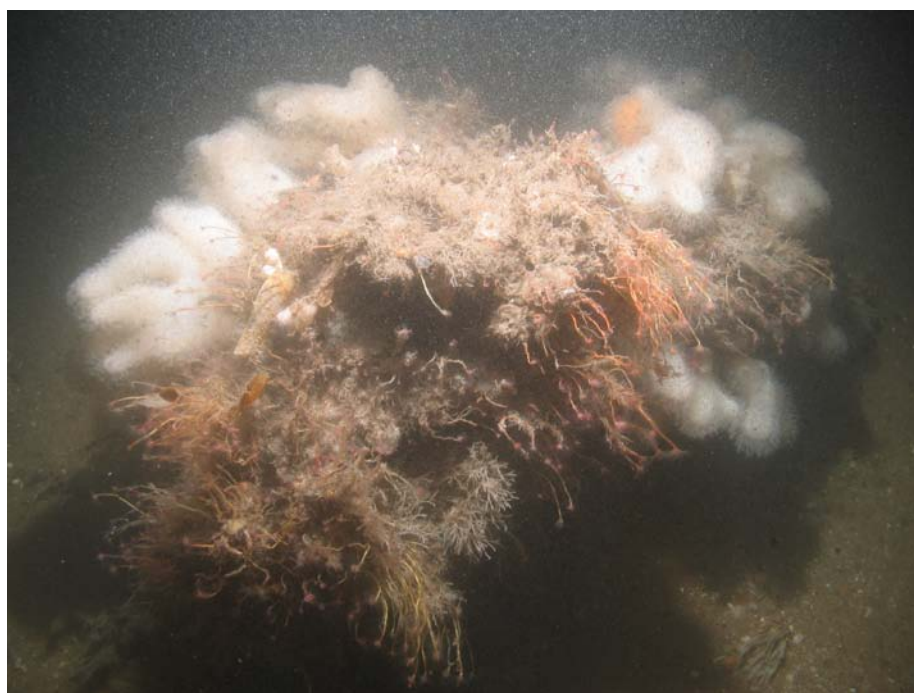


## **Offshore Special Area of Conservation: Croker Carbonate Slabs**

### **SAC Selection Assessment Document**



©JNCC<sup>1</sup>

**Version 3.0 (1<sup>st</sup> June 2011)**

---

<sup>1</sup> Cover photo illustrates soft corals (*Alcyonium digitatum*) and dense *Tubularia indivisa* hydroids on a methane derived authigenic carbonate structure in the Croker Carbonate Slabs site

## Introduction

This document provides detailed information about the Croker Carbonate Slabs site and evaluates its interest features according to the Habitats Directive selection criteria and guiding principles.

The advice contained within this document is produced to fulfil requirements of JNCC under Part 2 of the Offshore Marine Conservation (Natural Habitats, & c.) Regulations 2007 (as amended), relating to the conservation of natural habitat types and habitats of species through identification of Special Areas of Conservation (SACs) in UK offshore waters. Under these Regulations, JNCC has an obligation to provide certain advice to Defra to enable the Secretary of State to fulfil her obligations under the Regulations, and to Competent Authorities to enable them to fulfil their obligations under the Regulations.

This document includes information required under Regulation 7 of the Offshore Marine Conservation (Natural Habitats, & c.) Regulations 2007 (as amended), to enable the Secretary of State to transmit to the European Commission the list of sites eligible for designation as Special Areas of Conservation (SACs). JNCC have been asked by Defra to provide this information to Government.

Sites eligible for designation as offshore marine SACs are selected on the basis of the criteria set out in Annex III (Stage 1) to the Habitats Directive and relevant scientific information. Sites are considered only if they host a Habitats Directive Annex I habitat or Annex II species. Moreover, sites for Annex II species must contain a clearly identifiable area representing physical and biological factors essential to these species' life and reproduction to be eligible. Socio-economic factors are not taken into account in the identification of sites to be proposed to the European Commission<sup>2</sup>.

In addition to information on the Annex I habitats and/or Annex II species hosted within the site, this document contains i) a chart of the site, ii) its name, location and extent, and iii) the data resulting from application of the criteria specified in Annex III (Stage 1) to the Habitats Directive. This is in line with legal requirements outlined under Regulation 7. JNCC has adhered to the format established by the Commission for providing site information. This format is set out in the 'Natura 2000 Standard data form' (CEC, 1995) (prepared by the European Topic Centre for Biodiversity and Nature Conservation on behalf of the European Commission to collect standardised information on SACs throughout Europe).

---

<sup>2</sup> Following European Court of Justice 'First Corporate Shipping' judgement [C-371/98](#) (7 November 2000)

## Document Version Control

Version and issue date	Amendments made	Issued to and date
SAC SAD version 3.0 01/06/11	Site changed to possible SAC throughout the document	Public consultation (June 2011)
SAC SAD version 2.0 18.03.11	Formal recommendation to Government	Defra, Devolved Administrations, and other Govt. departments 18.03.11
SAC SAD version 1.0 07.12.10	Site boundary defined; site, habitat and data maps created; report edited	John Goad, 07.12.10

### Further information

This document is available as a pdf file on JNCC's website for download ([www.jncc.defra.gov.uk](http://www.jncc.defra.gov.uk)).

