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Southern Inshore Fisheries and Conservation Authority (IFCA)

Fisheries in EMS Habitats Regulations Assessment for red, amber and green risk categories

European Marine Sites: Solent Maritime SAC, Chichester and Langstone Harbours SPA, Portsmouth Harbour SPA, Chesil and the Fleet SAC, Chesil Beach and The Fleet SPA & Poole Harbour SPA.

Feature (Sub feature)/Supporting Habitat: Intertidal seagrass beds, Subtidal seagrass beds

Gear type(s) Assessed: Bottom Towed Fishing Gear (Clam dredging, Oyster dredging, Scallop dredging & Demersal trawling)

Technical Summary

Duties under Regulation 63 of the Conservation of Habitats and Species Regulations 2017 require Southern IFCA, as a competent Authority, to make a Habitats Regulations Assessment (HRA) of any fishing activity likely to have a significant effect on a European site (either alone or in combination with other plans or projects). As such, Southern IFCA must undertake an HRA when assessing the impacts of bottom towed fishing gear activities within European Marine Sites (EMS). Following the Revised Approach assessment period and the introduction of the Bottom Towed Fishing Gear Byelaw 2016 Southern IFCA must make and assessment if a change in the status of an existing fishery or a new fishery arose, new feature data becomes available or new features are added to the site.

Habitat and species feature data is continually being added to and updated. In 2020 Southern IFCA received updated 'red risk' habitat data regarding seagrass and reef features. Therefore, this new data requires habitats regulations assessment to determine whether or not in the view of Southern IFCA the conservation measures in place are appropriate to maintain and restore the habitats and species for which the site has been designated to a favourable conservation status (Article 6(2)).

A review of research into bottom towed fishing gear (BTFG) identified that the activities have the potential to cause abrasion, penetration or disturbance of the seabed, removal of non-target and target species and changes in suspended solids and smothering and siltation rates. Scientific literature shows that seagrass habitats can be immediately destroyed by BTFGs, as well as cause other impacts such as damage and mortality of associated biological communities and changes in sediment character.

Any potential impacts and risk to the integrity of the EMSs across the Southern IFCA district will be mitigated by the introduction of new spatial management for bottom towed fishing gears. The management will fully protect the features from the fishing activities by prohibiting all forms of BTFG. This may include extensions to areas already closed to bottom towed fishing gears as well as new closed areas. Within these areas all forms of BTFG (trawling, dredging, pump scooping) will be prohibited all year around. This will ensure that none of the aforementioned pressures will be exerted on the features and therefore no impact will be caused.

Based on these mitigation measures, in the form of the additional management, it is concluded that the fishing activities will not hinder the sites from achieving their conservation objectives and as such will not have an adverse effect on the integrity of the European Marine Sites.

Contents

1 Introduction

1.1 Need for an HRA assessment

Southern IFCA has duties under Regulation 9(3) of the Conservation of Habitats and Species Regulations 2017 as a competent authority, with functions relevant to marine conservation to exercise those functions so as to secure compliance with the Habitats Directive. Article 6.2 of the Habitats Directive requires appropriate steps to be taken to avoid, in Natura 2000 sites, the deterioration of natural habitats and habitats of species as well as significant disturbance of the species for which the area has been classified.

Management of European Marine Sites is the responsibility of all competent authorities which have powers or functions which have, or could have, an impact on the marine area within or adjacent to a European Marine Site (EMS). Under section 36 of the Species and Habitats Regulations (2017):

"*The relevant authorities, or any of them, may establish for a European marine site a management scheme under which their functions (including any power to make byelaws) are to be exercised so as to secure in relation to that site compliance with the requirements of the Habitats Directive*."

In 2012, the Department for Environment, Food and Rural Affairs (Defra) announced a revised approach to the management of commercial fisheries in European Marine Sites (EMS). The objective of this revised approach is to ensure that all existing and potential commercial fishing activities in European Marine Sites are managed in accordance with Article 6 of the Habitats Directive. Articles 4.1 and 4.2 of the Birds Directive also require that the Member States ensure the species mentioned in Annex I and regularly occurring migratory bird species are subject to special conservation measures concerning their habitat in order to ensure survival and reproduction in their area of distribution. This affords Special Protection Areas (SPAs) a similar protection regime to that of Special Areas of Conservation (SACs).

This approach was implemented using an evidence based, risk-prioritised, and phased approach. Risk prioritisation was informed by using a matrix of the generic sensitivities of the sub-features of the EMS to a suite of fishing activities as a decision-making tool. These sub-feature-activity combinations were categorised according to specific definitions, as red[1], amber[2], green[3] or blue[4].

Activity/feature interactions identified within the matrix as red risk had the highest priority for implementation of management measures by the end of 2013 in order to avoid the deterioration of Annex I features in line with obligations under Article 6(2) of the Habitats Directive. Therefore, at this time Habitats regulations assessments were not carried out in order to facilitate the timely introduction of management measures.

Activity/feature interactions identified within the matrix as amber risk required a site-level assessment to determine whether management of an activity was required to conserve site features. Activity/feature interactions identified within the matrix as green also required a site level assessment if there were "in combination effects" with other plans or projects.

Site level assessments were carried out in a manner consistent with the provisions of Article 6(3) of the Habitats Directive, but were also required to meet the 6(2) responsibilities of Southern IFCA as a competent authority. The aim of the assessments was to consider if any activity could significantly disturb the species

[1] Where it is clear that the conservation objectives for a feature (of sub-feature) will not be achieved because of its sensitivity to a type of fishing, - irrespective of feature condition, level of pressure, or background environmental conditions in all EMSs where that feature occurs – suitable management measures will be identified and introduced as a priority to protect those features from that fishing activity or activities.

[2] Where there is doubt as to whether conservation objectives for a feature (or sub-feature) will be achieved because of its sensitivity to a type of fishing, in all EMSs where that feature occurs, the effect of that activity or activities on such features will need to be assessed in detail at a site specific level. Appropriate management action should then be taken based on that assessment.

[3] Where it is clear that the achievement of that conservation objectives for a feature is highly unlikely to be affected by a type of fishing activity or activities, in all EMSs where that feature occurs, further action is not likely to be required, unless there is the potential for in combination effects.

[4] For gear types where there can be no feasible interaction between the gear types and habitat features, a fourth categorisation of blue is used, and no management action should be necessary.

or deteriorate natural habitats or the habitats of the protected species. From this, a judgement was made as to whether or not the conservation measures in place were appropriate to maintain and restore the habitats and species for which the site has been designated to a favourable conservation status (Article 6(2)). If assessments identified that additional conservation measures were required, these had to be implemented or be in the process of implementation by the end of 2016. Southern IFCA completed this process by the 2016 deadline. Following the end of 2016, the need for assessment i.e. if a change in the status of an existing fishery or a new fishery arose, will be reviewed by Southern IFCA on an as and when basis.

Habitat and species feature data is continually being added to and updated. In 2020 Southern IFCA received updated 'red risk' habitat data regarding seagrass and reef features. Therefore, this new data requires habitats regulations assessments to determine whether or not the conservation measures in place were appropriate to maintain and restore the habitats and species for which the site has been designated to a favourable conservation status (Article 6(2)).

This document forms the basis of a Habitats Regulations Assessment for the updated seagrass in European Marine Sites 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 European marine sites alone, and 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 European Marine Sites will be met and the integrity of the site is not adversely affected.

Southern IFCA have now completed a Test of Likely Significant Effect of the activities over these features. This indicated that some pressures created by the activities are exerted on the feature, and therefore are required to be assessed in a Habitats Regulations Assessment (HRA). Therefore, this document contains the HRA for Seagrass Beds within EMSs with the Southern IFCA District.

2 Documents reviewed to inform this assessment

- Natural England's risk assessment Matrix of fishing activities and European habitat features and protected species[5]
- Reference List (Section 13)
- Natural England's Conservation Advice Packages for the relevant European Marine Sites[6]
- Site maps – feature location and extent (Annex 1)
- Fishing Activity Maps (Annex 2)
- Fisheries Impact Evidence Database (FIED)

3 Information about the EMSs

3.1 Overview and relevant features/supporting habitats

Solent Maritime SAC

The Solent Maritime SAC is located in a major sheltered channel lying between the Island (The Isle of Wight) and the mainland of South Britain. The body of water between these two land masses known as The Solent is unique for its complex tidal regime, with double high tide and the young flood stand about 2.5 hours after low water, as well as for the complexity and particularly dynamic nature of the marine and estuarine habitats which present here. The site is designated for its wide variety of marine sediment habitats which are influenced by a range of salinities, wave shelter and intensity of tidal stream. Sediment habitats within the estuaries include extensive estuarine mud and sandflats, with intertidal and subtidal areas often supporting eelgrass and seagrass species (*Zostera* sp.).

[5] See Fisheries in EMS matrix: http://www.marinemanagement.org.uk/protecting/conservation/documents/ems_fisheries/populated_matrix3.xls
[6] https://designatedsites.naturalengland.org.uk/

Relevant features of the SAC:

- Mudflats and sandflats not covered by sea water at low tide
    - Intertidal seagrass beds
- Sandbanks which are slightly covered by sea water all the time
    - Subtidal seagrass beds

Chesil and the Fleet SAC & Chesil Beach and The Fleet SPA

The Chesil and the Fleet SAC and Chesil Beach and The Fleet SPA are located on the south coast of England in the County of Dorset. The sites are characterised by the 29km Chesil Bank which stretches from West Bay to Portland; the longest shingle beach in Great Britain. On the landward side of the Bank is the Fleet Lagoon, which is the largest lagoonal habitat in Britain. The fully saline lagoon is shallow throughout, and sheltered from wave action, with a small tidal range. Within the Fleet's mud, sand, cobble and pebble habitats, extensive seagrass beds are found in the lower, mid and west of the Fleet. The lagoon also supports a number of rare lagoonal species such as the DeFolin's Lagoon snail (*Caecum armoricum*).

Relevant Features of the SAC:

- Costal Lagoons (containing extensive seagrass habitat)

Relevant Supporting Habitats of the SPA:

- Intertidal seagrass beds
- Subtidal seagrass beds

Chichester and Langstone Harbours SPA, Portsmouth Harbour SPA, Solent and Southampton Water SPA and Poole Harbour SPA

Chichester, Langstone, Portsmouth and Poole Harbours, and Southampton Water are located on the South Coast of England. The four harbours are large sheltered estuaries, whilst Southampton Water and the Solent, combined are one of the most sheltered channels in Europe. These areas contain a range of habitats marine sediment habitats which in turn support internationally and nationally important numbers of birds such as the dark-bellied Brent geese, black-tailed godwit and the little tern, throughout the winter and summer months. Important habitats in the sites including extensive mud and sandflats, saltmarsh, freshwater reedbeds and seagrass beds. These habitats provide areas for protected birds to forage, roost and breed.

Relevant Supporting Habitats of the SPA:

- Intertidal seagrass beds

3.2 Conservation Objectives

For Special Areas of Conservation

The site's conservation objectives apply to the site and individual species and/or assemblage of species for which the site has been classified (the "Qualifying features" listed above).

The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the Favourable Conservation Status of its qualifying features, by maintaining or restoring:

- The extent and distribution of qualifying natural habitats and habitats of the qualifying species
- The structure and function (including typical species) of qualifying natural habitats
- The structure and function of the habitats of the qualifying species
- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
- The populations of each of the qualifying species

- The distribution of qualifying species within the site

For Special Protection Areas

The site's conservation objectives apply to the site and individual species and/or assemblage of species for which the site has been classified (the "Qualifying features" listed above).

The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the aims of the Wild Birds Directive, by maintain or restoring:

- The extent and distribution of the habitats of the qualifying features
- The structure and function of the habitats of the qualifying features
- The supporting processes on which the habitats of the qualifying features rely
- The populations of each of the qualifying features
- The distribution of qualifying features within the site

4 Interest feature(s) of the EMSs categorised as 'Red' risk and overview of management measures(s) (if applicable)

- Intertidal seagrass
- Subtidal seagrass
- Reefs

A red risk interaction between bottom towed gears and eelgrass/seagrass beds and reef features was identified and subsequently addressed through the creation of the 'Bottom Towed Fishing Gear' byelaw[7] (and its subsequent revocation and revision in 2016[8]) and 'Prohibition of Gathering (Sea Fisheries Resources) in Seagrass Beds' byelaw[9]. The 'Bottom Towed Fishing Gear' byelaw prohibits the use any bottom towed fishing gear within sensitive areas (characterised by reef features or eelgrass/seagrass beds) in European Marine Sites throughout the district. The byelaw also states that if transiting through a prohibited area carrying bottom towed fishing gear, all parts of the gear are inboard and above the sea. Within the Southern IFCA District, there are 40 prohibited areas. The 'Prohibition of Gathering (Sea Fisheries Resources) in Seagrass Beds' byelaw prevents digging, fishing for or taking any sea fisheries resource in or from prohibited areas containing eelgrass/seagrass beds in European Marine Sites throughout the District. Exceptions to the prohibition include if a net, rod and line or hook and line are used, in addition to the use of a vessel as long as the vessel's hull is not in contact with the seabed. It is also prohibited to carry a rake, spade, fork or any similar tool within specified areas. Within the Southern IFCA District, there are 29 prohibited areas.

