Document Control

Title	Poole Rocks MCZ – Part B Fisheries Assessment – Potting
SIFCA Reference	MCZ/02/002
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Approver	
Owner	V Gravestock
Template Used	MCZ Assessment Template v1.0

Revision History

Date	Author	Version	Status	Reason	Approver(s)
15/11/2016	V Gravestock	1.0	Draft	Initial Draft	
08/12/2016	V Gravestock	1.1	Draft	Addition of landings data	S Pengelly
03/01/2017	V Gravestock	1.2	Draft	Minor changes following QA by SP	
30/01/2017	V Gravestock	1.3	Final Draft	Amendments following NE comments	
20/02/2017	V Gravestock	1.3	FINAL		

This document has been distributed for information and comment to:

Title	Name	Date sent	Comments received
Poole Rocks MCZ – Part B Fisheries Assessment – Potting v1.2	Natural England	04/01/2017	Yes
Poole Rocks MCZ – Part B Fisheries Assessment – Potting v1.3 FINAL	Natural England	20/02/2017	

Southern Inshore Fisheries and Conservation Authority (IFCA)

Marine Conservation Zone Fisheries Assessment (Part B)

Marine Conservation Zone: Poole Rocks

Feature: Moderate energy circalittoral rock

Broad Gear Type: Static – pots/traps

Gear type(s) Assessed: Pots/creels (crustacea/gastropods); Cuttle pots

1. Introduction

1.1 Need for an MCZ assessment

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

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

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

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

1.2 Documents reviewed to inform this assessment

- Defra's matrix of fisheries gear types and European Marine Site protected features
- Natural England's High Level Conservation Objectives for the Poole Rocks MCZ
- Natural England's Supplementary Advice on Conservation Objectives for the Poole Rocks MCZ
- Natural England's Advice on Operations for Poole Rocks MCZ

2. Information about the MCZ

2.1 Overview and designated features

The Poole Rocks MCZ is located on the central south coast in the English Channel. This inshore site covers an area of 3.73 km^2 and lies to the east of Poole Harbour entrance and approximately 2 km each of Sandbanks beachfront. The site contains rocky outcrops within the sediment-dominated Poole Bay. Depths range between 10.1 to 15 metres above Ordnance Datum. The site was designated in 2013.

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

Table 1. Designated features and General Management Approach

Designated feature	General Management Approach
Subtidal mixed sediments	Maintain in favourable condition
Moderate energy circalittoral rock	**Maintain in favourable condition**
Couch's goby (*Gobius couchi*)	Recover to favourable condition
Native oyster (*Ostrea edulis*)	Recover to favourable condition

A conflict was identified with respect to designated features between the Poole Rocks MCZ designation order and post-survey site report. The designation order states that designated features of the site include moderate energy circralittoral rock, whilst the post-survey site report states that the majority of rock outcrops are shallower than 10 m and are dominated by foliose algae and sparse kelp and are therefore classified as moderate energy infralittoral rock. 'Circalittoral' is defined as the 'region of the seafloor within the sublittoral zone beyond where sunlight reaches the seafloor. This subtidal zone is characterised by animal-dominated communities. The depth at which the circalittoral zone begins is directly dependent on how much light reaches the seabed'[1]. This definition helps to explain why the conflict exists and the reason for this is included within the designated feature description (for circalittoral rock) below[2]:

'Poole Rocks MCZ marks a rocky outcrop within the typically sandy and sediment dominated Poole Bay. Due to high levels of suspended sediment within the water benthic communities are overlaid with a layer of silt. This creates circalittoral conditions at infralittoral depths. Therefore circalittoral rocky communities have been recorded throughout the site on rock at depths commonly associated with infralittoral communities, making this an unusual feature (Davies et al., 2001), (Ware and Kenny, 2011), (Seasearch, 2000), (Defra, 2013), (Dorset Seasearch, 2012).'

Please refer to Annex 1 for a site feature map.

2.2 Conservation Objectives

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

The conservation objective of each of the zones is that the protected habitats:
1. are maintained in favourable condition if they are already in favourable condition
2. be brought into favourable condition if they are not already in favourable condition

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

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

For each species of marine fauna, favourable condition means that the population within a zone is supported in numbers which enable it to thrive, by maintaining:
1. the quality and quantity of its habitat
2. the number, age and sex ratio of its population. Any temporary reduction of numbers of a species is to be disregarded if the population is sufficiently thriving and resilient to enable its recovery.

[1] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/82738/mcz-annex-i-121213.pdf

[2] https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UKMCZ0014&SiteName=poole%20rocks&countyCode=&responsiblePerson=

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

3. MCZ Assessment Process

3.1 Overview of the assessment process

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

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

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

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

3.2 Screening and Part A Assessment

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

The screening of commercial fishing activities in the Poole Rocks MCZ was undertaken using broad gear type categories. Sightings data collected by the Southern IFCA, together with officers' knowledge, was used to ascertain whether each activity occurs within the site, or has the potential to occur/is anticipated to occur in the foreseeable future. Engagement with the local fishing industry was also undertaken as part of this process. For these occurring/potentially occurring

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

activities, an assessment of pressures upon MCZ designated features was undertaken using Natural England's Advice on Operations.

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

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

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

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

3.2.3 Screening of commercial fishing activities based on occurrence

Initial screening was undertaken to identify the commercial fishing activities which currently occur within the site, together with those which have the potential to occur or/and are reasonably foreseen to occur in the future (Annex 2). To maintain consistency with Southern IFCA's assessment of commercial fishing activities in European Marine Sites, the individual gear types identified in Defra's matrix were assessed and these were grouped into broad gear types.

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

Fishing activities which were identified as occurring, have the potential to occur and/or are anticipated to occur in the foreseeable future within the site were screened with respect to the potential pressures which they may be exert upon designated features (Part A assessment). This screening exercise was undertaken using Natural England's Advice on Operations for the Poole Rocks MCZ[4]. This advice provides a broad scale assessment of the sensitivity of designated features to different activity-derived pressures, using nationally available evidence on their resilience (an ability to recover) and resistance (the level of tolerance) to physical, chemical and biological pressures (Natural England, 2016). The assessments of sensitivity to these pressures are measured against a benchmark. It should be noted that these benchmarks are representative of the likely intensity of a pressure caused by typical activities, and do not represent a threshold of an 'acceptable' intensity of a pressure. It is therefore necessary to consider how the level of fishing intensity observed within the Poole Rocks MCZ compares with these benchmarks when screening individual activities.

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

A summary of Natural England's Advice on Operations for the Poole Rocks MCZ is provided in Annex 4. The resultant activity pressure-feature interactions which have been screened in for potting gear for the part B assessment are summarised in Table 1. The activity pressure-feature interactions which were screened out in the Part A Assessment are detailed in a standalone document for Poole Rocks MCZ. Where there is insufficient evidence on the sensitivity of a

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4 https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UKMCZ0014&SiteName=poole%20rock&countyCode=&responsiblePerson=

designated feature to fishing-related pressures, and these pressures present a risk to designated features, these pressure-feature interactions have been included for further assessment.

Table 1. Summary of fishing pressure-feature screening for moderate energy circalittoral rock. Please note only pressures screened in for the part B are presented here.

Potential Pressures	Considered in Part B Assessment?	Justification	Relevant Attributes
Abrasion/disturbance of the substrate on the surface of the seabed	Y	The activity is likely to lead to abrasion of the feature through contact with the feature during deployment/retrieval and subsequent movement of gear, including the ground rope from currents or storm activity. The activity is considered as low impact and evidence, gathered through potting impact studies, suggests that there is likely to be no or limited impact on the feature. Further investigation into existing literature, severity and magnitude of this pressure, including spatial scale and activity intensity considerations are necessary to confirm this for this site.	Distribution: presence and spatial distribution of circalittoral rock communities; Structure/function: presence and abundance of key structural and influential species;; Structure: species composition of component communities
Removal of non-target species	Y	Mechanical impacts of potting may include damage to, and potentially the removal of non-target species through contract with gear including entangling of ropes and surface abrasion. The area directly affected however is likely to be relatively small. Studies on this gear type have reported limited impacts in areas of rocky habitat. Moderate energy circalittoral rock communities found at this site include faunal and algal crusts often dominated by bryozoans, sponges and tunicates. Emergent fauna can be tangled, damaged or removed by setting or hauling pots. The above-mentioned communities are however likely to be relatively low-lying and therefore less likely to be subject to damage. Potential bycatch species are generally limited (i.e. wrasse, dogfish) and will often be returned alive. The evidence suggests that there is likely to be no or limited impact on the feature, however further investigation into existing literature, sensitivity of species within the site, severity and magnitude of this pressure, including spatial scale and activity intensity considerations is necessary to confirm this activity will not lead to a significant effect on this feature.	Distribution: presence and spatial distribution of circalittoral rock communities; Structure/function: presence and abundance of key structural and influential species;; Structure: species composition of component communities
Removal of target species	Y	The target species of potting activities include edible crab, European lobster, common whelk and cuttlefish. Recent Seasearch surveys (2014 & 2015) recorded the presence of edible crab, European lobster and common whelk.	Structure/function: presence and abundance of key structural and influential species;;

		Video analysis, conducted as part of the post-survey site report however did not record any target species as being present within the site. The lack of reporting of cuttlefish indicates they do not form a significant part of moderate energy circalittoral rock communities. Crustaceans and whelks are subject to a minimum landing size, below which individuals cannot be removed from the fishery and if caught in a pot must be returned to the sea. Catches of undersized lobster and crab are also reduced through the use of escape gaps, which is a voluntary measure in the Southern IFCA district. Whelk potting is commonly concentrated in areas of subtidal sediments, indicating the species occurrence is likely to be limited in areas of rocky reef habitat. The main concern would therefore be the removal of edible crab and European lobster above the minimum landing size. The removal of larger edible crab, in some instances, may have an adverse impact on the ecosystem as large individuals can constitute apex predators and thus belong to a smaller 'functional group' of species. Impacts of European lobster removal is hard to ascertain due to the 'sliding baseline' phenomenon. Further investigation is necessary to ascertain the impacts of the removal of edible crab and European lobster on moderate energy circalittoral rock communities.	

4. Part B Assessment

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

In order to adequately assess the potential impacts of an activity upon a designated feature, it is necessary to consider the relevant attributes of that feature that may be affected. Attributes are provided in Natural England's Supplementary Advice on Conservation Objectives (SACOs) and represent the ecological characteristics or requirements of the designated species and habitats within a site. These attributes are considered to be those which best describe the site's ecological integrity and which if safeguarded will enable achievement of the Conservation Objectives[5].Each attribute has an associated target which identifies the desired state to be achieved; and is either quantified or qualified depending on the available evidence. After relevant pressures were identified from the pressure-feature interaction screening, suitable attributes were identified from Natural England's Supplementary Advice. These are outlined in Table 1.

4.1 Assessment of potting in the Poole Rocks MCZ

5 https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UKMCZ0014&SiteName=poole%20rock&countyCode=&responsiblePerson=

4.1.1 Summary of the fishery

Potting is a year round fishery occurring on a regular basis within the Poole Rocks MCZ. The activity targets crustaceans (European lobster (*Homarus gammarus*) and Edible crab (*Cancer pagurus*)), common whelk (*Buccinum undatum*) and cuttlefish (*Sepia officinalis*). The pots used for all target species differ, both in construction and size. Potting for crab and lobster is the most common activity, followed closely by whelk potting and then cuttlefish potting.

4.1.2 Technical gear specifications

Pots and traps differ in size, shape and construction material depending on the behaviour of the target species and local fishing practices (Seafish, 2015).

In the UK, potting configuration and methods vary between locations including the materials used for pot construction, size and weight of pots, the number of pots per string and distance between pots and size of anchor-weights used (Stephenson *et al*., 2016). Pot set up and deployment however is relatively standardised in the UK (Lovewell *et al*., 1988; Bullimore *et al*., 2001; Coleman *et al*., 2013; Stephenson *et al*., 2016). Ten to thirty baited pots are attached to a ‘mainline’ using 2 to 3 m of rope at intervals of approximately 10 fathoms (18 metres) (Stephenson *et al*., 2016). This is referred to a ‘string’ or ‘fleet’ of pots. Bait used in pots is typically a type of fish or shellfish and the type used varies depending on location and target species. At the end of each string, anchor-weights are attached to prevent movement or dragging during periods of water movement from waves or strong currents (Stephenson *et al*., 2016). Marker buoys are attached to each end of the string and are used to mark the location of gear and facilitate retrieval (Stephenson *et al*., 2016). Pots are deployment by dropping the first buoy and anchor-weight into the water. The pots and second anchor-weight and buoy are then pulled overboard as the vessel travels over the chosen fishing ground (Stephenson *et al*., 2016). Anchors and buoys are designed to remain static whilst slack in the mainline will allow the pots some freedom of movement (Stephenson *et al*., 2016). Pots will often be soaked for a period of 24 to 48 hours, potentially longer in periods of adverse weather.

Crab/lobster pots

One of the most common styles of pots used for catching lobster and crab is the ‘D’ creel, also referred to as a parlour pot and is the type of pot used within the Poole Rocks MCZ. Parlour pots are typically constructed with a metal frame, commonly plastic coated steel and covered with netting, often black in colour. The size of pots can range between 22 x 16 x 13” to 42 x 22 x 17” and weigh approximately 15 to 20 kg. The stretch mesh size of the netting used typically ranges between 80 and 100 mm and the width of the netting used typically ranges between 3 and 5 mm. Once the netting is fitted, the outside edges are wrapped with rope or strings of rubber to protect the pot from damage through abrasion on the seabed (Seafish, 2015). The position of the entrance can vary; some have a side entry and others have a top entrance (Figure 1). Those with an entrance on top often have a plastic entrance which resembles a plastic bucket without a bottom. The diameter of the entrance typically ranges between 8 and 10 inches. Those with a side entry commonly have tapered netting entrance held open with a plastic ring, and is referred to as a ‘hard eye’. The size of the plastic ring can vary, with those sold ranging between 60 and 150 mm. Some do not have a plastic ring in the entrance and this is referred to as a ‘soft eye’. Typically there will only be one entry point but there may be two. The end of the pot is hinged to allow the removal of catch and bait replacement. The base may be constructed using metal bars, the spacing of which can be used to release crab and lobsters under the minimum landing size (MLS) (Seafish, 2015). Alternatively, the base can be made of plastic. Escape gaps, a rectangular plastic release panel, may also be fitted to the end of each pot. The aim of the escape gap is designed to allow the release of animals below the MLS. Southern IFCA currently employ a voluntary escape gap scheme using escape gaps measuring 45 x 87 mm in size.

