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Marine Surveys, Analysis & Consultancy

Beachy Head East MCZ Subtidal Survey 2023:

Survey Report

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Details

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Abbreviations

CLOC	Clear Liquid Optical Chamber
DDC	Drop-Down Camera
DSV	Diving Support Vessel
DVV	Dual Van-Veen
FoCI	Features of Conservation Importance
GPS	Global Positioning System
HD	High Definition
HDD	Hard Disk Drive
HoCI	Habitat of Conservation Importance
HR	Habitats Regulations
INNS	Invasive Non-Native Species
JNCC	Joint Nature Conservation Committee
LAT	Lowest Astronomical Tide
LED	Light-Emitting Diode
MCA	Maritime and Coastguard Agency
MCZ	Marine Conservation Zone
MDS	Marine Directorate Science
MP	Megapixel
MPA	Marine Protected Area
NCMPA	Nature Conservation Marine Protected Area
OEL	Ocean Ecology Limited
PO	Plan Option
PSD	Particle Size Distribution
SAC	Special Area of Conservation
SBAS	Satellite-Based Augmentation System
SVP	Sound Velocity Profiler
UPS	Uninterruptable Power Supply
USBL	Ultra-Short Baseline
UTC	Universal Time Coordinated
UTM	Universal Transverse Mercator

1. Introduction

1.1. Project Overview

Beachy Head East Marine Conservation Zone (MCZ) is an inshore site that covers an area of 195 km^2 and is located along the coast near Eastbourne in East Sussex, in the Eastern Channel region. This site became a MCZ in May 2019 resulting in the protection of specific features within this area and, where necessary, regulators will manage marine activities.

Ocean Ecology Limited (OEL) were contracted by the Centre for Environment, Fisheries and Aquaculture Science (Cefas) to undertake a subtidal survey of Beachy Head East MCZ in November 2023.

The focus of this project was to better define specific features by collecting data that can be used to delineate habitat and species boundaries within the MCZ which, in turn, can be used to support the ongoing monitoring objectives of Natural England (NE). This was achieved with the use of grab sampling and drop-down camera (DDC) techniques.

The complete target sampling array is outlined in Table 1. All grab samples and DDC imagery were delivered to Cefas directly to allow for their own in-house analysis.

1.2. Document Overview

This document details the setup, progress, and initial field observations of the Beachy Head East MCZ subtidal survey undertaken by OEL during November 2023. Further detail is also provided on site information and sampling strategy.

1.3. Site Information

1.3.1. Site Location

The survey area is located in the eastern region of the English Channel along the East Sussex coastline and covers an area of approximately 455 km^2 (area occupied by sampling stations

detailed


725000
730000
735000
740000
5640000
5635000
5630000
5625000
5620000
BHE16
BHE21
BHE_2023_DDV_1
Muss4
BHE9
BHE20
BHE6
BHE14
BHE_20
BHE3
BHE2023_1
Muss7
BHE4
BHE22
Muss2
BHE2
BHE12
Chalk3
BHE1
BHE5
BHE13
BHE_2023_

Figure 1).

Water depths across the proposed survey area were expected to range from approximately 5 m to 15 m below Lowest Astronomical Tide (LAT). Information available from EMODnet (EUSeaMap 2021) suggests the surface and shallow sub-surficial sediments of the proposed survey area comprise of shallow infralittoral and circalittoral biogenic habitats (including EUNIS code MC2235), rock and coarse sediment (including EUNIS codes MB12, MC12, MC32 and MD12).

1.3.2. Designated Sites

The proposed survey area lies within the Beachy Head East MCZ. The north-eastern edge of the survey area also falls within the Dungeness, Romney Marsh and Rye Bay Special Protection Area (SPA) (Figure 1).

Beachy Head East MCZ

The Beachy Head East MCZ has a sandstone/chalk reef system which supports a wide range of species across a variety of habitats. Chalk reef extends from the subtidal area up to the coast and white cliffs between Beachy Head and Holywell and forms sheltered rockpools at low tide. Where chalk extends above the high-water mark such as the chalk cliffs and sea caves rich littoral chalk communities are supported by wave action, including unique communities of seaweeds[1].

