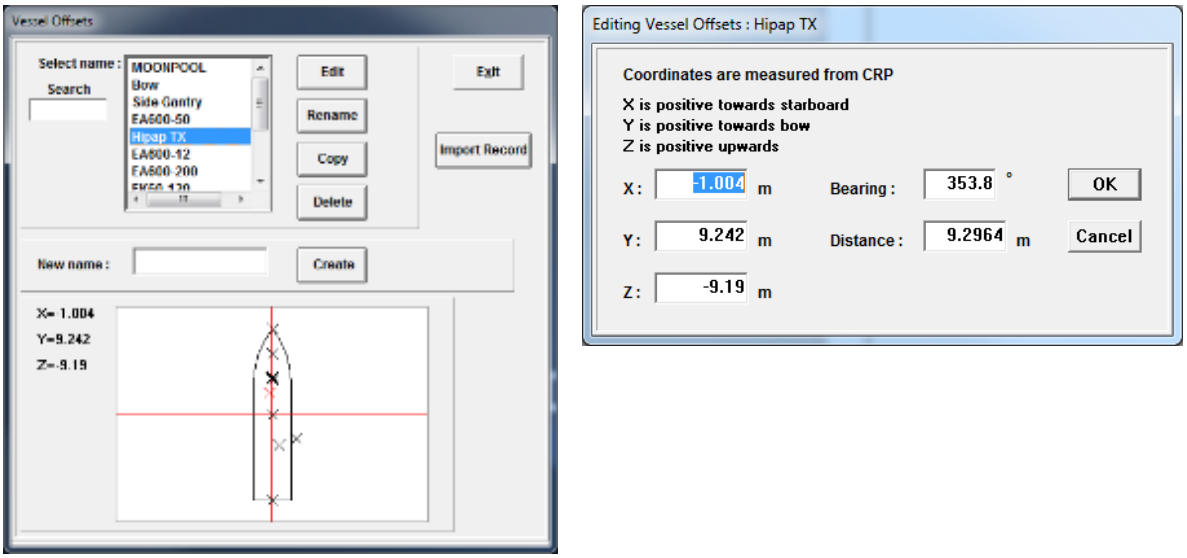

Figure 21. Hipap vessel offsets in the Tower Navigation system.

Appendix 3. Health and safety and ships drills

Table 13. Drills and toolbox talks held during CEND0119.

Drill/Toolbox	Time	Date	Staff
Vessel Induction	15:00	03/01/2019	All staff every six months
Masters & SIC Toolbox	11:00	04/01/2019	All staff
Muster stations and abandon ship	11:30	04/01/2019	All staff
CTD toolbox	13:30	04/01/2019	MIST and shift leads
Revised CTD toolbox	11:30	09/01/2019	MIST Day and shift lead
Revised CTD toolbox	00:00	10/01/2019	MIST Night and shift lead
Firefighting Drill	11:30	11/01/2019	All Staff
Drop camera and Hamon grab toolbox on bridge	10:30	12/01/2019	Night shift staff
Drop camera and Hamon grab toolbox on bridge	16:20	12/01/2019	Day shift staff
Drop camera toolbox on deck	17:30	12/01/2019	Day shift staff
Drop camera toolbox on deck	00:00	13/01/2019	Night shift staff
Hamon grab toolbox on deck	10:00	14/01/2019	Night shift staff
Hamon grab toolbox on deck	N/A	N/A	Day shift staff
Drop camera toolbox	22:00	16/01/2019	Day shift staff
Drop camera toolbox	00:00	17/01/2019	Night shift staff
Muster stations and abandon ship	11:00	17/01/2019	All staff
Hamon grab toolbox	08:15	18/01/2019	Night shift staff
Hamon grab toolbox	13:45	18/01/2019	Day shift staff

Appendix 4. Summary of survey operation time

Provision for 10% weather downtime was included in the planning for this survey. However, the weather throughout CEND0119 was consistently good. Only 03:50 hours of weather downtime were recorded. In addition, downtime due to equipment and vessel issues was also minimal (Table 14). Some survey objectives were added during the survey to make use of this time and some existing survey objectives were expanded on (with more stations or replicates).

Table 14. Breakdown of survey operations.

Type	Time
Mob/Demob	28:30
Offshore Calibrations	05:10
Total Operation Acoustic Survey	210:00
Total Operation Sampling	196:15
Equipment/Downtime	04:15
Ship/Plant Downtime	02:00
Waiting On Weather	03:50
Transit	55:05
Standby Port	33:00
Transit within Survey Area	06:55
Other	00:00
Total:	**545:00**

Appendix 5. Survey metadata

Table 15. Summary of multibeam run-lines carried out at Offshore Overfalls on CEND0119. SOL = Start of Line, EOL = End of line.

Event	Line ID	Replicate	Depth (m) SOL	Date	SOL Time	Latitude	Longitude	EOL Time	Latitude	Longitude
2	MBES_CAL	A1	60	04/01/2019	14:35	50.5093279	-0.5561038	14:44	50.5153846	-0.5330556
2	MBES_CAL	A2	60	04/01/2019	14:49	50.5162616	-0.5286755	14:57	50.5103699	-0.5484795
2	MBES_CAL50	B1	60	04/01/2019	15:09	50.5085432	-0.5561326	15:20	50.5157262	-0.5334668
2	MBES_-CAL50	B2	60	04/01/2019	15:36	50.5088715	-0.5519418	15:45	50.5149338	-0.5326592
2	MBES_CAL	C1	60	04/01/2019	15:54	50.5160316	-0.5308345	16:03	50.5111357	-0.5462589
3	MBES_79	A1	60	04/01/2019	16:30	50.5251673	-0.5090456	18:16	50.4038423	-0.71179
3	MBES_80	A1	60	04/01/2019	18:33	50.403687	-0.7082164	20:08	50.5218637	-0.5112831
3	MBES_81	A1	60	04/01/2019	20:18	50.5196114	-0.5110076	21:50	50.4032834	-0.705465
3	MBES_82	A1	60	04/01/2019	21:56	50.4041317	-0.700671	23:34	50.5173512	-0.5115138
3	MBES_83	A1	60	04/01/2019	23:41	50.5147533	-0.5118872	01:01	50.4035908	-0.6979327
3	MBES_84	A1	67	05/01/2019	01:15	50.4035691	-0.6942869	02:43	50.5133466	-0.5110025
3	MBES_85	A1	56	05/01/2019	02:50	50.51132	-0.5113956	04:18	50.4035574	-0.6906065
5	MBES_86	A1	66	05/01/2019	04:56	50.4032043	-0.687439	06:24	50.5089685	-0.5109034
5	MBES_87	A1	68	05/01/2019	06:32	50.5058075	-0.5109166	08:00	50.4038022	-0.6830912
5	MBES_88	A1	68	05/01/2019	08:15	50.403982	-0.680127	09:37	50.5059543	-0.5093387
5	MBES_89	A1	75	05/01/2019	09:44	50.5033898	-0.5094817	11:08	50.4030196	-0.6773298
5	MBES_90	A1	69	05/01/2019	11:15	50.4026931	-0.6743057	12:41	50.5006463	-0.5105643
5	MBES_91	A1	78	05/01/2019	12:48	50.4989256	-0.510334	14:04	50.4027759	-0.6703957
5	MBES_92	A1	67	05/01/2019	14:13	50.4027578	-0.6670876	15:35	50.4957546	-0.511402

Event	Line ID	Replicate	Depth (m) SOL	Date	SOL Time	Latitude	Longitude	EOL Time	Latitude	Longitude
5	MBES_93	A1	74	05/01/2019	15:41	50.4937987	-0.5115263	17:00	50.4028805	-0.6629551
7	MBES_94	A1	66	05/01/2019	17:57	50.4038112	-0.6574209	19:10	50.4915232	-0.5110618
7	MBES_95	A1	65	05/01/2019	19:16	50.4894198	-0.5109786	20:31	50.4029624	-0.6559955
7	MBES_96	A1	67	05/01/2019	20:37	50.4021867	-0.6523322	21:43	50.4870775	-0.5118449
7	MBES_97	A1	69	05/01/2019	21:52	50.4852329	-0.5110753	23:01	50.4032448	-0.6481014
7	MBES_98	A1	67	05/01/2019	23:08	50.4028167	-0.6451107	00:12	50.4782782	-0.5192615
9	MBES_98	A2	67	05/01/2019	00:55	50.4842854	-0.5087004	01:05	50.4730881	-0.5281983
9	MBES_99	A1	68	06/01/2019	01:23	50.4824924	-0.5086329	02:27	50.4019332	-0.6430112
9	MBES_100	A1	57	06/01/2019	02:36	50.4023127	-0.6392398	02:59	50.4296958	-0.5932852
9	MBES_100	A1	57	06/01/2019	03:01	50.4314239	-0.5903457	03:43	50.4797008	-0.509353
9	MBES_101	A1	59	06/01/2019	04:02	50.4772475	-0.5106976	05:08	50.4017671	-0.6360987
9	MBES_102	A1	54	06/01/2019	05:15	50.4002307	-0.6351179	06:19	50.4751342	-0.5099349
9	MBES_103	A1	56	06/01/2019	06:25	50.4728357	-0.5096337	07:27	50.4025361	-0.627511
9	MBES_104	A1	54	06/01/2019	07:31	50.4010139	-0.6255405	08:26	50.4698003	-0.5116442
9	MBES_105	A1	61	06/01/2019	08:42	50.468173	-0.5108755	09:37	50.4024004	-0.6206211
9	MBES_106	A1	52	06/01/2019	09:54	50.4023955	-0.615916	10:46	50.4657946	-0.5111044
9	MBES_107	A1	61	06/01/2019	10:53	50.4646287	-0.5097234	11:49	50.4020872	-0.6140771
12	MBES_108	A1	51	06/01/2019	15:10	50.4023766	-0.6106178	16:02	50.4624201	-0.509461
12	MBES_109	A1	54	06/01/2019	16:08	50.4595065	-0.5113596	16:57	50.4024425	-0.6062059
12	MBES_110	A1	49	06/01/2019	17:05	50.4021588	-0.603446	17:52	50.4572023	-0.5110091
12	MBES_111	A1	?	06/01/2019	17:59	50.4554122	-0.5100894	18:48	50.4023748	-0.5991243
12	MBES_112	A1	50	06/01/2019	18:54	50.4020397	-0.5954802	19:36	50.4524867	-0.5116838