Figure 1. Top entry (left) and side entry parlour pot (right) used to catch crab and lobster. Source: http://www.medleypots.co.uk/products/fully-rigged-pots/

Whelk pots

Whelk pots are typically smaller than those used for used to target crab and lobster and are often made from discarded 25 litre plastic containers, although purpose built ones are available. Pots typically weigh about 12 to 13 kg. One side of the plastic container is removed and replaced by a section of netting with a hole in the centre which acts as an entrance (Figure 2). The entrance often forms the top of the trap. This set up allows whelks to easily enter the pot but prevents escape. The bottom of the pot is weighted using cement to ensure pots land upright when they land on the seabed. There numerous holes inside the pot to allow water to drain from it.

Figure 2. Whelk pot. Source: http://www.seafish.org/geardb/gear/pots-and-traps-whelks/

Cuttlefish pots

Cuttlefish pots are much larger than those used to target crab/lobster and whelk. The pots are either square or circular in shape. Circular traps typically measure 100 cm in diameter are 50 cm in height whilst square traps approximately 90 cm square and height of 50 cm. Pots typically weight approximately 15 kg and are light in both construction and weight. Pots are constructed from steel bars covered with light weight netting, with a typical stretch mesh size range between 80 to 100 mm (Figure 3). Each pot has two or three plastic entrances with plastic fingers on the inside of the trap to prevent cuttlefish from escaping. The plastic fingers are able to bend freely as a cuttlefish enters. Fishermen bait pots with a plastic disc or live (female if possible) cuttlefish to attract cuttlefish into the pot. This uses their matting instinct to attract others into the trap.

Figure 3. Cuttlefish pot. Source: http://www.seafish.org/geardb/gear/pots-and-traps-cuttlefish/

4.1.3 Location, Effort and Scale of fishing activities

Under ten commercially licensed vessels, using all potting methods, operate within the Poole Rocks MCZ. All vessels are believed to be operated by regular and full time fishermen. All vessels are small (under ten metres) in size. Vessels predominantly operate out of Poole Harbour and occasionally Swanage.

The number of pots worked by each vessel and the number of pots in a string can largely vary and is often related to vessel size. It is typical UK practice to arrange pots in strings of ten to thirty.
The number of pots used within the area is unknown, however it is believed to be of light to moderate intensity at a maximum of 500 (all types), although definitions of gear intensity largely varies between studies (see Annex 5). Parlour pots, targeting crustaceans, are deployed all year round over or areas surrounding harder rocky ground. Potting for whelks and cuttlefish is concentrated over subtidal mixed sediments. The greatest deployment of whelk pots occurs during winter and spring. Potting for cuttlefish is a seasonal fishery which occurs between April to June, although inactive traps are left over summer to allow cuttlefish eggs to hatch as these are commonly laid on traps. Inactive traps are then removed before the winter months.

Sightings data presented in figure 4 confirm potting for crab and lobster and whelks occurs within Poole Rocks MCZ. The sightings are located relatively centrally within the site, with both activities also recorded within the wider surrounding area. In this area, both activities operate within a relatively similar distance from the shore, with both occurring not particularly close and potting for crab and lobster also occurring in areas also slightly further offshore. Unfortunately there is no sightings data for cuttlefish potting within the site or surrounding area of Poole Bay. The numbers of sightings within the site alone for other potting methods are also relatively limited. Please note that Southern IFCA’s sightings data may reflect home ports of patrol vessels, high risk areas and typical patrol routes and therefore are only indicative of fishing activity. Over the ten year period covered by sightings data (2005-2016), it is likely that the geographical extent of the fishery is relatively well reflected; however intensity may be skewed by aforementioned factors. Unfortunately, Poole Bay is not likely to be considered a particularly high risk area and therefore unlikely to form part of typical patrol routes, thus explaining the paucity of sightings data in this area.

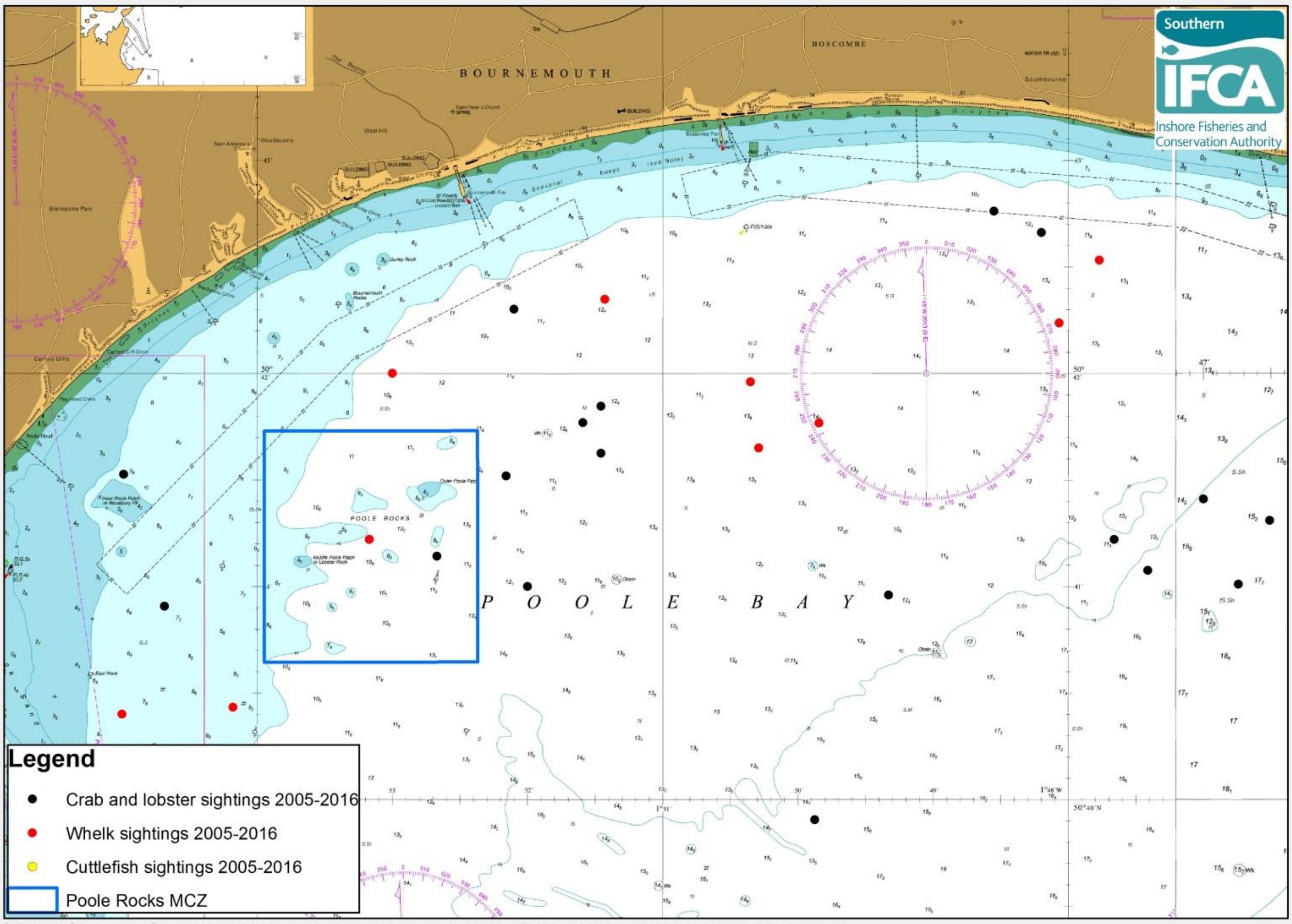

Figure 4. Fishing activity map(s) using potting sightings data from 2005-2016, split by potting method (whelks, crustaceans and cuttlefish) in the Poole Rocks MCZ and surrounding area of Poole Bay.

Landings data provided by the Marine Management Organisation show the quantities of all target species caught between 2005 and 2015 landed into Poole. Cuttlefish landings show an overall increase between 2005 and 2012 with landings peaking at 48.4 tonnes in 2012, despite a relatively large dip in 2011. Following this peak year, landings fell dramatically in 2013 and from this point grew year on year. Fluctuations in cuttlefish landings are driven by recruitment variability (Bloor *et al*., 2013). Cephalopods are highly sensitive to changes in environmental conditions and respond both 'actively' by migrating to areas with more favoured environment conditions and 'passively' through variations in growth and survival (Pierce *et al*., 2008). A study of cuttlefish migration among spawning adults in the English Channel identified a range of movement patterns, with individuals moving up to 35km along the coast (Bloor, 2012). Annual stock size of cephalopods depends on recruitment success and as a short-lived species is expected to be strongly affected by environmental conditions (CEFAS, 2011). Landings of edible crab and European lobster showed similar trends with peak landings occur between 2005 and 2007, followed by an overall decline until 2013, increasing slightly in 2014 and 2015, although not to previous levels recorded in 2005-2007. As both species show a similar pattern, this may be explained by changes in fishing effort over this period or environmental pressures affecting both species. Landings of whelks showed a rapid increase between 2005 and 2009, peaking at 897.0 tonnes in 2009. This rapid increase in landings reflects the rapid growth in the participation of this relatively accessible fishery. Following the peak in 2009, landings declined year on year (except for a slight in 2014) to 349.9 tonnes in 2015. Please note that landings data should be viewed with caution, although reflective of the overall trends of the fishery. Landings into Poole will not be exclusively from vessels potting within the Poole Rocks MCZ and as such will reflect landings from the wider surrounding area (i.e. Poole Bay), much of which supports an active potting fishery (as reflected in figure 4). These landings are therefore an indication of the likely trends of target species caught within the Poole Rocks MCZ. Exact figures are not always accurate; however this data represents the best available evidence to date.

Table 2. Landings (in tonnes) from 2005 to 2015 of target species (edible crab, European lobster, cuttlefish, whelk) into ports known to serve vessels (using potting gear) operating within the Poole Rocks MCZ. Data was provided by the Marine Management Organisation (MMO). Increases in landings between 2005 and 2006 are likely to reflect the legal requirement since 2005 for all buyers and sellers of first sale fish and shellfish landed into England to be registered with the MMO.

		Landings (Tonnes)										
	Port of Landing	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Edible crab	**Poole**	204.3	204.8	169.2	160.6	123.1	130.5	117.2	103.4	100.4	114.4	116.4
Lobster	**Poole**	30.4	28.7	30.0	25.5	16.6	17.6	18.4	15.8	13.6	19.5	22.8
Whelk	**Poole**	49.4	292.0	142.9	440.4	897.0	861.5	758.4	500.6	402.5	428.8	349.9
Cuttlefish	**Poole**	14.0	21.5	24.2	22.5	31.0	43.4	27.8	48.4	9.3	22.8	39.8

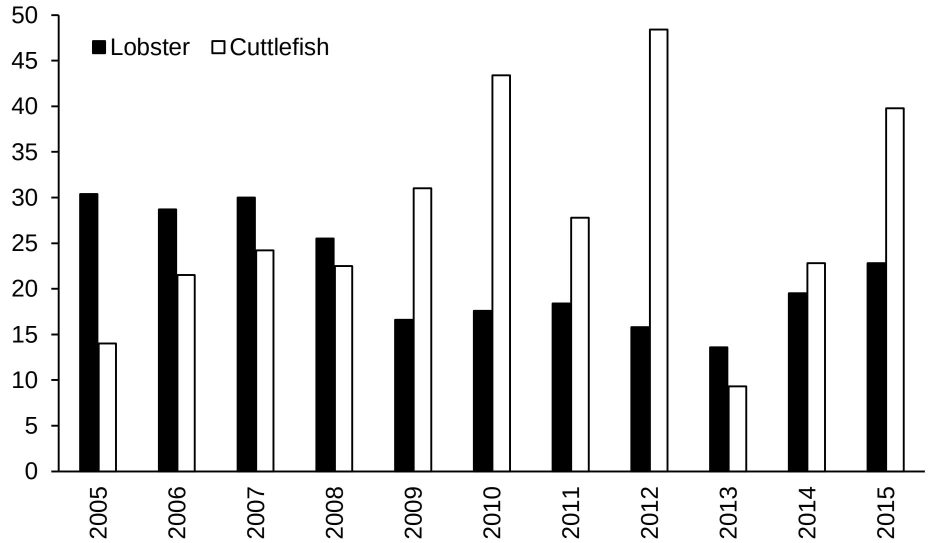

Figure 5. Total landings (in tonnes) from 2005 to 2015 of target species (European lobster, cuttlefish) into ports known to serve vessels (using potting gear) operating within the Poole Rocks MCZ. Data was provided by the Marine Management Organisation (MMO). Increases in landings between 2005 and 2006 are likely to reflect the legal requirement since 2005 for all buyers and sellers of first sale fish and shellfish landed into England to be registered with the MMO.

