Document Control

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Natural England	Richard Morgan	28 August 2020	16 October 2020 - Approved

Southern Inshore Fisheries and Conservation Authority (IFCA)

Marine Conservation Zone Fisheries Assessment (Part B)

Marine Conservation Zone: Chesil Beach and Stennis Ledges MCZ

Feature: High Energy Circalittoral Rock

Broad Gear Type: Bottom Towed Fishing Gear

Gear type(s) Assessed: Light otter trawl; Beam trawl; Scallop Dredges

Technical Summary

Chesil Beach and Stennis Ledge MCZ was designated as a part of tranche 1 of the MCZ designations. Subsequently in 2016 and 2019 additional features were added in the following tranches. As part of the MCZ assessment process for the Tranche 3 Chesil Beach and Stennis Ledges MCZ features, it was identified that trawling (light otter trawl & beam trawl) and scallop dredging and their potential impacts require an in-depth assessment. The level of trawling and scallop dredging within the site is considered to be light to moderate, with trawling occurring over subtidal sediments in the north of the site and along the front of Chesil beach a maximum 30 times a year. Scallop dredging also occurs over subtidal sediments in the north of the site at a lower level for a maximum of two weeks per year.

The potential pressures likely to be exerted by the activity upon designated features were identified as abrasion, disturbance and penetration of the seabed below and on the surface of the seabed, the removal of non-target and target species, smothering and siltation rate changes and changes in suspended solids. Scientific literature shows that scallop dredging and trawling can damage, remove and cause mortality of the epifaunal species which make up the key communities associated with reef habitats, as well as physical damage through the scraping, movement and dragging of rocks, boulders and cobbles. Recovery of the habitats and associated species can take years to decades.

When considering that trawling and shellfish dredging occurs within Chesil Beach & Stennis Ledges MCZ, in combination with other evidence (scientific literature, feature data, sightings data) it was concluded the activity is likely to pose a significant risk to High Energy Circalittoral Rock. As such, it is believed the activity will hinder the achievement of the designated features ‘recover’ general management approaches and that it is not compatible with the site’s conservation objectives.

Existing management measures are therefore not considered sufficient to ensure that trawling and dredging remains consistent with the conservative objectives of the site. Therefore, additional management for bottom towed fishing gear will be introduced which will protect High Energy Circalittoral Rock within the site.

When scientific literature, fishing activity, sightings data and existing and proposed management is considered, the management of BTFG is considered sufficient to ensure that trawling remains consistent with the conservative objectives of the site - fishing effort will continue to be monitored.

Contents

1 Introduction

1.1 Need for an MCZ assessment

This assessment has been undertaken by Southern IFCA in order to document and determine whether management measures are required to achieve the conservation objectives of Chesil Beach and Stennis Ledges Marine Conservation Zone (MCZ). Southern IFCA has duties under section 154 of the Marine and Coastal Access Act 2009 which states;

154 Protection of marine conservation zones

> (1) The authority for an IFC district must seek to ensure that the conservation objectives of any MCZ in the district are furthered.
>
> (2) Nothing in section 153(2) is to affect the performance of the duty imposed by this section.
>
> (3) In this section—
>
> > (a) “MCZ” means a marine conservation zone designated by an order under section 116;
> >
> > (b) the reference to the conservation objectives of an MCZ is a reference to the conservation objectives stated for the MCZ under section 117(2)(b).

Section 125 of the 2009 Act also requires that public bodies (which includes the IFCA) exercise its functions in a manner to best further (or, if not possible, least hinder) the conservation objectives for MCZs.

The MCZ assessment process complements Southern IFCA’s assessment of commercial fishing activities in European Marine Sites (EMS) – designated to protect habitats and species in line with the EU Habitats Directive and Birds Directive. To bring fisheries in line with other activities, the Department for Environment, Food and Rural Affairs (DEFRA) announced on the 14th August 2012 the revised approach to manage fishing activities within EMSs. This change in approach promotes sustainable fisheries while conserving the marine environment and resources, securing a sustainable future for both.

1.2 Documents reviewed to inform this assessment

- Reference list (Section 7)
- Defra’s matrix of fisheries gear types and European Marine Site protected features[1]
- Site map(s) – feature location and extent (Annex 1)
- Natural England’s Advice on Operations for Chesil Beach and Stennis Ledges MCZ (Annex 4)
- Natural England’s Supplementary Advice on Conservation Objectives Chesil Beach and Stennis Ledges MCZ[2]
- Fishing activity data (map(s), etc) (Annex 5)
- Fisheries Impact Evidence Database (FIED)

2 Information about the MCZ

2.1 Overview and designated features

Chesil Beach and Stennis Ledges MCZ was designated in December 2013, with additional features added in 2016 and 2019. The site covers the stretch of the Dorset coast running also Chesil Bank, over an area of approximately 37 km² and protects the native oyster, pink sea fan, intertidal coarse sediment and intertidal rock. In May 2019 an additional five features of rock and sediment habitats were protected. The site offer protection to number of rare and fragile habitats including rocky reefs and a mixture of sediment types which support communities of flat fish, starfish, sea urchins, bristle worms and Venus clams, as well as the native oyster and a type of soft coral called the Pink Sea Fan.

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[1] https://www.gov.uk/government/publications/fisheries-in-european-marine-sites-matrix

[2] https://designatedsites.naturalengland.org.uk/Marine/SupAdvice.aspx?SiteCode=UKMCZ0004&SiteName=chesil&SiteNameDisplay=Chesil+Beach+and+Stennis+Ledges+MCZ&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=&NumMarineSeasonality=,0

A summary of the site's designated features is provided in Table 1, together with the recommended General Management Approach (GMA) for each feature. The GMA required for a feature in a MCZ will either be for it to be maintained in favourable condition (if it is currently in this state), or for it to be recovered to favourable condition (if it is currently in a damaged state) and then to be maintained in favourable condition.

Table 1 Designated features and General Management Approach

Designated feature	General Management Approach
Intertidal coarse sediment	Maintain in favourable condition
Subtidal coarse sediment	Maintain in favourable condition
Subtidal mixed sediments	Maintain in favourable condition
Subtidal sand	Maintain in favourable condition
High energy intertidal rock	Maintain in favourable condition
High energy infralittoral rock	Maintain in favourable condition
High energy circalittoral rock	Recover in favourable condition
Native oyster (*Ostrea edulis*)	Recover in favourable condition
Pink sea-fan (*Eunicella verrucosa*)	Recover in favourable condition

Please refer to Annex 1 for site feature maps of broad-scale habitats and features of conservation importance. This feature data comes from the Natural England, 2019 data set given to Southern IFCA, containing a collation of marine habitat and species records that contribute to the designation of marine habitats and features. This corresponds with the feature data on Magic Map which represents Natural England's best available evidence (https://magic.defra.gov.uk/MagicMap.aspx).

2.2 Conservation objectives

The site's conservation objectives apply to the Marine Conservation Zone and the individual species and/or habitat for which the site has been designated (the "Designated features" listed below).

The conservation objective of each of the zones is that the protected habitats:

1. are maintained in favourable condition if they are already in favourable condition
2. be brought into favourable condition if they are not already in favourable condition

For each protected feature, favourable condition means that, within a zone:

1. its extent is stable or increasing
2. its structure and functions, its quality, and the composition of its characteristic biological communities (including diversity and abundance of species forming part or inhabiting the habitat) are sufficient to ensure that its condition remains healthy and does not deteriorate

Any temporary deterioration in condition is to be disregarded if the habitat is sufficiently healthy and resilient to enable its recovery.

For each species of marine fauna, favourable condition means that the population within a zone is supported in numbers which enable it to thrive, by maintaining:

1. the quality and quantity of its habitat
2. the number, age and sex ratio of its population. Any temporary reduction of numbers of a species is to be disregarded if the population is sufficiently thriving and resilient to enable its recovery.

Any alteration to a feature brought about entirely by natural processes is to be disregarded when determining whether a protected feature is in favourable condition.

3 MCZ assessment process

3.1 Overview of the assessment process

The assessment of commercial fishing activities within the Chesil Beach and Stennis Ledges MCZ will be undertaken using a staged process, akin to that proposed by the Marine Management Organisation (MMO)[3], for marine license applications (Annex 2). The assessment process comprises of an initial screening stage to establish whether an activity occurs or is anticipated to occur/has the potential to occur within the site. Activities which are not screened out are subject to a simple 'part A' assessment, akin to the Test of Likely Significant Effect required by article 6(3) of the Habitats Directive. The aim of this assessment is to identify pressures capable of significantly affecting designated features or their related processes. Fishing activities and their associated pressures which are not screened out in the part A assessment and then subject to a more detailed 'part B' assessment, where assessment is undertaken on a gear type basis. A part B assessment is akin to the Appropriate Assessment required by article 6(3) of the Habitats Directive. The aim of this assessment is to determine whether there is a significant risk of the activity hindering the conservation objectives of the MCZ. Within this stage of assessment, 'hinder' is defined as any act that could, either alone or in combination:

- in the case of a conservation objective of 'maintain', increase the likelihood that the current status of a feature would go downwards (e.g. from favourable to degraded) either immediately or in the future (i.e. they would be placed on a downward trend); or

- in the case of a conservation objective of 'recover', decrease the likelihood that the current status of a feature could move upwards (e.g. from degraded to favourable) either immediately or in the future (i.e. they would be placed on a flat or downward trend) (MMO, 2013).

If the part B assessment is unable to conclude that there is no significant risk of an activity hindering the conservation objectives of the MCZ, then the activity may be subject to management and consideration will be given to whether or not the public benefit of the activity outweighs the risk of damage to the environment; and if so, whether the activity is able to deliver measures of equivalent environmental benefit to the damage that is likely to occur to the MCZ.

3.2 Screening and part A assessment

The aim of the screening stage and part A assessment is to determine whether, under section 125 and 154 of MCAA, fishing activities occurring or those which have the potential to occur within the site are compatible with the conservation objectives of the MCZ.

The screening of commercial fishing activities in Chesil Beach and Stennis Ledges MCZ was undertaken using broad gear type categories. Sightings data collected by the Southern IFCA, together with officers' knowledge, was used to ascertain whether each activity occurs within the site, or has the potential to occur/is anticipated to occur in the foreseeable future. For these occurring/potentially occurring activities, an assessment of pressures upon MCZ designated features was undertaken using Natural England's Advice on Operations.

Activities were screened out for further part B assessment if they satisfied one or more of the following criteria:

1. The activity does not occur within the site, does not have the potential to occur and/or is not anticipated to occur in the foreseeable future.

2. The activity does occur but the pressure(s) does not significantly affect/ interact with the designated feature(s).

3. The activity does occur but the designated feature(s) is not sensitive to the pressure(s) exerted by the activity.

[3] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/410273/Marine_conservation_zones_and_marine_licensing.pdf

3.2.1 Screening of commercial fishing activities based on occurrence

Initial screening was undertaken to identify the commercial fishing activities which currently occur within the site, together with those which have the potential to occur or/and are reasonably foreseen to occur in the future (Annex 3). To maintain consistency with Southern IFCA's assessment of commercial fishing activities in European Marine Sites, the individual gear types identified in Defra's matrix were assessed and these were grouped into broad gear types.

3.2.2 Screening of commercial fishing activities based on pressure-feature interaction

Fishing activities which were identified as occurring, have the potential to occur and/or are anticipated to occur in the foreseeable future within the site were screened with respect to the potential pressures which they may be exert upon designated features (Part A assessment). This screening exercise was undertaken using Natural England's Advice on Operations and Supplementary Advice for Chesil Beach and Stennis Ledges MCZ (Annex 4). The Advice on Operations provides a broad scale assessment of the sensitivity of designated features to different activity-derived pressures, using nationally available evidence on their resilience (an ability to recover) and resistance (the level of tolerance) to physical, chemical and biological pressures (Annex 4). The assessments of sensitivity to these pressures are measured against a benchmark. It should be noted that these benchmarks are representative of the likely intensity of a pressure caused by typical activities, and do not represent a threshold of an 'acceptable' intensity of a pressure. It is therefore necessary to consider how the level of fishing intensity observed within Chesil Beach and Stennis Ledges MCZ compares with these benchmarks when screening individual activities.

Due to the broad-scale nature of the sensitivity assessments provided in Natural England's Advice on operations, each pressure is assigned a risk profile based upon the likelihood of the pressure occurring and the magnitude of the impact should that pressure occur. These risk profiles have been used, together with site-specific knowledge, to identify those pressures which could significantly affect designated features.

The resultant activity pressure-feature interactions which have been screened in for bottom towed fishing gear for the part B assessment are summarised in Table 2 for sensitive designated features. The activity pressure-feature interactions which were screened out in the Part A Assessment are detailed in a standalone document ('Screening and Part A Assessment') for Chesil Beach and Stennis Ledges MCZ.

Table 2 Summary of fishing pressure-feature screening for High Energy Circalittoral Rock demersal trawls and dredges. Please note only pressures screened in for the part B assessment are presented here.

Pressure	Sensitivity	Part B assessment?	Justification	Attributes
Abrasion/disturbance of the substrate on the surface of the seabed	S	Y	This gear type is known to cause abrasion and disturbance to the seabed surface. Further investigation is needed on the magnitude of the pressure, including the spatial scale/intensity of the activity.	Distribution: presence and spatial distribution of biological communities, Structure and function: presence and abundance of key structural and influential species, Structure: species composition of component communities, Structure: physical structure of rocky substrate.

