Marine Management Organisation

Stage 3 MPA Fisheries Assessment Methodology






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Stage 3 MPA Fisheries Assessment Methodology

Contents

1 Introduction

MMO is assessing and managing the impacts of fishing on offshore marine protected areas (MPAs). Stage 3 of this work includes the creation of draft MPA fisheries assessments to analyse the impact of fishing gear-designated feature interactions for all benthic features not already assessed within Stage 1 and Stage 2. In total 43 offshore MPAs are included in the Stage 3 assessment and are displayed in **Table 1** and in **Figure 1**.

This document outlines the steps, processes and information used in the creation of the 43 draft Stage 3 MPA fisheries assessments (**Figure 2**). The assessments determine the impacts of fishing on Stage 3 MPAs using evidence collated in the Stage 3 Fishing Gear MPA Impacts Evidence documents (bottom towed gear, anchored nets and lines and traps) and site-specific details, including:

- the conservation objectives of the site,
- the fishing activity and intensity within the site,
- the environmental conditions of the site,
- the ecological characteristics of the designated feature including biotope sensitivity,
- other relevant marine activities that could impact the MPA.

Proposed management measures for each MPA have been developed based on the outcome of the draft Stage 3 MPA fisheries assessments. Management measures will be finalised as appropriate following the outcome of formal consultation.

Table 1: MPAs included for assessment in Stage 3.

Inshore (6 to 12 nm from coast)	Straddling 12 nm limit (6 to 200 nm)	Offshore (12 to 200 nm)
• Land's End and Cape Bank SAC • Foreland MCZ* • Hartland Point to Tintagel MCZ • Goodwin Sands MCZ • Start Point to Plymouth Sound and Eddystone SAC • Fylde MCZ* • Shell Flat and Lune Deep SAC* • Albert Field MCZ • North West of Lundy MCZ • Margate and Long Sands SAC • Beachy Head East MCZ • Bristows to the Stones MCZ • Skerries Bank and Surrounds MCZ	• Haisborough, Hammond and Winterton SAC • Cape Bank MCZ • Farnes East MCZ • Holderness Offshore • Orford Inshore MCZ • Kentish Knock East MCZ • Inner Bank MCZ* • Offshore Overfalls MCZ* • East of Start Point MCZ • South West Approaches to Bristol Channel MCZ • West of Walney MCZ* • South of the Isles of Scilly MCZ	• North Norfolk Sandbanks and Saturn Reef SAC • Offshore Brighton MCZ • Wight-Barfleur Reef MCZ • Haig Fras SAC • East of Haig Fras MCZ • South of Celtic Deep MCZ • Fulmar MCZ • South West Deeps (East) MCZ • South West Deeps (West) MCZ • North West of Jones Bank MCZ • Greater Haig Fras MCZ • Swallow Sand MCZ • West of Copeland MCZ • Markham's Triangle MCZ • Bassurelle Sandbank SAC • West of Wight-Barfleur MCZ • Western Channel MCZ • North East of Haig Fras MCZ

* MMO is assessing the impacts of fishing on the portion of these MPAs inshore of 6 nm.

North East of Farnes Deep MPA was originally included in the Stage 3 sites however in 2023 the North East of Farnes Deep highly protected marine area was designated, overlapping the existing MPA. The MPA has therefore been removed from Stage 3 fisheries assessment and this area is now being managed as an HPMA.

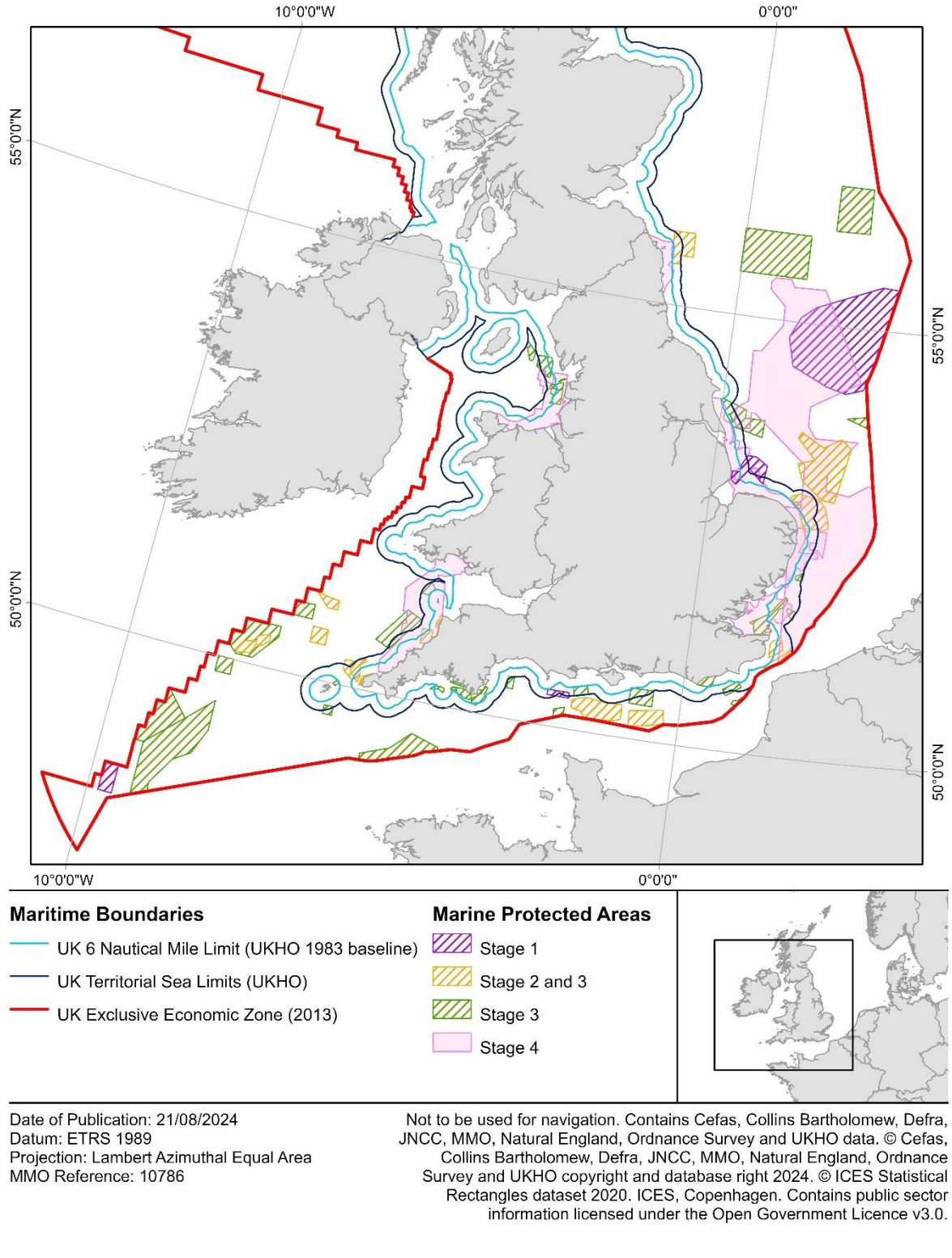

Figure 1: MPAs assessed in Stages 1, 2, 3 and 4.

