Marine Management Organisation

MMO Stage 3 Site Assessment: Wight-Barfleur Reef MPA (DRAFT)

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Title: MMO Stage 3 Site Assessment: Wight-Barfleur Reef MPA (DRAFT)

Contents

Executive Summary

This assessment analyses the impact of anchored nets and lines, and traps on the designated feature 'Annex I Reefs'' in Wight-Barfleur Reef Marine Protected Area (MPA) to determine whether an adverse effect on site integrity can be excluded beyond reasonable scientific doubt. The interaction between bottom towed gear and moderate energy circalittoral rock will not be assessed as this was already considered during Stage 2. The assessment sets out the evidence considered and analyses the quality of that evidence. **The assessment finds that ongoing fishing activities in the site will not result in an adverse effect on the site integrity of Wight Barfleur Reef MPA. As such the Marine Management Organisation (MMO) concludes that management measures are not required.**

1 Introduction

This assessment considers whether fishing activities are compatible with the conservation objectives of Wight-Barfleur Reef MPA.

This site is designated as a special area of conservation (SAC). This assessment uses the best available evidence to review site characteristics and fishing activity and determine if fishing activity is causing an adverse effect on the integrity of the site. If so, MMO will develop and introduce suitable management measures, such as MMO byelaws. If MMO byelaws are required, then these will be subject to public consultation and will require confirmation from the Secretary of State to come into effect.

2 Site information

2.1 Overview

The following Joint Nature Conservation Committee (JNCC) site information was used for background on site geography, designations, features, and conservation objectives:

- JNCC Site Information - Wight-Barfleur Reef SAC[1]

Wight-Barfleur Reef MPA is an offshore site located in the central English Channel and covers an area of 1,373 km^2 (**Figure 1**). It was designated as a SAC in 2017 to protect bedrock and stony reef in circalittoral and deep circalittoral waters characterised by a series of well-defined exposed bedrock ridges up to 4 m high. The south-east of the site has a large palaeochannel known as the Northern Palaeovalley which is largely unfilled by sediment due to the strong currents in the area, and is characterised by a gravel, cobble and boulder substrate which in places forms stony reef. The faunal communities of the MPA are characteristic of high and moderate energy circalittoral rock including sponges, tube worms, anemones and sea squirts which in turn support a range of fish species using the area as feeding and nursery grounds. The site is an excellent example of circalittoral bedrock and the only known example in offshore waters within the eastern English Channel. The designated features and their conservation objectives are set out in **Table 1**.

[1] JNCC Site Information – Wight-Barfleur Reef MPA: jncc.gov.uk/our-work/wight-barfleur-reef-mpa/ (Last accessed 27 October 2023)

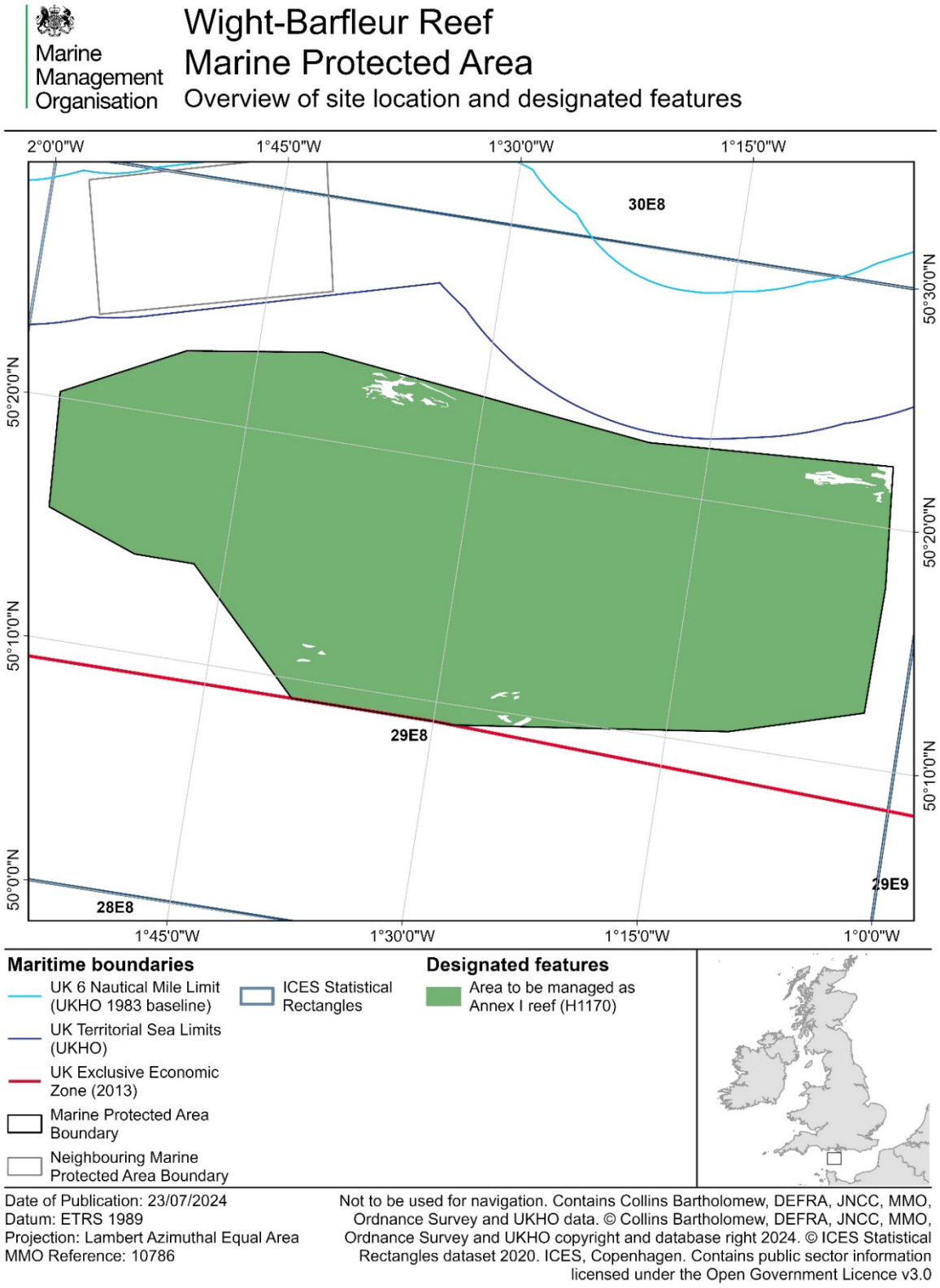

Figure 1: Wight-Barfleur Reef MPA location overview.

The conservation objectives for the features of Wight-Barfleur Reef MPA have been set based on a vulnerability assessment.

Table 1: Designated features, including supporting habitats, and conservation objectives.