At the time these management measures were brought in, these features were categorised as red risk and therefore were prioritised for management. Therefore, habitats regulations assessments were not carried out in order to facilitate timely introduction of management measures.

[7] Bottom Towed Fishing Gear Byelaw:
https://secure.toolkitfiles.co.uk/clients/25364/sitedata/files/PDFbyelaw_bottomtowedfishi.pdf

[8] https://secure.toolkitfiles.co.uk/clients/25364/sitedata/files/Bottom-Towed-Fishing-Gear-byelaw-2016.pdf

[9] Prohibition of Gathering (Sea Fisheries Resources) in Seagrass Beds Byelaw:
https://secure.toolkitfiles.co.uk/clients/25364/sitedata/files/PDFbyelaw_prohibitionofgat.pdf

5 Information about the fishing activities within the sites

5.1.1 Fishing activities under consideration

This HRA is being conducted to assess the impact off all forms of bottom towed fishing gear upon the features and supporting habitats 'seagrass beds'. Within the Southern IFCA district a number of bottom towed fishing gears may occur. In Poole Harbour there is an active pump scoop dredge fishery for clams and cockles. In Langstone and Portsmouth Harbours and Southampton Water there are a number of vessels which use mechanical dredges to fish for manila clams. Trawling for white fish is common throughout the Solent and in the bays outside of Poole Harbour. Historically, there was a large oyster dredge fishery within the Solent, however, this has been heavily restricted if not closed for a number of years now due to stock collapse. In a small area to the North and East of the Isle of Wight a seasonal scallop dredge fishery has also occurred for a number of years.

5.2 Technical gear specifications

5.2.1 Pump scoop dredge fishing

Fishing for shellfish in Poole Harbour is carried out using pump-scoop dredge. A pump-scoop dredge consists of toothed dredge basket which is towed through the seabed alongside a vessel (Jensen *et al*., 2005).

Figure 1. Typical pump-scoop dredge set up with basket dredge, water jets, davit arm and sorting riddle.

Attached to the front end of the dredge is a series of water jets which direct a flow of water to the rear of the dredge basket (Jensen *et al*., 2005) (Figure 1). The water jets, powered by a hydraulic pump, allow sediment to be moved through the dredge basket (Jensen *et al*., 2005). In 2012, the use of a trailed pump-scoop dredge, which uses the aid of a davit arm and winch, was introduced. This type of dredge evolved from the previously used and more physically demanding hand-held dredge or scoop, pushed into the sediment and pulled along by a vessel (Jensen *et al*., 2005; Clarke *et al*., 2018). The pump-scoop dredge is deployed from small (less than 10 metre in length) and shallow drafted vessels. This gear type is unique to Poole Harbour and differs from suction or hydraulic dredging techniques which both fluidise the sediment by spraying water in front of the dredge (Jensen *et al*., 2005).

A comparison between the pump-scoop and hand-held dredge revealed no differences in the areas fished in terms of proximity to the shore (i.e. potential displacement of birds) or sediment penetration (i.e. likelihood of impacting on infaunal communities). Further observations also showed no increase in fishing intensity when comparing both dredge types.

The pump-scoop dredge is towed in a circular motion with each tow lasting from 2 to 5 minutes depending on the nature of the seabed. After each tow the pump-scoop dredge is lifted into the vessel and the contents of the dredge basket are emptied directly onto the riddle for sorting. Fishers must sort their catch immediately and return all shellfish under minimum size restrictions, as well as bycatch, to the water.

The configuration of the pump-scoop dredge is dictated by the conditions of the permit. These include restrictions on the dimensions of a dredge basket to a maximum of 460 mm in width, 460 mm in depth and 30 mm in height (excluding any poles or attachment). Dredges must be constructed on rigid bars having spaces of no less than 18 mm between them. Bar spacing is designed to allow young spat and infauna to go through the dredge basket (Jensen *et al*., 2005). A riddle with bar spacing of 18 mm is mandatory for the sorting of shellfish.

5.2.2 Mechanical dredge fishing

A type of mechanical dredge, known as a box dredge, is used to fish for clams in the Solent SACs and SPAs. A mechanical dredge consists of a metal frame with a row of metal teeth which are towed through the sediment using a boat (Figure 2) (Wheeler *et al*., 2014). The dredge is characterised by skis which sit on the base of the dredge and allow it to sit on the seabed whilst being towed. Current management measures do not specify the required configuration of box dredge and as a result the size of a box dredge can widely vary. Box dredges vary from 82 to 122 cm in width, 111 to 130 cm in length and 20 to 36 cm in depth. Some box dredges have a diving plate which helps to stabilise the dredge during deployment. The metal teeth range from 9 to 14 cm (16 cm diagonally) and are situated on the base of the dredge mouth opening. Teeth can be orientated vertically or angled diagonally forward to help cut through the sediment. These teeth penetrate into the sediment disturbing the buried clams which are subsequently caught and retained in the dredge. The posterior metal box is made up of bars, who's spacing also varies from 1.4 to 3.4 cm. This allows the dredge to pass through the sediment and unwanted debris can escape through the bars. Spacing may vary depending on the target species, with a larger bar spacing used for the hard-shell American clam, which has a greater minimum legal size than the Manila clam.

Typically, one or two dredges, although up to three has been observed, are deployed side by side, depending on the size of the boat, from the stern. The dredge is typically deployed using a mechanized winch to lower the gear to the sea bed and lift it back onto the vessel. The dredge is attached to the vessel using a rope which is typically tied to the tow riddle (Figure 2). The angle at which the dredge is towed depends on the tow riddle configuration; the further forward the rope is attached to the dredge, the steeper the angle it will penetrate into the sediment. The dredge is towed along the seabed in straight lines in the direction of the boat. Tows can vary in length and a vessel will go back and forth over the same fishing ground. Once back on deck, the dredge is emptied onto a riddle where the catch is, washed, sorted and sized. The riddle spacing is often optimised to allow for undersized clams to return straight back to the seabed.

5.2.3 Light otter trawling

Figure 2. Box dredge used in the Solent clam fishery. Tow attachments. Dredge ski and teeth.

An otter trawl comprises of following design (see Figure 3). 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

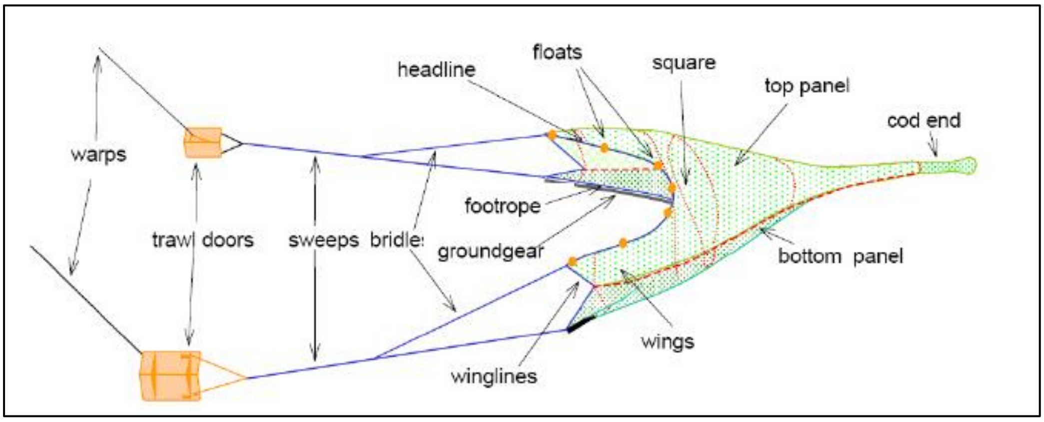

Figure 3. a Key components of an otter trawl. Source: www.seafish.org/upload/b2b/file/r_d/BOTTOM%20TRAWL_5a.pdf

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).

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).

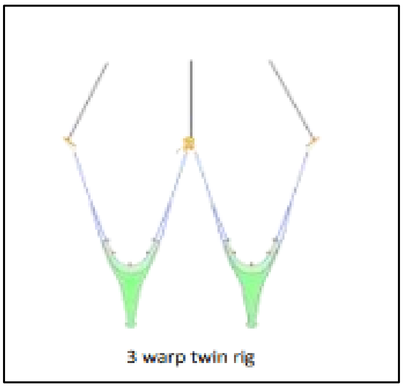

Figure 4. Set up of a twin rig trawl. (Source Seafish.org)

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, however, it is known that one vessel operates with a twin-rig trawl (Figure 4) and therefore it is be possible that other vessels also use this method of fishing.

5.2.4 Beam trawling

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

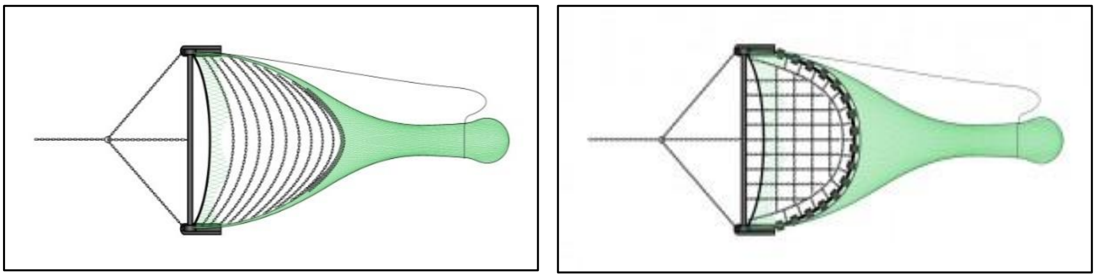

Figure 5. a) 'Open gear' beam trawl. b) 'Chain mat gear' beam trawl.

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).

5.2.5 Oyster dredge fishing

A type of mechanical dredge, known as a ladder dredge is used to fish for oysters in the Solent SACs and SPAs. A ladder dredge consists of a metal frame with parallel bars at the base of the dredge mouth which form a 'ladder', a set of skis at both ends of the dredge base and a posterior mesh chain-link bag used to collect oysters, which sit on the surface of the seabed (Figure 6). The skis allow the dredge to sit on the seabed whilst being towed. Unwanted debris and sediment pass through the mesh chain-link bag. A diving plate is fitted to the top of the dredge and helps to stabilise the dredge during deployment. The ladder, which reduces penetration into the sediment when compared with toothed dredges such those used for clam dredging in the Solent, can be up to 8.5 cm long, with parallel bars spaced approximately 4.5 cm apart. As stipulated by the 'Oyster Dredges' byelaw (see section 6.4), the width of a dredge cannot exceed 1.5 m in width.

One or two dredges are deployed side by side, depending on the size of the boat, from the stern. The dredge is typically deployed using a mechanized winch to lower the gear to the sea bed and lift it back onto the vessel. The dredge is attached to the vessel using a metal wire and is towed along the seabed in straight lines in the direction of the boat. Once back on deck, the dredge is emptied onto sorting table where the catch is sorted and sized.

Figure 6. Ladder style oyster dredge similar to those used within the Solent oyster fishery.

5.2.6 Scallop dredge fishing

Scallop dredges are rigid structures of the following design (see Figure 7). 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.

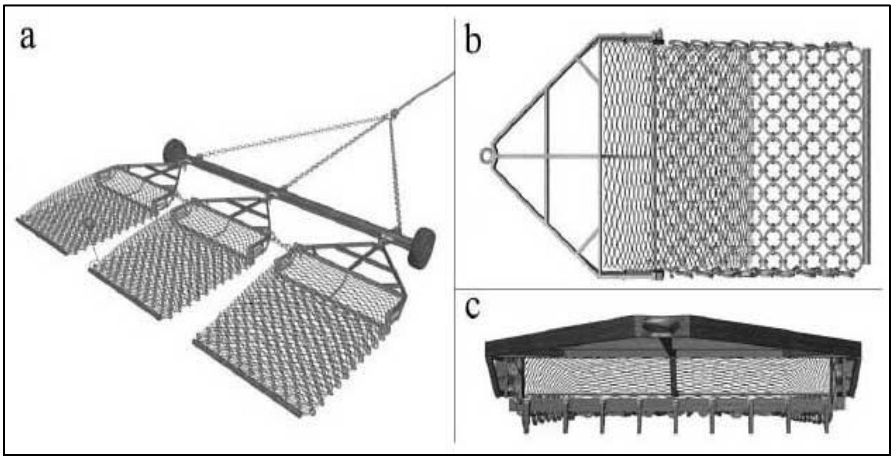

Figure 7. Typical scallop dredge set up used in the UK. (a) 3-dredge-a-side set up and spreading bar. (b) Chain mesh and collection bag (top side). (c) Spring-loaded toothed bar. Source: http://www.gov.scot/Publications/2012/10/7781/4

5.2.7 Location, Scale and Effort of fishing Activities

In 2016, Southern IFCA made a byelaw which prohibited the use of all bottom towed fishing gears in a number of prohibited areas throughout the district. These areas covered 'Red risk' habitats such as seagrass and rocky reef. Since then, bottom towed fishing gear activities have not been allowed in these sites and therefore have not occurred over the protected features. Figure 8 and Figure 9 show these prohibited areas throughout the Southern IFCA district alongside the European Marine Sites.