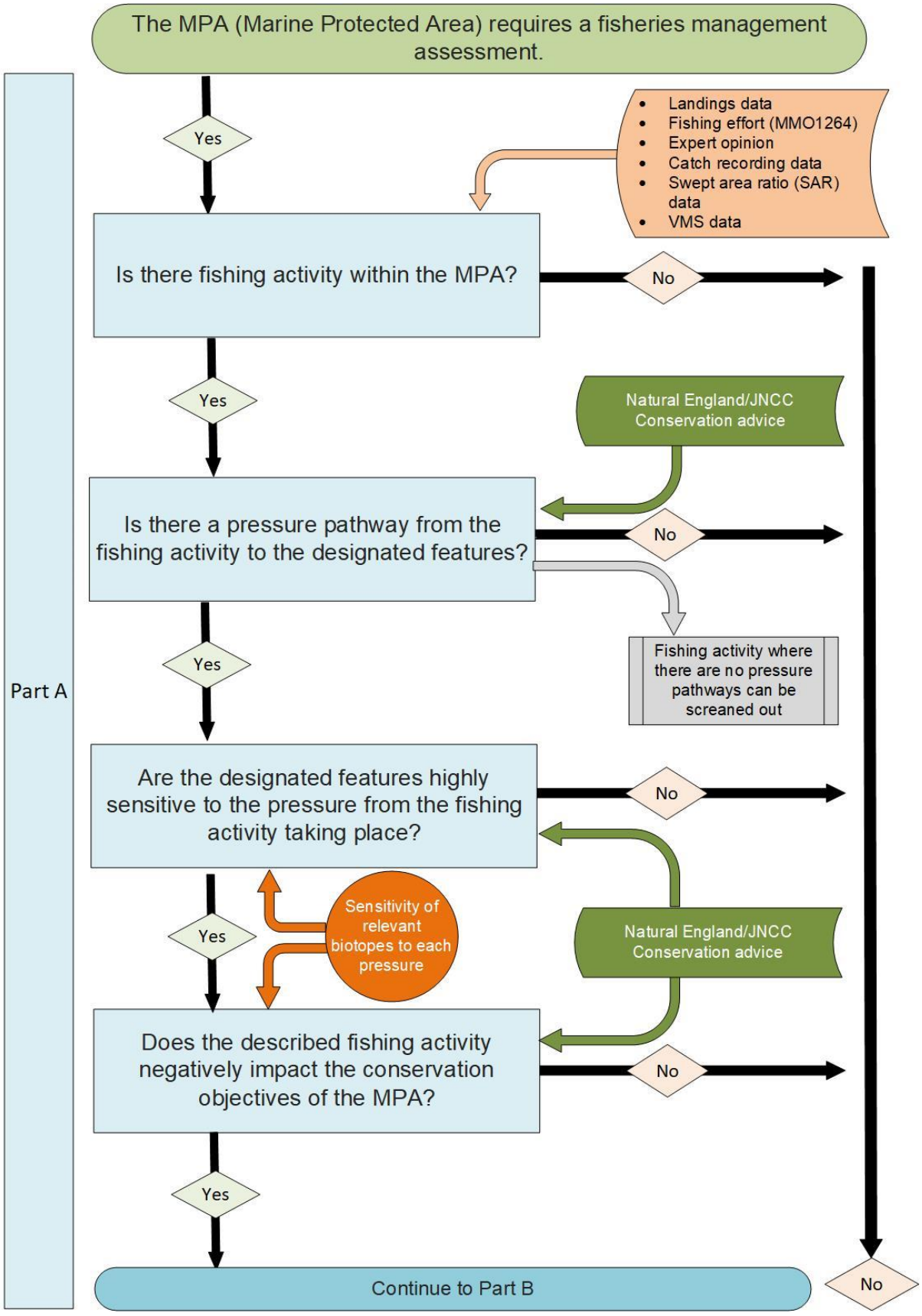

Figure 2: Stage 3 MPA Fisheries Assessment Decision Tree (page 1 of 2).

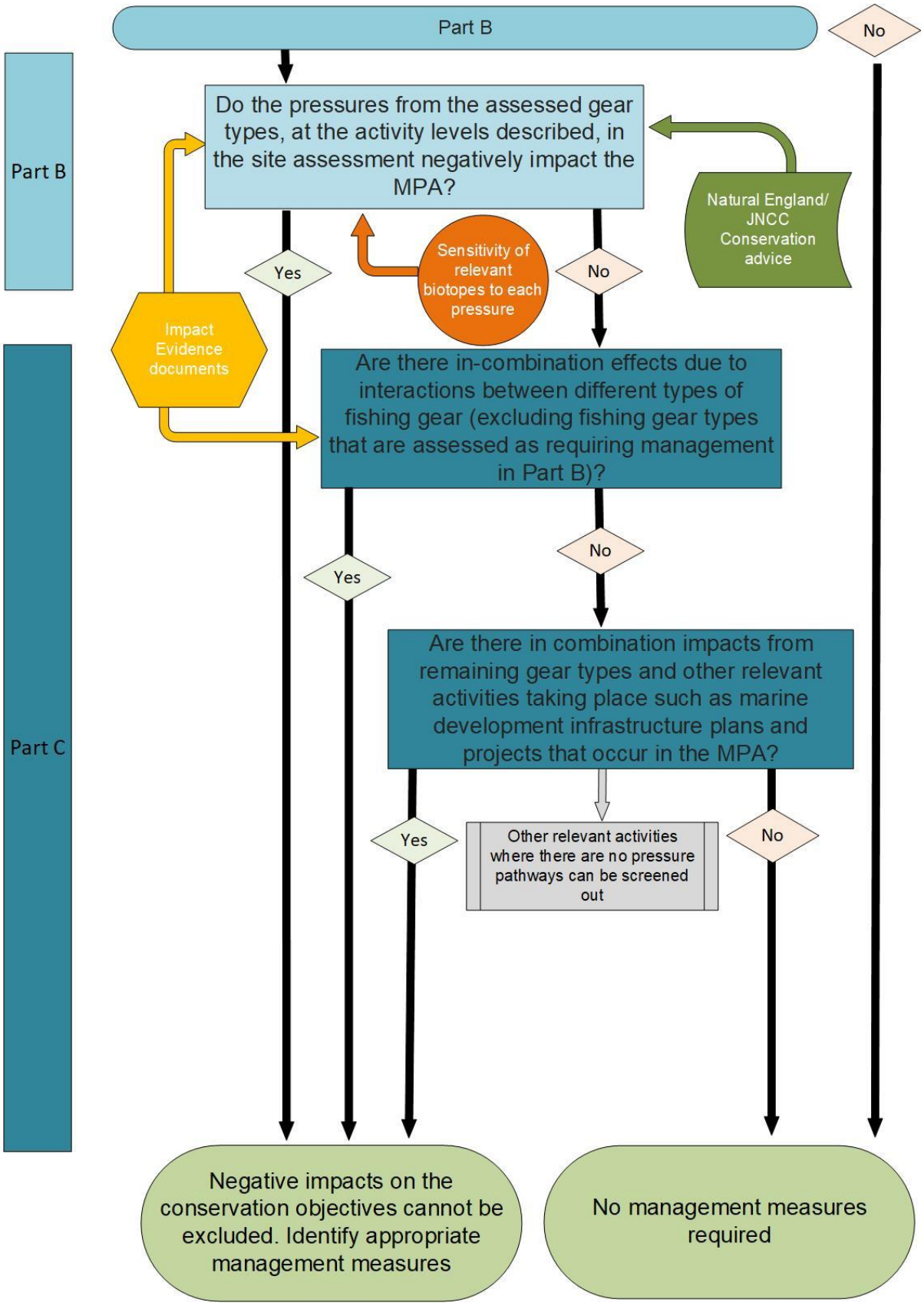

Figure 2: Stage 3 MPA Fisheries Assessment Decision Tree (page 2 of 2)

2 Roles and Responsibilities

There are several organisations with responsibilities for the marine environment and with roles in reviewing the potential impacts of fishing activity. **Figure 3** identifies the organisations, jurisdictions and illustrates how they are engaged with for this work.

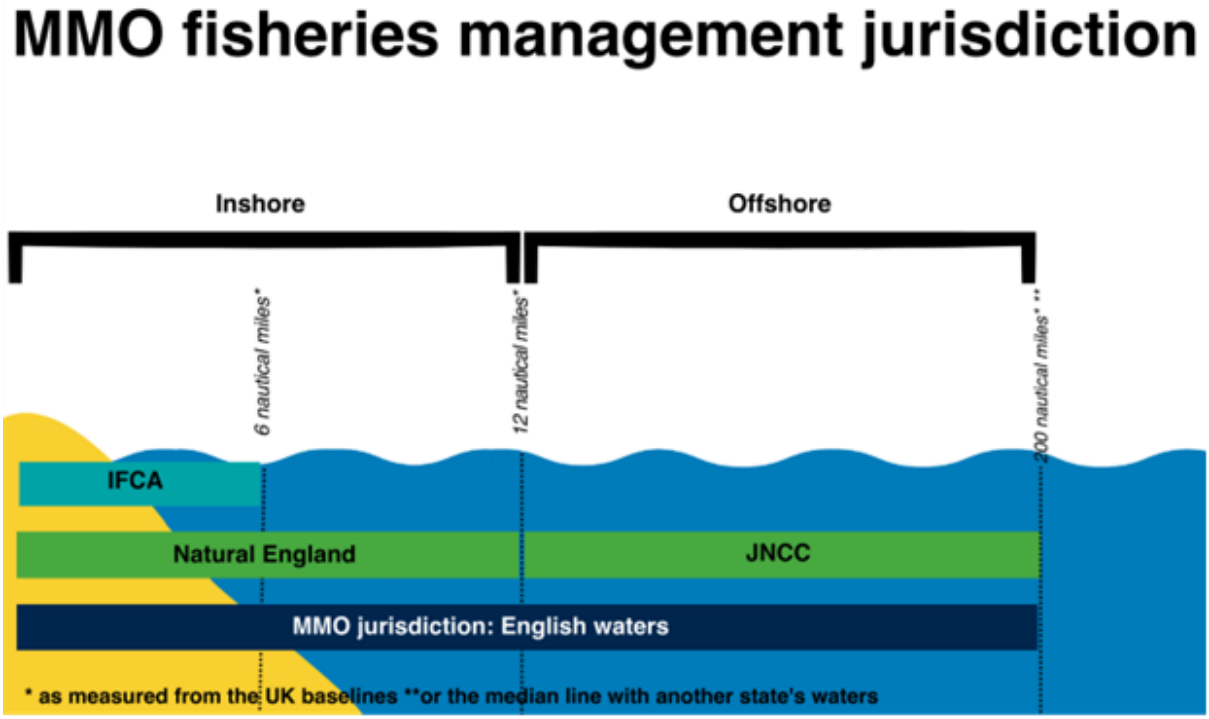

Figure 3. Diagram showing the jurisdiction of MMO, JNCC, Natural England and IFCA.

The Marine Management Organisation (MMO)

We are responsible for assessing and managing the impacts of fishing on the designated features (protected habitats and species) of MPAs in English waters offshore of 6 nm. These assessments aid the delivery against legal obligations for European marine sites (EMSs), which include special areas of conservation (SACs) which protect habitats and marine mammals and special protection areas (SPAs) which protect bird species and supporting habitats, and marine conservation zones (MCZs).

