JNCC/Cefas Partnership Report Series

Report No. 34

North East of Farnes Deep MCZ
2016 Survey Report (Version 3)

Whomersley, P., Mitchell, P., Silburn, B. & Albrecht, J.

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ISSN 2051-6711

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For further information please contact:

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

Marine Monitoring Team (marinemonitoring@jncc.gov.uk)

This report should be cited as:

Whomersley, P., Mitchell, P., Silburn, B. & Albrecht, J. (2020). North East of Farnes Deep MCZ 2016 Survey Report (Version 3). JNCC/Cefas Partnership Report Series No.34. 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/ and was reviewed by Cefas and JNCC.

Acknowledgements

We thank the Marine Protected Areas Survey Coordination and Evidence Group (MPAG) representatives for reviewing earlier drafts of this report.

Funded by:

Department for Environment, Food and Rural Affairs (Defra)
Marine and Fisheries Directorate
Nobel House
17 Smith Square
London SW1P 3JR

Please Note:

This work was delivered by Cefas and JNCC on behalf of the Marine Protected Areas Survey Coordination & Evidence Delivery Group (MPAG) and sponsored by Defra. MPAG was established in November 2012 and continued until March 2020. MPAG, was originally established to deliver evidence for Marine Conservation Zones (MCZs) recommended for designation. In 2016, the programme of work was refocused towards delivering the evolving requirements for Marine Protected Area (MPA) data and evidence gathering to inform the assessment of the condition of designated sites and features by SNCBs, in order to inform Secretary of State reporting to Parliament. MPAG was primarily comprised of members from Defra and its delivery bodies which have MPA evidence and monitoring budgets and/or survey capability. Members included representatives from Defra, JNCC, Natural England, Cefas, the Environment Agency, the Inshore Fisheries Conservation Authorities (IFCAs) and the Marine Management Organisation (MMO)).

Since 2010, offshore MPA surveys and associated reporting have been delivered by JNCC and Cefas through a JNCC\Cefas Partnership Agreement (which remained the vehicle for delivering the offshore survey work funded by MPAG between 2012 and 2020).

This report, originally published by Defra in 2017, has been revised to comply with GDPR and provide a clearer explanation of the survey design used.

Contents

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Abbreviations

BACI	Before-After-Control-Impact
BSH	Broadscale Habitats
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CRP	Common Reference Point
CTD	Conductivity Temperature Depth
Defra	Department for Environment, Food and Rural Affairs
DC	Drop Camera
EOL	End of Line
EUNIS	European Nature Information System
FOCI	Feature of Conservation Importance
HG	Hamon Grab
IHO	International Hydrographic Organization
JNCC	Joint Nature Conservation Committee
MBES	Multibeam echosounder
MCAA	Marine and Coastal Access Act
MCZ	Marine Conservation Zone
MESH	Development of a framework for Mapping European Seabed Habitats
MPA	Marine Protected Area
MPAG	Marine Protected Areas Survey Coordination and Evidence Group
MSFD	Marine Strategy Framework Directive
PSA	Particle Size Analysis
ROG	Recommended Operating Guidelines
RV	Research Vessel
SOL	Start of Line
STR	Subsea Technology and Rentals Ltd

1 Introduction

The survey at North East of Farnes Deep Marine Conservation Zone (MCZ) was carried out between 24 – 27 May 2016 on the RV *Cefas Endeavour* cruise CEND1016. The survey team for the duration of the fieldwork included Cefas marine ecologists, marine surveyors, habitat mappers and marine chemists along with a marine monitoring specialist from the Joint Nature Conservation Committee (JNCC).

1.1 Site overview

North East of Farnes Deep MCZ protects 492km^2 of seabed and is located approximately 55km offshore from the north Northumberland coast, in the mid North Sea (Figure 1).

The North East of Farnes Deep MCZ includes an area of mixed sediments, predominantly consisting of 'A5.2 Subtidal sand' subtidal sand interspersed with areas of 'A5.1 Subtidal coarse sediment' and gravels. 'A5.3 Subtidal mud' is also present. The mixture of sediment types within the MCZ creates a dynamic seabed environment that hosts a diverse ecosystem. The site depth ranges from 50m to 100m below chart datum with the deepest section of the site running parallel to the western boundary, while the shallowest section is to the south-east of the site. The site was originally designated for the broadscale habitat features 'A5.1 Subtidal coarse sediment' and 'A5.2 Subtidal sand'. The additional features designated in January 2016 included the broadscale habitat features 'A5.4 Subtidal mixed sediments' and 'A5.3 Subtidal mud' along with the species Feature of Conservation Importance (FOCI) 'Ocean Quahog (*Arctica islandica*)'.

Formerly known as Rock Unique, much of the data used to originally identify the site was sourced from maps based on habitat models, primarily UK SeaMap. A seabed survey led by Cefas and JNCC in 2012, designed to verify the presence of the predicted habitats (MB0120 survey CEND 04_12), found an absence of the low energy circalittoral rock feature predicted by the models. The site name was subsequently updated to North East of Farnes Deep MCZ, to better reflect the findings of the 2012 survey. Further inspection of the data for the site has indicated that the predicted rock could be present though covered by a layer of sediment, explaining its apparent absence from survey data.

An updated habitat map was produced following the 2012 survey. According to this map, the 'A5.4 Subtidal mixed sediments' feature occupies almost half of the MCZ, and the 'A5.2 Subtidal sand' and 'A5.1 Subtidal coarse sediment' features each occupy approximately a quarter of the total site area, with a small area of 'A5.3 Subtidal mud' present to the west of the site. A total of 410 infaunal and 39 epifaunal species were recorded during the 2012 survey, including the long-lived designated species FOCI 'Ocean Quahog (*Arctica islandica*)'.

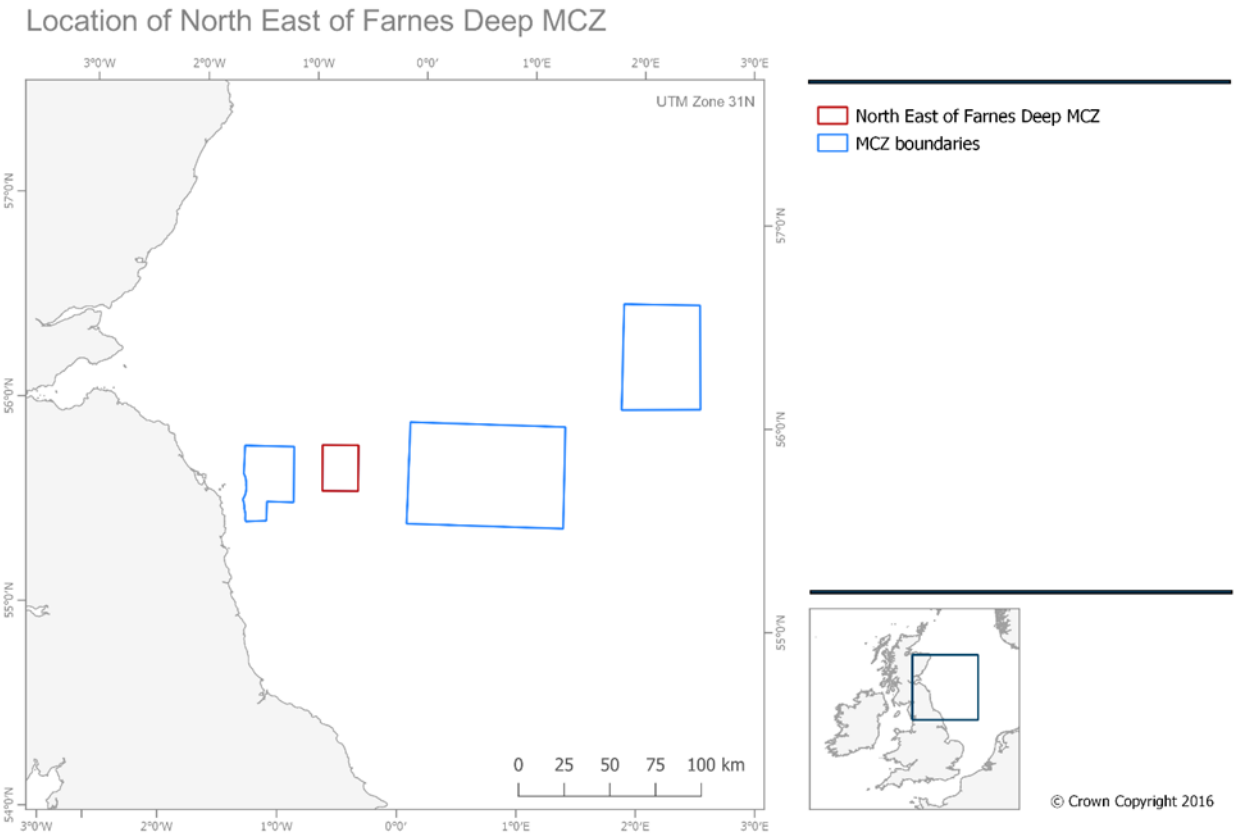

Figure 1. Location of the North East of Farnes Deep MCZ in the context of Marine Protected Areas proximal to the site.

Table 1. Site designations and proposed general management at North East of Farnes Deep MCZ.

