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

Supporting documentation for the
conservation status assessment for the habitat:

H1170 - Reefs

UK OFFSHORE

IMPORTANT NOTE - PLEASE READ

- The information in this document is a UK offshore-level contribution to 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.
- The 2019 Article 17 UK Approach document provides details on how this supporting information was used to produce the UK Report.
- The UK Report on the conservation status of this habitat is provided in a separate document.
- The reporting fields and options used are aligned to those set out in the European Commission guidance.
- Explanatory notes (where provided) for UK offshore are included at the end. These provide an audit trail of relevant supporting information.
- Some of the reporting fields have been left blank because either: (i) there was insufficient information to complete the field; (ii) completion of the field was not obligatory; and/or (iii) the field was only relevant at UK-level (sections 10 Future prospects and 11 Conclusions).
- For technical reasons, the UK offshore-level future trends for Range, Area covered by habitat and Structure and functions are only available in a separate spreadsheet that contains all the UK offshore-level supporting information.
- The UK offshore-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.

Amendment

Section 11.4: Short-term trend of habitat area in good condition within the network: Direction (on page 6) was originally incorrectly documented in this assessment as Uncertain (U) for H1170 – Reefs. This section was updated on 24/05/2021 to display the correct Decreasing (-) trend for this habitat.

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 (Offshore information only)**
1.2 Habitat code	**1170 - Reefs**

2. Maps

2.1 Year or period	
2.3 Distribution map	Yes
2.3 Distribution map Method used	
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:10.14465/2013.arc20.193-203 Dinmore, T., Duplisea, D. E., Rackham, B. D., Maxwell, D. L. & Jennings, S. (2003). Impact of a large-scale area closure on patterns of fishing disturbance and the consequences for benthic communities. ICES Journal of Marine Science, 60, 371-380. Eastwood, P. D., Mills, C. M., Aldridge, J. N., Houghton, C. A. & Rogers, S. I. (2007). Human activities in UK offshore waters: an assessment of direct, physical pressure on the seafloor. ICES Journal of Marine Science, 64, 453-463.). Foden, J., Rogers, S. I. & Jones, A. P. (2011). Human pressures on UK seafloor habitats: a cumulative impact assessment. Marine Ecology Progress Series, 428, 33-47. Foden, J., Rogers, S. I. & Jones, A. P. (2010). Recovery of UK seafloor habitats from benthic fishing and aggregate extraction - towards a cumulative impact assessment. Marine Ecology Progress Series, 411, 259-270. HM Government, 2012. Marine Strategy Part One: UK Initial Assessment and Good Environmental Status. Report No. PB13860. Jennings, S., Lee, J., & Hiddink, J. G. (2012). Assessing fishery footprints and trade-offs between landings value, habitat sensitivity, and fishing impacts to inform marine spatial planning and an ecosystem approach. ICES Journal of Marine Science, 1-11. JNCC, 2017. Offshore benthic habitats monitoring options - Method paper 1: Risk assessment for offshore Marine Protected Areas and benthic habitats in UK, v.04 JNCC, 2015. Pressures-Activities Database. http://jncc.defra.gov.uk/default.aspx?page=7136 [Accessed 09/17] JNCC, 2013. European Community Directive on the Conservation of Natural Habitat and of Wild Fauna and Flora (92/43/EEC) Supporting documentation for the Third Report by the United Kingdom under Article 17 on the implementation of the Directive from January 2007 to December 2012 Conservation status assessment for Habitat:H1170 - Reefs JNCC, 2011. Review of methods for mapping anthropogenic pressures in UK waters in support of the Marine Biodiversity Monitoring R&D Programme.