Changes in suspended solids (water clarity)	S	Y	This gear type is known to cause the resuspension of finer sediments, therefore further assessment is required.	Supporting processes: water quality- turbidity
Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion	S	Y	This gear type is known to cause penetration and disturbance to the seabed surface. Further investigation is needed on the magnitude of the pressure, including the spatial scale/intensity of the activity.	Distribution: presence and spatial distribution of biological communities, Structure and function: presence and abundance of key structural and influential species, Structure: species composition of component communities, Structure: physical structure of rocky substrate.
Removal of non-target species	S	Y	Impacts on the associated community may occur through the removal of epifaunal species. Abrasion, resulting from contact with the gear, is likely to disturb smaller species. There is no site-specific information on the communities associated with this feature as it is newly designated. General information on the designated features from the MCZ features catalogue provides a general description. The feature tends to be dominated by sponges, sea firs, barnacles and soft and branching corals. The post-survey site report provides a species list from video samples. Further investigation is needed as to the magnitude of disturbance to associated communities/species.	Distribution: presence and spatial distribution of biological communities, Structure and function: presence and abundance of key structural and influential species, Structure: species composition of component communities,
Removal of target species	S	Y	Dredging in the site targets scallops (Pecten maximus). Further, investigation is needed as to the magnitude of disturbance to associated communities/species and location of the activity in relation to the feature.	Distribution: presence and spatial distribution of biological communities
Smothering and siltation rate changes (Light)	S	Y	This gear type is known to cause the resuspension of finer sediments, therefore further assessment is required.	Supporting Processes: sedimentation rate

4 Part B Assessment

The aim of the part B assessment is for the IFCA to ensure that that there is no significant risk of a fishing activity hindering the conservation objectives of the MCZ; and to confirm that the authority is able to exercise its functions to further the site's conservation objectives.

In order to adequately assess the potential impacts of an activity upon a designated feature, it is necessary to consider the relevant attributes of that feature that may be affected. Attributes are provided in Natural England's Supplementary Advice on Conservation Objectives (SACOs) and represent the ecological characteristics or requirements of the designated species and habitats within a site. These attributes are considered to be those which best describe the site's ecological integrity and which if safeguarded will enable achievement of the Conservation Objectives. Each attribute has an associated target which identifies the desired state to be achieved; and is either quantified or qualified depending on the available evidence. These are outlined in Table 2.

4.1 Assessment of trawling & dredging in the Chesil Beach and Stennis Ledges MCZ

4.1.1 Summary of the Fishery

Trawling takes place during the winter months in and around the Chesil Beach and Stennis Ledges MCZ. The level of activity is however low with up to four vessels fishing every other week using light otter trawls. There are therefore approximately 20-30 instances of trawling in the site a year. The activity does not target a specific species. The species caught is dependent on the time of year and catches can include common sole (*Solea solea*) and European plaice (*Pleuronectes platessa*), skates and rays.

Currently 3 scallop dredging vessels can operate within the site. The target species is the King Scallop (*Pecten maximus*). The activity can occur at any time of year. It lasts approximately two weeks in the site. The activity occurs in periods of easterly/ north easterly winds when vessels are sheltered by the beach.

4.2 Technical gear specifications

4.2.1 Light otter trawl

An otter trawl comprises of following design (see Figure 1). Two shaped panels of netting are laced together at each side to form an elongated funnel shaped bag (Seafish, 2015). The funnel tapers down to a cod-end where fish are collected (Seafish, 2015). The remaining cut edges of the net and net mouth are strengthened by lacing them to ropes to form 'wings' that are used to drive fish into the net (Seafish, 2015). The upper edge of the rope is referred to as the head line, the lower edge is referred to as the foot rope of fishing line and side ropes are known as wing lines (Seafish, 2015). Floats are attached to the headline to hold the net open and the foot rope is weighted to maintain contact with the seabed and prevent damage to the net (Seafish, 2015). The wings of the net are held open by a pair of trawl doors, also known as otter boards, and are attached to the wings by wires, ropes or chains known as bridles and sweeps (Seafish, 2015). The sweep connects the trawl door to top and bottom bridles which are attached to the headline and footrope of the net, respectively (Seafish, 2015). The choice of material used for the sweeps and bridles depends on the size of gear and nature of the seabed, with smaller inshore boats using thin wire and combination rope (Seafish, 2015). The trawl doors, which are made of wood or steel are towed through the water at an angle which causes them to spread apart and open the net in a horizontal direction (Seafish, 2015). The trawl doors are attached to the fishing vessel using wires referred to as trawl warps (Seafish, 2015). The trawl doors must be heavy enough to keep the net on the seabed as it is towed (Seafish, 2015). As the trawl doors are towed along the seabed, they generate a sediment cloud which helps to herd fish towards the mouth of the trawl (Seafish, 2015). The bridles and sweeps continue the herding action of the trawl doors as the trail on the seabed and disturb the sediment, creating a sediment cloud (Seafish, 2015). The length of the sweeps and bridles and distance between the two trawl doors is tuned to the target species (Seafish, 2015). Species such as lemon sole and plaice can be herded into the trawl over long distances and so the length of the sweeps is longer (Seafish, 2015).

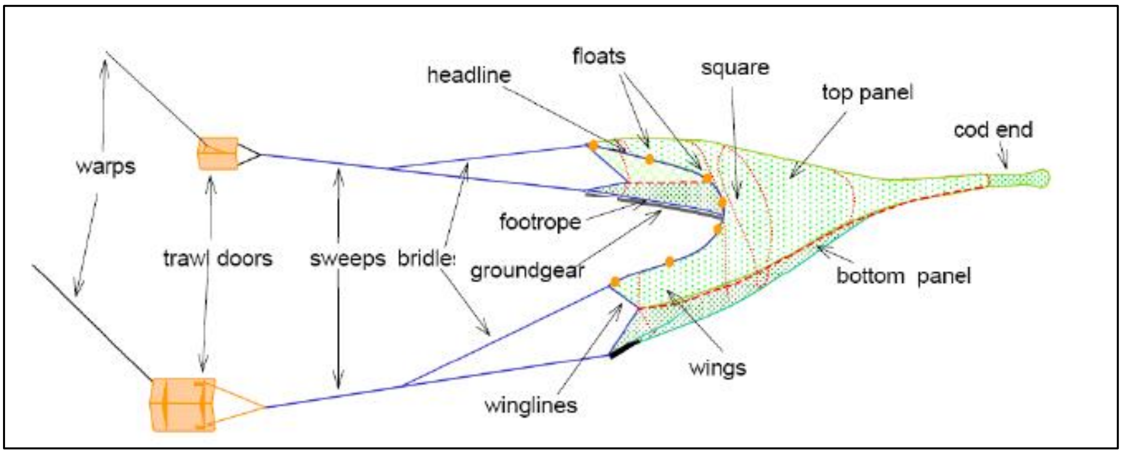


Figure 1 Key components of an otter trawl. Source: www.seafish.org/upload/b2b/file/r_d/BOTTOM%20TRAWL_5a.pdf

The mesh size of the net used varies depending on the type of trawl (Seafish, 2015). In the UK, there has been a move towards an increase in mesh size, particularly in the top panel and wings, in order to improve gear selectivity (Seafish, 2015).

The ground rope will have some form of ground gear attached to protect the netting from damage on the seabed (Seafish, 2015). The ground gear can largely vary. The most basic is where bare fishing line and the netting is laced directly to the rope of combination rope (Seafish, 2015). Chains may also be used and the style of attachment can vary (Seafish, 2015). Ground gear may also include bobbins and rock hoppers which commonly use small and large rubber discs (up to 600 mm) (Seafish, 2015).

The drag of the gear, combined with the floats on the headline, mean the weight of the trawl on the seabed is in the region of 10 to 20% of what it would be in air (Seafish, 2015).

A light otter trawl is one that uses anything less than the definition given for a heavy otter trawl, which include any of the following (MMO, 2014):

- Sheet netting of greater than 4 mm twine thickness
- Rockhoppers or discs of 200 mm or above in diameter
- A chain for the foot/ground line (instead of wire)

Generally, vessels will shoot and haul their gear over the stern of the boat (Seafish, 2015). Restrictions on vessels over 12 metres in length in the Southern IFCA district limits the size of gear that can be used within the district.

4.2.2 Beam trawl

A net is held open by a rigid framework to maintain trawl opening, regardless of towing speed, in addition to supporting the net (Seafish, 2015). The framework consists of a heavy tubular steel beam which is supported by steel beam heads at each end. Each beam head has wide shoes at the base which slide over the seabed (Seafish, 2015). A cone shaped net is towed from the framework, with the head rope attached to the beam and foot rope connected to the base of the shoes (Seafish, 2015). The footrope forms a ‘U’ shape curve behind the beam as it is towed over the seabed (Seafish, 2015). The beam is towed using a chain bridle which is attached to both shoes and at the centre of the beam; all coming together to form a single trawl warp which leads to the vessel (Seafish, 2015).

There are two types of beam trawl and these are referred to as ‘open gear’ and ‘chain mat gear’ (Seafish, 2015). Open gear uses a lighter rig, with a number of chains, known as ‘ticklers’, which are towed along the seabed across the mouth of the net (Figure 2a) (Seafish, 2015). Tickler chains help to disturb fish from a muddy seabed. Open gear is used on clean and soft ground. Chain mat gear on the other hand is used for towing over harder and stonier seabed and if often used by larger vessels (Seafish, 2015). The chain mat gear uses a lattice work of chains which are towed from the back of the beam and attach to the footrope of the net (Figure 2b) (Seafish, 2015). Lighter styles of beam, using fewer tickler chains and without a chain mat, are used to target shrimp (Seafish, 2015).

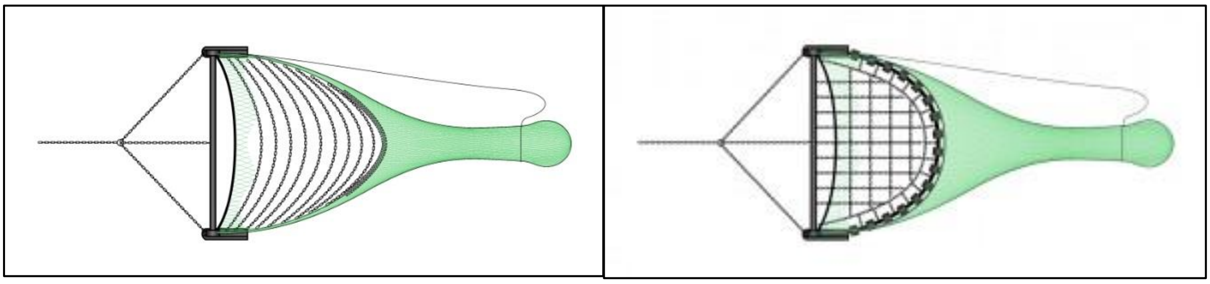


Figure 2 a) 'Open gear' beam trawl. b) 'Chain mat gear' beam trawl.

Generally, vessels below 12 metres, like those used in the Southern IFCA district, tow one trawl from the stern of the vessel (Seafish, 2015). The size of the beam towed, and the horsepower of many vessels, can be restricted by the local fishery regulations (Seafish, 2015).

4.2.3 Scallop dredges

Scallop dredges are rigid structures of the following design (see Figure 3). A triangular frame, with a width of up 85 cm in the Southern IFCA district, is attached to a collection bag and chain mesh which sits behind it. The triangular frame is fitted with a toothed bar at the front to dislodge scallops from the seabed and into the collection bag. In the Southern IFCA district, the dredge must be fitted with a spring-loaded tooth bar. The teeth on the bar are approximately 120 mm long; with 20 mm penetrating the seabed (depending on the substrate). The collection bag sits on top on the chain mesh. A number of dredges are attached to and towed behind a spreading bar with a bar usually deployed from each side of the vessel. The length of the bar and number of dredges depends on the size and power of the vessel. In Southern IFCA, the maximum number of dredges which may be towed at any time is twelve.

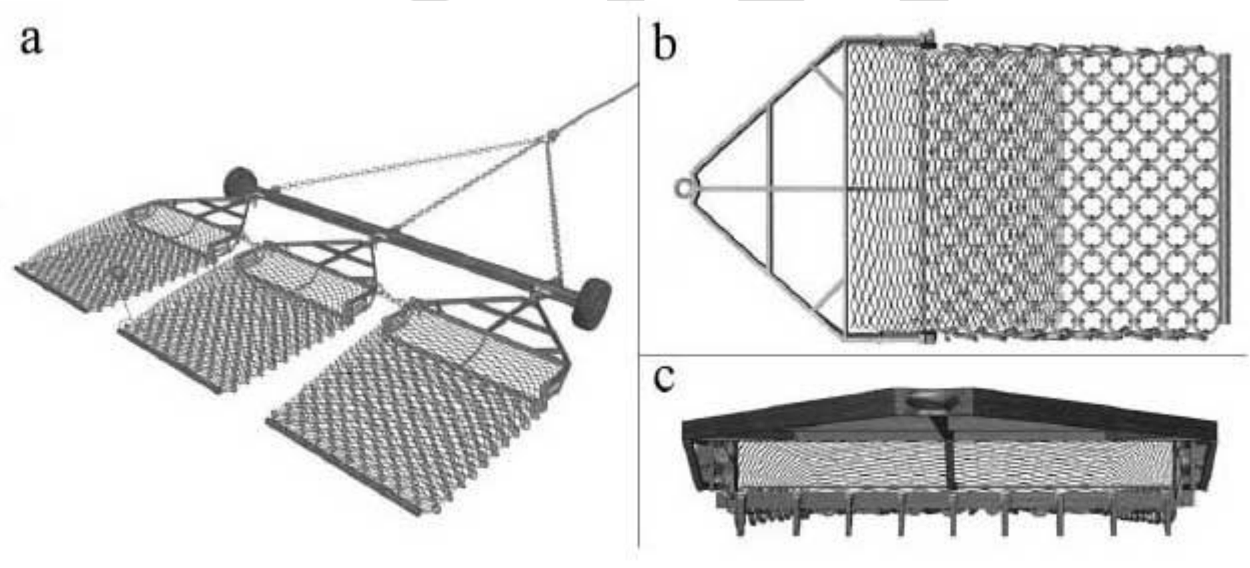


Figure 3.Typical scallop dredge set up used in the UK. (a) 3-dredge-a-side set up and spreading bar. (b) Chain mesh and collection bag (top side). (c) Spring-loaded toothed bar. Source: http://www.gov.scot/Publications/2012/10/7781/4

4.2.4 Location effort and scale of fishing activities

Trawling takes place subtidally and occurs during the winter months in and around the Chesil Beach and Stennis Ledges MCZ. Up to four vessels fish in the area (although not at the same time) using light otter trawls. There are approximately 20-30 instances of trawling in the site a year, with each instance totalling around 4 hours in duration. The Bottom Towed Fishing Gear byelaw prevents fishing over three areas in the site including Stennis Ledges (Figure 4). The activity does not target a specific species, with catch varying dependant on the time of year. Catches can include common sole (*Solea solea*), European plaice (*Pleuronectes platessa*), squid (*Loligo forbesii*), skates and rays.

