Red List of Ecosystem assessment series

Produced by JNCC and NatureScot, supported by Natural Resources Wales, Natural England, and Northern Ireland Environment Agency.

This resource is one in a series/number of Ecosystem Red List assessments developed to accompany the UK Biodiversity Indicator 'Red List of Ecosystems'. The assessments are available at: https://jncc.gov.uk/resources/7b922dfc-708b-4c8c-9e6a-e2040447fb39.

Resilient ecosystems are crucial for preventing biodiversity loss and species extinction. Maintaining healthy ecosystems safeguards the essential services they provide, which are fundamental to human well-being and a thriving economy. However, pressures and threats such as deforestation, overfishing, or climate change, can disturb the balance of ecosystems and threaten their health and functioning. Assessing the level of threat facing ecosystems is important in helping us understand the current status of the environment, and on a practical level, assessments can be used to help prioritise conservation funding decisions and where to take conservation management action on the ground.

The 'Red List of Ecosystems' (RLE) is a global assessment approach set out by the International Union on Conservation of Nature (IUCN). The approach includes consideration of a series of criteria, including change in geographic distribution through time; whether the ecosystem distribution is geographically restricted; evidence for any environmental degradation; and disruption to biotic processes or interactions. We have not carried out the quantitative analyses of the probability of ecosystem collapse necessary to assess criterion E as we do not have the data needed to carry out such analyses consistently. The IUCN methodology is widely used as a robust approach to assessing the status of ecosystems. Further details of the criteria used in these assessments are available on the IUCN portal.

This assessment series sets out the RLE assessment conclusions for ecosystems found in the UK, alongside the details of how the assessment was made, including for each IUCN component criterion. The assessments have been peer-reviewed, and source data is referenced. Once complete, the series will cover the full range of natural and seminatural habitats that occur in the UK, throughout marine, terrestrial and freshwater environments.

Assessments are conducted according to the Global Ecosystem Typology Level 3 (Ecosystem Functional Groups). This enables the assessments to feed into the Kunming-Montreal Global Biodiversity Framework (GBF) headline indicator A.1 Red List of Ecosystems. This indicator, which has been incorporated into the UK Biodiversity Indicator suite, is designed to measure progress against Goal A ('Protect and restore') and Target 1 ('Plan and manage all areas to reduce biodiversity loss') of the GBF.

M3.5 Deep Water Biogenic Beds

1. Key facts

Ecosystem description: This ecosystem encompasses cold-water coral reefs, coral gardens, carbonate mounds and deep-sea sponge aggregations. These habitats are structurally complex, supporting highly diverse faunal communities.

Image credit: (Left to right) Cold water coral reef © JNCC; The Canyons MPA, Sponge aggregation © JNCC; Faroe-Shetland Sponge Belt MPA, Carbonate mound © JNCC Hatton Bank MPA

Overall assessment conclusion: Critically Endangered (CR) based on criteria A2a and C2.

Date assessment published: 02.12.2025 (Please note a correction to the distribution map was made on 18.02.2026)
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Corresponding habitat classifications:
The following habitats were considered in the production of this assessment:
EUNIS codes: MD22, ME22, MF22, MG22
UK Marine Habitat Classification:
Sublittoral biogenic reefs on sediment SS.SBR
Atlantic upper bathyal biogenic structure M.AtUB.Bi
Atlantic mid bathyal biogenic structure M.AtMB.Bi
Atlantic lower bathyal biogenic structure M.AtLB.Bi
Atlantic upper abyssal biogenic structure M.AtUA.Bi
Atlantic mid abyssal biogenic structure M.AtMA.Bi
Atlantic lower abyssal biogenic structure M.AtLA.Bi

2. Assessment against IUCN criteria

Criterion A: Reduction in geographic distribution

Criterian A considers reduction in geographic distribution over ANY of the defined time periods for criteria A1, A2a, A2b or A3. For details of time periods and criteria see IUCN Red List of Ecosystems Criteria Summary Sheet_2.2_EN.pdf