Event	Line ID	Replicate	Depth (m) SOL	Date	SOL Time	Latitude	Longitude	EOL Time	Latitude	Longitude
12	MBES_113	A1	53	06/01/2019	19:43	50.4505792	-0.5109474	20:24	50.4024832	-0.591794
12	MBES_114	A1	52	06/01/2019	20:55	50.4023098	-0.5879145	21:34	50.4484898	-0.511299
12	MBES_115	A1	54	06/01/2019	21:44	50.4463409	-0.5113445	22:22	50.4022804	-0.5848876
12	MBES_116	A1	53	06/01/2019	22:35	50.4023822	-0.5808031	22:36	50.4062634	-0.5758232
12	MBES_116	A2	53	06/01/2019	22:52	50.4026181	-0.5818899	23:38	50.444301	-0.5111136
12	MBES_117	A1	53	06/01/2019	23:36	50.4418397	-0.5116296	00:07	50.4018308	-0.5783903
14	MBES_118	A1	53	07/01/2019	00:38	50.4018847	-0.5749664	01:11	50.440172	-0.5107774
14	MBES_119	A1	53	07/01/2019	01:18	50.438363	-0.5101591	01:47	50.4015659	-0.5717191
14	MBES_120	A1	51	07/01/2019	01:55	50.4009157	-0.569711	02:26	50.4362658	-0.5103576
14	MBES_121	A1	52	07/01/2019	02:38	50.4335766	-0.5110696	03:06	50.3998912	-0.5673243
14	MBES_122	A1	50	07/01/2019	03:14	50.4012467	-0.5614733	03:41	50.4317173	-0.5104082
14	MBES_123	A1	50	07/01/2019	03:47	50.4296194	-0.510529	04:11	50.4012644	-0.5577372
14	MBES_124	A1	50	07/01/2019	04:19	50.4014746	-0.5537626	04:40	50.427235	-0.5108019
14	MBES_125	A1	50	07/01/2019	04:46	50.4255432	-0.5101045	05:07	50.401614	-0.549987
14	MBES_126	A1	49	07/01/2019	05:12	50.4002863	-0.54851	05:32	50.4228992	-0.5108209
14	MBES_127	A1		07/01/2019	05:38	50.4206264	-0.5107136	05:54	50.4012882	-0.5433134
14	MBES_128	A1	49	07/01/2019	06:02	50.4000447	-0.5416791	06:19	50.4184308	-0.5110611
14	MBES_129	A1	49	07/01/2019	06:26	50.4168737	-0.510181	06:40	50.401323	-0.5359885
14	MBES_130	A1	49	07/01/2019	06:50	50.4001609	-0.5342203	07:01	50.4137595	-0.511477
14	MBES_131	A1	50	07/01/2019	07:38	50.412067	-0.5107358	07:47	50.4013323	-0.528774
14	MBES_132	A1	50	07/01/2019	07:52	50.400935	-0.5260463	07:59	50.4097162	-0.5111717
14	MBES_133	A1	50	07/01/2019	08:05	50.4082189	-0.5095943	08:11	50.4011511	-0.5219332

Event	Line ID	Replicate	Depth (m) SOL	Date	SOL Time	Latitude	Longitude	EOL Time	Latitude	Longitude
14	MBES_134	A1	50	07/01/2019	08:17	50.4013387	-0.5174847	08:20	50.4055094	-0.5111729
14	MBES_135	A1	50	07/01/2019	08:27	50.4034191	-0.5106203	08:28	50.4013384	-0.5144267
14	INF01	A1	54	07/01/2019	09:20	50.4099132	-0.6029657	09:24	50.4052269	-0.6111743
14	INF02	A1	53	07/01/2019	09:44	50.4034769	-0.6097226	09:47	50.4037261	-0.618677
14	INF03	A1	55	07/01/2019	09:54	50.4058111	-0.6158459	09:56	50.4093567	-0.6106382
14	INF04	A1	63	07/01/2019	10:14	50.4074207	-0.6342665	10:17	50.4040551	-0.6408712
14	INF05	A1	68	07/01/2019	10:25	50.4040824	-0.6502362	10:29	50.4043892	-0.6602457
14	INF06	A1	87	07/01/2019	10:39	50.4114363	-0.6691386	10:43	50.4159829	-0.6611679
14	INF07	A1	67	07/01/2019	10:53	50.4198195	-0.6638625	10:57	50.4145219	-0.6726481
14	INF08	A1	64	07/01/2019	11:08	50.4065855	-0.6982935	11:10	50.4036229	-0.7025373
16	MBES_78	A1	67	07/01/2019	11:20	50.4027075	-0.7166443	13:06	50.5262754	-0.5108498
16	MBES_77	A1	64	07/01/2019	13:41	50.5298717	-0.5083809	15:28	50.4038836	-0.7189517
16	MBES_76	A1	64	07/01/2019	15:36	50.4033972	-0.7234208	17:27	50.5300308	-0.511809
16	MBES_75	A1	62	07/01/2019	17:43	50.5333318	-0.5090816	19:37	50.4032298	-0.7273656
16	MBES_74	A1	63	07/01/2019	19:44	50.4039355	-0.7292526	19:47	50.4083589	-0.7239322
16	MBES_74	A2	63	07/01/2019	20:02	50.4034733	-0.729826	20:08	50.4130368	-0.7162438
16	MBES_47	A1	67	07/01/2019	20:38	50.435602	-0.7700208	21:06	50.4044306	-0.8221526
16	MBES_45	A1	67	07/01/2019	21:13	50.4056002	-0.8244332	21:17	50.4115893	-0.8152342
16	MBES_45	A2	67	07/01/2019	21:34	50.4344085	-0.7760707	22:00	50.4046605	-0.8253452
16	MBES_43	A1	68	07/01/2019	22:21	50.433209	-0.7810305	22:46	50.4046006	-0.8290755
16	MBES_41	A1	68	07/01/2019	23:04	50.4319009	-0.7871682	23:28	50.4045663	-0.8328218
16	MBES_39	A1	69	07/01/2019	23:48	50.4307132	-0.7926341	00:11	50.4045451	-0.8362734

Event	Line ID	Replicate	Depth (m) SOL	Date	SOL Time	Latitude	Longitude	EOL Time	Latitude	Longitude
16	MBES_37	A1	67	07/01/2019	00:44	50.4046232	-0.8397087	01:08	50.4292075	-0.7991408
18	MBES_35	A1	68	07/01/2019	01:13	50.4287093	-0.8036115	01:34	50.4048977	-0.8429808
18	MBES_49	A1	68	07/01/2019	01:50	50.4043585	-0.8187309	04:34	50.5856978	-0.5158653
18	MBES_50	A1	45	07/01/2019	04:40	50.5859165	-0.5120651	07:16	50.4044045	-0.8149915
18	MBES_51	A1	67	08/01/2019	07:20	50.4043555	-0.8118288	09:43	50.5842085	-0.511228
18	MBES_52	A1	51	08/01/2019	09:51	50.5827177	-0.5099349	12:21	50.4048794	-0.8069938
20	MBES_53	A1	68	08/01/2019	12:58	50.4043098	-0.8045292	15:30	50.5800013	-0.5110678
20	MBES_54	A1	50	08/01/2019	15:35	50.5782094	-0.5106793	16:34	50.5091656	-0.6260775
20	MBES_54	A1	59	08/01/2019	16:36	50.5076911	-0.628542	18:01	50.4043412	-0.8007616
20	MBES_55	A1	55	08/01/2019	18:18	50.4043104	-0.7973089	20:40	50.5755689	-0.5111722
20	MBES_56	A1	52	08/01/2019	20:47	50.5733056	-0.5113501	23:13	50.4043035	-0.7936758
20	MBES_57	A1	58	08/01/2019	23:20	50.4044503	-0.7902528	01:50	50.5715033	-0.5110631
22	MBES_58	A1	61	09/01/2019	03:06	50.5701982	-0.5100668	05:15	50.4042551	-0.7864757
22	MBES_59	A1	55	09/01/2019	05:26	50.4032071	-0.7846343	07:46	50.5677351	-0.5097928
22	MBES_60	A1	67	09/01/2019	07:51	50.5655586	-0.5099609	10:09	50.4041601	-0.7796822
22	MBES_61	A1	63	09/01/2019	10:29	50.4034628	-0.7760207	12:39	50.5627311	-0.5110163
24	MBES_62	A1	62	09/01/2019	13:36	50.5616254	-0.5092356	15:39	50.404479	-0.771641
24	MBES_63	A1	64	09/01/2019	15:51	50.4037109	-0.7694658	18:05	50.5585864	-0.5107828
24	MBES_64	A1	63	09/01/2019	18:14	50.5570588	-0.5102998	20:22	50.4038713	-0.7656562
24	MBES_65	A1	57	09/01/2019	20:27	50.4037206	-0.7621207	22:26	50.5540804	-0.5113224
24	MBES_66	A1	61	09/01/2019	22:35	50.5523774	-0.5102498	00:40	50.4039904	-0.7582844
26	MBES_67	A1	63	10/01/2019	01:25	50.4034326	-0.7559931	03:41	50.5499249	-0.5108986

