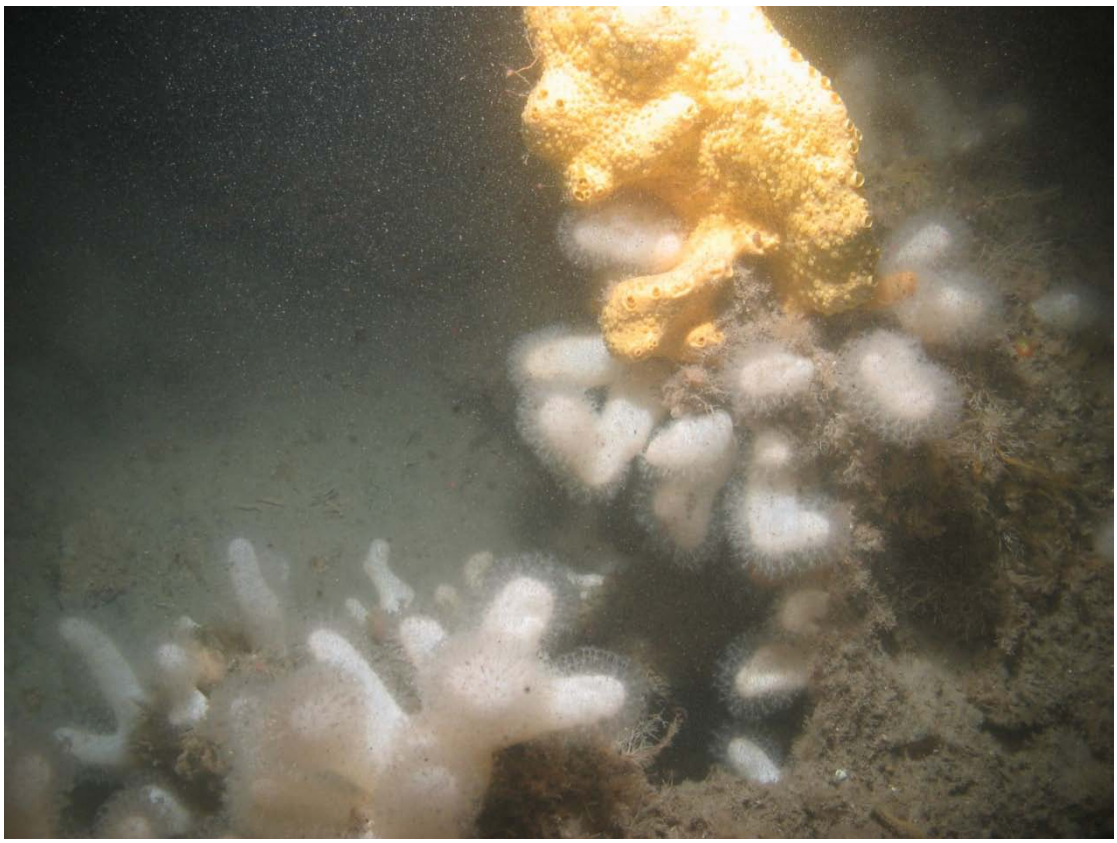
Offshore Special Area of Conservation: Croker Carbonate Slabs

Draft Conservation Objectives and Advice on Operations



Version 4.0 (23rd March 2011)

*Cover photo illustrates soft corals (*Alcyonium digitatum*) and yellow boring sponge (*Cliona celata*) on a methane-derived authigenic carbonate structure that forms part of Croker Carbonate Slabs.

Document version control

Version and date	Amendments made	Issued to and date
Croker Carbonate Slabs Draft Conservation Objectives & Advice on Operations Version 4.0 (23rd March 2011)	Amendment to wording in light of comments received from Joint Committee. Amendment to objective in light of review of sensitivity assessment.	Defra, Devolved Administrations and other Govt. Departments (23/3/11)
Croker Carbonate Slabs Draft Conservation Objectives & Advice on Operations Version 3.0 (31st January 2011)	Reviewed by JNCC Committee	JNCC Joint Committee (23/02/11)
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Summary of Draft Advice on Operations for Croker Carbonate Slabs Special Area of Conservation (SAC)

This advice is based on information on the SAC presented in JNCC's 'Croker Carbonate Slabs: SAC Selection Assessment' (version 2.0 March 2011). JNCC's Conservation Objectives and Advice on Operations is site and feature specific, and has been developed using best available scientific information and expert interpretation as at March 2011. The advice is generated through a coarse grading of sensitivity and exposure of site interest features to physical, chemical and biological pressures associated with human activity. Sensitivity and exposure have been combined to give a measure of the vulnerability of an interest feature to operations which may cause damage or deterioration, and which therefore may require management action.

The Conservation Objective for the Croker Carbonate Slabs' submarine structures made by leaking gases is to maintain in favourable condition.

