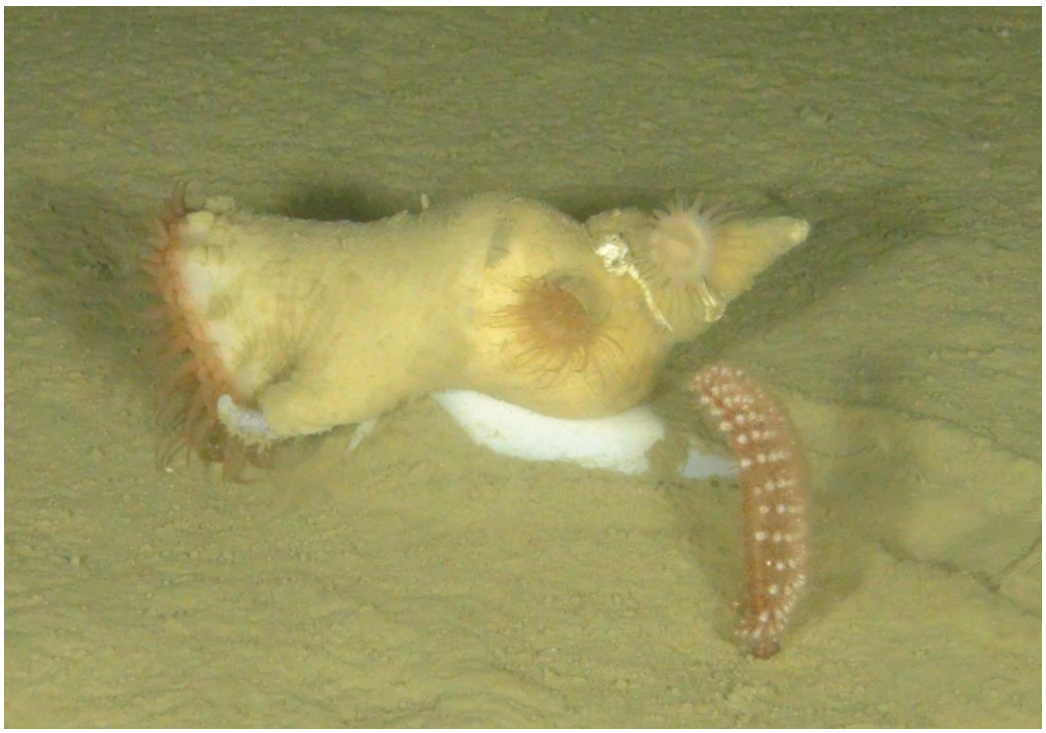
Offshore Special Area of Conservation (SAC): Scanner Pockmark

SAC Selection Assessment Document



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Version 5.4 (March 2018)

[1] Whelk with attached anemones and sea pen on soft sediment at Scanner Pockmark SAC © Oceana

Introduction

This document provides detailed information about the Scanner Pockmark Special Area of Conservation (SAC) and evaluates its interest feature (Submarine structures made by leaking gases) following the EC Habitats Directive[2] selection criteria and guiding principles. The site was submitted to the European Commission in 2008 for the protection of Annex I habitat Submarine structures made by leaking gases, approved as a Site of Community Importance (SCI) in 2009 and designated as a SAC in 2015. Analysis of additional survey data collected in 2012 (reported in Gafeira & Long 2015) recorded the potential presence of the interest feature beyond the original site boundary. This document is a revised version of JNCC's Selection Assessment Document that supported the original site nomination, taking into account newly available information on the distribution and extent of the qualifying feature Submarine structures made by leaking gases.

The advice contained within this document is produced to fulfil the requirements of JNCC under Part 2 of the Conservation of Offshore Marine Habitats and Species Regulations 2017, 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 Marine Scotland and Defra to enable the Secretary of State and Scottish Ministers to fulfil their obligations under the Regulations as well as to Competent Authorities to enable them to fulfil their obligations.