Event	Line ID	Replicate	Depth (m) SOL	Date	SOL Time	Latitude	Longitude	EOL Time	Latitude	Longitude
26	MBES_68	A1	60	10/01/2019	03:47	50.5475512	-0.5112294	05:42	50.4036962	-0.7515546
26	MBES_69	A1	61	10/01/2019	05:49	50.4031662	-0.7487695	07:48	50.5453187	-0.5113924
26	MBES_70	A1	61	10/01/2019	07:51	50.544586	-0.5098523	09:54	50.4032667	-0.7450664
26	MBES_71	A2	64	10/01/2019	10:23	50.4026629	-0.7427107	12:11	50.5409323	-0.5116484
28	MBES_72	A1	72	10/01/2019	12:52	50.5398928	-0.5096835	14:46	50.4041917	-0.7364451
28	MBES_73	A1	65	10/01/2019	15:22	50.4031304	-0.7345565	17:19	50.5371643	-0.5106759
29	XLINE01	A1	62	10/01/2019	17:32	50.5309716	-0.5096746	18:23	50.5859426	-0.617065
30	MBES_20_3	A1	40	10/01/2019	18:53	50.5843082	-0.6186362	18:55	50.5866002	-0.6149124
32	MBES_20_10	A1	41	10/01/2019	19:21	50.5825844	-0.6188258	19:25	50.5866752	-0.6119053
32	MBES_20_17	A1	44	10/01/2019	19:32	50.5871912	-0.6082861	19:36	50.5814179	-0.6178452
32	MBES_20_24	A1	42	10/01/2019	19:45	50.5791207	-0.6188901	19:50	50.5866654	-0.6061771
32	MBES_20_31	A1	45	10/01/2019	19:56	50.586932	-0.602633	20:03	50.5778421	-0.6180981
32	MBES_20_38	A1	45	10/01/2019	20:10	50.5756442	-0.6189984	20:19	50.5866474	-0.6003565
32	MBES_20_46	A1	47	10/01/2019	20:27	50.5864695	-0.59727	20:38	50.5739462	-0.6183055
32	MBES_20_54	A1	49	10/01/2019	20:45	50.571251	-0.6196138	20:58	50.5864213	-0.5941368
32	MBES_20_62	A1	52	11/01/2019	02:32	50.5876189	-0.5901537	02:49	50.5694612	-0.619243
32	MBES_20_72	A1	66	11/01/2019	03:00	50.5678652	-0.6195273	03:16	50.586792	-0.5878358
32	MBES_20_90	A1	55	11/01/2019	03:24	50.5869519	-0.5843958	03:42	50.565608	-0.6196504
32	MBES_20_106	A1	62	11/01/2019	03:50	50.5637488	-0.6194966	04:10	50.586593	-0.5811455
32	MBES_20_122	A1	40	11/01/2019	04:17	50.5866111	-0.5777116	04:38	50.562	-0.6191869
32	MBES_20_138	A1	45	11/01/2019	04:46	50.5586597	-0.6212298	05:11	50.5864233	-0.5746975
32	MBES_20_154	A1	47	11/01/2019	05:16	50.5870191	-0.5701867	05:41	50.55771	-0.6195474

Event	Line ID	Replicate	Depth (m) SOL	Date	SOL Time	Latitude	Longitude	EOL Time	Latitude	Longitude
32	MBES_20_168	A1	43	11/01/2019	05:49	50.5553087	-0.6205737	06:16	50.5864605	-0.5683533
32	MBES_20_180	A1	45	11/01/2019	06:23	50.586283	-0.5669496	06:49	50.5545434	-0.6194337
32	MBES_20_188	A1	40	11/01/2019	06:57	50.5533694	-0.6206426	07:24	50.5861834	-0.5648193
32	MBES_20_198	A1	44	11/01/2019	07:31	50.5862939	-0.5629774	07:59	50.552441	-0.6193059
34	MBES_20_208	A1	37	11/01/2019	08:27	50.5501214	-0.6208614	08:56	50.5859674	-0.5610803
34	MBES_20_218	A1	40	11/01/2019	09:04	50.5863296	-0.5581663	09:34	50.550087	-0.619143
34	MBES_20_228	A2	39	11/01/2019	10:05	50.5481708	-0.6201336	10:35	50.5857665	-0.5572122
34	MBES_20_240	A1	42	11/01/2019	10:47	50.5864063	-0.5535097	11:21	50.5468815	-0.6199883
34	MBES_20_252	A1	43	11/01/2019	11:29	50.5454522	-0.6202368	12:02	50.5859804	-0.5521109
34	MBES_20_266	A1	47	11/01/2019	12:12	50.5862284	-0.5485675	12:47	50.5440015	-0.6193425
34	MBES_20_280	A1	44	11/01/2019	12:55	50.5416056	-0.6200759	13:16		
34	MBES_20_280	A1	44	11/01/2019	13:18	50.5694029	-0.5740559	13:32	50.5863513	-0.5452484
34	MBES_20_294	A1	39	11/01/2019	13:41	50.5859924	-0.5433105	14:20	50.5402723	-0.6197602
34	MBES_20_308	A1	47	11/01/2019	14:24	50.5380682	-0.6206659	15:07	50.5855924	-0.5410117
34	MBES_20_304	A1	36	11/01/2019	15:16	50.5843639	-0.5440756	15:18	50.5813537	-0.5489505
34	MBES_20_312	A1	35	11/01/2019	15:33	50.5862226	-0.5396269	15:38	50.5796188	-0.5502244
34	MBES_20_318	A1	37	11/01/2019	15:56	50.5857941	-0.5384925	16:38	50.5374373	-0.6196285
34	MBES_20_330	A1	44	11/01/2019	16:46	50.5355644	-0.6201948	17:30	50.5856022	-0.5365197
34	MBES_20_340	A1	38	11/01/2019	17:38	50.58592	-0.5335194	18:22	50.5348487	-0.6193943
36	MBES_20_352	A1	43	11/01/2019	19:04	50.5324392	-0.6208432	19:49	50.5856068	-0.5319112
36	MBES_20_364	A1	43	11/01/2019	19:57	50.5857609	-0.5291751	20:44	50.5315585	-0.6200764
36	MBES_20_376	A1	43	11/01/2019	20:54	50.5297794	-0.620413	21:38	50.5852758	-0.527509

Event	Line ID	Replicate	Depth (m) SOL	Date	SOL Time	Latitude	Longitude	EOL Time	Latitude	Longitude
36	MBES_20_390	A1	45	11/01/2019	21:49	50.5858766	-0.5239242	22:39	50.528479	-0.6197871
36	MBES_20_404	A1	46	12/01/2019	23:03	50.5261633	-0.6214556	23:52	50.5852848	-0.5217078
36	MBES_20_418	A1	48	12/01/2019	00:03	50.5857898	-0.5180532	01:00	50.5248346	-0.6201241
36	MBES_20_426	A1	50	12/01/2019	01:16	50.5234071	-0.6209007	02:02	50.5759426	-0.5329612
36	MBES_20_426	A1	48	12/01/2019	02:32	50.5862512	-0.5155345	02:42	50.5743832	-0.5355098
36	MBES_74	A1	66	12/01/2019	03:08	50.5364574	-0.5081688	05:00	50.4033505	-0.7305654
37	XLINE10	A1	56	12/01/2019	05:23	50.4024931	-0.7902519	05:41	50.4247698	-0.8215204
38	MBES_9	A1	52	12/01/2019	06:11	50.4059438	-0.8879061	06:17	50.4125457	-0.8768297
38	MBES_11	A1	52	12/01/2019	06:23	50.4141221	-0.8709929	06:31	50.4050619	-0.8855975
38	MBES_13	A1	53	12/01/2019	06:37	50.4048377	-0.882429	06:46	50.4150942	-0.8653746
38	MBES_15	A1	57	12/01/2019	06:52	50.4164676	-0.8597237	07:02	50.4046933	-0.8790208
38	MBES_17	A1	56	12/01/2019	07:11	50.4052358	-0.8745246	07:21	50.4174158	-0.8543786
38	MBES_19	A1	58	12/01/2019	07:26	50.4189201	-0.848244	07:38	50.4051236	-0.8711214
38	MBES_20	A1	58	12/01/2019	07:45	50.4050157	-0.8677753	07:57	50.4197872	-0.8433915
40	MBES_23	A1	63	12/01/2019	08:33	50.4214929	-0.8377744	08:47	50.4051378	-0.8638963
40	MBES_25	A1	61	12/01/2019	08:53	50.40459	-0.8615296	09:07	50.4220497	-0.832367
40	MBES_27	A1	64	12/01/2019	09:20	50.4231513	-0.8266304	09:35	50.4048341	-0.8573216
40	MBES_29	A1	64	12/01/2019	09:42	50.4048493	-0.8538032	09:58	50.4242412	-0.8214931
40	MBES_31	A1	65	12/01/2019	10:10	50.4257283	-0.8157415	10:28	50.4051411	-0.8496328
40	MBES_33	A1	65	12/01/2019	10:54	50.4047587	-0.8470671	11:11	50.4268786	-0.8098885
40	MBES_35	A1	66	12/01/2019	11:32	50.4299773	-0.8013427	11:53	50.404863	-0.8429943
40	MBES_39	A1	66	12/01/2019	12:06	50.4047887	-0.8362249	12:27	50.4304672	-0.7934233

Event	Line ID	Replicate	Depth (m) SOL	Date	SOL Time	Latitude	Longitude	EOL Time	Latitude	Longitude
41	XLINE09	A1	64	12/01/2019	13:17	50.4894127	-0.6967719	14:28	50.399668	-0.5646312
41	XLINE06	A1	54	12/01/2019	15:02	50.4428263	-0.4961928	16:09	50.5277459	-0.6210418
42	INF12	A1	55	12/01/2019	20:29	50.5063637	-0.6309838	20:33	50.511297	-0.6227956
79	INF16	A1	73	14/01/2019	03:17	50.5029321	-0.5200044	03:22	50.5077377	-0.5102552
79	INF15	A2	65	14/01/2019	03:38	50.5110247	-0.5207528	03:43	50.5171666	-0.5092344
81	INF13	A1	64	14/01/2019	04:52	50.4692712	-0.5358664	04:57	50.4743316	-0.5258796
101	INF14	A1	56	14/01/2019	20:17	50.4283677	-0.59552	20:21	50.4327772	-0.5881738
114	INF10	A1	61	15/01/2019	06:06	50.5213686	-0.610278	06:10	50.5256279	-0.6038155
114	INF09	A1	61	15/01/2019	06:18	50.5315954	-0.5970546	06:25	50.5243812	-0.6107234
114	INF11	A1	54	15/01/2019	06:33	50.5221116	-0.6121847	06:38	50.5288168	-0.6163651
114	INF22	A1	63	15/01/2019	06:58	50.5372675	-0.5738792	07:00	50.5402488	-0.5687937
114	INF21	A1	65	15/01/2019	07:09	50.5458288	-0.5618439	07:15	50.5384833	-0.57507
114	INF25	A1	70	15/01/2019	07:32	50.5431684	-0.5558694	07:36	50.5483092	-0.5479956
114	INF24	A2	66	15/01/2019	07:51	50.5589369	-0.5330421	07:53	50.5564952	-0.5394567
114	INF23	A1	58	15/01/2019	08:06	50.5592531	-0.5566484	08:08	50.561864	-0.5519396
114	INF20	A1	58	15/01/2019	08:20	50.5712862	-0.5706979	08:24	50.5665189	-0.5787179
114	INF19	A1	32	15/01/2019	08:35	50.573719	-0.5864238	08:39	50.5778671	-0.5772063
114	INF18	A1	40	15/01/2019	08:50	50.579142	-0.5495074	08:52	50.5814352	-0.5443904
114	INF17	A1	38	15/01/2019	09:02	50.5823614	-0.5382723	09:09	50.5758821	-0.5519125

Table 16. Drop camera samples taken at Offshore Overfalls MCZ on CEND0119. Failed attempts not included. SOL = Start of Line, EOL = End of line.