The exact impact of any operation will be dependent upon the nature, scale, location and timing of events. This Advice on Operations for the Croker Carbonate Slabs site will be kept under review and will be periodically updated to reflect new evidence that suggests changes in both sensitivity and exposure.

Management actions should enable the Croker Carbonate Slabs' submarine structures made by leaking gases to maintain Favourable Condition. This will require assessment and management of human activities likely to affect the feature adversely, and of activities likely to impact natural environmental quality and environmental processes upon which the features are dependent.

Croker Carbonate Slabs SAC is not currently known to be moderately or highly vulnerable to any of the six pressures against which it is assessed in terms of sensitivity and exposure. Therefore to fulfil the conservation objectives for the **Annex I submarine structures made by leaking gases**, the competent authorities for this area are advised to continue managing human activities within their remit such that they do not result in deterioration or disturbance of this feature**.**

Risk of Damage to Croker Carbonate Slabs SAC

Within the Croker Carbonate Slabs SAC, it is currently thought that no offshore activities may result in damage to the interest feature.

This indicates that no additional form of management measure(s) may be required or further measures where actions are already in force. This advice is indicative and does not remove the need for formal consultation on individual plans and projects.

There is a lack of detailed information on levels of exposure to human activities and their ecological impact on the feature at this site. Further information will be required to assess and monitor favourable condition of Annex 1 submarine structures made by leaking gases at this offshore SAC.

Croker Carbonate Slabs SAC: Draft Conservation Objectives and Advice on Operations

1 Introduction

1.1 JNCC's role

The Offshore Marine Conservation (Natural Habitats &c.) Regulations 2007 (as amended) transpose the Habitats Directive into law for UK offshore waters (from 12-200 nm from the coast or the UK Continental Shelf). These Regulations give JNCC a statutory responsibility to i) establish conservation objectives for SACs, ii) inform Competent Authorities of these conservation objectives and iii) advise Competent Authorities of any operations which may adversely affect the integrity of the site. This draft document for Croker Carbonate Slabs SAC is therefore prepared by JNCC in fulfilment of requirements under Regulation 18 of the Offshore Marine Conservation (Natural Habitats &c.) Regulations 2007 (as amended).

This advice is also required under the Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001 (as amended); and the Environmental Impact Assessment and Natural Habitats (Extraction of Minerals by Marine Dredging) Regulations 2007.

This advice is based on information on the SAC presented in JNCC's 'Croker Carbonate Slabs: SAC Selection Assessment' (version 1.0 December 2010). JNCC's Conservation Objectives and Advice on Operations is site and feature specific, and has been developed using best available scientific information and expert interpretation as at December 2010. The advice is generated through a coarse grading of sensitivity and exposure of site interest features to physical, chemical and biological pressures associated with human activity. Sensitivity and exposure have been combined to give a measure of the vulnerability of an interest feature to operations which may cause damage or deterioration, and which therefore may require management action.

For offshore SACs, JNCC are required to provide conservation objectives and advice on operations once a site has been submitted by Government to the European Commission (i.e. becomes a candidate SAC).

1.2 Offshore (12 – 200 nautical miles): The role of competent authorities

Regulations 22 and 23 of the Offshore Marine Conservation (Natural Habitats &c.) Regulations 2007 (as amended) require competent authorities to ensure compliance with the Habitats Directive. Competent authorities must, within their jurisdiction, have regard to both direct and indirect effects on interest features of the site. This may include consideration of issues outside the boundary of the SAC.

1.3 Activity outside the control of competent authorities

Nothing within this document will require competent authorities to undertake any actions if it is shown that any changes result wholly from natural causes. Having issued Advice on Operations for SACs, JNCC will work with competent authorities and others to agree, within a defined time frame, a protocol for evaluating all observed changes to baselines and to develop an understanding of natural change and provide further guidance as appropriate and possible. This does not, however, preclude competent authorities from taking action to prevent deterioration to the interest features, and indeed such actions should be taken when required.

1.4 Role of conservation objectives

The conservation objectives set out what is needed to ensure Favourable Condition of the Annex I feature. The UK conservation agencies use the term 'favourable condition' to represent the concept of Favourable Conservation Status for the interest features of an individual SAC (Davies *et al*., 2001). For an Annex I habitat, Favourable Conservation Status under the Habitats Directive occurs when: i) its natural range and area it covers within that range are stable or increasing; and ii) the specific structure and functions, which are necessary for its long-term maintenance, exist and are likely to continue to exist for the foreseeable future; and iii) the conservation status of its typical species is favourable[1] (Article 1e).

Conservation objectives are the starting point from which management measures and monitoring programmes may be developed as they provide the basis for determining what currently, or may in the future, impact the site. The SAC Conservation Objectives will also inform appropriate assessment under the Habitats Regulations.

