European Community Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC)

Fourth Report by the United Kingdom under Article 17

on the implementation of the Directive
from January 2013 to December 2018

Conservation status assessment for the habitat:

H1180 - Submarine structures made by leaking gases

UNITED KINGDOM

IMPORTANT NOTE - PLEASE READ

- The information in this document represents the UK Report on the conservation status of this habitat, submitted to the European Commission as part of the 2019 UK Reporting under Article 17 of the EU Habitats Directive.
- It is based on supporting information provided by the geographically-relevant Statutory Nature Conservation Bodies, which is documented separately.
- The 2019 Article 17 UK Approach document provides details on how this supporting information contributed to the UK Report and the fields that were completed for each parameter.
- The reporting fields and options used are aligned to those set out in the European Commission guidance.
- Maps showing the distribution and range of the habitat are included (where available).
- Explanatory notes (where provided) are included at the end. These provide additional audit trail information to that included within the UK assessments. Further underpinning explanatory notes are available in the related country-level and/or UK offshore-level reports.
- Some of the reporting fields have been left blank because either: (i) there was insufficient information to complete the field; and/or (ii) completion of the field was not obligatory.
- The UK-level reporting information for all habitats and species is also available in spreadsheet format.

Visit the JNCC website, https://jncc.gov.uk/article17, for further information on UK Article 17 reporting.

Report on the main results of the surveillance under Article 17 for Annex I habitat types (Annex D)

NATIONAL LEVEL

1. General information

1.1 Member State	**UK**
1.2 Habitat code	**1180 - Submarine structures made by leaking gases**

2. Maps

2.1 Year or period	2015-2018
2.3 Distribution map	Yes
2.3 Distribution map Method used	Based mainly on extrapolation from a limited amount of data
2.4 Additional maps	No

BIOGEOGRAPHICAL LEVEL

3. Biogeographical and marine regions

3.1 Biogeographical or marine region where the habitat occurs	**Marine Atlantic (MATL)**
3.2 Sources of information	Birchenough, S.N.R., Bremner, J., Henderson, P., Hinz, H.,Jenkins, S., Mieszkowska, N., Roberts, J.M., Kamenos, N.A.,and Plenty, S. (2013) Impacts of climate change on shallow and shelf subtidal habitats, MCCIP Science Review 2013,193-203, doi:10.15565/2013.arc20.193-203 Boulcott, P. & Howell, T.R.W., 2011. The impact of scallop dredging on rocky-reef substrata. Fisheries Research (Amsterdam), 110 (3), 515-520. Dando, P.R. (2010). Biological communities at marine shallow-water vent and seep sites. In: Kiel, S. (Ed.), The vent and seep biota - from microbes to ecosystems. Topics in Geomicrobiology, 33, 333-378. HM Government, 2012. Marine Strategy Part One: UK Initial Assessment and Good Environmental Status. Report No. PB13860. Jennings, S. & Kaiser, M.J., 1998. The effects of fishing on marine ecosystems. Advances in Marine Biology, 35, 201-352. JNCC and Natural England, 2011. General advice on assessing potential impacts of and mitigation for human activities on MCZs, using existing regulation and legislation. Natural England Marine Conservation Zones. June 2011. URL: http://www.naturalengland.org.uk/Images/activitiesadvice_tcm6-26819.pdf JNCC 2018a. Habitats Directive Annex I: Submarine structures made by leaking gases. Version 3. http://jncc.defra.gov.uk/page-6639 JNCC, 2018b. Statements on conservation benefits, condition & conservation measures for Croker Carbonate Slabs candidate Special Area of Conservation and Site of Community Importance. http://jncc.defra.gov.uk/pdf/Croker_ConservationStatements_V1.0.pdf JNCC, 2018c. Statements on conservation benefits, condition & conservation measures for Braemar Pockmarks Special Area of Conservation. http://jncc.defra.gov.uk/pdf/BraemarPockmarks_ConservationStatements_V1.0.pdf JNCC 2018d. Statements on conservation benefits, condition & conservation measures for Scanner Pockmark Special Area of Conservation. http://jncc.defra.gov.uk/pdf/ScannerPockmark_ConservationStatements_V1.0.pdf JNCC, 2017. Offshore benthic habitats monitoring options - Method paper 1: Risk assessment for offshore Marine Protected Areas and benthic habitats in UK, v.05 JNCC, 2016. Method for Creating a Map of Annex I Submarine Structures made

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4. Range

4.1 Surface area (in km²)	14074	
4.2 Short-term trend Period	2007-2018	
4.3 Short-term trend Direction	Uncertain (u)	
4.4 Short-term trend Magnitude	a) Minimum	b) Maximum
4.5 Short-term trend Method used	Insufficient or no data available	
4.6 Long-term trend Period		
4.7 Long-term trend Direction		
4.8 Long-term trend Magnitude	a) Minimum	b) Maximum
4.9 Long-term trend Method used		
4.10 Favourable reference range	a) Area (km²)	
	b) Operator	
	c) Unknown	Yes
	d) Method	FRV-Unknown - Since the range of the feature is primarily dependent on geological processes the actual range is likely to be equivalent to the favourable reference range. However, in the absence of both a true range estimate (Map 1.1.5 represents potential range only) and trend data, it is not appropriate to report a favourable reference range estimate for this reporting period.
4.11 Change and reason for change in surface area of range	Improved knowledge/more accurate data	
	The change is mainly due to:	Improved knowledge/more accurate data

4.12 Additional information

4.1-The UK range map was developed from the UK distribution map, but additionally included areas that had the potential for the habitat to occur based on an understanding of seabed geology (JNCC, 2016; JNCC, 2018a). Submarine structures made by leaking gases are created through a process of precipitation (attributed to the oxidation of methane) whereby the carbonate cements the normal seabed sediment, forming rock-like concretions of 'Methane-Derived Authigenic Carbonate (MDAC) (Judd, 2001). Therefore, a fundamental requirement for the formation of these structures is the presence of methane (Judd, 2005).
There is insufficient data on the habitat to determine its true range, due to the practical difficulties in detecting MDAC remotely. Nevertheless, it is possible to identify sites at which MDAC is likely to occur by identifying 'shallow gas' (gas in the sediments close to the seabed), gas seeps, and seabed features associated with gas seepage (pockmarks, mud volcanoes etc.) (Judd, 2005; Judd et al., 2007). Therefore, a range map has been produced showing these areas within which the Annex I habitat may occur. The value given is the estimated potential range over which MDAC could occur.
4.3- As described above, it is not possible to determine the true range of this habitat. Detection difficulties mean that the area of the feature is not believed to have been fully mapped. Range has, therefore, been determined from current

known occurrences of the habitat and from areas of shallow gas where the habitat could potentially occur. It is extremely difficult to predict in which specific areas of the shallow gas, this habitat would occur, therefore a model of area and range is not available. Consequently, figures represent potential habitat range and there are no real trend data from which to determine any change in the range of this habitat.
4.11-The most recent update incorporated new survey data to inform the potential range of this feature (JNCC, 2016). The most recent value is 14074 km2; an increase of 910 km2 since Art 17 2013 report where the range was 13164 km2.
For further details see 2019 UK Approach Document on the JNCC website.