Please return comments or queries to:

Marine Protected Sites  
Joint Nature Conservation Committee  
Monkstone House  
Peterborough  
Cambridgeshire  
PE1 1JY

Email: [offshoresacs@jncc.gov.uk](mailto:offshoresacs@jncc.gov.uk)

Tel: +44 (0)1733 866833

Fax: +44 (0)1733 555948

Website: [www.jncc.defra.gov.uk/marineprotectedareas](http://www.jncc.defra.gov.uk/marineprotectedareas)

# Croker Carbonate Slabs SAC: Selection Assessment Document

<b>1. Site name</b> Croker Carbonate Slabs	<b>2. Site centre location</b> 53°28'21", -5°14'17" (Datum: WGS 1984)
<b>3. Site surface area</b> 6591ha/66km <sup>2</sup> (Datum: WGS 1984 UTM Zone 30 North, calculated in ArcGIS 9.2)	<b>4. Biogeographic region</b> Atlantic

## 5. Interest features under the EU Habitats Directive

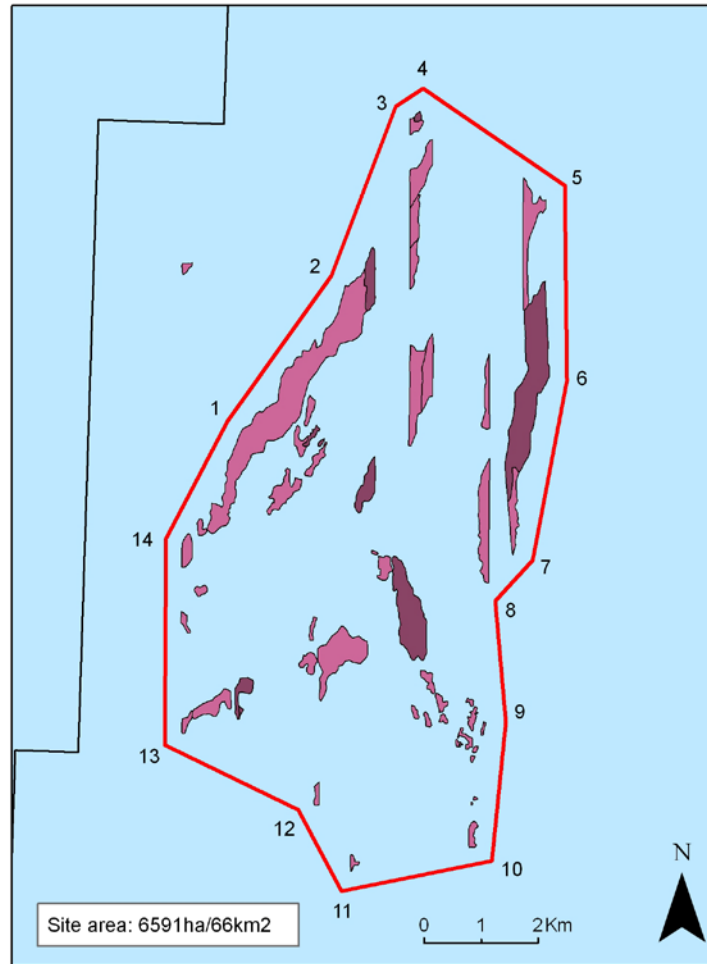
1180 Submarine structures made by leaking gases

1351 Harbour porpoise (*Phocoena phocoena*) (non-qualifying)

1364 Grey seal (*Halichoerus grypus*) (non-qualifying)

## 6. Map of site

### Offshore Special Area of Conservation Site Map: Croker Carbonate Slabs



Boundary coordinates:

- 1) 53°29'11", -5°16'48"
- 2) 53°30'36", -5°15'13"
- 3) 53°32'13", -5°14'16"
- 4) 53°32'24", -5°13'51"
- 5) 53°31'31", -5°11'32"
- 6) 53°29'40", -5°11'25"
- 7) 53°27'57", -5°11'52"
- 8) 53°27'34", -5°12'26"
- 9) 53°26'25", -5°12'13"
- 10) 53°25'6", -5°12'22"
- 11) 53°24'46", -5°14'45"
- 12) 53°25'31", -5°15'28"
- 13) 53°26'6", -5°17'38"
- 14) 53°28'3", -5°17'43"

#### Legend

Possible SAC boundary v1.0 (07/12/10)

— UK Continental Shelf Limit

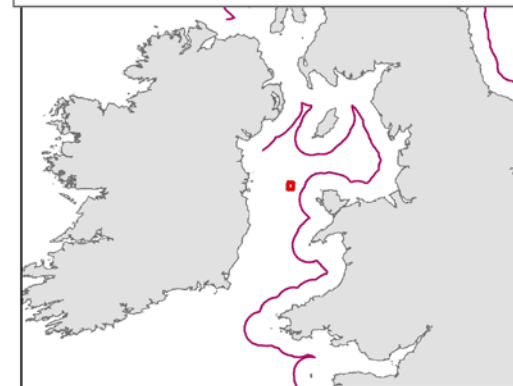
Land

#### Annex I Habitat

High Relief MDAC

Low Relief MDAC

#### Location of main map in relation to the UK



Map Version number 3.0 (01/06/11) Created by LR

Site map projected in UTM (Zone 30N, WGS84 datum).

This product has been derived in part from material obtained from the UK Hydrographic Office with the permission of the Controller of Her Majesty's Stationery Office and UK Hydrographic Office ([www.ukho.gov.uk](http://www.ukho.gov.uk)). NOT TO BE USED FOR NAVIGATION. The exact limits of the UK Continental Shelf are set out in orders made under section 1(7) of the Continental Shelf Act 1964 (© Crown Copyright). World Vector Shoreline © US Defense Mapping Agency. Map copyright JNCC 2010.