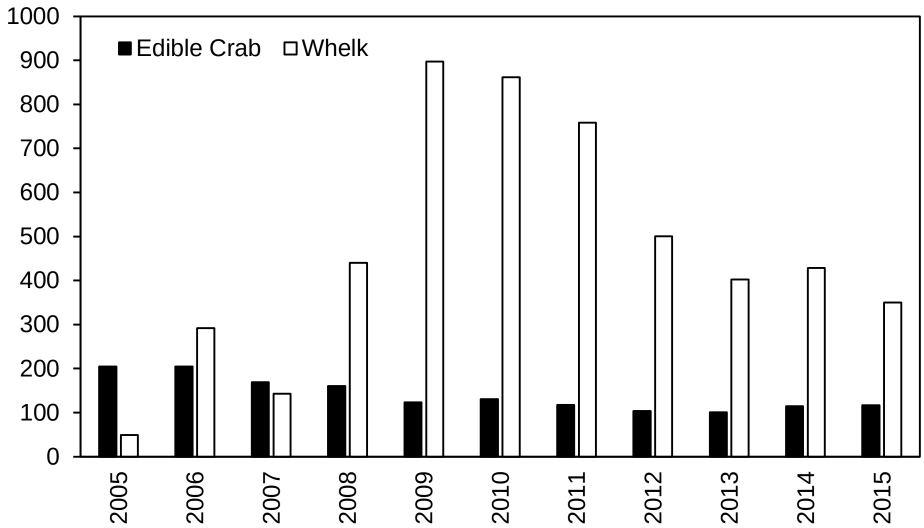

Figure 6. Total landings (in tonnes) from 2005 to 2015 of target species (Edible crab, Whelk) into ports known to serve vessels (using potting gear) operating within the Poole Rocks MCZ. Data was provided by the Marine Management Organisation (MMO). Increases in landings between 2005 and 2006 are likely to reflect the legal requirement since 2005 for all buyers and sellers of first sale fish and shellfish landed into England to be registered with the MMO.

4.3 Co-Location of Fishing Activity and Designated Features

By comparing the broadscale habitat map, found in Annex 1, and potting sightings data illustrated in figure 4, it can be inferred which substrate each potting activity is occurring over. Both potting activities (crab and lobster & whelk) illustrated in figure 4 appear to be occurring in areas surrounding or adjacent to circalittoral rock (defined as infralittoral rock in the post-survey site report). It is clear from the broadscale habitat map and conservation advice that the nature of the moderate energy circalittoral rock feature within Poole Rocks MCZ consists of numerous rocky outcrops within the sediment dominated area of Poole Bay. Based on this, it unlikely the activity will occur directly over these rocky outcrops but in areas surrounding the feature, thus limiting the possibility of direct interaction.

4.4 Pressures

4.4.1 *Abrasion/disturbance of the substrate on the surface of the seabed (Physical)*

Mechanical impacts of static gear include weights and anchors hitting the seabed which is likely to occur when the gear is set, hauling the gear over the seabed during retrieval and rubbing or entangling effects of ropes (when pots are fixed in strings) (JNCC & NE, 2011). In addition, the movement of gear may also occur over benthic habitats during rough weather or storm events (Roberts *et al*., 2010). Eno *et al*. (2001) reported that from observations of potting in Lyme Bay on rocky substrate, that when the wind and tidal streams were strong, pots tended to drag the most along the seabed, especially when the wind was blowing across the tide. Anchor-weights on the end of each string of pots are typically used to prevent dragging when fishing in dynamic areas (Coleman *et al*., 2013). When deployed correctly, pots were typically observed to be static, however when there is insufficient line during deployment, it can cause the lead pot to bounce up and down on the seabed during periods of strong tides and large swell (Eno *et al*., 2001).

Lewis *et al*. (2009) investigated the impact of single-buoyed lobster traps after winter storms on coral communities in areas of hard-bottom and reef habitats in the Florida Keys, United States. Impacts were assessed after 26 wind events occurring over three winters. Traps moved when stormed sustained winds higher than 15 knots (27.8 km/h). Storms above this threshold were reported to move buoyed traps a mean distance of 3.63m, 3.21m and 0.73m per trap and affected a mean area of 4.66m^2, 2.88m^2 and 1.06m^2 per trap at depths of 4, 8 and 12 m respectively.

Young *et al*. (2013) assessed the effects of physical disturbance from potting on chalk reef communities in Flamborough Head European Marine Site. The maximum potential footprint of pots within the EMS was calculated using information of fishing effort, intensity and configuration. The maximum potential area within the SAC affected by potting per year was calculated at 2.97km^2 or 4.71% of the site. This was based on the following assumptions, which are derived from discussions with local fishermen and other information sources, include; potting intensity is at its highest in summer and halved in the winter, the number of pots fished in the EMS at any one time during the summer is 3562, each pot has a 1m^2 foot print (high estimate) and no duplicated seabed interaction, average fishing days per days of 150 and two thirds of total pots are hauled per fishing day. Survey work was also undertaken as part of the study in the Flamborough Head no-take zone (NTZ), designated in 2010, and a fished area of similar size, physical and hydrographic properties. Both areas occurred within the Flamborough Head Prohibited Trawl Area. In the fished site, a higher percentage of bare substrate (7.2%) was reported, which may imply physical abrasion from pots could be removing sessile epifauna. Reduced epifauna was however vastly reduced by adverse weather during the study which led to the seafloor being scoured within both the NTZ and fished site.

Stephenson *et al*. (2015) examined the long-term impacts of potting on benthic habitats in the Berwickshire and North Northumberland Coast European Marine Site from 2002 to 2012. The study was split up into a number of sections, one of which explored pot movement over a 23 day period using novel acoustic telemetry methods. The experimental pot configuration was made up of a string of 10 parlour pots, attached to the mainline by 2 m lengths of rope at intervals of 18 m. The end of each string was anchored with a 25 kg weight. The acoustic telemetry array allowed the position of each pot to be recorded every 1 to 5 minutes. Significant pot movements were not reported to occur daily, but were detected on 6 out of 17 sampling occasions; equating to less than half of the sampling days. Significant movements occurred during neap and spring tides and at swell heights of 0-1 m and > 2 m, but not 1-2 m. Four of the six days with significant pot movement occurred during spring tides. Mean and maximum pot movement distances were slightly greater with increasingly extreme conditions, suggesting wave height and tidal height influence pot movement. The area potentially impacted by pot movements ranged between 53 and 115 m^2 per pot, with a mean of 85.8 m^2. There was no difference in the impacted area between neap and spring tides or between swell heights. The authors pointed out two aspects of the data that should be discussed, the first was lack of robustness based on the low number of significant pot movements and the second is the methodology which may under represent pot movement frequency. The conservative approach used to calculate 95% confidence intervals means only large movements will be significant as small non-significant distances are always lower than the mean error. Additionally, the mean error also means the range of possible movement is large and this means in reality the potentially impacted area may be smaller.

There are a number of ongoing pieces of research into the effects of potting, one of which is being conducted by Sarah Gall at the University of Plymouth. This study based in Lyme Bay and is aiming to quantify the direct ecological impacts of potting associated with pot landing, pot movements and associated rope scour and hauling of strings using GoPro digital cameras attached to pots in order to capture video footage. The research is still in progress and results are not yet available, indications are that impacts are not significant, reflecting the fact that the whole base of the pot does not come into contact with the seabed and when hauling, the pots are not in contact with the seabed for long distances. Pots and ropes have also been observed to be fairly stationary during the time they are on the ground.

4.4.2 *Abrasion/disturbance of the substrate on the surface of the seabed (Biological); Removal of non-target species*

Benthic communities, including non-target epifauna, may be directly impacted by potting gear in a number of ways, including being directly struck by a pot or end-weight during deployment, through the entanglement or removal with moving pots or ropes under the influence of tidal currents or waves and through retrieval of pots which may lead to lateral dragging of the gear as it is being lifted (Coleman *et al*., 2013). The latter method is generally avoided by fishermen and is only likely to occur under the influence of wind, tide or navigational hazard which prevents vertical lift (Coleman *et al*., 2013). Up until recently there has been a paucity of scientific evidence on the impacts of static gear on benthic habitats (Walmsley *et al*., 2015). Although there is still considerably scientific literature less when compared to mobile fishing, there has been a recent rise in the number of studies investigating the impacts of potting in order to address this evidence gap. A number of the studies are still ongoing and where preliminary findings have been indicated, they have been reported here. This section will be discussed study by study.

Eno *et al*. (2001) investigated the effects of fishing with crustacean traps on benthic species in Great Britain were examined. In Scottish sea lochs, the effects of *Nephrops* creels on different sea pens was studied. In southern England (Lyme Bay) and west Wales (Greenala Point), the effects of crab and lobster pots on rocky substrates and associated communities was studied. Three species of sea pen (*Pennatula phosphorea*, *Virgularia mirabilis* and *Funiculina quadrangularis*) were all observed to bend as a result of the pressure wave generated by the sinking creel, protecting the tip of the sea pen from damage. *P. phosphorea* and *V. mirabilis* were thought to be more tolerant to disturbance than *F. quadrangularis*, although *F. quadrangularis* was found to be able to reinsert themselves after being uprooted. No lasting effects on the muddy substrate were found, although no other species were studied. In Lyme Bay and west Wales, rocky substrate habitats and associated communities appeared to be unaffected (no significant differences in abundance of species) before and after four weeks of relatively intense fishing activity (equivalent to around 1,000,000 pot hauls per km^2 per year). In west Wales, the abundance of five sponge species (*Dysidea*, *Hemimycale*, *Phorbas*, *Tethya*, Axinellids) increased significantly in experimental plots after potting, whilst in control plots no significant changes were found, except for an increase in *Dysidea* spp. *Halichondria* spp. abundance decreased significantly in control plots, but showed no significant change in experimental plots. In Lyme Bay, three out of five species (*Phallusta*, *Stelligera/Raspailia*, *Pentapora*) significantly increased in abundance in experimental plots, whilst in control plots no significant changes were found in the same three species, in addition to *Haliclona simlans*. Significant changes in *Haliclona* spp. and *Eucinella* spp. abundance (within experimental plots) could not be determined as a result of statistical limitations. *Pentapora foliacea* colony was found broken after hauling, although the cause of which is unknown and the Pink sea fan (*Eunicella verrucosa*) was observed to bend under the action of pots, but returned to an upright position once the pots had passed. The pink sea fan is slow growing and long lived and therefore considered as relatively susceptible to damage.

Sheridan *et al*. (2005) assessed the effects lobster and fish traps on coral reef ecosystems in the US Virgin Islands, Puerto Rico and Florida Keys. One part of the study was to quantify damage to corals and other structure providing organisms. Overall, a relatively small proportion (<20%) of traps set in shallow water (<30m) made contact with hard corals, gorgonians or sponges. Damage mainly occurred to hard corals and this was patch, at a scale less than the total trap footprint. In Florida Keys, habitat damage was only occasionally observed under or near traps and such limited observations did not allow for quantification of trap impacts. Habitat distribution maps revealed that only 10% are deployed over coral or sponge/gorgonian habitats, with relatively few traps found on coral habitats. In the US Virgin Islands, a significant proportion (54%) of trap locations were located within coral habitats. Unsurprisingly, diver surveys found that traps were estimated to cause damage at about 50% of traps visited, instances of damage were most relevant amount gorgonians and sponges, followed by corals.

Adey *et al*. (2007) examined the effects of fishing with *Nephrops norvegicus* creels on benthic species, in areas of soft mud, on the west coast of Scotland were examined and compared to areas of trawling and no fishing. Sampling was undertaken using towed video cameras and recordings from 2000, 2002 and 2003 were analysed. Animals were identified to the lowest possible taxonomic level and the number of species at each sampling site was recorded. A total of 142 stations were analysed and 29 species or taxonomic groups were identified. Species composition significantly differed among areas, but these differences were largely caused by variation in environmental conditions. Sea pens were used as an indicator of physical disturbance of the seabed and sea pen species *Virgularia mirabilis*, *Pennatula phosphorea* and *Funiculina quadrangularis* (and associated brittle star *Asteronyx loveni*) were all found in lower densities in the trawled areas when compared to areas fished solely by *Nephrops* creels. Despite being caught in moderate quantities by the creel fishery, high densities of *V. mirabilis* and *P. phosphorea* were observed in creel-fished areas where bycatch was greatest. High densities of *F. quadrangularis* were also observed, thus suggesting no adverse impact on these three species. Abundances of *A. loveni* in creel-fished areas were also not significantly different from no-fished zones. The portion of damaged or dead colonies of sea pen species was significantly higher in the creel-fished areas than in the trawled areas for both *F. quadrangularis* and *V. mirabilis* (10.7% and 18.6% in creel-fished areas and 5.5% and 5.4% in trawled areas, respectively). The authors however concluded this finding was contradictory and requires further investigation.

Lewis *et al*. (2009), the details of which are also discussed in section 6.2.1, reported injuries of scraping, fragmenting and dislodging sessile fauna as a result of trap movement. This resulted in significant damage to stony corals, octocorals and sponges. In areas of trap movement, sessile faunal cover reduced from 45% to 31%, 51% to 41% and 41% to 35% at depths of 4m, 8m and 12m, respectively.

Shester and Micheli (2011) quantified and compared the ecosystem impacts (discards and benthic habitat impacts) of four gear types (including lobster traps) employed in small-scale fisheries in Baja California in Mexico in areas of temperate to sub-tropical kelp forests and rocky reef. Observations were made of traps being deployed from a boat at the surface were made and to simulate the worse-case scenario of crushing of gorgonian corals, a diver lifted and forcefully dropped traps on top of gorgonian corals. Observations were also made of fishermen occasionally dragging traps and divers tried to replicate the same action that has been observed from a boat. Further simulations were achieved by divers by pulling a trap by the line over corals. After each treatment, gorgonian corals were examined for signs of skeletal damage or tissue loss. Lobster traps that were dropped onto gorgonians had minimal impact, with only one in 37 trials resulting in damage of less than 1% of the colony in the yellow gorgonian coral *Eugorgia ampla*. Lobster traps that were dragged caused damage to corals significantly more frequently than crushing, although damage was never over 5% of the skeleton. No corals were detached from the seafloor.

