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

Feature: Pink sea-fan (*Eunicella verrucosa*)

Broad Gear Type: Bottom Towed Fishing Gear

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

Technical Summary

As part of the MCZ assessment process for the tranche 1 Chesil Beach and Stennis Ledges MCZ, it was identified that updated feature data had been received by Southern IFCA, from Natural England. In order to ensure the sites conservation objectives would retain their status of not being hindered by fishing activities it was required that Southern IFCA followed the MCZ Assessment process for pink sea-fan within the site.

It was identified that trawling (light otter 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 and disturbance on the surface of the seabed and the removal of non-target species. Scientific literature shows that trawling can lead to the damage, removal and mortality of rocky reef species including the reduction in the presence and abundance of pink sea fans. Recovery of pink sea fans has been shown to not be achieved after 9 years and is predicted to take between 17 and 20 years.

When considering that trawling and scallop dredging occur within the MCZ, in combination with other evidence (scientific literature, feature data, sightings data) it was concluded the activity was likely to pose a significant risk to pink sea-fans. 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 remain consistent with the conservative objectives of the site. Therefore, additional management for bottom towed fishing gear will be introduced which will protect the pink sea-fan features.

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 and dredging will remain 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 the 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.

Habitat and species feature data is continually being added to and updated. In 2020 Southern IFCA received updated habitat data regarding pink sea-fan features (Figure 4). Therefore, this new data requires MCZ assessments to determine whether or not the conservation measures in place were appropriate to further the conservation objectives of the habitats and species for which the site has been designated (Marine and Coastal Access Act 2009).

This document forms the basis of a Marine Conservation Zone Assessment for the updated pink sea-fan in Chesil Beach and Stennis Ledges MCZ feature data. The purpose of this document is to assess whether or not in the view of Southern IFCA, the Bottom Towed Fishing Gear activity will have a likely significant effect on the features and sub-features of the MCZ alone, and where appropriate in-combination with other plans or projects. The assessment ensures Southern IFCA meets its responsibilities as a competent authority by ensuring the conservation objectives of the Marine Conservation Zone are furthered with regards to fishing activity.

Southern IFCA have now completed a Part A Assessment of the activities over these features. This indicated that some pressures created by the activities are exerted on the features, and therefore are required to be assessed in a Part B Assessment. Therefore, this document contains the Part B Assessment for Pink sea-fan within Chesil Beach and Stennis Ledges MCZ with the Southern IFCA District.

1.2 Documents reviewed to inform this assessment

- Defra’s matrix of fisheries gear types and European Marine Site protected features

- Natural England's Advice on operations for Chesil Beach and Stennis Ledges MCZ[1]
- Natural England's Supplementary Advice on Conservation Objectives for the Chesil Beach and Stennis Ledges MCZ[2]
- Habitat feature maps (Annex 1)
- Fishing activity maps (Annex 3)
- Reference List (Section 7)

2 Information about the MCZ

2.1 Overview and designated features

Chesil Beach and Stennis Ledges MCZ was designated in December 2013 and covers the stretch of the Dorset coast running also Chesil Bank. The site covers an area of approximately 37 km² and protected 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 also 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, bristleworms and *venus* clams, as well as the native oyster and a type of soft coral called the Pink Sea-fan.

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

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

[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

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. 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:

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

- 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 the 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. Engagement with the local fishing industry was also undertaken as part of this process. 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.

3.2.4 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 for the Chesil Beach and Stennis Ledges MCZ[4]. This advice 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. 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

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

'acceptable' intensity of a pressure. It is therefore necessary to consider how the level of fishing intensity observed within the 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.

A summary of Natural England's Advice on Operations for the Chesil Beach and Stennis Ledges MCZ is provided in Annex 2. The resultant activity pressure-feature interactions which have been screened in for bottom towed fishing gear for the part B assessment are summarised in Tables 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. Where there is insufficient evidence on the sensitivity of a designated feature to fishing-related pressures, and these pressures present a risk to designated features, these pressure-feature interactions have been included for further assessment.

Table 2. Summary of trawl and dredge fishing pressure-feature screening for Pink sea-fan (*Eunicella verrucosa*). Please note only pressures screened in for the part B are presented here.

Pressure	Sensitivity	Considered in Part B Assessment	Justification	Relevant Attributes (effected by identified pressures)
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. A part B assessment will be necessary to investigate the magnitude of the pressure, including the effect of the gear and the spatial scale/intensity of the activity.	Population: population size; Presence and spatial distribution of the species
Removal of non-target species	S	Y	Pink sea-fans themselves could be removed by the abrasion of gear. Further assessment required.	Population: population size; Presence and spatial distribution of the species

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[5].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. After relevant pressures were identified from the pressure-feature interaction screening, suitable attributes were identified from Natural England's Supplementary Advice. These are outlined in Tables 2.

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5 https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UKMCZ0004&SiteName=chesil%20beach&countyCode=&responsiblePerson=

4.1 Assessment of scallop 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 three 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. The activity 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 Scallop dredges

Scallop dredges are rigid structures of the following design (see Figure 1). 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.

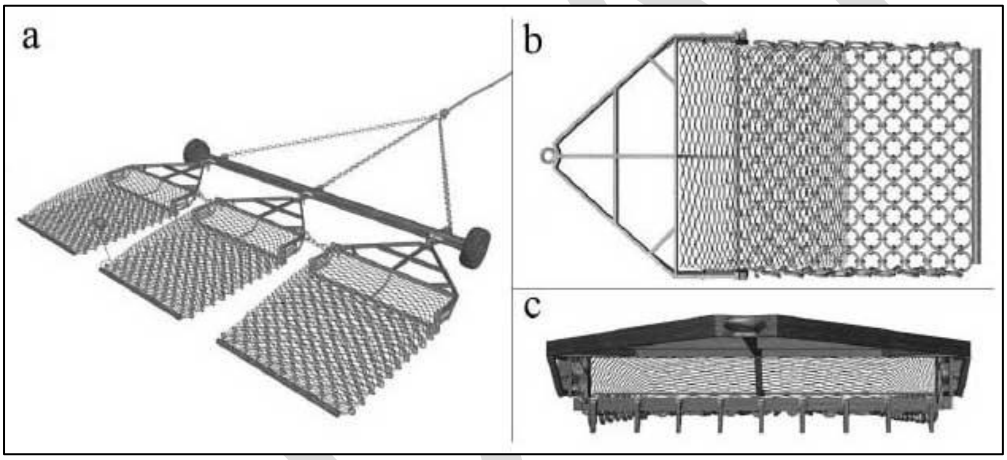

Figure 1. Typical scallop dredge set up used in the UK. (a) 3-dredge-a-side set up and spreading bar. (b) Chain mesh and collection bag (top side). (c) Spring-loaded toothed bar. Source: http://www.gov.scot/Publications/2012/10/7781/4

4.2.2 Light otter trawls

Light otter trawls are used to fish for a number of fish species on the fringes of the Chesil Beach and Stennis Ledges MCZ, outside of the closed areas. There is also the potential for a beam trawl and multi-rig trawl to be used within the site, although it is not currently known to occur.

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).