Sites eligible for designation as offshore marine SACs are selected using the criteria set out in Annex III (Stage 1) of the Habitats Directive and relevant scientific information. Sites are considered only if they host a Habitats Directive Annex I habitat or Annex II species. Socio-economic factors are not taken into account in the identification of sites to be proposed to the European Commission[3].

In addition to information on the Annex I habitat (Submarine structures made by leaking gases) found 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) of the Habitats Directive. This complies with the 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 on Biological Diversity on behalf of the European Commission to collect standardised information on SACs throughout Europe).

NOTE: No recent evidence is available to infer any changes to the non-qualifying features listed in the original Site Assessment Document. The present document only updates our formal advice for the designated feature Submarine structures made by leaking gases.

[2] See: http://jncc.defra.gov.uk/page-1445

[3] Following European Court of Justice 'First Corporate Shipping' judgement C-371/98 (7 November 2000)

Document version control

Version	Issue date	Amendments made	Issued to and date
5.4	13.03.18	Cover image updated following Sub Group review	Scottish Government (March 2018)
5.3	22.01.18	MPA Programme Leader sign-off	
5.1	10.01.18	Addressing comments from public consultation	
5.0	11.07.17	Finalised for public consultation	
4.7	05.07.17	Updated following comments received from programme leader review	Marine Scotland (July 2017)
4.6	30.05.17	Updated following comments received from the MPA Sub-Group	
4.5	26.05.17	Document updated to reflect new data and proposed site boundary change to incorporate revised extent of pockmarks incorporating verified and potential Submarine structures made by leaking gases.	MPA Sub-Group (May 2017)
4.0	01.07.08	Post consultation modifications, including site boundary amendment	Secretary of State (July 2008)
3.1	13.11.07	Draft SAC changed to possible SAC	Public consultation (December 2007)
3.0	25.05.07	New introductory text, revised site summary and map layout, heading & text amendments Additional guiding principles for site selection incorporated under Global Assessment Conservation Objectives and Advice on Operations moved to separate document	JNCC Committee (June 07) and UK Marine Biodiversity Policy Steering Group (September 07)
2.0	26.08.06	Draft Conservation Objectives and (revised) Advice on Operations added. Map layout revised	Defra, Devolved Administrations, and other Govt. departments (25th September 2006)
1.0	15.12.04	Site boundary defined; site, habitat and data maps created; report edited	JNCC Committee (December 2004) Defra (15th December 2004)

Further information

This document is available as a pdf file on JNCC's website for download if required (www.jncc.defra.gov.uk)

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Scanner Pockmark: SAC Selection Assessment

1. Site name Scanner Pockmark	**2. Site centre location** 58º17'7″, 0º58'10″ (Datum: WGS 1984 UTM Zone 31 North, calculated in ArcGIS™)
3. Site surface area 674 ha/ 6.74km^2 (Datum: WGS 1984 UTM Zone 31 North, calculated in ArcGIS)	**4. Biogeographic region** Atlantic

5. Interest feature(s) under the EU Habitats Directive

Habitat code: 1180 **-** Submarine structures made by leaking gases

6. Site summary

Scanner pockmark is a large seabed depression in the northern North Sea, which had in the past been identified as containing verified examples of large blocks of the Annex I habitat Submarine structures made by leaking gases (Dando, 1990; Dando, *et al.*, 1991; Hovland and Judd, 1988). The Scanner pockmark itself, together with additional pockmark depressions, make up the Scanner Pockmark SAC. The site is situated approximately 185km off the north-east coast of Scotland near the centre of the Witch Ground Basin, in waters of approximately 150 m depth. A total of 67 pockmarks have been identified within the Scanner Pockmark SAC boundary. The pockmarks were created by the expulsion of fluids and have been maintained by active gas seepage.

