# Offshore Special Area of Conservation: Scanner Pockmark

## SAC Selection Assessment Document

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**Version 5.0 (July 2017)**

[1] Dublin Bay prawn (*Nephrops norvegicus*) on soft sediment at Scanner pockmark SAC ©JNCC/Cefas

## 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 Special Area of Conservation (SAC) in 2015. Analysis of additional survey data collected in 2012 (reported in Gafeira & Long 2015) recorded the presence of the interest feature beyond the previous site boundary. This document is a revised version of JNCC's Selection Assessment Document that supported the original site nomination, taking into account the newly available information.

The advice contained within this document is produced to fulfil the requirements of JNCC under Part 2 of the Offshore Marine Conservation (Natural Habitats, & c.) Regulations 2007, 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 |
|---|---|---|---|
| 5.0 | 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<br>Additional guiding principles for site selection incorporated under Global Assessment<br>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.<br>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)<br>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

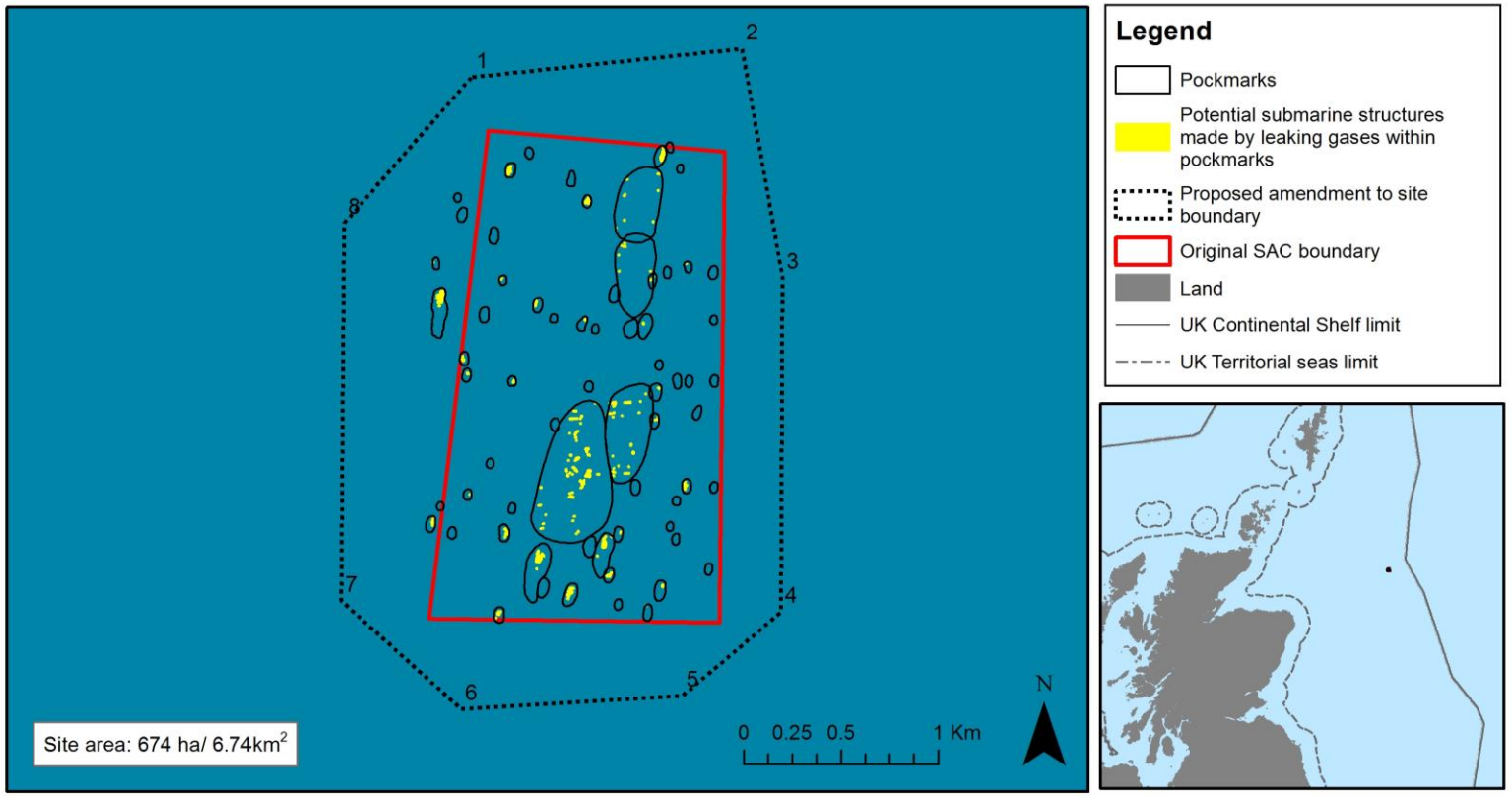
| | |
|---|---|
| **1. Site name**<br>Scanner Pockmark | **2. Site centre location**<br>58º17'7″, 0º58'10″<br>(Datum: WGS 1984 UTM Zone 31 North, calculated in ArcGIS™) |
| **3. Site surface area**<br>674 ha/ 6.74km$^2$<br>(Datum: WGS 1984 UTM Zone 31 North, calculated in ArcGIS) | **4. Biogeographic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