Inshore Fisheries and Conservation Authorities (IFCAs)

There are ten IFCAs in England, with jurisdictions for the 0 to 6 nm area. IFCAs are responsible for assessing fishing impacts and where necessary, introducing management to protect MPAs. Where MPAs straddle the 6 nm limit, MMO works closely with IFCAs to ensure a consistent and clear management decision process.

JNCC and Natural England

The Joint Nature Conservation Committee (JNCC) is the government statutory nature advisor for the entire UK, and Natural England is the government's statutory nature advisor for England. Both provide conservation advice for MPAs, and report on the condition of protected features. In English waters, Natural England is responsible for fisheries advice in inshore MPAs (up to 12 nm limit) and JNCC for offshore MPAs (between 12 nm to 200 nm).

2 MPA conservation objectives and conservation advice

The MPAs assessed as part of Stage 3 are a combination of marine conservation zones (MCZs) and special areas of conservation (SACs). Each MCZ or SAC protects specific habitats or species ('features') and has a set of conservation objectives which relate to these features achieving and/or remaining in 'favorable condition'.

For MCZs, MMO MPA fisheries assessments are consistent with the principles of an MCZ assessment, which determines whether MMO can be satisfied that ongoing fishing activities will not result in a "significant risk of the act hindering the achievement of the conservation objectives stated for the MCZ."[1].

For SACs, MMO MPA fisheries assessments are consistent with the principles of a habitats regulation assessment (HRA), which determines whether MMO can ascertain that ongoing fishing activities "will not adversely affect the integrity" of the SAC[2].

The conservation objectives set for each MPA are available via the JNCC site information centre[3] for that site or Natural England's Designated Sites View[4]. Conservation objectives state the overall target for an MPA's features, and seek to ensure that the features meet, or are maintained in a 'favourable condition'.

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[1] Section 126, Marine and Coastal Access Act 2009: www.legislation.gov.uk/ukpga/2009/23/section/126

[2] Regulation 63 of the Conservation of Habitats and Species Regulations 2017: www.legislation.gov.uk/uksi/2017/1012/regulation/63 and regulation 28 of the Conservation of Offshore Marine Habitats and Species Regulations 2017: www.legislation.gov.uk/uksi/2017/1013/regulation/28

[3] JNCC MPA site information centres: https://jncc.gov.uk/our-work/offshore-mpas/

[4] Natural England Designated Sites View: https://designatedsites.naturalengland.org.uk/

Favourable condition can broadly be defined as healthy, functioning ecosystems that contribute to the status of the feature at a local, national and/or international level.

Conservation objectives for MCZs are set in the MCZ designation order as maintain in, or recover to, favourable condition. Natural England and JNCC provide a 'general management approach' for each MCZ feature to indicate whether the feature should be recovered to, or maintained at, favourable condition. Conservation objectives (for SACs) or general management approach (for MCZs) are set by Natural England and JNCC based on the environmental condition of site features. Where possible this is informed by direct evidence (e.g. surveys) of each site. However, it is seldom possible to assess the condition of a feature using direct evidence alone. Where direct evidence is limited, feature condition is primarily assessed using proxy information on feature resilience and recovery (sensitivity), and exposure to pressures from human activities, a process known as a vulnerability assessment. Sensitivity assessments are derived from the Marine Evidence-based Sensitivity Assessment (MarESA) (MarLIN, 2018).

Natural England and JNCC publish conservation advice packages which include additional information on the specific targets for each feature in 'supplementary advice on conservation objectives. 'Maintain' targets do not preclude the need for management to avoid a significant risk of damage or deterioration to the feature. The supporting and/or explanatory notes in the supplementary advice on conservation objectives set out why the target was chosen and any relevant site based supporting information. To produce the draft Stage 3 MPA Fisheries Assessment documents MMO has used conservation advice packages and conducted direct consultation with Natural England and JNCC.

3 The Stage 3 Fishing Gear MPA Impacts Evidence documents

To underpin the draft Stage 3 MPA fisheries assessments, MMO has drafted three 'Stage 3 Fishing Gear MPA Impacts Evidence documents' to collate and analyse the impacts on MPA features of each gear group: anchored nets and lines, traps, and bottom towed gear. Each document describes the gear types, the pressures from the gear types and analyses the impacts of these fishing gears on the features of the MPAs. **Table 2** provides links for all the feature descriptions.

Table 2: Feature Descriptions.

Feature Name	Feature Description
Sea-pen and burrowing megafauna communities	JNCC: Seapens and burrowing megafauna in circalittoral fine mud

	MarLIN: Seapens and burrowing megafauna in circalittoral fine mud
Fan mussel	MarLIN: Fan mussel (*Atrina fragilis*)
Ocean quahog	MarLIN: Ocean quahog (*Arctica islandica*)
Rocky reef	JNCC: Annex I reef JNCC: Circalittoral rock (and other hard substrata) JNCC: High energy circalittoral rock JNCC: Moderate energy circalittoral rock
Biogenic reef (*Sabellaria spp.*)	JNCC: Annex I reef JNCC: Reefs MarLIN: Ross worm (*Sabellaria spinulosa*) MarLIN: Honeycomb worm (*Sabellaria alveolata*) OSPAR Commission: *Sabellaria spinulosa* reefs
Annex I sandbanks[2] **and MCZ sediment**[3]	JNCC: Subtidal sand MarLIN: Subtidal mud JNCC: Subtidal coarse sediment JNCC: Subtidal mixed sediments JNCC: Sandbanks which are slightly covered by sea water all the time

Table A. 4 in **Annex 4: Gear Feature Interaction** details all gear-feature interactions considered at Stage 3 and the corresponding gear review document.

- Stage 3 Fishing Gear MPA Impacts Evidence documents[5]

The Stage 3 Fishing Gear MPA Impacts Evidence documents were compiled using a systematic approach to gather the evidence. Key words were identified for literature searches that describe the prioritised gear-feature interactions. Searches were completed using Google Scholar and results were reviewed and filtered on evidence robustness and extensivity. MMO also reviewed the Natural England 'Fisheries Impact Evidence Database' (FIED) (Natural England, 2022) to identify relevant literature available. Evidence was reviewed and analysed and key findings from each source were extracted and assessed for relevance and gear-feature interactions.

The Impact Evidence documents were updated following the call for evidence from January 2023 to March 2023, and review by an independent panel of specialists commissioned by MMO.

[5] Stage 3 Fishing gear MPA Impacts Evidence documents www.gov.uk/government/publications/stage-3-site-assessments

4 Use of evidence

In carrying out MPA fisheries assessments and developing management measures MMO considers the relative strengths and weaknesses of different evidence sources.

Information on each type of evidence is set out **Section 5.3**. The availability of relevant evidence to support Stage 3 assessments also varies across different gears and features. There is very limited direct research on the impacts of certain gear-feature interactions (for example demersal seining on seabed habitats or impacts from anchored nets and lines and traps on designated MCZ species: sea-pens and burrowing megafauna, fan mussels, ocean quahog).

The limited evidence available for these gear-feature interactions will lead to increased uncertainty and reduced confidence levels in the conclusions on the potential impacts of specific fishing gears on these species. Where appropriate, MMO has applied the precautionary principle to mitigate the risk of serious or irreversible environmental harm. This is consistent with the legal requirements set for each type of MPA, which require that, to allow ongoing fishing activities to continue, MMO must be satisfied that that ongoing fishing activities will not result in a "significant risk of the act hindering the achievement of the conservation objectives stated for the MCZ" or that MMO must ascertain that ongoing fishing activities "will not adversely affect the integrity" of the SAC.

5 Assessment structure

5.1 Site information

This section of the draft Stage 3 MPA fisheries assessment sets out the Natural England or JNCC conservation advice package used for the assessment, the conservation objectives (and for MCZs the general management approach), and other relevant information about the site and its features.

This section also defines the scope of the assessment, including which fishing gear-feature interactions are included, and which parts of the site (for example if part of the site is situated inshore of 6 nautical miles and therefore within an inshore fisheries and conservation district).

5.2 Part A

Part A of the assessment identifies the interactions between pressures from fishing gears and the designated features of the MPA, and which of these require further assessment to rule out negative impacts.

5.2.1 Fishing activities

Table A. 2 in **Annex 3: Fishing gears overview** provides a brief description of different fishing gears and how these have been categorised into 'anchored nets and lines', 'bottom towed gear' and 'traps'. These descriptions have been collated from previous MMO MPA fisheries assessments, Montgomerie (2022), Food and Agriculture Organization of the United Nations[6] and the Seafish website[7].

Table A. 3 in **Annex 3: Fishing gears overview** is a list of all commercial fishing activities that have been considered within the assessment. Gear types are screened out if there is no evidence of them taking place within the MPA. **Section 5.3** describes all the evidence sources used in detail.

5.2.2 Screening of pressures, features and activities

Pressures, features and activities occurring in a site are screened out from requiring further assessment, where a feature is not exposed to the pressure, or the pressure is unlikely to impact the designated feature. Examples of some specific pressures, features and activities which are screened out are:

- **Midwater gears:** there is no feasible pathway for gears of this type to interact with benthic designated features under normal operation. 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 is not considered to be capable of affecting the benthic designated features.
- **Unknown gear/Miscellaneous**: this occurs when 'other gear' has been declared as having been used to land fish from the International Council for the Exploration of the Sea (ICES) statistical rectangles. The gear codes used to report these landings do not provide any further information relating to the fishing method used. Where possible MMO have drawn on expert opinion to determine and assess the likely type of fishing and consider its impacts. However, in many cases it is not possible to assess the likelihood of this fishing method interacting with the seabed and it is not considered further within the assessments. Current draft MPA Stage 3 fisheries assessments have concluded that minimal unknow/miscellaneous gears are used in the MPAs assessed. Should this significantly increase, MMO will consider this further.