5. Area covered by habitat

5.1 Year or period			
5.2 Surface area (in km²)	a) Minimum	b) Maximum	c) Best single value
5.3 Type of estimate			
5.4 Surface area Method used	Insufficient or no data available		
5.5 Short-term trend Period	2007-2018		
5.6 Short-term trend Direction	Uncertain (u)		
5.7 Short-term trend Magnitude	a) Minimum	b) Maximum	c) Confidence interval
5.8 Short-term trend Method used	Insufficient or no data available		
5.9 Long-term trend Period			
5.10 Long-term trend Direction			
5.11 Long-term trend Magnitude	a) Minimum	b) Maximum	c) Confidence interval
5.12 Long-term trend Method used			
5.13 Favourable reference area	a) Area (km²)		
	b) Operator		
	c) Unknown	Yes	
	d) Method	In the absence of a current area estimate and trend data, it is not possible to determine the favourable reference area.	
5.14 Change and reason for change in surface area of range	Improved knowledge/more accurate data		
	The change is mainly due to:	Improved knowledge/more accurate data	
5.15 Additional information	5.2-The total area of the habitat in UK waters is unknown due to the practical difficulties in detecting Methane-Derived Authigenic Carbonate remotely. To date, known occurrences of the habitat in UK waters cover an area of 58 km2. 5.6-There is not enough data available to establish the area of submarine structures made by leaking gases and as result a short-term trend cannot be determined. EEA Guidelines advise to report 'uncertain' if some data are available but are not enough to accurately determine direction. 5.14-The total area of the habitat in UK waters is still unknown. For further details see the 2019 UK Approach Document on the JNCC website.		

6. Structure and functions

6.1 Condition of habitat	a) Area in good condition (km²)	Minimum	Maximum

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	b) Area in not-good condition (km²)	Minimum	Maximum
	c) Area where condition is not known (km²)	Minimum	Maximum
6.2 Condition of habitat Method used	Insufficient or no data available		
6.3 Short-term trend of habitat area in good condition Period	2007-2018		
6.4 Short-term trend of habitat area in good condition Direction	Uncertain (u)		
6.5 Short-term trend of habitat area in good condition Method used	Insufficient or no data available		
6.6 Typical species	Has the list of typical species changed in comparison to the previous reporting period?	No	
6.7 Typical species Method used			
6.8 Additional information			

6.2-The actual total area of Submarine Structures Made by Leaking Gases in the UK is unknown, therefore, is not possible to determine the condition of this feature throughout the UK. The range (Section 5.1) was calculated by identifying areas of the seabed known to possess characteristics likely to produce the Annex I feature (JNCC, 2016). The calculated range is 14074 km2, whilst the known mapped area of the feature is 58 km2.
Known occurrences are located in four sites in UK waters. Croker Carbonate Slabs cSAC/SCI, Braemar Pockmarks SAC and Scanner Pockmark SAC in offshore waters, and Holden's Reef (within the Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC) in welsh inshore waters.
Croker Carbonate Slabs cSAC/SCI is the largest known example of the feature in the UK and is in favourable condition (JNCC, 2018b). A survey in 2015 (Noble-James et al., 2017) showed evidence that the seep is still active and that Methane-Derived Authigenic Carbonate (MDAC) is still likely to be forming. Patches of thiotrophic bacterial mats, Beggiotoa sp. were observed. Fauna typical of hard substrates were observed at the site and multivariate analyses identified five epifaunal taxa that were typically associated with the MDAC feature and occurred more frequently in areas of the 'outcropping' form of the feature. These were (the soft coral Alcyonium digitatum, the hydroids Nemertesia and Tubularia, the bryozoan Cellaria and the polychaete family Sabellidae).
The Annex I Submarine Structures Made by Leaking Gases features within the Braemar Pockmarks SAC and Scanner Pockmark SAC are in unfavourable condition due to removal or abrasion of characteristic biological communities in the sites by demersal trawling (JNCC, 2018c, JNCC 2018dc). The Conservation Objectives for the features in both site are to 'maintain or restore'.
The feature is thought to be in favourable condition in Croker Carbonate Slabs cSAC/SCI and has a 'maintain or restore' Conservation Objective.
In the welsh SAC (Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC), the feature is present and is thought to be stable. It is not yet listed as a designated feature and so there is no specific Conservation Objective (NRW, 2017).

6.4-The total area of Submarine Structures Made by Leaking Gases in the UK is unknown and as a result it is not possible to determine the condition of this feature throughout the UK. Monitoring of the known features is in its early stages and time-series are not yet established.
For further details see the 2019 UK Approach Document on JNCC website.

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7. Main pressures and threats

7.1 Characterisation of pressures/threats

Pressure	Ranking
Marine fish and shellfish harvesting (professional, recreational) causing reduction of species/prey populations and disturbance of species (G01)	H
Marine fish and shellfish harvesting (professional, recreational) activities causing physical loss and disturbance of seafloor habitats (G03)	H

Threat	Ranking
Marine fish and shellfish harvesting (professional, recreational) causing reduction of species/prey populations and disturbance of species (G01)	H
Marine fish and shellfish harvesting (professional, recreational) activities causing physical loss and disturbance of seafloor habitats (G03)	H
Temperature changes (e.g. rise of temperature & extremes) due to climate change (N01)	M
Change of habitat location, size, and / or quality due to climate change (N05)	M
Desynchronisation of biological / ecological processes due to climate change (N06)	M
Decline or extinction of related species (e.g. food source / prey, predator / parasite, symbiote, etc.) due to climate change (N07)	M
Change of species distribution (natural newcomers) due to climate change (N08)	M

7.2 Sources of information

7.3 Additional information

Method Overview - Pressures
The following steps were taken to identify the pressures of highest importance:
- The human activities and associated pressures to which the habitat's communities were highly and moderately sensitive were identified (JNCC, 2015; Tillin et al., 2010).
- These human activities/pressures were matched to the Article 17 pressures list.
- A spatial overlap was performed between human activities data and the feature habitat map. Only pressures occurring over the known mapped area of the feature were considered as the full extent of the feature is uncertain.
- Article 17 pressures were marked as high importance (H) when a high or moderate sensitivity was identified AND there was an overlap of >25% (unfavourable-bad condition threshold) with the habitat.
- Article 17 pressures were marked as medium importance (M) when a high or moderate sensitivity was identified AND there was a 10-25% (unfavourable-inadequate threshold) overlap with the habitat.
Resources used - Pressures
The spatial overlap between the habitat and human activities were identified using the UK offshore benthic monitoring options risk assessment results