Further offshore the high and moderate energy circalittoral rock features provide habitats for a wide variety of species including hydroids, bryozoans, sponges, star fish, sea squirts and anemones. The rocky reef habitats are characterised by ridges, gullies and overhangs. The reef system interacts with areas of mobile sediment which are reflected in the inclusion of the subtidal coarse sediment and subtidal sand features[1].

The subtidal sand feature is considered an important nursery area for herring (*Clupea harengus*), plaice (*Pleuronectes platessa*) and Dover sole (*Solea solea*) and provide a habitat for invertebrate species on which adult fish prey[1].

The rare short-snouted seahorse (*Hippocampus hippocampus*) and Ross worm (*Sabellaria spinulosa*) reef have been recorded within the MCZ. Ross worms build tubes from sand and shell fragments. Large colonies can form reefs, stabilising the seabed, providing shelter for other fauna and boosting the species diversity and abundance in the area[1].

There are also small, isolated records of peat and clay exposures in the MCZ. These unique and fragile habitats are irreplaceable[1].

[1] Natural England Designated Sites: https://designatedsites.naturalengland.org.uk/SiteGeneralDetail.aspx?SiteCode=UKMCZ0053

The site contains two marine Sites of Nature Conservation Importance, the Royal Sovereign Shoals and Horse of Willingdon Reef[1].

Dungeness, Romney Marsh and Rye Bay SPA

Dungeness, Romney Marsh and Rye Bay SPA is located on the south coast of England between Norman's Bay in East Sussex and Hythe in Kent. This SPA intersects the northeastern corner of the Beachy Head East MCZ[2].

Coastal processes have shaped this landscape, forming a barrier of extensive coastal shingle beaches and sand dunes across an area of intertidal mud and sand flats. The site includes the largest and most diverse area of shingle beach in Britain, with low-lying hollows in the shingle providing nationally important saline lagoons, natural freshwater pits and basin fens. Rivers draining the Weald to the north were diverted by the barrier beaches, creating a sheltered saltmarsh and mudflat environment, which was gradually infilled by sedimentation, and then reclaimed on a piecemeal basis by man[2].

The extensive network of open water, including flooded gravel pits, the canal, reservoirs and lowland ditch system are all important supporting habitats for the SPA birds, as are other terrestrial habitats including damp grassland, grazing marsh, reedbeds and the adjoining cultivated fields. Saltmarsh, saline lagoons and other intertidal habitats are also important supporting habitats[2].

The site also includes a diverse range of broadscale habitats within the marine environment which support a variety of prey species for the foraging seabirds. These habitats include subtidal and intertidal sand and muddy sand, subtidal biogenic reef, intertidal stony reef, coarse and mixed sediments, and moderate energy infralittoral and circalittoral rock. At Dungeness, the large tidal range and a fast falling tide often traps fish in shallow waters in the intertidal, providing a valuable food resource for seabirds[2].

[2] Natural England Designated Sites: https://designatedsites.naturalengland.org.uk/SiteGeneralDetail.aspx?SiteCode=UK9012091