[6] Food and Agriculture Organization of the United Nations. www.fao.org/fishery/en/geartype/search

[7] Seafish: www.seafish.org.uk

- **Shore based activities:** landings data may show that this type of fishing activity using occurs within the site, this is based on all activity occurring within site-overlapping ICES rectangles. It is not possible that shore-based activities would be capable of affecting the designated features of offshore MPAs due to distance.
- **Bottom towed gear interactions with the features high energy circalittoral rock/ moderate energy circalittoral rock/biogenic reef:** these interactions have not been included in these assessments (except in Skerries Bank and Surrounds MPA, Beachy Head East MPA and Bristows to the Stones MPA which previously had not been assessed) as they have already been addressed in Stage 2 which assessed the impacts of fishing using bottom towed gears on rock, rocky and biogenic reef in 13 MPAs.
- **Geological or geomorphological:** designated features are out of scope for this assessment as fishing activities are considered incapable of significantly impacting these features.
- **Abandoned, lost, discarded fishing gear (ALDFG):** there may be instances where the pressure of litter from fishing gear ('ghost gear') could impact upon site features. However, localised management of marine litter is not appropriate at MPA level for fisheries only, and international legislation and agreements are in place for its control, including Annex V of the International Convention for the Prevention of Pollution from Ships, 1973 (MARPOL); the 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972, (London Protocol); and the United Nations Convention of the Law of the Sea, 1982 (UNCLOS). 'Ghost' fishing gear is therefore not considered further within the draft Stage 3 MPA fisheries assessments.

5.2.3 Summary of pressures on designated features

The screening table (Table 3) in the draft Stage 3 MPA fisheries assessments is compiled using evidence gathered in the Stage 3 Fishing in MPA Impact Evidence documents (as described in **section 3**) which is presented in tables A1.2 and A1.3 of these documents and displays the most precautionary sensitivities to each gear type and each feature.

Site level information from Natural England's and JNCC's Advice on Operations is then used to supplement the evidence to determine if a feature is sensitive to a pressure from that gear type within that MPA.

The Advice on Operations is found within the conservation advice packages for each MPA:

- Natural England[4] – Designated Sites View
- JNCC[3] – Offshore MPA Site Information Centres

MMO determines which pressures from each type of fishing require further assessment, taking into account those pressures identified as sensitive in the Advice on Operations, in particular those identified as having a medium or high risk.

Pressures identified as having a low risk, or not deemed capable of affecting a designated feature above a pressure benchmark, are not considered further, and are screened out.

Not all MPAs have conservation advice packages currently available. In these cases, Natural England and JNCC advised using the conservation advice package from a proxy site. These sites have been selected by SNCBs from within the same bioregion with the same designated features, providing a comparative alternative conservation advice package.

However, a proxy conservation advice package cannot be used as a substitute for condition assessment, nor for attribute target information. MMO therefore seeks direct advice from Natural England and JNCC, as well as referring to the vulnerability assessment produced at the time of the site designation.

This is the best advice available at the time, but it is recognised that it will not be as good as site-specific advice. The draft Stage 3 MPA fisheries assessments will be reviewed following formal consultation and any changes in the management advice identified. Where there is a significant change there may be a need to repeat the formal consultation for specific sites.

5.2.4 Screening based on sensitivity to pressures

The pressures associated with fishing activities were identified using either Natural England or JNCC Advice on Operations which provides the most up-to-date site level information. The Advice on Operations links the pressures of interest with the designated feature and determines if a pressure is affecting or likely to affect the designated feature in the future. The Advice on Operations is not site specific and is used in tandem with MarESA to ascertain biotopes sensitivities to relevant pressures.

Table 3 details all the pressures that have been identified from fishing activities that have the potential to impact the designated features of a site. Descriptions of all pressures can be found in the JNCC Marine Pressures-Activity Database[8] and

[8] JNCC Marine Pressures-Activities Database: https://hub.jncc.gov.uk/assets/97447f16-9f38-49ff-a3af-56d437fd1951

pressure benchmarks can be found in the Marine Evidence based Sensitivity Assessment (MarESA)[9].

The pressures considered in Table 3 (the pressure summary table) of each MPA fisheries assessment are specific to each MPA and therefore may vary between assessments. Only pressures which are relevant to the specific features within each site are presented in the Advice on Operations, and therefore considered in the assessments. The main factor determining whether a pressure is considered in a specific site is whether the designated features are sensitive to that pressure. Where all features in a site are categorised as not sensitive or not relevant to a specific pressure, this pressure will not be considered in the pressure summary table, except where JNCC or Natural England have provided site specific advice.

In addition, the included pressures and the sensitivity of features to certain pressures may vary by site due to specific fishing gears used within a site. For instance, the gear group, bottom towed gear, contains a variety of fishing methods from demersal seines to dredging. Each method will have different impacts on a feature. The pressure sensitivities within Table 3 are taken from the conservation advice packages and are then refined using the fishing activities occurring within that site. Therefore, the comparison of feature sensitivity to gear groups may vary across sites due to the fishing methods used within the site

Table 3: All pressures associated with fishing activities.

Potential pressures
Above water noise
Abrasion or disturbance of the substrate on the surface of the seabed
Barrier to species movement
Changes in suspended solids (water clarity)
Collision ABOVE water with static or moving objects not naturally found in the marine environment
Collision BELOW water with static or moving objects not naturally found in the marine environment
Deoxygenation
Hydrocarbon + polycyclic aromatic hydrocarbon (PAH) contamination
Introduction of light
Introduction of microbial pathogens
Introduction or spread of invasive non-indigenous species
Litter

[9] Marine Evidence based Sensitivity Assessment: https://www.marlin.ac.uk/sensitivity/SNCB-benchmarks

Potential pressures
Nutrient enrichment
Organic enrichment
Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion
Physical change (to another seabed type)
Physical change (to another sediment type)
Removal of non-target species
Removal of target species
Smothering and siltation rate changes
Synthetic compound contamination
Transition elements and organo-metal contamination
Underwater noise changes
Visual disturbance

5.3 Part B

Part B considers the pressures and activities screened in in Part A alongside fishing activity levels and more detailed impacts evidence. Part B assesses how fishing will impact the designated features and determines whether or not management is required. Conservation advice, the Fishing Gear MPA Impact Evidence documents, JNCC and Natural England site specific advice, and biotope evidence are used to determine the sensitivities of the features. The main evidence sources used are detailed in the following sections.

5.3.1 Fishing activity evidence sources

To determine the levels of fishing activity within draft Stage 3 MPA fisheries assessments, the following evidence sources were used:

- vessel monitoring system (VMS) data 2016 to 2021;
- fisheries landings data (logbooks and sales records) 2016 to 2020;
- ICES rectangle level fishing effort data in days (MMO, 2023) 2016 to 2021;
- expert opinion from MMO marine officers, inshore fisheries and conservation officers; and
- swept area ratio calculations 2016 to 2020.

This section describes each type of fishing activity evidence and summarises the strengths and limitations of each source. The most recent data available have been used. For VMS this goes up to 2021 and for other data types this is up to 2020. The activity data will be updated alongside any new information following formal consultation and the MPA fisheries assessment recommendations reviewed. The

assessment outcomes have considered the corrections made to the sea fisheries statistics made in 2024[10].

Though there may be landings associated with midwater gears, these have been screened out of further assessment at Part A of each MMO MPA fisheries assessment and are therefore not considered further.

No single data source is used in isolation as a threshold for determining fishing activity impacts. Fishing activity within an MPA is established by using a combination of activity levels and location data. For bottom towed gear MMO use the swept area ratio (SAR) data to provide an additional level of evidence to describe the impact of the fishing gear.

5.3.2 Vessel monitoring system data for vessels over 12 m

VMS records the location, date, time, speed, and course of a fishing vessel at least once every two hours and is only required on vessels over 12 m in length. Fishing gear information is linked to the VMS data by MMO by matching vessel logbook information or using the fleet register. VMS data displayed in tables within the draft Stage 3 MPA fisheries assessments cover the period 2016 to 2021 to provide the most recent six years available. VMS data tables in assessments show the total number of discrete records for over 12 m vessels active in each site per nation, year and gear type; averages across all years have been rounded to the nearest whole number. The % VMS columns may not add up to 100 due to rounding of individual figures.

WebApps have been produced displaying VMS density information for Stage 3 MPAs. Each map shows VMS total cumulative report density data of UK and non-UK vessels for the years 2016 to 2021, aggregated to squares of 500 m by 500 m. Only vessels where the speed is reported at 0.1 to 6 knots are included as fishing activity is assumed to be occurring only when vessels are travelling between these speeds.

VMS records provide useful high-quality information about fishing activity but are not fully representative of the intensity of fishing. The limitations are discussed below.

Some vessels can tow certain fishing gears at speeds greater than 6 knots which may lead to an underestimate of fishing activity. Some vessels may be travelling at speeds lower than six knots for reasons other than fishing (currents, tides etc.), this may lead to an overestimate of fishing activity.