Based on the information described above; trawling occurs only up to a maximum of thirty times per year in the MCZ. Hall *et al.* (2008) assessed the sensitivity of marine habitats and species to fishing activities. According to their fishing intensity categories[4] the fishing level in the Chesil Beach and Stennis Ledges MCZ is classed as Light to moderate (between 1-2 times a month during a season in 2.5nm x 2.5nm and 1 to 2 times a week in 2.5 nm x 2.5 nm).

Sightings data in Annex 5 shows trawling activity sightings in the site between 2009-2020. One historic trawl sighting has been made in the site over the past 11 years.

Currently three scallop dredging vessels operate within and around the MCZ, however only one vessel fishes at any one time. The activity can occur at any time of year, but only in periods of easterly/ north easterly winds when vessels are sheltered by the beach. The maximum amount of fishing in the site totals 2 weeks each year. The Bottom Towed Fishing Gear byelaw prevents fishing over the three areas in the site including Stennis Ledges. The target species is the King Scallop (*Pecten maximus*).

Based on the information described above; scallop dredging occurs for a maximum of two weeks per year in the MCZ. Hall *et al.* (2008) assessed the sensitivity of marine habitats and species to fishing activities. According to their fishing intensity categories the fishing level in the MCZ is classed as Light to moderate (between 1-2 times a month during a season in 2.5nm x 2.5nm and 1 to 2 times a week in 2.5 nm x 2.5 nm).

Sightings data in Annex 5 shows dredging activity sightings in the site between 2009-2020. Many dredge sightings have been made in the site over the past 11 years, however no dredge activity sightings have been made in the past three years. Many of the dredge sightings were made before the Bottom Towed Fishing Gear byelaw came into act and therefore it is clear that the activity used to occur in the now closed areas of the site. Several recent sightings of dredging have been made to the south west of the sight.

4.3 Co-location of fishing activity and features under assessment

Maps of the broad scale habitat data for the site overlaid with fishing sightings data are available in Annex 5. Many of the dredge sightings were made before the Bottom Towed Fishing Gear byelaw came into act and therefore it is clear that the activity used to occur in the now closed areas of the site. In the past 11 years scallop dredging has occurred within the northern area of the site over coarse, mixed and sand sediments. One sighting, in the past three years, of trawling have been made in the site, again in the northern section over mixed sediments. It is understood that trawling occurs along the length of Chesil beach outside the closed areas.

4.4 Pressures

4.4.1 Abrasion/disturbance of the substrate on the surface of the seabed/ Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion/ Removal of non-target species

The environmental impacts of bottom towed fishing gear are complex (Boulcott *et al*., 2014). The extent of disturbance depends on a number of factors including substrate type (Kaiser *et al*., 2002), design and weight of the gear (Boulcott & Howell, 2011) performance of the gear over a particular substrate (Caddy, 1973; Currie and Parry, 1999) and the sensitivity of the benthic community (Currie and Parry, 1996; Bergman *et al*., 1998; Collie *et al*., 2000a; Boulcott *et al*., 2014).

In a meta-analysis of 41 bottom towed impact control studies, only 3 were found to look at reef features, and these focused on biogenic reefs (Hiddink *et al.,* 2020). The meta-analysis revealed that effects of bottom towed gears were strongest on coarse sediments and biogenic structures. Additionally, those effects were worse for impacts caused by dredges rather than trawls (Hiddink *et al.,* 2020). Whole community biomass and numbers were found to be strongly negatively affected by bottom towed gear in benthic habitats and

[4] Heavy – Daily in 2.5 nm x 2.5 nm, Moderate – 1 to 2 times a week in 2.5 nm x 2.5 nm, Light – 1 to 2 times a month during a season in 2.5 nm x 2.5 nm, Single pass – Single pass of fishing activity in a year overall

were determined to be the best indicators (Hinddink *et al.,* 2020). However, biomass of individual taxa was not found to be significantly affected (Hiddink *et al.,* 2020).

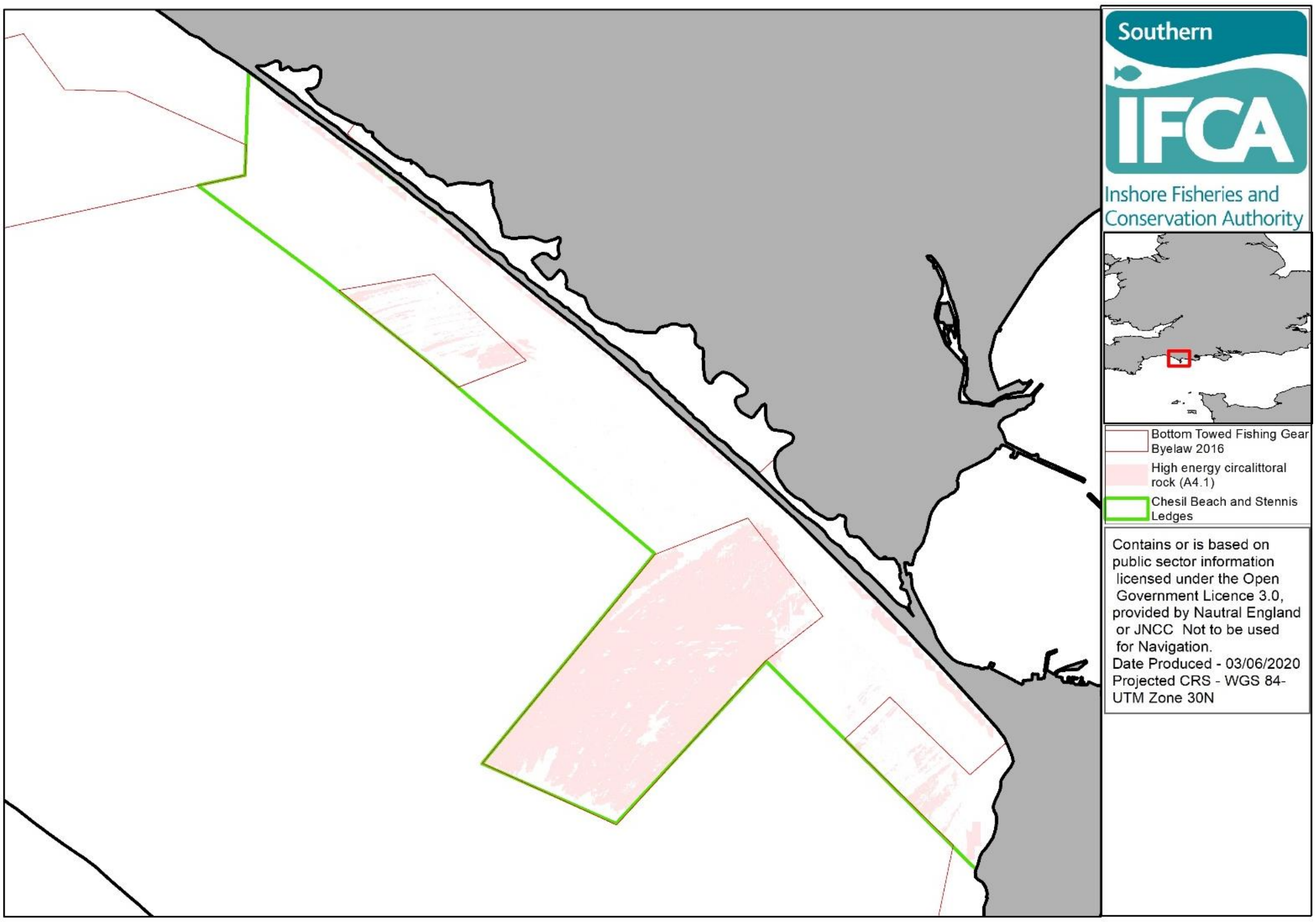


Figure 4. A map of high energy circalittoral rock habitat in the Chesil Beach and Stennis Ledge MCZ, with Bottom Towed Fishing Gear Closures overlaid.

Dredges

Very few studies have been carried out of the impacts of bottom towed fishing gear over rocky reef habitat. A meta-analysis of 39 fishing impact studies revealed dredging had a more negative impact than trawling (Collie *et al*., 2000b). Potential effects include reductions in habitat structural complexity and subsequent habitat homogenisation, reduction in biodiversity, removal of erect epifaunal species and large sessile species some of which are likely to large, fragile and long-lived and physical damage to fragile structures (Sewell and Hiscock, 2005). Such impacts are caused through direct contact with the seabed.

Cranfield *et al.,* (2003) studied the effect of oyster dredges in the Foveaux Strait, New Zealand, on bryozoan biogenic reefs. Side scan surveys revealed that dredging over the reefs completely removed the biogenic structure and, on the fringes, had damaged the framework structure (Cranfield *et al.,* 2003). The removal of the biogenic structures had exposed associated sediments which were then transported down current, however this sediment supply stopped when dredging ceased due to a lack of oyster stock (Cranfield *et al.,* 2003).

In Lyme Bay, within the southern IFCA district king scallops are typically harvested using mechanical dredges in the past over rocky, boulder and coble reef habitats (Munro & Baldock, 2012). The introduction of a statutory closed area provided the opportunity to measure the effects of scallop dredging over rocky habitats. Three types of area were studied – areas which had been voluntarily closed to fishing before the statutory closure, areas newly closed as a part of the statutory closure, and areas which were open to fishing. In open areas there were significantly fewer taxa when compared to both closed and newly closed areas. In particular the number of branching sponges and cover of sponge crusts were significantly lower in areas open to scallop dredging (Munro & Baldock, 2012). The assemblage composition was also significantly different between open and closed areas (Munro & Baldock, 2012). Open sites were characterised by hydroids, polychaetes and barnacles, whilst the closed sites contained sponges as an important component (Munro & Baldock, 2012).

Trawling

Otter trawl fishing gear has contact with the seabed through ground rope, chains and bobbins, sweeps, doors and any chaffing mats or parts of the net bag (Jones, 1992). Otter door marks are often the most recognisable and commonly observed effects of otter trawls on the seabed (Caddy, 1973; Friedlander *et al*., 1999; Grieve *et al*., 2014). Bridles or sweeps, the cables that connect the trawl doors to the trawl net, can snag on boulders or other obstructions over rough ground (Grieve *et al*., 2014). This contact with the seabed disturbs the benthos and relocates stones and boulders (Gislason 1994).

A number of studies have reported impacts of otter trawling in areas of reef and where corals are present. In an area of mixed substrata at 50 to 100 m depth in north-western Australia, Moran and Stephenson (2000) reported, on each tow of an otter trawl (dimensions unknown), a 15.5% reduction in benthic organisms that stood higher than 20 cm off the seabed, comprised mainly of gorgonians, sponges and soft corals. Van Dolah *et al*. (1987) reported significant decreases in the density of barrel sponges and damage to finger sponges, vase sponges, whip corals, fan corals, stock corals and stony tree corals after a single pass with an otter trawl in a hard-bottom sponge and coral community at 20 m in Grays Reef, Georgia. The otter trawl used had a 40/54 fly net,12.2-m headrope,16.5-m footrope with 30 cm rubber rollers and 15-cm rubber discs and 1.8 x 1.2 m China V-doors. Recovery was reported to occur within one year (Van Dolah *et al*.,1987).

Deep-water trawling has had a clear and significant impact on deep-water coral reefs (200-1300m) and other organisms, including *Lophelia*, in the North Atlantic since the 1980s (Sewell and Hiscock, 2005; Malecha & Heifetz, 2017). Halls-Spencer *et al*. (2002) analysed commercial otter trawl catches taken from the West Ireland continental shelf break and West Norway and reported large amounts of coral bycatch in 5 out of 229 trawls, including pieces up to 1 m^2. ROV video observation revealed sparse living coral, coral rubble and track marks in trawled area. The otter trawls used in the fishery are fitted with rockhopper gear and 900-kilogram trawl doors. A similar study, looking at the same corals in the same area, documented that trawling had caused complete destruction of reef structures, removal and displacement of reefs by the otter boards and trawl nets (Fossa et al., 2002).

The intensity of trawling activity plays a key role in the severity of the effect to reef habitats. Kędra *et al.* (2017) found that high intensity trawled areas had considerably lower taxonomic richness, species numbers and significant differences in epifaunal abundance and biomass. Hydrozoans, bryozoans and annelids were particularly negatively affected; however, gastropods were found only in trawled areas (Kędra *et al.,* 2017). Sponges occurred five times less frequently in trawled areas (Kędra *et al.,* 2017).