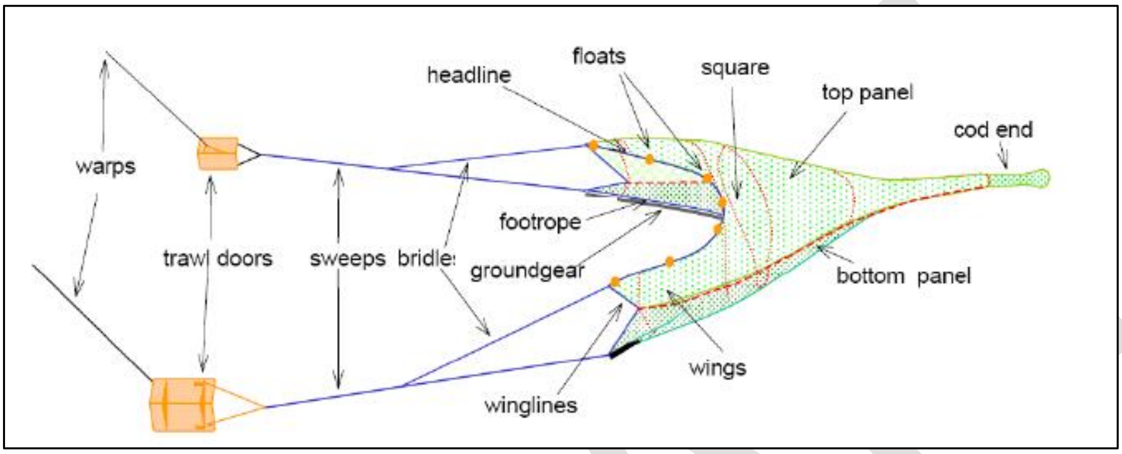

Figure 2 Key components of an otter trawl. Source:
www.seafish.org/upload/b2b/file/r_d/BOTTOM%20TRAWL_5a.pdf

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.

4.2.3 Beam trawl

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 3a) (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 3b) (Seafish, 2015). Lighter styles of beam, using fewer tickler chains and without a chain mat, are used to target shrimp (Seafish, 2015).

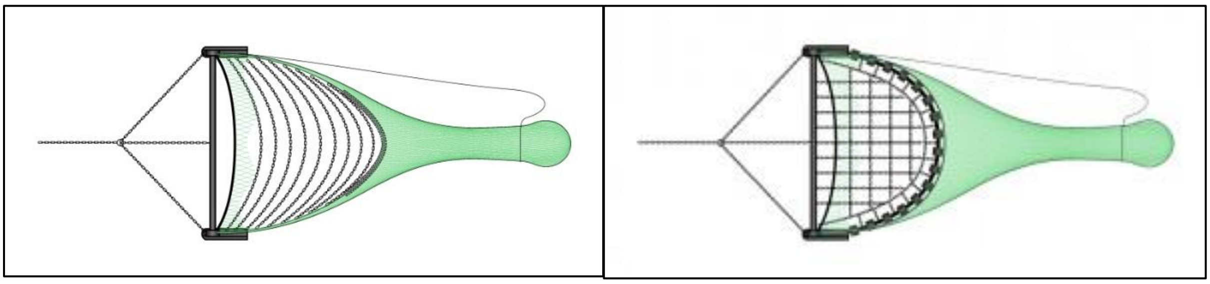

Figure 3 a) 'Open gear' beam trawl. b) 'Chain mat gear' beam trawl.

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).

4.2.4 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 (Figure 4). The Bottom Towed Fishing Gear byelaw prevents fishing over three areas in the site including Stennis Ledges. 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[6] the fishing level in the Needles 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 3 shows trawling activity sightings in the site between 2009-2020. One trawl sightings 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 3 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 dredge sightings have been made recently to the south west of the site.

[6] 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

4.3 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 3. 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. Two sightings, one 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 inside the closed areas. There are pink sea-fans located in the northern area of the site which are not currently protected. This is the area where fishing is known to occur.

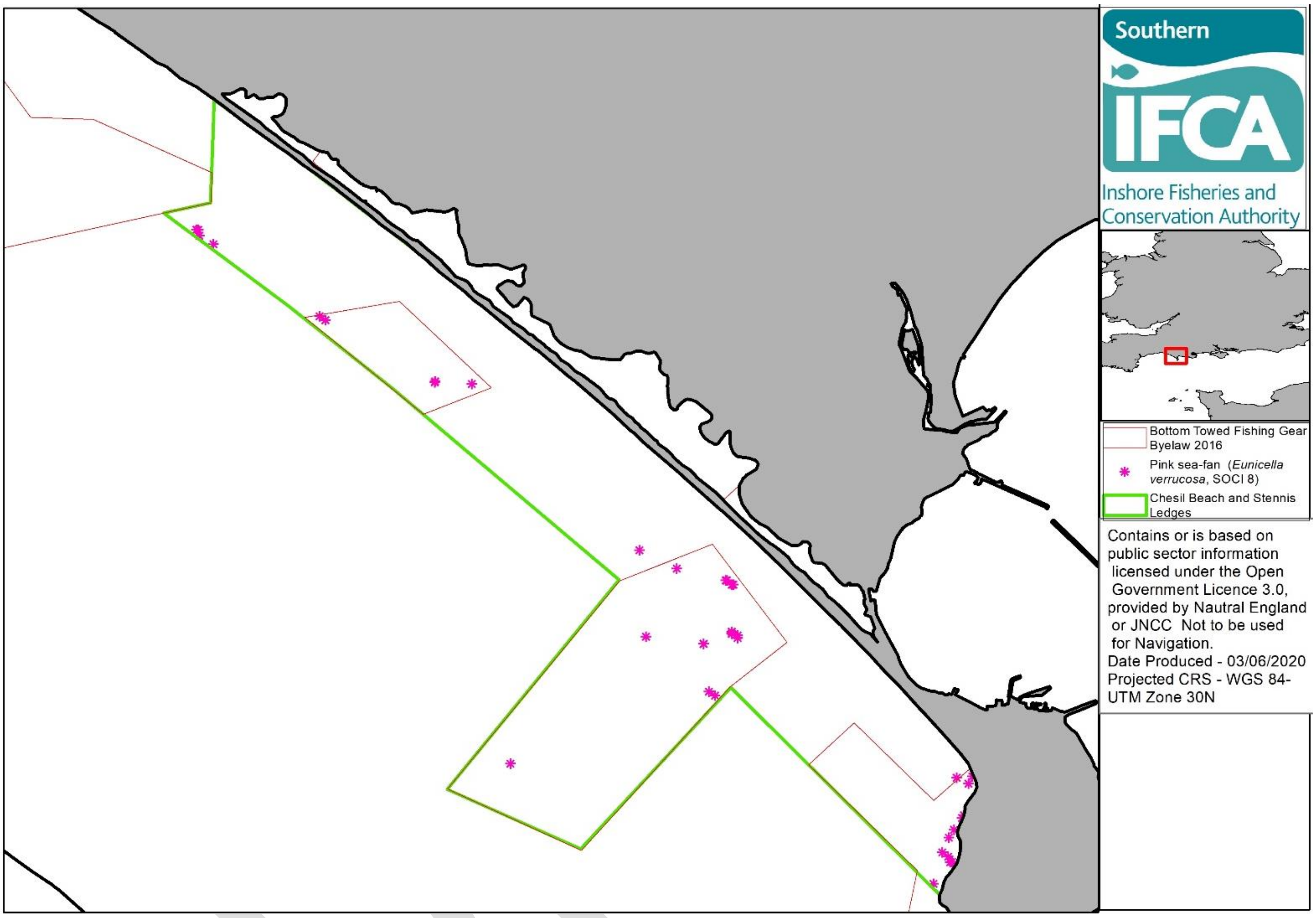

Figure 4. Map of pink sea-fan spatial data in the Chesil Beach and Stennis Ledge MCZ, with Bottom Towed fishing Gear Closures overlaid.