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

Briefing paper to UKMMAS evdience groups. Presented 06/10/2011.
MCCIP, 2017. Marine Climate Change Impacts: 10 years' experience of science to policy reporting. (Eds. Frost M, Baxter J, Buckley P, Dye S and Stoker B) Summary Report,MCCIP, Lowestoft, 12pp.doi: 10.14465/2017.arc10.000-arc.
MCCIP, 2013. Marine Climate Change Impacts Report Card 2013. http://www.mccip.org.uk/impacts-report-cards/full-report-cards/2013/[Accessed 09/07]
MCCIP, 2006. Annual Report Card. http://www.mccip.org.uk/impacts-report-cards/full-report-cards/2006/ [Accessed 09/17].
OSPAR Commission, 2017. OSPAR CEMP Guidelines. Common Indicator: BH3 Extent of Physical damage to predominant habitats. https://www.ospar.org/documents?v=37641
OSPAR Commission, 2009. Trend analysis of maritime human activities and their collective impact on the OSPAR maritime area. Biodiversity Series. Publication Number 443/2009.
Tillin, H. & Tyler-Walters, H., (2014): Assessing the sensitivity of subtidal sedimentary habitats to pressures associated with marine activities - Phase 1 Report, JNCC Report 512. http://jncc.defra.gov.uk/page-6790
Tillin, H.M., Hull, S.C. & Tyler-Walters, H., 2010. Development of a sensitivity matrix (pressures-MCZ/MPA features). Report to the Department of the Environment, Food and Rural Affairs from ABPmer, Southampton and the Marine Life Information Network (MarLIN) Plymouth: Marine Biological Association of the UK., Defra Contract no. MB0102 Task 3A, Report no. 22., London, 145 pp. <http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=16368>
Tyler-Walters, H., Tillin, H.M., d'Avack, E.A.S., Perry, F., Stamp, T., 2018. Marine Evidence-based Sensitivity Assessment (MarESA) - A Guide. Marine Life Information Network (MarLIN). Marine Biological Association of the UK, Plymouth, pp.91

4. Range

4.1 Surface area (in km²)	58191.09256	
4.2 Short-term trend Period		
4.3 Short-term trend Direction		
4.4 Short-term trend Magnitude	a) Minimum	b) Maximum
4.5 Short-term trend Method used		
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	No
	d) Method	
4.11 Change and reason for change in surface area of range	No change	
	The change is mainly due to:	
4.12 Additional information		

5. Area covered by habitat

5.1 Year or period	

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

5.2 Surface area (in km²)	a) Minimum	50727.232	b) Maximum	50727.232	c) Best single value	50727.23163
5.3 Type of estimate						
5.4 Surface area Method used						
5.5 Short-term trend Period						
5.6 Short-term trend Direction						
5.7 Short-term trend Magnitude	a) Minimum		b) Maximum		c) Confidence interval	
5.8 Short-term trend Method used						
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	No				
	d) Method					
5.14 Change and reason for change in surface area of range	No change					
	The change is mainly due to:					
5.15 Additional information						

6. Structure and functions

6.1 Condition of habitat	a) Area in good condition (km²)	Minimum	36201	Maximum	36201
	b) Area in not-good condition (km²)	Minimum	15159	Maximum	15159
	c) Area where condition is not known (km²)	Minimum	0	Maximum	0
6.2 Condition of habitat Method used	Based mainly on extrapolation from a limited amount of data				
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	Decreasing (-)				
6.5 Short-term trend of habitat area in good condition Method used	Based mainly on expert opinion with very limited data				
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					

7. Main pressures and threats

7.1 Characterisation of pressures/threats

Pressure	Ranking
Marine fish and shellfish harvesting (professional, recreational) activities causing physical loss and disturbance of seafloor habitats (G03)	H

Marine fish and shellfish harvesting (professional, recreational) causing reduction of species/prey populations and disturbance of species (G01)	H

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

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	Long-term results (after 2030)	
8.5 List of main conservation measures		

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

8.6 Additional information

9. Future prospects

9.1 Future prospects of parameters	a) Range
	b) Area
	c) Structure and functions
9.2 Additional information	

10. Conclusions

10.1. Range

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

10.2. Area	
10.3. Specific structure and functions (incl. typical species)	
10.4. Future prospects	
10.5 Overall assessment of Conservation Status	
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	

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	25568
	b) Maximum	25568
	c) Best single value	25568
11.2 Type of estimate		
11.3 Surface area of the habitat type inside the network Method used		
11.4 Short-term trend of habitat area in good condition within the network Direction	Decreasing (-)	
11.5 Short-term trend of habitat area in good condition within network Method used	Insufficient or no data available	
11.6 Additional information		