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[10] UK Sea Fisheries Statistics: Unscheduled corrections: https://assets.publishing.service.gov.uk/media/6704015da31f45a9c765f249/UK_Sea_Fisheries_Statistics_Unscheduled_Corrections.pdf

VMS data logs vessel movement and can act as a good proxy for mobile gear (e.g. trawls and dredges) effort. However, it is more challenging to link VMS data to static gear effort due to the different soak times, the quantity and size of gear deployed and variability in vessel speed when fishing. Assessments of fishing activity rely on the inference that higher VMS activity equates to higher fishing activity. This has limitations particularly for static gears as conclusions based on such assumptions do not account for further information that (alongside VMS activity) may additionally reflect fishing activity levels (e.g. the number of nets or pots deployed and soak time).

Not all VMS activity can be assigned to a fishing gear, leading to potential underrepresentation of fishing fleets. As stated, fishing vessels 12 m and over overall length are required to report using VMS, however VMS does not record fishing gear being used by the vessel. Assessments of fishing activity assume that the gear information available (such as through logbooks) accurately represents the gear type used during the associated VMS activity.

The data shown are spatially restricted to the extent of the Stage 3 MPAs plus a buffer of 15 km to show fishing activity around the edge of an MPA to give a full picture of fishing activity in the area. Separate maps have been generated for each aggregated gear group – bottom towed gear and static gear (including anchored nets and lines, and traps).

The following links provide access to the WebApps:

- Stage 3 Bottom Towed Gear VMS Report Density 2016 to 2021[11]
- Stage 3 Static Gear VMS Report Density 2016 to 2021[12]

Each assessment contains a table displaying a breakdown of VMS records registered from within the MMO section of the relevant MPA per gear type, year and nation group (UK, EU member states (EUMS), EU Free Trade Association member states (EFTA)) and the proportion of all records for each gear type belonging to each nation group from 2016 to 2021. Gear type and landings information cannot be attributed to VMS records from EFTA member states.

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[11] VMS Report Density Bottom Towed Gear for Stage 3 MPAs: https://defra.maps.arcgis.com/apps/dashboards/7c42fd0f339d4af9be3b484e559750af

[12] VMS Report Density Static Gear for Stage 3 MPAs: https://defra.maps.arcgis.com/apps/dashboards/e6e92d9301f74da4b8300cf64bd67593

5.3.3 Landings data – vessels over 12 m in length

Landings data have been included from 2016 to the most up to date information available, in order to provide at least five full years of data for analysis.

Landings data are recorded at ICES statistical rectangle level through landings declarations and logbooks. For UK vessels that carry VMS (those over 12 metres (m) in length), MMO link landings data and gear codes from these records for specific vessels to VMS reports from that vessel. Landings reported by UK over 12 m vessels in electronic logbooks have been apportioned amongst their 'fishing speed' VMS records based on a match on vessel RSS number, activity date and ICES rectangle. All weight of fish reported by that vessel on a specific date from that ICES rectangle is equally divided between all their VMS records in that rectangle on that date that were at assumed fishing speeds (0.1 to 6 knots). Landings estimates for UK vessels over 12 m in length in the draft Stage 3 MPA fisheries assessments are derived from the VMS reports that occur within an MPA.

For EU member state vessels VMS data cannot be matched to logbooks and therefore landings data is not available at this scale. However, reasonable estimates can be made using ICES rectangle landings data and the proportion of VMS fishing activity inside and outside of an MPA. Estimates of landings by EU member state vessels therefore assume that landings from an ICES rectangle are divided equally amongst the VMS fishing reports occurring within the rectangle for each gear type.

Confidence in UK vessel data is greater than that for EU member state vessel data due to the greater resolution, and availability of logbook information to more confidently determine gear types used.

For non-UK, non-EU countries (e.g. European Free Trade Association (EFTA) members such as Norway and Iceland), landings data are not available, and VMS data are available but with reduced detail (in particular gear data). Speed of vessels are available, and therefore assumptions of fishing activity can be made, however little evidence is available regarding the gear type employed by these vessels. Estimates of fishing activities by gear type within MPAs with significant non-UK, non-EU activity may therefore be over or underestimated. However, non-UK, non-EU activities represent a very small proportion of the total. Potential sources for these data will be investigated and the consultation stage for each set of assessments provides an opportunity for these data to be submitted.

EU landings data were obtained from the Fisheries Dependent Information (FDI) database from the EU Scientific, Technical and Economic Committee for Fisheries (STECF). Since 2015, STECF data has not been assigned to separate nationalities and was recorded for all nations (UK and EU). For EU vessels over 12 m in length, landings were estimated using the proportion of EU VMS reports from vessels travelling between 0 and 6 knots for the relevant ICES rectangle that occurring in the

site. For EU gear link, information is primarily derived from the public EU fleet register which lists the primary gear of the vessels as reported on its licence. This primary gear information is linked to the VMS data based on date. For 2021 data onwards where available EU VMS reports are linked to relevant logbook information to find the associated gear code reported as used on that date to produce a more robust result however this represents a minority of the data with most still being derived from a match to the EU public fleet register.

5.3.4 Landings data – vessels under 12 m in length

Landings data for vessels under 12 m in length are provided at ICES rectangle level (approximately 30 by 30 nautical miles or 55 by 55 km^2). These data are then apportioned to the MPA within the MMO jurisdiction as per **Figure 4**. This method assumes landings attributed to each ICES rectangle are evenly distributed throughout. It is recognised this is unlikely to be the case and as such, MPA landings estimates for vessels smaller than 12 m in length may represent an over or underestimate.

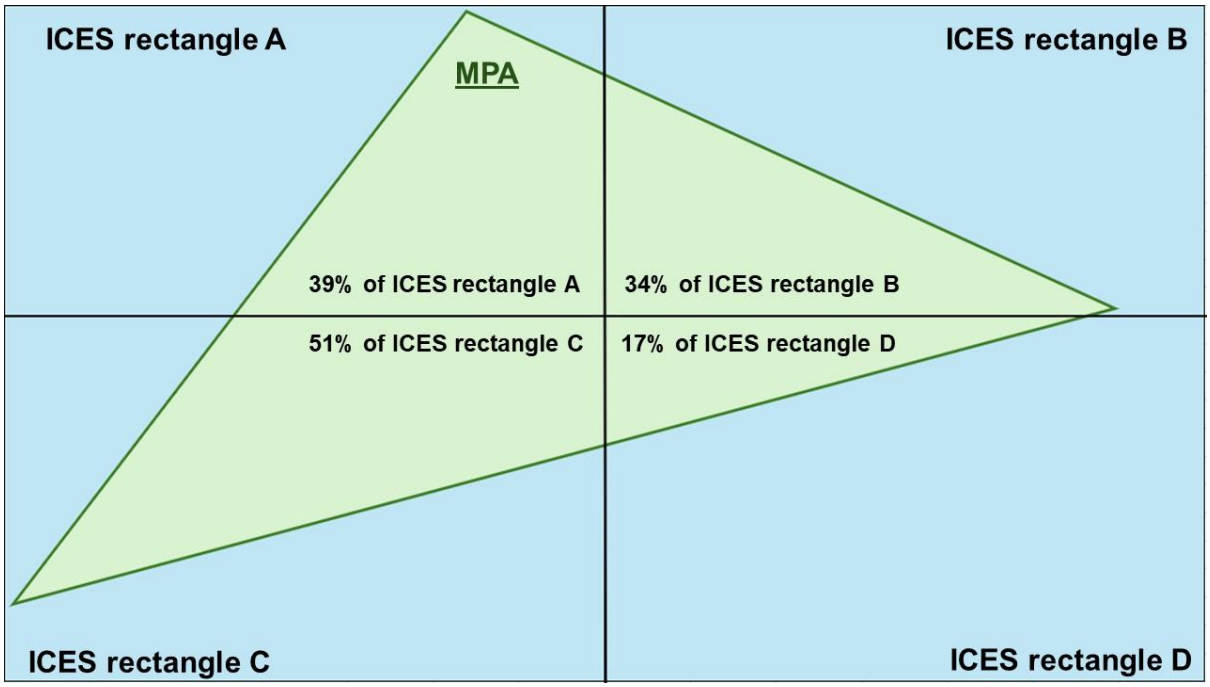

Figure 4: Apportionment example: Total landings for ICES rectangle D = 5,000 tonnes. Total landings apportioned to the MPA (17%) = 850 tonnes. Landings remaining to ICES rectangle D = 4,150 tonnes.

5.3.5 Swept area ratio data – bottom towed gears

Swept area ratio (SAR) data for bottom towed gears have been analysed for Stage 3 MPAs in order to estimate the spatial footprint of bottom towed gears on the benthic features of the sites.

The data used for these assessments was produced by ICES at the request of the OSPAR commission (ICES, 2017). The data is provided at 0.05 x 0.05 degree C-square resolution (Rees, 2003).

Swept-area is calculated by combining the width of the gear in contact with the seabed, with the average vessel speed and the time fished for a specific unit area (c-square) per year. The SAR (representative of fishing intensity) is the swept-area divided by the total surface area of the c-square and therefore represents the proportion of each c-square swept per annum. A SAR of '1' means that an area equivalent to the size of the c-square had been swept that year. This could mean that the whole c-square had been swept once, that half the cell had been swept twice, or a quarter of the cell had been swept four times. SARs may also be larger than '1' if the area swept is larger than that of the c-square for example, if areas are swept multiple times (Church et al., 2016).