Feature	Feature Type	General Management Approach
A5.1 Subtidal coarse sediment	Broadscale Habitat	Maintain in favourable condition
A5.2 subtidal sand	Broadscale Habitat	Maintain in favourable condition
A5.4 Subtidal mixed sediments	Broadscale Habitat	Maintain in favourable condition
A5.3 Subtidal mud	Broadscale Habitat	Maintain in favourable condition
Ocean Quahog *(Arctica islandica)*	Species Feature of Conservation	Maintain in favourable condition

1.2 Aims and objectives

1.2.1 Survey aims and objectives

The aim of the North East of Farnes Deep MCZ survey was to gather the initial dataset of a site monitoring time-series, that will contribute information on the habitats found at this site to inform habitat specific assessments (e.g. under the MCAA, MSFD).

The survey focused on Type 1 monitoring (see Table 2 below) of the designated Broadscale Habitat features of this site.

Table 2. Definitions of monitoring types and approaches.

Monitoring Type	Definition
Type 1	Type 1 monitoring constitutes a design to measure the rate and direction of change in the long-term (at the scale appropriate to the question), whilst at the same time collecting relevant information on environmental variables and human pressures to allow inference to be made about possible causes of such change.
Type 2	Type 2 monitoring specifically examines habitats subject to different levels of a pressure to answer questions about the relationship between cause and effect (i.e. measurements along a gradient of pressure). If the conditions on the seabed allow (i.e. the change in human pressure is not confounded by a change in another key variable, such as depth or temperature), then this is potentially a more powerful design than Type 1 when specifically looking to improve understanding of any state / pressure relationship.
Type 3	Type 3 monitoring is about designing an experiment (i.e. changing levels of a pressure experimentally by adding or removing the pressure) to find evidence of cause and effect. In principle this can be a very powerful design (i.e. using Before-After-Control-Impact (BACI) designs) but can be difficult to achieve in practice.

The objectives of the monitoring survey were as follows (listed in order of priority):

1. Collect data (infauna, particle size and underwater video and still images) to form the first dataset of a time-series against which to monitor change in condition of the designated Broadscale Habitat features of North East of Farnes Deep MCZ. While doing so, incorporate revisits to previously sampled stations to allow an assessment of temporal variability to be carried out.

2. Collect water samples for determination of chlorophyll and suspended particulate matter, which will be used for calibrating SmartBuoy, Ferrybox and ocean colour space-borne data (for the EU FP7 project HIGHROC, C5878).

3. Process invalid grabs for future genetic analysis of infaunal species.

2 Survey design and methods

2.1 Survey planning and design

75 stations were identified for sampling prior to the survey (Figure 2):

- 45 sample stations were positioned within the boundaries of the MCZ using expert judgement. Station locations were offset to infill gaps between the 2012 survey sample stations. Seven additional sampling stations were placed within the predicted Broadscale Habitat (BSH) ‘A5.3 Subtidal mud’ to ensure a sufficient number of samples were collected from this Broadscale Habitat.
- 23 sampling stations from the 2012 survey were revisited; these were selected at random from all stations sampled in 2012.

A single Hamon grab sample was collected from each sample station. At approximately every third station, an underwater camera deployment was undertaken. Stations for camera deployment were selected based on the provisional sediment descriptions taken from the

grab samples and were focussed on grab sample stations provisionally assigned to sand and mud.

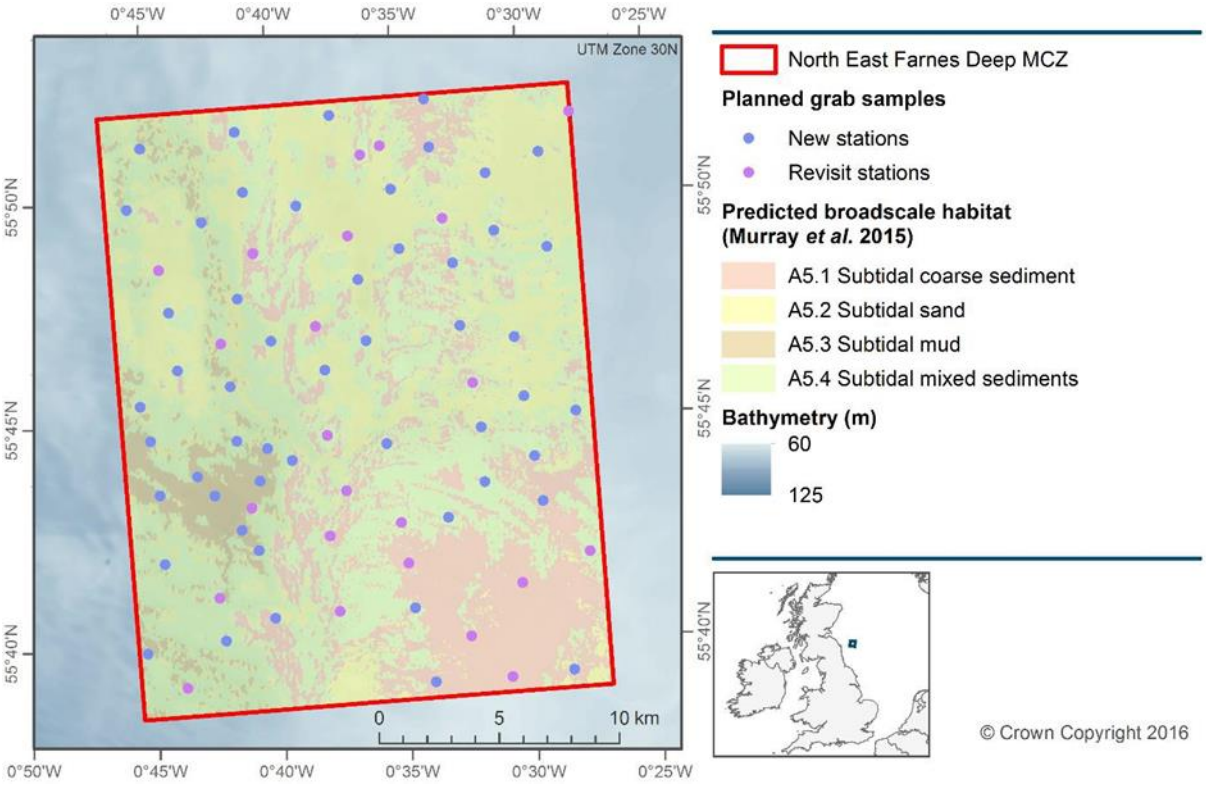

Figure 2. North East of Farnes Deep MCZ CEND1016 planned sampling stations.

2.2 Survey equipment and sample processing

2.2.1 Multibeam echosounder bathymetry and backscatter

Multibeam echosounder (MBES) bathymetry and backscatter data were acquired using the Kongsberg EM2040 system operated at 300kHz and deployed on the drop keel of RV Cefas Endeavour, which was lowered to its full extent to minimise the effect of bad weather on the acoustic signal. Variations of sound velocity with water depth were determined using a Conductivity Temperature Depth (CTD) probe and applied during MBES data acquisition. Details of the MBES equipment are provided in Annex 6.4 and a calibration report in Annex 6.5.

The raw MBES bathymetry data was processed using CARIS HIPS. Tidal information was gathered using a CNAV 3050 DGPS receiver. Tide height data was smoothed and extracted to reduce the effect of the tide on the bathymetry. The soundings were cleaned and smoothed using CARIS to IHO order 1 (IHO 2008). MBES backscatter data were processed with Fledermaus Geocoder Toolbox (GT) to produce standard and floating point (FP) geotiffs. Separate processing reports are provided, which detail quality assurance (QA) steps undertaken.

2.2.2 Sampling

Ground truth sampling was achieved using the 0.1m^2 Hamon grab and underwater video cameras on a drop frame.

2.2.2.1 Grab

The grab system used during the survey was a 0.1m^2 mini Hamon grab. Samples were collected from anywhere within a 100m radius bullring centred on the target location. On recovery, the grab was emptied into a large plastic bin and a representative sub-sample of sediment (approx. 0.5 litres) taken for Particle Size Analysis (PSA). The sample was stored in a labelled plastic container and frozen ready for transfer to a laboratory ashore. The remaining sample was photographed and the volume of sediment measured and recorded. Benthic fauna were collected by washing the sample with seawater over a 1mm sieve. The retained >1mm fraction was transferred to a labelled container and preserved in buffered 4% formaldehyde for later analysis ashore. 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 preliminary EUNIS and BSH sediment classes.

Figure 3. 0.1m^2 mini Hamon grab.

2.2.2.2 Camera drop frame

The stills camera fitted to the drop frame was an STR Seaspyder Telemetry (Canon EOS) 18-megapixel digital stills camera with flat lens and STR MP-F through-the-lens-controlled flash. It was controlled through a dual role copper/fibre multiplexor custom built to Cefas specification. The video footage was shot using an STR SP-HDC-3000aw 1080p video camera with a 1 Lux colour 2-megapixel sensor. It was run at 1080p (25 frames per second) video resolution along with all other control signals over a dual fibre optic cable. The digital stream was captured by the surface PC and recorded direct to MP4 format video files. Lighting was provided by four STR MP-3 LED lights running at 1500 Lumens light intensity per unit. Laser scaling was provided by two green dot class 3r laser pointers providing a

reference width of 21cm on the seabed. The drop frame was also fitted with a digital heading/pitch/roll sensor, altimeter and water temperature sensor. This was recorded in real time along with GPS time and position using a video overlay. Set-up and operation followed the MESH 'Recommended Operating Guidelines (ROG) for underwater video and photographic imaging techniques' (Coggan *et al*. 2007).

