Supplementary Advice on Conservation Objectives for East of Gannet and Montrose Fields Nature Conservation MPA UKNCMPA021

December 2025

UKNCMPA021

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The information provided in this document sets out JNCC's supplementary advice on the conservation objectives set for East of Gannet and Montrose Fields Nature Conservation MPA, 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 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;
    - protected 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 impact it and hinder the achievement of 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 here describes the ecological characteristics or 'attributes' of the site's protected features: **offshore deep-sea muds**, **ocean quahog aggregations** and **offshore subtidal sands and gravels** (representing sediment types suitable for ocean quahog colonisation), specified in the site's conservation objectives listed in the site's Designation Order. These attributes include extent and distribution, structure and function and supporting processes.

Figure 1 below illustrates the concept of how a protected 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 **Error! Reference source not found.** and 2 below, along with the objectives set for each of them, describe the desired ecological condition

(favourable) for the site's protected features. All attributes listed in Table 1 and 2 must be taken into consideration when assessing impacts from an activity.

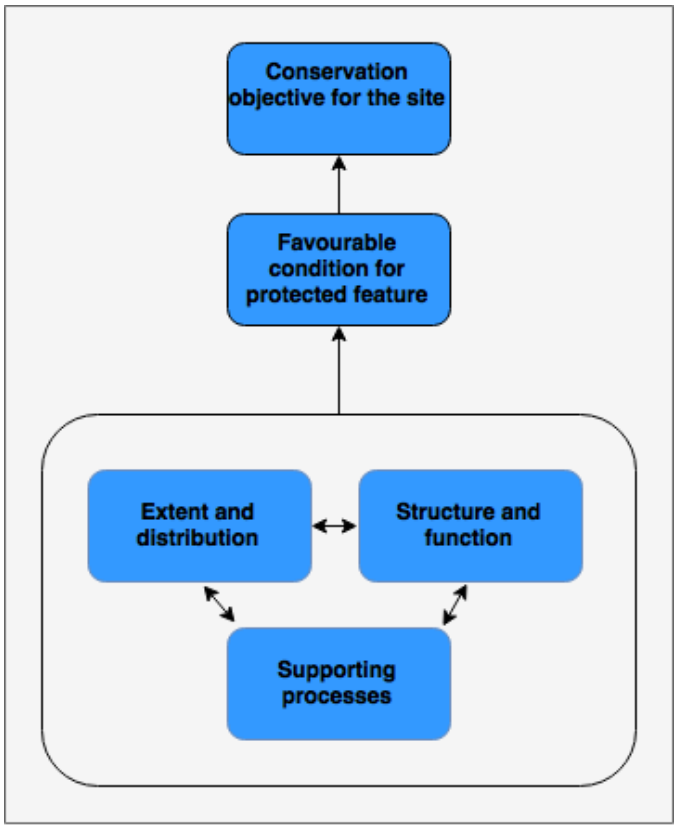

Figure 1. Conceptual diagram showing how feature attributes are interlinked and collectively describe favourable condition and contribute to the conservation objectives stated for the site.

In Tables 1 and 2 below, the attributes for the offshore deep-sea muds and ocean quahog aggregations with offshore subtidal sands and gravels (representing sediment types suitable for ocean quahog colonisation) protected features are listed, respectively. An objective of recover or conserve is set for each protected feature attribute, reflecting our understanding of available evidence e.g. whether it indicates some of a protected feature's extent is lost and needs to be recovered or that extent is not lost and needs to be conserved to ensure the protected feature is in overall favourable condition. Where a recover objective is advised and there is considerable uncertainty as to whether recovery 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 also that when a conserve objective is set, this does not preclude the need for management, now or in the future to ensure a protected feature remains in favourable condition.

Table 1 Supplementary Advice on Conservation Objectives for offshore deep-sea muds protected feature of the site

In summary, the offshore deep-sea muds protected feature in the site is in unfavourable condition and needs to be recovered. Active management of human activities is required to recover the extent and distribution, and the structure and function, of offshore deep-sea muds within the site with respect to sediment composition and characteristic biological communities, and by association function. 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 is needed to recover the offshore deep-sea muds protected feature of the site.