4.4 Assessment of trawling in the Chesil Beach and Stennis Ledges MCZ

4.4.1 Summary of the Fishery

Trawling, using a light otter trawl occurs on a seasonal basis, predominantly within the winter months, within the Chesil Beach and Stennis Ledges MCZ. The activity targets flatfish, skates and rays.

4.4.2 Technical Gear Specifications

There is occurrence of one type of demersal trawl within the Chesil Beach and Stennis Ledges MCZ. This includes a light otter trawl.

4.4.3 Light otter trawl

An otter trawl comprises of following design (see Figure 5). 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).

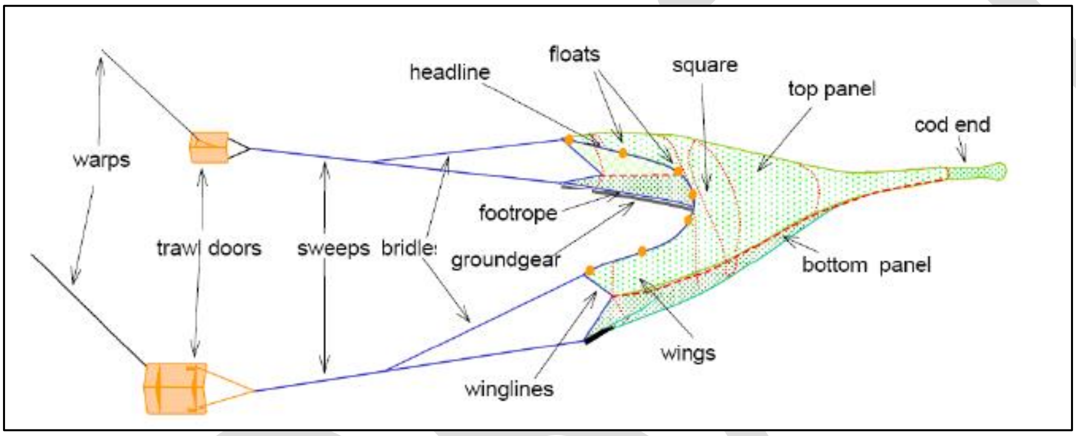

Figure 5. Key components of an otter trawl. Source: www.seafish.org/upload/b2b/file/r_d/BOTTOM%20TRAWL_5a.pdf

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.

4.5 Pressures

4.5.1 Abrasion/disturbance of the substrate on the surface of the seabed/ 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).

4.5.2 Scallop dredging

Scallop dredging is considered to be one of the most destructive forms of bottom towed fishing (Kaiser *et al*., 2006; Hinz *et al*., 2011). A meta-analysis of 101 different fishing impact manipulation concluded that the most severe impact was caused by scallop dredging in biogenic habitats (those constructed or composed of primarily living biota) (Kaiser *et al*., 2006). The main effects of scallop dredging largely relate to the direct physical passage of gear over the seabed (Kaiser, Unpublished). Impacts include physical damage to soft rocky outcrops, soft or fragile and long-lived species are killed or damaged, removal of erect faunal species and large sessile species, reduction in biodiversity and a reduction in structural complexity and subsequent habitat homogenisation (Sewell & Hiscock, 2005).

The tooth bar on the gear is designed to penetrate into the seabed as the target species, *Pecten maximus*, will generally bury in the seabed so that their shell is level with the sediment surface (Kaiser, Unpublished). The teeth can penetrate up to 12 cm of the seabed (Kaiser, Unpublished). Over harder substrata (i.e. bedrock, cobble or boulder fields) the teeth are known to scrape the surface and if soft, the rock can be broken up or physically damaged by the passage of the gear (Kaiser, Unpublished), potentially leading to a reduction in complexity (Roberts *et al*., 2010). Softer rock (slate, limestone, mica), like that found off the south Devon and Dorset coasts, is less resistant to damage (JNCC & NE, 2011; Kaiser, Unpublished).

The removal of erect faunal species, which increase topographic relief of the habitat, can also lead to reductions in biogenic structure and habitat complexity (Kaiser, Unpublished). Many of these erect faunal species, such as sea-fans including the Pink sea-fan, soft corals and bryozoans such as Ross coral, have slow growth rates, large body sizes and attach to the substratum, making them particularly susceptible to the impacts of bottomed towed fishing gear (Kaiser, Unpublished). The Pink sea-fan it often used as proxy for the presence of hard ground as their basal 'holdfasts' must recruit onto a solid substratum (Pikesley *et al*., 2016). Furthermore, the topographic relief and complexity created by these emergent epifauna, support diverse seabed communities and provide shelter for juvenile fish, shellfish and their prey (Kaiser, Unpublished). In a meta-analysis, scallop dredging was reported to cause an immediate reduction in mean abundance of animals from -22% to 98%, with the greatest declines observed for sea-fans and sponges in biogenic habitats (Kaiser *et al*., 2006).

Typically scallop dredging occurs over gravel or mixed substrata, although can occur in areas of mud or harder seabed type which support populations of the target species (Shumway and Parsons, 2006; Hinz *et al*., 2011). Rocky-reef habitats can also present a considerable risk to dredging gear, with the gear known to come fast (Boulcott and Howell, 2011). As a result, there is a severe lack of impact studies on scallop dredging in areas of rocky reef (Boulcott and Howell, 2011; Hinz *et al*., 2011). Improvements in electronic navigation and bottom discrimination technology have allowed for the expansion of scallop dredging into previously inaccessible areas of the seabed (Boulcott & Howell, 2011).

Boulcott and Howell (2011) and Boulcott *et al*. (2014) investigated the impact of scallop dredging in areas of rocky-reef and mixed substrate (including bedrock, boulder, cobble) in south west Scotland. The former study used a photographic survey of four experimental tows performed in two areas of rocky-reef biotopes. The prevalence of tow marks of faunal turf was difficult to identify from digital images and where they were detected resembled the action of sprung teeth (Boulcott and Howell, 2011). Visible signs of damage to dead man's fingers *Alcyonium digitatum*, a species considered to be potentially vulnerable, were limited in only 13% of photographic quadrats. The elephant hide sponge *Pachymatisma johnstonia* on the other hand, also considered to be of the most vulnerable species, showed consistent signs of visible damage in 69% of photographic quadrat. Whilst the study provides evidence of damage to epifaunal communities, only one species of emergent displayed high rates of physical damage, despite the presence of various other species. This suggests that damage caused to rocky reef communities is likely to be incremental in nature, increasing with repeated tows (Boulcott and Howell, 2011).