Malecha & Heifetz (2017) revisited an experimentally trawled site, ~200m depth, in the Gulf of Alaska, 13 years after the experimental original study. Thirteen years after the trawling average density of large sponges was more than 30% lower and incidence of sponge damage was 59% higher in trawled transects compared to reference areas, indicating the long-term effects of trawl damage to fragile species.

Unfortunately, due to the lack of similarity between areas and habitats in which trawling has been shown to cause adverse effects and those found in the Southern IFCA district, many of the studies examined are of limited relevance.

4.4.2 Removal of target species

The king scallop (*Pecten maximus*) can be found throughout most of the inshore waters of the English Channel (Le Goff *et al.,* 2017). Throughout the Southern IFCA district both in the east around the Isle of Wight and the West in Lyme Bay the king scallop is harvested and landed as an important commercial species (Le Goff *et al.,* 2017). *Pecten maximus* contribute 6-20% of the total catch weight in scallop dredges in the English Channel, with shell and rock making up the majority of the catch (Szostek *et al.,* 2017; Jenkins *et al.,* 2001).

Of the live biomass caught within the dredge the king scallop accounts for, on average, 81%, indicating the fishing method is relatively selective (range 55-83%) (Szostek *et al.,* 2017).

The average efficiency of dredges 1.2m wide, with 12 teeth and bag belly rings of 83mm diameter was studied by Chapman *et al.* (1977). The dredge efficiency of standard dredges in Scotland showed large variations from 0 to 35.7% capture efficiency (Chapman *et al.,* 1977). The average efficiency for all scallop sizes was around 20%, but slightly higher for larger scallops. Only 3.3 % of scallops smaller than 80mm were caught. The overall efficiency of a spring-loaded dredge varied from 2.5 to 37.5 %, at an average of around 13 % (Chapman *et al.,* 1977). 4.3% of scallops left behind in a dredge track showed mortality, compared to 2.6 % in an unfished control group. Mortality occurred mostly in those individuals which were severely damaged. Only 5% or less of those scallops within the dredge track and dredge catch showed sever damage (Chapman *et al.,* 1977).

In a Newhaven style scallop dredge, of those scallops which are brought to the surface within the dredge between 5 and 6% have died (Shephard *et al.,* 2009). Of those scallops which are undersized and returned to sea, it is generally considered that unless badly damaged these scallops survive (Howell and Frazer 1984).

On the seabed only 15% of scallops disturbed by a dredge remain recessed within the sediment (Jenkins *et al.,* 2001). Of all the scallops both brought up within the dredge and those which remain in the dredge track more than 90% show very little damage (Jenkins *et al.,* 2001).

However, in the lab, experimental simulations of dredging have caused a significant increase in scallop (*P. maximus*) time taken to respond to a predator stimulus and the adduction number of the response (Jenkins and Brand, 2001). Larger scallops take longer to respond than smaller individuals. After 1 hour's recovery time, scallops showed a similar response indicating recovery from dredging takes more than 1 hour (Jenkins and Brand 2001).

Bremec *et al.* (2004) studied the survival of the Patagonian scallop (*Zygochlamys patagonica*) after exposure to 30 minutes of air onboard a fishing vessel, the equivalent time to that which it takes to sort the catch for commercial sizes (>55mm). Survival of this scallop species was high with a mean value of 95.5%, with more than 90% of scallops surviving exposure times of up to 4 hours (Bremec *et al.,* 2004). Jenkins and Brand (2001) found that exposure to air (20 mins) had a negative effect on 3 out of 4 predator response variables of *P. maximus*.

Specific experiments have looked at the effect of simulated dredging and tow speed on the stress of small scallops (<75mm) (Maguire *et al.,* 2002). Higher tow speeds led to greater stress, however, the low tow speed also caused to stress. The ability of scallop to self-right and recess into the sediment declined only in individuals exposed to the high tow speed (Maguire *et al.,* 2002). Tow length does not have a significant effect on scallop stress level. Repeated dredging at a lower speed after 24 hours leads to a cumulative effect of scallop stress but no additional increases was found after repeated dredging at 48 h. Tows at the higher speed additional dredge disturbance did not lead to a cumulative effect (Maguire *et al.,* 2002). Importantly for all stimulation's scallops recovered relatively quickly, between 2 and 6 hours after dredging (Maguire *et al.,* 2002).

When areas of the seabed are protected from scallop dredging and other forms of towed gears, the density of scallops on the seabed can increase (Leigh *et al.,* 2014). Scallops can live for considerably longer and grow to much larger sizes if not harvested, with exploitable and reproductive biomass also increasing, compared to open fishing grounds (Leigh *et al.,* 2014). Juvenile scallops can be as much as 350% more abundant in no take zones than in fished areas. Overall, it has been found that bottom towed gear closures or no take zones, not only increase the productivity of scallop populations inside the zones, but this also positively effects scallop populations on active fishing grounds (Leigh *et al.,* 2014).

A study of the effects of scallop dredging in Lyme bay found that within three years an area was closed to all bottom towed gears, scallop numbers had significantly increased in a newly closed area when compared to open controls (Sheehan *et al.,* 2013). On the other hand, a study in the same area found fishing history treatment and time had no significant effect upon the abundance of king scallops in a before and after study (9 years) (Kaiser *et al.,* 2018).

Changes in scallop density have been found to be primarily driven by seasonal fluctuations in Cardigan Bay, Wales (Sciberras *et al.,* 2013).

4.4.3 Changes in suspended solids/ Smothering and siltation rate changes

The resuspension of fine sediments takes place as fishing gear is towed along the seafloor (Johnson *et al*., 2002). Larger sand particles are redeposited near the dredge whilst measurable amounts of fine silt and clay particles remain in suspension and are potentially transported away by currents (Godcharles, 1971; Tuck *et al*., 2000). The effects of sediment resuspension include increased turbidity and thus a reduction in light, burial of benthic biota, smothering of adjacent areas including potential spawning areas, and negative effects on the feeding and metabolic rates of organisms (Johnson *et al*., 2002). These effects are site-specific and depend on grain size, sediment type, water depth, hydrological conditions, sensitivity of fauna, currents, tides and water mass properties (Coen, 1995).

Where gear is towed over rocky habitat the impact of this will be significantly reduced due to the low or non-existence level of sediment present within the sea habitats. However, if gear is towed between reef areas in coarse and mixed sediment the suspension of sediment is likely.

Dale *et al.,* (2011) used a particle tracking model to determine the effect of a vessel towing eight dredges on either side in a water current of 0.1m per second. The model suggested that the majority of all sediment size classes suspended settles within 100 meters of the dredge (Dale *et al.,* 2011). Of the suspended sand and larger particles, only 10m from the dredge all but 3.6% of these particles will have settled (Dale *et al.,* 2011). However, of the fraction of silt that makes up the sediment, 92.5% persists in the water column 100m away from the dredge site (Dale *et al.,* 2011). The total sediment accumulation immediately outside the dredge is just 1.6mm, and, after 1 hour, just 8,2% of the suspended silt remains in suspension at 315m away from the dredge which is comparable to low natural suspended sediment levels (Dale *et al.,* 2011).

For a 48-minute dredge tow, in combination with tidal period, in the far field (where the sediment has been carried by the current away from the dredge site) the maximum suspended concentration is 0.24g per m cubed, with a maximum settled thickness of 0.0012mm (Dale *et al.,* 2011). If sediment hotspots from multiple vessels coincided it would take more than 15 tows for silt concentrations to match low natural levels, and more than 200 tows for the levels to equal that seen during stormy conditions (Dale *et al.,* 2011). The model therefore suggests that reefs in the area are only at risk if they are within 10m of the dredge site, and that those which lay further afield will not be significantly affected by changes in turbidity, siltation or smothering rates beyond natural levels (Dale *et al.,* 2011).

The resuspension of sediment can impact upon benthic communities through smothering, burial and increased turbidity. These effects may extend to organisms living a distance away from the fished area (Kyte & Chew, 1975). If high levels of sediment are resuspended and exposure to such events is regular, impacts may be severe (Mercaldo-Allen & Goldberg, 2011). Increased turbidity can inhibit respiratory and feeding functions of benthic organisms, in addition to causing hypoxia or anoxia (Morgan & Chuenpagdee, 2003). Sediment resuspension can jeopardise the survival of bivalves and fish as a result of clogged gills and inhibition of burrowing activity (Dorsey & Pederson, 1998). Small organisms and immobile species are particularly vulnerable to smothering (Manning, 1957). A redistribution of finer sediment can also hinder the settlement of organisms if hard surfaces are smothered (Tarnowski, 2006). The severity of such impacts is largely determined by sediment type, the level of sediment burden and the tolerance of organisms which is largely related to their biology (i.e. size, relationship to substrate, life history, mobility) (Coen, 1995).

4.4.4 Natural disturbance

Communities that exist in areas of high natural disturbance rates are likely to have characteristics that provide resilience to additional disturbance (Hiddink *et al*., 2006a). Any vulnerable species would be unable to exist within conditions of frequent disturbance (Hiddink *et al*., 2006a). The impact of bottom towed fishing gear (such as trawling and scallop dredging is therefore expected to be higher in areas that experience low levels of natural disturbance and lower at locations of high levels of natural disturbance (Hiddink *et al*., 2006a).

Despite the significance between benthic community responses to bottom towed gears disturbance and levels of natural disturbance, the relationship remains unquantified (Hiddink *et al*., 2006a). There can often be a failure to detect the effect of experimental fishing disturbance in areas exposed to high levels of natural disturbance (Thrush & Dayton, 2002). Whilst it may be appropriate to equate effects of natural disturbance to some effects of trawling disturbance, it is not always the case. Fishing can involve a higher intensity of disturbance, although this is dependent on frequency and extent (Thrush & Dayton, 2002). Bottom towed gear effects small-sized organisms through sediment perturbations, which is comparable to that of natural disturbance, whereas its impacts on larger-bodied organisms will be through physical contact with fishing gear (Bergman & van Santbrink, 2000). The relatively low impact on benthic communities inhabiting mobile sediments might therefore only apply to small-bodied animals (Bergman & van Santbrink, 2000).

The Lyme Bay area, including the Chesil Beach and Stennis Ledges, has relatively low tidal flows. Along the Chesil Beach front tidal streams reach a maximum of 1.5 knots on a spring tide at the eastern side of the site, and 1.1 knots at the western end of the site[5]. Bolam *et al*. (2014) modelled natural seabed disturbance as part of a study looking at the sensitivity of microbenthic second production to trawling in the English sector of the greater North Sea. Natural seabed disturbance was represented by tidal bed stress and kinetic energy at the seabed. Maps showing the probability of natural forces disturbing the seabed to 1 and 4 cm for a range of frequencies (once, 10 times, and 17 times were also created. These maps cover Lyme Bay (Figure 5 & Figure 6), although the resolution is low as the area covered includes the North Sea and western English Channel. These maps show a conflicting understanding of natural disturbance in the Chesil Beach and Stennis Ledges area. Figure 5. (left) demonstrates that Lyme bay area, including the Chesil Beach and Stennis Ledges MCZ, is subject to relatively low maximum annual tidal bed stress ranges from 0-0.5 NM^2 in the site. However, in Figure 5(right) kinetic energy at the seabed ranges from moderate to high within the site, with high running close along the length of Chesil beach. The probability of natural forces disturbing the seabed to 1 cm are at the lowest probability (0.00-0.40) at all frequencies, except to 1cm depth >1 day per year where the probability is 0.21-0.4 (Figure 6).