Designated feature	Sub-feature	Conservation objective
Annex I Reefs	Bedrock and Stony reef (Circalittoral rock)	Restore to favourable condition.

There is no feature condition assessment available for this site; in its absence a vulnerability assessment, which includes sensitivity and exposure information for features and activities in a site, is used as a proxy for condition. The vulnerability assessment suggests that the site is in unfavourable condition. More information on this can be found in JNCC's supplementary advice on conservation objectives - Wight-Barfleur Reef MPA[2]. JNCC's impact assessment for Wight Barfleur Reef[3] before designation of the site as an SAC indicates that the site and associated biological communities have a moderate level of vulnerability to physical disturbance and/or abrasion, selective extraction of species from for example demersal fishing, and a lesser extent smothering, changes in suspended sediment and turbidity resulting from demersal fishing. Demersal fishing for sole in this region has contributed to the restore objectives.

2.2 Scope of this assessment

The scope of this assessment covers fishing activities alone, and relevant activities in combination with fishing.

Bottom towed gear interactions with the Annex I Reefs feature have not been included in this assessment as they have already been addressed in the MMO Stage 2 assessment of Wight-Barfleur Reef MPA. Stage 2 assessed the impacts of fishing using bottom towed gear on rock and rocky and biogenic reef in 13 MPAs and was subsequently prohibited by the MMO Marine Protected Areas Bottom Towed Fishing Gear Byelaw 2023[4].

[2] Supplementary advice on conservation objectives – Wight-Barfleur Reef MPA: hub.jncc.gov.uk/assets/11c55f61-4aa7-4665-a95b-0a552ccccd62#WBR-3 (Last accessed 26 June 2023)

[3] JNCC Impact Assessment (IA) for Wight-Barfleur Reef Special Area of Conservation, 2012: data.jncc.gov.uk/data/d2f2a300-5f46-46f4-9099-c73a3399f2a4/WBR-Final-ImpactAssessment.pdf

[4] MMO MPA Bottom Towed Fishing Gear Byelaw 2023: www.gov.uk/government/publications/marine-protected-areas-bottom-towed-fishing-gear-byelaw-2023 (Last accessed 28 August 2024)

3 Part A - Identified pressures on the MPA

Part A of this assessment was carried out in a manner that is consistent with the 'likely significant effect (LSE)' test required by regulation 63 of the Conservation of Habitats and Species Regulations 2017[5] and regulation 28 of the Conservation of Offshore Marine Habitats and Species Regulations 2017[6].

Part A assesses the interactions between pressures from fishing gears and the designated features of this site, screening for interactions that require further consideration. Assessment of interactions not screened out in Part A will form Part B of the assessment. For each activity assessed in Part A, there are two possible outcomes for each identified pressure-feature interaction:

1. The pressure-feature interactions **are not** included for assessment in Part B and screened out:
    a. if the feature is not exposed to the pressure, and is not likely to be in the future;
    b. if the effect/impact of the pressure is not likely to be significant; or
    c. if MMO has information that the activity or pressure is not occurring in the site and/or does not need to be considered further.

2. The pressure-feature interactions **are** included for assessment in Part B:
    a. if the feature is exposed to the pressure, or is likely to be in the future;
    b. if the potential scale or magnitude of any effect is likely to be significant;
    c. if it is not possible to determine whether the magnitude of any effect is likely to be significant; or
    d. if MMO has information that the activity or pressure is occurring in the site and/or does need to be considered further.

3.1 Activities taking place

Table 2 lists all commercial fishing gears included for assessment. All other gears have been screened out of further assessment as they do not take place and are not likely to take place in the future, as there are no vessel monitoring system (VMS) records present within the site linked to these gear codes, nor do they appear in landings data for International Council for the Exploration of the Sea (ICES) statistical rectangles that overlap the site.

To determine fishing activity occurring within the site, the following evidence sources were used:

- VMS data;

[5] For more information see: www.legislation.gov.uk/uksi/2017/1012/regulation/63.
[6] For more information: www.legislation.gov.uk/uksi/2017/1013/regulation/28

- fisheries landings data (logbooks and sales records);
- ICES rectangle level fishing effort data in days (reference: MMO1264); and
- swept area ratio (SAR) data.

For more information about the above evidence sources, please see the MPA Site Assessment Methodology document[7], which describes each type of fishing activity evidence and summarises the strengths and limitations of each source.

Table 2: Fishing activities covered by this assessment present in VMS records (2016 to 2021) and landings data (2016 to 2020) for Wight-Barfleur Reef MPA.

Gear type	Gear name	Gear code	Justification
Anchored nets and lines	Gill nets (not specified)	GN	Present in under 12 m vessel landings data for ICES statistical rectangles that overlap the site.
	Gillnets and entangling nets	GEN	
	Set gillnet (anchored)	GNS	
	Trammel net	GTR	
	Drift gillnet	GND	
	Hand-operated pole-and-line	LHP	
	Hook and line (unspecified)	LX	
	Longlines (demersal)	LLS	Present in VMS records and in over 12 m vessel landings data for ICES statistical rectangles that overlap the site.
Bottom towed gear	Pair seine	SPR	Present in VMS records.
	Otter trawls (unspecified)	OT	Present in under 12 m vessel landings data for ICES statistical rectangles that overlap the site.
	Twin bottom otter trawl	OTT	Present in VMS records and in under 12 m vessel landings data for ICES statistical rectangles that overlap the site.
	Danish / anchor seine	SDN	Present in VMS records and in over 12 m vessel
	Scottish / fly seine	SSC	

[7] MPA Site Assessment Methodology document: www.gov.uk/government/publications/stage-3-site-assessments (Last accessed 13 August 2024).

Gear type	Gear name	Gear code	Justification
			landings data for ICES statistical rectangles that overlap the site.
	Beam trawl	TBB	Present in VMS records and in under and over 12 m vessel landings data for ICES statistical rectangles that overlap the site.
	Bottom otter trawl	OTB	
	Boat dredge	DRB	
	Bottom pair trawl	PTB	Present in VMS records.
Midwater gear	Midwater otter trawl	OTM	Present in VMS records and in over 12 m vessel landings data for ICES statistical rectangles that overlap the site.
	Midwater pair trawl	PTM	
Traps	Pot/Creel	FPO	Present in VMS records and in under and over 12 m vessel landings data for ICES statistical rectangles that overlap the site.
	Trap	FIX	Present in under 12 m vessel landings data for ICES statistical rectangles that overlap the site.
Miscellaneous	Unknown	NK	Present in VMS records.

3.2 Pressures and activities screened out

This section identifies activities or pressures that are **occurring but do not need to be considered** for Wight-Barfleur Reef MPA.