Coleman *et al*. (2013) studied the effects of potting on benthic assemblages, specifically sessile epifauna, in circalittoral reef habitats over a four year period following the designation of a no-take zone (NTZ) at Lundy Island in 2003. Control locations were positioned on the west coast of Lundy and on the east coast of Lundy, the latter occurring within the NTZ and for each sampling year six different sites within each location was random selectively. Differences in wave exposure, depth and substrate were present between control and NTZ locations. Control locations outside the NTZ were subject to normal levels of commercial fishing effort and those inside the NTZ were subject experimental potting of approximately 2000 pots per km^2 per year. Multivariate analyses revealed no difference in how assemblages changed over the four year period between areas subject to potting and those not fished. The study concluded no detectable effects of potting for lobster and crabs on the benthic assemblage over the time scale of the experiment. It is important to note that physical differences in NTZ and control locations are likely to complicate the detection of any changes in assemblage.

A study by Young *et al*. (2013), the details of which are also discussed in 6.2.1, consisted of a vulnerability analysis and survey work. The vulnerability analysis involved sensitivity mapping of different biotopes combined with mapping of fishing effort. A sensitivity score of 0 to 3 was assigned (0=none, 1=low, 2=moderate, 3 = high) and the following effort intensity thresholds were defined; very high (250+ pots per km^2/12 strings per km^2), high (175-250 pots per km^2/9-11 strings per km^2), moderate (100-175 pots per km^2/6-8 strings per km^2), low (50-100 pots per km^2/3-5 strings per km^2), very low (0-50 pots per km^2/0-2 strings per km^2) and none (0 pots per km^2/0 strings per km^2). Vulnerability to abrasion from potting was then defined as a function of sensitivity and exposure to fishing. Mapping revealed areas of moderate to high fishing intensity coincided with habitats of moderate sensitivity, resulting in approximately 3 km^2 considered to have high vulnerability to potting and 1 km^2 to have very high vulnerability. This analysis only applies during summer months when potting intensity it at its highest. The survey work, undertaken in in the Flamborough Head no-take zone (NTZ), designated in 2010, and a fished area, revealed a statistically significant difference in community assemblage between the NTZ and fished site was identified. A higher abundance of benthic taxa, namely Mollusca, Hydrozoa and Rhodophyta, were reported within the NTZ, the three of which accounted for 68% of the dissimilarity between the NTZ and fished site. Table 3 provides details of the differences in mean presence of different taxonomic groups. In the fished site, there was a higher percentage of bare substrate (7.2%), which may imply physical abrasion from pots could be removing sessile benthic epifauna. Contrary to expectation, the abundance of kelp species, *Sacharinna latissima*, was found to be higher in the fished site than the NTZ. The abundance of Bryozoans between sites was also found to be similar, suggesting potting pressure is unlikely to be impacting upon their abundance. The authors stated a degree of uncertainty must be associated with the survey due to unusually adverse weather conditions which occurred from January to March 2013. This led to the seafloor being scoured within both sites and subsequent reductions in epibiota across both sites. Prior to the spell of adverse weather, video footage gathered by divers' shows very high benthic cover of fauna and flora, which highlights the severity of damage. The extent of which the adverse weather influenced the outcome of the study is unknown.

Table 3. Summary of mean presence (% cover) of taxonomic groups in a no-take zone and fished area in Flamborough Head European Marine Site. Source: Young *et al*. (2013).

Site	Bryozoa	Hydrozoa	Decapoda	Mollusca	Ochrophyta	Rhodophyta
No-take zone	10.11	55.05	11.45	39.10	6.58	45.94
Fished area	13.92	36.79	8.50	29.36	20.37	31.60

Haynes *et al*. (2014) compared a dataset on the abundance of five sponge species (*Axinella dissimilis*, *Axinella infundibuliformis*, *Haliclona oculata*, *Stelligera stuposa* and *Raspailia ramosa*) from the Skomer Marine Nature Reserve collected during the autumn of 2006, 2008 and 2009, to pot density within a 50 m radius to assess the impacts of abrasion from potting. These species were identified as being susceptible to abrasion. Total species abundance and potting density (a proxy for abrasion) were tested and regression analysis revealed no significant relationship between sponge abundance and potting density. Regression analyses were also performed to examine potting density against sponge life strategy and morphotype diversity, as well as *Eucinella verrucosa* abundance (a potential indicator species for abrasion). The results reveal no significant relationship between any of these variables. Analysis of the data for testing and validation however proved inconclusive due to limited availability of suitable environmental and pressure data. The surveys were not designed to test to changes driven by a wide range of anthropogenic pressures and power to detect such changes was not a consideration of the original sampling design, meaning that existing datasets were not well suited for validation.

Stephenson *et al*. (2015; 2016) investigated the long-term impacts of potting on benthic habitats in the Berwickshire and North Northumberland Coast European Marine Site from 2002 to 2012. The study was split into a number of phases.

The first involved frequency analysis of biotopes from previously collected video footage for the purposes of condition monitoring (2002/03 and 2011), provided by Natural England, to examine if any biotope changes had occurred in relation to shellfish potting intensity. Data were extracted from previously collected video monitoring footage, undertaken in three transect corridors throughout the EMS (stratified by depth 0-10m, 10-20m, 20m+), and grouped into biotopes. These biotopes were analysed including the change in number, composition and range, to give an indication of the ecological health of the EMS. Species were recorded to the lowest taxonomic level and biotope classifications were assigned. It was hypothesised temporal changes (between 2002/03 and 2011) were related to shellfish potting intensity. Biotope richness varied slightly between years and transects, however non-significant differences were a result of rare biotopes. Biotope composition was similar between years and transects. Non-significant fluctuations in biotopes between years were attributed to natural variability and by the low frequency occurrence of rare biotopes. Overall, the number and range of biotopes was maintained between the two sampling periods (2002/03 and 2011), with the persistence of a few dominating biotopes; infralittoral kelp and circalittoral faunal and algal crust biotopes. The lack of observed change in biotopes between years meant fishing pressure as a cause of change was not investigated. Conclusions drawn from this analysis are limited due to the broad nature of biotope analysis and low number of sampling years. The methodology used did not allow for changes in abundance, species diversity or species composition of each biotope to be taken into account.

The second phase of the study involved an in depth analysis of video monitoring footage collected in 2002/03 and 2011, including changes in benthic community parameters in relation to potting intensity. Video monitoring footage, used in biotope frequency analysis (first phase of the study), was used to investigate changes in benthic community structure within specific biotopes between years, including taxonomic composition, species diversity and ecologically important species. Data was pooled and change across the whole EMS was explored to examine the effects of potting pressure. A lack of scale on the camera system used prevented collection of abundance data from the footage collected, so species presence/absence was used to describe communities. It was hypothesised that there was a link between biotic changes and potting pressure. This was tested by examining potting pressure effects on changes in benthic community structure of individual biotopes across the EMS between years (2012/03 and 2011). Potting pressure data, was categorised into two levels (low = 0 – 226 and high = 227 – 770 pots / month / km^2). The effect of potting pressure on species presence/absence between years was investigated using a mixed model. Overall, the results indicated no significant changes in species composition of biotopes within the EMS between years. Post-hoc analysis revealed the only biotope to exhibit change in species composition between years and across all transects was ‘faunal and algal crusts on exposed to moderately wave-exposed circalittoral rock’ (CR.MCR.EcCR.FaAlCr), thus indicating little change overall between 2002 and 2011. When incorporating ‘fishing pressure’ into the analysis, the same biotope exhibited an altered species assemblage and a significantly differing species composition between years. The author advised caution should be used during interpretation of results and temporal change is likely during this period, with further investigation recommended to determine specific links with pressures.

There was little evidence to suggest that species richness within biotopes differed between years, with differences only detected in ‘*Laminaria hyperborea* on tide-swept infralittoral mixed substrata’ (IR.MIR.KR.LhypT.Pk), Species richness did not differ in response to fishing pressure however for this biotope (IR.MIR.KR.LhypT.Pk). In three out of ten biotopes, species richness differed between levels of fishing pressure (CR.MCR.EcCr.FaAlCr, CR.MCR.EcCR.FaAlCr.Bri and CR.MCR.EcCR.FaAlCr.Flu (*Flustra foliacea* on slightly scoured silty circalittoral rock)). Greater species richness was reported at low fishing pressures in nine out of ten biotopes when compared higher fishing pressures, although not all differences were significant. The exception to this was the ‘Brittlestars on faunal and algal encrusted exposed to moderately wave-exposed circalittoral rock’ (CR.MCR.EcCR.FaAlCr.Bri) biotope where low species richness suggests in areas of high fishing pressure that the assemblage structure may be affected. Further information however is required and conclusions were deemed as speculative. The results suggest that biotopes most likely to be impacted by fishing pressure are deeper, faunal and algal crusts as opposed to the shallower *Laminaria* biotopes. It does however remain uncertain as to whether fishing pressure is linked to species diversity as no clear pattern in species richness between years at different fishing pressure was observed. The low number of biotopes affected and the limited temporal data do not confirm whether fishing pressure impacts the environment or not. Analysis involving the reduced list of species, chosen in relation to those which can indicate biotope sensitivity to anthropogenic impacts, revealed no changes between years. From this data, it was concluded no deterioration in 'biotope health' from 2002 – 2011 occurred; the state of health of biotopes however could not be concluded. Overall it was concluded that, despite changes in species richness and composition of the biotope FaAlCr between years, there was little evidence of change in species composition or species richness of biotopes between years and it was not fully possible to investigate the role of fishing pressure in relation to community change. Results from this research suggest that on the scale of the EMS, impacts of small scale potting on epibenthic assemblages cannot be detected against the background of natural variability.

The third phase of the study aimed to quantify small scale potting impacts on two subtidal habitat types; 'Faunal and algal crusts on exposed to moderately wave-exposed circalittoral rock' (abbreviated as FaAlCr) and Laminaria hyperborea park with foliose red seaweeds on moderately exposed lower infralittoral rock (abbreviated as Lhyp.Pk) through in-situ experimental fishing using a BACI design (Stephenson *et al*., 2016). Historic intensively (187-265 pots month^{-1} km^{-2}) and lightly (0-139 pots month^{-1} km^{-2}) fished areas were chosen and subject to the same level of experimental potting (equivalent to 10,000 pots month^{-1} km^{-2}). Three sites were selected for each fishing pressure and habitat type. Due to a lack of suitable sites Lhyp.Pk habitat was only sampled for intensively fished areas. Each site consisted of two impact areas (25 x 10 m) and one control area (5 x 10 m). Baseline data was collected by divers using photoquadrats for impact and control sites. Following this, experimental fishing began in impact sites using a single parlour pot attached to a mainline rope, anchored by two weights. Parlour pots were soaked for a minimum of 24 hours and then hauled following local commercial methods. The impact and control areas were then resampled using the same method as the baseline data. Pots were left to soak, hauled and then sampled three times in each site. Benthos from the images collected were identified and recorded and percentage cover analysis was completed. Overall changes in percentage benthos cover were the same between treatments (control and experimental fishing) in both habitats and fishing pressures. Assemblages did not differ between baseline and control treatments for all sites, habitats and fishing pressures, allowing any changes found between baseline and impact treatments and not reflected in controls to be potentially explained by experimental fishing. Whilst significant interactions between baseline and impact treatments were reported, assemblages between control baseline and control impact treatments also differed and no differences were observed between impact and control impact treatments, indicating temporal change in community composition cannot be attributed to potting impacts. Only small differences were reported in overall abundance of different species between treatments in both habitat types. Percentage cover of species did not greatly differ between pre- and post-experimental fishing in impact or control areas, with no pattern in the benthos between treatments consistent with patterns predicted to occur from potting. FaAlCr habitats subject to intensive fishing activity exhibited a greater overall diversity and abundance of large erect species than areas of low fishing intensity showing that there is no evidence community composition differences between areas of different fishing intensity is caused by potting. The lack of short-term direct impacts shown by this study infer long-term direct impacts are unlikely in the habitats examined. The four phase explored pot movement over a 23 day period using novel acoustic telemetry methods (Stephenson *et al*., 2015) (as discussed in section 6.2.1)

Walmsley *et al*. (2015) analysed existing literature and ongoing studies on the impacts of potting on different habitats and features as part of a project funded by the Department for Environment Food and Rural Affairs in order to provide conclusions from evidence on whether potting may compromise the achievement of conservation objectives within European Marine Sites. The review of evidence found limited sources of primary evidence specifically addressing the physical impact of potting. Studies reported no or limited significant impacts from potting on subtidal bedrock reef and subtidal boulder and cobble reef, on brittlestar beds and subtidal mud. Particular evidence gaps were identified include those which relate to certain habitats (specifically maerl, seagrass, mussel beds, subtidal mixed sediments) and pot types (i.e. whelk pots and cuttle traps). Overall, the review of evidence found that most sub-features are unlikely to be of significant concern, particularly at existing potting intensity levels and limited impacts are likely to be undetectable against natural variability and disturbance.

There are a number of ongoing pieces of research into the effects of potting on benthic habitats, including Sarah Gall at the University of Plymouth, Adam Rees who is also at the University of Plymouth, and the Agri-Food and Biosciences Institute (AFBI). The details of the study being completed by Sarah Gall is given in section 6.2.1.

The objectives of the study being conducted by Adam Rees include assessing the level of static gear likely to have a significant impact on benthic communities and mobile organisms associated with reef habitats, assessing how different gear intensities impact populations of target species (brown crab and European lobster) (see section 4.4.3) and to assess whether areas of no fishing can lead to spillover effects into surrounding areas. All of which are based in the Lyme Bay section of the Lyme Bay and Torbay SCI (Rees *et al*., 2016). This will be achieved by manipulating potting intensity across a set number of experimental areas (16 in total). Test areas measure 500 by 500 m and are located on mixed ground or rocky reef to allow for comparison. The four potting intensities being used include no potting, low density (5 to 10 pots), medium density (15 to 25 pots) and high density (30+ pots). Intensity calculations are based on the highest density of pots, which equates to approximately 30 pots per 0.25 km^2 (120 pots per 1 km^2). Based on the assumption pots are hauled three times a week (on average), the highest density of pots equates to 19,000 pot hauls per km^2 per year. Impacts on the benthic communities and mobile species are monitored using underwater video sampling, including baited underwater video for mobile species. Data collection began in the summer of 2013 and the latest results contain information collected during summer 2013 to 2015. Adverse weather experienced during December 2013 to March 2014 interrupted the project with many of the key sessile reef features and associated mobile species being significantly reduced as a result of increased wave action from store events (Figure 7). Most reef areas were of a similar condition and represented a severely naturally disturbed state, likened to towed gear impacts and much more severe that any impacts which may occur as a result of the potting density study. Impacts from the period of adverse weather have removed any evidence of impact that the different levels of potting intensity may have started to show. As such project milestones were pushed back and an extra year was added to the project. Whilst this period of adverse weather served to interrupt the project it provides a unique opportunity to look at recovery under different fishing intensity scenarios.