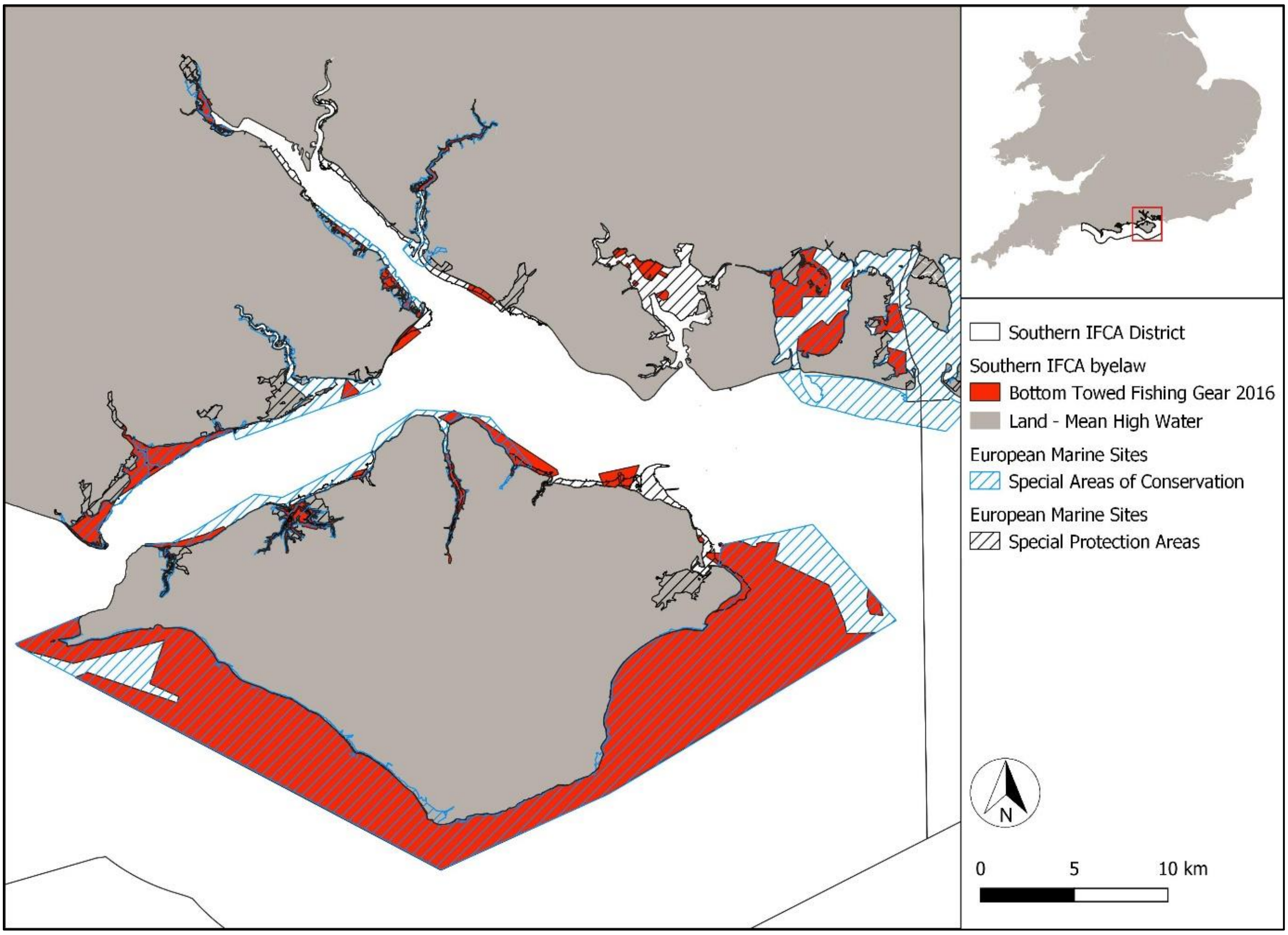

Figure 8. A map of European Marine Sites and Bottom Towed Fishing Gear Prohibited Areas in the east of the Southern IFCA district.

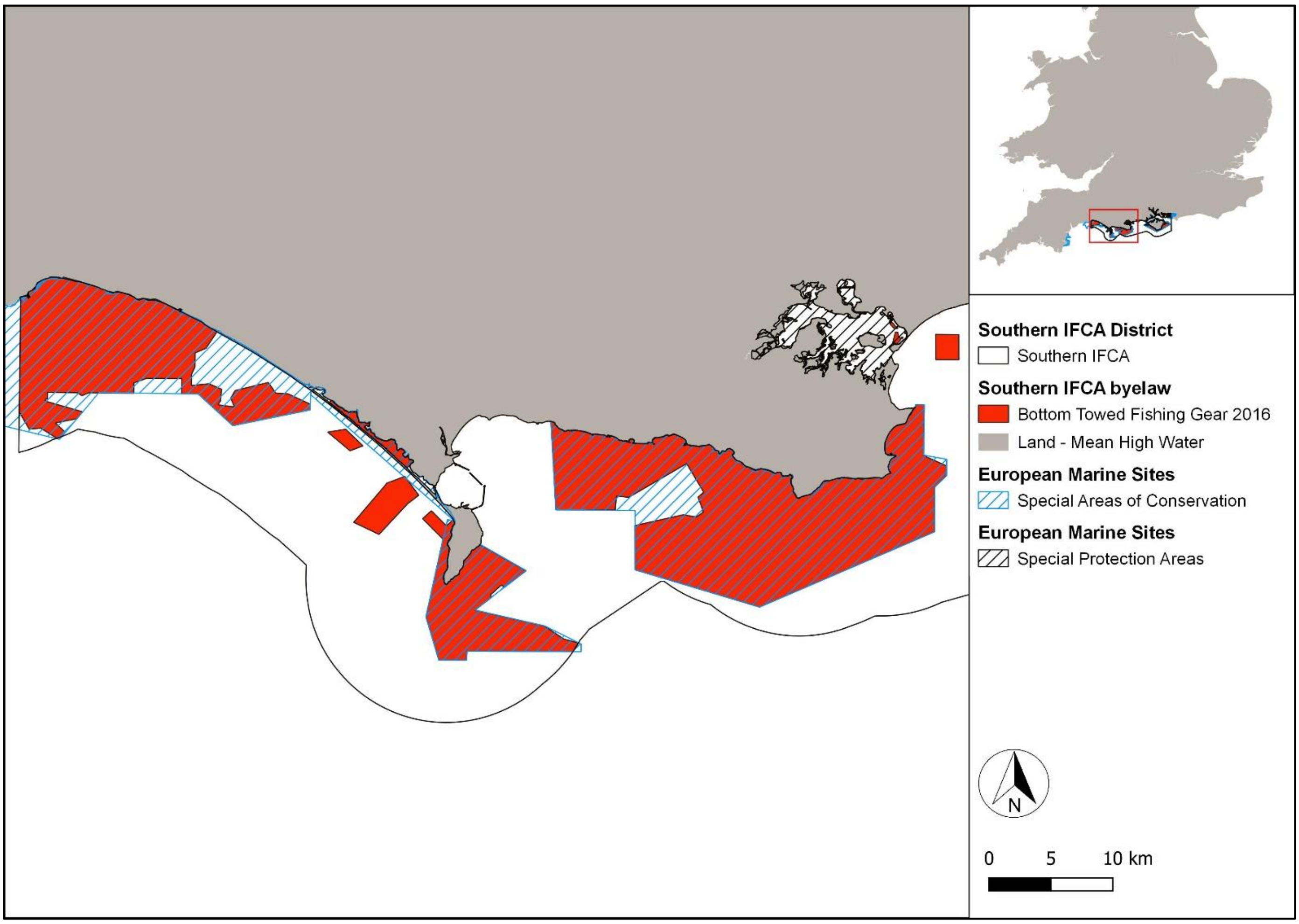

Figure 9. A map of European Marine Sites and Bottom Towed Fishing Gear Prohibited Areas in the west of the Southern IFCA district.

Outside of these prohibited areas bottom towed fishing gear continues. Sightings data collected by IFCOs whilst out on boat patrol gives an indication as to the location of these activities after the introduction of the BTFG byelaw. Bottom towed fishing gear is used throughout the district both all year around and seasonally, with the exception of oyster dredging which is currently prohibited in the Solent. These activities may occur just outside of the prohibited areas. Since 2016 new data on the extent of seagrass beds has been collected, and therefore these beds and parts of beds may not be protected from bottom towed fishing gear activity. Where these beds and parts of beds are found bottom towed fishing gear activity may occur. The ‘potential’ activity of all forms of bottom towed fishing gear in areas of seagrass not currently protected by the bottom towed fishing gear byelaw is the focus of this HRA.

6 Test of Likely Significant Effect (TSLE)

The Habitats Regulations assessment (HRA) is a step-wise process and is first subject to a coarse test of whether an activity will cause a likely significant effect on an EMS[10]. Each feature/sub-feature was subject to a TLSE, the results of which are summarised in Table 1.

1. Is the activity/activities directly connected with or necessary to the management of the site for nature conservation?				No – fishing activity is not necessary to the management of the site for nature conservation		
2. What potential pressures exerted by the gear type(s) are likely to affect the feature(s)/sub-feature(s)?	3. Is the feature(s)/sub-feature(s) likely to be exposed to the pressure (s) identified?					
	Advice on operations - trawling (Solent Maritime SAC)	Advice on Operations - Dredging (Solent Maritime SAC)	Further assessment?	Intertidal seagrass beds	Subtidal seagrass beds	Relevant Attributes
Abrasion/disturbance of the substrate on the surface of the seabed	S	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 spatial scale/intensity of the activity and location of the activity in relation to the feature.	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 spatial scale/intensity of the activity and location of the activity in relation to the feature.	Distribution: presence and spatial distribution of biological communities; Extent and distribution; Structure and Function: presence and abundance of key structural and influential species; Structure Biomass; Structure: sediment composition and distribution; Structure: species composition of component communities;

[10] Managing Natura 2000 sites: http://ec.europa.eu/environment/nature/natura2000/management/guidance_en.htm

Changes in suspended solids (water clarity)	S	S	Y	This gear type is known to cause the resuspension of finer sediments. Therefore, further assessment is required.	This gear type is known to cause the resuspension of finer sediments. Therefore, further assessment is required.	Supporting processes: turbidity, Supporting processes – light levels
Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion	S	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 spatial scale/intensity of the activity and location of the activity in relation to the feature.	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 spatial scale/intensity of the activity and location of the activity in relation to the feature.	Structure: rhizome structure and reproduction; Distribution: presence and spatial distribution of biological communities; Extent and distribution; Structure and Function: presence and abundance of key structural and influential species; Structure Biomass; Structure: sediment composition and distribution; Structure: species composition of component communities

Removal of non-target species	S	S	Y	Impacts on the feature and associated community may occur through the removal of the feature itself, larger epifaunal and potentially infaunal species, whilst smaller organisms are likely to pass through the gear. Abrasion, resulting from contact with the gear, however is likely to disturb smaller species. Further investigation is needed as to the magnitude of disturbance to associated communities/species and location of the activity in relation to the feature.	Impacts on the feature and associated community may occur through the removal of the feature itself, larger epifaunal and potentially infaunal species, whilst smaller organisms are likely to pass through the gear. Abrasion, resulting from contact with the gear, however is likely to disturb smaller species. 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; Structure and Function: presence and abundance of key structural and influential species; Structure: species composition of component communities;
Removal of target species		S	Y	Scallops and oysters are not usually found or targeted within seagrass beds. Clams however are likely to found in the soft sediments of seagrass beds. Further investigation is needed as to the magnitude of the effect of removal of clams to the feature.	Scallops and oysters are not usually found or targeted within seagrass beds. Clams however are likely to found in the soft sediments of seagrass beds. Further investigation is needed as to the magnitude of the effect of removal of clams to the feature.	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;
Smothering and siltation rate changes (Light)	S	S	Y	This gear type is known to cause the resuspension of finer sediments. Therefore, further assessment is required.	This gear type is known to cause the resuspension of finer sediments. Therefore, further assessment is required.	Supporting processes: sedimentation rate