[5] Information and diagrams on the tidal streams experienced in Lyme Bay can be found at https://www.visitmyharbour.com/articles/3184/hourly-tidal-streams-around-lyme-bay

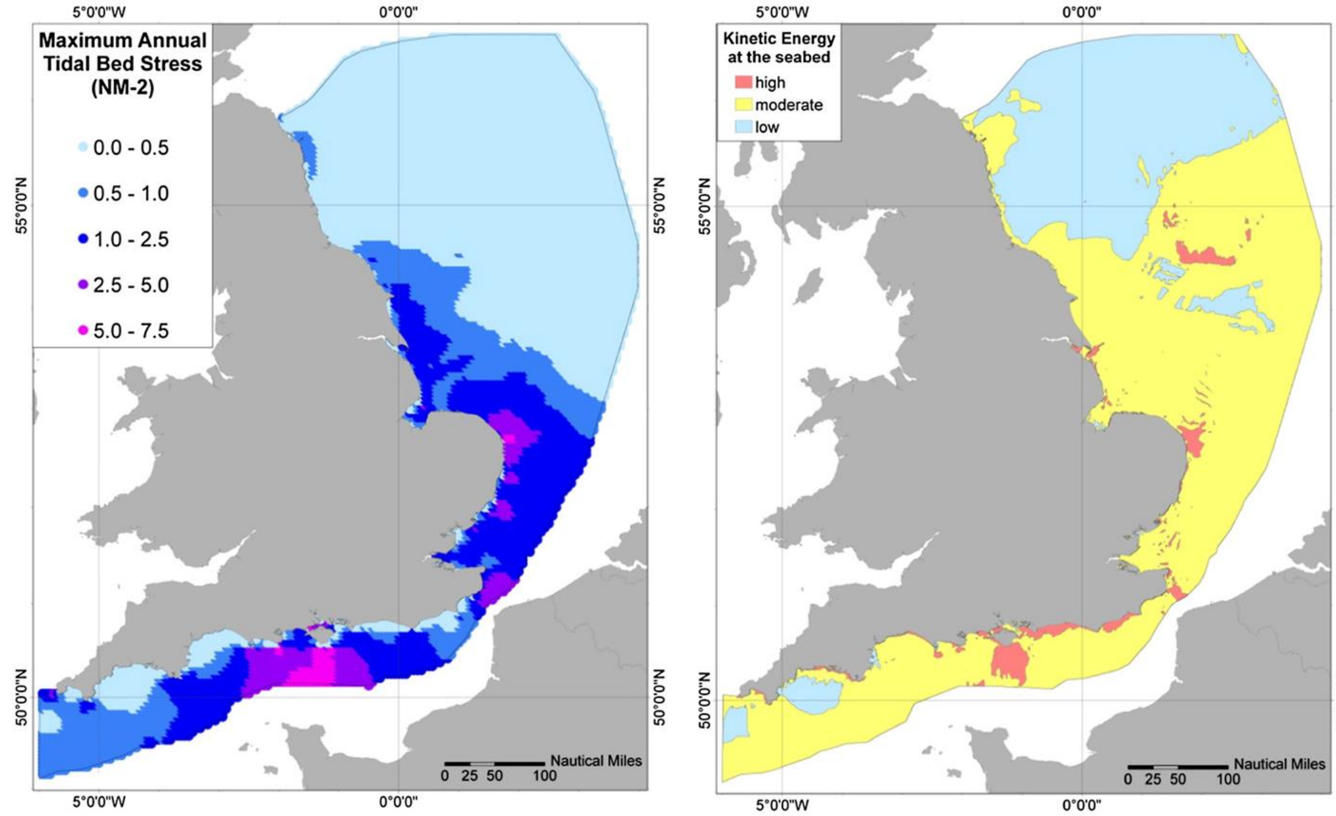


Figure 5. Maps of modelled natural disturbance of the seabed, represented by tidal bed stress (left) and kinetic energy (right). Source: Bolam *et al.*, 2014

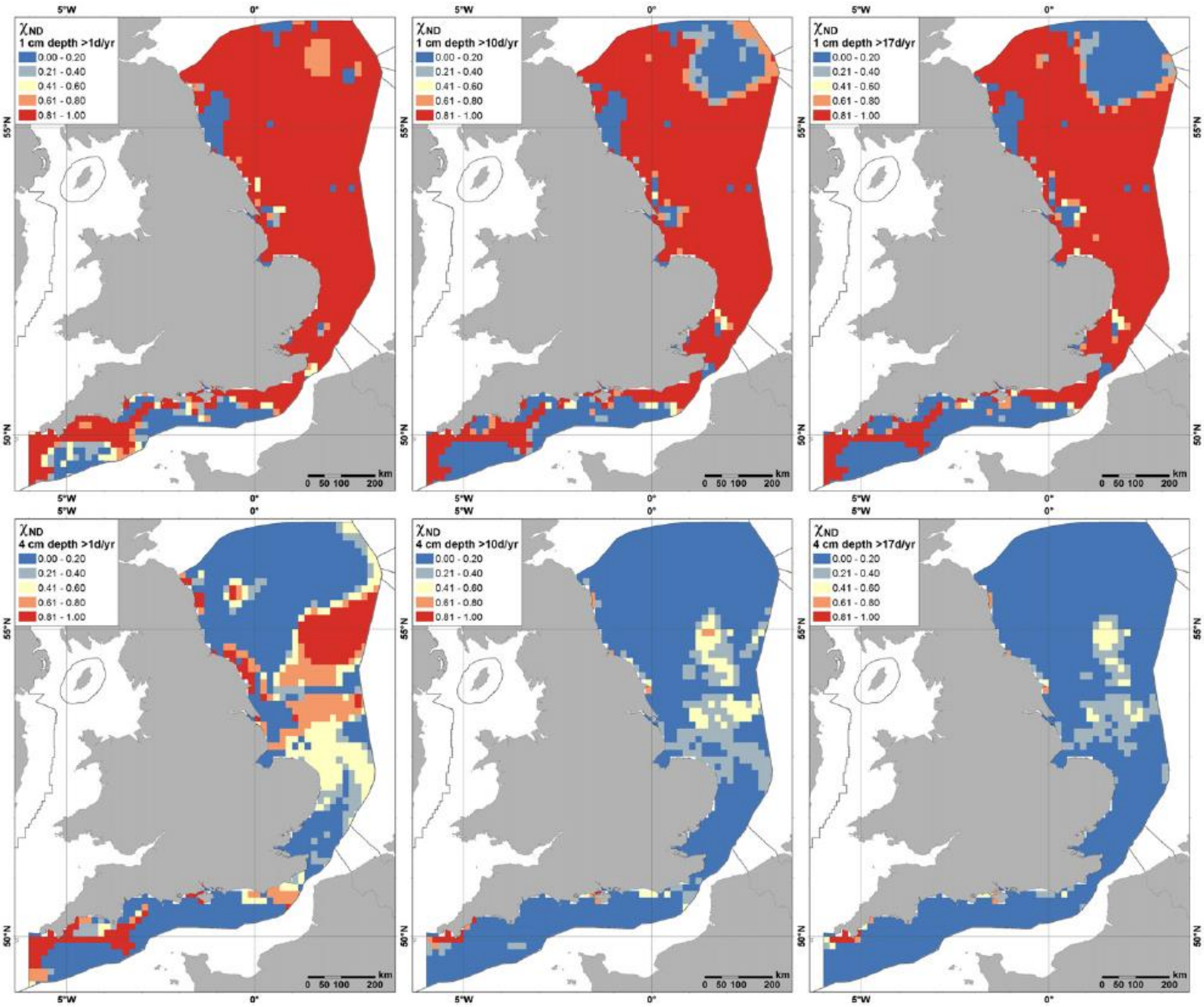


Figure 6. Maps of the modelled probability that natural forces disturb the seabed to different depths of 1 and 4 cm for a range of frequencies per year (once, 10 and 17 times). Source: Bolam *et al*., 2014

In the context of MPA management, it is important to qualify which changes occur to naturally dynamic communities as a result of natural variability within the environment, as opposed to that resulting from anthropogenic pressures (Goodchild *et al*., 2015). The reason being that the conservation objectives of a site are 'subject to natural change (Goodchild *et al*., 2015). It can therefore prove difficult in ascertaining if the conservation objective of a site is being compromised by anthropogenic pressures if the MPA feature is also subject to natural variability (Goodchild *et al*., 2015). Potential changes caused by towed fishing gear could be masked by the impacts of natural sediment movements which maintain the benthic community in a state of successional flux (Løkkeborg, 2005; Goodchild *et al*., 2015). A recent study attempted to analyse existing data to study effects of towed fishing gears on mobile sediments against a background of natural variability, however, it concluded the results of the study were of little direct value in terms of MPA management (Goodchild *et al*., 2015)

4.4.5 Sensitivity

A number of recent studies have endeavoured to map the sensitivity of habitats to different pressures (Tillin *et al*., 2010) and fishing activities (Hall *et al*., 2008).

Tillin *et al*. (2010) developed a pressure-feature sensitivity matrix, which in effect is a risk assessment of the compatibility of specific pressure levels and different features of marine protected areas. The approach used considered the resistance (tolerance) and resilience (recovery) of a feature in order to assess its sensitivity to relevant pressures (Tillin *et al*., 2010). Where features have been identified as moderately or highly sensitive to benchmark pressure levels, management measures may be needed to support achievement of conservation objectives in situations where activities are likely to exert comparable levels of pressure (Tillin *et al*., 2010). In the context of this assessment, the relevant pressures likely to be exerted are surface abrasion, shallow abrasion/penetration and penetration and/or disturbance of the substrate below the surface of the seabed. Sensitivity to all pressures is considered high for Pink sea-fans, with medium confidence in these assessments (Table 3. Sensitivity of features to pressures identified by Tillin et al. (2010). Confidence of sensitivity assessment is included in brackets.

Hall *et al*. 2008 aimed to assess the sensitivity of benthic habitats to fishing activities. A matrix approach was used, composed of fishing activities and marine habitat types and for each fishing activity sensitivity was scored for four levels of activity (Hall *et al*., 2008). The matrix was completed using a mixture of scientific literature and expert judgement (Hall *et al*., 2008). The type of fishing activity chosen was 'beam trawls and scallop dredges' and 'light demersal trawls and seines' as they best encompassed the fishing activities under consideration. The majority towed bottom gears where considered unlikely to be deployed in these habitat types and as such were not assessed for heavy to light gear intensities. Rock with erect and branching species appears to be slightly less sensitive to a single pass of the heavier gear types than very slow growing erect and branching species (Table 4). On the other hand, the assessment for the lighter gear type revealed a high sensitivity for both habitat types to a single pass, which may be inaccurate when considering against the sensitivity assigned for heavier gear types.

Table 3. Sensitivity of features to pressures identified by Tillin et al. (2010). Confidence of sensitivity assessment is included in brackets.

	Pressure			
Feature	**Surface abrasion: damage to seabed surface features**	**Shallow abrasion/penetration: damage to seabed surface and penetration**	**Penetration and/or disturbance of the substrate below the surface of the seabed**	**Siltation rate changes (low)**
High energy circalittoral rock	Medium to High (Low)	Medium to High (Low)	Medium to High (Low)	Medium to High (Low)

Table 4. Sensitivity of relevant features to different intensities (high, medium, low, single pass) of static gear (fishing activities which anchor to the seabed) as identified by Hall *et al*. (2008).

Habitat Type	**Gear Type**	**Gear Intensity***			
		Heavy	Moderate	Light	Single pass
Erect and branching spp. very slow growing	**Beam trawls and scallop dredges**				High
	Light demersal trawls and seines				High
	Demersal trawls				High
Rock with low-lying fast-growing faunal turf	**Beam trawls and scallop dredges**				Low
	Light demersal trawls and seines				Medium
	Demersal trawls				Low
Rock with erect and branching species	**Beam trawls and scallop dredges**				Medium
	Light demersal trawls and seines				High
	Demersal trawls				Medium

*Gear activity levels are defined as follows; Heavy – Daily in 2.5 nm x 2.5 nm, Moderate – 1 to 2 times a week in 2.5 nm x 2.5 nm Light – 1 to 2 times a month during a season in 2.5 nm x 2.5 nm, Single pass – Single pass of fishing activity in a year overall

4.4.6 Recovery

Since the introduction of a statutory closed area in Lyme Bay it has provided the opportunity to study the recovery of rocky reef habitats and species from the effects of scallop dredging. Three years after the gear was prohibited, overall sessile reef associated species (RAS) were significantly greater within the Marine Protected Area compared to before and still open controls (Sheehan *et al.,* 2013). The mean abundance of RAS increased by 158%. Analysis of the assemblage compositions revealed that before the closure open to fishing and MPA sites were similar to one another, however after three years before and after sites assemblage composition were significantly different. Four species (ross coral, sea squirt (*P. mammillata)*, dead man's fingers and branching sponges) significantly increased in abundance from before the MPA to the after the MPA relative to open to fishing controls (Sheehan *et al.,* 2013). These species were found in coarse, cobbled and boulder sediment areas between those areas of solid bedrock, showing that the exclusion of bottom towed fishing gear not only enables the reef itself to recover, but also enables reef associated species to thrive in areas between reef structures (Sheehan *et al.,* 2013).

A longer-term study of the Lyme Bay reefs found that species recovery within these sites showed that recovery is linked to life history characteristics (Kaiser *et al.,* 2018). Species with high dispersal rates and less specific habitat requirement such as soft corals (dead men's fingers) and king scallops recovered within 3 years, whilst longer lived ross corals, white sea squirts and pink sea fans increased in abundance but had not fully recovered after 10 years (Kaiser *et al.,* 2018). Kaiser *et al.,* predicted that these species could take 17 to 20 years to recover fully from the damage of scallop dredging (Kaiser *et al.,* 2018).

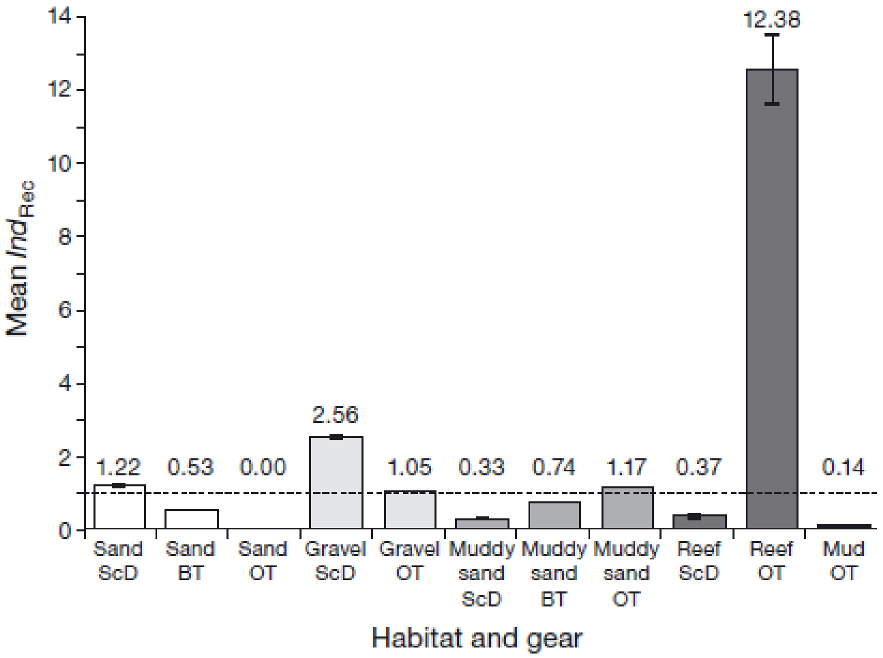
Foden *et al*. (2010) investigated recovery of different sediment types based on the spatial and temporal distribution of benthic fishing. Vessel monitoring system data (2006 to 2007) was used to estimate the distribution and intensity of scallop dredging, beam trawling and otter trawling in UK marine waters. This data was then linked to habitat in a geographic information system. Recovery periods for different habitats were estimated based on existing scientific literature for gear types and fishing intensity (Table 5), with recovery rates generally increasing with sediment hardness. It was estimated that based on mean annual trawl frequencies that 80% of bottom-fished areas were able to recover completely before repeat trawling. In 19% percentage bottom-fished areas however, the frequency of scallop dredging in sand and gravel and otter trawling in muddy sand and reef habitats occurred at frequencies that prevented full habitat recovery. At average fishing intensities (for each gear type), sand and mud habitats were able to recover fully, whilst gravel, muddy sand and reef habitats were fished at frequencies in excess of the estimated recovery period (shown in Figure 7 where the mean index of recovery exceeds 1).