The gear types and pressures screened out on this basis are listed below with justification:

- **Midwater gears:** although the use of midwater gears does occur within Wight-Barfleur Reef MPA, there is no feasible pathway for gears of this type to interact with benthic designated features. These gears are not designed to operate on or near the seabed and are deployed entirely within the water column. Therefore, the use of midwater gear within Wight-Barfleur Reef MPA

is not considered to be capable of affecting the designated features other than insignificantly and is not considered further within this assessment.

- **Bottom towed gear interactions with the features high and moderate energy circalittoral rock**: Bottom towed gear interactions with the Annex I Reefs feature have not been included in this assessment as they have already been addressed in the MMO Stage 2 assessment. Stage 2 assessed the impacts of fishing using bottom towed gears on rock and rocky and biogenic reef in 13 MPAs and subsequently prohibited such interactions through the MMO Marine Protected Areas Bottom Towed Fishing Gear Byelaw 2023[8].
- **Unknown gear:** 'other gear' has been declared as having been used to land fish from this ICES statistical rectangle. The gear code used to report these landing does not provide any further information relation to the fishing method used. It is therefore not possible to assess the likelihood of this fishing method interacting with the seabed and it is not considered further within this assessment.

3.3 Pressures to be taken forward to Part B

The Stage 3 Fishing Gear MPA Impacts Evidence documents detail all pressures created by fishing activity on features of interest. The documents justify which pressures should be taken forward for consideration for each feature. This is documented in Table A1.2 in the anchored nets and lines, and traps Impacts Evidence documents:

- Stage 3 Fishing Gear MPA Impacts Evidence Anchored Nets and Lines [9]; and
- Stage 3 Fishing Gear MPA Impacts Evidence Traps[10].

To determine whether a pressure should be taken forward for this particular site, **Table 3** uses the information from the Impacts Evidence documents, alongside site level information, including sensitivity assessments, risk profiling of pressures from conservation advice packages, and JNCC advice to assess the sensitivities of pressures on the designated features of the site. **Table 3** details the pressures for

[8] MMO MPA Bottom Towed Fishing Gear Byelaw 2023: www.gov.uk/government/publications/marine-protected-areas-bottom-towed-fishing-gear-byelaw-2023 (Last accessed 29 August 2024)
[9] Stage 3 Fishing Gear MPA Impacts Evidence Anchored Nets and Lines www.gov.uk/government/publications/marine-protected-areas-stage-3-impacts-evidence (Last accessed 13 August 2024)
[10] Stage 3 Fishing Gear MPA Impacts Evidence Traps www.gov.uk/government/publications/marine-protected-areas-stage-3-impacts-evidence (Last accessed 13 August 2024)

each gear type - anchored nets and lines (A), and traps (T) - to be assessed in Part B, taking into account the pressures screened out in **sections 3.1** and **3.2**.

Key	
	Dark blue highlighting indicates that the feature is sensitive to this pressure from the gear type in this site, and that the interaction should be taken forward for consideration.
	Light blue highlighting indicates that feature is sensitive to the pressure in general, but the gear type is unlikely to exert this pressure to an extent where impacts are of concern in the site.
	Grey highlighting indicates that there is insufficient evidence to make sensitivity conclusions, or that a sensitivity assessment has not been made for this feature to this pressure from the gear type.
	If there is no highlighting within a cell, this indicates that the pressure from the gear type is not relevant to the feature, or that the feature is not sensitive to the pressure.

Table 3: Summary of pressures on designated feature of Wight-Barfleur Reef MPA to be taken forward to Part B.

Potential pressures	Designated feature	
	Annex I Reefs	
	Circalittoral rock	
	A	T
Abrasion or disturbance of the substrate on the surface of the seabed		
Hydrocarbon and polycyclic aromatic hydrocarbon (PAH) contamination		
Introduction or spread of invasive non-indigenous species		
Litter		
Organic enrichment		
Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion		
Removal of non-target species		
Removal of target species		
Synthetic compound contamination		
Transition elements and organo-metal contamination		

4 Part B - Fishing activity assessment

Part B of this assessment was carried out in a manner that is consistent with the 'appropriate assessment' required by regulation 63 of the Conservation of Habitats and Species Regulations 2017[5] and regulation 28 of the Conservation of Offshore Marine Habitats and Species Regulations 2017[6].

Table 3 shows the fishing activities and pressures identified in Part A which have been included for assessment in Part B. The most relevant attributes of the designated features that could be compromised by fishing pressures were identified using the JNCC Wight-Barfleur Reef MPA conservation advice package and are shown in **Table 4**.

Table 4: Relevant favourable condition targets for identified pressures.

Feature	Attribute	Target	Relevant pressures
Annex I Reefs	• Extent and distribution • Structure and function • Supporting processes	Restore	• Abrasion or disturbance of the substrate on the surface of the seabed. • Removal of non-target species.

4.1 Fisheries access and existing management

Non-UK vessels can operate within Wight-Barfleur Reef MPA, provided that they have a licence issued by the UK to do so. Nationalities which fished within the MPA from 2016 to 2021 include vessels from Belgium, Denmark, Finland, France, Germany, Ireland, Lithuania, the Netherlands, Norway, Portugal, Spain, and the UK. VMS records indicate that vessels from France and the UK were most prevalent.

The MMO Marine Protected Areas Bottom Towed Fishing Gear Byelaw 2023 prohibits fishing using bottom towed gears on rock and rocky and biogenic reef in Wight Barfleur Reef MPA.

More information on non-UK vessel access to UK waters can be found on MMO's Single Issuing Authority page[11].

4.2 Fishing activity summary

Tables A1.1 to A1.12 in **Annex 1** display a detailed breakdown of fishing activity within Wight-Barfleur Reef MPA. VMS record counts were available from 2016 to

[11] The UK Single Issuing Authority: www.gov.uk/guidance/united-kingdom-single-issuing-authority-uksia (Last accessed 04 October 2023).

2021 and landings data were available from 2016 to 2020. When discussing weights from landings in this section, figures used are a total of weights from all nationalities.

Of the fishing activities not screened out in Part A of this assessment, traps were the most prevalent gear type. There was a total of 490 VMS records for vessels over 12 m using traps, accounting for 26 % of all VMS records in the site between 2016 and 2021. However, 327 VMS records for traps came from 2016 alone, dropping to 36 records in 2017 and remaining at a similar level each year through to 2021. Over 12 m vessels using traps landed an annual average of 12 tonnes (t) between 2016 and 2020. VMS records were distributed in the southern half of the MPA overlapping the designated reef feature.