Deoxygenation	NS	NS	N	The feature is not sensitive to the pressure.	The feature is not sensitive to the pressure.	N/A
Hydrocarbon & PAH contamination	NA	NA	N	The sensitivity of the feature to the pressure is not assessed. Low risk profile - see key.	The sensitivity of the feature to the pressure is not assessed. Low risk profile - see key.	N/A
Introduction of light	S	S	N	Trawling and dredging fishing activity do introduce light to the benthos. Low – Risk profile – see key.	Trawling and dredging fishing activity do introduce light to the benthos. Low – Risk profile – see key.	N/A
Introduction of microbial pathogens		S	N	The fleet only operate locally. Low risk profile – see key.	The fleet only operate locally. Low risk profile – see key.	N/A
Introduction or spread of invasive non-indigenous species (INIS)	S	S	N	The fleet only operate locally. Low risk profile – see key.	The fleet only operate locally. Low risk profile – see key.	N/A
Litter	NA	NA	N	Trawling and dredging fishing activity do not lead to litter in the marine environment. Low-risk profile – see key.	Trawling and dredging fishing activity do not lead to litter in the marine environment. Low-risk profile – see key.	N/A
Nutrient enrichment	S	S	N	The activity does not add nutrients to the habitat. Low risk profile – see key.	The activity does not add nutrients to the habitat. Low risk profile – see key.	N/A
Organic enrichment	S	S	N	This pressure is associated with sediment mobilisation which is relatively short lived and localised. Low risk Profile – see key.	This pressure is associated with sediment mobilisation which is relatively short lived and localised. Low risk Profile – see key.	N/A
Physical change (to another seabed type)						

Physical change (to another sediment type)	S	S	N	Any physical change to this habitat is a result of other pressures and as such will be assessed as part of other pressures (i.e. abrasion/penetration and/or disturbance of the substrate below the surface of the seabed). Low risk profile - see key.	Any physical change to this habitat is a result of other pressures and as such will be assessed as part of other pressures (i.e. abrasion/penetration and/or disturbance of the substrate below the surface of the seabed). Low risk profile - see key.	N/A
Synthetic compound contamination (incl. pesticides, antifoulants, pharmaceuticals)	NA	NA	N	The features sensitivity to the pressure has not been assessed. Low-risk profile – see key.	The features sensitivity to the pressure has not been assessed. Low-risk profile – see key.	N/A
Transition elements & organo-metal (e.g. TBT) contamination	NA	NA	N	The features sensitivity to the pressure has not been assessed. Low-risk profile – see key.	The features sensitivity to the pressure has not been assessed. Low-risk profile – see key.	N/A
Underwater noise changes						
Visual disturbance						

7 Appropriate Assessment

7.1 Co-location of fishing activity and site features/sub-features

Maps of bottom towed fishing gear activity and site features/supporting habitats can be found in Annex 2. In general bottom towed fishing gears are not currently used within or in close proximity to seagrass beds, partly due to the unsuitability of the substrate for fishing but also due to the fact that over the past 5 years great awareness of the sensitivity of these habitats to bottom towed fishing gears has occurred within the fishing communities.

7.2 Potential impacts

7.2.1 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.

Very little research has been carried out on the impacts of dredge fishing and trawling over seagrass beds, particularly over the last decade.

Moore and Jennings (2000) suggest that fishing with mobile gear has major direct and indirect impacts on seagrass beds. The substrate holding the seagrass beds may be lost or destabilised, seagrass is uprooted and damaged (Tudela, 2004) and re-suspension of sediment reduces light intensity required for photosynthesis (Ardizzone *et al*., 2000).

Numerous studies have shown (Peterson et al 1987, Fonseca et al 1984, Neckles *et al*. 2005 and De Jonge and de Jong 1992) that shellfish dredging immediately reduce shoot density and biomass of seagrass, whilst also increasing the turbidity of the water column (Bishop *et al*., 2005) which in turn has indirect consequences for species assemblages.

In 1984, Fonseca *et al.* found that scallop dredging over eelgrass in North Carolina led to significant reductions in eelgrass biomass and shoot number. The effects were seen on eelgrass found in both hard and soft substrates (Fonseca *et al.,* 1984). Similarly, along the Mediterranean coast, *Posidonia oceanica* meadows have seen significant declines in density after trawling activity (Sánchez-Jerez & Esplá, 1996).

Further research on *Z. marina* found that other activities including hydraulic dredging for clams, dragging for *Mytilus edulis* and illegal trawling had significant impacts on the seagrass beds (Orth *et al.,* 2002; Neckles *et al.,* 2005). Large areas of 'scaring' within seagrass beds were found of Florida's coast caused by dredging for clams (Orth *et al.,* 2002). In Maine, eelgrass shoot density was reduced to as little as 3%, with total biomass below 1% after mussel dredging activity (Neckles *et al.,* 2005). Illegal trawling activity in Spain led to complete absence of seagrass beds (Rueda *et al.,* 2009).

In many countries hand held bottom towed fishing gears are used on intertidal sediment to collect bivalves and bait. Studies from the effects of these can be used to infer potential damage which could occur to intertidal seagrass beds from bottom towed fishing gears. Clam kicking (propeller modified to push the wash towards the boat which suspends sediment and clams, which are collected in a trawl towed behind) and clam raking at low intensities in North Carolina were found to decrease seagrass biomass by 25% (Peterson *et al.,* 1987). However, at high intensities clam kicking led to a 65% decrease in seagrass biomass (Peterson *et al.,* 1987). Conflictingly, Boese (2002) found that two weeks after clam raking in Z. marina beds in Oregon no significant effect of treatment was found despite leaf and rhizome material visibly removed during the experiment.

Sediment character

Bottom towed fishing gear activities can also change the sediment character of the benthos. Rueda *et al*. (2009) found that trawling led to an increase in the organic and mud content of the benthos where seagrass was previously found.

Towed demersal fishing gear has been shown to alter sedimentary characteristics and structure, particularly in subtidal muddy sand and mud habitats, as a result of penetration into the sediment (Jones, 1992; Gubbay & Knapman, 1999; Ball *et al*. 2000; Roberts *et al*. 2010). Surface organic material can be mixed into subsurface layers, changing the vertical distribution of sediment layers (Mayer *et al*., 1991; Jones, 1992). Sediment structure may change through the resuspension of sediment, nutrients and contaminants and relocation of stones and boulders (ICES, 1992; Gubbay & Knapman, 1999). Trawling can increase the fraction of fine sediment on superficial layers of the seabed (Queirós *et al*. 2006). As fine material is suspended, it can be washed away from the surface layers (Gubbay & Knapman, 1999). Trimmer *et al*. (2005) reported significant correlations between fishing intensity and sediment silt content (Queirós *et al*. 2006). It is thought that continual sediment resuspension, as a result of trawling, can lead to the accumulation of fine sediments in the superficial layers of sediment in areas that are trawled if there is an absence of significant advective transport (Jennings & Kaiser, 1998; Trimmer *et al*. 2005). Changes in sediment structure from coarse-grained sand or gravel to fine sand and coarse silt has been reported to occur within beam trawl tracks (Leth & Kuijpers, 1996).

Johnson *et al*. (2002) found a number of studies on the effects of otter trawling in gravel and variable habitats and these revealed trawling physically removed fine sediments and biogenic structures through the removal of structure-forming epifauna, moved or overturned stones and boulders, smoothed the seafloor and exposed sediment/shell fragments (Bridger, 1972; Auster *et al*., 1996; Collie *et al*., 1997; Engel & Kvitek, 1998; Freese *et al*., 1999; Johnson *et al*., 2002; Sewell and Hiscock, 2005).

In Estero Bay of the Californian coast, grain size analyses were used to detect any changes in sediment grain size as a result of experimental trawling using a small footrope otter trawl (61 ft head rope, 60 ft ground rope, 8 inch and 4 inch discs, 3.5 ft x 4.5 700 lbs ft trawl doors) (Lindholm *et al*., 2013). The study plots were located at a depth of 160-170 m and sediment analyses revealed the nature of the sediment to be coarse silt/fine sand (Lindholm *et al*. 2013). Post-trawl samples displayed the same grain size distribution as pre-trawl samples, albeit with a slight increase in silt content and 2% decrease in the fine sand fraction (Lindholm *et al*. 2013). Despite these differences, average mean grain size per plot indicated no visible differences between pre- and post- trawl samples and no quantifiable significant sedimentary differences were observed between trawled and control pots or between sample periods (Lindholm *et al*. 2013). These results are supported by a number of other studies including Tuck *et al*. (1998) and Schwinghamer *et al*. (1998), both of which reported no significant differences in sediment grain size in relation to trawling disturbance. Tuck *et al*. (1998) investigated the physical effects of trawling disturbance on a sheltered sealoch in Scotland at 35-40 m depth in an area characterised by 95% silt and clay using modified rockhopper ground gear without a net. Unfortunately, further details on the gear are not available. Schwinghamer *et al*. (1998) examined physical impacts of experimental otter trawling in the Grand Banks in an area of sandy habitat at 120-146 m depth using an Engel 145 otter trawl with 1250 kg oval otter boards and 46 cm rock hopper gear. Despite reporting no change in sediment grain size, acoustic data did reveal that trawling changed small-scale biogenic sediment structures (such as tubes and burrows) down to 4.5 cm (Schwinghamer *et al*. 1998), indicating a reduction in habitat complexity (Løkkeborg, 2005).

Experimental clam dredging activity in Langstone Harbour, using a modified oyster dredge, led to the removal of the coarse fraction of the sediment and larger sand and fine sediment fraction, with minor differences in the silt component (EMU, 1992). The sediment type for this area was muddy gravel (EMU, 1992). In contrast, a study assessing the impacts of suction dredging for common cockle in the Dutch Wadden Sea, revealed a loss of fine silts and subsequent increase in median grain size from 166.2 μm in 1988 to 179.1 μm in 1994 (Piersma *et al*., 2001). The sediment type in the study was sand. In addition, it was speculated that the loss of adult shellfish stocks as a result of suction dredging, may have also resulted in a reduction in the production of faeces and pseudofaeces which contribute to the silt component of the sediment (Piersma *et al*., 2001). The resuspension and dispersal of fine particles can lead to long term effects on particular sieve fraction (Pranovi & Giovanardi, 1994); potentially decreasing the clay portion of the sediment (Maier *et al*., 1998). Other changes in sediment character may also include a lack of consolidation of sediments (Aspden *et al*., 2004), the removal of stones and the removal of taxa that produce structure (i.e. tube-dwelling and burrowing organisms) (Johnson, 2002; Mercaldo-Allen & Goldberg, 2011). Such physical alterations can cause a reduction in sediment heterogeneity and structure available to biota as habitat (Johnson, 2002). In soft sediments, impacts on benthic fauna are likely to change sediment characteristics and vice versa (Piersma *et al*., 2001).

Recovery

Seagrass beds impacted by bottom towed gears can take years to recover from the effects. Orth *et al.* (2002) found that clam dredging scars in *P. oceanica* took more than three years to return to undisturbed levels. Whilst in *Z. marina* beds in Maine, recovery of beds from mussel dragging was found to be highly dependent on dragging intensity (Neckles *et al.,* 2005). Where dragging had been less intense and patches of seagrass were present recovery took as little as a year. However, where intensive dragging had cleared all seagrass Neckles *et al.* (2005) projected that it would require a mean of 10.6 years for recovery of eelgrass shoot density (based on a lateral patch expansion rate of 12.5cm per year).

7.2.2 Smothering and siltation rate changes; Changes in suspended solids

Smothering effects

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).

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 modelled 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).

Resultant sediment plumes and areas of elevated turbidity can extend up to 30 metres beyond the dredge zone (Manning, 1957; Haven, 1979; Manzi *et al*., 1985; Maier *et al*., 1998), potentially transporting and redistributing sediment into adjacent areas (Vining, 1978). In most cases however, the amount of suspended sediment rapidly returns to low levels with distance from the dredge activity (Kyte *et al*., 1976; Maier *et al*., 1998) with 98% resettling within 15 m (Mercaldo-Allen & Goldberg, 2011). Effects of sediment plumes and enhanced turbidity levels appear to be temporary, with the majority of sediment plumes disappearing within hours of dredging (Maier *et al*., 1998). Dispersed sediments may take 30 minutes to 24 hours to resettle (Lambert & Goudreau 1996; Northeast Region EFHSC 200). Shallow water environments with high silt and clay content are likely to experience larger plumes and greater turbidity (Ruffin 1995; Tarnowski 2006).

In the context of natural disturbance, the resuspension of sediment caused by clam dredging in comparison to long-term wind-induced suspension of sediments, may be relatively minor (Auster & Langton 1999).