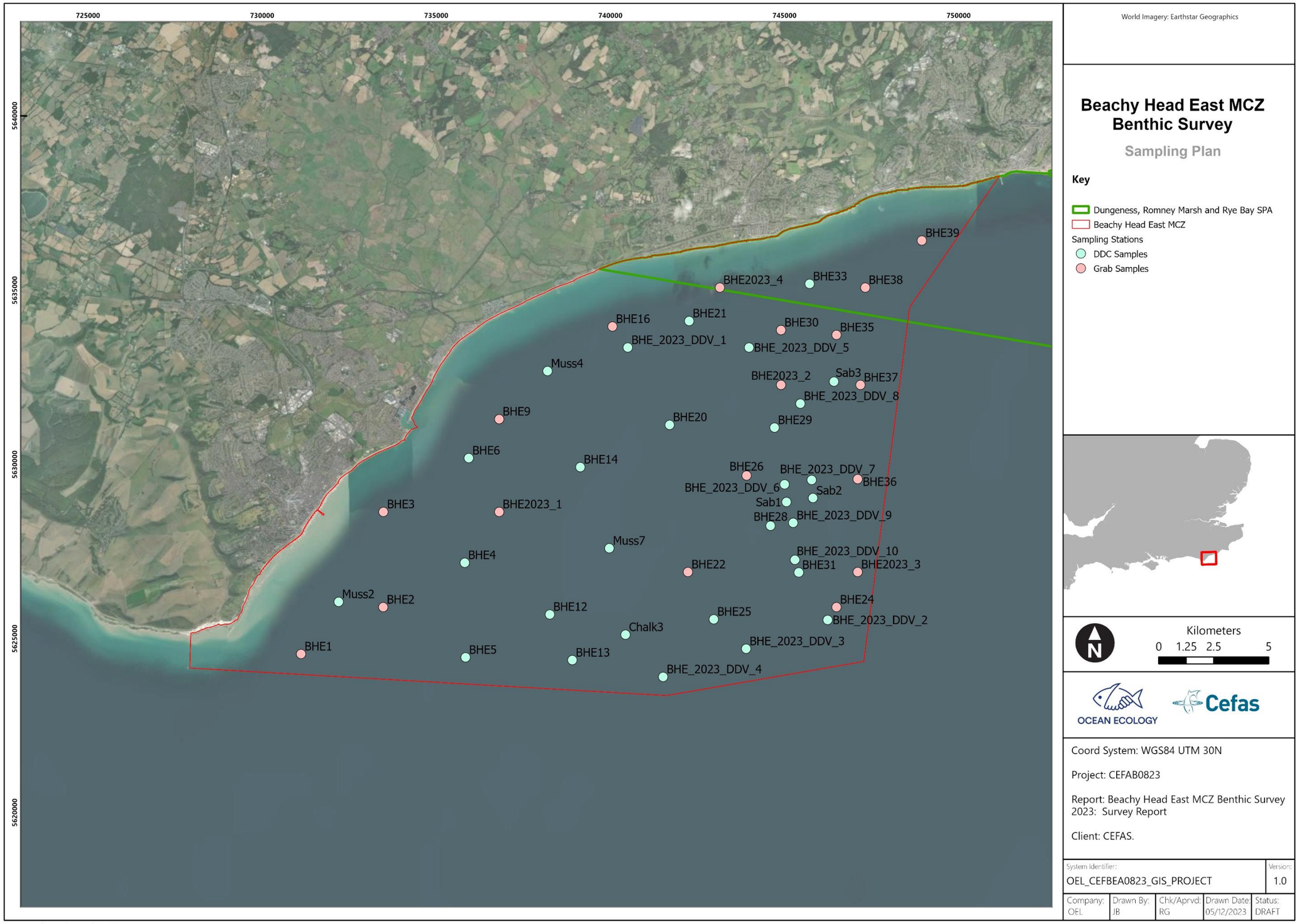

Figure 1 Overview of the sampling stations and marine designations at Beachy Head East MCZ.

2. Survey Design

2.1. Rationale

The subtidal habitat sampling plan was based on pre-determined grab and DDC sampling stations provided to OEL during consultation with Cefas and NE.

Prior to the survey and in the absence of geophysical datasets, consideration was given to of the recommendations of best practice guidance where relevant (Saunders et al. 2011, Natural England 2021) whilst also accounting for all surface, subsurface, and subsea hazards, and their respective relocation/ exclusion / buffer zones if / where present.

2.2. Sampling Approach

The benthic survey array consisted of 18 grab sampling stations. 12 stations that were sampled for single grab samples and 6 that were sampled in triplicate. Each sample was collected using a 0.1 m^2 mini-Hamon grab within a 20 m radius of the station target location.

In addition to the grab sampling, the survey area also consisted of 30 high-resolution DDC seabed imagery transects. Each transect was 50 m in length and recorded within a 50 m radius of the station target location.

Table 1 Number of sampling stations across the survey area.

Type	Stations	Replicates	Total Samples
Grabs (Macrofauna and PSD)	18	1 replicate at 12 stations 3 replicates at 6 stations	30
DDC	30	1	30

2.3. Timing

The sampling was undertaken during periods of favourable weather between the 22nd and 29th of November 2023.