12. Complementary information

12.1 Justification of % thresholds for trends	
12.2 Other relevant information	

Distribution Map

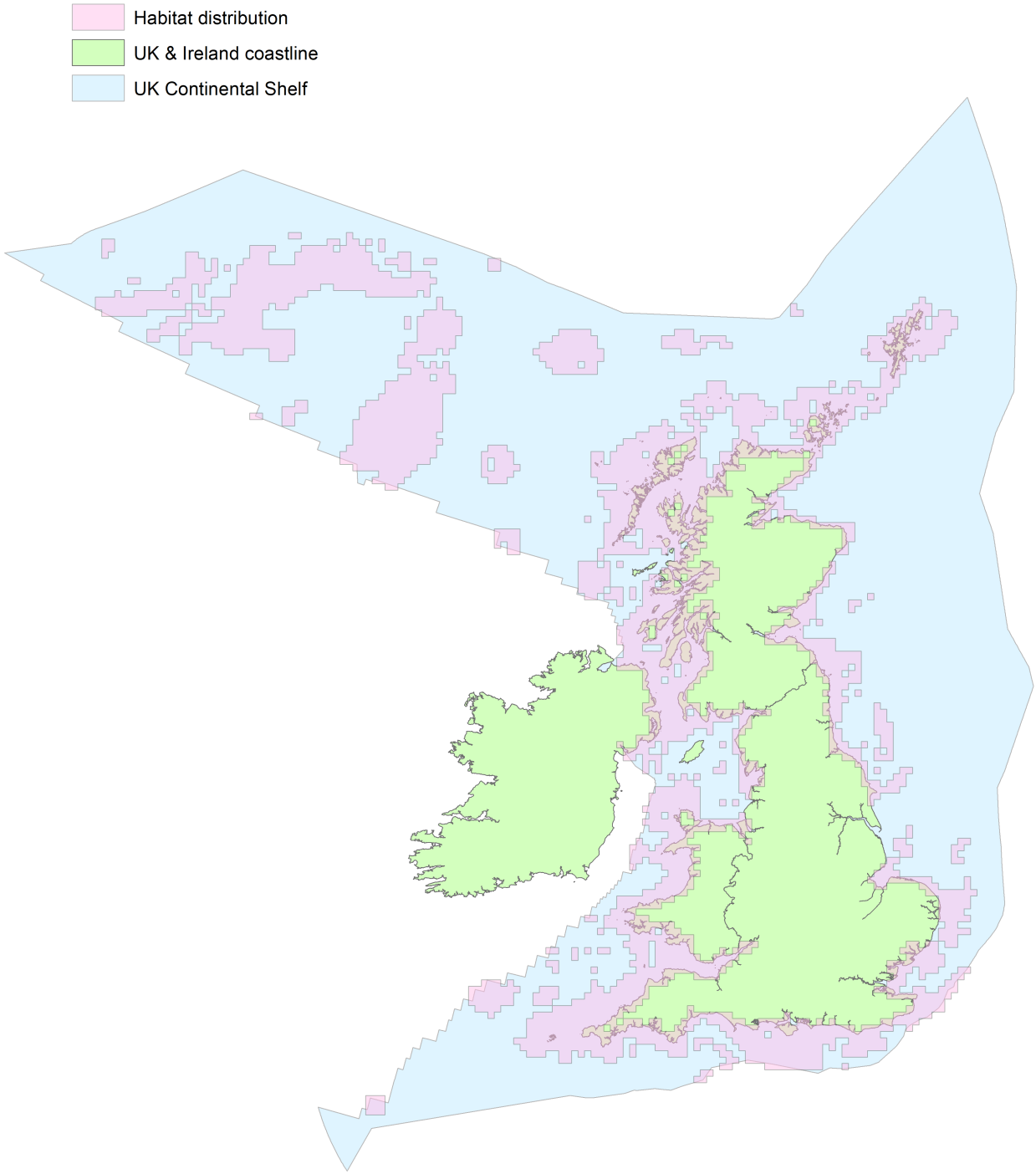

Figure 1: UK distribution map for H1170 - Reefs.