Natural levels of turbidity, generated as a result of winds and tides, can produce particle loads equal to or exceeding that of dredging disturbance (Tarnowski, 2006). Organisms inhabiting inshore environments are therefore adapted to tolerate the resuspension of sediment at a certain level (Tarnowski, 2006). In addition, shellfish dredging only occurs in discrete areas, so the effects caused by resuspension will occur on a much smaller scale than those caused by natural disturbance (Wilber & Clarke, 2001).

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 shell or cultch material is buried (Tarnowski, 2006). *Zostera nolti* seagrass beds experience 50% shoot mortality when buried in just 2cm of sediment, and 100% in 8cm (Cabaco et al., 2008). 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).

Studies conducted in England and Florida found that the redistribution of sediments caused through dredging activity did not result in the smothering of benthic organisms within the nearby area and impacts were found to be limited to the directly disturbed area of the dredge (Schroeder, 1924; Spencer *et al*., 1998). Estuarine ecosystems, where dredging typically takes place, are high variable environments with elevated and variable suspended sediment loads and the organisms living there are often well adapted to such conditions (Coen, 1995). Such organisms are therefore generally considered tolerant to short-term perturbations in sediment loads (Lutz, 1938; Kyte *et al*., 1975). Laboratory experiments have shown that the majority of estuarine infaunal species are able to survive burial depths of up to 20 cm or more (Coen, 1995). In contrast, epifaunal and non-motile species can suffer high mortality rates after burial (Coen, 1995).

7.2.3 Removal of non-target species / Removal of target species

Studies into the impacts of bottom towed fishing gears have focused on the physical effects to seagrass themselves. Rueda *et al.,* (2009) found that the density and richness of Mollusca species decreased significantly after eelgrass loss – particularly those gastropods usually associated with leaf/sediment substratum.

However, we can infer the impacts from research which has studied the effects of these methods in other benthic sediments. Bottom towed fishing gear can result in the mortality of non-target species through direct physical damage inflicted by the passage of the trawl or indirectly through damage, exposure and subsequent predation (Roberts *et al*. 2010). This can lead to long-term changes in the benthic community structure (Jones, 1992), including decreases in biomass, species richness, production, diversity, evenness (as a result of increased dominance) and alterations to species composition and community structure (Tuck *et al*., 1998; Roberts *et al*. 2010). Disturbance from repeated trawling selects for more tolerant species, with communities becoming dominated by smaller-bodied infaunal species with fast life histories, juvenile stages, mobile species and rapid colonists (Engel & Kvitek, 1998; Gubbay & Knapman, 1999; Kaiser *et al*. 2000; Jennings *et al*. 2001; Kaiser *et al*. 2002). In addition, larger individuals may become depleted more than smaller individuals (Jennings *et al*. 2002).

The impacts of fishing activities on benthic communities varies with gear type, habitat and between taxa (Collie *et al*. 2000; Thrush & Dayton, 2002; Kaiser *et al*. 2006). Reported effects are habitat-specific (Roberts *et al*. 2010). A meta-analysis conducted by Kaiser *et al*. (2006) revealed that soft-sediment, especially muddy sands were vulnerable to fishing impacts, with otter trawling and beam trawling all producing a significant immediate impact on this habitat. A number of studies found no detectable impacts, specifically in relation to different forms of trawling in sand habitats (Van Dolah *et al*., 1991; Kaiser & Spencer, 1996; Kenchington *et* *al*., 2001; Roberts *et al*., 2010), although this is not true in all cases. Such habitats are likely to be pre-adapted to higher levels of natural disturbance and are characterised by relatively resistant fauna (Kaiser *et al*. 2006).

Scallop Dredging

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). On mixed-substrate, sites which are not scallop dredged have been found to have significantly higher faunal turf coverage (Boulcott et al., 2014).

The level of the effect is varied depending on the gear type used (Hinz et al., 2009). When the effects of an otter trawl (with rock hopper ground rope), traditional scallop dredges (0.76m wide with 17 x 6cm teeth), and new scallop dredges (1.95m wide with rubber lip instead of teeth) were compared bycatch was found to be significantly higher in the two dredges. Epifauna biomass was only significantly reduced after dredging using the new scallop dredges. However, changes in abundance and biomass of scavengers and vulnerable species between treatments showed no significant differences. Similarly, infauna biomass showed only significant differences after impact for the new dredge type.

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 reserves 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.

Trawling

A number of studies have identified common trends for certain species in response to trawling disturbance. The gastropod *Buccinum undatum* is shown to decline in areas of trawling disturbance (Tuck *et al*., 1998; Kaiser *et al*., 2000), with one study stating the effects of trawling persisted for 6 months into the recovery period (Tuck *et al*., 1998). Similarly, *Echinocarodium cordatum* has been identified as fragile and highly vulnerable to trawling disturbance (Bergman & Hup, 1992; Bergman & van Santbrink, 2000), showing declines of 40 to 60% in density in one study (Bergman & Hup, 1992). Similar reductions were shown by the polychaete *Lanice conchilega* (Bergman & Hup, 1992), a species of polychaete which is incapable of movement in response to disturbance and therefore take a significant period of time to recolonise disturbed habitats (Goss-Custard, 1977). Other species that have been reported to exhibit adverse effects when in an area subject to trawling include the polychaete species *Nephtys* (Kaiser *et al*., 1998; Tuck *et al*., 1998) and *Magelona* (Bergman & Hup, 1992; Kaiser *et al*., 2000) and the emergent soft coral *Alcyonium digitatum* (Kaiser *et al*., 1998; 2000; Depestele *et al*., 2012). By contrast, the brittle star, *Ophiura* sp., has been reported to increase or remain constant in response to trawling disturbance (Tuck *et al*., 1998; Gubbay & Knapman, 1999; Kaiser *et al*., 2000; Callaway *et al*., 2007).

The relative impact of bottom towed fishing gear on benthic organisms is species-specific and largely related to their biological characteristics and physical habitat. The vulnerability of an organism is ultimately related to whether or not it is infaunal or epifaunal, mobile or sessile and soft-bodied or hard-shelled (Mercaldo-Allen & Goldberg, 2011). Fragile fauna (i.e. bivalves and sea cucumbers) have been shown to be particularly vulnerable to trawling damage and disturbance and sedentary and slowing moving species can be significantly lower (Kaiser & Spencer, 1996; Gubbay & Knapman, 1999). Motile groups and infaunal bivalves have shown mixed responses to trawling disturbance, with life history considerations such as habitats requirements and feeding modes likely to play a key role in determining a species response (McConnaughey *et al*., 2000; Johnson *et al*., 2002). In a meta-analysis of experimental fishing impact studies, conducted by Kaiser *et al*. (2006), otter trawling was found to have the greatest impact on suspension feeders in mud habitats, perhaps reflecting the depth of penetration from the otter doors, whilst the response of suspension feeders and deposit feeders to beam trawling was highly variable. The most negative effect on deposit feeders was found in gravel habitats and the most negative effect on suspension feeders was found in sand habitats (Kaiser *et al*., 2006). Suspension feeding bivalves, such as *Corbula gibba*, are largely unable to escape burial of more than 5 cm (Maurer *et al*., 1982) and are also sensitive to high sedimentation rates that may occur following intensive trawling (Howell & Shelton, 1970; Tuck *et al*., 1998). Having said this, larger-sized individuals have been shown to be more resistant to trawling disturbance as they are relatively robust (Bergman & van Santbrink, 2000).

Studies have revealed mixed effects on epifauna (organisms that inhabit the seabed surface). Jennings *et al*., (2001) found that chronic trawling disturbance had no significant effect on epifauna in the North Sea. Similarly, no long-term effects on the number of epifaunal species or individuals were detected by Tuck *et al*. (1998), although a number of species-specific changes in density did occur (increase in *Ophiura* sp. and decreases in *Hippoglossoides platessoides*, *Metridium senile* and *Buccinum undatum*). The lack of long-term effects detected by Tuck *et al*. (1998) is likely to be compounded by the fact that beam trawl gear used was not equipped with a net, as greater effects on epifauna may be expected. The removal of 7 tonnes of epifaunal was reported by Pitcher *et al*. (2000) during experimental trawling, however no significant changes in the density of epifauna were reported (Thrush & Dayton, 2002). Kenchington *et al*. (2001) investigated the impacts of otter trawling on benthic communities on a sandy bottom in Grand Banks, Newfoundland over a three-year period. Changes in the benthic community were sampled using an epibenthic sledge. The sled is largely used to sample epifauna and some infauna as the sled penetrates to a depth of 2 to 3 cm. Samples collected using the benthic sled revealed a 24% reduction in average biomass in trawled corridors compared to reference corridors. Hinz *et al*. (2009) investigated the biological consequences of long-term chronic disturbance caused by the otter trawl *Nephrops norvegicus* (Norway lobster) fishery along a gradient of fishing intensity over a muddy fishing ground in the north-eastern Irish Sea. The study reported reductions in epifaunal abundance of 81% from the lowest trawling effort recorded (1.3 times trawled/year) to the highest (18.2 times trawled/year). Over the same range of trawl intensities, epifaunal species richness decreased by 18%, while no effect was evident for epibenthic biomass.

7.2.4 Sensitivity analyses

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).

Tilin *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 (Tilin *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 (Tilin *et al*., 2010). In the context of this assessment, the relevant pressures likely to be exerted are penetration and abrasion of the seabed and removal of non-target species. Sensitivity of subtidal sediment types to these pressures vary from not sensitive to high, generally with low confidence in these assessments (Table 7). Subtidal mixed sediments appear to be sensitive overall, followed by subtidal mud, whilst subtidal coarse sediment and sand appears to has relatively low sensitivity overall.

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 activities chosen were 'beam trawl & scallop dredges' and 'demersal trawls' as these encompassed the fishing activities under consideration. Generally, stable habitat types exhibit high sensitivity to heavy gear intensities for beam trawls and scallop dredges and demersal trawls (Table 8). A large number of habitat types exhibit medium sensitivity to moderate gear intensities, except for beam trawls and scallop dredges in subtidal muddy sand and stable rich mixed sediments. All habitat types, except stable rich mixed sediments, exhibit low sensitivity to light fishing intensity and all habitat types exhibit low sensitivity to a single pass (Table 8). Generally, sensitivity across all habitat types is lower for light demersal trawls and seines, as would be expected (Table 8).

Table 1. Sensitivity of SAC features to pressures identified by Tillin et al. (2010). Confidence of sensitivity assessment is included in brackets.

	Pressure					
Feature	Penetration and/or disturbance of the substrate below the surface of the seabed – structural damage to seabed >25mm	Shallow abrasion/penetration – damage to seabed surface and penetration <25mm	Surface abrasion: damage to seabed surface features	Removal of non-target species	Removal of target species	Siltation rate changes (low)
Seagrass Beds	High (low)	High (High)	Low (Low)	High (high)	Not Sensitive (high)	High (medium)

Table 2. Sensitivity of SAC features to different intensities (high, medium, low, single pass) of oyster/mussel dredging as identified by Hall et al. (2008).

Gear Type	**Habitat Type**	**Gear Intensity***			
		Heavy	Moderate	Light	Single pass
Beam trawls & scallop dredges	**Seagrass beds**	High	High	High	High
Demersal trawls	**Seagrass beds**	High	High	High	High
Light demersal trawls and seines	**Seagrass beds**	High	High	High	High
*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					

7.2.5 Recovery

Seagrass beds impacted by bottom towed gears can take years to recover from the effects. Orth *et al.* (2002) found that clam dredging scars in *P. oceanica* took more than three years to return to undisturbed levels. Whilst in *Z. marina* beds in Maine, recovery of beds from mussel dragging was found to be highly dependent on dragging intensity (Neckles *et al.,* 2005). Where dragging had been less intense and patches of seagrass were present recovery took as little as a year. However, where intensive dragging had cleared all seagrass Neckles *et al.* (2005) projected that it would require a mean of 10.6 years for recovery of eelgrass shoot density (based on a lateral patch expansion rate of 12.5cm per year).

The recovery of seagrass beds is highly variable and are dependent on the extent of removal. Rates may be slow where adjacent seed sources and viable grass beds are present, but can take between 60 and 100 years where the removal of rhizomes has occurred (Gonzalez-Correa *et al*., 2004; Moore and Jennings, 2000).