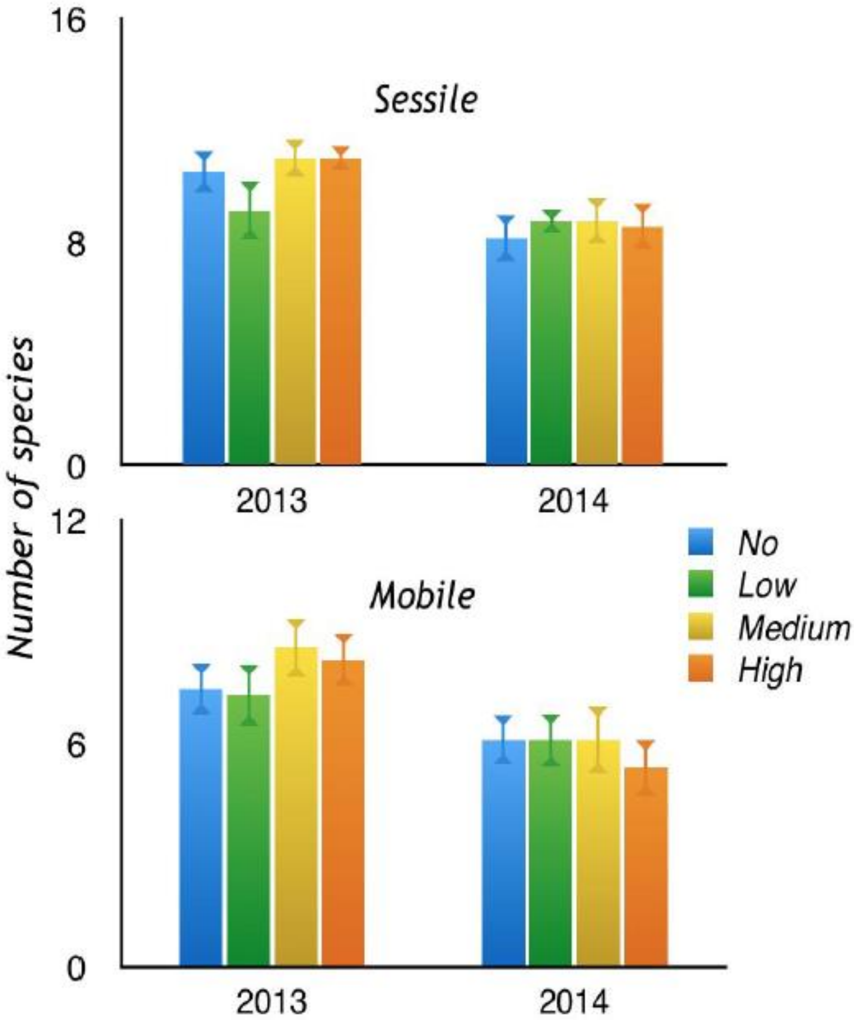

Figure 7. Changes in the number of sessile and mobile species between 2013 and 2014 in Lyme Bay, prior to and after a period of extreme weather (December 2013 to March 2014). Source: Rees, No Date.

Between 2013 and 2014, the overall abundance and species richness of sessile fauna was significant reduced across all potting intensities and in 2015 remained at a consistent level showing no treatment effects. In areas of medium and high potting intensities abundance and species richness were less than 2013 levels. It is important to note that in 2013, prior to the period of adverse weather, both mean abundance and species richness were higher in areas of medium and high gear intensities than no potting and low gear intensities. Decreases in abundance between 2013 and 2014 were mirrored in the following key indicator species and species group; dead man's finger (*Alcyonium digitatum*), Ross coral (*Pentapora fascialis*); the white sea squirt (*Phallusia mammillata*), encrusting species and large bodied erect species. Other species (Pink sea fans (*Eunicella verrucosa)* and the king scallop (*Pecten maximus*) did not exhibit a significant decline. This indicates the Pink sea fan have a tough exoskeleton and as such are more resilient to physical damage. In 2015, *P. mammillata*, a relatively fast growing species, had recovered significantly across all treatments exhibiting no treatment effect, whilst the slower growing *P. fascialis* only increased significantly in areas of no potting (similar to 2013 levels) when compared to other potting intensities. It is important to note however in areas of other potting intensity, some level of recovery was also observed. This indicates *P. fascialis* benefitted from a period of no potting, particularly in relation to its recovery. This is to be confirmed by 2016 results. Statistically, other species did not exhibit any signs of recovery but remained at a consistent level across all potting intensities.

Mobile fauna abundance and species richness declined across all treatments between 2013 and 2014 and between 2014 and 2015 increased in all treatments. Such declines may be associated with the removal of sessile reef species. Significant treatment effects were reported in areas of no potting and medium intensity potting, with higher abundances reported in both. Grouped large fish declined in all treatments (except no potting) between 2013 and 2014, remaining at similar levels in 2015 with no sign of recovery; perhaps caused by removal of key reef species which are still recovering.

The study being completed by Agri-Food and Biosciences Institute is assessing the impacts of potting on different SAC features in Northern Ireland. These include rocky reefs with sponges, *Modiolus* beds, maerl and sandbanks. The project is combining ecological data with other data sources such as fishing pressure, allowing experimental work to be extrapolated to what is occurring at a fishery scale. The project has also focused on the experimental deployment of pots with cameras and accelerometers with associated faunal analysis. Although the research is still in progress, preliminary results indicate a lack of effect on the habitats mentioned above.

4.4.3 *Removal of target species*

Fishing leads to the removal of certain species from an ecosystem. More specifically, potting principally targets edible crab, European lobster, annd whelk, alongside other species which may be favourably retained including the velvet swimming crab. Edible crab, European lobster, whelks and velvet swimming crab are subject to minimum landing sizes and so are only removed above a certain size. Removing top predators, such as lobsters or large edible crabs, may lead to indirect destabilizing effects on the ecosystem as a result of alterations to food web interactions (Eno *et al*., 2001; Stephenson *et al*., 2016). There is a strong interaction between crustacean target species and other non-target species, thus any removal is likely to impact on the structure of benthic communities (Stephenson *et al*., 2016). Literature on the ecological effects of selective extraction of target species is relatively limited and little studied as a result of the long timescales needed for such studies (Stephenson *et al*., 2016). The following studies however may give some insight as to the ecological impacts of removing target species through potting.

A study by Hoskin *et al*. (2011) explored ecological effects of removing the top down pressure of potting on target species (edible crab, European lobster, velvet swimming crab), by examining changes in their populations under different fishing scenarios. These included a no-take zone (NTZ) in an area adjacent to Lundy Island which were compared with areas (proximal and distant locations) subject to an experimental potting program (using 240 pots in total) over a four year period (2004-2007). Rapid and large increases in the abundance and size of legal-sized lobsters (*Homarus gammarus*) occurred within the NTZ and there was evidence of spillover of sublegal lobsters into adjacent areas. Legal-sized lobsters were observed to exhibit an effect of the NTZ within 18 months of its designation. Between 2004 and 2007, mean abundance within the NTZ increased by 127%, four years after being designated as a NTZ, whilst abundances in the proximal and distinct location did not change significantly. This equated to legal-sized lobsters being 5 times more abundant in the NTZ than other locations. Sublegal lobsters increased by 97% within the NTZ and by 140% in proximal locations. Over the four year period, the mean size of legal-sized lobsters in the NTZ increased by 5.2%, whilst mean sizes in the proximal and distant locations declined by 2.8% and 2.1% respectively. Small but significant increases of 25% were observed in the size of brown crab (*Cancer pagurus*), but no apparent effects were seen in abundance. Declines of 65% in the abundance of velvet swimming crab (*Necora puber*) were also observed within the NTZ, potentially owing to predation and/or predation from lobsters.

A study by Rees *et al*. (2016) is currently assessing how different gear intensities impact populations of target species (brown crab and European lobster) and has also begun to assess whether areas of no fishing can lead to spillover effects into surrounding areas. A quantitative experimental potting survey is being used to sample and collect data on target species populations from each experimental area on a quarterly basis and potential spillover effects are being assessed using no potting control areas inside treatment areas. Spillover effects will be quantified by using pots deployed within a 10 metre zone surrounding each experimental area. Data collection for spillover effects only began in summer 2016 and as such no analysis has yet been completed. Abundance, carapace width and total wet weight were used a response variables for target species. Data collected in the summer months of 2013 to 2015 was used to assess how different gear intensities may impact target species populations. Brown crab showed a relative reduction in abundance between 2013 and 2014 although abundance and appeared to be variable between year and treatment. This was mirrored in mean carapace width and mean weight, with both reducing significantly across all treatments between 2013 and 2014 but increasing (although not significantly) in 2015. European lobster exhibited a contrasting trend to brown crab, with mean abundance increasing significantly between 2013 and 2014 in all treatments except for high potting intensities (which was significant higher than other treatments in 2013). Between 2014 and 2015, mean abundance significantly increased in areas of no potting, becoming significantly higher than abundances in areas of high potting intensity. Mean abundance remained constant between 2013 and 2015 in high intensity areas. A lack of increase between years, as seen in other treatments, may suggest a negative impact of high intensity areas. Mean weight and carapace length significantly decreased across all treatments and between 2013 and 2014 and did not increase in 2015. These patterns in mean carapace length and weight are largely driven by changes in 'undersized' lobsters (i.e. those below the minimum landing size of 87 mm carapace length), who's abundance was significantly higher between 2013 and 2014 in low potting intensity areas and significantly greater than in other treatments. Mean abundances of under sized lobster were significantly greater in no potting and low intensity areas in 2015 when compared to medium and high intensity areas.

A study by Babcock *et al*. (1999) based in New Zealand investigated whether changes in protected predators, in 'no take' marine reserves, resulted in indirect changes to grazers and subsequently algal abundances. Abundances of spiny lobster (*Jasus edwardsii*) were approximately 1.6 to 3.7 times greater inside reserves than outside reserves. The mean carapace length of spiny lobsters was also greater inside reserves, with a mean carapace length of 109.9 mm compared with 93.5 m outside the reserves. Similar trends were displayed by the demersal predatory fish *Pagrus auratus*. Densities of the sea urchin, *Evechinus chloroticus* however declined from 4.9 to 1.4 m^{-2} and as a result kelp forests become more extensive inside of the reserves (due to a lack of grazing action). This led to a lack of dominance of urchin-dominated barrens, occupying only 14% of available reef substratum inside of reserves, as opposed to 40% outside of reserves. Authors speculated higher predation upon sea urchins inside reserves by enhanced populations of lobsters and predatory fish, led to observed changes in community structure i.e. significantly lower proportional cover of urchin-grazed rock flat habitats and increases in macroalgal cover.

Siddon and Witman (2004) examined the indirect effects of changes in predator behaviour (prey switching) in a shallow subtidal food web off the Isles of Shoals, Maine in the USA. Crab (*Cancer* *borealis*) predation on sea urchins (*Strongylocentrous droebachiensis*) was investigated in three habitats (*Codium* fragile algal beds, barrens, and mussel beds); representing different combinations of food and shelter. The lobster (*Homarus americanus*) was also added to the experiment to investigate multiple predator effects. In areas lacking alternate prey species, urchin mortality rates were high, whereas in mussel beds (which represent an alternate food source) crab predation on sea urchins was functionally eliminated. In areas of high urchin mortality, crabs had a positive indirect effect the introduced ascidian *Diplosoma* sp. The foraging effectiveness of crabs was dampened by the introduction of lobsters, leading to a predation risk reduction for urchins. This reduction is attributed to the modification of crab behaviour by lobsters as no direct trophic linkage exists between the two species. The presence of mussels reduced the interaction strength between crab and lobsters on urchins. The authors concluded that crab and lobster are strong interactors and the inclusion of a secondary predator species help to dampen or stabilize community structure. In the Maine fishery, American lobster comprises the majority of commercial landings, follows by sea urchins and crab, which comprises a minor fishery. This is likely to lead to increases in widespread crab predation of sea urchins and indirect increases in *Diplosoma*.

Wootton *et al*. (2015) investigated the potential ecological effects of removing certain target species through potting and trapping around the British coast. The results of this analysis are summarised below for each species:

<u>Edible/Brown crab – *Cancer pagurus*</u>
In the UK there are a large number of brachyuran crab species (50-60), including *C. pagurus*. These species are thought to have very similar diets and behaviour and because of this are likely to belong to a large functional group of species. As a consequence, the removal or large reduction in abundance of *C. pagurus* is unlikely to significantly modify any existing top-down control exerted by the species and negatively impact on ecosystem function and stability. Additionally, *C. pagurus* is not considered a keystone species and this means the probability of detrimental trophic cascades and phase shifts is low if the species were removal. The only concern is the removal of large *C. pagurus*, as they constitute apex predators in some ecosystems, particularly subtidally. Larger individuals belong to a smaller ‘functional group’ together with the European lobster. The potential for ecological perturbations may occur if the European lobster, which belongs to the same small ‘functional group’ is unable to fill the vacant apex predator niche and functional role.