## 7. Site summary

The Croker Carbonate Slabs is an area in the mid-Irish Sea, approximately 30km west of Anglesey, where extensive areas of the Annex I feature “submarine structures made by leaking gases” have been identified. The site lies in 70m water depth in the north descending down to approximately 100m at the south west corner. The seabed surface is composed of extensive areas of exposed methane-derived authigenic carbonate (MDAC). These MDAC structures range from ‘low relief’ (elevation of up to 20cm above the surrounding seabed) to ‘high relief’ (elevation over 20cm above the surrounding sediment, and often up to 2m). A cliff feature up to 8m in elevation and 500m long has also been recorded, created by the action of the surrounding coarse seabed sediments being scoured away at the base of the high relief MDAC by currents (Whomersley *et al*, 2010; Judd, 2005). The seabed habitats created by these MDAC structures are distinctive, supporting a diverse range of marine species that are absent from the surrounding seabed characterised by coarse sediment (Judd, 2005). Areas of ‘high relief’ MDAC support a diverse range of soft corals, erect filter feeders, sponges, tube worms and anemones whilst the ‘low relief’ MDAC is colonised with scour-resistant hydroids and bryozoans (Whomersley *et al*, 2010). The surrounding sediment is highly mobile and consists of poorly sorted sand (from fine to coarse grained) with a large proportion of broken shell gravel and whole shells interspersed with rippled sand. A blue-grey clay was also commonly seen towards the southern end of the site.

The Croker Carbonate Slabs is located in the Irish Sea regional sea (Defra, 2004). In this regional sea, there is one other location in Welsh territorial waters where the Annex I habitat ‘Submarine structures made by leaking gases’ has been recorded; ‘Holden’s Reef’ within the Pen Llyn a’r Sarnau European marine site. There are also two SACs within the Northern North Sea regional sea (Defra, 2004) where the Annex I habitat ‘Submarine structures made by leaking gases’ is a qualifying feature<sup>3</sup>, encompassing an area of approximately 45ha of Annex I habitat. Therefore, the Croker Carbonate Slabs site makes a significant contribution to maintaining this Annex I habitat at favourable conservation status within its natural range.

## 8. Site boundary

The site boundary for the Croker Carbonate Slabs has been defined using JNCC’s marine SAC boundary definition guidelines (JNCC, 2008). The proposed boundary is a simple polygon enclosing the minimum area necessary to ensure protection of the Annex I habitat, following the extent of the habitat feature as closely as possible. The habitat feature is delineated from acoustic and groundtruthing data collected during surveys in 2004 and 2008 (see section 11). It should be noted that as a consequence of the survey methodology in 2008, ‘corridors’ of data were gathered over some areas of the site. In the gaps between these corridors, methane-derived authigenic carbonate (MDAC) is expected to occur, but has not been mapped explicitly. In addition, certain areas of coarse sediment have been enclosed within the site boundary where bathymetric and backscatter data has shown that MDAC underlies the shifting sediment bodies (Whomersley *et al*, 2010).

Several small areas of the Annex I habitat feature (MDAC) were mapped at the northerly and southerly ends of the survey area in 2008 (see site map in section 6). However, as incorporation of these features within the site boundary would have resulted in a large area of non-Annex I habitat being included, these areas were omitted from the site boundary.

---

<sup>3</sup> Braemar Pockmarks SCI and Scanner Pockmarks SCI

The boundary definition guidelines indicate that where interest features are at risk from bottom trawling, a margin should be included in the proposed boundary to ensure their protection. The proposed boundary therefore includes a margin to allow for mobile gear on the seabed being at some distance from the location of a vessel on the sea surface. The maximum depth of water around the feature is 100m; therefore, assuming a ratio of 3:1 fishing warp length to depth on the continental shelf, the proposed boundary is defined to include a margin of 300m from the mapped MDAC features.

Note the boundary proposed is for the SAC only. Any future management measures required under the Offshore Marine Conservation (Natural Habitats, & c.) Regulations 2007 (as amended) will be determined by Competent Authorities in consultation with JNCC, and may have different boundaries to the SAC site boundary.

## **9. Assessment of interest feature against selection criteria**

### **9.1. Submarine structures made by leaking gases**

#### **Annex III selection criteria (Stage 1A)**

##### **a) Representativity**

The Croker Carbonate Slabs is wholly located within the Irish Sea Regional Sea. This site is characteristic of the habitat 'submarine structures made by leaking gases' under the subtype "bubbling reefs". Within the site, blocks of methane-derived authigenic carbonate (MDAC) up to 2m in height, platforms up to 2 km long by 500 m across and a 6 – 8 m high cliff occur (Whomersley *et al*, 2010; Judd, 2005). These structures form a complex seabed topography providing a diverse habitat for a range of marine life. In other parts of the site, thin slabs of MDAC form 'pavements', which are often overlain with a thin veneer of mobile sand and gravel (see Figure 1). These pavements are often undercut by tidal currents, providing shelter for species such as the long-clawed squat lobster *Munida rugosa* (Whomersley *et al*, 2010).

While no evidence of active gas leaks were recorded from surveys undertaken in 2004 or 2008, analysis of samples gathered during both surveys demonstrate that the carbonates are MDAC in origin (Judd, 2005; Whomersley *et al*, 2010).

The known occurrence of the Annex I habitat 'submarine structures made by leaking gases' is limited within UK waters. Therefore, the MDAC structures within the Croker Carbonate Slabs make a valuable contribution to representativity of this habitat in UK waters.

