Supplementary Advice on Conservation Objectives for Croker Carbonate Slabs Special Area of Conservation

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The information provided in this document sets out JNCC's supplementary advice on the conservation objectives set for Croker Carbonate Slabs Special Area of Conservation (SAC), hereafter referred to as 'the site'. This document forms part of JNCC's formal conservation advice package for the site and must be read in conjunction with all parts of the package as listed below:

- **Background Document** explaining where to find the most up to date version of the advice package, JNCC's role in the provision of conservation advice, how the advice has been prepared, when to refer to it and how it can be applied;
- **Conservation Objectives and Management Advice** document setting out the broad ecological aims (conservation objectives) for the site and JNCC's advice on;
    - qualifying feature condition;
    - conservation benefits that the site can provide if managed effectively; and
    - conservation measures that JNCC consider are required to support achievement of the conservation objectives stated for the site.
- **Advice on Operations** providing information on those human activities that, if taking place within or near the site, can adversely affect the site's integrity, presenting a risk of not achieving the conservation objectives stated for the site.

The most up-to-date conservation advice package for the site can be downloaded from the conservation advice section of the Site Information Centre (SIC) on JNCC's website.

The advice presented in this document describes the ecological characteristics or 'attributes' of the site's qualifying Annex I feature as specified in the site's conservation objectives: **Submarine structures made by leaking gases**. These attributes include extent and distribution, structure and function and supporting processes.

Figure 1 below illustrates the concept of how a qualifying feature's attributes are interlinked: with impacts on one potentially having knock-on effects on another e.g. the impairment of any of the supporting processes on which a feature relies can result in changes to its extent and distribution and structure and function.

Collectively, the attributes set out in Table 1 below, along with the objectives set for each of them, describe the desired ecological condition (favourable) for the site's qualifying feature. The condition of each feature contributes to its favourable conservation status more widely,

as well as the site's integrity. All attributes listed in Table 1 must be taken into consideration when assessing impacts from an activity.

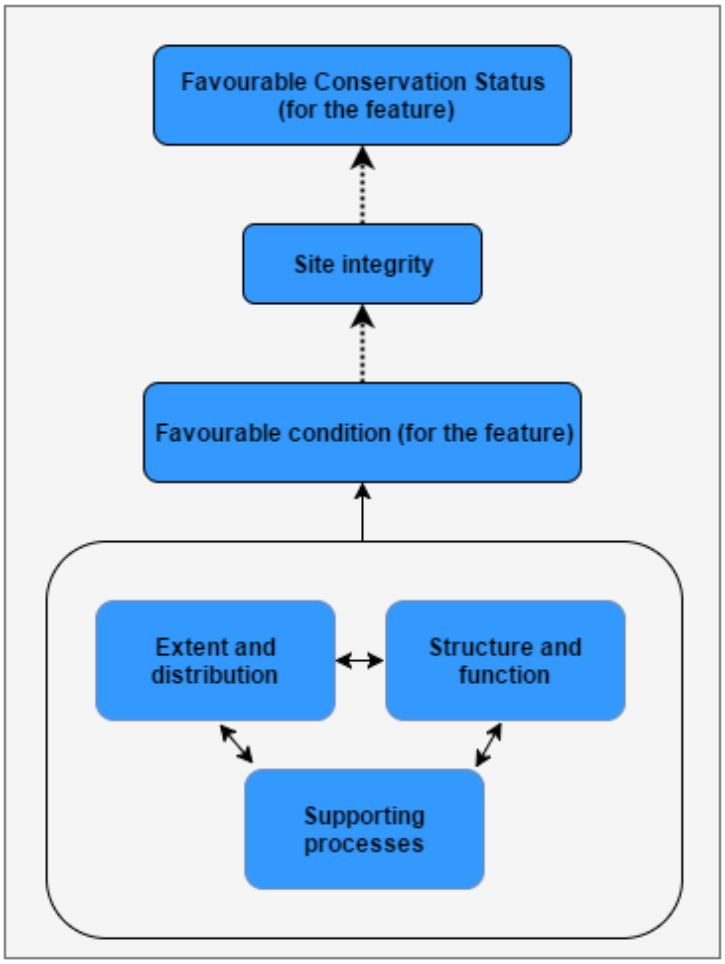

Figure 1. Conceptual diagram showing how qualifying feature attributes are interlinked, describing favourable condition and contribute to site integrity and more widely a qualifying feature's favourable conservation status.