Event	Station Code	Replicate	Depth (m)	Date	SOL Time	Latitude	Longitude	EOL Time	Latitude	Longitude
43	OOVR049	A1	39	12/01/2019	21:40	50.5461599	-0.6492812	21:46	50.5460757	-0.6499693
44	OOVR041	A1	47	12/01/2019	22:34	50.519601	-0.6270729	22:40	50.519398	-0.6277855
44	OOVR041	B1	46	12/01/2019	22:56	50.5196146	-0.6278948	23:02	50.5198491	-0.6271522
44	OOVR041	C1	47	12/01/2019	23:11	50.5194371	-0.6269172	23:17	50.5192269	-0.6275891
45	OOVR050	A1	47.2	13/01/2019	00:42	50.5451484	-0.6020066	00:49	50.5450523	-0.6028141
46	OOVR051	A1	69	13/01/2019	01:22	50.544126	-0.5546914	01:28	50.5440303	-0.5555155
47	OOVR060	A1	57	13/01/2019	02:03	50.5678533	-0.5326266	02:09	50.5677174	-0.5334277
48	OOVR059	A1	49	13/01/2019	02:42	50.5708357	-0.5771284	02:47	50.5707853	-0.5779426
49	OOVR058	A1	49	13/01/2019	03:20	50.5735782	-0.6211591	03:26	50.5735836	-0.622016
50	OOVR057	A1	31	13/01/2019	04:13	50.5738373	-0.6760429	04:19	50.5738493	-0.6768502
51	OOVR056	A1	30	13/01/2019	04:53	50.5736668	-0.7192314	04:59	50.5736819	-0.7200351
52	OOVR055	A1	31	13/01/2019	05:36	50.5745313	-0.7666205	05:45	50.5745673	-0.7677767
53	OOVR054	A1	28	13/01/2019	06:12	50.575391	-0.8138974	06:18	50.575525	-0.8146694
54	OOVR053	A1	36	13/01/2019	06:49	50.5763094	-0.8625818	06:55	50.5763845	-0.8618205
55	OOVR052	A1	36	13/01/2019	08:07	50.5770195	-0.9100071	08:13	50.5772334	-0.9093657
56	OOVR044	A1	26	13/01/2019	08:51	50.550777	-0.8863117	08:57	50.5506123	-0.8870494
56	OOVR044	B1	25	13/01/2019	09:05	50.5508598	-0.8870281	09:11	50.5510104	-0.886291
56	OOVR044	C1	26	13/01/2019	09:20	50.5505629	-0.886132	09:27	50.5503751	-0.886992
57	OOVR045	A1	25	13/01/2019	10:04	50.5498475	-0.8389051	10:10	50.5497503	-0.8396924
57	OOVR045	B1	26	13/01/2019	10:17	50.550013	-0.8395995	10:23	50.5500906	-0.8387869
57	OOVR045	C1	25	13/01/2019	10:33	50.5496212	-0.8388025	10:40	50.549531	-0.8395906
58	OOVR046	A1	26	13/01/2019	11:18	50.5488001	-0.7925496	11:24	50.5489175	-0.7917924
59	OOVR047	A1	28	13/01/2019	12:20	50.5450129	-0.7482222	12:26	50.5450448	-0.7474481
60	OOVR048	A1	27	13/01/2019	12:55	50.546974	-0.6978134	13:01	50.5470232	-0.6971732
61	OOVR040	A1	34	13/01/2019	13:36	50.5205661	-0.6751883	13:42	50.5205759	-0.6744327
62	OOVR039	A1	27	13/01/2019	14:33	50.521374	-0.7218122	14:39	50.5212911	-0.7226534

Event	Station Code	Replicate	Depth (m)	Date	SOL Time	Latitude	Longitude	EOL Time	Latitude	Longitude
62	OOVR039	B1	27	13/01/2019	14:48	50.5210839	-0.7225661	14:54	50.5211492	-0.7217586
62	OOVR039	C1	27	13/01/2019	15:03	50.5216036	-0.7218565	15:09	50.5215234	-0.7226457
63	OOVR038	A1	30	13/01/2019	15:44	50.5223802	-0.7693558	15:50	50.5222724	-0.7699994
64	OOVR037	A1	30	13/01/2019	16:16	50.5229814	-0.8163719	16:22	50.5230729	-0.817111
65	OOVR036	A1	30	13/01/2019	16:45	50.5241119	-0.8640666	16:51	50.5240989	-0.8648201
66	OOVRGT2	A1	29	13/01/2019	17:46	50.539112	-0.8948687	18:01	50.5393062	-0.8928509
67	OOVR035	A1	32	13/01/2019	18:32	50.5248338	-0.9124822	18:38	50.5248603	-0.9117821
68	OOVRGT3	A1	29	13/01/2019	19:07	50.5145182	-0.871042	19:22	50.5147049	-0.8689725
69	OOVR027	A1	28	13/01/2019	19:52	50.4983084	-0.8899748	19:58	50.4983155	-0.8891939
70	OOVR028	A1	28	13/01/2019	20:47	50.4974461	-0.842639	20:53	50.4974414	-0.8419002
71	OOVR029	A1	27	13/01/2019	21:29	50.496627	-0.7938921	21:35	50.4965276	-0.7946949
72	OOVR030	A1	33	13/01/2019	22:07	50.4956335	-0.7465152	22:13	50.495638	-0.7474032
73	OOVR031	A1	50	13/01/2019	22:44	50.4946991	-0.6992781	22:50	50.494755	-0.7
74	OOVR032	A1	65	13/01/2019	23:23	50.4936678	-0.6520513	23:29	50.493791	-0.6527018
75	OOVR033	A1	66	14/01/2019	00:12	50.492663	-0.6049535	00:19	50.4928413	-0.6057856
76	OOVR042	A1	76	14/01/2019	00:56	50.5186638	-0.580465	01:02	50.5184954	-0.5797532
77	OOVR043	A1	65	14/01/2019	01:39	50.5183961	-0.5309148	01:45	50.5183892	-0.5317147
77	OOVR043	B1	66	14/01/2019	01:54	50.5181372	-0.5317145	02:00	50.5181564	-0.5309456
77	OOVR043	C1	65	14/01/2019	02:11	50.5186114	-0.5309322	02:17	50.5186134	-0.5317327
80	OOVR034	A1	77	14/01/2019	04:23	50.4916063	-0.557409	04:29	50.4918349	-0.5580208
82	OOVR026	A1	64	14/01/2019	05:30	50.4648921	-0.5360281	05:37	50.4651777	-0.5352575
83	OOVR025	A1	67	14/01/2019	06:09	50.4659478	-0.5834063	06:15	50.4662006	-0.5826867
84	OOVR024	A1	68	14/01/2019	06:46	50.4668813	-0.6307124	06:53	50.4671927	-0.6298906
85	OOVR023	A1	57	14/01/2019	08:04	50.4678199	-0.6779672	08:10	50.468141	-0.6774417
86	OOVR022	A1	66	14/01/2019	08:56	50.4687583	-0.7252432	09:02	50.4691305	-0.724676
87	OOVR021	A1	49	14/01/2019	09:43	50.4697011	-0.7725768	09:49	50.4700375	-0.7720801
88	OOVRGT5	A1	51	14/01/2019	10:26	50.4588041	-0.7732721	10:42	50.4596272	-0.7748709