Table 5 Recovery rates (days) of different habitats for different fishing gear types. ND: No Data. Source: Foden et al., 2010.

Gear Type	Reef
Beam trawl	ND
Otter trawl	2922[a]
Scallop dredge	1175[a]

[a] Kaiser *et al.,* 2006

Figure 7 Mean index of recovery (Ind_{Rec}) for gear-habitat combinations using fishing intensity data derived from Vessel Monitoring Systems in 2007. At Ind_{Rec} Rec = 1, the recovery period is equal to fishing frequency (horizontal dashed line), at Ind_{Rec} <1 fishing frequency is less than the predicted recovery period and at Ind_{Rec} fishing frequency exceeds the recovery period. BT: Beam



Trawl, OT: Otter Trawl and ScD: Scallop Dredge. Source: Foden et al., 2010.

Physical disturbance from chronic trawling occurs over large spatial scales and it may be expected that recovery rates will be slower than those assumed from experimental studies (Hinz *et al*., 2009). Recovery at small experimental scales is likely to simply be immigration, which is a form of recovery that is unlikely in large and repeatedly trawled areas (Jennings *et al*., 2001). The recovery of chronically disturbed benthic communities on fishing grounds will be largely dependent on recruitment and population growth, rather than on immigration from adjacent untrawled areas (Hiddink *et al*., 2006b). The importance of larval recruitment for the recolonization of a disturbed area increases with the size of the disturbed area (Smith & Brumsickle, 1989; Foden *et al*., 2010). The time of year when disturbance takes place may also influence the mode of recovery and recovery rate of the affected community (Foden *et al*., 2010). The recruitment supply of larvae and adult infauna will vary at different times of year and in relation to the physical characteristics at a specific location (Foden *et al*., 2010). The hydrodynamic regime will influence the rate of recolonization by influencing the deposition of infaunal adults and larval stages (Foden *et al*., 2010).

Population recovery rates are known to be species specific (Roberts *et al*., 2010). Long-lived bivalves will undoubtedly take longer to recovery from disturbance than other species (Roberts *et al*., 2010). Megafaunal species such as molluscs and shrimp over 10 mm in size, especially sessile species, are more vulnerable to impacts of fishing gear than macrofaunal species as a result of their slower growth and therefore are likely to have long recovery periods (Roberts *et al*., 2010). Short-lived and small benthic organisms on the other hand have rapid generation times, high fecundities and therefore excellent recolonization capacities (Coen, 1995). For example, slow-growing large biomass biota such as sponges and soft corals are estimated to take up to 8 years, whilst biota with short life-spans such as polychaetes are estimated to take less than a year (Kaiser *et al*., 2006).

4.5 Existing management measures

All Bottom Towed Gears:

- **Bottom Towed Fishing Gear** byelaw 2016 – prohibits bottom towed fishing gear over sensitive features including reef features and seagrass within the District, closing most of the site to these activities.
- **Vessels Used in Fishing** byelaw – prohibits commercial fishing vessels over 12 metres from the Southern IFCA district. The reduction in vessel size also restricts the type of gear that can be used, with vessels often using lighter towed gear and restricted to carry less static gear.

Shellfish dredging:

- The **Scallop Fishing (England) Order 2012** states that no more than 8 dredges per side to be towed at any one time and provides details for dredge configuration (i.e. the frame cannot exceed 85 cm in width).
- **The Scallop Fishing** byelaw – prohibits any person from taking or fishing for scallops before 0700 local time and after 1900 local time. The byelaw dictates the fishing set up that can be used including a limit on the maximum which number of dredges that can be towed at any one time (up to 12), all dredges must be fitted with a spring loaded tooth bar, the mouth of a dredge must not exceed 85 cm in overall width and no more than two tow bars can be used any time with a maximum length of 5.18 metres (including attachments).
- European minimum size, listed under Technical Conservation Regulation 1241/2019, specify the minimum conservation reference size for King Scallop (*Pecten maximus*) is 110mm in area 7d and 100mm in 7e.

Trawling:

- Southern IFCAs **Minimum Fish Sizes** Byelaw prohibits the taking of fish under the specified size (Black Seabream, Brill, Dab, Conger Eel, Flounder, Red Mullet, Shad, Turbot, Witch Flounder).
- A separate Minimum Size Southern IFCA byelaw exists for Skates and Rays and this states that no person shall take any ray that measures less than 40 cm between the extreme tips of the wings or any wing which measures less than 20 cm in its maximum dimension and which is detached from the body of a skate or ray.
- Other regulations include minimum sizes, mesh sizes and catch composition as dictated by European legislation. European minimum sizes, listed under Technical Conservation Regulation 1241/2019 and Bass Emergency Measures 2020/123 specify the minimum size for bass is 42 cm

4.6 Table 6 Assessment of trawling and dredging activity on high energy circalittoral rock.

Feature	Attribute	Target	Potential pressure(s) and Associated Impacts	Likelihood of Impacts Occurring/Level of Exposure to Pressure	Current mitigation measures
High energy circalittoral rock	Distribution: presence and spatial distribution of biological communities	Not available	Abrasion/disturbance of the substrate on the surface of the seabed and penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion, and removal of non-target species were identified as potential pressures. Bottom towed fishing gear directly impacts on rock habitats through physical passage of fishing gear over the seabed. The otter doors, chains and net bag found on trawl gear and the teeth and dredge on a shellfish dredge scrape the surface and can lead to the damage and removal of erect, branching and soft epifaunal species. Recovery of these species will take years and is dependent upon the life history characteristics of the species, with some predicted to require 20 years to recover.	Shellfish dredging and demersal trawling are known to occur within the MCZ, in the northern area of sediments and along the beach shore side of the closed areas. Up to four vessels may trawl and up to 3 may dredge within the site, however only one at a time. There is a maximum of 30 instances of trawling in the site and a maximum of 14 days of scallop dredging, although these are believed to be more than actually occurs. Sightings data shows historical dredging over rocky reefs which is now prohibited by a byelaw. Additionally, trawling and dredging sightings are seen in the north of the site over sediment habitats. It is also known that trawling occurs along the length of the beach shore side of the closed areas. Rocky reef habitats support a wide range of fauna including algae, hard corals, soft corals, hydrozoans, sea squirts, sponges, crustaceans, echinoderms, fish and many more. In addition, they can support nationally rare species such as the pink sea fan and sunset cup coral. Scientific literature has indicated that dredging and trawling can have significant negative effects on the presence, diversity and abundance of many reef associated species. BTFG can also drag boulders, cobbles, species and biogenic structures across the seafloor. The intensity of the activity is linked to the severity of the affects. Recovery of reef associated species in Lyme Bay, Dorset is between 3 and 20 years depending on the life history characteristics of the species. Hall *et al.*, (2008) assessed the sensitivity of reef habitats to all bottom towed fishing gear types for a single pass to be medium to high. At the present time BTFG activities are unlikely to occur in the majority of rock habitats in the site which are protected by the BTFG byelaw. However, where new rock data has been identified there is the possibility the activity could occur. The habitats and associated communities are highly sensitive to these types of fishing gear and have a long recovery period. If fishing were to occur over the habitats it could lead to significant damage and changes to the communities associated with the feature. Therefore, it is believed that bottom towed fishing gears will pose a significant risk to rock features within the Chesil beach and Stennis Ledges MCZ.	**Bottom Towed Fishing Gear** byelaw 2016 – prohibits bottom towed fishing gear over sensitive features including reefs within the District, closing most of these habitats to these activities **Vessels Used in Fishing** byelaw – prohibits commercial fishing vessels over 12 metres from the Southern IFCA district. The reduction in vessel size also restricts the type of gear that can be used, with vessels often using lighter towed gear and restricted to carry less static gear.
	Structure and function: presence and abundance of key structural and influential species	Not available			
	Structure: species composition of component communities	Not available			

	Structure: physical structure of rocky substrate	Not available	Physical impacts on the seabed from trawling and dredging include scraping and ploughing, creation of depressions, trenches, scouring and flattening of the seabed, and dragging of large boulders/rock features. Studies on the effects of otter trawling in variable habitats have revealed trawling can lead to the removal of biogenic structures, moved or overturn stones and boulders, smooth the seafloor and exposed sediment/shell fragments.	Addressed above	Addressed Above
	Distribution: presence and spatial distribution of biological communities	Not available	Removal of target species (Scallop dredging) was identified as a potential pressure. Commercial fishing directly removes and harvests a specific species or group of fauna. The sustainability, including the size and age composition, of the stock can be compromised if unmanaged, leading to indirect effects such as impacts to energy flows through food webs.	Three scallop dredging vessels operate within and around the site. The Bottom Towed Fishing Gear byelaw prevents fishing over the three areas rock. Outside of this the activity can occur at any time of year, but only during periods of easterly/ north easterly winds. Approximately fishing occurs for 2 weeks each year. Many dredge sightings have been made in the closed areas of the site before the byelaw. Other than these no other dredge sightings have been made inside the site, however, just outside of the site over what is likely to be mixed sediments, two recent dredge sightings have been made. Scallop dredges are considered to be relatively selective with 81% of biomass caught comprising of scallops (Szostek *et al.,* 2017). Their capture efficiency however is relatively low (20%), being considerably less for small scallops (3.3%) (Chapman *et al.,* 1977). Levels of mortality in the dredge track are only 1.8% greater than natural mortality (Chapman *et al.,* 1977). Only scallops which are severely damaged may die. Of all scallops (left in dredge track and brought to surface) sever damage occurs in only 5%. Scallops which are both exposed to air or disturbed by a dredge do experience a level of stress which can inhibit their predator response and recessing behaviours (Jenkins and Brand 2201 and Maguire *et al.,* 2002). However, scallops have been found to r3ecover from this stress within 6 hours (Maguire *et al.,* 2002). Areas of the seabed protected from scallop dredging have been found to have greater numbers of scallops (Leigh *et al.,* 2014) however this has not been found in all cases (Kaiser *et al.,* 2018 and Sciberras *et al.,* 2013) where it has been found that scallop populations are driven greatly by seasonal fluctuations and habitat suitability.	**The Scallop Fishing** byelaw – prohibits any person from taking or fishing for scallops before 0700 local time and after 1900 local time. The byelaw dictates the fishing set up that can be used including a limit on the maximum which number of dredges that can be towed at any one time (up to 12), all dredges must be fitted with a spring loaded tooth bar, the mouth of a dredge must not exceed 85 cm in overall width and no more than two tow bars can be used any time with a maximum length of 5.18 metres (including attachments).

				Scallop dredging is a closely managed fishery in England with minimum conservation reference sizes, gear configuration regulations and within the southern in IFCA district the activity is not permitted between the hours of 19:00 and 07:00. Based upon the low level of scallop dredging occurring within the MCZ, the low efficiency of scallop dredges along with high survival rates of both scallops returned to sea or left within the dredge track, with the current mitigation of the current management measures it is believed that dredging will not pose a significant risk to the high energy circalittoral rock biological communities in the MCZ through removal of target species, and will not therefore hinder the ability of the feature to achieve it's 'recover' general management approach (GMA).	**European minimum size**, listed under Technical Conservation Regulation 1241/2019, specify the minimum conservation reference size for King Scallop (*Pecten maximus*) is 110mm in area 7d and 100mm in 7e. The **Scallop Fishing (England) Order 2012** states that no more than 8 dredges per side to be towed at any one time and provides details for dredge configuration (i.e. the frame cannot exceed 85 cm in width).
	Supporting Process sedimentation rate	Not available	Smothering and siltation rate changes (Light) and Changes in suspended solids (water clarity) were identified as potential pressures. The resuspension of sediment can impact upon benthic communities through smothering, burial and increased turbidity. These effects may extend to organisms living a distance away from the fished area. The timescale for recovery after trawling disturbance largely depends on sediment type, associated fauna	Shellfish dredging and demersal trawling are known to occur within the MCZ, in the northern area of sediments and along the beach shore side of the closed areas. Up to four vessels may trawl and up to 3 may dredge within the site, however only one at a time. There is a maximum of 30 instances of trawling in the site and a maximum of 14 days of scallop dredging, although these are believed to be more than actually occurs. Sightings data shows historical dredging over rocky reefs now prohibited by a byelaw. Additionally, trawling and dredging sightings are seen in the north of the site over sediment habitats. It is also known that trawling occurs along the length of the beach shore side of the closed areas. Rocky reef habitats support a wide range of fauna including algae, hard corals, soft corals, hydrozoans, sea squirts, sponges, crustaceans,	Addressed above.
	Supporting processes water quality - turbidity	Not available			

			and rate of natural disturbance, and variation in recovery arises from characteristics specific to the site. Generally speaking, locations subject to high levels of natural disturbance, the associated fauna are likely to be adapted to withstand and recover from disturbance.	echinoderms, fish and many more. In addition, they can support nationally rare species such as the pink sea fan and sunset cup coral. Scientific literature has indicated that dredging and trawling may resuspend sediment which can lead to changes in smothering and siltation rate. This can negatively affect communities through smothering, burial and restriction of respiratory or feeding processes. The timescale for recovery for these processes however varies considerably depending on the scale of the impact. Dale *et al.,* (2011) used a model to track suspended sediment from a boat towing 8 dredges on either side. The model suggested that reefs in the area are only at risk if they are within 10m of the dredge site, and that those which lay further afield will not be significantly affected by changes in turbidity, siltation or smothering rates beyond natural levels (Dale *et al.,* 2011). Tillin *et al.,* (2010) completed a sensitivity assessment of reef habitats to siltation rate changes. He found that circalittoral rock was not sensitive to high sensitivity to this pressure, whilst fragile sponge and anthozoan species showed medium sensitivity to this activity. Whilst there is some confusion as to the level of natural disturbance in the site (Bolam *et al.,* 2014), the site is located in a large and exposed bay, which is subject to strong wave action during storms and periods of high winds. The feature itself is high energy indicating that water does not lie still and therefore resuspended sediment would not be likely to settle over the feature. At the present time BTFG activities are unlikely to occur in the majority of rock habitats which are protected by the byelaw. However, trawling in particular is known to occur just outside of rock habitats over sediments along the length of Chesil beach. The habitat is not sensitive to highly sensitive to this type of pressure. Activity levels are very low with only a very small number of vessels able to take part in the fishery. Additionally, the feature is high energy reducing the possibility of resuspended particles having the ability to settle over the feature. Therefore, it is believed that bottom towed fishing gears will not significantly affect the turbidity, smothering and siltation rates of the high energy circalittoral rock feature.	