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

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

## 6. Map of site

***Figure 1:*** Map of current boundary of the SAC showing the proposed amendment, alongside the known distribution of potential records of the Annex I habitat Submarine structures made by leaking gases.




Map version 06/07/2017

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"

## 7. Site summary

Scanner pockmark is a large seabed depression in the northern North Sea, which contain large blocks of the Annex I habitat Submarine structures made by leaking gases. The blocks lie in the base of the pockmark and support fauna more typically associated with rocky reef. These carbonate structures are notably colonised by large numbers of anemones (*Urticina felina* and *Metridium senile*) and squat lobsters (Dando *et al* 1991). These features also appear to support micro-organisms known as 'chemosynthesizers' that utilise the discharged methane and its by-product, hydrogen sulphide (Judd 2001). The gutless nematode *Astomonema southwardorum*, which may have a symbiotic relationship with chemosynthetic bacteria, is also prevalent and was first described at this site (Austen *et al* 1993). Fish (hagfish, haddock, wolf-fish and small redfish) also appear to be using the pockmark depressions and the carbonate structures for shelter (Dando 2001).

Scanner Pockmark Special Area of Conservation (SAC) 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. Four of these pockmarks have a considerably greater volume than more typical pockmarks in the vicinity of the site (Judd & Hovland 2007). The pockmarks were created by the expulsion of shallow methane gas and have been maintained by active gas seepage. At the base of the pockmarks, blocks of 'methane derived authigenic carbonate' (MDAC) have been previously recorded (Judd 2001). 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 & Long 2015). This site also contains the Scotia pockmark complex in the north, 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 & Long 2015) and so are currently recognised as potential interest feature records.

Scanner pockmark 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 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 methane-derived authigenic[4] carbonate (MDAC) are present in six pockmarks within the site and on the seabed nearby. These Submarine structures made by leaking gases provide a habitat for marine fauna usually associated with rocky reef as well as very specific chemosynthetic organisms which utilise the methane seeping from beneath the sea floor (and its by-product, hydrogen sulphide). Larger blocks of carbonate also provide shelter for large fish species such as wolf-fish and cod (Dando 2001). |

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

| | |
|---|---|
| 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 the 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.

## 8. 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 & 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.

Any future management measures which may be required under the Offshore Marine Conservation (Natural Habitats, & c.) Regulations will be determined by Competent Authorities in consultation with JNCC. These measures may have a different spatial extent to the SAC boundary.

## 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***

This 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 are representative of those present on Submarine structures made by leaking gases, consisting principally of anemones (*Bolocera tuediae, Urticina felina* and *Metridium senile*), as well as chemosynthetic organisms (Dando *et al* 1991). 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 & Long 2015). The cause of slope failure is unknown, but may be either anthropogenic or natural (Gafeira & Long 2015).