Event	Station Code	Replicate	Depth (m)	Date	SOL Time	Latitude	Longitude	EOL Time	Latitude	Longitude
89	OOVRGT6	A1	41	14/01/2019	11:18	50.4762421	-0.8066818	11:34	50.4766931	-0.8086286
90	OOVR020	A1	44	14/01/2019	12:17	50.470799	-0.8189223	12:23	50.4708767	-0.8196225
90	OOVR020	A1	45	14/01/2019	12:31	50.4706409	-0.8196591	12:37	50.4705583	-0.8189248
90	OOVR020	A1	44	14/01/2019	12:46	50.4710223	-0.8188367	12:52	50.4711009	-0.8195604
91	OOVR019	A1	32	14/01/2019	13:23	50.4717403	-0.866157	13:29	50.4717983	-0.866867
92	OOVR018	A1	31	14/01/2019	13:58	50.4724897	-0.9135613	14:04	50.4725449	-0.9143214
92	OOVR018	B1	31	14/01/2019	14:11	50.4723129	-0.9143521	14:17	50.4722658	-0.9136692
92	OOVR018	C1	31	14/01/2019	14:23	50.4727229	-0.9135838	14:29	50.4727733	-0.9143067
93	OOVR010	A1	37	14/01/2019	14:55	50.4458243	-0.8911597	15:01	50.4459029	-0.8919283
94	OOVR011	A1	50	14/01/2019	15:27	50.4464369	-0.8456949	15:33	50.4464884	-0.846423
95	OOVR012	A1	57	14/01/2019	16:01	50.444182	-0.7966466	16:07	50.4442485	-0.7974147
96	OOVR013	A1	68	14/01/2019	16:35	50.4432254	-0.7502666	16:41	50.4432563	-0.7495633
97	OOVR014	A1	58	14/01/2019	17:34	50.4422519	-0.7027881	17:40	50.4423851	-0.70209
98	OOVR015	A1	67	14/01/2019	18:10	50.4413345	-0.6555907	18:16	50.4415067	-0.6548463
99	OOVR016	A1	67	14/01/2019	18:48	50.4403505	-0.6080747	18:54	50.4406073	-0.6073682
99	OOVR016	B2	66	14/01/2019	19:17	50.4406858	-0.607915	19:23	50.4404807	-0.6085486
99	OOVR016	C1	67	14/01/2019	19:32	50.4401288	-0.6080323	19:38	50.4403598	-0.6073589
102	OOVR017	A1	53	14/01/2019	20:55	50.4375067	-0.5586442	21:01	50.4375918	-0.5579251
103	OOVR009	A1	49	14/01/2019	21:40	50.4126523	-0.5388626	21:46	50.412781	-0.5381517
104	OOVR008	A1	51	14/01/2019	22:25	50.4137899	-0.5861842	22:31	50.4139614	-0.5854589
105	OOVR007	A1	66	14/01/2019	23:14	50.4145133	-0.6325113	23:20	50.4148674	-0.6329375
106	OOVR006	A1	66	14/01/2019	23:50	50.4157978	-0.679441	23:56	50.4157942	-0.6801821
107	OOVR005	A1	67	15/01/2019	00:25	50.4167784	-0.7270528	00:31	50.4168485	-0.7278734
108	OOVR004	A1	66	15/01/2019	01:01	50.4177191	-0.774127	01:07	50.417784	-0.7749688
109	OOVR003	A1	67	15/01/2019	01:48	50.4186372	-0.8215664	01:54	50.4186951	-0.8223765
110	OOVR002	A1	53	15/01/2019	02:30	50.4192552	-0.8686711	02:36	50.4192945	-0.8694679
111	OOVR001	A1	45	15/01/2019	03:08	50.4201172	-0.9162374	03:14	50.4201383	-0.9170913

Event	Station Code	Replicate	Depth (m)	Date	SOL Time	Latitude	Longitude	EOL Time	Latitude	Longitude
117	OOVRGT4	A1	42	15/01/2019	12:10	50.539332	-0.6622372	12:26	50.5391764	-0.6640687
118	OOVRGT7	A1	24	15/01/2019	13:22	50.5581335	-0.7498295	13:37	50.5578922	-0.7517634
119	OOVRGT1	A1	28	16/01/2019	23:44	50.5641666	-0.824306	00:00	50.5641482	-0.8263892
120	OOVRGT12	A1	68	17/01/2019	01:18	50.5134051	-0.6149701	01:33	50.5129763	-0.6168251
121	OOVRGT9	A1	68	17/01/2019	02:05	50.4947012	-0.5976458	02:20	50.4945397	-0.5995652
122	OOVRGT8	A1	61	17/01/2019	02:51	50.5008941	-0.5742528	03:06	50.501244	-0.5761723
123	OOVRGT11	A1	65	17/01/2019	03:40	50.475015	-0.5469078	03:55	50.4751619	-0.548964
124	OOVTGT13	A1	54	17/01/2019	04:54	50.42199	-0.5408641	05:11	50.4218453	-0.5431555
125	OOVTGT10	A1	59	17/01/2019	06:11	50.4337795	-0.6440643	06:26	50.4338888	-0.6460794
244	OOVR016	D1	68	21/01/2019	12:30	50.4406757	-0.6084326	12:36	50.4407093	-0.6076215
244	OOVR016	D2	68	21/01/2019	12:53	50.4409663	-0.6084707	12:59	50.4409662	-0.6076951
244	OOVR016	E1	68	21/01/2019	13:12	50.4400773	-0.6083739	13:18	50.4400786	-0.6076535
246	OOVR043	D1	62	21/01/2019	15:24	50.5188352	-0.5319449	15:30	50.518837	-0.5312038
246	OOVR043	E1	63	21/01/2019	15:42	50.5179405	-0.531814	15:48	50.5179245	-0.5310313
247	OOVR041	D1	46	21/01/2019	16:24	50.5198612	-0.6269912	16:30	50.5198653	-0.6277043
247	OOVR041	E1	45	21/01/2019	16:43	50.5190049	-0.6271456	16:49	50.5189994	-0.6279448
248	OOVR039	D1	24	21/01/2019	17:36	50.5218213	-0.7215398	17:42	50.5217198	-0.7223724
248	OOVR039	E1	24	21/01/2019	17:56	50.5210447	-0.721433	18:02	50.5209916	-0.722217
249	OOVRGT14	A1	27	21/01/2019	18:44	50.565604	-0.777976	19:00	50.5653843	-0.779688
250	OOVR045	D1	25	21/01/2019	19:45	50.550209	-0.83928	19:51	50.5502483	-0.8385809
250	OOVR045	E1	26	21/01/2019	20:15	50.5493755	-0.8393993	20:21	50.5493797	-0.8386544
251	OOVR044	D1	28	21/01/2019	21:05	50.5510766	-0.8863132	21:11	50.5509705	-0.8871022
251	OOVR044	E1	25	21/01/2019	21:27	50.5501957	-0.8870574	21:33	50.5502882	-0.8862978
252	OOVR018	D1	33	21/01/2019	22:34	50.4729973	-0.9135252	22:40	50.4730294	-0.9142791
252	OOVR018	E1	33	21/01/2019	22:56	50.47216	-0.9141616	23:04	50.4721627	-0.9134437
253	OOVR020	D1	47	22/01/2019	00:13	50.4712041	-0.8189068	00:18	50.4712526	-0.8195523
274	OOVR020	D2	46	23/01/2019	22:51	50.4711876	-0.818847	22:57	50.4713172	-0.8195339

Event	Station Code	Replicate	Depth (m)	Date	SOL Time	Latitude	Longitude	EOL Time	Latitude	Longitude
274	OOVR020	E1	47	23/01/2019	23:22	50.4704358	-0.8194841	23:28	50.4703666	-0.8186814

Table 17. Hamon grab samples taken at Offshore Overfalls MCZ on CEND0119. Failed attempts not included.

Event	Station Code	Replicate	Depth (m)	Date	Time	Latitude	Longitude	Event
112	OOVR001	PSA	A2	44	15/01/2019	03:42	50.4201012	-0.9163007
112	OOVR001	Macrofauna	A2	44	15/01/2019	03:42	50.4201012	-0.9163007
112	OOVR001	PSA	B1	44	15/01/2019	03:47	50.4200983	-0.9162312
112	OOVR001	Macrofauna	B1	44	15/01/2019	03:47	50.4200983	-0.9162312
112	OOVR001	PSA	C3	44	15/01/2019	04:03	50.4200943	-0.9160235
112	OOVR001	Macrofauna	C3	44	15/01/2019	04:03	50.4200943	-0.9160235
115	OOVR060	PSA	A1	57	15/01/2019	09:30	50.5673527	-0.5328669
115	OOVR060	Macrofauna	A1	57	15/01/2019	09:30	50.5673527	-0.5328669
115	OOVR060	PSA	C2	57	15/01/2019	09:57	50.5675762	-0.5330235
115	OOVR060	Macrofauna	C2	57	15/01/2019	09:57	50.5675762	-0.5330235
115	OOVR060	PSA	D3	57	15/01/2019	10:13	50.567697	-0.5331013
115	OOVR060	Macrofauna	D3	57	15/01/2019	10:13	50.567697	-0.5331013
115	OOVR060	PSA	E1	57	15/01/2019	10:19	50.5677375	-0.5331311
115	OOVR060	Macrofauna	E1	57	15/01/2019	10:19	50.5677375	-0.5331311
116	OOVR059	PSA	A1	47	15/01/2019	10:46	50.5704085	-0.5775449
116	OOVR059	Macrofauna	A1	47	15/01/2019	10:46	50.5704085	-0.5775449
116	OOVR059	PSA	B1	47	15/01/2019	10:51	50.5704516	-0.5775306
116	OOVR059	Macrofauna	B1	47	15/01/2019	10:51	50.5704516	-0.5775306
116	OOVR059	PSA	C1	47	15/01/2019	10:57	50.570491	-0.5775307
116	OOVR059	Macrofauna	C1	47	15/01/2019	10:57	50.570491	-0.5775307
116	OOVR059	PSA	D1	47	15/01/2019	11:02	50.5705319	-0.5775285
116	OOVR059	Macrofauna	D1	47	15/01/2019	11:02	50.5705319	-0.5775285
116	OOVR059	PSA	E1	47	15/01/2019	11:07	50.5705831	-0.577554
116	OOVR059	Macrofauna	E1	47	15/01/2019	11:07	50.5705831	-0.577554
220	OOVR058	PSA	A1	48	20/01/2019	12:09	50.5733449	-0.6221862
220	OOVR058	Macrofauna	A1	48	20/01/2019	12:09	50.5733449	-0.6221862