1.5 Role of advice on operations

Under the Habitats Directive, Member States are required to take appropriate steps to avoid the deterioration or disturbance of interest features within SACs (Article 6.2). The advice on operations set out in Section 2 provides the basis for discussion about the nature and extent of the operations taking place within or close to the site and which may have an impact on its interest features. The advice should also be used to identify the extent to which existing measures of control, management and forms of use are, or can be made, consistent with the conservation objectives, and thereby focus the attention of competent authorities on areas that may need management measures. This operations advice may need to be supplemented through further discussions with the competent authorities and any advisory groups formed for the SAC.

This document will also inform the scope and nature of any appropriate assessment to be undertaken for a plan or project (Regulation 25 of the Offshore Regulations) that:

- either alone or in-combination with other plans or projects would be likely to have a significant effect on a European Site; and
- is not directly connected with the management of the site for nature conservation.

Where a project is likely to undermine the site's conservation objectives, it is likely to have a significant effect on the site and therefore require an appropriate assessment. The scope and content of any appropriate assessment will depend upon the location, size and significance of the proposed project and JNCC will advise on a case by case basis.

Through an appropriate assessment, competent authorities are required to ascertain the effect on the integrity of the site in view of the site's conservation objectives (Article 6.3). The integrity of the site is defined as 'the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified'[2].

Although closely linked, the judgement of effect upon site integrity is subtly different to determination of favourable condition of a specific feature. An assessment of favourable condition determines the current

[1] The term Favourable Conservation Status relates to the individual habitats and species over their natural range within the European Union. However, because the selection of the European network of SACs is seen as fundamental to achieving Favourable Conservation Status, the European Commission considers that the conceptshould also be applied at the site level.

[2] Institute of Ecology and Environmental Management (2010). Guidelines for Ecological Impact Assessment in Britain and Ireland.

status of a feature. Any evaluation of effects on site integrity needs to consider whether the plan or project in question is compatible with the long-term maintenance of the site's features. For example, there may be a time-lag between a plan or project being initiated and a consequent adverse effect upon integrity becoming manifest in the condition assessment. In such cases, a plan or project may have an adverse effect upon long-term site integrity even though the features remain in favourable condition in the short term.

1.6 Croker Carbonate Slabs SAC conservation objectives

The conservation objectives for the Croker Carbonate Slabs SAC interest features are provided below. These are high level objectives for the site features, and JNCC may refine them in future as our understanding of the features improves. They should be read in the context of (and in conjunction with) other advice given, particularly the SAC Selection Assessment Document which provides more detailed information about the site and evaluates its interest features according to the Habitats Directive selection criteria and guiding principles.

Within the objectives below superscript letters refer to explanatory text provided subsequently in section 1.7.

The Conservation Objectives for the Croker Carbonate Slabs' submarine structures made by leaking gases are:

Subject to natural change, maintain[a] the submarine structures made by leaking gases in favourable condition, such that:

The natural environmental quality[b] is maintained

The natural environmental processes[c] are maintained

The extent[d], physical structure[e], diversity[f], community structure[g] and typical species[h] representative of **submarine structures made by leaking gases** in the Irish Sea are maintained.

At the Croker Carbonate Slabs SAC, there is no direct evidence that any activities have impacted the reef feature or associated community and the feature is not currently thought to be exposed to levels of activities likely to damage the feature. The conservation objective for the site may be revised at a later date if new information indicates this assessment is not correct.

The feature's vulnerability to human pressure is further documented in section 3.3. However there is a lack of detailed information on levels of exposure to human activities and their ecological impact on the feature at this site. As outlined in section 1.8 below, further information will be required to assess and monitor favourable condition of the submarine structures made by leaking gases at this offshore SAC.

1.7 Explanation of terms used in the Conservation Objectives

Maintain or restore

Maintain implies that, based on our existing understanding, the feature is regarded as being in **favourable condition** and will, subject to natural change, remain at its condition at designation.

Restore implies that the feature is likely to have been degraded to some degree and that activities may have to be managed to reduce or eliminate potential negative impact(s).

Restoration in the marine environment generally refers to natural recovery to favourable condition through the reduction or removal of impacts.

JNCC consider that maintenance or restoration of the following parameters (b - h) meets the requirements of the Habitats Directive to achieve favourable conservation status of the natural habitat through favourable "distribution, structure and functions".

a) **Natural environmental quality** e.g. chemical quality parameters of water, suspended sediment levels, radionuclide levels etc should not deviate from baseline at designation (if available) or reference conditions.
b) **Natural environmental processes** e.g. circulation, sediment deposition and erosion etc. should not deviate from baseline at designation (if available) or reference conditions.
c) **Extent** - the area covered by the habitat and communities
d) **Physical structure** - the shape, form and composition of the habitat and its substrata.
e) **Diversity** - the number of different biological communities or number of species within a given community**.**
f) **Community structure** e.g. age classes, sex ratios, distribution of species, abundance, biomass, reproductive capacity, recruitment, range and mobility.
g) **Typical species** – see Appendix V for criteria for identifying typical species.