The grade for the feature is A (excellent representativity)

##### **b) Area of habitat**

An evaluation of the area of the site covered by submarine structures made by leaking gases in relation to the total area covered by this interest feature in UK waters is not possible, since all occurrences of this habitat are not known. However, evidence from known occurrences of the habitat shows that the extent at each occurrence (Braemar and Scanner pockmarks) are relatively small (approximately 45 ha). The grades for this criterion are Grade A (site contains '15-100%' of total resource of Annex I habitat), Grade B (site contains '2-15%' of

total resource of Annex I habitat) and Grade C (site contains '0-2%' of total resource of Annex I habitat) (CEC, 1995). As the area of Annex I habitat within the Croker Carbonate Slabs site is 810.5ha (excepting that this is likely to be an underestimate, based on where MDAC was mapped from available data within the site), it is likely that it comprises between 15 and 100% of the total extent of submarine structures made by leaking gases.

The grade for this criterion is therefore A (site contains '15-100%' of total resource of Annex I habitat).

### **c) Conservation of structure and functions**

#### ***Degree of conservation of structure***

Static fishing gear was encountered during the survey (Whomersley *et al*, 2010) indicating a fishery for crab (*Cancer pagurus*) and/or lobster (*Homarus gammarus*). Other species are known to be exploited and include cod (*Gadus Morhua*), haddock (*Melanogrammus aeglefinus*), whiting (*Merlangius merlangus*), herring (*Clupea harengus*) and the Norway Lobster (*Nephrops norvegicus*) (Whomersley *et al*, 2010). There is moderate to high intensity *Nephrops norvegicus* fishing occurring to the north-west of the site (CEFAS 2010) but not close to enough to exert a damaging impact on the feature. Beam trawling occurs at low intensity (approximately 50 hrs effort per year) at the northern and southern peripheries of the site's boundary, however the data is too coarse to be able to state conclusively whether trawlers are fishing on the feature itself or whether they fish around it. It is anticipated that trawlers would avoid fishing on the feature to prevent damage to their fishing gear; hence, the exposure level has been assessed to be low.

The grading for this sub-criterion is therefore II: structure well conserved.

#### ***Degree of conservation of functions***

The prospects of this feature to maintain its structure in the future, taking into account unfavourable influences and reasonable conservation effort, are good. A mechanism is available through the European Commission's Common Fisheries Policy regulations to modify fishing activity in the area if this is deemed to be necessary. In addition, regulations are in place to regulate oil and gas activity in and around SACs in the UK Continental Shelf Designated Area, should hydrocarbon exploration/exploitation occur in this area. The laying of submarine cables and pipelines also requires regulatory consent. The feature is distant from terrestrial sources of pollution.

The grading is I: excellent prospects.

#### ***Restoration possibilities***

Restoration methods in the offshore area focus on the removal of impacts which should allow recovery where the habitat has not been removed. Restoration of the biological communities within the Croker Carbonate Slabs site may be possible where the submarine structures have not been destroyed. However where damage has occurred, the restoration potential is unknown. This is because the MDAC is accreted naturally (and over long time periods) and further accretion is dependent on sufficient gas seepage as well as the presence of specific chemosynthetic micro-organisms. There is no evidence to suggest that gas seepages in the immediate area are still active (Judd, 2005; Whomersley *et al*, 2010).

The grade is III: restoration difficult or impossible.

## Overall grade

Due to the first sub-criterion of this criterion being graded II: structure well conserved, and the second sub-criterion being I: excellent prospects, the overall grading is A: excellent conservation, regardless of the grading of the third sub-criterion.

### d) Global assessment

The suggested grades for Stage 1A criteria a)-c) are A, A and A. Given these evaluations, and taking into account the rarity of this habitat in UK waters, the Global Assessment grade is A ('excellent conservation value').

#### Summary of scores for Stage 1a criteria

Habitat type	Representativity (a)	Area of habitat (b)	Structure and function (c)	Global assessment (d)
Croker Carbonate Slabs	A	A	A	A

## 9.2. Harbour porpoise (*Phocoena phocoena*)

### Annex III selection criteria (Stage 1B)

#### a) Proportion of UK population

Harbour porpoise (*Phocoena phocoena*) are found throughout the majority of UK continental shelf waters (Reid *et al*, 2003; SCANS II, 2008). The species is widespread in the Irish Sea, with the species having been recorded in the area of the proposed SAC (Reid *et al*, 2003, SCANS II, 2008; Baines and Evans 2009; WWT, 2009). There is no indication that the size and density of the population within the site's boundaries are particularly significant in relation to other areas within the Irish Sea. It is therefore considered to be grade D, i.e. a non qualifying feature. As such, no other indication is required for the additional evaluation criteria concerning this species within the site.

## 9.3. Bottlenose dolphin (*Tursiops truncatus*)

### Annex III selection criteria (Stage 1B)

#### a) Proportion of UK Population

This species is found in many parts of UK waters, on the continental shelf and further offshore (Evans *et al*, 2003; Reid *et al*, 2003; SCANS II, 2008). There are no records of bottlenose dolphin occurrences within the proposed boundary (Reid *et al*, 2003; Baines and Evans, 2009; WWT, 2009) therefore the species is not considered a feature of the site. However, they have been recorded in the vicinity of the site (Evans *et al*, 2003) and are highly mobile, so this assessment may change if new data becomes available.

## 9.4. Grey seals (*Halichoerus grypus*)

### Annex III selection criteria (Stage 1B)

#### a) Proportion of UK Population

From satellite telemetry work, grey seals (*Halichoerus grypus*) appear to forage in or very near the area (Baines and Evans, 2009; WWT, 2009) and haul-out sites are found on the mainland north of Anglesey. At this time, however, it is not possible to estimate what proportion of the population utilises the area, or how important the area is with respect to the physical and biological factors essential to their life and reproduction. Additionally, there is no evidence that the Croker Carbonate Slabs site is any more important for this species than other areas in the Irish Sea. Therefore, grey seals are considered to be grade D, i.e. a non-qualifying feature. This grading may be revised at a later date depending on the outcome of data analyses to be commissioned by JNCC that will enable a more detailed assessment of the importance of areas for seals at sea.