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

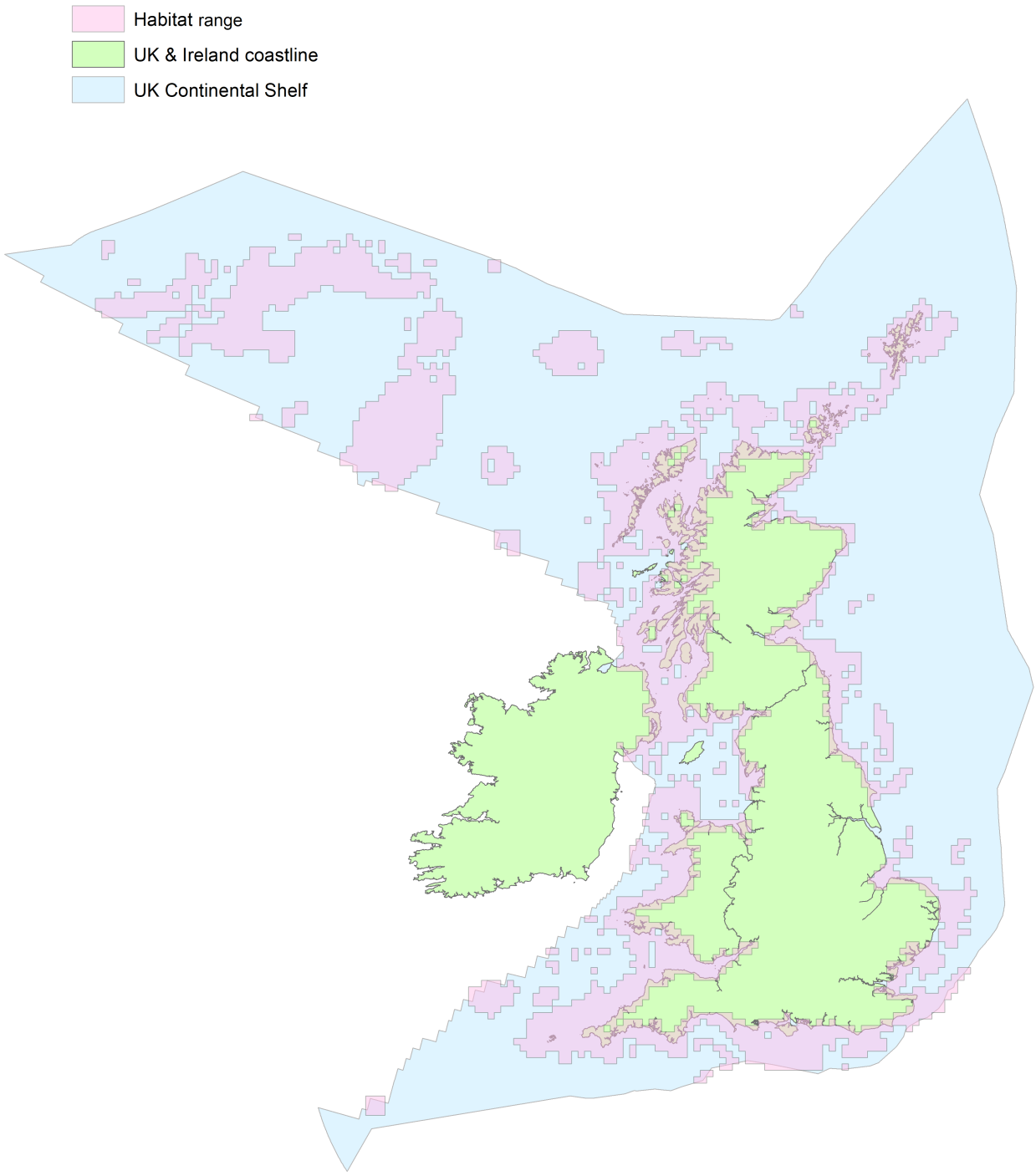

Figure 2: UK range map for H1170 - Reefs.

The UK range map was developed from the UK surface area map, but additionally included an area of iceberg ploughmarks off North-West Scotland in offshore waters, where cobble reefs had been recorded (JNCC, 2018a).

Explanatory Notes

Habitat code: 1170 Region code: MATL

Field label	Note
6.1 Condition of habitat	For methods see Section 6.2 audit

6.2 Condition of habitat; Method used

Method Overview

The indicator 'Extent of Physical Damage to Predominant and Special Habitats (BH3)' (OSPAR Commission, 2017) was used to assess the area of the UK offshore (beyond 12nm) Annex I reefs. The method spatially combines different levels of fishing intensity pressure and habitat sensitivity ranges (resilience and resistance) to determine the distribution and degree of seafloor disturbance across the UK.