For vessels under 12 m in length, landings data have been used to determine activity in the absence of VMS records. These data are recorded at ICES rectangle level and have been attributed to Wight-Barfleur Reef MPA based on the 34.66 % of the ICES rectangle intersected by the MPA (**Figure 1**). Because of this, there are limitations on the accuracy of this data, as it is only possible to estimate how much activity is occurring in the MPA based on the average activity across the entire rectangle, rather than at specific locations within the site. Fishing effort days derived from logbooks are also collected at ICES rectangle level and then apportioned accordingly using the percentage overlap of the MPA (**Table A1. 4**). Vessels under 12 m using traps landed an estimated total of 175 t, and an annual average of 23 t. Traps also accounted for 93% of the total UK under 12 m fishing effort in the site between 2016 and 2021.

There were only 7 VMS records for anchored nets and lines, all of which were from 2016 alone and landed a total of 6 t, which averages out to 1 t per year. These records were from the eastern half of the MPA overlapping the designated reef feature. Under 12 m vessels using anchored nets and lines in the site between 2016 and 2020 landed an estimated total of 21 t and an annual average of 4 t.

4.3 Pressures by gear type

The Stage 3 Fishing Gear MPA Impacts Evidence documents for anchored nets and lines[9], and traps[10] collate and analyse the best available evidence on the impacts of different fishing gears on MPA features. This section summarises the analyses and conclusions of those documents, and considers these alongside site level information, including the nature and condition of the habitats and species present, conservation objectives, intensity of fishing activity taking place and exposure to natural disturbance.

In the context of MPA assessment, the pressures removal of target and non-target species refer to any damage, loss, or removal of species defined as a designated feature, or integral to the integrity of a designated feature (for example key structural

or influential species). This may occur through intentional or unintentional catch associated with the act of commercial fishing.

Impacts from target and/or non-target removal pressures have been scoped out from this assessment in most cases, as the detail of key structural and influential species is yet to be fully defined and they are assessed more completely within the abrasion and penetration pressures.

These pressures may require consideration as a result of any future evidence review, in conjunction with updated conservation advice from JNCC. Where separate consideration of these pressures is required, this has been stated.

There is limited survey information available for this site so available information on biotopes of the features potentially present in the site have been assessed at the Eastern English Channel sub-region level. Wight-Barfleur Reef MPA's location in terms of sub-region and information about the biotopes was taken from evidence from 'Assigning the EUNIS classifications to UK's Offshore Regional Seas 2020' (Tillin *et al.*, 2020) which lists those European Nature Information System (EUNIS) biotopes that were present, likely to be present ('possible'), or absent from each UK offshore sub-region based on survey data, environmental information, species records, literature and expert judgement. Sensitivity information was extracted from Marlin[12].

Using this information biotopes were screened out if:

- they were not located in the same bioregion as Wight-Barfleur Reef MPA;
- if they were only found in the inshore area;
- if they were out of the depth range for the site (25 to 100 m); or
- if they were not sensitive or had low sensitivity to the relevant pressures in **Table 4**.

The resulting screened in biotopes are listed in **Table 5**.

[12] Sensitivity information from Marlin. www.marlin.ac.uk/ (Last accessed 23 June 2023)

Table 5: Biotopes in Eastern English Channel sub-region 3 to be considered for the designated feature Annex I Reefs; circalittoral rock.

Biotope name	Sensitivity to abrasion
Deep sponge communities (Readman, 2018)	High
Phakellia ventilabrum and Axinellid sponges on deep, wave-exposed circalittoral rock (Readman, K.A. Lloyd and Watson, 2023c)	
Eunicella verrucosa and *Pentapora foliacea* on wave-exposed circalittoral rock (Readman, Jackson, *et al.*, 2023)	
Bryozoan turf and erect sponges on tide-swept circalittoral rock (Readman, K. A. Lloyd and Watson, 2023)	Medium
Mixed turf of bryozoans and erect sponges with *Cylista elegans* on tide-swept ciraclittoral rock (Readman, K.A. Lloyd and Watson, 2023b)	
Sponges and anemones on vertical circalittoral bedrock (Readman, K.A. Lloyd and Watson, 2023d)	
Caryophyllia (Caryophyllia) smithii and *Swiftia pallida* on circalittoral rock (Readman, Durkin, *et al.*, 2023)	
Brittlestars overlying coralline crusts, *Parasmittina trispinosa* and *Caryophyllia (Caryophyllia) smithii* on wave-exposed circalittoral rock (De-Bastos and Hill, 2016)	
Urticina felina and sand-tolerant fauna on sand-scoured or covered circalittoral rock (Tillin and Hiscock, 2016)	
Brittlestars on faunal and algal encrusted exposed to moderately wave-exposed circalittoral rock (De-Bastos *et al.*, 2023)	
Sabellaria spinulosa encrusted circalittoral rock (Tillin, Marshall, Gibb, Lloyd, *et al.*, 2023a)	
Sabellaria spinulosa with a bryozoan turf and barnacles on silty turbid circalittoral rock (Tillin, Marshall, Gibb, Lloyd, *et al.*, 2023b)	
Sabellaria spinulosa, didemnids and other small ascidians on tide-swept moderately wave-exposed circalittoral rock (Tillin, Marshall, Gibb, Williams, *et al.*, 2023)	
Mytilus edulis beds with hydroids and ascidians on tide-swept exposed to moderately wave-exposed circalittoral rock (Tyler-Walters, Mainwaring and Williams, 2022)	
Circalittoral faunal communities in variable salinity (Readman, K.A. Lloyd and Watson, 2023a)	

4.3.1 Anchored nets and lines

The relevant pressures on the Annex I Reefs of Wight-Barfleur Reef MPA from anchored nets and lines were identified in **Table 4** and are:

- abrasion or disturbance of the substrate on the surface of the seabed; and
- removal of non-target species.

As noted, impacts from target and non-target removal pressures have been scoped out of this assessment, as they are assessed more completely within the abrasion and penetration pressures.

Impacts on reef features relating to abrasion or disturbance of the substrate on the surface of the seabed occur primarily from the footrope and anchors during the hauling of gear, and during movement along the seabed due to tides, currents or storms. As per section 7.3 of the anchored nets and lines Impacts Evidence document[9], while abrasion impacts from this gear type may cause sediment veneer disturbance and damage to epifaunal/epifloral communities, physical damage to the rock itself is unlikely. Some studies indicate that slow growing branching species and rock with erect branching species are considered particularly sensitive to damage from netting, whilst rock with low-lying fast growing faunal turf has been determined as having moderate sensitivity to moderate levels of netting. Repeated netting activity could damage reefs and the associated communities through cumulative damage.

Table 5 lists those biotopes which may be present in Wight-Barfleur Reef MPA. Out of 15 possible biotopes three of the biotopes have a high sensitivity to abrasion. Out of 15, 12 of the biotopes have a medium sensitivity to abrasion.