(JNCC,2017). These were sense checked against the most recent human activities layers.
The JNCC Pressures-Activities Database was used to link Article 17 human activities/pressures to MARESA pressures (JNCC, 2015). The MARESA results were then used to identify the sensitivity of 'A5.712-Bubbling reefs in the aphotic zone' and A5.71-Seeps and vents in sublittoral sediments' to pressures (Tyler-Walters, 2018a; Tyler-Walters, 2018b).
Method-used - Threats
Expert judgement used the best available information to predict the main human activities (Article 17 pressures) that are thought to have a future impact on the feature, within the next two reporting cycles. Habitat sensitivity and spatial overlap were considered as they were for the list of pressures. For the climate change codes, the confidence in the prediction led these to being listed as medium threats.
Comparison of results between reporting periods
The lists of pressures and threats listed and the rank given has mostly remained the same except for the rank given to climate change codes (N01, N05, N06, N07, N08). The climate change threats were ranked medium as a result of predictions made in the 2013 Birchenough et al., report which was part of the MCCIP 2013 report card.
Caveats-Human activities data
- The monitoring options UK benthic habitats risk assessment and was completed in 2016 and so uses habitat and human activity data updated in that year (JNCC, 2017).
- Surface and subsurface abrasion is depicted using 0.5 degree x 0.5 degree c-square grid, which is at a larger scale than habitat or human activity data and overlaps with the c-square grid could be over-estimated.
Caveats - Habitat sensitivity
- Caveats associated with the MARESA sensitivity information can be found in the Tyler-Walters, (2018a, 2018b) reports.
Caveats - Habitat map
- The pressures section only considers the activities that occur over the known mapped area of the feature, as the full extent of the feature is uncertain.
Caveats - Threats
- The evidence used in relation to climate change has low confidence (Birchenough et al., 2013).
Results
G03:
Pressure: The overlap pressure generated by this activity (physical disturbance and physical loss) was ranked high for this feature by combining medium sensitivity attributed by MarESA (Marine Evidence and Sensitivity Assessment) (Tyler-Walters et al., 2018a, 2018b) and 100% spatial overlap with surface and sub-surface abrasion derived from the UK monitoring options risk assessment (JNCC, 2017).
Physical disturbance by fishing gear has been shown to adversely affect emergent epifaunal communities with hydroid and bryozoan matrices reported to be greatly reduced in fished areas (Jennings & Kaiser, 1998). For example, drop down video surveys of Scottish reefs exposed to trawling showed that visual evidence of damage to bryozoans and hydroids on rock surfaces was generally limited and restricted to scrape scars on boulders (Boulcott & Howell, 2011).
Fishing continues to be a widespread pressure on significant areas of seabed sediment habitats in UK waters (UKMMAS, 2010).

Threat: Trends reported until 2020 predict a decrease in fisheries activities in the Celtic Seas and Greater North Sea, however, there is low confidence in this trend (OSPAR Commission, 2009). Another study predicts no change in the overall level of expected fishing activity up until 2020/2030, but details that revisions to the Common Fisheries Policy and possible national measures are expected to increase management of fisheries within a broader ecosystem framework (HM Government, 2012).
G01:
The overall pressure from this activity is ranked as high by combining a sensitivity considered as medium in MarESA and 100% spatial overlap with surface and sub-surface abrasion (JNCC, 2017).
Pockmarks may be affected by trawling or bottom gear depending on their size and depth. It is possible that shallow pockmarks could be disturbed by bottom gear and species removed from the pockmark or its slopes (see 'abrasion' above). However, removal of emergent infauna (e.g. sea pens or sea anemones) from the slopes of pockmarks or removal of a proportion of the macro-infauna as by-catch may not adversely affect the character of the pockmark community as the microbial and meiofaunal communities will probably remain.
The only human activities on Holden's reef of significance is from potting. The MDAC reef is a complex 3D structure and is relatively fragile, the deployment and recovery of pots can cause damage on such structures. Ropes can catch around outcrops and snapped off/ lifted dropped and snapped etc. There is no evidence to support this apart from visually.
Threat: See G03.
N01, N05, N06, N07, N08:
Threat:
The epifaunal community found associated with Methane-Derived Authigenic Carbonate probably represents similar sublittoral rock faunal communities in the surrounding area (Dando, 2010).
Hard-substrate habitats in southern and south-westerly waters appear to be affected (by climate change), with changes in algal distribution and abundance and the appearance and increased occurrence of a previously unrecorded warm-water barnacle all linked to increased seawater temperatures.' (Birchenough et al., 2013).
'There are knowledge-gaps in a number of areas. We are currently unable to fully assess the scale of benthic species and community responses in relation to climate change, understand how climate interacts with other marine stressors or model future species distributions for many benthic species. An appropriate benthic monitoring programme, coupled with continued involvement in international initiatives, is essential for characterising climate impacts on UK benthos'
(Birchenough et al., 2013). Although, this pressure could potentially affect the entire UK submarine structures made by leaking gases, it has been listed as medium importance due to the low confidence in the current evidence.
Pressures and threats ranked as low:
C01: Extraction of minerals (e.g. metal ores, rock, gravel, sand), C03: Extraction of oil and gas including infrastructure, C06: Dumping, depositing of inert materials from terrestrial extraction, C07: Dumping depositing of dredged material from marine extraction, D01: Wind, wave and tidal power including infrastructure, D06: Transmission of electricity of communication cable, D07: Oil and gas pipelines, E02: Shipping lanes and ferry lanes transport operations,I02: Other invasive alien species (other than species of Union

concern), F25: Industrial or commercial activities and structures generating noise, light, heat or other forms of pollution.
Pressures: Although sensitivity to these activities and the pressures they generate were assessed as mostly high, the lack of (or limited) spatial overlap (<5%) derived from the UK monitoring options risk assessment (JNCC,2017) means that the feature has limited exposure and therefore subjected to low pressure. A description of how these pressures are thought to affect the feature is detailed in Section 2.5 of the 2013 Art 17 report (JNCC, 2013). It is suggested that the cumulative impacts of multiple pressures could have a negative effect on habitat condition.
The relative importance/impact of marine water, groundwater and surface water pollution on the feature is considered to be low because of its low direct and indirect influence on the habitat. Offshore submarine structures are likely to be exposed to marine pollution from oil and gas operations and spillages and release from shipping. Marine pollution is, therefore, covered under the relevant pressure/threat codes. Further details are provided in the 2013 report (JNCC, 2013).
Threats: Although the feature is sensitive to these activities, and the pressures they generate, they are not expected to impact more than 10% of the feature within the next two reporting cycles.