The latter study (by Boulcott *et al*. (2014) investigated the impact of experimental scallop dredging (before and after) over hard substrates in three sites. To investigate the potential of recovery, all sites were resurveyed 2.5 months after experimental dredging. Each site had an 'impact' box that was subject to experimental dredging and two 'control' boxes, one open to fishing and another closed to fishing for the past two years (within an SAC). Although not significant, all three impact boxes had lower point estimates of coverage of faunal turf communities immediately after dredging, with estimates of -69%, -10% and -22% compared with before-impact coverage. There were however significant shifts in community composition in impact boxes before and after impact surveys at two sites. This was driven by a reduction in the numbers of *Alcyonium digitatum* and sponges, erect epibenthic species that are vulnerable to dredging. Coverage of faunal turfs was significantly greater in the SAC than outside control boxes in 4 out of 6 comparisons with a medium reduction in coverage of 33% between the outside and SAC controls, consistent with a reduction in the abundance of emergent epifauna caused by dredging. Immediately after dredging communities in all three impact boxes become less similar to those inside the SAC boxes.

Hinz *et al*. (2011) investigated the impacts scallop dredging in Lyme Bay SCI, a marine protected area, adjacent to the Chesil Beach and Stennis Ledges MCZ, where Pink sea-fans occur. The study compared areas subject to different fishing activity levels. These were arranged around 4 voluntary reserved closed to fishing and included 2 fixed treatments with 2 levels (1. Protection i.e. stations inside the reserves (Closed) and outside (Open); 2. Past Fishing Activity i.e. stations that had been fished prior to the implementation of the reserves (Fished) and stations that had experienced no prior dredging or at very low intensities (Not Fished). Fished sites were estimated to have been dredged on average 1.2 times per year. The study found sessile emergent epifauna occurred at significantly lower levels and abundances at fished sites compared to unfished sites, with a significant negative effect on 3 out of 9 species analysed. The abundance of ross coral *Pentapora fascialis* and dead men's fingers *Alcyonium digitatum, and presence of Axinella dissimilis* (erect sponge) were 73%, 67% and 54% lower in fished sites compared to non-fished sites, respectively. The Pink sea-fan *Eucinella verrucosa* however did not show a significant negative response with respect to abundance and body size in relation to fishing intensity, despite being 3.4 times more abundant inside the reserve areas compared to outside the reserve areas. Using least squares regression to investigate the effect of fishing intensity, *E. verrucosa* showed no noticeable trend.

The lack of widespread damage or impact on structural and potentially vulnerable species reported by Boulcott and Howell (2011) and Hinz *et al*. (2011) is thought to be related to a scallop dredge passes over morphologically complex substrata like rocky reefs (Boulcott *et al*., 2014). This is also supported by results reported by Boulcott *et al*. (2014) who found that at one site the community composition of one impact box did not significantly differ after dredging and became more similar to the SAC control box during the 2.5 month recovery period. It is thought this is because of the higher proportion of bedrock at this site. When passing over morphologically complex substrata, the dredge loses continuous contact with the substrate which limits the area of substrate impacted. The spring action of the toot bar against uneven substrate also reduces contact with the seabed. It is therefore expected that scallop dredging has a more severe impact on even ground where continuous contact with seabed is more likely to occur. In addition, Hinz *et al*. (2011) speculated the flexibility of *E. verrucosa* colonies may also make this species less susceptible to damage from scallop dredging. This has been shown to occur in response to contact with lobster pots (Eno *et al*., 2001).

Species such as the Pink sea-fan and others associated with rocky habitats are likely to have prolonged recovery times of over 5 years when compared with dynamic sandy seabed habitats where recovery can be less than a year (Dernie *et al*., 2003; Kaiser *et al*., 2006; Hinz *et al*., 2011). Ultimately recovery will depend on life history characteristics of the species affected, including the ability of damaged adults to repair lost or damaged parts and the ability of larvae to reach and recolonise a habitat (Roberts *et al*., 2010). Recovery potential of the Pink sea-fan was scored as 'long' and 'low' by MacDonald *et al*. (1996) and Jackson *et al*. (2008) respectively. This is likely to reflect their slow growth rate (Pikesley *et al*., 2016).

The rock, boulder and cobble reefs of Lyme bay are widely known for their biodiverse underwater reef communities, supporting rare species such as the sunset coral, (*Leptopsammia pruvoti*), ecologically important ross coral (*Pentapora fascialis*), and at the edge of their northern and eastern range the pink sea-fan (*Eunicella verrucosa*) (Attrill *et al.*, 2011). In 2001 two small areas in the site were agreed as voluntary closures to protect the reefs from bottom towed fishing gear (Attrill *et al.,* 2011). These were increased to 4 small closures (12nm^2) in 2006 (Attrill *et al.,* 2011). However, in 2008, the government closed a 60nm^2 area through a statutory instrument (SI) to all forms of bottom towed gear (Attrill *et al.,* 2011). Since the site has been closed a number of short and long-term studies have studied the effects of the bottom towed gear exclusion on the benthos and reef communities within the site, including the pink sea-fan.

Attrill *et al.* (2011) used high definition towed video footage and baited camera footage to assess the effects and recovery of the site after two years of closure. In addition, surveys were completed to assess changes in scallop populations. Changes in assemblage showed that newly closed areas showed a change away from the direction of fished sites. However, previously closed areas also showed this change indicating that both areas were likely still in a recovery period. When looking at species individually there were a number who abundance increased in the new closures (king scallop, Neptune's heart sea squirt, velvet swimming crab, goldsinny wrasse and hydroids) – these were considered to have a high or medium recoverability. Surprisingly two species known for low recoverability, the ross coral and dead man's fingers, also showed positive change. However, while the pink sea-fan appeared to be more frequent within the closure the difference was not statistically significant from the fished areas (Figure 6).

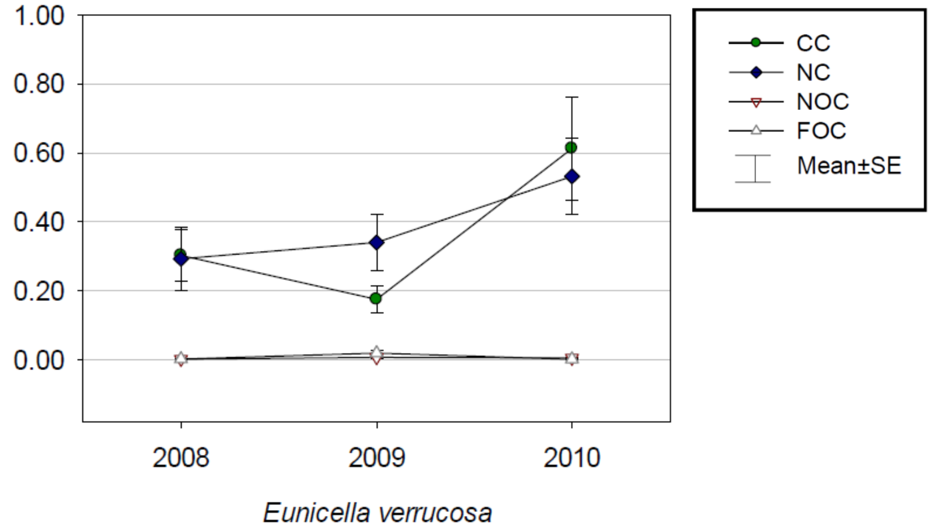

Figure 6. Relative abundance of *Eunicella verrucosa* (mean m-2 +- SE) per treatment (CC = closed control, NC = new closure, NOC = near open control, FOC = far open control), per year (2008, 2009, 2010). Taken from Attrill et al., 2011.