Event	Station Code	Replicate	Depth (m)	Date	Time	Latitude	Longitude	Event
220	OOVR058	PSA	B1	48	20/01/2019	12:14	50.5733556	-0.6221048
220	OOVR058	Macrofauna	B1	48	20/01/2019	12:14	50.5733556	-0.6221048
220	OOVR058	PSA	C1	48	20/01/2019	12:18	50.5733852	-0.6220382
220	OOVR058	Macrofauna	C1	48	20/01/2019	12:18	50.5733852	-0.6220382
220	OOVR058	PSA	D1	48	20/01/2019	12:22	50.5734097	-0.6219673
220	OOVR058	Macrofauna	D1	48	20/01/2019	12:22	50.5734097	-0.6219673
220	OOVR058	PSA	E1	48	20/01/2019	12:26	50.5734359	-0.6218954
220	OOVR058	Macrofauna	E1	48	20/01/2019	12:26	50.5734359	-0.6218954
221	OOVRS07	PSA	A2	64	20/01/2019	13:09	50.5601746	-0.5353285
221	OOVRS07	Macrofauna	A2	64	20/01/2019	13:09	50.5601746	-0.5353285
221	OOVRS07	PSA	B2	64	20/01/2019	13:17	50.5601729	-0.5351763
221	OOVRS07	Macrofauna	B2	64	20/01/2019	13:17	50.5601729	-0.5351763
221	OOVRS07	PSA	C1	64	20/01/2019	13:22	50.5601726	-0.5351011
221	OOVRS07	Macrofauna	C1	64	20/01/2019	13:22	50.5601726	-0.5351011
222	OOVRS06	PSA	A1	60	20/01/2019	13:49	50.5512908	-0.5609494
222	OOVRS06	Macrofauna	A1	60	20/01/2019	13:49	50.5512908	-0.5609494
222	OOVRS06	PSA	B1	60	20/01/2019	13:53	50.5513026	-0.560873
222	OOVRS06	Macrofauna	B1	60	20/01/2019	13:53	50.5513026	-0.560873
222	OOVRS06	PSA	C1	60	20/01/2019	13:58	50.5513174	-0.5608077
222	OOVRS06	Macrofauna	C1	60	20/01/2019	13:58	50.5513174	-0.5608077
223	OOVR051	PSA	A1	66	20/01/2019	14:16	50.5441067	-0.5552955
223	OOVR051	Macrofauna	A1	66	20/01/2019	14:16	50.5441067	-0.5552955
224	OOVRS05	PSA	A1	60	20/01/2019	15:15	50.5423875	-0.5693924
224	OOVRS05	Macrofauna	A1	60	20/01/2019	15:15	50.5423875	-0.5693924
224	OOVRS05	PSA	B1	60	20/01/2019	15:21	50.5424173	-0.5693337
224	OOVRS05	Macrofauna	B1	60	20/01/2019	15:21	50.5424173	-0.5693337
224	OOVRS05	PSA	C1	60	20/01/2019	15:25	50.5424504	-0.5692667

Event	Station Code	Replicate	Depth (m)	Date	Time	Latitude	Longitude	Event
224	OOVRS05	Macrofauna	C1	60	20/01/2019	15:25	50.5424504	-0.5692667
225	OOVRS04	PSA	A1	53	20/01/2019	15:43	50.542539	-0.5861012
225	OOVRS04	Macrofauna	A1	53	20/01/2019	15:43	50.542539	-0.5861012
225	OOVRS04	PSA	B1	53	20/01/2019	15:48	50.5425632	-0.5860245
225	OOVRS04	Macrofauna	B1	53	20/01/2019	15:48	50.5425632	-0.5860245
225	OOVRS04	PSA	C1	53	20/01/2019	15:52	50.5425764	-0.5859377
225	OOVRS04	Macrofauna	C1	53	20/01/2019	15:52	50.5425764	-0.5859377
226	OOVR050	PSA	A1	44	20/01/2019	17:41	50.5451119	-0.602233
226	OOVR050	Macrofauna	A1	44	20/01/2019	17:41	50.5451119	-0.602233
226	OOVR050	PSA	B1	44	20/01/2019	17:45	50.5451124	-0.6023
226	OOVR050	Macrofauna	B1	44	20/01/2019	17:45	50.5451124	-0.6023
226	OOVR050	PSA	C1	44	20/01/2019	17:51	50.5451479	-0.6023866
226	OOVR050	Macrofauna	C1	44	20/01/2019	17:51	50.5451479	-0.6023866
226	OOVR050	PSA	D1	44	20/01/2019	17:55	50.545182	-0.6024252
226	OOVR050	Macrofauna	D1	44	20/01/2019	17:55	50.545182	-0.6024252
226	OOVR050	PSA	E4	44	20/01/2019	18:14	50.545215	-0.6027582
226	OOVR050	Macrofauna	E4	44	20/01/2019	18:14	50.545215	-0.6027582
227	OOVRS03	PSA	A1	58	20/01/2019	19:21	50.5338896	-0.5946863
227	OOVRS03	Macrofauna	A1	58	20/01/2019	19:21	50.5338896	-0.5946863
227	OOVRS03	PSA	B1	58	20/01/2019	19:26	50.5338803	-0.5947506
227	OOVRS03	Macrofauna	B1	58	20/01/2019	19:26	50.5338803	-0.5947506
227	OOVRS03	PSA	C1	58	20/01/2019	19:31	50.5338619	-0.5948384
227	OOVRS03	Macrofauna	C1	58	20/01/2019	19:31	50.5338619	-0.5948384
228	OOVRS02	PSA	A1	65	20/01/2019	20:29	50.5246753	-0.6034988
228	OOVRS02	Macrofauna	A1	65	20/01/2019	20:29	50.5246753	-0.6034988
228	OOVRS02	PSA	B1	65	20/01/2019	20:35	50.5246499	-0.6035684
228	OOVRS02	Macrofauna	B1	65	20/01/2019	20:35	50.5246499	-0.6035684

Event	Station Code	Replicate	Depth (m)	Date	Time	Latitude	Longitude	Event
228	OOVRS02	PSA	C4	65	20/01/2019	20:54	50.5245813	-0.6037606
228	OOVRS02	Macrofauna	C4	65	20/01/2019	20:54	50.5245813	-0.6037606
229	OOVRS01	PSA	A1	49	20/01/2019	21:51	50.5251297	-0.6198087
230	OOVR049	PSA	A1	43	20/01/2019	22:36	50.5460558	-0.6499759
232	OOVRS14	PSA	A2	40	21/01/2019	02:51	50.4452459	-0.8861338
232	OOVRS14	Macrofauna	A2	40	21/01/2019	02:51	50.4452459	-0.8861338
232	OOVRS14	PSA	B2	40	21/01/2019	03:01	50.4452586	-0.8860049
232	OOVRS14	Macrofauna	B2	40	21/01/2019	03:01	50.4452586	-0.8860049
232	OOVRS14	PSA	C2	40	21/01/2019	03:08	50.4452542	-0.88587
232	OOVRS14	Macrofauna	C2	40	21/01/2019	03:08	50.4452542	-0.88587
236	OOVRS10	PSA	A2	45	21/01/2019	05:49	50.4185794	-0.911623
237	OOVRS08	PSA	A3	46	21/01/2019	06:34	50.4119536	-0.9179799
237	OOVRS08	PSA	B3	46	21/01/2019	06:49	50.4119307	-0.9182037
237	OOVRS08	Macrofauna	B3	46	21/01/2019	06:49	50.4119307	-0.9182037
237	OOVRS08	PSA	C2	46	21/01/2019	06:57	50.4119203	-0.9183446
237	OOVRS08	Macrofauna	C2	46	21/01/2019	06:57	50.4119203	-0.9183446
238	OOVRS09	PSA	B3	50	21/01/2019	08:30	50.4118106	-0.9057223
238	OOVRS09	Macrofauna	B3	50	21/01/2019	08:30	50.4118106	-0.9057223
238	OOVRS09	PSA	C1	50	21/01/2019	08:34	50.4117967	-0.9057798
238	OOVRS09	Macrofauna	C1	50	21/01/2019	08:34	50.4117967	-0.9057798
240	OOVRS11	PSA	C2	47	21/01/2019	09:45	50.4254095	-0.9048361
242	OOVRS13	PSA	C3	45	21/01/2019	10:47	50.4386221	-0.8927984
242	OOVRS13	Macrofauna	C3	45	21/01/2019	10:47	50.4386221	-0.8927984
243	OOVRS16	PSA	A1	69	21/01/2019	12:09	50.4406308	-0.6082357
243	OOVRS16	Macrofauna	A1	69	21/01/2019	12:09	50.4406308	-0.6082357

Table 18. Drop camera samples taken at Offshore Brighton MCZ on CEND0119. Failed attempts not included. SOL = Start of Line, EOL = End of line.

Event	Station	Replicate	Depth (m)	Date	SOL Time	Latitude	Longitude	EOL Time	Latitude	Longitude
126	OBRG023	A1	54	17/01/2019	08:02	50.2948181	-0.6875215	08:08	50.2944928	-0.6881733
127	OBRG022	A1	55	17/01/2019	08:42	50.2954341	-0.7237406	08:48	50.2954163	-0.7245104
128	OBRG024	A1	62	17/01/2019	09:34	50.31549	-0.7407696	09:40	50.3158176	-0.7413202
129	OBRG021	A1	59	17/01/2019	10:23	50.2960835	-0.759113	10:29	50.2966081	-0.7591004
129	OBRG021	B1	59	17/01/2019	10:35	50.2966099	-0.7593847	10:41	50.2961862	-0.7593769
129	OBRG021	C1	57	17/01/2019	10:47	50.296116	-0.7595908	10:53	50.2965854	-0.7595671
129	OBRG021	D1	58	17/01/2019	10:59	50.2966424	-0.7597757	11:05	50.2961538	-0.759774
129	OBRG021	E1	58	17/01/2019	11:10	50.2961788	-0.760023	11:16	50.2966337	-0.759981
130	OBRGGT2	A1	69	17/01/2019	12:12	50.3047914	-0.7674336	12:28	50.3060402	-0.7678663
131	OBRG020	A1	65	17/01/2019	13:01	50.2966543	-0.7950503	13:07	50.2971241	-0.795158
132	OBRG019	A1	65	17/01/2019	13:39	50.2973255	-0.8307744	13:45	50.2977874	-0.8310203
133	OBRG018	A1	69	17/01/2019	14:15	50.2979894	-0.8664488	14:21	50.2984055	-0.866863
134	OBRG013	A1	69	17/01/2019	14:48	50.2778533	-0.88935	14:54	50.2781931	-0.889922
135	OBRG014	A1	67	17/01/2019	15:24	50.2809167	-0.8519141	15:30	50.2810415	-0.8525948
136	OBRG015	A1	79	17/01/2019	15:59	50.2773003	-0.8134021	16:05	50.2774482	-0.8140828
137	OBRG050	A1	73	17/01/2019	16:28	50.2868347	-0.8014815	16:34	50.2867188	-0.8021963
138	OBRG016	A1	61	17/01/2019	17:37	50.2767276	-0.7775749	17:43	50.276573	-0.7782072
139	OBRG017	A1	57	17/01/2019	18:12	50.276086	-0.7420201	18:18	50.27583	-0.7426985
140	OBRGGT1	A1	61	17/01/2019	18:49	50.2780455	-0.6947712	19:05	50.2786079	-0.6966792
141	OBRG012	A1	54	17/01/2019	19:35	50.2556652	-0.7255856	19:41	50.2552979	-0.7261072
142	OBRG011	A1	59	17/01/2019	20:08	50.256255	-0.7613733	20:14	50.2567109	-0.7614004
143	OBRG010	A1	58	17/01/2019	20:46	50.2573028	-0.7972851	20:52	50.2577978	-0.797273
144	OBRG009	A1	65	17/01/2019	21:28	50.257859	-0.8331175	21:34	50.2580773	-0.8324336
145	OBRG008	A1	70	17/01/2019	22:07	50.2584748	-0.8690146	22:13	50.25885	-0.8686559
146	OBRGGT5	A1	73	17/01/2019	22:38	50.2653112	-0.8677008	22:55	50.2666949	-0.8676875
147	OBRG003	A1	67	17/01/2019	22:39	50.2390429	-0.8872599	23:45	50.2391976	-0.8865246