4.7 Site Condition

As this site is newly designated a condition assessment has not yet been completed by Natural England. Additionally, this site is not underpinned by a Site of Special Scientific Interest and therefore, no condition assessment of areas within the site are available.

Part of the site overlaps with the Chesil and the Fleet SAC, for which an assessment of the condition of part of the site has been made. However, this covers only the Fleet Lagoon and does not overlap with the Chesil Beach and Stennis Ledges MCZ.

5 Proposed mitigation measures

In recognition of the potential pressures of bottom towed fishing gear upon designated features and their supporting habitats, Southern IFCA recognises that management measures will need to be put in place to protect sensitive, high energy circalittoral rock features from the effects of all forms of bottom towed fishing gears. This is due to the result of this MCZ assessment which has found that bottom towed fishing gears are likely to pose a significant risk to the high energy circalittoral features of Chesil Beach and Stennis Ledges MCZ.

Based on the findings of the assessment, the Authority is therefore required to develop management that will provide protection to the high energy circalittoral features within the site from the relevant fishing gears. Spatial closures, based on the most up to date data for the location of high energy circalittoral features, will be introduced and incorporated into appropriate management following best practice[6]. This will involve consultation with the local community and the consideration of formal advice from the Authorities Statutory Nature Conservation Body Natural England. Existing closures will be considered against the updated data to determine the most appropriate course of action to protect the features and ensure Southern IFCA meets its responsibilities afforded by the Marine and Coastal Access Act 2009.

6 Conclusion

In order to conclude whether types of bottom towed fishing gear (trawls and scallop dredges) pose a significant risk, it is necessary to assess whether the impacts of the activities will hinder the achievement of the general management approach of the designated feature (high energy circalittoral rock), of ‘recover to favourable condition’ and the sites conservation objectives, namely:

“The conservation objective of each of the zones is that the protected habitats:

1. are maintained in favourable condition if they are already in favourable condition
2. be brought into favourable condition if they are not already in favourable condition

For each protected feature, favourable condition means that, within a zone:

1. its extent is stable or increasing
2. its structure and functions, its quality, and the composition of its characteristic biological communities (including diversity and abundance of species forming part or inhabiting the habitat) are sufficient to ensure that its condition remains healthy and does not deteriorate

Any temporary deterioration in condition is to be disregarded if the habitat is sufficiently healthy and resilient to enable its recovery.”

The likelihood and magnitude of impacts associated with bottom towed fishing gear upon the feature was determined by the following variables:

I. Number of vessels participating
II. Location of bottom towed fishing gear activity
III. Timing and duration of bottom towed fishing gear activity
IV. Sensitivity of rock to the impacts of bottom towed fishing gear
V. Ability of rock to recover from the impacts of bottom towed fishing gear

Having reviewed a wide range of evidence, including scientific literature, IFCO knowledge, habitat feature mapping, it has been concluded that bottom towed fishing gear activity as it is currently managed is likely to pose a significant risk to high energy circalittoral rock within the Chesil Beach and Stennis Ledges MCZ.

[6] http://www.association-ifca.org.uk/Upload/About/ifca-byelaw-guidance.pdf

The review of the research into the impacts of bottom towed fishing gear on high energy circalittoral rock (rock with erect and branching species, erect and branching spp. very slow growing) reported the habitat to have medium to high sensitivity to a single pass. It was determined that the potential for fishing activity to occur over or in close proximity to the features of the site could prevent the ability of high energy circalittoral rock to attain its 'recover' general management approach. In summary, this was based upon the following evidence:

- IFCO knowledge indicates that trawling and shellfish dredging occurs within the site over subtidal sediments which border the subtidal rock feature, at a low intensity.
- Sightings data shows historic dredge sightings in permanently closed areas over rock habitats. Additionally, more recent trawling and dredging sightings data is available in the north of the site.
- A review of scientific literature demonstrated that bottom towed fishing gear at any intensity can lead to the direct removal, damage and mortality of non-target species found to make up part of the component communities of the feature.
- Sensitivity of these rock habitats to pressures associated with trawls is medium to high.
- Recovery of rocky reef habitats and species can take between 3 and 20 years.

It was therefore recognised that the activities have the potential to pose a significant risk upon the high energy circalittoral rock attributes:

- Structure: physical structure of rocky substrate;
- Distribution: presence and spatial distribution of biological communities
- Structure and function: presence and abundance of key structural and influential species
- Structure: species composition of component communities

In recognition that the feature will be at risk from BTFG activity, additional management measures are required to ensure the MCZs conservation objective can be furthered. The location, timing, duration and intensity of bottom towed fishing gear within the site will be influenced by new management measures being developed, which will protect the sensitive feature (high energy circalittoral rock), by prohibiting all BTFG activities over the feature. This is to support the general management approach of the features discussed to/at a favourable condition.

When the above evidence, fishing activity levels, current and, proposed management measures are considered it has been concluded that bottom towed fishing gear will <u>not</u> pose a significant risk to the achievement of sites conservation objectives to 'recover' the high energy circalittoral rock to favourable condition. Southern IFCA must seek to ensure that the conservation objectives of any MCZ in the district are furthered.

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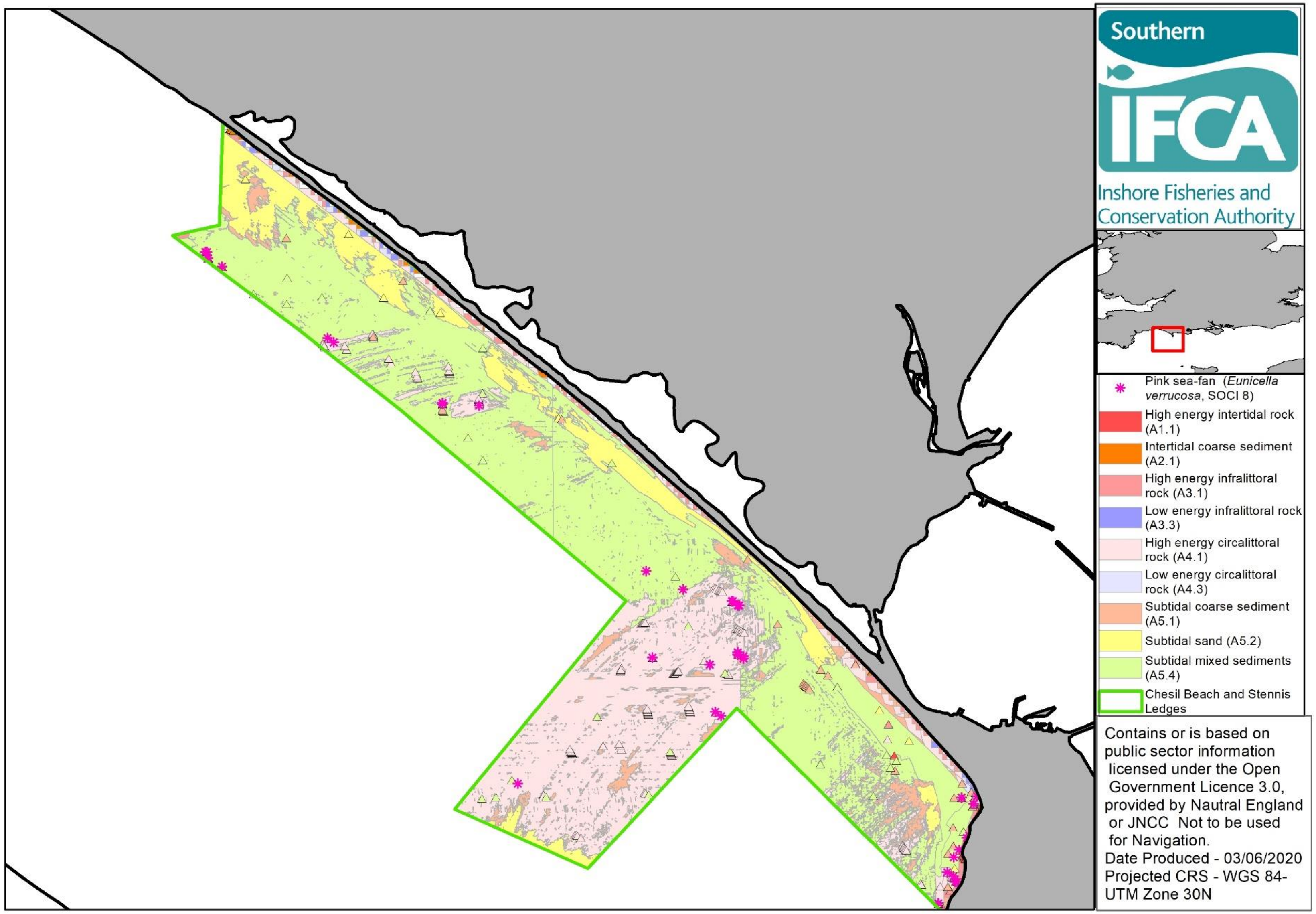
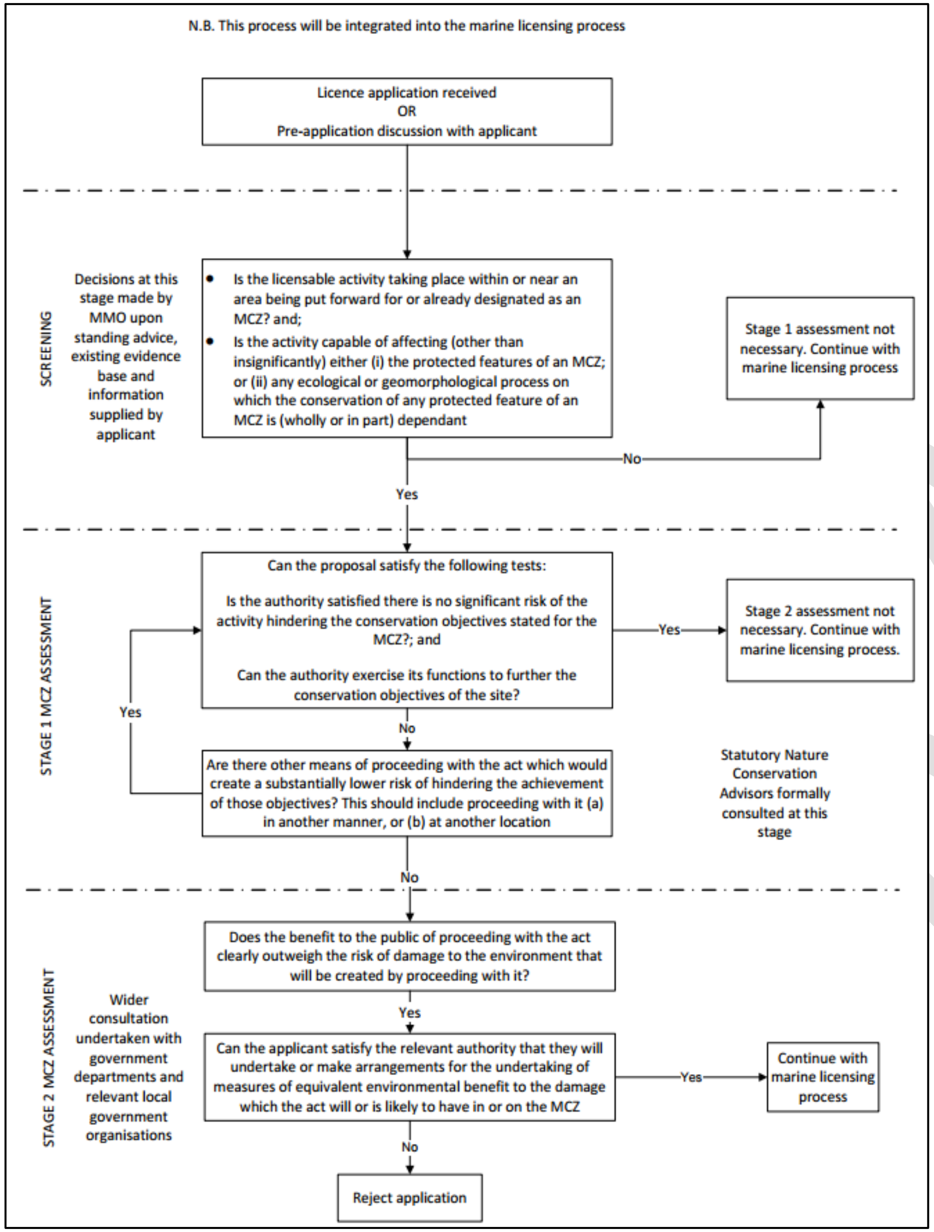
Annex 1. Broadscale habitat and species and habitat features of conservation importance maps for the Chesil Beach and Stennis Ledges MCZ.