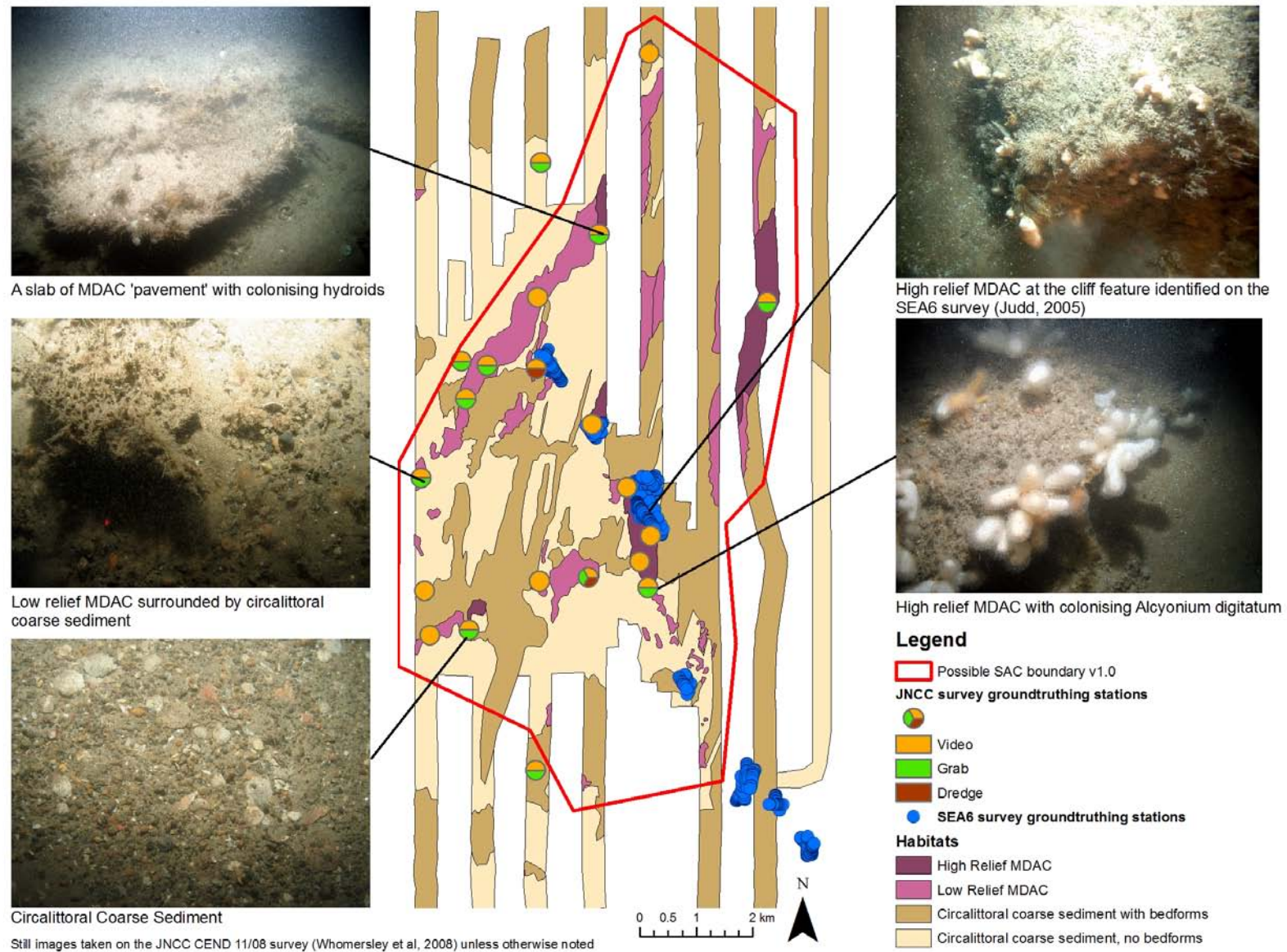
## 10. Sites to which this site is related

