

JNCC/Cefas Partnership Report Series

Report No. 8

**Croker Carbonate Slabs cSAC/SCI CEND23/15
Marine Mammal Observations Report**

Archer, S. & Albrecht, J.

February 2016

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For further information please contact:

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

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1 Introduction

1.1 Scope

In partnership with JNCC, Cefas undertook a geophysical and environmental monitoring survey of the Croker Carbonate Slabs cSAC/SCI between 24 October and 6 November 2015 on board the RV Cefas Endeavour (CEND 23/15). The aim of the survey was to identify and map the methane derived authigenic carbonates (MDAC), which have been created by the seeping of the underlying gas into the substrate. Geophysical operations included the use of multibeam echo sounders, side-scan sonar and sub-bottom profiling boomer.

The additional noise emitted into the water by geophysical equipment may constitute a threat to marine mammals within the area of activity. Under the EU Habitats Directive 92/43/ECC, member states are required to put in place a strict system of protection for animal species listed under Annex IV, which includes cetaceans. As part of the licence agreements between the regulator and the contracting company, a standard condition of survey is that the JNCC guidelines for minimising the risk of disturbance and injury to marine mammals from seismic surveys (August 2010) are followed.

This report details the seismic operations and the implementation of the JNCC guidelines during the geophysical survey of the Croker Carbonate Slabs cSAC/SCI.

1.2 Site description

Croker Carbonate Slabs was designated under the EU Habitats Directive as an SCI (Site of Community Importance) in November 2012. The site is designated for the Annex I habitat '1180 Submarine structures made by leaking gases' and is located in the mid-Irish Sea, approximately 30km to the west of Anglesey. The site covers an area of ~66km² and has a depth range of 60 to 120m.