<u>European lobster – *Homarus gammarus*</u>
It is unfeasible to determine the impact of *H. gammarus* removal on ecosystem structure, function and stability as a result of the ‘sliding baseline’ phenomenon. It is known however that when *H. gammarus* is freed from commercial exploitation the population is able to rapidly expand at the expense of other species (*C. pagurus* and *Necora puber*), whose populations’ contract. Lower *H. gammarus* populations may therefore increase biodiversity, maintain ecosystem function ad stability and minimise the risk of deleterious trophic cascades.

<u>Velvet swimming crab – *Necora puber*</u>
N. puber fulfils functional roles similar to that of other decapod crustaceans with respect to ecosystem structure, function and stability. There is no documented evidence of *N. puber* fulfilling a unique role in ecosystem function and stability and it is likely that another decapod crustacean such as *Carcinus maenas* would be able to fill the ecological niche of the species if it were removed or reduced in abundance. This means that any adverse effects on top-down and bottom-up regulation, community structuring, ecosystem connectivity and energy flow within ecosystem are likely to be nullified.

<u>Whelk – *Buccinum undatum*</u>
B. undatum belongs to a large functional group of species with regards to ecosystem function and structure, with numerous crustaceans, echinoderms and fish species fulfilling a similar scavenging and predatory role. Such species could easily fill the ecological niche of *B. undatum* if the species

was removed within an ecosystem. A limiting factor in determining this species role however is the lack of research into its general biology and ecology.

<u>Cuttlefish – *Sepia officinalis*</u>
The short-lived nature of *S. officinalis* means that it is susceptible to large interannual fluctuations in abundance, the knock on effects of which on ecosystem function and stability have not been documented. It is likely the species belongs to large functional group of organisms and thus if the species diminished the potential for any detrimental effects to ecological system function and structure are likely to be offset. A limiting factor in determining this species role however is the lack of research into its general biology and ecology.

4.4.4 Sensitivity

4.4.4.1 Sensitive species

A number of studies used indicator species, perceived to be sensitive to potting, to detect change as a result of potting impacts, whilst others use community assemblage (Young *et al*., 2013). Such species are often sessile and are diverse and abundant in rocky reef habitats, where crab and lobster potting commonly takes place. Epifauna on subtidal rock include erect and branching species which can be characterised by slow growth and as such are vulnerable to physical disturbance (Roberts *et al*., 2010). There is a risk that static gear could cause cumulative damage to such species, with some being more resilient to the effects of fishing than others, and the recovery of more vulnerable species from such impacts likely to be slow (Roberts *et al*., 2010; JNCC & NE, 2011). The ability of fauna to resist impacts of static gear will depend on the species and degree of impact will depend on intensity and duration (Roberts *et al*., 2010). Recovery of species will depend on the life-history characteristic of species affected, including the ability to repair or regenerate damaged parts and the ability of larvae to recolonise the habitat (Roberts *et al*., 2010). Typical species include axinellid sponges, pink sea fan (*Eunicella verrucosa*) and Ross coral (*Pentapora foliacea*) (Roberts *et al*., 2010). Other potential vulnerable species in the North East Atlantic include dead men's fingers (*Alcyonium digitatum*) and various erect branching sponges (e.g. *Axinella* spp., *Raspalia* spp.) (Coleman *et al*., 2013).

MacDonald *et al*. (1996) assessed the fragility and recovery potential of different benthic species to determine their sensitivity to fishing disturbance. Recovery represents the time taken for a species to recover in a disturbed area and fragility represents the inability of an individual or colony of the species to withstand physical impacts from fishing gear. Recovery was scored on a scale of 1 to 4 (1 – short, 2 – moderate, 3 – long and 4 – very long) and fragility was scored on a scale of 1 to 3 (1 – not very fragile, 2 – moderately fragile and 3 – very fragile). The scores assigned to potentially vulnerable species in the Poole Rocks MCZ are provided in table 4. The table also includes sensitivity information assigned by MarLIN in relation to physical disturbance and abrasion. Please note that the sensitivity ratings assigned by MarLIN are based on a single dredging event, the force of which is likely to be greater in magnitude than the impacts caused by potting. Also note this is not an exhaustive list of potentially vulnerable species, these were selected based on those listed by MacDonald *et al*. (1996) on rocky ground and which also occur within the Poole Rocks MCZ (as per the post-survey site report and recent Seasearch Site Surveys (2014&2015)).

Table 4. Likely sensitivity of species (representative of sensitive designated features: moderate energy circalittoral rock) to disturbance caused by an encounter with fishing gear on rocky ground scored by MacDonald *et al*. (1996) and MarLIN (in relation to physical disturbance and abrasion). Low intensity gears include pots, gill nets and longlines. Fragility is derived from personal knowledge of species structure and recovery values were derived from a review of literature on life-histories of the species. Source: MacDonald *et al*. (1996) and www.marlin.ac.uk/).

		MacDonald *et al.* (1996)			**MarLIN**		
Species	**Common name**	**Fragility**	**Recovery**	**Sensitivity (for low intensity gears)**	**Intolerance**	**Recoverability**	**Sensitivity**
Pentapora foliacea	Ross coral	3	2	16	High	Moderate	Moderate
Flustra foliacea	Hornwrack	2	2	11	Intermediate	High	Low
Cliona celata (massive)	A boring sponge	2	2	11	-	-	-
Alcyonium digitatum	Dead man's fingers	1	2	5	Intermediate	High	Low
*Tubularia indivisal**	Oaten pipes hydroid	3	1	8	-	-	-
*Halichondria panacea**	Breadcrumb sponge	1	1	3	-	-	-

* These species were not recorded within the Poole Rocks MCZ during Seasearch surveys (2014& 2015) or post-survey site report. These species are however listed as characteristic of the 'Dense foliose seaweeds on silty moderately exposed infralittoral rock' biotope which was assigned to patch reefs within the Poole Rocks MCZ (Seasearch, 2015).

4.4.2.1 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).

Tillin *et al*. (2010) developed a pressure-feature sensitivity matrix, which in effect is a risk assessment of the compatibility of specific pressure levels and different features of marine protected areas. The approach used considered the resistance (tolerance) and resilience (recovery) of a feature in order to assess its sensitivity to relevant pressures (Tillin *et al*., 2010). Where features have been identified as moderately or highly sensitive to benchmark pressure levels, management measures may be needed to support achievement of conservation objectives in situations where activities are likely to exert comparable levels of pressure (Tillin *et al*., 2010). In the context of this assessment, the relevant pressures likely to be exerted are surface abrasion, removal of non-target species and removal of target species. The sensitivity of moderate energy circalittoral rock to relevant pressures appears to range. The feature is least sensitive to removal of target species and most sensitive to removal of non-target species, whilst experiencing low to high sensitivity to surface abrasion (Table 5).

Hall *et al*. 2008 aimed to assess the sensitivity of benthic habitats to fishing activities. A matrix approach was used, composed of fishing activities and marine habitat types and for each fishing activity sensitivity was scored for four levels of activity (Hall *et al*., 2008). The matrix was completed using a mixture of scientific literature and expert judgement (Hall *et al*., 2008). The type of fishing activity chosen was 'static gear – pots' as this best encompassed the fishing activities under consideration. Both habitat types had low sensitivity to a single pass of the activity. As expected, rock with erect and branching species exhibited the greatest sensitivity, whilst rock with low-lying fast growing faunal turf exhibited low sensitivity to all gear intensities except for heavy gear intensity (Table 6).

Table 5. Sensitivity of moderate energy circalittoral rock to pressures identified by Tillin *et al*. (2010). Confidence of sensitivity assessment is included in brackets.

	Pressure		
Feature	Surface abrasion: damage to seabed surface features	Removal of non-target species	Removal of target species
Moderate energy circalittoral rock	Low to High (Low)	Medium to High (Medium)	Not Sensitive to Medium (High)

Table 6. Sensitivity of relevant features to different intensities (high, medium, low, single pass) of static gear (fishing activities which anchor to the seabed) as identified by Hall *et al*. (2008).

Gear Type	**Habitat Type**	**Gear Intensity***			
		Heavy	Moderate	Light	Single pass
Static gear - pots	**Rock with erect and branching species**	High	Medium	Medium	Low
	Rock with low-lying fast growing faunal turf	Medium	Low	Low	Low

* **Heavy** – Lifted daily, more than 5 pots per hectare (i.e. 100m by 100m), **Moderate** – Lifted daily, 2-4 pots per hectare, **Light** – Lifted daily, less than 2 pots per hectare, **Single** – Single accidental fishing event of a string

4.5 Existing Management Measures

- **Vessel Used in Fishing** byelaw – prohibits commercial fishing vessels over 12 metres from the Southern IFCA district. The reduction in vessel size also restricts the type of gear that can be used, with vessels often using lighter towed gear and restricted to carry less static gear.

- **Voluntary Escape Gap Scheme** – Southern IFCA commenced the voluntary scheme in July 2014 through the purchase of 500 escape gaps (87 x 45 mm) which were subsequently distributed to fishermen throughout the district. A further 500 escape gaps were purchased and are still in the process of being distributed. The aim of the trial scheme was to promote the use of escape gaps in crab and lobster pots and encourage their use on a voluntary basis.

- **Protection of Berried (Egg Bearing) Lobsters Byelaw** – prohibits the removal of any berried lobster of the species *Homarus gammarus* with any berried lobsters caught to be returned immediately to the sea as near as possible from where it was taken.

- **Lobsters and Crawfish (Prohibition of Fishing and Landing) Order 2000 No. 874** – national legislation which prohibits the landings of any mutilated lobster or crawfish or any lobster or crawfish bearing a V notch.

- Other regulations include minimum sizes as dictated by European legislation. European minimum sizes, listed under Council Regulation (EEC) 850/98 specify the minimum size for European lobster is 87 mm (carapace length), 140 mm for edible crab (carapace width) and 45 mm for whelks (shell length).

4.7 Site Condition

Natural England provides information on the condition of designated sites and describes the status of interest features. Under the Habitats Directive, relevant for SACs and SCIs, the UK is obliged to report on the Favourable Condition Status of Annex I and Annex II features every 6 years. Similar reporting requirements under the Birds Directive are required for SPAs. Under the Marine and Coastal Access Act there is a need to assess the achievement of conservation objectives for MCZs. Alongside these national reporting requirements is the need to provide a current view of feature condition within protected sites is crucial to underpin advice on site management and casework.

During 2015/16 Natural England reviewed, refined and tested the condition assessment methodology. This methodology will be used to start a rolling programme of marine feature condition assessments in 2016/17. As such, the feature condition of Pink sea-fans and high energy infralittoral rock is currently not assessed.[6]

Where there is no evidence to determine a marine feature's condition, a vulnerability assessment, which includes sensitivity and exposure information for features and activities in a site, has been used as a proxy for condition[7].

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6 https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UKMCZ0014&SiteName=poole%20rock&countyCode=&responsiblePerson=

7 https://designatedsites.naturalengland.org.uk/Marine/SupAdvice.aspx?SiteCode=UKMCZ0014&SiteNameDisplay=Poole+Rocks+MCZ

4.6 Table 7. Assessment of potting pressures upon moderate energy circalittoral rock

Feature	Attribute	Target	Potential pressure(s) and Associated Impacts	Likelihood of Impacts Occurring/Level of Exposure to Pressure	Mitigation measures
Moderate energy circalittoral rock	Distribution: presence and spatial distribution of circalittoral rock communities	Maintain the presence and spatial distribution of circalittoral rock communities	Abrasion/disturbance of the substrate on the surface of the seabed and removal of non-target species were identified as potential pressures. Benthic communities can be directly impacted by potting through crushing, entanglement or removal when gear is being deployed, hauled or under the influenced of currents or waves which can involve lateral damage. Erect and branching specie, are often characterised slow growth and are therefore considered particularly vulnerable to physical damage. There is a relative paucity of scientific evidence on the impacts of potting on	Under ten commercially licensed vessels use mixed potting methods (whelk, cuttlefish, crustaceans) within the Poole Rocks MCZ. The number of pots within the area is unknown, however it is believed to be of light to moderate intensity, although definitions of gear intensity largely varies between studies (see Annex 5). The number of pots worked by each vessel and the number of pots in a string can largely vary and is often related to vessel size. Parlour pots, targeting crustaceans, are deployed all year, whelk pots are predominantly deployed during winter and spring and potting for cuttlefish occurs during a short season between April and June.	Vessel Used in Fishing byelaw prohibits commercial fishing vessels over 12 metres from the Southern IFCA district. The reduction in vessel size also restricts the level of pots that can be worked.