Four of these pockmarks have a considerably greater volume than more typical pockmarks in the vicinity of the site (Judd and Hovland, 2007), comprised of two pockmark complexes; Scanner and Scotia. The Scanner pockmark complex in the south of the site comprises two large pockmarks with a combined area of approximately 320,000m^2 and depths of up to 16.7m below the surrounding sea floor (Gafeira and Long, 2015). At the base of the pockmarks, blocks of 'methane derived authigenic[4] carbonate' (MDAC) (equivalent to the interest feature of the site: Annex I Submarine structures made by leaking gases) have been previously recorded (Judd, 2001). Scotia pockmark complex in the north is a composite feature composed of two deeper sections with active methane seeps (Dando, 2001). Analysis of survey data collected in 2012 (Rance *et al.,* 2017) suggests that small patches of harder substrate do occur within the Scotia pockmark complex, but whether these represent MDAC requires further confirmation (Gafeira and Long, 2015).

Some of the pockmarks appeared to have infilled due to slope failure, interrupting gas migration and likely obscuring seabed features previously present such as MDAC or bacterial mats (Gafeira and Long, 2015). The cause of slope failure is unknown, but may be either anthropogenic or natural (Gafeira and Long, 2015). On the basis that verified examples of the qualifying feature having been recorded in the past, potential examples of Annex I Submarine structures made by leaking gases have been considered in establishing the boundary for the site. High acoustic backscatter may be indicative of hard carbonate structures so are considered as potential feature records associated with pockmarks (JNCC, 2016). Both verified and potential occurrences of the habitat are considered to represent the known extent of the feature within the site (JNCC, 2016).

Scanner Pockmark SAC is located in the Northern North Sea Regional Sea (JNCC, 2004; Defra, 2004). There is one other SAC in the Northern North Sea with Submarine structures made by leaking gases as a qualifying interest feature of the site. Braemar Pockmarks SAC is situated to the north-east of Scanner Pockmark SAC. There is also a candidate Special Area of Conservation/Site of Community Importance (cSAC/SCI) for the feature in the Irish Sea – Croker Carbonate Slabs cSAC/SCI. Notable characteristics of these other sites identified for the interest feature are provided in the table below with links provided to further information on these sites.

SAC	Notable characteristics of interest feature
Braemar Pockmarks	Large blocks, pavements slabs and smaller fragments of MDAC are present in six pockmarks within the site. These Submarine structures made by leaking gases provide a habitat for benthic marine fauna usually associated with rocky reef as well as hosting specific chemosynthetic organisms which utilise the methane seeps (and its by-

[4] An authigenic sedimentary rock deposit is one that was generated where it is found or observed. Sedimentary authigenic minerals include calcium carbonate.

	product, hydrogen sulphide). Larger blocks of carbonate and the pockmarks themselves also provide shelter for large fish species such as wolf-fish and cod (Dando, 2001).
Croker Carbonate Slabs	The seabed surface is composed of extensive areas of exposed MDAC. 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).