Figure 4. STR (Subsea Technology and Rentals) drop frame with video and still imaging system.

Field notes were made during each camera deployment, noting station and sample metadata, real- time observations of substrate and taxa, and an initial assessment of the range of BSHs that had been seen. A summary pencil sketch depicting the main site characteristics was often included.

2.2.3 GPS positions and corrections

GPS fixes were recorded using the Tower Navigation system on RV Cefas Endeavour. This records the Lat/Long position of the gantry from which the sampling equipment is being deployed, automatically compensating for the offset between these gantries and the GPS antenna. Fixes for grab samples were taken at the instant the grab contacted the seabed. The grab was always deployed from the side gantry and the position recorded is taken to be the true position of the grab sample, as the grab typically drops directly down from the gantry. In strong tides an offset of up to about 10 metres may occur but is not accounted for.

Fixes of start and end of camera survey line were taken from the stern gantry and the HiPAP beacon attached to the camera frame.

3 Survey narrative

3.1 North East of Farnes Deep MCZ

The survey was completed between 21:00 hrs on 24/05/16 and 12:00 hrs on 27/05/16. On arrival at the study site, work began on the planned Hamon grab survey. Hamon grab samples were collected from the four Broadscale Habitats represented within the North East of Farnes Deep MCZ. On completion of the Hamon grab survey, the multibeam system was calibrated and work began on the drop camera survey. The choice of camera survey locations was based on the preliminary assessment of the sediments sampled during the Hamon grab survey. On completion of the drop camera survey, RV Cefas Endeavour transited east back to Swallow Sand MCZ.

When “no samples” occurred during Hamon grab sampling (an invalid grab where sample volume is less than three litres), the sample was retained and processed for future genetic analyses. In areas where 100 % sampling success occurred, additional replicates were taken.

3.2 Water sampling

A water sample was taken every 24 hours and filtered on board for determination of chlorophyll and suspended particulate matter. This sample will be used to calibrate SmartBuoy, Ferrybox and ocean colour space-borne data (for the EU FP7 project HIGHROC, C5878).

4 Data acquired

4.1 Grab and imagery samples

Figure 5 shows the locations of Hamon grab samples (73 successful samples, eight ‘no samples’) and seabed imagery (26 transects) collected. Note on survey six additional stations were added to those planned before the survey to target features of interest identified on survey.

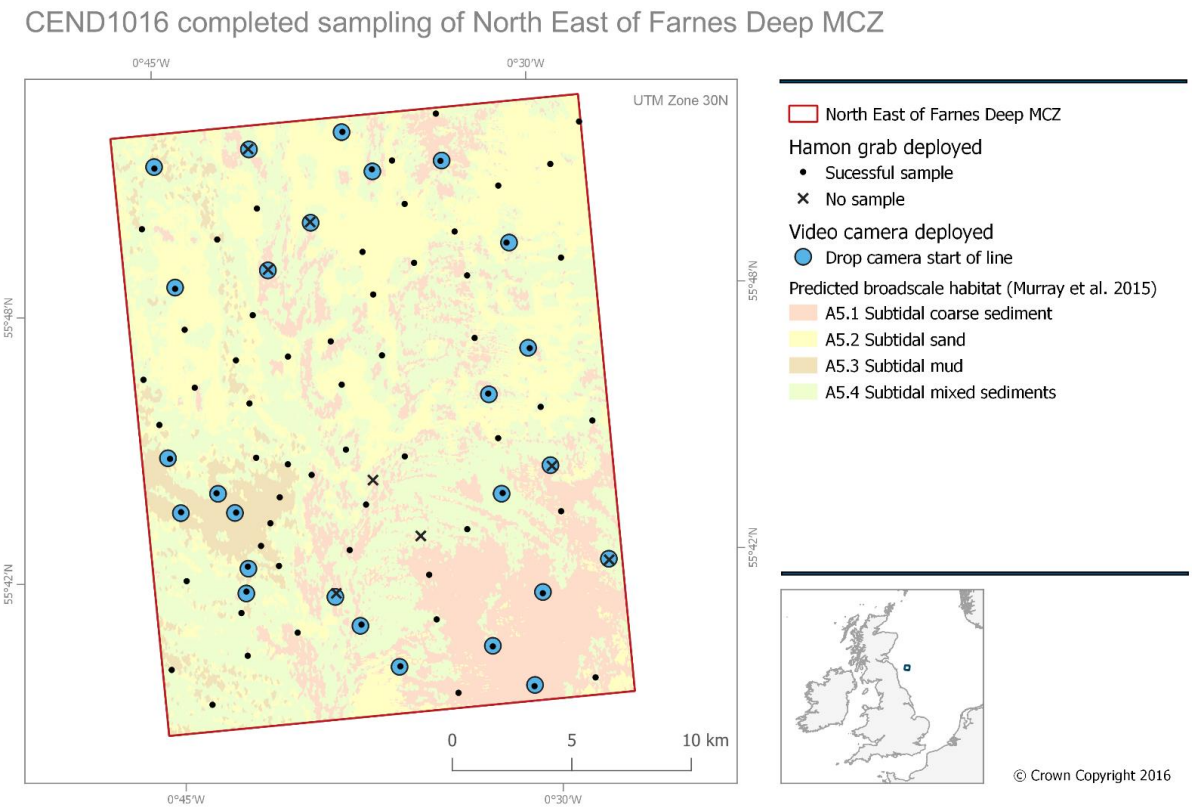

Figure 5. The sampling stations visited with the Hamon grab and drop camera at North East of Farnes Deep MCZ. The base map shows predicted broad-scale habitats.

Images of grab samples collected are shown in Table 3.

Table 3. Photographs of grab samples (whole sample, 5mm and 1mm sieve mesh).

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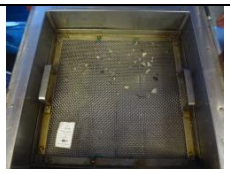
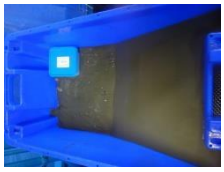
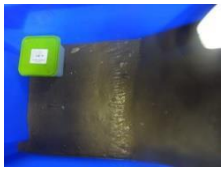
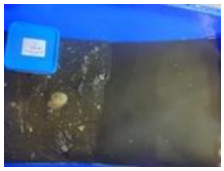
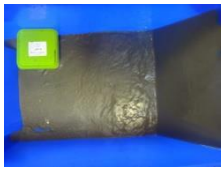
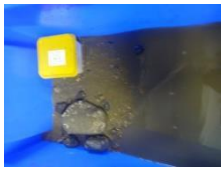
NEFD_CEND1016_NEFD23_STN_216_A1				5	0.25
NEFD_CEND1016_NEFD58_STN_217_A1				4.5	0.25
NEFD_CEND1016_NEFD51_STN_218_A1				5	0.125

NEFD_CEND1016_NEFD67_STN_219_A1				5.5	5
NEFD_CEND1016_NEFD54_STN_220_A1				3.5	0.5
NEFD_CEND1016_NEFD50_STN_221_A1				3	5
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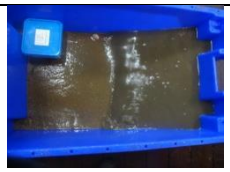
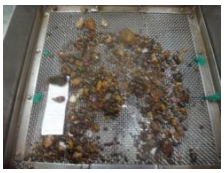
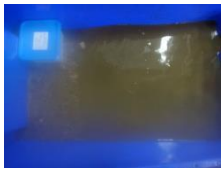
NEFD_CEND1016_NEFD49_STN_225_A1				4.5	1
NEFD_CEND1016_NEFD04_STN_227_A2				3	2.5
NEFD_CEND1016_NEFD56_STN_228_A1				4.5	2.5

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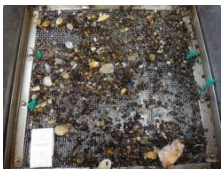
NEFD_CEND1016_NEFD38_STN_232_A1				5.5	10
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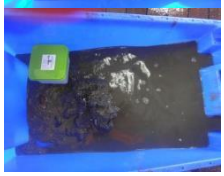
NEFD_CEND1016_NEFD68_STN_239_A2				5	2.5
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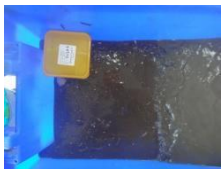
NEFD_CEND1016_NEFD48_STN_243_A2				4	5
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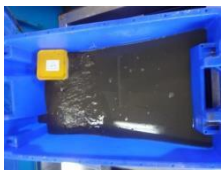
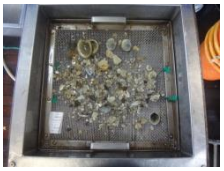
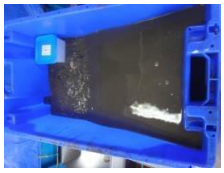
NEFD_CEND1016_NEFD22_STN_246_A1				4	5

NEFD_CEND1016_NEFD44_STN_247_A1				5	5
NEFD_CEND1016_NEFD07_STN_248_A1				4.5	0.5
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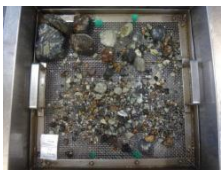
NEFD_CEND1016_NEFD09_STN_253_A2				3.5	10