One year on Attrill *et al.,* (2012) completed a further year of sampling following the same methods. In 2011 abundance and species richness improved in both closed and open treatments, but were more pronounced in closed treatments reflecting signs of recovery as sites in the new closure became more dissimilar to those in open controls. Taxa abundance and species richness were significantly different between closed and open sites in 2011 when compared to other years (Attrill *et al.,* 2012). In addition, in 2011 baited camera surveys found the greatest abundance of reef associated nekton and epibenthic assemblage across all treatments (Attrill *et al.,* 2012). This suggests the closure of the SI is aiding the recovery of these species across the site rather than just within closed areas. Indicator species trends largely conformed to species assemblages, however abundance of Pink sea-fan, *Necor puber* and grouped gobies decreased in the closed sites from 2010 to 2011 (Figure 7).

At a similar time, another study occurred comparing sites within the pre-existing voluntary closures with nearby sites outside the closed SI area and sites within the closed SI area. Data was collected by SCUBA divers in 2008, 2009 and 2010 (Munro and Baldock, 2012). Munro and Baldock's research focused specifically on boulder and cobble reef. The number of taxa, overall abundance and assemblage composition were significantly significant between treatments, but not years (Munro and Baldock, 2012). Noticeably lower numbers of erect and encrusting sponges, dead man's fingers and Neptune's heart sponge were seen in open control sites compared to closed control and new closure sites. However, differences were apparent between open control sites east and west of the SI closure indicating varied benthic conditions and environmental gradients across Lyme Bay (Munro and Baldock, 2012).

When the mean total number of taxa recorded from all replicates over the three-year period were compared between the three sites, the open controls supported fewer taxa in total than either the closed controls to the new closure. In addition, the total number of taxa appeared to decline within open controls perhaps reflecting continued fishing impacts (Munro and Baldock, 2012). Samples in the new closure (2010) were more dissimilar to each other than they were to closed controls, but they had similar dissimilarity to open controls (Munro and Baldock, 2012). Munro and Baldock suggest this may be due to the change of stress (reduced fishing activity) within the new closure.

Sponges are considered particularly sensitive to fishing disturbance by bottom towed gear. The closed control sites had greater cover of encrusting sponges than either of the other sites and were statistically more than the open controls (Munro and Baldock, 2012). Meanwhile, branching sponges were very low in open sites and highly variable in both closed sites. However, all types of sponges were more abundant in both closed sites compared with open sites (Munro and Baldock, 2012).

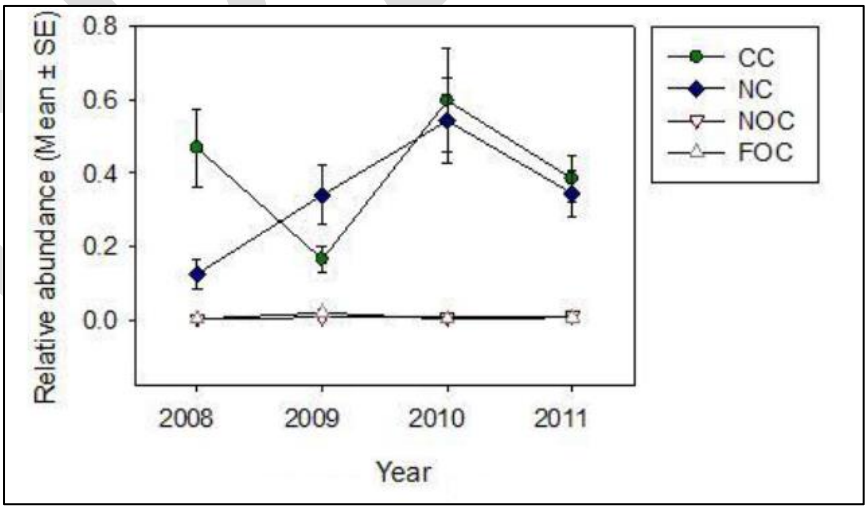

Figure 7. Relative abundance (Mean m^{-2} ± SE) of Pink sea-fans (*Eucinella verrucosa*) in Lyme Bay following the closure to bottom towed fishing gear in 2008 between 2008-2011. CC = closed control, NC = new closure, NOC = new open control, FOC = far open control. Taken from Attrill *et al.,* 2012.

A before and after study comparing data from 2008 (before the closure) and 2011 (3 years after the closure) found that sessile reef associated species (RAS) benefited not just over reef habitats themselves but also over pebbly sand habitats (Sheehan *et al.,* 2013). Sessile RAS abundance was significantly greater in the MPA after the closure than outside of it, showing an increase of 158% (Sheehan *et al.,* 2013). The assemblage in the after MPA sites was clearly separate from that of other sites. Open sites and MPA sites were similar to each other 'Before' but were significantly different to one another 'after' the site closure (Sheehan *et al.,* 2013). Four of the indicator species significantly increased over the three-year period (Ross coral (*P. fascialis)*, sea squirt (*P. mammillata),* Dead man's fingers (*A. digitatum)* and branching sponges) while pink sea-fans (increase of 636%) and hydroids showed an increasing trend over time but they were not significant) (Sheehan *et al.,* 2013) (Figure 9).