Section 4.3 describes fishing activity within Wight-Barfleur Reef MPA, and notes that anchored nets and lines within the site had annual average landings of 5 t for combined over 12 m and under 12 m vessels between 2016 and 2020. Although the fishing activity from over 12 m vessels using anchored nets and lines overlaps the designated feature, at the level of activity observed the risk of abrasion and disturbance is limited. The site is also subject to strong currents, biological communities that dominate Wight Barfleur Reef MPA are therefore likely to be acclimatised to some level of disturbance and will have a degree of resilience to abrasion. As such, it is considered that at these activity levels, and with disturbance of the substrate on the surface of the seabed by anchored nets and lines considered to be relatively low, given the small footprint of gear, the use of anchored nets and lines is unlikely to create heavy disturbance over an extensive range and hence the resilience of the community should be maintained.

With regards to the discussion above, the assessed activity levels and the evidence available for the impact of anchored nets and lines, **MMO concludes that, at the levels described, the use of anchored nets and lines will not result in an adverse effect on site integrity for Wight-Barfleur Reef MPA.**

4.3.2 Traps

The relevant pressures on the Annex I Reefs of Wight-Barfleur Reef MPA from traps were identified in **Table 4** and are:

- abrasion or disturbance of the substrate on the surface of the seabed; and
- removal of non-target species.

As noted, impacts from target and non-target removal pressures have been scoped out of this assessment, as they are assessed more completely within the abrasion and penetration pressures.

As per section 7.3 of the traps Impacts Evidence document[10], abrasion impacts from this gear type are unlikely to impact the rocky substrate itself but may impact associated taxa. Most of the literature before 2015 has suggested that traps are unlikely to significantly impact rocky reef biotopes. However, more recent studies suggest that traps will have negative impacts on the biological functions of reef habitats at increased spatial and temporal densities. (Rees, 2018) for example defined high potting as 30 pots and higher per 500 x 500 m. Due to the lack of knowledge on how many pots are being set in the MPA, and the fact that data on fishing effort has been apportioned to the MPA based on the percentage area of the ICES rectangle that intersects the MPA, these thresholds are not directly comparable to the information available for the MPA. However, the levels evident from fishing effort data, VMS records and landings figures for Wight-Barfleur Reef MPA suggest that potting is well below the levels defined as high potting in (Rees, 2018). Studies show that upright and branching species that protrude from the reef (such as sponges or bryozoans) were found to be particularly vulnerable to damage from the hauling of traps. The impact of abrasion or disturbance of the substrate on the surface of the seabed by traps is considered to be relatively low given the small footprint of gear, though the different sizes, materials and number of traps will mean the impact varies.

Table 5 lists those biotopes which may exist in Wight-Barfleur Reef MPA. Out of 15 possible biotopes three of the biotopes have a high sensitivity to abrasion. Out of 15, 12 of the biotopes have a medium sensitivity to abrasion.

Section 4.3 describes the fishing activity within Wight-Barfleur Reef MPA and estimates that an annual combined average for both over and under 12 m vessels of 35 t were landed from within the MPA using traps.

Although MMO webmaps indicate that areas to be managed as reef can be found across the site and overlaps fishing activity from traps, at the level of activity observed, risk of abrasion and disturbance is limited. The site is also subject to strong currents, biological communities that dominate Wight-Barfleur Reef MPA are therefore likely to be acclimatised to some level of disturbance and will have a degree of resilience to abrasion. Given the relatively low levels of trap activity within

the site, together with the low scale of footprint for impacts from traps, it is considered that trap activity is unlikely to create heavy disturbance over an extensive range and hence the resilience of the community should be maintained at these activity levels.

With regards to the discussion above, the assessed activity levels and the evidence available for the impact of traps, **MMO concludes that, at the levels described, the use of traps will not result in an adverse effect on site integrity for Wight-Barfleur Reef MPA.**

4.4 Part B conclusion

The assessment of anchored nets and lines, and traps on the reef feature of Wight-Barfleur Reef MPA has concluded that, at the levels described the use of anchored nets and lines, and traps will not result in an adverse effect on the site integrity of the MPA. Management measures will not therefore be implemented for anchored nets and line, and traps for Wight-Barfleur Reef MPA.

5 Part C - In-combination assessment

This section assesses the impacts of fishing activities in-combination with relevant activities taking place. This includes the following:

- fishing interactions assessed in Part B but which were not considered, alone, to have an adverse effect on the site integrity; and
- other activities: such as marine development infrastructure plans and projects that occur in the MPA.

ArcGIS software has been used to check relevant activities that occur within, or adjacent to, the assessed site where there could be a pathway for impact. To determine relevant activities to be included in this part of the assessment, a distance of 5 km was selected as suitable to capture any potential way in which the activity could impact the benthic features of the site in-combination with effects of the fishing activities assessed. A 5 km buffer was therefore applied to the site boundary to identify relevant activities. This assessment considers the in-combination impacts of marine licensable activities that are ongoing or upcoming, and with the same medium to high-risk pressure impact pathways as permitted fishing activity. As the models were run using ArcGIS in August 2023, any licences that ended before this date were screened out of the assessment.

The North Sea Transition Authority (NSTA) is responsible for regulating the oil, gas and carbon storage industries, and as such these activities fall outside of MMO's marine licensing remit. Oil, gas and carbon storage industry activities are not currently considered in this draft assessment, as information on the potential pressures exerted by associated activities is currently under review, and the likelihood of these activities resulting in an in-combination adverse effect on site integrity with fishing is expected to be very low. Following formal consultation, relevant oil, gas and carbon storage industry activities that could impact the site in-combination with the effects of assessed fishing activities will be included before finalising this assessment, alongside marine licence applications submitted after August 2023.

There may be operational and historic submarine cables within this MPA, these cables are already in-situ and are unlikely to have any residual abrasion/removal pressure in-combination with the assessed fishing activity. Any abrasion/removal pressure from submarine cable operation and maintenance activity will be temporary with limited seabed impacts and is therefore unlikely to have significant in-combination effects with assessed fishing.

Anchored nets and lines, and traps, are the only remaining fishing activities occurring within Wight Barfleur Reef MPA that interact with the seabed. In-combination effects of these fishing activities as well as these activities in-combination with other relevant activities will be assessed in this section.

In accordance with the methodology detailed above, ArcGIS identified one licence held by Cemex for aggregate extraction in Area 407, within the 5 km buffer applied. **Table 6** shows this activity and the relevant category from the JNCC Pressures-Activities Database (PAD)[13].

Table 6: summary of marine licensable activities and associated PAD categories.