The SAR data presented in the draft Stage 3 MPA fisheries assessments is likely to be an underestimate of total fishing pressure on the designated features of the site as it is derived from VMS and logbook data and therefore does not account for vessels under 12 m in length. The underestimate is likely to be greater in inshore sites than those further offshore, as under 12 m vessels tend to make up a higher proportion of fishing activity in inshore areas. Similarly, this underestimate will mostly affect the estimates for UK vessel activity as relatively few non-UK under 12 m vessels operate in UK waters. The SAR data presented also accounts only for bottom towed fishing gears and not for the footprint of other gear types such as anchored nets and lines or traps.

WebApps have been produced displaying the surface and subsurface SAR per C-square, summed over the period 2016 to 2020 in Stage 3 MPAs. In this analysis 'surface' swept area is defined as the area swept with a gear penetration depth of less than 2 centimetres (cm) and 'subsurface' is defined as the area swept with a gear penetration depth of 2 cm or greater.

Click on the following links to access the SAR WebApps:

- Swept Area Ratio - All Bottom Towed Gears 2016 to 2020[13].
- Swept Area Ratio - Demersal Seines 2016 to 2020[14].
- Swept Area Ratio - Demersal Trawls 2016 to 2020[15].
- Swept Area Ratio - Dredges 2016 to 2020[16].

The SAR fishing activity tables within Annex 1 of the assessments provide a mean average figure for each of the years 2016 to 2020 for each of the bottom towed gear groups, for both surface and subsurface SAR values. These data were estimated by combining the SAR for each c-square intersecting the MPA and then dividing that figure by the number of MPA intersecting c-squares. These data are used within the draft Stage 3 MPA fisheries assessments as a reference point for activity within the site however the mean figure may not always give a true representation of activity levels as it does not consider regional variation in activity levels across the site. These data are used alongside the WebApps which show the regional variation in activity levels. Where it is considered useful additional context to the assessment maximum SAR has also been provided.

Both SAR data and WebApps are used within the draft Stage 3 MPA fisheries assessments to provide the most accurate account of activity levels and where it is occurring within each MPA.

5.3.6 UK fishing effort (days)

UK fishing effort data (days), derived from the MMO evidence project MMO1264 (MMO, 2023) have been used in the draft Stage 3 fisheries assessments to estimate the fishing effort by UK fishing vessels in ICES rectangles that intersect the relevant MPA. These data cover vessels under 12 m in length.

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[13] SAR All Bottom Towed Gear: https://defra.maps.arcgis.com/apps/dashboards/a2fe4e2102414f79898f175cb04a6a30

[14] SAR Demersal Seine: https://defra.maps.arcgis.com/apps/dashboards/7485f2aca7c54f8482f181ddbbc5c2b5

[15] SAR Demersal Trawl: https://defra.maps.arcgis.com/apps/dashboards/13a12f1b2251419e94e40ca9a677968a

[16] SAR Dredge: https://defra.maps.arcgis.com/apps/dashboards/d4ea330b7bea46b288905a94b6c69d08

WebApps have been produced displaying these data at ICES rectangle resolution. Click on the following links to access the WebApps:

- Fishing Effort UK Static Gear 2016 to 2021[17].
- Fishing Effort UK Midwater Gear 2016 to 2021[18].
- Fishing Effort UK Bottom Towed Gear 2016 to 2021[19].

Similarly, to landings data for vessels under 12 m in length, these data are provided at ICES rectangle level and are therefore apportioned based on the percentage of the sea area of the ICES rectangle that overlaps the MPA. As previously highlighted the apportioned data for fishing effort is assumed equal over the site however, it is also possible for all activity or no activity to be occurring within the ICES area overlapping the site.

5.3.7 Fishing activity data tables

The data tables of UK live weight landings, fishing effort days and SAR values are rounded to 2 decimal places. However, for fishing effort days, if the majority of data is over 100, numbers are displayed as whole integers. For all tables, any zero (0) figures are true zeros. If a number is smaller than 0.01 but greater than zero, it is shown in tables as <0.01. Numbers greater than 1000 are generally not shown with decimal places unless the majority of the table contains figures less than 100 in which case all numbers in the table will be shown to 2 decimal places.

5.3.8 Existing fisheries management

Existing fisheries management within the MPA is identified using the Seafish Kingfisher UK Fishing Restrictions map[20] and EU access rights to UK territorial waters.

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[17] UK Fishing Effort Static Gear: https://defra.maps.arcgis.com/apps/dashboards/282e34ddb8e34bc9938b151afb0d39f2

[18] UK Fishing Effort Midwater Gear: https://defra.maps.arcgis.com/apps/dashboards/f1febf7b5fd244c08373e33ae26d4f0f

[19] UK Fishing Effort Bottom Towed Gear: https://defra.maps.arcgis.com/apps/dashboards/e2d896af6376474f9f4308b465227608

[20] Seafish Kingfisher UK Fishing Restrictions map: https://kingfisherrestrictions.org/fishing-restriction-map

5.3.9 Conservation advice and identifying relevant biotopes

Natural England and JNCC provide conservation advice packages for each MPA, which contain information on the location, extent, sensitivity and condition of each designated feature. Conservation advice packages for MPAs offshore of 12 nm this evidence is available in the JNCC site information centre[3] for that site. For MPAs inshore of 12 nm, conservation advice packages are available in the 'conservation advice' section for that site on Natural England's Designated Sites View[4]. The evidence base and associated level of confidence underpinning JNCC and Natural England MPA advice is available in the 'Monitoring and Evidence' section for each MPA in the JNCC site information centres and the 'Supplementary Advice on Conservation Objectives' and 'Feature Condition' sections for each MPA in Natural England's Designated Sites View. Natural England and JNCC have a number of published evidence standards and policies relating to the use of evidence in producing conservation advice[21,22.]

Direct evidence on the condition of each MPA feature is not always available. In many cases Natural England and JNCC base their assessment of feature condition on the level of human activities taking place in or around the MPA, rather than on direct observation of the feature itself. In some cases Natural England or JNCC may determine that the feature is likely to be in favourable condition, and therefore set a 'maintain' conservation objective (**See section 2**). However, this does not mean that management measures are not required, as ongoing or new activities could result in an unacceptable level of risk of damaging the feature.

Natural England and JNCC feature data contain a collation of marine habitat and species biotope records created during contracts commissioned by Natural England and JNCC; collected by Defra and associated bodies/agencies; or provided by third parties that have allowed their data to be republished under the Open Government Licence. MMO has made use of the most appropriate MPA habitat data on a site-by-site basis dependent on its location.

Natural England provide biotope information within the Advice on Operations component of their conservation advice. JNCC provide biotope information within two spreadsheets that were produced as part of a JNCC project 'Assigning the EUNIS classifications to UK's Offshore Regional Seas' (Tillin et al., 2020). One is a biotope presence-absence spreadsheet and the other is a biotope database. Both

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[21] Natural England Evidence Standards: https://publications.naturalengland.org.uk/category/3769710

[22] JNCC Evidence Quality Assurance Policy: https://jncc.gov.uk/about-jncc/corporate-information/evidence-quality-assurance/

the JNCC spreadsheets and Natural England's Advice on Operations provide information on the sensitivities of features for a given site to the pressures exerted by different activities. Biotope information is given either at the regional or site-specific level. MMO uses monitoring survey data, Marine Life Information Network (MarLIN), Marine Evidence-based Sensitivity Assessment (MarESA) and the JNCC Marine Habitat Classification for Britain and Ireland, to determine which biotopes are, or could be, present in the site and therefore required assessment. Where site specific survey information is not available, biotopes are screened in or out for each MPA depending on various environmental variables.

Depth: biotopes containing species not found within the depth of the MPA are screened out. E.g. "*Echinocardium cordatum* and *Ensis* spp. in lower shore and shallow sublittoral slightly muddy fine sand" would be screened out for any MPA that is entirely at depths greater than 30 m.

Salinity: biotopes that are commonly found in environments with variable salinity are screened out for offshore MPAs. Offshore MPAs are fully saline.

Exposure: Offshore MPAs are subjected to high wave and tidal action. They are exposed sites with little protection. Biotopes that are found in sheltered areas such as lagoons or bays are screen out.

A WebApp displaying designated feature information for the MPAs considered in the draft Stage 3 MPA fisheries assessments has been produced:

- Designated feature WebApp[23].

5.3.10 Assessing the impacts of fishing on MPA features

Within each draft Stage 3 MPA fisheries assessment, Section 4.3, 'Pressures by gear type', details the impacts of fishing activity by gear type. In this section MMO uses site specific activity data, biotope sensitivity information, alongside evidence from each of the different Stage 3 Fishing Gear Impact Evidence documents to evaluate, establish and draw conclusions on whether the fishing activity at the described level is having an impact on the designated benthic features of the MPA.

This evidence has come from a range of sources, including MMO systematic gathering of academic and other relevant literature (including technical reports, and commissioned studies) collated in the Stage 3 Fishing Gear Impacts Evidence documents.

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[23] Designated feature WebApp: https://defra.maps.arcgis.com/apps/dashboards/6e5322b6cb664066a2a667ed964b694a

The evidence across all of the gears and features assessed varies significantly in terms of quality, quantity, timeliness and relevance. In some cases, there is strong consistent evidence from a range of credible sources. In other cases, different evidence sources may appear contradictory. In certain cases there may be a complete lack of direct evidence describing the interactions between a specific type of fishing gear and a designated feature. The level of evidence available for each gear-feature interaction is set out in the Stage 3 Fishing Gear Impacts Evidence documents.