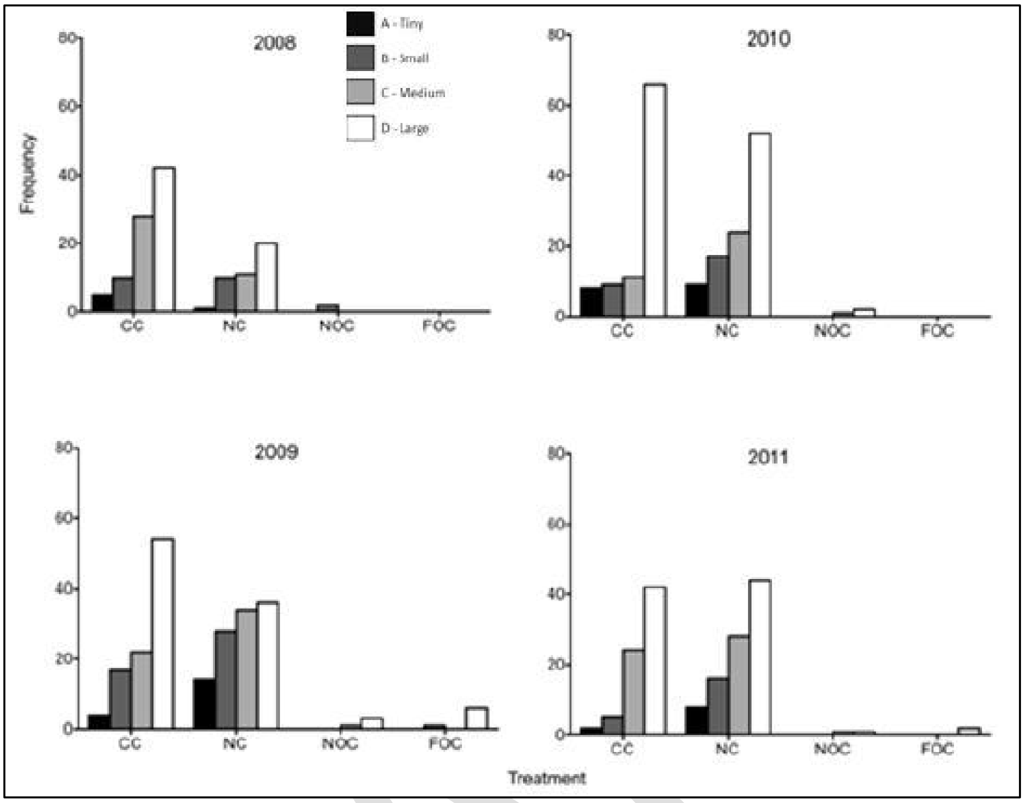

Figure 8. Size class distributions for *Eucinella verrucosa* showing the frequency of individuals by size class (A= Tiny (<6 cm), B= Small (6-11 cm), C= Medium (11-18 cm), D= Large (>18 cm)) for each treatment (CC = closed control, NC = new closure, NOC = new open control, FOC = far open control) between 2008 and 2011.Taken from Attrill *et al.,*., 2012.

The study of recovery of species within the Lyme Bay Marine Protected area has spanned 9 years since its closure to bottom towed gear (Kaiser *et al.,* 2018). Kaiser *et al.* focused on the nine species: pink sea-fan (*Eunicella verrucose),* branched sponge (*Axinella dissimilis)* (Bowerbank)*,* dead men's fingers (*Alcyonium digitatum),* Ross corals *Pentapora foliacea* and white sea squirts *(Phallusia mammillata).* Four commercially important species were also quantified; king scallop (*Pecten maximus)*, queen scallop *(Aequipecten*

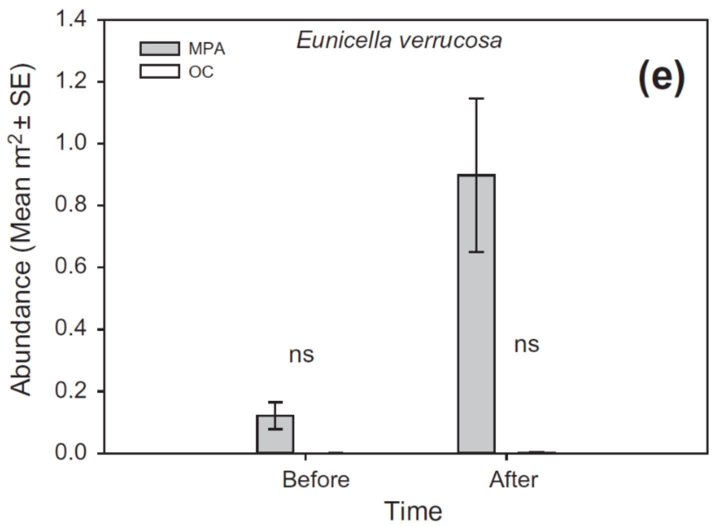

Figure 9. Differences between *Eunicella verrucosa* on pebbly sand between Times 'Before' and 'After' three years of protection and between Treatments (MPA = Marine Protected Area; OC = Open Control). Taken from Sheehan et al 2013.

opercularis), brown crab (*Cancer pagurus)* and spider crab (*Maja squinado).* For pink sea-fans, ross coral and branched sponges there was no significant change in their abundance across fishing history treatments with time (Kaiser *et al.,* 2018). However, there was significantly more individuals found in closed no fishing sites (compared to open fishing, open no fishing and closed fishing) (Figure 10). On the other hand, dead man's fingers and white sea squirts consistently increased in abundance across all fishing history treatments, and over time (Kaiser *et al.,* 2018). Projected recovery time was calculated at 17 to 20 years for Ross coral, white sea squirts and pink sea-fans to achieve t80, whilst for branched sponges t95 was expected to take 51 years (Kaiser *et al.,* 2018).

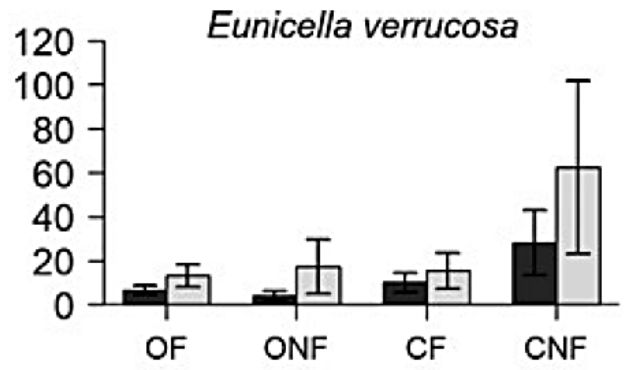

Figure 10. Mean abundance (±1*SE*) of the *Eunicella verrucosa* epibenthic species sampled to investigate temporal changes following the implementation of the Marine protected area (MPA) in Lyme Bay in 2008, at previously open fished (OF), open not-fished (ONF), closed fished (CF) and closed not-fished (CNF) sites, for the years 2007 (dark grey) and 2016 (light grey). Taken from Kaiser *et al.,* 2018.

4.5.3 Trawling

The potential effects of demersal trawls over areas of rocky reefs are similar to those caused by scallop dredging (Sewell and Hiscock, 2005). Although 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.

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 ad 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).

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. Recover 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). 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.

Unfortunately, due to the lack of similarity between areas and habitats in which otter trawling has been shown to cause adverse effects and those found in Chesil Beach and Stennis Ledges MCZ, the studies examined are of limited relevance.

4.5.4 Sensitivity

MacDonald *et al*. (1996) assessed the fragility and recovery potential of different benthic species to determine their sensitivity to fishing disturbance. Recovery represents the time taken for a species to recover in a disturbed area and fragility represents the inability of an individual or colony of the species to withstand physical impacts from fishing gear. Recovery was scored on a scale of 1 to 4 (1 – short, 2 – moderate, 3 – long and 4 – very long) and fragility was scored on a scale of 1 to 3 (1 – not very fragile, 2 – moderately fragile and 3 – very fragile). The scores assigned to the Pink sea-fan are provided in Table 2. The table also includes sensitivity information assigned by MarLIN in relation to physical disturbance and abrasion. Please note that the sensitivity ratings assigned by MarLIN are based on a single dredging event.

Table 2. Likely sensitivity of Pink sea-fans to disturbance caused by an encounter with fishing gear scored by MacDonald *et al*. (1996) and MarLIN (in relation to physical disturbance and abrasion). Medium intensity gears include otter trawls. Fragility is derived from personal knowledge of species structure and recovery values were derived from a review of literature on life-histories of the species. Source: MacDonald *et al*. (1996) and www.marlin.ac.uk/).

		MacDonald *et al.* (1996)			MarLIN (Abrasion/disturbance of the seabed)		
Species	**Common name**	**Fragility**	**Recovery**	**Sensitivity (for medium intensity gears)**	**Resistance**	**Resilience**	**Sensitivity**
Eucinella verrucoa	Pink sea-fan	3	3	67	Low	Medium	Medium

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).