3. Methods

3.1. Survey Vessel

All sampling work was conducted aboard OEL's dedicated 10.4 m Marine and Coastal Agency (MCA) category 2 coded survey vessel Seren Las (**Error! Reference source not found.**). The vessel was equipped with a Hemisphere V104s GPS Compass system that provided an accurate offset position of the sampling equipment when deployed from the stern A frame. This provided a Global Positioning System (GPS) feed to a dedicated survey navigation PC operating EIVA NaviPac and TimeZero Navigator v3 marine navigation with routing module and SeaTraceR Class B AIS.

A notice to mariners (NtM) was issued 14 days prior to the commencement of the survey and made available to local port and marine authorities and to the fishing community through the Kingfisher Information Services ran by Seafish.

Table 2 Vessel details

Vessel Name	Seren Las
Call Sign	MDAH2
MMSI	235087047
Mobilisation Port	Sovereign Harbour, Eastbourne
Length	10.0 m.
Beam	3.5 m
Draft	1.5 m

Plate 1 Nearshore survey vessel Seren Las.

3.2. Geodetic Parameters

3.2.1. Horizontal Datum

Table 3 Geodetic parameters

Parameter	Details
Name	World Geodetic System 1984 (WGS84)
Ellipsoid	WGS 84
Semi-Major Axis (a)	6378137.000 m
Semi-Minor Axis (b)	6356752.314 m
Inverse Flattening	298.257 223 563
Geodetic parameters EPSG Code	4326

Table 4 Projection parameters.

Projection	Universal Transverse Mercator (UTM)
Zone	30 North
Central Meridian	3° West
Latitude of Origin	0°
False Easting	500 000.00 m
False Northing	0.00 m
Scale Factor at Central Meridian	0.9996
Projected coordinate system EPSG code	32630
Units	metres

3.2.2. Datum Transformation Parameters

All data is referenced to WGS84, Universal Transverse Mercator (UTM) 30N, with no datum transformation need. No conversion or test coordinate was provided by the Client.

3.2.3. Vertical Datum

All altitude and depth data above seabed are referenced to LAT. All depth data below the seabed is referenced to LAT where available.

3.2.4. Unit Format and Conversions

The following have been used throughout this project and are expressed using the following conventions.

Table 5 Project unit format and convention details.

Unit Formats and Conventions	
Geographical Coordinates	Latitude N DD˚MM.mmmmmm' to 6 decimal places. Longitude E/W DD˚MM.mmmmmm' to 6 decimal places.
Grid Coordinates	Meters in the following format: Easting EEE EEE.eee m to 3 decimal places. Northing NNN NNN.nnn m to 3 decimal places.
Linear distances	Meters to 1 decimal places.
Offset measurement sign conventions	Meters in the following format: 'Y' is positive forward. 'X' is positive to starboard. 'Z' values are positives upwards from the waterline.
Time	UTC (GMT).

3.3. Survey Navigation

3.3.1. Surface Positioning

The Seren Las was equipped with a Hemisphere V104s Global Positioning System (GPS) compass system.

The Hemisphere V104s internal GPS receiver utilises a minimum of 4 GPS satellites, managing the navigation information required to obtain a position within 3 m at 95% accuracy. The V104s automatically tracks Satellite-Based Augmentation System (SBAS) differential correction to improve position accuracy to > 1 m at 95% accuracy. The V104s includes an integrated gyro and two tilt sensors to provide an accurate heading for navigation software.

3.3.2. Subsea Positioning

Subsea positioning of the grab and DDC equipment was achieved through the application of a 5 m stern offset. The offset was applied automatically relative to the vessel's position through the software package EIVA NaviPac at the point the equipment contacted the seabed and fix was taken.

3.3.3. Navigation Software

A vessel-based positioning system was employed utilizing EIVA NaviPac V4.6 software to ensure the accurate positioning of the vessel and subsea positioning of the sampling equipment via fixed offset as well as recording continuous track plots of the sampling equipment and recording sampling fixes. A navigation screen, displaying EIVA Helmsman Display was available at the helm.

3.3.4. Positional Checks & Calibrations

The GPS has an internal precision calculation which outputs a graphical representation of horizontal accuracy, displaying numerical precision as easting and northing. The accuracy of vessel heading, and reference systems was verified during mobilisation using agreed reference points.