Attribute	**Summary of evidence** Further information on activities capable of affecting the protected features of the site can be found in the Advice on Operations workbook available also in the conservation advice section of the SIC.	**View of attribute condition & objective**	**Confidence in attribute condition**
Extent and distribution	The extent and distribution of offshore deep-sea muds are defined by their sediment composition and biological assemblages. Any changes to sediment composition and/or biological assemblages brought about by human activities may impact the conservation status of the feature. Within the site, the protected feature occupies 49% of the total site area (McCabe *et al.,* 2020). There is evidence to suggest that infrastructure associated with oil and gas extraction (over 80 drilled wells and 250km of pipelines) and cabling (over 25km of cables) has led to a change in seabed type within the site with the introduction of hard substratum such as rock dump and concrete mattresses to an otherwise soft-sedimentary habitat. The low-energy hydrodynamic regime associated with offshore deep-sea muds allows for impacts from offshore industry, such as introduced material, to persist over longer timescales (Cordes et al. 2016, Kraus and Carter 2018).	Unfavourable - needs to be recovered	Low - Whilst JNCC have a good understanding of the extent and distribution of offshore deep-sea muds within the site based on data from a dedicated survey that took place in 2015 (McCabe *et al.,* 2020), evidence for impact is based on our understanding of the sensitivity of offshore deep-sea muds and their associated biological communities to pressures associated with human activities known to take place within the site. Our information on human activities taking place is incomplete.
Structure and function	The structure of offshore deep-sea muds pertains to the physical structure of the feature itself (fine scale topography, sediment composition) and its biological structure (the presence of key and influential species and characteristic communities). JNCC considers that there is insufficient evidence with which to assess the conservation status of offshore deep-sea muds with respect to key and influential species. JNCC also considers that	Unfavourable - needs to be recovered	Low - Whilst JNCC have a good understanding of the characteristic biological communities and sediment composition within the site based on data from a dedicated survey that took place in 2015 (McCabe *et al.,* 2020), evidence for impact is based on our understanding of the sensitivity of offshore deep-sea muds and their associated biological communities to

	fine scale topography is not relevant to this particular feature type. Results from the 2015 survey of the site (McCabe *et al.,* 2020) support the presence of community biotopes that typify offshore deep-sea muds in this area of the North Sea. Within the site, fishing activity includes several types of demersal trawling at moderate to high intensity, which can impact benthic species through surface abrasion and sub-surface penetration. Based on the exerted fishing effort, and the evidence of offshore industry activity presented above under extent and distribution, JNCC conclude that the characteristic biological communities of offshore deep-sea muds within the site and sediment composition may have been adversely affected by ongoing human activities and a recover objective is advised. Functions are ecological processes that include sediment processing, secondary production, habitat modification, supply of recruits, bioengineering and biodeposition. Given that a recover objective is advised for characteristic communities on which these functions rely, as well as the extent of the feature as noted above, JNCC also advise a recover objective for function as an integrated component of this feature attribute.		pressures associated with human activities known to take place within the site. Our information on human activities taking place, as well as on key and influential species of this habitat, are incomplete.
Supporting processes	Supporting processes with respect to offshore deep-sea muds include hydrodynamic regime, water and sediment quality. There is no evidence to suggest that human activities within, or in close proximity to, the site are having an adverse impact on the typical hydrodynamic regime to which the site is exposed to. Whilst evidence suggests that water and sediment quality within the site are not falling below environmental quality standards, there is a lack of time series data on which to understand how human activities may have affected sediment and water quality over time. Oil and gas activities have been taking place within the site and are now subject to strict regulations concerning contamination of pollutants since the OSPAR decision 2000/3. However, more than half of the wells drilled within the offshore deep-sea muds feature were spudded before these regulations came in place. Historic cutting piles containing oil-based muds	Favourable - needs to be conserved	Low - The evidence-base supporting JNCC's assessment against this attribute draws upon data from the wider North Sea, rather than within or in close proximity to the site itself. Moreover, there is a lack of time series data information about sediment and water quality and how human activities may have impacted this and our information on human activities taking place is incomplete.

	may present a pollution pathway at a local scale if disturbed (Bakke et al. 2013). Overall, there is limited evidence to suggest that supporting processes that operate at this site are being impeded with respect to supporting the presence of offshore deep-sea muds, but a lack of time series data pertaining to sediment and water quality limits this assessment.		

Table 2: Supplementary Advice on Conservation Objectives for ocean quahog aggregations with offshore subtidal sands and gravels (representing sediment types suitable for them to colonise) protected features of the site

In summary, the ocean quahog aggregations with offshore subtidal sands and gravels (representing sediment types suitable for them to colonise) protected features in the site is in unfavourable condition. Active management of human activities is required to recover the extent and distribution, and the structure and function, of ocean quahog aggregations and their supporting habitat within the site. 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 is needed to recover the offshore deep-sea muds protected feature of the site.