These structurally complex habitats in the deep sea are largely composed of reef forming cold water corals such as *Desmophyllum pertusum* (formerly *Lopehila pertusa*), *Madrepora oculata* and *Solenosmilia variabilis*; coral gardens created by cup corals, lace corals, black

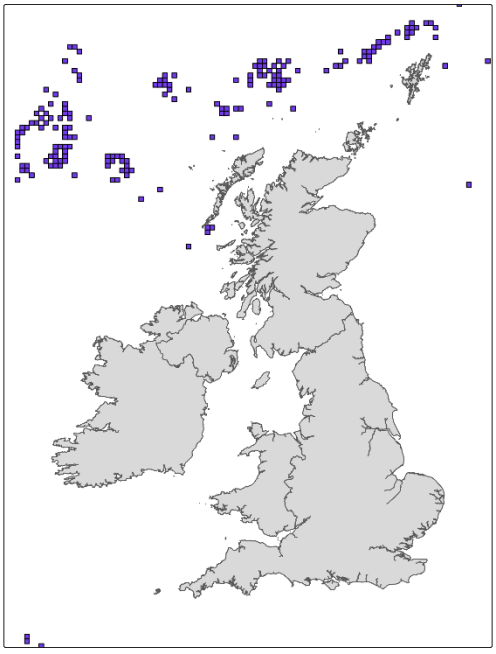
or thorn corals, bamboo corals, and gorgonian sea fans; and deep sea sponge aggregations that are principally composed of glass sponges (Hexactinellida) and giant sponges (Demospongia).

These habitats are distributed throughout the North Atlantic, mainly on the continental slopes. In the waters around the UK, they have predominantly been recorded in northern areas including Rockall, Hatton and George Bligh Banks; Anton Dohrn, Rosemary Bank and Hebrides Terrace Seamounts; as well as the Wyville-Thomson Ridge and Darwin Mounds; with one example from southwest England, The Canyons. There is also a single example, Mingulay Reef, that exists in the nearshore waters of the Sea of Hebrides.

A2a Critically Endangered (CR) – 85% of deep-water biogenic beds are expected to be impacted by changes in ocean acidity within 35 years, leading to a loss of habitat complexity and associated biodiversity (Jackson et al., 2014; Hennige et al., 2015, 2020; Puerta et al., 2020).

Criterion B: Restricted geographic distribution

Criterion B considers restricted geographic distribution indicated by any of criteria B1, B2 or B3. For details of criteria see IUCN Red List of Ecosystems Criteria Summary Sheet_2.2_EN.pdf.



The full extent of deep-water biogenic habitats in UK waters is thought to be 28 km^2 (Mountford et al., 2025). Environmental variables, including the availability of suitable habitat for settlement, and water mass properties such as temperature, salinity, food supply, carbonate chemistry, and oxygen, are all key components that affect the distribution and health of deep-water biogenic beds.

Deep Water Biogenic Beds are generally considered to be in a poor condition (OSPAR, 2022a-d, 2023; Scottish Government, 2024).

B1b Critical Endangered (CR) – The extent of deep-water biogenic beds is 28 km^2 in UK waters (Mountford et al., 2025) with the quality of the beds thought to be declining (OSPAR, 2022a-d; Scottish Government, 2024).

Criterion C: Environmental degradation

Criterion C considers environmental degradation over ANY of the time periods for criteria C1, C2a, C2b or C3. For details of time periods and criteria see IUCN Red List of Ecosystems Criteria Summary Sheet_2.2_EN.pdf.

Deep water biogenic beds are slow growing, some developing over thousands of years. Consequently, recovery rates when damaged are extremely slow. These habitats are highly sensitive to demersal fishing activities (Davies et al., 2009; Dahl, 2013; Durán Muñoz, 2011, 2012; Ragnarsson et al., 2017; Morrison et al., 2020; OSPAR, 2022a-d, 2023). Ocean warming is expected to lead to the significant loss of habitat (Hennige *et al*., 2020; Morato *et*

al., 2020) and ocean acidification may impact coral and sponge health, also leading to ecosystem-scale habitat loss (Roberts & Cairns, 2014; Hennige *et al*., 2020; Beazley et al., 2021a, Krueger et al., 2023).