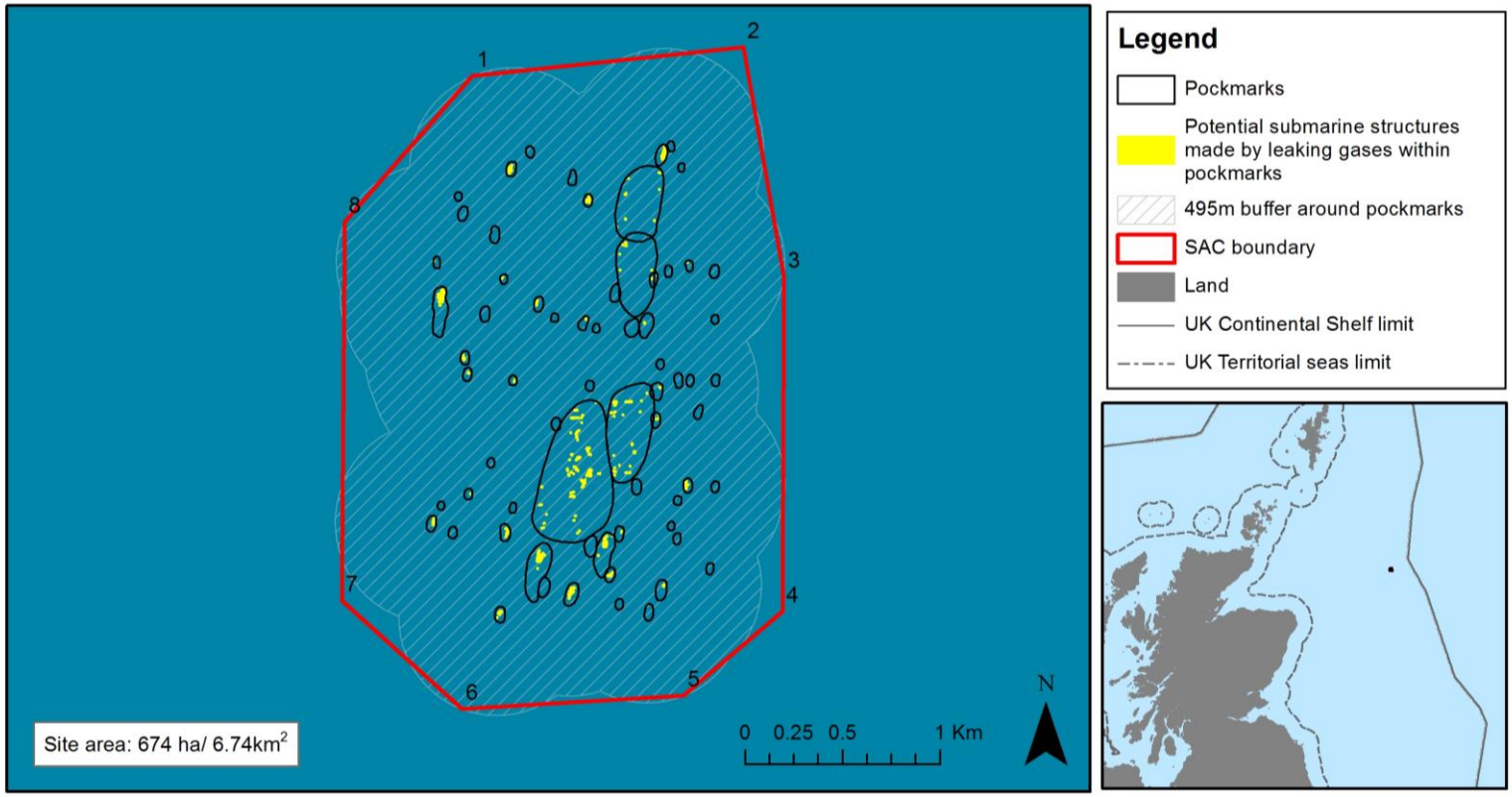
In character, the interest features of the Scanner Pockmark site are similar to those in Braemar Pockmarks SAC. However, the Submarine structures made by leaking gases at Scanner appear to be characterised by slightly different species assemblages and exhibit a different morphology in terms of the pockmarks found here.

7. Site boundary

The boundary for the Scanner Pockmark SAC encompasses all potential records of the Annex I habitat Submarine structures made by leaking gases recorded in the area (based on evidence presented within Gafeira and Long, 2015). Using JNCC's guidance (2012) on defining boundaries for marine SACs for Annex I habitat sites fully detached from the coast, a 3:1 ratio of distance from a feature to depth ratio was used to create a buffer on a precautionary basis around examples of the feature. The proposed amendment to the site boundary was drawn from the outermost edges of the buffers. Maximum water depth in the site is 165m; therefore, a buffer of 495m has been applied around all potential records of the feature.

8. Map of site

Figure 1: Map of the SAC boundary, the known distribution of potential[5] records of the Annex I habitat Submarine structures made by leaking gases and the pockmarks with which they are associated within the SAC.



Map version 18/01/2018

Boundary coordinates:
1) 58° 17' 58", 0° 57' 36" 2) 58° 18' 4", 0° 59' 1" 3) 58° 17' 26", 0° 59' 16" 4) 58° 16' 30", 0° 59' 19"
5) 58° 16' 16", 0° 58' 49" 6) 58° 16' 13", 0° 57' 39" 7) 58° 16' 30", 0° 57' 0" 8) 58° 17' 33", 0° 56' 57"

[5] Both verified and potential records should be considered as the feature. For more details please see section 6.