**The grade for the feature is B: Good representativity.**

***b. Area of habitat***

Taking into account the distribution of the two known sub-types of Submarine structures made by leaking gases in UK waters (bubbling reefs and MDAC

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 candidate Special Area of Conservation/Site of Community Importance by comparison to Scanner Pockmark (0.608km$^2$). However, when considering the specific sub-type included within this SAC, approximately 77% of the total known UK resource of MDAC associated with pockmarks is protected.

**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 (2009-2012), there is evidence of mobile demersal fishing effort within the Scanner pockmark SAC, 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 & 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 & Long 2015). The cause of slope failure is unknown, and could be either anthropogenic or natural (Gafeira & 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 site 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. There is anecdotal evidence to suggest that the submarine structures are sustained by shallow biogenic gas seepage (Hartley 2005); however, if deeper

petrogenic gas supports the structures, there is potential for a reduction in seepage if the underlying reservoir is depleted through commercial activities (Oil & Gas UK 2008).

**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 sub-type of the Annex I habitat Submarine structures made by leaking gases. However, evidence suggests that conservation structure has been degraded. As such, the global assessment is classed as **B: Site holds excellent stands of the Annex I habitat, but of somewhat lower value than grade A sites.**

***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 | B | A | C | B |

## 10. Sites to which this site is related
Braemar Pockmarks SAC; Croker Carbonate Slabs SAC

## 11. Supporting scientific documentation

**Overview of available evidence**
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 & 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 & 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.

**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 & 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 & Long 2015). The pockmarks were created by the expulsion of shallow methane gas and have been maintained by active seepage. At the base of the pockmark, large blocks of 'Methane Derived Authigenic Carbonate' (MDAC) have previously been recorded (Hovland & Judd 1988); These carbonate rocks, formed by the precipitation of calcium carbonate and cementation of the surrounding sediment, have been identified as Annex I Submarine structures made by leaking gases, but have not been confirmed by more recent 2012 survey data. 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 & Long 2015). The cause of slope failure is unknown, and could be either anthropogenic or natural (Gafeira & Long 2015).

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 & 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 & Long 2015).

Gafeira & Long (2015) observed infilling of some of the pockmarks which must have obscured features previously present at the seabed such as MDAC or bacterial mats. However, almost half of the mapped pockmarks presented areas of high backscatter response which can be correlated to seabed exposures of MDAC, therefore several pockmarks in the study area could potentially have MDAC at or near the seabed.