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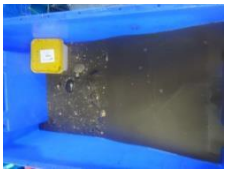
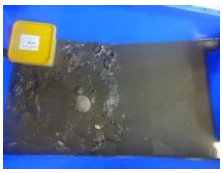
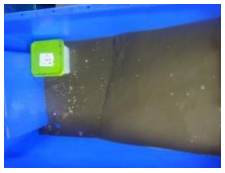
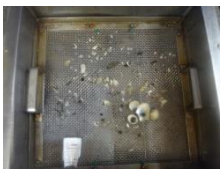
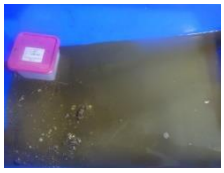
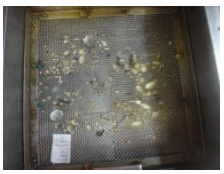
NEFD_CEND1016_NEFD31_STN_260_A1				7	5
NEFD_CEND1016_NEFD24_STN_261_A1				5	5
NEFD_CEND1016_NEFD16_STN_262_A1				5.5	1
NEFD_CEND1016_NEFD76_STN_263_A1				6	0.5
NEFD_CEND1016_NEFD77_STN_264_A1				6.5	0.5

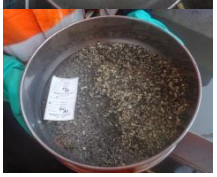
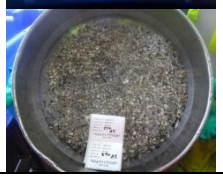
Station Code	Sample image	5mm	1mm	Sample volume (l)	Container size (l)
NEFD_CEND1016_NEFD28_STN_265_A1				5	0.25
NEFD_CEND1016_NEFD75_STN_266_A1				5.5	0.25

NEFD_CEND1016_NEFD18_STN_267_A2				5	0.25
NEFD_CEND1016_NEFD74_STN_268_A1				4.5	0.25
NEFD_CEND1016_NEFD32_STN_269_A2				4.5	5
NEFD_CEND1016_NEFD72_STN_270_A1				6.5	0.25
NEFD_CEND1016_NEFD64_STN_271_A1				5.5	0.5
NEFD_CEND1016_NEFD29_STN_272_A1				3	0.5
NEFD_CEND1016_NEFD59_STN_273_A1				4	0.5

Station Code	Sample image	5mm	1mm	Sample volume (l)	Container size (l)
NEFD_CEND1016_NEFD06_STN_274_A1				4.5	2.5
NEFD_CEND1016_NEFD33_STN_275_A1				4.5	1

NEFD_CEND1016_NEFD60_STN_278_A2				4	0.5
NEFD_CEND1016_NEFD27_STN_280_A1				3.5	0.5
NEFD_CEND1016_NEFD43_STN_281_A1				3	0.5
NEFD_CEND1016_NEFD30_STN_282_A1				3.5	0.5
NEFD_CEND1016_NEFD20_STN_283_A2				3	0.5
NEFD_CEND1016_NEFD15_STN_284_A2				4.5	0.5
NEFD_CEND1016_NEFD57_STN_285_A1				6	1

Station Code	Sample image	5mm	1mm	Sample volume (l)	Container size (l)
NEFD_CEND1016_NEFD55_STN_286_A1				4.5	2.5
NEFD_CEND1016_NEFD71_STN_287_A1				5.5	1
NEFD_CEND1016_NEFD73_STN_288_A1				6	0.5

NEFD_CEND1016_NEFD25_STN_289_A2				5	0.5
NEFD_CEND1016_NEFD70_STN_290_A1				6	0.5
NEFD_CEND1016_NEFD35_STN_291_A2				5.5	1
NEFD_CEND1016_NEFD78_STN_292_A2				4.5	5
NEFD_CEND1016_NEFD65_STN_293_A1				4	2.5
NEFD_CEND1016_NEFD19_STN_294_A2				4.5	0.5

Station Code	Sample image	5mm	1mm	Sample volume (l)	Container size (l)
NEFD_CEND1016_NEFD26_STN_295_A1				5	5
NEFD_CEND1016_NEFD80_STN_326_A2				4	2.5

4.2 Feature of Conservation Importance (FOCI) Ocean Quahog *(Arctica islandica)*

Two occurrences of the bivalve *Arctica islandica* were also noted within the North East of Farnes Deep MCZ (Table 4).

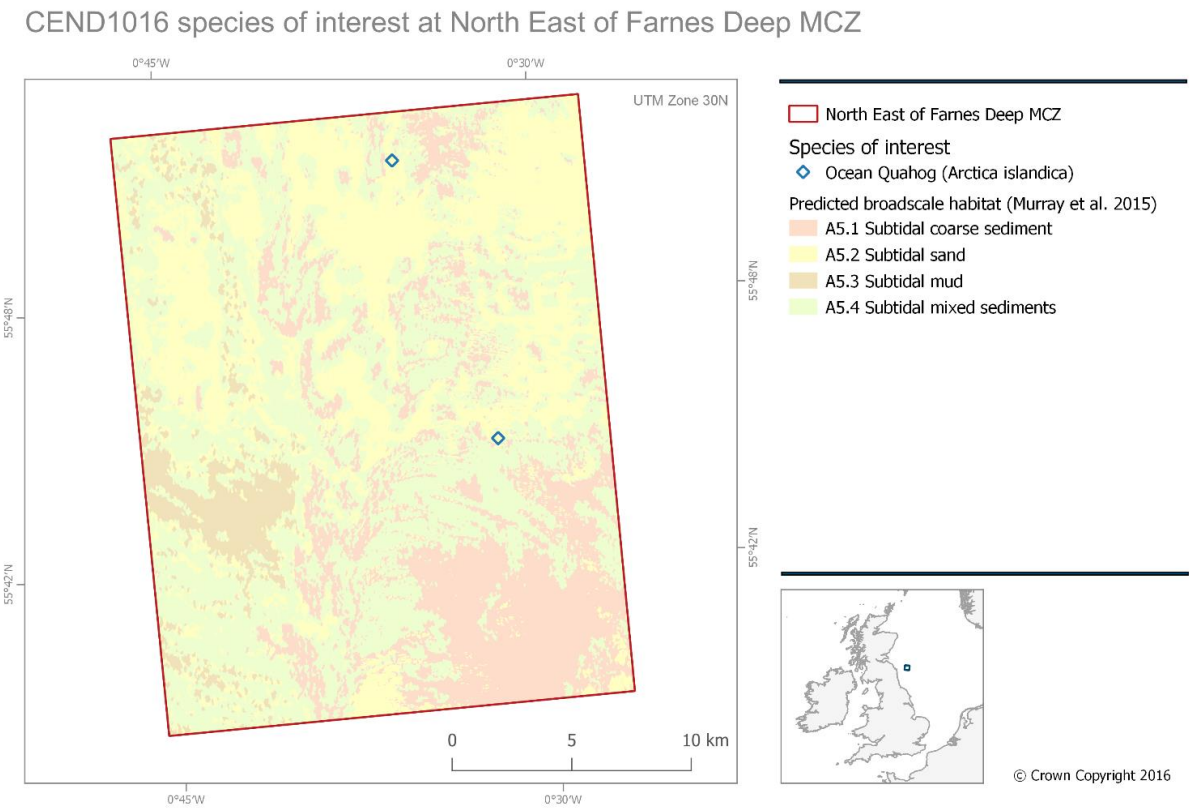
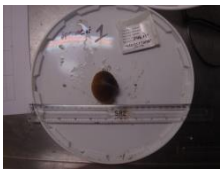


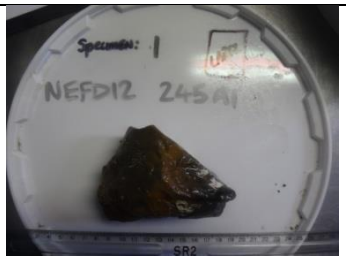
Figure 6. Presence of the Ocean Quahog (Arctica islandica) within the surveyed area of North East of Farnes Deep MCZ.

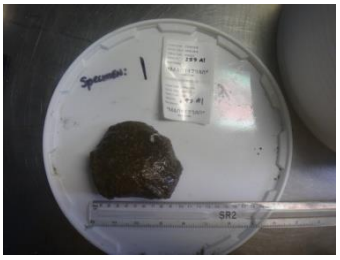
Table 4. Specimens of Ocean Quahog (Arctica islandica) sampled using the Hamon grab.

Station code	Specimen 1	Specimen 2	Specimen 3	Specimen 4	BSH
NEFD_CE ND1016_ NEFD46_ STN_237_ A1		_____	_____	_____	Sand
	Length: 7cm Width 7.2cm	_____	_____	_____	
NEFD_CE ND1016_ NEFD22_ STN_246_ A1		_____	_____	_____	Coarse
	Length 4.5cm Width 5cm	_____	_____	_____	

Cobbles identified in the Hamon grab samples were processed separately to the benthic sample and then returned to the sample before the sample was finalised (Table 5).

Table 5. Cobbles sampled using the Hamon grab.