In Table 1 below, the attributes for the submarine structures made by leaking gases qualifying feature are listed. An objective of restore or maintain is set for each attribute, reflecting our current understanding of available evidence e.g. whether it indicates some of the qualifying feature's extent is lost and needs to be restored or that extent is not lost and needs to be maintained to ensure the qualifying feature is in overall favourable condition. Where a restore objective is advised and there is considerable uncertainty as to whether restoration is possible, this will be noted alongside the objective.

The rationale for setting an objective is provided in the summary of evidence column and supporting references listed in the reference section at the end of this document.

Note: when a maintain objective is set, this does not preclude the need for management, now or in the future to ensure a qualifying feature remains in favourable condition.

Table 1: Supplementary Advice on Conservation Objectives for the submarine structures made by leaking gases qualifying feature of the site

In summary, the submarine structures made by leaking gases qualifying feature of the site is considered to be in favourable condition. This assessment is primarily driven by the fact the only activity known to occur within, or in close proximity to, the site is mobile bottom-contacting fishing practices and that interaction between fishing and the qualifying feature itself poses a risk of damage to fishing gear. Active avoidance is therefore highly likely. Please see the Conservation Objectives and Management Advice document available in the conservation advice section of the SIC for JNCC's advice on the management of activities which JNCC consider are needed to maintain the favourable condition of the qualifying feature of the site; particularly of relevance for the qualifying feature of the site given the permanent nature of impact
Further information on activities capable of affecting the qualifying feature of the site can be found in the Advice on Operations workbook available also in the conservation advice section of the SIC.

Attribute	Summary of evidence	View of attribute condition & objective	Confidence in attribute condition
Extent and distribution	The Annex I habitat submarine structures made by leaking gases form over geological time scales. The slow formation of the carbonate structures that characterise the physical structure of this habitat is dependent upon the migration of gases (methane) to the seabed and is mediated by a unique community of microbial organisms. These communities undertake the anaerobic oxidation of methane (AOM) at the sulphate-methane interface, which is most commonly close beneath the seabed surface (Boetius *et al*., 2000). AOM leads to the precipitation of a carbonate cement that binds the seabed sediments to form Methane-Derived Authigenic Carbonate (MDAC) (Niemann *et al*., 2005). It is the MDAC feature itself that is directly equivalent to the qualifying feature Annex I submarine structures made by leaking gases. The extent and distribution of MDAC structures are influenced by natural processes, including sediment deposition and erosion. Mobile sediments can cover or uncover MDAC formations over time, affecting their exposure and the associated biological communities.	Favourable – needs to be maintained	Low - JNCC has a baseline understanding of the extent and distribution of submarine structures made by leaking gases within the site. This is based on seabed habitat data collected on dedicated site surveys in 2008 (Whomersley *et al.*, 2008) and in 2015 (Wood *et al.*, 2016). Evidence for impact is indirect, based on our understanding of the sensitivity of the qualifying feature to pressures associated with human activities known to take place within the site (Tyler-Walters *et al*., 2023 & JNCC, 2018). Our information about activities within the site is incomplete, notably for mobile bottom-contacting and static gear use. The best available evidence underpinning our understanding of fishing activity is up until the year 2020 and human activities evidence is insufficient to support an