C2b Critically Endangered (CR) – Historic and ongoing fisheries impacts on deep water biogenic beds have caused significant long-term damage, whilst ocean acidification and warming impacts present a significant future threat to these habitats (OSPAR, 2022a-d, 2023; Scottish Government, 2024).

Criterion D. Disruption of biotic processes or interactions

Criterion D considers Disruption of biotic processes or interactions over ANY of the time periods for criteria D1, D2a, D2b or D3. For details of time periods and criteria see IUCN Red List of Ecosystems Criteria Summary Sheet_2.2_EN.pdf

The availability of a sufficient larval supply, suitable substrate for settlement and food supply are key factors affecting the biotic processes of deep-water biogenic beds. Once settled, adults cannot migrate from unsuitable and/or changing environments. The motile larval stages are the primary means of potential relocation and if conditions are unfavourable during spawning and dispersal, the entire annual reproductive output can be lost (Järnegren et al., 2017, 2020; Puerta et al., 2020; Waller et al., 2023). Critical information regarding adaptation and resilience are still unknown for most of the deep-sea benthic communities, from species through to population and community-level processes (Hebbeln et al., 2019).

Data Deficient (DD) - Sites considered degraded but insufficient monitoring data to define quantitatively.

Conservation measures in place

Conservation measures to protect deep sea biogenic beds have been implemented through national and international legislation in UK waters. Coral gardens, Carbonate Mounds, Deep sea sponge aggregations, and Reef forming cold water corals (such as *Desmophyllum pertusum*), are all on the OSPAR List of Threatened and / or Declining Species and Habitats (OSPAR, 2008). These habitats are also listed as Priority Marine Features (PMF) in Scotland's seas. Policy GEN 9 on the *Natural Heritage* in Scotland's National Marine Plan requires that development and use of the marine environment must not result in a significant impact on the national status of PMFs.

There are 14 marine protected areas (MPAs) designated for deep water biogenic habitats. These are:

- East Mingulay Special Area of Conservation (SAC)
- Anton Dohrn Seamount SAC
- Darwin Mounds SAC
- East Rockall Bank SAC
- Faroe-Shetland Sponge Belt Nature Conservation MPA (NCMPA)
- Hatton Bank SAC
- Hatton-Rockall Basin NCMPA
- Northeast Faroe-Shetland Channel NCMPA
- Northwest Rockall Bank SAC
- Pobie Bank Reef SAC
- The Barra Fan and Hebrides Terrace Seamount NCMPA
- The Canyons Marine Conservation Zone (MCZ)

- West of Scotland MPA (which encompasses Anton Dohrn Seamount SAC, although this remains a separate MPA in its own right)
- Wyville Thomson Ridge MPA

Fisheries measures have been implemented in these sites to protect their biogenic habitats. Several component habitats of deep sea biogenic beds are also recognised as Vulnerable Marine Ecosystems (VMEs) under the Northeast Atlantic Fisheries Commission (NEAFC) Recommendation 19-2014. This Recommendation aims to ensure effective measures to prevent significant adverse impacts to VMEs from bottom fishing activities are implemented within the NEAFC Regulatory Area.

The Scottish Biodiversity Strategy to 2045, the Scottish Biodiversity Duty and UK Marine Strategy provide further drivers to ensure biological diversity is restored, and ecosystems are safeguarded. Removing anthropogenic pressures can lead to recovery of ecosystem function in the short term and structural complexity in the longer term (decades) (Buhl-Mortensen 2017; Beazley *et al.*, 2021b). Therefore, ensuring that all pressures are removed from marine protected areas established for the conservation of these habitats will be crucial for promoting resilience and allow the species the space to adapt to climate change over the coming decades (OSPAR, 2022a-d).

Efforts to aid restoration of cold-water coral reefs are also being considered. These include translocation and the provision of artificial structures to improve settlement on degraded reefs (e.g. Montseny et al., 2021; Strong et al., 2023; Lui et al., 2024).

Overall assessment conclusion

Deep water biogenic beds in the UK are assessed as being Critically Endangered (CR) based on criteria A2a and C2.

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