None

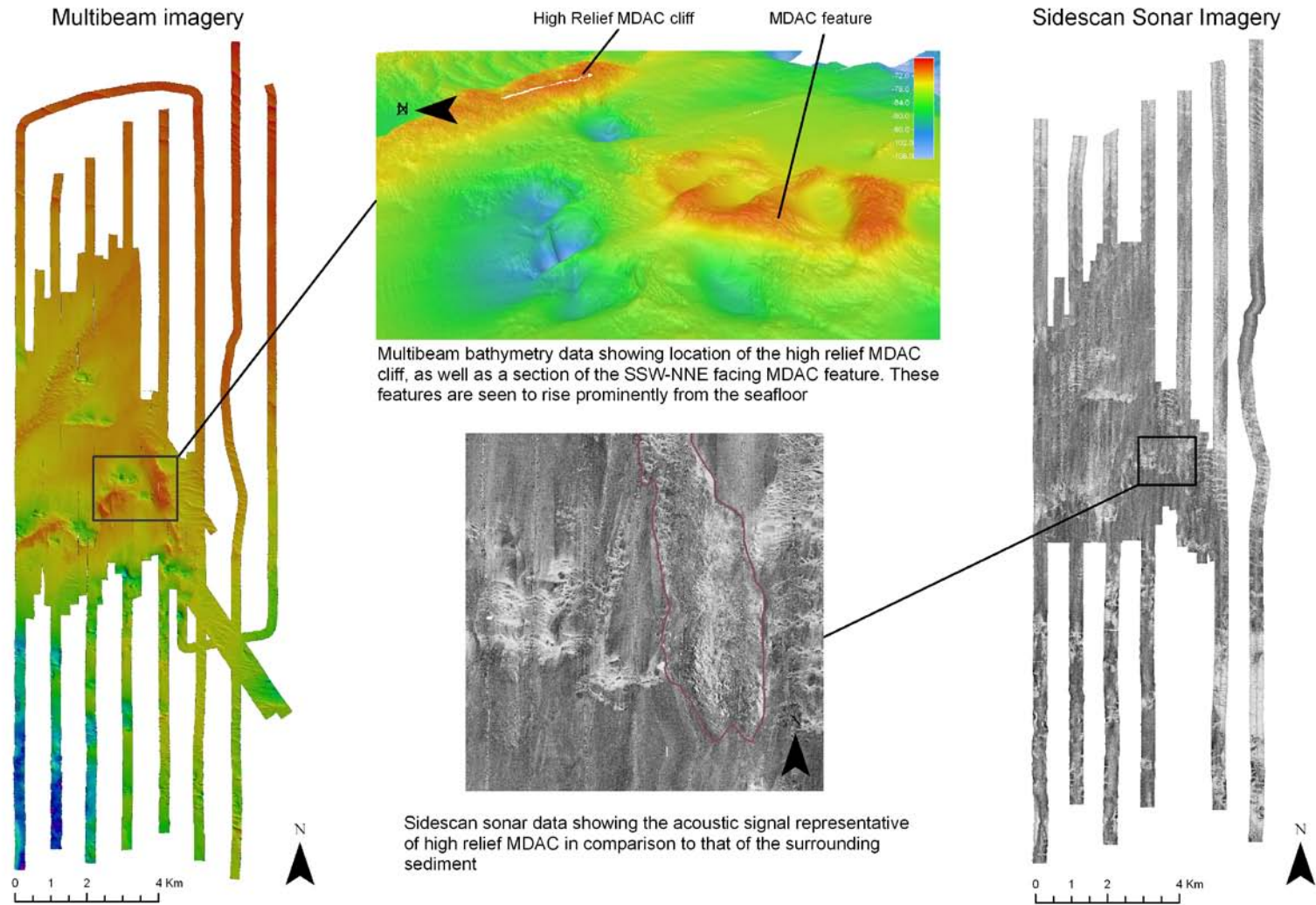
## 11. Supporting scientific documentation

The information to support this SAC designation comes from a number of sources. Seismic surveys carried out in the western part of the Irish Sea found extensive acoustic turbidity within the seabed to the north-west of the site in the Western Irish Sea Mud Belt (Yuan *et al*, 1992), indicative of shallow gas. Meanwhile, seismic data gathered during a cable route survey (Croker, 1995) west of Anglesey recorded further acoustic turbidity within the sediment, again indicative of shallow gas. During the Strategic Environmental Assessment (SEA) 6 survey of the Irish Sea in 2004, two areas, Texel 10 and Texel 11, were surveyed using multibeam echo-sounder, sidescan sonar, sub-bottom profiling, video and stills imagery and grab sampling. Analysis of this data showed that carbonate structures were present on the seabed within the Texel 11 survey area, and that these were formed by methane-derived authigenic carbonate (MDAC) (Judd, 2005).

In May 2008, JNCC commissioned a more extensive survey of the area, CEND 11/08, aboard the *R/V Cefas Endeavour* where multibeam echo-sounder and sidescan sonar data were collected along with seabed imagery and Hamon grab samples (Whomersley *et al*, 2010). Initially, corridors of multibeam and sidescan acoustic data were gathered across a broad area. Infill lines were then surveyed to obtain 100% coverage in areas where potential MDAC acoustic signatures were detected. Extensive MDAC structures were identified across the site (see Figure 1), confirmed following analysis of the acoustic data along with petrographical/x-ray diffraction analysis of the physical samples (Whomersley *et al*, 2010).



**Figure 1:** Map showing distribution of different seabed habitats within the SAC boundary, including areas of Annex I habitat *Submarine structures made by leaking gases* and the location of biological sampling undertaken.



**Figure 2:** Acoustic data (2004 & 2008 surveys) showing imagery of seabed and example area of methane-derived authigenic carbonate (MDAC) (with purple outline) delineated from sidescan sonar data.

## 12. Site overview and conservation interest

This site is being recommended for inclusion within the Natura site network for its Annex I habitat 'Submarine structures made by leaking gases'. This habitat is associated with methane-derived authigenic carbonate (MDAC). MDAC forms when methane rising through the upper part of the sediment column is oxidised and the pore waters become supersaturated with calcium carbonate (calcite) (Jorgensen, 1992; Judd, 2001). The calcite precipitates and infills the pore spaces between the sand grains, creating a layer or crust that can form carbonate 'pavements' and 'chimneys'; significant hard ground compared to the surrounding sediment. Analysis of the cement recovered from within the site boundary showed it to be carbonate, high magnesium calcite or aragonite (Milodowski *et al*, 2009).

Earlier surveys by Judd (2005) confirmed the existence of MDAC. Acoustic data indicated a generally flat seabed with large depressions up to 500m in diameter, with steep sides, alongside small mounds and sediment waves. In addition, a cliff structure 6-8 high and up to 500m long was recorded. Groundtruthing of this area found cemented rocks providing a firm substrate for a diverse range of fauna (Judd *et al*, 2007). Chemical analysis of carbonate samples collected during this survey indicated they were methane-derived and thermogenic in origin.