9. Assessment of interest feature(s) against selection criteria

This assessment has been undertaken following UK guidance set out in JNCC (2009).

9.1 Submarine structures made by leaking gases

Annex III selection criteria (Stage 1A):

a) Representativity

The Scanner Pockmark site occurs in the Northern North Sea Regional Sea, and represents the Annex I feature Submarine structures made by leaking gases in this sea area. The faunal communities within the site have previously represented typical assemblages associated with these features including benthic fauna utilising the surface of the carbonate structure for attachment and chemosynthetic organisms associated with the seep environment (Dando *et al.,* 1991). However, a survey in 2012 suggested that the carbonate structures appeared to have been buried by sediment infilling of the pockmarks. This has resulted in a likely reduction in the feature present within the site. As a result, typical species assemblages appear to be more similar to wider soft sediment ecosystems due to the lack of hard substrate provided by MDAC.

On the basis that verified examples of the qualifying feature having been recorded in the past, potential examples of Annex I Submarine structures made by leaking gases inferred from high reflectance backscatter data have been considered as representing the qualifying feature.

The grade for the feature is C: Significant representativity.

b. Area of habitat

Taking into account the distribution of the two known types of Submarine structures made by leaking gases in UK waters (bubbling reefs and submarine structures associated with pockmarks), Scanner Pockmark SAC represents a relatively small proportion (approximately 1%) of the total known resource in UK waters. This is because a significantly greater recorded extent of the feature (55km^2) occurs within the Croker Carbonate Slabs cSAC/SCI by comparison to Scanner Pockmark (0.608km^2). However, when considering the specific type included within this SAC, approximately 77% (accounting for verified and potential records) of the total known UK resource of MDAC associated with pockmarks is included within the site boundary.

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

c) Conservation of structure and functions

Degree of conservation of structure

The biological and physical structure of the interest feature at the Scanner Pockmark SAC is likely to have been partially impacted by bottom trawling. From Vessel Monitoring System (VMS) data (2009-2015), there is evidence of mobile demersal fishing effort within the site, predominantly by UK vessels. Evidence of trawling scars from fishing have been identified throughout the area, with the majority of activity orientated north to south within the Scanner Pockmark SAC boundary (Rance *et al.,* 2017). The south-east corner of the MPA overlaps with the Blenheim oil field (production ceased) and two abandoned, explorative oil wells occur within the site from 1984. There are acoustic anomalies at the well

sites, most likely to be due to the deposition of cuttings and anchoring of the rig, which are still prevalent due to low sedimentation rates in the area (Gafeira and Long, 2015). Some of the pockmarks appeared to have infilled due to slope failure, interrupting gas migration and likely obscuring seabed features previously present such as MDAC or bacterial mats (Gafeira and Long, 2015). The cause of slope failure is unknown, and could be either anthropogenic or natural (Gafeira and Long, 2015).

The grading for this sub-criterion is III: average or partially degraded structure.

Degree of conservation of functions
The prospects of this feature maintaining its structure in the future, taking into account unfavourable influences and reasonable conservation effort, are good. Existing Regulations manage oil and gas activity in and around SACs on the UK continental shelf, and a mechanism is available through the European Commission's Common Fisheries Policy to manage fishing activity in the area if deemed to be necessary. The feature is distant from terrestrial sources of pollution, however debris has been recorded on the seabed from human activities such as oil and gas extraction and fishing activities (Rance *et al.,* 2017).

The grade for this sub-criterion is I: excellent prospects.

Restoration possibilities
Restoration methods in the offshore area focus on the removal of impacts to allow recovery where the habitat has not been removed. Restoration of biological communities at the Scanner Pockmark SAC may be possible where the submarine structures have not been destroyed. However, where damage has occurred, the restoration potential is unknown. 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 and therefore restoration is considered difficult or impossible. However, he periodic expulsion of large volumes of methane (Hong *et al.,* 2016) may also expel sediments from within pockmarks, which in turn may result in the uncovering of MDAC below the surface.