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 Pink sea-fan (*Eucinella verrucosa*) 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
Eucinella verrucosa	High (Medium)	High (Medium)	High (Medium)

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).

Gear Type	**Habitat Type**	**Gear Intensity***			
		Heavy	Moderate	Light	Single pass
Beam trawls and scallop dredges	**Rock with erect and branching species**				Medium
	Erect and branching spp. very slow growing				High
Light demersal trawls and seines	**Rock with erect and branching species**				High
	Erect and branching spp. very slow growing				High

There is no information on sensitivity for heavy, moderate or light gear intensity as the gear types are considered unlikely to occur in these habitat types.
* **Heavy** – Daily in 2.5nm x 2.5 nm, **Moderate** – 1-2 times a week in 2.5 nm x 2.5 nm, **Light** – 1-2 times a month during a season in 2.5 nm x 2.5 nm, **Single** – Single pass of fishing activity in a year overall

4.6 Existing Management Measures

All Bottom towed gears:

- **Bottom Towed Fishing Gear Byelaw 2016** - prohibits bottom towed fishing gear over sensitive features including pink sea-fans within the District, closing much of the site to these activities.
- **Vessel 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.

Scallop dredging:

- The **Scallop Fishing (England) Order 2012** provides details for dredge configuration (i.e. a dredge cannot exceed 150 kg including all fittings).
- **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

- **Fishing Under Mechanical Power – Closed Area** byelaw – this prohibits trawling (where the vessel is propelled entirely or in part by means of mechanical power) between 1st May and 31st August within one nautical mile from any part of the coast from Golden Cap to Chesil Beach. This area falls within the western portion of the site.

- 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

4.7 Table 7. Assessment of trawling and scallop dredging activity on Pink sea-fan (*Eucinella verrucosa*)

Feature	Attribute	Target	Potential pressure(s) and Associated Impacts	Likelihood of Impacts Occurring/Level of Exposure to Pressure	Current mitigation measures
Pink sea-fan (*Eunicella verrucosa*)	Population: population size	Recover the population size within the site.	Abrasion/disturbance of the substrate on the surface of the seabed and removal of non-target species were identified as potential pressures. Bottom towed fishing gear directly impacts on soft, fragile and long-lived species like the Pink sea-fan through physical passage of fishing gear over the seabed. The teeth found on scallop dredging gear scrape the surface and can lead to the of removal erect epifaunal species. Scientific evidence of scallop dredging on rocky reef habitats is relatively sparse, with only one study based in an area where Pink sea-fans exist (Hinz *et al*., 2011). Unexpectedly, the Pink sea-fan did not show a significant negative response, unlike other fragile and long-lived species known to co-occur alongside the Pink sea-fan. Other studies based over rocky reef habitats (Boutlcott and Howell, 2011; Boutcott *et al*. 2014) reported	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 within the site totalling a maximum of 30 instances in the site per year. Up to 3 may dredge within the site but for a maximum of two weeks each year. 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. The pink sea-fan is a soft coral. Living in areas of strong currents on rocky reef below 10m depth. They are extremely slow growing but can grow up to 80cm high and 100 cm across at right angles to the current. The species is a large colony tiny anemone like polyps with stinging tentacles which are used to catch food in the water column. Pink sea-fans supports other creatures including sea slugs, a rare anemone and the egg cases of dogfish. There are a general lack of studies investigating the effects of bottom towed fishing gears over rocky habitats and those	**Vessels Used in Fishing byelaw** prohibits commercial fishing vessels over 12 metres from the Southern IFCA district. The reduction in vessel size also limits the size of fishing gear (i.e. number of scallop dredge of size of trawl) that can be deployed. **Bottom Towed Fishing Gear Byelaw 2016** - prohibits bottom towed fishing gear over sensitive features including pink sea-fans within the District, closing much of the site to these activities.

			a lack of widespread damage or impact on structurally and potentially vulnerable species. The reason for this is thought to be because of the lack of continuous contact with the substrate, however the damage is likely to be incremental in nature, increasing with repeated tows (Boulcott and Howell, 2011). Studies on the recovery of pink sea-fans and their associated habitat shows that after 4 years of closures to bottom towed fishing gear, recovery is still uncertain (Attrill *et al*., 2012). After 9 years Pink sea-fans were still recovering in the Lyme Bay MPA and it was predicted that full recovery would take 17-20 years (Kaiser *et al.,* 2018) Potential impacts of trawling are similar to those caused by scallop dredging, with dredging likely to be more damaging (Collie *et al*., 2000b; Sewell & Hiscock, 2005). This is due to the nature of the scallop dredging gear, which is more likely to penetrate deeper into the substrate (Collie *et al*., 2000b).	which contain pink sea fan. Hinz *et al.,* (2011) studied the impact of very light (1.2 times per year) scallop dredging intensity in the Lyme Bay area where pink sea fans are known to occur. The study found that sessile reef communities were negatively affected at fished sites. However, the pink sea fan did not show a significant negative response which was believed to be due to the presence of bedrock and large boulders in the site which cause the fishing gear to loos continuous contact with the seabed and the flexibility of the species in response to contact (Eno *et al.,* 2001). Therefore, it is likely that if fishing were to occur at greater intensities the impact would accumulate (Boulcott *et al.,* 2014). Studies on the recovery of pink sea fans in sites where bottom towed gear has been prohibited compared to sites where fishing is permitted to continue have consistently found that more and larger pink sea-fans are found in protected sites however this has not been significant (Attrill *et al.,* 2011; Attrill *et al.,* 2012). Despite and increase in pink sea fan abundance on pebbly sand in between rocky areas of 636% after three years of closure the difference was still not significant (Sheehan *et al.,* 2013). Similarly, 9 years after the closure pink sea fan abundance still remained not significantly different between sites but was	

				greater in the non-fished site (Kaiser *et al.,* 2018). Modelled recovery time for this species predicted it could be another 8 to 11 years (total recovery time of 17-20 years) before recovery of the species to t80 would be clear (Kaiser *et al.,* 2018). Potential impacts caused by trawling are similar to those discussed for scallop dredging, although likely to be less severe. Despite a lower incidence of trawling within rocky reef areas, fringing of this habitat may still occur. The Bottom Towed Fishing Gear Byelaw protects many of the known examples of pink sea fan throughout the site. However, updated data has revealed that there are some records of pink sea fan which are outside of the sites closed areas, and are therefore at risk from the impacts of scallop dredging and trawling. Based on the long recovery times for Pink sea-fans and their supporting habitat, impacts from bottom towed fishing gear and the incidence of this gear type outside areas subject to the bottom towed fishing gear byelaw, bottom towed fishing gear is likely to pose a significant risk to the population size of the Pink sea-fan. Furthermore, the target to 'recover' Pink sea-fans populations is unlikely to be achieved with the current level (albeit at relatively low levels) of bottom towed fishing gear occurring over areas in close proximity to records of pink sea	

				fan within the site. It is important to recognise however that a relatively large proportion of Pink sea-fan supporting habitat has been afforded protection through the bottom towed fishing gear byelaw 2016 which will have already enabled the population to move towards achieving the 'recover' target.	
	Presence and spatial distribution of the species	Recover the presence and spatial distribution of the species.	Addressed above.	Addressed above. Based on the long recovery times for Pink sea-fans and their supporting habitat, impacts from bottom towed fishing gear and the incidence of this gear type outside areas subject to the bottom towed fishing gear byelaw, bottom towed fishing gear is likely to pose a significant risk to the presence and spatial distribution of the Pink sea-fan. Furthermore, the target to 'recover' Pink sea-fans presence and spatial distribution is unlikely to be achieved with the current level (albeit at relatively low levels) of bottom towed fishing gear occurring over areas in close proximity to records of pink sea fan within the site. It is important to recognise however that a relatively large proportion of Pink sea-fan supporting habitat has been afforded protection through the bottom towed fishing gear byelaw 2016 which will have already enabled the population to move towards achieving the 'recover' target.	Addressed above.