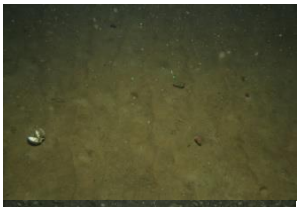
Station Code	Cobble 1	Cobble 2	Cobble 3
NEFD_CEND1016_NEFD12_STN_245_A1			
Cobble dimensions	90mm x 65mm x 60mm	105mm x 90mm x 50mm	
NEFD_CEND1016_NEFD09_STN_253_A2			
Cobble dimensions	145mm x 110mm x 60mm	130mm x 85mm x 45mm	105mm x 80mm x 50mm

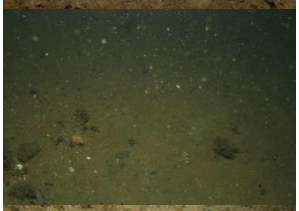
Station Code	Cobble 1	Cobble 2	Cobble 3
NEFD_CEND1016_NEFD09_STN_253_A2 Continued			
Cobble dimensions	90mm x 80mm x 55mm		
NEFD_CEND1016_NEFD10_STN_259_A1_			
Cobble dimensions	79mm x 94mm x 41mm		

4.3 Seabed imagery

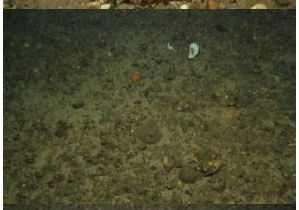
A selection of three still images from each of the drop camera deployments is presented in Table 6 to illustrate what was observed on the video.

Table 6. Selection of seabed images for each camera deployment.

Station Code/Filename	Representative sample 1	Representative sample 2	Representative sample 3
NEFD_CEND1016_NEFD20_STN_296_A1			
NEFD_CEND1016_NEFD27_STN_297_A1			
NEFD_CEND1016_NEFD34_STN_298_A1			

Station Code/Filename	Representative sample 1	Representative sample 2	Representative sample 3
NEFD_CEND1016_NEFD21_STN_299_A1			
NEFD_CEND1016_NEFD37_STN_300_A1			
NEFD_CEND1016_NEFD12_STN_301_A1			
NEFD_CEND1016_NEFD41_STN_302_A1			

NEFD_CEND1016_NEFD61_STN_305_A1			
NEFD_CEND1016_NEFD67_STN_306_A1			
NEFD_CEND1016_NEFD50_STN_307_A1			
NEFD_CEND1016_NEFD05_STN_308_A1			

Station Code/Filename	Representative sample 1	Representative sample 2	Representative sample 3
NEFD_CEND1016_NEFD52_STN_309_A1			
NEFD_CEND1016_NEFD63_STN_310_A1			
NEFD_CEND1016_NEFD02_STN_311_A1			
NEFD_CEND1016_NEFD04_STN_312_A1			

NEFD_CEND1016_NEFD11_STN_313_A1			
NEFD_CEND1016_NEFD03_STN_314_A1			
NEFD_CEND1016_NEFD80_STN_315_A1			
NEFD_CEND1016_NEFD10_STN_316_A1			

Station Code/Filename	Representative sample 1	Representative sample 2	Representative sample 3
NEFD_CEND1016_NEFD81_STN_317_A1			
NEFD_CEND1016_NEFD77_STN_319_A1			
NEFD_CEND1016_NEFD73_STN_320_A1			
NEFD_CEND1016_NEFD25_STN_321_A1			

NEFD_CEND1016_NEFD71_STN_322_A1			
NEFD_CEND1016_NEFD70_STN_323_A1			

5 References

Coggan, R., Mitchell, A., White, J. & Golding, N. (2007). Recommended operating guidelines (ROG) for underwater video and photographic imaging techniques. (http://www.emodnet-seabedhabitats.eu/Default.aspx?page=1442) [Accessed 02/08/2017].

International Hydrographic Organization. (2008). IHO Standards For Hydrographic Surveys. International Hydrographic Bureau Special Publication No. 44. 5th Edition, February 2008, 28 pp.

Murray, J., Downie, A., Stephens, D. & Diesing, M. (2015) North East of Farnes Deep rMCZ Post- survey Site Report, Marine Protected Areas Data and Evidence Co-ordination Programme (MB0120) Report 5.

Annex 1. Glossary

Definitions signified by an asterisk (*) have been sourced from Natural England and JNCC Ecological Network Guidance (Natural England & Joint Nature Conservation Committee 2010).

Benthic	A description for animals, plants and habitats associated with the seabed. All plants and animals that live in, on or near the seabed are benthos (e.g. sponges, crabs, seagrass beds).*
Broadscale Habitats	Habitats which have been broadly categorised based on a shared set of ecological requirements, aligning with level 3 of the EUNIS habitat classification. Examples of Broadscale Habitats are protected across the MCZ network.
Epifauna	Fauna living on the seabed surface.
EUNIS	A European habitat classification system, covering all types of habitats from natural to artificial, terrestrial to freshwater and marine.*
Favourable Condition	When the ecological condition of a species or habitat is in line with the conservation objectives for that feature. The term 'favourable' encompasses a range of ecological conditions depending on the objectives for individual features.*
Feature	A species, habitat, geological or geomorphological entity for which an MPA is identified and managed.*
Features of Conservation Importance (FOCI)	Habitats and species that are rare, threatened or declining in Secretary of State waters.*
Infauna	Fauna living within the seabed sediment.
Joint Nature Conservation Committee (JNCC)	JNCC is the public body that advises the UK Government and devolved administrations on UK-wide and international nature conservation. JNCC has responsibility for nature conservation in the offshore marine environment, which begins at the edge of territorial waters and extends to the UK Continental Shelf (UKCS).
Marine and Coastal Access Act (MCAA)	The Marine and Coastal Access Act (2009) provides for the designation of conservation zones within English and Welsh waters.
Marine Strategy Framework Directive (MSFD)	The MSFD (EC Directive 2008/56/EC) aims to achieve Good Environmental Status (GES) of EU marine waters and to protect the resource base upon which marine-related economic and social activities depend.
Marine Conservation Zone (MCZ)	MPAs designated under the Marine and Coastal Access Act (2009). MCZs protect nationally important marine wildlife, habitats, geology and geomorphology, and can be designated anywhere in English and Welsh inshore and UK offshore waters.*
Marine Protected Area (MPA)	A generic term to cover all marine areas that are 'A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values' (Dudley 2008).*

Pressure	The mechanism through which an activity has an effect on any part of the ecosystem (e.g. physical abrasion caused by trawling). Pressures can be physical, chemical or biological, and the same pressure can be caused by a number of different activities (Robinson *et al.* 2008).*
Supplementary Advice on Conservation Objectives (SACO)	Site-specific advice providing more detailed information on the ecological characteristics or 'attributes' of the site's designated feature(s). This advice is issued by Natural England and/or JNCC.

Annex 2. 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. Cellphone Voice/Fax/Data Radio TELEX Inmarsat C Fleet 77 (Inmarsat F) and VSAT (eutelsat) internet access
Endurance	42 days
Complement	En-suite 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) Sternthruster (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 EM3002D & EM2040 swathe bathymetry sounders Hull 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

Annex 3. Position logging software – Tower Navigation

Vessel offsets are defined from the pitch roll centre of the vessel – the Common Reference Point (CRP) used by the Tower Cemap software to calculate offsets.

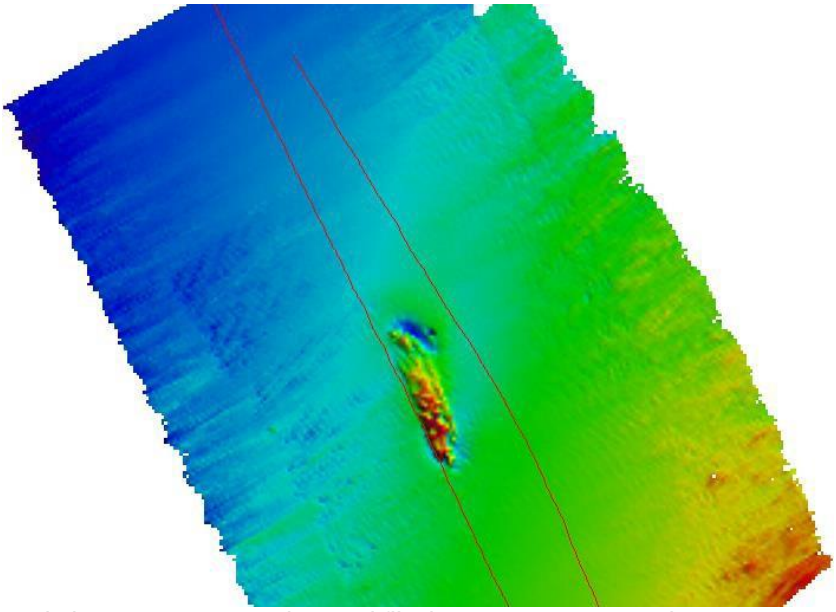
Annex 4. Multibeam echosounder acoustic systems

Model: Simrad EM2040 operated at 300kHz. Calibrated by patch test on 4 July 2012 (see calibration report below).