The grade for this sub-criterion is III: restoration difficult or impossible.

Overall grade
As set out in JNCC (2009) (Section 4.3 – Synthesis) aggregation rules dictate that due to the degree of conservation of structure being graded as III, restoration possibilities as III and conservation functions being graded as I, the overall grade equates to **C: average or reduced conservation.**

d) Global assessment
There are currently two other SACs with this habitat as a qualifying feature in UK waters. This site makes an important contribution to protecting approximately 77% of the total known UK resource of the MDAC associated with pockmarks type of the Annex I habitat Submarine structures made by leaking gases when considering all potential records of the feature. However, evidence suggests that conservation structure has been degraded and is of lower representativity value. As such, the global assessment is classed as **C: Examples of the Annex I habitat are of at least national interest, but not significantly above this.**

Summary of scores for Stage 1a criteria

Area of habitat	Representativity (a)	Area of habitat (b)	Structure and function (c)	Global assessment (d)
Scanner Pockmark	C	A	C	C

10. Sites to which this site is related

Braemar Pockmarks SAC; Croker Carbonate Slabs SAC

11. Supporting scientific documentation

Overview of available evidence

An overview of example data collected from the Scanner Pockmark SAC is provided in Figure 2.

The Scanner pockmark was discovered in 1983 during a routine environmental survey in UK Petroleum Block 15/25b. This pockmark and the surrounding area have been studied in great detail since its discovery. This includes shallow seismic and side-scan sonar surveys (1983, 1991, 1992, 2001, 2002 and 2012), seabed sediment sampling (1988, 1989, 1990, 1991, 2002 and 2012), ROV inspection (1985) and a manned submersible survey (1990). Analysis from these surveys described the carbonate blocks within the pockmark, the epifauna associated with the feature, surrounding infauna, mapped the pockmark and confirmed the successive presence of active methane seepage (see Figure 2 for a visualisation of selected available evidence). This work has been published in Hovland & Sommerville (1985), Dando *et al.* (1991), Judd *et al.* (1994), Judd (2001), Dando (2001) and Judd and Hovland (2007).

A dedicated scientific survey was undertaken by JNCC and Cefas in 2012 to further investigate the Scanner pockmark (Rance *et al.,* 2017). Ground truthing data were collected using a drop camera for stills and videos, and a 0.1m^2 Day grab collected sediment samples which were sub-sampled for Particle Size Analysis (PSA) and benthic fauna data. Gafeira and Long (2015) used available survey data to undertake semi-automated mapping that helped to characterise the morphology of the pockmarks based on multibeam bathymetry. Backscatter and side scan sonar data were used to characterise the seafloor and associated MDAC. Many of the mapped pockmarks in the area showed a high backscatter response which is indicative of the presence of MDAC, however no samples verified this.

Geo-physical evidence

A total of 67 pockmarks have been identified within the Scanner Pockmark SAC boundary. Four of these pockmarks have a considerably greater volume than more typical pockmarks in the vicinity of the site (Judd and Hovland, 2007). The Scanner pockmark complex in the south comprises two large pockmarks with depths of up to 16.7m below the surrounding sea floor (Gafeira and Long, 2015). The pockmark depressions were created by the expulsion of fluid. At the base of the pockmark, large blocks of MDAC have previously been recorded (Hovland and Judd 1988). The slow formation of the MDAC that characterises the physical structure of this habitat is dependent upon the migration of gases (methane) to the seabed and is mediated by a unique community of microbial organisms. These communities undertake the anaerobic oxidation of methane (AOM) at the sulphate-methane interface (SMI), which is most commonly close beneath the seabed surface (Boetius *et al*., 2000). AOM leads to the precipitation of a carbonate cement that binds the seabed sediments (Niemann *et al*., 2005).