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; Pink sea-fan 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 pink sea-fan 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 Pink sea-fan features within the site from the relevant fishing gears. Spatial closures, based on the most up to date data for the location of pink sea-fan features, will be introduced and incorporated into appropriate management following best practice[7]. 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 (scallop dredging and light otter trawl) 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 (Pink sea-fan) 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.

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.

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

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

IV. Sensitivity of Pink sea-fans and their supporting habitat to the impacts of bottom towed fishing gear
V. Ability of Pink sea-fans and their supporting habitat 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 (including bathymetric data), it has been concluded that bottom towed fishing gear is likely to pose a significant risk to Pink sea-fans and their supporting habitat within the Chesil Beach and Stennis Ledges MCZ. The rationale for this conclusion is summarised below:

- IFCO knowledge indicates the number of vessels scallop dredging and light otter trawling within the MCZ is relatively low, with both activities occurring for limited periods during any one year depending on the season (light otter trawling) or weather (scallop dredging).
- Scallop dredging is the main threat to Pink sea-fans due to the focus over rocky reef habitats, whilst light otter trawling is known to fringe areas of rocky reef habitat.
- A review of scientific literature demonstrated that Pink sea fans are no susceptible to very low levels of bottom towed fishing gear, however cumulative impacts were likely. Studies have consistently found fewer and smaller pink sea fans in fished areas however this was often not significant.
- Sensitivity of Pink sea-fans to pressures associated with bottom towed fishing gear is high.
- Recovery of pink sea-fans has been shown to be more than 9 years and is predicted at between 17 and 20 years for full and significant recovery.
- Many of the records of pink se fan within the site are protected by the bottom towed fishing gear byelaw however new data has revealed records outside of these areas.
- Based on the above, Southern IFCA feel it is now appropriate for refinement to the spatial extent of the closures. This is to support the general management approach to ‘recover’ the Pink sea-fan to a favourable condition.
- The primary reason for management is to protect Pink sea-fans.

It is therefore recognised that the activities have the potential to pose a significant risk upon the following Pink sea-fan attributes:

- Population: population size
- Presence and spatial distribution of the species

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 (pink sea fan), 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 pink sea fan 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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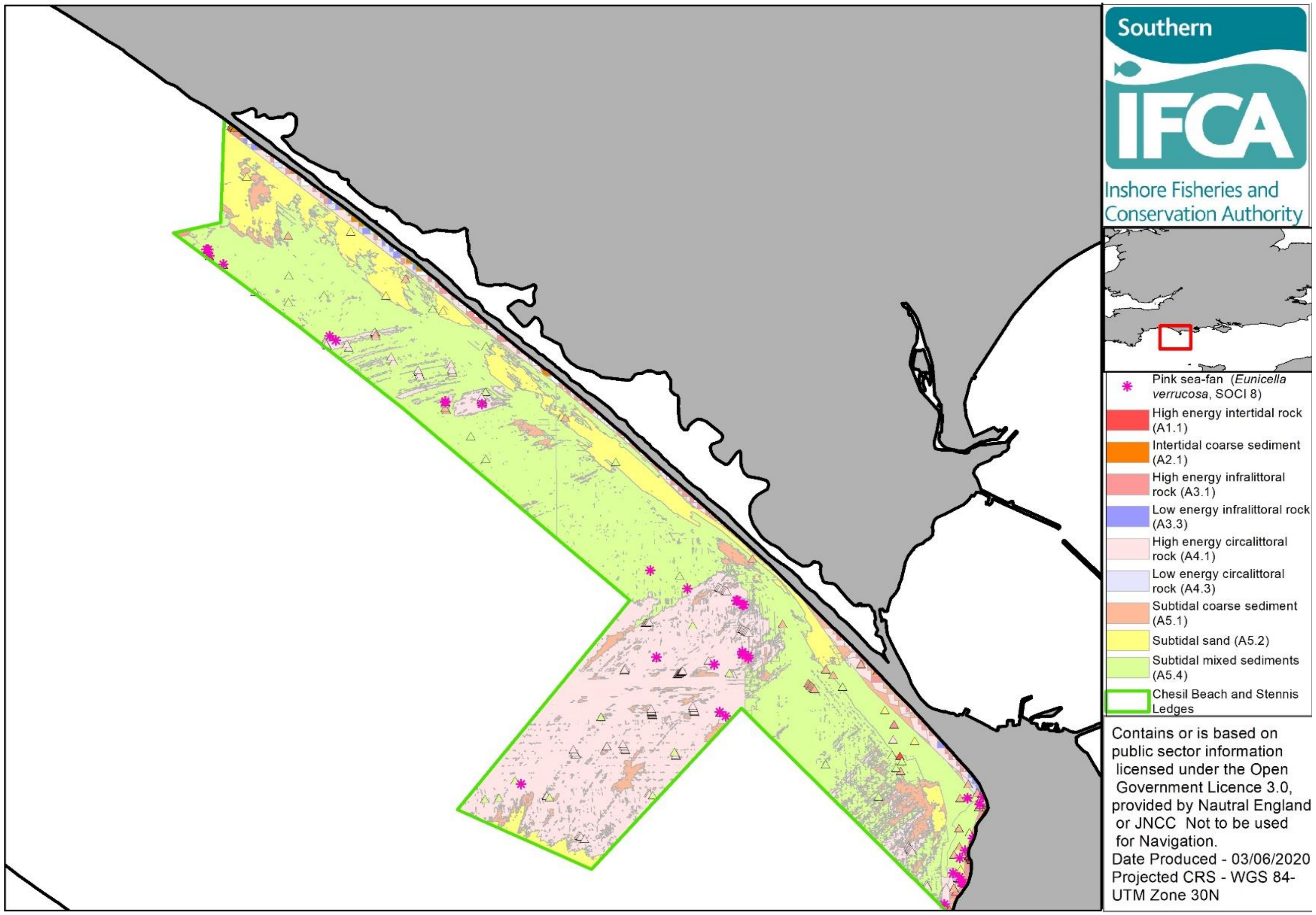
Annex 1. Broadscale Habitat and species of conservation importance map for Chesil Beach and Stennis Ledges MCZ.



Annex 2. Advice on operations for commercial trawling (a) and dredging (b) activity in Chesil Beach and Stennis Ledges MCZ

Pressure name	Habitat							Species	
	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
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		

Pressure name	Habitat							Species	
	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			

Annex 3. Fishing activity maps using trawl sightings data from 2009-2020 in Chesil Beach and Stennis Ledges MCZ with Pink Sea-fan spatial data.