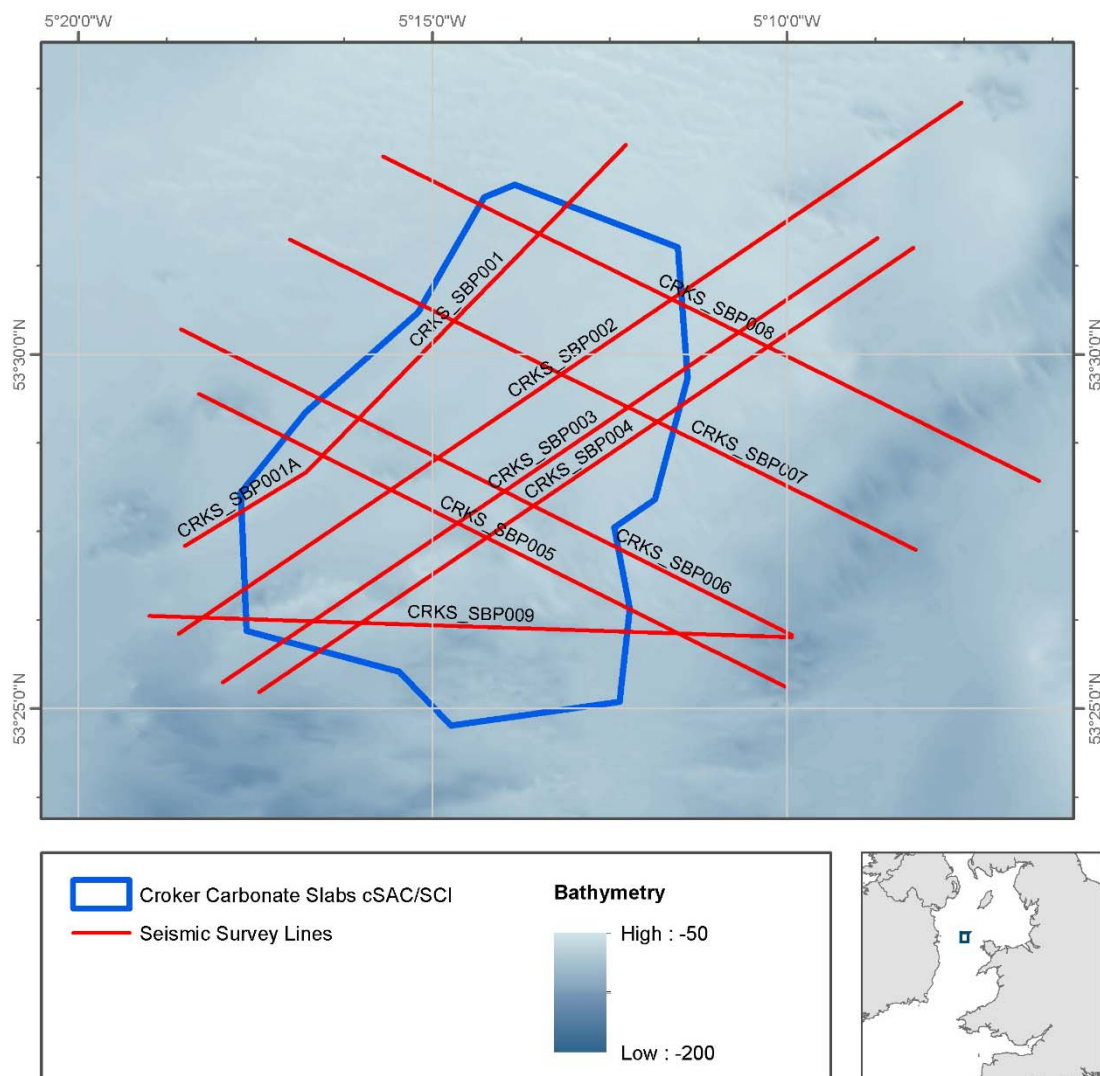
2 Survey and Equipment

2.1 Geophysical survey

The aim of the geophysical survey was to identify and map the extent of the MDAC present within the site and to help in the monitoring of variations in size in the future. As part of this, sub-bottom profiling was employed to identify features such as fissures and gas hydrates, which act as a source and pathway for methane to reach the surface.

2.2 Line plan

The line plan developed contained nine sub-bottom lines running either south-west to north-east, or south-east to north-west across the site (Figure 1). Additional lines were added to the west and east of the site during the survey. The location of fixed fishing gear within the site meant that some of the lines had to be shortened during the survey or run as two separate lines from opposite directions.



Map not to be reproduced without the permission of Cefas

Figure 1. Seismic line plan for the survey of the Croker Carbonate Slabs cSAC/SCI.

2.3 Vessel

The RV Cefas Endeavour is a purpose built multi-disciplinary research vessel built for Cefas/Defra and launched in 2002. The vessel has a length of 74m and a draft of 5.5m. The underwater radiated noise profile is compliant with standards established by the International Council for the Exploration of the Seas (ICES). The bridge, which is where the marine mammal observations are carried out during survey, is 11m above the water line and allows for good all round visibility.

2.4 Equipment

The sub-bottom equipment used during the survey was a deep-tow boomer system towed off the stern A-frame of the vessel at a speed of between 4 and 5 knots. The boomer system consisted of a sound source and integrated hydrophone, in addition to a short towed hydrophone of 5m. Specifications of the system used within the Croker survey are detailed in Table 1. The source was typically towed at a depth of 60m, which gave a horizontal offset of approximately 20m from the vessel.

Table 1. Specification of the deep-tow boomer system used during the Croker survey.

Source	Geoforce deep tow boomer
Owner	Exploration Electronics
Source depth	60 m
Frequency	400 to 1400 Hz
Source energy	540 joules
Shot point interval (distance)	0.6 m
Shot point interval (seconds)	0.25 s
Hydrophone	AQ-16 Hydrophone Element

The boomer was run in conjunction with a multibeam echo sounder and a side-scan sonar running at 300 kHz and 300/600 kHz, respectively.

2.5 Pre-shoot watch

As per the JNCC guidelines, a minimum pre-shoot watch of 30 minutes must be completed before sub-bottom operations can begin. If any cetaceans are spotted within the 500m mitigation zone around the source during the pre-shoot watch, operations should be postponed until 20 minutes after the cetaceans have left the mitigation zone.

2.6 Soft start

The guidelines specify that for airgun arrays under 10 cu.in or equivalent, including the boomer array used within this project, no soft start is required before commencing firing.