Marine licence case reference number[14]	PAD Category	Description
MLA/2011/00302/1	Aggregate dredging Physical Sampling	Cemex Area 407 aggregate extraction sites 2 km north of the north eastern corner of the MPA. Activities include removal of sediment for sampling purposes and aggregate dredging. Outside of the site boundary. **No direct or indirect pressure pathway for impact and therefore, no in-combination effects possible.**

The PAD and **Table 3** from section 3.3, were used to identify medium-high risk pressures exerted by fishing and non-fishing activities to identify those which require in-combination assessment (**Table 7**).

Table 7 summarises the pressures exerted by fishing and non-fishing activities and identifies those exerted by both (Y: pressure exerted). Activity-pressure interactions

[13] JNCC Pressures-Activities Database (PAD): hub.jncc.gov.uk/assets/97447f16-9f38-49ff-a3af-56d437fd1951)

[14] Details on the marine licence activities can be viewed on the public register of marine licence applications and decisions, searching by the marine licence case reference numbers: marinelicensing.marinemanagement.org.uk/mmofox5/fox/live/MMO_PUBLIC_REGISTER

are highlighted dark blue to illustrate an in-combination effect. Only fishing activity with no proposed or current fisheries management in place are considered.

Table 7: Pressures exerted by fishing and non-fishing activities.

	Fishing activities	
Potential pressures	**Anchored nets and lines**	**Traps**
Abrasion or disturbance of the substrate on the surface of the seabed	Y	Y
Removal of non-target species	Y	Y

5.1 In-combination pressure sections

Fisheries vs fisheries in-combination pressures will be considered in this section.

5.2 Fishing vs Fishing in-combination pressures

5.2.1 Abrasion and disturbance of the substrate on the surface of the seabed and removal of target and non-target species

As noted in Part B (**Section 4.3.1** nets and lines and **Section 4.3.2** traps), impacts from the removal of target and non-target species pressure is not being considered in detail in this assessment. In-combination impacts from the removal of target and non-target species pressures are more fully assessed under the pressure abrasion, as the detail of key structural and influential species is yet to be fully defined. Therefore, the removal pressures are not considered further in this in-combination assessment. The pressures may require further consideration as future evidence becomes available, in conjunction with updated conservation advice from JNCC and Natural England.

The annual average VMS records for over 12 m vessels within the MPA totalled 83 (1 count for anchored nets and lines, and 82 counts for traps). For under 12 m vessels, between 2016 and 2020, the annual average fishing effort estimated to have been derived from the MPA via traps and anchored nets and lines was 101 (2.62 days for anchored nets and lines, and 98.82 days for traps). For the same period (2016-2020), the total fishing effort (under 12s) estimated to have been derived from the MPA were 609 days (15.73 days for anchored nets and lines, and 592.90 days for traps). The fishing effort data is further supported by the estimated live weight landings for under 12 m vessels (both UK and EU) that equal an annual average of 27.26 tonnes (4.17 tonnes for anchored nets and lines, and 23.09 tonnes for traps), between 2016 and 2020.

The combined impacts from anchored nets and lines and traps could potentially increase the risk of negative effects from the pressures, abrasion and disturbance,

and removal of target and non-target species. However, the annual average anchored nets and lines effort is low (2.62 days) and there is only one VMS recording of over 12 m vessels using anchored nets and lines. Trap activity has been assessed alone as having no significant risk to the integrity of the site, as such with the addition of such low anchored nets and lines activity, any in-combination impact is considered insignificant.

Therefore, the combined pressures from anchored nets and lines and traps will not result in an adverse effect on site integrity for Wight Barfleur Reef MPA at the levels described.

5.3 Fishing vs non-fishing activities in-combination pressures

The designated features of the Wight Barfleur MPA are sensitive to physical damage through surface abrasion and disturbance of the substrate from anchored nets and lines and traps during gear deployment, movement of the gear on the seabed due to tidal movements and storm activity, and as the gear is dragged along the seabed during retrieval.

Activities associated with the aggregate dredging (MLA/2011/00302/1) which might cause abrasion or disturbance of the seabed relate to the marine aggregate extraction and physical sampling from area 407, south of the Isle of White. This project looks to extract a maximum of 15,000,000 tonnes of material over a 15-year period. In addition, seabed sediment samples will be taken via grab or vibrocore sampling throughout the lifetime of the project. However, these activities will take place adjacent to and not within the MPA boundaries. Therefore, there are no medium to high-risk pressure pathways associated with these marine licensable activities that could have an impact on the designated features within the site boundary and are therefore not considered further in this in-combination assessment.

Therefore, MMO concludes that the combined pressures from anchored nets and lines and traps and other relevant activities will not result in an adverse effect on site integrity for the Wight Barfleur MPA.

5.4 Part C conclusion

MMO concludes that fishing in-combination with other relevant activities will not result in an adverse effect on the site integrity for Wight Barfleur Reef MPA. Further management measures will not therefore be implemented for fishing activities currently occurring within the MPA.

6 Conclusion and proposed management

Part A of this assessment concluded that anchored nets and lines, and traps, are likely to have a significant effect on the designated features of Wight Barfleur Reef MPA.

Parts B and C of this assessment concluded that at the activity levels described, use of anchored nets and lines and traps, alone or in combination with each other and with other relevant activities, will not result in an adverse effect on site integrity of the MPA. Therefore, no further management will be implemented.

7 Review of this assessment

MMO will review this assessment every five years, or earlier if significant new information is received. Such information could include:

- updated conservation advice
- updated advice on the condition of the site's feature(s)
- significant increase in activity levels

To coordinate the collection and analysis of information regarding activity levels, and to ensure that any required management is implemented in a timely manner, a monitoring and control plan will be implemented for this site. This plan will be developed in line with MMO's Monitoring and Control Plan framework.

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Annex - Fishing activity data

Table A1. 1: VMS record count per nation group (UK and EU Member State) and proportional activity (%), per gear, per gear group, per year (2016 to 2021), totals and annual average (2016 to 2021).

			2016		2017		2018		2019		2020		2021		Total (2016 to 2021)		Annual average (2016 to 2021)
Gear group	**Gear code**	**Nation group**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**
Anchored Net/Line	LLS	EU	7	100	0	0	0	0	0	0	0	0	0	0	7	100	1
	LLS Total		**7**	**100**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**100**	**1**
Anchored Net/Line Total			**7**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**1**
Demersal Seine	SDN	EU	3	100	0	0	3	100	1	100	7	88	2	100	16	94	3
	SDN	UK	0	0	0	0	0	0	0	0	1	13	0	0	1	6	0
	SDN Total		**3**	**43**	**0**	**0**	**3**	**33**	**1**	**50**	**8**	**100**	**2**	**14**	**17**	**39**	**3**
	SPR	EU	0	0	0	0	1	100	0	0	0	0	0	0	1	100	0
	SPR Total		**0**	**0**	**0**	**0**	**1**	**11**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**0**
	SSC	EU	4	100	4	100	5	100	1	100	0	0	12	100	26	100	4
	SSC Total		**4**	**57**	**4**	**100**	**5**	**56**	**1**	**50**	**0**	**0**	**12**	**86**	**26**	**59**	**4**
Demersal Seine Total			**7**	**1**	**4**	**2**	**9**	**5**	**2**	**1**	**8**	**3**	**14**	**3**	**44**	**2**	**7**
Demersal trawl	OTB	EU	88	100	85	98	51	100	147	100	175	100	223	100	769	100	128
	OTB	UK	0	0	2	2	0	0	0	0	0	0	0	0	2	0	0
	OTB Total		**88**	**98**	**87**	**93**	**51**	**85**	**147**	**91**	**175**	**91**	**223**	**73**	**771**	**85**	**129**
	OTT	EU	0	0	0	0	0	0	1	100	1	100	62	100	64	100	11
	OTT Total		**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**1**	**62**	**20**	**64**	**7**	**11**
	PTB	EU	0	0	0	0	0	0	0	0	0	0	1	100	1	100	0