Annex 2. Summary of MMO assessment process for MCZs.



Annex 3. Initial screening of commercial fishing activities in the Chesil Beach and Stennis Ledges MCZ.

Broad Gear Type (for assessment)	Aggregated Gear Type (EMS Matrix)	Fishing gear type	Does it Occur?	Details	Sources of Information	Potential for Activity Occur/ Is the activity anticipated to occur?	Justification	Suitable for Part A Assessment?	Priority
Bottom towed fishing gear	**Towed (demersal)**	Beam trawl (whitefish)	N	Currently does not occur.	Local IFCO.	N	Previously known to occur and suitable trawl ground because of substrate type and species known to occur i.e. flatfish. Having said this, with the loss of boats with grandfather rights (i.e. boats above 12 m which are capable of deploying larger gear such as beam trawls) in the district, the activity is not anticipated to occur in foreseeable future.	N	
		Beam trawl (shrimp)	N		Local IFCO.	N	Target species does not occur.	N	
		Beam trawl (pulse/wing)	N		Local IFCO.	N	Prohibited via Electric fishing byelaw.	N	
		Heavy otter trawl	N		Local IFCO.	N	The activity has the potential to occur but is not anticipated to due loss of boats with grandfather rights (i.e. boats above 12 m which are capable of deploying larger gear such as heavy otter trawls) and lack of historical heavy otter trawling within the site.	N	

		Multi-rig trawls	N		Local IFCO.	N	It not likely to occur as it has not occurred historically. Limited potential and not anticipated to occur for multi-rig set up due to size and power of vessel needed.	N	
		Light otter trawl	Y	Currently four vessels fish in the area. Activity occurs every couple of weeks in the winter months. There are approx. 20 - 30 instances a year of trawling within the site overall - 4 hours per instance. Fishing over coarse and mixed sediments, potentially fringing rocky/cobbly areas. Target species - flatfish, skates and rays.	Local IFCO.	N/A	Activity is known to occur.	Y	High
		Pair trawl	N		Local IFCO.	N	Not anticipated to occur and very limited potential due to restricted area of the site to accommodate for two vessels.	N	
		Anchor seine	N		Local IFCO.	N	Gear type has not been historically used within the area and is not anticipated to occur. Activity needs a large area and, in the site, considered would be very limited. In addition, large vessels are also required for this gear type and vessels over 12 m in length are prohibited from fishing within the Southern IFCA district.	N	

		Scottish/fly seine	N		Local IFCO.	N	Gear type has not been historically used within the area and is not anticipated to occur. Activity needs a large area and, in the site, considered would be very limited. In addition, large vessels are also required for this gear type and vessels over 12 m in length are prohibited from fishing within the Southern IFCA district.	N	
Pelagic towed fishing gear	**Towed (pelagic)**	Mid-water trawl (single)	N		Local IFCO.	Y	Activity has the potential to occur however this gear type does not come into contact with the seabed and therefore there is no chance for interaction with designated features.	N	
		Mid-water trawl (pair)	N		Local IFCO.	Y	Activity has the potential to occur however this gear type does not come into contact with the seabed and therefore there is no chance for interaction with designated features. Also, very limited potential due to the restricted area of the site to accommodate for two vessels.	N	
		Industrial trawls	N		Local IFCO.	N	Activity is not able to occur due to the size of vessel required. Vessels over 12 m are prohibited from fishing within the Southern IFCA district.	N	

Bottom towed fishing gear	**Dredges (towed)**	Scallops	Y	Currently three vessels operate within the site. The Bottom towed fishing gear bylaw prevents fishing over Stennis Ledges. Target species are the king scallop (*Pecten maximus*). Sporadic activity at any time of year - can be up to two weeks at a time, up to five times a year for all vessels - (Total approximately 10 weeks a year) Predominantly in periods of easterly/ north easterly winds when vessels are sheltered by Chesil Beach and Portland.	Local IFCO.	N/A		Y	High
		Mussels, clams, oysters	N		Local IFCO.	N	Target species do either not occur within the site or do not occur in commercially viable population.	N	
		Pump scoop (cockles, clams)	N		Local IFCO.	N	Site is too deep and the substrate is unsuitable for fishing method.	N	
Suction	**Dredges (other)**	Suction (cockles...)	N		Local IFCO.	N	Suction dredging for cockles, clams, mussels and oysters is prohibited (by default) in the Southern IFCA district (by Southern IFCA byelaws).	N	
Tractor		Tractor	N		Local IFCO.	N	No access and substrate is unsuitable.	N	
Intertidal work	**Intertidal handwork**	Hand working (access from vessel)	N		Local IFCO.	N	Unsuitable substrate for fishing and as supporting habitat for target species.	N	
		Hand work (access from land)	N		Local IFCO.	N	Unsuitable substrate for fishing and as supporting habitat for target species.	N	

Static - pots/traps	**Static - pots/traps**	Pots/creels (crustacea/ gastropods)	Y	Approximately six vessels, small under ten metres (three under 8 m), operating all year. Light to medium intensity - no more than 1000 parlour pots all year round and 1000-2000 whelk pots in the winter/spring within the site. Activity occurring in Chesil Cove and over Stennis Ledges. Regular activity. Target species include European lobster and brown crab. 24 to 72 hour soak period.	Local IFCO.	N/A		Y	Mediu m
		Cuttle pots	N		Local IFCO.	N	Activity has not historically occurred within the site and is not anticipated to occur. The presence of cuttle fish within this area is unknown.	N	
		Fish traps	N		Local IFCO.	N	Activity has not historically occurred within the site and is not anticipated to occur. No known target species within the site.	N	
Demersal nets/lines	**Static - fixed nets**	Gill nets	Y	Mainly use gill and trammel nets. Approximately three boats are known to go netting. Activity of the vessels is seasonal - summer and autumn. Targeting flatfish, skates and rays. Activity occurs throughout the site. Concentrated in areas of subtidal mixed/coarse sediment. Nets will be worked over a tide with a one or two day lay.	Local IFCO.	N/A		Y	Mediu m
		Trammels	Y	See above.	Local IFCO.	N/A		Y	Mediu m

		Entangling	Y	See above.	Local IFCO.	N/A		Y	Medium
Pelagic nets/lines	**Passive - nets**	Drift nets (pelagic)	N		Local IFCO.	N	Activity has not historically occurred within the site and is not anticipated to occur.	N	
Demersal nets/lines		Drift nets (demersal)	N		Local IFCO.	N	Activity has not historically occurred within the site and is not anticipated to occur.	N	
	Lines	Longlines (demersal)	N		Local IFCO.	Y	It is likely the activity has taken place in the past but is not currently known to occur. It has the potential to occur in the future.	Y	Medium
Pelagic nets/lines		Longlines (pelagic)	N		Local IFCO.	N	Activity has not historically occurred within the site and is not anticipated to occur.	N	
		Handlines (rod/gurdy etc)	Y	Up to approximately five vessels at any one time, including recreational and commercial operators. Activity is undertaken throughout the year, particularly in the autumn. Target species include bass. Activity is generally concentrated around wrecks.	Local IFCO.	N/A	Activity is known to occur however this gear type does not come into contact with the seabed and therefore there is no chance for interaction with designated features.	N	
		Jigging/trolling	Y	See above.	Local IFCO.	N/A	See above.	N	
Purse seine	**Seine nets and other**	Purse seine	N		Local IFCO.	N	Activity has not historically occurred within the site and is not anticipated to occur.	N	
Demersal nets/lines		Beach seines/ring nets	Y	One vessel operating one to two times a year from Chesil Beach at various access points. Target species include mackerel and sprats. Gear is deployed using a rowing boat.	Local IFCO.	N/A		Y	Low

Miscellaneous		Shrimp push-nets	N		Local IFCO.	N	Activity has not historically occurred within the site and is not anticipated to occur. The target species of the activity does not occur within the site. No suitable area or access to allow the activity to occur from.	N	
EA Only		Fyke and stake nets	EA Only	EA Only	EA Only	EA Only	EA Only	EA Only	EA Only
Miscellaneous	**Miscellaneous**	Commercial diving	N		Local IFCO.	Y	Activity has not historically occurred but has the potential to occur over circalittoral rock habitats for king scallops (*Pecten maximus*).	Y	Low
Bottom towed fishing gear		Bait dragging	N		Local IFCO.	N	Activity has not historically occurred within the site and is not anticipated to occur. The substrate present is not suitable for the activity to take place. As such, the target species are also not present.	N	
Miscellaneous		Crab tiling	N		Local IFCO.	N	Activity has not historically occurred within the site and is not anticipated to occur. There are not suitable areas for the activity to take place.	N	
Intertidal work	**Bait collection**	Digging with forks	N		Local IFCO.	N	Activity has not historically occurred within the site and is not anticipated to occur. There are not suitable areas for the activity to take place, the substrate is unsuitable and as such the target species is not present within the site.	N	

Annex 4. Advice on operations for commercial fishing activities in the Chesil Beach and Stennis Ledges MCZ (a) demersal trawl and (b) dredges.

	Habitat							Species	
Pressure name	High energy intertidal rock	Intertidal coarse sediment	High energy infralittoral rock	Subtidal coarse sediment	Subtidal mixed sediments	Subtidal sand	High energy circalittoral rock	Native oyster	Pink sea-fan
Abrasion/disturbance of the substrate on the surface of the seabed		NS	S	S	S	S	S	S	S
Changes in suspended solids (water clarity)		NS	S	S	S	S	S	S	NS
Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion		NS		S	S	S	S	S	
Removal of non-target species			S	S	S	S	S	S	S
Smothering and siltation rate changes (Light)		NS	NS	S	S	S	S	S	NS
Deoxygenation		NS	IE	S	S	S	S	NS	S
Hydrocarbon & PAH contamination		NA	NA	NA	NA	NA	NA	NA	NA
Introduction of light			S	IE	IE	S	NS	NS	
Introduction or spread of invasive non-indigenous species (INIS)			S	S	S	S	IE	S	S
Litter		NA	NA	NA	NA	NA	NA	NA	NA
Nutrient enrichment		NS	S	NS	NS	NS	NS	NS	NS
Organic enrichment		NS	S	S	S	S	S	IE	IE
Physical change (to another seabed type)			S				S	S	S
Physical change (to another sediment type)		S		S	S	S		NS	
Synthetic compound contamination (incl. pesticides, antifoulants, pharmaceuticals)		NA	NA	NA	NA	NA	NA	NA	NA
Transition elements & organo-metal (e.g. TBT) contamination		NA	NA	NA	NA	NA	NA	NA	NA
Underwater noise changes					NS	NS	NS		
Visual disturbance					NS	NS			

Pressure name	Habitat: High energy intertidal rock	Habitat: Intertidal coarse sediment	Habitat: High energy infralittoral rock	Habitat: Subtidal coarse sediment	Habitat: Subtidal mixed sediments	Habitat: Subtidal sand	Habitat: High energy circalittoral rock	Species: Native oyster	Species: Pink sea-fan
Abrasion/disturbance of the substrate on the surface of the seabed		NS	S	S	S	S	S	S	S
Changes in suspended solids (water clarity)		NS	S	S	S	S	S	S	NS
Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion		NS		S	S	S	S	S	
Removal of non-target species			S	S	S	S	S	S	S
Removal of target species			S	NS	S	S	S	S	
Smothering and siltation rate changes (Light)		NS	NS	S	S	S	S	S	NS
Visual disturbance					NS	NS			
Deoxygenation		NS	IE	S	S	S	S	NS	S
Hydrocarbon & PAH contamination		NA	NA	NA	NA	NA	NA	NA	NA
Introduction of light			S	IE	IE	S	NS	NS	
Introduction of microbial pathogens			S	IE	S	S	S	S	S
Introduction or spread of invasive non-indigenous species (INIS)			S	S	S	S	IE	S	S
Litter		NA	NA	NA	NA	NA	NA	NA	NA
Nutrient enrichment		NS	S	NS	NS	NS	NS	NS	NS
Organic enrichment		NS	S	S	S	S	S	IE	IE
Physical change (to another seabed type)			S				S	S	S

Physical change (to another sediment type)		S		S	S	S		NS	
Synthetic compound contamination (incl. pesticides, antifoulants, pharmaceuticals)		NA	NA	NA	NA	NA	NA	NA	NA
Transition elements & organo-metal (e.g. TBT) contamination		NA	NA	NA	NA	NA	NA	NA	NA
Underwater noise changes					NS	NS	NS		

Annex 5. Fishing activity maps using trawl and dredge sightings data from 2009-2020 in (a) Chesil beach and Stennis Ledges MCZ