1.8 Favourable condition

Conservation objectives for inshore SACs have been provided in association with a 'favourable condition' table, which outlines how to recognise favourable condition for the interest features in question. However, understanding the functioning and condition of complex and dynamic offshore marine sites, which experience a variety of pressures resulting from historic and current activities, is difficult. For offshore sites, there is presently insufficiently detailed information on i) the existing condition of qualifying interest features and ii) the preferred or target condition of interest features. This currently limits the identification of measures and associated targets for condition monitoring. It is anticipated that further information on the condition of interest features will be obtained through baseline surveys and monitoring.

2 Advice on operations

2.1 Purpose of advice

The aim of this advice is to enable all competent authorities to prioritise management of activities that pose a threat to the interest features of the Croker Carbonate Slabs site. The advice is linked to the conservation objectives outlined in the section above, and will help provide the basis for detailed discussions on management of activities that may affect the features of the site.

2.2 Methods for assessment of vulnerability to pressures

Six broad Pressure Categories which may cause i) deterioration of natural habitats or the habitats of species, or ii) disturbance of species, (either alone or in combination), are considered in JNCC's Advice on Operations:

- Physical loss
- Physical damage
- Non-physical disturbance
- Toxic contamination
- Non-toxic contamination
- Biological disturbance

Example sources of pressures are provided (See Table 1), although these examples are not inclusive of all potentially detrimental activities.

A three-step process is used to assess the vulnerability of the site's features (**submarine structures made by leaking gases**) to the above pressures (see flow diagram in Appendix I):

1. An assessment of the **sensitivity** of the interest feature to the listed pressures (2.3);

2. An assessment of the current **exposure** of the interest feature to the pressures (2.4); and

3. An assessment of the **vulnerability** of the interest feature to the pressures. Vulnerability occurs where sensitivity to a given pressure is combined with exposure to that pressure.

This approach is sufficiently robust to take into account the effects of new activities or changes in patterns of usage. By assessing sensitivity, exposure and vulnerability independently, the reasoning behind current (and any future) advice is made clear. If an interest feature is known or thought to be sensitive to a particular pressure category, new activities or changes in patterns of activities which result in that pressure are likely to cause deterioration or disturbance.

All the scores of relative **sensitivity**, **exposure** and **vulnerability** are derived using best available scientific data and expert judgement. This method uses a coarse categorisation system, reflecting the current state of our understanding of the marine environment. It should be recognised that data for offshore habitats are sparse and assessments are likely to need revision in light of new research.

2.3 Sensitivity assessment

This assessment evaluates the relative sensitivity of the features of the Croker Carbonate Slabs SAC to the effects of physical, chemical and biological pressures. Sensitivity is defined here as 'intolerance of a habitat, community or individual (or individual colony) of a species to damage, or death, from an external factor and the time taken for its subsequent recovery' (MarLIN, 2006). For example, a very sensitive species or habitat is one that is very adversely affected by an external factor arising from human activities or natural events (killed/destroyed, high intolerance) and is expected to recover over a very long period of time, i.e. >10 or up to 25 years ('low' recoverability) (MarLIN, 2006). The sensitivity of interest features (and scientific understanding of sensitivity) may change over time. Hence, an operation which is not currently deemed to have a negative effect may do so in the future.

Table 1 (column 3) shows the sensitivity assessments for the features of the Croker Carbonate Slabs SAC. They are drawn principally from MarLIN's (2004) evaluation of the sensitivity of the following biotope (which is the closest biotope in the EUNIS classification to that present within the SAC for which a sensitivity assessment has been carried out):

- **Piddocks with a sparse associated fauna in upward-facing circalittoral very soft chalk or clay (CR.MCR.SfR.Pid)**

The applicability of the MarLIN assessments of sensitivity is dependent on the quality of available scientific information on these biotopes and their characterising species. In addition, both the biotope classification system and the MarLIN sensitivity assessments primarily rely on inshore biological data, so although they are applicable to habitats in offshore waters, confidence in these assessments in an offshore context is necessarily lower. JNCC have in some cases, therefore, adjusted the assessments of sensitivity to be more precautionary. Further detail on our approach to evaluating sensitivity can be provided on request.

Interest feature sensitivity to physical, chemical and biological pressures:

The interest features and associated biological communities of the Croker Carbonate Slabs site are sensitive to: **physical loss**, **physical damage**, **toxic** and **non-toxic contamination**, and **biological disturbance**. Further detail on sensitivities of the submarine structures made by leaking gases is provided in Table 1.

The interest feature and associated biological communities of the Croker Carbonate Slabs are sensitive to:

Physical loss

Many of the species within the biotope are attached to the substratum or are slow moving so that substratum removal would result in loss of most faunal populations. With the loss of adult populations, recovery depends upon recolonisation by larvae during the breeding season. For species representative of the CR.MCR.SfR biotope, recovery by recolonisation is likely to be slow.