3.4. Survey Equipment and Sampling

3.4.1. DDC System and Seabed Imagery Collection

Seabed imagery (simultaneous video and stills) was acquired at each station using OEL's SubC Rayfin PLE camera system, set up to obtain 1080p High Definition (HD) video and 20 Megapixel (MP) still images. The camera system (Plate 2) consisted of a SubC Imaging Rayfin PLE camera mounted in a Clear Liquid Optical Chamber (CLOC) (otherwise known as a 'freshwater lens') filled with fresh water to ensure imagery of suitable quality is obtained regardless of turbidity. The frame included light emitting diode (LED) strip lamps and a 10 cm point laser scaling array that is projected into the field of view and topside computer. The camera was powered with the use of an Uninterruptable Power Supply (UPS) to ensure no damage would be caused should the vessel have lost power or in the case of a power surge.

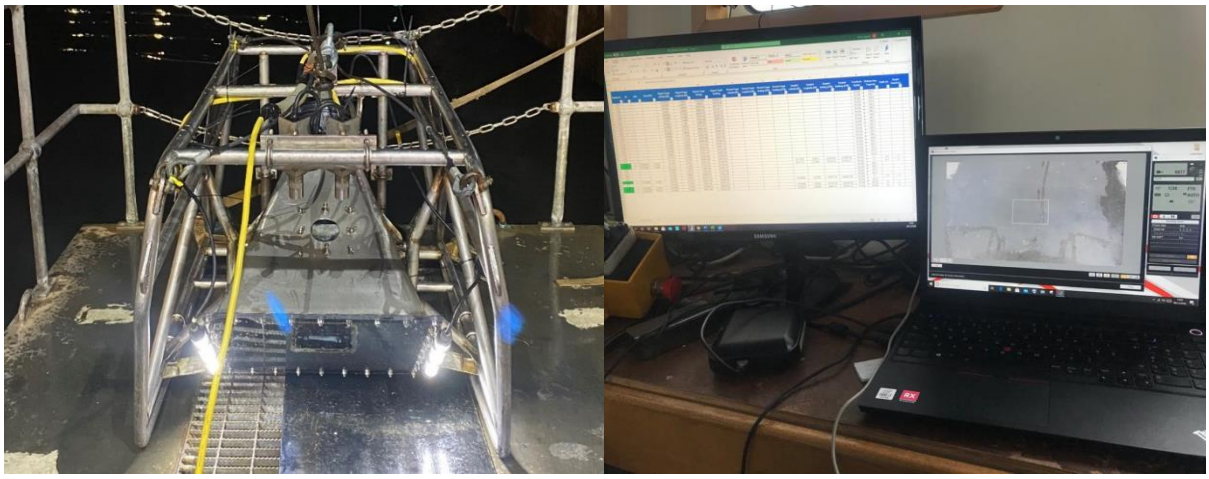

Plate 2 Left: OEL CLOC camera system. Right: The camera system topside setup.

All DDC transects were sampled in consideration of the Joint Nature Conservation Committee (JNCC) epibiota remote monitoring operational guidelines (Hitchin et al. 2015).

The camera system was deployed from the hydraulic 'A' frame on the aft deck of the Seren Las using the following method:

- As the vessel approached the target location, deck personnel began to prepare lifting equipment, camera, and readied the coaxial winch control.
- Deck personnel were alerted by the vessel master once on position, and the camera was raised using the A-frame and coaxial winch and lowered into the water column.
- Once the camera system was within 5 m of the seabed, video recording was started, and the camera was gently lowered and landed on the seabed.
- Once any disturbed sediment/ debris had cleared, the first still image could be taken. A bed hopping approach was then used along the remaining length of the transect with the camera being raised from and lowered to the seabed to allow for clear, unique images of the seabed. The vessel was manoeuvred along the length of the 50 m transect using slight forward propulsion or drift. Each transect was kept within a 50 m radius of the target location.
- Following the capture of the final image, the camera was lifted, video recording was stopped, and the camera was slowly brought to the surface.
- The winch operator then took the tension on the wire and once the vessel master had confirmed sea conditions were suitable, the camera system was recovered aboard and lowered onto the deck.