7.3 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:

- **Solent Dredge Fishing Byelaw 2016 –** dredge fishing is prohibited between 17.00 and 07.00 any day and throughout 1st March and 31st October.
- **The Solent European Marine Site (Prohibition of Method of Dredging) Order 2004** prohibits any fishing boat from deploying or carrying a dredge (unless inboard, secured and stowed) in any part of the Solent European Marine Site. Within the order 'dredge' refers to any form of shellfish dredge used in conjunction with any means of injecting water into the dredge or into the vicinity of the dredge. The reason the order was originally created was to protect seagrass but also restricts this type of shellfish dredging over other protected habitats within the EMS, including intertidal areas.
- **Fishing for Oysters, Mussels and Clam** byelaw states that when fishing for these species only the following methods are used; a) hand picking and b) dredging using a dredge with a rigid framed mouth so designed to take shellfish only when towed along the sea bed.
- **Oysters, Clams, Mussels – Prohibition on Night Fishing** byelaw – No person shall dredge or fish or take any before 8.00 am or after 4.00 pm, although this byelaw does not apply to the taking of clams and mussels during any close season for oysters. This byelaw does also not apply to the dredging or fishing or taking of clams in Southampton Water North of the line joining the Northern ends of the Hamble and Fawley Oil Terminal Jetties
- **Oyster Dredge** byelaw – in dredging or fishing for oysters is any fishery no dredge shall be used which has a front edge or blade exceeding 1.5 metres in length and if two or more dredges are in dredging or fishing for oysters used at the same time or in from the same boat or vessel the total length of the front edges or blades of such dredges when added together shall not exceed 3.0 metres.
- **Oysters** byelaw – no person shall remove from a public or regulated fishery any oyster (other than Portuguese or Pacific oysters) which will pass through a circular ring of 70 mm in internal diameter.
- **Oyster Close Season** prohibits any person from dredging or fishing for in or taking any fishery oysters during the period from the 1st day of March to the 31st of October in any year.
- **Temporary Closure of Shellfish Beds** byelaw allows the authority to temporarily close any bed or part of a bed of shellfish where it is the opinion of the Committee that it is severely depleted and as such required temporary closure in order to ensure recovery, or any bed or part of bed containing mainly immature or undersized shellfish which is in the interest of protection and development of the fishery, or any bed of transplanted shellfish that ought to not be fished until it becomes established. In the context of this byelaw, 'shellfish' refers to mussels, oysters and clams. Currently this byelaw has been used to close the Solent Oyster fishery for the 2019 & 2020 season based on results of the survey of Solent Oyster Beds.
- 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** Southern Sea Fisheries District Committee legacy byelaw states the maximum number of dredges which can be towed at any time is twelve, provides details of dredge configuration and that no person shall fish for or take any scallop from any fishery on any day before 0700 and after 1900 local time

- The **Cockles** byelaw states that no person shall fish for or take from a fishery any cockle between 1st day of February and 30th of April and when the cockle bed is covered by water only a dredge less than 460 mm in width can be used. In addition, no person shall remove a cockle that is able to pass through a gauge with a square opening measuring 23.8 mm along each side.
- **American Hard-Shelled Clams – Minimum Size** byelaw – no person shall remove from a fishery any clams of the species *Mercenaria mercenaria* which measures less than 63 mm across the longest part of the shell.
- European minimum size, listed under Council Regulation (EEC) 850/98, Statutory Instruments specify the minimum size for Manila clams (*Ruditapes philippinarum*) is 3.5 cm and for Grooved Carpet Shell clams (*Ruditapes decussatus*) is 4.0 cm

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 Council Regulation (EEC) 850/98 specify the minimum size for plaice is 27 cm and for bass is 42 cm

7.4 Table 3 Summary of Impacts

Feature(s)/ Supporting habitat(s)	Attribute	Target (taken from the Solent Maritime SAC)	Potential Pressure(s) and Associated Impacts	Nature and Likelihood of Impacts	Current mitigation measures
Intertidal and subtidal seagrass beds	Distribution: presence and spatial distribution of biological communities;	Restore the presence and spatial distribution of seagrass bed communities.	Bottom towed fishing gear activity is known to cause abrasion, penetration and disturbance to the seabed surface and removal of target and non-target species. Dredging, trawling and dragging have all been shown to significantly effect seagrass beds. These activities can immediately significantly reduce the shoot number and biomass on both hard and soft substrates. Few studies have assessed the impacts of these activity on seagrass biological communities. However, one such study indicated that Mollusca numbers and richness decreased significantly after illegal trawling. Bottom towed gear can lead to the removal, damage or mortality of non-target & target species particularly epifaunal species, reduction in structural complexity and reduction in biodiversity and composition of benthic assemblages. The recovery of seagrass habitats after disturbance by bottom towed fishing gear activity has been found to take between 1 and 3+ years. Projections of recovery where all seagrass and rhizomes have been removed have been 10 to 100 years.	Shellfish dredging and demersal trawling is known to occur throughout the Southern IFCA district both within and outside of designated sites. Sightings data indicates that activity is focused in the Solent and Poole Harbour. The majority of seagrass habitats in the district have been protected by the Bottom Towed Fishing Gear Byelaw 2016 which prohibits all BTFG activities over sensitive features such as seagrass. Therefore, these activities do not usually overlap with seagrass habitats however new and updated data has been created since the byelaw was made and therefore there may be areas where the feature is not protected and fishing activities have the potential to occur. Seagrass beds provide nursery habitat for a range of fish species as well as food for a number of waterfowl bird species. Many other animals live on, within or in the sediments of seagrass beds including seahorses, anemones, crabs, worms, bivalves, and molluscs.	**Bottom Towed Fishing Gear** byelaw 2016 – prohibits bottom towed fishing gear over sensitive features including seagrass within the District, closing most of these habitats to these activities
	Structure and Function: presence and abundance of key structural and influential species;	Maintain or Recover or Restore the abundance of listed species, to enable each of them to be a viable component of the habitat.			
	Structure: species composition of component communities,	Maintain the species composition of component communities			

				Scientific literature has indicated that dredging and trawling within seagrass beds can lead to the immediate removal of the substrate and designated feature. Recovery from such impact can vary greatly but is likely to be between 1 and 10+ years. Hall et al., 2008 assessed the sensitivity of seagrass bed to all bottom towed fishing gear types at all fishing intensity levels to be high. At the present time BTFG activities are unlikely to occur in seagrass habitats however where new beds have been found or beds extended there is the possibility this could occur. The habitats 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 the instant removal of the feature. Therefore, it is believed that bottom towed fishing gears will pose a significant risk to intertidal and subtidal seagrass features within the district's EMSs.	
	Structure: rhizome structure and reproduction;	Restore the extent and structure of the rhizome mats across the site, and conditions to allow for regeneration of seagrass beds	Addressed Above	Addressed Above	Addressed Above

	Structure Biomass;	Restore the leaf/shoot density, length, percentage cover, and rhizome mat across the feature at natural levels (as far as possible), to ensure a healthy resilient habitat.			
	Extent and distribution;	Restore the total extent and spatial distribution of seagrass beds.			
	Structure: sediment composition and distribution;	Maintain the distribution of sediment composition types across the sub-feature	Bottom towed fishing gear activity is known to cause abrasion, penetration and disturbance to the seabed surface, changes in suspended solids (water clarity) and smothering and siltation rate changes. Very few studies have focused on the effect of BTFGs to sediment character, turbidity and light levels. One such study found that trawling in seagrass beds significantly increased the carbon and mud content of the sediments. In sediment not containing seagrass BTFGs have been found to lead to the resuspension of sediment which 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.	Shellfish dredging and demersal trawling is known to occur throughout the Southern IFCA district both within and outside of designated sites. Sightings data indicates that activity is focused in the Solent and Poole Harbour. The majority of seagrass habitats in the district have been protected by the Bottom Towed Fishing Gear Byelaw 2016 which prohibits all BTFG activities over sensitive features such as seagrass. Therefore, these activities do not usually overlap with seagrass habitats however new and updated data has been created since the byelaw was made and therefore there may be areas where the feature is not protected and fishing activities have the potential to occur.	Addressed Above
	Supporting processes: water quality – turbidity	Maintain natural levels of turbidity (e.g. concentrations of suspended sediment, plankton and other material) across the habitat.			
	Supporting Processes – light levels	Maintain the natural light availability to the seagrass beds			
	Supporting processes:	Maintain the natural rate of			

	sedimentation rate,	sediment deposition		Seagrass beds provide nursery habitat for a range of fish species as well as food for a number of waterfowl bird species. Many other animals live on, within or in the sediments of seagrass beds including seahorses, anemones, crabs, worms, bivalves, and molluscs. Research has found that high levels of sediment and regular exposure can cause severe impacts. Increased turbidity can inhibit respiratory and feeding functions of benthic organisms, and cause hypoxia or anoxia. Small organisms and immobile species are particularly vulnerable to smothering. The severity of the impact is determined by sediment type, the level of sediment burden and the sensitivity of organisms which is largely related to their biology (i.e. size, relationship to substrate, life history, mobility). Hall et al., 2008 assessed the sensitivity of seagrass bed to all bottom towed fishing gear types at all fishing intensity levels to be high. Tillin et al. (2010) assessed the sensitivity of these habitats to changes in siltation and found seagrass beds to have a high sensitivity. At the present time BTFG activities are unlikely to occur in seagrass habitats	

				however where new beds have been found or beds extended there is the possibility this could occur. The habitats are highly sensitive to these types of fishing gear and changes in siltation rates and have a long recovery period. If fishing were to occur in close proximity to the habitats it could lead to the smothering of the feature. Therefore, it is believed that bottom towed fishing gears will pose a significant risk to intertidal and subtidal seagrass features within the district's EMSs.	

8 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; seagrass beds feature from the effects of all forms of bottom towed fishing gears. This is due to the result of this habitats regulations assessment which has found that bottom towed fishing gears are likely to pose a significant risk to the seagrass features of the districts EMSs.

Based on the findings of the assessment, the Authority is therefore required to develop management that will provide protection to the seagrass features within the site from the relevant fishing gears. Spatial closures, based on the most up to date data for the location of seagrass features, will be introduced and incorporated into appropriate management following best practice[11]. 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 Conservation of Habitats and Species Regulations 2017.

9 Conclusion

In order to conclude whether bottom towed fishing gears has an adverse effect on the integrity of the Southern IFCA districts EMSs seagrass beds, it is necessary to assess whether the impacts of this activity will hinder the site's conservation objectives, namely:

ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the Favourable Conservation Status of its qualifying features, by maintaining or restoring:

- The extent and distribution of qualifying natural habitats and habitats of the qualifying species
- The structure and function (including typical species) of qualifying natural habitats
- The structure and function of the habitats of the qualifying species
- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
- The populations of each of the qualifying species
- The distribution of qualifying species within the site

OR

ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the aims of the Wild Birds Directive, by maintain or restoring:

- The extent and distribution of the habitats of the qualifying features
- The structure and function of the habitats of the qualifying features
- The supporting processes on which the habitats of the qualifying features rely
- The populations of each of the qualifying features
- The distribution of qualifying features within the site

The review of research into the impacts of bottom towed fishing gear (detailed in Section 5.2) identified that the activities have the potential to cause significant physical and biological disturbance. Physical disturbance can occur through the complete removal of the seagrass bed feature through abrasion and penetration of the gear. Biological disturbance can occur through burial, smothering and disturbance of the sediment and

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

changes to the sediment character. It is therefore recognised that these activities have the potential to lead to an adverse effect upon the following feature attributes:

- 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: rhizome structure and reproduction;
- Structure Biomass;
- Extent and distribution;
- Structure: sediment composition and distribution;
- Supporting processes: water quality – turbidity;
- Supporting Processes – light levels;
- Supporting processes: sedimentation rate.

The likelihood and magnitude of adverse effects upon these attributes will be determined by the following variables:

i) Number of vessels participating
ii) Location of activity
iii) Timing and duration of activity
iv) Sensitivity of site features/sub-features to dredging
v) Ability of site features/sub-features to recover from dredging

Additionally, the location, timing, duration and intensity of the activity within the sites will be influenced by existing management measures (see section 5.3) and those being developed to mitigate adverse effects (see section 7).

Having reviewed a wide range of evidence, including scientific literature, sightings data and feature mapping, it has been concluded that the activities have the potential to have a significant adverse effect on the seagrass features of the European Marine Sites in the Southern IFCA District. This risk to the site's integrity will be addressed through the introduction of management measures outlined in section 7 which will ensure that all seagrass habitats are fully protected from all forms of bottom towed fishing gears. Therefore, based on the introduction of these management measures it is concluded that bottom towed fishing gear will not have an adverse effect on the EMSs integrities. The rationale for this conclusion is summarised below:

- Fisheries data held by Southern IFCA indicates that bottom towed fishing gear activities occur throughout the district but are particularly concentrated in the Solent and Poole Harbour where the majority of seagrass habitats occur.
- Due to the introduction of the Bottom Towed Fishing Gear Byelaw 2016 BTFG activity has been prohibited in most of the district's seagrass habitats. However, data has been updated over the past four years and therefore there is potential that new beds or parts of beds may not be protected. Where these occur, there is potential that BTFG could occur over the features.
- A review of literature indicates that seagrass habitats are highly sensitive to bottom towed fishing gears which can lead to the immediate removal of the feature through abrasion and penetration as well as significant effect to the communities associated and sediment character through increased turbidity, smothering and physical disturbance.
- The recovery time of seagrass beds can vary depending upon the species and location however it is well accepted that recovery times in most cases are likely to take years with an estimate of 10 years for beds affected by intensive BTFG activity.
- In order to mitigate against such impacts, the Southern IFCA will introduce management measures to fully protect seagrass features found within European Marine Sites throughout the district.