8. Conservation measures

8.1 Status of measures	a) Are measures needed?	Yes
	b) Indicate the status of measures	Measures identified, but none yet taken
8.2 Main purpose of the measures taken		
8.3 Location of the measures taken		
8.4 Response to the measures		
8.5 List of main conservation measures		

Management of professional/commercial fishing (including shellfish and seaweed harvesting) (CG01)

Adopt climate change mitigation measures (CN01)

8.6 Additional information

8.1 - There is overlap between the feature and pressures known to impact the feature. The feature is in unfavourable condition in some MPAs where it is protected, and conservation objectives are to restore or maintain.
A number of draft proposals concerned with fisheries management areas have been recommended for the majority of offshore sites but have not been submitted yet to the European Commission. When fisheries management measures are required to protect offshore sites member states must submit a proposal for measures to the European Commission (EC). This process involves working with other member states who have a direct management interest to develop suitable management proposals. These proposals have not yet been submitted to the European Commission and therefore not yet operational. Management areas are proposed for all the SACs where this habitat is present. The proposals aim at excluding demersal trawls, dredges and seine nets to protect Annex I Submarine structures made by leaking gases feature within the sites management boundaries.
Examples of some measures currently in place:
- Regulation (EU) 2016/2336 establishes specific conditions for fishing for deep-

sea stocks in the north-east Atlantic banning bottom trawling in waters deeper than 800 m, where some areas have been identified as being suitable for MDAC to occur.
8.2 - Conservation objectives for this feature within the MPAs where it is protected are mainly maintain or restore. The Conservation Advice for the Braemar Pockmarks SAC and the Scanner Pockmarks SAC set restore objectives for the structure and functions attributes and maintain objectives for the extent and distribution attributes. The purpose of identified measures will be to restore the structures and functions.
The pressure causing physical loss and disturbance of seafloor habitats and reduction of species/prey populations and disturbance of species deriving from fisheries can be limited through the implementation of fisheries management areas where restrictions on gear apply.
8.3-Through Environmental Impact Assessment, Habitats and Birds Directives, conservation measures will be implemented both inside and outside Natura 2000 sites; if features of conservation interest are identified during surveys for EIA outside Natura 2000 sites, they are still given consideration in terms of impact limitation and mitigation.
8.4-MarESA (Marine Evidence based Sensitivity Assessment) indicates that the habitat is sensitive to the pressures caused by fishing including 'physical change to another seabed type', as well as surface and subsurface abrasion ('abrasion/disturbance of the surface of the substratum or seabed' and 'penetration or disturbance of the substratum subsurface'). The assessment suggests that the habitat has high sensitivity and very low resilience to the pressure 'physical change to another seabed type', this predicts negligible or prolonged recovery; at least 25 years to recover structure and function (Tyler-Walters, 2018a; Tyler-Walters, 2018b). Therefore, the response to measures, once implemented, is predicted to be long-term. The habitat has medium sensitivity to surface and subsurface abrasion, which suggests full recovery within 2 to 10 years (Tyler-Walters, 2018a; Tyler-Walters, 2018b).
8.5- CG01:Ranked as medium. Two activities (G03 and G01) were ranked high in terms of both pressures and threats for Annex I habitats Submarine Structures made by Leaking Gases. Fisheries management measures are proposed in all three offshore MPAs that are designated for this feature. These measures can remove or reduce significantly the pressure deriving from this type of activity. The measures have the potential to take place over the next two reporting cycles, however, will only act over part of the feature's potential range.
Conservation measures linked to the high and medium pressures/threats (Section 7) but ranked as low:
CN01 Adopt climate mitigation measures:
The Climate Change Act 2008 is the basis for the UK's approach to tackling and responding to climate change (https://www.theccc.org.uk/tackling-climate-change/the-legal-landscape/the-climate-change-act/). The measure is ranked as low as it is unknown how this will impact marine habitats in the next two reporting periods.
Comparison of results between reporting periods
The European list of conservation measures has changed considerably between reporting rounds.
Fisheries management measures (CG01) were also listed as a conservation measure (under 1.2 measures needed, but not implemented) in the 2013 offshore report, however, they were given a rank of high importance as they were generally referring to the areas both within and outside MPAs. Whereas in the current report CG01 is listed and is referring to planned measures in MPAs

where the feature is currently known to occur, and so is ranked as medium importance.
In 2013, '6.1 Establish protected areas/sites' was reported as a conservation measure of high importance, however, the equivalent measure was not on list of conservation measures for the current reporting round.
For further details on approaches used in this section see 2019 UK Approach Document on JNCC website.

9. Future prospects

9.1 Future prospects of parameters	a) Range	Unknown
	b) Area	Unknown
	c) Structure and functions	Unknown
9.2 Additional information	Due to insufficient information on the range, area and structure and functions parameters it is not possible to assess the future prospects for submarine structures made by leaking gases.	

10. Conclusions

10.1. Range	Unknown (XX)
10.2. Area	Unknown (XX)
10.3. Specific structure and functions (incl. typical species)	Unknown (XX)
10.4. Future prospects	Unknown (XX)
10.5 Overall assessment of Conservation Status	Unknown (XX)
10.6 Overall trend in Conservation Status	
10.7 Change and reasons for change in conservation status and conservation status trend	a) Overall assessment of conservation status No change The change is mainly due to: b) Overall trend in conservation status No change The change is mainly due to:
10.8 Additional information	10.1-Conclusion on Range reached because: (i) the short-term trend direction in Range surface area is uncertain; and (ii) the Favourable Reference Range is unknown. 10.2-Conclusion on Area covered by habitat reached because: (i) the short-term trend direction in Area is uncertain; and (ii) the Favourable Reference Area is unknown. 10.3-Conclusion on Structure and functions reached because habitat condition data indicates that the condition of the habitat is unknown. 10.4-Conclusion on Future prospects reached because: (i) the Future prospects for Range are unknown; (ii) the Future prospects for Area covered by habitat are unknown; and (iii) the Future prospects for Structure and functions are unknown. 10.5-Parameter conservation status of Range, Area and Structure and functions are unknown. 10.6-Overall trend in Conservation Status is based on the combination of the short-term trends for Range - uncertain, Area covered by habitat - uncertain, and

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Structure and functions - uncertain.

11. Natura 2000 (pSCIs, SCIs, SACs) coverage for Annex I habitat types

11.1 Surface area of the habitat type inside the pSCIs, SCIs and SACs network (in km² in biogeographical/ marine region)	a) Minimum b) Maximum c) Best single value 58
11.2 Type of estimate	Best estimate
11.3 Surface area of the habitat type inside the network Method used	Based mainly on extrapolation from a limited amount of data
11.4 Short-term trend of habitat area in good condition within the network Direction	Uncertain (u)
11.5 Short-term trend of habitat area in good condition within network Method used	Insufficient or no data available
11.6 Additional information	11.1-The known area of this feature was intersected with all Natura 2000 sites that contain qualifying marine habitats or species. The cut-off used for SAC designations was Tranche 56 in November 2017. 11.4-Known occurrences are located in four sites in UK waters. Croker Carbonate Slabs cSAC/SCI, Braemar Pockmarks SAC and Scanner Pockmark SAC in offshore waters and Holden's Reef (within the Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC) in welsh inshore waters. However, monitoring is in the initial stages and time-series data are not yet available. For methods see JNCC website for 2019 UK Approach Document.