Physical damage

Erect epifaunal species such as sea squirts and anemones are particularly vulnerable to physical disturbance. Veale *et al*. (2000) reported that the abundance, biomass and production of epifaunal assemblages decreased with increasing fishing effort. Hydroid and bryozoan matrices were reported to be greatly reduced in fished areas (Jennings & Kaiser, 1998 and references therein). The removal of rocks or boulders to which species are attached by the passage of mobile fishing gears (Jennings & Kaiser, 1998) may also result in substratum loss.

The majority of the characterising species in this biotope are sessile, attached to the substratum and so are unable to move away and are likely to be physically removed or damaged by a passing trawl. However, recovery of many of the species is likely to be relatively high. Therefore, given the evidence above, an overall sensitivity of moderate has been recorded.

Toxic and non-toxic contamination

The feature and associated communities are considered sensitive to various types of chemical disturbance, though there is currently no information available to quantify this disturbance.

Biological disturbance

The biological effects of fisheries include**:**

- Removal of target species
- Mortality of non-target species

These effects can lead to shifts in population dynamics and species interactions (e.g. if predators are removed from the system) which may then lead to cascading effects on the assemblage as a whole. Sensitivity to biological disturbance though selective extraction of species has been assessed as moderate for this feature.

It has not been possible to determine whether the interest feature is sensitive to the introduction: of radionuclides; of microbial pathogens and non-native species and translocation.

2.4 Exposure assessment

Table 1 (column 4) shows the relative exposure of the Croker Carbonate Slabs' interest features to physical, chemical and biological pressures. This assessment is based on known human activities operating in or adjacent to the site, and the anticipated pressures associated with these activities.

As offshore sites cover a relatively large geographical area and precise information on operations within SAC boundaries is not yet available, assigning scores for exposure carries certain assumptions about the spatial extent, frequency and intensity of the pressures associated with offshore activities. Expert judgement was used to determine where onsite activities are likely to affect interest features physically, chemically and/or biologically.

Spatial data on offshore industry activities has been provided by the Crown Estate for aggregate extraction and windfarm development, UK Deal for oil and gas industry activities and the United Kingdom Cable Protection Committee for submarine cable distribution. UK-wide fisheries data for offshore waters are not yet available to JNCC at sufficient resolution to enable a full assessment of exposure to different types of fishing activities.

Fishing exposure was derived from work on a Defra marine biodiversity research programme (MB106)[3]. Estimations of fishing activity were derived from Vessel Monitoring System (VMS) data and are available for 2006-9. The derived surfaces represent activity from all vessels (both UK and non-UK registered vessels) of at least 15m length. VMS data for UK vessels were linked to skipper logbook information in order to determine the fishing gear being employed. For non-UK registered vessels where logbook information is not available information on fishing gear employed has been obtained from 'primary gear' listed on the EU vessel register. Unprocessed VMS data have been filtered using a simple speed rule of between 1 and 6 knots to indicate fishing activity for all gear types. Date and time information attached to unprocessed VMS data were used to determine elapsed time between consecutive VMS locations for each vessel (usually 2 hours) and summarised at a resolution of 0.05 decimal degrees. The same programme recorded distribution of trapping/potting activity, though it should be noted that many vessels undertaking potting/trapping may be less than 15m in length and as such not recorded in this dataset.

From landings data, information is available on which species are removed from the ICES rectangle within which the site is located, using particular gear types and the size of the vessel used. We can therefore take into consideration the importance of these target species in the functioning of the biotope when assessing the level of biological disturbance through selective extraction of species by static gear. Landings data, however, does not provide information on the possible mortality/extraction of non-target species. Additional research to assess the distribution of static/set demersal gear use and the intensity of its physical and biological impacts is needed. Interest feature exposure and vulnerability to static/set demersal gears have therefore been assessed but are possibly an underestimate.

The exposure assessment is based on best available information on the levels of pressures associated with activities at the Croker Carbonate Slabs site. If new information becomes available this may lead to modification of the advice on operations presented herein. In addition, an activity may not currently be occurring on the site but may do in future. As such, **competent authorities will need to take into account both the sensitivity of the feature and the conservation objectives outlined in section 1.6 whenever a new activity is proposed.**

Interest feature exposure to physical, chemical and biological pressures
The interest features and associated biological communities of the Croker Carbonate Slabs site are exposed to the following pressures.

[3] Cefas (2010) Report no. 1: Objective 1 – Provision of geo-database containing standardised layers showing the distribution of specified activities, sites and resources with associated metadata and comments. Project MB106: Further development of marine pressure data layers and ensuring the socio-economic data and data layers are developed for use in the planning of marine protected area networks

- **Physical loss** due to **obstruction** (cable and wreck) at a low level
- **Physical damage** through **physical disturbance and abrasion** (demersal fishing) at low levels
- **Biological disturbance** through **selective extraction of species** (demersal fishing) at low levels
- **Toxic contamination** through the **introduction of radionuclides** at low levels

Physical loss

The site is exposed to low levels of **obstruction**. A submarine cable lies across the site, running approximately east to west. A wreck is located within the site boundary and another located on the western edge of the boundary. Potentially, a small proportion of the feature has been physically lost and so the exposure level to obstruction has been assessed to be low.