In summary, it is concluded that BTFG activity alone will not have an adverse effect on the seagrass beds within the European Marine Sites found in the Southern IFCA District, and will not hinder the sites from achieving their conservation objectives with the considerations that additional management measures will be brought in to fully protect these features. It is Southern IFCA's duty as the competent authority and relevant authority to manage damaging activities that may affect site integrity and lead to deterioration of the site.

10 Integrity Test

Based on the management measures proposed by Southern IFCA, (See section 10), it has been concluded that bottom towed fishing gear will not have an adverse effect on the integrity of the European Marine Sites, and will not hinder the sites from achieving their conservation objectives. The in-combination assessment concluded there would be no potential for in-combination effect between BTFG and other fishing activities in areas of seagrass habitat. The proposed management measures, which will apply to all bottom towed activities, will address any risk posed to the sites' integrities through in-combination effects of BTFG activities themselves as these features will be fully protected from all forms of BTFGs.

A change in the current status of these fisheries, upon which the Habitats Regulations Assessment is based, is unforeseen, however it is recognised that future changes could occur. Southern IFCA will continue to monitor fishing activity within the European Marine Sites as well as monitor compliance with byelaws. In the event new evidence has the potential to hinder the sites conservation objectives, a Habitats Regulations Assessment will be undertaken.

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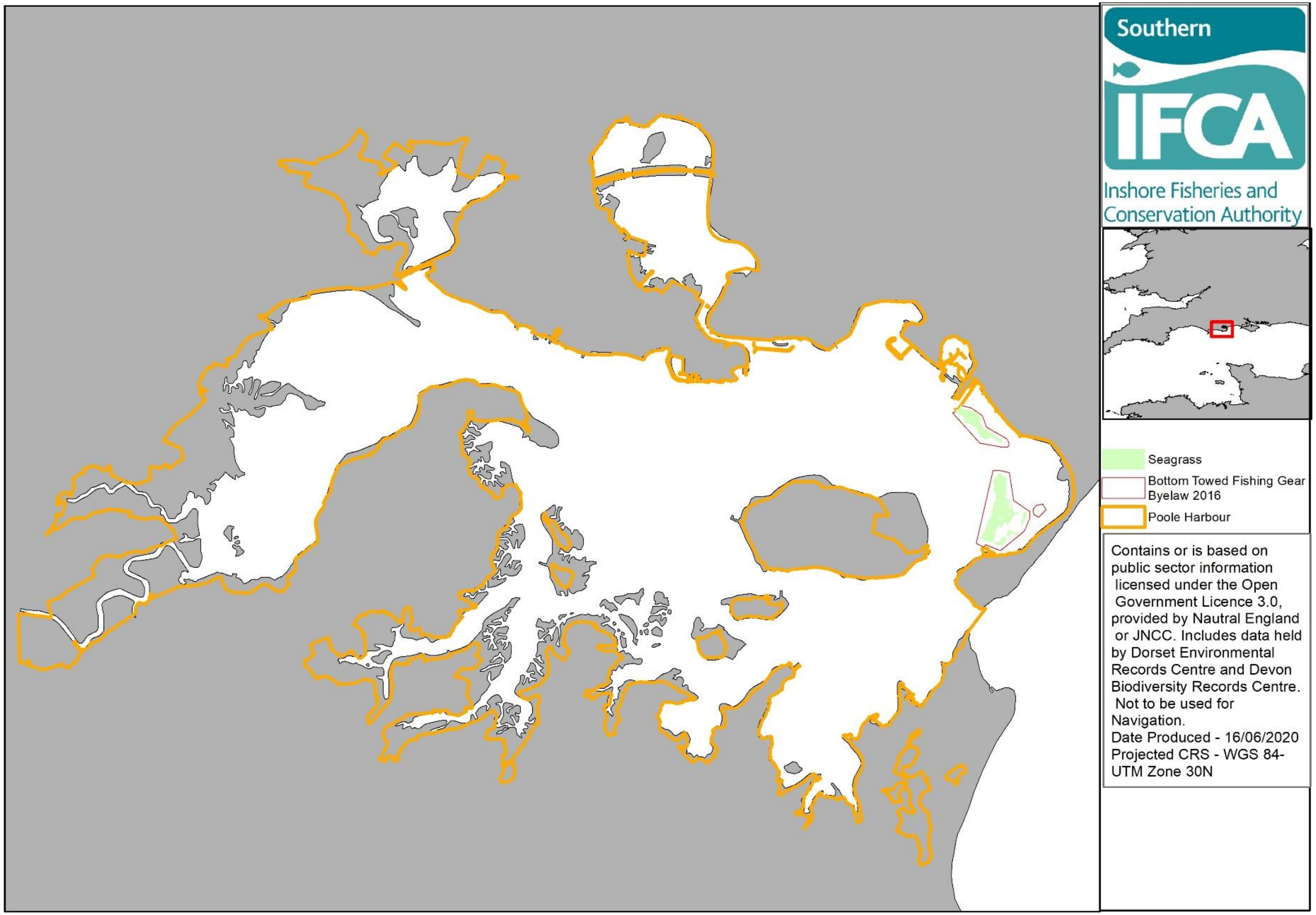
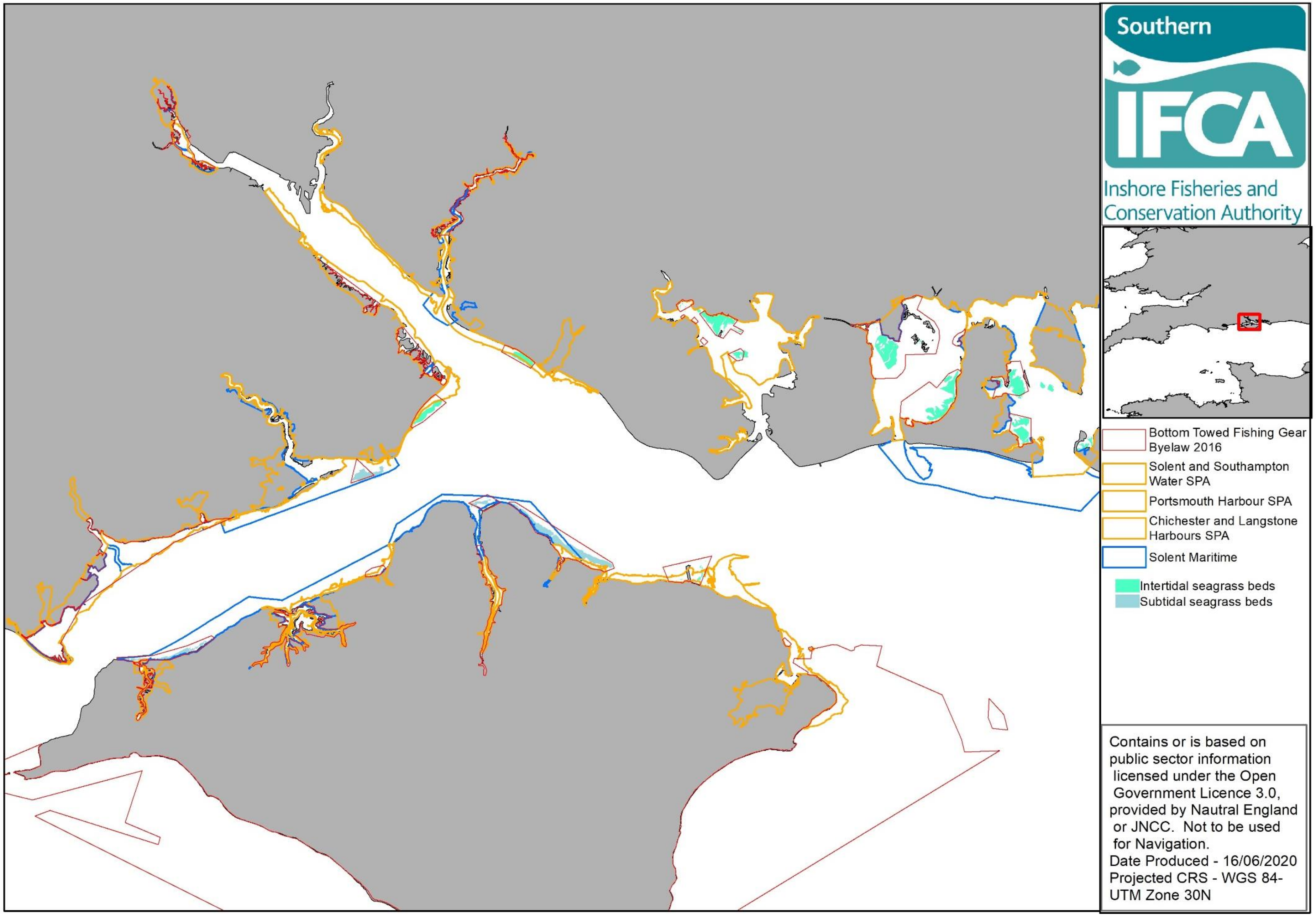
Annex 1. Habitat feature maps of seagrass habitat in (a) Poole Harbour EMSs, (b) Solent EMSs and (c) Chesil and the Fleet EMSs.