			2016		2017		2018		2019		2020		2021		Total (2016 to 2021)		Annual average (2016 to 2021)
Gear group	**Gear code**	**Nation group**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**
	PTB Total		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**0**	**0**
	TBB	EU	2	100	7	100	9	100	13	100	16	100	19	100	66	100	11
	TBB Total		**2**	**2**	**7**	**7**	**9**	**15**	**13**	**8**	**16**	**8**	**19**	**6**	**66**	**7**	**11**
Demersal trawl Total			**90**	**15**	**94**	**56**	**60**	**30**	**161**	**77**	**192**	**67**	**305**	**74**	**902**	**48**	**150**
Dredge	DRB	EU	140	100	26	93	43	100	1	100	51	100	9	100	270	99	45
	DRB	UK	0	0	2	7	0	0	0	0	0	0	0	0	2	1	0
	DRB Total		**140**	**100**	**28**	**100**	**43**	**100**	**1**	**100**	**51**	**100**	**9**	**100**	**272**	**100**	**45**
Dredge Total			**140**	**24**	**28**	**17**	**43**	**22**	**1**	**0**	**51**	**18**	**9**	**2**	**272**	**15**	**45**
Midwater Trawl	OTM	EU Member State	9	100	5	100	39	100	5	100	8	100	36	100	102	100	17
	OTM Total		**9**	**60**	**5**	**71**	**39**	**81**	**5**	**31**	**8**	**100**	**36**	**77**	**102**	**72**	**17**
	PTM	EU	6	100	2	100	9	100	11	100	0	0	1	9	29	74	5
	PTM	UK	0	0	0	0	0	0	0	0	0	0	10	91	10	26	2
	PTM Total		**6**	**40**	**2**	**29**	**9**	**19**	**11**	**69**	**0**	**0**	**11**	**23**	**39**	**28**	**7**
Midwater Trawl Total			**15**	**3**	**7**	**4**	**48**	**24**	**16**	**8**	**8**	**3**	**47**	**11**	**141**	**8**	**24**
Traps	FPO	UK	327	100	36	100	37	100	26	100	28	100	36	100	490	100	82
	FPO Total		327	100	36	100	37	100	26	100	28	100	36	100	490	100	82
Traps Total			**327**	**55**	**36**	**21**	**37**	**19**	**26**	**13**	**28**	**10**	**36**	**9**	**490**	**26**	**82**
Unknown	NK	EU	4	67	0	0	0	0	0	0	0	0	0	0	4	50	1
	NK	European Free Trade	2	33	0	0	0	0	2	100	0	0	0	0	4	50	1

			2016		2017		2018		2019		2020		2021		Total (2016 to 2021)		Annual average (2016 to 2021)
Gear group	Gear code	Nation group	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count
		Association															
	NK Total		6	100	0	0	0	0	2	100	0	0	0	0	8	100	1
Unknown Total			6	1	0	0	0	0	2	1	0	0	0	0	8	0	1
Grand Total			592	1	169	0	197	0	208	0	287	0	411	1	1864	0	310

Table A1. 2: UK live weight landings tonnage (t) estimates by gear from vessels over 12 m in length in the MMO section of Wight-Barfleur Reef MPA (2016 to 2020).

Gear group	Gear code	2016	2017	2018	2019	2020	Total (2016 to 2020)	Average (2016 to 2020)
Demersal Seine	SDN	0.00	0.00	0.00	0.00	0.07	0.07	0.01
Demersal Seine Total		**0.00**	**0.00**	**0.00**	**0.00**	**0.07**	**0.07**	**0.01**
Demersal trawl	OTB	0.00	0.02	0.00	0.00	0.00	0.02	0.00
Demersal trawl Total		**0.00**	**0.02**	**0.00**	**0.00**	**0.00**	**0.02**	**0.00**
Dredge	DRB	0.00	1.13	0.00	0.00	0.00	1.13	0.23
Dredge Total		**0.00**	**1.13**	**0.00**	**0.00**	**0.00**	**1.13**	**0.23**
Traps	FPO	27.13	5.12	24.04	1.42	1.39	59.11	11.82
Traps Total		**27.13**	**5.12**	**24.04**	**1.42**	**1.39**	**59.11**	**11.82**
Grand Total		**27.13**	**6.28**	**24.04**	**1.42**	**1.46**	**60.33**	**12.07**

Table A1. 3: EU27 live weight landings tonnage (t) estimates by gear from vessels over 12 m in length in the MMO section of Wight-Barfleur Reef MPA (2016 to 2020).

Gear group	Gear code	2016	2017	2018	2019	2020	Total (2016 to 2020)	Average (2016 to 2020)
Anchored Net/Line	LLS	5.60	0.00	0.00	0.00	0.00	5.60	1.12
Anchored Net/Line Total		**5.60**	**0.00**	**0.00**	**0.00**	**0.00**	**5.60**	**1.12**
Demersal Seine	SDN	0.00	0.00	0.00	0.06	0.00	0.06	0.01
	SSC	0.00	0.00	1.00	0.00	0.00	1.01	0.20
Demersal Seine Total		**0.00**	**0.00**	**1.00**	**0.06**	**0.00**	**1.06**	**0.21**
Demersal trawl	OTB	8.71	7.06	4.86	6.12	7.90	34.64	6.93
	TBB	7.40	23.56	53.83	47.96	17.33	150.07	30.01
Demersal trawl Total		**16.10**	**30.62**	**58.68**	**54.08**	**25.23**	**184.72**	**36.94**
Dredge	DRB	0.58	0.00	0.00	0.03	0.00	0.61	0.12
Dredge Total		**0.58**	**0.00**	**0.00**	**0.03**	**0.00**	**0.61**	**0.12**
Midwater Trawl	OTM	12.56	286.86	63.04	2.29	4.78	369.53	73.91
	PTM	0.40	0.07	0.63	0.71	0.00	1.80	0.36
Midwater Trawl Total		**12.96**	**286.93**	**63.67**	**2.99**	**4.78**	**371.33**	**74.27**
Grand Total		**35.25**	**317.55**	**123.35**	**57.16**	**30.01**	**563.32**	**112.66**

Table A1. 4: Percentage of each ICES rectangle intersected by the MMO section of Wight-Barfleur Reef MPA.