Physical damage

In recent years (2006-2009) there has been moderate to high intesity *Nephrops norvegicus* (Norway lobster) fishing occurring to the north west of the site (CEFAS 2010) but not close enough to exert a damaging impact on the feature. Beam trawling is occurring at low intensity (approximately 50 hrs effort per year) at the northern and southern peripheries of the site's boundary. In 2008 very low levels of dredging (2hours) occurred within the site. There is an abundance of mobile species fished in the wider area, including some species that may be associated with the feature. A number of other species are harvested on a modest scale, including haddock, cod, sole, monkfish, skates and rays, turbot, and plaice[4].

Although VMS data indicates beam trawling occurs within the site to the north and south, and dredging occurs (albeit at very low levels) within the site, the data is at too low a spatial resolution to be able to state conclusively that trawlers are fishing on the feature itself or whether they fish around it. However, it is likely that trawlers would avoid fishing on the feature to prevent damage to their fishing gear. Static gear has also been found during a survey of the site (Whomersley *et al*., 2010). Beam trawling, dredging and, to a lesser extent, static gear can result in **physical disturbance and abrasion** of the feature. Hence, the exposure level has been assessed to be low.

Biological disturbance

Beam trawling may or may not be occurring within the site, as mentioned under physical damage, subsequently the feature is potentially exposed to selective extraction of species resulting from bottom contact of gear which can damage and/or kill erect epifaunal species key to the assigned biotope's structure and function. Exposure has been assessed to be low.

Toxic contamination (introduction of radionuclides)

Levels of radioactive isotopes in the Irish Sea have increased as a result of authorised discharge from the British Nuclear Fuels plc (BNFL, 1991–1998) reprocessing plant at Sellafield (e.g. Smith *et al*., 2001). Artificial radionuclides - including caesium (^{137}Cs), plutonium ($^{239/240}$Pu), Technetium-99, and ^{241}Am - have all been recorded in marine organisms and sediments in the region around the Pisces Reef SAC to the north of Croker Carbonate Slabs SAC. Croker Carbonate Slabs SAC is located further away from Sellafield than the Pisces Reef SAC and hence the exposure level to radionuclides is assessed as low.
It has not been possible to determine whether the interest features are exposed to noise (acoustic), introduction of microbial pathogens or introduction of non-native species and translocation.

[4] MMO landings data 2010 for ICES rectangle 36E4 and 35E4 over the period 2006-2009.

Vulnerability assessment

The vulnerability of the interest feature to external pressures is determined by integrating the sensitivity evaluation with that of exposure. Only if a feature is both sensitive *and* exposed to a human activity is it considered vulnerable. In this context, therefore, **vulnerability** has been defined as the **exposure** of the habitat, community or individual (or individual colony) of a species to an external factor to which it is **sensitive** (Hiscock, 1996) see Table 1. An assessment of interest features' vulnerability (Table 1) helps to guide site management decisions by highlighting potentially detrimental activities that may need to be managed (or continue to be managed) by the Competent Authorities.

The **Croker Carbonate Slabs submarine structures made by leaking gases** and associated biological communities are vulnerable to:

- Physical disturbance or abrasion (demersal fishing) and obstruction (submarine cable & wreck(s)) and selective extraction of species (demersal fishing) at a low level;

Vulnerability to introduction of microbial pathogens; introduction of radionuclides; noise (acoustic) and introduction of non-native species and translocation remains unknown for this interest feature.

2.6 Assessment of risk of damage or disturbance

JNCC considers 'risk' to be the likelihood of deterioration of the feature due to an activity. It is the vulnerability of the feature to an activity, assessed against the current level of management of that activity.

High risk activities will be those to which the feature is highly or moderately vulnerable, and for which current management may not be adequate. For example, industries which are not location specific and not subject to prior consent procedures or reliable enforcement are more likely to cause damage/disturbance to the interest feature. These industries include fishing and shipping. However, clearly not all activities associated with these industries are detrimental to interest features.

Low risk activities will be those where there is no feature vulnerability (i.e. the activity does not interact with the feature) or where the high vulnerability is mitigated for by effective management. For example, for industries which are location specific, are always subject to prior consent requiring consideration of effects on the integrity of the site and have clear reliable methods of enforcement, there is generally a lower likelihood of causing damage or disturbance to interest features. This includes the activities of the oil and gas, aggregates and renewable energy industry sectors. Competent Authorities are advised to consider management actions that might need to be taken to reduce the risk of damage associated with these activities to the SAC feature.

Only high or medium-high risk activities are noted here.