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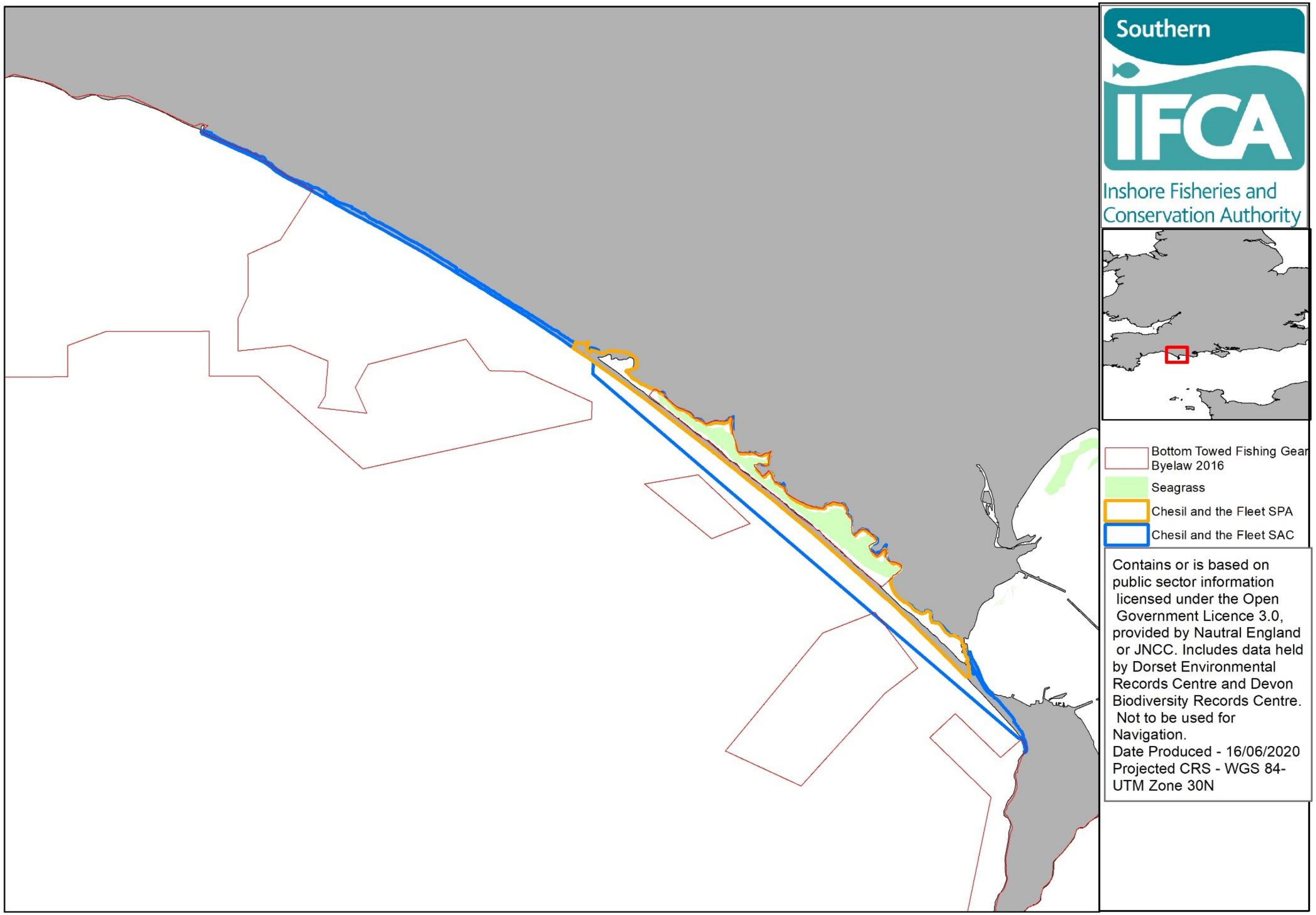
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Chesil and the Fleet SAC
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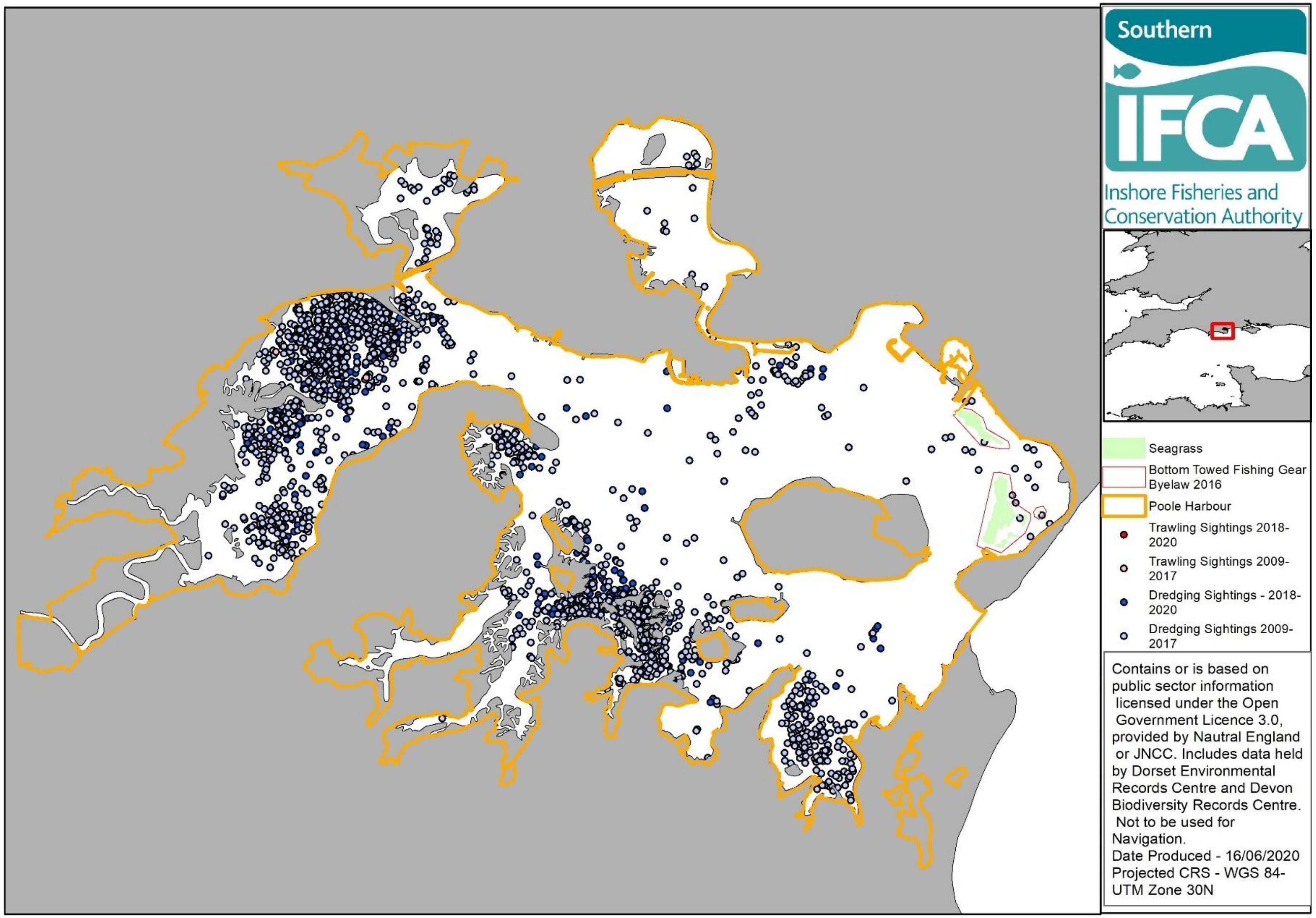
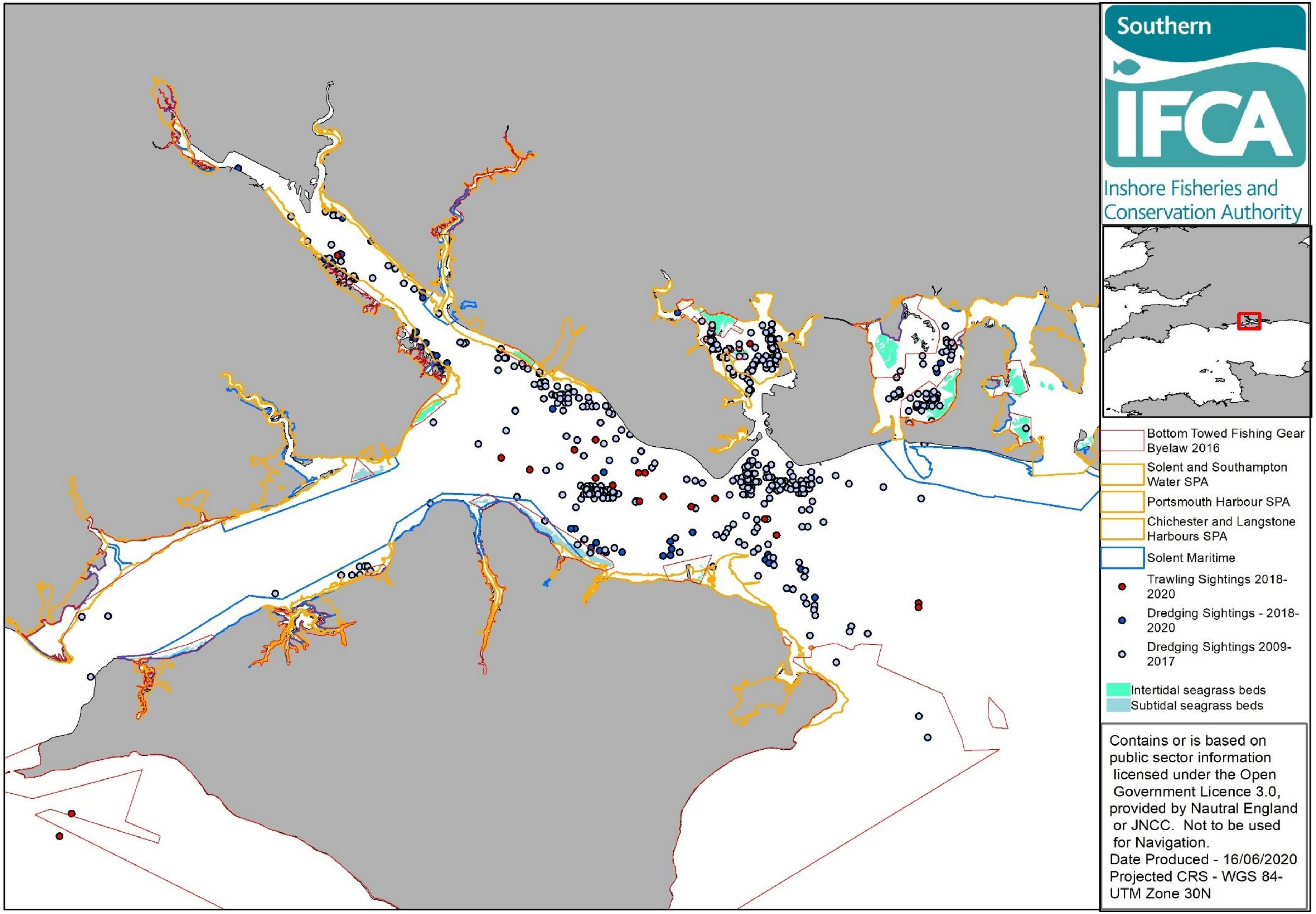
Projected CRS - WGS 84- UTM Zone 30N

Annex 2. Co-Location of fishing activity using trawling and dredging sightings data from (2009-2020) and site feature data in (a) Poole Harbour EMSs, (b) Solent EMSs and (c) Chesil and the Fleet EMSs.




Southern
IFCA
Inshore Fisheries and Conservation Authority
Bottom Towed Fishing Gear Byelaw 2016
Solent and Southampton Water SPA
Portsmouth Harbour SPA
Chichester and Langstone Harbours SPA
Solent Maritime
Trawling Sightings 2018-2020
Dredging Sightings - 2018-2020
Dredging Sightings 2009-2017
Intertidal seagrass beds
Subtidal seagrass beds
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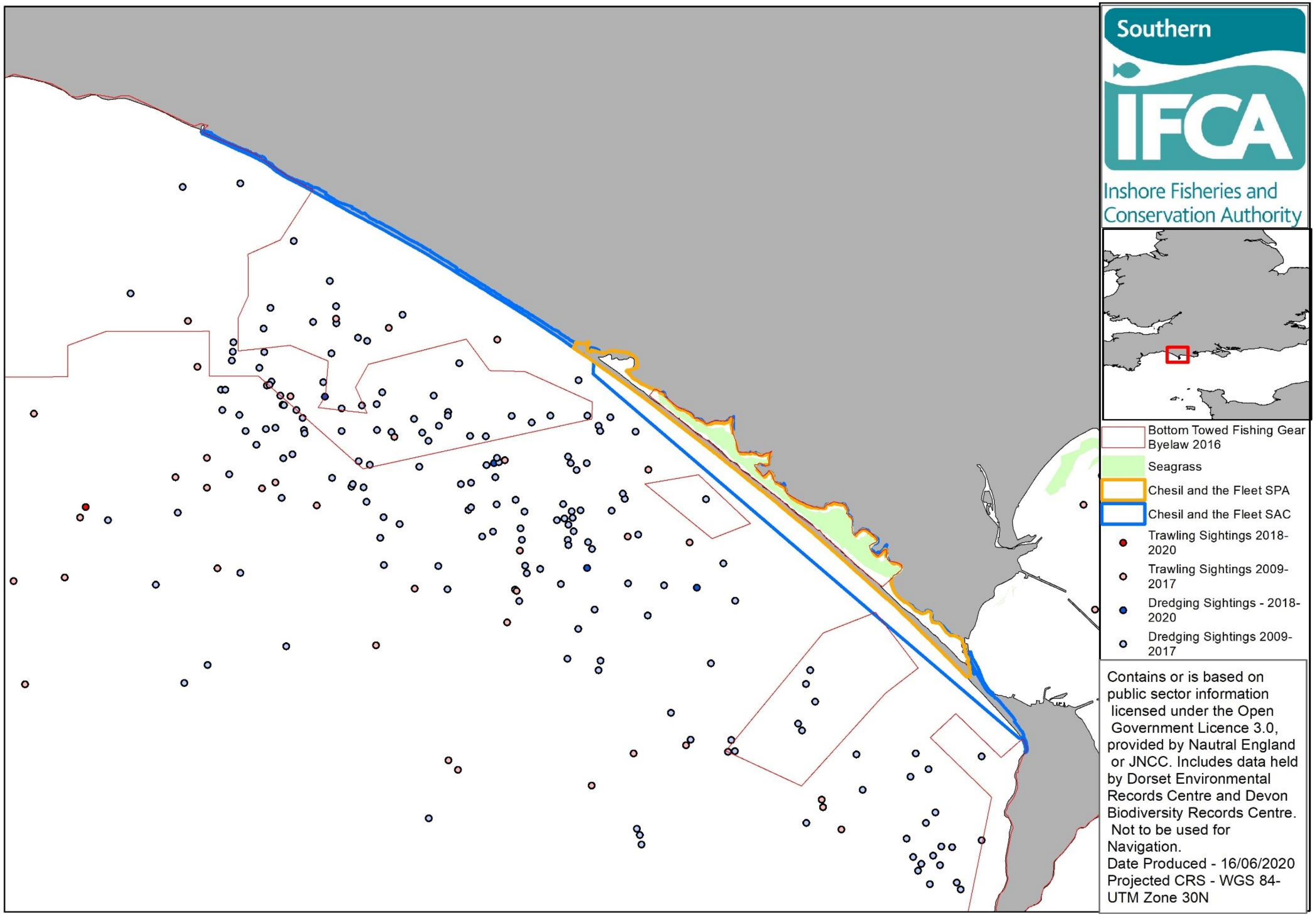
Southern
IFCA
Inshore Fisheries and Conservation Authority
Bottom Towed Fishing Gear Byelaw 2016
Seagrass
Chesil and the Fleet SPA
Chesil and the Fleet SAC
Trawling Sightings 2018-2020
Trawling Sightings 2009-2017
Dredging Sightings - 2018-2020
Dredging Sightings 2009-2017
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