ICES rectangle	Percentage overlap (%)
29E8	34.66

Table A1. 5: UK live weight landings tonnage (t) estimates by gear from vessels under 12 m in length for the MMO section of Wight-Barfleur Reef MPA (2016 to 2020).

Gear group	Gear code	2016	2017	2018	2019	2020	Total (2016 to 2020)	Average (2016 to 2020)
Anchored Net/Line	GEN	0.18	0	0	0	0	0.18	0.04
	GN	1.65	1.38	0	0	0.04	3.07	0.61
	GNS	0.13	0	0	0	0	0.13	0.03
	GTR	0	0	0	0	0	<0.01	0
Anchored Net/Line Total		**1.95**	**1.38**	**0**	**0**	**0.04**	**3.37**	**0.67**
	OTB	0	0.13	0	0.49	0	0.62	0.12
	OTT	0	0	0.18	0	0	0.18	0.04
	TBB	0	0	0.06	3.11	0.89	4.05	0.81
Demersal trawl Total		**0**	**0.13**	**0.24**	**3.59**	**0.89**	**4.86**	**0.97**
Dredge	DRB	0	0	0.91	0	2.43	3.33	0.67
Dredge Total		**0**	**0**	**0.91**	**0**	**2.43**	**3.33**	**0.67**
Midwater Hook/Lines	LHP	0	0.21	0.22	0.06	0	0.49	0.10
	LX	0.61	0.34	0	0.01	0	0.96	0.19
Midwater Hook/Lines Total		**0.61**	**0.55**	**0.22**	**0.07**	**0**	**1.45**	**0.29**
Traps	FIX	3.22	1.79	0.00	0.00	0	5.01	1.00
	FPO	37.63	24.79	19.38	17.67	9.45	108.92	21.78
Traps Total		**40.85**	**26.59**	**19.38**	**17.67**	**9.45**	**113.94**	**22.79**
Grand Total		**43.42**	**28.64**	**20.75**	**21.33**	**12.81**	**126.95**	**25.39**

Table A1. 6:EU27 live weight landings tonnage (t) estimates by gear from vessels under 12 m in length for the MMO section of Wight-Barfleur Reef MPA (2016 to 2020).

Gear group	Gear code	2016	2017	2018	2019	2020	Total (2016 to 2020)	Average (2016 to 2020)
Anchored Net/Line	LLS	5.57	2.90	6.27	2.71	0.00	17.44	3.49
	GTR	0.00	0.00	0.00	0.05	0.01	0.06	0.01
Anchored Net/Line Total		**5.57**	**2.90**	**6.27**	**2.75**	**0.01**	**17.50**	**3.50**
Demersal Seine	SSC	0.00	0.00	0.00	0.00	0.59	0.59	0.12
Demersal Seine Total		**0.00**	**0.00**	**0.00**	**0.00**	**0.59**	**0.59**	**0.12**
Demersal trawl	OTB	0.00	1.51	0.15	0.35	0.00	2.01	0.40
	TBB	0.00	0.10	0.00	0.00	0.00	0.10	0.02
Demersal trawl Total		**0.00**	**1.61**	**0.15**	**0.35**	**0.00**	**2.11**	**0.42**
Dredge	DRB	0.00	0.36	0.00	0.37	0.00	0.73	0.15
Dredge Total		**0.00**	**0.36**	**0.00**	**0.37**	**0.00**	**0.73**	**0.15**
Midwater - Gill Drift	GND	0.00	0.00	0.00	0.18	0.00	0.18	0.04
Midwater - Gill Drift Total		**0.00**	**0.00**	**0.00**	**0.18**	**0.00**	**0.18**	**0.04**
Midwater Trawl	OTM	0.00	0.89	0.00	0.00	0.00	0.89	0.18
Midwater Trawl Total		**0.00**	**0.89**	**0.00**	**0.00**	**0.00**	**0.89**	**0.18**
Traps	FPO	0.19	0.21	0.19	0.65	0.23	1.48	0.30
Traps Total		**0.19**	**0.21**	**0.19**	**0.65**	**0.23**	**1.48**	**0.30**
Grand Total		**5.77**	**5.98**	**6.62**	**4.30**	**0.83**	**23.49**	**4.70**

Table A1. 7: Mean annual surface and subsurface SAR values for C-squares intersecting the MMO section of Wight-Barfleur Reef MPA (2016 to 2020).

Gear group	SAR category	2016	2017	2018	2019	2020
Demersal Seines	Surface	0.01	<0.01	0.02	<0.01	0.02
	Subsurface	0	0	<0.01	0	<0.01
Dredges	Surface	0	<0.01	<0.01	<0.01	0
	Subsurface	0	0	<0.01	0	0
Demersal Trawls	Surface	0.11	0.09	0.08	0.12	0.14
	Subsurface	0.01	0.01	0.01	0.02	0.03
Bottom Towed Gear	Surface	0.12	0.1	0.1	0.13	0.16
	Subsurface	0.01	0.01	0.02	0.02	0.03

Table A1. 8: Fishing effort (days) recorded by UK vessels under 12 m in length, separated by gear type for the area of Wight-Barfleur Reef MPA that intersects the marine portion of ICES rectangle 29E8 (2016 to 2021). ICES rectangle level data has been apportioned to the MPA based on the percentage area of the ICES rectangle that intersects the MPA (see Table A1. 4).

Gear group	Fishing effort (days at sea)							
	2016	2017	2018	2019	2020	2021	Total (2016 to 2021)	Annual average (2016 to 2021)
Bottom towed gear	0	0.69	2.67	4.55	4.16	2.25	14.32	2.39
Midwater hooks and lines	7.28	3.81	2.77	1.73	0	1.39	16.98	2.83
Midwater gear total	**7.28**	**3.81**	**2.77**	**1.73**	**0**	**1.39**	**16.98**	**2.83**
Traps	160.46	145.38	109.44	98.42	44.01	35.18	592.90	98.82
Anchored nets and lines	5.55	7.23	0.17	0	1.39	1.39	15.73	2.62
Static gear total	**166.00**	**152.62**	**109.62**	**98.42**	**45.40**	**36.56**	**608.63**	**101.44**
MPA total	**173.28**	**157.12**	**115.06**	**104.71**	**49.56**	**40.20**	**639.93**	**106.66**