Event	Station	Replicate	Depth (m)	Date	SOL Time	Latitude	Longitude	EOL Time	Latitude	Longitude
147	OBRG003	B1	68	18/01/2019	01:42	50.239309	-0.8867867	01:48	50.2391398	-0.8874486
147	OBRG003	C1	66	18/01/2019	02:05	50.2391787	-0.8876673	02:11	50.2393268	-0.8869394
147	OBRG003	D1	67	18/01/2019	02:21	50.2388655	-0.8874954	02:27	50.2389851	-0.8867394
147	OBRG003	E1	68	18/01/2019	02:34	50.2388435	-0.8867598	02:40	50.2386499	-0.8874461
148	OBRG004	A1	56	18/01/2019	03:17	50.2378149	-0.8152433	03:23	50.2376885	-0.816084
149	OBRG005	A1	56	18/01/2019	03:50	50.2369561	-0.7794577	03:56	50.2370073	-0.7802579
150	OBRG002	A1	57	18/01/2019	04:36	50.2182746	-0.8340137	04:42	50.2180965	-0.8347909
151	OBRG001	A1	62	18/01/2019	05:12	50.2188768	-0.8697109	05:18	50.2187763	-0.8704335
152	OBRG036	A1	57	18/01/2019	06:28	50.2209235	-0.6443443	06:34	50.2205724	-0.6448806
153	OBRGGT6	A1	60	18/01/2019	07:03	50.228813	-0.6195261	07:19	50.2284758	-0.6215673
154	OBRG006	A1	65	18/01/2019	08:08	50.2335144	-0.6008471	08:14	50.2333269	-0.601604
155	OBRG007	A1	59	18/01/2019	08:49	50.2325735	-0.5656619	08:56	50.2320682	-0.564999
156	OBRG037	A1	54	18/01/2019	09:32	50.2195604	-0.5798148	09:39	50.2195842	-0.5789136
156	OBRG037	A2	53	18/01/2019	11:15	50.2196115	-0.5801829	11:21	50.219614	-0.5793894
157	OBRG035	A1	57	18/01/2019	12:24	50.2217985	-0.6926598	12:31	50.2218964	-0.6918808
158	OBRG034	A1	51	18/01/2019	13:18	50.2234221	-0.749014	13:24	50.2231272	-0.7483649
159	OBRG028	A1	51	18/01/2019	14:12	50.1938022	-0.8347631	14:18	50.1934357	-0.8342202
160	OBRG025	A1	63	18/01/2019	15:13	50.1630939	-0.8638231	15:20	50.162555	-0.8638621
162	OBRG026	A1	52	18/01/2019	16:41	50.1617111	-0.8072414	16:47	50.161526	-0.8077246
163	OBRG027	A1	53	18/01/2019	17:43	50.1594424	-0.7512624	17:49	50.1591759	-0.750702
164	OBRG029	A1	54	18/01/2019	18:31	50.1917755	-0.7761999	18:37	50.1915437	-0.7753846
165	OBRG030	A1	52	18/01/2019	19:19	50.1914243	-0.721774	19:25	50.1913548	-0.7210476
166	OBRG031	A1	53	18/01/2019	20:06	50.1905383	-0.666079	20:12	50.1900396	-0.6661443
167	OBRG032	A1	53	18/01/2019	21:02	50.1890437	-0.6098545	21:08	50.1885539	-0.609778
168	OBRG033	A1	52	18/01/2019	21:42	50.1880521	-0.5533008	21:48	50.1873895	-0.5527523
169	OBRG038	A1	53	18/01/2019	22:32	50.2187754	-0.5238062	22:38	50.218375	-0.5233774
171	OBRG039	A1	51	18/01/2019	23:49	50.2172645	-0.4676343	23:55	50.2170018	-0.4671189

Event	Station	Replicate	Depth (m)	Date	SOL Time	Latitude	Longitude	EOL Time	Latitude	Longitude
172	OBRG040	A1	49	19/01/2019	00:40	50.2161499	-0.4114714	00:45	50.2159761	-0.4109012
173	OBRG041	A1	52	19/01/2019	01:30	50.2145731	-0.3551477	01:36	50.2146101	-0.3543833
175	OBRG049	A1	50	19/01/2019	02:42	50.2442821	-0.2690174	02:47	50.2441445	-0.2684199
176	OBRG048	A1	49	19/01/2019	03:24	50.2458136	-0.3247097	03:32	50.2451798	-0.3247696
176	OBRG048	B1	49	19/01/2019	03:42	50.2451421	-0.3245891	03:47	50.2456149	-0.3245135
176	OBRG048	C1	49	19/01/2019	03:54	50.2457273	-0.3243643	03:59	50.2453262	-0.3243219
176	OBRG048	D1	49	19/01/2019	04:07	50.2451885	-0.3250287	04:12	50.24564	-0.3250317
176	OBRG048	E1	50	19/01/2019	04:22	50.245561	-0.3252721	04:28	50.2451443	-0.3252312
177	OBRG047	A1	50	19/01/2019	05:25	50.2468696	-0.3812432	05:31	50.2466384	-0.3808449
178	OBRGGT3	A1	50	19/01/2019	06:20	50.2495223	-0.4157358	06:36	50.2483849	-0.4148168
179	OBRG046	A1	52	19/01/2019	07:12	50.2479825	-0.4374134	07:18	50.2476502	-0.4368408
180	OBRG045	A1	55	19/01/2019	08:07	50.2492461	-0.4937337	08:12	50.2490046	-0.4940824
181	OBRG044	A1	55	19/01/2019	08:56	50.2506519	-0.5498313	09:03	50.2499147	-0.5502741
182	OBRG043	A1	59	19/01/2019	09:41	50.2517871	-0.6065	09:47	50.2513232	-0.6063757
183	OBRG042	A1	56	19/01/2019	10:28	50.2527136	-0.6626666	10:34	50.2522908	-0.662112
183	OBRG042	B1	55	19/01/2019	10:40	50.2521406	-0.6622032	10:46	50.2525385	-0.6626977
183	OBRG042	C1	54	19/01/2019	10:53	50.2524256	-0.6628565	10:59	50.2520489	-0.6623981
183	OBRG042	D1	55	19/01/2019	11:06	50.2519304	-0.6625017	11:13	50.2523798	-0.6630719
183	OBRG042	E1	54	19/01/2019	11:20	50.2522712	-0.6632052	11:27	50.2518082	-0.6626357
184	OBRG051	A1	51	19/01/2019	12:09	50.2831928	-0.6331684	12:15	50.2832539	-0.6324027
185	OBRG052	A1	49	19/01/2019	12:51	50.2822233	-0.5769933	12:56	50.2823128	-0.5763981
187	OBRG053	A1	48	19/01/2019	13:51	50.2809992	-0.5206894	13:57	50.2810543	-0.5199017
188	OBRG054	A1	47	19/01/2019	14:30	50.2797853	-0.4643747	14:36	50.279783	-0.4635982
189	OBRG055	A1	47	19/01/2019	15:03	50.2787788	-0.4081604	15:09	50.2786396	-0.407424
190	OBRG056	A1	46	19/01/2019	15:40	50.2772935	-0.3517829	15:46	50.2772557	-0.351005
193	OBRG057	A2	51	19/01/2019	16:50	50.2759813	-0.2948202	16:56	50.2756107	-0.2942824
194	OBRG067	A1	47	19/01/2019	17:38	50.3079553	-0.321149	17:44	50.3075049	-0.3208609