12. Complementary information

12.1 Justification of % thresholds for trends	
12.2 Other relevant information	

Distribution Map

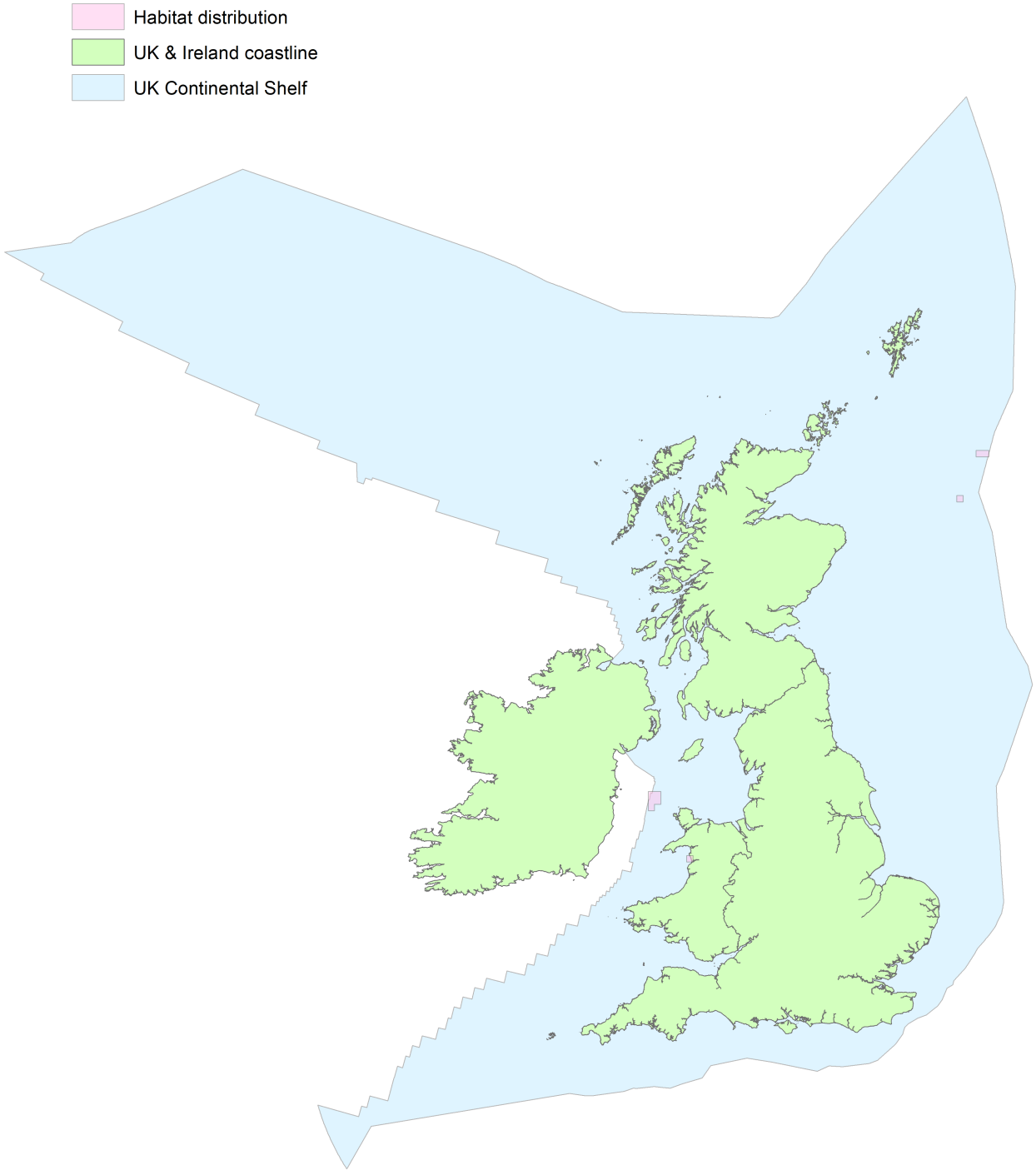

Figure 1: UK distribution map for H1180 - Submarine structures made by leaking gases.

The 10km grid square distribution map is based on available habitat records which are considered to be representative of the distribution within the current reporting period. For further details see the 2019 Article17 UK Approach document.