Physical disturbance of the seafloor by human activities such as bottom contact fishing, aggregate extraction or offshore construction can adversely affect benthic habitats. Previous studies have found that bottom trawling is known to be affecting a large area of the seafloor (Dinmore et al., 2003; Eastwood et al., 2007; Foden et al., 2010, 2011; JNCC, 2011; Jennings et al., 2012) so the assessment method currently focuses on this activity.

The Extent of Physical Damage indicator (BH3) uses two types of information: i) the distribution and sensitivity of habitats (resilience and resistance), and ii) information on the distribution and intensity of human activities and pressures that cause physical damage, such as mobile bottom gear fisheries, sediment extraction and offshore constructions, although only fisheries are covered in this assessment. These two sources of information (pressure and sensitivity) are combined to calculate the potential damage to a given seafloor habitat, and the trends across the six-year period. Disturbance is assessed in 0.05 degree grid squares. The disturbance categories between 0 and 9 were grouped into two main groups: 0-4 and 5-9, to distinguish between low to moderate and moderate to high categories, and a qualitative threshold of moderate (middle value between these two groups) was selected as an MSFD qualitative indicator of Good Environmental Status for broad-scale habitats.

Disturbance categories 0-4 are used to report Section 6.1a 'area in good condition' and disturbance categories 5-9 are used to report 6.1b 'area in not good condition'. The UK Article 17 Report Management Group have agreed that the proportion of a habitat in 'good condition', reported in Section 6.1a, will be treated as equivalent to the proportion of habitat in favourable condition when drawing final conclusions in Section 10. This alignment should ensure consistent messages from Article 17 and MSFD reporting.

Data used

- Fishing pressure: ICES abrasion layers from 2013 to 2016 were used to map fishing pressure in the current reporting period. The specific version used was Version 1 of sr.2017.17, published 25 August 2017, https://doi.org/10.17895/ices.pub.2861.
- Habitat sensitivity: The sensitivity of reefs was derived from the sensitivity of reef-species and all broad-scale habitats that were recorded in the Annex I offshore reef area (area reported in Section 5.2). Reef-species point data was obtained from the Marine Recorder database and clipped to the Annex I offshore reef layer. The EUNIS level 3 broad-scale habitat map was clipped to the Annex I offshore reef layer.
- Habitat map: A draft version of the Article 17 Annex I offshore reef layer (Section 5.2)

Results- Current reporting period (2013-2018)

The results of the current 2018 physical damage indicator assessment displayed 30% of offshore reef in 'not good' condition and '70%' in good condition. This places the structures and functions of offshore reef into an unfavourable-bad (>25% of the feature in 'not good' condition) conclusion. There is low confidence in this assessment (see below for caveats in the method).

For UK horse mussel reefs (Modiolus modiolus) the MSFD (Article 8) assessment of physical loss is showing a decrease in extent across their potential range, therefore, not achieving the Good Environmental Status target of 'maintain or increase ' (Defra, in prep). The main identified causes include dredge and spoil disposal along with a number of coastal activities.

An MSFD Biogenic Reef Indicator is currently being developed and tested with the aim of being used in the future to determine the condition of biogenic reef.

Results-Previous reporting period (2007-2012)