Further survey work undertaken in 2008 (Whomersley *et al*, 2008) established the presence of MDAC over a wider area. MDAC features were mapped using high resolution acoustics (multibeam echosounder and sidescan sonar) and then validated using seabed imagery and grab samples. Within the site, the MDAC structures took two key forms, extensive MDAC 'pavement' or 'slabs' up to 20mm thick (termed 'low relief' MDAC) and larger structures over 20mm thick and up to 2m high (termed 'high relief' MDAC). Surrounding these features, extensive areas of circalittoral coarse sediment (consisting of shelly, mobile and rippled sand, frequently >20% shell gravel and >5% whole shell) was observed along with sediment bedforms including sand wave fields, indicating a dynamic seabed with evidence of sediment transport (Whomersley *et al*, 2010).

The extent of MDAC coverage (based on existing data) has been estimated at over 8km<sup>2</sup>, but information on the underlying geology suggests that MDAC could extend further west of the site (Whomersley *et al*, 2010); further survey work would need to be commissioned to confirm this. The exposed MDAC was observed forming two longitudinal features with a SSW-NNE orientation (see Figure 2). Several reasons for these two features having such prominent relief have been suggested (Whomersley *et al*, 2010); either they represent areas of flexure within the underlying Quaternary raising the MDAC sufficiently to allow greater weathering, or the features may be indicators of bedrock structure. When exposed at the seabed surface, MDAC appears to be broken down and eroded rapidly both through biological activity (boring by bivalve molluscs) and by water currents into sand and gravel sized fragments.

The hard substratum provided by the MDAC provides an ideal physical habitat for a range of marine life, in stark contrast to the surrounding coarse sediment. Information on the biological communities was gained through analysis of the seabed imagery; over 79 species were identified. The MDAC substratum was categorised into three classes, based upon visual appearance and colonising epifauna (Whomersley *et al*, 2010):

- 'High relief' MDAC (see Plate 1): raised at least 20 cm and often up to 2m high above the surrounding sediment. Extensively colonised with the soft coral *Alcyonium digitatum* and a dense hydroid turf of *Eucretea loricata* and *Diphasia pinaster*. The abundance of the robust hydroid *Tubularia indivisa* is indicative of the strong currents in the area. Sponges such as the yellow boring sponge *Cliona celata* and *Iophonopsis nigricans* were present along with tubeworms such as *Sabella pavonina* and *Sabellaria spinulosa*. The anemone *Sagartia troglodytes* was also frequently found on these raised MDAC structures.

- 'Low relief' MDAC (see Plate 2): less than 20 cm above the surrounding sediment and colonised by more scour resistant species such as the bryozoans *Flustra foliacea* and *Vesicularia spinosa*. The robust hydroids *Tubularia indivisa* and occasionally *Nemertesia* spp. and *Diphasia pinaster*, were also associated with this substratum. Notably the tubeworm *Sabellaria spinulosa* was often found to entirely cover the exposed MDAC in large numbers. Boring by bivalves such as *Hiatella arctica* was clearly evident in samples gathered by Hamon grab
- Uncolonised MDAC: MDAC that had been recently uncovered by the mobile shifting sediments and had not yet been colonised by visible epifauna. The uncolonised MDAC was generally of very low relief and distinct from other substratum types.

A biotope describing the MDAC habitat recorded within the site is not yet represented in either the JNCC Marine Habitat Classification for Britain and Ireland (Connor *et al*, 2004) or the EUNIS habitat classification. Two new biotopes have been proposed by Whomersley *et al* (2010) within the CR.MCR.SfR biotope complex, and have been submitted to JNCC for further investigation prior to updating the classification. For the purposes of the study, the MDAC classes were labelled as follows:

- 'High relief' MDAC – Proposed new biotope CR.MCR.SfR.MDAC.1 (A4.23v1 EUNIS class)
- 'Low relief' MDAC - Proposed new biotope CR.MCR.SfR.MDAC.2 (A4.23v2 EUNIS class)

In addition to epifaunal communities observed from the seabed imagery, infaunal communities were identified from a suite of grab samples obtained. Two types of seabed habitat were targeted by Hamon grab; (1) thin MDAC crust ('low relief' MDAC) with associated sediment and (2) sediment located away from areas of observed MDAC. Seabed samples in the vicinity of MDAC crust contained infaunal communities with a significantly higher number of individuals than in adjacent sediments. However, there was no significant difference in the number of species, species richness or diversity (Whomersley *et al*, 2010). Key differences in the communities were due to encrusting and boring species in the MDAC crust but not the surrounding sediments, such as bivalve *Hiatella arctica*.

Due to the extent of mobile sediment in the immediate area, areas of MDAC overlain with shifting sediment bodies (but from the interpretation of bathymetric and backscatter data also contain underlying MDAC) (Whomersley *et al*, 2010) have been included within the site boundary, where they are interspersed between mapped areas of low and high relief MDAC.

Species not previously associated with habitats in the Irish Sea were also recorded at the site during the recent survey. These included the hydroid *Lytocarpia myriophyllum* and a newly described species of Polymastid sponge *Polymastia* cf. *agglutinans* (B. Picton, *pers. comm.*). The Ross Coral *Pentapora fascialis* which is rarely found in the Irish Sea was also observed at this site. The presence of these species highlights the Croker Carbonate Slabs as an important site for protection of these species' habitat within the Irish Sea regional sea (Defra, 2004).