			benthic communities when compared with mobile gear. Existing literature however infers that impacts on potting on temperature rocky habitats are negligible or limited in extent, especially when compared to impacts resulting from adverse weather conditions (i.e. Eno *et al*., 2001; Shester & Micheli, 2011; Coleman *et al*., 2013; Young *et al*., 2013; Haynes *et al*., 2014; Stephenson *et al*., 2015;16; Rees *et al*., 2016). Preliminary results from ongoing studies are also in agreement (Sarah Gall, Adam Rees, AFBI).	Colocation of sightings data and feature mapping reveal potting activities (crab and lobster & whelk) occur in areas surrounding or adjacent to circalittoral rock. The nature of the moderate energy circalittoral rock feature consists of numerous rocky outcrops within the sediment dominated area of Poole Bay. Based on this, it unlikely the activity will occur directly over these rocky outcrops but in areas surrounding the feature, thus limiting the possibility of direct interaction. Existing scientific literature and ongoing studies suggest that impacts of potting on benthic communities are negligible or limited in extent. Damage to benthic habitats caused by adverse weather conditions in Lyme Bay have been reported to be far in excess of that expected to be caused by potting impacts (Rees, no date).	
	Structure/function: presence and	[Maintain OR Recover OR	Abrasion/disturbance of the substrate on the	Under ten commercially licensed vessels use mixed	Vessel Used in Fishing byelaw

	abundance of key structural and influential species	Restore] the abundance of listed species*, to enable each of them to be a viable component of the habitat.	surface of the seabed and removal of non-target species are addressed above. The removal of target species was identified as a potential pressure (and is not addressed above). Recent Seasearch surveys (2014 & 2015) recorded the presence of edible crab, European lobster and common whelk. All these species are targeted through potting which will lead to the removal of individuals above the minimum landing size. Such removal may lead to ecological effects on the structure and functioning of benthic communities. The ecological effects of removing fishing pressure were studied in the Lundy Island Marine Reserve (Hoskin *et al*., 2011). Populations of European lobster expanded at the expensive of other crustacean species (edible	potting methods (whelk, cuttlefish, crustaceans) within the Poole Rocks MCZ. The number of pots within the area is unknown, however it is believed to be of light to moderate intensity, although definitions of gear intensity largely varies between studies (see Annex 5). The number of pots worked by each vessel and the number of pots in a string can largely vary and is often related to vessel size. Parlour pots, targeting crustaceans, are deployed all year, whelk pots are predominantly deployed during winter and spring and potting for cuttlefish occurs during a short season between April and June. The relatively high selectivity of pots results in low incidental bycatch and retained undersized lobsters, crabs or whelks are returned to the sea. The selectivity of pots is improved through the use of escape gaps, whose use is encouraged through a voluntary scheme in the	prohibits commercial fishing vessels over 12 metres from the Southern IFCA district. The reduction in vessel size also restricts the level of pots that can be worked. Voluntary Escape Gap Scheme run by Southern IFCA aims to promote the use of escape gaps (87 x 45 mm) and encourage their use on a voluntary basis. Escape gaps used in crab and lobster pots and are designed to release undersized individuals (those below the minimum landing size) from pots at the seabed, thus reducing mortality and chance of appendage loss. Protection of Berried (Egg Bearing) Lobsters byelaw, prohibits the removal

			crab and velvet swimming crab). Rees *et al*. (2016) is currently undertaking a study looking at the effect of different gear intensities on target species population in the Lyme Bay portion of the Lyme Bay and Torbay SCI. The work was interrupted by a period of adverse weather during the winter of 2013/14. Preliminary results (for 3 out of the 4 years) show variable abundances of brown crab between year (2013 to 2015) and gear intensities, decreasing during the period of adverse weather. European lobster abundance on the other hand increased significantly after 2013 in areas of no potting, low and medium gear intensities, whilst remaining constant in high intensity areas. This was largely driven by undersized lobsters. Indications from the results may suggest a	Southern IFCA district. Colocation of sightings data and feature mapping reveal potting activities (crab and lobster & whelk) occur in areas surrounding or adjacent to circalittoral rock. The nature of the moderate energy circalittoral rock feature consists of numerous rocky outcrops within the sediment dominated area of Poole Bay. Based on this, it unlikely the activity will occur directly over these rocky outcrops but in areas surrounding the feature, thus limiting the possibility of direct interaction. Studies looking into the likely impacts of the selective extraction of the target species conclude limited potential for adverse ecological effects.	of any berried lobster (regardless of size) and requires they are returned immediately to the sea as near as possible from where they were taken. This byelaw helps to safeguard future European lobster populations, especially through the protection of larger berried females (above the minimum landing size) who are more fecund. Minimum sizes are dictated by European legislation and specify the minimum size for European lobster is 87 mm (carapace length), 65 mm for velvet swimming crab (carapace width), 140 mm for edible crab (carapace width) and 45 mm for

			negative impact of high intensity areas on lobster abundances. Potential ecological effects of removing target species were investigated by Wootton *et al*. (2015). Based on information known on the expansion of European lobster populations (as described above), controlled populations (i.e. through commercial exploitation) may reduce the chance of adverse ecological effects. The edible crab, velvet swimming crab, whelk and cuttlefish were all reported to belong to large functional groups and therefore if the species diminishes any potential negative adverse effects on ecosystem function and structure are likely to be negated as another species could easily fill the ecological niche left. The other concern which potential arose was the removal of large edible crabs as they constitute apex predators, alongside		whelks (shell length).

			the European lobster. The potential for ecological perturbations may occur if the European lobster was unable to fill the niche left by the removal of large edible crabs.		
	Structure: species composition of component communities	Maintain the species composition of component communities.	Addressed above.	Addressed above.	Addressed above.

5. Conclusion

Research into the impacts on benthic habitats has shown there is a relative paucity of scientific evidence when compared with the impacts of mobile gear. The number of studies completed in recent years on the impacts of potting in rocky habitats has however increased and additional studies are ongoing in order to address this evidence gap. Existing literature (i.e. Eno *et al*., 2001; Shester & Micheli, 2011; Coleman *et al*., 2013; Young *et al*., 2013; Haynes *et al*., 2014; Stephenson *et al*., 2015; 2016) and preliminary results from ongoing studies (Sarah Gall, Adam Rees, AFBI) infer the impacts of potting on temperate rocky habitats are negligible or limited in extent, especially when compared to impacts resulting from periods of adverse weather (Young *et al*., 2013; Rees, no date). Periods of extreme weather over the course of a study have compounded results and introduced a degree of uncertainty (Young *et al*., 2013; Rees, no date). A study by Young *et al*. (2013), based in Flamborough Head EMS, reported a higher abundance of benthic taxa in non-fished sites when compared to fished sites, however the authors stated a degree of uncertainty must be associated with the survey results due to unusually adverse weather which scoured both sites and led to reductions in epibiota across both sites.

Potting in Poole Rocks MCZ is a year round fishery occurring on a regular basis and undertaken by less than ten commercially licensed vessels, all 10 metres in length or less. Combining sightings data and feature mapping data (provided by Natural England), revealed that both potting activities occur predominantly in areas surrounding or adjacent to circalittoral rock (defined as infralittoral in the post-survey site report). The nature of the moderate energy circalittoral rock feature within Poole Rocks MCZ consists of numerous rocky outcrops within the sediment dominated area of Poole Bay. Based on this, it was considered the activity is unlikely to occur directly over the feature but in areas surrounding the feature, thus limiting the possibility of direct interaction.

Having reviewed a wide range of evidence, including scientific literature, sightings data and feature mapping, it has been concluded that potting for crab and lobster, whelks and cuttlefish, is unlikely to have a significant impact on the moderate energy circalittoral rock feature in the Poole Rocks MCZ. This is based on the level of fishing activity, considered to be light to moderate, moderate number of vessels partaking in the fishery and limited potential for interaction, in combination with the lack of scientific evidence to suggest potting is likely to have a significant adverse impact on reef features.

It is Southern IFCA's duty as the competent and relevant authority to manage damaging activities that may impact the achievement of a designated features general management approach, lead to deterioration of the site or hinder the conservation objectives of the site. The light to moderate levels of fishing activity, limited area for interaction (of static gear) with reef features and severe lack of scientific evidence to suggest that potting has an adverse effect on reef habitats is such that it is not believed to hinder the achievement of the designated feature general management approach and that it is compatible with the sites conservation objectives.

A change in the status of the fishery is unforeseen, however it is recognised that the status of the fishery may change (i.e. gear enhancements, increase in fishing effort). Southern IFCA will continue to monitor fishing effort through sightings data and any information on gear enhancement from IFCOs. The need for assessments will be reviewed should new evidence relevant to this gear/feature interaction become available.

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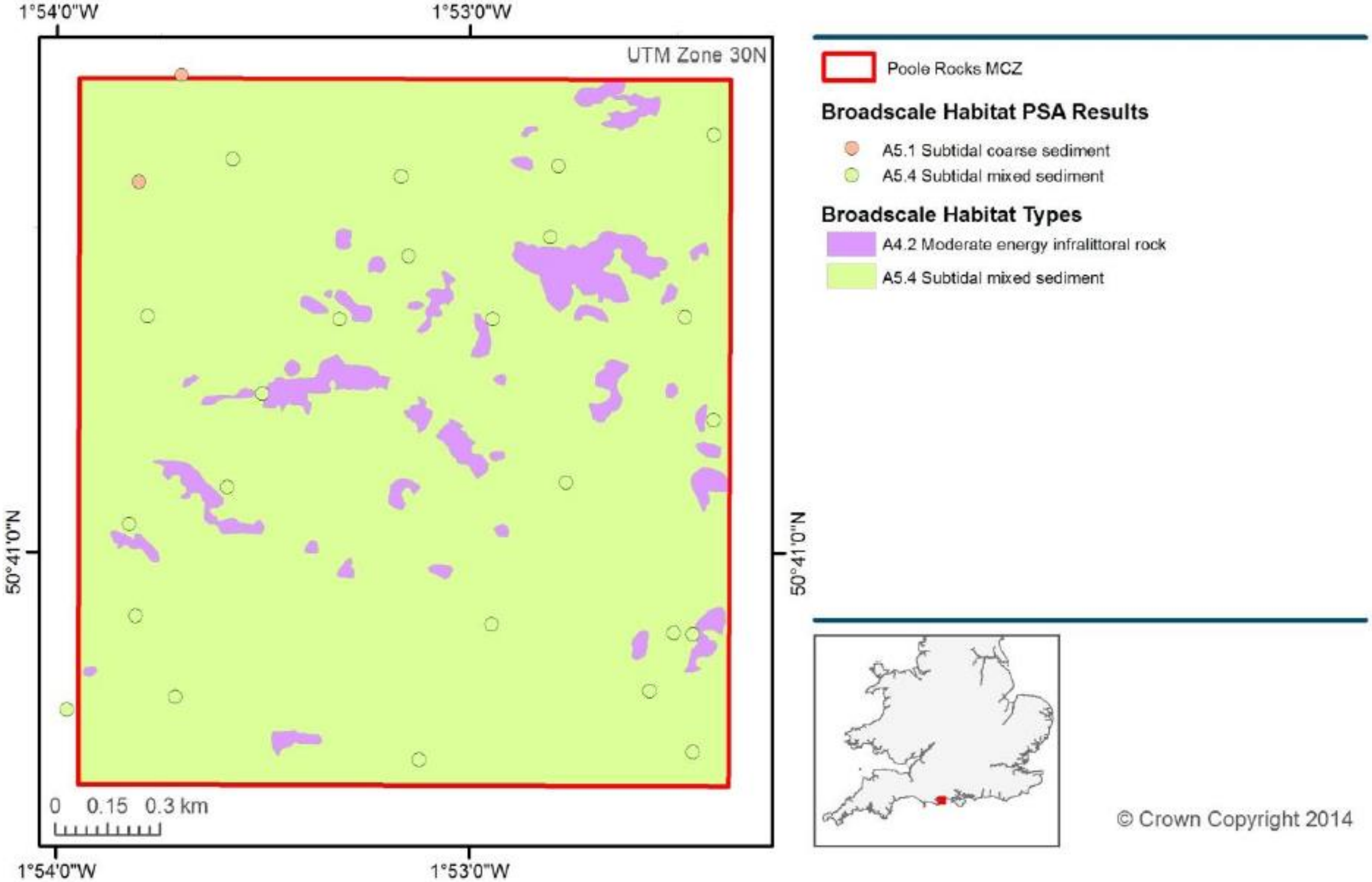
Annex 1. Broadscale Habitat Map for Poole Rocks MCZ. Source: Poole Rocks MCZ Post-survey Site Report 2015.



 SIFCA Reference: SIFCA/MCZ/02/002

Annex 2. Initial screening of commercial fishing activities which take place in the Poole Rocks MCZ.

Broad Gear Type (for assessment)	Aggregated Gear Type (EMS Matrix)	Fishing gear type	Does it Occur?	Details	Sources of Information	Potential For Activity Occur/ Is the activity anticipated to occur?	Justification	Suitable for Part A Assessment?	Priority
Bottom towed fishing gear	**Towed (demersal)**	Beam trawl (whitefish)	N		Local IFCO	**Y**	**One vessel known to previously (up until 2013) fish on the fringes of site. This indicates the fringes of the site may be suitable for trawling.**	Y	High
		Beam trawl (shrimp)	N		Local IFCO	**N**	**Target species does not occur within the site.**	N	
		Beam trawl (pulse/wing)	N		Local IFCO	**N**	**This activity is prohibited by 'Electric Current' byelaw.**	N	
		Heavy otter trawl	N		Local IFCO	**N**	**There is a limited potential for the activity to occur as vessels are restricted in length to 12 m or less (as per the Southern IFCA byelaw) and therefore have limited capacity to deploy a heavy otter trawl. In addition, the activity does not take place within the site or surrounding area of Poole Bay and has not historically done so. It is therefore not anticipated to take place in the**	N	

							future.		
		Multi-rig trawls	N		Local IFCO	**N**	**There is limited potential for the activity to occur as vessels are restricted in length to 12 m or less (as per the Southern IFCA byelaw) and are therefore limited by size and probably power necessary for a multi-rig set up. In addition, the activity does not take place within the site or surrounding area of Poole Bay and has not historically done so. It is therefore not anticipated to take place in the future.**	N	
		Light otter trawl	N		Local IFCO	**Y**	**Up to five vessels operate within the surrounding area of Poole Bay. It is therefore likely that there may be suitable trawl grounds within areas of the site.**	Y	High
		Pair trawl	N		Local IFCO	**N**	**The activity is not anticipated to occur within the site or within the surrounding area of Poole Bay as the activity has not taken place within the district for the past 30 years.**	N	