The results of the 2013 vulnerability assessment displayed 25% of offshore reef in 'not good' condition, 40% in 'good' condition and 34% in 'unknown' condition. In 2013, non-reef broad-scale habitats were excluded from the assessment, resulting in 34% of the offshore reef being reported as in 'unknown' condition. In the current 2018 assessment the non-reef codes were included in the assessment as described in the caveats section below, therefore, there were no areas in unknown condition.
The 2013 vulnerability assessment, narrowly placed the assessed proportion of the offshore reef into unfavourable-bad (>25% of the feature in 'not good' condition) conservation status. However, UK aggregation 'provisionally concluded' that structure and functions of UK reefs were unfavourable-inadequate due to the proportion of UK reef in unknown condition.
Comparision of results between reporting periods.
In 2013, the Art17 Vulnerability Assessment Method was used to give a conclusion for Section 2.8.3 Specific structures and functions conclusion. The current method (BH3 Physical Damage Indicator) was adapted from the previous method (Vulnerability Assessment used in Art 17 2007-2012), but is a more automated approach that assigns data to a more refined set of categories. It also allows for the most updated data to be incorporated. The difference in the results, is thought be driven by the updated fishing, habitat and sensitivity data that have been used in the latest assessment.
The data used in the current assessment was improved in the following ways:
- BH3 was run on ICES VMS fishing data from 2013 to 2016 (The specific version used was Version 1 of sr.2017.17, published 25 August 2017, https://doi.org/10.17895/ices.pub.2861). In 2012, EU Regulations came into force, changing the minimum vessel size for VMS reporting from 15 m to 12 m, therefore, increasing the size of the fleet that were required to report this data. The extent to which the changed minimum reporting size has increased contributed to changes in the datasets is being investigated but is not currently known
- VMS datasets have been improving year on year as the method of preparation has developed and the minimum reporting size has changed to give a more accurate representation of fishing activity.
- The mapped area of Annex I reefs has improved so that a more accurate area was assessed with the BH3 indicator (assessed offshore Annex I reef area has changed from 60646 km2 to 50727 km2). The accuracy of habitat maps are constantly being improved with increased survey data.
- There has been an increase in the evidence and understanding of habitat sensitivity incorporated into the BH3 method; in particular, where resistance and resilience scores are assigned to groups of species with similar biological traits (ecological groups), for example, burrowers (Tillin & Tyler Walters, 2014).
Caveats - Indicator targets
For the 2018 UK MSFD Assessment, BH3 indicator has been used to assess the UK environmental targets of Good Environmental Status for predominant habitats including Soft Sediments and Sublittoral Rock and Biogenic habitats. The quantitative thresholds used for MSFD purposes are based on <15% cut off when combined with the qualitative threshold of moderate as explained above. This means that for an assessment area to achieve the indicator target less than 15% of the assessed habitats needs to be within the highly disturbed categories. In Art 17 <5% of the habitat can be in unfavourable condition to achieve FCS. However, the current assessments round of MSFD undertaken with the BH3 indicator was focused on broad-scale habitats whereas Art 17 is focusing on listed Annex I habitats.
Caveats - Reef map
A draft version of the offshore reef map was used in the BH3 assessment, which was 633 km2 larger than the final offshore reef area map (Section 5.2).
Caveats - Human activities - The indicator only assesses the physical disturbance pressure of bottom trawling. However, the impact of bottom trawling is considered the most widespread physical impact. Fishing is ranked as high importance Iin Section 7,

	fishing was ranked as high importance and was the only current pressure reported as either high or medium importance. -The cumulative impacts of all human activities acting upon the feature have not been considered. -ICES fishing vessel monitoring system data from 2013 to 2016 were used for the pressure layers (The specific version used was Version 1 of sr.2017.17, published 25 August 2017, https://doi.org/10.17895/ices.pub.2861). Data from 2017 and 2018 were not available at the time of the assessments. - Fishing data is for fishing vessels > 12 m only meaning the disturbance is likely to be an underestimate in those areas where small fishing vessels operate.. - Fishing pressure data is at the 0.05 degree grid cell (c-square) resolution. This level of resolution is due to the limitations of data availability, as only aggregated fishing activities are submitted by countries. It is not certain that there will be disturbance from fishing is homogenously distributed across the whole cell, but the pressure intensity per cell was estimated using a robust method outlined below to take account of data limitations. The swept area is calculated using the parts of the fishing gear in contact with the seabed and is calculated on the width of fishing gear (in metres) multiplied by the average vessel speed (in knots) and the time fished. This calculation is undertaken on a cell-by-cell (grids or c-squares) basis per gear and per year. The swept area ratio (proportion of cell area swept per year; SAR) is then calculated by dividing the swept area by the grid cell area. The trawling effort is classified with an intensity scale ranging from 'none' to 'very high' (cell area swept more than 300% or three times per year). An intensity score is assigned to the whole grid cell, even if the fishing was occurring in one section of the cell. Caveats - Habitat sensitivity - The latest Annex I reef map is our best estimate of the distribution of reefs in offshore waters. However, the sensitivity scores are assigned based on the broad-scale habitat map and based on reef-species point data. The broad-scale habitat map is not yet fully aligned with the Annex I reef map. As a result, there is low confidence in the distribution of broad-scale habitat types and associated sensitivity scores within the Annex I offshore reef area. Alignment of these two maps would result in the habitat sensitivity either staying the same or increasing, suggesting that the current results could be underestimating disturbance. - The indicator bases broad-scale habitat sensitivity on the MB0102 sensitivity matrix rather that our most recent sensitivity matrix (MARESA). Caveats associated with MB0102 sensitivity information can be found in the Tillin et al. (2010) report. - If sensitivity of the broad-scale habitat is a range then the highest is taken. This results in the highest possible disturbance category being selected as a precautionary approach.
6.3 Short term trend of habitat area in good condition; Period	See 6.4
6.4 Short term trend of habitat area in good condition; Direction	The results of the extent of physical damage indocator (BH3) which was used to assess the condition of reefs (6.1), suggest that reefs are highly disturbed as a result of widespread fishing. Therefore, it is likely that the condition of reefs has deteriorated over the last 12 years. There is low confidence in this assessment. Monitoring surveys have only recently started on offshore reefs and so there aren't yet time-series data available. Fishing data has been constantly improving (see Section 6.2) making it difficult to compare data from the previous reporting round. For UK horse mussel reefs (Modiolus modiolus), the MSFD (Article 8) assessment of physical loss is showing a decrease in extent across their potential range, therefore, not achieving the Good Environmental Status target of 'maintain or increase' (Defra, in prep). The main identified causes include dredge and spoil disposal along with a number of coastal activities. An MSFD Biogenic Reef Indicator is currently being developed and tested with the aim of being used in the future to determine the condition of biogenic reef.