Attribute	**Summary of evidence** Further information on activities capable of affecting the protected features of the site can be found in the Advice on Operations workbook available also in the conservation advice section of the SIC.	**View of attribute condition & objective**	**Confidence in attribute condition**
Extent and distribution	Ocean quahog aggregations have been recorded from the north, north-west and eastern sections of the site (McCabe *et al.,* 2020; oil and gas industry surveys, various years) and are typically associated with coarser sediment types such as sands and mixed sediments in which they burrow. Recruitment of individuals to the site, and UK waters more broadly, is thought to depend on spawning populations from Icelandic waters (Witbaard and Bergman, 2003). Ocean quahog recovery is likely to be a very slow process, owing to its life-history characteristics (long-lived, sporadic recruitment episodes and the vulnerable nature of the species itself to physical pressures). Moreover, warming seas associated with the impacts of climate change is projected to reduce the success of recruitment events (Witbaard and Bergman, 2003). Within the site itself there are activities taking place that are known to impact ocean quahog aggregations and affect the availability of supporting habitat. This includes the indirect impacts from the introduction of hard substrata associated with marine industries, limiting the availability of suitable habitat for recruitment, and direct impacts from the damaging effects of bottom-contacting fishing gear.	Recover to favourable condition; acknowledging the uncertainty which the influence of climate-change related pressures and the dependence on larval source populations from outwith UK waters can have on ocean quahog aggregations recovery	Low - Whilst JNCC have a good understanding of the extent and distribution of ocean quahog aggregations within the site based on data from a dedicated survey that took place in 2015 (McCabe *et al.,* 2020) and data from oil and gas surveys that took place between 1990 and 2000 (oil and gas industry surveys, various years), evidence for impact is based on our understanding of the sensitivity of ocean quahog aggregations to pressures associated with human activities known to take place within the site, noting our information on human activities taking place is incomplete.

Structure and function	Structure with respect to ocean quahog aggregations refers to the densities and age classes of individuals from a population found within a site. Forty-seven individual ocean quahog records were sampled in the site between 1990-2000 (oil and gas industry surveys, various years). A collaborative survey between JNCC and Marine Directorate in 2015 sampled 69 ocean quahog records throughout the site (McCabe *et al.,* 2020). The average density of ocean quahog aggregations recorded from 155 Hamon grab samples taken across the site in 2015 was 1.77 individuals per meter squared. This is well below the range of documented average densities from the northern North Sea (12-286 individuals per meter squared) (Witbaard, 1997; Witbaard and Bergman, 2003). However, the 2015 survey used a different grab type to sample compared to previous surveys so this must be taken into account. During the 2015 survey, 39 of the 69 individuals recorded were juveniles (McCabe *et al.,* 2020). As the species is estimated to mature between 5 and 11 years of age (Thorarinsdóttir 1999), this indicates successful settlement of larvae took place into the site during the 2000s. Some types of demersal trawling have been shown to cause varying rates of damage and mortality to ocean quahog based on the size of the individuals, potentially resulting in a skewed impact on the population and therefore structure (Witbaard and Klein 1994). Based on the same evidence presented above under extent and distribution, JNCC conclude that the structure, and by association function, of ocean quahog aggregations may have been adversely affected by human activities based on our understanding of the sensitivity of ocean quahog aggregations to pressures associated with human activities known to occur within the site. Given that a recover objective has been advised for extent and distribution, JNCC also advise a recover objective for structure and function.	Recover to favourable condition; acknowledging the uncertainty which the influence of climate-change related pressures and the dependence on larval source populations from outwith UK waters can have on ocean quahog aggregations recovery	Low - JNCC have limited understanding of the structure and function of ocean quahog aggregations within the site. More data is required to develop a time series of ocean quahog population structure so that JNCC can assess whether the population is declining, being conserved or increasing within the site. The age structure, growth rates and reproductive viability of the population located within the site are also currently unknown. Evidence for impact is based on our understanding of the sensitivity of ocean quahog aggregations to pressures associated with human activities known to take place within the site, noting our information on human activities taking place is incomplete.
Supporting processes	Supporting processes with respect to ocean quahog aggregations include hydrodynamic regime, supporting habitat water and sediment quality. These environmental conditions can affect species persistence, growth, and recruitment.	Recover the extent of ocean quahog aggregations supporting habitat (offshore subtidal	Low - The evidence-base supporting JNCC's assessment against this attribute for the sub-attributes of hydrodynamic regime, sediment and water quality largely

	There is no evidence to suggest that human activities within, or in close proximity to, the site are having an adverse impact on the typical hydrodynamic regime to which the site is exposed to. Whilst evidence suggests that water and sediment quality within the site are not falling below environmental quality standards, there is a lack of time series data on which to understand how human activities may have affected sediment and water quality over time. Oil and gas activities have been taking place within the site and are now subject to strict regulations concerning contamination of pollutants since the OSPAR decision 2000/3, however, historic cutting piles containing oil-based muds may present a pollution pathway at a local scale if disturbed (Bakke et al. 2013). Within the site there is evidence to suggest that infrastructure associated with oil and gas extraction and cabling has led to a reduction in suitable habitat for ocean quahog colonisation with the introduction of hard substratum such as rock dump and concrete mattresses.	sands and gravels) to favourable condition.	draws upon data from the wider North Sea, rather than within or in close proximity to the site itself. There is a lack of time series data information about sediment and water quality and how human activities may have impacted this. There is a good understanding of the extent of supporting habitat within the site based on the 2015 survey (McCabe *et al.,* 2020). However, evidence for impact is based on our understanding of the sensitivity of supporting habitat for ocean quahog aggregations to pressures associated with human activities known to take place within the site, noting our information on human activities taking place is incomplete.

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