		Anchor seine	N		Local IFCO	**N**	**Gear type has not been historically used within the area and is not anticipated to occur. Large vessels are also required for this type of gear type and vessels over 12 m in length are prohibited from fishing within the Southern IFCA district (as per the Southern IFCA byelaw).**	N	
		Scottish/fly seine	N		Local IFCO	**N**	**Gear type has not been historically used within the area and is not anticipated to occur. Large vessels are also required for this type of gear type and vessels over 12 m in length are prohibited from fishing within the Southern IFCA district (as per the Southern IFCA byelaw).**	N	
Pelagic towed fishing gear	**Towed (pelagic)**	Mid-water trawl (single)	N		Local IFCO	**N**	**Activity has the potential to occur however this gear type does not come into contact with the seabed and therefore there is no chance for interaction with designated features.**	N	
		Mid-water trawl (pair)	N		Local IFCO	**N**	**Activity has the potential to occur however this gear type does not come into contact with the seabed and therefore there is no**	N	

							chance for interaction with designated features.		
		Industrial trawls	N		Local IFCO	**N**	**Activity is not able to occur due to the size of vessels required. Vessels over 12 m are prohibited from fishing within the Southern IFCA district (as per the Southern IFCA byelaw).**	N	
Bottom towed fishing gear	**Dredges (towed)**	Scallops	N		Local IFCO	**N**	**The target species of the activity does not occur in commercially viable population size within the site. The activity is therefore not anticipated to occur.**	N	
		Mussels, clams, oysters	N		Local IFCO	**Y**	**Native oysters were historically fished for within Poole Bay approximately ten years ago. This indicates the area surrounding the site is able to support viable populations of the Native oyster and therefore could be subject to future oyster dredging. Dredging for mussels and clams in Poole Bay has not historically occurred. Mussels and clams do either not occur within the site or do not occur in commercially viable populations. It is therefore anticipated**	Y	High

							that dredging for mussels and clams will not take place in the future.		
		Pump scoop (cockles, clams)	N		Local IFCO	**N**	**Activity is not able to occur due to the nature of the site which is too deep, in addition to the incompatible nature of the substrate (circalittoral rock; subtidal mixed sediment) with the gear type considered. It is therefore anticipated that pump scoop dredging will not take place in the future.**	N	
Suction	**Dredges (other)**	Suction (cockles...)	N		Local IFCO	**N**	**Suction dredging for cockles, clams, mussels and oysters is prohibited (by default) in the Southern IFCA district (by Southern IFCA byelaws).**	N	
Tractor		Tractor	N		Local IFCO	**N**	**The activity is unable to take place as site is subtidal in nature.**	N	
Intertidal work	**Intertidal handwork**	Hand working (access from vessel)	N		Local IFCO	**N**	**The activity is unable to take place as site is subtidal in nature.**	N	
		Hand work (access from land)	N		Local IFCO	**N**	**The activity is unable to take place as site is subtidal in nature.**	N	
Static - pots/traps	**Static - pots/traps**	Pots/creels (crustacea/gastropods)	Y	No more than ten vessels. Exact number of vessels is unknown. Light to moderate activity.	Local IFCO	**N/A**		Y	Medium

		Cuttle pots	N	It is not known if the activity occurs within the site.	Local IFCO	**Y**	**Vessels deploy cuttle fish pots within the surrounding area of Poole Bay. It is therefore possible that the activity occurs within the site. The site is relatively far from the shore however which may make it less suitable for the activity.**	Y	Medium
		Fish traps	N		Local IFCO	**N**	**Activity has not historically occurred within the site and is not anticipated to occur. No known target species occur within the site. It is therefore anticipated that the activity will not occur in the future.**	N	
Demersal nets/lines	**Static - fixed nets**	Gill nets	Y	Activity is known to occur but at unknown levels and location.	Local IFCO	**N/A**		Y	Medium
		Trammels	Y	See above.	Local IFCO	**N/A**		Y	Medium
		Entangling	Y	See above.	Local IFCO	**N/A**		Y	Medium
Pelagic nets/lines	**Passive - nets**	Drift nets (pelagic)	N	It is not known if the activity occurs within the site.	Local IFCO	**Y**	**The activity is known to occur within the surrounding area of Poole Bay and therefore it is possible that it could occur within the site. There is very limited, if no, interaction with the designated features of the sites as the activity is pelagic.**	N	

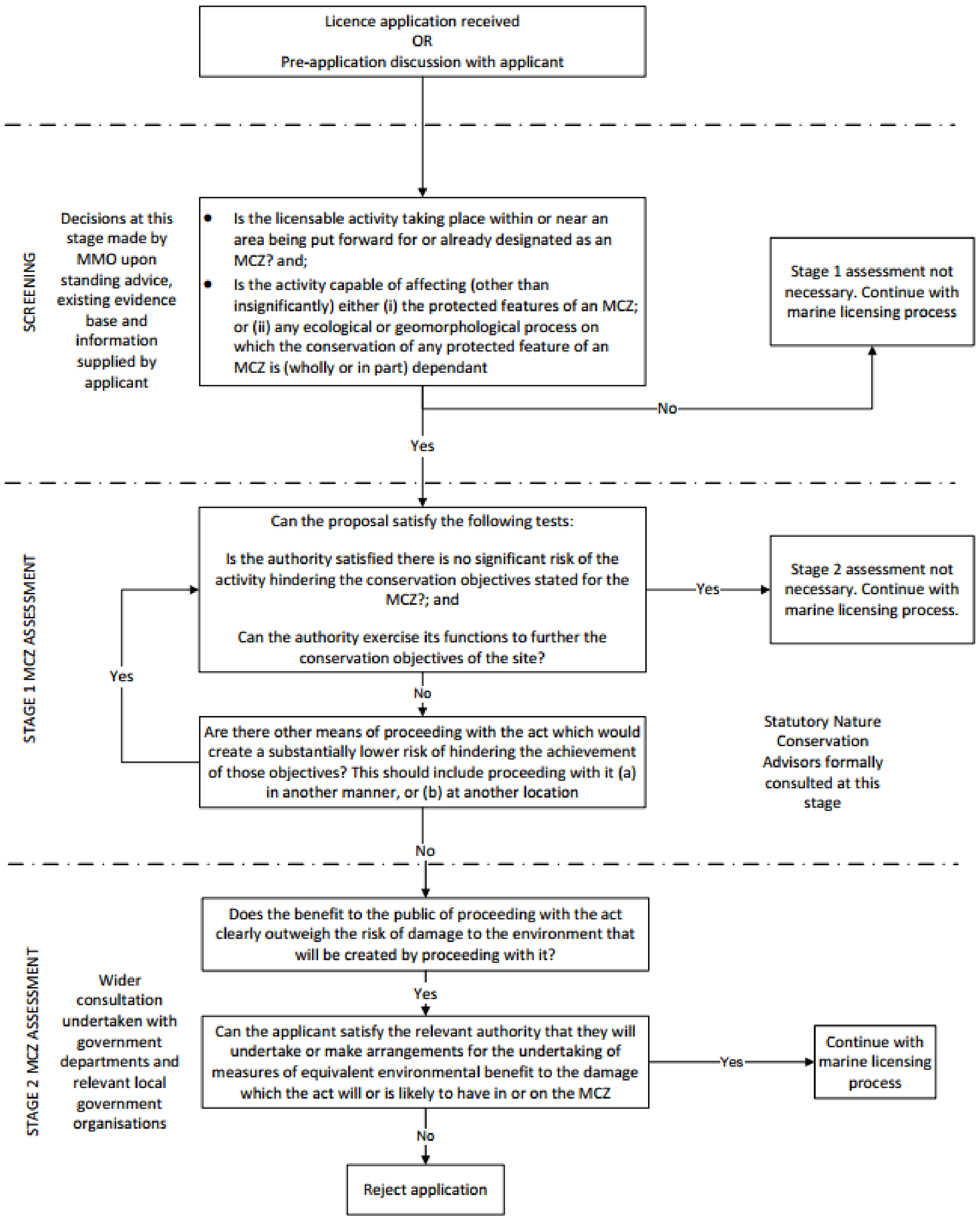
Demersal nets/lines		Drift nets (demersal)	N		Local IFCO	**N**	**The activity is not known to occur within the site or surrounding area of Poole Bay. Based on the nature of areas of the seabed within the site (circalittoral rock) it is unlikely that gear type would be compatible due to snagging. It is therefore anticipated there is limited potential for the activity to occur and is not anticipated to occur in the future.**	N	
	Lines	Longlines (demersal)	N		Local IFCO	**Y**	**The activity is not known to occur within the site or the surrounding area of Poole Bay. The activity does however have the potential to occur.**	Y	Low
Pelagic nets/lines		Longlines (pelagic)	N		Local IFCO	**Y**	**The activity is not known to occur within the site or the surrounding area of Poole Bay. The activity does however have the potential to occur.**	Y	Low
		Handlines (rod/gurdy etc)	Y	Large numbers of recreational anglers - up to 10/15 at any one time. Activity occurs throughout the site. Activity occurs all year round.	Local IFCO	**Y**	**The activity is known to occur within the site however this gear type is only likely to come into contact with the Couch's goby and not likely to interact with other designated features of the site.**	Y	Low

		Jigging/trolling	Y	See above.	Local IFCO	**Y**	**The activity is known to occur within the site however this gear type is only likely to come into contact with the Couch's goby and not likely to interact with other designated features of the site.**	Y	Low
Purse seine	**Seine nets and other**	Purse seine	N		Local IFCO	**N**	**The activity has not historically occurred within the site or surrounding area of Poole Bay. Although the activity has the potential to occur, it is not anticipated to occur in the future due to the lack of historical activity.**	N	
Demersal nets/lines		Beach seines/ring nets	N		Local IFCO	**N**	**The activity is unable to take place as site is subtidal in nature.**	N	
Miscellanous		Shrimp push-nets	N		Local IFCO	**N**	**The activity is unable to take place as site is subtidal in nature.**	N	
EA Only		Fyke and stakenets	EA Only	EA Only	**EA Only**	**EA Only**	**EA Only**	EA Only	EA Only
Miscellaneous	**Miscellaneous**	Commercial diving	N		Local IFCO	**N**	**The activity has not historically occurred within the site. The main target species of commercial diving (king scallop) is also absent from the site (post-survey site report). It is therefore anticipated there is limited potential**	N	

							for the activity to occur and is not anticipated to occur in the future.		
Bottom towed fishing gear		Bait dragging	N		Local IFCO	**N**	**The activity is unable to take place in the site as the substrate present is not suitable for the activity, and as such, the target species are also not present. In addition, the activity has not historically occurred within the site. It is therefore anticipated there is no potential for the activity to occur and is not anticipated to occur in the future.**	N	
Miscellaneous		Crab tiling	N		Local IFCO		**The activity is unable to take place as site is subtidal in nature.**	N	
Intertidal work	**Bait collection**	Digging wth forks	N		Local IFCO		**The activity is unable to take place as site is subtidal in nature.**	N	

Annex 3. Summary of MMO assessment process for MCZs

N.B. This process will be integrated into the marine licensing process



Annex 4. Summary of Natural England's Advice on Operations for commercial fishing activities in Poole Rocks MCZ

Activity	Pressure	Habitats: Moderate energy circalittoral rock	Habitats: Subtidal mixed sediment	Species: Couch's goby (*Gobius couchi*)	Species: Native oyster (*Ostrea edulis*)	Risk profile
Traps	Above water noise					Low
Traps	Abrasion/disturbance of the substrate on the surface of the seabed	S	S		S	High to medium
Traps	Barrier to species movement					Low
Traps	Collision ABOVE water with static or moving objects not naturally found in the marine environment (e.g., boats, machinery, and structures)					Low
Traps	Collision BELOW water with static or moving objects not naturally found in the marine environment (e.g., boats, machinery, and structures)					Low

Traps	Deoxygenation	NS	NS	S	NS	Low
Traps	Hydrocarbon & PAH contamination. Includes those priority substances listed in Annex II of Directive 2008/105/EC.	NS	NS	IE	NS	Low
Traps	Introduction of light					Low
Traps	Introduction or spread of non-indigenous species	S	S	IE	S	Low
Traps	Litter	IE	IE	IE	IE	Low
Traps	Organic enrichment	S	IE		NS	Low
Traps	Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion	S	S		S	Low
Traps	Removal of non-target species	S	S		S	High to medium
Traps	Removal of target species	NA	NA			High to medium
Traps	Synthetic compound contamination (incl. pesticides, antifoulants, pharmaceuticals). Includes those priority substances listed in Annex II of Directive 2008/105/EC.	NS	NS	IE	NS	Low
Traps	Transition elements & organo-metal (e.g. TBT) contamination. Includes those priority substances listed in Annex II of Directive 2008/105/EC.	NS	NS	IE	NS	Low

Traps	Underwater noise changes			S		Low
Traps	Visual disturbance					Low

Legend:

S	Sensitive
NS	Not sensitive at this benchmark
IE	Insufficient evidence to assess
NA	Not applicable
	Not relevant

Annex 5. Gear intensity thresholds defined by different studies.

Study	**Gear Intensity Thresholds**
Eno *et al*., 2013	Heavy — Lifted daily, more than five pots per hectare (i.e. 100m by 100m) (equivalent to over 182,500 pot hauls per km^2 per year) Moderate — Lifted daily, two to four pots per hectare (equivalent to 73,000– 182,500 pot hauls per km^2 per year) Light — Lifted daily, less than two pots per hectare (equivalent to less than 73,000 pot hauls per km^2 per year) Single — Single accidental fishing event of a string
Young *et al*., 2013	Very high - 250+ pots per km^2/12 strings per km^2 High - 175-250 pots per km^2/9-11 strings per km^2 Moderate - 100-175 pots per km^2/6-8 strings per km^2 Low - 50-100 pots per km^2/3-5 strings per km^2 Very low - 0-50 pots per km^2/0-2 strings per km^2 None - 0 pots per km^2/0 strings per km^2
Stephenson *et al*., 2016	Low – 0 – 139 pots $month^{-1}$ km^{-2} (equivalent to 4170 pot hauls $month^{-1}$ km^{-2}, assuming 30 hauls per month) Medium – 140 – 187 pots $month^{-1}$ km^{-2} High – 188 – 265 pots $month^{-1}$ km^{-2} (equivalent to 7950 pot hauls $month^{-1}$ km^{-2}, assuming 30 hauls per month)
Rees *et al*., 2016	Low – 5 – 10 pots 0.25 km^{-2} (equivalent to 20-40 pots per km^{-2}) Medium – 15 – 25 pots 0.25 km^{-2} (equivalent to 60-100 pots per km^{-2}) High – 30+ pots 0.25 km^{-2} (equivalent to 120 pots per km^{-2})