During the deployment, all footage underwent a preliminary review *in situ* by OEL's onboard Environmental Scientists. Videos were recorded in a digital format direct to topside hard disk drives (HDDs). Detailed notes were taken of visible sediment conditions and seabed features, obvious fauna, and habitat-related features whilst in the field.

3.4.2. Grab Equipment and Sediment Sampling

Sediment samples were collected from within 20 m of the target sampling location using OEL's 0.1 m^2 mini-Hamon grab sampler (

Plate 3).

A single deployment of the mini-Hamon grab yielded one sample of approximately 10 L at each station for macrobenthic and particle size distribution (PSD) analysis. From the same sample, a sub-sample of the sediment (approx. 0.5 L in volume) was removed for characterisation of the physical nature of the substrate (via PSD analysis).

The grab system was deployed and retrieved from the same hydraulic 'A' frame on the aft deck of the Seren Las using the deck winch in a similar approach to the camera system deployment previously detailed.

To ensure consistency in sampling, grab samples were screened by the lead Environmental Scientist and considered unacceptable if:

- The sample was less than 5 L. i.e., the sample represented less than half the 10 L capacity of the grab used.
- The jaws failed to close completely or were jammed open by an obstruction, allowing fines to pass through (washout or partial washout).
- The sample was taken at an unacceptable distance from the target location (> 20 m).

At least four attempts were made at each station before a station was to be abandoned. No pooling of samples took place.

Initial grab sample processing was undertaken onboard the survey vessel in line with the following methodology:

- An initial visual assessment was made of sample size and acceptability.
- A photograph was taken of the sample with station details and scale bar.
- 500 - 750 ml of the sample was removed for PSD analysis and transferred to a labelled tray.
- The remaining sample (retained for faunal sorting and identification) was emptied onto a 1.0 mm sieve net laid over a 4.0 mm sieve table and washed through using gentle rinsing with a seawater hose.
- This remaining sample was backwashed into a suitably sized sample container, and diluted 10 % formalin solution was added to fix the sample prior to laboratory analysis.
- Sample containers were clearly labelled internally and externally with date, sample ID and project name.
- Detailed field notes were taken including station number, fix number, number of attempts, sample volume, sediment type, conspicuous fauna, any sign of protected features, and water depth.

Plate 3 OEL's 0.1 m^2 mini-Hamon grab. Right: Grab deployment on *Seren Las*.

4. Results

4.1. Survey Progress

Grab and DDC sampling was conducted aboard the Seren Las between 22nd and 29th November 2023. The vessel was mobilised on the 21st November 2023 at Sovereign Harbour in Eastbourne and was demobilised on the 29th November 2023.

A summary of the sampling undertaken is detailed in Table 6, sampled locations with coordinates can be found in Appendices I, II, III and IV.

Table 6 Sampling summary (UTC).

Date	Activity	DDC	Grab
21.11.2023	Vessel mobilisation.	0	0
22.11.2023	Grab sampling commenced at 08:00 with all stations sampled by 14:15. Three stations were abandoned. See comments below. The vessel arrived back alongside in Sovereign Harbour at 14:45. Equipment and samples were demobilised for transport back to OEL premises.	0	25
23.11.2023	Vessel remained in port down on weather. Grab samples were safely transported back to the OEL storage facilities.	0	0
24.11.2023	Vessel remained in port due to unfavourable weather.	0	0
25.11.2023	Vessel remained in port due to unfavourable weather.	0	0
26.11.2023	Vessel remained in port due to unfavourable weather.	0	0
27.11.2023	Vessel remained in port due to unfavourable weather.	0	0
28.11.2023	OEL personnel arrived in Eastbourne marina at 11:00 UTC. The vessel departed Eastbourne marina at 15:03 UTC when conditions became favourable for DDC sampling. On arrival at the site, an issue with the camera umbilical was identified. The decision was made to return to port rather than replace the umbilical at sea, due to falling light. The vessel bunkered fuel. A full replacement of the umbilical was undertaken whilst alongside and a full wet test in port conducted.	0	0
29.11.2023	All DDC stations (30) were successfully completed. A further two stations (where grab attempts had failed) were surveyed. The vessel returned to Eastbourne for de-mobilisation and lift out	33	0
	Total	33[1]	25[1]

[1]25 of the 30 grab samples were completed successfully. The three stations; BHE1, BHE9 and BHE26 were unable to be sampled due to hard ground. Triplicate samples were required at BHE1 and, in addition to BHE9 and BHE26, resulted in a total of five unsuccessful grab samples. At least three attempts were made at each station prior to abandonment. These were subsequently sampled using DDC resulting in a total of 33 DDC stations when combined with the existing stations.