During survey by Statoil in 1985, images of MDAC were taken to the west of the Scanner pockmark complex within the site. These were sometimes partially covered by sediments but often present as isolated blocks. The MDAC slabs were generally oval discs and appeared to be supported by a pillar or pedestal structure (Hovland and Judd, 1988). Cement samples from the MDAC were formed from aragonite and calcite ($CaCO_3$). In 1990 the manned submersible Jago revealed high levels of methane, carbonate-cemented sediment formed from clay, sorted sand and gravel, bacterial mats and gas seeps, one of which emitted dark 'smoke' (Dando, 1990). In 2004 (cruise HE 208) exposed carbonate outcrops were found at the base of pockmarks populated with benthic organisms such as sea anemones (Gafeira and Long, 2015).

The MDAC structures have not been verified in recent surveys from 2001 and 2012. Some of the pockmarks appeared to have infilled due to slope failure, interrupting gas migration and likely obscuring seabed features previously present such as MDAC or bacterial mats (Gafeira and Long, 2015). The cause of slope failure is unknown, and could be either anthropogenic or natural (Gafeira and Long, 2015). However, almost half of the mapped pockmarks presented areas of high backscatter response which may be correlated to seabed exposures of MDAC. Therefore, several pockmarks in the study area could potentially have MDAC at or near the seabed surface.