This assessment also uses evidence from the Marine Life Information Network ((MarLIN, 2024) which provides sensitivity reviews for marine biotopes based on the Marine Evidence based Sensitivity Assessment (MarESA) (Tyler-Walters et al., 2018). MarLIN sensitivity reviews include an assessment (and associated confidence score) of the resistance, resilience and sensitivity of a biotope against a range of pressures, using pressure benchmarks to qualify and quantify impacts. A physical pressure assessment within MarESA assumes a single abrading/penetration event will cause damage to the seabed surface/sub-surface habitats.

MarLIN considers three categories in assessing the confidence in the underlying evidence: the quality of the evidence or information used, the degree to which evidence is applicable to the assessment and the degree of agreement between evidence types (Tyler-Walters et al., 2018). A confidence assessment is conducted for resistance and resilience of each feature/pressure interaction and then combined to provide an overall confidence score for each of the categories for this interaction.

Confidence scores range from ‘high’ (based on peer reviewed or high-quality grey literature to on the same pressures and features with consistent agreement on the direction and/or magnitude of impact) to ‘low’ (based on expert judgement, relying on use of proxies, and/or inconsistent on the direction and magnitude of impacts).

5.3.11 Removal of target species and removal of non-target species pressure

The pressures of removal of target species and removal of non-target species have been considered at site level in line with the designated features of the site and advice received from Natural England and JNCC.

The definitions for both pressures are:

Removal of non-target species: by-catch associated with all fishing, harvesting and extraction activities of a designated species feature or component species of a designated habitat feature. Ecological consequences include food web dependencies, population dynamics of fish, marine mammals, turtles and sea birds (including survival threats in extreme cases, e.g. harbour porpoise in Central and Eastern Baltic). The physical effects of fishing gear on seabed communities are

addressed by the "abrasion" pressure type so the pressure addresses the direct removal of individuals associated with fishing or harvesting.

Removal of target species: the commercial exploitation of fish and shellfish stocks, including smaller scale harvesting, angling and scientific sampling of a designated MPA species feature or component species of a designated feature habitat. The physical effects of fishing gear on seabed communities are addressed by the "abrasion" pressures. This pressure addresses the direct removal or harvesting of biota. Ecological consequences include the sustainability of stocks, impacting energy flows through food webs and the size and age composition within fish stocks.

Impacts from the removal of target and non-target species pressures have been scoped out from the assessments 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. Where species are the designated feature of a site, i.e. pink sea-fan, ocean quahog, fan mussel and Nephrops as part of sea-pen and burrowing megafauna communities, the pressures of removal of target or non-target species are taken into consideration.

For sites which require assessment from the pressures of target and non-target removal (such as those with an active Nephrops fishery where sea-pen and burrowing megafauna communities is a designated feature, or fan mussel which may be caught as by-catch), MMO has identified the key information available such as the location of the fishing activity and other measures in place (IFCA byelaws, fisheries management plans and minimum conservation reference size measures) which may impact on the MPA. The MPA assessment has then reviewed the sensitivity of the designated features and associated biotopes to ensure that the pressure is assessed fully.

5.4 Part C

Part C of the assessment considers the in-combination effects of the fishing activities assessed in Part B that were not considered to require management. It also considers other activities such as licenced marine developments and infrastructure plans and projects that occur in the MPA, and the in-combination impacts of these activities.

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. GIS data outputs were created in August 2023 and

identified live marine licence applications (MLAs). License that expired prior to this date and any completed MLAs were screened out of Part C in-combination assessments. The ArcGIS output will be re-run and assessed again for MLAs post formal consultation to establish any conclusions made are still valid and relevant. The JNCC Marine Pressure-Activities Database (PAD) was used to identify pressure activity categories and their associated pressures for the remaining MLAs identified for each site.

MMO's internal geographic information tool SPIRIT is used alongside MLA data outputs to confirm the spatial location and overlap with site boundaries and sensitive features. SPIRIT is also used to identify any development consent orders (DCOs) and cables that run through the site. Each activity identified is also examined in the MMO Marine Case Management System (MCMS) for a more detailed understanding of the works to be undertaken to determine what specific PAD activity-pressures were associated with the activities.

For assessments of in-combination activity pressures, focus is given to medium and high-risk pressures and only fishing in-combination with marine license applications (pre-approved), current licenced plans or projects are considered, excluding completed developments such as windfarms at site level. Any ongoing or continuous licenced activities associated with windfarm, such as licenced operational maintenance works are considered for in-combination effects.

MLAs are subject to the MCZ assessment provisions of the Marine and Coastal Access Act 2009, and the assessment provisions of the Conservation of Habitats and Species Regulations 2017 and the Conservation of Offshore Marine Habitats and Species Regulations 2017. Regulators are therefore obliged to complete assessments of the impacts of these activities on MPAs. The impact of future MLAs will require assessment in their own right, including accounting for any in-combination effects alongside existing activities, including fishing activities.

If in-combination pressures between fishing and MLA are occurring this is assessed, and fishing will only be allowed to continue where MMO can ascertain that it will not adversely affect the integrity of the site concerned (for an SAC), or where MMO is satisfied that there is no significant risk of the act hindering the achievement of the conservation objectives stated (for an MCZ).

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Annex 1: Glossary of terms

Bottom towed gear - A range of fishing gear types designed to take or disturb species living on or near the bottom of the seabed. Forms of bottom towed gear include bottom and semi-pelagic trawls, dredges and seines.

Call for evidence – informal consultation conducted by MMO during the MPA management process. The purpose of this is to collect evidence from stakeholders. This allows the best available evidence to be used for the drafting of MPA fisheries assessments and recommended management options (if required).

Conservation objectives – Conservation objectives are set for each designated feature of an MPA by Natural England or JNCC, to either maintain or restore a designated feature of the protected site. Regulators have legal duties to further the achievement of conservation objectives.

Designated features – a species, habitat, geological or geomorphological entity for which an MPA is identified and managed.

Inshore Fisheries and Conservation Authorities (IFCAs) – IFCAs are responsible for fisheries management from 0 to 6 nautical miles (nm). There are 10 IFCAs in England, each one funded by local authorities.

Joint Nature Conservation Committee (JNCC) - a public body that advises the government on UK and international nature conservation. This includes aspects related to the marine environment from 12 nm to 200 nm and have a statutory responsibility to provide conservation advice for MPAs and report on the condition of protected features.

Marine conservation zone (MCZ) – a type of MPA in English, Welsh and Northern Irish waters designated under the Marine and Coastal Access Act 2009[3] (for England and Wales) or the Marine Act (Northern Ireland) 2013[4] (for Northern Ireland).

Marine Management Organisation (MMO) - MMO is an executive non-departmental public body, sponsored by the Department for Environment, Food and Rural Affairs and is the manager and independent regulator of England's seas.

Marine plans – MMO marine plans have been designed to help manage the seas around England.

Marine protected area (MPA) - a generic term to cover all marine areas that are a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values. This includes European marine sites (special areas of conservation (SAC) and special protection areas (SPA)) and marine conservation zones (MCZ).

MMO MPA fisheries assessment – MMO assessment of the impacts of fishing on an MPA.

Natural England - government advisor for the environment in England. This includes aspects of the marine environment of 0 to 12 nm. This organisation has a statutory responsibility to provide conservation advice for MPAs and report on the condition of protected features.

Pressure – the mechanisms through which an activity has an effect on a feature. Individual pressures are broadly defined in JNCC's Marine Pressures-Activities Database (PAD) in the 'pressures' tab of the data tables.
Resilience – The ability of an ecosystem to return to its original state after being disturbed (MarLIN, 2024).

Resistance – The degree to which a variable is changed following perturbation. The tendency to withstand being perturbed from the equilibrium (MarLIN, 2024).

Sensitivity – An assessment of the intolerance of a species or habitat to damage from an external factor and the time taken for its subsequent recovery. For example, a very sensitive species or habitat is one that is very adversely affected by an external factor arising from human activities or natural events (killed/destroyed, 'high' intolerance) and is expected to recover over a very long period of time, i.e. >10 or up to 25 years ('low'; recoverability). Intolerance and hence sensitivity must be assessed relative to change in a specific factor (MarLIN, 2024).

Special area of conservation (SAC) – SACs are MPAs designated under the Conservation of Habitats and Species Regulations 2017[5], and the Conservation of Offshore Marine Habitats and Species Regulations 2017[6] to protect important habitats and species.

Special protection areas (SPA) – SPAs are MPAs put into place to protect threatened bird species, classified under the Conservation of Habitats and Species Regulations 2017[4], and the Conservation of Offshore Marine Habitats and Species Regulations 2017[5].

Sublittoral zone – extending from the lowest limit of the intertidal to the outer edge of the continental slope. This can be divided into the infralittoral zone (characterised by algae) and the circalittoral zone (the subzone below the infralittoral dominated by animals) (JNCC, 2022).

Supporting processes – used to describe the natural processes that support the feature. These include hydrodynamic regime, water and sediment quality and supporting habitats[7].

Vessel monitoring system (VMS) – all commercial fishing vessels over 12 metres in length in UK waters must report their position via VMS when at sea. VMS devices on the vessels send regular reports of position and vector.