4.2. Benthic Grab Sampling

A total of 25 successful macrobenthic and PSD samples were collected during the survey. Three sampling stations (BHE1, BHE9 and BHE26) were abandoned due to the seabed being too hard to achieve a successful grab.

Full grab sample logs are presented in Appendix I. Example photographs of released and sieved grab samples are presented in Plate 4 and Plate 5, respectively. All sample images are displayed in Appendix II and Appendix III for released and sieved grab samples, respectively.

The three stations (BHE1, BHE9 and BHE26) where grab sampling was unsuccessful were sampled using DDC. The imagery data for these stations has been provided to Cefas along with the 30 existing stations and the video and stills logs for which are included in Appendix IV and Appendix V respectively.

4.2.1. Preliminary Habitat Assessment

Preliminary sediment assessments can be made *in situ* using grab samples. The main sediment types observed *in situ* were sand and muddy sandy gravel. A summary of *in situ* sediment classifications can be found in Table 7 with examples in

and **Error! Reference source not found.**.

Table 7 *In situ* preliminary assessed sediment classifications found across the Beachy Head East MCZ survey area[3].

Folk Classification	Number of stations
Gravelly Sand	5
Sandy Gravel	1
Sand	7
Muddy Sandy Gravel	6
Muddy Gravel	3
Muddy Sand	2

[3]Folk (1954) The distinction between grain size and mineral composition in sedimentary-rock nomenclature. The Journal of Geology 62

Plate 4 Examples of sediment types found from released grab samples. Top left: BHE30 – Gravelly Sand (gS). Top middle: BHE36 – Sandy Gravel (sG). Top right: BHE35 – Sand (S). Bottom left: BHE16 – Muddy Sandy Gravel (msG). Bottom middle: BHE2023_1 – Muddy Gravel (mG), Bottom right: BHE2023_4 – Muddy Sand (mS).

Plate 5 Examples of sediment types found from sieved grab samples. Top left: BHE30 – Gravelly Sand (gS). Top middle: BHE36 – Sandy Gravel (sG). Top right: BHE35 – Sand (S). Bottom left: BHE16 – Muddy Sandy Gravel (msG). Bottom middle: BHE2023_1 – Muddy Gravel (mG), Bottom right: BHE2023_4 – Muddy Sand (mS).

4.3. Seabed Imagery

Digital photographic stills and video footage were successfully obtained at each of the 30 DDC stations and were reviewed *in situ* to assess for the presence of protected or sensitive habitats (e.g., Annex I reef features). A particular focus of this survey was to identify the presence of *S. spinulosa* reefs. The preliminary review of the captured imagery undertaken by the onboard ecologist at the time of collection could not identify any obvious presence of this species. This would be more effectively determined with detailed analysis of the imagery and video data under suitable laboratory conditions.

The survey resulted in the collection of 312 still images and 30 videos which will be provided to Cefas for further analysis on sediment type, EUNIS classification, epibota, features and habitats of conservation importance (FoCI and HoCI respectively), and more.

Drop down video (DDV) logs and DDC still logs are presented in Appendix IV and Appendix V, respectively. Example imagery is presented in **Error! Reference source not found.**.