Event	Station	Replicate	Depth (m)	Date	SOL Time	Latitude	Longitude	EOL Time	Latitude	Longitude
196	OBRG066	A1	49	19/01/2019	18:28	50.3092419	-0.3776702	18:34	50.3091045	-0.378399
198	OBRG065	A1	50	19/01/2019	19:23	50.3159875	-0.4387441	19:29	50.3161431	-0.4380982
199	OBRG064	A1	51	19/01/2019	20:02	50.3116367	-0.4898474	20:08	50.3115811	-0.4906492
200	OBRG063	A1	52	19/01/2019	20:44	50.3130575	-0.5463393	20:50	50.312953	-0.5471075
201	OBRG062	A1	54	19/01/2019	21:25	50.3141809	-0.6030564	21:31	50.3138696	-0.6036424
201	OBRG062	B1	53.5	19/01/2019	21:39	50.3140076	-0.6037419	21:45	50.3143066	-0.6031759
201	OBRG062	C1	54	19/01/2019	21:51	50.3144123	-0.6033232	21:57	50.3140914	-0.6039147
201	OBRG062	D1	54	19/01/2019	22:08	50.3138003	-0.6034706	22:14	50.3140956	-0.6029144
201	OBRG062	E1	53.5	19/01/2019	22:02	50.3140174	-0.6027128	22:26	50.313687	-0.6033179
202	OBRG061	A1	53	19/01/2019	23:02	50.3151642	-0.6600313	23:08	50.3151799	-0.6592823
203	OBRG060	A1	57	19/01/2019	23:44	50.3162134	-0.7163549	23:50	50.3162047	-0.7156222
204	OBRG059	A1	65	20/01/2019	00:21	50.3173972	-0.7727527	00:27	50.3175099	-0.7719805
205	OBRG058	A1	65	20/01/2019	01:02	50.3183583	-0.8291329	01:08	50.3186108	-0.8284243
207	OBRG068	A1	50	20/01/2019	02:33	50.3458844	-0.6303168	02:40	50.345981	-0.6295066
208	OBRG069	A1	49	20/01/2019	03:09	50.3445364	-0.5737423	03:15	50.3448632	-0.573082
209	OBRG070	A1	48	20/01/2019	03:43	50.3435695	-0.5175606	03:50	50.3436875	-0.5167466
210	OBRG071	A1	48	20/01/2019	04:17	50.3422183	-0.460542	04:23	50.3423373	-0.4598
211	OBRG072	A1	48	20/01/2019	04:55	50.3410731	-0.4036877	05:01	50.3409472	-0.4044915
212	OBRG073	A1	49	20/01/2019	05:34	50.3398643	-0.3476011	05:39	50.3399817	-0.348295
212	OBRG073	B1	49	20/01/2019	05:46	50.3398456	-0.3484245	05:51	50.3397396	-0.3477824
212	OBRG073	C1	50	20/01/2019	05:57	50.3396159	-0.3478261	06:02	50.3397336	-0.3485014
212	OBRG073	D1	50	20/01/2019	06:09	50.3395828	-0.3485567	06:15	50.3394827	-0.3478606
212	OBRG073	E1	51	20/01/2019	06:26	50.3393841	-0.3480722	06:31	50.3394849	-0.348766
213	OBRGGT4	A1	50	20/01/2019	07:04	50.328197	-0.3000886	07:19	50.3279868	-0.3020297
214	OBRG074	A1	50	20/01/2019	08:05	50.3386609	-0.2907677	08:10	50.3385407	-0.2914634
216	OBRG076	A1	61	20/01/2019	09:06	50.3705007	-0.3171609	09:11	50.3705035	-0.3178534
218	OBRG075	A1	51	20/01/2019	10:12	50.3715397	-0.3743989	10:17	50.3719427	-0.3742994

Table 19. Hamon grab samples taken at Offshore Brighton MCZ on CEND0119. Failed attempts not included.

Event	Station Code	Analysis	Replicate	Depth (m)	Date	Time	Latitude	Longitude
174	OBRG041	Macrofauna	A1	52	19/01/2019	01:47	50.2146179	-0.3543042
174	OBRG041	PSA	A1	52	19/01/2019	01:47	50.2146179	-0.3543042
192	OBRG057	PSA	A1	50	19/01/2019	16:36	50.2760264	-0.2948929
192	OBRG057	Macrofauna	A1	50	19/01/2019	16:36	50.2760264	-0.2948929
195	OBRG067	PSA	A1	47	19/01/2019	17:52	50.3079661	-0.3211949
195	OBRG067	Macrofauna	A1	47	19/01/2019	17:52	50.3079661	-0.3211949
197	OBRG066	PSA	A1	49	19/01/2019	18:44	50.3092241	-0.377874
197	OBRG066	Macrofauna	A1	49	19/01/2019	18:44	50.3092241	-0.377874
206	OBRG068	PSA	A1	65	20/01/2019	01:19	50.3186213	-0.8283941
206	OBRG068	PSA	A2	65	20/01/2019	01:24	50.3186087	-0.8284698
206	OBRG068	PSA	A3	65	20/01/2019	01:29	50.3185943	-0.8285485
215	OBRG074	PSA	A2	51	20/01/2019	08:28	50.3384958	-0.2916386
215	OBRG074	Macrofauna	A2	51	20/01/2019	08:28	50.3384958	-0.2916386
217	OBRG076	PSA	A3	60	20/01/2019	09:28	50.3704798	-0.3180791
217	OBRG076	Macrofauna	A3	60	20/01/2019	09:28	50.3704798	-0.3180791
219	OBRG075	PSA	A1	51	20/01/2019	10:24	50.3720293	-0.3743221
219	OBRG075	Macrofauna	A1	51	20/01/2019	10:24	50.3720293	-0.3743221
255	OBRG057	PSA	B2	51	22/01/2019	07:06	50.276061	-0.2943099
255	OBRG057	Macrofauna	B2	51	22/01/2019	07:06	50.276061	-0.2943099
255	OBRG057	PSA	C2	51	22/01/2019	07:15	50.276046	-0.2944418
255	OBRG057	PSA	D1	51	22/01/2019	07:19	50.2760441	-0.2944437
255	OBRG057	Macrofauna	D1	51	22/01/2019	07:19	50.2760441	-0.2944437
255	OBRG057	PSA	E1	51	22/01/2019	07:23	50.2759684	-0.2943772
255	OBRG057	Macrofauna	E1	51	22/01/2019	07:23	50.2759684	-0.2943772
256	OBRG067	PSA	B2	47	22/01/2019	08:21	50.3082093	-0.3213168
256	OBRG067	Macrofauna	B2	47	22/01/2019	08:21	50.3082093	-0.3213168

Event	Station Code	Analysis	Replicate	Depth (m)	Date	Time	Latitude	Longitude
256	OBRG067	PSA	C3	47	22/01/2019	08:40	50.3082093	-0.3213168
256	OBRG067	Macrofauna	C3	47	22/01/2019	08:40	50.3082093	-0.3213168
256	OBRG067	PSA	D2	47	22/01/2019	08:52	50.3082093	-0.3213168
256	OBRG067	Macrofauna	D2	47	22/01/2019	08:52	50.3082093	-0.3213168
256	OBRG067	PSA	E1	47	22/01/2019	08:59	50.3082093	-0.3213168
256	OBRG067	Macrofauna	E1	47	22/01/2019	08:59	50.3082093	-0.3213168
257	OBRG066	PSA	E3	50	22/01/2019	11:07	50.3082093	-0.3213168
257	OBRG066	Macrofauna	E3	50	22/01/2019	11:07	50.3082093	-0.3213168
258	OBRG074	PSA	B1	52	22/01/2019	11:51	50.3082093	-0.3213168
258	OBRG074	Macrofauna	B1	52	22/01/2019	11:51	50.3082093	-0.3213168
262	OBRG016	PSA	A3	58	22/01/2019	18:33	50.3082093	-0.3213168
262	OBRG016	Macrofauna	A3	58	22/01/2019	18:33	50.3082093	-0.3213168
262	OBRG016	PSA	E3	58	22/01/2019	19:58	50.3082093	-0.3213168
262	OBRG016	Macrofauna	E3	58	22/01/2019	19:58	50.3082093	-0.3213168
263	OBRGGT2	PSA	A2	68	22/01/2019	20:39	50.3049521	-0.7674385
263	OBRGGT2	Macrofauna	A2	68	22/01/2019	20:39	50.3049521	-0.7674385
264	OBRG014	PSA	E3	69	23/01/2019	00:39	50.2809078	-0.8518102

Table 20. Summary of multibeam run-lines carried out at Offshore Brighton on CEND0119. SOL = Start of Line, EOL = End of line.

Event	Line ID	Replicate	Depth(m)	Date	SOL Time	Latitude	Longitude	EOL Time	Latitude	Longitude
268	OBRG_CAL	A1	68	23/01/2019	03:53	50.2905661	-0.8313755	03:58	50.2910957	-0.8200423
268	OBRG_CAL	A1	65	23/01/2019	04:06	50.2914399	-0.8174536	04:10	50.2905163	-0.8293652
268	OBRG_CAL	A1	66	23/01/2019	04:22	50.2909754	-0.8308873	04:27	50.291597	-0.8198081
268	OBRG_CAL	A1	67	23/01/2019	04:44	50.2898603	-0.8338174	04:50	50.2906861	-0.8195157
268	OBRG_MB17	A1	63	23/01/2019	05:50	50.3242092	-0.863676	07:02	50.2039851	-0.8013108
268	OBRG_MB16	A1	51	23/01/2019	07:12	50.2005638	-0.8021887	08:29	50.3226873	-0.8653291
268	OBRG_MB165_17	A1	63	23/01/2019	08:54	50.3224027	-0.86629	08:55	50.3203875	-0.8656108
268	OBRG_MB165_17	A1	63	23/01/2019	09:06	50.3225591	-0.866514	10:19	50.2010625	-0.8040423
268	OBRG_MB165_16	A1		23/01/2019	10:29	50.2021303	-0.8069214	11:41	50.3212745	-0.8685412
270	OBRG_MB165_15	A1	67	23/01/2019	12:23	50.3207583	-0.8700775	12:23	50.2007613	-0.8085926
271	OBRG_MB165_5	A1	53	23/01/2019	14:02	50.1906079	-0.8271528	15:12	50.309756	-0.8886923
271	OBRG_MB165_4	A1	64	23/01/2019	15:29	50.3092603	-0.8907777	16:42	50.1895602	-0.828828
271	OBRG_MB165_3	A1	50	23/01/2019	16:53	50.1873813	-0.8299067	18:10	50.3079585	-0.8923764
271	OBRG_MB165_2	A1	62	23/01/2019	18:22	50.3074375	-0.8946163	19:36	50.187345	-0.8322831
273	X-LINE	A1	68	23/01/2019	20:55	50.2777791	-0.8904306	21:11	50.2882201	-0.8416995

JNCC/Cefas Partnership Report Series. *CEND0119 Survey Report: Offshore Overfalls MCZ and Offshore Brighton MCZ*, **No. 35**. Wood, D., Albrecht, J., Hawes, J. & Sperry, J. 2020. ISSN 2051-6711