**Biological evidence**

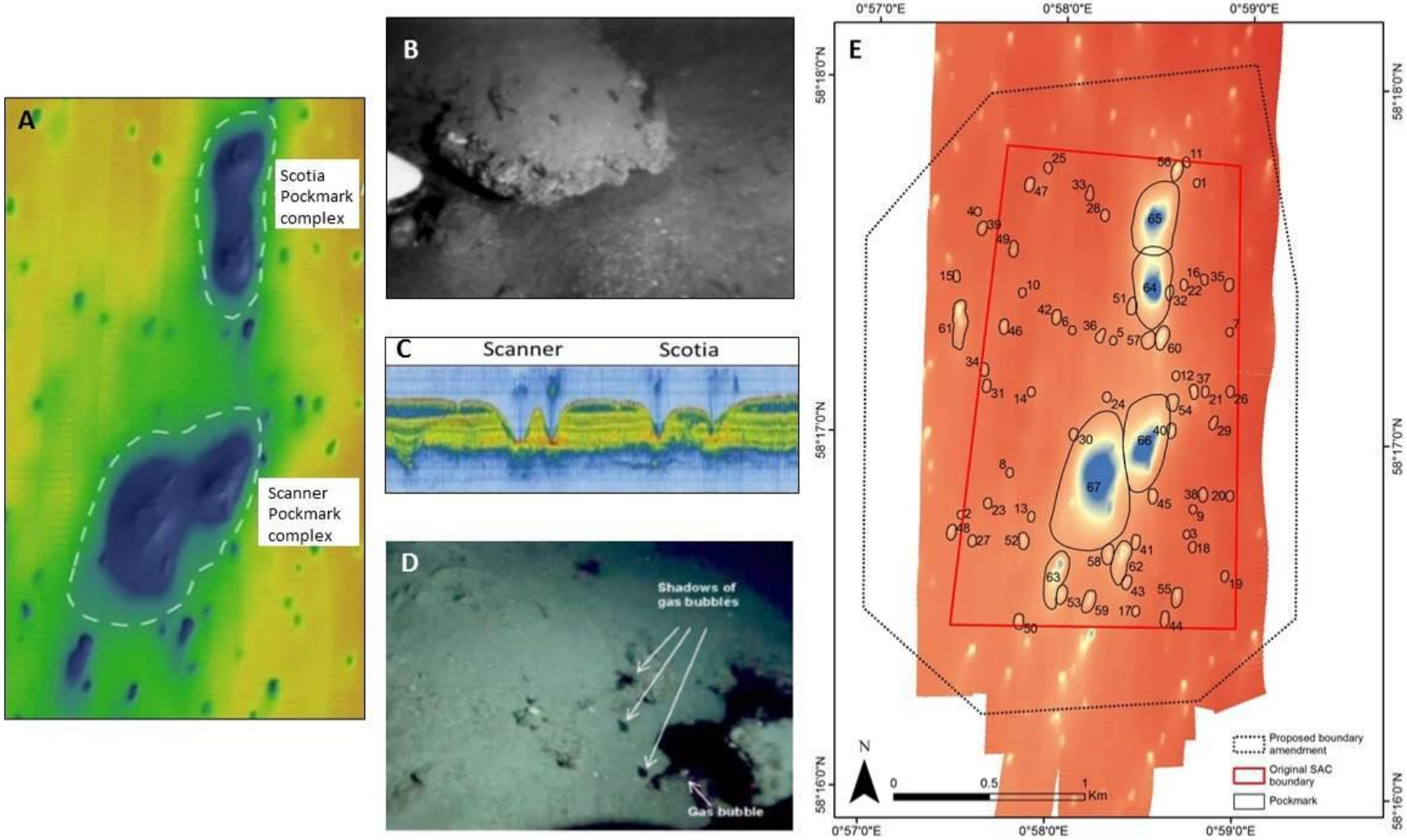
Scanner pockmark SAC habitat consists of subtidal mud and sandy mud and the pockmark features have a mixed/coarse sediment type attributed to them (Rance *et al* 2017). Macrofaunal analyses have shown highest abundances but low diversity within the pockmark features, however assemblages were not found to be significantly different inside and outside the pockmarks (Rance *et al* 2017). 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. This species was first described at the Scanner Pockmark area (Austen *et al* 1993). Another important species associated with the gas seepage in the pockmark is the bivalve *Thyasira sarsi*, (Oliver & Killeen 2002), which is largely dependent on endosymbiotic sulphur-oxidising bacteria for its nutrition.

The structures and pockmark depression 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 carbonates and *Anarhichas lupus* (wolf-fish) lying in cavities under the rocks. These fish appear to be using the pockmark depressions and the carbonate structures for shelter, since no large fish were seen outside the pockmark (Dando 2001). As well as providing a potentially favourable, sheltered habitat for a variety of marine organisms, pockmarks which have active gas seeps and associated structures may be of ecological significance because i) of the utilisation of methane and its by-product, hydrogen sulphide, by chemosynthesisers; (Judd 2001) and ii) MDAC

provides a hard substrate suitable for colonisation by certain benthic organisms (Dando *et al* 1991).

Other invertebrates 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 and the sea anemones *Bolocera tuediae, Urticina felina* and *Metridium senile* on the carbonate structures (Dando *et al* 1991). Among other species, hermit crabs (*Pagurus* sp.), large echinoderms, squat lobsters and an egg mass were also found on 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) Image showing active gas seeps (adapted from Judd & Hovland (2007) in Gafeira & Long (2015)); C) A slab of MDAC near the centre of the Scanner Pockmark (Judd 2001); C & 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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