2.7 Line turns

As per the JNCC guidelines, during line turns expected to take under 40 minutes the source remained active, but with an increased shot point interval. This helped to minimise unnecessary noise entering the water column. If a line turn was predicted to take longer than 40 minutes, the source was turned off and a pre-shoot watch of 30 minutes was carried out before the beginning of the next line.

2.8 Marine Mammal Observers

Two dedicated and one reserve marine mammal observers were on board during the whole duration of the survey. All observers had received training from a JNCC approved Marine Mammal Observer course. Details of the MMOs are given in Table 2.

Table 2. Marine Mammal Observers.

Name	Company
Simeon Archer	Cefas, Lowestoft
James Albrecht	JNCC, Peterborough
Chris Jenkins*	Cefas, Lowestoft

*Reserve MMO

3 Operations

3.1 Conditions

The conditions for the duration of the survey remained favourable for both scientific operations and the observation of marine mammals. The sea state remained slight with no sun glare for the majority of the cruise. Visibility varied over the survey with a minimum visibility of 3km from the vessels wings. Full details of the conditions are given in Appendix 2.

3.2 Survey operations

A total of 19 sub-bottom lines were run during the survey, with the majority of lines being run twice on different power settings to allow better resolution or penetration. In total, including lines, turns and testing, the seismic source was operational for 34 hours and 12 minutes during the survey of the Croker Carbonate Slabs cSAC/SIC. Full details of the survey timings and operations are displayed in Table 3. Full details of the survey operations are given in Appendix 1.

Table 3. Sub-bottom profiling statistics from the survey of the Croker Carbonate Slabs cSAC/SCI.

Total number of survey lines	19
Time spent in lines	20 hours 10 minutes
Time spent in line turns	8 hours 43 minutes
Time spent in testing	4 hours 41 minutes
Total firing time	34 hours 12 minutes
Effort (time on watch)	16 hours 41 minutes
Number of pre-shoot watches	7
Number of pre-shoot watches less than 20 minutes	0
Average line turn length	19 minutes
Longest line turn length	55 minutes
Number of line turns over 40 minutes	1

3.3 Sightings and mitigating action

During the pre-shoot watch on 27 October, a pod of approximately 25 common dolphins were spotted by the marine mammal observer, travelling towards the vessel (Figure 2 and Figure 3). As the boomer had not commenced firing, the line was postponed and the source remained off. The dolphins stayed within the mitigation zone for approximately 2 hours and 35 minutes. Once the dolphins left the mitigation zone a pre-shoot watch of an additional 20 minutes was carried out before beginning operations.

During operations on 29 October, six dolphins were spotted at a distance of 1500m from the seismic source. As the source was already firing no mitigating action was taken.



Figure 2. Common dolphins spotted on 27 October (© Neil Golding/JNCC, 2015).



Figure 3. Common dolphins spotted on 27 October (© Neil Golding/JNCC, 2015).

3.4 Non-compliance

During the survey there was one incidence of non-compliance. One line turn took longer than the specified time of 40 minutes, taking a total of 55 minutes. This was due to the line turn taking longer than expected due to the strong currents in the area. The source remained active during the line turn.

4 Conclusions

4.1 General

A total of 19 lines of survey data were collected from across the site between 25 October and 1 November 2015. During the survey a total of 34 hours and 12 minutes of operations were carried out with the boomer source running. Compliance with the JNCC guidelines was good throughout the survey with only one incident of non-compliance, where a line turn took longer than the specified time of 40 minutes.

5 References

JNCC. 2010. JNCC guidelines for minimising the risk of injury and disturbance to marine mammals from seismic surveys. http://jncc.defra.gov.uk/marine/seismic_survey

Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/200285/Annex-A-Habitats-Directive.pdf