Annex 2: Management Areas

Management areas prohibiting or restricting certain fishing activities are implemented over sensitive features through MMO byelaws to protect the designated features of the site and further the site's conservation objectives. Buffers are applied to the management areas to ensure that activities taking place adjacent to a sensitive feature do not negatively impact it either directly or indirectly.

Buffer size for mobile gear is determined based on water depth of the site and warp length of the gear and will be applied in accordance with guidance from Natural England and JNCC.

Table A. 1: Buffer size determination table for mobile gear.

Water depth	Ratio warp length: depth	Buffer
Shallow waters (≤ 25 metres (m))	4:1	4 x actual depth
Continental shelf (25-200 m)	3:1	3 x actual depth
Deep waters (200 to over 1000 m)	2:1	2 x actual depth

Where static gear management is proposed Natural England have recommended that a buffer of 100 metres is applied, or the distance calculated by 2 x water depth, whichever is greater.

Annex 3: Fishing gears overview

Table A. 2 provides a brief description of different fishing gears and how these have been categorised into 'anchored nets and lines', 'bottom towed gear' and 'traps'. These descriptions have been collated from previous MMO MPA fisheries assessments, Montgomerie (2022), FAO[6] and the Seafish website[7]. The list below is not exhaustive. Further detailed information and illustrations are available using the external resources cited.

Table A. 2: Descriptions of different fishing gears and gear categories.

Gear document	Gear name	Description
Anchored nets and lines	Gillnets (set/anchored)	A gillnet is a wall of netting that hangs in the water column. Set (fixed) gillnets are anchored in the seabed and held down by the heavy rope line. They can be either vertical (with a float line) or flat (without a float line). Targets coastal species.
	Longlines (set/anchored)	Longlining can be set at different positions in the water column to target different species. This gear consists of a long length of line. Regular branches of hooks come from this line. The length of the line and number of branches/hooks depends on the size of vessel being used.
	Tangle nets (set/anchored)	These nets are made up of a single wall of netting (like gill nets). Unlike gill net the netting is hung on the ropes, allowing a greater amount of slack netting, making it more effective for catching species on the bottom of the seabed (for example flatfish and shellfish).
	Trammel nets (set/anchored)	These nets are like gill net but instead are made up of three layers of netting. The two outer layers have a large mesh size with a smaller mesh layer in the centre.

Gear document	Gear name	Description
Bottom towed gear (including seines)	Beam trawls	Mouth of trawl is permanently held open by a beam with guides/skids attached. This disturbs bottom fish which rise up and get caught.
	Boat dredges	Two types; one that is dragged along seabed, another that is like a benthic scoop that penetrates the sea bottom. Targets mussels, clams, scallops, crab etc.
	Demersal seine (Danish / anchor seine)	A net shot in the open sea using very long ropes to lay out the net and ropes on the seabed prior to hauling from a boat at anchor.
	Demersal seine (Scottish / fly seine)	Gear is shot on the seabed in a rounded triangle shape with very long weighted ropes attached to each end of the net. The net is gradually hauled in with the vessel maintaining station using its engine power rather than an anchor as in anchor seining.
	Mechanized dredges	Hydraulic dredges dig and wash out mussels from the seabed. It is considered a harvesting machine when the same gear collects the mussels and hauls them on board.
	Nephrops trawls	Adapted to be selective for Nephrops with mall holed mesh. Some have devices to allow the inevitable larger bycatch to escape.
	Otter trawls (bottom)	Dragged along bottom and has an extended top panel to stop fish escaping upwards. Targets bottom and demersal species.
	Otter twin trawls (bottom)	Two identical trawls fixed together to increase the fishing area. Two otter boards to hold mouths open, one at each far end. The connection between the two trawls is a rope which joins the connection between the two pulling. Usually targets shrimp.
	Pair seines (bottom)	The gear is shot by one vessel (as with a single seine). The other vessel picks up the shot Dhan/ropes. Then the pair of vessels tow the gear, allowing the gear to remain open for longer and increased time.
	Pair trawl (bottom)	Gear is towed between two boats, either on the seabed or in midwater – for stage 3 we are considering those on the seabed. The trawl is kept open by the distance between the two vessels.

Gear document	Gear name	Description
Traps	Creel	Creels are a common style of trap used to target crabs and lobsters. The creel uses bait and has a sloped entrance to catch the target species. Originally a wooden base and net covered frame (with a weight), now likely steel covered by plastic covered in netting.
	Pots	Cages/baskets made from various materials and come in various sizes. Mainly set on the bottom, sometimes designed for midwater use. Pots target fish, crustacea and cephalopods.
	Traps	Traps are large stationary nets, cages or baskets in which species are retained or enter voluntarily and will be hampered from escaping. There are many different variations (for example, whelk pots, cuttlefish traps and inkwell pots) – please refer to Montgomerie (2022) for further details and illustrations.

Table A. 3 displays all fishing gears considered in the draft Stage 3 MPA fisheries assessments. Gear types from this list are screen in or out of the assessment according to the fishing activity data analysed for each MPA.

Table A. 3: All commercial fishing gears considered for assessment.

Gear type	Gear name	Gear code
Anchored nets and lines	Combined gillnet-trammel net	GTN
	Fixed gillnet (staked)	GNF
	Gill nets (not specified)	GN
	Gillnets and entangling nets	GEN
	Longline (unspecified)	LL
	Longlines (demersal)	LLS
	Set gillnet (anchored)	GNS
	Trammel net	GTR
	Beam trawl	TBB
Bottom towed gear	Boat seine (unspecified)	SV
	Bottom otter trawl	OTB
	Bottom pair trawl	PTB
	Bottom trawl (unspecified)	TB
	Danish / anchor seine	SDN
	Dredge (unspecified)	DRX
	Electric beam trawl	PUK

Gear type	Gear name	Gear code
	Hand mechanised dredge	HMD
	Mechanised (suction) dredge	DRM
	Multiple bottom otter trawl	OTP
	Nephrops trawl	TBN
	Otter trawls (unspecified)	OT
	Pair seine	SPR
	Pair trawl (unspecified)	PT
	Pump / scoop dredge	HMP
	Scottish / fly seine	SSC
	Seine (unspecified)	SX
	Semi-pelagic trawl	TSP
	Shrimp trawl	TBS
	Sumwing beam trawl	PUL
	Towed dredge	DRB
	Trawl (unspecified)	TX
	Twin bottom otter trawl	OTT
Midwater gear	Boat operated lift net	LNB
	Drift gillnet	GND
	Encircling gillnet	GNC
	Hand fishing	HF
	Hand-operated pole-and-line	LHP
	Hook and line (unspecified)	LX
	Jigging or trolling line	LTL
	Lampara (ring net)	LA
	Longlines (pelagic)	LLD
	Mechanised pole-and-line	LHM
	Midwater otter trawl	OTM
	Midwater pair trawl	PTM
	Midwater shrimp trawls	TMS
	Midwater trawl (unspecified)	TM
	Purse seine (ring net)	PS
	Purse seine (ring net) single vessel	PS1
	Purse seine (ring net) two vessels	PS2
	Surrounding net (unspecified)	SUX
	Vertical line	LVT
Shore based	Beach seine	SB
	Cast net	FCN

Gear type	Gear name	Gear code
	Hand dredge	DRH
	Lift net	LN
	Portable lift net	LNP
	Shore operated stationary lift net	LNS
	Tractor	CGD
Traps	Aerial trap	FAR
	Barrier, fence or weir	FWR
	Cover pot or lantern net	FCO
	Fyke net	FYK
	Pot/Creel	FPO
	Stationary uncovered pound net	FPN
	Stow net	FSN
	Trap	FIX
Shore based	Digging with forks	-
	Drive in net	MDR
	Hand gathering	MHI
	Push net	MPN
	Scoop net	MSP
Miscellaneous	Bait dragging	-
	Crab tiling	-
	Diving	MDV
	Electric fishing	MEL
	Falling gear	FG
	Harpoon	HAR
	Harvesting machine (unspecified)	HMX
	Miscellaneous	MHX, MIS
	Not known	NK
	Pump	MPM
	Recreational fishing gear	RG

Annex 4: Gear Feature Interaction

Table A. 4 provides a summary of the different fishing gear review documents and the features contained within each of these gear documents.

Table A. 4: Gear-feature interactions considered at Stage 3 and the corresponding gear review document.

Fishing Gears	Features	Review document
Anchored nets and lines	• biogenic reef (*Sabellaria spp.*) • rocky reef (includes high/moderate energy circalittoral rock, pink sea-fan, and fragile sponge and anthozoan communities on rocky habits) • sandbanks and subtidal sediments (includes coarse sediment, sand, mixed sediments and subtidal mud) • ocean quahog • sea-pen and burrowing megafauna communities • fan mussel	Stage 3 Fishing Gear MPA Impacts Evidence documents[5]
Bottom towed gears (including seines)	• sandbanks and mixed sediments (includes subtidal coarse sediment, subtidal sand, subtidal mixed sediments, subtidal mud) • ocean quahog • sea-pen and burrowing megafauna communities • fan mussel	
Traps	• biogenic reef (*Sabellaria spp.*) • rocky reef (includes high/moderate energy circalittoral/infralittoral rock, pink sea- fan, and fragile sponge and anthozoan communities on rocky habits) • sandbanks and subtidal sediments (includes coarse sediment, sand, mixed sediments and mud) • ocean quahog • sea-pen and burrowing megafauna communities • fan mussel	