Range Map

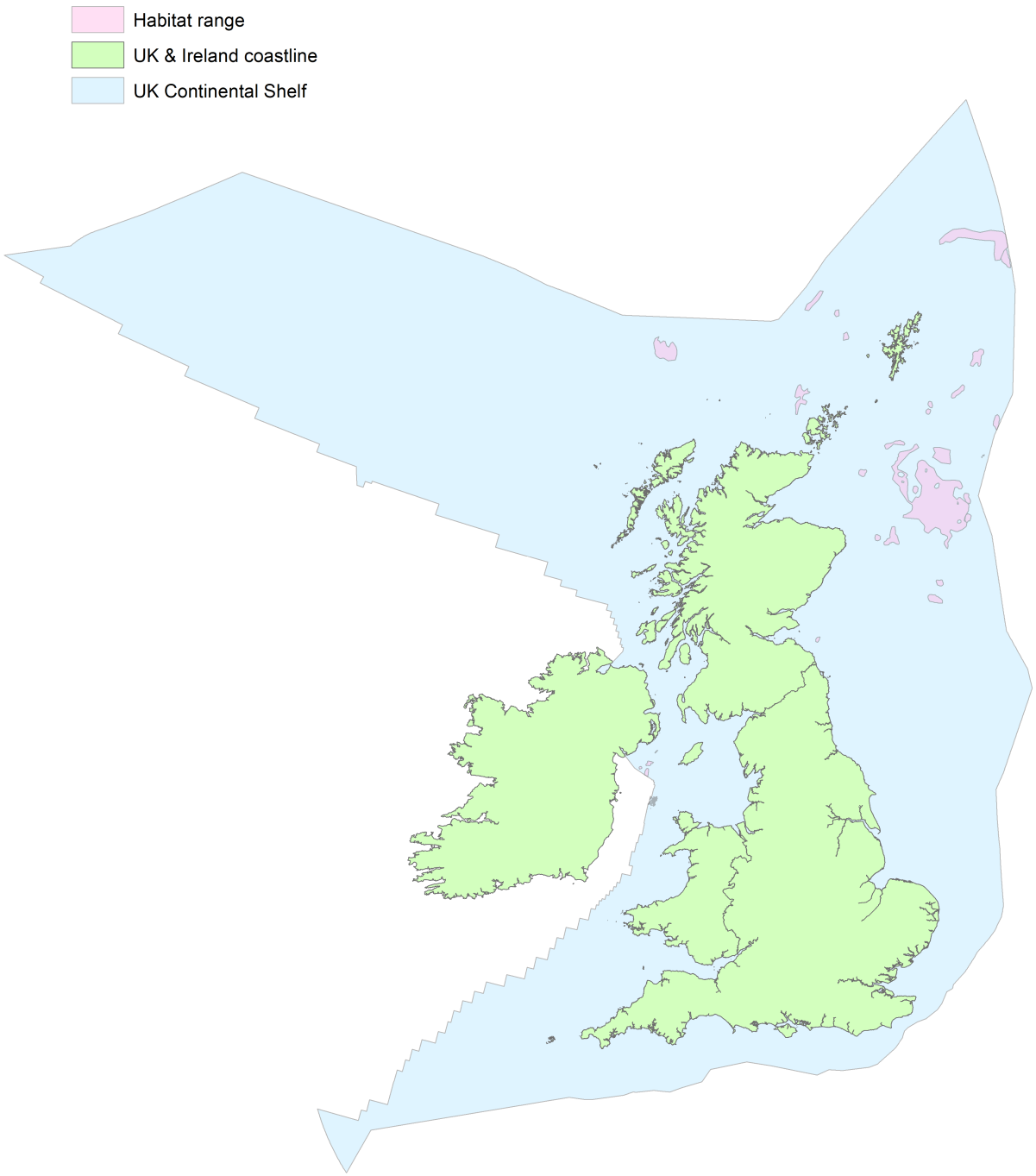

Figure 2: UK range map for H1180 - Submarine structures made by leaking gases.

The UK range map was developed from the UK distribution map, but additionally included areas that had the potential for the habitat to occur based on an understanding of seabed geology (JNCC, 2016; JNCC, 2018a).

Submarine structures made by leaking gases are created through a process of precipitation (attributed to the oxidation of methane) whereby the carbonate cements the normal seabed sediment, forming rock-like

concretions of 'Methane-Derived Authigenic Carbonate (MDAC) (Judd, 2001). Therefore, a fundamental requirement for the formation of these structures is the presence of methane (Judd, 2005).

There is insufficient data on the habitat to determine its true range, due to the practical difficulties in detecting MDAC remotely. Nevertheless, it is possible to identify sites at which MDAC is likely to occur by identifying 'shallow gas' (gas in the sediments close to the seabed), gas seeps, and seabed features associated with gas seepage (pockmarks, mud volcanoes etc.) (Judd, 2005; Judd et al., 2007). Therefore, a range map has been produced showing these areas within which the Annex I habitat may occur. The value given is the estimated potential range over which MDAC could occur.

Explanatory Notes

Habitat code: 1180

Field label	Note
2.1 Year or period	The data sources used to produce the distribution map ranged from 2015 to 2018.
2.3 Distribution map; Method used	The distribution map represents areas of known occurrence of the habitat up to 2018. These are protected sites in UK waters that contain the habitat - Braemar Pockmarks SAC, Scanner Pockmark SAC, Croker Carbonate SlabscSAC/SCI, Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC. Consequently, the map constitutes a poor representation of the actual distribution of Submarine Structures Made By Leaking Gases in UK waters.

Habitat code: 1180 Region code: MATL

Field label	Note
4.1 Surface area	The UK range map was developed from the UK distribution map, but additionally included areas that had the potential for the habitat to occur based on an understanding of seabed geology (JNCC, 2016; JNCC, 2018a). Submarine structures made by leaking gases are created through a process of precipitation (attributed to the oxidation of methane) whereby the carbonate cements the normal seabed sediment, forming rock-like concretions of 'Methane-Derived Authigenic Carbonate (MDAC) (Judd, 2001). Therefore, a fundamental requirement for the formation of these structures is the presence of methane (Judd, 2005). There is insufficient data on the habitat to determine its true range, due to the practical difficulties in detecting MDAC remotely. Nevertheless, it is possible to identify sites at which MDAC is likely to occur by identifying 'shallow gas' (gas in the sediments close to the seabed), gas seeps, and seabed features associated with gas seepage (pockmarks, mud volcanoes etc.) (Judd, 2005; Judd et al., 2007). Therefore, a range map has been produced showing these areas within which the Annex I habitat may occur. The value given is the estimated potential range over which MDAC could occur.
4.2 Short term trend; Period	See 4.3
4.3 Short term trend; Direction	As described in Section 4.1, it is not possible to determine the true range of this habitat. Detection difficulties mean that the area of the feature is not believed to have been fully mapped. Range has, therefore, been determined from current known occurrences of the habitat and from areas of shallow gas where the habitat could potentially occur. It is extremely difficult to predict in which specific areas of the shallow gas, this habitat would occur, therefore a model of area and range is not available. Consequently, figures represent potential habitat range and there are no real trend data from which to determine any change in the range of this habitat.
4.5 Short term trend; Method used	See 4.3
4.11 Change and reason for change in surface area of range	The most recent update incorporated new survey data to inform the potential range of this feature (JNCC, 2016). The most recent value is 14074 km2; an increase of 910 km2 since Art 17 2013 report where the range was 13164 km2
5.2c Surface area (in km2) - Best single value	The total area of the habitat in UK waters is unknown due to the practical difficulties in detecting Methane-Derived Authigenic Carbonate remotely. To date, known occurrences of the habitat in UK waters cover an area of 58 km2
5.3 Type of estimate	See 5.2
5.4 Surface area; Method used	See 5.2

5.6 Short term trend; Direction	There is not enough data available to establish the area of submarine structures made by leaking gases and as result a trend cannot be determined. EEA Guidelines advise to report 'uncertain' if some data are available but are not enough to accurately determine direction.
5.8 Short term trend; Method used	See 5.6
5.14 Change and reason for change in surface area	The total area of the habitat in UK waters is still unknown.
6.1a1 Condition of habitat - Area in good condition (km2) - Minimum	See 6.2
6.1a2 Condition of habitat - Area in good condition (km2) - Maximum	See 6.2
6.1b1 Condition of habitat - Area in not-good condition (km2) - Minimum	See 6.2
6.1b2 Condition of habitat - Area in not-good condition (km2) - Maximum	See 6.2
6.1c1 Condition of habitat - Area where condition is not known (km2) - Minimum	See 6.2
6.1c2 Condition of habitat - Area where condition is not known (km2) - Maximum	See 6.2