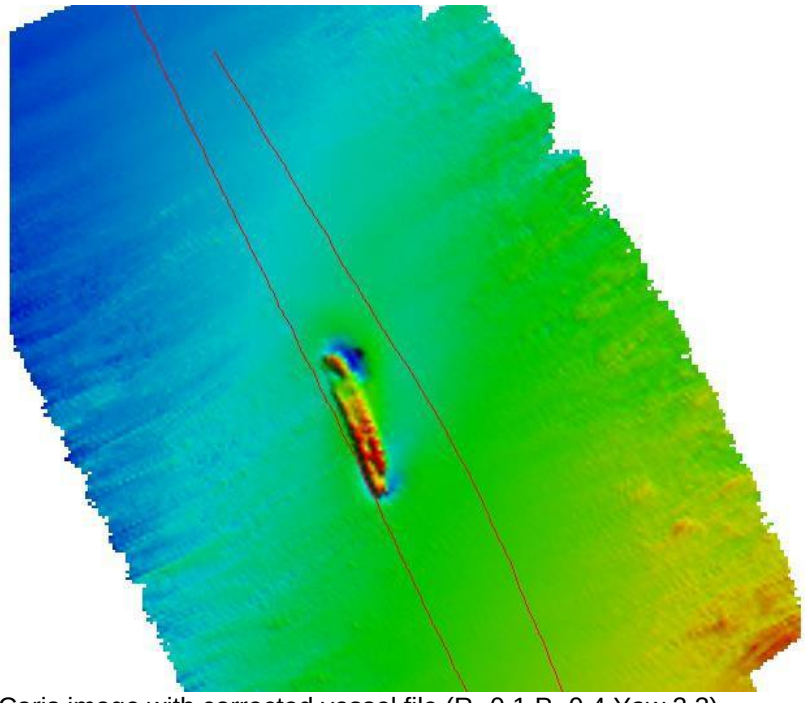
Hardware On-line	**Remarks**
Kongsberg EM2040	Head serial 220
Seapath 330 plus MRU-5	Serial MRU-5 2043 Serial Seapath S/N10580
C-Nav 3050 GPS	C-NAVC2 (GPS + GLONASS)
Thales 3011 GPS	Fugro Seastar differential corrections
MAHRS Gyro	SN 040644
SAIV SD204	CTD casts SN 718
Reson SVP24	Mounted on blade next to sonar heads
Druck PTX 1830	Vessel draft sensor
Software (including version)	**Remarks**
Kongsberg SIS V3.83	-
Caris HIPS V7.1 SP2 Hotfix 1-5	-
IVS3D Fledermaus GT v7.3.2a	-

Annex 5. Recalibration report, Kongsberg EM2040 multibeam echosounder

The deep water recalibration of the EM2040 was carried out over an unknown wreck situated just North of North East of Farnes Deep MCZ. A recalibration of data collected in April 2016 was carried out after noticing poor registration of a wreck during survey.



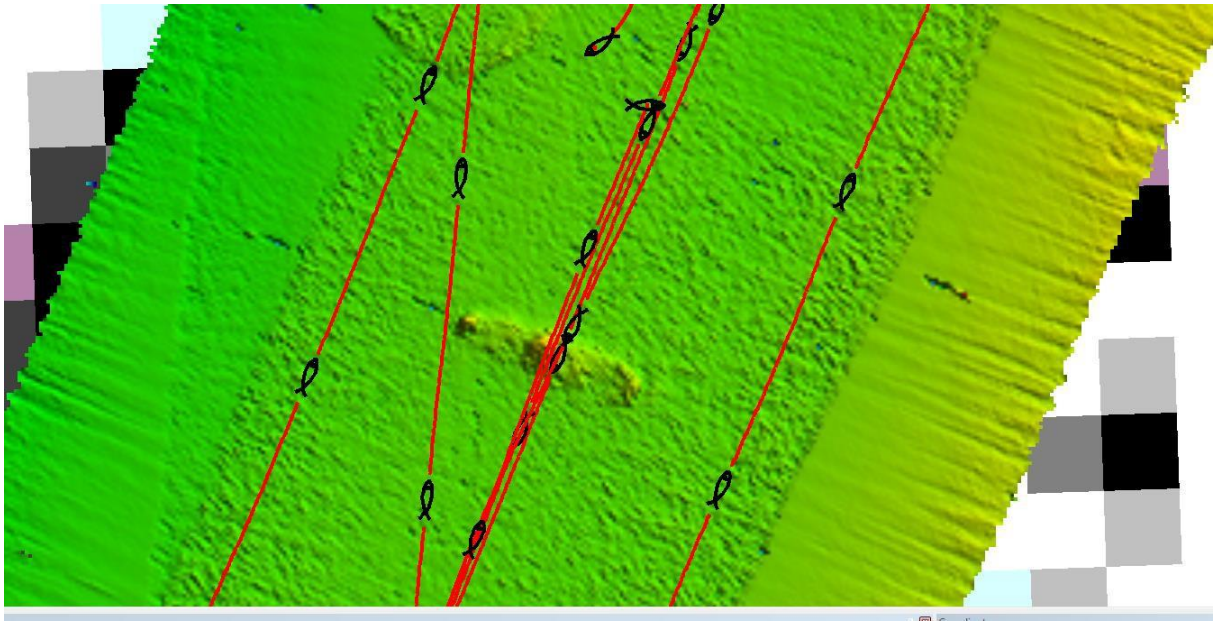
Caris image uncorrected vessel file (R 0.0 P 0.0 Yaw 0.0).



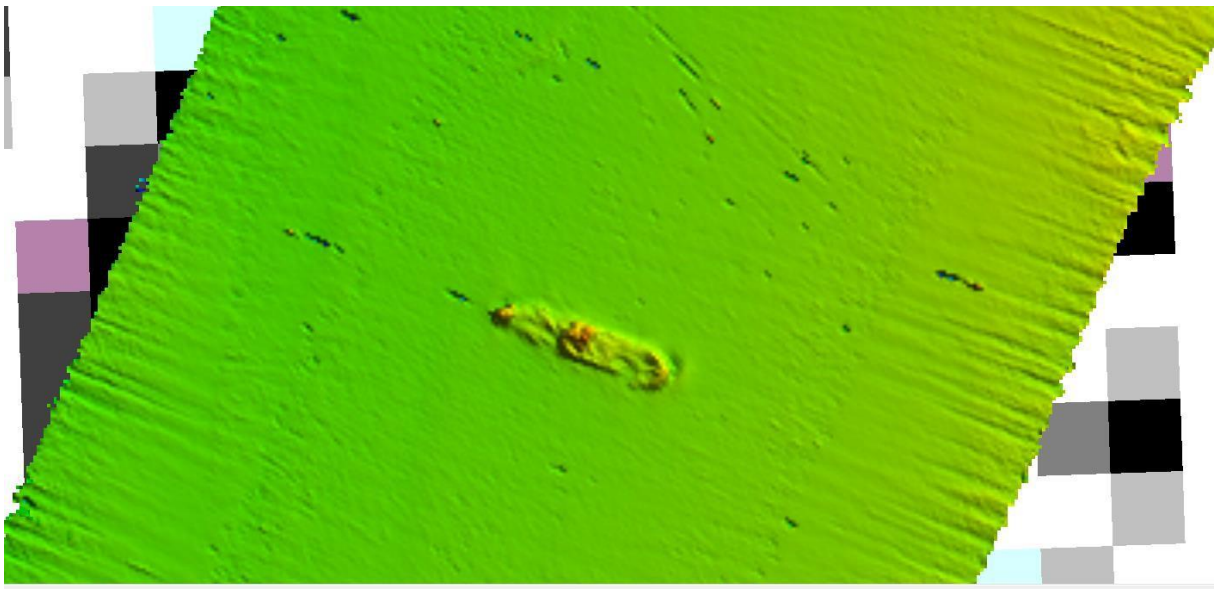
Caris image with corrected vessel file (R -0.1 P -0.4 Yaw 2.3).

	Date	Time	Time Correctio...	X (m)	Y (m)	Z (m)	Pitch (deg)	Roll (deg)	Yaw (deg)	Manufacturer	Model	Serial Numb
1	2012-158	00:00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Kongsberg	Simrad EM204	
2	2016-092	00:00	0.000	0.000	0.000	0.000	-0.400	-0.100	2.300	Kongsberg	Simrad EM204	
3	2016-147	00:00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Kongsberg	Simrad EM204	
4		00:00										

Vessel file modified to correct data during period of April to May 24 when SIS was updated with new calibration details from North East of Farnes Deep calibration wreck.



Uncorrected.



Corrected head -1.8°.

Annex 6. Station metadata

All stations were sampled on Cruise CEND1016. Station Code is used to identify the location of the sampling station. Station Number is a sequential event number for the cruise, so changes each time a new gear is used or a new location is sampled. MB2= Kongsberg EM2040 Multibeam, HG=Hamon grab, DC, Drop Camera, SOL = Start Of Line, EOL = End Of Line. All positions in decimal degrees, Lat/Long WGS84.