**Plate 1.** A block of high relief MDAC colonised with soft corals (*Alcyonium digitatum*), hydroids including *Nemertesia antennina* and *Tubularia indivisa*, and *Henricia* sp. Starfish. (Station 1; © JNCC.defra.gov.uk)



**Plate 2.** A thin slab of low relief MDAC 'pavement' with coarse sediment and Dahlia anemone (*Urticina* sp.), creating a refuge for long clawed squat lobsters (*Munida rugosa*). (Station 6; © JNCC.defra.gov.uk)

## 13. References

- BAINES, M.E. AND EVANS, P.G.H. 2009. Atlas of the Marine Mammals of Wales. CCW Monitoring Report No. 68.
- CEFAS (2010) Report no. 1: Objective 1 – Provision of geo-database containing standardised layers showing the distribution of specified activities, sites and resources with associated metadata and comments. Project MB106: Further development of marine pressure data layers and ensuring the socio-economic data and data layers are developed for use in the planning of marine protected area networks
- COMMISSION OF THE EUROPEAN COMMUNITY (CEC). 1995. *Natura 2000 Standard Data Form: Explanatory Notes*. Brussels: European Commission DG Environment.
- CONNOR, D.W., ALLEN, J.H., GOLDING, N., HOWELL, K.L., LIEBERKNECHT, L.M., NORTHEN, K.O., REKER, J.B. 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 JNCC, Peterborough ISBN 1 861 07561 8. Available from: [www.jncc.defra.gov.uk/MarineHabitatClassification](http://www.jncc.defra.gov.uk/MarineHabitatClassification) [Accessed May 2011].
- CROKER, P.F., 1995. Shallow Gas Accumulation and Migration in the Western Irish Sea, IN: Croker, P.F. and Shannon, P.M. (ed.), *The Petroleum Geology of Ireland's Offshore Basins*, Geological Society of London, London, Special Publication 93, 41 - 58.
- JORGENSEN, 1992.
- DEFRA. 2004. *Review of Marine Nature Conservation*. Working Group Report to Government [online]. London: Defra. Available from: <http://archive.defra.gov.uk/environment/biodiversity/marine/documents/rmnc-report-0704.pdf> [Accessed May 2011].
- EVANS, P.G.H., ANDERWALD, P. & BAINES, M.E. 2003. *UK Cetacean Status Review*. Report to English Nature and the Countryside Council for Wales.
- JNCC. 2008. *UK Guidance on defining boundaries for marine SACs for Annex I habitat sites fully detached from the coast*. Peterborough: JNCC. Available from: [http://jncc.defra.gov.uk/pdf/SACHabBoundaryGuidance\\_2008Update.pdf](http://jncc.defra.gov.uk/pdf/SACHabBoundaryGuidance_2008Update.pdf) [Accessed May 2011].
- JORGENSEN, N.O. 1992. Methane derived carbonate cementation of Holocene marine sediments from Kattegat, Denmark. *Continental Shelf Research*, 12, 1209-1218.
- JUDD, A.G. 2001. Pockmarks in the UK sector of the North Sea. *Technical Report produced for Strategic Environmental Assessment SEA2*. Department of Trade and Industry, UK.
- JUDD, A.G. 2005. The distribution and extent of methane-derived authigenic carbonates. *DTI Strategic Environmental Assessment, Area 6 (SEA6)*. Department of Trade and Industry, UK
- JUDD, A.G., CROKER, P., TIZZARD, L. and VOISEY, C. 2007. Extensive methane-derived authigenic carbonates in the Irish Sea. *Geo-Marine Letters*, 27, 259-267.
- MILODOWSKI, A. E., LACINSKA, A. AND SLOANE, H. 2009. Petrography and stable isotope geochemistry of samples of methane-derived authigenic carbonates (MDAC) from the Mid Irish Sea. *British Geological Survey commissioned report, cr/09/051*. 17pp.
- PICTON, B. 2010. *Personal Communication*. National Museums Northern Ireland, Co. Down.

REID, J.B., EVANS, P.G.H. & NORTHRIDGE, S.P. 2003. *Atlas of cetacean distribution in north-west European waters*. Joint Nature Conservation Committee, Peterborough.

SCANS II. 2008. Small Cetaceans in the European Atlantic and North Sea. Final Report submitted to the European Commission under project LIFE04NAT/GB/000245. Available from: SMRU, Gatty Marine Laboratory, University of St Andrews, St Andrews, Fife, KY16 8LB, UK.

SHARPLES, R.J., CUNNINGHAM L., HAMMOND P.S. 2005. Distribution and movements of harbour seals around the UK. Briefing paper for the Special Committee on Seals 2005.

WHOMERSLEY, P., WILSON, C., LIMPENNY, D. AND LESLIE, A. 2008. Understanding the marine environment – seabed habitat investigations of submarine structures in the mid-Irish Sea and Solan Bank Area of Search (AoS) – cruise report. JNCC Contract No: F90-01-1200. *CEFAS Cruise Report CEND 11/08*, 120pp.

WHOMERSLEY, P., WILSON, C., CLEMENTS, A., BROWN, C., LONG, D., LESLIE, A. & LIMPENNY, D. 2010. Understanding the marine environment – seabed habitat investigations of submarine structures in the mid Irish Sea and Solan Bank Area of Search (AoS). *JNCC Report No. 430*.

WWT, 2009. Distributions of Cetaceans, Seals, Turtles, Sharks and Ocean Sunfish recorded from Aerial Surveys 2001-2008. Report to Department of Energy and Climate Change. Available from: [http://www.offshore-sea.org.uk/consultations/Offshore Energy SEA/OES TechRep non avian species.pdf](http://www.offshore-sea.org.uk/consultations/Offshore_Energy_SEA/OES_TechRep_non_avian_species.pdf) [Accessed May 2011].

YUAN, F., BENNELL, J.D. and DAVIS, A.M. 1992. Acoustic and physical characteristics of gassy sediments in the western Irish Sea. *Continental Shelf Research*, 12, 1121-1134.