	Human activities that cause physical disturbance to the seabed, such as demersal trawling, dredging and the installation of infrastructure (e.g., pipelines or cables), can damage or remove MDAC structures. Given that MDAC formations develop over extensive periods of time, their removal or significant alteration is effectively permanent; natural recovery would be exceedingly slow. Vessel Monitoring Service (VMS) data of fishing activity up to the year 2020 suggests some mobile bottom-contact fishing gear use along the edges of the site. However, this remains at a relatively low level and it is likely that fishers make efforts to avoid known MDAC due to the risk of entanglement. Static gear (pots) has also been observed within and around the site (Woods *et al.,* 2016). If deployed over MDAC, pots are capable of irrevocably damaging the structure and therefore feature extent & distribution. However, there is insufficient information on the nature of pot deployment within the site to assess impacts on this attribute. Therefore, JNCC advise a maintain objective for this attribute.		assessment of the potential impact of static fishing gears. On this basis, our confidence in the objective for the feature's extent & distribution is low.
Structure and function	Structure and function of submarine structures made by leaking gases pertains to the physical structure itself (finer scale topography) and its biological structure (the presence of key and influential species and characteristic communities). JNCC does not consider that there is enough evidence to assess the conservation status of the key and influential species associated with submarine structures made my leaking gases within site. Based on the same evidence presented under extent and distribution, JNCC conclude that the structure and function of the qualifying feature is likely to be in favourable condition. As such, a maintain objective is advised for this attribute.	Favourable – needs to be maintained	Same assessment as that presented under extent and distribution above.
Supporting processes	The key supporting processes underpinning the conservation status of submarine structures made by leaking gases include hydrodynamic regime, water and sediment quality.	Favourable – needs to be maintained	Low - The evidence-base supporting JNCC's assessment against this attribute draws upon data from the wider Celtic Sea

	There is currently no evidence to suggest that human activities are negatively impacting upon the typical hydrodynamic conditions operating within the site, such as current flow or water mixing, beyond that to which the site is typically exposed. The site benefits from relatively stable conditions that allow for the continued AOM and the precipitation of carbonates (Wood *et al*., 2016). Sediment quality also supports the stability of the MDAC structures, though mobile sediments can occasionally cover or expose these formations. There is no evidence to suggest that human activities are having an adverse impact on the typical hydrodynamic regime to which the site is exposed. Whilst it is noted that the Celtic Seas OSPAR region within which the site is located has been assessed to have a poor contaminant status (Larson 2022), this is insufficient evidence to assess water or sediment quality in the site.		Region (Larsen *et al*., 2022), rather than any evidence available from within, or in close proximity to the site itself. This lack of data pertaining to water quality within the site limits our assessment. Moreover, there is a lack of time series data information about water quality and on how human activities may have impacted this.

References

Boetius, A., Ravenschlag, K., Schubert, C.J., Rickert, D., Widdel, F., Gieseke, A., Amann, R., Jørgensen, B.B., Witte, U. and Pfannkuche, O. (2000). A marine microbial consortium apparently mediating anaerobic oxidation of methane. *Nature*. 407: 623-626.

JNCC (2018). Marine Activities and Pressures Evidence. Available at: https://jncc.gov.uk/our-work/marine-activities-and-pressures-evidence/

Larsen, M.M., Fryer, R., Hjermann, D., McHugh, B. and Sorensen, A. 2022. *Status and Trend hazardous substances using CHASE*. In: OSPAR, 2023: The 2023 Quality Status Report for the North-East Atlantic. OSPAR Commission, London. Available at: https://oap.ospar.org/en/ospar-assessments/quality-status-reports/qsr-2023/other-assessments/chase

Niemann, H., Elvert, M., Hovland, M., Orcutt, B., Judd, A., Suck, I., Gutt, J., Joye, S., Damm, E., Finster, K. and Boetius A. (2005). Methane emission and consumption at a North Sea gas seep (Tommeliten area). *Biogeosciences, 2:* 335-351

Tyler-Walters, H., Tillin, H.M., d'Avack, E.A.S., Perry, F., Stamp, T., 2023. Marine Evidence based Sensitivity Assessment (MarESA) – Guidance Manual. Marine Life Information Network (MarLIN). Marine Biological Association of the UK, Plymouth, pp. 170. Available from https://www.marlin.ac.uk/publications

Whomersley, P., Wilson, C., Clements, A., Brown, C., Long, D., Leslie, A. & Limpenny. D. (2010). Understanding the marine environment – seabed habitat investigations of submarine structures in the mid Irish Sea and Solan Bank Area of Search (AoS). JNCC Report No. 430. JNCC, Peterborough, ISSN 0963-8091.

Wood, D., Jenkins, C., Eggett, A., Judd, A. & Golding, N. (2016). CEND23/15 Cruise Report Monitoring Survey of Croker Carbonate Slabs cSAC/SCI. JNCC/Cefas Partnership Report No. 10, JNCC, Peterborough, ISSN 2051-6711.

VMS MMO internal underlying dataset variant of Fishing Activity for over 15 metre vessels which covers 2007 – 2020.