Table 7. Survey metadata for North East of Farnes Deep MCZ CEND101**6.**

StnCode	StnNum	Attempt	SOL/EOL	Time	Date	Gear Code	LatDD	LongDD
NEFD23	216	A1		20:04	24/05/2016	HG	55.863000	-0.465800
NEFD58	217	A1		20:26	24/05/2016	HG	55.847660	-0.486530
NEFD51	218	A1		20:59	24/05/2016	HG	55.840600	-0.521990
NEFD67	219	A1		21:22	24/05/2016	HG	55.819070	-0.518538
NEFD54	220	A1		21:45	24/05/2016	HG	55.812340	-0.482736
NEFD50	221	A1		22:21	24/05/2016	HG	55.779020	-0.506809
NEDF62	222	A1		22:46	24/05/2016	HG	55.756770	-0.501623
NEFD53	223	A1		23:06	24/05/2016	HG	55.750630	-0.467706
NEFD52	224	A1		23:31	24/05/2016	HG	55.734410	-0.496213
NEFD52	224	A2		23:45	24/05/2016	HG	55.734450	0.495850
NEFD52	224	A3		23:55	24/05/2016	HG	55.734250	-0.496801
NEFD49	225	A1		00:18	25/05/2016	HG	55.717240	-0.491713
NEFD02	226	A1		00:49	25/05/2016	HG	55.698080	-0.461543
NEFD02	226	A2		01:04	25/05/2016	HG	55.698100	-0.461126
NEFD02	226	A3		01:15	25/05/2016	HG	55.697950	-0.462208
NEFD04	227	A1		01:52	25/05/2016	HG	55.686910	-0.507061
NEFD04	227	A2		01:56	25/05/2016	HG	55.686840	-0.506818
NEFD56	228	A1		02:33	25/05/2016	HG	55.654240	-0.474787
NEFD11	229	A1		02:55	25/05/2016	HG	55.652180	-0.515618
NEFD03	230	A1		03:39	25/05/2016	HG	55.667900	-0.541874
NEFD45	231	A1		04:04	25/05/2016	HG	55.651170	-0.566282
NEFD38	232	A1		04:32	25/05/2016	HG	55.679150	-0.578242
NEFD17	233	A1		04:54	25/05/2016	HG	55.696030	-0.581658
NEFD14	234	A1		05:11	25/05/2016	HG	55.710760	-0.585884
NEFD14	234	A2		05:17	25/05/2016	HG	55.711020	-0.586367
NEFD14	234	A3		05:22	25/05/2016	HG	55.711060	-0.586024
NEFD42	235	A1		05:40	25/05/2016	HG	55.712380	-0.554763
NEFD42	235	A2		05:45	25/05/2016	HG	55.712490	-0.555146

StnCode	StnNum	Attempt	SOL/EOL	Time	Date	Gear Code	LatDD	LongDD
NEFD42	235	A3		05:51	25/05/2016	HG	55.712230	-0.554539
NEFD63	236	A1		06:11	25/05/2016	HG	55.725230	-0.529946
NEFD46	237	A1		07:03	25/05/2016	HG	55.745900	-0.531021
NEFD05	238	A1		07:22	25/05/2016	HG	55.762810	-0.536057
NEFD68	239	A1		07:44	25/05/2016	HG	55.783970	-0.543246
NEFD68	239	A2		07:49	25/05/2016	HG	55.783940	-0.543133
NEFD47	240	A1		08:13	25/05/2016	HG	55.807550	-0.546784
NEFD47	240	A2		08:17	25/05/2016	HG	55.807090	-0.546084
NEFD47	240	A3		08:23	25/05/2016	HG	55.807530	-0.545926
NEFD08	241	A1		08:43	25/05/2016	HG	55.824400	-0.551780
NEFD08	241	A2		08:49	25/05/2016	HG	55.824110	-0.551060
NEFD08	241	A3		08:55	25/05/2016	HG	55.824250	-0.552711
NEFD61	242	A1		09:28	25/05/2016	HG	55.850870	-0.558717
NEFD61	242	A2		09:32	25/05/2016	HG	55.851010	-0.559693
NEFD61	242	A3		09:38	25/05/2016	HG	55.850620	-0.558817
NFED48	243	A1		10:04	25/05/2016	HG	55.868870	-0.561092
NFED48	243	A2		10:09	25/05/2016	HG	55.868820	-0.561071
NEFD41	244	A1		10:37	25/05/2016	HG	55.863910	-0.624690
NEFD41	244	A2		10:43	25/05/2016	HG	55.863800	-0.624065
NEFD12	245	A1		11:06	25/05/2016	HG	55.849200	-0.605676
NEFD22	246	A1		11:22	25/05/2016	HG	55.852110	-0.591964
NEFD44	247	A1		11:47	25/05/2016	HG	55.835580	-0.585040
NEFD07	248	A1		12:17	25/05/2016	HG	55.818420	-0.614815
NEFD66	249	A1		12:42	25/05/2016	HG	55.813310	-0.580978
NEFD66	249	A2		12:49	25/05/2016	HG	55.813290	-0.580826
NEFD40	250	A1		13:14	25/05/2016	HG	55.802230	-0.609168
NEFD69	251	A1		13:41	25/05/2016	HG	55.779240	-0.605419
NEFD36	252	A1		14:04	25/05/2016	HG	55.769030	-0.633252
NEFD09	253	A1		14:27	25/05/2016	HG	55.744720	-0.632771
NEFD09	253	A2		14:32	25/05/2016	HG	55.744590	-0.632677
NEFD39	254	A1		14:53	25/05/2016	HG	55.740700	-0.593594
NEFD39	254	A2		14:59	25/05/2016	HG	55.740900	-0.593760
NEFD13	255	A1		15:19	25/05/2016	HG	55.723920	-0.621017
NEFD13	255	A2		15:24	25/05/2016	HG	55.723590	-0.621182
NEFD01	256	A1		15:44	25/05/2016	HG	55.707250	-0.632618
NEFD01	256	A2		15:50	25/05/2016	HG	55.707150	-0.632725
NEFD01	256	A3		15:58	25/05/2016	HG	55.706850	-0.633617

StnCode	StnNum	Attempt	SOL/EOL	Time	Date	Gear Code	LatDD	LongDD
MB_CAL_CTD	257	A1		16:39	25/05/2016	CTD	55.697280	-0.576339
Run	258	A1	SOL	17:03	25/05/2016	MB2	55.692040	-0.569014
Run	258	A1	EOL	17:08	25/05/2016	MB2	55.696620	-0.578684
Run (Re-run1)	258	A1	SOL	17:14	25/05/2016	MB2	55.695620	-0.577102
Run (Re-run1)	258	A1	EOL	17:17	25/05/2016	MB2	55.692880	-0.570007
MBCAL120	258	A1	SOL	17:25	25/05/2016	MB2	55.691180	-0.569147
MBCAL120	258	A1	EOL	17:28	25/05/2016	MB2	55.694830	-0.578069
Run (Re-run2)	258	A1	SOL	17:35	25/05/2016	MB2	55.695030	-0.577009
Run (Re-run2)	258	A1	EOL	17:37	25/05/2016	MB2	55.692540	-0.569960
MBCAL_-120	258	A1	SOL	17:44	25/05/2016	MB2	55.692350	-0.567123
MBCAL_-120	258	A1	EOL	17:47	25/05/2016	MB2	55.695990	-0.574972
NEFD10	259	A1		18:30	25/05/2016	HG	55.678680	-0.628346
NEFD31	260	A1		18:35	25/05/2016	HG	55.676870	-0.670973
NEFD24	261	A1		18:55	25/05/2016	HG	55.669150	-0.704934
NEFD16	262	A1		19:13	25/05/2016	HG	55.685300	-0.707665
NEFD76	263	A1		19:26	25/05/2016	HG	55.693250	-0.703641
NEFD77	264	A1		19:39	25/05/2016	HG	55.702590	-0.701867
NEFD28	265	A1		19:54	25/05/2016	HG	55.702260	-0.681150
NEFD75	266	A1		20:35	25/05/2016	HG	55.710100	-0.692396
NEFD18	267	A1		20:54	25/05/2016	HG	55.718360	-0.683750
NEFD18	267	A2		21:00	25/05/2016	HG	55.718420	-0.685411
NEFD74	268	A1		21:24	25/05/2016	HG	55.727980	-0.678344
NEFD32	269	A1		21:45	25/05/2016	HG	55.735630	-0.656597
NEFD32	269	A2		21:54	25/05/2016	HG	55.735750	-0.656361
NEFD72	270	A1		22:12	25/05/2016	HG	55.740200	-0.671787
NEFD64	271	A1		22:32	25/05/2016	HG	55.743240	-0.692665
NEFD29	272	A1		22:55	25/05/2016	HG	55.763760	-0.695323
NEFD59	273	A1		23:20	25/05/2016	HG	55.780590	-0.668075
NEFD06	274	A1		23:46	25/05/2016	HG	55.785460	-0.639085
NEFD33	275	A1		00:16	26/05/2016	HG	55.796780	-0.690150
NEFD21	276	A1		00:50	26/05/2016	HG	55.813590	-0.678353
NEFD21	276	A2		00:51	26/05/2016	HG	55.813240	0.000000
NEFD21	276	A3		00:56	26/05/2016	HG	55.813730	-0.679028
NEFD21	276	A4		01:01	26/05/2016	HG	55.813530	-0.678015
NEFD37	277	A1		01:29	26/05/2016	HG	55.830640	-0.648687
NEFD37	277	A2		01:35	26/05/2016	HG	55.830510	-0.648500
NEFD37	277	A3		01:41	26/05/2016	HG	55.830400	-0.648244