6.2 Condition of habitat; Method used	The actual total area of Submarine Structures Made by Leaking Gases in the UK is unknown, therefore, is not possible to determine the condition of this feature throughout the UK. The range (Section 5.1) was calculated by identifying areas of the seabed known to possess characteristics likely to produce the Annex I feature (JNCC, 2016). The calculated range is 14074 km2, whilst the known mapped area of the feature is 58 km2. Known occurrences are located in four sites in UK waters. Croker Carbonate Slabs cSAC/SCI, Braemar Pockmarks SAC and Scanner Pockmark SAC in offshore waters, and Holden's Reef (within the Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC) in welsh inshore waters. Croker Carbonate Slabs cSAC/SCI is the largest known example of the feature in the UK and is in favourable condition (JNCC, 2018b). A survey in 2015 (Noble-James et al., 2017) showed evidence that the seep is still active and that Methane-Derived Authigenic Carbonate (MDAC) is still likely to be forming. Patches of thiotrophic bacterial mats, Beggiotoa sp. were observed. Fauna typical of hard substrates were observed at the site and multivariate analyses identified five epifaunal taxa that were typically associated with the MDAC feature and occurred more frequently in areas of the 'outcropping' form of the feature. These were (the soft coral Alcyonium digitatum, the hydroids Nemertesia and Tubularia, the bryozoan Cellaria and the polychaete family Sabellidae). The Annex I Submarine Structures Made by Leaking Gases features within the Braemar Pockmarks SAC and Scanner Pockmark SAC are in unfavourable condition due to removal or abrasion of characteristic biological communities in the sites by demersal trawling (JNCC, 2018c, JNCC 2018dc). The Conservation Objectives for the features in both site are to 'maintain or restore'. The feature is thought to be in favourable condition in Croker Carbonate Slabs cSAC/SCI and has a 'maintain or restore' Conservation Objective. In the welsh SAC (Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC), the feature is present and is thought to be stable. It is not yet listed as a designated feature and so there is no specific Conservation Objective (NRW, 2017).
6.4 Short term trend of habitat area in good condition; Direction	The total area of Submarine Structures Made by Leaking Gases in the UK is unknown and as a result it is not possible to determine the condition of this feature throughout the UK. Monitoring of the known features is in its early stages and time-series are not yet established.
6.5 Short term trend of habitat area in good condition; Method used	See 6.4

7.1 Characterisation of pressures/ threats

Method Overview - Pressures The following steps were taken to identify the pressures of highest importance: - The human activities and associated pressures to which the habitat's communities were highly and moderately sensitive were identified (JNCC, 2015; Tillin et al., 2010). - These human activities/pressures were matched to the Article 17 pressures list. - A spatial overlap was performed between human activities data and the feature habitat map. Only pressures occuring over the known mapped area of the feature were considered as the full extent of the feature is uncertain. - Article 17 pressures were marked as high importance (H) when a high or moderate sensitivity was identified AND there was an overlap of >25% (unfavourable-bad condition threshold) with the habitat. - Article 17 pressures were marked as medium importance (M) when a high or moderate sensitivity was identified AND there was a 10-25% (unfavourable-inadequate threahold) overlap with the habitat. Resources used - Pressures The spatial overlap between the habitat and human activities were identified using the UK offshore benthic monitoring options risk assessment results (JNCC,2017). These were sense checked against the most recent human activities layers. The JNCC Pressures-Activities Database was used to link Article 17 human activities/pressures to MARESA pressures (JNCC, 2015). The MARESA results were then used to identify the sensitivity of 'A5.712-Bubbling reefs in the aphotic zone' and A5.71-Seeps and vents in sublittoral sediments' to pressures (Tyler-Walters, 2018a; Tyler-Walters, 2018b). Method-used - Threats Expert judgement used the best available information to predict the main human activities (Article 17 pressures) that are thought to have a future impact on the feature, within the next two reporting cycles. Habitat sensitivity and spatial overlap were considered as they were for the list of pressures. For the climate change codes, the confidence in the prediction led these to being listed as medium threats. Comparison of results between reporting periods The lists of pressures and threats listed and the rank given has mostly remained the same except for the rank given to climate change codes (N01, N05, N06, N07, N08). The climate change threats were ranked medium as a result of predictions made in the 2013 Birchenough et al., report which was part of the MCCIP 2013 report card. Caveats-Human activities data - The monitoring options UK benthic habitats risk assessment and was completed in 2016 and so uses habitat and human activity data updated in that year (JNCC, 2017). - Surface and subsurface abrasion is depicted using 0.5 degree x 0.5 degree c-square grid, which is at a larger scale than habitat or human activity data and overlaps with the c-square grid could be over-estimated. Caveats - Habitat sensitivity - Caveats associated with the MARESA sensitivity information can be found in the Tyler-Walters, (2018a, 2018b) reports. Caveats - Habitat map - The pressures section only considers the activities that occur over the known mapped area of the feature, as the full extent of the feature is uncertain. Caveats - Threats - The evidence used in relation to climate change has low confidence (Birchenough et al., 2013). Results G03: Pressure:The overlap pressure generated by this activity (physical disturbance and physical loss) was ranked high for this feature by combining medium sensitivity attributed by MarESA (Marine Evidence and Sensitivity Assessment) (Tyler-Walters et al., 2018a, 2018b) and 100% spatial overlap with surface and sub-surface abrasion derived from the UK monitoring options risk assessment (JNCC, 2017). Physical disturbance by fishing gear has been shown to adversely affect emergent epifaunal communities with hydroid and bryozoan matrices reported to be greatly reduced in fished areas (Jennings & Kaiser, 1998). For example, drop down video surveys of Scottish reefs exposed to trawling showed that visual evidence of damage to bryozoans and hydroids on rock surfaces was generally limited and restricted to scrape scars on boulders (Boulcott & Howell, 2011). Fishing continues to be a widespread pressure on significant areas of seabed sediment habitats in UK waters (UKMMAS, 2010). Threat: Trends reported until 2020 predict a decrease in fisheries activities in the Celtic Seas and Greater North Sea, however, there is low confidence in this trend (OSPAR Commission, 2009). Another study predicts no change in the overall level of expected fishing activity up until 2020/2030, but details that revisions to the Common Fisheries