Appendix 1

Ship/ platform name	Date	Reason for firing	Time of full power (UTC)	Time of start of line (UTC)	Time of end of line (UTC)	Time airguns/ source stopped (UTC)	Time pre-shoot search began (UTC)	Time search ended (UTC)	Depth range	Was it day or night in the period prior to firing?	Was any mitigating action required?
RV Cefas Endeavour	25/10/2015	t					7:45	8:20	s	d	n
RV Cefas Endeavour	27/10/2015	t	13:38	13:38	15:30	15:30	7:55	13:38	S	d	n
RV Cefas Endeavour	29/10/2015	t	8:40	9:40	9:45		7:43	9:40	s	d	n
RV Cefas Endeavour	29/10/2015	t		9:45	9:48				s	d	n
RV Cefas Endeavour	29/10/2015	t		10:03	10:15				s	d	n
RV Cefas Endeavour	29/10/2015	t		10:42	10:49				s	d	n
RV Cefas Endeavour	29/10/2015	l	11:05	11:20	12:23		10:20	11:05	s	d	n
RV Cefas Endeavour	29/10/2015	l		13:20	15:52				s	d	n
RV Cefas Endeavour	29/10/2015	x		15:54	16:11				s	d	n
RV Cefas Endeavour	29/10/2015	l		16:30	17:04	17:04			s	d	n
RV Cefas Endeavour	30/10/2015	l	8:42	8:52	10:13		7:48	8:42	s	d	n
RV Cefas Endeavour	30/10/2015	l		10:20	10:58				s	d	n
RV Cefas Endeavour	30/10/2015	l		11:00	11:19				s	d	n
RV Cefas Endeavour	30/10/2015	l		11:54	12:37				s	d	n
RV Cefas Endeavour	30/10/2015	t		12:52	13:11				s	d	n
RV Cefas Endeavour	30/10/2015	l		13:42	15:19				s	d	n
RV Cefas Endeavour	30/10/2015	l		15:59	17:18	17:18			s	d	n
RV Cefas Endeavour	31/10/2015	l	8:00	8:06	9:20		7:10	8:00	s	d	n
RV Cefas Endeavour	31/10/2015	l		10:15	11:34				s	d	n
RV Cefas Endeavour	31/10/2015	t		11:50	12:50				s	d	n
RV Cefas Endeavour	31/10/2015	l		13:25	14:23				s	d	n
RV Cefas Endeavour	31/10/2015	l		14:39	16:18	16:18			s	d	n
RV Cefas Endeavour	01/11/2015	l	8:06	8:13	9:35		6:57	8:06	s	d	n
RV Cefas Endeavour	01/11/2015	t		9:48	10:51				s	d	n
RV Cefas Endeavour	01/11/2015	l		11:16	11:52				s	d	n

Ship/ platform name	Date	Reason for firing	Time of full power (UTC)	Time of start of line (UTC)	Time of end of line (UTC)	Time airguns/ source stopped (UTC)	Time pre-shoot search began (UTC)	Time search ended (UTC)	Depth range	Was it day or night in the period prior to firing?	Was any mitigating action required?
RV Cefas Endeavour	01/11/2015	I		12:02	12:40				s	d	n
RV Cefas Endeavour	01/11/2015	I		12:58	13:41				s	d	n
RV Cefas Endeavour	01/11/2015	I		14:08	15:26				s	d	n
RV Cefas Endeavour	01/11/2015	I		15:53	17:14	17:14			s	d	n