6.5 Short term trend of habitat area in good condition; Method used	See 6.4
7.1 Characterisation of pressures/ threats	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) Pressures: Although sensitivity to these activities and the pressures they generate were assessed as mostly high from the MB0102 sensitivity matrix, the lack of (or limited) spatial overlap (<5%) (derived from the offshore benthic habitats monitoring options risk assessments (JNCC, 2017)) means that the feature has limited exposure. A description of how these pressures are thought to affect offshore reefs is detailed in Section 2.5 of the 2013 Art 17 offshore reefs report (JNCC, 2013). It is suggested that the cumulative impacts of multiple pressures could have a negative effect on habitat condition. For UK horse mussel reefs (Modiolus modiolus), the MSFD (Article 8) assessment of physical loss is showing a decrease in extent across their potential range; therefore, not achieving the Good Environmental Status target of 'maintain or increase' (Defra, in prep). The main identified causes include dredge and spoil disposal along with a number of coastal activities. The relative importance/impact of marine water pollution on Annex I Reefs in UK offshore waters is considered to be low because of its low direct and indirect influence on the habitat. Reefs are exposed to marine pollution from oil and gas operations and spillages and release from shipping. Pollution is, therefore, covered under the relevant pressure/threat codes. Threats: Although sensitivity to these activities and the pressures they generate were assessed as mostly high from the MB0102 sensitivity matrix they are not expected to impact more than 10% of the feature within the next two reporting cycles.

7.1 Characterisation of pressures/ threats	Method - Pressures The following steps were taken to identify the pressures of highest importance: - The human activities and associated pressures to which the reef 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 offshore reefs habitat map - 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 offshore reefs. - 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 offshore reefs. Resources used - Pressures The spatial overlap between reefs 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 MB0102 pressures (JNCC, 2015). The MB0102 sensitivity matrix was then used to identify the sensitivity of reef broad-scale habitats to pressures (Tillin et al., 2010). Method - 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 reefs, 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 addition of climate change codes (N01, N05, N06, N07, N08) to threats. The climate change threats were added as a result of predictions made in theBirchenough et al. (2013) report which was part of the MCCIP (2013) report card. Caveats - Human activities data - The monitoring options UK benthic habitats risk assessment and offshore MPA risk assessment were completed in 2016 and so use habitat and human activity data updated in that year. - The UK risk assessment gave results for rocky reef and Sabellaria spinulosa habitats down to 200 m depth. Deep-sea reefs were not included in this assessment; however, the results were thought to be broadly representative of the UK offshore reef area. Caveats - Habitat sensitivity data - Caveats associated with MB0102 sensitivity information can be found in the Tillin et al. (2010) report. - A more in-depth sensitivity matrix (MARESA) is available (Tyler-Walters et al., 2018), but does not yet provide sensitivity assessments at the broader feature level. Therefore, MB0102 sensitivity information was used. - If sensitivity of the broad-scale habitat is a range then the highest is taken. This results in the highest possible disturbance category being selected as a precautionary approach. Caveats - Threats - The evidence used in relation to climate change has low confidence (Birchenough et al., 2013).