Policy and possible national measures are expected to increase management of fisheries within a broader ecosystem framework (HM Government, 2012). G01: The overall pressure from this activity is ranked as high by combining a sensitivity considered as medium in MarESA and 100% spatial overlap with surface and sub-surface abrasion (JNCC, 2017). Pockmarks may be affected by trawling or bottom gear depending on their size and depth. It is possible that shallow pockmarks could be disturbed by bottom gear and species removed from the pockmark or its slopes (see 'abrasion' above). However, removal of emergent infauna (e.g. sea pens or sea anemones) from the slopes of pockmarks or removal of a proportion of the macro-infauna as by-catch may not adversely affect the character of the pockmark community as the microbial and meiofaunal communities will probably remain. The only human activities on Holden's reef of significance is from potting. The MDAC reef is a complex 3D structure and is relatively fragile, the deployment and recovery of pots can cause damage on such structures. Ropes can catch around outcrops and snapped off/ lifted dropped and snapped etc. There is no evidence to support this apart from visually. Threat: See G03. N01, N05, N06, N07, N08: Threat: The epifaunal community found associated with Methane-Derived Authigenic Carbonate probably represents similar sublittoral rock faunal communities in the surrounding area (Dando, 2010). Hard-substrate habitats in southern and south-westerly waters appear to be affected (by climate change), with changes in algal distribution and abundance and the appearance and increased occurrence of a previously unrecorded warm-water barnacle all linked to increased seawater temperatures.' (Birchenough et al., 2013). 'There are knowledge-gaps in a number of areas. We are currently unable to fully assess the scale of benthic species and community responses in relation to climate change, understand how climate interacts with other marine stressors or model future species distributions for many benthic species. An appropriate benthic monitoring programme, coupled with continued involvement in international initiatives, is essential for characterising climate impacts on UK benthos' (Birchenough et al., 2013). Although, this pressure could potentially affect the entire UK submarine structures made by leaking gases, it has been listed as medium importance due to the low confidence in the current evidence. Pressures and threats ranked as low: C01: Extraction of minerals (e.g. metal ores, rock, gravel, sand), C03: Extraction of oil and gas including infrastructure, C06: Dumping, depositing of inert materials from terrestrial extraction, C07: Dumping depositing of dredged material from marine extraction, D01: Wind, wave and tidal power including infrastructure, D06: Transmission of electricity of communication cable, D07: Oil and gas pipelines, E02: Shipping lanes and ferry lanes transport operations,I02: Other invasive alien species (other than species of Union concern), F25: Industrial or commercial activities and structures generating noise, light, heat or other forms of pollution. Pressures: Although sensitivity to these activities and the pressures they generate were assessed as mostly high, the lack of (or limited) spatial overlap (<5%) derived from the UK monitoring options risk assessment (JNCC,2017) means that the feature has limited exposure and therefore subjected to low pressure. A description of how these pressures are thought to affect the feature is detailed in Section 2.5 of the 2013 Art 17 report (JNCC, 2013). It is suggested that the cumulative impacts of multiple pressures could have a negative effect on habitat condition. The relative importance/impact of marine water, groundwater and surface water pollution on the feature is considered to be low because of its low direct and indirect influence on the habitat. Offshore submarine structures are likely to be exposed to marine pollution from oil and gas operations and spillages and release from shipping. Marine pollution is, therefore, covered under the relevant pressure/threat codes. Further details are provided in the 2013 report (JNCC, 2013). Threats: Although the feature is sensitive to these activities, and the pressures they generate, they are not expected to impact more than 10% of the feature within the next two reporting cycles.

8.1 Status of measures; Needed	There is overlap between the feature and pressures known to impact the feature. The feature is in unfavourable condition in some MPAs where it is protected, and conservation objectives are to restore or maintain. A number of draft proposals concerned with fisheries management areas have been recommended for the majority of offshore sites but have not been submitted yet to the European Commission. When fisheries management measures are required to protect offshore sites member states must submit a proposal for measures to the European Commission (EC). This process involves working with other member states who have a direct management interest to develop suitable management proposals. These proposals have not yet been submitted to the European Commission and therefore not yet operational. Management areas are proposed for all the SACs where this habitat is present. The proposals aim at excluding demersal trawls, dredges and seine nets to protect Annex I Submarine structures made by leaking gases feature within the sites management boundaries. Examples of some measures currently in place: - Regulation (EU) 2016/2336 establishes specific conditions for fishing for deep-sea stocks in the north-east Atlantic banning bottom trawling in waters deeper than 800 m, where some areas have been identified as being suitable for MDAC to occur.
8.2 Main purpose of the measures taken	Conservation objectives for this feature within the MPAs where it is protected are mainly maintain or restore. The Conservation Advice for the Braemar Pockmarks SAC and the Scanner Pockmarks SAC set restore objectives for the structure and functions attributes and maintain objectives for the extent and distribution attributes. The purpose of identified measures will be to restore the structures and functions. The pressure causing physical loss and disturbance of seafloor habitats and reduction of species/prey populations and disturbance of species deriving from fisheries can be limited through the implementation of fisheries management areas where restrictions on gear apply.
8.3 Location of the measures taken	Through Environmental Impact Assessment, Habitats and Birds Directives, conservation measures will be implemented both inside and outside Natura 2000 sites; if features of conservation interest are identified during surveys for EIA outside Natura 2000 sites, they are still given consideration in terms of impact limitation and mitigation.
8.4 Response to the measures	MarESA (Marine Evidence based Sensitivity Assessment) indicates that the habitat is sensitive to the pressures caused by fishing including 'physical change to another seabed type', as well as surface and subsurface abrasion ('abrasion/disturbance of the surface of the substratum or seabed' and 'penetration or disturbance of the substratum subsurface'). The assessment suggests that the habitat has high sensitivity and very low resilience to the pressure 'physical change to another seabed type', this predicts negligible or prolonged recovery; at least 25 years to recover structure and function (Tyler-Walters, 2018a; Tyler-Walters, 2018b). Therefore, the response to measures, once implemented, is predicted to be long-term. The habitat has medium sensitivity to surface and subsurface abrasion, which suggests full recovery within 2 to 10 years (Tyler-Walters, 2018a; Tyler-Walters, 2018b).

8.5 List of main conservation measures	CG01:Ranked as medium.Two activities (G03 and G01) were ranked high in terms of both pressures and threats for Annex I habitats Submarine Structures made by Leaking Gases. Fisheries management measures are proposed in all three offshore MPAs that are designated for this feature. These measures can remove or reduce significantly the pressure deriving from this type of activity. The measures have the potential to take place over the next two reporting cycles, however, will only act over part of the feature's potential range. Comparison of results between reporting periods The European list of conservation measures has changed considerably between reporting rounds. Fisheries management measures (CG01) were also listed as a conservation measure (under 1.2 measures needed, but not implemented) in the 2013 offshore report, however, they were given a rank of high importance as they were generally referring to the areas both within and outside MPAs. Whereas in the current report CG01 is listed and is referring to planned measures in MPAs where the feature is currently known to occur, and so is ranked as medium importance. In 2013, '6.1 Establish protected areas/sites' was reported as a conservation measure of high importance, however, the equivalent measure was not on list of conservation measures for the current reporting round.
9.1a Future prospects of parameters - Range	Due to insufficient information on the range, area and structure and functions parameters it is not possible to assess the future prospects for submarine structures made by leaking gases.
9.1b Future prospects of parameters - Area	Due to insufficient information on the range, area and structure and functions parameters it is not possible to assess the future prospects for submarine structures made by leaking gases.
9.1c Future prospects of parameters - Structure and functions	Due to insufficient information on the range, area and structure and functions parameters it is not possible to assess the future prospects for submarine structures made by leaking gases.
11.1c Surface area of the habitat type inside the pSCIs, SCIs and SACs network (in km2 in biogeographical/ marine region) - Best single value	The known area of this feature was intersected with all Natura 2000 sites that contain qualifying marine habitats or species. The cut-off used for SAC designations was Tranche 56 in November 2017.
11.2 Type of estimate	See section 11.1
11.3 Surface area of the habitat type inside the network; Method used	See section 11.1
11.4 Short term trend of habitat area in good condition within the network; Direction	Known occurrences are located in four sites in UK waters. Croker Carbonate Slabs cSAC/SCI, Braemar Pockmarks SAC and Scanner Pockmark SAC in offshore waters and Holden's Reef (within the Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC) in welsh inshore waters. However, monitoring is in the initial stages and time-series data are not yet available.
11.5 Short term trend of habitat area in good condition within the network; Method used	See section 11.4