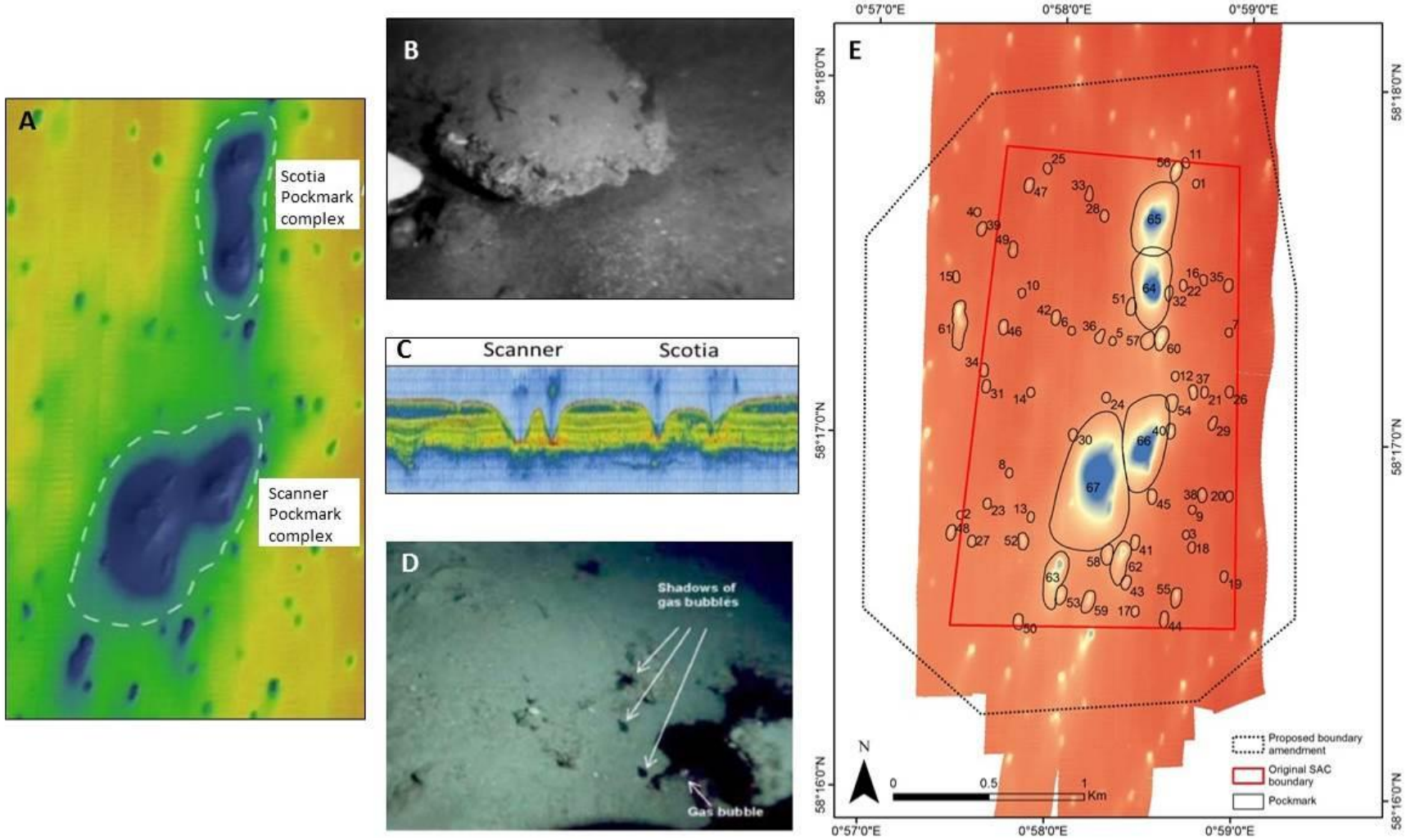
Biological evidence

Scanner Pockmark SAC habitat consists of subtidal mud and sandy mud and the pockmarks have a mixed/coarse sediment type attributed to them (Rance *et al.,* 2017). Macrofaunal analyses have shown highest abundances but low diversity within the pockmark features, however assemblages were not found to be significantly different inside and outside the pockmarks (Rance *et al.,* 2017). Although pockmark infilling appears to have obscured MDAC structures and bacterial mats, meiofaunal analyses showed a very high abundance and dominance of the nematode species *Astomonema southwardarum,* known to host endosymbiotic, chemoautotrophic bacteria within their body cavity (Rance *et al.*, 2017). This species was first described at the Scanner Pockmark area (Austen *et al.,* 1993). Another important species which may be associated with methane seepage is the bivalve *Thyasira sarsi*, (Oliver and Killeen, 2002), which is largely dependent on endosymbiotic sulphur-oxidising bacteria for its nutrition and has been recorded within the site.

When the site contained exposed carbonate structures these provided a hard substrate suitable for colonisation by organisms such as the sea anemones *Bolocera tuediae, Urticina felina* and *Metridium senile* (Dando *et al.,* 1991). The structures and pockmark depressions have also attracted a range of fish species. Fish noted in the pockmark were *Myxine glutinosa* (hagfish), *Rhinonemus cimbrius* (fourbeard rockling), *Melanogrammus aeglefinus* (haddock) and *Sebastes viviparus* (small redfish) on top of the MDAC and within the pockmarks and *Anarhichas lupus* (wolf-fish) lying in cavities under the rocks. These fish appear to use the pockmark depressions and the carbonate structures for shelter, since no large fish were seen outside the pockmark (Dando, 2001). It is likely that there are not currently any carbonate structures present within the site to provide refugia, however species still likely use the pockmark depressions themselves.

Other invertebrates that have been observed at the Scanner Pockmark SAC include *Pennatula phosphorea (*phosphorescent sea pen*), Virgularia mirabilis* (slender sea pen) and *Cerianthus lloydii* (tube anemone) in the sediments of the pockmark. Among other species, hermit crabs (*Pagurus* sp.), large echinoderms and squat lobsters were also found in the site (Dando *et al.,* 1991).

Figure 2. Examples of the outputs from analysis of data for the Scanner Pockmark SAC A) Multibeam dataset illustrating the Scanner and Scotia pockmark complexes (Gafeira & Long 2015); B) A slab of MDAC near the centre of the Scanner pockmark (Judd 2001); C) Image showing active gas seeps (adapted from Judd & Hovland (2007) in Gafeira & Long (2015)); D) Images of gas bubbles escaping from Scanner pockmark by Statoil 1985 (Gafeira & Long 2015) and E) Semi-automated mapping of pockmarks undertaken by Gafeira & Long (2015) showing the existing and proposed boundary amendment.



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