7.1 Characterisation of pressures/ threats	N01, N05, N06, N07, N08:Threat: '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). 'Species forming cold-water corals may experience shifts in distribution as a result of intolerance to altered seawater temperature and chemistry, with knock-on effects of community composition and function' (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 offshore reefs, it has been listed as medium importance due to the low confidence in the current evidence.
7.1 Characterisation of pressures/ threats	G01 and G03: Pressure: Section 6 shows that fishing is thought to result in higher disturbance in >25% of offshore reefs. The ranking of this pressure is considered high due to the sensitivity of this habitat to the effects of demersal trawling and fishing, and the large spatial overlap. The MB0102 sensitivity matrix assigns a high sensitivity score to the pressure generated by this activity (physical disturbance and physical loss). 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).
8.1 Status of measures	There is overlap between the feature and pressures known to impact the feature. A number of draft proposals have been recommended for the majority of offshore sites but have not been submitted yet to the European Commission and therefore not yet operational. 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. Management areas are proposed for some of the SACs where this habitat is present. The proposals aim at excluding demersal trawls, dredges and seine nets to protect Annex I Reefs feature within the sites management boundaries. Examples of some measures currently in place: - NEAFC (North east Atlantic Fisheries Commission) fisheries closure areas are in place in an area that include Hatton Bank SAC (NEAFC, 2018). - Byelaws are in place to protect biogenic ross worm (Sabellaria spinulosa) reefs by prohibiting the use of bottom towed fishing gear in specified areas of the Inner Dowsing, Race Bank and North Ridge and Haisborough, Hammond and Winterton SCIs (MMO, 2018). - Closures are in place in Darwin Mounds and North West Rockall SACs under Regulation (EC) No 850/98 and Regulation (EU) No 227/2013 respectively. - 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.
8.2 Main purpose of the measures taken	Conservation objectives for this feature within the MPAs where it is protected are mainly to restore the feature to favourable conservation status. 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 the Environmental Impact Assessment (EIA), Habitats and Birds Directives, conservation measures are implemented both inside and outside Natura 2000 sites; if features of conservation interest are identified during surveys for EIA Directive outside Natura 2000 sites, they are still given consideration in terms of impact limitation and mitigation.
8.4 Response to the measures	MB0102 sensitivity matrix has L-H for sensitivity to the fishing pressures abrasion and physical loss for reef broad-scale habitats. MB0102 rResilience scores are, therefore, high to very low which ranges from full recovery within 2 years to negligible or prolonged recovery; at least 25 years to recover structure and function (Tillin et al., 2010).
8.5 List of main conservation measures	CG01: In Section 7.1, two fishing pressures (G03 and G01) were ranked high in terms of both pressures and threats for Annex I offshore reefs. Some fisheries management measures already are in place while there is potential for others to be implemented over the next two reporting cycles. Conservation measures consisting of fisheries management areas/closures can be ranked as medium where operational and requiring gear restriction; these measures can remove or reduce significantly the pressure deriving from this type of activity, however, these measures only act over part of the area where the feature is found. 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 Fisheries management measures (CG01) were also listed as a conservation measure in the 2013 offshore report and were given the same ranking of '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.
11.4 Short term trend of habitat area in good condition within the network; Direction	The results of the extent of physical damage indicator (BH3) which was used to assess the condition of reefs (6.1), suggest that reefs are highly disturbed as a result of widespread fishing. Therefore, it is likely that the condition of reefs has deteriorated over the last 12 years. There is low confidence in this assessment. Monitoring surveys have only recently started on offshore reefs and so there aren't yet time-series data available. Fishing data has been constantly improving (see Section 6.2 audit above) making it difficult to compare data from the previous reporting round. For UK horse mussel reefs (Modiolus modiolus), the MSFD (Article 8) assessment of physical loss is showing a decrease in extent across their potential range, therefore, not achieving the Good Environmental Status target of 'maintain or increase' (Defra, in prep). The main identified causes include dredge and spoil disposal along with a number of coastal activities. An MSFD Biogenic Reef Indicator is currently being developed and tested with the aim of being used in the future to determine the condition of biogenic reef.
11.5 Short term trend of habitat area in good condition within the network; Method used	See 11.4