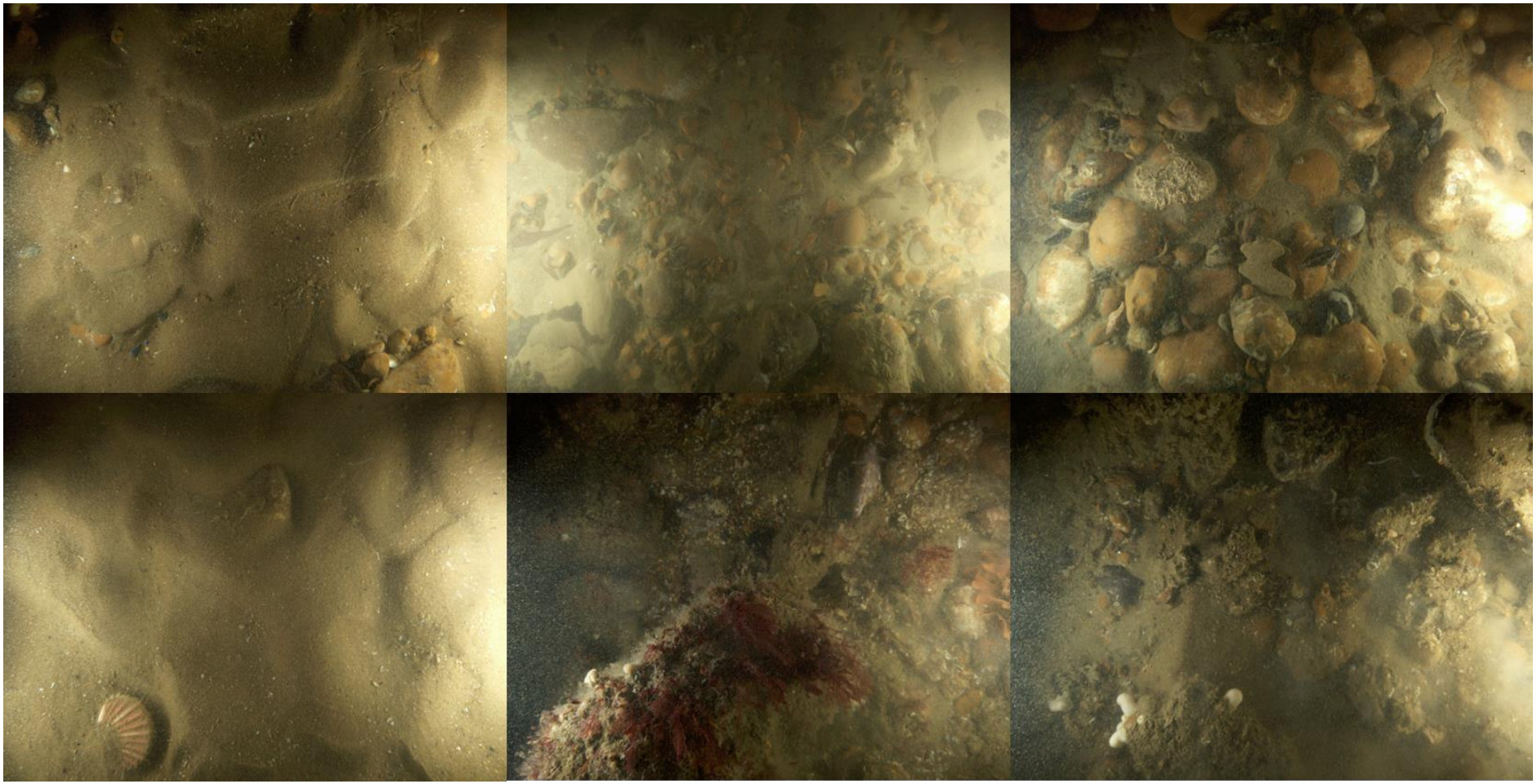

Plate 6 Mixed lower infralittoral habitats observed whilst collecting DDC footage. Station numbers: Top Left: SAB1, Top Centre: MUSS4, Top Right: BHE33, Bottom Left: BHE_2023_DDV_9, Bottom Centre: CHALK3, Bottom Left: BHE12.

5. References

Folk RL (1954) The distribution between grain size and mineral composition in sedimentary rock nomenclature. Journal of Geology 62:344–359.

Hitchin R, Turner JA, Verling E (2015) Epibiota Remote Monitoring from Digital Imagery: Operational Guidelines. NMBAQC and JNCC.

Natural England (2021) Offshore Wind Marine Environmental Assessments: Best Practice Advice for Evidence and Data Standards.

Saunders G, Bedford GS, Trendall JR, Sotheran I (2011) Guidance on survey and monitoring in relation to marine renewables deployments in Scotland. Volume 5. Benthic Habitats. Unpublished draft report to Scottish Natural Heritage and Marine Scotland.

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