StnCode	StnNum	Attempt	SOL/EOL	Time	Date	Gear Code	LatDD	LongDD
NEFD37	277	A4		01:53	26/05/2016	HG	55.830740	-0.648336
NEFD60	278	A1		02:15	26/05/2016	HG	55.836700	-0.683724
NEFD60	278	A2		02:22	26/05/2016	HG	55.836490	-0.684215
NEFD34	279	A1		02:50	26/05/2016	HG	55.859200	-0.687582
NEFD34	279	A2		02:55	26/05/2016	HG	55.858840	-0.687585
NEFD34	279	A3		03:01	26/05/2016	HG	55.858730	-0.688263
NEFD27	280	A1		03:49	26/05/2016	HG	55.853620	-0.750785
NEFD43	281	A1		04:13	26/05/2016	HG	55.831120	-0.761108
NEFD30	282	A1		04:38	26/05/2016	HG	55.825830	-0.711236
NEFD20	283	A1		05:03	26/05/2016	HG	55.808450	-0.741418
NEFD20	283	A2		05:07	26/05/2016	HG	55.808140	-0.740985
NEFD15	284	A1		06:10	26/05/2016	HG	55.652030	-0.731401
NEFD15	284	A2		06:14	26/05/2016	HG	55.651440	-0.729967
NEFD57	285	A1		07:03	26/05/2016	HG	55.665280	-0.755885
NEFD55	286	A1		07:29	26/05/2016	HG	55.698300	-0.743022
NEFD71	287	A1		07:53	26/05/2016	HG	55.724260	-0.744438
NEFD73	288	A1		08:15	26/05/2016	HG	55.723090	-0.707826
NEFD25	289	A1		08:32	26/05/2016	HG	55.730760	-0.719638
NEFD25	289	A2		08:36	26/05/2016	HG	55.730700	-0.720228
NEFD70	290	A1		08:59	26/05/2016	HG	55.744470	-0.750004
NEFD35	291	A1		09:18	26/05/2016	HG	55.757580	-0.755578
NEFD35	291	A2		09:22	26/05/2016	HG	55.757390	-0.755995
NEFD78	292	A1		09:42	26/05/2016	HG	55.774620	-0.765079
NEDF65	293	A1		10:06	26/05/2016	HG	55.770700	-0.731207
NEFD19	294	A1		10:31	26/05/2016	HG	55.780350	-0.702092
NEFD19	294	A2		10:35	26/05/2016	HG	55.780180	-0.702834
NEFD26	295	A1		11:03	26/05/2016	HG	55.792610	-0.735990
NEFD20	296	A1	SOL	11:55	26/05/2016	DC	55.808540	-0.740975
NEFD20	296	A1	EOL	12:06	26/05/2016	DC	55.809220	-0.741751
NEFD27	297	A1	SOL	12:44	26/05/2016	DC	55.854240	-0.751036
NEFD27	297	A1	EOL	12:54	26/05/2016	DC	55.855170	-0.752503
NEFD34	298	A1	SOL	13:30	26/05/2016	DC	55.858940	-0.687118
NEFD34	298	A1	EOL	13:40	26/05/2016	DC	55.858860	-0.690210
NEFD21	299	A1	SOL	14:22	26/05/2016	DC	55.813310	-0.678523
NEFD21	299	A1	EOL	14:32	26/05/2016	DC	55.813920	-0.676151
NEFD37	300	A1	SOL	14:59	26/05/2016	DC	55.830350	-0.648411
NEFD37	300	A1	EOL	15:09	26/05/2016	DC	55.831650	-0.646986

StnCode	StnNum	Attempt	SOL/EOL	Time	Date	Gear Code	LatDD	LongDD
NEFD12	301	A1	SOL	15:34	26/05/2016	DC	55.848410	-0.605458
NEFD12	301	A1	EOL	15:45	26/05/2016	DC	55.849700	-0.604259
NEFD41	302	A1	SOL	16:39	26/05/2016	DC	55.863730	-0.624661
NEFD41	302	A1	EOL	16:49	26/05/2016	DC	55.865140	-0.623889
MB_CAL2_CTD	303	A1	-	17:08	26/05/2016	CTD	55.877900	-0.619607
Run2	304	A1	SOL	17:15	26/05/2016	MB2	55.879280	-0.617400
Run2	304	A1	EOL	17:24	26/05/2016	MB2	55.873480	-0.621601
MBCAL_2-120	304	A1	SOL	17:29	26/05/2016	MB2	55.871680	-0.625233
MBCAL_2-120	304	A1	EOL	17:35	26/05/2016	MB2	55.878160	-0.620118
Run2 (Re-run1)	304	A1	SOL	17:39	26/05/2016	MB2	55.878570	-0.617627
Run2 (Re-run1)	304	A1	EOL	17:43	26/05/2016	MB2	55.873100	-0.621908
MBCAL2_120	304	A1	SOL	17:49	26/05/2016	MB2	55.872230	-0.620576
MBCAL2_120	304	A1	EOL	17:52	26/05/2016	MB2	55.876380	-0.617264
Run2 (Re-run2)	304	A1	SOL	17:58	26/05/2016	MB2	55.877410	-0.618313
Run2 (Re-run2)	304	A1	EOL	17:52	26/05/2016	MB2	55.873240	-0.621806
Run2 (Re-run3)	304	A1	SOL	18:07	26/05/2016	MB2	55.870850	-0.623704
Run2 (Re-run3)	304	A1	EOL	18:13	26/05/2016	MB2	55.876030	-0.619690
NEFD61	305	A1	SOL	19:04	26/05/2016	DC	55.851060	-0.558961
NEFD61	305	A1	EOL	19:14	26/05/2016	DC	55.849270	-0.558670
NEFD67	306	A1	SOL	19:39	26/05/2016	DC	55.818970	-0.516977
NEFD67	306	A1	EOL	19:49	26/05/2016	DC	55.818340	-0.515571
NEFD50	307	A1	SOL	20:21	26/05/2016	DC	55.779180	-0.507870
NEFD50	307	A1	EOL	20:31	26/05/2016	DC	55.778690	-0.506097
NEFD05	308	A1	SOL	20:57	26/05/2016	DC	55.762510	-0.535631
NEFD05	308	A1	EOL	21:07	26/05/2016	DC	55.761980	-0.534058
NEFD52	309	A1	SOL	21:43	26/05/2016	DC	55.734720	-0.497204
NEFD52	309	A1	EOL	21:53	26/05/2016	DC	55.734410	-0.495070
NEFD63	310	A1	SOL	22:15	26/05/2016	DC	55.724940	-0.530647
NEFD63	310	A1	EOL	22:25	26/05/2016	DC	55.725120	-0.529257
NEFD02	311	A1	SOL	23:05	26/05/2016	DC	55.698460	-0.461730
NEFD02	311	A1	EOL	23:11	26/05/2016	DC	55.699370	-0.458632
NEFD04	312	A1	SOL	23:57	26/05/2016	DC	55.687310	-0.506684
NEFD04	312	A1	EOL	00:08	26/05/2016	DC	55.688180	-0.505819
NEFD11	313	A1	SOL	00:44	27/05/2016	DC	55.652620	-0.515238
NEFD11	313	A1	EOL	00:54	27/05/2016	DC	55.653350	-0.513912
NEFD03	314	A1	SOL	01:20	27/05/2016	DC	55.668140	-0.541852
NEFD03	314	A1	EOL	01:30	27/05/2016	DC	55.668570	-0.541048

StnCode	StnNum	Attempt	SOL/EOL	Time	Date	Gear Code	LatDD	LongDD
NEFD80	315	A1	SOL	02:12	27/05/2016	DC	55.662090	-0.604529
NEFD80	315	A1	EOL	02:22	27/05/2016	DC	55.663240	-0.601821
NEFD10	316	A1	SOL	02:56	27/05/2016	DC	55.678210	-0.629108
NEFD10	316	A1	EOL	03:06	27/05/2016	DC	55.679070	-0.626690
NEFD81	317	A1	SOL	03:45	27/05/2016	DC	55.689540	-0.644749
NEFD81	317	A1	EOL	03:55	27/05/2016	DC	55.690890	-0.644186
NEFD76	318	A1	SOL	04:29	27/05/2016	DC	55.692550	-0.703785
NEFD76	318	A1	EOL	04:39	27/05/2016	DC	55.693440	-0.703181
NEFD77	319	A1	SOL	05:04	27/05/2016	DC	55.701810	-0.701563
NEFD77	319	A1	EOL	05:14	27/05/2016	DC	55.702930	-0.701292
NEFD73	320	A1	SOL	05:40	27/05/2016	DC	55.722970	-0.708652
NEFD73	320	A1	EOL	05:50	27/05/2016	DC	55.724120	-0.708479
NEFD25	321	A1	SOL	06:08	27/05/2016	DC	55.730470	-0.719246
NEFD25	321	A1	EOL	06:18	27/05/2016	DC	55.731690	-0.718770
NEFD71	322	A1	SOL	07:11	27/05/2016	DC	55.723920	-0.744618
NEFD71	322	A1	EOL	07:21	27/05/2016	DC	55.722880	-0.743675
NEFD70	323	A1	SOL	07:45	27/05/2016	DC	55.744740	-0.751374
NEFD70	323	A1	EOL	07:55	27/05/2016	DC	55.744140	-0.750461
NEFD79	324	A1		08:42	27/05/2016	HG	55.732630	-0.615727
NEFD79	324	A2		08:48	27/05/2016	HG	55.732470	-0.615535
NEFD79	324	A3		08:54	27/05/2016	HG	55.732920	-0.615304
NEFD81	325	A1		09:32	27/05/2016	HG	55.690870	-0.644003
NEFD81	325	A2		09:45	27/05/2016	HG	55.690580	-0.644960
NEFD81	325	A3		09:48	27/05/2016	HG	55.690660	-0.644977
NEFD81	325	A4		09:53	27/05/2016	HG	55.690880	-0.644719
NEFD80	326	A1		10:23	27/05/2016	HG	55.662850	-0.604837
NEFD80	326	A2		10:30	27/05/2016	HG	55.662250	-0.603969

JNCC/Cefas Partnership Report Series. *North East of Farnes Deep MCZ 2016 Survey Report (Version 3)*, **No. 34**. Whomersley, P., Mitchell, P., Silburn, B. & Albrecht, J. 2020. ISSN 2051-6711