Within the Croker Carbonate Slabs site, no offshore activity is currently considered to pose a moderate to high risk of damage to the interest features.

The vulnerability of the SAC to climate change is not considered in the tables below, given the uncertainties surrounding the effects of global change on the ocean

Table 1: Sensitivity, exposure and vulnerability of the Croker Carbonate Slabs submarine structures made by leaking gases to physical, chemical and biological pressures

Sensitivity key: ••• = High sensitivity •• = Moderate sensitivity • = Low sensitivity, ○ = No known sensitivity and **?** = Insufficient information to make assessment
Exposure key: High = High exposure, Medium = Medium exposure, Low = Low exposure, None = No known exposure, Unknown level = Exposure of an unknown level and **?** = Insufficient information to make assessment.

List of pressures which may cause deterioration or disturbance (with example activities)		Croker Carbonate Structures: submarine structures made by leaking gases		
		Sensitivity	**Exposure**	**Vulnerability**
Physical Loss	**Removal** (e.g. aggregate dredging, isolated rock dump, infrastructure development)	•••	**None**	**No known vulnerability**
	Obstruction (e.g Permanent constructions [oil & gas infrastructure, windfarms, cables] & wrecks)	••	**Low**	**Low vulnerability**
	Smothering (e.g. drill cuttings)	•	**None**	**No known vulnerability**
Physical Damage	**Changes in suspended sediment** (e.g. screening plumes from aggregate dredging)	•	**None**	**No known vulnerability**
	Physical disturbance or abrasion (e.g. mobile benthic fishing, anchoring, windfarm scour pits, pipeline burial, potting)	••	**Low**	**Low vulnerability**
Non-physical disturbance	**Noise** (e.g. boat activity, seismic)	○	**?**	**Insufficient information**

	Visual presence (e.g. recreational activity)	○	**None**	**No known vulnerability**
Toxic contamination	**Introduction of synthetic compounds** (e.g. TBT, PCBs, industrial chemical discharge, produced water, fuel oils)	••	**None**	**No known vulnerability**
	Introduction of non-synthetic compounds (e.g. heavy metals, crude oil spills)	••	**None**	**No known vulnerability**
	Introduction of radionuclides (e.g. nuclear energy industry)	**?**	**Low**	**Insufficient information**
Non-toxic contamination	**Changes in nutrient loading** (e.g. outfalls)	••	**None**	**No known vulnerability**
	Changes in thermal regime (e.g. cooling water discharges)	••	**None**	**No known vulnerability**
	Changes in turbidity (e.g. laying of pipelines, aggregate dredging)	•	**None**	**No known vulnerability**
	Changes in salinity (e.g. outfalls from rigs, ships)	••	**None**	**No known vulnerability**
Biological disturbance	**Introduction of microbial pathogens** (e.g. outfalls)	**?**	**?**	**Insufficient information**
	Introduction of non-native species and translocation (e.g. ballast water, hull fouling)	**?**	**?**	**Insufficient information**
	Selective extraction of species (e.g. bioprospecting, scientific research, demersal fishing)	•••	**Low**	**Low vulnerability**