Appendix 2

Date	Time of start of section of watch (UTC)	Time of end of section of watch (UTC)	Source activity	Start position - latitude	Start position - longitude	Depth at start (metres)	End position - latitude	End position - longitude	Depth at end (metres)	Speed of vessel (knots)	Wind direction and speed (Beaufort)	Sea state	Swell	Visibility	Sun glare
25/10/2015	7:45	8:20	n	53°24.80N	5°19.18W	99.0	53°24.73N	5°19.66W	106.0	2.0	sw-4	s	m	m	n
27/10/2015	7:55	9:00	n	53°25.76N	5°09.86W	117.0	53°25.58N	5°10.57W	100.0	0.6	e-4	s	m	m	n
27/10/2015	9:00	10:00	n	53°25.58N	5°10.57W	100.0	53°25.27N	5°09.98W	115.0	0.5	e-4	s	m	m	n
27/10/2015	10:00	11:00	n	53°25.27N	5°09.98W	115.0	53°24.68N	5°10.9W	95.0	0.5	e-5	s	m	m	n
27/10/2015	11:00	12:00	n	53°24.68N	5°10.90W	95.0	53°29.73N	5°11.66W	74.0	0.5	e-5	s	m	m	n
27/10/2015	12:00	12:25	n	53°29.73N	5°11.66W	80.0	53°31.43N	5°11.78W	72.0	0.5	e-5	s	m	m	n
27/10/2015	12:25	13:25	n	53°31.43N	5°11.78W	72.0	53°34.68N	5°12.10W	62.0	0.5	e-5	s	m	m	n
27/10/2015	13:25	13:38	n	53°34.68N	5°12.10W	62.0	53°34.74N	5°12.13W	60.0	0.5	e-5	s	m	m	n
27/10/2015	13:38	13:53	f	53°34.74N	5°12.13W	60.0	53°33.51N	5°11.66W	65.0	2.5	e-5	s	m	m	n
28/10/2015	7:52	8:00	n	53°24.30N	5°10.44W	108.0	53°28.06N	5°10.71W	108.0	1.3	se-4	s	o	g	n
28/10/2015	8:00	9:23	n	53°28.06N	5°10.71W	108.0	53°27.83N	5°10.58W	82.0	6.7	se-4	s	o	g	n
28/10/2015	9:23	10:20	f	53°27.83N	5°10.58W	82.0	53°24.36N	5°10.37W	88.0	4.0	se-4	s	o	g	n
28/10/2015	10:20	11:20	f	53°24.36N	5°10.37W	88.0	53°28.49N	5°12.45W	110.0	3.6	se-4	s	o	g	wf
28/10/2015	11:20	11:40	n	53°28.49N	5°12.45W	110.0	53°29.85N	5°13.07W	76.0	3.5	se-4	s	o	g	n
28/10/2015	11:40	11:45	f	53°29.85N	5°13.07W	76.0	53°30.36N	5°13.11W	75.0	4.9	se-4	s	o	g	n
29/10/2015	7:43	8:40	n	53°32.25N	5°12.48W	65.0	53°31.33N	5°13.35W	73.0	6.6	w-4	c	l	m	n
29/10/2015	8:40	9:35	n	53°31.33N	5°13.35W	73.0	53°28.19N	5°13.11W	82.0	4.5	w-4	c	l	g	wf
29/10/2015	9:35	10:20	f	53°28.19N	5°13.11W	82.0	53°28.52N	5°13.36W	81.0	1.7	w-4	s	l	g	n
29/10/2015	10:20	11:05	f	53°28.52N	5°13.36W	81.0	53°33.35N	5°12.41W	68.0	6.9	sw-4	s	l	g	n
30/10/2015	7:48	8:33	n	53°27.06N	5°06.73W	89.0	53°26.88N	5°06.14W	91.0	2.5	se-3	s	m	g	n
30/10/2015	8:33	8:42	f	53°26.88N	5°06.14W	91.0	53°26.83N	5°06.72W	90.0	1.5	se-3	s	m	g	n
31/10/2015	7:10	7:53	n	53°24.47N	5°15.52W	75.0	53°24.33N	5°19.00W	118.0	4.5	s-5	s	m	m	n

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Date	Time of start of section of watch (UTC)	Time of end of section of watch (UTC)	Source activity	Start position - latitude	Start position - longitude	Depth at start (metres)	End position - latitude	End position - longitude	Depth at end (metres)	Speed of vessel (knots)	Wind direction and speed (Beaufort)	Sea state	Swell	Visibility	Sun glare
31/10/2015	7:53	8:00	f	53°24.33N	5°19.00W	118.0	53°24.77N	5°18.50W	127.0	4.9	s-4	s	m	m	n
01/11/2015	6:57	7:40	n	53°29.07N	5°12.82W	73.0	53°27.13N	5°08.61W	112.0	4.5	s-1	g	o	m	n
01/11/2015	7:40	7:58	n	53°27.13N	5°08.61W	112.0	53°26.48N	5°07.03W	90.0	4.5	s-1	g	o	m	n
01/11/2015	7:58	8:06	f	53°26.48N	5°07.03W	90.0	53°26.83N	5°07.47W	97.0	4.0	s-1	g	o	m	n