3 References

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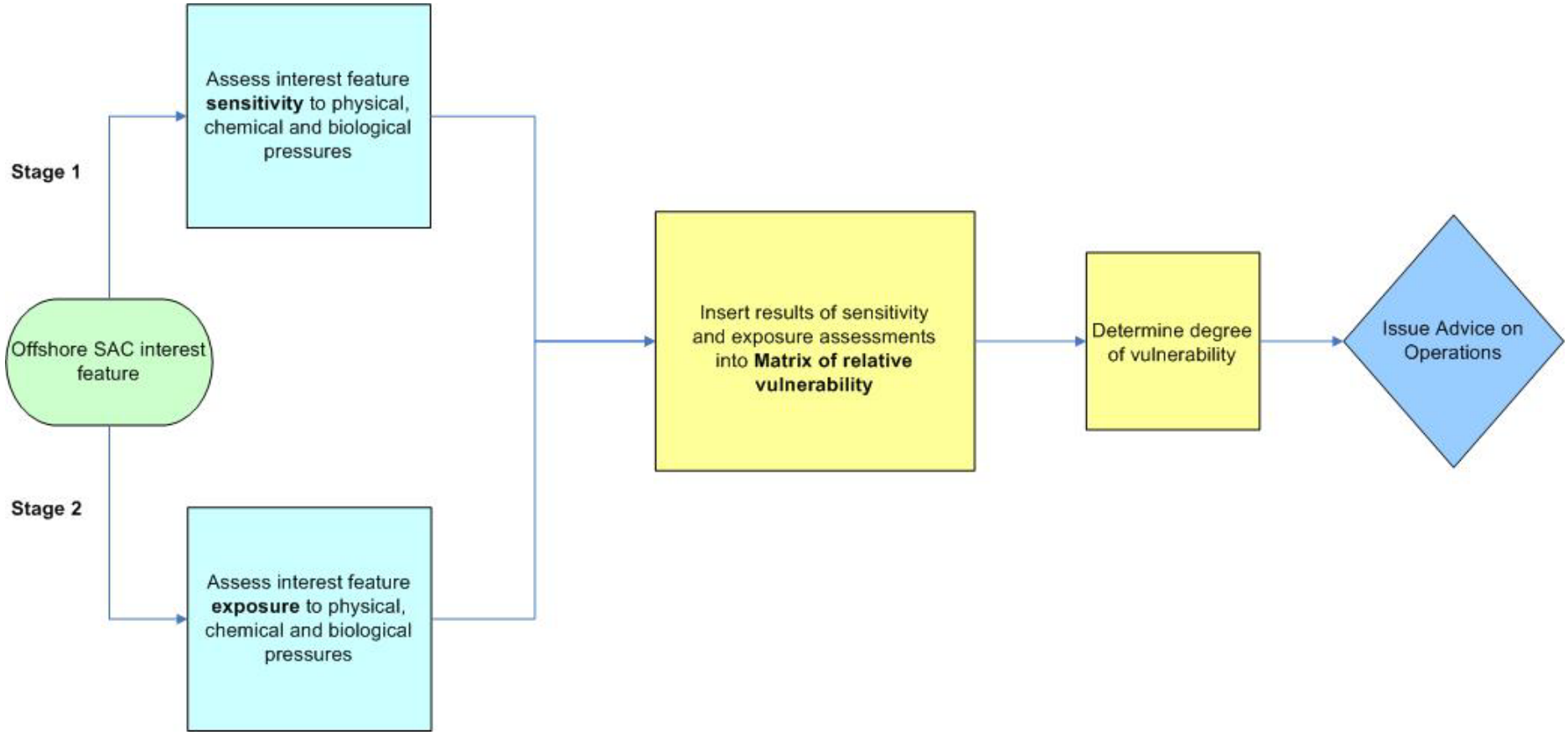
Appendix I: Flow diagram illustrating process of determining vulnerability of interest features



Appendix II: Matrix of relative vulnerability

The relative vulnerability of an interest feature is determined by combining the sensitivity and exposure assessments according to the table below.

		Relative sensitivity of the interest feature			
		High ●●●	Moderate ●●	Low ●	None ○
Relative exposure of the interest feature	High (3)	9	6	3	0
	Medium (2)	6	4	2	0
	Low (1)	3	2	1	0
	Unknown				0
	None (0)	0	0	0	0

Note: if there is insufficient information to assess either exposure **or** sensitivity of a given interest feature, vulnerability will always be categorised 'insufficient information to make any assessment'.

Categories of relative vulnerability

High vulnerability	6 to 9
Moderate vulnerability	3 to 5
Low vulnerability	1 to 2
Vulnerability identified, but not quantified as level of exposure unknown	
No known vulnerability	0
Insufficient information to make any assessment	

Appendix III: Typical species criteria

Identification of a species as typical is not in itself sufficient to indicate the importance of the species or any need for management. The importance of the species should be judged on the contribution made by the species to ecological integrity of the feature. These criteria are intended to help identify or classify typical species and are not limited to the benthos. They are relevant to the Annex I habitat feature and its component parts at the *site* level.

A typical species should meet one or more of the following criteria a – e below:

a) Consistently associated with, but not necessarily restricted to, the feature
   For example:
   - Can be predicted to occur at certain seasons/times (e.g. seasonal & temporal)
   - Stages of life cycle associated with the feature (e.g. spawning)
   - Species is dependent upon feature (for food, shelter, nest)

b) A species on which identification of the habitat is founded
   This criterion is unlikely to apply to complex physiographic features which may be composed include other Annex 1 features (e.g. H1130 Estuaries, H1160 Large Shallow Inlets and Bays which may include H1170 Reefs, H1110 Sandbanks which are slightly covered by seawater all the time etc.)

c) Characteristic of the habitat
   For example:
   Ammodytes tobianus, Zostera marina for 'H1110 Sandbanks which are slightly covered by seawater all the time'

d) An integral part of the structure of the habitat
   For example:
   - Any species that gives the habitat structural complexity (e.g. kelp)
   - Any species that forms the habitat (e.g. biogenic reef species, maerl)

e) A species which influences the habitat's structure and function
   For example:
   - Bioturbators
   - Grazers
   - Animals which bore into the substratum
   - Predators
   - Keystone species (i.e. A species that influences the ecological composition, structure, or functioning of its community far more than its abundance would suggest (EEA, 2008)

Note: above criteria should not be used to describe non-natives as typical; these are marine species and plants and algae transported from their native range to 'new' areas. Introductions and transfer of non-native marine species to their non-native environment mainly occurs by the transport and discharge of ballast water, and to a lesser extent by transport of fouling organisms on hulls or through aquaculture (JNCC, 2008b).